JUDGE FORREST

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK

SONY CORPORATION, Plaintiff, v. MIZCO INTERNATIONAL INC., Defendant.	11 CV 9250 Civil Action No.: COMPLAINT AND JURY DEMAND

Plaintiff Sony Corporation ("Sony") alleges as follows, with knowledge as to its own actions and upon information and belief as to the activities of others:

JURISDICTION AND VENUE

1. This action arises under the federal Trademark Act, 15 U.S.C. § 1051 *et seq.*, the patent laws of the United States of America, 35 U.S.C. § 1, *et seq.* and related state statutes and the common law. This Court has jurisdiction under 15 U.S.C. § 1121, 28 U.S.C. § 1338(a) and (b), and 28 U.S.C. § 1367(a).

2. This Court has personal jurisdiction over Mizco because Mizco is a corporation organized and existing under the laws of the State of New York, and has continuous, systematic, and substantial business contacts in this judicial district.

3. Venue is proper in this judicial district pursuant to 28 U.S.C. §§ 1391 (b) and (c) and § 1400(b).

PARTIES

4. Plaintiff Sony is a corporation organized and existing under the laws of Japan with offices at 1-7-1 Konan, Minato-ku, Tokyo, 108-0075, Japan.

5. Defendant Mizco International Inc. ("Mizco") is a corporation organized and existing under the laws of the State of New York with a principal executive office at 140 58 Street, Building B #1F, Brooklyn, New York 11220.

6. Mizco markets, distributes, offers for sale and sells mobile phone accessories, power supply solutions, and travel related products to customers through distributors throughout the United States, including in the State of New York.

7. Mizco markets, distributes, offers for sale and sells power supply solutions, including at least some of the accused batteries as set forth below, in this judicial district, including through Best Buy retail outlets in Manhattan and through Best Buy's website.

8. Mizco has been, and presently is, regularly doing business in the State of New York, and in this judicial district.

SONY'S BUSINESS, TRADEMARKS, AND PATENTS

9. Sony is one of the world's best known consumer electronics companies, renowned for its innovative and high-quality products which result from Sony's unparalleled investment in developing its products.

10. As a result of its substantial development efforts, and in order to address technological problems that arise as a first generation product developer, Sony frequently invents new features that advance the relevant technological art.

11. As a result of its development and promotional efforts, Sony's consumer electronic products, including cameras, camcorders and batteries are sought after by consumers looking for the newest and best products.

12. Sony's development continues to lead the field in developing forward thinking solutions. In the field of batteries, this includes novel features allowing, for example, expanded

battery capacity and connection schemes that ensure a proper fit and compatibility with the device for which the batteries are intended.

13. Sony owns a variety of utility and design patents for it innovative batteries which entitle Sony to exclusive use of the claimed features.

14. Sony's exclusive rights to the innovative technological and design features of its batteries are embodied at least in United States Patent Numbers 7,306,878 ("the '878 Patent"); 7,485,394 ("the '394 Patent"); 7,679,318 ("the '318 Patent"); D503,922 ("the '922 Patent"); D608,276 ("the '276 Patent"); D619,959 ("the '959 Patent"); D635,512 ("the '512 Patent") and D646, 222 ("the '222 Patent"); true and correct copies of these patents are attached as Exhibits A – H, respectively.

15. The '878 Patent, entitled "Battery Device And Electronic Apparatus," was issued on December 11, 2007, and is in full force and effect.

16. The '394 Patent, entitled "Battery Having A Case With An Identification Recess And Guide Grooves For Coupling To An Electronic Device," was issued on February 3, 2009, and is in full force and effect.

17. The '318 Patent, entitled "Battery Device," was issued on March 16, 2010, and is in full force and effect.

18. The '922 Patent, entitled "Battery," was issued on April 12, 2005, and is in full force and effect.

19. The '276 Patent, entitled "Battery," was issued on January 19, 2010, and is in full force and effect.

20. The '959 Patent, entitled, "Battery," was issued on July 20, 2010, and is in full force and effect.

21. The '512 Patent, entitled "Battery", was issued on April 5, 2011, and is in full force and effect.

22. The '222 Patent, entitled "Battery," was issued on October 4, 2011, and is in full force and effect.

23. Sony is the owner by assignment of all rights, title, and interest in and to the '878 Patent, the '394 Patent, the '318 Patent, the '922 Patent, the '276 Patent, the '959 Patent, the '512 Patent and the '222 Patent and possesses all rights of recovery thereunder, including the right to sue for infringement and recover past damages.

24. Sony's products are sold worldwide under its SONY trademark, its rights in which are partially evidenced by United States Trademark Registration No. 1,622,127 for, among other goods, batteries ("the '127 Registration").

25. The '127 Registration is incontestable pursuant to 15 U.S.C. § 1065 and, pursuant to 15 U.S.C. § 1115, is evidence of the validity of the mark, of Sony's ownership of the mark, and of Sony's exclusive right to use and license the marks throughout the United States.

26. As a result of the long, extensive and widespread use of the SONY trademark, the general consuming public in the United States recognizes the SONY trademark as exclusively associated with Sony.

27. The SONY trademark is famous in the United States by virtue of its wide recognition by the general public of the United States as a designation of source of Sony's goods and services.

28. As a result of Sony's position as a leader in the consumer electronic industry, its products are frequently copied to take advantage, both lawfully and unlawfully, of Sony's innovations.

29. The SONY trademark is also used by competitors in order to create an association with Sony in the minds of the consumers.

MIZCO'S ACTIVITIES

30. Mizco claims to have been creating and manufacturing a line of mobile phone accessories, power supply solutions, and travel related products for over 20 years.

31. While Mizco may create and manufacture mobile phone accessories, power supply solutions and travel related products, it does not create and/or manufacture mobile phones or the products that use its "power supply solutions."

32. Instead, Mizco's power supply solutions are intended replace the power supplies provided by the manufacturer of products such as cameras and camcorders.

33. Among the brands Mizco uses to sell its "power supply solutions" is its DIGIPOWER brand.

34. Using the DIGIPOWER brand, Mizco offers a number of replacement batteries for consumer electronic products, including replacement batteries for products sold by Sony.

35. Among the batteries Mizco offers to replace batteries in Sony products are batteries model number BP-NPV50 ("NPV50 Battery"), BP-SNV50 ("SNV50 Battery"), BP-FH50 ("FH50 Battery"), BP-FW50 ("FW50 Battery), BP-BN1 ("BN1 Battery"), BP-BG1 ("BG1 Battery"), and BP-FG1 ("FG1 Battery").

36. Mizco infringes one or more claims of the '878 Patent by making, using, selling, offering to sell, and/or importing in the United States Mizco's NPV50 Battery, SNV50 Battery, and FH50 Battery in violation of 35 U.S.C. § 271. Mizco's NPV50 Battery, SNV50 Battery, and FH50 Battery are covered by one or more claims of the '878 Patent. Mizco's acts of infringement have been willful under 35 U.S.C. § 284 since at least as early as September 1,

2011, when Mizco received actual notice of the '878 Patent and its applicability to the NPV50 Battery.

37. Mizco infringes one or more claims of the '394 Patent by making, using, selling, offering to sell, and/or importing in the United States Mizco's NPV50 Battery, SNV50 Battery, and FH50 Battery in violation of 35 U.S.C. § 271. Mizco's NPV50 Battery, SNV50 Battery, and FH50 Battery are covered by one or more claims of the '394 Patent. Mizco's acts of infringement have been willful under 35 U.S.C. § 284 since at least as early as September 1, 2011, when Mizco received actual notice of the '394 Patent and its applicability to the NPV50 Battery.

38. Mizco infringes the claim of the '922 Patent by making, using, selling, offering to sell, and/or importing in the United States Mizco's NPV50 Battery, SNV50 Battery, and FH50 Battery in violation of 35 U.S.C. § 271. Mizco's NPV50 Battery, SNV50 Battery, and FH50 Battery are covered by the ornamental design claimed in the '922 Patent. Mizco's acts of infringement have been willful under 35 U.S.C. § 284 since at least as early as September 1, 2011, when Mizco received actual notice of the '922 Patent and its applicability to the NPV50 Battery.

39. Mizco infringes one or more claims of the '318 Patent by making, using, selling, offering to sell, and/or importing in the United States Mizco's FW50 Battery in violation of 35 U.S.C. § 271. Mizco's FW50 Battery is covered by one or more claims of the '318 Patent. Mizco's acts of infringement have been willful under 35 U.S.C. § 284 since at least as early as September 1, 2011, when Mizco received actual notice of the '318 Patent and its applicability to the FW50 Battery.

40. Mizco infringes the claim of the '512 Patent by making, using, selling, offering to sell, and/or importing in the United States Mizco's BN1 Battery in violation of 35 U.S.C. § 271. Mizco's BN1 Battery is covered by the ornamental design claimed in the '512 Patent. Mizco's acts of infringement have been willful under 35 U.S.C. § 284 since at least as early as September 1, 2011, when Mizco received actual notice of the '512 Patent and its applicability to the BN1 Battery.

41. Mizco infringes the claim of the '222 Patent by making, using, selling, offering to sell, and/or importing in the United States Mizco's BN1 Battery in violation of 35 U.S.C. § 271. Mizco's BN1 Battery is covered by the ornamental design claimed in the '222 Patent.

42. Mizco infringes the claim of the '276 Patent by making, using, selling, offering to sell, and/or importing in the United States Mizco's BG1 Battery and FG1 Battery in violation of 35 U.S.C. § 271. Mizco's BG1 Battery and FG1 Battery are covered by the ornamental design claimed in the '276 Patent. Mizco's acts of infringement have been willful under 35 U.S.C. § 284 since at least as early as September 1, 2011, when Mizco received actual notice of the '276 Patent and its applicability to the BG1 Battery.

43. Mizco infringes the claim of the '959 Patent by making, using, selling, offering to sell, and/or importing in the United States Mizco's BG1 Battery and FG1 Battery in violation of 35 U.S.C. § 271. Mizco's BG1 Battery and FG1 Battery are covered by the ornamental design claimed in the '959 Patent. Mizco's acts of infringement have been willful under 35 U.S.C. § 284 since at least as early as September 1, 2011, when Mizco received actual notice of the '959 Patent and its applicability to the BG1 Battery.

44. Mizco has marketed, distributed, offered for sale, and sold its products using the SONY trademark. It continues to engage in these activities today.

45. Mizco's use of the SONY trademark appears prominently on the front of its products designed to replace Sony products.

46. The use of the SONY trademark is more prominent than, and overshadows, the use of Mizco's DIGIPOWER brand. The prominence of the SONY trademark is evidenced in part by the use of a distinctive, bold color that is not used in connection with any other text on the packaging and which appears significantly larger than the surrounding text.

47. The prominent use of the SONY trademark is deliberate and intentional and designed to create confusion and mistake and to deceive persons into the incorrect belief that Mizco or its products are genuine products sold by Sony or that Mizco or its products are authorized by Sony or are endorsed by Sony or are connected in some way with Sony.

48. Mizco's intent is evidenced in part by its use of model numbers that are designed to mimic those of Sony. Mizco takes no affirmative steps to reduce the confusion caused by its use of the SONY trademark.

49. Mizco has used the SONY trademark more than is reasonably necessary to identify the products which Mizco intends to replace.

50. Mizco's use of the SONY trademark does not reflect the true and accurate relationship between Mizco and Sony.

51. Mizco's use of the SONY trademark has caused actual confusion among sophisticated customers. This actual confusion has resulted in Mizco products being sold as, and accounted for as, Sony products.

52. Mizco's use of the Sony trademark falsely designates the origin of Mizco's products and constitutes false descriptions and representations to the effect that Mizco's products

are genuine products sold by Sony or that Mizco or its products are authorized by Sony or are endorsed by Sony or are sponsored by Sony or are connected in some way with Sony.

53. Mizco's use of the SONY trademark is identical to Sony's use of its SONY trademark, or so similar to Sony's use of its SONY trademark that consumers will believe them to be identical, and is used in connection with the same or highly related goods so that consumer confusion will inevitably occur.

54. Mizco's use of the SONY trademark knowingly and willfully trades off the goodwill established in Sony's quality products.

55. Mizco, by its acts complained of herein, has infringed and continues to infringe the SONY trademark, diluted and continues to dilute the unique commercial impression of the famous SONY trademark, unfairly competed and continues to unfairly compete with Sony in the marketplace, and otherwise improperly used and continues to use the reputation and goodwill of Sony to promote its goods and services, which are not connected with, or approved by, Sony.

56. As a result of Mizco's acts set forth herein, the consuming public and trade will likely be confused as to the source and origin of the goods sold in connection with Mizco's use of the SONY trademark, mistakenly associating the goods offered by Mizco with those of Sony.

57. Mizco's use of the SONY trademark was deliberate and intentional and designed to dilute the distinctive quality of Sony trademarks. Mizco had knowledge of Sony's prior rights in the SONY trademark.

58. The aforesaid acts of Mizco have caused and, unless restrained and enjoined by this Court, will continue to cause irreparable damage, loss and injury to Sony, for which Sony has no adequate remedy at law.

CLAIMS FOR RELIEF

COUNT I
PATENT INFRINGEMENT
(Infringement of the '878 Patent)

59. Sony repeats and realleges the allegations of paragraphs 1 through 58 as if set forth herein.

60. Mizco has infringed and continues to infringe one or more claims of the '878 Patent by using, selling and/or offering to sell, in the United States and/or importing into the United States products identified in this Complaint.

61. Mizco's infringing activities violate 35 U.S.C. § 271.

62. Since at least as early as September 1, 2011, Mizco's infringement has been willful pursuant to 35 U.S.C. § 284.

63. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

64. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT II
PATENT INFRINGEMENT
(Infringement of the '394 Patent)

65. Sony repeats and realleges the allegations of paragraphs 1 through 64 as if set forth herein.

66. Mizco has infringed and continues to infringe one or more claims of the '394 Patent by using, selling and/or offering to sell, in the United States and/or importing into the United States products identified in this Complaint.

67. Mizco's infringing activities violate 35 U.S.C. § 271.

68. Since at least as early as September 1, 2011, Mizco's infringement has been willful pursuant to 35 U.S.C. § 284.

69. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

70. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT III
PATENT INFRINGEMENT
(Infringement of the '318 Patent)

71. Sony repeats and realleges the allegations of paragraphs 1 through 70 as if set forth herein.

72. Mizco has infringed and continues to infringe one or more claims of the '318 Patent by using, selling and/or offering to sell, in the United States and/or importing into the United States products identified in this Complaint.

73. Mizco's infringing activities violate 35 U.S.C. § 271.

74. Since at least as early as September 1, 2011, Mizco's infringement has been willful pursuant to 35 U.S.C. § 284.

75. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

76. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT IV
PATENT INFRINGEMENT
(Infringement of the '922 Patent)

77. Sony repeats and realleges the allegations of paragraphs 1 through 76 as if set forth herein.

78. Mizco has infringed and continues to infringe the claim of the '922 Patent by using, selling and/or offering to sell, in the United States and/or importing into the United States products identified in this Complaint.

79. Mizco's infringing activities violate 35 U.S.C. § 271.

80. Since at least as early as September 1, 2011, Mizco's infringement has been willful pursuant to 35 U.S.C. § 284.

81. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

82. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT V
PATENT INFRINGEMENT
(Infringement of the '276 Patent)

83. Sony repeats and realleges the allegations of paragraphs 1 through 82 as if set forth herein.

84. Mizco has infringed and continues to infringe one or more claims of the '276 Patent by using, selling and/or offering to sell, in the United States and/or importing into the United States products identified in this Complaint.

85. Mizco's infringing activities violate 35 U.S.C. § 271.

86. Since at least as early as September 1, 2011, Mizco's infringement has been willful pursuant to 35 U.S.C. § 284.

87. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

88. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT VI
PATENT INFRINGEMENT
(Infringement of the '959 Patent)

89. Sony repeats and realleges the allegations of paragraphs 1 through 88 as if set forth herein.

90. Mizco has infringed and continues to infringe one or more claims of the '959 Patent by using, selling and/or offering to sell, in the United States and/or importing into the United States products identified in this Complaint.

91. Mizco's infringing activities violate 35 U.S.C. § 271.

92. Since at least as early as September 1, 2011, Mizco's infringement has been willful pursuant to 35 U.S.C. § 284.

93. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

94. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT VII
PATENT INFRINGEMENT
(Infringement of the '512 Patent)

95. Sony repeats and realleges the allegations of paragraphs 1 through 94 as if set forth herein.

96. Mizco has infringed and continues to infringe one or more claims of the '512 Patent by using, selling and/or offering to sell, in the United States and/or importing into the United States products identified in this Complaint.

97. Mizco's infringing activities violate 35 U.S.C. § 271.

98. Since at least as early as September 1, 2011, Mizco's infringement has been willful pursuant to 35 U.S.C. § 284.

99. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

100. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT VIII
PATENT INFRINGEMENT
(Infringement of the '222 Patent)

101. Sony repeats and realleges the allegations of paragraphs 1 through 100 as if set forth herein.

102. Mizco has infringed and continues to infringe one or more claims of the '222 Patent by using, selling and/or offering to sell, in the United States and/or importing into the United States products identified in this Complaint.

103. Mizco's infringing activities violate 35 U.S.C. § 271.

104. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

105. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT IX
INFRINGEMENT OF A REGISTERED TRADEMARK (FEDERAL)

106. Sony repeats and realleges the allegations of paragraphs 1 through 105 as if set forth herein.

107. Mizco's unlawful and improper actions, as set forth above, are likely to cause confusion, mistake, or deception as to the source, origin, affiliation, association, or sponsorship of Mizco's goods and services and falsely mislead consumers into believing that Mizco's goods originate from, are affiliated or connected with, or approved by, Sony.

108. Accordingly, Mizco's use of the SONY trademark constitutes infringement of Sony's registered trademarks, in violation of the Lanham Act, 15 U.S.C. § 1114.

109. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

110. Mizco has engaged and continues to engage in these activities willfully, so as to justify the assessment of treble damages and attorneys' fees under 15 U.S.C. § 1117.

111. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT X
TRADEMARK INFRINGEMENT AND UNFAIR COMPETITION (FEDERAL)

112. Sony repeats and realleges the allegations of paragraphs 1 through 111 as if set forth herein.

113. Mizco's unlawful and improper actions, as set forth above, are likely to cause confusion, mistake, or deception as to the source, origin, or sponsorship of Mizco's goods, and to falsely mislead consumers into believing that Mizco's goods originate from, are affiliated or connected with, or are approved by, Sony.

114. Accordingly, Mizco's activities constitute an infringement of the SONY trademark and unfair competition in violation of 15 U.S.C. § 1125(a).

115. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

116. Mizco has engaged and continues to engage in these activities willfully, so as to justify the assessment of treble damages and attorneys' fees under 15 U.S.C. § 1117.

117. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT XI
TRADEMARK DILUTION (FEDERAL)

118. Sony repeats and realleges the allegations of paragraphs 1 through 117 as if set forth herein.

119. The SONY trademark is famous in accordance with the standard set forth in 15 U.S.C. § 1125(c), and the SONY trademark became famous long before Mizco began using it.

120. Mizco's adoption of the SONY trademark and its use in commerce is likely to dilute, and has diluted, the distinctive quality of the famous SONY trademark in violation of 15 U.S.C. § 1125(c).

121. Mizco's acts of infringement have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

122. Mizco has engaged and continues to engage in these activities willfully, so as to justify the assessment of treble damages and attorneys' fees under 15 U.S.C. § 1117.

123. Mizco's acts of infringement, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

COUNT XII
VIOLATION OF NEW YORK GENERAL BUSINESS LAW § 360-l

124. Sony repeats and realleges the allegations of paragraphs 1 through 123 as if set forth herein.

125. Mizco's acts are diluting and are likely to continue diluting Sony's distinctive SONY trademark. Mizco's acts also injure the business reputation of Sony, in violation of Sony's rights under New York General Business Law § 360-l.

126. Mizco's violations of New York General Business Law § 360-l have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

127. Mizco's violations of New York General Business Law § 360-l, unless enjoined by this Court, will continue to cause Sony to sustain irreparable harm, for which Sony has no adequate remedy at law.

COUNT XIII
UNFAIR COMPETITION (COMMON LAW)

128. Sony repeats and realleges the allegations of paragraphs 1 through 127 as if set forth herein.

129. Mizco has infringed Sony's mark as alleged herein with the intent to deceive the public into believing that goods sold by Mizco are made by, approved by, sponsored by or affiliated with, Sony. Mizco's acts as alleged herein were committed with the intent to pass off and palm off Mizco's goods as the goods of Sony, and with the intent to deceive and defraud the public. Mizco's activities complained of herein constitute forms of unfair competition under New York State common law.

130. Mizco's aforesaid violations of New York State common law have caused Sony to sustain monetary damage, loss and injury, in an amount to be determined at trial.

131. Mizco fraudulently engaged, and continues to engage, in this activity willfully and wantonly with morally culpable behavior, so as to justify the assessment of punitive damages against it, in an amount to be determined at trial.

132. Mizco's aforesaid violations of New York State common law, unless enjoined by this Court, will continue to cause Sony to sustain irreparable damage, loss and injury, for which Sony has no adequate remedy at law.

PRAYER FOR RELIEF

WHEREFORE, Sony Corporation demands judgment against Defendant Mizco International Inc.:

A. A judgment that Mizco has infringed one or more claims of each of Sony's asserted patents.

B. A judgment that Mizco has infringed the SONY trademark.

C. A judgment that Mizco has diluted the SONY trademark.

D. A preliminary and permanent injunction against Mizco and each of its affiliates, officers, agents, servants, employees and attorneys, and all persons in active concert or participation with it who receive actual notice of the Order, by personal service or otherwise:

1. Restraining and enjoining Mizco from further acts of infringement of Sony's asserted patents.

2. Restraining and enjoining Mizco from using the SONY trademark, or any other reproduction, counterfeit, copy, colorable imitation or confusingly similar variation of the SONY trademark in any manner suggesting in any way that Mizco and/or its activities, services or products originate from, are affiliated with or authorized by Sony, or that Sony and/or its activities, services or products are affiliated in any way with Mizco.

3. Restraining and enjoining Mizco from using any other mark, term, slogan, tagline or phrase which suggests or tends to suggest in any way that Mizco and/or its activities, services or products originate from, are affiliated with, or authorized by, Sony, or that Mizco or its activities, services or products are affiliated in any way with Sony.

4. Restraining and enjoining Mizco from using and/or importing in connection with any goods or services, any false or deceptive designation, description or representation, whether by words or symbols, which suggests or implies any relationship with Sony or gives Mizco an unfair competitive advantage in the marketplace.

5. Restraining and enjoining Mizco from violating 35 U.S.C. § 271.

6. Restraining and enjoining Mizco from violating 15 U.S.C. § 1125(c).

7. Restraining and enjoining Mizco from engaging in any acts of common law trademark infringement, unfair competition or misappropriation which would damage or injure Sony.

8. Restraining and enjoining Mizco from inducing, encouraging, instigating, aiding, abetting, or contributing in any third party usage of the SONY trademark.

E. An order that Mizco deliver up to this Court for destruction all products infringing upon, directly or otherwise, any claim of Sony's asserted patents or the use of which would infringe, directly or otherwise, any claim of Sony's asserted patents.

F. That in accordance with 15 U.S.C. § 1118, all materials, packaging, labels, tags, pamphlets, brochures, signs, sales literature, stationery, advertisements, billboards, banners, posters, documents and the like in the possession or under the control of Mizco and its affiliates, and all plates, molds, matrices, negatives, masters and other means of making the same, which might, if used, violate the Order herein granted, be delivered up and destroyed as the Court shall direct.

G. That in accordance with 15 U.S.C. § 1116, Mizco files with the Court and serves on counsel for Sony within thirty (30) days after service on Mizco of such Order, or within such extended period as this Court may direct, a report in writing and under oath, setting forth in detail the manner and form in which Mizco has complied with the Order.

H. For an award of Mizco's profits or other advantages and Sony's damages resulting from Mizco's unlawful acts set forth herein, in an amount to be proven at the time of trial, together with legal interest from the date of accrual thereof.

I. For an award of treble damages, in an amount to be proven at the time of trial, pursuant to 15 U.S.C. § 1117.

J. For an award of treble damages, in an amount to be proven at the time of trial, pursuant to 35 U.S.C. § 284.

K. For an award of damages, in an amount of Mizco's total profits pursuant to 35 U.S.C. § 289.

L. For an award of exemplary and punitive damages and/or increased profits, in an amount to be proven at the time of trial.

M. For an award of attorneys' fees and disbursements incurred by Sony in this action.

N. For an award of costs of this action.

O. That Sony be awarded such other and further relief as the Court may deem equitable and proper.

JURY DEMAND

Sony demands trial by jury.

Respectfully submitted,

Dated: December 16, 2011

KENYON & KENYON LLP

By: _____

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EXHIBIT A

US007306878B2

(12) **United States Patent**
Takeshita et al.

(10) **Patent No.: US 7,306,878 B2**
(45) **Date of Patent: Dec. 11, 2007**

(54) **BATTERY DEVICE AND ELECTRONIC APPARATUS**

(75) Inventors: Toshio Takeshita, Kanagawa (JP); Kei Tashiro, Kanagawa (JP); Takeshi Kondou, Aichi (JP); Yoshihito Tamesue, Aichi (JP)

(73) Assignee: Sony Corporation, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 10/580,535

(22) PCT Filed: Dec. 24, 2004

(86) PCT No.: PCT/JP2004/019780

§ 371 (c)(1),
(2), (4) Date: Sep. 26, 2006

(87) PCT Pub. No.: WO2005/064708

PCT Pub. Date: Jul. 14, 2005

(65) **Prior Publication Data**

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H01M 2/10 (2006.01)

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(58) Field of Classification Search 429/96, 429/97, 99, 100, 123

See application file for complete search history.

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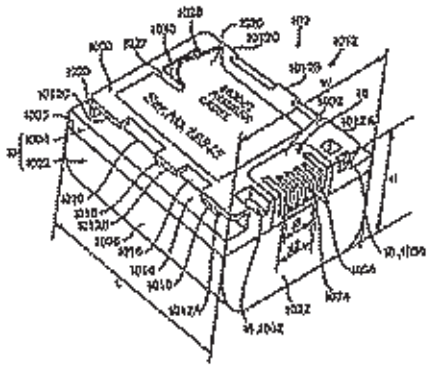
(57) **ABSTRACT**

A battery apparatus and electronic equipment, in which the battery apparatus having a characteristic compatible with the electronic equipment can be suitably attached to the electronic equipment, and which are advantageous in miniaturizing themselves and improving their operability. In a battery apparatus (100), an identification section (18) of the battery apparatus (100) serves to identify a characteristic of the battery apparatus (100), and which is provided on an end surface (1022) and on both sides of a battery-side terminal (14) in the width direction (W) of the battery apparatus (100). The identification section (18) is configured with identification recesses (1802), (1804) formed in a manner open to the end surface (1022), and at least one of the positions, cross-sectional shapes, and lengths on the end surface (1022) of the identification recesses (1802), (1804) is formed on the basis of the characteristic of the battery apparatus. In the identification (18), the cross-sectional shape and length of the identification recess (1802) is formed on the basis of the characteristic of the battery apparatus (100).

14 Claims, 17 Drawing Sheets



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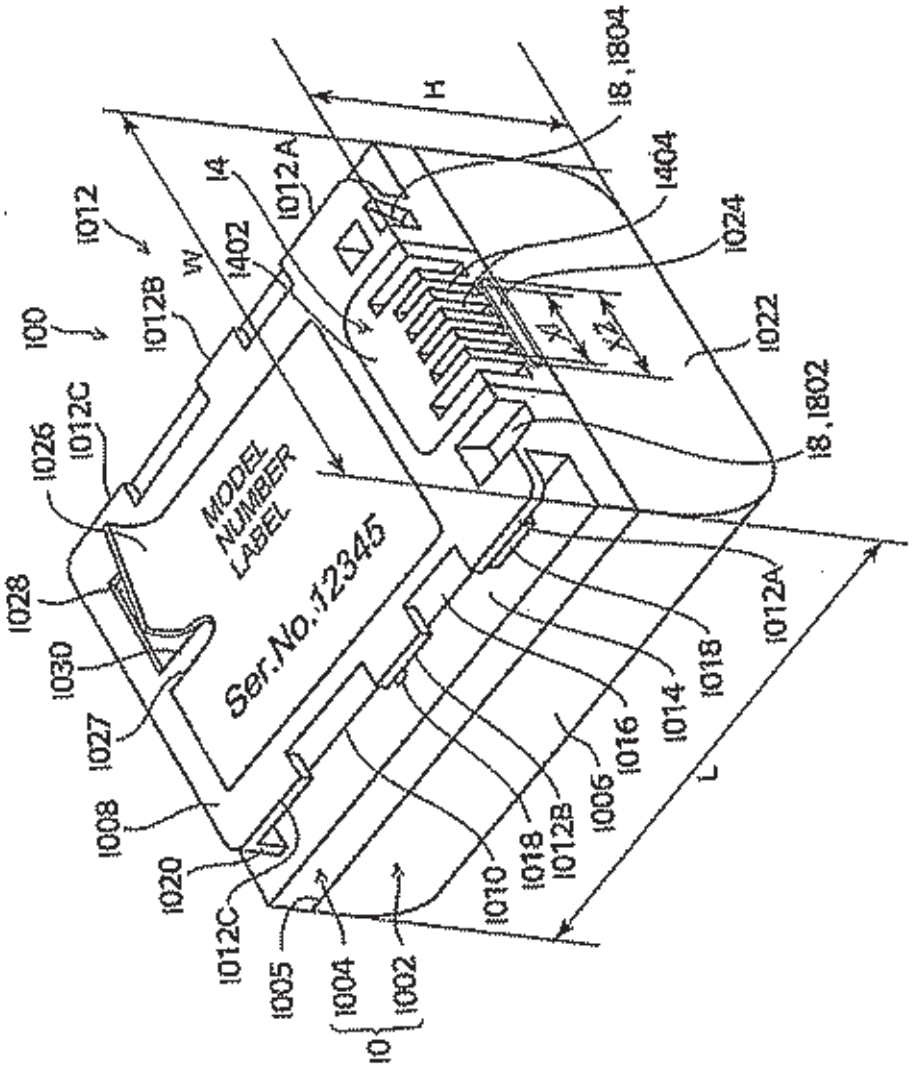
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H
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L
14
18,1804
18,1802
1404
1402
1012
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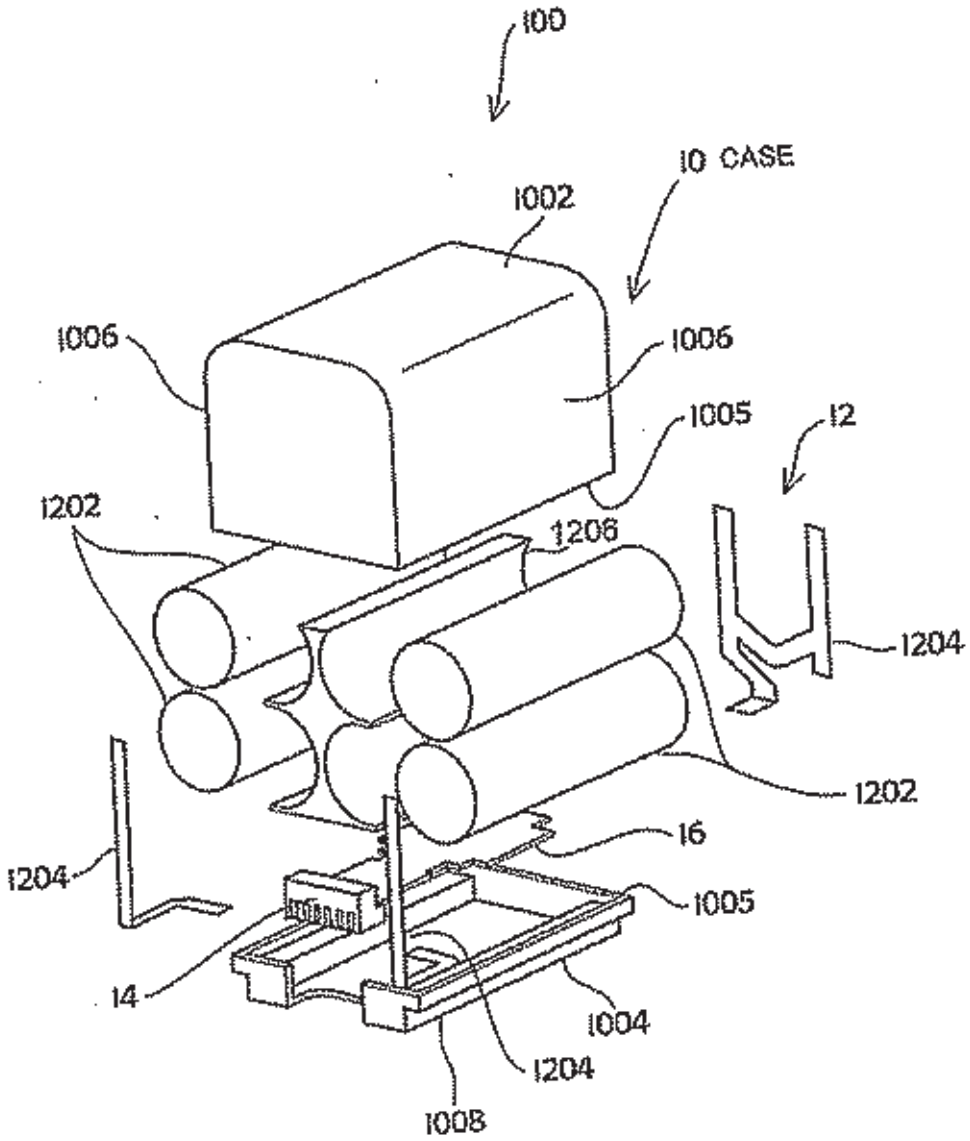
1012C
100
1022
1024
1026
1028
1030
1027
1008
1020
1005
1004
1002
10
1010
1018
1006
1016
1014

Fig.1


100
10 CASE
1002
1006
1006
1005
12
1202
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1204
1202
16
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1005
14
1004
1204
1008

Fig.2

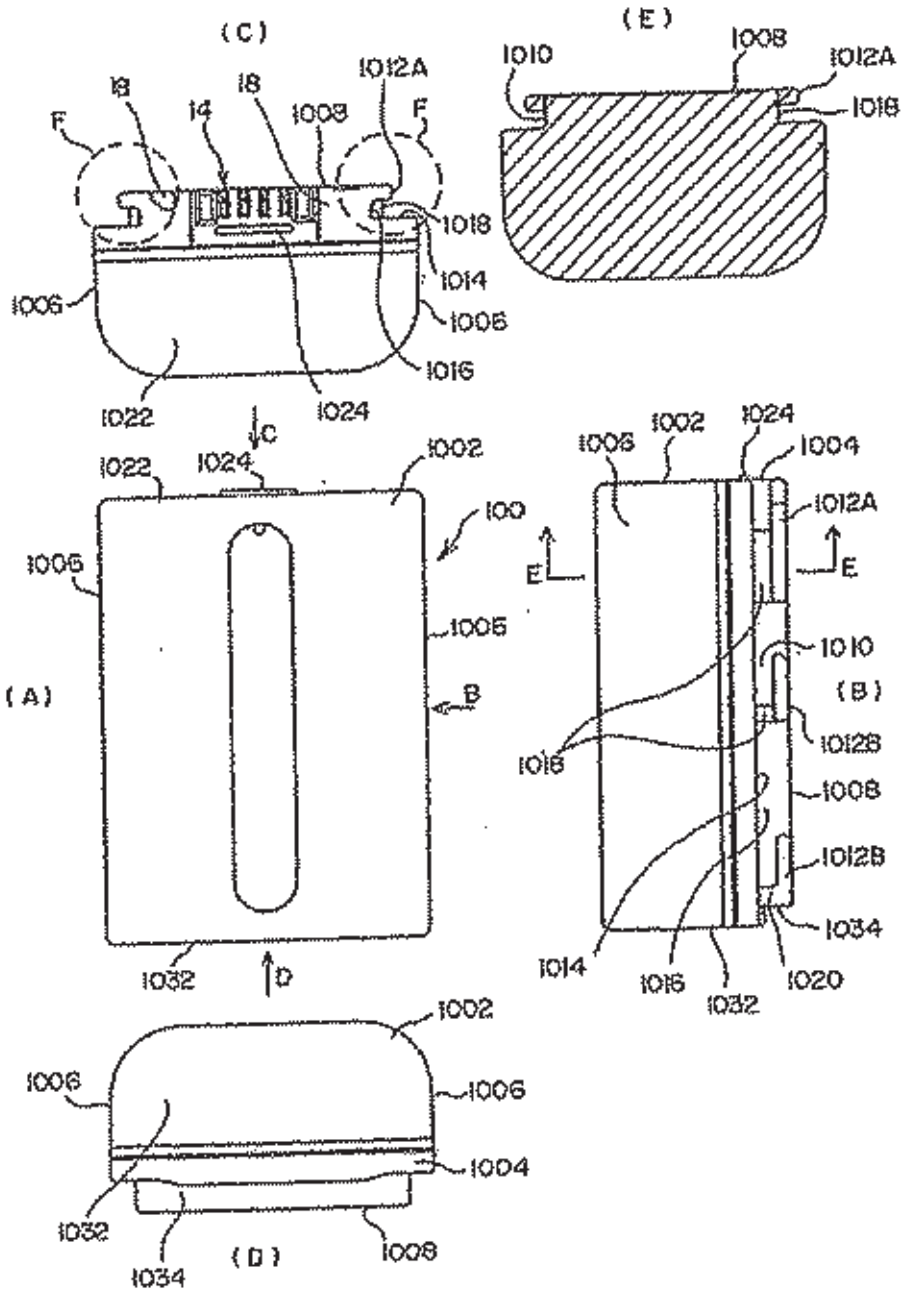

(C)
(E)
1012A
1010
1008
1018
F
18
14
1014
1006
1005
1016
1022
1024
C
1002
100
B
(A)
D
1032
1012B
1034
1020
(B)
(D)

Fig.3

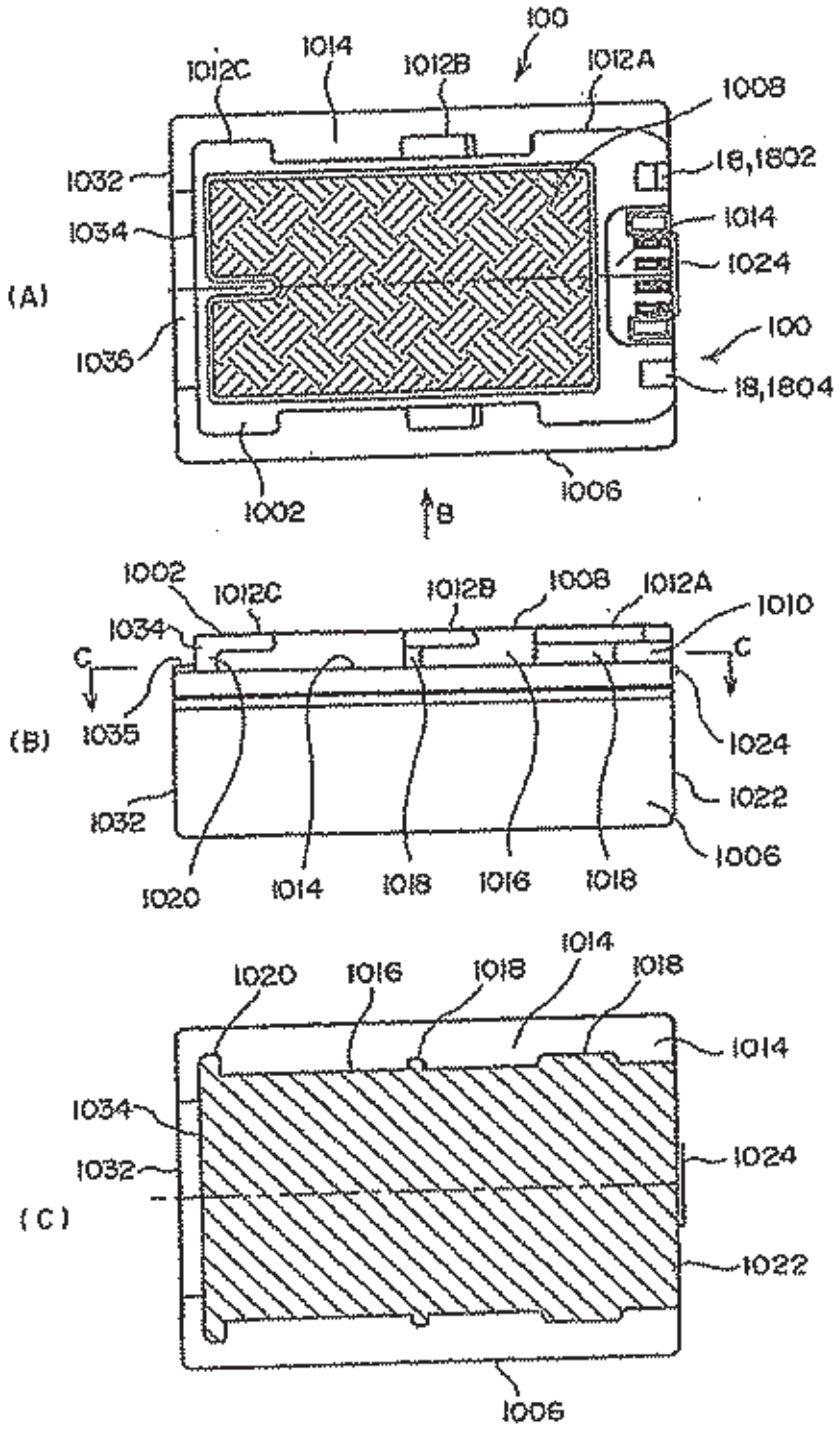
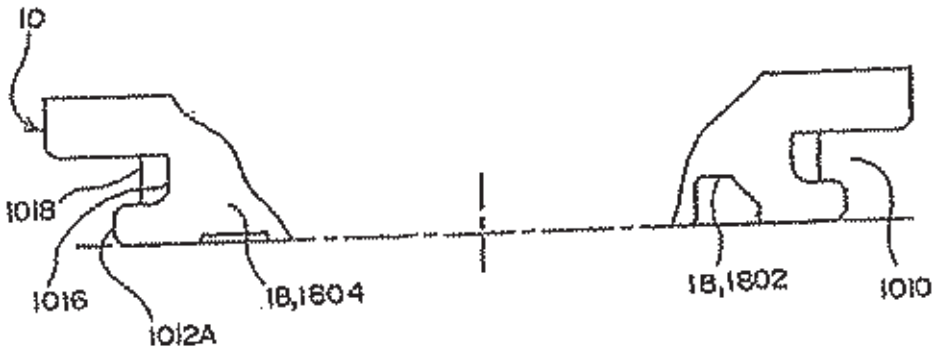

100
1012C
1014
1012B
1012A
1008
18,1802
1032
1034
1014
1024
(A)
100
1036
18,1804
1002
1006
B
1002
1012C
1012B
1008
1012A
1010
1034
C
C
(B)
1035
1024
1022
1032
1006
1020
1014
1018
1016
1018
1014
1020
1016
1018
1018
1014
1034
1024
1032
(C)
1022
1006

Fig.4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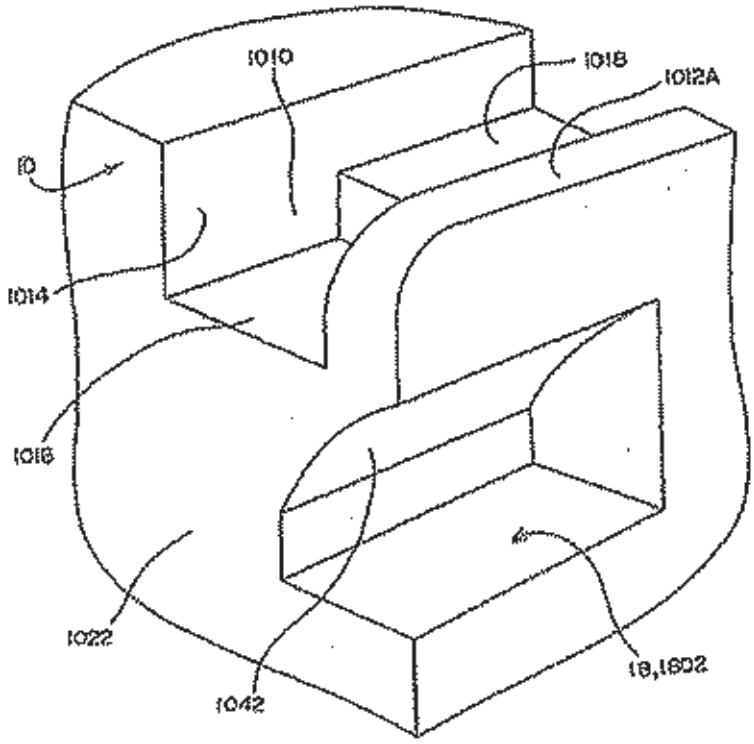
1018
1016
1012A
18,1804
18,1802
1010

Fig.5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1018
1012A
10
1014
1016
1022
1042
18,1802

Fig.6

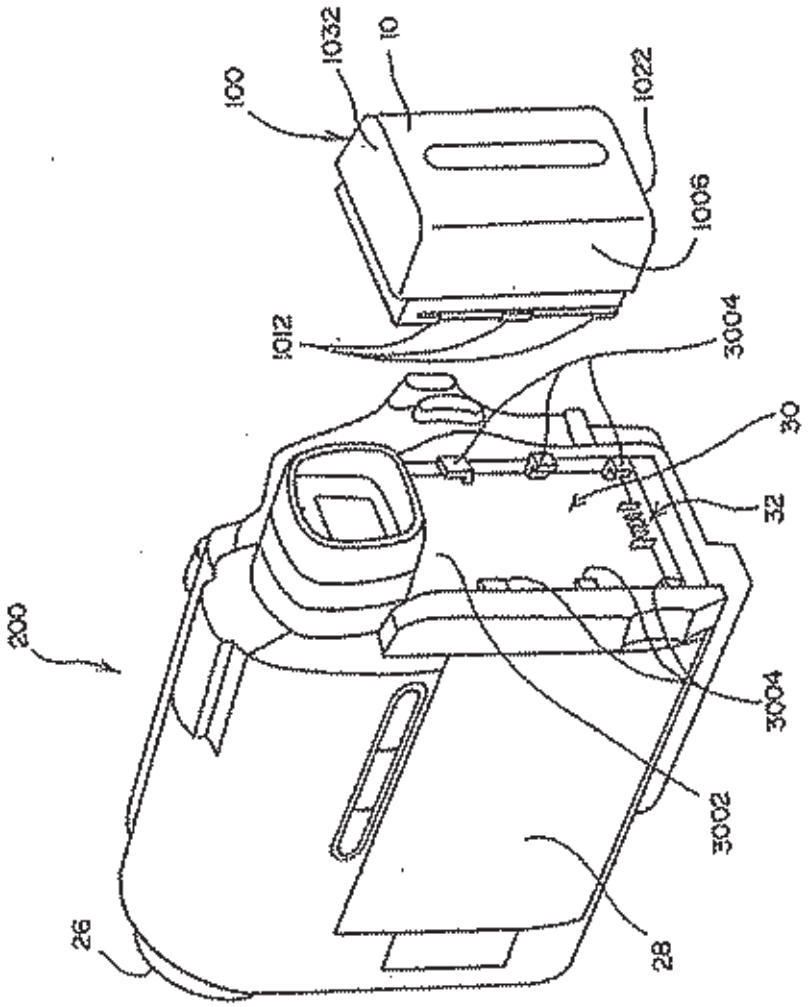


Fig.7

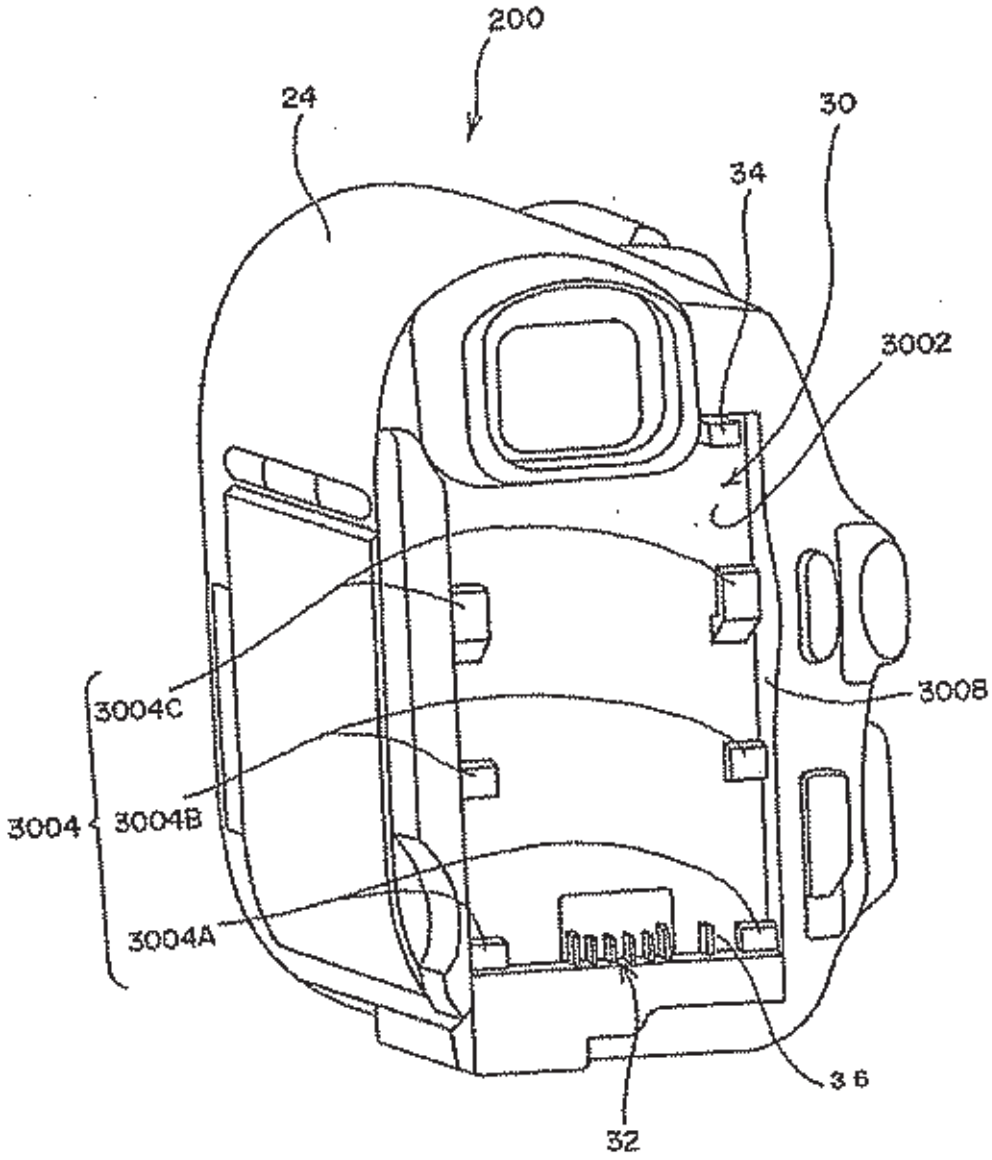


Fig.8

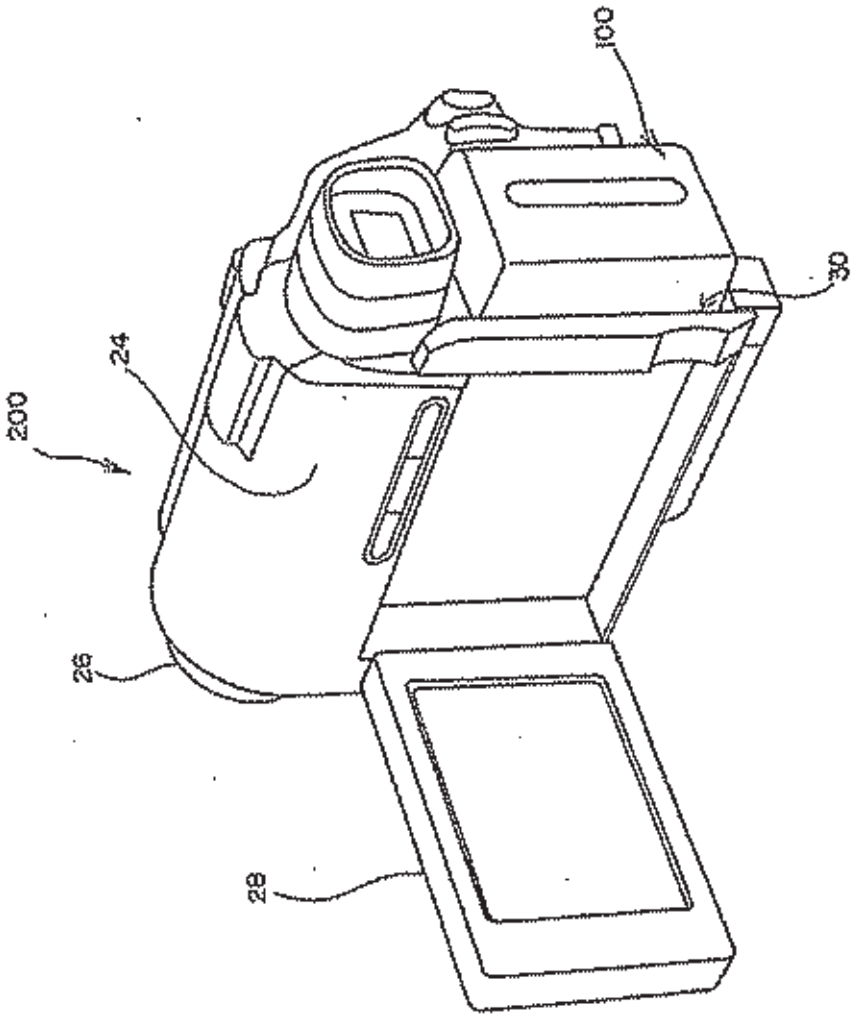


Fig.9

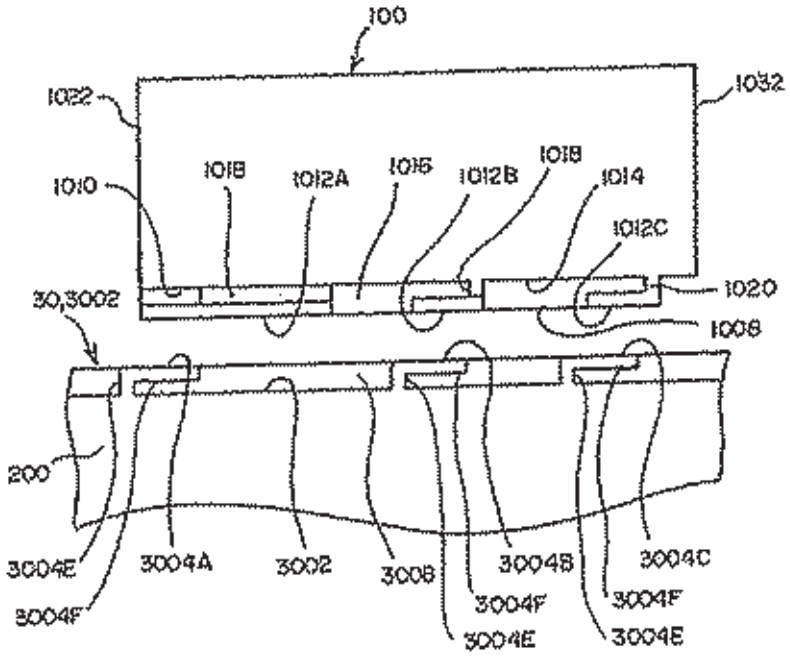
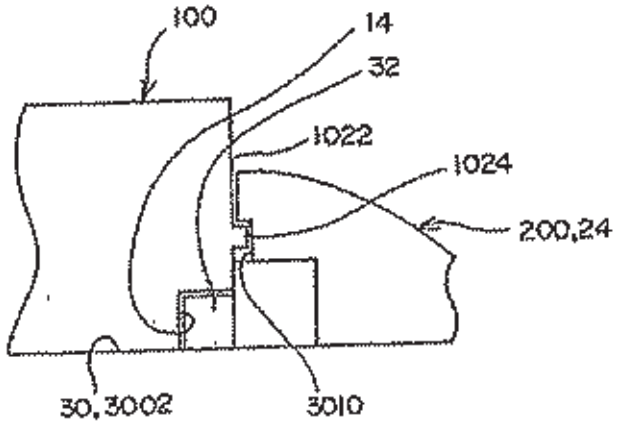

100
1022
1032
1010
1018
1012A
1016
1012B
1018
1014
1012C
30,3002
1020
1008
200
3004E
3004A
3002
3008
3004B
3004C
3004F
3004F
3004E
3004E

Fig.10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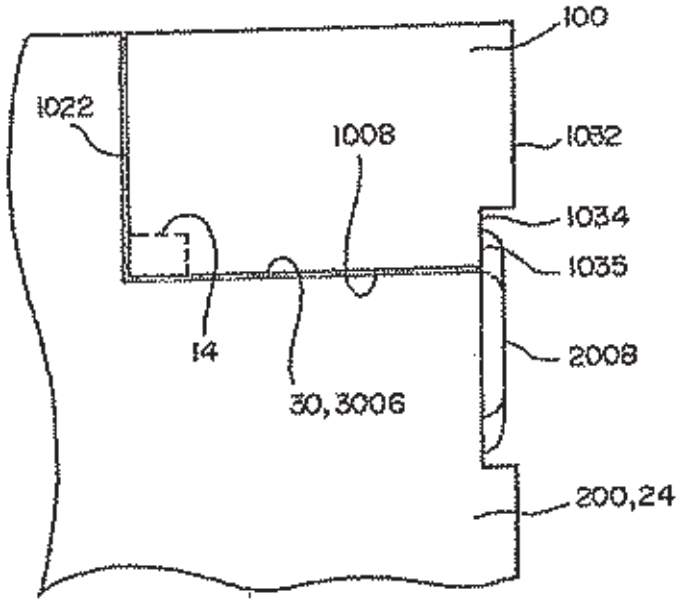
32
1022
1024
200,24
30,3002
3010

Fig.11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1008
1032
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14
30, 3006
2008
200, 24

Fig.12

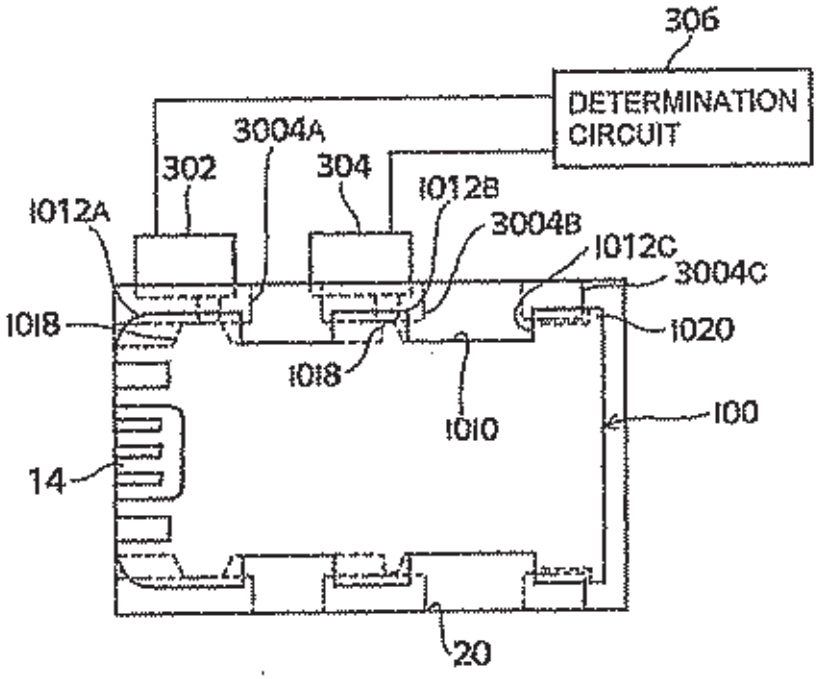

306
DETERMINATION CIRCUIT
3004A
302
304
1012B
1012A
3004B
1012C
3004C
1018
1020
1018
1010
100
14
20

Fig.13

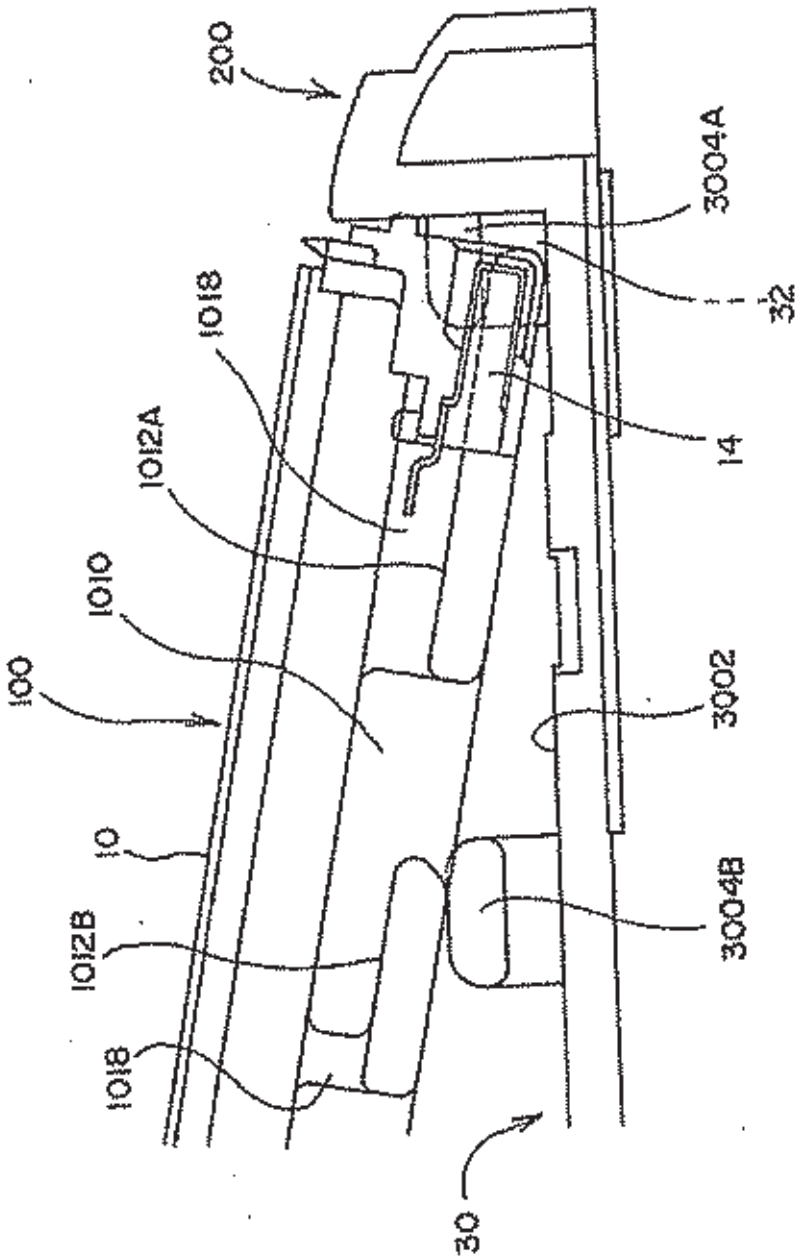
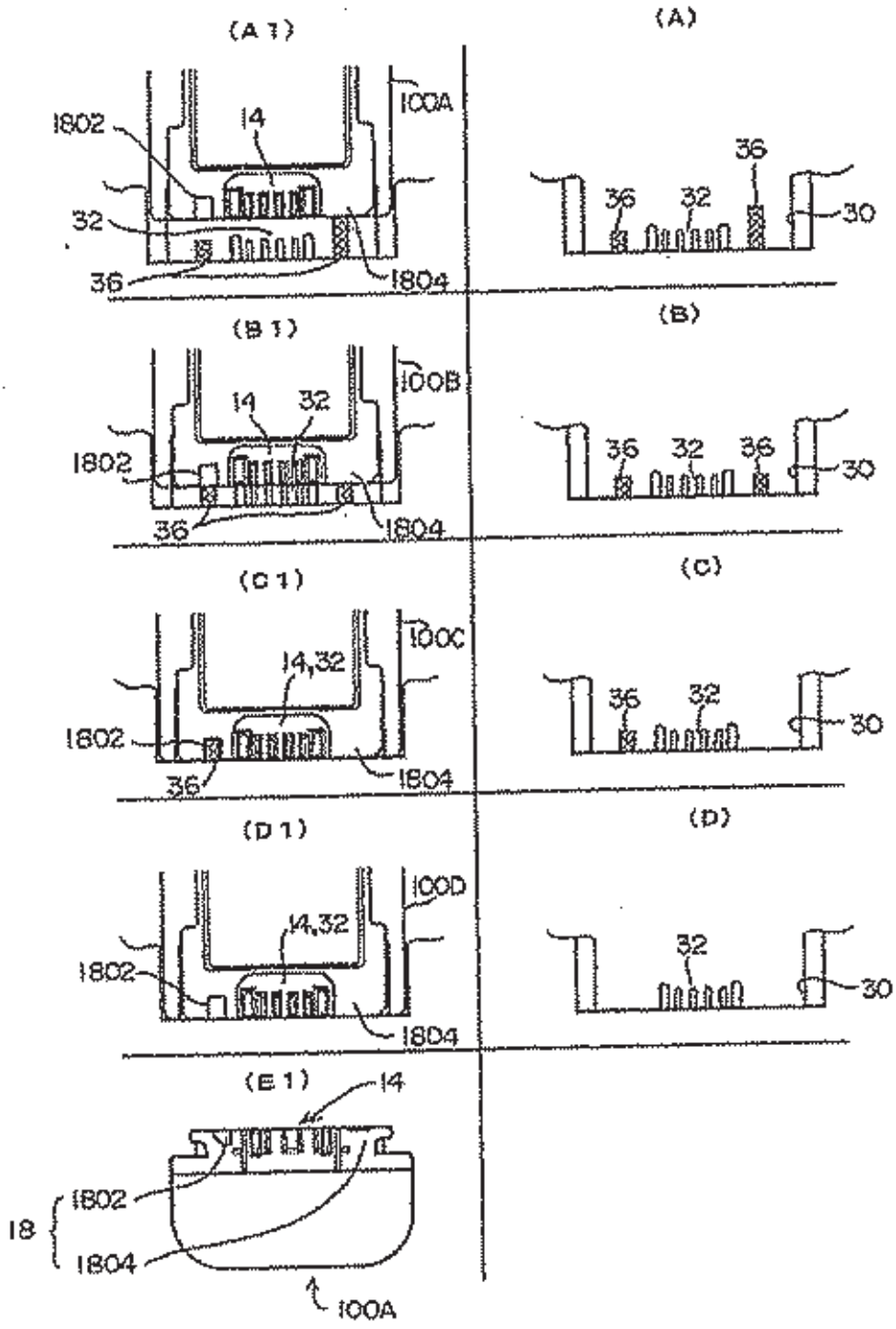

200
3004A
32
1018
14
1012A
1010
100
3002
10
3004B
1012B
1018
30

Fig. 14


(A 1)
(A)
1802
14
100A
32
36
1804
36
32
30
(B 1)
(B)
14
32
100B
1802
36
1804
36
32
36
30
(C 1)
(C)
14,32
100C
1802
36
1804
36
32
30
(D 1)
(D)
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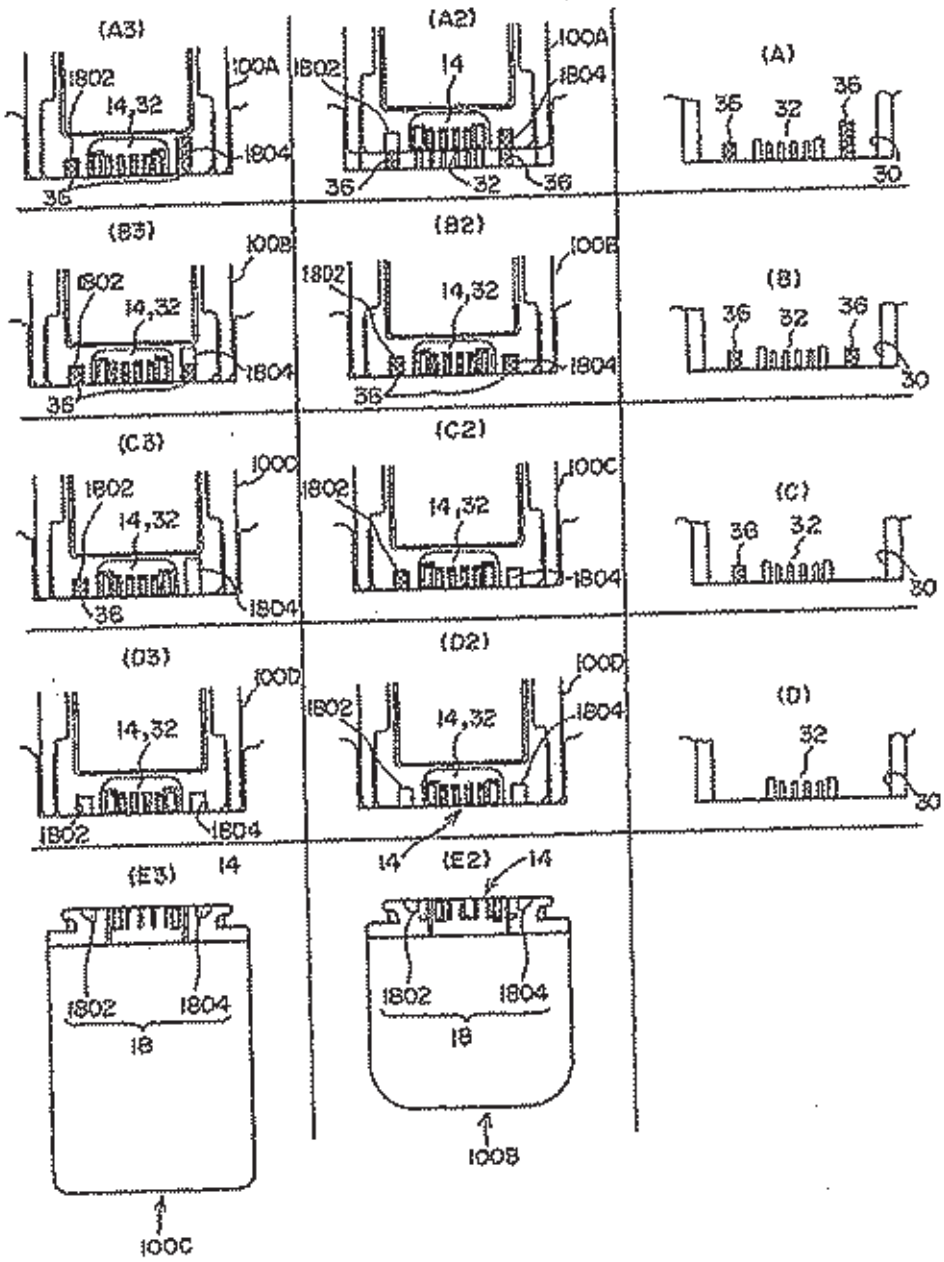
(E 1)
14
18
1802
1804
100A

Fig.15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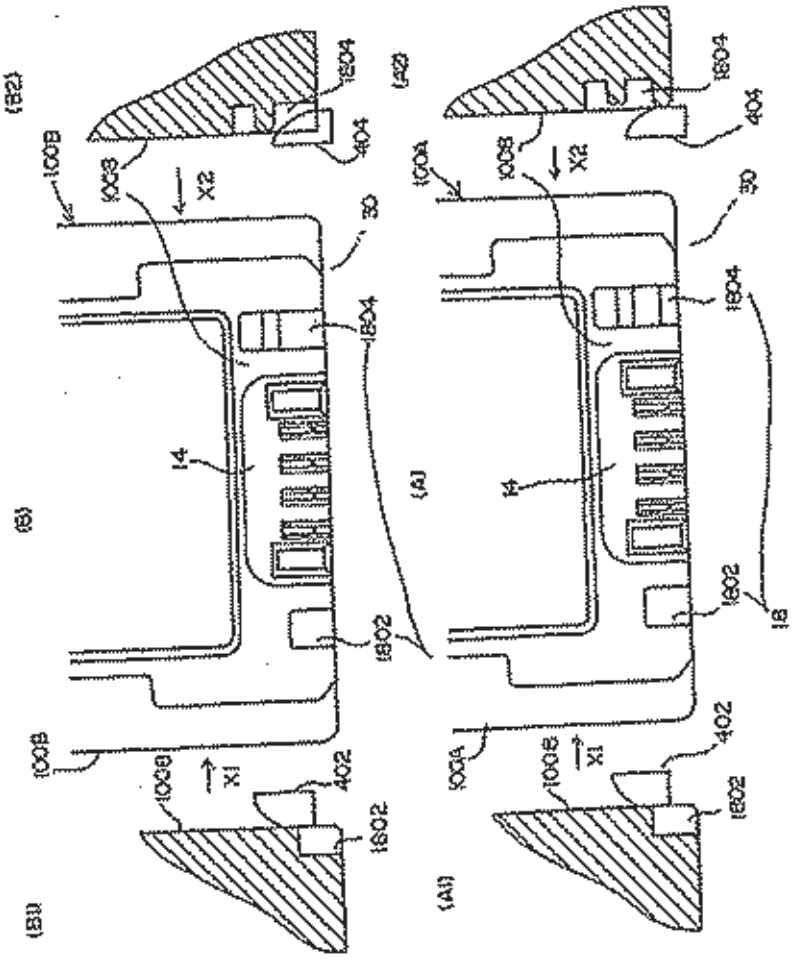
(A2)
(A)
(B3)
(B2)
(B)
(C3)
(C2)
(C)
(D3)
(D2)
(D)
(E3)
(E2)
1802
1804
14,32
14
36
32
30
100A
100B
100C
100D
18

Fig.16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1008
X2
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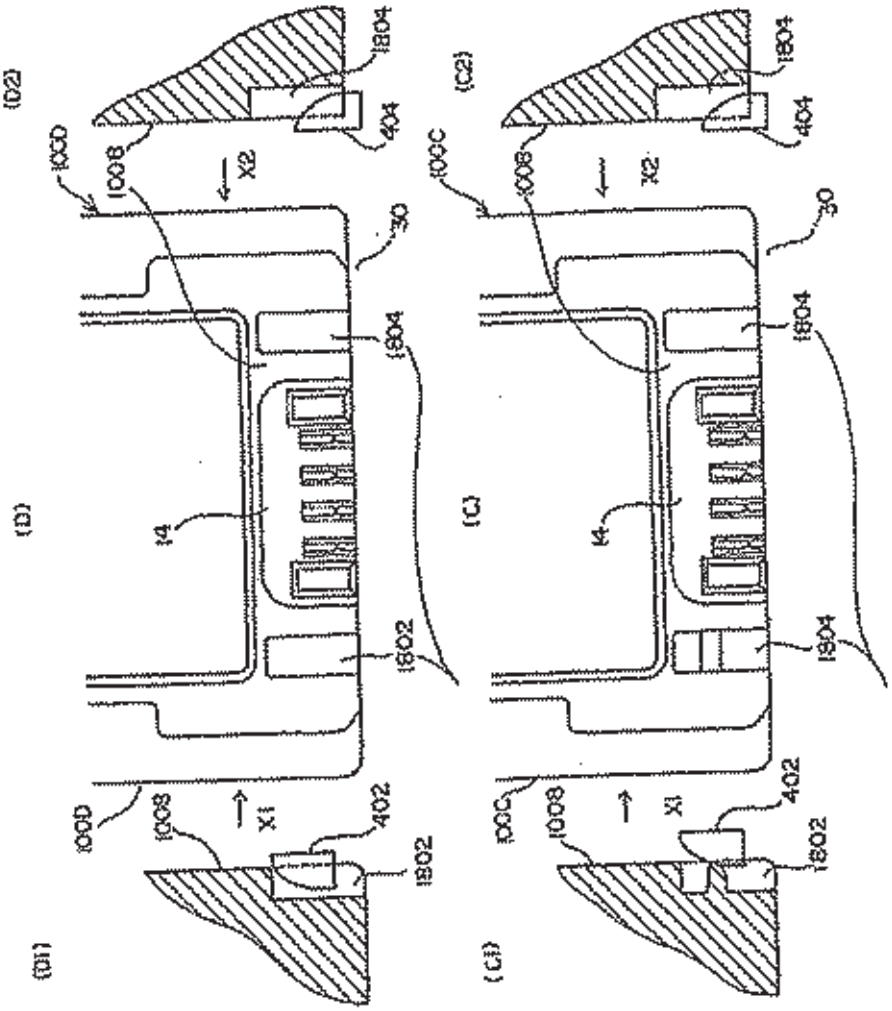
1804
14
(B)
1802
1008
1008
X1
402
1802
(B1)
(A2)
1804
404
1004
1008
X2
30
1804
14
(A)
1802
18
1004
1008
X1
402
1802
(A1)

Fig.17


(B2)
1804
404
1000
1008
X2
30
(B)
14
1804
1802
1000
1008
X1
402
1802
(B1)
(C2)
1804
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100C
1008
X1
402
1802
(C1)

Fig. 18

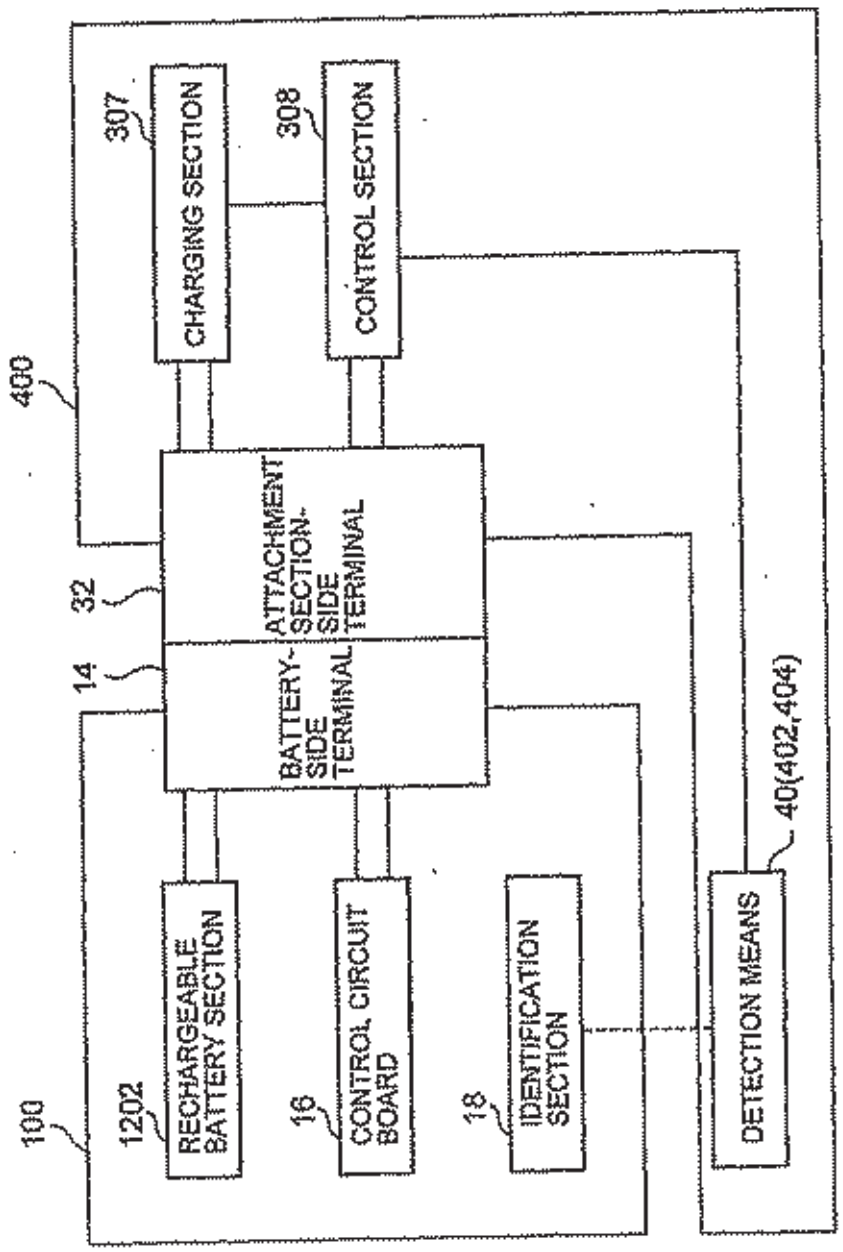
400
307
CHARGING SECTION
308
CONTROL SECTION
32
ATTACHMENT SECTION-SIDE TERMINAL
14
BATTERY-SIDE TERMINAL
100
1202
RECHARGEABLE BATTERY SECTION
16
CONTROL CIRCUIT BOARD
18
IDENTIFICATION SECTION
40(402,404)
DETECTION MEANS

Fig.19

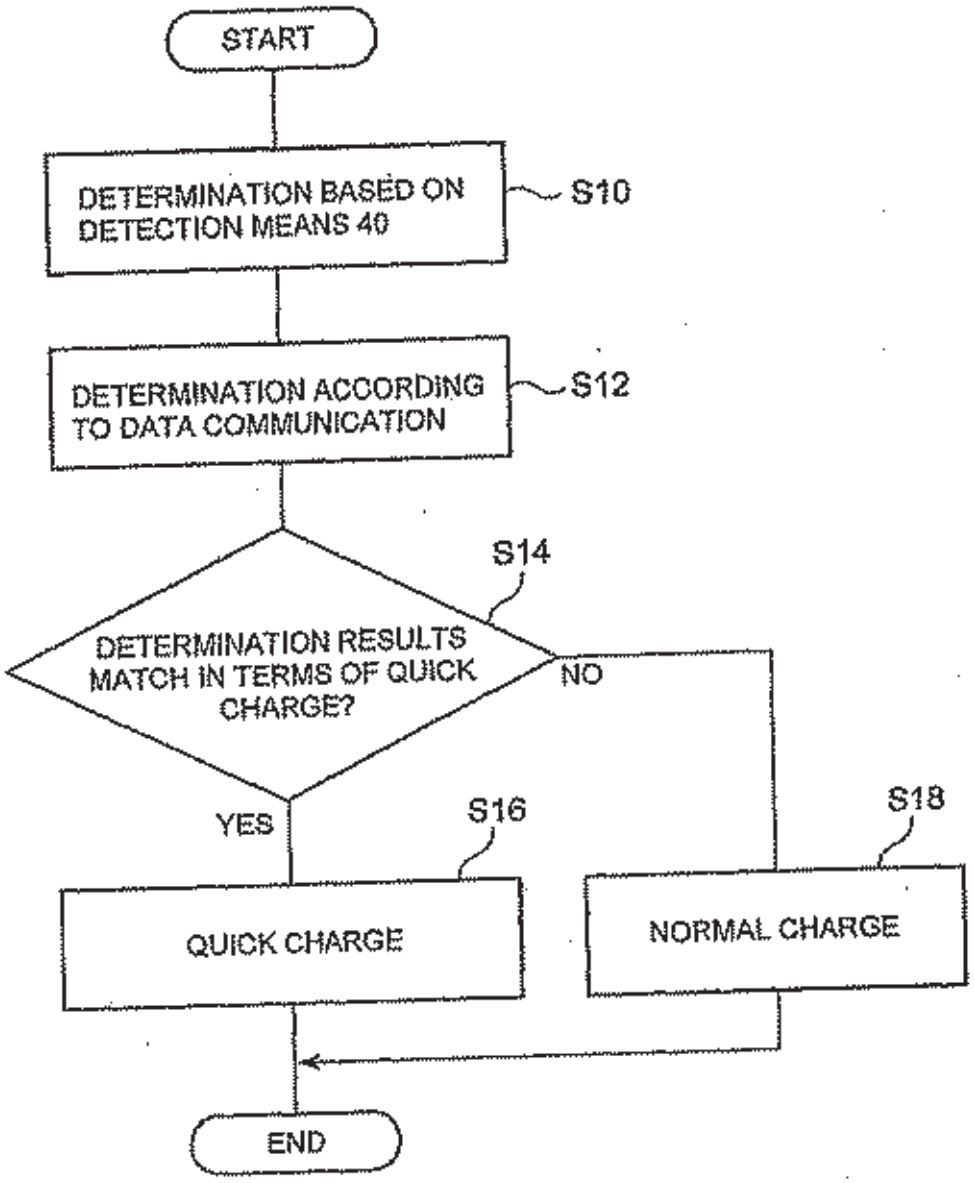
START
DETERMINATION BASED ON DETECTION MEANS 40
S10
DETERMINATION ACCORDING TO DATA COMMUNICATION
S12
S14
DETERMINATION RESULTS MATCH IN TERMS OF QUICK CHARGE?
NO
YES
S16
S18
QUICK CHARGE
NORMAL CHARGE
END

Fig.20

BATTERY DEVICE AND ELECTRONIC APPARATUS

TECHNICAL FIELD

The present invention relates to a battery apparatus, and electronic equipment which operates by the battery apparatus.

BACKGROUND ART

There have been provided a battery apparatus, and electronic equipment which has a battery attachment section to which the battery apparatus is attached, and operates by power supplied from the battery apparatus (see, e.g., Japanese Patent Publication No. 2508447).

If the electronic equipment is to be used by attaching the battery apparatus thereto, it is required that a battery apparatus having a capacity suitable for a current to be consumed by the electronic equipment be attached to the electronic equipment. Therefore, it is preferable to permit attachment of only a battery apparatus having a suitable capacity, to the battery attachment section, and not to permit attachment of a battery apparatus not having a suitable capacity.

Thus, conventionally, e.g., around the middle of an attachment surface of the battery attachment section of the electronic equipment, a projection (recess) is provided which projects outward from the attachment surface, and in a bottom surface of the battery apparatus which faces the above-mentioned attachment surface, a recess (projection) is also provided so as to be hollowed out from the bottom surface of the battery apparatus. And it is configured such that only when the projection and the recess match, attachment of the battery apparatus to the attachment section is permitted, and such that when they do not match, attachment of the battery apparatus to the battery attachment section is prohibited (see, e.g., Japanese Patent Publication No. 3427900).

Further, a battery charger as electronic equipment for charging the battery apparatus needs to set proper charging current values for supply to a plurality of types of battery apparatus, each having a different characteristic (capacity, suitable charging current, or the like). Thus, e.g., a switch for switching charging current values is provided on the battery charger, and a user operates the switch according to the battery apparatus.

However, if the recess is provided around the middle of the attachment surface or the bottom surface of the battery apparatus or the electronic equipment, due to the fact that substrates and electronic components are disposed around the middle of the attachment surface and the bottom surface, the size of the battery apparatus or the electronic equipment must be increased, depending on the depth of the recess, and this configuration has been disadvantageous in miniaturizing the battery apparatus and the electronic equipment.

Further, in the case where the switch for switching charging currents is provided on the battery charger, the user must operate the switch for each different characteristic of the battery apparatus, and this configuration has been disadvantageous in improving their operability. The present invention has been made in view of such circumstances, and an object thereof is to provide a battery apparatus and electronic equipment, in which the battery apparatus having a characteristic compatible with the electronic equipment can be suitably attached to the electronic equipment, and which are advantageous in miniaturizing themselves and improving their operability.

Further, another object of the present invention is to provide electronic equipment which can operate suitably according to a characteristic of a battery apparatus, and which is advantageous in enhancing its usability.

DISCLOSURE OF THE INVENTION

To achieve the above-mentioned objects, a battery apparatus of the present invention is characterized as follows. The battery apparatus includes: a case having a width, a thickness, and a length; a battery cell accommodated inside the case; and a battery-side terminal provided on an end surface which is positioned at one of ends of the case in a length direction and which is electrically connected to the battery cell. A bottom surface positioned on one side of the case in a thickness direction is aligned with an attachment surface of a battery attachment section of electronic equipment to attach the battery apparatus by sliding the case along the length direction thereof, and the battery-side terminal comes in contact with an attachment section-side terminal of the battery attachment section. The battery-side terminal is provided on the end surface, and an identification section for identifying a characteristic of the battery apparatus is provided at a location which is on the end surface and which is on a side of the battery-side terminal in the width direction. The identification section is configured with an identification recess formed in a manner open to the end surface, and at least one of a position, a cross-sectional shape, and a length of the identification recess is formed on the basis of the characteristic of the battery apparatus.

Further, electronic equipment of the present invention is electronic equipment having a battery attachment section to which a battery apparatus is releasably attached, and is characterized as follows. The battery apparatus includes a case having a width, a thickness, and a length; a battery cell accommodated inside the case, and a battery-side terminal provided on an end surface which is positioned at one of ends of the case in a length direction and which is electrically connected to the battery cell. The battery-side terminal is provided on the end surface, and an identification section for identifying a characteristic of the battery apparatus is provided at a location which is on the end surface and which is on a side of the battery-side terminal in the width direction. The identification section is configured with an identification recess formed in a manner open to the end surface, and at least one of a position, a cross-sectional shape, and a length of the identification recess is formed on the basis of the characteristic of the battery apparatus. The battery attachment section is provided with an attachment section-side terminal which connects to the battery-side terminal in a state in which a bottom surface positioned at one end of the case in a thickness direction is aligned with an attachment surface of the battery attachment section to attach the battery apparatus by sliding the case along the length direction thereof, and an identification projection which is inserted into the identification recess of the battery apparatus having the characteristic usable for the electronic equipment.

Furthermore, electronic equipment of the present invention is electronic equipment having a battery attachment section to which a battery apparatus is releasably attached, and is characterized as follows. The battery apparatus includes a case having a width, a thickness, and a length; a battery cell provided inside the case; and a battery-side terminal provided on an end surface which is positioned at one of ends of the case in a length direction and which is connected to the battery cell. The battery-side terminal is

provided on the end surface, and an identification section for identifying a characteristic of the battery apparatus is provided at a location which is on the end surface and which is on a side of the battery-side terminal in the width direction. The identification section is configured with an identification recess formed in a manner open to the end surface, and at least one of a position, a cross-sectional shape, and a length of the identification recess is formed on the basis of the characteristic of the battery apparatus. The battery attachment section is provided with an attachment section-side terminal which connects to the battery-side terminal in a state in which the battery apparatus attached to the battery attachment section, and detection means for detecting at least one of the position, the cross-sectional shape, and the length of the identification recess of the battery apparatus, wherein the characteristic of the battery apparatus is determined on the basis of a detection result by the detection means.

As a result, according to the battery apparatus and the electronic equipment of the present invention, attachment of the battery apparatus having a characteristic usable for the electronic equipment, to the battery attachment section is permitted by the identification projection being inserted into the identification recess. On the other hand, the identification recess of the battery apparatus not having a characteristic usable for the electronic equipment does not have the identification projection inserted thereinto, and thus, attachment of the battery apparatus not having the characteristic usable for the electronic equipment, to the battery attachment section is prohibited by the identification projection not being inserted into the identification recess. As a result, the battery apparatus having the characteristic compatible with the electronic equipment can be attached suitably.

Further, in the battery apparatus, portions which are inside of an end surface at one end of the case in the length direction and which are on both sides of the battery-side terminal in the width direction are left as a dead space where neither boards nor electronic components are disposed. Thus, even if the identification recess is provided in the end surface of the case, the size of the case is not increased. Therefore, this configuration is not a hindrance to miniaturizing the battery apparatus.

Furthermore, according to the battery apparatus of the present invention, when the battery apparatus has been attached to the battery attachment section of the electronic equipment, at least one of the position, cross-sectional shape, and length of the identification recess of the battery apparatus is detected by the detection means, whereby a suitable charging operation compatible with the characteristic of the battery apparatus can be performed on the basis of this detection result. Therefore, this configuration is advantageous in enhancing the usability of the electronic equipment.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of a battery apparatus of Embodiment 1, as viewed from the bottom thereof.

FIG. 2 is an exploded perspective view showing a configuration of the battery apparatus of Embodiment 1.

FIG. 3 is explanatory diagram of a battery apparatus 100.

FIG. 4 is explanatory diagram of the battery apparatus 100.

FIG. 5 is an enlarged view of a main portion of FIG. 3.

FIG. 6 is an enlarged perspective view of the vicinity of an identification section 1036.

FIG. 7 is a perspective view of an imaging apparatus 200 to which the battery apparatus 100 is externally attached.

FIG. 8 is an enlarged view of a battery attachment section of the imaging apparatus 200.

FIG. 9 is a perspective view of the imaging apparatus 200 showing a state in which the battery apparatus 100 is attached thereto.

FIG. 10 is a diagram explaining attachment of the battery apparatus 100 to the battery attachment section.

FIG. 11 is an explanatory diagram showing a state in which the battery apparatus 100 is attached to a battery attachment section 30.

FIG. 12 is an explanatory diagram of a locking mechanism.

FIG. 13 is a block diagram showing a determination circuit for projections 1018.

FIG. 14 is an explanatory diagram showing a state in which the battery apparatus 100 is attached to the battery attachment section 30 at an angle.

FIG. 15 is an explanatory diagram showing the relationship between identification recesses 1802, 1804 of an identification section 18 of the battery apparatus 100 and identification projections 36 of the imaging apparatus 200.

FIG. 16 is an explanatory diagram showing the relationship between the identification recesses 1802, 1804 of the identification section 18 of the battery apparatus 100 and the identification projections 36 of the imaging apparatus 200.

FIG. 17 is an explanatory diagram showing states in which four types of battery apparatus 100 (100A, 100B, 100C, 100D), each having a different capacity, charging current value for supply during charge, or the like, are attached to a battery charger 400 as electronic equipment.

FIG. 18 is an explanatory diagram showing states in which four types of battery apparatus 100 (100A, 100B, 100C, 100D), each having a different capacity, charging current value for supply during charge, or the like, are attached to the battery charger 400 as the electronic equipment.

FIG. 19 is a block diagram showing a configuration of the battery apparatus 100 and the battery charger 400.

FIG. 20 is a flowchart showing a charging operation in a modified example of Embodiment 2.

BEST MODES FOR CARRYING OUT THE INVENTION

The object of permitting suitable attachment of a battery apparatus having a characteristic compatible with electronic equipment, and miniaturizing them and improving their operability is realized by providing identification recesses as an identification section in side portions of a battery-side terminal of the battery apparatus, and also providing identification recesses in the electronic equipment.

Further, the object of enhancing the usability of the electronic equipment is realized by providing detection means for determining the characteristic of the battery apparatus on the basis of at least the position, cross-sectional shape, and the length of each identification recess of the battery apparatus.

EMBODIMENT 1

Next, Embodiment 1 of the present invention will be described with reference to the drawings.

In the present embodiment, a case will be described, where a battery apparatus of the present invention is used while attached to an imaging apparatus as electronic equipment.

FIG. 1 is a perspective view of a battery apparatus of Embodiment 1, as viewed from the bottom thereof, and FIG. 2 is an exploded perspective view showing a configuration of the battery apparatus of Embodiment 1.

First, the battery apparatus will be described.

As shown in FIG. 1, a battery apparatus 100 includes a case 10, a rechargeable battery section 12 (see FIG. 2) provided inside the case 10, a control circuit board 16 provided inside the case 10, a battery-side terminal 14 provided on the case 10, and an identification section 18.

As shown in FIG. 2, the rechargeable battery section 12 has four column-shaped battery cells 1202, a plurality of wiring members 1204 for connection of the electrodes of these battery cells 1202, and a holding member 1206 set between the side surfaces of the respective battery cells 1202.

The control circuit board 16 is configured to be attached to the rechargeable battery section 12 by connection to the electrodes of the battery cells 1202 through the wiring members 1204, respectively, and to have a microcomputer including a CPU, a RAM, a ROM, and an interface, thereby performing data communication with external electronic equipment through the battery-side terminal 14. The above-mentioned data communication includes an operation of outputting identification data indicative of a characteristic (including a capacity, a suitable charging current value) of the battery apparatus 14. The identification data includes, e.g., data on whether or not the battery is quickly chargeable when attached to a battery charger, data indicative of a proper charging current value, or a maximum charging current value.

The battery-side terminal 14 is provided on a surface of the case 10, and is attached to the control circuit board 16 inside the case 10 for conduction to the electrodes of the battery cells 1202 through the respective wiring members 1204, whereby it is configured to supply an operating current to the external electronic equipment from the respective battery cells 1202, or to supply a charging current to the respective battery cells 1202 from the battery charger, through the battery terminal 14.

It should be noted that the number and shape of the battery cells 1202 that forms the rechargeable battery section 12 depends, of course, on the characteristic of the battery apparatus 100.

Next, a configuration of the case 10 will be described in detail.

FIG. 3 (A) is a plan view of the battery apparatus 100. FIG. 3 (B) is a view on arrow B of FIG. 3 (A). FIG. 3 (C) is a view on arrow C of FIG. 3 (A). FIG. 3 (D) is a view on arrow D of FIG. 3 (A). FIG. 3 (E) is a cross-sectional view taken along a line EE of FIG. 3 (B). FIG. 4 (A) is a bottom view of the battery apparatus 100. FIG. 4 (B) is a view on arrow B of FIG. 4 (A). FIG. 4 (C) is a cross-sectional view taken along a line CC of FIG. 4 (B). FIG. 5 is an enlarged view of a portion F of FIG. 3 (C). FIG. 6 is an enlarged perspective view of the vicinity of the identification section 18.

The case 10 has a body section 1002 that extends along a length direction L at an equal width W across, and a bottom section 1004 which is provided in the middle of the body section 1002 in a width direction W and at one end of the body section 1002 in a thickness direction H and which extends in the length direction L at an equal width, which is smaller than the width of the body section 1002, across.

In the present embodiment, the case 10 includes a first segment excluding a portion of the body section 1002 which is near the bottom section 1004, and the bottom section 1004, and a second segment including the portion of the body section 1002 which is near the bottom section 1004, and the bottom section 1004. The case 10 is formed by bonding these segments together along a bonding surface 1005. The rechargeable battery section 12 and the control circuit board 16 are accommodated inside these segments.

As shown in FIGS. 2, 3, 4, portions on both sides of the case 10 in the width direction W are formed as flat side surfaces 1006 which extend in parallel to each other in the length direction L, and one of surfaces of the case 10 in the thickness direction H is formed as a flat bottom surface 1008. In the present embodiment, side surfaces on both sides of the body section 1002 in the width direction W form the above-mentioned side surfaces 1006, and a bottom surface of the bottom section 1004 forms the above-mentioned bottom surface 1008.

From both sides of the bottom surface 1008 in the width direction W project a plurality of locking pieces 1012. In the present embodiment, three locking pieces 1012A, 1012B, 1012C are formed on each side so as to project outward in the width direction W, keeping a space therebetween in the length direction L. Each locking piece 1012 (1012A, 1012B, 1012C) portion which is positioned at one end in the thickness direction H is formed as a bottom surface positioned coplanar with the bottom surface 1008, and each locking piece 1012 (1012A, 1012B, 1012C) portion which is positioned at the other end in the thickness direction H is formed so as to be positioned coplanar with a surface parallel to the bottom surface 1008.

And when the three locking pieces 1012 (1012A, 1012B, 1012C) are provided in this way, the respective locking pieces 1012 (1012A, 1012B, 1012C), a side surface 1016 of the bottom section 1004 which is positioned on each of both sides in the width direction W, and a surface 1014 of the body section 1002 which faces the bottom section 1004 form three recessed portions 1010 in a bottom surface 1008 portion on each of both sides in the width direction W. Each recessed portion 1010 extends in the length direction L.

These locking pieces 1012 (1012A, 1012B, 1012C) are formed so as to position the case 10 thickness direction H in a battery attachment section of the electronic equipment. That is, when the bottom surface 1008 of the case 10 is aligned with an attachment surface of the battery attachment section of the electronic equipment and then the case 10 is slid thereover along the length direction L thereof, the locking pieces 1012 are locked into locking hooks of the battery attachment section, whereby the case 10 is positioned in the thickness direction H in the battery attachment section.

The battery-side terminal 14 is provided at a corner portion which is formed from an end surface 1022 and the bottom surface 1008 at one end in the length direction L.

As shown in FIG. 1, the battery-side terminal 14 includes a terminal case 1402 which is incorporated into the case 10 and which forms a part of the end surface 1022 and the bottom surface 1008 of the case 10, engaging grooves 1404 formed in a manner extending to both the end surface 1022 and the bottom surface 1008, and contact pieces provided inside the engaging grooves 1404.

The battery-side terminal 14 has a width extending width direction W of the case 10, a length extending in the length

direction L of the case 10, and a thickness extending in the thickness direction H of the case 10.

Of the three locking pieces 1012 (1012A, 1012B, 1012C), the two locking pieces 1012A, 1012C are provided at locations near the ends of the case 10 in length direction L, and the remaining locking piece 1012B is provided at a location closer to the locking piece 1012A which is provided near the end of the case 10 where the battery-side terminal 14 is positioned.

In the present embodiment, at side surface 1016 portions of the bottom section 1004 corresponding to the two locking pieces 1012A, 1012B, there are provided two projections 1018 projecting outward in width direction W from each of the side surfaces 1016, respectively. The two projections 1018 are formed so as to be smaller in their projecting dimensions than the locking pieces 1012A, 1012B.

Through one of the two projections 1018, the locking piece 1012A, the surface 1034 along which the body section 1002 faces the bottom section 1004, and the side surface 1036 of the bottom section 1004 positioned on each of both sides in width direction W are connected to each other, and through the other projection 1018, the locking piece 1012B, the surface 1034, and the side surface 1036 are connected to each other. As a result, these two projections 1018 provide an advantage of improving the mechanical strength of the locking pieces 1012A, 1012B.

Further, a stopper wall 1020 is provided at each side surface 1016 portion of the bottom section 1004 which corresponds to the remaining locking piece 1012C and which is opposite to the location where the battery-side terminal 14 is provided. Each stopper wall 1020 closes an end of the corresponding recessed portion 1010 in the length direction L. When the battery apparatus 100 is to be attached to the battery attachment section, and if the battery apparatus 100 is not correctly oriented in the length direction L, the stopper wall 1020 serves to block attachment of the battery apparatus 100 in a wrong direction by abutment on the corresponding locking hooks of the battery attachment section.

Since each locking piece 1012C, the surface 1014, and the corresponding side surface 1016 are connected to each other by the corresponding stopper wall 1020, the stopper wall 1020 provides an advantage of improving the mechanical strength of the locking piece 1012C.

Further, in the present embodiment, as shown in FIG. 1, the end surface 1022 of the case 10 on which the battery-side terminal 14 is provided is formed as a flat surface.

In the present embodiment, the battery-side terminal 14 is provided in the middle of the end surface 1022 in the width direction W.

The identification section 18 serves to identify the characteristic of the battery apparatus 100. In the present embodiment, the identification section 18 is provided at locations which are on the end surface 1022 and which are on both sides of the battery side terminal 14 in the width direction W.

The identification section 18 includes identification recesses 1802, 1804 which are formed in a manner open to the end surface 1022. The identification recesses 1802, 1804 are provided at locations near the bottom surface 1008, and also formed in a manner open to the bottom surface 1008.

And at least one of the positions, the cross-sectional shapes, and the lengths of the identification recesses 1802, 1804 on the end surface 1022 is formed on the basis of the characteristic of the battery apparatus 100. In the present embodiment, the identification section 18 is formed such that the cross-sectional shape and length of the identification recess 1802 are based on the characteristic of the battery apparatus 100.

Note that in the present embodiment, as shown in FIG. 6, of surfaces forming the identification recess 1802, a surface portion close to the corresponding recessed portion 1010 is formed into an angled surface 1042 that nears the battery-side terminal 14 as it moves away from the bottom surface 1008, whereby to secure a thickness between that recessed portion 1010 and the identification recess 1802 and also to secure the mechanical strength of the corresponding locking piece 1012A.

And at a location on the end surface 1022 which is distant from the battery-side terminal 14 in the thickness direction H, a projection 1024 is formed in a manner projecting therefrom. The projection 1024 has an equal dimension in the thickness direction H, and linearly extends in the width direction W. The projection 1024 is formed at a location corresponding to the battery-side terminal 14, to have a length X2 which is greater than at least a length X1 of a portion where electrodes of the battery-side terminal 14 are disposed.

Further, as shown in FIG. 1, a recess 1028 is formed in the bottom surface 1008, and a model number label 1026 is stuck onto this recess 1028. It is also configured such that either the surface of the model number label 1026 is coplanar with the bottom surface 1008, or the surface of the model number label 1026 is positioned inward of the bottom surface 1008 as viewed from the case 10. A positioning projection 1030 is formed, which projects in the length direction L from a portion of the recess 1028 which is positioned opposite to the battery-side terminal 14 in the length direction L, so as to form the same surface as the bottom surface 1008. This projection 1030 is fitted into a positioning notch 1027 of the model number label 1026.

Further, as shown in FIGS. 4(A) and (B), of end surfaces at both ends of the case 10 in the length direction L, the end surface of the body section 1002 which is positioned opposite to the battery-side terminal 14 is formed into a flat end surface 1032 that extends at right angles to the bottom surface 1008. An end surface of the bottom section 1004 which is positioned opposite to the battery-side terminal 14 is formed into a flat end surface 1034 that parallels the end surface 1032 at a location inward of the above-mentioned end surface 1032 as viewed from the case 10. Therefore, a cut portion 1035 is formed from these end surfaces 1032, 1034 at an end which is positioned opposite to the battery-side terminal 14 in the length direction L of the case 10, and along which the body section 1002 borders the bottom section 1004.

Further, as shown in FIGS. 1 to 6, two identification portions 18 are formed at locations on both sides of the bottom surface 1008 of the bottom section 1004, which interpose the battery-side terminal 14 therebetween in the width direction W. These identification portions 18 are formed as a recess 1804 that is open both in the thickness direction H and the length direction L, or formed as a recess 1802 that is open in the thickness direction H and closed in the length direction L. The identification portions 18 are identified by identification means provided on the side of the electronic equipment, and their identification is made on the basis of the shapes of the recesses 1804, 1802, or the length L of the recess 1804.

Note that, of surfaces forming the recess 1804, a surface portion which is nearest to the recessed portion 1010 is formed into an angled surface 1042, whereby a thickness

between that recessed portion 1010 and the recess 1038 is secured to secure the mechanical strength of the locking piece 1012A.

Next, the imaging apparatus 200 will be described.

FIG. 7 is a perspective view of the imaging apparatus 200 to which the battery apparatus 100 is externally attached. FIG. 8 is an enlarged view of the battery attachment section of the imaging apparatus 200. FIG. 9 is a perspective view of the imaging apparatus 200 showing a state in which the battery apparatus 100 is attached thereto.

As shown in FIGS. 7 and 8, the imaging apparatus 200 includes a case 24, an optical system 26 incorporated into the front of the case 24, an image pickup device, not shown, for imaging an object captured by the optical system 26, a liquid-crystal display section 28 for displaying an image formed by the image pickup device, a recording/reproducing section, not shown, for recording and/or reproducing the image captured by the image pickup device on and/or from a recording medium, the above-mentioned image pickup device, liquid-crystal display section 28, an identification projection 36, and the battery apparatus 100.

In the rear of the case 24 is a battery attachment section 30 to which the battery apparatus 100 is to be releasably attached.

The battery attachment section 30 has a flat attachment surface 3002, a plurality of locking hooks 3004 (3004A, 3004B, 3004C) provided on the attachment surface 3002, an attachment section-side terminal 32 that can come in contact with the battery-side terminal 14, an attachment projection 34 provided on the attachment surface 3002, and the identification projection 36.

The attachment surface 3002 has a width corresponding to the width of the bottom surface 1008 of the case 10 of the battery apparatus 100, and a length greater than the length of the bottom surface 1008, and has side surfaces 3008 erected from peripheral sides of the attachment surface 3002.

The attachment section-side terminal 32 is provided at an end of the placement surface 3002 in the length direction L, which is opposite to the optical system 26, for connection to the battery-side terminal 14 to supply power of the battery apparatus 100 to the recording/reproducing section. In the present embodiment, the attachment section-side terminal 32 is formed, as shown in FIG. 7, from a plurality of plate-shaped contact pieces for insertion into the engaging grooves 1404 of the battery-side terminal 14.

The attachment projection 34 is provided at a location on the attachment surface 3002 which is opposite to the attachment section-side terminal 32 in a longitudinal direction of the attachment surface 3002, so as to be retractable from the attachment surface 3002, and is configured to be urged so as to project from the placement surface 3002 at all times, and retract inward of the placement surface 3002 upon operation of an unlocking button, not shown.

The locking hooks 3004 (3004A, 3004B, 3004C) are provided in a number corresponding to the number of locking pieces 1012 of the battery apparatus 100. In the present embodiment, there are provided three locking hooks 3004 on each of both sides of the attachment surface 3002 in the width direction, and formed so as to be lockable with the locking pieces 1012 (1012A, 1012B, 1012C).

Each of the locking hooks 3004 (3004A, 3004B, 3004C) is provided with, as shown in FIG. 10, a vertical wall 3004E erecting from the placement surface 3002, and a horizontal wall 3004F projecting from the distal end of the vertical wall 3004E in a manner paralleling the placement surface 3002.

Of the three locking hooks 3004 (3004A, 3004B, 3004C), the two locking hooks 3004A, 3004C are provided at locations near ends of the attachment surface 3002 in the length direction, and the remaining locking hook 3004B is provided at a location closer to the locking hook 4003A provided near the end of the attachment surface 3002 where the attachment section-side terminal 32 is positioned.

And the case 10 is aligned with the attachment surface 3002 both in the width direction W and the length direction L, respectively, to cause the battery-side terminal 14 of the battery apparatus 100 to face the attachment section-side terminal 32 of the battery attachment section 30, and also to cause the bottom surface 1008 of the battery apparatus 100 to face the attachment surface 3002 of the battery attachment section 30, and then the locking pieces 1012 (1012A, 1012B, 1012C) of the battery apparatus 100 are spaced apart from the locking hooks 3004 (3004A, 3004B, 3004C) in the above-mentioned length direction L direction, respectively. Under this state, the bottom surface 1008 of the battery apparatus 10 is abutted on the attachment surface 3002 of the battery attachment section 30, whereby the battery apparatus 100 is slid in such a direction as to cause the battery-side terminal 14 to near the attachment section-side terminal 32 in the length direction of the case.

As a result, the plurality of locking hooks 3004 are inserted into the corresponding recessed portions 1010 to be locked with the locking pieces 1012. The bottom surface 1008 of the case 10 is aligned with the attachment surface 3002, whereby to regulate the movement of the battery apparatus 100 toward the attachment surface 3002. Furthermore, the locking hooks 3004 and the locking pieces 1012 are locked together, whereby to regulate the movement of the battery apparatus 100 away from the attachment surface 3002. In this case, it may otherwise be configured such that the locking hooks 3004 and the locking pieces 1012 are engaged, whereby to regulate the movement of the battery apparatus 100 both toward and away from the attachment surface 3002.

In the battery apparatus 100, of the two end surfaces of the case 10 in the length direction L, the end surface 1022 on the side of the battery-side terminal 14 abuts onto one of the side surfaces 3008 of the battery attachment section 30, with the locking hooks 3004 and the locking pieces 1012 locked together, and the attachment projection 34 engages with the cut portion 1035 of the battery apparatus 100, whereby to regulate the movement of the case 10 in the length direction L. As a result, attachment of the battery apparatus 100 in the battery attachment section 30 is implemented, and thus the battery apparatus 100 is held therein.

In the present embodiment, the distal ends of the locking hooks 3004 and the corresponding ends of the projections 1018 come in contact with each other, with the locking hooks 3004 and the locking pieces 1012 locked together, to regulate the movement of the battery apparatus 100 in the above-mentioned width direction W. In this case, it may otherwise be configured such that other portions of the battery apparatus 100 are brought into contact with other portions of the battery attachment section 30 whereby to regulate the movement of the battery apparatus 100 in the above-mentioned width direction W, by, e.g., bringing the side surfaces 1006 of the case 10 of the battery apparatus 100 into contact with the side surfaces 3008 of the battery attachment section 30, instead of bringing the distal ends of the locking hooks 3004 into contact with the corresponding ends of the projections 1018.

And when the battery apparatus 100 has been attached to the battery attachment section 30, the battery-side terminal

14 of the battery apparatus 100 comes in contact with the attachment section-side terminal 32 of the battery attachment section 30.

The identification projection 36 is formed so as to be inserted into the identification recess 1002 of the battery apparatus 100 having the characteristic usable for the imaging apparatus 200, with the battery apparatus 100 attached to the battery attachment section 30.

In the present embodiment, as shown in FIG. 8, one identification projection 36 is provided at a location on a side surface 3008 which is positioned on one side of the battery-side terminal 14 in the width direction. More particularly, the identification projection 36 is provided at a location on the side surface 3008, which is near the attachment surface 3002, and a portion of the identification projection 36 facing the attachment surface 3002 is connected with the attachment surface 3002, and thus the strength, rigidity of the identification projection 36 are ensured.

When the battery apparatus 100 has been attached to the battery attachment section 30, a gap may be formed in some case, as shown in FIG. 11, between the end surface 1022 on the side of the battery-side terminal 14 of the battery apparatus 100 and a portion of the case 24 (a side surface 3008 of a recess 3006) of the imaging apparatus 200, which is opposed to the end surface 1022.

In this case, a recessed groove 3010 is formed in the side surface 3008 of the recess 3006, and the projection 1024 of the battery apparatus 100 is fitted into this recessed groove, whereby the above-mentioned gap can be closed by the projection 1024. Thus, this configuration provides an advantage of reliably preventing entrance of, e.g., foreign matter having conductivity from the above-mentioned gap to allow the foreign matter to come in contact with connections between the battery-side terminal 14 and the attachment section-side terminal 32.

Further, as shown in FIG. 12, it may alternatively be configured as follows. That is, a locking hook 2008, which slides toward and away from the cut portion 1035 of the battery apparatus 100 that has been attached to the battery attachment section 30, and which is urged by an urging member, such as a spring, toward the cut portion 1035 at all times, is provided on the case 24. The locking hook 2008 is engaged with the cut portion 1035, whereby to prevent the dropping of the battery apparatus 100 from the battery attachment section 30, and the locking hook 2008 is disengaged from the cut portion 1035 of the battery apparatus 100, whereby to allow the battery apparatus 100 to be detached from the battery attachment section 30.

In this case, since the cut portion 1035 is formed so as to be inward of the end surface 1032 as viewed from the battery apparatus 100, the locking hook 2008 can be provided inward of the outer surface of the case 24, and thus the locking hook 2008 can be formed in a manner not projecting outward from the outer surface of the case 24 of the imaging apparatus 200. Therefore, this configuration is advantageous in miniaturizing the imaging apparatus 200 and improving its designability.

Furthermore, in this case, the portion of the locking hook 2008 which engages with the cut portion 1035 is urged toward the bottom surface 1008 of the battery apparatus 100 at all times, and thus when the bottom surface 1008 of the battery apparatus 100 is slid along the attachment surface 3006 for attaching the battery apparatus 100 to the battery attachment section 30 or detaching the battery apparatus 100 from the battery attachment section 30, the distal end of the locking hook 2008 projecting toward the bottom surface 1008 by the above-mentioned urging mechanism abuts on the surface of a label of the model number label 1026 or the like, which has been stuck onto the bottom surface 1008, making it likely to wear off a printed portion on the surface of, e.g., the model number label 1026 due to friction.

In this case, if the locking hook 2008 is disposed such that the distal end thereof abuts on the positioning projection 1030 and thus does not abut on the surface of the model number label 1026, the surface of the model number label 1026 is less subject to damage or foul. Thus, this configuration is advantageous in protecting the printed portion on the surface of the model number label 1026. In this case, it may be acceptable if the positioning projection 1030 is provided coplanar with the surface of the model number label 1026 or so as to be positioned outward of the surface of the model number label 1026 as viewed from the case 10.

Furthermore, using the position of the end surface 1022 of the case 100 as a reference, whether or not the battery apparatus 100 is a genuine one can be determined on the basis of the position of each projection 1018 provided in the above-mentioned length direction L direction (or the presence/absence of each projection 1018 or the number of projections 1018).

For example, as shown in FIG. 13, sensors 302, 304 are provided in a battery accommodating chamber 20. The sensors 302, 304 are formed from microswitches for sensing the positions of the projections 1018 as viewed in the above-mentioned length direction L, using the end surface 1022 of the case 100 as a reference. And a determination circuit 306 is provided, which serves to determine whether or not the projections 1018 are in their correct position on the basis of sensed signals from the respective sensors 302, 304.

According to such a configuration, supply of power from the battery apparatus 100 is permitted only when the battery apparatus 100 is recognized as a genuine product on the basis of a determination result of the determination circuit 306. Otherwise, supply of power from the battery apparatus 100 can be prohibited, to prevent use of any ungenuine battery apparatus 100.

Furthermore, the above-mentioned identification data on the battery apparatus 100 can be indicated according to the position of each projection 1018 provided in the above-mentioned length direction L, or the presence/absence of each projection 1018, or the number of projections 1018.

For example, according to the configuration shown in FIG. 13, four types of identification data can be represented by a combination of the on/off states of the two sensors 302, 304. Therefore, if four sensors are provided such that the positions of a total of four projections 1018 provided on both sides of the case 10 of the battery apparatus 100 in the width direction can be sensed, it goes without saying that as many as eight types of identification information can be obtained.

Furthermore, using as the sensor one capable of measuring the position of each projection 1018 as viewed in the above-mentioned length direction, using the end surface 1022 as a reference, it goes without saying that the number of types of identification data that can be sensed by the sensor can further be increased.

Furthermore, if the electronic equipment to which the battery apparatus 100 is attached is a battery charger for charging the battery apparatus 100, it may be acceptable to provide the battery charger with one or more sensors similar to the above-mentioned sensors 302, 304, to sense attachment/detachment of the battery apparatus 100 using the sensors, and to start the operation of charging the battery apparatus 100 in response to the sensing operation.

Furthermore, if the positions of the projections 1018 are determined with the above-mentioned sensors, it may also be implementable to cause the battery charger to judge the characteristic (capacity, suitable charging current value, quick chargeability, or the like) of the battery apparatus 100.

Furthermore, as shown in FIG. 1, it is configured such that the surface of the model number label 1026 is coplanar with the bottom surface 1008, or such that the surface of the model number label 1026 is positioned inward of the bottom surface 1008 as viewed from the case 10. Also, the positioning projection 1030 forming the same surface as the bottom surface 1008 is fitted into the positioning notch 1027 of the model number label 1026. Thus, even if the bottom surface 1008 of the battery apparatus 100 comes in frictional contact with the attachment surface 3002 of the battery attachment section 30 due to the battery apparatus 100 being attached to and detached from the battery attachment section 30, the surface of the model number label 1026 is less subject to damage or foul. Thus, this configuration is advantageous in protecting the label on the model number label 1026.

Furthermore, as shown in FIG. 14, when the battery apparatus 100 is attached to the battery attachment section 30 at an angle, the locking piece 1012A provided near the end of the case 100 at which the battery-side terminal 14 is positioned is locked into the locking hook 3004A positioned near the attachment section-side terminal 32. However, the locking piece 1012B provided at the location closer to the above-mentioned locking piece 1012A abuts on the locking hook 3004B, to make great an angle of inclination formed by the battery apparatus 100 with respect to the attachment surface 3002, i.e., an angle formed between the bottom surface 1008 of the case 10 of the battery apparatus 100 and the attachment surface 3002 of the battery attachment section 30.

Therefore, it can be determined instantly that the battery apparatus 100 is attached imperfectly, and thus this configuration is advantageous in attaching the battery apparatus 100 reliably.

In the present embodiment, since the locking piece 1012B is disposed so as to be closer to the locking hook 3004A which is positioned near the attachment section-side terminal 32, the inclination of the battery apparatus 100 with respect to the attachment surface 3002 increases when the battery apparatus 100 is attached imperfectly, and thus it can be determined further simply that the battery apparatus 100 is attached imperfectly.

Note that if the angle of the battery apparatus 100 with respect to the attachment surface 3002 is ten degrees or more, the inclination of the battery apparatus 100 can be determined instantly.

Furthermore, in FIG. 10, of the locking hooks 3004 of the imaging apparatus 200, if the length of the locking hook 3004A which is near the attachment section-side terminal 32 is made shorter than those of the other two locking hooks 3004B, 3004C, the following advantages can be provided.

That is, when attachment of the battery apparatus 100 to the battery attachment section 30 is imperfect, i.e., when the two locking pieces 1012B, 1012C are not locked into the locking hooks 3004B, 3004C, even if the locking piece 1012A provided near the end of the case 100 where the battery-side terminal 14 is positioned is locked into the locking hook 3004A positioned near the attachment section-side terminal 32, the battery apparatus 200 inclines in such a direction as to be away from the attachment surface 3002 by the self weight of the battery apparatus 100, and this angle of inclination increases with decreasing length of the locking hook 3004A which is near the attachment section-side terminal 32. As a result, similarly to what has been mentioned above, the inclination of the battery apparatus 100 with respect to the attachment surface 3002 increases when attachment of the battery apparatus 100 is imperfect, and thus it can be determined further simply that the battery apparatus 100 is attached imperfectly.

Next, advantages of the present embodiment will be described.

According to the battery apparatus 100 and the imaging apparatus 200 of the present embodiment, the battery apparatus 100 is provided with the identification recesses 1802, 1804 which are based on the characteristic of the battery apparatus 100, and the battery attachment section 30 is provided with the identification projection 36 for insertion into the identification recess 1802 of the battery apparatus 100 having the characteristic usable for the imaging apparatus 200.

Therefore, attachment of the battery apparatus 100 having the characteristic usable for the imaging apparatus 200, to the battery attachment section 30 is permitted by the identification projection 36 being inserted into the identification recess 1802.

On the other hand, the identification recess 1802 of a battery apparatus 100 not having the characteristic usable for the imaging apparatus 200 does not permit insertion of the identification projection 36 thereinto, and thus attachment of the battery apparatus 100 not having the characteristic usable for the imaging apparatus 200, to the battery attachment section 30 is prohibited by the identification projection 36 not being inserted into the identification recess 1802.

As a result, the battery apparatus 100 having the characteristic compatible with the imaging apparatus 200 can be attached suitably. For example, to an imaging apparatus 200 that consumes a large amount of current, attachment is permitted of a battery apparatus 100 having a large capacity that can hold the large amount of current to be consumed, and attachment is prohibited of a battery apparatus 100 having a small capacity that cannot hold the above-mentioned large amount of current to be consumed. Alternatively, to an imaging apparatus 200 that consumes a small amount of current, attachment is permitted of a battery apparatus 100 having capacities ranging from a small capacity corresponding to the current to be consumed, to a large capacity.

And in the battery apparatus 100, portions which are inward of an end surface that is at one end of the case 10 in the length direction, and which are on both sides of the battery-side terminal 14 in the width direction are left as a dead space where neither boards nor electronic components are disposed. Thus, even if the identification recess 1802 is provided in the end surface of the case 10, it does not increase the size of the case 10. Therefore, this configuration is not a hindrance to miniaturizing the battery apparatus 100. To describe it in more detail, an end surface, which is positioned opposite to the bottom surface 1008 of the case 10 in the thickness direction of the battery-side terminal 14, is positioned inside the case 10. Although lead wires for connection to the control circuit board 16 are positioned at locations on this end surface, not only portions which are near the bottom surface 1008 of the case 10 and which are on both sides of the battery-side terminal 14 in the width direction and portions which are in the middle of the battery-side terminal 14 in the thickness direction and which are on both sides of the battery-side terminal 14 in the width direction, but also portions which are positioned inside the case 10 which are near the end surface of the battery-side

terminal 14 and which are on both sides of the battery-side terminal 14 in the width direction are left as a dead space where neither components nor members are disposed. Thus, even if the identification recess 1802 is provided, it does not increase the size of the case 10. Therefore, this configuration is not a hindrance to miniaturizing the battery apparatus 100. Further, the identification projection 36 provided on the battery attachment section 30 of the imaging apparatus 200 is acceptable as long as it has a shape that can be inserted into the identification recess 1802 of the battery apparatus 100, and thus this configuration is not a hindrance to miniaturizing the imaging apparatus 200, similarly to the case of the battery apparatus 100.

Note that the case where the identification recess 1802 is formed in a manner open to both the end surface and the bottom surface has been described in the present embodiment. However, the identification recess 1802 may otherwise be formed in a manner closed at the bottom surface. However, when the identification recess 1802 is formed in a manner open to both the end surface and the bottom surface as in the embodiment, the identification projection 36 can be formed so as to be connected to both the attachment surface 1008 and the side surface 3008, and thus this configuration is advantageous in maintaining the strength of the identification projection 36.

The present embodiment will be described in more detail with reference to FIGS. 15, 16.

FIGS. 15, 16 are explanatory diagrams showing the relationship between the identification recesses 1802, 1804 of the identification section 18 of the battery apparatus 100 and the identification projection 36 of the imaging apparatus 200. Note that FIGS. 15(A) through (D) and FIGS. 16(A) through (D) are perspective diagrams of the attachment section-side terminals 32 and the identification projections 36 of battery attachment sections 30. FIGS. 15(A1) through (D1) and FIGS. 16(A2) through (D2) are perspective diagrams in which battery apparatus 100 are attached to the battery attachment sections 30. FIGS. 16(A3) through (D3) are perspective diagrams in which a battery apparatus 100 is attached to the battery attachment sections 30. FIG. 15(E1), FIG. 16(E2), FIG. 16 (E3) show side views of the battery apparatus 100. FIG. 15(E1), FIGS. 16(E2), (E3) are diagrams of three types of battery apparatus 100 (100A, 100B, 100C), each having a different characteristic from the others. Their widths are equal, but their capacity and thickness increase in the stated order, and the number of identification recesses 1802, 11804 and their lengths differ from one battery apparatus to another.

FIGS. 15(A), (B), (C), (D), FIGS. 16(A), (B), (C), (D) are diagrams respectively showing portions of four types of battery attachment sections 30 of the imaging apparatus 200 to which the battery apparatus 100 are attached. Each of these four types of battery attachment sections 30 permits attachment of a different type of battery apparatus 100, and its identification projection(s) 36 differs in number and height.

And FIGS. 15(A1), (B1), (C1), (D1) show states in which the battery apparatus 100A is attached to the four types of battery attachment sections 30. FIGS. 16 (A2), (B2), (C2), (D2) show states in which the battery apparatus 100B is attached to the four types of battery attachment sections 30. FIGS. 16 (A3), (B3), (C3), (D3) show states in which the battery apparatus 100C is attached to the four types of battery attachment sections 30.

As shown in FIGS. 15(A), (B), (C), (D), FIGS. 16(A), (B), (C), (D), one of the battery attachment sections 30 is provided with only one identification projection 36 on one side of its attachment section-side terminal 32, and other battery attachment sections 30 are provided with a total of two identification projections 36 on both sides of their attachment section-side terminal 32. As to the two identification projections 36, there are variations in their length from one battery attachment section 30 to another, such as two long identification projections 36 of the same length, two short identification projections 30 of the same length, or two identification projections 30 each having a different length.

Therefore, as to, e.g., a battery attachment section 30A, one of the two identification projections 36, 36 is formed to be large in length, and the other identification projection 36 is formed to be short in length.

Further, as shown in FIG. 15(A1), FIGS. 16(A2), (A3), in one of the battery apparatus 100, one of the two identification recesses is closed, and in other battery apparatus 100, both of the two identification recesses 1802, 1804 are open. As to the two identification recesses, there are variations in their length from one battery apparatus 100 to another, such as two long identification recesses 1802, 1804 of the same length, two short identification recesses 1802, 1804 of the same length, or two identification recesses 1802, 1804 each having a different length.

Therefore, as to, e.g., the battery apparatus 100A, one of the two identification recesses, i.e., the identification recess 1802, is short, and the other identification recess 1804 is closed.

Thus, in the case of the battery apparatus 100A, as in FIGS. 15(A1), (B1), if the identification projection 36 is positioned at a location corresponding to the identification recess 1804 which is closed, attachment of the battery apparatus 100A is prohibited. On the other hand, as shown in FIG. 15(C1), when the identification projection 36 is provided so as to correspond to the identification recess 1802 which is open, and when the length of the identification projection 36 is equal to or smaller than the identification recess 1802, attachment of the battery apparatus 100A is permitted. Further, as shown in FIG. 15(D1), even if no identification projection 36 is provided at a location corresponding to the identification recess 1802 which is open, attachment of the battery apparatus 100A is permitted.

Furthermore, in the case of the battery apparatus 100B, 100C, similarly to the case of the battery apparatus 100A, types of imaging apparatus 200 which permit their attachment are determined according to combinations of the lengths of the identification recesses 1802, 1804, the length of the identification projection(s) 36, and the presence/absence of the identification projection(s) 36.

EMBODIMENT 2

Next, Embodiment 2 of the present invention will be described with reference to the drawings.

Embodiment 2 differs from Embodiment 1 in that the electronic equipment is a battery charger and that detection means for detecting the identification section 18 of the battery apparatus 100 is provided.

FIGS. 17, 18 are explanatory diagrams showing states in which four types of battery apparatus 100 (100A, 100B, 100C, 100D), each having a different capacity or charging current for supply during charge, are attached to a battery charger 400.

FIG. 19 is a block diagram showing a configuration of the battery apparatus 100, and the battery charger 400 as the electronic equipment. In the following, the same or similar

parts as in Embodiment 1 are denoted by the same reference symbols, and their descriptions are omitted.

Note that FIGS. 17(A), (B), and FIGS. 18(C), (D) are perspective diagrams of battery-side terminals 14. FIGS. 17(A1), (B1) are views on arrow X1 of FIGS. 17(A), (B) with the battery apparatus attached to a battery attachment section of the battery charger 400. FIGS. 17(A2), (B2) are views on arrow X2 of FIGS. 17(A), (B) with the battery apparatus attached to the battery attachment section of the above-mentioned battery charger. FIGS. 18(C1), (D1) are diagrams as viewed in the direction of an arrow X1 of FIGS. 18(C), (D) with the battery apparatus attached to the battery attachment section of the battery charger. FIGS. 18(C2), (D2) are views on arrow X2 of FIGS. 18(A), (B) with the battery apparatus attached to the battery attachment section of the above-mentioned battery charger.

In the battery attachment section 30 (FIGS. 17, 18) of the battery charger 400, there are provided an attachment section-side terminal (not shown) and detection means 40 (FIG. 19). The attachment section-side terminal connects to the battery-side terminal 14 with the battery apparatus 100 attached to the battery attachment section. The detection means 40 serves to detect at least one of the positions, cross-sectional shapes, and lengths of the identification recesses 1802, 1804.

In the present embodiment, as the detection means 40, sensors 402, 404 (FIGS. 17, 18) formed from microswitches or the like are provided at locations of the battery attachment section 30 which face the two identification recesses 1802, 1804, respectively.

Of the two sensors 402, 404, the sensor 402 is provided at such a position as to be pressed by a case 10 portion which forms the identification section 18 if one of the identification recesses, i.e., the identification recess 1802 is short, and not to be pressed by the case 10 portion which forms the identification section 18 if the identification recess 1802 is long. Therefore, the sensor 402 is configured to detect the length of the identification recess 1802, whether it is long or short, and supply the detection result to a control section 308.

The other one of the two sensors 402, 404, i.e., the sensor 404 is provided at such a position as to be pressed by a case 10 portion which forms the identification section 18 if the other identification recess 1804 is absent, and not to be pressed by the case 10 portion which forms the identification section 18 if the identification recess 1804 is present. Therefore, the sensor 404 is configured to detect the presence/absence of the identification recess 1804, and supply the detection result to the control section 308.

Further, as shown in FIGS. 17(A), (B), FIGS. 18(C), (D), similarly to the case of Embodiment 1, in some of the battery apparatus 100, one of the two identification recesses is closed, and in other battery apparatus 100, both of the two identification recesses 1802, 1804 are open. As to the two identification recesses, there are variations in their length from one battery apparatus to another, such as two long identification recesses 1802, 1804 of the same length, two short identification recesses 1802, 1804 of the same length, or two identification recesses 1802, 1804 each having a different length.

Therefore, as to, e.g., the battery apparatus 100A, one of the two identification recesses, i.e., the identification recess 1802 is short, and the other identification recess 1804 is closed.

As shown in FIG. 19, the battery apparatus 100 has the battery-side terminal 14, a rechargeable battery section 12, the control circuit board 16, the identification section 18.

The battery charger 400 has the attachment section-side terminal 32, the detection means 40, a charging section 307, the control section 308.

The charging section 306 is configured to supply a charging current to the charging section 12 of the battery apparatus 100 through the attachment section-side terminal 32 and the battery-side terminal 14, to charge the charging section 12.

The control section 308 is configured to implement data communication with the control circuit board 16 of the battery apparatus 100 through the attachment section-side terminal 32 and the battery-side terminal 14, to receive identification data indicative of a characteristic of the battery apparatus 100 from the control circuit board 16.

Further, the control section 308 is configured to determine the characteristic of the battery apparatus 100 on the basis of a detection result by the detection means 40, to control the above-mentioned charging current according to the detection result. Specifically, it is configured to adjust the above-mentioned charging current value and its supply time by controlling the charging section 306. In the present embodiment, it is configured such that the charging current is adjustable on three levels, i.e., a normal charging current, a quick charging current, and a super quick charging current. Note that the normal charging current, quick charging current, super quick charging current are set such that their current values increase in this order.

Next, advantageous effects of the present embodiment will be described.

When the battery apparatus 100 has been attached to the battery attachment section 30 of the battery charger 400, a detection result as to the presence/absence (cross-sectional shape) of the identification recess(es) 1802, 1804 of the battery apparatus 100 and the length of the identification recess (es) 1802, 1804 of the battery apparatus 100 is supplied by the detection means 40, to the control section 308. As a result, the control section 308 determines the type of the battery apparatus 100 on the basis of the above-mentioned detection result, to control the charging section 306 such that a suitable charging current corresponding to the determined characteristic of the battery apparatus 100 is to be supplied to the rechargeable battery section 1202. Specifically, any of the normal charging current, quick charging current, super quick charging current is set as the charging current.

Therefore, only by attaching the battery apparatus 100 to the battery charger 400, a suitable charging operation which corresponds to the characteristic of the battery apparatus 100 attached can be performed. Thus, since the user has to perform no special operation, this configuration is advantageous in enhancing the usability of the battery charger 400.

By the way, as mentioned above, the control circuit board 16 of the battery apparatus 100 holds identification data indicative of the characteristic of the battery apparatus 100 itself, i.e., the capacity, suitable charging current value, or whether any of the normal charging current, quick charging current, super quick charging current is applicable as the charging current, and can transmit the identification data to the control section 308 of the battery charger 400.

Thus, by performing both determination of the battery apparatus 100 by the detection means 40 and determination of the battery apparatus 100 by the identification data, a suitable charging current can be supplied to the battery apparatus 100 more reliably, as hereinafter described.

FIG. 20 is a flowchart showing a charging operation in a modified example of Embodiment 2.

First, when the battery apparatus 100 has been attached to the battery charger 400, the control section 308 determines the characteristic of the battery apparatus 100 on the basis of a detection result by the detection means 40 (step S10).

Further, the control section 308 receives the above-mentioned identification data on the battery apparatus 100 by implementing data communication with the control circuit board 16 of the battery apparatus 100, to determine the characteristic of the battery apparatus 100 on the basis of the identification data received (step S12).

The control section 308 determines whether or not these two determination results match in terms of the battery apparatus being quickly chargeable (step S14).

If the determination result in step S14 is positive ("Y") the control section 308 controls the charging section 306 so as to perform a charging operation based on quick charge (step S16). If the determination result in step S14 is negative ("N"), the control section 308 controls the charging section 306 so as to perform a charging operation based on normal charge (step S18).

In this way, a quick charge is implemented only if the determination result by the detection means 40 match the determination result by the above-mentioned identification data. Thus, even if a battery apparatus 100 having the identification section 18 not correctly configured, i.e., a battery apparatus 100 which is not a genuine product, has been attached to the battery charger 400, only a normal charging operation is permitted, prohibiting a quick charging operation in which a charging current greater than in a normal charge is supplied to the battery apparatus 100. Thus, neither the battery apparatus 100 nor the battery charger 400 are unreasonably loaded. Consequently, this configuration is advantageous in implementing a suitable charging operation.

While the two identification recesses 1802, 1804 are provided as the identification section 18 of the battery apparatus 100 in each of the above-mentioned embodiments, one, or three or more identification recesses may be provided. Further, the identification recesses may come in three or more different lengths. Furthermore, while the identification recesses are made different in terms of their presence/absence (cross-sectional shape) and length in each of the above-mentioned embodiments, the identification recesses may be made different otherwise in terms of their position, e.g., their positions in the width direction W of the case 100. In these cases, identification projections on the side of the battery attachment section are, of course, provided so as to correspond to the cross-sectional shapes including the presence/absence of the identification recesses, the lengths of the identification recesses, the positions of the identification recesses.

Furthermore, it can be said that the battery apparatus 100 according to each of the above-mentioned embodiments is configured as follows.

That is, the battery apparatus has the case 10. The case 10 has the two end surfaces 1022, 1032 positioned on both ends in the length direction, and the side surfaces 1006 connecting these two end surfaces 1022, 1032, and the battery-side terminal 1014 is provided so as to face at least one of the end surface 1022, which is one of the two end surfaces 1022, 1032, and the side surfaces 1006 connected to that end surface 1022. In each side surface 1006 is an erroneous insertion prevention groove, which includes the plurality of recessed portions 1010 and which extends in the above-mentioned length direction L. In the length direction L, if it is termed a side of the battery-side terminal 1014 is as being frontward and a side opposite thereto is termed as being rearward, the erroneous insertion prevention groove is open at a portion (front end portion) which is one of both ends thereof in the length direction L and which is near the battery-side terminal 1014, and is closed at a portion (rear end portion) which is opposite thereto. And on each of the above-mentioned erroneous insertion prevention grooves, a single projection 1018 or two or more projections 1018 are formed, which project outward of the case 10. In the case of the plurality of projections 1018, they extend at intervals in the above-mentioned length direction L.

According to such a configuration, as described in FIG. 13, the identification data on the battery apparatus 100 can be indicated by the position of the projection(s) 1018 in the length direction L, the presence/absence of the projection(s) 1018, the number of projections 1018, or the like. In this case, since the projection(s) 1018 projects outward of the case 10, it occupies no space inside the case 10, and thus, this configuration is advantageous in securing a space for accommodating components inside the case 10, or minimizing the case 10. Additionally, this configuration is advantageous in improving the degree of freedom in designing the battery apparatus 100.

Further, the battery apparatus 100 of the present embodiments is provided with the above-mentioned erroneous insertion prevention groove along each of the two side surfaces 1006 which interpose the case 10 in the width direction W and which are opposed to each other. In this case, the two erroneous insertion prevention grooves are engaged with projections corresponding thereto, whereby the above-mentioned case can be positioned in the above-mentioned thickness direction H, and thus the above-mentioned erroneous insertion prevention grooves can be made to function as positioning grooves.

According to such a configuration, if a battery accommodating chamber is provided, which accommodates the battery apparatus 100 by having the battery apparatus 100 inserted thereinto in the above-mentioned length direction L, the above-mentioned respective projections are provided within that battery accommodating chamber, and the above-mentioned two erroneous insertion prevention grooves are engaged with these projections, respectively, whereby battery apparatus, each having a dimension different from the above-mentioned thickness H, can be positioned and accommodated within the above-mentioned battery accommodation chamber.

Further, in the battery apparatus 100 of the present embodiments, the plurality of recessed portions 1010 are formed from the plurality of locking pieces 1012 (1012A, 1012B, 1012C) the side surface 1016 portions respectively facing these plurality of locking pieces 1012 (1012A, 1012B, 1012C), and the surface 1014 portions respectively facing these locking pieces 1012 (1012A, 1012B, 1012C). And thus, the above-mentioned erroneous insertion prevention grooves can be formed from these plurality of recesses 1010.

Furthermore, the battery apparatus 100 of the present embodiments is provided with the projections 1018 so as to be connected to the plurality of locking pieces 1012 (1012A, 1012B, 1012C), respectively, and the projections 1018 are respectively connected to the locking pieces 1012 (1012A, 1012B, 1012C) at locations (near the battery-side terminal) which are toward such a direction as to move (slide) the battery apparatus 100 in the above-mentioned length direction L while the battery apparatus 160 is attached to the battery attachment section 30.

According to such a configuration, when these locking pieces 1012 (1012A, 1012B, 1012C) are looked into and

unlocked from the plurality of locking hooks 3004 (3004A, 3004B, 3004C) respectively, spaces are provided between the locking piece 1012A and the locking book 3004A, between the locking piece 1012B and the locking hook 3004B, between the locking piece 1012C and the locking hook 3004C, in the above-mentioned length direction L. As a result, when the plurality of locking pieces 1012 (1012A, 1012B, 1012C) are locked into and unlocked from the plurality of locking hooks 3004 (3004A, 3004B, 3004C), each locking hook is less subject to interference with the corresponding projection 1018, and this configuration is advantageous in attaching and detaching the battery apparatus 100 smoothly.

Furthermore, in each of the embodiments, e.g., an external type has been described, in which the battery apparatus 100 is attached to the outer surface of the case of the electronic equipment, e.g., by the locking hooks 3004 of the battery attachment section 30 being locked with the locking pieces 1012 of the battery apparatus 100.

However, the present invention is not limited to this configuration. The present invention is, of course, applicable even to an incorporated type, in which a battery accommodation chamber is provided, by which the battery apparatus 100 is accommodated in the electronic equipment. That is, the battery accommodating chamber has a width corresponding to the width of the case 10 of the battery apparatus 100, a height corresponding to the thickness of the case 10, a depth corresponding to the length of the case 10, and an accommodation chamber-side terminal (equivalent to the attachment section-side terminal) that comes in contact with the battery-side terminal 14, with the battery apparatus 100 as oriented in the above-mentioned length direction partially inserted into the battery accommodating chamber as oriented in the above-mentioned depth direction, and the battery apparatus 100 is attached to the electronic equipment when the battery apparatus has been accommodated in the battery accommodation chamber.

Furthermore, while the examples in which the electronic equipment includes an imaging apparatus and a battery charger has been shown in each of the embodiments, the present invention is, of course, applicable to various electronic equipment that operate using a battery apparatus.

The invention claimed is:

1. A battery apparatus comprising:

a case having a width, a thickness, and a length;

a battery cell accommodated inside the case;

a battery-side terminal provided on an end surface positioned at one of ends of the case in a length direction and electrically connected to the battery cell;

at least one locking piece on each of two lateral sides of the case and extending a distance in the width direction from the case, each locking piece forming a locking recess between the locking piece and an overhanging surface of the case; and

a strengthening projection located in each locking recess and extending from each respective locking piece to the overhanging surface of the case, each strengthening projection extending from the case in the width direction a shorter distance than the distance the respective locking piece extends from the case in the width direction,

wherein a bottom surface positioned on one side of the case in the thickness direction is aligned with an attachment surface of a battery attachment section of an electronic device to attach the battery apparatus by sliding the case along the length direction thereof, and the battery-side terminal comes in contact with an attachment section-side terminal of the battery attachment section.

2. The battery apparatus according to claim 1, wherein the battery-side terminal is provided approximately in the middle of the end surface of the case in the width direction.

3. The battery apparatus according to claim 1, further comprising:

a convex portion projecting in the length direction from the end surface of the case and extending in the width direction along the end surface of the case.

4. The battery apparatus according to claim 3, wherein

the convex portion extends in the width direction above the battery-side terminal.

5. The battery apparatus according to claim 1, further comprising:

a cutout portion formed in an end portion of the bottom surface of the case, the cutout portion configured to receive a locking device of the battery attachment section.

6. The battery apparatus according to claim 5, wherein

the battery-side terminal is provided at an opposite end portion in the length direction of the bottom surface.

7. The battery apparatus according to claim 1, wherein the bottom surface also includes a recess portion.

8. The battery apparatus according to claim 7, further comprising:

a convex portion in the recess portion; and

a machine name plate located in the recess portion and including a positioning groove receiving the convex portion of the recess portion.

9. The battery apparatus according to claim 1, wherein

the strengthening projection has beveled edges.

10. The battery apparatus according to claim 1, wherein

a first and a second locking piece are located on each side of the case in the width direction.

11. The battery apparatus according to claim 10, wherein

a first strengthening projection connected to the first locking piece extends in the length direction a greater distance than a second strengthening projection connected to the second locking piece.

12. The battery apparatus according to claim 11, wherein

the first locking piece is closer to the battery-side terminal than the second locking piece.

13. The battery apparatus according to claim 10, wherein

a first locking piece extends in the length direction a greater distance than the second locking piece.

14. The battery apparatus according to claim 13, wherein

the first locking piece is closer to the battery-side terminal than the second locking piece.

* * * * *

EXHIBIT B

US007485394B2

(12) **United States Patent**
Takeshita et al.

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(45) **Date of Patent: Feb. 3, 2009**

(54) **BATTERY HAVING A CASE WITH AN IDENTIFICATION RECESS AND GUIDE GROOVES FOR COUPLING TO AN ELECTRONIC DEVICE**

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(73) Assignee: Sony Corporation, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 60 days.

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PCT Pub. Date: Jul. 14, 2005

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H01M 2/02 (2006.01)

(52) U.S. Cl. 429/179; 429/163

(58) Field of Classification Search 429/163, 429/179

See application file for complete search history.

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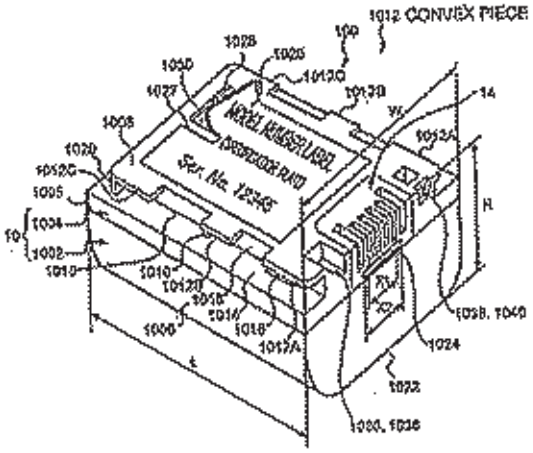
Primary Examiner—Mark Ruthkosky
(74) *Attorney, Agent, or Firm*—Oblon, Spivak, McClelland, Maier & Neustadt, P.C.

(57) **ABSTRACT**

A battery apparatus and an electronic equipment are provided which permit the use of a plurality of types of battery apparatuses that differ in capacity, and are advantageous in improving ease of use. A case of a battery apparatus has a main body portion and a bottom portion disposed at one side in a thickness direction at the midpoint in a width direction of the main body portion. Portions on both sides in the width direction of the case are formed as flat side surfaces that are parallel to each other and extend in a length direction. A plane on one side in the thickness direction of the case is formed as a flat bottom surface. At portions of the case on both sides in the width direction, guide grooves are formed which extend in the length direction and engage projections disposed at a battery housing chamber thereby to position the position of the case in the thickness direction within the battery housing chamber.

24 Claims, 12 Drawing Sheets



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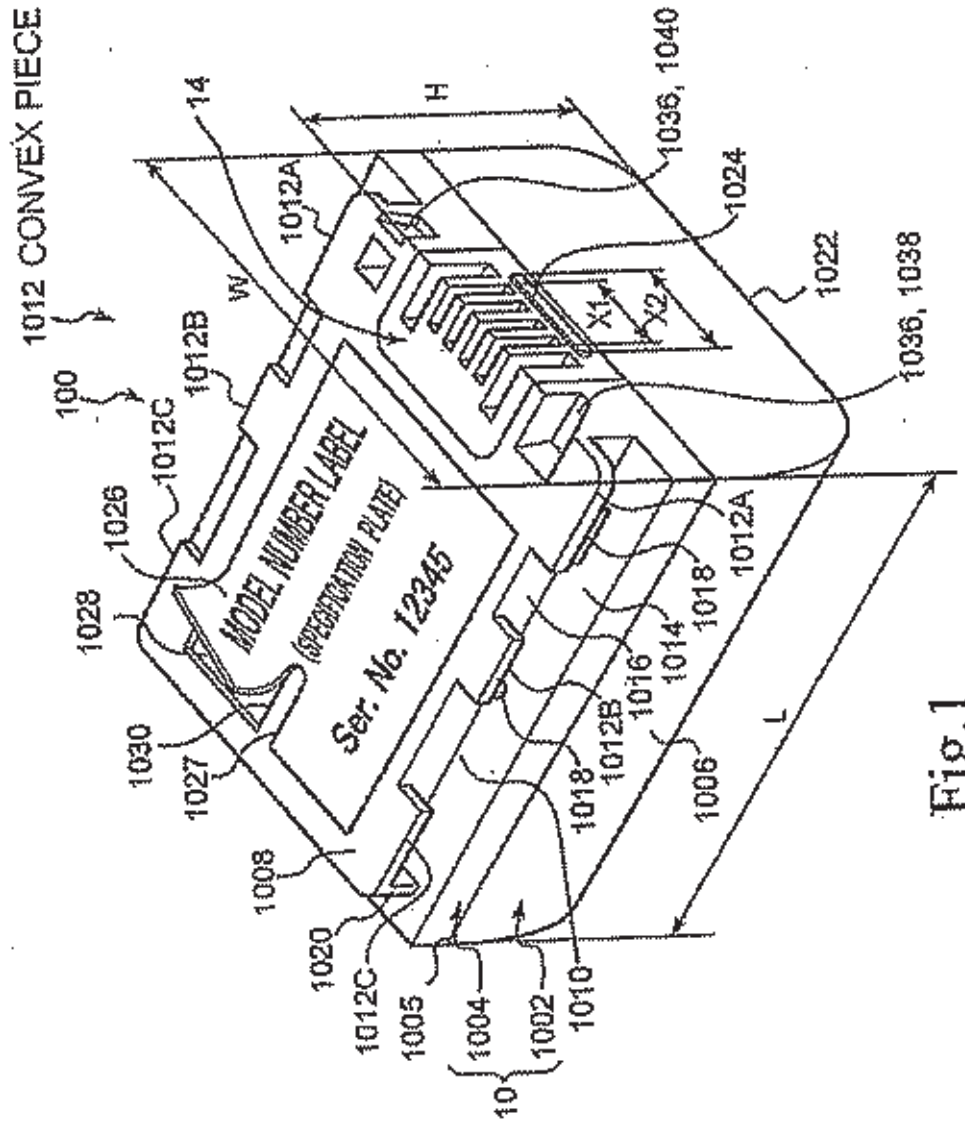
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1028
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1027
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(SPECIFICATION PLATE)
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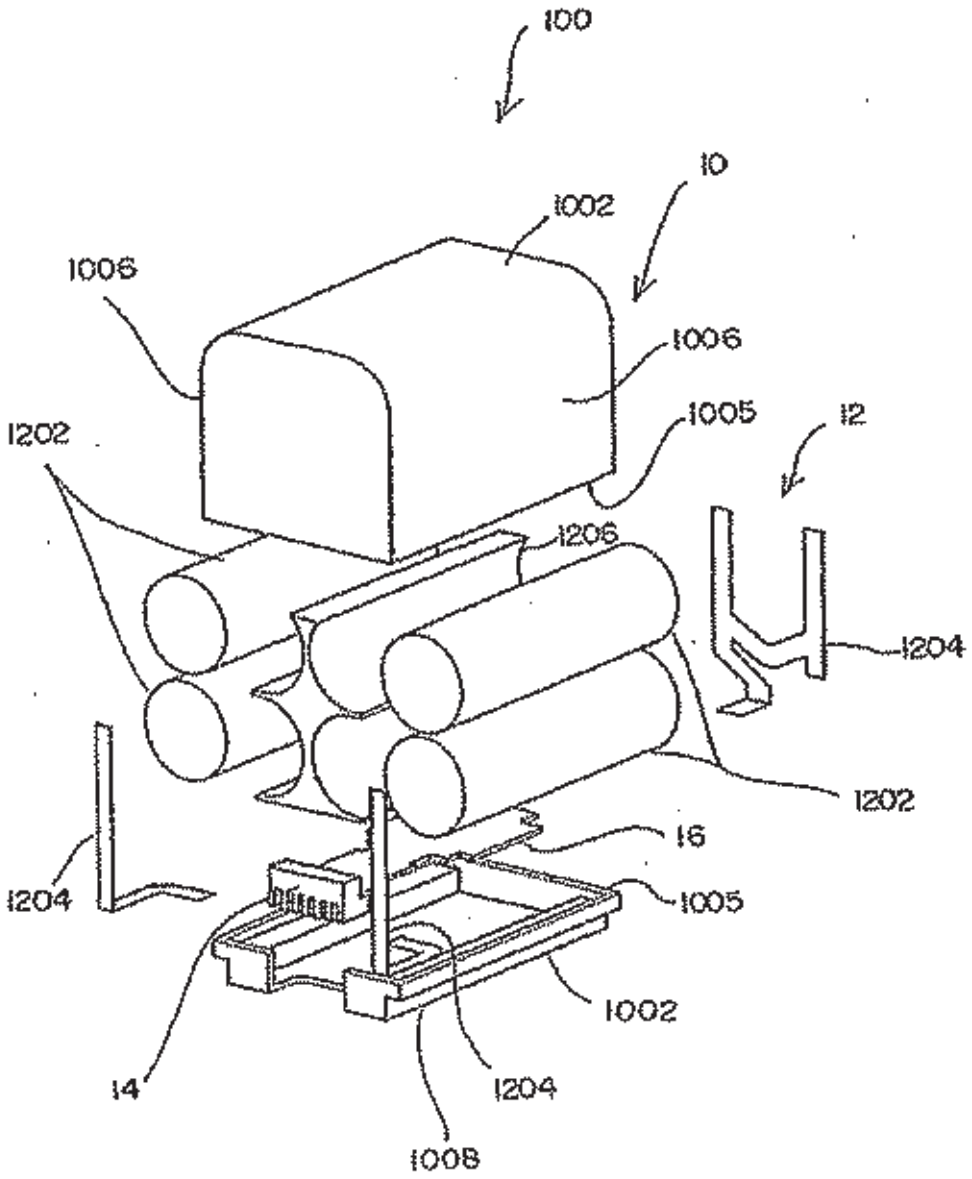
Fig. 1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1204
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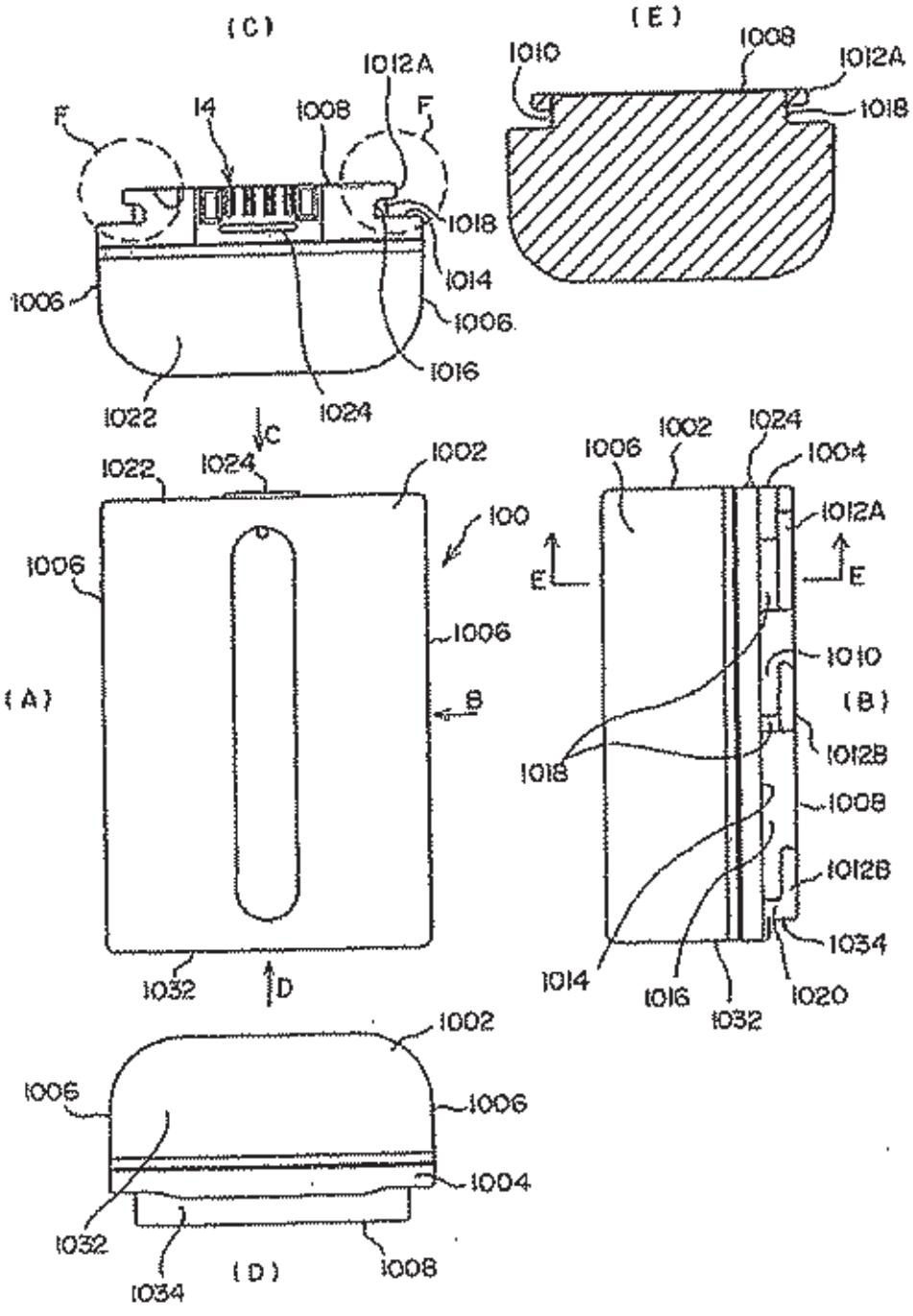
Fig.2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1002
1024
1004
1012A
E
E
1010
(B)
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1012B
1008
1012B
1034
1014
1016
1032
1020
1002
1006
1006
1004
1032
1034
(D)
1008

Fig.3

Fig.4A

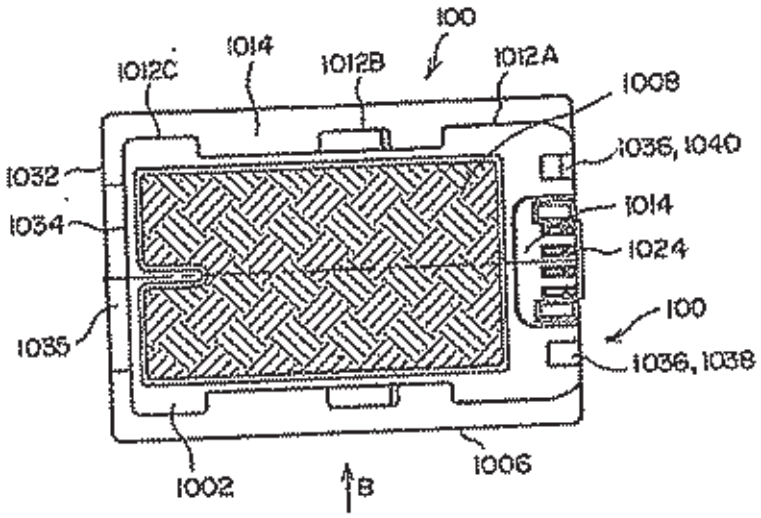


Fig.4B

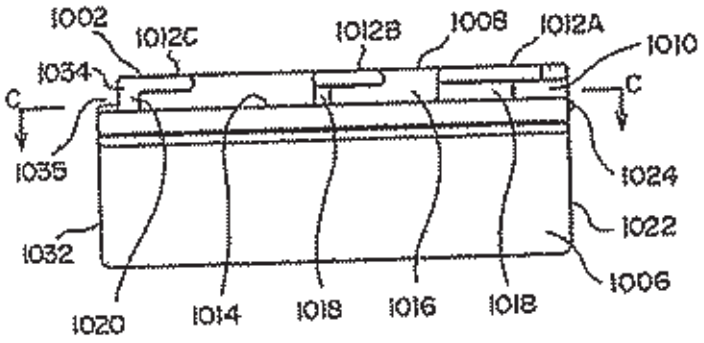
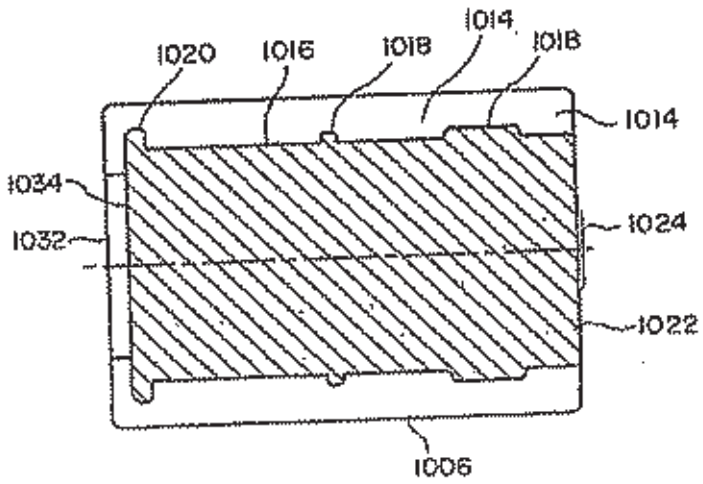


Fig.4C



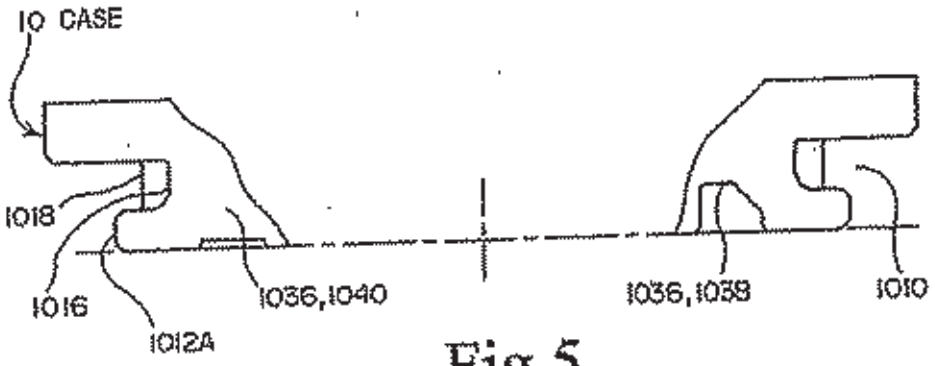

10 CASE
1018
1016
1012A
1036,1040
1036,1038
1010

Fig.5

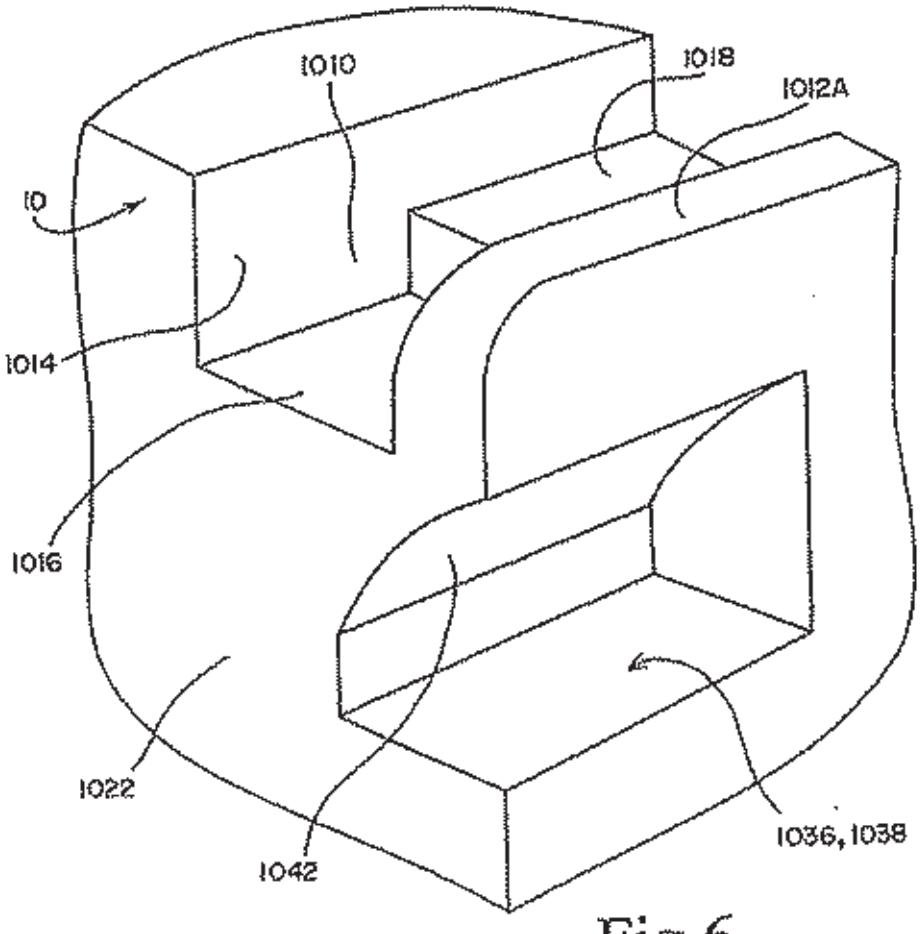

1010
1018
1012A
10
1014
1016
1022
1042
1036,1038

Fig.6

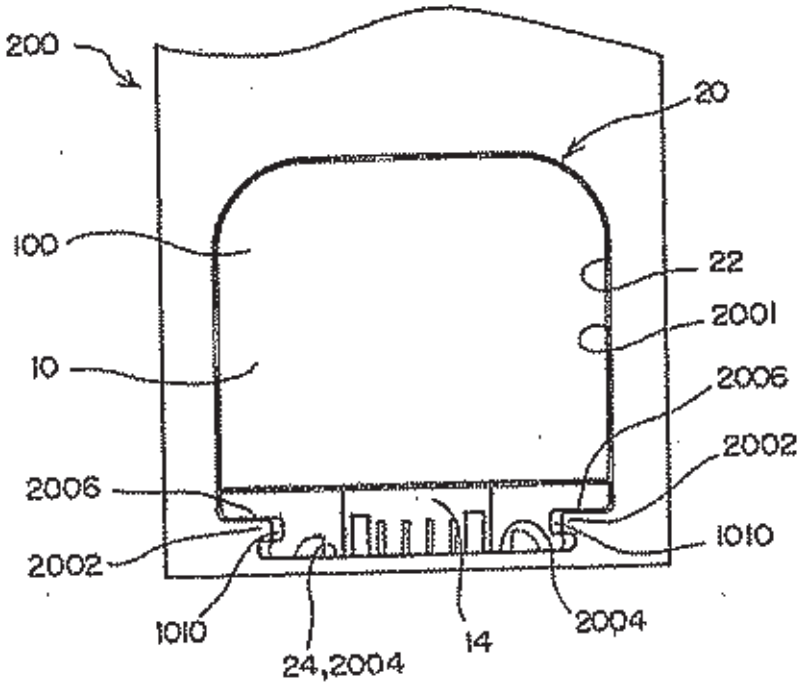

200
20
100
22
2001
10
2006
2002
2006
2002
1010
1010
24,2004
14
2004

Fig.7

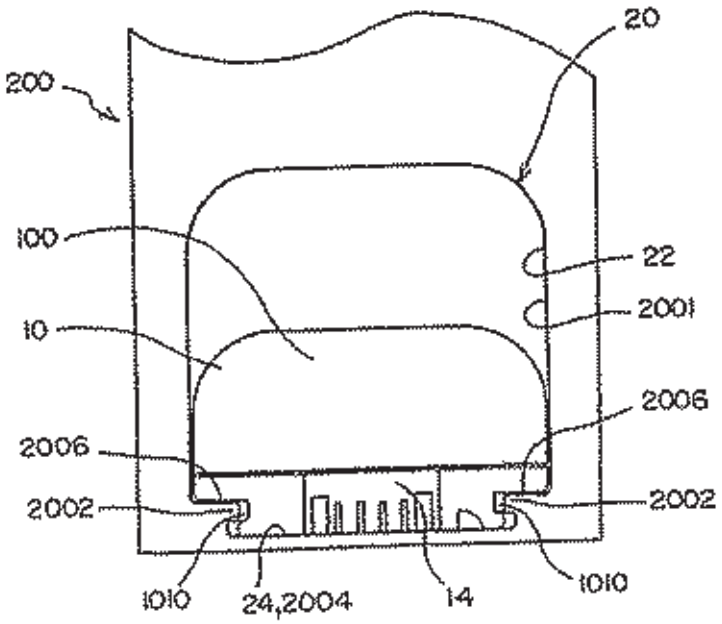

200
20
100
22
2001
10
2006
2006
2002
2002
1010
24,2004
14
1010

Fig.8

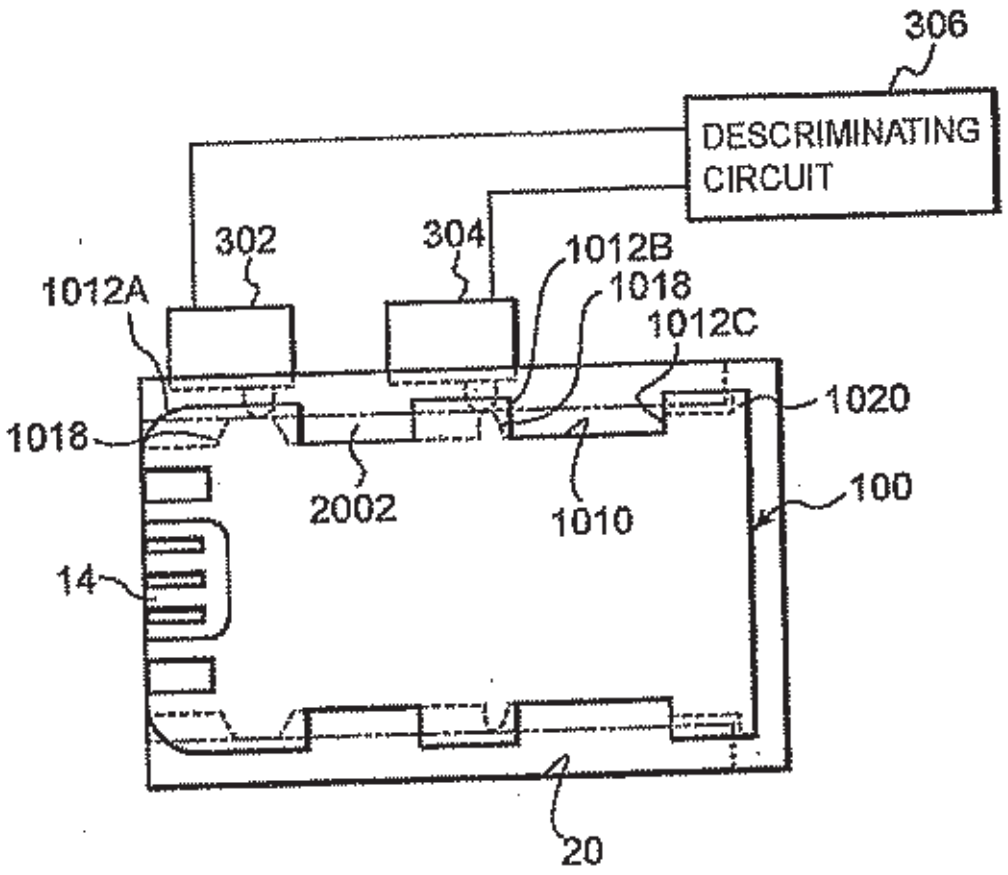

306
DESCRIMINATING CIRCUIT
302
304
1012B
1018
1012A
1012C
1020
1018
2002
1010
100
14
20

Fig.9

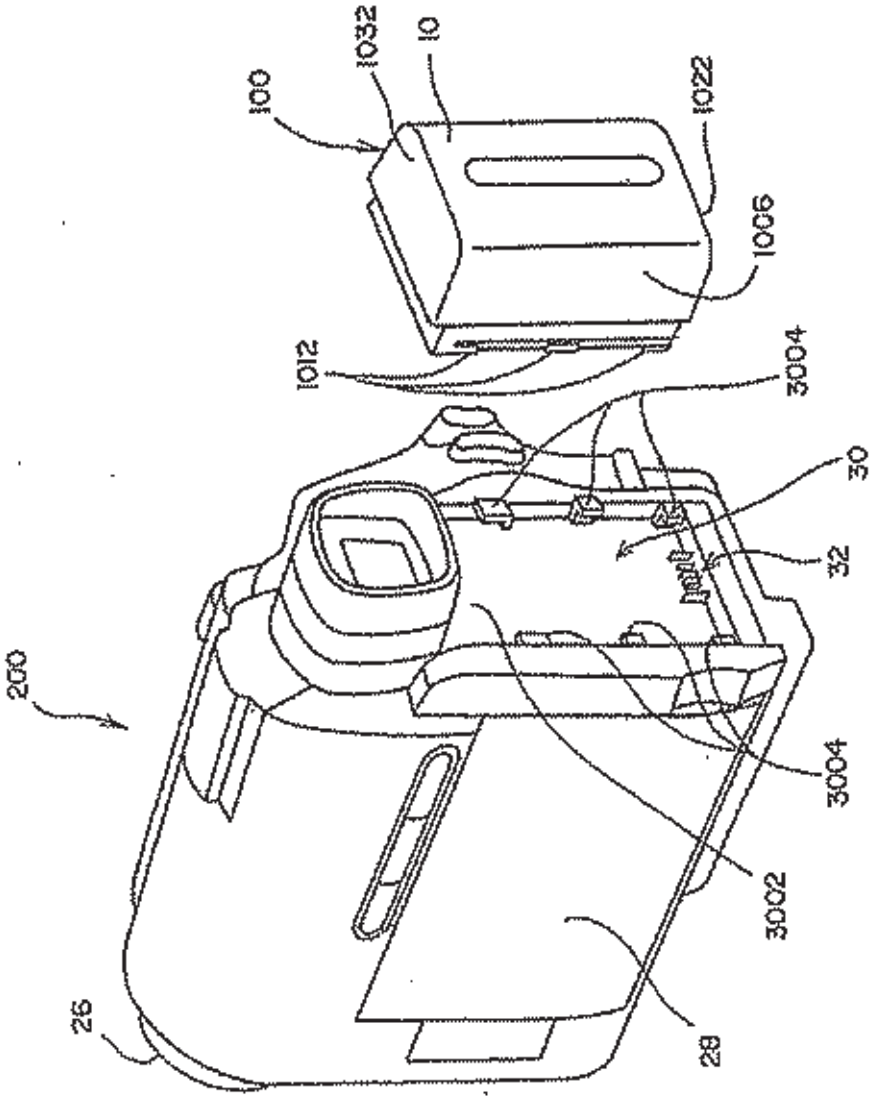


Fig.10

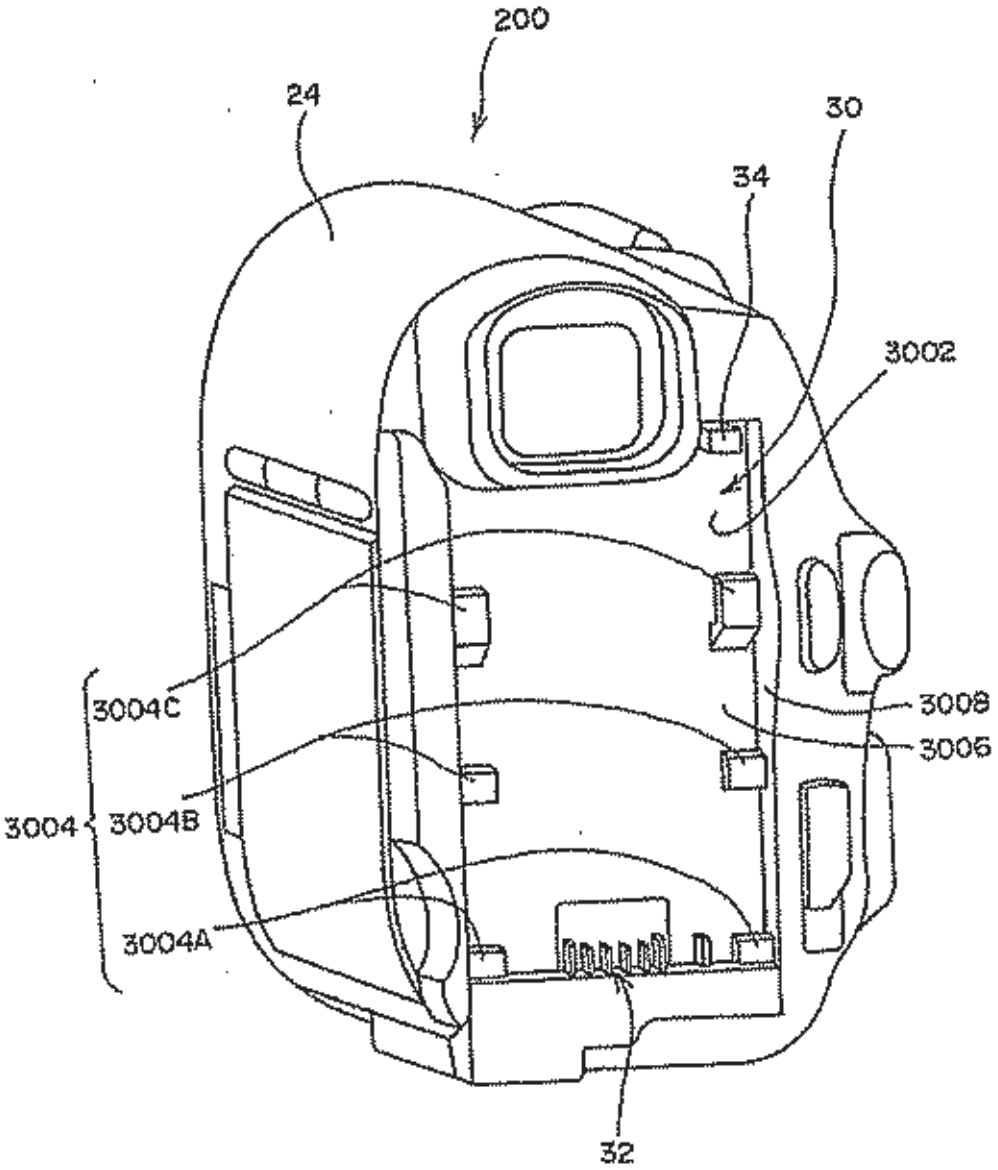


Fig.11

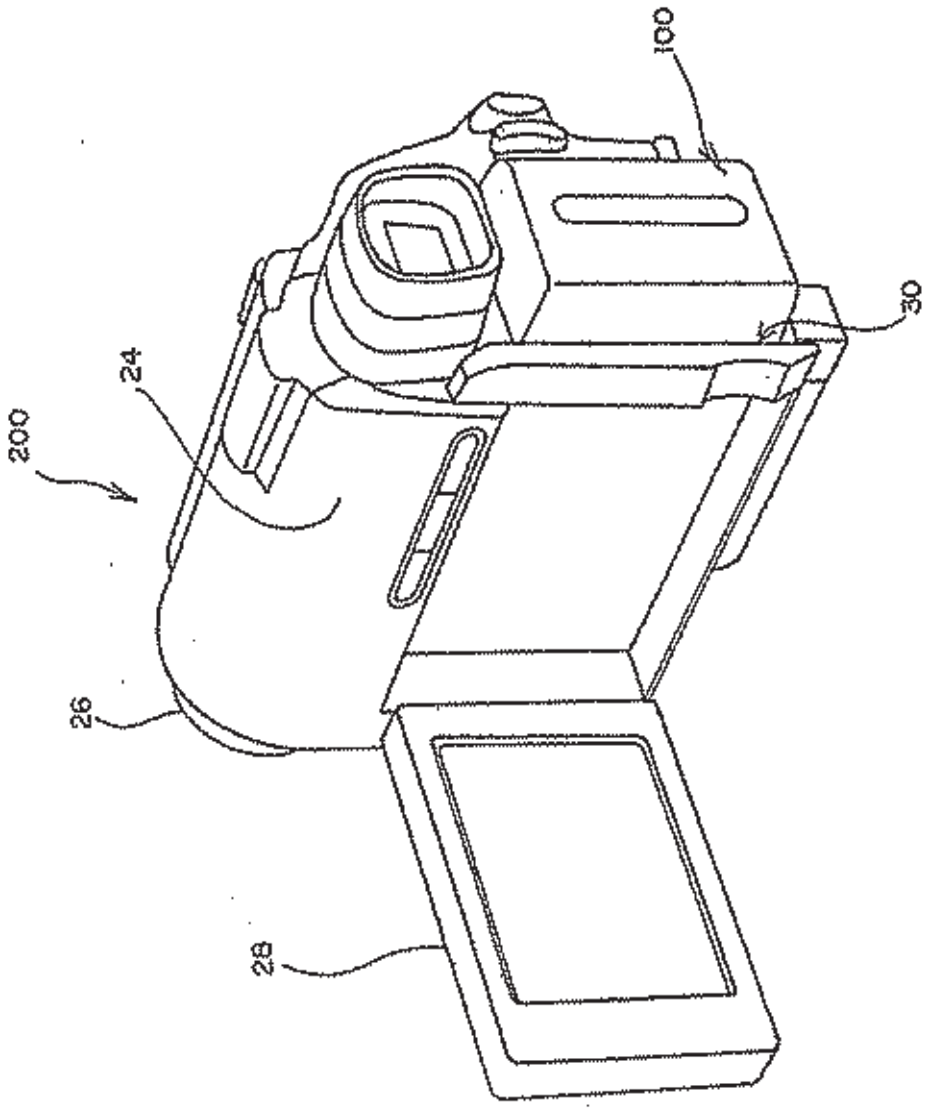


Fig.12

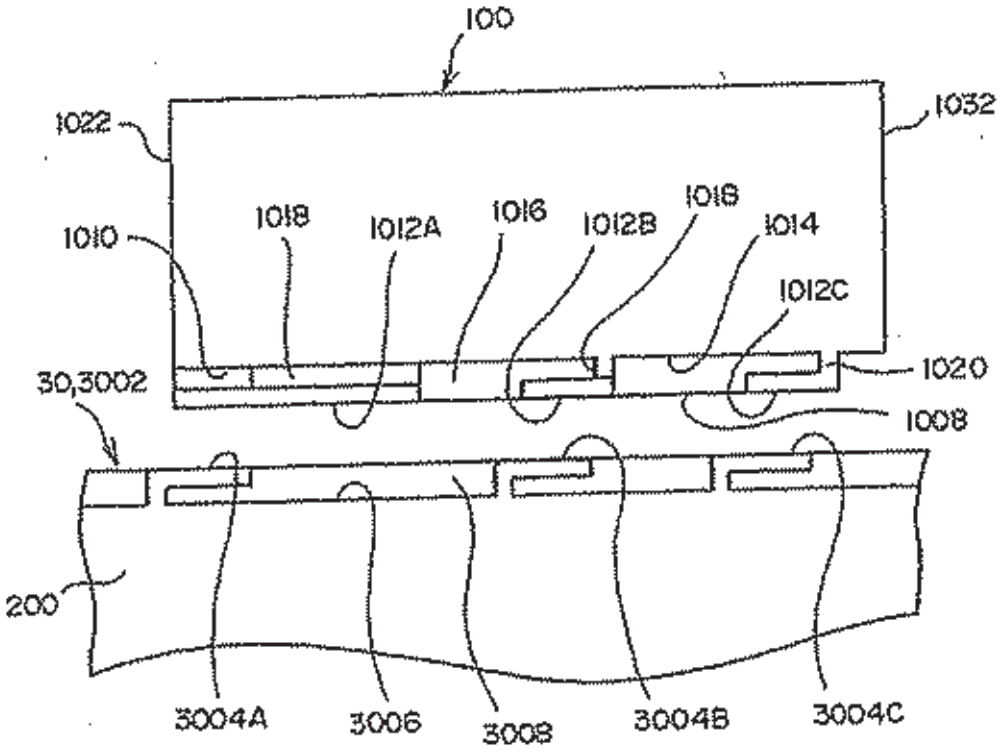

100
1022
1032
1010
1018
1012A
1016
1012B
1018
1014
1012C
1020
30,3002
1008
200
3004A
3006
3008
3004B
3004C

Fig.13

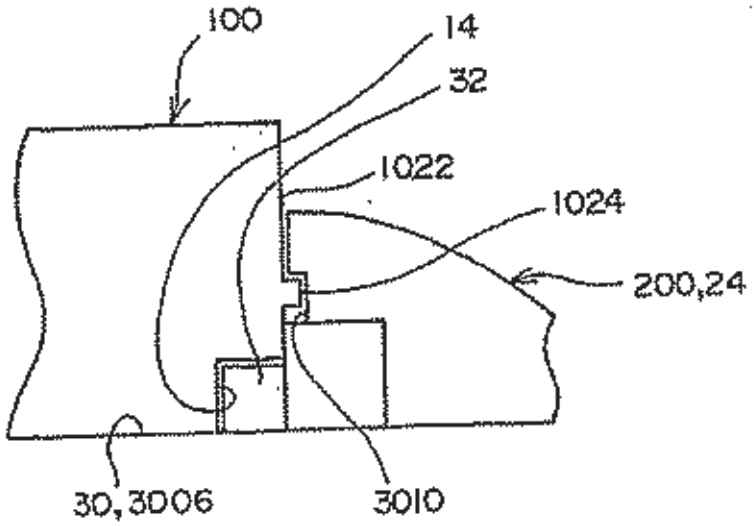

100
14
32
1022
1024
200,24
30,3006
3010

Fig.14

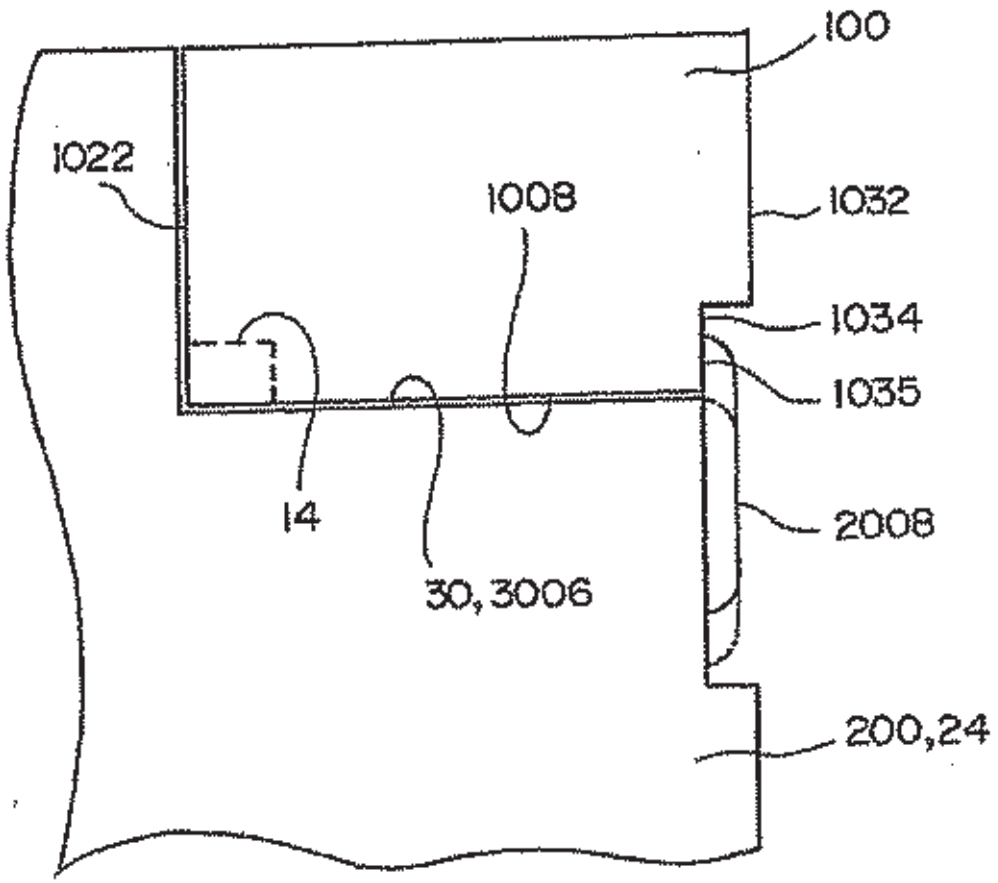


Fig.15

BATTERY HAVING A CASE WITH AN IDENTIFICATION RECESS AND GUIDE GROOVES FOR COUPLING TO AN ELECTRONIC DEVICE

TECHNICAL FIELD

The present invention relates to a battery apparatus and an electronic equipment operable by the battery apparatus.

BACKGROUND ART

As a battery apparatus mountable on an electronic equipment, there is provided one which is provided with a case having a predetermined width, thickness and length, a battery cell housed in the inside of the case, and a battery-side terminal disposed at the surface of the case and electrically connected to the battery cell, and which is inserted into a battery housing chamber of the electronic equipment in the direction of the length so that the battery-side terminal makes connection with a housing chamber-side terminal of the battery housing chamber (see for example Japanese Patent No. 2508447).

However, in the above-mentioned battery apparatus and the electronic equipment, if a battery apparatus having a smaller contour dimension than the shape of a battery housing chamber is inserted into the battery housing chamber, the battery apparatus is unstable in the battery housing chamber, thus failing to use suitably. That is, there is the disadvantage that it is impossible to selectively use a plurality of types of battery apparatuses having different contour dimensions, namely, different capacities.

DISCLOSURE OF THE INVENTION

The present invention provides a battery apparatus and an electronic equipment in which it is able to use a plurality of types of battery apparatuses having different capacities and are advantageous in improving ease of use.

To achieve the above-mentioned advantage, a battery apparatus according to an embodiment of the present invention includes a case having a predetermined width, thickness and length, a battery cell housed in the inside of the aforesaid case, and a battery-side terminal disposed at the surface of the aforesaid case and electrically connected to the aforesaid battery cell. The aforesaid battery apparatus is inserted into a battery housing chamber of the electronic equipment in the direction of the aforesaid length so that the aforesaid battery-side terminal makes connection with a housing chamber-side terminal of the aforesaid battery housing chamber. At portions of the aforesaid case on both sides in the direction of the aforesaid width, there are formed guide grooves that extend in the direction of the aforesaid length and engage projections disposed at the aforesaid battery housing chamber thereby to position the position of the aforesaid case in the direction of the aforesaid thickness within the aforesaid battery housing chamber.

Electronic equipment of the present invention is an electronic equipment having a battery housing chamber in which a battery apparatus is housed. The aforesaid battery apparatus includes a case having a predetermined width, thickness and length, a battery cell disposed at the inside of the aforesaid case, and a battery-side terminal disposed at the surface of the aforesaid case and electrically connected to the aforesaid battery cell. The aforesaid battery housing chamber has a width corresponding to the width of the aforesaid case, a height corresponding to the thickness of the aforesaid case, a depth corresponding to the length of the aforesaid case, and a housing chamber-side terminal that connects with the aforesaid battery-side terminal in the state in which the aforesaid battery apparatus is inserted by keeping the direction of the aforesaid length parallel with the direction of the aforesaid depth. Guide grooves extending in the direction of the aforesaid length direction are disposed at portions on both sides in the direction of the aforesaid width of the aforesaid case of the aforesaid battery apparatus. Projections are disposed at the aforesaid battery housing chamber which engage the aforesaid guide grooves and position the position in the direction of the aforesaid thickness of the aforesaid case in the direction of the aforesaid height direction within the aforesaid battery housing chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view taken from the bottom of a battery apparatus in an embodiment of the present invention.

FIG. 2 is a disassembled perspective view illustrating the construction of the battery apparatus an embodiment.

FIG. 3 is an explanatory drawing of a battery apparatus 100.

FIG. 4 is an explanatory drawing of a battery apparatus 100.

FIG. 5 is an enlarged view of an important part in FIG. 3.

FIG. 6 is an enlarged perspective view of an identification section 1036 and its surroundings.

FIG. 7 is a sectional view of a battery housing chamber 20 of a case.

FIG. 8 is a sectional view of a battery housing chamber 20 of a case.

FIG. 9 is a block diagram illustrating a discriminating circuit of convex portions 1018.

FIG. 10 is a perspective view of an imaging apparatus 200 to which the battery apparatus 100 is attached externally;

FIG. 11 is an enlarged view of a battery mounting section of the imaging apparatus 200.

FIG. 12 is a perspective view of the imaging apparatus 200 with the battery apparatus 100 mounted thereon.

FIG. 13 is an explanatory drawing of a lock mechanism.

FIG. 14 is an explanatory drawing illustrating the mounting of the battery apparatus 100 onto the battery mounting section.

FIG. 15 is an explanatory drawing illustrating the state in which the battery apparatus 100 is mounted on the battery mounting section.

BEST MODE FOR CARRYING OUT THE INVENTION

The advantage of making possible the use of a plurality of types of battery apparatuses which differ in capacity is realized by disposing guide grooves at a battery apparatus and disposing projections at a battery housing chamber of the electronic equipment.

An embodiment of the present invention will next be described by referring to the drawings.

In this embodiment, a description will be made of a case where a battery apparatus of the present invention is mounted for use on an imaging apparatus as an electronic equipment.

FIG. 1 is a perspective view taken from the bottom of a battery apparatus of the first preferred embodiment. FIG. 2 is a disassembled perspective view illustrating the construction of the battery apparatus of the first preferred embodiment.

First, a description of the battery apparatus will be presented.

As shown in FIG. 1, a battery apparatus 100 has a case 10, a chargeable battery section 12 (see FIG. 2) disposed at the inside of the case 10, a control circuit board 16 disposed at the inside of the case 10, and a battery-side terminal 14 disposed at the case 10.

The case 10 has a main body portion 1002 that is uniform in the dimension in a width direction W and extend in a length direction L, and a bottom portion 1004 that is disposed at the midpoint in the width direction W of the main body portion 1002 on one side in a thickness direction H, and extends in the length direction L in a uniform width of a dimension smaller than the width of the main body portion 1002.

A battery-side terminal 14 is disposed at one end in the length direction L of the bottom portion 1004.

In this embodiment, the case 10 includes a first segment excluding the portion toward the bottom portion 1004 of the main body portion 1002 and the bottom portion 1004, and a second segment including the portion toward the bottom portion 1004 of the main body portion 1002 and the bottom portion 1004. These segments are mated with a mating surface 1005 to form the case 10. The chargeable battery section 12 and the control circuit board 16 are housed in the inside of these segments.

As shown in FIG. 2, the chargeable battery section 12 has four cylindrical battery cells 1202, a plurality of wiring members 1204 for connecting the electrodes of these respective battery cells 1202, and a holding member 1206 interposed between the side surfaces of the respective battery cells 1202.

The control circuit board 16 is connected via the wiring members 1204 to the electrodes of the respective battery cells 1202 such that it is attached to the chargeable battery section 12. The control circuit board 16 has a microcomputer containing a CPU, a RAM and a ROM, an interface, etc, and is configured to execute data communication with an external electronic equipment via the battery-side terminal 14. The data communication includes the output operation of identification data indicating the capacity and the characteristic of the battery apparatus 100. Examples of the identification data are data indicating whether quick charge is possible or not when mounted on a battery charger, and data indicating an appropriate charging current value or an upper limit value of charging current.

The battery-side terminal 14 is, at the inside of the case 10, attached to the control circuit board 16 thereby to become conductive to the electrodes of the battery cells 1202 via the respective wiring members 1204, so that there are performed, via the battery-side terminal 14, the supply of operating current from the respective battery cells 1202 to the external electronic equipment, or the supply of charging current from the battery charger to the respective battery cells 1202.

The number and the shape of the battery cells 1202 constituting the chargeable battery section 12, of course, vary according to the capacity and the characteristic of the battery apparatus 100.

Description will now be made in detail of the construction of the case 10.

FIG. 3A is a plan view of the battery apparatus 100, FIG. 3B is a view taken in the direction of arrow B in FIG. 3A, FIG. 3C is a view taken in the direction of arrow C in FIG. 3A, FIG. 3D is a view taken in the direction of arrow D in FIG. 3A, and FIG. 3E is a sectional view taken along the line E-E in FIG. 3B. Further, FIG. 4A is a bottom view of the battery apparatus 100, FIG. 4B is a view taken in the direction of arrow B in FIG. 4A, and FIG. 4C is a sectional view taken along the line C-C in FIG. 4B. FIG. 5 is an enlarged view of a portion indicated by F in FIG. 3C. FIG. 6 is an enlarged perspective view of an identification section 1016 and its surroundings.

As shown in FIGS. 2, 3, and 4A to 4B, the portions on both sides in the width direction W of the case 10 are formed as flat side surfaces 1006 that are parallel to each other and extend in the length direction L. One plane in the thickness direction H of the case 10 is formed as a flat bottom surface 1008. In this embodiment, the side surfaces on both sides in the width direction W of the main body portion 1002 constitute the side surfaces 1006, and the bottom surface of the bottom portion 1004 constitutes the bottom surface 1008.

At portions of the case 10 on both sides in the width direction W, there are formed guide grooves 1010 that extend in a length direction L and engage projections disposed at a battery housing chamber of the electronic equipment thereby to position the position of the case 10 in the thickness direction H within the battery housing chamber.

In this embodiment, the guide grooves 1010 are disposed at portions toward the bottom surface 1008. More specifically, a plurality of convex pieces 1012 (1012A, 1012B and 1012C) are formed at the bottom surface 1008 on both sides in the width direction W such that they project outwardly in the width direction W from a plurality of portions at spaced intervals in the length direction L. The portions of the convex pieces 1012 (1012A, 1012B and 1012C) positioned at the end portion on one side in the thickness direction H are formed as a bottom surface arranged flush with the bottom surface 1008.

The guide grooves 1010 are formed so as to extend in the length direction of the case 10 and in its open state on the outside in the width direction by using the plurality of convex pieces 1012 (1012A, 1012B and 1012C), a plane 1014 on which the main body portion 1002 faces the bottom portion 1004, and side surfaces 1016 of the bottom portion 1004 which are positioned on both sides in the width direction W. In this embodiment, the guide grooves 1010 are opened toward the bottom surface 1008 at portions between the convex pieces 1012A, 1012B, and 1012C.

In this embodiment, at portions of the side surfaces 1016 of the bottom portion 1004 which are spaced apart in the length direction L, there are disposed convex portions 1018 projecting outwardly in the width direction W from the side surfaces 1016. The convex portions 1018 are formed in a projected dimension smaller than the convex pieces 1012.

Further in this embodiment, the convex portions 1018 are disposed at portions corresponding to the convex pieces 1012A and 1012B, respectively, so that the convex pieces 1012A and 1012B, the plane 1014, and the side surfaces 1016 are connected to one another.

In addition, stopper walls 1020 for filling the guide grooves 1010 are disposed at portions of the bottom surface 1008 which are on the opposite side of the portion at which the battery-side terminal 14 is disposed.

In addition, the stopper walls 1020 are disposed at the portion corresponding to the convex piece 1012C, so that the convex piece 1012C, the plane 1014, and the side surfaces 1016 are connected to one another.

Further in this embodiment, as shown in FIG. 1, the end surfaces of the main body portion 1002 and the bottom portion 1004 on the side on which the battery-side terminal 14 is disposed, which is one of the end surfaces on both ends in the length direction L of the case 10, are formed as a flat end surface 1022 orthogonal to the bottom surface 1008. A convex portion 1024, which is uniform in the dimension in the thickness direction H, and extends linearly in the width direction W, is formed so as to swell at a portion apart in the thickness direction H from the battery-side terminal 14 of the end surface 1022. The convex portion 1024 is formed at the portion corresponding to the battery-side terminal 14 and in a

length X2 having a greater dimension than a length X1 of the portion at which at least the electrodes of the battery-side terminal 14 are disposed.

Additionally, as shown in FIG. 1, a recess portion 1028 is formed at the bottom surface 1008, and a machine name plate 1026 is affixed to the recess portion 1028. The surface of the machine name plate 1026 is flush with the bottom surface 1008, or the surface of the machine name plate 1026 is arranged to position toward the inside of the case 10 from the bottom surface 1008. A positioning convex portion 1030 arranged flush with the bottom surface 1008 is formed in the length direction L from the portion positioned on the opposite side of the battery-side terminal 14 in the length direction L of the recess portion 1028. The convex portion 1030 is inserted into a positioning groove 1027 of the machine name plate 1026.

As shown in FIGS. 4A and 4B, the end surface of the main body portion 1002 positioned on the opposite side of the battery-side terminal 14, which is one of the end surfaces of both ends in the length direction L of the case 10, is formed as a flat end surface 1032 orthogonal to the bottom surface 1008, and the end surface of the bottom portion 1004 positioned on the opposite side of the battery-side terminal 14 is formed as a flat end surface 1034 that is parallel to the end surface 1032, at a portion displaced toward the inside of the case 10 from the end surface 1032. Accordingly, the end surfaces 1032 and 1034 constitute a cutout portion 1035 at a boundary portion between the main body portion 1002 and the bottom portion 1004, which are at the end portion positioned on the opposite side of the battery-side terminal 14 in the length direction L of the case 10.

As shown in FIG. 1, FIG. 5 and FIG. 6, two identification sections 1036 are formed at portions on both sides of the bottom surface 1008 of the bottom portion 1004 which sandwich therebetween the battery-side terminal 14 in the width direction W. These identification sections 1036 are formed as recess portions 1038 that are opened in the thickness direction H and the length direction L, or as recess portions 1040 that are opened in the thickness direction H and blocked in the length direction L. The identification sections 1036 are identified by identification means disposed on the electronic equipment side, and this identification is based on the shape of the recess portions 1038 and 1040, and the dimension in the length direction L of the recess portions 1038.

A plane portion in the vicinity of the recess portion 1010 of planes constituting the recess portion 1038 is made in an inclined surface 1042 so as to ensure a wall thickness dimension between the guide groove 1010 and the recess portion 1038, thereby ensuring the mechanical strength of the convex piece 1012A.

Electronic equipment will next be described.

In this embodiment, an electronic equipment is an imaging apparatus 200. The imaging apparatus 200 includes a case, an optical system incorporated into a front portion of the case, an imaging device for imaging an image of a subject captured by the optical system, a liquid crystal display section for displaying an image taken by the imaging device, a recording/reproducing section for recording and/or reproducing an image taken by the imaging device in a record medium, and a battery apparatus for supplying power to the imaging device, the liquid crystal display section, and the recording/reproducing section.

The case is provided with a battery housing chamber on which the battery apparatus 100 is removably mounted. The battery housing chamber is disposed so as to open in a rear surface of the case, and the opening is blocked with a cover plate (not shown).

FIGS. 7 and 8 are sectional views of a battery housing chamber 20 of the case. The battery housing chamber 20 has a width corresponding to the width W of the case 10 of the battery apparatus 100, a height corresponding to the thickness of the case 10, and a depth corresponding to the length of the case 10.

At a back portion in the depth direction of the battery housing chamber 20, there is disposed a housing chamber-side terminal (not shown) making connection with the battery-side terminal 14 in the state in which the battery apparatus 100 is inserted by keeping the length direction L parallel with the depth direction.

In addition, the battery housing chamber 20 is provided with projections 2002 that engage the guide groove 1010 and position the position in the thickness direction H of the case 10 in the height direction within the battery housing chamber 20.

In this embodiment, the battery housing chamber 20 has a main body portion 22 that is uniform in the dimension in the width direction and extend in a depth direction, and a bottom portion 24 that is disposed at the midpoint in the width direction of the main body portion 22 on one side in the height direction, and extends in the depth direction in a uniform width of a dimension smaller than the width of the main body portion 22.

One plane in the height direction of the battery housing chamber 20 is formed by the plane of the bottom portion 24, as a flat bottom surface 2004.

At portions of the boundary between the main body portion 22 and the bottom portion 24 which are on both sides in the width direction, there are disposed intermediate mounting surfaces 2006 that are parallel to the bottom surface 2004 and extend in the depth direction.

The projections 2002 are projected in the direction in which they approach each other from portions on the both sides at which the intermediate mounting surfaces 2006 are opposed to each other. In other words, the projections 2002 are disposed at portions toward the bottom surface 2004 on the side surfaces 2001 positioned on both ends in the width direction of the battery housing chamber 20.

One plane of the projection 2002 in the height direction is parallel to the bottom surface 2004, and the other plane in the height direction is arranged flush with the intermediate mounting surface 2006.

The height of the battery housing chamber 20 is dimensioned to hold a plurality of types of battery apparatuses 100 which differ in the thickness of the case 10, as shown in FIGS. 7 and 8.

Description will next be made of the operational effects of this embodiment.

When housing and holding the battery apparatus 100 at the battery housing chamber 200, the battery apparatus 100 is inserted into the battery housing chamber 20 by facing the battery-side terminal 14 of the battery apparatus 100 into the opening of the battery housing chamber 20, and facing the bottom surface 1008 of the battery apparatus 10 into the bottom surface 2004 of the battery housing chamber 20.

Upon this insertion, the projections 2002 of the battery housing chamber 20 are engaged to the guide grooves 1010 of the battery apparatus 100, so that the battery apparatus 100 in the height direction is positioned in the thickness direction H of the case 10 within the battery housing chamber 20.

In this embodiment, the bottom surface 1008 of the case 10 is mounted on the bottom surface 2004 of the battery housing chamber 20 with the projections 2002 engaged to the guide grooves 1010. The mounting of the bottom surface 1008 of the case 10 onto the bottom surface 2004 of the battery hous-

ing chamber 20 restricts the movement of the battery housing chamber 20 toward the bottom surface 2004. The engagement between the guide grooves 1010 and the projections 2002 of the battery housing chamber 20 restricts the movement of the battery apparatus 100 in the direction away from the bottom surface 2004 of the battery housing chamber 20. Alternatively, the engagement between the projections 2002 and the guide grooves 1010 may restrict both of the movement of the battery apparatus 100 toward the bottom surface 2004 of the battery housing chamber 20 and the movement of the battery apparatus 100 in the direction away from the bottom surface 2004 of the battery housing chamber 20.

In addition, with the engagement between the projections 2002 and the guide grooves 1010, the tips of the convex portions 1008 make connection with the tips of the projections 2004 and thereby to restrict the movement of the battery apparatus 100 in the width direction W. In another alternative, without providing connection between the tips of the convex portions 1018 and the tips of the projections 2004, the movement of the battery apparatus 100 in the width direction W may be restricted by providing connection between other portions of the battery apparatus 100 and portions of the battery housing chamber 20, such as between the side surfaces 1006 of the case 100 of the battery apparatus 100 and the side surfaces 2002 of the battery housing chamber 20.

Then, the battery apparatus 100 is inserted into the back portion of the battery housing chamber 20 thereby to provide connection between the battery-side terminal 14 of the battery apparatus 100 and the housing chamber-side terminal of the battery housing chamber 20.

Upon the insertion of the battery apparatus 100 into the back portion of the battery housing chamber 20, the above-mentioned opening is closed with a cover plate (not shown), thus terminating the loading of the battery apparatus 100 into the battery housing chamber 20.

The movement of the battery apparatus 100 in the length direction L is restricted by already known restricting means, such as the manner that one end surface 1022 of the case 10 abuts the wall surface of the back portion of the battery housing chamber 20, and the other end surface 1032 of the case 10 abuts the internal surface of the cover plate.

Thus, in accordance with the battery apparatus 100 of this embodiment, a plurality of types of battery apparatuses 100, which differ in the thickness of the case 10, can be housed in the battery housing chamber 20 because, at the portions of the case 10 on both sides in the width direction of the battery apparatus 100, there are formed the guide grooves 1010 that extend in the length direction L and engage the projections 2002 disposed at the battery housing chamber 200 thereby to position the position of the case 10 in the thickness direction H within the battery housing chamber 20.

In accordance with the imaging apparatus 200 of this embodiment, a plurality of types of battery apparatuses 100, which differ in the thickness of the case 10, can be housed in the battery housing chamber 20 because the battery housing chamber 20 is provided with the projections 2002 that engage the guide grooves 1010 of the battery apparatus 100 thereby to position the position in the thickness direction H of the case 10 in the height direction within the battery housing chamber 20.

Therefore, for example, when the imaging apparatus 200 is operated for a long period of time, the battery apparatus 100 having a large power capacity, namely, the battery apparatus 100 with the case 10 having a large dimension in the thickness direction H can be housed and held at the battery housing chamber 20. On the other hand, when the imaging apparatus 200 is operated for a short period of time, the battery apparatus 100 having a small power capacity, namely, the battery apparatus 100 with the case 10 having a small dimension in the thickness direction H can be housed and held at the battery housing chamber 20. Thus, the battery apparatus 100 can be selectively and suitably used depending on the application thereof, and hence it is advantageous in improving ease of use.

Further, in this embodiment the guide grooves 1010 are disposed at the portions of the battery apparatus 100 which are toward the bottom surface 1008, and the projections 2002 are disposed at the portions of the battery housing chamber 20 which are toward the bottom surface 2004. This is advantageous in reliably performing the positioning in the thickness direction H of the case 10 in the height direction within the battery housing chamber 20, even if the thickness of the battery apparatus 100 is extremely small.

In this embodiment, the stopper wall 1020 functions to prevent error insertion. Specifically, user can recognize immediately that the direction of the battery apparatus 100 is wrong because the stopper wall 1020 abuts the projection 2002 if the battery apparatus 100 is inserted into the battery housing chamber 20 in the wrong direction of insertion, namely, if inserted into the battery housing chamber 20 with the opposite side of the battery-side terminal 14 of the case 100 set in forward direction.

Additionally, in this embodiment, the convex portions 1018 are disposed at the portions corresponding to the convex pieces 1012A and 1012B, respectively, so that the convex pieces 1012A and 1012B, and the plane 1014 are connected to the side surfaces 1016, and hence it is advantageous in improving the mechanical strength of the convex pieces 1012A and 1012B by the two convex pieces 1018.

Further, the stopper wall 1020 is disposed at the portion corresponding to the convex piece 1012C so that the convex piece 1012C and the plane 1014 are connected to the side surfaces 1016, and hence it is advantageous in improving the mechanical strength of the convex piece 1012C by the stopper wall 1020.

In another alternative, with the position of the end surface 1022 of the case 10 as reference, it is able to determine whether the battery apparatus 100 is a normal product or not, based on the positions of the respective convex portions 1018 disposed in the length direction L (or based on the presence and absence of the respective convex portions 1018 or the number of the convex portions 1018).

For example, as shown in FIG. 9, sensors 302 and 304 are disposed at a battery housing chamber 20, each of which includes a microswitch for sensing the positions of the respective convex portions 1018 in the length direction L with the end surface 1022 of the case 10 as reference. There is also disposed a discriminating circuit 306 for discriminating whether the respective convex portions 1018 are positioned correctly, based on detecting signals from the respective sensors 302 and 304.

With this construction, based on the discriminating result of the discriminating circuit 306, the power supply from the battery apparatus 100 can be permitted only when the battery apparatus 100 is recognized as a normal product, and if not, the power supply from the battery apparatus 100 can be prohibited. This enables to prevent in advance the use of the battery apparatus 100 that is not a normal product.

In addition, the above-mentioned identification data of the battery apparatus 100 can be indicated by the positions of the respective convex portions 1018 disposed in the length direction L, or the presence and absence of the respective convex portions 1018, or the number of the convex portions 1018.

For example, in accordance with the construction shown in FIG. 9, four types of identification data can be indicated in a combination of ON and OFF of the two sensors 302 and 304. Needless to say, eight types of identification information are obtainable by disposing four sensors so as to detect the positions of a total of four convex portions 1018 disposed on both sides in the width direction of the case 10 of the battery apparatus 100.

Additionally, if used a sensor that can measure the position of the respective convex portions 1018 in the length direction with the end surface 1022 as reference, it is of course able to further increase the type of identification data detectable by the sensors.

In a case where the electronic equipment on which the battery apparatus 100 is mounted is a battery charger for executing charge to the battery apparatus 100, one or more sensors similar to the above-mentioned sensors 302 and 304 may be disposed at the battery charger such that they sense the presence and absence of the mounting of the battery apparatus 100, and the charging operation to the battery apparatus 100 is started in response to this sensing operation. In this construction, the sensors are disposed at the portions corresponding to the convex portions 1018, that is, the sensors are disposed in a direction orthogonal to the inserting direction of the battery apparatus 100. Therefore, as compared to the case where the sensor is disposed so as to face into the insertion direction of the battery apparatus 100 at the back portion of the battery housing chamber 20, there is the advantage that the sensors are unsusceptible to malfunction due to bar-shape foreign matter entered through the opening of the battery housing chamber 20.

Further, the characteristics of the battery apparatus 100 (such as an appropriate charging current value, or as to whether quick charge is possible or not) can be determined on the battery charger side by sensing the positions of the convex portions 1018 with the above-mentioned sensors.

Alternatively, a lock mechanism for providing engagement and removal with respect to part or all of the respective convex portions 1018 may be disposed at the battery housing chamber 20. The engagement between the lock mechanism and part or all of the convex portions 1018 is advantageous in reliably preventing the battery apparatus 100 from coming off the battery housing chamber 20.

In addition, as shown in FIG. 1, it is arranged such that the surface of the machine name plate 1026 is flush with the bottom surface 1008, or the surface of the machine name plate 1026 is positioned at the inside of the case 10 from the bottom surface 1008, and also the positioning convex portion 1030 arranged flush with the bottom surface 1008 is inserted into the positioning groove 1027 of the machine name plate 1026. Therefore, even if the bottom surface 1008 of the battery apparatus 100 and the bottom surface 2004 of the battery housing chamber 20 are worn off by loading and unloading the battery apparatus 100 with respect to the battery housing chamber 20, the surface of the machine name plate 1026 is unsusceptible to damage and dirt, and hence it is advantageous in protecting the surface of the machine name plate 1026.

In another alternative, the above-mentioned battery apparatus 100 is usable as so-called internal type in which it is housed in the battery housing chamber 20, as described in the foregoing preferred embodiment, as well as so-called exterior type in which it is attached to the exterior of the imaging apparatus 200 as described below.

Description will next be made of a case where the battery apparatus 100 is used as the exterior type.

FIG. 10 is a perspective view of the imaging apparatus 200 to which the battery apparatus 100 is attached externally. FIG. 11 is an enlarged view of a battery mounting section of the imaging apparatus 200. FIG. 12 is a perspective view of the imaging apparatus 200 with the battery apparatus 100 attached thereto. FIG. 13 is an explanatory drawing of the mounting of the battery apparatus 100 and the battery mounting section. FIG. 14 is an explanatory drawing of the lock mechanism. FIG. 15 is an explanatory drawing illustrating the state in which the battery apparatus 100 is mounted on the battery mounting section.

As shown in FIG. 10, the imaging apparatus 200 includes a case 24, an optical system 26 incorporated into a front portion of the case 24, an imaging device (not shown) for imaging an image of a subject captured by the optical system 26, a liquid crystal display section 28 for displaying an image taken by the imaging device, a recording/reproducing section (not shown) for recording and/or reproducing an image taken by the imaging device in a record medium, and a battery apparatus 100 for supplying power to the imaging device, the liquid crystal display section 28, and the recording/reproducing section.

A battery mounting section 30, on which the battery apparatus 100 is removably mounted, is disposed at a rear portion of the case 24.

As shown in FIG. 11, the battery mounting section 30 has a recess portion 3002 in which the battery apparatus 100 is housed, a plurality of engaging convex pieces 3004 (3004A, 3004B and 3004C) disposed at the recess portion 3002, an apparatus-side terminal 32 disposed at the recess portion 3002, and an engaging convex portion 34 disposed at a portion of the recess portion 3002 which is the opposite side of the apparatus-side terminal 32.

The recess portion 3002 has a mounting surface 3006, and a side surface 3008 standing from the periphery of the mounting surface 3006.

The mounting surface 3006 is formed in a width corresponding to the width of the bottom surface 1008 of the battery apparatus 100, and a length of a dimension greater than the length of the bottom surface 1008.

As shown in FIGS. 11 and 13, engaging convex pieces 3004 (3004A, 3004B, and 3004C) engageable to the guide groove 1010 are disposed at portions on both sides in the width direction of the mounting surface 3006 and at spaced intervals in the length direction.

The engaging convex portion 34 is arranged to be able to protrude and retract with respect to the mounting surface 3006, and is normally biased in the direction in which it protrudes, so as to be engageable to the cutout portion 1035 of the battery apparatus 100.

The battery apparatus 100 is mounted on the battery mounting section 30 in the following manner.

The battery-side terminal 14 of the battery apparatus 100 is faced into the apparatus-side terminal 32 of the battery mounting section 30, and the bottom surface 1008 of the battery apparatus 10 is faced into the mounting surface 3006 of the battery mounting section 30 such that the respective convex pieces 1012 (1012A, 1012B, and 1012C) of the battery apparatus 100 are respectively positioned apart in the length direction L with respect to the engaging convex pieces 3004 (3004A, 3004B, and 3004C).

In this state, the bottom surface 1008 of the battery apparatus 10 is brought into connection with the mounting surface 3006 of the battery mounting section 30, and the battery apparatus 100 is slid in the direction in which the battery-side terminal 14 approaches the apparatus-side terminal 32.

Thereby, the respective convex pieces 1012 (1012A, 1012B, and 1012C) of the battery apparatus 100 are inserted

into between the engaging convex pieces 3004 (3004A, 3004B, and 3004C) and the mounting surface 3008, and the positioning in the thickness direction H of the battery apparatus 100 in the height direction on the battery mounting section 30 is accomplished to provide connection between the battery-side terminal 14 of the battery apparatus 100 and the apparatus-side terminal 32 of the battery mounting section 30.

In this construction, in this embodiment, with the respective convex pieces 1012 (1012A, 1012B, and 1012C) engaged to their respective corresponding engaging convex pieces 3004 (3004A, 3004B, and 3004C), the bottom surface 1008 of the case 10 abuts on the mounting surface 3006 of the battery mounting section 30.

On condition that the end surface 1022 on the battery-side terminal 14 side of the two end surfaces in the length direction L of the battery apparatus 100 abuts on the side surface 3008 of the battery mounting section 30, the engaging convex portion 34 is engaged to the cutout portion 1035 of the battery apparatus 100 and thereby to lock the state in which the battery apparatus 100 is mounted on the battery mounting section 30, thus terminating the mounting of the battery apparatus 100 onto the battery mounting section 30.

Thus, upon the mounting of the battery apparatus 100 on the battery mounting section 30, as shown in FIG. 14, there may leave a gap between the end surface 1022 of the battery-side terminal 14 side of the battery apparatus 100 and a portion of a case 24 of the imaging apparatus 200 opposed to the end surface 1022 (the side surface 3008 of the recess portion 3006).

In this case, such a gap can be filled with the convex portion 1024 by forming a recess groove 3010 in the side surface 3008 of the recess portion 3006 such that the convex portion 1024 of the battery apparatus 100 is inserted into the recess groove 3010. This is advantageous in reliably preventing, for example, foreign matter having conductivity from entering through the above-mentioned gap portion and connecting with a connecting portion between the battery-side terminal 14 and the apparatus-side terminal 32.

If the direction in the length direction of the battery apparatus 100 is not a normal direction when mounting the battery apparatus 100 onto the battery mounting section, the stopper wall 1020 abuts the engaging convex piece 3004A of the battery mounting section 30 thereby to serve the function of avoiding that the mounting of the battery apparatus 100 is mounted in the wrong direction.

Alternatively, as shown in FIG. 15, the case 24 may be provided with a lock claw 2008 that is slid in the direction in which it connects and departs with respect to the cutout portion 1035 of the battery apparatus 100 being mounted on the battery mounting section 30, and is normally biased in the direction in which it approaches the cutout portion 1035 by a biasing member such as a spring. Thus, it is able to arrange such that the engagement between the lock claw 2008 and the cutout portion 1035 prevents the battery apparatus 100 from coming off the battery mounting section 30, and the battery apparatus 100 can be removed from the battery mounting section 30 by releasing the engagement between the cutout portion 1035 of the battery apparatus 100 and the lock claw 2008.

In this case, the cutout portion 1035 of the battery apparatus 100 is displaced toward the inside of the battery apparatus 100 from the end surface 1032, and hence the lock claw 2008 can be disposed at a portion displaced toward the inside of the case 24 from the exterior of the case 24, thus enabling to construct the lock claw 2008 without causing it to project outwardly from the exterior of the case 24 of the imaging apparatus 200. Accordingly, it is advantageous in achieving miniaturization of the imaging apparatus 200 and also improving design characteristic.

Herein, the portion at which the lock claw 2008 is engaged to the cutout portion 1035 is normally biased in the direction in which it approaches the bottom surface 1008 of the battery apparatus 100. Therefore, upon the slide of the bottom surface 1008 of the battery apparatus 100 along the mounting surface 3006 when mounting the battery apparatus 100 on the battery mounting section 30, or when removing the battery apparatus 100 from the battery mounting section 30, the tip of the lock claw 2008 projecting to the bottom surface 1008 abuts the surface of a label, such as the machine name plate 1026 affixed to the bottom surface 1008, by the above-mentioned bias, and the printed portion of the surface of the machine name plate 1026 etc. might be worn off and vanished by friction.

In this case, the lock claw 2008 may be arranged to abut at its tip against the positioning convex portion 1030. Thus, the tip of the lock claw 2008 abuts the positioning convex portion 1030, but does not abut the surface of the machine name plate 1026. Therefore, the surface of the machine name plate 1026 is unsusceptible to damage and dirt, and hence it is advantageous in protecting the printed portion of the surface of the machine name plate 1026. In this construction, the positioning convex portion 1030 may be arranged flush with the surface of the machine name plate 1026, or may be disposed so as to position at the outside of the case 10 from the surface of the machine name plate 1026.

Alternatively, the battery apparatus 100 of this embodiment may be constructed as follows.

Specifically, the battery apparatus 100 has a case 10. The case 10 has two end surfaces 1022 and 1032 positioned at both ends in the length direction L of the case 10, and side surfaces 1006 for connecting the two end surfaces 1022 and 1032. A battery-side terminal 1014 is disposed so as to face at least one selected from either of the end surface 1022 of the two end surfaces 1022 and 1032, and the side surfaces 1006 connected to the end surface 1022. Error insertion preventing grooves extending in the length direction L (the guide grooves 1010) are formed in the side surfaces 1006. Letting the battery-side terminal 1014 side be the front in the length direction L, and the opposite direction be the back, the error insertion preventing groove is opened at a portion toward the battery-side terminal 1014 of both ends in the length direction L (the front end portion), and closed at the opposite side portion (the back end portion). Further, a convex portion 1018 swelling outwardly of the case 10 is formed at the error insertion preventing groove, or two or more convex portions 1018 are formed at spaced intervals in the length direction L.

With this construction, as described with reference to FIG. 9, the identification data of the battery apparatus 100 can be indicated by the position of the convex portions 1018 in the length direction L, or the presence and absence of the convex portions 1018, or the number of the convex portions 1018. In this case, since the convex portions 1018 swell outwardly of the case 10, they do not occupy the space within the case 10. This is advantageous in ensuring the space for housing parts in the inside of the case 10, or achieving miniaturization of the case 10, and also advantageous in improving the degree of freedom of the design of the battery apparatus 100.

Alternatively, in the battery apparatus 100 of this embodiment, the above-mentioned error insertion preventing groove is disposed respectively at the portions on the two side surfaces 1006, which sandwich the case 10 therebetween in the width direction W and are opposed to each other. In this case, by having the two error insertion preventing grooves engaged

to their respective corresponding projections, the position of the case 10 in the thickness direction H can be positioned to permit the error insertion preventing grooves to function as positioning grooves.

With this construction, as shown in FIGS. 7 and 8, a battery apparatus having a different dimension in the thickness direction H can be positioned within the battery housing chamber 20 by disposing the respective projections 2002 at the battery housing chamber 20, and engaging the two error insertion preventing grooves to the respective projections 2002.

Alternatively, in the battery apparatus 100 of this embodiment, a plurality of recess portions are formed by a plurality of convex pieces 1012 (1012A, 1012B and 1012C), portions of the side surfaces 1016 which face these convex pieces 1012 (1012A, 1012B and 1012C), respectively, and portions of planes 1014 which face these convex pieces 1012 (1012A, 1012B and 1012C), respectively. These recess portions can constitute the above-mentioned error insertion preventing grooves.

Alternatively, in the battery apparatus 100 of this embodiment, there are disposed convex portions 1018 connecting to the plurality of convex pieces 1012 (1012A, 1012B and 1012C), respectively. The portions at which the respective convex portions 1018 are respectively connected to the plurality of convex pieces 1012 (1012A, 1012B and 1012C) are portions in the length direction L toward the direction in which the battery apparatus 100 is moved (slid) when mounting the battery apparatus 100 on the battery mounting section 30 (i.e., the portions toward the battery-side terminal).

With this construction, when the respective convex pieces 1012 (1012A, 1012B and 1012C) are engaged to and removed from the engaging convex pieces 3004 (3004A, 3004B and 3004C), respective distances in the length direction L are ensured respectively between the convex piece 1012A and the engaging convex portion 3004A, between the convex piece 1012B and the engaging convex piece 3004B, and between the engaging piece 1012C and the engaging convex piece 3004C. Accordingly, when the respective convex pieces 1012 (1012A, 1012B and 1012C) are engaged to and removed from the engaging convex pieces 3004 (3004A, 3004B and 3004C), it is hard to cause interference between the respective engaging convex pieces 3004 and the respective convex portions 1018, and hence it is advantageous in executing smooth mounting and removal of the battery apparatus 100.

While in this embodiment the imaging apparatus is illustrated as an electronic equipment, the present invention is of course applicable to a battery charger for charging a battery apparatus, and a variety of electronic equipments operable with a battery apparatus.

INDUSTRIAL APPLICABILITY

In accordance with the battery apparatus of the present invention, a plurality of types of battery apparatuses, which differ in the thickness of a case, namely, differ in capacity, can be housed in the battery housing chamber because there are formed, at the portions of the case on both sides in a width direction of the battery apparatus, the guide grooves that extend in a length direction and engage the projections disposed at the battery housing chamber thereby to position the position of the case in a thickness direction within the battery housing chamber.

In accordance with the electronic equipment of the present invention, a plurality of types of battery apparatuses, which differ in the thickness of a case, namely, differ in capacity, can be housed in a battery housing chamber because the battery housing chamber is provided with projections that engage the guide grooves of a battery apparatus and position the position in a thickness direction of a case in a height direction within the battery housing chamber.

The invention claimed is:

1. A battery apparatus comprising:

a case having a width, thickness and length, the case including a body section and bottom section;

a battery cell housed in the inside of the body section of the case;

a battery-side terminal disposed at a surface of the case and electrically connected to the battery cell; and

an identification portion including a recess located on the bottom section,

wherein guide grooves extending in a length direction are formed at portions of the case on both sides of the bottom section in a width direction, the guide grooves extending in a thickness direction to a plane surface forming an upper surface of the body section, the plane surface extending an entire length of the case, and a width of the bottom section is smaller than a width of the body section.

2. The battery apparatus as cited in claim 1, wherein

portions at both sides in the width direction of the case are formed as side surfaces parallel to each other and extending in the length direction;

one of surfaces in the thickness direction of the case is formed as a bottom surface;

the battery-side terminal is provided at an end portion of the case in the length direction of the case; and

the guide grooves are formed at the side surface portions and close to the bottom surface.

3. The battery apparatus as cited in claim 1, wherein

one of surfaces in the thickness direction of the case is formed as a bottom surface;

the battery-side terminal is provided at an end portion in the length direction of a bottom portion;

movement of the battery apparatus toward the bottom surface of the battery housing chamber is restricted by mounting the bottom surface of the case on the bottom surface of the battery housing chamber; and

movement of the battery apparatus in the direction away from the bottom surface of the battery housing chamber is restricted by engaging the projection of the battery housing chamber with the guide grooves, when the battery apparatus is housed in the battery housing chamber.

4. The battery apparatus as cited in claim 1, wherein

the case includes a main body portion extending in the length direction with a uniform size in the width direction, and a bottom portion provided at one of thickness directions at a central portion in the width direction and extending in the length direction with a smaller width size than the width of the main body portion;

one of surfaces in the thickness direction of the case is formed as a bottom surface by a surface of the bottom portion;

the battery-side terminal is provided at an end portion in the length direction of the bottom portion;

convex pieces are formed to be projected outwardly in the width direction from bottom surface portions of both sides in the width direction; and

the guide grooves are formed with the convex pieces, side surfaces of the bottom portion positioned at both sides in the width direction, and a surface where the main body portion is facing the side surface.

5. The battery apparatus as cited in claim 4, wherein a convex portion projecting outwardly from the side surface in the width direction is provided at side face of the bottom portion and at portions with regular intervals; the convex portion is formed with a smaller projecting size than the convex piece; and movement of the battery apparatus in the width direction is restricted by contacting the convex portion and the projection while the projection is engaging with the guide groove.

6. The battery apparatus as cited in claim 1, wherein one of surfaces in the thickness direction of the case is formed as a bottom surface; the battery-side terminal is provided at an end portion in the length direction of the bottom surface; and a stopper barrier for sealing the guide groove is provided at a portion of the case opposite to a portion where the battery-side terminal is provided in the length direction.

7. The battery apparatus as cited in claim 1, further comprising:

a convex portion projecting in the length direction from an end surface of the case and extending in the width direction along the end surface of the case.

8. The battery apparatus as cited in claim 7, wherein the battery-side terminal is provided at an end portion in the length direction of a bottom portion, and the convex portion extends in the width direction above the battery-side terminal.

9. The battery apparatus as cited in claim 1, further comprising:

an identification portion including a projection having a size that corresponds with an electrical characteristic of the battery, the electrical characteristic is at least one of a capacity, a charging current value, and whether the battery apparatus includes a quick charge capability.

10. The battery apparatus as cited in claim 1, further comprising:

a cutout portion formed in an end of a bottom surface of the case, the cutout portion configured to receive a locking device of the battery housing chamber.

11. The battery apparatus as cited in claim 10, wherein the battery-side terminal is provided at an opposite end portion in the length direction of the bottom surface.

12. The battery apparatus as cited in claim 1, wherein the bottom surface also includes a recess portion.

13. The battery apparatus as cited in claim 12, further comprising:

a convex portion in the recess portion; and a machine name plate located in the recess portion and including a positioning groove receiving the convex portion of the recess portion.

14. A battery apparatus comprising:

a case having a width, thickness and length, the case including a body section and a bottom section;

a battery cell housed in the inside of the body section of the case;

a battery-side terminal disposed at a surface of the case and electrically connected to the battery cell, the battery side terminal including both a positive and negative electrode and located proximate an edge where a first end surface and a bottom surface of the bottom section meet, the battery side terminal located a substantially equal distance from both sides in a width direction; and

an identification portion including a recess located on the bottom section,

wherein guide grooves extending in a length direction are formed at portions of the case on both sides of the bottom section in the width direction, the guide grooves extending in a thickness direction to a plane surface forming an upper surface of the body section, the plane surface extending an entire length of the case, and a width of the bottom section is smaller than a width of the body section.

15. The battery apparatus as cited in claim 14, further comprising:

a convex portion projecting in the length direction from the first end surface of the case and extending in the width direction along the first end surface of the case.

16. The battery apparatus as cited in claim 15, wherein the convex portion extends in the width direction above the battery-side terminal on a top side of the terminal.

17. The battery apparatus as cited in claim 14, further comprising:

an identification portion including a projection having a size that corresponds with an electrical characteristic of the battery, the electrical characteristic is at least one of a capacity, a charging current value, and whether the battery apparatus includes a quick charge capability.

18. The battery apparatus as cited in claim 14, further comprising:

a cutout portion formed in a second end surface proximate a bottom surface of the case, the cutout portion configured to receive a locking device of the battery housing chamber, the cutout portion extending in the width direction along an entire width of the first end surface of the battery.

19. The battery apparatus as cited in claim 14, further comprising:

a recess portion in the bottom surface of the case;

a convex portion in the recess portion; and

a machine name plate located in the recess portion and including a positioning groove receiving the convex portion of the recess portion.

20. The battery apparatus as cited in claim 14, further comprising:

a second identification portion including a second recess having a size that corresponds with an electrical characteristic of the battery, the electrical characteristic is at least one of a capacity, a charging current value, and whether the battery apparatus includes a quick charge capability, the second identification portion located in the first end surface to an other side of the battery-side terminal proximate the edge where the first end surface and the bottom surface meet.

21. The battery apparatus as cited in claim 14, further comprising:

an identification portion including a recess having a size determined by a value of an electrical characteristic of the battery apparatus, the size identifying a predetermined value of the electrical characteristic of the battery apparatus, the electrical characteristic is at least one of a capacity, a charging current value, and whether the battery apparatus includes a quick charge capability, the

identification portion located in the first end surface to one side of the battery-side terminal proximate the edge where the first end surface and the bottom surface meet.

22. The battery apparatus as cited in claim 1, wherein the recess has a size determined by a value of an electrical characteristic of the battery apparatus, the size identifying a predetermined value of the electrical characteristic of the battery apparatus, the electrical characteristic is at least one of a capacity, a charging current value, and whether the battery apparatus includes a quick charge capability.

23. The battery apparatus as cited in claim 1, wherein the battery-side terminal and the guide grooves are substantially a same distance in the thickness direction from the bottom section.

24. The battery apparatus as cited in claim 16, wherein the battery-side terminal and the guide grooves are substantially a same distance in the thickness direction from the bottom section.

* * * * *

EXHIBIT C

US007679318B2

(12) **United States Patent**
Aoki et al.

(10) **Patent No.: US 7,679,318 B2**
(45) **Date of Patent: Mar. 16, 2010**

(54) **BATTERY DEVICE**

(75) Inventors: Hisashi Aoki, Aichi (JP); Hiroaki Sato, Kanagawa (JP); Yoichi Miyajima, Tokyo (JP); Toshio Takeshita, Kanagawa (JP)

(73) Assignee: Sony Corporation, Tokyo (JP)

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PCT Pub. Date: Oct. 13, 2005

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H02J 7/00 (2006.01)

(52) U.S. Cl. 320/112; 320/107; 320/113; D13/107

(58) Field of Classification Search 320/114, 320/112, 106, 107, 110, 111, 113; 429/97, 429/98, 99; D13/103, 107; 439/500
See application file for complete search history.

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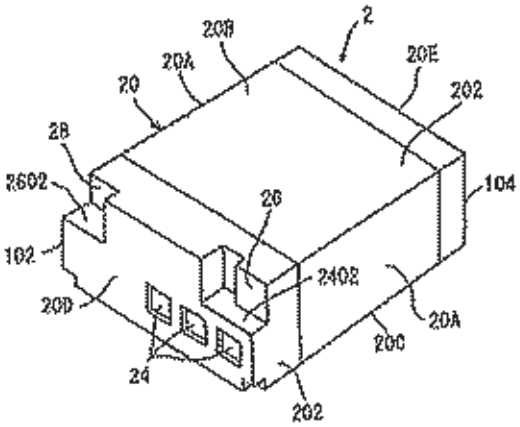
(57) **ABSTRACT**

Battery side terminals disposed on the first and second battery devices are arranged at the same places at front surfaces with respect to lower surfaces and side surfaces. On the front surface of a case of the second battery device, there are formed engaging recessed parts. Positions close to the lower surface of the engaging recessed parts are formed as flat surfaces parallel to a upper surface and the lower surface. The dimensions from the lower surface of the case to flat surfaces and the dimension from the lower surface of the case of the first battery device to an upper surface are configured to be the same. Accordingly, it is possible to provide an advantageous battery device that allows the use of battery devices having various capacities and improves the ease of use.

22 Claims, 8 Drawing Sheets



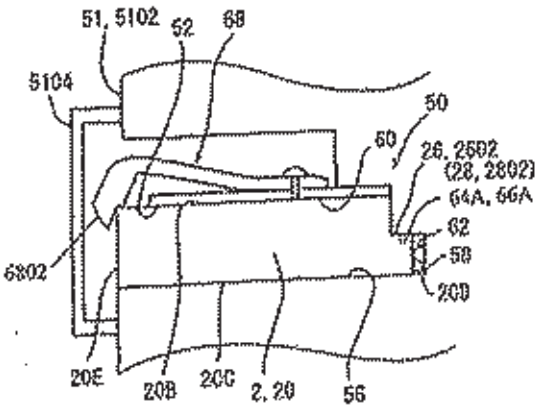


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Fig.1A

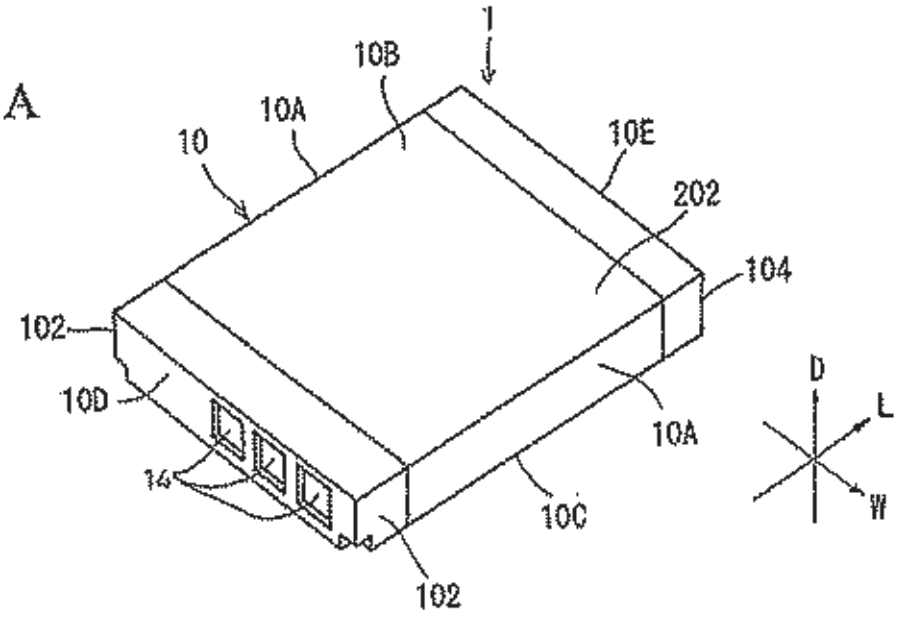
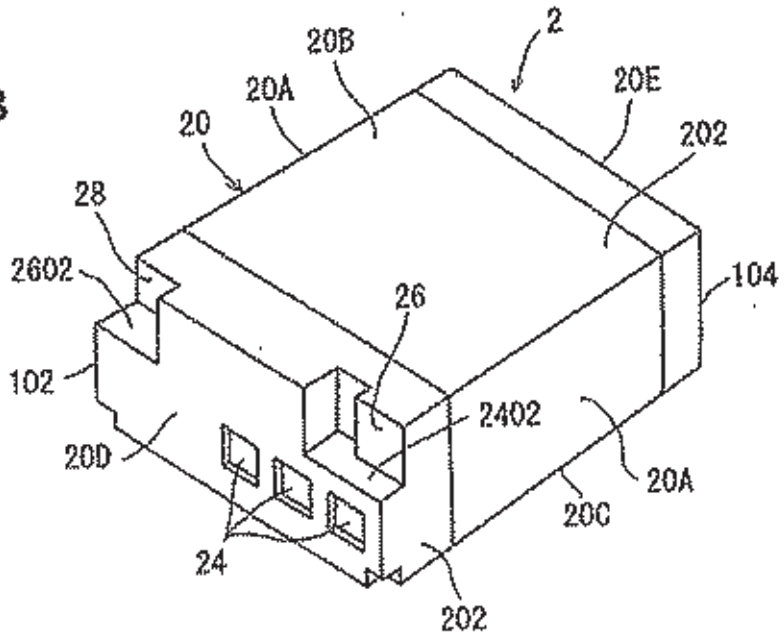

1
10B
10A
10
10E
202
104
102
10D
14
10A
10C
102
D
L
W

Fig.1B


2
20B
20A
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20E
202
28
2602
104
26
102
2402
20D
20A
20C
24
202

Fig .2A

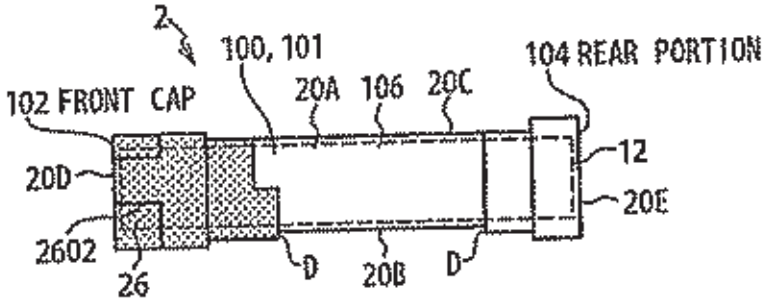


Fig.2B

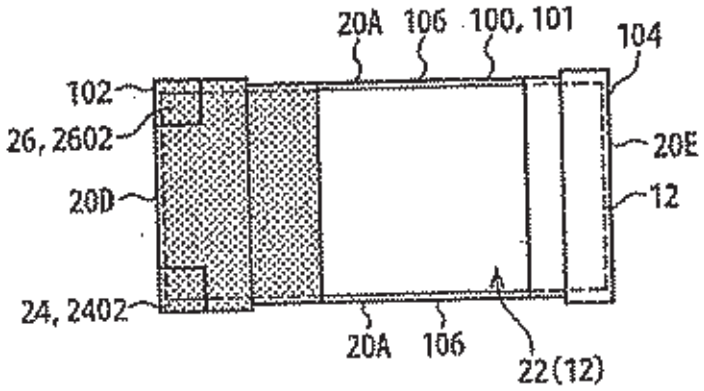


Fig.2C

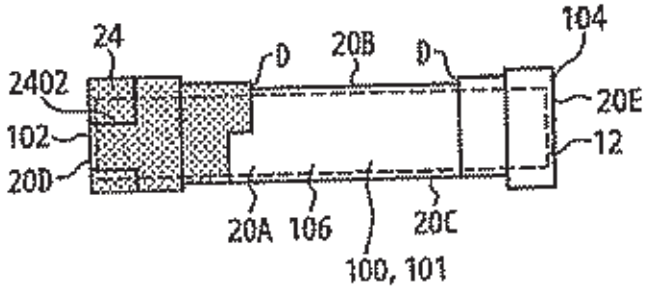


Fig.3A

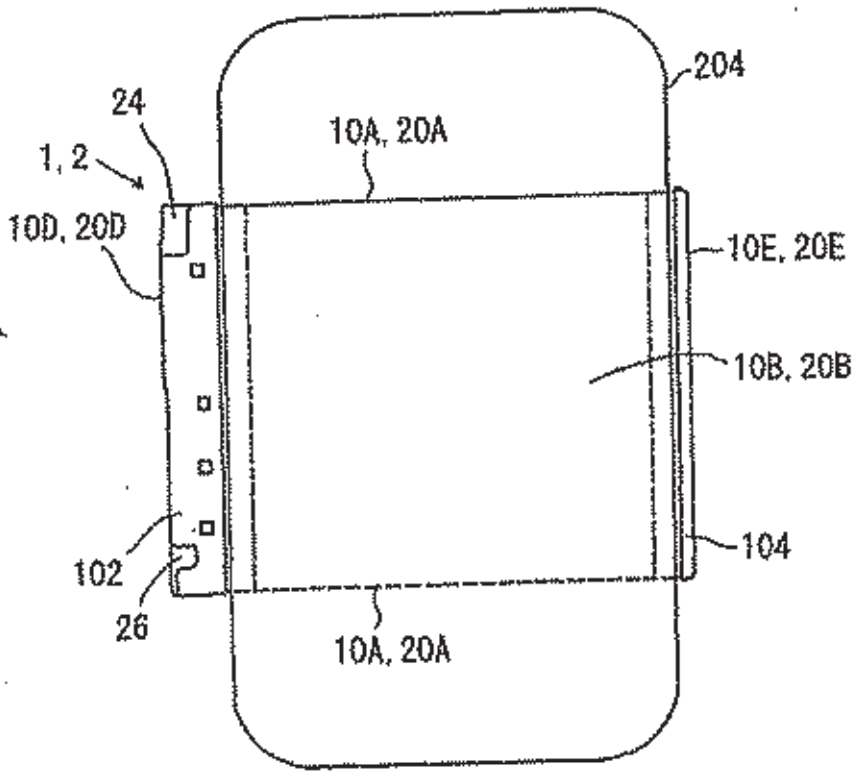

204
24
10A, 20A
1, 2
10D, 20D
10E, 20E
10B, 20B
104
102
26
10A, 20A

Fig.3B

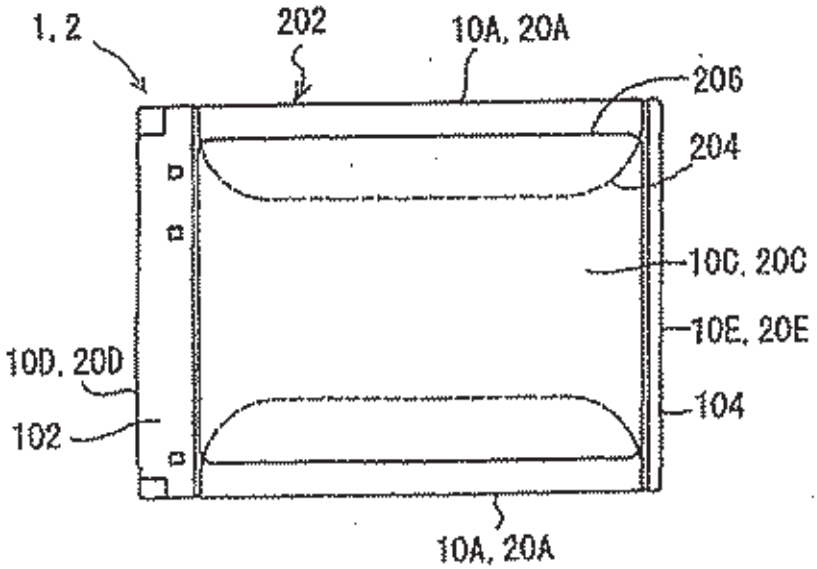

1, 2
202
10A, 20A
206
204
10C, 20C
10E, 20E
10D, 20D
104
102
10A, 20A

Fig.4

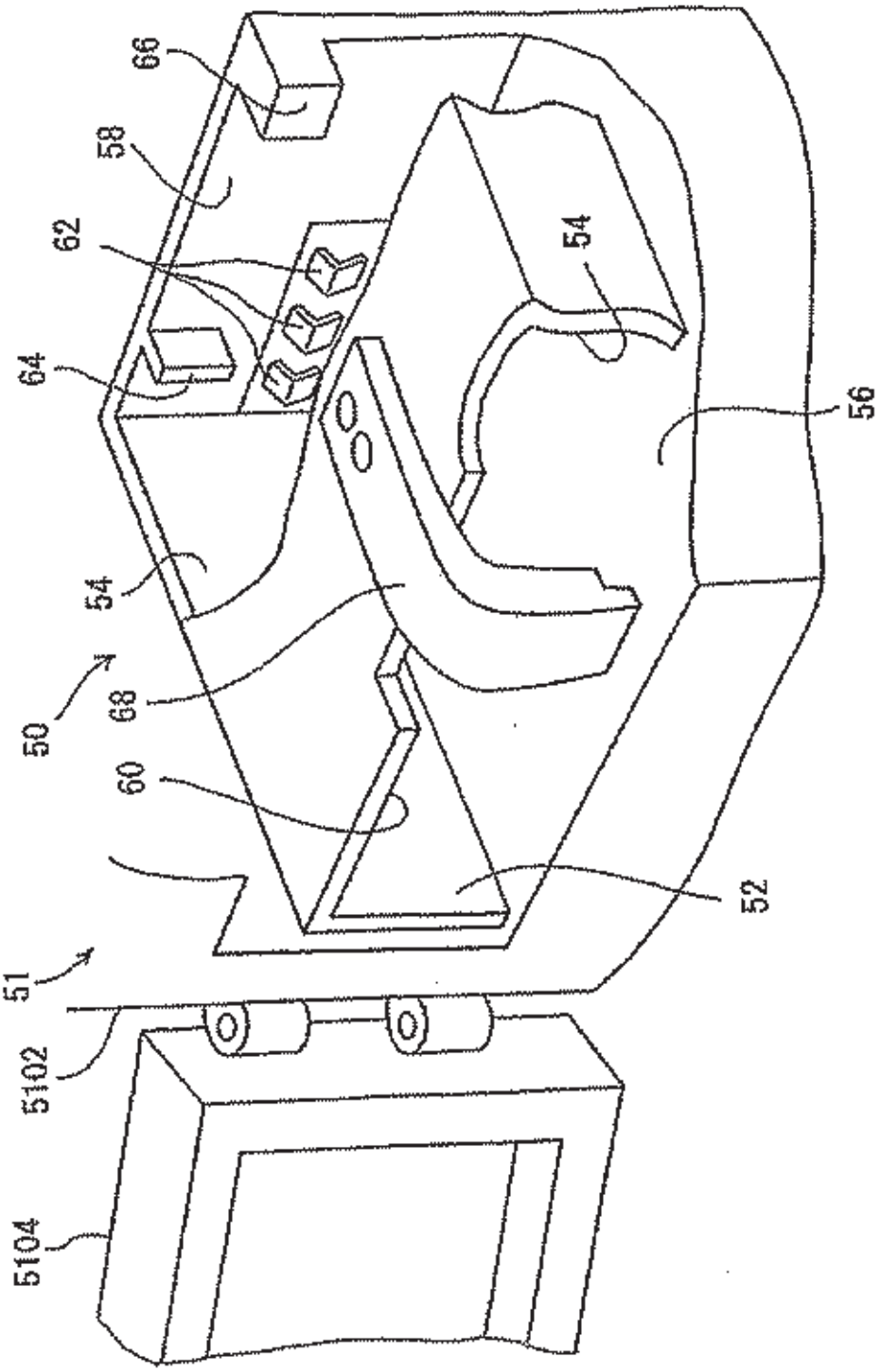


Fig.5A

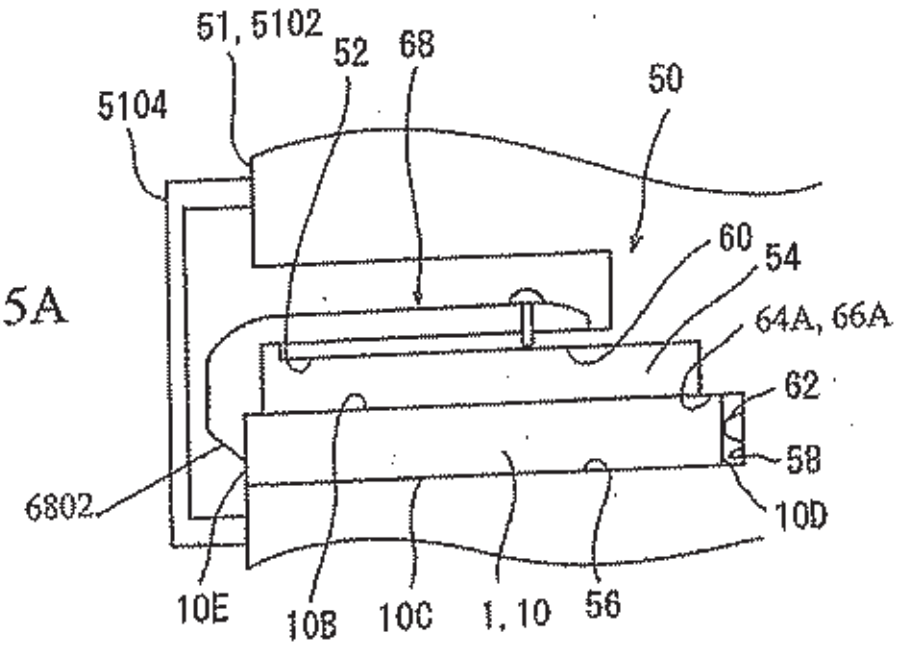
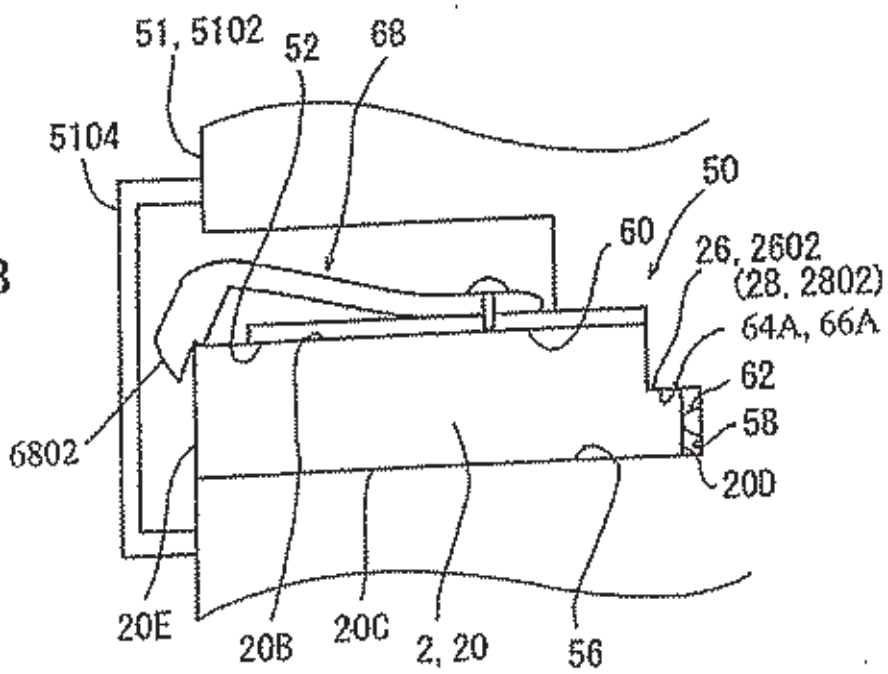

51, 5102
52
68
50
5104
60
54
64A, 66A
62
58
10D
6802
10E
10B
10C
1, 10
56

Fig.5B


51, 5102
52
68
5104
50
60
26, 2602
(28, 2802)
64A, 66A
62
58
20D
6802
20E
20B
20C
2, 20
56

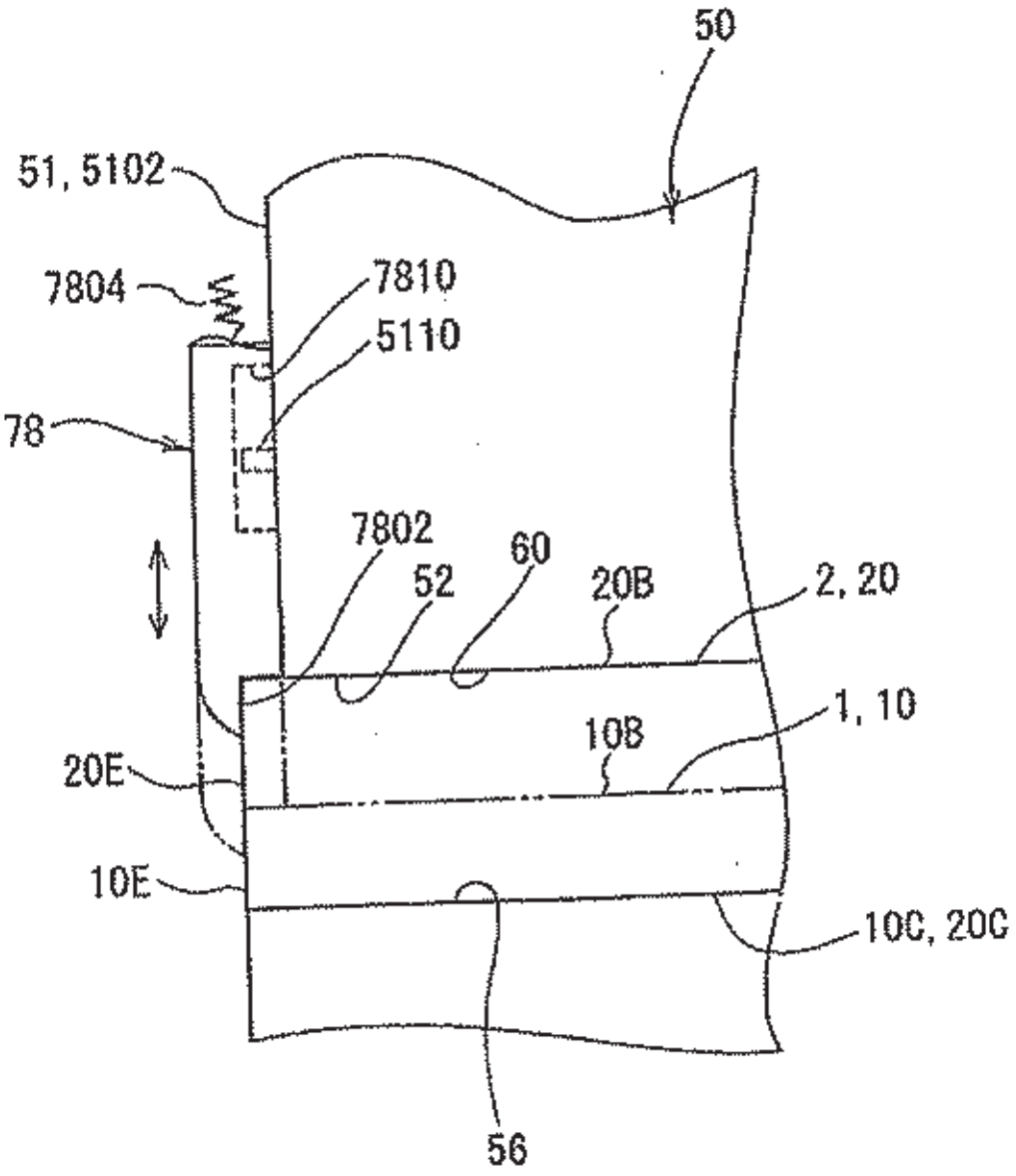

50
51, 5102
7804
7810
5110
78
7802
60
52
20B
2, 20
1, 10
10B
20E
10E
10C, 20C
56

Fig.6

Fig.7A

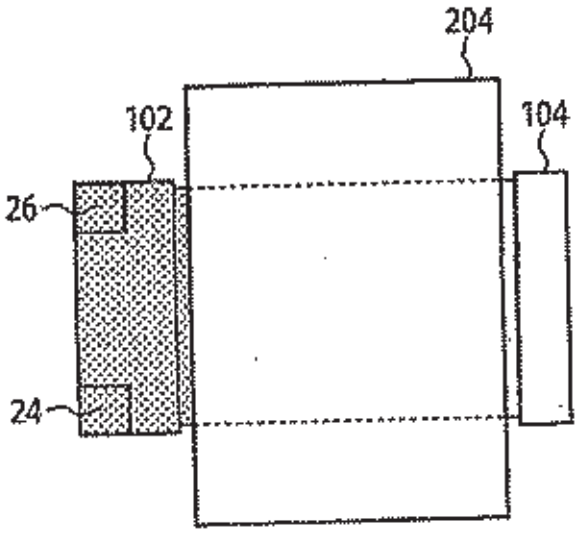


Fig.7B

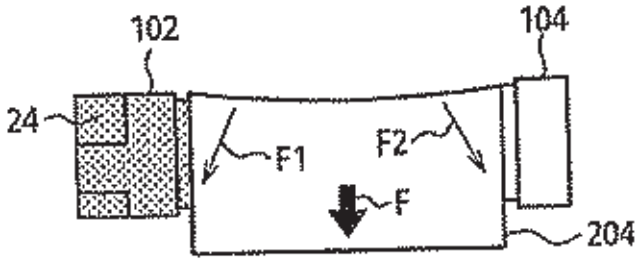


Fig.7C

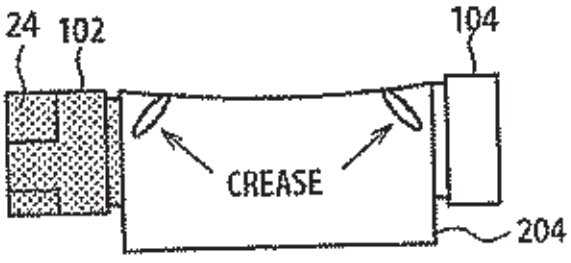


Fig.8A

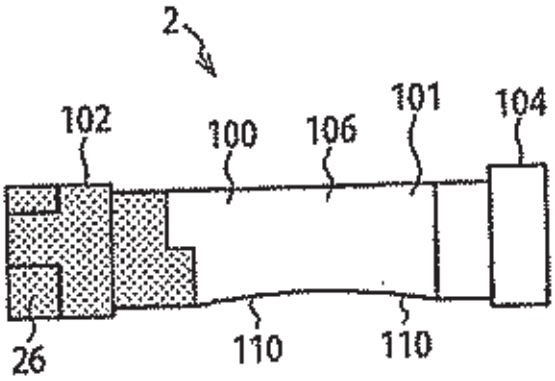


Fig.8B

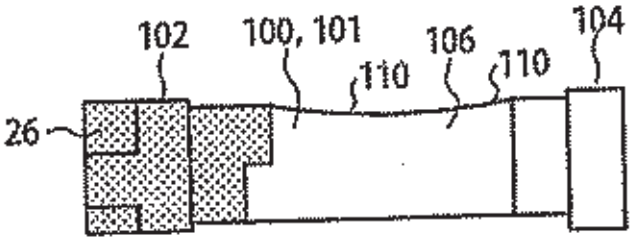


Fig.9A

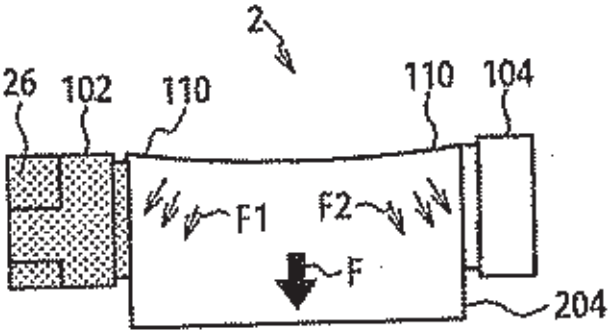
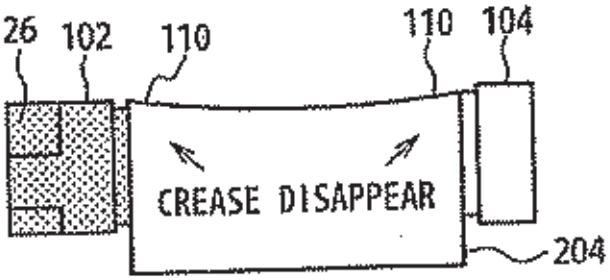


Fig.9B



BATTERY DEVICE

TECHNICAL FIELD

The present invention relates to a battery device.

BACKGROUND ART

In past, there has been commercially available a battery device equipped with; a case formed in a rectangular shape having a width in a left-to-right direction, a thickness in an up-and-down direction, and a length in a front to rear direction, with an upper surface and a lower surface opposite thereto in the up-and-down direction, and a front surface and a rear surface opposite thereto in the length direction; a charging unit disposed inside the case; and a battery side terminal connected to the charging unit and disposed on the front surface of the case (for example, see Japanese Patent Application Publication No. 2002-110121).

Further, electronic devices having a battery housing chamber for accommodating the battery device is also available.

This type of battery housing chamber is structured with a width corresponding to the width of the battery device, a height corresponding to the case thickness, a depth corresponding to the case length, and a housing side chamber terminal to be in contact with the battery side terminal when the battery device is aligned with chamber and inserted therein.

DISCLOSURE OF THE INVENTION

However, in the above-mentioned battery device, since the height of the battery housing chamber is formed to allow fitting of battery with a certain thickness, two types of battery devices having different thicknesses cannot be housed.

Consequently, for example, it is difficult to use battery devices of different capacities for different uses or purposes. There is a need for improvement in ease of use.

The present invention has been made in view of such circumstances. An object of the present invention is to provide a battery device capable of accommodating battery devices having different capacities, and that is advantageous in improving the ease of use.

In order to achieve the above-mentioned object, a battery device according to the present invention is a battery device that is a first or a second battery devices and housed in a single battery housing chamber of an electronic device, characterized in that each of the first and second battery device includes: a case having side surfaces located on both ends of a width direction, an upper surface and lower surface located on both ends of a thickness direction, and a front surface and a rear surface located on both ends of a length direction; a charging unit disposed inside the case; and a battery side terminal disposed on the front surface of the case and connected to the charging unit. The case of the first battery device and the case of the second battery device have a substantially same width and length while the case of the second battery device is formed with thickness larger than the case of the first battery device. The battery side terminal disposed on the first battery device and the battery side terminal disposed on the second battery device are located at a same position on the respective front surfaces with respect to the lower surfaces and the side surfaces. An engaging recessed part is formed on the front surface of the case of the second battery device. A dimension from the lower surface of the case of the second battery device to a position close to the lower surface on a wall of the case where the engaging recessed part is formed and a dimension from the lower surface to the upper surface of the case of the first battery device are arranged to be a same.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1A and FIG. 1B are perspective views of a first and a second battery device of an embodiment 1.

FIG. 2A to FIG. 2C are explanatory diagrams of a battery device.

FIG. 3A and FIG. 3B are explanatory diagrams of a film to be attached to a battery device.

FIG. 4 is a perspective view showing a broken-out structure of a part of a battery housing chamber of an electronic device.

FIG. 5A and FIG. 5B are explanatory diagrams showing a condition of the first and second battery devices being housed in the battery housing chamber.

FIG. 6 is an explanatory diagram showing a construction of a battery housing chamber in an embodiment 2.

FIG. 7A to FIG. 7C are explanatory diagrams showing a condition of generation of crease when attaching a film.

FIG. 8A and FIG. 8B are explanatory diagrams showing a construction with a slant part disposed on a frame of the battery device.

FIG. 9A and FIG. 9B are explanatory diagrams showing a condition for preventing from generation of creases when attaching a film.

BEST MODES FOR CARRYING OUT THE INVENTION

By providing an engaging recessed part formed on the front surface in one type of battery device having larger thickness, the object of providing an advantageous battery device, which allows the use of battery devices having various capacities and improvement in ease of use, is achieved.

Next, an embodiment 1 of the present invention will be described with reference to the drawings.

FIG. 1A and FIG. 1B show perspective views of the first and second battery devices; FIG. 2A to FIG. 2C shows explanatory diagrams of battery devices; FIG. 3A and FIG. 3B show explanatory diagrams of films attached to the battery devices; FIG. 4 shows a perspective view of a partially broken-out portion to show construction of a battery housing chamber of an electronic device; and FIG. 5A and FIG. 5B show explanatory diagrams in which the first and the second battery device are housed in a battery housing chamber.

In the present embodiment, two types of battery devices having different thicknesses, which are the first battery device 1 and the second battery device 2 shown in FIG. 1A and FIG. 1B, are selectively housed in a single battery housing chamber 50 shown in FIG. 4.

First, description will be made about the battery devices.

As shown in FIG. 1A, the first battery device 1 includes a case 10, a charging unit 12 (FIG. 2B) disposed inside the case 10, and a battery side terminal 14 disposed in the case 10.

As shown in FIG. 1B, the second battery device 2 includes a case 20, a charging unit 22 (FIG. 2B) disposed inside the case 20, and a battery side terminal 24 disposed on the case 20.

In the present embodiment, the cases 10 and 20 have side surfaces 10A and 20A located on both ends of a width direction W, upper surfaces 10B and 20B and lower surfaces 10C and 20C located on both ends of a thickness direction D, and front surfaces 10D and 20D and rear surfaces 10E and 20E located on both ends of a length direction L.

The case 10 of the first battery device 1 and the case 20 of the second battery device 2 have the same or substantially the

same width and length, with the thickness of the case 20 of the second battery device being formed larger than the thickness of the case 10 of the first battery device 1.

The battery side terminals 14 and 24 disposed on the first and the second battery devices 1, 2 are located at the same places at these front surfaces 10D and 20D with respect to lower surfaces 10C and 20C and side surfaces 10A and 20A, and are connected to a charging unit 22, respectively.

FIG. 2A to FIG. 2C show a left side view, a plan view, and a right side view of the case 20 of the second battery device 2.

In reference to these FIG. 2A to FIG. 2C, schematic construction of the case 10 of the first battery device 1 will be described, together with the case 20 of the second battery device 2.

The cases 10 and 20 respectively have a frame 100, the frame 100 including a quadrilateral frame-like member 101 and a front cap 102 fitted on a front portion of the frame-like member 101.

Further, the front surfaces 10D and 20D are formed with a front surface of the front cap 102, while rear surfaces 10E and 20E are formed with a rear surface of a rear portion 104 of the frame-like member 101.

Further, a side wall 106 of the frame-like member 101 is exposed between the front cap 102 and the rear part 104, and the charging unit 12 is attached to the front cap 102 and housed in a space formed by these front cap 102, rear portion 104, and two side walls 106.

Further, between part close to the front surface 10D or 20D and part close to the rear surface 10E or 20E of the cases 10, 20, as shown in FIG. 1A and FIG. 1B, a film 202 is wrapped around the entire circumference of the front cap 102, the rear part 104, and two side walls 106 and attached thereon.

More specifically, the film 202 has insulating property, including an upper film 204 and a lower film 206.

As shown in FIG. 3A and FIG. 3B, first, the upper film 204 is adhered to cover the charging unit 12 part exposed upward and the side walls 106, between the front cap part 103 and the rear part 104, and further, adhered to parts in both sides of a lower surface of the charging unit 12. Next, the lower film 206 is adhered to cover a part of the upper film 204, which is adhered to parts in both sides of the lower surface of the charging unit 12 (22), and the lower surface part of the charging unit 12 (22) exposed downward between the front cap 102 and the rear part 104.

In this manner, the cases 10 and 20 of the first battery device 1 and the second battery device 2 having different sizes and shapes are respectively formed with the frame 100 and the film 202.

On the front surface 20D of the case 20 of the second battery device 2, there are formed engaging recessed parts 26 and 28 with a spacing in the width direction W.

One engaging recessed part 26 is formed so as to open on the other side surface 20A of two side surfaces 20A and the front surface 20D as well as the upper surface 20B.

The other engaging recessed part 28 is formed so as to open on the other side surface 20A of two side surfaces 20A and the front surface 20D as well as the upper surface 20B.

Positions close to the lower surface 20C on a wall of the front cap 202 forming each of the engaging recessed parts 26 and 28 are formed as flat surfaces 2402 and 2602 parallel to the upper surface 20B and the lower surface 20C.

The dimensions from the lower surface of the case 20 to flat surfaces 2402 and 2602 and the dimension from the lower surface 10C of the case 10 of the first battery device 1 to the upper surface 10B are configured to be the same.

Next, a battery housing chamber of an electronic device will be described.

As shown in FIG. 4, a battery housing chamber 50 is provided in a casing 5102 of an electronic device 51.

The battery housing chamber 50 has an insert/take-out opening 52 on the rear surface of the casing 5102, and this insert/take-out opening 52 is opened and closed by an opening/closing cover 5104.

The battery housing chamber 50 includes a side wall 54 which can abut the side surfaces 10A and 20A on both ends in the width direction W of the cases 10 and 20 of the first and the second battery devices 1, 2, an abutting wall 56 which can abut the lower surfaces 10C and 20C of the cases 10, 20, a back wall 58 provided at a depth corresponding to the length of the cases 10 and 20, and an upper wall 60 provided at a height corresponding to the thickness of the case 20 of the second battery device 2.

On the back wall 58, there are disposed housing chamber side terminals 62, which will be in contact with the battery side terminals 14 and 24 when the first battery device 1 or the second battery devices 2 is aligned parallel to a length direction L and inserted from the insert/take-out opening 52 to the depth direction.

At positions of the back wall 58 with spacing in between in the width direction, the engaging raised parts 64, 66 are formed so as to protrude towards the insert/take-out opening 52.

The engaging raised parts 64 and 66 are so constructed as to hold the lower surface 10C of the case 10 of the first battery device 1 in a condition of abutting the lower surface 10C to the abutting wall 56 by engaging a front edge of the upper surface 10B of the case 10 of the first battery device 1, and to hold the lower surface 20C of the case 20 of the second battery device 2 in a condition of abutting the lower surface 20C to the abutting wall 56 by engaging the engaging recessed parts 26 and 28 of the case 20 of the second battery device 2.

More specifically, the apparatus is so constructed that the first battery device 1 is held in a condition of abutting the first battery device 1 to the abutting wall 56 by engaging the lower surfaces 64A and 66A, in which each engaging raised part 64 and 66 faces the abutting wall 56, with the front edge of the upper surface 10B of the case 10 of the first battery device 1, and that the second battery device 2 is held in a condition of abutting the second battery device 2 to the abutting wall 56 by engaging the lower surfaces 64A and 66A of the engaging raised parts 64 and 66 with the flat surfaces 2602 and 2802 of the engaging recessed parts 26 and 28 of the case 20 of the second battery device 2.

Further, the apparatus is constructed such that a holding member 68 is disposed on an upper wall 60 part constituting the insert/take-out opening 52, and that an engaging part 6802 of a tip of the holding member 68 engages upper edges of rear surfaces 10E and 20E of both cases 10 and 20 of the first battery device 1 and the second battery device 2, forcing the first battery device 1 and the second battery device 2 housed in the battery housing chamber in a direction to the back wall 58, so as to hold the battery side terminals 14 and 24 in a condition of contacting with the housing chamber side terminals 62. In the present embodiment, the holding member 68 is formed with a resilient member having flexibility such that during inserting or taking out of the battery device, the holding member 68 may be lifted with a finger.

Further, as a structure of forcing the first and the second battery devices 1, 2 in the direction of the back wall 58 and holding the battery side terminals 14 and 24 in a condition of contacting with the housing chamber side terminals 62, various structures are known, and such a structure may be disposed on the housing side as in the present embodiment or disposed on the opening/closing cover 5104.

Next, installing and taking out of the first and the second battery devices 1, 2 to/from the battery housing chamber 50 will be described.

When installing the first battery device 1 in the battery housing chamber 50, as shown in FIG. 5A, the engaging part 6802 of the holding member 68 is moved by a finger from the insert/take-out opening 52 upward, the battery side terminal 14 of the first battery device 1 is made to face the insert/take-out opening 52 of the battery housing chamber 50, and its length direction L is made to parallel to the depth direction of the battery housing chamber 50 to insert. This enables the lower surface 10C of the first battery device 1 to be guided to the abutting wall 56 of the battery housing chamber 50 and both side surfaces 10A of the first battery device 1 to be guided to both side walls 54 of the battery housing chamber 50, thereby initiating the insertion into the battery housing chamber 50.

When the finger is removed from the holding member 68, the engaging part 6802 is placed in a condition of contacting with the upper surface 10B of the first battery device 1. Further insertion of the first battery device 1 causes the two engaging raised parts 64 and 66 of the battery housing chamber 50 to be engaged at a place close to the front surface 10D of the upper surface 10B of the first battery device 1, the lower surface 10C of the case 10 of the first battery device 1 being held in a condition of abutting the abutting wall 56.

Further insertion of the first battery device 1 causes the battery side terminal 14 to contact the housing chamber side terminal 62, and in this condition the engaging part 6802 of the holding member 68 engages a rear edge of the upper surface 10B, while the battery side terminal 14 is held in a condition of contacting with the housing chamber side terminal 62, the first battery device 1 being housed in the battery housing chamber 50.

On the other hand, when taking out the first battery device 1 from the battery housing chamber 50, the engaging part 6802 of the holding member 68 is moved by a finger from the insert/take-out opening 52 upward, and by holding the first battery device 1 by the fingers and taking it out towards the rear, the first battery device 1 is taken out from the battery housing chamber 50.

When installing the second battery device 2 in the battery housing chamber 50, as shown in FIG. 5B, the engaging part 6802 of the holding member 68 is moved from the insert/take-out opening 52 upward, the battery side terminal 24 of the second battery device 2 is made to face the insert/take-out opening 52 of the battery housing chamber 50, and its length direction L is made to parallel to the depth direction of the battery housing chamber 50 to insert. This enables the lower surface 20C of the second battery device 2 to be guided to the abutting wall 56 of the battery housing chamber 50, the upper surface 20B of the second battery device 2 to be guided to the upper wall 60 of the battery housing chamber 50, and both side walls 20A of the first battery device 2 to be guided to both side walls 54 of battery housing chamber 50, thereby initiating the insertion into the battery housing chamber 50.

When the finger is removed from the holding member 68, the engaging part 6802 is placed in a condition of contacting with the upper surface 20B of the second battery device 2 and further insertion of the second battery device 2 causes lower surfaces 64A and 66A of two engaging raised parts 64 and 66 of the battery housing chamber 50 to engage flat surfaces 2602 and 2802 of each engaging recessed part 26 and 28 of the second battery device 2, so that the lower surface 20C of the case 20 of the second battery device 2 is held in a condition of abutting the abutting wall 56.

Further insertion of the second battery device 2 causes the battery side terminal 24 to contact the housing chamber side terminal 62, and in this condition the engaging part 6802 of the holding member 68 engages a rear edge of the upper surface 20B, while the battery side terminal 14 is held in a condition of contacting with the housing chamber side terminal 62, the second battery device 2 being housed in the battery housing chamber 50.

On the other hand, when taking out the second battery device 2 from the battery housing chamber 50, the engaging part 6802 of the holding member 68 is moved by the finger from the insert/take-out opening 52 upward, and by holding the second battery device 2 with the fingers and taking it out towards the rear, the second battery device 2 is taken out from the battery housing chamber 50.

Consequently, according to the present embodiment, it is possible to house selectively two types of the first and the second battery devices 1, 2 having different thicknesses in the same battery housing chamber 50. For example, corresponding to different uses and different purposes, it is possible to use battery devices of various capacities, making it advantageous in terms of the ease of use.

Further, in the present embodiment, since a plurality (two) of the engaging raised parts 64 and 66 and the engaging recessed parts 24 and 26 are disposed with a spacing in the width direction W, it is advantageous in stabilizing the inserted first and the second battery devices 1, 2 in the battery housing chamber 50.

Further, in the present embodiment, since the upper wall 60 which can abut the upper surface 20B of the second battery device 2 is disposed in the battery housing chamber 50, it is advantageous in stabilizing the inserted second battery device 2 in the battery housing chamber 50.

Next, an embodiment 2 will be described.

The embodiment 2 is different from the embodiment 1 in that a holding member 78 is slidably disposed in the up-and-down direction.

FIG. 6 is an explanatory diagram to show construction of a battery housing chamber in the embodiment 2.

As FIG. 6 shows, the holding member 78 extends linearly in the up-and-down direction, with an engaging recessed part 7802 engaging the rear surfaces 10B and 20B of the cases 10 and 20 disposed on its lower end.

The holding member 78 is slidably disposed in the up-and-down direction as a pin 5110 disposed so as to protrude from the casing 5102 engages a guide groove 7810 which is provided at the holding member 78, while the engaging recessed part 7802 at the lower end is being forced at all times by a forcing member 7804 towards the direction of the abutting wall 56, so that by moving the holding member 78 upward by the finger, the engaging recessed part 7802 can retreat from the insert/take-out opening 52.

Consequently, when inserting or taking out the first battery device 1 and the second battery device 2, in the same way as the embodiment 1, the holding member 78 is retreated by the finger from the insert/take-out opening 52.

Further, as shown in alternate lines of long and two short dashes in FIG. 6, when the first battery device 1 is inserted into the battery housing chamber 50, the engaging recessed part 7802 of the holding member 78 engages the upper edge of the upper surface 10B of the case 10 of the first battery device 1, thus holding a condition in which the battery side terminal 14 of the first battery device 1 is in contact with the housing chamber side terminal 62.

Further, as shown in solid lines in FIG. 6, when the second battery device 2 is inserted into the battery housing chamber 50, the engaging recessed part 7802 of the holding member 78

engages the upper edge of the upper surface 20B of the case 20 of the second battery device 2, thus holding a condition in which the battery side terminal 24 of the second battery device 2 is in contact with the housing chamber side terminal 62.

Accordingly, in the embodiment 2, similar advantages as in the embodiment 1 are naturally produced.

Next, attachment of the film 202 will be described.

In the present embodiment, as shown in FIG. 2A and FIG. 2B, when the first and the second battery devices 1, 2 are viewed from the side, between the front cap 102 and the upper edge of each side wall 106, there is formed a height difference respectively with the front cap 102 being high and the upper edge of each side wall 106 being low, and between the rear part 104 and the upper edge of each side wall 106, there is formed a height difference D respectively with the rear part 104 being high and the upper edge of each side wall 106 being low.

As mentioned above, having these four height differences D, as shown in FIG. 7A and FIG. 7B, the upper film 204 is attached to cover the front cap 102, the rear part 104, and the two side walls 106 between part close to the front surface 10D or 20D and part close to the rear surfaces 10E or 20E. When applying a downward tensile force (in the direction of arrow F) to both sides of the width direction of the upper film 204, as shown in FIG. 7C, stresses F1 and F2 generate in concentration on portions abutted by each height difference D, thus causing creases to be generated on the upper film 204, thereby preventing from spoiling appearance of the apparatus.

In order to prevent from such generation of creases, as shown in FIG. 8A and FIG. 8B, a slant part 108 protruding upward to eliminate the height difference D is disposed on the upper edge portion of the side wall 106 facing the front cap 102 while, at the same time, slant parts 110 protruding upward to eliminate the height difference D are disposed on an upper edge portion of the side wall 106 facing the rear part 104. In other words, the slant parts 110 are formed in such a way that the slant parts 110 start to form from a middle portion of the length direction of the frame 100 to the front cap 102 or the rear part 104, the amount of protrusion from the frame 100 gradually increase so as to make continuous connection to the front cap 102 or the rear part 104.

According to such construction, as shown in FIG. 9A and FIG. 9B, the upper film 204 is attached to the front cap 102, the rear part 104, and the two side walls 106 between the portions close to the front surfaces 10D and 20D and the portions close to the rear surfaces 10E and 20E, so that even if the downward tensile force (in the direction of arrow F) is applied to both sides of the width direction of the upper film 204, since the upper film abuts each slant part 110, the stresses F1 and F2 generated at the abutted portions disperse, thereby preventing from generating the creases in the upper film 204 and making it possible to improve external appearance of the apparatus.

INDUSTRIAL APPLICABILITY

According to the battery device of the present invention, by using the engaging recessed part, it is possible to selectively house the first or the second battery device of different thicknesses in the same battery housing chamber, and allows to use battery devices having various capacities for different uses and different purposes and improve the ease of use.

The invention claimed is:

1. A battery device housed in a single battery housing chamber of an electronic device, comprising:

a case having side surfaces located on both ends of a width direction, an upper surface and lower surface located on both ends of a thickness direction, and a front surface and a rear surface located on both ends of a length direction;

a charging unit fixed inside the case; and

a battery side terminal disposed on the front surface of the case and connected to the charging unit, the battery side terminal configured to connect to a housing chamber side terminal of the electronic device to provide electric power to the charging unit from the electronic device as said charging unit charges and to provide electric power from the charging unit to the electronic device through the battery side terminal as the charging unit discharges,

wherein a first engaging recessed part is formed on the front surface of the case of the battery device and a second engaging recessed part is formed on the front surface of the case of the battery device, the first and second engaging recessed parts being separated in the width direction by a gap.

2. The battery device according to claim 1, wherein the battery device comprises a frame and a film attached to portions of the frame excluding a front and back side portions of the frame.

3. The battery device according to claim 2, wherein the film is attached to the frame so as to wrap around the entire circumference excluding the front and back side portions of the frame; and the battery device further includes slant parts disposed on side surfaces of the frame, which correspond to the side surfaces of the case, each of the slant parts facing toward the front or back side of the frame, an amount of protrusion from the frame being increased starting from the middle position in the length direction of the frame to the front or back side portion of the frame, the slant part making continuous connection to the front and back side portion.

4. The battery device according to claim 1, wherein the first recessed engaging part is also formed on a first side surface of the case.

5. The battery device according to claim 4, wherein the second recessed engaging part is also formed on a second side surface of the case.

6. The battery device according to claim 5, wherein the first recessed engaging part is formed above the battery side terminal.

7. The battery device according to claim 1, wherein the second recessed engaging part is also formed on a second side surface of the case.

8. The battery device according to claim 7, wherein the first recessed engaging part is formed above the battery side terminal.

9. The battery device according to claim 1, wherein the first recessed engaging part is formed above the battery side terminal.

10. A battery device housed in a single battery housing chamber of an electronic device, comprising:

a case having side surfaces located on both ends of a width direction, an upper surface and lower surface located on both ends of a thickness direction, and a front surface and a rear surface located on both ends of a length direction;

a charging unit fixed inside the case; and

a battery side terminal disposed on the front surface of the case and connected to the charging unit, the battery side terminal configured to connect to a housing chamber side terminal of the electronic device to provide electric power to the charging unit from the electronic device as said charging unit charges and to provide electric power

from the charging unit to the electronic device through the battery side terminal as the charging unit discharges,

wherein first engaging means are formed on the front surface of the case of the battery device and second engaging means are formed on the front surface of the case of the battery device, the first and second engaging means being separated in the width direction by a gap.

11. The battery device according to claim 10, wherein the battery device comprises a frame and a film attached to portions of the frame excluding a front and back side portions of the frame.

12. The battery device according to claim 11, wherein the film is attached to the frame so as to wrap around the entire circumference excluding the front and back side portions of the frame; and the battery device further includes slant parts disposed on side surfaces of the frame, which correspond to the side surfaces of the case, each of the slant parts facing toward the front or back side of the frame, an amount of protrusion from the frame being increased starting from the middle position in the length direction of the frame to the front or back side portion of the frame, the slant part making continuous connection to the front and back side portion.

13. The battery device according to claim 10, wherein the first engaging means extends to a first side surface of the case.

14. The battery device according to claim 13, wherein the second engaging means extends to a second side surface of the case.

15. The battery device according to claim 14, wherein the first engaging means is formed above the battery side terminal.

16. The battery device according to claim 10, wherein the second engaging means extends to a second side surface of the case.

17. The battery device according to claim 16, wherein the first engaging means is formed above the battery side terminal.

18. The battery device according to claim 10, wherein the first engaging means is formed above the battery side terminal.

19. The battery device according to claim 18, wherein the first engaging means and the second engaging means are both open to the front surface, the upper surface, and a corresponding side surface.

20. The battery device according to claim 19, wherein the first engaging means and the second engaging means are both include a flat surface parallel to both the upper surface and the lower surface.

21. The battery device according to claim 1, wherein the first engaging recessed part and the second engaging recessed part are both open to the front surface, the upper surface, and a corresponding side surface.

22. The battery device according to claim 1, wherein the first engaging recessed part and the second engaging recessed part are both include a flat surface parallel to both the upper surface and the lower surface.

* * * * *

EXHIBIT D

US00D503922S

(12) United States Design Patent

Shimizu

(10) Patent No.: US D503,922 S
(45) Date of Patent: ** Apr. 12, 2005

(54) BATTERY

(75) Inventor: Minoru Shimizu, Tokyo (JP)

(73) Assignee: Sony Corporation, Tokyo (JP)

(**) Term: 14 Years

(21) Appl. No.: 29/200,442

(22) Filed: Mar. 1, 2004

(51) LOC (7) Cl. 13-02

(52) U.S. Cl. D13/103

(58) Field of Search D13/103, 106, D13/110, 119, 184; D14/185; 429/96–100, 163, 176

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(Continued)

Primary Examiner—Alan P. Douglas
Assistant Examiner—Rosemary Tarcza
(74) *Attorney, Agent, or Firm*—Rader, Fishman & Grauer PLLC

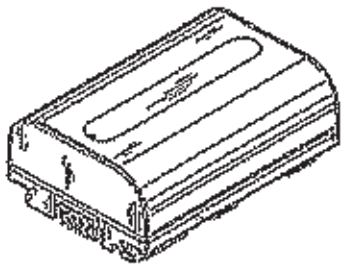
(57) CLAIM

The ornamental design for a battery, as shown.

DESCRIPTION

FIG. 1 is a front right top perspective view of a first embodiment of a battery showing my new design;
FIG. 2 is a front left bottom perspective view thereof;
FIG. 3 is a front elevational view thereof;
FIG. 4 is a rear elevational view thereof;
FIG. 5 is a left side elevational view thereof;
FIG. 6 is a right side elevational view thereof;
FIG. 7 is a top plan view thereof;
FIG. 8 is a bottom plan view thereof;
FIG. 9 is a front right top perspective view of a second embodiment of a battery showing my new design;
FIG. 10 is a front left bottom perspective view thereof;
FIG. 11 is a front elevational view thereof;
FIG. 12 is a rear elevational view thereof;
FIG. 13 is a left side elevational view thereof;
FIG. 14 is a right side elevational view thereof;
FIG. 15 is a top plan view thereof;
FIG. 16 is a bottom plan view thereof;
FIG. 17 is a front right top perspective view of a third embodiment of a battery showing my new design;
FIG. 18 is a front left bottom perspective view thereof;
FIG. 19 is a front elevational view thereof;
FIG. 20 is a rear elevational view thereof;
FIG. 21 is a left side elevational view thereof;
FIG. 22 is a right side elevational view thereof;
FIG. 23 is a top plan view thereof; and,
FIG. 24 is a bottom plan view thereof.

1 Claim, 15 Drawing Sheets



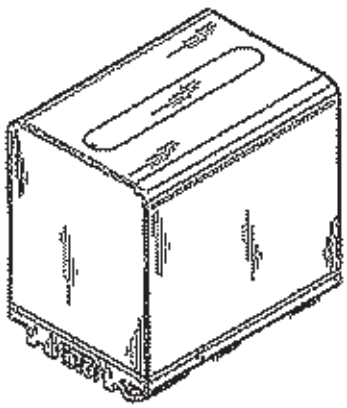


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Fig.1

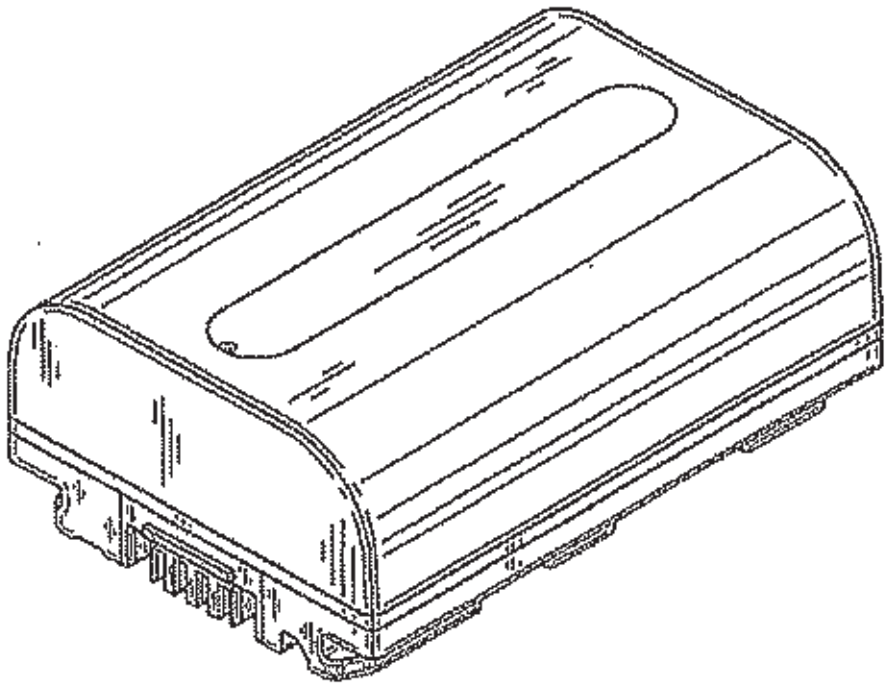

Fig.2

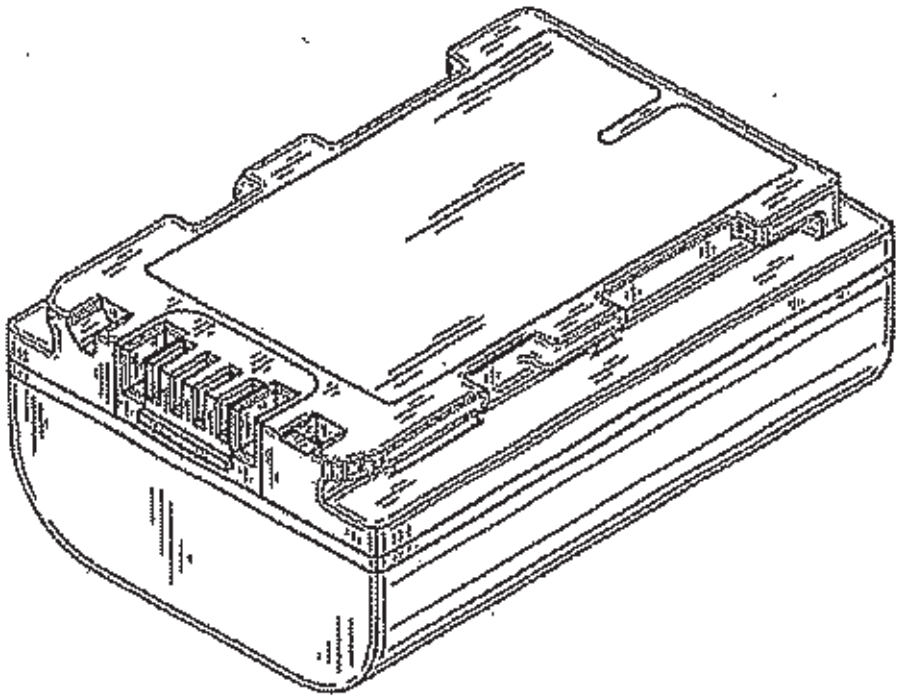

Fig.3

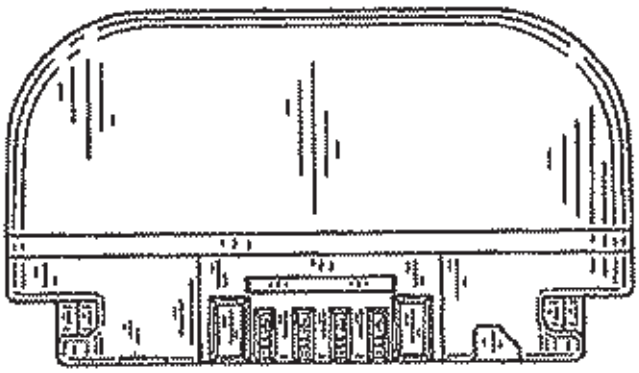

Fig.4

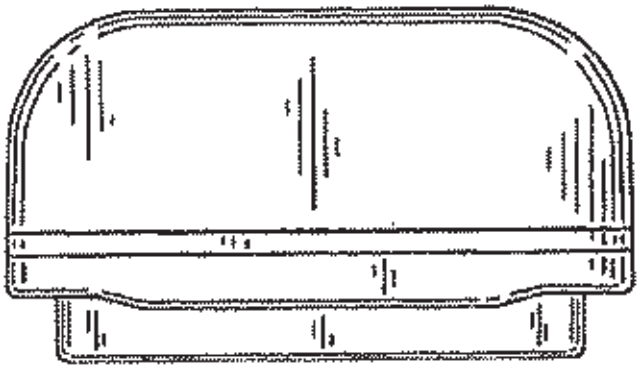

Fig.5

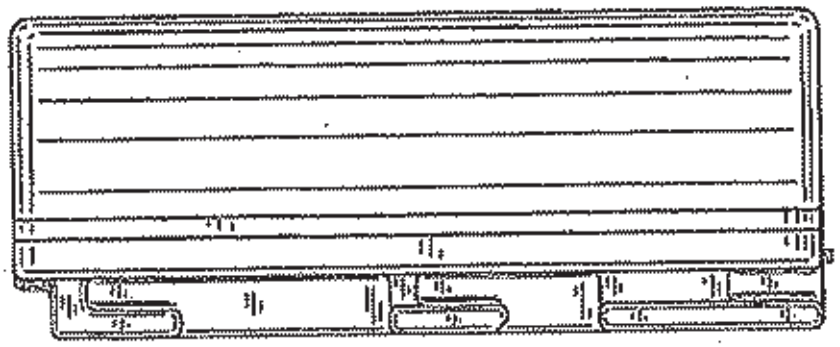

Fig.6

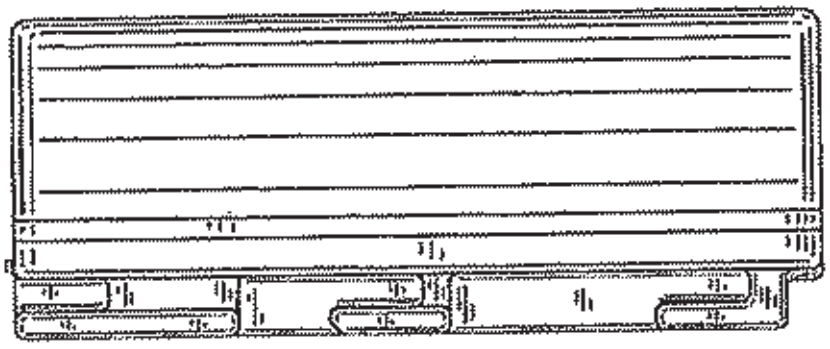

Fig.7

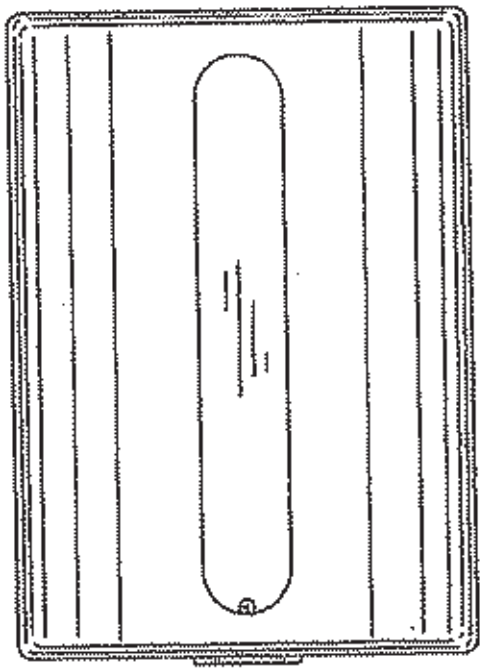

Fig.8

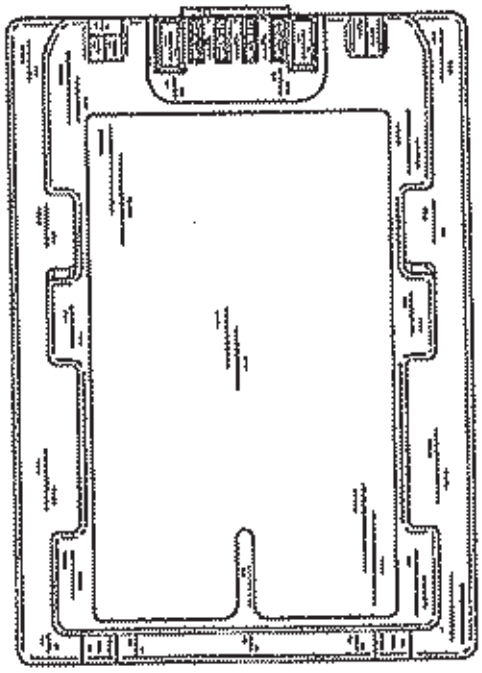

Fig.9

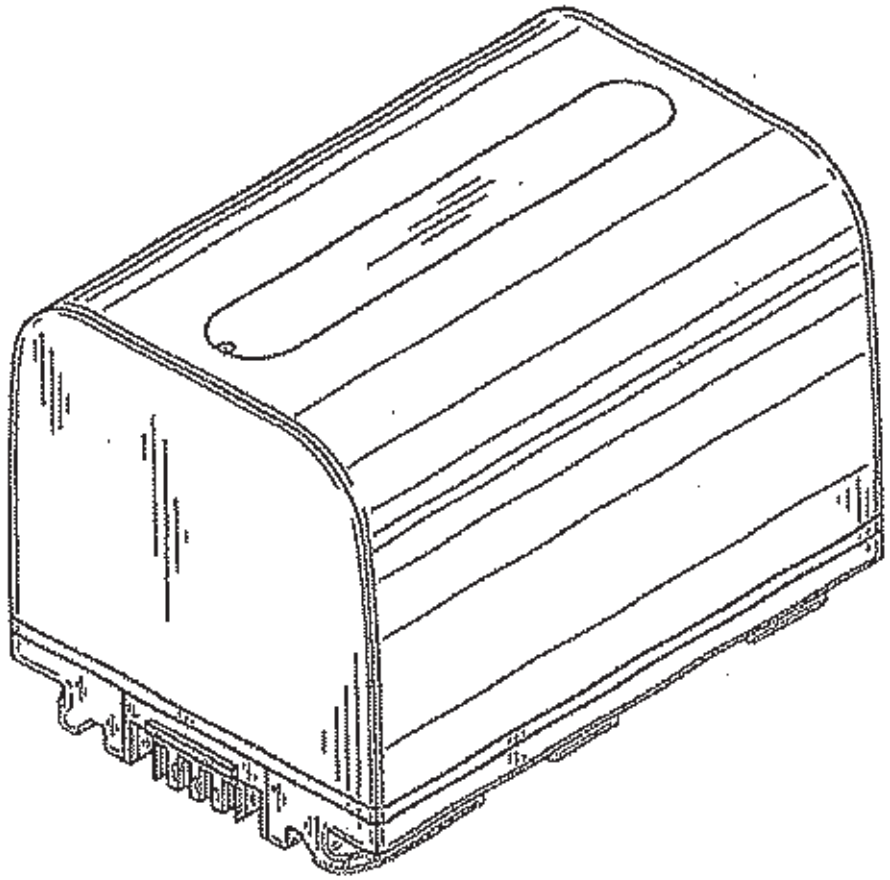

Fig.10

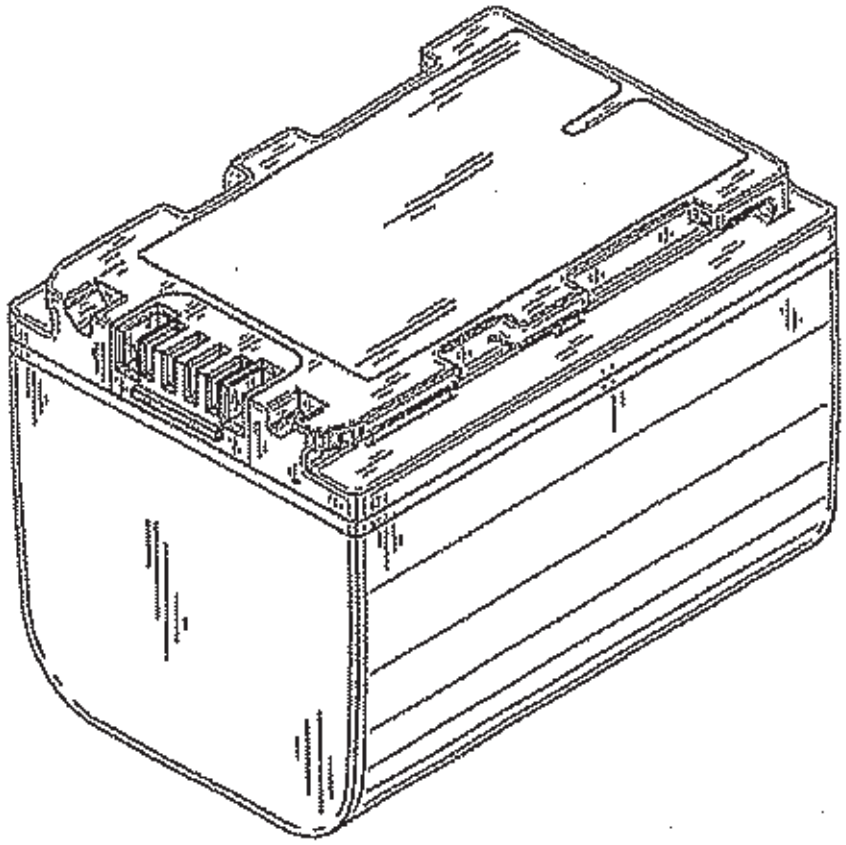

Fig.11

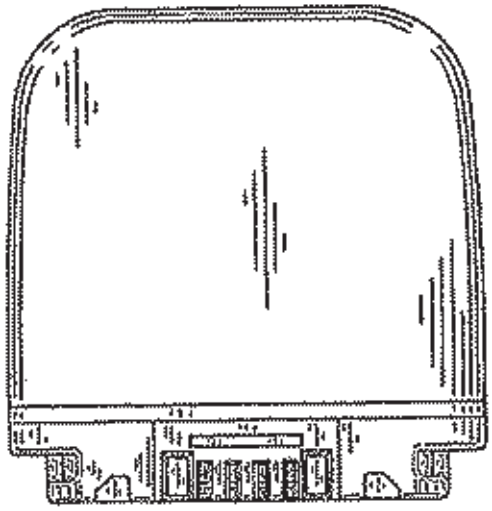

Fig.12

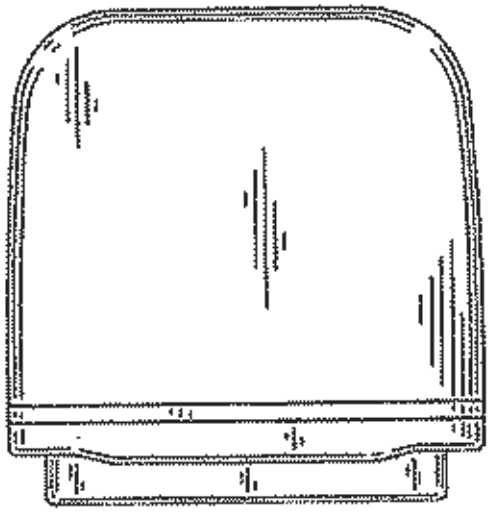

Fig.13

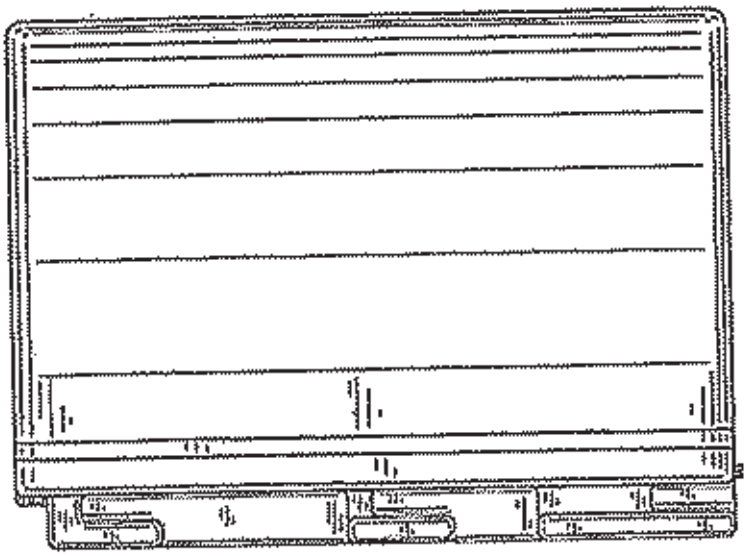

Fig.14

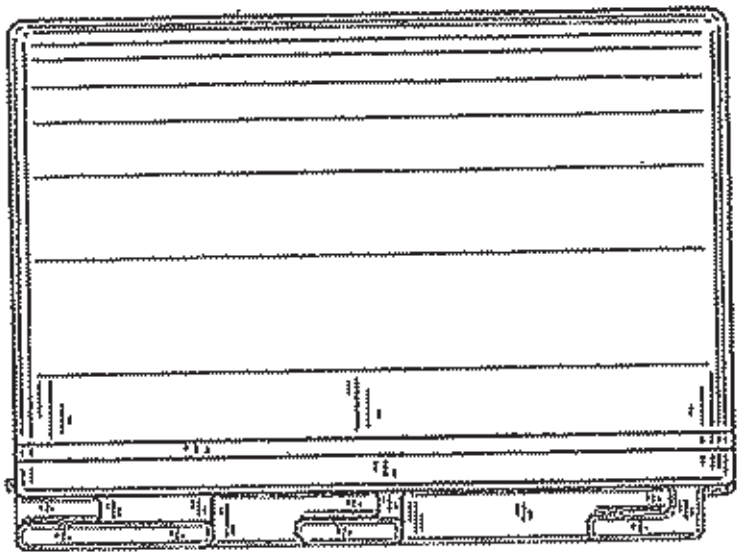

Fig.15

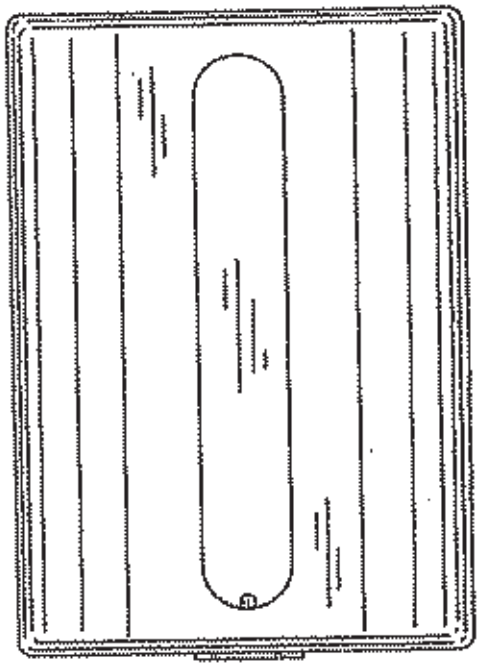

Fig.16

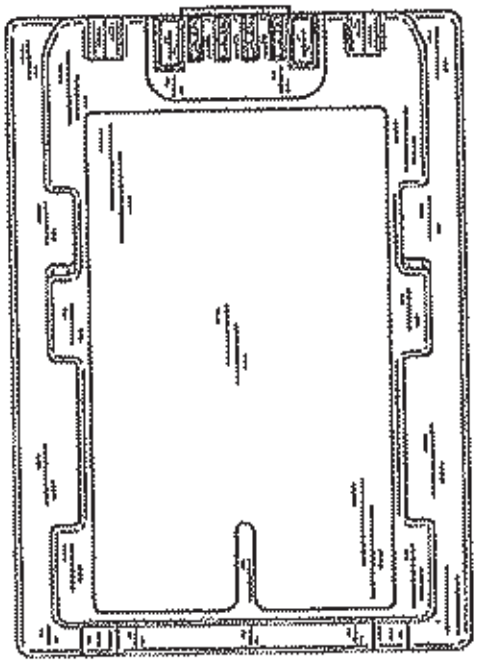

Fig.17

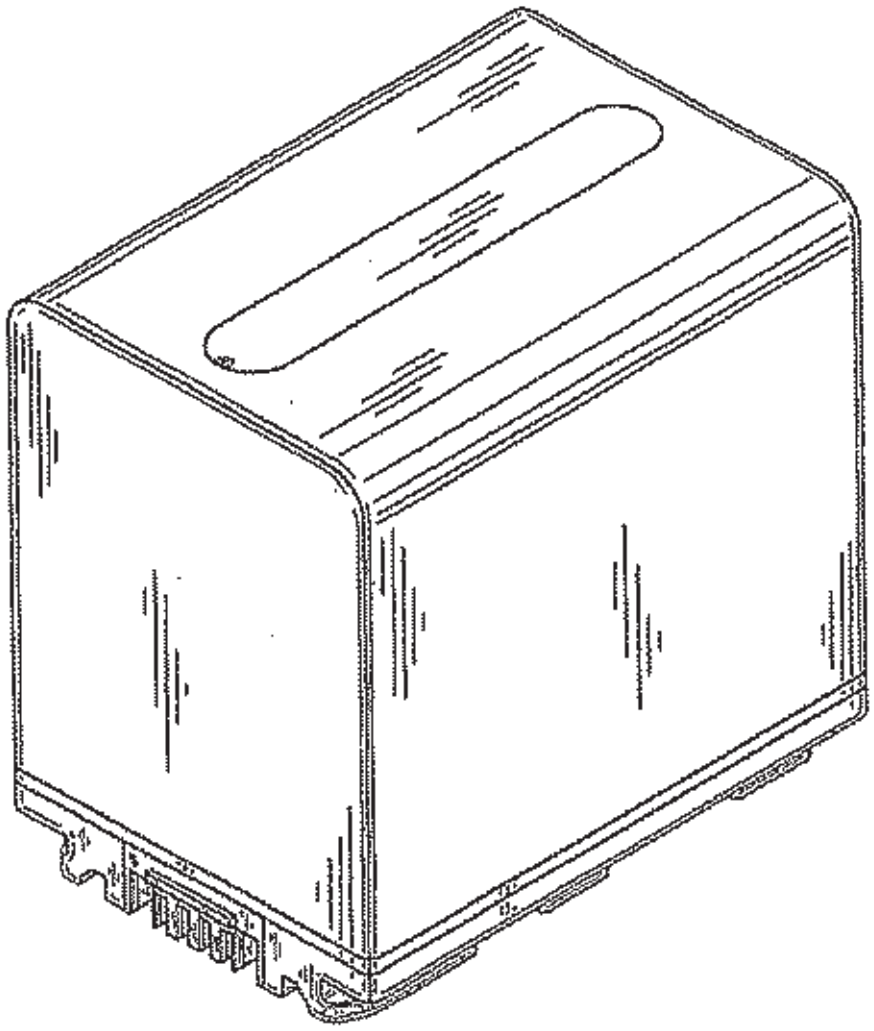

Fig.18

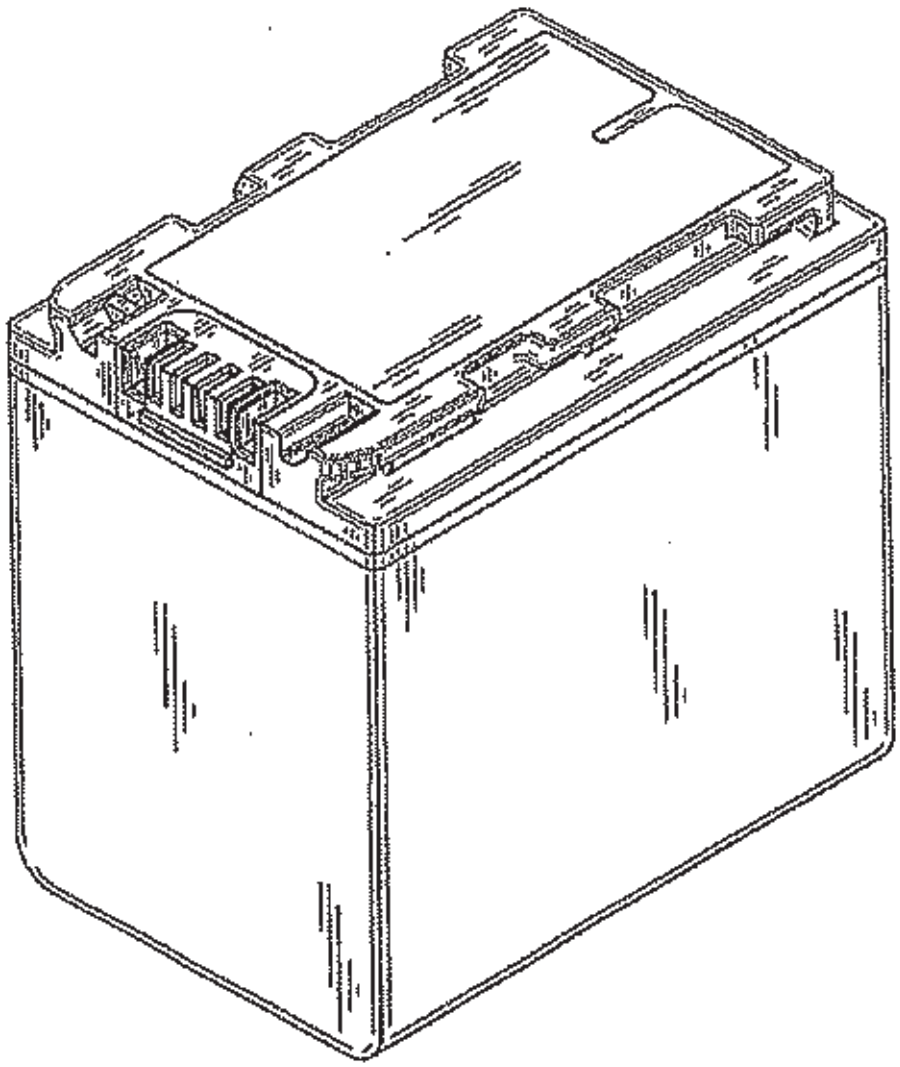

Fig.19

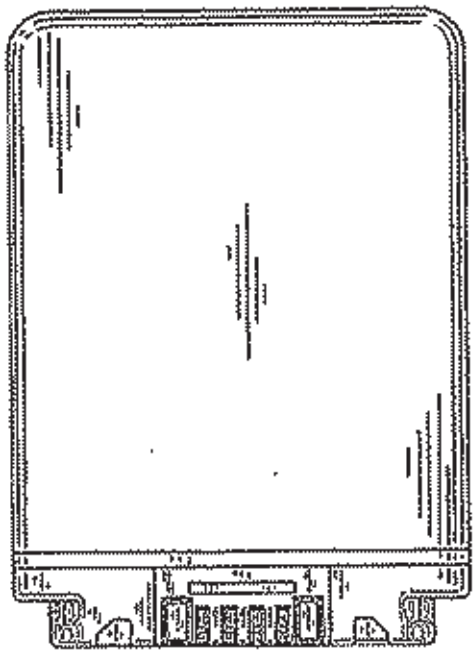

Fig.20

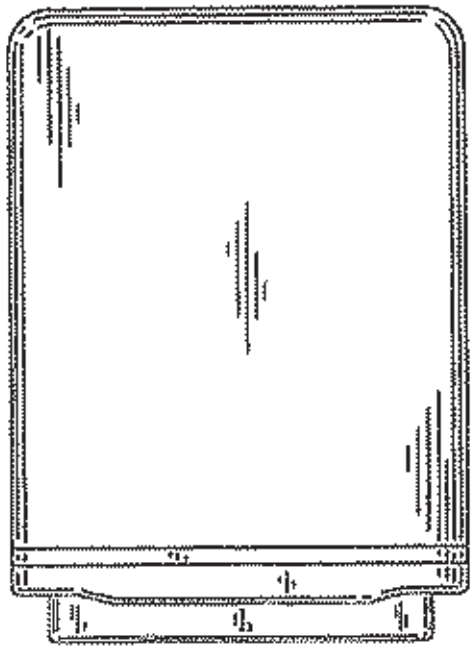

Fig.21

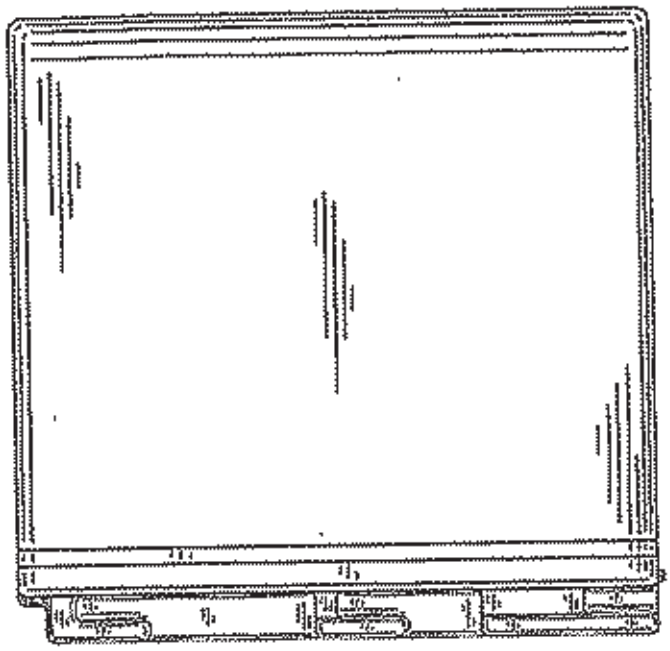

Fig.22

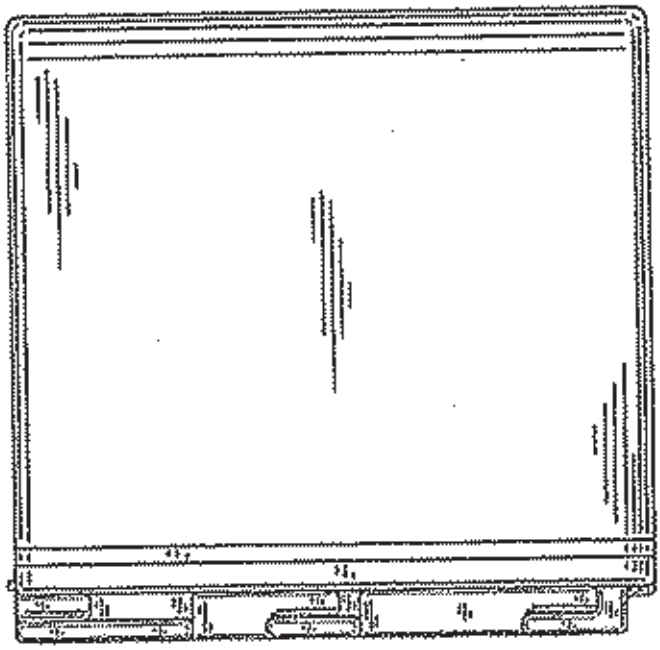

Fig.23

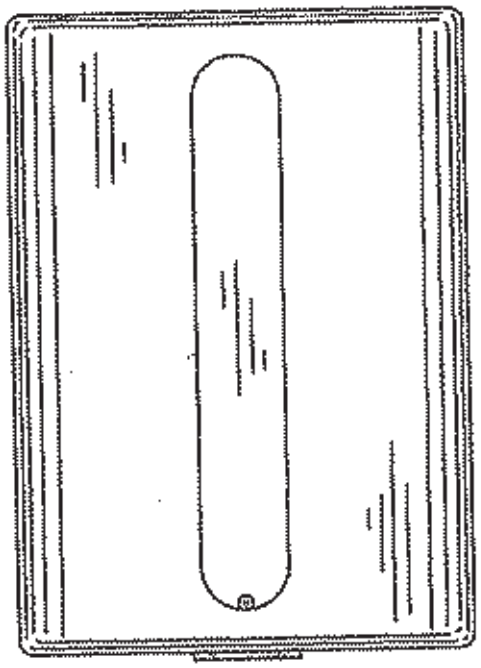

Fig.24

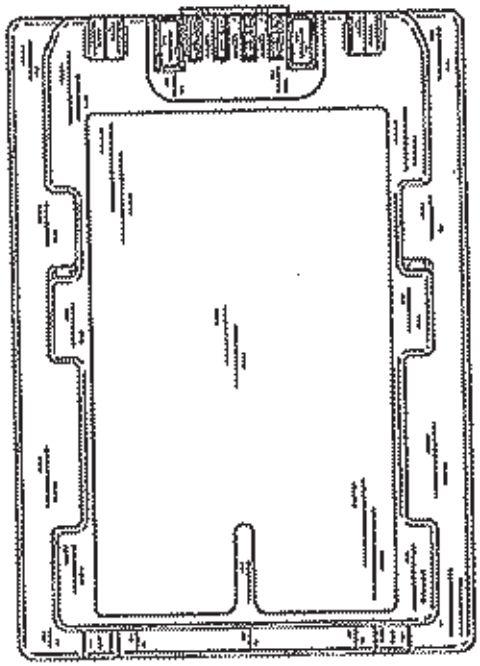

EXHIBIT E

US00D608276S

(12) United States Design Patent

Takeshita et al.

(10) Patent No.: US D608,276 S
(45) Date of Patent: ** Jan. 19, 2010

(54) BATTERY

(75) Inventors: Toshio Takeshita, Tokyo (JP); Yoichi Miyajima, Tokyo (JP); Atsushi Takahashi, Tokyo (JP); Hiroaki Sato, Tokyo (JP)

(73) Assignee: Sony Corporation, Tokyo (JP)

(**) Term: 14 Years

(21) Appl. No.: 29/254,895

(22) Filed: Mar. 2, 2006

(30) Foreign Application Priority Data

Sep. 2, 2005 (JP) 2005-025527
Sep. 2, 2005 (JP) 2005-025528
Sep. 30, 2005 (CN) 2005 3 0129131
Sep. 30, 2005 (CN) 2005 3 0129138

(51) LOC (9) Cl. 13-02
(52) U.S. Cl. D13/103
(58) Field of Classification Search D13/102–106, D13/110, 118–121, 184; 429/96–100, 163, 429/176

See application file for complete search history.

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U.S. Appl. No. 29/254,889, filed Mar. 2, 2006, Takeshita et al.

* cited by examiner

Primary Examiner—Cathron C Brooks
Assistant Examiner—Rosemary K Tarcza
(74) *Attorney, Agent, or Firm*—Oblon, Spivak, McClelland, Maier & Neustadt, P.C.

(57) CLAIM

The ornamental design for a battery, as shown and described.

DESCRIPTION

The design of the present application is directed to a battery that can be used, for example, in a camera or camcorder.

FIG. 1 is a top and right front perspective view of a first embodiment of a battery, showing our design;

FIG. 2 is a front elevational view of the first embodiment;

FIG. 3 is a rear elevational view of the first embodiment;

FIG. 4 is a left side elevational view of the first embodiment;

FIG. 5 is a right side elevational view of the first embodiment;

FIG. 6 is a top plan view of the first embodiment, rotated ninety degrees clockwise;

FIG. 7 is a bottom plan view of the first embodiment, rotated ninety degrees counterclockwise;

FIG. 8 is a top and right front perspective view of a second embodiment of a battery, showing our design;

FIG. 9 is a front elevational view of the second embodiment;

FIG. 10 is a rear elevational view of the second embodiment;

FIG. 11 is a left side elevational view of the second embodiment;

FIG. 12 is a right side elevational view of the second embodiment;

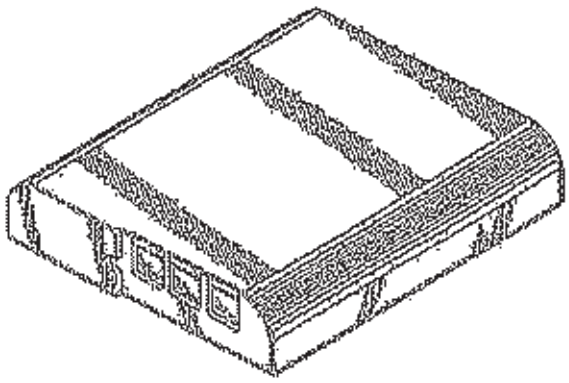

FIG. 13 is a top plan view of the second embodiment, rotated ninety degrees clockwise;

FIG. 14 is a bottom plan view of the second embodiment, rotated ninety degrees counterclockwise;

FIG. 15 is a top and right front perspective view of a third embodiment of a battery, showing our design;

FIG. 16 is a front elevational view of the third embodiment;

FIG. 17 is a rear elevational view of the third embodiment;

FIG. 18 is a left side elevational view of the third embodiment;

FIG. 19 is a right side elevational view of the third embodiment;

FIG. 20 is a top plan view of the third embodiment, rotated ninety degrees clockwise;

FIG. 21 is a bottom plan view of the third embodiment, rotated ninety degrees counterclockwise;

FIG. 22 is a top and right front perspective view of a fourth embodiment of a battery, showing our design;

FIG. 23 is a front elevational view of the fourth embodiment;

FIG. 24 is a rear elevational view of the fourth embodiment;

FIG. 25 is a left side elevational view of the fourth embodiment; and,

FIG. 26 is a right side elevational view of the fourth embodiment.

The phantom lines shown in the fourth embodiment are for the purpose of illustrating environmental structure and form no part of the claimed design.

1 Claim, 12 Drawing Sheets

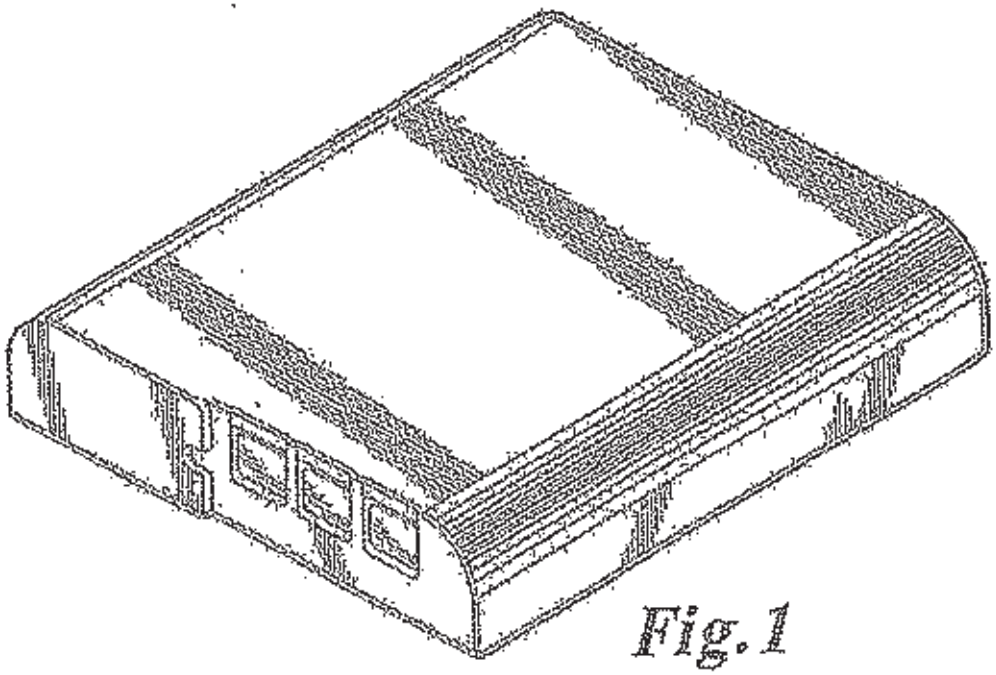

Fig. 1

Fig. 2

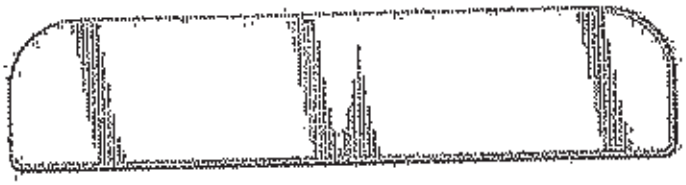

Fig. 3

Fig. 4

Fig. 5

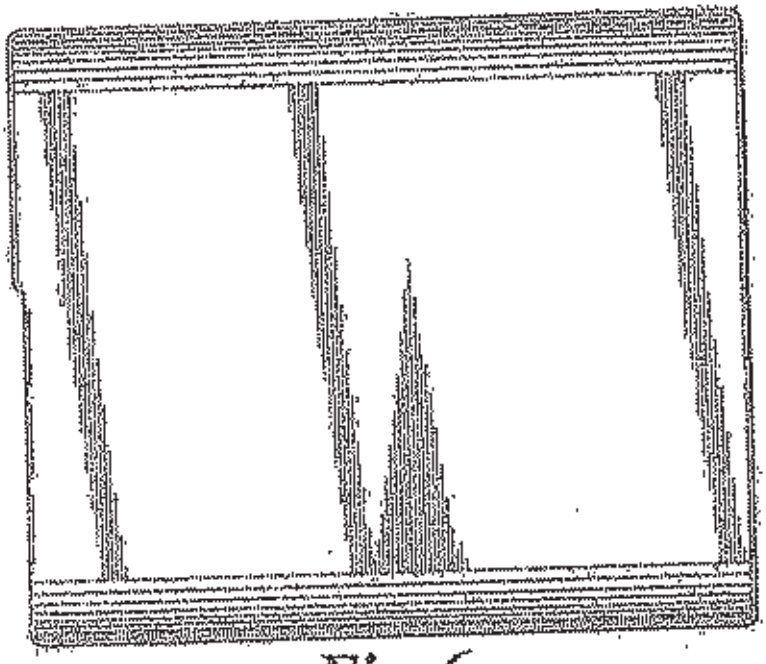

Fig. 6

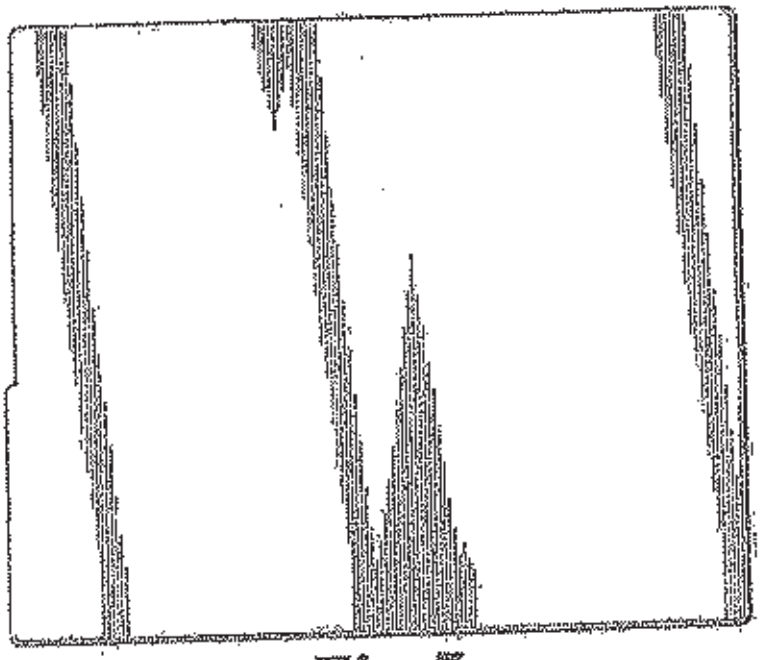

Fig. 7

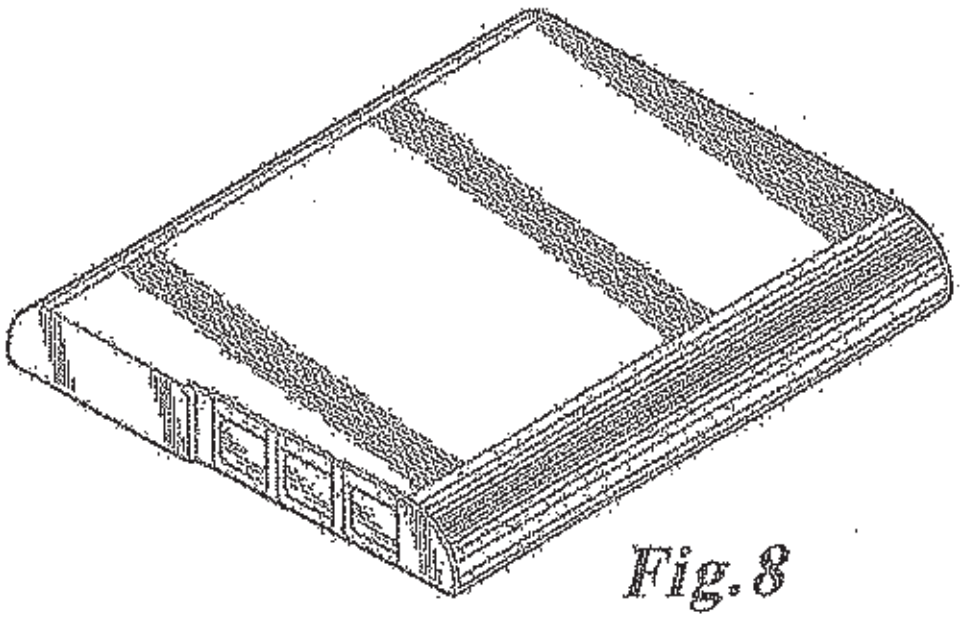

Fig. 8

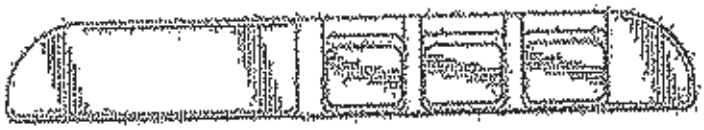

Fig. 9

Fig. 10

Fig. 11

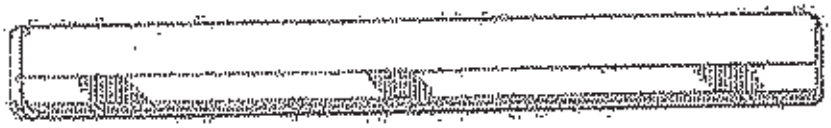

Fig. 12

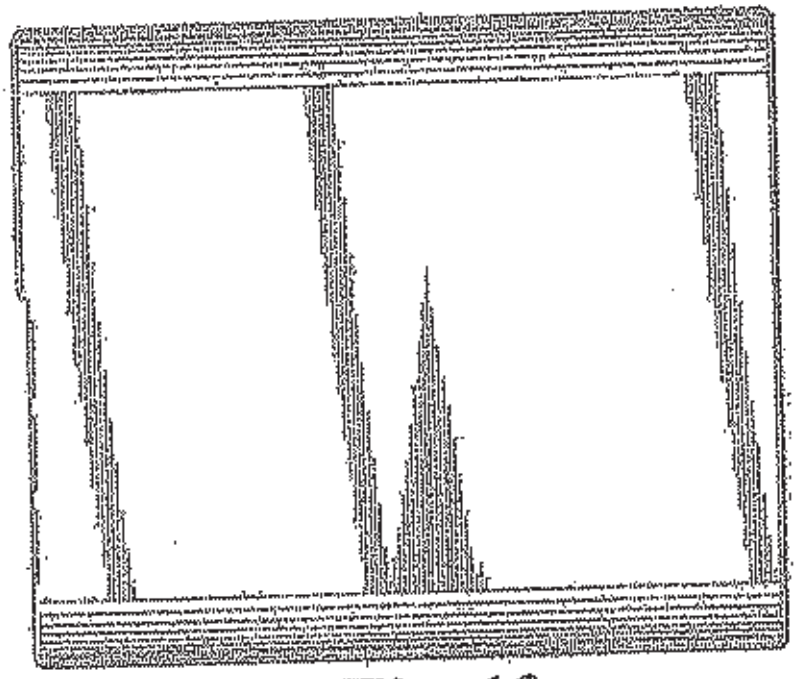

Fig. 13

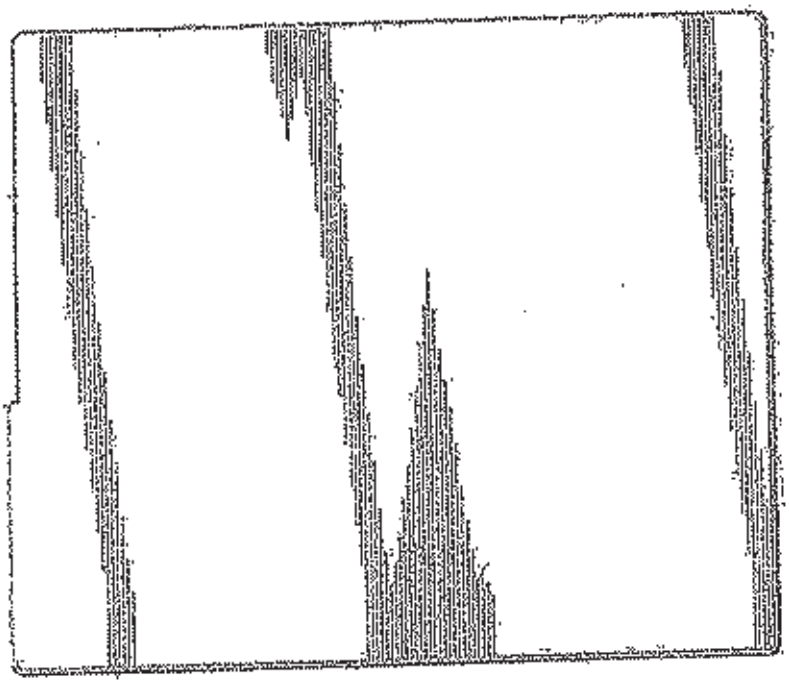

Fig. 14

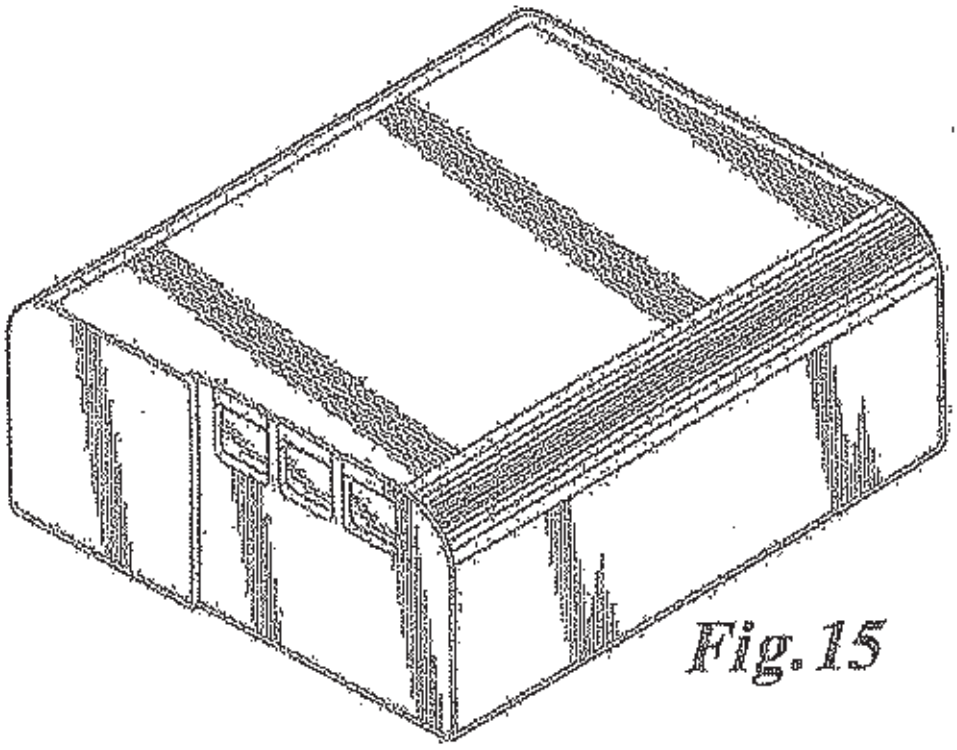

Fig. 15

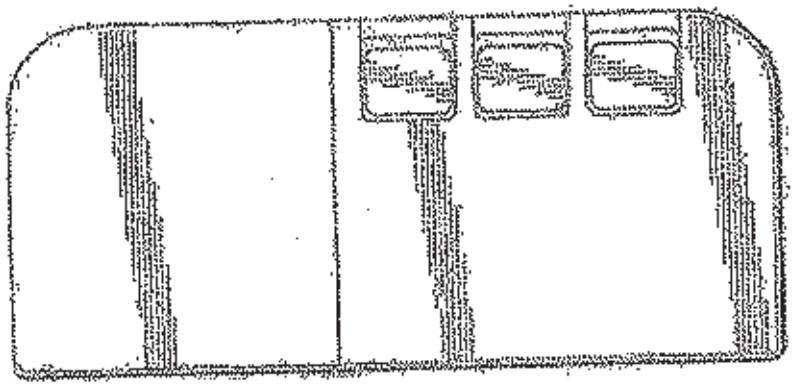

Fig. 16

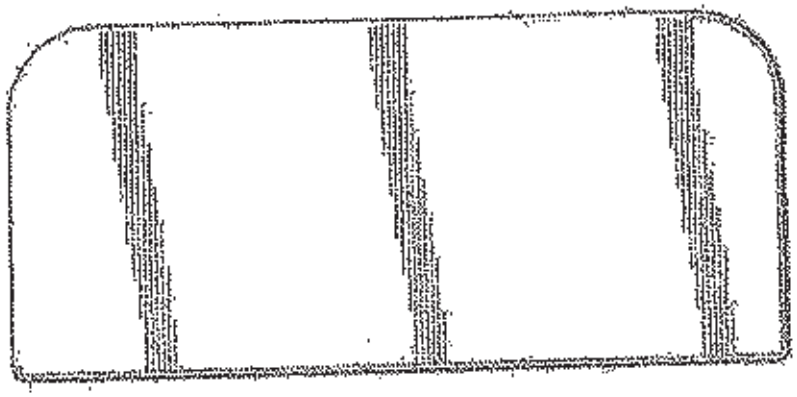

Fig. 17

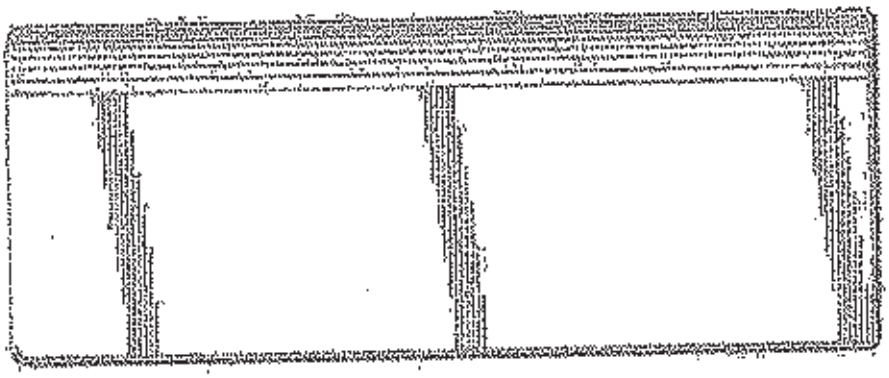

Fig. 18

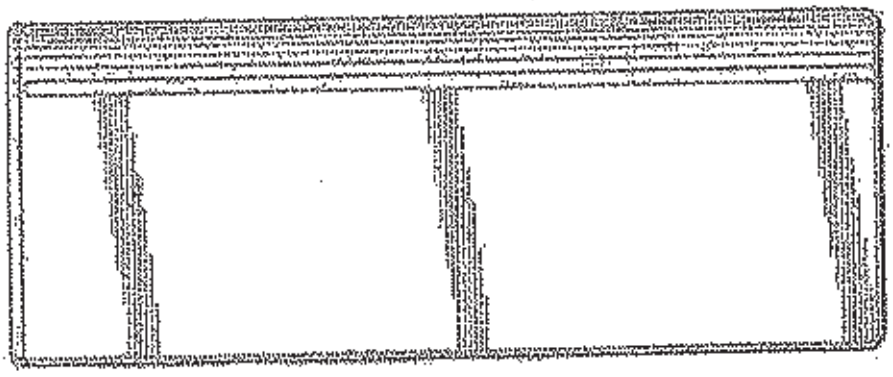

Fig. 19

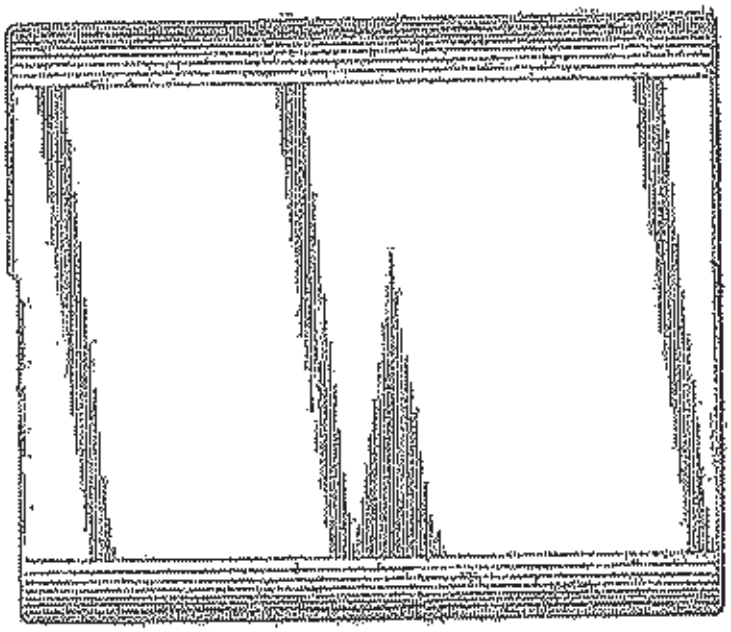

Fig. 20

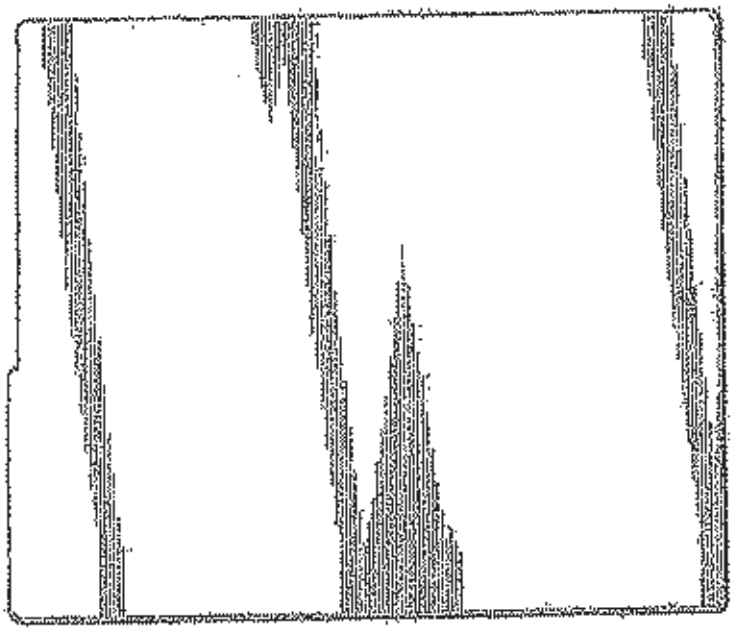

Fig. 21

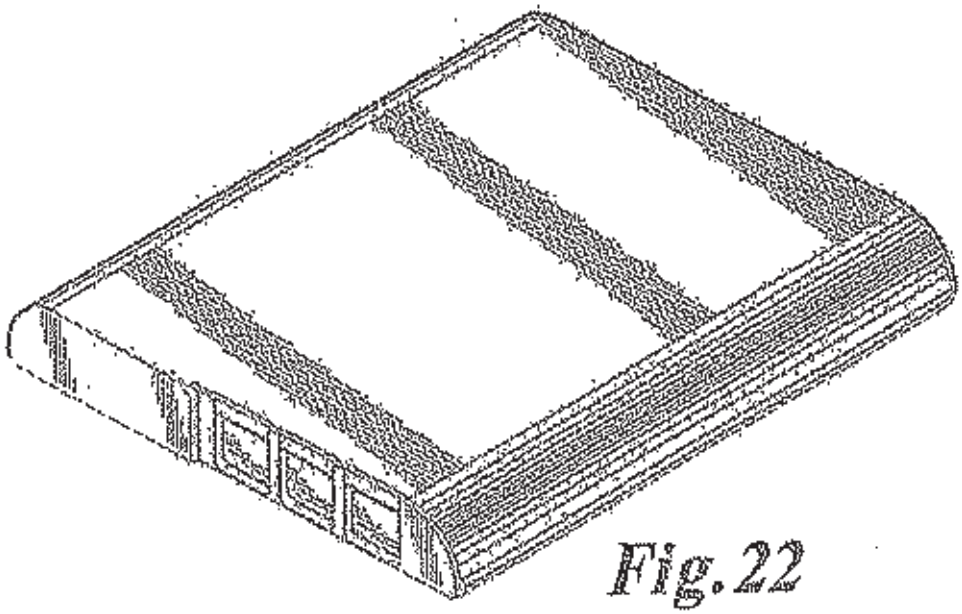

Fig. 22

Fig. 23

Fig. 24

Fig. 25

Fig. 26

EXHIBIT F

US00D619959S

(12) **United States Design Patent**
Takeshita et al.

(10) **Patent No.: US D619,959 S**
(45) **Date of Patent: ** Jul. 20, 2010**

(54) **BATTERY**

(75) Inventors: **Toshio Takeshita**, Tokyo (JP); **Yoichi Miyajima**, Tokyo (JP); **Atsushi Takahashi**, Tokyo (JP); **Hiroaki Sato**, Tokyo (JP)

(73) Assignee: **Sony Corporation**, Tokyo (JP)

(**) Term: 14 Years

(21) Appl. No.: 29/340,569

(22) Filed: Jul. 21, 2009

Related U.S. Application Data

(62) Division of application No. 29/254,895, filed on Mar. 2, 2006.

(30) Foreign Application Priority Data

Sep. 2, 2005 (JP) 2005-025527
Sep. 2, 2005 (JP) 2005-025528
Sep. 30, 2005 (CN) 2005 3 0129131
Sep. 30, 2005 (CN) 2005 3 0129138

(51) LOC (9) Cl. 13-02
(52) U.S. Cl. D13/103
(58) Field of Classification Search D13/102–106, D13/110, 118–121, 184; 429/96–100, 163, 429/176

See application file for complete search history.

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(Continued)

Primary Examiner—Rosemary K Tarcza
(74) *Attorney, Agent, or Firm*—Oblon, Spivak, McClelland, Maier & Neustadt, L.L.P.

(57) CLAIM

The ornamental design for a battery, as shown and described.

DESCRIPTION

FIG. 1 is a top and right front perspective view of a first embodiment of a battery, showing our design;

FIG. 2 is a front elevational view of the first embodiment;

FIG. 3 is a rear elevational view of the first embodiment;

FIG. 4 is a left side elevational view of the first embodiment;

FIG. 5 is a right side elevational view of the first embodiment;

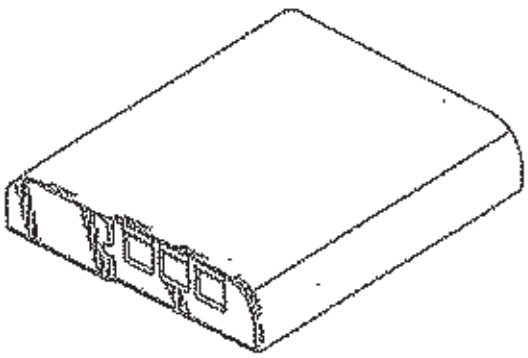
FIG. 6 is a top plan view of the first embodiment, rotated ninety degrees clockwise;

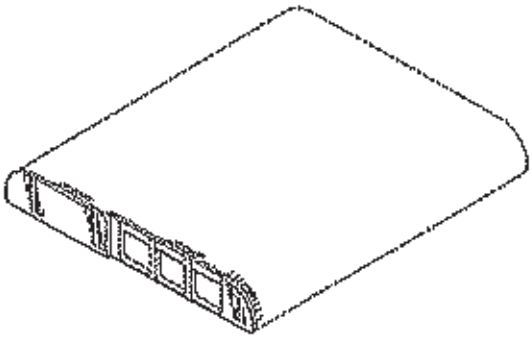
FIG. 7 is a bottom plan view of the first embodiment, rotated ninety degrees counterclockwise; and,

FIG. 8 is a top and right front perspective view of a second embodiment of a battery, showing our design.

The phantom lines shown in the figures of the first and second embodiments are shown for illustrative purposes only and form no part of the design of their respective embodiments.

1 Claim, 4 Drawing Sheets





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D515,499	S	2/2006	Matsuda et al.	
D516,593	S	3/2006	Takeshita et al.	
D521,447	S	5/2006	Ono et al.	
D522,451	S	6/2006	Hayes et al.	
D529,437	S	10/2006	Miyashita	
D556,680	S	12/2007	Matsumoto	
D585,742	S *	2/2009	Song	D13/103
D588,058	S *	3/2009	Ohata	D13/103
D590,334	S *	4/2009	Tatehata et al.	D13/103
D590,769	S *	4/2009	Tatehata et al.	D13/103
D592,130	S *	5/2009	Tatehata et al.	D13/103
D594,402	S *	6/2009	Inoue et al.	D13/103
D597,483	S *	8/2009	Wild et al.	D13/103
D601,494	S *	10/2009	Otani et al.	D13/103

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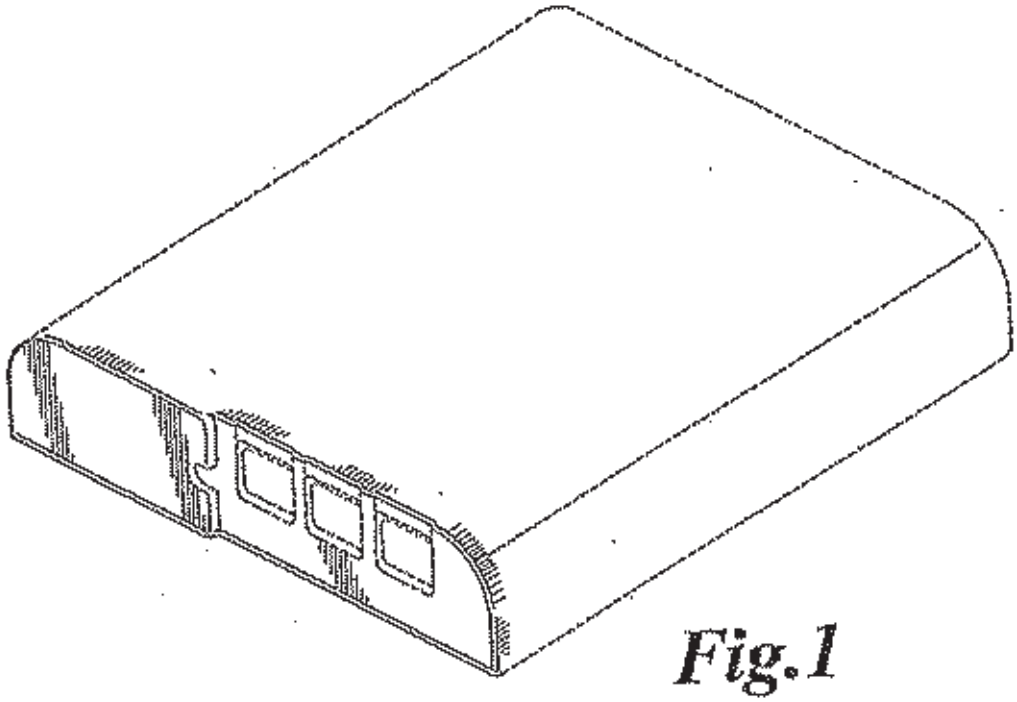

Fig. 1

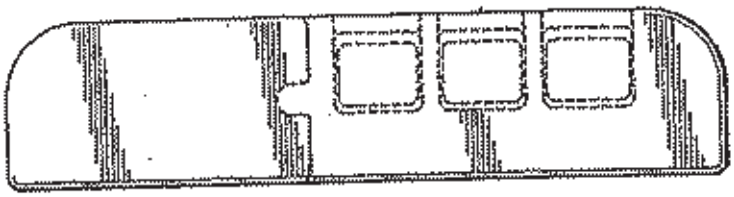

Fig.2

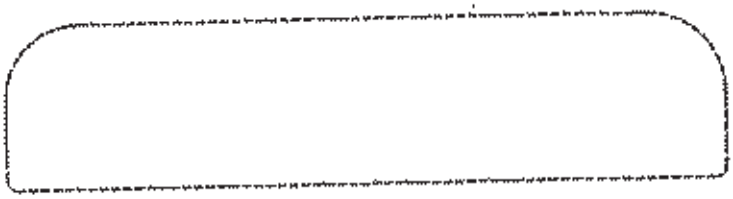

Fig.3

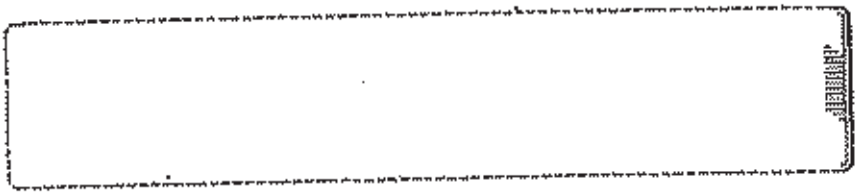

Fig.4

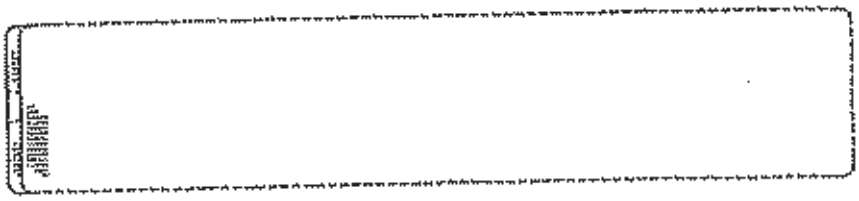

Fig.5

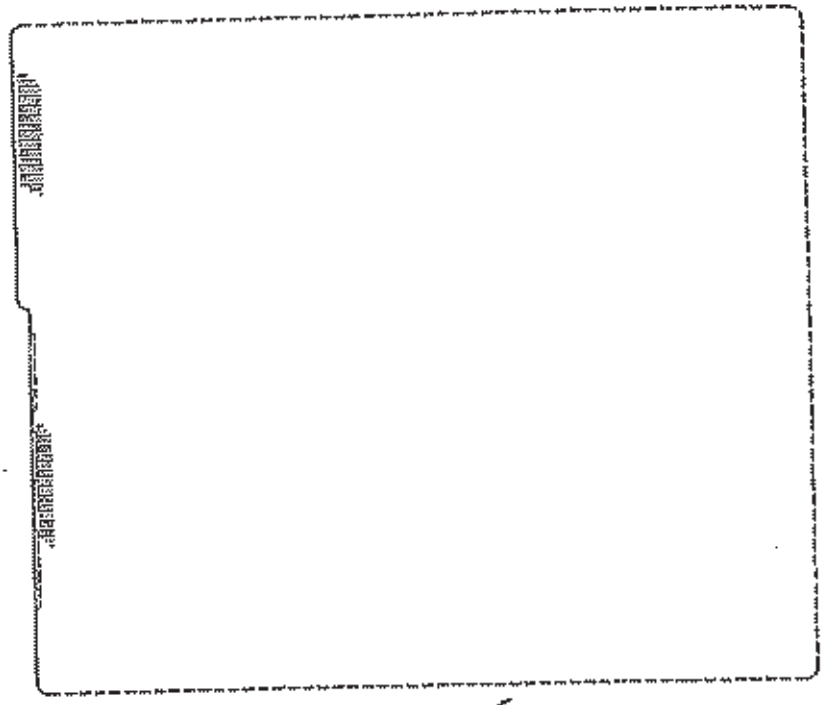

Fig.6

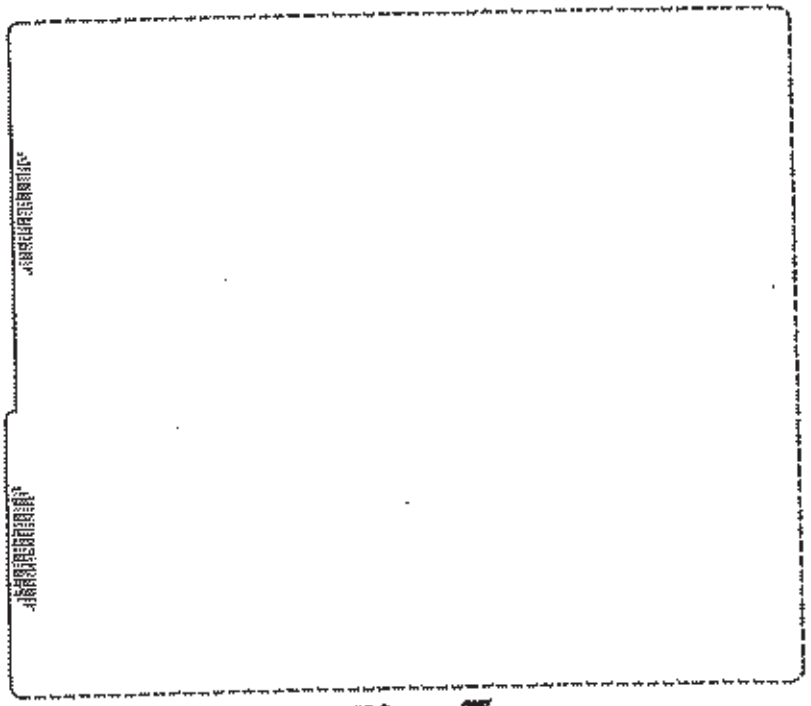

Fig.7

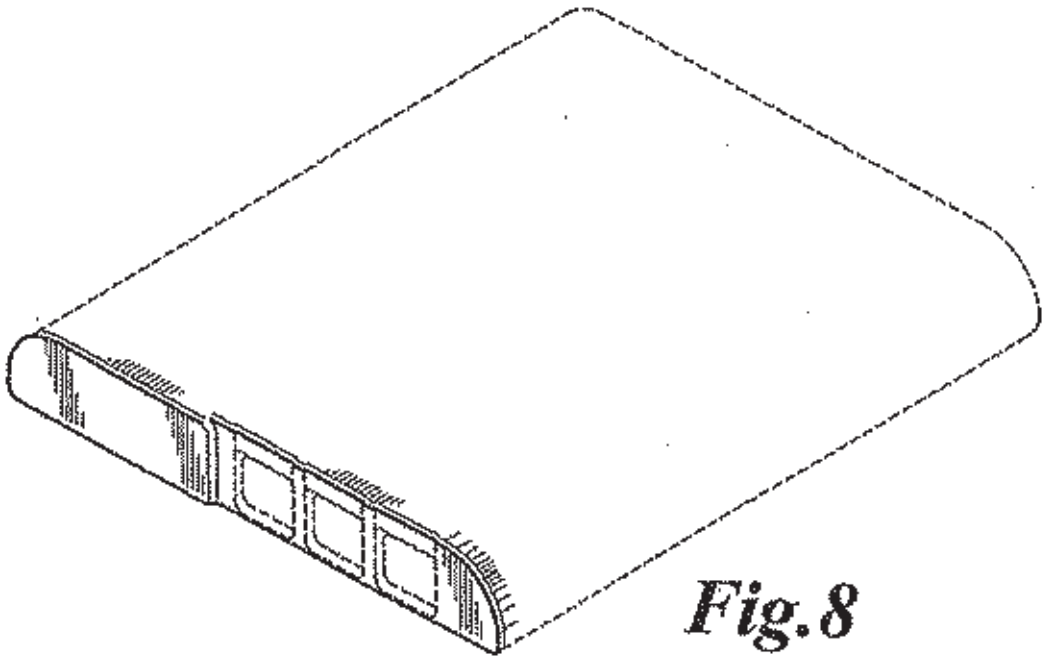

Fig. 8

EXHIBIT G

US00D635512S

(12) **United States Design Patent**
Tatehata et al.

(10) **Patent No.: US D635,512 S**
(45) **Date of Patent: ** Apr. 5, 2011**

(54) **BATTERY**

(75) Inventors: Shouji Tatehata, Fukushima (JP); Atsuhiro Kumagai, Tokyo (JP); Osamu Nagashima, Tokyo (JP)

(73) Assignee: Sony Corporation, Tokyo (JP)

(**) Term: 14 Years

(21) Appl. No.: 29/347,574

(22) Filed: Mar. 5, 2010

(30) Foreign Application Priority Data

Jan. 6, 2010 (JP) D2010-000252
Jan. 6, 2010 (JP) D2010-000255
Jan. 6, 2010 (JP) D2010-000258
Jan. 6, 2010 (JP) D2010-000266

(51) LOC (9) Cl. 13-02
(52) U.S. Cl. D13/119
(58) Field of Classification Search D13/102–106, D13/110, 118–121, 184, 199; 429/96–100, 429/163, 176, 187
See application file for complete search history.

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D516,019	S *	2/2006	Obasko et al.	D13/103
D516,502	S	3/2006	Takeshita et al.	
D529,437	S	10/2006	Miyashita	
D543,956	S *	6/2007	Hayes et al.	D13/184
D556,687	S *	12/2007	Miyamoto et al.	D13/119
D590,334	S	4/2009	Tatehata et al.	
D590,335	S	4/2009	Tatehata et al.	
D590,336	S	4/2009	Tatehata et al.	
D590,337	S	4/2009	Tatehata et al.	
D590,341	S	4/2009	Tatehata et al.	
D590,769	S	4/2009	Tatehata et al.	
D592,139	S *	5/2009	Tatehata et al.	D13/103
D594,402	S *	6/2009	Inoue et al.	D13/103
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D619,959	S *	7/2010	Takeshita et al.	D13/103
2008/0305367	A1 *	12/2008	Back et al.	429/7

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JP	D1142063/2	S	5/2002
JP	D1142063	S	5/2002
JP	D1142064	S	5/2002
JP	D1142063/3	S	7/2002
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JP	D1174520	S	6/2003

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Primary Examiner — Rosemary K Theza
(74) *Attorney, Agent, or Firm* — Rader, Fishman & Grauer PLLC

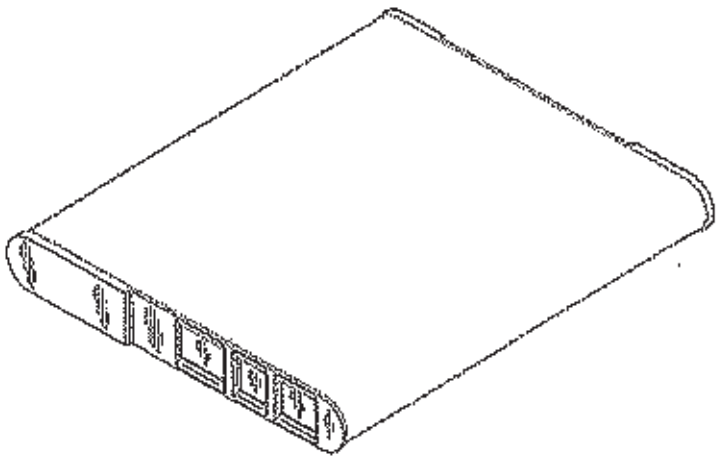
(57) CLAIM

The ornamental design for a battery, as shown and described.

DESCRIPTION

FIG. 1 is a perspective view of a battery showing our new design;
FIG. 2 is a front elevational view thereof;
FIG. 3 is a left side elevational view thereof;
FIG. 4 is a right side elevational view thereof;
FIG. 5 is a top plan view thereof; and,
FIG. 6 is a bottom plan view thereof.
Portions in broken lines are for illustrative purpose only and form no part of the claimed design.

1 Claim, 5 Drawing Sheets



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JP	D1287898	S	12/2006
JP	D1290911	S	1/2007
JP	D1290912	S	1/2007
JP	D1311935	S	10/2007
JP	D1324317	S	3/2008
JP	D1355276	S	4/2009

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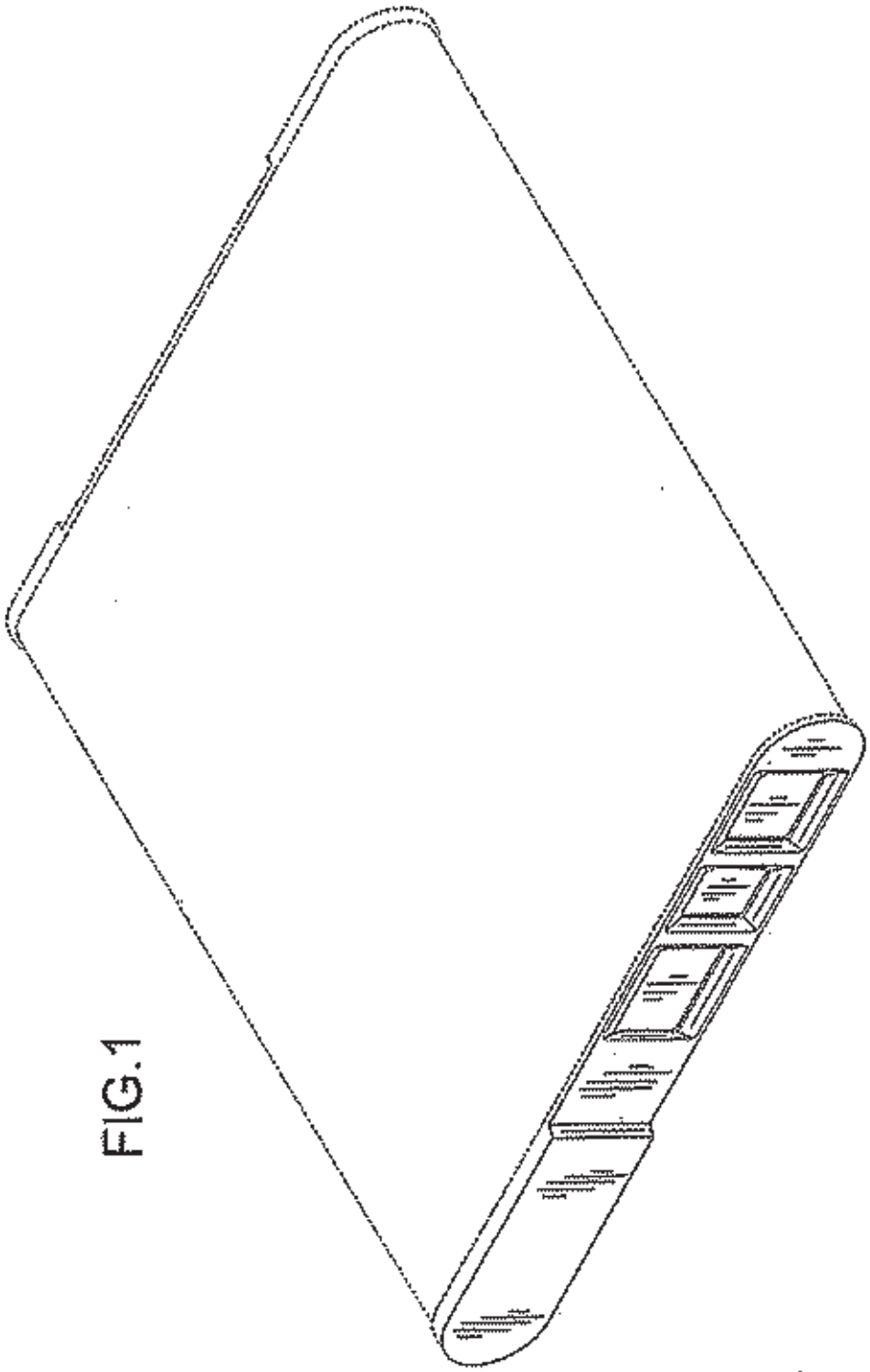

FIG.1

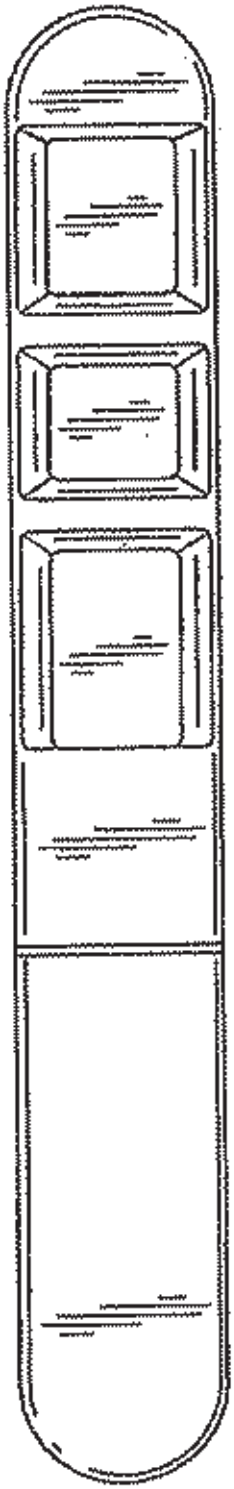

FIG.2

FIG.3

FIG.4

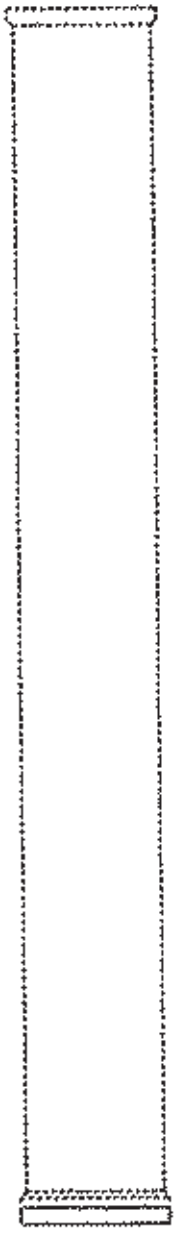

FIG.5

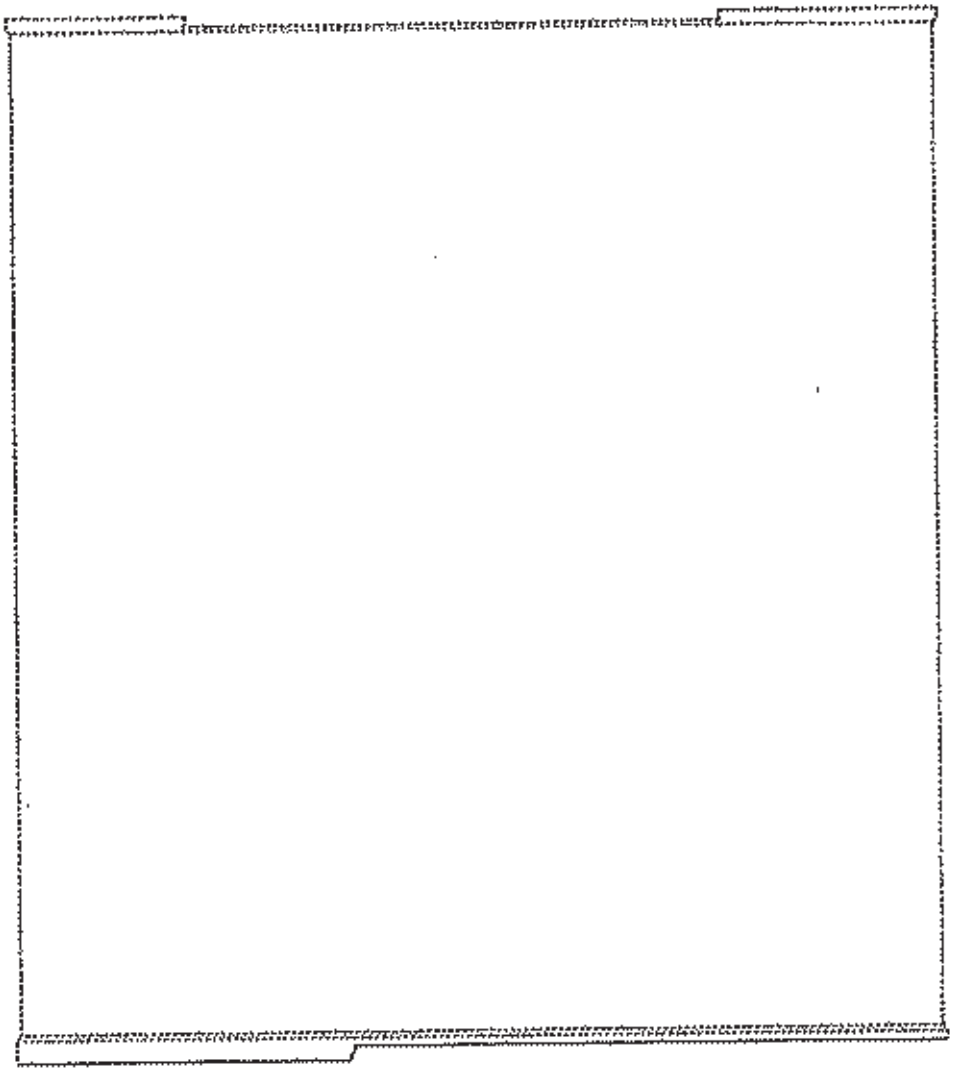

FIG.6

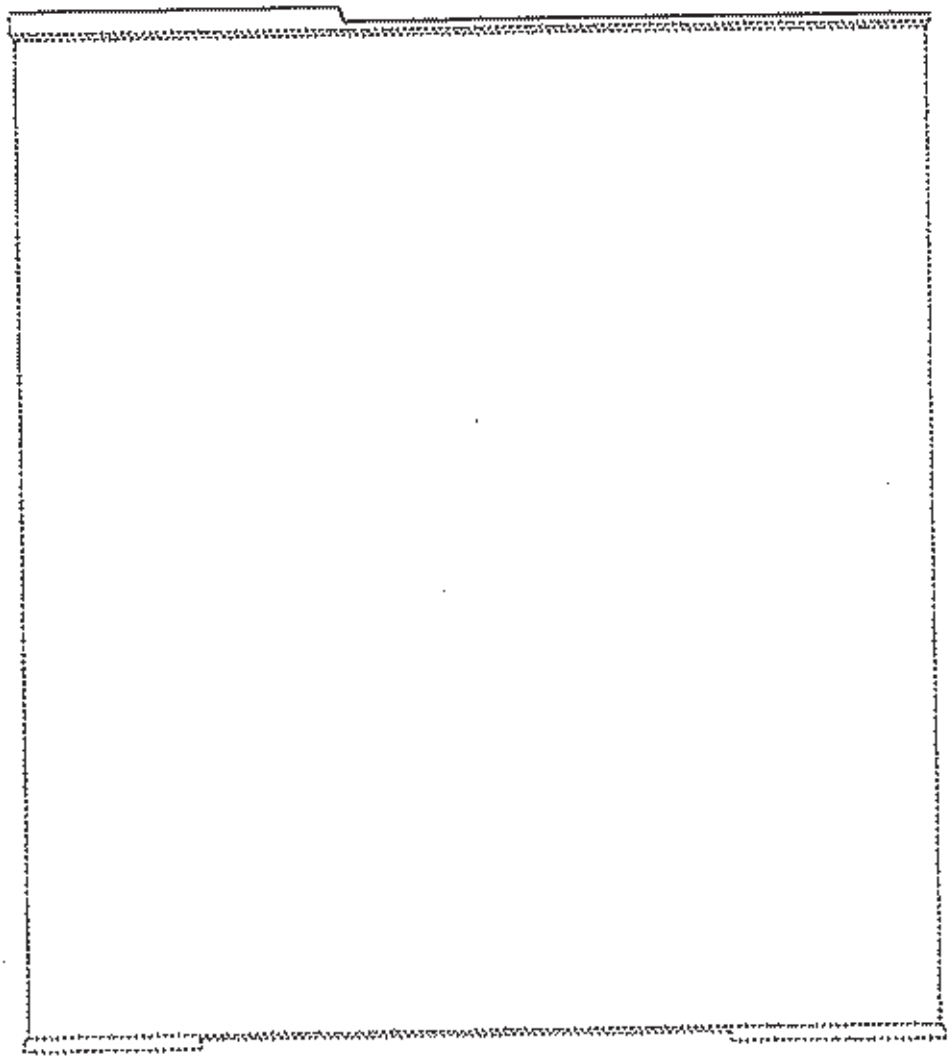

EXHIBIT H

(12) **United States Design Patent**
Tatehata et al.

(10) **Patent No.:** **US D646,222 S**
(45) **Date of Patent:** ** **Oct. 4, 2011**

(54) **BATTERY**

(75) Inventors: Shouji Tatehata, Tokyo (JP); Atsuhiro Kumagai, Tokyo (JP); Osamu Nagashima, Tokyo (JP)

(73) Assignee: Sony Corporation, Tokyo (JP)

(**) Term: 14 Years

(21) Appl. No.: 29/371,527

(22) Filed: Apr. 4, 2011

Related U.S. Application Data

(63) Continuation of application No. 29/347,574, filed on Mar. 5, 2010, now Pat. No. Des. 635,512.

(30) Foreign Application Priority Data

Jan. 6, 2010 (JP) D2010-000252
Jan. 6, 2010 (JP) D2010-000255
Jan. 6, 2010 (JP) D2010-000258
Jan. 6, 2010 (JP) D2010-000266

(51) LOC (9) Cl. 13-02
(52) U.S. Cl. D13/103
(58) Field of Classification Search D13/102–106, D13/110, 118–121, 134, 199; 429/96–100, 429/163, 176, 187
See application file for complete search history.

(56) References Cited

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(Continued)

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(Continued)

Primary Examiner — Rosemary K Tarcza
(74) *Attorney, Agent, or Firm* — Rader, Fishman & Grauer PLLC

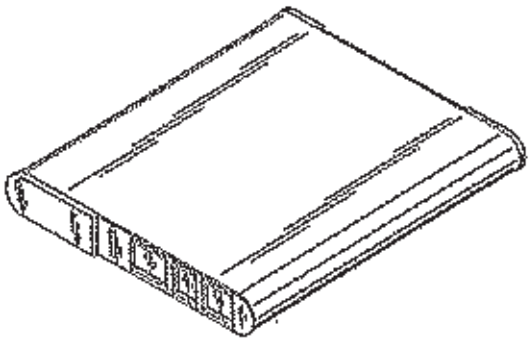
(57) **CLAIM**

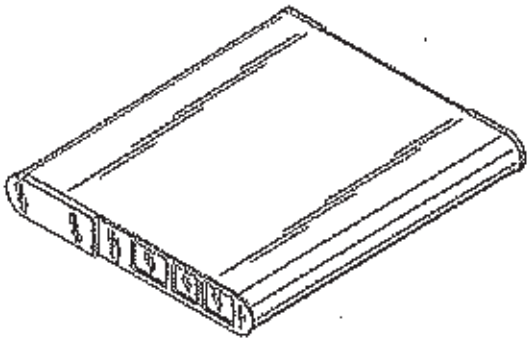
The ornamental design for a battery, as shown and described.

DESCRIPTION

FIG. 1 is a perspective view of a battery showing our new design;
FIG. 2 is a front elevational view thereof;
FIG. 3 is a rear elevational view thereof;
FIG. 4 is a left side elevational view thereof;
FIG. 5 is a right side elevational view thereof;
FIG. 6 is a top plan view thereof; and
FIG. 7 is a bottom plan view thereof.
FIG. 8 is an enlarged cross sectional view along the lines 8-8 of FIGS. 2 and 6; and
FIG. 9 is an enlarged cross sectional view along the lines 9-9 of FIGS. 2 and 6.
FIG. 10 is a perspective view of another embodiment of a battery showing our new design;
FIG. 11 is a front elevational view thereof;
FIG. 12 is a rear elevational view thereof;
FIG. 13 is a left side elevational view thereof;
FIG. 14 is a right side elevational view thereof;
FIG. 15 is a top plan view thereof; and
FIG. 16 is a bottom plan view thereof.
FIG. 17 is an enlarged reference cross sectional view along the lines 17-17 of FIGS. 11 and 15; and
FIG. 18 is an enlarged reference cross sectional view along the lines 18-18 of FIGS. 11 and 15.
FIG. 19 is a perspective view of still another embodiment of a battery showing our new design;
FIG. 20 is a front elevational view thereof;
FIG. 21 is a rear elevational view thereof;
FIG. 22 is a left side elevational view thereof;
FIG. 23 is a right side elevational view thereof;
FIG. 24 is a top plan view thereof; and
FIG. 25 is a bottom plan view thereof.
FIG. 26 is an enlarged reference cross sectional view along the lines 26-26 of FIGS. 20 and 24; and,
FIG. 27 is an enlarged reference cross sectional view along the lines 27-27 of FIGS. 20 and 24.

1 Claim, 18 Drawing Sheets





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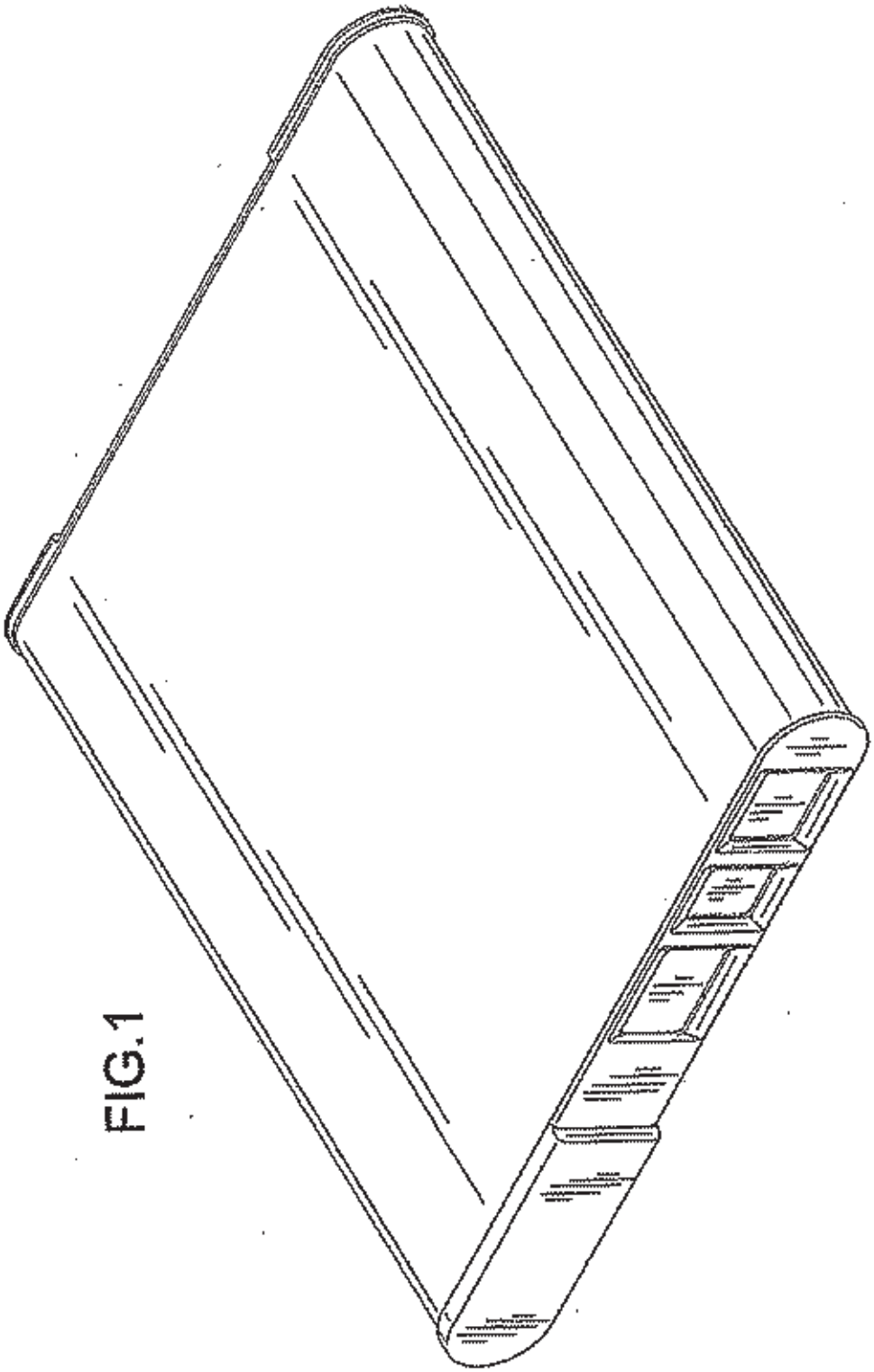


FIG.1

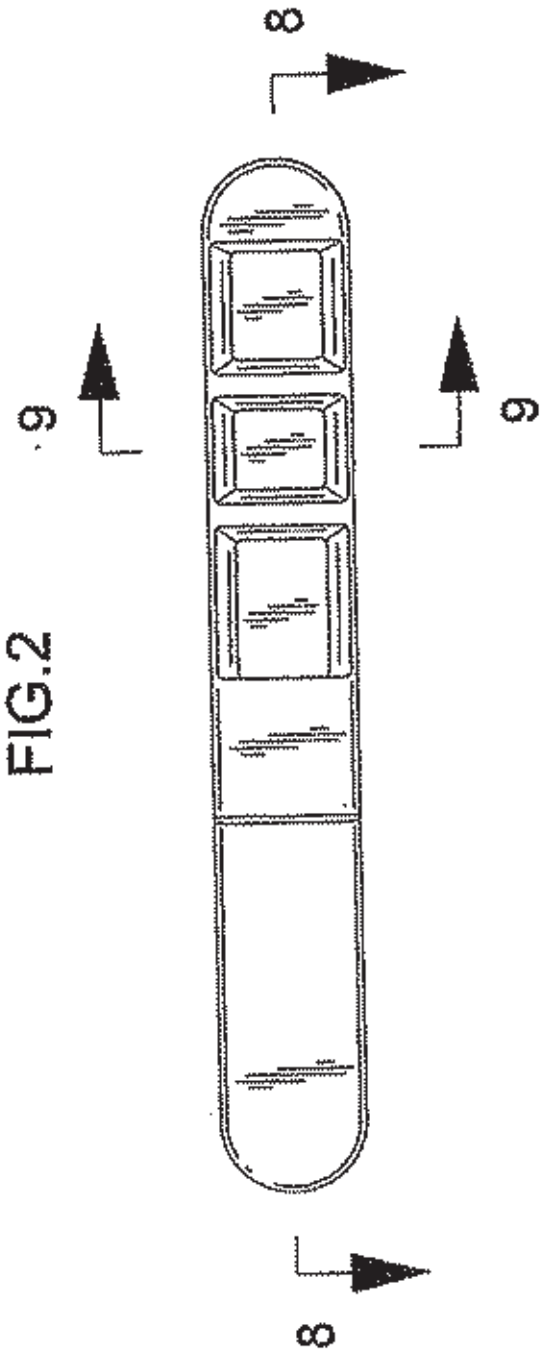


FIG.2

FIG.3

FIG.4

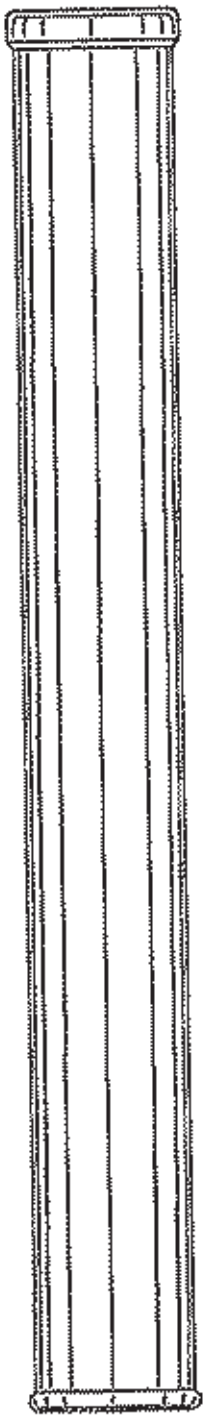


FIG.5

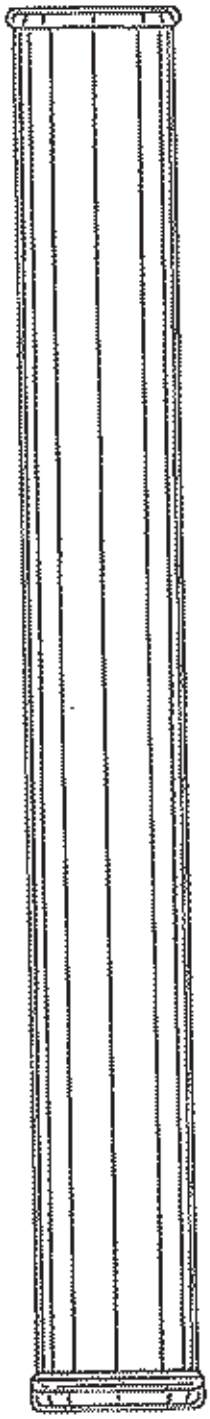


FIG.6

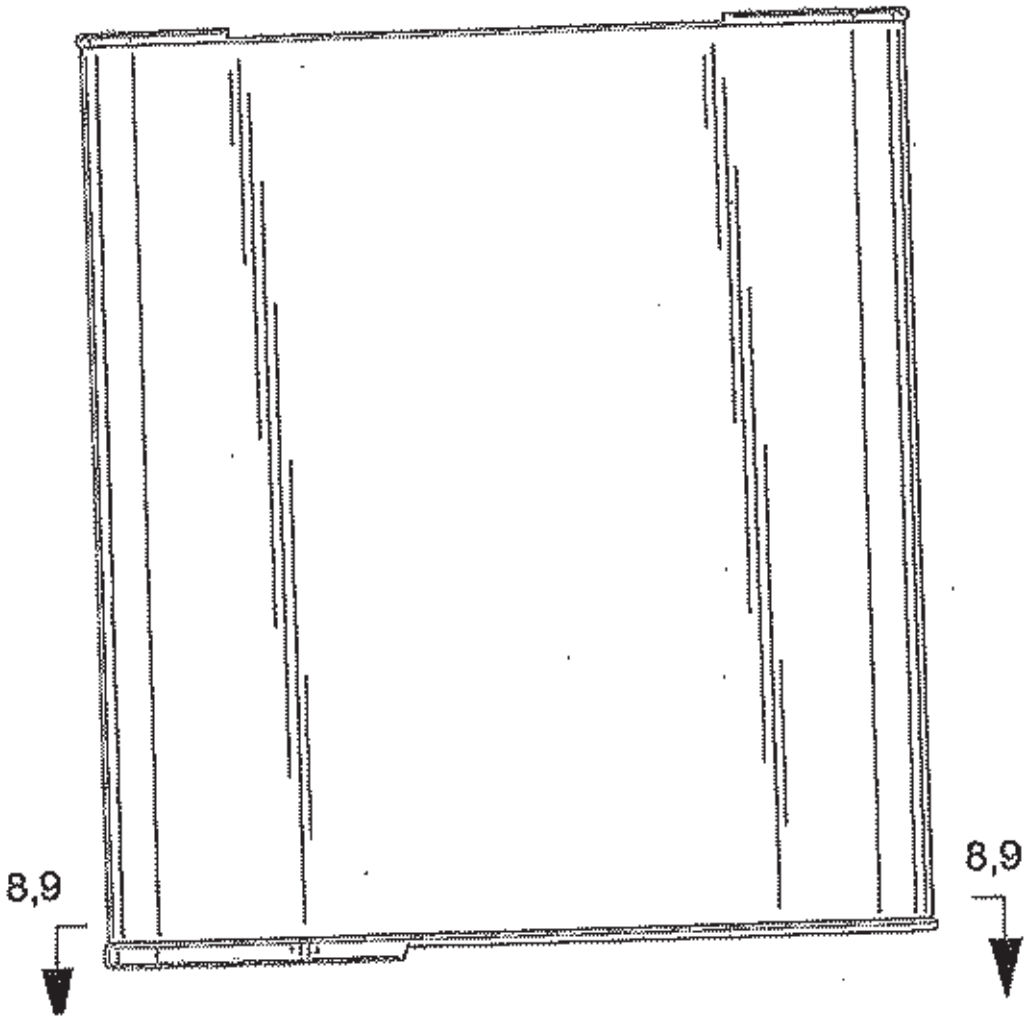


FIG.7

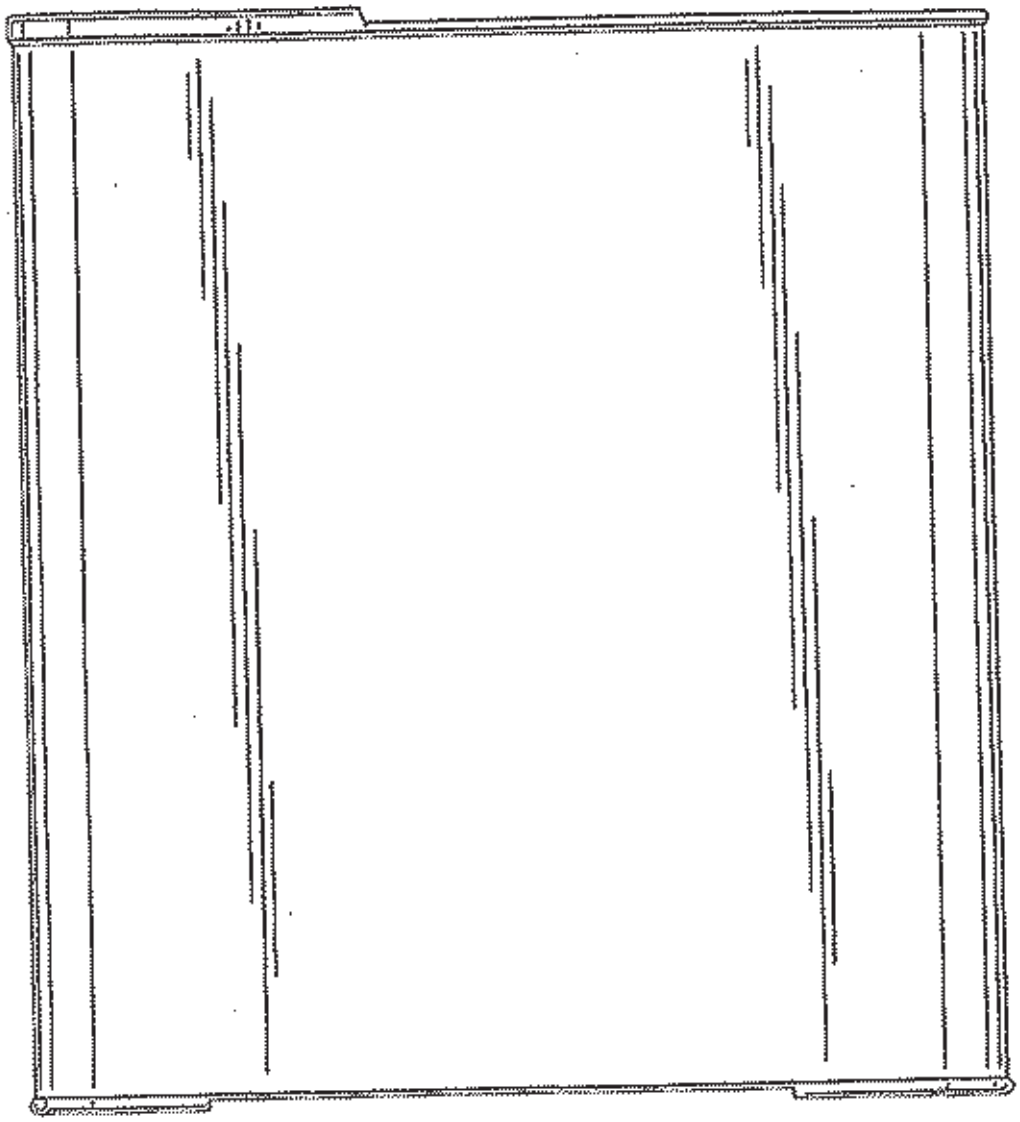


FIG.8

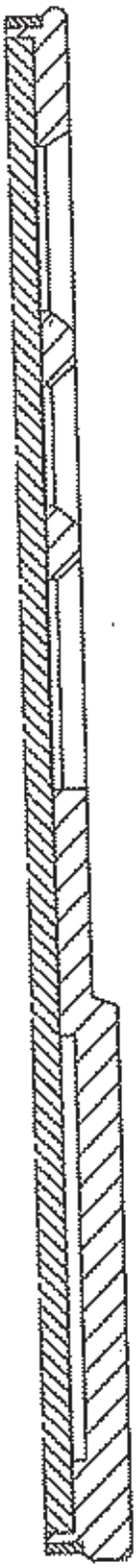
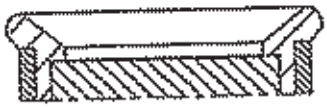


FIG.9



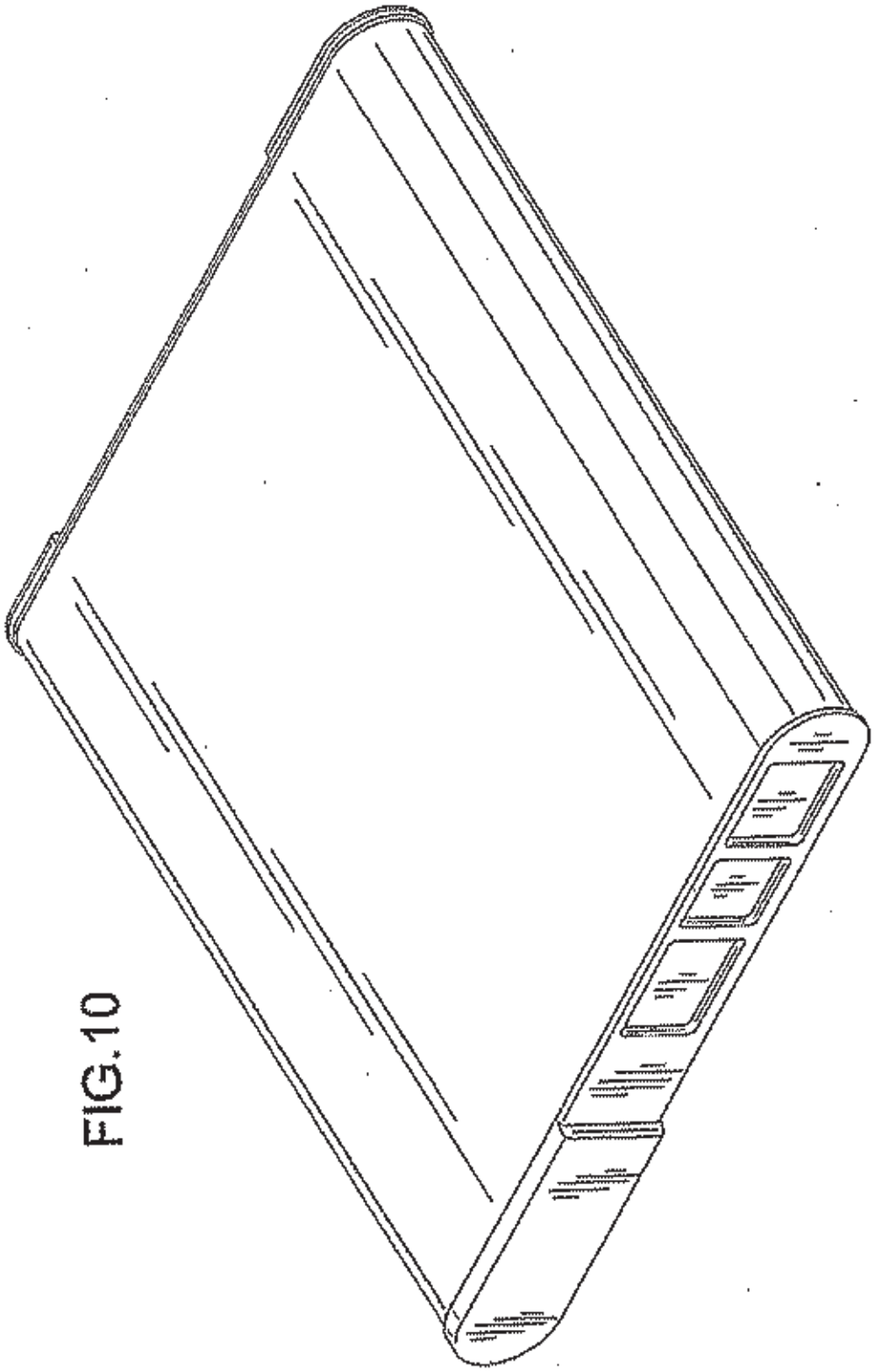


FIG. 10

FIG.11

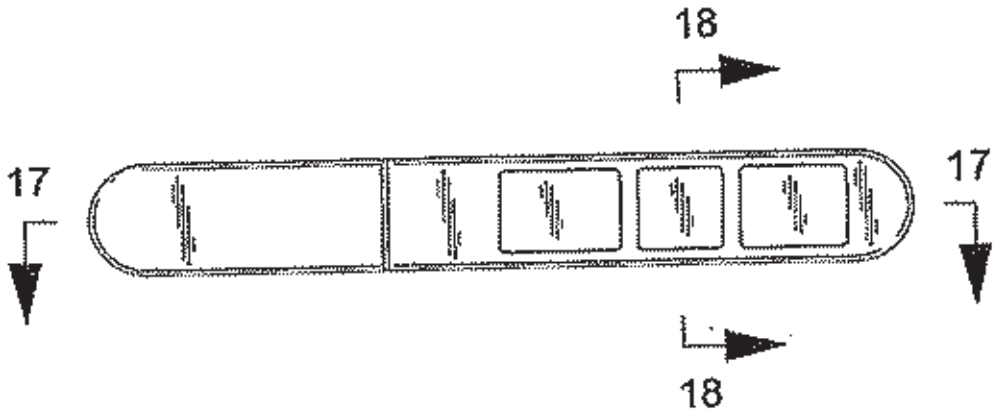


FIG.12

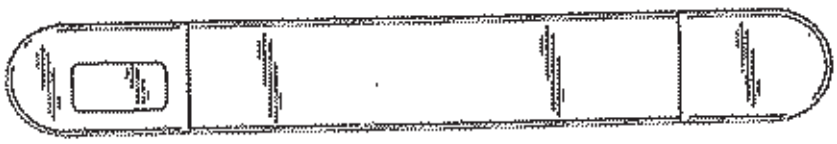


FIG.13

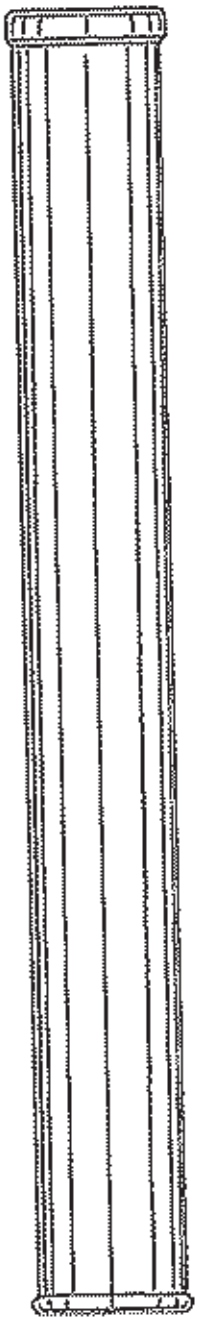


FIG.14

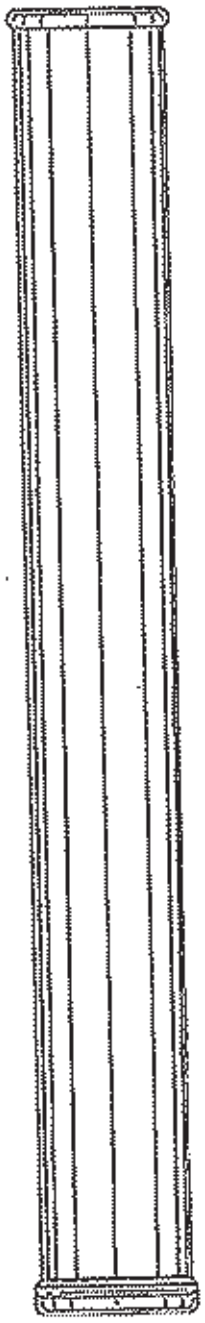


FIG.15

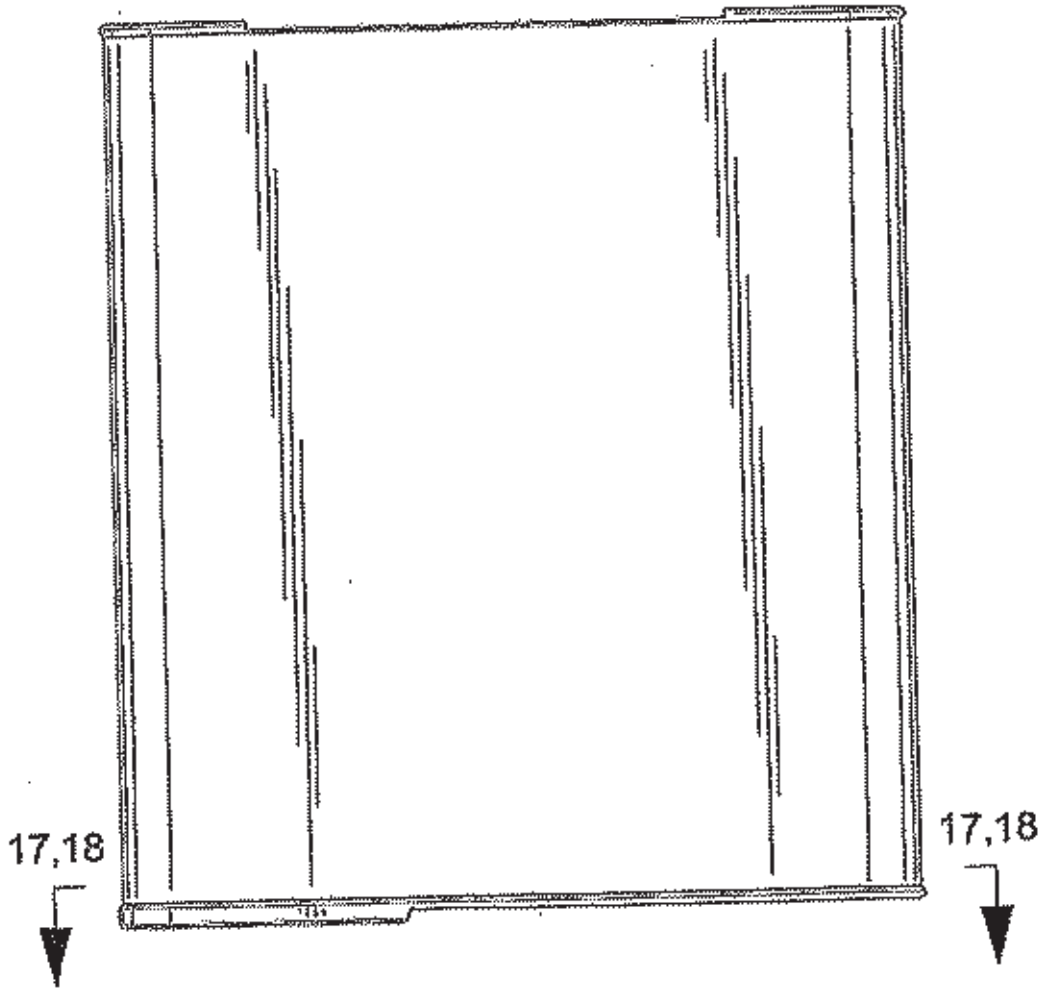


FIG.16

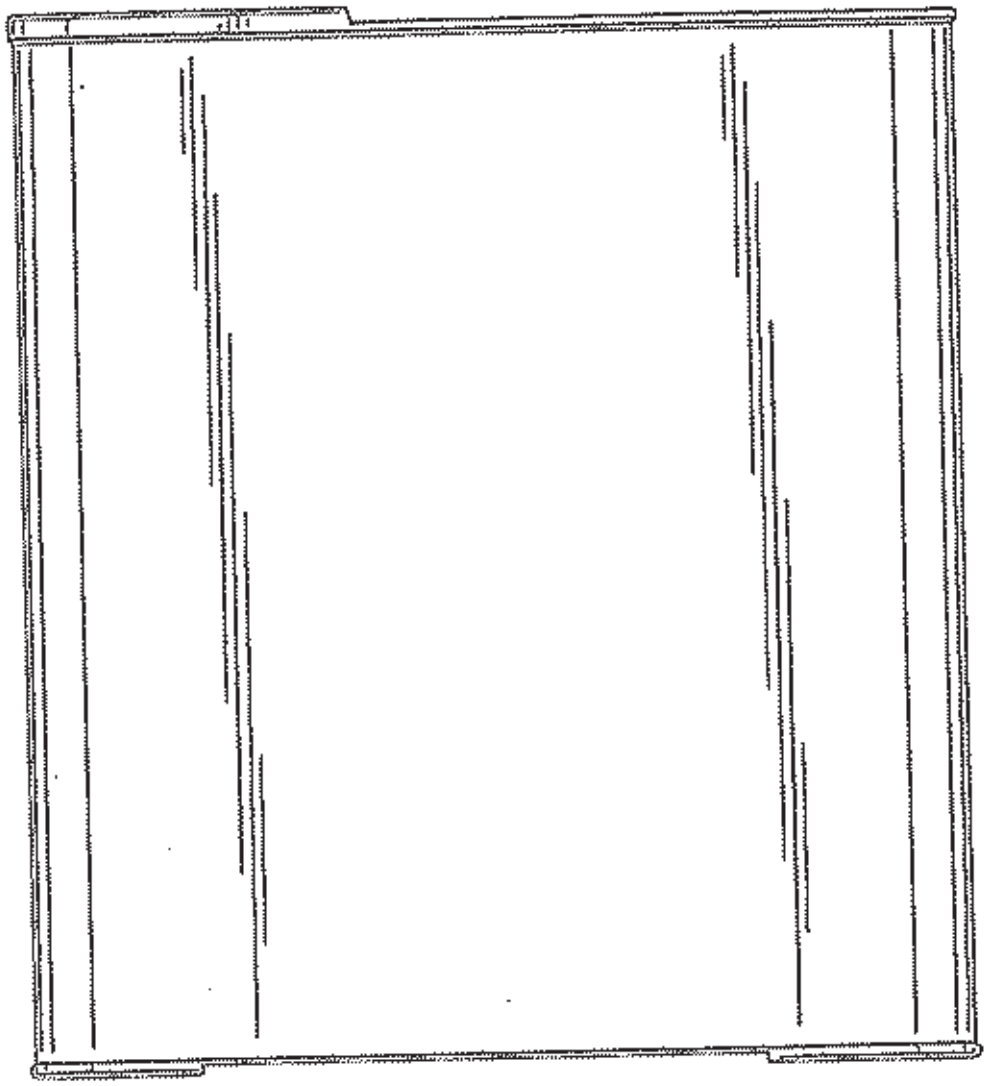
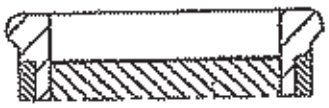


FIG.17

FIG.18



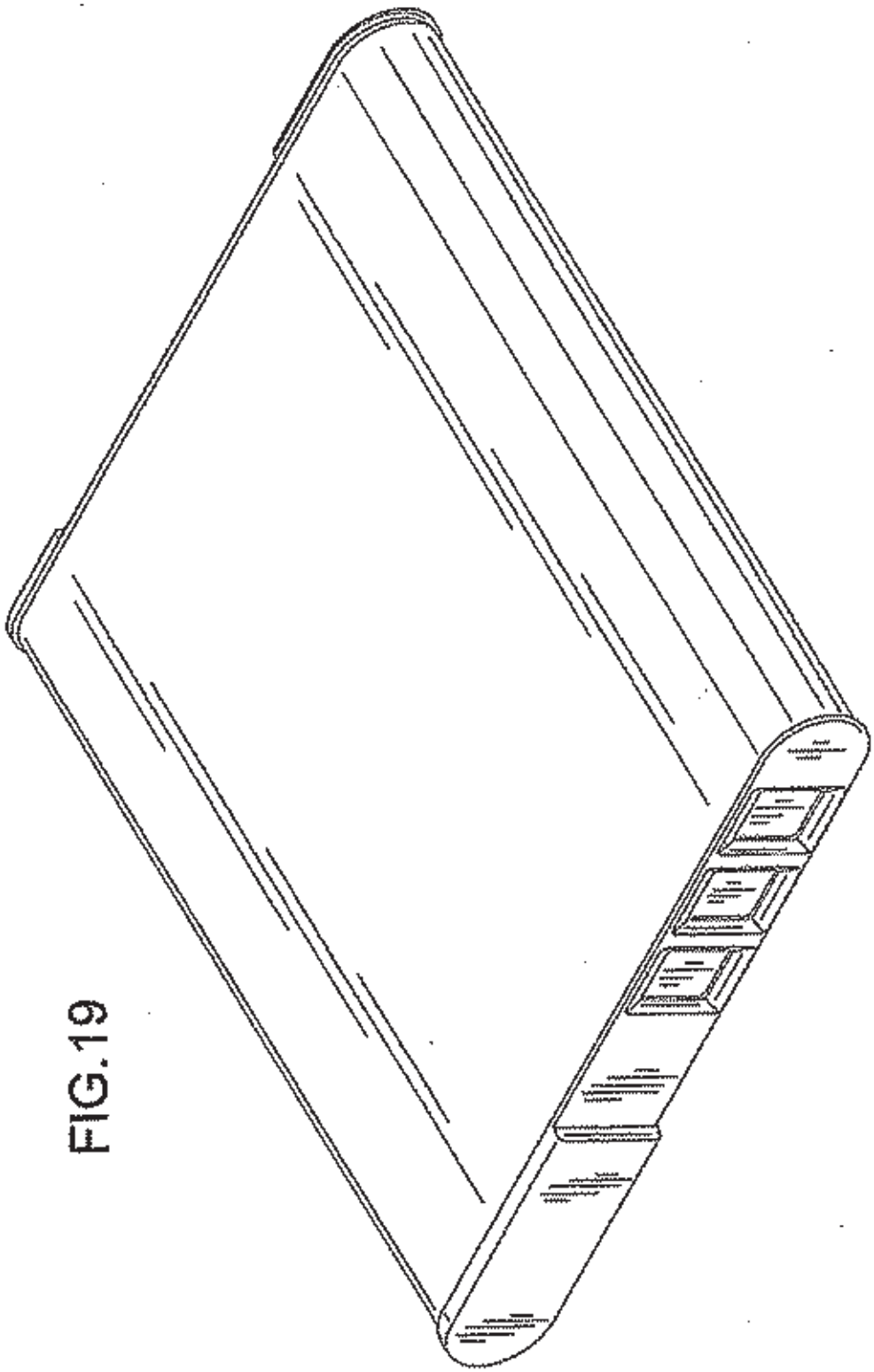


FIG.19

FIG.20

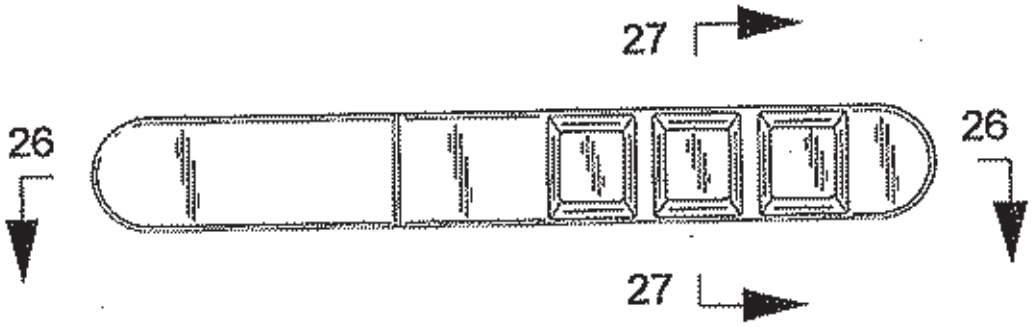


FIG.21

FIG.22

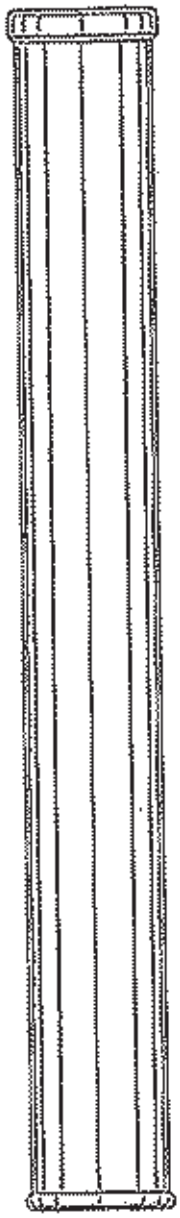


FIG.23

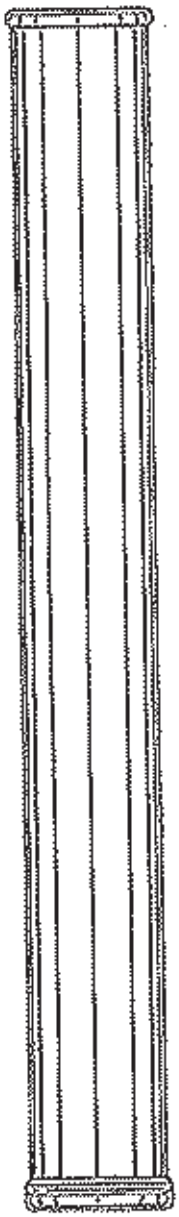


FIG.24

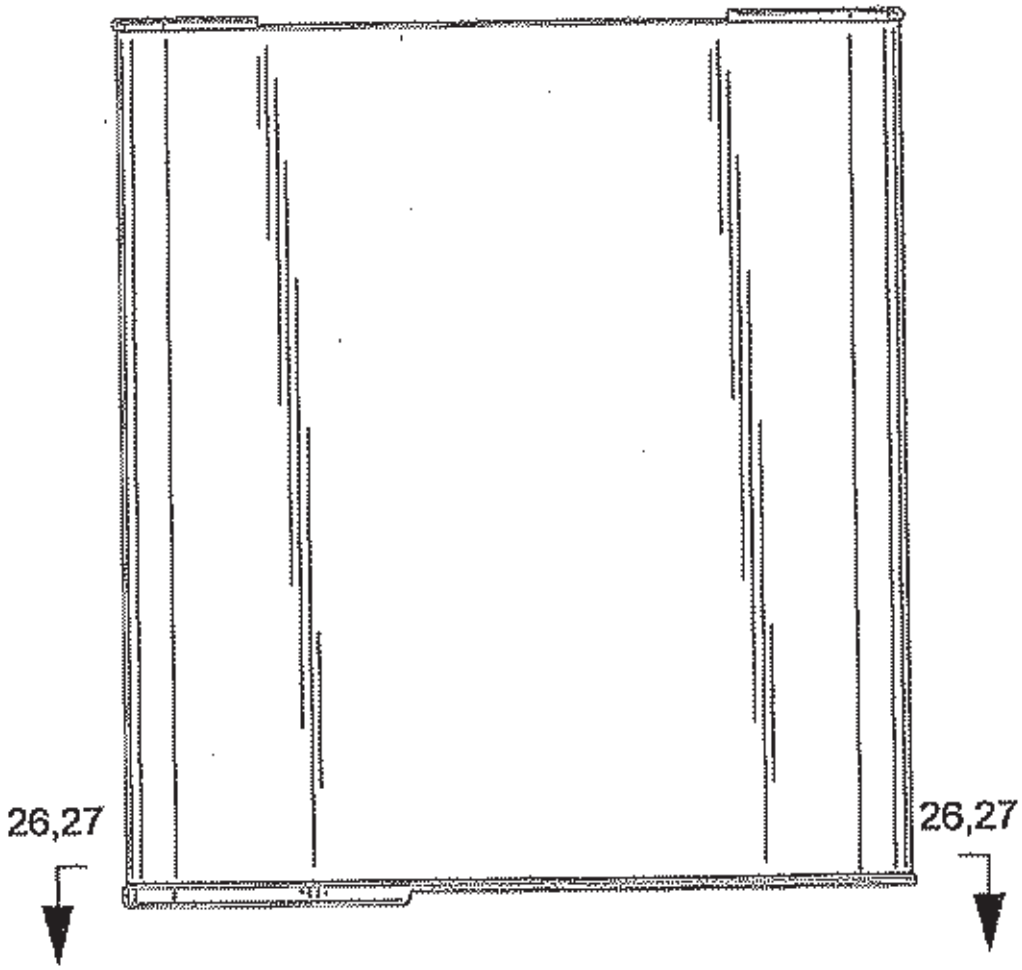


FIG.25

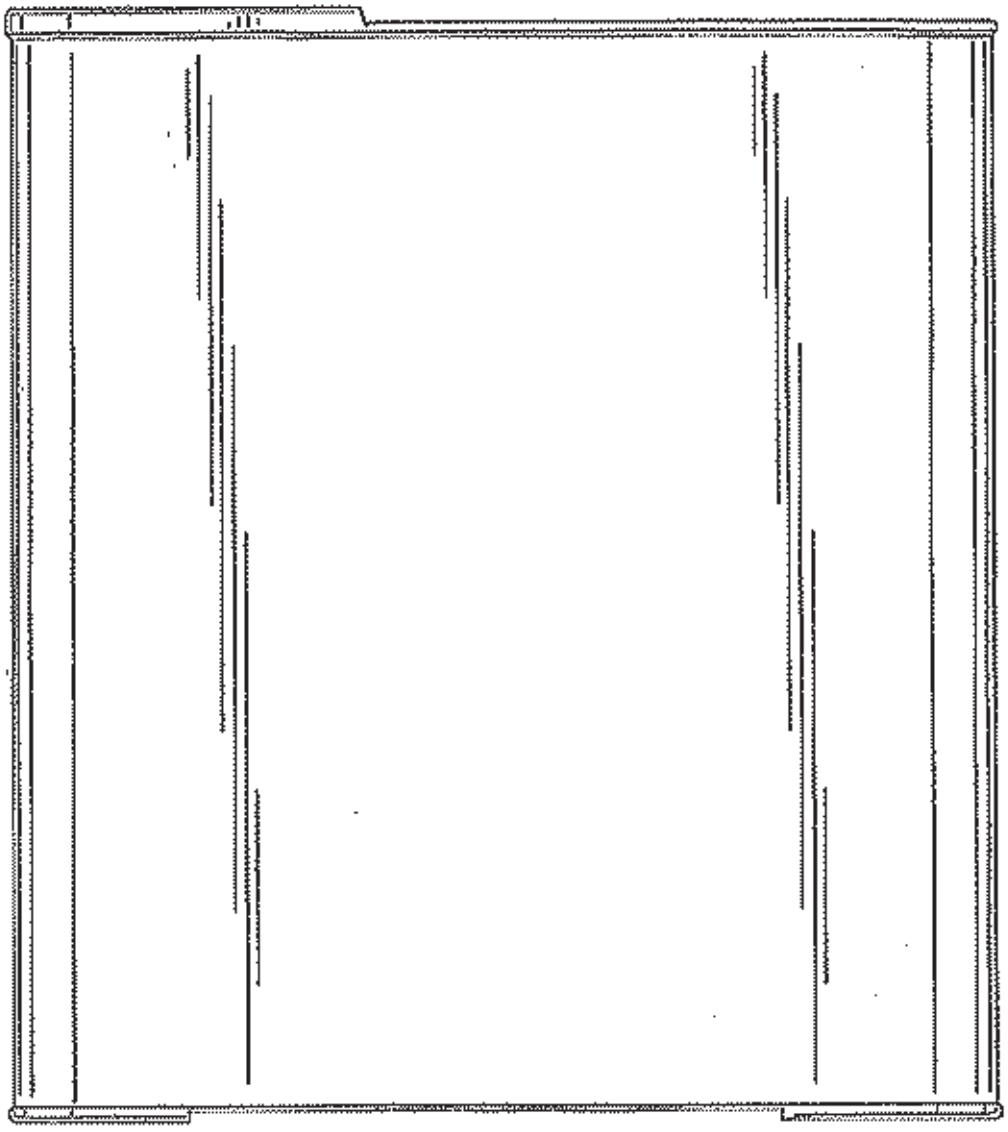


FIG.26

FIG.27