ADRIAN M. PRUETZ - State Bar No. 118215
apruetz@glaserweil.com
AVRAHAM SCHWARTZ - State Bar No. 260591
aschwartz@glaserweil.com
GLASER WEIL FINK JACOBS
HOWARD AVCHEN & SHAPIRO LLP
10250 Constellation Boulevard, 19th Floor
Los Angeles, California 90067
Telephone: (310) 553-3000
Facsimile: (310) 556-2920

Attorneys for Plaintiff
Mednovus, Inc.

FILED
12 APR 23 PM 12:56
CLERK U.S. DISTRICT COURT
CENTRAL DIST. OF CALIF.
LOS ANGELES
BY: ________

UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

MEDNOVUS, INC.,

Plaintiff,

v.

QINETIQ, LTD., METRASENS, INC., ETS-LINDGREN L.P., and INVIVO CORP.

Defendants.

CASE NO.: CV12-03487 GHK (JCx)

COMPLAINT FOR:
(1) PATENT INFRINGEMENT;
(2) DECLARATORY JUDGMENT OF PATENT NONINFRINGEMENT; AND
(3) DECLARATORY JUDGMENT OF PATENT INVALIDITY

DEMAND FOR JURY TRIAL

Glaser Weil Fink Jacobs Howard Avchen & Shapiro LLP

Plaintiff Mednovus, Inc. ("Mednovus") hereby alleges for its Complaint against QinetiQ, Ltd., Metrasens, Inc., ETS-Lindgren L.P., and Invivo Corp. (collectively, "Defendants") on personal knowledge and information and belief, as follows:

JURISDICTION AND VENUE

1. This action arises under the patent laws of the United States, 35 U.S.C. § 1 *et seq*. and under the Declaratory Judgment Act, 28 U.S.C. §§ 2201 and 2202.

2. This Court has subject matter jurisdiction over this case pursuant to 28 U.S.C. §§ 1331, 1338(a), and 2201.

3. This Court has personal jurisdiction over each of the Defendants. On information and belief, the Defendants, directly or through intermediaries, conduct business in this judicial district and elsewhere in the state of California. The Defendants regularly and deliberately engage in activities that occur in and/or result in the sales of goods and/or services in the State of California and in this judicial district. On information and belief, each Defendant has transacted business in this district, and/or has committed, contributed to, and/or induced acts of patent infringement in this judicial district. The Defendants have established minimum contacts with this forum and the exercise of jurisdiction over the Defendants would not offend the traditional notions of fair play and substantial justice.

4. Venue is proper in this judicial district pursuant to 28 U.S.C. §§ 1391 and 1400.

THE PARTIES

5. Plaintiff Mednovus is a corporation organized and existing under the laws of the state of California, with a principal place of business at 664 Hymettus Avenue, Leucadia, California 92024.

6. On information and belief, Defendant QinetiQ, Ltd. ("QinetiQ") is a limited company organized and existing under the laws of the United Kingdom, with a principal place of business at Cody Technology Park, Ively Road, Farnborough, Hampshire, United Kingdom.

Glaser Weil Fink Jacobs Howard Avchen & Shapiro LLP

7. On information and belief, Defendant Metrasens, Inc. ("Metrasens") is a corporation organized and existing under the laws of the state of Delaware, with a principal place of business at 106 Stephen Street, #203, Lemont, Illinois 60439.

8. On information and belief, Defendant ETS-Lindgren L.P. ("ETS-Lindgren") is a limited partnership organized and existing under the laws of the state of Texas, with a principal place of business at 1301 Arrow Point Drive, Cedar Park, Texas 78613.

9. On information and belief, Defendant Invivo Corp. ("Invivo") is a corporation organized and existing under the laws of the state of Delaware, with a principal place of business at 3545 SW 47th Avenue, Gainesville, Florida 32608.

FACTUAL BACKGROUND

10. In a letter dated December 27, 2010, QinetiQ informed Mednovus that it owns U.S. Patent No. 7,133,092 ("the '092 Patent") and accused Mednovus's Safescan range of products of infringing the '092 Patent.

11. The '092 Patent was issued to Mark N. Keene on September 26, 2006 and is entitled "Ferromagnetic Object Detector." QinetiQ is the record owner of the '092 Patent. A copy of the '092 Patent is attached hereto as Exhibit A.

12. In a letter dated February 1, 2011, Mednovus informed QinetiQ that the '092 Patent is not infringed by Mednovus and is invalid in light of prior art, including but not limited to U.S. Patent No. 6,133,829 ("the '829 Patent").

13. The '829 Patent was duly and legally issued to James C. Johnstone and Sidney G. Freshour on October 17, 2000 and is entitled "Walk-Through Metal Detector System and Method." A copy of the '829 Patent is attached hereto as Exhibit B.

14. The February 1, 2011 letter also provided notice regarding Mednovus's exclusive rights in the '829 Patent and the Defendants' infringement of the '829 Patent.

FIRST CLAIM FOR RELIEF

(Infringement of the '829 Patent)

15. Mednovus realleges and incorporates by reference Paragraphs 1 through 14 as if fully set forth herein.

16. Mednovus is the exclusive licensee of the '829 Patent for medical applications, including the right to sue for infringement of the '829 Patent.

17. On information and belief, Defendant QinetiQ has been and now is infringing, inducing others to infringe, and/or contributorily infringing, literally, under the doctrine of equivalents, and/or jointly, one or more claims of the '829 Patent in the United States by, among other things, making, using, selling, offering to sell, and/or importing systems and methods that implement, utilize or otherwise embody the patented invention including ferromagnetic detection products such as the Ferroguard system. Therefore, QinetiQ is liable for infringement of the '829 Patent under 35 U.S.C. § 271.

18. On information and belief, Defendant Metrasens has been and now is infringing, inducing others to infringe, and/or contributorily infringing, literally, under the doctrine of equivalents, and/or jointly, one or more claims of the '829 Patent in the United States by, among other things, making, using, selling, offering to sell, and/or importing systems and methods that implement, utilize or otherwise embody the patented invention including ferromagnetic detection products such as the Ferroguard system. Therefore, Metrasens is liable for infringement of the '829 Patent under 35 U.S.C. § 271.

19. On information and belief, Defendant ETS-Lindgren has been and now is infringing, inducing others to infringe, and/or contributorily infringing, literally, under the doctrine of equivalents, and/or jointly, one or more claims of the '829 Patent in the United States by, among other things, making, using, selling, offering to sell, and/or importing systems and methods that implement, utilize or otherwise embody the patented invention including ferromagnetic detection products such as the

Ferroguard system. Therefore, ETS-Lindgren is liable for infringement of the '829 Patent under 35 U.S.C. § 271.

20. On information and belief, Defendant Invivo has been and now is infringing, inducing others to infringe, and/or contributorily infringing, literally, under the doctrine of equivalents, and/or jointly, one or more claims of the '829 Patent in the United States by, among other things, making, using, selling, offering to sell, and/or importing systems and methods that implement, utilize or otherwise embody the patented invention including ferromagnetic detection products such as the Ferroguard system. Therefore, Invivo is liable for infringement of the '829 Patent under 35 U.S.C. § 271.

21. Mednovus has been and is irreparably harmed by each of the Defendants' infringement of the '829 Patent and will continue to be harmed by such infringement unless each of the Defendants is enjoined from further acts of infringement.

22. As a result of the Defendants' acts of infringement, Mednovus has also suffered and will continue to suffer damages in an amount to be proved at trial. The Defendants are liable to Mednovus in an amount that adequately compensates Mednovus for the Defendants' respective infringements, including but not limited to lost profits and a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

23. Defendants' infringement is willful, entitling Mednovus to enhanced damages under 35 U.S.C. § 284.

SECOND CLAIM FOR RELIEF

(Declaratory Judgment of Noninfringement of the '092 Patent)

24. Mednovus realleges and incorporates by reference Paragraphs 1 through 23 as if fully set forth herein.

25. QinetiQ has accused Mednovus of infringing the '092 Patent.

26. Mednovus denies infringement, whether direct or indirect, literal or by equivalents, of any valid and enforceable claim of the '092 Patent.

27. An actual and justiciable controversy exists as to whether the '092 Patent is infringed by Mednovus.

28. A judicial declaration is necessary and appropriate to ascertain Mednovus's rights, duties, and obligations with regard to the '092 Patent.

29. Mednovus accordingly requests a declaratory judgment of noninfringement of any valid and enforceable claims of the '092 Patent.

THIRD CLAIM FOR RELIEF

(Declaratory Judgment of Invalidity of the '092 Patent)

30. Mednovus realleges and incorporates by reference Paragraphs 1 through 29 as if fully set forth herein.

31. QintetiQ has accused Mednovus of infringing the '092 Patent.

32. Mednovus denies infringement, whether direct or indirect, literal or by equivalents, of any valid and enforceable claim of the '092 Patent.

33. The claims of the '092 Patent are invalid because they fail to comply with the conditions and requirements for patentability set forth in 35 U.S.C. § 1 *et seq*., including but not limited to 35 U.S.C. §§ 101, 102, 103, and 112.

34. An actual and justiciable controversy exists as to whether the '092 Patent is valid.

35. A judicial declaration is necessary and appropriate to ascertain Mednovus's rights, duties, and obligations with regard to the '092 Patent.

36. Mednovus accordingly requests a declaratory judgment of invalidity of any and all claims of the '092 Patent.

PRAYER FOR RELIEF

WHEREFORE, Mednovus respectfully requests the Court to grant the following relief:

A. An order entering judgment in favor of Mednovus that each defendant has infringed, and continues to infringe, the '829 Patent and that such infringement is willful;

B. An order enjoining each defendant, its officers, subsidiaries, agents, servants, employees, and all persons in active concert with any of them from the following:

1. any further infringement of the '829 Patent; and
2. alleging infringement or instituting any action for infringement of the '092 Patent against Mednovus and/or any of Mednovus's customers for the use or sale of Mednovus's products;

C. An award of all monetary relief available under the patent laws of the United States, including but not limited to actual damages, pre- and post- judgment interest, enhanced damages, and costs pursuant to 35 U.S.C. § 284;

D. A declaration that Mednovus's products have not and do not infringe, either directly or indirectly, literally or by equivalents, any valid and enforceable claim of the '092 Patent;

E. A declaration that the '092 Patent is invalid;

F. An order declaring that Mednovus is the prevailing party and that this is an exceptional case under 35 U.S.C. § 285;

G. An award of reasonable attorneys fees, expenses, and costs in relation to this action; and

H. Such other relief as this Court may deem just and proper.

DATED: April 23, 2012

GLASER WEIL FINK JACOBS
HOWARD AVCHEN & SHAPIRO LLP

By: [signature]
ADRIAN M. PRUETZ
AVRAHAM SCHWARTZ
Attorneys for Plaintiff
Mednovus, Inc.

DEMAND FOR JURY TRIAL

Pursuant to Federal Rule of Civil Procedure 38(b) and the Central District of California Local Rule 38-1, Mednovus respectfully requests a jury trial on all issues triable thereby.

DATED: April 23, 2012

GLASER WEIL FINK JACOBS
HOWARD AVCHEN & SHAPIRO LLP

By: [signature]
ADRIAN M. PRUETZ
AVRAHAM SCHWARTZ
Attorneys for Plaintiff
Mednovus, Inc.

EXHIBIT A

US007113092B2

(12) **United States Patent**
Keene

(10) **Patent No.: US 7,113,092 B2**
(45) **Date of Patent: Sep. 26, 2006**

(54) **FERROMAGNETIC OBJECT DETECTOR**

(75) Inventor: **Mark Nicholas Keene**, Malvern (GB)

(73) Assignee: **QinetiQ Limited** (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 38 days.

(21) Appl. No.: **10/706,593**

(22) Filed: **Nov. 12, 2003**

(65) **Prior Publication Data**

US 2004/0135687 A1 Jul. 15, 2004

(30) **Foreign Application Priority Data**

Nov. 12, 2002 (GB) 0226334

(51) **Int. Cl.**
G08B 13/24 (2006.01)

(52) **U.S. Cl.** **340/551**; 340/686.1; 340/686.6; 324/207.26

(58) **Field of Classification Search** 340/551, 340/552, 572, 686.1, 686.6; 324/326, 323, 324/200, 207.26
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,573,817 A 4/1971 Akers
3,665,449 A * 5/1972 Elder et al. 340/572.1
3,725,888 A 4/1973 Solomon
3,971,983 A 7/1976 Jaquet
4,326,198 A 4/1982 Novikoff
4,413,254 A 11/1983 Pinneo et al.
4,595,915 A * 6/1986 Close 340/572.2
4,888,579 A * 12/1989 ReMine et al. 340/572.4
5,726,628 A * 3/1998 Yoo 340/551
5,790,685 A 8/1998 Sallee
6,133,829 A * 10/2000 Johnstone et al. 340/551
6,307,473 B1 * 10/2001 Zampini et al. 340/572.1
6,308,644 B1 * 10/2001 Diaz 109/6
6,819,241 B1 * 11/2004 Turner et al. 340/551
2003/0171609 A1 9/2003 Kopp
2004/0147833 A1 7/2004 Czipott et al.
2004/0147834 A1 7/2004 Czipott et al.
2004/0169509 A1 8/2004 Czipott et al.
2004/0189293 A1 9/2004 Czipott et al.

FOREIGN PATENT DOCUMENTS

EP 0 353 035 1/1990
EP 0 831 339 3/1998
WO WO 96/36873 11/1996
WO WO 03/077725 9/2003

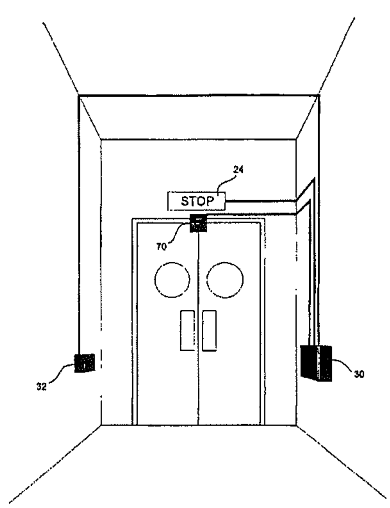
* cited by examiner

Primary Examiner—Thomas J. Mullen, Jr.
Assistant Examiner—Travis Hunnings
(74) *Attorney, Agent, or Firm*—McDonnell Boehnen Hulbert & Berghoff LLP

(57) **ABSTRACT**

An apparatus for detecting ferromagnetic objects in the vicinity of a magnetic resonance imaging scanner. The apparatus comprises primary sensor means adapted to measure a magnetic field, arranged in communication with signal processing means configured to identify temporal variations in the measured magnetic field due to the movement of a ferromagnetic object within an ambient magnetic field and to provide an output indicative of the presence of a ferromagnetic object in the vicinity of the primary sensor means. The apparatus further comprises secondary, non-magnetic, sensor means adapted to detect the movement of objects in the vicinity of the primary sensor means in order to reduce false alarms. The output from the signal processing means may be used to operate an audible alarm, a visual alarm, an automatic door lock or a physical barrier.

20 Claims, 5 Drawing Sheets



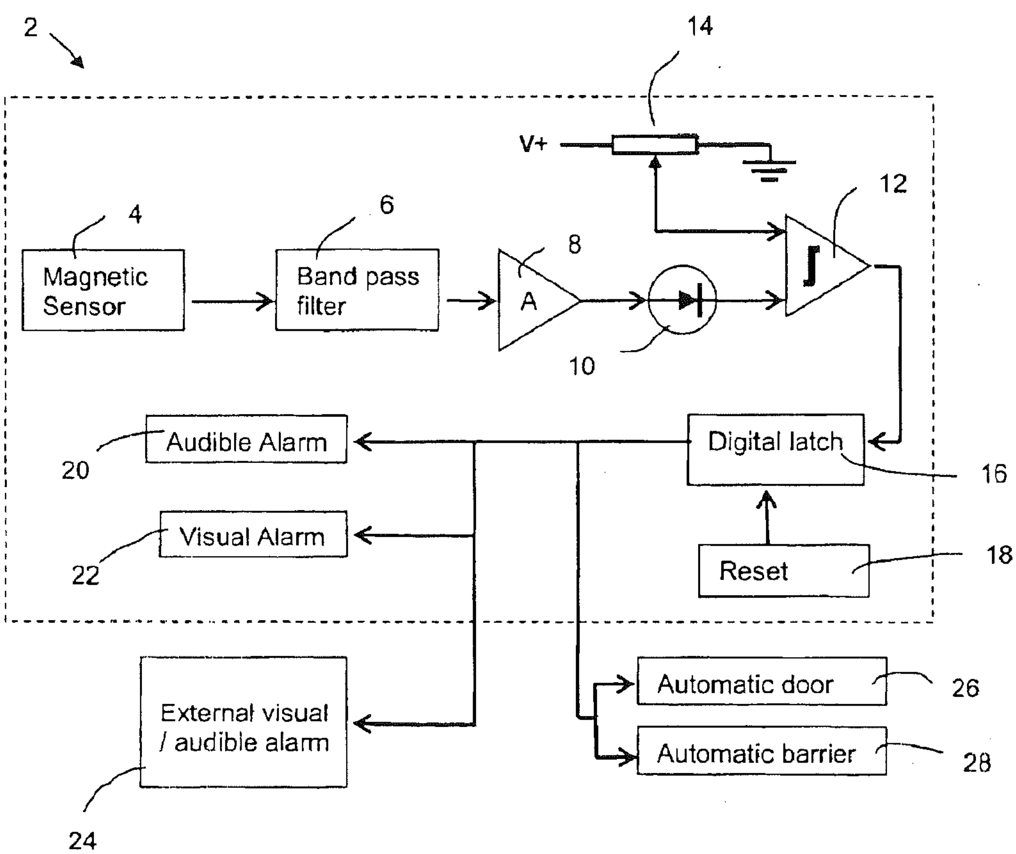

2
14
V+
12
4
6
8
Magnetic Sensor
Band pass filter
A
∫
10
Audible Alarm
Digital latch
20
16
Visual Alarm
Reset
22
18
Automatic door
26
External visual / audible alarm
Automatic barrier
28
24

Figure 1

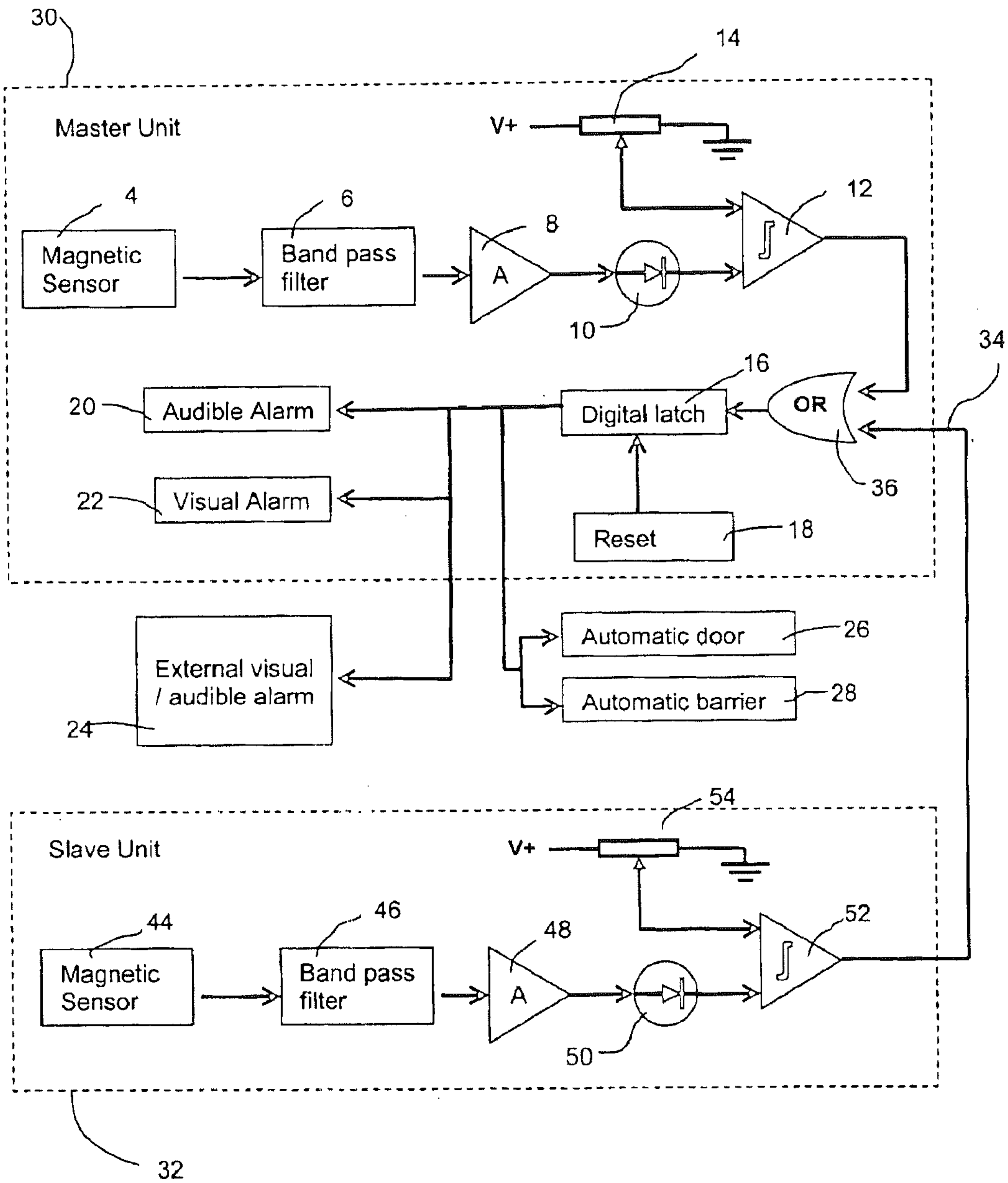

30
14
Master Unit
V+
4
6
12
8
Magnetic Sensor
Band pass filter
A
10
34
16
OR
20
Audible Alarm
Digital latch
36
22
Visual Alarm
Reset
18
Automatic door
26
External visual / audible alarm
Automatic barrier
28
24
54
Slave Unit
V+
44
46
52
48
Magnetic Sensor
Band pass filter
A
50
32

Figure 2

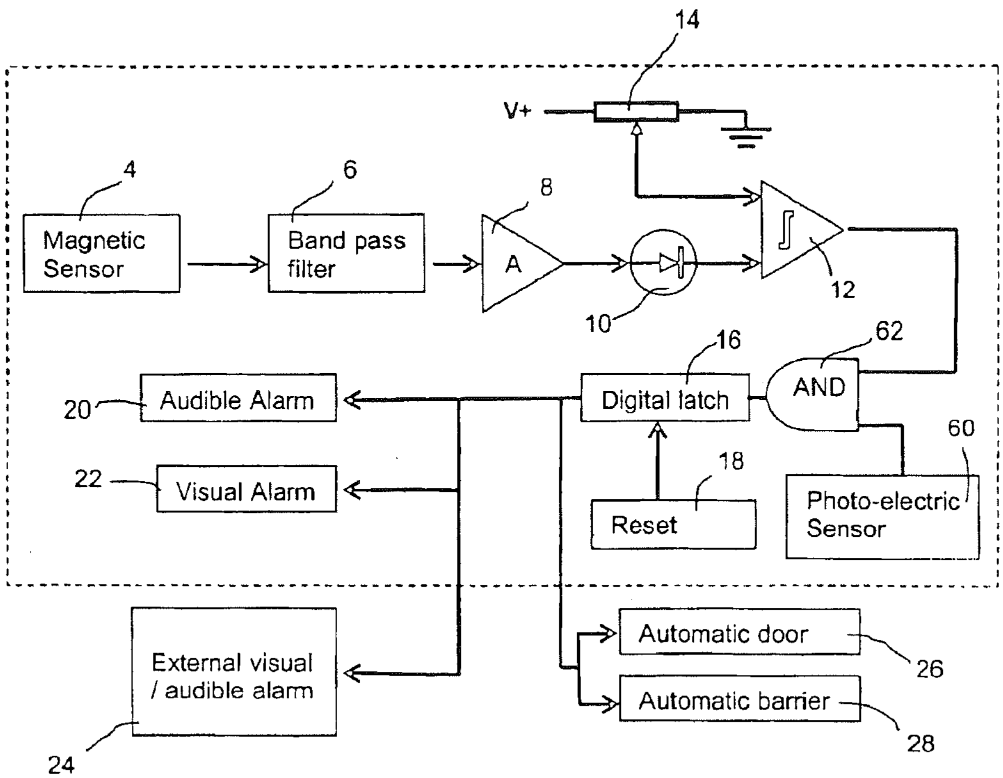

14
V+
4
6
8
Magnetic Sensor
Band pass filter
A
12
10
16
62
Audible Alarm
Digital latch
AND
20
22
Visual Alarm
60
18
Photo-electric Sensor
Reset
External visual / audible alarm
Automatic door
26
Automatic barrier
28
24

Figure 3

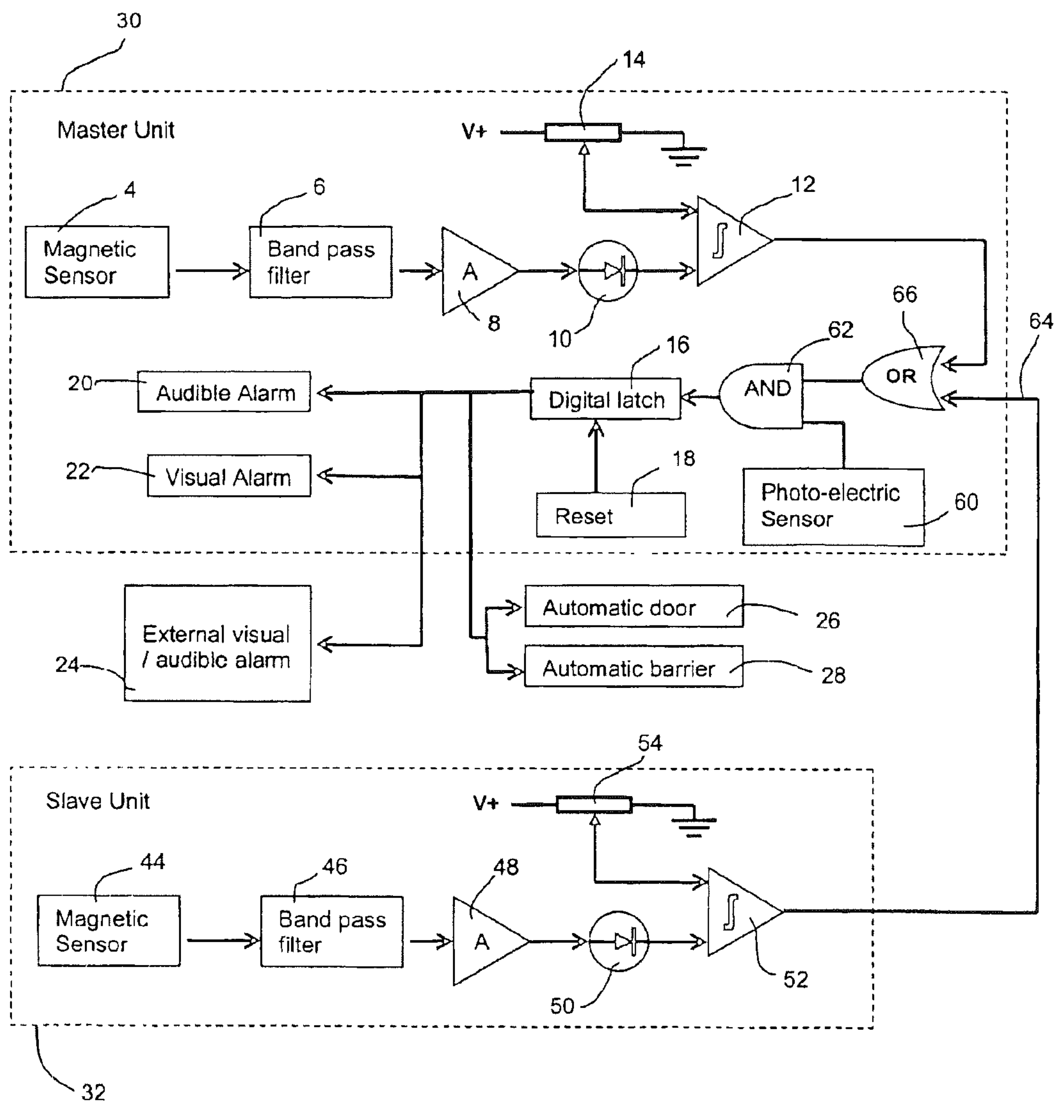

30
14
Master Unit
V+
4
6
12
Magnetic Sensor
Band pass filter
A
8
10
66
62
64
16
20
Audible Alarm
Digital latch
AND
OR
22
Visual Alarm
18
Reset
Photo-electric Sensor
60
External visual / audible alarm
24
Automatic door
26
Automatic barrier
28
54
Slave Unit
V+
44
46
48
Magnetic Sensor
Band pass filter
A
52
50
32

Figure 4

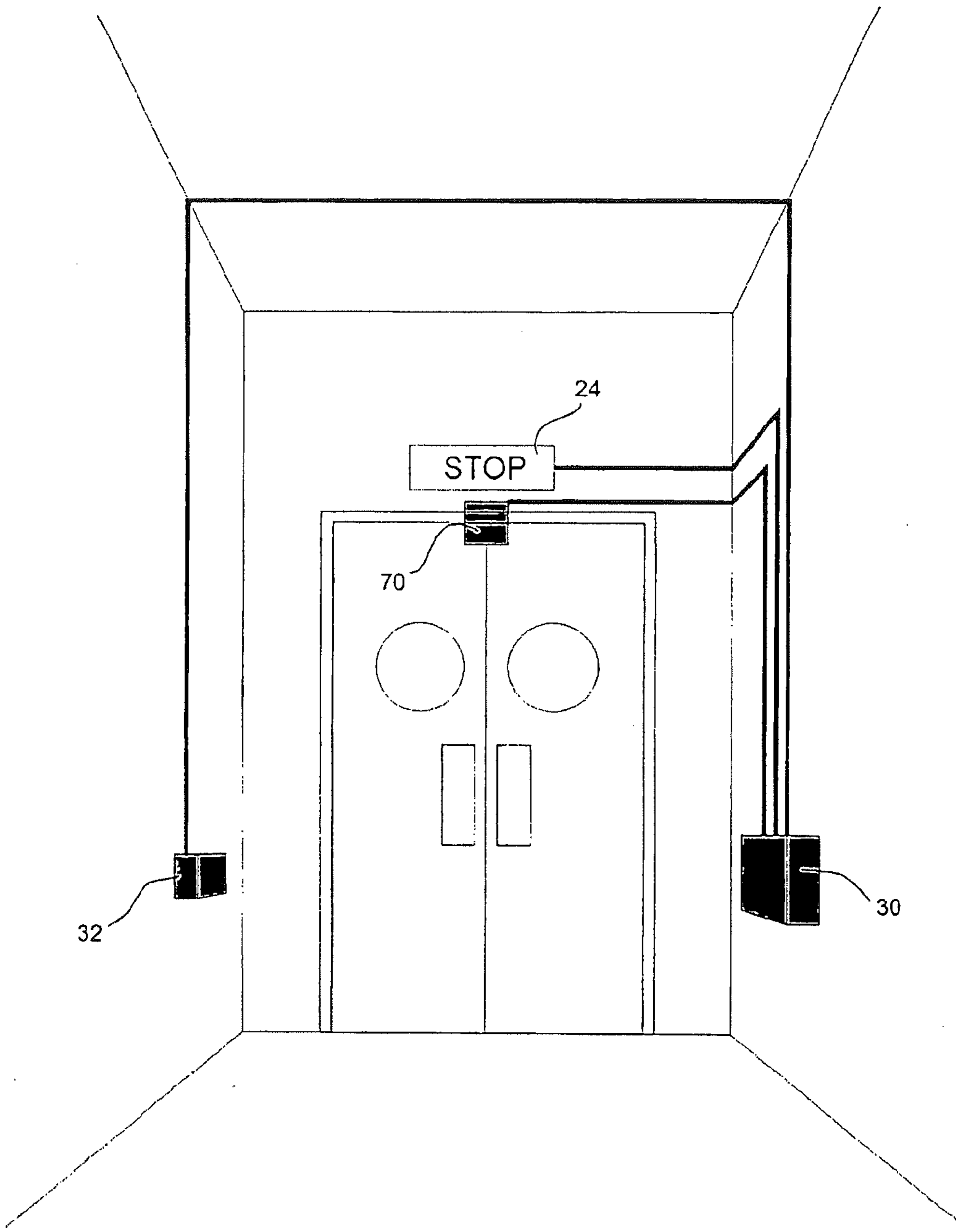


Figure 5

FERROMAGNETIC OBJECT DETECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an apparatus for detecting ferromagnetic objects and in particular to a device for detecting the presence of ferromagnetic objects in the vicinity of magnetic resonance imaging (MRI) scanners.

2. Discussion of Prior Art

Most major hospitals have rooms for Magnetic Resonance Imaging (MRI) scanners. These scanners have a large magnet that is usually superconducting and produces a very high magnetic field up to several Tesla within the bore of the MRI scanner. The magnetic field strength outside of the magnet falls rapidly with distance creating very large magnetic field gradients in the surrounding room. Any ferromagnetic metal object in the vicinity of the magnet will experience a force attracting it towards the magnet. The force exerted by the magnet may be sufficiently strong to accelerate an unrestrained ferromagnetic object towards the MRI scanner, where it will come to rest in or near to the bore of the MRI scanner. This is called the projectile effect or missile effect and it can be very dangerous and damaging.

Large ferromagnetic metal objects undergoing the projectile effect can enter the bore of the MRI scanner with sufficient kinetic energy to injure a patient or damage the MRI machine extensively. Furthermore, such objects may be impossible to remove from the bore without switching the magnetic field off. It can take over a week to restore the field and the down-time can be expensive for the hospital.

Examples of problem ferromagnetic objects that cause projectile effect accidents include gas bottles (small and large), wheelchairs, tool boxes, mop buckets, vacuum cleaners, pens, scissors and various medical devices, for example defibrillators and respirators.

Because of these dangers a strict screening procedure is enforced that is usually adequate in ensuring that staff and patients are free of ferromagnetic metal objects before entering the room in which the MRI scanner is located. However, there are a few major instances of projectile effects in the world every year and many minor incidents. Each major incident is usually very costly to the hospital or their insurers.

Metals that are non-ferrous do not present this danger and are used routinely in MRI rooms. Metal items for use in MRI rooms are usually pre-approved. However, it is often difficult for people to know if a metal is ferrous or non-ferrous and it is not always convenient to check for approved items. Accordingly, there is always a danger of the projectile effect due to oversights and mistakes on part of staff and patients, and general human error.

Installing metal detectors at the entrance to hospital rooms in which MRI scanners are located might help reduce the incidence of MRI related accidents (The New England Journal of Medicine 2001; 345; pp 1000–1001). For example, it has been suggested that an archway metal detector, similar to those employed at airports, could be placed at the entrance to an MRI room to detect metal objects which might pose a danger.

However, there are several difficulties with the above suggestion which have hitherto precluded the use of conventional metal detectors for screening persons in the vicinity of an MRI scanner.

Firstly, the metal detector would have to reliably discriminate between ferromagnetic and non-ferromagnetic metals

otherwise it would alarm on approved metal objects. Not all conventional archway metal detectors are capable of such discrimination.

Discriminating metal detectors are available, however such devices tend to transmit relatively large amounts of electromagnetic energy. This is not desirable in a clinical environment where sensitive equipment abounds.

Moreover, conventional archway metal detectors are primarily aimed at security applications rather than safety applications and typically exhibit a high degree of sophistication (see for example U.S. Pat. No. 3,971,983). Consequently, sophisticated archway metal detectors are prohibitively expensive for use in MRI screening applications.

Furthermore, conventional archway metal detectors are physically incompatible with the beds, trolleys and wheelchairs used in a hospital environment (see for example U.S. Pat. No. 6,133,829).

Finally, conventional metal detection systems aimed at security applications are almost exclusively attended by an operator who will take appropriate action in response to a visual or audible signal from the metal detection system. In contrast, a screening device for an MRI scanner must operate automatically to provide an audible/visual warning of a potential danger, and even prohibit access to the MRI scanner if appropriate.

It is an object of the present invention to mitigate at least some of the disadvantages of the foregoing metal detection systems. It is a further object of the present invention to provide an alternative device for detecting ferromagnetic objects in the vicinity of an MRI scanner.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is now proposed an apparatus for detecting a ferromagnetic object comprising

primary sensor means adapted to measure a magnetic field and to produce a corresponding measurement signal,

secondary, non-magnetic, sensor means adapted to detect the movement of objects in the vicinity of the primary sensor means, and

signal processing means arranged in communication with the primary and secondary sensor means,

wherein the signal processing means is configured to identify temporal variations in the measurement signal due to the movement of a ferromagnetic object within an ambient magnetic field and to correlate the identified temporal variations in the measurement signal with movement of objects detected by the secondary, non-magnetic sensor means, and to provide an output indicative of the presence of a ferromagnetic object in the vicinity of the primary sensor means only in the presence of a correlation therebetween.

The above mentioned apparatus is advantageous in that ferromagnetic objects can be reliably detected using a combination of the primary and secondary sensor means. False alarms due to interference from non-hazardous ferromagnetic objects moving within the extended zone of sensitivity of the apparatus are reduced by the combination of the primary and secondary sensor means.

The apparatus is optimised to merely detect the presence of a ferromagnetic object in the vicinity of the primary sensor means rather than to indicate the exact location of a ferromagnetic object. The capability to merely detect the presence of a ferromagnetic object is sufficient since the apparatus is primarily intended to detect ferromagnetic objects inadvertently brought into the vicinity of the primary sensor means rather than deliberately concealed therefrom.

In the interest of clarity, it should be noted that the ambient magnetic field referred to above may comprise several components, for example arising from the earth's magnetic field, any localised magnetic fields generated by magnetic or electromagnetic equipment, and local perturbations in the above magnetic field(s) due to static ferromagnetic objects located therein. In the absence of extraneous interference (caused, for example, by the movement of ferromagnetic objects), it is assumed that the ambient magnetic field is substantially static and has substantially constant field strength.

Preferably, the secondary, non-magnetic sensor means comprises at least one of a photo-electric sensor, a fibre-optic sensor, a passive infrared sensor, a camera, a thermal imager, an ultrasonic sensor, a radar sensor, an electrostatic sensor, a millimeter wave sensor and a pressure sensitive mat.

In a preferred embodiment the apparatus further comprises at least one of an audible warning device, a visual warning device and means for preventing access to a prohibited area, operable by the output from the signal processing means.

The audible and visual warning devices provide the advantage that an immediate and direct warning is provided of the presence of a ferromagnetic object. The output from the apparatus does not require analysis by a skilled operator as would be the case for a conventional security ferrous metal detector.

The means for preventing access provides an additional benefit should the audible and visual warning devices be ignored.

Advantageously, the means for preventing access comprises at least one of a locking device and a barrier device.

In a further preferred embodiment, the signal processing means comprises filter means arranged to substantially reject spurious variations in the measured magnetic field.

Conveniently, the filter means comprises a high-pass filter.

Advantageously, the high-pass filter is responsive to the measurement signal produced by the primary sensor means to attenuate variations therein having a frequency of less than 0.3 Hz.

Preferably, the filter means comprises a low-pass filter.

Advantageously, the low-pass filter is responsive to the measurement signal produced by the primary sensor means to attenuate variations therein having a frequency of greater than 3 Hz.

Preferably, the signal processing means comprises means for comparing the amplitude of the output from the filter means with an adjustable threshold level so as to indicate temporal variations in the measurement signal due to the movement of a ferromagnetic object within an ambient magnetic field.

The means for comparing the amplitude of the output from the filter means with an adjustable threshold level is advantageous in that the sensitivity of the apparatus may be adjusted depending on the size and magnetic signature of the ferromagnetic object to be detected and the level of background interference.

In a preferred embodiment, the primary sensor means has a first magnetic sensor comprising one of a fluxgate sensor, a magneto-resistive sensor, a magneto-impedance sensor, a hall-effect sensor, and a galvanic coil sensor. Additionally, the primary sensor means may have a second magnetic sensor comprising one of a fluxgate sensor, a magneto-resistive sensor, a magneto-impedance sensor, a hall-effect sensor, and a galvanic coil sensor.

The apparatus is optimised to detect a ferromagnetic object using a localised primary sensor means. It is assumed that a ferromagnetic object to be detected will pass through a given volume of space. Accordingly, the zone of sensitivity of the primary sensor means and the positioning of the primary sensor means in use, are optimised to detect ferromagnetic objects within the above mentioned given volume of space.

For example, where the apparatus is used to detect ferromagnetic objects at the entrance to a magnetic resonance imaging scanner, it may be assumed that any ferromagnetic objects will be carried or transported at about waist height. The primary sensor means would therefore be located at approximately waist height and be arranged to detect ferromagnetic objects across the entire width of the entrance. In this example, the entrance to the scanner provides a physical restriction which ensures that anyone entering or leaving the MRI suite (the room in which the magnetic resonance imaging scanner is located) will pass through the zone of sensitivity of the primary sensor means. In this example, the apparatus is aimed primarily at a safety application, namely to detect ferromagnetic objects being inadvertently carried near the magnetic resonance imager, rather than to detect the deliberate concealment of a ferromagnetic object (security applications). Accordingly, an archway style ferrous metal detector, as used in security applications, is not required.

Conveniently, at least one of the first and second magnetic sensors is separable from the signal processing means such that, in use, the at least one separable sensor may be disposed remotely to the signal processing means.

In use, the primary sensor means may be arranged to detect ferromagnetic objects in the vicinity of a magnetic resonance imaging scanner.

According to a second aspect of the present invention, there is now proposed a magnetic resonance imaging scanner comprising an apparatus for detecting ferromagnetic objects according to the first aspect of the present invention.

According to a third aspect of the present invention, a method for detecting a ferromagnetic object comprises the steps of

(i) measuring a magnetic field using primary sensor means and producing a corresponding measurement signal,

(ii) detecting the movement of objects in the vicinity of the primary sensor means using secondary, non-magnetic, sensor means,

(iii) identifying temporal variations in the measurement signal produced by the primary sensor means due to the movement of a ferromagnetic object within an ambient magnetic field,

(iv) assessing said identified temporal variations in the measurement signal in conjunction with movement of objects detected by the secondary, non-magnetic sensor means to determine a correlation there-between, and

(v) in the occurrence of a correlation, providing an indication of the presence of a ferromagnetic object.

The foregoing aspects of the present invention utilise secondary, non-magnetic, sensor means to detect the movement of objects in the vicinity of the primary sensor means. Alternatively, the secondary, non-magnetic, sensor means may be omitted from the apparatus, however susceptibility to false alarms may be increased.

Therefore, according to another aspect of the present invention, there is now proposed an apparatus for detecting a ferromagnetic object comprising primary sensor means adapted to measure a magnetic field and to produce a corresponding measurement signal, arranged in communication with signal processing means configured to identify temporal variations in the measurement signal due to the movement of a ferromagnetic object within an ambient magnetic field and to provide an output indicative of the presence of a ferromagnetic object in the vicinity of the primary sensor means.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by example only, with reference to the accompanying drawings in which;

FIG. **1** shows a schematic representation of the ferromagnetic object detector according to the present invention,

FIG. **2** illustrates an alternative embodiment of the present invention having a second magnetic sensor,

FIG. **3** shows a schematic representation of the ferromagnetic object detector according to the present invention having a complementary, non-magnetic, sensor,

FIG. **4** illustrates an alternative arrangement of the ferromagnetic object detector shown in FIG. **3** incorporating a second magnetic sensor, and

FIG. **5** illustrates a typical installation of a ferromagnetic object detector according to the present invention installed at the entrance to a room in which an MRI scanner is located.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, the ferromagnetic object detector (**2**) according to the present invention comprises a magnetic sensor (**4**), such as a fluxgate sensor, a magneto-resistive sensor, a magneto-impedance sensor, a hall-effect sensor, or a galvanic coil sensor, that outputs a signal that is a measurement of the magnetic field incident upon the sensor (**4**). Since the ferromagnetic object detector (**2**) will invariably be installed in a fixed position, for most of the time the sensor (**4**) will register a largely unchanging ambient magnetic field due to the earth. This constitutes a large offset on the output of the sensor. The signal due to the ambient field can be removed using a high pass filter. Furthermore, in a hospital environment, for example, there is a lot of ambient magnetic noise particularly at the power supply frequency and its harmonics. These frequencies are above those of interest so they may be removed with a low pass filter. The filters collectively constitute a band-pass filter (**6**) to perform these functions.

The time for a person to pass a location is typically within the range 0.3 to 3 seconds. The reciprocal of these times are the frequencies of interest, approximately 0.3 to 3 Hz. This is the passband of interest. Because the main D.C. field of the earth and the higher frequencies of the ambient magnetic noise are removed, the remaining signal is small and is amplified, by an amplifier (**8**), to a convenient level.

If a ferromagnetic object passes close to the sensor (**4**), the ambient magnetic field will be altered causing a change in the output of the sensor (**4**). That change will pass the filter (**6**) and be amplified by the amplifier (**8**). In order to trigger an alarm the signal size is compared to a pre-set threshold. Because the signal may be positive or negative, the threshold detector consists of a rectification stage (**10**) followed by a

comparator (**12**) that has a circuit (**14**) to provide a threshold voltage. Alternatively, separate comparators are used for positive and negative signals with the outputs combined to give a single alarm signal instead of a rectifier (**10**) and a single comparator (**12**). The output of the comparator (**12**) may be arranged to have logic level 'zero' for the state where the signal does not exceed the threshold, and logic level 'one' for the state when the signal has exceeded the threshold.

It should be noted that the output of the comparator (**12**) will return to logic level 'zero' when the ferromagnetic object has passed the sensor and its signal has dropped below the threshold. In practice, the ALARMED state needs to be maintained until a reset signal is provided (for example by pressing a reset button). A digital latch (**16**) is used to maintain an ALARMED state after the ferromagnetic object has passed the magnetic sensor (**4**). The latch (**16**) consists of a simple reset-set flip-flop (RS flip-flop). Alternatively, other methods may be used to latch the output of the comparator (**12**). Once the reset button (**18**) is pressed the output of the latch (**16**) returns to the NOT ALARMED state.

The digital latch (**16**) is used to trigger one or more warning devices such as an audible alarm (**20**) and a visual alarm (**22**). Depending on the circumstances it may be appropriate to have one of these alarms. All of these functions may be constructed in a single unit to be mounted on a wall or on a stand that is fixed to the floor as appropriate. The unit incorporates outputs to activate external components, for example remote audible and visual alarm devices (**24**) that are mounted above the door to a MRI room so the person can see the visual alarm (**24**) directly in front of them although the sensor unit would be by their side.

In addition, connections are available for activating access control devices such as electronic door locks (**26**) or barriers (**28**), so physical prevention may be invoked.

In an alternative embodiment of the present invention, the magnetic sensor (**4**) is separate from the main (master) unit but connected to it by wires. In this embodiment of the present invention, the master unit is identical to that shown in FIG. **1**, except in that the magnetic sensor (**4**) of FIG. **1** is removed and is mounted separately and connected to the master unit by a cable. This allows the main unit to be located in a convenient place; not necessarily adjacent to the thoroughfare before the room in which the MRI scanner is located.

For rooms where wide or double doors are used, the sensing range of this device may be insufficient to cover the whole area of the thoroughfare adequately. In this case a second sensor is required that is placed on the opposite side of the thoroughfare so each sensor needs to only cover half of the width of the thoroughfare.

Referring to FIG. **2**, one way of achieving the above is to use a master unit (**30**) and a slave unit (**32**) that are mounted respectively either side of the thoroughfare. The master unit (**30**) is identical to that of FIG. **1** with the exception of an additional input (**34**) and a digital OR gate (**36**). The slave unit (**32**) comprises a slave magnetic sensor (**44**) which outputs a signal that is a measurement of the magnetic field incident upon the sensor (**44**). The output from the slave magnetic sensor (**44**) is filtered by a band pass filter (**46**) and amplified by a slave amplifier (**48**) before being compared with a preset threshold level. As with the master unit (**30**), the threshold detector consists of a rectification stage (**50**) followed by a comparator (**52**) that has a circuit (**54**) to provide a threshold voltage. Alternatively, separate comparators are used for positive and negative signals with the outputs combined to give a single alarm signal instead of a rectifier (50) and a single comparator (52).

The output from the slave comparator (52) is communicated to the master unit (30). A cable connects the output of the slave unit (32) to the input (34) of the master unit (30). The OR gate (36) ensures that the ALARMED state activates when either or both of the master and slave comparators (12, 52) pass to logic level one.

There are several other possible configurations such as locating the two complete electronics channels of FIG. 2 in one single unit with one or both magnetic sensors (4, 44) arranged external to the unit and connected by leads to the unit.

The split of the second sensor channel between the master and slave units (30, 32) can be made at any point e.g. after the filter (46), or the amplifier (48), or the rectifier (50) or after the comparator (52) as illustrated in FIG. 2.

It is, however, beneficial from the point of view of minimising interference pickup that the digital signal is passed as shown in FIG. 2. With any of these embodiments of the present invention the magnetic sensors (4, 44) may be external to the units (30, 32) and connected to them by cables.

Where the analogue signals from the two channels, i.e. before the comparators (12, 52), are together in the master unit, they may be combined in an opposite polarity so that noise that is common to both sensors (4, 44) is cancelled. In this embodiment only one rectifier and comparator are needed.

Whilst effective at detecting ferromagnetic objects, the foregoing embodiments of the present invention may be prone to false alarms. One of the problems with magnetic sensors is that they are omni-directional and they will sense changes in field due to sources outside of the region of interest. Examples may include traffic, filing cabinets being opened, passing trolleys etc. Hospitals have environments where this is particularly frequent and unavoidable so a magnetic sensor would give rise to many false alarms.

Referring to FIG. 3, to reduce the false alarms, the magnetic sensor (4) is used in conjunction with a complementary, non-magnetic, sensor (60) that senses when a person is passing the magnetic sensor (4). The non-magnetic sensor (60) comprises a photo-electric sensor arranged to detect a person passing through a beam of light. Alternatively, the photo-electric sensor comprises a retro-reflective sensor, a diffuse scan sensor, a fibre-optic sensor or a contrast type optical sensor. The photo-electric sensor is positioned to indicate when a person is actually passing into the room to be protected. The system will only produce an alarm if there is coincidence between the magnetic sensor (4) and the non-magnetic sensor (60), i.e. something is breaking the light beam AND the magnetic signal is above the predetermined threshold level. This is achieved by passing the output from the comparator (12) and the output from the non-magnetic sensor (60) into a logic AND gate (62).

This does leave a false alarm condition when a magnetically clean person is passing into the room simultaneously with an independently caused magnetic signal from elsewhere. However, these occurrences will be rare compared to those if the photo-electric sensor was not used.

In alternative embodiments of the present invention, the non-magnetic sensor (60) comprises any sensor capable of detecting a person moving past the magnetic sensor (4). For example the non-magnetic sensor (60) may comprise a camera, a thermal imager, a passive infrared sensor (PIR), an ultrasonic sensor, a radar sensor (electromagnetic or ultrasonic), an electrostatic sensor, a millimeter wave sensor or a pressure sensitive mat.

As with some of the embodiments of the invention described previously, the magnetic sensor (4) and the non-magnetic sensor (60) may be arranged separately from the main (master) unit but connected to it. In this embodiment of the present invention, the master unit is identical to that shown in FIG. 3, except in that the magnetic sensor (4) and the non-magnetic sensor (60) of FIG. 3 is removed and is mounted separately and connected to the master unit by a cable. Similarly, the non-magnetic sensor (60) is mounted separately from the master unit. This allows the main unit to be located in a convenient place; not necessarily adjacent to the thoroughfare before the room in which the MRI scanner is located.

As discussed previously, for rooms where wide or double doors are used, the sensing range of the embodiment of the present invention shown in FIG. 3 may be insufficient to cover the whole area of the thoroughfare adequately. In this case a second magnetic sensor is required that is placed on the opposite side of the thoroughfare so each sensor needs to only cover half of the width of the thoroughfare.

A similar arrangement to that shown in FIG. 2 and discussed above may be used with the embodiments of the present invention incorporating a complementary non-magnetic sensor (60).

Referring to FIG. 4, a master unit (30) and a slave unit (32) are mounted respectively either side of the thoroughfare. The master unit (30) is identical to that of FIG. 3 with the exception of an additional input (64) and a digital OR gate (66). The slave unit (32) comprises a slave magnetic sensor (44) which outputs a signal that is a measurement of the magnetic field incident upon the sensor (44). The output from the slave magnetic sensor (44) is filtered by a band pass filter (46) and amplified by a slave amplifier (48) before being compared with a preset threshold level. As with the master unit (30), the threshold detector consists of a rectification stage (50) followed by a comparator (52) that has a circuit (54) to provide a threshold voltage. Alternatively, separate comparators are used for positive and negative signals with the outputs combined to give a single alarm signal instead of a rectifier (50) and a single comparator (52).

The output from the slave comparator (52) is communicated to the master unit (30). A cable connects the output of the slave unit (32) to the input (64) of the master unit (30). The AND gate (62) operates in conjunction with the OR gate (66) to ensure that the ALARMED state activates when the output from the non-magnetic sensor (60) AND either or both of the master and slave comparators (12, 52) pass to logic level one.

As with the embodiment shown in FIG. 2, there are several other possible configurations such as locating the two complete electronics channels of FIG. 4 in one single unit with one or both magnetic sensors (4, 44) arranged external to the unit and connected by leads to the unit.

The split of the second sensor channel between the master and slave units (30, 32) can be made at any point e.g. before the filter (46), after the filter (46), after the amplifier (48), after the rectifier (50), or after the comparator (52) as illustrated in FIG. 4.

It is, however, beneficial from the point of view of minimising interference pickup that the digital signal is passed as shown in FIG. 4. With any of these embodiments of the present invention the magnetic sensors (4, 44) may be external to the units (30, 32) and connected to them by cables.

Where the analogue signals from the two channels, i.e. before the comparators (**12**, **52**), or before the filters (**4**, **46**), are combined together in the master unit, they may be combined in an opposite polarity so that noise that is common to both sensors (**4**, **44**) is cancelled. In this embodiment only one rectifier and comparator are needed.

FIG. **5** illustrates how the embodiments of the invention shown in FIGS. **2** and **4** may be installed in a situation where the entrance to an MRI room is at the end of a corridor.

Referring to FIG. **5**, the master and slave in units (**30**, **32**) are located either side of the thoroughfare at waist height above the floor because that is the most likely height at which a ferromagnetic material may be inadvertently carried. The master and slave units (**30**, **32**) are also positioned about one meter before the door. An automatic door lock (**70**) and a visual warning device (**24**) are also shown in FIG. **5**.

Where the MRI room entrance is located in the side of a corridor it is not practical to mount the sensors one meter before the door. In this case the units are mounted on the walls either side of the door. It may not be practical in this case to use an automatic door lock because the door may have been opened before it can be activated. It is important that a clear warning is given in this case.

Where the MRI room entrance is located off a lobby area or a larger room the units could be mounted on stands fixed to the floor a short distance to the door or less preferably on the walls either side as described above.

In some situations it may be deemed that an audible alarm is sufficient and no external warning devices are necessary. One example of this is where the device is not installed on the entrance of a MRI room but at the exit of the preparatory area as a final check after the normal screening procedures.

While there have been shown and described several embodiments of the present invention, it should be understood by those skilled in the art that various changes and modifications may be made therein without departing from the spirit and scope of the invention as claimed.

What is claimed is:

1. An apparatus for detecting a ferromagnetic object comprising

- a passive primary sensor comprising first and second magnetic sensors, the primary sensor adapted to measure an ambient magnetic field within a localized volume of space defined by a zone of sensitivity of the first and second magnetic sensors and to produce a corresponding measurement signal,
- a secondary, non-magnetic, sensor adapted to detect the movement of objects in the vicinity of the primary sensor,
- a signal processor arranged in communication with the primary and secondary sensors, and
- a warning device operable by an output from the signal processor, the warning device adapted to provide within the vicinity of the primary sensor at least one of an audible warning and visible warning, wherein the signal processor is configured to identify temporal variations in the measurement signal due to the movement of a ferromagnetic object within the an ambient magnetic field and to correlate the identified temporal variations in the measurement signal with movement of objects detected by the secondary, non-magnetic sensor, and to provide an output indicative of the presence of a ferromagnetic object in the vicinity of the primary sensor only in the presence of a correlation there-between.

2. An apparatus according to claim **1** wherein the secondary, non-magnetic sensor comprises at least one of a photo-electric sensor, a fibre-optic sensor, a passive infrared sensor, a camera, a thermal imager, an ultrasonic sensor, a radar sensor, an electrostatic sensor, a millimeter wave sensor and a pressure sensitive mat.

3. An apparatus according to claim **1** further comprising an access control device for preventing access to a prohibited area, operable by the output from the signal processor.

4. An apparatus according to claim **3** wherein the access control device comprises at least one of a lock and a barrier.

5. An apparatus according to claim **1** wherein the signal processor comprises a filter arranged to substantially reject spurious variations in the measured magnetic field.

6. An apparatus according to claim **5** wherein the filter comprises a high-pass filter.

7. An apparatus according to claim **6** wherein the high-pass filter is responsive to the measurement signal produced by the primary sensor to attenuate variations therein having a frequency of less than 0.3 Hz.

8. An apparatus according to claim **5** wherein the filter comprises a low-pass filter.

9. An apparatus according to claim **8** wherein the low-pass filter is responsive to the measurement signal produced by the primary sensor to attenuate variations therein having a frequency of greater than 3 Hz.

10. An apparatus according to claim **5** wherein the signal processor comprises a comparator for comparing the amplitude of the output from the filter with an adjustable threshold level so as to indicate temporal variations in the measurement signal due to the movement of a ferromagnetic object within an ambient magnetic field.

11. An apparatus according to claim **1** wherein the first magnetic sensor comprises one of a fluxgate sensor, a magneto-resistive sensor, a magneto-impedance sensor, a hall-effect sensor, and a galvanic coil sensor.

12. An apparatus according to claim **11** wherein the magnetic sensor comprises one of a fluxgate sensor, a magneto-resistive sensor, a magneto-impedance sensor, a hall-effect sensor, and a galvanic coil sensor.

13. An apparatus according to claim **12** wherein, at least one of the first and second magnetic sensors is separable from the signal processor such that, in use, the at least one separable sensor may be disposed remotely to the signal processor.

14. An apparatus according to claim **1** wherein, in use, the primary sensor is arranged to detect ferromagnetic objects in the vicinity of a magnetic resonance imaging scanner.

15. A magnetic resonance imaging scanner comprising an apparatus for detecting ferromagnetic objects according to any one of the preceding claims.

16. A method for detecting a ferromagnetic object comprising the steps of

- (i) measuring an ambient magnetic field using a passive primary sensor comprising first and second magnetic sensors and producing a corresponding measurement signal,
- (ii) detecting the movement of objects in the vicinity of the primary sensor using a secondary, non-magnetic, sensor,
- (iii) identifying temporal variations in the measurement signal produced by the primary sensor due to the movement of a ferromagnetic object within the ambient magnetic field within a localized volume of space defined by a zone of sensitivity of the first and second magnetic sensors,
- (iv) assessing said identified temporal variations in the measurement signal in conjunction with movement of

objects detected by the secondary, non-magnetic sensor to determine a correlation there-between, and

(v) in the occurrence of a correlation, providing an indication of the presence of a ferromagnetic object wherein the step of providing the indication of the presence of a ferromagnetic object comprises the step of producing within the vicinity of the primary sensor means at least one of an audible and visible warning.

17. A method of preventing the introduction of a ferromagnetic object into the vicinity of a magnetic resonance imaging scanner comprising the steps of

(i) providing an apparatus for detecting a ferromagnetic object according to claim **1**,

(ii) surveying an entrance to a room in which the magnetic resonance imaging scanner is located and identifying at least one preferred mounting position for the apparatus,

(iii) installing said apparatus at the at least one preferred mounting position, such that, in use, the apparatus provides a warning upon detection of a ferromagnetic object in the vicinity of the entrance to the room in which the magnetic resonance imaging scanner is located.

18. A method according to claim **17** wherein the at least on preferred mounting position is at the side of the entrance to the room in which the magnetic resonance imaging scanner is located.

19. A method according to claim **17** wherein the at least on preferred mounting position is about 1 metre from the entrance to the room in which the magnetic resonance imaging scanner is located.

20. A method according to claim **17** further comprising the step of (iv) installing an access control device at the entrance to the room in which the magnetic resonance imaging scanner is located such that, in use, the apparatus prohibits entry to the room upon detection of a ferromagnetic object in the vicinity of the entrance.

* * * * *

EXHIBIT B

US006133829A

United States Patent [19]

Johnstone et al.

[11] Patent Number: 6,133,829

[45] Date of Patent: Oct. 17, 2000

[54] WALK-THROUGH METAL DETECTOR SYSTEM AND METHOD

[75] Inventors: James Christian Johnstone, Livermore; Sidney Glenn Freshour, Modesto, both of Calif.

[73] Assignee: FRL, Inc., Los Banos, Calif.

[21] Appl. No.: 09/263,162

[22] Filed: Mar. 5, 1999

[51] Int. Cl.[7] G08B 13/24

[52] U.S. Cl. 340/551; 340/572.4

[58] Field of Search 340/551, 572.4, 340/540, 693.5, 572.8; 324/260, 259

[56] References Cited

U.S. PATENT DOCUMENTS

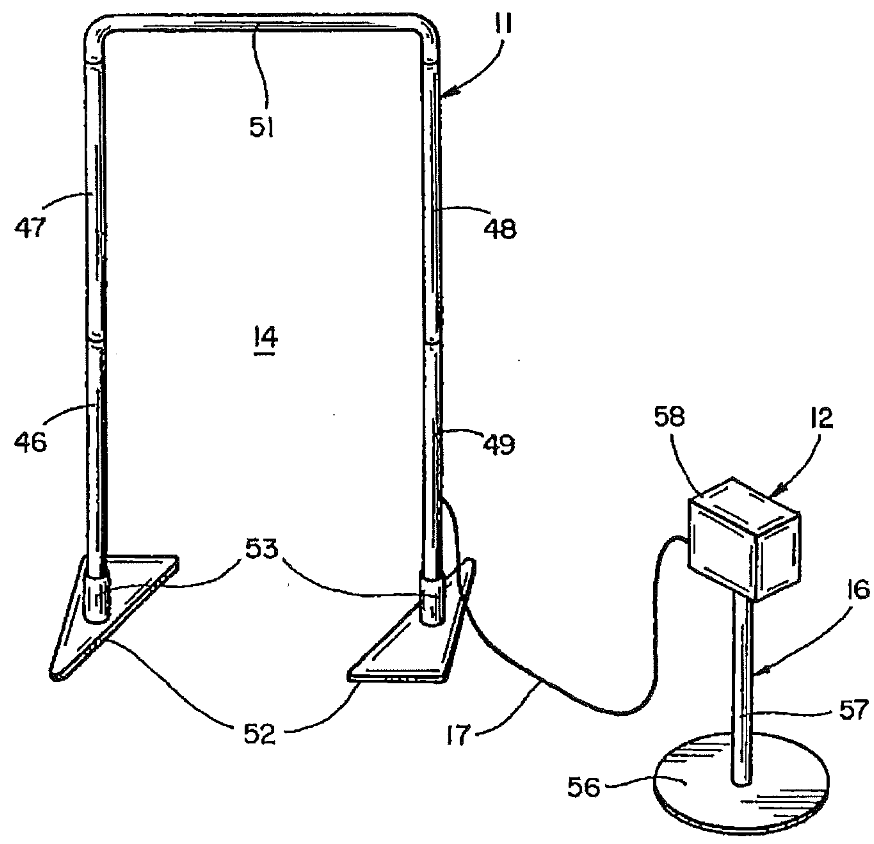
Re. 35,042	9/1995	Anderson, III et al. .	
3,950,696	4/1976	Miller et al. .	
3,956,743	5/1976	Geiszler et al. .	
3,968,482	7/1976	Schuman .	
3,971,983	7/1976	Jaquet .	
4,068,164	1/1978	Schwartz et al.	324/226
4,274,090	6/1981	Cooper .	
4,573,042	2/1986	Boyd et al. .	
4,652,861	3/1987	Domes .	
4,779,077	10/1988	Lichtblau	340/572
4,812,822	3/1989	Feltz et al.	340/572
4,821,023	4/1989	Parks	340/551
4,906,973	3/1990	Karbowski et al. .	
5,144,285	9/1992	Gore .	
5,317,309	5/1994	Vercellotti et al. .	
5,341,124	8/1994	Leyden et al. .	
5,414,411	5/1995	Lahr .	
5,463,376	10/1995	Stoffer	340/572
5,521,583	5/1996	Frahm et al.	340/551
5,541,577	7/1996	Cooper et al. .	
5,576,621	11/1996	Clements .	
5,583,488	12/1996	Sala et al. .	
5,648,757	7/1997	Vernace et al. .	
5,841,346	11/1998	Park	340/540
5,859,532	1/1999	Keller	324/232

Primary Examiner—Jeffery A. Hofsass
Assistant Examiner—Sihong Huang
Attorney, Agent, or Firm—Flehr Hohbach Test Albritton & Herbert LLP

[57] ABSTRACT

Walk-through ferrous metal detector and method in which potential carriers of weapons and other ferrous metal objects pass through a surveillance area in which the earth's magnetic field is monitored, and disturbances in the field due to movement of ferrous metal objects are detected.

25 Claims, 2 Drawing Sheets



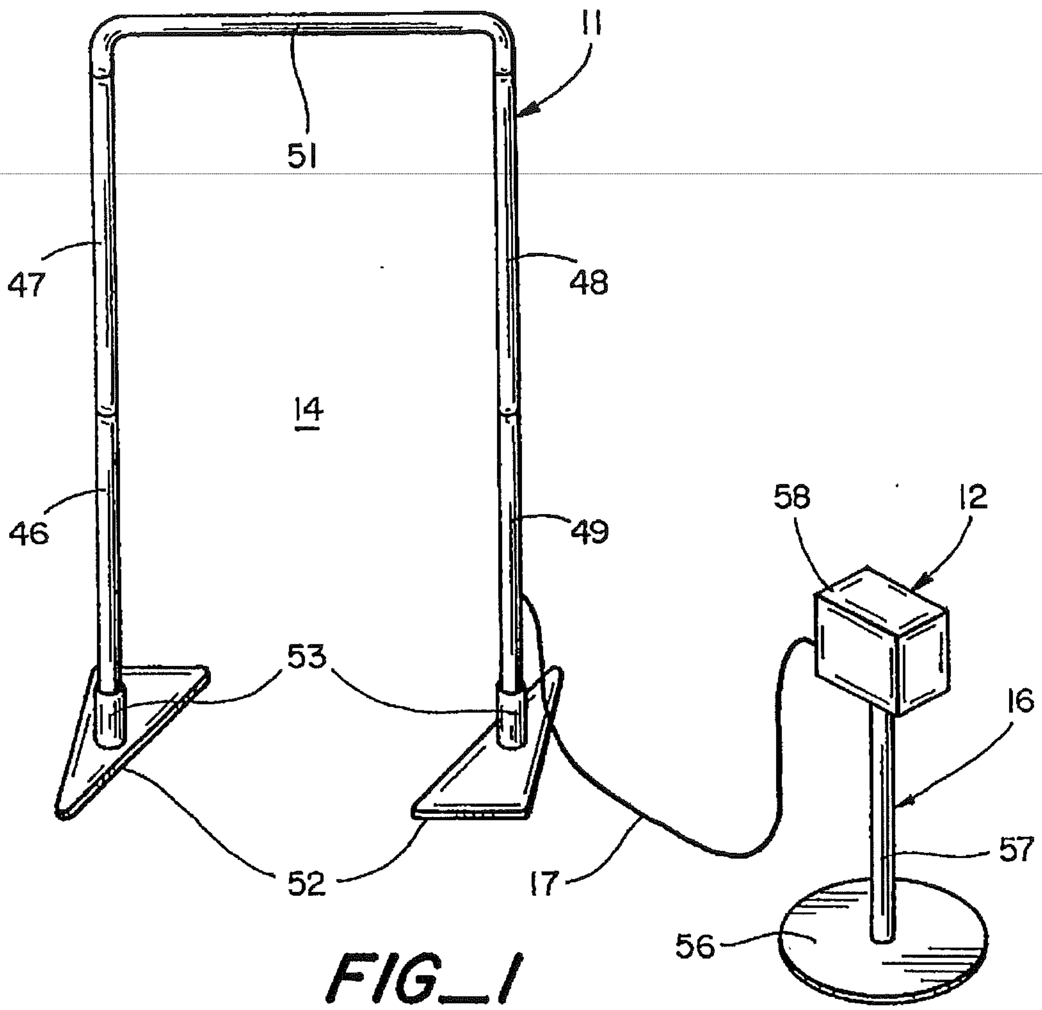


FIG_1

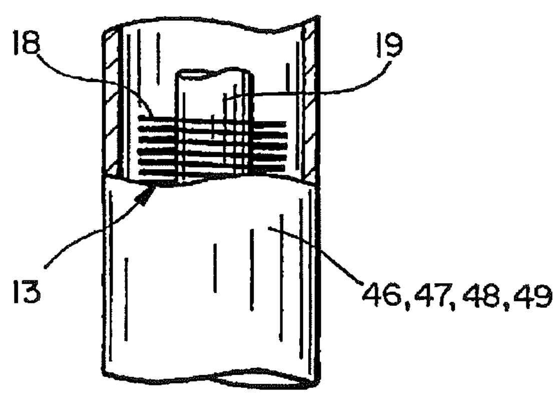


FIG_2

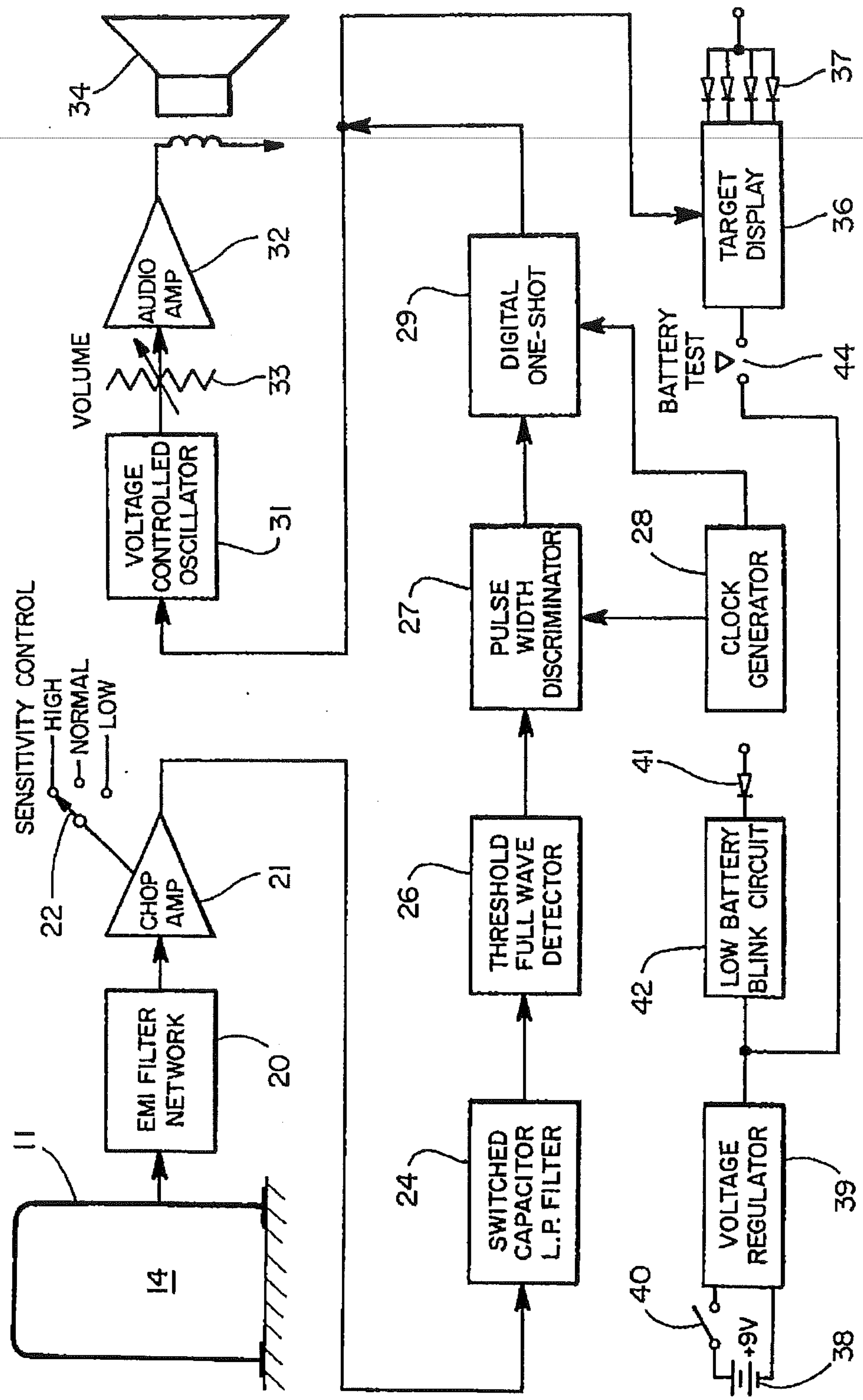

14
11
EMI FILTER NETWORK
20
CHOP AMP
21
22
SENSITIVITY CONTROL
HIGH
NORMAL
LOW
VOLTAGE CONTROLLED OSCILLATOR
31
VOLUME
33
AUDIO AMP
32
34
SWITCHED CAPACITOR L.P. FILTER
24
THRESHOLD FULL WAVE DETECTOR
26
PULSE WIDTH DISCRIMINATOR
27
DIGITAL ONE-SHOT
29
CLOCK GENERATOR
28
TARGET DISPLAY
36
37
BATTERY TEST
44
LOW BATTERY BLINK CIRCUIT
42
41
VOLTAGE REGULATOR
39
40
+9V
38

FIG_3

WALK-THROUGH METAL DETECTOR SYSTEM AND METHOD

This invention pertains generally to metal detectors and, more particularly, to a system and method for detecting weapons and other ferrous metal objects carried by a person.

Walk-through metal detectors are commonly used for detecting weapons in locations such airports and buildings where security is a concern. Such systems generally include large, permanent structures with transmitters for generating localized magnetic fields and means for detecting signals produced by metal objects carried by persons passing though those fields.

Those systems are relatively expensive, and have a further disadvantage in that they cannot be used in proximity to large stationary metal objects such as buildings or fences. If such objects are in the magnetic field, they will be detected unless the sensitivity of the system is reduced. When the sensitivity is reduced to a point where the large stationary objects are no longer detected, then certain guns and other weapons may not be detected either. Also, when such systems are moved, they often must be re-tuned to null out any metal in the floor on which they are used.

The prior art systems have a further disadvantage in that they respond to nonferrous metal objects (e.g., coins) as well as to ferrous ones.

It is in general an object of the invention to provide a new and improved walk-through metal detector and method for detecting weapons and other ferrous metal objects carried by a person.

Another object of the invention is to provide a metal detector and method of the above character which overcomes the limitations and disadvantages of the prior art.

These and other objects are achieved in accordance with the invention by providing a ferrous metal detector and method in which potential carriers of weapons and other ferrous metal objects pass through a surveillance area in which the earth's magnetic field is monitored, and disturbances in the field due to movement of ferrous metal objects are detected.

FIG. 1 is an isometric view, partly broken away, of one embodiment of a walk-through ferrous metal detector system incorporating the invention.

FIG. 2 is an enlarged fragmentary view, partly broken away, of the walk-through sensor frame in the embodiment of FIG. 1.

FIG. 3 is a block diagram of the embodiment of FIG. 1.

As illustrated in the drawings, the metal detector consists of a walk-through frame **11** and a control unit **12**. The frame has a plurality of sensing coils **13** for monitoring magnetic flux within the area **14** bounded by the frame. The control unit is mounted on a separate stand or pedestal **16** and is connected to the sensing coils by a cable **17**. The frame is of a size suitable for people to walk through and can, for example, have a height on the order of 77 inches and a width on the order of 32–36 inches.

The magnetic flux monitored by the sensing coils is produced by the earth's magnetic field, and the movement of ferrous metal objects such as weapons through the sensing frame causes localized disturbances in that field. The disturbances in the magnetic flux are in the form of a bell-shaped Gaussian curve, and the voltage induced by those disturbances is an analog signal which has an amplitude corresponding to the rate of change in the magnetic flux.

Each of the sensing coils consists of a large number of turns of copper wire **18** wound upon a ferrite core **19**, and the coils are distributed throughout the frame to provide

coverage for the entire area within it. The coils are connected together in oppositely phased pairs in order to cancel the effects disturbances produced by far field objects such as automobiles in motion. The coils in each pair are balanced to within about 1 percent of each other to contribute about 40 dB to the far field rejection.

The control unit is located far enough from the frame (e.g. 6–10 feet) so that large metal objects such as a police service revolver carried by persons operating the system will not be detected.

The control unit includes an EMI filter network **20** and an input amplifier **21** which amplifies the analog signals from the sensing coils to a level on the order of one volt. The amplitude of the signals from the coils varies widely, depending upon the size of the object which produces the disturbance, and in one presently preferred embodiment, the amplifier is a chopper stabilized operational amplifier which accommodates signals down to the microvolt level.

The gain of the input amplifier is controlled by a sensitivity control **22** to accommodate input signals of different amplitudes. In one presently preferred embodiment, the amplifier provides low, normal and high gains of 73 dB, 92 dB and 107 dB, respectively. At low gain, the system will detect weapons the size of a .22 caliber automatic pistol, and larger, and at normal gain, it will detect FAA test guns in which the only metal parts are the firing pin and spring. At high gain, it will detect small knives.

The amplified analog signals are passed through a low pass filter **24** which rejects small signals corresponding to motion faster than the normal walking speed of a person passing through the frame. It also eliminates stray 60 Hz disturbances and other spurious electrical noise. The filter has a cut-off frequency on the order of 1 Hz, and in one presently preferred embodiment, it is a 5-pole switched capacitor active filter.

Since the feet move at twice the speed of the body when a person is walking, the filter discriminates against disturbances produced by the metal shanks found in some shoes.

A threshold detector **26** connected to the output of the filter digitizes the analog signal and produces a pulse having a width corresponding to the amplitude and duration of the disturbance in the magnetic field. The threshold detector is a full-wave circuit which responds to both positive and negative excursions of the analog signal. The duration or width of the pulse thus represents the transit time of a ferrous object passing through the frame.

The width of the pulse is monitored by a pulse width discriminator **27** which passes pulses having a width corresponding to the time required for a person walking at a normal rate to pass through the area of surveillance. In one presently preferred embodiment, the pulse width discriminator consists of synchronous sequential logic which is clocked by clock signals from a clock generator **28** with a highly accurate ceramic resonator.

The target signal produced by the pulse width discriminator is applied to the input of a digital mono-stable latch or one-shot **29** which produces a single output pulse when triggered. This circuit comprises a digital flip-flop which is triggered by the target signal and reset by a counter driven by clock generator **28**. The counter holds the flip-flop in an inactive or "off" "off" state for a period of about 2–3 seconds in order to prevent multiple triggering from a single target.

The output pulse from the one-shot is applied to a voltage controlled oscillator **31** which provides an audio signal having a duration corresponding to the width of the output pulse. The audio signal is applied to the input of an amplifier **32** through a volume control potentiometer **33**, and the output of the amplifier is connected to a speaker 34 which provides an audible tone or "beep" in response to the target signal. With the duration of the "beep" determined by the period of the one-shot, the duration and volume of the "beep" will be the same regardless of the size of the target.

The output pulse from the one-shot is also applied to a target display 36 which includes a display driver and a plurality of light emitting diodes (LED's) 37 that are illuminated in response to the pulse to provide a visual indication that a ferrous metal object has been detected.

The system is powered by a pair of 9 volt batteries 38 through a voltage regulator 39 of conventional design. The batteries are connected to the voltage regulator by an ON-OFF switch 40 on with the volume control potentiometer. An LED 41 serves as a POWER ON indicator and is connected to the voltage regulator through a circuit 42 which monitors the level of the supply voltage and causes the LED to blink if the voltage falls to a level, e.g. 6 volts, which indicates that the batteries need to be replaced. The system can also be powered by an A.C. adapter (not shown), if desired.

The battery condition can also be monitored by LED's 37 and a test circuit in display driver 36 which illuminates different numbers of the LED's in accordance with the level of the supply voltage. In the embodiment illustrated, there are four LED's, and they are all illuminated when the supply voltage is 8.0 volts or higher. When the supply voltage is between 7.5 and 8.0 volts, three of the LED's are illuminated, and when the supply voltage is between 7.0 and 7.5 volts, two of the LED's are illuminated. When the supply voltage is between 6.2 and 7.0 volts, only one of the LED's is illuminated, and when it drops below 6.2 volts, LED 41 flashes. The supply voltage is applied to the test circuit by means of a test switch 44 which can, for example, be a normally open pushbutton switch on the volume control potentiometer.

In the preferred embodiment, frame 11 is constructed in the form of a knock-down portable frame which is readily transported to different locations and easily set up and taken down. It is fabricated of aluminum tubing, and includes four upright members 46–49 and a cross member 51 which are joined together by suitable connectors. The sensing coils are mounted inside the upright sections of tubing and are connected together by cables (not shown) as the sections are brought together. The frame is supported by a pair of triangular base plates 52 with upstanding posts 53 that receive the lower portions of upright sections 46, 49.

The pedestal or stand 16 for control unit 12 is likewise constructed in knock-down form, and includes a base plate 56 and a post 57. The control unit is enclosed within a cabinet 58 which is mounted on the post.

Operation and use of the metal detector, and therein the method of the invention, are as follows. The system is transported to a desired location, and the frame and control unit are set up, with the control unit about 6–10 feet from the frame. Persons to be checked for weapons then walk through the frame, and any ferrous objects carried by them will produce disturbances in the earth's magnetic field.

The sensing coils produce signals corresponding to the disturbances, and those signals are analyzed to detect the presence of a weapon. The signals are first increased in amplitude by amplifier 21, then passed through low pass filter 24 which eliminates signals corresponding to motion faster than the normal walking speed of a person passing through the frame. The analog signal is then digitized by threshold detector 26 to produce a pulse having a width corresponding to the transit time of the object which produced the disturbance. When the transit time corresponds to that of a person walking through the area of surveillance, pulse width discriminator 27 delivers a target signal which triggers digital one-shot 29. In response, an audible tone or "beep" is delivered by speaker 34, and LED's 37 are illuminated to indicate the presence of a weapon.

Since threshold detector 26 is a full-wave circuit which responds to both positive and negative excursions of the analog signal, the system is able to detect magnetized objects as well as nonmagnetized ferrous ones. Magnetized objects moving through the field produce a signals of relatively large residual magnitude which can be either positive or negative in polarity, depending on how the objects are oriented and where they are located relative to the sensing coils when they pass through the frame. Nonmagnetized ferrous objects can also produce signals of either polarity, and with a half-wave circuit, only a portion of the signals would be detected. In addition, with the full-wave circuit, subjects can walk through the frame in either direction.

The invention has a number of important features and advantages. It is a passive system which does not generate any magnetic fields of its own, and consequently can be used in locations where active systems cannot be used. It is highly portable and easy to set up and take down, which makes it suitable for use in places where larger, more expensive systems cannot be used. It is capable of detecting a wide range of ferrous objects, and can detect objects which are magnetized as well as ferrous objects which are not. Subjects can walk through the frame in either direction.

The total system weighs only about 60 pounds and breaks down to fit into two compact carrying cases which will fit into the trunks of most cars. It operates on only two 9 volt transistor batteries, and can be set up by one person in about 5–10 minutes. It is economical to manufacture, and can be sold for substantially less than other walk-through metal detectors. Being passive, it will not affect pacemakers, and being a motion detector, it can be used in proximity to large stationary metal objects. It has only two controls for an operator to learn to use, and requires a minimum of training. Since it detects ferrous objects only, it does not produce false signals in response to coins, keys and other objects that will set off other systems, and it can be used in close proximity to large nonferrous objects, both stationary and moving.

It is apparent from the foregoing that a new and improved ferrous metal detector and method have been provided. While only certain presently preferred embodiments have been described in detail, as will be apparent to those familiar with the art, certain changes and modifications can be made without departing from the scope of the invention as defined by the following claims.

What is claimed is:

1. In a system for detecting weapons and other ferrous metal objects: a portable, knock-down frame having a pair of nonferrous tubular uprights defining a surveillance area through which objects can pass, a plurality of sensing coils mounted inside the tubular uprights in vertical coaxial alignment and connected together in oppositely phased pairs for monitoring the earth's magnetic field within the surveillance area, and means connected to the sensing coils for detecting a disturbance in the earth's magnetic field due to movement of a ferrous metal object in the surveillance area.

2. In a system for detecting weapons and other ferrous metal objects: a frame defining a surveillance area through which objects can pass, a plurality of sensing coils carried by the frame for monitoring the earth's magnetic field within the surveillance area, means for amplifying a signal from the

sensing coils, means for digitizing the amplified signal to provide a pulse having a width corresponding to the time the amplified signal is above a predetermined level, and means for monitoring the width of the pulse and providing a target signal when the pulse is of predetermined width.

3. The system of claim 2 further including a low pass filter having a cutoff frequency on the order of 1 Hz connected between the means for amplifying the signal from the sensing coils and the means for digitizing the amplified signal.

4. The system of claim 2 wherein the means for digitizing the amplified signal comprises a full wave threshold detector which responds to both positive and negative excursions of the amplified signal.

5. The system of claim 2 further including means for providing a single pulse of predetermined width in response to the target signal.

6. The system of claim 5 further including means responsive to the pulse of predetermined width for providing an audible indication that a ferrous metal object has been detected.

7. The system of claim 5 further including means responsive to the pulse of predetermined width for providing a visual indication that a ferrous metal object has been detected.

8. The system of claim 5 wherein the means for providing a single pulse of predetermined width comprises a digital one-shot circuit which is triggered by the target signal and then held in an inactive state for a predetermined period of time to prevent multiple responses to the target signal.

9. In a method of detecting weapons and other ferrous metal objects, the steps of: assembling a plurality of non-ferrous tubular members to form a pair of uprights on opposite sides of a surveillance area, passing potential carriers of weapons and other ferrous metal objects through the surveillance area, monitoring the earth's magnetic field within the surveillance area with sensing coils disposed in vertical coaxial alignment inside the tubular members, and detecting a disturbance in the earth's magnetic field produced by movement of a ferrous metal object in the surveillance area.

10. In a method of detecting weapons and other ferrous metal objects, the steps of: passing potential carriers of weapons and other ferrous metal objects through a surveillance area, monitoring the earth's magnetic field within the surveillance area with sensing coils, amplifying a signal from the sensing coils, digitizing the amplified signal to provide a pulse having a width corresponding to the time the amplified signal is above a predetermined level, monitoring the width of the pulse, and providing a target signal when the pulse is of predetermined width.

11. The method of claim 10 further including the step of passing the amplified signal through a low pass filter having a cutoff frequency on the order of 1 Hz before the amplified signal is digitized.

12. The method of claim 10 wherein the amplified signal is digitized by a full wave threshold detector which responds to both positive and negative excursions of the amplified signal.

13. The method of claim 10 further including the step of providing a single pulse of predetermined width in response to the target signal.

14. The method of claim 13 further including the step of providing an audible indication that a ferrous metal object has been detected in response to the pulse of predetermined width.

15. The method of claim 13 further including the step of providing a visual indication that a ferrous metal object has been detected in response to the pulse of predetermined width.

16. The method of claim 13 wherein the single pulse of predetermined width is provided by triggering a digital one-shot circuit in response to the target signal and then holding the circuit in an inactive state for a predetermined period of time to prevent multiple responses to the target signal.

17. In a walk-through ferrous metal detector for detecting a weapon carried by a person: means defining an area of surveillance though which a person can walk, means for monitoring the earth's magnetic field within the area of surveillance and providing an analog signal corresponding thereto, means for digitizing the analog signal to provide pulses corresponding to disturbances in the field, and means for monitoring the width of the pulses to detect a disturbance corresponding to movement of a ferrous metal object at a normal walking speed.

18. The walk-through ferrous metal detector of claim 17 including means for filtering the analog signal to remove components having a frequency above about 1 Hz.

19. The walk-through ferrous metal detector of claim 17 wherein the means for digitizing the analog signal comprises a full wave threshold detector which responds to both positive and negative excursions of the analog signal.

20. The walk-through ferrous metal detector of claim 17 further including means for providing a single pulse of predetermined width in response to detection of a disturbance corresponding to movement of a ferrous metal object at a normal walking speed.

21. The walk-through ferrous metal detector of claim 20 further including means responsive to the pulse of predetermined width for providing an audible indication that a ferrous metal object has been detected.

22. The walk-through ferrous metal detector of claim 20 further including means responsive to the pulse of predetermined width for providing a visual indication that a ferrous metal object has been detected.

23. The walk-through ferrous metal detector of claim 20 wherein the means for providing a single pulse of predetermined width comprises a digital one-shot circuit which is triggered upon detection of a disturbance corresponding to movement of a ferrous metal object at a normal walking speed and then held in an inactive state for a predetermined period of time thereafter.

24. In a walk-through ferrous metal detector for detecting a weapon carried by a person: a knock-down portable frame having a plurality of nonferrous tubular members assembled together to form a pair of uprights on opposite sides of a surveillance area through which a person can walk, sensing coils mounted in the tubular members in coaxial vertical alignment with each other in each of the uprights and connected together in oppositely phased pairs for monitoring the magnetic field within the surveillance area, and means coupled to the sensing coils for detecting a disturbance in the magnetic field produced by movement of a ferrous metal object in the surveillance area.

25. A portable walk-through metal detector, comprising a pair of tubular uprights positioned on opposite sides of a surveillance area in which moving ferrous metal objects can be detected by disturbances they produce in a steady-state reference magnetic field, vertically paired sensing coils mounted in the uprights for monitoring the magnetic field within the surveillance area, and means connected to the sensing coils for detecting a disturbance in the reference field.

* * * * *

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

NOTICE OF ASSIGNMENT TO UNITED STATES MAGISTRATE JUDGE FOR DISCOVERY

This case has been assigned to District Judge George King and the assigned discovery Magistrate Judge is Jacqueline Chooljian.

The case number on all documents filed with the Court should read as follows:

CV12- 3487 GHK (JCx)

Pursuant to General Order 05-07 of the United States District Court for the Central District of California, the Magistrate Judge has been designated to hear discovery related motions.

All discovery related motions should be noticed on the calendar of the Magistrate Judge

===

NOTICE TO COUNSEL

A copy of this notice must be served with the summons and complaint on all defendants (if a removal action is filed, a copy of this notice must be served on all plaintiffs).

Subsequent documents must be filed at the following location:

[X] **Western Division** **312 N. Spring St., Rm. G-8** **Los Angeles, CA 90012**	[ ] **Southern Division** **411 West Fourth St., Rm. 1-053** **Santa Ana, CA 92701-4516**	[ ] **Eastern Division** **3470 Twelfth St., Rm. 134** **Riverside, CA 92501**

Failure to file at the proper location will result in your documents being returned to you.

ADRIAN M. PRUETZ - State Bar No. 118215
GLASER WEIL FINK JACOBS
HOWARD AVCHEN & SHAPIRO LLP
10250 Constellation Boulevard, 19th Floor
Los Angeles, California 90067
Telephone: (310) 553-3000

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

MEDNOVUS, INC. PLAINTIFF(S) v. QINETIQ, LTD.; METRASENS, INC.; ETS-LINDGREN L.P.; and INVIVO CORP. DEFENDANT(S).	CASE NUMBER CV12-03487 GHK (JCx) **SUMMONS**

TO: DEFENDANT(S):

A lawsuit has been filed against you.

Within 21 days after service of this summons on you (not counting the day you received it), you must serve on the plaintiff an answer to the attached ☑ complaint ☐ ________ amended complaint ☐ counterclaim ☐ cross-claim or a motion under Rule 12 of the Federal Rules of Civil Procedure. The answer or motion must be served on the plaintiff's attorney, Adrian M. Pruetz, whose address is 10250 Constellation Boulevard, 19th Floor, Los Angeles, CA 90067. If you fail to do so, judgment by default will be entered against you for the relief demanded in the complaint. You also must file your answer or motion with the court.

APR 23 2012

Dated: ________________

Clerk, U.S. District Court

JULIE PRADO

By: ________________
Deputy Clerk

SEAL

(Seal of the Court)

[Use 60 days if the defendant is the United States or a United States agency, or is an officer or employee of the United States. Allowed 60 days by Rule 12(a)(3)].

ADRIAN M. PRUETZ - State Bar No. 118215
GLASER WEIL FINK JACOBS
HOWARD AVCHEN & SHAPIRO LLP
10250 Constellation Boulevard, 19th Floor
Los Angeles, California 90067
Telephone: (310) 553-3000

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

MEDNOVUS, INC. PLAINTIFF(S) v. QINETIQ, LTD.; METRASENS, INC.; ETS-LINDGREN L.P.; and INVIVO CORP. DEFENDANT(S).	CASE NUMBER CV12-03487 GHK (JCx) **SUMMONS**

TO: DEFENDANT(S):

A lawsuit has been filed against you.

Within 21 days after service of this summons on you (not counting the day you received it), you must serve on the plaintiff an answer to the attached ☑ complaint ☐ ____________ amended complaint ☐ counterclaim ☐ cross-claim or a motion under Rule 12 of the Federal Rules of Civil Procedure. The answer or motion must be served on the plaintiff's attorney, Adrian M. Pruetz, whose address is 10250 Constellation Boulevard, 19th Floor, Los Angeles, CA 90067. If you fail to do so, judgment by default will be entered against you for the relief demanded in the complaint. You also must file your answer or motion with the court.

Clerk, U.S. District Court

Dated: APR 23 2012

By: ____________________
Deputy Clerk

(Seal of the Court)

[Use 60 days if the defendant is the United States or a United States agency, or is an officer or employee of the United States. Allowed 60 days by Rule 12(a)(3)].

UNITED STATE DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

I (a) PLAINTIFFS (Check box if you are representing yourself ☐)
MEDNOVUS, INC.

DEFENDANTS
QINETIQ, LTD.; METRASENS, INC.; ETS-LINDGREN L.P.; and INVIVO CORP.

(b) Attorneys (Firm Name, Address and Telephone Number. If you are representing yourself, provide same.)
Adrian M. Pruetz (Bar No. 118215), Avraham Schwartz (Bar No. 260591)
Glaser Weil Fink Jacobs Howard Avchen & Shapiro LLP, 10250 Constellation Blvd., 19th Floor, Los Angeles, CA 90067, Telephone: (310) 553-3000

Attorneys (If Known)

II. BASIS OF JURISDICTION (Place an X in one box only.)

☐ 1 U.S. Government Plaintiff
☑ 3 Federal Question (U.S. Government Not a Party)
☐ 2 U.S. Government Defendant
☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES - For Diversity Cases Only (Place an X in one box for plaintiff and one for defendant.)

	PTF	DEF		PTF	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated or Principal Place of Business in this State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated and Principal Place of Business in Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. ORIGIN (Place an X in one box only.)

☑ 1 Original Proceeding ☐ 2 Removed from State Court ☐ 3 Remanded from Appellate Court ☐ 4 Reinstated or Reopened ☐ 5 Transferred from another district (specify): ☐ 6 Multi-District Litigation ☐ 7 Appeal to District Judge from Magistrate Judge

V. REQUESTED IN COMPLAINT: JURY DEMAND: ☑ Yes ☐ No (Check 'Yes' only if demanded in complaint.)

CLASS ACTION under F.R.C.P. 23: ☐ Yes ☑ No ☑ **MONEY DEMANDED IN COMPLAINT: $** According to proof

VI. CAUSE OF ACTION (Cite the U.S. Civil Statute under which you are filing and write a brief statement of cause. Do not cite jurisdictional statutes unless diversity.)
35 U.S.C. § 1 et seq. - Action for patent infringement, declaratory judgment of patent noninfringement, and declaratory judgment of patent invalidity

VII. NATURE OF SUIT (Place an X in one box only.)

OTHER STATUTES
- ☐ 400 State Reapportionment
- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce/ICC Rates/etc.
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
- ☐ 480 Consumer Credit
- ☐ 490 Cable/Sat TV
- ☐ 810 Selective Service
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 875 Customer Challenge 12 USC 3410
- ☐ 890 Other Statutory Actions
- ☐ 891 Agricultural Act
- ☐ 892 Economic Stabilization Act
- ☐ 893 Environmental Matters
- ☐ 894 Energy Allocation Act
- ☐ 895 Freedom of Info. Act
- ☐ 900 Appeal of Fee Determination Under Equal Access to Justice
- ☐ 950 Constitutionality of State Statutes

CONTRACT
- ☐ 110 Insurance
- ☐ 120 Marine
- ☐ 130 Miller Act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loan (Excl. Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholders' Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability
- ☐ 196 Franchise

REAL PROPERTY
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

TORTS — PERSONAL INJURY
- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Fed. Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury
- ☐ 362 Personal Injury-Med Malpractice
- ☐ 365 Personal Injury-Product Liability
- ☐ 368 Asbestos Personal Injury Product Liability

IMMIGRATION
- ☐ 462 Naturalization Application
- ☐ 463 Habeas Corpus-Alien Detainee
- ☐ 465 Other Immigration Actions

TORTS — PERSONAL PROPERTY
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

BANKRUPTCY
- ☐ 422 Appeal 28 USC 158
- ☐ 423 Withdrawal 28 USC 157

CIVIL RIGHTS
- ☐ 441 Voting
- ☐ 442 Employment
- ☐ 443 Housing/Accommodations
- ☐ 444 Welfare
- ☐ 445 American with Disabilities - Employment
- ☐ 446 American with Disabilities - Other
- ☐ 440 Other Civil Rights

PRISONER PETITIONS
- ☐ 510 Motions to Vacate Sentence Habeas Corpus
- ☐ 530 General
- ☐ 535 Death Penalty
- ☐ 540 Mandamus/ Other
- ☐ 550 Civil Rights
- ☐ 555 Prison Condition

FORFEITURE / PENALTY
- ☐ 610 Agriculture
- ☐ 620 Other Food & Drug
- ☐ 625 Drug Related Seizure of Property 21 USC 881
- ☐ 630 Liquor Laws
- ☐ 640 R.R. & Truck
- ☐ 650 Airline Regs
- ☐ 660 Occupational Safety /Health
- ☐ 690 Other

LABOR
- ☐ 710 Fair Labor Standards Act
- ☐ 720 Labor/Mgmt. Relations
- ☐ 730 Labor/Mgmt. Reporting & Disclosure Act
- ☐ 740 Railway Labor Act
- ☐ 790 Other Labor Litigation
- ☐ 791 Empl. Ret. Inc. Security Act

PROPERTY RIGHTS
- ☐ 820 Copyrights
- ☑ 830 Patent
- ☐ 840 Trademark

SOCIAL SECURITY
- ☐ 861 HIA (1395ff)
- ☐ 862 Black Lung (923)
- ☐ 863 DIWC/DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

FEDERAL TAX SUITS
- ☐ 870 Taxes (U.S. Plaintiff or Defendant)
- ☐ 871 IRS-Third Party 26 USC 7609

CV12-03487

FOR OFFICE USE ONLY: Case Number: ____________________

AFTER COMPLETING THE FRONT SIDE OF FORM CV-71, COMPLETE THE INFORMATION REQUESTED BELOW.

UNITED STATE DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

VIII(a). IDENTICAL CASES: Has this action been previously filed in this court and dismissed, remanded or closed? ☑ No ☐ Yes
If yes, list case number(s): ______

VIII(b). RELATED CASES: Have any cases been previously filed in this court that are related to the present case? ☑ No ☐ Yes
If yes, list case number(s): ______

Civil cases are deemed related if a previously filed case and the present case:
(Check all boxes that apply) ☐ A. Arise from the same or closely related transactions, happenings, or events; or
☐ B. Call for determination of the same or substantially related or similar questions of law and fact; or
☐ C. For other reasons would entail substantial duplication of labor if heard by different judges; or
☐ D. Involve the same patent, trademark or copyright, and one of the factors identified above in a, b or c also is present.

IX. VENUE: (When completing the following information, use an additional sheet if necessary.)

(a) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named plaintiff resides.
☐ Check here if the government, its agencies or employees is a named plaintiff. If this box is checked, go to item (b).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
	San Diego County

(b) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named defendant resides.
☐ Check here if the government, its agencies or employees is a named defendant. If this box is checked, go to item (c).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
	Illinois, Florida, Texas, and United Kingdom

(c) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** claim arose.
Note: In land condemnation cases, use the location of the tract of land involved.

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
Los Angeles	Nationwide

*** Los Angeles, Orange, San Bernardino, Riverside, Ventura, Santa Barbara, or San Luis Obispo Counties**
Note: In land condemnation cases, use the location of the tract of land involved

X. SIGNATURE OF ATTORNEY (OR PRO PER): [signature] **Date** April 23, 2012

Notice to Counsel/Parties: The CV-71 (JS-44) Civil Cover Sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law. This form, approved by the Judicial Conference of the United States in September 1974, is required pursuant to Local Rule 3-1 is not filed but is used by the Clerk of the Court for the purpose of statistics, venue and initiating the civil docket sheet. (For more detailed instructions, see separate instructions sheet.)

Key to Statistical codes relating to Social Security Cases:

Nature of Suit Code	Abbreviation	Substantive Statement of Cause of Action
861	HIA	All claims for health insurance benefits (Medicare) under Title 18, Part A, of the Social Security Act, as amended. Also, include claims by hospitals, skilled nursing facilities, etc., for certification as providers of services under the program. (42 U.S.C. 1935FF(b))
862	BL	All claims for "Black Lung" benefits under Title 4, Part B, of the Federal Coal Mine Health and Safety Act of 1969. (30 U.S.C. 923)
863	DIWC	All claims filed by insured workers for disability insurance benefits under Title 2 of the Social Security Act, as amended; plus all claims filed for child's insurance benefits based on disability. (42 U.S.C. 405(g))
863	DIWW	All claims filed for widows or widowers insurance benefits based on disability under Title 2 of the Social Security Act, as amended. (42 U.S.C. 405(g))
864	SSID	All claims for supplemental security income payments based upon disability filed under Title 16 of the Social Security Act, as amended.
865	RSI	All claims for retirement (old age) and survivors benefits under Title 2 of the Social Security Act, as amended. (42 U.S.C. (g))