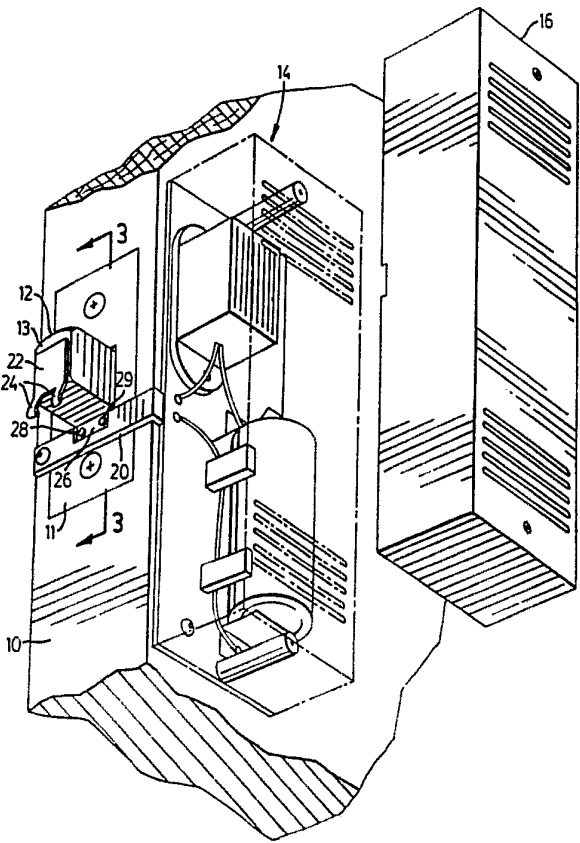


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(21) International Application Number: PCT/CA91/00385 (22) International Filing Date: 22 October 1991 (22.10.91) (30) Priority data: 601,648 23 October 1990 (23.10.90) US (71)(72) Applicant and Inventor: GROSSMAN, Emanuel [CA/CA]; 1555 Finch Avenue East, Suite 1105, Willowdale, Ontario M2J 4X9 (CA). (74) Agent: ROGERS, BERESKIN & PARR; 40 King Street West, 40th Floor, Toronto, Ontario M5H 3Y2 (CA). (81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CI (OAPI patent), CM (OAPI patent), CS, DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GN (OAPI patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, PL, RO, SD, SE, SE (European patent), SN (OAPI patent), SU⁺, TD (OAPI patent), TG (OAPI patent).		Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: LOCK MONITOR (57) Abstract A lock monitor for fitting to lockable objects that have locks that incorporate a bolt mechanism including a slidable bolt and mortise. The opening of the mortise is larger in at least one dimension than the engaging face of the slidable bolt. The lock monitor comprises a status indicator, a contact means mountable to the bolt mechanism adjacent to the slidable bolt and in communication with the status indicator, and an actuating arm mountable on the slidable bolt such that the actuating arm engages the contact means when the slidable bolt is disengaged from the mortise. When the actuating arm engages the contact means it causes the status indicator to register a change in status in the lock. 		

+ DESIGNATIONS OF "SU"

Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

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LOCK MONITOR

FIELD OF THE INVENTION

The present invention relates to a lock monitor,
5 and in particular to a lock monitor that fits most
existing slidable bolt and mortise locks.

DESCRIPTION OF THE PRIOR ART

The need for security and the desire for peace
of mind are increasingly important nowadays. Many people
10 feel unsafe unless their residences are locked or guarded
against intruders. Some people have a guard dog or a
sophisticated alarm system to warn against intruders, but
most people rely mainly upon the deterrence provided by
sturdy door and window locks. Typically these locks are of
15 the bolt variety, where a form of slidable bolt located on
the door or window is received by a mortise located in the
door frame or window frame. Such locks provide a
reasonable degree of security against intruders and are
found in most homes.

20 Regardless of their strength, locks are useless
if left open. Many people, especially the elderly, worry
constantly about whether they have left the locks of their
doors and windows open. It is therefore desirable to have
some form of monitor for indicating when a lock is
25 disengaged. Such a system, in addition to improving
security, provides peace of mind and allows a person to
relax in their place of residence knowing that their doors
and windows are actually locked. Such a system may also
serve to remind people to lock their doors when they are
30 leaving their homes. Finally, such a system may provide an
alarm deterrent to intruders who succeed in forcing open
the slidable bolt or who have a copy of the key.

Monitoring systems that respond to the opening
and closing of a bolt lock are known. Typically the
35 monitoring systems require the installation of an entirely
new lock mechanism, or a modification of an existing
mechanism. When an existing lock mechanism is being

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modified to install a lock monitoring system, drilling is often required to fit the monitoring mechanism to the lock mechanism. Such drilling can permanently disfigure the door or window. If it is desired to subsequently install a new
5 lock mechanism, the door or window may have to be replaced if too much material has been drilled or removed. It is therefore desirable to have a lock monitor that is inexpensive, and that may be installed with little or no drilling or other disfigurement to the door or window.

10 SUMMARY OF THE INVENTION

A lock monitor is provided for fitting to lockable objects that have locks that incorporate a bolt mechanism including a slidable bolt and mortise. The opening of the mortise is larger in at least one dimension
15 than the engaging face of the slidable bolt. The lock monitor comprises a status indicator, a contact means mountable to the bolt mechanism adjacent to the slidable bolt and in communication with the status indicator, and an actuating arm mountable on the slidable bolt such that
20 the actuating arm engages the contact means when the slidable bolt is disengaged from the mortise. When the actuating arm engages the contact means it causes the status indicator to register a change in status in the lock.

25 In one aspect the status indicator is electrically operated. The contact means includes first and second circuit contacts that are separate and insulated from each other. When the slidable bolt is disengaged from the mortise the actuating arm bridges the
30 separation between the first and second circuit contacts and an electrical circuit is completed. The status indicator monitors the status of the circuit and therefore registers the change in status of the lock.

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BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of
5 example, to the accompanying drawings, which show a preferred embodiment of the present invention, and in which:

Fig. 1 shows a perspective view of a bolt mechanism mounted in a door, and a lock monitor according
10 to the present invention;

Fig. 2 shows an enlarged perspective view of the actuating arm of the lock monitor;

Fig. 3 shows a sectional view of the lock monitor as viewed along line 3-3 in Fig. 1;

15 Fig. 4 is a perspective view of a portion of the lock monitor of the present invention showing an embodiment having a releasable contact plate; and

Fig. 5 is a schematic diagram showing an embodiment having a transmitter and a receiver.

20 DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 depicts the preferred embodiment of a lock monitor affixed to a lockable object, in this case a door. The body of the door is generally indicated at 10 with the bolt mechanism indicated at 11. The bolt
25 mechanism 11 includes a slidable bolt 12. The engaging face of the slidable bolt is shown at 13 and the mortise is shown at 15.

The status indicator 14, as shown in Fig. 1, is electrically operated and includes a battery operated
30 audible alarm. The alarm and the battery are located within the status indicator housing 16. In the preferred embodiment, the alarm and battery are connected by a simple series circuit that is also connected to the contact means 26. Conceivably the status indicator 14
35 could be simplified and its size reduced by means of a printed circuit. The status indicator may take a range of

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forms. Electrically operated status indicators could incorporate a range of audible and visual alarms including buzzers, lights or LED displays. A switch may be provided to disengage the status indicator when desired.

5 Mechanically operated status indicators could include flags or signs to indicate a change in status. The status indicator housing 16 may be fastened to the interior or exterior face of the door or window by fastening means. A range of fastening means is conceivable, including screws,

10 glue or two-sided tape.

The actuating arm 22 is affixed to the engaging face 13 of the slidable bolt 12. It is necessary that the mortise 15 have a sufficiently greater area than the area of the engaging face 13 so that the overhanging edge 24 of

15 the actuating arm 22 can freely enter and exit the mortise when the slidable bolt 12 is engaged and disengaged. Many slidable bolt and mortise locks have a mortise that is elongated in one direction. Door locks for instance would typically have a mortise elongated relative to the top and

20 bottom of the door. Consequently, in the case of a typical door lock, the actuating arm 22 may be affixed to the engaging face 13 of the slidable bolt 12 such that the overhanging edge 24 overhangs the upper or lower edge of the engaging face 13 relative to the door. An example of

25 a door where the overhanging edge 24 overhangs the lower edge of the engaging face 13 is shown in Fig. 1.

Extending from the housing 16 is a contact plate

20 one end of which is situated over the bolt mechanism 11 at the edge of the door adjacent to the engaging face 13

30 of the slidable bolt 12. The contact plate 20 carries the contact means 26. In the preferred embodiment, the contact plate is "L" shaped such that the plate may extend over the bolt mechanism 11 from the back of the housing 16. The part of the contact plate 20 that is situated over

35 the bolt mechanism 11 may be attached to the edge of the door to ensure that the contact means 26 remain in a position to engage the actuating arm 22. Attachment means

- 5 -

may include screws, glue, or two-sided tape. Other embodiments of the contact plate are conceivable including a contact plate that does not extend from the housing 16 but rather is attached directly to the bolt mechanism at the edge of the door or window adjacent to the slidable bolt 12. In such a case, the contact plate 20 must still be capable of communicating with the status indicator 14. This communication would most likely be provided by electrical wires running from the contact means 26 located on the contact plate 20 to the status indicator 14 located in the housing 16.

The contact plate 20, in the preferred embodiment, is integrally connected to the housing 16. In order that the lock monitor may be fitted to various lockable objects, such as right or left opening doors, the status indicator 14 may be inverted so that the contact plate 20 extends from the side of the housing 16 adjacent the bolt mechanism. In an alternative embodiment, the contact plate 20 may be releasably connected to the housing 16. A range of means for releasably connecting the contact plate to the housing are conceivable, including pin and socket connectors as shown in Fig. 4. Releasable connecting means may be located on each side of the housing so that the contact plate may be attached to the side of the housing adjacent to the bolt mechanism.

The contact plate 20 should be sufficiently thin to be able to slip into the gap normally present between a door and door jamb. In the preferred embodiment, the contact plate 20 has a thickness of approximately two millimetres. The contact means 26 may be recessed within the contact plate 20 to minimize the thickness of the contact plate.

The contact plate 20 has first and second circuit contacts 28 and 29. These circuit contacts act as a contact means 26. They are separated a distance not exceeding the width of the overhanging edge 24 of the actuating arm 22. The separation between the first and

- 6 -

second circuit contacts 28, 29 is insulated such that an electric current cannot pass between them through the contact plate 20. Each circuit contact 28, 29 is connected to a wire communicating with the status indicator 14. In the preferred embodiment, the circuit contacts are connected in a series circuit with the status indicator. The insulated separation between the circuit contacts 28, 29 creates an open circuit. When the slidable bolt 12 is disengaged from the mortise 15 the actuating arm 22 engages the circuit contacts 28, 29 and the circuit is closed. Once the circuit is closed, the status indicator depicted in Fig. 1 will indicate the change in status by way of an audible alarm.

The contact means 26 may take alternative forms provided that it accurately senses the actuating arm 22 when the slidable bolt 12 is disengaged from the mortise 15. For example the contact means could comprise a pair of contacts that are normally closed, but which are opened by the actuating arm 22. Also, it is conceivable that a mechanical status indicator may be used. In such a case, the contact means 26 must be capable of mechanically communicating with the status indicator when the lock is engaged or disengaged.

The preferred embodiment as shown in Fig. 1 depicts the actuating arm 22 mounted on the engaging face 13 of the slidable bolt 12. The overhanging edge 24 of the actuating arm is shown facing the bottom edge of the door 10 in Fig. 1, however, as stated earlier, it is conceivable that the actuating arm could overhang any edge of the engaging face 13 of the slidable bolt 12. The important requirement is that the overhanging edge 24 be in a position to engage the contact means 26 when the slidable bolt 12 is disengaged from the mortise. In particular, with respect to the preferred embodiment, the overhanging edge 24 must be in a position to engage the first and second circuit contacts 28, 29 when the lock is disengaged. The overhanging edge 24 of the actuating arm

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22 should be constructed from a resilient conducting material that allows a small current to pass between the first and second circuit contacts when the overhanging edge engages the contact point.

5 The actuating arm 22 may conceivably be an integral part of the engaging face 13 of the slidable bolt 12, however the preferred embodiment as shown in Fig. 1 depicts the actuating arm 22 as a simple modification of an existing lock mechanism. The actuating arm 22 may be
10 attached to the engaging face 13 of the slidable bolt 12 by fastening means. A range of fastening means is conceivable, including glue, two-sided tape, or a screw.

 The overhanging edge 24 of the actuating arm 22, as shown in Figs. 1 and 2, is divided into two forks 30
15 and 31. The forks are separated by a distance generally equal to the separation between the circuit contacts 28 and 29 so that they engage the circuit contacts when the slidable bolt 12 is disengaged. The forked overhanging edge 24 ensures a firm contact with each circuit contact
20 28, 29 in situations where the contact plate 20 is uneven, or where the engaging face 13 of the slidable bolt is not square with the edge of the door or window. The forks are not essential to the invention however, since the overhanging edge 24 could comprise a single piece capable
25 of contacting both circuit contacts 28, 29.

 The overhanging edge 24 of the actuating arm in the preferred embodiment is arched as is shown in Figs. 2 and 3. The arching enables the actuating arm to maintain contact with the circuit contacts 28, 29 even when the
30 slidable bolt 12 is recessed within the door 10.

 The lock monitor as described in the present invention comprises several elements that may be arranged in a number of ways. The arrangement shown in Fig. 1 is preferred for its ease in fitting the lock monitor to an
35 existing slidable bolt and mortise lock. More sophisticated arrangements are conceivable however. For instance, a transmitter 32 may be connected to the circuit

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including the first and second circuit contacts. The transmitter 32 could be located in a transmitter housing 34 fastened to the door by fastening means including glue, two-sided tape, or screws. The transmitter could in turn
5 communicate with a receiver 36 connected to the status indicator which would be located at an external location. This arrangement is depicted schematically in Fig. 5. It is conceivable that such an arrangement could have one centrally located status indicator that is responsible for
10 all the doors and windows in the home. Thus, at a glance, a person can determine if all the locks are engaged.

It is to be understood that what has been described are preferred embodiments of the invention. The invention nonetheless is susceptible to certain changes
15 and alternative embodiments fully comprehended by the spirit of the invention as described above and the scope of the claims set out below.

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I CLAIM:

1. A lock monitor for fitting to lockable objects that have locks that incorporate a bolt mechanism including a slidable bolt having an engaging face at a free end thereof and a mortise, where the opening of said mortise is larger in at least one dimension than the engaging face of said slidable bolt, said lock monitor comprising:
- 10 a status indicator;
a contact means mountable to said bolt mechanism adjacent to said slidable bolt and in communication with said status indicator; and
an actuating arm mountable on said slidable bolt, such that said actuating arm engages said
15 contact means when said slidable bolt is disengaged from said mortise, said engagement between said actuating arm and said contact means causing said status indicator to register a change in status of said lock.
- 20 2. A lock monitor as claimed in claim 1, wherein said actuating arm extends generally perpendicular to the direction of movement of said slidable bolt.
3. A lock monitor as claimed in claim 2, wherein said actuating arm is mountable upon said engaging face
25 of said slidable bolt.
4. A lock monitor as claimed in claim 3, wherein said status indicator is electrically operated.
5. A lock monitor as claimed in claim 4, wherein said contact means comprises first and second circuit
30 contacts, said first and second circuit contacts being connected in a circuit monitored by said status indicator, with said first and second circuit contacts being

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separated and insulated from each other such that said circuit remains open until the separation between said first and second circuit contacts is bridged by engagement with said actuating arm.

5 6. A lock monitor as claimed in claim 3, wherein said lock monitor further includes a status indicator housing.

7. A lock monitor as claimed in claim 6 wherein said status indicator includes fastening means for
10 fastening said status indicator housing to said lockable object.

8. A lock monitor as claimed in claim 7, wherein said contact means are carried by a contact plate.

9. A lock monitor as claimed in claim 8, wherein
15 said contact plate extends from said status indicator housing.

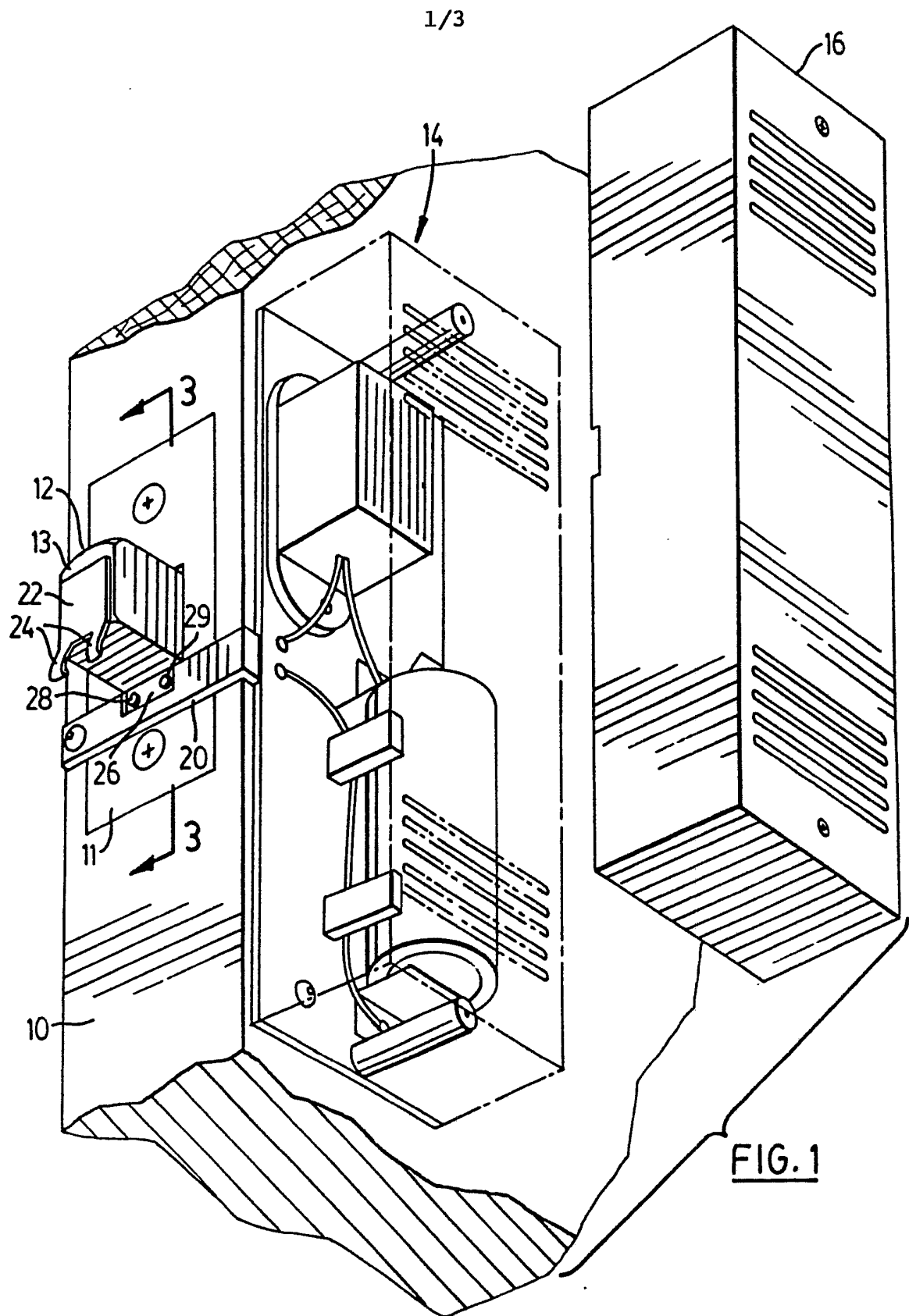
10. A lock monitor as claimed in claim 9, wherein said status indicator is electrically operated.

11. A lock monitor as claimed in claim 10, wherein
20 said contact means comprises first and second circuit contacts, said first and second circuit contacts being connected in a circuit monitored by said status indicator, with said first and second circuit contacts being separated and insulated from each other such that said
25 circuit remains open until the separation between said first and second circuit contacts is bridged by engagement with said actuating arm.

12. A lock monitor as claimed in claim 11, wherein said contact means are recessed within said contact plate.

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13. A lock monitor as claimed in claim 12, wherein said contact plate is "L" shaped such that it extends from said status indicator housing to a location adjacent to said engaging face of said slidable bolt.
- 5 14. A lock monitor as claimed in claim 13, wherein said contact plate is releasably connected to said status indicator housing.
- 15 15. A lock monitor as claimed in claim 14, wherein said actuating arm includes first and second forks, said first and second forks being spaced to engage said first and second circuit contacts when said slidable bolt is disengaged from said mortise.
- 15 16. A lock monitor as claimed in claim 15, wherein said actuating arm is arched at one end such that said arched end engages said first and second circuit contacts when said slidable bolt is disengaged from said mortise.
17. A lock monitor as claimed in claim 16, wherein said circuit is switchable so that said status indicator may be disengaged when desired.
- 20 18. A lock monitor as claimed in claim 5, further comprising a transmitter connected to said circuit and a receiver connected to said status indicator such that said transmitter will communicate with said receiver when said circuit is open or closed.
- 25 19. A lock monitor as claimed in claim 18, further comprising a transmitter housing.
20. A lock monitor as claimed in claim 19, wherein said transmitter and said transmitter housing are fastened to said lockable object by fastening means.



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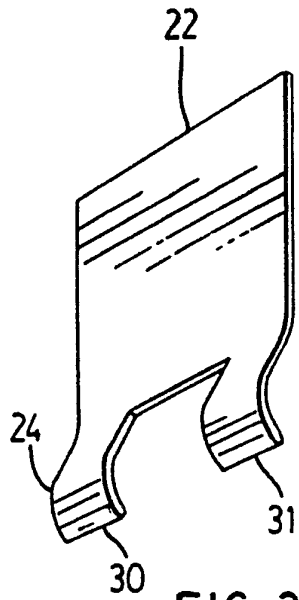


FIG. 2

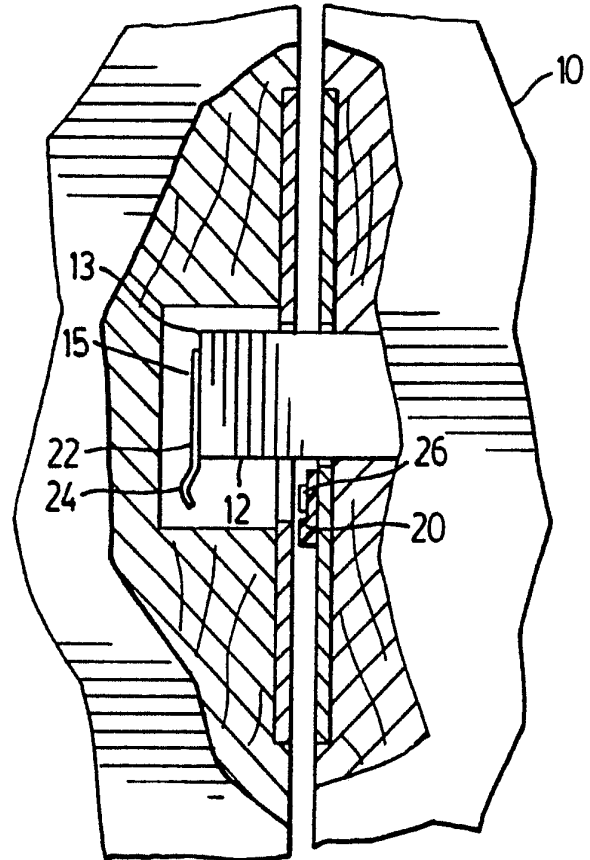


FIG. 3

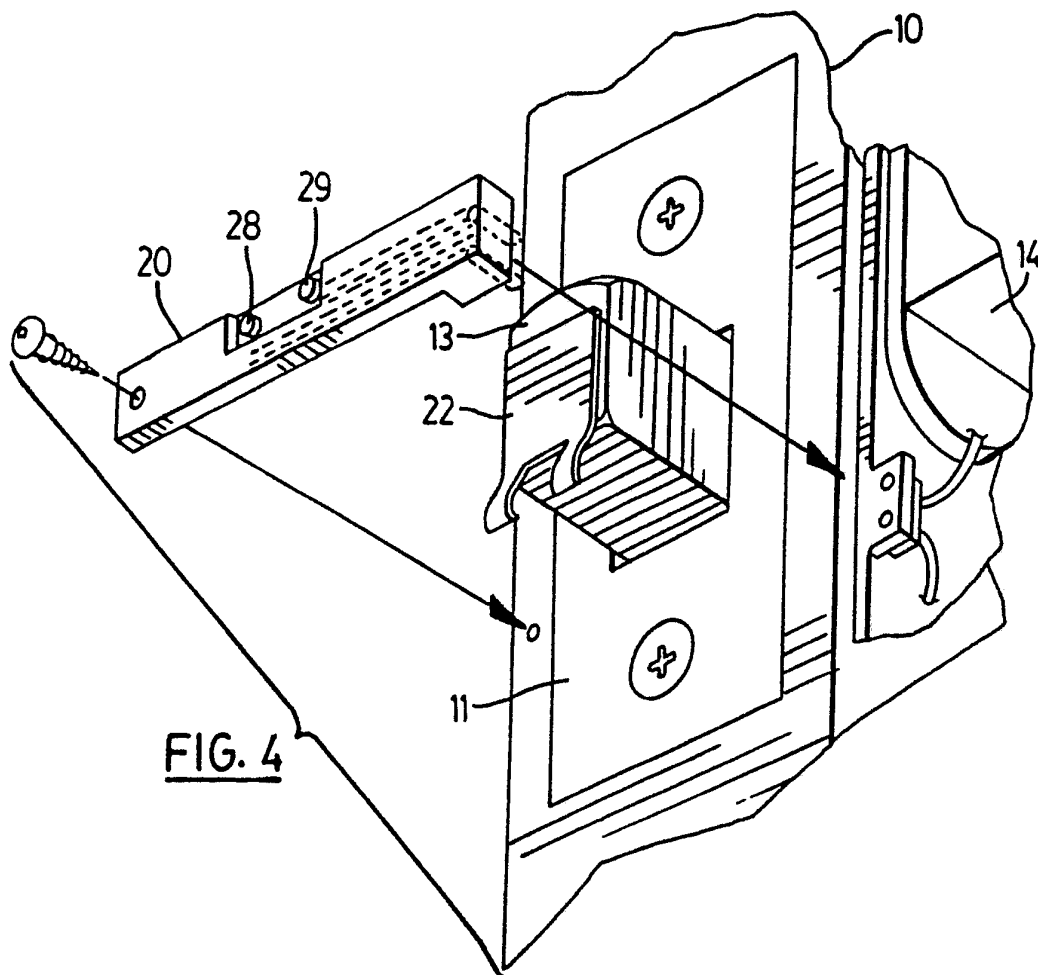
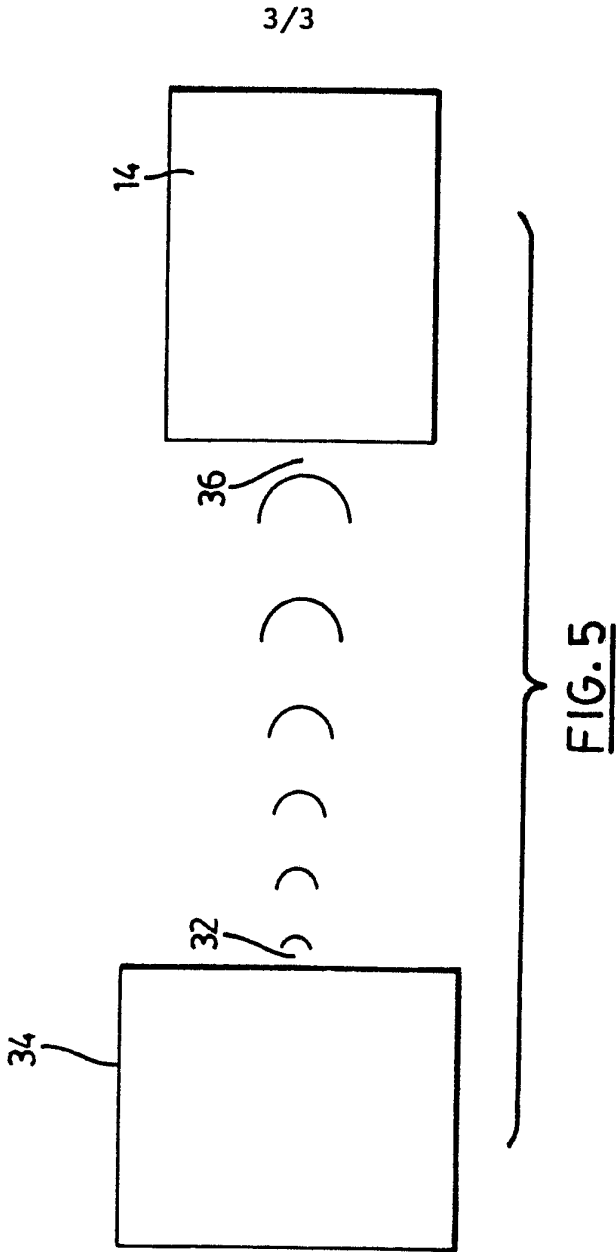


FIG. 4



INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 91/00385

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 E05B45/12

II. FIELDS SEARCHEDMinimum Documentation Searched⁷

Classification System

Classification Symbols

Int.Cl. 5

E05B

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸**III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹**

Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	US,A,3 259 707 (EICKHOFF) 5 July 1966 see the whole document ---	1-4, 6, 10, 11
A	FR,A,2 637 003 (HERTZ) 30 March 1990 see claim 1; figures 1, 2 ---	1
A	EP,A,0 131 398 (WILMOT BREEDEN) 16 January 1985 see page 4, line 13 - line 28; figure 2 ---	1

⁹ Special categories of cited documents: ¹⁰^{"A"} document defining the general state of the art which is not considered to be of particular relevance^{"E"} earlier document but published on or after the international filing date^{"L"} document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)^{"O"} document referring to an oral disclosure, use, exhibition or other means^{"P"} document published prior to the international filing date but later than the priority date claimed^{"T"} later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention^{"X"} document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step^{"Y"} document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.^{"&"} document member of the same patent family**IV. CERTIFICATION**

Date of the Actual Completion of the International Search

23 JANUARY 1992

Date of Mailing of this International Search Report

18. 02. 92

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

KOUSOURETAS I.

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

CA 9100385
SA 52544

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-3259707		None	
FR-A-2637003	30-03-90	None	
EP-A-0131398	16-01-85	GB-A- 2142077	09-01-85
		EP-A- 0148875	24-07-85
		WO-A- 8500192	17-01-85