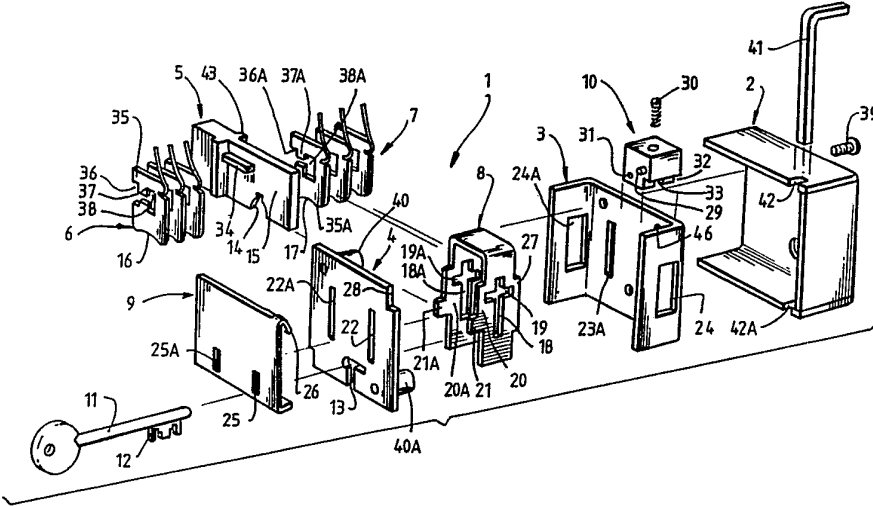


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

| | | |
|--|-----------|--|
| (51) International Patent Classification ⁵ : E05B 21/00 | A1 | (11) International Publication Number: WO 91/19873 (43) International Publication Date: 26 December 1991 (26.12.91) |
| (21) International Application Number: PCT/AU91/00253 (22) International Filing Date: 13 June 1991 (13.06.91) (30) Priority data: PK 0690 19 June 1990 (19.06.90) AU (71)(72) Applicant and Inventor: ROSS, Keith, James [AU/AU]; 23 Dorset Street, Glen Waverley, VIC 3150 (AU). (72) Inventors; and (75) Inventors/Applicants (for US only) : ROSS, Geoffrey, How- ard [AU/AU]; 96 Haversham Avenue, Wheelers Hill, VIC 3150 (AU). ROSS, Beverley, Ann [AU/AU]; 19 Bal- four Place, Noble Park North, VIC 3174 (AU). | | (74) Agent: JAMES MURRAY & CO.; 21 Queensberry Street, Carlton, VIC 3053 (AU). (81) Designated States: AT (European patent), AU, BE (Euro- pean patent), BR, CA, CH (European patent), DE (Eu- ropean patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (Eu- ropean patent), US. Published <i>With international search report.</i> |
| (54) Title: LEVER LOCK  | | |
| (57) Abstract A bolt-operated, vertical-lift lever lock (1) having a lockcase (3) or lock base and a lock cap (4), characterized by the provi- sion of a lever housing (8) attached to at least one of the lockcase or lock base and lock cap, wherein the lever housing is so con- structed that the or each lever (6, 7) may slide within the lever housing and be protected against unauthorised lateral or longitudi- nal forces applied to the bolt (5). | | |

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

| | | | | | |
|----|--------------------------|----|--|----|--------------------------|
| AT | Austria | ES | Spain | MG | Madagascar |
| AU | Australia | FI | Finland | ML | Mali |
| BB | Barbados | FR | France | MN | Mongolia |
| BE | Belgium | GA | Gabon | MR | Mauritania |
| BF | Burkina Faso | GB | United Kingdom | MW | Malawi |
| BG | Bulgaria | GN | Guinea | NL | Netherlands |
| BJ | Benin | GR | Greece | NO | Norway |
| BR | Brazil | HU | Hungary | PL | Poland |
| CA | Canada | IT | Italy | RO | Romania |
| CF | Central African Republic | JP | Japan | SD | Sudan |
| CG | Congo | KP | Democratic People's Republic of Korea | SE | Sweden |
| CH | Switzerland | KR | Republic of Korea | SN | Senegal |
| CI | Côte d'Ivoire | LI | Liechtenstein | SU | Soviet Union |
| CM | Cameroon | LK | Sri Lanka | TD | Chad |
| CS | Czechoslovakia | LU | Luxembourg | TG | Togo |
| DE | Germany | MC | Monaco | US | United States of America |
| DK | Denmark | | | | |

- 1 -

LEVER LOCK

Field of the Invention

This invention relates to a lever lock, in particular to a lever lock for use in a wide range of circumstances which has particular utility in safes and in like structures.

Background of the Invention

Lever locks have been developed over several hundred years. When used with corresponding keys, and with an appropriate selection of levers, very many combinations may be achieved.

As these locks have developed, so have techniques to pick or disable the locks. For example, locksmiths (and thieves) have access to picking tools which may be used to move levers one at a time past the gating stump so that the bolt may be withdrawn. Another technique, which is used by locksmiths, is to drill into a lock to remove the gating stump. Yet another technique is to force a flat tool into the lock between the bolt and the socket. The bolt may then be levered back or bent to such an extent that the door may be opened.

If wall safes are considered, locks may be fitted at the right side of a door, its left side or at its bottom or top. It is necessary, therefore, for a locksmith to carry several different types of lock to suit left-handed or right-handed persons.

SUBSTITUTE SHEET

- 2 -

It is an object of the present invention to make the unauthorised opening of locks significantly more difficult.

It is another object of the invention to provide a lock which may be used at a variety of locations on a door.

It is yet another object of the invention to provide a lock which may be used to lock into the tail bar of the main locking bolt for a bank safe, strong-room or vault.

It is a further object of this invention to provide a lock which may be used domestically, for example, a mortice lock.

Brief Description of the Drawings

The drawings accompanying this specification relate to a lever lock according to the invention. Thus:

Fig 1 is an exploded view of the lock;

Fig 1A is a reverse view of a lockbolt forming part of the lock according to Fig 1;

Fig 2 is an isometric view of a portion of the lock of Fig 1 shown in the assembled state;

Fig 3 is a partially cutaway, side sectional view of the lock of Figs 1 and 2 shown mounted on a door;

Fig 4 is a cross-sectional view of the mounted lock of Fig 3 taken along section line 4 ____ 4;

SUBSTITUTE SHEET

- 3 -

Fig 5 is a cross-sectional view of the mounted lock of Fig 3 taken along section line 5 ____ 5;

Fig 6 is a similar view of the lock of Fig 3 but with the lockbolt withdrawn;

Fig 7 is a cross-sectional view of the mounted lock of Fig 6 taken along section line 7 ____ 7;

Fig 8 is a cross-sectional view of the mounted lock of Fig 6 taken along section line 8 ____ 8;

Fig 9 is a similar view of the lock of Fig 3 but with a relocker arranged to block travel of the lockbolt;

Fig 10 is a cross-sectional view of the mounted lock of Fig 9 taken along section line 10 ____ 10;

Fig 11 is a cross-sectional view of the mounted lock of Fig 9 taken along section line 11 ____ 11;

Fig 12 is a similar view to Fig 3 but with the lockbolt reversed and the lock mounted at the right side of a door; and

Fig 13 is an isometric view of a mortice lock according to the invention.

It is to be understood that the embodiments shown are examples only and are not intended to limit the broad scope of the invention.

Brief Summary of the Invention

This invention relates to a lever lock having at least one lever operably connected to a bolt wherein the or each lever is protected by an internal lever housing through which the bolt penetrates.

SUBSTITUTE SHEET

- 4 -

Detailed Description of the Invention

This invention provides a bolt-operated, vertical-lift lever lock having a lockcase or lock base and a lock cap, characterized by the provision of a lever housing attached to at least one of the lockcase or lock base and lock cap, wherein the lever housing is so constructed that the or each lever may slide within the lever housing and be protected against unauthorised lateral or longitudinal forces applied to the bolt.

Preferably the lever housing is attached to both the lock case or lock base and the lock cap.

Preferably the lever housing is adapted to act as a guide for the or each lever as it is shifted from a first, inoperative position to a second, operative position and vice versa.

Preferably the lever housing is of box-like construction having two, three or four upstanding walls, wherein two opposing walls of the lever housing act as guides for the lever or levers.

Conveniently the lever housing is so constructed that the bolt may penetrate through a selected one of two opposing walls of the lever housing whereby the lock may be altered from a right-hand to a left-hand lock or vice versa.

Preferably at least one lever is located on either side of the bolt. More preferably the same number of levers is located on either side of the bolt.

SUBSTITUTE SHEET

- 5 -

In a preferred embodiment, the lever lock according to the invention is provided with a relocking device wherein the relocking device is adapted to be actuated by tampering with the lock.

Conveniently the relocking device comprises a relocker plate which protects the lock, which relocker plate is capable of actuating a spring-loaded relocker to hinder travel of the bolt.

If it is intended that the lever lock according to the invention should be removable and replaceable in another location, the lever lock may be provided with a retaining key adapted for engagement and disengagement of the lever lock with the element to be secured, such as a door.

In Fig. 1, numeral 1 refers to the lock according to the invention generally. A closed cover 2 is provided for lock 1. Lock case 3 co-operates with lockcap 4, housing lockbolt 5. Groups of three vertical lift levers 6 and 7 respectively are provided on corresponding sides of lockbolt 5. The groups of vertical lift levers 6 and 7 and lockbolt 5 are arranged to travel within lever housing 8. A relocker plate 9 located outside lockcap 4 co-operates with deadlock relocker 10 located between lockcase 3 and lockcap 4 and adjacent the tail 15 of lockbolt 5.

Key 11 having a bitted end 12 fits through keyhole 13 in lockcap 4 and co-operates with recess 14 in tail 15 of lockbolt 5. Bitted end 12 further co-operates with the bellies of lever groups 6 and 7, that is, bellies 16 and 17 respectively, to move them within lever housing 8.

SUBSTITUTE SHEET

- 6 -

Lever housing 8 is generally U-shaped and is provided with cruciform openings 18 and 18A in the respective legs of the U-shape. Cruciform openings 18 and 18A are provided with short horizontal openings 19 and 19A respectively. Each leg is provided with side projections 21 and 21A respectively. On the other side of each leg is provided an opposite projection 27 and 27A respectively (27A is not shown).

Projections 20 and 20A are adapted to fit into vertical slots 22 and 22A in lockcap 4. Further projections 21 and 21A on projections 20 and 20A respectively fit into slots 25 and 25A respectively in relocker plate 9.

Opposing projections 27 and 27A fit into vertical slots 23 and 23A respectively in lockcase 3. (vertical slot 23 is not shown).

Lockbolt 5 may be directed through either bolt openings 24 and 24A in opposite arms of generally U-shaped lockcase 3. Tail 15 of lockbolt 5 travels within lockcase 3 and expanded portion 43 of lockbolt 5 impinges against inner surfaces surrounding lock openings 24 and 24A respectively.

Relocker plate 9 is provided with a turned over portion 26 which is adapted to project through cutaway portion 28 in lockcap 4. Turned over portion 26 impinges on spring-loaded pin 29 mounted in relocker 10.

Relocker 10 is generally cube-shaped with a rebate 32 along one edge and a channel 33, perpendicular to rebate 32, cut into a lower face. A removable pin 31 bridges channel 33. Spring-loaded pin 30 is mounted in an upper face of relocker 10 and is arranged to impinge against an inner surface of

SUBSTITUTE SHEET

- 7 -

lockcase 2. As can best be seen in Fig 5, turned over portion 26 of relocker plate 9 is designed to compress the spring of spring-loaded pin 29 allowing relocker 10 to be forced downwardly by the spring of spring-loaded pin 30. In the lock configuration of Figs 1 to 11 inclusive, pin 31 is left in place. Relocker 10 drops behind the tail of lockbolt 15 until it is held by the action of spring-loaded pin 45 projecting the corresponding pin into hole 46 in lockcase 3.

As can be seen by reference to Figs 2 and 12, when the lockbolt 5 is reversed, pin 31 is removed to allow channel 33 to ride down over the tail of the lockbolt. The function of rebate 32 is to fit over expanded portion 43 of lockbolt 5.

Whether the lockbolt 5 is arranged to travel to the left or to the right, the function of relocker 10 is to travel downwards under the influence of spring-loaded pin 32 to jam either behind the lockbolt 5 or across it to prevent movement. This jamming action is actuated by rotation of relocker plate 9, under pressure from the tip of a drill, for example.

As can best be seen in Fig 2, numeral 34 refers to a gating stump which penetrates horizontal opening 19A in lever housing 8. The end of the gating stump 34 is shown fitting into depressed portion 36 of gate 35 in lever 6. When the lockbolt 5 is withdrawn by moving the levers 6 and 7 using bitted end 12 of key 11, the end of the gating stump 34 rides over elevated portion 37 of the gates in the lever group. On the other side (see Fig 1A) of the tail of lockbolt 5 is a shorter gating stump 34A which can ride over the portions corresponding to elevated portions 37 and into the portions

- 8 -

corresponding to depressed portion 38. (Portions 36A, 37A and 38A in gate 35A correspond to portions 36, 37 and 38 respectively.) This means that lever group 6 is compressed into lever housing 8 and lever group 7 is slack within lever housing 8. In these configurations of lever groups, the levers are held against undesired motion upwards, downwards or laterally. Elongation of gating stump 34 provides rigidity through interaction with lever housing 8.

The lock is held together by screws 39 (one is shown) which screw into ferrules 40 and 40A on lockcap 4.

Closed cover 2 may be welded or otherwise attached to a door. The body of the lever lock 1 may be retained within the closed cover 2 by means of a retaining key 41 which fits through corresponding holes 42 and 42A in closed cover 2. Numeral 44 indicates the outer skin of a door.

Turning to Fig 13, numeral 50 indicates a simplified version of the lock according to the invention, a mortice lock. Lever housing 51 supports and guides lever groups (not shown).

Numerals 52 and 52A indicate a lock cap and a lock base respectively.

Projections 53 and 53A on the lever housing 51 protrude through corresponding slots in lock cap 52 and lock base 52A. Screws 54 screw into threaded ferrules 55. Lockbolt 56 is shown in the locking position.

SUBSTITUTE SHEET

- 9 -

Turning now to the operation of the embodiment of Figs 1 to 12, Figs 3 to 5 inclusive show lockbolt 5 in the locked position with relocker 10 in the ready-to-use position. Figs 6 to 8 inclusive show the lockbolt 5 withdrawn and relocker 10 in the same position as in Figs 3 to 5. In Figs 9 to 11, the relocker 10 has operated, projecting down into the path of the tail of lockbolt 5 preventing it from being withdrawn.

Turning to the advantage of elongating gating stump 34 in the direction of movement of the bolt, this elongation provides extra strength to the assembly since the gating stump passes through horizontal openings 19 or 19A in lever housing 8. Thus, in use, with the bolt in the locked position, the gating stump is supported against a thrust from an inserted tool, up or down or sideways.

Bellies 16 and 17 of lever groups 6 and 7 respectively are curved, that is, the distal extremities to left and right are curved gently upwards. With conventional levers, in which the distal extremities are not curved, it is possible to observe wear patterns on the levers, with the consequence that the relative height of the levers may be estimated and the lock picked.

Relocker plate 9 is desirably case-hardened so that, if an attempt is made to drill into the lock, for example, to disable a gating stump, relocker plate 9 engages relocker 10.

When the lever lock according to the invention is assembled and the lockbolt is inserted into a socket in the jamb of a door, an attempt to force the lockbolt sideways is resisted by the lever housing 8 within the body of the lever lock.

- 10 -

The lever lock according to the invention is compatible with electronic security devices such as delay timers.

SUBSTITUTE SHEET

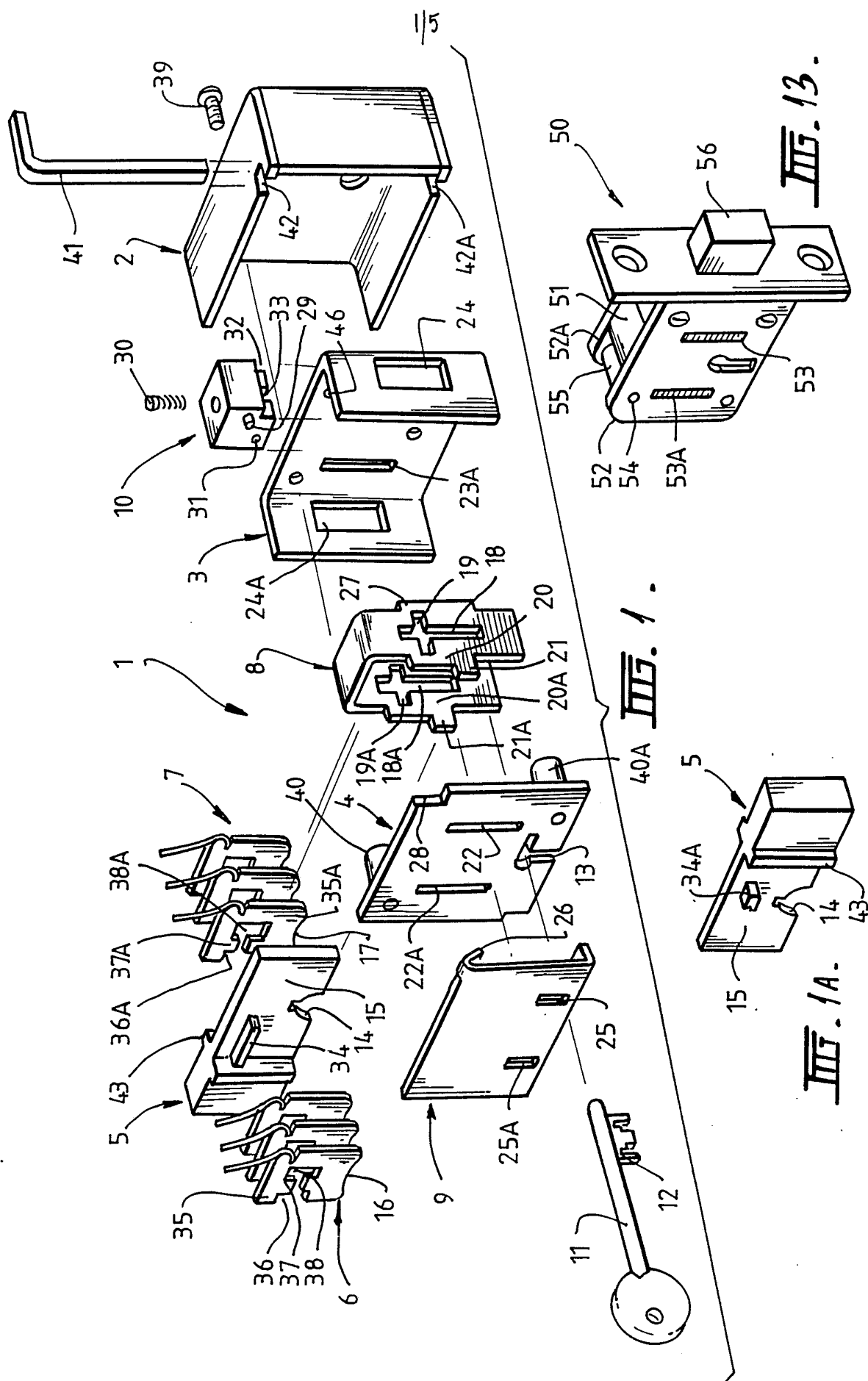
The claims defining the invention are as follows:-

1. A lever lock having at least one lever operably connected to a bolt wherein the or each lever is protected by an internal lever housing through which the bolt penetrates.
2. A bolt-operated, vertical-lift lever lock having a lockcase or lock base and a lock cap, characterized by the provision of a lever housing attached to at least one of the lockcase or lock base and lock cap, wherein the lever housing is so constructed that the or each lever may slide within the lever housing and be protected against unauthorised lateral or longitudinal forces applied to the bolt.
3. A lever lock as claimed in claim 1, characterized in that the lever housing is attached to both the lockcase or lock base and the lock cap.
4. A lever lock as claimed in claim 2, characterized in that the lever housing is adapted to act as a guide for the or each lever as it is shifted from a first, inoperative position to a second, operative position and vice versa.
5. A lever lock as claimed in claim 2, characterized in that the lever housing is of box-like construction having two, three or four upstanding walls, wherein two opposing walls of the lever housing act as guides for the lever or levers.

- 12 -

6. A lever lock as claimed in claim 5, characterized in that the lever housing is so constructed that the bolt may penetrate through a selected one of two opposing walls of the lever housing whereby the lock may be altered from a right-hand to a left-hand lock or vice versa.
7. A lever lock as claimed in claim 6, characterized in that at least one lever is located on either side of the bolt.
8. A lever lock as claimed in claim 7, characterized in that the same number of levers is located on either side of the bolt.
9. A lever lock as claimed in claim 1, characterized in that it is provided with a relocking device wherein the relocking device is adapted to be actuated by tampering with the lock.
10. A lever lock as claimed in claim 9, characterized in that the relocking device comprises a relocker plate which protects the lock, which relocker plate is capable of actuating a spring-loaded relocker to hinder travel of the bolt.

SUBSTITUTE SHEET



2/5

FIG. 2.

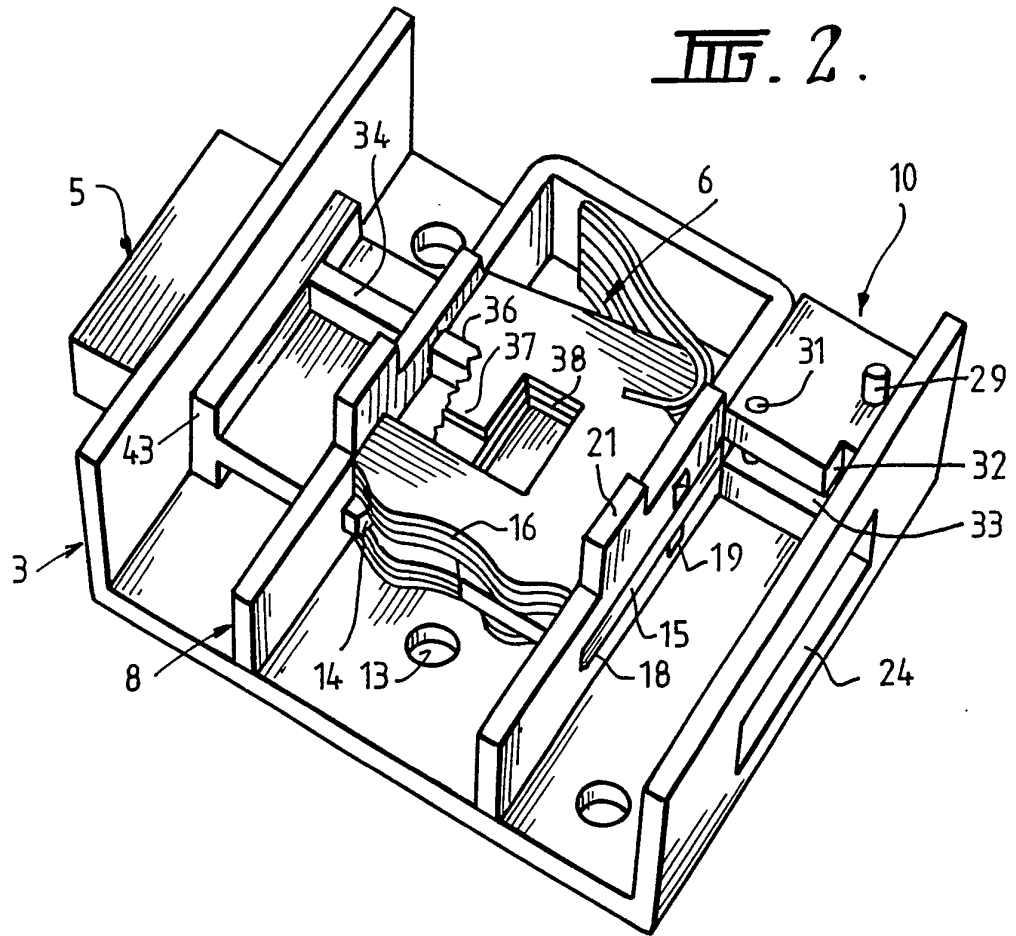
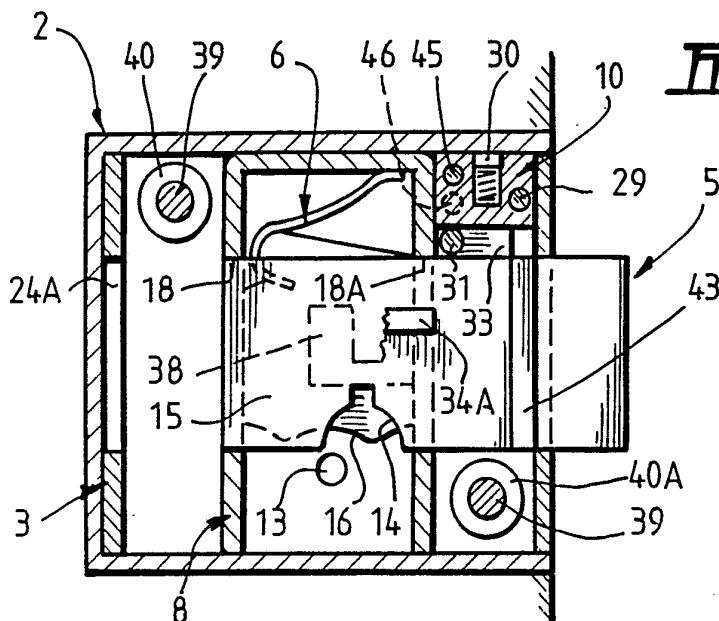


FIG. 12.



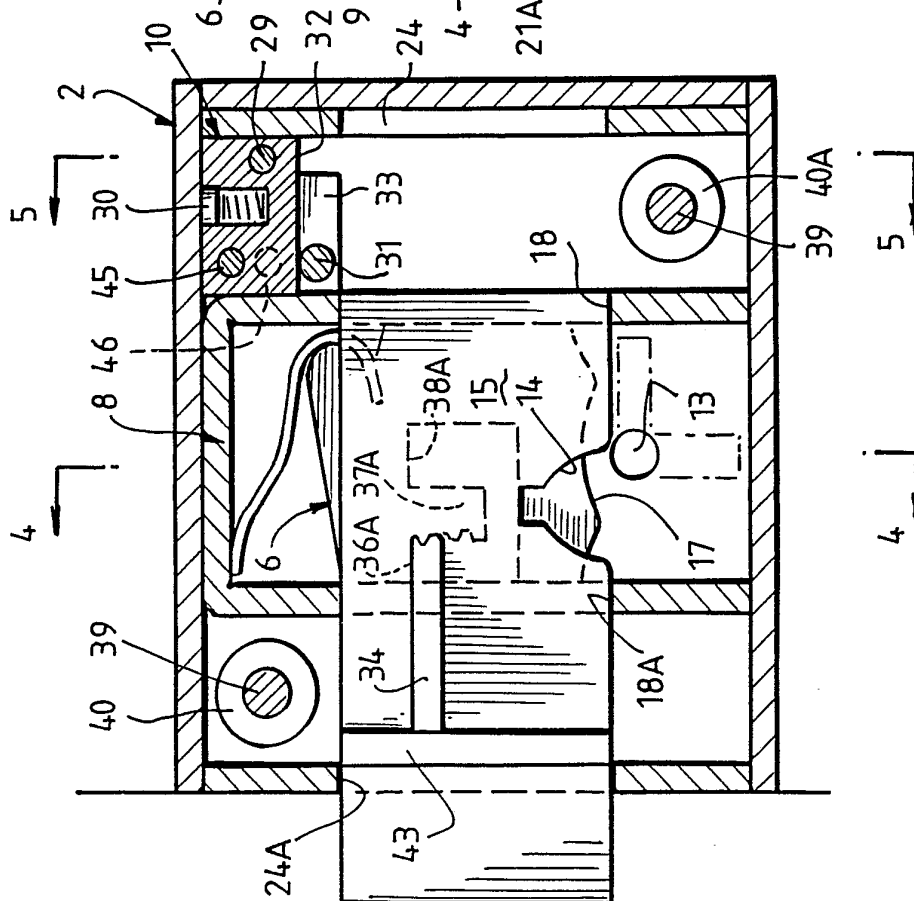


Fig. 3.

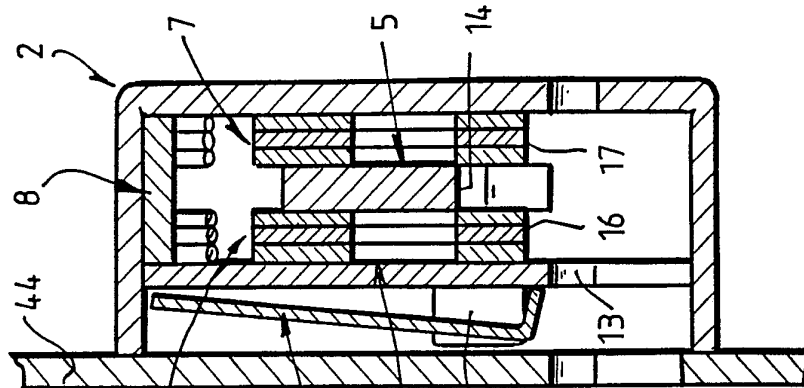


Fig. 4.

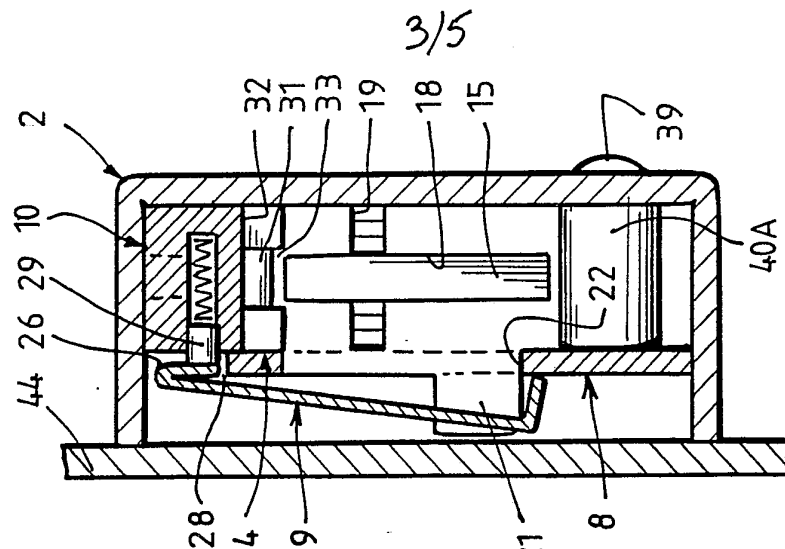
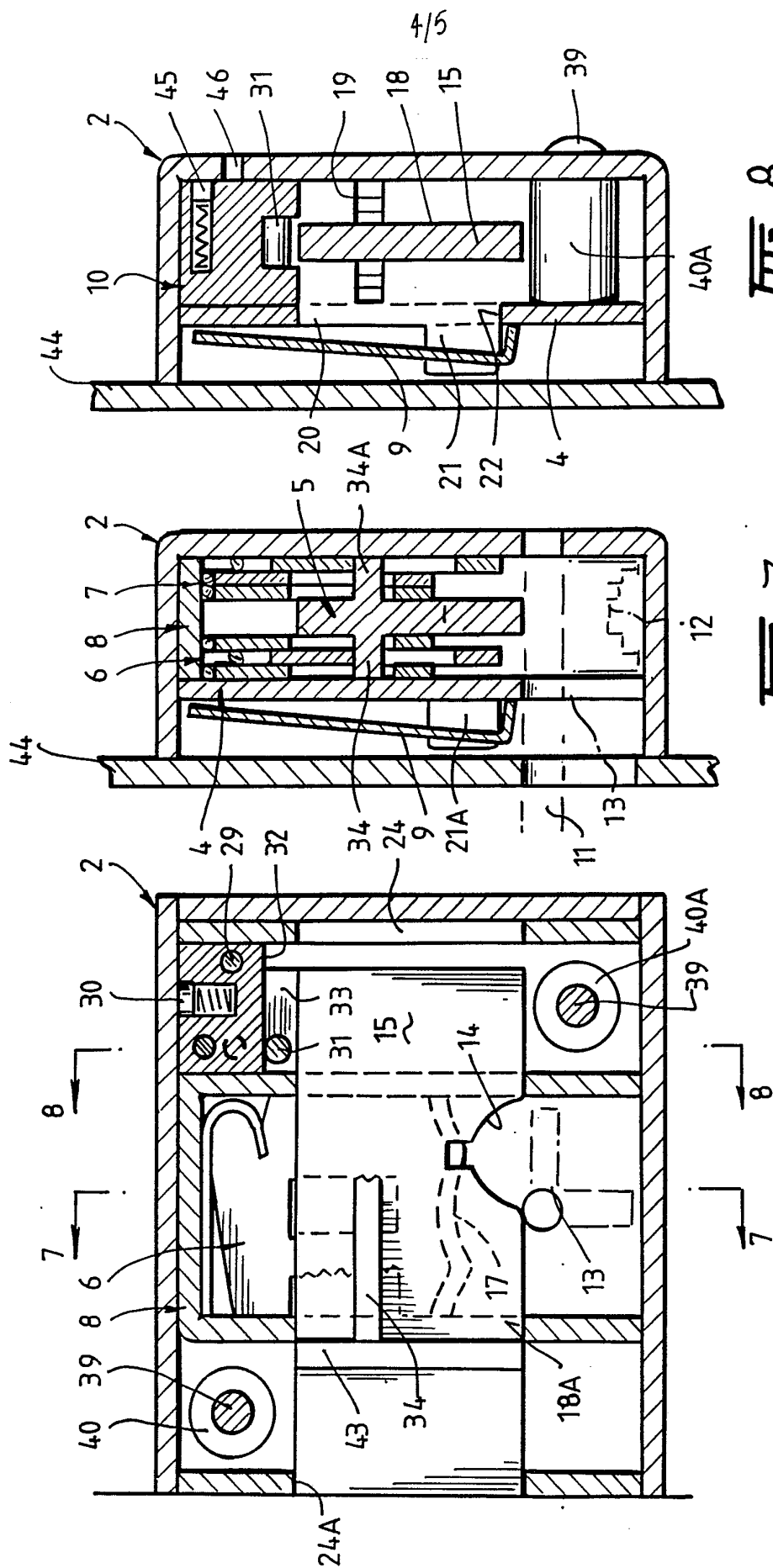
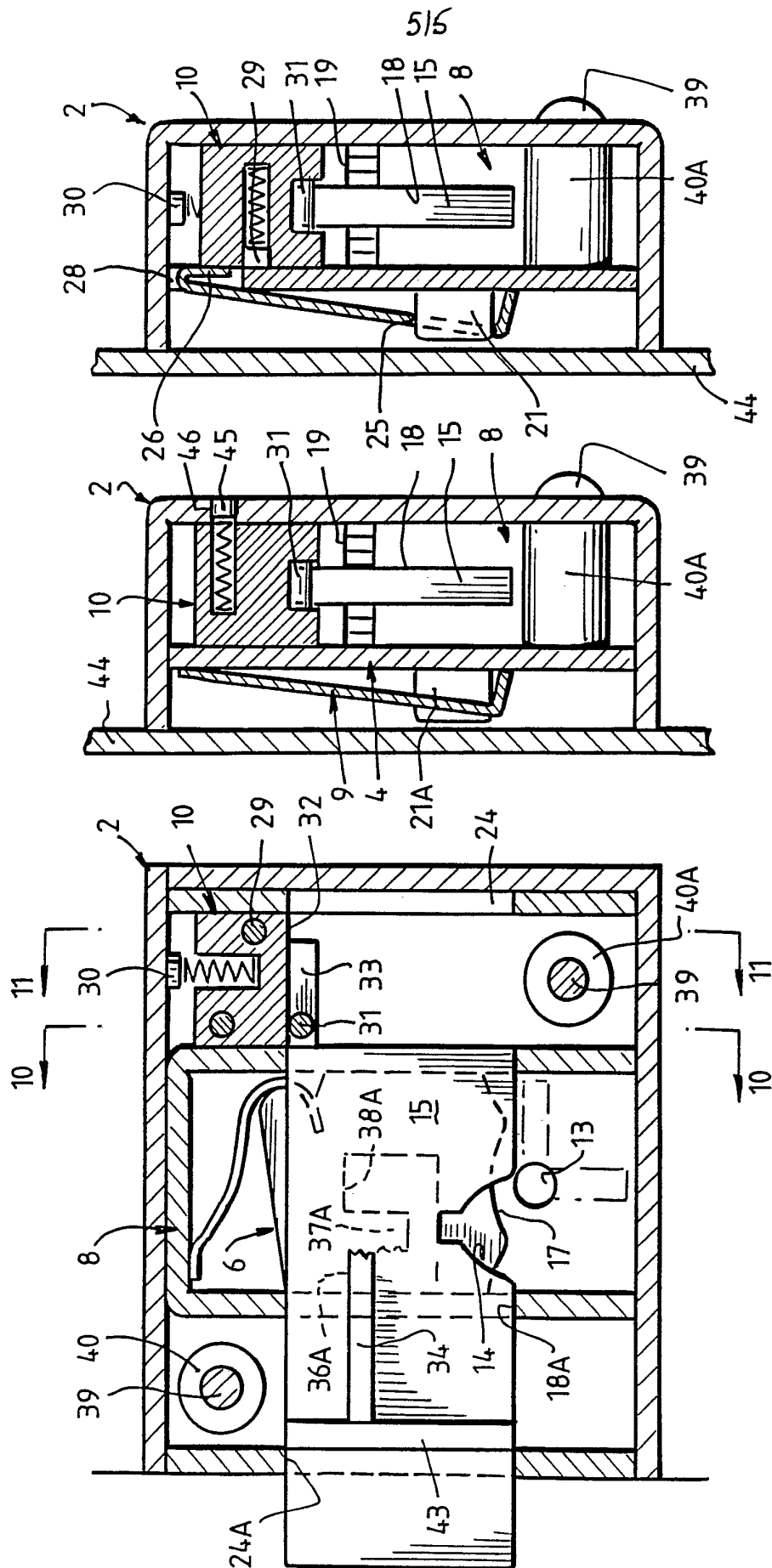



Fig. 5.





INTERNATIONAL SEARCH REPORT

International Application No. **PCT/AU 91/00253**

| | | |
|---|---|----------------------------|
| 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 E05B 21/00 | | |
| II. FIELDS SEARCHED | | |
| Minimum Documentation Searched 7 | | |
| Classification System | Classification Symbols | |
| IPC | E05B 21/00; 21/02 | |
| Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 8 | | |
| AU : IPC as above | | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT 9 | | |
| Category* | Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages 12 | Relevant to Claim No 13 |
| A | AU,B, 15312/83 (560266) (CHUBB & SON'S LOCK AND SAFE COMPANY LTD) 15 December 1983 (15.12.83) | |
| A | GB,A, 179256 (SCHULZ et al) 27 April 1922 (27.04.22) | |
| A | GB,A, 1146007 (LOWE AND FLETCHER LTD) 19 March 1969 (19.03.69) | |
| A | DE,A, 803581 (SCHWEPPER) 1 February 1951 (01.02.51) | |
| A | CH,A, 130109 (KROMER) 16 January 1929 (16.01.29) | |
| <p>* Special categories of cited documents: 10</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&" document member of the same patent family</p> | | |
| IV. CERTIFICATION | | |
| Date of the Actual Completion of the International Search 6 August 1991 (06.08.91) | Date of Mailing of this International Search Report 19 August 91 | |
| International Searching Authority Australian Patent Office | Signature of Authorized Officer  M.E. DIXON | |

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE 1

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim numbers ..., because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim numbers , because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim numbers ..., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4 (a):

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING 2

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
☐ No protest accompanied the payment of additional search fees.