

12

# EUROPEAN PATENT APPLICATION

21 Application number: 82302544.0

51 Int. Cl.<sup>3</sup>: **E 05 C 19/00**  
**E 06 B 5/10, E 05 D 5/06**

22 Date of filing: 19.05.82

43 Date of publication of application:  
 23.11.83 Bulletin 83/47

64 Designated Contracting States:  
 AT BE CH DE FR IT LI LU NL SE

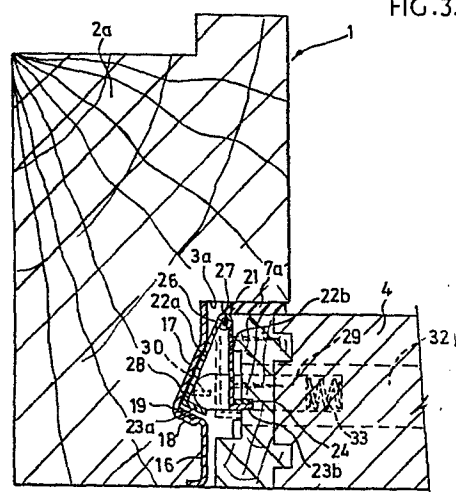
71 Applicant: Morgan, Laurence George  
 "The Gables" Rosemary Lane  
 Thorpe Egham Surrey(GB)

72 Inventor: Morgan, Laurence George  
 "The Gables" Rosemary Lane  
 Thorpe Egham Surrey(GB)

74 Representative: Godwin, Edgar James et al,  
 MARKS & CLERK 57-60 Lincoln's Inn Fields  
 London, W.C.2A 3LS(GB)

64 Locking device.

57 An elongate leaf (22a) is connected to a first member, e.g. a door (4), along substantially the whole of one longitudinal edge portion (26), the other longitudinal edge portion (28) being pivotable through an acute angle between an unlocking position and a locking position in which the edge portion (28) is capable of engaging an elongate step (18). The leaf (22a) is preferably pivoted by a bolt (29) connected to it.



- 1 -

LOCKING DEVICE

This invention relates to a locking device primarily, but not solely, for security doors, windows, and drawers. The term "door" is used herein to mean any openable closure for an aperture.

My specification GB 2 000 215 A describes a security door which  
5 closes against rebates in a door-frame and which has a core  
comprising a sheet steel layer covered on the outer side by  
a resilient rubber or cork layer. This door has been very  
successful in resisting attack from the outside. However,  
the ability of the door to resist attack from the inside is  
10 not dependent only on the strength of the door itself but also  
depends on the strength of the locking device and, to some  
extent, the hinges. A locking device comprising a single bolt,  
which engages in a recess in the door-frame, has very little  
resistance to breaking-open of the door from the inside. It  
15 is expensive to provide a plurality of bolts. What is desired  
is a locking device which is simple to construct and to operate  
and which provides enhanced resistance to breaking-open.

In general terms, the present invention provides a locking  
device comprising an elongate leaf, means for connecting the  
20 leaf to a first member along substantially the whole of a first  
one of the two longitudinal edge portions of the leaf, the  
second of the two longitudinal edge portions being pivotable  
about an axis parallel to the edge portions through an acute

angle between an unlocking position and a locking position in which the second edge portion is capable of engaging an elongate step on a second member to prevent motion of the members past each other, and means for pivoting the second edge portion  
5 between the said positions.

In one aspect the invention provides a locking arrangement comprising the said locking device in combination with the said members.

The resistance of the locking device to breaking-open depends,  
10 among other things, on the strength of the leaf, the strength of the connecting means, and the length of the leaf. Thus, the required resistance can simply be achieved by making the leaf of sufficient length; increasing the length enhances the distribution of shock waves emanating from a percussion attack.

15 Preferably, the first edge portion is connected to the first member by a hinge. Alternatively, it would be possible for the first edge portion to be fixed to the first member, the leaf being flexible (preferably resiliently) about a longitudinal axis to provide the necessary pivotability of the second edge  
20 portion.

The pivoting means may comprise resilient means urging the leaf into one said position and a bolt for pushing the leaf into the other said position, or may comprise two bolts pushing

the leaf from opposite sides. However, in a preferred embodiment a single bolt (e.g. a spring-biassed latch bolt) for pushing the leaf in one direction is connected to the leaf so as to be able to pull the leaf in the opposite direction by operation  
5 of a key or knob device.

In its application to a door, the invention provides the combination of the locking device, a door, and a door-frame, the door constituting one of the said first and second members (preferably the first), and the frame constituting the other. In a preferred  
10 embodiment, designed to resist attack from both sides of the door, the door closes against rebates in the frame, resiliently deformable material being interposed between the inner side of the door and the opposed surfaces of the frame; the step on the second member is faced with resiliently deformable material;  
15 the said first member constitutes a vertical part of the door, the opposite vertical part of the door being connected to the frame by a hinge extending along a major part (preferably the whole of) the height of the door, the leaves of the hinge having flanges which project into the door and into the frame and at least one  
20 of which is covered on only one side with resiliently deformable material; and the door has a core layer comprising a layer of sheet metal and a layer of resiliently deformable material. The door (and the frame) may have the structure described in my specification GB 2 000 215 A; however, since the door is  
25 now to resist attack from both sides, it is preferable for a layer of resiliently deformable material to be positioned

on each of the sides of the sheet metal layer. If the door is attacked with a sledge-hammer, for example, the resiliently deformable material will dissipate much of the shock, thus reducing damage to the rigid parts.

5 The invention will be described further, by way of example, with reference to the accompanying drawings, in which

Figure 1 is a fragmentary exploded perspective view of a locking device;

10 Figure 2 is a horizontal section through part of the locking device;

Figure 3 is a horizontal section through a door and a door-frame provided with the locking device;

Figure 4 is a fragmentary exploded perspective view of another embodiment of locking device;

15 Figure 5 is a horizontal section through this embodiment; and

Figure 6 is a horizontal section through an alternative embodiment of a door hinge.

Referring first to Figures 1 to 3, the door-frame 1 has two door-posts 2a, 2b provided with rebates 3a, 3b. The door 4 is  
20 mounted on a hinge 6 on the post 2b and closes against rubber strips 7a, 7b fixed in the rebates 3a, 3b. The hinge 6 is a

piano-type hinge, preferably extending substantially the whole height of the door. Its leaves 8a, 8b are bent to form flanges 9a, 9b which project into the door 4 and the door-post 2b respectively. The inner side of the flange 9a and the outer side of the flange 9b are covered by respective rubber strips 11a, 11b. The door 4 is mainly of wood and has a core layer 12 comprising a steel sheet 13 on the inner side and a layer 14 of fire-resistant cork on the outer side.

In the rebate 3a the post 2a is provided with a striking plate 16 which cooperates with the locking device (described below) mounted on the door. The striking plate 16 is, for example, 60 cm in height and defines an elongate recess delimited by a sloping base 17 and a step 18 faced with a rubber strip 19. The base 17 slopes at an angle of about 25° relative to the perpendicular to the door (when closed).

The locking device mounted on the door 4 comprises a piano hinge 21 more or less equal in height to the striking plate 16. The hinge 21 has two leaves 22a, 22b, one being narrower than the other. The narrower leaf 22b is screwed to the door at points spaced along its height, and its free edge has a flange 23b which projects into the door and whose inner side is covered by a rubber strip 24. The inner longitudinal edge portion 26 of the leaf 22a is connected along the whole of its length to the leaf 22b by the hinge pin 27 so that the outer longitudinal edge portion 28 is pivotable through about 25° between an unlocking

position (shown in broken line in Figure 3) in which it is clear of the striking plate 16 and a locking position (full line) in which it is capable of engaging the step 18 to prevent the door from opening. The edge portion 28 has a flange 23a which increases the friction between the leaf 22a and the step 18 and thus hinders escape of the leaf 22a from the recess in the striking plate 16 if force is applied to the inside of the door 4.

The movement of the leaf 22a between the unlocking and locking positions is controlled by a bolt 29 connected to the leaf 22a by a screw 30 extending through a slot 31 in the leaf 22a. The bolt 29 extends from a lock 32 embedded in the door and can be locked in the projecting position by a conventional mechanism (not shown). The bolt 29 is a latch bolt which is biased by a spring 33 (shown schematically) into the projecting position in which it pushes against the leaf 22a. Thus, as the door 4 is closed the leaf 22a will initially be in the locking position, it will then be forced towards the door against the action of the spring 33 on contact with the striking plate 16, and finally it will automatically engage in the recess in the striking plate 16.

The door is unlocked by withdrawing the bolt 29 by means of a conventional mechanism (not shown) so that the head of the screw 30 pulls the leaf 22a into the unlocking position. It is to be noted that any violent attack directed at the locking

device would tend to break the connection between the bolt 29 and the leaf 22a by means of the screw 30, so that it would then become virtually impossible to free the leaf 22a by brute force alone, thereby defeating the attack. The greater the  
5 force applied to the inner side of the door 4, the more firmly is the leaf 22a engaged with the step 18, so that the leaf is prevented from escaping. The sloping base 17 of the recess in the striking plate 16 supports the leaf 22a against bending.

Referring now to Figures 4 and 5, which illustrate an alternative  
10 embodiment of the locking device, parts which are similar to those described above will be denoted by the same reference numerals. In this embodiment the bolt 29 is bifurcated and its upper and lower limbs 29a, 29b have aligned vertical holes 41a, 41b receiving a pin 42 which passes through a bracket 43  
15 fixed to the leaf 22a, thereby connecting the bolt 29 to the leaf 22a. The lock 32 in this embodiment is a mortice lock.

The step 18 of the striking plate 16 is not faced with a rubber strip, but the inner edge of the striking plate 16 is formed with a flange 46 which extends into a slot containing a rubber  
20 strip 47 behind the flange 46.

Apart from the features just described, the locking device shown in Figures 4 and 5 is similar to that shown in Figures 1 to 3.

Figure 6 illustrates an alternative form of hinge 6', which

- 8 -

is again a piano-type hinge extending substantially the whole height of the door. The leaf 48a adjacent the door 4 is bent in the middle to form a flange 49a which projects into a recess in the door, its inner side being covered by a rubber strip 51a in the recess. The other leaf 48b is bent at its free end to form a flange 49b which projects into a recess in the door-post 2b, its outer side being covered by a rubber strip 51b. This hinge is easier to manufacture and fit and uses less material than the hinge 6 shown in Figure 3

CLAIMS

1. A locking device comprising an elongate leaf (22a), means for connecting the leaf (22a) to a first member along substantially the whole of a first one of the two longitudinal edge portions (26,28) of the leaf (22a), the second of the two longitudinal edge portions (26,28) being pivotable about an axis parallel to the edge portions through an acute angle between an unlocking position and a locking position in which the second edge portion (28) is capable of engaging an elongate step (18) on a second member to prevent motion of the members past each other, and means for pivoting the second edge portion (28) between the said positions.
2. A locking device as claimed in claim 1, in which the connecting means comprises a hinge (21).
3. A locking device as claimed in claim 1 or 2, in which the pivoting means comprises a bolt (29) movable transversely with respect to the leaf (22a) so as to push the leaf (22a) from one of the said positions to the other.
4. A locking device as claimed in claim 3, in which the bolt is a spring-loaded latch bolt.
5. A locking device as claimed in claim 3 or 4, in which the bolt (29) is connected to the leaf (22a) so as to be able to

pull the leaf (22a) from the said other position to the said one position.

6. A locking device as claimed in claim 5, in which the bolt (29) is bifurcated, having two limbs (29a,29b), and the bolt (29) is connected to the leaf (22a) by a bracket (43) fixed to the leaf (22a) and a pin (42) which extends between the two limbs (29a,29b) of the bolt (29) and through the bracket (43).

7. A locking device as claimed in any of claims 1 to 6, in which the second edge portion (28) has a terminal flange (23a) projecting in the direction from the locking position to the unlocking position.

8. A locking device as claimed in any of claims 1 to 7, in which the acute angle is less than 45°.

9. A locking device as claimed in any of claims 1 to 8, in combination with the said first and second members, one member constituting part of a door (4), the other member constituting part of a door-frame (1).

10. A locking device as claimed in claim 9, in which the step (18) is faced with resiliently deformable material (19).

11. A locking device as claimed in claim 9 or 10, in which the said first member constitutes a vertical part of the door (4), the opposite vertical part of the door (4) being connected to the frame (1) by a hinge (6;6') extending along a major part of the height of the door (4).

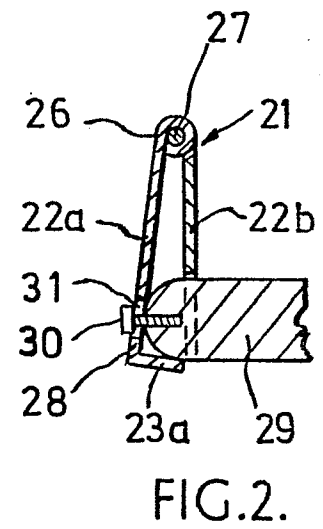
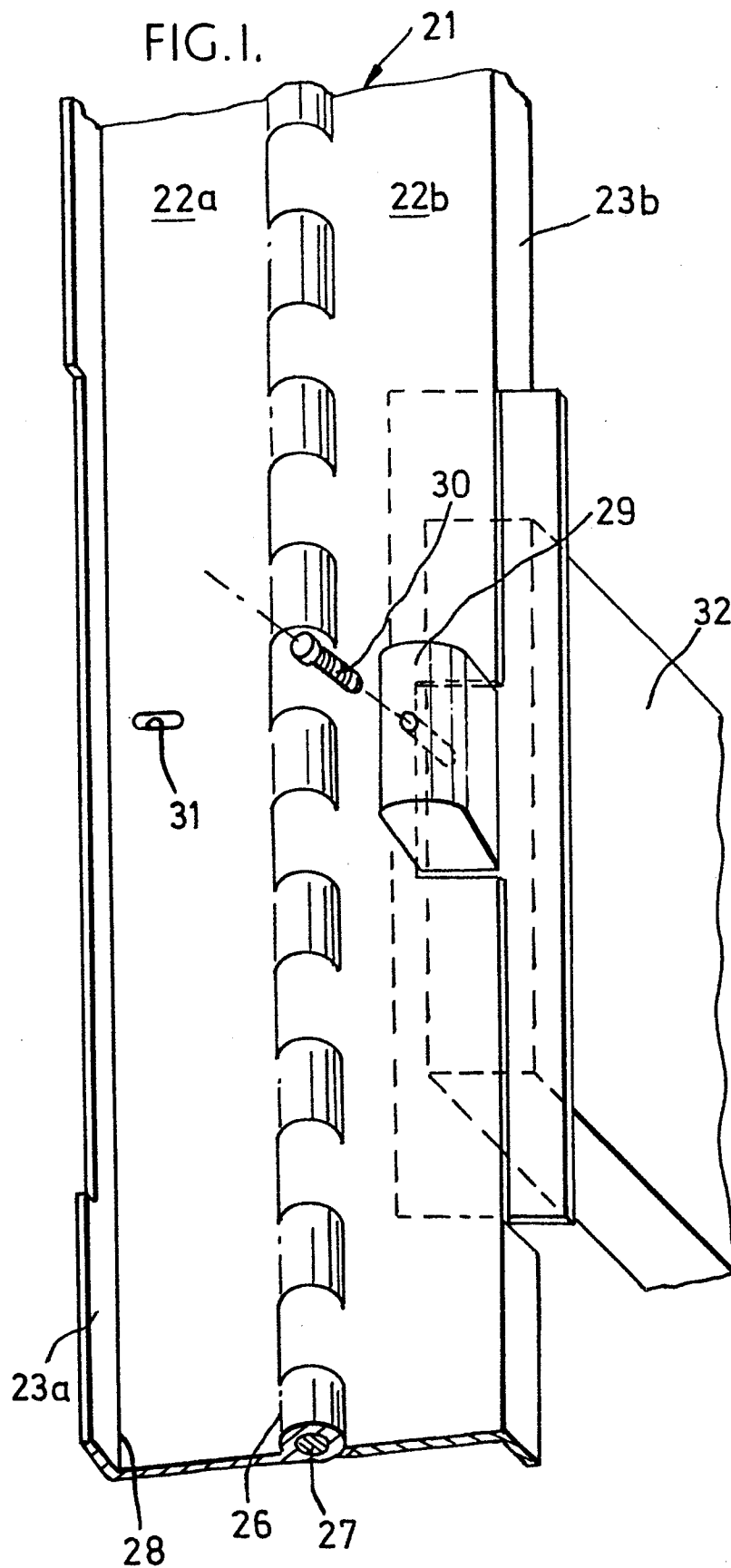
12. A locking device as claimed in claim 11, in which the said hinge (6;6') has two leaves (8a,8b;48a,48b) having respective flanges (9a,9b;49a,49b) projecting into the door (4) and the frame (1) respectively.

13. A locking device as claimed in claim 12, in which at least one of the flanges (9a,9b;49a,49b) is covered on only one side with resiliently deformable material (11a,11b;51a,51b).

14. A locking device as claimed in any of claims 9 to 13, in which the door (4) closes against rebates (3a,3b) in the frame (1), resiliently deformable material (7a,7b) being interposed between the inner side of the door (4) and the opposed surfaces of the frame (1).

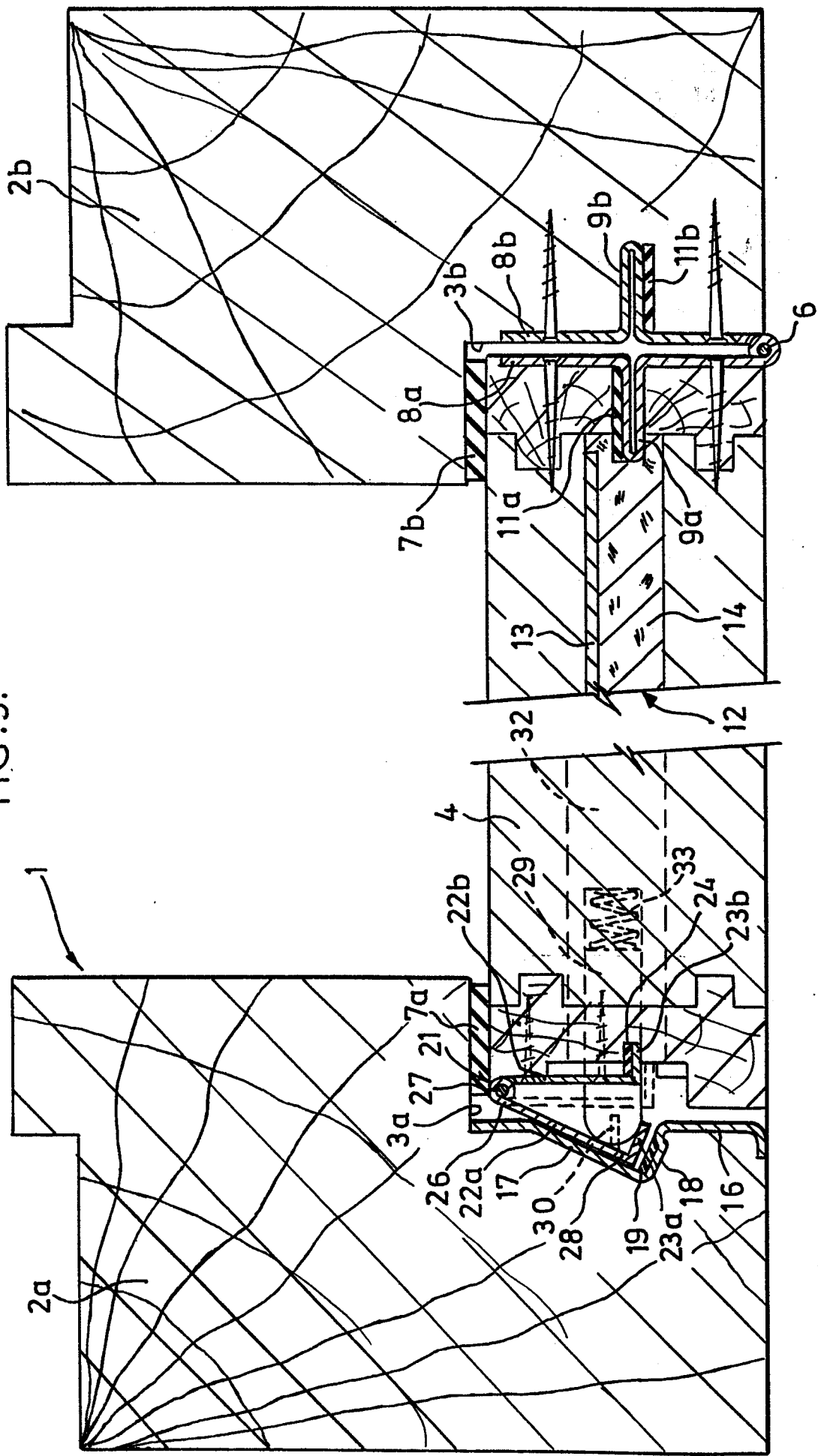
15. A locking device as claimed in any of claims 9 to 14, in which the door (4) comprises a core layer (12) and a layer of wood on each side of the core layer (12), the core layer (12) comprising a layer (13) of sheet metal and a layer (14) of resiliently deformable material.

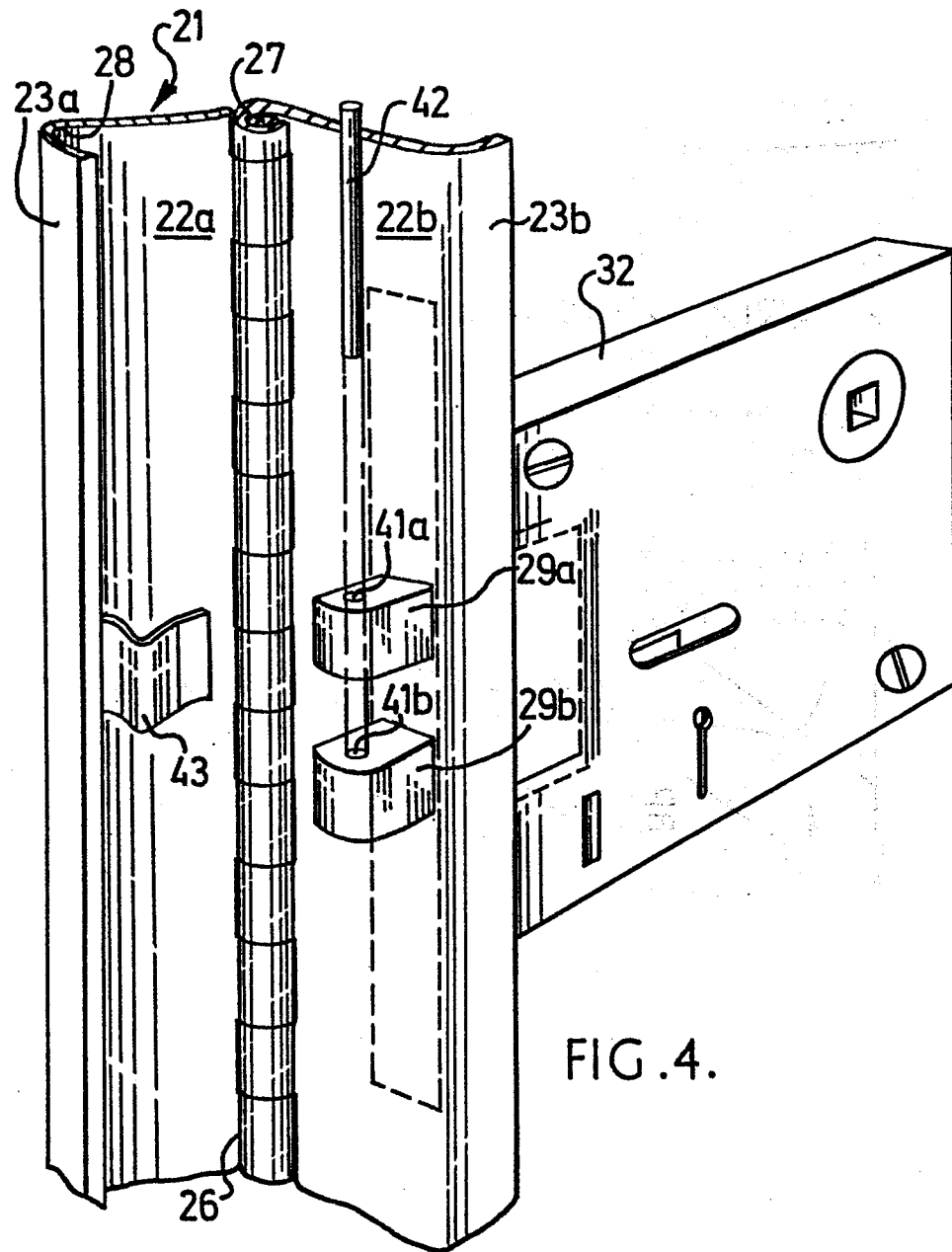
16. A hinge for connecting a door (4) to a door-frame (1), the hinge comprising two elongate leaves (8a,8b;48a,48b) which are hinged together along adjacent longitudinal edges, characterised in that the leaves (8a,8b;48a,48b) have respective flanges (9a9b;49a,49b) which are to project into the door (4) and the frame (1) respectively.



2:4

FIG. 3.





4:4

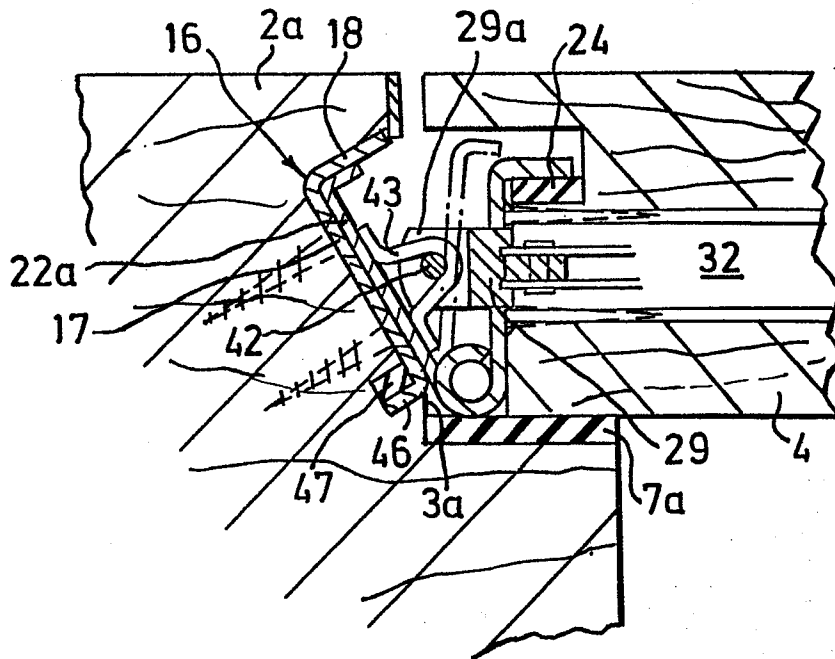


FIG. 5.

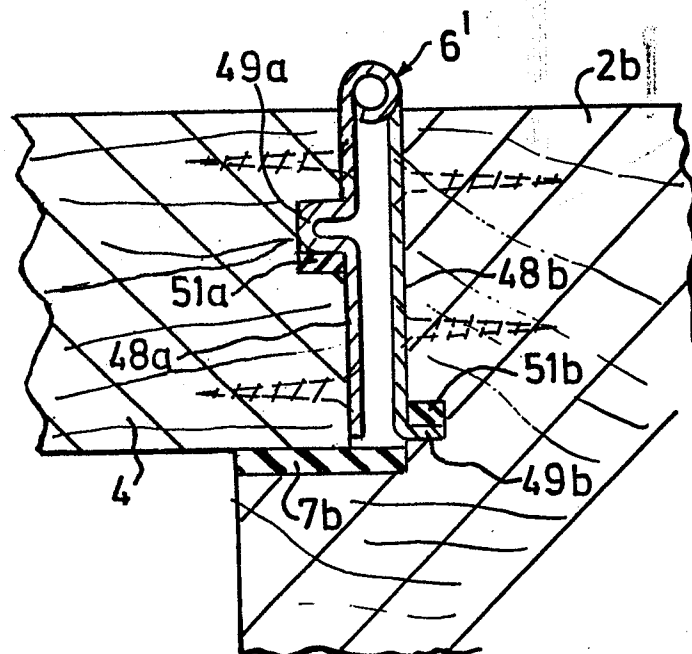


FIG. 6.



European Patent  
Office

# EUROPEAN SEARCH REPORT

0094461

Application number

| DOCUMENTS CONSIDERED TO BE RELEVANT                                              |                                                                               |                                                                         | EP 82 30 2544                                  |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------|
| Category                                                                         | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim                                                       | CLASSIFICATION OF THE APPLICATION (Int. Cl. 3) |
|                                                                                  | NL - C - 46 685 (VAN 'T HAG)                                                  |                                                                         |                                                |
| X                                                                                | * the whole document *                                                        | 1,2,7-9                                                                 |                                                |
| Y                                                                                | --                                                                            | 11-13                                                                   | E 05 C 19/00<br>E 06 B 5/00<br>E 05 D 5/06     |
|                                                                                  | US - A - 1 723 305 (SIPE)                                                     |                                                                         |                                                |
| X                                                                                | * the whole document *                                                        | 1,3-5,<br>7-10                                                          |                                                |
| Y                                                                                | --                                                                            | 11-13                                                                   |                                                |
|                                                                                  | DE - C - 225 909 (HIERONIMI)                                                  |                                                                         |                                                |
| X                                                                                | * the whole document *                                                        | 16                                                                      |                                                |
| Y                                                                                | --                                                                            | 11-13                                                                   |                                                |
|                                                                                  | DE - A - 2 936 603 (SCHMALE)                                                  |                                                                         |                                                |
| X                                                                                | * the whole document *                                                        | 16                                                                      |                                                |
| Y                                                                                | -----                                                                         | 11-13                                                                   | E 05 C<br>E 05 D                               |
| The present search report has been drawn up for all claims                       |                                                                               |                                                                         |                                                |
| Place of search                                                                  |                                                                               | Date of completion of the search                                        | Examiner                                       |
| The Hague                                                                        |                                                                               | 21-03-1983                                                              | VAN BOGAERT                                    |
| CATEGORY OF CITED DOCUMENTS                                                      |                                                                               |                                                                         |                                                |
| X : particularly relevant if taken alone                                         |                                                                               | T : theory or principle underlying the invention                        |                                                |
| Y : particularly relevant if combined with another document of the same category |                                                                               | E : earlier patent document, but published on, or after the filing date |                                                |
| A : technological background                                                     |                                                                               | D : document cited in the application                                   |                                                |
| O : non-written disclosure                                                       |                                                                               | L : document cited for other reasons                                    |                                                |
| P : intermediate document                                                        |                                                                               | & : member of the same patent family, corresponding document            |                                                |



## CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

## X LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions,

namely:

1. claims 1-15; locking device
2. claim 16; hinge

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims: