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(72) Inventors:  
• **Harrison, Peter James**  
**Darlaston, West Midlands WS10 7QT (GB)**  
• **Fletcher, Peter**  
**Coseley, West Midlands WV14 8YT (GB)**

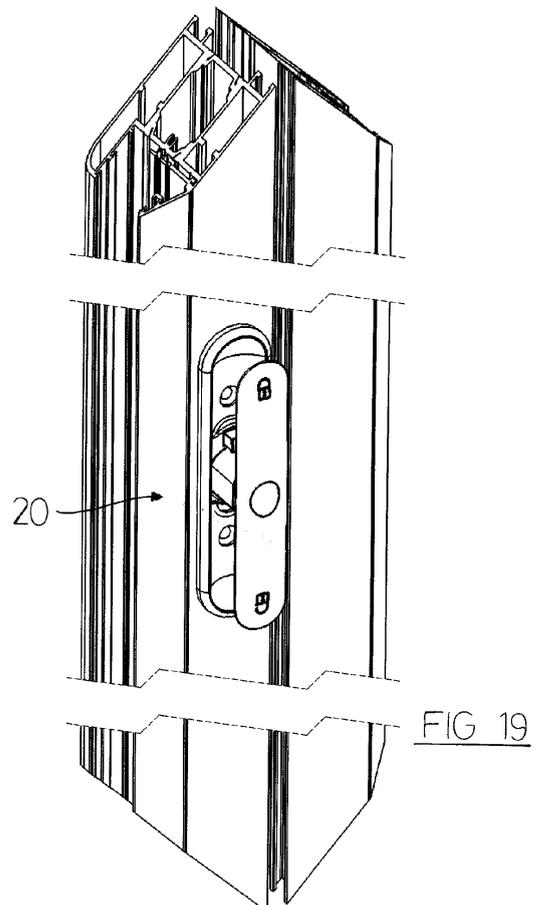
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(74) Representative: **Gee, Steven William**  
**D.W. & S.W. Gee**  
**1 South Lynn Gardens**  
**London Road**  
**Shipston on Stour, Warwickshire CV36 4ER (GB)**

(71) Applicant: **J. Banks & Co. Ltd.**  
**Tipton**  
**West Midlands DY4 9LE (GB)**

(54) **Operating handle for a folding/sliding door**

(57) This invention relates to an operating handle (20; 120; 220) for a folding/sliding door (1, 2, 3). The operating handle has a mounting part (42; 142; 242) by which it may be secured to a part of the folding/sliding door in use, and a handle part (22; 122; 222) which is mounted upon the mounting part. The handle part is movable relative to the mounting part between a storage position and an operating position. The handle part is engageable with an operating shaft (32; 132) which in use engages a locking mechanism of the folding/sliding door. The handle part has a manually-grippable part (24; 124; 224) which extends to opposed sides of the operating shaft, permitting a balanced (or substantially balanced) force to be applied to the operating shaft, thereby avoiding the requirement for a separate grab handle.



**EP 2 213 816 A2**

## Description

### FIELD OF THE INVENTION

**[0001]** This invention relates to an operating handle for a folding/sliding door.

**[0002]** Directional and orientational terms used in this specification, such as "top", "bottom", "height" etc., are used to describe objects in their normal orientation of use, as shown for example in Fig.1.

### BACKGROUND TO THE INVENTION

**[0003]** Folding/sliding doors are a particular type of door and an example is shown in Figs.1 and 2. A set of door panels 1-3 are located in an opening (not shown) in the wall of a building, the number and size of the panels being chosen to fit the opening. Typically the panels will be of a height to span the distance between the top and bottom of the opening, so that the set of panels comprises the required number of panels arranged side by side to span the width of the opening.

**[0004]** In Fig.1 three door panels 1,2,3 are shown, though it will be understood that a set of folding/sliding doors can comprise two or more door panels.

**[0005]** The door panels 1,2,3 each comprise a substantially rigid frame 4 surrounding a glazing panel 5. Respective sets of hinges 6,7 (typically butt hinges as drawn) interconnect each pair of adjacent panels. Each hinge 6 is mounted upon a respective slider 8, the slider 8 being located on one of the two guide rails 9 which are mounted at the top and bottom of the opening (only the guide rail 9 at the bottom of the opening is shown in Figs. 1 and 2), so that the hinges 6 are "captive" in that they are maintained in alignment with the guide rails 9.

**[0006]** The hinges 7 which interconnect the panels 2 and 3 on the other hand do not have a slider, and the hinges 7 are therefore "free" in that they can be moved away from the guide rails 9 as shown.

**[0007]** The set of door panels for a particular opening are constructed with alternating captive hinges 6 and free hinges 7.

**[0008]** The panel 1 in this embodiment is designed to be connected (by a set of free hinges 7) to another panel (not shown, but similar to panel 2), but in alternative embodiments it is secured to an adjacent wall. The panel 3 may be connected (by a set of captive hinges 6) to another panel (similar to panel 2) if desired, or it may be secured to an adjacent wall, or it may carry locking means whereby it may be locked to the end panel of another set of folding/sliding doors which span another part of the opening.

**[0009]** As shown in Fig.2, the alternating arrangement of captive and free hinges 6,7 which are typical of folding/sliding doors allows the door panels 1,2,3 to be hinged relative to one another in "concertina" fashion.

**[0010]** Folding/sliding doors have the particular advantage that they maximise the size of the opening which is

available for ventilation or access. A set of patio doors, for example, will typically comprise one fixed panel and one sliding panel. Since only the sliding panel is movable a fully-opened set of patio doors can provide slightly less than half of the opening for ventilation or access. A set of folding/sliding doors on the other hand can usually provide almost all of the opening for ventilation or access.

**[0011]** Accordingly, folding/sliding doors are particularly beneficial for buildings containing private swimming pools for example, and also for restaurants having indoor and outdoor areas which can be separated when desired by closing the doors, or combined into substantially a single area when the doors are opened.

**[0012]** It is typical to have a locking means whereby each of the freely-hinged junctions can be secured to the guide rails 9 when the folding/sliding door is closed. The locking means will typically comprise a locking mechanism in the form of an espagnolette or cremone mounted to the door panels adjacent to the free hinges 7, the locking mechanism including shoot bolts which can be driven into keepers located upon the top and bottom guide rails 9. Providing such a locking means at every freely-hinged junction maximises the security afforded by the closed folding/sliding door, and also allows the folding/sliding door to be partially opened in the event that full access or ventilation through the opening is not required.

**[0013]** It is also typical to locate a draught seal upon the top and bottom rail 9, the draught seal being compressed when the folding/sliding door is closed.

**[0014]** Fig. 3 shows an enlarged view of the circled section C of Fig.1, in the condition in which the folding/sliding door is almost closed. Fig. 3 shows in more detail the operating handle 10 of a locking means which is used on a known folding/sliding door. As will be seen From Fig.2 the space which is available for the operating handle 10 when the folding/sliding door is opened is relatively small, and so the operating handle 10 has a minimum "stack height", i.e. it projects the minimum possible distance from the door panel 2 upon which it is mounted, consistent with the ability of the user to be able to grasp the operating handle.

**[0015]** When the stack height is minimised, however, the user can only grasp the operating handle 10 by the fingertips, and this is not enough to allow the user to rotate the handle and operate the locking mechanism. Accordingly, the handle 10 is designed to pivot about a mounting pin 11, the user being able to pivot the handle 10 outwardly sufficiently so that a full grip upon the handle 10 may be obtained. In known operating handles of this type the handle 10 is resiliently biased towards its retracted position as shown.

**[0016]** It has been recognised that whilst a pivotable handle 10 such as that shown will permit the user to operate the locking mechanism it is not sufficiently strong to allow the user also to compress the draught seals, and it is therefore necessary to fit an additional grab handle 12 which the operator can grasp with one hand in order to pull the freely-hinged junction towards the guide rails

9 and compress the draught seals whilst with the other hand the user can grasp and rotate the operating handle 10 so as to operate the locking mechanism. It will be seen by comparing Figs. 2 and 3 that the grab handle 12 is pivotable so that its stack height may be minimised when not required, and some embodiments of grab handle are resiliently biased towards the retracted position shown in Fig.2.

**[0017]** Even with the reduced stack height of a pivotable operating handle and a pivotable grab handle, these components often provide the limit to opening movement of the folding/sliding door. It will be appreciated from Fig. 2 in particular than when the folding/sliding door is opened the operating handle 10 and the grab handle 12 lie between facing frame parts of the door panels 2 and 3. Whilst it is intended that when the folding/sliding door is opened the door panels 2 and 3 will lie parallel so that access through the opening is maximised, the operating handle 10 and the grab handle 12 will often foul the door panel 3 before the panels 2 and 3 become parallel. This problem is exacerbated by the (necessary) positioning of the operating handle 10 and grab handle 12 close to the axis of the free hinges 7, each millimetre of additional stack height of the operating handle 10 or the grab handle 12 often being translated into a gap between the panels 2 and 3 of several centimetres at the guide rails.

**[0018]** Whilst attempts are made to make the grab handle 12 as aesthetically pleasing as possible it is relatively obtrusive and is often the most visually unappealing element of a folding/sliding door. The manufacturers and installers of such doors realise the disadvantage of providing a grab handle for each of the freely-hinged junctions of the door, but have not so far been able to provide a better solution. Thus, whilst it is recognised that a grab handle could be avoided by providing a stronger operating handle, a stronger operating handle would necessary be more bulky, and would be less aesthetically pleasing and/or would have a larger stack height.

#### SUMMARY OF THE INVENTION

**[0019]** It is an object of the present invention to provide an operating handle which has a minimum stack height, and ideally a stack height less than existing operating handles for folding/sliding doors, whilst avoiding the requirement for a separate grab handle.

**[0020]** According to the invention there is provided an operating handle for a folding/sliding door having a mounting part by which it may be secured to a part of the folding/sliding door in use and a handle part which is mounted upon the mounting part, the handle part being movable relative to the mounting part between a storage position and an operating position, the handle part being connectable to an operating shaft adapted to engage a locking mechanism of the folding/sliding door, the handle part projecting to opposed sides of the operating shaft.

**[0021]** The inventors have therefore appreciated that avoiding the cantilever mounting of the prior art operating

handles can avoid the requirement for a separate grab handle. Alternatively stated, operating handles according to the invention can be used with the handle held (and pulled) by the operator with fingers positioned either side of the longitudinal axis of the operating shaft, so that the force upon the operating shaft can be more closely aligned with its longitudinal axis. The reduction (or elimination) of an offset loading upon the operating shaft enables a greater force to be applied to the operating handle, and in particular allows the operating handle to be pulled with sufficient force to compress the draught seals.

**[0022]** In some embodiments of the present invention the handle part (in its operating position) intersects the longitudinal axis of the operating shaft, so that a pulling force applied to the operating handle can be perfectly balanced and act precisely along the operating shaft. The handle part may be movable linearly between its storage and operating positions, the path of movement being aligned with the longitudinal axis. Accordingly, in some embodiments the handle part intersects the longitudinal axis in both of its storage and operating positions.

**[0023]** In other embodiments the handle part (in its operating position) does not intersect the longitudinal axis of the operating shaft, so that a pulling force applied to the operating handle provides an offset force to the operating shaft. Nevertheless, the degree of offsetting is considerably less than is the case for a prior art operating handle, or alternatively stated the applied force acts significantly closer to the longitudinal axis of the operating handle than with a prior art (cantilever) operating handle, so that these other embodiments are also able to avoid the use of a separate grab handle.

**[0024]** In some of the described embodiments the handle part is securable in its storage position by a latch mechanism, the handle part being resiliently biased to its operating position. In other of the embodiments the handle part is resiliently biased to its storage position.

**[0025]** In the embodiments in which the operating handle is resiliently biased towards its operating position it is not necessary for the user to pass his or her fingers around a part of the operating handle in order to move the handle part to its operating position. This allows the stack height of the operating handle in its storage position to be minimised.

**[0026]** Any suitable latch mechanism may be employed to secure the handle part in its storage position. Preferably, however, the latch mechanism has an actuating axis substantially parallel to the axis of movement of the handle part. Preferably also the handle part has a releasing position, the storage position lying between the operating position and the releasing position; movement of the handle part from its storage position to its releasing position disengages the latch mechanism and permits the handle to be moved to its operating position, and subsequent movement of the handle part from its operating position to its storage position re-engages the latch.

**[0027]** Using a latch mechanism which has an actuating axis substantially parallel to the axis of movement of

the handle part allows the latch mechanism to be located between the handle part and the mounting part, and specifically underneath the handle part where it will be hidden from view when the handle part is in its storage position.

**[0028]** The mounting part can include a recess for the handle part, the recess being shaped to accommodate the handle part in its storage (and its releasing, if applicable) positions.

**[0029]** Preferably, the handle part is not rotatable whilst it is in its storage position, so that it is necessary to move the handle part to its operating position before it can be rotated to actuate the locking mechanism.

**[0030]** In some embodiments the handle part is T-shaped, the top bar of the T-shaped handle part comprising a manually-grippable part and the leg of the T being connected to the operating shaft.

#### BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0031]** The invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:

- Fig.1 shows a perspective view of a prior art folding/sliding door in the almost closed position;
- Fig.2 shows a plan view of the folding/sliding door of Fig.1 in the almost fully-opened position;
- Fig.3 shows an enlarged view of the circled part C of Fig.1;
- Fig.4 shows a perspective view of a folding/sliding door fitted with a first embodiment of operating handle according to the present invention, in the almost closed position;
- Fig.5 shows a plan view of the folding/sliding door of Fig.4, in the almost fully-opened position;
- Fig.6 shows an enlarged view of the circled part D of Fig.5;
- Fig.7 is a front view of the first embodiment of operating handle;
- Fig.8 is an end view of the first embodiment of operating handle in its storage position;
- Fig.9 is an end view of the first embodiment of operating handle in its operating position;
- Fig.10 is a view along the line A-A of Fig.8;
- Fig.11 is a view along the line B-B of Fig.9;
- Fig.12 is an exploded view of the components of the first embodiment of operating handle;
- Figs 13-17 are views of the first embodiment of operating handle in various positions of use;
- Fig.18 is a detailed view of a part similar to the circled part C of Fig.4, with the operating handle in its storage position;
- Fig.19 is a detailed view of a part similar to the circled part C of Fig.4, with the operating handle in its operating position;

- Fig.20 shows an exploded view of a second embodiment of operating handle;
- Fig.21 shows an end view of the second embodiment of operating handle in its storage position;
- Fig.22 is a view along the line A-A of Fig.21;
- Fig.23 shows a perspective view of part of a folding/sliding door fitted with a third embodiment of operating handle, with the handle part in its storage position;
- Fig.24 shows a view as Fig.23, but with the handle part in its operating position;
- Fig.25 shows an exploded view of the components of the third embodiment of operating handle;
- Fig.26 shows an underside view of the third embodiment of operating handle, in its storage position;
- Fig.27 shows a sectional view from below of the third embodiment of operating handle, with the handle part locked in its storage position; and
- Fig.28 shows a perspective view from below of the third embodiment of operating handle, in its operating position.

#### DETAILED DESCRIPTION

**[0032]** A description of Figs. 1-3 is provided above and will not be repeated here.

**[0033]** The operating handle 20 according to the first embodiment of the present invention is shown fitted to a door panel 2 in Figs.4-6, Figs. 4 and 5 being similar views to Figs. 1 and 2 for ease of comparison. Unlike the prior art operating handle 10 the operating handle 20 will remain in the operating position shown in Fig.4 unless moved by the user. It is therefore not necessary for a user to be able to pass his or her fingertips around any part of the operating handle 20 in its storage position, so that in the storage position the operating handle 20 can have a much lower stack height than the prior art operating handle 10, as most clearly demonstrated in Figs. 5 and 6. This in turn makes available full opening movement of the folding/sliding door, and it will be understood from Fig.5 in particular that the stored operating handle 20 will not limit the relative hinging movement of the door panels 2 and 3, so that the access available through a fully-opened door is maximised.

**[0034]** As shown in detail in Figs. 7-12, the operating handle 20 includes a handle part 22 which is T-shaped. The handle part 22 comprises a manually-grippable part 24 (i.e. a part which is adapted to be gripped by the user during use), a shaft part 26 and a spring housing 30. The shaft part 26 has an acircular recess, in particular a recess of square cross-section, which can receive one end of an operating shaft 32. The other end of the operating shaft 32 will engage the acircular recess in the locking mechanism (not shown) which is located within the profile

of the door panel 2, in known fashion, whereby rotation of the handle part 22 causes actuation of the locking mechanism.

**[0035]** The spring housing 30 (Fig. 12) has an inner wall 34 and an outer wall 36, the inner wall closely surrounding the shaft part 26. A compression spring 40 is located between the walls 34,36.

**[0036]** The mounting part 42 comprises a base 44 and two latches 46. The base 44 can be secured to a part of the frame 4 of the door panel 2 by way of screws (not shown) in known fashion. The screws are visible and accessible when the handle part 22 is in its "90°" position (s), one of which positions is shown in Fig. 15, but are not accessible or even visible when the handle part 22 is in its stored position as shown in Figs. 13 and 17 for example.

**[0037]** The base 44 carries a boss 50 which has an outer wall 52 and an inner wall 54. The space between the inner wall 52 and the outer wall 54 is designed to slidably accommodate the outer wall 36 of the spring housing 30.

**[0038]** The operating handle 20 is assembled by locating the spring housing 30 upon the shaft part 26, and inserting the spring 40 into the spring housing. Also, the latches 46 are inserted into their respective recesses 56 in the base 44. The handle part 22 is assembled to the mounting part 42 by locating the outer wall 36 of the spring housing 30 into the gap between the inner wall 54 and the outer wall 52 of the boss 50. The handle part 22 is pressed towards the mounting part 42 so as to compress the spring 40, whereupon the end of the shaft part 26 will project beyond the end of the boss 50 (see Fig. 10 for example). In this position, the annular retainer 60 is passed over the end of the shaft part 26 and secured thereto.

**[0039]** When the handle part 22 is subsequently released the compression spring 40 will bias the handle part 22 away from the mounting part 42 until the retainer 60 engages the lip 62 on the inner wall 54 of boss 50. The retainer 60, and the bias of the compression spring 40, therefore together maintain the handle part 22 in its operating position, as shown in Fig. 11.

**[0040]** Figs. 10 and 11 also represent the action of the latches 46. In this embodiment the latches 46 are the latches sold under the trade name "NS-2 non-magnetic mini touch latch" by Sugatsune Kogyo (UK) Limited of Henley on Thames, RG9 5QW, UK ([www.sugatsune.co.uk](http://www.sugatsune.co.uk)), but other similar latches could alternatively be used. Each of the latches 46 has an L-shaped element 64 (it will be understood that the latches 46 will have other elements also, but since these are proprietary parts the detail is not shown). In their active position shown in Fig. 10 one leg of each of the L-shaped elements 64 projects from the respective latch housing 66 and locates within an annular groove 70 (Fig. 11) formed by a step 72 in the outer wall 36 of the spring housing 30, and the underside of manually-grippable part 24. In that position, the latches 46 can hold the handle part 22 in its stored position

against the bias of the spring 40.

**[0041]** It will be seen that the base 44 includes a recess 74 which can accommodate part of the manually-grippable part 24. It will also be seen (from Fig. 10 in particular) that the manually-grippable part 24 does not engage the bottom of the recess 74 in its storage position. This enables the handle part 22 to be pressed further into the recess 74, to a releasing position (not shown). In the releasing position the latch housings 66 are moved slightly into the body of the respective latch 46, releasing the L-shaped element 64 and causing the leg of this element to be withdrawn into the latch housing 66. When the handle part 22 is then released it is driven by the spring 40 to its operating position.

**[0042]** In the described embodiments of the invention the operating handle 20 is connected to a locking mechanism (not shown) in which 180° rotation of the operating shaft 32 is required to actuate the locking mechanism, i.e. to move the locking mechanism between its unlocked and locked positions. The sequence of operations whereby an initially unlocked folding/sliding door may be locked are shown in Figs. 13-17.

**[0043]** In Fig. 13 the handle part is held in its storage position by the latches 46, and the locking mechanism (not shown) is in its unlocked condition (as represented by the released padlock symbol being uppermost upon the manually-grippable part 24). This handle position is used when it is desired to fully open the folding/sliding door, i.e. as shown in Figs. 5 and 6, with the operating handle 20 providing the minimum restriction to relative hinging movement of the door panels 2 and 3. It will be understood that this position of the operating handle 20 corresponds to the shoot bolts or other locking members being released from their keepers, so that the junction between the panels 2 and 3 carrying the free hinges 7 can be moved away from the guide rails 9.

**[0044]** When it is desired to close the folding/sliding door the respective panels 1,2,3 are pushed so that the respective sliders 8 move along the guide rails 9 until the door panels 1,2,3 lie almost parallel with the guide rails 9, i.e. in a position close to that shown in Fig. 4.

**[0045]** The operating handle 20 is released from its storage position by depressing and then releasing the handle part 22, which deactivates the latches 46 as above stated. The spring 40 then drives the handle part 22 to its operating position as shown in Fig. 14. In that position the handle part 22 can be gripped by the user, and pulled so as to fully close the door and compress the draught seals (not shown).

**[0046]** When the door is fully closed the operating handle 22 is rotated through 180°, i.e. through the "90°" position shown in Fig. 15 and into the position shown in Fig. 16, which rotation actuates the locking mechanism and secures the respective freely hinged junction to the guide rails 9.

**[0047]** When the door is closed and locked, the operating handle 22 is depressed again, which in turn presses the latch housings 66 into their respective body and caus-

es the L-shaped elements 64 to project into the groove 70, so that upon reaching (or in some embodiments slightly passing, depending upon the latch mechanism) its storage position the latches 46 will secure the handle part 22 in the storage position of Fig.17.

It will be understood that a closed and locked folding/sliding door may be opened by releasing the handle part 22 and rotating it through 180° to the unlocked position of Fig.14, whereupon the door panels 2,3 may be relatively hinged so as to open the folding/sliding door.

**[0048]** Desirably, the handle part 22 will be moved back to its storage position before the door panels are fully opened so that the handle part 22 does not engage any of the door panel 3. If, however, the handle part 22 is left in the operating position when the door panels 2 and 3 are opened, the handle part 22 will foul the door panel 3. The handle part 22 is not likely to damage the door panel 3, however, since it projects only with the force of the spring 40, and instead continued door opening movement is likely to drive the handle part 22 towards the mounting part 42.

**[0049]** In this embodiment the axis H-H (Fig.7) of the manually-grippable part 24 of the handle part 24 is substantially (and ideally precisely) perpendicular to the longitudinal axis of the operating shaft 32 (the longitudinal axis of the operating shaft being aligned with the sectional lines A-A and B-B in Figs. 8 and 9). Also, the axis H-H intersects the longitudinal axis of the operating shaft. Accordingly, the operator can apply a substantially balanced force upon the operating shaft, i.e. a force which acts substantially or precisely along the axis of the operating shaft. It will be understood that the reduction or elimination of unbalanced forces upon the operating shaft minimises the stresses upon the components within the operating handle 20, and permits the operator to apply a force sufficient to compress the draught seals without requiring bulky componentry, and in particular without requiring a separate grab handle.

**[0050]** Alternatively stated, the force to compress the draught seals is applied by the handle part 22 in a direction which is substantially parallel to and aligned with the movement axis of the shaft part 26, so that the operating handle 20 does not need to accommodate significant off-axis or unbalanced forces. Substantially all of the force required to compress the draught seals is accommodated by the retainer 60 engaging the lip 62, and it can be arranged that these components can withstand the forces which are likely to be exerted. In some embodiments it may be desirable to utilise a threaded connection between the retainer 60 and the shaft part 26 if it is not believed that a frictional connection will withstand the forces involved.

**[0051]** The second embodiment of operating handle 120 is shown in Figs. 20-22. The operating handle 120 has several parts in common with the operating handle 20, and since the function of the common parts is the same they will not be described again.

**[0052]** The operating handle 120 differs from the op-

erating handle 20 in the means by which the handle part 122 is retained in its storage and operating positions. Specifically, the operating handle 120 includes a sleeve 80, two latch parts 82, 84 and pin 86. When assembled, the components are held together by a cap member 88, which encloses part of the spring 140, the latch parts 82, 84, and the pin 86 (as shown in Fig.22, and in particular the enlarged section thereof).

**[0053]** The pin 86 passes through a hole 90 in the operating shaft 132, and thereby secures the operating shaft 132 to the handle part 122.

**[0054]** It will be seen in Fig.20 that the latch part 84 is annular, and the inner wall contains a series of teeth 92, substantially of rounded saw-tooth form. The dimensions of the pin 86 and latch part 84 are such that the pin 86 can lie within the circular wall of the latch part 84, the ends of the pin engaging opposed teeth 92.

**[0055]** The latch part 82 is also annular and on its inner wall it has a set of cups 94, each of which can locate an end of the pin 86. Between each of the cups 94 are respective gaps 96, the gaps 96 being wide enough to accommodate the ends of the pin 86.

**[0056]** The function of the latch of this embodiment is somewhat similar to the operating mechanism of some retracting pens. When the operating handle 120 is in its storage position the ends of the pin 86 are located in respective cups 94, and are biased into the cups 94 (and away from the teeth 92 of the latch part 84) by the spring 140.

**[0057]** When it is desired to move the operating handle to its operating position the handle part 122 is pressed downwardly further into the recess 174 of the base 144. This movement causes the ends of the pin 86 to move out of the cups 94 and into engagement with respective sloping portions of the teeth 92 of the latch part 84. The pin 86 is fixed against rotation by the operating shaft 132, and so during depression of the handle part 122 engagement of the ends of the pin 86 with sloping parts of the teeth 92 drive the latch part 84 to rotate relative to the operating shaft 132.

**[0058]** The latch parts 82 and 84 rotate together by virtue of the projecting pegs 76 of the latch part 82 being secured within respective recesses 78 in the latch part 84.

**[0059]** The handle part 122 reaches the limit of its travel when the ends of the pin 86 reach the bottom of a first trough formed between adjacent teeth 92. When the handle part 122 is released from that position the ends of the pin 86 engage a sloping edge of the cups 94, and the spring 140 pushes the ends of the pin along the sloping edge, causing further rotation of the latch parts 82, 84, until the ends of the pin overlie opposed gaps 96.

**[0060]** The sleeve 80 has two opposed channels 98 (only one of which can be seen in Fig.20), each channel being aligned with, and being able to accommodate, an end of the pin 86. When the latch parts 82, 84 have been rotated to a position in which the ends of the pin 86 overlie the gaps 96, the ends of the pin 86 are driven (by the spring 140) through the gaps 96 and along the respective

channels 98.

**[0061]** It will be understood that during movement of the ends of the pin 86 along the channels 98, the handle part 122 is moving away from the base 144 into its operating position, the operating position being defined by engagement of the ends of the pin 86 with the ends of the respective channels 98.

**[0062]** To move the handle part 122 back to its storage position, it is depressed against the force of the spring 140, causing the ends of the pin 86 to pass back through the gaps 96 and into engagement with respective sloping parts of the teeth 92. Further depression of the handle part 122 causes rotation of the latch parts 82, 84. The limit of travel of the handle part 122 is defined by the ends of the pin 86 reaching the bottom of a second trough between adjacent teeth 92, and when the handle part 122 is released from that position the spring 140 urges the ends of the pin 86 out of engagement with the teeth and into respective cups 94.

**[0063]** It will be understood that repeated depression of the latch moves the pin 86 alternately into the first trough or second trough, so that the operating handle 120 may move repeatedly between its storage and operating positions due to the shaping of the teeth 92 and the cups 94.

**[0064]** It will also be understood that it is not necessary for both ends of the pin to engage the respective latch parts, and in another embodiment only one end of the pin is utilised. However, embodiments such as that described in which both ends of the pin are utilised are preferred since they provide a balanced arrangement to opposed sides of the operating shaft.

**[0065]** In this second embodiment the axis H-H of the manually grippable part 124 of the operating handle, in its operating position, is also substantially (and ideally precisely) perpendicular to the longitudinal axis of the operating shaft 132 (the longitudinal axis of the operating shaft being aligned with the sectional lines A-A in Fig. 21). Also, the axis H-H intersects the longitudinal axis. Accordingly, the operator can apply a substantially balanced force upon the operating shaft 132, and in particular a force sufficient to compress the draught seals without requiring bulky componentry, and in particular without requiring a separate grab handle.

**[0066]** The third embodiment of operating handle 220 is shown in Figs.23-28. In Fig.23 the operating handle 220 is in its storage position whereas in Fig.24 it is in its operating position. In common with the earlier embodiments, it will be understood that when the handle part 222 is in its operating position as shown in Fig. 24 it may be grasped by a user, and rotated so as to rotate an operating shaft (not shown) and actuate a locking mechanism of the folding/sliding door.

**[0067]** The components which make up the operating handle 220 are shown in the exploded view of Fig. 25. The handle part 222, including the manually-grippable part 224, is connected by way of respective pivot pegs 225 to a housing 230.

**[0068]** The third embodiment differs from the first and second embodiments in that the operating handle 220 is lockable in its storage position (the first and second embodiments can if desired be made lockable in alternative embodiments). Accordingly, the housing 230 mounts a lock body 227 which can accommodate a key 229. A lock plate 231 is connected to the lock body 227.

**[0069]** Though not seen in Fig.25, the housing 230 also contains a shaft part 226 (see Fig.26), which has a square recess and can therefore accommodate an end of an operating shaft. The operating shaft is not shown in relation to this embodiment but can be identical to the operating shaft 32 or 132 of the earlier embodiments. Whilst in the first and second embodiments the operating shaft is assembled with the operating handle and is therefore a component of the operating handle, in this third embodiment the operating shaft can be separate from the operating handle, with the operating shaft being inserted into the shaft part 226 during fitment of the operating handle onto the folding/sliding door.

**[0070]** As seen in Fig. 26, the shaft part 226 is located within an opening 254 in the mounting part 242, the outer periphery of the shaft part 226 closely matching the circular opening 254 whereby the shaft part 226 (and the connected housing 230 and handle part 222) can be rotated relative to the mounting part 242. A washer 233 surrounds the shaft part 226 and lies between an underside part (not seen) of the housing 230 and the mounting part 242.

**[0071]** The mounting part 242 in this embodiment is acircular, and in particular has two longer edges 235. As better seen in Fig.26 the longer edges 235 are slightly curved for aesthetic purposes, but in other embodiments can be flat. The skirt 237 of the housing 230, which generally covers the mounting plate 242, is shortened at its opposed sides to provide archways 239 (only one of which can be seen in Fig.25) which permit the housing 230 to overlie the mounting part 242 as shown in particular in Figs.24, 26 and 28. The skirt 237 is also locally shortened further to provide an additional archway 241 for the lock plate 231.

**[0072]** The manually-grippable part 224 has a flange 243 which in its storage position lies alongside one or other of the longer edges 235 of the mounting part 242. The flange 243 and the longer edge 235 can interengage to prevent the housing 230 from rotating relative to the mounting part 242 whilst the handle part 222 is in its storage position, as shown in Fig.26.

**[0073]** The handle part 222, and in particular the manually-grippable part 224, has a groove 245 formed therein, which groove can accommodate the end of the lock plate 231, as shown in Fig. 27. The groove 245 is also shown in Fig.28, which shows the artificial position in which the lock plate 231 is projecting from the housing 230 whilst the handle part 222 is in its operating position. This drawing is included for clarity, but it will be understood that the lock plate 231 is not normally in the projecting position shown unless the handle part 222 is in

its storage position.

**[0074]** When the folding/sliding doors to which the operating handle 220 is mounted are closed, and their locking mechanism is actuated to its locking position, the operating handle 220 can be moved to its storage position and the lock body 227 rotated by the correct key so as to move the lock plate 231 into the groove 245 (i.e. to the position shown in Fig. 27). The folding/sliding doors are therefore locked, and can only be unlocked by insertion of the correct key 229.

**[0075]** To unlock the folding/sliding door, the key 229 is inserted, and the lock body 227 is rotated by approximately 180° to move the lock plate 231 from the position shown in Figs. 27 to the position shown in Fig. 26. The handle part 222 can then be pivoted about its pivot pegs 225 to the operating position of Fig. 24.

**[0076]** Moving the handle part 222 to its operating position separates the flange 243 from the edge 235 of the mounting part 242, permitting the handle part 222 and the attached housing 230 to be rotated through approximately 180°. This rotation drives the operating shaft to actuate (release) the locking mechanism in known fashion, allowing the folding/sliding door to be opened.

**[0077]** Importantly, the lock body 227 is positioned so that the handle part 222 will foul the key 229. This encourages the user to remove the key 229 before the handle part 222 is moved to its operating position. It will be understood that if the key is left projecting from the lock body during opening movement of the folding/sliding door the head of the key might be broken off as the door is opened.

**[0078]** In addition, in contrast to the earlier embodiments, the handle part 222 is biased towards its storage position by a torsion spring 247. Accordingly, once the operating handle 220 is released during opening movement of the folding/sliding door, the handle part 222 is biased to return to its storage position so that the stack height of the operating handle is minimised.

**[0079]** It will be understood that the resilient biasing of the handle part 222 is of relatively low force, but this necessarily requires the user to be able to grasp the handle part 222 and lift this towards the operating position whilst overcoming the resilient biasing force. The stack height of the third embodiment is therefore slightly greater than the stack height of the earlier embodiments, but is nevertheless no greater than, and in practical embodiments can be slightly less, than the stack height of the prior art operating handles and grab handles.

**[0080]** It will also be understood that the axis H-H of the manually-grippable part 224 of the operating handle 220, in its operating position as shown in Fig. 24, is substantially (and ideally precisely) perpendicular to the longitudinal axis of the operating shaft. Unlike the earlier embodiments, however, the axis H-H does not intersect the longitudinal axis of the operating shaft, but is spaced slightly from the longitudinal axis.

**[0081]** Accordingly, in this third embodiment the operator cannot apply a precisely balanced force upon the

operating shaft. It will be understood that the operator can nevertheless apply a considerably more balanced force upon the operating shaft than is possible with the prior art cantilever operating handles, and in particular can apply a force sufficient to compress the draught seals without requiring bulky componentry, and without requiring a separate grab handle.

**[0082]** It will be understood that the modified versions of the third embodiment could be provided in which the axis of the manually-grippable part 224 does intersect the longitudinal axis of the operating shaft in the operating position (for example by aligning the pivot pegs 225 with the shaft part 226), if that is desired or required in a particular application.

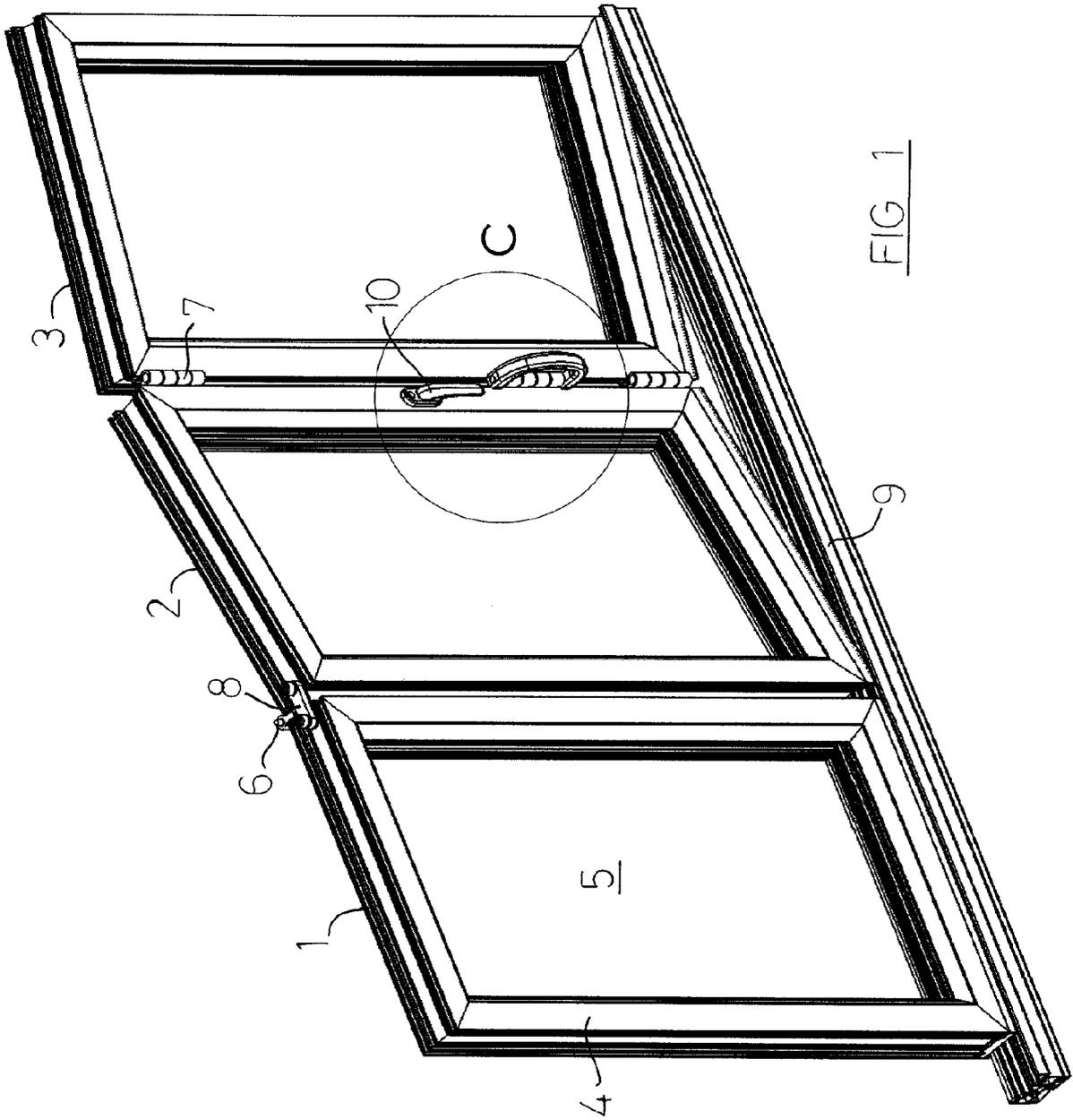
**[0083]** It will be appreciated that the majority of door panels which are used for folding/sliding doors are made from aluminium or plastics. In general aluminium is preferred as it has a lower thermal expansion at the temperature ranges involved. Both aluminium and plastics door panels usually utilise hollow profile frames with much of the locking mechanism located within the profile.

**[0084]** It will be understood from Figs. 5 and 6 in particular that the first embodiment of operating handle 20 (and similarly the second embodiment of operating handle 120) are almost flush with the surface of the frame 4 of the door panel 2. It is not necessary that the operating handle 20, 120 be totally flush since there is some freedom afforded by the butt hinges 7 which are typical of folding/sliding doors. Thus, whilst it would be possible to rebate the operating handle 20, 120 further into the door panel the present invention has been designed to require a minimum of routing or rebating into the profile, but it will be understood that some rebating of the door panel 2 will be required to accommodate the mounting part 42 of the first and second embodiment. In the third embodiment, which has the largest stack height of the disclosed embodiments, the mounting part 242 is designed to be surface-mounted, so that no rebating of the frame is required, although some rebating could be undertaken in order to further reduce the stack height.

## Claims

1. An operating handle (20; 120; 220) for a folding/sliding door (1, 2, 3) having a mounting part (42; 142; 242) by which it may be secured to a part of the folding/sliding door and a handle part (22; 122; 222) which is mounted upon the mounting part, the handle part being movable relative to the mounting part between a storage position and an operating position, the handle part being engageable with an operating shaft (32; 132) which is adapted to engage a locking mechanism of the folding/sliding door, the handle part having a manually-grippable part (24; 124; 224) which extends to opposed sides of the operating shaft.

2. An operating handle according to claim 1 in which the manually-grippable part (24; 124), in use and in the operating position, intersects the longitudinal axis of the operating shaft (32; 132).
3. An operating handle according to claim 1 or claim 2 in which the handle part (22; 122) is movable substantially linearly between the storage position and the operating position.
4. An operating handle according to claim 3 in which the path of movement of the operating handle (22; 122) between the storage position and the operating position is substantially aligned with the longitudinal axis of the operating shaft (32; 132).
5. An operating handle according to any one of claims 1-4 in which the handle part (22; 122) is held in its storage position by a latch mechanism (46; 82, 84, 86).
6. An operating handle according to claim 5 in which the handle part (22; 122) is held in its storage position by two latch mechanisms (46), the latch mechanisms being positioned on opposed sides of the operating shaft (32).
7. An operating handle according to claim 5 or claim 6 in which the handle part (22; 122) has a releasing position, the storage position being between the operating position and the releasing position.
8. An operating handle according to any one of claims 5-7 in which the handle part (22; 122) is resiliently biased towards its operating position.
9. An operating handle according to any one of claims 1-8 in which the handle part (22; 122) is T-shaped, the top bar of the T-shaped handle part comprising the manually-grippable part (24; 124) and the leg of the T being connected to the operating shaft (32; 132).
10. An operating handle according to any one of claims 1-9 in which the handle part (22; 122; 222) actuates the locking mechanism by way of rotation of the operating shaft, and in which the handle part cannot rotate the operating shaft whilst in its storage position.
11. An operating handle according to claim 10 in which the mounting part (242) has an engagement surface (235) and the handle part (222) has a cooperating engagement surface (243), the engagement surfaces preventing rotation of the handle part when the handle part is in the storage position.
12. An operating handle according to claim 1 or claim 2 in which the handle part (222) pivots relative to the mounting part (242) between the storage position and the operating position.
- 5 13. An operating handle according to claim 12 in which the handle part pivots about a pivot axis, the pivot axis being substantially perpendicular to the longitudinal axis of the operating shaft.
- 10 14. An operating handle according to any one of claims 1-13 in which the handle part (222) is key-lockable in the storage position.
- 15 15. An operating handle according to claim 14 in which a lock body (227) is mounted upon a housing (230), and is positioned such that an inserted key prevents movement of the handle part (222) between the storage and operating positions.
- 20
- 25
- 30
- 35
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- 50
- 55



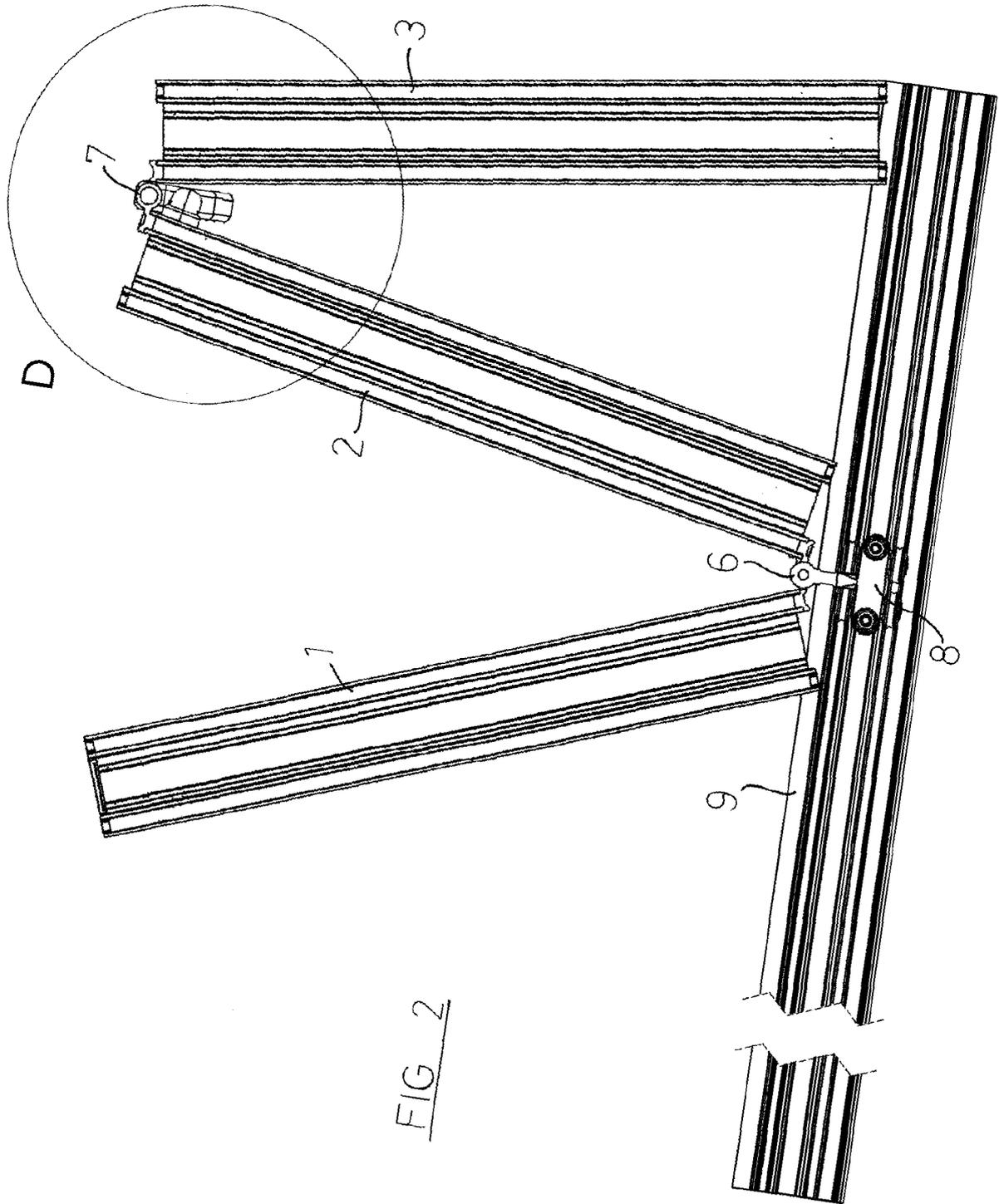
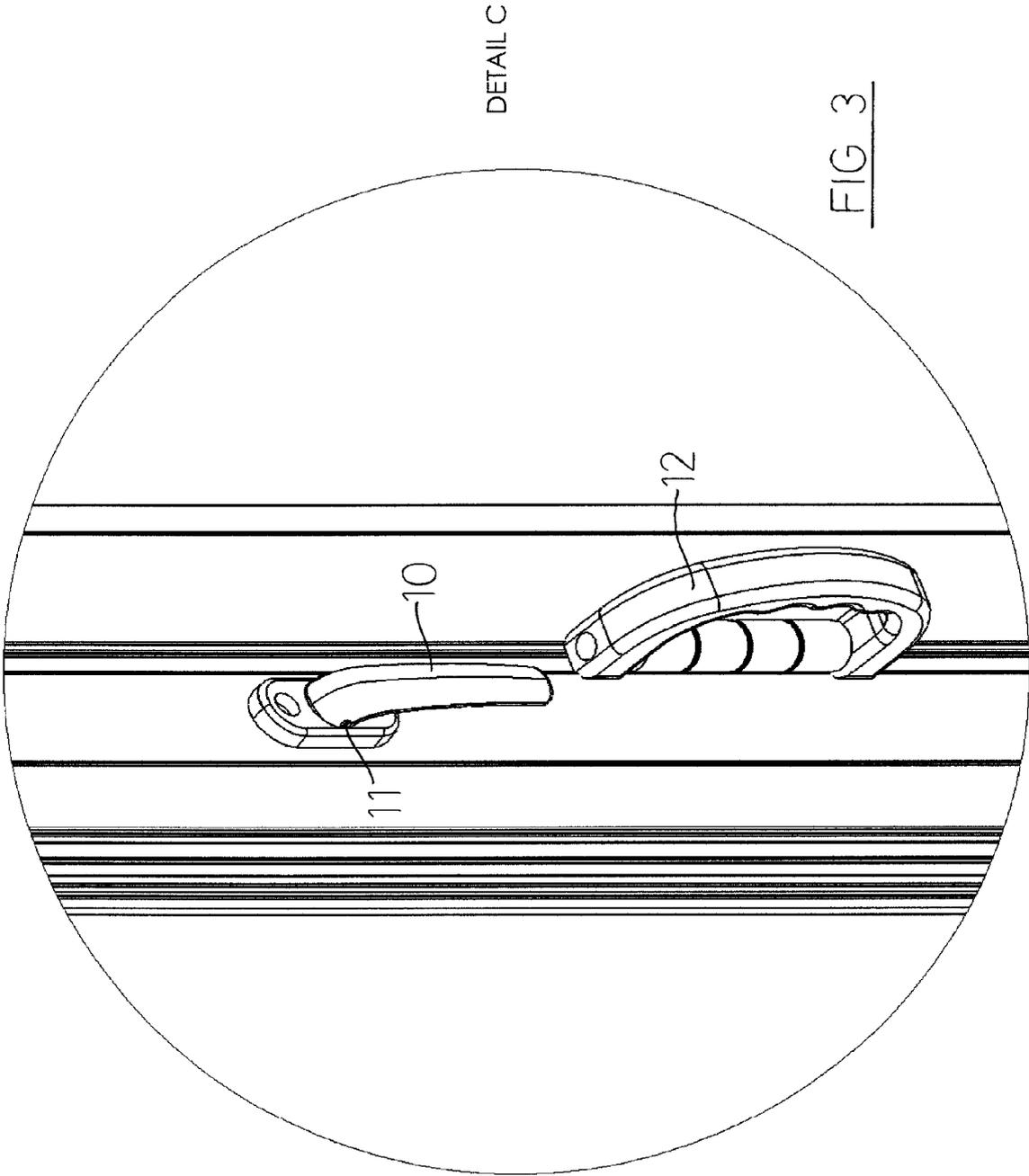
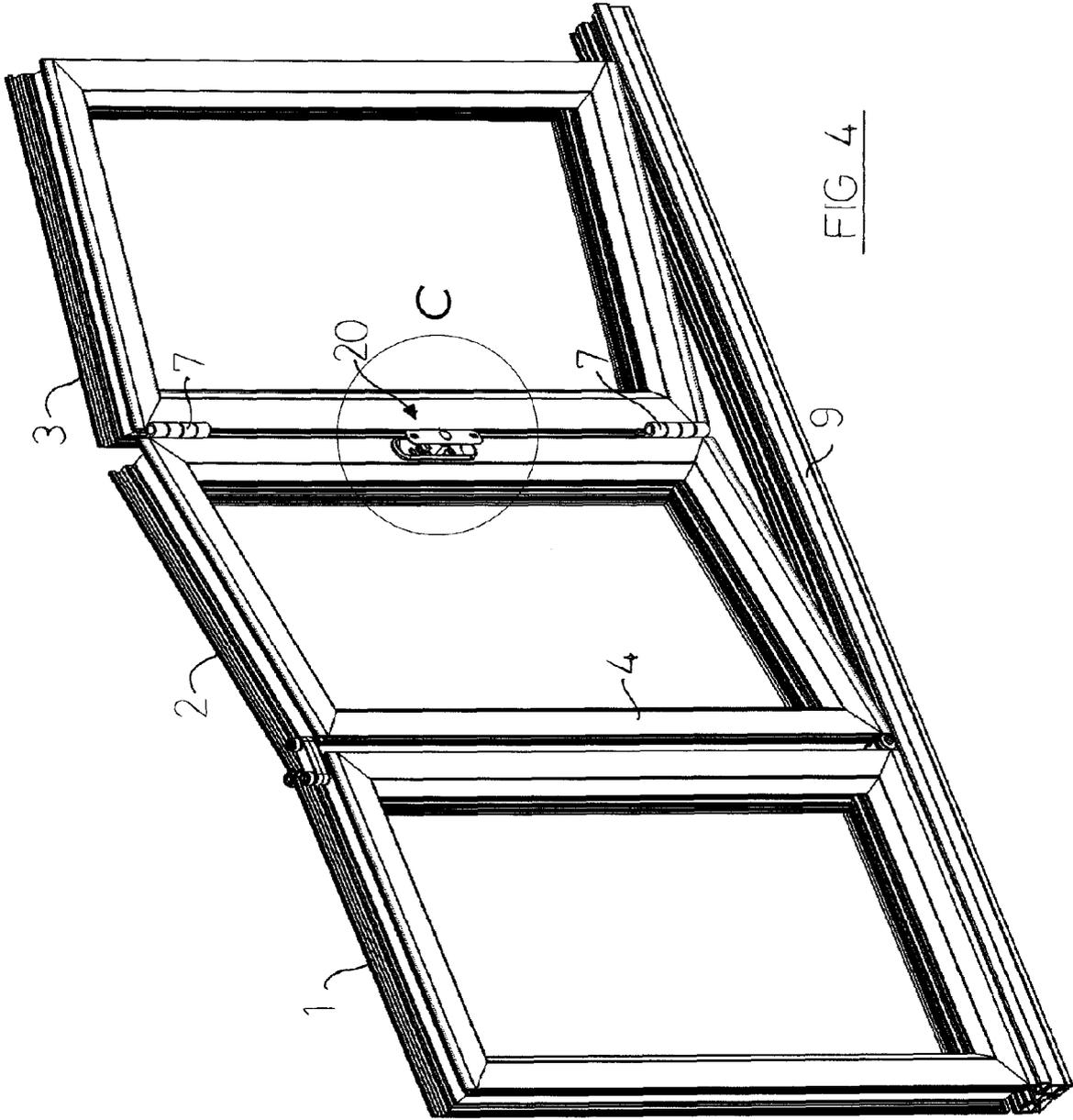


FIG 2





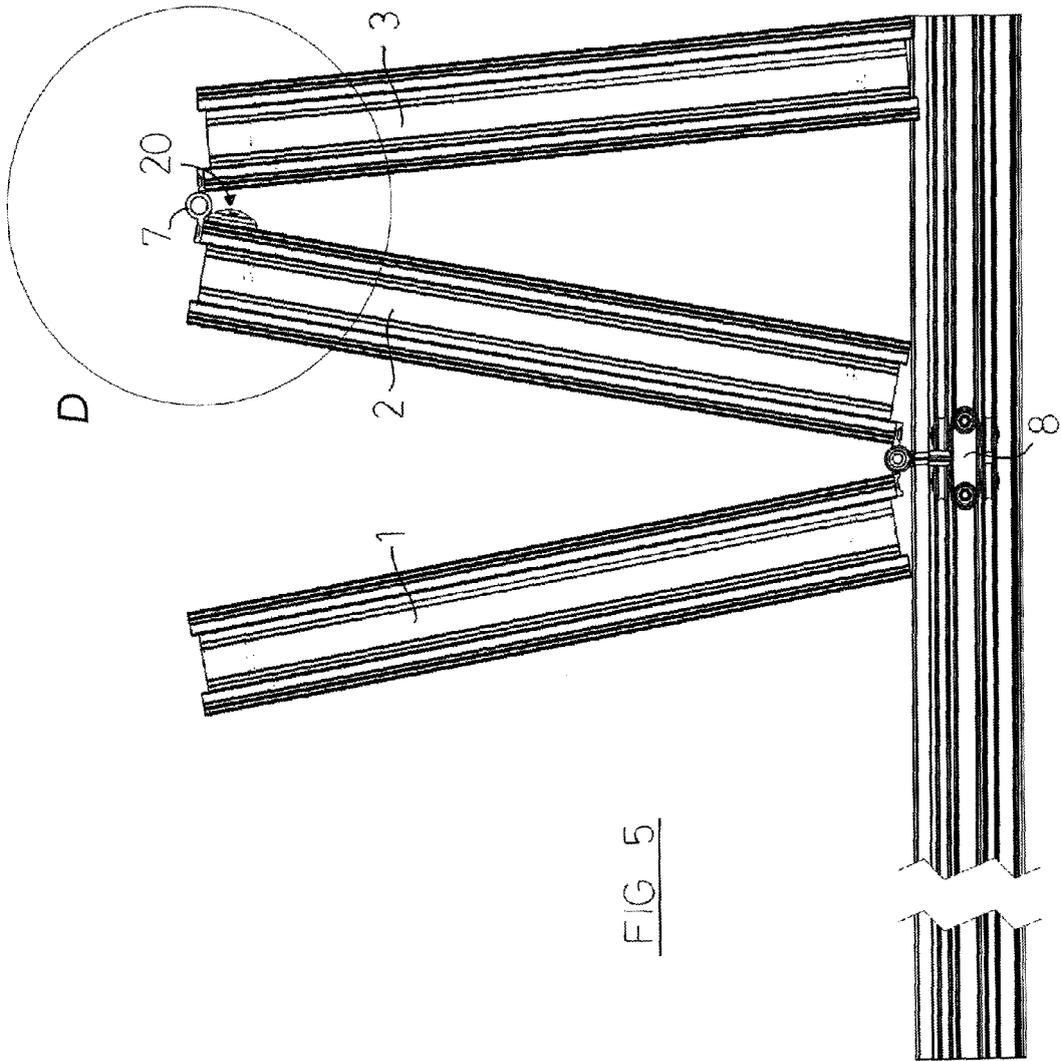


FIG 5

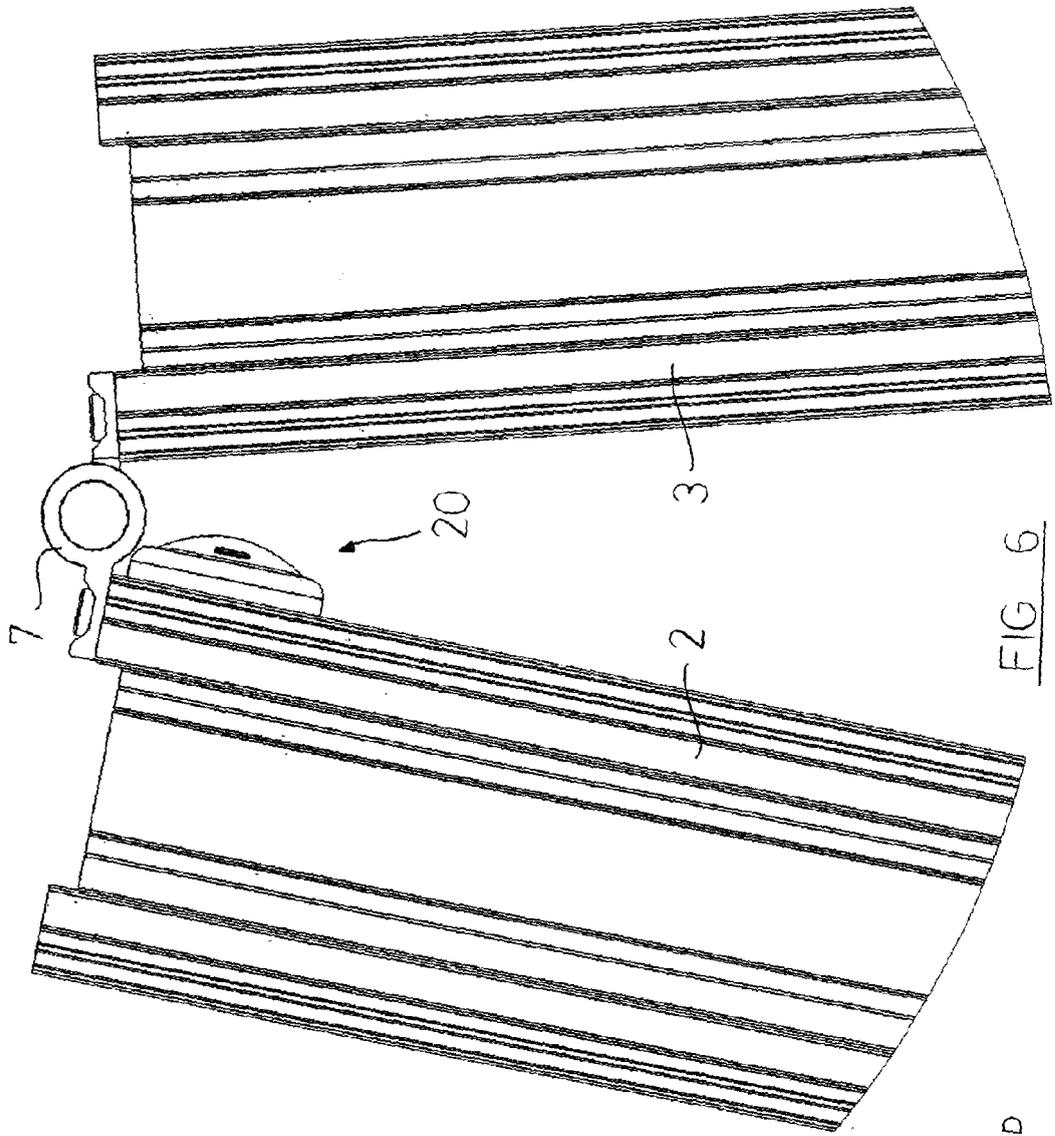
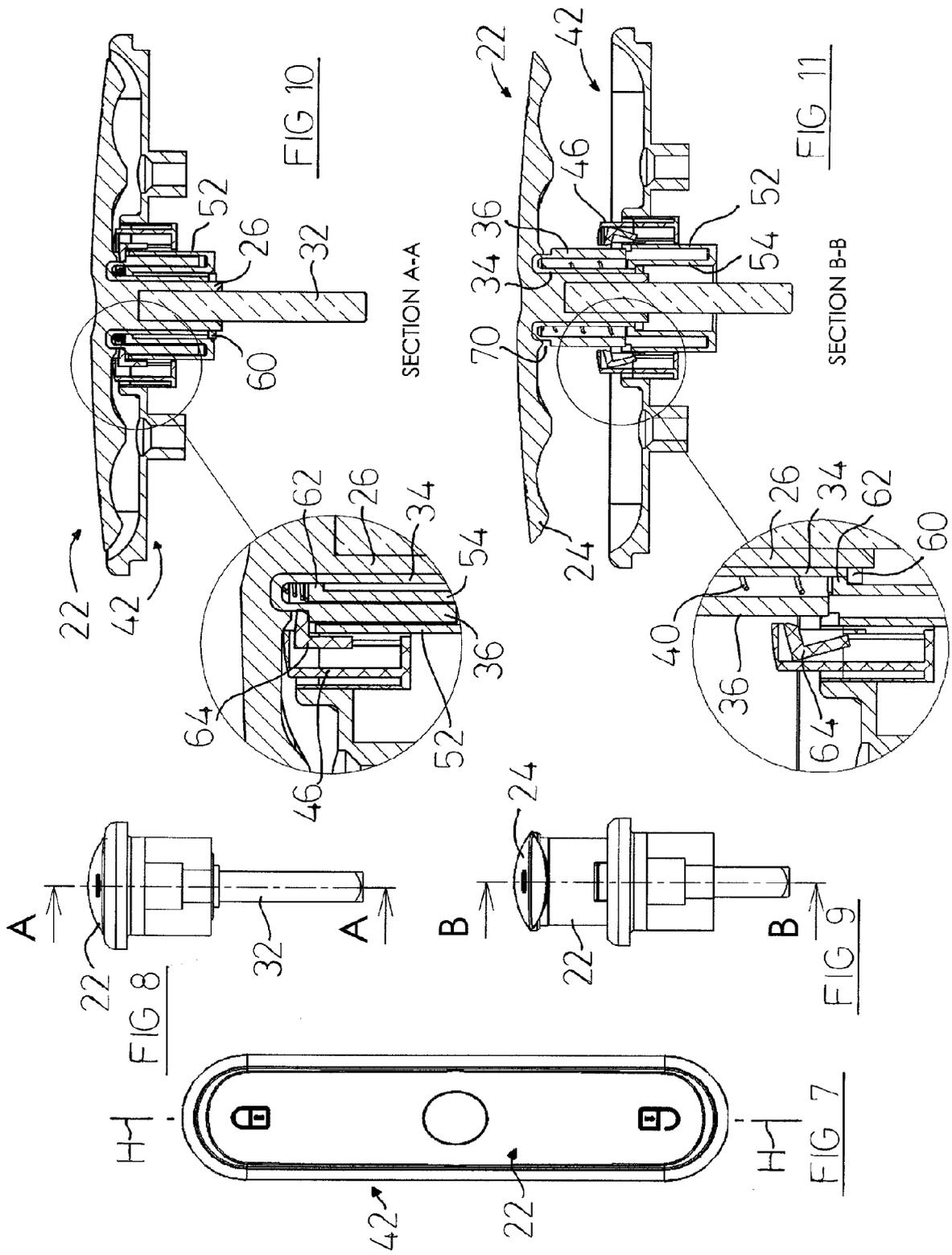


FIG. 6

DETAIL D





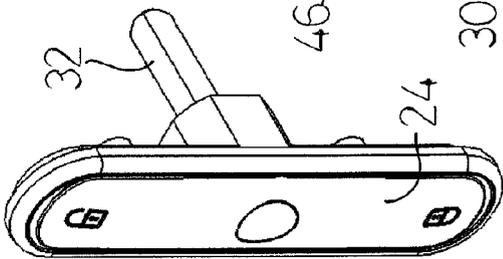


FIG 13

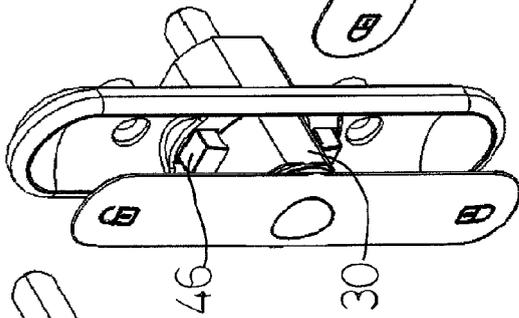


FIG 14

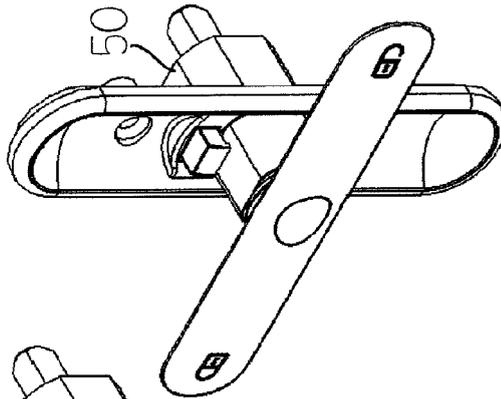


FIG 15

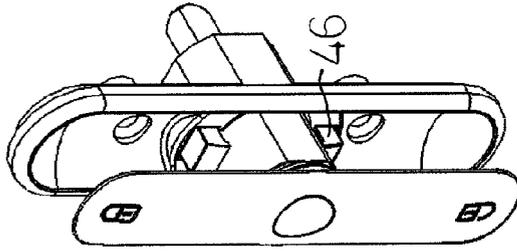


FIG 16

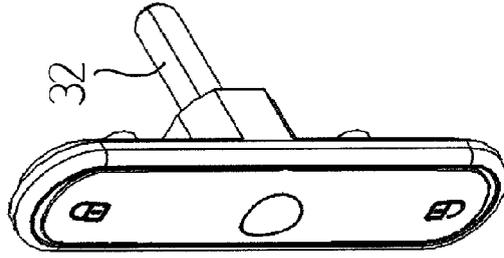


FIG 17

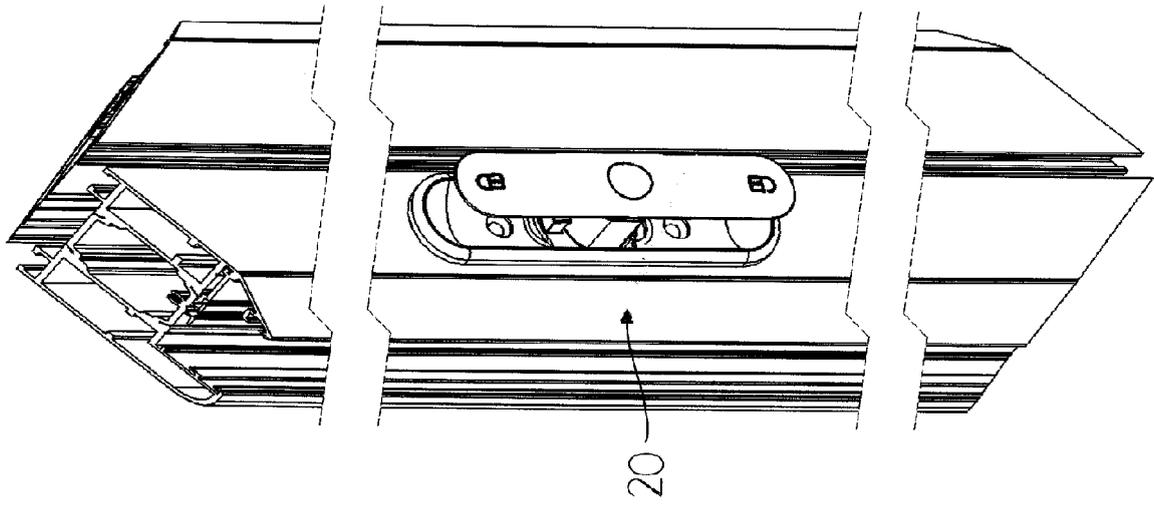


FIG 19

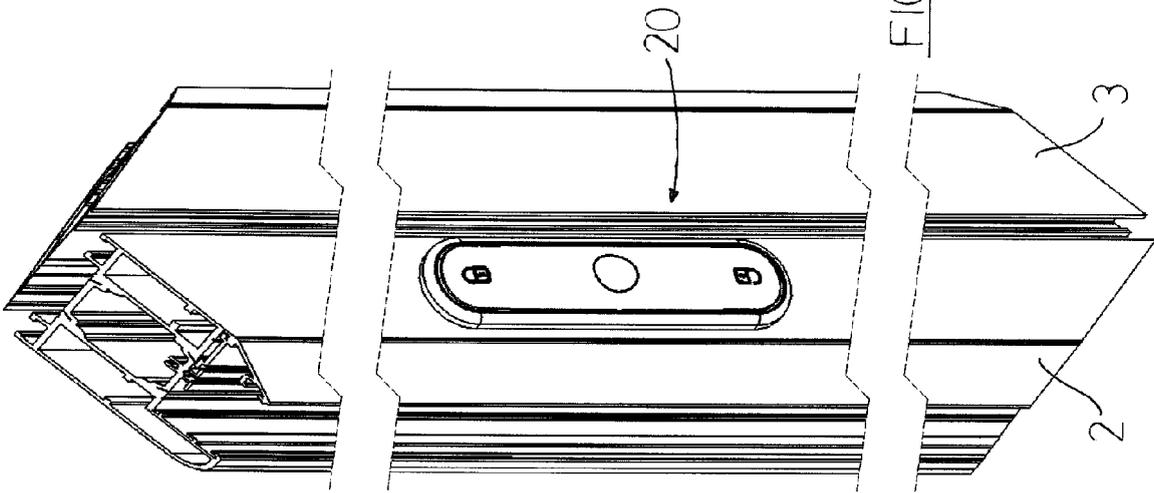


FIG 18

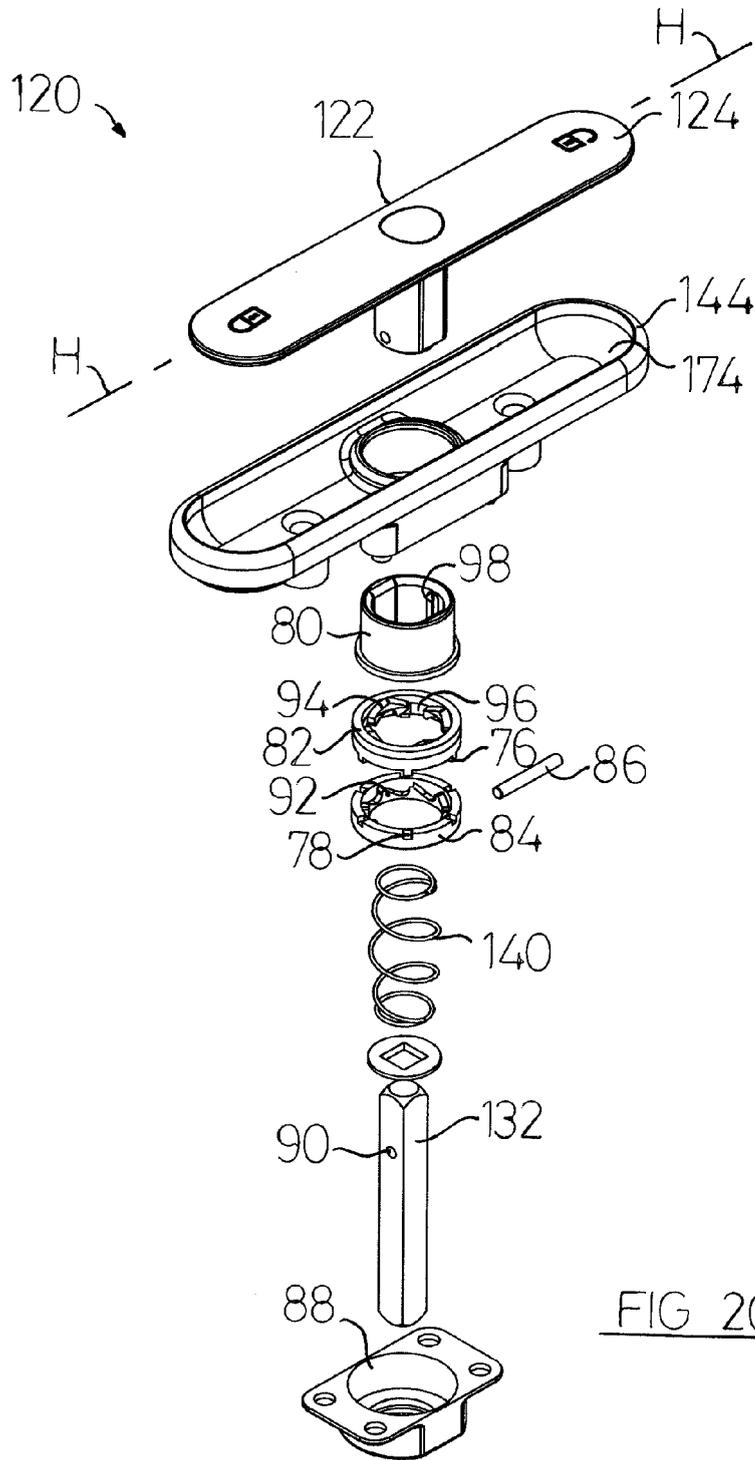
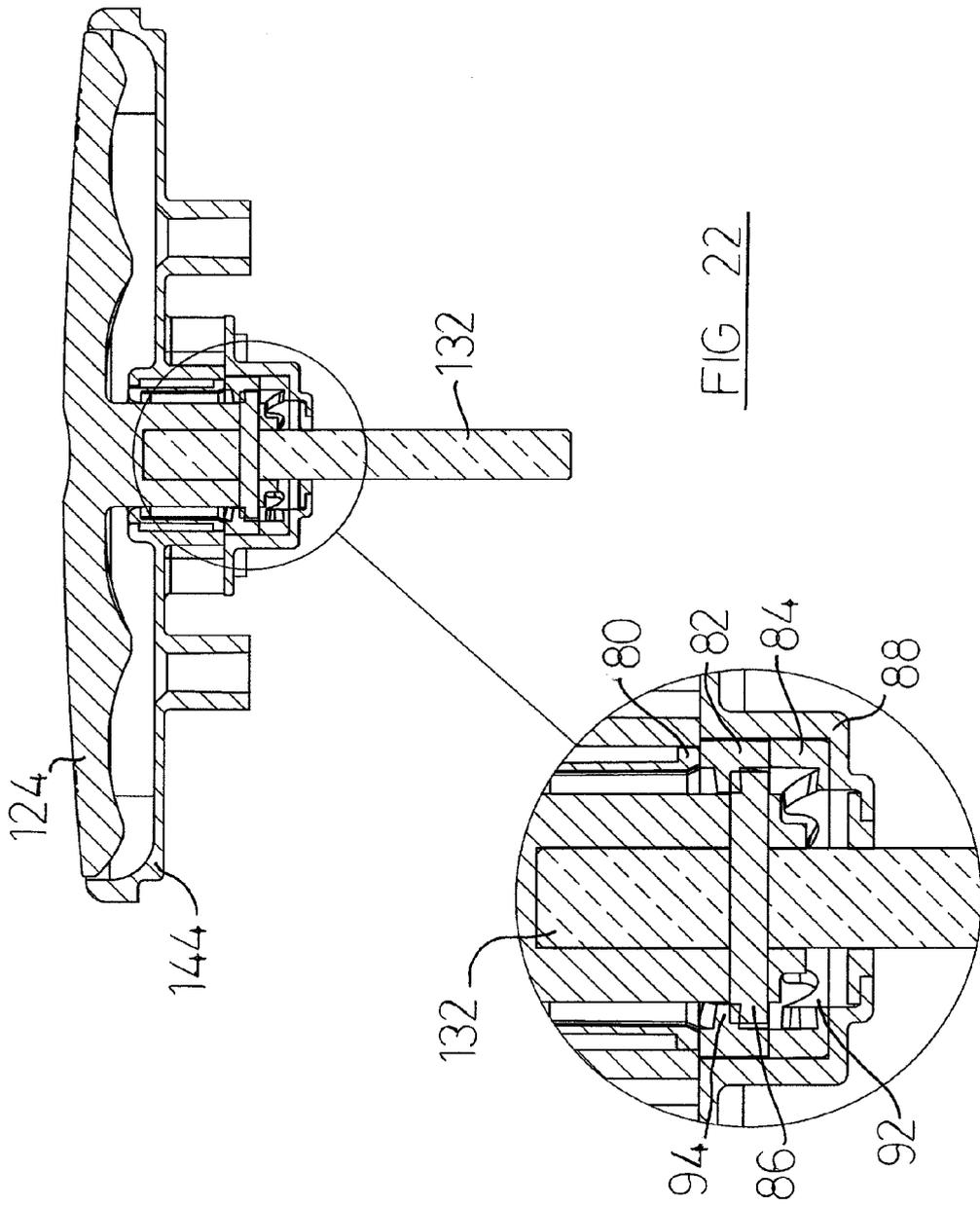
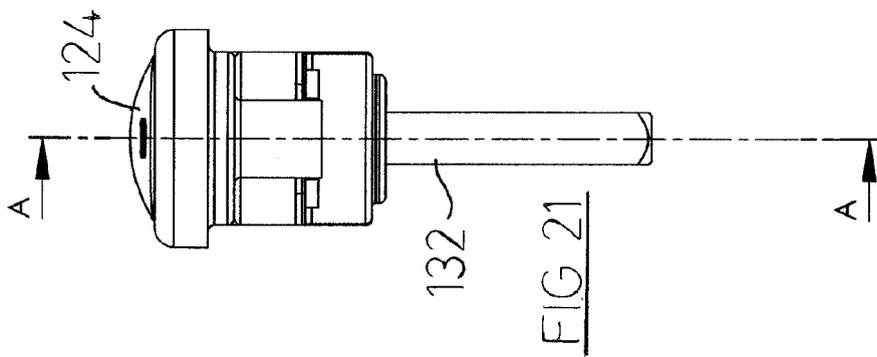
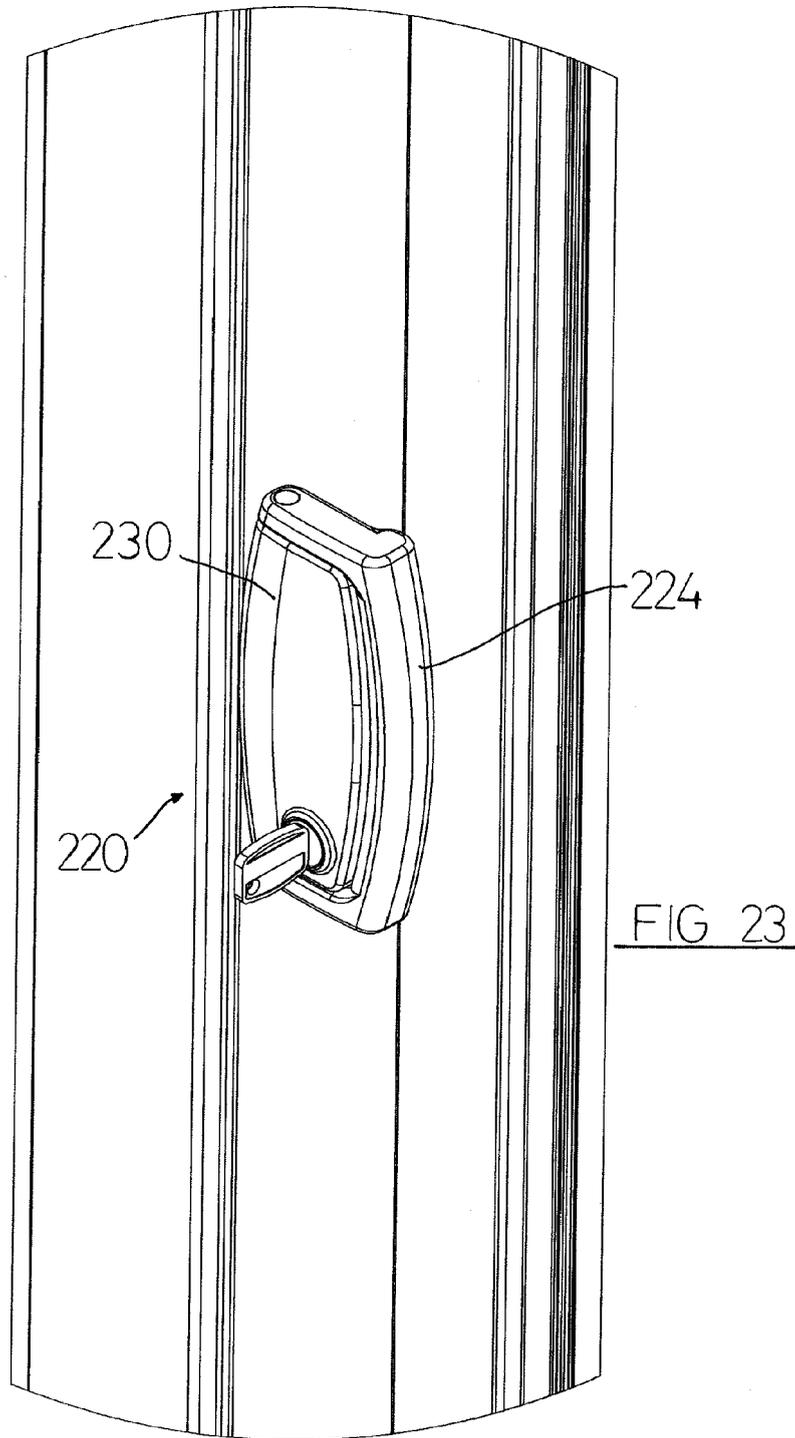


FIG 20





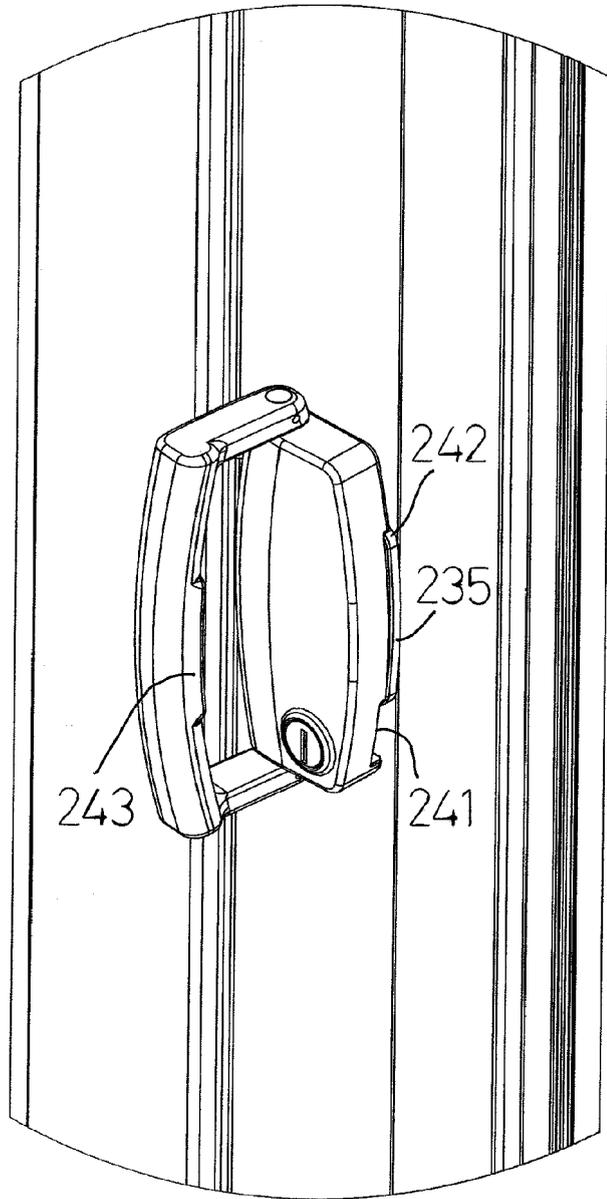
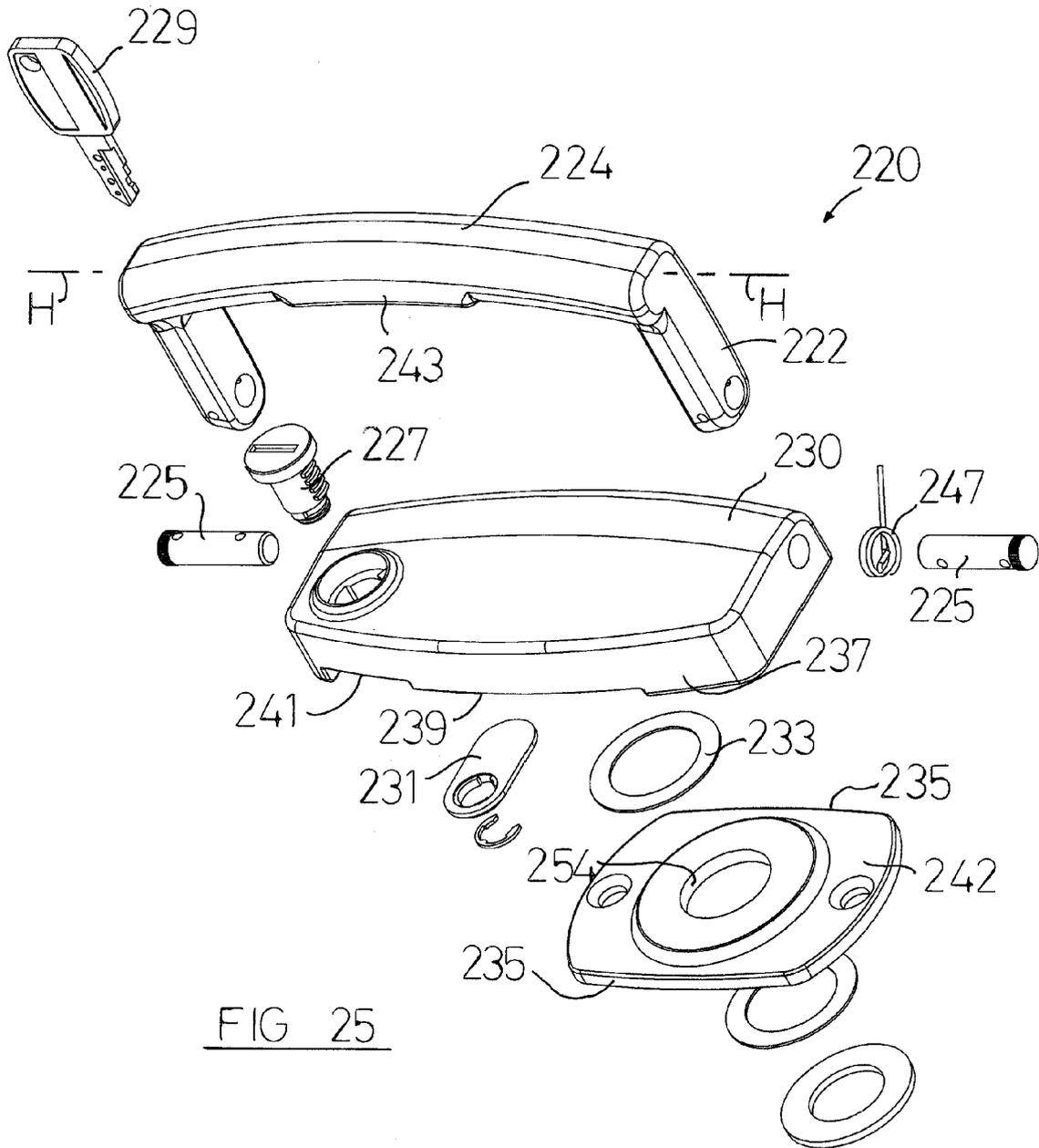


FIG 24



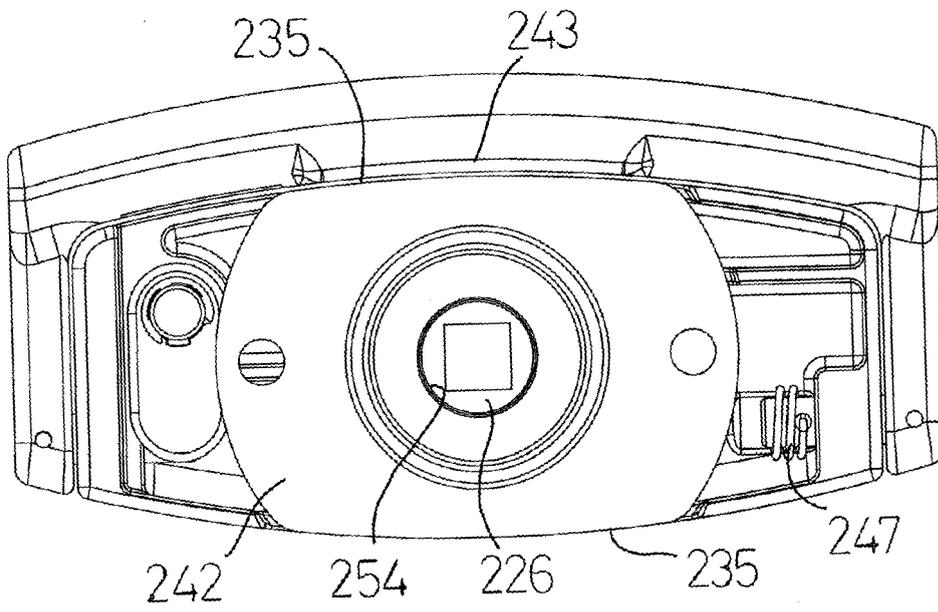


FIG 26

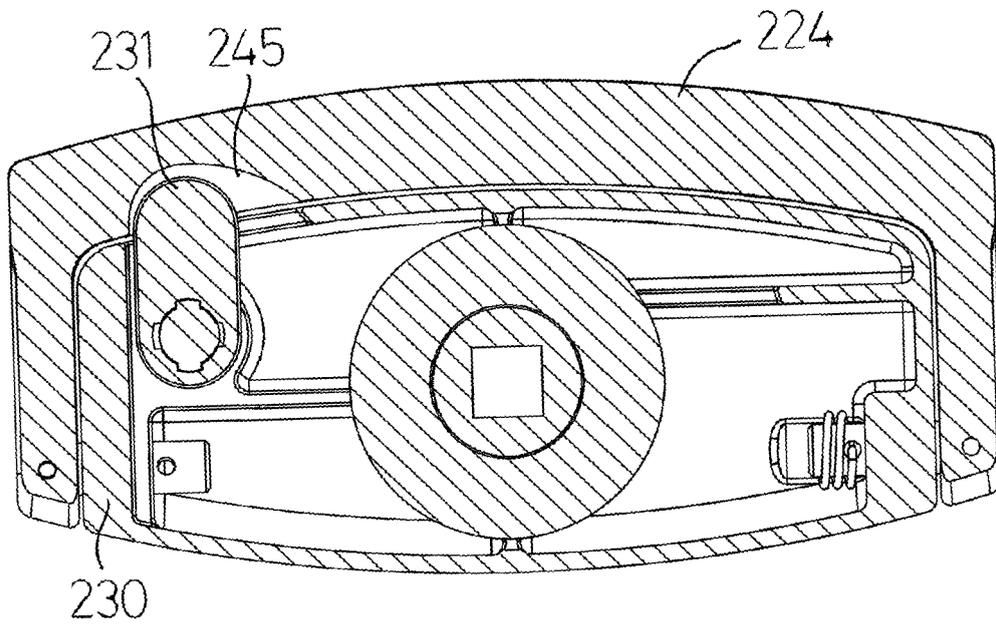


FIG 27

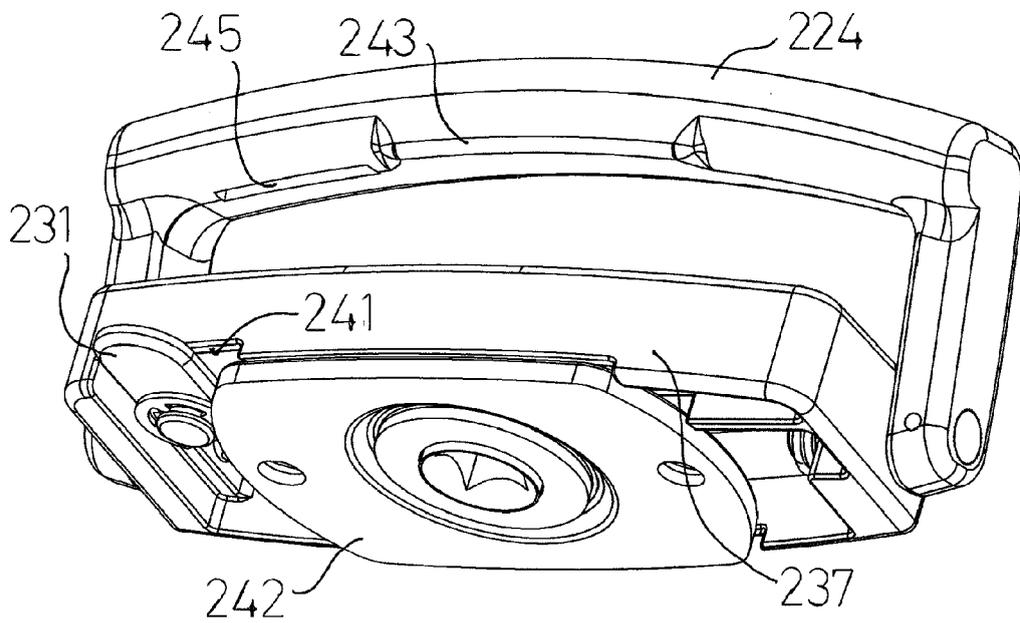


FIG 28