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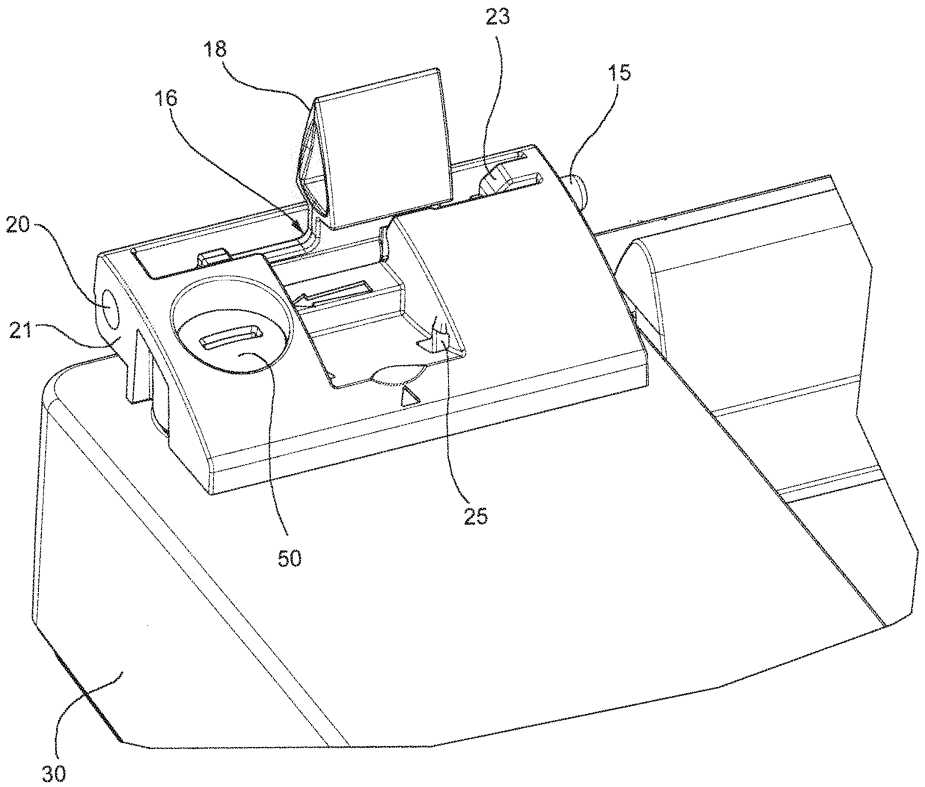
(54) **A hinge device for the door of a switchboard cabinet**

(57) For rotatably mounting a door (40) to a switchboard enclosure (30), a hinge device (10) comprises a body (11) fixable to the enclosure (30), a fixed pintle (15) integral with the body (11) and extending in a vertical direction, and a mobile pintle (16) vertically slidably in the body (11). The pintle (16) is movable between an extended position for rotatably engaging the door (40), and a retracted position towards the inside of the body (11) for disengaging from the door.

FIG.2



EP 1 835 103 A1

Description

[0001] The present invention relates to a hinge device for the door of a switchboard enclosure.

[0002] Switchboard enclosures comprise a rear box fixable to a vertical wall and capable of containing a plurality of electrical switches. Attached to the box is a front cover having one or more one or more openings for access to the control levers or pushbuttons of the electrical switches housed in the box. Along a vertical side of the box there are fixed two hinges forming pintles on which a door is rotatably mounted for closing the front of the enclosure.

[0003] A general object of the present invention is to provide a hinge device capable of making the steps of assembling and disassembling the door of a switchboard enclosure safer and easier.

[0004] A particular object of the invention is to provide a hinge device that allows an operator to assemble and disassemble a door in two phases, with an intermediate assembling or disassembling phase in which the door is secured to the enclosure provisionally but steadily enough to prevent the door from accidentally falling while the operator is completing the locking or unlocking of the door.

[0005] These and other objects and advantages, which will be understood more fully below, are achieved, in accordance with the present invention, by a hinge device having the features defined in claim 1. According to another aspect of the invention, there is provided a door for a switchboard enclosure as defined in claim 15. Preferred embodiments of the invention are defined in the dependent claims.

[0006] The features and advantages of the invention will emerge from the detailed description of an example of embodiment thereof, with reference to the accompanying drawings, provided by way of a non-limiting illustration, in which:

- figures 1 to 5 are perspective views showing the assembling steps of a hinge device according to the invention and a door on a switchboard enclosure;
- figure 6 is an exploded perspective view showing the front side of the hinge device and a fastening screw;
- figure 7 is a perspective view showing the rear side of the hinge device of Figure 6; and
- figures 8 and 9 a partial cross sectional views of the enclosure where a hinge is fitted.

[0007] With reference to the drawings, numeral 10 indicates overall one of the two hinge devices fixable along a side of a front cover 30 of a switchboard enclosure for rotatably mounting a door 40. The cover 30 is removably fixable by means of screw 50 to a rear box 34 (shown partially in figures 8 and 9) of the enclosure. The cover 30 typically has an opening 31 in which there are located recessed panels 60 allowing access to the controls of the electrical switches (not shown) housed in the enclosure.

[0008] Throughout the description and the claims which follow, terms indicating positions and orientations, such as "front", "rear", "horizontal" and "vertical", must be understood from the view point of a person standing in the front of an electric switchboard mounted on a vertical wall.

[0009] Each hinge device 10 (only one is shown in the drawings) comprises a body 11 of moulded plastic material forming a bush portion 12 rearwardly projecting with an inner cylindrical non-threaded passage 13 that passes through the body 11 from side to side in the front-rear direction. On its outside, the bush portion 12 forms a pair of angularly spaced L-shaped radial recesses 14 intended to cooperate with a respective pair of formations 32 (figure 1) radially projecting in a horizontal through bore 33 of the cover 30. The hinge device 10 is coupled with the cover 30 by fitting the bush portion 12 in the bore 33, as indicated schematically by arrows A and B in figure 1. The recesses 14 and projections 32 provide a bayonet coupling mechanism that allows to fix the hinge device 10 to the cover 30 quickly and removably.

[0010] Each hinge device 10 has two vertically aligned pintles 15, 16 on which the door 40 is rotatably mounted. One of the pintles, indicated 15, is a fixed pintle or pin formed integrally with the body 11, whereas the other pintle 16 is a mobile element formed separately from the body 11 (figure 6). The mobile pintle 16 comprises a vertical pin portion 17 and a locking lever 18 perpendicular to the pin 17. The pintle 16 is slidingly accommodated in the body 11 along a vertical axis x aligned with the fixed pintle 15.

[0011] The mobile pintle 16 is inserted in a vertical guiding channel 19 formed by the body 11 (figure 6) and aligned with the axis x and a through bore 20 obtained in a side wall 21 of the body 11. The pin 17 is inserted in snap manner in the guide 19, elastically forcing a tooth 22 that serves to hold the pin 17 along the guide 19. After insertion, the mobile pintle 16 is brought in a retracted position in which the end 17a of the pin 17 does not protrude out of the bore 20 (figure 2). This position is determined by the abutment of the other end 17b of the pin against a stop 23.

[0012] The door 40 is preliminarily coupled with the fixed pintle of each hinge device by a snap coupling (figure 3, arrow C) obtained by fitting the fixed pintle 15 in a fork formation 41 of the door. A preliminarily assembled condition is so achieved (figure 4), in which a bore 42 of the door is axially adjacent and aligned with the bore 20 of each hinge and with the pin 17 retracted. By acting manually on the lever 18, the mobile pintles 16 are then forced to slide in the vertical direction indicated by arrow D in figure 4, thereby bringing the pins 17 in an extended position where they pass through both of the aligned bores 20 and 42. Sliding motion of the mobile pintle 16 with respect to the door 40 and the body 11 of the hinge are prevented by rotating the lever 18 about the axis x until the lever is locked between a pair of vertically spaced

and elastically openable locking teeth 25 (only one of which is visible in the drawings). In this position (figure 5), the teeth 25 hold the lever 18 so as to prevent the pintle 16 from sliding in the direction of axis x and thereby the door from accidentally coming off. The door is so secured steadily to each hinge device at two distinct points.

[0013] In order to assemble a door, two hinge devices must first be mounted on the enclosure cover 30. Then the door 40 is preliminarily coupled with each hinge device by making the forks 41 snap-engage the fixed pintles 15. It should be noted that in this condition (as shown in figure 4) the door is suspended to the enclosure but needs to be secured more steadily, because if it were opened by rotating it more than 180° degrees from its closed position, the forks 41 would be forcefully brought apart from one another and would come off the fixed pintles 15. However, the provisionally secured condition of figure 4 allows the operator to complete closing the mobile pintles 16 safely enough for himself and the door, which will not fall unless it is opened too much, as said. The same safety is attained upon disassembling the door. After unlocking the mobile pintles 16 by making the levers 18 first rotate free of the locking teeth 25 and then withdrawing the ends 17a of the pins from the bores 42 of the door, the operator has both of his hands free to grab the door and remove it in snap manner of the fixed pintles 15.

[0014] Referring finally to figures 8 and 9, the horizontal bore 33 of the cover 30 is axially aligned with the threaded bore 35 of the rear box 34. A screw 50 for fastening the cover 30 onto the box 34 (figure 9) is fitted through the cylindrical passage 13 of the hinge and the non-threaded bore 33 of the cover and screwed into the threaded bore 35. Upon unscrewing the screws 50, the cover can be separated from the rear box. Owing to the bayonet coupling between the hinge and the cover, removal of the screws will not cause separation of the hinges, and therefore the door, from the cover 30. While carrying out this operation, the operator does not need to take care of holding both the cover and the door to avoid that either or both may fall and get damaged. The door remains secured to the cover, whereby it is sufficient to use one hand to take hold of either the cover or the door to prevent both from falling.

[0015] In the embodiment shown in figures 8 and 9, the hinge body 11 forms an abutment surface 13a within the cylindrical passage 13 for the head 51 of the screw 50. Similarly, the two-diameter bore 33 has an abutment surface 36 for the rear or free end of the bush portion 12. When the screw 50 is tightly screwed in the threaded bore 35, the head 51 prevents the hinge device 10 from being accidentally removed from the rest of the enclosure. Owing to the fact that the mechanism for coupling the hinge to the cover is formed integrally with these two parts, each hinge is associated to only one screw. The smaller the number of screws, the less is the risk of losing one of them when the cover is disassembled. The coaxial arrangement of the screw 50 with respect to the bush portion 12 and the bayonet coupling mechanism allows the manufacturing of very compact hinge, having a body even much smaller than the one illustrated by way of example in the attached drawings.

[0016] Furthermore, it will be appreciated that the provision of two pintles or securing points on each hinge device guarantees that the door will be steady also in case one of the two pintles (of plastic material) is broken.

[0017] It is understood that the invention is not limited to the embodiment described and illustrated here, which is to be considered as an example of implementing the hinge device. Rather, the invention is open to modifications concerning the shape and layout of parts, constructional details and materials used. In a further alternative embodiment (not shown), the quick coupling bayonet mechanism may be replaced by a different kind of quick coupling, preferably threaded. For example, the outer surface of the bush portion 12 may form a number of inclined ribs providing a thread for cooperating with corresponding radial reliefs formed in the cover bore 33. Preferably the inclination of the ribs will be chosen such that the hinge body is fixable to the cover by rotating it a fraction of a turn, typically one fourth turn.

Claims

1. A hinge device for rotatably mounting a door to a switchboard enclosure, comprising in combination:

   - a hinge body (11) fixable to an enclosure,
   - a fixed pintle (15) integral with the body (11) and extending in a given direction (x),
   - a mobile pintle (16) mounted slidably in the body (11) along said given direction between an extended position for rotatably engaging a door, and a retracted position towards the inside of the body (11) for disengaging from the door.

2. A hinge device according to claim 1, wherein the body (11) is of moulded plastic material and forms integrally the fixed pintle (15).

3. A hinge device according to claim 1, further comprising means (18; 25) for retaining the mobile pintle (16) in its extended position.

4. A hinge device according to claim 3, wherein said retaining means comprise first (18) and second (25) locking means, formed respectively by the mobile pintle (16) and the body (11), cooperating for locking the mobile pintle in its extended position.

5. A hinge device according to claim 4, wherein the mobile pintle (16) comprises a pin portion (17) extending in said direction (x) and a locking lever (18) perpendicular to said direction for rotating the mobile

pintle (16) about an axis (x) parallel to said given direction, wherein the lever (18) constitutes said first locking means.

6. A hinge device according to claim 5, wherein the mobile pintle (16) is rotatable about said axis (x) so as to reach an angular position in which the lever (18) engages at least one stopping tooth (25) which constitutes said second locking means for limiting the motion of the mobile pintle along said direction and hold it in its extended position.

7. A hinge device according to claim 6, wherein the stopping tooth (25) is elastically flexible so as to releasably retain the lever (18) in said angular position.

8. A hinge device according to claim 6 or 7, wherein the second locking means comprise a pair of stopping teeth (25) spaced from one another along said direction for preventing the mobile pintle from moving along said direction.

9. A hinge device according to claim 1, wherein the fixed (15) and mobile (16) pintles are spaced from one another in said direction so as to rotatably engage a first (41) and a second (42) portion, respectively, of a door (40).

10. A hinge device according to claim 2, wherein the body (11) forms a rearwardly projecting bush portion (12) adapted to be accommodated in a through bore (32) of a cover (30) of the enclosure, the bush portion (12) having a quick coupling means (14) for removably mounting the hinge device (10) on the enclosure cover (30).

11. A hinge device according to claim 10, wherein the quick coupling means (14) is part of a bayonet coupling mechanism.

12. A hinge device according to claim 11, wherein the quick coupling means (14) is an L-shaped radial recess formed in the bush portion (12).

13. A hinge device according to claim 2, wherein a through bore (13) is formed through the body (11) coaxially within the bush portion (12), for accommodating a threaded fastening means (50) for removably fastening a front cover (30) of the enclosure to a rear box (34) of the enclosure.

14. A hinge device according to any one of the preceding claims, **characterized in that** it is completely made of a moulded plastics material.

15. A door for a switchboard enclosure, the door comprising at least two zones for rotatably mounting to respective hinge devices (10) fixed to the enclosure, wherein each zone has

- a quick coupling means (41) for engaging in snap manner around a first pintle portion (15) of the hinge device, and
- a bore (42), aligned and spaced apart in a given direction from the quick coupling means (41), for receiving a second pintle portion (16) of the hinge device.

16. A door according to claim 15, wherein the quick coupling means (41) is a fork-like formation capable of being elastically divaricated in a plane perpendicular to said given direction.

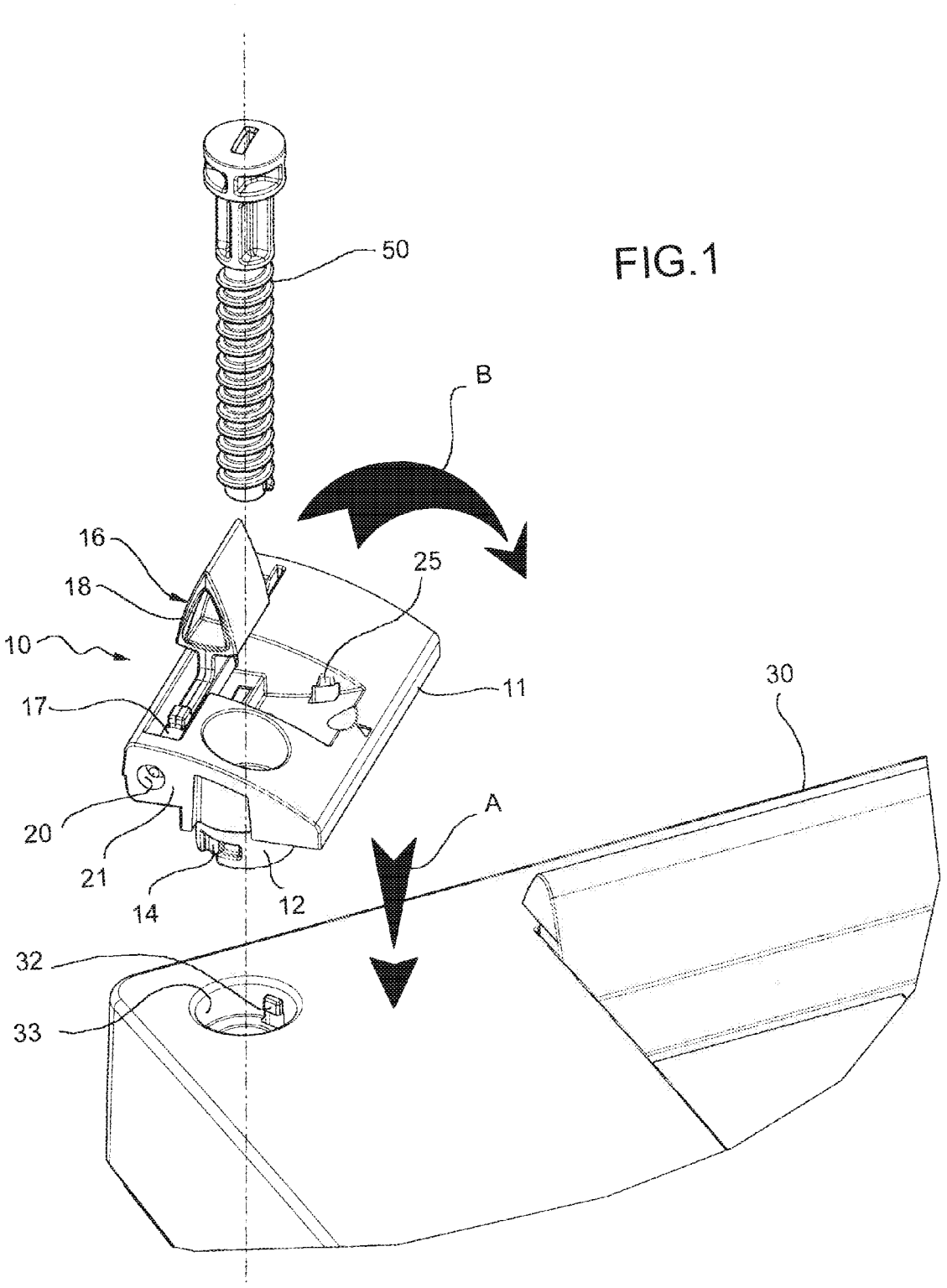


FIG.1

FIG.2

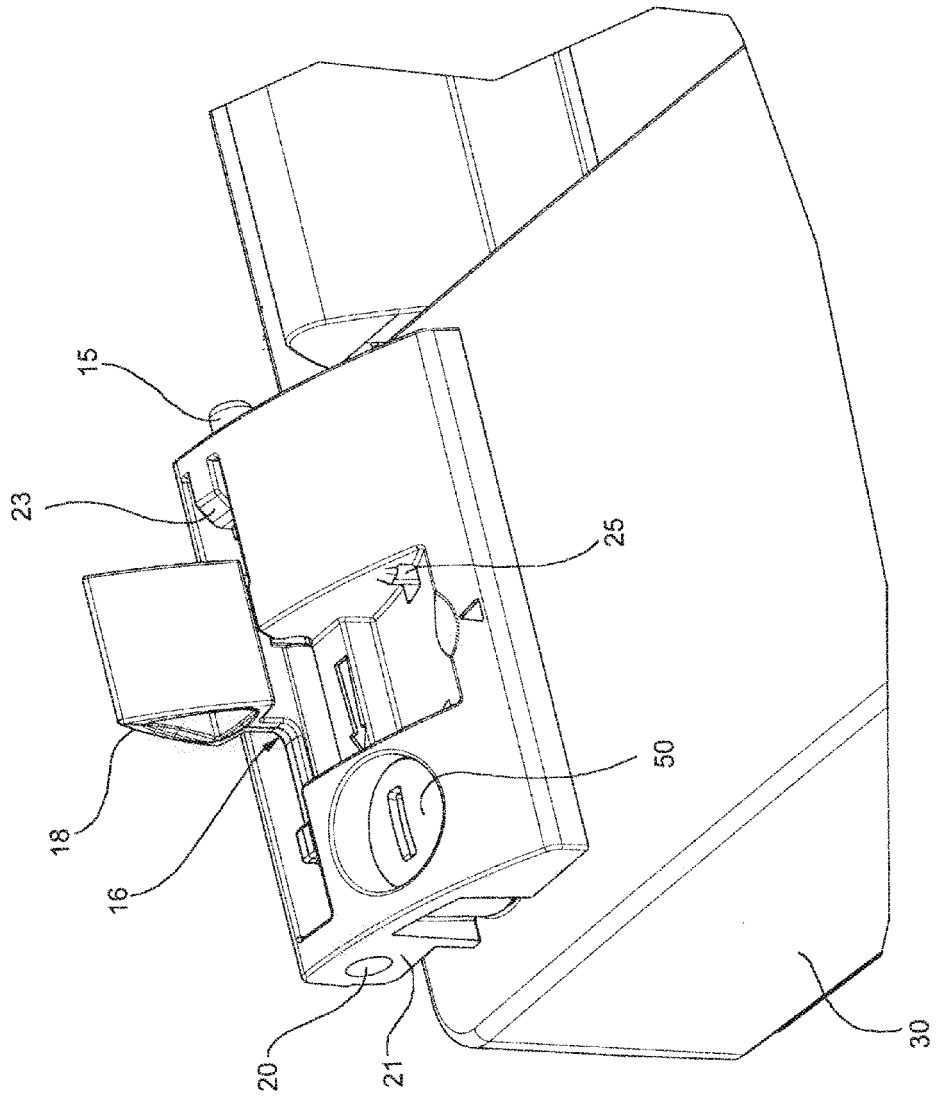


FIG.3

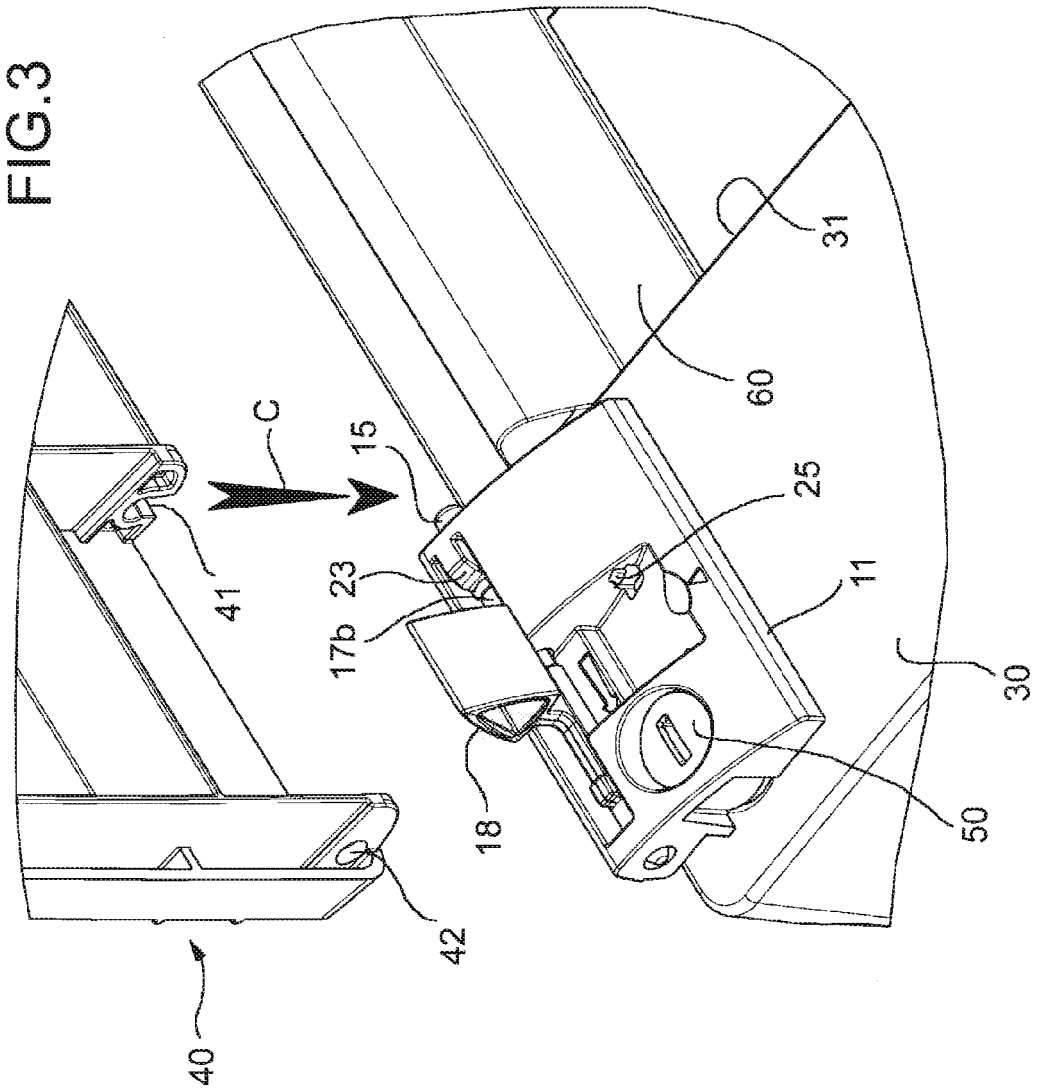
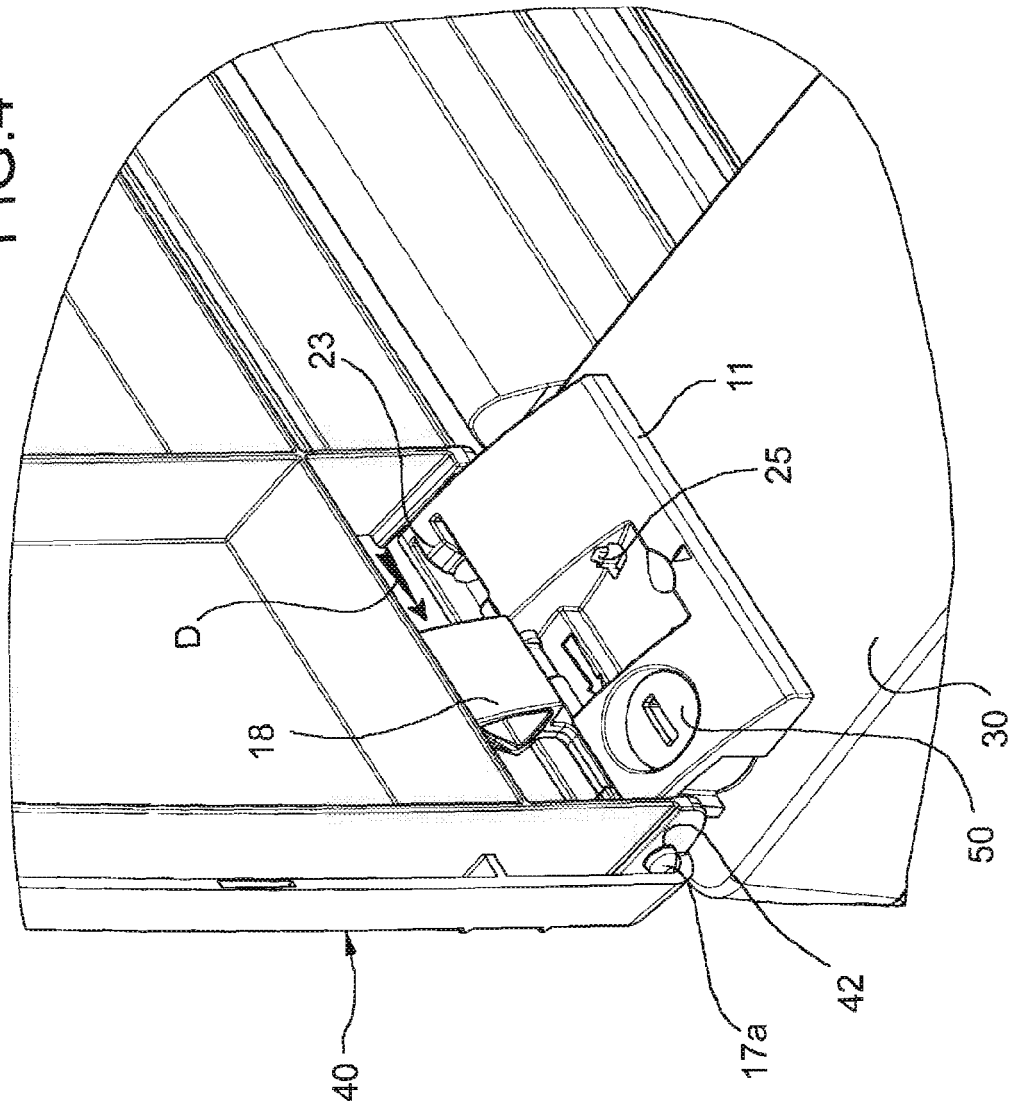


FIG.4



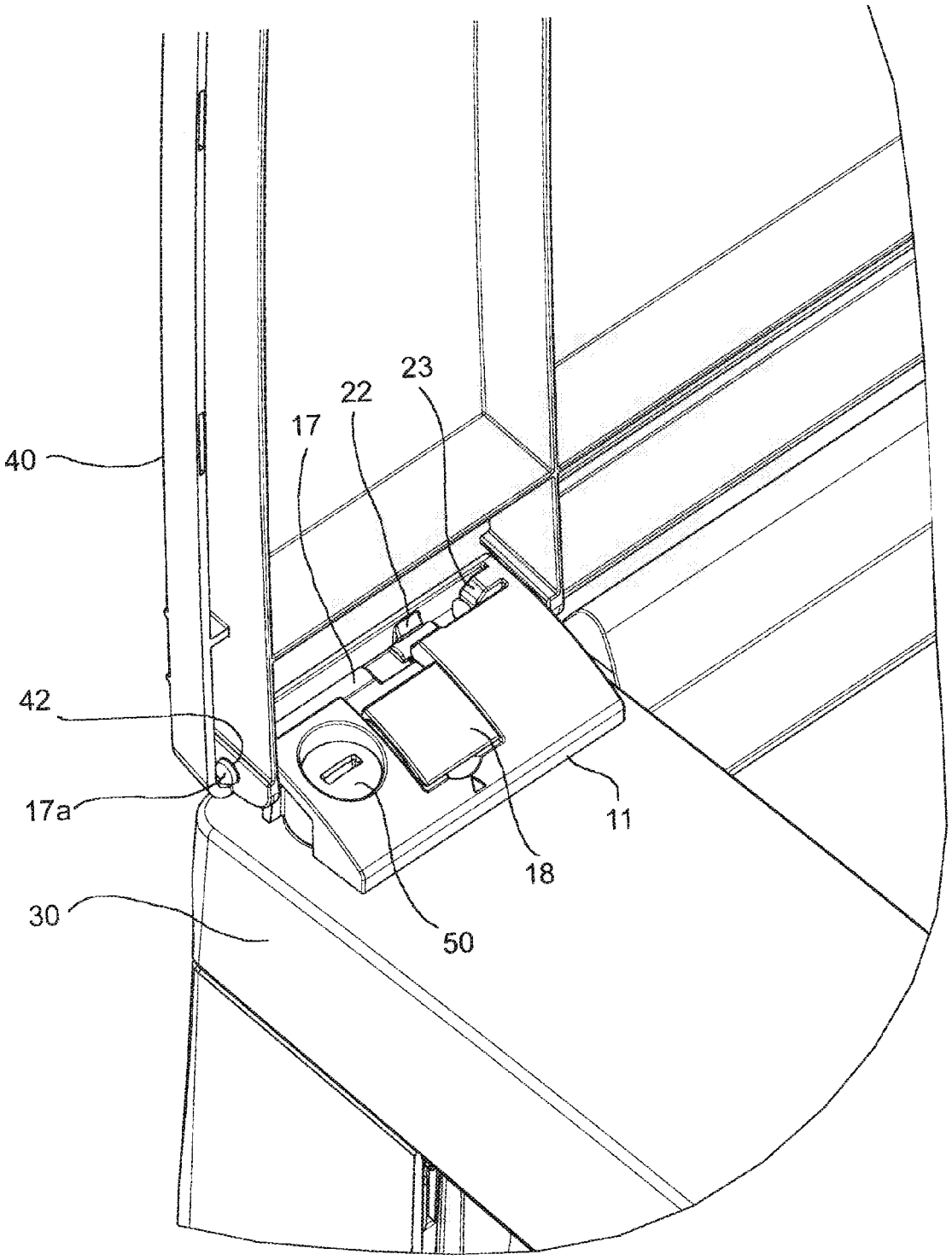


FIG.5

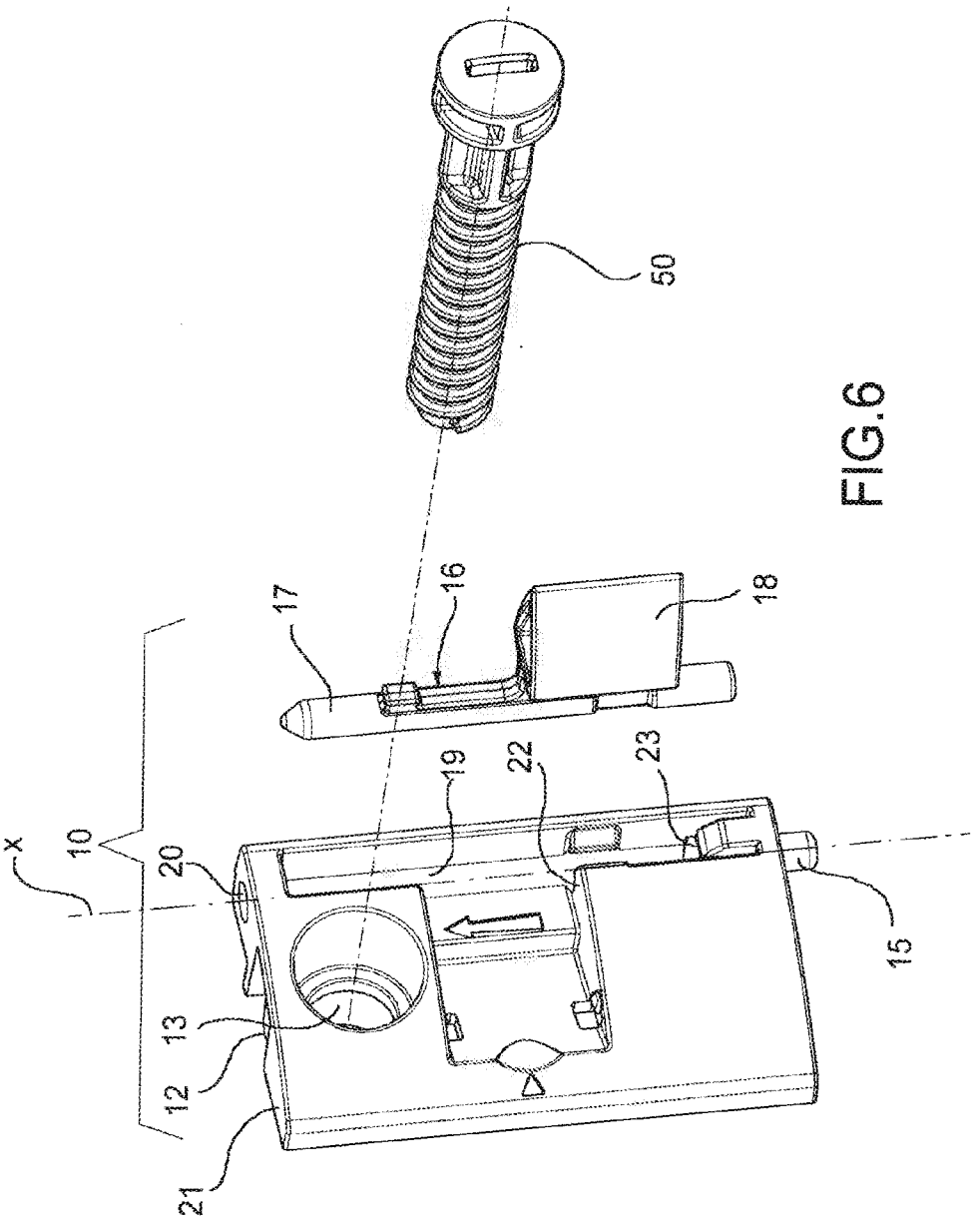


FIG.6

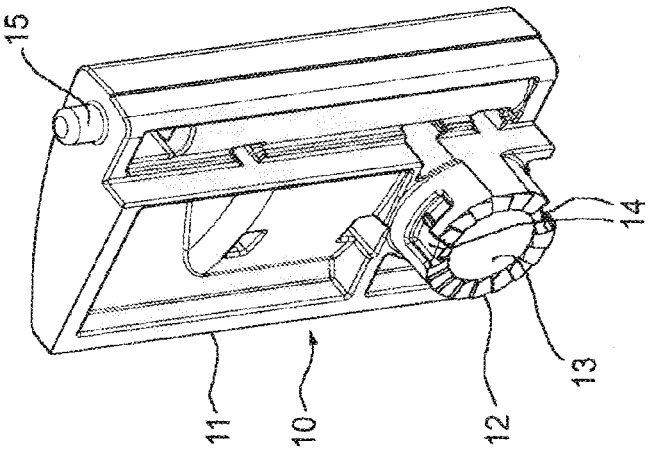


FIG.7

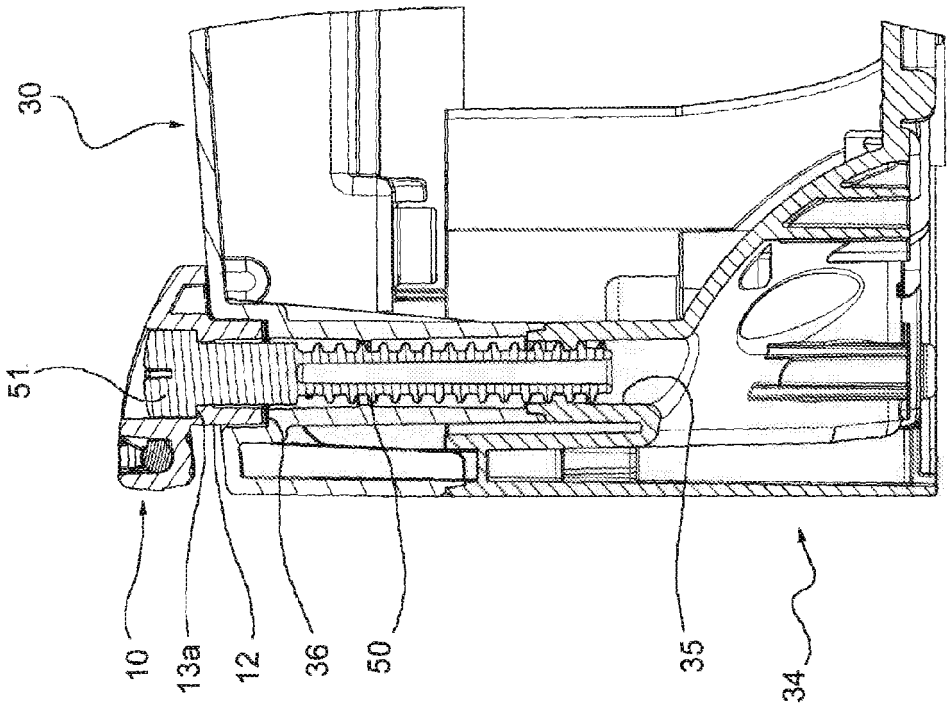


FIG.9

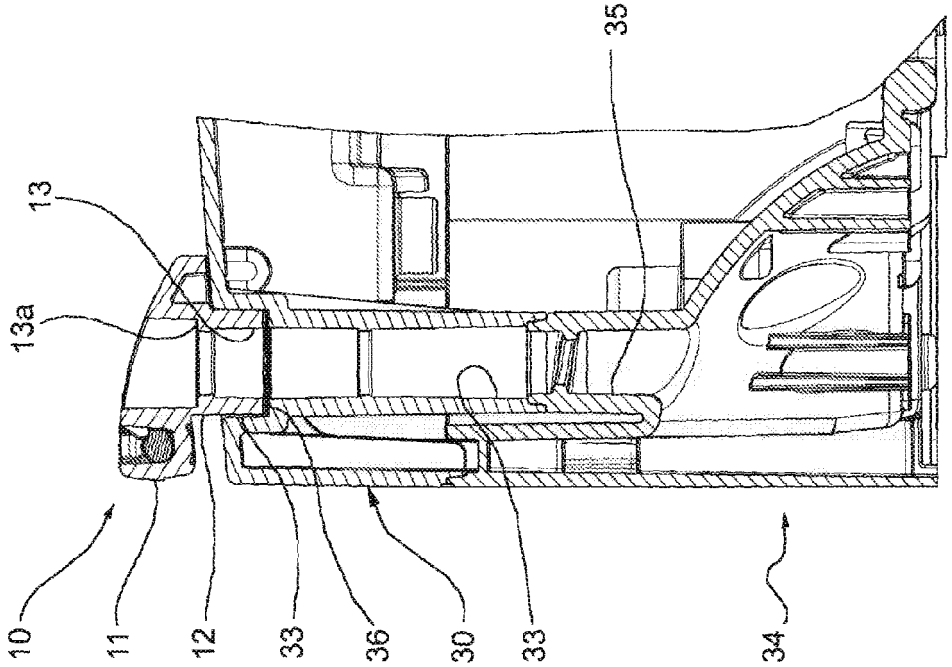


FIG.8

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EUROPEAN SEARCH REPORT

Application Number
EP 07 10 3728

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	US 2005/172452 A1 (KOESSLER JUERGEN [CA]) 11 August 2005 (2005-08-11) * paragraph [0001] * * paragraphs [0034], [0035]; claim 1; figures 5-8 *	15,16	TECHNICAL FIELDS SEARCHED (IPC) E05D H02B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 June 2007	Balice, Marco

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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