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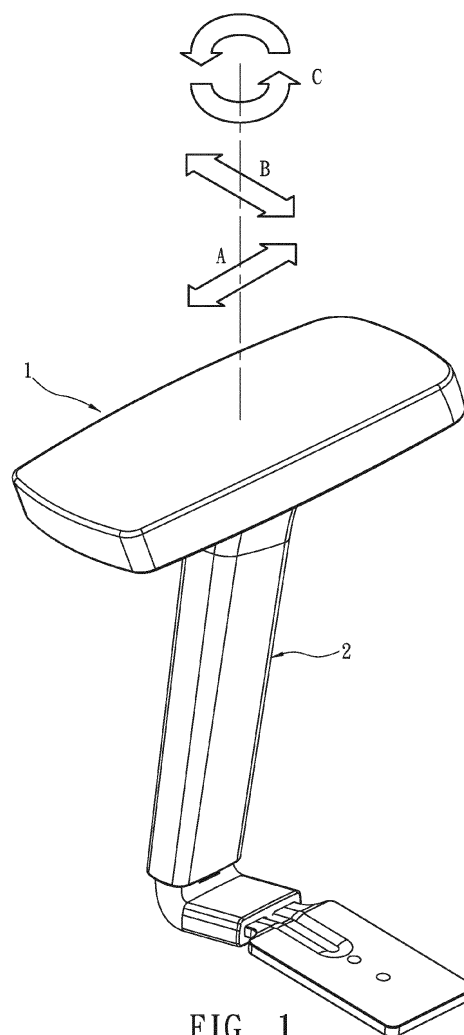
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(54) **Adjustment mechanism for armrest**

(57) An adjustment mechanism for armrests is revealed. An armrest includes an armrest surface and a lower plate fastened to form a space for receiving a movable block. Thus the movable block is moved forward and backward and positioned in relation to the lower plate. A rectangular slot is disposed on the movable block and a rectangular piece is moved and positioned transversely therein. A round slot is set on the rectangular piece while a hat-shaped disc is mounted in the round slot and fastened elastically on a projecting rod of a bottom frame. By a positioning bump on the hat-shaped disc elastically mounted into or separated from a positioning hole arranged circularly on the projecting rod, the hat-shaped disc and the bottom frame are rotated and positioned in relation to each other in a 360 degree circle. Thereby the armrest can be moved transversely and rotated 360 degrees.



**FIG. 1**

## Description

### BACKGROUND OF THE INVENTION

[0001] The present invention relates to an adjustment mechanism for armrests, especially to an adjustment mechanism for armrests that moves forward and backward, transversely or rotates 360 degrees with safety.

[0002] Generally, an armrest of an office chair includes an armrest body and an armrest support. The armrest body formed by an armrest surface and a lower plate is disposed on a top surface of the armrest support while the armrest support is fastened and fixed on the left side and the right side of a chair seat. The armrest adjustment involves adjusting the position of the armrest in the horizontal direction and the height of the armrest in the vertical direction. A height adjustment part is for adjusting height of the armrest and is arranged at the armrest support. A horizontal adjustment part is used to adjust the armrest in a fore-and-aft direction, in a left-and-right direction (the width between a left armrest and a right armrest), or adjust an angle of the armrest and is usually disposed on the armrest body. Although there are various designs of the adjustment mechanism for armrests, a simple member that enables an armrest moving in a left-and-right direction, in a transverse direction and rotating is rare.

[0003] However, the adjustment mechanism for armrests available now poses dangers to users while being adjusted and rotated 360 degrees. A safety assistant structure is required to avoid the hidden dangers. Once users intend to adjust the angle of the armrest, a control button is added for a safe operation. If there is no safety assistant structure, the armrest is easy to be rotated due to unintentional contact or hit when the position effect doesn't work well. This is dangerous while in use. Thus there is a need to provide a novel adjustment mechanism for armrests.

### SUMMARY OF THE INVENTION

[0004] Therefore it is a primary object of the present invention to provide an adjustment mechanism for an armrest that is fastened and fixed on a top surface of the armrest support. The adjustment mechanism for the armrest includes an armrest surface, a lower plate, a bottom frame, a movable block, a rectangular piece, a hat-shaped disc, a plurality of positioning rings and a plurality of elastic parts corresponding to the positioning rings. The adjustment mechanism allows the armrest to be moved in a fore-and-aft direction, in a left-and-right direction, or rotated 360 degrees in relative to the armrest support safely.

[0005] In order to achieve the above object, the armrest surface and the lower plate are fastened to form a space therebetween for receiving the movable block with smaller size. An elastic positioning ring corresponding to a linear positioning slot formed by curved slots and located

at the left and right sides inside the lower plate is disposed on the left side and the right side of the movable block. Thus the movable block can be moved forward and backward in relation to the lower plate and positioned. Moreover, a rectangular slot is disposed on the movable block and the rectangular piece with smaller width is mounted in the rectangular slot. One side of the rectangular piece is disposed with curved slots for positioning so that the rectangular piece is moved and positioned in the left-and-right direction in relation to the rectangular slot. A round slot is set on the rectangular piece and the hat-shaped disc is mounted in the round slot. A center hole is on the center of the hat-shaped disc and is aligned with a center hole of the rectangular piece and a transverse groove on the bottom of the movable block. The hat-shaped disc is fastened on a projecting rod of the bottom frame by a spring and a nut. The bottom frame is fixed on top of the armrest support. By at least one positioning bump on an inner top surface of the hat-shaped disc elastically mounted into or separated from at least one of the positioning holes arranged circularly at equal intervals on top surface of the projecting rod, the hat-shaped disc and the bottom frame are rotated and positioned in relation to each other 360 degrees. Thereby the armrest is moved in a fore-and-aft direction, in a left-and-right direction, or rotated 360 degrees in relative to the armrest support safely.

### BRIEF DESCRIPTION OF THE DRAWINGS

#### [0006]

Fig. 1 is a perspective view of an embodiment in use according to the present invention;

Fig. 2 is an explosive view of an embodiment according to the present invention;

Fig. 2A is a bottom view of a hat-like disc according to the present invention;

Fig. 3 is a partial assembled view of the embodiment in Fig. 2;

Fig. 4 is a partial cross sectional view of an armrest before being rotated 360 degrees according to the present invention;

Fig. 5 is a partial cross sectional view of the embodiment in Fig. 2 while being rotated 360 degrees;

Fig. 6 is a schematic drawing showing a top view of an armrest at a first position according to the present invention;

Fig. 7 is a schematic drawing showing a top view of an embodiment moving forward and backward from the first position in Fig. 6 to a second position according to the present invention;

Fig. 8 is a schematic drawing showing a top view of an embodiment moving in a left-and-right direction from the first position in Fig. 6 to a third position according to the present invention;

Fig. 9 is a schematic drawing showing a top view of an embodiment rotating from the first position in Fig.

6 to a fourth position according to the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

**[0007]** Refer from Fig. 1 to Fig. 3, an armrest 1 of the present invention is fastened on a top surface of an armrest support 2. The armrest 1 includes an armrest surface 10, a lower plate 20, a bottom frame 30, a movable block 40, a rectangular piece 50, a hat-shaped disc 60, a plurality of positioning rings 70 and a plurality of elastic parts 71 corresponding to the positioning rings 70. Each positioning ring 70 is corresponding to one of the elastic parts 71. The armrest 1 moves in a fore-and-aft direction (as an arrow A indicated), in a left-and-right direction (as an arrow B indicated), or rotate 360 degrees (as an arrow C indicated) in relative to the armrest support 2.

**[0008]** The armrest surface 10 is formed by, but not limited to, a soft pad layer 11 and a hard plate layer 12 connected to each other. The soft pad layer 11 made from plastic, rubber or foam provides users good sense of touch while the hard plate layer 12 can be an iron plate or a plastic plate. A plurality of screw holes 13 for fastening is disposed on an inner side around a peripheral of the hard plate layer 12 and is corresponding to a plurality of screw holes 21 on the lower plate 20. But there is no limitation on the fastening way between the armrest surface 10 and the lower plate 20. The screw holes 13 and the screw holes 21 can be replaced by other types of fastening holes.

**[0009]** The lower plate 20 is a plastic housing to be fastened and integrated with the hard plate layer 12. And there is a rectangular inner space formed between the armrest surface 10 and the lower plate 20 for receiving components related to armrest adjustment. Two symmetrical linear positioning slots 22 are arranged at the left and right sides of one end (a front end or a rear end) of the lower plate 20. The linear positioning slot 22 includes a plurality of curved slots 23 and each curved slot 23 has the same size. The other end of the lower plate 20 is disposed with two symmetrical long flanges 24 corresponding to the linear positioning slots 22 so as to form a sliding slot under each long flange 24.

**[0010]** The bottom frame 30 is fixed on a top surface of the armrest support 2 for supporting the armrest 1 of the present invention and allowing the armrest 1 is movably fastened on top of the armrest support 2. In this embodiment, the bottom frame 30 is a round disc, but not limited to the round disc. A plurality of fastening holes 31 is set around the bottom frame 30 so that the bottom frame 30 can be fastened on top of the armrest support 2 by fasteners such as screws (not shown in figure). A projecting rod 32 with a certain height is arranged at a center of the bottom frame 30 and a center hole 33 disposed on a center of a top surface of the projecting rod 32 is penetrating the projecting rod 32 to be communicated with a groove 34 on the bottom of the bottom frame

30, as shown in Fig. 4 and Fig. 5. The top surface of the projecting rod 32 is also disposed with a plurality of positioning holes 35 arranged circularly at equal intervals.

**[0011]** The movable block 40 is movably mounted in the lower plate 20 and the length of the movable block 40 (in a fore-and-aft direction) is smaller than an internal length of the lower plate 20. The edges on the left and right sides of the movable block 40 are respectively mounted into the sliding slots under each long flange 24. Thus the lower plate 20 slides forward and backward stably in relation to the movable block 40, as shown in Fig. 7. The moveable block 40 consists of two symmetrical receiving slots 41 respectively arranged at the left and right sides of the front end or the rear end thereof, a rectangular slot 42 disposed around a middle part thereof, a transverse guiding rail 43 set on one side in the rectangular slot 42, a transverse groove 44 arranged at about a middle part of the rectangular slot 42, and a receiving groove 45 mounted on one side of the rectangular slot 42. The receiving slot 41 is used to receive a positioning ring 70 and an elastic part 71 elastically pressing the positioning ring 70. Thus the positioning ring 70 elastically presses against the positioning slot 22 or one of the curved slots 23. When the movable block 40 slides forward and backward in the lower plate 20, the movable block 40 is positioned by the positioning ring 70 aligned with and against the curved slot 23 of the positioning slot 22. The receiving groove 45 is also used to receive a positioning ring 70 and an elastic part 71 elastically pressing the positioning ring 70 so that the positioning ring 70 presses toward the rectangular slot 42.

**[0012]** The rectangular piece 50 is movably mounted in the rectangular slot 42. The rectangular piece 50 is composed of a guiding slot 51 with an opening facing downward and at one side of the rectangular piece 50, a plurality of transverse curved slots 52 corresponding to the positioning ring 70 in the receiving groove 45 of the movable block 40, and arranged at equal intervals on the other side of the rectangular piece 50 opposite to the guiding slot 51, a round slot 53 and a center hole 54 on the bottom of the round slot 53. The guiding slot 51 is assembled with the guiding rail 43 correspondingly to provide the guiding effect. The width of the rectangular piece 50 is smaller than an internal width of the rectangular slot 42 so that it can slide in the left-and-right direction in relation to the rectangular slot 42. When the rectangular piece 50 slides transversely in the rectangular slot 42, the positioning ring 70 in the receiving groove 45 is aligned with and mounted in one of the curved slots 52 for positioning the rectangular piece 50. The elastic part 71 can be a rubber ring with elasticity. The positioning ring 70 is pressed to project outward elastically due to elasticity of the elastic part 71.

**[0013]** The hat-shaped disc 60 is mounted in the round slot 53 of the rectangular piece 50 and having a round slot 61 on a bottom thereof, as shown in Fig. 2A. The round slot 61 is corresponding to and assembled with the projecting rod 32 of the bottom frame 30. An inner

top surface 62 of the slot 61 is disposed with at least one positioning bump 63. Refer to Fig. 2A, there are three bumps 63 for positioning but not limited to three. The shape and the size of the positioning bump 63 are corresponding to those of the positioning hole 35 on the top surface of the projecting rod 32 so that at least one positioning bump 63 can be mounted into at least one of the positioning holes 35, as shown in Fig. 4, or moved upward to be separated from the positioning hole 35 elastically, as shown in Fig. 5. A center hole 64 on the center of the disc 60 is aligned with the center hole 33 on the center of the top surface of the projecting rod 32. While being assembled, the disc 60 is mounted into the round slot 53 of the rectangular piece 50 while the round slot 61 is simultaneously assembled with the projecting rod 32 of the bottom frame 30, as shown in Fig. 4. Then a fastener 65 such as a bolt is passed through the center hole 64 of the disc 60 and the center hole 33 of the bottom frame 30 so that a rear end of the fastener 65 is exposed inside the groove 34 on the bottom of the bottom frame 30. Next an elastic part 36 such as a compression spring is set around the rear end of the fastener 65 and a nut 37 is threaded onto the rear end of the fastener 65. Thus the elastic part 65 is elastically compressed between the inner bottom surface of the groove 34 and the nut 37. Thereby the hat-shaped disc 60, the rectangular piece 50, the movable block 40, and the lower plate 20 are fastened by the fastener 65 and the nut 37 in turn from top to bottom to form a linking body (60, 50, 40, 20) that elastically presses against the projecting rod 32 of the bottom frame 30, as shown in Fig. 3 and Fig. 4. At this moment, at least one positioning bump 63 is elastically mounted into at least one of the positioning holes 35 due to elasticity of the elastic part 36 to be positioned, as shown in Fig. 4. When the armrest surface 10 and the linking body (60, 50, 40, 20) is lifted by the user, refer to Fig. 5, the positioning bump 63 is moved upward and released from the positioning hole 35 by the elastic part 36. Thus the users can adjust and rotate the armrest surface 10 with the linking body (60, 50, 40, 20) in a 360 degree turn, as shown in Fig. 9.

**[0014]** The armrest surface 10 and lower plate 20 are fastened and fixed to form the armrest 1. By the fastener 65 and the nut 37, the hat-shaped disc 60, the rectangular piece 50, the movable block 40, and the lower plate 20 are fastened to form a linking body 60, 50, 40, 20 which elastically presses the central projecting rod 32 of the bottom frame 30, as shown in Fig. 3 and Fig. 4. When the user lifts the armrest surface 10 or the armrest 1, the linking body 60, 50, 40, 20 is also moved upward at the same time. The bottom frame 30 and the armrest support 2 are fastened and integrated into one piece. Thus the bottom frame 30 remains still in relation to the armrest support 2. The hot-shaped disc 60 is set on the central projecting rod 32 of the bottom frame 30 by elasticity of the elastic part 36. Thus the hot-shaped disc 60 remains still in relation to the bottom frame 30 (the armrest support 2) in the left-and-right direction and in the fore-and-aft

direction. But the hot-shaped disc 60 can move vertically so that at least one positioning bump 63 is elastically mounted into at least one of the positioning holes 35 due to elasticity of the elastic part 36 to be positioned, as shown in Fig. 4, or elastically separated from the positioning hole 35. Therefore users can adjust the angle of the armrest 1 in a 360 degree circle, as shown in Fig. 1 and Fig. 9.

**[0015]** While in use, the armrest 1 can be moved and adjusted in a fore-and-aft direction, in a left-and-right direction, or rotates 360 degrees in relation to the armrest support 2. The details are as followings:

(1) The forward and backward movement of the armrest 1: The linking body 10, 20 is moved in a fore-and-aft direction in relation to the movable block 40. That means the movable block 40, the rectangular piece 50 and the hat-shaped disc 60 remain still while the user operates the armrest 1 (the linking body 10, 20) to move forward and backward in relation to the movable block 40, as an arrow A indicated in Fig. 7. The linking body 10, 20 formed by the armrest surface 10 assembled with the lower plate 20 is moved from a first position in Fig. 6 to a second position in Fig. 7. After the forward/backward adjustment, the linking body 10, 20 is positioned at the second position shown in Fig. 7 by the positioning ring 70 elastically aligned with and mounted in one curved slot 23 of the positioning slot 22.

(2) The leftward and rightward movement of the armrest 1: The movable block 40 can be slid in a left-and-right direction in relation to the rectangular piece 50 and the hat-shaped disc 60. That means the rectangular piece 50 and the hat-shaped disc 60 remain still while the linking body 10, 20, 40 formed by the above linking body 10, 20 assembled with the movable block 40 is moved leftward and rightward, as an arrow B indicated in Fig. 8. Thus the linking body 10, 20, 40 is moved from the first position in Fig. 6 to a third position shown in Fig. 8 in relation to the rectangular piece 50. After the leftward and rightward adjustment, the linking body 10, 20, 40 is positioned at the third position in Fig. 8 by the positioning ring 70 elastically aligned with and mounted in one of the curved slots 52.

(3) The 360 degree rotation of the armrest 1: The user firstly lifts the armrest 1 a certain height. The armrest surface 10 and the linking body 60, 50, 40, 20 is changed from the condition shown in Fig. 4 to the condition shown in Fig. 5. In the Fig. 4, the positioning bump 63 is mounted into the positioning holes 35 while the positioning bump 63 and the positioning holes 35 are separated from each other in Fig. 5. Now the user can rotate the armrest 1 (the armrest surface 10) a certain degrees, as an arrow C indicated in Fig. 9. When the armrest surface 10 and the linking body 60, 50, 40, 20 are rotated from the first position in Fig. 6 to a fourth position shown in Fig. 9,

as dotted lines shown in Fig. 9, the armrest 1 is released. Now at least one positioning bump 63 is elastically mounted into another positioning hole 35 due to elasticity of the elastic part 36 and is positioned at the fourth position shown in Fig. 5 and Fig. 9. Thus the rotation of the armrest in a 360 degree circle is finished.

**[0016]** Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, and representative devices shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalent.

## Claims

1. An adjustment mechanism for an armrest disposed on top of an armrest support comprising: an armrest surface, a lower plate, a bottom frame, a movable block, a rectangular piece, a hat-shaped disc, a plurality of positioning rings and a plurality of elastic parts corresponding to the positioning rings; wherein the armrest surface is fastened and integrated with the lower plate to form a rectangular inner space therebetween for receiving components related to armrest adjustment;  
the lower plate is disposed with two symmetrical linear positioning slots each of which is formed by a plurality of curved slots and respectively set on the left and right sides of one end therein;  
the movable block is movably mounted in the lower plate and having a length smaller than an internal length of the lower plate; the moveable block includes two symmetrical receiving slots respectively arranged at the left and right sides of one end thereof, a rectangular slot disposed around a middle part thereof, a transverse groove arranged at about a middle part in the rectangular slot, and a receiving groove mounted on one side of the rectangular slot; the receiving slot is for receive a positioning ring and an elastic member elastically pressing the positioning ring and is corresponding to the linear positioning slot of the lower plate so that the movable block is sliding forward and backward in relation to the lower plate and is positioned by the positioning ring elastically aligned with and against one of the curved slots of the linear positioning; the receiving groove is for receiving a positioning ring and an elastic member elastically pressing the positioning ring so that the positioning ring presses toward the rectangular slot; the bottom frame is fixed on a top surface of the armrest support and having a projecting rod with a certain height arranged at a center thereof, a center hole disposed on a center of a top surface of the

projecting rod and penetrating the projecting rod to be communicated with a groove on a bottom of the bottom frame, and a plurality of positioning holes arranged circularly at equal intervals on the top surface of the projecting rod;

the rectangular piece is movably mounted in the rectangular slot while a width of the rectangular piece is smaller than an internal width of the rectangular slot; the rectangular piece includes a plurality of curved slots arranged linearly on one side thereof and corresponding to the receiving groove of the movable block, a round slot set around a middle part thereof, and a center hole on a bottom surface of the round slot; while the rectangular piece is sliding transversely in the rectangular slot, the rectangular piece is positioned by the positioning ring in the receiving groove elastically aligned with and against one of the curved slots thereof;

the hat-shaped disc is mounted in the round slot of the rectangular piece and having a round slot on a bottom thereof that is corresponding to and assembled with the projecting rod of the bottom frame; an inner top surface of the slot is disposed with at least one positioning bump whose shape and the size are corresponding to the positioning hole on the top surface of the projecting rod; a center hole mounted on the center of the hat-shaped disc is aligned with the center hole on the center of the projecting rod of the bottom frame; a fastener is passed through the center hole of the hat-shaped disc and the center hole of the bottom frame so that a rear end of the fastener is exposed inside the groove on the bottom of the bottom frame and an elastic part and a nut are set around and threaded onto the rear end of the fastener; thus the elastic part is elastically compressed between an inner bottom surface of the groove and the nut while the hat-shaped disc, the rectangular piece, the movable block, and the lower plate are fastened in turn from top to bottom to form a linking body that elastically presses against the projecting rod of the bottom frame; the positioning bump is elastically mounted into at least one of the positioning holes due to elasticity of the elastic part to be positioned; when the armrest surface and the linking body is lifted, the positioning bump is moved upward and released from the positioning hole by elasticity of the elastic part so that the armrest surface and the linking body are adjusted and rotated in a 360 degree circle;

wherein the armrest surface and the lower plate are fastened to form the armrest;

wherein the lower plate slides forward and backward in relation to the movable block so as to achieve adjustment of the armrest in a fore-and-aft direction;

wherein the movable block slides transversely in relation to the rectangular piece so that the armrest is adjusted in a transverse direction;

wherein when the linking body formed by the hat-

shaped disc, the rectangular piece, the movable block, and the lower plate is lifted, an angle of the armrest is adjusted in relation to the bottom frame in a 360 degree circle.

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2. The device as claimed in claim 1, wherein two symmetrical long flanges are disposed on the left and right sides in one end of the lower plate to form a sliding slot under each long flange; transverse edges of the movable block are respectively mounted into the sliding slots under each long flange and sliding therein. 10
3. The device as claimed in claim 1, wherein a transverse guiding rail is arranged at one side in the rectangular slot and a guiding slot corresponding to the guiding rail is transversely disposed on one side of the rectangular piece; thus the guiding slot is assembled with the transverse guiding rail in the rectangular slot correspondingly. 15 20
4. The device as claimed in claim 1, wherein the elastic part is a rubber ring with elasticity. 25

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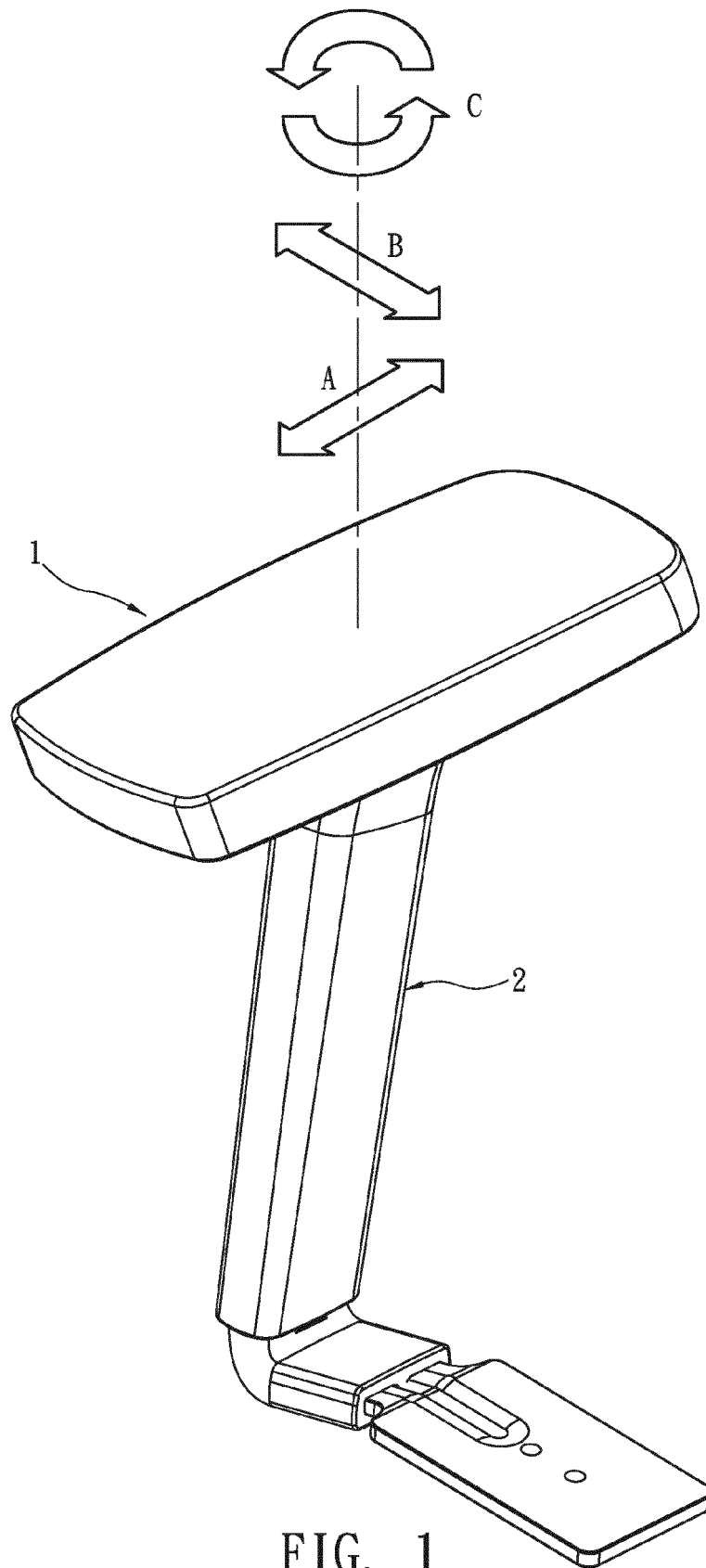
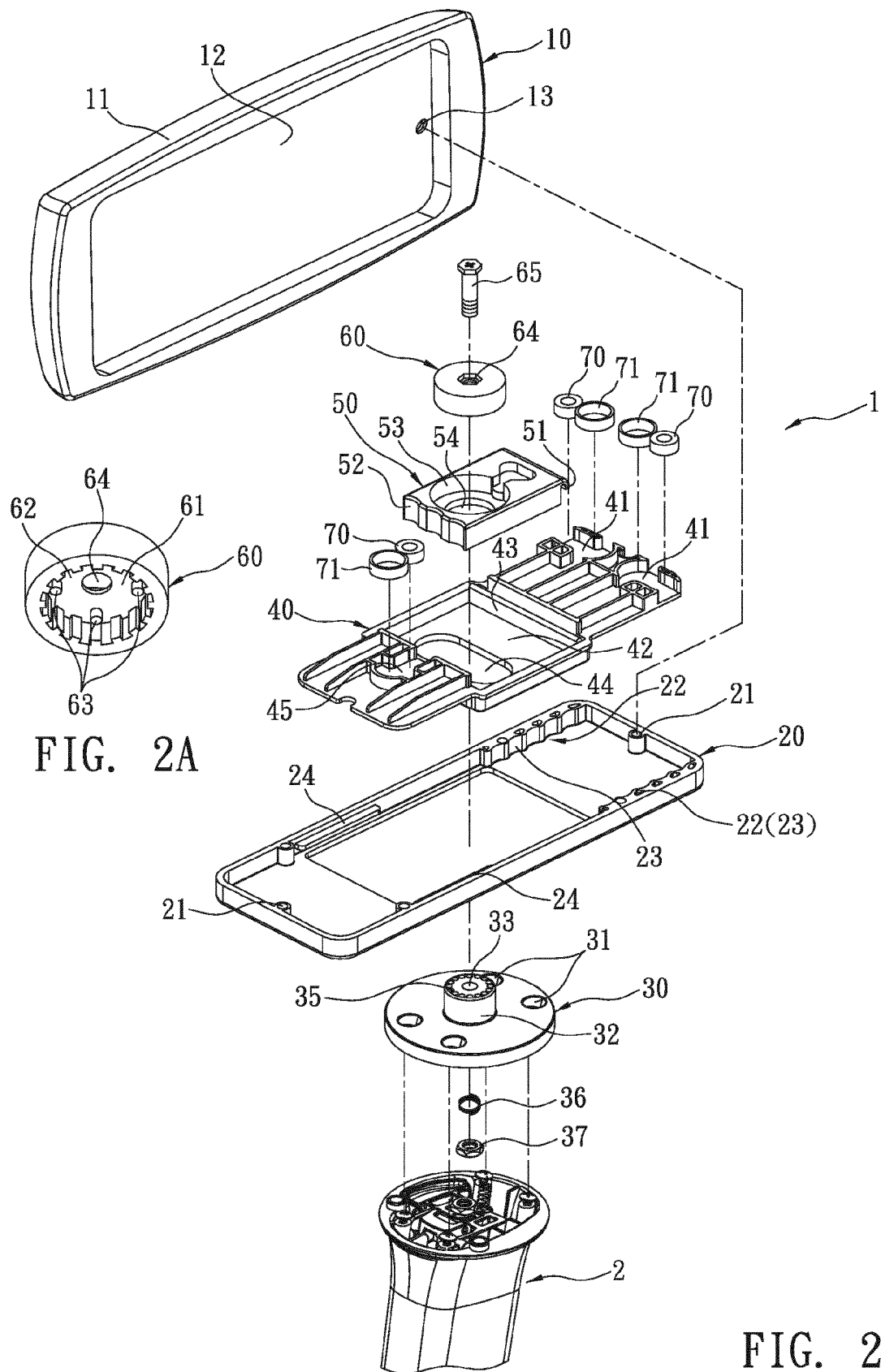


FIG. 1



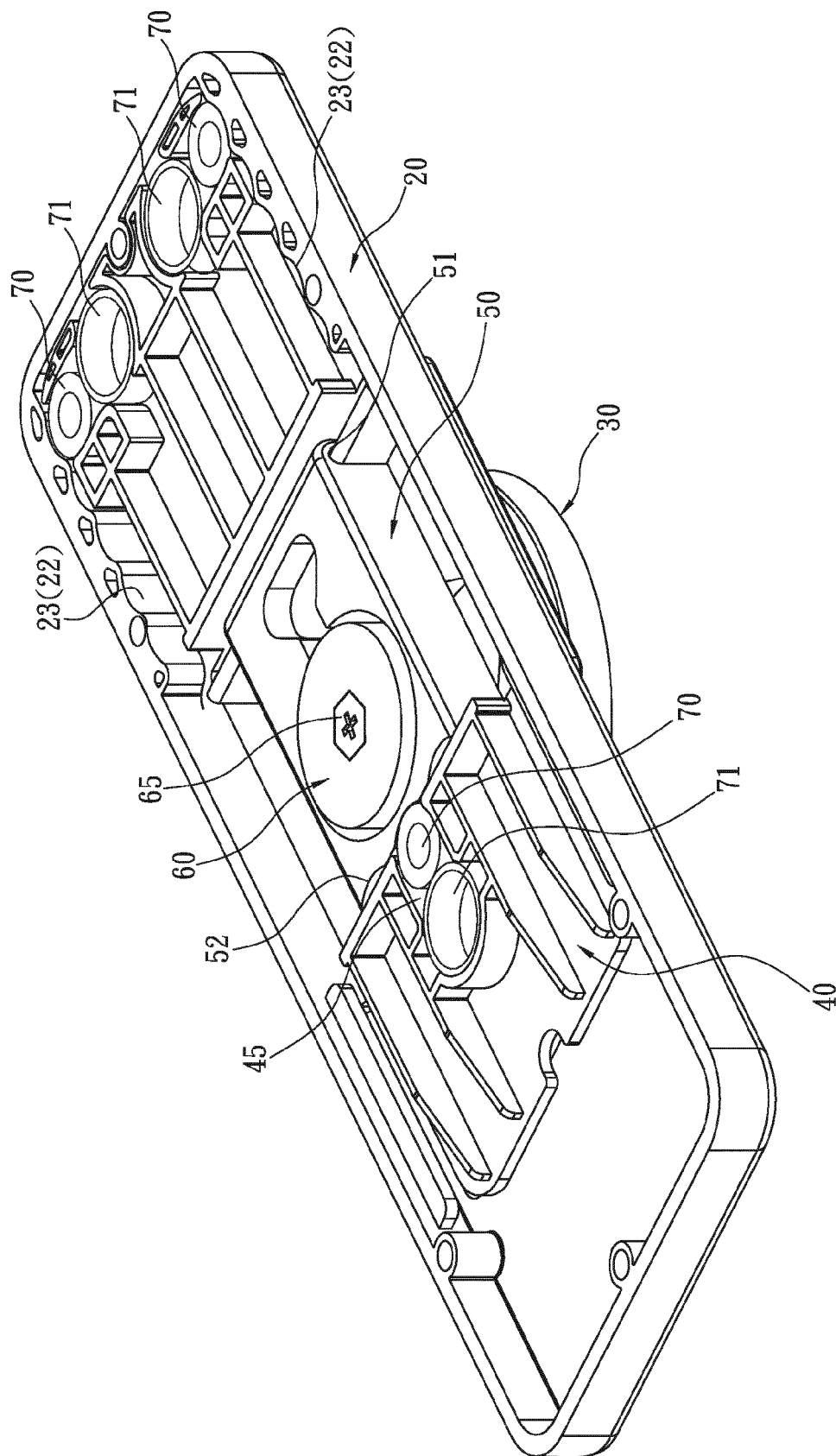


FIG. 3

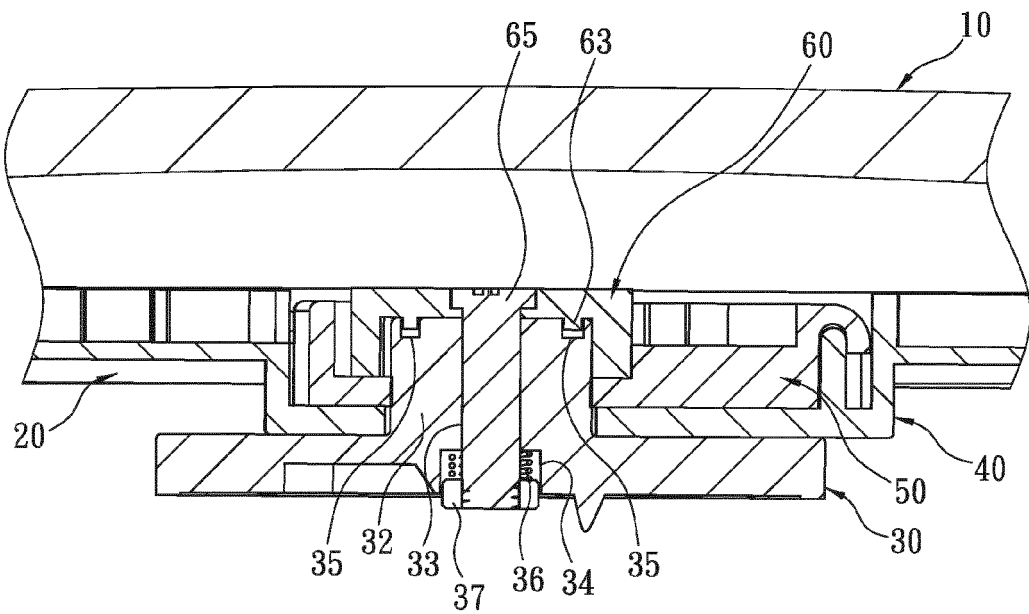


FIG. 4

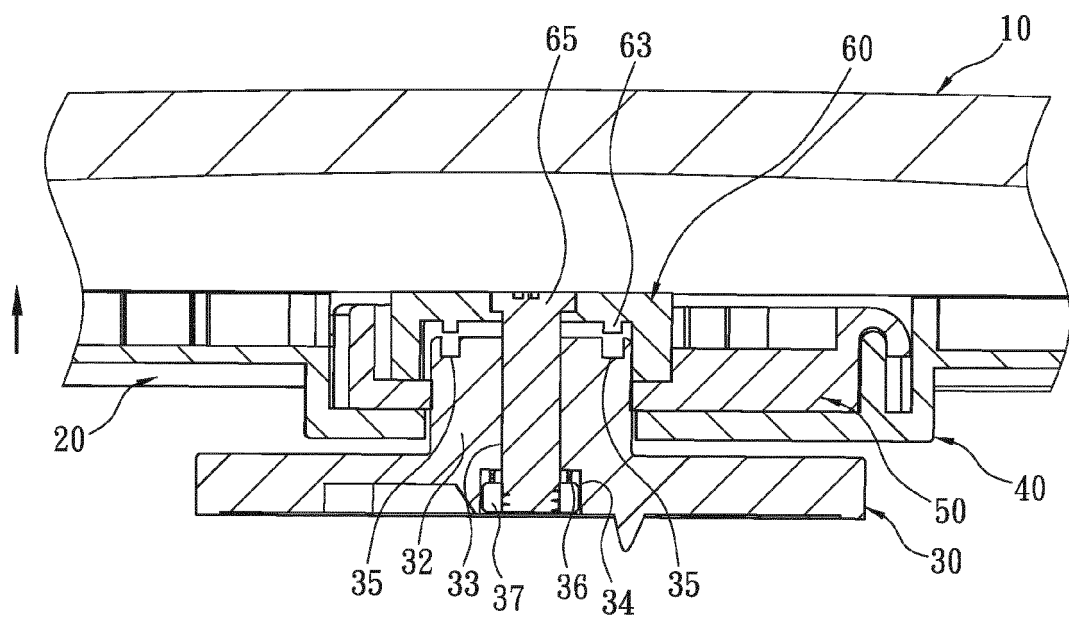


FIG. 5

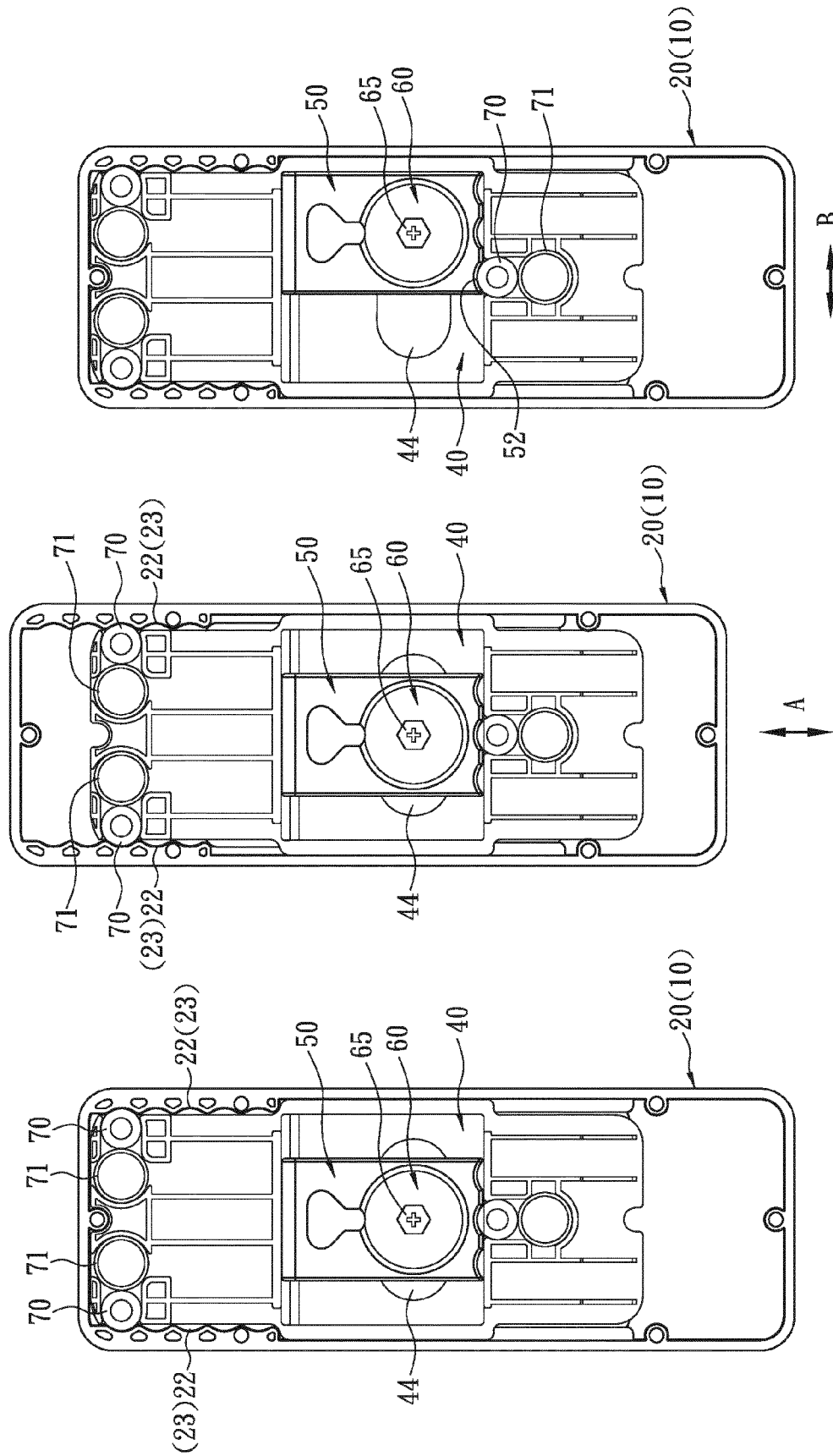


FIG. 6

FIG. 7

FIG. 8

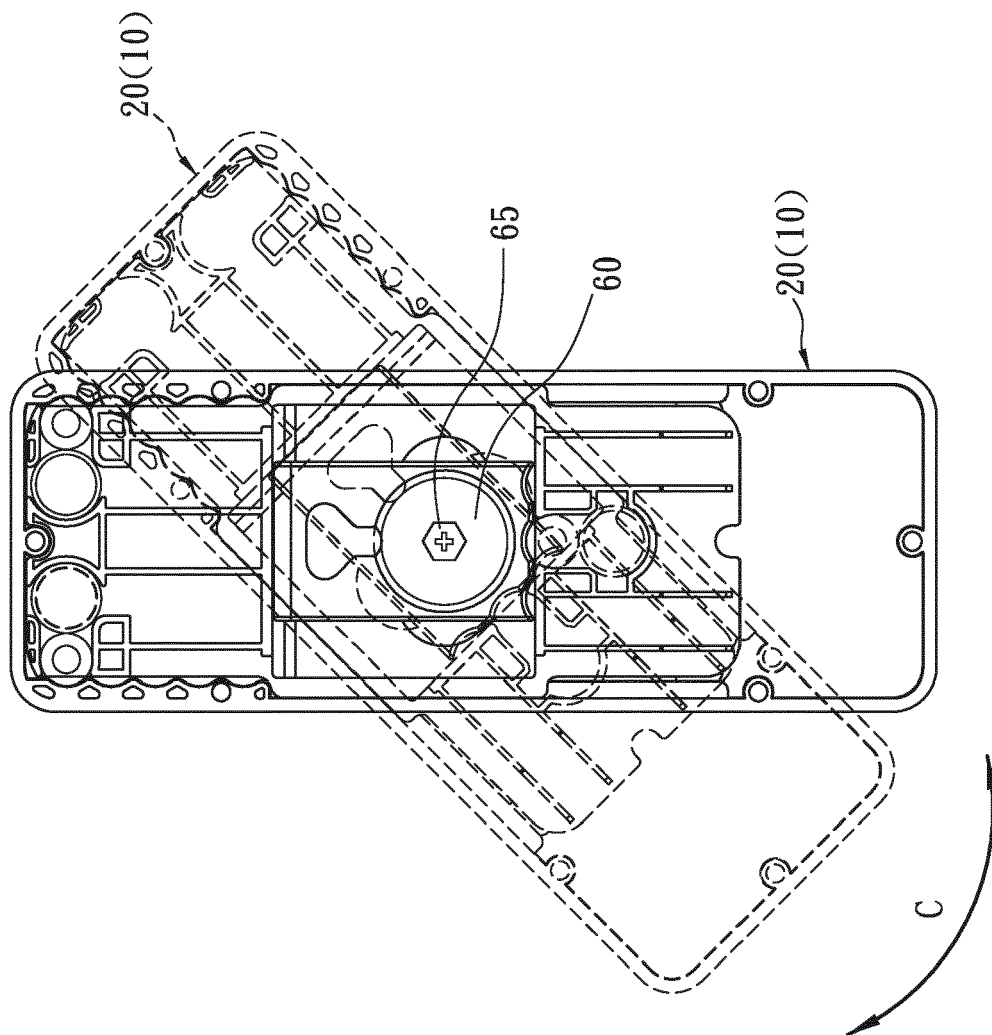


FIG. 9



## EUROPEAN SEARCH REPORT

Application Number  
EP 12 19 4150

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                 |                                                      |                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                   | Relevant to claim                                    | CLASSIFICATION OF THE APPLICATION (IPC) |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | WO 96/33452 A1 (LORD CORP [US])<br>24 October 1996 (1996-10-24)<br>* the whole document *       | 1-4                                                  | INV.<br>A47C1/03<br>A47C7/54            |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 7 150 504 B1 (LEE HWANG-PAO [TW])<br>19 December 2006 (2006-12-19)<br>* the whole document * | 1-4                                                  |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | EP 1 161 903 A2 (PRO CORD SPA [IT])<br>12 December 2001 (2001-12-12)<br>* the whole document *  | 1-4                                                  |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2003/025378 A1 (LIN CHIN-TAO [TW])<br>6 February 2003 (2003-02-06)<br>* the whole document * | 1-4                                                  |                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                 |                                                      | TECHNICAL FIELDS SEARCHED (IPC)         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                 |                                                      | A47C                                    |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                 |                                                      |                                         |
| Place of search<br>Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                 | Date of completion of the search<br>19 February 2013 | Examiner<br>MacCormick, Duncan          |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                 |                                                      |                                         |

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

EP 12 19 4150

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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19-02-2013

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                                                                                 | Publication<br>date                                                                            |
|-------------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| WO 9633452 A1                             | 24-10-1996          | US 5634537 A<br>WO 9633452 A1                                                                                              | 03-06-1997<br>24-10-1996                                                                       |
| US 7150504 B1                             | 19-12-2006          | NONE                                                                                                                       |                                                                                                |
| EP 1161903 A2                             | 12-12-2001          | CN 1329866 A<br>DE 60108555 D1<br>DE 60108555 T2<br>EP 1161903 A2<br>HK 1042637 A1<br>IT T020000539 A1<br>US 2002043862 A1 | 09-01-2002<br>03-03-2005<br>29-12-2005<br>12-12-2001<br>04-05-2007<br>06-12-2001<br>18-04-2002 |
| US 2003025378 A1                          | 06-02-2003          | NONE                                                                                                                       |                                                                                                |

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