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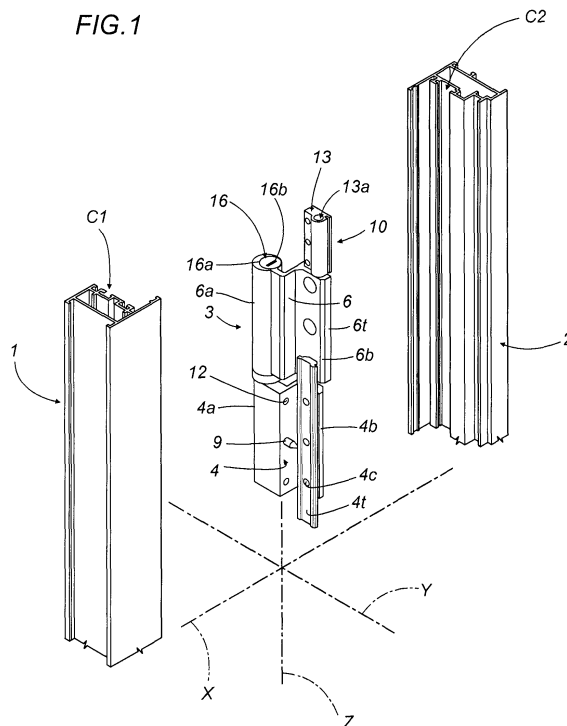
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(54) **An adjustable hinge for heavy doors and windows.**

(57) A hinge for door and window units, especially heavy door and window units comprising a fixed frame (1) and a mobile frame (2) whose profiles define respective longitudinal grooves (C1, C2) for fastening operating accessories. The hinge (3) comprises: a first male, or lower, hinge body (4) having a first cylindrical socket (4a) and a first flap (4b) that can be associated, through respective first fastening means (5), with the groove (C1) of the fixed frame (1); a second female, or upper, hinge body (6) having a second cylindrical socket (6a) and a second flap (6b) that can be associated, through respective second fastening means (7), with the groove (C2) of the mobile frame (2); a hinge pin (8) that can be housed in the two sockets (4a, 6a) and defining the axis of rotation (Z8) of the mobile frame (2). Third means (9) are also provided for fastening the first hinge body (4), acting at least between the first flap (4b) of the first body (4), in the vicinity of the first socket (4a), and the surface of the fixed frame (1) facing it. These third fastening means (9) can, in particular, be housed directly in the first socket (4a) of the first hinge body (4).

FIG. 1



Description

[0001] This invention relates to an adjustable hinge for doors or windows, in particular heavy doors or windows.

[0002] Hinges for heavy doors or windows currently available on the market can be divided broadly into the following two types:

- "face-mounted hinges", that is to say, hinges applied to doors or windows by means of holes or slots made on the outer front part of the frame profiles (used for exterior doors and windows, for example of the reinforced type);
- traditional hinges, that is to say hinges applicable to frames, especially door frames, with traditional profiles (like those usually used for windows) where there is an internal groove - on both the fixed and mobile frame - for positioning and fastening the respective flap of the hinge body directly to the inside of the mobile frame or fixed frame.

[0003] This specification refers to hinges of the second type, that is, traditional hinges, used on large doors and windows for large indoor areas (as in shopping centres for example).

[0004] Hinges of this type, apart from differences in size, consist basically of components used for doors and windows that are smaller and lighter. The components are essentially the following:

- a first male, or lower, hinge body having a socket and a flap for fastening it to the fixed frame;
- a second female, or upper, hinge body having a respective socket and a flap for fastening it to the mobile frame;
- a hinge pin that can be accommodated in the two sockets and defining the axis of rotation of the mobile frame.

[0005] The hinge flaps are fastened to the respective frames by screws that act on a segment (or block) of profile housed in the groove of the respective frame (usually consisting of a pair of L-shaped protrusions) and opposing the inside surface of the protrusions themselves.

[0006] In addition to these components, there are also components or means for adjustment in: a vertical axis (axis of rotation Z); an axis perpendicular to the vertical plane of the fixed frame (axis Y, with adjustment known as "compression" in the jargon of the trade) and an axis parallel to the vertical plane of the door or window frame (axis X).

[0007] Usually, the adjustment in the axis Z is accomplished by a pushing action on the male hinge body to permit lifting or lowering of the mobile frame together with the male and female hinge body assembly (by means of operating elements located in the groove of the fixed frame and acting on the flap of the respective male hinge body).

[0008] The adjustment in the axes Y and X is usually performed with an offset bush inserted into the socket of the female hinge body and which can be rotated to vary, by fixed steps, the position of the mobile frame relative to the fixed frame.

[0009] In technical and structural terms, hinges of this kind have proved extremely practical and convenient but their use on heavy doors and windows has, over time, been shown to have the disadvantage of excessive stress and strain on the male hinge body eventually leading to breakage (due to fatigue).

[0010] In particular, after thorough research by the Applicant, it was found that the critical breaking point (due to fatigue) of the male hinge body is located at the point where the hinge flap rests on the fixed frame at an angle: this is because during the repeated movements of the mobile frame relative to the fixed frame, forces are applied to the flap of the male hinge body at gradually shifting points which, over time, leads to breakage of the hinge flap neck, as mentioned above.

[0011] After numerous tests, the Applicant has created an additional connection between the male hinge body and the fixed frame, thus achieving a high level of hinge operating safety and reliability on heavy doors and windows, and practically eliminating risks of hinge failure.

[0012] Another aim of this solution is to provide a hinge with few structural variations compared to the previous solution but which can be mounted on larger and heavier doors and windows while also appreciably facilitating assembly of the door or window.

[0013] In accordance with the invention, this aim is achieved by a hinge for heavy door and window units comprising a fixed frame and a mobile whose profiles define respective longitudinal grooves for fastening operating accessories. The hinge comprises: a first male, or lower, hinge body having a first cylindrical socket and a first flap that can be associated, through respective first fastening means, with the groove of the fixed frame; a second female, or upper, hinge body having a second cylindrical socket and a second flap that can be associated, through respective second fastening means, with the groove of the mobile frame; a hinge pin that can be housed in the two sockets and defining the axis of rotation of the mobile frame; third means are also provided for fastening the first hinge body, acting at least between the first flap of the first body, in the vicinity of the first socket, and the surface of the fixed frame facing it; these third fastening means can, in particular, be housed directly in the first socket of the first hinge body.

[0014] The technical characteristics of the invention, with reference to the above aims, are clearly described in the claims below and its advantages are apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred embodiment of the invention provided merely by way of example without

restricting the scope of the inventive concept, and in which:

- Figure 1 is a perspective view, with some parts exploded and some parts cut away, of a hinge according to the invention in an assembled state in the proximity of partly illustrated profiles defining the door or window frames;
- Figure 2 shows the hinge of Figure 1 in an exploded view of all the hinge components;
- Figures 3 and 4 both illustrate the hinge of Figures 1 and 2 mounted on the door or window frame, with some parts of the frame cut away, and showing an adjustment in a vertical axis, both these drawings being schematic front views with some parts cut away;
- Figure 5 is cross section through line V - V of Figure 3;
- Figure 6 is a side view, with some parts in cross section in order to better illustrate others, of the hinge of Figures 3 and 4.

[0015] With reference to the accompanying drawings, in particular Figures 1 and 2, the hinge according to the invention, labelled 3 in its entirety, is applied to large and heavy doors and windows installed in large indoor areas (such as shopping centres, for example).

[0016] A door or window unit of this type comprises a fixed frame 1 and a mobile frame 2 (sash) whose profiles define respective longitudinal grooves, labelled C1 and C2, respectively, for fastening operating accessories to the frame itself.

[0017] Still with reference to Figures 1 and 2, the hinge 3 basically comprises:

- a first male, or lower, hinge body 4 having a first cylindrical socket 4a and a first flap 4b that can be associated, through respective first fastening means 5, with the groove C1 of the fixed frame 1;
- a second female, or upper, hinge body 6 having a second cylindrical socket 6a and a second flap 6b that can be associated, through respective second fastening means 7, with the groove C2 of the mobile frame 2;
- a hinge pin 8 that can be housed in the two sockets 4a and 6a and defining the axis of rotation Z8 of the mobile frame 2 for its opening and closing.

[0018] At a constructional level, the first and second means 5 and 7 for fastening the two hinge bodies 4 and 6 usually comprises (see also Figure 5) fastening screws 4v and 6v that can be accommodated in holes 4s and 6s in the two flaps 4a and 6a.

[0019] These screws 4v and 6v engage holes 4c and 6c in a respective profile block 4t and 6t which is slidably housed in the respective groove C1 and C2 of the frame (usually consisting of a pair of L-shaped protrusions) and which opposes the inside surface of the protrusions themselves.

[0020] In addition to the above, the hinge 3 according to the invention also comprises third means 9 for fastening the first hinge body 4, acting at least between the first flap 4b of the first body 4, in the vicinity of the first socket 4a, and the surface of the fixed frame (1) facing it.

[0021] Preferably, the third fastening means 9 are positioned on the first cylindrical socket 4a of the first hinge body 4 and act between the first socket 4a itself and the surface of the fixed frame 1 facing it.

[0022] This gives the first hinge body 4 a fixed, rigid structure with a high degree of fatigue resistance at the angled connecting area (or neck) of the flap 4b.

[0023] The aforementioned third fastening means may comprise threaded means 9 insertable into respective through holes 11 made in the first hinge flap 4b and screwed to the surface of the fixed frame 1 (see broken line in Figure 5).

[0024] Alternatively, the third fastening means may comprise threaded means 9 insertable into respective radial through holes 12 made in the first socket 4a in such a way that the threaded means 9 can be tightened on the surface of the fixed frame 1.

[0025] As clearly shown in Figure 5, each of the radial holes 12 has a countersunk portion 12v inside the first socket 4a enabling the threaded means 9 to be positioned without interfering with the pin 8 housed in the first socket 4a.

[0026] The first socket 4a thus has through holes 12 made in it and, to improve its appearance, there is preferably an outer covering element 21 fitted by sliding it axially over the surface of the first socket 4a itself (see Figure 2).

[0027] The hinge 3 also comprises known first and second means 10 and 16 for adjusting it in three axes: a first vertical axis Z for varying a relative distance D between the mobile frame 2 and a tread surface P; a second axis Y perpendicular to a vertical plane of the fixed frame 1; a third axis X parallel to the vertical plane (the arrangement of the three axes is shown in Figure 1).

[0028] The first adjustment means 10 define the position of the mobile frame 2 in the first vertical axis Z (see Figures 3 and 4) and, owing to the fixed position of the first hinge body 4, these first adjustment means 10 are positioned on the groove C2 of the mobile frame 2, close to the second hinge body 6, and act between the mobile frame 2 itself and the entire hinge 3 in such manner as to vary the relative distance D between the mobile frame 2 and the tread surface P.

[0029] More specifically, again with reference to Figures 2 and 3, the first adjustment means 10 comprise a slide 13 than can be slid into the groove C2 and rigidly fastened to the mobile frame 2 by respective (threaded) means 14 acting

between the slide 13 and the respective groove C2.

[0030] The slide 13 is then placed in contact with the second flap 6b of the second hinge body 6 and securely fastened to the latter (see Figure 3).

[0031] The slide 13 also has a longitudinal threaded through hole 13a engaged by a threaded element 15 that can be screwed in and made to abut against the second flap 6b to permit adjustment of the relative distance D between the mobile frame 2 and the tread surface P.

[0032] In other words, screwing the threaded element 15 (see arrow F15) produces an opposing force on the hinge 3 flap 6b which, since the first hinge body 4 is locked in place, creates a fixed supporting point and enables the slide 13 and the mobile frame 2 to be lifted relative to the tread surface P (see arrow F13, Figure 4).

[0033] The above mentioned second means 16 for separate adjustment in the second and third axes Y and X comprise (see Figures 2 and 6) a bush 16a, that is offset relative to the axis of rotation Z8 and can be interposed between the second socket 6a and the hinge pin 8: turning the bush 16a permits combined adjustments in the two axes Y and X by shifting the second hinge body 6 relative to the first hinge body 4. The bush 16a can be adjusted from the outside thanks to a slot 16b made in the closed top surface of the bush 16a which can be engaged by a tool such as a screwdriver.

[0034] As clearly illustrated in Figure 6, the bush 16a comprises securing means 17 for preventing the bush 16a from sliding in the second socket 6a.

[0035] These securing means 17 comprise:

- a ball 18 housed in a first radial seat 18a made in the bush 16a close to the top end of the bush 16a; and
- a grub screw 19 housed in a respective second, threaded hole 20 perpendicular to the first hole (18a) and accessible from the outside (the hole 20 is next to the slot 16b).

[0036] The second hole 20 communicates with the first hole 18a to allow contact between the grub screw 19 and the ball 18 so that, when necessary, screwing the grub screw 19 (see arrow F19, Figure 6) causes the ball 18 to move in a radial direction (see arrow F18) towards the second socket 6a in such a way as to secure the bush 16a against the second socket 6a.

[0037] At its lower end, the bush 16a also has an annular extension 16c (see Figure 2 and 6) which protrudes from the second socket 6a and whose outside diameter is substantially the same or greater than the diameter of the second socket 6a itself to define an element for covering, at least partially, an annular anti-friction element 23 positioned between the two hinge bodies 4 and 6.

[0038] In other terms, this extension defines an annular seat for housing and covering the anti-friction element 23 which remains on the same axis as the hinge 8 irrespective of the adjustment carried out with the bush 16a.

[0039] Lastly, between the two hinge bodies 4 and 6 there is interposed, in use, an annular anti-friction spacing element or shim 23 that might, by way of non restricting example, consist of a ball bearing facilitating the movement of the second hinge body 6.

[0040] Yet another feature of the hinge 3 is an axial, threaded blind hole 22 made in the lower end of the pin 8 which, in use, is positioned inside the first socket 4a, enabling engagement with a suitable tool (not illustrated) in order to pull the pin 8 out of the hinge 3.

[0041] As shown in Figures 5 and 6, the pin 8 is held in place inside the sockets 4a and 6a by a grub screw 8g that passes radially through the first socket 4a and engages an annular groove 8a made in the pin 8 itself.

[0042] This type of hinge 3 also modifies and facilitates the door or window installation procedure.

[0043] Thus, installing a door or window with hinges of this type involves the following steps:

- applying the male hinge bodies to the fixed frame in their final required positions;
- installing the fixed frame in the required place;
- fitting and pre-positioning on the mobile frame the female hinge bodies and the slides for adjustment in the axis Z;
- positioning the mobile frame in the door or window space in such a way that the female hinge bodies rest on the fixed male hinge bodies;
- inserting the hinge pins into the sockets from below;
- partly rotating the mobile frame (which, at this stage, is resting on the tread surface) and securing the pins inside the hinges.

[0044] At this point, adjustments can be started: in particular, adjustment in height by positioning the slides so they rest on the female hinge bodies and then securing them to the mobile frame.

[0045] Next, using a suitable too, the threaded element inside the slide can be acted upon in such a way as to raise only the mobile frame and the slide relative to the hinge, thus moving the mobile frame away from the tread surface.

[0046] Further adjustments in the other axes can then be carried out using the bush.

[0047] A hinge made in the manner described above achieves the aforementioned aims thanks to the rigid connection

between the socket of the male hinge body and the frame profile using screws in such a way as to reduce fatigue stress on the hinge as a whole.

[0048] This novel feature, without altering the basic structure of the hinge bodies, makes it possible to increase operating safety and reliability of the hinges over time, even on extremely large and heavy door or window units.

[0049] The fixed position of the male hinge body makes installing and adjusting the door or window unit much more practical and less tiring and, at the same time, quicker and more accurate.

[0050] It will be understood that the invention described may be useful in many industrial applications and may be modified and adapted in several ways without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1. A hinge for door and window units, especially heavy door and window units comprising a fixed frame (1) and a mobile frame (2) whose profiles define respective longitudinal grooves (C1, C2) for fastening operating accessories; the hinge (3) comprising at least:

- a first male, or lower, hinge body (4) having a first cylindrical socket (4a) and a first flap (4b) that can be associated, through respective first fastening means (5), with the groove (C1) of the fixed frame (1);
- a second female, or upper, hinge body (6) having a second cylindrical socket (6a) and a second flap (6b) that can be associated, through respective second fastening means (7), with the groove (C2) of the mobile frame (2);
- a hinge pin (8) that can be housed in the two sockets (4a, 6a) and defining the axis of rotation (Z8) of the mobile frame (2); the hinge (3) being **characterised in that** it comprises third means (9), positioned on the first cylindrical socket (4a) of the first hinge body (4), for fastening the first hinge body (4) and acting between the first socket (4a) and the surface of the fixed frame (1) facing it.

2. A hinge for door and window units, especially heavy door and window units comprising a fixed frame (1) and a mobile frame (2) whose profiles define respective longitudinal grooves (C1, C2) for fastening operating accessories; the hinge (3) comprising at least:

- a first male, or lower, hinge body (4) having a first cylindrical socket (4a) and a first flap (4b) that can be associated, through respective first fastening means (5), with the groove (C1) of the fixed frame (1);
- a second female, or upper, hinge body (6) having a second cylindrical socket (6a) and a second flap (6b) that can be associated, through respective second fastening means (7), with the groove (C2) of the mobile frame (2);
- a hinge pin (8) that can be housed in the two sockets (4a, 6a) and defining the axis of rotation (Z8) of the mobile frame (2); the hinge (3) being **characterised in that** it comprises third means (9) for fastening the first hinge body (4), acting at least between the first flap (4b) of the first hinge body (4), in the proximity of the socket (4a), and the surface of the fixed frame (1) facing it.

3. The hinge according to claim 1 or 2, including first means (10) for adjustment in a first vertical axis (Z) designed to vary a relative distance (D) between the mobile frame (2) and a tread surface (P), **characterised in that** the first adjustment means (10) are positioned on the groove (C2) of the mobile frame (2), in the proximity of the second hinge body (6) and acting between the mobile frame (2) and the hinge (3) in such a way as to vary the relative distance (D) between the mobile frame (2) and the tread surface (P).

4. The hinge according to claim 1, **characterised in that** the third fastening means comprise threaded means (9) which can be inserted into respective radial through holes (12) made in the first hinge socket (4a) so that the threaded means (9) can be screwed into the surface of the fixed frame (1).

5. The hinge according to claim 2, **characterised in that** the third fastening means comprise threaded means (9) which can be inserted into respective through holes (11) made in the first hinge flap (4b) and which can be screwed tight into the surface of the fixed frame (1).

6. The hinge according to claim 4, **characterised in that** the radial hole (12) has a countersunk portion (12v) inside the first socket (4a) enabling the threaded means (9) to be positioned without interfering with the pin (8) housed in the first socket (4a).

7. The hinge according to claim 3, **characterised in that** the first adjustment means (10) comprise a slide (13) than

can be rigidly fastened to the mobile frame (2) by respective means (14) acting between the slide (13) and the respective groove (C2) and designed to be positioned in contact with the second flap (6b) of the second hinge body (6); the slide (13) having a longitudinal threaded through hole (13a) engaged by a threaded element (15) that can be screwed in and made to abut against the second flap (6b) to permit adjustment of the relative distance (D) between the mobile frame (2) and the tread surface (P).

8. The hinge according to claim 1 or 2, including second means (16) for separate adjustment in a second axis (Y) perpendicular to a vertical plane of the fixed frame (1) and in a third axis (X) parallel to said vertical plane; the second adjustment means (16) comprising a bush (16a), that is offset relative to the axis of rotation (Z8) and can be interposed between the second socket (6a) and the hinge pin (8), so that rotating it permits these combined adjustments, the hinge being **characterised in that** the bush (16a) comprises securing means (17) for preventing the bush (16a) from sliding in the second socket (6a); said securing means (17) comprising:

- a ball (18) housed in a first radial hole (18a) made in the bush (16a) close to the top end of the bush (16a); and
- a grub screw (19) housed in a respective second, threaded hole (20) perpendicular to the first hole (18a), accessible from the outside, and communicating with the first hole (18a) to allow contact between the grub screw (19) and the ball (18) so that, when necessary, screwing the grub screw (19) causes the ball (18) to move in a radial direction towards the second socket (6a) in such a way as to secure the bush (16a) against the second socket (6a).

9. The hinge according to claim 1, **characterised in that** the first socket (4a) of the first hinge body (4) has an outer covering element (21) fitted by sliding it axially over the surface of the first socket (4a) itself.

10. The hinge according to claim 1 or 2, **characterised in that** the pin (8) has a lower end positioned inside the first socket (4a) and having an axial, threaded blind hole (22) made in it, enabling engagement with a suitable tool in order to pull the pin (8) out of the hinge (3) when necessary.

11. The hinge according to claim 1 or 2, **characterised in that** between the two hinge bodies (4, 6) there is interposed, in use, an annular anti-friction element (23).

12. The hinge according to claim 1 or 2, **characterised in that** the annular anti-friction element is a ball bearing (23).

13. The hinge according to claim 8, **characterised in that** the lower end of the bush (16a) has an annular extension (16c) which protrudes from the second socket (6a) and whose outside diameter is greater than the diameter of the second socket (6a) itself to define an element for covering and securing, at least partially, an annular anti-friction element (23) positioned between the two bodies (4, 6) constituting the hinge (3).

FIG.1

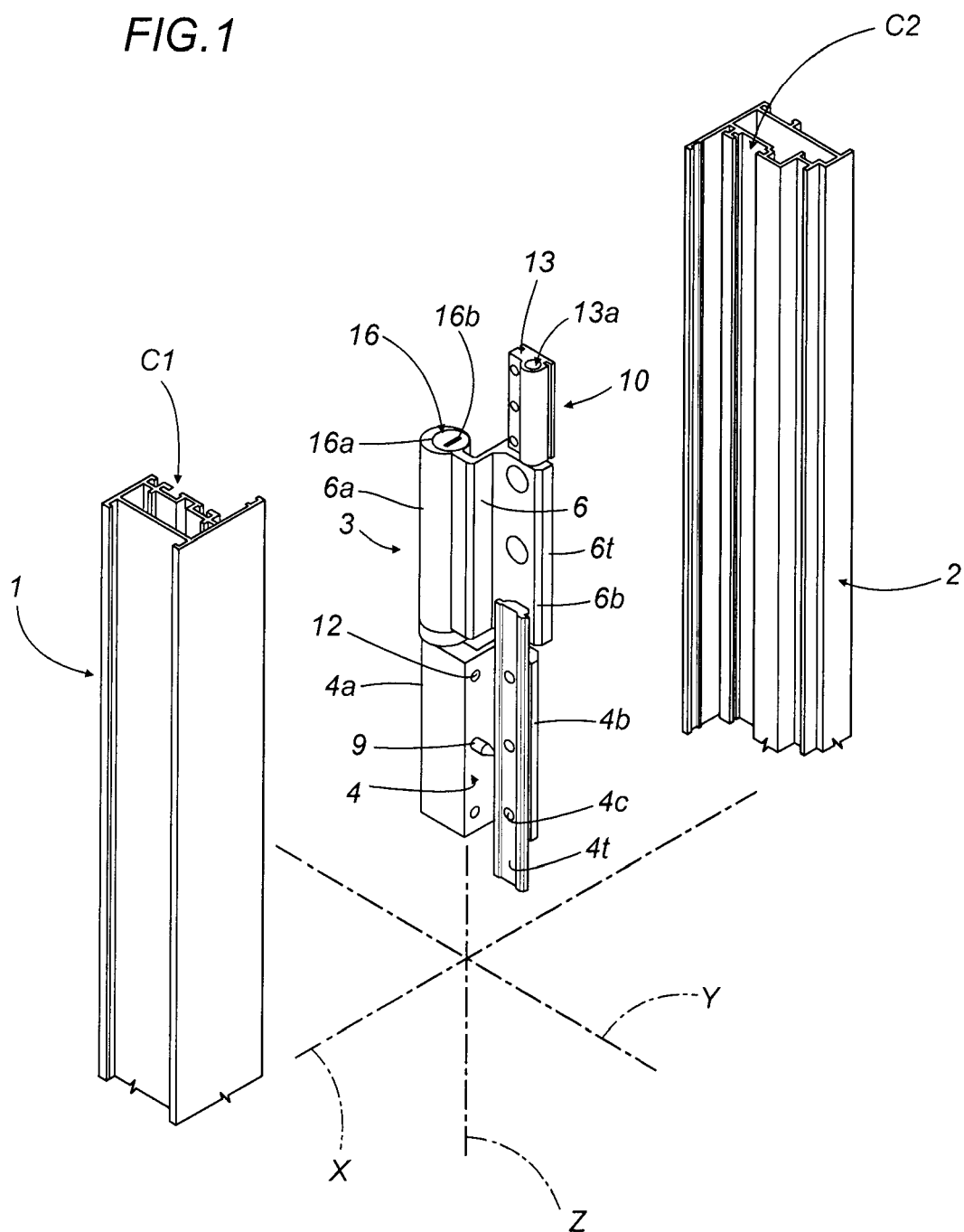


FIG. 2

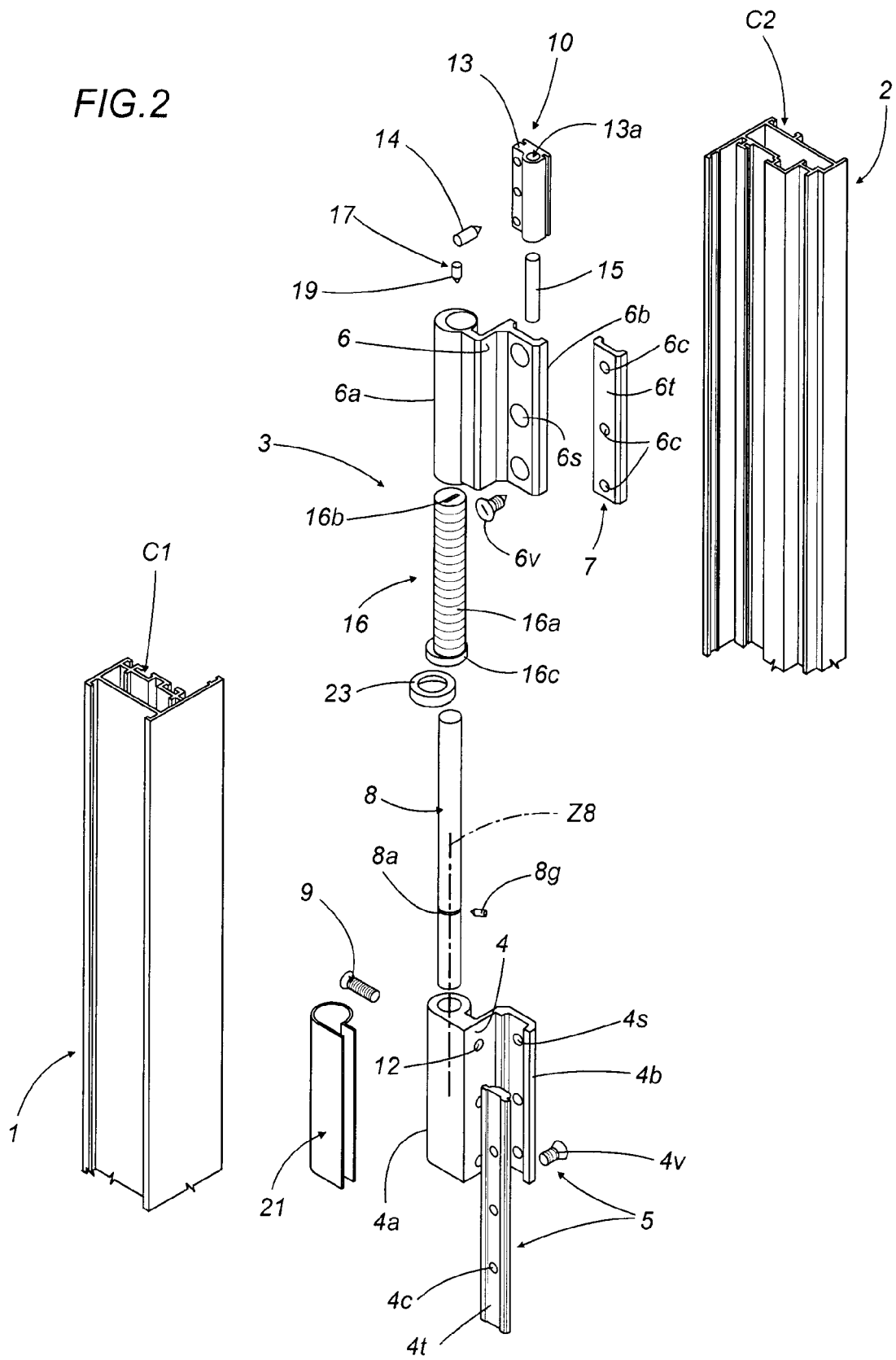


FIG.3

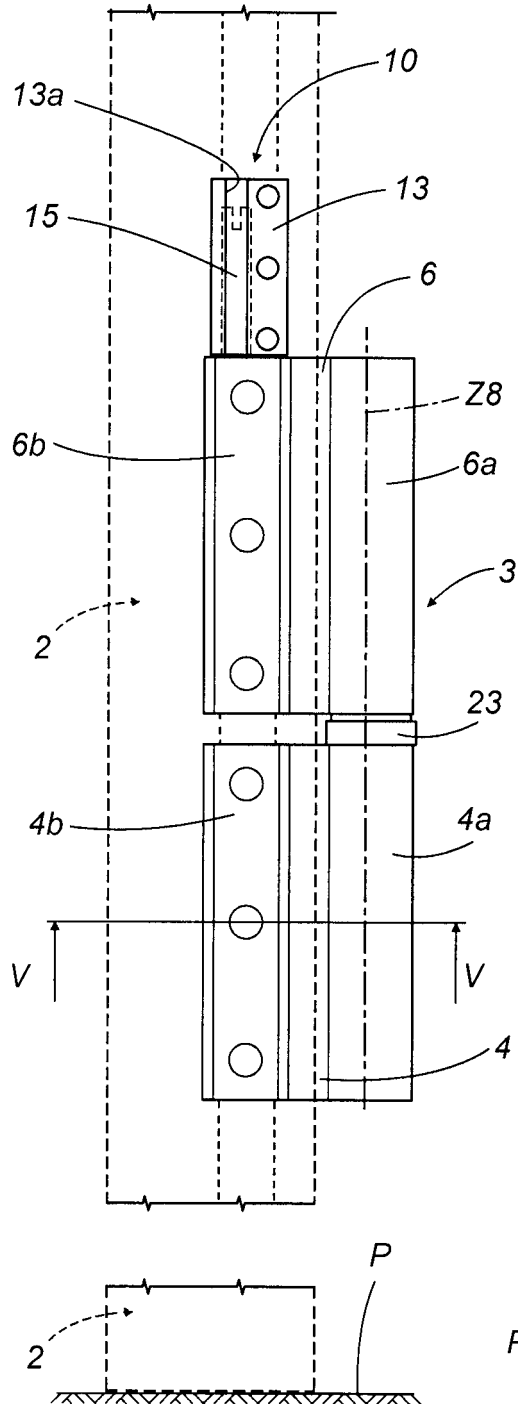


FIG.4

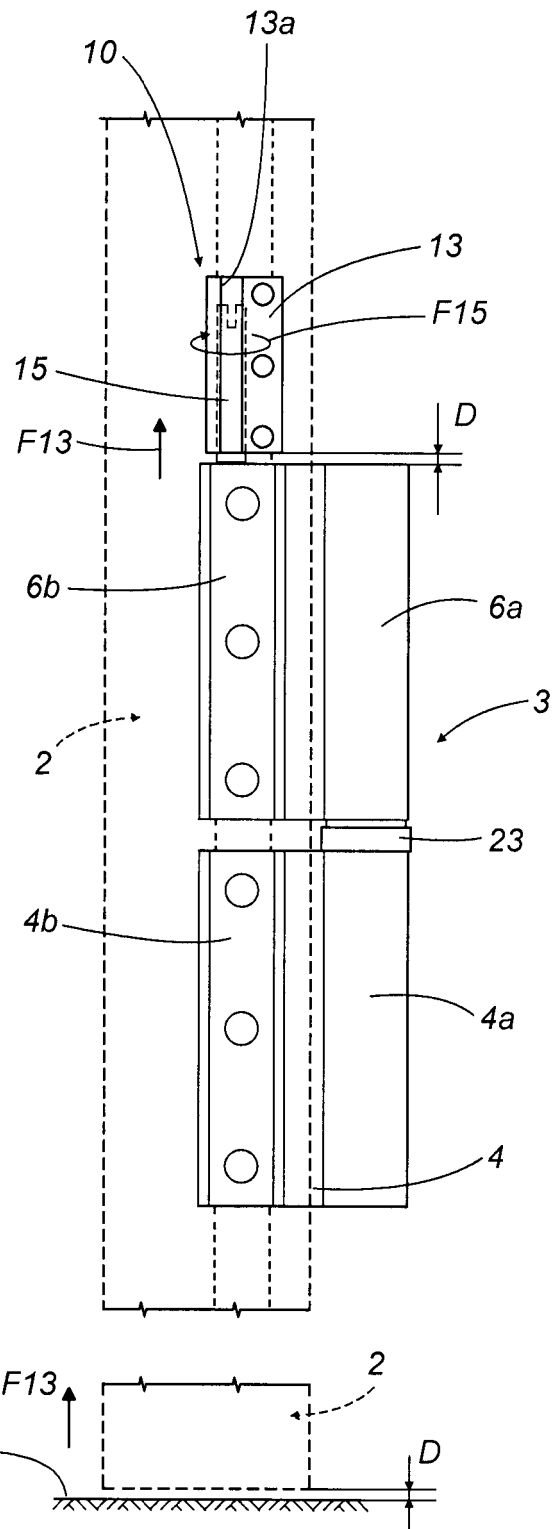


FIG.5

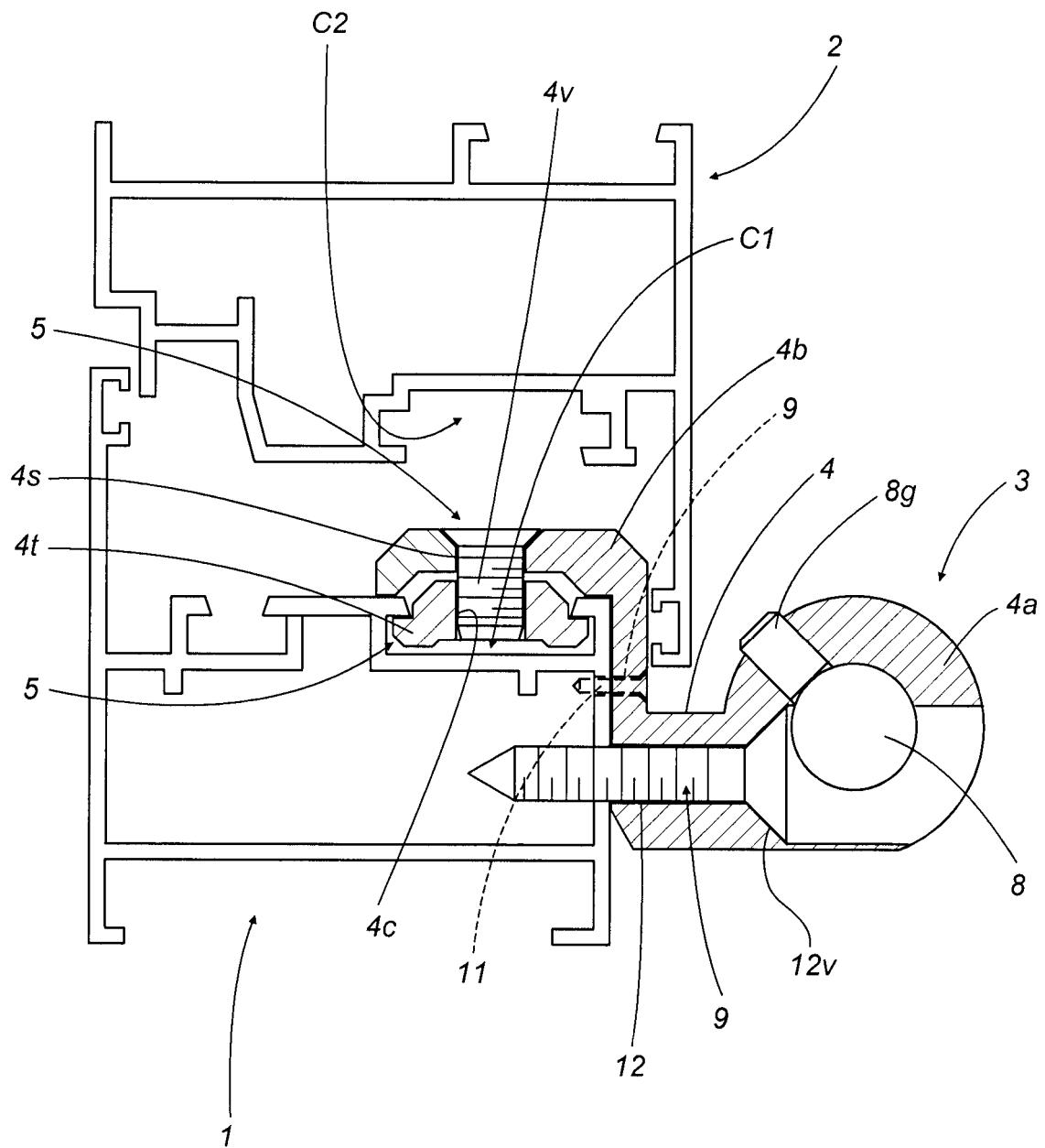


FIG.6

