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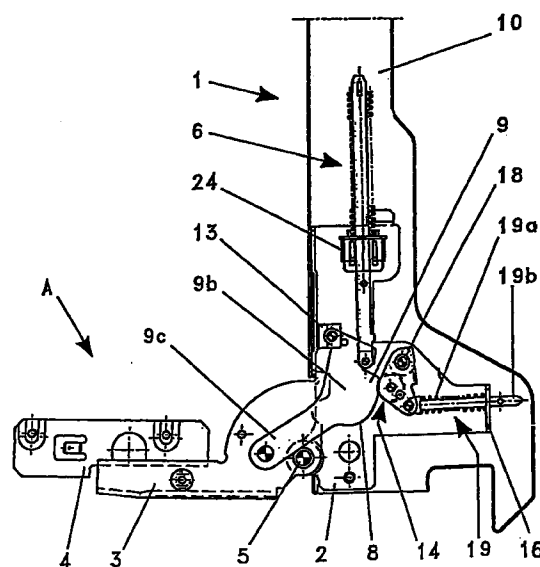
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(54) Hinge device, particularly for the door of household electric appliances and the like with counterbalancing and self-regulating means

(57) A hinge device for the door of household electric appliances, includes: a coupling element (2), having a frontal wall (12) and fixed to a frame (10) fixable to the structure of the appliance; a support element (3), pivoted to the coupling element (2) and to which the door is fixed; first counterbalancing means (6), designed to practice an antagonist force against the weight force of the door; a shaped element (9), hinged to the first counterbalancing means (6) and to the support element (3), and designed to slide along the frontal wall (12) by virtue of the interposition of sliding means (30) in correspondence of the passage from a closing condition (C) of the device (1), in which the support element (3) is faced to the frontal wall (12), to an opening condition (A), in which the axle of the support element (3) is almost orthogonal to the frontal wall (12), and vice versa in such a way that the sliding causes an antagonistic force of increasing intensity between the sliding block (13) and the frontal wall (12) and proportional to the increasing of the opening angle of the door and to the arm of the antagonistic force.

The hinge device 1 can moreover include second counterbalancing means (15) slidable on an outer contour (8) of the shaped element (9), so as to exert a further antagonistic force thereon proportionally increasing in correspondence of the passage from the closing condition (C) to the opening condition (A).

FIG. 4



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Description

[0001] The present invention concerns the production of components for household electric appliances and the like.

[0002] In particular the object of the invention is an hinge device of the self-regulating type, fit to allow the articulation between the door and the related appliance body, preferably a dishwashers.

[0003] It is known that the doors of appliances such as ovens, dishwashers and the like, are fixed to the electric household frame through a couple of hinges allowing the door rotation between a closing and an opening positions.

[0004] The known hinges, such as self-regulating, are fit to produce a counterbalancing action during the opening and closing phases of the door linked thereto. Every hinge is provided with a kinematic motion, moving as regards the hinge movement, including elastic means, tensile or compressive stressed, in such a way that its elastic reaction varies as regards the door position and is fit to balance the weight of the door during its opening.

[0005] Such hinges include a series of lever elements mutually pivoted fit to constitute a mechanism providing the gradually increasing of the reaction strength of the elastic element during the door opening and so counterbalancing the moment produced by the door weight that increase as regards the increasing of the projection from the appliance frame and therefore by to increasing the lever arm.

[0006] The main drawback of the known hinges is that to vary the counterbalancing strength exerted by the spring assembled with the appliance is necessary to replace said spring with another able to produce a suitable counterbalancing strength.

[0007] To avoid such drawback, the known hinges are provided with means fit to allow the adjustment of the counterbalancing force of the elastic means as regards the door weight. For instance, such adjustment means are constituted by small cable that, suitably tensioned through regulation screws accessible from outside of the appliance, allow opportunely to pre-load the spring in such a way to vary its initial elastic reaction.

[0008] The need of regulating such counterbalancing strength is particularly evident in the case in which the appliances are integral part of modular furniture, such as for instance modular ranges, which, for aesthetic reasons, include the panel assemblage covering the appliance doors. Every panel weights therefore the related door in a variable way depending on the material thereof, so being a random variable for the makers of the appliances, and particularly of the hinges.

[0009] Another drawback, due to the adjustment of the regulation means, inside the hinge, during the panel assemblage onto the appliance door; it is that such manual operation is not often made with workmanlike, for instance because of the non symmetrically adjust-

ment of the counterbalancing action for each hinge. The consequence is that the elastic means of one of the two hinges is more loaded than the other and therefore subjected to greater stresses that can cause the breaking thereof or however it can cause a non symmetrical opening or closing of the door with the consequent damage of the appliance functionality.

[0010] Besides, the regulation systems of the hinge devices do not always allow a wide adjustment range of the counterbalancing action, therefore the same hinge is not often usable in different appliances having doors of different weights or providing for panels of different weights.

[0011] Therefore it is often necessary to make the same hinge model with different spring types of the related counterbalancing means, to be used depending on the appliance type. This causes an heavy drawback for the management of each single type of hinge concerning the carrying out of hinges with different springs, the adjustment during the furniture installation and the storage of the same hinge type with different springs.

[0012] The main object of the present invention is to propose a hinge device, fit to allow the articulation between the door and the related appliance body, having a counterbalancing self-balancing and self-regulating system, without adjustment means fit to automatically counterbalance doors of variable weight within a reasonable range

[0013] Another object of the present invention is to propose a device of simple making, easy installation, sure and precise use.

[0014] Said objects are archived according to the claim content.

[0015] The features of the invention are underlined in the following, with reference to the enclosed drawings, in which:

- figure 1 shows a side view of the hinge device in a closing condition;
- figure 2 shows a side view the device of figure 1 in correspondence of an extreme opening condition;
- figure 3 shows a side view of a variant of the preferred embodiment of the device of figure 1, in the closing condition;
- figure 4 shows a side view of the device of figure 3 at the extreme opening condition;
- figure 5 shows a side view of a second embodiment of the device in the closing condition;
- figure 6 shows a side sight of the device of figure 5 in the extreme opening condition;
- figure 7 shows a side sight of a variant of the second embodiment of the device of figure 5 in the closing condition;
- figure 8 shows a side view of the device of figure 7 in the extreme opening condition.

[0016] With reference to the figures from 1 to 8, numeral 1 refers to a hinge device, particularly for the

door of electric appliances and the like, including a coupling element 2, a support element 3, first counterbalancing means 6 and a shaped element 9.

[0017] The coupling element 2 is fixed to the frame 10 of the hinge device 1 fixable to the structure, known and not illustrated, of each electric appliance.

[0018] The support element 3 is pivoted to the coupling element 2 through a pivot 5 allowing the rotation. A joint plate 4 is fixed near to a end of the support element 3 to which the door, known and not illustrated, is fixed. Moreover, there is an abutment 20 in correspondence of the remaining end of the support element 3.

[0019] The coupling element 2 has a frontal wall 12 interposed between the support element 3 and the shaped element 9.

[0020] The first counterbalancing means 6 are constituted by a spring 22 interposed between the head of a rod 23 and a seat 24 therefrom the free end of the rod 23 protrudes.

[0021] The shaped element 9 has a superior portion 9a hinged to the free end of the rod 23 and an inferior portion 9c hinged to the support element 3 through a pivot 26. Such shaped element 9 has middle portion 9b defining an inner contour 7 and an outer contour 8, opposed to the frontal wall 12.

[0022] The superior portion 9a of the shaped element 9, opposed to that pivoted to the first counterbalancing means 6, is besides pivoted to sliding means 30 constituted by a sliding block 13 fit to move with sliding friction along the portion of frontal wall 12 faced to the shaped element 9 during the opening/closing of the door.

[0023] The operation of the hinge device 1 illustrated in the figures 1 and 2 is very simple, because the door opening of the appliance coupled to the support element 3 causes the passage of this latter from a closing condition C, in which the support element 3 is faced to the frontal wall 12 of the coupling element 2, and therefore the door is turned toward the body of the appliance in such a way to close the frontal opening thereof, to an extreme opening condition A, in which the longitudinal axle of the support element 3 is nearly orthogonal to the frontal wall 12, and therefore the door is almost orthogonal with the frontal opening of the appliance.

[0024] The opening condition A is mainly limited by the abutment 20 of the support element 3 that, consequently its rotation, contacts inwardly the frontal wall 12 of the coupling element 2

[0025] During the passage from the closing condition C to the opening condition A, the support element 3 rotates on the pivot 5 causing the moving of the shaped element 9. In this passage, the sliding block 13 is forced to slide with friction on the frontal wall 12 exerting thereon a friction resistance force of proportionally increasing intensity as regards the door opening and therefore as regards the passage from the closing condition C to the opening condition A.

[0026] The rod 23 is moved downward causing the subsequent progressive compression of the spring 22

exerting an antagonist force proportionally increasing with the door opening and able to oppose the weight force.

[0027] It must be underlined that the presence of the sliding block 13 involves a driven movement of the shaped element 9 and in such a way to cause the progressive increasing of the arm of the antagonist force exerted by the counterbalancing means 6 in consequence of the passage from the closing condition C to the opening condition A. Particularly there is an almost rectilinear motion on the vertical of the counterbalancing means 6 or better of the pivoting point of the rod 23 with the shaped element 9.

[0028] In this way the combined action of the antagonist force of the first counterbalancing means 6 and the sliding with friction of the sliding block 13 along the frontal wall 12 allows a continuous balancing of the door and of a possible covering panel coupled thereto so allowing the same door to balance in correspondence of each intermediate opening angle reached by the door.

[0029] It is particular necessary to underline that the main counterbalancing force is due to the friction action of the sliding block 13 exerted on the frontal wall 12, since the sliding between the contact surfaces the sliding block 13 with frontal wall 12 causes a sliding friction.

[0030] Advantageously, the contact surface of the sliding block 13 with the frontal wall 12 is constituted by nylon enriched with a percentage of graphite ranging between 5% and 20%, and preferably it is of 12%, so that to increase the sliding friction between the surfaces.

[0031] Particularly the self-regulating effect is completely reached with a whole weight of the door and/or panel varying from 6 to 10 kilograms.

[0032] With reference to the figures 3 and 4, a variant of the preferred embodiment of the hinge device 1 object of the present invention includes the use of second counterbalancing means 15.

[0033] Such second counterbalancing means 15 are fixed to the coupling element 2, next to its end opposed to the frontal wall 12, and are active with the outer contour 8 of the shaped element 9. These means includes a lever 17 whole oscillation plain is parallel to the moving plane of the shaped element 9.

[0034] An end of the lever 17 is hinged, through a pivot 18, to the coupling element 2 and the remaining end is pivoted to the end of elastic means 19 while the middle portion supports an sliding element 14, directly in contact with the outer contour 8, for instance constituted by a free rolls 14a.

[0035] Particularly, the elastic means 19 include a guiding rod 19b of a helical spring 19 subjected to compression, whose free end is slidingly supported by a bracket 16 fixed to the frame 10.

[0036] The operation of the hinge device 1, according to the variant shown in the figures 3 and 4, are identical to the operation of the preferred embodiment of figures 1 and 2, with the only difference that the second coun-

terbalancing means 15 allow to exert a further antagonistic force on the shaped element 9 proportionally increasing in correspondence of the passage from the closing condition C to the opening condition A of the door.

[0037] In fact, during such passage, the rolls 14a rolls or, however, slides on the outer contour 8, particularly from the middle portion 9b toward the superior portion 9a, causing the rotation of the lever 17 around the pivot 18 and therefore the crushing, that is the compression, of the spring 19a onto the bracket 16 which transmits an equal and contrary force to such stress to the shaped element 9 for interposition of the roll 14a. Accordingly, the shaped element 9 is subjected to a further antagonist force opposing the movement thereof during the passage from the closing condition C to the extreme opening condition A and therefore increases the force against the weight force of the door and/or of the optional covering panel applied thereto.

[0038] In this way, the combined action both of the antagonist force of the first counterbalancing means 6 together with the friction force caused by the slide of the sliding block 13 along the frontal wall 12, and of the further antagonistic force exerted on the shaped element 9 by the second counterbalancing means 15, allows a continuous balance of the door and of the optional panel coupled therein so allowing the door to balance in any opening position.

[0039] Particularly the self-regulating effect is completely reached for a total weight of the door and/or of the panel varying from 6 to 14 kilograms.

[0040] It is useful to observe that the sliding element 14 can also be constituted by a sliding block 14a which slides or however runs on the outer contour 8.

[0041] It is also important to notice that with this hinge device 1 a self-balancing condition of the weight of the door and/or of the panel-door is reached without using any adjustment means of antagonistic force of the counterbalancing means, so making a hinge device completely self-regulating for a wide range of the weight of the door and the door together with the covering panel.

[0042] To this purpose is important to underline that the friction force raised between the contact surface of the sliding block 13 with the frontal wall 12, the antagonistic force of the first counterbalancing means 6 and the further antagonist force of the second counterbalancing means 15 vary proportionally to the opening angle of the door and therefore increase in the passage from the closing C to opening A conditions, and decrease in the inverse passage, however always proportionally respectively to the increase or to the decrease of weight force of the door or of the door with the covering panel.

[0043] The figures 5 and 6 illustrate a second embodiment of the hinge device 1 previously described, in which the inner contour 7 of the shaped element 9 is almost cycloidal and has an abutment 33 near the end of the superior portion 9a, and moreover is slidably

driven by the sliding means 30 constituted by a free roll 11 supported by the coupling element 2, while the outer contour 8 is almost rectilinear.

[0044] The portion of the shaped element 9 included between the middle portion 9b and the second end 9c has a recess 21.

[0045] The operation of the hinge device 1 of this second embodiment is identical to the operation of the preferred embodiment with the exception that the extreme opening A condition is not only mainly caused by the abutment 20 of the support element 3 that, subsequently its rotation, inwardly contacts the frontal wall 12 of the coupling element 2, but also because the recess 21 of the shaped element 9 is conformed in such a way to lean firmly on the pivot 5 and the abutment 33 is fit to contact the external surface of the roll 11.

[0046] During the passage from the closing condition C to the extreme opening condition A, the support element 3 rotates around the pivot 5 causing the movement of the shaped element 9. In this passage, the inner contour 7 of this latter slides on the external surface of the roll 11, the rod 23 is moved downward causing the consequent progressive compression of the spring 22 exerting an antagonistic force proportionally increasing to the increase of the opening angle of the door and able to oppose the weight force.

[0047] It must be underlined that the presence of the roll 11 and the particular conformation of the shaped element 9, or better of its inner contour 7, causes the progressive increase of the arm of antagonistic force exerted by the counterbalancing means 6 in consequence of the passage from the closing condition C to the extreme opening condition A in particular, the interaction between the inner contour 7 and the roll 11 causes the longitudinal movement almost on the vertical line of the counterbalancing means 6 or better of pivoting point of the rod 23 with the shaped element 9.

[0048] With reference to the figures 7 and 8, a variant of the second embodiment of the hinge device 1 includes the use of the second counterbalancing means 15 similar to those of the preferred embodiment with the exception that the lever 17 is pivoted to the pivot 18 in its central zone, one of its end is bound to the elastic means 19 while the free end rotatably supports the free roll 14a.

[0049] Particularly the elastic means 19 are constituted by a spring 19a whose ends are fixed respectively to the lever 17 end and to a bracket 16 hook so that the spring 19a works in traction.

[0050] It is advantageous to notice that the elastic means 19 can be fixed to the lever 17 between the pivot 18 and the free end of this latter, supporting the sliding element 14, so that the spring 19a of the elastic means 19 works in compression rather than in traction

[0051] The main advantage of the present invention is therefore to furnish a hinge device, designed to allow the articulation between the door and the body of a related appliance, fitted with a counterbalancing system

of the self-adjusting and self-balancing type, without adjustment means, able to counterbalance doors of weight varying automatically within a reasonable but wide range.

[0052] Further advantage is to furnish a device of simple realisation and operation, of easy installation, of sure, precise and reliable use.

Claims

1. Hinge device, particularly for the door of household electric appliances and the like, of the type including a coupling element (2) having a frontal wall (12) and fixed to the frame (10) of said hinge device (1) fixable to the frame of each of said household appliances; a support element (3), pivoted to said coupling element (2), through a pivot (5), and to which said door is fixed; first counterbalancing means (6), fitted to exert an antagonistic force opposing the weight force of said door; said device (1) being characterised in that it includes:

- at least a shaped element (9) constituted by a superior portion (9a), to which said first counterbalancing means (6) are hinged, by a middle portion (9b) and an inferior portion (9c) to which said support element (3) is hinged, said shaped element (9) having an outer contour (8) and an inner contour (7) turned toward said support element (3);
- sliding means (30) interposed between said shaped element (9) and said frontal wall (12) of said coupling element (2) and designed to allow the sliding of said shaped element (9) on said frontal wall (12) so as to cause the progressive increasing of the arm of said antagonistic force in consequence of the passage from a closing condition (C), in which said support element (3) is faced to said frontal wall (12), to a condition of extreme opening (A), in which the axle of said support element (3) is almost orthogonal to said frontal wall (12).

2. Device according to claim 1 characterised in that said sliding means (30) are constituted by a sliding block (13) hinged to the end of said inner contour (7) and designed to slide with sliding friction along said frontal wall (12).

3. Device according to claim 1 characterised in that said sliding means (30) are constituted by a roll (11) rotatably supported by said coupling element (2) onto which said inner contour (7) of said shaped element (9) slides.

4. Device according to any one of the preceding claims characterised in that said extreme opening condition (A) is defined by an abutment (20) of said

support element (3) abutting the frontal wall (12) of said coupling element (2).

5. Device according to claim 3 characterised in that the portion of said shaped element (9) included between said middle portion (9b) and said inferior portion (9c) has a recess (21) designed to lean on said pivot (5), in correspondence of mid extreme opening condition (A).

6. Device according to claim 3 characterised in that said first outer contour (7) has an abutment (33) designed to abut the external surface of said roll (11), in correspondence of said extreme opening condition (A).

7. Device according to any one of the preceding claims characterised in that it moreover includes second counterbalancing means (15) bounded to said frame (10) and slidable on said outer contour (8) of said shaped element (9) in such a way to exert onto this latter a further antagonistic force proportionally increasing in correspondence of the passage from said closing condition (C) to said extreme opening condition (A) and proportionally decreasing during the inverse passage.

8. Device according to claim 7 characterised in that said second counterbalancing means (15) include a lever (17) hinged to said frame (10) and supporting a sliding element (14) designed to contact said outer contour (8) by virtue of the reaction exerted thereon by the elastic means (19) on one side connected to an end of said lever (17) and on the other side connected to said frame (10).

9. Device according to claim 8 characterised in that said elastic means (19) are constituted by a spring (19a) subjected to traction or compression.

10. Device according to claim 8 characterised in that said sliding element (14) is constituted by a free roll (14a) designed to run on said outer contour (8).

11. Device according to claim 8 characterised in that said sliding element (14) is constituted by a sliding block (14a) fitted to crawl with sliding friction on said outer contour (8).

12. Device according to claim 8 characterised in that said sliding element (14) slides on said outer contour (8) from the middle portion (9b) towards the superior portion (9a) in correspondence of the passage from said closing condition (C) to said extreme opening condition (A).

13. Device according to claim 1 characterised in that the combined action of said antagonistic force of

said first counterbalancing means (6) and the sliding of said shaped element (9) on said frontal wall (12) allow in continuous balancing of said door coupled to said support element (3) and having a weight varying from 6 to 10 kilograms.

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14. Device according to claim 7 characterised in that the combined action both of said antagonistic force of said first counterbalancing means (6) exerted on said shaped element (9) and the sliding of this latter onto said frontal wall (12), and of said further antagonistic force exerted onto said shaped element (9) of said second counterbalancing means (15), allows a continuous balancing of said door coupled to said support element (3) and having weight variable from 6 to 14 kilograms.
15. Device according to claim 2 characterised in that at least the contact surface of said sliding block (13) with said frontal wall (12) is constituted by nylon enriched with a percentage of graphite ranging between 5% to 20%, and preferably it is 12%.

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FIG. 1

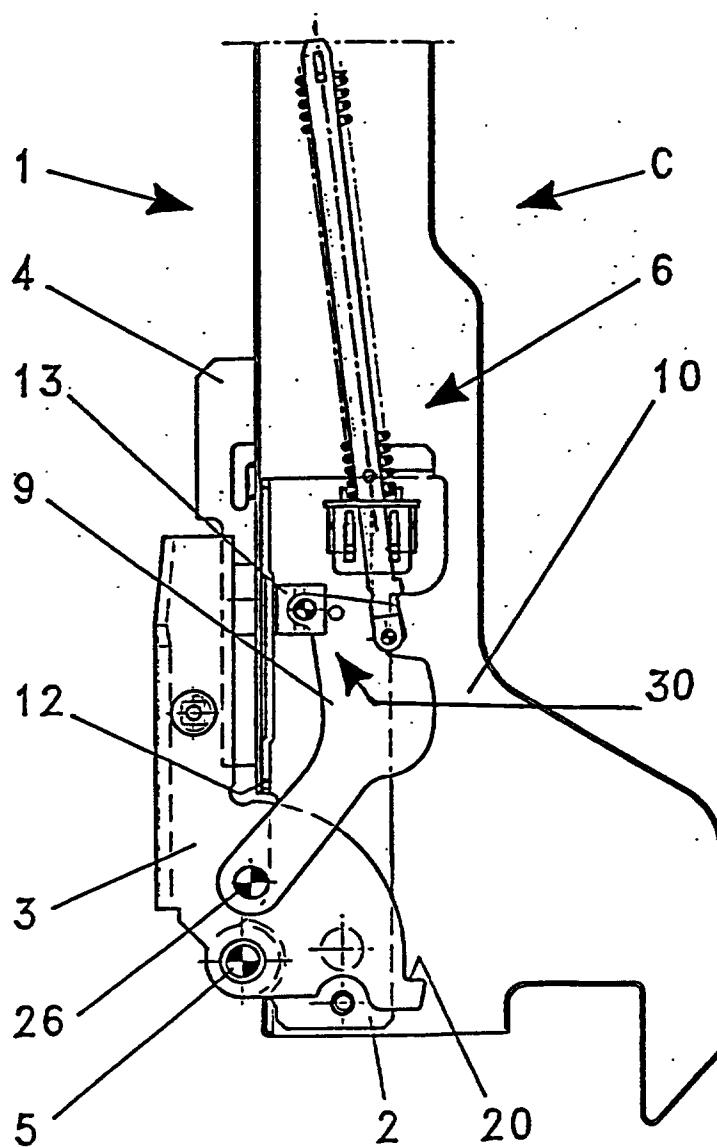


FIG. 2

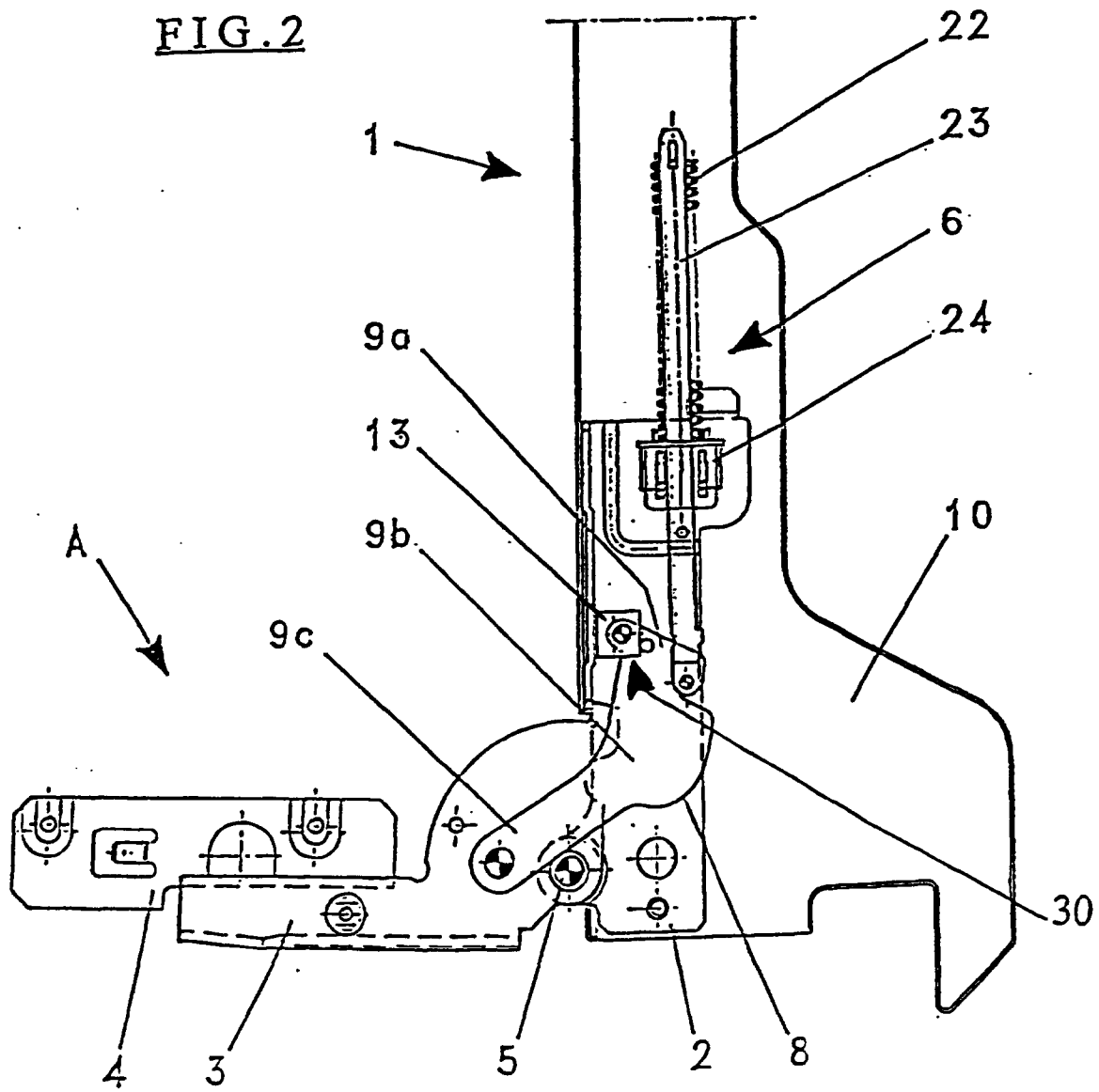


FIG. 3

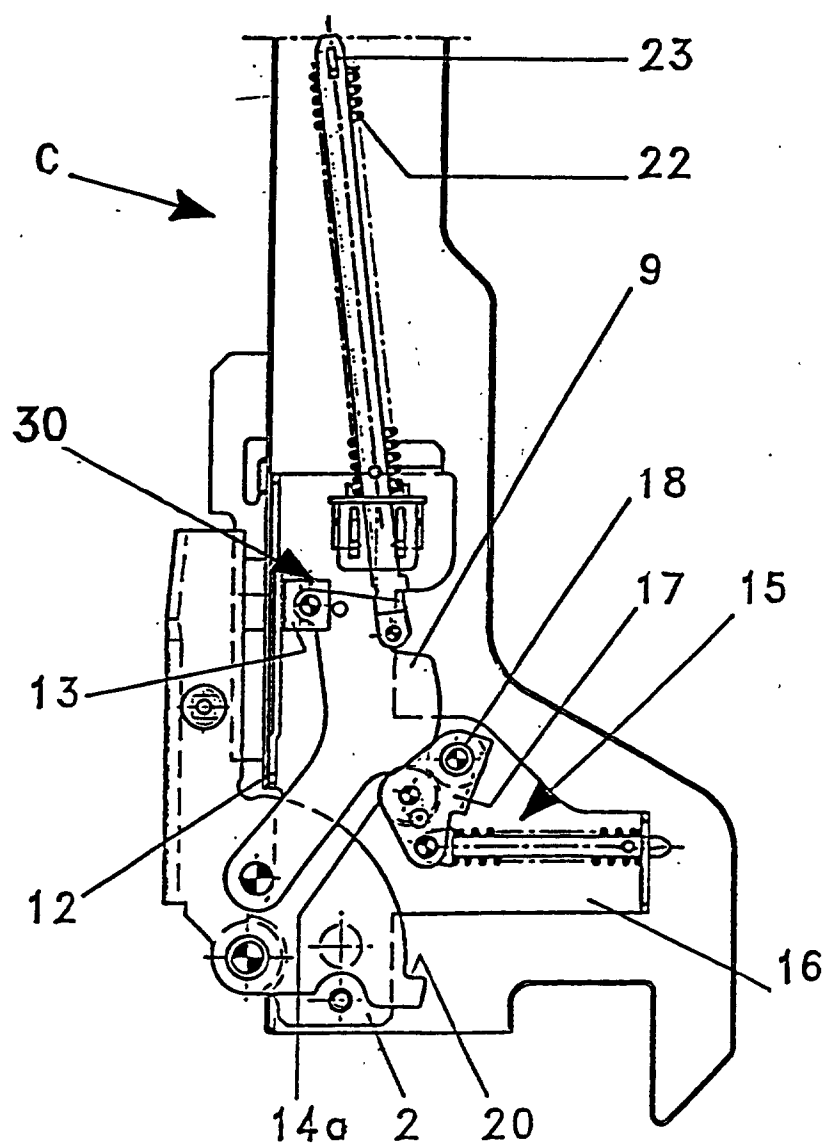


FIG. 4

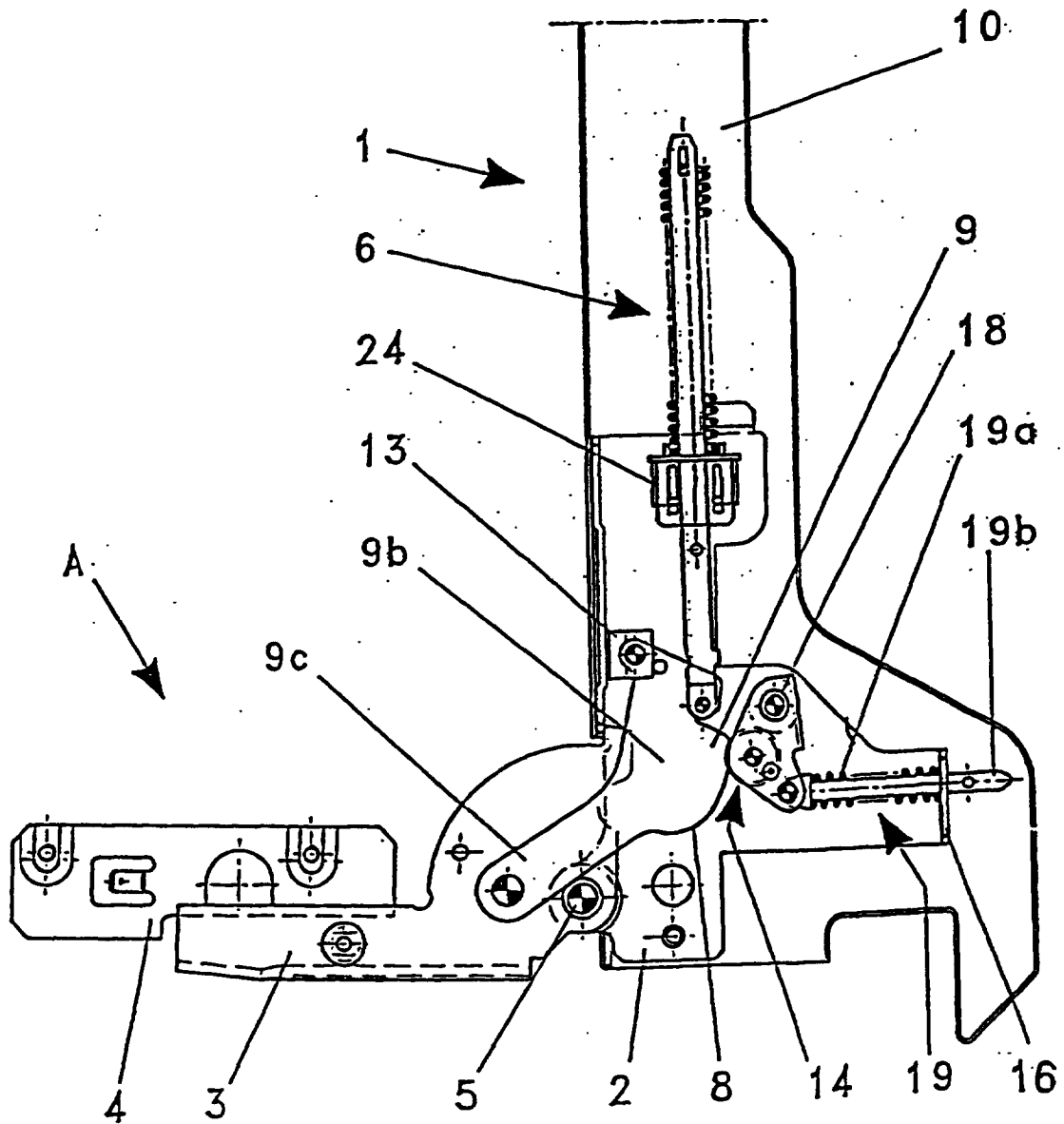


FIG. 5

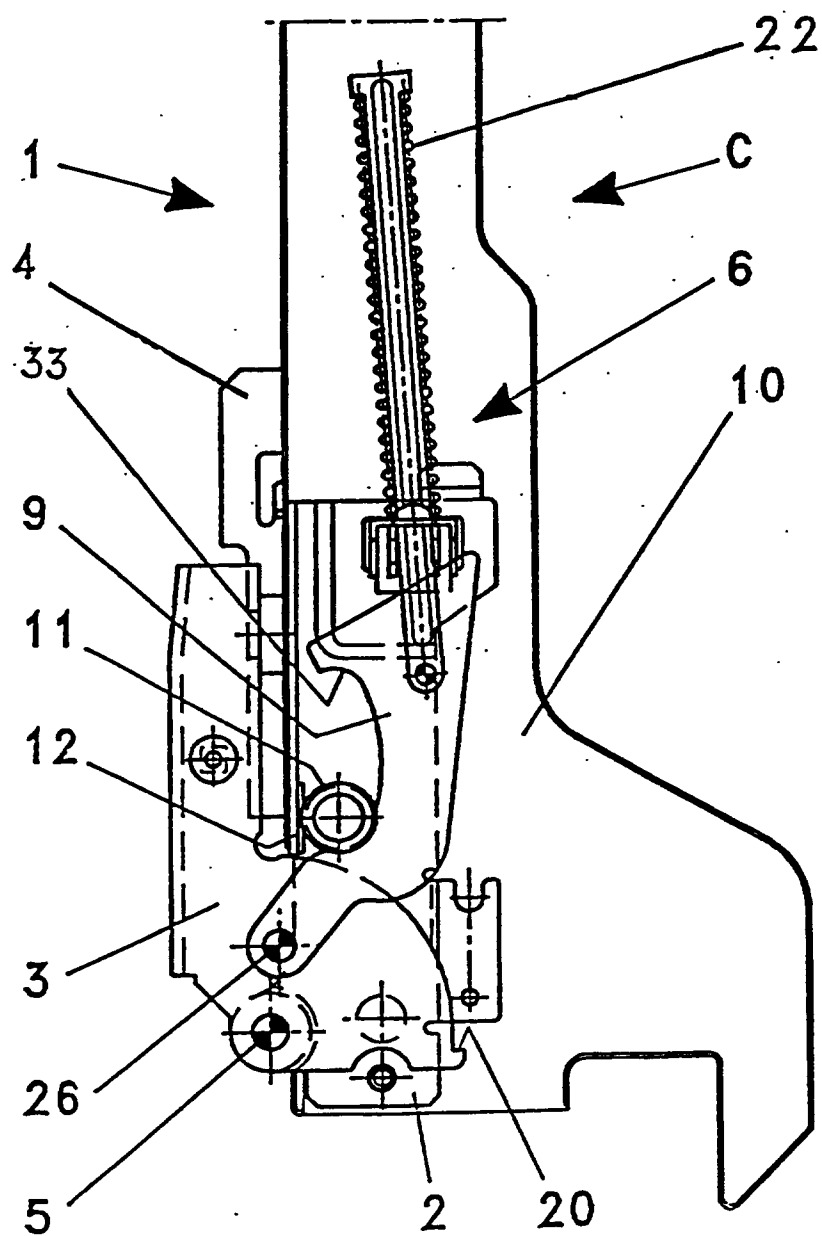


FIG. 6

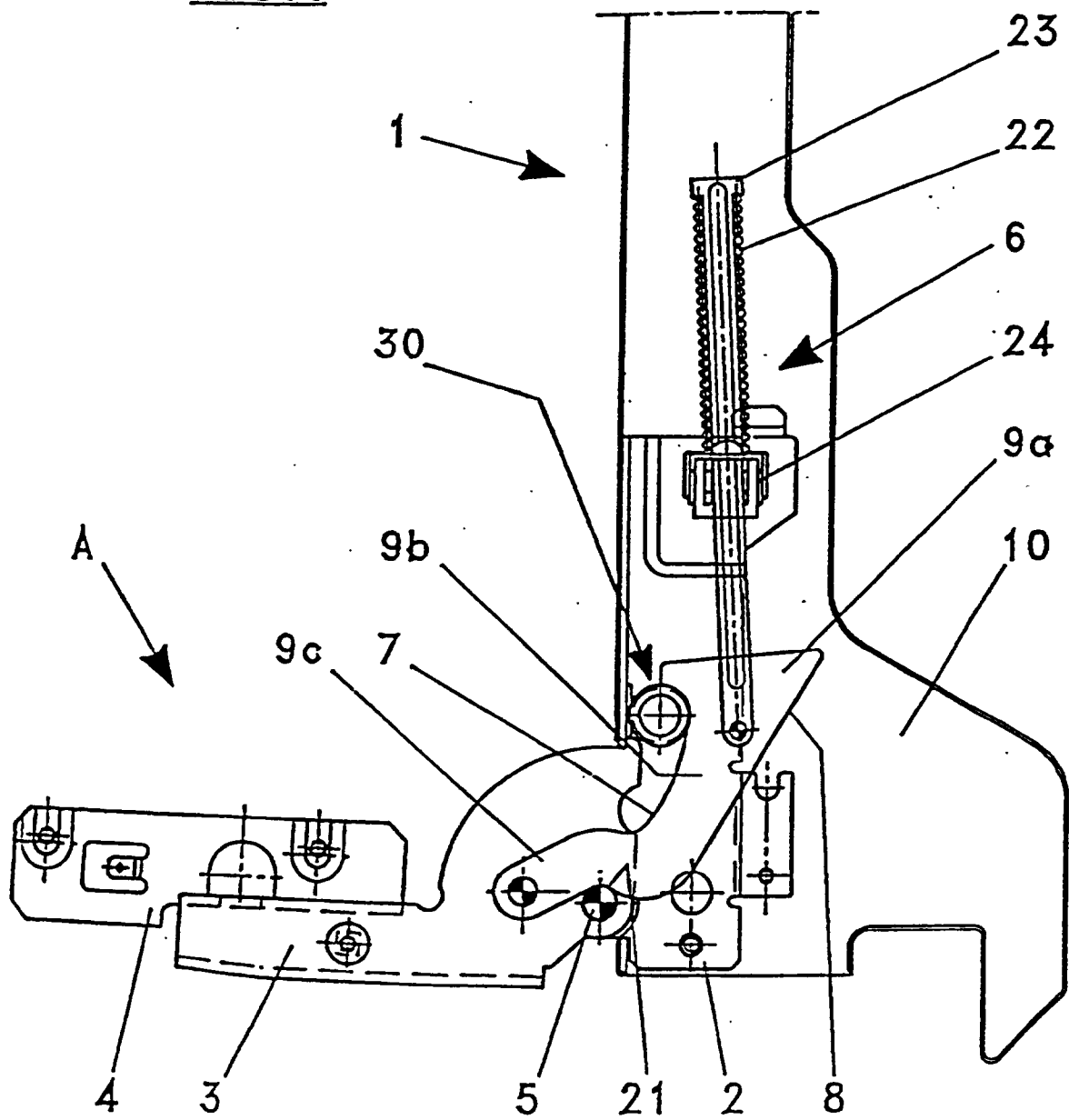


FIG. 7

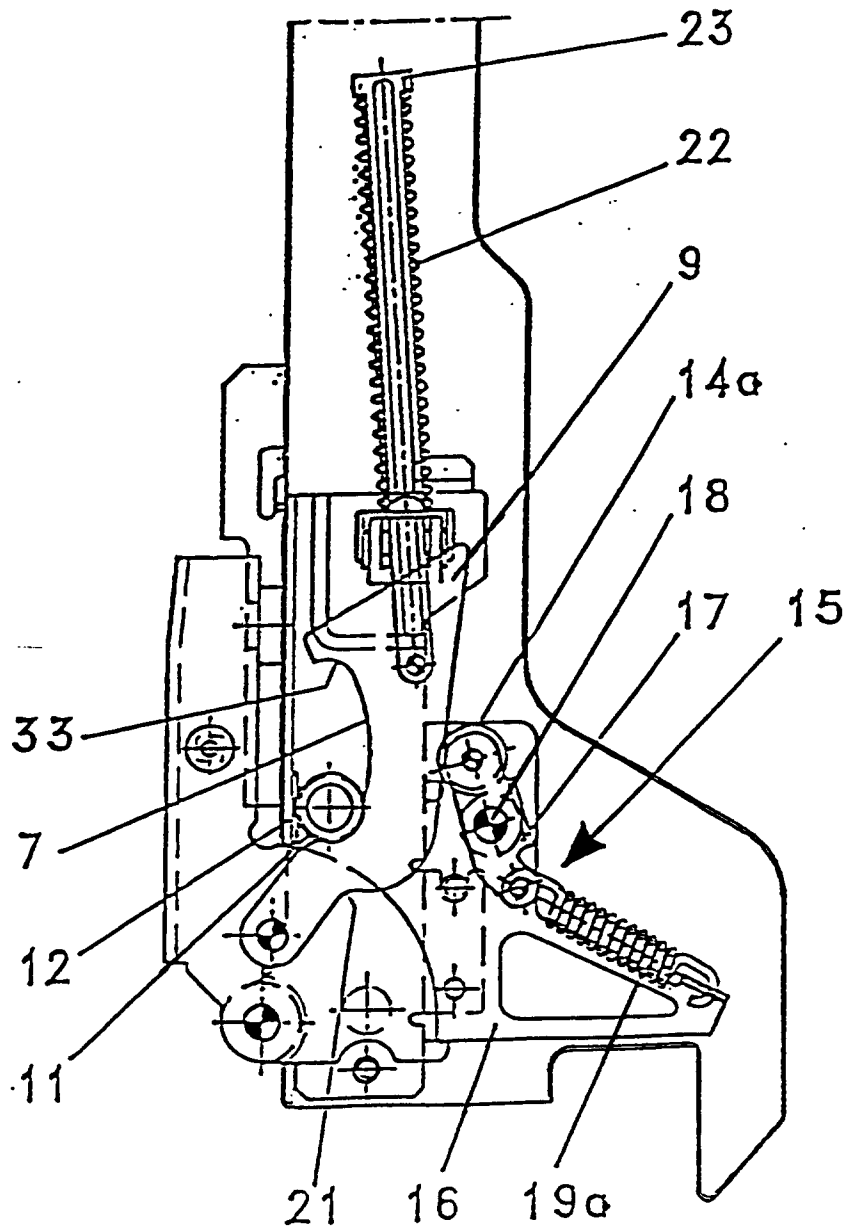


FIG. 8

