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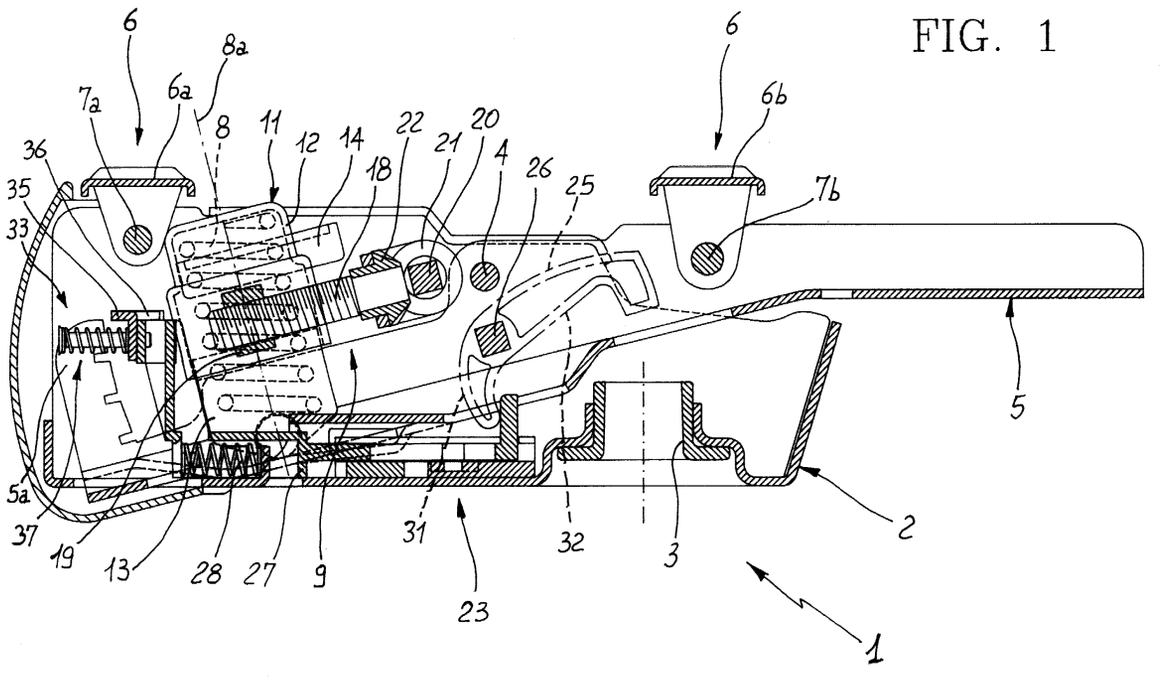
(54) Adjustment device for inclinable office chair and the like

(57) It is provided for an adjustment system for office reclining chairs and the like, consisting of a primary body (2) showing a lower seat (3) adapted to be engaged with a vertical stand of a chair, a support element (5) of the back of the chair turnably engaged with the primary body (2) on an oscillation axis (4), elastic means (8) placed between the support element (5) and the primary body (2), said means being adapted to exert onto said support element (5) an elastic force at a distance from the oscillation axis (4), and an adjustment group (9) simultaneously increasing or decreasing both the elastic force exerted by the elastic means (8) and the arm of said elastic force with respect to the oscillation axis (4).

FIG. 1



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Description

[0001] The present invention relates to an adjustment system for office reclining chairs and the like.

[0002] As known, office chairs are generally adjustable both in height and in the inclination of the back, and sometimes even in the inclination of the seat. In the latter case the seat can be wholly integral with the back, so that both can incline together of the same angle, or the seat can be only partially connected to the back so as to incline less than the latter.

[0003] It is also possible that the seat is completely free from the back and its inclination is therefore adjusted independently from the latter.

[0004] Chairs of the above-mentioned kind normally consist of a primary body, for instance box-shaped, having a lower seat adapted to house and engage an upper end of an upright which defines a vertical stand for an office chair.

[0005] According to several embodiments said upright consists of a fluid-dynamic cylinder carrying out a pneumatic spring used to change the seat height.

[0006] To the primary body is turnably engaged around an oscillation axis, a support element of the back so as to enable the adjustment of the inclination of the latter.

[0007] Moreover, elastic means are placed between the support element of the back and the primary body, said means being able to exert onto said support element of the back a resisting moment with respect to said oscillation axis, said moment tending to turn the back forward in contrast with the moment tending to push the latter backward, due to the pressing force developed by the sitter.

[0008] As a matter of fact, said elastic means comprise at least one elastic element with linear strain, such as for instance a cylindrical helical compression spring, adapted to exert, directly or indirectly, onto the support element of the back an elastic force at a distance from said oscillation axis, so as to define said resisting moment.

[0009] In most known embodiments it is also provided for the possibility to adjust the elastic force exerted by said elastic element with linear strain by varying the length of its housing so as to change its compression degree.

[0010] The known technique, briefly described above, shows some limitations and disadvantages.

[0011] As a matter of fact, firstly, the adjustment of the elastic force exerted by the elastic element or elements with linear strain, obtained by compression or reduction of the compression of the latter, requires quite slow operations, since the aim is to modify the length of the housing containing each elastic element by turning a screw.

[0012] Moreover, considering the peculiar structure of known systems, said operations are difficult to carry out and of little functionality since they have to be executed by turning handles placed in positions difficult to reach for the sitters, for instance under or behind the seat.

[0013] In this situation the technical aim of the present invention is to provide for an adjustment system for office reclining chairs and the like which can obviate said disadvantages.

[0014] Within said technical aim an important purpose of the present invention is to provide for an adjustment system for chairs which enables, given the same rotation angle of the control element for instance a handle, to modify to a greater extent the resisting moment exerted onto the back by the elastic means said back is equipped with, thus making the adjustment of said means faster and more direct.

[0015] Another important purpose of the present invention is to provide for an adjustment system whose operation is easy and convenient for the user, even when the latter is normally sitting.

[0016] A further purpose is to provide for an adjustment system for office reclining chairs which also enables to block the back into a chosen position by operating said handle, normally used to vary the seat height.

[0017] The technical aim and the purposes indicated above are substantially reached by means of an adjustment system for office reclining chairs and the like, characterized in that it comprises one or more of the technical solutions claimed later.

[0018] The description of a preferred though not exclusive embodiment of an adjustment system according to the invention is now disclosed as a mere non-limiting example, as shown in the enclosed drawings, in which:

- Fig. 1 shows a view in longitudinal section of the whole system according to the invention, comprising both the adjustment group for the elastic means and the blocking group for the support element of the back;
- Fig. 2 shows a plan view of the system of Figure 1 comprising the adjustment group for the elastic means only;
- Fig. 3 shows a section according to plane III-III of Figure 2 highlighting elastic means which have been adjusted in their position of maximum resisting moment;
- Fig. 4 is a section similar to the one in Figure 3, but highlighting the elastic means as they have been adjusted in their position of minimum resisting moment;
- Fig. 5 shows a plan view of the system comprising a blocking group for the support element of the back only;
- Fig. 6 is a schematic view of a section according to plane VI-VI of Figure 5 highlighting the slide of the blocking group in a first position corresponding to the release of the support element of the back, though with the blocking tooth still engaged with said element;
- Fig. 7 is similar to Figure 1, with the blocking tooth

in a position in which it is not engaged with the support element of the back;

- Fig. 8 is a section similar to the one in Figure 6, highlighting the slide in a section position enabling the snap engagement of the blocking tooth;
- Fig. 9 shows a section similar to the one in Figure 6, highlighting the slide being moved to stop the support element of the back with the blocking teeth.

[0019] With reference to the mentioned figures, the adjustment system according to the invention is generally indicated with the numeral 1.

[0020] It consists of a primary body 2 showing a lower seat 3 adapted to be engaged with an upper end of an upright, not shown in the enclosed figures, which defines the vertical stand of a chair.

[0021] The primary body 2 is turnably engaged with a support element 5 of the back of the chair along an oscillation axis 4. The support elements 6 of the seat of the chair are located above the primary body 2.

[0022] In the embodiment shown in the enclosed figures said support elements include a first support element 6a hinged to the primary body 2 according to a first hinging axis 7a located before the oscillation axis 4 and parallel to it, and a second support element 6b hinged to the support element of the back 5 on a second hinging axis 7b located behind the oscillation axis 4 and parallel to it.

[0023] Moreover, said hinging axis 7a and 7b, and the oscillation axis 4 are substantially lined up, so as to enable the inclination, with respect to the primary body 2, both of the support element 5 and, to a smaller extent, of the seat engaged with the support elements 6a and 6b.

[0024] In order to avoid a three-hinge arch which would not allow the reciprocal inclination of said elements, it is necessary to carry out a slot within which one of the hinging points defining the above-mentioned rotation axes can slide.

[0025] Advantageously, in the shown embodiment the arrangement, substantially lined up, of the three axes enables to carry out a simple clearance, for instance on the rotation axis 7b, instead of a real slot.

[0026] It is also possible to provide, instead of the kind of chair illustrated above with synchronous inclination both of the back and of the seat, other kinds of chairs in which, for instance, also the second support elements 6b is integral with the primary body 2, and the seat is therefore fixed, that is to say, in permanent touch with the latter, or in which both support elements of the seat are integral with the support elements of the back and the seat can oscillate integrally with said back.

[0027] Between the primary body 2 and the support element of the back 5 elastic means 8 are placed, said means being adapted to exert, with respect to the oscillation axis 4, onto said support element 5, and therefore also onto the back, a resisting moment in elastic contrast with the moment tending to push the latter backward, due to the pressing force developed by the sitter.

[0028] In order to carry out said resisting moment the elastic means 8 include at least one element with linear strain, such as for instance a pair of cylindrical helical compression springs exerting their elastic forces according to action lines 8a, whose distance "b" from the oscillation axis 4 forms the arm contributing to define said resisting moment (Figures 3 and 4).

[0029] Originally, the system according to the invention includes an adjustment group 9, simultaneously increasing or reducing both the elastic force exerted by the elastic means 8 and the arm "b" of said force with respect to the oscillation axis 4.

[0030] Advantageously, the adjustment group 9 is equipped with a control handle 10 laterally projecting from the seat.

[0031] More precisely, the adjustment group 9 includes a housing 11 for each spring 8, said housing being divided into two half-shells, that is to say, a first half-shell 12 and a second half-shell 13 telescopically movable one with respect to the other in the sense of the linear strain of the corresponding spring 8, i.e. in the direction of the action line 8a.

[0032] The first half-shell 12 shows on its outer portion a lateral extension 12a slidingly coupled with a first track 14 integral with the primary body 2 and defined by a guiding groove perpendicular to the oscillation axis 4.

[0033] The second half-shell 13 shows on its outer and end portions a grooved seat 13a for a rolling element 15 sliding along a second track 16 integral with the support element 5 and also perpendicular to the oscillation axis 4.

[0034] The first track 14 ad the second track 16 are convergent one with respect to the other moving away from the oscillation axis 4, and the convergence angle they form increases with the increment of the inclination backward of the support element 5 and therefore of the back of the chair.

[0035] The shift of the housing 11 along the tracks 14 and 16 is carried out by means of control means 17 linked up with the control handle 10.

[0036] In further detail:

the control means 17 include an operating screw 18 turnably coupled with an internal thread 19 placed between the first half-shells and integral with the latter.

[0037] The operating screw 18 is oriented perpendicularly to the oscillation axis 4 and it is rotated by a control spindle 20 by means of a pair of cone-shaped toothed wheels including a first wheel 21 integral with said spindle and a second wheel 22 fitted onto an end of the operating screw 18.

[0038] The control spindle 20 is turnably engaged with the primary body 2, it is parallel to the oscillation axis 4 and it is connected on its end with the control handle 10.

[0039] The adjustment system for chairs according to

the invention further comprises a blocking group 23 (Figs. 7-9) for the support element of the back 5 with respect to the primary body 2, said group being able to block said support element, and therefore the back integral with it, into a plurality of different inclined positions.

[0040] Originally, the blocking group 23 uses the same operating lever 24 (Fig. 5) which is used, according to a known technique, for the height adjustment of the seat in the embodiments in which the upright defining the vertical stand of the chair consists of a fluid-dynamic cylinder (not shown in the enclosed drawings). More precisely, the blocking group 23 provides for an equalizing element 25 integral with a control bar 26, parallel to the oscillation axis 4, the end of said bar being connected to a operating lever 24. When the rocker arm 25 is turned in a first sense, and more precisely counterclockwise with reference for instance to Figure 1, it enables to alternately carry out, always in said first rotational sense, the release and the blocking of the support element 5 into one of said inclined positions.

[0041] When said rocker arm is turned in a second sense, i.e. clockwise always with reference for instance to Figure 1, it enables to carry out the activation of the above-mentioned fluid-dynamic cylinder so as to adjust the height of the seat.

[0042] The blocking group 23 includes a slide 27 moving onto the primary body 2 along a sliding direction which is perpendicular to the oscillation axis 4, and a first member with linear elastic strain 28, for instance a compression spring, pushing the slide 27 in a first sliding sense 29 (Fig. 6).

[0043] The slide is movable, in contrast with the spring 28, along a second sliding direction 30 by means of a thrusting element defined by an arm 31 of the rocker arm 25 showing a second arm 32 for the action onto said fluid-dynamic cylinder.

[0044] Joint elements 33 are located on the slide 27 and on the support element 5 (Fig. 6), said joint elements being adapted to reciprocally interfere in order to prevent the rotation of said support element.

[0045] Finally, the blocking group 23 includes stop and release means 34 associated with the slide 27 and of a known type, for instance as described in the patent application for utility model no. ITBS970042 filed on 5.5.1997 by the present applicant.

[0046] Said stop and release means 34 have the function, alternately, to stop the slide 27, against the spring 28, in a first position (illustrated in Figures 6 and 7), in which the joint elements 33 interfere one with the other, and to release said slide in a second position (see Figure 8) to enable the following snap engagement of said elements under the action of the spring 28 (Figure 9).

[0047] The joint elements 33 include a blocking tooth 35, consisting of a shaped bar with a "L"-section sliding with its ends within a pair of guiding grooves 36 obtained in the primary body 2 and developing parallel to said sliding direction of the slide 27, so as to define the maximum stroke of said blocking tooth 35.

[0048] The latter is also connected to the slide 27 by means of connection means 37 consisting in their turn of at least a second member with linear elastic strain 38, for instance two compression spring exerting an elastic thrust onto said blocking tooth so as to shift it closer to the slide, in contrast with the action exerted by the first member with elastic strain 28.

[0049] The connection means 37 also include a support pin 39 integral with the slide 27 and adapted to guide and keep the spring 38.

[0050] The support pin 39 passes through a base connection 35a of the blocking tooth 35, which is therefore placed between the spring 38 and the slide 27.

[0051] The joint elements 33, beside the blocking tooth 35, also provide for a plurality of hollow seats 40 (Fig. 4) placed on an end portion 5a of the support element of the back 5 and each housing said blocking tooth 35. The working of an adjustment system like the one described above mainly from the structural point of view is the following.

[0052] In order to adjust the resisting moment developed onto the support element of the back 5 by the elastic forces of the springs 8 with respect to the oscillation axis it is necessary to use the operating handle 10 allowing, by means of the control means 17, to shift the housing 11 on the tracks 14 and 16.

[0053] Said shift involves on the one hand the increase or the decrease of the length of the arm "b" (see Figures 3 and 4) and on the other hand the reciprocal approaching or pushing away of the first and second half-shell 12 and 13, and therefore an increase or a decrease of the elastic force of the spring 8.

[0054] It should be noted that the greater is the inclination backwards of the support element 5 of the back, the greater is the convergence between the first track 14 and the second track 16 on which the half-shells 12 and 13 respectively slide, and therefore, supposing the sliding of the latter is the same, the greater is the variation in the elastic force of the spring 8 and of the resisting moment developed by said spring.

[0055] In order to vary the inclination of the back and to block it in a chosen reclined position it is necessary to use the operating lever 24.

[0056] More precisely, with reference to Figure 6, from a first rotation of said operating lever anticlockwise and its following release results a corresponding rotation of the equalizing element 25 and a first shift in the same sliding direction 30 as the slide 27, until the latter reaches a first position in which it is kept by the stop and release means 34.

[0057] Simultaneously, the first spring 28 partially compresses, as do the second springs 38.

[0058] During this first step the blocking tooth 35 does not come out of the seat into which it has been introduced because of the friction existing between the walls of said seat and the blocking tooth itself.

[0059] By swinging slightly the back it is possible to

eliminate said friction, and the springs 38, now loaded, are able to thrust the blocking tooth 35 out of the seat housing it.

[0060] The back is thus released and can be reclined in a new position (see Figures 1 and 7).

[0061] In order to block the back it is necessary to use again the operating lever 24, always in the same rotational sense, so as to shift, still in the second sliding direction 30, the slide 27 until it reaches a second position, illustrated in Figure 8, in which there is a further compression of the spring 28 and, simultaneously, a new compression of the second springs 38 due to the fact that the blocking tooth 35 is stopped in its previous position, corresponding to the end of the guiding grooves 35 in which it slides. In said second position the stop means 34 allow the release of the slide 27, which is then pushed in the first sliding direction 29 by the first spring 28 (see Figure 9).

[0062] As soon as the chair is brought in such an angular position that the blocking tooth 35 is in a new seat, the shift of the slide, under the thrust of the spring 28, causes the snap introduction of the blocking tooth 35 into its new seat.

[0063] The invention shows important advantages.

[0064] First of all, the adjustment of the resisting moment exerted by the elastic means located between the primary body and the support element of the back is fast and effective, since it is possible to simultaneously modify the two quantities on which said moment depends, i. e. the elastic force and its arm with respect to the oscillation axis of the back.

[0065] Moreover, the peculiar embodiment of the adjustment group of the resisting moment makes the use of the operating handle provided easy and practical, since said handle is placed in a convenient and easily accessible position.

[0066] It should also be noted that the blocking group which should modify the inclination of the back and to block the latter with respect to the primary body of the system, beside being extremely practical since it only requires rotations of the operating lever it is provided with in the same direction, enables thanks to this characteristic to integrate into said operating lever the control of the height adjustment of the seat commonly present in office chairs, thus avoiding the addition of other operating levers.

Claims

1. Adjustment system for office reclining chairs and the like, including:

   a primary body (2) showing a lower seat (3) engaging with an upper end of an upright defining the vertical stand of a chair,
   a support element (5) of the back of the chair, turnably engaged with said primary body (2) on an oscillation axis (4),
   support elements (6a, 6b) of the seat of the chair, placed above said primary body (2),
   and elastic means (8) placed between said support element (5) and said primary body (2) and exerting onto said support element (5), with respect to said oscillation axis (4), a resisting moment elastically opposed to the moment pushing the back backwards, the latter being due to the pressing force against said back,
   said elastic means (8) including at least an elastic element with linear strain exerting onto said support element an elastic force at a distance from said oscillation axis (4), so as to define said resisting moment,

   characterized in that it includes an adjustment group (9) for said elastic means (8), simultaneously increasing or decreasing both said elastic force exerted by said elastic element (8), and the arm of said elastic force with respect to said oscillation axis (4).

2. System according to claim 1, **characterized in that** said adjustment group (9) includes an operating handle (10) projecting laterally with respect to the seat.

3. System according to claim 1, **characterized in that** said elastic element (8) with linear strain is of the compression type, and **in that** said adjustment group (9) includes:

   a housing (11) for said elastic element, divided into two half-shells (12, 13) moving one with respect to the other in the direction of the linear strain of the corresponding elastic element (8), said half-shells including a first half-shell (12) sliding along a first track (14) integral with said primary body (2) and developing perpendicularly to said oscillation axis (4), and a second half-shell (13) sliding along a second track (16) integral with said support element (5) of the back and developing perpendicularly to said oscillation axis (4),
   and control means (17) linked up with an operating handle (10) and moving said housing (11) along said tracks (14, 16).

4. System according to claim 3, **characterized in that** said tracks (14, 16) are convergent one with respect to the other while getting away from said oscillation axis (4) according to a convergence angle which gets wider together with the increase of the backward inclination of the back of the chair.

5. System according to claim 4, **characterized in that** said control means (17) include:

an operating screw (18), turnably coupled with an internal thread (19) which is integral with said housing (11) of the elastic element (8), said operating screw (18) being oriented perpendicularly to said oscillation axis (4),
a control spindle (20), turnably engaged with the primary body (2) and placed parallel to said oscillation axis (4), said operating handle (10) being integral with said spindle (20), and a pair of toothed wheels including a first wheel (21) integral with said spindle (20), and a second wheel (22) integral with said operating screw (18).

6. System according to claim 3, **characterized in that** said first track, integral with the primary body (2), is defined by a guiding groove, and said first half-shell (12) shows a lateral extension (12a) sliding in said guiding groove, and **in that** said second half-shell (13) shows on its end a hollow seat for a rolling element (15) sliding on said second track (16), which is integral with said support element (5) of the back.

7. System according to claim 1, **characterized in that** said support elements of the seat (6a, 6b) include:

a first support element (6a) hinged onto said primary body along a first hinging axis (7a) placed before and parallel with respect to said oscillation axis (4),
a second support element (6b) hinged onto said support element of the back (5) on a second hinging axis (7b) placed behind and parallel to said oscillation axis (4), and **in that** said oscillation axis (4) and said hinging axes (7a, 7b) are substantially lined up.

8. System according to claim 1, **characterized in that** said support elements of the seat (6a, 6b) are integral with said primary body (2).

9. System according to claim 1, **characterized in that** said support elements of the seat (6a, 6b) are integral with said support element (5) of the back.

10. System according to claim 1, **characterized in that** it includes a blocking group (23) for said support element (5) of the back against said primary body (2), blocking said support element in a plurality of different reclined positions, and **in that** said blocking group (23) includes an operating lever (24) adapted to be operated at least in a first rotational sense to alternately enable to carry out in said rotational sense the release of said support element (5) and its blocking in one of said reclined positions.

11. System according to claim 10, **characterized in that** said upright defining the vertical support of the chair includes a fluid-dynamic cylinder for the height adjustment of the chair, and **in that** said operating lever (24) can be operated, beside in a first rotational sense, in a second rotational sense in order to carry out the activation of said fluid-dynamic cylinder.

12. System according to claim 10, **characterized in that** said blocking group (23) includes:

a slide (27) moving on said primary body (2) along a sliding direction which is perpendicular to said oscillation axis (4), at least a first member with linear elastic strain (28) pushing said slide (27) in a first sliding direction (29), a thrusting element (31) connected to said operating lever (24) and moving said slide (27) in a second sliding direction (30) against said first member with elastic strain (28), joint elements (33) reciprocally interfering so as to prevent the rotation of said support element (5) of the back, said elements being placed partly on said slide (27) and partly on said support element (5) of the back,
and stop and release means (34) associated with said slide (27), stopping alternately said slide against said first member with elastic strain (28) in a first position in which said joint elements (33) do no interfere one with the other, and releasing said slide (27) in the second position so as to enable the snap engagement between said joint elements (33) under the action of said first member with elastic strain (28).

13. System according to claim 12, **characterized in that** said joint elements (33) include:

at least one blocking tooth (35),
connection means (37) of said blocking tooth with said slide (27),
and a plurality of hollow seats (40) placed on an end portion (5a) of said support element (5) of the back and each housing said blocking tooth (35).

14. System according to claim 13, **characterized in that** said blocking tooth (35) is slidingly engaged with said primary body (2), parallel to said sliding direction of the slide (27), and **in that** said connection means (37) of the blocking tooth (35) include at least a second member with linear elastic strain (38) exerting an elastic thrust onto said blocking tooth (35) while approaching said slide (27) and against the action of said first member with elastic strain (28).

15. System according to claim 14, **characterized in that** said second member with elastic strain (38) is

defined by a compression spring, and **in that** said connection means (37) include a support pin (39) integral with the slide (27), which guides and keeps the compression spring (38), said blocking tooth (35) showing a base connection (35a) through which said support pin (39) passes, said base connection being placed between said spring (38) and the slide (27).

FIG. 1

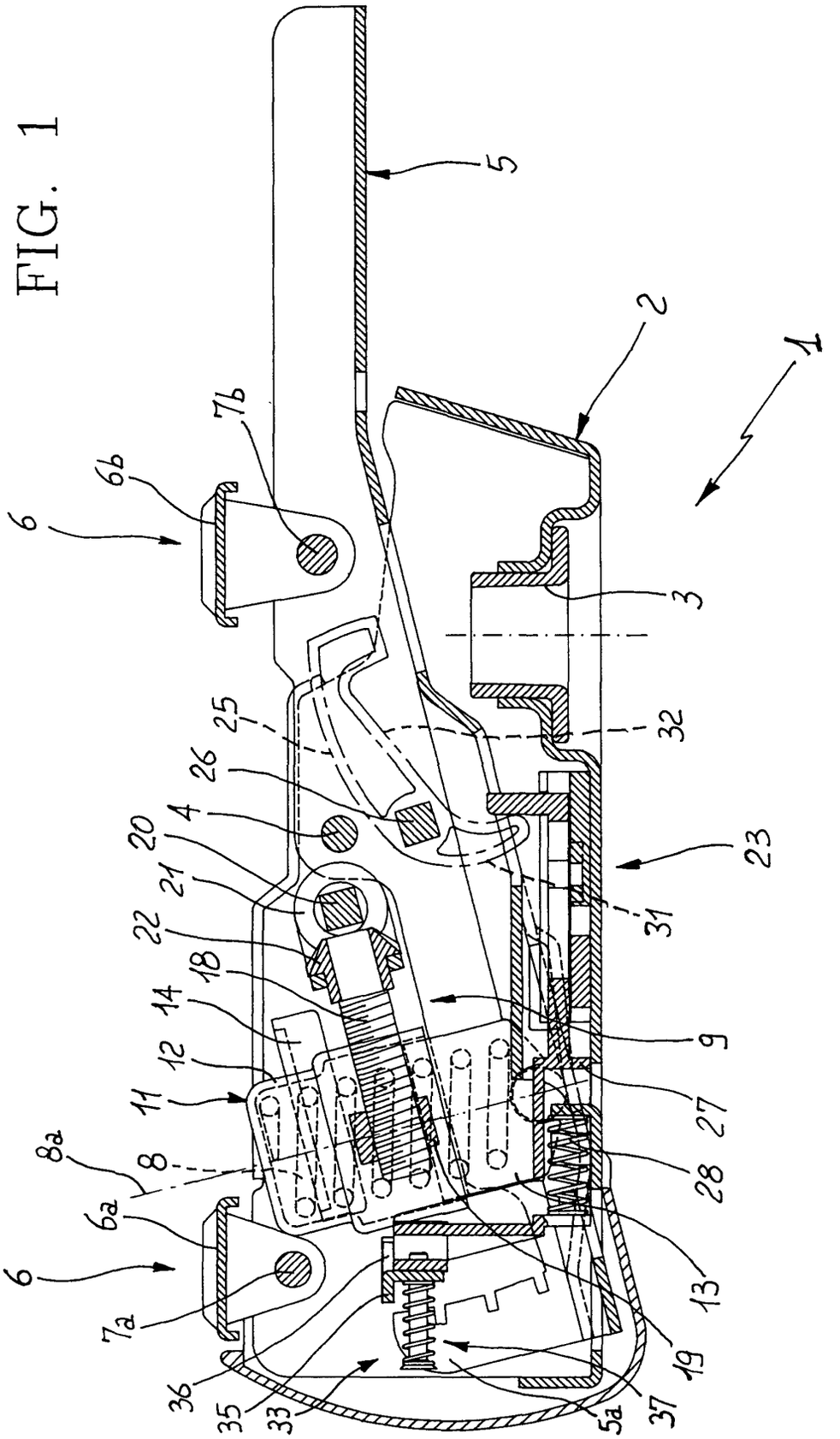
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FIG. 2

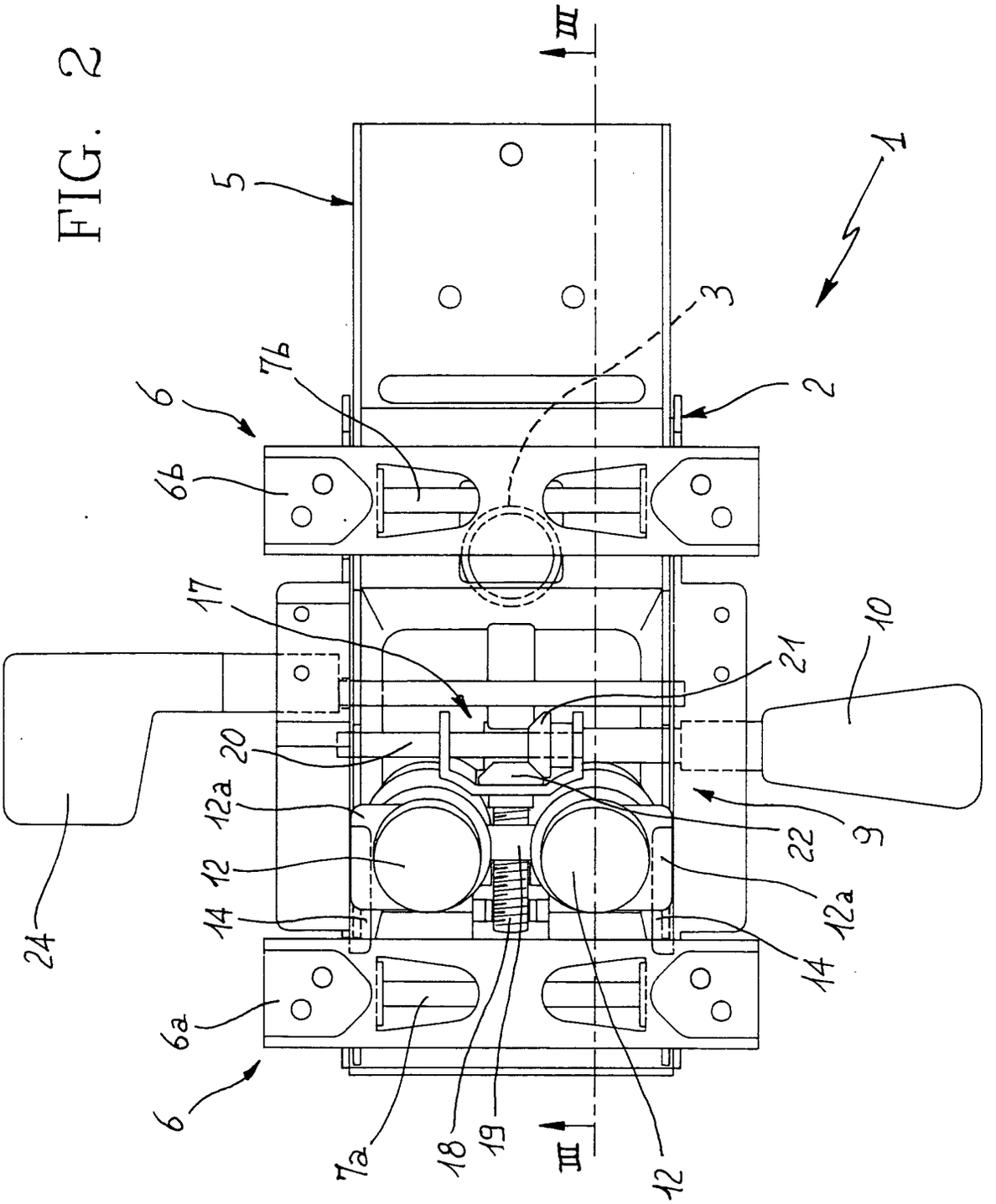
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FIG. 3

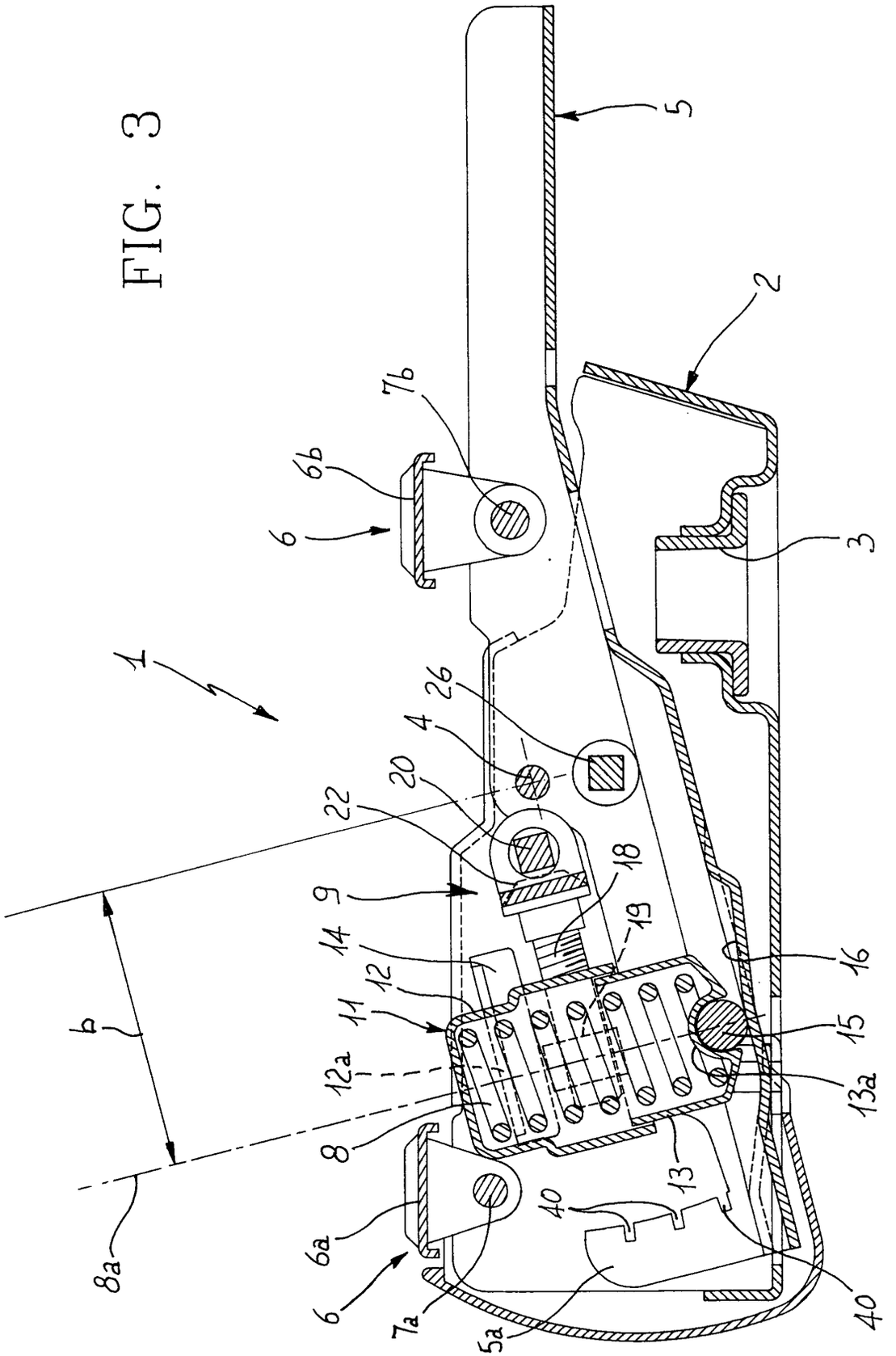
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FIG. 4

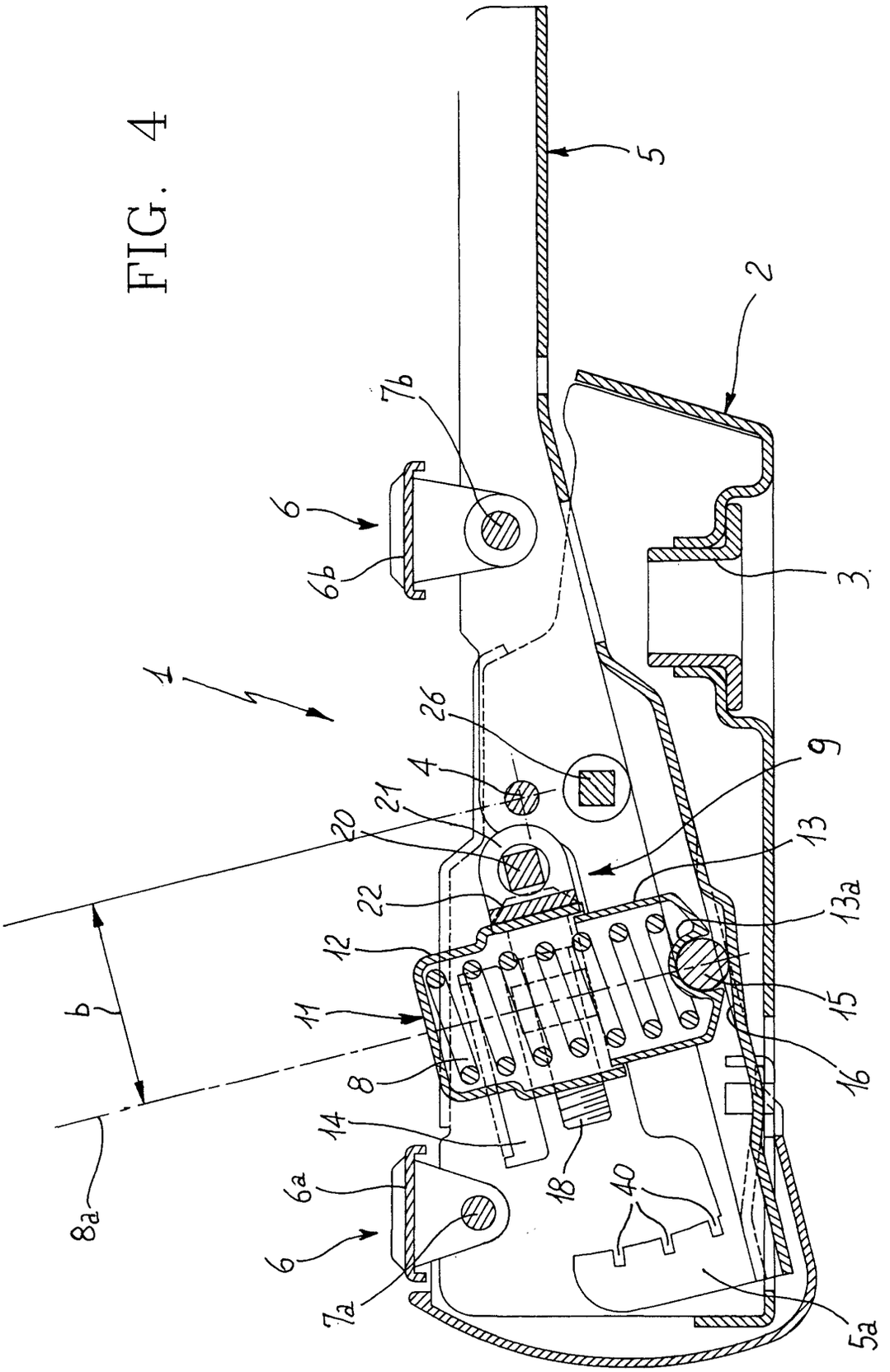

FIG. 5

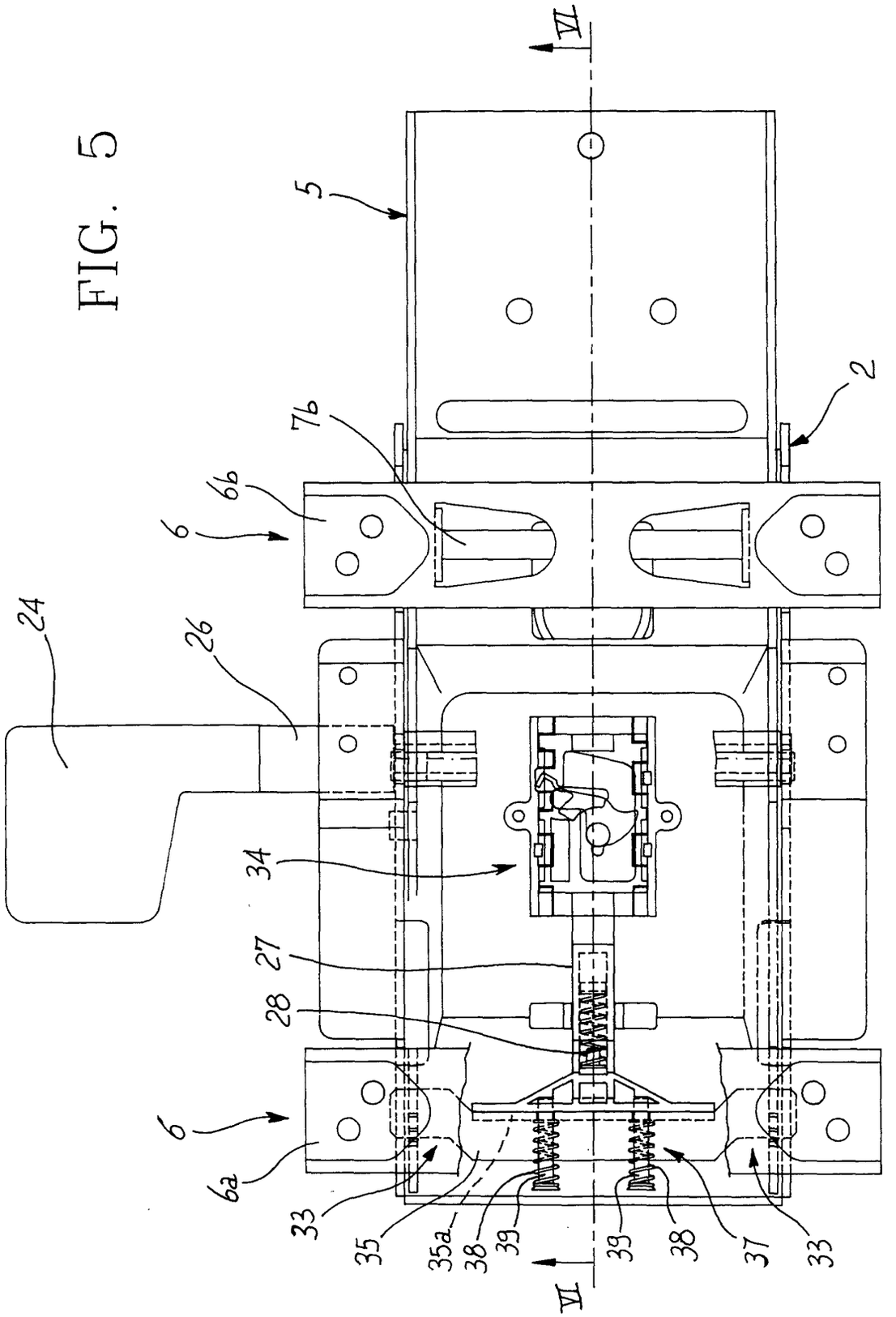

FIG. 6

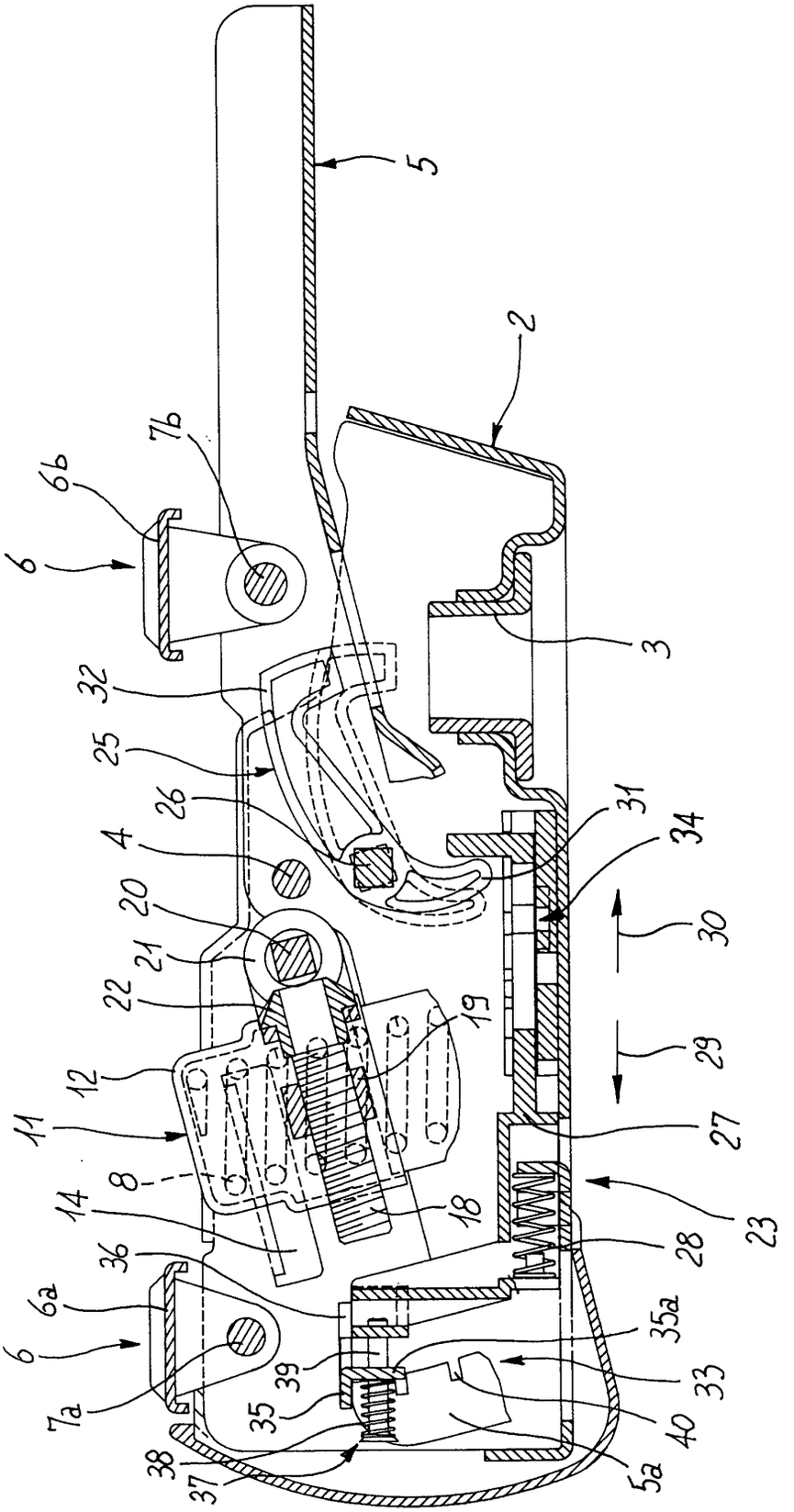
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FIG. 7

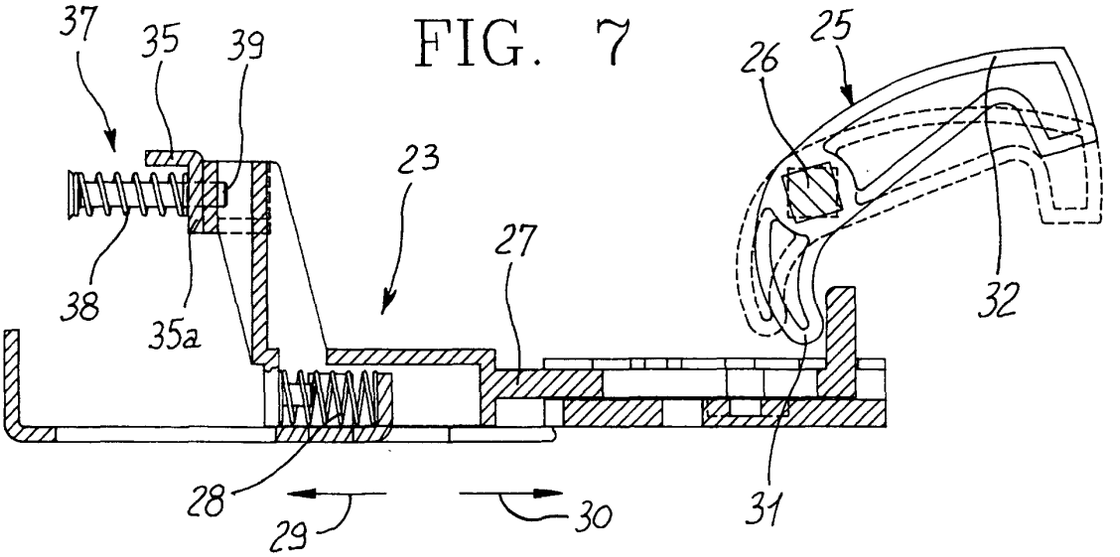


FIG. 8

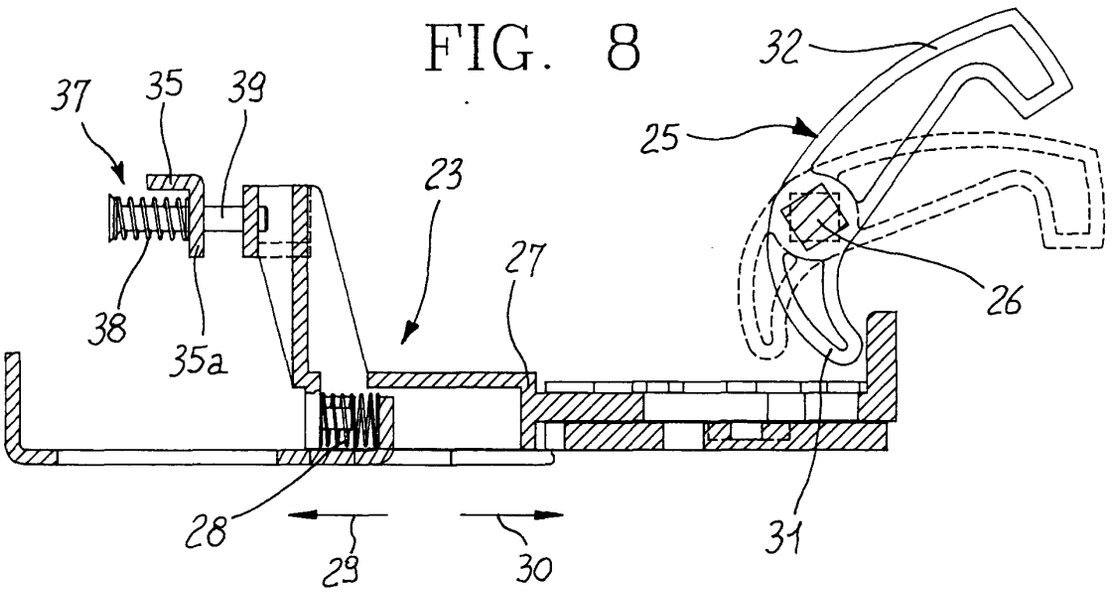
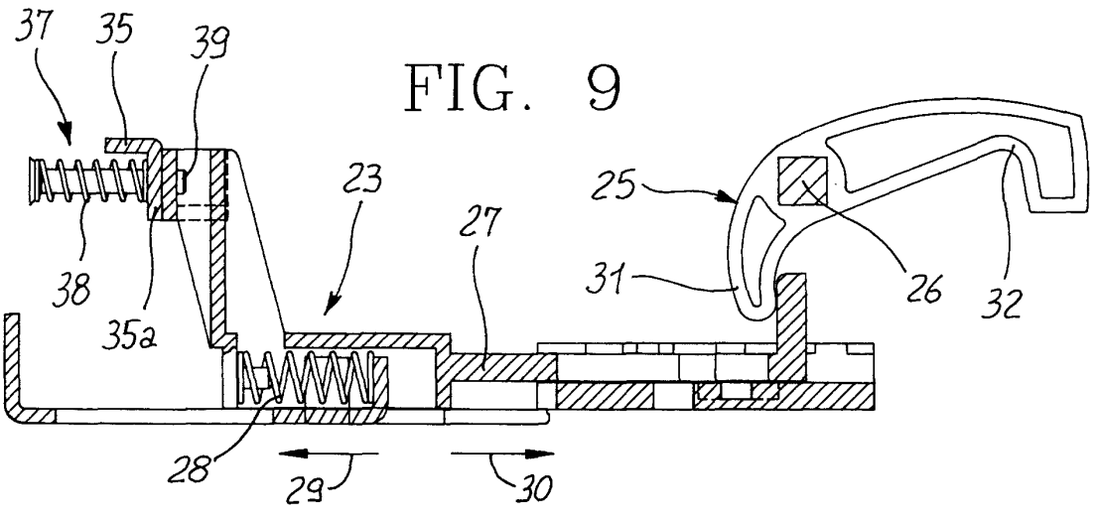


FIG. 9



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Application Number
EP 00 83 0528

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 December 2000	VandeVondele, J

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 83 0528

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