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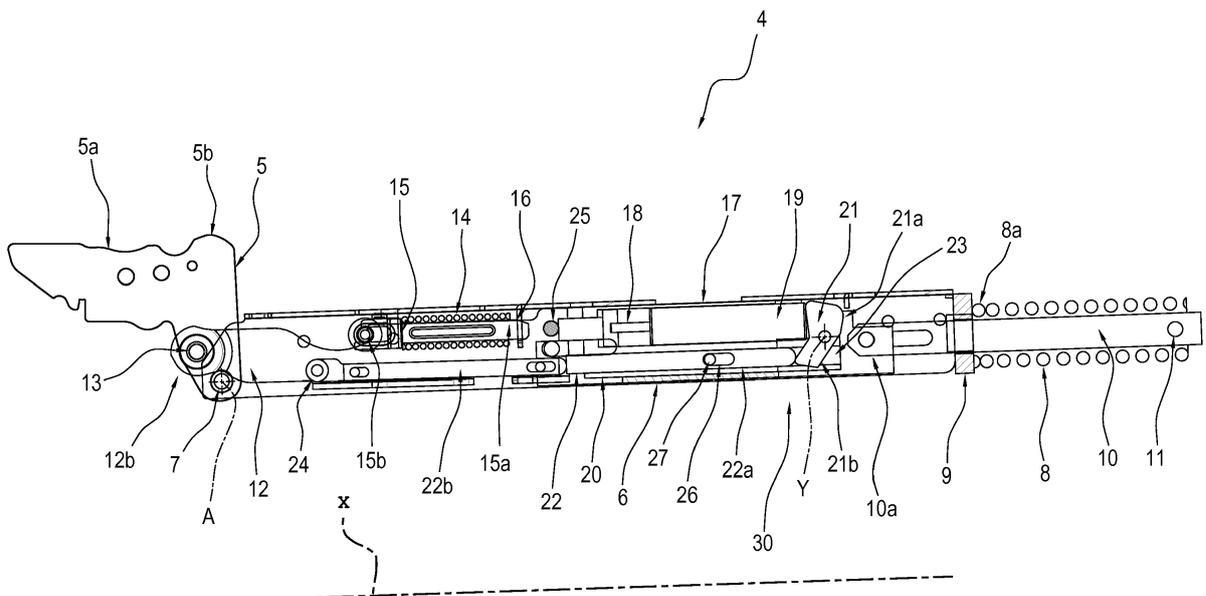
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(54) **HINGE FOR DOORS OF DOMESTIC APPLIANCES**

(57) Described is a hinge for doors of domestic appliances, comprising a box-shaped element (6) and a first lever (5) pivoted to the box-shaped element (6) by means of a pin (7); one of either the box-shaped element (6) or the first lever (5) being fixable to a frame and the other being fixable to a door, to make the door tiltably movable relative to the frame between a closed position

and an open position; elastic means (8, 14) supported by the box-shaped element (6) and designed to apply an elastic action on the first lever (5), a damper unit (17) for applying a damping action during the reciprocal motion of the first lever (5) and the box-shaped element (6), in the proximity of the above-mentioned closed position, means (30) for operating the damper element (17).

FIG. 2



Description

[0001] This invention relates to a hinge for doors of domestic appliances.

[0002] More specifically, this invention relates to a hinge for electric household appliances equipped with an internal damper.

[0003] This specification describes the present invention with reference to an oven purely by way of a non-limiting example.

[0004] In the ovens of known type, the hinges used normally comprise a box-shaped structure connected by a kinematic mechanism to a lever, with the lever and the box-shaped structure designed to open mutually in a tilting fashion.

[0005] The box-shaped structure and the lever are designed so as to be connected one to a door and the other to a frame of the oven.

[0006] More precisely, one between the box-shaped structure and the lever is fixed to the frame of the oven, at a side of the access opening of the latter, whilst the other is fixed to an edge of the door, which in this way is made tiltably movable relative to the above-mentioned frame.

[0007] Elastic elements act on the above-mentioned lever which influence the movement of the door during both opening and closing.

[0008] During the rotation of the door starting from its closed position, the above-mentioned elastic elements oppose, in a first step, the detachment of the door from the supporting frame of the oven and, in a second step, the subsequent rotation of the door and its consequent lowering to a fully open end of stroke position of the access opening of the oven. In this second step of opening, the door, under the combined action of its weight which facilitates the lowering and the elastic elements which perform a braking action, performs a gradual rotation.

[0009] During the rotation of the door starting from its open end-of-stroke position, the action of the above-mentioned elastic elements is firstly balanced by the weight of the door, and this guarantees, initially, a gradual closing rotation; next, however, in the absence of an adequate action by the user, the door is pushed by the elastic elements towards the frame of the oven with a force such as to cause a closing which is often quite sudden and noisy.

[0010] For this purpose, that is to say, for applying an braking action, suitable damping means have been introduced in the hinges.

[0011] The use of internal dampers in hinges in order to slow the closing or opening of the of the door is well known in the prior art.

[0012] The introduction of these damper elements in the hinges for electric household appliances has given rise to numerous problems.

[0013] A first drawback is due to the difficulty of inserting damping members in the limited space available for housing the hinges which are actually effective and long-

lasting.

[0014] It is clear that the damping capacity of a damping member must take into consideration its actual dimensions.

[0015] Another problem linked with the introduction of damping members inside the hinges consists in the difficulty of associating the damping action of the damping member with the movement of the hinge. In other words, since the stroke of the damping member, which normally consists of a cylinder and a piston slidable lengthways, has a predetermined amplitude and has its maximum effectiveness in a stretch of the stroke, it is often complicated to harmonize the amplitude with the angular stretch of the movement in which a damping action is actually requested.

[0016] In effect, a damping action which is exerted outside the required interval, for example near to the closing of the oven door, would constitute an obstacle for the closing of the oven, forcing the manufacturer to increase the size of the elastic elements.

[0017] The aim of this invention is to provide a hinge for doors of domestic appliances which is free of the above-mentioned drawbacks and is, at the same time, structurally simple and practical and effective to use.

[0018] The technical features of the invention, in accordance with the above mentioned aim, may be clearly inferred from the contents of the appended claims, in particular from claim 1 and, preferably, from any of the claims directly or indirectly dependent on claim 1.

[0019] The advantages of the invention are more apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred, non-limiting example embodiment of the invention and in which:

- Figure 1 is a schematic perspective view from above of an oven with a door connected to it by two hinges made in accordance with the present invention;
- Figures 2 to 5 are respective schematic side elevation views, with some parts in cross-section and others cut away to better illustrate others, of the hinge according to this invention in four different use configurations.

[0020] The numeral 1 in Figure 1 denotes in its entirety an oven comprising a frame 2 to which a door 3 is connected by two hinges 4 which enable it to be tiltably rotated about a horizontal axis A.

[0021] Figures 2 to 5 show preferred embodiments of a hinge 4 made according to this invention.

[0022] Each of the two hinges 4 comprises a first lever 5, fixed to the frame 2 of the oven 1 at a respective side of the access opening of the latter, and an box-shaped element 6, fixed to a respective edge of the door 3.

[0023] The first lever 5 is fixed to the frame 2 either directly or by interposing a respective box-shaped body not illustrated.

[0024] The box-shaped element 6 has an elongate

shape and extends lengthways along a predetermined axis X.

[0025] The first lever 5 is pivoted on the box-shaped element 6 by means of a pin 7 and has a portion 5a constrained rigidly to the frame 2 to make the door 3 tiltably movable relative to the frame 2, between a closed end position, illustrated in Figure 5, and an open end position, illustrated in Figure 2.

[0026] As illustrated in Figures 2 to 5, the hinge 4 comprises a first helical spring 8 housed outside the box-shaped element 6, the first spring 8 abutting, with a relative lower end turn 8a, with a transversal end wall 9 of the box-shaped element 6.

[0027] The first spring 8 is kept in abutment against the above-mentioned transversal wall 9 by the head 11 of a compression rod 10 which is positioned coaxially inside the first spring 8 and which defines a guide for the first spring 8.

[0028] The compression rod 10 protrudes below from the first spring 8 with an end 10a, which passes through an opening made in the transversal wall 9 to couple, by means of a connecting element (not illustrated), to a tie rod 12, the lower end 12b of which is hinged to the first lever 5 by a pin 13 located near the above-mentioned pin 7.

[0029] The position of the pin 13, at which the elastic reaction force of the first spring 8 is applied, relative to the pin 7, and the pre-compression of the first spring 8, guarantee an elastic action which tends to push the door 3 into its closed position.

[0030] With reference to the accompanying Figures 2 to 5, the hinge 4 comprises a second helical spring 14 fitted on a respective rod 15.

[0031] The rod 15 has a first upper end 15a inserted in a slidable fashion in a suitable guide 16 integral with the wall of the box-shaped element 6.

[0032] The rod 15 has a second lower end 15a supporting a roller 15b.

[0033] The roller 15b is designed to engage with a respective cam-shaped portion 5b of the first lever 5 for defining with it a cam-follower coupling.

[0034] The second helical spring 14, together with the respective rod 15 defines means for closing the hinge 4, that is to say, elastic means designed to guarantee the closed position of the door 3 of the oven.

[0035] The first and the second helical spring 8, 14 define, for the hinge 4, respective elastic means designed to apply an elastic action on the first lever 5.

[0036] As illustrated in Figures 2 to 5, the hinge 4 comprises a gas or fluid damper cylinder 17 comprising a piston 18 and a cylindrical body 19.

[0037] The cylinder 17 is inserted in, and supported by, a respective containing body 20, in turn housed inside the box-shaped element 6.

[0038] A rocker lever 21 is pivoted on the containing body 20, designed to oscillate about a respective pivot axis Y, perpendicular to the plane of the drawings.

[0039] The pivot axis Y, with the containing body 20

positioned inside the box-shaped element 6, is therefore fixed relative to the latter.

[0040] The rocker lever 21 is located near the damper cylinder 17 to act on it. Advantageously, the rocker lever 21 acts directly on the damper cylinder, that is, without the interposing of further mechanical parts.

[0041] The rocker lever 21 has, on opposite sides of the pivot axis Y, a first arm 21 a and a second arm 21 b.

[0042] The first arm 21 a is designed to engage with the above-mentioned cylindrical body 19 of the damper cylinder 17.

[0043] The hinge 4 comprises a control rod 22 of the rocker lever 21, designed to engage with the second arm 21 b of the latter.

[0044] A rectilinear guide 23 for longitudinal sliding of the drive rod 22 is made on the containing body 20.

[0045] Advantageously, according to the preferred embodiment illustrated in the accompanying drawings, the control rod 22 is made of two separate portions 22a, 22b, respectively upper and lower, arranged in succession but physically disconnected from each other.

[0046] At a lower end of lower portion 22b, the control rod 22 has an idle roller 24.

[0047] As will be described in more detail below, the cam-shaped portion 5b of the first lever 5 and the idle roller 24 are designed to engage with each other to define a cam-follower coupling wherein, precisely, the roller 24 defines a follower element.

[0048] As illustrated in Figures 2 to 5, the tie rod 12 supports a contrast peg 25 of the damper cylinder 17.

[0049] The damper cylinder 17 engages the contrast peg 25 when it is engaged above in compression by the rocker lever 21.

[0050] The above-mentioned rocker lever 21, drive rod 22 and contrast peg 25 define, for the hinge 4, respective means 30 for actuating the damper cylinder 17.

[0051] The operation of one of the two hinges 4 is described briefly below.

[0052] Starting from the position for complete opening of the door 3, for which the corresponding configuration of the hinge 4 is illustrated in Figure 2, a rotation of this towards the closed position is favoured by the action of the helical spring 8 and is initially obstructed by the weight of the door 3. Figure 3 shows the hinge 4 in a first intermediate position of the door 3, at which the cam-shaped portion 5b of the first lever 5 comes into contact with the roller 15b of the rod 15 for compressing the second helical spring 14.

[0053] In the configuration just described, the idle roller 24 located at the lower end of the control rod 22 is still disengaged from the cam-shaped portion 5b.

[0054] Considering the configuration of the hinge 4 illustrated in Figure 4, this relates to when the door 3 reaches an intermediate closing position, in which contact is made between the idle roller 24 and the cam-shaped portion 5b of the first lever 5.

[0055] As the closing of the door 3 continues from the configuration of the hinge 4 illustrated in Figure 4 to the

fully closed configuration illustrated in Figure 5, following the raised profile of the cam portion 5b, the idle roller 24 transmits a corresponding translational movement, in the direction X.

[0056] In detail, the idle roller 24 is lifted, along the direction X, towards the upper part of the box-shaped element 6 (that is, towards the first spring 8) and in this movement pushes the lower portion 22b of the drive rod 22; the lower portion 22b in turn pushes the upper portion 22a which, having entered into contact with the arm 21 b of the rocker lever 21, causes an anticlockwise rotation in the latter (with reference to the representation of Figures 4 and 5) around the respective pivot axis Y.

[0057] The anticlockwise rotation of the rocker lever 21 described above causes a corresponding pushing action of the cylindrical body 19 of the damper cylinder 17 by the arm 21 a of the lever 21.

[0058] The pushing of the cylindrical body 19, as the piston 18 is engaged with the contrast peg 25, determines the compression of the damper cylinder 17.

[0059] With the above-mentioned compression, due to the relative movement between the cylindrical body 19 and the piston 18, the gas or fluid damper cylinder 17 applies its action for damping the reciprocal motion between the first lever 5 and the box-shaped shape 6.

[0060] The damping action is different to the closing action performed by the springs 8, 14 and makes the movement of the door 3 towards the completely closed position both gradual and slowed down.

[0061] It is evident that even in the absence of a braking action by the user, the door 3, pushed by the springs 8, 14 towards the frame 2 of the oven 1, reaches this in a smooth and silent manner thanks to the end of stroke damping performed by the damper cylinder 17.

[0062] Advantageously, the fact of dividing the drive rod 22 into two separate pieces 22a, 22b allows one of these portions to be integrated inside the containing body 20 which houses the damper cylinder 17 and also the rocker lever 21.

[0063] This configuration allows a unit to be provided which is easily assembled inside the box-shaped element 6.

[0064] In that way, the hinge 4 may or may not be provided with a damper element.

[0065] Advantageously, with reference to the accompanying drawings, the upper portion 22a of the control rod 22 has a slot 26 designed to engage in a sliding fashion with a respective pin 27.

[0066] The slot 26 and the pin 27 allow the portion 22a to remain stably connected to the containing body 20 also if it is removed from the box-shaped element 6.

[0067] The hinge 4 according to this invention has major advantages.

[0068] A first advantage, connected to the adoption of the drive rod 22 and of the rocker lever 21 is relative to the fact that, according to the length of the two arms 21 a, 21 b, it is easy to determine the operating interval of the damper member 17 to enable it to act in a specific

predetermined stretch of the closing of the door 3.

[0069] A further advantage is due to the possibility of using, again thanks to the possibility of varying the length of the two arms 21 a, 21 b, damper cylinders 17 of the commercial type and having strokes which are also longer than 10 mm.

[0070] The above-mentioned variation in the length of the two arms 21 a, 21b of the rocker lever 21 is easily achieved due to the fact that the lever 21 acts directly on the damper element 17 and, in any case, is located close to it. In effect, the fact that the lever 21 acts directly on the damper cylinder 17 greatly simplifies the adapting of the hinge to different needs, requiring solely the replacement of the lever 21 with another lever 21 having respective arms 21a, 21b of the same length.

[0071] Furthermore, the fact that the pivot axis Y is fixed relative to the box-shaped element 6 also simplifies the dismantling/reassembling of the lever 21, that is to say, without affecting other components the hinge.

[0072] In effect, with the prior art type hinges the use of dampers cylinders having strokes longer than 10 mm is made difficult by the fact that the stroke of the first spring is normally in the order of a few millimetres and does not therefore allow the use of this damping action especially for only a part of its stroke.

[0073] According to a variant embodiment, not illustrated, of the hinge according to the invention, the above-mentioned means 30 for driving the gas or fluid cylinder 17 comprise a pushing element which acts in conjunction with the rocker lever 21 to compress the cylinder 17 bilaterally.

[0074] In other words, according to this variant embodiment, the cylinder 17 is compressed on both sides, above by the rocker lever 21 and below by a respective pushing element.

[0075] Advantageously, in line with the structural characteristics of the hinge 4 illustrated in the accompanying drawings, the pushing element is defined by the rod 15 for supporting the second helical spring 14, the rod 15, when close to reaching the closing position of the door 3, pushing the piston 18 of the damper cylinder 17.

Claims

1. A hinge for doors of electrical household appliances, comprising:

- a box-shaped element (6) and
- a first lever (5) pivoted on the box-shaped element (6) by means of a pivot (7); one of either the box-shaped element (6) or the first lever (5) being fixable to a frame (2) and the other of either the box-shaped element (6) or the first lever (5) being fixable to a door (3), to make the door (3) tiltably movable relative to the frame (2) between a closed position and an open position;
- elastic means (8, 14) supported by the box-

- shaped element (6) and adapted to apply an elastic action to the first lever (5),
 - a damping member (17) for applying a damping action during the reciprocal motion of the first lever (5) and the box-shaped element (6) in the proximity of the closed position,
 - means (30) for actuating the damping member (17); the hinge (4) being **characterized in that** the actuating means (30) comprise a rocker lever (21) oscillating about an axis (Y) fixed relative to the box-shaped element (6) and a drive rod (22) for driving the rocker lever (21), the rocker lever (21) having a first arm (21 a) adapted to engage the damping member (17) and a second arm (21b) adapted to engage the drive rod (22), the drive rod (22) being slidable along the box-shaped element (6).
2. The hinge according to claim 1, **characterized in that** the first lever (5) has a cam-like portion (5b) adapted to engage a first longitudinal end of the drive rod (22) to form a cam and follower coupling.
3. The hinge according to claim 2, **characterized in that** the drive rod (22) has a roller (24) located in the proximity of its first longitudinal end, the roller (24) constituting a follower element of the cam and follower coupling.
4. The hinge according to any one of claims 1 to 3, **characterized in that** the drive rod (22) is made up of two or more distinct portions (22a, 22b) located in succession.
5. The hinge according to any one of claims 1 to 4, where the damping member (17) comprises a gas or fluid cylinder, **characterized in that** it comprises a containment body (20) for holding the damping member (17), the containment body (20) being housed inside the box-shaped element (6).
6. The hinge according to claim 5, **characterized in that** the containment body (20) for holding the damping member (17) pivotally mounts the rocker lever (21) and has a runner (23) in which the drive rod (22) slides.
7. The hinge according to claim 5 or 6, **characterized in that** the means (30) for actuating the gas or fluid cylinder (17) comprise an opposing element (25), the cylinder (17) being adapted to abuttingly engage the opposing element (25) when compressively engaged by the rocker lever (21).
8. The hinge according to claim 7, where the elastic means (8, 14) comprise a first helical spring (8) adapted to oppose the weight force of the door (3) being opened and comprising a tie rod (12) adapted to connect the first lever (5) to the first spring (8), **characterized in that** the opposing element (25) is fixed to the tie rod (12).
9. The hinge according to claim 5 or 6, **characterized in that** the means (30) for actuating the gas or fluid cylinder (17) comprise a pushing element acting in conjunction with the rocker lever (21) to compress the cylinder (17) bilaterally.
10. The hinge according to claim 9, wherein the elastic means (8, 14) comprise a first helical spring (8) adapted to oppose the weight force of the door (3) being opened and a second helical spring (14) adapted to generate a closing force in the proximity of a closed position of the door (3), the second helical spring (14) being supported by a respective supporting rod (15), **characterized in that** the supporting rod (15) at least partly defines the pushing element.

FIG.1

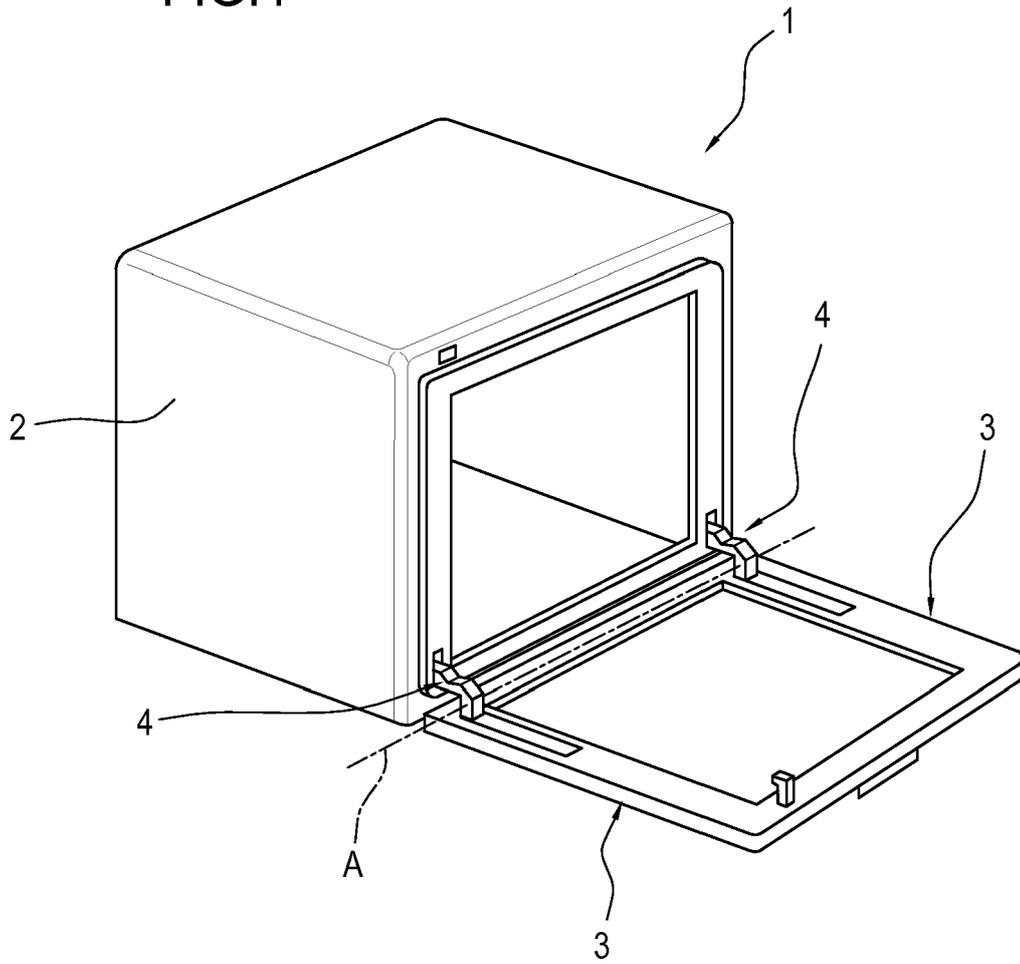


FIG. 2

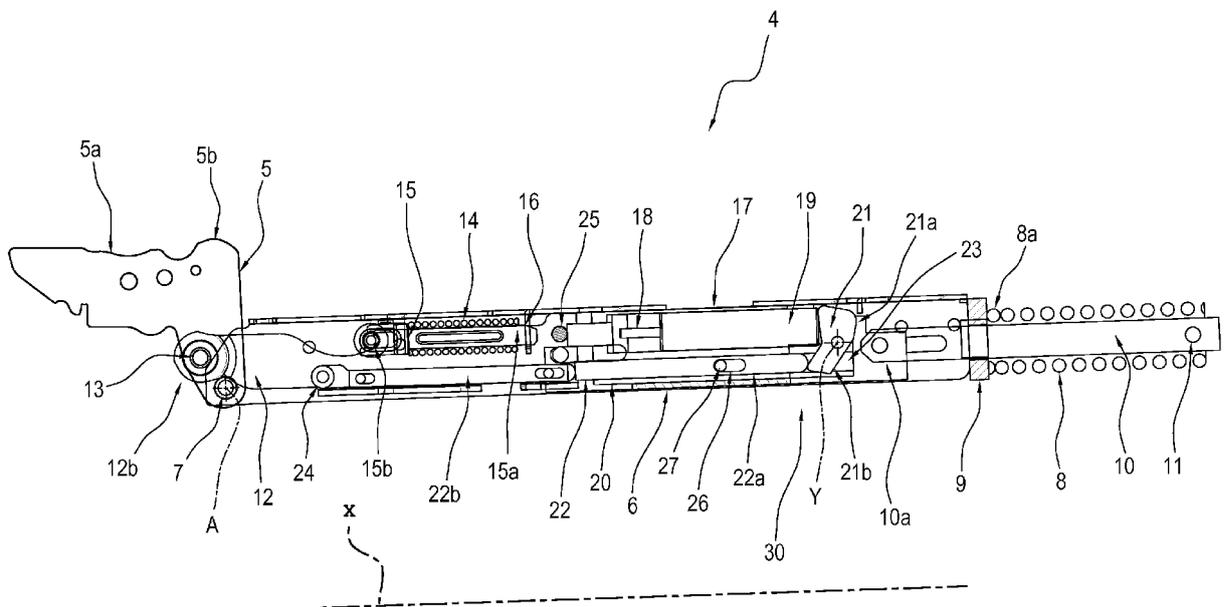


FIG. 3

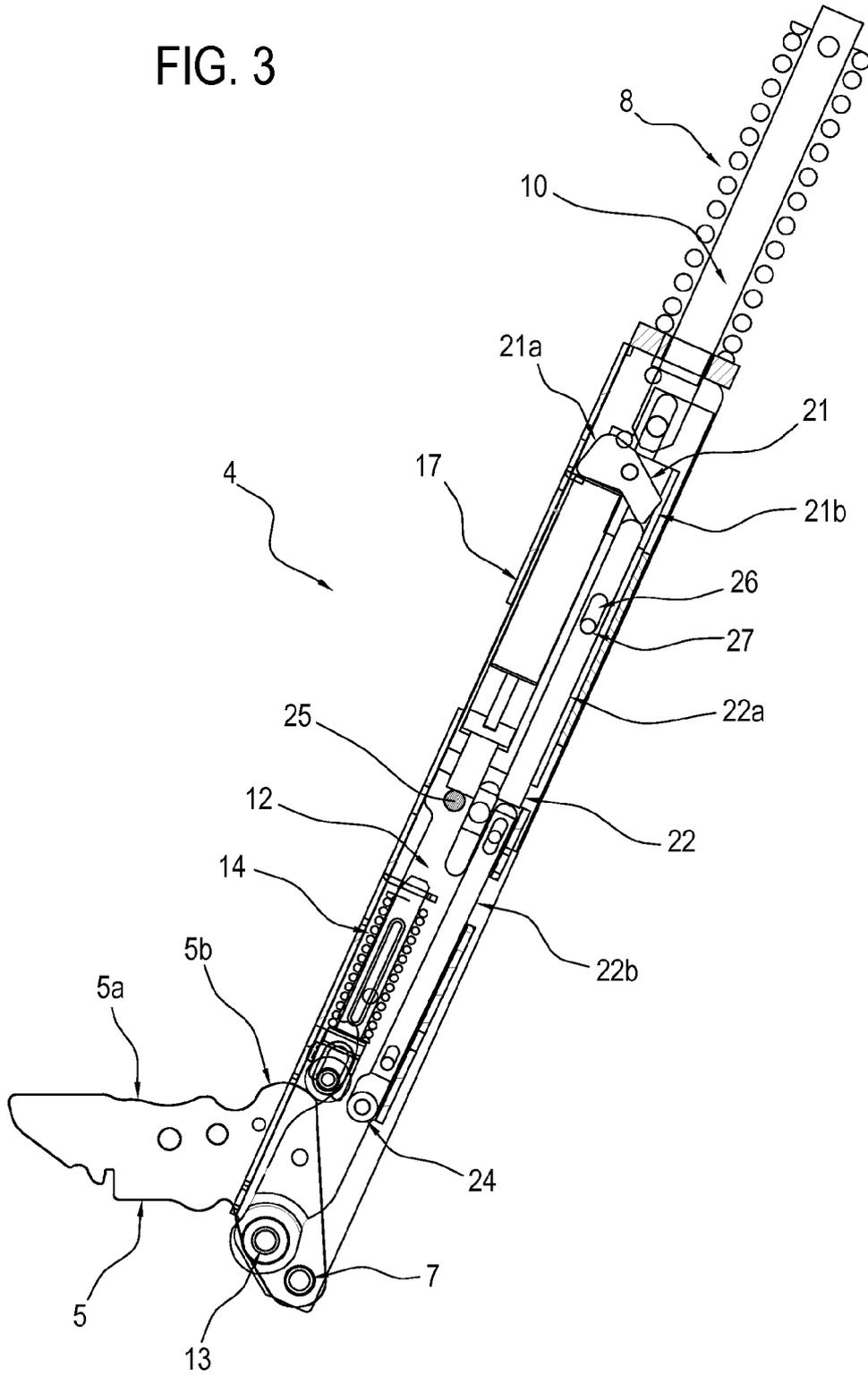


FIG. 4

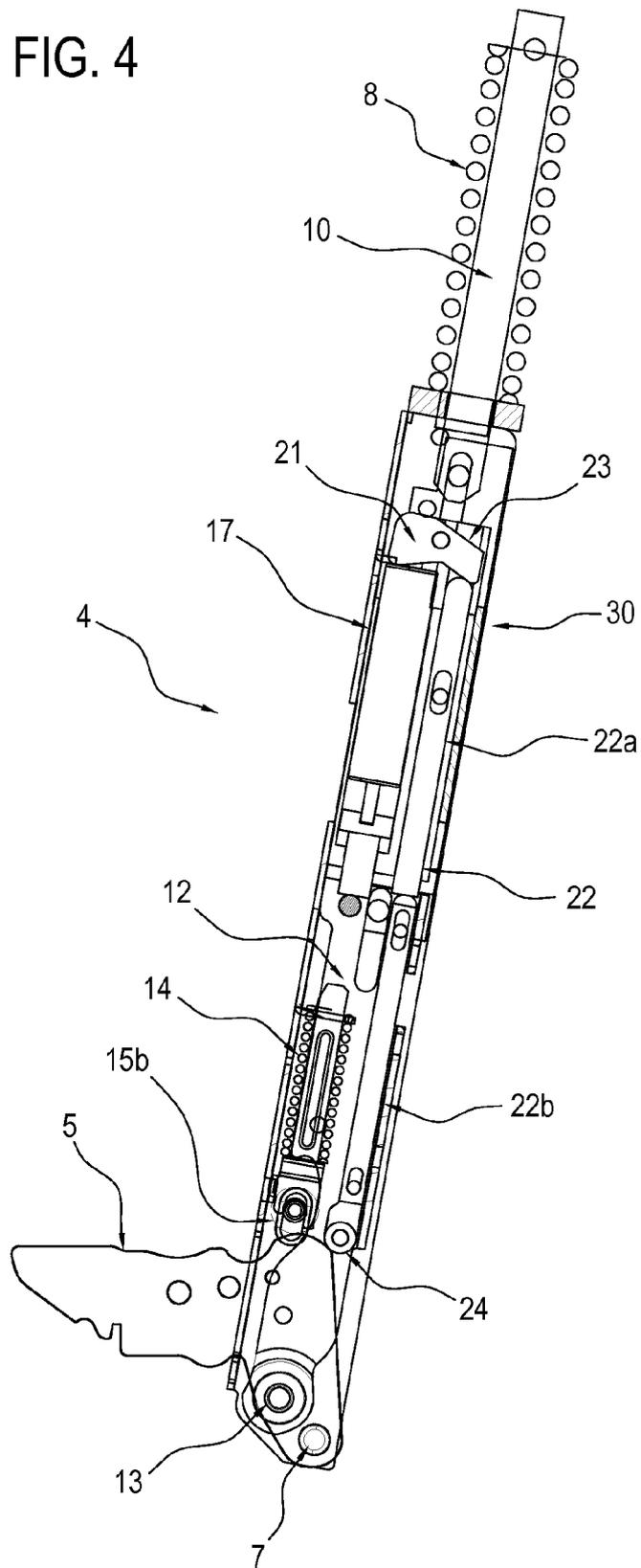
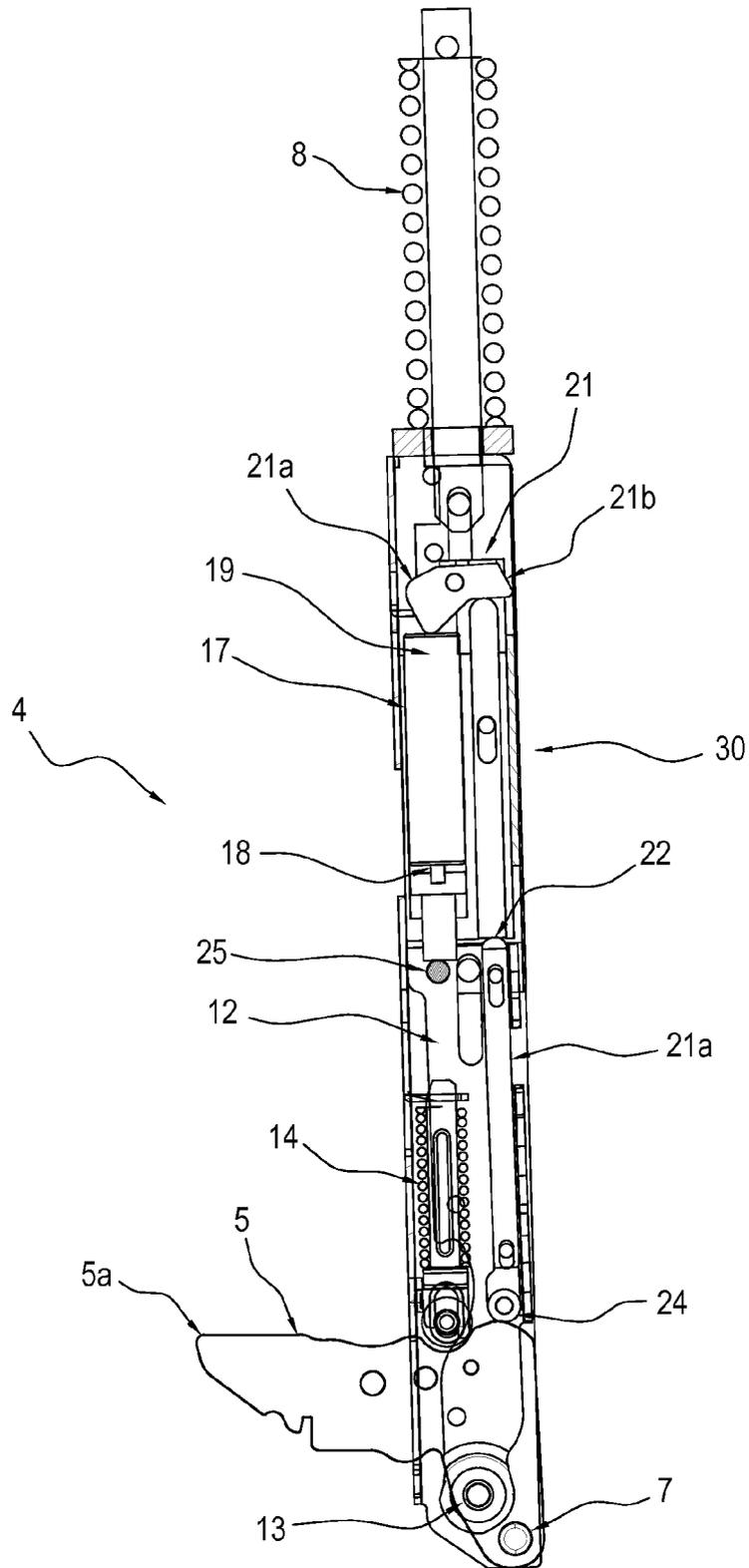


FIG. 5





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