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(71) Applicant: **Nuova Star S.p.A.**
40069 Zola Predosa (BO) (IT)

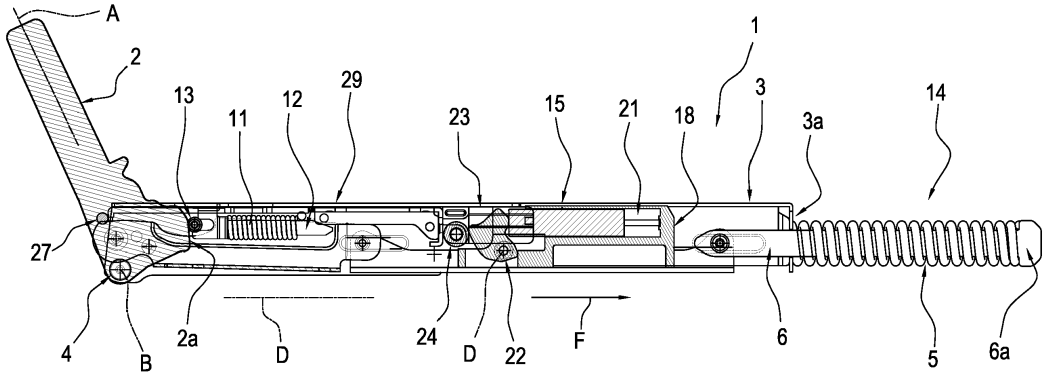
(72) Inventor: **VANINI, Marco**
40134 BOLOGNA (IT)

(74) Representative: **Firmati, Leonardo**
Bugnion S.p.A.
Via di Corticella, 87
40128 Bologna (IT)

(54) **HINGE FOR DOORS OF ELECTRICAL HOUSEHOLD APPLIANCES**

(57) Described is a hinge for doors of electrical household appliances, comprising a box-shaped element (3) and a first lever (2) pivoted on the box-shaped element (3) by means of a first pin (4); one of either the box-shaped element (3) or the first lever (2) 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 (14) supported by the box-shaped element (3) and designed to apply an elastic action on the first lever (2), a damping member (15) for applying a damping action during the reciprocal motion of the first lever (2) and the box-shaped element (3), in proximity of reaching the above-mentioned closed position, means (29) for actuating the damping member (15).

FIG. 2



EP 3 073 038 A1

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 example and without restricting the scope of the inventive concept.

[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] When the oven door is tilted away from the closed position, the elastic elements oppose, firstly, the movement which detaches the door from the oven mounting frame and, secondly, the subsequent rotational movement of the door and its consequent lowering to the position in which the access opening of the oven is fully open. During the second part of its opening movement, the door, under the combined action of its weight, which tends to pull it downwards, and of the elastic elements, which oppose this downward pulling action, is thus made to turn gradually.

[0009] When the oven door is tilted up from the fully open limit position, the action of the elastic elements is first balanced by the weight of the door, thus initially ensuring that it turns gradually towards the closed position. After that, however, if the user is not careful to slow the door down, the force of the elastic elements tends to push it forcefully towards the oven frame, causing it to slam shut, often rather suddenly and noisily.

[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, that is, 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] Moreover, reasons of an economic nature suggest the use of standard dampers available on the market whose stroke does not necessarily match the requirements of each hinge or, even worse, each door on which the hinge can be mounted.

[0018] Depending on the specific door, that is to say, depending on the weight and the type of opening that it must actuate, the hinge might in fact require damping members with strokes which are even quite different to each other.

[0019] This circumstance has the direct drawback of requiring specific damping means, with respective different strokes for different applications of the hinge, thereby increasing the related production costs.

[0020] 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.

[0021] The technical characteristics of the invention according to the aforementioned aim may be easily inferred from the contents of the appended claims, especially claim 1, and preferably any of the claims that depend, either directly or indirectly, on claim 1.

[0022] The advantages of this invention are more apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a non-limiting example embodiment of the invention, and in which:

- Figures 1 to 3 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 three different use configurations;
- Figure 4 is a schematic perspective view from above, with some parts cut away, of the hinge of Figure 3;
- Figure 5 is a schematic perspective view from above of a detail of the hinge of the previous drawings;

- Figure 6 is a schematic perspective view from above of the detail of Figure 5 in an exploded configuration;
- Figure 7 is a schematic front elevation view, with some parts transparent, of the detail of Figure 5 in an exploded configuration.

[0023] With reference to Figure 1, the numeral 1 denotes in its entirety a hinge for doors or wings made according to this invention.

[0024] The hinge 1 comprises a first lever 2, which can be fixed for example to the frame of an oven, not illustrated, at a respective side of the inlet opening of the latter, and a box-shaped element 3, fixed to a respective edge of a door, also not illustrated, for closing the oven.

[0025] The first lever 2 has a longitudinal axis A of extension.

[0026] The box-shaped element 3 has an elongate shape and extends lengthways along a predetermined axis D.

[0027] The first lever 2 and the box-shaped element 3 are kinematically connected to each other, with the first lever 2 pivoted on the box-shaped element 3 by means of a first pin 4 to make the above-mentioned and not illustrated door tiltably movable relative to the frame, between a closed position and an open position.

[0028] The first pin 4 has a central axis B which defines an axis of rotation of the hinge 1.

[0029] Figure 3 illustrates in particular the configuration of the hinge 1 corresponding to the closed position of the door.

[0030] The central longitudinal axis A of the first lever 2 and the direction of extension D of the box-shaped element 3 lie on a plane at right angles to the central axis B of the first pivot 4 which, as mentioned, defines the axis of rotation of the door relative to the frame, and which are at right angles to each other in the above-mentioned closed position (Figure 3) and substantially aligned in the open position illustrated in Figure 1.

[0031] As illustrated in Figures 1 to 4, the hinge 1 comprises a first helical spring 5 housed outside the box-shaped element 3, the first spring 5 abutting, with a relative lower end turn 5a, with a transversal end wall 3a of the box-shaped element 3.

[0032] The first spring 5 is kept in abutment against the above-mentioned transversal wall 3a by the head 6a of a compression rod 6 which is positioned coaxially inside the first spring 5 and which defines a guide for it.

[0033] The compression rod 6 protrudes below from the first spring 5 with an end 6b, which passes through an opening made in the transversal wall 3a to couple, by means of a second pin 7, to a first tie rod 8.

[0034] The first tie rod 8 consists of a rod extending longitudinally along the above-mentioned predetermined direction of extension D and has a U-shaped transversal cross-section.

[0035] The first tie rod 8 is connected to a second tie rod 9, substantially aligned with it according to predetermined direction D, a lower end 9a of it being hinged to the first lever 2 using a third pin 10 located in the proximity of the above-mentioned first pin 4.

[0036] The position of the third pin 10, at which the elastic reaction force of the first spring 5 is applied, relative to the first pin 4, and the pre-compression of the first spring 5, guarantee an elastic action which tends to push the door 3 into its closed position which corresponds, for the hinge 1, the configuration illustrated in Figure 3.

[0037] Added to the above-mentioned elastic action of the spring 5, only in the proximity of the closed position, towards and away from the closed position, is the action of a second, pre-compressed helical spring 11, designed to act in conjunction in known manner with a cam-shaped portion 2a of the first lever 2 through a rod 12 which operates on a tappet roller 13, to impart a spring action closing movement to the door.

[0038] The second spring 11 is dimensionally the smaller than the first spring 5, since, whilst the function of the first spring 5 is mainly that of balancing the weight of the door, the function of the second spring 11 is, as mentioned, to impart a closing to the door.

[0039] The two first and second springs 5, 11, the respective rods 6 and 12, the tappet roller 13, the first and second tie rods 8, 9 define, in their entirety, elastic means 14, supported by the box-shaped element 3 and designed to exert an elastic action on the first lever 2.

[0040] The position of the third pin 10 and the pre-compression of the first spring 5 ensure an elastic action which continuously tends to push and keep the door into its closed position.

[0041] The hinge 1 comprises a hydraulic damping member 15 for applying a damping action during the reciprocal motion between the first lever 2 and the box-shaped element 3, in the proximity of reaching their above-mentioned mutual closed position.

[0042] The term hydraulic damping member is used to mean, in this description, any gas or fluid damping member, of substantially known type, wherein the gas or fluid slides from one chamber to another following the mutual movement of its two parts.

[0043] More specifically, with reference to the accompanying drawings, the hydraulic damping member 15 comprises a rod 16 and a sleeve 17.

[0044] The hinge 1 comprises a cartridge 18 for containing the hydraulic damping member 15.

[0045] The cartridge 18 is removable, meaning that it is inserted already assembled inside the box-shaped element 3 during assembly of the hinge 1 and, vice versa, by removing at least partly the hinge 1, it may be removed entirely, that is to say, without having to disassemble it.

[0046] The cartridge 18 is located inside the box-shaped element 3, positioned in abutment against a pin 19 fixed to the side walls of the box-shaped element 3 and passing through the internal volume of it.

[0047] As clearly illustrated in Figures 5 to 7, the cartridge 18 has a main body 20 containing, in a specific compartment 21, the damping member 15, and supports

a cam-shaped lever 22, acting on the damping member 15 and pivoted on the main body 20.

[0048] The cartridge 18 also comprises a cowl 23, mounted slidably movable on the main body 20, the cowl 23 being designed to engage with the cam-shaped lever 22 for defining with it a cam-follower coupling.

[0049] The cowl 23 has two lateral tabs 23a facing, in use, respective lateral portions 20b of the main body 20.

[0050] The above-mentioned flaps 23a and portions 20b are shaped to match each other to define respective longitudinal sliding guides for the cowl 23 on the main body 20.

[0051] More specifically, as illustrated in detail in Figures 5 to 7, the cowl 23 rotatably supports an idle roller 24 designed to define a follower element in the above-mentioned cam-follower coupling.

[0052] With reference to Figure 4, the hinge 1 also comprises, housed inside the box-shaped element 3, a command slide 25 extending longitudinally along the above-mentioned predetermined direction D.

[0053] The slide 25 is designed to engage with the first lever 2 and with the cowl 23 so as to slide longitudinally and command the movement of the latter along the direction D.

[0054] In more detail, as illustrated in Figure 4, the slide 25 has, at a first longitudinal end 25a facing the cartridge 18, a wall 26 positioned transversely to its direction of extension D, the wall 26 being designed to engage by pushing against the cowl 23.

[0055] The slide 25, at its second longitudinal end 25b opposite its first end 25a, has a fork shape, which is designed to come into contact with corresponding pushing protrusions 27 emerging on both sides from the first lever 2.

[0056] As illustrated in the accompanying drawings, because of how it is positioned inside the respective compartment 21 of the cartridge 18, the damping member 15 has a fixed part, formed by the rod 16, and a mobile part, defined by the sleeve 17.

[0057] With reference to Figures 2 and 3, under the action of the slide 25, the cowl 23 and the mobile part 17 of the damping member 15 move parallel to each other according to the above-mentioned predetermined direction of extension D.

[0058] As clearly shown in the accompanying drawings, the cam-shaped lever 22 is interposed between the cowl 23 and the mobile part 17 of the damping member 15 and has a profile such as to determine, in the passage between the above-mentioned closed and open positions of the hinge 1, for the cowl 23 and the mobile part 17 of the damping member 15, respective strokes C23, C17 of different lengths along the direction of extension D.

[0059] In other words, the stroke C23 of the cowl 23, caused by an equivalent pushing movement by the slide 25, determines a stroke C17 with a different length for the mobile part 17 of the damping member.

[0060] The difference in the respective strokes C23, C17 of the cowl 23 and the mobile part 17 is due to the interposing of the cam-shaped lever 22 which, with its relative profile, allows, in the specific case illustrated, the damping action of the damping member 15 to be used for an angular stretch of the movement of the hinge which is less than that which there would be with a direct contact of the slide 25 on the damping member 15. Advantageously, in this way, by varying the profile of the cam-shaped lever 22 it is possible to adapt a same damping member 15 to different needs, in terms of extent of the angular stretch of the damping action of the damping member 15 or also in terms of precise positioning of this angular stretch during the opening/closing movement of the hinge 1.

[0061] In effect, with reference to this second opportunity, by definition of the profile of the cam-shaped lever 22 it is possible to bring forward or delay the moment at which the above-mentioned damping action of the damping member 15 starts, for example during the closing of the door, not illustrated, of an electrical household appliance.

[0062] Moreover, since the cartridge 18 is removable and therefore extractable from the box-shaped element 3, cartridges are advantageously provided with cam-shaped levers 22 equipped with different profiles in such a way as to allow, during assembly of the hinge 1, selection of the cartridge (between the many available) which is most suitable for the specific use of the hinge 1.

[0063] In short, the concept of removability with reference to the cartridge 18, must be considered in the sense that the cartridge 18 is a separate element, which may be inserted or removed from the box-shaped element 3 of the hinge 1 without having to make particular modifications to it, other than the insertion/removal of the pin 19.

[0064] As illustrated in Figures 4 and 5, the main body 20 of the cartridge 18 has a bottom portion 20a with which the above-mentioned first tie rod 8 is designed to slidably engage.

[0065] In other words, the above-mentioned lower portion 20a of the main body 20 of the cartridge 18 defines a guide rail for the first tie rod 8 in its movement along the predetermined direction D.

[0066] The above-mentioned first tie rod 8 and second tie rod 9 define for the hinge 1, means 28 for connecting the first lever 2 to the above-mentioned elastic means 14.

[0067] The above-mentioned pushing protrusions 27, command slide 25, cowl 23 and cam-shaped lever 22 define, in their entirety, for the hinge 1, means 29 for actuating the damping member 15.

[0068] The operation of the hinge 1 is briefly described below.

[0069] Starting from the position for complete opening of the door, for which the corresponding configuration of the hinge 1 is illustrated in Figure 1, a rotation of this towards the closed position is favoured by the action of the first helical spring 5 whilst it is initially obstructed by the weight of the door. Figure 2 shows the hinge 4 in a first intermediate position of the door, not illustrated, at

which the cam-shaped portion 2a of the first lever 2 comes into contact with the roller 13 of the rod 12 for compressing the second helical spring 11.

[0070] Continuing the closing of the door from the configuration of the hinge 1 illustrated in Figure 2 to the totally closed configuration illustrated in Figure 3, when the door reaches an intermediate closing position, in which contact is established between the above-mentioned second fork-shaped end 25b of the slide 25 and the protrusions 27 of the first lever 2, the slide 25, with the relative first end 25a, starts pushing on the cowl 23, as indicated by the arrow F.

[0071] The idle roller 24 supported by the cowl 23 pushes the cam-shaped lever 22 which, rotating about its own pivot axis C, exerts a pushing action against the mobile part 17 of the damping member 15.

[0072] The damping member 15, following the compression of the sleeve 17, defining the mobile part, against the rod 16, defining the fixed part, exerts a damping action different to the closing action exerted by the elastic means 14, and thus makes the movement of the door, not illustrated, gradual and braked, towards the completely closed position at which the respective hinges 1 adopt the configuration illustrated in Figure 3.

[0073] It is thus evident that, even in the absence of a braking action applied by the user, the above-mentioned and not illustrated door, pushed by the elastic means 14 towards the frame of the oven, reaches the closed position gently and silently thanks to the limit position damping operated by the damping members 15.

[0074] The invention brings the advantages described and achieves the preset aims.

[0075] The adoption of the cartridge 18 for containing the damping member 15 and the respective cam-shaped lever 22 provides a compact element, which is easy to apply during the assembly and, if necessary, which can also be replaced.

[0076] Moreover, according to the size of the lever 22 and of its shape (profile), it is possible, for example, to slow down a door in a stretch of variable size and with a damping law which can be defined as desired.

Claims

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

- a box-shaped element (3) having a prevalent development direction (D),
- a first lever (2) pivoted on the box-shaped element (3) by means of a pivot (4); one of either the box-shaped element (3) or the first lever (2) being fixable to a frame and the other of either the box-shaped element (3) or the first lever (2) 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 (14) supported by the box-shaped element (3) and adapted to apply an elastic action to the first lever (2),
- a hydraulic damping member (15) for applying a damping action during the reciprocal motion of the first lever (2) and the box-shaped element (3) in proximity of the closed position,
- -actuating means (29) of the damping member (15) configured for provoking in it the damping action; the hinge being **characterised in that** it comprises a removable containing cartridge (18) of the hydraulic damping member (15), the cartridge (18) being housed in the box-shaped element (3), and **in that** the actuating means (29) comprise a cam-shaped lever (22) supported by the cartridge (18) and acting on the damping member (15).

2. The hinge according to claim 1, **characterised in that** the cartridge (18) exhibits a main body (20) containing the damping member (15), on which main body (20) the cam-shaped lever (22) is pivoted, and a mobile cowl (23) slidably mobile on the main body (20), the cowl (23) being able to engage with the cam-shaped lever (22) for defining a cam-follower coupling.

3. The hinge according to claim 2, **characterised in that** it comprises an idle roller (24) supported by the cowl (23) and able to define a follower element in the cam-follower coupling, the lever (22) being cam-shaped.

4. The hinge according to claim 2 or 3, **characterised in that** the actuating means (29) comprise a command slide (25) developing longitudinally according to the direction (D) and able to engage with the first lever (2) and with the cowl (23) so as to slide longitudinally and command the movement thereof.

5. The hinge according to claim 4, wherein the damping member (15) exhibits a fixed part (16) and a mobile part (17), **characterised in that** the cowl (23) and the mobile part (17) of the damping member (15) move parallel in the determined development direction (D).

6. The hinge according to claim 5, wherein the cam-shaped lever (22) is interposed between the cowl (23) and the mobile part (17) of the damping member (15), **characterised in that** the cam-shaped lever (22) has a profile such as to determine, in the passage between the closed position and the open position of the hinge, for the cowl (23) and the mobile part (17) of the damping member (15), respective travels (C23, C17) of different lengths along the development direction (D).

7. The hinge according to claim 6, **characterised in that** the travel (C23) of the cowl is shorter in length than the corresponding travel (C17) of the mobile part (17) of the damping member (15).

8. The hinge according to any one of the preceding claims from 2 to 7, **characterised in that** the cowl (23) has two lateral tabs (23a) facing on respective lateral portions (20b) of the main body (20), respective longitudinal sliding guides being fashioned between the tabs (23a) and the lateral portions (20b).

9. The hinge according to any one of claims from 1 to 8, comprising connecting means (28) of the first lever (2) and the elastic means (14), **characterised in that** the connecting means (28) comprise a rod (8) developing longitudinally in the determined development direction (D) and exhibiting a U-shape transversal conformation for slidably engaging with the main body (20) of the cartridge.

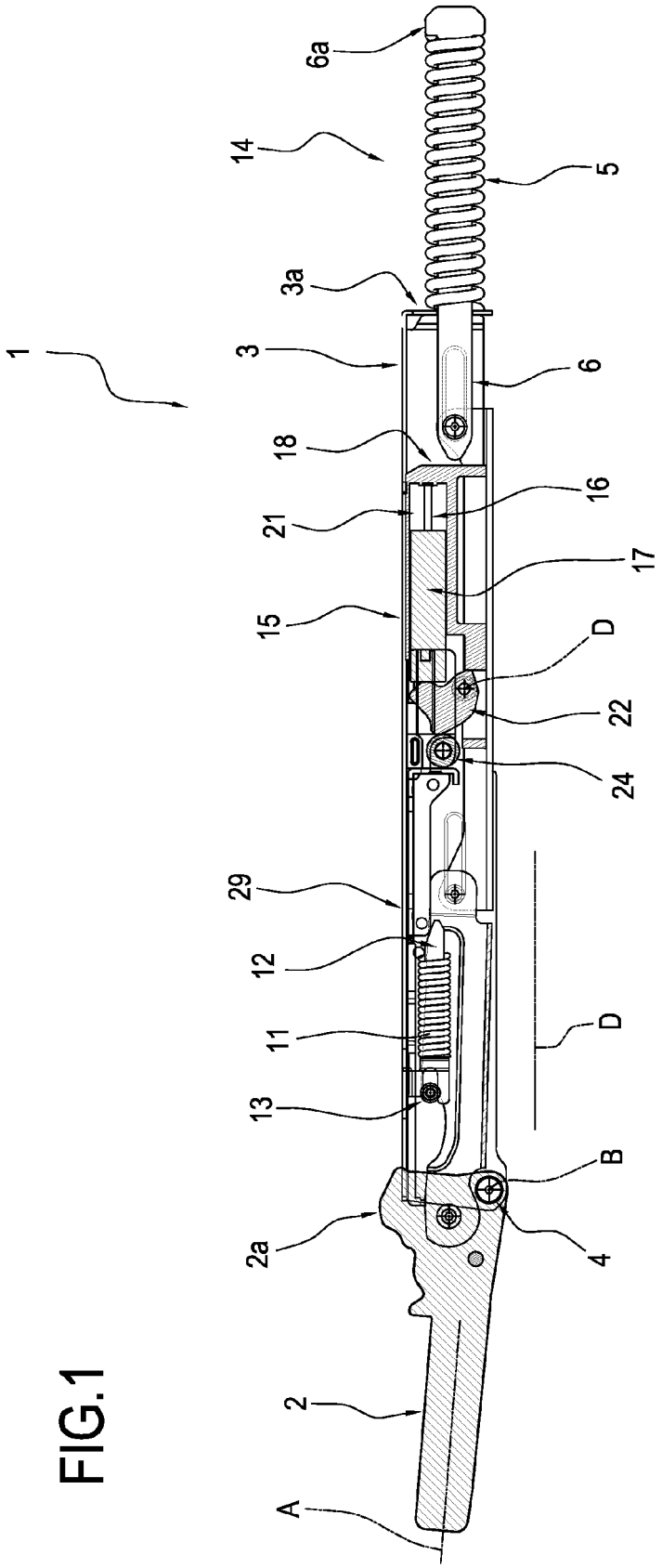
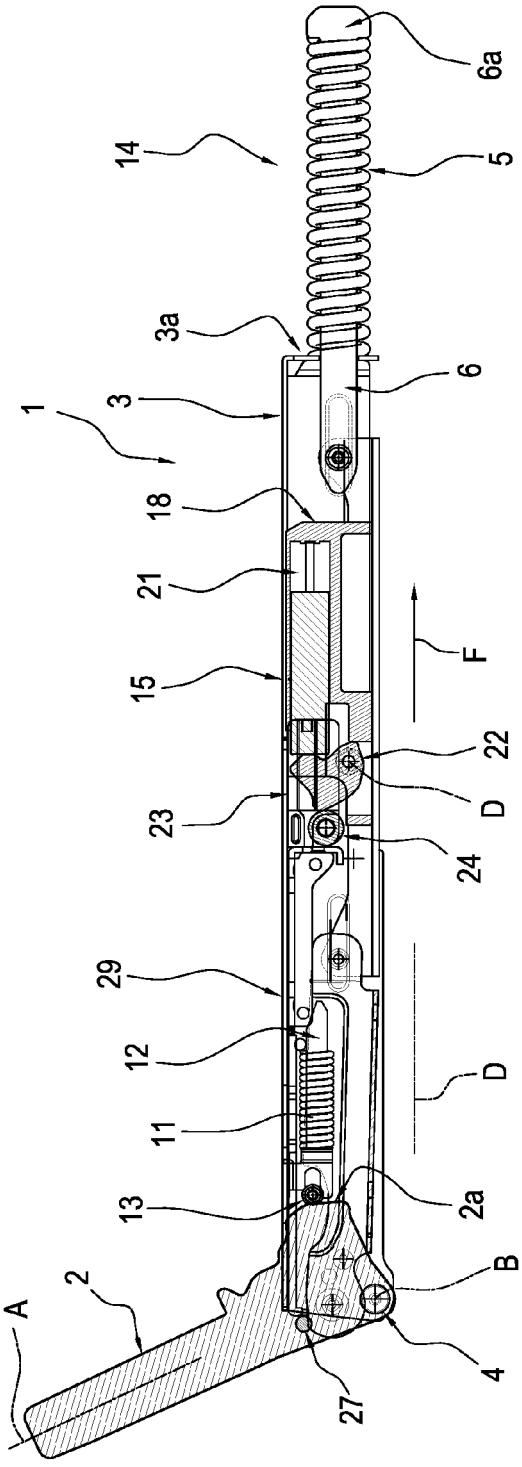


FIG.1


14
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1
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18
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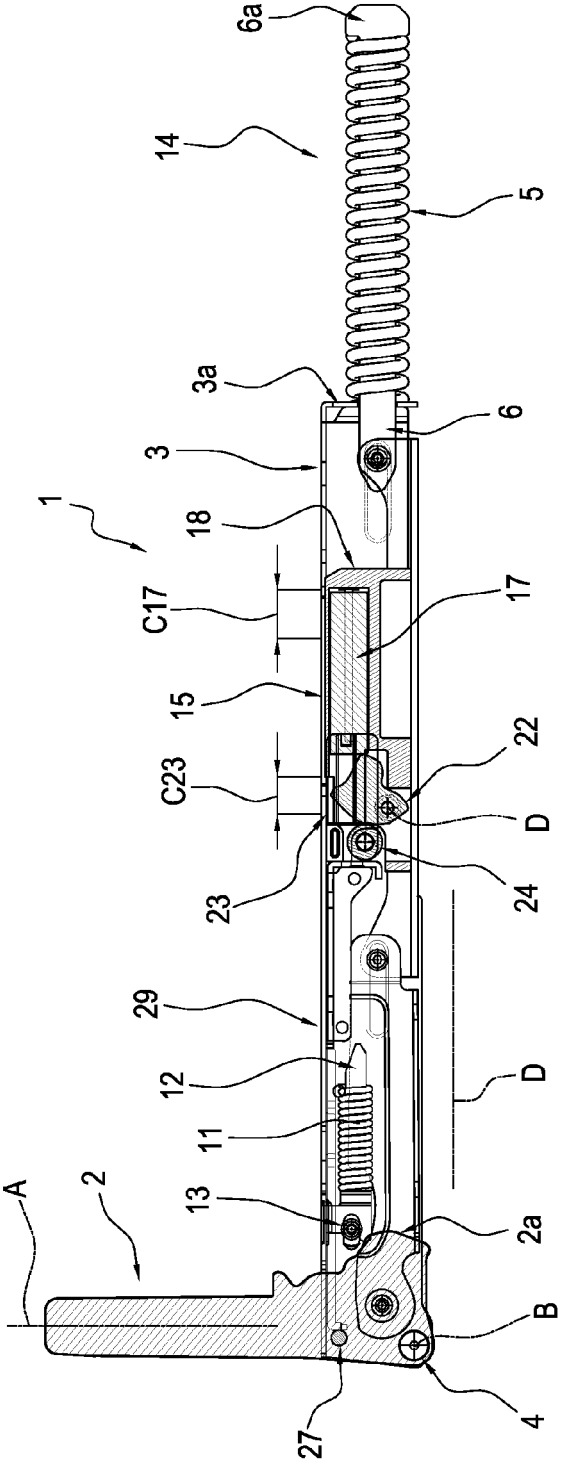
24
29
12
D
11
13
2a
B
2
A
4
27

FIG. 2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6
3
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18
C17
17
15
22
C23
D
23
24
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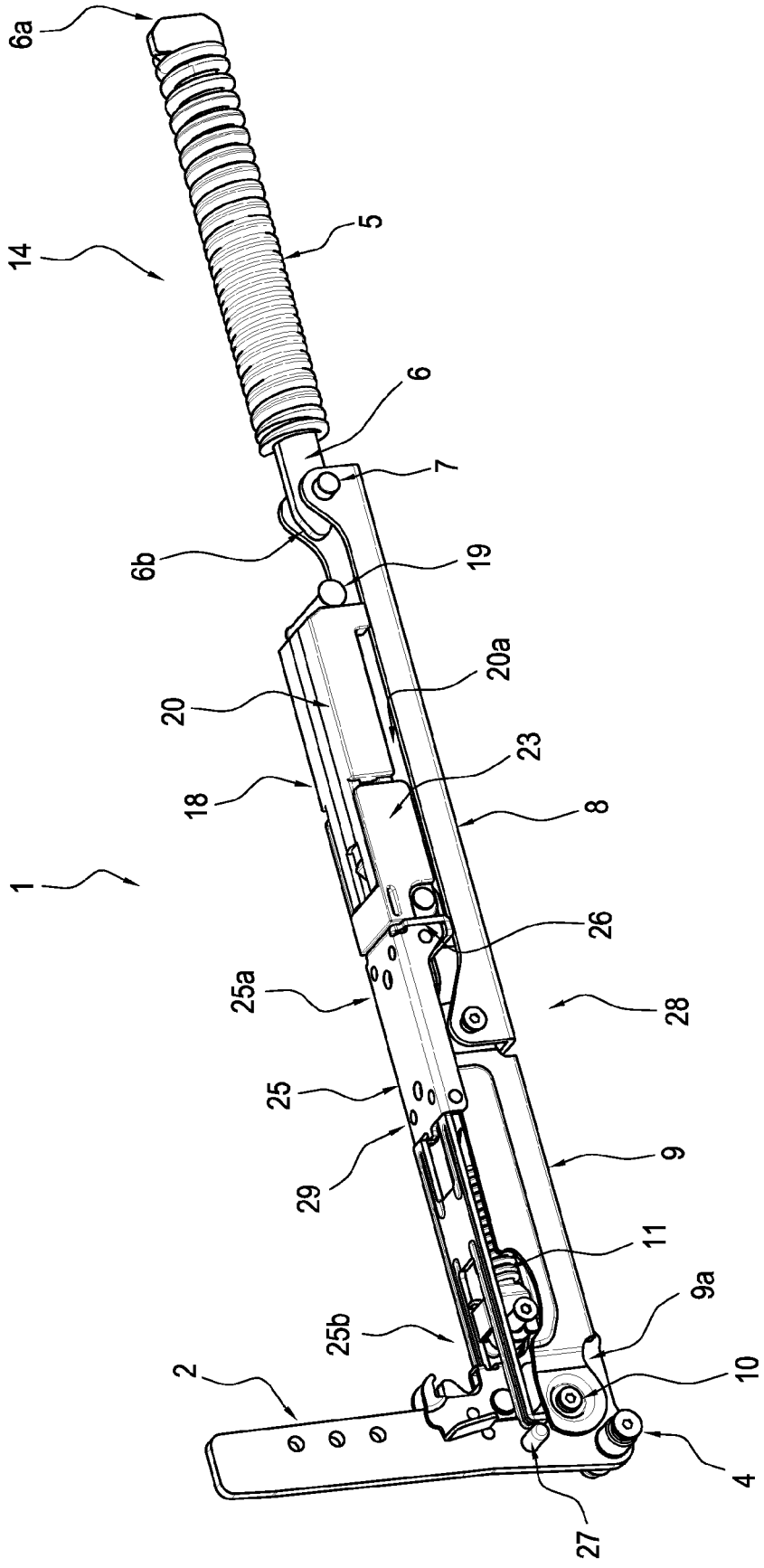
D
12
11
13
2a
A
2
B
27
4

FIG. 3

FIG. 4



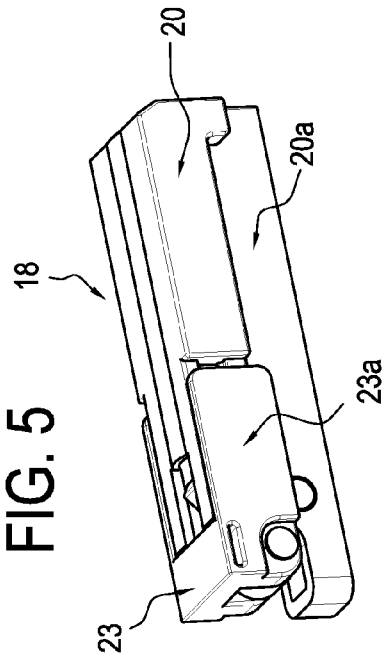


FIG. 5

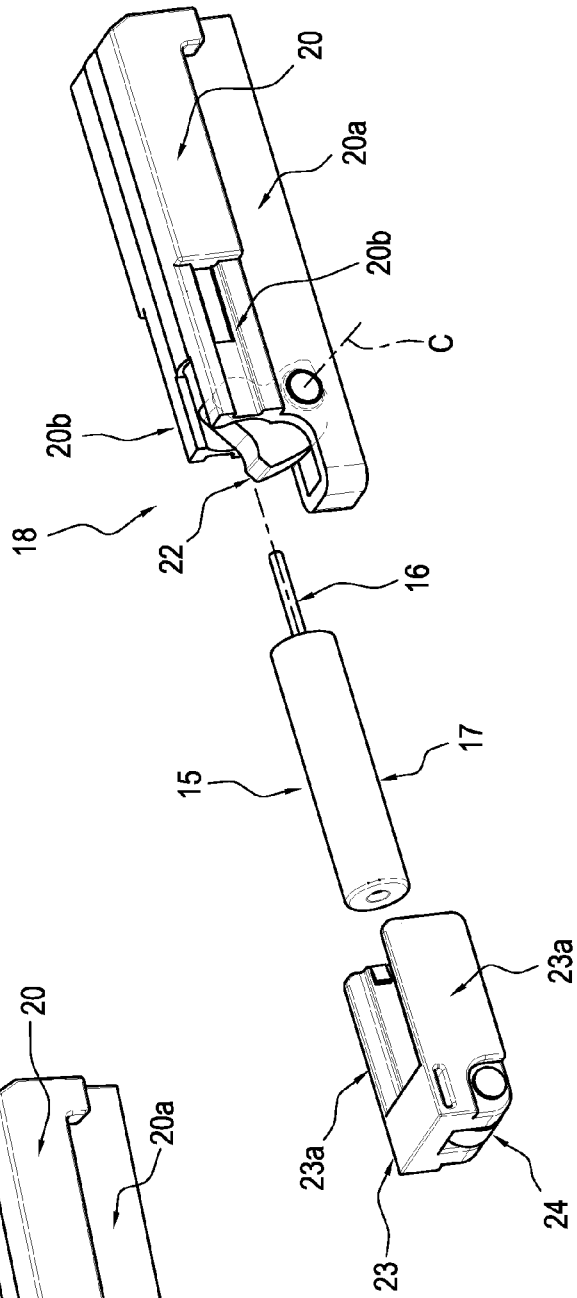


FIG. 6

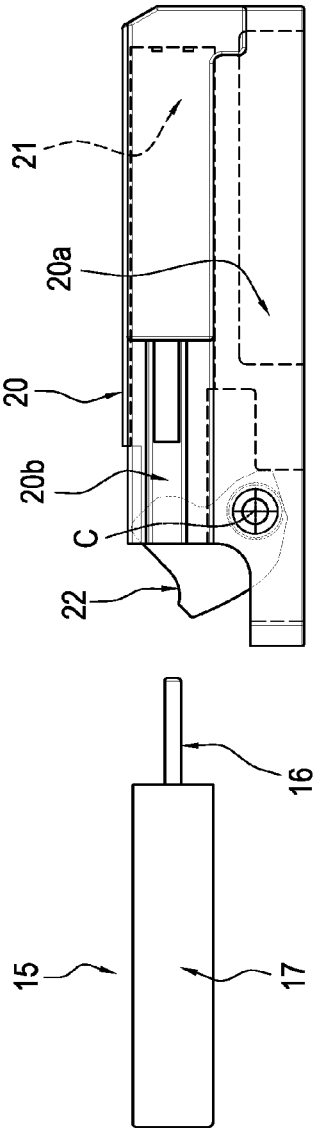
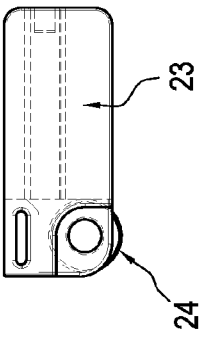


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 16 16 1661

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 10 2011 081917 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 28 February 2013 (2013-02-28) * paragraph [0026] - paragraph [0029] * * figures 1-3 * -----	1-9	INV. E05F1/12 E05F3/20 E05F5/02
A	EP 1 847 670 A2 (NUOVA STAR SPA [IT]) 24 October 2007 (2007-10-24) * paragraph [0011] * * paragraph [0015] * * paragraph [0018] - paragraph [0026] * * figures 1-4 * -----	1-9	

TECHNICAL FIELDS SEARCHED (IPC)

E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 August 2016	Prieto, Daniel

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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