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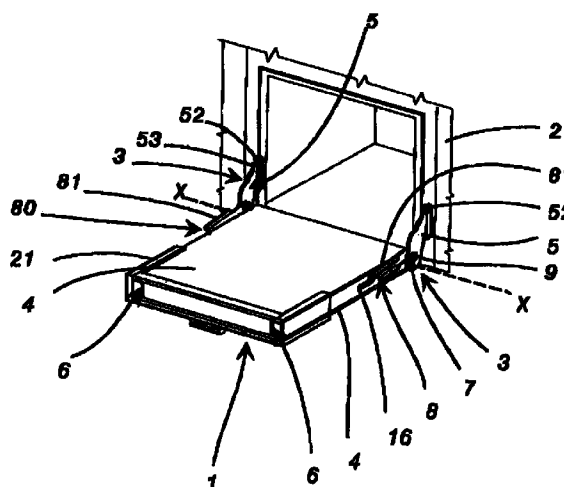
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(54) Hinge for attaching a door to a supporting structure

(57) The invention relates to a hinge (3) for attaching a door (1) to a supporting structure (2) such as, an oven, for example, and in which a lever (5) is attached to the supporting structure (2) and a substantially box-shaped supporting element (6) is joined to the lever (5) along a hinge axis (x) by means of an offset joint whose hinge pin (7) protrudes sideways from the supporting element (6); a link rod (8) is hinged to the lever (5) eccentrically with respect to the hinge axis (x) and has at least one end that moves lengthways relative to the second supporting element (6); the door (1) is formed of two front walls (4) consisting of parallel glass panes with a hollow space between them, one fixed to the front side of the second supporting element (6) and the other fixed to its rear side; the door (1) is capable of assuming three stable positions, namely, closed, half open and fully open.

FIG 2



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Description

The present invention relates to a hinge for attaching a door to a supporting structure.

The invention can be applied in particular and to best advantage, but not exclusively, to the bottom-hinged doors of ovens, dishwashers and similar household appliances to allow a door to be tilted to the open and closed positions, usually about two coaxial, horizontal hinges fitted at opposite ends of the door. In this description, reference will be made to oven doors but without thereby restricting the scope of application of the invention.

Hinges of this kind have been known for some time and usually include a first supporting element, attachable to the structure of the oven, and a second supporting element, substantially box-shaped, attachable to the door. The two elements are joined to each other in such a way that, when used, the element attached to the door is capable of assuming two limit positions relative to the element attached to the oven corresponding to a door closed position and a door open position.

There is also envisaged a link rod which is hinged to one of the supporting elements (the one attached to the oven) eccentrically with respect to the hinge axis between the two elements and at least one end of which moves lengthways with respect to the supporting element attached to the door. The hinge also includes elastic means which operate on the link rod and which are located inside the box-shaped element attached to the door.

In hinges of this kind, the joint between the two supporting elements may be offset so that the second supporting element (the one attached to the door) is situated next to the first supporting element (the one attached to the oven) and is capable of rotating without interfering with the latter to permit the tilting open/close movement of the door: this has the advantage of allowing the door to be made by applying two front walls (usually parallel panes of glass, plexiglas or other transparent material with a hollow space between them) directly on the inner rear side and outer, front side of the second supporting element, or rather, of the two second supporting elements, each connected with one of the two opposite hinges attaching the door to the structure of the oven. In other terms, the second supporting elements constitute a frame for the front wall of the door.

This simplifies the structure of doors, especially those normally used for household ovens whose front wall is made of glass. With hinges where the joint between the two elements is not offset but, for example, forked, it is not possible to apply the glass door panes directly on to one of these elements unless the panes are appropriately machined in order to remove the parts that would otherwise interfere with the hinge. Obviously, this additional operation to make the glass panes into the right shape considerably increases the cost of manufacturing the door.

In known hinges with offset supporting elements,

the link rod between the first and second supporting elements is attached to the outer side of the second element and has one end connected, inside the box-shaped supporting element, to a roller which runs in straight guides made in the supporting element itself. The elastic means comprise a spring with one end fixed to the end of the second supporting element opposite the end at the joint between the two supporting elements and the other end connected to the aforesaid roller, so that, when stretched, the spring pulls the link rod. The spring keeps the second supporting element in one or the other of two stable positions relative to the first supporting element, one in which the door is open and other in which it is closed.

However, in known hinges of the type concerned, that is, hinges with offset joint, the second supporting element cannot assume a third stable position, half way between the limit positions and corresponding to a door half open condition such as, for instance, to allow access to the inside of the oven leaving both hands free but without opening the door completely.

Prior art also includes door hinges for household appliances which, like the ones concerned here and described briefly above, are made in two parts, one fixed, attached to the structure of the oven, and the other moving, attached to the door, but where these two parts are not connected by an offset joint but by a forked or similar type of joint.

When these hinges are used, the front walls of the door, consisting for example, of rectangular glass panes, cannot be applied directly on to the hinges (for the reason mentioned above) but must be fitted to a frame, generally on all four sides, which is in turn fitted to the hinges.

The need for an intermediate element (i.e. the frame) complicates the construction of the door but has the advantage that these hinges, unlike offset hinges, allow the oven door to remain in a half-open position. In this second type of hinge, the first supporting element has a cam profile and the second supporting element, substantially box-shaped, is designed to be fixed to the door and is pivoted to the first supporting element by a fork joint. In addition, the second supporting element houses an intermediate connecting element which slides with respect to the second element and which is joined to the first supporting element eccentrically with respect to the hinge axis between the two supporting elements. A swinging bridge element mounted by the second supporting element is equipped with a roller which follows the cam profile of the first supporting element. The roller is kept in contact with the cam profile by a spring.

In hinges of this kind, the cam profile can be appropriately shaped to allow the second supporting element to assume a stable intermediate position in which the door is half open. These known hinges, however, must be mounted in a specially made cavity in a frame that supports the front wall of the door. Another disadvantage with these hinges in particular is that at certain

points in the opening or closing movement of the oven door, the force exerted by the elastic means tends to push the entire hinge upwards, causing a slight but brusque and undesired movement of the door which may also damage the hinge itself.

The aim of the present invention is to overcome the drawbacks and shortcomings of the prior art by providing a hinge of the type described above which allows a door to remain in a stable half-open position and which can at the same time be fitted directly to a door consisting of a pair of parallel panes with a hollow space between them.

The present invention discloses a hinge for attaching a door to a supporting structure, the hinge comprising a lever designed to be rigidly but removably attached to the supporting structure, a substantially box-shaped supporting element designed to be attached to the door and pivoted to the lever about a hinge axis by means of an offset joint such that the lever and the supporting element are arranged side by side, the said supporting element being able, when the hinge is used, to rotate about the lever and assume relative to the latter at least two positions corresponding to door open and door closed, a link rod placed between the lever and the said supporting element, the lower end of the link rod being hinged to the lever eccentrically with respect to the hinge axis and at least one top end being movable lengthways with respect to the said supporting element, the hinge disclosed being characterized in that it includes elastic means located inside the said supporting element and operating between a transverse part of the said link rod extending from the top end of the latter to the inside of the supporting element and the lever, the said elastic means tending to stop the supporting element from reaching the said open position, roller means capable of assuming at least two positions relative to the supporting element, namely, a fixed position and a moving position; the lever being rigidly connected by the said joint to a cam mechanism located inside the supporting element and kinematically cooperating with the said roller means.

In a preferred embodiment of the present invention, the link rod has a longitudinal section, on the outer side of the second supporting element between the two supporting elements, and a transverse wing that moves within, and with respect to, the second supporting element and that is connected to the longitudinal section through an opening in the walls of the second supporting element, the aforementioned elastic means operating on the said transverse wing.

In this preferred embodiment, the shape of the cam profile is such that the supporting element attached to the door tends to move, under the action of the said elastic means, from the door closed position to the half open position, there being envisaged rapid lock/release means, operated from the outside, designed to stop the door in the closed configuration. This makes it possible to open the door at least partially by a simple operation such as, for instance, pressing a pushbutton to release

the door locking means.

Another advantage of the present invention is that the force exerted by the elastic means while the door is being opened and closed cannot at any point move the supporting element attached to the oven out of its seat, which means that the door is not subject to brusque upward movements. This advantage is achieved by the special shape of the supporting element attached to the oven which has means to stop it against the supporting structure of the oven and designed to prevent an upward twisting of the top end of the supporting element attached to the oven where it is joined to the supporting element attached to the door.

The advantages and characteristics of the invention are apparent from the detailed description which follows, with reference to the accompanying drawings, which illustrate two preferred embodiments of the invention by way of example and in which:

- Figure 1 is a perspective view of a hinge made in accordance with the present invention, with some parts cut away in order to better illustrate others and showing the hinge in the position assumed when the door is closed;
- Figure 2 is a perspective view of a door attached to the structure of an oven by means of two hinges made in accordance with the present invention, the door being in the fully open position;
- Figure 3 is an interrupted side view, in elevation, of another embodiment of the hinge disclosed, with the hinge shown in the position assumed when the door is closed.

With reference to the above drawings, the numeral 1 indicates an oven door attached to a supporting structure 2, illustrated partially, of the oven itself by means of two hinges 3 made in accordance with the present invention. The hinges 3 are located at opposite ends of the bottom edge of the door 1 and enable the door 1 to be opened and closed by tilting about a horizontal axis x-x. The fact that the supporting structure 2 described here forms part of an oven should not be considered as a restriction on the scope of the invention, since the supporting structure 2 may be of any type.

The door 1 is formed of two front walls 4 consisting of two rectangular glass panes, parallel to each other with a hollow space between them. The walls 4 are fitted directly on to the two hinges 3, as explained in more detail below. The edge of the door 1 is covered by a seal 21.

Each hinge 3 includes a lever 5 that is rigidly but removably attached to the supporting structure 2. A supporting element 6, that is substantially box-shaped and designed to be attached to the door 1, is pivoted to the lever 5 by means of an offset joint whose hinge pin 7 protrudes sideways from the supporting element 6 and from the lever 5, so that the two are arranged side by side. When the hinge is used, the supporting element 6 rotates about the lever 5 and assumes relative to the

latter at least two limit positions corresponding to a position where the door 1 to which it is attached is closed (Fig. 1) and a position where the door is fully open (Fig. 2). In the embodiment described, the supporting element is a C section with a plane central portion 60, which one edge of one of the walls 4 forming part of the door 1 is to be applied against, and two lateral arms 61, to the ends of which one edge of the other plane wall 4, parallel to the first and also forming part of the door 1, is to be applied.

A link rod 8 is hinged at its bottom end 80a to the supporting element 5 about a pin 9. The pin 9 is eccentric with respect to the hinge pin 7, which extends along the hinge axis x, between the supporting element 6 and the lever 5. The link rod 8 has at least one upper end 80b opposite the pin 9 which moves lengthways with respect to the supporting element 6.

The hinge 3 includes elastic means 10, consisting, in this embodiment, of a spring, located inside the supporting element 6 and operating between the link rod 8 and the lever 5. In particular, the elastic means operate on a transverse section 82 of the link rod 8. The transverse section 82 extends from the upper end 80b of the link rod and goes into the box-shaped supporting element 6 against the upper end of the elastic means 10 which thus resist the rotation of the element 6 about the lever 5, thus tending to stop the door 1 from reaching its open position. The hinge is also equipped with a cam mechanism 12 located inside the supporting element 6 and comprising a cam 11 that cooperates with roller means 13 mounted at the end of the elastic means 10 opposite the end to which the link rod 8 is connected. The roller means 13 are mounted with a degree of play on the supporting element 6 and are kept in contact with the cam 12 by the elastic means 10.

In the hinges illustrated, the cam 11 is mounted on the hinge pin 7 of a joint 70 placed between the supporting element 6 and the lever 5. In particular, the roller means 13 consist of a roller 13 that turns freely on a pin 14 whose ends are housed in longitudinal slots 15 made in the lateral arms 61 of the supporting element 6. Thus, the roller means 13 can assume at least two positions relative to the supporting element 6, namely, a fixed position, where the pin 14 is in contact with the bottom of the slot 15, and a moving position, where the pin 14 is substantially half way along the slot 15 and can continue sliding in it.

In a preferred embodiment of the invention, the link rod 8 has a longitudinal section 81, on the outer side of the supporting element 6 between the latter and the lever 5, and a transverse section, consisting of a wing, located at the sliding end 80b, inside the supporting element 6 and connected to the longitudinal section 80 through a first longitudinal opening 16 made in the walls of one of the two lateral arms of supporting element 6. The end of the transverse section 82 that is not connected to the longitudinal section 81 can move lengthways within a second opening 18, opposite and parallel to the first opening 16 and made in the other of the two

lateral arms 61.

The transverse section 82 has a flattened shape and is parallel to the central portion 60 of the supporting element 6. The elastic means 10 are compressed between the bottom edge of the transverse section, from which there protrudes a tab 28 situated within the elastic means 10, and a rod 17 over which the elastic means 10 are fitted and one of whose ends is forked, the branches of the fork being pointed by the elastic means 10 at the pin 14 that mounts the roller means 13 (Fig.3).

The openings 16 and 18 extend lengthways to allow the transverse section 82 of the link rod 8 to move lengthways relative to the supporting element 6 and they are wider than the transverse section 82 to allow the latter to have a certain clearance crossways with respect to the second supporting element 6. This is an advantage because, when the door 1 is opened and closed, it allows the transverse section 82 to move lengthways relative to the supporting element 6 within the openings 16 and 18 without scraping against the longitudinal sides of the two openings. The top and bottom ends of the openings 16 and 18 act as stops for the transverse section 82 of the link rod 8.

In the embodiment illustrated in Fig. 1, the cam 12, when in use and during the rotation of the element 6 with respect to the lever 5, can move between at least two active positions in which it touches the said roller means 13. These two active positions correspond to the aforesaid moving position of the roller means 13 and are defined by a first stable position corresponding to the said closed position of the said supporting element 6 with respect to the lever 5 where the elastic means 10 keeps the supporting element 6 closed by pushing apart the link rod 8 and the cam 11, and a second stable position where the said supporting element 6 is partially open and where the cam 11 has turned about the element 6 and, being rigidly mounted by the lever 5, has moved past the roller 13 to the other side of the said roller means 13. In this position, the cam 11 opposes the force of the elastic means 10 tending to move the supporting element 6 towards its closed position.

As the element 6 continues to turn about the lever 5, the cam 11 is allowed to move towards a position where it is away from the said roller means 13 and where the latter assume the fixed position relative to the supporting element 6 and allow the link rod 8 to compress the elastic means 10 during the rotation of the supporting element 6 towards its open position. In this working condition, the elastic means 10 oppose the rotation of the supporting element 6 towards the position corresponding to the open position of the door 1.

In the embodiment illustrated in Fig. 3, the cam profile 12 is shaped and arranged in such a way that the second supporting element 6 tends, under the action of the elastic means 10, to move from the limit position corresponding to the position in which the door 1 is closed to the intermediate position in which the door 1 is half open.

Again with reference to the embodiment illustrated in Fig. 3 (shown in the condition in which the door 1 is fully closed) the cam mechanism 12 extends in an inclined plane downwards in the opening direction of the door 1. In other words, the inclined plane 30 has an upper portion 31 arranged and orientated towards the lever 5 and a lower portion 32 opposite to the previous.

The numeral 19 indicates rapid lock/release means for the door 1 in its open and closed positions.

These means 19, being known and hence not described in any detail, operate between the door 1 and the supporting structure 2 and, once the door 1 has been closed manually, are capable of keeping the door 1 closed, allowing it to open only when they are manually released by pressing pushbutton 19'.

When the lock/release means 19 are released, the combined action of the elastic means 10 and of the cam mechanism coupled with the roller means 13 generates a moment of rotation M1 which is applied to the supporting element 6 and which causes the latter to rotate slightly in such a way as to partially open the door 1 to the half-open position.

The elastic means 10 then generate a second moment of rotation in the opposite direction, so as to stop the door from continuing to rotate under its own weight towards the fully open position.

The lever 5 has at the lower end of it a recess 50 designed when in use to engage the bottom edge 22 of a seat 26 made in a wall 20 of the supporting structure 2, and at the upper end of it an active surface 51 which when in use comes in front of the upper edge 23 of the seat 26 in which the lever 5 is inserted. There is also envisaged a rear fastening element 52, consisting of a horizontal projection which, when the hinge 3 is assembled to the oven supporting structure 2, is placed against the side 24 of the wall 20 located on the side opposite the door. The rear fastening element 52 is designed to interact with the rear side 24 of the wall 20 to prevent the first supporting element 5 of the hinge 3 from rotating clockwise (with reference to Fig. 3) by pivoting on the bottom edge 22 of the opening in the wall 20 in which it is fitted.

To cancel the force exerted by the elastic means 10 on the element 6 and hence on the door 1 during its opening tilt movement, the lever 5 also has, near the active surface 51, a front fastening element 53, consisting of a vertical projection designed when in use to interact with the front side 25 of the wall 20, situated on the same side as the door 1. The fastening element 53 acts as an obstacle designed to stop the first supporting element 5 from rotating counterclockwise (with reference to Fig. 3) by pivoting on the contact area between the recess 50 and the bottom edge 22 of the opening in wall 20. The rotation might be caused by the twisting force exerted by the elastic means 10 when the supporting element 6 passes certain positions during the tilting movement of the door 1. This twisting force, which is generated by the elastic means 10 being compressed, that is, loaded, during certain stages in the movement of

the door 1, creates a counterclockwise moment which tends to make the end of the lever 5 that is joined to the supporting element 6 move brusquely upwards and which is compensated by the reaction of wall 20 on the fastening element 53.

Claims

1. A hinge (3) for attaching a door (1) to a supporting structure (2), the hinge (3) comprising a lever (5) designed to be rigidly but removably attached to the supporting structure (2), a substantially box-shaped supporting element (6) designed to be attached to the door (1) and pivoted to the lever (5) about a hinge axis (x) by means of an offset joint (70) such that the lever (5) and the supporting element (6) are arranged side by side, the said supporting element (6) being able, when the hinge is used, to rotate about the lever (5) and assume relative to the latter at least two positions, namely closed and open, corresponding to door (1) closed and door (1) open, a link rod (8) placed between the lever (5) and the said supporting element (6), the lower end (80a) of the link rod (8) being hinged to the lever (5) eccentrically with respect to the hinge axis (x) and at least one upper end (80b) being movable lengthways with respect to the said supporting element (6), the hinge (3) being characterized in that it includes elastic means (10) located inside the said supporting element (6) and operating between a transverse part (82) of the said link rod (8) extending from the upper end (80b) of the latter to the inside of the supporting element (6) and the lever (5), the said elastic means (10) tending to stop the supporting element (6) from reaching the said open position, roller means (13) capable of assuming at least two positions relative to the supporting element (6), namely, a fixed position and a moving position; the lever (5) being rigidly connected by the said joint (70) to a cam mechanism (12) located inside the supporting element (6) and kinematically cooperating with the said roller means (13).
2. The hinge according to claim 1, characterized in that the said cam mechanism (12) consists of a cam (11) which, when in use and during the rotation of the supporting element (6) with respect to the lever (5), can move between at least two active positions in which it touches the said roller means (13), these two active positions corresponding to the aforesaid moving position of the roller means (13) and being defined by a first stable position corresponding to the said closed position of the said supporting element (6) with respect to the lever (5) where the elastic means (10) keeps the supporting element (6) closed, and a second stable position where the said supporting element (6) is partially open and where the cam (11) has moved to the other side of the said roller means (13) and

opposes the force of the elastic means (10) tending to move the supporting element (6) towards its closed position.

3. The hinge according to claim 2, characterized in that the said cam (11) can move towards a position where it is away from the said roller means (13) and where the latter assume the fixed position relative to the supporting element (6) and allow the link rod (8) to compress the elastic means (10) during the rotation of the supporting element (6) towards its open position, thus allowing the elastic means (10) to oppose the rotation of the supporting element (6) towards the position corresponding to the open position of the door (1). 5
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4. The hinge according to claim 1, where the door (1) is equipped with rapid lock/release means (19) to keep the door (1) in its closed position against the supporting structure (2), characterized in that the said cam mechanism (12) consists of an inclined plane (30) extending from an upper portion (31) arranged towards the lever (5) to a lower portion (32) arranged towards the open position of the element (6), the said roller means (13), when the said lock/release means (19) are released and during the rotation of the door towards its fully open position, operating between a first position where they are in the moving position in contact with the said upper portion (31) of the said inclined plane (30) and where the said elastic means (10) generate a moment (M1) applied to the said supporting element (6) which causes a first rotation of the latter away from the supporting structure (2) and hence partially opens the door (1) partly opposed by the elastic means (10) being compressed by the said link rod (8), and a second position where the said roller means (13) are in their fixed position, not touching the inclined plane (30) and where the elastic means (10), compressed by the link rod (8), resist the further rotation of the supporting element (6) away from the supporting structure (2). 20
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5. The hinge according to claim 1, characterized in that the said supporting element (6) is a C section with a plane central portion (60), against which one edge of a first pane (4) forming part of the door (1) is to be applied, and two lateral arms (61), to the ends of which one edge of a second pane (4) parallel to the first and also forming part of the door (1), is to be applied. 45
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6. The hinge according to any of the foregoing claims, characterized in that the link rod (8) has a longitudinal section (81), on the outer side of and parallel to the supporting element (6), and a transverse section (82) that is within the supporting element (6) and that is connected to the longitudinal section (81) through an opening (16) made in the walls of 55

the supporting element (6).

7. The hinge according to claim 4, characterized in that the elastic means (10) operate by being compressed between the transverse section (82) and the said cam mechanism (12).

8. The hinge according to claim 6, characterized in that the opening (16) extends lengthways to allow the flattened transverse section (82) to move lengthways relative to the supporting element (6) and is wider than the transverse section (82) to allow the latter to have a certain degree of play crossways with respect to the second supporting element (6) so as to avoid reciprocal scraping.

9. The hinge according to claim 5, characterized in that there is an opening (16) made in each lateral arm (61).

10. The hinge according to claim 9, characterized in that the top and bottom ends of the said opening (16) are shaped and arranged in such a way as to act as stops for the transverse section (82) of the link rod (8).

11. The hinge according to any of the foregoing claims, of the type where the lever (5) has at the lower end of it a recess (50) designed when in use to engage the bottom edge (22) of a seat (26) made in a wall (20) of the supporting structure (2) and has at the upper end of it an active surface (51) which when in use comes in front of the upper edge (23) of the seat (26) and a rear fastening element (52) designed when in use to interact with the side (24) of the said wall (20) located on the side opposite the door (1) so as to cancel the force exerted on the lever (5) while the supporting element (6) is being rotated towards its two limit positions, the hinge being characterized in that the said lever (5) also has a also has near the active surface (51), a front, vertical fastening element (53) designed when in use to interact with the side (25) of the wall (20), located on the same side as the door (1) and to cancel the force exerted by the elastic means (10) on the supporting element (6) and tending to raise the door (1) during the first rotation towards its open position.

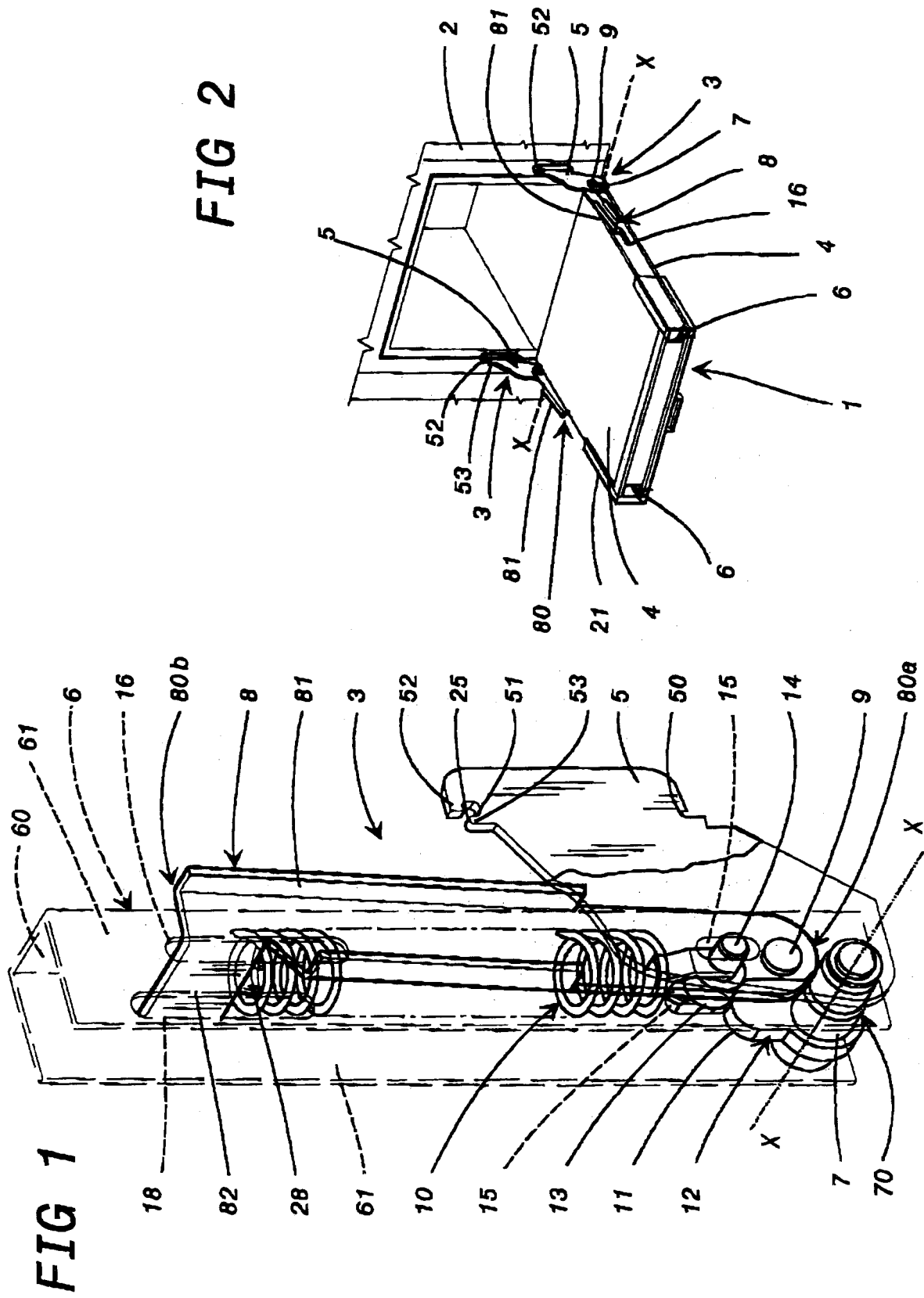
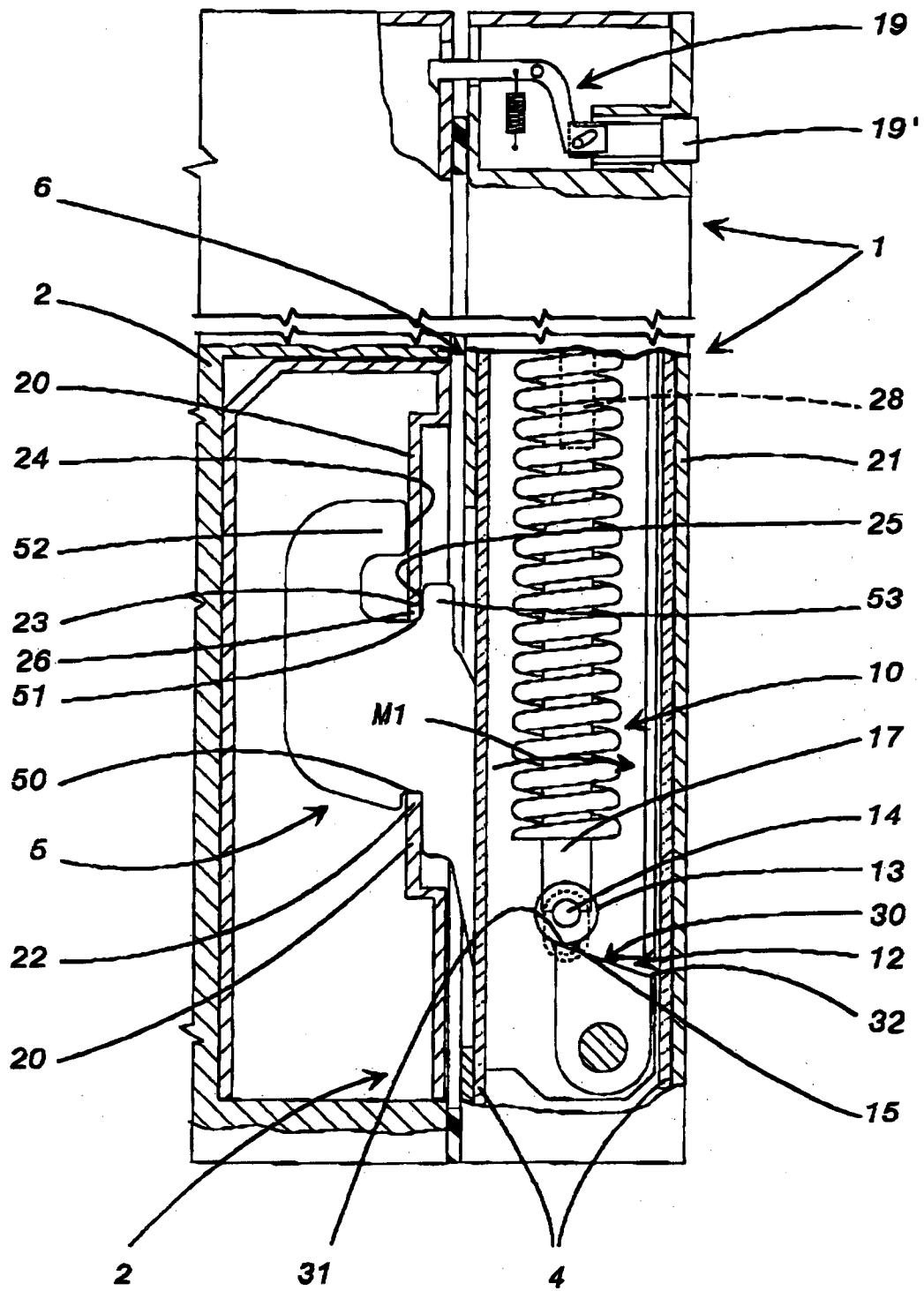


FIG 3





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 96 83 0304

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	FR-A-2 662 204 (C.M.I.) * page 7, line 15 - page 9, line 19; figures *	1	E05F1/12 F24C15/02
A	--- EP-A-0 149 937 (CEPEM) * column 3, line 5 - line 18; figures 1,2 *	1	
A	--- DE-A-17 08 409 (SIEGAS) * column 3, line 5 - line 10; figures 1,2 * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E05F F24C
Place of search	Date of completion of the search	Examiner	
THE HAGUE	30 October 1996	Van Kessel, J	
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