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(54) **Door locking arrangement for a household appliance, such as for example a dishwashing machine**

Türschliessvorrichtung für ein Haushaltsgerät, beispielsweise eine Geschirrspülmaschine

Dispositif de fermeture de porte pour appareil électroménager, par exemple pour lave-vaisselle

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Description

[0001] The present invention refers to a locking arrangement for the door of a household appliance, such as for example, but not exclusively, a dishwashing machine.

[0002] Certain household appliances are commonly known to have to operate with their loading door firmly locked in its shut position in view of preventing situations from arising that can be really worrisome, if not even dangerous for the safety of both persons and things such as, in the case of a dishwashing machine, water and/or steam pouring out accidentally into the surrounding environment. These appliances must of course allow also for the greatest possible convenience in their use, so that their door must be easy to open so as to be able to gain access to their interior, for instance to the purpose of loading the items to be washed therein or unloading said items therefrom.

[0003] To this purpose, appliances of such kind are generally provided with a door locking arrangement that substantially consists of an articulated mechanism, usually housed in the definitely reduced thickness of the door, and an anchor that is usually fixed to the stationary portion of the appliance.

[0004] An articulated mechanism that is widely used in this connection is the so-called "toggle-type", as described for instance in EP-A-0 727 178 and DE-G-94 13641.6, in which the various links are joined with each other by means of sliding pins which are quite obviously subject to wear and, anyway, due to the particularly tight tolerances to which they must be produced and assembled, have a significant incidence on the overall costs.

[0005] The practice is also known according to which a so-called "quick-snap" articulated mechanism is used in such door locking arrangements, which comprises at least a connecting rod and a compression spring adapted to pass from an equilibrium configuration to the other angularly spaced one through an intermediate position of greatest compression. A mechanism of such a kind has the twofold drawback of requiring a lot of space, thus heavily affecting the actual thickness of the door, and forcing the user to apply, when closing and opening the door, an effort that increases progressively up to the point at which the mechanism snaps into locking or releasing owing to the contrasting action exerted by the spring, said contrasting action obviously increasing with the extent to which the same spring is being compressed.

[0006] It therefore is a main purpose of the present invention to provide a locking arrangement for the door of a household appliance, in particular a dishwashing machine, which is particularly easy to actuate in both directions, ie. to both lock and release, has an articulated mechanism that does not take up much space, and is simple, reliable and unexpensive in its construction.

[0007] It is a further purpose of the present invention to provide a door locking arrangement that is capable of

being installed equally well in free-standing appliances, the doors of which are usually provided with a handle adapted to be actuated directly by the user, and on built-in appliances in which the appliance door is entirely covered by the door of the wooden cabinet in which the same appliance is built-in, so that it is practically only the handle of the cabinet door that is directly actuatable by the user.

[0008] An arrangement having the features and characteristics as recited in the appended claims enables these and further aims to be reached, as this can be inferred from the description that is given below by way of non-limiting example with reference to the accompanying drawings which to a merely indicative purpose are shown to refer to a free-standing dishwashing machine and in which:

- Figure 1 is an exploded view of the various parts that make up an articulated mechanism of the afore mentioned kind;
- Figure 2 is a vertical cross-sectional view of a door locking arrangement comprising the articulated mechanism shown in Figure 1, after it has been assembled and installed in a door, when such a door is in its open position;
- Figure 3 is a view similar to the one appearing in Figure 2, showing however the locking arrangement in the closed position of the door to which it is associated.

[0009] With particular reference to Figure 1, the articulated mechanism, generally indicated at 100, of a locking arrangement according to the present invention for the door of a dishwashing machine can be noticed to essentially comprise following component parts:

- a support member 1, adapted to be fixed on to the door of a dishwashing machine and comprising a horizontal plate 2 with two hole 3 for the fixing screws (not shown) and two parallel upright brackets 4. Underneath the plate 2, on a side thereof, there is provided a cavity 7 adapted to accommodate a micro-switch (not shown) associated to said articulated mechanism 100 and intended to cause the operation of the dishwashing machine to be instantaneously interrupted in the case of the door of the machine being opened before the washing cycle is terminated. On the inner faces thereof, each one of the brackets 4 of the support member 1 is integrally provided with a recess 5 and a pin 6 in such a manner that the axis A of the recesses 5 is situated at a level which is super-elevated by a height Δ with respect to the axis B of the pins 6;
- a spiral-type spring 10 with its two end portions 11 and 12 bent into a hook-like shape;

- an actuating lever 20 in the shape of a U, with two parallel arms 21 that are connected to each other, at an end portion thereof, by a cross-member 22 and are further provided, at their free end portion, with upwards facing recesses 23. The lower profile of the arms 21 emphasizes a rectilinear portion 24 which is inclined towards said recesses 23. In the proximity of the cross-member 22, the arms 21 of the actuating lever 20 are pierced across with a pair of through-holes 25 having a same axis perpendicular to the arms themselves;
- a pawl 30, provided with two opposed and coaxial pins 31 (only one of them being actually shown in Figure 1), which comprises a hook 32 and, on the opposite side with respect to said pins 31, two parallel appendices 33 that are pierced across by holes 34 having a same axis parallel to the axis of the pins 31.

[0010] The assembly of the above described component parts in view of forming an articulated mechanism 100 is performed as described below.

[0011] The safety or interlock micro-switch (not shown) is inserted in the appropriate cavity 7 provided in the support member 1, in such a manner that its power-connection terminals are facing downwards.

[0012] The opposed pins 31 of the pawl 30 are inserted in the recesses 5 of the support member 1 in such a manner that the hook 32 is facing towards the plate 2 and the opposed pins 6 of the same support member 1 are inserted in the recesses 23 at the end portions of the arms 21 of the actuating lever 20. In this manner, both the pawl 30 and the actuating lever 20 become hinged on to the support member 1 in such a manner that the axes A and B of the respective pins are stationary and spaced along the vertical of the afore mentioned height Δ .

[0013] The spiral-like spring 10 is then placed between the arms 21 of the lever 20 and is hooked on thereto in correspondence of a first end portion 11 thereof by means of the peg 40 which is forced through the aligned holes 25, and in correspondence of a second end portion 12 thereof by means of the peg 50 that is forced through the aligned holes 34 of the pawl 30. This means that the spiral-like spring 10 connects the actuating lever 20 with the pawl 30 in such a manner that they are even able to rotate with respect to each other.

[0014] According to a main feature of the present invention, the above described parts are arranged and sized in such a manner that, when the assembly of the articulated mechanism 100 is completed, the spring 10 is in tension, ie. in its stretched state. In other words, in such a manner that the distance between the axes of the attachment pegs 40 and 50 of said spring 10 is greater than the natural length (before assembly) of the spring along the axis X thereof, regardless of the position of the actuating lever 20 and the pawl 30.

[0015] As this is commonly known, and also illustrated in Figures 2 and 3, a locking arrangement for the door of a dishwashing machine, the latter being indicated generally at 80 in the above cited Figures, comprises also anchoring means 90 further to the above described articulated mechanism 100. As far as only those parts are concerned which are relevant to the purposes of the present invention, the door 80 can be noticed to essentially comprise an inner metal panel or door liner 81 having a bent upper edge 82, a control panel 83 which may for instance be made of plastics and, behind this panel, a handle 85. This handle, rotating on a pin 84, has a handgrip 86 that is accessible to the hands of the user through an aperture 87 in the control panel 83 and has, on its intrados 89, a protruding portion 88 the function of which will be explained in greater detail further on. Such door assembly 80 also includes an outer metal panel (not shown for reasons of greater simplicity) which is arranged underneath said control panel 83 and, in built-in dishwasher models, is generally covered by a wooden door that is conformed to the remaining cabinets of the kitchen furniture, has such a height as to extend to cover also the control panel 83 and is provided with its own handle.

[0016] The articulated mechanism 100 is mounted in the thickness of the door assembly 80, behind the control panel 83, above the handle 85, and is attached to the bent upper edge 82 of the door liner 81 by means of a pair of screws (not shown) that go into the holes 3 in the plate 2 of the support member 1.

[0017] The anchoring means 90, which are firmly fixed in a horizontal position to the stationary portion 91 of the dishwashing machine, above the loading aperture thereof, are a per se largely known part, such as for instance a formed sheet-metal C-shape. It therefore does not require being illustrated any closer in this description and is in fact only shown in a much simplified manner in the accompanying Figures.

[0018] Figure 2 refers to a door 80 in its opened position, in which the whole handle 85 remains spaced from the articulated mechanism 100. In this position, the axis X of the spiral-like spring 10 is in a higher position than both the hinging axes A and B of the pawl 30 and the actuating lever 20, respectively. It therefore ensues that the return force of the spiral-like spring 10 gives rise to an anti-clockwise torque on the pins 31 of the pawl 30.

[0019] In order to bring it from its above described opened position to its closed position, the user pushes the door 80 (which is hinged below, as generally known) in the direction shown by the arrow C in Figure 3, thereby bringing about a clockwise rotation of the handle 85 about its fixing pin 84. As a result, due to the interference that is brought about between the intrados 89 of the handle 85 and the actuating lever 20, and namely between the protruding portion 88 and the lower profile 24, the actuating lever 20 is forced into rotating in an anti-clockwise direction on its pins 6. The same happens to the peg 50 with the end portion 12 of the spiral-like spring

10. The return force exerted on the peg 40 at the other end portion 11 of the spiral-like spring 10 forces the pawl 30 into rotating in a clockwise direction, about the pins 31 with which it is attached to the support member 1, towards the anchor 90. This action of the spring 10, owing exactly to the fact that it is a return force what we are dealing with here (and not a compression as in prior-art locking arrangements), considerably alleviates the kind of effort required to the user, ie. makes it far less hard to close the door as compared with what normally happens with the current dishwashing machines.

[0020] Also when the door 80 reaches its closed position, in which the protruding portion 88 of the handle 85 presses against the lower profile 24 of the actuating lever 20, the spiral-like spring 19 keeps being held in a tension state. It therefore ensues that the return force exerted by said spring, owing to the fact that the axis A of the fixing pins 31 of the pawl 30 of the support member 1 is in a position which is displaced upwards with respect to the axis X, originates a clockwise torque that keeps the hook 32 locked on to the anchor 90 which in the meantime has partially moved into the door assembly 80 through an appropriate aperture 92 provided in the upper portion of the door liner 82 (see Figure 3).

[0021] In order to open a closed door, the user shall go through a sequence that is exactly the opposite of the one described above, ie. the user shall seize the handgrip 86 of the handle 85 so as to disengage it from the actuating lever 20 (or the handle of the wooden door arranged over there, in the case of a built-in dishwasher model), while pulling in a direction which is the opposite of the one shown by the arrow C. As it will be readily appreciated, also this operation is much easier for the user to perform than this is generally the case with prior-art machines, thanks to the fact that the spiral-like spring 10 is held constantly in a tension state.

[0022] Further to the above mentioned ones, the present invention has following advantages:

- the overall space requirements of the articulated mechanism 100 are very low;
- both the pins of the actuating lever and the pawl and the hook-on pegs to the spiral-like spring are fixed with respect to the portion of articulated mechanism on which they are assembled, so that no need arises for assembly tolerances, which usually affect in a quite heavy manner production costs, while the risks connected with the various parts wearing down are significantly reduced.

Claims

1. Locking arrangement for the door (80) of a household appliance, such as a dishwashing machine, comprising anchoring means (90), which are preferably fixed to the stationary portion of the appliance, and an articulated mechanism (100) which is

preferably installed in the thickness of the door assembly (80) and comprises:

- a support member (1) having hinging pins (6, 31) and thereto associated recesses (5, 23) which are spaced vertically from each other, an actuating lever (20) and a pawl (30) that is provided with a hook or similar attachment means (32) capable of engaging said anchoring means (90) when the door (80) is in its closed position, said actuating lever (20) being connected to said support member (1) through said respective hinging pins (6,31) and recesses (5,23);
- elastic connection means (10) between the actuating lever (20) and the pawl (30),

characterized in that the end portions (11, 12) of said elastic connection means (10) are hooked on to attachments means (40, 50) respectively provided on said actuating lever (20) and on said pawl (30), the distance between the centers of said attachment means (40, 50) being greater than the length of the same elastic connection means (10) before assembly of the door locking arrangement, so that said elastic connection means (10) are kept constantly in a tension state.

2. Locking arrangement for the door (80) of a household appliance according to claim 1, **characterized in that** said elastic connection means (10) comprise at least a tension spring, preferably in a spiral-like wound shape, and **in that** said attachments means (40, 50) are constituted by pegs (40, 50).
3. Locking arrangement for the door (80) of a household appliance according to claim 1 or 2, **characterized in that** when the door (80) is open, the axes (A, B) of the hinging pins (6, 31) of the actuating lever (20) and the pawl (30), respectively, are positioned, with respect to the axis (X) of said elastic connection means (10, on the opposite side to the one they on the contrary take when the door (80) is closed.
4. Locking arrangement for the door (80) of a household appliance according to any of the preceding claims, **characterized in that** the actuating lever (20) comprises two parallel arms (21) between which said elastic connection means (10) extend.
5. Locking arrangement according to any of the preceding claims for the door (80), provided with an articulated handle (85), of a household appliance, **characterized in that** a profile (24) of the actuating lever (20) is adapted to abut against a protruding portion (88) of the intrados (89) of said handle (85) when the door (80) is closed.

Patentansprüche

1. Verriegelungsanordnung für die Tür (80) eines Haushaltsgerätes, wie beispielsweise einer Geschirrspülmaschine, die eine Verankerungseinrichtung (90), die vorzugsweise an dem stationären Abschnitt des Gerätes befestigt ist, und einen Gelenkmechanismus (100) umfasst, der vorzugsweise in der Dicke der Türbaugruppe (80) installiert ist und umfasst:

ein Trägerelement (1) mit Gelenkbolzen (6, 31) und dazugehörigen Aussparungen (5, 23), die vertikal voneinander beabstandet sind, einem Betätigungshebel (20) und einer Klinke (30) die mit einem Haken oder einer ähnlichen Anbringungseinrichtung (32) versehen ist, die mit der Verankerungseinrichtung (90) in Eingriff kommen kann, wenn sich die Tür (80) in ihrer geschlossenen Position befindet, wobei der Betätigungshebel (20) mit dem Trägerelement (1) über die entsprechenden Gelenkbolzen (6, 31) und Aussparungen (5, 23) verbunden ist;

eine elastische Verbindungseinrichtung (10) zwischen dem Betätigungshebel (20) und der Klinke (30),

dadurch gekennzeichnet, dass die Endabschnitte (11, 12) der elastischen Verbindungseinrichtung (10) an Anbringungseinrichtungen (40, 50) angehängt sind, die an dem Betätigungshebel (20) bzw. der Klinke (30) vorhanden sind, wobei der Abstand zwischen den Mittelpunkten der Anbringungseinrichtungen (40, 50) größer ist als die Länge der elastischen Verbindungseinrichtung (10) vor der Montage der Türverriegelungsanordnung, so dass die elastische Verbindungseinrichtung (10) konstant in einem Spannungszustand gehalten wird.

2. Verriegelungsanordnung für die Tür (80) eines Haushaltsgerätes nach Anspruch 1, **dadurch gekennzeichnet, dass** die elastische Verbindungseinrichtung (10) wenigstens eine Zugfeder, vorzugsweise in spiralartig gewickelter Form, umfasst, und dass die Anbringungseinrichtungen (40, 50) durch Stifte (40, 50) gebildet werden.

3. Verriegelungsanordnung für die Tür (80) eines Haushaltsgerätes nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** wenn die Tür (80) offen ist, die Achsen (A, B) der Gelenkzapfen (6, 31) des Betätigungshebels (20) bzw. der Klaue (30) in Bezug auf die Achse (X) der elastischen Verbindungseinrichtung (10) auf der der Seite, die sie im Gegensatz dazu einnehmen, wenn die Tür (80) geschlossen ist, gegenüberliegenden Seite angeordnet sind.

4. Verriegelungsanordnung für die Tür (80) eines Haushaltsgerätes nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Betätigungshebel (20) zwei parallele Arme (21) umfasst, zwischen denen sich die elastische Verbindungseinrichtung (10) erstreckt.

5. Verriegelungsanordnung nach einem der vorangehenden Ansprüche für die mit einem Gelenkgriff (85) versehene Tür (80) eines Haushaltsgerätes, **dadurch gekennzeichnet, dass** ein Profil (24) des Betätigungshebels (20) an einem vorstehenden Abschnitt (88) der inneren Bogenfläche (89) des Griffs (85) anschlägt, wenn die Tür (80) geschlossen ist.

Revendications

1. Dispositif de fermeture pour la porte (80) d'un appareil électroménager, comme par exemple un lave-vaisselle, comprenant des moyens d'ancrage (90) qui sont, de préférence, fixés à la portion fixe de l'appareil, et un mécanisme articulé (100) qui est, de préférence, installé dans l'épaisseur de l'ensemble de porte (80) et qui comprend :

- un élément porteur (1) comportant des gonds de charnière (6, 31) et des encoches (5, 23) associées à ces derniers, qui sont espacés verticalement les uns par rapport aux autres, un levier de manoeuvre (20) et un cliquet (30) qui est muni d'un crochet ou de moyens de fixation similaires (32) capables d'enclencher lesdits moyens d'ancrage (90) lorsque la porte (80) est dans sa position fermée, ledit levier de manoeuvre (20) étant raccordé audit élément porteur (1) par lesdits gonds de charnière (6, 31) et encoches (5, 23) respectifs ;
- des moyens de raccordement élastiques (10) entre le levier de manoeuvre (20) et le cliquet (30),

caractérisé en ce que les portions d'extrémité (11, 12) desdits moyens de raccordement élastiques (10) sont accrochées sur les moyens de fixation (40, 50) prévus respectivement sur ledit levier de manoeuvre (20) et sur ledit cliquet (30), la distance entre les centres desdits moyens de fixation (40, 50) étant supérieure à la longueur de ces mêmes moyens de raccordement élastiques (10) avant l'assemblage du dispositif de fermeture de la porte, de sorte que lesdits moyens de raccordement élastiques (10) sont constamment maintenus sous tension.

2. Dispositif de fermeture pour la porte (80) d'un appareil électroménager selon la revendication 1, **caractérisé en ce que** lesdits moyens de raccorde-

ment élastiques (10) comprennent au moins un ressort de tension, de préférence en forme d'enroulement spiralé, et **en ce que** lesdits moyens de fixation (40, 50) sont constitués de clavettes (40, 50).

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3. Dispositif de fermeture pour la porte (80) d'un appareil électroménager selon la revendication 1 ou 2, **caractérisé en ce que**, lorsque la porte (80) est ouverte, les axes (A, B) des gonds de charnière (6, 31) du levier de manoeuvre (20) et le cliquet (30), respectivement, sont positionnés, par rapport à l'axe (X) desdits moyens de raccordement élastiques (10), sur le côté opposé à celui sur lequel ils se trouvent, au contraire, lorsque la porte (80) est fermée.
4. Dispositif de fermeture pour la porte (80) d'un appareil électroménager selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit levier de manoeuvre (20) comprend deux bras parallèles (21) entre lesquels s'étendent lesdits moyens de raccordement élastiques (10).
5. Dispositif de fermeture selon l'une quelconque des revendications précédentes, pour la porte (80) munie d'une poignée articulée (85) d'un appareil électroménager, **caractérisé en ce qu'un** profil (24) du levier de manoeuvre (20) est adapté pour buter contre une portion saillante (88) de l'intrados (89) de ladite poignée (85) lorsque la porte (80) est fermée.

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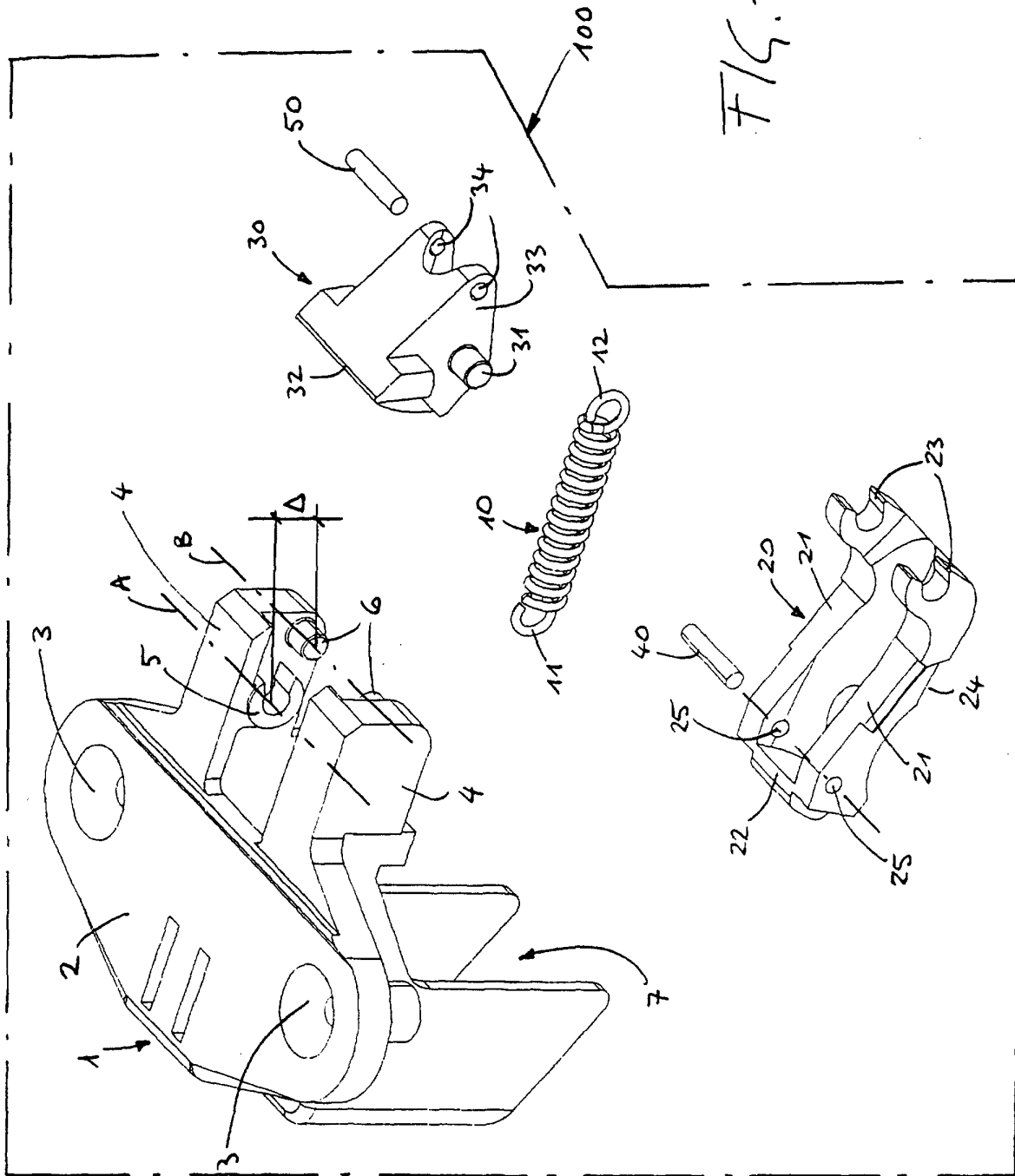


FIG. 2

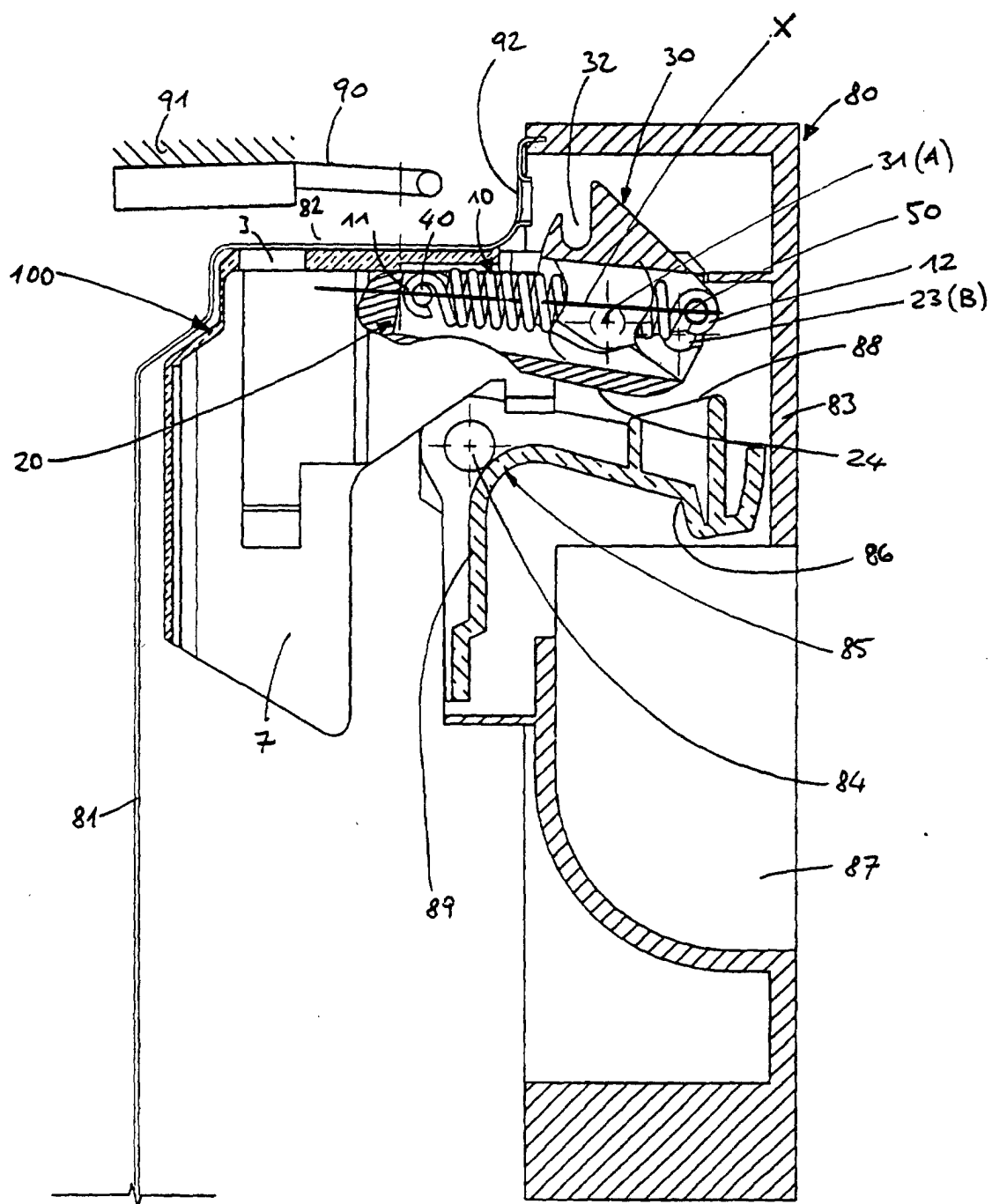


FIG. 3

