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(54) **A door lock for a washing machine or drier**

Türverriegelung für eine Waschmaschine oder für einen Trockner

Verrouillage de porte pour machine à laver ou sèche-linge

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Description

The present invention relates to a door lock for a washing machine or drier.

In particular, it concerns a lock comprising a support casing which is adapted to be fixed to the machine and has at least a first and a second terminal for connection to the electrical supply system when the machine is switched on, and a third terminal for connection to electrical devices of the machine to enable their supply; a locking slide which is movable relative to the casing and is adapted, in an operative position, to keep the door closed; a control and timing device housed in the casing and including a resistive heating element and a bimetal device which can be heated by the resistive element and deformed as a result of the supply of voltage to the first and second terminals and, in the deformed condition, can connect the third terminal to one of the first two and hold a stop peg in engagement with the locking slide to keep the latter in the operative position; a sensor for detecting the water level in the washing chamber, supported by the casing and having a movable stop member which, in use, can assume a rest position when the water in the washing chamber is below a predetermined level, and an operative position, in which it is adapted to lock the locking slide in the operative position, when the water in the washing chamber exceeds the predetermined level; and an electrical switch supported by the casing and having a pair of terminals for connection to electrical devices of the machine to control their supply, the switch being operated by the locking slide when the latter is in the operative position.

A lock of the type specified above is described in GB-A- 2165911 filed by the Applicant, to which reference is made. These devices are quite bulky and somewhat complex to produce since both the safety liquid-level sensor and the electrical switch must be fitted to the support casing which has already been assembled.

The object of the present invention is to provide a lock which does not have the above disadvantages and which, as well as being compact, is cheap and easy to produce.

According to the invention, this object is achieved by virtue of the fact that the sensor and the electrical switch are housed within the casing.

Thus, as well as being of reduced bulk, the lock has improved reliability since all its components are protected by the casing.

The electrical switch is preferably of the bistable resilient-blade type and includes a switching member constituted by a lever having a first end articulated to the casing and a second end in abutment with the resilient blade, the lever also having an operating portion for co-operating with a cam portion of the locking slide to close the switch when the slide slides towards its operative position.

The instant at which the electrical switch opens/closes upon operation of the slider can thus be determined

precisely by the appropriate selection of the position of the cam portion on the locking slide.

A lock according to the invention is also more manageable as regards the statistical controls of the production process, to the benefit of its reliability.

Further characteristics and advantages of the present invention will become clear from the detailed description which follows with reference to the appended drawings, provided by way of non-limiting example, in which:

Figure 1 is a perspective view of a lock according to the invention,

Figure 2 is a perspective view of the lock of Figure 1 from a different angle, without its cover,

Figure 3 is a plan view taken on the arrow III of Figure 2,

Figure 4 is a side view taken on the arrow IV of Figure 2,

Figure 5 is a schematic view taken on the arrow V of Figure 2 and shows a detail of the lock in a rest configuration,

Figure 6 is a view similar to Figure 5 and shows a detail of the device in an operative position,

Figure 7 is a view similar to Figure 5 and shows a variant of a component of the lock in a rest configuration,

Figure 8 is a view of the component of Figure 7 in an operative configuration,

Figure 9 is a schematic view taken on the arrow IX of Figure 2 and shows a component of the lock in a rest configuration,

Figure 10 is a view similar to Figure 9 and shows the component in an operative configuration,

Figure 11 is a view similar to Figure 9 and shows a different embodiment of the component,

Figure 12 is a view similar to Figure 11 and shows the component in an operative configuration,

Figure 13 is a detail of Figure 11 on an enlarged scale, and

Figure 14 is a view taken on the arrow XIV of Figure 11.

With reference to Figure 1, a lock, generally indicated 1, includes a support casing 2 which is adapted to be

fixed to the structure of a washing machine (not illustrated). A recessed guide 3 is formed in correspondence with a cover element 2a of the casing 2 and a locking slide 4 mounted for sliding therein is adapted, in an operative position, to keep the door of the washing machine closed. The cover 2a has an L-shaped guide peg 5 in correspondence with the guide 3 for acting as a guide for the slide 4 in cooperation with a longitudinal slot 4a therein.

The slide 4 also has a slot 6 with two ends 6a and 6b for cooperating with a helical spring 7 which biases the slide into a rest position (corresponding to the position illustrated in Figure 1). The slide 4 also has a front abutment edge 8, a notch 9 in correspondence with one of its lateral edges, and a shaped cam portion 10, whose respective functions will become clear from the following description.

When the cover 2a is removed, the inside of the casing 2 appears as in Figures 2 and 3. Three different regions of the casing can be distinguished, which are differentiated by their functions. A first region A houses a control and timing device which is connected to a first terminal 11, a second terminal 12, a third terminal 13 and a fourth terminal 14, all in the form of flat pins. A second region B houses a bistable resilient-blade microswitch connected to a respective pair of flat pins 15 and 16. The third region C of the casing 2 houses a pneumatic sensor of the type described and illustrated in the English application GB-A-8525244 filed by the Applicant.

The control and timing device includes a known type of bistable resilient-blade switch 17 constituted by a frame-like, resilient metal element 17a joined at 18 to a substantially rigid central limb 17b having an end which is adapted to cooperate with the frame-shaped element 17a with the interposition of a biconical spring 19. The frame-like element 17a of the bistable blade switch 17 has a movable contact 20 for cooperating with a first upper fixed contact 21 and with a second lower fixed contact 22 which faces the first fixed contact 21 (Figures 5 and 6). The element 17a of the bistable resilient blade 17 is connected electrically to the first terminal 11 which is intended to be connected to one of the leads of the electrical supply line of the washing machine. A metal rocker arm 24 is pivoted at 23 on the casing 2 beside the bistable resilient blade 17 and has a first end 24a for operating the bistable switch 17 and a second end 24b which is adapted to be acted upon by a bimetal device, generally indicated 25.

With reference to Figures 5 and 6, the bimetal device 25 comprises a pair of rectangular, plate-shaped bimetallic actuator elements 26 which are guided by rod-shaped projections 2c integral with the casing 2 and between which a pellet 27 of resistive material with a positive temperature coefficient (PTC) is interposed. The bimetallic elements 26 are arranged in contact with respective intermediate conductor elements 28a and 28b having right-angled-bridge shapes. The lower intermediate conductor elements 28a (with reference to Figure 5)

is interposed between one of the bimetal actuator elements 26 and a bimetallic control or compensator element 29 situated in contact with an adjustment screw 30 screwed into the base wall of the casing 2. The bimetallic compensator element 29 is connected electrically to the second terminal 12 which is adapted to be connected to the other lead of the electrical supply line of the machine, whilst the fixed contact 21 connected to the third terminal 13 is intended to be connected to the electrical supply circuits of the machine. The second fixed contact 22 is intended to be connected by the terminal 14 to, for example, a warning light for indicating that the washing machine is switched off.

When the machine is switched off, the region A of the casing 2 is as shown in Figures 2 and 5, with the movable contact 20 closed onto the second fixed contact 22. In this condition, the fixed contact 22, for example, lights a warning light for indicating that the machine is switched off. As soon as the machine is started, a voltage is applied to the terminals 11 and 12 so that the PTC pellet starts to heat up, causing the expansion of the bimetallic actuator elements 26 and the bimetallic compensator element 29 (see Figure 6). During this heating, the intermediate conductor element 28b acts on the first end 24a of the rocker arm 24 to pivot the rocker arm on its fulcrum 23 against the action of a biasing spring 31 interposed between the casing 2 and the central rigid limb 17b of the bistable resilient blade 17. When a predetermined deformation of the bimetallic elements 26 corresponding to a predetermined delay time has been reached, the rocker arm 24 causes the blade 17 to snap, bringing the movable contact 20 onto the first fixed contact 21 and enabling the supply of electricity to the circuits of the machine, for example, to the electric motor for rotating the drum. Moreover, in known manner, a locking pin 32 is connected to the movable contact 20 and, in the operative configuration of the bimetal device 25, is adapted to project from a suitable hole in the cover 2a of the casing 2 to cooperate with the front edge 8 of the slide 4 in order to lock the latter in its operative position.

When the washing machine has been switched on, the presence of the bimetallic compensator element 29 enables the reduction to an acceptable time of the delay with which the stop pin 32 returns into the casing 2, allowing the door to be opened. With the arrangement as described, the bimetal device 25 is not affected by the increase in temperature due to the Joule effect resulting from the passage of current through the contacts associated with the bistable resilient blade 17. In fact, the rocker arm 24 effectively separates the region of the PTC pellet from the region corresponding to the contacts 20 and 21, through which the current passes.

Figures 7 and 8 show a second embodiment of the bimetal device 25 which substantially corresponds to that shown in Figures 5 and 6. It differs from the first embodiment in having intermediate bridge-shaped conductor elements 33 constituted by shaped bimetal plates which are in contact with the bimetallic actuator elements

26 at their ends 33a. As is clearly shown in Figure 8 (the operative configuration of the bimetal device) the deformation of the intermediate conductor elements 33 has the opposite effect from that of the bimetallic actuator elements 26.

During the heating of the PTC pellet (the starting cycle of the machine), the bridge shape of the bimetallic compensators 33, which are not affected by the ambient temperature of the device, enables the entire displacement caused by the metallic actuator elements 26 to be transmitted. This displacement causes the switching of the electrical contacts 20, 21 and the protrusion of the locking pin 32.

After the switching of the bistable blade 17 due to the temperature and the consequent deformation of the bimetallic actuator elements 26, the bimetallic compensators 33 are deformed with an opposite effect so as to "subtract" a certain travel from the bimetallic actuators and place the rocker arm 24 in a condition nearer to the switching point of the bistable blade switch 17, thus reducing the delay in the opening of the contacts 20, 21 (end of cycle).

The microswitch housed in the region B of the casing 2 also includes a bistable resilient blade 34 defining a frame element 34a and a rigid central limb 34b. The bistable resilient blade 34 is electrically connected to the terminal 16 and its frame element 34a defines a movable contact 35 which can cooperate with a fixed contact 36 connected to the terminal 15. The terminals 15 and 16 are adapted for connection to devices of the washing machine for controlling their supply.

The bistable resilient blade 34 is provided with a switching member constituted by a plastics lever 37 having one end 37a articulated at 38 to the casing 2 and a second end 37b in contact with the central rigid limb 34b of the bistable resilient blade 34 for controlling its operation. The end 37b of the lever 37 also has a portion 39 for cooperating with the cam surface 10 of the slide 4.

As is clear from Figures 9 and 10, the sliding of the slide 4 as the door is closed causes the bistable resilient blade 34 to snap against the action of a biasing spring 40, closing the contacts 35 and 36 and thus operating an actuator device of the washing machine independently of the bimetal delay device 25. When the door of the machine is opened, the sliding of the slide 4 (Figure 9) causes the opening of the contacts 35 and 36.

A plastics rocker-arm element 41 pivoted on the casing 2 at 42 (Figures 11 and 12) may be used instead of the lever 37. The rocker-arm element 41 has a first end 41a provided with a T-shaped peg 43 connected to the central rigid limb 34b in correspondence with an aperture 44 therein. The end 41a of the rocker-arm element 41 may be connected to the central rigid limb 34b of the bistable resilient blade 34, for example, by the insertion of the T-shaped peg 43 through the aperture 44 and its subsequent rotation through about 90°. The first end 41a of the rocker-arm element 41 has a portion 45 for cooperating with a first cam surface 46 of the slide 4, whilst the

second end 41b of the rocker-arm element 41 has a portion 46a for cooperating with a second cam surface 47 of the slide 4. It is clear, that, as a result of the movement of the slide 4 towards its operative position, the first cam surface 46 acts on the end 41a of the rocker-arm element 41 to cause the closure of the contacts 35 and 36. When the door is opened, the sliding of the slide 4 positively controls the opening of the contacts 35 and 36 by means of the second cam surface 47 and the second end 41b of the rocker-arm element 41, by virtue of the connection between the rod 43 and the central limb 34b.

This system for controlling the bistable blade switch 34 makes the movement of the slide 4 independent of the hysteresis of the switch itself, affording very reliable control of the opening/closing of the contacts 35, 36 on the part of the cam surfaces 46 and 47 of the slide. As well as not requiring the use of a biasing spring, the positive opening and closing of the contacts 35 and 36 enables the microswitch to be made with very wide tolerances, with a consequent reduction in cost and with an improvement in the reliability of the switch.

The region C of the casing 2 defines a chamber 50 which communicates by means of a connector 51, situated in the wall of the casing 2, with a tube (not illustrated) one end of which is connected to an opening of the washing chamber of the washing machine beneath the door. Above the chamber 50, a resilient diaphragm (not illustrated) is sealingly interposed between the cover 2a and the casing 2 and is provided with a central pin which passes through a hole in the cover 2a and is adapted to cooperate with the lateral notch 9 of the slide 4 to lock the latter in the operative position when the water in the washing chamber is above a predetermined level. This eliminates the problem resulting from the possibility of the water contained in the washing chamber overflowing through the loading aperture as a result of the opening of the door by the user, for example, in the event of an accidental interruption of the electrical supply to the machine.

Claims

1. A door lock for a washing machine or drier, comprising
 - a support casing which is adapted to be fixed to the machine and has at least a first and a second terminal for connection to the electrical supply system when the machine is switched on, and a third terminal for connection to the electrical devices of the machine to enable their supply,
 - a locking slide which is movable relative to the casing and adapted, in an operative position, to keep the door closed.
 - a control and timing device housed in the casing and including a resistive heating element, and

- a bimetal device which can be heated by the resistive element and deformed as a result of the supply of voltage to the first and second terminals and, in the deformed condition, can connect the third terminal to one of the first two and hold a stop peg in engagement with the locking slide to keep the latter in the operative position,
- a sensor for detecting the water level in the washing chamber, said sensor having a housing defining a chamber in fluid flow communication with the washing chamber and a resilient diaphragm connected to a movable stop member which, in use, can assume a rest position when the water in the washing chamber is below a predetermined level, and an operative position, in which it is adapted to lock the locking slide in the operative position, when the water in the washing chamber exceeds the predetermined level, and
 - an electrical switch having a housing and having a pair of terminals for connection to electrical devices of the machine to control their supply, the switch being operated by the locking slide when the latter is in the operative position, characterised in that the support casing (2) has integral walls defining the sensor chamber (50), the resilient diaphragm of the sensor being sealingly interposed between the casing walls defining said sensor chamber (50) and a casing cover member (2a), and having a movable pin constituting said stop member passing through a hole in said cover member, the casing (2) and the casing cover member (2a) also constituting the housing of said electrical switch (34, 37, 10).
2. A lock according to Claim 1, characterised in that the electrical switch (34) is of the bistable resilient-blade type and includes a switching member constituted by a lever (37) having a first end (37a) articulated to the casing (2) and a second end (37b) in abutment with the resilient blade (34b), the lever (37) also having an operating portion (39) for cooperating with a cam portion (10) of the locking slide (4) to close the switch when the slide (4) slides towards its operative position.
 3. A lock according to Claim 1, characterised in that the electrical switch (34) includes a switching member constituted by a rocker-arm element (41) pivoted centrally on the casing (2) and having a first end (41a) connected to the bistable resilient blade (34b) and provided with a portion (45) for cooperating with a first cam surface (46) of the slide (4) to close the switch, and a second end (14b) provided with a portion (46a) for cooperating with a second cam surface (47) of the slide (4) to open the switch.
 4. A lock according to Claim 1, characterised in that the control and timing device includes a bistable resilient blade (17) which is connected electrically to the first terminal (11) and defines a movable contact (20) for cooperating with a fixed contact (21) connected to the third terminal (13) and a metal rocker arm (24) pivoted on the casing (2) and having a first end for operating the bistable resilient blade (17b) and a second end (24b) in contact with the bimetal device (25), the rocker arm (24) acting both as the electrical connection between the first terminal (11) and the second terminal (12) with the interposition of the resistive heating element (27), and as a member for operating the bistable resilient blade (17b) as a result of the deformation of the bimetal device (25).
 5. A lock according to Claim 4, characterised in that the movable contact (20) of the bistable resilient blade (17) of the control and timing device is adapted to cooperate, when the machine is switched off, with an auxiliary fixed contact (22) connected to a fourth terminal (14) for providing a signal indicative of the fact that the machine is switched off.
 6. A lock according to Claim 3, characterised in that the connection between the first end (41a) of the rocker-arm element (41) and the bistable resilient blade (34b) includes a T-shaped peg (43) connected to the first end (41a) and adapted to be inserted through a corresponding aperture (44) in the bistable resilient blade (34b), the subsequent rotation of the rocker-arm element (41) connecting the rocker-arm element and the blade together.
 7. A lock according to Claim 4, characterised in that the bimetal device (25) comprises:
 - a pair of bimetallic actuator elements (26) in contact with opposite faces of the resistive heating element (27),
 - a first and a second intermediate conductor element (28a, 28b) in contact with the bimetallic actuator element (26),
 - a bimetallic control element (29) which is interposed between the casing (30, 2) and the first conductor element (28a) and, as a result of its heating, can assume a deformation with the opposite effect from that of the bimetallic actuator elements (26), the second intermediate conductor element (28b) being in contact with the second end (24b) of the rocker arm (24).
 8. A lock according to Claim 4, characterised in that the bimetal device (25) comprises:
 - a pair of bimetallic actuator elements (26) in contact with opposite faces of the resistive heating element (27),
 - a pair of bridge-shaped bimetallic control ele-

ments (33) having ends (33a) which are in contact with the bimetallic actuator elements (26), the bimetallic control elements (33) being able, as a result of their heating, to assume a deformation with the opposite effect from that of the bimetallic actuator elements (26).

Patentansprüche

1. Türverriegelung für eine Waschmaschine oder einen Trockner, wobei die Türverriegelung enthält:

ein Traggehäuse, das so aufgebaut ist, daß es an der Maschine befestigt werden kann und zumindest einen ersten und zweiten Anschluß für die Verbindung mit einem elektrischen Versorgungssystem, wenn die Maschine eingeschaltet wird, sowie einen dritten Anschluß für die Verbindung mit elektrischen Einrichtungen der Maschine besitzt, um deren Anspeisung zu ermöglichen;

einen Verriegelungsschieber, der relativ zum Gehäuse bewegbar und so aufgebaut ist, daß er in einer Arbeitsstellung die Tür geschlossen hält;

eine Steuer- und Programm-Einrichtung, die im Gehäuse untergebracht ist und ein Widerstandselement sowie eine Bimetalleinrichtung aufweist, die vom Widerstandselement erhitzt und verformt werden kann, wenn eine Spannung am ersten und zweiten Anschluß liegt, wobei sie im verformten Zustand den dritten Anschluß mit einem der beiden ersten Anschlüsse verbinden und einen Anschlags-temmel mit dem Verriegelungsschieber in Eingriff halten kann, um den Verriegelungsschieber in der Arbeitsstellung zu halten;

einen Fühler, um den Wasserstand in der Waschkammer abzutasten, wobei der Fühler ein Gehäuse, das eine Kammer bildet, die strömungsmäßig mit der Waschkammer in Verbindung steht, sowie eine elastische Membran besitzt, die mit einem bewegbaren Anschlag-element verbunden ist, das im Betrieb eine Ruhestellung einnehmen kann, wenn das Wasser in der Waschkammer unter einem vorgegebenen Pegel liegt, sowie eine Arbeitsstellung einnehmen kann, in der es so aufgebaut ist, daß es den Verriegelungsschieber in der Arbeitsstellung verriegelt, wenn das Wasser in der Waschkammer den vorgegebenen Pegel überschreitet; und

einen elektrischen Schalter, der ein Gehäuse sowie ein Paar von Anschlüssen für die Verbindung mit elektrischen Einrichtungen der Maschine besitzt, um deren Anspeisung zu steuern, wobei der Schalter vom Verriegelungs-

schieber betätigt wird, wenn sich dieser in der Arbeitsstellung befindet,

dadurch gekennzeichnet, daß das Traggehäuse (2) gemeinsam aufgebaute Wände besitzt, die die Fühlerkammer (50) bilden, wobei die elastische Membran des Fühlers abgedichtet zwischen den Gehäusewänden, die die Fühlerkammer (50) bilden, und einem Gehäuse-Abdeckelement (2a) liegt, wobei sie einen bewegbaren Zapfen besitzt, der das Anschlagelement bildet, das durch eine Öffnung im Abdeckelement verläuft, wobei das Gehäuse (2) und das Gehäuse-Abdeckelement (2a) weiters das Gehäuse des elektrischen Schalters (34, 37, 10) bilden.

2. Verriegelung gemäß Anspruch 1, dadurch gekennzeichnet, daß der elektrische Schalter (34) ein bistabiler Federplättchen-Schalter ist und ein Schaltelement aufweist, das von einem Hebel (37) gebildet wird, der ein erstes Ende (37a), das im Gehäuse (2) gelenkig gelagert ist, sowie ein zweites Ende (37b) besitzt, auf dem das Federplättchen (34b) aufliegt, wobei der Hebel (37) weiters einen Betätigungsteil (39) besitzt, um mit einem Nockenteil (10) des Verriegelungsschiebers (4) zusammenzuwirken, um den Schalter zu schließen, wenn sich der Schieber (4) zu seiner Arbeitsstellung verschiebt.

3. Verriegelung gemäß Anspruch 1, dadurch gekennzeichnet, daß der elektrische Schalter (34) ein Schaltelement aufweist, das von einem Schwinghebelement (41) gebildet wird, das in der Mitte im Gehäuse (2) schwenkbar gelagert ist und ein erstes Ende (41a) besitzt, das mit dem bistabilen Federplättchen (34b) verbunden ist und einen Teil (45) besitzt, um mit einer ersten Nockenfläche (46) des Schiebers (4) zusammenzuwirken, um den Schalter zu schließen, sowie ein zweites Ende (14b) besitzt, das mit einem Teil (46a) versehen ist, um mit einer zweiten Nockenfläche (47) des Schiebers (4) zusammenzuwirken, um den Schalter zu öffnen.

4. Verriegelung gemäß Anspruch 1, dadurch gekennzeichnet, daß die Steuer- und Programm-Einrichtung ein bistabiles Federplättchen (17) aufweist, das elektrisch mit dem ersten Anschluß (11) verbunden ist und einen bewegbaren Kontakt (20) bildet, um mit einem festen Kontakt (21) zusammenzuwirken, der mit dem dritten Anschluß (13) verbunden ist, sowie einen Metall-Schwingarm (24) aufweist, der im Gehäuse (2) schwenkbar gelagert ist und ein erstes Ende besitzt, um das bistabile Federplättchen (17b) zu betätigen, sowie ein zweites Ende (24b) besitzt, das mit der Bimetalleinrichtung (25) in Berührung steht, wobei der Schwinghebel (24) sowohl als elektrische Verbindung zwischen dem ersten Anschluß (11) und dem zweiten Anschluß

(12) mit dem dazwischenliegenden Widerstandsheizelement (27) sowie als Element wirkt, um das bistabile Federplättchen (17b) durch die Verformung der Bimetalleinrichtung (25) zu betätigen.

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5. Verriegelung gemäß Anspruch 4, dadurch gekennzeichnet, daß der bewegbare Kontakt (20) des bistabilen Federplättchens (17) der Steuer- und Programm-Einrichtung so aufgebaut ist, um mit einem festen Hilfskontakt (22) zusammenzuwirken, der mit einem vierten Anschluß (14) verbunden ist, um dann, wenn die Maschine abgeschaltet ist, ein Signal zu liefern, das anzeigt, daß die Maschine abgeschaltet ist.

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6. Verriegelung gemäß Anspruch 3, dadurch gekennzeichnet, daß die Verbindung zwischen dem ersten Ende (41a) des Schwinghebelelements (41) und dem bistabilen Federplättchen (34b) einen T-förmigen Stempel (43) aufweist, der mit dem ersten Ende (41a) verbunden und so aufgebaut ist, daß er durch eine entsprechende Öffnung (44) im bistabilen Federplättchen (34b) eingesetzt werden kann, wobei eine nachfolgende Drehung des Schwinghebelelements (41) das Schwinghebelelement und das Plättchen miteinander verbindet.

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7. Verriegelung gemäß Anspruch 4, dadurch gekennzeichnet, daß die Bimetalleinrichtung (25) enthält:

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ein Paar von Bimetall-Betätigungselementen (26), die mit gegenüberliegenden Flächen des Widerstandsheizelements (27) in Berührung stehen,

ein erstes und zweites Zwischenleiterelement (28a, 28b), die mit dem Bimetall-Betätigungselement (26) in Berührung stehen,

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ein Bimetall-Steurelement (29), das zwischen dem Gehäuse (30, 2) und dem ersten Leiterelement (28a) liegt und durch seine Erhitzung eine Verformung annehmen kann, die entgegengesetzt zur Verformung der Bimetall-Betätigungselemente (26) wirkt, wobei das zweite Zwischenleiterelement (28b) mit dem zweiten Ende (24b) des Schwinghebels (24) in Berührung steht.

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8. Verriegelung gemäß Anspruch 4, dadurch gekennzeichnet, daß die Bimetalleinrichtung (25) enthält:

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ein Paar von Bimetall-Betätigungselementen (26), die mit gegenüberliegenden Flächen des Widerstandsheizelements (27) in Berührung stehen,

ein Paar von brückenartigen Bimetall-Steurelementen (33), die Enden (33a) besitzen, die mit den Bimetall-Betätigungselementen (26) in Berührung stehen, wobei die Bimetall-Steuer-

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elemente (33) durch ihre Erhitzung eine Verformung annehmen können, die der Verformung der Bimetall-Betätigungselemente (26) entgegengesetzt ist.

Revendications

1. Verrouillage de porte pour une machine à laver ou un sèche-linge, comprenant :

- un boîtier de support qui est adapté pour être fixé à la machine et qui comporte au moins une première et une seconde bornes pour une connexion au système d'alimentation électrique lorsque la machine est mise en marche , et une troisième borne pour une connexion aux dispositifs électriques de la machine en vue de permettre leur alimentation ,
- un coulisseau de verrouillage qui est mobile par rapport au boîtier et adapté , dans une position de fonctionnement, pour maintenir la porte fermée,
- un dispositif de commande et de synchronisation logé dans le boîtier et comprenant un élément de chauffage résistant et un dispositif bimétallique qui peut être chauffé par l'élément résistant et déformé par suite de l'application d'une tension aux première et seconde bornes et, à l'état déformé, peut connecter la troisième borne à l'une des deux premières et maintenir un tenon d'arrêt en engagement avec le coulisseau de verrouillage pour maintenir celui-ci dans la position de fonctionnement,
- un capteur pour détecter le niveau d'eau dans la chambre de lavage , ledit capteur comportant une enveloppe définissant une chambre en communication d'écoulement de fluide avec la chambre de lavage et une membrane élastique connectée à un élément de butée mobile qui, en fonctionnement, peut assurer une position de repos lorsque l'eau de la chambre de lavage se trouve au-dessous d'un niveau prédéterminé , et une position de fonctionnement dans laquelle il est adapté pour bloquer le coulisseau de verrouillage dans la position de fonctionnement, lorsque l'eau de la chambre de lavage dépasse le niveau prédéterminé , et
- un commutateur électrique comportant une enceinte et comportant une paire de bornes pour une connexion aux dispositifs électriques de la machine afin de commander leur alimentation , le commutateur étant actionné par le coulisseau de verrouillage lorsque ce dernier se trouve dans la position de fonctionnement, caractérisé en ce que le boîtier de support (2) comporte des parois solidaires définissant la chambre de capteur (50) , la membrane élastique du capteur

étant intercalée de façon étanche entre les parois de boîtier définissant ladite chambre de capteur (50) et un élément de couvercle de boîtier (2a) et comportant une broche mobile constituant ledit élément de butée passant à travers un trou dans ledit élément de couvercle, le boîtier (2) et l'élément de couvercle de boîtier (2a) constituant également le logement dudit commutateur électrique (34, 37, 10).

2. Verrouillage selon la revendication 1, caractérisé en ce que le commutateur électrique (34) est du type à lame élastique bistable et comprend un élément de commutation constitué d'un levier (37) comportant une première extrémité (37a) articulée au boîtier (2) et une seconde extrémité (37b) en butée avec la lame élastique (34b), le levier (37) comportant également une partie opérationnelle (39) destinée à coopérer avec une partie de came (10) du coulisseau de verrouillage (4) pour fermer le commutateur lorsque le coulisseau (4) coulisse vers sa position opérationnelle.

3. Verrouillage selon la revendication 1, caractérisé en ce que le commutateur électrique (34) comprend un élément de commutation constitué d'un élément de levier interrupteur (41) pivotant en son centre sur le boîtier (2) et comportant une première extrémité (41a) connectée à la lame élastique bistable (34b) et prévue avec une partie (45) destinée à coopérer avec une première surface de came (46) du coulisseau (4) en vue de fermer le commutateur, et une seconde extrémité (14b) prévue avec une partie (46a) destinée à coopérer avec une seconde surface de came (47) du coulisseau (4) pour ouvrir le commutateur.

4. Verrouillage selon la revendication 1, caractérisé en ce que le dispositif de commande et de synchronisation comprend une lame élastique bistable (17) qui est connectée électriquement à la première borne (11) et définit un contact mobile (20) pour coopérer avec un contact fixe (21) connecté à la troisième borne (13), et un levier interrupteur métallique (24) pivotant sur le boîtier (2) et comportant une première extrémité pour actionner la lame élastique bistable (17b) et une seconde extrémité (24b) en contact avec le dispositif bimétallique (25), le levier interrupteur (24) agissant à la fois en tant que connexion électrique entre la première borne (11) et la seconde borne (12) avec l'interposition de l'élément de chauffage résistant (27), et comme élément destiné à actionner la lame bistable élastique (17b) en conséquence de la déformation du dispositif bimétallique (25).

5. Verrouillage selon la revendication 4, caractérisé en ce que le contact mobile (20) de la lame élastique

bistable (17) du dispositif de commande et de synchronisation est adapté pour coopérer, lorsque la machine est arrêtée, avec un contact auxiliaire fixe (22) connecté à une quatrième borne (14) pour fournir un signal indicateur du fait que la machine est à l'arrêt.

6. Verrouillage selon la revendication 3, caractérisé en ce que la connexion entre la première extrémité (41a) de l'élément de levier interrupteur (41) et la lame élastique bistable (34b) comprend un ergot configuré en T (43) connecté à la première extrémité (41a) et adapté pour être inséré à travers une ouverture correspondante (44) dans la lame élastique bistable (34b), la rotation consécutive de l'élément de levier interrupteur (41) connectant ensemble l'élément de levier interrupteur et la lame.

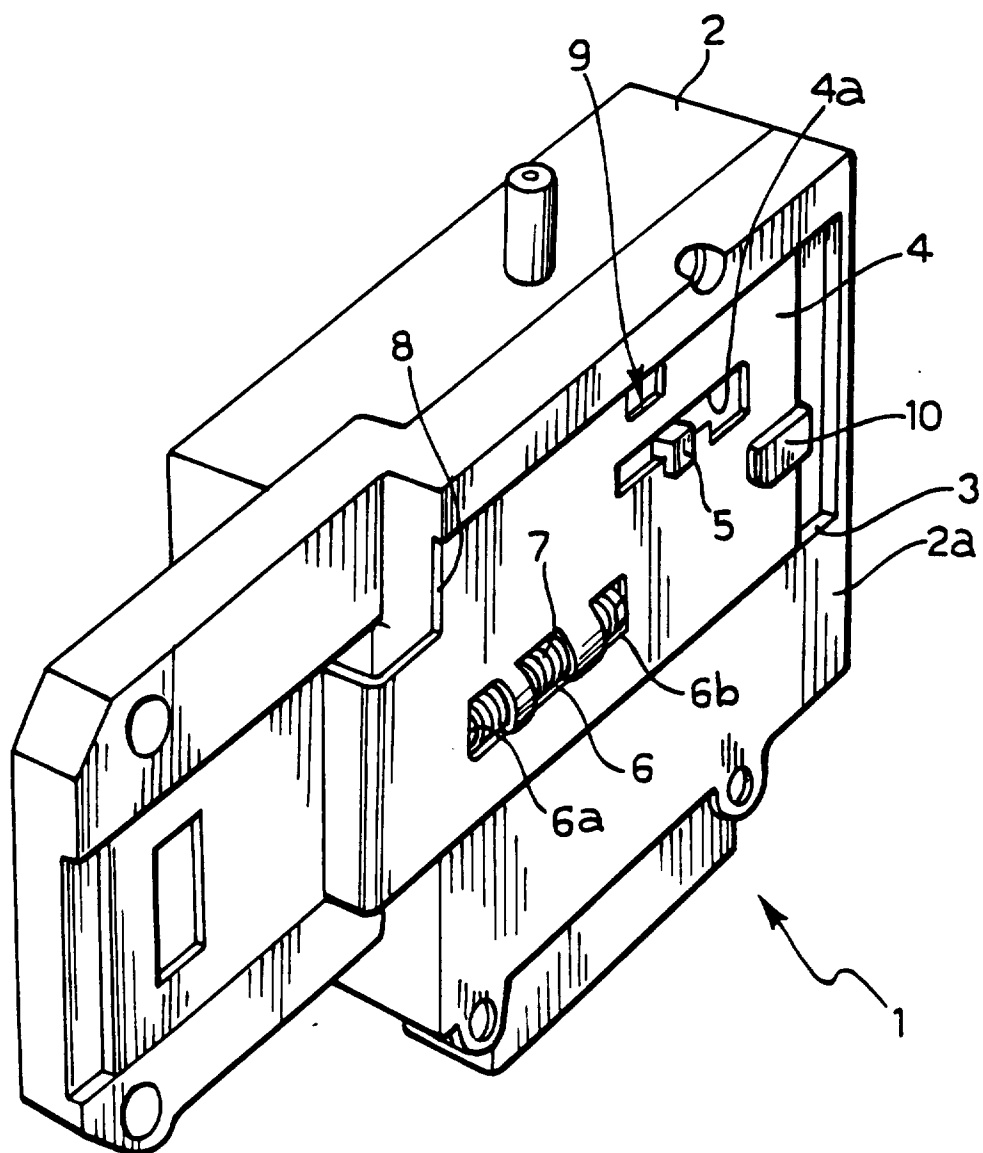
7. Verrouillage selon la revendication 4, caractérisé en ce que le dispositif bimétallique (25) comprend :

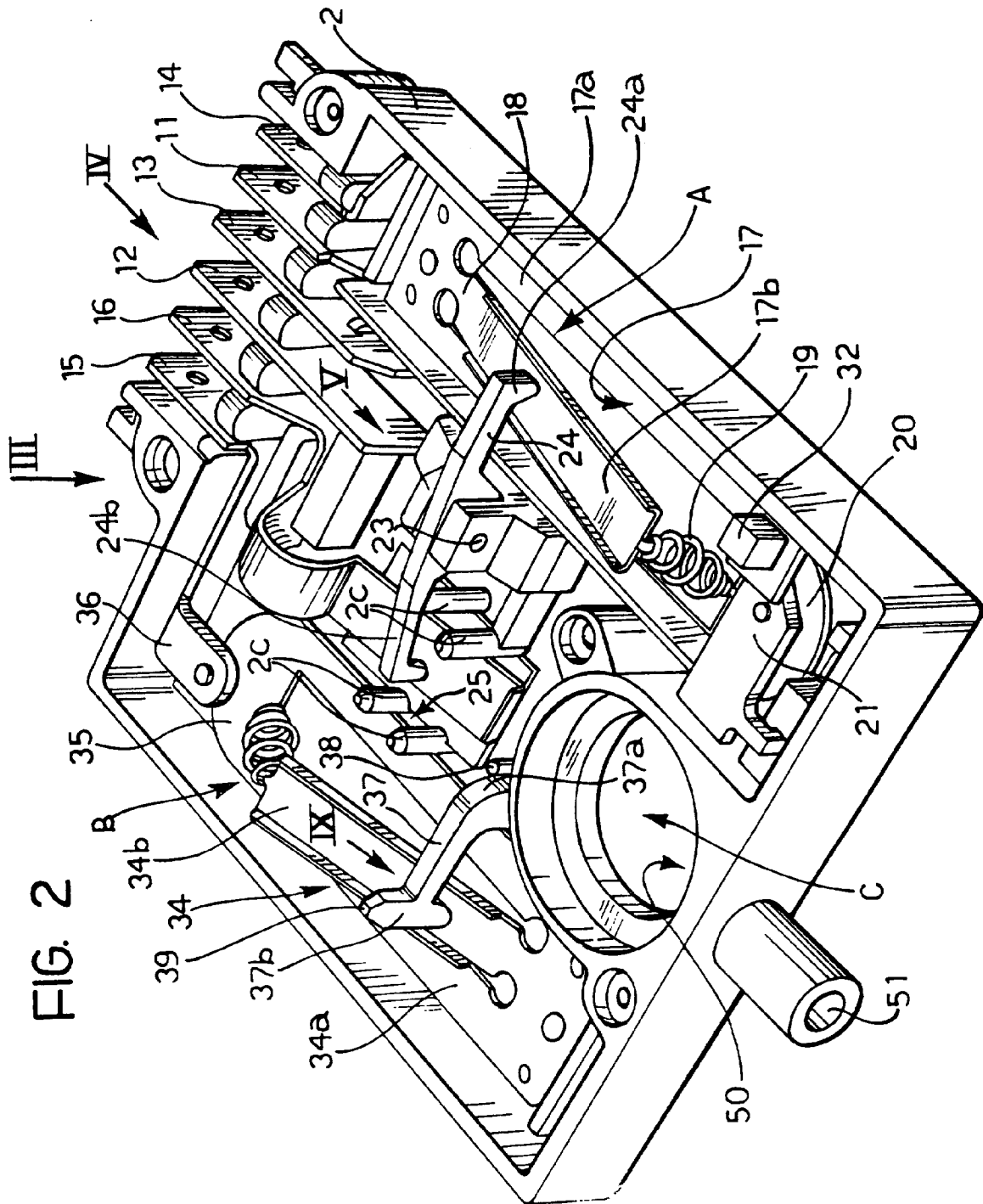
- une paire d'éléments actifs bimétalliques (26) en contact avec les faces opposées de l'élément de chauffage résistant (27),
- un premier et un second éléments conducteurs intermédiaires (28a, 28b) en contact avec l'élément actif bimétallique (26),
- un élément de commande bimétallique (29) qui est interposé entre le boîtier (30, 2) et le premier élément conducteur (28a) et, en conséquence de son chauffage, peut assurer une déformation ayant un effet opposé à celui des éléments actifs bimétalliques (26), le second élément conducteur intermédiaire (28b) étant en contact avec la seconde extrémité (24b) du levier interrupteur (24).

8. Verrouillage selon la revendication 4, caractérisé en ce que le dispositif bimétallique (25) comprend :

- une paire d'éléments actifs bimétalliques (26) en contact avec les faces opposées de l'élément de chauffage résistant (27),
- une paire d'éléments de commande bimétalliques configurés en pont (33) comportant des extrémités (33a) qui sont en contact avec les éléments actifs bimétalliques (26), les éléments de commande bimétalliques (33) étant capables, du fait de leur chauffage, d'assurer une déformation présentant l'effet opposé à celui des éléments actifs bimétalliques (26).

FIG. 1





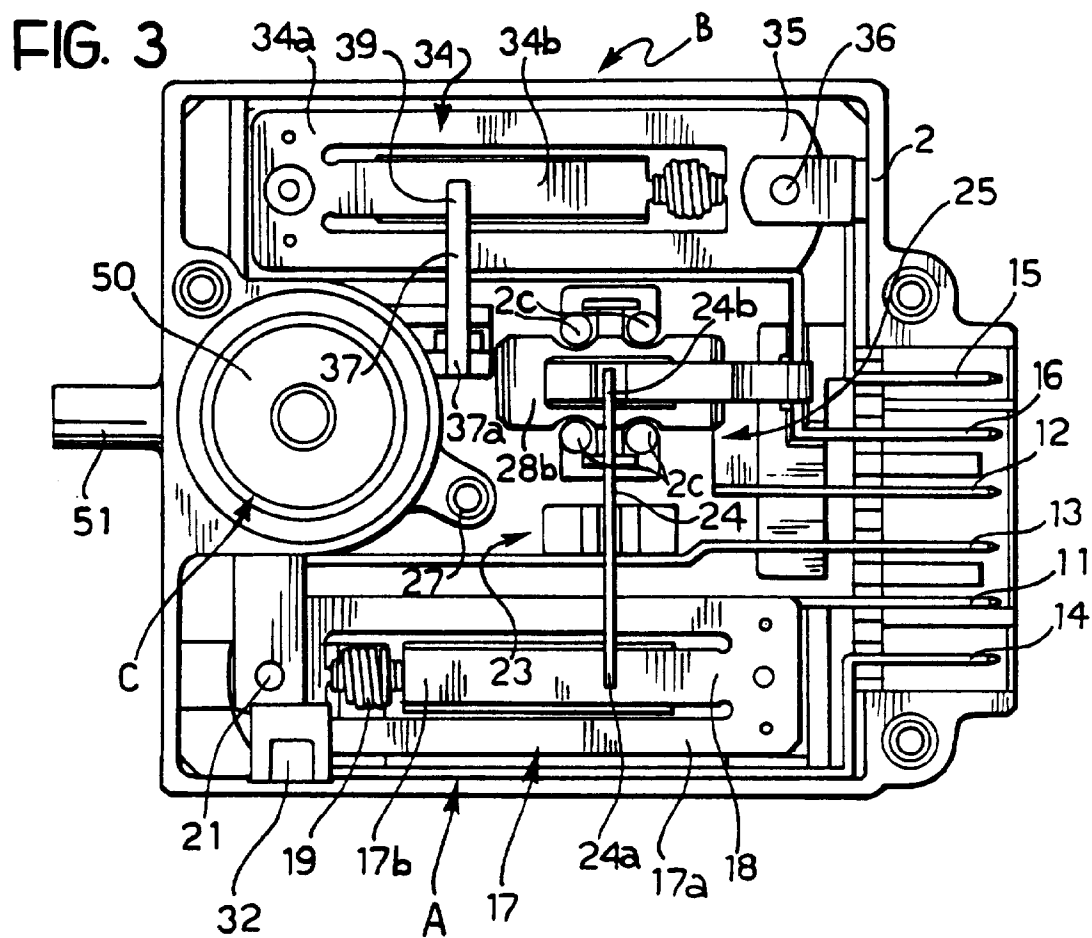


FIG. 4

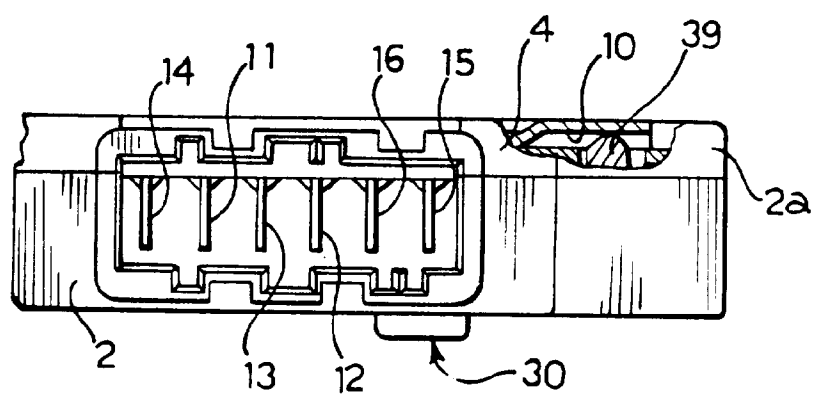


FIG. 5

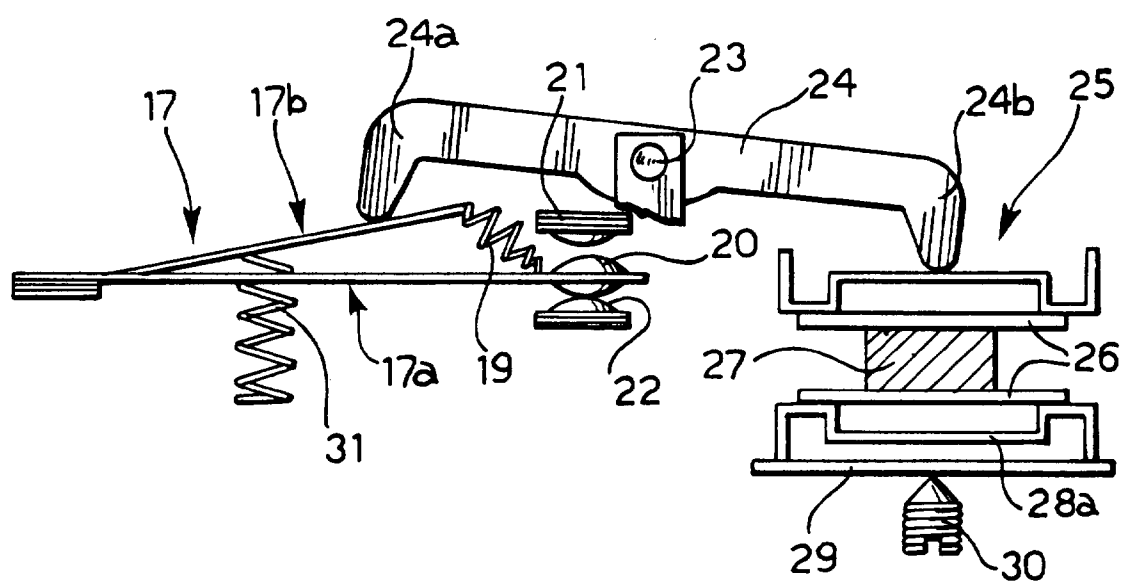


FIG. 6

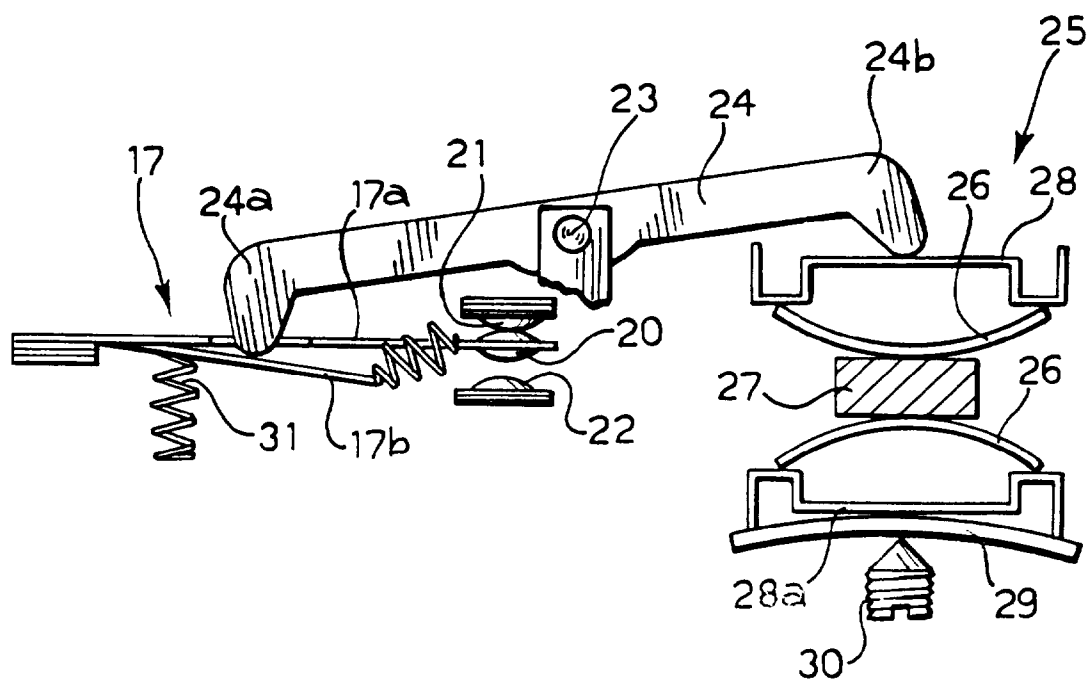


FIG. 7

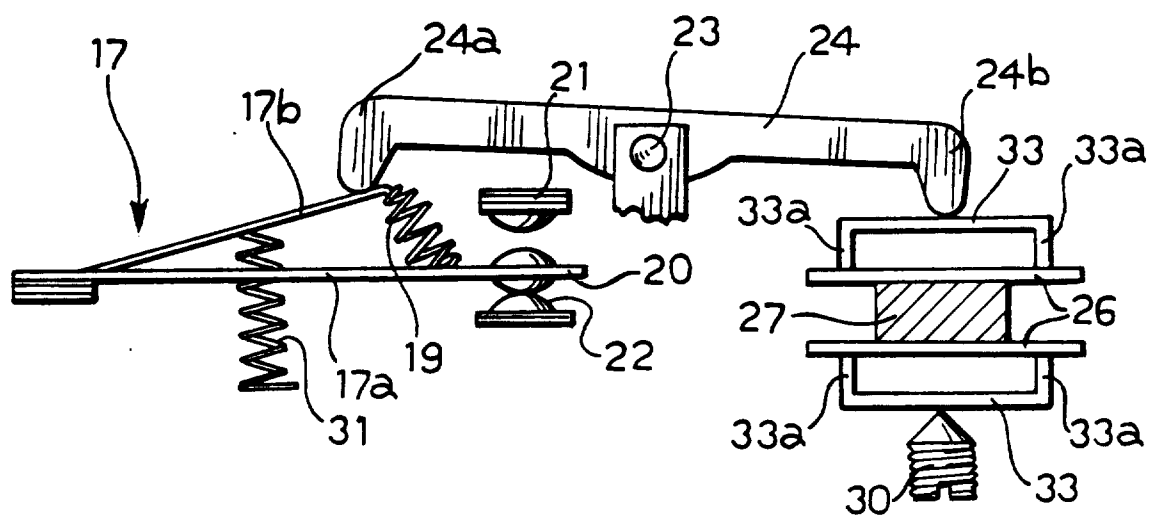


FIG. 8

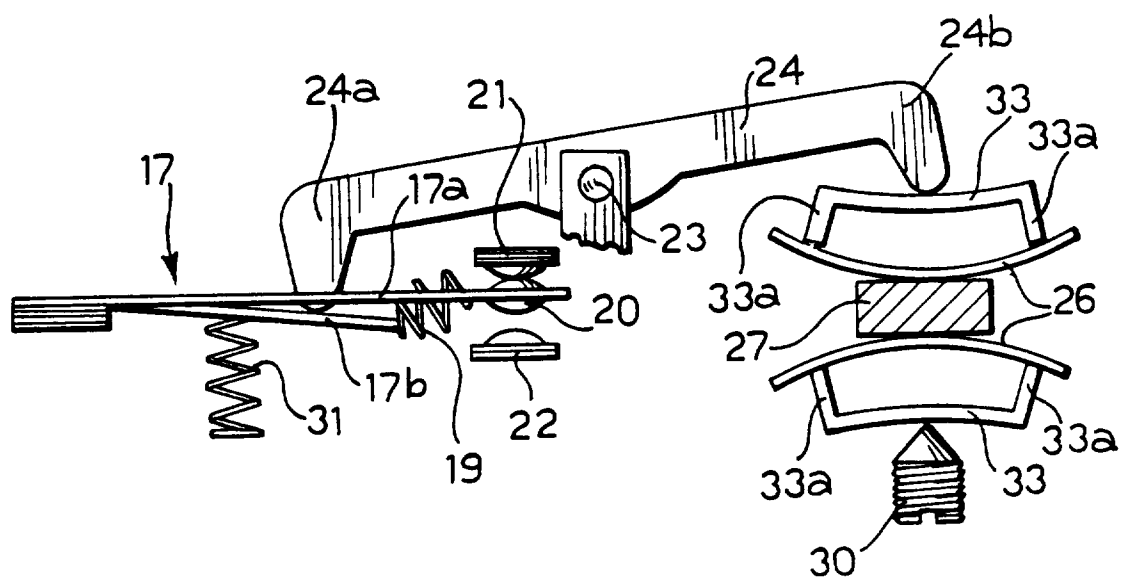


FIG. 9

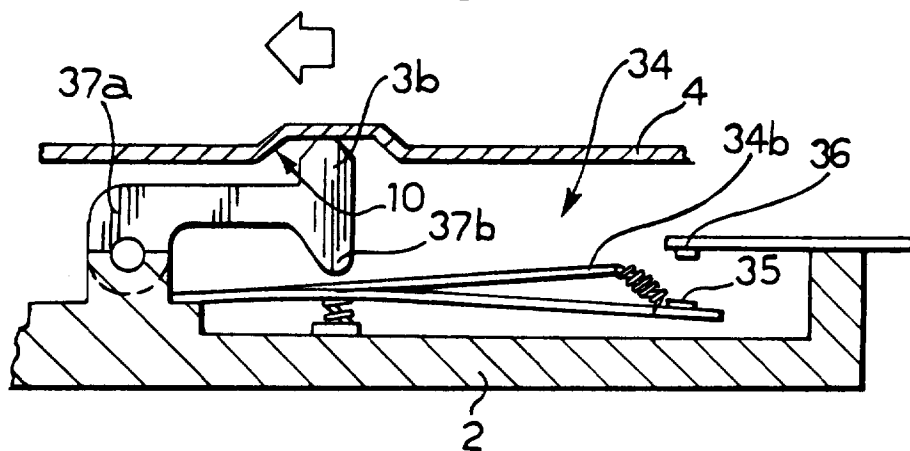


FIG. 10

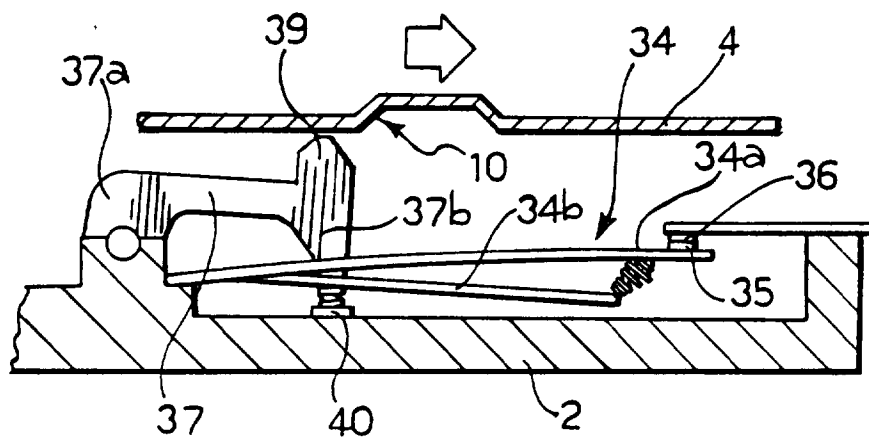


FIG. 13

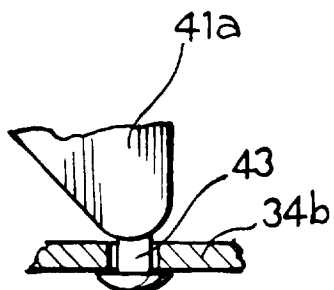
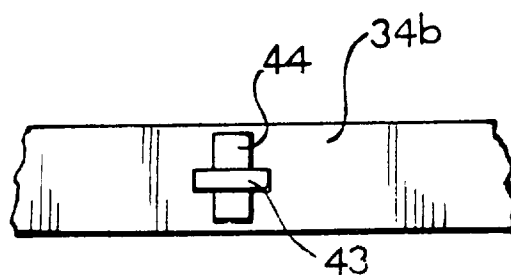


FIG. 14



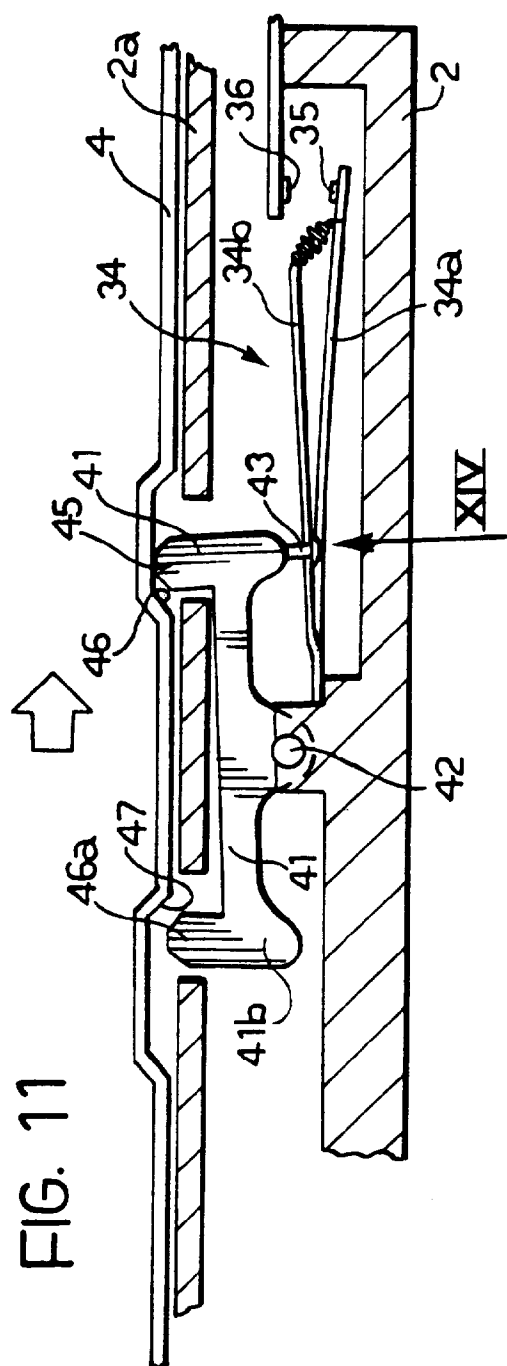


FIG. 12

