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(54) A domestic drying machine for laundry provided with an improved safety device.

(57) A front-loading drying machine for laundry provided with a safety device involving a mechanical transmission system 27, 28, 30, 33, adapted to connect the starting key 22 housed in the panel 17 of the machine 10 with a two-armed lever pivoted oscillatingly in the vicinity of the opening for introducing the stop catch of the door 14 into the cabinet, where said stop catch cooperates with a bolt.

The mechanical transmission system 27, 28, 30, 33, holds the lever in a position permitting introduction of the stop catch into the corresponding opening in the cabinet only when the starting key 22 of the machine 10 is switched off.

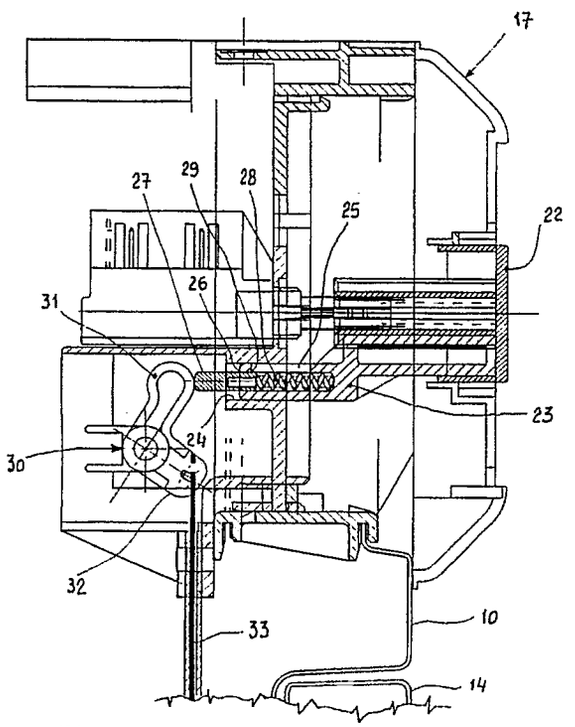


FIG. 2

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A domestic drying machine for laundry provided with an improved safety device

The present invention relates to a drying machine for laundry provided with an improved safety device, in particular a domestic drying machine for laundry comprising an outer cabinet, an operating panel housing a key for starting the machine, a drum for the laundry supported within the cabinet of the machine so as to rotate about a horizontal axis and provided with a front loading opening aligned with a corresponding opening in the outer cabinet. The door for closing the loading openings is hinged on the front wall of the outer cabinet and is generally provided with a stop catch to be introduced into a corresponding opening in a bolt means housed in the cabinet of the machine. The closing door also has safety means associated therewith, e.g. microswitches or the like, which are adapted to disallow or interrupt the energy supply to the machine if the closing door is not completely closed or is opened during operation of the machine. The loading openings for the laundry formed in the front walls of the cabinet and the drum are generally realized in an almost circular shape and with a diameter between 30 and 35 centimeters in order to facilitate the operations of loading and unloading the laundry.

These particularly ample dimensions of the loading openings make it necessary to adopt safety devices adapted to prevent improper use of the aforesaid drying machine by children.

Such safety devices must guarantee the possibility of opening the door of the machine by exerting a direct force on it from the inside toward the outside of the machine and, at the same time, must prevent operation of the machine whenever the door of the loading opening is not completely closed.

The first safety function is generally obtained by giving the stop catch of the closing door sloping surfaces so as to allow for a forcing of the blocking action of the bolt incorporated in the machine.

For the second safety function, British patent application no. 2 107 383 discloses a mechanism for blocking the door of a drying machine whose stop catch cooperates with a rocking lever pivoted in the slide of the bolt. When the door of the machine is closed, the rocking lever moves an oscillating microswitch and the machine to start.

When the door is opened, the rocking lever switches off the microswitch and interrupts the operation of the machine.

German patent application no. 3 501 538 discloses a mechanism for interconnecting the starting key of the machine and the stop catch of the closing door.

In this case as well, the stop catch cooperates with a rocking lever pivoted behind the operating panel so as to allow the starting key to be activated only when the door of the machine is completely closed.

Furthermore, an alarm signal is used for attracting the attention of the user in case the door is accidentally opened.

However, the described devices are not sufficiently safe.

It may happen that children force open the door of the drying machine while it is in operation, thereby interrupting its operation.

After that a child may climb into the drum of the machine and the door closed again by the children outside the machine.

One can readily imagine the consequences of thereafter starting the machine again.

In addition, it may happen that the child trapped in the drum does not succeed, for various reasons, in forcing open the door of the machine. It would therefore be favorable, and is the major goal of the invention, to equip such drying machines with a safety device which, after accidental opening of the door, makes it impossible to immediately close the door and start the machine again unless the user takes steps to restore the correct conditions for use of the drying machine.

This and other goals are achieved by the drying machine having the features as claimed below.

These features will now be described with the aid of the adjoined drawings, in which

Fig. 1 shows a domestic drying machine provided with the inventive safety device;

Figs. 2 and 3 show longitudinal cross-sections of the operating panel and the means for closing the door, respectively, with the machine in a state of rest with the door closed;

Figs. 4 and 5 show sections analogous to those of Figs. 2 and 3 still in a state of rest but with the door open;

Figs. 6 and 7 show the same sectional views as the preceding figures but with the machine in operation with the door closed;

Figs. 8 and 9 show the same sectional views as the preceding figures with the machine in operation and the door open.

Drying machine 10 shown in Fig. 1 comprises an outer cabinet 11 supporting a drum 12 therein, in such a way that it rotates about a horizontal axis, to contain the laundry to be dried.

Drum 12 and cabinet 11 of the machine are provided with loading openings formed concentrically on their front side and both shown with reference number 13.

Openings 13 can be closed by means of a

door 14 hinged in cabinet 11 of machine 10 about a vertical axis.

Door 14 is provided with a stop catch 15 adapted to be inserted into an opening 16 in the cabinet of the machine to cooperate with the blocking means which will be described in the following.

The upper part of the front side of machine 10 is provided with an operating panel 17 including a program knob 18, control keys 19 and display lights 20.

Control keys 19 comprise a door opening key 21 and a starting key 22 for machine 10.

As can be seen in Figs. 2, 4, 6, 8, starting key 22 is integral with a cylindrical extension 23 sliding horizontally within a corresponding guide 24 formed in the body of panel 17.

Cylindrical extension 23 is hollow and has an upper opening 25 and an opening 26 in correspondence with its free end, said openings being adapted to permit introduction and accommodation, in sliding fashion, of an elastic pusher 27 and the corresponding pressure spring 28, respectively.

Elastic pusher 27 is pressed continuously by spring 28 and slides toward the outside of cylindrical extension 23.

Furthermore, the upper side of pusher 27 is provided with a stop tooth 29 adapted to form an end stop on the edge of upper opening 25 of cylindrical extension 23. In the rear part of panel 17 and in the vicinity of pusher 27, a first two-armed lever 30 is pivoted in oscillating fashion about a horizontal axis.

Upper arm 31 of lever 30 contacts continuously elastic pusher 27, while lower arm 32 is connected by means of a cord 33 or the like with a blocking tappet 34 housed slidingly on one side of guide casing 35 of bolt 36 (Figs. 3, 5, 7, 9).

Blocking tappet 34 slides in guides 37 formed transversely in casing 35 of bolt 36 and is L-shaped, its upper end 38 being anchored on cord 33 and equipped with a stop pin 39 adapted to be inserted into a corresponding groove 40 formed in the side of bolt 36.

Lower end 41 of blocking tappet 34 constitutes a support seat for one end of a return spring 42 less rigid than spring 28. The other end of return spring 42 is engaged above a shoulder 43 formed on the outer side of guide casing 35 of bolt 36.

Bolt 36 is conventionally composed of an element sliding vertically within its guide casing 35 and provided with stop surfaces or end stops 44.

On the side facing opening 16 (Fig. 1) in the cabinet of machine 10, bolt 36 is provided with a horizontal arm 45 (Figs. 3, 5, 7, 9) adapted to engage in the known way a groove with sloping surfaces (not shown) formed on stop catch 15 of door 14 (Figs. 1, 3, 7).

The upper end of bolt 36 is connected by means of a cord 46 with door-opening button 21 housed in panel 17. A compression spring 47 is interposed between the upper end of bolt 36 and the inside top of casing 35 for continuously pushing bolt 36 and corresponding arm 45 into the engagement position (Figs. 3, 7) of stop catch 15 of door 14.

When door-opening button 21 is pressed, cord 46 is urged to overcome the resistance of spring 47 and to raise bolt 36 and corresponding arm 45 from the engagement position of stop catch 15.

Consequently, door 14 of machine 10 opens under the elastic push of the seal of door 14 or of other elastic means known in technology.

Drying machine 10 is also provided, in a known way that is not shown, with a microswitch located in the vicinity of loading openings 13 and adapted to permit operation of the machine only when door 14 is completely closed.

A second two-armed lever 48 is pivoted below bolt 36 so as to oscillate about a horizontal axis (Figs. 3, 5, 7, 9), its lower arm 49 having its free end shaped as a fork 50, while its upper arm 51 extends with its free end to partly occupy the inside width of opening 16 for stop catch 15.

The forked end 50 of lower arm 49 of lever 48 is adapted to engage slidingly the edge of lower end 41 of blocking tappet 34 in such a way that a counterclockwise oscillation of lever 48 causes blocking tappet 34 to slide upward in contrast with the action of return spring 42.

The operation of the described elements will now be explained first with reference to Figs. 2 and 3, in which machine 10 is in a state of rest with door 14 closed. In Fig. 2 starting button 22 is switched off and, in Fig. 3, stop catch 15 of door 14 is closed by arm 45 of bolt 36. In Fig. 3 one can also see that upper arm 51 of lever 48 is held in a position permitting the passage of catch 15 by means of forked end 50 of arm 49 of lever 48.

In this state, the elastic system comprising pressure spring 28, pusher 27, lever 30, cord 33, blocking tappet 34 and return spring 24 is in a state of balance.

To introduce the laundry into drum 12 of machine 10 it is necessary to open door 14 by pressing door-opening button 21.

Consequently (Figs. 4, 5), nothing changes in the rear part of panel 17 (Fig. 4), while in the closing zone of door 14 (Fig. 5) catch 15 is released from opening 16 due to the raising of bolt 36 and of its arm 45.

Once door-opening button 21 is released, bolt 36 is lowered again by the action of spring 47.

After the laundry is loaded and door 14 closed, the state already described for Figs. 2 and 3 is restored.

Starting machine 10 by means of button 22, we

obtain the situation shown in Figs. 6 and 7, where one can see that there are no changes in the closing zone of door 14 (Fig. 7), while in the rear zone of panel 17 (Fig. 6) cylindrical extension 23 has followed the sliding motion of button 22 toward the inside of machine 10, causing pusher 27 to move in the opposite direction and thereby compressing pressure spring 28.

In this state, the above-described elastic system between pressure spring 28 and return spring 42 is no longer in a state of balance due to the predominant force of pressure spring 28 over that of return spring 42.

Nevertheless, there is no oscillation of first two-armed lever 30 since forked end 50 of second two-armed lever 48 prevents any shift of blocking tappet 34 and of cord 33 which is in turn blocked from oscillation by stop catch 15.

If a child happens to press door-opening button 21 or force open door 14 of machine 10 during the operation of the machine, the already-mentioned safety microswitch immediately interrupts the operation of the machine. At the same time, stop catch 15 is discharged from opening 17 and permits oscillation in the counterclockwise direction of second two-armed lever 48 under the push exerted thereon by spring 28 via pusher 27, first two-armed lever 30, cord 33 and blocking tappet 34.

When this happens, the situation arises that is illustrated in Figs. 8 and 9, in which one can see that pressure spring 28 (Fig. 8) is relaxed, thereby causing first two-armed lever 30 to oscillate in the counterclockwise direction and, through the traction of cord 33, subsequently raising blocking tappet 34 in order to obtain the insertion of its stop pin 39 into corresponding groove 40 in bolt 36.

In this way, upper arm 51 of second two-armed lever 48 occupies the inside width of opening 16 and prevents door 14 from closing again. This expedient avoids the adverse consequences described in the introduction to this invention.

Door 14 cannot be closed again and machine 10 put back into operation until the latter is returned to a correct state of use.

To do this, the user must first switch off starting button 22.

Thereafter, first two-armed lever 30 releases cord 33, blocking tappet 34 can be returned downward by spring 42 and causes second two-armed lever 48 to oscillate in the clockwise direction. The oscillation of lever 48 raises its upper arm 51 into a position permitting introduction of stop catch 15 into corresponding opening 16 of cabinet 11.

Door 14 can then be closed again, so that machine 10 can be started by pressing button 22.

One thus achieves the major goal of the invention of realizing a safety device which, if the operation of drying machine 10 is interrupted by the incidental opening of door 14, prevents the machine from being started again by merely closing door 14, and obliges the user to take further steps to restore the correct state of use of the machine.

Claims

1. A drying machine for laundry, in particular a domestic drying machine for laundry comprising an outer cabinet, an operating panel housing control and display elements and a key for starting the machine, a drum for the laundry supported within the cabinet of the machine so as to rotate about a horizontal axis and provided with a loading opening aligned with a corresponding opening in the outer cabinet of the machine, a door for closing the loading openings hinged to the front wall of the outer cabinet and provided with a stop catch to be introduced into a corresponding opening in a bolt means housed in the cabinet of the machine, safety means adapted to interrupt the operation of the machine whenever the door is not in a position so as to close the loading openings, characterized in that the starting key (22) is connected, by means of a mechanical transmission system (27, 28, 30, 33, 34, 42), to a two-armed lever (48) pivoted so as to oscillate within the cabinet (11) of the machine (10) and in the vicinity of the opening (16) for introduction of the stop catch (15) of the door (14) in such a way that the mechanical system (27, 28, 30, 33, 34, 42) holds the lever (48) in a position permitting the introduction of the stop catch (15) into the corresponding opening (16) in the bolt (36) only when the starting key (22) is in a position of rest.

2. The drying machine of claim 1, characterized in that the mechanical transmission system comprises an elastic pusher (27) and the corresponding compression spring (28) both housed slidingly within a cylindrical extension (23) integral with the starting key (22) and sliding within a guide (24) in the body of the panel (17), a two-armed lever (30) pivoted in the rear part of the panel (17) and having an arm (31) in continuous contact with the pusher (27), and an arm (32) connected by means of a cord (33) with the upper end (38) of a blocking tappet (34) housed slidingly within guides (37) formed transversely within the guide casing (35) of the bolt (36), and provided with a stop pin (39) adapted to be inserted into a corresponding groove (40) in the side of the bolt (36), a return spring (42) less rigid than the spring (28) and interposed between the lower end (41) of the blocking tappet (34) and a shoulder (43) formed on the outer side of the guide casing (35) of the bolt (36), the lower end (41) of the blocking tappet (34) being slidingly connected with an arm (49) of the two-armed lever (48) to make the other arm (51) of the

lever (48) oscillate between a position permitting introduction of the stop catch (15) into the corresponding opening (16) when the starting key (22) is switched off, and a position blocking the opening (16) due to the door (14) of the machine (10) being opened with the starting key (22) in a switched on position.

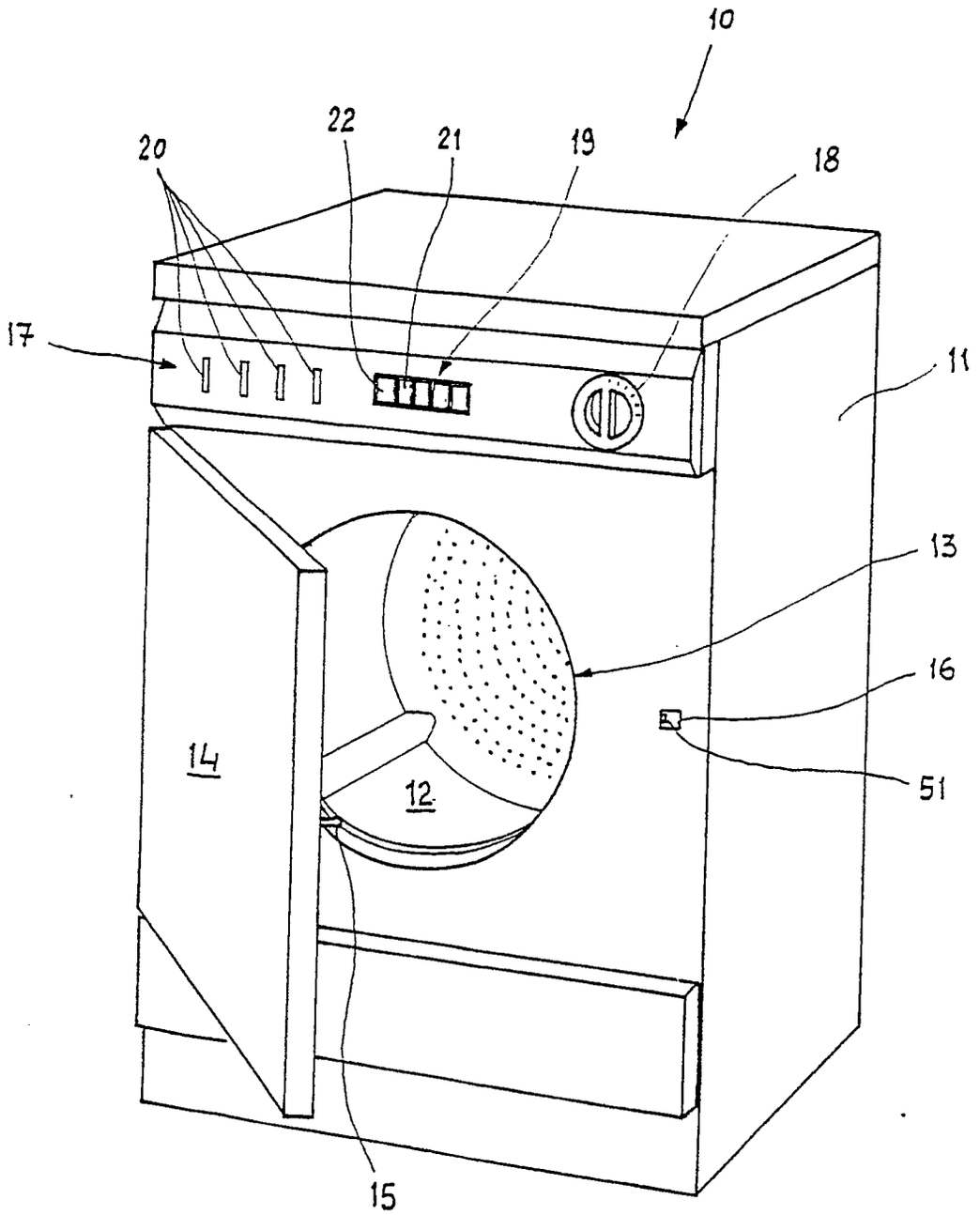


FIG. 1

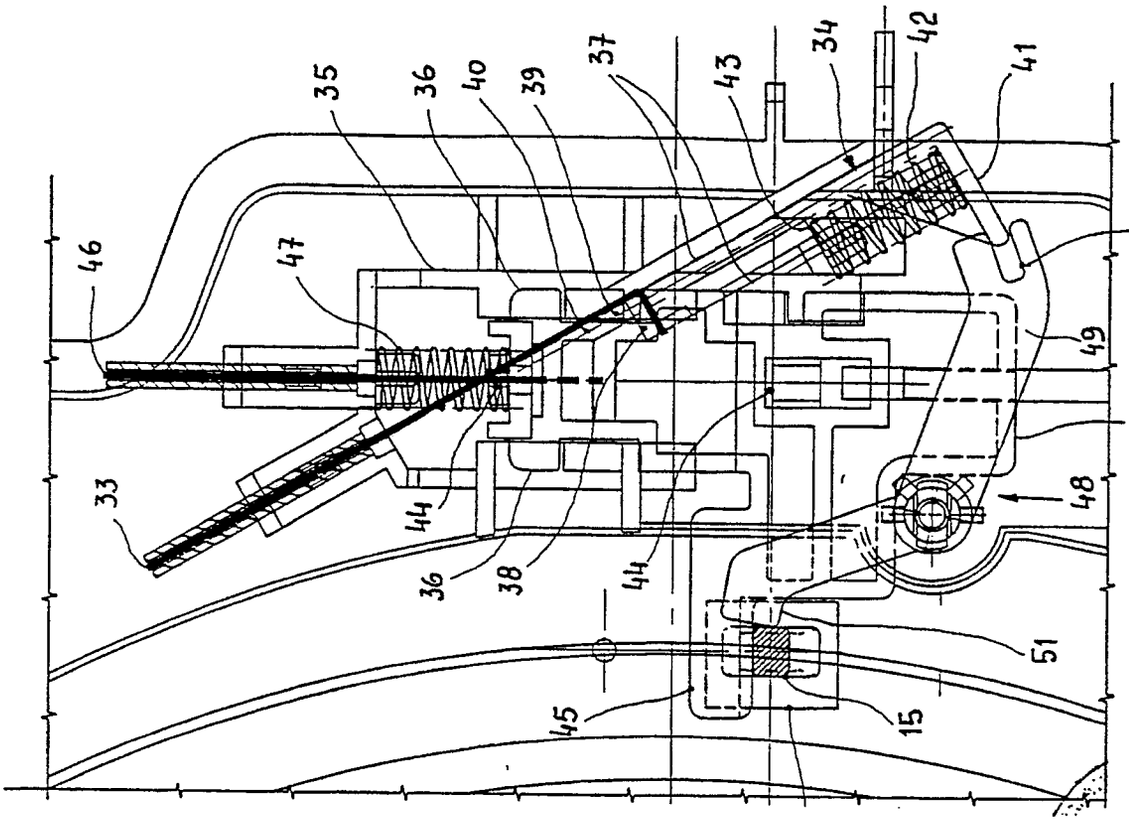

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FIG. 3

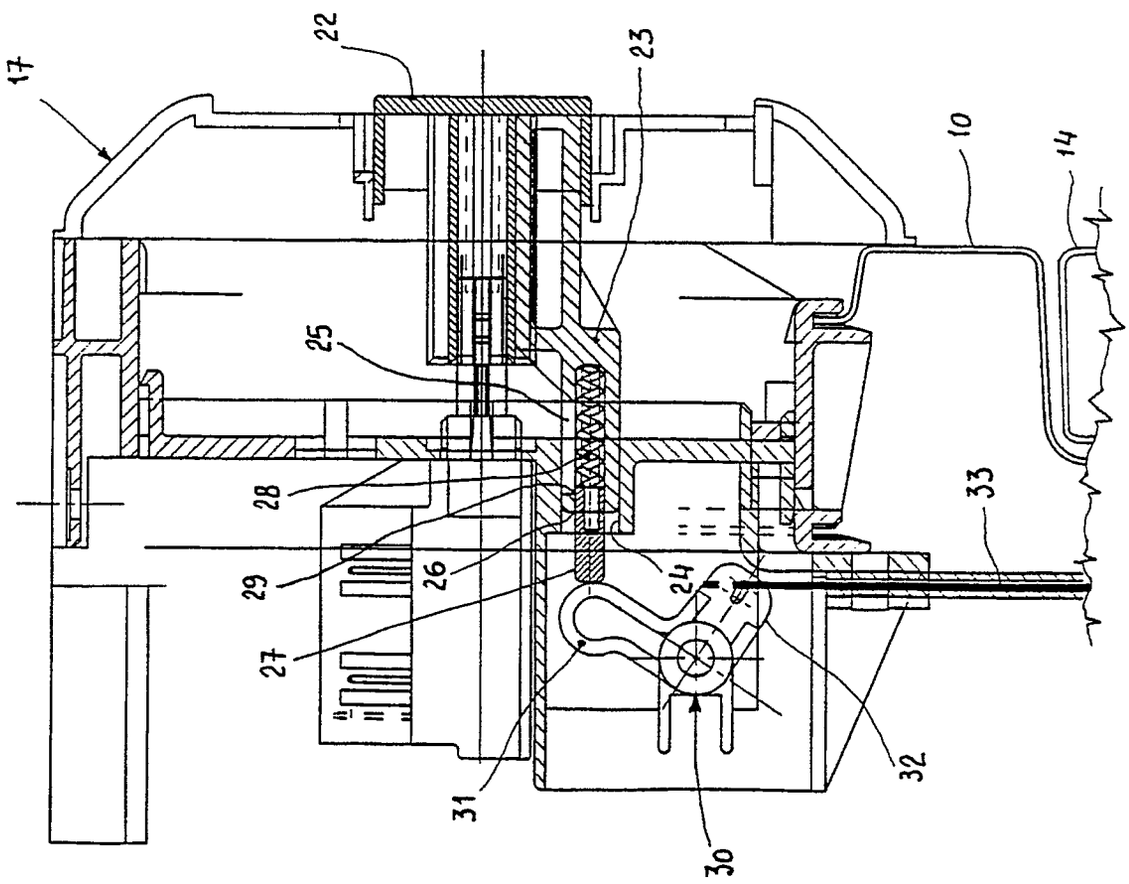

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FIG. 2

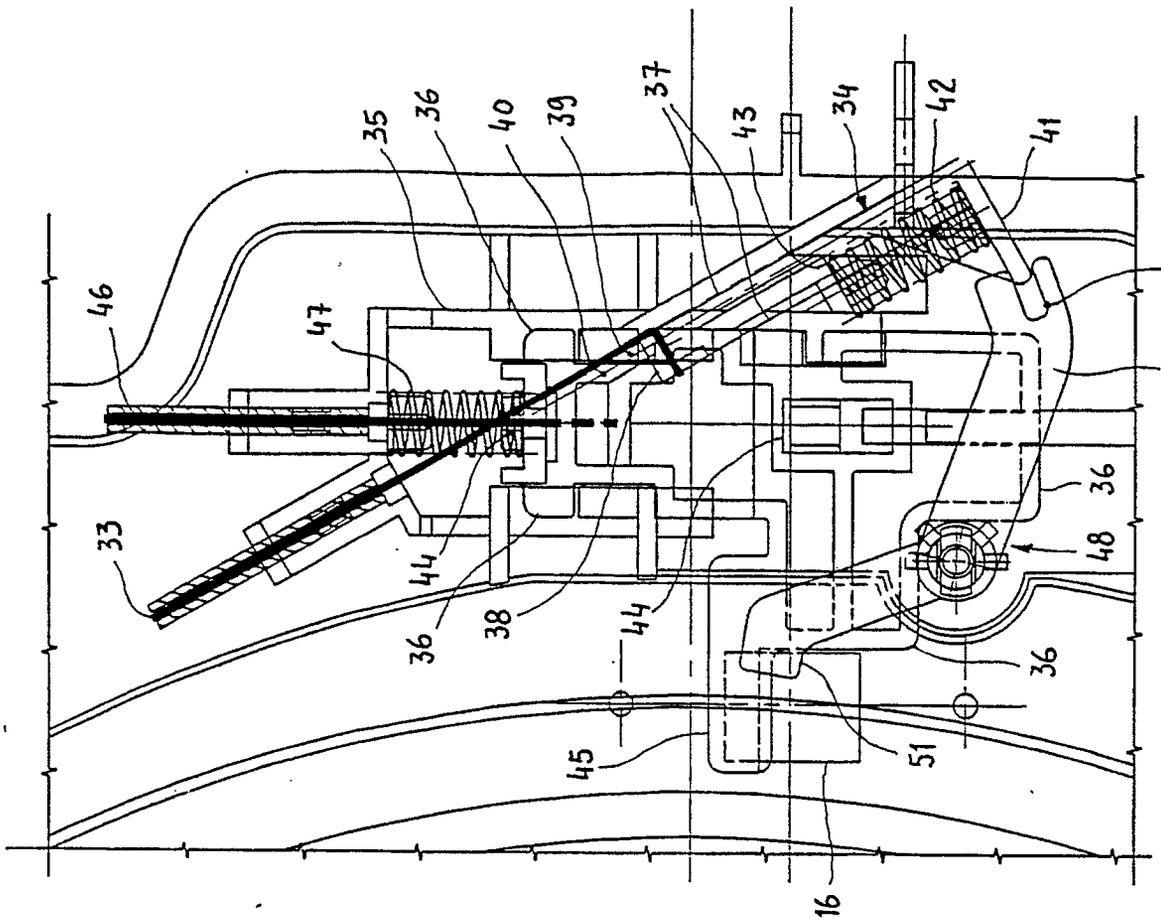

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FIG. 5

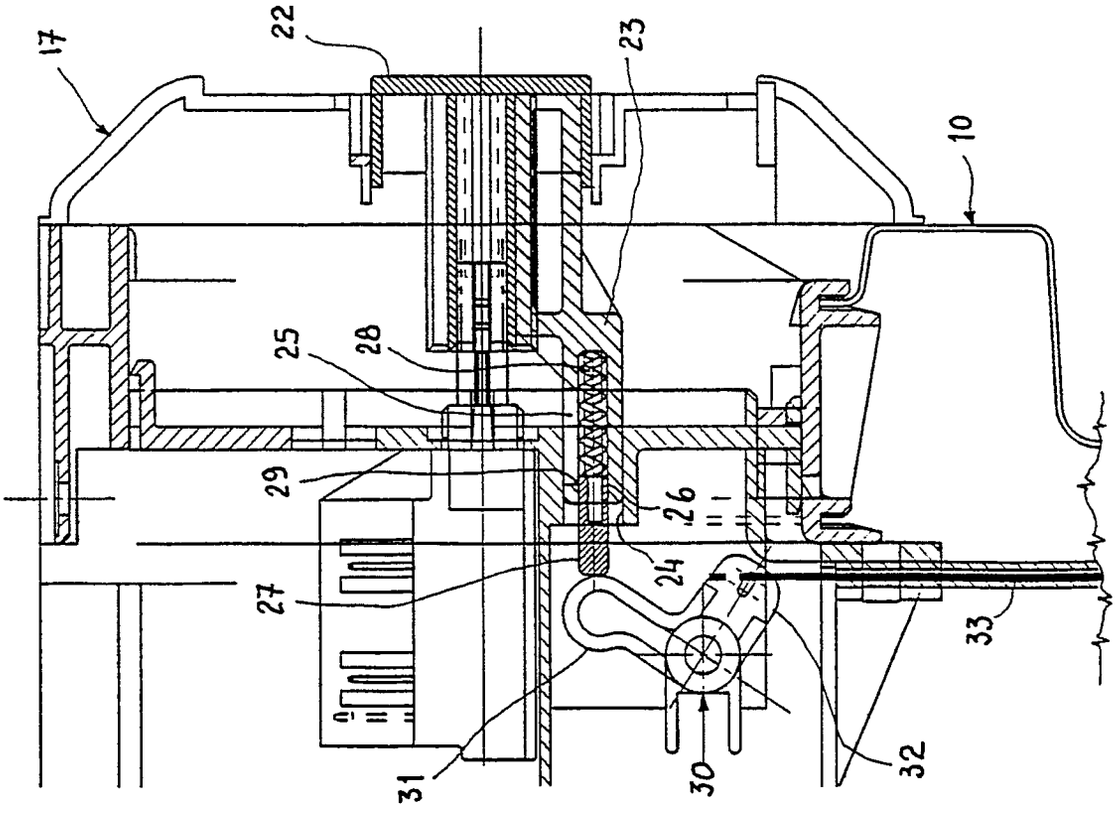

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FIG. 4

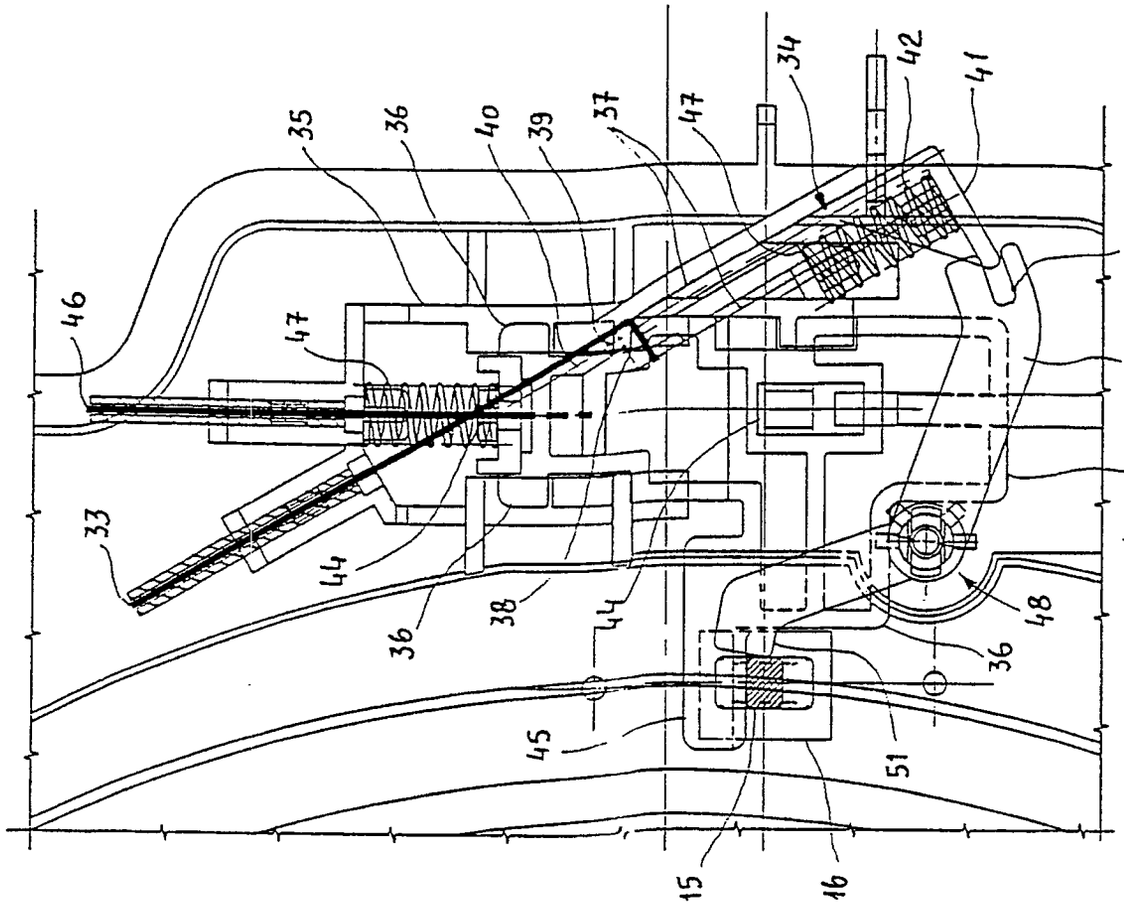

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FIG. 7

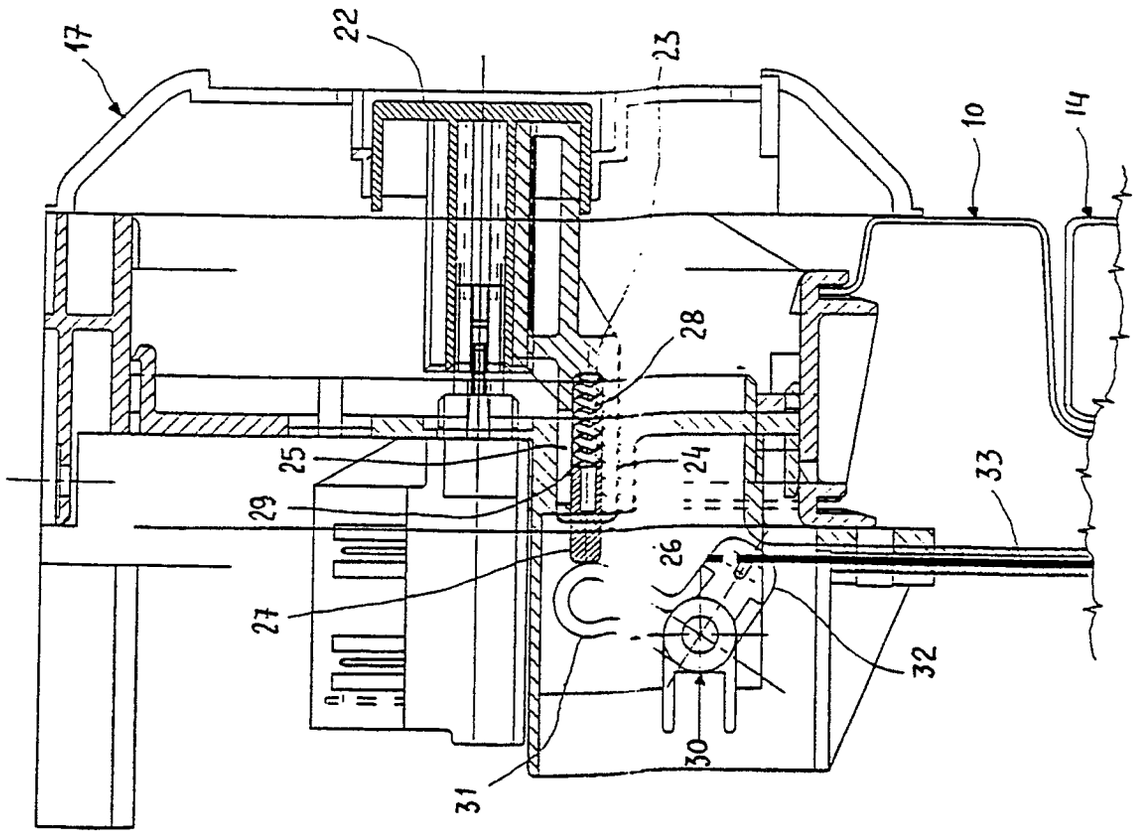

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FIG. 6

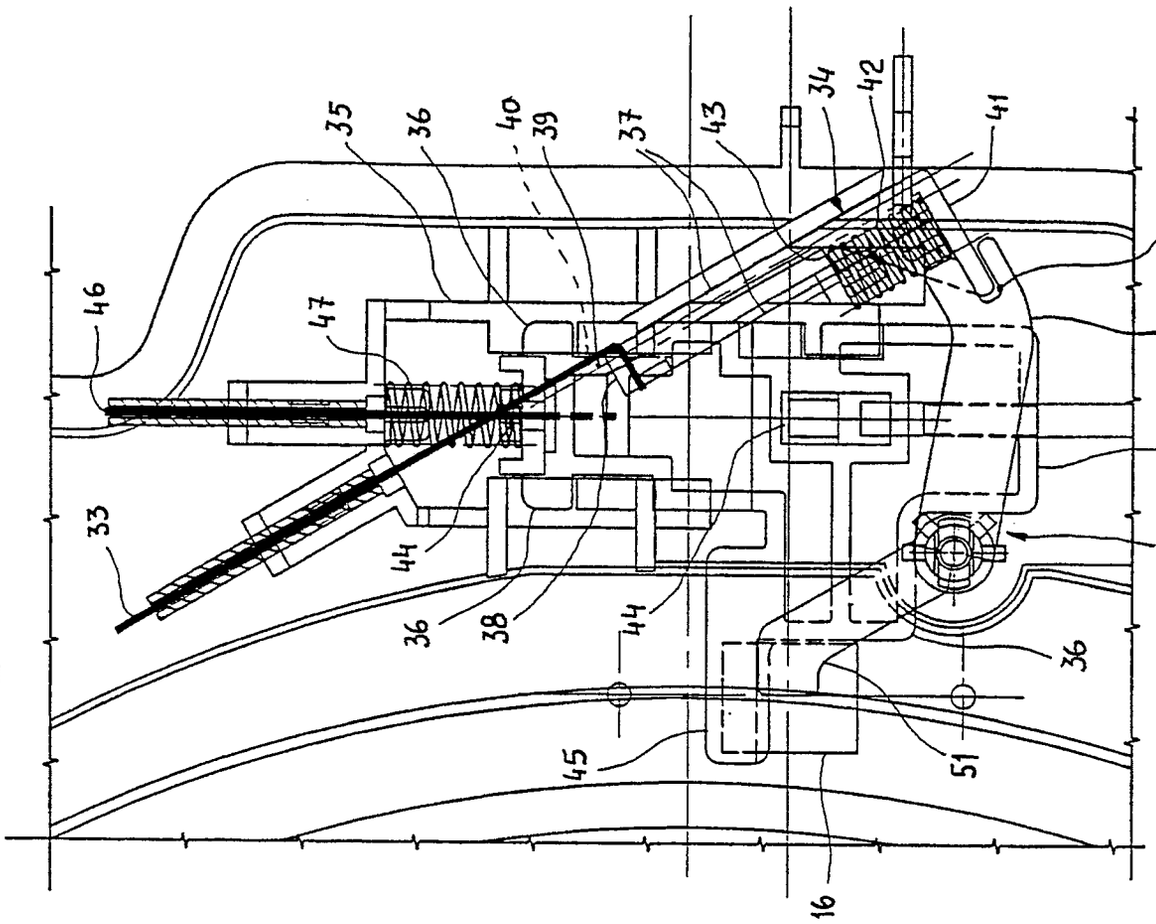

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FIG. 9

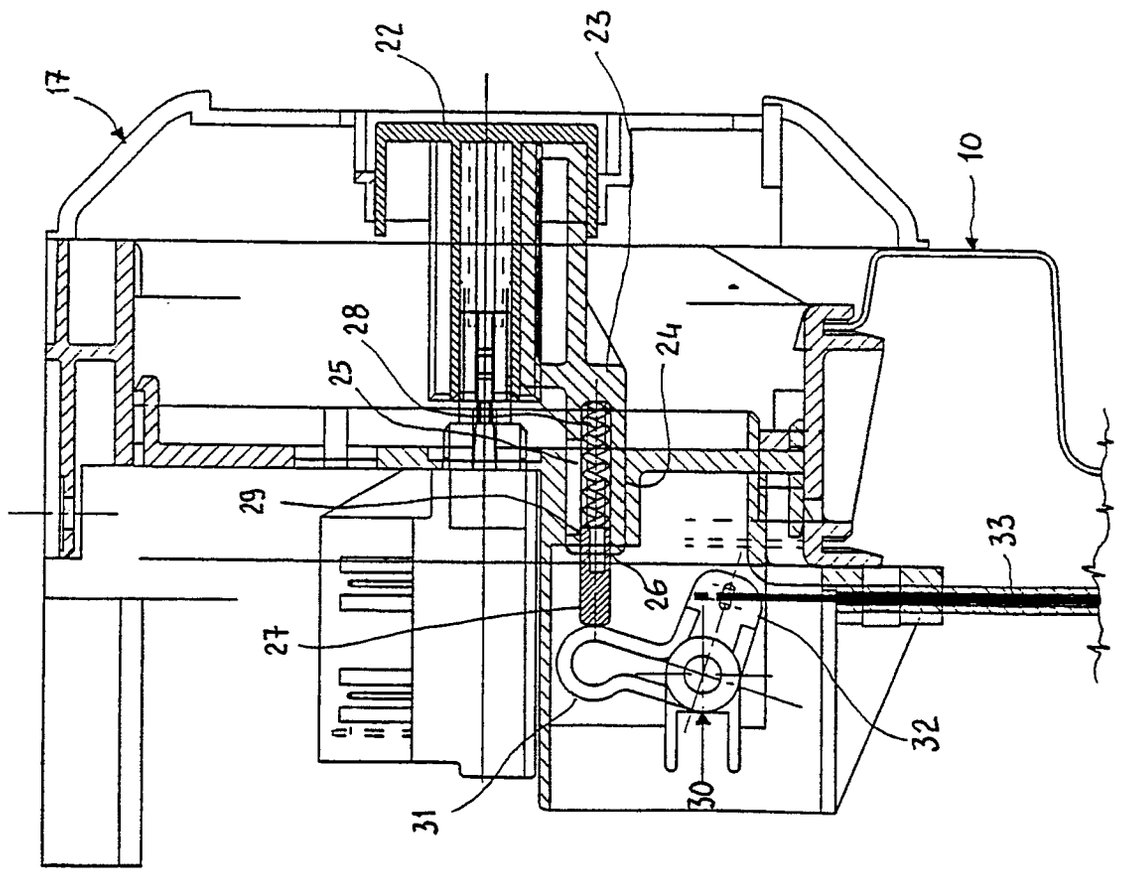

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FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 10 5735

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.5)
D,A	GB-A-2107383 (HOTPOINT LTD.)		D06F37/42
D,A	DE-A-3501538 (LICENTIA PATENT-VERWALTUNGS-GMBH)		
A	US-A-3803725 (K. TAKEYAMA)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03 JULY 1990	GOODALL C.J.

CATEGORY OF CITED DOCUMENTS

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