(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 245 870 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **87107068.6**

(22) Date of filing: **15.05.87**

(51) Int. Cl.4: **D06F 39/10** , D06F 58/22 , D06F 39/08

(30) Priority: **16.05.86 IT 4572686**

(43) Date of publication of application: **19.11.87 Bulletin 87/47**

(84) Designated Contracting States: **DE ES FR GB IT**

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(54) Filter monitoring device for an electric household appliance.

(57) A filter monitoring device for a laundry washer or a laundry dryer having a filter associaetd with indicator means (16) for indicating its operative condition.

The device comprises a pressure switch (7) having a movable contact (8) adapted to close on one and the other of the fixed contacts (10, 11) of the pressure switch, respectively, when the tub of the machine is empty or filled with a washing liquid to a predetermined level.

The fixed contact (11) of the pressure switch (7) is connected via a circuit breaker (13) associated with a cam of the program control unit of the machine to actuator means (14; 22; 26; 38) adapted to maintain the indicator means (16) deenergized or to energize said indicator means under conditions indicating said filter to be non-obstructed or obstructed, respectively.

The circuit breaker (13) on its part is closed on said actuator means (14;22;26;38) after expiry of a predetermined period of time from the beginning of the discharge of the washing liquid from the tub. While said circuit breaker (13) is closed, said movable contact (8) may be closed on one or the other of the fixed contacts (10, 11) of the pressure switch (7). In the first case, corresponding to the non-obturated state of the filter, said indicator means (16) remains deenergized, while in the second case said indicator means (16) is energized to indicate the obturated state of the filter.

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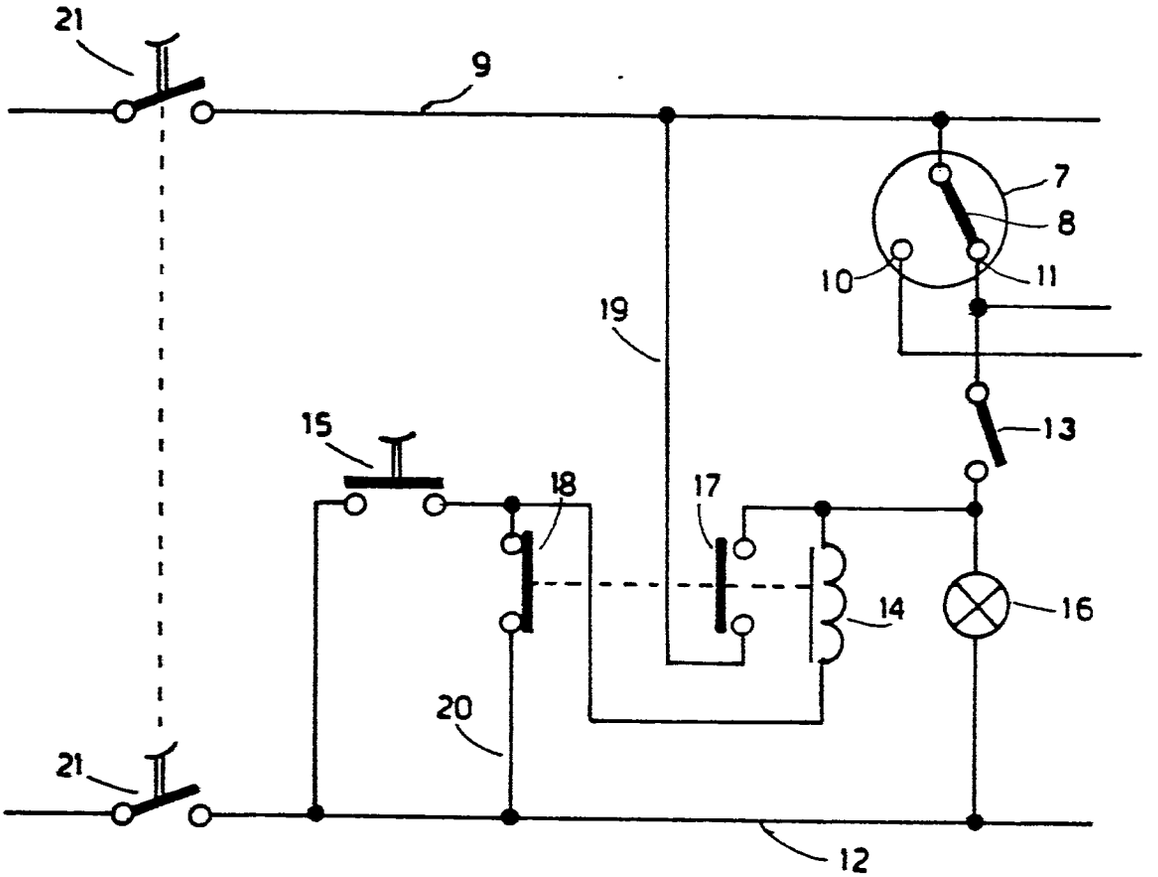

FIG. 1

FILTER MONITORING DEVICE FOR AN ELECTRIC HOUSEHOLD APPLIANCE

The present invention relates to a device for monitoring a filter in an electric household appliance, particularly a laundry washer or laundry dryer, for indicating the operative state of such filter.

Known laundry washers and laundry dryers are usually equipped with filters for retaining particulate impurities and/or solid bodies entrained in the washing liquid, or for retaining loose fibers and fluff, respectively, enttrained by the drying air flow circulating through the dryer. During operation of the respective machines, the associated filter is progressively obturated by the particulate impurities or solid bodies, or by loose fibers and fluff, respectively, until it is finally completely clogged, so that an effective filtering action is no longer obtained, resulting in insatisfactory operation of the respective machine. For avoiding these disadvantageous effects, the known machines are provided with suitable monitoring devices associated with the respective filter for giving timely indication of the clogged state of the filter and thus of its need of being cleaned.

In particular, a known filter monitoring device for a laundry dryer comprises a thermostat disposed downstream of the filter with respect to the direction of circulation of the drying air and operatively connected to an indicator lamp visible at the control panel of the machine and adapted to indicate the operative state of the filter. The thermostat senses the temperature of the drying air circulating downstream of the filter, and is calibrated to control the energization of the indicator lamp in the presence of excessively high air temperatures resulting from the reduction of the air flow caused by the complete obturation of the filter by loose fibres and fluff.

This monitoring device suffers from the disadvantage, however, that it is automatically deenergized as soon as the machine itself is deenergized at the end of the laundry drying cycle or in response to faulty operation eventually necessitating maintenance operations to be carried out on the machine.

Under these circumstances the indicator lamp of the known monitoring device is thus likewise deenergized, so that the indication of the operative state of the filter is not maintained operative to advise the user that suitable action should be taken. It would therefore be desirable, and is in fact an object of the present invention, to provide a filter monitoring device for a laundry washer or laundry dryer capable of indicating the operative state of the filter irrespective of whether or not the respective machine is in operation.

These and other objects are attained according to the invention by a filter monitoring device for electric household appliances, particularly laundry washers or laundry dryers comprising at least one filter and, in association therewith, indicator means for indicating its operative state, such as at least one indicator lamp, an acoustic warning device or the like, connected to the electric circuit of the machine.

The device according to the invention is characterized in that it comprises circuit breaker means adapted to energize said indicator means and adapted to to be actuated to two different operative positions, a first position in which said indicator means is deenergized and assumed when said filter is not obstructed, and a second position in which said indicator means is energized and assumed when said filter is obstructed, and further characterized by comprising activator means adapted to be energized through said circuit breaker means and acting on said indicator means so as to maintain it in a constantly energized state when said circuit breaker means is actuated to its second operative position.

The characteristics of the invention will become more clearly evident from the following description, given by way of example with reference to the accompanying drawings, wherein:

figs. 1, 2, 3 and 4 show electric circuit diagrams of the filter monitoring device according to the invention, in four different embodiments intended for use in a laundry washing machine, and

figs. 5 and 6 show electric circuit diagrams of the filter monitoring device according to the invention in two further embodiments intended for use in a laundry dryer.

With reference to fig. 1, there is shown a first embodiment of a filter monitoring device for use in a laundry washing machine of a conventional type, including a filter (not shown) associated with the (likewise not shown) discharge pump and discharge pipe of the machine for retaining any foreign bodies entrained by the washing liquid.

The laundry washing machine further includes a pressure switch 7 or the like connected to the electric circuit of the machine for controlling the filling level of the washing liquid in the washing tub (not shown).

Pressure switch 7 includes a movable contact 8 connected to a supply conductor 9 of the machine and adapted to selectively close on fixed contacts 10 and 11 of the pressure switch, said fixed contacts being connected to conventional components (not shown) of the electric circuit of the machine.

In its first operative position movable contact 8 is caused to close on fixed contact 10 when the tub of the machine is empty or filled with a washing liquid to a level below that to which pressure switch 7 is calibrated.

In its second operative position movable contact 8 is caused to close on fixed contact 11 when the tub is filled with the washing liquid to the level to which pressure switch 7 is calibrated.

Fixed contact 11 of pressure switch 7 is adapetd to be additionally connected to another supply conductor 12 of the machine through an electric circuit breaker 13 associated to a specific cam of the program control unit of the machine, and via a solenoid 14 and a normally open contact 15 connected in series with solenoid 14 and suitably disposed adjacent the filter so as to be operable to close in response to the filter being removed from its seat for cleaning or replacement.

Normally open contact 15 may also be mounted on the control panel of the machine for manual operation to its closed state.

Connected in parallel to solenoid 14 is an indicator lamp 16 operable in the manner to be described for indicating the operative state of the filter. Associated to solenoid 14 are two electric contacts 17 and 18 adapted respectively to close between solenoid 14 and a conductor 19 connected to supply conductor 9, and to close between solenoid 14 and a further conductor 20 connected to the other supply conductor 12.

In particular, contacts 17 and 18 are of the normally open and normally closed type, respectively, and adapted to be simultaneously actuated to their opposite operative positions, i.e. their closed and open positions, respectively, in response to the energization of solenoid 14.

According to the invention, indicator lamp 16 may be supplemented or replaced by other indicator devices of conventional type, for instance by an acoustic warning device connected to the electric circuit in the same manner as described. The thus constructed monitoring device is adapted to have a voltage applied thereto in response to the closing of a main switch 21 of the machine connected to the above described supply conductors 9 and 12.

Closing of main switch 21 prepares the laundry washing machine for carrying out a selected laundering program under the control of the program control unit of the machine, and initiated by the admission of the washing liquid to the tub to the charging level determined by pressure switch 7, at which level movable contact 8 of pressure switch 7 is caused to close on fixed contact 11.

At the end of the selected program the washing liquid is discharged from the tub by means of the discharge pump causing it to pass through the filter and the discharge pipe (none of these components being shown in the drawing).

As long as the filter is not obstructed by any foreign bodies and/or loose fibres of the laundry entrained by the washing liquid, the discharge operation is carried out within a relatively short time, while requiring a noticeably longer period of time when the filter is obstructed.

In practice, movable contact 8 of pressure switch 7, which at the beginning of the discharge operation is still closed on fixed contact 11, will be caused to close on fixed contact 10 after a predetermined period of time during which the tub of the machine has been emptied to a lower liquid level, provided that the filter is not obstructed.

If on the other hand the filter is in fact obstructed, movable contact 8 will be caused to close on fixed contact 10 after a period of time which is longer than that specified above.

According to the invention, the respective cam of the program control unit of the machine operates to close electric circuit breaker 13 of the filter monitoring device at the end of the above specified period of time.

Provided that the filter is not obstructed, movable contact 8 of pressure switch 7 will be caused to close on fixed contact 10 before the end of this period of time, so that indicator lamp 16 does not light up and solenoid 14 is not energized, as a result of which contacts 17 and 18 associated to solenoid 14 remain in their open and closed state, respectively, with respect to conductors 19 and 20.

If on the other hand the filter is obstructed, movable contact 8 remains closed on fixed contact 11 while circuit breaker 13 is being closed, as a result of which indicator lamp 16 lights up and simultaneously solenoid 14 is energized, so that contacts 17 and 18 are switched over to their other operative positions, in which contact 17 closes on conductor 19 and contact 18 opens with respect to conductor 20.

Under these conditions, indicator lamp 16 will continue to be energized via conductor 19, even when circuit breaker 13 is subsequently caused to open by the action of the associated cam of the program control unit, while solenoid 14 is deenergized due to contacts 15 and 18 being in their open state.

Also under these conditions, indicator 16 will constantly remain energized, even when the machine is switched off by the program control unit at the end of the laundering program, or in the presence of faulty operation of the machine necessitat-

ing maintenance operations to be carried out. As a matter of fact, indicator lamp 16 will thus remain energized as long as electric current is suppied to conductors 9 and 12.

Normally open contact 15 may subsequently by caused to close by removing the filter for cleaning or replacement, or by manual operation. Closing of normally open contact 15 causes solenoid 14 to be energized to thereby return contacts 17 and 18 to their initial operative positions shown in fig. 1.

When the filter is subsequently reinserted into its seat, contact 15 is again opened, whereby solenoid 14 is deenergized and indicator lamp 16 is extinguished.

With reference now to fig. 2, there is shown a second embodiment of the present filter monitor device likewise for use in a laundry washing machine of conventional type.

As in the preceding case, the machine is provided with a filter (not shown) and a pressure switch 7 of the same type as specified above, these two elements being installed in the machine in the same manner and for the same purpose as indicated.

Pressure switch 7 is again connected between the supply conductors 9 and 12 of the electric circuit of the machine, with the interposition of an electric circuit breaker 13 of the same type and operable in the same manner as described above, circuit breaker 13 being in this case connected in series with an electric resistance 22 cooperating with a movable contact 23 of a manually resettable thermostat of conventional construction.

Movable contact 23 is adapted to close a circuit including indicator lamp 16 for the indication of the operative state of the filter and connected between supply conductors 9 and 12 in parallel to the circuit including pressure switch 7, circuit breaker 13 and resistance 22.

Movable contact 23 is of the normally open type and adapted to be shifted to its closed state by its thermal expansion in response to the heating of resistance 22 when the latter is being energized by the closing of circuit breaker 13 with movable contact 8 of pressure switch 7 still closed on fixed contact 11.

Subsequently movable contact 23 remains in its closed state, causing indicator lamp 16 to light up for indicating the obstructed state of the filter, even after the machine has been switched off by the program control unit, or in the case of faulty operation necessitating maintenance operations to be carried out.

The movable contact can only be returned to its open state to extinguish indicator lamp 16 by manually resetting the thermostat after the filter has been cleaned or replaced.

Referring now to fig. 3, there is shown a third embodiment of the present filter monitoring device, likewise for use in a laundry washing machine provided with a filter and a pressure switch 7 of the same type as described above.

Also in this case pressure switch 7 is connected between supply conductors 9 and 12 of the electric circuit of the machine, with the interposition of an electric circuit breaekr 13 operable in the manner described and connected in series with the gate 24 of a conventional thyristor 25 via a thyristor activating circuit 26 composed of per se known elements, and a voltage memory circuit 27, such as a conventional electronic memory circuit or the like, said memory circuit having a voltage applied thereto through at least one diode 28 connected to supply conductor 9, and adapted to be reset by a key switch 29 adapted to close on a conductor 30 connected to the memory circuit. Key switch 29 is of the normally open type and adapted to be automatically closed in response to removal of the filter from its seat for cleaning or replacement, or by manual operation by the user, in which case it may be mounted on the control panel of the machine.

All of the named circuit components are disposed in parallel to an electric circuit comprising a diode 31, a charging circuit 32 and the above named thyristor 25 connected in series with one another, said charging circuit being composed of conventional electric components for the energization of the indicator lamp 16 connected in parallel to said circuit for the same purpose as previously described.

The thus construcetd monitoring device is likewise capable of indicating the operative state of the filter irrespective of whether movable contact 8 of pressure switch 7 is closed on fixed contact 10 or fixed contact 11. In the first case, closing of circuit breaker 13 will not result in energization of activating circuit 26 and memory circuit 27, so that thyristor 25 remains turned OFF and indicator lamp 16 does not light up.

In the second case, however, closing of circuit breaker 13 causes activating circuit 26 and memory circuit 27 to be energized, resulting in thyristor 25 being turned ON and charging circuit 32 to be energized, so that indicator lamp 16 lights up.

The thyristor remains in its conductive state, and the indicator lamp thus remains turned ON via diode 31, charging circuit 32 and thyristor 25 even after circuit breaker 13 has subsequently been opened by the action of the associated cam of the program control unit.

This condition is also maintained when the machine is deenergized by the action of the control unit, or in the case of faulty operation necessitating maintenance operations to be carried out. To this

purpose memory circuit 27 stores the voltage levels attained during closure of circuit breaker 13 and the energization of activating circuit 26, these stored voltage levels being immediately transferred to thyristor 25, so that the latter is maintained in its conductive state and indicator lamp 16 thus continues to be energized.

As the filter is subsequently cleaned or replaced, key switch 29 is closed on conductor 30 in the manner described above, so that memory circuit 27 is reset to zero to thereby deenergize thyristor 25 and thus indicator lamp 16.

Fig. 4 shows a fourth embodiment of the present filter monitoring device for a laundry washer, including a pressure switch 7 of the type described above, a diode 31, a charging circuit 32, an indicator lamp 16 and a thyristor 25 connected to the electric circuit of the machine in the same manner as described with reference to fig. 3.

The laundry washer further includes an electric circuit breaker 33 adapted to be actuated by an associated cam of the program unit and connected to supply conductor 9, said circuit breaker being adapted to close on a discharge pump 34 itself connected to the other supply conductor 12, for controlling the discharge of the washing liquid contained in the tub of the machine.

The machine finally includes an electronic delay circuit 35 of a per se known type connected between the juncture between circuit breaker 33 and discharge pump 34 on the one side, and on the other side to a first input terminal 37 of a logic AND gate 38 via a diode 39.

The other input terminal 40 and the output terminal 41 of AND gate 38 are connected respectively to fixed contact 11 of pressure switch 7 via a diode 42, and to gate 24 of thyristor 25 via a similar memory circuit 27 as in fig. 3.

Delay circuit 35 carries out the same function as the circuit breaker 13 provided in the previously described embodiments, and to this purpose permits a voltage to be applied to input terminal 37 of logic AND gate 38 only for a predetermined period after initiation of the discharge of the washing liquid, this period being required for the tub of the machine to be partially emptied under normal operating conditions.

Logic AND gate 38 on its part controls gate 24 of thyristor 25 to turn the latter ON and OFF in response to the voltage levels applied to its input terminals 37 and 40.

In particular, when the voltage level applied to one or both input terminals 37 and 40 of gate 38 is zero, the output terminal 41 of gate 38 is likewise at the level zero, so that thyristor 25 remains turned OFF.

If on the other hand a voltage is applied to both input terminals of gate 38, the same voltage will appear at its output terminal 41, so that thyristor 25 is turned ON.

This monitoring device is thus likewise capable of indicating the non-obstructed and obstructed operative conditions, respectively, of the filter when movable contact 8 of press switch 7 is closed on fixed contact 10 or on fixed contact 11.

In the first case, input terminal 40 and output terminal 41 of AND gate 38 are at zero voltage level, so that thyristor 25 remains turned OFF and indicator lamp 16 does not light up.

In the second case, however, input terminal 40 and output terminal 41 of AND gate 38 are at a selected voltage level when a voltage is applied to the other input terminal 37 of gate 38 after the predetermined delay explained above following energization of delay circuit 35 as a result of circuit breaker 33 closing on discharge pump 34.

Under these conditions, the voltage appearing at output terminal 41 of gate 38 is applied to memory circuit 27 and gate 24 of thyristor 25 to turn the latter ON, so that indicator lamp 16 is energized via charging circuit 32.

The thyristor remains energized through diode 31 and charging circuit 32, and indicator lamp 16 thus remains turned ON, even after the discharge of the washing liquid from the tub has been terminated when discharge pump 34 is deenergized by the opening of circuit breaker 33 under control of the program control unit.

In the same manner as described with reference to fig. 3, the provision of memory circuit 27 also in this case permits indicator lamp 16 to stay turned ON when the machine is switched off by its program control unit, or in the case of faulty operation necessitating maintenace operations to be carried out.

With reference finally to figs. 5 and 6 there are shown a fifth and a sixth embodiment of the present monitoring device, both of which for use in a laundry dryer of con ventional type equipped with a filter (not shown) disposed in the flow path of the drying air circulating in the machine for retaining losse fibres and fluff released by the laundry.

In particular, the device shown in fig. 5 is composed of the same electric components as the device of fig. 1, which are therefore designated by the same reference numerals, with the exception of the pressure switch which in this embodiment is replaced by a thermostat 42 disposed downstream of the filter in the flow direction of the circulating drying air.

Thermostat 42 has a movable contact 43 of the normally open type, which remains in its open position as long as the filter is not obstructed, i.e. as long as the air passing through the filter is at a temperature between predetermined limits. Under these conditions indicator lamp 16 thus does not light up.

In the opposite case of the filter being obstructed, resulting in the air passing therethrough being at a temperature above the predetermined limit, contact 43 of thermostat 42 closes the circuit composed of solenoid 14, conductor 20 and indicator lamp 16.

The resultant energization of solenoid 14 causes indicator lamp 16 to light up and to remain in this state in the same manner as described with reference to fig. 1.

The device shown in fig. 6 on its part is composed of the same electric components as the device of fig. 2, which are therefore designated by the same reference numerals, with the exception of the pressure switch, which in this case is replaced by the thermostat 42 described with reference to fig. 5.

Movable contact 43 of thermostat 42 is thus likewise adapted to be switched between an open and a closed position under the same operating conditions as described with reference to fig. 5. In particular, the energization of indicator lamp 16 is achieved in the same manner as in the embodiment of fig. 2 by the closing of contact 23 of the manually resettable thermostat, this closing operation being brought about by the energization of resistance 22 for the same reasons as explained with reference to fig. 2.

Claims

1. A filter monitoring device for electric household appliances, particularly laundry washers or laundry dryers, comprising at least one filter associated with indicator means for indicating its operative condition, such as at least one indicator lamp, an acoustic warning device or the like, connected to the electric circuit of the machine, characterized in that it comprises circuit breaker means (7; 42) adapted to energize said indicator means (16) and to be actuated to two different operative positions, a first position in which said indicator means (16) is not energized and corresponding to the non-obturated state of said filter, and a second position in which said indicator means (16) is energized in response to the obturated state of said filter, and further characterized by comprising actuator means (14;22;26;38) adapted to be energized via said circuit breaker means (7;42) and acting on said indicator means (16) so as to maintain the energized state thereof when said circuit breaker means (7;42) is actuated to its second operative position.

2. Monitoring device according to claim 1, for use in a laundry washing machine provided with electromechanic components of conventional type, characterized in that said circuit breaker means comprises at least one pressure switch (7) or similar level control means having a movable contact (8) connected to a supply conductor (9) of the machine, and at least a first and a second fixed contact (10, 11) connected to said electromechanic components, said movable contact (8) being adapted to be actuated from said first to said second operative position and vice versa to close on said first (10) or said second fixed contact (11), respectively, in response to the tub of the machine being empty or filled with a washing liquid to a level below that determined by the calibration of said pressure switch (7), and in response to said tub being filled to the charging level determined by said pressure switch (7), said second fixed contact (11) being further connected to the other supply conductor (12) of the machine via said actuator means (14;22;26;38), delay means (13;35) being additionally provided for energizing said actuator means (14;22;26;38) only after expiry of a predetermined period of time subsequent to initiation of the discharge of the washing liquid from the tub.

3. A monitoring device according to claim 2, characterized in that said actuator means comprises at least one solenoid (14) connected in parallel to said indicator means (16) and associated with at least one first and one second electric contact (17,18) adapted respectively to close on a conductor (19) connected between said solenoid (14) and said supply conductor (9) and on a further conductor (20) connected between said solenoid (14) and said other supply conductor (12), said first and second electric contacts (17, 18) being of the normally open and normally closed type, respectively, and adapted to be simultaneously actuated form one of their operative positions to the other solely in response to energization of said solenoid (14).

4. A monitoring device according to claim 2, characterized in that said actuator means comprises at least one electric resistance (22) associated to the contact (23) of a manually resettable conventional thermostat, said contact (23) being adapted to close on said indicator means (16) connected in parallel between said supply conductors (9, 12) of the machine.

5. A monitoring device according to claim 2, characterized in that said actuator means comprises a circuit (26) of conventional type for the activation of at least one thyristor (25) or similar element, said circuit being connected in series to

the respective gate (24) of said thyristor (25) via storage means such as at least one electronic memory circuit (27) or the like adapted to store the voltage levels applied thereto during the energization of said activating circuit (26) and to apply said voltage levels to said gate (24) when said activating circuit (26) is not energized, said activating circuit (26) and said memory circuit (27) being connected in parallel to a further electric circuit itself connected between said supply conductors (9, 12) of the machine and composed of said thyristor (25) in series-connection with at least one diode (31), and a charging circuit (32) of a per se known type, the latter being connected in parallel to said indicator means (16).

6. A monitoring device according to any of claims 3-5, characterized in that said delay means comprises at least one electric circuit breaker (13) associated to a cam of the program control unit of the machine and adapetd to be actuated from an open position to a closed position after expiry of said predetermined period of time, and vice versa.

7. A monitoring device according to claim 2, wherein said laundry washing machine is additionally provided with a discharge pump adapted to be energized via at least one electric circuit breaker associated to a cam of the program control unit of the machine and connected, together with said discharge pump, in parallel between the supply conductors of the machine, characterized in that said actuator means comprises at least one logig AND gate (38) having a first and a second input terminals (37, 40) and an output terminal (41) and adapted to activate at least one thyristor (25) or similar element in response to voltage levels applied to both said input terminals (37, 40) of said logic AND gate (38), said first and second input terminals (37, 40) being connected respectively to a connection point (36) between said electric circuit breaker (33) and said discharge pump (34) via said delay means (35) and at least one diode (39), and to said second fixed contact (11) of said pressure switch (7) via at least one diode (42), said output terminal (41) being connected to the respective gate (24) of said thyristor (25) via storage means such as at least one electronic memory circuit (27) or the like adapted in the presence of a voltage level at said output terminal (41) to store such voltage level for subsequently transmitting it to said gate (24) in the absence of a voltage level at said output terminal (41), the circuit including said delay means (35) said diodes (39, 42), said logic AND gate (38) and said memory circuit (27) being connected in parallel to a further electric circuit itself connected between said supply conductors (9, 12) of the machine and comprising said thyristor (25) in series-connection with at least one diode (31) and a charging circuit (32) of a per se known type, the latter being connected in parallel to said indicator means (16).

8. A monitoring device according to claim 7, characterized in that delay means comprises an electronic delay circuit (35) of a per se known type adapted to permit said first input terminal (37) of said logic AND gate (38) to have a voltage applied thereto only after expiry of said predetermined period of time.

9. A monitoring device according to claims 5 and 7, characterized in that said memory circuit is supplied with a voltage via at least one diode (28) connected to said supply conductor (9), and is resettable by means of at least one key switch (29) of the normally open type adapted to close on a conductor (30) connected to said memory circuit (27).

10. A monitoring device according to claim 9, characterized in that said key switch (29) is adapted to be closed in response to removal of said filter from its seat.

11. A monitoring device according to claim 9, characterized in that said key switch (29) is mounted on the control panel of the machine and adapted to be closed by manual operation.

12. A monitoring device according to claim 1, for use in a laundry drying machine comprising a drying air circulation conduit housing said filter, characterized in that said circuit breaker means comprises at least one thermostat (42) disposed downstream of said filter in the direction of circulation of the drying air and provided with at least one movable contact (43) of the normally open type.

13. A monitoring device according to claim 12, characterized in that said actuator means comprises at least one solenoid (14) adapted to be connected in series to said movable contact (43) and disposed in parallel to said indicator means (16), said solenoid (14) being associated with at least a first and a second electric contact (17, 18) adapted respectively to close on a conductor (19) coneected between said solenoid (14) and said supply conductor (9), and on a further conductor (20) connected between said solenoid (14) and said other supply conductor (12), said first and second electric contacts (17, 18) being of the normally open and the normally closed type, respectively, and adapted to be simultaneously actuated from one of their operative positions to the other solely in response to energization of said solenoid (14).

14. A monitoring device according to claims 3 and 13, characterized in that said solenoid (14) is adapted to be additionally connected to said other supply conductor (12) via at least one third electric contact (15) of the normally open type disposed in series with said solenoid (14).

15. A monitoring device according to claim 14, characterized in that said third contact (15) is disposed adjacent said filter and adapted to be closed solely in response to the extraction of said filetr from its seat.

16. A monitoring device according to claim 14, characterized in that said third contact (15) is disposed on the control panel of the machine and adapetd to be closed by manual operation.

17. A monitoring device according to claim 12, characterized in that said actuator means comprises at least one electric resistance (22) adapted to be connected in series with said movable contact (43) and associated to a contact (23) of a manually resettable thermostat of conventional type adapetd to close on said indicator means (16), the latter being connected in parallel between said supply conductors (9, 12) of the machine.

18. A monitoring device according to claims 4 and 17, characterized in that said contact (23) is of the normally open type and adapted to be actuated to its closed position by its thermal expansion in response to the heating of said electric resistance (22) when having a voltage applied thereto.

19. A monitoring device according to the preceding claims, substantially as described with reference to the accompanying drawings and for the stated purposes.

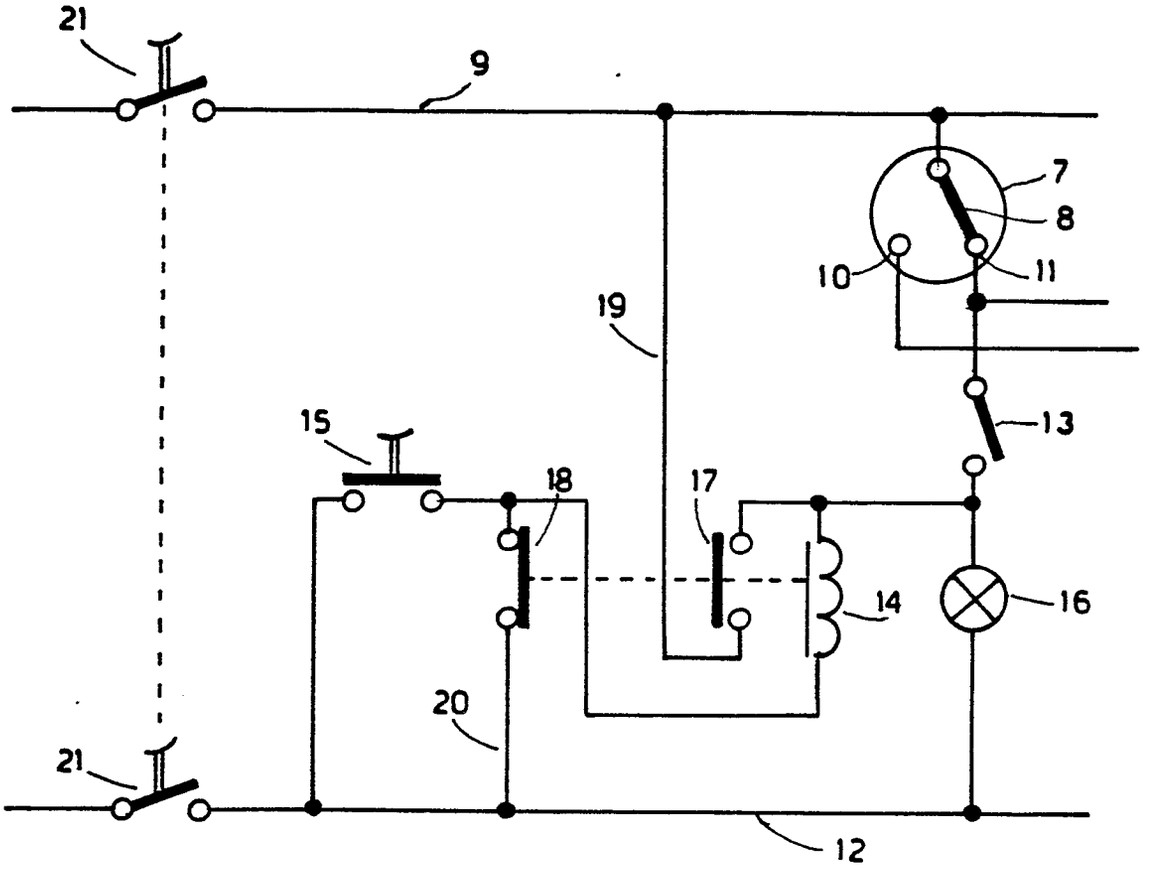
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FIG. 1

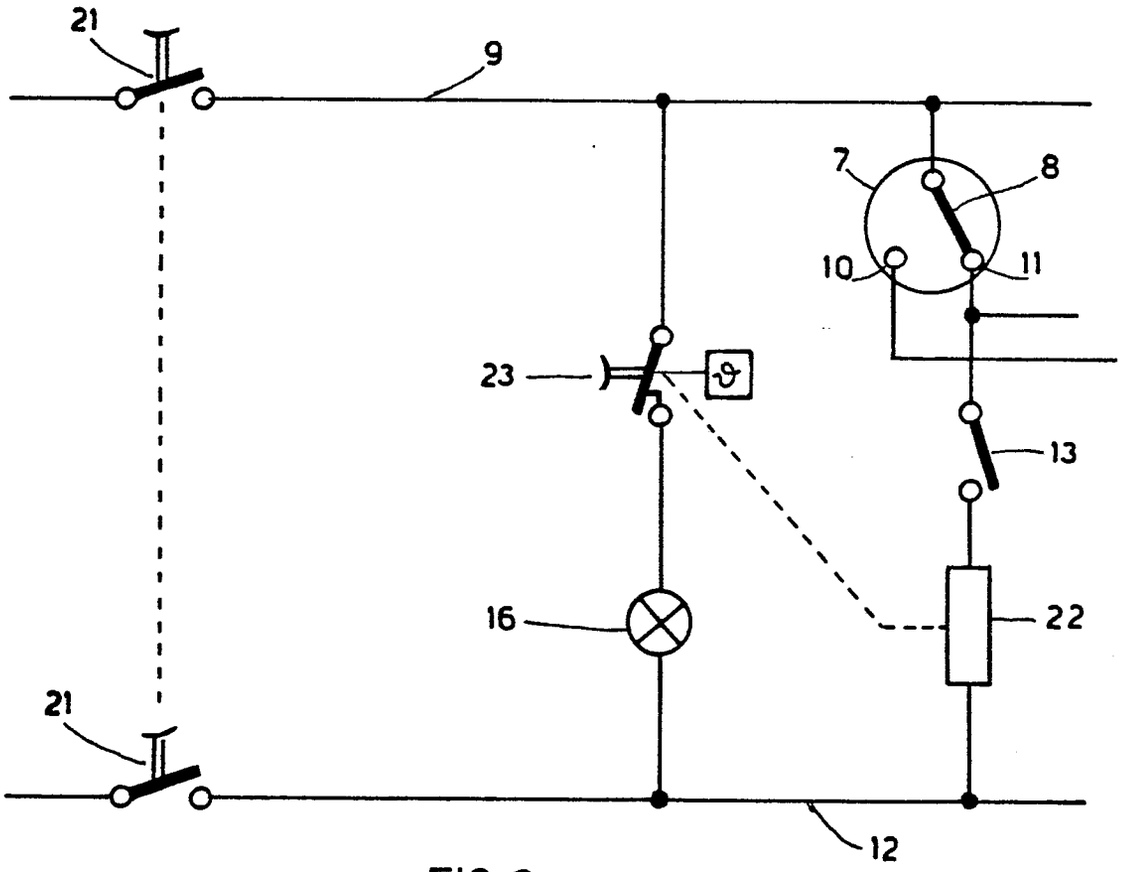
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FIG. 2

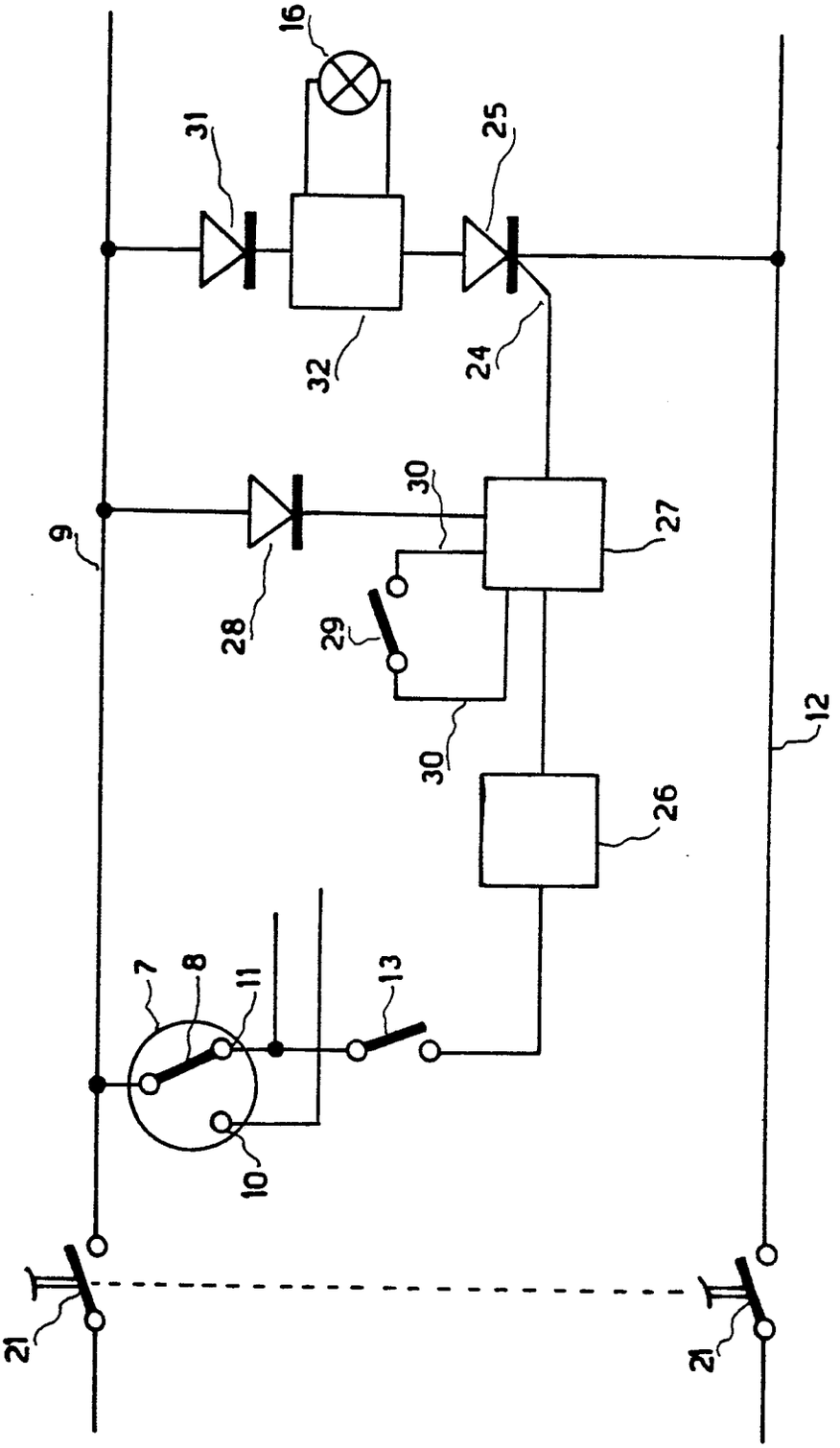

FIG. 3

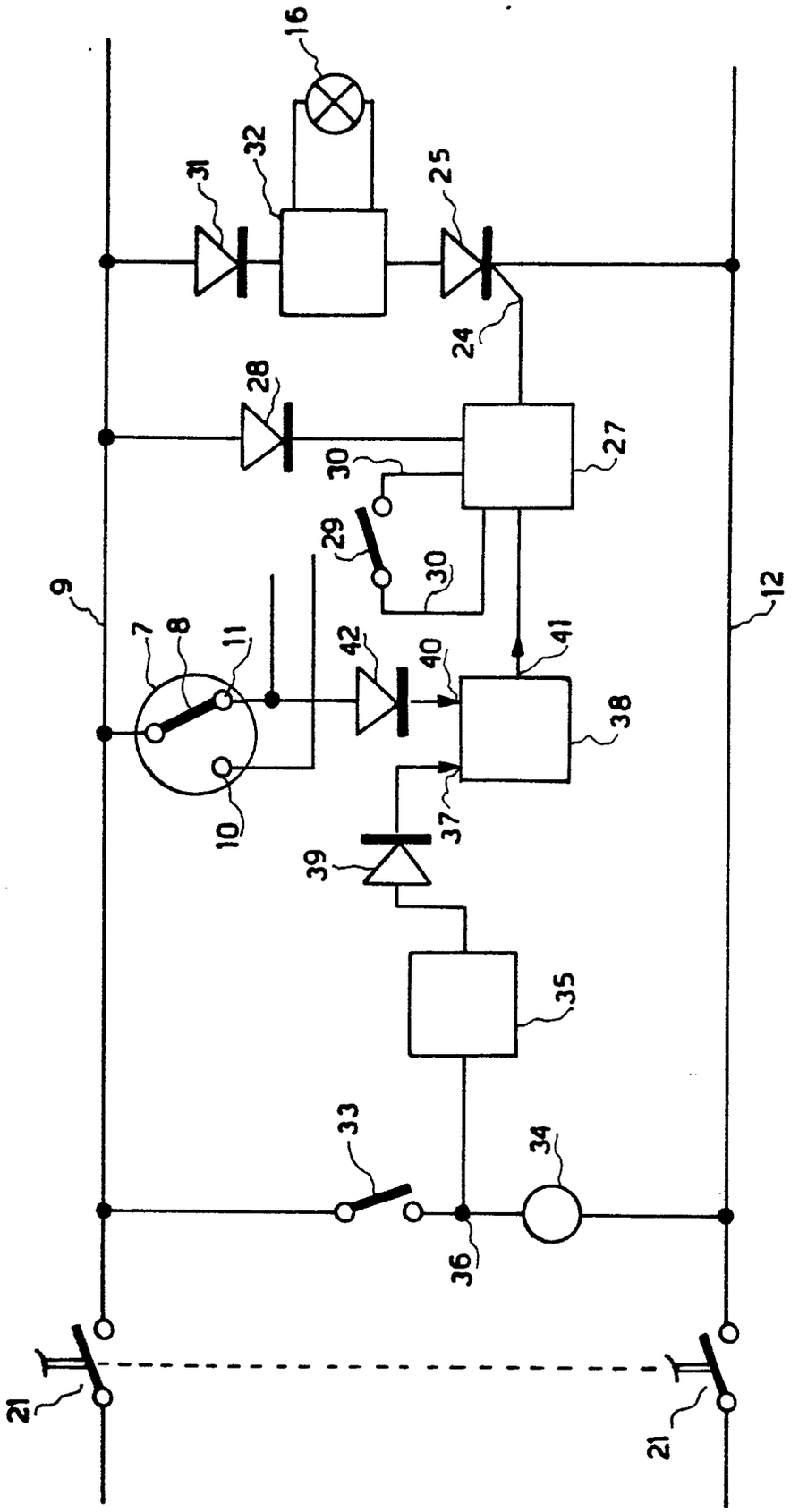
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FIG. 4

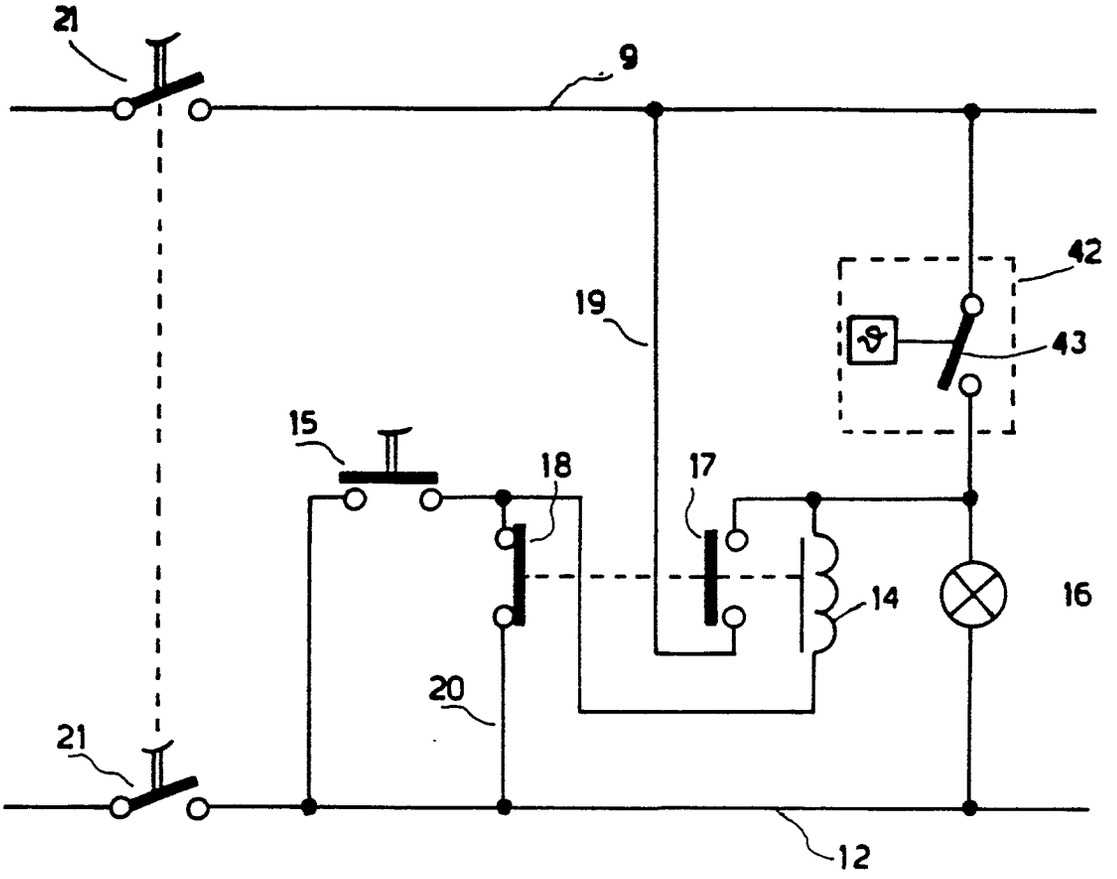

FIG. 5

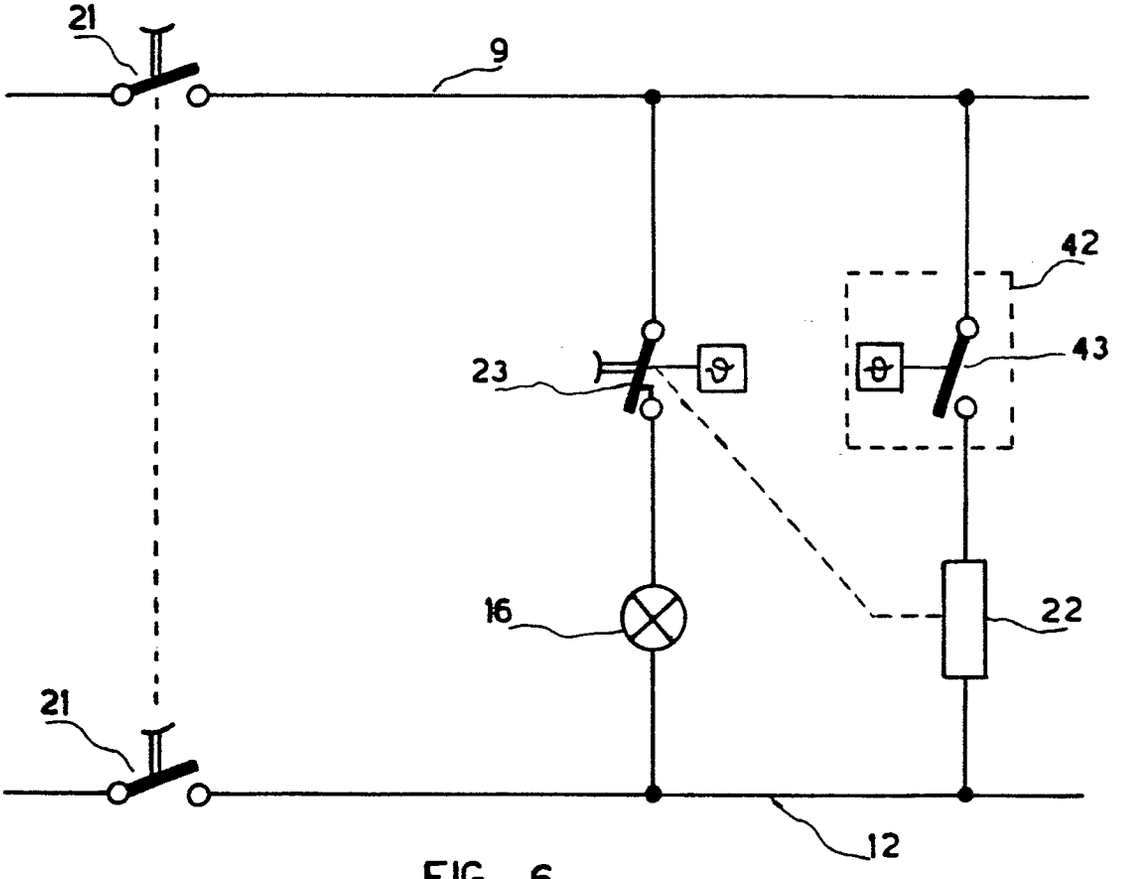

FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 87 10 7068

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.4)
X	EP-A-0 028 067 (THRON) * Figures; abstract; claims; page 5, lines 29-33 *	1,2,5	D 06 F 39/10 D 06 F 58/22 D 06 F 39/08
A		6-8	
X	US-A-2 903 799 (PHILCO CORP.) * Figures; column 3, line 73 - end; column 4, lines 1-70; column 5, line 54 - end; column 6 *	1,12, 16	
X	DE-A-2 135 932 (SIEMENS) * Figures 1,2; claims *	1	
A	US-A-2 950 539 (BORG WARNER CORP.) * Figure 2; claims; column 2, line 61 - end; column 3, lines 1-31 *	1,12, 14,15	TECHNICAL FIELDS SEARCHED (Int. Cl.4) D 06 F
A	PATENT ABSTRACTS OF JAPAN, vol. 2, no. 83 (M-78), 6th July 1978, page 2308 M 78; & JP-A-53 53 166 (HITACHI SEISAKUSHO K.K.) 15-05-1978	1,2	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	04-08-1987	COURRIER,G.L.A.

CATEGORY OF CITED DOCUMENTS

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