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(54) Security system for washing machines.

(57) The present invention relates to a security system for washing-drying machines of the type comprising an electric motor, an electronic control module, a revolving basket and a door. The main characteristic of the invention consists in the fact that, first means apt to verify the motors rotation speed and to control second means for blocking the opening of the door are provided for when the motors rotation speed exceeds a predetermined value.

EP 0 447 929 A2

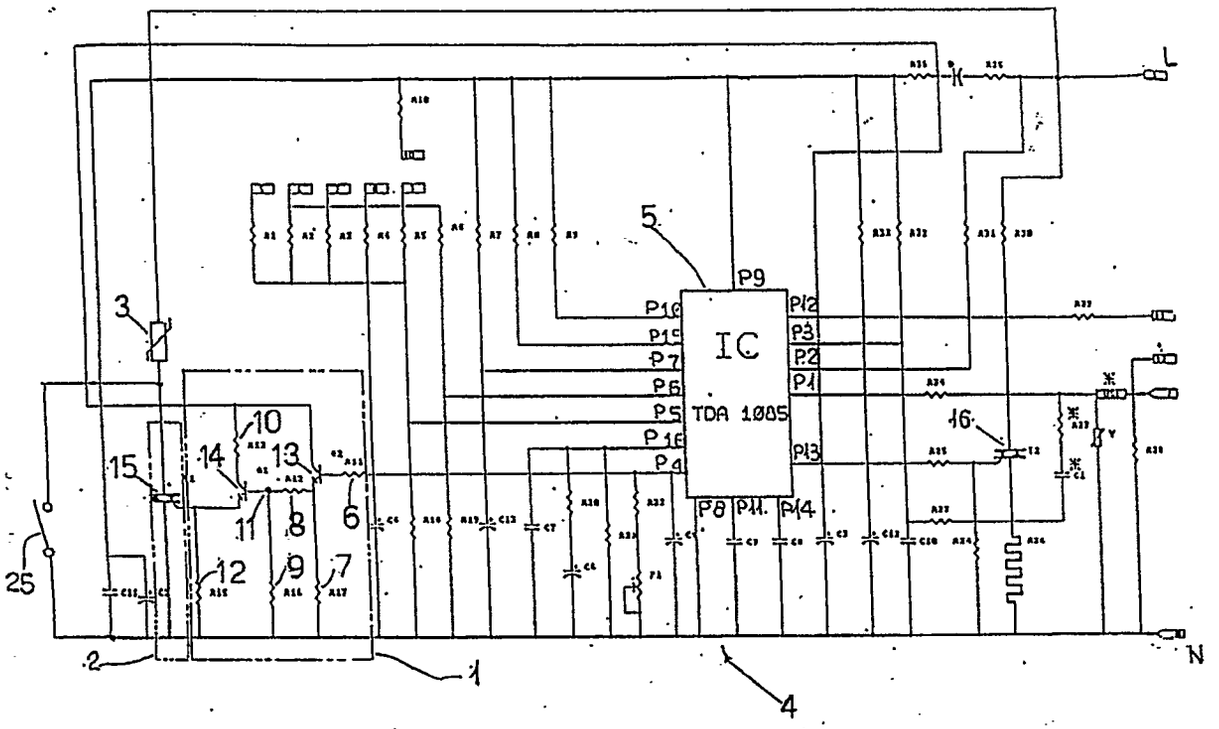
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Fig. 1

The present invention relates to a security system for washing and drying-machines of the type comprising an electric motor, an electric control module, a revolving basket and a door.

It is known that for security reasons, washing machines must be realised in such a way that the door cannot be opened by the user whilst functioning.

In particular the opening of the door is prevented for the duration of time in which the machine is being used and for a given amount of time, usually for several minutes, after the machine has terminated its wash cycle or been switched off.

Such security needs and the respective regulations imposed by the institution, must also be taken into consideration in the case of washing-drying machines.

Such machines must also be realised utilising the procedures that prevent the opening of the door during the phase in which clothes are being washed.

During the drying phase, however, it could be extremely useful to be able to open the door in order to carry out determined operations (for example to control the drying process, the addition of more clothes to be dried, the removal of certain clothes already dry, etc.).

In this phase of the cycle, thanks to the relative slowness of the motor and of the slow basket movements, the opening of the door and the eventual introduction of the users hands into the basket can be carried out calmly and without risk. Therefore, in normal functioning conditions, during the drying phase, the carrying out of the cited operations can be done so without danger, it is also true that the security regulations consent this type of performance.

On the contrary serious problems can arise in the case of the machines disfunctioning.

For example danger may arise in the case of a disfunction regarding the electric control module of the motor speed during the drying phase, when it is possible to open the door. In particular if there is a short circuit of the triac that pilots the motor, the motor will start to rotate at a high speed and so will the basket which is in liaison with the motor by a belt and pully.

With the basket revolving at a very high speed the user must be prevented from having access to the inside of the machine.

To solve this problem, particularly referred to washing-drying machines that present an electronic speed control module, it is possible for example to prevent the opening of the door, be it during the wash and spin phase or during the drying phase.

This, however creates the disadvantage of not being able to intervene inside the basket, whenever certain needs arise (for example to control the drying process, the addition of more clothes to be dried, the removal of certain clothes already dry, etc.).

Other solutions involve the presence of electric circuits that having detected an excessive motor speed of the machine, cut off the current or cause the machine to stop.

Such systems, although allowing the opening of the door during the drying phase, are complicated and require expensive components.

The object of the present invention is that of providing a remedy concerning the described inconveniences and to indicate a security system for washing-drying machines that permit the opening of the door during the drying phase without placing the user at risk, realised in a simple and economic way.

To permit such aims, the present invention has as its object a security system for washing-drying machines of the type comprising an electric motor, an electronic control module, a revolving basket and a door, characterised by the fact that, first means apt to verify the motors rotation speed and to control second means for blocking the opening of the door are provided for when the motors rotation speed exceeds a predetermined value.

Further objects and advantages of the present invention will become clear from the detailed description which follows and from the attached drawings, which are supplied only as a non-limiting example, wherein:

-Fig.1 represents a wiring diagram of a security system for washing machines realised according to the precepts of the present invention;

-Fig.2 represents a block diagram of the self-same security system illustrated in figure 1;

Fig.3 represents an alternative circuitry solution to that illustrated in figure 1.

In the three figures a comparator block is referred to by the number 1, a switch by the number 2, realised by means of a triac 15, the number 4 refers to an electric control module of the motors speed, number 3 refers to a thermo resistive element of the type PTC that serves in blocking the door and number 5 refers to an intergrated circuit that accomplishes a great part of the motors functioning controls, available on the markets under TDA 1085.

16 indicates a triac, that constitutes a piloting element of the number of revolutions of the washing-drying machines motor.

25 indicates a contact of the timer programer that energizes the PTC 3 only during the complete wash cycle.

The comparator block 1, that has the function of a threshold comparator, composed of six resistences, indicated by the numbers 6, 7, 8, 9, 10, and 12, and of two transistors indicated by the

numbers 13 and 14.

Having stated in advance that the characteristics of the cited elements are already known and that the description and the functions of the TDA 1085 are easily found from the data-sheet published by the producer, the functioning of the circuit is the following.

The washing-drying machine comprises a tachymetric dynamo T (fig.2) mounted on the motor M (fig.2) that, by a belt actuates the basket (for simplicity reasons these two elements are not represented in the drawings).

When the motor runs, the dynamo T generates a voltage, proportional to the number of revolutions carried out by the motor M, that is sent to the intergrated circuit 5.

Said voltage is elaborated on the inside of the integrated circuit 5 by means of the comparison with a voltage of reference, achieved in the known way, relative to the number of revolutions that the motor must carry out.

The result of such comparison generates a signal utilised for controlling the conduction of the triac 16 and as a consequence to bring the number of revolutions of the motor to the desired value. The voltage generated by the dynamo T is therefore compared to the voltage of reference, corrisponding to the value of revolutions of the motor programed for a given functioning cycle.

In the case of divergences between the two voltages, and therefore divergences between the effective revolutions and those programed, the value of the latter will be re-established by means of the piloting element.

Infact, a major or minor current will be sent to the motor, by means of the triac 16 according to whether the number of revolutions is major or minor to that required.

In other words the motor speed is controlled by a locked loop control circuit.

In the case of a short circuit of the triac 16, nevertheless, the maximum number of revolutions will be reached by the motor without the possibility of regulation: the motor infact receives all the available current from the supply, there no longer being control, by means of the piloting element.

A signal co-related to the rotation speed assumed by the motor M, is sent in the present realisation also to the comparator 1.

Said comparator 1 has been projected to provide a command signal to the switch 2 in function of the speed assumed by the motor M in the drying phase.

In particular, the potential voltage divider 11, constituted in this case by the resistences 8 and 9, generates a threshold value that defines the maximum speed that the motor M can have during the drying phase along the lines of normal functioning.

The intergrated circuit 5 sends a voltage present at the pin P4 to the comparatore 1, that is representative of the tension generated by the tachymetric dynamo T.

At this point the comparator 1 detects the difference between the tension coming from the intergrated circuit 5 and the threshold value given by the voltage divider 11. If the signal coming from the intergrated circuit 5 exceeds the threshold value, this means that there is an abnormal functioning of the machine.

In other words the tension coming from the pin P4 of the intergrated circuit 5 reaches the base of the transistor 13, that being in emitter follower configuration serves to pilot at a low impedance the potential voltage divider 11.

When the tension provided by the voltage divider 11 at the base of the transistor 14 is such that it exceeds the prefixed threshold value, the transistor 14 changes state and becomes a conductor letting pass a current, provided to conduct the triac 15 that, supplying the PTC 3, provides to block the door by means of a door block of the type known. An analogous functioning occures in the absence of faliures of the triac 16 of the electronic module during the wash spin phase, that is when the motor speed exceeds that expected for the drying.

In this case the door is already blocked by the PTC 3, electrically supplied through the contact 25 of the timing programer; the current passed on by the comparator 1 through the switch 2, results to be un-influential from the moment that the switch in this phase is supplied independently.

It has been found that the security system for washing machines object of the present invention effectively solve the previous mentioned objects and from the effected description the advantages become evident.

In particular the advantages are represented by the extreme realisation simplicity and its economical properties (low cost components). It is clear that many variations of the security system for washing machines, the object of the present invention, are possible, one of which being illustrated in fig.3 and regards an alternative way of realising the comparator 1.

In such a form of realisation the comparator 1 is composed of six resistences, indicated by the numbers 17, 18, 19, 20, 21 and 22, and by two transistors 23 and 24 in common emitter configuration.

In this case the potential voltage divider 11 is constituted by the resistences 17 and 18 and can be found before the transistors.

When the voltage transmitted to the comparator 1, from the pin P4 of the intergrated circuit 5, exceeds the threshold value that inspires the conduction of the transistor 23, this item changes state

and becomes a conductor causing the cut-off of the transistor 24, that being a polarity inverter, forcing the triac 15 to conduct the triac 15 thus supplying the PTC 3, providing in turn of the opening of the door.

To those skilled in the art it will be clear that various changes can be made to the described washing machine security system without, however departing from the scope of the present invention as set out in the claims. One of the possible variations could be to utilise the switch 2 to supply the thermo sensitive element PTC 3 also in the washing phase, sending an appropriate signal to the comparator 1, without having to utilise a respective contact of the timer.

Claims

1. Security system for a washing-drying machine of the type comprising an electric motor, an electric control module, a revolving basket and a door, characterised by the fact that first means (1,4,T) apt to verify the motors (M) rotation speed and to control second means (2,3) for blocking the opening of the door are provided when the motors (M) rotation speed exceeds a predetermined value.

2. Security system according to claim 1, characterised by the fact that said first means comprises a tachymetric dynamo (T) that generates a voltage in function of the motors (M) rotating speed that actuates the basket.

3. Security system according to claim 1, characterised by the fact that a control module (4) is foreseen for commanding the motors (M) rotation speed.

4. Security system according to claim 2,characterised by the fact that said first means (1,4,T) comprises a comparator circuit 1 for comparing the voltage produced by the tachymetric dynamo (T) with a voltage of reference and generating a command signal apt for piloting said second means (2,3).

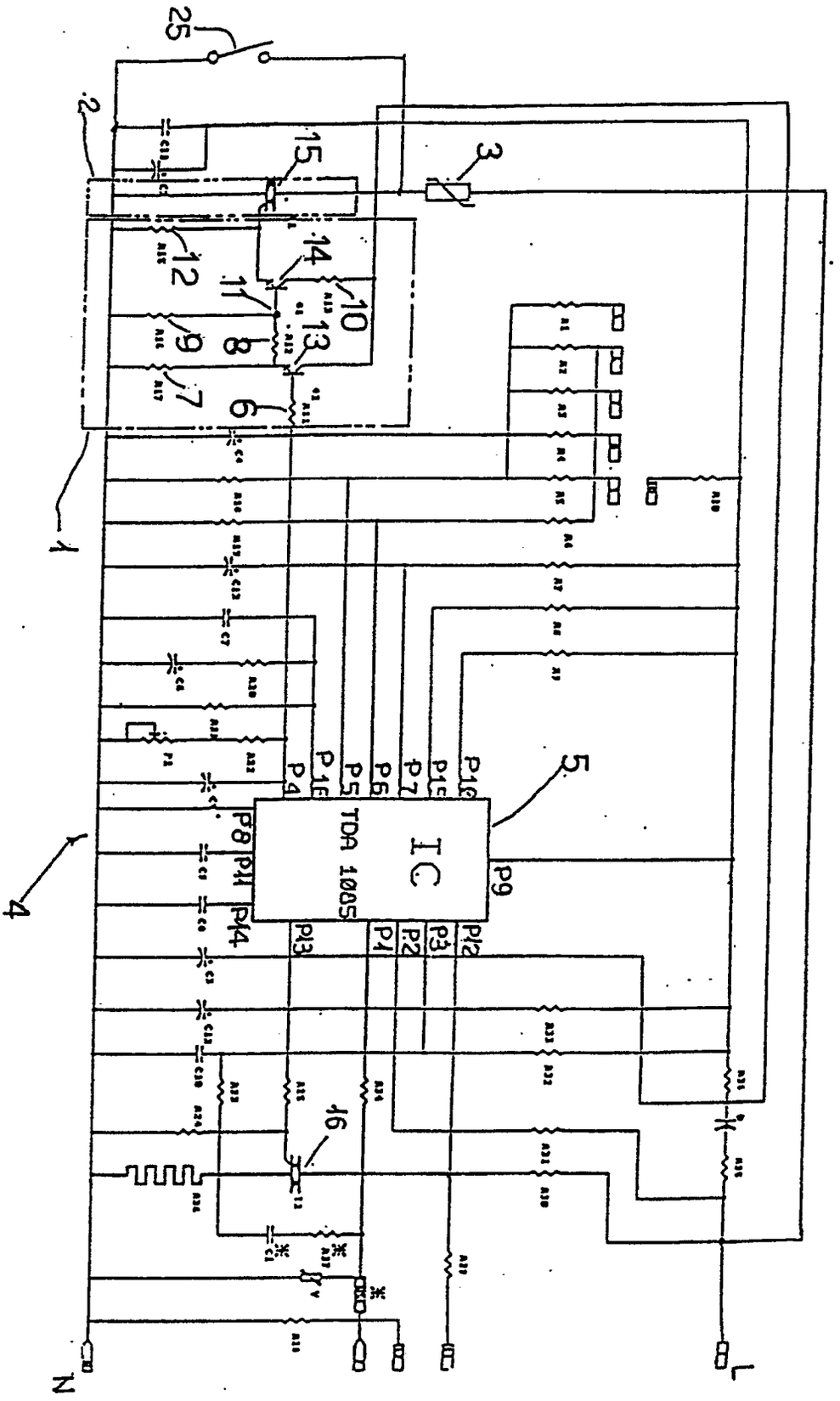
5. Security system according to claim 4, characterised by the fact said second means (2,3) comprises a switch (2) that controls the supply of a thermal resistive element, particularly of the PTC type (3).

6. Security system according to claim 5, characterised by the fact that said predetermined motor (M) speed value is equal to the maximum revolving speed value provided for the motor (M) when the machine carries out a drying phase.

7. Security system according to claim 5, characterised by the fact that during the drying phase and in normal functioning conditions said first means (1,4,T) control said second means (2,3) in such a way as to permit the user to open the door even if the machine is functioning.

8. Security system according to claim 5, characterised by the fact that the switch (2) comprises a triac (15).

10. Security system for a washing-drying machine that results from the present description and enclosed drawings.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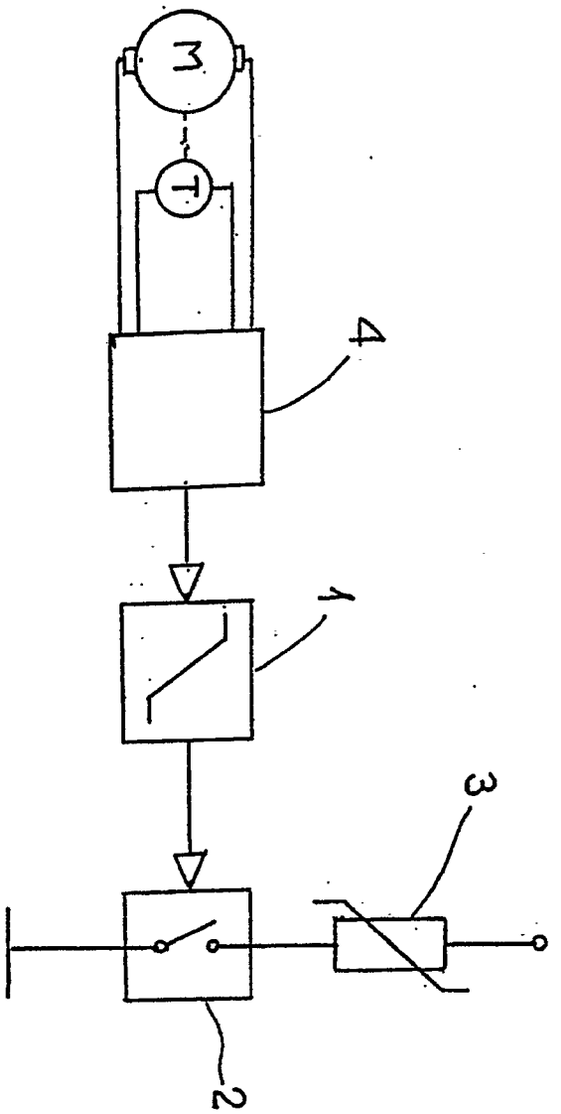

Fig. 2

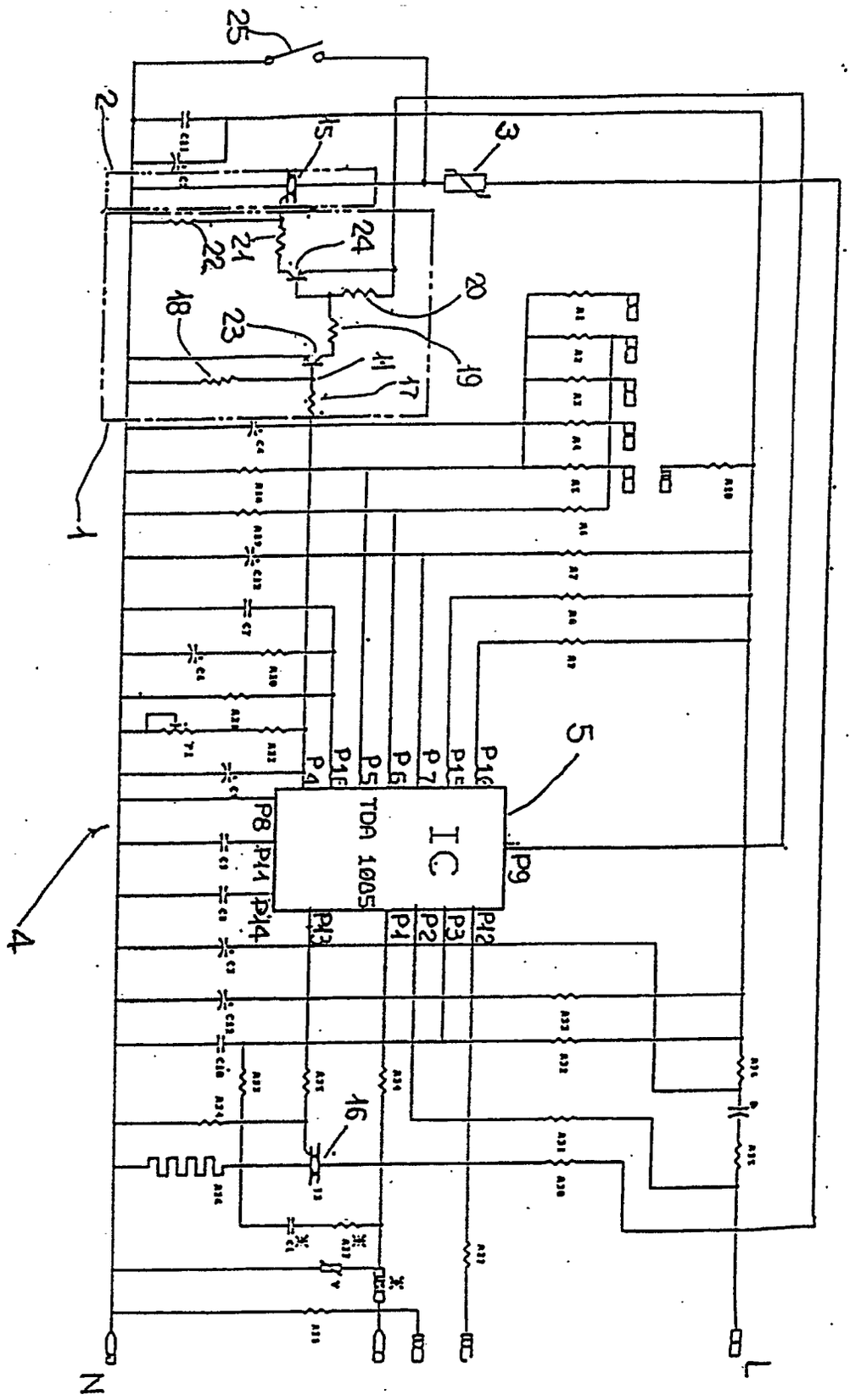
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Fig. 3