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(54) Title: AUTOMATIC THERMOELECTRIC SWITCH IN DIRECT CURRENT

(57) Abstract: Purely electronic device, planned to interrupt, in the shortest time possible the supply of direct current towards the user whether for the maximum absorption or for the highest temperature or owing to a short circuit, so avoiding the excessive heating (overheating) and the deterioration of the wire cables of feeding (which can be the cause of fire) owing to very high current at stake. The thermoelectric switch may have various thresholds of fixed intervention which can go from 100 mA to 20, 30, 40 etc. A ampere or variable. The model examined is of variable type; if one makes suitable changes to some small resistors, he may obtain the fixed model he wishes, at 12 and/or 24 V (Volt) with disconnections of amperage from 100 mA to 20, 30, 40 etc. A. The thermoelectric switch has got inside itself, (contains) other features that make it versatile for uses in which there is a broad utilization of accumulators 12 and/or 24 V. The device has been planned for the purpose of having continually under control, when it is activated, both the current and the tension of the continuous current among which those of the accumulators in series or parallel coupling. This last feature has a double task. 1) It has to control the tension of the accumulator by stopping the block device (owing to the minimum tension of the accumulator itself) so avoiding the threshold of the discharge rate beyond which the accumulator cannot and must not go, as it might be destroyed by sulphatization. 2) To control the maximum tension, to protect the appliances that are connected to it, from the excessive tension of the recharge, from external sources connected to the same accumulator (see alternators-battery charge etc.). The thermoelectric switch d.c. master, depending on the requirements, may be connected to the thermoelectric switch d.c. slave of which it has the same features but with one more option: it may go to the stand-by position whether it needed further more power; this stand-by is sent by an impulse from the switch d.c. master to the switch d.c. slave, that is already in pre stand-by position: that will finish automatically when the switch d.c. master diminishes its energetic consumption. Another feature of the device, on the same current conducted, is that it has a remarkable potential drop of the temperature dispersion of the same device concerning a traditional magnetocaloric.

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AUTOMATIC THERMOELECTRIC SWITCH IN DIRECT CURRENT

DESCRIPTION AND FUNCTIONING OF THE TECHNIQUE OF THE THERMOELECTRIC SWITCH D.C. MASTER AND SLAVE

Purely electronic device

The switch d.c. master (slave) has got inside itself 6 operational amplifiers, 4 logic doors and some active and passive electronic components.

How it works.

-1 Operational amplifier I.C. (1), picture 1/5 A.O. (amplifier stage).

The entries of A.O. are connected by two resistive carriers to the SHUNT of the positive of primary's supply.

The A.O. is used to amplify the tension present at the ends of the SHUNT; the resistive carriers will give the possibility to vary the sensitivity at the entry of the operational.

At exit 1 of the operational we shall find a positive amplified tension that will be also earthed by means of a resistive divider; from the same potential divider we shall take a tension that will lead to the entry of the little foot n. 5 of the operational amplifier I.C. (2).

-2 Operational amplifier I.C. (2) A.O. (phase comparator).

From the exit n. 1 of the first operational we shall connect, by means of the resistive divider, the entry of the little foot n. 5 of the second operational, which is used as a phase comparator; in this way we shall have a positive exit on the foot n. 7, logic level (1) until the tension on the little foot n. 5 exceeds the threshold present on the little foot n. 6 (tension point). The exit 7 of the phase comparator will lead to the phase FLIP-FLOP I. C. (7).

-3 The phase FLIP-FLOP I. C. (7). This phase has the task to steer the MOS-FET of power; the task of this phase is subjected to the phase comparator, until the level of the little foot n. 5, as already mentioned, will go beyond the threshold present in the little foot n. 6; the exit 7 will remain at a logic level (1). At this point the FLIP-FLOP will permit the MOS-FET of power to send the primary tension that is at the entry, towards the user. The FLIP-FLOP has been endowed with two buttons. One is START, the second STOP. START re-establishes the tension every time the device goes under protection, while stop interrupts the tension if necessary. The other exit of

the FLIP-FLOP leads to the entry of the comparator n. 3 used to signal, both acoustically and visually, the unexpected alarm.

-4 Operational amplifier I.C. (4) master/slave

This operational is used as a comparator for the switch d.c. Slave.

The exit of the comparator controls the guide of the GATE of MOS-FET of power; this exit maintains the electric conductivity in the final of power until the tension of the little foot n. 5, reconducted on the little foot n. 13, of A.O. n. 4 exceeds the threshold's tension of the little foot n. 12 (reference voltage which is slightly superior to the threshold's reference of the little foot n. 6). The exit of this operational of the switch d.c. slave, is sent to an entrance of the logic door NAND I. C. (7), which prepares the switch slave for the pre stand-by picture 2/5. The stand-by will be transmitted by the switch master, to pin n. 3 should it need power, changing the logic stage of the comparator n. 4 from 1-0, taking the slave to the stand-by position. Note. In the switch master the little feet of the comparator have the opposite tension reference.

-5/6: the other two operational amplifiers A.O. I.C. (5) I.C. (6) have the task of controlling, by some resistive dividers and a reference tension, the tension of the primary supply of the switch master-slave, before the stabilizers of tension. The exits 1 and 7 of the two comparators are sent to the FLIP-FLOP. These two exits when they reach the logic level 0 will take the device to emergency, by disarming the tension out.

-7 The device is controlled by a thermostat N.A. at a temperature that may change from a variation of 30°-75°C (celsius) according to the type. The thermostat will take the FLIP-FLOP to earth by sending the device to emergency; this device may be refitted only when the temperature has gone back to its parameters.

-8 DISPLAY. The display conveniently connected with the signals will show the typologies of the different situations (see how the switch works).

-9 The device may be monopolar or bipolar.

AESTHETICS AND OPERATING INSTRUCTIONS OF THE THERMOELECTRIC SWITCH D.C. MASTER AND SLAVE

As for the aesthetics (dimensions: width L 2 cm, height H 6 cm, depth P 12,20 cm).

The device has got a switch, three buttons and a display. The switch is the system that allows the above mentioned functions.

The other three buttons: the first "start", gives the electric current to the user, the second "stop" forbids the current towards the user, the third "stop buzzer" only stops the sound of the device that has been given the alarm (this is due to the features mentioned above).

Operating instructions: this device stops the power supply towards the user, informing both acoustically and visually, by the help of a "Bip" and a "display", that there is something wrong which may be produced by a short circuit, by the maximum absorption, by the highest temperature and by the highest and least tension of the accumulator; the display shows the different types of alarm, which are marked, for the switch d.c. master and the switch d.c. slave by the letter "A" (It appears systematically in every types of alarm with intermittence) + Bip.

"A" alone: it stands for short-circuit, maximum absorption and the safety catch of the device (stop) + Bip.

"A" associated with "C" "celsius" degrees centigrade for the maximum temperature (visual intermittence A-C) + Bip.

"A" associated with H "high" stands for high tension of the accumulator or other source (visual intermittence A-H) + Bip.

"A" associated with L "Low" stands for low tension of the accumulator or other source (visual intermittence A-L) + Bip

The function stand-by is marked with the letter "S" and refers only to the switch d.c. slave and the functions of the switch d.c. master remain unchanged.

The alpha numerical function 6A + Bip of the switch d.c. slave is referred to three interventions: "L" stands for least tension of the accumulator/s or other source.

"S" Stand-by.

"A" Alarm.

A further surety of the switch d.c. master and slave, is given by the existence inside it, of a fuse whose only function is to preserve the user from a possible, but rare damage

of the safety device.

Both the switch d.c. master and the slave, are active devices; this means that they need their own source of energy that may be obtained from the supply source of the same user, or from an external source.

The device may be monopolar or bipolar 12 or 24 V.

PATENT CLAIMS

Thermoelectric device to protect a circuit, similar to a fuse, but with the difference that it can be put back automatically in operation very quickly. Monopolar and bipolar 12 and 24 V that allows the control of both the tension and the current and also of the temperature, all important elements able to supply equipments with direct current, by tension and established current and, whether different, wiring harnesses and equipments would be damaged.

The automatic protective device is activated owing to maximum absorption, maximum temperature and owing to short circuit, minimum and maximum supply tension.

The device at issue, is the only one that, in addition to control the current, also controls the incoming tension by switching off automatically out of the range for which it has been devised or for which it has been calibrated, by warning acoustically and visually when the device is protected and when the electric system and the equipments, which are connected with it, are safe. Another feature of the device is that the automatic switch master, has the possibility to control the automatic switch slave by putting it on the stand-by position, and breaking off the supply of its energy and reactivating it automatically, when the master itself lowers its primary consumptions of power.









