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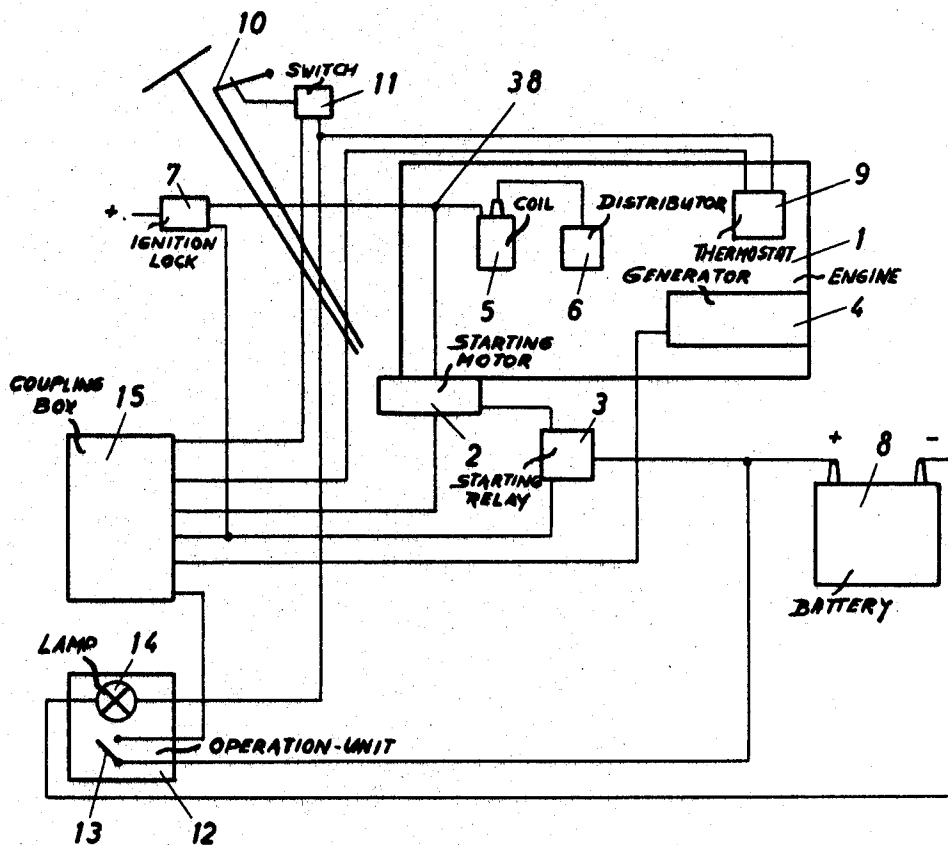
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AUTOMATIC INTERNAL COMBUSTION ENGINE STARTING APPARATUS

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2 Sheets-Sheet 1

Fig.1



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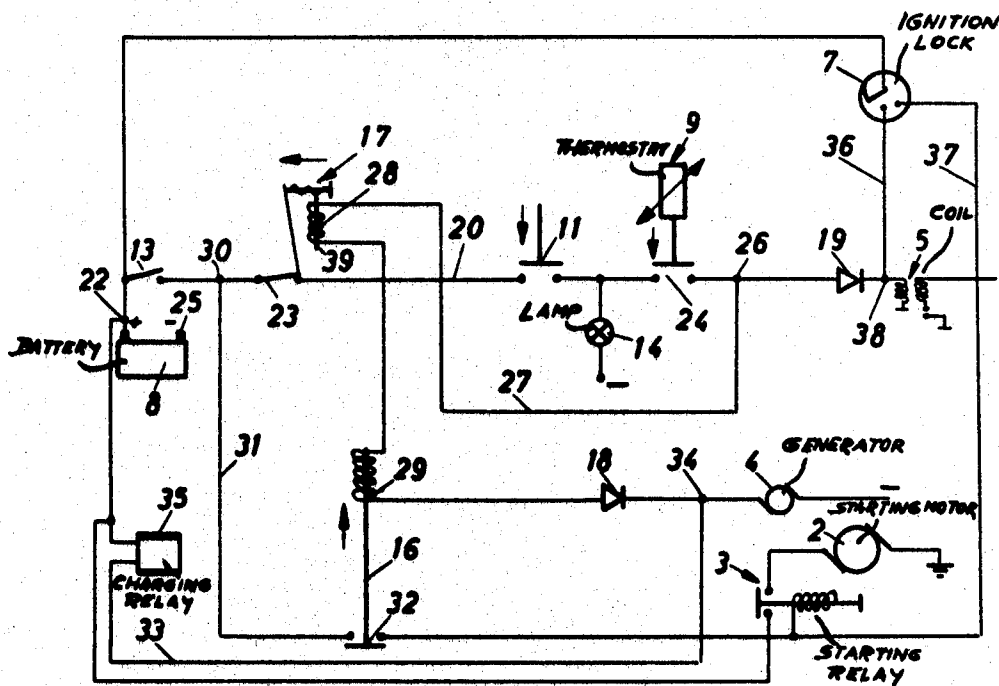
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Fig. 2



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AUTOMATIC INTERNAL COMBUSTION ENGINE STARTING APPARATUS

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8 Claims. (Cl. 123—41.15)

ABSTRACT OF THE DISCLOSURE

A device for the automatic starting of an engine having a charging generator and a starting relay. An ignition support is provided wherein said starting relay is connected in parallel. Also a thermostat is provided in the ignition support to close the ignition circuit at a predetermined temperature of the engine and to break said circuit at a higher predetermined temperature. A coupling relay is connected in the circuit between the thermostat and the generator for closing the circuit to the starting relay.

The present invention relates to a device for the automatic starting of an internal combustion engine, in particular a vehicle engine, this engine being provided with a battery charging generator and a coupling relay, said device comprising a thermostat which is adapted to close the ignition circuit of the engine at a certain temperature of the engine, e.g. 60° C., and another, higher temperature, e.g. 80° C. to interrupt this circuit. Previously known automatic starting devices of this kind are rather complicated, and their function is unsatisfactory in many respects.

The present invention has for its object to provide a rather simple starting device which simultaneously has safe and automatic function. The main feature of the invention is to be seen therein that a coupling relay for closing a circuit containing said starting relay and paralleling the ignition circuit is connected between the thermostat and the generator.

The invention will now be elucidated with reference to the accompanying partly diagrammatic drawings. In the drawings:

FIG. 1 shows a block diagram of the electric equipment of a car engine, and

FIG. 2 shows a similar coupling diagram more in detail.

Referring now to FIG. 1, reference numeral 1 denotes the vehicle engine, reference numeral 2 its starting motor, reference numeral 3 the starting relay of the latter, reference numeral 4 the battery charging generator, reference numeral 5 the ignition coil of the internal combustion engine, reference numeral 6 its distributor, reference numeral 7 the ignition lock, and reference numeral 8 the battery. The thermostat which controls the temperature and is included in the coupling according to the invention has been denoted with reference numeral 9 and a contact which is influenced by the gear lever 10 has been denoted with reference numeral 11. The contact 11 is connected in the ignition circuit of the internal combustion engine and the contact 11 is closed when the gear lever 10 is in its neutral position. Reference numeral 12 denotes an operation unit containing a main switch 13 and an indication lamp 14. Reference numeral 15 denotes a coupling box which contains a coupling relay 16, an engine protection relay 17 and two diodes 18 and 19 and other suitable semi-conductors.

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The main switch 13 is connected in the ignition circuit 20 of the ignition coil 5 from the positive pole 22 of the battery 8. The ignition circuit also comprises the contact 23 of the engine protection 17 and further the contact 11 which is operated by the gear lever 10, and the contact 24 of the thermostat 9 as well as the diode 19. The indication lamp 14 is coupled to the negative pole 25 of the battery in parallel with the ignition circuit.

A wire 27 is connected to the ignition circuit 20 as at 26 and the operation coil of the engine protection 17 is connected to this wire 27 and the coil 28 is further connected in series with the operation coil 29 of the coupling relay and the diode 18. The wire 27 is with its opposite end connected to the generator 4. A wire 31 is connected in parallel with the ignition circuit at a point 30 between the main switch 13 and the coupling contact 23 of the engine protection 17 to the starting relay 3 for the starting engine 2 of the internal combustion engine 1. The contact 32 of the coupling relay 16 is connected to the wire 31. The charging wire 33 issues from the generator at a point 34 between the diode 18 and the generator and leads to the positive pole 22 of the battery 8 via a battery charging relay 35.

From the ignition lock 7 of the vehicle, this lock 7 being connected to the positive pole 22 of the battery, there extend ordinarily a wire 36 to the ignition coil 5 and a wire 37 to the starting relay 3. The wire 36 is connected to the ignition circuit 20 at a point 38 between the diode 19 and the ignition coil 5.

The device is started by switching in the main switch 13. The contact 23 is normally always closed and the contact 11 is closed when the gear lever is in neutral position. When the main switch 13 and the contacts 23 and 11 are closed, the lamp 14 burns and the positive voltage from the battery 8 reaches the contact 24 of the thermostat 9. This thermostat closes the contact 24 when the temperature of the engine block falls under a predetermined value, e.g. 60° C., and is disconnected when the temperature rises again to about e.g. 80° C. At connected thermostat 9 the positive voltage reaches also the bimetal spring 39 of the protection relay 17 and further to the operation coil 29 of the coupling relay 16 and via the diode 18 to the generator 4. When the internal combustion engine 1 is at rest, the generator 4 has the same potential as the negative pole 25 of the battery and for this reason a current flows from the positive pole 22 of the battery via the switch 13, the contacts 23, 11, and 24, through the bimetal spring 39 and the operation coil 29 as well as through the diode 18 and back to the negative pole 25 of the battery 8. The relay 16 then closes the contact 32 and the current reaches the starting relay 3 through the switch 13 and the wire 31 and the starting engine 2 begins its operation. When the internal combustion engine 1 has started, the generator 4 begins to charge and for this reason the potential of the generator rises and the current through the operation coil 29 is interrupted. The contact 32 falls and the starting engine 2 is disconnected.

If, for any reason, the internal combustion engine 1 does not start within a certain predescribed time, e.g. 20 seconds, the bimetal spring 39 will influence the contact 23 in such a way that the whole device is disconnected. The contact 23 can then be closed only by a manual connection of the same.

The voltage of the generator 4 is often higher than the voltage at the ignition coil 5. So as to prevent the relay 16 from being closed in such a case, the diode 18 is connected in the wire 27 and this semi-conductor prevents the current from passing the operation coil 29. The diode 19 prevents current from flowing to the operation coil 29 when the ignition key in the ignition lock

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7 is turned to the ignition position. Only when the ignition key is turned to starting position the positive voltage from the battery 8 reaches, via the wire 37, the starting relay 3. The diode 19 also prevents current from passing the operation coil 29 when one or several of the contacts 23, 11, 24 are disconnected and the internal combustion engine 1 is at rest.

The invention has been described in the foregoing for purposes of illustration only and is not intended to be limited by this description or otherwise except as defined in the appended claims. Thus, many modifications of constructive nature could be carried out without departing from the inventive idea. The diodes 18 and 19 may be replaced by other semi-conductors, e.g. transistors. The motor protection relay 17 with its contact 23 may, if desired, be completely dispensed with and the operation coil 29 of the coupling relay 16 be coupled directly to the point 26 of the ignition circuit 20.

What we claim is:

1. A device for the automatic starting of an engine equipped with a charging generator and starting relay comprising an ignition circuit, said starting relay being connected in parallel with the ignition circuit, a thermostat in said circuit to close said ignition circuit at a predetermined temperature of the engine, and to break said circuit at a higher predetermined temperature, and a coupling relay connected in said circuit between said thermostat and said generator for closing the circuit to said starting relay.

2. A device according to claim 1, wherein in said circuit between said thermostat and said generator there is connected a semiconductor allowing current to flow only one way towards said generator.

3. A device according to claim 1, wherein in said circuit between said thermostat and said generator there is connected a diode allowing current to flow only one way towards said generator.

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4. A device according to claim 1, wherein an ignition lock and an ignition coil is provided in said circuit and a semi-conductor allowing current to flow only one way towards said ignition coil is mounted between said lock and coil and the connection of said thermostat to said generator.

5. A device according to claim 4, wherein between said engine and said generator there is mounted a semi-conductor allowing current to flow only one way towards said ignition coil.

6. A device according to claim 4, wherein in said circuit between the connector from said ignition lock to said ignition circuit, and the connection of said generator to said ignition circuit, there is mounted a diode allowing current to flow only one way towards said ignition coil.

7. A device according to claim 4, wherein in said circuit between the connection from the engine to said ignition circuit, and the connection of said generator to said ignition circuit, there is mounted a diode which allows current to flow only one way towards said ignition coil.

8. A device according to claim 1, wherein a protection relay for the engine is provided in said circuits so that, if said engine does not start after a predetermined time said ignition circuit will be broken.

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