Jan. 29, 1929. 1,700,314

W. G. HARTWIG

RELAY

Filed Feb. 5, 1925

Fig. 1.

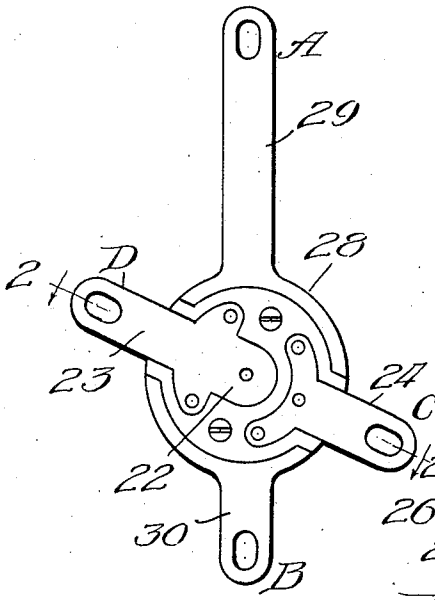


Fig. 2.

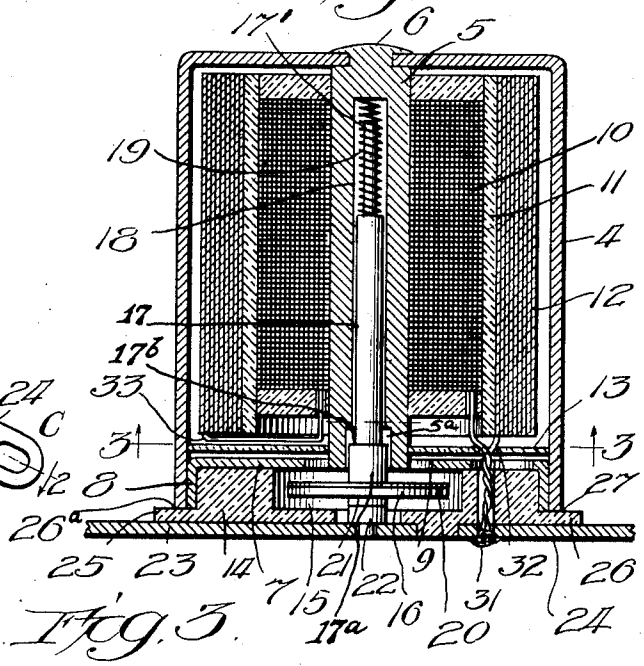


Fig. 3.

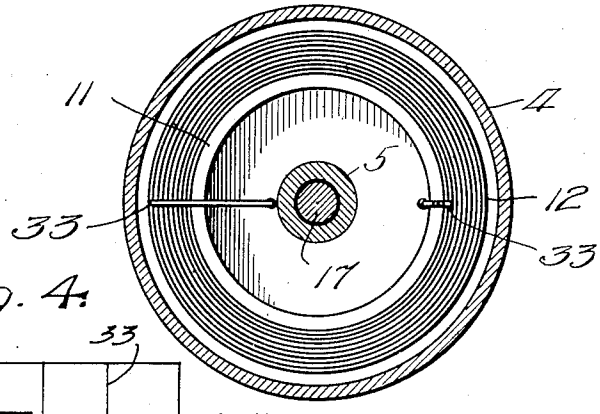
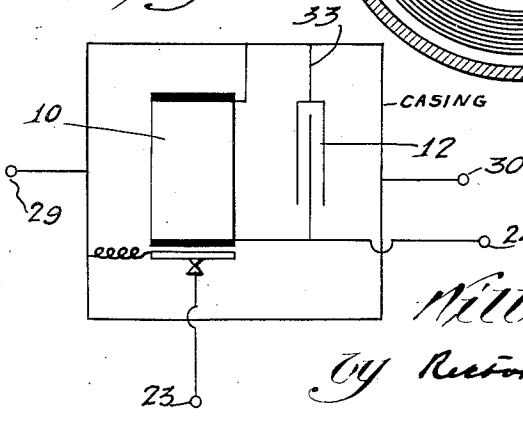


Fig. 4.



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UNITED STATES PATENT OFFICE.

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RELAY.

Application filed February 5, 1925. Serial No. 7,082.

My invention is more particularly designed for use in connection with automatically controlled electric heating systems such as are employed in street cars and the like. In such heating systems it has been found desirable to employ the thermometer form of thermostat, because of its relative accuracy, to control the contactor by which the heating current is switched on and off. As such thermostats are adapted, however, only for relatively feeble current, it has been customary to employ a relay, the circuit through the coil of which includes and is opened and closed by the thermostat, and which relay in turn, controls the electromagnetic means for opening and closing the contactor of the heating circuit. In order to protect the thermostat from the surge of current on making and breaking the circuit therethrough, such relays have heretofore been provided with Morrow condensers in shunt to the windings of their electro-magnets.

The present invention relates to a relay of the above description and has for its object to produce such a relay of simple and compact design and construction which may be manufactured at relatively low cost and which is efficient and durable in use.

In the drawings accompanying and forming part of this application, Fig. 1 is an elevation of a preferred embodiment of my improved relay, Fig. 2 an axial section thereof, Fig. 3 a transverse section on a plane of the line 3—3 of Fig. 2 and Fig. 4 a diagram showing the connections.

In the form of the invention shown in the drawing a casing 4 of magnetic material encloses the working parts. The magnetic core 5 is mounted in the casing axially thereof and is secured to the ends of the casing as shown at 6. The casing 4 is cup-shaped, the mouth of the cup being closed by a flanged disk 7 of magnetic material, except for the openings through said disk to which reference will hereafter be made. The flange 8 of said disk fits snugly within the mouth of the cup. The disk is formed with a central perforation 9 into which the end of the magnetic core 5 extends, the magnetic circuit comprising said core, cup and disk. The coil 10 of the magnet surrounds the core as usual and is enclosed in a shell 11 of dielectric material.

Upon the shell 11 of dielectric material is wound a foil and paper condenser 12. Between the flanged disk 7 and the magnet and condenser is interposed a disk 13 of dielectric material centrally perforated to receive the end of the magnetic coil.

The armature of the electro-magnet comprises a disk 16 of magnetic material mounted on the end of a rod 17 of non-magnetic metal which rod is received and guided in the axial bore 18 of the hollow core 5. The end of rod 17 is reduced and surrounded by a coiled spring 19 which bears against the bottom of the bore 18. The rod is enlarged at 17^a adjacent the disk 16 to form a shoulder 17^b and the bore of the core is enlarged at 5^a to receive the enlarged portion of the rod 17, the shoulder 17^b on the rod serving to limit the inward movement of the armature. To avoid sticking, a disk 20 of dielectric material, paper or the like is preferably located between the armature and the core and disk 7.

The armature carries a contact button 21 preferably of a metal which well resists corrosion. When the armature is in the outer position shown in Fig. 2, said button is in contact with a stationary contact 22 carried by a terminal 23, to which one end of the circuit to be controlled may be attached. The flanged disk 7 is formed with two connector terminals 29 and 30, preferably, and as shown, struck up from the metal of said disk to either of which the other end of the circuit to be controlled may be attached. Thus when the coil 10 of the magnet is de-energized and the armature thrust outward by the spring closing the contact button 21 against the stationary contact 22 an electric circuit is closed which circuit comprises the disk 7, the casing 4, the core 5, rod 17, armature 16, contacts 21, 22 and terminal 23.

One terminal of the coil 10 is grounded on the core 5, and the other end of said coil is connected by wire 31 to terminal 24. One end of the condenser 12 is grounded on the casing, or as shown, at 33 on the core, and the other end of the condenser is likewise connected to the terminal 24, the condenser thus being in shunt to the coil and operating in the usual manner to minimize sparking on making or breaking the current through the coil. One end of the controlling circuit (which includes the thermostat, as heretofore pointed out) is connected to one of the arms 29 or 30 of the disk 7 and the other end of said controlling circuit is connected to the terminal 24 so that when contact is made

through the thermostat the magnet is energized and when contact is broken at the thermostat the magnet is de-energized, the condenser, as usual, taking care of the induction current and preventing it injuriously affecting the thermostat.

Terminals 23 and 24 are imbedded in a block 14 of insulating material as best shown in Fig. 1. Said block is mainly circular in outline and fits snugly within the flange 8 of the disk 7. It is formed, however, with oppositely extending lugs or projections 25, 26 which extend beyond the wall of the casing 4, the latter being cut-away or recessed at 26a, 27 for the reception of said lugs. Said block of insulating material is likewise chambered or recessed at 15 to provide a housing for the reception of the armature 16. Said block is also apertured at 40 to permit the extension therethrough of the contact 22.

The described construction provides a relay for the described purpose which is very compact, well protected against injury, and which may be cheaply manufactured.

I claim:

1. In a relay of the class described, a magnetic core, a magnet coil surrounding the core, a condenser surrounding the coil, a housing of metal connected to the core and surrounding the condenser, said housing being in the form of a metal cup, a metal disc in the opening of said cup and in electric contact therewith, said disc having an opening therein in register with the core, an insulating body in the mouth of the cup having a recess therein in registry with the opening in the disc and the core, an armature for the magnet movable in said recess and in electric connection with said core, said armature provided with a contact, a terminal embedded in said insulating body and having a stationary contact engaged by the contact on the armature, a second terminal embedded in said insulating body, connections from the last-named terminal to the coil and condenser in multiple, the other terminals of the coil and condenser being electrically connected to said core.

2. In a relay, a magnet core, a coil surrounding the same, a condenser surrounding the core, a cup of ferrous metal surrounding the condenser and to the bottom of which the core is electrically connected, a flanged disc of ferrous metal seated within the mouth of the cup and having an opening surrounding the end of the core, a body of insulating material within the hollow of the flanged disc and having a chamber formed therein in registry with the opening in the disc and with the core, an armature for the magnet movable in said chamber, a guide rod on the magnet extending into a hollow in the core, a spring compressed between said guide rod and core and tending to force the armature away from the magnet, a contact on the armature, a stationary contact for engaging the contact on the armature, a terminal carrying the stationary contact embedded in the insulating body, a second terminal also embedded in the insulating body, connections from the last-mentioned terminal to the coil and condenser respectively, the other end of the coil and the other member of the condenser being grounded on the magnet core, and means for attaching the flanged disc to a support.

3. In a relay of the class described, a magnet having a core, a condenser wound about said magnet, an armature for the magnet, a casing of electro-magnetic material surrounding the magnet and condenser and to which the core of the magnet is attached, a body of insulating material in the end of said casing, terminals secured to said body of insulating material, one of said terminals carrying a contact adapted to be engaged by said armature, means for electrically connecting said armature to the casing, connections between one end of the magnet coil and one end of the condenser and the casing and connections from the other end of the magnet coil and condenser respectively to the other of said terminals.

4. In a relay of the class described, a magnetic core, a magnet coil surrounding the core, a condenser surrounding the coil, a housing of metal connected to the core and surrounding the condenser, said housing being in the form of a metal cup, an insulating body in the mouth of the cup having a recess therein in registry with the core, an armature for the magnet movable in said recess and in electric connection with the core, said armature provided with a contact, a terminal secured to said insulating body and having a stationary contact engaged by the contact on the armature, connections from the last named terminal to the coil and condenser in multiple, the other terminals of the coil and condenser being electrically connected to said core.

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