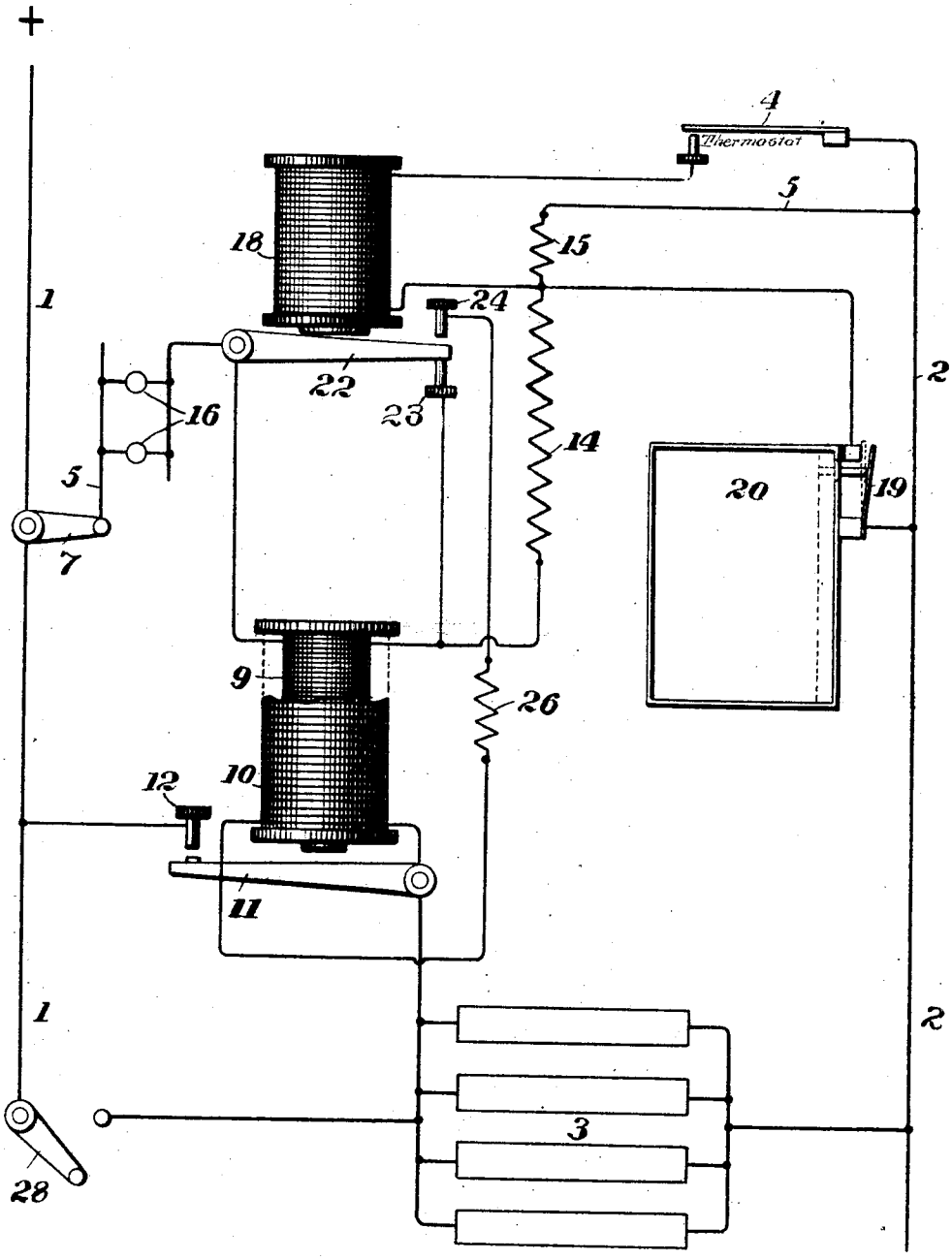
H. G. GEISSINGER.

AUTOMATIC ELECTRIC HEAT CONTROL.

APPLICATION FILED DEC. 22, 1909.

969,781. **Patented Sept. 13, 1910.**



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AUTOMATIC ELECTRIC HEAT CONTROL.

969,781. Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed December 22, 1909. Serial No. 534,498.

To all whom it may concern:

Be it known that I, HARRY G. GEISSINGER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Automatic Electric Heat Control, of which the following is a specification.

My invention relates to a system for controlling the electric circuits leading to translating devices, and is especially applicable to the control of electric heater circuits.

One of the objects of my invention is to render perfectly safe the control of the electric heaters of public conveyances, such as passenger cars, the staterooms of vessels, or other rooms in which the public especially are conveyed or housed.

Another object is to provide a system in which a high voltage may be supplied to the heaters and be controlled with facility by means of a delicate thermostat operating in a low voltage circuit.

A further object is to automatically disconnect the heaters from the supply circuit whenever the doors are left open by accident or otherwise.

Other advantages will be apparent from the following description, while a clearer comprehension of my invention will be obtained by reference to the accompanying drawings, which diagrammatically illustrate an automatic electric heat control system.

In the drawings, 1 and 2 indicate the main supply conductors which may carry electric currents of high voltage. If, for instance, the system is applied to the control of the heaters upon electric traction cars, the conductor 1 may be connected with the trolley or shoe of the car and the conductor 2 may be connected with the axles or metallic frame of the car if a rail or ground return is employed. Thus there would be a difference of potential of six hundred and fifty or more volts between the conductors 1 and 2. The electric heaters 3 are connected directly between the supply conductors and are under the automatic control of the thermostat 4 in the manner hereinafter described.

An operating or regulating circuit 5, connected to the main 2 and to the main 1 through a switch 7, includes the holding or retaining coil 9 of the main circuit-closer whose armature 11 coöperates with the contact stud 12 to connect the heaters 3 to the supply mains. Resistances 14, 15, are inserted in the circuit 5, and if desired, pilot lamps 16 may also be included. In a system having the voltage above-mentioned, the resistance 14 may conveniently be about 1800 ohms, and that of 15, about 40 ohms, so that the volume of current in this circuit would be very small, approximately one-third of an ampere. In shunt about the resistance 15 is the circuit containing the door-switch 19 which is normally held in the open position illustrated when the door 20 is closed. With the values assumed above for purpose of illustration, there would be the very small difference of potential of about 13 volts at the gap of the thermostat contacts, due to the drop across the resistance 15, and the current would be almost inappreciable, being less than one-tenth of an ampere. Thus, the only circuits or contacts which would require to be placed in a position accessible to passengers or the public, are perfectly safe and without depending upon insulation.

The operation of my system of automatic electric heat control may now be explained. When the switch 7 is closed, current will flow through the regulating circuit 5 by way of the armature 22 of the relay and the contact stud 23, which short-circuit the retaining coil 9 of the main circuit-closer, and if the temperature is above normal so that the thermostat contacts are open, neither the relay nor the circuit-closer magnets will be energized. If, however, the temperature is too low, so that the contacts of the thermostat 4 are closed, energizing the shunt circuit through the relay coil 18, the armature 22 will be lifted into contact with the stud 24, thus opening the short-circuit about the retaining coil 9 of the main circuit-closer, and diverting the current of the regulating circuit therethrough. With the values previously assumed, if the resistance of this coil is about 80 ohms, there will be but a small diminution of the regulating current and only a voltage of about 27 volts across its terminals. The magnetic power of the coil 9 is only sufficient to retain the armature 11 when once lifted, and is not sufficient to start it from its lower position. When, however, the relay armature 22 is in contact with the stud 24, a current flows from the main 1 through the resistance 26, which may con-

veniently be made 500 ohms, and through the lifting coil 10, to the main 2 by way of the heaters 3. The combined magnetic power of the coils 9 and 10, which may be superposed upon the core, raises the armature 11 into contact with the stud 12, thus connecting the heaters directly between the supply mains and at the same time short-circuiting the lifting coil 10, depriving it of its energy but without disconnecting it. The actual flow of current through the coil 10 is, therefore, of very brief duration. As above stated, the holding coil 9 has sufficient power to retain the armature 11 in raised position, and accordingly it will remain in contact with the stud 12 as long as the relay armature 22 maintains the circuit through the coil 9. The heaters 3, now in operation, warm the air of the car or other compartment until the temperature is raised to the degree at which the thermostat 4 opens its contacts. When this occurs, the relay coil 18 is deënergized, and the armature 22 drops from the contact stud 24, short-circuiting the retaining-coil 9 of the main circuit-closer at the contact 23 and causing its armature 11 to drop from the stud 12, thus cutting out the heaters 3.

In order that there may not be a useless waste of heat when a door of the car is open, I provide a switch 19 which is normally held in the open position as shown when the door is closed, but which will close a shunt circuit about the resistance 15 when the door is open as shown in dotted lines, thus eliminating the drop of potential across the resistance, deënergizing the relay 18 and causing the heater circuit to be broken in the manner previously described.

It will be observed that a substantially constant current flows through the regulating circuit 5, as long as the system is in operation. This constant current circuit may be used for the operation of other auxiliary apparatus and I have shown, by way of illustration, the lamps 16, though it is evident that other devices may also be inserted.

While I have only shown one set of heaters 3, it is to be understood that other heaters may be employed and be under the control of the main circuit closer. In case it is desired to short-circuit the thermostatic control apparatus, or to disconnect it from the mains for any purpose, the heaters may be manually connected to the mains by means of a switch 28.

The advantages to be derived from my invention will be appreciated by those skilled in the art from the foregoing description. It will be observed that I am enabled to control a high voltage heating circuit by means of a delicate thermostat which operates upon a very small current and that the regulating circuit which actuates the main circuit closer for the heaters also carries an exceedingly small amount of current, maintains the contacts of the main circuit-closer with a minute expenditure of energy, permitting the use of small energizing coils. It will be noted that current flows through the lifting coil only for the instant that the armature is being lifted, and that I eliminate the usual resistance-inserting mechanism by short-circuiting the coil, thus depriving it of current and avoiding the use of a resistance to absorb energy.

The above disclosure is merely for the purpose of illustrating one embodiment of my invention, and it is to be understood that many changes can be made therein without departing from the spirit of my invention, since

What I claim and desire to secure by Letters Patent, is—

1. A system of automatic heat control, comprising an electric heater, and a circuit closing device arranged to connect said heater to supply mains having an armature connected with the closer contacts and energizing coils comprising lifting and retaining coils coöperating to raise the armature, said lifting coil being short-circuited by said armature when in raised position.

2. A system of automatic heat control, comprising an electric heater, a circuit closing device arranged to connect said heater to supply mains having an armature connected with the closer contacts and energizing coils comprising lifting and retaining coils coöperating to raise the armature, said lifting coil being short-circuited by said armature when in raised position, and a regulating circuit for said circuit closing device having mechanism for short-circuiting said retaining coil.

3. A system of automatic heat control, comprising an electric heater, a circuit closing device arranged to connect said heater to supply mains having an armature connected with the closer contacts and energizing coils comprising lifting and retaining coils cooperating to raise the armature, said lifting coil being short-circuited by said armature when in raised position, a regulating circuit for said circuit closing device having mechanism for short-circuiting said retaining coil, and a thermostat controlling the operation of said mechanism.

4. A system of automatic heat control, comprising an electric heater, a circuit closing device arranged to connect said heater to supply mains having an armature connected with the closer contacts and energizing coils comprising lifting and retaining coils coöperating to raise the armature, said lifting coil being short-circuited by said armature when in raised position, a regulating circuit for said circuit closing device having mechanism for short-circuiting said retain-

ing coil, a thermostat controlling the operation of said mechanism, and a switch for nullifying the controlling effect of the thermostat.

5. A system of automatic heat control, comprising an electric heater and a circuit closing device connecting the heater to supply mains, said device having an armature controlling main contacts and energizing coils for actuating the armature connected respectively in shunt and in series with the heater, and one of said coils being short-circuited when the armature is in attracted position.

6. A system of automatic heat control, comprising an electric heater, a circuit-closing device connecting the heater to supply mains, said device having an armature controlling main contacts and energizing coils for actuating the armature connected respectively in shunt and in series with the heater, and one of said coils being short-circuited when the armature is in attracted position, and a thermostat having connections for controlling a short-circuit about the other of said coils.

7. A system of automatic heat control, comprising an electric heater, a circuit closing device connecting the heater to supply mains, said device having an armature controlling main contacts and energizing coils for actuating the armature connected respectively in shunt and in series with the heater, and one of said coils being short-circuited when the armature is in attracted position, electromagnetic mechanism arranged to short-circuit said other coil, and a thermostat connected with and controlling said mechanism.

8. A system of automatic heat control, comprising an electric heater, a circuit closing device connecting the heater to supply mains, said device having an armature controlling main contacts and energizing coils for actuating the armature connected respectively in shunt and in series with the heater, and one of said coils being short-circuited when the armature is in attracted position, electromagnetic mechanism arranged to short-circuit said other coil, a thermostat connected with and controlling said mechanism, and a device for nullifying the controlling effect of said thermostat.

9. A system of automatic heat control, comprising an electric heater, a circuit closing device having contact to connect the heater with supply mains, said device having an armature to control said contacts and energizing coils comprising lifting and retaining coils coöperating to lift the armature, a regulating circuit in shunt to said heater and having said retaining coil and a resistance included therein, a device for short circuiting the retaining coil, and a thermostat in shunt to said resistance and controlling the operation of said short-circuiting device.

10. A system of automatic heat control, comprising an electric heater, a circuit closing device having contacts to connect the heater with supply mains, said device having an armature to control said contacts and energizing coils comprising lifting and retaining coils coöperating to lift the armature, a regulating circuit in shunt to said heater and having said retaining coil and a resistance included therein, a relay device for short-circuiting the retaining coil, and a thermostat in circuit with said relay and in shunt to said resistance.

11. A system of automatic heat control, comprising an electric heater, a circuit-closing device arranged to connect said heater to supply mains, said device having an armature operating to control the contacts of said circuit-closing device and an energizing coil, a normally closed regulating circuit to which said energizing coil is connected and which normally carries a substantially constant current and means for connecting and disconnecting said circuit to the supply mains.

12. A system of automatic heat control, comprising an electric heater, a circuit-closing device arranged to connect said heater to supply mains, said device having an armature operating to control the contacts of said circuit-closing device and energizing coils comprising lifting and retaining coils coöperating to raise said armature, a constant-current regulating circuit to which said retaining coil is connected, a switch for short-circuiting said retaining coil and a thermostatically controlled circuit having therein a relay magnet to actuate said switch.

13. A system of automatic heat control, comprising an electric heater, a circuit-closing device arranged to connect said heater to supply mains, said device having an armature operating to control the contacts of said circuit-closing device and energizing coils comprising lifting and retaining coils cooperating to raise said armature, a regulating circuit, a switch member connected to said circuit which in one position short-circuits said retaining coil and in another position connects one terminal of the lifting coil to the regulating circuit, a shunt to a portion of said regulating circuit including a thermostat and a relay coil to actuate said switch-member.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HARRY G. GEISSINGER.

Witnesses:
LAURA E. SMITH,
LOUISA E. SIMSON.