G. E. PALMER.

ELECTRICAL CONTACT SYSTEM.

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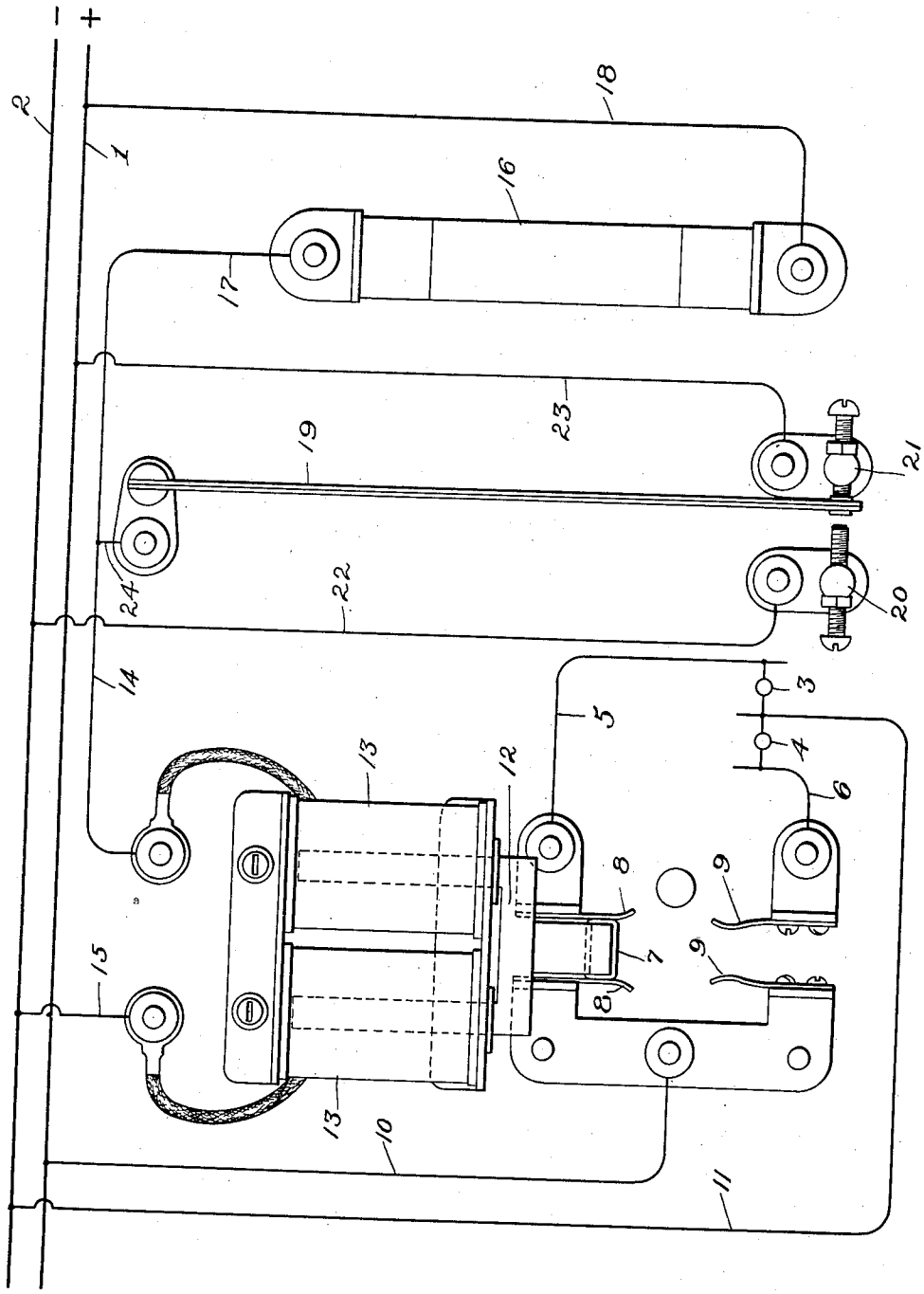
1,330,337.

Patented Feb. 10, 1920.



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UNITED STATES PATENT OFFICE.

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ELECTRICAL-CONTACT SYSTEM.

1,330,337. Specification of Letters Patent. Patented Feb. 10, 1920.

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To all whom it may concern:

Be it known that I, GRANVILLE E. PALMER, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Electrical-Contact Systems, of which the following is a specification.

This invention has relation to those electrical mechanisms in which some electrical translating device is operated upon the opening or closing of a circuit controlled by a relatively delicate contactor responsive to external influences such as heat, moisture, etc., and which, because of its delicacy, is subject to vibration and likely to fail in maintaining a perfect or a broken contact, as the case may be. In the operation of such mechanisms, there is required for a successful operation a better electrical contact than is afforded by the delicate contactor referred to.

According to the present invention, the primary contactor, which is responsive to variations in heat, moisture, etc., controls the operation of a secondary contactor which supplies current for translating devices of any suitable character. The secondary contactor is operated or functions at two certain alternate positions of the primary contactor, and its functioning is not otherwise affected by any operation of the primary contactor. The construction, arrangement and electrical connection of the parts are such that the primary contactor is protected against damage to its contact surfaces, either when making the alternate contacts which cause the operation of the secondary contactor or when making any other contacts due to the delicacy of its construction which renders it readily susceptible or responsive to external influences.

In order that the invention may be understood and its principle of operation may be made clear, I shall describe one embodiment of the invention as employed in connection with a temperature-controlled or thermostatic contactor, but, of course, the invention is not limited to such embodiment or to the association with a temperature-controlled contactor, as it may be embodied in other forms and associated with contactors responsive to other external influences.

As illustrated upon the drawing, I may employ a magnet and a resistance arranged in series in a circuit, and a contactor which, when moved in one direction to make contact, closes a by-pass for the current around the resistance, and, when moved in another direction, closes a by-pass for the current around the magnet. In this case, the armature for the magnet operates a secondary contactor, which controls the translating devices. When the armature is attracted in one direction by an increase of current through the coils of the magnet due to the by-passing of the resistance, the subsequent inclusion of the resistance in the magnet circuit, due to the breaking of the branch circuit by the contactor, leaves the magnet with sufficient current thereto to prevent a decrease in magnetic force sufficient to effect the release of the armature. Conversely, when the contactor on moving in the opposite direction closes a circuit to by-pass the magnet, and thus causes the magnet to release its armature, the subsequent inclusion of the magnet in the resistance circuit by the contactor breaking the branch circuit, does not cause sufficient current to be supplied to the magnet to overcome the inertia of the armature and move it. Hence, when the armature has been moved to either of its positions, it is not affected by vibrations of the contactor of a lesser amplitude of motion than that which would cause it to oscillate between its extremes of motion.

Referring to the drawing, which illustrates conventionally and diagramamtically an embodiment of the invention,—1, 2 indicate the positive and negative sides of a main circuit, from which current is derived for the operation of translating devices or electrical working mechanisms indicated conventionally at 3, 4, respectively. By the term "translating device" I mean to include any electrical mechanism in which an electric current is employed to insure any desired result. For example, it may include a motor for opening or closing a furnace draft or damper, or a switch mechanism for opening or closing a current through an electric heater,

or any other electro-mechanical appliance. The two translating devices 3 and 4 are respectively connected in two circuits 5, 6, controlled by a secondary contactor, which in the present case consists of a switch comprising the movable member 7, and the two pairs of spring contacts 8, 8, and 9, 9. A conductor 10 connects the left-hand contacts 8, 9, to the positive side 1 of the main circuit, and a return conductor 11 common to the two translating devices 3, 4, is connected to the negative side 2, of said main circuit. This arrangement of the circuits, including the main circuit and the translating-device circuits 10, 5, 6, and 11, may be varied as circumstances require.

The switch member 7 is carried by an armature 12, having a U-shaped plunger which is associated with a magnet comprising two solenoid coils 13, 13, arranged in what, for convenience, I may term the solenoid or magnet circuit and which comprises in addition thereto the conductors 14, 15. 16 indicates a resistance, placed in a circuit, comprising, in addition thereto, the conductors 17, 18. 19 indicates a delicate contactor, such for example as a thermostat adapted to have its free end engage either of two adjustable stationary contacts 20, 21, these last-mentioned contacts being connected with the main line conductors by the conductors 22, 23. The fixed end of the contact 19 is connected by conductor 24 with both the conductor 17 of the resistance circuit and with the conductor 14 of the solenoid circuit. By reason of this arrangement of the parts and the circuits, assuming the contact member 19 to be disengaged from both contacts 20 and 21, the solenoid circuit and the resistance circuit are normally in series connection, so that current from the main line circuit will flow through them, through the following path: conductor 1, conductor 18, resistance 16, conductor 17, conductor 14, solenoid coils 13, 13, conductor 15, and main line conductor 2. Under these conditions, the plunger, if at the lower end of its stroke, will not be affected since its inertia is sufficient to resist the upward pull of the weakened solenoid; whereas, if the plunger is at the top of its stroke, it will be held there by the solenoid, which though weakened by the inclusion of the resistance, is still strong enough to prevent it from dropping. Consequently current will be supplied to the one or the other of the translating devices 3, 4, as the case may be.

Now, if the movable contactor 19, from thermal or other causes, swings into engagement with contact 21, the resistance is bypassed, and the current follows a path including conductors 23, contact 21, primary contactor 19, conductors 24 and 14, coils 13, and conductor 15 to main line conductor 2. Under these circumstances, the coils 13 are energized by the full strength of the current, and the plunger is drawn upward, to the position shown on the drawing, and current will be supplied to the translating device 3.

If, on the other hand, the primary contactor 19 engages the screw or stationary contact 20, the solenoid is by-passed, and the plunger is permitted to drop so that the secondary contactor or switch member 7 carried thereby closes the circuit through translating device 4. Under these conditions, the current traverses the controlling circuits as follows: conductor 18, resistance 16, conductors 17 and 24, primary contactor 19, stationary contact 20 and conductor 22.

Thus the movable primary contactor 19, in engaging the contacts 20, 21, in alternation, by-passes the current around the resistance or the solenoid to effect the movement of the plunger and of the secondary contactor in one direction or the other, but, when the primary contactor by reason of vibration or from other cause leaves one contact momentarily or for a longer period of time, the plunger is not affected (nor the secondary contactor nor the translating device 3 or 4 as the case may be) until the said contactor 19 engages its other stationary contact. Of course a single translating device may be employed instead of two, if desired.

From the foregoing description, it will be seen that I have provided a magnet and a resistance in series connection, a secondary contactor which functions in the two alternate positions of the primary contactor but not otherwise, and a movable electrical contactor and two associated stationary contacts which, when alternately engaged thereby, by-pass the said magnet and the said resistance in alternation to cause the secondary contacts to perform its alternate functions only at the contact-making points in the movement of the contactor.

The resistances of the resistance coil 16 and of the magnet are so proportioned to the circuit in which they operate that they may individually carry without damage the full potential of the circuit.

From the description herein given, it is apparent that, when once electrical contact is made by the primary contactor with one of its associated stationary contacts, the secondary contactor immediately moves to one position or the other and there remains, even though the contactor vibrates against the associated contact or assumes an intermediate position between said contacts, and said secondary contactor is not again affected until the primary contactor moves to its alternate contact-making position in engagement with the other of its associated contacts. Hence the system which I have herein described is particularly applicable

for use in connection with circuits controlled by thermostats, hydrometers, volt-meters etc., to regulate temperature, moisture or electrical circuit conditions, where the moving parts are necessarily delicate and are subject to external disturbances and where it is desired to secure certain desired conditions with but a small tolerance in variation. The secondary contactor functions in each of its two positions, that is, in one position it closes a circuit through a translating device, and, in its other position, it opens the circuit. Incidentally in the present case, it closes a circuit through one translating device and practically simultaneously opens the circuit through the other translating device.

Having thus explained the nature of my said invention and described a way of making and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, what I claim is:—

1. An electrical contact system, comprising a main circuit, a magnet and a resistance, conductors connecting said magnet and resistance in series with each other and with said main circuit, a movable primary contactor responsive to external influences and associated contacts adapted to be engaged in alternation thereby, said contacts being connected with opposite sides of the main circuit, and said contactor being electrically connected to said magnet and resistance at a point between them to by-pass the one or the other only when said contactor engages the one or the other of said contacts in alternation, and a secondary contactor controlled by said magnet which functions in two positions.

2. An electrical contact system, comprising a main circuit, a magnet and a resistance in series connection with each other and said main circuit, an armature and a secondary contactor which is operated by said magnet and which functions in opposite positions, and a primary contactor and associated contacts adapted to be engaged in alternation thereby, said contactor being electrically connected with said resistance and magnet at a point between them and said contacts being connected with the opposite sides of the main circuit to by-pass the magnet or the resistance only when said contactor engages said contacts in alternation, and not otherwise, to cause the operation of said secondary contactor.

3. An electrical contact system, comprising a main circuit, a branch circuit including a magnet and a resistance in series connection with said main circuit, translating devices arranged to function alternately, an armature adapted in opened and closed positions to control the operation of said translating devices respectively, a movable contactor connected to said branch circuit at a point between the magnet and the resistance, and associated contacts adapted to be engaged in alternation by said contactor and respectively electrically connected to the opposite sides of the main circuit, whereby when said contactor engages the contacts in alternation, and not otherwise, either the magnet or the resistance is by-passed.

4. An electrical contact system, comprising a main circuit, a primary contactor responsive to variations in external conditions, and associated contacts adapted to be engaged alternately thereby and respectively connected to opposite sides of the main circuit, a magnet, a magnet circuit, a resistance, a resistance circuit, the magnet and resistance circuits being normally connected in series with each other and the main circuit, and an electrical connection between said contactor and said resistance circuit and said magnet circuit respectively, whereby the magnet and the resistance may be by-passed by the engagement of said contactor with said contacts.

5. The combination of a magnet and an armature, a resistance connected normally in series with said magnet, means for automatically by-passing the current around the magnet or around the resistance, said means including a contactor responsive to varying thermal conditions, and contacts adapted to be engaged alternately thereby, said contactor and said contacts being electrically connected with but intermediate of said magnet and said resistance, and a secondary contactor which functions in two positions and which is operated by said armature.

In testimony whereof I have affixed my signature.

GRANVILLE E. PALMER.