Dec. 19, 1922. 1,439,561.

J. C. LINDNER.

RELAY.

FILED APR. 4, 1918.

Fig. 1.

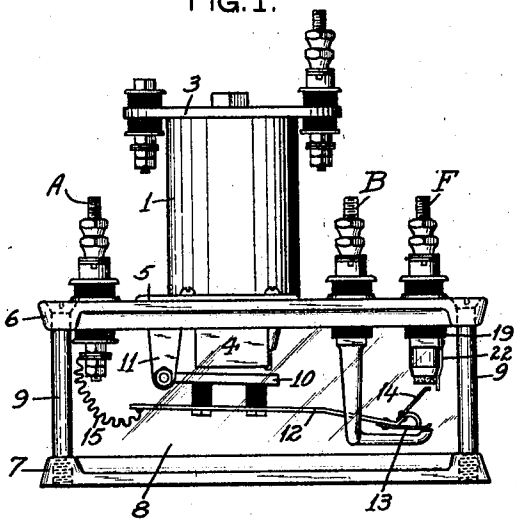


Fig. 3.

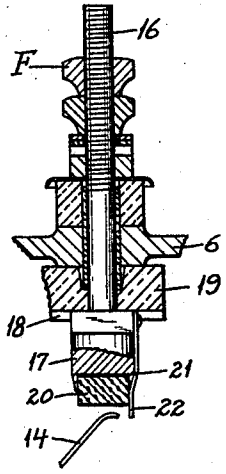


Fig. 2.

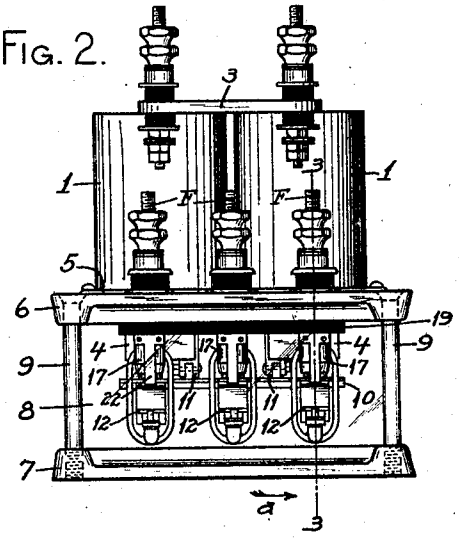


Fig. 4.

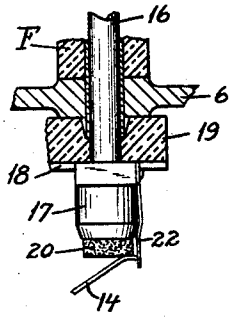
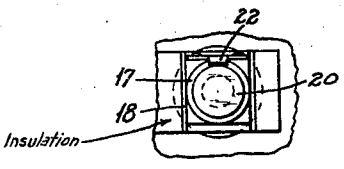


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN C. LINDNER, OF ROCHESTER, NEW YORK, ASSIGNOR TO GENERAL RAILWAY SIGNAL COMPANY, OF GATES, NEW YORK, A CORPORATION OF NEW YORK.

RELAY.

Application filed April 4, 1918. Serial No. 226,711.

To all whom it may concern:

Be it known that I, JOHN C. LINDNER, a citizen of the United States, and resident of the city of Rochester, in the county of Monroe and State of New York, have invented a new and useful Relay, of which the following is a specification.

This invention relates to improvements in the contacts of relays of the type commonly used in electric signaling systems for railways.

In railway signaling systems, it is found in practice that the available energy for operating the relays is comparatively small, especially in the case of track circuits. On account of this limitation in operating energy, a relay, made so that it will operate satisfactorily under these conditions, is capable of exerting only a comparatively small pressure between its contracts, and likewise a comparatively small force tending to separate the contacts. It is highly desirable, however, that the contact resistance be as low as possible, on account of the length of the circuits, the comparatively low voltage available, and the number of relay contacts often included in such circuits. The desired low contact resistance may be obtained by the use of metal to metal contacts, but in the practical use of relays, it has been found that such metal to metal contacts have serious disadvantages. In the first place, the circuits opened and closed by the relay contacts are often highly inductive and upon separation of the contacts by the deenergization of the relay, arcs are generally drawn. This continual arcing between the contacts in time results in pitting and roughening the contact surfaces to such an extent that the contact resistance is materially increased, and frequent renewal of these contacts is required. Also, it has been found in some cases that the metal to metal contacts have actually been fused together, due to excessive currents, occasioned by lightning or other heavy current discharges through the relay. On account of the comparatively small force available for separating the contacts, only a slight fusing or sticking together of the contacts is sufficient to prevent them from separating and breaking the circuit. This fusing of the contacts together is highly objectionable, since the entire safety of the signaling system depends upon the contacts separating and breaking the circuit when the relay is de-energized.

On account of these objections to the use of metal to metal contacts, it has been proposed to make either one or both of the contacts of graphite, carbon or some other highly refractory material. In the contact construction for relays quite commonly used at the present time, a button of carbon or graphite is made the fixed contact, while the movable contact is made of some highly conductive metal, such as silver. Such a construction is found to obviate the difficulties attendant with the use of metal to metal contacts, but introduces the other difficulty of high and variable contact resistance. Practical experience has demonstrated that there is great difficulty in obtaining with this construction low contact resistance, or a contact resistance which will remain constant, it having been found that for some reason the contacting surfaces of the carbon or metal are in some way caused to deteriorate and increase the contact resistance after the relay has been operated for a time.

With the above consideration in view, the primary object of this invention is to provide a contact construction for relays which will possess the desirable requisite of low contact resistance, but which will at the same time prevent the deterioration or fusing of the contacts.

A further object of the invention is to obtain this end by a simple, inexpensive and reliable construction, which will not easily get out of adjustment.

Other objects and advantages will appear as the description progresses and the novel features of the invention will be particularly pointed out in the appended claims.

In describing the invention in detail, reference will be made to the accompanying drawings, in which is illustrated a preferred physical embodiment of this invention, and in which like reference characters refer to corresponding parts throughout the several views, and in which:

Fig. 1 is a side elevation of a preferred type of relay embodying my invention;

Fig. 2 is a front elevation of the relay shown in Fig. 1;

Fig. 3 is an enlarged sectional view taken

substantially on the line 3—3 in Fig. 2, viewed in the direction indicated by the arrow *a* and showing in detail the contact construction embodying this invention, the parts being in the deenergized or open position;

Fig. 4 is a fragmentary section similar to Fig. 3 showing the parts in the picked up or closed position; and

Fig. 5 is a bottom view of the contact post shown in Figs. 3 and 4.

Referring to Figs. 1 and 2 of the drawing, I have illustrated a preferred form of my invention applied to a well-known type of relay. This relay comprises the usual pair of relay coils 1—1 with a back strap 3 and cores 4 which are fastened to a coil support 5, secured to a top plate 6 of the relay casing. This casing consists of a base plate 7, the carrying or top plate 6, and glass walls or sides 8. The sides 8 are seated within flanges on the top plate 6 and base plate 7, which are held together by screws 9; and with gaskets between the sides 8 and the plates 6 and 7, this housing forms a dampproof chamber for the working parts of the relay. The relay armature 10 is pivotally secured to the lugs 11 integral with the coil support 5; and carried by but insulated from the armature 10 are contact fingers 12. These contact fingers 12 are bent slightly downward at one end and carry at that end a pair of resilient contact pieces 13 and 14 which are adapted to cooperate with fixed back contact posts B and front contact posts F, respectively. The opposite ends of the contact fingers 12 are electrically connected by flexible connections 15 to binding posts A, which are secured to and insulated from the top plate 6.

My invention relates more particularly to the construction of the front contact post F which is secured to and insulated from the top plate 6. This front contact post F comprises a spindle 16 which is screw threaded for a part of its length; and which has an enlarged head or holder 17 at its lower end. The base portion of the holder 17 is squared and fits without turning in a slot 18 cut in a block 19 of suitable insulating material which extends across the under side of the top plate 6. The spindle 16 forms in effect a binding post and is insulated from the top plate 6 in the usual manner, as shown in Fig. 3, and is clamped in position on the top plate 6 by nuts which are screwed down on the threaded portion of the spindle 16, as shown in Fig. 3. The holder 17 has a cylindrical cavity formed therein to receive a button 20 of carbon, graphite, or other refractory material. The button 20 is pressed tightly into this cavity in the holder 17, and the edges of the holder are spun over to hold the button 20 rigidly in position. Between the button 20 and the bottom of the cavity in the holder 17 is a washer 21 of tinfoil or other suitable material of low resistance, for the purpose of assuring a better electrical connection between the carbon button 20 and the spindle 16.

A resilient metallic strip 22 of relatively low resistance, preferably of silver, is secured to the square portion of contact holder 17, in any convenient manner as for instance by rivets, as shown in Figs. 2 and 3. This strip 22 is shaped to fit snugly along the contour of the holder 17 and the button 20, and extends a short distance below the under face of the carbon button 20.

The contact piece 14 on the contact finger 12 is positioned at an oblique angle to the axis of contact post F as shown in Fig. 1, so that when the contact finger 12 is raised, the contact 14 will first make contact with the carbon button 20 and then, due to the pressure exerted on the contact finger, will flatten out and slide lengthwise along the contacting surface of the button 20 until it touches the metallic strip 22.

Operation.—When the relay coils 1—1 are energized and the armature 10 is picked up, the contact fingers 12 carried thereby will be raised to a position wherein the resilient contact pieces 14 make contact with their cooperating front contact posts F. As explained herenibefore, the parts are so proportioned and shaped that the contact pieces 14 will first make contact with the carbon button 20, then with the resilient metallic strip 22. On the contrary, when the relay is deenergized, and the contact finger 12 moves downward, the first effect is to relax the pressure upon the contact piece 14, so that this contact piece slides lengthwise out of contact with the metallic strip 22, and then finally the contact piece 14 separates from the carbon button 20 and breaks the circuit.

By reason of the construction embodying this invention, upon energization of the relay, electrical contact is made first between metal and a refractory material, and then between two metals of low resistance. Since the circuit is established between metal and carbon, any spark or arc which might occur would not cause fusing, and by the time the metal to metal contact is made the arc has disappeared. Furthermore, while the relay is energized, the electrical contact is between metal and metal, so that the contact resistance is low and remains substantially constant. Upon the denergization of the relay, the circuit is broken between metal and carbon, and any arc or spark which may occur does no damage. In short, the contact construction embodying this invention has the combined desirable advantages of a metal to metal contact and a carbon to metal contact without their disadvantages. The construction is simple and inexpensive,

is easy to adjust, and is not likely to work out of adjustment. The metallic contacting pieces 14 and 22 may be readily replaced at a small expense.

Although I have particularly described the construction of one physical embodiment of my invention and explained the operation and principle thereof, nevertheless, I desire to have it understood that the form selected is merely illustrative and does not exhaust the possible physical embodiments of the idea of means underlying my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a relay, the combination with a pivoted armature and coils for actuating said armature, of a contact post comprising a fixed carbon contact and a resilient metallic contact, a contact finger carried by said armature and having a resilient contact piece of metal adapted to make contact initially with the carbon contact when the armature is attracted, and to be flexed by such engagement to move into contact with the resilient contact without breaking contact with the carbon contact.

2. In a relay, the combination with the pivoted armature and coils for attracting said armature, of a contact post provided with a fixed carbon contact and a contiguous resilient metallic contact, and a resilient metallic contact piece actuated by the armature and disposed at an angle with respect to its direction of movement, said contact piece initially engaging the carbon contact as the armature is attracted and being flexed by such engagement to move into contact with the metallic contact without breaking contact with the carbon contact.

3. In a relay, the combination with a pivoted armature and coils for actuating said armature, of a fixed contact post, comprising an elongated spindle which is screw threaded at one end to form a binding post and formed at its other end with an enlarged head having a cylindrical cavity therein, a contact button of refractory material rigidly held in said cavity, a resilient metallic contact strip of relatively low resistance secured to said holder and extending below the contacting surface of said button, and a contact finger carried by said armature and having a resilient contact piece secured to one end which is normally disposed in angular relation to the contacting face of said button, said contact piece engaging initially with said button and being flexed by such engagement to move into contact with said metallic contact strip.

4. A relay comprising a contact post having two fixed contiguous contact members, one of refractory material and the other of a relatively low resistance metal, a movable contact finger having a resilient contact piece disposed at an angle to the direction of movement of said finger, said contact piece initially engaging the refractory fixed contact as the finger is moved to its attracted position and being flexed by such engagement to contact at its end against the metallic fixed contact.

5. A relay comprising a vertically movable contact finger carrying a resilient contact piece, and a contact post for cooperating with said contact piece and provided with a fixed contact of refractory material and a metallic contact of relatively low resistance with horizontally and vertically disposed contact surfaces respectively adjacent to each other in the plane of movement of said contact finger, said contact piece being inclined with respect to said contact surfaces of the fixed contacts and being initially engaged with the refractory contact by the upward movement of the contact finger and being projected by such engagement into endwise contact with said metallic contact.

6. A contact post for relays comprising an elongated metallic spindle, a button of refractory material attached to said spindle, and a resilient metallic contact strip of relatively low resistance attached to said spindle and partly projecting beyond the outer face of said button.

7. In a contact construction for relays of the tractive type provided with a vertically movable contact finger and a fixed contact post cooperating therewith, a resilient contact piece carried by said contact finger, said post having a recess holding a carbon button and being provided with a resilient metallic contact strip of relatively low resistance partly projecting beyond the outer face of said button, the contact piece of said finger being inclined with respect to the surface of said carbon button, said contact piece engaging initially with the carbon button and being flexed by such engagement into contact with the metallic contact strip during the upward movement of the finger, whereby the making and breaking of contact takes place between carbon and metal while the established contact is between metal and metal.

JOHN C. LINDNER.