Jan. 26, 1937. J. F. MERKEL 2,069,171

RELAY

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FIG. 1.

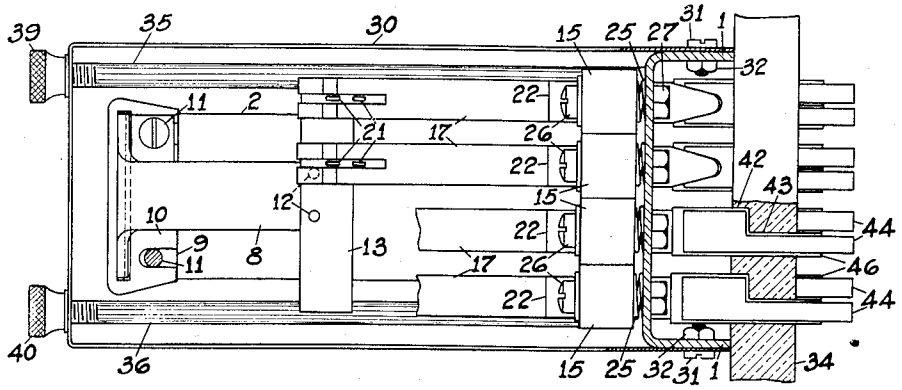
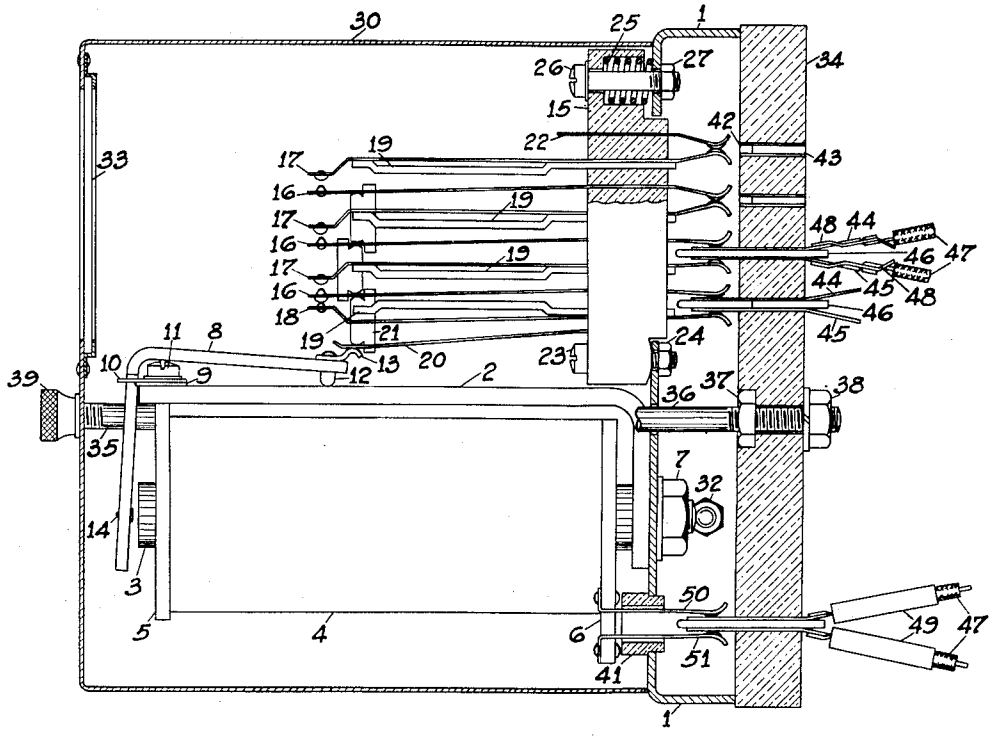


FIG. 2.



INVENTOR
J. F. Merkel,
BY
Neil M. Preston,
his ATTORNEY

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FIG. 5.

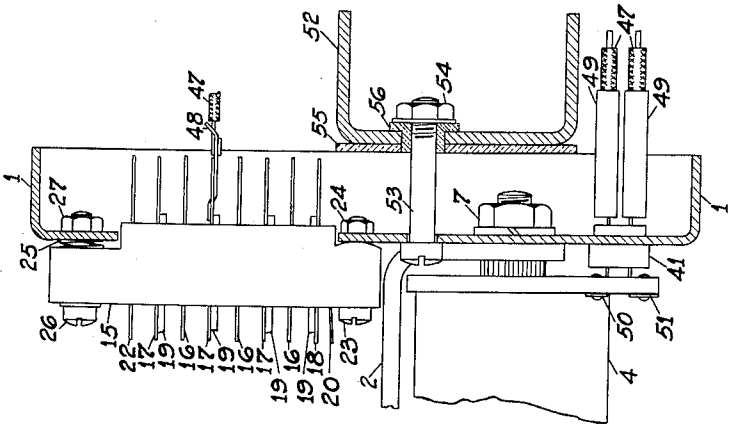


FIG. 4.

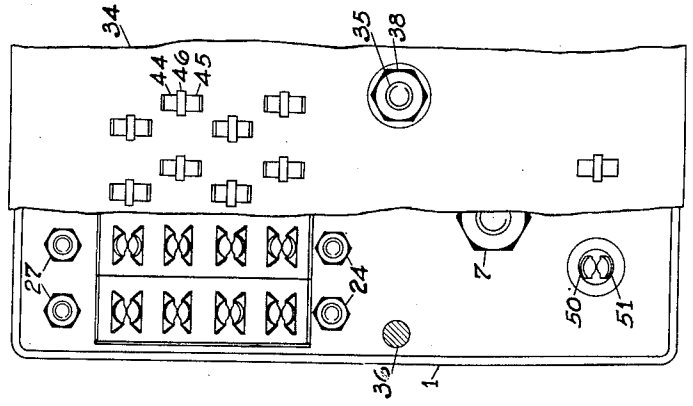
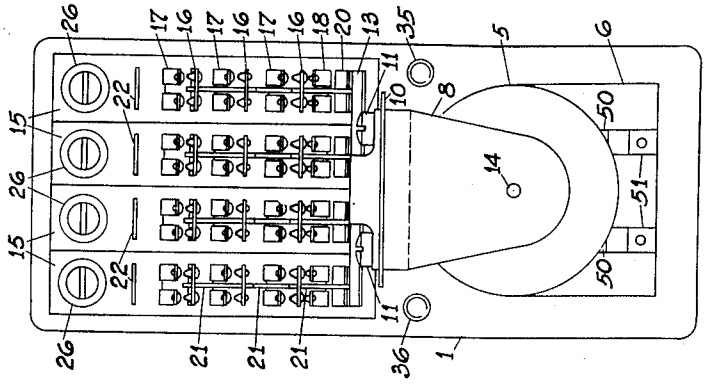


FIG. 3.



INVENTOR
J. F. Merkel
BY Neil W. Preston
his ATTORNEY

Patented Jan. 26, 1937

2,069,171

UNITED STATES PATENT OFFICE

2,069,171

RELAY

Joseph F. Merkel, Rochester, N. Y., assignor to General Railway Signal Company, Rochester, N. Y.

Application April 28, 1932, Serial No. 608,037

14 Claims. (Cl. 200—1)

This invention relates to relays and more particularly to a compact type of neutral relay for use in railway centralized traffic controlling systems.

In certain selective types of railway centralized traffic controlling systems, such as described for example in the application of N. D. Preston et al., Ser. No. 455,304 filed May 24, 1930, a considerable number of relays is employed to effect the selection and control of various traffic controlling devices along the trackway. The limited space available for this number of relays and the comparatively large number of contacts which are required necessitates that these relays be of as simple and compact design as possible. However, the nature of the circuits in which these relays are employed requires a more ruggedly constructed relay and having more reliable operation than is found in the usual small relay, such as for example, the type used in telephone practice. The ordinary telephone type relay also has the external circuit connections soldered permanently to their contact members, and in railway centralized traffic controlling systems where the relays must be removed from time to time for maintenance or replacement, considerable difficulty is experienced in removing such external circuit wires and in making new soldered connections.

In view of the above and other considerations, it is proposed in accordance with the present invention to construct a relay which will possess the necessary reliability of operation, which will be of sufficiently rugged construction, and which will operate a number of contacts to meet the requirements of a centralized traffic controlling system of the above mentioned type. It is further proposed to provide means which may be incorporated in such a relay whereby it may be easily removed from service without disturbing the external wire connections thereto.

Other objects, purposes and characteristic features of the invention will appear as the description thereof progresses during which references will be made to the accompanying drawings which show the invention in a manner to make it easily understood, rather than with the view of showing the particular construction preferably employed in practice, and in which:—

Fig. 1 is a plane view of a relay constructed in accordance with the present invention with parts thereof sectioned and other parts broken away to more clearly show the construction;

Fig. 2 is a side elevational view of Fig. 1 also with parts sectioned;

Fig. 3 is an elevational view of the armature end of this relay;

Fig. 4 is an end elevational view of the mounting end of this relay with a part of the supporting panel broken away; and,

Fig. 5 is a partial side elevational view of a modified form of this invention also shown in section.

Referring to the accompanying drawings, the relay proper is assembled in a rigid back plate 1 formed of sheet metal with the outside edges pressed at right angles thereto to add to its rigidity. Upon this plate 1 is assembled an electro-magnetic operating means comprising a magnetic top yoke 2 spot welded thereto and a magnetic core 3 carrying a coil 4 wound thereon between insulating end washers 5 and 6 which may be pressed onto knurled ends of the core 3. One end of the core 3 is of smaller diameter which passes through a hole in the top yoke 2 and the back plate 1 and is held in place by a nut 7 threaded thereon to clamp the shoulder, formed by the larger body of the core 3, against the top yoke 2.

It may be mentioned here that the top yoke 2 is shaped to form a slightly acute angle between the outwardly extending portion and the portion welded to the back plate 1. This extending portion is then straightened out to approximately a right angle when the coil and core is assembled thereon by the pressure exerted at its end by the end washer 5 due to the tightening of the nut 7 thus leaving a slight stress between the end washer 5 and the end of the top yoke 2 to assure a fixed relation therebetween.

An armature 8 is arranged to operate between the extending end of the top yoke 2 and the free end of the magnetic core 3. This armature 8 is retained in place by means clearly shown in Fig. 1 and Fig. 2, which means comprises a pivot strip 9 resting in a transverse slot in the armature 8 about which the armature is allowed to operate, and a retaining strip 10 which encircles the armature 8 to retain the transverse slot on the strip 9. These strips 9 and 10 are held in place by two screws 11 threaded into the top yoke 2 and passing through holes in the pivot strip 9 and open slots in the retaining strip 10. This arrangement permits the lower end of the armature 8 to be passed through the retaining strip 10 and positioned with its slot on the pivot strip 9 after which the strip 10 is moved inwardly and clamped by the screws 11 to permit a free pivoting motion of the armature and yet retain the transverse slot on the strip 9.

The de-energized position of the armature 8 is limited by the enlarged head of a rivet 12 which holds a transverse strip 13 shaped as shown in Fig. 2 and the attracted or energized position of the armature 8 is limited by a residual pin 14 which is arranged to engage the extending end of the core 3. Spring contact fingers of the convention type are molded in hard insulating members 15 of material, such as bakelite or the like, to form individual vertical groups, four of which groups are shown in the embodiment illustrated herein.

These spring contact fingers consist of movable fingers 16 and front and back fingers 17 and 18, which front and back fingers 17 and 18 have bifurcated ends with a low resistance, arc resisting contact point on each of these bifurcations arranged to engage with similar low resistance contact points on the movable contact fingers 16. The biased position, or the unengaged position, of the front and back contact fingers 17 and 18 is limited by rigid stops 19 which are also molded into the member 15 forming the individual vertical groups.

Each contact finger is formed in a suitable fixture to the required curvature before being molded into the member 15, or, that is, the front and back contact fingers 17 and 18 are shaped to exert a predetermined pressure against their stops 19 when assembled, and the movable finger 16 is shaped to exert the proper downward pressure. This procedure then assures that no further adjusting of individual fingers will be necessary after assembling on the relay, which is advantageous because such adjusting in assembly is very inconvenient and inaccuracy often results.

Beneath the lower contact fingers of each group is a finger operating arm, or idler, 20 which is also molded in the member 15, and extends beneath the fingers with its end resting on the transverse strip 13 attached to the armature 8. This finger operating arm 20 is connected with the lower movable contact finger 16 by an insulating pusher 21 which passes through the slot forming the bifurcation of the back contact finger 18 and through a similar slot aligning therewith in the rigid stop 19. Smaller rectangular ends of this pusher 21 pass through rectangular holes in both the movable contact finger 16 and the operating arm 20, with a wider body portion thereof engaging the top of the arm 20 and the bottom of the finger 16 on a slightly curved surface, as shown. Each movable contact finger 16 has two of these rectangular holes into which ends of similar insulating pushers are fitted in alternate positions, as shown in Fig. 2, to effect the operation of all movable contact fingers 16 in unison.

This method of operating the contact fingers 16 at a point in the rear of the low resistance contact points provides greater access to these points for cleaning or inspecting than is obtained by arranging the pushers 21 on forward extensions of the fingers. The contact finger operating arm 20 maintains constant travel of the fingers 16 by maintaining the lower pusher 21 in proper alignment even in the event that the armature 8 becomes slightly canted on its pivot.

The insulating members 15 into which these spring contact fingers are molded are shaped at the ends for mounting vertically side by side on the back plate 1, and have a center extending portion passing through a hole in this back plate 1. The lower end of these insulating members 15 is shaped with a slight vertical arc resting against the back plate 1, and this end is attached thereto by a bolt 23 held by a nut 24. The top end of these members 15 is held away from the back plate 1 by a compression spring 25 resting in a recess in the member 15, and a bolt 26 and nut 27 is arranged to clamp this top end against the back plate 1.

It is obvious from Fig. 2 that this arrangement of mounting the vertical contact groups permits a slight adjustment relative to the base plate 1, or it can be seen that tightening the top retaining bolt 26 draws the top of the member 15 toward the back plate 1 thereby raising the free ends of the contact fingers away from the transverse contact operating strip 13. Thus, with the armature 8 arranged to have the proper movement, and the individual fingers properly adjusted in their vertical groups, the final adjustment necessary can be made by this adjustment of the members 15, or, by adjusting the bolts 26, the proper travel of the movable fingers 16 to make at either front contact fingers 17 or back contact fingers 18 can be obtained.

The entire relay as assembled on the back plate 1 is not enclosed by a metal cover 30 which extends over the sides of the back plate 1 as shown in Fig. 1 and the top and bottom ends are allowed to butt against this plate. The cover 30 is shown as held to the back plate 1 by bolts 31 and nuts 32 but in cases where the external wire connections are made permanently to the relay proper, such as the embodiment shown in Fig. 5, a more accessible means for securing the cover may be employed, such as a snap retaining means. A window 33 is provided in the front of this cover 30 which is positioned to afford a view of the spring contacts.

The embodiment of the present relay shown in the accompanying drawings, except Fig. 5, has a quick detachable means for the external wire connections. The external wire connections for the relay having such means are arranged on an insulating supporting panel 34 which may hold a plurality of these relays by bolts 35 and 36 secured to the panel 34 by nuts 37 and 38, which bolts have elongated bodies extending through holes in the back plate 1 and cover 30 with knurled nuts 39 and 40 bearing against the cover 30.

The relay side of this panel 34 has a plurality of short horizontal grooves 42 therein, spaced the same as the spring contact fingers of the relay but positioned to be between adjacent pairs of contact fingers when the relay is mounted thereon. In one side of each of these grooves 42, a slot 43 extends through the panel 34, which slot is not the full length of the groove and is on alternate sides thereof in adjacent vertical slots, as shown in the rear view of the panel 34 in Fig. 4.

In each of these grooves 42, two terminal strips 44 and 45 are placed having smaller ends extending through the slots 43, and a similarly shaped insulating member 46 is also placed therein to separate the terminals 44 and 45. The shape of the terminals 44 and 45 and the insulating member 46 is clearly shown in Fig. 1 where it may be seen that the member 46 is slightly wider at all parts and extends toward the relay farther than the terminals 44 and 45 and it may also be seen that this difference in width is taken into consideration in the shaping of the grooves 42 and the slots 43.

The ends of the terminal strips 44 and 45 extend beyond the rear of the panel 34 and are

bent slightly outward to facilitate in making wire connections thereto, which connections may be made such as by soldering wires 47 to lugs 48, which lugs are in turn soldered to the ends of the terminal strips 44 and 45 and a short piece of varnished cambric tubing 49 may then be placed over these connections as shown at the lower end of Fig. 2. The purpose of staggering the ends of the terminal strips, as shown in Fig. 4, is to obtain greater space between adjacent terminal strips thereby facilitating in making the wire connections and decreasing the possibility of short circuits between terminals or wires.

Each spring contact finger on the relay extends beyond the member 15 and is shaped as shown in Fig. 2, or so that the relay may be forced backward on the bolts 35 and 36 to enter the extending ends of the terminal strips 44 and 45 between adjacent inwardly biased pairs of contact finger extensions. These contact finger extensions have a depressed portion in contact with the terminal strips which assures a low resistance contact, and this contact is self cleaning by the wiping action obtained in forcing the relay into position. A dummy finger 22 is employed in the particular contact arrangement shown to hold the top pair of terminal strips in the same position as the lower pairs, but it is obvious that with an arrangement employing an even number of contact fingers, this dummy finger is not necessary. External connections to the operating coil 4 are made through members 50 and 51 mounted on the insulating end washer 6 and operating in the same manner as the contact connecting means. An insulating bushing 41 is provided to protect the members 50 and 51 from the back plate 1, and if a double operating coil is employed on the core 3, two sets of these coil connecting means are employed as shown in Fig. 4.

The modified form of the present relay, shown in Fig. 5, has the quick detachable means for the external wire connections omitted and the wires are soldered directly to straight extensions of the spring contact fingers and coil terminal strips. The relay, in this case, may be mounted directly to a channel iron transverse support 52 by a shorter bolt 53 and nut 54 clamping the back plate 1 thereto. The relay may be insulated from the support 52 by an insulating strip 55 separating the back plate 1 therefrom, and a bushing 56 insulating the bolt 53 and nut 54 from the support 52.

A relay has thus been provided which meets the requirements of a railway centralized traffic controlling system, or, that is, it has a very rugged construction with a contact operating capacity to meet the requirements, and a simplicity of design which insures a very reliable operation. The means for adjusting the spring contact fingers is considered one of the more important features of the present invention inasmuch as a more uniform and dependable relay has been found to result from simplifying the contact adjustments which are necessary after the relay has been assembled. The quick detachable means for external wire connections has been disclosed as an optional feature for the reason that, in some applications, the increased cost and complication is not considered warranted.

The above rather specific description of one form of the present invention is given solely by the way of example, and is not intended in any manner whatsoever, in a limiting sense. It is also to be understood that various modifications, adaptations and alterations may be applied to meet the requirements of practice, without in any manner departing from the spirit or scope of the present invention, except as limited by the appended claims.

Having thus described my invention, what I claim is:—

1. In a relay, a back plate, a plurality of separate vertical contact holding members carried by the plate, and a plurality of insulated spring contact fingers moulded into said holding members.

2. In a relay, an operating arm, a contact holding member, an extending spring arm moulded into said contact holding member and having a free end resting on said operating arm, a plurality of front and back spring contact fingers moulded into said contact holding member, a plurality of movable spring contact fingers moulded into said contact holding member, and insulated pushers passing through slots in said front and back contact fingers and arranged to operate the movable contact fingers in unison by a movement of the extending spring arm.

3. In a relay, an operating arm, a contact holding member, an extending spring arm moulded into said contact holding member and having a free end resting on said operating arm, a plurality of front and back spring contact fingers moulded into said contact holding member, a plurality of movable spring contact fingers moulded into said contact holding member and having contact points engageable with contact points on associated front or back contact fingers, and insulated pushers passing through slots in said front and back contact fingers and engaging said movable fingers at the rear of said contact points to transmit movement of said extending spring arm to the movable contact fingers.

4. In combination, in a relay, a plurality of insulated spring contact fingers moulded into insulating holding members, an insulating supporting panel, a plurality of shouldered terminal strips placed in slots in said panel, insulating members in said panel separating adjacent pairs of said terminal strips, an extension on one side of each terminal strip passing through said panel and arranged with each pair in vertically staggered order to adjacent pairs, and contacting means formed from extensions of said spring contact fingers to engage alternate sides of said terminal strips.

5. In combination, in a relay, a plurality of fixed and movable contacts, a panel supporting the relay and contacts at one side and connectors for connecting the said contacts to wires at the other side of the panel, each connector including a stem passing through a slot in the panel and an enlarged, offset head on the stem at the end on the relay side of the panel.

6. In combination, in a relay, a plurality of fixed and movable contacts, a panel supporting the relay and contacts at one side, connectors for connecting the said contacts to wires at the other side of the panel, each connector including a stem passing through a slot in the panel and an enlarged, offset head on the stem at the end on the relay side of the panel, wire connecting members on each stem and diverging at the end of the stem at the other side of the panel, the connectors being arranged in rows on the panel and adjacent connectors having their heads oppositely arranged to thus stagger the adjacent diverging wire connecting members in the row, whereby to safely permit close spacing of the connectors in the row.

7. In a relay, a rigid back plate, a plurality of separate vertical contact holding members, a

plurality of insulated spring contact fingers moulded into each of said holding members and separate means mounting each of the holding members on the back plate.

8. In a relay, a rigid back plate, a plurality of vertical contact holding members, a plurality of insulated spring contact fingers moulded into each of said holding members, and individually adjustable means for mounting each of said vertical contact holding members on said back plate effective to permit adjustment thereof.

9. In a relay, a plurality of vertical contact holding members, a plurality of insulated spring contact fingers carried by each of the members, a pivotable mounting means for one end of the contact holding members and a spring biased micrometer adjustable means for individually mounting the other end of the contact holding members.

10. In a relay, a plurality of vertical contact holding members, a plurality of insulated spring contact fingers carried by each of said members, a supporting member carrying said contact holding members, a substantial knife edge on one end of each of the contact holding members held into engagement with said supporting member to allow vertical pivoting thereabout, a spring biasing the other end of each of the contact holding members away from the supporting member, and individual threaded means for drawing said biased end of the contact holding members toward the supporting member.

11. In a relay, insulated spring contacts having spaced extending ends, a mounting member, terminal strips arranged on said mounting member, and means fastening the relay on the mounting means so that the terminal strips over-lap the extending ends of said spring contacts.

12. In a relay, insulated spring contacts having spaced extending ends, a mounting member, spaced wire terminal strips on said mounting member, detachable means for holding said relay on said mounting member so that said terminal strips over-lap the extending ends of the spring contacts, and means for guiding the ends of the spring contacts into said position over-lapping the terminal strips.

13. In combination, and for use with relays, a plurality of contacts having integral extensions constituting a plurality of flat connecting plug means, a holding means for the contacts, a plurality of flat plug receiving and means attached to said holding means, and retaining means for holding said plug connecting means in said plug receiving means.

14. In a relay, a plurality of spaced contact fingers permanently mounted on the relay, integral extending ends on the contact fingers, a supporting means, a plurality of spaced terminal strips permanently mounted on the supporting means, and means for detachably holding the relay on the supporting means so that the extending ends of the contact fingers over-lap and engage the ends of the terminal strips.

JOSEPH F. MERKEL.