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RELAY

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FIG. 1.

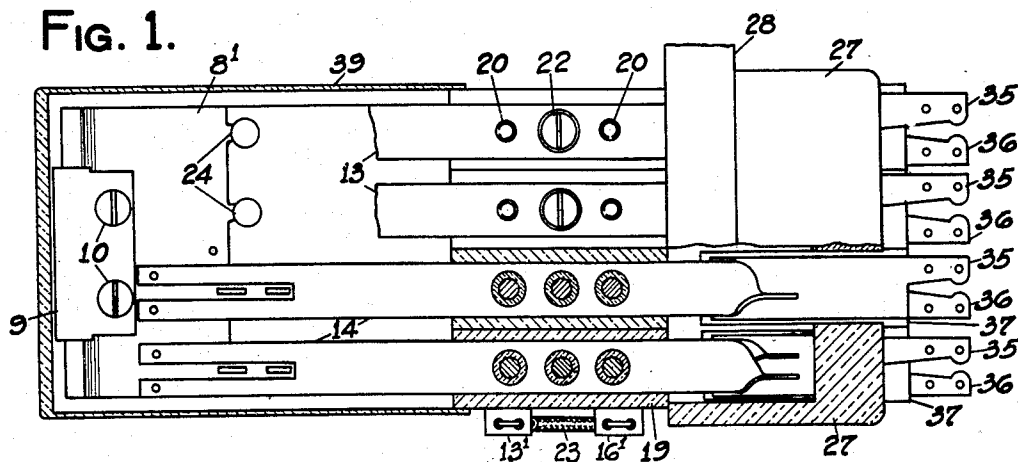
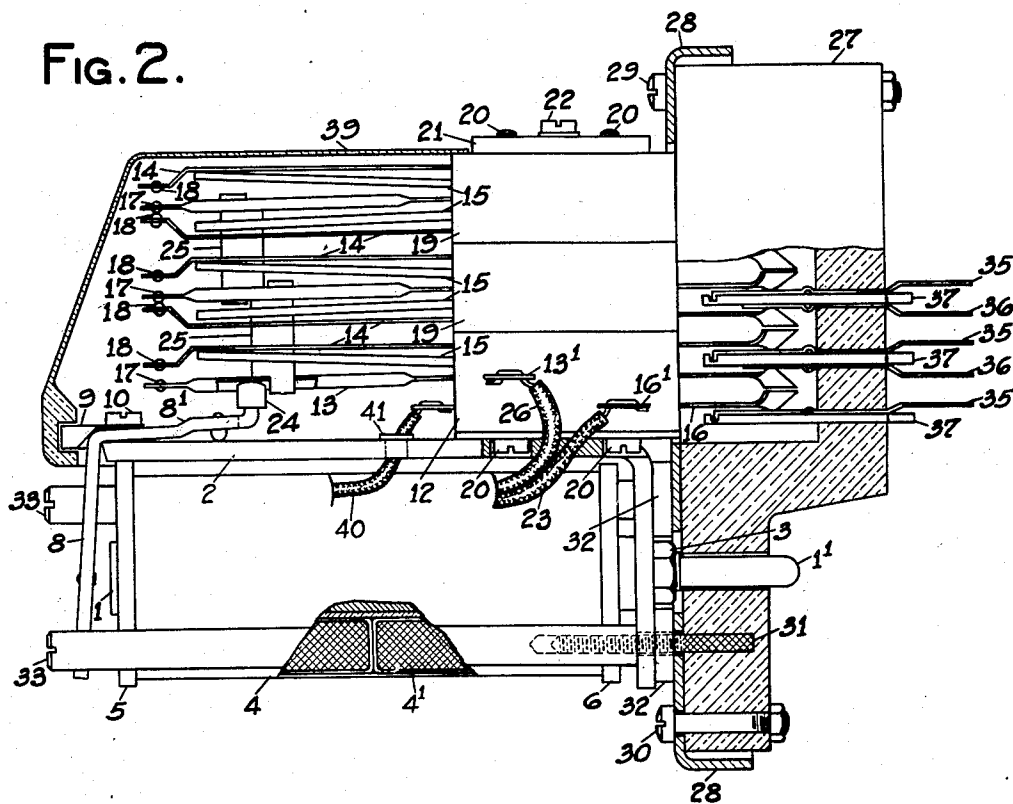


FIG. 2.



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RELAY

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12 Claims. (Cl. 200—166)

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

5 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 is required necessitates that these relays be of as simple and compact a 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, undue expense and lost time are experienced in removing such external circuit wires and in making new soldered connections.

30 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 drawing which shows 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 plan 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; and,

55 Fig. 2 is a side elevational view of the relay

of Fig. 1 also with parts shown in section and other parts broken away.

Referring to the accompanying drawing, the operating mechanism of the relay comprises a magnetic core 1 having a small threaded end on which is clamped a magnetic top member 2 by a nut 3. An operating coil 4 and a stick coil 4¹ are wound on the core 1 between insulating end washers 5 and 6. An armature 8 is arranged to pivot about a slightly acute end of the magnetic top member 2 and has an arm 8¹ extending above the top magnetic member 2 to form a slightly obtuse angle over its knife edge pivot.

The top or operating arm 8¹ of this armature has a rectangular hole therein into which is placed a retaining member 9 and held by screws 10 which are threaded into the top magnetic member 2. This retaining member 9 has edges extending over the side of the rectangular hole in the armature with an inside edge cut at an angle which forms a tangent to the arc formed by the obtuse bend in the armature 8. This arrangement obviously holds the armature 8 against an acute edge of the top member 2, yet permits a slight pivoting motion thereabout.

This operating mechanism, as just described, is employed to actuate a plurality of spring contact fingers. An insulating holding member 12 has a movable contact finger 13, a fixed spring contact finger 14 and a rigid stop 15 moulded therein. The method of moulding these contact fingers into the holding member 12 is clearly shown in the sectional view of Fig. 1, that is, the fingers and stops have three enlarged holes therein with a smaller hole through the insulating holding material 12 concentric therewith thus permitting insulating material filling the space therebetween to form an insulating bushing between the contact fingers and screws placed in these holes as later described.

The movable contact finger 13 is made rigid in its center portion by bending down the edges thereof, as shown in Fig. 2 with the flexible portion near the holding member 12 permitting movement of this rigid portion with another flexible portion at the extreme free end holding low resistance, arc resisting contact points 17. The fixed contact finger 14 is flexible throughout its entire length with its free end bifurcated as shown in Fig. 1 with similar contact points 18 arranged in engageable relation to the contact points 17 of the movable finger 13.

This lower contact finger holding member 12 has a strip 16 also moulded therein which has a side projection 16¹ to which a coil lead wire 23

is soldered, and in the embodiment shown in the accompanying drawing, a similar side projection 13¹ is provided on one of the movable fingers 13 to which is soldered a lead wire 26 of the stick coil 4¹. The side projection 13¹ is provided on the movable finger 13 because the application of this relay in the circuits of a centralized traffic controlling system requires that the stick coil energizing circuit be carried through a normally open contact of the relay and this means enables the circuit to be conveniently set up although it is to be understood that this side projection 13¹ and the stick coil 4¹ will not be necessary in every embodiment of the relay. The operating coil 4 has lead wires 40 which are brought up through insulating bushings 41 in the top magnetic member 2 and soldered to an extending end of strips 16 in other vertical contact groups.

A similar contact finger holding member 19 may be arranged to hold any combination of movable and fixed contact fingers, such as shown in Fig. 2, which comprises a movable finger 13 engageable with a front or a back fixed finger 14. These contact finger holding members 12 and 19 may then be assembled in a vertical group comprising the required contact arrangement and are held in such a vertical group by through screws 20 threaded into a top retaining member 21. A third through screw 22 threaded into the top member 2 may be employed to clamp this vertical group, thus assembled, to the top magnetic member 2, and any number of these vertical groups to meet the contact requirements may then be assembled side by side in a similar manner, four of which vertical groups are shown herein.

The armature operating arm 8¹ has four up-turned extensions each with an insulating cap 24 fixed thereto which engages the lower side of the lower movable contact finger 13 of each vertical contact group. The movable contact fingers 13 have two small rectangular slots therein as shown in Fig. 1 into which slot is placed a small end of insulating pushers 25 which are sufficiently thin to freely pass through the slot forming the bifurcation of the fixed fingers 14 as well as a similar slot in the stops 15. The center portion of these insulating pushers 25 being wider than the ends passing through the slots in the movable fingers 13 engage the top of the lower movable finger and the bottom of the movable finger next above to thereby effect the operation of all movable fingers in unison.

It is obvious from the view shown in Fig. 2 that the arrangement of operating the movable fingers from a point nearer the holding member for these fingers than the contact points enables the proper travel to be obtained in the operation of the contact points by a comparatively small armature travel. Although this same operation can be duplicated by employing a longer armature operating arm 8¹ in operating the fingers from a point directly beneath or in front of the contact points of the fingers, such an arrangement would require that the contact assembly be placed farther toward the rear of the relay thereby increasing the overall length of the relay to an extent requiring undue space.

An insulating terminal panel 27 is secured to a transverse support 28 by screws 29 and 30, which insulating panel carries two diagonally arranged studs 31 moulded therein and arranged to enter holes in the downwardly extending portion of the top magnetic member 2. A hole is provided

in this insulating panel 27 to receive an extension 1¹ of the magnetic core 1 which is round at its end to guide the relay when being assembled on the panel 27. Small spacing washers 32 are provided to separate the downwardly extending portion of the top magnetic member 2 from the transverse supporting member 28 and elongated diagonally arranged cap nuts 33 (see Fig. 2) are threaded onto the extending ends of the studs 31 to clamp the relay against this transverse support 28, which diagonally elongated nuts 33 are made sufficiently long to extend to the front of the relay which facilitates in the removal thereof when several relays are assembled in close relation on the support 28 and permit close assembly of relay units, in that the nuts 33 for adjacent relay units are vertically spaced from each other, due to the diagonal arrangement, so that the adjacent units can be placed within a horizontal distance of one nut width from each other.

A large rectangular depression is formed in the relay side of the insulating panel 27 in alignment with the rear of the contact fingers. A plurality of slots is formed in the back portion of this rectangular depression of the member 27 which slots are spaced the same as the contact fingers of the relay, but are arranged to align between adjacent pairs of such contact fingers. A top terminal strip 35 and a lower terminal strip 36 are placed in each of these slots and separated by an insulating spacer 37, which strips have shoulders, formed by transverse corrugations, engaging the inside edge of the panel 27 to thereby prevent being forced outwardly toward the rear of the panel.

The insulating spacer 37 is placed in the slots in the panel 27 after the strips 35 and 36 are in place so that a shoulder thereon formed by a slightly wider end rests against the outside surface of the panel 27. The end of the spacer 37 which is then in the depression of the panel 27 has a transverse slot into which a downturned end of the top strip 35 springs when the spacer is in place thereby fixing the members in the slot because the shoulder of the spacer 37 prevents their removal in one direction and the corrugation of the strip 35 prevents their removal in the other direction.

Each of the contact fingers of the relay as well as the coil terminal strip 16 has an extension entering the depression in the panel 27, which extension is twisted and formed in a shape clearly shown in Fig. 2. The twisting of these extensions in this shape provides a small surface contacting with the sides of the strips 35 and 36 thereby concentrating the entire pressure effected by the forming of the extensions on this small surface. This arrangement has been found in practice to produce a more dependable low resistance contact than by distributing the contacting pressure over a larger area. Although it is obvious that certain pairs of these extensions have their free ends bent inwardly, such ends are at alternate sides of these extensions, as clearly shown in Fig. 1, which thereby provides the proper clearance for electrical insulation.

These extensions are also biased by bending to the proper shape, so that, when the relay is assembled on the support 28, they engage sides of associated terminal strips 35 and 36, as shown, and it is obvious that the sliding motion of the relay in assembling on the support 28 effects a wiping action to these contacts which will act to clean the contact surface and consequently always insure a good electrical connection between

the contact fingers and the terminal strips. The ends of the terminal strips 35 and 36 which extend in the rear of the insulating panel 27 are shaped to receive wire connections, and from the view in Fig. 1, it may be seen that these strips are cut away on vertically alternate sides to provide the proper clearance for good insulation as well as to facilitate in the soldering of the wire connections thereto.

The contact fingers are enclosed by a cover 39 which may be snapped into place or held by suitable screws, not shown in the present embodiment. This cover is preferably of a transparent insulating material which may be moulded into the shape shown, thereby preventing dust particles from entering the contact mechanism and yet permitting the contact points to be examined without removing the cover. Inasmuch as the operating coil is not enclosed with the contacts, the heat generated by the energization thereof is readily dissipated, thus removing the possibility of moisture collecting in the enclosed part due to condensation caused by the heat of the operating coil when the complete relay is enclosed in the single cover. The quick detachable means for connecting the contacts and the coil energizing circuit to their external wire connections is also enclosed by the depression of the insulating panel 27, thereby preventing dust particles from affecting the electrical characteristics of their contacts.

The quick detachable means for making the external connections to the present relay is an optional feature, that is, the insulating panel 27 may be omitted from the transverse support 28 and the relay bolted directly to this support. The extensions of the contact fingers are then shaped for soldering the external wires directly thereto, and inasmuch as the support 28 is cut away to receive the extensions of the contact fingers, this form of the present relay is interchangeable on the same mounting means with relays having the quick detachable feature.

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 permits an economical construction and insures a very reliable operation. The arrangement of the contact mechanism permits the changing of the contact capacity or arrangement of the contacts after the relay has been placed in service without additional machining or rearranging of either the relay operating mechanism or the stationary terminal panel.

The above rather specific description of one form of the present invention is given solely by the way of example and 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 plurality of spaced contact fingers having a portion moulded into a block of insulating material, the portion of the contact fingers moulded into said block being apertured, said block being apertured to produce smaller holes therein concentric with the contact finger holes.

2. In a relay, finger operating means, a plu-

ality of spaced contact fingers having a portion moulded into a block of insulating material, the portion of the contact fingers moulded into said block being apertured, said block being apertured to produce smaller holes therein concentric with the contact finger holes, clamping screws passing through the holes in the block for holding a plurality of such blocks in a vertical pile, and a retaining screw passing through the vertical pile of such blocks to hold the contact fingers thereof in operable relation to said operating means.

3. In a relay, an operator, a plurality of movable contact fingers having rigid portions operated by said operator, and a plurality of upper and lower flexible spring contact fingers engageable by associated movable contact fingers, said movable contact fingers having a flexible spring portion adjacent the rigid portion thereof to permit movement of the rigid portion.

4. In a relay, an operator, a plurality of movable contact fingers having rigid portions operated by said operator with a flexible end portion carrying low resistance contact points, and a plurality of upper and lower flexible spring contact fingers having low resistance contact points at their free ends engageable by said low resistance contact points on associated movable contact fingers, said movable contact fingers having a flexible spring portion adjacent the rigid portion thereof to permit movement of the rigid portion.

5. In combination, an operator, a plurality of fixed and movable spring contact fingers operated by said operator, a depressed insulating panel, the depression in the panel aligning with the ends of said contact fingers, a plurality of terminal strips in the depression in said panel in correlation with ends of said contact fingers and extending through said panel to receive wires associated with corresponding contact fingers, and extensions integral with said contact fingers having twisted ends shaped to engage alternate sides of associated terminal strips.

6. In combination, in a relay, an operator, a plurality of fixed and movable spring contact fingers operated by said operator, a depressed insulating panel, the depression in the panel aligning with the end of said contact fingers, a plurality of terminal strips in the depression in said panel in correlation with the ends of said contact fingers and extending through said panel to receive wires associated with corresponding contact fingers, insulating spacers fitted into said panel to separate pairs of said terminal strips, and extensions integral with said contact fingers having twisted ends shaped to engage alternate sides of associated terminal strips, said terminal strips having transverse corrugations resting against the inside surface of said panel.

7. In combination, in a relay, an operator, a plurality of fixed and movable spring contact fingers operated by said operator, a depressed insulating panel, the depression in the panel aligning with the end of said contact fingers, a plurality of terminal strips in the depression in said panel in correlation with the ends of said contact fingers and extending through said panel to receive wires associated with corresponding contact fingers, insulating spacers fitted into said panel to separate pairs of said terminal strips with an enlarged head engaging the outside surface of the panel, and extensions integral with said contact fingers having twisted ends shaped to engage alternate sides of associated terminal

strips, said terminal strips having transverse corrugations resting against the inside surface of said panel and one of each of said pairs of terminal strips having a downturned end portion entering a notch in its associated insulating spacer to thereby retain said terminal strips and insulating spacers in the panel.

8. In combination, in a relay, a plurality of fixed and movable spring contact fingers, a depressed insulating panel, the depression in the panel aligning with the ends of said contact fingers, a plurality of terminal strips in the depression in said panel in correlation with ends of said contact fingers and extending through said panel to receive wires associated with corresponding contact fingers, and extensions integral with said contact fingers having twisted ends shaped to engage alternate sides of associated terminal strips.

9. In combination, in a relay, a plurality of fixed and movable spring contact fingers, a depressed insulating panel, the depression in the panel aligning with the end of said contact fingers, a plurality of terminal strips in the depression in said panel in correlation with the ends of said contact fingers and extending through said panel to receive wires associated with corresponding contact fingers, insulating spacers fitted into said panel to separate pairs of said terminal strips, and extensions integral with said contact fingers having twisted ends shaped to engage alternate sides of associated terminal strips, said terminal strips having transverse corrugations resting against the inside surface of said panel.

10. In combination, in a relay, a plurality of fixed and movable spring contact fingers, a depressed insulating panel, the depression in the panel aligning with the end of said contact

fingers, a plurality of terminal strips in the depression in said panel in correlation with the ends of said contact fingers and extending through said panel to receive wires associated with corresponding contact fingers, insulating spacers fitted into said panel to separate pairs of said terminal strips with an enlarged head engaging the outside surface of the panel, and extensions integral with said contact fingers having twisted ends shaped to engage alternate sides of associated terminal strips, said terminal strips having transverse corrugations resting against the inside surface of said panel and one of each of said pairs of terminal strips having a downturned end portion entering a notch in its associated insulating spacer to thereby retain said terminal strips and insulating spacers in the panel.

11. In combination, in a relay, a plurality of fixed and movable spring contact fingers, an insulating panel, a plurality of terminal strips in said panel in correlation with ends of said contact fingers and extending through said panel to receive wires associated with corresponding contact fingers, and extensions integral with said contact fingers arranged to engage associated terminal strips.

12. In combination, in a relay, a plurality of fixed and movable spring contact fingers, an insulating panel, a plurality of terminal strips in said panel in correlation with the ends of said contact fingers and extending through said panel to receive wires associated with corresponding contact fingers, insulating spacers fitted into said panel to separate pairs of said terminal strips, and extensions integral with said contact fingers shaped to engage alternate sides of associated terminal strips.

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