

Jan. 26, 1937.

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2,069,162

RELAY

Filed April 28, 1932

2 Sheets-Sheet 1

Fig. 1.

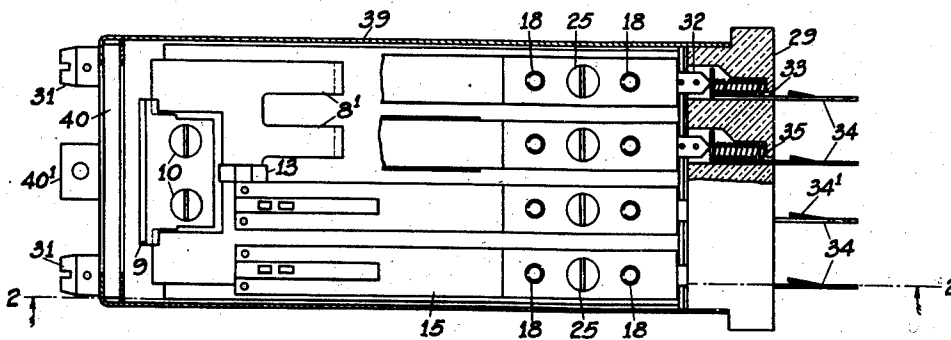
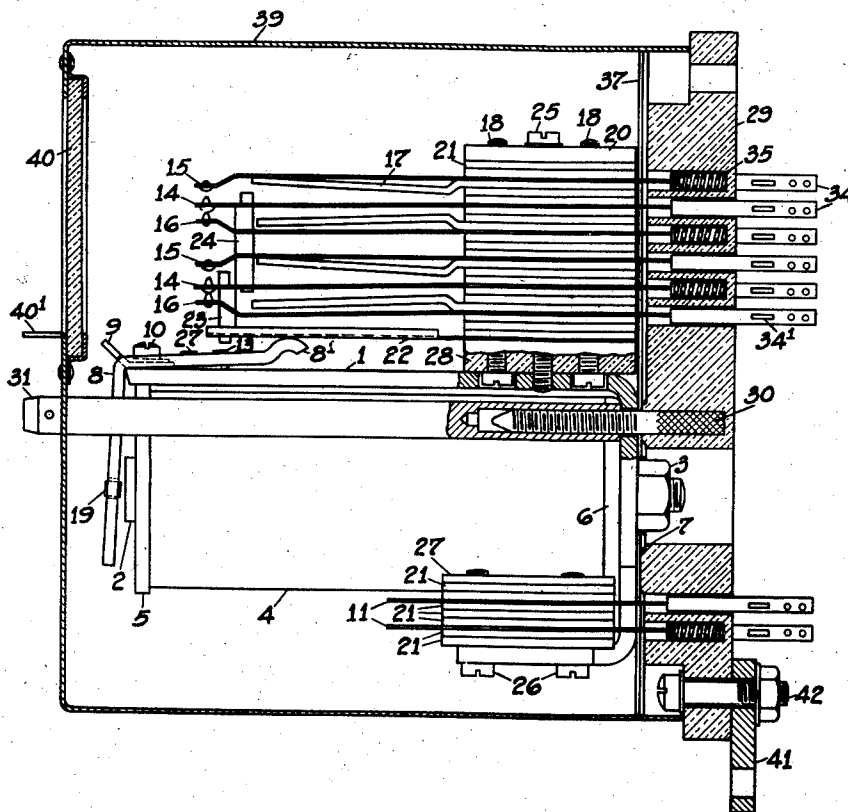


Fig. 2.



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FIG. 4.

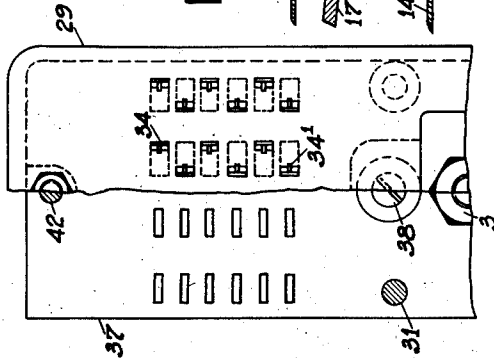


FIG. 5.

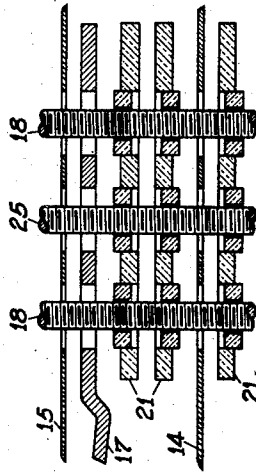
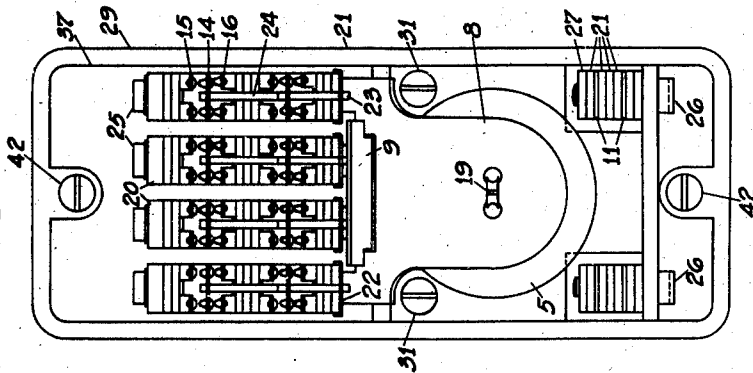


FIG. 3.



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2,069,162

RELAY

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10 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 are required necessitate 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.

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 sufficient 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:—

50 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;

55 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 a partial end elevational view of the mounting end of this relay with a part of the terminal panel broken away; and,

Fig. 5 is an exploded sectional view illustrating the contact finger mounting and insulating arrangement.

Referring to the accompanying drawings, the relay operating mechanism comprises a top magnetic member 1 having a flat top substantially the total width of the relay with a downwardly extending back portion to which a magnetic core 2 is secured. The core 2 has a smaller threaded end passing through a hole (not shown) in the top member 1 and a nut 3 is employed to clamp the shoulder formed by the larger body of the core against the top member 1 to securely hold the core beneath and parallel to the top portion of the magnetic member 1. A coil 4 is permanently wound by a suitable machine on this core 2 between insulating end washers 5 and 6 and the complete coil is treated with a suitable insulating substance such as varnish to prevent moisture or corrosive foreign substances from entering the coil and altering its characteristics.

An armature 8 operates about a knife edge formed at the end of the top member 1 by a slightly acute angle and has a horizontally extending operating arm bent over the top member 1. A portion in the center of the horizontal arm of the armature 8 is cut away to receive a retaining member 9 which is secured to the top member 1 by screws 10. This armature retaining member 9 is substantially T-shaped, or has members extending at the sides to overlap the sides of the rectangular hole in the top of the armature and this T of the retaining member is bent upwardly at such an angle that the straight inside edge of the T may form a tangent to the outside arc of the armature bend fitting over the knife edge on the end of the top member 1.

The de-energized, or retracted position of the armature 8 is limited by a strip 13 of non-magnetic material, such as copper, which is positioned in the center of the arm of the armature by bending its end around the edges as shown in Fig. 1, so that the thickness of the strip 13 separates the arm of the armature from the magnetic top member 1. A similarly arranged strip 19 limits the energized position, or the position of the armature 8 when attracted by the core 2. This strip 19 is fixed to the vertical portion of the armature 8 by bending its ends

through holes therein and over on the outside surface to separate the armature from the end of the core 1 by the thickness of the strip.

The lower end of the magnetic top member 1 is bent outward horizontally to hold terminal strips 11 for the coil energizing leads. These terminal strips 11 are clamped thereto by bolts 26 threaded into a plate 27 and are separated by insulating spacers 21 constructed in a manner similar to the contact insulating spacers which will be fully described hereinafter. This operating mechanism then forms a complete unit, or it may be seen that it has a single structure to which any arrangement of contacts may be applied according to its particular application.

The contacts operated by this mechanism are made up in vertical groups, four of which groups are shown in the accompanying drawings, and it is to be understood that these groups may be made up of any number or arrangement of contacts and that the number of groups may also be arranged to give the proper total number of contacts as required in its particular circuit application. The groups, as shown in Fig. 2, are made up of movable contact fingers 14 with associated front contact fingers 15 and back contact fingers 16. Rigid stops 17 are supplied which extend beneath the front contact 15 and above the back contact 16 to limit the biased position of these fingers when not engaged by the movable finger 14.

Low resistance, arc resisting contact points are provided on bifurcated ends of these contact fingers and shaped as clearly shown in Fig. 2, or it may be seen that the contact points which are above the fingers or pointing upward are sharply crowned or pointed and comparatively high, which shape tends to prevent an increase of the resistance of their contact due to the collection of foreign material thereon. The contact points on the underside of the fingers are of less sharp crown and present a large surface to be engaged by the more pointed top contact points. Each contact group is individually held together by screws 18 having heads resting against a base separator 28 and threaded into a compression member 20, and thin insulating spacers 21 are provided to separate adjacent fingers, the construction of which is more clearly shown in Fig. 5.

These spacers 21 are of thin insulating material, such as bakelite, with three holes therein around which a boss is formed on one side of the material by punching a section of the material part way through as clearly shown in the sectional view in Fig. 5. When these spacers are mounted in their vertical groups, the downwardly extending bosses enter enlarged holes in the contact fingers and stops, such as shown in the finger 15 and stop 17 in Fig. 5, to form an insulation around the body of the retaining screws 18 thereby electrically insulating these screws from the contact fingers.

In each of the vertical contact groups is mounted a lower extending member 22 which is held in a manner similar to the contact fingers except that it need not be insulated. This extending member 22 is made rigid at the most part of its length by upturned edges thereof as shown in Fig. 2, but a small portion near the contact mounting is left flexible to affect a pivot for the rigid portion of the member.

The extending member 22 is connected with the movable contact fingers 14 by insulating pushers 23 which pass through slots forming the bifurcation in the back contact fingers 16,

as shown in Fig. 1, with a small end passing through a rectangular hole in the movable finger 14 and a similar small other end passing through a hole in the member 22 with a shoulder formed by the larger body portion of this pusher resting above the member 22 and beneath the movable contacts 14. A similar pusher 24 connects the two movable contacts 14 together by passing through slots in the front contact 15 and the back contact finger 16 to effect the operation of the movable contacts in unison by a movement of the extending member 22.

Each of these vertical contact groups, when assembled as just described is mounted above the top plate 1 by a screw 25 tapped into the top plate 1 with the heads of the contact clamping screws 18 resting in holes in the top plate 1 to prevent turning of the contact groups thereon. This method of mounting the vertical contact groups directly upon the top magnetic member 1 makes a very rigid arrangement inasmuch as a small amount of armature motion is sometimes lost due to longitudinal springing of other mounting means such as auxiliary brackets. The horizontal portion or operating arm of the armature has four extending fingers 8¹ which are directly beneath the various contact groups and have upturned curved ends resting against the lower sides of associated members 22, as shown. Proper travel of the contact fingers is effected by the fingers of the armature operating arm engaging the members 22 at a point nearer the rear, or effective pivot point thereof than the pusher 23 thereby effecting a multiplication of the operating movement of the armature.

Each contact finger is shaped before assembling in its proper group, or in other words, it is curved to be biased to its unoperated position when clamped between the insulating spacers 21. The front and back contact fingers 15 and 16 are pre-formed to exert the proper force against their stops 17 when not engaged by the movable finger 14, and these fingers 14 are pre-formed to present a downward biasing force sufficient to properly depress the back contacts 16, as well as to bias the armature 8 to its de-energized position. These contact groups are then individually placed in a holding fixture and tested before assembling on the relay with a suitable gauge to check this biasing force which has been formed into the contact fingers, and such corrections as are required may be conveniently made thereon by suitable tools thus assuring that when assembled, the fingers are properly adjusted so far as their shaping and operating movement is concerned.

When the vertical contact groups are assembled on the top magnetic member 1, the only adjustment, which is then necessary for the contact fingers is to obtain the proper engagement between the armature operating arms 8¹ and their various multipliers 22, or that is, to adjust the armature operating arms so that the armature in its extreme deenergized position allows a complete movement of contact fingers but does not have a substantial amount of loss motion in operation. It has been found that, in adjusting such engagement between the movable fingers and their operating arms, inaccuracy of the various contact groups or in mounting such groups may result in different positions of the end of the fingers so that it is necessary to provide individual adjustment of the engagement of each vertical group. This adjustment is provided in the present relay by the contact fingers 8¹ which

may be individually bent over a suitable fixture to adjust its engagement with the associated vertical contact groups.

A thin backboard 37, of insulating material, such as a phenolic plate, is secured to the rear of the relay by a screw 38 threaded into the magnetic member 1. This backboard 37 has rectangular holes punched therein to receive the extending end of the contact fingers and the coil terminal strips 11. A cover 39, having a window 40, encloses the relay as now assembled, which cover 39 fits tightly over and is supported by the backboard 37 in the rear, and the front has two holes receiving the ends of the elongated cap nuts 31. The ends of the cap nuts 31 have small holes therein through which a wire seal may be placed and fastened to an L-shaped projection 40¹ on the cover 40.

A quick detachable means for mounting the relay and for making external wire connections to the contact fingers and operating coil has been provided by an insulating terminal panel 29. This panel 29 has two studs 30 with a knurled portion thereof moulded into the panel and a threaded extending end on which the relay may be secured by two elongated cap nuts 31 threaded thereon to clamp the downwardly extending portion of the relay top member 1 against bosses around the studs 30 on the panel 29. The lower end of the downturned portion of the top member 1 rests against a boss 7 on the panel 29 to provide a sturdy three point mounting means.

Rectangular depressions 32 spaced so as to align with extending ends of the contact fingers are formed in the panel 29 with slots 33 extending through the panel on one side of these rectangular depressions 32 which side is alternated in vertical rows. Wire terminal strips 34 are placed into these slots and have an end portion bent to form an L resting in the rectangular depressions in the panel with a spring 35 biasing these terminal strips 34 against pointed ends on extensions of the contact fingers as shown in Fig. 1. The terminal strips 34 are retained in their slots by a small integral detent 34¹ stamped out and shaped to spring out into engagement with the side of the panel 29 and thereby prevent their removal.

The staggering of the extending portions of the wire terminals in vertical rows obtains greater space between adjacent terminal strips to enable more convenient soldering of the external wire connections and to provide greater insulating spaces therebetween. A similar arrangement for making the external wire connections to the coil terminal strips 11 is provided on the panel 29 and functions in the same general manner as just described. A means for mounting a plurality of the insulating terminal panels may be provided by a transverse support 41, these supports being spaced so that a bolt 42 passing through a hole at the lower end of the panel 29 may enter a top hole of the support 41 and a similar bolt may then clamp the top of the panel 29 by passing through a lower hole in the transverse support next above.

In some applications, where this quick detachable means for connecting the external circuit wires is not considered warranted, the insulated panel 29 may be omitted, and the wire connection then soldered directly to the extending ends of the contact fingers. A support for the relay is then provided to which the relay is secured at the threaded extension of the core 2.

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 operation of the individual contact groups is considered a more important feature of the present invention inasmuch as a more uniform adjustment of the contacts and their operation is obtained.

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, an extending member, an operator on said extending member, a plurality of vertical contact groups each comprising a plurality of insulated spring contact fingers held by insulated screws, and means for holding said vertical contact groups on said extending member in operative relation to said operator, comprising insulated screws passing through said vertical groups and threaded into the extending member with heads of the contact group holding screws fitting into holes in the extending member.

2. In a relay, an extending member, an operator on said extending member, a plurality of vertical contact groups each comprising a plurality of insulated spring contact fingers and a contact operating lever held by insulated screws, and means for holding said vertical contact groups on said extending member to engage said operating lever with said operator comprising insulated screws passing through said vertical groups and threaded into the extending member with heads of the contact group holding screws fitting into holes in the extending member.

3. In a relay, a rockable member, a plurality of vertical contact groups each having a plurality of insulated spring contact fingers and a contact operating arm in each of said vertical contact groups operable by said member, said operating arm having a rigid portion arranged to multiply the movement of said member and a flexible portion allowing movement of said rigid portion.

4. In a relay, a movable member, a plurality of vertical contact groups each having a plurality of insulated spring contact fingers, a plurality of contact group operating fingers on said member, and a contact operating arm in each of said vertical contact groups operable by an associated finger on said member, said operating arm having a rigid portion arranged to multiply the movement of said member and a flexible portion allowing movement of said rigid portion.

5. In a relay, a pivoted member, a plurality of vertical contact groups each comprising a plurality of pre-formed spring contact fingers held between insulating spacers, and fingers on said member arranged to individually operate the contact fingers of the vertical contact groups whereby individual group adjustment of such contact operation may be obtained by individually bending said member fingers.

6. In a relay, pre-formed spring contact fingers, through bolts clamping said contact fingers

in vertical piles, and insulating spacers between said contact fingers having holes therein receiving the body of said through bolts and bosses around the holes entering holes in the contact fingers.

5 7. In a relay, pre-formed spring contact fingers, an upper pointed contact on said fingers engageable with a lower flat contact on adjacent fingers, through bolts clamping said contact fingers in vertical piles, and insulating spacers between said contact fingers having holes therein receiving the body of said through bolts and bosses around the holes entering holes in the contact fingers.

10 8. In a relay, a plurality of pre-formed spring contact fingers, and low resistance contact points one on each side of each of said contact fingers, said contact points which are above the contact fingers being pointed and those which are beneath the contact fingers being flat to thereby prevent the collection of dust between such contact points.

9. In combination, in a relay, a plurality of fixed and movable spring contact fingers, a panel supporting the relay, terminal strips extending through said panel for connecting wires to said contact fingers, each terminal strip having a transversely bent end biased to engage pointed extensions of the contact fingers.

10 10. In combination, in a relay, a plurality of fixed and movable spring contact fingers, a panel supporting the relay and contacts, terminal strips extending through said panel for connecting wires to said contact fingers, each terminal strip having a transversely bent end biased to engage pointed extensions of the contact fingers, said terminal strips being arranged in horizontal rows on the panel with the said biased end bent transversely at alternate sides in adjacent horizontal rows to thus permit close spacing between rows.

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