

Nov. 11, 1952

O. S. FIELD

2,617,846

SHELF MOUNTED PLUG COUPLED DETACHABLE TYPE RELAY

Filed Oct. 20, 1949

2 SHEETS—SHEET 1

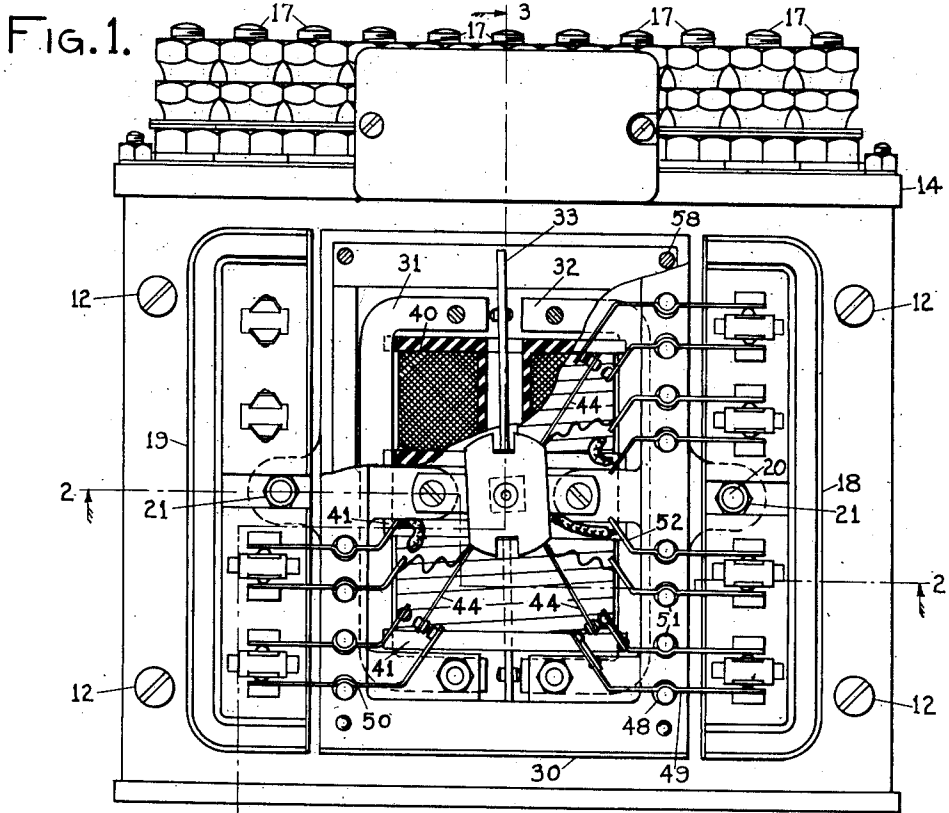
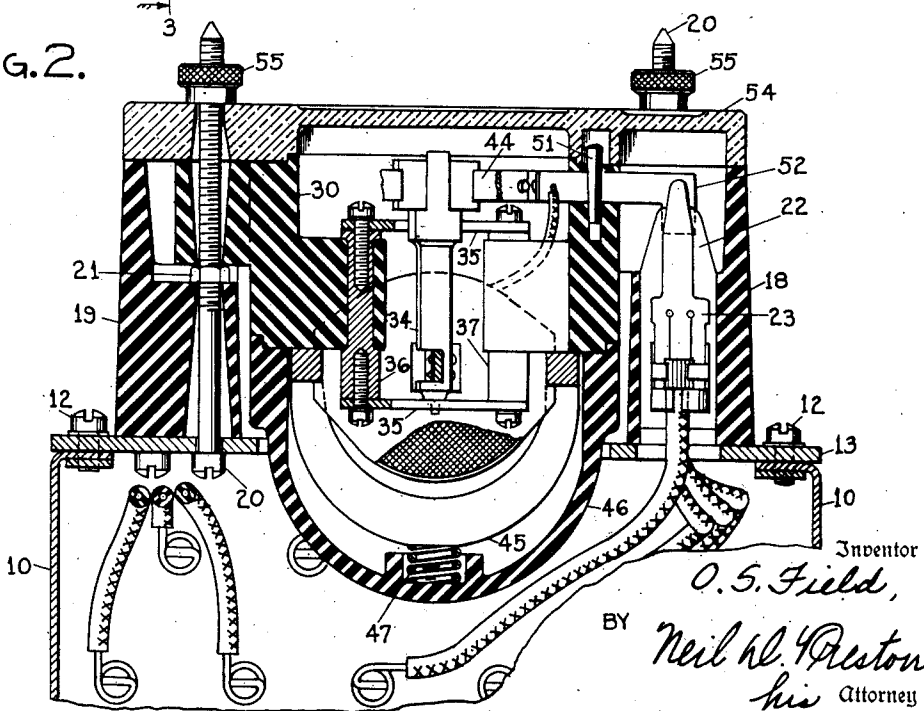


FIG. 2.



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2 SHEETS—SHEET 2

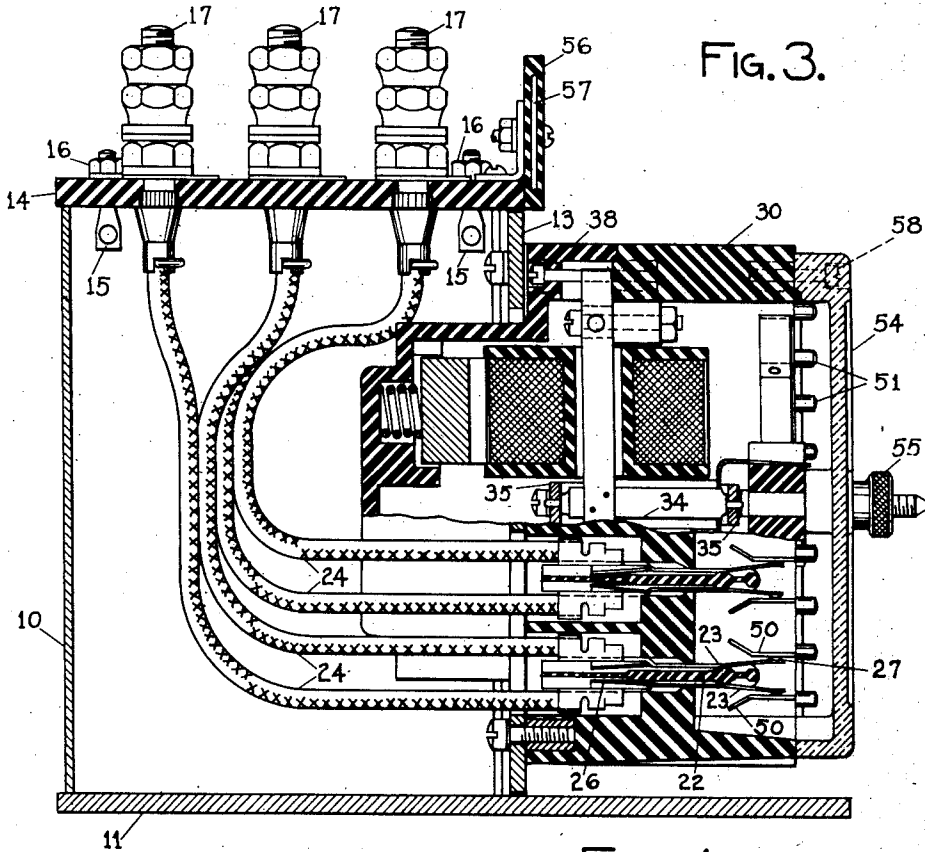


FIG. 3.

FIG. 6.

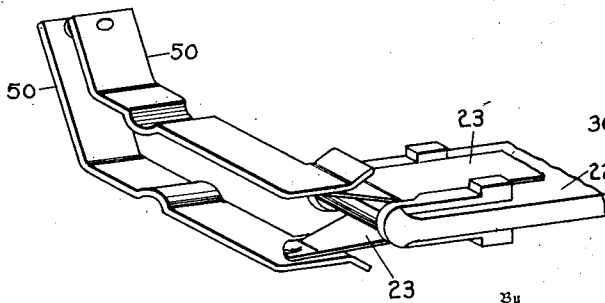


FIG. 4.

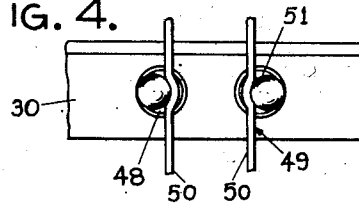
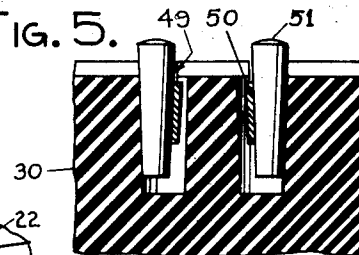


FIG. 5.



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UNITED STATES PATENT OFFICE

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SHELF MOUNTED PLUG COUPLED DETACHABLE TYPE RELAY

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eral Railway Signal Company, Rochester, N. Y.

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2 Claims. (Cl. 173-328)

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This invention relates in general to electro-magnetic relays, and more particularly pertains to improvements in contact structures and mounting means for such relays.

In general, quickly detachable plug coupled type relays are employed in connection with vertically supported relay racks which are adapted to receive the relay mechanisms both for supporting such mechanisms and for establishing the electrical connections through suitable plug couplers all in one operation. It will be readily appreciated that this is highly desirable so that the relay mechanisms may be readily replaced by a maintainer in case of trouble, and the replaced unit may be removed to a suitable repair shop or the factory. In many cases there are no relay racks available and it is necessary to use the conventional shelf type relay which involves the disconnection of many wires during a replacement operation.

In accordance with the present invention, it is proposed to provide a structural organization that is adapted to be mounted on a shelf of any suitable type such as may be found either in a tower or in a relay case along the right-of-way of a railroad. This structural organization is arranged to have the circuit connections permanently made to its terminals in the usual way provided for shelf type relays. On the other hand, the relay operating mechanism of this structural organization is made quickly detachable by the use of plug couplers.

In view of this general proposed type of organization, it is proposed that the relay organization shall be constructed in such a way as to cover the plug coupling units when the mechanism is in place. Also, it is proposed that sufficient space shall be left for the wire connections to the plug units, and the complete mechanism shall be of such a shape and character as to be stable on the shelf both during the normal use of the structure and also during the removal and replacement of the operating mechanism. It is further proposed that the relay contact arms be made readily replaceable and especially adapted for use with plug coupling connectors.

The general relay structure and plug coupling arrangement is claimed herein; whereas, the novel replaceable contact structure and mounting, illustrated more particularly in Figs. 4, 5 and 6, has been disclosed and claimed in my divisional application Ser. No. 288,282, filed May 16, 1952.

Various other objects, purposes, and characteristic features of the present invention will be in part apparent and in part pointed out as the description of the invention progresses.

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In describing the invention in detail, reference will be made to the accompanying drawings in which—

Fig. 1 is a front view, with certain parts removed, of the relay structural organization embodying the present invention;

Fig. 2 is a bottom sectional view of the relay mechanism and plug coupling organization taken on line 2-2 of Fig. 1;

Fig. 3 is a side sectional view of the complete relay structural organization taken on line 3-3 of Fig. 1;

Fig. 4 is a fragmentary view of the contact mounting structure employed in the relay operating mechanism;

Fig. 5 is a sectional view of the contact mounting means shown in Fig. 4; and

Fig. 6 is a fragmentary isometric view of a pair of plug coupling elements used in the relay operating mechanism.

In connection with the drawings, it should be understood that they have been made more with the purpose in mind of showing the general structural characteristics of a relay embodying the present invention than for the purpose of showing the details of design of such a relay. For this reason, the drawings include sectional views, and the like, to more clearly show the portions contemplated as constituting the elements of the present invention. It will, of course, be understood that various changes in position, size, and shape may be made to the various elements constituting the structure embodying the present invention without in any way departing from the basic principles involved in the proposed relay structure.

Referring to Fig. 3, it will be seen that the relay structure includes a metal casing formed of a single metal member 10 bent in a generally rectangular shape having three enclosed sides and a partially open fourth side. This member 10 is mounted on a base plate 11 which extends to the right beyond the partially enclosed fourth side of the case. This partially enclosed side of the case 10 has a metal plate 13 attached by four screws 12, as viewed in Figs. 1 and 2, to the turned edges of the side plate 10 as can best be seen in Fig. 2. This plate 13 has one suitable opening for receiving a part of the relay operating mechanism (see Figs. 2 and 3), as well as two other openings allowing the passage of wires to the plug units 18 and 19 which are attached outside of the case, as will presently be described.

The cover 14 to the case is preferably made of suitable molded insulating material and is held in position by bolts 15 which are spot welded to

the sides of the case and have nuts 16 applied thereto (see Fig. 3). The top or cover plate 14 has a large number of holes drilled therein for receiving terminal posts 17 which are held in position by suitable nuts. These posts have sufficiently elongated threaded portions to receive suitable nuts beneath which the terminal wires extending to the relay may be secured. The lower ends of these terminal posts 17 have wires 24 connected thereto which extend within the casing to the plug coupling units 18 and 19.

Referring to Fig. 1 it will be seen that plug units 18 and 19 are mounted on each side of the central opening within the side plate 13, and are secured in position by bolts 20 and nuts 21. Thus, they are permanently and firmly held in position. Each of these units 18 and 19 includes a plurality of openings for receiving the parts of the plug units which are constructed similarly to those disclosed in the patent, No. 2,457,703, granted December 28, 1948, to J. F. Merkel. Each of these plug units includes a plurality of bayonet portions 22 which are placed in position by a pressed fit subsequent to the molding of the unit. Thus, a receiving recess is provided for each of the wire connector elements 23. The wires 24 from the terminals 17 are then connected to these connector elements 23 which are snapped into their positions in the recesses in a manner that they cannot be accidentally pulled out by reason of the spring portions 26 of each element. These contact elements 23 may readily be removed by the insertion of a special tool for compressing spring portion 26, when required, as shown and described in the prior patent above mentioned.

The two adjacent wire connector elements 23 (see Fig. 3) form opposing resilient spring portions extending beyond the bayonet portion 22 and these spring portions have contact points 27 attached thereto or formed thereon for contacting the rigid fixed fingers 50 of the relay operating mechanism when it is inserted. Each pair of wire connectors 23 are biased apart by the associated bayonet portion 22. A reason for this feature will be described later in connection with the insertion of the relay operating mechanism.

Referring to Figs. 1 and 2, a generally rectangular shaped molded base 30 of suitable insulating material is provided within which the core members 31 and 32 of a general U-shape may be mounted. These core pieces 31 and 32 of suitable soft iron are separated sufficiently to permit an armature 33 to be vertically supported on shaft 34 which has both front and back pivot points as shown in Figs. 2 and 3. These pivot points are made by suitable members 35 extending between two posts 36 and 37 which are molded into the case 30.

Within the confines of the core members 31 and 32, are located two winding spools 40 and 41 which are of molded material and have end pieces of the general shape outlined best in Fig. 2. Such generally oval end pieces on the spools have recesses at their widest portions which receive the core members 31 and 32 in a manner to be held in their proper positions. These winding spools 40 and 41 have the windings of the relay wound thereon with suitable leads extending to fixed contact members such as 52 shown in Fig. 1. These winding spools have longitudinal passages through their centers to allow for the presence of armature 33 and its relative movement between the ends of the core members 31 and 32.

The relay is polarized by two permanent mag-

nets, one of which can be seen in Fig. 2. This permanent magnet 45 by reason of its residual magnetism holds itself against the core members 31 and 32, and its location is determined by reason of its ends falling between the two end pieces of the winding spool 40. In addition, the placing of the cover member 46 in its position by tightening securing screws 38 (see Fig. 3) provides that a spring 47 located within a circular recess of member 46 (see Fig. 2) provides a constant pressure to mechanically hold the permanent magnet 45 in position. A similar spring is also provided to hold the other permanent magnet in position with its ends between the end members of the associated winding spool.

The molded base member 30 has a series of slots and holes along both sides as viewed in Fig. 1, where the parts are shown with cover 54 removed. These slots are adapted to receive fixed contact members 50 as shown in the enlarged Figs. 4 and 5. These slots 49 are exactly perpendicular so as to hold the fixed contact members 50 in proper vertical positions as required to cooperate with the movable armature operated contacts 44. The contact fingers 50 have been shown in detail in Fig. 6 where it can be seen, as well as in Fig. 1, that a semi-circular bend is provided at an intermediate point such as to properly locate the contact end-wise with respect to case 30. In other words, these deformed portions of the contact fingers 50 are so formed as to fit within the circular holes 48; but these circular holes are suitably tapered and so positioned with respect to the slots 49 for receiving the fixed contact fingers, that the circular portion of the contact finger does not actually contact the inner periphery of the holes. Thus, the insertion of the tapered plugs 51 results in firmly securing the fixed contact finger 50 in place. It is noted that the tapered plugs 51 extend slightly above the surface of the case member 30, and thus are accessible so as to be removed to allow the replacement of the fixed contact fingers when this is required. This is a considerable advantage over prior structures where the fixed contact fingers are permanently molded in the case member, since in that case a whole new structure would need to be provided to replace any worn contact fingers.

With reference to Figs. 1 and 4, it will be seen that each pair of fixed contact fingers 50 are so located with respect to each other that the tapered plugs tend to move such fingers toward each other and in this way provides a central pressure for the fingers within their slots in such a way as to oppose any pressure applied by movable contacts 44 or by their contact with the plug wire connectors 23 of the plug units.

It will be noted that the fixed contact fingers 50 have obliquely bent arms extending at right angles away from its longitudinal axis which serve as inclined planes against which the plug wire connectors 23 may slide into position as the relay mechanism is moved into place, as can be viewed in Figs. 3 and 6. This use of fixed contacts 50 in pairs provides for an equalization of the pressure of the plug contacts on opposite sides of the bayonet member 22. This is repeated, of course, in each case. In some instances, such as in the case of fixed contact member 52 of Fig. 1, there is actually no cooperating movable contact, but the fixed contact 52 is employed as an outlet for a winding connection and acts to equalize the pressure on opposite sides of

the associated bayonet members 22 of the plug coupling unit.

A suitable cover 54 of glass or other transparent material is secured in position on the case member 30 by suitable screws 58 as viewed in Fig. 3, so that the operating mechanism is completely enclosed both when it is in position and when it is removed. The cover 54 extends beyond the case member 30, as viewed in Fig. 2, in a manner to also act as a cover for the plug coupling units 18 and 19. When the relay operating mechanism is in position, the cover passes over the extending bolts 20, so that suitable thumb nuts 55 may be placed in position to hold the entire operating mechanism in its proper location.

At the top of the casing and in front a transparent molded member 56 is mounted by suitable screws and angle brackets to the cover plate 14 within which a slot 57 is located, so that any desired name plate, giving the operating characteristics of the relay, can be inserted within the slot and be protected from exposure, and be entirely visible.

Having thus described a relay and plug coupler for shelf mounting as one specific embodiment of the present invention, it is desired to be understood that this form is selected to facilitate in the disclosure of the invention rather than to limit the number of forms which it may assume; and, it is to be further understood that various modifications, adaptations, and alterations may be applied to the specific form shown 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.

What I claim is:

1. In a unitary relay structure for shelf mounting; a box-like casing having a base plate extending forwardly outside the confines of the casing enclosure, a top plate of insulating material, and a side opening in said casing on that side adjacent said base plate extension; a plug coupling unit mounted on each side of said side opening in said casing; a plurality of terminals attached to said top plate; a plurality of connectors in each of said coupling units, wires extending between said terminals on said top plate and their respective connectors of said coupling units; a relay mechanism having a portion thereof adapted to enter said side opening and also having extending contact arms adapted to enter said plug coupling units for making contact with their respective connectors; and a transparent cover plate extending over said relay mechanism and both said plug coupling

units to protect said mechanism and said coupling units, said cover plate being attached to said casing to thereby hold said relay mechanism in its position required for its contacts to connect with their respective connectors.

2. In a relay structure of the type described, a casing having an opening in one side, two plug coupling units connected outside said casing on that side having said opening, said units being on opposite sides of said opening and immediately adjacent its edges, and each of said units including a plurality of pairs of wire connectors, said connectors of each pair being separated by a bayonet member having a rounded end, and said connectors extending an appreciable distance beyond the end of said bayonet members to provide resilient end portions, and a relay mechanism constructed to be inserted into said opening and having a plurality of pairs of relatively rigid contact fingers extending from its opposite sides, each of said pairs of contact fingers located to engage their respective pair of wire connectors between the two fingers of that pair when said relay mechanism is inserted into the opening of said casing, each of the contact fingers of each pair having a cam surface formed by an extending lip on one side of the finger adjacent its end, whereby each pair of wire connectors have their resilient end portions compressed toward each other by their respective pair of contact fingers to provide good electrical connection throughout the time said relay mechanism is inserted in the casing.

OSCAR S. FIELD.

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