

April 13, 1937.

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2,076,612

DETACHABLE TERMINAL PLATE FOR ELECTRICAL APPARATUS

Filed Jan. 2, 1935

2 Sheets-Sheet 1

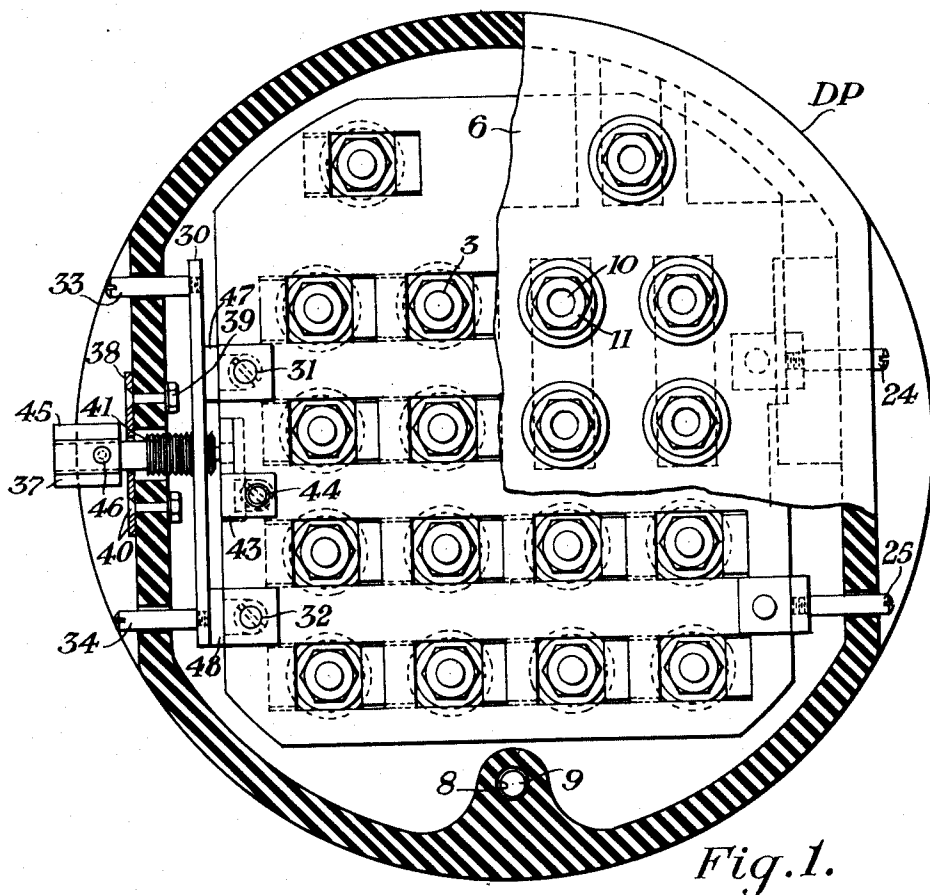


Fig. 1.

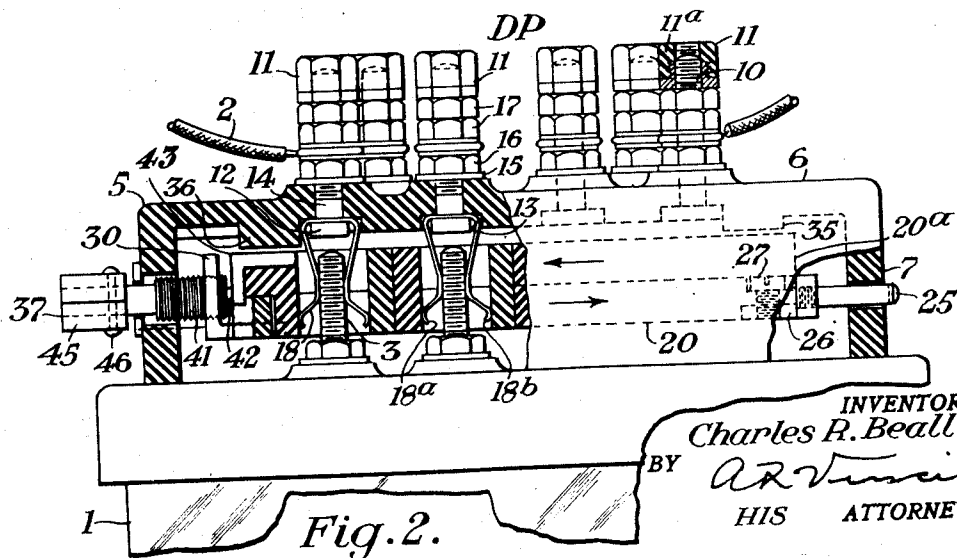


Fig. 2.

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2 Sheets-Sheet 2

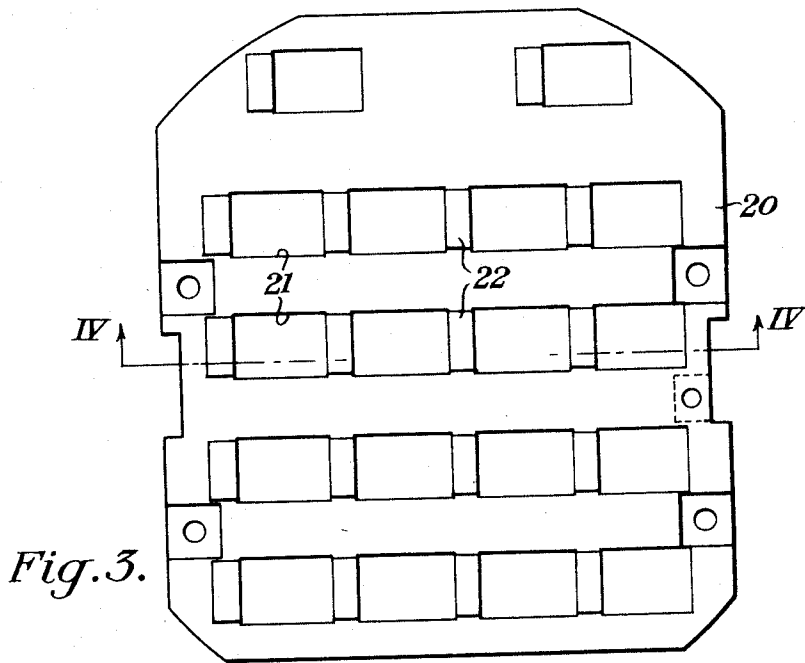
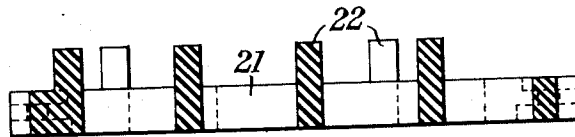


Fig. 4.

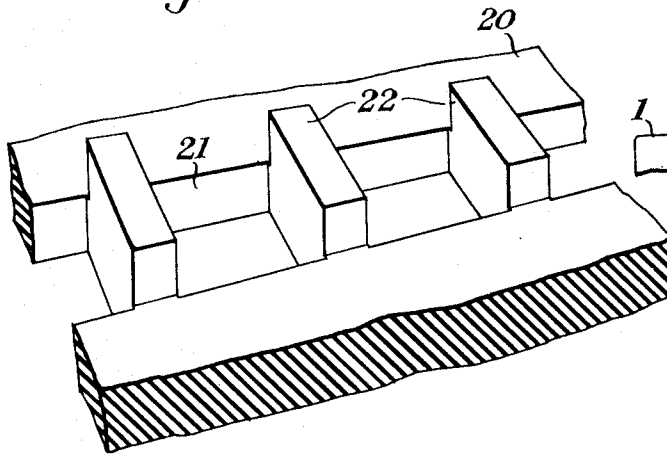


Fig. 5.

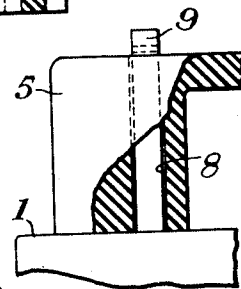


Fig. 6.

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DETACHABLE TERMINAL PLATE FOR
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Application January 2, 1935, Serial No. 184

13 Claims. (Cl. 173—328)

My invention relates to detachable terminal plates for electrical apparatus, and particularly to detachable terminal plates for apparatus requiring a group of external connecting wires.

I will describe one form of a detachable terminal plate embodying my invention, and will then point out the novel features thereof in claims.

In some fields of electrical apparatus it is desirable to have provision made whereby it is possible to remove a piece of apparatus from service and replace it with another one without the necessity of disconnecting one at a time the external connecting wires from the terminals of the old apparatus and again connecting them to the terminals of the new unit. This disconnecting and reconnecting of the external connecting wires offer an opportunity for mistakes to occur, and in addition require considerable time that may cause a serious delay in restoring the service of the apparatus. A feature of my invention is the provision of a novel and improved detachable terminal plate wherewith the external connecting wires of an electrical operating unit are grouped on a movable plate to permit their manipulation in unison, and wherewith the connecting springs for making connection between the individual wires and the respective terminals of the operating unit are clamped into engagement and released simultaneously. Other features and advantages of my invention will appear as the specification progresses.

Referring to the drawings, Fig. 1 is a plan view partly in section of a detachable terminal plate embodying my invention, the particular construction employed being that for a relay extensively used in present day railway signal systems. Fig. 2 is a side view partly in section of the terminal plate of Fig. 1. Fig. 3 is a plan view of the contact clamping plate which forms a part of the terminal plate of Fig. 1. Fig. 4 is a sectional view of the clamping plate taken on the line IV—IV of Fig. 3. Fig. 5 is a perspective view of the contact clamping plate of Figs. 3 and 4. Fig. 6 is a detail view of the guide post construction of Fig. 1. In each of the several views like reference characters designate similar parts.

Many different applications for detachable terminal plates embodying my invention will suggest themselves to those skilled in the art, and it will be understood that I do not wish to limit myself to any specific type or class of electrical apparatus to which my invention may be applied since it will be susceptible of use in many fields. One such class of apparatus will be the relays

and control devices for railway signal systems where rather complicated circuit arrangements requiring many connecting wires, each of which must be secured to a particular terminal post, are used. As stated above, the construction of the detachable terminal plate disclosed in the accompanying drawings is that for a relay of a railway signal system, and this one application of a detachable terminal plate embodying my invention will serve to illustrate the many places my invention will be useful.

Referring to the drawings, the reference character 1 designates a relay for a railway signal system, the operating parts and contacts of which are inclosed within a weatherproof case and are electrically connected with terminal posts firmly secured in a fixed top plate of the relay, the terminal posts being insulated from each other and from the top plate either by insulating bushings or by the top plate being of insulating material as desired, and all of which construction is in accordance with standard practice for such relays and is not shown in the drawings since the relay construction forms no part of my present invention. The external circuits cooperating with the relay 1 are connected with the respective terminal posts of the relay through the medium of lead wires such for example as the lead wire designated by the reference character 2. Each lead wire 2 is preferably provided with an eyelet adapted to slip over a terminal post of the relay such as the terminal post designated by the reference character 3. Heretofore it has been customary to fasten each lead wire with its respective terminal post by the eyelet being held in place by washers and terminal nuts adapted to fit the threaded portion of the post, a lock nut being preferably added to prevent the connection from becoming loose. To make it possible to quickly disconnect the relay 1 and replace it with another one and to assure the circuit connections to the new relay are not altered, I provide a detachable terminal plate for the relay and which plate is designated as a whole by the reference character DP. The detachable terminal plate DP is equipped with terminal posts and contact springs one for each terminal post of the relay, together with clamping means effective to simultaneously clamp all the contact springs of the detachable plate to their respective terminal posts of the relay, and to simultaneously release the contact springs from the relay terminal posts. The detachable terminal plate DP comprises a removable or false top plate 5 of suitable insulating material and

which is formed with a terminal portion 6 and a skirt 7, the removable plate 5 being so proportioned as to fit on the fixed top plate of the relay with a slight clearance around the outer edge.

So that the removable plate 5 always registers a predetermined position with respect to the top of the relay, a guide post 9 is fitted onto the upper end on one of the screws fastening the top of the relay, and the removable plate 5 is provided with a hole 8 of a size to just slide over the guide post 9. Two such guide posts 9 may be fitted one on the top of each of two screws for fastening the relay top and each post made of a particular diameter, and the two mating holes formed in the removable plate 5 made of corresponding diameters if found desirable to provide additional assurance that the movable plate registers a predetermined position with respect to the top of the relay. It is clear that a gasket may be placed between the skirt 7 and the relay top and the guide posts 9 provided with a thread and nut and a dustproof seal between the detachable terminal plate and the relay provided if desired. It follows that whenever the detachable terminal plate DP is placed on top of the relay 1, it registers a predetermined position with respect to the top of the relay.

The terminal portion 6 of the removable top plate 5 carries terminal posts 10, one for each terminal post 3 of the relay 1. These terminal posts 10 are all alike and are preferably of standard construction used for the terminal posts of relays of the type here involved except for the lock nut 11. As here shown, each terminal post 10 comprises a head 12 adapted to fit a recess 13 molded in the underside of the plate 5, and a bolt portion 14 threaded substantially throughout its length. Each terminal post 10 is secured to the removable plate 5 by a washer 15 and a nut 16. The eyelet of the respective lead wire is placed between two washers and is secured in place by a nut 17. The lock nut 11 is constructed with its upper portion 11^a of suitable insulating material and the parts are so proportioned that the top of the lock nut 11 extends slightly above the bolt portion 14. The function of such arrangement of the lock nut 11 will appear later. As stated above, each terminal post provided in the removable plate 5 is constructed in a similar manner.

Each terminal post 10 is provided with a contact spring 18 which is secured under the head 12 and its two contact fingers 18^a and 18^b are bent downward to slidably fit over the mating terminal post of the relay, the parts being so proportioned and adjusted that the contact fingers of the spring 18 normally fit the mating terminal post of the relay with only a slight contact pressure. It is to be understood that in practicing my invention the usual washers and nuts provided for each terminal post of the relay are removed and the terminal posts are all made of substantially uniform height. Consequently, when the removable top plate 5 is placed on the relay 1, each terminal post of the relay is engaged by the contact spring 18 of the corresponding terminal post of the detachable terminal plate DP, the contact pressure of the contact fingers of the springs 18 being such that the detachable terminal plate is slipped down into place with little resistance.

After the detachable terminal plate DP is in place, the contact springs 18 are made to firmly engage the relay terminal posts by a clamping means which I shall now describe. Referring to Figs. 3 and 4, a contact clamping plate 20 of suit-

able insulating material is constructed with a plurality of holes designated by the reference character 21, there being a hole 21 for each terminal post of the relay 1. As shown more clearly on Fig. 5, adjacent each hole 21 of the plate 20 a bridge or leg member 22 extending above the surface of the plate 20 is provided. It is clear that, if a second clamping plate 20^a similar in all respects to the clamping plate 20 is placed upside down on the plate 20, the legs 22 of the second plate extend downward into the holes 21 of the first plate and the legs 22 of the lower plate 20 extend upward in the holes 21 of the plate 20^a, and as a result the remaining holes through the combination of two such clamping plates has a leg from one plate on one end and a leg from the other plate on the opposite end. The parts are so proportioned that, when the two clamping plates 20 and 20^a are combined in the manner just explained and placed on the underside of the removable top plate 5 as shown in Fig. 2, the contact springs 18 project downward into the holes of the clamping plates. The clamping plate 20 is provided with two guide pins 24 and 25 which screw into angle members 26 fastened to the plate 20 by screws 27. The outer ends of the pins 24 and 25 extend through holes drilled in the skirt 7 as will be understood by an inspection of Figs. 1 and 2, the outer ends of the pins 24 and 25 being slotted for screw driver operation. A bar member 30 is secured to the lower clamping plate 20 by means of feet 47 and 48 which fit into molded recesses of the plate, and held in place by the screws 31 and 32. Two guide pins 33 and 34 similar to the guide pins 24 and 25 are provided for holding the left-hand side of the contact clamping plate 20 in place, the pins 33 and 34 being screwed into the bar member 30 and fitting into holes in the skirt 7. The upper clamping plate 20^a rides free on the upper surface of the lower clamping plate 20 but is retained in position by depending lugs 35 and 36 formed on the underside of the removable plate 5. An adjusting screw 37 is journaled in a plate 38 secured to the skirt 7 by means of two screws 39 and 40. A threaded portion 41 of the adjusting screw 37 is threaded into the bar member 30 secured to the lower clamping plate 20 as explained above, and its inner tip 42 engages a plate 43 secured in a recess of the upper clamping plate 20^a by a screw 44, the lower end of the plate 43 moving in a recess of the lower plate 20 to permit a certain amount of motion of plates 20 and 20^a with respect to each other when moved in a manner to be shortly explained. A hexagonal head 45 is pinned at 46 to the adjusting screw 37 for receiving a socket wrench. It follows that turning the adjusting screw 37 clockwise as viewed when facing the head 45 thrusts the upper clamping plate 20^a to the right and pulls the lower clamping plate 20 to the left with the result that the legs 22 of the two clamping plates are drawn together and compress the lower end of the two fingers 18^a and 18^b of the contact springs 18 and press these contact fingers firmly against the terminal posts 3 of the relay. The fingers of the springs 18 are so shaped that, when they are forced into contact with the terminal posts of the relay by the legs 22 of the two clamping plates, they each engage several threads of the terminal post and a reliable electrical contact between the spring 18 and the relay terminal post is assured. When the adjusting screw 37 is turned counterclockwise, the lower clamping plate 20 is moved to the right and the pressure of the springs 18 is

relieved and the springs 18 are released from engagement with the terminal posts 3 of the relay. Since the two clamping plates 20 and 20^a are provided with legs 22 for each spring 18 of the detachable terminal plate DP, it is clear that operation of the adjusting screw 37 when the terminal plate is placed on the relay is effective to clamp all of the springs 18 into place simultaneously and to release the engagement of the springs 18 from the relay terminals simultaneously.

In the practicing of my invention the nuts and washers will be removed from the terminal posts of the relay except the washer and nut for holding the post in the fixed top plate of the relay, and the terminal posts will be made of proper uniform height. The lead wires for the cooperating circuits will be connected with the terminal post 10 of the detachable terminal plate, each lead wire being fastened to the terminal post 10 corresponding to the terminal post 3 of the relay to which the wire would be connected. As explained hereinbefore, the parts are so proportioned that, with the eyelets of the lead wires on the terminal posts 10 and the lock nuts 11 run down into place, the insulated portion 11^a of each lock nut will extend slightly above the post. Hence, if in the manipulation of the detachable terminal plate DP after all the lead wires are connected thereto, the tops of the nuts 11 should accidentally come in contact with a metal shelf of the relay housing, a false circuit connection between the terminal posts 10 will be avoided. After the lead wires are connected with the detachable terminal plate it will be slipped over the guide posts 9 on the top of the relay and, with the adjusting screw 37 released as it should be, the springs 18 will slip over the respective terminal posts of the relay with little resistance. When the detachable terminal plate is in place on the relay the adjusting screw 37 will be turned clockwise and the springs 18 will be clamped firmly with the terminal posts of the relay. This is the operating position for the detachable terminal plate. To remove the relay from service the adjusting screw 37 will be turned counter-clockwise to release the springs 18 from engagement with the terminal posts of the relay and the detachable terminal plate DP will be lifted bodily off the top of the relay. The placing of the detachable terminal plate DP on the top of the new relay will be after the manner just explained. In this connection it will be noted that the skirt 7 is made long enough to extend below the lower end of the springs 18 and hence during the process of removing a relay the detachable terminal plate may be set down on a shelf of the relay housing without false electrical connection between the springs 18.

To seal the detachable terminal plate on the relay, the guide posts 9 may be drilled as indicated on Fig. 6, and a seal wire may be passed through the hole after the detachable plate is in place. Furthermore, the head 45 of the adjusting screw 37 may be made to fit a special socket wrench and drilled to receive a seal wire passing through a hole in the guide post and a hole in the head 45.

Although I have herein shown and described only one form of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination with an electrical operating unit having terminals for making connections with outside circuits, a detachable terminal plate including terminal posts one for each terminal of the operating unit and each post adapted to receive an outside connecting wire, an extending contact spring secured to each terminal post, means for mounting the plate on the operating unit in a position for causing the contact spring of each post to register with a corresponding terminal, a first and a second clamping plate constructed of insulating material and mounted on the detachable plate in a plane at right angles to the terminal posts and said plates provided with openings aligned for the contact springs to pass through, there being one opening for each spring, and manually operable means effective to move said clamping plates in opposite directions relative to each other for forcing the contact springs into engagement with the respective terminals.

2. In combination with an electrical operating unit having terminals for making connections with outside circuits, a detachable terminal plate having terminal posts mounted thereon for receiving the connecting wires of outside circuits, one terminal post for each terminal of the operating unit, an extending contact spring secured to each post on the side of said plate opposite the connecting wires, a first and a second clamping plate constructed of insulating material and placed one above the other and mounted on the detachable plate on the same side as the contact springs, said clamping plates provided with openings aligned for the contact springs to pass through, there being one opening for each spring, means for mounting the detachable plate on the operating unit with the contact spring of each post adjacent the corresponding terminal, and manually operable means effective to move at least one of said clamping plates for forcing the contact springs into engagement with the respective terminals.

3. In combination with an electrical operating unit having terminals for making connections with outside circuits, a detachable terminal plate having terminal posts mounted thereon for receiving the connecting wires of outside circuits, one terminal post for each terminal of the operating unit, an extending spring contact finger secured to each post on the side of said plate opposite the connecting wires, a clamping plate mounted adjacent the same side of the detachable plate as the contact fingers, said clamping plate constructed of insulating material and provided with openings, one opening for each contact finger to pass through, means for mounting the detachable plate on the operating unit with the contact finger of each post adjacent a corresponding terminal, and manually operable means effective to move the clamping plate for forcing the contact fingers into engagement with the respective terminals.

4. In combination with an electrical operating unit having terminals for making connections with outside circuits, a detachable terminal plate having terminal posts mounted thereon for receiving the connecting wires of outside circuits, one terminal post for each terminal of the operating unit, a plurality of extending spring contact fingers secured to each post on the side of said plate opposite the connecting wires, a clamping plate mounted adjacent the same side of the

detachable plate as the contact fingers, said clamping plate constructed of insulating material and provided with openings, one opening for the contact fingers of each post to pass through, means for mounting the detachable plate on the operating unit with the contact fingers of each post surrounding a corresponding terminal, and manually operable means effective to move the clamping plate for compressing the contact fingers of each of said posts into engagement with the respective terminals.

5. In combination with an electrical operating unit having terminals for making connections with outside circuits, a detachable terminal plate including terminal posts one for each terminal of the operating unit, means for fitting said detachable plate over the terminals of the operating unit in a predetermined position, means for connecting the conductors of the outside circuits with the terminal posts, a contact spring for each terminal post for engaging the corresponding terminal of the operating unit, a first and a second clamping plate mounted on the detachable terminal plate in a plane at right angles to the terminals of the operating unit and each clamping plate constructed of insulating material and provided with an opening aligned for a contact spring to pass through there being one opening for each spring, and means including a manually operated adjusting screw effective to move said clamping plates in opposite directions relative to each other for clamping the springs into engagement with the respective terminal of the operating unit.

6. In combination with an electrical operating unit having terminals for making connections with outside circuits, a detachable terminal plate including a top plate having terminal posts mounted therein for receiving the connecting wires of the outside circuits, one terminal post for each terminal of the operating unit, a contact spring for each terminal post secured to the post on the side of the top plate opposite the connecting wires and each spring equipped with two contact fingers, a first and a second clamping plate each constructed of insulating material and provided with an opening for each contact spring and a leg adjacent each end of each opening whereby said second plate inverted and placed on said first plate forms an opening for each spring with a leg of the second plate adjacent one contact finger of the spring and a leg of the first plate adjacent its other contact finger, means for mounting said clamping plates on said detachable plate with the contact fingers extending in said openings, means for positioning the detachable plate on the operating unit in a position for causing each contact spring to embrace a particular terminal of the operating unit, and manually operated means effective to move said clamping plates in opposite directions with respect to each other for compressing the contact fingers of each spring into engagement with the respective terminal of the operating unit.

7. In combination with an electrical operating unit having terminals for making connections with outside circuits, a detachable terminal plate including a top plate having terminal posts mounted therein for receiving the connecting wires of the outside circuits, one terminal post for each terminal of the operating unit, a contact spring for each terminal post secured to the post on the side of the top plate opposite the connecting wires and each spring equipped with two contact fingers, a first and a second clamping plate

each constructed of insulating material and provided with an opening for each contact spring and a leg adjacent each end of each opening whereby said second plate inverted and placed on said first plate forms an opening for each spring with a leg of the second plate adjacent one contact finger of the spring and a leg of the first plate adjacent its other contact finger, means for mounting said clamping plates on said detachable plate with the contact fingers extending in said openings, means for positioning the detachable plate on the operating unit in a position for causing each contact spring to embrace a particular terminal of the operating unit, and means including a manually operated adjusting screw effective when turned in one direction to move said clamping plates to compress the contact fingers of all the springs simultaneously into engagement with their respective terminals of the operating unit and effective when turned in the opposite direction to move said clamping plates to release the contact fingers of the springs simultaneously from engagement with said terminals.

8. In combination with an electrical operating unit having a terminal surface with terminal posts mounted therein for connection with outside circuits, a detachable terminal plate including a top member having terminal posts mounted therein one for each terminal post of the operating unit and a skirt member adapted to fit said terminal surface, a contact spring secured to each terminal post of the detachable plate and each consisting of two compressible contact members, a first and a second clamping plate each constructed of insulating material and provided with rectangular openings one for each contact spring and an extending bridge member adjacent each end of each opening, said clamping plates assembled with the second plate inverted on the first plate to form openings having a bridge member of the second plate adjacent one end and a bridge member of the first plate adjacent the other end, means for mounting the assembled clamping plates on the detachable plate with the contact members of each spring extending into a particular opening, means for mounting the detachable plate to said terminal surface in a predetermined position for causing the contact members of each spring to engage a particular terminal post of the operating unit, and manually operated means effective when moved in one direction to move said clamping plates to compress the contact members of said springs simultaneously into engagement with their respective terminal posts of the operating unit and when moved in the other direction to simultaneously release the contact members.

9. In combination with an electrical relay having terminal posts mounted in a fixed top plate, a detachable terminal plate provided with side walls to fit onto the relay top plate and having mounted therein terminal posts one for each terminal post of the relay, a contact spring secured to each terminal post of the detachable plate and each provided with two extending compressible contact members, means for registering the detachable plate in a predetermined position on the relay top plate for causing the contact members of each spring to engage a particular terminal post of the relay, clamping means mounted on the detachable plate and including two insulation plates assembled to form openings for receiving the contact members of the springs, one opening for each spring, said clamping plates effective to compress the contact members of the springs

when actuated in one direction relative to each other and to release the contact members when they are actuated in the reverse direction, and means including a manually operated adjusting screw for actuating said clamping plates.

10. In combination with an electrical operating unit having terminals for making connections with outside circuits and which terminals are arranged in rows for close assembly, a detachable terminal plate having terminal posts mounted therein for receiving the connecting wires of outside circuits, there being one terminal posts for each terminal of said unit and said posts being arranged in rows similar to said terminals, an extending spring contact finger secured to each post on the side of said plate opposite the connecting wires, a clamping plate slidably mounted on the detachable plate adjacent the side of said contact fingers, said clamping plate provided with openings, one opening for each finger and constructed to effectively insulate said fingers from each other, means for mounting the detachable plate thus assembled in a predetermined position on the operating unit with each contact finger adjacent a particular terminal, and manually operable means effective to move the clamping plate for causing the contact fingers to engage the respective terminals.

11. In combination with an electrical operating unit having a terminal surface with terminal posts mounted thereon for connection with outside circuits, a detachable terminal plate including a top member formed with recesses and holes to receive terminal posts and a skirt member formed to fit said terminal surface with the top member above the terminal posts of the unit, terminal posts mounted in said top member, one for each terminal post of said unit, an extending contact finger secured to each terminal post of the detachable plate, a clamping plate of insulating material provided with openings, one for each finger of the detachable plate, means for slidably mounting said clamping plate on the underside of said top member with each contact finger extending into a particular opening, means to mount the detachable plate thus assembled on the terminal surface in a predetermined position with each terminal post of the operating unit extending into a particular opening of the clamping plate, and an adjusting screw journaled in the skirt

member for operative engagement with said clamping plate and provided with a manually operable element outside of said skirt member whereby said clamping plate is moved for simultaneously engaging the contact fingers with the respective terminal posts of the operating unit.

12. In combination with an electrical operating unit having terminals for making connections with outside circuits, a detachable terminal plate, a plurality of contact springs grouped on said plate one for each terminal of the operating unit, said springs each formed with two extending contact fingers, means for securing an outside wire to each spring, a first and a second clamping plate each constructed of insulating material and provided with openings, there being one opening for each contact spring, said clamping plates mounted on the detachable plate with their openings aligned for the contact fingers to pass through, means for mounting the detachable plate thus assembled on the operating unit for causing the contact fingers of each spring to register with a corresponding terminal, and manually operable means effective to move said clamping plates in opposite directions relative to each other for causing the contact fingers of each spring to engage the respective terminal.

13. In combination with an electrical operating unit having terminals for making connections with outside circuits, a detachable terminal plate, a plurality of contact springs grouped on said plate, one for each terminal of the operating unit, said springs each formed with two extending contact fingers, means for securing an outside wire to each of said springs, a first and a second clamping plate each provided with openings, there being one opening for each contact spring, said plates assembled one above the other and mounted on the detachable plate with their openings aligned for the contact fingers to pass there-through and said plates constructed to effectively insulate the contact springs from each other, means for mounting the terminal plate thus assembled on the operating unit for causing the contact fingers of each spring to register with a corresponding terminal, and manually operable means effective to move said clamping plates relative to each other for causing the contact fingers of each spring to engage the respective terminal.

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