July 6, 1965 H. EGE 3,193,794

TERMINAL BLOCKS AND CONNECTORS THEREFOR

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Fig. 1.

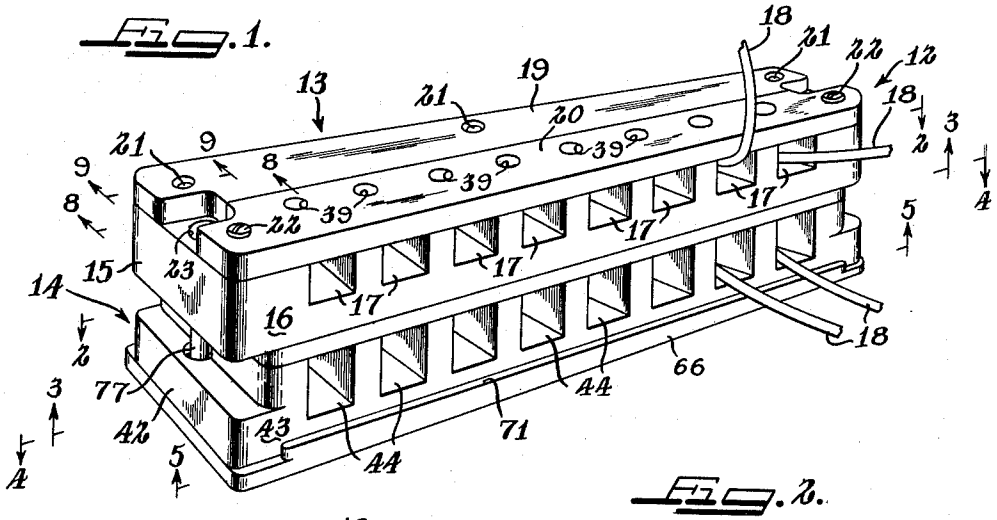
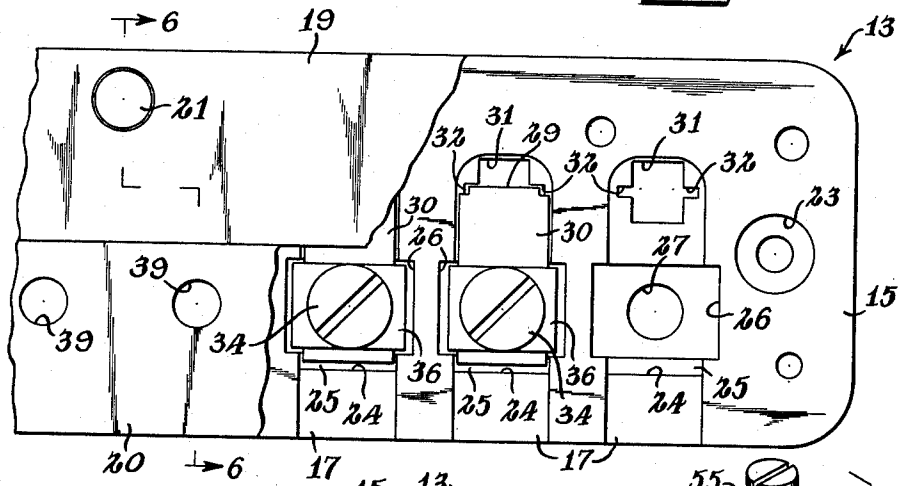


Fig. 2.



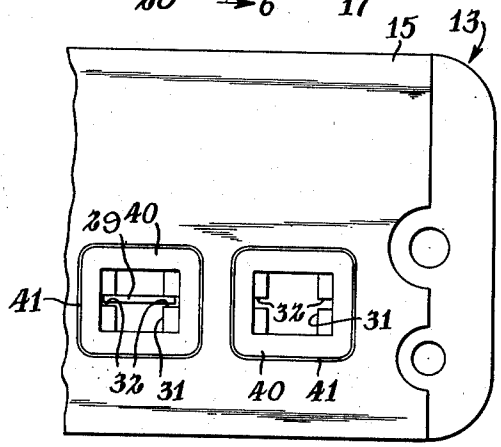


Fig. 3.

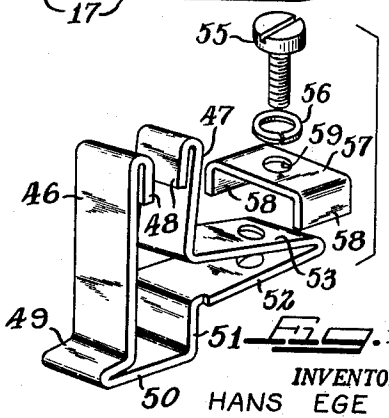


Fig. 11.

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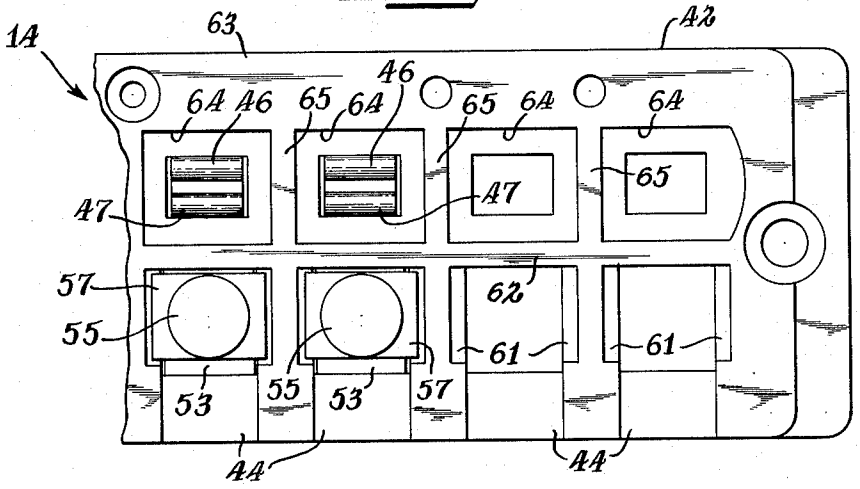
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TERMINAL BLOCKS AND CONNECTORS THEREFOR

Filed June 26, 1962 3 Sheets-Sheet 2

Fig. 4.



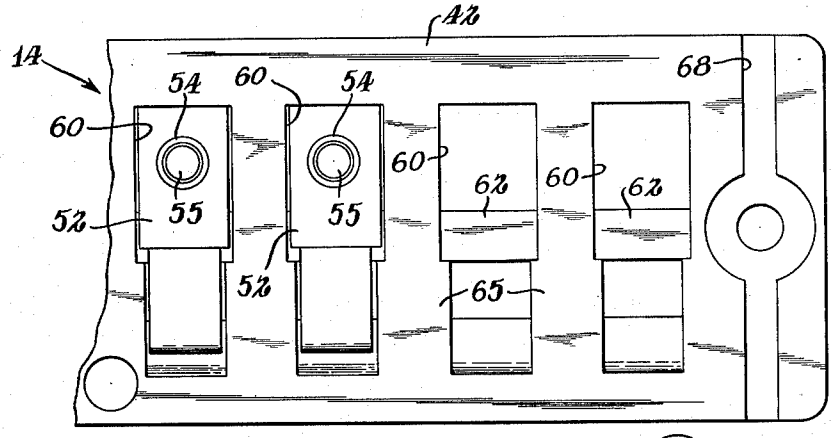


Fig. 5.

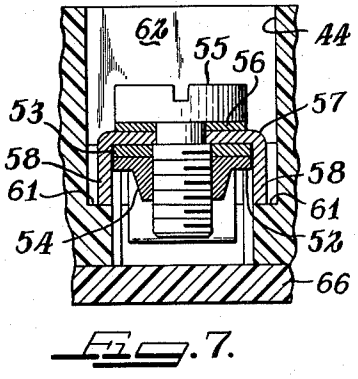


Fig. 7.

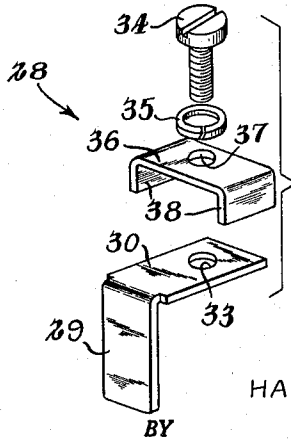


Fig. 10.

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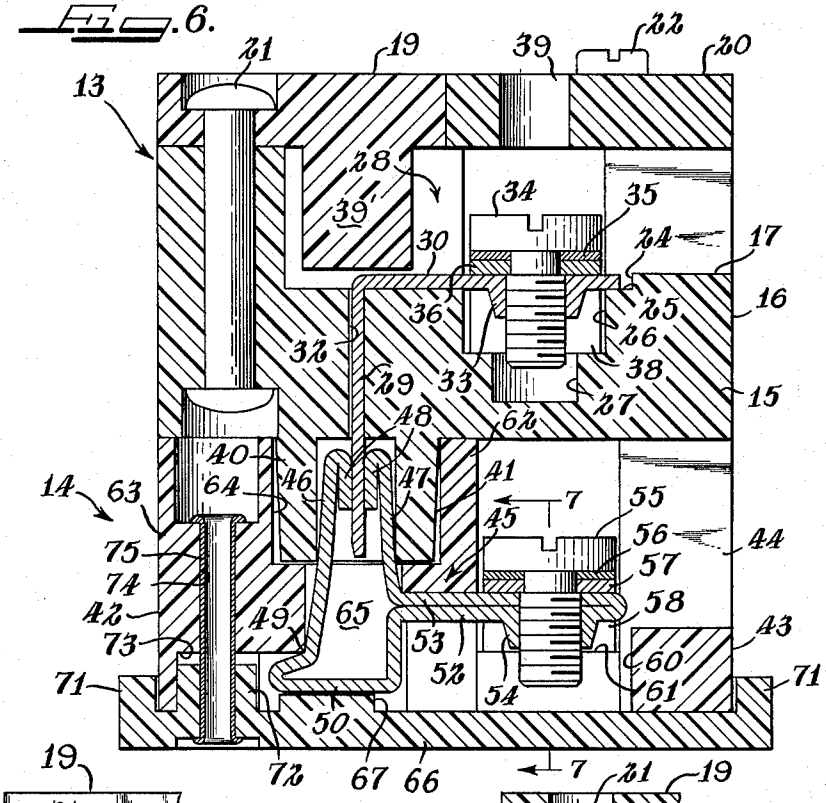
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TERMINAL BLOCKS AND CONNECTORS THEREFOR

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Fig. 6.



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3,193,794

TERMINAL BLOCKS AND CONNECTORS THEREFOR

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Filed June 26, 1962, Ser. No. 205,449
2 Claims. (Cl. 339—192)

This invention is directed to new and improved forms of terminal blocks of the disconnect-type, such blocks including cooperating block members having as a part thereof uniquely arranged and designed connectors.

Disconnect-type terminal blocks are being used more extensively primarily due to advantages gained during assembly and maintenance of electrical systems incorporating the same. Basically, the disconnect-type block includes separable block members which upon pressure application become frictionally engaged between cooperating connectors forming parts thereof to complete a plurality of circuits. Similarly, these circuits may be readily disconnected by merely disengaging one of the block members from the other without the necessity of interruption of continuity of individual circuits involving screw post and solder lead connections.

In the design of terminal blocks of the type described, consideration must be given to the provision of adequate electrical isolation of separate multiple circuits for at least the purpose of preventing or minimizing arcing during connection and disconnection of the block members. Additionally, ease of assembly of the individual block members including the component friction-tight connectors thereof is an important factor of particular concern with regard to fabrication and maintenance. Among other things, it is essential that the multiple frictional connector engagement between block members must be efficiently established and maintained during extended use of the terminal block.

It is an object of the present invention to provide a new and improved terminal block of the diconnect-type including uniquely designed and cooperating block members capable of providing electrical isolation and interconnection of a plurality of circuits under simultaneous connect and disconnect conditions of use.

A further object is to provide a new and improved terminal block composed of disconnect block members each including specially designed and mounted terminals or connectors providing for frictional and electrical connections between block members, the terminals or connectors being of unique design and arrangement within the block members permitting ready fabrication and assembly thereof as well as efficient maintenance during extended periods of use.

Still another object is to provide a new and improved terminal block incorporating therein a unique mounting arrangement for specially designed terminals capable of efficiently maintaining the same in readily assembled operative position, certain components of the block member providing for improved maintenance of the connectors throughout extended periods of operative use.

Another object is to provide a new and improved disconnect type terminal block and connector arrangement including cooperating elements which provide for controlled frictional and electrical interconnection between connectors, the connectors themselves being of unique design with the block members of the assembly including specially arranged parts cooperating with the connectors to maintain efficient functioning thereof.

Still a further object is to provide new and improved forms of connectors for use in terminal blocks, the connectors being readily fabricated and designed for ready installation in a terminal block.

Other objects not specifically set forth will become apparent from the following detailed description of the invention made in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective of a preferred form of terminal block of the present invention illustrating a pair of block members in connected relation;

FIG. 2 is an enlarged fragmentary top plan view of one of the block members as viewed generally along line 2—2 in FIG. 1;

FIG. 3 is an enlarged fragmentary bottom plan view of a portion of one of the block members as viewed generally along line 3—3 in FIG. 1;

FIG. 4 is an enlarged fragmentary plan view of still another portion of one of the block members taken generally along line 4—4 in FIG. 1;

FIG. 5 is an enlarged fragmentary bottom plan view of one of the block members taken generally along line 5—5 in FIG. 1;

FIG. 6 is a transverse sectional view of the terminal block of FIG. 1 taken generally along line 6—6 in FIG. 2;

FIG. 7 is a transverse sectional view of the terminal portion of one of the connectors of the terminal block taken generally along line 7—7 in FIG. 6;

FIG. 8 is an enlarged vertical section of an edge portion of the terminal block of FIG. 1 as viewed generally along line 8—8 therein;

FIG. 9 is a vertical section of another end portion of the terminal block of FIG. 1 as viewed generally along line 9—9 therein;

FIG. 10 is an exploded perspective of one form of connector used in the terminal block; and

FIG. 11 is an exploded perspective of another form of connector used in the terminal block.

The terminal block 12 of FIG. 1 comprises generally two block members 13 and 14, these members for convenience of description being referred to hereinafter as top and bottom block members respectively. The block members 13 and 14 are of the disconnect type being formed with aligned openings mounting inwardly acting blade and spring finger type connectors functioning to mechanically and electrically interconnect the circuits of the individual block members.

Referring first to the top block member 13, this member includes a body portion 15 preferably formed from molded plastic material and provided along one side face 16 thereof with a plurality of outwardly opening recesses 17 through which wire leads 18 are received for terminal connection therein. Top cover plate sections 19 and 20 close off the recesses 17 along the tops thereof and are suitably connected to the body portion 15 by rivets 21 and retractable fasteners, such as screws 22 respectively. Opposite ends of the combined cover plates 19 and 20 are provided with centrally located recessed portions which expose at opposite ends of the body portion 15 vertical bores 23 for a purpose to be described.

Referring particularly to FIGS. 2 and 6, each recess 17 extends inwardly from the side face 16 of the body portion 15 with the bottom surface of the recess first including an inwardly positioned shoulder 24 defining a transverse support ledge 25 extending inwardly and terminating in a bottom rectangular chamber 26 having a central bore 27 in the bottom surface thereof.

FIGS. 2, 6 and 10 best illustrate one form of connector 28 mounted in the block member 13 in each of the recesses 17 thereof. This connector includes a depending flat tab portion 29 integrally formed with a right angle flat base portion 30 which at its free end defines a terminal portion placed in resting engagement on the ledge 25 and the remaining inner surface portion of the recess

17 as shown in FIG. 6. The tab portion 29 projects downwardly through a rectangular opening 31 (FIG. 2) formed in the body portion 15 and provided with a pair of laterally extending slots 32 which confine the opposite marginal portions of the tab 29 therein.

The terminal end portion of the base portion 30 of the connector 28 is formed with an internally threaded collar portion 33 receiving therethrough the threaded shank of a screw-type terminal fastener 34 having an upwardly exposed slotted head portion. A lock washer 35 is received about the shank of the fastener in engagement with the top surface of a terminal plate 36 which is formed with a flat central portion having an aperture 37 through which the fastener extends and opposite side margin depending flanges 38. The side flanges 38 along the bottom edges thereof abut the base of the recessed area 26 when the fastener 34 is advanced tightly through the base portion 30 of the connector to electrically connect a conventional lead 18 thereto. The depending flanges 38 being received in the chamber 26 provide a means for positive positioning and seating of the connector 28 in its recess 17. This positive seating and positioning is further completed by the provision of the cover plate sections 19 and 20.

As best shown in FIG. 6, the cover plate section 19 includes along the inner surface thereof a plurality of depending bosses 39' which project downwardly into the recess 17 into bottom surface close association with the area of the base portion 30 of the connector 28 adjacent the integral connection thereof with the depending tab 29. The cover plate section 19 is formed with a boss 39' for each recess 17 and connector 28 received therein. The boss may be dimensioned to actually engage the adjacent portion of the connector 28 if desired. The boss 39' prevents withdrawal of the tab from its operative position in the slots 32. These slots prevent transverse displacement of the connector 28 as best illustrated in FIG. 6. The engagement of the depending flanges 38 of the terminal plate 36 with the base of the chamber 26 provides for stable mounting of the connector in its operative position in the block 13.

The base portion 30 of the connector 28 as best shown in FIGS. 2 and 10 is wider than the depending tab 29 thus providing marginal portions which overlap the top surfaces surrounding the rectangular opening 31 in the body portion 15. This feature also aids in stabilizing the fixed positioning of the connector 28 in the block 13 during operative use thereof.

The cover plate section 20 as best shown in FIGS. 1, 2 and 6 is formed with a plurality of spaced openings 39 therealong which are positioned over the slotted heads of the terminal fasteners 34 to permit ready access thereto for tool operation thereof without the necessity of removing the cover plate section 20. However, if cover plate section removal is desirable, the screw fasteners 22 are readily retractable for this purpose while the remaining cover plate section 19 is permanently connected to the body portion 15 to prevent inadvertent displacement of the connectors therefrom.

The bottom surface of the body portion 15 of the terminal block 13 is formed with a plurality of longitudinally spaced, downwardly projecting sleeve-like members 40 as best illustrated in FIGS. 3 and 6. The bottom end portions of the tabs 29 of the connector 28 project downwardly and centrally into the sleeve members 40 and are completely enclosed thereby except at the very bottom ends of the tabs. Preferably, each tab 29 will not project outwardly beyond the bottom edge of its sleeve member 40 as shown in FIG. 6. The outer surface of each sleeve member 40 is preferably provided with a continuous peripheral taper 41 for a purpose to be described. Each sleeve member 40 is vertically aligned with an opening 31 including the slots 32 with these slots being arranged to place the tab 29 centrally in the sleeve member 40.

Details of the structural features of the bottom block member 14 are illustrated in FIGS. 1 and 4–7. This block member includes a body portion 42 which along one side surface 43 thereof is formed with a plurality of longitudinally spaced, inwardly directed openings or recesses 44 closed at the top by the engaging bottom surface of the block member 13. Wire leads 18 extend into the recesses 44 for connection to terminal portions of connectors 45 mounted in the block 14 and best illustrated in FIGS. 6 and 11. Each connector 45 includes a pair of upstanding spring fingers 46 and 47 formed from resilient metallic material and at the top free ends thereof including reversely bent tab engaging portions 48. The connector 45 is formed from a single strip of resilient and conductive material with certain portions of the strip being reversely folded to provide the various elements of the connector. The spring finger 46 extends vertically downwardly and at the base thereof has integrally formed therewith an outwardly projecting downwardly inclined portion 49 which is reversely bent on itself to define a flat base portion 50 extending rearwardly away from the spring finger 46. The base portion 50 includes a vertically directed intermediate portion 51 joining a further flat terminal portion 52 of rather substantial length. The furthermost end of the terminal portion 52 is reversely folded on itself to define a flat base portion 53 which is integrally joined with the bottom margin of the other vertically extending spring finger 47.

The inclined base portion 49 and cooperating flat base portion 50 form therebetween an outwardly projecting foot-like detent. The terminal portion 52 including the base portion 53 includes aligned apertures and an internally threaded depending collar 54 through which a terminal screw-type fastener 55 is threadedly received. The fastener 55 includes an enlarged slotted head which upon disconnection of the block members 13 and 14 is readily accessible through the top open portion of its respective recess 44 for tool application and the connection or disconnection of a lead 18 thereto. The connector 45 further includes a lock washer 56 adapted to be received on the fastener 55 and a terminal plate 57 of the same design as the terminal plate 36 previously described and including opposite marginal depending side flanges 58. A central aperture 59 is formed in the terminal plate 57 to receive the fastener 55 therethrough.

Referring particularly to FIGS. 4, 5 and 6, the body portion 42 of the block member 14 inwardly of the side face 43 thereof is formed with slot-like openings 60 extending transversely across the bottom surface thereof. Opposite sides of each opening 60 include raised oppositely positioned shoulders 61 which receive thereon in abutment therewith the bottom edges of the side flanges 58 of the terminal plate 57 of the connector 45. A generally L-shaped longitudinally extending dividing wall 62 extends transversely of the openings 60 and projects upwardly into alignment with the top lattice-type surface of the body portion 42. A continuous longitudinal side wall portion 63 defines with the dividing longitudinal wall portion 62 a plurality of top surface recesses 64 arranged to receive therein the depending sleeve members 40 of the top block member 13. These recesses 64 are further longitudinally separated by transverse wall sections 65.

Each connector 45 is mounted in a recess 44 with the depending side flanges 58 of the terminal plate 57 thereof in engagement with the ledge-like shoulders 61 as previously described. The top surface of the flat base portion 53 is in confined engagement with the bottom flat surface of the L-shaped wall portion 62. The foot-like detent defined by the cooperating portions 49 and 50 is engaged with the bottom corner portion of the longitudinal side wall 63, this engagement cooperating with the engagement between the wall portion 62 and the base portion 53 to prevent upward displacement of the connector from the block member 14. The detent 49 in engagement with the side wall portion 63 and the engage-

ment of the side flanges 58 of the terminal plate 57 with the shoulder 61 also cooperate to prevent rocking of the connector 45 in its mounted position in the block member 14. Furthermore, the engagement between the side flanges 58 of the terminal plate 57 and the shoulder 61 prevent displacement of the connector 45 downwardly out of the body portion 42 of the block member 14. This engagement is best illustrated in FIG. 7.

The spring fingers 46 and 47 project upwardly between the wall portions 62, 63 and 65 into the recess 64 defined therebetween. The block member 14 includes a bottom cover plate 66 which during assembly of the connectors 45 in the block member is removed thus providing complete access through the bottom surface of the body portion 42 to place the connectors 45 in their operative positions. This is brought about by withdrawal of the fastener 55 from each terminal portion of the connector and removal of the terminal plate 57 therefrom. The remainder of the connector is then placed in operative position and the terminal plate 57 is advanced downwardly about the combined base portions 52 and 53 of the connector and the fastener 55 is advanced through the aligned threaded openings. Upon adequate advancement of the fastener 55, the side flanges 58 of the terminal plate 57 will abut the shoulders 61 and will result in drawing up the remainder of the connector into mounted engagement with the various wall portions of the block member 14. The bottom cover plate 66 is then permanently applied to complete the assembly.

As shown in FIG. 11, the single strip connector 45 prior to installation in the bottom block member 14 is in a "sprung" condition. Preferably, the spring finger 47 and its base portion 53 is sprung upwardly out of parallel relation with the base portion 52. When the connector is mounted in the bottom block member 14 in the manner previously described, the advancing of the fastener 55 and engagement between the terminal plate 57 and the shoulders 61 results in a tensioning of the base portion 53 and its spring finger 47 downwardly into operative position placing its reversely folding contact end 48 in tight engagement with the opposed contact end of the spring finger 46. In this manner the spring fingers are pre-tensioned in their mounted condition and the connector 45 is adapted for extended efficient use.

Referring particularly to FIG. 6, it will be noted that when the block members 13 and 14 are combined, the depending sleeve-like members 40 of the top block member 15 are received in the corresponding recesses 64 of the bottom block member 14. The outer surface taper 41 of each sleeve member permits ready alignment and insertion of the sleeve member into its respective recess 64. The interior of the sleeve member 40 is of sufficient dimensions to readily receive therein the spring fingers 46 and 47 of a connector 45. These spring fingers are introduced into the bottom end of the sleeve member 40 and the adjacent inner end edges of the sleeve member engage the outer surfaces of the spring fingers. This occurs virtually simultaneously with the engagement of the end of the tab 29 with the rounded top edges of the spring fingers 46 and 47. Upon continued application of force causing the block members 13 and 14 to combine with one another, the spring fingers 46 and 47 are advanced into the interior of the aligned sleeve member 40 and the tab 29 is advanced between the reversely folded flat contact ends 48 of the spring fingers. During continued advancement the opposite edge portions of the sleeve member 40 slide downwardly in tight engagement along the outer divergently inclined surfaces of the spring fingers 46 and 47 toward the base portions thereof and in doing so actually cam the spring fingers into the slightly reversely bowed position generally illustrated in FIG. 6. The spring fingers 46 and 47 are preferably upwardly convergently inclined so as to provide outer angled surfaces which are cammed by the contacting opposite end edges of the sleeve member 40. This camming action results in the spring fingers 46 and 47 being "squeezed" together thus providing a tight clamping action against opposite surfaces of the tab 29. This tight clamping action also results in efficient wiping of the opposite surfaces of the tab 29 to establish an efficient electrical contact.

The bottom cover plate 66 is formed with a plurality of longitudinally spaced, upwardly projecting bosses 67 which are located directly below the flat base portion 50 of each connector 45 as shown in FIG. 6. Preferably, the bosses 67 are sufficiently close to the base portions 50 or are in actual engagement therewith to resist any downward movement of the connectors 45 during forced interconnection between the block members 13 and 14.

FIGS. 5, 8 and 9 illustrated the provision of a transverse groove 68 in the bottom surface of the body portion 42 just inwardly of the opposite ends thereof. This transverse groove is centrally enlarged with a circular portion through which a hollow rivet 69 (FIG. 8) extends. Opposite ends of the bottom cover plate 66 are formed with transverse upstanding ribs 70 which are received in the opposite end grooves 68, each rib 70 also centrally thereof being formed with an enlarged upstanding circular boss portion through which the hollow rivet 69 is received. The cooperating grooves 68 and ribs 70 provide a transverse end seal between the cover plate 66 and the body portion 42 to prevent the ingress of dust or other foreign material which might interfere with the electrical connections of the terminal block. A longitudinal side edge seal is provided by a pair of side margin upstanding ribs 71 (FIGS. 1 and 6) carried by the cover plate 66 and vertically overlapping the opposite bottom side margins of the body portion 42 of the bottom block member 14. FIG. 6 illustrates the bottom cover plate 66 as further being provided with at least one additional raised boss 72 located centrally thereof along a side margin and which is received in a recess 73 formed in the bottom surface of the wall portion 63 of the bottom block member 14 and in communication with a vertically directed bore 74. A hollow rivet 75 or other suitable fastening means provides a tight interconnection between the bottom cover plate 66 and the body portion 42.

As shown in FIG. 8, the openings 23 in the opposite ends of the top block member 13 and the hollow rivets 69 in the opposite ends of the bottom block member 14 may be used advantageously in attaching the fully assembled terminal block 12 to a supporting surface 76. Any suitable fastener 77 of sufficient length may be advanced through the aligned openings in the combined block members 13 and 14 and used in attaching the terminal block 12 in its operative position on the mounting surface 76. For disconnect purposes, the fastener 77 may be readily removed and the block members separated.

The engaging portions of the connectors 28 and 45 are, in effect, mounted in recessed relation in their respective block members thus providing for complete confinement from adjacent cooperating connectors to prevent arcing during interconnection of a plurality of circuits. The "hot" portions of the connectors and leads of the block members are separated by wall sections which function to completely insulate the circuit connections. However, the terminal portions of the connectors are readily available without disassembly of the individual block members for connection or disconnection of the leads 18. The connectors 28 and 45 are readily mounted in their respective block members in fixed operative position without the necessity of relying on permanent connections. The manner in which the connectors are mounted also permits ready disassembly of the same from a block member for maintenance or conversion purposes.

Obviously certain modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore

only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A terminal block comprising at least one connector formed with a pair of upstanding spring fingers having reversely folded free ends in engagement with one another and being divergently downwardly inclined, one of said fingers including a base portion extending as a flat strip and being reversely folded on itself to define a terminal portion, the reversely folded portion extending toward said one finger and formed integral with said other finger as the base portion thereof, a terminal plate having depending side flanges mounted on said base portion adjacent the reverse folding thereof, a retractable fastener connecting said plate to said base portion and providing means for releasable lead connection thereto, said block including a first recess communicating with a surface thereof and in which said spring fingers are received, said base portion extending to one side of said recess and in confined engagement with the material of said block to prevent movement of said fingers toward said surface, said terminal portion being received in a separate recess communicating with another surface of said block, said separate recess including shoulder means with which the bottom edges of the side flanges of said plate are in engagement, said shoulder means being so located that said terminal portion resists movement of said fingers in the opposite direction from said first-named recess.

2. A terminal block comprising at least one connector formed with a pair of upstanding spring fingers having reversely folded free ends in engagement with one another and being divergently downwardly inclined, one of said fingers including a base portion which projects outwardly from said finger at approximately right angles thereto to form a foot-like detent, said base portion extending as a flat strip inwardly from said detent and being reversely folded on itself to define a terminal portion, the reversely folded portion extending toward said one finger and formed integral with said other finger as the base portion thereof, a terminal plate having depending side flanges mounted on said base portion adjacent the reverse folding thereof, a retractable fastener connecting said plate to said base portion and providing means for releasable lead connection thereto, said block including a first recess communicating with a surface thereof and in which said spring fingers are received, said detent and base portion extending to opposite sides of said recess and in confined engagement with the material of said block to prevent movement of said fingers toward said surface, said terminal portion being received in a separate recess communicating with another surface of said block, said separate recess including shoulder means with which the bottom edges of the side flanges of said plate are in engagement, said shoulder means being so located that said terminal portion resists movement of said fingers in the opposite direction from said first-named recess.

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