

Dec. 20, 1960

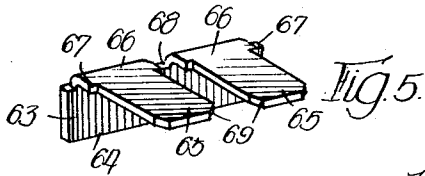
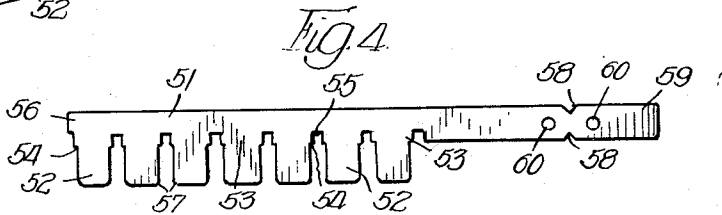
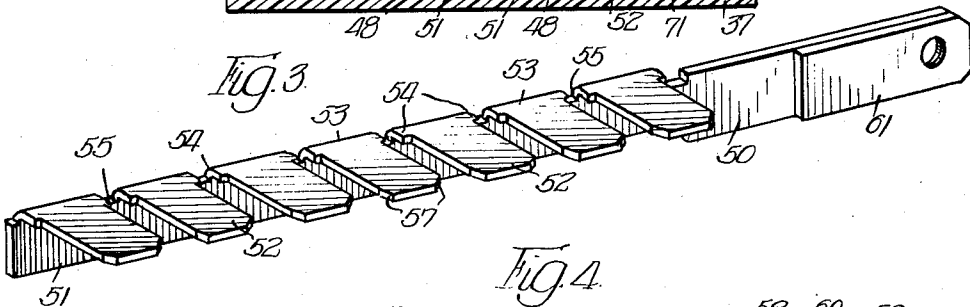
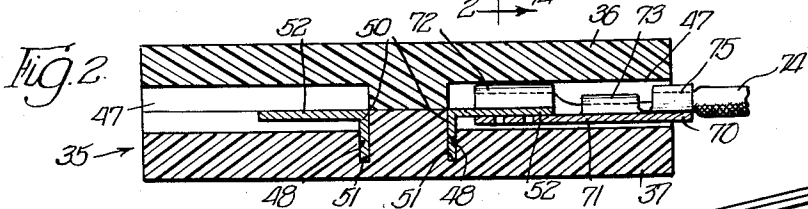
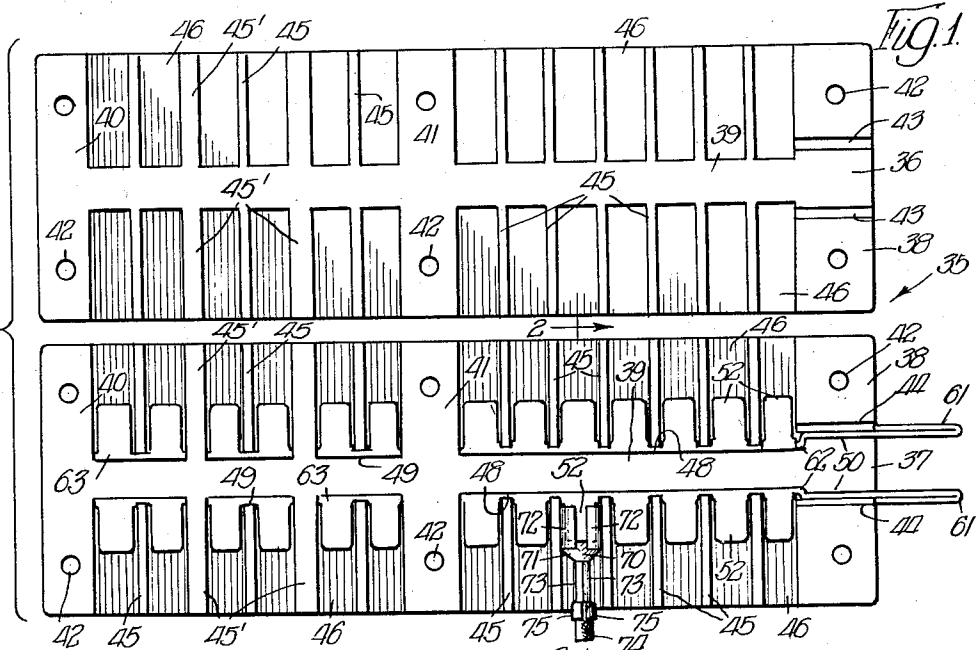
R. L. LINN

2,965,872

TERMINAL CONNECTOR BLOCK WITH PLURAL CONDUCTOR TABS

Filed June 7, 1955

4 Sheets-Sheet 1



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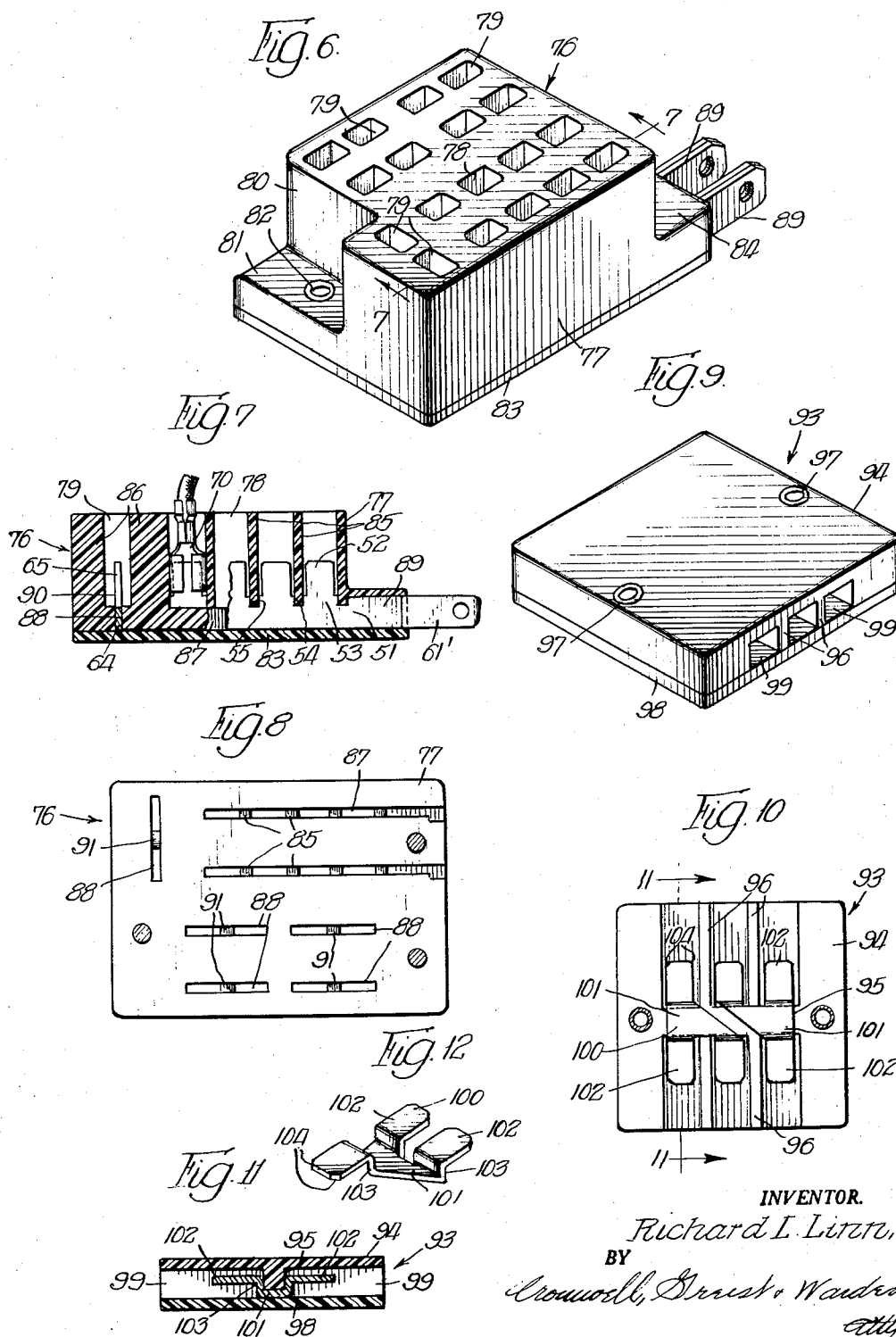
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TERMINAL CONNECTOR BLOCK WITH PLURAL CONDUCTOR TABS

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4 Sheets-Sheet 2



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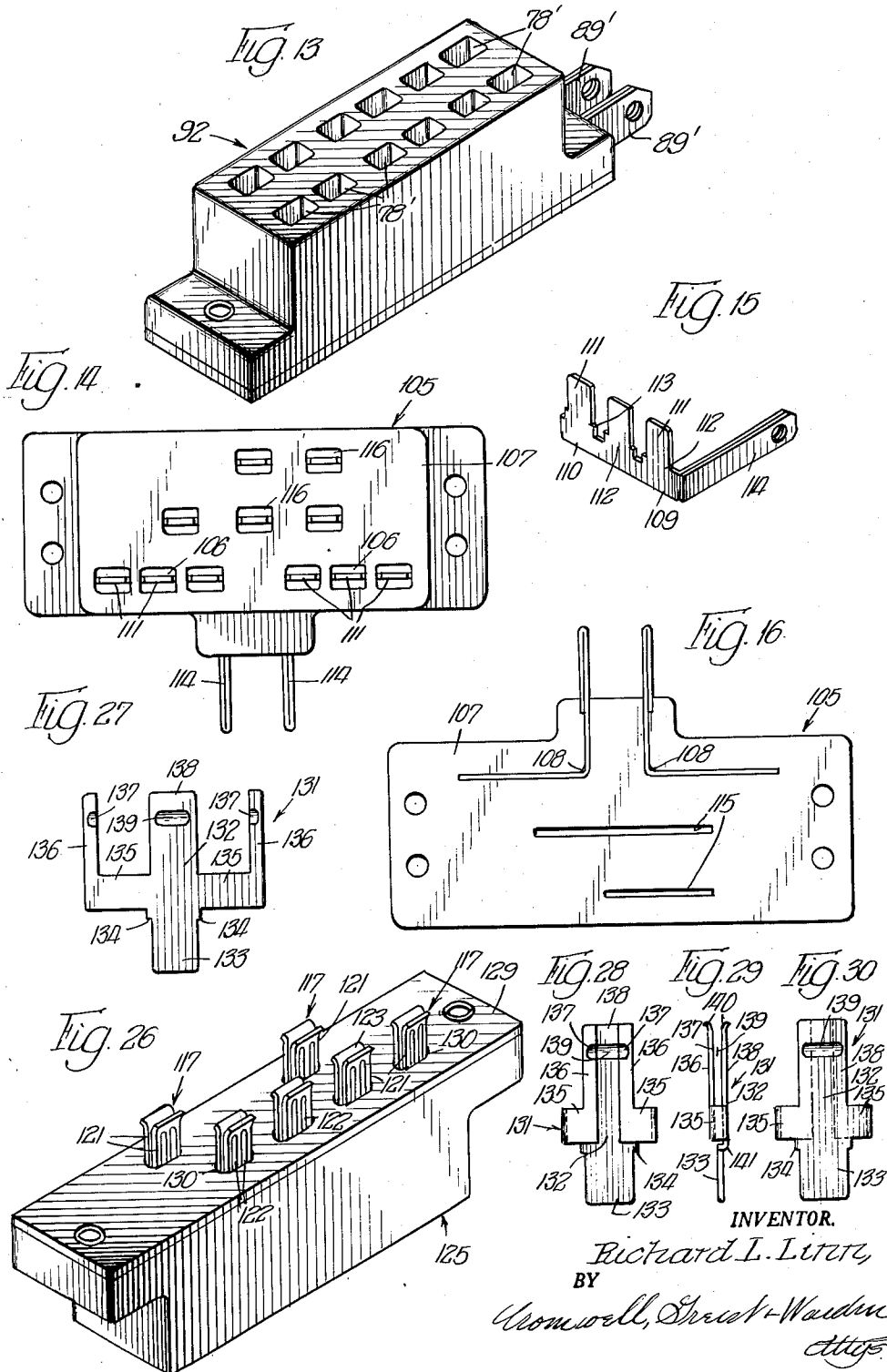
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TERMINAL CONNECTOR BLOCK WITH PLURAL CONDUCTOR TABS

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Dec. 20, 1960

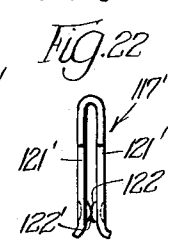
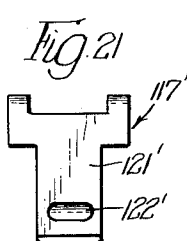
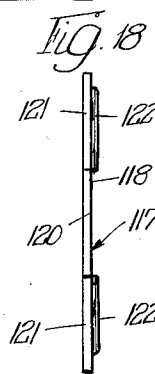
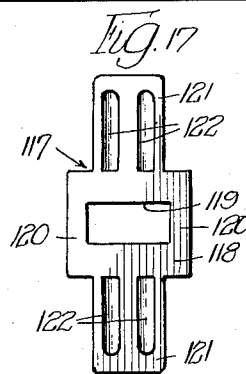
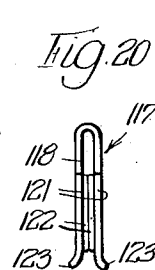
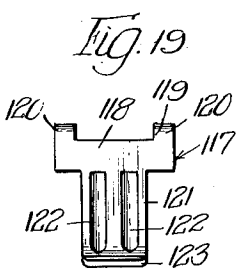
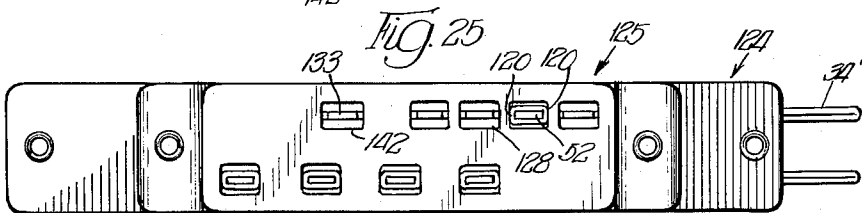
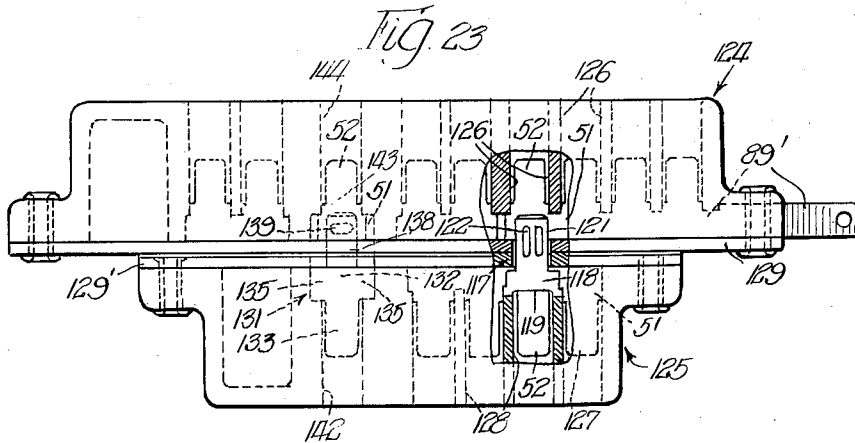
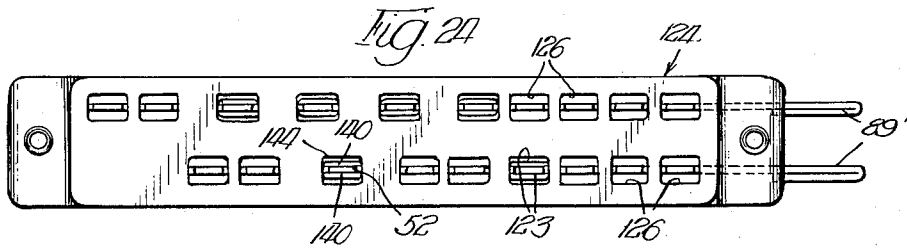
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TERMINAL CONNECTOR BLOCK WITH PLURAL CONDUCTOR TABS

Filed June 7, 1955

4 Sheets-Sheet 4



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2,965,872

TERMINAL CONNECTOR BLOCK WITH PLURAL CONDUCTOR TABS

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12 Claims. (Cl. 339—159)

The present invention relates generally to terminal blocks adapted for use in electrical circuits and systems. More specifically the present invention is directed toward the provision of improved types of terminal blocks utilizing new and improved electrical conducting means which include block attaching means, the blocks and incorporated electrical conducting means being adapted for inexpensive fabrication, highly efficient use, ready modification to meet changing requirements and requiring little if no maintenance.

Many of the modern household appliances have incorporated therein different types of electrically operated devices. For example the modern gas or electric range not only includes the use of heating elements but also electrically operated timers, thermostats, electrical outlets, lights, etc. These various devices are often capable of independent operation and as a result there are a number of independent electrical systems incorporated in the overall design of the range. In the assembling of such devices it is desirable to have a central point at which the individual systems are connected to the main source of energy. This central point is not only desirable from the standpoint of assembling the range during the manufacture thereof but also is desirable with respect to home installation and maintenance.

Different types of terminal blocks have been designed for the purpose of detachably receiving the various electrical circuit leads in devices such as the cooking range but it has been found that difficulties are present in the use of existing terminal blocks due to various reasons. For example, some of the rather simply constructed terminal blocks are not capable of permanently maintaining proper contact between the various lead connectors. Those blocks which utilize a spring action type of clamping means for engaging the insertable lead connectors often lose their inherent resiliency over protracted periods of use. Furthermore, this type of connection has been often found undesirable due to the presence of irregularities in tension supplied to the spring-like clamping members. It is difficult to uniformly provide each clamping member with the required degree of resiliency necessary to provide the block with a useful life equivalent to that of the particular devices incorporated in the range. The failure of even one of the spring-like clamping members to retain the electrical lead connector firmly within the block causes maintenance problems which often require the skill of a repairman in correcting. Furthermore, the known types of terminal blocks are often by necessity complicated in construction as a result of efforts being made to overcome the inherent disadvantages such as the aforementioned.

It is therefore an object of the present invention to provide new and improved terminal blocks which are of simple design and construction and which make use of new and improved electrical conducting means capable of permanently maintaining proper electrical contact.

A further object is to provide a readily constructed terminal block which is adapted for quick and efficient

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modification to meet changing electrical requirements in devices which utilize a plurality of independent electrical systems.

Still a further object is the provision of terminal blocks which include the use of insulating block housings of simple design which can be readily formed from moldable material such as plastic and the like and which contain removable electrical conducting means in the form of readily fabricated metallic strips which in turn are further adapted to removably receive lead connecting means and permanently maintain highly efficient electrical contact therebetween thereby alleviating the problem of loose connections.

Another object is the provision of a substantially flat electrical conducting means formed from relatively non-resilient material which is adapted for ready insertion and removal in a terminal block housing and which has integrally formed therewith tabs adapted for securely receiving lead connectors and which further is adapted to have integrally formed therewith a male plug member.

An additional object is to provide electrical conducting means in the form of strip elements which are readily adapted for formation into various configurations to meet varying requirements in the size and shape of their associated insulating block housings.

Still another object is to provide terminal blocks adapted for interconnection by use of an electrical conductor of resilient strip metal which can be readily attached to the improved electrical conducting means of the present invention incorporated in the interconnected terminal blocks.

Another object taken in conjunction with the last mentioned is to provide various forms of electrical conductors of resilient strip metal adapted for use in the terminal blocks of the present invention for interconnecting the same in a detachable manner, one form of the conductors being of the type to be removably received by any of the electrical conducting means incorporated in the terminal blocks, while the other form of the electrical conductors is an integral combination of an improved electrical conducting means with a disconnect tab arrangement which is adapted for frictional engagement with an electrical conducting means of a separate terminal block.

Other objects not specifically set forth will become apparent from the following detailed description.

The present invention contemplates the provision of various forms of terminal blocks which include a plurality of inwardly extending, laterally spaced recessed portions. These blocks have incorporated therein an electrical conducting means which includes a connecting strip having at least one tab extending laterally thereof into one of the recessed portions. The strip and the tab are of substantially flat cross section and the tab is adapted to receive a lead connector thereabout and removably retain the connector indefinitely.

The terminal blocks of the present invention are further adapted to be removably interconnected by use of a specially designed electrical conductor which is formed from a strip of resilient U-shaped material having an opening in the arcuate portion thereof to receive a tab of the aforementioned electrical conducting means of a first block. The legs of the U-shaped connector are provided with ribs or flutes to receive therebetween a strip element of the type above described which is carried by a second terminal block. By use of such an electrical connector the terminal blocks may be removably electrically connected in a back-to-back manner.

In addition to the U-shaped electrical conductor for use in removably interconnecting a plurality of terminal blocks, the present invention also includes the provision of a modified form of integrally combined electrical conducting means and block interconnecting means. This

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form of electrical conductor consists of a tab element of the type previously described integrally formed with an oppositely directed connector which comprises a plurality of resilient legs adapted for frictionally gripping a separate electrical conducting means in the same manner as described in connection with the resilient U-shaped electrical conductor. This additional form of block connecting means generally comprises an elongated strip forming at one end thereof a tab and at the other end thereof a leg having an indented fluted portion thereon, the strip containing laterally extending shoulders intermediate the ends thereof which are folded upon themselves in a U-shaped manner and which support laterally of the ends thereof strips or leg segments which in turn cooperate with the aforementioned leg to provide therebetween a resiliently closed gap to frictionally receive another electrical conducting means.

In the drawings:

Fig. 1 is a plan view of a parallel terminal block shown immediately prior to the final step in the assembling thereof and illustrates the inner surfaces of the block members which are unattached and shown in a side-by-side relationship;

Fig. 2 is a sectional view of the parallel block of Fig. 1 in assembled condition along the line 2—2 in Fig. 1;

Fig. 3 is an enlarged perspective view of one of the electrical conducting means utilized in the parallel block of Fig. 1;

Fig. 4 is an elevation of a blank of one of the forms of electrical conducting means forming a part of the present invention;

Fig. 5 is an enlarged perspective view of a further modification of electrical conducting means;

Fig. 6 is a perspective view of a vertical terminal block illustrating a modification of the present invention;

Fig. 7 is a vertical sectional view of the block of Fig. 6 along line 7—7 in Fig. 6;

Fig. 8 is a bottom plan view of the block of Fig. 6 with the backing and electrical conducting means removed;

Fig. 9 is a perspective view of a modified form of parallel terminal block;

Fig. 10 is a plan view of the modified parallel block of Fig. 9 looking upwardly from the bottom thereof and with the backing member removed;

Fig. 11 is a sectional view of the terminal block of Fig. 10 along line 11—11 therein;

Fig. 12 is a perspective view of a modified form of electrical conducting means which is utilized in the terminal block of Fig. 9;

Fig. 13 is a perspective view of a modified form of vertical terminal block;

Fig. 14 is a top plan view of another modified form of vertical terminal block;

Fig. 15 is a perspective view of one form of electrical conducting means used in the vertical terminal block of Fig. 14;

Fig. 16 is a bottom plan view of the vertical terminal block of Fig. 14 with the backing removed and with two of the elements of the type shown in Fig. 15 in their operative position;

Fig. 17 is a plan view of the blank of one form of an electrical terminal block connecting means;

Fig. 18 is a side elevation of the blank of Fig. 17;

Fig. 19 is an elevation of the electrical terminal block connecting means as formed from the blank shown in Fig. 17;

Fig. 20 is a side elevation of the electrical terminal block connecting means of Fig. 19;

Fig. 21 is an elevation of a slightly modified form of electrical terminal block connecting means shown in Fig. 19;

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Fig. 22 is a side elevation of the modified electrical terminal block connecting means of Fig. 21;

Fig. 23 is a side elevation of two forms of vertical terminal blocks connected with one another by use of a plurality of electrical terminal block connecting means, a portion of each block being broken away to illustrate certain of the connecting means and internal components of the two blocks in full lines;

Fig. 24 is a top plan view of the connected terminal blocks of Fig. 23;

Fig. 25 is a bottom plan view of the connected terminal blocks of Fig. 23;

Fig. 26 is a perspective view of the bottom vertical terminal block of Fig. 23, this block being disconnected from the upper terminal block of Fig. 23;

Fig. 27 is a plan view of the blank of a modified form of an electrical terminal block connecting means;

Fig. 28 is an elevation of the modified electrical terminal block connecting means as formed from the blank shown in Fig. 27;

Fig. 29 is a side elevation of the electrical terminal block connecting means of Fig. 28; and

Fig. 30 is an elevation of the reverse face of the electrical terminal block connecting means shown in Fig. 28.

In Fig. 1 an open parallel terminal block 35 is shown having block members 36 and 37 in side-by-side relation with their inner surfaces facing upwardly to better illustrate the internal construction of the block. Each of the block members 36 and 37 has raised end portions 38, longitudinally extending raised central portions 39, raised end portions 40 and laterally extending raised central portions 41. The raised portions 38—41 are intended to be placed in abutting relation upon the assembling of the block members 36 and 37 by moving the top surfaces shown in Fig. 1 into engagement. The block members 36 and 37 contain bores 42 along the raised end portions 38 and 40 which become aligned upon the assembly thereof to provide openings for the insertion of rivets to fixedly secure the block members 36 and 37 in abutting engagement. Block member 36 contains two grooves or slots 43 which extend laterally across the raised end portion 38 and which are adapted for alignment with laterally extending grooves or slots 44 in the raised end portion 38 of block member 37. Each of the block members 36 and 37 are provided with laterally extending upstanding ridges 45 which may be of varying width, as indicated at 45' and which define therebetween grooves 46. The grooves 46 of the block members 36 and 37 are adapted for alignment upon the positioning of the block members 36 and 37 in abutting relation to thereby form inwardly extending, laterally spaced recessed portions 47 (see Fig. 2) on the two side surfaces of the parallel terminal block 35. Block member 37 is further provided with vertical grooves or slots 48 and 49 which are positioned at the inward ends of the grooves 46. The vertical grooves 48 extend longitudinally between end portion 38 and central portion 41 and are adapted to receive electrical conducting means 50 as shown in Figs. 1 and 2.

The electrical conducting means 50, more clearly illustrated in Fig. 3, consists of a connecting strip 51 which has integrally attached thereto a plurality of laterally extending tabs 52. Each of the tabs 52 includes a base section 53 which, as shown in Fig. 3, is of an arcuate shape resulting from the tabs 52 being bent with relation to the connecting strip 51. The bending of the tabs 52 in this respect is carried out to prepare the electrical conducting means 50 for use in conjunction with the parallel terminal block 35 shown in Fig. 1. Each of the base sections 53 extend laterally of their associated tab 52 to provide shoulders 54 thereto. The shoulders 54 of each adjoining tab 52 are spaced from one another thereby providing an exposed top surface portion 55 of the connecting strip 51 resulting in a predetermined spacing of each tab 52 and its associated base section 53.

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During the assembling of the parallel terminal block 35 the connecting strip 51 of each electrical conducting means 50 is inserted in one of the slots 48 in such a manner as to position the tabs 52 so that they are directed outwardly from the raised portion 39 of the block member 37 intermediate the ridges 45. As shown in Fig. 2, the tabs 52 are held out of contact with the surfaces of the recessed portions 47.

The electrical conducting means 50 shown in Fig. 3 is particularly adapted for use in the parallel terminal block 35 of Figs. 1 and 2 but is formed from a blank 56 similar to that shown in Fig. 4. Referring to the blank 56 in Fig. 4 the tabs 52 are shown as having beveled corners 57 and the connecting strip 51 extends well beyond one of the endmost tabs 52. The extension of the connecting strip 51 contains notches 58 near the end thereof and an end portion 59 which is adapted to be folded inwardly against the surface of the connecting strip 51 as shown in Fig. 3. Drilled holes 60 are suitably positioned in the extension of the connecting strip 51 and these holes in combination with the doubled end acquired by folding the portion 59 against the inner portion of the connecting strip 51 form a male plug member 61 shown in Fig. 3. In transforming the blank 56 shown in Fig. 4 into the electrical conducting means 50 of Fig. 3 it is necessary only to fold the end portion 59 in the manner just described and bend the tabs 52 about their base sections 54 at right angles to the connecting strip 51. The blank 56 is thereby modified for use in the parallel terminal block 35 of Figs. 1 and 2.

Referring to Figs. 1 and 2 it can be seen that the electrical conducting means 50 is inserted in the slot 48 and the extension of the connecting strip 51 is inserted into one of the slots 44. The male plug member 61 extends outwardly beyond the end of the block member 37 and by using two of the electrical conducting means 50 a complete male plug member is provided to the block. The grooves 43 in the block member 36 are aligned with the grooves 44 of the block member 37 to receive the top portions of the connecting strip 51 thereby holding the electrical conducting means 50 firmly within the terminal block 35 upon the assembly thereof. As shown in Fig. 1 the electrical conducting means 50 contains S-shaped bends 62 near the first tab 52 to conform with the spacing of the slots 44. The S-shaped bends 62 not only further aid in retaining the conducting means 50 in the slots 44 and 48 but also allow the tabs 52 to be positioned more toward the center of the block while spacing the male plug members 61 at a distance from one another suitable for the use of conventional sockets.

Fig. 5 shows a different type of electrical conducting means 63 which is adapted for use in slots 49 in the block member 37. The electrical conducting means 63 is a short member including a connecting strip 64 and bent tabs 65. The tabs 65 are integrally connected to the strip 64 by base sections 66 which in turn contain laterally extending shoulders 67 and are also spaced from one another to provide an open topped surface portion 68 to the strip 63 intermediate the tabs 65. Furthermore, the tabs 65 are bevelled along their outer corners as at 69 as previously described in connection with the tabs 52 of the electrical conducting means 50. In comparing Fig. 5 with Fig. 3 it can be seen that the electrical conducting means 63 is quite similar to the electrical conducting means 50 but does not contain the male plug member 61 nor does it contain the same number of tabs. The electrical conducting means 63 is inserted in the slots 49 of the block 37 in the same manner as described in connection with the electrical conducting means 50. The abutment between the block members 36 and 37 is capable of retaining the electrical conducting means 63 in the slots 49. As can be noted in Fig. 1 the slots 49 which retain the strip elements 64 of the electrical conducting means 63 do not extend the full length of the left hand side of the block 37. As the electrical conducting means 63,

in the form shown, consists merely of two tabs it is desired to properly position the tabs within their respective recessed portions 47 and restrict the tabs to that particular area. To do this it will be noted in Fig. 1 that the left hand portion of the block member 37 is made up of a plurality of pairs of grooves 46 which are separated from one another by thicker ridges 45'. The slots 49 do not extend past the ridges 45' but are limited in their length between the ridges 45'. The latter ridges are preferably thicker than the intermediate ridges 45 for purposes of identification. In other words the thickened ridges 45' are noticeable along the side surface of the assembled terminal block 35 and indicate the location of each conducting means 63 thereby alleviating any confusion between any two conducting means 63 during the interconnection of separate circuits.

As can be seen from the types of conducting means shown, various forms of electrical conducting means may be used depending upon the type of electrical connection desired. For example, in utilizing the electrical conducting means 63 it is possible to interconnect two circuits at a central point without interference from other circuits. By use of the electrical conducting means 50 a number of circuits can be interconnected with a source of electricity and in the same manner the interconnection between the various systems may be readily changed or discontinued at will.

The type of female connector 70 preferably used in conjunction with the tabs 52 and 65 is shown in Figs. 1 and 2. The connector 70 includes a body portion 71 which snugly fits against the bottom surface of the tab 52 and is held in place by arcuate arms 72 which are folded inwardly over the top surface of the tab 52. The connector 70 is made preferably of slightly resilient material to allow a force fit between the tabs 52 and the inwardly folded edges of the arms 72. The body portion 71 further contains an additional pair of arms 73 folded inwardly and downwardly over the wires of an electrical lead 74 which is firmly clamped at the edge of its insulation by an additional pair of arms 75. As can be readily seen from Figs. 1 and 2 the type of electrical connection obtained between the tabs 52 and the connector 70 includes the use of a rather large surface area. The relative flatness of the combined units further guards against undesirable rotation of one element with relation to another thereby negating the creation of a loose connection. The suspension of the tabs 52 out of contact with all of the surfaces of the ridges 45 and grooves 46 which combine to form the recessed portions 47 insures proper engagement between the tabs 52 and the connector 70. The use of relatively non-resilient material in the manufacture of the electrical conducting means 50, 56 and 63 provides a substantially rigid tab which is capable of readily receiving the resilient arms 72 of the connector 70. The bevelled corners 57 and 69 of the tabs 50 and 63, respectively, act to aid in guiding the connector 70 into full contact with the tabs thereby insuring ready engagement of the elements.

Referring to Figs. 6, 7 and 8, a vertical terminal block 76 is shown which incorporates the general principles of the present invention relating to simplicity of design in construction as well as efficiency in use. The vertical block 76 has a body portion 77 which contains a plurality of inwardly extending, laterally spaced recessed portions 78 and 79. The recessed portions 79 are somewhat differently arranged with respect to the recessed portions 78. An indented side wall 80 on the vertical block 76 provides a shoulder 81 which carries a rivet 82 supplied to hold a backing 83 against the bottom surface of the body portion 77. An additional shoulder 84 also carries a rivet (not shown) for the same purpose. In the sectional view in Fig. 7 the vertical block 76 is shown as having a plurality of upstanding walls 85 which form therebetween the recessed portions 78. The block 76 further contains a number of thicker upstanding walls

86 which define the differently arranged recessed portions 79. The bottoms of the recessed portions 78 and 79 are substantially closed except for the provision of upstanding slots or grooves 87 and 88 into which the electrical conducting means 89 and 90, similar to those previously described, are inserted. The electrical conducting means 89 can be formed from the blank 56 of Fig. 4 by merely folding the projection 59 inwardly upon a portion of the connecting strip 51 thereby forming a male plug member 61'. The electrical conducting means 89 is in every other respect similar to the blank 56 shown in Fig. 4 in that it is made up from a connecting strip 51, from which tabs 52 having base sections 53' laterally extend, shoulders 54 and intermediate connecting strip portions 55. The tabs 52 are maintained in coplanar relationship with the connecting strip 51 and extend laterally thereof. The electrical conducting means 90 is quite similar to electrical conducting means 63 shown in Fig. 5 with the exception that the tabs 65 are retained in coplanar relationship with the connecting strip 64. In other words, as shown in Fig. 5 the tabs 65 are bent at right angles to the connecting strip 64 thereby adapting the electrical conducting means 63 for use in the parallel terminal block 35 of Figs. 1 and 2. When it is desired to use a double tab electrical conducting means such as 90 in Fig. 7 it is necessary merely to retain the tabs 65 in coplanar relationship with the connecting strip 64 to thereby allow the tabs and connecting strip to be inserted through the groove 88 to position the tabs 65 within the recessed portions 79 and the connecting strip 64 within the groove 88.

Fig. 8 is a bottom plan view of the body portion 77 of the vertical terminal block 76 with the backing 83 removed and the electrical conducting means 89 and 90 removed from their respective slots 87 and 88. In referring to Figs. 7 and 8 it will be noted that the slots 87 are each adapted to receive an electrical conducting means 89 in such a manner that the tabs 52 thereof extend inwardly into the recessed portions 78. To retain the electrical conducting means 89 properly within the body portion 77 the exposed top surfaces 55 of the connecting strip 51 about the bottom edge of the upstanding walls 85. This feature is shown clearly in Fig. 7 and to further illustrate the construction of the body portion 77 a portion of the electrical conducting means 89 is cut away to show one side wall of the slot 87. The manner in which the walls 85 extend across the slots 87 to receive the exposed top surface portions 55 of the electrical conducting means 89 is clearly shown in Fig. 8. In a similar manner the electrical conducting means 90 is retained in the body portion 77 of the vertical terminal block 76 by an upstanding wall 91 the bottom surface of which is shown in Fig. 8.

The vertical terminal block 76 can be readily formed from plastic material or the like in a suitable mold capable of providing the inwardly directed recessed portions 78 and 79 and the associated slots 87 and 88 in communication with these portions. The electrical conducting means 89 and 90 are then inserted in their respective slots and the tabs 52 and 65 extend centrally within the recessed portions 78 and 79. The backing member 83 of suitable insulating material is then placed in position flush with the bottom surface of the body portion 77 and the rivet 82 along with any other number of suitable rivets is applied to fixedly secure the backing member 83 to the body portion 77.

As shown in Fig. 7 the connector 70 may be readily inserted within the recessed portions 78 or 79 into association with the tabs. As can be seen from this arrangement as compared with the parallel terminal block 35 of Fig. 1, the electrical conducting means blank 56, as shown in Fig. 4, is adapted for modification thereby making it highly useful in various forms of terminal block housings. Only minor modifications are necessary in order to prepare the electrical conducting means blank 56 for

use either in a parallel terminal block 35 or vertical terminal block 76.

Fig. 13 sets forth a vertical terminal block 92 of slightly modified design which makes use of two rows of recessed portions 78' and which utilizes two electrical conducting means 89' in the same manner as previously described in connection with Figs. 6-8. In considering the modification shown in Figs. 1, 6 and 13 it can be readily seen that the general principles utilized in the construction of the terminal blocks of the present invention can be fully realized and followed in the manufacture of terminal blocks of varying designs capable of meeting many different needs.

Still a further modification of the type of terminal block capable of incorporating the general objects of the present invention is set forth in Figs. 9-12. The terminal block 93 illustrated therein is a parallel type block somewhat similar to that shown in Fig. 1. The block 93 contains a body portion 94 which has a central ridge 95 from which laterally extends a plurality of ridges 96. Rivets 97 inserted through the body portion 94 fasten a backing 98 to the bottom surface of the body portion 94. The backing 98 in combination with the central ridge 95 and lateral ridges 96 define a plurality of inwardly extending recessed portions 99.

Fig. 12 illustrates an electrical conducting means 100 of substantially different design but which is capable of carrying out the objects of the present invention when used in conjunction with the body portion 94 and backing 98. The electrical conducting means 100 consists of a flat central strip 101 which has integrally attached thereto a plurality of tabs 102 extending laterally thereof. Intermediate the tabs 102 and the central strip 101 are upstanding shoulders 103. The corners of the tabs 102 are beveled as at 104. As shown in Figs. 10 and 11 the electrical conducting means 100 is mounted over the central ridge 95 in the body portion 94 and is held in position by the inner surface of the backing 98. The provision of the upstanding shoulders 103 positions the tabs 102 independent of all of the sides of the recessed portions 99. The electrical conducting means 100 as shown contains three tabs 102 with one corner of the central strip 101 being cut at an angle or beveled to eliminate unnecessary material as well as provide room for the protruding tab 102 of a second electrical conducting means 100. A particular use of the angled corner of the central strip 101 is shown clearly in Fig. 10 wherein a complement of electrical conducting means 100 are mounted in their operative position on the central ridge 95. In comparing the type of electrical conducting means shown in Fig. 12 with those shown in the above described figures it can be seen that such means could be provided with any number of tabs depending on the type of electrical circuit needed. For example, the three-tabbed electrical conducting means 100 can be used to interconnect two separate systems and also be connected to a source of electrical power to provide the requisite energy to the two systems.

Figs. 14-16 illustrate a further modifications of a terminal block which incorporates a slightly modified form of electrical conducting means. The terminal block 105 shown in Figs. 14 and 16 is a modified form of vertical terminal block having a slightly different arrangement of recessed portions 106 in the block housing 107. A bottom plan view of the block 105 is shown in Fig. 16 with the backing member removed and the modified electrical conducting means of Fig. 15 in place. The block 105 is of similar construction as those previously described with the exception that the block is provided with slots 108 which contain segments at right angles to one another thereby allowing the extension of the male plug members of the electrical conducting means to be positioned outwardly of the side of the block. Referring in particular to the type of electrical conducting means used in order to make possible this arrangement reference is

made particularly to Fig. 15 wherein an electrical conducting means 109 is shown as being constructed similarly to the blank 56 of Fig. 4. The means 109 consists of a connecting strip portion 110 from which spaced tabs 111 laterally extend in a coplanar relation. Here again the tabs are integrally connected to the connecting strip 110 by base sections 112 which provide shoulders 113 to the tabs. The extension of the connecting strip 112 which forms a male plug member 114 is bent at right angles to the remainder thereof thereby allowing the male plug member 114 to extend laterally of the main portion of the electrical conducting means 109.

The electrical conducting means 109 is shown inserted in the grooves 108 of the body portion 107 of the vertical terminal block 105 in Fig. 16. The remaining grooves 115 are adapted to receive the various types of electrical conducting means previously described and communicate with the additional recessed portions 116 shown in Fig. 14 in the conventional manner.

Figs. 17 and 18 illustrate a blank from which a form of U-shaped connector 117 is formed for use in electrically connecting two terminal blocks in a back-to-back relation. The U-shaped connector 117 is an important feature of the present invention in that it further provides greater adaptability to the terminal blocks previously described in meeting the requirements of changes in electrical systems. The blank from which the U-shaped connector 117 is formed consists of a central portion 118 which is of generally rectangular shape and which contains centrally thereof a rectangular opening or slot 119 wide enough to receive a tab such as the tab 52 therethrough. Side portions 120 of the central portion 118, which aid in defining the opening 119, provide shoulders to the U-shaped connector 117. Extending outwardly on either side of the central portion 118 are legs 121 which are indented longitudinally thereof to form flutes or indents 122. The blank of Figs. 17 and 18 is folded upon itself along the central portion 118 along a line extending laterally and centrally of the side portions 120 to form the arcuate section of the U-shaped connector 117. The final form of the U-shaped connector 117 is shown in Figs. 19 and 20 wherein it can be seen that the flutes or indents 122 are positioned on the inner surfaces of the legs 121 in such a manner as to become juxtaposed upon the folding of the blank into its operative position. The clearance left between the folded portions of the central portion 118 is preferably equal to the thickness of the electrical conducting means. The endmost portions of the legs 121 are flanged at 123 to provide self-aligning means to the U-shaped connector 117 when it is inserted within a terminal block.

A slightly modified form of a U-shaped connector 117' is shown in Figs. 21 and 22. The modification existing in this form resides in the positioning of the flutes or indents 122'. Instead of the flutes extending longitudinally of the legs 121' the modified flutes 122' extend laterally across the legs 121' near the ends thereof. As can be seen in Fig. 22 the flutes are arranged to be juxtaposed and due to the resiliency of legs 121' it is possible to force an electrical conducting means in between the flutes 122' and upwardly into the space existing between the legs 121'. The lateral flutes 122' are preferred over the longitudinal flutes 122 in view of the wiping action obtained in the use of the U-shaped connector 117'. As the flutes 122' are forced across the opposite surfaces of an electrical conducting means they wipe the surface in such a manner as to insure proper electrical contact between the connector 117' and the electrical conducting means associated therewith. By using flutes of this nature it is also possible to obtain a greater surface area contact between the inner surfaces of the legs 121' and the outer surfaces of the associated electrical conducting means. In other words, due to the longitudinal length of the flutes 122 of the connector 117 the area of the connector 117 contacting the surfaces of the elec-

trical conducting means positioned in between the legs is solely the outer surface of the flutes and the remaining surface of the legs does not come into electrical contact with the conducting means. Therefore, in utilizing a laterally positioned flute a greater surface area contact is obtainable.

Figs. 23-25 illustrate the manner in which the U-shaped connector 117 is used in accordance with the teachings of the present invention. As can be seen in Fig. 23 an upper vertical terminal block 124 similar to that disclosed in Fig. 6 and a lower vertical terminal block 125 also somewhat similar to that shown in Fig. 6 are attached in a back-to-back relation by a plurality of U-shaped connectors 117 as well as a modified form of connector to be subsequently described. The vertical terminal block 124 contains electrical conducting means 89' of the type shown in Fig. 7 which contain vertical tabs 52 extending upwardly into the recessed portions 126. The vertical terminal block 125 contains electrical conducting means 127 which are of the type disclosed in Fig. 7 without the male plug member 61' and having tabs 52 extending into recessed portions 128. Each of the vertical terminal blocks 124 and 125 contains backing members 129.

Referring to the manner in which the U-shaped connector 117 is utilized, reference is made particularly to Fig. 23 wherein it is shown at the right thereof a U-shaped connector 117 mounted over a connecting strip 51 positioned in the vertical terminal block 125 with the associated tab 52 of the connecting strip 51 extending through the opening or slot 119 in the central portion 118. The legs 121 of the connector 117 extend through the backing member 129' and outwardly of the vertical terminal block 125. A suitable slot is supplied in the backing member 129 of the vertical block 124 to receive the legs therethrough and to allow the legs to straddle a connecting strip 51 of one of the electrical conducting means 89' therein. The material used to form the U-shaped connector 117 is preferably resilient to allow a certain amount of spring action in the legs 121 when they are moved outwardly away from one another by the insertion of a connecting strip 51 therebetween. Fig. 24 is a top plan view of the connected blocks of Fig. 23 and, in completing this connection, the flanges 123 on the ends of the legs 121 afford ready receiving of the connecting strip 51 between the legs 121. The bottom plan view of the joined blocks of Fig. 23 is shown in Fig. 25 and here it can be seen that the side portions 120 are positioned on either side of the upstanding tab 52 and the inner surface of the arcuate sections of side portions 120 rest against the upper surface of the exposed connecting strip 51 intermediate the tabs 52.

It should be understood that the U-shaped connector 117 is particularly important where changes are made in existing electrical systems and it is found necessary to rearrange the circuits or add additional ones. In this manner, for example, a terminal block such as 125 can be added to the system and readily attached to an existing vertical terminal block such as 124. By this arrangement it is unnecessary for the terminal block 125 to contain electrical conducting means having male plug members formed integrally therewith. The electrical current passing through the terminal block 124 can be tapped by the use of any number of U-shaped connectors 117 to provide a suitable source of power in the system controlled by the attached terminal block 125. The U-shaped connector 117' is attached in the same manner as described in connection with the U-shaped connector 117. As previously described the U-shaped connector 117' is preferred over the U-shaped connector 117 because of the lateral flutes provided on the legs thereof which are capable of supplying a wiping action to the connecting strip 51 introduced between the legs.

Referring now to Fig. 26 wherein a perspective view of terminal block 125 is shown disconnected from ter-

terminal block 124 and illustrating the manner in which the legs 121 of a series of U-shaped connectors 117 extend outwardly of the backing member 129. The backing member 129 contains a series of openings 130 through which the legs 121 of the U-shaped connectors 117 extend. Corresponding openings are positioned in the backing member 129 of the terminal block 124 to receive the legs 121 therethrough as previously described. The flanged ends 123 of the legs 121 are adapted for self-alignment with their respective connecting strips 51 when the block 125 is attached to the block 124. The resilient nature of the legs 121 makes it possible for the blocks 124 and 125 to be tightly held in electrical contact without the use of any additional means for clamping the blocks together. The arrangement described allows the blocks to be readily clamped together and easily separated at will.

An additional form of block connecting means which also is a part of the present invention is set forth in Figs. 27-30. This connector is generally designated by the numeral 131 and its blank is shown in Fig. 27. The connector is a combination tab and block connector formed from one piece of material and consists of a central body portion 132 which forms at one end thereof a tab 133 having inwardly positioned shoulders 134. Extending laterally from the shoulders are leg connecting portions 135 which contain at the ends thereof laterally extending leg segments 136. These segments contain near the ends thereof indents or flutes 137. The body portion 132 has the remaining end thereof formed into a resilient leg 138 which contains a laterally extending indent 139 thereacross. In assembling the blank of Fig. 27 into the finished connector 131 of Figs. 28-30 the leg segments 136 are folded upwardly and inwardly toward one another followed by a downward folding to finally position them at a predetermined distance from the inner surface of the leg 138. The fold is accomplished along lines extending laterally across the arms 135 thereby allowing the leg segments 136 to be folded inwardly upon the leg 138.

In Fig. 29 it can be seen that the indents or flutes 137 of the leg segments 136 become juxtapositioned with respect to the indent 139 on the leg 138. This is quite similar to the arrangement described with relation to the legs 121' of the U-shaped connector 117' shown in Figs. 21 and 22. As can be seen in comparing Fig. 28 with Fig. 30 the leg segments 136 on one side constitute a single clamping means for engagement with a surface of a connecting strip while the leg 138 on the other side of the connector 131 engages the remaining side of the connecting strip to thereby clamp the connecting strip against the inner surfaces of the leg 138 and leg segments 136. Fig. 29 illustrates the leg 138 and the leg segments 136 as being provided with flanges 140 to aid in guiding the leg and leg segments into proper contact with a connecting strip. As can still further be seen in Fig. 29 the tab 133 is moved out of coplanar relationship with the leg 138 by means of an S-shaped curve 141. The curve or bend 141 is provided to position the tab 133 in a plane which lies in between the leg 138 and the leg segments 136. This is done to insure proper positioning of the tab 133 when it is inserted into a recessed portion of a block housing. As previously described it is necessary that the tab 133 be positioned centrally of its associated recessed portion to thereby facilitate its connection with a lead connector.

Referring back to Figs. 23-25 the use of the connector 131 is illustrated in the attached blocks 124 and 125. Particular reference is made to Fig. 23 wherein on the left hand portion thereof a connector 131 is shown in its operative position. The connector 131 is used only where it is desired to maintain a single tab unconnected with any other tabs in a terminal block while providing the single tab with disconnect means for connection with a connecting strip of an electrical conducting means positioned in

another block. It is often found desirable to maintain a single isolated tab in a terminal block while at the same time electrically connecting the tab with another tab situated in an independent and completely separate block particularly when circuits are removed or added.

Block 125 contains a recessed portion 142 of conventional design into the lower portion of which is positioned the tab 133 of the connector 131. The shoulders formed by the folding of the leg connecting strips 135 form the equivalent of the aforesaid connecting strip 51 and abut the ends of the recessed portion 142 to properly position the tab 133 therein. As previously described the S-shaped bend 141 is provided at the base of the tab 133 to centrally locate the tab within the recessed portion. The backing member 129 abuts the opposite surface of the shoulders formed by the leg connecting strip 135 to retain the connector 131 tightly within the block 125. A suitable opening in the backing member 129 receives the leg 138 and its associated leg segments 137 in the same manner as described in connection with the connectors 117 shown in Fig. 26. The backing member 129 of the block 124 also contains an aligned opening therein through which the leg 138 and its associated leg segments 136 can be inserted to engage therebetween a connecting strip 51 of an electrical conducting means mounted in the terminal block 124. The connecting strip 51 clampingly received by the leg 138 and the leg segments 136 may be part of a single tab 52 or may be a part of a series of tabs. As shown in Fig. 23 the connecting strip 51 is part of a single tab unit 143 merely for purposes of illustration. In this manner it can further be appreciated that a single tab unit can be provided in a block such as 124 to which can be connected by means of connectors 117, 117' or 131 a tab and strip element of a second block thereby reducing the amount of material necessary in the individual blocks during the fabrication thereof.

In Fig. 25 the bottom plan view of the connected blocks 124 and 125 of Fig. 23 illustrates the positioning of the tab 133 of the connector 131 in the recessed portion 142. From this it can be seen that the tab 133 is centrally located therein, free from contact with the inner surfaces of the recessed portion 142. In the top plan view of the connected blocks 124 and 125 shown in Fig. 24 the tab 52 of the element 143 is shown positioned in a recessed portion 144. On either side of the tab 52 can be seen the flanged ends 140 of the connector 131.

In considering Figs. 3-5, 12 and 15, it should be readily apparent that the electrical conducting means of the present invention is not only simply constructed and therefore readily fabricated but is also highly adaptable for varying needs. The tabs 52 can be arranged at any desired angle to the connecting strip 51 if it should be desired to make use of a terminal block having angled recessed portions therein. Furthermore, the connecting strip can be supplied with any number of tabs depending upon the number of recessed portions provided in the block housing. In further consideration of Figs. 1, 6, 13 and 14 as well as the vertical terminal blocks 124 and 125 of Figs. 23-25, the block may take many forms and configurations depending upon the conditions under which it is used. For example, the parallel terminal block 35 of Fig. 1 is particularly adapted for use in a space of limited depth while the vertical terminal block such as 76 is particularly adapted for use in spaces which are limited in width. The recessed portions may be arranged on any surface of the block housing in any relation desired with respect to one another. An example of this is set forth in the vertical block housing 76 of Fig. 6. The great adaptability of the electrical conducting means to meet varying requirements allows space saving features as further illustrated by the vertical terminal block 76 of Fig. 6. As can be seen therein, some of the recessed portions 79 are in a different position with respect to the recessed portions 78 and function independently of the latter. In other words a single terminal block can be designed to

contain electrical conducting means therein which are arranged to meet all the requirements of a rather complicated network of systems which would ordinarily require the use of a plurality of terminal blocks.

It should be further noted that the recessed portions provided in all of the terminal blocks disclosed may be designed to guide the lead connector 70 into proper engagement with the tab 52. The inner dimensions of the recessed portions can be readily regulated to allow the inner walls thereof to act as guiding surfaces against the outer surfaces of the lead connector 70 thereby insuring proper alignment between the lead connector 70 and the tab 52. By such an arrangement the lead connectors may be operatively contacted with the tabs in a split second without the necessity of moving the connectors back and forth until proper contact is obtained with the tabs. This feature is of particular importance where a terminal block of the present invention is used in remote location where it is impossible to observe the recessed portions or tabs during the insertion of the connectors. This feature is further important in that an unskilled person can readily obtain a proper connection by merely inserting the connector within the recessed portion. Guesswork and any appreciable mechanical skill is thereby alleviated in the use of the terminal blocks.

The terminal blocks are further adapted for the printing of indicia on any of the surfaces thereof to properly identify the manner in which the various systems should be connected to the terminal block. The parallel terminal block 35 of Fig. 1 is particularly adapted for this purpose. The outer surface of either of the block members 36 and 37 may be supplied with directions covering the manner in which the electrical systems should be interconnected. In the instance where plastic material is used to form the block housing, such directions may be supplied to the outer surface of the housing during the molding thereof.

Again referring to the simplicity of use of the terminal blocks of the present invention it should be pointed out that with the provision of male plug members the blocks may be connected with a source of electrical current in the conventional manner thereby alleviating the necessity of soldering or the use of other rather complicated connecting methods. This feature is of particular importance where an unskilled person is attempting to install a gas range or the like as it is unnecessary to shut off the building current during installation. Many types of terminal blocks presently used require the connection of two separate leads into the block to supply electrical current to the connected systems of the range. In other words, it is necessary to first insert one lead and then insert a hot lead into the block in order to supply to the block the requisite current. In making this connection it is necessary to shut off the building current to alleviate short circuiting the system as well as personal injury to the person making the installation. By the provision of the male plug members in the block, instantaneous contact can be made between the two male plug members with the building current during the plug-in of the block into a suitable socket in the range or in the building itself. As a result no damage can occur to the equipment or to the person making the installation. The type of electrical connections used are very simple to complete and no special equipment is necessary to interconnect a plurality of independent systems. The block connectors 117 and 131 may also be used by an unskilled person as the installation of the connectors is relatively simple and does not require the use of any special equipment. A block connector fabricated from spring bronze has been found to be highly desirable and efficient in operation.

Obviously many 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 a top and bottom member, each of said members having a plurality of horizontal grooves extending outwardly toward at least one side thereof, the grooves of said members being aligned to define recessed portions opening inwardly along said side of said block, a longitudinally continuous vertical groove on one of said members associated with the inner ends of said recessed portions, an electrical conducting means including a connecting strip received in said vertical groove and having integrally formed therewith at least one tab extending outwardly of said vertical groove and laterally of said strip and into one of said recessed portions, said tab adapted to receive a lead connector thereabout within said recessed portion.

2. A terminal block comprising a top and bottom member, each of said members having a plurality of horizontal grooves extending outwardly toward at least one side thereof, the grooves of said members being aligned to define recessed portions opening inwardly along said side of said block, a longitudinally continuous vertical groove on one of said members associated with the inner ends of said recessed portions, an electrical conducting means including a connecting strip received in said vertical groove and having integrally formed therewith at least one tab extending outwardly of said vertical groove and laterally of said strip into one of said recessed portions, said strip extending outwardly of said block and having its outermost portion folded rearwardly upon itself to form a male plug member, said strip and said tab each being substantially flat in cross section, said tab adapted to receive a lead connector thereabout within said recessed portion.

3. A terminal block comprising a plurality of inwardly extending laterally spaced recessed portions along one surface thereof, at least one slot in said block removably receiving an electrical conducting means, said means including a connecting strip received in said slot and having integrally formed therewith at least one tab extending laterally thereof and in coplanar relationship therewith into one of said recessed portions, said strip extending outwardly of said block and having its outermost portion folded rearwardly upon itself to form a male plug member, said tab extending into said recessed portion substantially equidistant from the top and bottom thereof and spaced from the sides thereof and adapted to receive a lead connector thereabout, and retaining means associated with said slot to retain said connecting strip therein.

4. A terminal block comprising a plurality of inwardly extending laterally spaced recessed portions along one surface thereof, at least one slot in said block removably receiving an electrical conducting means, said means including a connecting strip received in said slot and having integrally formed therewith at least one tab extending laterally thereof and in coplanar relationship therewith into one of said recessed portions, a portion of said strip positioned in an angular relation with the remainder thereof and extending outwardly of said block to one side thereof and having its outermost portion folded rearwardly upon itself to form a male plug member, said tab extending into said recessed portion substantially equidistant from the top and bottom thereof and spaced from the sides thereof and adapted to receive a lead connector thereabout, and retaining means associated with said slot to retain said connecting strip therein.

5. A terminal block comprising a plurality of horizontal grooves extending outwardly toward the sides thereof, a vertical upstanding rib in said block defining the inner ends of said grooves, an electrical conducting means removably mounted on said rib and of substantially U-shape outline having tabs integral with the ends of the legs thereof and extending laterally with relation thereto, said tabs extending into said grooves and adapted to receive a lead connector thereabout, and removable cover

means attached to said block to retain said electrical conducting means on said rib, said cover means cooperating with said grooves to define laterally spaced outwardly opening recessed portions and intimately holding the body portion of said conducting means against and on said rib.

6. A terminal block comprising a plurality of horizontal grooves extending outwardly toward the sides thereof, a vertical upstanding rib in said block defining the inner ends of said grooves, an electrical conducting means removably mounted on said rib and of substantially U-shape outline having vertically extending legs in a plane parallel with the sides of said rib, tabs integrally connected with the ends of said legs and extending laterally and outwardly with relation thereto, said tabs extending into said grooves and each being adapted to receive a lead connector thereabout, and removable cover means attached to said block to retain said electrical conducting means on said rib, said cover means cooperating with said grooves to define laterally spaced outwardly opening recessed portions and intimately holding the body portion of said conducting means against and on said rib.

7. A terminal block comprising a plurality of inwardly extending laterally spaced recessed portions along at least one surface thereof, means in said block removably receiving an electrical conductor of substantially rigid material, said conductor including a connecting strip having integrally formed therewith at least one tab extending laterally thereof into one of said recessed portions, said strip and said tab each being substantially flat in cross section, said tab extending into a recessed portion substantially equidistant from the top and bottom thereof and spaced from the sides thereof and adapted to receive a lead connector thereabout, and a separate electrical connector mounted in said block, said connector having a body portion with resilient legs extending therefrom in substantially parallel and coextensive relation to one another, said legs extending outwardly of said block and adapted to be urged outwardly out of parallel relation upon receiving a connecting strip of a second electrical conductor in a second terminal block thereby physically and electrically interconnecting said blocks.

8. A terminal block comprising a plurality of inwardly extending laterally spaced recessed portions along at least one surface thereof, means in said block removably receiving an electrical conductor of substantially rigid material, said conductor including a connecting strip having integrally formed therewith at least one tab extending laterally thereof into one of said recessed portions, said strip and said tab each being substantially flat in cross section, said tab extending into said recessed portion substantially equidistant from the top and bottom thereof and spaced from the sides thereof and adapted to receive a lead connector thereabout, and a separate U-shaped connector associated with said strip and having the legs thereof extending in a direction opposite of said tab with relation to said strip, the arcuate base portion of said U-shaped connector being apertured and receiving said tab therethrough, the legs of said U-shaped connector extending outwardly of said block and adapted to receive a second strip element similarly mounted in a second block therebetween to thereby physically and electrically connect the blocks.

9. A terminal block comprising a plurality of inwardly extending laterally spaced recessed portions along at least one surface thereof, means in said block removably receiving an electrical conductor of substantially non-resilient material, said conductor including a connecting strip having integrally associated therewith at least one tab extending laterally thereof into one of said recessed portions, said strip and said tab each being substantially flat in cross section, said tab extending into said

recessed portion substantially equidistant from the top and bottom thereof and spaced from the sides thereof and adapted to receive a lead connector thereabout, a second electrical conductor in said block adapted for attachment at one end thereof with a lead connector and at the other end thereof with a strip element of a second terminal block, said second electrical conductor including a body portion formed at one end thereof into a substantially flat tab positioned in one of said recessed portions and adapted to receive a lead connector thereabout, the other end of said body portion formed into a resilient leg, at least one laterally extending U-shaped arm on said body portion, and a leg segment on said arm, said leg segment extending laterally of said arm and substantially parallel with said leg, said leg and said leg segment extending outwardly of said block and adapted to receive a strip element of a second terminal block in gripping relation therebetween thereby physically and electrically interconnecting said blocks.

10. An electrical conducting means adapted for attachment at one end thereof with a lead connector and at the other end thereof with a strip element, said means including a body portion formed at one end thereof into a substantially flat tab adapted to receive a lead connector thereabout, the other end of said body portion formed into a resilient leg, a laterally extending flute on said leg near the outward end thereof, U-shaped arms extending laterally on both sides of said body portion, a leg segment of each of said arms, and flutes on said leg segments near the outermost ends thereof, said leg segments extending laterally of said arms and substantially parallel and coextensive with said leg, the flutes on said leg segments being juxtaposed with the flute on said leg and being adapted thereby to wipe the surface of a strip element introduced between the leg segments and the leg.

11. An electrical connector adapted to interconnect terminal blocks having strip elements therein with laterally extending integral tabs positioned in inwardly extending recessed portions, said connector being generally U-shaped with an apertured arcuate base portion adapted to receive a tab of a first block therethrough and receive the associated strip element between the legs thereof, said legs having longitudinally extending indented portions to receive a strip element of a second block therebetween.

12. An electrical conductor comprising a strip of substantially non-resilient material having tabs extending laterally therefrom, a separate U-shaped connector mounted on said conductor and having a tab extending through an aperture in the arcuate base portion thereof, said U-shaped connector having legs extending on either side of said strip in a direction opposite to said tab with relation to said strip, and indented portions on said legs adapted to receive a strip of a second electrical conductor therebetween thereby interconnecting said conductors.

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