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Johnson et al.

[11] **3,753,216**

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[54] **HIGH VOLTAGE TERMINAL STRIP**

[75] Inventors: **Erlon Fitch Johnson; Donald Eugene Crabb,** both of Elizabethtown, Pa.

[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.

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[52] **U.S. Cl.** ..... **339/198 GA,** 339/218 R, 339/242

[51] **Int. Cl.** **H01r 9/00**

[58] **Field of Search** ..... 339/198 R, 198 C, 339/198 E, 198 G, 198 GA, 198 H, 198 J, 198 K, 198 S, 198 P, 221, 218, 206, 207, 208, 209, 111, 242

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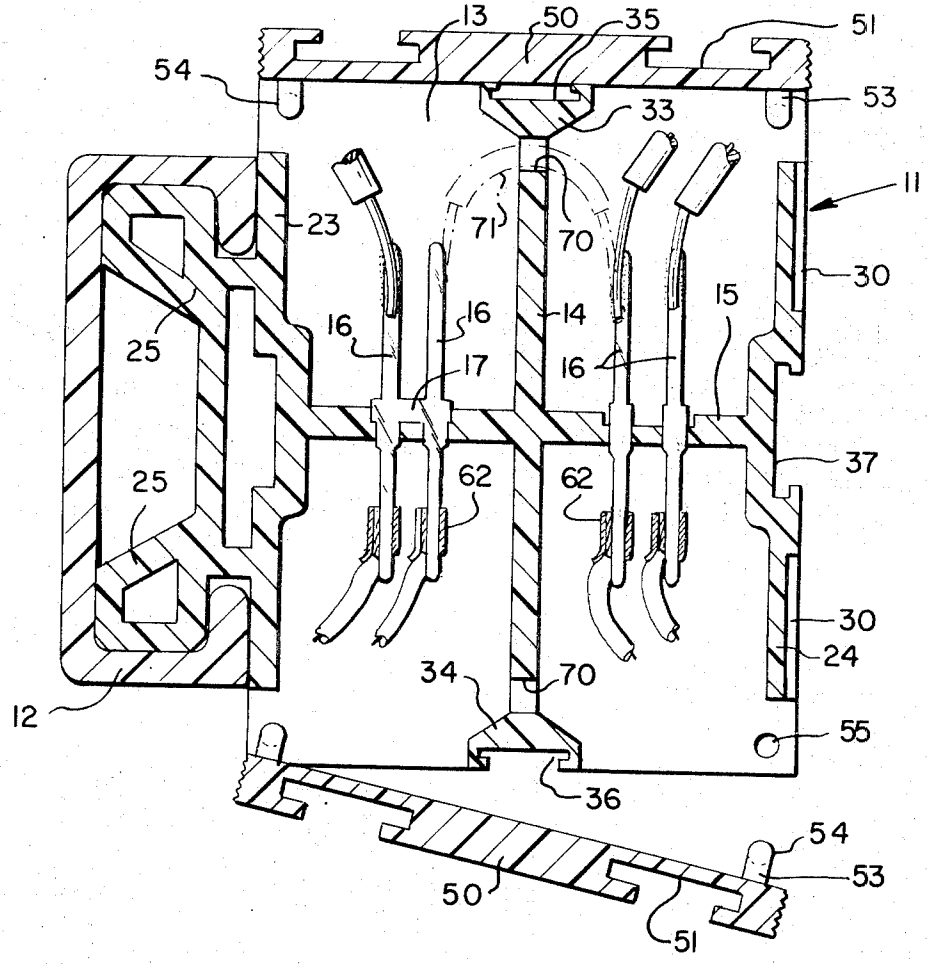
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Primary Examiner—Marvin A. Champion
Assistant Examiner—Robert A. Hafer
Attorney—William J. Keating et al.

[57] **ABSTRACT**

A terminal strip to provide for varying numbers and combinations of connections between input conductors and output conductors is disclosed. The strip is built up of any desired number of insulating block elements, each of identical structure, all mounted on a channel shaped track between end stops. The block elements have interlocking means, and they define plural cavities with sets of contact terminals inside the cavities to which the conductors are terminated in desired patterns. Barrier wall sections subdivide the cavities and separate sets of terminals. High voltage surge conditions can be successfully withstood due to cavity spacings, post spacings, presence of barrier walls, and use of insulating material for all elements except the contact terminals. Access cover means and cavity identifying marker means are also provided.

6 Claims, 5 Drawing Figures



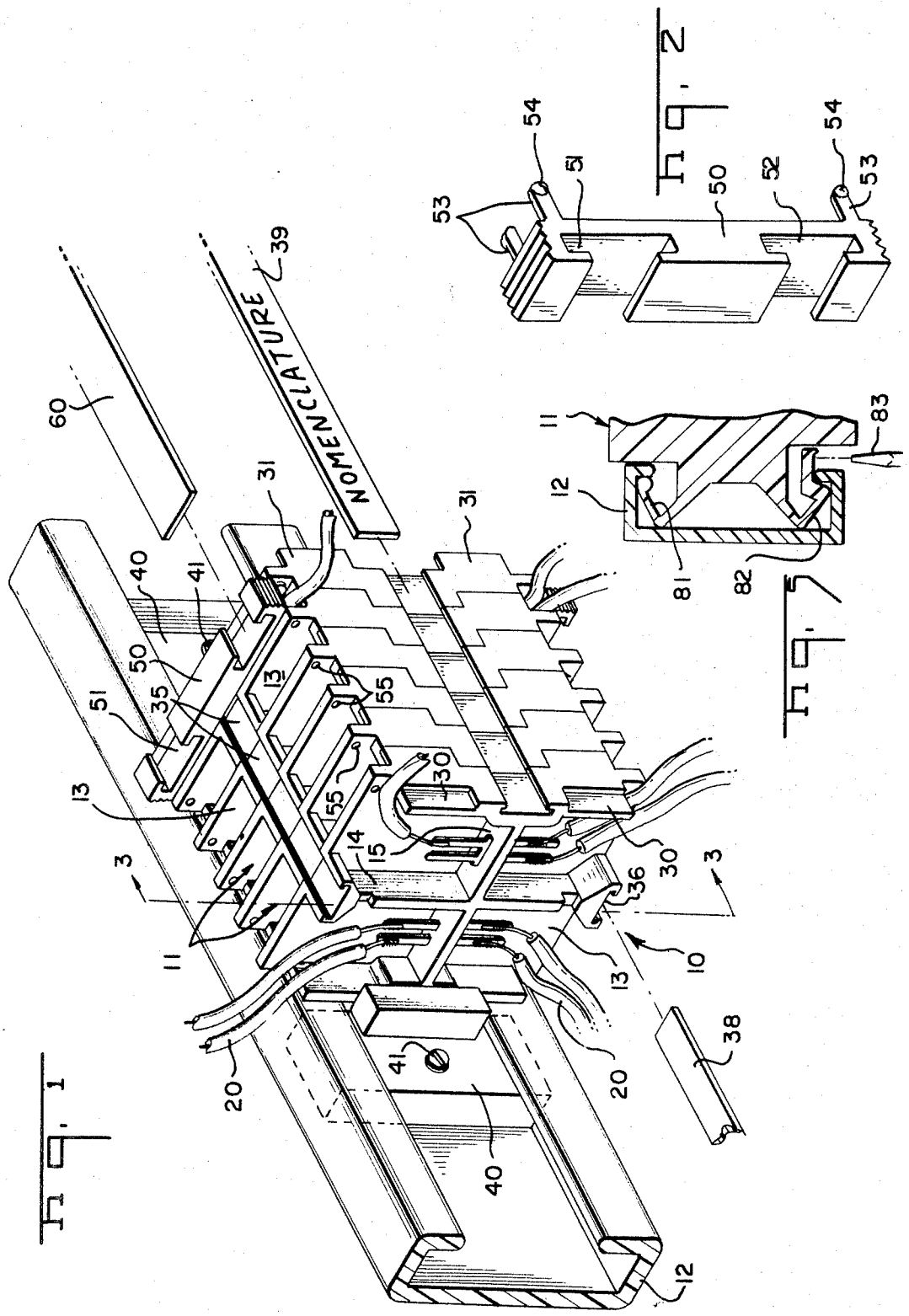


Fig. 1

Fig. 2

Fig. 5

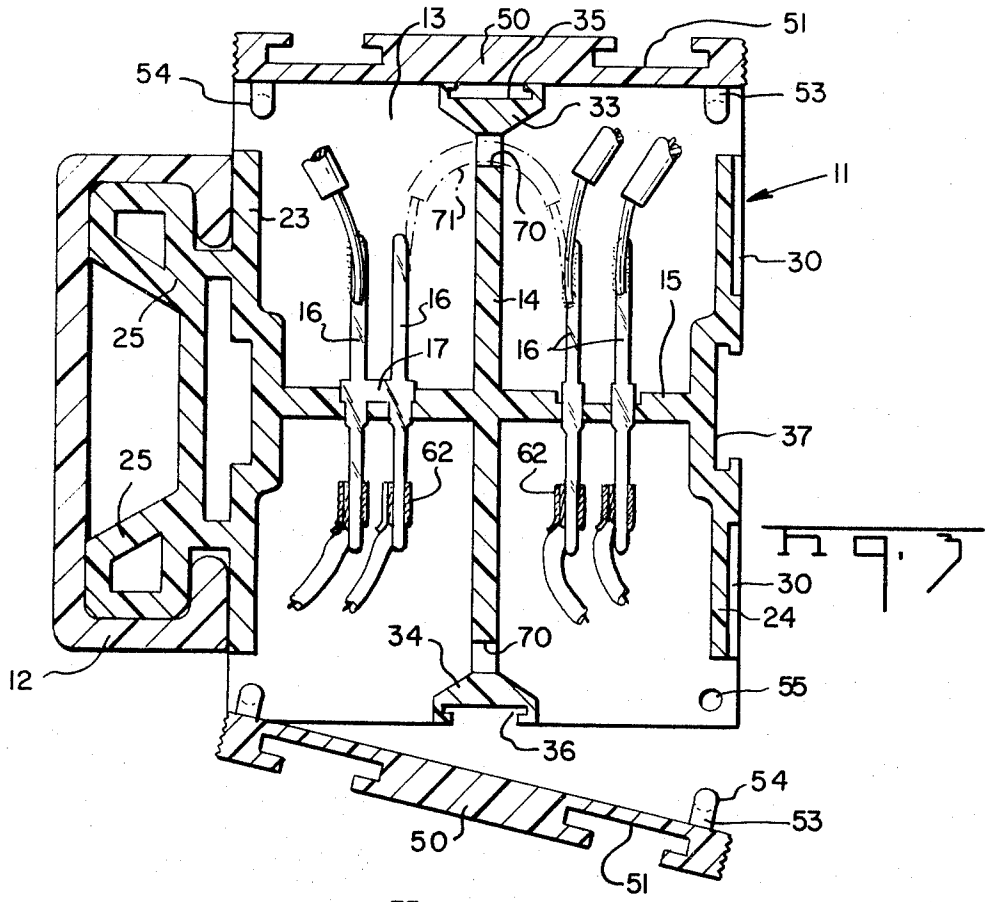

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Fig. 3

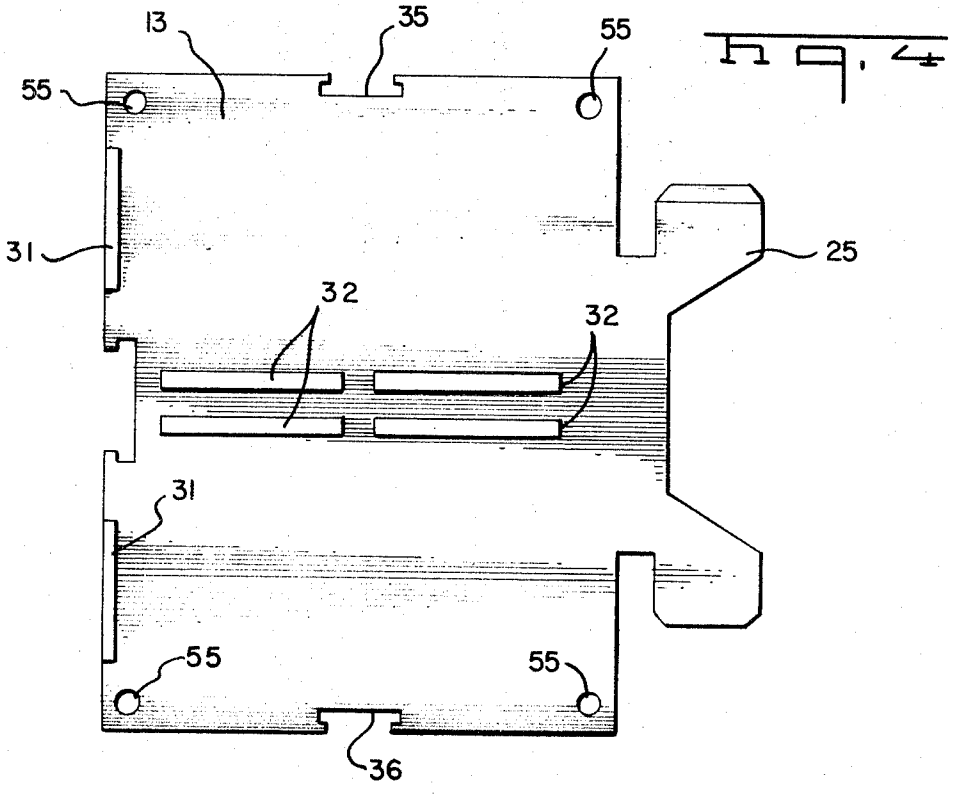

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Fig. 4

HIGH VOLTAGE TERMINAL STRIP

BACKGROUND OF THE INVENTION

The present invention relates in general to electrical terminal blocks or strips which are adapted to make any desired number and combination of electrical interconnections among a plurality of conductors. The terminal strip of the invention is of the modular type construction, in that it is built up of a plurality of identical terminal block sections. As will be seen, the terminal strip includes special provisions for withstanding very high voltages which under certain conditions might be imposed upon the individual conductors or leads.

The terminal strip of the invention will serve as a flexible and versatile interconnection system. For example, in a junction box for making multiple connections in telephone equipment networks, or among components in data processing systems, or the like, it will provide interconnections for plural sources to plural loads via individual conductors or via groups of plural conductors.

SUMMARY OF THE INVENTION

The high voltage terminal strip described herein is composed of a plurality of insulator housing blocks of identical construction which are mounted on a track member and held together thereon in a stack. The housing blocks are each, in essence, a flat plate or main wall with a pair of crossed dividing walls extending outward therefrom. A plurality of cavities are formed, one between each pair of adjacent main walls of the set, and conductors to be interconnected extend into the cavities from the outside. The aforesaid dividing walls subdivide each cavity into four chambers of equal size. Two pairs of metal contact terminals are mounted in one dividing wall, with the other dividing wall separating the pairs of terminals. The terminals are force fitted into small apertures in the wall in which they are mounted. The walls have notches and cooperating tabs fitted into notches of adjacent sections to interlock them into a unitary strip. The conductors are terminated to opposite ends of the terminals in any selected pattern. More than one conductor can be terminated to one end of each terminal if necessary.

It is an object of the invention to provide a terminal strip assembly serving to make interconnections between plural electrical conductors in any desired pattern, and in a structure which affords protection against high voltage surges on said conductors.

It is another object to provide such a terminal assembly made up of a small number of different component parts, all of insulating material for high voltage protection, and so as to be rugged, reliable, flexible in use and service repair, and at the same time inexpensive to manufacture.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there is shown and described an illustrative embodiment of the invention; it is to be understood, however, that this embodiment is not intended to be exhaustive nor limiting of the invention but is given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use

so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view, partly in section, of a group of terminal blocks assembled on a track and making up the terminal strip of the invention;

FIG. 2 is a perspective view of one of a plurality of cover members employed in the terminal strip assembly;

FIG. 3 is a cross-sectional view of one of the identical terminal blocks mounted on the track and with covers in place at top and bottom thereof, looking in the direction of arrows 3—3;

FIG. 4 is an elevational view of the back side of the terminal block of FIG. 3; and

FIG. 5 is a partial cross-section showing an alternative construction for mounting a terminal block in the track.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 3, the terminal strip 10 of the invention is made up of a plurality of terminal block housings 11 of insulating material stacked together on a track 12 as shown. Each housing 11 comprises a flat plate-like member 13 which forms a planar back wall of the housing oriented perpendicular to the track 12 when in position in the strip. A perpendicular pair of dividing walls or partitions 14 and 15 extend forward from back wall 13 along center lines as shown and serve to divide the volume between each adjacent pair of wall members 13 into four smaller cavities of equal size. The partitioning wall 15 in each of the plural housings 11 supports two sets of elecrical contact posts 16 which extend through apertures in the wall 15. It is seen that there are two such terminals 16 in each set and that the two sets of terminals are separated by the other wall 14.

With this arrangement a pair of insulated electrical conductors, such as leads 20 in FIG. 1, which are required to be interconnected may be terminated to opposite ends of one of the contact terminals 16. The termination of the conductors to the terminals may be effected by any standard technique, such as by soldering of the leads to the terminals, by conventional wrap-type connections or clip-type connections. The two posts 16 of each set are themselves interconnected by a conductive bridging element 17 which may simply be the carrier web between adjacent terminals where the latter are fabricated in strip form. With the arrangement shown, a maximum of four lead connections can be accommodated at each position, as shown at the left side of the first terminal block housing in FIG. 1. The right side of that block shows that one lead (at the top) may interconnect with two leads (at the bottom) if desired. The doubled posts 16 provide the further feature that an extra terminal is available in case of breakage of the originally used terminal, in those cases where double connections at one end are not needed, as at the right side in FIG. 1.

Each housing 11 has end wall portions 23 and 24 extending outward from back wall 13 along the left and right edges and parallel to walls 14 and 15. End walls 23 and 24 terminate short of the upper and lower edges of plate 13, as shown in FIG. 3, leaving space for the electrical leads to enter the respective cavities. A base

or footlike wall portion **25** extends from wall **23** and beyond the periphery of member **13.** It has a shape complementary to the interior channel of track **12** to mount each terminal block therein.

The various walls **14, 15, 23, 24** are all of the same height and with plural housings **11** stacked together, their outer edges abut the back side of the adjacent main wall member **13.** However, a number of interlocking means are provided to give rigidity to the stacked-up housing sections, as follows. Each wall portion **24** (at the right in FIGS. **1** and **3**) has a pair of cut-out portions in the form of notches or rectangular grooves **30,** and in addition, the wall **24** has two protruding rectangular tabs **31** of complementary shape extending out beyond the opposite side of main wall **13.** The tabs **31** of one housing section fit within the notches **30** of the adjacent housing section to intermate the housings. Also, a set of wall sections **32** extend out from the said opposite side of main wall **13** in a position to receive portions of the end of wall **15** therebetween. Finally, the outer ends of wall **14** are shaped so as to have a widened or thicker section, identified as **33** and **34,** which are provided with outwardly facing grooves or channels **35** and **36.** The wall **24** contains a similar channel or groove **37** intermediate the notches **30.** A plurality of flat elongated strip members of rectangular cross-section, such as members **38** and **39** in FIG. **1,** are provided with the assembly. These strips are dimensioned to fit within the grooves **35, 36,** and **37** to align the housing sections **37** and to make the terminal strip assembly more rigid. Another feature is that these strips **38, 39** may have an embossed tape applied thereto having indicia such as numerals or code lettering to identify each section of the strip. This can be for the purpose of identifying the circuits associated with particular signal conductors **20,** as suggested by the term "Nomenclature" shown on marker strip **39** in FIG. **1.**

The desired number of housing sections **11** may be inserted into track **12,** leads terminated to the contact terminals **16** in desired patterns or combinations, and the identical sections **11** brought together to form the strip by the interlocking means described above. End stop blocks such as at **40** in FIG. **1,** one at each end of the strip, tightly clamp the housing sections together via set screws engaging the track as shown at **41.**

The terminal strip of the invention has a number of features which allow its use in applications where unwanted surges of high voltage may have to be withstood without any damage to the interconnection system being provided. Thus, for instance, in making interconnections with this terminal strip in a telephone system junction box, the conductors **20** normally carry only low voltage level signal currents. However, under certain fault conditions in the equipment being interconnected, surges of high voltage (possibly as high as 20 KV or above) may be temporarily impressed on the conductors. Similar problems may occur in data processors or other communications equipment. The disclosed terminal strip assembly can be used in these circumstances of possible high voltage surge without danger of damage either to itself or to components connected thereto. Breakdown of insulation would occur in prior art terminal strips under such conditions.

In the first place, each housing **11** is of a dielectric material and has a cavity depth large enough to permit the application of up to 27 KV DC, under tests actually performed, with no voltage applied to the contact terminals of the adjacent housing section. That is to say, the sets of terminals are spaced apart axially (i. e., along the length axis of track **12**) so that, considering also the isolation provided by the insulating barrier wall **13,** the assembly can withstand high voltage above 20 KV between adjacent cavities. Also, within each housing section the two sets of contact terminals are separated by the barrier formed by wall **14,** and are spaced so as to permit a voltage difference of up to 1,500 volts DC between pairs of posts in one section. Another important aspect for withstanding high voltages is that no metallic parts are used in the assembly except for the contact terminals **16,** which may be of tin plated hard brass. All other elements described above are of insulating material and formed by injection molding, and extrusion molding in the case of track **12** and strips **38, 39.** The insulating material used may be any suitable insulating plastic such as diallyl phthalate or a relatively firm nylon such Ultramid.

The cavities within the various sections **11** require cover members at the top and bottom as seen in FIGS. **1** and **3.** A particularly suitable cover member is shown in perspective in FIG. **2.** It is in the form of a generally flat rectangular bar **50** with a pair of grooves or channels **51** and **52** formed in the outer surface thereof, similar to the previously described grooves. Bar **50** has serrated ends at **53** to provide a surface for good finger gripping as will be described. The bar **50** is dimensioned in length and width to fit in and close the ends of the cavities within housing sections **11,** as seen in FIG. **3,** one cover **50** also being shown in place in FIG. **1** on the rearmost housing section. The cover bars are snapped in place between adjacent main walls **13** and mounted pivotally at both ends in the following manner. The bar **50** has four thin legs depending therefrom, two at each end as at **53** in FIG. **2.** A disc-like lateral projection **54** extends outward at the end of each leg **53** as shown. Sets of four blind holes **55** are formed in each wall member **13** near the covers thereof and on both sides. The holes **55** are located and sized to pivotally receive the disc projections **54** of legs **53.** The covers can be snapped in place one way or rotated 180° since they are symmetrical. Also, access can be had to any cavity to make repairs to the connections either from the top or the bottom, and covers **50** can be pivoted out by hand in the manner shown in FIG. **3,** or the cover may pivot from the opposite end from the one shown at the bottom of FIG. **3.**

The wall **14** has a pair of openings **70** at opposite ends. This permits the use of a commoning or jumper lead **71** between sets of terminals in one cavity where connection patterns so require. The tracking length up to opening **70** between terminal sets is longer than the straight line separation distance, so the voltage difference of 1,500 volts DC can be held despite these openings in the barrier wall. FIG. **3** also shows clip-type connector member **62** coupling lead wires to terminals **16.**

A useful feature is the manner in which two or more of the covers **50** may be "ganged" together to gain access to a set of cavities without the necessity of operating each cover individually. For this purpose the grooves **51** and **52** have been provided. A flat strip **60** similar to previously described strips **38, 39** is dimensioned to fit within either groove **51** or **52.** By simply cutting sections of strip **60** to the appropriate lengths to couple or "gang" desired numbers of covers **50** together, one manual operation of a ganged cover group

can open any number of cavities, such as two, six, etc. Also single covers can be left uncoupled by any strip **60** for individual cavity access where desired. Also, a marker or indicia tape or other position indicating means may be applied to the outside of strip **60**, the same as in the case of numbering indicia carried on strips **38** and **39**.

The invention provides a versatile terminal strip, featuring maximum flexibility for achieving a wide range of connection patterns, an easy access to any contact area internally of the assembly from either end, provisions to give full protection against high voltage surges under circuit faults, paired contact posts to allow a spare if post breakage occurs in a given position, and indicia marking to identify each contact position.

FIG. **5** shows an alternative structure for mounting each housing section **11** in the track **12**. In the embodiment described above, foot **25** was rigid and sections were slipped in at the ends of the tracks. In FIG. **5** the foot of the housing **11** is in the form of two relatively thin plastic legs **81** and **82** of V-shape which have a spring action allowing the housing **11** to be snapped directly into place down over the edges of the track channel. A tool **83** can be used to release a housing **11**.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiment of the invention, which is shown and described herein, is intended as merely illustrative and not as restrictive of the invention.

What is claimed is:

1. An electrical connecting assembly comprising, in combination, a plurality of identical insulating housing members, means for mechanically interlocking said housing members to form a terminal strip of desired length, a plurality of space-partitioning walls carried by each housing member, a plurality of electrical contact posts mounted in and supported by at least one of said partitioning walls, and means to terminate input conductors and output conductors to selected ones of said contact posts, said assembly further comprising end cover means for said housing members, said cover means having a pair of opposed ends and being detachably and pivotally mounted at both ends thereof to the associated housing members.

2. The electrical connecting assembly of claim **1**, and further comprising track means for supporting said housing members in a unitary terminal strip assembly, and end stop means in said track means to clamp said housing members therein.

3. The electrical connecting assembly of claim **1**, and further comprising strip means for ganging together predetermined numbers of said end cover means, and indicia carrying identifying means mounted on said housing members.

4. An electrical connecting assembly comprising, in combination, a plurality of identical insulating housing members, means for mechanically interlocking said housing members to form a terminal strip of desired length, each housing member including a single side wall, a plurality of space-partitioning walls carried by each side wall on one side thereof and extending normal thereto, said space partitioning walls including a pair of perpendicular walls connected at substantially the center of each wall, said pair of walls providing four chambers in said housing, said pair of walls being dimensioned to prevent high voltage arcing between said chambers, a plurality of electrical contact posts mounted in and supported by at least one of said partitioning walls, and means to terminate input conductors and output conductors to selected ones of said contact posts.

5. The electrical connection assembly of claim **4**, and further comprising track means for supporting said housing members in a unitary terminal strip assembly, and end stop means in said track means to clamp said housing members therein.

6. An electrical connecting assembly as set forth in claim **5** wherein said space partitioning walls include a pair of perpendicular walls connected at substantially the center of each wall, said pair of walls providing four chambers in said housing, said pair of walls being dimensioned to prevent high voltage arcing between said chambers.

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