ELECTRICAL TERMINAL BLOCK ASSEMBLY

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Filed Dec. 1, 1965; Ser. No. 73,613

4 Claims. (Cl. 339—190)

This invention relates to connectors and more particularly to electrical terminal or connector block assemblies.

Terminal blocks are well known in the prior art for the purpose of removably interconnecting conductors by means of an internal connector or splice device. Commonly, the internal connector contains at least two sockets which receive plugs which are secured to the conductors to be interconnected. Preferably, the conductors or the plugs should be easily and readily inserted into the connector assembly, and make a secure mechanical and electrical connection therewith without the use of external tools; additionally, the connector or splice should be in the form of a socket which is insulated by its assembly housing, and be easily connected to other connectors in the assembly so that several connectors may thereby be readily commoned or electrically interconnected. It is desirable that the assembly housing be made of one piece construction, and be simply molded without elaborate core pin schemes; and that the connectors be made in a continuous process, such as a strip stamping. It is also desirable that the assembly housing provide a closed entry means for the connectors, that is, that the housing limits the diameter of probes which may be inserted into the connectors, to prevent oversize probes from distorting the connectors.

The prior art already includes several devices which to some degree meet these needs. Several of these devices include connector sockets in a continuous strip. A group of such sockets may be formed in the quantity needed and utilized to common a group of connectors. The commingling strip, however, is outside the assembly housing and is uninsulated. This raises the problem of unintentional shorting or grounding of the conductors. Another type of these devices includes a substantially flat strip which may be cut to length. But this version does not integrally include a complete socket which will mechanically lock to the inserted conductor. Additional structure is required to fill this function.

It is, therefore, an object of this invention to provide a terminal or connector block assembly wherein the connectors may be easily and readily inserted into the insulating housing.

Another object of this invention is to provide an assembly wherein the connectors are provided in a continuous strip, wherein a group of connectors may be cut to length, and the entire cut-off group may be inserted into the housing, with the commingling elements also being insulated by the housing.

Yet another object is to provide a connector in the form of a strip which will mechanically lock to an inserted conductor without the use of external tools.

Still another object is to provide an interlock for terminal block housing which is adapted to interlock with similar housings to completely insulate the included connectors and to form a multilevel connector assembly.

A further object of this invention is to provide an assembly housing which requires no core pins for the molding of the connector receiving body of the housing, and which will provide a closed entry means for the connectors contained therein.

A feature of this invention is a terminal block assembly comprising: an insulating housing having a plurality of contact receiving bores therein, each bore having an opening in its side wall through which a connector may be transversely inserted while concurrently connected to an adjacent connector.

Another feature of this invention is an interlock of a plug with a chord-like shoulder and a socket with a chord-like detent.

Yet another feature of this invention is an end plate which may be clamped to a mounting channel to secure a plurality of housings therein.

These and other objects and features of this invention will become more apparent by reference to the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective exploded rear view of a terminal assembly embodying this invention;
FIG. 2 is a perspective front view of a plurality of terminal housings mounted together;
FIG. 3 is a side view of a terminal housing of FIG. 1;
FIG. 4 is a top cross-sectional view of the terminal housing taken at line 4—4 of FIG. 3;
FIG. 5 is a top cross-sectional view of the terminal housing taken at line 5—5 of FIG. 3;
FIG. 6 is a side cross-sectional view of the terminal housing taken at line 6—6 of FIG. 1;
FIG. 7 is a partial cross-sectional view of the interlock of the housing taken at line 7—7 of FIG. 6;
FIG. 8 is a side view in cross-section of the terminal connector shown in FIG. 1, the section being taken partially along the longitudinal medial axis, and partially through the connector interconnecting strip;
FIG. 9 is an end view of a strip of terminal connectors, such as is shown in FIG. 8;
FIG. 10 is a perspective exploded rear view of a second terminal assembly embodying this invention;
FIG. 11 is a perspective front view of two terminal housings of FIG. 10 mounted together;
FIG. 12 is a top view of the terminal housing of FIG. 10;
FIG. 13 is a side cross-sectional view of the terminal housing taken at line 13—13 of FIG. 10;
FIG. 14 is a perspective view of a core pin diameter in a section taken along the detail of the mold utilized in forming the interlock of the housing shown in FIG. 7;
FIG. 15 shows a first endplate adapted for use with the assembly of FIG. 2; and
FIG. 16 shows a second endplate adapted for use with the assembly of FIG. 2.

As may be seen in FIGS. 1 through 9, the terminal assembly comprises an insulating housing 1 and a plurality of connectors 2. These connectors 2 may be formed in a continuous strip. The connector 2 may have a contact portion 3 formed at one or both ends and a connecting strip 4 joined to the adjacent connector to form the continuous strip, as may be seen in FIG. 9. As is shown in FIG. 8 the contact portion 3 may be formed into a socket, having two axially aligned pairs of opposed arms 5 which are adapted to encircle an inserted pin contact 6. A dimple 7 may be provided in the socket to engage an annular groove 8 or other surface discontinuity in the pin 6. As many connectors 2 as may be desired to be electrically interconnected in the same terminal assembly may be left physically interconnected in strip form by their connecting strips 4.

The insulating housing 1 includes a plurality of horizontally disposed longitudinal bores 9 to receive the connectors 2. Each bore 9 at its ends may have an opening 10 in its wall at the front side of the body; and at its middle has an opening 11 in its wall at the rear side of the body. When a plurality of housings are placed side by side, as shown in FIG. 2, the adjacent walls of the
flanking housings cover the openings 10 and 11 in the walls of the center housing boric, thus insulating the enclosed connectors from those of the flanking housings. The bodies 2 are inserted transversely through rear side wall openings into the boric 9. One end of the connector may first be inserted at an angle into the bore 9 and its end tab 13 hooked behind the adjacent bore wall; then the connector may be pushed fully into the bore and the end tab 13 at the other end may be resiliently snapped into its adjacent bore wall. The bore projections 14 are disposed between and in engagement with the sockets 3 and serve to prevent longitudinal movement of the connector 2 in the bore 9. The end tabs 13 engaging the inner surface of the bore serve to prevent transverse movement of the connector out of the bore.

The rear side of the housing may be undercut between adjacent bores, as at 15, to accommodate the connecting element 4. Thus a plurality of electrically and mechanically connected connectors may be inserted into the housing. Adjacent connectors may be made electrically independent by cutting away the connecting elements 4, to ensure an adequate space between adjacent independent connectors. Any number of bores may be provided in each housing, and any combination of independent and commoned connectors may be inserted into the bores. Under the body 2 of the connector 2 is a restricted entry for the mating pin contacts 6, commonly known as a "closed entry feature" for the connectors 2, it is merely necessary to mold the housing with end openings 10 of smaller transverse dimension than the middle openings 11 and the sockets 3 therein. Where the body 2 is stacked alongside a similar housing or an endplate 12, a complete closed entry means will be provided. Although this closed entry means will not include a rigid and unbroken annulus, it will still provide a satisfactory means for preventing oversize probe insertion.

Since the connectors 2 are transversely inserted through middle openings 11, rather than axially through end openings 10, the end openings can actually be molded to any size and section desired including a closed entry having an unbroken periphery, without being limited by the connector size and section.

Fig. 1 shows the use of a housing with four bores, and two independent pairs of commoned connectors. As seen in Figs. 10 through 13, the housings 101 may be provided with a plurality of vertically disposed longitudinal bores 109. Each bore 109, at its top end, may have an opening 110 in its side wall to the front side of the body, and at its middle, has an opening 111 in its side wall to the rear side of the housing.

The connector 102 for insertion in the vertically bored housing 101 is similar to previously described connector 2 but has a contact or socket 3 at one end only. A horizontal bore connector may be converted into a vertical bore connector by cutting off one socket 3, as at point A on Fig. 8.

The vertical bore connector 102 is transversely inserted into the bore 109 through the side wall opening 111. The connector 102 may be inserted at an angle so that vertical tab 115 passes into the bore 109 and engages the inner surface of the bore, and then the connector is pushed completely into the bore with end tab 13 being snapped into the bore. The rear side of the housing is undercut between adjacent bores, as at 115, to accommodate the connecting element 4. The bore projection 114 is disposed between the socket 3, and serves to prevent downward longitudinal movement of the connector in the bore; while connecting element 4 engages the undercut and serves to prevent upward longitudinal movement. The end tab 13 and vertical tab 113 engaging the inner surface of the bore serve to prevent transverse movement of the connector out of the bore.

The housings may be provided with a mutual interlock comprising a pin 21 of circular cross-section having two shoulders 22 formed therein by opposed chord flats 23; and a mating socket 24 of circular cross-section having two detents formed therein by opposed chord-rips 25. The body 2 of the connector 2 is molded in a mold 26. The core pin 32 is molded in a mold 27. The core pin 26 is formed of rod stock. The rod forms the socket 24, while two notches 28 cut into the rod form the two plastic ribs 25 in the socket. The end of the rod 26 has two flats 29 milled therein perpendicularly to the two notches 28; the plastic is excluded from the volume occupied by remaining section of the rod, and the absence of plastic resulting from the mating of the flatted pin and the mold forms the void providing the chord flats 23 with their shoulders 22.

It will be seen that by this design and method of molding, the entire housing can be molded in an economical two piece or "printing-line" mold; two simple core pins being used to form the interlock means. By the use of connector receiving bores having side openings, no side pull core pins are necessary to form the bores, the cope and drag of the mold itselfs having projections to form the sides 1 to provide the interlock. If used in a manner as above described, the flats 23 can be formed as part of the molding operation, without any need for more elaborate milling operations.

The housings may be disposed in a standard channel 17 shown in dotted lines, legs 18 being provided for this purpose; see Fig. 2.

The plurality of housings may be secured in the channel by a suitable end plate which will also cover the bore side wall openings 10 and 11 in the outermost housings. Fig. 15 illustrates an end plate 151 having a pair of legs 152 for insertion in channel 17. A cam 153 with a handle 154 is pivoted at 155 to plate 151, and on being rotated is adapted to press on the base of channel 17 or to dig into it and to clamp legs 152 to the underside of the channel.

A second embodiment of an endplate is shown in Fig. 16. An upper member 161 is slidably mounted to a lower member 162 having legs 163. A draw screw 164 is adapted to draw the two members together, clamping them to channel 17.

If it is so desired, channel arms 19, as shown in dotted lines in Fig. 1, may be formed on top of each housing 2 to permit vertical stacking of the housings. Suitable cross strips (not shown) may be provided through araches 20 and the top-most arms 19, to maintain the rigidity of the groups.

Further, if it is so desired, horizontally and vertically bored housings may be intermixed and interlocked together, since the housings can be made with standardized outer dimensions and mutual interlocks. Although adjacent intermixed housings may not provide a complete cover for each other's side openings, the side walls space the adjacent connectors apart and prevent unintentional connecting between the connectors of adjacent intermixed housings.

We claim:

1. A terminal block assembly, comprising: a one-piece insulating housing having a first longitudinally extending groove of given length in one side thereof forming a pair of insulated spaced-apart opposed end walls; a second longitudinally extending groove in said housing axially aligned with but facing in a direction opposite to said first groove and axially extending through one edge of said housing; one of said end walls of said first groove having an opening therethrough forming a connector-engaging recess for said connector, and for said first groove from said second groove; the other of said end walls having a connector-engaging recess therein; a one-
piece electrical connector adapted to be transversely inserted into said first groove, including a longitudinally extending base portion of substantially said given length adapted to be electrically connected to an external circuit and having a pair of transversely extending arm portions forming a split-sleeve electrical socket contact proximate one end thereof; said base portion including longitudinally extending resilient tab subportions at each end thereof adapted to engage said end wall recesses to interlock said connector to said housing.

2. A terminal block assembly according to claim 1 further including a plurality of said spaced-apart first and second grooves disposed in substantially parallel side-by-side relation in said housing, wherein a plurality of said electrical connectors are provided and are interconnected by transversely extending integral interconnecting subportions extending from the base portions of said connectors, and said housing is provided with notches between said plurality of grooves to receive said interconnecting subportions.

3. The terminal block assembly of claim 1, wherein: said connector includes an additional pair of transversely extending arm portions forming another split-sleeve socket proximate the other end of said connector base portion; said housing includes a third longitudinally extending groove axially aligned with said first groove at the said other end thereof and axially extending through an edge of said housing; and said other end wall of said first groove includes an opening therethrough providing axial access from said third groove to said first groove.

4. The terminal block assembly of claim 1, wherein: the sides of said housing are shaped to mate with other identical blocks in intimate side-by-side relationship, and said housing includes at least one interlocking recession on one side thereof and one interlocking recess on the other side thereof adapted to interlock with the projection of a mating housing.

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