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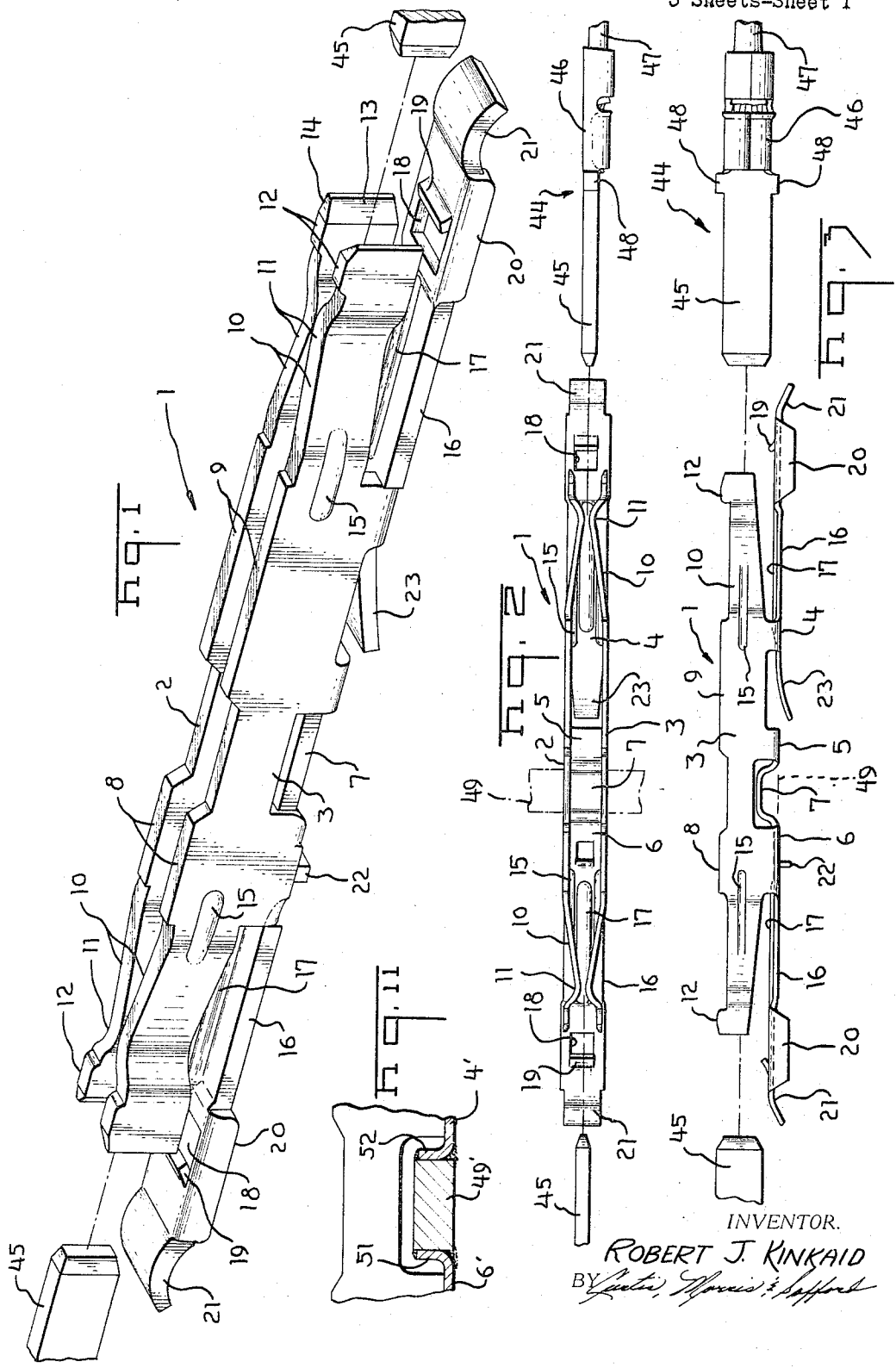
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3,346,834

FEED-THRU CONNECTOR

Filed Oct. 20, 1964

3 Sheets-Sheet 1



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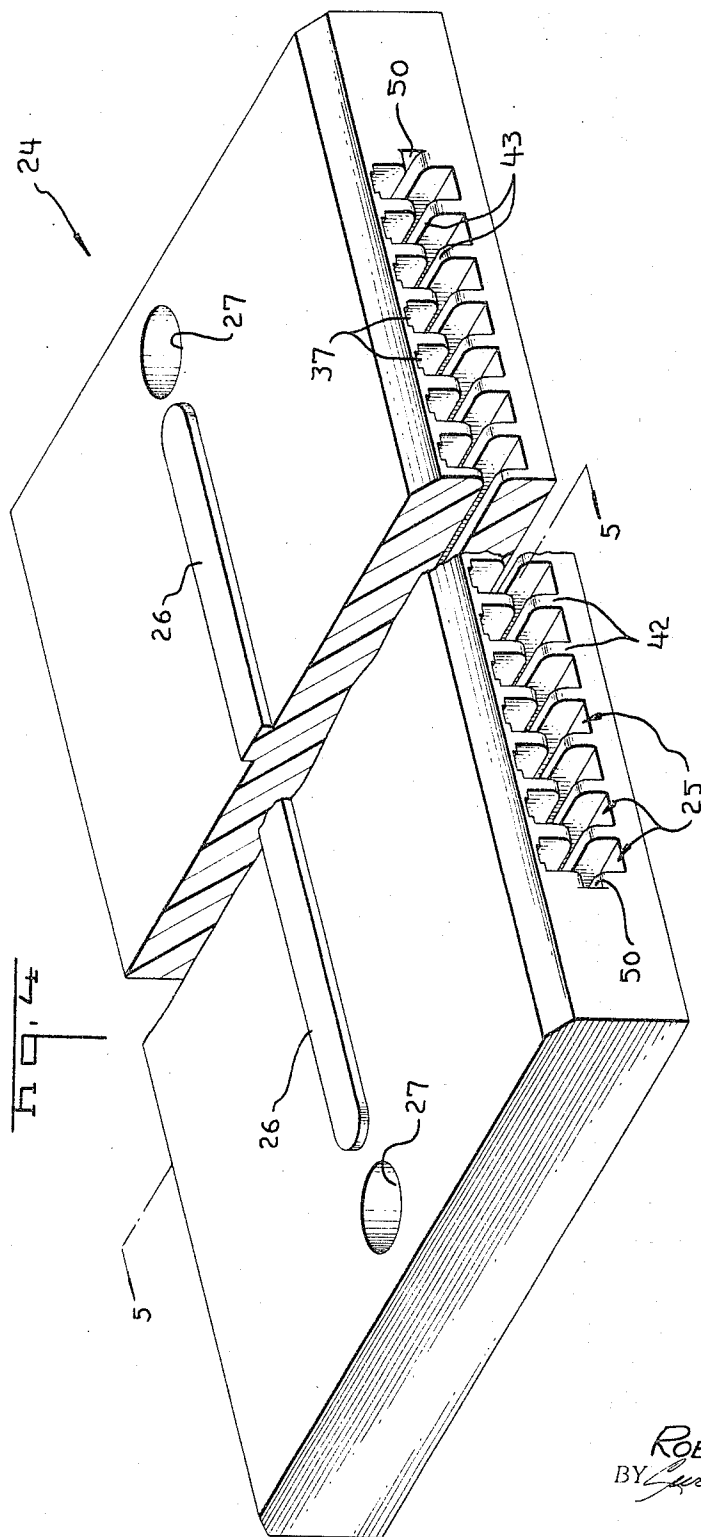
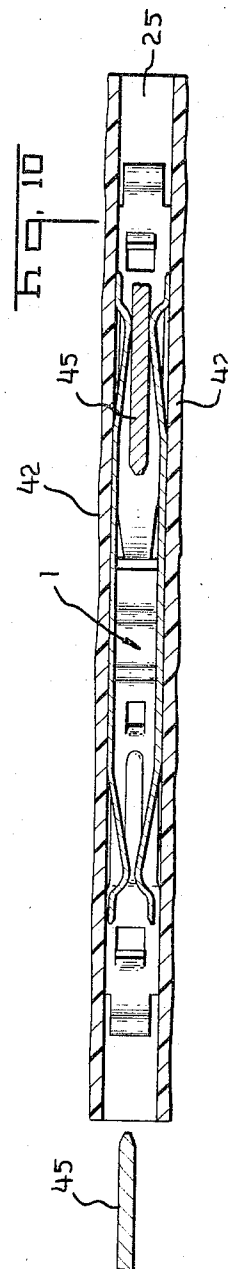
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3 Sheets-Sheet 2



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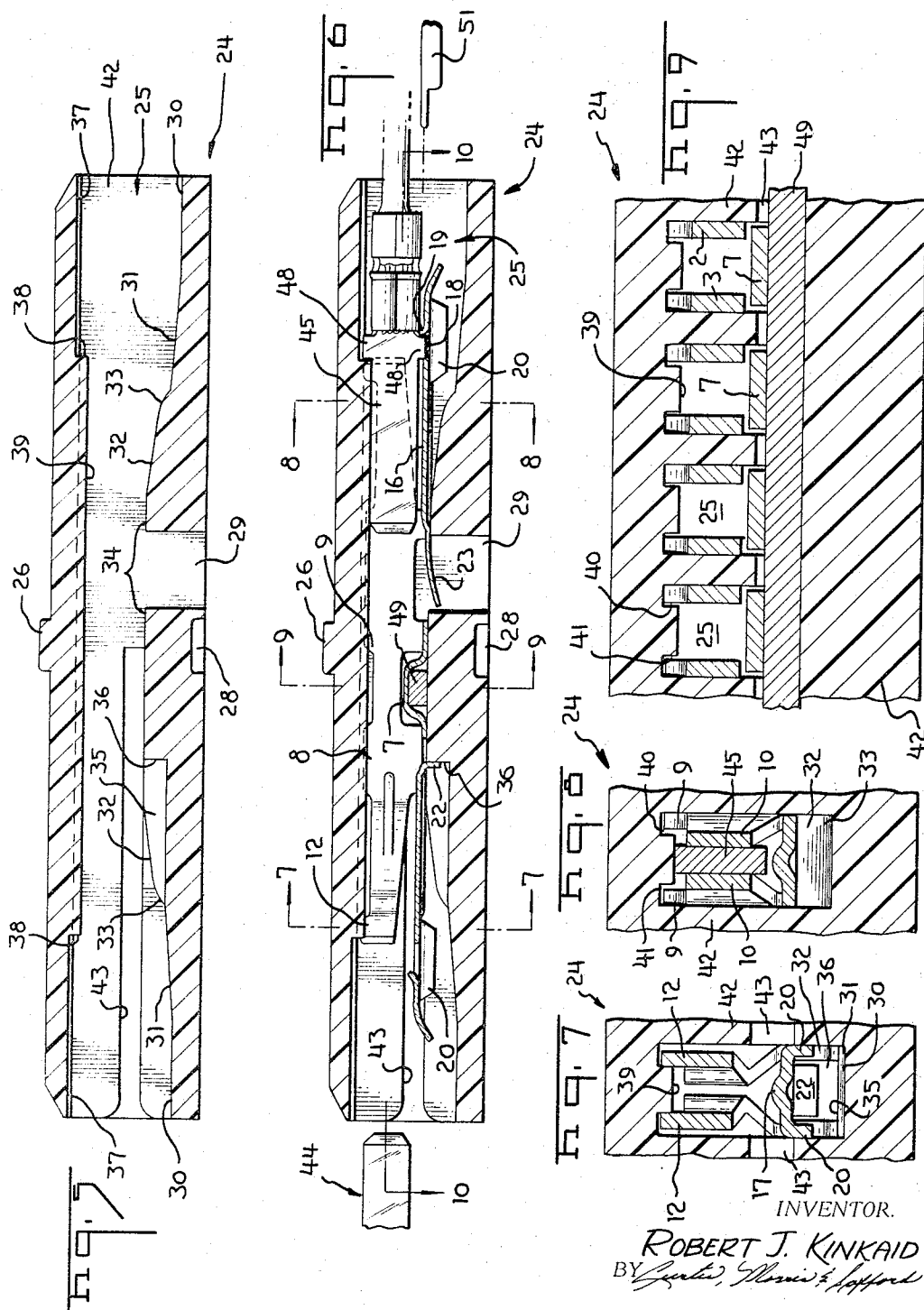
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FEED-THRU CONNECTOR

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3,346,834

## FEED-THRU CONNECTOR

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6 Claims. (Cl. 339-217)

This invention relates to electrical connectors and particularly electrical connectors of the type to receive electrical terminal means to electrically interconnect same.

Heretofore, feed-thru connectors which are used in the electrical field have been either simple or complex. In the case of simple feed-thru connectors, they are generally provided with such excessive retentive spring force that it is difficult to insert a terminal member therein, and, if the spring retentive forces is obtained via the mounting means, the spring retentive force varies in accordance with ambient environmental conditions as well as creepage if the block is made of plastic material as most are. If the feed-thru connector is complex, then the most important drawback in this case is that of cost.

It is, therefore, an object of the present invention to provide a feed-thru connector which can be economically manufactured and assembled, and which is extremely reliable and efficient in operation and enables the connection between at least two wires to be readily made.

Another object of the present invention is to provide a feed-thru connector which has a positive spring tab-locking feature.

A further object of the present invention is the provision of a feed-thru connector wherein the tab after being locked therein can be removed only by means of a tool which is a safety factor.

An additional object of the present invention is to provide a feed-thru connector which includes a common bus to common as many feed-thru connectors as desired.

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 are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration and principles thereof and the manner of applying them in practical use so that they may modify them in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIGURE 1 is a perspective view of a feed-thru connector with partial sections of tab members exploded therefrom;

FIGURE 2 is a top plan view of the feed-thru connector of FIGURE 1;

FIGURE 3 is a side elevational view of the feed-thru connector of FIGURE 1;

FIGURE 4 is a fragmentary perspective view of a housing or mounting member for the feed-thru connector of FIGURE 1;

FIGURE 5 is a cross-sectional view taken along lines 5-5 of FIGURE 4;

FIGURE 6 is a view similar to that of FIGURE 5 but showing the feed-thru connector disposed within the housing;

FIGURE 7 is a view taken along lines 7-7 of FIGURE 6;

FIGURE 8 is a view taken along lines 8-8 of FIGURE 6;

FIGURE 9 is a view taken along lines 9-9 of FIGURE 6;

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FIGURE 10 is a view taken along lines 10-10 of FIGURE 6; and

FIGURE 11 is a partial cross-sectional view of an alternative embodiment.

Turning now to the drawings and in particular FIGURES 1-3, there is shown a feed-thru connector 1. The connector is susceptible to mass production by automatic machinery and is conveniently formed by shaping a sheet metal blank or strip of a suitable electrically-conductive material, such as, brass, bronze, or the like, in successive forming steps. The metal is sufficiently hard and resilient to impart to the connection area a spring-like characteristic.

Connector 1 comprises side sections 2 and 3 which are connected by bight sections 4, 5 and 6. An inwardly-directed U-shaped section 7 is disposed between bight sections 5 and 6. As can be discerned, each side section has the same configuration so that it will be necessary to describe only one thereof.

Side section 3 includes projections 8 and 9 extending outwardly from the top thereof. A tine member 10 extends outwardly from each end of side member 3. Each tine member 10 includes an inwardly-curved portion 11 and an extension 12 extending outwardly from the top surface thereof on the free end thereof. Bevel surfaces 13 and 14 are located respectively on the inner surface of the free end of tine member 10 and the outer top end of extension 12.

As can be discerned, curved portions 11 of opposing tine members 10 approach each other but do not contact each other. Opposing tine members 10 and the curved portions 11 thereof, therefore, define a tab-receiving area. A recess 15 is disposed in each end of each side section and extends into each tine member 10. Recesses 15 provide strength for the tine members and impart thereto additional spring characteristics.

Extending outwardly from each bight section 4 and 6 is a spring tab-lock member 16 identical in configuration. Each tab-lock member 16 includes an inwardly-directed recess 17 which imparts strength thereto and an opening 18 disposed outwardly from recess 17. The outer end of opening 18 includes an upwardly-directed section 19, the purpose of which will be described hereinbelow. Lugs 20 are disposed on each side of tab-lock member 16 adjacent opening 18 and extend outwardly therefrom. The free end of tab-lock member 16 has a downwardly curved portion 21. A struck-out portion 22 located in bight section 6 extends downwardly therefrom in a substantially normal direction. A locking-lance member 23 is disposed between bight sections 4 and 5 and extends downwardly therefrom in a curved manner.

Turning now to FIGURES 4-10, there is shown a mounting block or housing 24 for the feed-thru connector or connectors 1 illustrated in FIGURES 1-3. Mounting block 24 is made from a suitable insulating material such as, for example, nylon, diallyl phthalate, Bakelite, or the like. Mounting block 24 includes a series of parallel openings 25 extending therethrough, a keying projection 26 extending outwardly from one surface of the mounting block, mounting holes 27 extending therethrough and a recess 28 located in the other surface in diametrical relationship to that of keying projection 26. Other openings 29 extend into mounting block 24 in a direction normal to that of openings 25 and are in communication with respective openings 25.

The bottom surface of each opening 25, as shown by FIGURES 5 and 6, has the same configuration on each side of opening 29, that is, at the right-hand entrance of opening 25, there is provided a flat surface 30 which connects with a slightly inclined surface 31 which merges

into another inclined surface 32 having more of an inclination than that of surface 31. Between surfaces 31 and 32, there is a slightly curved section 33. Inclined surfaces 32 on each side of opening 29 merge into a flat surface 34 which is parallel to the axis of opening 25. On the left-hand side of opening 29, a channel 35 extends from the junction of surfaces 31 and 32, within surface 32 and terminates at an abutting surface 36 located in surface 34.

A channel 37 is located in the top surface of each opening 25. Each channel 37 extends from its respective end of opening 25 to surface 38 at which point it terminates. Each of surfaces 38 merges into a flat surface 39 which is parallel to that of flat surface 34 but spaced therefrom. Channels 40 and 41 are disposed in flat surface 39 and extend between surfaces 38. Separating walls 42 are disposed in mounting block 24 in order to separate each opening 25 with respect to the other openings thereof. A channel 43 is disposed in each wall 42 and terminates midway of the mounting block 24. The opposing sides to the entrance of each channel 43 are preferably rounded as indicated in FIGURES 4-6.

In assembly, feed-thru connectors 1 are disposed within respective openings 25 of mounting block 24. This is accomplished by inserting the feed-thru connector into its respective opening 25 from the left end, as shown in FIGURES 5 and 6, toward the right end of the mounting block. Thus, with connector 1 disposed so that locking-lance member 23 precedes downwardly-directed portion 22 within opening 25, the feed-thru connector is then inserted within its opening. After the feed-thru connector has been inserted within its opening 25, as shown in FIGURE 6, locking-lance member 23 is disposed in opening 29 and downwardly-directed portion 22 is in engagement with surface 36, thereby locking the feed-thru connector within mounting block 24. Projections 8 and 9 of side section 2 are disposed in channel 41 and projections 8 and 9 of side section 3 are disposed in channel 40. These projections and channels stabilize the side sections within opening 25 of the mounting block. Extensions 12 of tine members 10 are disposed respectively in channels 40 and 41. This stabilizes the free ends of the tine members within openings of the mounting block. Now that the feed-thru connectors are disposed in their respective openings of mounting block 24, they are ready to receive tab members 44 within the tab-engaging area.

As shown in FIGURES 2 and 3, each tab member 44 includes a flat section 45 which is of rectangular configuration. A conductor-receiving section 46 extends outwardly from flat section 45. Conductor-receiving section 46 preferably includes a conductor ferrule section in which the conductor of insulated conductor means 47 is crimped and an insulation-receiving section in which the insulation of conductor means 47 is crimped. Of course, conductor means 47 may be secured to tab member 44 in any other well-known manner, such as, by soldering, welding, etc. The sides and ends of the free end of flat section 45 are preferably beveled in order to facilitate the insertion of tab member 44 within the tab-engaging area between tab members 10. Lugs 48 extend outwardly from the ends of flat section 45 adjacent conductor-receiving section 46.

Upon insertion of a tab member 45 into the tab-receiving area of the feed-thru connector 1, the top edge of flat section 45 engages flat surface 39 and the sides of flat section 45 frictionally engage the inwardly-curved sections 11 of tine members 10 until bottom lug 48 comes into contact with downwardly-curved portion 21 of member 16. Upon the tab member being pushed further within the tab-receiving area of feed-thru connector 1 and within opening 25, bottom lug 48 rides along downwardly-curved portion 21 and upwardly-directed section 19 until bottom lug 48 is disposed within opening 18 while top lug 48 abuts against surface 38. The action of the top edge of flat section 45 engaging flat surface 39 and bottom lug 48 riding along downwardly-curved portion 21 and upwardly-

directed section 19 is a camming action causing member 16 to be bent about its pivot point toward surfaces 30, 31 and 32. Downwardly-directed lugs 20 engage inclined surface 31 if member 16 is flexed too far, thereby preventing overstressing member 16.

Thus, as a result of the spring characteristics of member 16, the top edge of upwardly-directed section 19 engages the rear edge of bottom lug 48, this lug is then in position within opening 18 and the top edge of flat section 45 is in engagement with flat surface 39, thereby effectively locking the tab member within the tab-engaging area between tine members 10 of the feed-thru connector. As can be discerned, top lug 48 engages surface 38 and bottom lug 48 is disposed within opening 18 in order to limit the inner movement of the tab member within opening 25 and the tab-engaging area of the feed-thru connector.

From the foregoing, it can be discerned that there has been provided a unique feed-thru connector which is adapted to be secured in an opening of a mounting member, and the feed-thru connector has a tab-receiving area in which a tab member is limited in its movement thereinto, as well as being effectively locked in a positive manner thereon.

It should be pointed out that the free ends of tine member 10, when flat section 45 of the tab member is disposed therein, engage the sides of openings 25 within channels 40 and 41, thereby causing the tine members to be biased toward one another in order to frictionally engage section 45. This provides an excellent mechanical and electrical connection.

While it is possible to dispose a single feed-thru connector member within an opening 25 of a mounting member 24, it is also possible to provide a series of openings 25 within mounting member 24 in parallel relationship, as illustrated in FIGURE 4, and as disclosed hereinabove, in order to dispose a feed-thru connector 1 within respective openings 25 thereof so that tab members 44 and their respective conductor means 47 may be individually interconnected within a respective feed-thru connector 1. It is also possible to interconnect any number of feed-thru connectors 1 within mounting member 24. This is accomplished by affixing to U-shaped sections 7 of feed-thru connectors 1 a conductive strip 49 which may be secured to U-shaped sections 7, as by soldering, welding, etc. Conductive strip 49 is naturally affixed to U-shaped sections 7 of the feed-thru connectors before the selected number of feed-thru connectors affixed to conductive strip 49 are inserted within respective openings 25 of mounting member 24. A group of feed-thru connectors 1 affixed to conductive strip 49 can be inserted within mounting member 24 because the portion of conductive strip 49 between feed-thru connectors 1 is readily received within channels 43. Thus, it is important that feed-thru connectors 1 are properly spaced along conductive strip 49 when they are affixed thereto. Each end of mounting block 24 has a channel 50 disposed therein which is in communication with opening 25 adjacent thereto in order to receive therein the overhanging portion of conductive strip 49. This overhanging portion of conductive strip 49 which is to fit within channels 50 is important because it allows a small amount of latitude when affixing the outermost feed-thru connectors to the conductive strip. Thus, as can be discerned, any number or all of the feed-thru connectors within mounting block 24 may be commoned.

After tab members 44 have been inserted within the tab-engaging area of the feed-thru connector 1 and positively locked therein, they may be removed from the locked position within the feed-thru connector by means of a tool member 51, as illustrated in FIGURE 6. Tool member 51 is inserted within an opening 25 into engagement with downwardly inclined portion 21 of member 16 in order to pivot member 16 in a downward direction with lugs 20 coming into contact with surface 31 which limits its downward movement. This causes upwardly-directed section 19 to be moved out of engagement with the back

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part of bottom lug 48 so that tab member 44 can be removed from the tab-engaging area of the feed-thru connector and out of the mounting block. It should be pointed out that once the tab member has been inserted within the opening of the mounting block, the entire feed-thru connector and every conductive part of the tab member are completely insulated by the mounting block. In view of the fact that lug members 48 are located on each edge of the tab member, it is possible to insert the tab member in either direction within the tab-receiving area of the feed-thru connector, thereby eliminating any orientating or polarizing concept. Moreover, since the tab member can only be removed by means of a tool member, this is a safety factor.

Another mounting block similar to that of mounting block 24 may be mounted on the top or bottom of mounting block 24 via keying projection 26 or recess 28. Thus, as many blocks as desired may be mounted in stacked relationship. Alternatively, mounting block 24 may be formed with rows of aligned openings 25 instead of a single row, and the openings may be disposed in a direction normal to that shown by the openings in FIGURE 4 so that the vertically aligned openings may provide a common connection between the feed-thru connectors therein instead of providing a common connection between a longitudinal alignment of feed-thru connectors.

FIGURE 11 illustrates an alternative configuration within the feed-thru connector in which conductive strip 49' is secured. Legs 51, 52 extend outwardly from bight sections 4' and 6' and the free ends of legs 51, 52 are welded to conductive strip 49'. This allows a larger conductive strip to be used, thereby providing a larger current-carrying capacity.

From the foregoing, there has been disclosed a unique feed-thru connector means which is adapted to be mounted within a mounting member and in which tab member means are positively locked for interconnection therebetween.

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

What is claimed is:

1. In an electrical connector, the combination of an insulating housing having opening means therein, said opening means having spaced locking surfaces, contact means in said opening means comprising side section means connected by other section means, locking means extending outwardly from said other section means and in engagement with said locking surfaces to lock said contact means in said opening means, tine means extending outwardly from said side section means toward an entrance means of said opening means and including inwardly-directed sections defining tab-engaging means for receiving a tab means in electrical engagement therewith, and spring tab-lock means extending outwardly from said other section means and along said tine means, said tab-lock means being in spaced relationship with respect to said tine means and extending toward said entrance means

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of said opening means for engaging said tab means to lock same within said tab-engaging means.

2. In an electrical connector according to claim 1 wherein said opening means includes channels in surface means opposite the surface means containing said spaced locking surfaces, projections on said side section means and extensions on said tine means disposed within said channels to stabilize said side section means and said tine means in said opening means.

3. In an electrical connector according to claim 1 wherein said opening means includes means to limit the movement of said tab means within said tab-engaging means and said opening means.

4. In an electrical connector according to claim 1 wherein said tab-lock means includes lug means for engagement with a surface in said opening means to prevent overstressing said tab-lock means.

5. In an electrical connector according to claim 1 wherein said housing has a channel means in communication with said opening means, conductive strip means in said channel means and affixed to some or all of said contact means.

6. An electrical connector comprising, in combination, a dielectric housing and an electrical terminal, said housing having at least one opening extending therethrough, said opening having spaced stop areas, said electrical terminal being disposed in said opening, means on said electrical terminal and in engagement with said stop areas positioning said electrical terminal within said opening, said electrical terminal having side sections connected together by a bight section defining a U-shape, opposing spring members extending outwardly from said side sections toward each entrance of said opening and including inwardly-directed sections defining contact-receiving areas in which contact means are electrically receivable, spring-locking members extending outwardly from said bight toward each entrance, said spring-locking members extending along and being spaced from respective ones of said spring members, said spring-locking members engageable with the contact means when said contact means are disposed in said contact-receiving areas thereby locking said contact means therein, and means on said spring members and in said opening stabilizing said spring members.

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