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PLUG-IN TERMINAL BOARD

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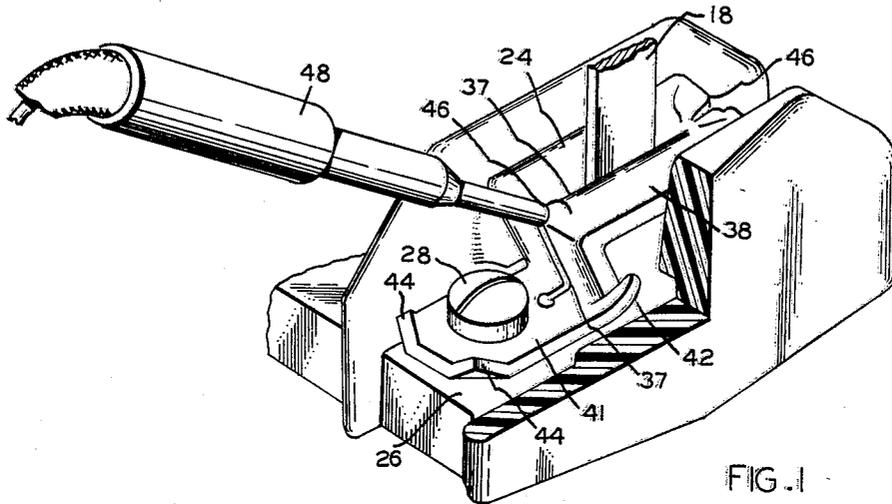


FIG. 1

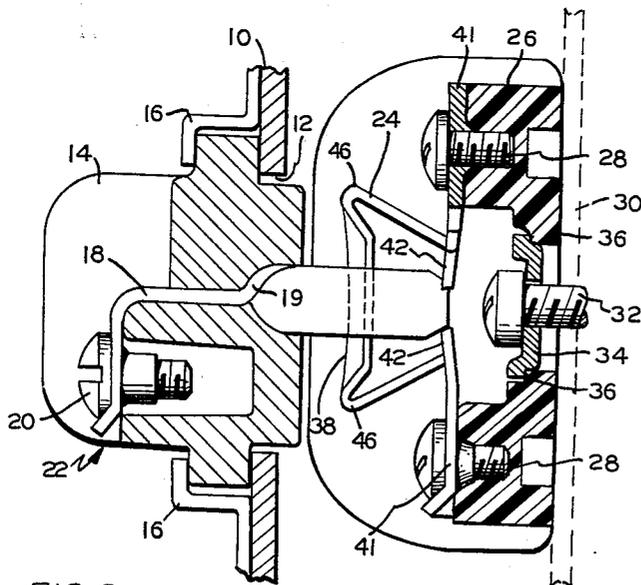


FIG. 2

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PLUG-IN TERMINAL BOARD

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The present invention relates to plug-in connectors for terminal boards having a funnel-shaped receptacle for a male electrical connector that is received by a self-aligning female unit. The invention has more particular reference to an improved plug-in type terminal board in which there is combined a terminal strip and a plug-in strip in the same unit. Basically, the present invention provides a new and improved electrical wire terminal arrangement with a plug-in feature for quick-disconnect or connect operation without the use of ancillary tools.

Additionally, the present invention further relates to providing a feature that includes two electrical test-jack positions used for inserting a common and standard test prod commonly used in electronic and electrical connections for testing of electrical characteristics.

It has been found that it is useful to provide as a single unit the combination of a terminal strip and a plug-in strip within a common unit. So far as is known this has never been accomplished as a practical matter because of the known intricacy of the manufacture of the pieces that comprise such a combination, together with the detailed tooling that is required in such manufacture. It is also an object of the invention to provide a single piece female metal part having terminal connections at each end of the part for forming an electrical juncture, and a funnel-shaped receptacle of the female metal part for reception of a male connector.

It is a further object of the invention to provide test-jack openings or points at end portions of the female metal part of the plug-in connector.

A further object of the invention is to provide a female metal part that is completely self-aligning with a male connector, and will yet allow a considerable amount of misalignment between the male connector and the female metal part without any substantial malfunction thereof.

The female metal part forming a connector is so arranged as to continuously exert a constant pressure upon a male connector that is received within the female metal part, regardless of any change in position of or the angle of approach from which the male connector may be applied thereto.

A further object of the invention is to provide a female metal part arranged to be self-cleaning and also to have a tendency to burnish and clean the male connector.

It is still another object of the invention to provide a one-piece male connector that may be provided with a single terminal that may be made with a double screw connection. It is a still further object of the invention to provide a terminal plug-in disconnect arrangement that comprises a multiple arrangement of knife switches that are arranged for terminal connections and include allowances for misalignment and allowances for other normal abuses that are found to be common in use of such components.

A complete understanding of the invention may be had from the following description of a particular embodiment of the invention. In the description, reference is made to the accompanying drawings of which:

FIG. 1 is a perspective view having a portion thereof broken away to show the details of a preferred embodiment of the present invention, including the application of a test prod thereto;

FIG. 2 is a cross-sectional view of the female metal

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part receiving a male connector in accordance with the preferred embodiment shown in FIG. 1.

Referring now to the figures, there is shown a terminal chassis or board 10 having a longitudinal opening 12 therein for receiving and mounting a male block 14 that is secured to the terminal board by brackets or straps 16, 16. The male block 14 may be constructed of a molded phenolic material and may be constructed in multiples of as many connectors that are to be used. A male terminal or connector 18 is constructed of metal and is molded or set in the male block at the time of molding thereof, or it may be inserted therein afterwards. The preferred form of the invention shows a 90° turn 19 in the male connector within the male block to secure the connector 18 within the block. At one end of the male connector 18 there is provided a screw 20 that may engage any wiring (not shown) that is to be used in providing an electrical connection through the terminal board. The other end of the male connector 18 is substantially spade-shaped so that the surfaces thereof provide substantial contact surfaces for and with engaging members.

The male block together with the male connector form a wire terminal or male unit 22. The male unit 22 may be used wherever multiple channel coupling is to be used, particularly where many connectors are needed or practical and comprise the multiple connectors of the male unit. One example of a male unit has eight male blocks in accordance with a preferred embodiment of the invention. The male connector 18 of the male unit engages or plugs into a funnel shaped, self-aligning female metal part 24 having the ends thereof secured to a female unit 26 by screws 28, 28. The female unit may be mounted upon a plate 30 shown in dotted lines by a screw 32. A plate 34 may be formed separately of a female unit so that the female unit may slide laterally along the plate when the screw is loosened, which allows the plate 34 to slide along shoulders 36, 36 of the female unit.

The female metal part uses a principle of the torsion spring to exert substantially constant pressure upon the male member that may be engaged therein. Although the exerting force is nominal, the tension built up is considerable, making it possible to obtain an electrically leak-proof connection without unnecessary externally applied forces. The female metal part is essentially constructed from a flat piece of metal having a slit 37 extending along the longitudinal center thereof without being extended to the screws 28, 28. The flat metal piece is then bent into a zig-zag piece or what may be called a shape similar to a cross-section of a hat. The portion forming the upper central area 38 along the slit 37 is folded or restrained downwardly to form a funnel-shaped receptacle for a male connector 18. On each side of the base portions 41, 41 forming the female metal part 24, there are retention tines 42, 42 which provide a spring tension or retention feature, and they necessitate that the male connector be forced into position. The tines tend to restrain or maintain the male connector in place. The retention tines 42, 42 urge the central area 38 into substantial close proximity to each other so that there is a wiping action also achieved upon the male connector as it is inserted into the female metal part.

Ends or corners 44 of the metal female part may be upwardly contoured to receive and maintain in place a metal wire or other connecting element (not shown).

At the ends of the central area 38 are test-jack recesses or openings 46, 46 in which may be inserted a test prod 48.

The female unit is also constructed of molded phenolic plastic material and is so constructed that it may receive the female metal parts after it has been molded.

The mounting plate 34 is used to mount the female unit with its female metal parts in any one of the several

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positions directly below each female metal part. Two or more screws 32 may be used to engage the mounting plate 34 securely against the shoulders 36, 36 of the female unit.

The plug-in connector formed of a funnel-shaped receptacle for the male connector and providing the self-aligning feature in the female unit is particularly useful for electronic and electrical door or panel mounted meters, amplifiers, instruments, printed circuit units, or other apparatus where quick-connect or disconnect operations are required for service, replacement or inspection. The features contained in the metal parts forming the male and female connectors or metal parts, respectively, are useful as low cost knife switches.

The entire assembly is quite compact, and provides for mounting the units in any position where plug-in connector terminals may be required, the space saving feature being that the connector terminal combination itself requires very little space over that required for a common terminal block only. The same general design of a terminal block connector arrangement may also be used in a solder-lug design instead of typical screw connections.

It has been observed in view of the trends toward modular constructions of electrical and electronic components and apparatus that a unit of this type is particularly useful in the facilitation of assembly and disassembly of component units. It is therefore possible to service interior parts of component apparatus with a minimum amount of time required for assembly, disassembly and/or replacement.

Because of the construction of the substantially upwardly extending sides of the female metal parts, it is apparent that a certain amount of lateral displacement may be provided for making allowances of misalignment as male connectors may be applied or extended to connect with the female metal parts of the female metal units.

It should be understood that the specific apparatus herein illustrated and described is intended to be representative only, as many changes may be made therein without departing from the clear teachings of the invention. Accordingly, reference should be made to the following claims in determining the complete scope of the invention.

What is claimed is:

1. A plug-in terminal connector comprising a slotted, funnel-shaped metal part having a central area and sides forming downwardly extending folded portions with outwardly folded mounting portions, the slot thereof extending along the center of the metal part substantially from one mounting portion to the other, the funnel-shaped metal part providing a self-aligning characteristic thereto with a male plug when applied thereto, a plurality of retention tines extending from the mounting portions and located to engage portions of the connector formed by said slot and to maintain tension thereon when the male plug is inserted in said slot, said mounting portions being secured by retaining means to a base member, and a molding for substantially enclosing the metal part.

2. The plug-in terminal connector of claim 1 wherein a recess is positioned at the ends of the funnel-shaped portion of the metal part for receiving a test-jack while the plug-in terminal connector is in its normal operating position.

3. A plug-in terminal connector comprising a slotted, funnel shaped metal part having a central area and sides forming downwardly extending folded portions with out-

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wardly folded mounting portions, the slot thereof extending along the center of the metal part substantially from one mounting portion to the other forming the central area into two components and the funnel-shaped metal part providing a self-aligning characteristic thereto with a male plug when applied thereto, a plurality of retention tines extending from the mounting portions and located to engage said central area components to maintain tension thereon when the male plug is applied thereto said mounting portions having means by which they are secured to a base member, and molding for substantially enclosing the metal part.

4. The plug-in terminal connector of claim 3 wherein a recess is positioned at the ends of the funnel shaped portion of the metal part and the arrangement being such that a test probe can be inserted in said recess while the plug-in terminal connector is in its normal operative position.

5. A plug-in terminal connector comprising a slotted, funnel shaped metal part having sides forming downwardly extending folded portions with outwardly folded mounting portions, the slot thereof extending along the center of the metal part substantially from one mounting portion to the other and the funnel-shaped metal part providing a self-aligning characteristic thereto when a male plug is applied thereto, and a plurality of retention tines extending from the mounting portions and located to engage portions of the metal part forming the slot and maintain tension thereon when said male plug is inserted therein.

6. A plug-in terminal connector comprising a slotted funnel shaped metal part having a central area and sides forming downwardly extending folded portions with outwardly folded mounting portions, the slot thereof extending along the center of the metal part substantially from one mounting portion to the other and forming components of the central area, a plurality of retention tines extending from the mounting portions located to engage the sides of the metal part forming the slot to maintain tension upon the components of the central area, a base member, said mounting portions having holes by which they are secured by screws to said base member, a molding for substantially enclosing the metal part, and a recess positioned at the ends of the funnel shaped portion of the metal part for receiving a test-jack while the plug-in terminal connector is in its normal operating position.

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