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MOUNTED ELECTRICAL CONNECTOR

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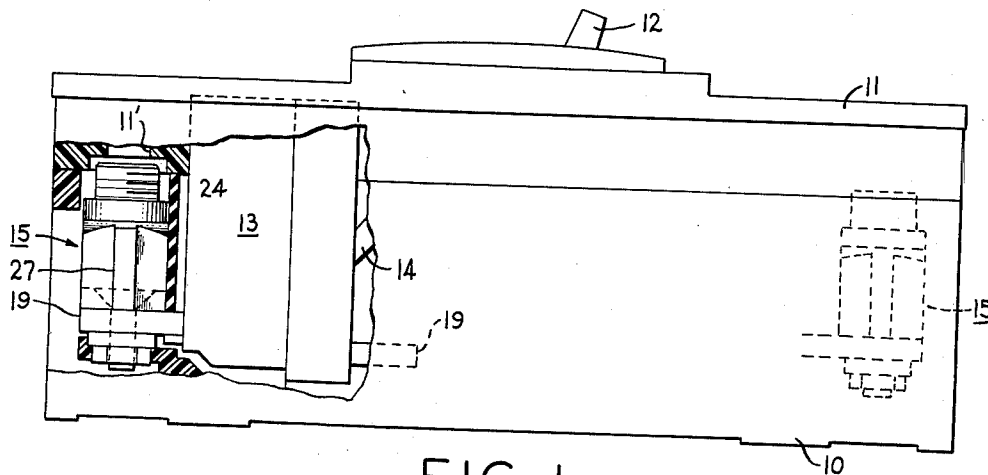


FIG. 1

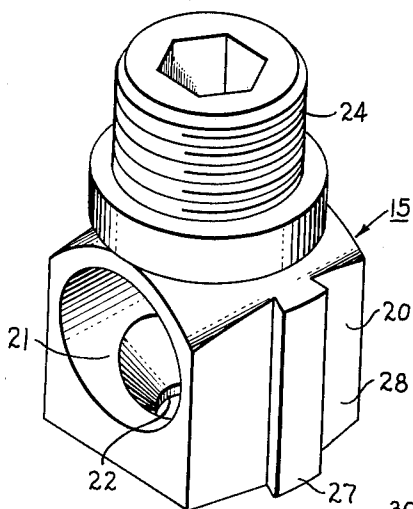


FIG. 3

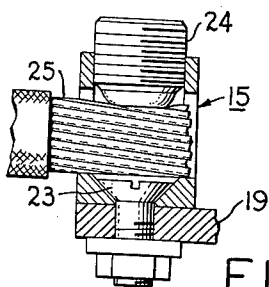


FIG. 4

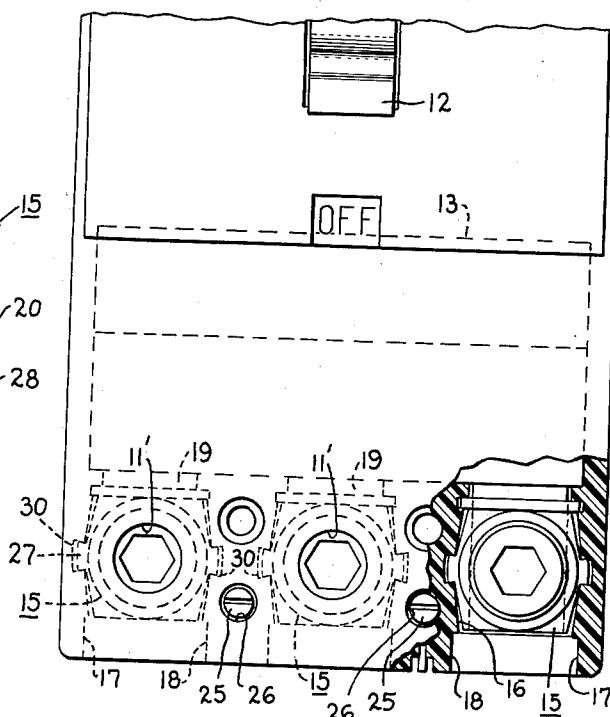


FIG. 2

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MOUNTED ELECTRICAL CONNECTOR

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5 Claims. (Cl. 339-150)

My invention relates to electrical conductor connecting structures, and particularly to electrical connectors which are mounted in or closely surrounded by insulating material.

In many electrical applications, such for example as in multi-pole electric circuit breakers, it is necessary to connect a plurality of electrical cables of differing potential to a device having an insulating casing, in relatively close side-by-side relation, or relatively close to other members, such as mounting screws.

Electrical connectors of the type referred to ordinarily include a clamping screw which serves to clamp the conductor against a base portion. Tightening forces exerted on the screw also tend to turn the whole connector, and means must be provided for preventing such turning. In many applications, such for example as multi-pole electric circuit breakers, no means for restraining the turning of the connector is readily available except the molded material of the casing. Since the turning forces are relatively high, walls of substantial thickness are required to avoid breakage of the insulating casing. As a result, the size of the connectors which can be used in a given device is limited by the limiting dimensions of the device.

It is an object of the present invention to provide an electrical connector assembly including a screw type electrical connector and insulating walls adjacent thereto, the turning forces exerted on the screw being resisted by the insulating side walls, the connector being of larger size than has heretofore been possible in a device of the same size.

It is another object of the invention to provide such a connector assembly in which the turning forces exerted on the connector are transmitted to the adjacent insulation side walls in a direction generally parallel to such walls, rather than at right angles thereto.

It is another object of the present invention to provide a mounted connector assembly comprising a pair of connectors mounted in side-by-side relation with a predetermined fixed center-to-center spacing, and with an insulating wall therebetween the construction being such that a connector of larger size may be used while affording ample wall thickness between such connectors.

In accordance with the invention in one form, I provide an electrical connector assembly including a generally rectangular connector body having a conductor-receiving aperture therein and a screw-receiving aperture receiving a clamping screw adapted to clamp a conductor. The side walls of the connector body are provided with projecting ribs and closely-adjacent insulating walls are each provided with a vertically extending groove or channel, receiving the ribs in closely-fitting relation. Twisting forces exerted on the connector assembly by a tightening tool are transmitted by the ribs to the insulation material in a direction substantially parallel to the walls, and do not tend to force the walls apart.

In a preferred form of the invention, the connector body has its maximum width at the center thereof and tapers to a lesser dimension at the front and back walls, thereby affording maximum spacing between such corresponding portions of adjacent connectors.

The invention will be more fully understood from the following detailed description, and its scope will be pointed out in the appended claims.

In the drawing,

FIGURE 1 is a side elevation view of an electric cir-

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cuit breaker incorporating the invention, a portion of the side wall being broken away;

FIGURE 2 is a top plan view of an end portion of the circuit breaker of FIGURE 1, a portion of the top cover 5 being broken away;

FIGURE 3 is a perspective view of the connector body utilized in the circuit breaker of FIGURE 1; and

FIGURE 4 is a sectional view through a connector body, showing a cable clamped therein.

The invention is shown in FIGURE 1 as incorporated in an electric circuit breaker having an insulating casing including a base portion 10 and a cover portion 11. The insulating casing serves to house switching mechanism, not shown, adapted to be operated by a manually engageable handle member 12. The circuit breaker also includes a tripping mechanism indicated generally at 13 and serving to normally restrain a releasable member 14 of the circuit breaker mechanism and to release it upon the occurrence of predetermined current conditions in the device.

The cover 11 is attached to the base 10 by means of screws 25 which pass through holes 26 in the cover 11 and engage tapped inserts, not shown, in the base 10.

The cover 11 is also provided with an aperture 11' affording access to the clamping screw 24 of the connector 15, to be described, through the top wall of the cover.

The circuit breaker includes three separate current paths or "poles," each having an incoming terminal connector 15, see FIGURE 2. Each of the terminal connectors 15, is mounted in a chamber 16 of the insulating casing. The chambers 16 are formed by extended portions 17 of the side walls of the base 10 and by intermediate barrier portions 18, preferably provided as integral parts of the base 10. The trip device 13 is provided with oppositely extending terminal straps 19 one end of which is connected to the load terminals 15 in a manner to be described and the other end of which is connected to a flexible conductor, not shown, leading to the separable contacts, not shown, which, in turn, lead to the input or line terminal 15.

Each of the connectors 15 comprises a generally cube-shaped metallic block or body 20 (see FIGURE 3) having a passageway 21 extending therethrough from the front to the back face for receiving an electrical conductor. The body 20 also has an aperture 22 in the bottom wall for receiving a mounting screw 23 as shown particularly in FIGURE 4. The top wall of the connector body 20 is provided with a tapped aperture which receives a clamping screw 24 adapted to engage a conductor as indicated in FIGURE 4.

The connector body 20 is provided with projecting ribs 27, dove-tailed in cross-section, extending from top to bottom along each of the opposed side walls 28, perpendicular to the bottom wall. As may be seen best in FIGURE 2, the body 20 has its greatest width at the center portion, that is, between the ribs 27, and tapers to a narrower width at the front and back walls.

As may be seen from FIGURE 2, the taper construction of the body 20 makes possible an increased thickness of the barriers 18 and 17 at the points adjacent the front and back faces of the connectors. Such increased thickness makes possible the provision of holes 26 for the cover retaining screws 25. Without such tapering, the wall thickness between such holes and the chambers 16 would be insufficient. In addition, the tapered construction increases the lateral spacing between adjacent corners of adjacent connectors. It is desirable that such spacing be maintained at a maximum to reduce the possibility of electrical breakdown from one terminal to another over the end surfaces of the barriers 18.

The barriers 17 and 18 are provided with grooves

30 which closely receive the ribs 27. In order to provide maximum wall thickness, the side walls of the barriers 17 and 18 are not perpendicular to the end walls, but taper in a manner corresponding to the tapering side walls 28 of the connector body 20. The barrier side walls, however, are dimensioned so that they contact the connector body 20 adjacent the center portion thereof, that is, adjacent the ribs 27, and they are spaced slightly from the connector body at the front and back faces of the body. As a result of this construction, the torque or twisting force which is exerted upon the entire body 20 when the screw 24 is given its final clamping turns, is exerted upon the barriers 17 and 18 by means of the ribs 27 in the grooves 30. It will be observed that such forces act on the barriers 17 and 18 nearly parallel to the side walls of the barriers 17 and 18. This action, together with the clearance provided between the barriers and the connector body 20 near the front and back surfaces, reduces to a minimum the forces which would tend to break the barriers 17 and 18 in a transverse direction, which is their weakest direction. It will be observed that if the body 20 were provided with straight sides captured between straight sided barriers, a high twisting force applied to the body 20 would be transmitted to the barriers at diagonally opposite corners of the body 20 and would act on the barriers in a direction tending to push them apart and therefore to break them in their weakest direction. Instead, in accordance with the present invention, these high forces are transmitted to the barrier portions in a direction which tends to place the barrier insulation material in compression rather than in tension.

While I have shown only one embodiment of the invention, it will be readily apparent that many modifications thereof may be made without departing from the spirit and scope of the invention. Thus the connector body 20 may comprise a generally tubular, thin-walled member. I therefore intend by the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electrical device comprising:

- (a) an insulating support having at least one pair of spaced apart wall portions,
- (b) an electrical connector supported on said insulating support between said wall portions and comprising a body of conductive material having a pair of opposed side walls, a pair of opposed front and back walls, and a pair of opposed top and bottom walls,
- (c) said side walls of said connector extending closely adjacent said opposed walls of said support respectively,
- (d) a wire receiving opening in said front wall of said connector body extending toward said back wall and generally parallel to said opposed side walls, and means for clamping a conductor in said opening,
- (e) an elongated projecting rib integral with said connector body carried by each of said opposed side wall portions and extending in a direction perpendicular to said top and bottom walls,
- (f) said opposed wall portions of said support each having an elongated channel-shaped recess therein closely receiving said elongated ribs respectively, said engagement of said ribs in said recesses comprising substantially the only means acting between said connector and said insulating support for preventing relative angular displacement of said connector with respect to said support.

2. An electrical device comprising:

- (a) an insulating support having at least one pair of spaced apart wall portions,
- (b) an electrical connector supported on said support

- between said wall portions and having a pair of opposed side portions, front and back walls, and opposed top and bottom walls,
 - (c) said side walls of said connector being closely adjacent said opposed walls of said support,
 - (d) a wire receiving opening extending into said connector from front to back in a direction generally parallel to said side walls,
 - (e) an elongated projecting rib integral with said side wall portions,
 - (f) an elongated channel-shaped recess in each of said opposed side wall portions closely receiving said elongated ribs respectively,
 - (g) said opposed side walls of said insulating support being closer to said connector body adjacent said elongated ribs than at other portions of said side wall portions of said connector body.
3. An electrical device comprising:
- (a) an insulating support having at least one pair of opposed wall portions,
 - (b) an electrical connector supported on said support and having a pair of opposed side walls, opposed front and back walls, and opposed top and bottom walls,
 - (c) said side walls of said connector being closely adjacent said wall portions of said support,
 - (d) a wire receiving opening extending into the front wall of said connector in a direction generally parallel to said side walls,
 - (e) means for clamping an electrical connector in said opening,
 - (f) each of said side walls of said connector having an integral elongated rib extending substantially from said top to said bottom wall and substantially mid-way between said front and back walls,
 - (g) each of said opposed wall portions of said insulating base having an elongated channel-shaped recess closely receiving said elongated ribs respectively,
 - (h) said wall portions of said insulating base being closer to said connector at the portions of said side walls adjacent said ribs than at the portions of said side walls adjacent said front and back walls, whereby force tending to cause angular movement of said connector with respect to said support is resisted substantially entirely by engagement of said projecting ribs in said recesses.
4. An electrical device comprising:
- (a) an insulating housing having at least three integral spaced apart barrier portions defining at least two terminal connector spaces,
 - (b) an electrical connector supported in each of said connector spaces between a corresponding pair of said barrier portions,
 - (c) said connectors each including a pair of opposed side wall portions in closely spaced relation to corresponding surfaces of said barriers,
 - (d) each of said connectors also including an elongated integral rib on each of said wall portions extending substantially from top to bottom and mid-way between front and back of said connector,
 - (e) said barrier portions each having an elongated channel-shaped groove therein closely receiving a corresponding one of said rib portions,
 - (f) the thickness of said barriers in a direction measured on a line between said connectors being greater at a point adjacent the front and back of said connectors than at the point adjacent the mid-point of said connectors.
5. An electrical device comprising:
- (a) an insulating enclosure having at least three integral spaced apart barrier portions defining at least two terminal connector receiving chambers,
 - (b) an electrical connector in each of said chambers, each of said connectors comprising a body having

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- opposed front and back walls, opposed side walls and opposed top and bottom walls,
- (c) a conductor receiving aperture extending into said front wall toward said back wall in a direction generally parallel to said side walls,
- (d) means for clamping an electrical connector in said aperture,
- (e) an elongated projecting rib carried by each of said side walls of said connector mid-way between said front and back walls and extending in a direction between said top and bottom walls,
- (f) said barrier portions each having an elongated generally channel-shaped recess therein closely receiving said elongated rib portions of said connectors respectively,
- (g) each of said connectors having a greater width as measured on a line between said projecting ribs than

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as measured at said front or back walls, whereby said connectors are spaced farther from said barrier portions at said front and back wall portions of said connectors than at said mid-portions of said connectors and whereby forces tending to angular movement of said connector with respect to said support are resisted substantially entirely by said projecting ribs.

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