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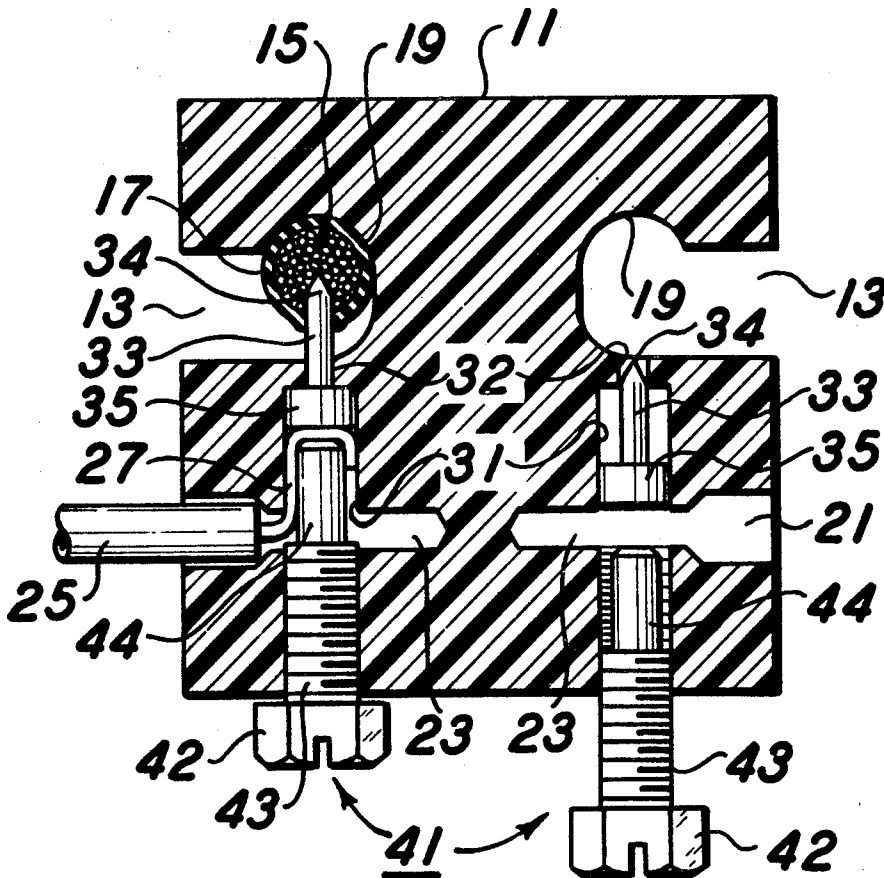
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[54] **ELECTRIC WIRE CONNECTOR WITH INSULATION PIERCING MEANS**
7 Claims, 4 Drawing Figs.

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 339/272
 [51] Int. Cl. H01r 7/12,
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 [50] Field of Search 339/97-
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ABSTRACT: A device for electrically connecting a pair of main supply wires to a pair of lateral branch wires without stripping insulation from the main wires. A block of insulating material has two parallel grooves which receive the main wires and their insulating covering. Adjacent each main wire is a bore extending radially with respect to the main wire, the bore containing a sharp pointed metallic conducting element. The bore containing the pointed metallic element intersects a lateral bore into which the stripped end of the branch wire is placed. A screw of insulating material bears against the stripped end of the lateral wire, presses it tightly against the butt end of the pointed metallic element and drives the point thereof through the insulation covering of the main wire, to make contact with the metallic conductor therein.



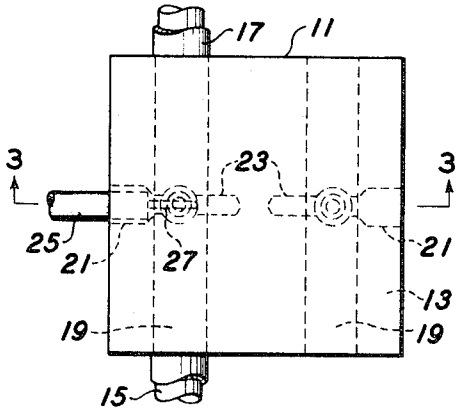


FIG. 1

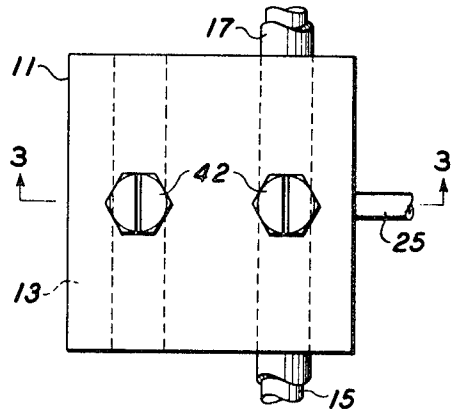


FIG. 2

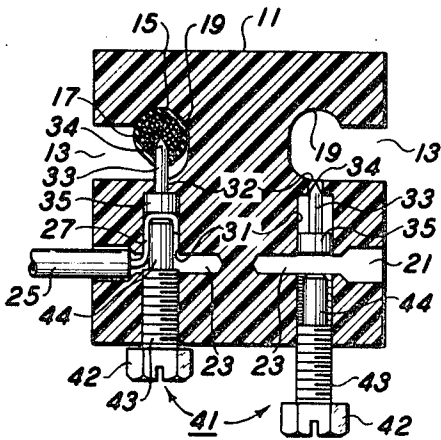


FIG. 3

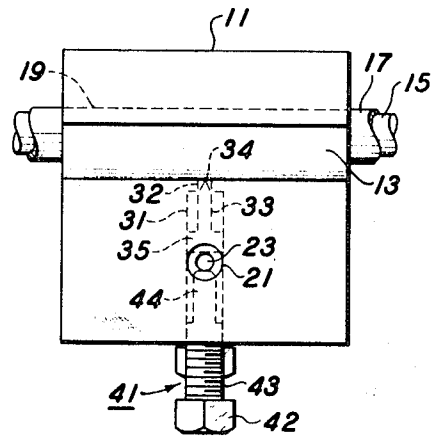


FIG. 4

ELECTRIC WIRE CONNECTOR WITH INSULATION PIERCING MEANS

BACKGROUND OF THE INVENTION

In the installation, for example, of a long series of fluorescent light fixtures along a ceiling, it is customary to run a pair of main supply wires along the line of lighting fixtures, and to tap off of the pair of main wires at each individual fluorescent unit, with lateral branch wires to supply current to the individual unit. These lateral branch wires are commonly called ballast wires, since they usually lead from supply wires to the so-called ballast of the individual fluorescent lighting unit. In modern large office buildings, there are frequently thousands of fluorescent lighting units to be installed. Conventional methods of making the electrical connections between the main supply wires and the lateral branches or ballast wires of each unit are fussy, awkward, and time-consuming, usually involving cutting the main wires, stripping the ends, and connecting the ends of two main wires and one ballast wire to each other by means of a "wire nut," on each side of the circuit at each of the lighting fixtures being installed. Although various types of special connectors for connecting a branch wire to a main wire without stripping the main wire are known in the art, they are difficult or inconvenient to use for one reason or another, and the known forms of special connectors have not gone into any widespread use.

An object of the present invention is the provision of a connecting device for connecting a pair of branch or ballast wires to a pair of main supply wires in such an easy and simple manner as to overcome the reluctance of electricians to use connectors of the forms previously available, and to provide a connecting device so designed that the necessary connections can be made in an extremely rapid and convenient manner, saving a substantial amount of time in making each connection as compared with the time previously required. When perhaps thousands of connections are to be made in a large installation, the saving of even a fraction of a minute in making each connection should result in the saving of a large amount of time and expense for the entire installation.

Another object is the provision of a connector of the type requiring no stripping of the main supply wires, so designed that it can be easily and inexpensively manufactured, that the electrical connection is reliably made from the standpoint of good conductivity from each main supply wire to the associated lateral branch or ballast wire, and that all electrically charged parts are adequately enclosed within insulating material, with no danger of shock or short circuits.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing, incorporated herein by reference and constituting a material part of the disclosure and relating to an exemplary embodiment of the invention:

FIG. 1 is a top plan view of a connector in accordance with a preferred embodiment of the invention;

FIG. 2 is a bottom plan view thereof;

FIG. 3 is a section taken approximately on the line 3-3 of FIGS. 1 and 2; and FIG. 4 is a side elevation of the connector.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The main body of the connector comprises a block 11 of insulating material, having therein two grooves or notches 13 arranged parallel to each other and running along opposite sides of the block 11. These grooves 13 receive the main supply wires or conductors, one of which is shown at 15, and has an insulating covering 17 surrounding the metallic conductor. The width of the groove 13, opening out to one side of the block 11, is sufficiently great to receive the wire 15, 17 in its original state, that is, without removal of the insulating covering. At the inner edge of each groove 13, the thickness of the groove is slightly enlarged by a rounded depression 19 extending longitudinally of the groove, to form a seat for the main wire, as will be readily understood from FIG. 3.

Extending inwardly from each of two opposite side faces of the block 11, is a bore for receiving the end of the ballast wire or other branch wire which is to be electrically connected to the main wire. This bore extends in a direction at approximately a right angle to the direction of the main wire, and has an outer portion 21 of sufficient diameter to receive the branch wire 25 with insulation thereon, and an inner portion 23 of smaller diameter, sufficient only to receive an end portion 27 of the branch wire with the insulation stripped or removed therefrom.

In each lateral half of the block there is still another bore indicated in general at 31, intersecting the bore 21, 23 and being perpendicular to this bore 21, 23 as well as perpendicular to the longitudinal length of the groove 13, and aligned with the hollowed or rounded part 19 of the groove 13, as readily apparent from FIG. 3. The inner end portion of this bore 31, that is, the end which opens into the groove 13, is of smaller diameter as shown at 32, and fits rather snugly around a cylindrical shank portion 33 of a metallic pin or plunger having a sharp pointed end 34. The pin also has an enlarged cylindrical head 35 which fits snugly and slidably in the larger diameter portion of the bore 31.

The outer portion of the length of the bore 31 is tapped to provide internal screw threads to engage the threads of a screw 41. In the preferred form of construction, the screw 41 is made of insulating material, such as a tough strong form of plastic, and has at its outer end either a screw driver slot, or a polygonal head 42, or preferably both, so that it may be turned either by a screw driver or by a small wrench. For some distance inwardly from the head, the screw is threaded at 43 to fit the threads of the outer portion of the bore 31. Inwardly of the threads 43, a smooth shank portion 44 is of somewhat smaller diameter than the bore 31, sufficiently smaller so that there is room for a stripped portion of the branch wire (ballast wire) between the smooth shank 44 and the surrounding wall of the bore 31.

In using this device, the two main supply wires are placed in the two grooves 13 on opposite sides of the body 11, and it is not necessary to take time to strip any insulation from these main wires. The width of each groove 13 will just snugly receive the wire 15 with insulation 17 thereon, it being intended to provide a separate size of connector for each separate size of main wire. Insulation is stripped from a short length at the extreme end of each ballast wire or other branch wire which is to be connected to a main wire, it being necessary to strip only a very short length of the branch wire, say about a quarter of an inch or three-eighths of an inch, much less length than would be necessary if the branch wire were to be wrapped around a stripped portion of the main wire, according to one form of connection commonly used heretofore, and less than necessary when using wire nuts according to another commonly used form of connection. In some cases, the ends of the ballast wires may come from the factory already stripped to the required extent.

The end of the branch wire is inserted in the lateral bore 21, 23 so that the still insulated part 25 of the branch wire enters the larger diameter portion 21 of the lateral bore, and the stripped portion 27 of the branch wire enters the smaller diameter portion 23 of the bore. At this time the screw 41 is in its outer position; that is, partially unscrewed so that it does not obstruct the entrance of the branch wire into the bore portion 23, as seen at the right side of FIG. 3. It is advisable, at this time, to have the block 11 upside down as compared with the position shown in FIG. 3, with the screws at the top rather than the bottom, so that gravity will hold the sharp point 34 of the metal plunger against the associated main wire, and the butt end or head 35 of the plunger will not obstruct entrance of the branch wire into its bore.

The screw 41 is now tightened. The end of the smooth shank portion 44 presses the stripped part 27 of the branch wire tightly against the butt end or head 35 of the metallic pin, and drives the pointed end 34 through the insulating covering 17 on the main wire and makes contact with the conductor 15 within the insulation. During the travel necessary to penetrate

the insulation 17 and drive the point 34 firmly into the metallic conductor 15, the end of the shank 44 will advance somewhat beyond the location of the lateral bores 21, 23, but this is possible because of the somewhat smaller diameter of the shank 44 as compared with the diameter of the bore 31. As seen at the left side of FIG. 3, where the parts are in the final "home" or fully connected position, the bare or stripped portion 27 of the branch wire can extend longitudinally along one side of the shank 44 and across the end thereof and down the other side of the shank 44.

This completes the connection of one branch wire to its main wire, and it can be done in less time than it takes to describe it, particularly if the ends of the branch wires have previously been stripped to the required extent, or if they come from the factory already stripped. Of course two connections are made with each device, one branch wire to one main wire, and a second branch wire to the second main wire. Upon tightening the respective screws 41, the connections are complete, and nothing remains to be done. Because the screws 41 are of insulating material, the fact that the outer ends of these screws are exposed does not create any hazard. The device does not have to be wrapped with insulating tape after the connections are completed.

It will be noted that this device comes from the manufacturer ready for use and all parts assembled. It is not necessary to take it apart in order to insert the wires and make the connections. In some of the connectors previously proposed, there are two mating parts which have to be separated from each other, then the wires (either the main wires or the branch wires or both) have to be inserted between the two separated parts, and then the parts have to be fastened together again, by screws or bolts or other means. This is very time consuming. In the present construction, nothing has to be taken apart, and there are no separate parts to be lost or mislaid. Each connector constitutes a single unit, assembled at the factory and reaching the ultimate user in complete condition ready for use. The electrician making the connections merely places the two main wires in the respective grooves 13, inserts the ends of the branch wires in the bores 21, 23, and tightens the two screws 41. That is all there is to it.

It has been mentioned above that the main body or block 11 is of insulating material. It may be molded of porcelain, or hard rubber, or any other insulating material capable of being molded to the desired shape. Preferably it is molded from any one of the modern plastics which have high dielectric strength as well as high mechanical strength. Several such materials are known. Conveniently, the plastic used is a transparent plastic, having the advantage that the user can look through the block to make sure that the end of the ballast wire is in proper relation to the screw, before the screw is tightened, but this feature of transparency is not essential. It will be noted that the

depression 19 in the groove 13 holds the main wire against accidental lateral displacement when the sharp pointed metallic connector element 33 is thrust into the insulation of the main wire.

What is claimed is:

1. An electric wire connector for connecting a branch wire to an insulated main wire without requiring insulation to be prestripped from the main wire, said connector comprising a body having a groove for receiving the main wire with insulation thereon, a first bore spaced from and extending crosswise with respect to said groove, said bore being adapted to receive an end of a branch wire with insulation stripped from a portion thereof, a second bore intersecting said first bore and opening externally of said body and also opening into said groove at a location aligned with a main wire therein, said second bore having screw threads therein, a metallic conductor element located in said second bore between said groove and said first bore, said element having a sharp point at the end thereof toward said groove, and a screw of insulating material located in said second bore on the opposite side of said first bore from said groove, said screw engaging said threads in said second bore, so that when said screw is screwed into said second bore with a stripped portion of a branch wire interposed between said screw and said conductor element, said screw will press said stripped portion tightly against said element and will press the point of said element into and through insulation on a main wire located in said groove to make electric contact with a conductor within said insulation.

2. A construction as defined in claim 1, wherein said body has two grooves for receiving two main wires extending parallel to each other adjacent opposite sides of the body, and wherein there is a first bore, second bore, conductor element, and screw in separate cooperative relationship to each groove, respectively.

3. A construction as defined in claim 1, wherein said body is of insulating material.

4. A construction as defined in claim 1, wherein said body is of molded plastic.

5. A construction as defined in claim 1, wherein said body is of transparent material.

6. A construction as defined in claim 1, wherein an outer portion of said first bore is of sufficient diameter to receive a branch wire with normal insulation thereon, and an inner portion of said first bore, in the vicinity of said second bore, is too small to receive a branch wire with normal insulation thereon but will a portion of the branch wire from which insulation has been stripped.

7. A construction as defined in claim 1, wherein said groove has a depression in which the main wire may become seated so as to resist accidental lateral displacement of the main wire while the point of said element is being forced into it.

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