

June 28, 1960

A. R. NORDEN

2,943,294

MULTIPLE-WIRE CONNECTORS

Filed Aug. 28, 1957

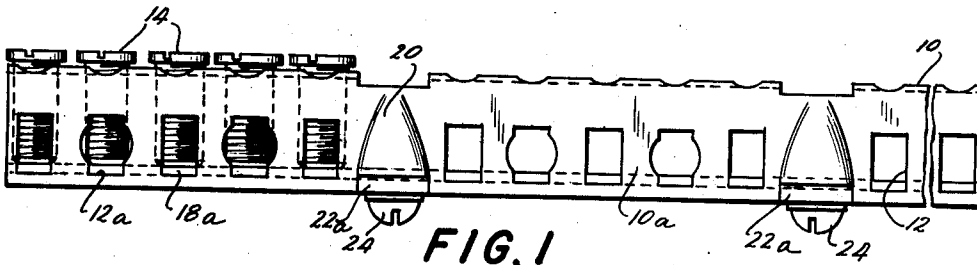


FIG. 1

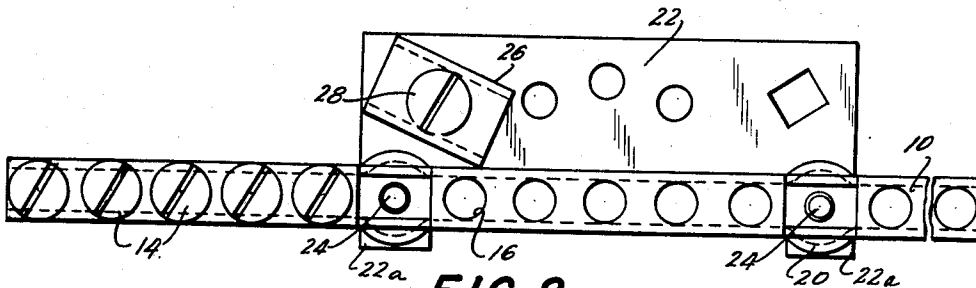


FIG. 2

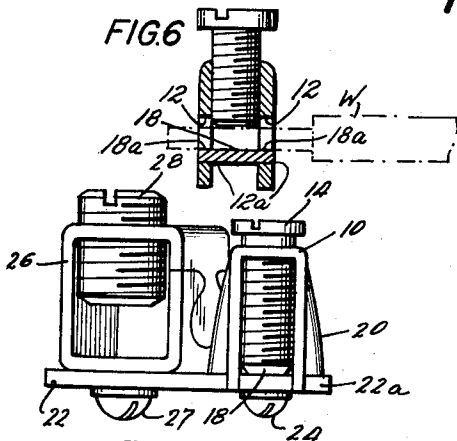


FIG. 3

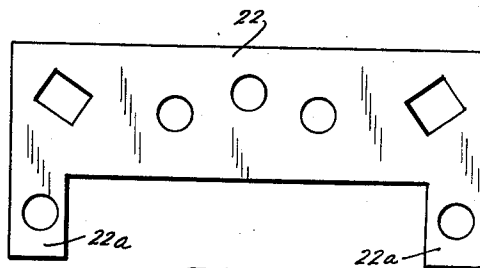


FIG. 4

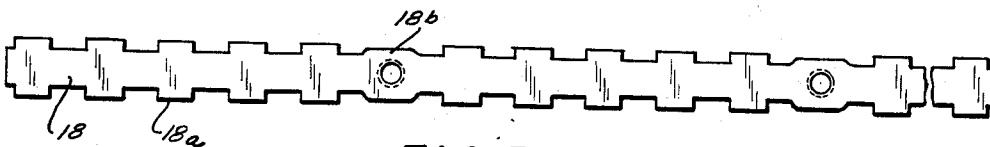


FIG. 5

INVENTOR
ALEXANDER R. NORDEN

BY *Paul S. Martin*
ATTORNEY

1

2,943,294

MULTIPLE-WIRE CONNECTORS

Alexander R. Norden, New York, N.Y., assignor to Federal Pacific Electric Company, a corporation of Delaware

Filed Aug. 28, 1957, Ser. No. 680,789

3 Claims. (Cl. 339-242)

The present invention relates to electrical connectors for joining multiple wires together.

Connectors of this type are commonly used with panelboards where a power line is to be connected to multiple two-wire branch circuits. A separate control or protective such as a fuse or circuit breaker is connected between one wire of the power line and one wire of each branch-circuit, and the remaining wires of the branch circuit pairs are directly connected to the power line by means of a multiple-wire connector or "neutral." The panelboard and the connector are enclosed in a protective metal box.

An object of the present invention is to provide a new and useful connector for multiple wires. Another object is to provide a connector for joining multiple branch circuit wires to a common main bus. More specific objects include the provision of a common connector of reduced manufacturing cost; and a connector readily manufacturable without dependence upon supplies of special metal shapes.

This last aspect of the invention will be readily appreciated from the following: It has been common practice to form connectors of copper tubing having a rectangular or square cross-section and including a series of transverse openings for receiving the branch circuit wires, and a screw hole formed adjacent each wire opening, for securing the branch circuit wires to the copper connector. Such special copper tubing is costly; but apart from cost it is a special metal shape, the supply of which is uncertain at times, in contrast to ordinary flat strip stock that may be employed in the present invention.

In one aspect the present invention is an improvement over the multiple-wire connector in application Serial No. 499,184 filed April 4, 1955, now Patent No. 2,907,977 dated October 6, 1959, by Arthur Gordon Daley and assigned to the assignee of the present application. In the connector of that application, a channel of steel is united to a strip of copper by lugs at the edges of the steel channel extending through holes in the copper strip, the projecting portions of the lugs being bent over against the copper strip. The construction there described, while satisfactory in general, may occasionally prove troublesome. One screw, in being tightened against a wire, has the tendency of withdrawing the adjoining lug from the copper strip, to thereby loosen the next adjacent screw-clamped wire. An object of the present invention, accordingly, is to provide a novel multiple-wire connector minimizing any such possibility.

The multiple-wire connector embodying features of the present invention which is described in detail below will be seen to include a channel of a tough metal such as steel having pairs of holes in the opposite walls of the channel, each wall having a series of such holes. A wire-securing screw is provided in the bottom of the channel adjacent each pair of opposite holes in the walls of the channel. Each hole has a flat edge remote from the screw. A copper strip closes the open side of the

2

channel. Laterally extending arms at the edges of the strip extend into the holes and to the outer surface of the channel. The diameter of the wire-securing screws is preferably the full inside width of the channel. When tightened against a wire (whether solid or stranded) the screws develop a nearly pure shear stress in the lateral arms of the copper strip. The metal strips or portions of the walls of the channel which separate or divide the wire-receiving holes from each other are subjected to nearly pure tension. These integral separator strips of the steel channel are effective to isolate the stresses produced when each screw is tightened against an inserted wire, this wire being pressed against the copper strip and pressing the associated lateral arms of that copper strip against the straight edges of the pair of holes receiving those arms. The subsequent tightening of a wire in an adjoining hole is without any tendency to loosen the previously tightened wire connection. For this purpose the separating strips between adjoining holes are made of ample width so as not to be significantly elongated by the wire-clamping stress built up by the wire-securing screws. The strip of copper or the like, whose arms take up the screw-developed stress, is not bowed lengthwise by one tightened screw in a way that would loosen an adjoining previously secured wire.

The nature of the invention and its further features of novelty will be better appreciated from the detailed description of an illustrative embodiment of the invention below, this embodiment being shown in the accompanying drawings wherein:

Figs. 1, 2 and 3 are front elevation, plan view, and end elevation, respectively, of a multiple-wire connector embodying features of the present invention;

Figs. 4 and 5 are plan views of two components of the multiple-wire connector in Figs. 1 to 3; and

Fig. 6 is a transverse cross-sectional view of a portion of the novel connector, in which an inserted wire is shown in phantom lines.

In the drawings there is shown a metal channel 10 of steel or like tough metal. Each side wall of the channel has a series of holes 12 of generally rectangular outline, the bottom edge 12a of each of the holes being formed as a straight shoulder. Holes 12 are in a straight line in each wall of the channel, and the holes in the opposite walls of the channel are directly opposed, in pairs. A series of screws 14 (only 5 being shown) are threaded into screw-threaded holes 16 in the bottom of the channel, adjacent each opposed pair of holes 12.

A strip of high conductivity metal 18 such as copper (see Fig. 5) has a series of arms 18a projecting integrally from its lateral edges, each arm 18a having an aligned arm extending from the opposite edge of the strip. Strip 18 is transversely enlarged so as to provide arms 18b which are of circular outline about screw-threaded openings 18c.

Strip 18 is disposed within the channel 10 so as to close the open side of the channel, as best shown in Fig. 3. Arms 18a occupy the thickness of the channel wall, and are approximately flush with the outside surface of the channel.

The channel as shown has outwardly bulging portions 20, which facilitate insertion of the strip. This is accomplished by placing the strip within the channel, first engaging the arms 18a of one edge of the strip within holes 12 in one wall of the channel, and then rotating the strip about its longitudinal axis until the other arms reach the straight edges or shoulders 12a of the related holes. During this operation, the outwardly bulged portions 20 of the channel receive the enlarged portions 18b of the strip.

A copper member 22 having a pair of arms 22a is connected by screws 24 to the threaded strip 18. Main

connector 26 is joined by screw 27 to member 22, connector 26 having its wire-securing screw 28.

In use a branch-circuit wire W is inserted in each opening 12 (as many as may be required for the branch circuits involved) and the screws 14 are tightened against those wires. The diameter of screws 14 is made ample so that when the wire is tightened against strip 18, the related arms 18a being thereby pressed against the shoulders or straight edges 12a of the holes, the stress imposed on the strip is purely one of shear at the arms 18a (see Fig. 6). There is little tendency of the pressure of the screw against the wire to cause serious bending of strip 18 midway between its arms 18a. This is because the screw stress is transmitted through the wire W and arms 18a toward the supporting edges 12a, which are carried by separators 10a (Fig. 1). The diameter of screws 14 is preferably about the same as the inside width of the channel, and about the same as the width of holes 12. The separators 10a which divide the holes 12 from each other are of ample cross-section so that the screw-imposed wire-securing stresses developed in the channel are localized, that is, these separators 10a are not elongated by the tightening of any screw. In consequence, when one wire has been tightened in place, and another is being tightened, there is no danger of the second wire causing the previously tightened connection to become loose. This is a most important consideration in a multiple-wire connector. The present construction minimizes the consequences of inadvertent excessive tightening of a particular screw (as may be occasioned when a heavier-than-usual branch-circuit wire is to be tightened in place).

Strip 18 is illustrated as being of sufficient length to accommodate at least 11 branch circuits. Because of its modest and economical cross-section, strip 18 is of limited current-carrying capacity. For this reason plural arms 22a of the main-line connector 22 make plural, spaced connections to strip 18.

It is evident that the foregoing illustrative multiple-wire connector may be variously modified in design, and it may be variously applied by those skilled in the art.

What is claimed is:

1. A multiple wire connector, including a channel of a steel having a series of opposed pairs of wire-receiving holes in the opposite side walls thereof, said holes being thus divided by separator strips of the side-wall metal of the channel, wire-securing screws threaded into the bottom of the channel, one screw being provided in alignment with each of said pairs of wire-receiving holes, and a longitudinal strip of copper extending along the channel between its side walls and closing its open side, said longitudinal strip having a series of arms projecting from the lateral edges thereof, said arms being transversely in alignment and formed to be received in said pairs of holes in the channel, each said wire-securing screw being effective to drive a transversely extending wire against said longitudinal strip and the stresses developed by a screw in securing any one wire being effectively isolated

by said separator strips from the adjacent wire-securing parts of the connector.

2. A multiple wire connector, including a channel of a steel having a series of opposed pairs of wire-receiving holes in the opposite side walls thereof, said holes being thus divided by separator strips of the side-wall metal of the channel, wire-securing screws threaded into the bottom of the channel, one screw being provided in alignment with each of said pairs of wire-receiving holes, and a longitudinal strip of copper extending along the channel between its side walls and closing its open side, said longitudinal strip having a series of arms projecting from the lateral edges thereof, said arms being transversely in alignment and formed to be received in said pairs of holes in the channel, each said wire-securing screw being effective to drive a transversely extending wire against said longitudinal strip and the stresses developed by a screw in securing any one wire being effectively isolated by said separator strips from the adjacent wire-securing parts of the connector, said holes and screws being proportioned for receiving branch circuit wires and said longitudinal strip having an additional connection means for each group of approximately five of said branch-circuit wire securing screws and holes.

3. A multiple wire connector, including a channel of a steel having a series of opposed pairs of wire-receiving holes in the opposite side walls thereof, said holes being thus divided by separator strips of the side-wall metal of the channel, wire-securing screws threaded into the bottom of the channel, one screw being provided in alignment with each of said pairs of wire-receiving holes, and a longitudinal strip of copper extending along the channel between its side walls and closing its open side, said longitudinal strip having a series of arms projecting from the lateral edges thereof, said edges being spaced by the internal width of the channel and the arms being approximately as long as the thickness of the channel wall, said arms being transversely in alignment and formed to be received in said pairs of holes in the channel, each said wire-securing screw being effective to drive a wire extending through a pair of holes against said strip and the screw stresses developed in securing any one wire being effectively isolated from the other parts of the connector by said separator strips, said holes and screws being proportioned for receiving branch-circuit wires, and main connection means to said longitudinal strip, each branch-circuit hole and screw being not farther away from the nearest connection point of said connection means than will leave four hole-and-screw units interposed therebetween.

References Cited in the file of this patent

UNITED STATES PATENTS

2,205,322	Thomas et al.	June 18, 1940
2,532,068	Larsen	Nov. 28, 1950
2,713,672	Allen	July 19, 1955
2,748,365	Speck	May 29, 1956