

[54] WIRE CONNECTOR

[75] Inventor: Herman H. Kobyner, Forest Hills, N.Y.

[73] Assignee: Arrow-Hart, Inc., Hartford, Conn.

[22] Filed: July 23, 1971

[21] Appl. No.: 165,496

[52] U.S. Cl. 339/272 UC

[51] Int. Cl. H01r 11/10

[58] Field of Search 339/263, 272

[56] References Cited

UNITED STATES PATENTS

3,133,781	5/1964	Rys et al.	339/272 UC
3,228,094	1/1966	Stanback et al.	339/272 R
3,335,399	8/1967	Rys.	339/272 UC

FOREIGN PATENTS OR APPLICATIONS

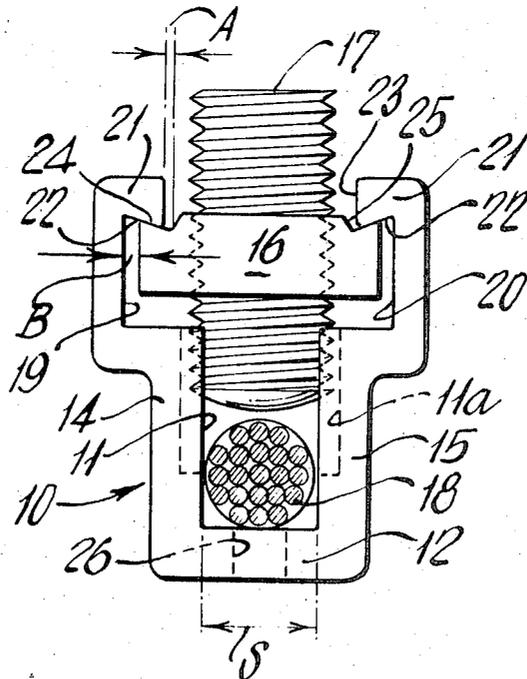
60,404	4/1954	France	339/272 UC
1,469,219	1/1967	France	339/272 UC

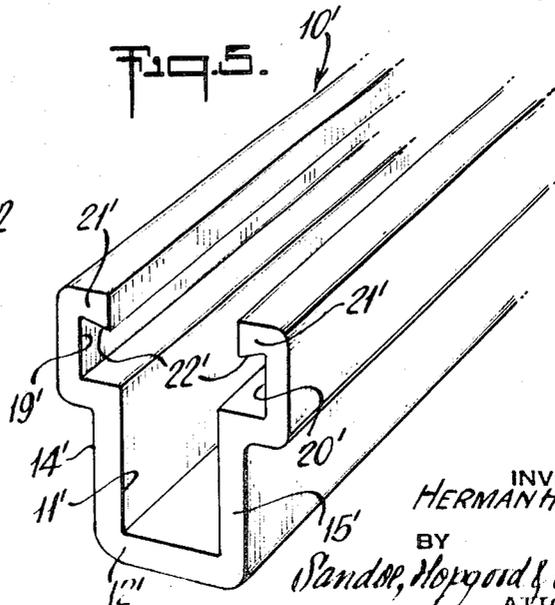
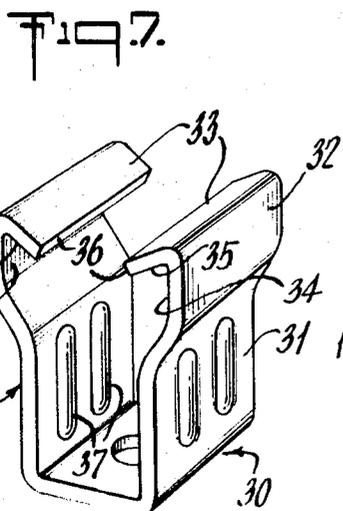
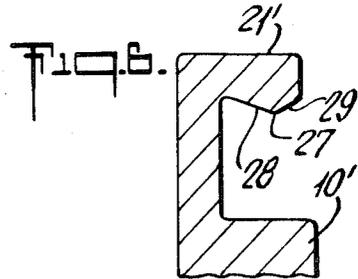
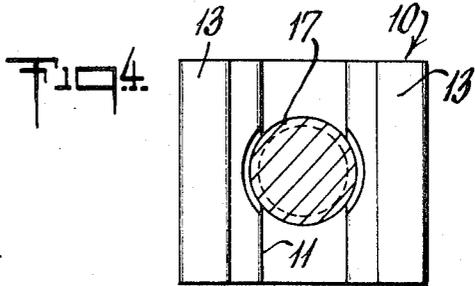
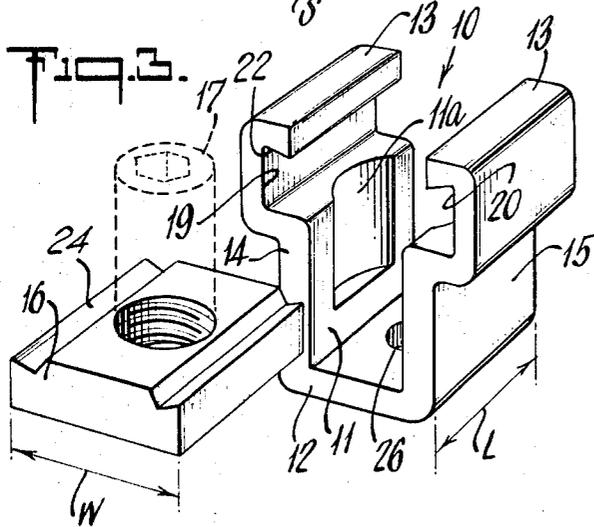
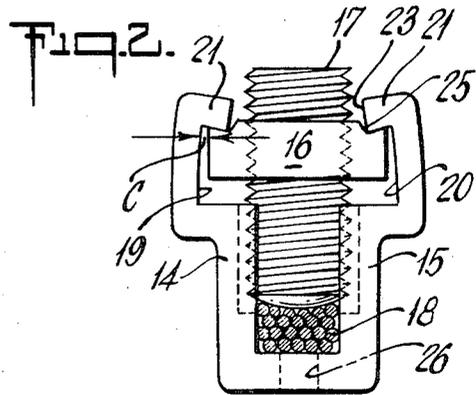
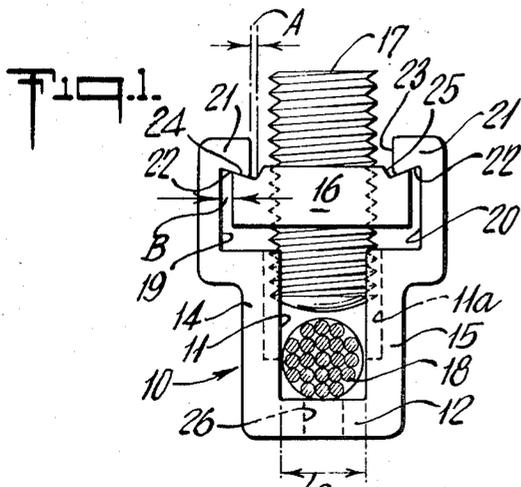
Primary Examiner—Joseph H. McGlynn
Attorney—Sandoe, Hopfgod & Calimafde

[57] ABSTRACT

The invention contemplates a so-called lay-in wire connector wherein a clamp nut is retained by spaced arms of a U-shaped body, adapted to receive an electrical conductor at the bottom of the U-shape. The nut carries a clamp screw and is longitudinally guided by and retained between the spaced arms. Interengaging parallel concave and convex V-formations on overlapping surfaces of the nut and arms (a) assure against arm-spreading when the clamp is applied to the conductor, and (b) assure against such clamped permanent deformation of the arms as might otherwise interfere with later removal and reassembly of the same nut and screw, as when changing the conductor in a re-wiring operation.

9 Claims, 7 Drawing Figures





INVENTOR
HERMAN H. KOBRYNER
BY
Sandoe, Hoxford & Calumafde
ATTORNEYS

WIRE CONNECTOR

This invention relates to a connector of the so-called lay-in type, wherein an electrical conductor is received between spaced upstanding arms and clamp mechanism carried by the arms is thereafter set against the conductor to secure the same.

It has been recognized that clamp mechanism removably carried by arms of the character indicated must be so fashioned that clamp forces should at least draw the arms together. Such mechanism operates satisfactorily as long as no wiring changes are to be made, i.e., as long as the clamp is to remain set. However, upon attempted release of the clamp, it is found that the arms and/or other parts of the mechanism have been so permanently deformed as to jam otherwise removable parts, thereby inviting the service man to resort to destructive measures in order to release the wire connection. At the same time, the deformation is found to be such, after having released and removed clamp parts, that one-handed reassembly is impossible, even if new clamp parts are reassembled to the existing connector body.

It is, accordingly, an object of the invention to provide an improved construction of the character indicated, avoiding deficiencies of prior constructions.

Another object is to provide a connector of the character indicated which is inherently non-jamming.

A further object is to provide a connector of the character indicated wherein reassembly with the same removable clamp parts is inherently feasible, a one-handed operation.

A general object is to meet the foregoing objects with a construction which is basically simple and inexpensive, and which inherently lends itself to re-setting, as when wiring changes are to be made.

Other objects and various further features of novelty and invention will be pointed out or will occur to those skilled in the art from a reading of the following specification in conjunction with the accompanying drawings. In said drawings, which show, for illustrative purposes only, a preferred form of the invention:

FIG. 1 is an enlarged view in end elevation, showing connector mechanism of the invention, poised for clamping upon a stranded electrical conductor;

FIG. 2 is a view as in FIG. 1, for the clamped condition;

FIG. 3 is an exploded perspective view of the connector of FIG. 1;

FIG. 4 is a plan view of the connector of FIG. 1;

FIG. 5 is a fragmentary view in perspective of extruded channel stock from which the body of the connector of FIG. 1 is formed; and

FIGS. 6 and 7 are, respectively, a fragmentary sectional view of body stock of slightly modified form, and another modified body.

Briefly stated, the invention contemplates a so-called lay-in wire connector wherein a clamp nut is retained by spaced arms of a U-shaped body, adapted to receive an electrical conductor at the bottom of the U-shape. The nut carries a clamp screw and is longitudinally guided by and retained between the spaced arms. Interengaging parallel concave and convex V-formations on overlapping surfaces of the nut and arms (a) assure against arm-spreading when the clamp is applied to the conductor, and (b) assure against such clamped permanent deformation of the arms as might otherwise inter-

fer with later removal and reassembly of the same nut and screw, as when changing the conductor in a re-wiring operation.

The connector shown in the drawings comprises a U-shaped body 10 which may be cut to desired length L from extruded channel stock 10' (FIG. 5), as of aluminum, brass or other conductive metal. Body 10 may thus be generally rectangularly prismatic, with a primary groove 11 extending longitudinally between opposite end faces 12 and upwardly open along a third face 13. The primary groove 11 thus defines spaced upstanding opposed arms 14-15. Clamp mechanism comprising a nut 16 and screw 17 is removably carried by arms 14-15, in such clearance relation with the bottom of the groove 11 as to permit nut manipulation while an electrical conductor 18 is placed in the groove bottom, as shown in FIG. 1.

To removably accommodate the clamp mechanism, secondary elongated grooves 19-20 characterize the opposed walls of arms 14-15, and nut 16 is of width W to overlap both grooves 19-20 with clearance B, to allow slidably guided retention of the nut by both arms, upon end-wise insertion to close the U-shape. The vertical dimension of grooves 19-20 is also such as to allow the indicated free-sliding accommodation of nut 16, but preferably the span S between arms 14-15 is determined by the intended maximum conductor size, as for example just to clear the diameter of the laid-in conductor 18. Preferably also, the diameter of screw 17 substantially spans the width S of the U-shape, so that clamp pressure via the end of the screw upon the conductor 18 may be distributed across the conductor-confining space. As shown, the opposed side-wall faces of the groove 11 are centrally recessed, at 11a, as by drilling vertically, and the diameter of screw 17 preferably exceeds the dimension S to an extent permitting clearance with the recesses 11a; entry of screw 17 into recesses 11a thus entraps nut 16 and screw 17, to maintain a unit-handling assembly.

In accordance with the invention, interfitting elongate concave and convex formations on the arms 14-15 and on nut 16 are provided at their regions of overlap in such manner that when the clamp is set, even with the possible permanent deformation of arms 14-15 by having too-tightly set the clamp, the nut 16 will nevertheless part freely from its engagement with arms 14-15, upon release of the screw. As shown, these formations are parallel, and of V-shape. The V-formations on each of the arms 14-15 define a convex corner or axis between a downwardly canted surface 22 and an upwardly extending surface 23, the surfaces 22 being oppositely canted beneath lugs 21, which extend toward each other at the upper ends of arms 14-15, by reason of the described secondary groove formations. Thus, the convex V-formations at lugs 21 may be produced by the extrusion die for the body material shown in FIG. 5.

The V-formations in the upper face of nut 16 are concaved and extend in parallel relation on corner axes which match or substantially match those for the corresponding V-formations of lugs 21; each of the nut V-formations may comprise an outer flat 24 to match the slope of the adjacent surface 22, and a flat 25 which extends upwardly and may diverge from the adjacent surface 23. As shown in FIG. 1, a slight lateral clearance or offset A may exist between the respective axes of matching grooves on lugs 21 and nut 16. It will be un-

derstood that this clearance is taken up by body deformation in the course of setting the clamp, as will be clear from inward bending of arms 14-15 in FIG. 2. It is important that the width dimension W of nut 16 shall be such in terms of any initial clearances A and B, that upon setting the clamp, no bind is developed in the region of clearance B. In FIG. 2, it is seen that this condition is assured when clearance B exceeds clearance A by the extent C.

In use, the body 10 is first secured to the device to which electrical connection is to be made. This may be done by riveting, bolting or other conventional technique, suggested for example by a tapped hole 26 in body 10. The bare wire to be connected, e.g., a multi-strand conductor 18 is then laid into the groove 11, and the nut 16 is inserted end-wise in its guide grooves 19-20, it being understood that the screw 17 is sufficiently backed off, so as to clear sidewall faces of groove 11. When thus inserted and centrally positioned, screw 17 is manipulated by hand into entrapment by and between the recesses 11a. The structure is then inherently self-retaining even though not clamped, thus permitting other aspects of preliminary wiring to be established, as at further connectors of the same kind. When all is ready for permanent connection, a suitable tool may drive each clamp screw tightly against its conductor.

The clamp action involves a reacting compression of the nut 16 against the lugs 21 at their interfitting V-formations, i.e., convex-dished surfaces 22 contacting concave-dished surfaces 24. The other walls 23-25 of the V-shapes may be of matching slopes, or they may diverge (as shown), so that if a clearance A exists, the action is to draw matching surfaces of the V-formations into maximum overlap, which in the form shown is achieved when adjacent corner axes coincide, for the adjacent convex and concave formations involved; specifically, in the form shown the divergence is provided by inner (nut) surfaces 25 which are equally and oppositely and upwardly sloped toward the screw axis, being inclined away from the adjacent more generally upright surfaces 23 of the lugs 21. In the situation depicted in FIG. 1, this means that arms 14-15 will be drawn slightly together to close the clearance A, and if the service man tightly sets the clamp, there may be a permanent deformation of the body 10. It is however important to note that regardless of the extent to which such permanent deformation may have occurred, it cannot result in binding contact in the region designated C in FIG. 2. It follows that upon release of the clamp, by unthreading screw 17, as when re-wiring the connection, the only surfaces to be parted are at adjacent V-formations, and a clearance C always exists for sliding end-wise removal of the nut and its screw. Since clearance C exists for such removal, it manifestly exists for reapplication of the clamp mechanism after new wiring has been laid in, and clamp effectiveness is just as good for the second setting of the mechanism as it was for the first.

For convenience, all described formations in the body 10 have been identified in FIG. 5 by corresponding reference numerals, with primed notation, these formations having been produced by a die through which the body stock 10' was extruded.

FIG. 6 illustrates a slight modification in the extruded profile to indicate that sharp corners in one or both the V-formations are not a critical necessity. In other

words, in FIG. 6, the bottom ridge 27, at which the slopes of the convex V-formation intersect beneath lug 21, may be gently rounded, as may all other corners of the body extrusion. This still leaves sufficiently extensive V-shaped areas 28-29 for coaction with the corresponding concave V-formation on nut 16, so that a tightly set clamp 16-17 may still draw the V-formations into corner-axis registry, without jamming or fully closing the clearance C.

It will be seen that the described clamp mechanism meets all stated objects and lends itself to simple one-handed installation, thus allowing the service man freedom for the use of his other hand to manipulate a tool, to manipulate the wiring, or otherwise to facilitate completion of his job. Modifications may be made without departure from the invention, as by utilizing inwardly drawing cam formations other than matching flats 22-24, as long as provision is made for corner-axis or near-corner axis abutment, to forestall a jam condition at C, regardless of the tightness with which clamp means 16-17 has been set.

Also, the body of the device need not be extruded, or of aluminum, as contemplated for FIGS. 1 to 6, but may be bent from sheet stock, such as steel, as illustrated by body 30 in FIG. 7. The body 30 is seen to be a single generally U-shaped piece, with upstanding arms 31 which diverge at 32 and are inwardly and downwardly canted at their ends 33, to define opposed nut-receiving grooves 34, and to establish the convex V-formation surfaces 35-36 for coaction with adjacent V-formations 24-25 on the nut 16. In FIG. 7, entrapment of the screw, and stiffening of arms 31, are achieved by spaced upstanding ridge formations 37 projecting inwardly of arms 31 to a spacing which is less than the diameter of screw 17.

What is claimed is:

1. An electrical wire connector, comprising a generally U-shaped body having spaced upstanding side arms extending upward from a mounting base, the upper ends of said arms including spaced lug portions extending toward each other, a nut of width greater than the span between opposed lug portions and receivable under said lug portions upon end-wise insertion within the U-shape, and a screw in threaded engagement with said nut and between said lugs, the axis of said screw being substantially parallel to said arms and directed to the bottom of the U-shape of said body, said screw and nut in retracted position being sufficiently spaced from said bottom to clear a conductor seated on said bottom, and said screw being sufficiently elongate to thereafter clamp said conductor by squeeze action against said bottom, the overlapping adjacent surfaces of said nut and lugs being characterized by interengaging parallel concave and convex V-formations having mating alignment axes which are spaced to limit the spacing of said arms in the clamped condition of said connector, the inner surfaces of the opposed V-formations of said nut being oppositely and upwardly sloped in the direction of the screw axis.

2. A connector according to claim 1, in which said arms are spaced in accordance with the size of conductor to be accommodated, and in which said arms have opposed facing parallel nut-receiving grooves short of the upstanding ends of said arms, said lugs being defined at corresponding upper walls of said grooves.

3. A connector according to claim 1, in which screw-trapping projections formed out of at least one of said

5

6

arms and on opposite lateral offsets from the path of screw displacement extend to locally reduce the clearance between arms to less than screw diameter.

4. A connector according to claim 3, in which said screw-trapping projections are located sufficiently remote from the region of conductor reception to trap the screw and at the same time permit free conductor insertion, whereby the connector assembly may be self-retaining prior to conductor clamping.

5. A connector according to claim 1, wherein the mating alignment axes of said V-formations are so positioned with respect to adjacent nut edges and adjacent upstanding inner surfaces of said arms that a clearance exists between said adjacent nut edges and inner surfaces when said connector is clamped.

6. A connector according to claim 1, wherein the mating alignment axes of said V-formations are so positioned with respect to adjacent nut edges and adjacent inner surfaces of said arms that all surfaces of said V-formations engage for a clamped relation.

7. A connector according to claim 1, wherein said body is a cut-off length of extruded electrically conductive metal having a cross-section characterized by said U-shape.

8. An electrical wire connector comprising a generally rectangularly prismatic body of conductive metal,

said body having a primary groove extending longitudinally between opposite end faces and upwardly open along a third face to define a generally U-shape between upstanding opposed arms, said arms having opposed facing longitudinally extending nut-receiving grooves near the upper ends of said arms, a nut longitudinally slidably guided in both arms at said opposed grooves and insertably removable from said grooves at one longitudinal end of said body, a screw threaded to said nut and extending toward the bottom of the primary groove, whereby clamp action against an inserted conductor involves reaction between overlapping adjacent surfaces of said nut and arms, said overlapping adjacent surfaces being characterized by interengaging parallel concave and convex formations having mating longitudinally extending alignment axes which are spaced to limit the spacing of said arms in the clamped condition of said connector, the inner surfaces of the opposed V-formations of said nut being oppositely and upwardly sloped in the direction of the screw axis.

9. A connector according to claim 1, in which the space between said arms is less than the diameter of said screw, opposed upstanding central regions of said arms being locally recessed to an extent permitting screw accommodation and entrapment.

* * * * *

30

35

40

45

50

55

60

65