Feb. 26, 1963 A. I. APPLETON 3,079,182

CABLE CONNECTOR HAVING A DEFORMABLE PORTION THEREIN

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Fig. 1

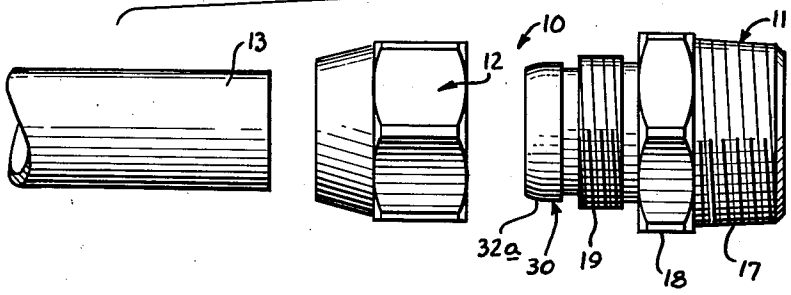

Fig. 2

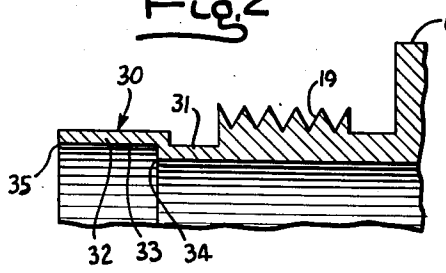

Fig. 2a

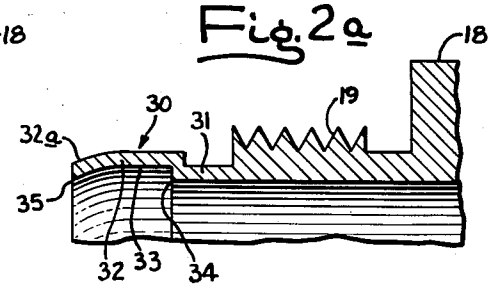

Fig. 3

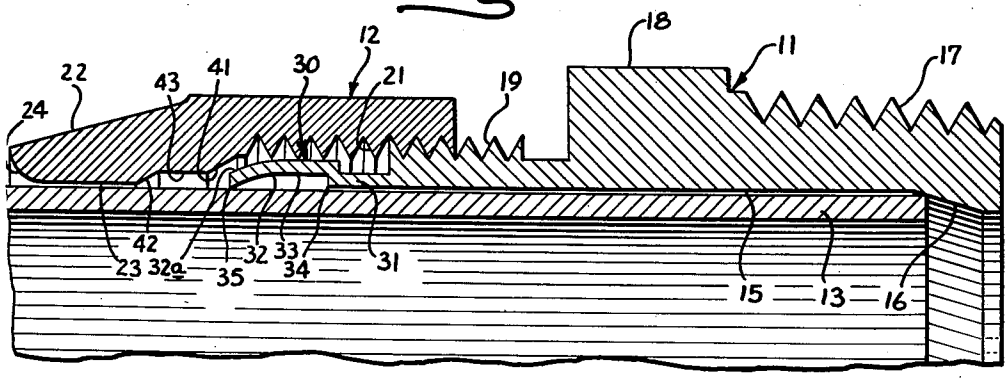

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Fig. 4

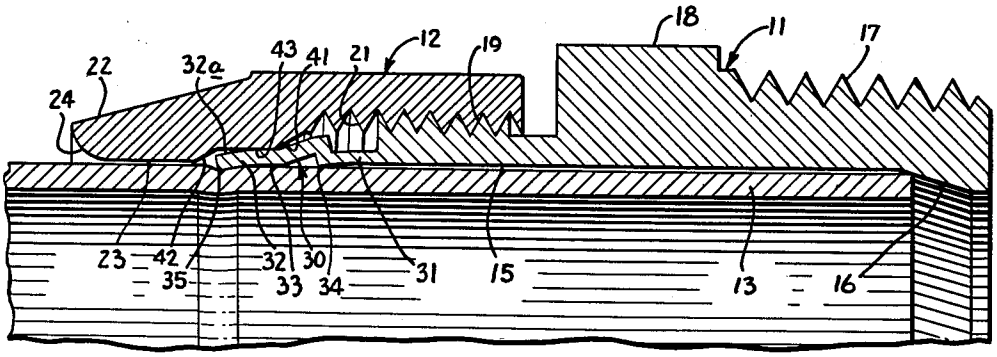
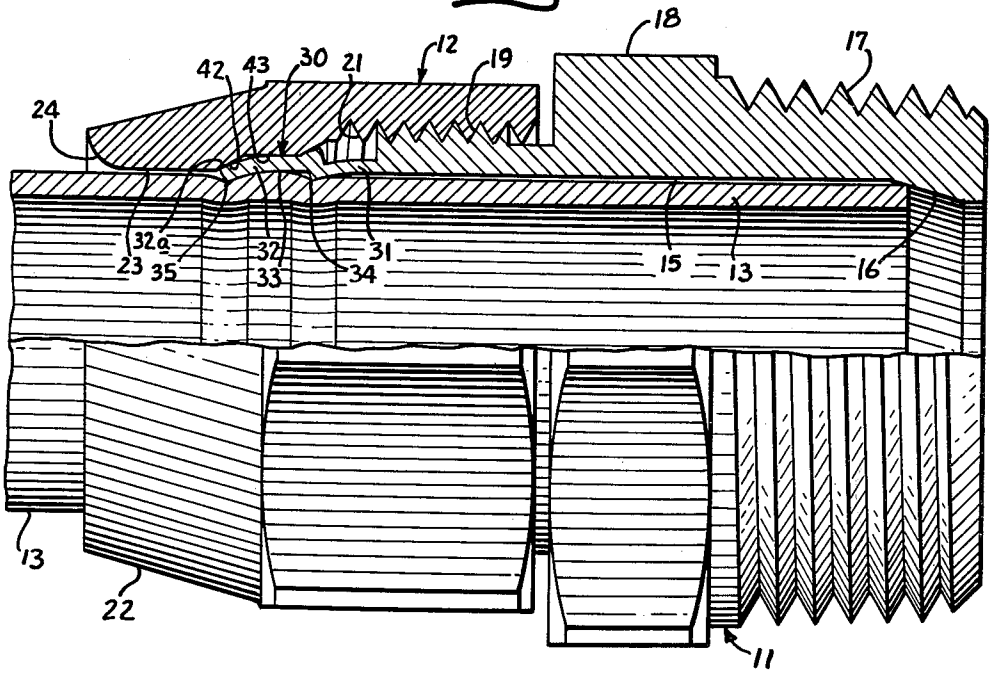


Fig. 5



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CABLE CONNECTOR HAVING A DEFORMABLE PORTION THEREIN

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4 Claims. (Cl. 285—343)

The present invention relates generally to conduit connectors and more particularly to a novel connector fitting for use with shielded electrical cables, conduits or the like.

This application is a continuation-in-part of applicant's copending application Serial No. 654,286, filed April 22, 1957, and now abandoned.

It is an object of the invention to provide a novel cable connector fitting that is simply formed, comprising only two pieces, and which may be tightened to annularly grip a shielded cable or conduit along two spaced lines of securement and become virtually an integral part of the cable or conduit.

It is an object related to the above to provide such a connector fitting whose two pieces are designed to move smoothly together under a light force until a final locking position is reached whereupon the need for a brief application of a stronger force both completes the assembly and indicates to the workman that the job has been completed.

It is a further object to provide a connector of the above type that firmly supports the cable or conduit which it grippingly engages in a manner that prevents the cable or conduit from working loose even with repeated flexing.

It is also an object to provide a connector of the type described above which is tightened into place without requiring the rotation of either the connector fitting or the cable or conduit to which the fitting is to be secured.

It is moreover an object to provide a connector of the character described which can be formed of light, easily shaped materials such as aluminum since the problem of goring or surface tearing encountered with such materials is minimized by the present design.

Still another object is to provide a novel connector that is particularly economical to manufacture and readily adapted for mass production in that it comprises only parts that may be readily machined using common tools and methods.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings in which:

FIGURE 1 is an exploded view of the parts of a connector embodying the present invention together with a section of conduit or the like.

FIGS. 2 and 2*a* are before and after views, respectively, showing a step in the formation of the fitting member of the connector.

FIG. 3 is a fragmentary sectional view of the connector shown in FIG. 1 in position on the end of a conduit prior to being tightened and secured.

FIG. 4 is a view similar to FIG. 3 showing the parts in an intermediate position as they are tightened.

FIG. 5 is an elevational view partially in section, of the connector shown in FIG. 1, fully tightened and secured to the end of a conduit or the like.

While the invention will be described in connection with a preferred embodiment, it will be understood that I do not intend to limit the invention to that embodiment. On the contrary, I intend to cover all alterations, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

Turning first to FIG. 1, there is shown an illustrative connector 10 embodying the present invention, comprising a threaded fitting member 11 and a sealing nut 12, positioned for connection to an electrical shield or conduit 13. When attached, the connector 10 becomes a rigid and substantially integral part of the conduit 13 and permits the conduit to be threadably secured to a connection box or similar structure.

Referring more particularly to the fitting member 11 and FIG. 3, it can be seen that the fitting is a single, integral, annular member having a main central bore 15 of a diameter to closely, but slidably, surround the particular conduit outer diameter with which the connector 10 is intended to be utilized. A stop is provided for permitting the fitting 11 to be accurately positioned over the end of the conduit 13. In this instance, the stop takes the form of an interiorly projecting, tapered, annular ridge 16. To permit the fitting member 11 to be threadably secured to a connection box or the like, its forward end is provided with a pipe-threaded portion 17 and a nut portion 18. So that the sealing nut 12 may be drawn into the fitting member 11, the latter is provided with a screw threaded portion 19.

Referring now to the sealing nut 12, the latter has a conventional flat-sided configuration and is provided with internal screw threads 21 which are complementary to the threaded portion 19 and permit the sealing nut to be threadably drawn onto the fitting member 11. Rearwardly of its flat-sided nut configuration, the sealing nut 12 is provided with an axially extending nose 22 having a smooth bore 23 which has approximately the same diameter as the bore 15 of the fitting 11 and is thus able to closely but slidably surround the conduit 13. At its outer end, the bore 23 is flared outwardly to define a rounded throat 24 which eliminates the danger of having a sharp edge on the sealing nut 12 dig into the conduit 13 when the latter is flexed relative to the connector 10.

Structural provision is made for the connector 10 to "double grip" the conduit 13 by squeezing the latter concentrically about its periphery at two axial spaced points. For this purpose, the fitting member 11 and the sealing nut 12 are formed so that threadably drawing the nut onto the fitting causes cam portions on the nut to inwardly deflect circular edges on the fitting which bitingly engage and grip a conduit which has been inserted into the fitting. To provide the biting edges in the present embodiment, the fitting member 11 is formed with a two-section, cylindrical portion 30 at its rearward end. The forward section 31 of the cylindrical portion 30 has an internal diameter substantially equal to that of the bore 15, and preferably its inner cylindrical surface is contiguous with the bore 15. The rear section 32 of the cylindrical portion 30 has an internal diameter, formed by a counterbore 33, which is slightly greater than that of the bore 15. It can be seen that the cylindrical sections 31, 32, define circular inner edges 34, 35, respectively, which face outwardly of the counterbore 33.

In the preferred embodiment, the rear section 32 of the cylindrical portion 30, is turned inwardly to define an outer tapered portion 32*a*. That is, the outer edge of the portion 30 is turned from its cylindrical FIG. 2 shape to the tapered FIG. 2*a* configuration. The degree of taper is preferably sufficient to equalize the diameters of the circular inner edges 34, 35. The purpose of this turning operation will be made clear below.

For the purpose of deflecting the edges 34, 35 inwardly and thus grippingly engaging the conduit 13, the nut 12 is provided with two conically tapering, internal cam surfaces 41, 42, separated by a cylindrical bore 43. The bore 43 is of sufficiently greater diameter than the conduit 13 so as to permit the cylindrical section 32 of

the fitting 11 to be received within the bore 43 without being forced into the conduit 13. By virtue of this construction, the internal cam surfaces 41, 42 are separated along the axial length of sealing nut 12 by a flat cylindrical wall defining a cylindrical bore 43 between said cam surfaces, which bore is of a sufficiently greater radial dimension than the radial dimension of the circular inner edge 35 of the rear section 32 to permit said circular inner edge 35 at the outer end of rear section 32 to enter said cylindrical bore and to permit said rear section 32 to be moved along the length of said cylindrical bore 43 and into contact with the outermost cam surface 42 as nut 12 is threaded onto fitting 11. It will be noted that cam surface 41, upon initial contact with the circular inner edge 35, forces the tapered portion 32*a* inwardly toward conduit 13 and into the entrance of cylindrical bore 43 but not into contact with conduit 13, and that the construction is such that engagement of cam surface 41 with said circular inner edge 35 does not offer any solid resistance to further advance movement of nut 12 as said nut is screwed onto threaded fitting member 11.

The function of the described parts can be best seen by briefly recounting the operational steps involved in installing the connector 10 on the conduit 13. The nut 12 is first slid over the end of the conduit, the bore 23 closely surrounding the outer diameter of the conduit. The fitting member 11 is then placed over the end of the conduit with the latter sliding within the closely fitting bore 15 until the end of the conduit 13 strikes the ledge 16. The mating threads 19, 21 are then engaged and the sealing nut 12 is threadably drawn onto the fitting member 11. As the nut 12 is rotated along the fitting 11, the cam surface 41 will strike the tapered portion 32*a*, deflecting it inwardly with a turning action, so as to allow the cylindrical section 32 to pass into the bore 43 (see FIG. 4).

Since the portion 32*a* has been inwardly tapered, it will be appreciated that the nut 12 can be drawn up more fully on the member 11 to obtain a solid engagement therewith before the cam surface 41 strikes the section 32. Also because of the taper given the section 32, the first contact between the surface 41 and the portion 32*a* will not offer a solid resistance to further movement of the nut 12, but rather the cam surface 41 will simply continue the turning movement begun when forming the tapered portion.

As the nut 12 is tightened into final position, the cam surface 41 is effective to drive the circular edge 34 inwardly, while simultaneously the cam surface 42 engages the tapered portion 32*a* and drives the circular edge 35 inwardly. Thus both of the circular edges 34, 35 are simultaneously turned inwardly to bitingly engage and firmly grip the conduit 13 around two spaced circular lines 51, 52 evidenced by the depressions in the outer wall of the conduit 13 (see FIG. 5).

It will be noted as a feature of the invention embodied in connector 10 that when the connector is installed on the end of a conduit or cable, the conduit or the like is rigidly and closely supported on either side of the areas of biting engagement between the connector 10 and itself. This is accomplished in the present instance by permitting the bore 15 to closely support the outer end of the conduit on one side of the lines of engagement 51, 52, while the bore 23, rigid with the bore 15, closely supports the conduit on the opposite side of the lines of engagement 51, 52. Thus, the gripping engagement between connector 10 and the conduit 13 is not weakened or loosened when the conduit 13 is flexed, since the close rigid support of the conduit 13 on each side of the lines of engagement 51, 52 does not permit flexure and resulting loosening to occur at those points.

As a further feature of the invention embodied in connector 10, the sections 31, 32 of the cylindrical portion 30 formed at one end of the fitting member 11 are

formed of approximately equal thickness so that the bending or turning forces which must be exerted by each of the cam surfaces 41, 42 remain substantially equal. Thus, each cam surface 41, 42 will be required to act on a cylindrical wall of the same thickness requiring approximately equal exertion of force to turn inwardly. By this equalizing of the forces exerted on each of the cam surfaces 41, 42, the user of the connector 10 is assured that the edges 34, 35 will be driven an approximately equal amount into the outer wall of the conduit 13 and thus that a particularly strong, double line of sealing contact is produced.

Because the tapered portion 32*a* minimizes the force required to turn the section 32 into the bore 43, the parts of the connector move smoothly together under a light turning force applied to the nut 12 until the FIG. 4 position is reached where the cam surface 42 is about to engage the portion 32*a*, and the cam surface 41 is about to drive the edge 34 inwardly. Beyond this point there is a sharp increase in the resistance of the nut to further turning and the workman therefore knows that the edges 34, 35 are gripping the conduit and that the nut has been turned as far as is necessary.

It will be appreciated that when installing the connector 10, neither the conduit 13 nor the fitting member 11 need be rotated since the entire connecting operation can be performed by rotating the sealing nut 12 relative to both the conduit 13 and the fitting member 11. Thus, if it is desired to secure the end of the conduit 13 to a connection box or the like, the fitting 11 can be first threadably installed in the connection box before being secured to the conduit. Once the fitting member 11 has been properly positioned, the conduit 13 can be then slid into the bore 15 and the sealing nut 12 rotated to lock the assembly into the desired position.

It will be apparent that the connector 10 embodying the invention is unusually simple and economical to manufacture since only two pieces are required, and each of these are readily adaptable for mass production with ordinary machine tools such as screw machines or the like.

It is particularly important to note that the connector 10 is especially adapted to be formed of light, easily shaped materials such as aluminum. Materials of this nature are inherently soft and therefore may be easily damaged by the application of excessive forces. This is avoided in the present construction by shaping the parts so that a sharp increase in resistance instantly tells the user that the connector is in place and further force is unnecessary.

Materials of this type also present a problem of goring or surface tearing when opposed surfaces are wedged together. This is minimized in the present case by turning inwardly the end of the section 32 to form the tapered portion 32*a*. This turning operation has been found to work harden the surface on the fitting 11 which bears most of the force imparted by the nut 12 as the connector is locked into placed. Since the outer surface of the portion 32*a* is worked hardened, little goring or surface tearing has been found to occur between it and the cam surfaces 41, 42, and thus the connector 10 may be installed quickly and reliably.

In the description above, as well as in the appended claims, the connector 10 has been associated with an electrical conduit merely for illustrative purposes. It will be appreciated by those skilled in the art that the connector is equally useful with shielded electrical cable, fluid conducting tubing, and wires or rods of other types. It will be understood that the term "conduit" in the following claims will be taken to include the above and similar equivalent structures.

I claim as my invention:

1. A connector fitting intended for attachment to a cylindrical conduit or the like, comprising a fitting body having a central bore for closely but slidably receiving

a conduit, an externally threaded portion on one end of said body, a thin-walled, generally cylindrical portion with said body extending axially from said externally threaded portion and comprising two overlapping sections, the first section adjoining the body having an internal diameter equal to said central bore and the second section having an internal diameter greater than said central bore so that there is a circular inner edge defined by the outer end of each section, said cylindrical portions being of substantially uniform thickness throughout, a sealing nut having a portion to threadably engage said threaded body portion and two axially spaced, conically tapered, internal cam surfaces, the innermost cam surface tapering inwardly from a diameter at least equal to the outer diameter of said second section to a diameter substantially equal to the outer diameter of the first section and the outermost cam surface tapering inwardly from a diameter at least equal to the inner diameter of said second section to substantially the diameter of said central bore, said cam surfaces being axially spaced a distance substantially equal to the axial distance between said edges less the axial length of said outermost cam surface, said cam surfaces being separated along the length of said sealing nut by a flat cylindrical wall defining a cylindrical bore between said cam surfaces of a sufficiently greater radial dimension than the radial dimension of the circular inner edge of said second section to permit said circular inner edge at the outer end of said second section to enter said cylindrical bore and to be moved along the length thereof and into contact with said outermost cam surface as said nut is threaded onto said fitting, initial contact between said innermost cam surface and the circular inner edge at the outer end of said second section offering no solid resistance to further advance movement of said sealing nut and serving

to force said circular inner edge into the entrance to said cylindrical bore, a conduit passing into said central bore, said cam surfaces causing said circular inner edges defined by the outer ends of said first and second sections to bitingly engage and grip said conduit along two spaced circular lines with substantially equal gripping action along each of said edges due to said uniformity of the cylindrical portion thickness as said sealing nut is threaded onto said fitting.

2. A connector fitting as defined in claim 1 wherein said thin-walled, generally cylindrical portion which extends axially from said externally threaded portion of the body is integral with said body.

3. A connector fitting as defined in claim 1 wherein the outer end of said second section is turned inwardly to define a tapered end portion adjacent its circular inner edge, and wherein said tapered end portion has a work hardened outer surface.

4. A connector fitting as defined in claim 1 wherein said sealing nut has an axially extending nose portion spaced axially and rearwardly of said cam surfaces and which has a smooth internal cylindrical surface of a diameter substantially equal to the diameter of the central bore of the fitting body.

References Cited in the file of this patent

UNITED STATES PATENTS

1,143,816	Duffy	June 22, 1915
2,139,413	Kreidel	Dec. 6, 1938
2,211,856	Kriedel	Aug. 20, 1940
2,412,664	Wolfram et al.	Dec. 17, 1946
2,693,374	Wurzburger	Nov. 2, 1954
2,856,451	Appleton	Oct. 14, 1958
2,934,362	Franck	Apr. 26, 1960