Sept. 29, 1964 T. W. BRIEGEL ETAL 3,150,886

ELECTRICAL CONDUIT CONNECTOR

Filed May 23, 1961

Fig. 1

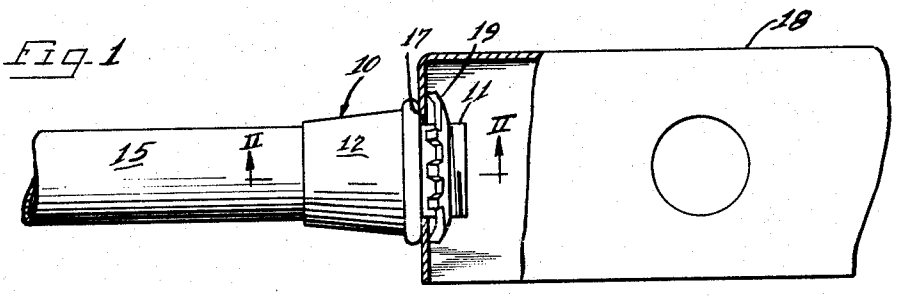
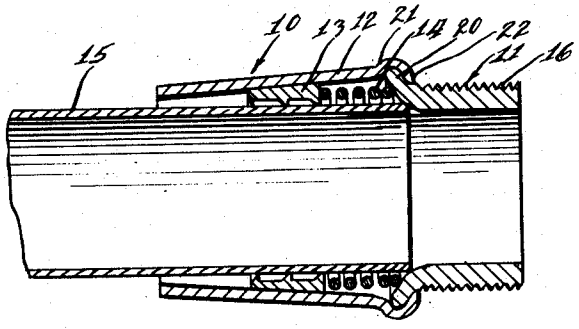


Fig. 2



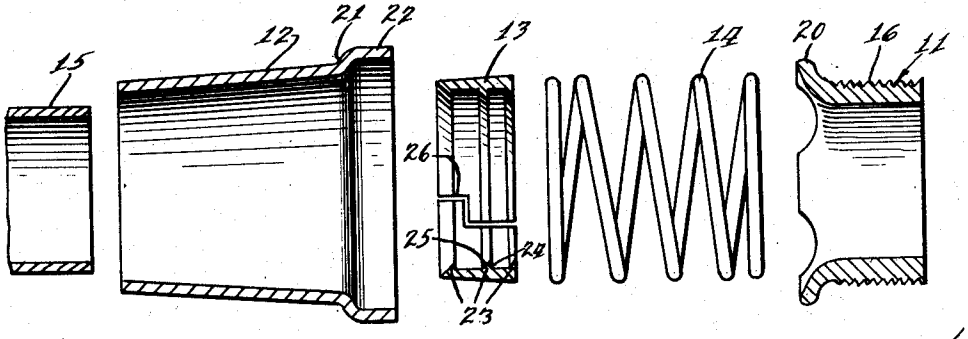


Fig. 3

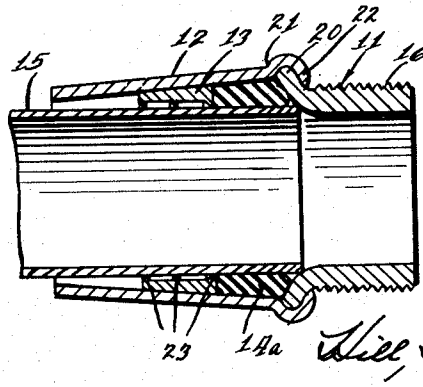


Fig. 4

Fig. 5

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ELECTRICAL CONDUIT CONNECTOR

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This invention relates to electrical connectors for use with outlet boxes or the like, and more particularly to a connector which may be readily assembled, but which resists disassembly with a high degree of strength.

The present invention meets the need for a simple but rugged and weatherproof connector for electrical lines and the like, by providing a slip-on construction wherein a threaded end or insert for the outlet box is engaged by a tapered sleeve receiving a complementary locking ring or gland which is biased into snug-fitting engagement with the sleeve by resilient means, preferably constituting a rubber washer for weatherproofing the connector. Thus a tube for receiving the electrical wiring may be inserted through the locking ring and resilient means, to abut the threaded insert, and withdrawal of the tube is prevented by annular contact teeth on the inside diameter of the locking ring which dig into the tube when withdrawal is attempted.

Accordingly, it is an object of the present invention to provide an electrical connector which may be readily assembled by slipping a conduit tube into position and which resists withdrawal of the tube with a strength which is several times that required by established standards for such units.

Another object of the invention is to provide a connector as described which affords a rain-tight joint so that it may be used out of doors.

Another object of the invention is to provide a connector as described which is simple in construction and is readily assembled without the need for special skills or techniques.

Other objects and advantages of the invention will become apparent as the description proceeds in accordance with the drawings in which:

FIGURE 1 is a side elevational view, partly in vertical section, of a connector according to the present invention in assembled relation with an outlet box or the like;

FIGURE 2 is a horizontal sectional view taken along the lines II—II of FIGURE 1 and somewhat enlarged;

FIGURE 3 is an exploded view of the structure shown in FIGURE 2;

FIGURE 4 is a view corresponding to the view of FIGURE 2 and showing a different embodiment of resilient means within the connector; and

FIGURE 5 is a vertical sectional view of another form of resilient means in accordance with the invention.

Referring now to the drawings, and to FIGURES 1 to 3 in particular, an electrical connector **10** is shown according to the present invention which includes a threaded insert **11**, a tapered sleeve **12**, a locking ring or gland **13**, resilient means **14** within the sleeve **12** and a tube **15** inserted within the sleeve and against the insert **11**, as hereinafter further described.

The insert **11** is externally threaded with straight pipe threads **16** and thus may be inserted through an opening **17** in an outlet box **18**, to be retained in position by a nut or the like **19** as understood by those skilled in the art.

The outer end of the insert **11** is flared radially outwardly at **20** and may be provided with a scalloped configuration for this purpose. The sleeve **12** tapers inwardly away from the insert **11** at a predetermined acute angle which may, for example, be an angle of approximately 4° from the axis of the sleeve. The wider end of the sleeve **12** defines an outwardly turned annular shoulder **21** and an integral marginal flange **22** which is rolled over onto the flared end **20** of the insert **11** to afford a secure connection with the insert **11**, also as hereinafter further described.

The locking ring or gland **13** is a relatively thin metal member having an external surface tapered correspondingly to the taper of the sleeve **12**, as for example 4° from its axis in the embodiment described, and the inner diameter of the ring defines one or more but preferably two or three radially inwardly projecting, annular contact points or teeth **23**, which are spaced axially from one another along the inner diameter of the ring **13**. The annular teeth **23** are characterized by a surface **24** which is perpendicular to the axis of the ring and facing the wider end of the ring and a surface **25** which is beveled toward the narrower end of the ring. The ring is preferably split at **26** in an axially Z-shaped configuration to afford a resilient construction for the ring.

The resilient means **14** in the embodiment of FIGURES 1–3 comprises a helical spring, which may be of high-carbon steel or the like such as piano wire, and as illustrated, includes five complete spirals with one end bearing against the flared end portion **20** of the insert **11** and the other end bearing against the wider end of the ring **13**. Thereby, the ring **13** is urged toward the narrow end of the sleeve **12**. The ring **13** is dimensioned to engage snugly with the sleeve **12** as urged by the resilient means **14**.

The tube **15** has an inner diameter which preferably is identical to the inner diameter of the insert **11** and an outer diameter which is slightly greater than the minimum inner diameter of the ring **13** in its free state and is also adapted to be inserted into the sleeve **12** through the ring **13** and spring **14**.

It will thus be seen that with the spring **14** and ring **13** in the assembled position, the tube **15** can be inserted into the sleeve **12** and through the ring **13** and spring **14**, into abutting engagement with the end portion **20** of the insert **11**. However, withdrawal of the tube **15** from the sleeve **12** is prevented by the teeth **23** which dig into the tube **15** with progressively increasing force when the tube and the ring are pulled toward the smaller diameter end of the sleeve. The sleeve **12** thus cams the ring **13** radially inwardly and progressively constricts the ring when the ring is moved relatively towards the smaller diameter end of the sleeve.

When the tube **15** is inserted initially, the configuration of the teeth **23** and the split construction of the ring will permit the tube to move readily through the ring into the abutting relation with the insert **11**. The spring **14** may be further compressed at such time as the ring is carried slightly axially toward the wider end of the sleeve so that the ring may expand slightly for easy entry of the tube. However, when insertion is completed the spring will again urge the ring **13** toward the smaller end of the sleeve **12** to constrict the ring and assure a secure locking connection of the ring with the tube with the ring snugly abutting the sleeve **12**. And, as indicated, any attempt to remove the tube **15** will increase the engagement of the teeth with the tube. The spring **14**, which normally exerts axial force on the ring as described, will maintain this engagement and prevent any tendency of the ring to move toward the wider diameter end of the sleeve, although where the tube **15** is fully inserted no such movement would be possible with the ring cammed into engagement with the tube. And since the teeth **23** are normally smaller in diameter than the tube, relative movement of the ring after biting engagement of the teeth with the tube is virtually precluded in any event.

The insert **11**, the sleeve **12** and the ring **13**, as well as the tube **15**, if desired, may be made of a material such as mild or low carbon steel. It will thus be seen that the construction provided in accordance with the invention is exceptionally rugged, and it has been found that the pull required to separate the tube from the sleeve once it has been engaged as described is three times the separation pull or tension required by conventional safety standards. As a matter of fact, in practice the tube cannot be separated except by the destruction of the device.

In assembling the connector **10**, the ring **13** is inserted in the sleeve **12** from the wider end of the sleeve and the spring or resilient means **14** is similarly inserted, against the wider end of the ring. The sleeve is brought into abutting engagement with the flared end **20** of the insert **11** and the flange **22** is rolled over this flared end. The insert may then be threaded for connection with the outlet box **18**. Accordingly, the ring **13** and resilient member **14** will be retained within the sleeve so that the device is ready to receive the tube **15**.

Referring now to FIGURE 4, another and preferred embodiment of the invention is shown wherein a resilient rubber or neoprene bushing **14***a* is used as the resilient means for urging the ring **13** toward the smaller end of the sleeve **12**. In this embodiment, similar reference numerals designate similar parts, since the construction is otherwise the same as in the preceding embodiment. The bushing **14***a* has an outer diameter tapered at an angle which corresponds to the taper of the inner diameter of the sleeve **12**, as for example 4°, and has a length such as to exert axial force on the ring **13** when the said bushing is positioned in abutting engagement with the end **20** of the insert **11** and the ring **13**. Thus the bushing acts to maintain the ring in locking position when the tube **15** is inserted as above described, and to assure the locking relation of the ring with the tube when insertion has been completed.

Also, the inner diameter of the bushing **14***a* is such that the bushing snugly and sealingly engages the tube in the assembled condition of the device while the outer diameter sealingly engages the inner diameter of the sleeve **12**.

It will therefore be seen that the bushing **14***a* serves as a gasket which not only pushes the ring or gland **13** back on the tubing and affords automatic locking as does the spring **14**, but also provides a rain-tight joint permitting outdoor use of the device. And although the bushing **14***a* has been described with respect to rubber or neoprene material, it will be understood that other non-oxidizing long-life plastic materials or the like may be used within the scope of the invention.

Referring now to FIGURE 5, another form of bushing is shown in accordance with the present invention, as designated by reference numeral **14***b*. The bushing **14***b* may be formed of a resilient material as described in respect to the bushing **14***a* and may similarly have an outer wall which is tapered conformably with the taper of the sleeve **12** to fit sealingly therewithin, and an inner diameter surface which is adapted to snugly receive the tube **15**. Likewise, the length of the bushing **14***b* is such as to push the ring or gland **13** back onto the tubing for automatic locking. However, to further assure an effective weatherproof and rain-tight joint, the bushing **14***b* has a radially inwardly extending annular shoulder **27** at the larger diameter end thereof which not only engages with the insert **11** as does the bushing **14***a*, but also may afford a sealing engagement with the tube **15** at the end of the tube. And when the tube **15** has been fully inserted initially, the shoulder **27** may also urge the tube backwardly slightly to automatically further tighten the engagement of the teeth **23** with the tube, as hereinabove described.

There has thus been provided a slip-on type connector for electrical conduits or the like which is exceptionally

rugged, but which may be assembled with a minimum of effort and with no need for special tools or skills and techniques, so that once the tube for the electrical lines has been inserted, disengagement thereof is virtually impossible without destruction of the unit. Further, the device is adapted to effect an increased locking action with increased pull on the tube and is constructed to compensate for slight variations in tolerances of the parts and to positively assure a suitable locking action at all times, by virtue of resilient means contained therein. And because of the rain-type joint which is provided within the scope of the invention, as hereinabove set forth, the unit may be used out of doors or in any other location without hazard, so that a wide range of applications is afforded in addition to those herein referred to.

Although I have herein set forth and described my invention with respect to certain specific principles and details thereof, it will be understood by those skilled in the art that these may be varied without departing from the spirit and scope of the invention as set forth in the hereinto appended claims.

We claim as our invention:

1. A connector comprising a tubular insert adapted to be secured in an opening of an outlet box or the like and having an outwardly flared end, a tapered sleeve secured to said end and relatively wider adjacent said end than the minimum diameter of said insert and converging from said end, a resilient tubular member in said sleeve and abutting said end, an expansible ring in said sleeve urged toward the narrower end of said sleeve by said resilient member and dimensioned to be constricted by movement toward said narrower end, gripping means in said ring and a conduit inserted into said sleeve and gripped by said gripping means and by said resilient tubular member, said resilient tubular member having an external surface tapered complementarily to said sleeve and in sealing engagement with said sleeve.

2. A slip-on type connector for electrical outlet boxes and the like comprising a tubular insert adapted to be secured in an outlet box opening or the like and having an outwardly turned end, a tapered sleeve secured to said end and having a wider inner diameter adjacent said end than the minimum inner diameter of said insert, an axially open resilient tubular member in said sleeve having an inwardly turned shoulder at one end abutting said outwardly turned end of said insert, said shoulder forming an opening of reduced diameter relative to the major inner diameter of said resilient tubular member and an expansible ring in said sleeve having inner gripping means and urged by said resilient tubular member toward the narrower end of said sleeve and dimensioned to be constricted when moved toward said narrower end, said gripping means being effective to lock against a conduit inserted into said sleeve and said ring and the inner diameter of said resilient tubular member being dimensioned to seal against a conduit inserted thereinto and locked by said gripping means and said resilient tubular member having an outer surface tapered complementarily to said sleeve and adapted to seal against said sleeve when a conduit is inserted snugly into said resilient tubular member, said shoulder being effective to seal against the end of a conduit inserted into said resilient tubular member and against said outwardly turned end of said insert.

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