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(54) ELECTRICAL CONNECTION ASSEMBLY WITH UNITARY SEALING AND COMPRESSION RING

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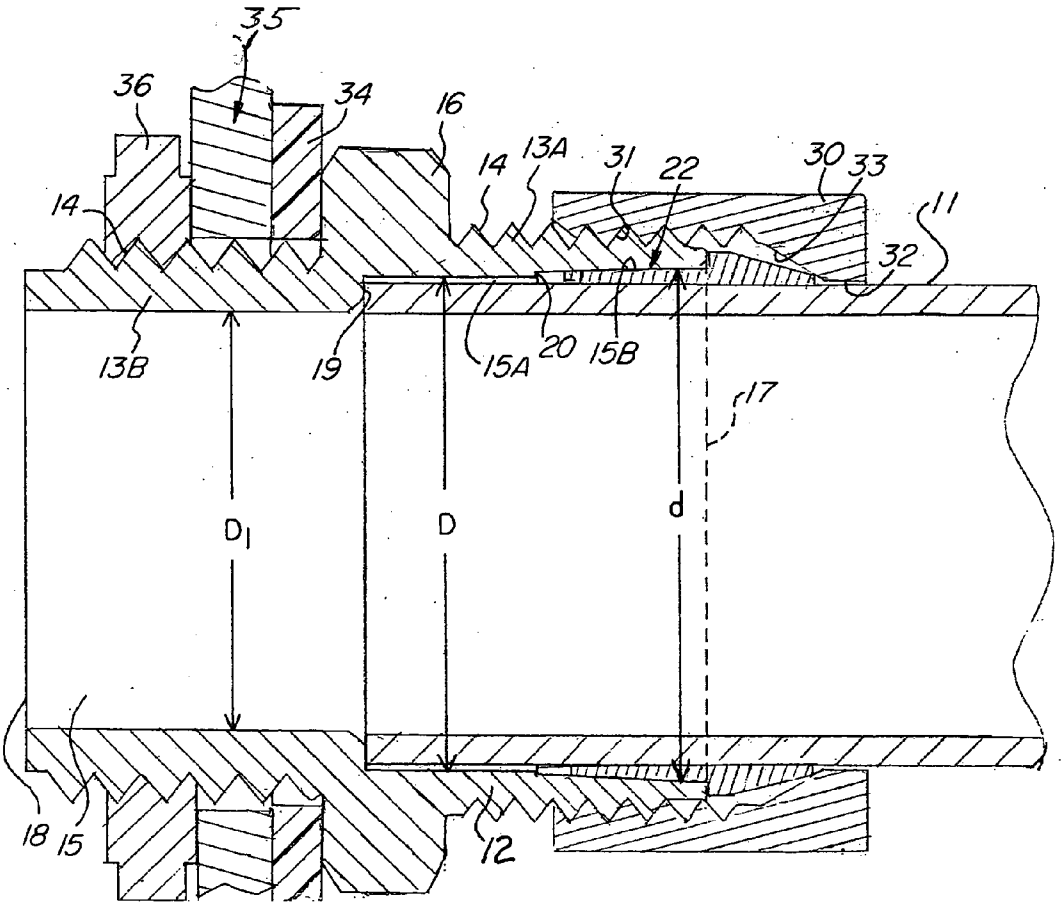
(57) **ABSTRACT**

An electrical connection assembly for securing electrical metal conduit to a junction box or the like, having a connection body with an inlet end portion for receiving a conduit wherein the inlet end includes a first portion sized to snugly receive an end portion of a conduit and a second portion having an internal surface that diverges outwardly toward the opening of the inlet end portion. A unitary sealing and compression ring is fitted onto the end portion of a conduit, and is positioned thereon so that the sealing ring portion of the unitary ring is received within the inlet end portion. A fastening nut secures the conduit to the inlet portion by causing the sealing ring portion to form a water or fluid tight seal between the connector body and the associated conduit and forming a mechanically sound connection between the connector body and the conduit. The unitary sealing and compression ring formed of metal insures positive electrical grounding of the assembled connection.



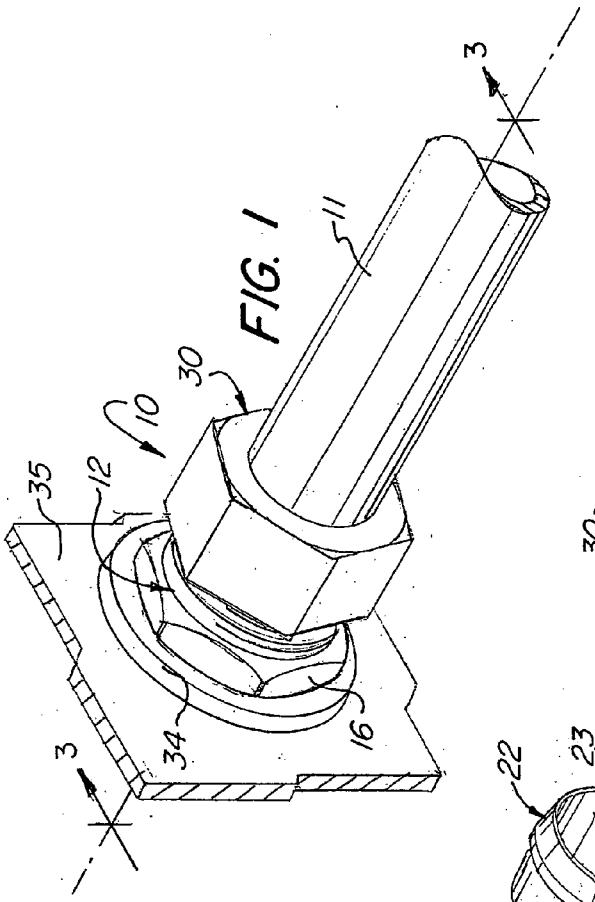

3
11
30
10
35
12
34
16
3

FIG. 1

11
30
31
32
22
23
22B
22A
15
13A
12
16
17
13B
34
14
18
14
36

FIG. 2

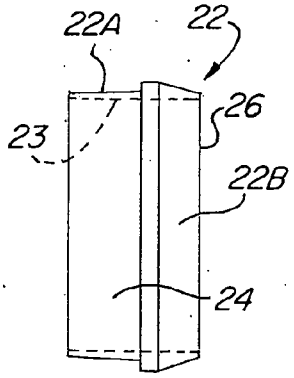


FIG. 4

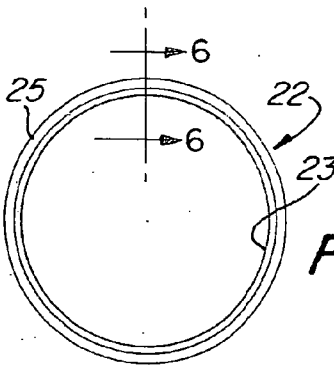


FIG. 5

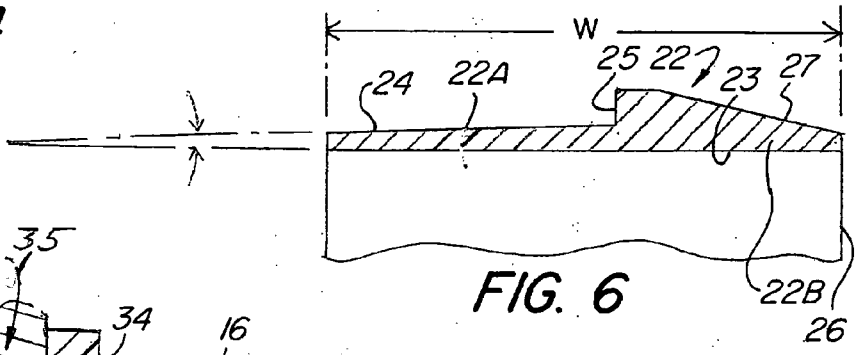


FIG. 6

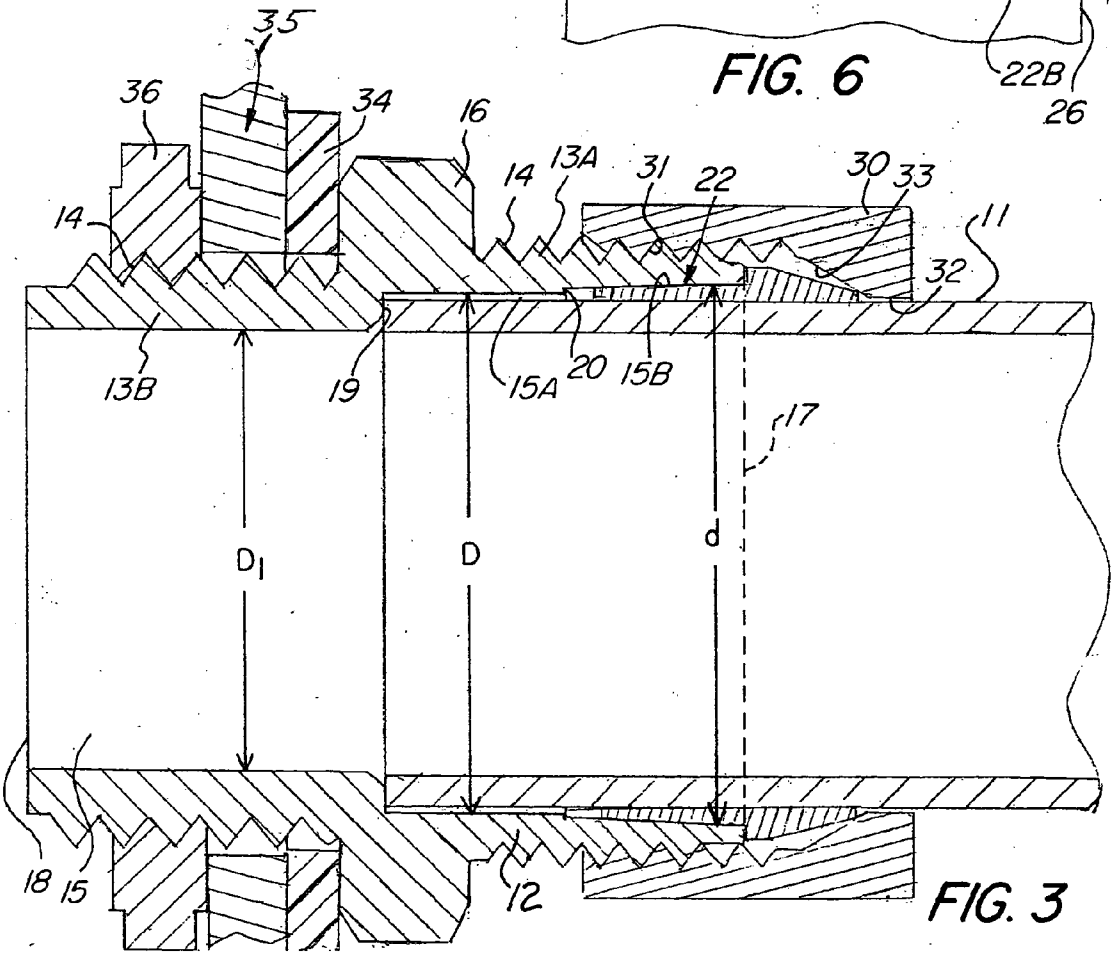


FIG. 3

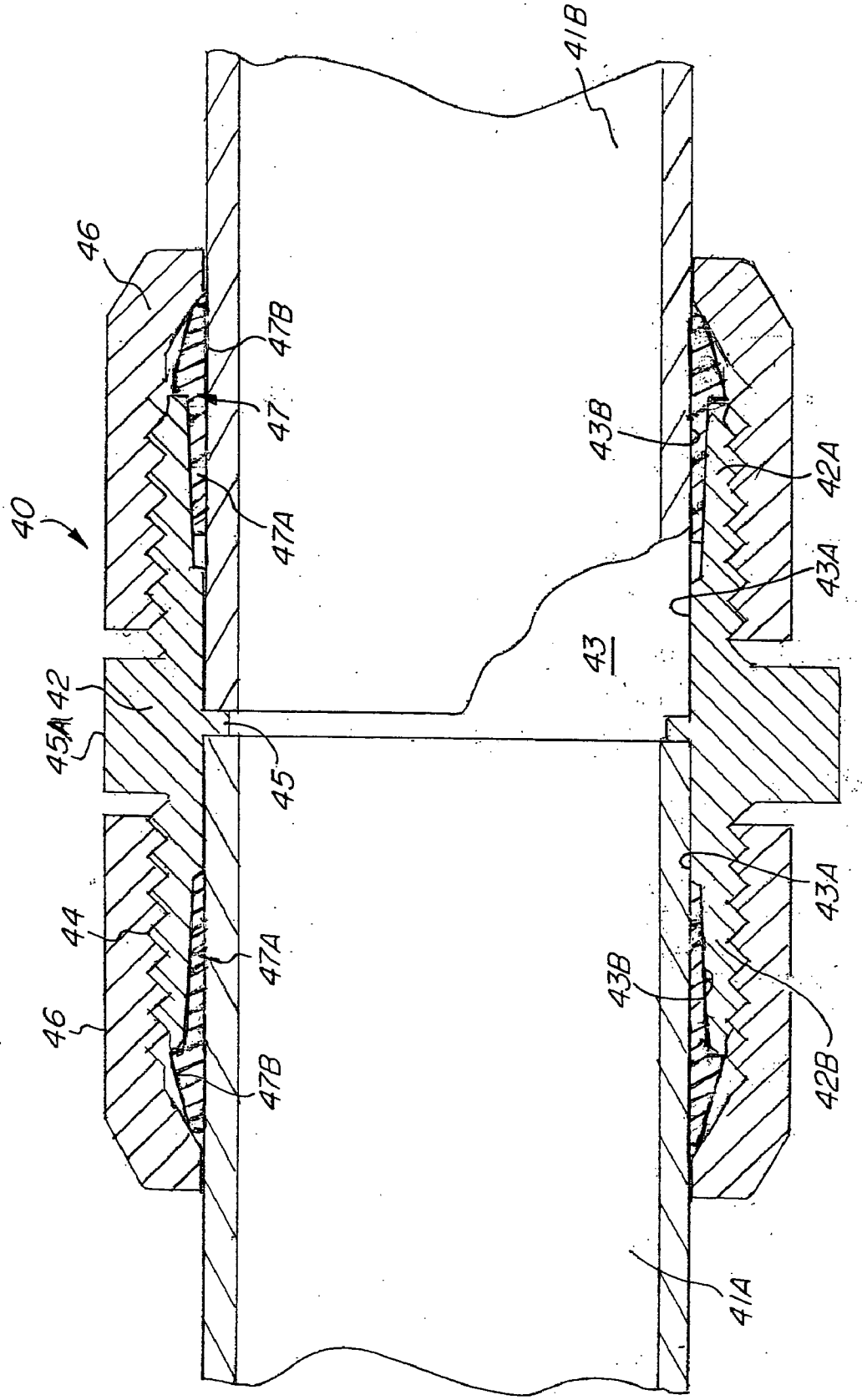

40
46
47B
47
47A
41B
43B
42A
43A
43
42
45A
45
44
46
47A
47B
43B
43A
42B
41A

FIG. 7

ELECTRICAL CONNECTION ASSEMBLY WITH UNITARY SEALING AND COMPRESSION RING

RELATED APPLICATION

[0001] This application is a continuation application of application Ser. No. 10/639,906 filed Aug. 13, 2003 for Electrical Connection Assembly With Unitary Sealing And Compression Ring.

FIELD OF THE INVENTION

[0002] This invention is directed to a connection assembly, and more specifically to a connector or coupling assembly having a unitary sealing and compression ring to effect a positively secured, sealed and electrically grounded connection.

BACKGROUND OF THE INVENTION

[0003] Heretofore it was common practice to secure an electric metal conduit that shields electrical conductors, wires or cables by inserting one end of a conduit into an externally threaded inlet end of a connecting body and securing the conduit to the threaded inlet end of the connecting body by a suitable tightening nut. The outlet end of the connecting body in turn was secured to an electrical junction box by inserting the other or outlet end of the connecting body into the knockout hole of the electrical junction box and securing the same by a locking nut or other suitable means, e.g. a snap fit retaining means as disclosed in a co-pending U.S. patent application Ser. No. 10/283,978 filed Oct. 30, 2002, which is incorporated herein by reference. It has been noted that such prior known connecting assemblies did not prohibit rain or water from seeking its way through the connection. Also, electrical grounding of conduits was not at all times positive.

SUMMARY OF THE INVENTION

[0004] An object of this invention is to provide an improved coupling or connector assembly which is capable of prohibiting water or rain from seeping through the coupling or connector assembly.

[0005] Another object is to provide an improved coupling or connector assembly capable of effecting a positive electrical grounding of a conduit connected thereto.

[0006] Another object is to provide an improved electrical coupling or connector assembly that is relatively simple to fabricate, easy to assemble and positive in operation.

[0007] Another object is to provide an electrical connection assembly having a unitary or integrally formed sealing and compression ring adapted to be snugly fitted onto an end portion of a conduit that will effectively secure, seal and electrically ground the conduit upon assembly of the connection assembly.

[0008] The foregoing objects and other features and advantages are readily obtained by a connector or coupling assembly that includes a connector or coupling body provided with an inlet end having an opening adapted to receive a conduit, and an outlet having an opening through which the electrical conductors, wires, or cables adapted to be inserted through the conduit may extend. The external surface of the inlet end is threaded to receive a connecting nut for securing the conduit to the inlet end. The connector or coupling body is provided with a through bore having a shoulder formed intermediate the length thereof to define a stop to limit the distance a conduit may be inserted thereinto. The internal surface of the inlet end of the connector or coupling body may be optionally provided with a second ridge or stop, disposed between the intermediate shoulder stop and the opening to the inlet end. The internal surface of the inlet end includes a first portion that is generally shaped and sized to snugly receive the outer surface of the conduit, and a second portion wherein the internal surface tapers or diverges outwardly toward the inlet opening.

[0009] To secure, seal and to provide a positive electric ground for the conduit, a unitary sealing and compression ring is fitted onto the end of the conduit. The sealing ring portion of the unitary sealing and compression ring is provided with a sloping or tapered outer surface that complements the taper of the outer second portion of the inlet end. The compression ring portion of the unitary sealing and compression ring is provided with an outer camming surface which is sloped in the opposite direction to that of the sealing ring portion, and to a greater degree of slope.

[0010] The arrangement is such that as the connecting nut is tightened onto the threaded inlet end of the connector body, the metallic unitary sealing ring portion is urged into a positive sealing relationship between the conduit and the second portion of the inlet end of the connector or coupling as the metallic compression ring portion is being compressed onto the conduit to insure a positive electric grounding of the conduit while imparting a secure frictional holding force sufficient to prohibit the conduit from being pulled out of the connector or coupling body.

[0011] Other features and advantages will become readily apparent in view of the following detailed description and drawings.

IN THE DRAWINGS

[0012] **FIG. 1** is a perspective view of an assembled connector embodying the present invention.

[0013] **FIG. 2** is an expanded perspective view illustrating the component parts of a connector embodying the invention.

[0014] **FIG. 3** is a side sectional view of the connector assembly embodying the invention taken along line **3-3** on **FIG. 1**.

[0015] **FIG. 4** is a side view of the unitary sealing and compression ring component.

[0016] **FIG. 5** is an end view of **FIG. 4**.

[0017] **FIG. 6** is a sectional view taken along line **6-6** on **FIG. 5**.

[0018] **FIG. 7** is a sectional side view of a coupling assembly embodying the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Referring to the drawings, there is illustrated in **FIGS. 1 and 2** a connection assembly embodying the invention. A connection assembly as broadly used herein encompasses a connector assembly **10**, by which an electric

metallic conduit **11** is connected to an electrical junction box **35** as shown in **FIG. 1**, or coupling assembly **40** as shown in **FIG. 7** for coupling two conduits **41**A and **41**B in end to end relationship.

[**0020**] The illustrated embodiment of the invention as depicted in FIGS. **1** to **6** is directed to a connector assembly **10** which includes a connector body **12** which is generally formed as zinc casting or other suitable metal. The connector body **12** includes an inlet end **13**A and an outlet end **13**B. In the illustrated embodiment of **FIGS. 1 and 2**, the outer surfaces of the inlet end **13**A and outlet end **13**B are provided with suitable external threads **14**. The connector body **12** also includes a through bore **15**, as will be hereinafter described in more detail. Intermediate the inlet end **13**A and outlet end **13**B, the connector body **12** is provided with a radially outwardly extending flange **16** having a hexagonal shape. However, it will be understood that the flange **16** may assume any suitable shape that will facilitate gripping the same for purposes of assembling.

[**0021**] Intermediate between the inlet opening **17** and the outlet opening **18** of the through bore **15** there is formed an internal shoulder **19** which functions as a stop to limit the distance a conduit **11** can be inserted into the inlet end **13**A of the connector body **12**. Generally, such conduits are formed of metal, e.g. steel and the like.

[**0022**] In accordance with this invention, the portion of the through bore **15** defining the distal portion or first portion **15**A of the inlet end **13**A, adjacent the stop shoulder **19**, has a substantially uniform diameter D of a size and shape to snugly receive the end portion of the conduit **11** as shown in **FIG. 3**. The distal or first portion **15**A of the inlet end **13**A extends from the stop shoulder **19** to an intermediate point or ridge or shoulder **20** spaced inwardly of the inlet opening **17**. It will be understood that the ridge **20** is optional. The internal surface at the proximate end of the inlet **13**A or second portion **15**B of the inlet end **13**A has an internal surface that tapers outwardly so that the diameter d of proximate end or second portion **15**A progressively increases from the end of the first portion **15**A to the inlet opening **17**. The portion of the bore **15** defining the outlet end **13**B has a diameter D_1 which is slightly less than diameter D, as determined by the thickness of the stop shoulder **19**.

[**0023**] In accordance with this invention, a unitary metallic sealing and compression ring **22** is snugly fitted onto an end portion of a conduit **11** as seen in **FIG. 3**. The unitary sealing and compression ring **22** includes a sealing ring portion **22**A and a compression ring portion **22**B. The internal surface **23** of the sealing and compression ring **22** is sized so as to be fitted onto the end portion of a conduit, e.g. conduit **11**. The external surface **24** of the sealing ring portion **22**A is formed with a slight taper that complements the internal taper of the described second portion **15**B of the inlet end **13**A. As best seen in **FIG. 6**, the taper **24** slopes in a radially outward direction. At a point intermediately of the width W of the ring **22**, there is formed a radially outwardly extending shoulder **25**. Between the shoulder **25** and the inlet opening **26**, the outer surface **27** defines a camming surface that slopes downwardly from the shoulder **25** to the inlet opening **26**. Preferably, the unitary sealing and compression ring **22** is formed of brass.

[**0024**] A fastening nut **30** is provided for securing the conduit **11** to the inlet end **13**A of the connector body **12**. The nut **30** is provided with internal threads **31** by which it can be threaded onto the external threads **14** of the inlet end **13**A of the connector body **12**. The nut **30** is provided with an opening **32** sized to permit the nut **30** to be fitted onto the end of the conduit **11**. Circumscribing the opening **32**, the nut **30** is provided with an internal cam surface **33** arranged to engage the external cam surface **27** of the combined sealing and compression ring **22** as the nut **30** is threaded onto the inlet end **13**A of the connector body **12** to finally secure the conduit **11** to the connector body **12**.

[**0025**] Completing the connector assembly **10** is a resilient washer **34** formed of a resilient plastic, rubber or the like, which is arranged to be fitted onto the outlet end **13**B of the connector body **12**. In operation, the washer **34** is fitted onto the outlet end **13**B of the connector body **12** so as to be positioned between the flange **16** and the side wall of a junction box **35** or the like. A lock nut **36** or other suitable locking fastener is fitted onto the outlet end portion **13**B of the connector to positively secure the connector body **12** to an electrical junction box **35** or the like. As the locking nut **36** is tightened onto the outlet end **13**B of the connector body **12**, the resilient washer **34** is compressed or wedged between the flange **16** and the side wall of the junction box **35**. Accordingly, the resilient washer **34** provides a seal about the knockout opening of the junction box **35** that receives the outlet end portion **13**B of the connector body **12**.

[**0026**] In assembling the connector assembly **10**, the fastening nut **30** is positioned onto the end of the conduit **11**, as noted in **FIG. 3**. The unitary sealing and compression ring **22** is then fitted onto the end of the conduit so that the sealing ring portion **22**A is received within the inlet end **13**A as noted in **FIG. 2**. With the fastening nut **30**, and sealing and compression ring **22** thus positioned onto the end of the conduit, the conduit **11** is inserted into the inlet end **13**A until the end of the conduit **11** is brought into abutting relationship with stop shoulder **19**. With the conduit **11** seated against the stop shoulder **19**, the fastening nut **30** is tightened onto the inlet end **13**A. The tightening of the fastening nut **30** onto the inlet end **13**A causes the cam surface **33** of the nut to engage the compression ring portion **22**B. In doing so, the sealing ring portion **22**A is urged or wedged between the outer surface of the conduit **11** and the internal tapered surface **15**B of the inlet portion **13**A to form a fluid tight seal thereat while causing the compression ring portion **22**B to be compressed tightly onto the periphery of the conduit **11** to positively secure the connection so as to preclude any separation or pull out of the conduit **11** from the connector body **13**. As the sealing and compression ring **22** is formed of a metal; preferably brass, a positive electrical grounding of the conduit and connector assembly is also achieved.

[**0027**] It will be understood that the conduit **11** may be connected to the connector body **12** either before or after the connector body **12** has been attached to a juncture box **35** or the like. To secure the described connector body **12** to a juncture box **35**, a resilient washer **34** is positioned on the outlet end **13**B, which is then inserted through a knockout hole of a juncture box **35** and secured thereto by the lock nut **36** or by other means, e.g. a snap fit ring as disclosed in the heretofore mentioned co-pending application.

[**0028**] **FIG. 7** illustrates a modified embodiment of the invention as applied to a coupling assembly **40** for connecting conduits **41**A and **41**B in end to end relationship. As shown, the coupler assembly **40** includes a coupling body **42** which may be formed of a suitable material, e.g. a zinc casting or the like. The coupling body **42** is provided with opposed inlet and outlet end portions **42**A, **42**B having a through bore **43**. In the illustrated embodiment, the outer

surfaces of the inlet and outlet portions **42**A, **42**B are externally threaded as indicated as **44**. Between the opposed open ends of the bore, there is provided on the internal surface thereof a circumscribing rib, ridge or shoulder **45**. As will be noted, the shoulder **45** defines a stop to limit the insertion of conduits **41**A, **41**B into the opposed end portions of the coupling body **42**.

[**0029**] The respective opposed end portions **42**A, **42**B are each provided with a bore portion **43**A having a substantially uniform diameter sized to snugly receive the outer diameter of the conduit to be fitted thereinto, and an internally tapered or second portion **43**B similar to that hereinbefore described with respect to the connector body **13**.

[**0030**] Externally, the coupling body **42** is provided with an external radial flange **45**A having a shape that can be readily gripped to effect the turning thereof if necessary for assembly purposes. The external surfaces of the respective opposed ends of the coupling body **42** are suitably threaded for receiving a fastening nut **46** similar to the fastening nut **30** hereinbefore described.

[**0031**] A unitary sealing and compression ring **47** constructed as hereinbefore described, is fitted onto each end of the respective conduits **41**A, **41**B.

[**0032**] To assemble the described coupling assembly **40**, each of the respective conduits is fitted with the fastening nut **46**. The described unitary sealing and compression ring **47** is then fitted onto the end of the respective conduits **41**A, **41**B. The unitary ring **47** is positioned on the conduit so that the sealing ring portion **47**A is received within the end portion of the coupler body. With the nut **46** and unitary ring **47** so positioned on the end of a conduit, the end of the conduit is inserted into one end portion of the coupling body **42** until the conduit is seated or abuts the stop shoulder **45**. The fastening nut **46** is then threaded onto its respective end portion until the sealing ring portion **47**A has wedged itself into sealing relationship between the inlet end of the coupling body **42** and the mating conduit. The tightening of the fastening nut **46**, as hereinbefore described, causes the compression ring portion **47**B to be tightly compressed onto the conduit. As the unitary ring **47** is preferably formed of brass, a positive electric grounding is also effected in the assembly of the coupler assembly **40**.

[**0033**] From the foregoing, it will be apparent that a fluid tight and a pressure tight connection is effected between the connector or coupling body and its corresponding conduit whereby any pullout or separation of the conduit is positively prohibited, and at the same time a positive electrical grounding of the conduit and the associated connector or coupling body is achieved.

[**0034**] While the invention has been described with respect to several embodiments thereof, it will be understood that variations and modifications may be made without departing from the spirit or scope of the invention.

What is claimed is:

1. An electrical connection for connecting a conduit thereto comprising:

a connector body having an inlet end and an outlet end,

a bore extending through said connector body from said inlet end to said outlet end to form opposed inlet and outlet openings,

said bore extending through said inlet end having a first inner portion and a second outer portion,

said first inner portion having a diameter less than the diameter of said second outer portion,

said first inner portion having an internal surface sized and shaped to snugly receive an end portion of a conduit,

and said second outer portion having an axial length forming an internal surface that tapers progressively outwardly toward said inlet opening,

a unitary sealing and compression metallic ring being adapted to be fitted onto an end portion of a conduit,

said unitary sealing and compression metallic ring including a sealing ring portion having an external outwardly tapering, smooth surface having an axial length for extending into said second portion of said bore whereby said external tapering surface of said sealing ring portion complements said internal taper of said second outer portion,

a radially outwardly shoulder circumscribing said metallic ring intermediate the width of said metallic ring,

a compression ring portion having a smooth inclined camming outer surface that converges toward the axis of said unitary ring,

said inclined camming outer surface sloping from the outer periphery of said shoulder toward the inlet opening of said metallic ring whereby the outer surface of said compression ring portion is threadless,

and a fastening nut having a complementary cam surface arranged to engage said inclined camming outer surface of said compression ring portion,

said fastening nut being adapted to be fitted onto an end portion of a conduit for securing the end portion of a metallic conduit to said inlet end and whereby said sealing ring portion is urged in sealing relationship with said second outer portion of said inlet end as said compression ring portion is compressed onto the end portion of a conduit, adapted to be received in said inlet end, as said fastening nut is threaded onto said inlet end,

and said unitary combined sealing and compression ring including a smooth cylindrical inner surface extending therethrough,

and wherein said unitary metallic ring is formed of brass.

2. A unitary metallic sealing and compression ring for sealing and securing an electrical conduit to a connecting body comprising

a unitary member forming a closed circular ring having a radially outwardly circumscribing shoulder intermediate the axial length thereof to define a sealing ring portion adapted to be received within an inlet end of a connector body and a compression ring portion,

said sealing ring portion having inner and outer surfaces,

said inner and outer surfaces being smooth and free of any threads, and said inner surface being adapted to be snugly fitted onto an electrical conduit and said outer surface having a smooth and threadless taper that slopes radially outwardly from one end of said sealing

ring portion toward said intermediate shoulder of said unitary sealing and compression ring,

said taper being adapted to complement an internal surface of a connector body inlet end,

and said compression ring portion having a smooth inner peripheral surface and a smooth and threadless outer peripheral surface,

said outer peripheral surface being shaped so as to slope downwardly from said shoulder toward the other end of said unitary sealing and compression ring, and

said inner peripheral surface of said compression ring portion forming an extension of said inner surface of said sealing ring portion,

wherein the angle of taper of the outer periphery of said compression ring portion is greater than the angle of taper of said outer surface of said sealing ring portion.

3. An electrical coupling assembly for connecting electrical conduits in an end to end relationship comprising:

a coupling body having opposed end portions,

a bore extending through said opposed end portions,

each of said end portions having an a distal inner surface portion and a proximal inner surface portion,

each of said distal inner surface portions having an internal peripheral surface sized and shaped to snugly receive an electrical conduit,

and each of said proximal inner surface portions of said end portions having an internal peripheral surface that gradually diverges radially outwardly,

a unitary sealing and compression ring forming a closed ring having an inlet opening and an outlet opening adapted to be snugly received on the end of each conduit to be connected to said coupling body,

each of said sealing and compression rings including a sealing ring portion and a compression ring portion,

a radially outwardly extending circumscribing shoulder defining said sealing ring portion from said compression ring portion,

said sealing ring portion having a smooth, tapering outer peripheral surface that complements the internal surface of said proximal inner surface portion of said end portions,

said compressing ring portion having a circumscribing, smooth, threadless surface that slopes radially inwardly from said shoulder toward said outlet opening,

and a fastening nut having an opening sized to be fitted onto the end of an electrical conduit to be connected to said end portion, and

said fastening nut having a cam surface adjacent said nut opening for engaging the external sloping, threadless surface of said compression ring portion as said fastening nut is being tightened onto said inlet end portion for simultaneously effecting a fluid tight seal and a secured compressive connection with an electrical conduit,

wherein said coupling body is formed of metal,

and including an electric metal conduit for connection thereto,

said unitary sealing and compression ring being formed of metal, whereby said compression ring portion effects a positive electric grounding of said electrical metal conduit in the assembled position.

4. An electrical connector assembly comprising:

a connector body having an inlet end and an outlet end,

said inlet end being externally threaded,

a bore extending through said inlet end and outlet end to form opposed inlet and outlet openings,

said bore extending through said inlet end having a first inner portion and a second outer portion, each of which extending over an axial length of said inlet end,

said second outer portion having an internal surface that progressively diverges toward said inlet opening wherein the internal minimum diameter of said second outer portion is greater than the internal diameter of said first inner portion,

a unitary sealing and compressing metallic ring adapted to be fitted onto an end portion of an electrical conduit,

said metallic ring including a sealing ring portion and a connected compression ring portion,

said sealing ring portion having an external, threadless, progressively outwardly tapering surface having an axial length for complementing said internal diverging surface of said second outer portion,

a radially outwardly extending shoulder circumscribing said metallic ring intermediate the axial length thereof for delineating the sealing ring portions from said compression ring portions of said metallic ring,

said compression ring portion having a smooth and threadless outer surface that converges toward the axis of said metallic ring,

said outer surface of said compression ring portion converging from said shoulder toward the axis of said metallic ring whereby the slope of said outer surface of said compression ring portion is greater than the external taper of said sealing ring portion,

and a fastening nut adapted to be fitted onto the end of a conduit,

said fastening nut having a complementary cam surface arranged to engage the camming outer surface of said compression ring portion whereby said sealing ring portion is urged into sealing relationship with said second portion of said inlet end as said compression ring portion is compressed onto the end portion of a conduit, as said fastening nut is threaded onto said inlet end.

* * * * *