

[72] Inventors **Kenneth M. Collins**  
**Markham, Ontario;**  
**John B. Davis, Oakville, Ontario, Canada**  
 [21] Appl. No. **773,823**  
 [22] Filed **Nov. 6, 1968**  
 [45] Patented **Mar. 2, 1971**  
 [73] Assignee **Grouse - Hinds Company**  
**Syracuse, N.Y.**

2,816,949 12/1957 Curtiss ..... 174/51  
 2,986,409 5/1961 Weber..... 285/161  
 3,259,406 7/1966 Kish ..... 285/341

**FOREIGN PATENTS**

701,907 1/1941 Germany..... 174/65.1  
 945,642 1/1964 Great Britain..... 285/348

*Primary Examiner*—Laramie E. Askin  
*Attorney*—Robert E. Sandt

[54] **ELECTRICAL CONNECTOR FOR WATERPROOF JACKETED ARMORED CABLE**  
**3 Claims, 1 Drawing Fig.**

[52] U.S. Cl..... **174/51,**  
 174/65, 174/78, 285/161, 285/341, 339/14

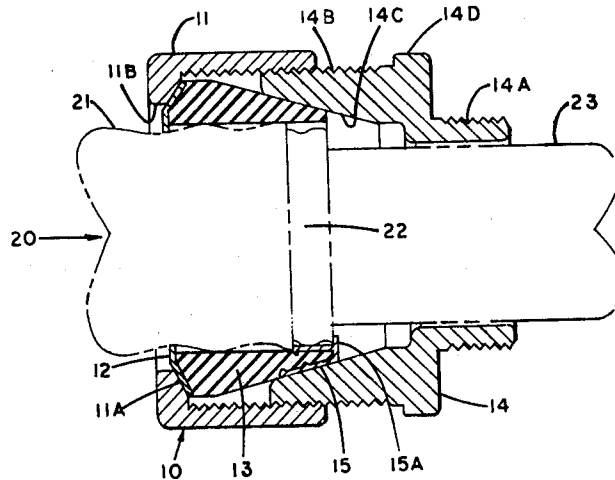
[51] Int. Cl..... **H01r 3/04,**  
 H02g 3/18

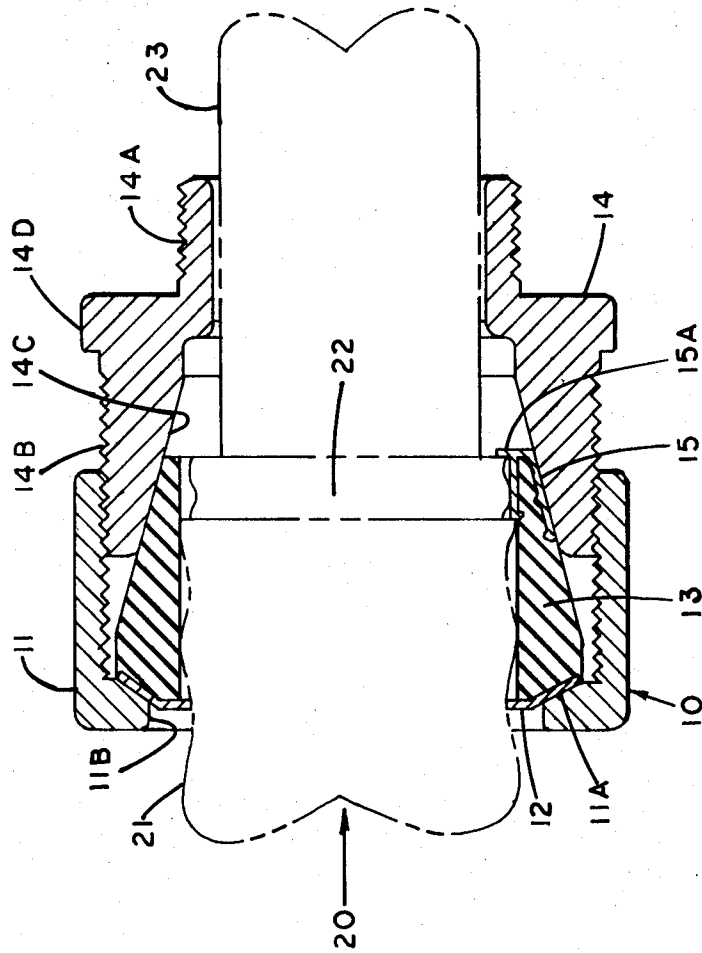
[50] Field of Search..... 174/51, 65,  
 65.1, 77, 78, 84.3; 339/14, 14 (L); 277/110, 112,  
 115, 117, 235; 285/340, 341, 342, 343, 348, 353,  
 161

[56] **References Cited**  
**UNITED STATES PATENTS**

2,503,169 4/1950 Phillips..... 174/78UX

**ABSTRACT:** An electrical connector for attaching an armored cable having an exterior waterproof jacket to a junction box, such that the cable is rigidly mechanically gripped by the connector, is electrically grounded thereto, and is sealed therein in a watertight seal, consists of a resilient grommet surrounding the cable jacket and compressed between two threaded members to provide a watertight seal and mechanical gripping, and a plurality of metallic stirrups straddling the inner and outer surfaces of the grommet at one end thereof to coact both with an exposed portion of the metallic armor of the cable and the metal of the connector to provide electrical grounding and additional mechanical gripping of the cable, the connector being further provided with an additional threaded portion for attachment to the junction box.





INVENTORS  
KENNETH M. COLLINS  
JOHN B. DAVIS

BY *Robert E. Sandt*  
ATTORNEY

## ELECTRICAL CONNECTOR FOR WATERPROOF JACKETED ARMORED CABLE

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates to electrical connections and more particularly to a connector for attaching an armored cable having a waterproof jacket to an electrical junction box.

#### 2. Description of the Prior Art

Connectors for attaching nonarmored jacketed power cables to junction boxes are well known in the art. Generically these usually consist of a resilient grommet which is compressed between two threaded members of a connector to form a watertight gland for sealing the cable to the connectors.

Also, well known in the art are connectors for connecting nonjacketed armored cables to a junction box, wherein the armored cable is gripped by setscrews in the connector. Prior workers in the field have combined the features of the latter type of connector with a resilient grommet to provide a connector for jacketed armored cable wherein the grommets gland seals against the jacket and the setscrews bear on an exposed portion of the armor to provide electrical grounding. To prevent deformation of the armor a metal sleeve or pressure pads are frequently interposed between the armor and in the setscrews.

In other known connectors for the same purpose, resilient grommets of rubberlike material and deformable lead grommets with suitable compression fittings are employed to secure the watertight seal and electrical continuity.

Finally, in another known construction a grounding sleeve is forced between the insulating jacket and the armor of the cable and a depending tab bent back upon the jacket to provide a ground connection with the metal surface of the connector when it is assembled on the cable with the compressible waterproof bushing.

### SUMMARY OF THE INVENTION

It is an object of this invention to provide a connector for attaching jacketed armored cable to an electrical junction box in a watertight seal with electrical grounding of the cable armor, wherein the connector comprises resilient means having electrically conducting inserts integral therewith and means for deformably compressing both the bushing and the inserts to coact respectively with the jacket and the armor of the cable inserted therein to provide the electrical and watertight connection thereto.

It is a further object to provide a connector in accordance with the foregoing object wherein the maximum number of components are preassembled to minimize assembly in the field and obviate the loss of parts.

Yet another object is to provide a connector in accordance with the foregoing objects, which through the employment of various sizes can accommodate a range of sizes of cables.

A final and specific object of the invention is to provide a connector for attaching jacketed armored cables to an electrical junction box wherein the connector comprises a resilient grommet having a plurality of metallic stirrups formed upon one end thereof with the legs of each stirrup contacting the inner and outer surfaces of the grommet, and a pair of complementarily threaded members, one of which has an inner conical surface surrounding the grommet, the axial relative movement of the members providing a radial compression of the grommet and the inserts upon the cable inserted therein to provide both a seal and an electrical grounding.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawing, which is a cross-sectional view taken on the axis of the connector.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

In the single drawing the connector 10 is intended to connect the cable 20 to an electrical junction box (not shown). This connection is achieved conventionally by passing the male threaded body member 14 through an opening in the box and threading a nut thereon, with suitable washers and thread lubricant to achieve a watertight and electrically grounded joint between the connector and the box. Alternatively the male threaded body member 14 can be threaded directly into a female threaded boss on the junction box with a suitable electrically conductive sealant to provide the requisite waterproof and electrically conductive joint.

The foregoing is by way of background, and since it is conventional practice, forms no part of the invention. The connector 10 acts as a waterproof gland to seal the cable to the box. In addition to this function it must provide electrical continuity between the armor of the cable and the box, as well as a rigid mechanical connection thereto to resist any strains to which the cable might be subjected in use.

The cable 20 is an industrial standard jacketed armored cable wherein the outer jacket 21 of polyvinyl-chloride, or other suitable plastic or synthetic rubber composition protects the cable from corrosion by providing a waterproof protective covering. Inside the jacket 21, is an interlocking helical metal armor 22 for protection against physical damage to the insulated cable core 23. The cable 20 is prepared for installation by stripping both the jacket 21 and the armor back from the cable core 23 a distance sufficient to make up the electrical connections within the junction box, in the usual manner. The jacket 21 is then stripped back further to expose a short length of the armor 22 beneath.

The nut 11, washer 12, and grommet 13 (with integral stirrups 15) are then slipped upon the thus-prepared cable 20 and the cable passed through the body member 14, which has previously been fastened to the junction box (not shown). The cable is then pressed snugly forward (to the right as viewed in the drawing) and the nut 11 threaded tightly upon the body member 14. This automatically provides the requisite connection by coaction of the elements now to be described in detail.

The body member 14, shown in the drawing to approximate scale, consists of the male threaded portion 14a (for connection to the junction box), the male threaded portion 14b (to receive nut 11), the internal conical bore 14c, and a wrenching flange 14d, which may be hexagonal or any other convenient shape. The internally threaded nut 11, also drawn approximately to scale, is generally cup-shaped with a tapered, or chamfered, surface 11a formed in the bottom around the opening 11b. This chamfer, while it is not critical, does contribute toward the compression of the grommet to effect a tight seal. The washer 12, dished to an angle corresponding to the chamfer 11a on nut 11, fits around the jacket 21 of cable 20 and provides a free-sliding surface with nut 11 to permit rotation thereof without rotation of the grommet 13.

The grommet 13 is compressed between the washer 12 and the internal conical surface 14c of body member 14 as nut 11 is threaded tightly thereon. Since the reactive forces of these surfaces is radially inward, the grommet 13 is forced to grip the cable tightly and conform to every convolution thereof in a watertight seal, the grommet being fabricated of a resilient material such as, for example, synthetic rubber of the requisite resiliency.

Preassembled to the grommet 13 are three (preferably) stirrups 15 which are crimped at 120° spacings over the end of the grommet so that one leg fits along the inner wall, and the other leg fits along the outer wall of the grommet, the connecting web fitting over the end of the grommet to connect the two legs. A lip 15a depending from the connecting web provides an inwardly protruding stop against which the metallic armor 22 of the cable is inserted upon assembly. The length of exposed armor on the pre-prepared cable is stripped to approximately the length (or slightly greater than the length) of the inner legs of the stirrups 15. These stirrups are preferably ex-

truded in the desired cross section, which includes internal teeth. The individual stirrups are then cut from the extruded length and crimped on the grommet in the desired angular spacing (preferably at 120°). The metallic composition is so chosen for its electrical conductivity, its compatibility with the metals of the cable armor and the connector body materials (to resist corrosion) and to provide the requisite deformability when the connector is assembled upon the cable. The deformation is effected by the clamping action of the conical section 14c of the body member 14 which coacts with the outer legs of the stirrups 15 and the grommet to provide a tight grip upon the cable armor.

By the foregoing structure the mechanical bond between the cable and the connector (and derivatively to the junction box) is achieved by the clamping action of the conical surface of the connector body acting both upon the grommet 13 and the stirrups 15 as the nut 11 is tightened, forcing these elements to bear tightly upon the cable jacket and armor respectively. The coaction of the grommet with the cable jacket further provides the requisite watertight seal, while the coaction of the stirrups with both the cable armor and the connector body provides the requisite electrical bonding.

The suitability of connectors of this general variety for their intended use is determined by specifications issued by the various standards associations, such as, for example, the Canadian Standards Association. Laboratory testing of submitted samples for conformance with the specifications determines whether the samples are approved and thus permits listing of the equipment as "approved." These specifications are frequently very exacting, and conformance thereto imposes very stringent requirements upon the designer. This, coupled with the competitive market in the connector business, further requires that the designer minimize both the number and complexity of the component parts so as to produce a functionally superior product at a minimum cost. A final desideratum is that the connector be so designed that field installation is expedited.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

We claim:

1. An electrical connector for affixing a waterproof jacketed armored electrical cable to a junction box in an elec-

trically grounded watertight connection thereto, comprising:

- a. a body member having a first threaded portion for connection to the box, an internal conical bore, and a second threaded portion;
  - b. a resilient grommet having a cylindrical inner bore substantially equal to the outer diameter of the cable to be secured, and a conical outer surface complementary to the conical bore in said body member inserted in said bore;
  - c. a plurality of grounding stirrups secured to said grommet, said stirrups each having first and second leg portions connected by a web in a generally U-shaped configuration, and the said stirrups each include a tab depending inward as a prolongation of the web connecting the said two legs, the first leg lying contiguous to the cylindrical surface of the grommet and the second leg lying contiguous to the conical surface of the grommet, and the web overlying the end of the grommet whereby the tabs serve as a stop to coact with the armor of the cable to limit the insertion thereof and automatically align the bared armor with the grounding stirrups;
  - d. a cup-shaped nut having an opening therein to pass the cable, and threaded upon the said second portion of said body member to, together with said body member, enclose said grommet; and
  - e. whereby when a jacketed armored cable, pre-prepared to bare a length of the armor substantially equal to the length of the said first legs of said stirrups and to expose a length of wiring internal of the armor sufficient to effect electrical connections, is inserted through said opening in the said nut and into the cylindrical bore with the exposed armor in apposition to the said first legs of said stirrups and the nut tightened to deform the grommet and the stirrups, the requisite grounded watertight connection between the connector and the cable is secured.
2. The connector of claim 1 wherein the stirrups are crimped upon the grommet to provide a unitary preassembly therewith.
3. The connector of claim 2 wherein the said nut is provided with a chamfered surface surrounding the opening, and the grommet is provided with a sloping end wall complementary to the chamfer, and a dished washer is interposed between the said nut and the grommet to provide a radial component of force to further compress the grommet as the nut is tightened upon the body member.

5  
10  
15  
20  
25  
30  
35  
40  
45  
50  
55  
60  
65  
70  
75

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,567,843 Dated March 2, 1971

Inventor(s) Kenneth M. Collins et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet [73] "Grouse-Hinds Company" should read -- Crouse-Hinds Company --.

Signed and sealed this 14th day of September 1971.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

ROBERT GOTTSCHALK  
Acting Commissioner of Pat