United States Patent

Caveney et al.

[15] **3,638,169**

[45] **Jan. 25, 1972**

[54] STRAIN RELIEF CLAMP AND ASSEMBLY

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[22] Filed: **Jan. 12, 1970**

[21] Appl. No.: **2,079**

[52] **U.S. Cl.** **339/107**

[51] **Int. Cl.** **H01r 13/58**

[58] **Field of Search** 339/103, 104, 107, 62, 206, 339/116, 101, 208

[56] **References Cited**

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[57] **ABSTRACT**

There is disclosed a strain relief clamp and assembly for limiting relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical conductors, the clamp assembly comprising a strain relief clamp including at least two body members each having a part-cylindrical connector body portion and a part-cylindrical cable body portion and an interconnecting portion joining the connector body portion and the cable body portion, a first binder tie clamping the connector body portions about the connector to provide engagement between locking structure on the connector body portion and the retaining structure, a second binder tie clamping the cable body portions about the cable at a predetermined position therealong, hinges interconnecting the two body members, and binder tie positioning structure provided on the connector body portions and the cable body portions.

24 Claims, 10 Drawing Figures

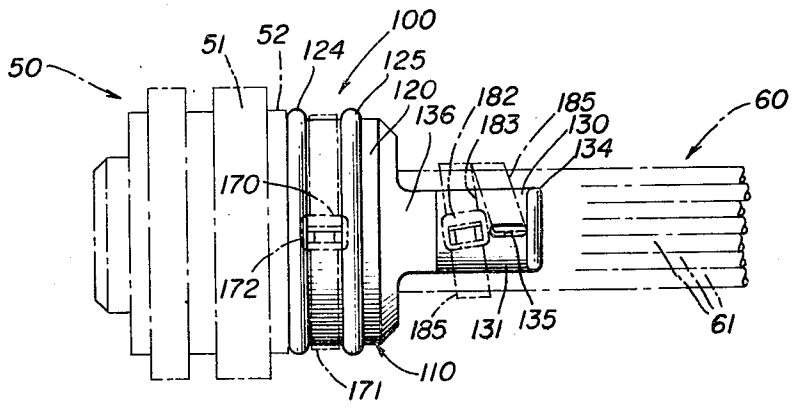

FIG. 1

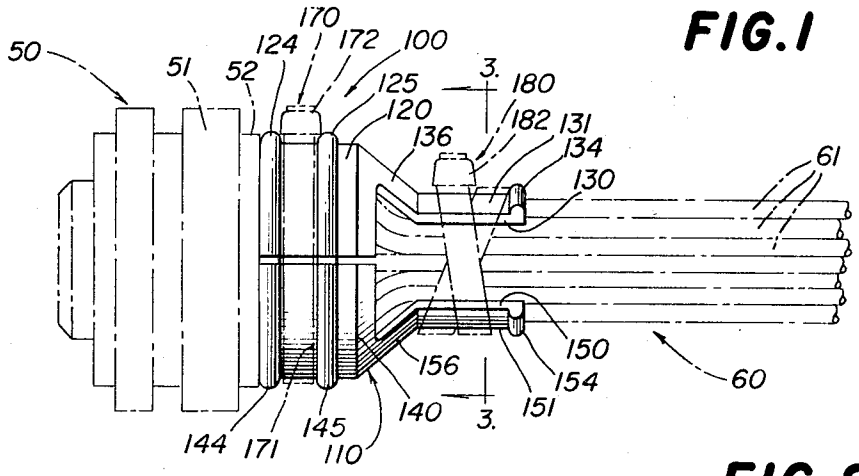

FIG. 2

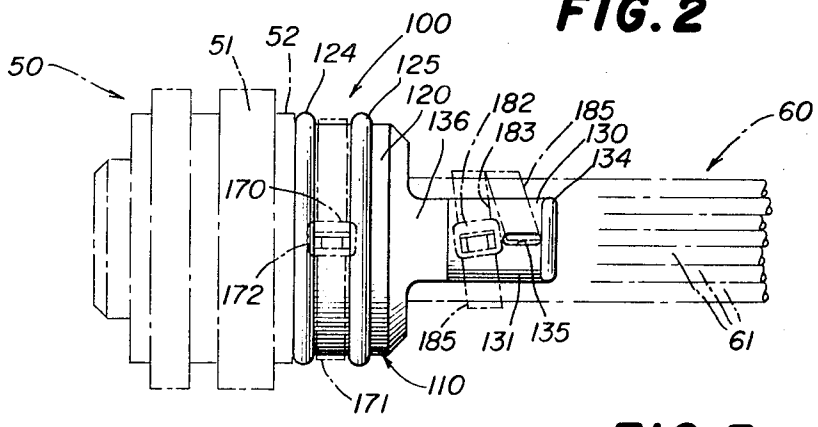

FIG. 4

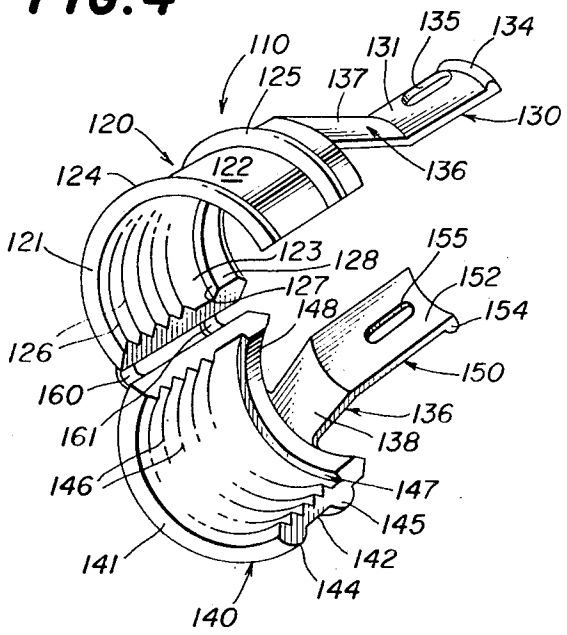

FIG. 3

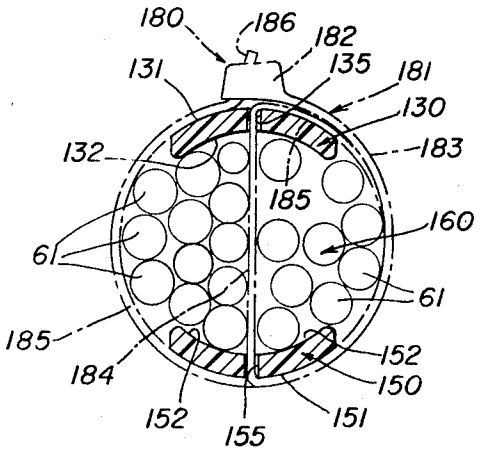

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FIG. 5

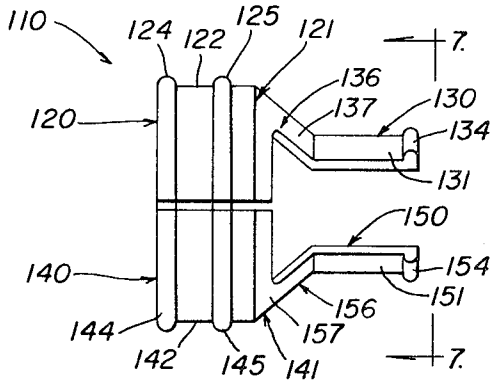


FIG. 6

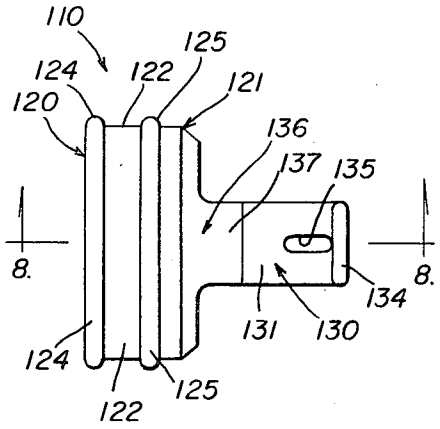


FIG. 7

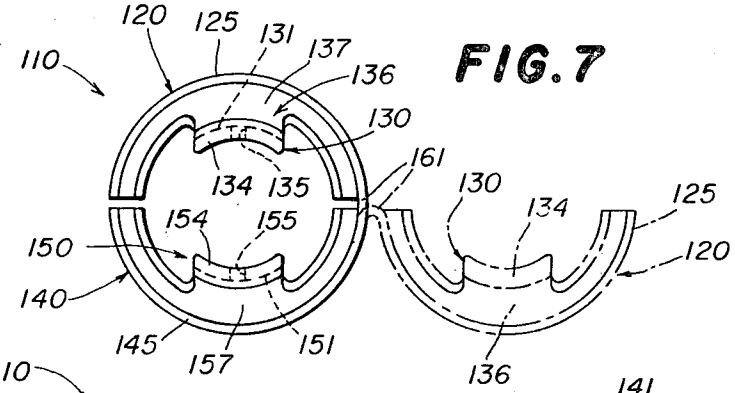


FIG. 8

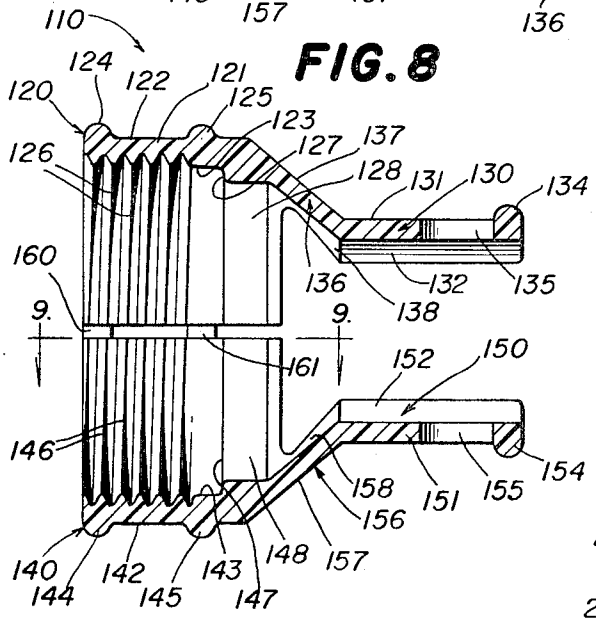


FIG. 9

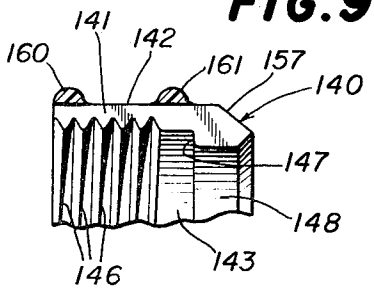
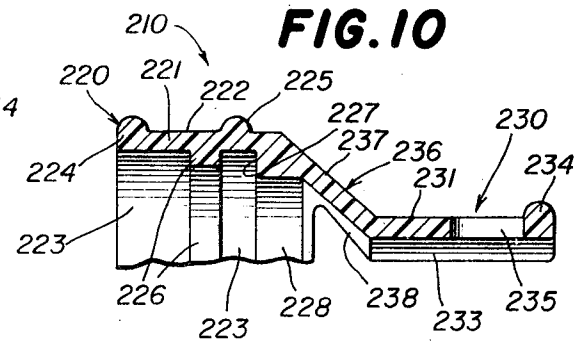


FIG. 10



STRAIN RELIEF CLAMP AND ASSEMBLY

The present invention is directed to an improved strain relief clamp and a strain relief clamp assembly incorporating the clamp, the assembly serving to limit the relative movement between a generally cylindrical connector and a cable of electrical conductors.

It is an important object of the present invention to provide a strain relief clamp for use in a strain relief clamp assembly to limit the relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical connectors wherein the strain relief clamp is held in operative position by first and second binder ties disposed thereabout, the strain relief clamp comprising an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining the connector body portion and the cable body portion, the strain relief clamp in use being arranged with the connector body portion disposed about the associated connector and clampingly held thereon by the first associated binder tie and with the cable body portion disposed about the associated cable and clampingly held thereon by the second associated binder tie, locking structure on the inner surface of the connector body portion for engagement with the retaining structure on the associated connector, first binder tie positioning structure on the outer surface of the connector body portion and cooperating to hold the first associated binder tie in a predetermined longitudinal position with respect to the connector body portion, and a second binder tie positioning structure on the outer surface of the cable body portion and cooperating to hold the associated second binder tie in a predetermined longitudinal position with respect to the cable body portion.

Another object of the invention is to provide a strain relief clamp of the type set forth formed of a synthetic organic plastic resin and more particularly one molded or nylon resin.

Another object of the invention is to provide a strain relief clamp of the type set forth wherein the connector body portion is essentially semicylindrical in shape.

Another object of the invention is to provide a strain relief clamp of the type set forth wherein the locking structure is in the form of transversely arranged locking ridges, which ridges may be helical in form or alternatively wherein the locking structure is in the form of a transversely arranged projection along the inner surface of the connector body portion.

Another object of the invention is to provide an improved strain relief clamp of the type set forth including at least two body members each having an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining the connector body portion and the cable body portion, the several portions named having the construction and functioning as set forth hereinabove.

In connection with the prior object, it is another object of the invention to provide a strain relief clamp of the type set forth and further including hinge structure interconnecting the body members and accommodating movement thereof into positions wherein the connector body portions are arranged in generally cylindrical form and the cable body portions are arranged as on the surface of a cylinder.

In connection with the foregoing object, it is another object of the invention to provide a strain relief clamp of the type set forth wherein the hinge structure interconnecting the connector body portions is in the form of two longitudinally spaced-apart hinge members, the strain relief clamp being molded of a synthetic organic plastic resin with the free longitudinal edges of the body members disposed in a common plane.

Still another object of the invention is to provide a strain relief clamp of the type set forth wherein each of the cable body portions has an opening therein for receiving therethrough the associated second binder tie, the second binder tie in use being disposed around and engaging the outer surfaces of the cable body portions and extending through the openings and through the associated cable for clampingly holding the cable body portions about the cable at a predetermined position therealong.

A further object of the invention is to provide an improved strain relief clamp assembly incorporating therein an improved strain relief clamp of the type set forth above.

Further features of the invention pertain to the particular arrangement of the parts of the strain relief clamp and of the assembly incorporating the strain relief clamp therein, whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation together with further objects and advantages thereof, will best be understood by reference to the following specification when taken in connection with the accompanying drawings, in which:

FIG. 1 is a view of a strain relief clamp assembly made in accordance with and embodying the principles of the present invention, the clamp assembly there illustrated incorporating therein a first preferred embodiment of the strain relief clamp of the present invention;

FIG. 2 is a plan view of the strain relief clamp assembly of FIG. 1;

FIG. 3 is a view on an enlarged scale in cross section through the clamp assembly of FIG. 1 along the line 3—3 thereof;

FIG. 4 is a perspective view of the strain relief clamp illustrated in FIGS. 1 to 3;

FIG. 5 is a side elevational view of the strain relief clamp of FIGS. 1 to 4;

FIG. 6 is a plan view of the strain relief clamp of FIG. 5;

FIG. 7 is an end view of the strain relief clamp of FIG. 5 as seen in the direction of the arrows along the line 7—7 thereof, one of the body members of the strain relief clamp being shown in dashed lines to illustrate the molded position thereof;

FIG. 8 is a cross-sectional view on an enlarged scale of the strain relief clamp of FIG. 6 along the line 8—8 thereof;

FIG. 9 is a fragmentary view in section through FIG. 8 along the line 9—9 thereof; and

FIG. 10 is a view in section illustrating a second embodiment of the strain relief clamp of the present invention.

Referring to FIGS. 1 to 3 of the drawings, there is illustrated a strain relief clamp assembly **100** interconnecting a connector **50** and a cable **60**, the clamp assembly **100** including a strain relief clamp **110** and two binder ties **170** and **180** respectively holding the strain relief clamp **100** about the connector **50** and the cable **60**. As illustrated, the connector **50** is of the type made in accordance with military specification MIL-C-26500 and includes a generally cylindrical body **51** carrying thereon a shoulder **52** adjacent to which there are disposed a plurality of helically arranged retaining grooves (not shown). The cable **60** is formed of a plurality of insulated electrical conductors **61**, the terminal ends of which are disposed to the left in FIG. 1 and soldered, crimped or otherwise connected to terminal pins sealingly received and mounted in the connector **50**. The clamp assembly **100** serves to provide a mechanical connection directly from the body of the cable **60** to the connector **50** so as to prevent bending of the conductors at the terminal pins and thus to relieve any strain upon the electrical connections between the terminal ends of the conductors **61** and the terminal pins in the connector **50**.

Referring specifically to FIGS. 4 to 9 of the drawings, the strain relief clamp **110** of the present invention is illustrated and comprises a pair of body members **120** and **140** which are interconnected by hinge members **160** and **161**. The body member **120** in turn includes an essentially semicylindrical connector body portion **121** having an essentially semicylindrical outer surface **122** and an essentially semicylindrical inner surface **123**. Disposed on the outer surface **122** and extending radially outwardly therefrom are two longitudinally spaced-apart beads **124** and **125** which cooperate with each other and with the intervening portion of the outer surface **122** to define a groove which is useful to position the associated binder tie **171** as will be explained more fully hereinafter. Disposed on the inner surface **123** is a plurality of locking ridges **126**, the locking ridges actually being portions

of a helical thread which cooperate with the retaining grooves on the connector **50** to increase the clamping connection therebetween. The inner surface **123** terminates in a shoulder **127** disposed toward the right in FIG. **8** and joins a generally semicylindrical surface **128**.

The body member **120** further comprises a part-cylindrical cable body portion **130** having a part-cylindrical outer surface **131** and a part-cylindrical inner surface **132**. Disposed on the outermost end of the outer surface **131**, i.e., the end disposed to the right in FIGS. **5**, **6** and **8**, is a bead **134** which is useful in holding the second binder tie **180** in the clamping position, all as will be explained more fully hereinafter. Disposed in the cable body portion **130** is a longitudinally extending slot **135** which also receives the second binder tie **180** therethrough as will be explained later.

Joining the connector body portion **121** and the cable body portion **130** is an interconnecting portion **136**, the interconnecting portion **136** having an outer surface **137** shaped as the surface of a cone and an inner surface **138** also shaped as the surface of a cone, the surface **137** merging into the surface **122** and the surface **138** merging into the surface **128**.

A second body member **140** is provided as a part of the strain relief clamp **110**, the body member **140** including an essentially semicylindrical connector body portion **141** having an essentially semicylindrical outer surface **142** and an essentially semicylindrical inner surface **143**. Disposed on the outer surface **122** and extending radially outwardly therefrom are two longitudinally spaced-apart beads **144** and **145** which cooperate with each other and with the intervening portion of the outer surface **142** to define a groove which is useful to position the associated binder tie **171** as will be explained more fully hereinafter. Disposed on the inner surface **143** is a plurality of locking ridges **146**, the locking ridges actually being portions of a helical thread which cooperate with the retaining grooves on the connector **50** to increase the clamping connection therebetween. The inner surface **143** terminates in a shoulder **147** disposed toward the right in FIG. **8** and joins a generally semicylindrical surface **148**.

The body member **140** further comprises a part-cylindrical cable body portion **150** having a part-cylindrical outer surface **151** and a part-cylindrical inner surface **152**. Disposed on the outermost end of the outer surface **151**, i.e., the end disposed to the right in FIGS. **5**, **6** and **8**, is a bead **154** which is useful in holding the second binder tie **180** in the clamping position, all as will be explained more fully hereinafter. Disposed in the cable body portion **150** is a longitudinally extending slot **155** which also receives the second binder tie **180** therethrough as will be explained later.

Joining the connector body portion **141** and the cable body portion **150** is an interconnecting portion **156**, the interconnecting portion **156** having an outer surface **157** shaped as the surface of a cone and an inner surface **158** also shaped as the surface of a cone, the surface **157** merging into the surface **142** and the surface **158** merging into the surface **148**.

The body members **120** and **140** are interconnected by two longitudinally spaced-apart hinge members **160** and **161**, the hinge member **160** being disposed to the left as viewed in FIGS. **8** and **9** and at the left-hand-most end of the strain relief clamp **110**, while the hinge member **161** is disposed essentially in alignment with the bead **125**. The hinge members **160** and **161** are essentially semicylindrical in cross section as viewed in FIG. **9** and are formed integral with the respective body members **120** and **140**.

The strain relief clamp **110** is preferably formed of a synthetic organic resin, the preferred resin being nylon resin, and is molded integral and of one-piece construction. Referring to FIG. **7**, the position of the body members **120** and **140** as molded is illustrated wherein the body member **120** is illustrated by dashed lines in the as-molded position while the body member **140** is illustrated by solid lines in the as-molded position. It will be appreciated that the longitudinally extending free edges of the body members **120** and **140** all lie along a common plane in the as-molded position, i.e., more specifically, the longitudinal edges of the connector body portions **121** and **141** are disposed in a common plane in the as-molded positions thereof. Subsequent to molding, the body member **120** is pivoted with respect to the body member **140** through substantially a 180° arc about the hinge members **160** and **161** from the dashed line portion of FIG. **7** to the solid line portion of FIG. **7**.

Because of the material of construction of the strain relief clamp **110**, i.e., a resilient organic plastic resin such as nylon resin, the interconnecting portions **136** are essentially flexible and deformable, whereby the cable body portions **130** and **150** can be moved toward and away from each other and with respect to the as-molded positions thereof, thereby to accommodate therebetween cables **60** of widely different effective diameters.

The binder ties **170** and **180** may be of any suitable construction, but one preferred construction is that illustrated in U.S. Pat. No. 3,197,829 granted Aug. 3, 1965 to Jack E. Caveney and Roy A. Moody for BINDER STRAP and another preferred construction illustrated in the copending U.S. Pat. application of Jack E. Caveney, Ser. No. 750,570 filed Aug. 6, 1968 for INTEGRAL ONE-PIECE CABLE TIE, now U.S. Pat. No. 3,537,146. As illustrated, the binder tie **170** is formed of nylon plastic and includes a strap **171** carrying on one end thereof and integral therewith a locking head **172**. The binder tie **180** likewise is formed of nylon plastic and includes a strap **181** carrying on one end thereof and integral therewith a locking head **182**, the strap **181** for illustrative purposes having been shown as comprising sections **183** through **186** in FIG. **3** as will be explained more fully hereinafter.

The binder ties **170** and **180** may be manually applied, but preferably are applied by a tool such as that illustrated in U.S. Pat. No. Re. 26,492 granted Nov. 12, 1968 to Jack E. Caveney and Roy A. Moody for BINDER STRAP TOOL, or the tool illustrated in U.S. Pat. No. 3,254,680 granted June 7, 1966 to Jack E. Caveney and Roy A. Moody for STRAP-TENSIONING TOOL, or that illustrated in the copending U.S. Pat. application, Ser. No. 870,190, filed July 28, 1969 for STRAP-TENSIONING AND SEVERING TOOL, which application is a continuation of U.S. Ser. No. 772,441.

In use, the strain relief clamp **110** may typically be received in the as-molded position of the parts thereof, i.e., with the body member **120** in the dashed position of FIG. **7** connected by the hinge members **160** and **161** to the body member **140**. The user folds the body members **120** and **140** toward the solid line positions in FIG. **7** to assemble the strain relief clamp **110** about the associated connector **50** and the associated cable **60**. As a result, the connector body portions **121** and **141** are assembled about the adjacent end of the connector **50** thus to place the locking ridges **126** and **146** into the complementarily shaped retaining grooves on the connector **50**. The cable body portions **130** and **150** are simultaneously assembled adjacent to the outer periphery of the cable **60**. The binder tie **170** is then placed around the connector body portions **121** and **141** in the groove defined by the beads **124–144** and **125–145**, the free end of the strap **171** being passed through the locking head **172**, after which the binder tie **170** is drawn tight and the excess strap **171** typically severed at a point just beyond the clamping head **172**.

The binder tie **180** is then applied, the strap **181** being fed through and around the cable **60** so that the parts are then in the position as illustrated in FIG. **3**, i.e., the strap **181** extends from the locking head **182** along a strap section **183** and over the outer surfaces **131** and **151** to the opening **155**. A strap section **184** extends through the opening **155** and through the center of the cable **60** and through the opening **135**. The strap then continues along a strap section **185** in a clockwise direction from the opening **135** completely around the cable **60** and the cable body portions **130** and **150** to the locking head **182**, a portion **186** of the strap extending through the head **182**. It will be appreciated that in applying the binder tie **180**, the strap **181** is tightened, preferably mechanically by a tool to press the cable body portions **130** and **150** firmly

against the cable 60, the free end of the strap section 186 being severed after the binder tie 180 has been fully tightened. The binder tie 180 is further held in position by the bead 134.

The resultant strain relief clamp assembly 100 serves to pass any mechanical forces applied between the connector 50 and the cable 60 through the strain relief clamp 110, i.e., directly between the position on the connector 50 at which the connector body portions 121 and 141 are clamped by the binder tie 170 to the position on the cable 60 at which the cable body portions 130 and 150 are clamped by the binder tie 180. More specifically, the strain relief clamp 110 positively prevents bending motion between the terminal ends of the conductors 61 and the terminal pins in the connector 50 to which the terminal ends of the conductors 61 are attached. As a consequence, there is no tendency to cause failure at these connections because of such bending motion, and likewise the sealing connection between the terminal pins and the connector 50 is preserved in the sealed condition thereof. In fact, all mechanical forces transmitted between the connector 50 and the cable 60 are transmitted directly through the strain relief clamp 110 and around the connections between the terminal ends of the conductors 61 and the terminal pins connected thereto and sealingly mounted in the connector 50.

The strain relief clamp 110 can be applied to the cable 60 with the terminal ends of the conductors 61 already soldered in place without requiring that the individual conductors 61 be threaded through the clamp prior to soldering. When it is necessary to repair, replace, or add conductors 61 in the cable 60, the strain relief clamp assembly 100 provides ready access, the binder ties 170 and 180 being formed of plastic can be readily severed to permit removal of the strain relief clamp 110. Accordingly, access can be readily gained to the pin receptacle of the connector 50 to aid or remove individual pins and contacts without disturbing other pins and contacts. This is true even if there is limited space available such as in aircraft installations, since the strain relief clamp 110 can be readily removed in all directions, and need not be "backed off" as is the case with certain conventional strain relief clamps known in the art heretofore.

The strain relief clamp 110 is useful in many installations wherein steel and other metal clamps have been utilized heretofore. The strain relief clamp 110 being made of plastic by high production methods is substantially less expensive than steel clamps and other metal clamps, and furthermore is substantially lighter in weight than steel clamps of the same general utility, the strain relief clamp 110 being only about one-quarter as heavy as a comparable steel clamp. Accordingly, the strain relief clamp 110 can be utilized in those applications, such as aircraft applications, where weight is a significant factor. The fact that the strain relief clamp assembly 100 is formed entirely of plastic further makes the assembly 100 particularly useful in aircraft applications since there are no metallic parts that could cause electrical malfunctions if parts of the assembly 100 were lost during installation and/or removal.

There is illustrated in FIG. 10 of the drawings the second preferred embodiment of a strain relief clamp 210 made in accordance with the present invention, a single-body member 220 having been illustrated, it being understood that the other body member would be made essentially identical thereto. Since most of the construction of the body member 220 is identical to that of the body member 120, like reference numerals in the 200 series have been applied to the parts in the body member 220 that correspond to like parts at the body member 120. The fundamental difference between the body member 120 and the body member 220 resides in the locking structure on the inner surface of the connector body portion 221, there being illustrated an inwardly directed rib or projection 226 disposed transversely with respect to the longitudinal axis of the strain relief clamp 210 and extending around the inner surface 223. It will be appreciated that the rib 226, which is essentially rectangular in cross section, would be received in a complementarily shaped groove in the associated connector to which the strain relief clamp 210 would be applied. In all other respects, the strain relief clamp 210 is constructed and is utilized in the same manner as the strain relief clamp 110 described above.

While there have been described what are at present considered to be the preferred embodiments of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

We claim:

1. A strain relief clamp assembly for limiting the relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical conductors coupled to the connector, said clamp assembly comprising a strain relief clamp including an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, said strain relief clamp in use being arranged with said connector body portion clampingly engaging the associated connector and said cable body portion clampingly engaging the associated cable, locking structure of the inner surface of said connector body portion for engagement with the retaining structure on the associated connector, a first binder tie disposed around and engaging the outer surface of said connector body portion for clampingly holding said connector body portion about the associated connector with said locking structure engaging the retaining structure, first binder tie positioning structure on the outer surface of said connector body portion for holding said first binder tie in a predetermined longitudinal position with respect to said connector body portion, said cable body portion having an opening therein for receiving therethrough a binder tie, and a second binder tie disposed around and engaging the outer surface of said cable body portion and extending through said opening in position to extend between the conductors of the associated cable for clampingly holding said cable body portion about the cable at a predetermined position therealong.

2. The strain relief clamp assembly set forth in claim 1, wherein said opening in said cable body portion is in the form of an elongated slot extending longitudinally of said strain relief clamp.

3. The strain relief clamp assembly set forth in claim 2, and further comprising a second binder tie positioning structure on the outer surface of said cable body portion cooperating to hold said second binder tie in a predetermined longitudinal position with respect to said cable body portion.

4. A strain relief clamp assembly for limiting the relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical conductors coupled to the connector, said clamp assembly comprising a strain relief clamp including at least two body members each having an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, said strain relief clamp in use being arranged with said connector body portion clampingly engaging the associated connector and said cable body portion clampingly engaging the associated cable, locking structure on the inner surface of each of said connector body portions for engagement with the retaining structure on the associated connector, a first binder tie disposed around and engaging the outer surfaces of said connector body portions for clampingly holding said connector body portions about the associated connector with said locking structure engaging the retaining structure, first binder tie positioning structure on the outer surface of each of said connector body portions and cooperating to hold said first binder tie in a predetermined longitudinal position with respect to said connector body portions, a second binder tie disposed around and engaging the outer surfaces of said cable body portions for clampingly holding said cable body portions about the cable at

a predetermined position therealong, and second binder tie positioning structure on the outer surface of each of said cable body portions and cooperating to hold said second binder tie in a predetermined longitudinal position with respect to said cable body portions.

5. A strain relief clamp assembly for limiting the relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical conductors coupled to the connector, said clamp assembly comprising a strain relief clamp including at least two body members each having an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, hinge structure interconnecting said body members and accommodating movement thereof into positions wherein said connector body portions are arranged in generally cylindrical form and said cable body portions are arranged on the surface of a cylinder, said strain relief clamp in use being arranged with said connector body portions clampingly engaging the associated connector and said cable body portions clampingly engaging the associated cable, locking structure on the inner surface of each of said connector body portions for engagement with the retaining structure on the associated connector, a first binder tie disposed around and engaging the outer surfaces of said connector body portions for clampingly holding said connector body portions about the associated connector with said locking structure engaging the retaining structure, first binder tie positioning structure on the outer surface of each of said connector body portions and cooperating to hold said first binder tie in a predetermined longitudinal position with respect to said connector body portions, a second binder tie disposed around and engaging the outer surfaces of said cable body portions for clampingly holding said cable body portions about the cable at a predetermined position therealong, and second binder tie positioning structure on the outer surface of each of said cable body portions and cooperating to hold said second binder tie in a predetermined longitudinal position with respect to said cable body portions.

6. The strain relief clamp assembly set forth in claim 5, wherein said hinge structure interconnects said connector body portions.

7. The strain relief clamp assembly set forth in claim 6, wherein said hinge structure includes a pair of hinge members integral with the associated connector body portions.

8. The strain relief clamp assembly set forth in claim 5, wherein said strain relief clamp is molded of a synthetic organic plastic resin with the free longitudinal edges of said body members disposed in a common plane and interconnected by said hinge structure.

9. A strain relief clamp assembly for limiting the relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical conductors coupled to the connector, said clamp assembly comprising a strain relief clamp including at least two body members each having an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, said strain relief clamp in use being arranged with said connector body portions clampingly engaging the associated connector and said cable body portions clampingly engaging the associated cable, locking structure on the inner surface of each of said connector body portions for engagement with the retaining structure on the associated connector, a first binder tie disposed around and engaging the outer surfaces of said connector body portions for clampingly holding said connector body portions about the associated connector with said locking structure engaging the retaining structure, first binder tie positioning structure on the outer surface of each of said connector body portions and cooperating to hold said first binder tie in a predetermined longitudinal position with respect to said connector body portions, each of said cable body portions having an opening therein for receiving therethrough a binder tie, and a second binder tie disposed around and engaging the outer surfaces of said cable body portions and extending through said openings in position to extend between the conductors of the associated cable for clampingly holding said cable body portions about the cable at a predetermined positioned therealong.

10. The strain relief clamp assembly set forth in claim 9, wherein said opening in each of said cable body portions is in the form of an elongated slot extending longitudinally of said strain relief clamp.

11. The strain relief clamp assembly set forth in claim 10, and further comprising a second binder tie positioning structure on the outer surface of each of said cable body portions cooperating to hold said second binder tie in a predetermine longitudinal position with respect to said cable body portions.

12. A strain relief clamp for use in a strain relief clamp assembly to limit the relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical conductors coupled to the connector wherein the strain relief clamp is held in operative position by first and second binder ties disposed thereabout, said strain relief clamp comprising an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, said strain relief clamp in use being arranged with said connector body portion disposed about the associated connector and clampingly held thereon by the first associated binder tie and with said cable body portion disposed about the associated cable and clampingly held thereon by the second associated binder tie, locking structure on the inner surface of said connector body portion for engagement with the retaining structure on the associated connector, and first binder tie positioning structure on the outer surface of said connector body portion for holding the first associated binder tie in a predetermined longitudinal position with respect to said connector body portion, said cable body portion having an opening therein for receiving therethrough the associated second binder tie, the second binder tie in use being disposed around and engaging the outer surface of said cable body portion and extending through said opening and between the conductors of the associated cable for clampingly holding said cable body portion about the cable at a predetermined position therealong.

13. The strain relief clamp set forth in claim 12, wherein said opening in said cable body portion is in the form of an elongated slot extending longitudinally of said strain relief clamp.

14. The strain relief clamp set forth in claim 13, and further comprising a second binder tie positioning structure on the outer surface of said cable body portion for holding the associated second binder tie in a predetermined longitudinal position with respect to said cable body portion.

15. A strain relief clamp for use in a strain relief clamp assembly to limit the relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical conductors coupled to the connector wherein the strain relief clamp is held in operative position by first and second binder ties disposed thereabout, said strain relief clamp comprising at least two body members each having an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, said strain relief clamp in use being arranged with said connector body portion disposed about the associated connector and clampingly held thereon by the first associated binder tie and with said cable body portion disposed about the associated cable and clampingly held thereon by the second associated binder tie, locking structure on the inner surface of each of said connector body portions for engagement with the retaining structure on the associated connector, first binder tie positioning structure on the outer surface of each of said connector body portions and cooperat-

ing to hold the first associated binder tie in a predetermined longitudinal position with respect to said connector body portions, and second binder tie positioning structure on the outer surface of each of said cable body portions and cooperating to hold the associated second binder tie in a predetermined longitudinal position with respect to said cable body portions.

16. A strain relief clamp for use in a strain relief clamp assembly to limit the relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical conductors coupled to the connector wherein the strain relief clamp is held in operative position by first and second binder ties disposed thereabout, said strain relief clamp comprising at least two body members each having an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, hinge structure interconnecting said body members and accommodating movement thereof into positions wherein said connector body portions are arranged in generally cylindrical form and said cable body portions are arranged as on the surface of a cylinder, said strain relief clamp in use being arranged with said connector body portions disposed about the associated connector and clampingly held thereon by the first associated binder tie and with said cable body portions disposed about the associated cable and clampingly held thereon by the second associated binder tie, locking structure on the inner surface of each of said connector body portions for engagement with the retaining structure on the associated connector, first binder tie positioning structure on the outer surface of each of said connector body portions and cooperating to hold the first associated binder tie in a predetermined longitudinal position with respect to said connector body portions, and second binder tie positioning structure on the outer surface of each of said cable body portions and cooperating to hold the associated second binder tie in a predetermined longitudinal position with respect to said cable body portions.

17. The strain relief clamp set forth in claim 16, wherein said hinge structure interconnects said connector body portions.

18. The strain relief clamp set forth in claim 17, wherein said hinge structure includes a pair of hinge members integral with the associated connector body portions.

19. The strain relief clamp set forth in claim 18, wherein said strain relief clamp is molded of a synthetic organic plastic resin with the free longitudinal edges of said body members disposed in a common plane and interconnected by said hinged structure.

20. A strain relief clamp for use in strain relief clamp assembly to limit the relative movement between a generally cylindrical connector having retaining structure thereon and a cable of electrical conductors coupled to the connector wherein the strain relief clamp is held in operative position by first and second binder ties disposed thereabout, said strain relief clamp comprising at least two body members each having an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, said strain relief clamp in use being arranged with said connector body portions disposed about the associated connector and clampingly held thereon by the first associated binder tie and with said cable body portions disposed about the associated cable and clampingly held thereon by the second associated binder tie, locking structure on the inner surface of each of said connector body portions for engagement with the retaining structure on the associated connector, and first binder tie positioning structure on the outer surface of each of said connector body portions and cooperating to hold the first associated binder tie in a predetermined longitudinal position with respect to said connector body portions, each of said cable body portions having an opening therein for receiving therethrough the associated second binder tie, the second binder tie in use being disposed around and engaging the outer surfaces of said cable body portions and extending through said openings and between the conductors of the associated cable for clampingly holding said cable body portions about the cable at a predetermined position therealong.

21. The strain relief clamp set forth in claim 20, wherein said opening in each of said cable body portions is in the form of an elongated slot extending longitudinally of said strain relief clamp.

22. The strain relief clamp set forth in claim 21, and further comprising a second binder tie positioning structure on the outer surface of each of said cable body portions cooperating to hold the associated second binder tie in a predetermined longitudinal position with respect to said cable body portions.

23. A strain relief clamp assembly for limiting the relative movement between a generally cylindrical connector having helical grooves in the outer surface thereof and a cable of electrical conductors coupled to the connector, said clamp assembly comprising a strain relief clamp including an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, said strain relief clamp in use being arranged with said connector body portion clampingly engaging the associated connector and said cable body portion clampingly engaging the associated cable, locking structure in the form of interrupted helical ridges on the inner surface of said connector body portion shaped complementary to the helical grooves on the associated connector for engagement therewith, a first binder tie disposed around and engaging the outer surface of said connector body portion for clampingly holding said connector body portion about the associated connector with said locking structure engaging the retaining structure, first binder tie positioning structure on the outer surface of said connector body portion for holding said first binder tie in a predetermined longitudinal position with respect to said connector body portion, a second binder tie disposed around and engaging the outer surface of said cable body portion for clampingly holding said cable body portion about the cable at a predetermined position therealong, and second binder tie positioning structure on the outer surface of said cable body portion for holding said second binder tie in a predetermined longitudinal position with respect to said cable body portion.

24. A strain relief clamp for use in a strain relief clamp assembly to limit the relative movement between a generally cylindrical connector having helical grooves in the outer surface thereof and a cable of electrical conductors coupled to the connector wherein the strain relief clamp is held in operative position by first and second binder ties disposed thereabout, said strain relief clamp comprising an essentially part-cylindrical connector body portion and an essentially part-cylindrical cable body portion and an interconnecting portion joining said connector body portion and said cable body portion, said strain relief clamp in use being arranged with said connector body portion disposed about the associated connector and clampingly held thereon by the first associated binder tie and with said cable body portion disposed about the associated cable and clampingly held thereon by the second associated binder tie, locking structure in the form of interrupted helical ridges on the inner surface of said connector body portion shaped complementary to the helical grooves on the associated connector for engagement therewith, first binder tie positioning structure on the outer surface of said connector body portion for holding the first associated binder tie in a predetermined longitudinal position with respect to said connector body portion, and second binder tie positioning structure on the outer surface of said cable body portion for holding the associated second binder tie in a predetermined longitudinal position with respect to said cable body portion.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,638,169 Dated January 25, 1972

Inventor(s) JACK E. CAVENEY and ROY A. MOODY

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

Claim 3, Column 6, line 45, "2" should be -- 1 --.

Claim 7, Column 7, line 44, "6" should be -- 5 --.

Claim 9, Column 8, line 6, "positioned" should be -- position --.

Claim 11, Column 8, line 12, "10" should be -- 9 --.

Claim 14, Column 8, line 50, "13" should be -- 12 --.

Claim 18, Column 9, line 41, "17" should be -- 16 --.

Claim 19, Column 9, line 44, "18" should be -- 16 --.

Claim 22, Column 10, line 11, "21" should be -- 20 --.

Signed and sealed this 29th day of August 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
☆ U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,638,169 Dated January 25, 1972

Inventor(s) JACK E. CAVENEY and ROY A. MOODY

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

Column 4, line 40, after "772,441" insert -- now abandoned --;

Column 5, line 33, "aid" should be -- add --;

line 58, "single-body" should be -- single body --;

Claim 1, Column 6, line 23, "of" should be -- on --;

Claim 11, Column 8, line 15, "predetermine" should be -- predetermined --;

Signed and sealed this 20th day of March 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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☆ U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334