

[54] **STRAIN RELIEF CLAMP**

[76] Inventor: **Thomas L. McKnight**, Lake San Marcos, Calif.

[22] Filed: **May 4, 1971**

[21] Appl. No.: **140,091**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 859,923, Sept. 22, 1969, abandoned.

[52] U.S. Cl. **339/103 M, 339/89 M**

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

[58] Field of Search **339/103, 104, 105, 339/89**

[56] **References Cited**

UNITED STATES PATENTS

1,328,774	1/1920	Tregoning.....	339/103 R X
1,943,739	1/1934	Nowosielski.....	339/103 C X
2,047,126	7/1936	Hastings.....	339/103 C X
3,137,536	6/1964	Healy.....	339/103 C

3,603,913 9/1971 Hasty, Jr. 339/104

Primary Examiner—Richard E. Moore

Attorney—Paul Adams

[57] **ABSTRACT**

A strain relief clamp for a wire bundle which may be disposed at an angle to the axis of a mating connector including a cylindrical collar for connection to the mating connector, a wire guide having a tubular portion located concentrically within the cylindrical collar and secured to the collar by a snap ring within aligned circumferential grooves in each, and an arm portion joined to the tubular portion and extending outwardly at an angle to the axis of the guide, the wire guide being rotatable to a position where the arm portion is aligned with the wire bundle prior to or after the collar has been loosely connected to the mating connector whereupon the guide may be non-rotatably locked relative to the mating connector and a bundle binder attaches the wire bundle to the arm portion.

5 Claims, 9 Drawing Figures

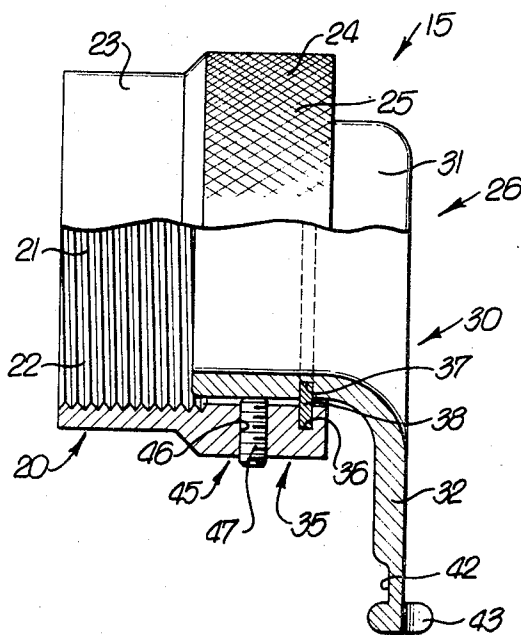


FIG. 1.

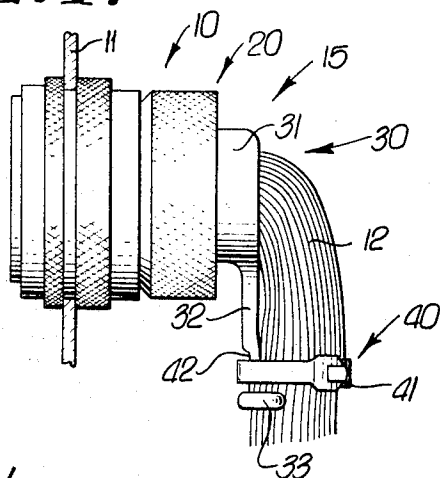


FIG. 3.

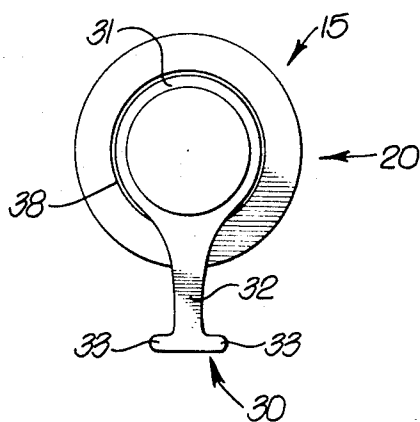


FIG. 2.

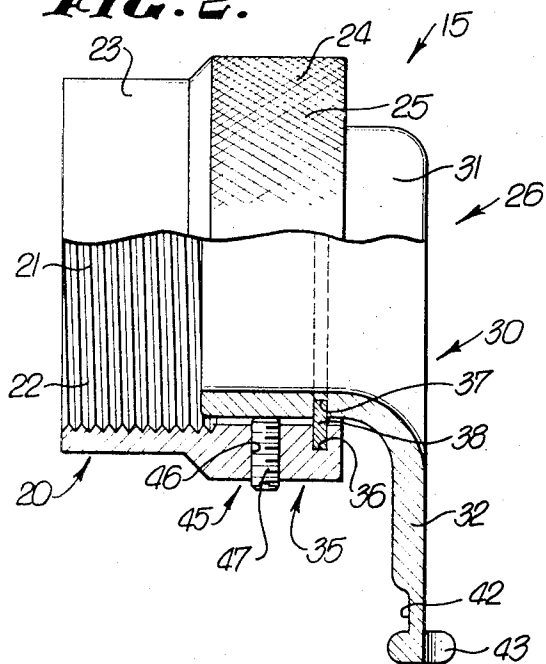
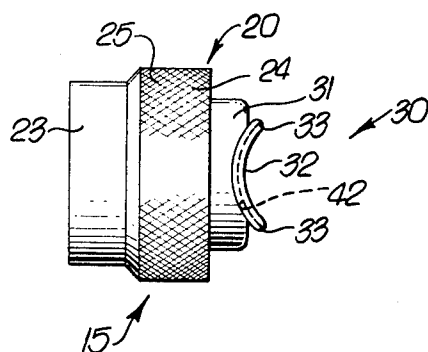


FIG. 4.



INVENTOR.
THOMAS L. McKNIGHT

FIG. 5.

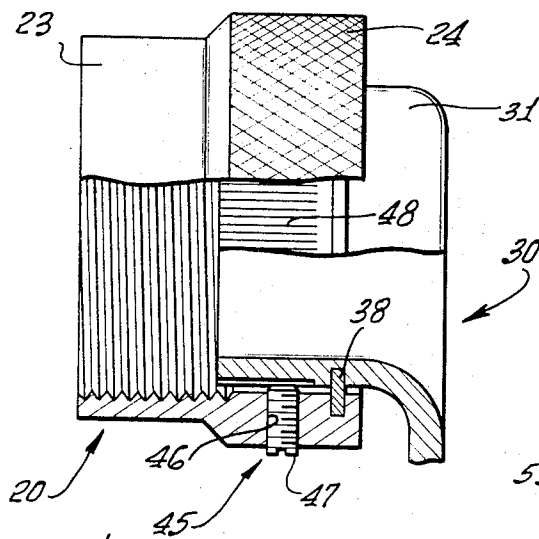


FIG. 6.

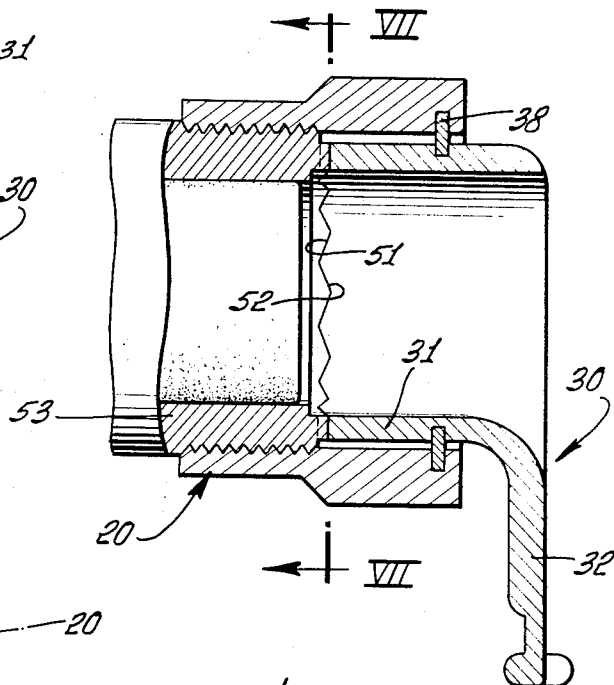


FIG. 7.

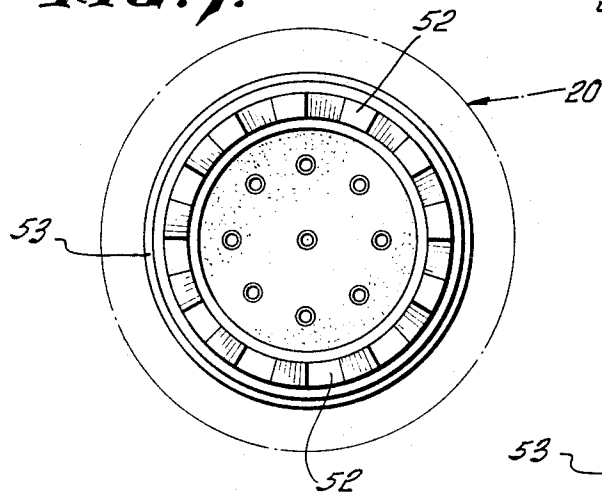


FIG. 8.

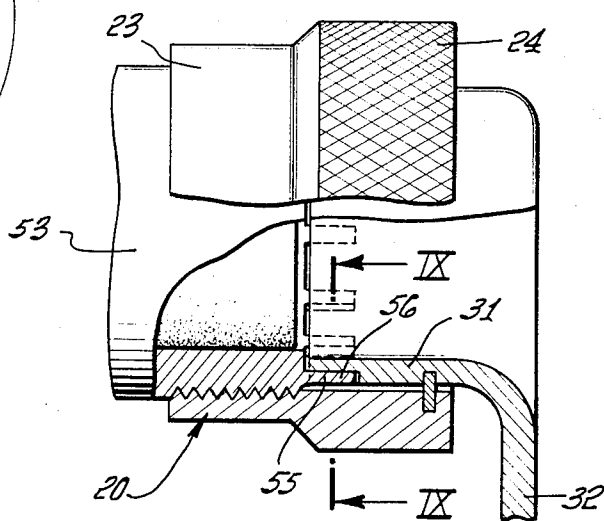
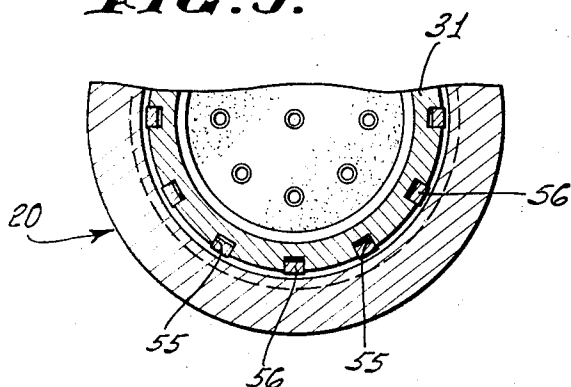


FIG. 9.



INVENTOR.
THOMAS L. MCKNIGHT

STRAIN RELIEF CLAMP**RELATED APPLICATION**

This application is a continuation-in-part of application Ser. No. 859,923, being abandoned concurrently with the filing of the instant case.

BACKGROUND OF THE INVENTION

This invention relates to clamps for wire bundles and more particularly to a strain relief clamp for a wire bundle which permits the arm thereof to be rotated in alignment with the wire bundle prior to or after the clamp has been connected to a mating connector.

In most applications of wire bundles in vehicles, notably aircraft, the bundles are subjected to flexing, pulling and movement in general due to the flexing of the structure of the aircraft itself. In such applications, the individual wires of the wire bundle are connected to other wires on the opposite side of a wall or bulkhead by means of a connector assembly which is inserted through an opening in the wall. The connector assembly contains a multiplicity of pin plugs and each wire of the bundle is connected to an individual wire pin for insertion into a corresponding pin plug. Because of the pulling on the wire bundle from the flexing of the aircraft, and the vibration of the bundle, a strain relief clamp may be provided. Such a clamp is attached to the wire bundle and to the connector assembly to maintain the bundle of wires secure in the presence of vibration and to reduce the possibility of pulling on the individual wire pins to which they are soldered or otherwise attached.

The existing strain relieving clamp design has several disadvantages. One such disadvantage is that the arm of the clamp rotates as the clamp is being connected to the connector assembly and once the clamp is tight, the arm thereof extends outwardly in a direction which usually does not correspond to the direction that the wire bundle enters or leaves the connector. The clamp must then be loosened to bring the arm into alignment with the wire bundle or the wire bundle must be moved to an aligned position with the arm. It is therefore a primary object of this invention to provide a strain relief clamp for a wire bundle with a wire guide means which is rotatable relative to the collar after the collar is secured to a mating connector enabling the wire guide means to be aligned with the wire bundle for attachment thereof.

It is a further object of this invention to provide a strain relief clamp for use with a wire bundle which has a collar for connection to a mating connector and a wire guide means including a tubular portion and an arm portion which is independently rotatable prior to or after the collar is connected, to align the arm portion with the wire bundle for attachment thereto.

It is an advantage of the strain relief clamp according to this invention that the wire guide means thereof may be rotated to any position prior to or after the collar is loosely secured to a mating connector.

It is a further advantage of such a clamp that the bundle of wires need not be moved in order to attach the bundle to the wire guide means of the clamp.

It is yet a further advantage of one embodiment of such a clamp that the angle of approach of the wire bundle to the connector can be rotated without loosening the collar thereof from the mating connector.

It is yet a further advantage of such embodiment of the clamp that locking means can be selectively released enabling the angle of the approach of the bundle to be changed without releasing the collar connection to the mating connector.

It is another advantage of such a strain relief clamp that it is provided with a releasable locking means to lock the collar and the wire guide means together enabling the wire guide to help maintain the bundle of wires in the desired position.

SUMMARY OF THE INVENTION

A strain relief clamp according to the present invention including a generally cylindrical collar for connecting to a mating connector and a wire guide means rotatably secured to the collar and to which is secured a wire bundle which may approach the connector at an angle to the axis thereof. The strain relief clamp also includes releasable locking means to non-rotatably lock the wire guide means relative to the mating connector. In the preferred embodiment, the wire guide means includes a tubular portion concentrically rotatably mounted within the collar and an arm portion attached to the tubular portion and extending outwardly therefrom. The collar may have threads for screwing onto a mating connector and prior to or after the collar is loosely threaded on the mating connector, the arm portion is rotated into an aligned position with the wire bundle and the wire bundle is secured to the arm portion by a binder strap. The wire guide means is then locked with respect to the mating connector by suitable means such as the engaging edges of the connector and tubular portion which may frictionally prevent rotation (or the edges may be sawtoothed and interlocking), or splines may be provided on the connector and tubular portion, or a set screw may be mounted in the collar for engaging the tubular portion so as to non-rotatably lock the guide means relative to the mating connector.

These and various other objects and advantages of the strain relief clamp according to this invention will become apparent to those skilled in the art from consideration of the following detailed description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of a wall to which a conventional wall connector assembly with an exemplary embodiment of a strain relief clamp according to this invention is mounted;

FIG. 2 is an enlarged side elevation view of the strain relief clamp of FIG. 1 with a section thereof partially cut away to show the internal construction of the clamp.

FIG. 3 is an end view of the strain relief clamp of FIG. 1;

FIG. 4 is a bottom view of the strain relief clamp of FIG. 1;

FIG. 5 is a side elevation view of the strain relief clamp of FIG. 1 with a modified guide cylinder portion;

FIG. 6 is a side elevation view of a modified strain relief clamp with a section thereof partially cut away;

FIG. 7 is a view of the clamp shown in FIG. 6 taken along the line VII—VII;

FIG. 8 is a side elevation view of a second modified strain relief clamp with a section thereof partially cut away; and

FIG. 9 is a partial view of the clamp shown in FIG. 8 taken along the line IX—IX.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring now to the drawings and particularly FIG. 1, the exemplary embodiment of a strain relief clamp in accordance with the present invention is illustrated in connection with a conventional wall mounted conductor assembly indicated generally at 10. Assembly 10 is secured in a manner well known in the art through an opening in a wall 11 such as would be found in vehicles, for example, an aircraft. The wall mounted connector assembly 10 provides a coupling or connection for each individual wire of a wire bundle 12, oriented with respect to the connector assembly 10 at a position other than along the axis thereof. As shown in FIG. 1, the wire bundle 12 approaches the connector assembly 10 from a direction generally at a right angle to the axis thereof.

The wall connector assembly 10 includes an exemplary embodiment of a strain relief clamp 15 according to this invention. The strain relief clamp 15 generally includes a ring or cylindrical collar, indicated generally at 20, wire guide means, indicated generally at 30, means securing the collar 20 and the wire guide means 30 together for relative rotation therebetween, indicated generally at 35, and means for attaching, positioning or holding the wire bundle 12 to the wire guide means 30, indicated generally at 40. The clamp 15 also includes releasable locking means, indicated generally at 45, to lock the collar 20 and the wire guide means 30 against relative rotation therebetween, and thus lock means 30 relative to the connector.

The ring or cylindrical collar 20 of the exemplary embodiment of the strain relief clamp 15 as best seen in FIG. 2 is generally tubular in shape and may be either male or female depending upon the particular connector assembly 10 with which it is to be used. In the exemplary embodiment, a female collar is shown, having connecting means, indicated generally at 21, at the left end thereof for connecting to a mating connector, not shown. The particular connecting means 21 shown is an internal thread 22 for mating to an external thread (not shown). It will be appreciated that other connecting means such as J-slots or the like may be employed with collar 20 for effecting the connection.

Externally, the collar 20 has a neck 23 inserted into the mating connector and torque means 24 for applying rotative torque to the collar 20, such means in the exemplary embodiment comprising a knurled surface 25.

The wire guide means 30 in the exemplary embodiment of the strain relief clamp 15 includes a tubular portion 31 with an external diameter less than the internal diameter of the collar 20 and an internal diameter greater than the diameter of the wire bundle 12. The tubular portion has an arm portion 32 associated therewith which is joined at its upper end to the tubular portion 31 as an integral part thereof. The arm portion 32 extends outwardly from the tubular portion 31 radially; or may extend at an angle to the axis thereof which corresponds to the angle that the wire bundle 12 approaches the wall connector assembly 10 which in the exemplary embodiment is at a right angle thereto.

As best seen in FIG. 4, the arm portion 32 is of a curved cross section so as to more readily receive the

wire bundle 12. As best seen in FIG. 3, the arm portion 32 is slightly tapered from the tubular portion 31 towards the outward end and terminating in an arcuate member 33 for engaging and holding the wire bundle 12.

As best seen in FIGS. 3 and 4, the wire guide means 30 is inserted into the collar 20 with the tubular portion 31 positioned concentrically therein. The collar 20 and the wire guide means 30 are secured together by securing means indicated generally at 35 which prevents relative axial movement while permitting relative rotation of the collar 20 and the wire guide means 30. In the exemplary embodiment, the securing means 35 includes an internal circumferential groove 36 in the collar 20 adjacent the right hand end thereof, and a corresponding external circumferential groove 37 centrally located in the tubular portion 31. The groove 36 opens inwardly toward the axis of the collar, and the groove 37 opens outwardly so that when the grooves 36 and 37 are aligned, an opening is formed for a ring 38 such as a snap ring. The ring 38 seats in both grooves to maintain the grooves in axial alignment while permitting rotation of the wire guide means 30 relative to the collar 20.

Once the strain relief clamp 15 has been assembled, the wire bundle 12 is inserted through the tubular portion 31 of the wire guide means 30 and the pins (not shown) containing the ends of the individual wires are inserted into a corresponding pin plug in the wall connector assembly 10. The strain relief clamp 15 is next secured to the wall connector assembly 10 by the collar 20 being partly screwed onto the connector assembly 10. After the collar 20 is on, the wire guide means 30 is rotated until the arm portion 32 is aligned with the wire bundle 12 so that the wire bundle 12 rests against the arm portion 32 and the arcuate member 33. The wire guide means 30 rotates relative to the collar 20 by sliding with and/or along the ring 38.

Once the arm portion 32 and the wire bundle 12 are aligned, means 40 for holding or positioning the arm portion 32 to the wire bundle 12 is secured. In the exemplary embodiment the means 40 includes a conventional non-conducting wire bundle binder 41 which encircles both the wire bundle 12 and the outer end of the arm portion 32 to seat in a notch 42 adjacent the outer end of the arm portion 32. The notch 42 prevents the binder 41 from being pulled off the outer end of the arm portion 32.

Once the wire bundle 12 and the arm portion 32 are secured together, the wire guide means 30 is locked to the collar 20 by releasable locking means 45. The locking means may comprise the end faces of the tubular portion 31 and the end face of the connector (not shown) which axially abuts the tubular portion 31. Where collar 20 threadably engages the mating connector, collar 20 when tightened will force the ends into tight contact so that they will be frictionally interlocked. Where severe vibration is encountered however, other locking means are preferred such as that shown in the first exemplary embodiment which includes a tapped hole 46 through the collar 20 to the interior thereof, and a set screw 47 screwed into the tapped hole 46. The inner end of the set screw 47 engages the tubular portion 31 of the wire guide means 30

to lock the wire guide means 30 to the collar 20 so that the weight of the wire bundle 12 or the vibration of the environment will not rotate the wire guide means 30 out of its proper position. The tubular portion 31 may be provided with axially extending striations 48 on its exterior surfaces for contact with the end of the set screw to aid in locking, as illustrated in FIG. 5. Also, locking of the wire guide means 30 and the collar 20 relative to one another enables the wire bundle 12 via the arm portion 32 to hinder any tendency of the collar 20 to unscrew because of vibration, etc. It will be understood that other locking means, for example, end serrations of the wire guide means and on the mating connector to which collar 20 is secured, as shown in FIGS. 6 and 7, may be provided. In the latter example the wire guide means is not locked relative to the collar but is locked directly to the connector assembly, since the teeth 51 on the tubular portion 31 mesh with the teeth 52 on the mating connector body 53. Another alternative locking means is shown in FIGS. 8 and 9 wherein the tubular portion 31 is provided with axial slots 55 and the mating connector body 53 carries mating splines 56. The strain relief clamp 15 securely holds the wire bundle 12 so as to transfer any pull on the bundle 12 to the connector assembly rather than having such pull applied to the individual wires at the pins.

Thus the strain relief clamp 15 according to this invention for a wire bundle 12 permits the wire guide means 30 to rotate relative to the secured collar 20 to any position to be aligned with the wire bundle 12 for securing the wire bundle 12 to the strain relief clamp 15.

The foregoing description of the exemplary embodiment of the strain relief clamp of this invention is intended to be exemplary only and it should be understood that other modifications or alterations of the construction and method of assembly of the clamp may be made and are within the scope of the present invention which is defined and limited only by the following claims.

I claim:

1. A strain relief clamp for a wire bundle, the clamp adapted to be attached to an electrical connector, comprising:

a generally cylindrical collar including means for attaching said collar to the connector;

wire guide means including a tubular portion positioned concentrically within the collar for receiving the wire bundle and having an arm extending away from said tubular portion from one edge thereof, said arm tapering toward the outer end and terminating in a transverse member, said arm having a notch adjacent the outer end thereof;

means securing the collar and the tubular portion of

the wire guide means together, said securing means preventing relative axial movement while permitting relative rotation between said collar and said wire guide means;

releasable locking means to non-rotatably lock said tubular portion of said wire guide means relative to the connector; and

a wire bundle binder encircling the wire bundle and said arm and seated in said notch.

2. The clamp of claim 1 wherein said releasable locking means comprises a screw threadably mounted in said collar for selective engagement with said tubular portion of said wire guide means, whereby when said collar is non-rotatably attached to said connector, said screw may be made to engage said tubular portion of said wire guide means so that said arm is non-rotatably locked to said connector.

3. The clamp of claim 2 wherein said tubular portion of said wire guide means includes axially directed striations on the outer surface thereof to be engaged by the end of said screw to aid in locking said wire guide means relative to said collar.

4. The strain relief clamp of claim 7 adapted to be attached to a connector having a threaded cylindrical body with a serrated end wall, said means for connecting said collar to said connector comprising threads, said tubular portion having a diameter approximately equal to the diameter of the connector body and said releasable locking means comprising a serrated end wall for engagement with said connector body serrated end wall, whereby said collar may be initially threadably attached to the electrical connector so that said arm is free to be rotated to a desired position and said collar subsequently tightened on the electrical connector to effect mating engagement of said serrations on said connector body and said tubular portion of said wire guide means to non-rotatably lock the arm relative to the connector.

5. The strain relief clamp of claim 1 adapted to be attached to a connector having a threaded cylindrical body, said means for connecting said collar to said connector comprising threads, said tubular portion having a diameter approximately equal to the diameter of the connector body, and said releasable locking means comprising axial splines on the exterior surface of said connector cylindrical body and axial slots on said tubular portion of said wire guide means, whereby said collar may be initially threadably attached to the electrical connector so that said arm is free to be rotated to a desired position and said collar subsequently tightened on the electrical connector to effect mating engagement of said splines on said connector body with said slot on said tubular portion of said wire guide means to non-rotatably lock the arm relative to the connector.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,732,527

Dated May 8, 1973

Inventor Thomas L. McKnight

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

Column 6, Line 23, "7" should read -- 1 --.

Signed and sealed this 10th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents