July 9, 1963 N. CHENEY 3,097,257

ELECTRICAL CONNECTOR

Filed Nov. 2, 1961

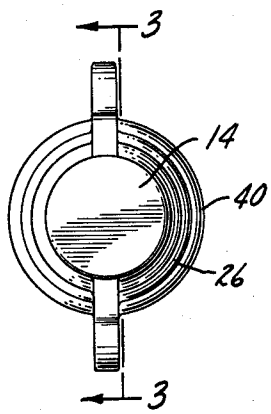

Fig. 2.

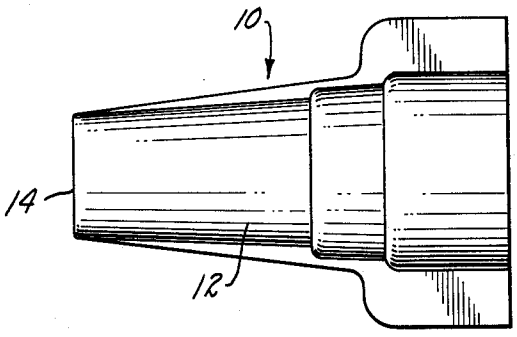

Fig. 1.

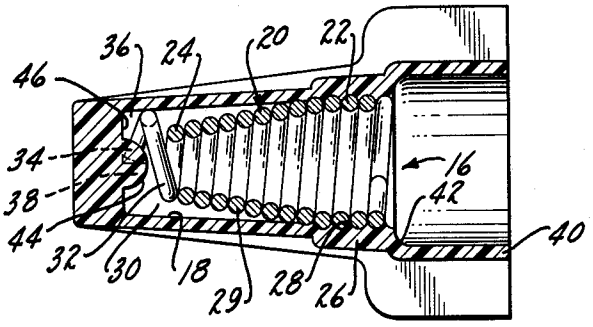

Fig. 3.

INVENTOR.
North Cheney,
BY Parker & Carter
Attorneys.

United States Patent Office 3,097,257 Patented July 9, 1963

3,097,257

ELECTRICAL CONNECTOR

North Cheney, Petersburg, Ill., assignor to Ideal Industries, Inc., Sycamore, Ill., a corporation of Delaware

Filed Nov. 2, 1961, Ser. No. 149,635
3 Claims. (Cl. 174—87)

This invention is in the field of connectors of the screw-on type and is a new and improved insulating cap with a connecting structure, constructed and arranged to be turned or screwed down on the stripped ends of a plurality of electric wires, for example, two or more, either stranded and/or solid, of the same or different sizes, or otherwise.

A primary object of the invention is a new and improved electrical connector with an insulating cap molded and constructed to prevent the wire ends from penetrating or damaging the end wall of the cap.

Another object is a connector of the above type which does not require a separate insert to prevent damage to the cap and the wire ends.

Another object is an insulating connector with a cap made of a stiffly flexible plastic material otherwise capable of penetration by the wire ends but constructed to prevent such penetration in normal use.

Other objects will appear from time to time in the ensuing specification and drawings in which:

FIGURE 1 is a plan view of the connector;

FIGURE 2 is an end view; and

FIGURE 3 is a section along line 3—3 of FIGURE 2.

In the drawings, the connector has been shown with an insulating cap or cover which has been indicated generally at **10** and may include a generally cylindrical body or shell **12** closed at one end by an end wall **14**, which is preferably integral with the cap and generally open at the other end at **16**, providing what shall be termed a generally open central bore **18**. The bore of the cap or coil houses or encloses a wire coil **20**. For purposes of illustration, the coil has been shown generally tapered with a large end **22** adjacent the open end of the cap and a small end **24** adjacent the closed end.

I may provide an enlarged or thickened portion **26** in the cap or shell generally at the open end which may be formed with a threaded inner surface or relief surface **28** on the inside, although this is not necessary. The threads may be molded directly into the inside, and the large end **22** of the coil meshes into the groove of the threads. I prefer to make the cap or shell out of nylon, or polyethylene, or any other suitable thermoplastic material which is tough but somewhat resilient and at the same time is a good dielectric and suitable for high temperature use.

The inner surface of the bore may remain somewhat cylindrical from the open end toward the end wall but the intermediate or middle turns of the coil have been shown as decreasing in diameter, or tapered, as at **29**, so that a clearance or spacing is provided at **30** throughout the majority or a substantial portion of the length of the coil with respect to the inner surface of the cap, although this is not necessary. This provides what is referred to as a "free spring" connector.

An extended and possibly distended turn **32** may be provided adjacent the small end of the coil to serve as a guide or pilot for the small end to center it relative to the axial bore of the cap. The spacing, shown at **36**, is not totally necessary and the coil may have a uniform pitch throughout its length.

The end **34** of the coil may be extended slightly or pulled away from the normal turns of the coil and an abutment **38** may be provided in or as an integral part of the shell or cap to function as a shoulder or anchor for the end of the coil. This abutment or shoulder may

be of a suitable formation but it is preferred that it oppose the end of the coil to resist the normal rotative tendency of the coil, when the connector is being turned down over the stripped ends of a plurality of wires. The abutment may be a separate metal insert, but I find it easier to mold it as an integral part. The end **34** of the coil might be blunt, turned in or back, or otherwise suitably shaped, to engage the abutment regardless of its particular size, shape or disposition.

The open end of the cap may be provided with an enlarged, preferably integral skirt **40**, which may be cylindrical and well rounded, as at **42**, where it joins the shell or cap to function as a guide or funnel and also as a skirt to prevent arcing to a ground.

The end wall of the cap may be molded with a generally centrally located somewhat hemispherical projection, deflection or guide **44** on its inner surface. The projection may be aligned with the axis of the cap and may be of a diameter somewhat or materially smaller than the inner diameter of the cap bore. The projection may be a full hemisphere or it may be slightly more or less. In any event, I prefer that the effective diameter of the projection be such that an annular flat or wall or surface **46** is defined around the projection. Thus, the shoulder **38** may project axially forward somewhat from this annular surface **46** and, as shown in FIGURE 3, is on the opposite side of the projection **38** as the section is taken in FIGURE 3.

The use, operation and function of the invention are as follows:

I provide a cap or cover which is preferably made of a stiffly flexible plastic, such as nylon, polyethylene, or the like. A wire coil is positioned in the cap and is held therein in a suitable manner. The cap and coil, as a unit, are then screwed down on the stripped ends of a plurality of electric wires in a known manner. The coil functions like threads so that the cap and coil automatically feed down on the stripped ends of the wires and will compress the wires together and form grooves or threads thereon corresponding to the coil. The coil is interlocked to the cap so that when the cap is rotated, the coil will also be rotated.

When the coil is screwed down on the wires, the stripped ends will eventually pass completely through the coil and will engage the end wall of the cap. The ends of the wires have normally been cut or snipped with electrician's pliers or the like and are sharp or jagged. When the stripped ends contact the end wall of the cap, if the cap is thereafter turned an appreciable amount, the sharp ends of the wires may rip or drill through or otherwise mar the end wall which is plastic.

Previously, a separate insert, either in the form of a disk or ball or the like, preferably metallic, has been positioned in the cap between the end wall and the coil to prevent penetration or damage to the end wall. This has the disadvantage that it requires a separate step in assembly. This means that conventional assembling machines must be altered somewhat to accommodate the separate step of dropping or inserting the ball or disk, as the case may be.

The present invention has the advantage that the projection or deflector is preferably integral with the end wall and, therefore, can be molded at the same time that the cap is molded. This can be done by recessing or milling out a socket in the end of the mold pin on the molding machine. Thereafter, the projection or hemisphere **44** will be molded at the same time that the cap is molded. This requires no alteration of the assembling equipment nor any additional steps in either molding or assembling.

I prefer that the projection be hemispherical or something approximating a hemisphere. It does not necessarily have to be a perfect hemisphere, but might be

somewhat elliptical or axially elongated, either longitudinally or laterally. In fact, it might be somewhat conical or have a plurality of sides and, therefore, might be considered somewhat polygonal. In other words, the precise shape of the projection is not considered critical. However, it should have an exterior shape and dimension so that when the stripped ends of the wires hit its outer surface, the ends of the wires will be deflected or guided in an outward direction. Thereafter, additional turning of the cap will merely bend the wire ends into a helical or spiral configuration. In any event, they will not penetrate or damage the end wall.

There is no possibility of an insert falling out of the connector, nor are there any loose parts. However, it should be understood that I might mold the projection as a separate part with a surrounding flange to fit in the bore against the end wall, if desired. But this would suffer the disadvantage of a separate insert, i.e., an additional step in the assembling procedure, a separate molding operation, etc. Therefore, I prefer that the projection be integral with the end wall.

I have referred to the projection as having a somewhat convex exterior, but it might have concave sides rising to a projecting point, somewhat axially disposed. However, this would require much more precise machining of the mold pin to get such a formation. And the form shown has the advantage of simplicity and a simple alteration of the molding equipment.

While I have shown and described the preferred form of my invention, and suggested several variations, it should be understood that additional changes, alterations,

substitutions and modifications may be made without departing from the invention's fundamental theme. I, therefore, wish that the invention be unrestricted, except as by the appended claims.

I claim:

1. In an article of manufacture, a connector for joining the stripped ends of two or more electric wires and the like, including a cap of a stiffly flexible insulating material otherwise capable of being penetrated by the wire ends with a generally central bore open at one end and closed by an end wall at the other end, a generally cylindrical wire coil in the bore, means for holding the coil in the bore, and a deflector in the bore at the end wall for preventing the wire ends from penetrating the end wall in the form of a symmetrical projection integrally formed on the inner surface of the end wall as an integral part thereof and projecting into the bore of the cap.

2. The structure of claim 1 in which the projection is hemispherical.

3. The structure of claim 1 further characterized in that the cap is made of nylon.

References Cited in the file of this patent

UNITED STATES PATENTS

2,308,286	Joyce	Jan. 12, 1943
3,001,002	Schinske	Sept. 19, 1961

FOREIGN PATENTS

678,994	Great Britain	Sept. 10, 1952