

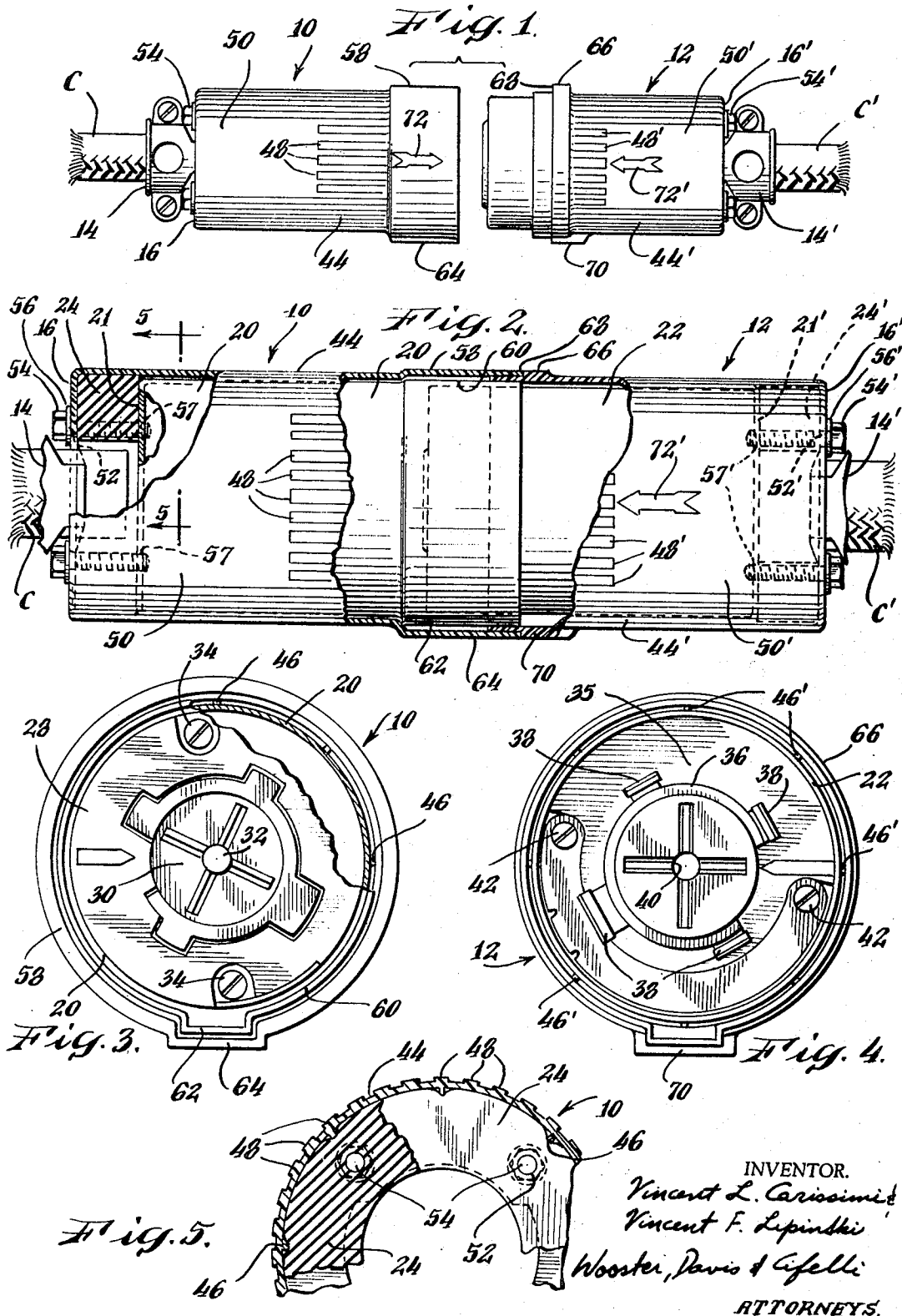
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V. L. CARISSIMI ET AL

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ELECTRICAL CONNECTOR HAVING A PROTECTIVE COVER

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INVENTOR.

Vincent L. Carissimi

Vincent F. Lipinski

Wooster, Davis & Cafelli

ATTORNEYS.

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ELECTRICAL CONNECTOR HAVING A PROTECTIVE COVER

Vincent L. Carissimi, Fairfield, and Vincent F. Lipinski, Stratford, Conn., assignors to Harvey Hubbell Incorporated, Bridgeport, Conn., a corporation of Connecticut

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10 Claims

ABSTRACT OF THE DISCLOSURE

A protective cover for an electrical connector having substantially the same configuration as the connector and further having circumferentially spaced axially and radially inwardly extending ribs on its inner surface and circumferentially spaced axially and radially outwardly extending ribs on its outer surface.

This invention relates to electrical connectors, particularly to those of high amperage rating and heavy duty application which require protective covers of electrical insulating, impact shock-resistant, corrosion-resistant and/or color coding properties.

Conventionally, in most electrical connectors, particularly of higher amperage ratings and heavy duty uses, it has been the practice to encase the connector components, i.e. connector caps and bodies, in protective metal shells. These metal shells possess many serious deficiencies:

(1) They are subject to the possibility of becoming a shock hazard. Ordinarily, they are internally grounded; however, if the grounding system continuity is broken, they can become electrically energized and thereby become a serious shock hazard to the user who might grasp them, for example, to connect or disconnect the connector components.

(2) They are subject to damage resulting from physical impact with external objects, such as sharp corners or edges.

(3) They are subject to deterioration, such as corrosion, resulting from environmental conditions. To preclude or minimize this, they are sometimes covered with protective paints or coatings; however, these are subject to scratching, marring or cutting in usage which can penetrate the covering and reduce their protective effectiveness.

(4) They do not readily lend themselves to the application of color for visibility, information color coding, rating color coding and/or appearance enhancement. Painting of the metal shells to achieve these purposes has been unsuccessful, because of its susceptibility in usage to scratching, cutting and deterioration.

(5) They have smooth outer surfaces which make it difficult to get the firm grip on them which is necessary to apply the axial and twisting forces required when connecting or disconnecting their electrical connector components.

Accordingly, it is a primary object of this invention to provide an improved electrical connector having a protective cover which may be in the form of an accessory attached externally to the usual metal shell and: insure electrical safety; have sufficient impact resistance to mechanical abuse and protect the metal shell therefrom; provide resistance to environmental deterioration; lend itself to ready application of durable color covering for the many purposes of color application, and provide an outer surface that is non-smooth for firm gripping.

Another object is to provide such protective accessories

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which are easily formed of a variety of suitable available plastic materials and inexpensive to manufacture.

To accomplish these objects in one form, I have provided a protective cover which is configured to be mounted on the usual metal shell of an electrical connector component without disturbing its basic elements, formed of a high impact-resistant, electrically insulating, corrosion-resistant moldable plastic material and comprises: a substantially cylindrical sleeve open at one end and having a planar end wall at its other end, the planar end wall having an electrical cable-receiving aperture therethrough; circumferentially spaced, axially extending, radially inwardly extending ribs on the inner surface of the cylindrical sleeve; circumferentially spaced axially extending, radially outwardly extending ribs on the outer surface of the cylindrical sleeve; and fastening means arranged to pass through the planar end wall of the protective cover, and arranged to be anchored into the usual planar end wall of the metal shell so as to assemble these elements together.

Other objects and further details of that which we believe to be novel and our invention will be clear from the following description and claims taken with the accompanying drawing, wherein:

FIG. 1 is a side elevational view showing a disconnected electrical connector with protective covers embodying the invention mounted in place on its connector body and connector cap;

FIG. 2 is an enlarged side elevational view of the FIG. 1 connector body and connector cap connected, with portions cut away to show internal parts;

FIG. 3 is an end elevational view of the connector body with the protective cover in place;

FIG. 4 is an end elevational view of the connector cap with the protective cover in place, and

FIG. 5 is a partial sectional view taken substantially along line 5—5 of FIG. 2 and showing the internal and external ribs of the protective cover.

With particular reference to the drawings, there is shown in FIGS. 1 and 2, the connector body protective cover 10 and the connector cap protective cover 12 mounted on the usual metal shells 20, 22, respectively, of these electrical connector components. The protective covers are of the same basic construction, the principal differences in structure being at the mating ends of the covers, which are designed to interconnect with one another. Therefore, only one of these covers will be described in detail, but the description will apply equally well to the other cover. The structural differences in the mating ends of the covers will, however, be described.

The connector body and connector cap may be internally constructed in any known desired way, and are connected, respectively, to a suitable source of power and to the equipment to be powered by means of electrical cables C, C' which are internally wired to the electrical elements in any known manner. The cables are strain-relieved by the cable clamps 14, 14' which may be made of metal coated with an appropriate insulating and protective paint or coating. The cables are introduced to the wiring areas of the respective connector components through appropriate openings in the planar end walls 16 and 16' of the protective covers 10, 12, respectively, the planar end walls 21 and 21' of the metal shells 20 and 22, respectively, and the annular resilient bushings 24 and 24', which are disposed between the adjacent end walls of the metal shells and protective covers.

The connector body (see FIG. 3) may be of "dead front" construction and include a contact blade supporting insulator housing portion 28 having an opening in its front wall normally closed by a spring biased shutter 30, axially movably mounted on a positioning pin 32

arranged to insure the proper positioning and guidance of the shutter plate. The insulator housing portion 28 is secured to the connector body metal shell 20 by means of elongated securing screws 34 which pass through the portion 28 and other internal insulator parts, and are anchored in tapped openings in the end wall 21 of the metal shell 20. The detailed construction of the connector body forms no specific part of our invention and, therefore, will not be described further.

The connector cap (see FIG. 4) includes an insulator housing portion 35 which carries a contact blade-carrying post 36 within which are molded the contacts 38. The post 36 is provided with a central aperture 40 which receives the positioning pin 32. The connector cap insulator housing portion 35 is secured to the connector cap metal shell 24 by means of elongated securing screws 42 which pass through the portion 35 and other internal insulator parts, and are anchored in tapped openings in the end wall 23 of metal shell 22. The detailed construction of the connector cap forms no specific part of our invention and, therefore, will not be described further.

The protective covers 10, 12 each comprise a substantially cylindrical sleeve 44, 44', and a respective planar end wall 16, 16'. The sleeves 44, 44' are provided with circumferentially spaced, axially extending, radially inwardly extending ribs 46, 46' on their inner surfaces which provide a small bearing area for centering the metal shells, and reducing the surface friction during assembly of the protective covers 10, 12 on the metal shells 20, 22 while maintaining a tight fit of the metal shells in the protective covers. It is to be noted that even though the wall of a cover is not perfectly round, a tight fit may still be effected and maintained by adjusting the heights of the ribs 46, 46' to provide a round bearing area. Furthermore, these ribs insure that a shock resistant buffer is provided between most of the opposing surfaces of the metal shell and the protective covers.

The exterior surface of the covers 10, 12 is provided with circumferentially spaced, axially extending, radially outwardly extending ribs 48, 48' which aid in the manual gripping and handling of the connector components. They provide a non-smooth external surface which is extremely advantageous since the user must maintain a firm grip on the connector components in usage to be able to apply the necessary axial and twisting forces when connecting or disconnecting the connector. It is to be noted in FIG. 1 that the non-smooth exterior surface of the protective covers does not extend over their entire outer surface, as there is provided a smooth area 50, 50' upon which any desired information may be applied.

The end walls 16, 16' of the covers are provided with a plurality of openings 52, 52' surrounding their central cable receiving openings, which openings are arranged to receive securing screws 54, 54'. The heads of the securing screws are spaced from the cover end walls by washers 56, 56' and pass through the end walls of the protective covers 10, 12 through appropriate passages in the resilient annular rubber bushings 24, 24' and are anchored in tapped openings 57, 57' in the end walls 21, 21' of the metal shells 20, 22. The bushings are disposed between the adjacent end walls of the cover and the metal shell and serve to clamp the electrical cables when the securing screws 54, 54' are tightened sufficiently to reduce the inner diameter of the opening in the bushing. This clamping effect supplements that of cable clamps 14, 14', the feet of which are firmly held between the inner surfaces of cover end walls 16, 16' and the outer end surfaces of bushings 24, 24'. The clamping of the electrical cables C, C' provides a tight seal around the cables, thereby preventing the entry of foreign objects, especially liquids, into the interior of the protective covers or the connector components.

The open axial end 58 of the connector body cover sleeve 44 is of a slightly larger diameter than the major remainder portion of the sleeve to accommodate the

diametrically enlarged end 60 of the connector body metal shell 20. Furthermore, as the shell is provided with a radially enlarged portion 62 to accommodate the usual spring grounding clip for engaging the metal shell of the connector cap, the connector body cover is likewise provided with a radially enlarged portion 64 so as to accommodate portion 62 of the metal shell.

The connector cap cover 12 is provided with an enlarged collar 66 having an axial shoulder 68 on its leading edge which serves to limit the axial engagement of the connector cap cover and the connector body cover, when the connector devices are mated. At its open end, the cover 12 has a radially enlarged portion 70 configured to fit within the portion 64 of cover 20.

In use, the connector components must be circumferentially aligned to effect proper contact connection. Therefore, appropriately disposed marks, such as arrows 72, 72', may be formed on covers 10, 12 to facilitate such alignment when making connections. When connected, the covers effect a sealed, corrosion-resistant cover about the connector.

The protective covers 10, 12 may be formed, as by molding, of any plastic material that is capable of providing the required mechanical strength, electrical insulation, corrosion resistance and color integrity that is required. To meet these requirements, a large selection of suitable materials is available, such as polyvinyl chloride, polycarbonate, polysulfone and nylon, one of which is commercially available under the trademark Lexan®. These materials are easily moldable and may be made to conform to the particular configuration of the metal shells. Many of these materials may be processed in the same molds, thus reducing tooling costs if one is changed to another. It should be noted that the materials need not be chosen to be compatible with the metal shells, as is required of a plastic coating or a paint of the prior art devices, since the protective covers of this invention are separate from and auxiliary to existing connector components.

Having described our invention of protective covers for electrical connector components, it will be readily apparent that these covers are especially effective protection against mechanical shocks which would ordinarily dent and damage the exposed or coated metal shell; against electrical shocks which would result if the metal shell were not properly grounded or lost its ground continuity, and against environmental deteriorations. Also, they afford effective, non-smooth, gripping surfaces, add the means for effecting color coding, as appropriate coloring matter may be readily added to the plastic material of which they are molded.

It is understood that the present disclosure has been made only by way of example, and that numerous changes in details of construction and the combination and arrangement of parts may be resorted to without departing from the scope and the spirit of the invention as herein-after claimed.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. For use with an electrical connector having a metal shell including a substantially cylindrical wall and a planar end wall at one axial end, a protective cover slightly larger than the metal shell and being of substantially the same configuration for being mounted thereon, including: a substantially cylindrical wall and a planar end wall, said cover being rigid and formed of an electrical insulating, corrosion-resistant, high impact shock resistant material; spacer means located upon the interior surface of said cylindrical wall of said protective cover to space said cylindrical wall from the cylindrical wall of the metal shell and to maintain the cylindrical walls substantially concentric; and non-smooth gripping means located on the exterior surface of said cylindrical wall of said protective cover.

2. The protective cover defined in claim 1 wherein said

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spacer means comprises a plurality of spaced, axially and radially inwardly extending ribs.

3. The protective cover defined in claim 1 wherein said gripping means comprises a plurality of spaced, axially and radially outwardly extending ribs.

4. The protective cover defined in claim 1 wherein said gripping means is interrupted by a smooth surface area upon which information may be applied on the surface of said protective cover.

5. The protective cover defined in claim 1 wherein said protective cover is made of a moldable material.

6. The protective cover as defined in claim 1 wherein: said protective cover is made of a moldable plastic material; said spacer means comprises a plurality of circumferentially spaced, axially and radially inwardly extending ribs; and said gripping means comprises a plurality of circumferentially spaced, axially and radially outwardly extending ribs.

7. In combination with an electrical connector having a metal shell including a substantially cylindrical wall and a planar end wall at one axial end; a protective cover as defined in claim 1, and fastener means securing said planar end walls of said metal shell and said protective cover together.

8. The covered electrical connector defined in claim 7 wherein: said planar end walls of said metal shell and said protective cover are provided with aligned central apertures, and a centrally apertured intermediate resilient disc is disposed between said planar end walls with its central aperture in alignment with said aligned central apertures.

9. The covered electrical connector defined in claim 8 wherein said fastening means comprises screws which pass through said planar end wall of said protective cover and through said resilient disc and are anchored in tapped holes in said planar end wall of said metal shell.

10. In combination with a connector cap and a connector body arranged to be connected to one another,

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each having a metal shell including a substantially cylindrical wall and a planar end wall at one axial end; pair of protective covers as defined in claim 1, said planar end walls of said cap and body metal shells and said protective covers being provided with aligned central apertures; fastener means securing said metal shells and said protective covers together; centrally apertured intermediate resilient discs disposed between said planar end walls, said fastener means passing therethrough; and an electrically conductive power cable connected to each said connector cap and said connector body and extending through all said openings when aligned, whereby, as said fastener means are tightened to urge said planar end walls axially toward one another, said resilient discs are compressed and clamp said power cables.

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