United States Patent [19]

Wyman

[11] **3,708,608**

[45] **Jan. 2, 1973**

[54] **ELECTRIC POWER CORD AND METHOD OF MAKING**

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[22] Filed: **Jan. 20, 1971**

[21] Appl. No.: **108,092**

[52] **U.S. Cl.** .....**174/70 R,** 29/624, 174/117 R, 174/117 F, 336/96, 317/101 CM

[51] **Int. Cl.**.....**H01b 7/08**

[58] **Field of Search** .174/113, 117 R, 117 F, 117 FF, 174/117 AS, 68.5, 70 R; 339/96, 98, 2 LR; 317/101 CM; 29/624

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[57] **ABSTRACT**

An electric power cord comprising conductors made up of elongated conductive filaments encased by an insulating jacket. The filaments of each conductor are arranged and the jacket constructed to allow easy penetration thereof by conductive prongs of an electrical load member (e.g. a light). In addition, two cords can be placed side by side and electrically spliced by conductive prongs penetrated through the jackets and conductors of the adjacent cords. In the method of manufacture, continuous conductive filaments are juxtaposed and arranged to form apertured conductors and encased (in sets of two or three) with an easily penetrable, insulating material.

9 Claims, 6 Drawing Figures

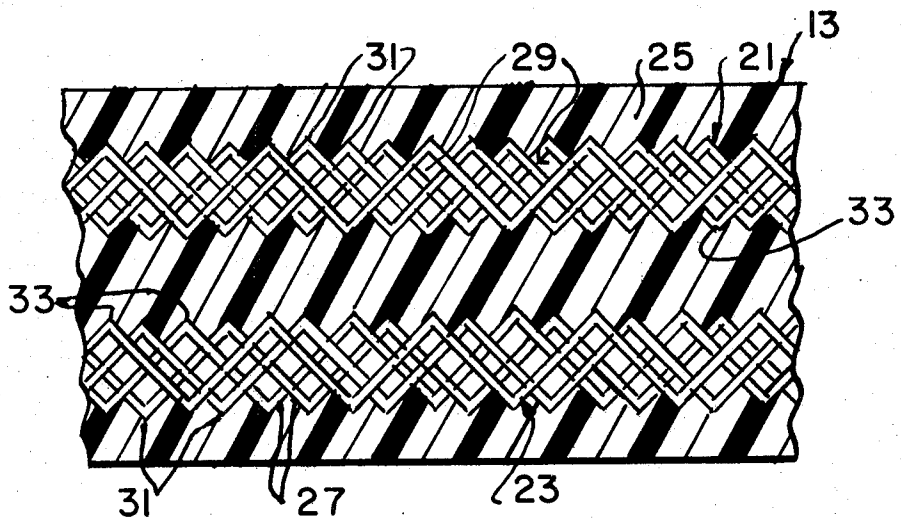


FIG. 1

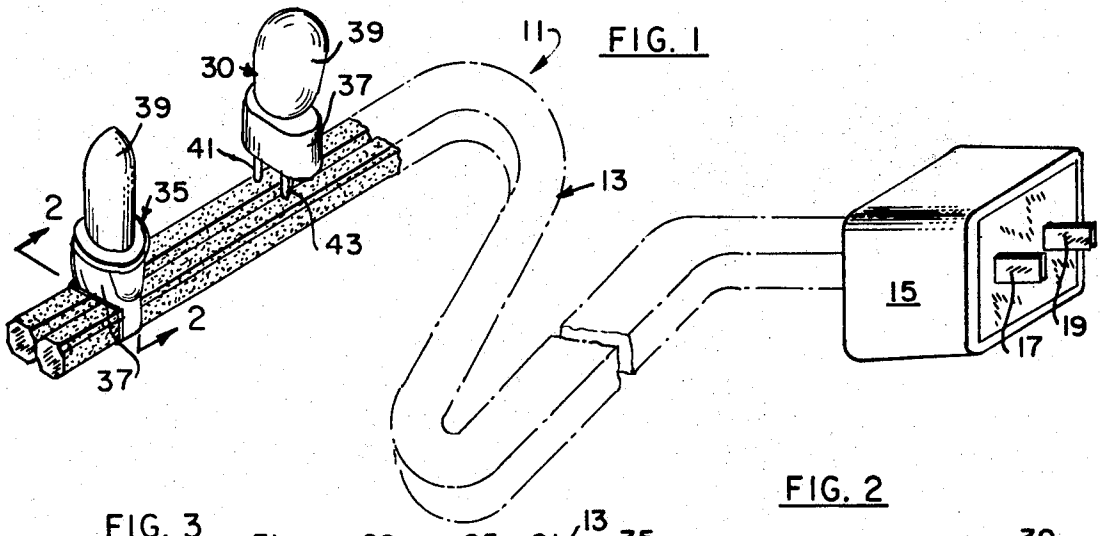


FIG. 2

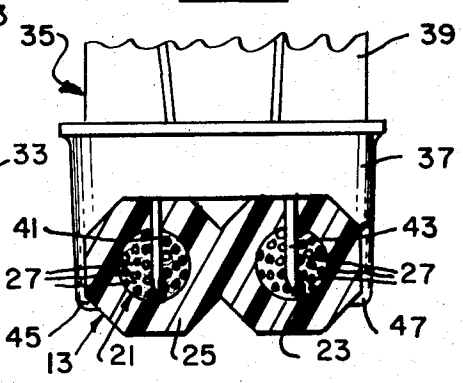


FIG. 3

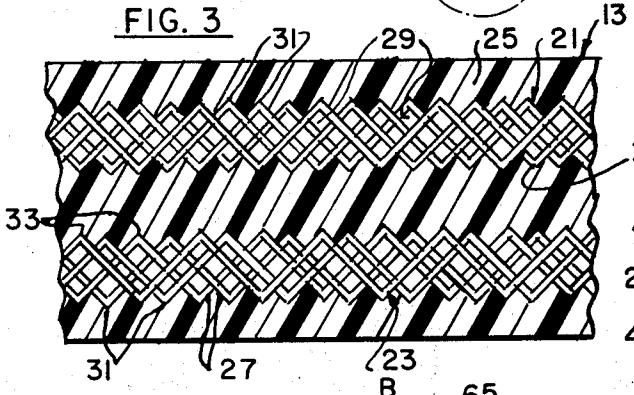


FIG. 6

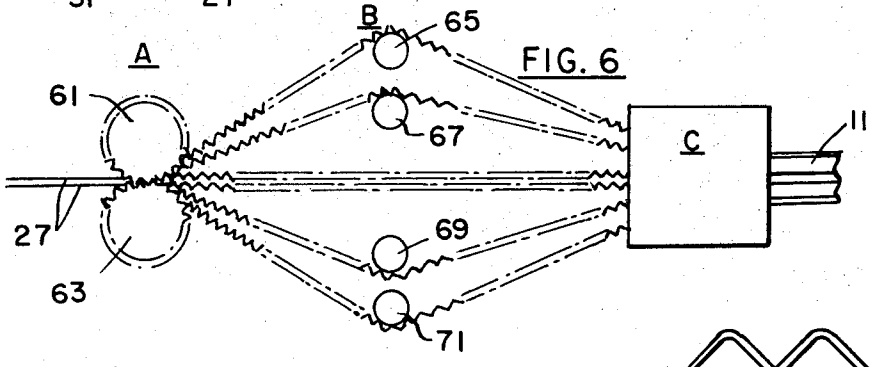


FIG. 4

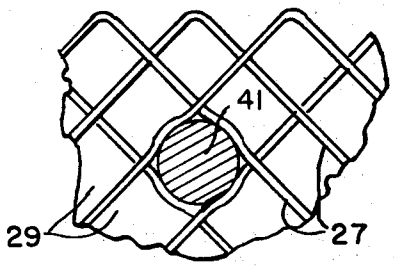
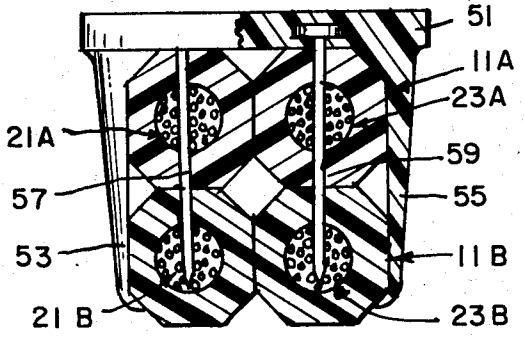


FIG. 5



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ELECTRIC POWER CORD AND METHOD OF MAKING

SUMMARY OF THE INVENTION

The present invention is directed to a novel electric power cord which allows connection of an electric load member thereto at virtually any point along its length. The cord is constructed to facilitate ready and easy connection and disconnection of electric load members thereto without requiring tools of any kind. The cord is constructed to regain basically its original nature upon disconnection of any or all of the electric load members thereby rendering it highly versatile and very safe in use. Also, two or more cords are readily electrically connected and disconnected using one or more splicing members. Again, the cords allow connection and disconnection without tools of any kind, and regain essentially their original nature upon disconnection.

In the method of making this cord, continuous conductive filaments are kinked, arranged in sets of two or three to form conductors made up of a plurality of kinked filaments juxtaposed to one another but with the kinks displaced or offset relative to one another. The conductors are then fed through an extruding or draw casting die where an insulating jacket of soft, easily penetrable material is applied thereto. This method facilitates use of high speed forming techniques and results in a reliable and low cost product.

Main objects of the present invention, therefore, are to provide a novel electric power cord which facilitates ready connection and disconnection of one or more electric load members thereto at an infinite variety of positions along its length, which facilitates ready splicing and disconnection of two or more cords, which requires no tools of any kind to effect connection and disconnection of these electric load members thereto or for splicing and disconnection of two or more cords, and which cord returns basically to its original state upon disconnection of an electric load member or upon disconnection of two or more cords.

Further important objects of the present invention are to provide a novel method whereby a power cord of the above character is formed continuously and inexpensively and results in a reliable, safe, and versatile product.

Additional important objects of the present invention will become more apparent from a consideration of the detailed description and claims to follow taken in conjunction with the drawings annexed hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view illustrating an electric power cord embodying the present invention and shown with an electric load member connected thereto and one disconnected therefrom;

FIG. 2 is an enlarged sectional view of FIG. 1 taken along the line 2—2 thereof;

FIG. 3 is a view illustrating schematically a sectional plan view, in two dimensions, of the cord of FIG. 1;

FIG. 4 is an enlarged view illustrating one of the conductors of FIG. 3 and showing a conductive prong penetrated therethrough;

FIG. 5 is a view similar to FIG. 2 and showing two cords of the invention spliced together; and

FIG. 6 is a schematic view illustrating the method of the present invention.

BROAD STATEMENT OF THE INVENTION

Broadly described, the present invention relates to an electric power cord comprising a plurality of conductors encased and separated by an insulating jacket, each said conductor including a plurality of elongated conductive filaments extending generally longitudinally of said cord, said filaments of each conductor being juxtaposed substantially each said filament being deformed laterally of said cord substantially throughout their length and relative to a large number of the other of said filaments, whereby to define a series of random apertures therealong, said insulating jacket being formed of a soft, pliable, and easily penetrable material.

In another aspect, the present invention comprises an elongated cord having a plurality of spaced, parallel conductors extending substantially throughout its length, means at one end of said cord for connection of said conductors to an electric source, said conductors including electrically conductive filaments defining an open lattice having randomly spaced, relatively small apertures substantially continuously along their length, a sheath of easily penetrable, self-sealing insulating material encasing said conductors, said cord receiving one or more pronged electrical load members along its length by manually pressing said prongs through said sheath and into said apertures in said conductors, said filaments being disposed within said sheath for limited movement relative to one another when engaged by said prongs whereby to permit said apertures to shift, said sheath material being constructed to snugly grip said prongs to support and retain said load members and electrically protect said prongs, said sheath material being further constructed to reclose the openings formed therein by said prongs upon removal of said load members from said cord.

In still another aspect, the present invention relates to an electric power cord comprising a plurality of conductors formed from elongated conductive filaments laterally deformed regularly along their length, said filaments of each said conductor being displaced longitudinally of others of said filaments, whereby to define random, irregular apertures transversely through said conductors substantially continuously throughout their length, said conductors being encased by a sheath of pliable, easily penetrable material having inherent cold flow chacterictics.

In still another aspect, the present invention relates to an infinite female connector comprising two or more elongated conductors encased and separated by a jacket of relatively soft, pliable insulating material, said conductors including juxtaposed electrically conductive filaments movable relative to one another and defining randomly spaced, relatively movable apertures disposed substantially continuously along their length, means for connecting two of said conductors to an electric source, said jacket having good cold flow chacteristics and being easily penetrable by conductive prongs of an electrically conductive member to allow said prongs to engage and move said filaments and penetrate respective ones of said conductors by way of aligned ones of said apertures, said jacket material reclosing and resealing the openings formed in said jacket by said prongs upon removal of said prongs therefrom.

In yet another aspect, the present invention relates to the method of making an electric power cord comprising the steps of selecting a plurality of elongated, laterally deformed electrically conductive filaments, arranging the filaments in spaced sets with the filaments of each set juxtaposed and the lateral deformations of each said filament being displaced longitudinally of the lateral deformations of a large number of the other of said juxtaposed filaments to define spaced, random and irregular apertures along said set, and encasing said filaments sets with an easily penetrable insulating material.

In yet another aspect, the present invention relates to the method of making an electric power cord comprising the steps of laterally kinking a plurality of substantially continuous conductive filaments, displacing at least some of said filaments longitudinally relative to others and arranging said filaments in laterally spaced sets, whereby to form random, irregular apertures substantially continuously throughout their length, and continuously encasing said spaced sets of filaments with an easily penetrable, electrically insulating material.

DETAILED DESCRIPTION

Referring now more specifically to the drawings, an electric power cord embodying the present invention is illustrated generally at **11** in FIG. **1** and is seen to include an elongated, flexible cord body **13** having a male plug connector **15** at one end thereof. The connector **15** has a plurality of plug blades **17, 19** for connection to a conventional female plug receptacle.

As shown in FIG. **2**, the cord body **13** includes a plurality of conductors **21, 23** encased and separated from one another by an insulating sheath or jacket **25**. The conductors **21, 23** are made up of a plurality of individual wires **27** interconnected with respective ones of the plug blades **17, 19**.

As in conventional electric power cords, the cord of the present invention is adapted to have an electrical load member connected thereto. In accordance with the invention and as a result thereof, the cord **11** forms an infinite female connector and facilitates ready connection of one or more electrical load members thereto at virtually any point along its length.

As shown in FIG. **2** and schematically in FIG. **3**, the individual wires **27** making up the conductors **21, 23** are arranged such that they define spaced apertures **29**. In a preferred form, this is achieved by forming at least some of the wires **27** with alternate kinks **31, 33** defining a zigzag configuration, and displacing some of the wires **27** longitudinally relative to others as seen schematically in two dimensions in FIG. **3**. By so doing, the juxtaposed wires **27** of each conductor **21, 23** define a three dimensional latticework. In actuality, the apertures **29** are randomly spaced along each conductor and define irregular paths transversely through the conductors **21, 23**.

The insulating jacket **25** is preferably made from a relatively soft, flexible and easily penetrable material having inherent cold flow chacteristics. A number of synthetic materials possessing the necessary characteristics are readily available, among which are the class of highly plasticized polyvinyl chloride (PVC) known as plastisol. This material is particularly advantageous in that it is readily extruded in place over and around the conductors **21, 23** and presents an attractive appearance and highly functional jacket.

The cord **11** is adapted to have one or more electric load members electrically connected thereto at virtually any position along its length. Exemplary load members are illustrated as electric lights shown at **35** in FIGS. **2** and **2**. These lights **35** include a base **37** having an incandescent bulb **39** fixed thereto and provided with conductive prongs **41, 43** dependent therefrom. The prongs **41, 43** are spaced, center to center, a distance which corresponds to the center to center space of the conductors **21, 23**.

The lights **35** are electrically connected to the cord **11** by pressing the prongs **41, 43** through the jacket **25** and into the conductors **21, 23**, respectively. The jacket material, as described above, is soft and easily penetrable and allows the prongs to pass easily therethrough. After the prongs **41, 43** penetrate the outer layer of the jacket **25**, they enter the conductors **21, 23** by way of the randomly spaced apertures **29**,between the individual wires **27**.

The apertures **29** generally are smaller than the thickness of the prongs **41, 43**; however, the flexible nature of the wires **27** and that of the wire latticework forming the conductors **21, 23** allows sufficient "give" so that the penetrating prongs **41, 43** expand successive ones of the apertures **29** transversely through the conductors **21, 23** and cause them to generally align with one another. This allows the prongs **41, 43** to easily pass into and substantially through the conductors **21, 23** as seen in FIG. **2**. At the same time, the wires **27** grip the prongs **41, 43**, as shown in FIGS. **2** and **4**, and hold the prongs in place in the conductors **21, 23** to maintain good electrical contact therewith. The jacket **25** tightly grips the prongs **41, 43** and electrically protects them.

In some cases, such as with the newer miniature decorative lights, the holding power of the wires **27** and the jacket **25** on the prongs **41, 43** is sufficient to support the members **35**. However, it may be necessary or desirable to provide the load members **35** with additional holding means such as contoured gripping fingers **45, 47** which releasably grip the sides of the cord body **13**, as shown in FIGS. **1** and **2**.

The load members **35** are removed from the cord **11** simply by manually pulling them away therefrom. When the prongs **41, 43** are withdrawn, the wires **27** relax back to their original shape. Also, because of the inherent cold flow chacteristics of the jacket **25**, it basically regains its original state and reseals the openings fromed by the prongs **41, 43**. Thus, the cord **11** can be used again and again and the load members **35** can be moved around as desired with complete safety. Further, the load members **35** are readily connected to and disconnected from the cord **11** quickly and easily and without requiring any tools of any kind.

As described above and shown in FIG. **1**, the cord **11** is connected to a suitable A.C. electric power source by means of the male plug connector **15**. In some cases, it may be desirable to utilize less voltage than is normally available at these sources. Such may be the case with the miniature decorative lights referred to above. There it may be desirable to utilize on the order of 3.5 volts, rather than the normal house voltage of 115

volts. To this end, the male plug **15** may have a step-down transformer (not shown) built directly into it to reduce the voltage in the conductors **21**, **23** to the desired level. Of course, it will be appreciated that the invention is not so limited.

Furthermore, it will be appreciated that the number and gauge of the wires **27** can and will vary according to the current and voltage chacteristics required in the particular installation. The invention, of course, contemplates three conductor cords as well as the two conductor cord shown.

Turning now to FIG. **5**, shown there are two cords **11A** and **11B** electrically connected by a splicer **51**. The cords **11A** and **11B** are laid side by side and are held together by a pair of contoured, flexible retaining fingers formed integral with the splicer **51**. A pair of conductive metal prongs **57**, **59** have their heads embedded in the insulating splicer member **51** and penetrate the cords **11A** and **11 B** to electrically connect conductors **21A** and **21B**, and **23A** and **23B**, respectively, when the splicer **51** is in place. As was the case with the cord **11**, the jackets **25A** and **25B** have good cold flow characteristics and effectively self seal the openings therein when the splicer **51** is withdrawn. Thus, as many individual cords **11** as desired may be quickly and easily joined together and disconnected at will.

The method of the preset invention is illustrated schematically in FIG. **6**. As shown there, a series of wires **27** are continuously fed to a forming station A which includes one or more sets of cooperating gear-like cogged wheels **61**, **63**. The wires **27** emerge from station A with a zigzag configuration as shown, and move into station B where some of the wires **27** are displaced longitudinally relative to one another. This may be achieved by feeding some of the wires **27** along a straight line path, and others over idler rollers **65**, **67**, **69**, **71** spaced different distances from the straight line path.

Next, the wires **27** reconverge to a set of two (or three) conductors at station C where the jacket **25** is continuously extruded thereover. Emerging from station C is the finished cord **11** which is then cut to length. One end of the cord **11** then has a male plug **15** secured thereto while the other end is sealed off.

It will be understood that a certain amount of tension is needed to draw the wire from station A through station C. Thus, to insure that sufficient kink remains in the wires **27** as the jacket **25** is extruded thereover, the wires may be "over kinked" at station A. Only approximately 5 to 10 lbs. pull is needed to feed the wires **27** through the system and this is easily accommodated.

By the foregoing, there has been disclosed a preferred form of the invention; however, various additions, substitutions, modifications, and omissions may be made thereto without departing from the spirit of the invention.

What is claimed is:

1. An electric power cord comprising a plurality of conductors encased and separated by an insulating jacket, each said conductor including a plurality of elongated conductive filaments extending generally longitudinally of said cord, said filaments of each said conductor being juxtaposed and substantially each said filament being deformed laterally of said cord substantially throughout their length and relative to a large number of the other of said filaments, whereby to define a series of random apertures therealong, said insulating jacket being formed of a soft, pliable and easily penetrable material.

2. An electric device comprising an elongated cord having a plurality of spaced, parallel conductors extending substantially throughout its length, means at one end of said cord for connection of said conductors to an electric source, said conductors including electrically conductive filaments defining an open lattice having randomly spaced, relatively small apertures substantially continuously along their length, a sheath of easily penetrable, self-sealing insulating material encasing said conductors, said cord receiving one or more pronged electric load members along its length by manually pressing said prongs through said sheath and into the apertures in said conductors, said filaments being disposed within said sheath for limited movement relative to one another when engaged by said prongs whereby to permit said apertures to shift, said sheath material being constructed to snugly grip said prongs to support and retain said load members and electrically protect said prongs, said sheath material being further constructed to reclose the openings formed therein by said prongs upon removal of said load members from said cord.

3. An electric power cord comprising a plurality of conductors formed from elongated conductive filaments laterally deformed regularly along their length, said filaments of each said conductor being displaced longitudinally of others of said filaments, whereby to define random, irregular apertures transversely through said conductors substantially continuously throughout their length, said conductors being encased by a sheath of pliable, easily penetrable material having inherent cold flow chacteristics.

4. An infinite female connector comprising two or more elongated conductors encased and separated by a jacket of relatively soft, pliable insulating material, said conductors including juxtaposed electrically conductive filaments movable relative to one another and defining randomly spaced, relatively movable apertures disposed substantially continuously along their length, means for connecting two of said conductors to an electric source, said jacket having good cold flow chacteristics and being easily penetrable by conductive prongs of an electrically conductive member to allow said prongs to engage and move said filaments and penetrate respective ones of said conductors by way of aligned ones of said apertures, said jacket material reclosing and resealing the openings formed in said jacket by said prongs upon removal of said prongs therefrom.

5. The method of making an electric power cord comprising the steps of selecting a plurality of elongated, laterally deformed, electrically conductive filaments, arranging the filaments in spaced sets with the filaments of each set juxtaposed and the lateral deformations of each said filament being displaced longitudinally of the lateral deformations of a large number of the other of said juxtaposed filaments to define spaced, random, irregular apertures along said set, and encasing said filaments sets with an easily penetrable insulating material.

6. The method of making an electric power cord comprising the steps of laterally kinking a plurality of substantially continuous conductive filaments, displacing at least some of said filaments longitudinally relative to others and arranging said filaments in laterally spaced sets, whereby to form random, irregular apertures substantially continuously throughout their length, and continuously encasing said spaced sets of filaments with an easily penetrable, electrically insulating material.

7. A cord as defined in claim 1 wherein said filaments comprise elongated wires formed with alternate kinks defining a zigzag configuration, said wires being positioned such that the kinks of adjacent wires are displaced longitudinally of one another, whereby to form said apertures.

8. A device as defined in claim 2 wherein said apertures extend irregularly transversely through said conductors, said apertures being generally smaller than said prongs, whereby said prongs expand said apertures and are gripped by said filaments.

9. A device as defined in claim 8 wherein said filaments comprise conductive wires extending substantially the length of said cord.

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