July 17, 1934. H. B. TAVERNER 1,967,014

INSULATING SLEEVE FOR TRUCK TYPE OIL SWITCHES

Filed July 13, 1931 2 Sheets-Sheet 1

Fig. 2.

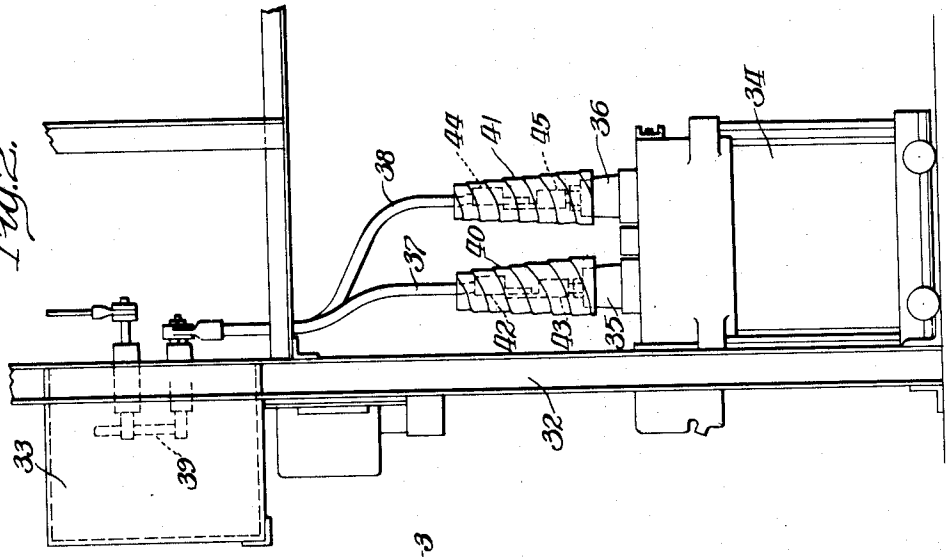
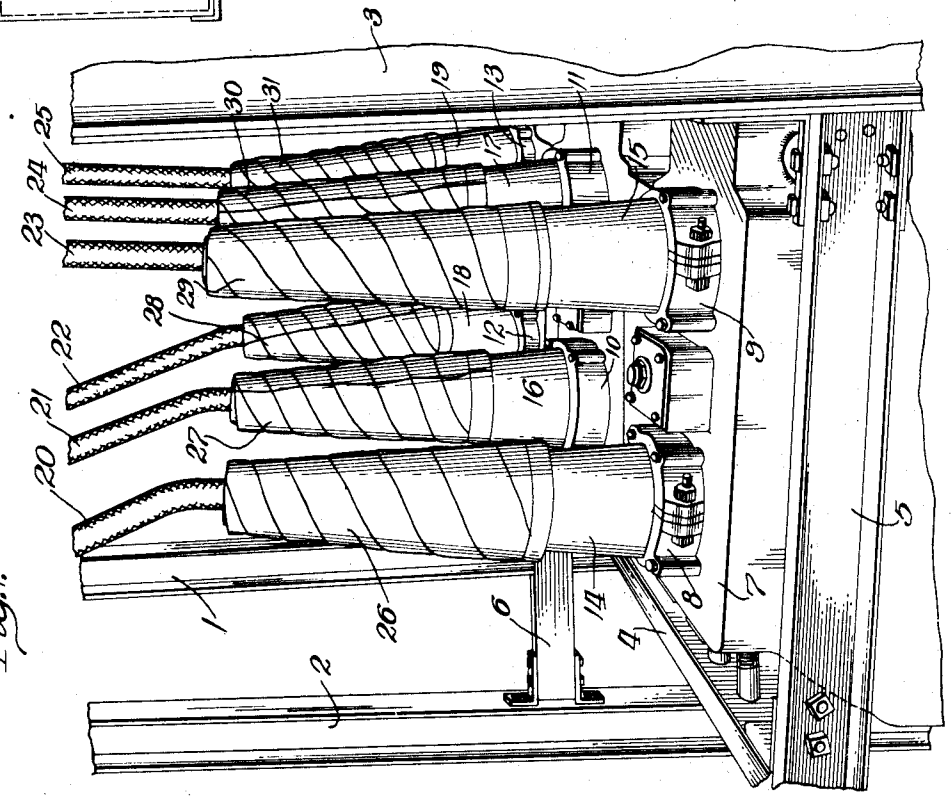


Fig. 1.



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Fig.3.

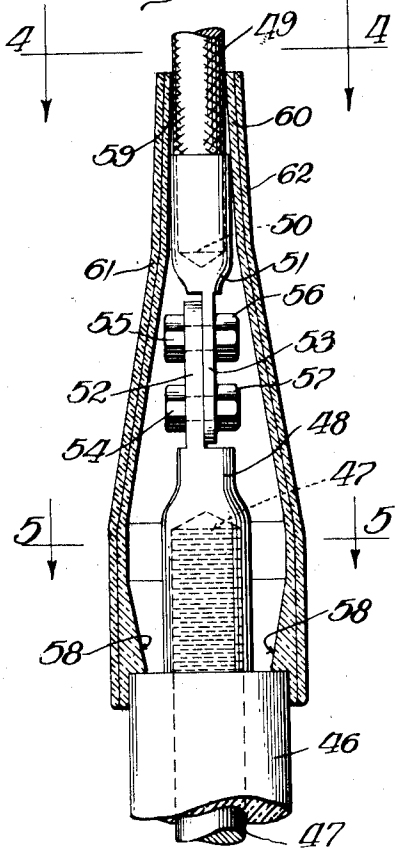


Fig.6.

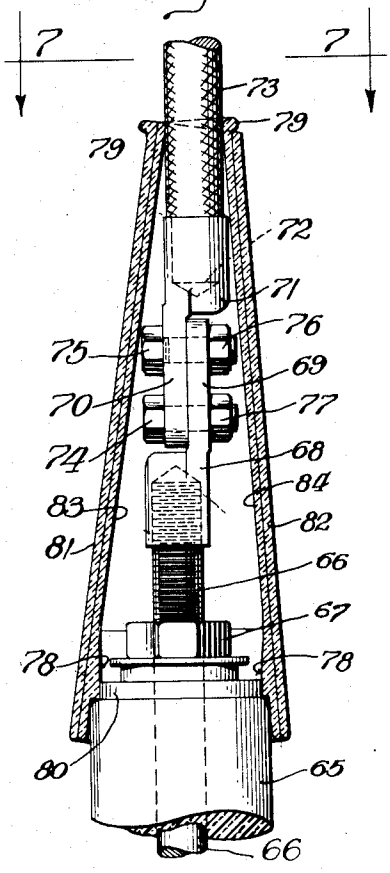


Fig.4.

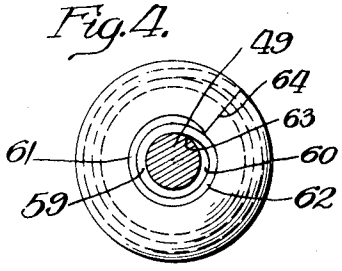


Fig.7.

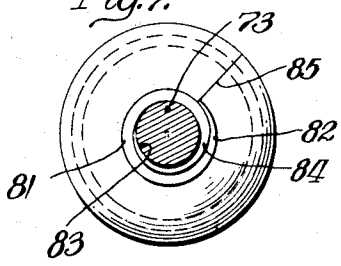
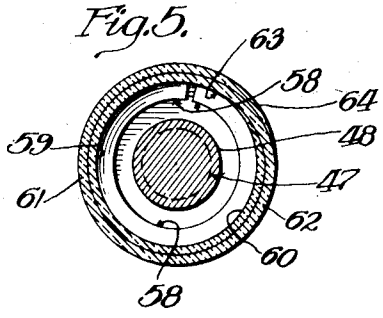


Fig.5.



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UNITED STATES PATENT OFFICE

1,967,014

INSULATING SLEEVE FOR TRUCK TYPE OIL SWITCHES

Howard B. Taverner, Chicago, Ill.

Application July 13, 1931, Serial No. 550,409

5 Claims. (Cl. 173—28)

My invention has reference broadly to protective appliances, and is specifically concerned with a novel insulating sleeve for encasing electrical conductors, particularly with a sleeve for use in connection with truck type oil switches, transformers, circuit breakers, and the like, designed and adapted to protect operators and others from shock when working around or coming into contact with such apparatus.

The terminal studs of oil switches or transformers are provided with suitable connecting lugs and similar lugs are attached to the cable conductors. These studs or lugs are provided for connecting the cable conductors with the terminals of a switch. The lugs are joined by means of clamping bolts or in another suitable manner. Such a connection requires protecting provisions on account of the high voltages which may be transmitted thereover, so that operators working around the apparatus, and other persons coming incidentally into contact therewith, might be protected against shock and possible injury.

There are certain methods known for protecting connections of this type and of similar character.

For example, one method proposes to rope and to tape the lugs and the connections. This method is very costly because it requires several hours' work for cutting the tape off from the terminals when an oil switch or the like is to be opened for periodical cleaning and inspection. The necessary re-taping of the terminal connections, after the switch has been cleaned, increases the cost further and renders the method quite clumsy if not entirely impractical.

Another method suggests to provide asbestos guards around the connections. This latter method is more in vogue, but it is not entirely satisfactory. Portions of the bare terminals and connecting lugs are exposed, and this condition represents a hazard and might lead to injury, particularly in case of equipment which is open to public inspection, or which is otherwise made accessible to inexperienced visitors. There are cases known in which even maintenance men and operators were injured due to inadvertence or some unfortunate negelect, a fact which illustrates clearly that a more permanent and more complete protection is desired and necessary than is commonly employed.

The object of my invention is to provide improved protecting sleeves for the purpose set forth above. The device which I disclose in this specification is simple in construction. It may be attached quickly and conveniently to a connection between an oil switch and the like and a corresponding cable, and may also be removed with great facility. It is effective for its designed purpose, and will retain its position on such a connection without separate securing means. It can be employed repeatedly, and represents, therefore, a device of standard character, rather than a temporary makeshift.

The sleeve which I have invented, and which I am about to disclose, is made of vulcanized rubber. It is formed with a bias, tending to curl itself up tight, just as a piece of paper will tend to do after it has been rolled up into a roll. The sleeve is applied by pulling the edges apart, passing it over the connection which is intended to be protected, and then allowing the ends to overlap each other by the resiliency of the material. The lower portion of the sleeve which engages the insulator or the bushing of the oil switch or transformer, etc., may be provided with an interior shoulder to aid in maintaining the sleeve in position. The upper portion of the sleeve which curls around the cable leading to the corresponding terminal of the switch may be provided with a ledge or lip if desired.

When put in position, the novel protecting sleeve which I have described above in general terms, encloses the connections between a cable and a terminal by attaching to the terminal bushing and to the insulation of the cable, respectively. It provides thus a protective housing or casing around the connections, tapering from the terminal bushing to the cable, and holding itself in position by the resiliency of the material and by the frictional qualities thereof.

As has been said previously, the sleeve is made of rubber. It has sufficient body to provide a secure grip upon the cable and upon the terminal bushing, to maintain itself in position, particularly with the aid of the interior shoulder resting on the bushing. The bias which is formed on the sleeve material tends to secure its resiliency and its quality to roll itself tightly around even after repeated use. The rubber may be strengthened by textile fabric vulcanized in it if desired.

The novel sleeve can be put in position and can also be removed with great facility. It needs no special provisions for attachment, provides a reliable protection, eliminates the need for asbestos guards, taping or wrapping and the like, and insures safety around the apparatus or equipment where it is employed. It can be easily manufactured with known processes and machinery of rubber goods production and can be furnished cheaply.

My invention secures thus an article for the reliable and complete protection of electrical connections of the type described, and of similar connections, and it secures this protection at less cost than it was necessary in the past to expend for cumbersome appliances which furnished incomplete protection or pratically no protection at all, since these prior appliances were merely of the character of temporary makeshifts, resorted to in the absence of a permanent safety

device especially designed for the purpose. It will be understood, of course, that my protective sleeve may also be used for other equipment than the one which I have specifically mentioned. Examples of other uses to which my invention may be put will be furnished later on.

I shall now describe the invention with reference to the accompanying drawings in which I have shown certain embodiments of the same in order to teach others how the invention may be put to practical use.

In the drawings:

Figure 1 represents an elevational view into station equipment and illustrates particularly an oil switch with its terminal bushings and cables leading to the terminal of the switch, showing also protecting sleeves of the novel construction in connection with each cable and the corresponding terminal bushing;

Figure 2 is a more diagrammatic partial side view into the equipment such as shown in Figure 1, showing a truck type oil switch, cables arranged above the oil switches adapted to connect with the terminals thereof, and my novel protecting sleeves attached to the cables and to the corresponding terminal bushings;

Figure 3 shows a longitudinal cross section through one embodiment of the novel insulating protecting sleeve as applied to a connection comprising a cable and a terminal bushing as well as the connections between the cable conductor and the lug projecting from the bushing;

Figure 4 is a transverse section through the cable taken on line 4—4 in Figure 3 and looking in the direction of the arrows;

Figure 5 is a transverse cross section through the arrangement taken on line 5—5 in Figure 3 and looking in the direction of the arrows;

Figure 6 is a longitudinal cross section through another embodiment of the novel insulating sleeve similar to the view shown in Figure 3 but illustrating a different type of connection as well as a somewhat modified type of sleeve; and

Figure 7 is a transverse cross section taken on line 7—7 in Figure 6 looking in the direction of the arrows.

Referring now to Figure 1, I have shown in this figure a structural framework comprising the vertical posts designated by numerals 1, 2 and 3, two horizontal beams 4 and 5, and a cross support designated by numeral 6. These beams and girders are part of a structural framework for mounting oil switches and related station equipment in place. The upper portion of a casing of such an oil switch, which may be of the truck type, is shown in this drawing and designated by numeral 7. Terminal bushings which may be of insulating material, such as porcelain or the like, are mounted on the casing 7 by means of clamping provisions such as 8, 9, 10, 11, 12 and 13. The insulating bushings are designated by numerals 14, 15, 16, 17, 18 and 19. Conductors rise from the interior of the oil switch within these bushings and each conductor is provided with a suitable lug. Cables such as indicated by the numerals 20 to 25, inclusive, are provided for making connection with the lugs of the individual conductors rising within the insulating bushings from the oil switch. The end of each of the conductors of these cables is also provided with a connecting lug or stud which is adapted to be connected by clamping bolts or the like with the corresponding lug or stud of the respective conductor which extends from the corresponding bushing.

It is this connection of the bare conductors and parts, extending from the end of the conductor of each cable to the conductor which rises from each of the insulating bushings, which must be protected in order to prevent the transmission of shocks from these conducting parts to a person working around the apparatus. In other words, it is the bare conductors disposed between the two insulating means (cable insulation and insulating bushing) which needs protection. The amount of work, when taping or the like is resorted to, will be realized when it is considered that several oil switches might be disposed in a station, each having several terminals that need protection. The expenses for the taping material are considerable and must be added to the expenses for the work in order to gain a clear conception of the prevailing conditions.

In order to secure the necessary and desired protection of these connections I have provided my novel insulating protecting sleeves. These protecting sleeves are shown to be applied to the arrangement shown in Figure 1 and are indicated in this figure by the reference numerals 26 to 31, inclusive. It will be seen that each sleeve is provided with a bias which is molded into the material. In other words, each sleeve is treated so that when the sleeve is unwrapped it will spring back to the original position without any shaping by the hands. Each sleeve consists of a sheet of rubber suitably treated as indicated above in order to bias the material, and this sheet of rubber is simply pulled apart or unrolled, put around the parts to be protected and the edges are then released. The resiliency of the rubber will wrap the sheet around the oil switch connections in a manner as shown in the drawings. The switch can then be made alive. The lower end of each sleeve will attach tightly to the corresponding cable insulation. The connection between the cable conductor and the conductor rising from the insulating bushing will thus be securely and reliably protected and enveloped within the insulating sleeve.

The helical lines on the sleeves in Figs. 1 and 2 indicate how the sleeve may be made up of narrow strips of raw rubber wrapped upon a suitable form to give a conical shape. This is incidental and not essential, as the preferred form of the finished article exhibits a smooth exterior surface. By the term bias I mean to designate the mechanical tendency which the finished sleeve has, to coil or roll upon itself.

It will be seen that the sleeves are tapering, or of conical shape. This, of course, is a consequence of the particular use to which the sleeves are put in this case. I do not wish to limit the invention to conical form only. The bushings, which are usually made of porcelain or like insulation of high grade, are of larger diameter than the cables and the tapering of the sleeves presents a neat appearance, being designed in line and in harmony with the other parts. In a case in which parts disposed between two insulating members of equal diameter are to be protected, the sleeve will preferably be substantially cylindrical, and may have a shoulder at each end. It may also take other forms, such as a spherical or bulbous form, if necessary.

Figure 2 will be easily understood from the previous remarks with reference to Figure 1. It shows a side view into a section of a station having a structural framework which comprises vertically disposed posts such as 32 with pro-

visions for mounting the switch box such as 33 and other apparatus. An oil switch of the truck type is shown at 34. This oil switch has the usual insulating bushings such as 35 and 36. Cables such as 37 and 38 are provided for making the connections from the oil switch to certain connecting switches, such as the one indicated at 39 which may be placed within the switch box 33. The connection between each cable conductor and the corresponding conductor rising from the oil switch is shown to be protected by means of my novel sleeves as indicated at 40 and 41. The connections are disposed within these insulating protecting sleeves as I have sketched in dotted lines. Each connection consists in this example of two lugs or studs, one attached to the conductor of the cable and the other attached to the conductor rising from the corresponding insulating bushing of the oil switch. In the drawings, Figure 2, these connections are indicated in dotted lines designated by the reference numerals 42—43 and 44—45, respectively. The nature of these connections will be better understood from a further description with reference to the remaining figures of the drawings.

Referring now particularly to the Figures 3, 4 and 5, which show several cross sections taken on a structure on which my insulating sleeve has been applied for protecting such a connection from an oil switch to a cable, the numeral 46 designates the upper portion of an insulating bushing which may be a part of an oil switch. A conductor 47 rises within the insulating bushing 46 from the interior of the oil switch and attached to this conductor 47 may be a connecting stud or lug such as 48. The lug 48 may be provided with a threaded opening and the conductor 47 may be provided with a threaded portion for engagement of the connecting lug 48 as shown. The end of the cable is shown at 49. At 50 I have indicated the conductor of the cable, the insulation being removed from the end of this conductor in order to permit the conductive connection with the lug or stud 51 to be made. Each of the lugs 48 and 51 is provided with a flat portion indicated by the reference numerals 52 and 53, respectively, and these flat portions of the lugs are brought into register with each other. Holes extend through each of the flat portions of the lugs and clamping bolts such as 54 and 55 may be employed for fastening the lugs together, the bolts being held in position by means of suitable nuts such as 56 and 57. This completes the conductive connection between the conductor 47 of the oil switch and the conductor 50 of the cable 49.

My novel insulating protecting sleeve is attached around the connection by spreading and then allowing it to roll up around the connection into the position previously described with reference to Figures 1 and 2. The cross section in Figure 3 which is now under discussion, shows more particularly how the sleeve is constructed and how the same attaches to the insulating bushing and to the cable.

It will be seen from this Figure 3 that the lower portion of the sleeve, where the same attaches to the insulating bushing 46, is provided with a ledge or interior shoulder designated by reference numeral 58. This shoulder is molded in the rubber sheet forming an integral part of the sleeve. It provides a means for positioning the sleeve quickly and accurately, and also gives substantial body to the lower portion of the sleeve so that the sleeve in rolling around the insulating bushing 46 will attach thereto, holding the sleeve tightly, and with a firm grip, on the bushing. The upper portion of the sleeve will attach to the cable 49 as shown. This attachment is indicated by the layers 59 and 60 in Figure 3 which designate the inner portion of the sleeve as it is rolled around the connection. The outer layers of the insulating sleeve are designated by the numerals 61 and 62. The bias which is molded into the material of the sleeve has not been indicated in Figure 3 because it would unnecessarily confuse the drawings.

It will be observed that the lugs or studs 48 and 51, as well as the means for connecting them in conductive relation, are entirely free, and encased within the insulating protecting sleeve. This shows that the sleeve has sufficient body to hold itself in position, self-supporting, without crushing in its intermediate portion. It is held merely at the ends, providing thus a hollow casing for the connection which is intended to be protected.

The transverse cross section shown in Figure 4 which is taken on lines 4—4 in Figure 3, shows how the sleeve attaches to the cable 49. The inner edge of the sleeve is designated in Figures 3, 4 and 5 by the numeral 63. The outer edge of the sleeve is indicated by the numeral 64.

In Figure 5, which is a transverse cross section taken on line 5—5 of Figure 3, I have applied the same reference numerals to identical parts. The outer layers of the sleeve, corresponding to the layers shown in Figure 3, are designated by the numerals 61 and 62, while the inner layers corresponding to the inner layers shown in Figure 3 are indicated by the numerals 59 and 60. The interior shoulder which is provided in the lower portion of the insulating sleeve and which attaches directly to the insulating bushing 46 is designated by like reference numeral as in Figure 3, namely, by numeral 58. It will be seen that this shoulder extends only far enough to provide a suitable reinforcing portion and a rest for the sleeve on the insulating bushing 46. Numeral 47 shows in dotted lines the conductor disposed within the stud or lug 48.

The embodiment which I have shown in Figures 6 and 7, the latter figure being a transverse cross section taken on line 7—7 in Figure 6, shows the application of my insulating protecting sleeve to a bushing and terminal of an oil switch of another type. This comprises an insulating bushing 65 from which projects a threaded conductor 66, being fastened by means of a suitable nut such as 67, and the conductor 66 being provided with the lug or stud 68, having a flat portion 69 which is brought into register with a similar flat portion 70 of a stud 71 fastened on the conductor 72 of the cable 73. The flat portions 69 and 70 of the studs 68 and 71 are clamped together by means of the bolts 74 and 75 held in place by the nuts 76 and 77 as shown. A washer 80 of metal or insulating and preferably heat resisting material, such as asbestos, may be provided on top of the insulating bushing 65.

For bushing and terminal stud constructions of the type wherein an ebony asbestos washer of greater diameter than that of the bushing, rests upon the top of the bushing, the lower end of my sleeve embraces the periphery of the washer and the shoulder 78 or 58 of my sleeve rests upon the top margin of the washer. The sleeve thereby does not touch the porcelain or like insulation which constitutes the body of the bushing.

The protecting sleeve employed for the above

described connection between the cable 73 and the conductor 66 rising through the insulating bushing 65 may again consist of a rubber sheet cured or formed with an inherent bias to provide the required resiliency and the tendency to roll up around the connection and attach itself on the one end to the insulating bushing 65 and on the other end to the cable 73. This insulating protecting sleeve is provided in its lower portion with an interior shoulder as is particularly indicated by the reference numeral 78 in Figure 6. This shoulder engages the upper portion of the insulating bushing 65 which may be either recessed or stepped down annularly or provided with a suitable insulating washer or the like against which the interior shoulder 78 may rest in position. The upper portion of the insulating sleeve may be provided with a reinforcing lip or bead such as indicated by the reference numeral 79. This lip or bead 79 will strengthen the upper edge of the insulating sleeve which curls around the cable 73 and thus reinforced will cause the firm attachment of the sleeve to the cable in the manner shown.

The outer layer is indicated in the Figure 6 as well as in the Figure 7 by the reference numerals 81 and 82, while the inner layer has been designated by the numerals 83 and 84. The numeral 85 in Figure 7 indicates the longitudinal edge on the sleeve as attached to the connection.

I have shown and described the invention in connection with embodiments particularly designed for use with oil switches and the like, for encasing the terminal connections between such switches and corresponding cable conductors in order to afford a reliable protection to sub-station operators and to anyone who might come accidentally into contact with such oil switch connections. It will be appreciated, however, that I have shown this specific form of realizing the invention mainly for the purpose of explanation and not for the purpose of indicating the limitations of the invention. The invention is manifestly capable of being employed in connection with apparatus and machinery of widely different type and character. It may also be employed for encasing and for reliably protecting electrical connections which are either of a delicate nature or for other reasons in need of protection against mechanical injury, or electrical contact, or both.

Inasmuch as the invention discloses novel and useful aspects apart from the specific use to which I have shown the same to be applied, it will be understood that I do not desire to be limited to this precise embodiment but that I desire to employ and to exploit the invention in all such embodiments and for all such uses as may fall within the scope and meaning of the appended claims. I have defined in these claims what I believe to be new and what I desire to have protected by Letters Patent.

I claim:—

1. A sleeve for enclosing electrical connections, said sleeve comprising resilient insulating material rolled upon itself to form a tapered tube of larger diameter at one end than at the other, the inner and outer longitudinal edges of the tube being free of interfering projections to permit uncoiling of the tube against its natural resiliency, and to permit a natural recoiling of the same to fit, and grip at its two ends, an object to be shielded, the large diameter end of the tube being thickened and provided with an internal shoulder for centering the tube and supporting the same in position.

2. In combination, electrical apparatus including an enclosing casing, an insulating bushing extending from the casing, a conductor extending outward of the casing through the bushing, a terminal at the end of the bushing terminating the conductor that extends through the bushing, a second conductor extending to said terminal and connected thereto to establish connections with the first mentioned conductor, and a tapered tubular shield surrounding the terminal and extending from the bushing to the conductor and comprising a resilient insulating tubing split lengthwise to permit opening of the same for removal and insertion around the terminal, and having an inherent inward coiling whereby the same tends to resume and maintain its tubular form, the wide end of said tubing embracing the bushing and including an internal shoulder supporting the tubing and centering it around the terminal, the narrow end of the tubing encircling the second mentioned conductor and gripping the same by the inherent resiliency of the tubing, the contraction of the tubing at the two ends being limited by the respective objects embraced whereby the tubing is firmly held in place.

3. In combination, electrical apparatus including an enclosing casing, an insulating bushing extending from the casing, a conductor extending outward of the casing through the bushing, a terminal at the end of the bushing and terminating the conductor that extends through the bushing, a second conductor extending to said terminal and connected thereto to establish connection with the first mentioned conductor, and a tubular shield surrounding the terminal, said shield extending from the bushing to the second conductor and comprising a resilient insulating tubing split lengthwise to permit opening of the same for removal and insertion around the terminal, and having an inherent inward coiling whereby the same tends to resume and maintain its tubular form, one end of said tubing embracing the periphery of said bushing and including an internal shoulder supporting the tubing and centering it on the bushing and around the terminal.

4. In combination, a bushing having a terminal conductor projecting therethrough, a second conductor adapted to be connected to said terminal conductor, said bushing being of greater diameter than said second conductor, and an insulating shield for enclosing the connection between said conductors extending from said bushing to said second conductor, said shield comprising a coiled helical strip with adjacent turns overlapping to form a resilient tubing adapted to be opened for removal and application around said connection and having an inherent inward coiling tendency whereby the shield tends to coil itself around the periphery of said bushing and around said second conductor.

5. In combination, a pair of conductors adapted to be connected together, a bushing enclosing one of said conductors adjacent said connection, and a resilient insulating shield member formed of a coiled helical strip adapted to enclose said connection and adapted to be opened for lateral removal and application about said connection, said shield member having an inherent inward coiling tendency whereby said member tends to embrace the peripheries of said bushing and the other one of said conductors to support said member in position.

HOWARD B. TAVERNER.