C. W. DAVIS.

TERMINAL FOR ELECTRICAL CABLES.

APPLICATION FILED MAR. 6, 1909.

941,860. Patented Nov. 30, 1909.

2 SHEETS—SHEET 1.

FIG. 1.

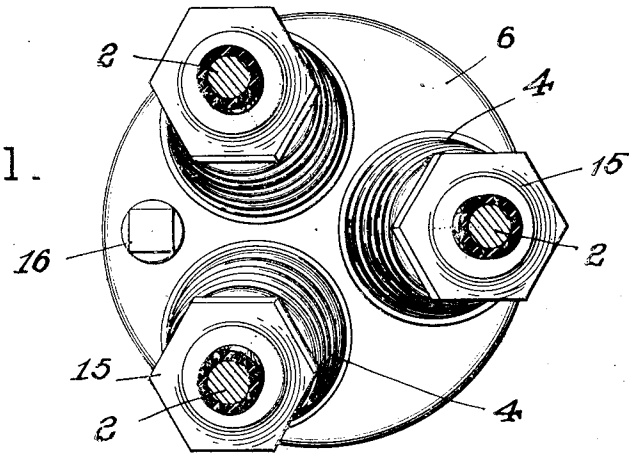
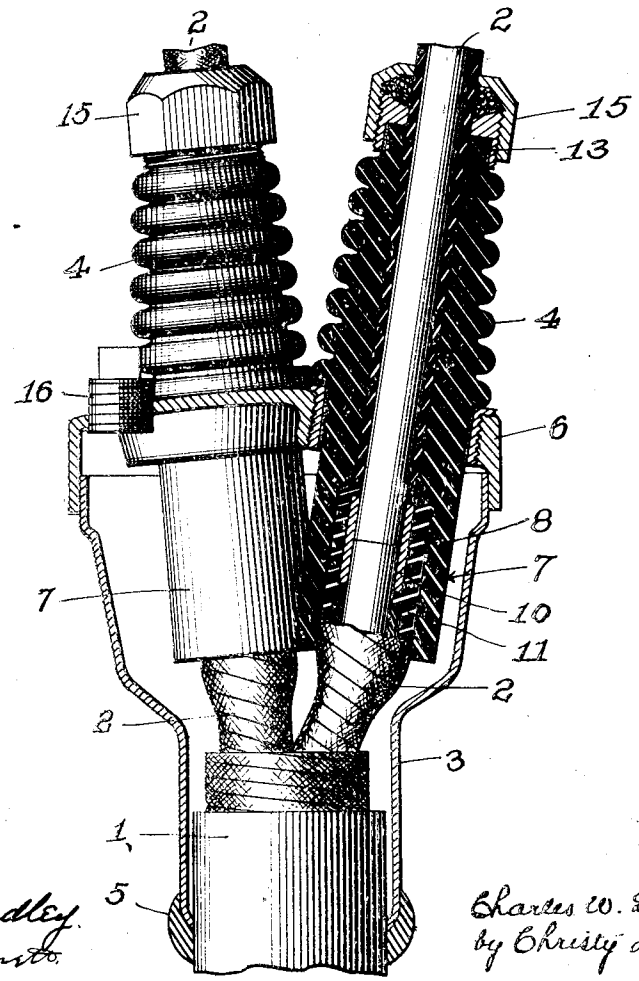


FIG. 2.



WITNESSES:

J. Herbert Bradley

Charles Barnitz

INVENTOR

Charles W. Davis

by Christy and Christy

Atty's

C. W. DAVIS.

TERMINAL FOR ELECTRICAL CABLES.

APPLICATION FILED MAR. 6, 1909.

941,860. Patented Nov. 30, 1909.

2 SHEETS—SHEET 2.

FIG. 3.

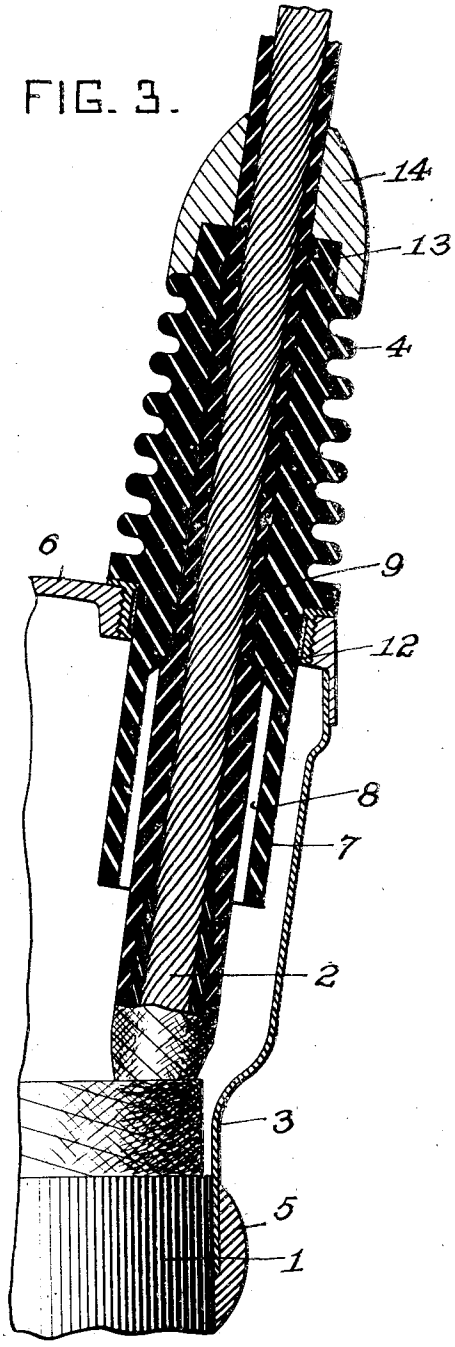
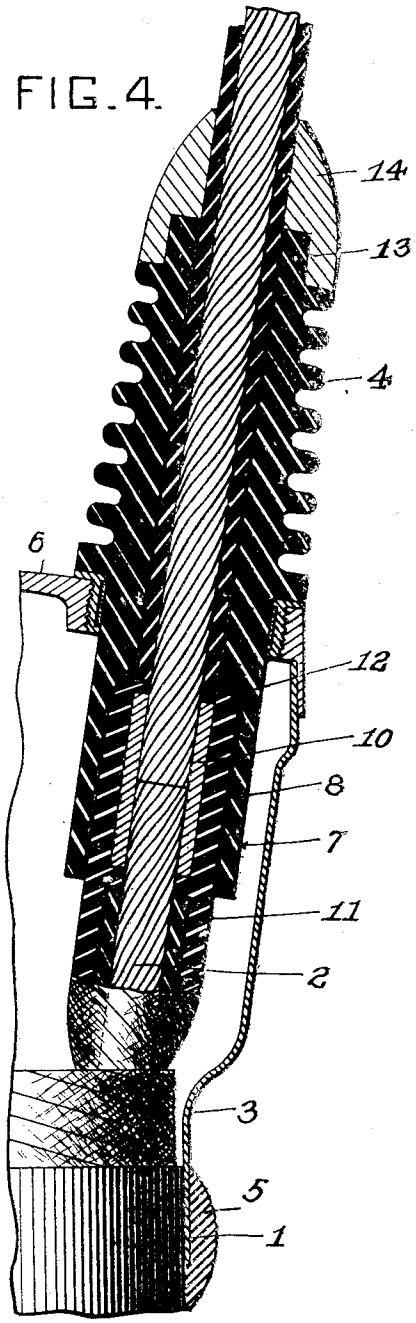


FIG. 4.



WITNESSES:

J. Herbert Bradley.

Charles Barnitz.

INVENTOR

Charles W. Davis

by Christy and Christy

Attys

UNITED STATES PATENT OFFICE.

CHARLES W. DAVIS, OF EDGEWORTH, PENNSYLVANIA.

TERMINAL FOR ELECTRICAL CABLES.

941,860. Specification of Letters Patent. Patented Nov. 30, 1909.

Application filed March 6, 1909. Serial No. 481,633.

To all whom it may concern:

Be it known that I, CHARLES W. DAVIS, residing at Edgeworth, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered a certain new and useful Improvement in Terminals for Electrical Cables, of which improvement the following is a specification.

My invention relates to improvements in terminal structures for electrical cables; and the objects of my invention are efficiency to prevent leakage of current and deterioration of material, and simplicity of structure, to cheapen manufacture and to eliminate difficulty in installation.

The invention is primarily concerned with a terminal for a multiple conductor cable, that is, a cable containing two or more separate and independent current-bearing conductors, each insulated from the other; secondarily, it is concerned with the particular formation of an insulator.

Though my improved insulator is peculiarly applicable to a terminal for a multiple-conductor cable, it will be understood that it is not thus limited in application, but may be used in terminals of other kinds as well.

In the accompanying drawings forming part of this specification, Figure 1 is a top plan view and Fig. 2 a view in vertical section of a terminal embodying my present invention; Figs. 3 and 4 are views on larger scale showing the insulators in detail and illustrating certain modifications in the structures thereof.

The purpose of a terminal is to surround and protect the end of a cable, and to afford structural continuity but electrical discontinuity between the sheath of the cable at a point adjacent to its end and the protruding conductor; it consists essentially of a thimble and an insulator. The thimble is ordinarily formed of metal; it surrounds and is united upon the surface of the cable sheath. The insulator is an annular body engaging at one end the thimble and at the other end, either immediately or through some interposed structure, engaging the outward leading conductor.

In designing a terminal for a multiple-core cable, from which the individual conductors are to have separate leads-out, the thimble must of necessity be expanded or enlarged into a casing to engage not a single insulator only, but several insulators, corresponding in number to the number of leads-out. It is of course desirable that the structure be as small as compact and as light as may be, and this requisite introduces a problem into the designing of terminals for multiple-conductor cables; for the several conductors left protruding from the end of the cable when the sheath is cut away are not readily pliable, they can be made to diverge at relatively small angles only, and accordingly it is not possible to bring all the several insulators which are to surround the leads-out within some considerable distance of the end of the cable sheath.

Referring to Figs. 1 and 2 of the drawings, the terminal there shown is applied to a three-conductor cable; the cable is indicated at 1 and the several conductors at 2. 3 is the thimble, and 4 are the insulators which correspond in number with the conductors of the cable. The thimble surrounds the end of the cable to the sheath of which it is secured, preferably by a wiped solder joint, as indicated at 5. From the point where it is secured to the cable sheath the thimble 3 flares outwardly to form a chamber or casing in the wall of which are formed three orifices for the introduction of three insulators through which the three conductors are continued in three leads-out.

In my earlier patent, No. 881,777 I have shown and described a terminal structure for multiple-conductor cables which comprises a two-part casing or box of cast metal provided with a single hole in one wall for the introduction of a thimble to which the sheathed cable may be secured, and with the holes for the leads-out opposite. This structure is designed to be assembled in the field; the casing is provided with a hand-hole through which necessary access is had to the interior for purposes of assembling, that hand-hole being closed by a plate bolted in place. My present improvement in this regard consists in a casing in which all the orifices for the leads-out arranged opposite the orifice for the introduced cable are symmetrically disposed about the prolonged axis of the orifice for the cable, and are further so particularly placed that the axis of all the several lead-out orifices converge toward the orifice for the cable. In consequence of such symmetrical arrangement of the leads-out, instead of the arrangement of them all

in one plane, I am able to thread the several conductors through the casing without the necessity of access to the interior, and consequently to simplify the structure. Furthermore, in such symmetrical arrangement, the undesirable effects of electrostatic and electro-magnetic induction are reduced to a minimum. I make the casing of light spun metal, dispensing with the necessity of making the casing and the thimble two separate parts or members; and, further, while it is a practical necessity under existing conditions in the art of metal working to complete the enlarged thimble with a cap or cover 6, the thimble with its cap may be and preferably is assembled in the shop to form in effect a one-piece thimble. My insulators are so designed that the structure may be assembled without separating the parts of which this enlarged thimble is composed. This is a distinct practical improvement over prior structures used for this purpose.

The insulators are secured in the orifices designed to receive them in any desired manner, preferably by the screw thread connection shown.

In order to properly apply the terminal to the cable, not only must the cable sheath be cut away; the insulating envelop of hygroscopic material also which lies between the core and the sheath of the cable must be removed, laying the conductor bare. The bared conductor may then be electrically united within the terminal to an aerial or other conductor introduced through the insulator to the interior of the terminal, or it may be wrapped with non-hygroscopic insulation and carried out through the insulator.

Fig. 3 shows the cable core protruding as a lead-out. In this case the hygroscopic insulation employed in the lead-sheathed cable has been removed, and moisture-proof insulation has been applied. This is done in the field.

Fig. 4 shows a covered aerial introduced through the insulator into the terminal and there united electrically with the conductor from the cable. It will however be observed that in each case it is requisite to cut away the sheath and insulating envelop of the cable; and, then either to connect the conductor within the thimble to a water-proofed insulated lead out, or to normally apply new insulation to the portion of the bared conductor which passes through and beyond the insulator. But whether a joint be made within the thimble or the conductor be stripped and covered again with weather-proof insulation, the insulation is weakened and there will exist within the terminal tendency to electrostatic discharge and to leakage, from one conductor to its neighbor, even though the intervening space be filled with some insulating substance. It therefore becomes desirable to prolong inwardly the insulator itself, in the form of a sleeve, surrounding such joint. In one case the joint is a joint of the conductor itself; and of its insulating envelops, and in the other case the joint is of insulating envelops alone. It is ordinarily desirable to have the bore through the insulator as small as may be and its walls correspondingly thick at the point where it passes through the orifice in the casing; it is also desirable to have the bore of the insulator enlarged where it surrounds the joint above alluded to. In the drawings, the inward prolongation of the insulator is indicated at 7, and its enlarged bore, 8. Thus the joint is protected, and the structure is not weakened.

My invention is further concerned with the character of the insulator itself. The insulator is shaped externally to meet the particular conditions of the service for which it is designed, and as illustrated in the drawings this outer surface is corrugated transversely, a well-known device for guarding against leakage, and suited particularly for "in-door" installations, that is, installations where the terminal is not directly exposed to falling rain and snow. I have found that by forming those surfaces of the insulator where water-tight joints are desired with a rough or granular finish and applying to such surfaces insulation preferably in the form of rubber tape, I obtain a cementing or adhesion of applied insulation to rigid insulator which is substantially water tight. Accordingly, I provide the bore of the insulator with such roughened or granular surface; and, in case the conductor is to protrude as the lead-out (as illustrated in Fig. 3), I wrap the severed end of the hygroscopic insulating envelop of the cable and the otherwise bared conductor with rubber tape as at 9, shaping it out to fill the bore of the insulator when the latter is applied; and then, the insulator being brought to place upon the wrapped conductor, the water-tight adhesion described is effected. Again, in case the lead-out is in the form of a weather proof aerial, such as is illustrated in Fig. 4, the serrated joint 10 within the insulator is wrapped with rubber tape 11 to fill the bore of the insulator at that point and seal the surfaces against the ingress of moisture.

In order to effect a more secure sealing of the joint, I preferably lay back or bevel the shoulder 12 formed where the bore of the insulator is enlarged inwardly; this surface, inclined to the axis of the bore, constitutes a surface upon which the rubber tape wrapping will be compressed when the conductor is drawn to place within the insulator, to form there a tight joint. The same sort of sealing may be employed to secure the protruding lead-out and the outer end of the insulator to one another in a moisture-proof

joint. To this end the insulator is provided with an extension 13 upon its outer end, and the external surface of this extension is made rough or granular. A wrapping 14 of rubber tape at this point, joining lead-out and insulator, will adhere to the insulator in moisture-proof engagement. In this construction, it will be observed, such a packing gland as is indicated at 15 in Figs. 1 and 2 is not necessary.

Ordinarily, the insulator will be formed of porcelain; its exposed surface will be glazed; but its bore and the surface of the extension 13 (if present) will be left with its natural rough, unglazed surface, which is well suited to effect the described ends. The inward prolongation 7 of the insulator will preferably be left unglazed externally as well as internally, for the insulating compound employed to fill the thimble chamber will adhere more firmly to the unglazed surface, to prevent leakage.

The parts are assembled as follows: The thimble 3, though ordinarily formed in two pieces because it may thus be more easily made, may be completed in the shop, and applied in the field as an entirety. The sheath and the hygroscopic insulating envelop of the cable are cut away and the free ends of the conductors are thrust into the inlet orifice in the casing, from which the insulators 4 have previously been removed, spread within, and drawn out through the several exit orifices. The leads-out are then connected, and wrapped as may be desired. If the conductors of the cable are themselves led out, the hygroscopic insulating envelop is removed from the conductor so far as necessary, and the wrappings of tape are applied upon the severed end of that envelop and the adjacent surface of the conductor. The insulator is then applied and secured in place in the casing. Then each lead-out in turn is drawn outward, and made fast to the outer end of the insulator, either by means of the packing gland, 15 of Figs. 1 and 2, or the wrappings 14 of tape of Figs. 3 and 4. It will be observed that this drawing outward and securing of each lead-out will bring the internal wrappings of tape to position upon the rough surfaces of the insulator (where such arrangement is employed) to effect the water-tight adhesion of surfaces already described. The parts being thus brought to proper relative positions, the wiped-solder joint 5 between thimble 3 and cable sheath 1 is made, securing the parts. Finally, an insulating substance in liquid form may be introduced to fill the spaces within the thimble through an opening to which a cap 16 is fitted.

I claim as my invention:

1. In a terminal structure for a multiple-core electrical cable, a casing provided with an orifice adapted to receive and to be united upon the surface of a cable introduced therein, and provided also with a plurality of oppositely disposed orifices arranged with their individual axes converging to said first named orifice, together with annular insulators filling the last named orifices and provided with prolongations extending inwardly through said casing toward the orifice therein first named, substantially as described.

2. In a terminal structure for an electrical cable, the combination of a casing and an insulator, said insulator consisting of a perforate cylindrical body provided externally with means for attachment in an orifice in the wall of said casing and of a perforate terminal extension, the perforation of the extension being of greater diameter than the perforation of the body portion of said insulator, substantially as described.

3. A terminal structure for an electrical cable, including a casing and an insulator carried in the wall of such casing, said insulator being perforated by a bore larger at one end than the other, a portion of the surface of the bore being arranged obliquely to the axis thereof, substantially as described.

4. A terminal structure for an electrical cable including a casing and a perforate insulator carried in an orifice in the wall of said casing, the surface of the bore of said perforate insulator being rough, substantially as described.

5. A terminal structure for an electrical cable including a casing and a perforate insulator carried in an orifice in the wall of said casing, said insulator being prolonged inwardly and the outer surface of said inward prolongation being rough, substantially as described.

6. An insulator for an electrical conductor consisting of a perforate body provided externally with means of attachment to a support, and having a rough exterior surface at one end thereof, substantially as described.

In testimony whereof, I have hereunto set my hand.

CHARLES W. DAVIS.

Witnesses:
CHARLES BARNETT,
EDWARD F. MOSER.