July 3, 1923. 1,460,624

F. M. VAN GELDEREN

INSULATING CAP FOR ELECTRICAL CABLE JOINTS

Filed March 3, 1923

Fig. 1.

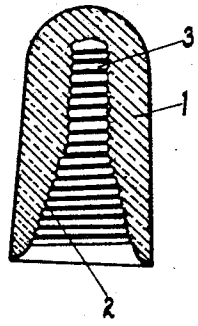


Fig. 2.

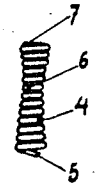


Fig. 3

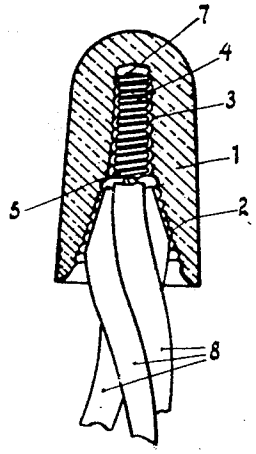
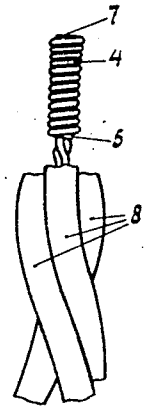


Fig. 4.



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Patented July 3, 1923. 1,460,624

UNITED STATES PATENT OFFICE.

FREDERIK MARINUS VAN GELDEREN, OF ENSCHEDE, NETHERLANDS.

INSULATING CAP FOR ELECTRICAL-CABLE JOINTS.

Application filed March 3, 1923. Serial No. 622,641.

To all whom it may concern:

Be it known that I, FREDERIK MARINUS VAN GELDEREN, a subject of the Queen of the Netherlands, residing at Enschede, in the Province of Overijsel, in the Kingdom of the Netherlands, have invented an Improved Insulating Cap for Electrical-Cable Joints, of which the following is a specification.

The invention relates to an insulating cap for the bare ends of electrical cables, these ends being preliminarily twisted together in well-known manner.

The purpose of the invention is to make the cap in such a way that one and the same cap can be used for joints of different cross sections without the cap becoming abnormally large or considerably more expensive than a cap which is adapted for insulating only one certain size of joint.

The invention more particularly refers to the well-known type of insulating cap which at the open end is provided with a funnel shaped entrance passing at the inner end into a substantially cylindrical central bore within which there is a helically wound metal wire. When a cap of this type is screwed onto the twined blank ends of the cables, the helix presses or cuts a helical path into the blank wires, the conical entrance forming a tight fit for the insulating covering of the cable. It will, however, be clear that this well-known type of cap is only suitable for insulating joints of one certain diameter, so that it is necessary to manufacture different sizes of caps when it is required to insulate joints of different diameters.

The present invention consists therein that the above-said metal wire is wound in the shape of a helix which tapers from the outer to the inner end, the inner diameter of this helix at its narrowest part being smaller than the diameter of the smallest twisted bunch of wires to be joined and insulated and the inner diameter of the outer end of the helix being larger than the diameter of the largest twisted bunch of wires, which it may be desired to insulate with the cap, the said helically wound metal wire only lying close against the inner wall of the cap at its inner end whereas the remaining part of the wire is adapted to expand in a radial direction in the inner space of the cap.

According to a further characteristic of my invention the wire may be wound in such a way that the helix tapers from the two ends towards the centre. In this case the central bore of the cap may be interiorly screw-threaded, the inner end of the helical wire being adapted to be screwed therein, the said interior screw-thread slightly tapering towards the inside.

The invention further comprises providing the funnel shaped entrance of the cap with a screw-thread and finally covering the inner wall of the cap wholly or partially with a layer of paraffine or other suitable water- and air tight viscous material.

In making my invention I have started from the consideration that a wire wound in the shape of a conical helix, the inner diameter of which at the narrowest place is smaller and at the widest place is larger than the diameter of a rod, will contort itself lengthwise along the said rod when the latter is screwed into the helix from its widest end. The helix or coil spring will in this case tightly grip the rod especially when this is composed of a plurality of twined wires. It will then only be possible to remove the helix from the said twined wires by exerting a force on the helix at the side of its widest opening (the entrance end) and in a direction so as to loosen the grip of the helix or coil. If, on the contrary, the force is exerted on the small end of the helix, any attempt to unscrew the parts will only cause the helix or coil to grip the rod more strongly since the helix or coil will tend to become narrower.

If therefore a metal wire wound along a conical helix is fixed with its narrow end into an insulating cap and that in such a way that the helix may expand in radial direction within certain limits, it will be possible to insulate with such a cap cable joints varying in thickness from a diameter which is somewhat greater than the narrowest opening of the helical spring to a diameter which is somewhat smaller than the wider opening of said spring, simply by screwing the cap onto the twined bare ends of the cables.

In order to make my invention better understood it will be more specifically described hereinafter with reference to the

appended drawing in which an embodiment of the invention is shown by way of example.

Fig. 1 is a longitudinal section across the axis of the cap.

Fig. 2 is a view of the spring wound along a double conical helix.

Fig. 3 shows a longitudinal cross section of the insulating cap and a cable joint of three twined cables clamped therein by means of the helically wound wire.

Fig. 4 shows the same cable as Fig. 3, around which the coiled spring has remained behind after the insulating cap has been unscrewed.

With reference to the drawing 1 is an insulating cap of porcelain or any other suitable insulating material. The cap at its open end presents a funnel shaped inwardly tapering mouth 2 which passes into a central hole 3 which may be cylindrical but which for a purpose to be described hereinafter will preferably be made slightly tapering. The funnel 2 and the hole 3 in the embodiment shown are both interiorly screwthreaded. As far as the funnel 2 is concerned the advantages obtained thereby are that a perfectly tight fit with the insulating coverings of the electrical cables is insured, further advantages being more particularly described later on. As far as the hole 3 is concerned the advantage is obtained that the helically wound wire or spring which will be described hereinafter can be detachably fixed therein.

The helical spring 4 shown in Figures 2, 3 and 4 is preferably made of steel, brass, hard copper or other resilient material and is helically wound along two co-axial cones having their apices turned towards each other. In this way the narrowest portion 6 comes intermediate the two wider ends 5 and 7. The portion between the inner end 7 and the narrowest part 6 is advantageously made shorter than the remaining portion of the spring. The spring can easily be screwed with its inner end 7 into the bore or hole 3, especially when the latter is made slightly tapering. When the helical spring is threaded into the cap only the larger convolutions at the inner end 7 of the spring engage the walls of the bore 3.

The inner diameter of the narrowest place 6 must be smaller than the outer diameter of the thinnest cable joint which must be insulated with the cap, for instance smaller than the diameter of the surrounding cylinder which may be imagined around two wires of $1\frac{1}{2}$ square millimeters each, twined together. The inner diameter of the spring at its widest portion, that is at the ends 5 and 7, must on the other hand be chosen larger than the diameter of the thickest cable joint to be insulated by the cap. For this upper limit may be safely and practically taken a joint consisting of three twined wires of $2\frac{1}{2}$ square millimeters each.

Figures 3 and 4 show a joint consisting of three twined wires of for example $1\frac{1}{2}$ square millimeters each. The bare ends of the cables 8 are twined in the usual manner and passed into the wide end 5 of the helix 4 which has been previously screwed with its inner end 7 into the bore 3 of the cap. When the cap with the spring therein is screwed on the bare ends of the cables 8, the helix 4 gradually expands in radial direction until it grips over its entire length or practically so around the bare cable ends. The radial expansion of the helix 4 due to the introduction of a conductor brings more or less of the intermediate portion of the helix into contact with the walls of the cap, the extent of the contact thus established being determined by the size of the conductor upon which the cap and helix are threaded. The insulating coverings of the cables 8 are thereby brought into close contact with the screw-thread of the funnel shaped portion 2 of the cap, an air- and water tight fit being insured in this way. This tightening can if desired still be further improved by preliminarily covering the inner wall of the cap or at least of the funnel 2 with a layer of paraffine or the like insulating material.

When the cap is unscrewed the spring will remain on the ends of the cables, as shown in Fig. 4 since, for the reasons stated, the force of the engagement of the expanded coil with the twisted strands is greater than the force of the engagement of the coil and the cap. Only by firmly gripping the helically wound wire at its end 5 and then turning it back, can the spring be removed from the cable ends. This may be done without injuring the spring which consequently is immediately again ready for use.

The most obvious advantage of the invention is certainly that with one single standard type of cap it will be possible to insulate joints of widely varying thickness. Notwithstanding this, the price of the cap will be low, since the two parts of which it consists can be simply and cheaply manufactured, the interconnection of these two parts being moreover of simple nature.

By providing the funnel shaped opening 2 interiorly with a screw-thread, the following advantages are obtained.

1. The said screw-thread will press into the insulating coverings so that these coverings will be forcibly drawn into the said conical opening which gives a better tightening effect.

2. The screw connection obtained in this way between the insulating cap and the coverings of the cables will prevent the said coverings from becoming loose or sliding out

through drying or any other reason, which might easily occur if the conical opening 2 were smooth.

3. The said screw connection strengthens the bond between the cap and the joint if it should be attempted to draw the cap from the joint.

When the above mentioned screw-threads of the entrance of the cap are filled with paraffine or the like material, the advantage is obtained that this material will enter into the clearances between the insulating coverings, forming one massive cone therewith.

It will be obvious that my invention is not limited to the employment of a cap of ceramic material, nor that the way of connecting the helically wound wire into the cap should be necessarily as that shown and described, since it would for example also be possible to fix the inner end of the spring into the inner end of the cap. In this case it would however not be possible to unscrew the joint without forcing one of the parts of which the cap is composed.

What I claim is:

1. An improved insulating cap for the bare ends of electrical cables having at its open end a funnel shaped entrance passing into a substantially cylindrical bore within which a helically wound metal wire is provided, characterized in that the said metal wire is wound in the shape of a helix which conically tapers from the entrance end and preferably also from the opposite end, the inner diameter at the narrowest place of the helix being smaller than the diameter of the thinnest joint to be insulated, the inner diameter of the entrance end of the helix being larger than the diameter of the thickest joint to be insulated with the cap, only one of the ends of the said helically wound wire lying close to the inner wall of the cap, the remaining portion of the helix being able to expand in radial direction within the said cap.

2. An insulating cap according to claim 1, characterized in that its central bore (3) is interiorly screw-threaded so as to form a nut into which one wide end (7) of the helically wound wire can be screwed, the said inner screw-thread preferably slightly tapering from the entrance towards the inner end, the funnel shaped entrance (2) of the cap being also preferably interiorly screw-threaded.

3. The combination with an insulating cap for the bare ends of electrical conductors, said cap having a substantially cylindrical interior bore and a funnel-shaped entrance communicating therewith, of a helical coil of wire within said bore conically tapering from the entrance end, the inner diameter of the smallest turn of said coil being smaller than the diameter of the thinnest joint to be insulated and the inner diameter of the entrance end being larger than the diameter of the thickest joint to be insulated, and only one of the ends of the coil lying close to the inner wall of the cap, the remaining portion of the coil being capable of expanding radially within the cap.

4. The combination as claimed in claim 3. in which the bore of the cap is screw-threaded to form a nut into which one end of the coil can be screwed, and in which the threaded bore tapers slightly toward the inner end, and in which the funnel-shaped entrance is internally screw-threaded.

5. The combination with a hollow insulating cap for the bare ends of electrical conductors, said cap being internally screw-threaded, a conical coil of wire within said cap having means in proximity to its narrower end for engaging the threads of the cap, the other portions of the coil being out of contact with the cap before application thereof to the conductor but expandible into engagement with the cap when the latter is applied to the conductor.

6. The combination with a hollow insulating cap for the bare ends of electrical conductors, said cap being internally screw-threaded, a conical coil of wire within said cap having means in proximity to its narrower end for engaging the threads of the cap, the other portions of the coil being out of contact with the cap before application thereof to the conductor but expandible into engagement with the cap when the latter is applied to the conductor, the force of the engagement between the coil and the conductor being greater than the force of the engagement between the coil and the cap, whereby when the cap is unscrewed from the conductor the coil remains on the latter.

7. The combination with a hollow insulating cap for the bare ends of electrical conductors, said cap being provided with an internal tapering screw thread, a conical coil of wire within the cap engaging the inner portion of the thread adjacent the apex end of said coil, the other portions of the coil being out of contact with the cap before application thereof to the conductor but expandible into engagement with the cap when the latter is applied to the conductor.

8. The combination with a hollow insulating cap for the bare ends of electrical conductors, said cap being internally screw-threaded, a coil of wire within said cap, said coil comprising two substantially conical sections apex to apex, the widest turn of one of said sections being in engagement with the threads of the cap ad-

jacent the bottom of the same, the remaining portions of the coil being out of contact with the wall of the cap before application of the cap to the conductor, but expandible into engagement with the threads of the cap when the latter is applied to the conductor.

9. The combination with a hollow insulating cap for the bare ends of electrical conductors, said cap being internally screw-threaded, a coil of wire within said cap, said coil comprising two substantially conical sections apex to apex, the widest turn of one of said sections being in engagement with the threads of the cap adjacent the bottom of the same, the remaining portions of the coil being out of contact with the wall of the cap before application of the cap to the conductor, but expandible into engagement with the threads of the cap when the latter is applied to the conductor, the force of the engagement between the coil and the conductor being greater than the force of the engagement between the coil and the cap, whereby when the cap is unscrewed from the conductor the coil remains on the latter.

In testimony whereof I affix my signature.

FREDERIK MARINUS van GELDEREN.