Jan. 11, 1938. P. NOWAK ET AL 2,105,362

INSULATED ELECTRICAL CONDUCTOR

Filed July 30, 1935

Fig. 1.

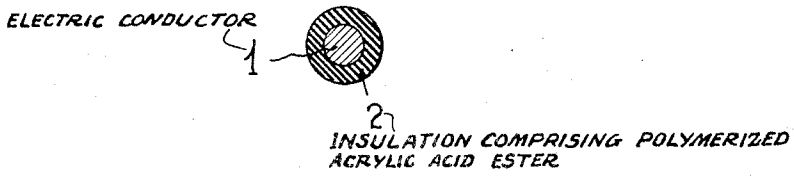
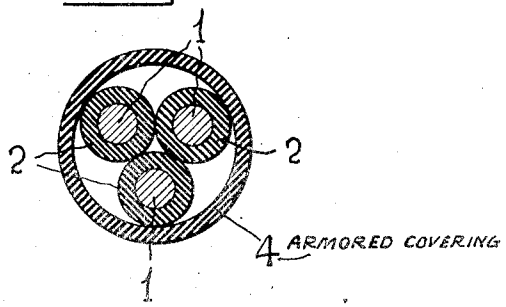


Fig. 2.



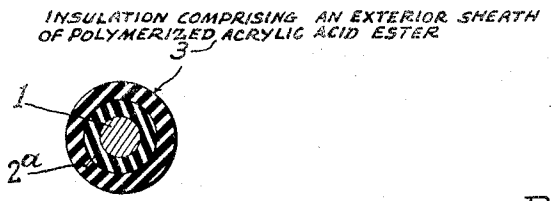


Fig. 3.

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INSULATED ELECTRICAL CONDUCTOR

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In Germany July 30, 1934

4 Claims. (Cl. 173—264)

The present invention relates to insulated electrical conductors and is more particularly concerned with conductors enclosed in a sheath of an improved electrically insulating material.

Various substances have been used for insulating electric conducting wires, but no material or composition has been found which answers fully the many requirements which the insulation must meet, for instance as regards temperature, resistance to aging, flexibility, resistance to oil, water, ozone, mechanical resistance and strength, and especially slight inflammability or combustibility.

It has been discovered, according to this invention, that when polymerized derivatives of the acrylic acid, or of the homologues thereof, are used as basic substances it is possible to produce thermo-plastic masses or compositions which answer the requirements stated. A composition prepared according to this invention can be applied to electric conducting wires by squirting it thereon at a temperature of about from 100° to 120° C. The insulation produced in this way not only presents the requisite pliableness and strength, but is also water-proof, oil-proof and ozone-proof. Detrimental consequences due to aging are not perceived even after long storing at temperatures of 70° C. and more. The new composition is not micro-porous in spite of its high percentage of filling substances, an effect which could not be foreseen in view of the known state of the art. A specimen having a thickness of 2 mm. and having been immersed in a mineral oil at a temperature of 100° C. for 120 hours did not permit any passage of the oil in spite of repeated mechanical stress by bending. The new composition presents also the advantage that it burns only with a very small flame without any addition of flame-extinguishing or suffocating agents, no burning particles dropping down, as is the case, for instance, with rubber containing an equal amount of filler. The non-combustible components of the composition remain on the wire as a solid covering which commences to crumble when it is subjected to finger-pressure, and maintains the conductor serviceable even in the case of a fire. With a conductor insulated with our composition and armored, for instance, by means of wire, if an ignition should occur at any place, the ignition will not propagate laterally but will extinguish by itself when the flame becomes sufficiently reduced in size.

A composition according to this invention may be prepared, for instance, of 500 parts of polymerized ethyl ester of acrylic acid to which preferably some softening agent has been added. The mass is kneaded in a kneading machine in the usual manner together with a mixture composed of 200 parts of magnesium silicate, 5 parts of sulphur, 15 parts of beta-naphthol and 280 parts of talc, at a temperature of about from 80° to 90° C.

Some mixtures have proved to be particularly resistant as regards mechanical strength, as for instance a mixture composed as hereinafter stated, which is very well suited as a sheath for wires and cables instead of the usual lead covering. That mixture is composed of 318 parts of polymerized ethyl ester of acrylic acid, 195 parts of carbon, 2 parts of sulphur, 18 parts of beta-nahthol and 467 parts of talc, the whole being kneaded in a kneading machine, as usual.

If in particular cases where the requirements are very high, that composition should not prove sufficient insulation, it is of course possible to provide the wire first with any other of the known insulating materials or any combination thereof, after which the new composition is applied. It is in this way possible, in many cases, to replace the usual lead covering and obtain the advantage of a better insulation, as well as a considerable reduction of the weight, since the weight of the new insulation is only about ⅛ that of lead. Besides, a wire or cable covered with the new insulation is much more pliable so that in curves a shorter radius is possible. If such a cable must be repeatedly bent, permanent changes of the shape occur much later than with lead as covering.

Also, for the purpose of electric screening the new composition may be combined with a metallic covering located above it or below it. The metallic covering may be made by braiding, or it may consist of a metallized band or even of a thin covering of lead.

Fig. 1 shows a transverse section through an electric conductor insulated according to this invention; Fig. 2 is a similar view of a cable having three such conductors; and Fig. 3 is a similar view of a conductor insulated in accordance with another embodiment of the invention. In all figures the numeral 1 designates an electric conductor. In Figs. 1 and 2 the numeral 2 indicates a layer of the new insulating composition. The numeral 4 in Fig. 2 designates an armored covering of any desired kind. In Fig. 3, 2a represents an insulating layer comprising any conventional insulating material on which is superimposed the new insulating material and serving, for example, as a substitute for the usual lead covering. 3 show-

ing the whole as insulation comprising an exterior sheath of polymerized acrylic acid ester.

Conductors provided, in lieu of a lead covering, with a fibrous covering may also be provided in addition, with a layer of the new composition.

In the co-pending application of Paul Nowak (one of the inventors in the instant case), Serial No. 749,476, filed October 22, 1934, is disclosed and claimed a composition of matter or artificial rubber of the kind used in making the insulated electrical conductors of the present invention.

We claim:

1. As an article of manufacture, a conductor enclosed in a mechanically strong, flexible, oil-, water-, and ozone-resistant sheath of a composition comprising the reaction product of sulphur with polymerized ester of acrylic acid in the presence of carbon.

2. An insulated electrical conductor in which the insulation comprises the product of reaction of sulphur and polymerized ethyl ester of acrylic acid in the presence of carbon, said insulation being mechanically strong, flexible, and oil-, water-, and ozone-resistant.

3. As an article of manufacture, a conducting core and superposed directly on said core a mechanically strong, flexible, oil-, water-, and ozone-resistant material comprising the reaction product of sulphur with polymerized ethyl ester of acrylic acid in the presence of carbon.

4. An insulated electrical conductor having an external sheath which is mechanically strong, oil-, water- and ozone-resistant and which comprises the product of reaction of sulphur and polymerized ethyl ester of acrylic acid in the presence of carbon.

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