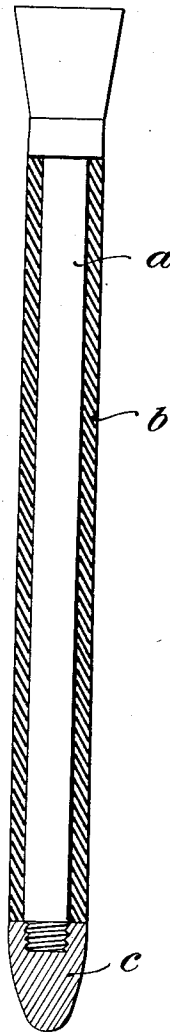


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ELECTRIC CIRCUIT INTERRUPTER

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ELECTRIC CIRCUIT INTERRUPTER

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There are known electric switches in which a compressed gas serving to quench an arc is liberated from, and delivered by, the walls of a switching tube consisting of a suitable gas-delivering material by the interrupting arc itself when the current is being switched off, and it has already been proposed to narrow in switches of the above-mentioned type the space in which the arc is burning at the time when the current is interrupted by means of a filling member comprising an insulating bolt or pin arranged co-axially with respect to the switching tube of the respective switch. Such bolts or pins are likewise manufactured preferably of a suitable gas-delivering material. Furthermore, it is known to provide the switching chamber with a supporting body consisting of hard paper or a similar material provided, in turn, with a shell of a suitable gas-delivering material, the purpose of that contrivance being to obtain a greater blow-bending strength and to save a certain quantity of the gas-delivering material. Also hard linen has been proposed as material for said supporting body.

When manufacturing such composed switching-chamber parts, for instance and especially filling bolts or pins of the above-mentioned kind, one can proceed in this way that a suitably dimensioned tube consisting of a suitable gas-delivering material, as for instance polymerized acrylic acid derivatives, is shoved onto a supporting body or base member of hard paper or hard linen and is affixed thereto. Connecting said members reliably with one another is, however, difficult, and in order to overcome the difficulties experienced it has been tried to apply the gas-delivering material to the supporting body by immersing this latter repeatedly into a liquid lacquer containing, or consisting of, the gas-delivering material chosen, and then drying the thus produced member. But also this procedure is connected with great difficulties if it is necessary to provide the hard paper or its equivalent with a comparatively thick layer of the gas-delivering material.

All difficulties hitherto met with are overcome by the present invention, the characteristic feature of which is that a preformed layer, as for example a film or a tubular member, is made of the gas-delivering material and, if it is a film, is wound upon or, if it is a tube, is shoved upon the non-thermoplastic supporting body whereafter the thus produced compound part is subjected to heat and simultaneously therewith to pressure whereby the two materials, i. e. the supporting

body or core and the shell, are securely connected with one another. The finished member may be rendered still more stable, as regards resistance to actions of heat, by subjecting it a second time to a heat-treatment.

The shell can be manufactured without the employment of a solvent or of a swelling substance by making it of polymerized acrylic acid derivatives, such, for instance, as polymerized acrylic acid esters with additions of polymerized, nitrogen-containing acrylic compound as, for example, polymerized acrylic acid nitrile or polymerized acrylic acid amide, and of a suitable filler as, for instance, good heat-conducting crystalline materials, such as finely granulated quartz, also pulverulent quartz, aluminium oxide and the like. With the aid of the respective filler distributed in the artificial mass a local superheating of the shell is prevented. Finally, also other thermoplastic substances able to deliver a large quantity of gas and to exert a flame-extinguishing effect can be incorporated into the mass, as, for instance, oxamide, also methylene-urea or so-called carbamide resins (also known as amino-plasts), and the like.

In order to manufacture the preliminarily shaped material in an economical and technically advantageous manner without the employment of a solvent, foils or films produced, for instance, by means of suitable devices, such as rollers or the like, with the aid of heat, are wound upon the non-thermoplastic supporting material with which it is firmly combined with the application of pressure at a temperature of about 140° C.

It is likewise possible to transform the fundamental material into plates which may then be further transformed into tubes that can be shoved upon the core and be firmly united with this latter in the above-described manner.

Another possibility is to extrude the artificial mixture from a nozzle in tubular form directly upon the core which is arranged just in front of the outlet opening of that nozzle. The mixture and the core are then again united with one another in the described manner.

Still another possibility is to manufacture by means of an extrusion-press corresponding tubes which then are shoved upon the supporting body and are firmly pressed upon it with the simultaneous application of heat. The tubes made on that press are so dimensioned that there is as little play as possible between their inner surface and the outer surface of the supporting body. If, for example, the filling pin to be produced is to have square transverse section, then the sup-

porting body and the pressed tube must likewise have square transverse section and the thickness of the wall of said tube should be a little more than the thickness of the finished covering of the core. If the core has longitudinal grooves as is practical in some cases, then the covering or pressed tube should have corresponding feathers.

It is a matter of course that means may be provided for preventing longitudinal displacement of the tube upon the core. The tube may, for this purpose, be provided with circumferential grooves which are filled up with the covering material, that is preferably supplied in a certain excess, but if the tubes are somewhat large in transverse section it is suited to the purpose in view to place a thread-like piece of the covering material into each circumferential groove of the core prior to showing the tube upon it whereafter the tube and the core are firmly united with one another in the manner described. In most cases grooves can, however, be dispensed with, especially when there is provided on the core a thin layer of the covering mixture which then serves to hold the covering firmly on the core.

We wish it to be understood that the invention is not limited to the above-mentioned substances constituting the thermoplastic mixture, but also similar substances suitable for the purpose in view can be used, and a filler or a softening agent or a plurality or mixture of such materials may be added.

The invention is illustrated diagrammatically and by way of example on the accompanying drawing which shows a switching chamber part constituted by a filling pin designed and manufactured according to this invention, the pin being shown partly in side-view and partly in longitudinal section, that is to say, the core is shown in side-view and the covering or shell in longitudinal section. *a* denotes the core or supporting body which consists, for instance, of hard paper or hard linen, and *b* denotes the tubular covering or shell made, for instance, of a polymerized methacrylate. The tube has been manufactured separately on an extrusion-press and has then been shifted onto the core. This latter is threaded at one end, as shown, and a cap *c* likewise consisting of hard paper or hard linen has an internally threaded cavity with which the cap is screwed upon the threaded end of the core. Finally, the entire part is subjected to pressure and heat, as repeatedly mentioned in the preceding part of this specification.

While we have described in said preceding part the manufacturing method of the switching chamber part as applied to a filling pin, we wish it to be understood that it is capable also of a more general application. As thermoplastic polymerization products we have already mentioned polyacrylic acid esters, polyacrylic acid nitrile and polyacrylic acid amide, to which we now add polystyrole, polyvinyl acetate, polyvinyl chloride and polymethacrylic acid and compounds thereof. These substances may be generically classified as polymerized organic compounds having a vinyl grouping. We are aware of the fact that said substances have been used for the production of insulating and protective sleeves or coverings for electric conductors, such sleeves having been manufactured by means of an extrusion-press, whereas the coatings have been produced by extruding the substance or compound chosen for the purpose in view upon the electric conductor, for instance a

wire, continuously and in any desired thickness. But this procedure entails difficulties if short and comparatively thick rods are to be covered, and it cannot be employed at all if the rods have a collar at one end, as in the constructional form shown by way of example on the drawing. There exist in such a case only two possibilities, the one consisting in applying the artificial substance to the rod, etc., in the form of a lacquer, viz., in dissolved state, and the other consisting in transforming the respective substance into bands which then are wound upon the rod, etc., and are united therewith by means of heat and pressure. But applying the substance in the form of a lacquer entails the disadvantage that, if the layer thereof is to be comparatively thick, a plurality of coatings are requisite and that there remain in the thick layers residues of the solvent which are likely to change the mechanical and the electric properties of the covering in an undesired manner. And as regards using the covering substance in the form of bands the winding procedure must generally be carried out manually and, as the components of the covering are generally hard or brittle, the bands must be very thin which entails the necessity to repeat the winding until the requisite thickness of the covering has been attained. Besides, if the bands are not wound with great care and in a clever manner there may remain within the covering, even after the treatment with pressure and heat has been carried out, air-bubbles which are very undesirable especially if electric insulations are to be made.

Now, our invention, as regards the method, permits the covering of bars, etc., of cylindrical or prismatic transverse section, also of a more or less complicated transverse section, or in the shape of bands, without the employment of a solvent, in that we produce tubes having the requisite transverse section by means of an extrusion press, then shove these tubes upon the bars, etc., to be provided with the covering, and finally connect the two members with one another by means of pressure and heat, as already mentioned in the first part of this specification, to which we here refer, also as regards the relative dimensions and the contrivances for reliably connecting the two members with one another.

The invention is particularly useful for the manufacture of filling pins for the chambers of switches operating with compressed gas in which the walls of the switching space are subject to the action of the arc and deliver the quenching gas. The substances mentioned (polymerized organic compounds having a vinyl grouping) evolve large quantities of arc-extinguishing gas without the formation of any detrimental reaction products.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In an electric switch wherein an arc is struck and gas is evolved for extinguishing the arc from the walls of a structure confining the arc, an assembly comprising a base member and firmly united under heat and pressure to at least those portions of said member which are exposed to the heat of the arc a preformed layer of a composition comprising a polymerized organic compound having a vinyl grouping and adapted to yield an arc-interrupting gas under an arc heat.

2. A filling pin for the switch tube of an electric switch, said pin comprising a core and securely connected under heat and pressure to said core a superposed, preformed layer of a com-

position comprising a polymerized organic compound having a vinyl grouping and adapted to yield an arc-interrupting gas under the heat of an arc.

5 3. In an electric switch wherein an arc is struck and gas is evolved for extinguishing the arc from the walls of a structure confining the arc, an assembly comprising a base member and, securely united under heat and pressure to at
10 least those portions of said member which are exposed to the heat of the arc, a preformed layer of a composition comprising a filler and a polymerized acrylic compound.

15 4. In an electric switch wherein an arc is struck and gas capable of extinguishing the arc is evolved from the walls of a structure confining the arc, the combination of a base member and, securely connected under heat and pressure to

said member on surfaces thereof exposed to the heat of the arc, a preformed layer of a composition comprising a polymerized, nitrogen-containing acrylic compound.

5 5. In an electric switch wherein an arc is struck and gas capable of extinguishing the arc is evolved from the walls of a structure confining the arc, the combination of a base member and, firmly united under heat and pressure to said member on surfaces thereof exposed to the arc
10 heat, a preformed layer of a composition comprising an inorganic filler of good heat-conducting properties and a mixture of polymerized acrylic compounds at least one of which is a polymerized,
15 nitrogen-containing acrylic compound.

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