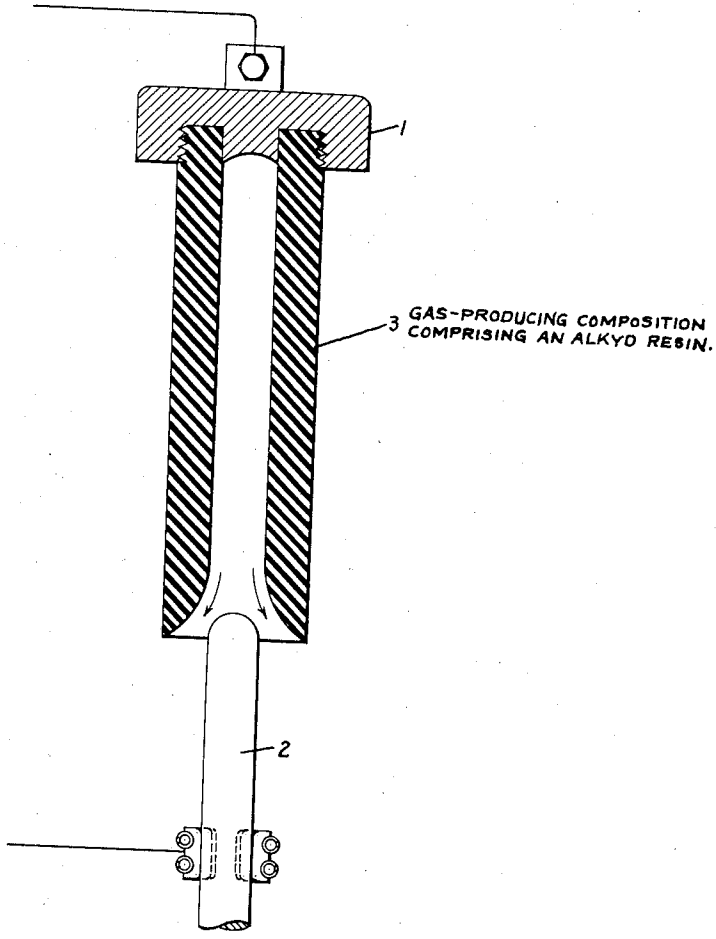
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ELECTRIC CIRCUIT INTERRUPTER

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Inventor:
Hans Schuhmann,
by Harry E. Dunham
His Attorney.

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ELECTRIC CIRCUIT INTERRUPTER

Hans Schuhmann, Berlin-Frohnau, Germany, assignor to General Electric Company, a corporation of New York

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This invention relates to electric circuit interrupters, and more particularly to circuit interrupters of the air-break expulsion type wherein a gas formed by decomposition of a material by the arc upon opening of the circuit is utilized to interrupt the arc.

In a well-known form of circuit interrupter of the aforesaid type, the arc is drawn in a confining insulating structure, such as a tube composed of material which under the influence of the arc heat emits gases or vapors tending to extinguish the arc. Inorganic materials such, for example, as boric acid, ammonium alum, etc., have been proposed as the gas-emitting material. In these substances water is chemically combined so that, under the influence of the arc, vapors are released for the arc-extinguishing process. These vapor-producing inorganic materials cannot be molded or formed satisfactorily for circuit-interrupting service, since they lack the more desirable mechanical characteristics, such as strength and rigidity, which are necessary in connection with the explosive pressures developed during interruption of the circuit.

It has also been proposed to use aminoplasts (general term for synthetic resins from amido or amino compounds) in the construction of arc-confining structures. Aminoplasts contain nitrogen which is evolved under the arc heat and tends to extinguish the arc. Tubes composed solely of such material, because of their limited wall strength, are unable to withstand the high internal pressure caused by the arc-interrupting processes. They must, therefore, be provided with suitable reinforcing means, for example by combining with a wound fiber tube.

More recently, other gas-producing materials or compositions containing the same have come into prominence for making arc-insulating members. For example, in Burmeister U. S. Patent 2,089,050 is disclosed and claimed an arc-confining structure composed of oxalic acid; and in Burmeister U. S. Patent 2,089,051, mechanically strong organic material, for instance hard rubber, impregnated with an inorganic material which upon decomposition yields an arc-interrupting gas and, specifically, with ammonium carbonate or bicarbonate, calcium carbonate, etc. Reference is also made to the co-pending applications of Paul Nowak, Serial No. 200,798, of Rudolf Auerback and Hermann Burmeister, Senial No. 200,770, and of Vitaly Grosse, Serial No. 200,784, all of which applications were filed April 7, 1938, and are assigned to the same assignee as the present invention. In these co-pending applications other solutions to the same general problem of improving circuit interrupters of the air-break expulsion type are disclosed and claimed.

In accordance with the present invention, electric circuit interrupters having insulating structures disposed adjacent and in confining relation to an arc formed upon opening the circuit comprise a resinous condensation product of a polyhydric alcohol and a polybasic acid or an anhydride thereof. Such condensation products are now commonly known in the resin art as alkyd resins. The preparation of an alkyd resin from, for example, glycerine and phthalic anhydride may be carried out in accordance with the method described, for instance, in U. S. Patents 1,108,329 and 1,108,330, issued to Michael J. Callahan on August 25, 1914. Other polyhydric alcohols and other polybasic acids may be caused to react to produce an alkyd resin. Modified alkyd resins also may be used in carrying the present invention into effect, for example oil-modified alkyd resins prepared as described, for example, in U. S. Patent 1,893,873 issued to Roy H. Kienle on January 10, 1933.

My invention will be set forth more fully in the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Referring to the drawing the single figure thereof is an elevational view, partly in section, of an electric circuit breaker of the expulsion type to which the present invention is applicable.

There is shown merely by way of example an electric circuit interrupter, more particularly, a circuit breaker having means, such as the stationary contact 1 and the movable rod contact 2, for opening the circuit so as to form an arc, and an insulating structure 3 forming an arc chamber for closely confining the arc between the contacts. The insulating structure 3 consists of a tubular member closed at the fixed contact end and open at the other end for receiving the rod contact. Upon opening of the circuit separation of the contacts 1 and 2 causes formation of an arc which decomposes some of the material of the arc chamber walls 3. The gas so formed is under considerable pressure by reason of the comparatively close fit of the rod contact 2 and the tube 3, with the result that when the rod leaves the tube a blast of gas is released as indicated for interrupting the arc.

In accordance with my invention the tube 3

is formed of, or has at least its inner walls surfaced with a composition comprising an alkyd resin such, for example, as a glyceryl-phthalate alkyd resin. The use of alkyd resins for constructing such tubes is particularly advantageous, since in a cured or hardened state these resins have a uniformly high resistance to heat. Hence, there is no tendency for the material to flow away under the influence of the operating heat of the circuit interrupter. Further, these resins are easy to form to the desired shape. They may be cast, and may be hardened in a cast condition, or they may be made in the form of a pressable, heat-hardenable powder, which is molded under pressure, or under heat and pressure, to form the shaped insulating structure. The shaped mass is cured, for instance under heat, to harden it.

Tubes for circuit interrupters may be made of alkyd resins in any desired wall thickness and of a wall strength sufficient to meet the widest range of service requirements. They have the further desirable feature that they show minimum tendency to cause high voltage surges during the arc-interrupting process.

Instead of using tubes formed of, or surfaced with pure or unfilled alkyd resin I may also employ, as desired or as conditions may require, alkyd resins suitably combined with materials which influence the gas vapors evolved from the surfaces of the tube under the heat of the arc and serving to quench the arc. Examples of such materials are urea, oxalic acid, boric acid, ammonium carbonate, ammonium bicarbonate, ammonium alum or other compounds capable of liberating an arc-interrupting gas. Due to its high decomposition velocity and compatibility with alkyd resins, nitro-cellulose (cellulose nitrate) is especially suitable for combining with such resins to form improved arc-extinguishing tubes.

The filled or unfilled alkyd resins may be combined with reinforcing materials such, for instance, as linen, paper, wool, spun glass, asbestos, and so forth. These materials in sheet or other form may, for example, be coated and impregnated with an alkyd resin composition and shaped into tubular form. Also, alternate layers of such reinforcing materials and sheet alkyd resin may be superposed to form a laminated insulating structure, the innermost layer being formed of alkyd resin. Vulcanized fiber or other conventional arc-interrupting tubes also may be fitted with an inner liner of a composition composed chiefly of alkyd resin.

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

1. An electric circuit interrupter comprising means for forming an arc, and an insulating structure disposed adjacent and in confining relation to said arc, the walls of said structure in proximity to said arc being surfaced with a composition comprising alkyd resin.

2. An electric circuit interrupter comprising means for forming an arc, and an insulating tubular structure within which said arc is drawn, said tubular structure being in confining relation to said arc and having walls in proximity thereto formed of a material consisting chiefly of glyceryl-phthalate resin.

3. An electric circuit interrupter comprising means for forming an arc, and an insulating structure disposed adjacent and in confining relation to said arc, said insulating structure comprising an alkyd resin suitably combined with other material capable of yielding an arc-interrupting gas under the heat of the arc.

4. An electric circuit interrupter comprising means for forming an arc, and an insulating structure disposed adjacent and in confining relation to said arc, said insulating structure comprising a combination of alkyd resin and cellulose nitrate.

5. An electric circuit interrupter including an arc-confining structure, said structure consisting of a reinforcing material impregnated with a composition comprising an alkyd resin.

6. An electric circuit interrupter including an arc-confining structure, said structure consisting of a reinforcing material having an inner lining formed of a composition comprising an alkyd resin.

7. An electric circuit interrupter comprising means for forming an arc, and an insulating structure disposed adjacent and in confining relation to said arc, the walls of said structure in proximity to said arc being formed of alternate superposed layers of fibrous reinforcing material and of resinous composition comprising alkyd resin, the innermost layer being constituted of the said resinous composition.

HANS SCHUHMANN.