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WATERTIGHT HIGH CURRENT-CARRYING-CAPACITY LOW-VOLTAGE CURRENT-LIMITING FUSES

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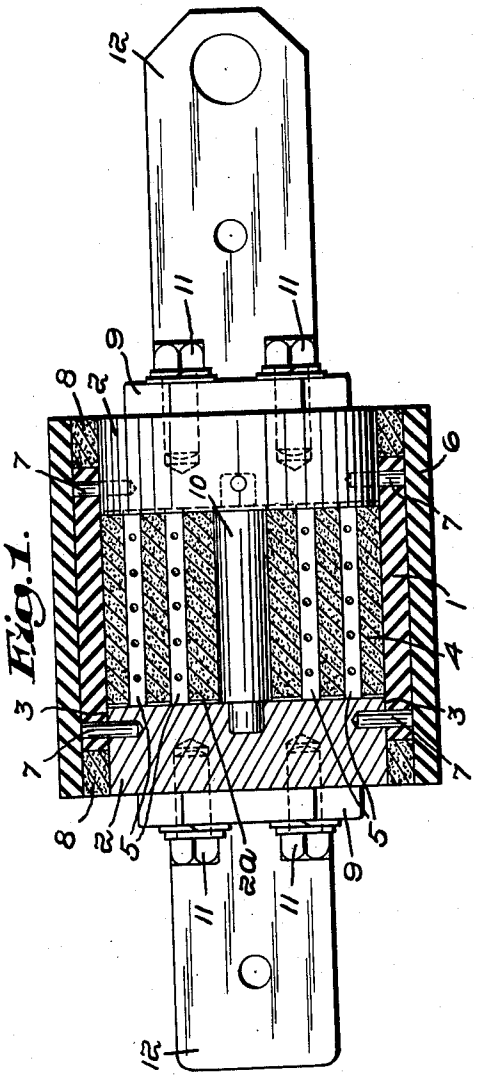


Fig. 1.

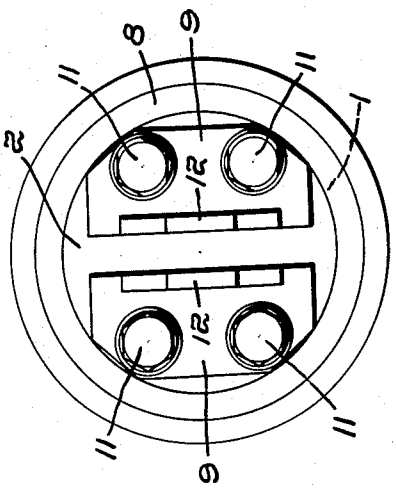


Fig. 2.

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WATERTIGHT HIGH CURRENT-CARRYING-CAPACITY LOW-VOLTAGE CURRENT-LIMITING FUSES

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2 Claims. (Cl. 200—131)

This invention relates to fluid-tight high-current-carrying-capacity current-limiting fuses, and more particularly to fuses of this character designed for relatively low circuit voltages, e. g. 600 volts, or less.

As a general rule, it is relatively easy to render current-limiting fuses designed for relatively low current intensities and relatively high circuit voltages fluid-tight, or water-tight, and to thus adapt such fuses for outdoor service. There are, however, considerable difficulties in rendering fuses designed for high current ratings fluid-tight, or water-tight.

It is, therefore one object of this invention to provide fluid-tight, or water-tight, current-limiting fuses designed to carry relatively high currents, e. g. currents in excess of 1000 amps.

United States Patent 2,681,398 to Frederick Kozacka et al, June 15, 1954, Fluid-Tight Fuse Structure, is concerned with improved fluid-tight, or water-tight, current-limiting fuses capable of carrying relatively high currents. In this particular design fluid-tightness is achieved by surface coatings consisting of a polysulfide type synthetic rubber bonded to the casings of the fuses as well as to a limited portion of the surfaces of the terminal elements thereof. This way of achieving fluid-tightness, or water-tightness, is relatively expensive since achieving surface coatings which are sufficiently even and thick requires expensive tools different for different ratings and types of current-limiting fuses.

It is, therefore, another object of the invention to provide fluid-tight, or water-tight, current-limiting fuses for high currents which can readily be manufactured without the need for expensive and complex tooling.

Another object of the invention is to provide current-limiting fuses which make it possible to proportion the internal volume of their casings in compliance with the dictates of highest interrupting capacity, or highest arc voltage.

Still another object of the invention is to provide fluid-tight fuses wherein fluid-tightness is achieved without the need of resorting to fragile casing materials such as, for instance, glass, porcelain, or other ceramic materials.

The novel features that are characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to structure and operation together with additional objects and advantages thereof will best be understood from the following detailed description of a preferred embodiment thereof when read in connection with the accompanying drawing in which:

Fig. 1 is substantially a longitudinal section of a current-limiting fuse embodying the invention, some of the constituent parts thereof being shown in side elevation; and

Fig. 2 is an end view of the structure shown in Fig. 1.

Referring now to the drawing, numeral 1 has been applied to indicate a tubular casing of an insulating material which has considerable bursting strength. Casing

1 consists preferably of a synthetic-resin-glass-cloth laminate. Each end of casing 1 is closed by one of a pair of cylindrical metal plugs 2, each press-fitted under consirable pressure into casing 1 by means of an hydraulic press. Spacing post 10 is provided to maintain the proper spacing between blocks 2 during the assembly of the parts of the fuse. The fit between casing 1 and plugs 2 is so tight as to virtually preclude any escape, or substantial leakage, of products of arcing formed within casing 1 upon blowing of the fuse through the fine openings or gaps 3 formed between casing 1 and plugs 2. Each plug 2 projects axially outwardly beyond the ends of casing 1, i. e. each plug 2 has one portion situated inside casing 1 and one portion situated outside of casing 1. A pulverulent arc-quenching filler 4 is accommodated inside of casing 1. This filler consists preferably of silicious material such as chemically reasonably pure quartz sand. Plugs 2 are conductively interconnected by a plurality of ribbon fuse links 5. Fuse links 5 are multiperforated and are made of a high conductivity low fusing energy metal such as silver, or copper. Links 5 are immersed in filler 4 and their ends are inserted into grooves 2*a* provided in plugs 2 and are soldered to plugs 2. The fuse comprises further a prefabricated casing 6 mounted on casing 1. Casing 6 is made of an insulating material which is reasonably strong, though it does not need to have the high bursting strength which casing 1 ought to have. Casing 6 may consist of a suitable synthetic resin but does not need to be reenforced with woven glass fibers unless subjected to an unusually severe mechanical duty. Plugs 2 are secured to casing 1 by a plurality of angularly displaced fastener pins 7, and casing 6 covers the points of casing 1 occupied by fastener pins 7. Casing 6 is longer than casing 1 and projects with the ends thereof to the planes defined by the outwardly projecting ends of plugs 2, whereby a pair of toroidal spaces 8 is being defined between the inner surface of casing 6 and the outer cylindrical surfaces of each of said pair of plugs 2. A pair of toroidal castings of a synthetic plastic, preferably an epoxy resin, fills the aforementioned toroidal spaces 8, thereby precluding access of fluids to the fine openings 3 formed between casing 1 and plugs 2.

Each of both plugs 2 supports a pair of spaced brackets 9 each held in position by a pair of screws 11. Each bracket 9 includes a pair of spaced blade contacts 12 to be used for connecting the current-limiting fuse into an electric circuit.

On occurrence of major fault currents blowing of the fuse is initiated by fusion of links 5 at the points of reduced cross-sectional area thereof formed by the perforations provided therein. The series arcs formed are rapidly quenched by the high heat absorbing capacity of filler 4.

In prior art fuses lacking the outer casing 6 the distance between fastener pins 7 is the shortest distance between exposed live parts. This distance must comply with certain minimum requirements. Such requirements call frequently for an increase of the size of the casing way beyond the dimensions thereof dictated by the conditions for best performance of the interrupting duty. For best performance of the interrupting duty the casing of the fuse might be relatively compact, and the pressure generated therein ought to be as high as compatible with the bursting strength characteristics of casing 1. The outer casing 1 and the two cast toroidal seals in spaces 8 enable to reduce the distance between fastener pins 7 to less than the shortest required distance between exposed live parts, and thus make it possible to better proportion the casing 1 for best interrupting performance.

Having disclosed a preferred embodiment of our inven-

tion, it is desired that the same be not limited to the particular structure disclosed. It will be obvious to any person skilled in the art that many modifications and changes may be made without departing from the broad spirit and scope of the invention. Therefore it is desired that the invention be interpreted as broadly as possible and that it be limited only as required by the prior state of the art.

We claim as our invention:

1. A fluid-tight high current-carrying-capacity current-limiting fuse comprising a first tubular casing of synthetic-resin-glass-cloth laminate; a pair of metal plugs each press-fitted into and closing one of the ends of said first casing, each of said pair of plugs having an axially outer end situated in a plane outside of said first casing; a plurality of fastener pins projecting radially through said first casing into said pair of plugs; a pulverulent arc-quenching filler inside of said first casing, ribbon fuse link means of a high conductivity low fusing energy metal immersed in said filler conductively interconnecting said pair of plugs; a second tubular

pre-fabricated casing of a synthetic resin mounted on said first casing covering the radially outer ends of said plurality of fastener pins and projecting beyond the axially outer ends of said first casing to the planes wherein said axially outer end of each of said pair of plugs is located thus defining a pair of toroidal spaces between the inner surface of said second casing and the radially outer surfaces of said pair of plugs, and a pair of toroidal castings of synthetic plastic each in one of said torodial spaces.

2. A fluid-tight high-current-carrying-capacity current-limiting fuse as specified in claim 1 wherein said pair of castings consists of an epoxy resin.

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