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LIQUID FUSE

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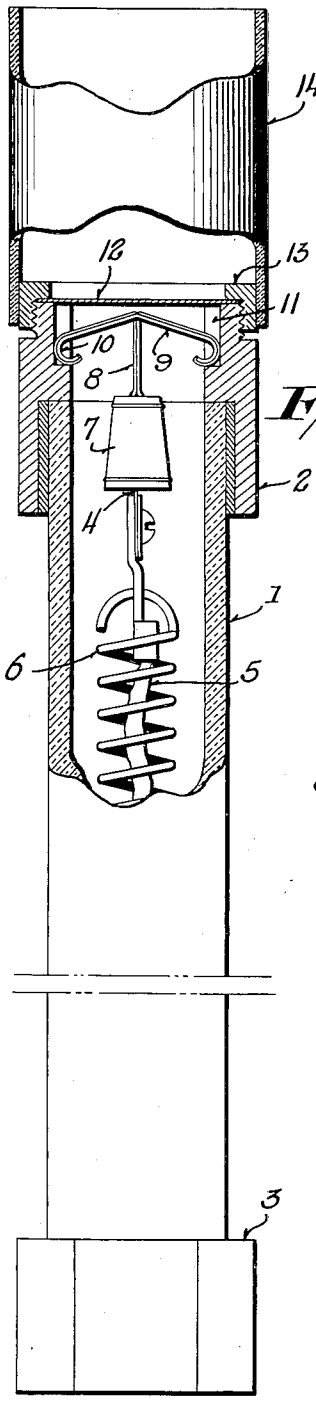


Fig. 1

Fig. 2

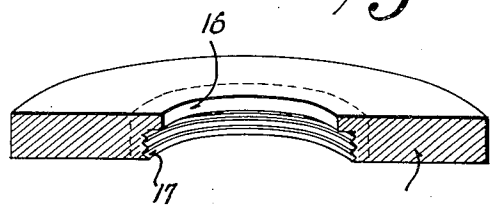
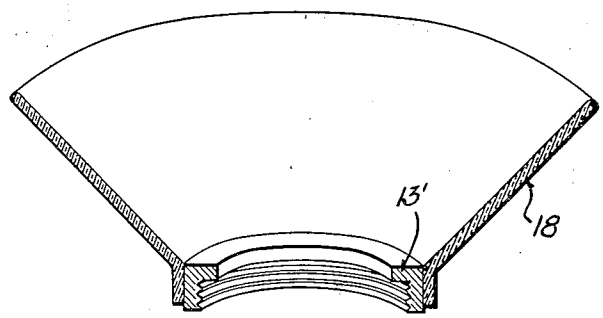


Fig. 3



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LIQUID FUSE

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4 Claims. (Cl. 200—120)

This invention relates to liquid fuses.

In liquid fuses it is the customary practice to provide a tube of glass, or other insulating material, within which an arc extinguishing liquid is carried. An upper and a lower contact are provided, connected by a fuse link and a flexible cable, a spring being employed to draw the lower portion of the fuse downwardly when the fuse blows.

These liquid fuses frequently give trouble due to the fact that the vapors form a conducting zone about the upper contact which may extend part way down the outside of the tube towards the lower contact, thus enhancing the chances for an arc to strike from the upper contact to the lower contact. Further, the liquid runs down the outer side of the tube and it is frequently carbonized, thus either guiding an arc from one contact to the other or else producing a leakage path between the contacts.

This invention is designed to avoid the above noted defects, and objects of this invention are to provide a novel form of liquid fuse which is so made that the vapors are prevented from forming a conducting path between the contacts, and in which the liquid which is discharged upon rupturing the fuse, is prevented from running down the outside of the tube thereby removing the danger of forming a carbonized path between the contacts.

Further objects are to provide a construction which does not constrict the bore of the tube but allows free discharge of the vapors and fuse parts while at the same time providing the protection against flash over, which does not interfere with the visibility of the fuse link so that ready inspection of the link is possible, and which is so made that it may be readily applied to the usual types of liquid fuses with a minimum of expense.

Embodiments of the invention are shown in the accompanying drawing, in which:

Figure 1 is a side elevation, partly in section and partly broken away, of one type of the device.

Figure 2 is a sectional view showing a further form of shield.

Figure 3 is a sectional view showing a still further form of shield.

Referring to Figure 1, it will be seen that the fuse comprises a tube 1 of glass or other suitable insulating material which is adapted to contain an arc extinguishing liquid, not shown. The tube carries an upper contact 2 and a lower contact 3 in the usual manner, and these contacts are connected by means of a fuse link 4 and a flexible cable 5. A spring 6 is provided for drawing the lower portion of the fuse downwardly at the time the fuse blows. If desired, the central or fusible portion of the link may be covered by a cork 7 in accordance with the usual practice.

It is preferable to form the fuse link of a lower member or ribbon and to receive this ribbon between a pair of upper ribbons. The upper ribbons are indicated by the reference character 8, and these upper ribbons are supported by a spring-like bridge member 9. This bridge member is provided with rounded ends 10 which fit within open ended slots 11 formed in the upper contact 2. The specific type of fuse link and associated structure forms no portion of this invention as this invention is applicable to any type of fuse link that it may be desired to use, one type only having been chosen for the purpose of illustration.

The upper end of the upper contact 2 is closed by means of a diaphragm 12 which is very thin and may be bulged upwardly and ruptured and blown outwardly from the upper portion of the fuse. This diaphragm may be formed of a soft metal or a soft alloy as desired. It is held in place by means of a clamping ring 13 which is internally threaded and screwed upon the externally threaded upper portion of the upper contact 2, as shown.

The upper clamping ring or closure ring 13 carries a tubular shield 14 which may be formed of any suitable insulating material or of metal. For example, it may be formed of "Bakelite" or other insulating materials, or may be formed equally well of brass or other metals. The shield 14, if made of brass, may be formed integrally with the clamping ring 13 or may be brazed or otherwise secured thereto, or it may be screw threaded to the ring, as is obvious. Also it is clear that a forced fit may be used, as shown in Figure 1.

This tubular shield has been found to direct the vapors and any discharged liquid outwardly away from the fuse structure, and to prevent the accumulation of a cloud of conducting vapors around the upper contact which has been found in prior constructions to increase the chances of an arc's striking from the upper to the lower contact externally of the glass tube 1. However, with this invention the vapors or gases and the discharged liquid are directed upwardly a considerable distance away from the fuse structure.

It has also been found that with the older types of liquid fuses a considerable amount of the discharged liquid flows downwardly over the

glass tube 1, and inasmuch as this liquid is frequently contaminated due to the fusing of the fuse link with conducting materials, and also is frequently at least partly carbonized, it is obvious that in the older constructions a carbonized path was frequently formed between the upper and lower contacts resulting either in an arc's forming between such contacts or in a slow discharge causing radio interference.

This invention eliminates this heretofore ever present difficulty in that it directs the conducting gases or vapors and the discharged liquid completely away from the fuse structure.

The invention may take other forms. For example, a flat disk shield 15, see Figure 2, may be provided in place of the tubular shield 14. This disk shield may be formed separately from the clamping ring heretofore described, or may be formed integral with the clamping ring, as has been shown in Figure 2. Also, this disk may be made of metal or of insulating material, metal having been shown in Figure 2. For the sake of comparison a dotted outline indicating a clamping ring has been shown merely to illustrate where the clamping ring would be placed in this structure if it were made distinct and separate from such clamping ring.

The disk shield 15 is provided with an overhanging inner flange 16 and with an undercut threaded portion 17. The threaded portion 17 is adapted to be screwed upon the threaded upper ends of the upper contact 2 and the flange 16 is adapted to clamp the diaphragm 12, see Figure 1, in place.

This disk shield also directs the gases or vapors and also the liquid outwardly from the fuse when the fuse blows. It, like the tubular shield 14 described hereinabove, prevents the accumulation of a cloud of conducting vapors around the upper contact and thus materially decreases the chance of an arc's forming on the outside of the glass tube 1 between the upper and lower contacts. Further than this, it prevents the liquid from flowing downwardly along the side of the glass tube and between the upper and lower contacts as it directs the gases and liquid outwardly from the fuse structure.

It has been found that this shield can be made of metal or of insulating material and will operate equally well under either condition.

The invention may take other forms. For example as shown in Figure 3, a clamping ring 13' has been illustrated similar in all respects to the clamping ring 13 hereinbefore described. This clamping ring carries a tubular or funnel-shaped, upwardly opening shield 18 which acts in the same capacity as the shields heretofore described. In effect, it is approximately half way between the tubular shield 14 and the flat shield 15. It directs the gases or vapors and the discharged liquid outwardly from the fuse structure as do the other shields, and prevents the accumulation of a cloud of conducting vapors around the upper contact and also prevents the discharged liquid from running down along the sides of the glass tube 1, as has been previously described.

For the sake of illustration the funnel-shaped or flaring shield 18 has been shown as formed of insulating material, although obviously it could be made of metal, as has been previously described in connection with the other forms of shield.

It may be attached to the ring 13' in any manner desired by screw threading or by means of a forced fit, as shown, or it may be formed integrally with the clamping ring 13'.

It will be seen that this invention is very easy to follow and that the various types of shields can be very readily constructed by ordinary methods, and that they add a negligible expense to the entire structure, although greatly enhancing the value of the fuse. A few of many possible forms of shields have been shown and these specific forms are not intended as limiting the scope of the invention.

It is also obvious that the shields, although insuring correct and reliable operation of the fuse, nevertheless do not extend downwardly over the glass tube and consequently do not obscure the vision of an inspector who wishes to determine whether or not the fuse is intact. The shields are carried wholly above the glass tube and are out of the way.

From actual tests conducted with the shields as described in this invention it has been found that they work as outlined hereinabove and are highly effective in insuring correct and reliable operation of the fuse.

It has been found that when the shields are made of insulation a somewhat quieter explosive sound is produced than when the shield is made of metal. This is particularly true of the tubular type such as shown in Figure 1.

It is within the province of this invention to so form or attach the shield, particularly the tubular type, that it may be blown free of the fuse. Further, while the disklike shield shown in Figure 2 is the only one in which the ring nut has been shown as integral with the shield, it is to be distinctly understood that this construction may be followed for each type of shield if desired.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A liquid fuse comprising an insulating tubular body portion adapted to contain an arc extinguishing liquid and having upper and lower contacts, means located within said tube including a fuse link for normally electrically connecting said contacts, said upper contact being an open ring and having screw threads, a rupturable diaphragm closing said upper contact, a clamping ring nut screwed upon said upper contact for clamping said diaphragm in place, and a vapor and liquid shield carried by said clamping ring and removable therewith as a unitary structure.

2. A liquid fuse comprising an insulating tubular body portion adapted to contain an arc extinguishing liquid and having upper and lower contacts, means located within said tube including a fuse link for normally electrically connecting said contacts, said upper contact being an open ring and having screw threads, a rupturable diaphragm closing said upper contact, a clamping ring nut screwed upon said upper contact for clamping said diaphragm in place, and an upwardly projecting vapor and liquid shield carried by said clamping ring and removable therewith as a unitary structure.

3. A liquid fuse comprising an insulating tubular body portion adapted to contain an arc extinguishing liquid and having upper and lower contacts, means located within said tube including a fuse link for normally electrically con-

necting said contacts, said upper contact being an open ring and having screw threads, a rupturable diaphragm closing said upper contact, a clamping ring nut screwed upon said upper contact for clamping said diaphragm in place, and an upwardly projecting conical vapor and liquid shield carried by said clamping ring and removable therewith as a unitary structure.

4. A liquid fuse comprising an insulating tubular body portion adapted to contain an arc extinguishing liquid and having upper and lower contacts, means located within said tube including a fuse link for normally electrically connecting said contacts, said upper contact being an open ring and having screw threads, a rupturable diaphragm closing said upper contact, a clamping ring nut screwed upon said upper contact for clamping said diaphragm in place, and an upwardly projecting tubular vapor and liquid shield carried by said clamping ring and removable therewith as a unitary structure, said tubular shield forming a continuation of said tubular body portion, whereby vapors and liquid discharged from said fuse are guided for a material distance from said tubular body portion and are projected outwardly therefrom.

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