May 25, 1937. H. W. DOUGHTY 2,081,325

FIRE EXTINGUISHER

Filed April 2, 1936 2 Sheets-Sheet 1

Fig. 1.

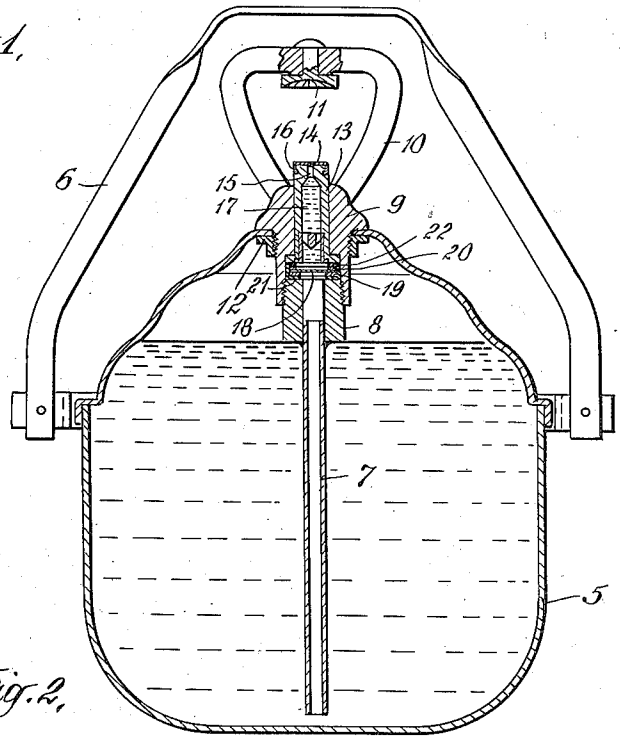
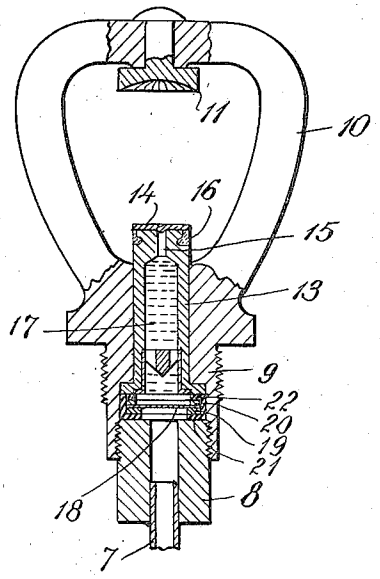


Fig. 2.



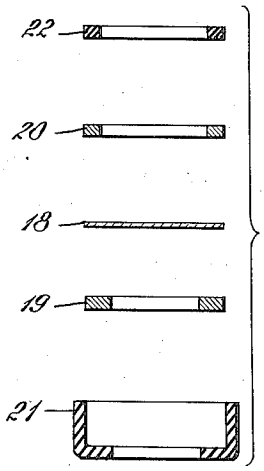


Fig. 3.

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Fig. 4,

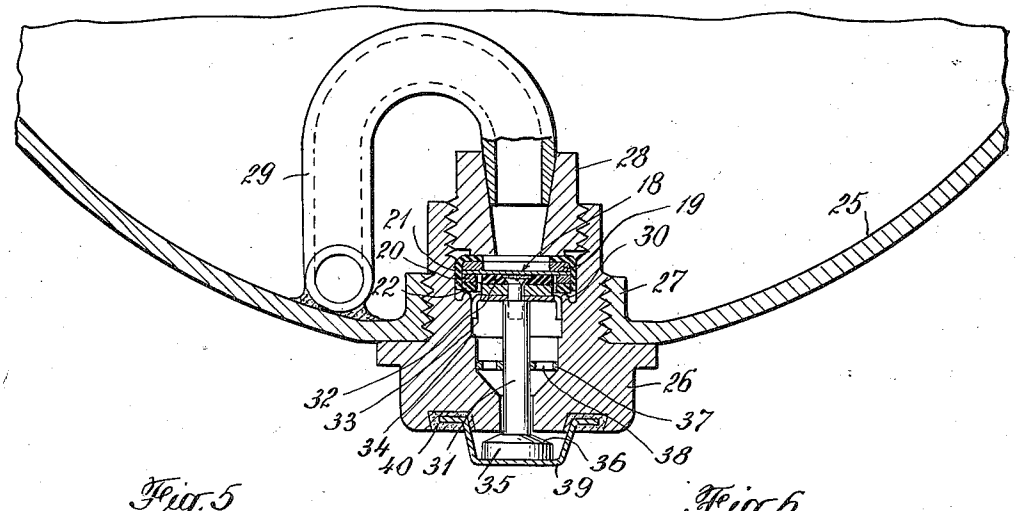


Fig. 5

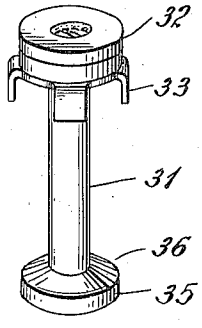
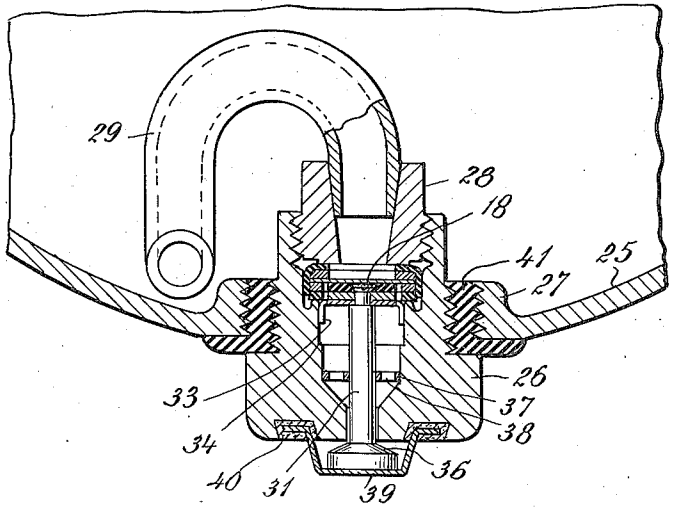


Fig. 6,



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2,081,325

FIRE EXTINGUISHER

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Application April 2, 1936, Serial No. 72,305

4 Claims. (Cl. 169—26)

This invention relates to fire extinguishers and particularly to improvements in extinguishers which are adapted to release a fire extinguishing agent automatically when the temperature in the vicinity of the apparatus rises to a predetermined point.

In apparatus of this type, a receptacle is provided for a fire-extinguishing liquid, usually a chlorinated hydrocarbon, such as carbon tetrachloride, and a gas-generating agent such as an aqueous solution of ammonia. The apparatus is provided with a sprinkler head or similar distributor and an outlet leading thereto which is normally sealed and adapted to be released when a fire occurs. Pressure is developed by the gas-generating agent when the temperature rises and the fire-extinguishing agent is forced through the outlet when the latter is released. The fire-extinguishing agent is distributed over the surrounding surface.

The receptacle in such extinguishers is customarily made of aluminum to avoid corrosion by the liquid contents as described in Patent No. 1,698,840. Usually such extinguishers are provided with the "dual control" features of Patent No. 1,736,255. In recent forms of such extinguishers, parts of the release mechanism have been constructed of stainless steel, as shown, for example, in Patent No. 2,020,427. The extinguishers may be constructed so that the fire extinguishing liquid is delivered upwardly through an outlet tube as shown, for example, in the last mentioned patent, or they may be inverted with the outlet mechanism at the bottom, as shown, for example, in the pending application Ser. No. 63,301 filed February 11, 1936.

The frangible diaphragm which is characteristic of the "dual control" feature of Patent No. 1,736,255, may be made of any suitable metallic foil of requisite strength, but usually gold foil is employed. The diaphragm is secured between two washers of suitable material, stainless steel being commonly used. The diaphragm prevents the escape of any liquid from the extinguisher until the pressure therein has risen to a point sufficient to rupture the diaphragm. The latter is ordinarily protected by means which prevents rupture until a link or cap has likewise been released by an increase of temperature sufficient to melt a low melting point alloy whereby the link or cap is held in place. Consequently, the liquid is not released until the temperature is sufficiently high to melt the alloy and likewise to generate gaseous pressure within the container.

In extinguishers such as I have described, the aluminum comprising the receptacle is relatively high in the electro-potential series, whereas both gold and stainless steel (iron 74%, chromium 18%, nickel 8% or similar composition) are relatively low in the same series. The liquid contents of the extinguisher afford an excellent electrolyte and consequently, as shown by a series of experiments which I have conducted over a period of years, electrolytic corrosion occurs and eventually will cause failure of the device if a closed circuit is maintained, permitting the flow of current between the gold, stainless steel, or other similar metal and the aluminum.

I have found, for example, by experiment that there is no appreciable electro-potential developed between stainless steel and gold when immersed in a mixture of aqueous ammonia and carbon tetrachloride. The actual potential difference is about 0.005 volt. On the other hand, the potential between these metals and aluminum in the same electrolyte varies somewhat with conditions and time, but is between 0.5 and 0.8 volt. A piece of aluminum in contact with gold under such conditions was completely disintegrated in about fifteen months.

It is the object of the present invention to avoid, in fire extinguishers of the type described, the effects of electrolytic corrosion and the consequent failure of the apparatus.

Another object of the invention is to afford a simple, inexpensive and effective means of preventing the flow of current as the result of differences of potential noted between the parts of a fire extinguisher and the consequent disintegration of the aluminum container.

Other objects and advantages of the invention will be apparent as it is better understood by reference to the following specification and accompanying drawings, in which

Fig. 1 is a sectional view through an extinguisher embodying the invention;

Fig. 2 is an enlarged sectional view of the sprinkler head in such an extinguisher;

Fig. 3 is a plan detail of the elements of the diaphragm assembly;

Fig. 4 is a sectional view illustrating the outlet in an inverted extinguisher embodying the invention;

Fig. 5 is a detail in perspective of a part of the outlet mechanism; and

Fig. 6 is a sectional view of the mechanism as shown in Fig. 4, illustrating a slightly different embodiment of the invention.

Two general methods of accomplishing the purpose of the invention are herein set forth.

The structural features of the two methods may be used separately, or they may be combined. The first method involves the partial enclosure of the diaphragm assembly by suitable insulating means made, preferably, of aldehyde phenol resins such as bakelite or similar products, although glass, porcelain, mica, fiber or other insulating products can be used. In this form of the invention, the remaining parts of the outlet which are in contact with the aluminum container must be made of aluminum or of some metal which, in contact with aluminum and in the presence of an electrolyte, will not set up electrolytic corrosion. In other words, in this form of the invention, the gold diaphragm and the stainless steel washers, if the latter are used, are insulated from other parts of the assembly so as to prevent flow of current induced by the difference in potential between the diaphragm and the aluminum container.

As an alternative, the entire outlet assembly may be insulated from the aluminum container by introducing a suitable insulating bushing between it and the aluminum container in such a manner as to afford a tight joint. In this case, there must be no parts of the outlet assembly in contact with the electrolyte of such a character as to permit a difference of potential between the diaphragm and such parts unless the diaphragm is also insulated as hereinbefore described.

As examples of the invention, and referring to Figs. 1 to 3 inclusive of the drawings, a receptacle 5 is made preferably of aluminum to avoid the chemical corrosive effect of the mixture of carbon tetrachloride and aqueous ammonia which is stored in the receptacle. In the form of the invention illustrated, the liquid is discharged upwardly through a tube 7, the extinguisher being adapted to be supported by a bail 6. The tube 7 is connected to a plug 8 threadedly secured in a head 9 having a yoke 10 with a distributor 11 mounted thereon. The plug 8 and head 9 are made of aluminum and are secured in an opening in the casing 5 by a collar 12 also of aluminum.

Supported within the head 9 is a thimble 13 of stainless steel which is flanged at its bottom and is adapted to receive a cap 14 covering an outlet 15 and held in place by low melting point solder 16 around the edges of the cap. The thimble is filled preferably with a material 17 which is liquid or semi-liquid at the temperature at which the apparatus is designed to operate. Vaseline and glycerin are suitable materials. Low melting point waxes and similar materials can be used. This material is designed to be ejected when the diaphragm is released to permit expulsion of the liquid contents of the receptacle. It serves meanwhile to protect the diaphragm hereinafter described and to prevent rupture thereof until the cap 14 is released by the melting of the solder.

Between the flange at the lower end of the thimble 13 and the shoulder formed by the inner end of the plug 8, the diaphragm assembly is mounted. As indicated in Fig. 3, the assembly consists of a diaphragm 18, of suitable metal foil, preferably gold. It is mounted between washers 19 and 20, preferably of stainless steel, which hold the diaphragm firmly and prevent leakage of liquid around it so that no liquid can escape until the diaphragm is ruptured. The diaphragm 18 and the washers 19 and 20 are inserted within a cup 21 of some suitable insulating material, preferably an artificial resin such as bakelite, although numerous known insulating materials may be employed for the purpose. The artificial resins are peculiarly adapted for the purpose because of the ease with which they are molded in the required form. A washer 22 of the same material, which composes the cup, is superposed on the washer 20. The assembly may be completed, if desired, by the application of a suitable adhesive such as is commonly used in joining parts made of artificial resins and similar materials. The assembly is thus completely insulated from contact with surrounding metal, particularly the plug 8 and the head 9 which are or may be in contact with the contents of the receptacle. Although the difference in potential exists, no current can flow between the gold and stainless steel parts and the aluminum, and corrosion is thereby avoided. The thimble 13, which may be of stainless steel as hereinbefore indicated, is not in contact with the contents of the receptacle except when the latter are ejected, and consequently there is no danger of corrosion at this point.

Referring to Figs. 4 and 5 of the drawings, a form of the device is illustrated which is adapted for use in connection with inverted extinguishers. In this form, the receptacle 25 is made preferably of aluminum as in the preceding embodiment. The outlet 26 is also of aluminum and is threadedly connected to a flange 27 of the receptacle. A plug 28 of aluminum is threadedly connected at the upper end of the outlet and supports a pipe 29 bent so as to ensure delivery of all of the contents of the receptacle. This pipe should also be of aluminum.

A diaphragm assembly embodying the parts illustrated in Fig. 3 and hereinbefore described is supported between a shoulder 30 on the outlet 26 and the lower end of the plug 28 and is insulated from the surrounding metal as hereinbefore described to prevent flow of current between the metals. The diaphragm is supported by a plunger 31 having a disc 32 of insulating material at its upper end in engagement with the diaphragm and downwardly extending ears 33 which are adapted to engage a shoulder 34 when the plunger is released. The lower end of the plunger is provided with a head 35 having a sloping surface 36 to act as a distributor. A guide 37 is mounted within the outlet to support the plunger and is provided with openings 38 through which the liquid may pass. The plunger is supported by a strap 39 having its ends embedded in solder 40 of low melting point held in recesses in the end of the outlet. If the latter is of aluminum, the solder does not adhere well thereto, but the recesses may be so formed as to nevertheless prevent the plunger from dropping until the solder has melted. When the temperature in the vicinity of the apparatus rises to a certain point, the solder melts, thus releasing the plunger which drops and no longer supports the diaphragm. The pressure generated within the receptacle ruptures the diaphragm and the liquid is ejected and distributed as in the previously described embodiment of the invention. Since the gold diaphragm and stainless steel washers are insulated from the other parts of the assembly and the plunger is likewise insulated at its point of contact with the gold diaphragm, no current is permitted to flow and consequently corrosion is prevented.

In the embodiment of the invention illustrated in Fig. 6 of the drawings, the assembly is the

same as described in connection with Fig. 4, but in addition a bushing 41 of suitable insulating material, for example, a molded synthetic resin such as bakelite, is disposed between the outlet and the receptacle where the two are joined, thus effectively insulating the parts and preventing the flow of current even if the outlet is constructed of stainless steel. In this case, the pipe 29' should be so disposed as not to come into contact with the aluminum receptacle, as otherwise a path for current would be afforded. In this form of the invention, the diaphragm may or may not be insulated from the surrounding metal, as may be desired.

In the assembly as illustrated in Fig. 3, the stainless steel washers may be omitted, if desired, the insulating material being employed to engage and hold the edges of the diaphragm. This arrangement is, however, not so satisfactory because of the possibility of slight swelling or other changes in form in the insulating material due to changes in humidity and other conditions. As hereinbefore indicated, the edges of the diaphragm must be firmly supported at all times to avoid any possible leakage.

It is apparent that in the form of the invention illustrated in Figs. 4 to 6 inclusive, the plunger which supports the diaphragm may be made of various materials, for example glass or porcelain, in which event it will not be necessary to provide an insulating cap at the end of the plunger where it contacts with the diaphragm. Also, numerous changes in detail with respect to the design and arrangement of the parts may be made, so long as the structure is assembled so that metals of various relative positions in the electropotential series are insulated from each other and currents induced by difference of potential are prevented from flowing in such a manner as to cause electrolytic corrosion, especially with respect to the aluminum container.

All such modifications are within the spirit and scope of the accompanying claims, in which I have defined my invention as hereinbefore described.

I claim:

1. In an automatic fire extinguisher adapted to release a fire-extinguishing liquid under pressure generated by increase in temperature in the vicinity of the extinguisher to a predetermined point, a receptacle for the fire-extinguishing liquid and pressure-generating agent, an outlet assembly connected thereto and including means adapted to burst when the pressure within the receptacle reaches a predetermined point, the receptacle and parts of the outlet assembly being of metals such that in the presence of an electrolyte substantial differences of electrical potential between the metals exist and means to electrically insulate the outlet assembly from the receptacle whereby, in the presence of an electrolyte, electrolytic corrosion is avoided, said insulating means including a cup of insulating material and a washer of like material inserted in and secured to the cup.

2. A diaphragm assembly for automatic fire extinguishers including a part of metal comprising a frangible diaphragm of a metal sufficiently different from that of said metal part of the fire extinguisher that, in the presence of an electrolyte, an appreciable electro-potential is developed, means for supporting the diaphragm and electrical insulating means embracing the periphery of the diaphragm and supporting means, including a cup of insulating material and a washer of like material inserted in and secured to the cup.

3. An automatic fire extinguisher adapted to release a fire-extinguishing liquid under pressure generated by an increase in temperature in the vicinity of the extinguisher to a predetermined point comprising an aluminum receptacle containing a fire-extinguishing liquid and a solution containing ammonium ions, which solution upon heating will liberate ammonia gas to create pressure upon the fire extinguishing liquid, an outlet assembly connected to the receptacle and including a frangible diaphragm of gold foil, a support of stainless steel for the diaphragm, and means for electrically insulating the diaphragm and support from the aluminum receptacle whereby in the presence of said solution electrolytic corrosion is avoided.

4. An automatic fire exinguisher adapted to release a fire-extinguishing liquid under pressure generated by an increase in temperature in the vicinity of the extinguisher to a predetermined point comprising an aluminum receptacle containing a fire-extinguishing liquid and a solution containing ammonium ions, which solution upon heating will liberate ammonia gas to create pressure upon the fire-extinguishing liquid, an outlet assembly connected to the receptacle and including a frangible diaphragm of gold foil, washers of stainless steel supporting the diaphragm, an electrically-insulating means embracing the periphery of the diaphragm and washers to electrically insulate the diaphragm and washers from the aluminum receptacle, whereby, in the presence of said solution, electrolytic corrosion is avoided.

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