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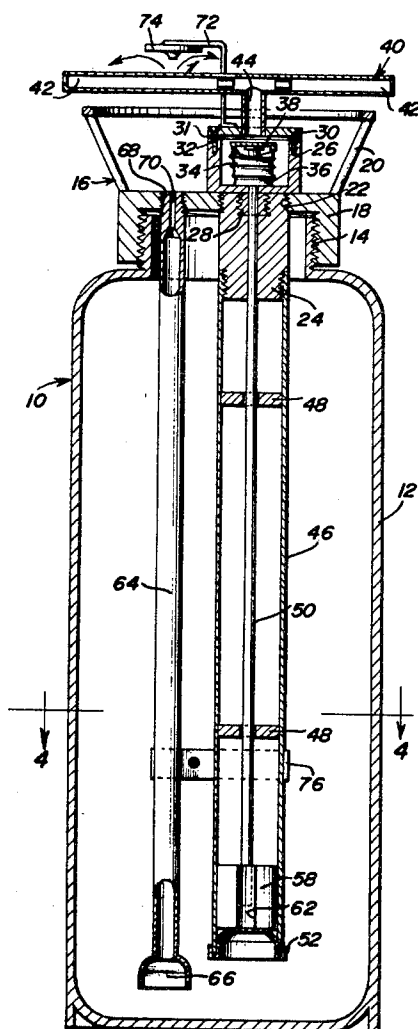
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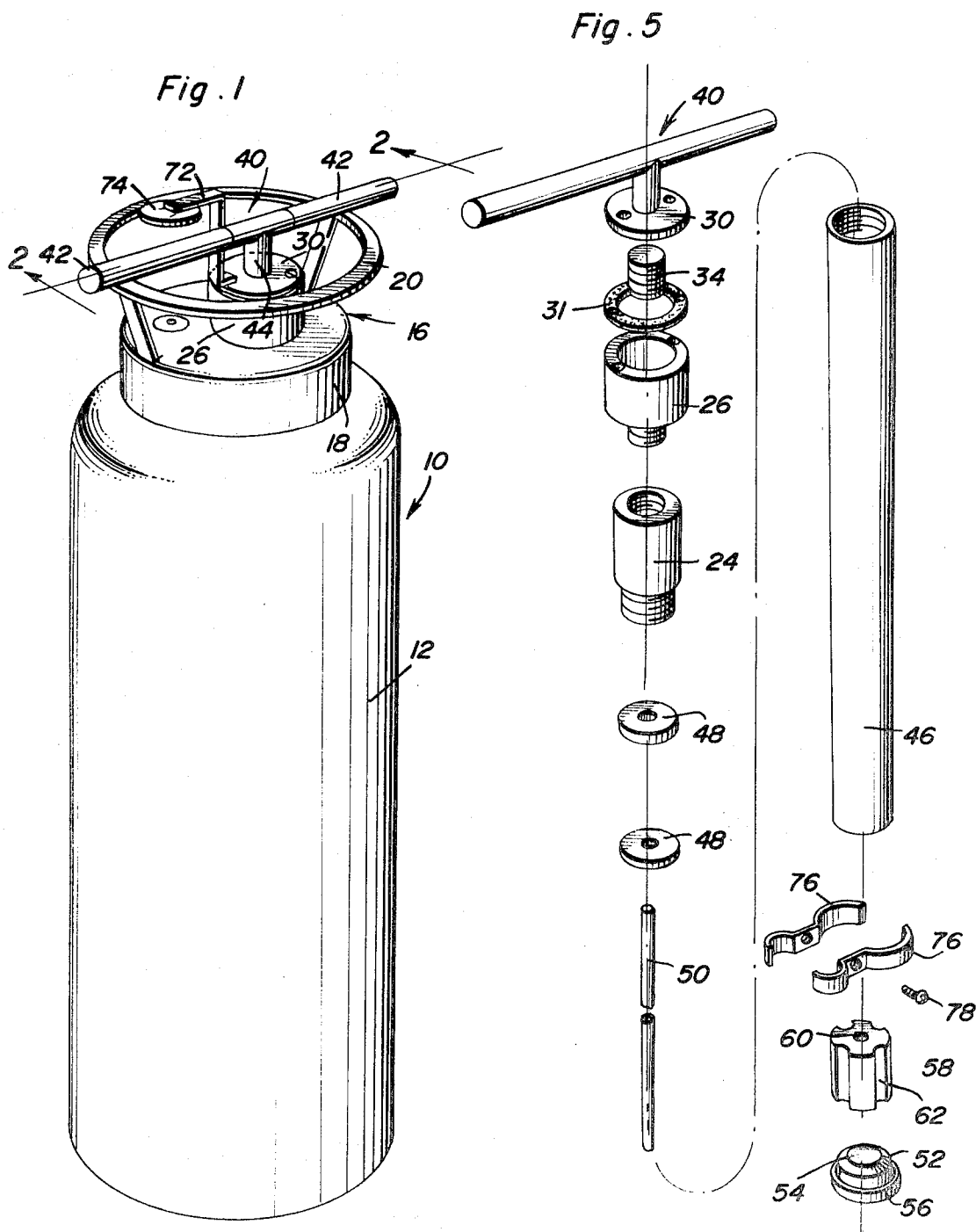
[54] **FLUID-ACTUATED FIRE EXTINGUISHER**  
 5 Claims, 5 Drawing Figs.

[52] U.S. Cl. 169/27  
 [51] Int. Cl. A62c 35/02  
 [50] Field of Search 169/7, 8,  
 19, 20, 21, 26, 27

[56] **References Cited**  
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**ABSTRACT:** A portable automatic fire extinguisher having a tubular member mounted exteriorly of the extinguisher housing and containing a fluid that expands significantly in response to an abnormal ambient temperature condition. A bellows is surrounded by the fluid and is displaced during fluid expansion. A push rod is connected to the bellows at a first end of the rod while the opposite end mounts a valve. When the bellows is displaced, the push rod is similarly moved thus causing the valve to open and free a stored reagent for mixing with a second reagent which results in the formation of a fire-extinguishing liquid. A discharge tube is disposed in the extinguisher housing and has a nozzle end extending outwardly from the housing so that the extinguishing fluid can be discharged omnidirectionally.





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Fig. 2

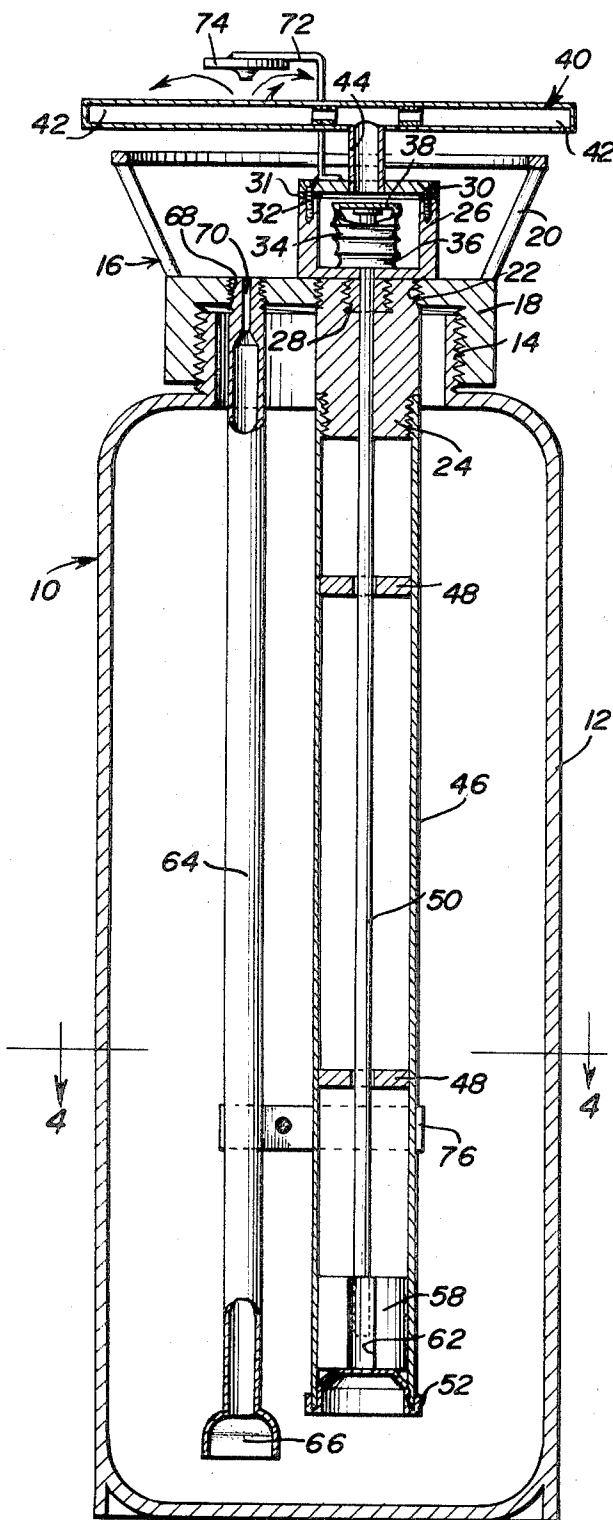


Fig. 3

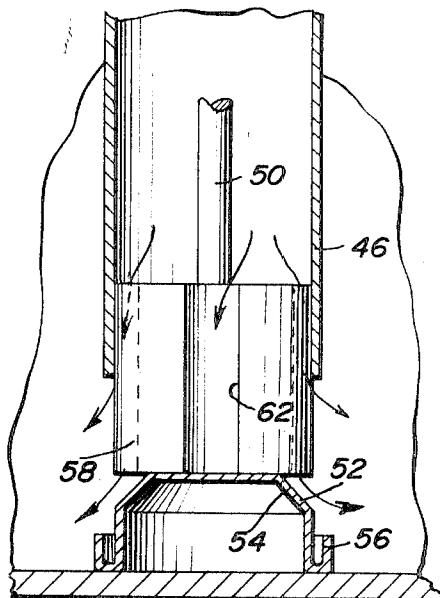
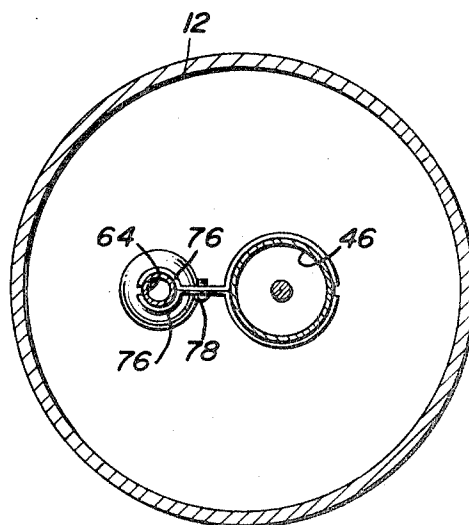


Fig. 4



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## FLUID-ACTUATED FIRE EXTINGUISHER

This invention is a continuation-in-part of U.S. application Ser. No. 746,978, filed July 23, 1968.

The present invention relates to automatic portable fire extinguishers.

The aforementioned application previously filed by me discusses the desirability of converting conventional portable fire extinguishers into a self-actuated unit requiring no human assistance. Like my prior invention, the present device is directed to a conversion apparatus which can simply and inexpensively modify a conventional fire extinguisher. However, the structure set forth herein is discussed in terms of a complete fire extinguishing unit and may be manufactured as such.

In my copending application, a heat expandable liquid exerts its influence upon a diaphragmlike member which bulges outwardly when an abnormally high ambient temperature is detected. Displacement of the diaphragm causes the unloosening of a bottle storing sulfuric acid. After loosening of the bottle, the acid mixes with a bicarbonate solution in the extinguisher housing to form the conventional fire extinguishing liquid.

Although my prior device operates satisfactorily, the present invention simplifies the actuating mechanism. The salient advantages over conventional extinguishers are the same for both units with the additional advantage, in this invention, of fabrication and consumer saving due to the simplified actuating mechanism.

In the present invention, a bellows member is exposed to the expandable liquid and upon detection of an abnormal temperature, the bellows is made to collapse and displace a connected push rod. At an opposite end of the push rod, a valve closes a container which stores a first reagent. A second reagent is stored within the tank or extinguisher housing so that when the valve is opened, the first and second reagents are mixed causing the formation of the fire-extinguishing liquid. Although the present invention will be described in terms of the conventional soda-acid type, the identical structure set forth may be employed in a foam type extinguisher. The primary difference resides in the utilization of different reagents.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a perspective view of a complete self-actuated extinguisher.

FIG. 2 is a vertical sectional view taken along a plane passing through section line 2-2 of FIG. 1.

FIG. 3 is a fragmentary sectional view illustrating the opening of a valve which causes the mixing of reagents within the fire extinguishing tank.

FIG. 4 is a transverse sectional view taken along a plane passing through section line 4-4 of FIG. 2. FIG. 5 is an exploded view showing the components forming the actuating device of the present invention.

Referring to the drawings and more particularly FIGS. 1, 2 and 5, a complete fire extinguisher unit is indicated by reference numeral 10 and is seen to generally resemble the conventional portable fire extinguisher. A housing or tank 12 has a threaded opening 14 for mounting a cover cap 16 which supports the structural members extending into the tank. It is presently contemplated that individuals having conventional portable fire extinguishers may remove the cover cap presently on a unit and replace it with the cover cap of the present invention. This enables an individual having a conventional extinguisher to utilize the advantages of the present invention without purchasing a new tank.

The cover cap 16 includes a fitting 18 which mates with the threaded collar 14 of the tank. A grasping ring 20 is attached

to the fitting 18 and permits one to carry the extinguisher from one point to another. Studying FIG. 2, the fitting 18 will be seen to include a threaded opening 22 for mounting a downwardly projecting boss 24. The purpose of the boss will be explained hereinafter. A cylindrical member 26 is positioned above and in axially spaced relation to the boss 24. The member appends to a threaded stud portion 28 adapted for mounting in the upper end of the boss. This is the means by which the cylindrical member 26 becomes attached and supported to the cover cap 16. Access to the interior of the cylindrical member 26 is gained by a removable top plate 30 which contiguously lies on the main body portion of the cylindrical member and is sealed thereto by means of a gasket 31. The top plate is secured to the cylindrical member by suitable fasteners 32.

The mechanism for actuating the mixing of reagents within the extinguisher tank includes a cylindrical bellows 34 concentrically positioned within the cylindrical member 26. The lower end 36 of the bellows abuts the base end of the cylindrical member 26 while the upper end 38 of the bellows maintains a normally spaced relation with respect to the top plate 30 of the cylindrical member. The purpose of the bellows is to detect fluid expansion in a thermal sensor tube 40, such expansion causing the exertion of static pressure along the upper 38 of the bellows resulting in the downward displacement of this upper end. This displacement forms the original causation of vertical mechanical movement that actuates the fire extinguisher.

Referring particularly to FIG. 1, the thermal sensing tube 40 is seen to include a T-shaped tube having an elongated horizontal portion 42 appending at a median point thereof to a perpendicular communicating tubular portion 44 which in turn communicates with the interior of the cylindrical member 26.

In order to store a first reagent that is necessary to complete charging of the fire-extinguishing liquid, a tube 46 having an upper threaded end is mounted to a mating threaded end portion at the lower end of boss 24. The tube is utilized to contain this first reagent separate from a second reagent. Washers 48 are concentrically placed in axial spaced relation within the tube 46 and serve as guides for a rod 50 which extends downwardly through the cover cap support. More particularly, the upper end of rod 50 is seated against the interior surface of the bellows upper end 38. Thus, when an abnormally high temperature rise occurs in the vicinity of the extinguisher, the liquid contained in the T-shaped tubular member 40 absorbs the heat and rapidly expands to exert pressure upon bellows 34 which then contracts. Thus, the bellows will be seen to serve as a detection device responsive to the expansion of fluid in the T-shaped sensing tube 40.

Upon contraction of bellows 34, the rod 59 is displaced downwardly through bore 24 and causes a valve assembly positioned at the lower end of tube 46 to open and free the stored reagent. Referring to FIGS. 2 and 5, the lower end of tube 46 serves as a valve seat for a capping valve 52 having a frustoconical main section 54 and an annular pocket 56 at the lower end thereof which normally engages the lower end of tube 46 to form sealing engagement therewith.

To aid in the uniform distribution of the reagent stored in tube 46, a cylindrical member 58 is press fitted to the lower end portion of rod 50. As will be seen in FIG. 5, the cylindrical member 58 has a centrally formed bore 60 therein for receiving the rod 50. Notches 62 are formed in axially spaced and peripheral locations around the cylindrical member 58. Thus, when rod 50 is displaced downwardly the valve 52 clears the lower end of tube 46 as will be seen in FIG. 3. Also, the cylindrical member 58 extends slightly outwardly from the lower end of the tube 46 so that the notches 62 form escape paths for the stored reagent.

If the fire extinguisher is to be used as a soda-acid type, the reagent stored in tube 46 will be a suitable acid such as sulfuric acid. Usually a bicarbonate water solution is stored within the tank 12 so that escape of sulfuric acid from tube 46

results in a pressurized fire-extinguishing fluid within the tank 12.

In order to discharge the fire-extinguishing fluid, a discharge tube 64 having a lower funnel-shaped projection 66 is positioned in spaced parallel relation with the tube 46. The upper threaded end 68 of the discharge tube is received within a threaded bore formed in the collar 18 of the cover cap 16. The upper end of the discharge tube is flush with the surface of the collar 18 and the interior of this upper discharge tube end includes an orifice 70 for directing the pressurized fire-extinguishing fluid upwardly and outwardly from tank 12.

In order to effect an omnidirectional distribution of the discharged liquid, it is made to impinge upon a diffusing plate 74 positioned in overlying spaced relation to the orifice 70. The diffuser plate 74 is cantilever mounted to an angle bracket 72 supported at the lower free end thereof to the top plate 30 of cylindrical member 26.

In order to retain tube 46 and discharge tube 64 in place and in order to protect these tubes from damaging movement during use, two bracket members 76 are positioned in side-by-side aligned relation so that they simultaneously embrace the storage tube 46 and the discharge tube 64. A suitable fastener 78 connects the two brackets together.

Periodic recharging of the complete fire-extinguishing unit is performed in a same manner as commonly done with conventional fire extinguishers of the portable type.

The adaptation of the present invention to any presently existing soda-acid fire extinguisher simply requires that the existing cover cap of an extinguisher be removed and replaced with the cover cap assembly 16. Also, the modification requires the removal of the usual discharge hose and the insertion of a plug in the discharge line of the conventional tank. By so plugging the usual discharge route, the advantages of omnidirectionally discharging the fire-extinguishing fluid through discharge tube 64 can be realized.

Of course, as will be appreciated by those familiar with fire extinguisher construction, in place of the sulfuric acid reagent and the bicarbonate water solution reagent, the present fire extinguisher may be utilized with two foam producing chemicals normally separated until pressurized discharge is desired. These reacting chemicals, for example "Foamite," are conventionally used in foam extinguishers. Thus, the present invention enjoys the advantage of being utilizable as a soda-acid or foam-type extinguisher, depending upon the types of chemicals used.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

I claim:

1. A temperature-responsive valve assembly comprising a support, means mounted to the support for containing a fluid that expands significantly in response to an abnormal ambient temperature change, detection means being exposed to the fluid for undergoing displacement in response to significant fluid expansion, a valve member normally residing in a first

position relative to a mating valve seat, and means connecting the detection means to the valve member for causing the member to move to a second position relative to the valve seat when displacement of the detection means occurs, a tubular member mounted to the support and surrounding the connection means, the member being adapted to store a material therein, an end of the member serving as the valve seat through which the material exits in response to valve displacement to the second position.

2. The structure set forth in claim 1 wherein the valve member has an upturned annular flange to form a pocket for engaging the valve seat end of the tubular member and creating a seal therewith.

3. A temperature-responsive valve assembly comprising a support, means mounted to the support for containing a fluid that expands significantly in response to an abnormal ambient temperature change, detection means being exposed to the fluid for undergoing displacement in response to significant fluid expansion, a valve member normally residing in a first position relative to a mating valve seat, and means connecting the detection means to the valve member for causing the member to move to a second position relative to the valve seat when displacement of the detection means occurs, the detection means comprising a bellows being collapsible in response to expansion of the surrounding fluid, the connection means being a push rod mounting the valve on a first end thereof and engaging the bellows at a second end, the valve assembly being fitted with a tubular member mounted to the support and surrounding the rod, the member being adapted to store material therein, a free end of the member being contiguous with the first rod end and providing the valve seat through which the material exits.

4. In a self-actuated fire extinguisher utilizing the valve assembly of claim 3 together with a tank capped by the support, the tubular member extending into the tank, the discharge tube having a discharge end facing outwardly from the support, the main body portion of the tube being mounted to the support and extending into the tank which stores a reagent, whereby said passage of stored material from the tubular member results in mixing with the reagent to generate a pressurized medium which becomes discharged through the discharge tube.

5. A temperature-responsive valve assembly comprising a support, means mounted to the support for containing a fluid that expands significantly in response to an abnormal ambient temperature change, detection means being exposed to the fluid for undergoing displacement in response to significant fluid expansion, a valve member normally residing in a first position relative to a mating valve seat, and means connecting the detection means to the valve member for causing the member to move to a second position relative to the valve seat when displacement of the detection means occurs, a tank for mounting the assembly support, the tank being adapted to store a first reagent, and a container disposed in the tank for storing a second reagent, the container having an outlet port controlled by the valve assembly for allowing the reagents to mix when the valve assembly moves to the second position thereby producing a fire-extinguishing fluid.