

[54] **AUTOMATIC FIRE EXTINGUISHER SYSTEMS**

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[58] **Field of Search:** 169/2 R, 26, 16, 169/20, 29, 4

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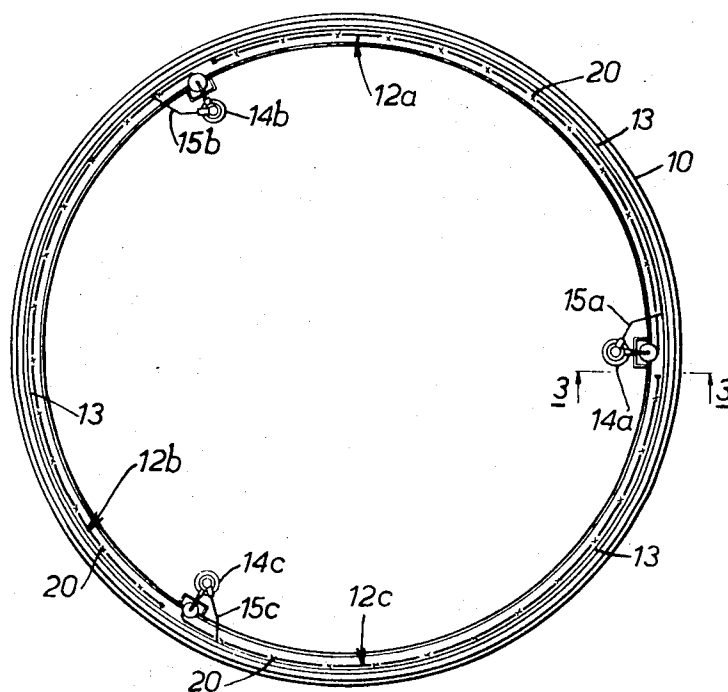
Primary Examiner—Lloyd L. King

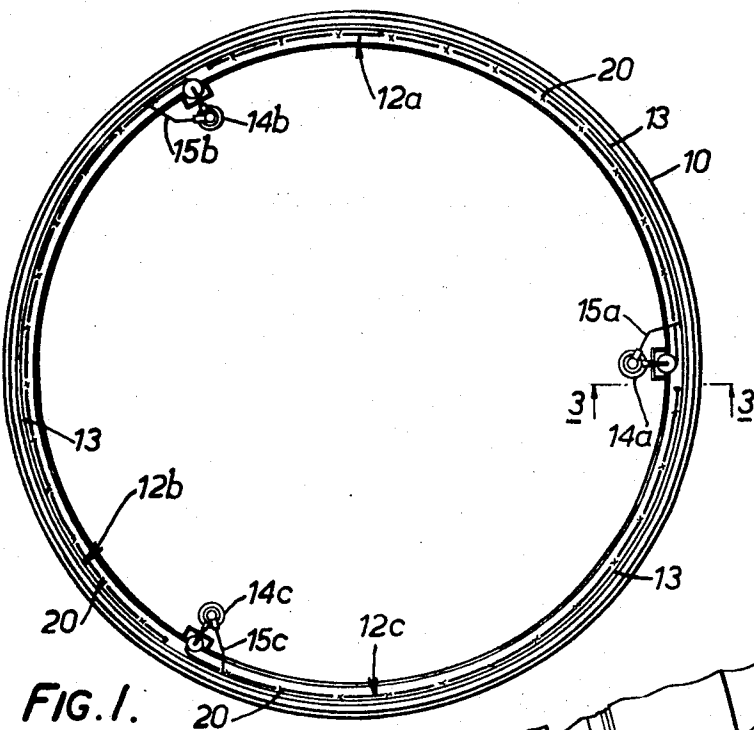
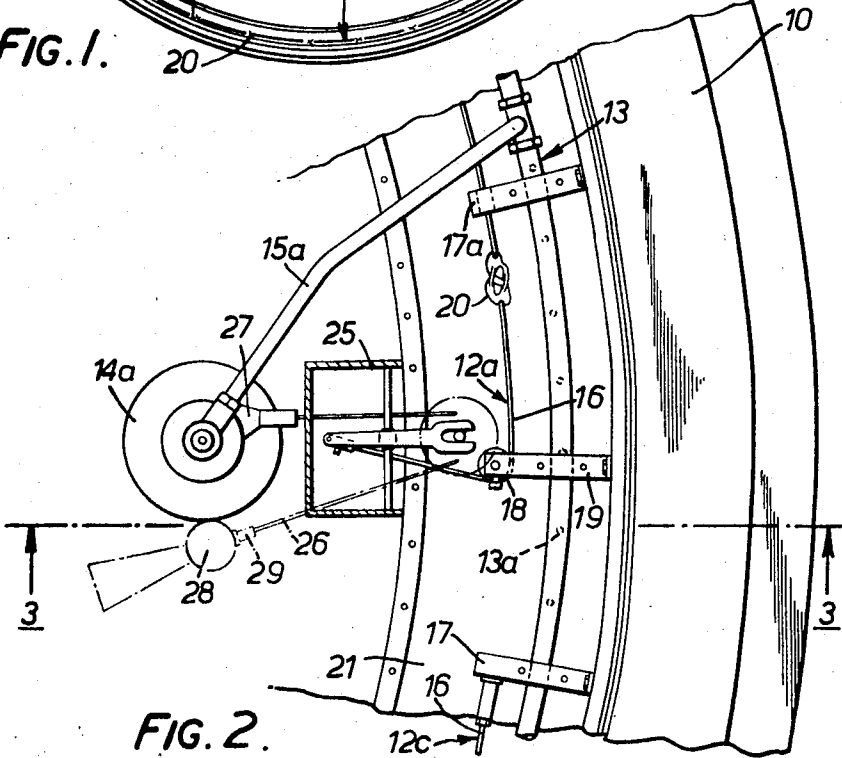
Attorney—Jarrett Ross Clark et al.

[57] **ABSTRACT**

An automatic fire extinguishing system for floating roof fuel tanks comprises several extinguishant containers mounted on the floating roof, a spray pipe system mounted around the periphery of the floating roof adjacent the roof/wall seal, and several linear fire detector elements each protecting a respective part of the roof periphery. Each element controls a respective one of the extinguishant containers and, when it detects fire conditions, causes that container to discharge extinguishant into the whole of the spray pipe system.

5 Claims, 5 Drawing Figures





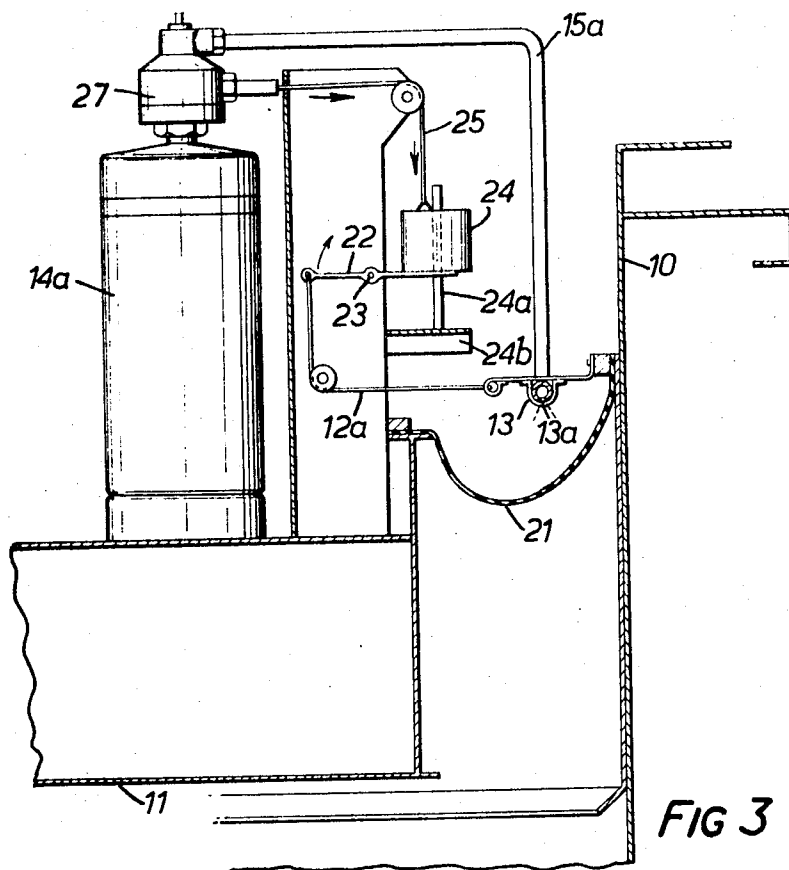


FIG 3

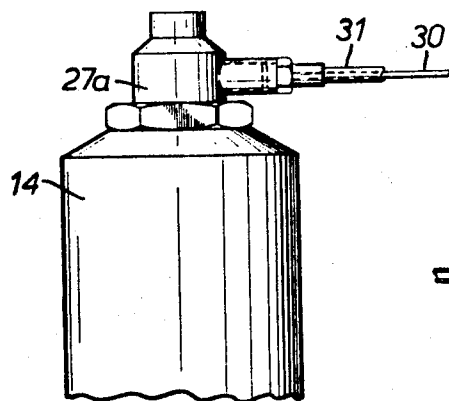


FIG. 4.

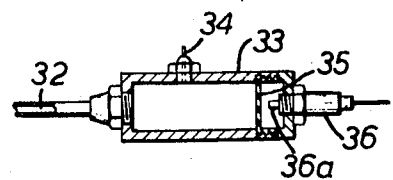


FIG. 5.

AUTOMATIC FIRE EXTINGUISHER SYSTEMS

BACKGROUND OF THE INVENTION

This invention relates to a fire extinguishing system for floating roof tanks containing inflammable fluids.

There are problems associated with the provision of an effective yet safe fire extinguishing system in fluid fuel tanks. Floating roof tanks are subject to fires occurring in the vicinity of the seal between the floating roof and the tank sides.

Systems are available for use in this type of hazard. However, they are severely limited in their application. One system utilizes foam reticulated to the top of the tank from a remote foam generator. This system suffers from the disadvantage of being insufficiently localized to the seat of a fire in the seal, particularly in the instance where the tank roof is resting low in the tank and therefore is lying a considerable distance from the fixed foam nozzles.

Another system is a standard "wet" system utilizing BCF (bromochlorodifluoro-methane) fluid housed in tanks disposed on the floating roof and supplying a number of standard flame-sensitive fixed sprinklers spaced around the periphery of the roof adjacent to the seal. This system is subject to leaks which are difficult to detect, and in use if a flame comes into contact with the sprinkler head, the fusible link adjacent the flame collapses and the extinguishant is completely discharged through the affected sprinkler head or heads. Thus, this system may only operate in an isolated area and may not prevent spreading of a fire from the isolated area before it is completely discharged.

There are problems associated in providing extinguishing systems for use in floating roof fuel tanks stemming from the extreme safety precautions that must be observed in their installation and operation because of the attendant fire risk. Thus, electrical extinguishant control equipment of any kind is usually prohibited by law from being positioned on or in the vicinity of floating roof fuel tanks.

It is a principal object of the present invention to provide an improved fire extinguishing system for floating roof tanks.

BRIEF SUMMARY OF THE INVENTION

According to the invention, there is provided an automatic fire extinguishant system for floating roof tanks, comprising fire detector means mounted in the vicinity of the periphery of the floating roof, extinguishant spray means mounted around substantially the whole of the vicinity of the periphery of the floating roof, extinguishant container means mounted on the floating roof, and means controlled by the fire detector means for coupling the container means to the spray means in the event of fire conditions being detected by the detector means whereby the container means discharges extinguishant into the spray means.

BRIEF DESCRIPTION OF THE DRAWINGS

Various forms of an automatic fire extinguishing system for floating roof fuel tanks and embodying the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a plan view of a floating roof tank with the fire extinguishing system mounted thereon;

FIG. 2 is a partial plan view showing in greater detail a section of one form of the system;

FIG. 3 is a section taken on line 3—3 in FIGS. 1 and 2;

FIG. 4 is a partial view of another form of the system utilizing a pyrotechnic cord as a detector element; and

FIG. 5 is a partial view of a further form of the system.

DESCRIPTION OF PREFERRED EMBODIMENTS

The extinguishant preferred for the system to be described is bromochlorodifluoro-methane (B.C.F.).

FIG. 1 is an overall plan view of a floating roof tank 10 with three independently controlled extinguishant containers 14a, 14b and 14c mounted on the floating roof 11. It will be appreciated that any number (with a minimum of one) of containers may be positioned on the roof according to various factors such as tank size and the inflammability of tank contents. A tube 13 having spaced tube outlets 13a extends around the perimeter of the tank in close proximity to the perimetral roof seal 21. Floating roof tank fires usually occur in the vicinity of the flexible roof seal 21 and accordingly, it is desirable for the tube 13 to be positioned closely adjacent to the seal 21.

Each container 14a, 14b and 14c has an independently controlled detector element section 12a, 12b and 12c comprising a cord 16 interconnecting a series of fusible links 20 in each section. Thus, a fire at any point on the perimeter of the roof will actuate at least one fire detector section whereupon the container controlled by that section or sections will exhaust its contents into the perimetral tube outlets 13a thus providing a complete perimetral blanketing of the roof seal with extinguishant.

Various forms of detector may be used, as will now be described.

One form is shown in FIGS. 2 and 3. The fire detectors 12a, 12b and 12c comprise lengths of flexible cable 16 joined along its length by fusible links 20. Each cable is fixed firmly at one end by bracket 17 and clipped loosely at intervals by brackets 12a along the line of the floating tank seal 21. The fusible links can be set to operate at various temperatures as is known in the art. The other end of the flexible cable 16 may be attached to a trigger (not shown) which retains a pivoted lever which in turn supports a weight 24, so arranged that it will drop when the trigger is released. Alternatively, the cable 16 is directly connected to the lever 22. The lever 22 is pivoted at 23 and supports the weight 24. A flame or overheating will cause the collapse of a fusible link or links 20, the cable will part, thus allowing the drop weight 24 to fall on its guide 24a onto platform 24b. The drop weight 24 is attached to a valve 27 on the appropriate extinguishant container, such as 14a, and a valve 29 on an air horn air cylinder 28 by means of cords 25, 26. Both of these containers are opened by movement of the drop weight. The BCF in the container 14a is then discharged into the pipework 13 and the gas cylinder discharges and operates an audible alarm.

In a modification (referring to FIG. 3), cord 25 may be connected directly to lever arm 22 and a tension spring (not shown) applies tension to cable 16 through the lever arm instead of drop weight 24. In the event of fire, the sprung arm opens valves 27 and 29 as before.

Another form of detector (FIG. 4) consists of a stainless steel capillary 31, one end of which is sealed and the other terminates on the automatic discharge head

27a attached to the BCF pressurized container 14. Each tube is clipped and fixed along the line of the tank seal 21 in similar manner to the detector sections 12, 12b and 12c utilizing brackets 17 and 17a shown in FIG. 2. The length of each detector element is variable, up to 60 feet or greater.

Within the stainless steel capillary 31 is a pyrotechnic cord 30. The application of a naked flame or rapid rise in temperature above 250°C to any point on the length of the capillary 31 ignites the pyrotechnic cord and the resultant pressure developed is sufficient to shear a diaphragm in the head 27a of the BCF container 14 allowing the BCF to discharge through the pipework 13. The air cylinder outlet valve can be simply controlled by movement of a piston movable under the influence of the pressurized BCF gas as it is exhausted, whereby air from the cylinder passes to an audible alarm.

A further form of detector is shown in FIG. 5. This comprises a length of copper capillary 32, one end of which is sealed and the other end connected to a chamber 33 which is sealed by a flexible diaphragm 35. The copper capillary 32 is secured around the perimeter of the floating roof in similar manner as that previously described with reference to the fusible link detector and pyrotechnic cord detector. A metered hole 34 in this chamber allows the air in the capillary 32 to escape on normal temperature rise. A rapid rise in temperature and subsequent rapid expansion of the air in the capillary 32 will not allow air to escape through the metered hole 34 fast enough, and the pressure within the expansion chamber 33 will move the diaphragm 35. This in turn will operate a pilot valve 36a to control the movement of a piston (not shown) which is powered by a reservoir or accumulator using compressed air or hydraulic oil. Thus, the movement of the piston through suitable linkage will operate the discharge head of the BCF cylinder and also release gas or air pressure to operate the audible alarm.

In a modification of the FIG. 5 arrangement, the capillary is filled with oil and when subject to normal temperatures this oil will expand into a second chamber or bellows (not shown) through the metered hole. Should there be a rapid rise in temperature the size of the metered hole is insufficient to cater for the increased oil flow which will then operate the main bellows or diaphragm. The movement will be transmitted through suitable linkage to operate the discharge head on the BCF cylinder and the gas cylinder which will operate the audible alarm.

It will be noted that the system described and illustrated is "dry", i.e., whilst inactive, all extinguishant is contained in the pressurized tanks and not in the pipework where it would be more prone to leaks.

What is claimed is:

1. An automatic fire extinguishant system for floating

roof tanks, comprising

a plurality of fire detector elements mounted at spaced positions around the periphery of the floating roof, each for detecting fire conditions over a respective part of the said periphery,

extinguishant spray means mounted around substantially the whole of the vicinity of the periphery of the floating roof,

a plurality of separate extinguishant containers mounted on the floating roof, and

valve means respectively controlling the discharge of the extinguishant from each said container into the spray means,

each detector element comprising a closed tube, means mounting the tube around the said respective part of the periphery of the floating roof, a pyrotechnic cord in the tube, and pressure sensitive means responsive to the pressure in the tube and operatively connected to a respective one of the said valve means to open the valve means in response to the rise in pressure in the tube in the event of ignition of the pyrotechnic cord.

2. An automatic fire extinguishant system for floating roof tanks, comprising

a plurality of fire detector elements mounted at spaced positions around the periphery of the floating roof, each for detecting fire conditions over a respective part of the said periphery,

extinguishant spray means mounted around substantially the whole of the vicinity of the periphery of the floating roof,

a plurality of separate extinguishant containers mounted on the floating roof, and

valve means respectively controlling the discharge of the extinguishant from each said container into the spray means,

each detector element comprising a fluid-containing capillary tube closed off except for a metered hole, means mounting the tube around the said respective part of the periphery of the floating roof, and pressure sensitive means responsive to the pressure in the tube and operatively connected to the respective one of the said valve means to open the valve means in response to pressure build-up in the tube as a result of very rapid fluid expansion therein.

3. A system according to claim 2, in which the said fluid is gaseous.

4. A system according to claim 2, in which the said fluid is hydraulic.

5. A system according to claim 1, including gas operated means operatively connected to the fire detector means to produce an audible alarm in the event of discharge of the extinguishant.

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