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AUTOMATIC FIRE EXTINGUISHER

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Fig. 1.

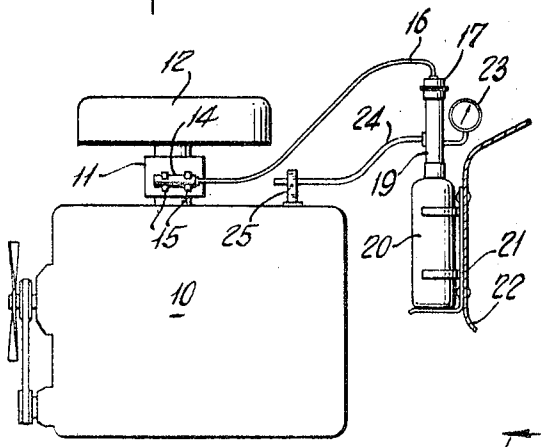


Fig. 2.

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AUTOMATIC FIRE EXTINGUISHER

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ABSTRACT OF THE DISCLOSURE

The invention contemplates an automatic release mechanism for fire-extinguisher materials, operative upon detection of a given temperature condition at a localized region, as in the vicinity of the carburetor, for the case of protection against damage from a carburetor fire. Valve mechanism fits a standard extinguisher tank, and the valve is actuated by a closed liquified-gas detection system. Heat-response and the charged extent and condition of the overall installation may be readily observed and checked as frequently as desired, without discharging the system; also, the system can be easily recharged without parts replacement.

Our invention relates to an automatic fire-extinguisher system for vehicular use, as to put out flash fires in the engine compartment of an automobile, truck, boat, etc.

Past proposals for releasing fire-extinguishing materials have relied upon fusible links, plugs or the like to detect heat, and one way or another the destruction of the fusible member is effective to release the extinguishing materials. Such systems are unduly complex, not only in regard to the number of parts which an installer must handle, but also in regard to the uncertainty of calibration—i.e., uncertainty as to the temperature of extinguisher release, as to the time to achieve such temperature response, and as to the capacity and readiness of the extinguisher to discharge. These difficulties undoubtedly account for the fact that virtually none of these systems are in use today.

It is, accordingly, an object of the invention to provide an improved extinguisher system of the character indicated.

Another object is to provide an automatic fire-extinguisher of elemental simplicity, both from the viewpoint of parts to be separately handled, and from the viewpoint of ease and fleixbility of installation.

A specific object is to meet the foregoing objects for a pressure-operated system, and at low cost.

Other objects and various further features of novelty and invention will be pointed out or will occur to those skilled in the art from a reading of the following specification in conjunction with the accompanying drawings. In said drawings, which show, for illustrative purposes only, a preferred form of the invention:

FIG. 1 is a simplified view in side elevation showing a fire extinguisher of the invention applied to a vehicle's engine compartment; and

FIG. 2 is an enlarged vertical sectional view through the body of a valve in the extinguisher of FIG. 1.

Briefly stated, the invention contemplates an automatic release mechanism for fire-extinguisher materials, operative upon detection of a given temperature condition at a localized region, as in the vicinity of the carburetor, for the case of protection against damage from a carburetor fire. Valve mechanism fits a standard extinguisher tank, and the valve is actuated by a closed liquified-gas detection system. Heat-response and the charged extent and condition of the overall installation may be readily observed and checked as frequently as desired, without discharging the system; also, the system can be easily recharged without parts replacement.

Referring to FIG. 1 of the drawings, the invention is shown in application to the engine compartment of a vehicle. The engine **10** includes a carburetor **11** and air cleaner **12**, and it is desired to automatically release extinguisher materials, such as foam, chemical or powder, upon detection of a flame temperature in the vicinity of carburetor **11**. Flame temperature is detected by a closed liquefied-gas system including a bulb **14** carried by suitable clamp means **1** on or adjacent the carburetor. Bulb **14** is connected by flexible conduit **16** to the cap **17** of a pressure-responsive actuator such as a diaphragm **18** (FIG. 2), for generating valve-actuating downward displacements as gas pressure increase with heat applied at **14**; the detecting system of bulb **14** may, for example, be filled with Freon. The valve has a body **19** secured to the mouth of a tank **20** for extinguisher materials. The entire assembly of tank **20**, valve body **19**, and cap **17** is carried by a snap-finger bracket **21** mounted on the fire wall **22** of the vehicle. Also carried by this assembly are pressure-indicator means **23** and a suitably elongated and configurated discharge conduit **24**, which is shown additionally, supported by a bracket **25** secured to the motor **10** near the discharge end.

The valve body **19** is shown elongated and tubular, having a through passage extending from a lower or tank-connection end, to an upper or actuator-connection end. This passage preferably comprises a smaller straight cylindrical bore **26** at the upper end and a larger straight cylindrical bore **27** at the lower end; a conical valve seat **28** joins bores **26–27** at an inner location. The flare of seat **28** is preferably in the range of 20° to 50° with respect to the bore axis.

At its lower end, body **19** is secured to the open mouth of tank **20** by threads **30** and sealed by an O-ring **31** carried in a peripheral groove at the reduced end of body **19**, the seal fit being within a smooth cylindrical counterbore **32** at the tank mouth. A tank-discharge pipe **33**, extending into the inner volume of tank **20** includes an upper-end bushing **34** threadedly engaged to the lower end of bore **27**.

An elongated valve stem **35** has an elongated upper cylindrical portion **36** in close (but not critically close) radial clearance with the upper bore **26**, so that this fact alone accounts for a degree of coaxial alignment of the stem **35**. An O-ring **37** is seated in a peripheral groove **38** near the lower end of stem portion **36**; the fit of O-ring **37** to the bore **26** is compressional, assuring a pressure seal when the extinguisher is operated. To maximize the area available for extinguisher discharge, the lower end **39** of valve stem **35** is of reduced diameter; at its lower end, it carries a conical valve member **40** having a peripheral groove **41** for the support of an O-ring **42**, in radial overlap with the flare of seat **28**. Seat engagement is sealed by O-ring compression, and the rigid remainder of valve member **40**, being also in radial overlap with seat **28**, serves as a positive stop against ejection of the valve stem, even under the strongest pressures.

Discharge means **24** is connected at **43** to body **19**, in communication with the upper bore **26**, and at a location intermediate the O-rings **37–42**. Finally, pressure indicator **23** is connected to body **19** at a port **44** which communicates with the larger bore **27**, i.e., below the O-ring **42**.

In order to set up our extinguisher for use, the tank **20** is first filled with the desired extinguisher materials. The valve body, including attached tank-discharge pipe **33**, is then secured and sealed to the tank mouth. Charging to requisite pressure is accomplished via line **24** or port **44**, and in FIG. 2 we show that the gage connection **45** may include a T fitting **46** and shut-off valve **47** for

the charging-pressure line **48**. Thus, to charge the system, compressed gas is admitted at **48**, with valve **47** in open position. To avoid premature initial exhaust, the head **50** may be lifted by hand in order to seat valve member **40–41**; alternatively, a relatively weak coil spring **51** will normally urge valve member **40–41** to closed position. Charging is complete upon indication of sufficient gage pressure at **23**. At this point, valve **47** is closed and the charging supply removed.

In case of an engine fire, usually around the carburetor, gas in bulb **14** will quickly respond to develop pressure under cap **17** and over diaphragm **18**. An actuator pin or button **52** is thus displaced into contact with the head **50** of the valve stem. Rising pressure soon (e.g., in five seconds after the fire starts) displaces the valve stem **35** to unseat member **40–41**. The pressurized gas in tank **20** then drives extinguisher material up pipe **33** to the discharge port **43** to the spray nozzle system. The short time delay, coupled with discharge in great volume in the fire region, combine to assure quick smothering action, and another vehicle is thereby saved from needless destruction.

It will be seen that we have provided an improved extinguisher system of elemental simplicity. Once triggered, the full contents of the extinguisher are rapidly discharged. The charged condition can always be observed at gage **23**, which need not involve a needle (quantitative data) but may be merely a simple "go or no-go" device such as a red indicator against a window, should pressure drop to an inadequate level.

As to heat-detector response, this can be periodically rechecked and calibrated by inserting a suitable tool through an access window **54** in the side of the base **55** which connects the diaphragm **18** and cap **17** to the valve body **19**. The axial clearance between actuator stem **52** and head **50** allows for insertion of a force-measuring tool, referenced on the base **55** (independently of head **50**) and tracking the diaphragm-urged displacement force in response to known heat inputs at bulb **14**.

Although the invention has been described in detail for the preferred form shown, it will be understood that modifications may be made without departing from the scope of the invention.

We claim:

1. In an automatic fire extinguisher, a tank for containing extinguishing material and having a threaded open mouth, an elongated valve body having a continuous through passage, said body being threadedly engaged at one end to the mouth of said tank to connect said passage to the interior of the tank, the bore of said passage at the tank-connection end being of larger cross-sectional area than the bore at the other end of said passage, said passage having a conic valve-seat region connecting the smaller and larger bores thereof, an elongated valve

stem reciprocable in the smaller bore of said passage, a head on said stem in axial clearance with the other end of said passage, a valve member on the other end of said stem and having a peripheral groove radially overlapping said conic region, a resilient O-ring seated in said groove and constituting the seat-engaging part of said valve member, said seat-engaging part being disengaged from said seat when said axial clearance is reduced, said stem having a second peripheral groove at a location intermediate said valve-member and head ends, a second resilient O-ring seated in said second groove under sealing compression against the adjacent wall of said passage, a spray-discharge port at the side of said body and communicating with said passage between the longitudinal locations of said O-rings, and heat-responsive mechanical-displacement actuator means carried at the head end of said body and including an actuating element axially moved into operative engagement with said head upon detection of a predetermined heat condition.

2. The extinguisher of claim **1**, in which an elongated tubular tank-discharge pipe is coupled to the tank-connection end of said body and extends into the interior volume of the tank.

3. The extinguisher of claim **1**, in which pressure-indicating means is carried by said body in communication with said passage between said valve-member O-ring and the tank-connection end of said body.

4. The extinguisher of claim **1**, in which said actuating element includes a pressure-responsive diaphragm, and an enclosed gas-filled system acting on said diaphragm; said system including a remote bulb for liquified gas, and a flexible conduit from said bulb to the actuating-pressure side of said diaphragm.

5. The extinguisher of claim **1**, in which the smaller and larger bores of said passage are straight cylindrical, the conic seat having a flare in the range of 20° to 50° with respect to the valve-stem axis.

6. The extinguisher of claim **1**, and including a spray head connected to said spray-discharge port.

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