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FIRE EXTINGUISHING APPARATUS

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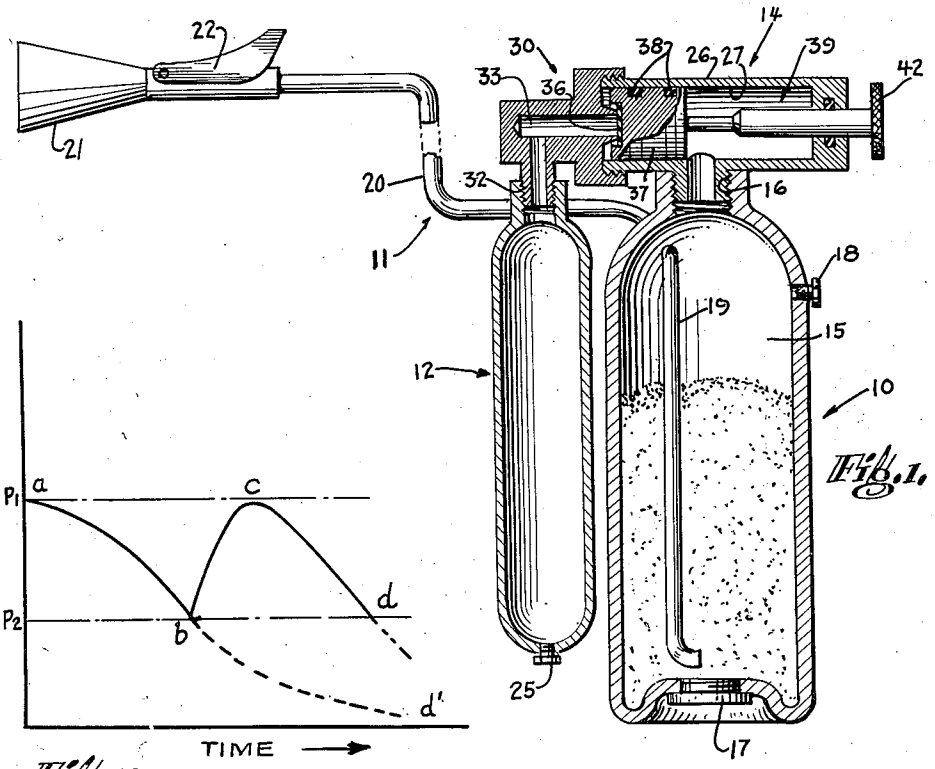


Fig. 1.

Fig. 3.

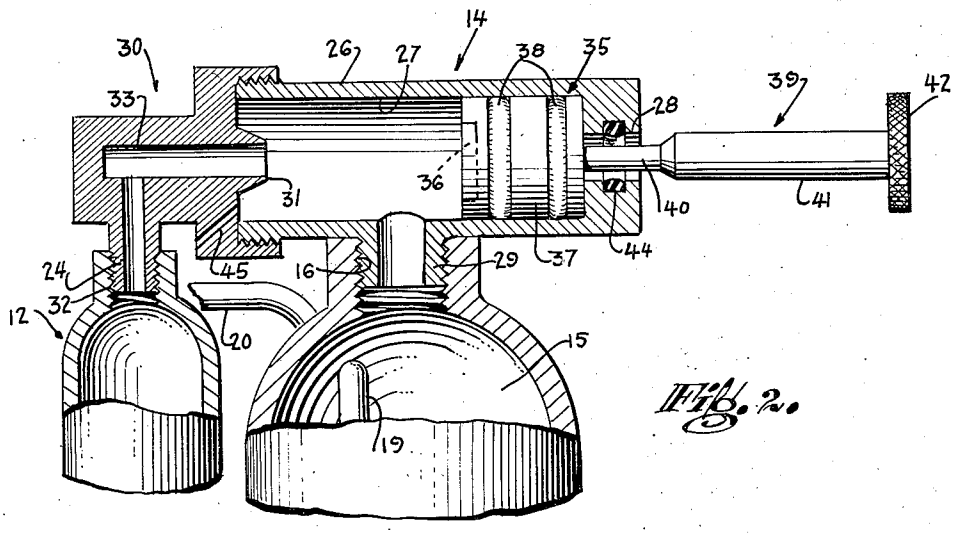


Fig. 2.

INVENTOR
Charles Anthony, Jr.
BY
Ernest A. Jorgensen
ATTORNEY

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FIRE EXTINGUISHING APPARATUS

Charles Anthony, Jr., East Orange, N. J., assignor to Specialties Development Corporation, Belleville, N. J., a corporation of New Jersey

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4 Claims. (Cl. 169—31)

The present invention relates to fire extinguishing apparatus, and, more particularly, to portable fire extinguishers containing an extinguishing agent adapted to be discharged therefrom as a fluid stream by gas, under pressure, confined in the extinguisher.

When such extinguishers are discharged, the pressure of the gas declines as it expands into the space provided by the expelled agent and is less effective to force out the agent, whereby the range of the stream is shortened considerably as the extinguisher is nearly empty.

In the extinguishment of fires, particularly burning liquids such as gasoline, it has been found that the initial discharge of the extinguisher tends to drive the fire back to a relatively confined area. If, due to local conditions, the operator is unable to physically advance on the fire, as the stream loses range, to complete extinguishment thereof, the fire will linger and subsequently flash back, particularly as the agent and/or gaseous propellant is nearly exhausted.

In order to overcome the foregoing difficulty, it has been proposed to provide a larger quantity of gaseous propellant by confining the same at a much higher initial pressure, but this resulted in the gas forcing its way through the agent to the atmosphere during the stages of initial discharge, particularly in the case of dry powder agents, whereby the remaining gas was no more effective near the end of discharge than the gas originally confined at a lower pressure. Another objection to confining the gaseous propellant at much higher pressures is that the extinguisher must be stronger and thus is much heavier.

Accordingly, an object of the present invention is to provide an extinguisher of the type described which is not subject to the foregoing difficulties and hence is more effective.

Another object is to provide such an extinguisher which has sufficient range to knock down the fire and extinguish the same after it has been driven back.

Another object is to accomplish the foregoing in a simple and economical manner without materially increasing the weight of the extinguisher.

Another object is to provide means for accomplishing the foregoing which may be operated manually and/or automatically.

A further object is to provide a novel method of extinguishing fire.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the present invention, the foregoing objects generally are accomplished by causing the confined gaseous propellant to effect initial discharge of the agent from its storage receptacle, and, after a predetermined reduction of the pressure in the extinguisher, preferably, to a predetermined value, supplying an additional quantity of gaseous propellant, whereby the stream gains range and is effective to knock down the fire in the later stages of discharge of the agent.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawing, forming a part of the specification, wherein:

Fig. 1 is a schematic, longitudinal sectional view of an extinguisher, in accordance with the present invention, illustrating the same in its charged condition.

Fig. 2 is an enlarged fragmentary longitudinal sectional view of the upper portion of the extinguisher, illustrating the same in the latter stage of discharge.

Fig. 3 is a graph illustrating the pressure within the extinguisher during the discharge thereof.

Referring to Figs. 1 and 2 of the drawing in detail, there is shown a fire extinguisher which essentially comprises a receptacle or container **10** for confining a fire extinguishing agent and gas under pressure, discharge means **11** for the container, an auxiliary container **12** for confining compressed gas and fluid flow connection means **14** between the containers **10** and **12**.

As shown in Fig. 1, the container **10** has a cylindrical chamber **15** provided with an internally threaded neck **16** at its upper end and a filling opening at the bottom thereof closed by a plug **17** threadedly secured therein. Suitable means **18** are provided near the neck **16** for pressurizing the chamber **15**.

The discharge means **11** includes a syphon tube **19** extending upwardly from near the bottom of the chamber **15** and through the side of the chamber near the upper end thereof, a flexible discharge hose **20** connected to the syphon tube and a discharge shield **21** having a discharge control valve **22**.

The auxiliary container **12** has an internally threaded neck **24** at its upper end and suitable means **25** at its lower end for charging the chamber provided by the container **12** with compressed gas.

As best shown in Fig. 2, the fluid flow connecting means **14** comprises a body **26** having a piston bore **27**, an aperture **28** at one end concentric with the bore and a threaded nipple **29** intermediate its ends which is secured into the neck **16** of the container **10** to provide a fluid flow connection between the chamber **15** and the bore **27**. A cap **30** is threadedly secured to the other end of the body **26** which has a raised seat **31** facing the bore **27** and a threaded nipple **32** secured into the neck **24** of the auxiliary container **12**. A passageway **33** extends from the seat **31** to the nipple to provide a fluid flow connection between the container **12** and the bore **27**. A piston **35** is slidably positioned in the bore **27** which has a seal **36** for engaging the seat **31** to close the passageway **33**, a head **37** provided with gasket means **38** and a piston rod **39** connected to the head. The piston rod has a section **40** of reduced diameter adjacent the head **37**, a section **41** of larger diameter which extends through the aperture **28**, and a knob **42** at the outer end of the section **41** for manually operating the piston. A gasket **44** provides a pressure tight seal between the aperture **28** and the rod section **41**.

The container **10** is filled to the desired level with an extinguishing agent and is pressurized while the seal **36** is firmly seated on the seat **31** as shown in Fig. 1. The auxiliary container **12** is then pressurized and the extinguisher is ready for discharge. The piston **35** is retained in this sealing position because the area thereof acted on by the pressure within the container **10** is much greater than the area thereof acted on by the pressure within the container **12**. As a safety precaution, against gas which might leak between the seat **31** and the seal **36** and build up a pressure on this side of the piston capable of moving it out of its sealing position, a very small bleed

port 45 extends from adjacent the seat 31 to the exterior of the cap.

In operation, the discharge shield 21 is directed to the base of the fire and the valve 22 is opened. As the fire has been driven back to a restricted zone and the discharge pressure starts to decline in the container 10, the piston 35 may be manually withdrawn by means of the knob 42 to unclose the passageway 33 and allow gas in the auxiliary countainer to enter the chamber 15 and complete discharge of the agent at a bolstered pressure. When the piston is so retracted, the section 40 of reduced diameter is positioned within the aperture 28, as shown in Fig. 2, to place the bore 27 in communication with the atmosphere whereby pressure cannot build up in back of the piston.

If desired, the diameters of the bore 27, the passageway 33 and the rod section may be so proportioned with respect to the pressures initially in the containers 10 and 12 to cause an automatic release of the gas in the auxiliary container when the pressure within the chamber 15 has declined to a predetermined value.

In Fig. 3, a typical pressure condition within the chamber 15 during the discharge period is illustrated graphically. Initially, the pressure has a value of P1 as represented by the point *a*, and upon discharge of the extinguisher, this pressure declines to a value of P2, as represented by the point *b*. The pressure drop from *a* to *b* usually takes place in about half the time required to discharge the extinguisher completely. At the point *b*, the stream of fire extinguishing agent commences to lose range and effectiveness and it is at this point that the pressure within the chamber is boosted by either manual or automatic operation of the piston, whereupon the pressure is restored to a value closely approaching P1, as represented by the point *c*, before it again declines to a value of about P2 as represented by the point *d*. Thus, in the latter stages of discharge, the stream has a range and force which is effective to knock down the "cornered" fire, the pressure at the point *d* when the extinguisher is emptied being almost as great as at the point *b* which exists when the extinguisher is about half empty.

In the event the pressure is not boosted as in the past, it declines from the point *b* to the point *d'*, as represented by the broken line, and is completely ineffective to knock down the fire near the end of discharge.

From the foregoing description, it will be seen that the present invention provides a novel and highly effective manner of extinguishing flammable liquids which assures extinguishment of the fire without the requirement of great skill on the part of the operator.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. In a fire extinguisher, the combination of a receptacle having a normally closed discharge outlet, a given quantity of a non-gaseous fire extinguishing fluid confined in said receptacle, a gas confined in said receptacle in a quantity and at a pressure to effectively expel approximately one half of said fluid upon opening of said discharge outlet and which gas after such discharge is reduced to a pressure incapable of effectively expelling the remainder of said fluid, a container having an outlet, a gas entirely in gaseous state confined in said container in a quantity and at a pressure to effectively expel the remainder of said fluid, a fluid flow connection between said container outlet and the interior of said receptacle, and valve means in said fluid flow connection constructed and arranged for fully closing said fluid flow connection while said gas in said receptacle is at a pressure to effectively expel said fluid and for fully opening said fluid flow connection when said gas in said receptacle is reduced to a pressure incapable of expelling said fluid, whereby said gas in said container enters said receptacle and boosts the pressure therein to a value and for a duration of time to effectively expel the remainder of said fluid.

2. A fire extinguisher according to claim 1, wherein said valve means include a cylinder and a freely movable piston serving as a valve member.

3. A fire extinguisher according to claim 2, wherein a manually operable member is provided for moving said valve member from one position to another.

4. A fire extinguisher according to claim 2, wherein said cylinder communicates with said container at one end thereof and with said receptacle intermediate the ends thereof.

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