

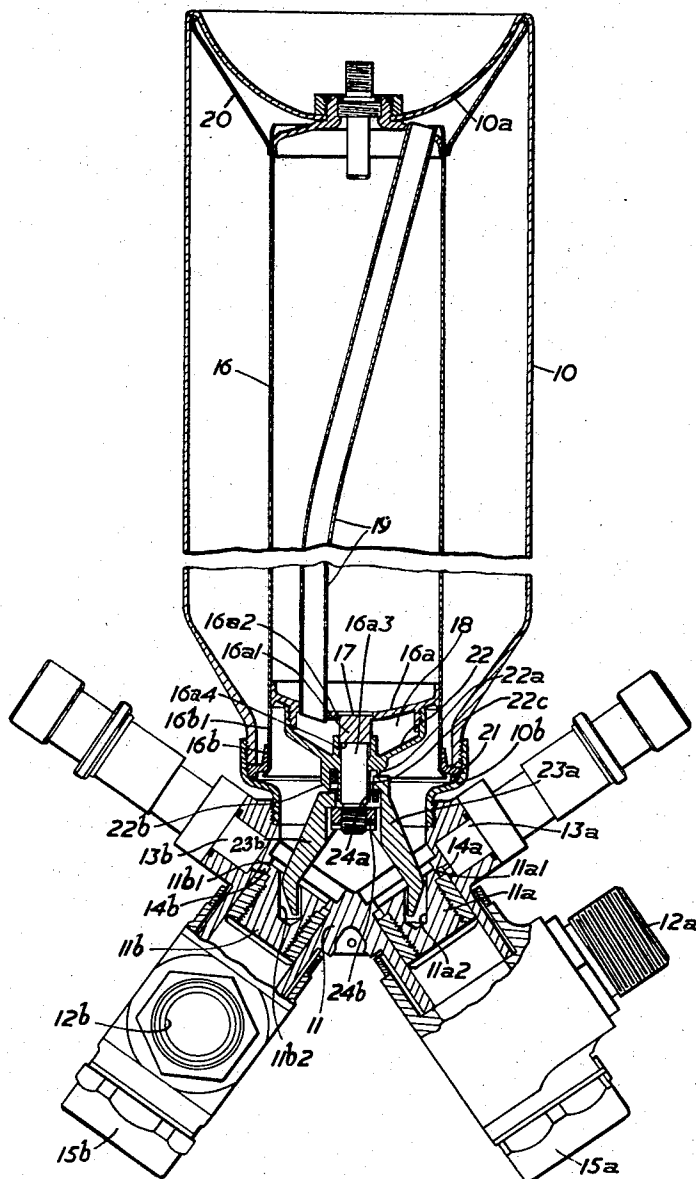
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FLUID CONTAINERS

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FLUID CONTAINERS

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This invention relates to fluid containers. The invention relates particularly, although not exclusively, to devices for containing liquids adapted to extinguish fires or suppress explosions, the devices being of the kind in which a pressurized gas is used to effect ejection of the liquid.

In the specification of United States Patent No. 2,795,282 is described fluid containers of the above kind in which the pressurized gas is kept out of contact with the liquid prior to the time when discharge is required. The present invention relates to fluid containers operating on the same principle and has for its object to provide fluid containers having the under-noted advantages over those known previously.

According to the present invention there is provided a liquid container of the kind in which a pressurized gas is used to effect ejection of the liquid, comprising a reservoir for the liquid having a normally sealed liquid discharge outlet, a reservoir for the gas which is substantially wholly contained within the liquid reservoir, said gas reservoir having a normally sealed gas outlet adapted when opened to place the gas reservoir in communication with the interior of said liquid reservoir, and means for substantially simultaneously unsealing both said liquid discharge outlet and said gas outlet whereby said pressurized gas is freed to effect ejection of liquid from said liquid reservoir through said liquid discharge outlet.

One construction of fluid container in accordance with the present invention, and designed to contain fire extinguishing liquid, will now be described by way of example only with reference to the accompanying drawing which shows a part-sectional side elevation of the container.

The container has a cylindrical wall 10 with a discharge head 11 at one end provided with two discharge orifices 12a, 12b. The outlet to the orifices 12a, 12b are normally sealed by stopper members 11a, 11b respectively which are formed integrally with the discharge head 11 and are connected thereto by thin frangible webs 11a1, 11b1 respectively. Removable electrically-fire explosive charges 13a, 13b are secured in the discharge head 11 and the explosive force resulting from ignition of the charges enters the spaces 14a, 14b respectively and acts upon the stopper members 11a, 11b respectively urging the respective stopper member downwards towards its associated discharge orifice 12a, 12b and severing the frangible web 11a1, 11b1. The stopper members 11a, 11b are driven by the explosive force into cup portions 15a, 15b respectively so that the liquid can pass out freely through the associated discharge orifice 12a, 12b. It will be understood that normally only one or other of the charges 13a, 13b will be fired depending upon whether it is desired to discharge the liquid through orifice 12a or orifice 12b.

The pressurized gas used to effect ejection of the liquid is contained in a gas reservoir 16 which has the form of an elongated cylinder with its longitudinal axis coaxial with that of the liquid reservoir. The liquid is contained mainly in the annular space between the outer surface of

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the wall of the gas reservoir 16 and the cylindrical wall 10. This construction permits a normally sealed outlet 17 from the gas reservoir and the liquid reservoir to be located at the discharge orifice end of the container, thereby simplifying the form of the mechanism by which this gas outlet 16 is opened and the stopper members 11a, 11b fractured by firing of one or other of the explosive charges 13a, 13b.

A small chamber 18 is provided adjacent that end of the gas reservoir 16 which contains the gas outlet 17, and this chamber 18 is connected by a gas transfer tube 19 to the exterior of the gas reservoir 16 at the opposite end thereof. Adjacent this end of the gas reservoir a piston 20 is located so that when the gas is freed by opening of the outlet 17 it can pass via the chamber 18 and transfer tube 19 and act on one side of the piston 20 to propel the piston 20 towards the discharge head 11 and thereby eject the liquid from the annular space within the wall 10 and out through the selected one of the discharge orifices 12a, 12b.

The tube forming the cylindrical wall of the gas reservoir 16 has an extension 16b beyond the end wall 16a by which this end of the gas reservoir 16 is supported by a collar 21 secured to the container wall 10 and a neck-piece 10b which in turn supports the discharge head 11. Ports 16b1 are provided in the extension 16b so that when the piston 20 reaches the end of its travel the gas behind the piston can escape through the ports to drive out the remaining liquid in the discharge head and drive the liquid down any pipes attached to the discharge orifices 12a, 12b.

The means for sealing the gas outlet 17 comprises a plug 16a1 formed integrally with the corresponding end wall 16a of the gas reservoir 16 and connected thereto by a thin frangible web 16a2 similar to that used for the stopper members 11a, 11b. The plug 16a1 has a spigot portion 16a3 of reduced diameter which can slide in a sleeve 22c extending outwardly from the wall of a sealing cap 22 which together with the end wall 16a of the gas reservoir 16 constitutes the walls of the gas chamber 18. The frangible web 16a2 of the gas sealing plug 16a1 is fractured by movement of one or other of two levers 23a, 23b, one lever being provided for each liquid discharge orifice. One end of each lever 23a, 23b fits in a blind hole 11a2, 11b2 in the associated liquid stopper member 11a, 11b. The axis of each hole 11a2, 11b2 is inclined at an angle, for example of the order of 30 to 35 degrees, to that of the axis of the liquid stopper member 11a, 11b, respectively. When the liquid stopper member 11a or 11b moves outwards on the firing of the explosive charge 13a or 13b it acts as a wedge cam on the lever 23a or 23b which rocks on a fulcrum 22a or 22b suitably located on the sealing cap 22, the levers 23a, 23b being so shaped as to pull against a nut 24a or 24b provided on the end of the spigot 16a3, thereby fracturing the frangible web 16a2. The gas plug 16a1 travels outwardly owing to its momentum and/or the pressure of the gas in the reservoir, but is brought to a stop by the shoulder 16a4 formed between the stopper 16a1 and the spigot 16a3 contacting the end of the sleeve 22c.

If there are more than two liquid discharge orifices a corresponding number of levers will be provided one above the other, each operated by one of the liquid stoppers, whilst only one lever will be required if there is only a single discharge orifice. When the lower lever 23b is actuated the end clearance of the tip of the upper lever 23a in the hole 11a2 of the liquid stopper 11a which has not been acted upon allows sufficient travel for the web 16a2 to be fractured. The sleeve 22c in which the spigot 16a3 travels prevents the tilting levers jamming the spigot before it has travelled to its full extent. A spring washer under the lower lever prevents

movement of the levers prior to firing of the explosive charge.

The piston 20, which may be of sheet metal or a plastic, for example polytetrafluoroethylene, may be provided with weak lugs (not shown) which hold it in position prior to operation, these lugs being readily deformed when the gas pressure is applied to the piston.

In order to ensure discharge of the maximum possible amount of liquid in the container, the end wall 10a of the container adjacent which the piston 20 lies prior to operation is so shaped that there is a minimum volume between the piston 20 and this wall 10a, and as shown may be a re-entrant form of roughly corresponding shape to that of the piston 20. Because of the appreciable diameter of the gas reservoir the piston 20 will have a relatively large bore which facilitates its passage through the neck of the container during assembly.

A Schrader type valve extends through the end wall 10a and the adjacent wall of the gas reservoir to enable the gas reservoir to be filled and to enable the pressure to be checked during service.

An important feature of containers in accordance with the invention is that as the gas reservoir is virtually surrounded by liquid the pressure on the walls 16 of the gas reservoir will only be the difference between the gas pressure and the vapour pressure of the fluid contents of the liquid reservoir, and the gas reservoir can be designed accordingly with walls less strong and therefore less weighty than would be necessary to withstand the full gas pressure.

In an alternative arrangement instead of the plug 16a1 being drawn out it is pushed inwards to fracture the web 16a2. To achieve this the levers are modified so that movement of the stopper members 11a, 11b causes inward movement of the ends of the levers adjacent the plug 16a1 which produces the desired inward movement of the plug 16a1. Suitable cam faces may be provided on the end of the levers and/or the plug 16a1 to achieve this.

I claim:

1. A fire extinguisher comprising a reservoir for extinguishing liquid, said liquid reservoir having a liquid discharge outlet at one end of said reservoir, a frangible member sealing said liquid discharge outlet, a gas reservoir, said gas reservoir being mounted entirely within the interior of said liquid reservoir with one end of said gas reservoir adjacent one end of said liquid reservoir and with the other end of said gas reservoir adjacent the other end of said liquid reservoir, a further frangible member sealing the interior of said gas reservoir from the interior of the liquid reservoir, an explosive charge, said explosive charge having electrical igniting means for igniting said explosive charge to produce an explosive force part of which is utilised to fracture said frangible member, means for utilising at least a further part of said explosive force for fracturing said further frangible member, a moving piston mounted in said liquid reservoir at the opposite end of said reservoir to said liquid discharge outlet, said movable piston having an inner periphery contacting the outer surface of said gas reservoir and an outer periphery contacting the inner surface of said liquid reservoir, and a tube extending through the interior of said gas reservoir for conveying gas discharged from said gas reservoir to the side of said piston further from said liquid discharge outlet, one end of said tube terminating outside said gas reservoir adjacent said further frangible member and the other end of said tube terminating outside said gas reservoir on the side of said piston further from said liquid discharge outlet, whereby when said further frangible member is fractured the gas released from said gas reservoir moves said piston along said liquid reservoir to eject the extinguishing liquid through said discharge outlet.

2. A liquid container comprising a liquid reservoir, said liquid reservoir having a wall of elongated cylindrical shape and having a liquid discharge outlet at one end of said container, frangible means sealing said discharge outlet, an electrically ignitable explosive charge for fracturing said frangible means to unseal said discharge outlet, a gas reservoir, said gas reservoir being of similar shape to said liquid reservoir but of smaller dimensions and being housed entirely within said liquid reservoir with its longitudinal axis coaxial with the longitudinal axis of said liquid reservoir, said gas reservoir having a gas outlet located at the same end of the container as the liquid discharge outlet, further frangible means sealing the gas reservoir outlet, means operable by said explosive charge for fracturing said further frangible means upon ignition of said explosive charge, a piston movable along the annular space between the gas reservoir and the wall of the liquid reservoir and normally located at the opposite end of said container to said liquid outlet, and a tube extending through the interior of said gas reservoir, one end of said tube terminating outside said gas reservoir adjacent said gas outlet and the other end of said tube terminating outside said gas reservoir on the side of said piston further from said liquid outlet whereby gas released from said gas reservoir as a result of said explosive charge acts on the piston to move the piston along said annular space and thereby eject liquid through said liquid discharge outlet.

3. A liquid container comprising a liquid reservoir, said liquid reservoir having first and second discharge outlets, first and second stopper members sealing said first and second discharge outlets respectively, each of said stopper members having a frangible portion which is fractured to release the respective stopper member and unseal the respective liquid outlet, a gas reservoir for containing pressurised gas used to effect ejection of the liquid, said gas reservoir being located wholly within the interior of said liquid reservoir, a frangible member sealing said gas reservoir from the interior of said liquid reservoir, first and second explosive charges, said first and second explosive charges having electrical igniting means and being mounted in proximity to said first and second stopper members respectively for fracturing the frangible portion thereof by the explosive force generated upon ignition of the respective charge to unseal the respective liquid discharge outlet, a first pivotable lever one end of which engages said frangible member for fracturing said frangible member when said first lever pivots by a predetermined amount, the other end of said first lever being located adjacent said first stopper member, said first lever being pivoted by said predetermined amount when said first stopper member is released by fracture of its frangible portion, and a second pivotable lever one end of which engages said frangible member for fracturing said frangible member when said second lever pivots by a predetermined amount, the other end of said second lever being located adjacent said second stopper member, said second lever being pivoted by said predetermined amount when said second stopper member is released by fracture of its frangible portion.

4. A liquid container comprising a liquid reservoir, said liquid reservoir having a discharge outlet, a stopper member sealing said liquid discharge outlet, said stopper member having a frangible portion which is fractured to release said stopper member and unseal said liquid outlet, a gas reservoir for containing pressurised gas used to effect ejection of the liquid, said gas reservoir being located wholly within the interior of said liquid reservoir, a frangible member sealing said gas reservoir from the interior of said liquid reservoir, an explosive charge, said explosive charge having electrical igniting means and being mounted in proximity to said stopper member for fracturing said frangible portion by the explosive force generated upon ignition of said charge to unseal said

liquid discharge outlet, and a pivotable lever one end of which is located adjacent said frangible member for fracturing said frangible member when said lever pivots by a predetermined amount, the other end of said lever being located adjacent said stopper, said lever being pivoted by said predetermined amount when said stopper is released by fracture of said frangible portion.

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