

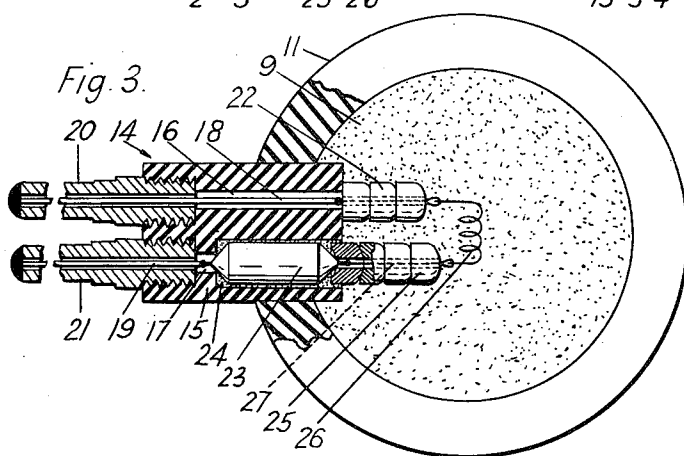
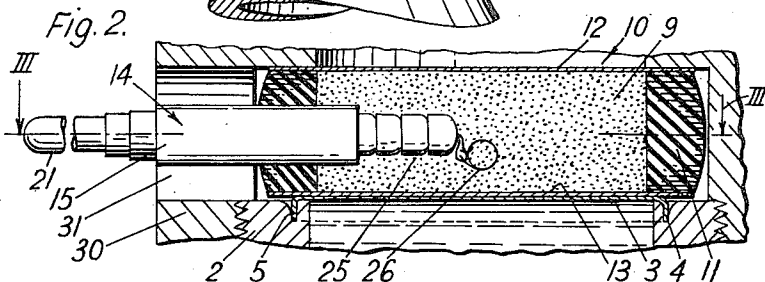
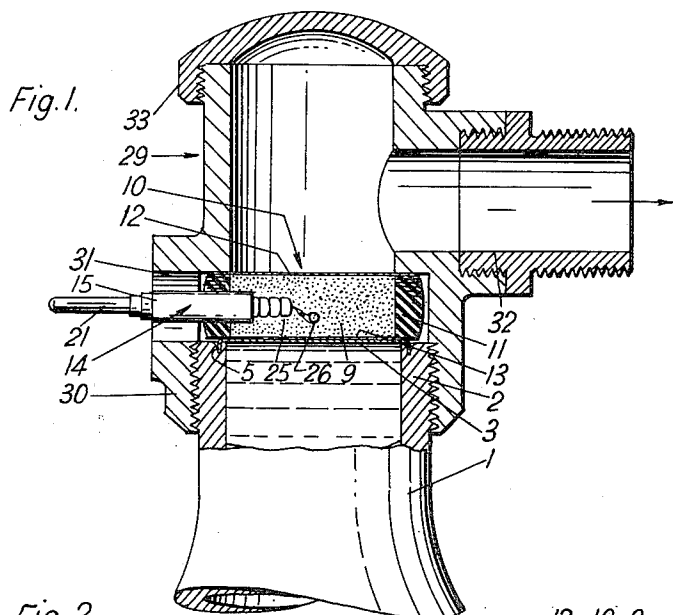
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MEANS FOR THE RELEASE OF COMPRESSED
FLUIDS FROM CONTAINERS

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2 Sheets-Sheet 1



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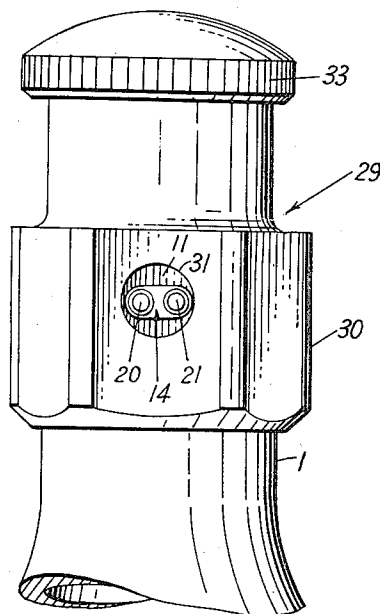
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Fig. 4.



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MEANS FOR THE RELEASE OF COMPRESSED FLUIDS FROM CONTAINERS

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12 Claims. (Cl. 220—89)

This invention relates broadly to means for the release of compressed fluids from containers.

For fire-extinguishing and other purposes fluids stored in containers under high pressures must sometimes be released by remote control. In fire-extinguishing apparatus used in airplanes, to which the invention is particularly applicable, it is often desirable to use an extinguishing fluid under a very high pressure. Now containers are commonly sealed by frangible diaphragms and if these are to resist high pressures they must be strong. To break them, therefore, requires considerable force. In an airplane, however, the discharge is commonly initiated electrically under remote control, and the amount of energy which can be transmitted is so small that it is unable to break a large diaphragm and in particular is unable to make a fairly large hole of the kind required if the extinguishing fluid is a liquid, e. g. methyl bromide, which must be rapidly ejected as a jet. What is required is an apparatus which can be operated by a small current in a very short time (a small fraction of a second) and which is free from corrosion and stable throughout a wide temperature range.

It is an object of this invention to provide improved means for releasing a compressed fluid by small electrical impulses.

Another object of the invention is to enable a sealing diaphragm to be melted or burnt with great speed to release a compressed fluid.

A further object is to provide an easily replaceable and self-contained device for releasing a compressed fluid from a fire extinguisher.

Other objects will appear hereinafter.

In the invention the sealing diaphragm of a container for compressed fluid is melted or even burnt away by the heat generated by the exothermic reaction of a chemical charge in direct or indirect contact with the diaphragm. The charge used in the invention acts entirely by generating heat, as distinguished from an explosive charge, which may rupture a diaphragm but which tends to damage parts of the apparatus other than the diaphragm, is unstable at high temperatures and has only a limited life in which it can be guaranteed to operate. In addition, any remnants of the diaphragm tend to obstruct the escape of the extinguishing fluid. The charge used in the invention does not depend upon the evolution of gas as an explosive charge does, but upon the high temperature attained upon its ignition. Furthermore the ash or residue resulting from the burning of the diaphragm, being brittle, is easily swept aside by the flow of extinguishing liquid fluid.

The invention will be described in detail in its application to a fire extinguisher with reference to the accompanying drawings in which:

Figure 1 shows the head of the fire extinguisher in longitudinal section;

Figure 2 shows the diaphragm and the chemical charge on a larger scale;

Figure 3 is a section on the line III—III in Figure 2; and

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Figure 4 is an elevation taken from the left of Figure 1.

The apparatus shown is part of a fire extinguisher containing methyl bromide under substantial pressure, e. g. 250 lbs. per square inch. The methyl bromide is kept in a container 1 and is pressurised in conventional manner through the lower end of the container. At its upper end the container has a neck 2 sealed by a diaphragm 3, the edge of which is bent to form a flange 4. This flange 4 is soldered into an annular groove 5 in the end of the neck 2.

The chemical charge 9 is in a casing 10 composed of a ring 11 preferably made of laminated fabric bonded by a synthetic resin and to which upper and lower discs 12 and 13 are cemented by a synthetic resin cement. The diaphragm 3 consists of a copper-base alloy and is 0.004 inch thick. The upper disc 12 consists of the same alloy and is 0.008 inch thick. The lower disc 13 consists of copper and is 0.002 inch thick.

An ignitor assembly 14 is cemented into a hole in the ring 11 and comprises an insulating block 15 bored at 16 and 17 to receive flexible electric wires 18 and 19, the ends of the wires being soldered into hollow connector pins 20 and 21 screwed into enlarged parts of the bores 16 and 17. The wire 18 projects into the charge 9 and constitutes a flexible electrode to which one end of an ignitor wire 26 is connected. The wire 19 is connected to a resistance 23 which is cemented in an enlarged part 24 of the bore 17, and this in turn is connected to a wire 27 constituting a further flexible electrode connected to the other end of the wire 26. This wire 26 is made of an 80% nickel 20% chromium alloy, 0.0032 inch thick, having a resistance of, say, 4 ohms. Being carried by the two flexible wires 18 and 27 it is centrally located in the charge 9 and yet is free to move with the bulk of the charge both during the filling of the casing 10 and under any changes in pressure in the charge, brought about for instance by distortion of the diaphragm 3 under the internal pressure on the container 1. To prevent any short-circuiting, insulating beads 22 and 25 are threaded over the wires 18 and 27 respectively. The outer end bead 27 enters the end of the bore part 24, so that powder is substantially prevented from entering this part.

The connector pins 20 and 21 are inserted into a socket connected to an electric battery, say of 32 volts. On closing the circuit a current will flow through the ignitor wire 26 and will lead to instantaneous ignition of the charge. The presence of the resistance 23 which is of about the same resistance as the ignitor wire 26, is valuable in preventing short-circuiting after ignition.

It will be seen that the casing 10 and ignitor assembly 14 form a self-contained unit which is put as such into the fire-extinguisher. This is useful in that it allows the unit to be put in position or changed if required without releasing the pressure in the container 1.

The casing 10 is held in close contact with the diaphragm 3 by a head member 29 which has a threaded skirt 30 screwing over the end of the neck 2, which is threaded externally. An opening 31 is made in the head member 29 to accommodate that part of the ignitor assembly 14 which projects out from the ring 11, and before the head member is screwed on the neck the casing is introduced into the head member through the interior of the skirt 30, the pins being passed into and through the opening 31. The head member 29 with the ignitor assembly 14 within it is then screwed over the neck 2.

When the charge 9 is ignited, great heat is generated very rapidly. This heat has little effect on the relatively heavy ring 11 before it melts or burns away the discs 12 and 13 and the diaphragm 3. It is found in practice that a clean opening 1 inch in diameter can be made, that is to say, substantially the whole of the seal formed by the diaphragm 3, is destroyed, in an extremely short space

of time. The discs 12 and 13 are also burnt away, thus leaving a clear passage for the escape of the extinguishing fluid to a lateral discharge outlet 32 to which any conventional hose connector or the like may be connected. Alternatively, by removing a cap 33 on the head member 29 and closing the outlet 32 the fluid can be projected axially.

The disc 12 which forms the outer wall of the casing 10 should be at least as resistant to the heat generated as in the diaphragm 3 itself in order to ensure that the disc is not burnt away with complete escape of the reacting charge 9 before the diaphragm itself is melted or burnt. This desired result is obtained by the use of the disc and diaphragm thicknesses given above.

Since the charge should have the property of generating heat without any substantial evolution of gas, it may be any of the mixtures of metal powder and a material containing available oxygen which possesses this property. Preferably it is aluminium powder and barium peroxide, which should be in the ratio of 5:2 by weight to insure total combustion. In such a mixture reaction causes aluminium oxide to be formed. The heat of formation of this material is very large. The charge 9 should have high bulk density and be closely confined within the casing 10 in order to provide the maximum available heat energy in the available space. To obtain high bulk density the powder may be prepared as a paste with a volatile solvent, which is removed by drying.

In the preferred way of making the powder charge and filling the casing 10, 50 gm. of barium peroxide and 20 gm. of flake aluminium are mixed to a stiff paste with white spirit. Although the paste is stiff, flow takes place when a quantity is placed in the casing and shaken by tapping, so that the casing is uniformly filled. The casing is over-filled to allow for slight shrinkage on drying, dried for an hour at 90-100° C. and then for an hour at 150° C. before levelling the charge and closing the casing by the disc 12. This method of charging the casing is advantageous because no pressure need be applied to the charge. Any such pressure would be liable to damage the ignitor 26.

Many variations and modifications of this apparatus shown are possible and will be apparent to those skilled in the art. For example, the chemical charge may be put in direct contact with the diaphragm in the event that it is not desired to incorporate it on a self-contained casing. Again, the charge need not be homogeneous, but rather the ignitor element may be surrounded by a small quantity of powder having a lower ignition temperature than the remainder of the charge.

We claim:

1. A container for fluid under pressure comprising a container body having an outlet, closure means for the outlet, ignition means, and chemical heat producing means in juxtaposition to the closing means and adapted to be ignited by the ignition means, whereby heat is produced opening the closure means for the release of the fluid.

2. The container of claim 1 in which the heat producing means is in direct contact with the closure means.

3. The container of claim 1 in which the heat producing means is in indirect contact with the closure means.

4. The container of claim 1 in which the igniting means includes an electrical resistance embedded in the heat producing means.

5. The container of claim 1 in which a casing is provided for the heat producing means, and the closure means is a diaphragm, the casing including an inner wall in contact with the diaphragm, and an outer wall for the casing, the outer wall at least as resistant to heat as the diaphragm.

6. The container of claim 1 in which the chemical heat producing means comprises a mixture of barium peroxide, and aluminium powder.

7. A container for fluid under pressure comprising a container body having an outlet, a diaphragm closing the outlet, a casing resting on the diaphragm, a chemical charge stored in the casing operative upon ignition to produce heat, the casing including an outer wall and an inner wall in contact with the diaphragm, the casing wall in contact with the diaphragm being less resistant to heat than the diaphragm and the outer casing wall being at least as resistant to heat as the diaphragm, and an electrical resistance embedded in the chemical charge forming an ignitor for the ignition of the chemical charge.

8. The container of claim 7 in which the casing and the ignitor are a unitary assembly, and a discharge head is provided to retain the assembly in position.

9. The container of claim 8 in which is included an ignitor resistance, and insulated flexible leads for the resistance are included in the ignitor assembly.

10. A unitary assembly for use in melting a sealing diaphragm for a container for fluid under pressure, the assembly comprising a casing including side walls of one thickness, and discs forming opposed major faces for the casing, the discs of lesser thickness than that of the side walls, an exothermic charge in the casing, and an ignitor assembly built into the casing and including an ignitor element embedded in the exothermic charge.

11. The unitary assembly of claim 10 in which is included a resistance externally located with respect to the charge for limiting current flow after ignition of the charge.

12. The unitary assembly of claim 10 in which is included contact pins projecting outwardly from the casing, and ignitor wires connecting the contact pins to the ignitor element.

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