Jan. 21, 1936. R. F. DAGNALL ET AL 2,028,651

RELEASE MECHANISM FOR PRESSURE FLUID CONTAINERS

Filed June 18, 1934 2 Sheets-Sheet 1

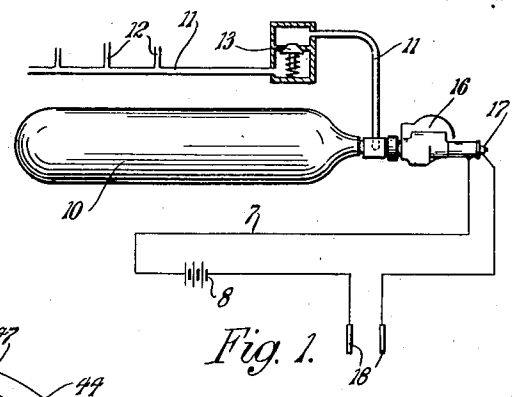



Fig. 1.




Fig. 2.




Fig. 5.

Reginald Foster Dagnall and
James Graham Lambert
Inventors
By Wm. Lee Lamb & Co.
Attys

Jan. 21, 1936. R. F. DAGNALL ET AL 2,028,651

RELEASE MECHANISM FOR PRESSURE FLUID CONTAINERS

Filed June 18, 1934 2 Sheets-Sheet 2

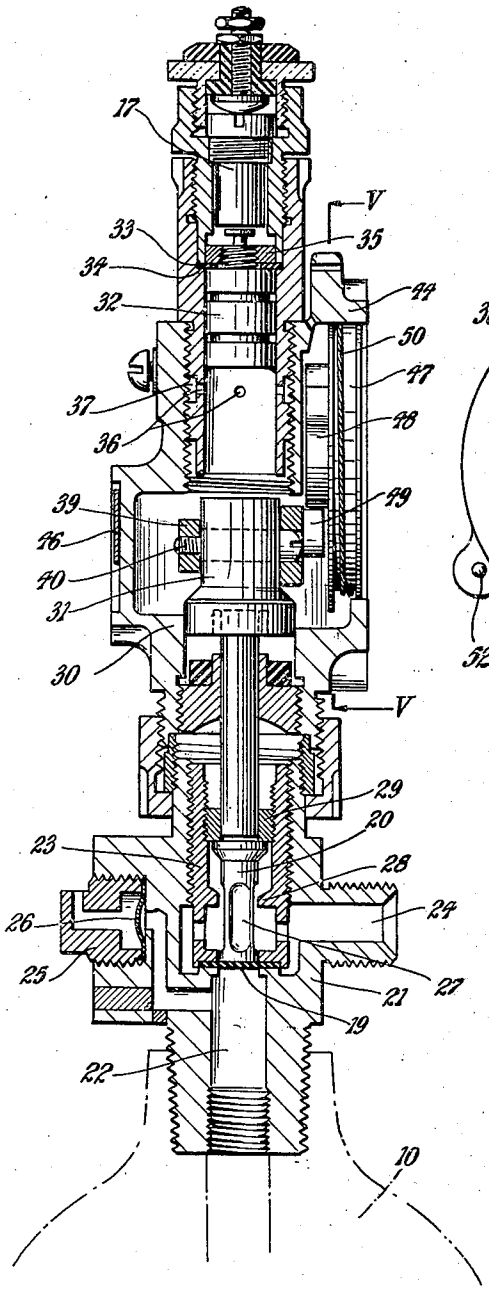



Fig. 3.

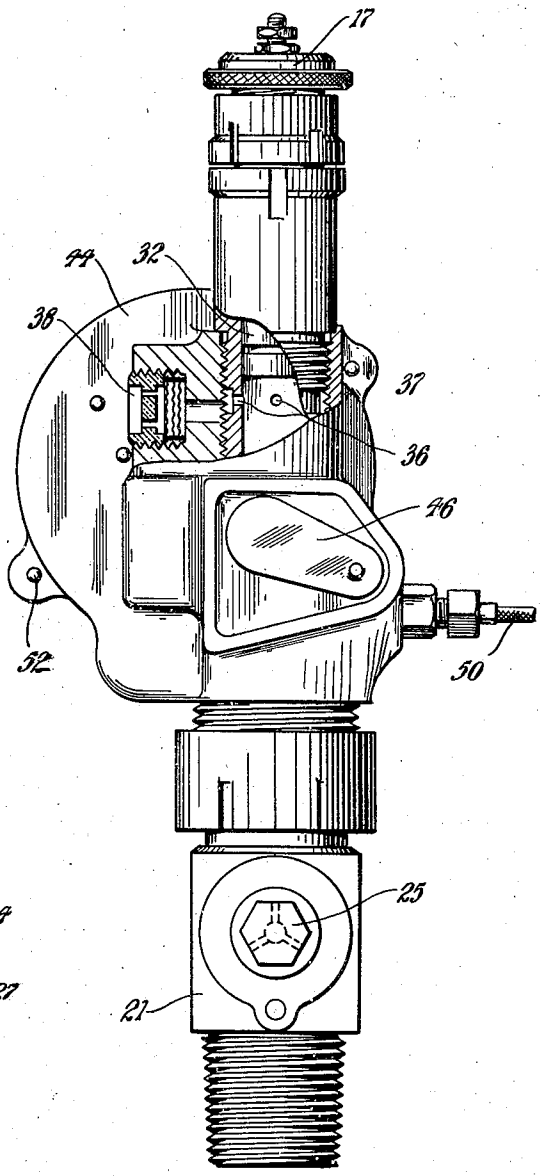



Fig. 4.

Reginald Foster Dagnall and
James Graham Lambert
Inventors
By Wm. Le Lamb
Atty

Patented Jan. 21, 1936 2,028,651

# UNITED STATES PATENT OFFICE

2,028,651

## RELEASE MECHANISM FOR PRESSURE FLUID CONTAINERS

Reginald Foster Dagnall, Guildford, and James Graham Lambert, Leicester, England

Application June 18, 1934, Serial No. 731,178
In Great Britain June 24, 1933

3 Claims. (Cl. 221—73.5)

This invention is for improvements in or relating to release mechanism for pressure fluid containers, in particular cylinders containing liquid carbon dioxide such as are used for fire extinguishing purposes or in flotation gear for aircraft.

More specifically the invention relates to release mechanism of the type in which the container is provided with a frangible closure, which normally prevents the escape of pressure fluid from the container, and including a cutter adapted to be driven forward to pierce the closure in order to effect the release of the gas from the container.

It has been found that after the cutter has moved forward to pierce the closure the pressure of the escaping gas is liable to force the cutter back into the hole which it has made in the closure, with the result that the flow of gas from the container is obstructed.

With a view to overcoming this difficulty, the invention provides a release mechanism of the above described type, including a locking device which operates automatically to prevent the return of the cutter towards its initial position after it has moved forward and pierced the closure.

In the preferred form of the invention the apparatus includes a spring-pressed member which permits of the forward movement of the cutter to pierce the closure, but, on such movement taking place, is moved by its spring into position to lock the cutter against return movement under the pressure of the gas escaping from the container. The spring-pressed member may conveniently be constituted by a ratchet, adapted to co-operate with a pawl carried on the cutter or on a plunger employed to drive the cutter forward to pierce the closure.

According to a feature of the invention the cutter may be arranged to abut, when in its inoperative position, against the closure so as to support the latter against the pressure exerted by the fluid in the container. Owing to the support for the closure afforded by the cutter, the closure can be made very thin and hence easy to pierce but will nevertheless be able to withstand the pressure in the container.

The release mechanism according to the invention is primarily intended for use with emergency flotation gear for aircraft in which the container is connected to one or more flotation bags by suitable conduits, the arrangement being such that when the closure is pierced the pressure fluid is allowed to pass to the bags so as to inflate them and support the aircraft against sinking in the water.

It is of importance to provide means for avoiding the danger of bursting of the container if for any reason (for example, exposure to high temperatures) the pressure within the container rises beyond a safe value. In flotation gear of the above type it has hitherto been proposed to employ the frangible closure as a safety valve which will give way and allow the fluid pressure to escape when the pressure within the container exceeds a predetermined value. This arrangement however suffers from the disadvantage that it necessitates the employment of special means for preventing pressure fluid released by bursting of the closure, due to excess pressure within the container, from reaching the bags—as it would clearly be exceedingly dangerous to permit the bags to become inflated while the aircraft was in flight—which means however must be rendered inoperative when the closure is pierced in an emergency by operation of the cutter. This arrangement suffers from the further disadvantage that it involves making the closure weak and so rendering it liable to be pierced on unintentional operation of the cutter (e. g. if the apparatus is given a severe accidental jolt).

According to a further feature of the invention, this difficulty may be overcome by providing the container with a weakened portion, in direct communication with the atmosphere, which is arranged to give way when the pressure within the container exceeds a predetermined safe value which is less than the pressure required to burst the frangible closure. Conveniently the container may be formed with a single orifice closed by a plug containing a pair of outlets, one communicating with the conduit leading to the bags and being sealed by the frangible closure, and the other communicating with the atmosphere and being sealed by a safety disc or the like which is adapted to give way at a pressure less than that required to burst the frangible closure.

One particular embodiment of the invention as applied to a flotation gear for aircraft will now be described in further detail by way of example with reference to the accompanying drawings, in which

Fig. 1 is a diagrammatic view of the flotation gear;

Fig. 2 is a front elevation of the release mechanism;

Fig. 3 is a section along the line III—III in Fig. 2;

Fig. 4 is a rear elevation partly in section of the release gear; and

Fig. 5 is a detail sectional view taken along the line V—V in Fig. 3.

Like references indicate like parts throughout the drawings.

The flotation gear shown in Fig. 1 of the drawings is of the kind described in Specification No. 1,956,494. The container 10, which is filled with carbon dioxide under pressure, is connected by a conduit 11 to pipes 12 leading to the inflatable bags which are situated at convenient points on the aircraft. The conduit 11 contains a non-return valve 31 so as to prevent any gas which may leak past the frangible closure of the container from reaching the bags and so inflating them. The container 10 is sealed by a member indicated generally by 16 which contains a cutter 20 (see Fig. 3) which cutter is adapted to be driven forward to pierce a frangible closure disc 19 sealing the mouth of the container when a cartridge 17 is fired by completion of an electric circuit 7. As shown in Fig. 1 the electric circuit 7 comprises a battery 8 and a pair of spaced plates 18. When the aircraft descends upon the water the circuit is completed and the cartridge 17 fired thereby causing the cutter 20 to pierce the frangible disc 19 and so effect delivery of the gas from the container 10 to the bags.

The closure member 16 comprises as its lower element a screw-threaded plug 21, which is adapted to fit in the neck of the container 10. The plug 21 is formed with a central through-way 22, which is sealed by the frangible disc 19. This disc is held in position by a sleeve member 23 screwed into the upper portion of the through-way of the plug. The plug is formed with a pair of outlets 24, 25 which communicate respectively with the conduit 11 leading to the bags and with the atmosphere. The conduit 25, which communicates with the through-way 22 of the plug on the container side of the frangible disc 19, is closed by a safety disc 26. The disc 26 is adapted to give way at a lower pressure than the disc 19 so as to permit the gas to escape to atmosphere in case the pressure in the container should become dangerously high.

As will be seen from Fig. 3, the cutter 20 normally rests on top of the frangible disc 19 and so supports the latter against the pressure of the gas in the container. The cutter is formed with longitudinal recesses 27 so that when it is driven through the disc 19 to pierce the latter, space will be afforded for the gas to escape past the cutter into the outlet 24. The sleeve 23 is provided with an inwardly projecting flange 28 which in turn co-operates with the head of the cutter so as to prevent the latter from being forced right into the container. An annular plug 29 is screwed into the sleeve 23 so as to hold the cutter against vibration, such as might cause the disc 19 to become accidentally pierced.

The plug 21 is in screw-threaded connection with a cylinder 30 containing a plunger 31 which rests on top of the cutter. At the top of the cylinder is located the cartridge 17 which, as explained above, is arranged to be fired electrically when the aircraft descends upon the water. Between the cartridge 17 and the plunger 31 is a piston 32 which is normally held in a position spaced from the plunger by a fibre disc 33, which rests on a shoulder 34 in the cylinder, the fibre disc being screwed to the top of the piston by a nut 35. When, however, the cartridge is fired, the fibre disc 33 is sheared by the pressure of the explosion gases on the piston so that the piston is driven forward to strike the plunger, thereby causing the cutter to pierce the frangible disc 19 and effect delivery of the gas from the container to the bags. The portion of the fibre disc which remains attached to the piston acts as a packing to prevent the explosion gases from leaking to the front of the piston between the sides of the piston and the cylinder walls. A number of holes 36 are provided in the wall of the cylinder between the piston and the plunger, these holes communicating with an annular channel 37 which is connected to atmosphere by the outlet 38, thus permitting the escape from the cylinder of the air displaced by the piston.

A pawl 39 is connected by means of a bolt 40 to the plunger 31 and is pivoted at 41 to the wall of the cylinder. The end of the pawl remote from the pivot 41 engages with a ratchet segment 42 which in turn is pivoted at 43 to the wall of a circular chamber 44 fitted to the side of the cylinder. The ratchet segment 42 is held in engagement with the pawl 39 by means of a spring 45. When the plunger 31 is driven forward to cause the cutter to pierce the disc 19, the pawl 39 will slip past the ratchet segment 42, but the latter will be moved by its spring 45 into position to prevent the return movement of the pawl and hence of the plunger, with the result that the cutter will be locked against return movement, so that it cannot be caused by the pressure of the escaping gases to move back into a position in which it would seal the hole in the disc.

An arm 46 is rigidly connected to the pivot pin 41 of the pawl 39. The arm 46 is located at the rear of the apparatus, and, by partaking of the pivotal movement of the pawl, serves to give a visual indication of whether the plunger is in its raised or lowered position, and consequently of whether or not the disc 19 has been pierced.

The apparatus includes manually operable means for actuating the cutter to pierce the disc 19 in case the cartridge should fail to explode in an emergency. The manually operated emergency means comprises a wheel 47 located within the chamber 44 and rigidly connected to a snail cam 48, which is adapted to co-operate with a pin 49 projecting transversely from the operative end of the pawl 39. A Bowden cable 50 is wound round a peripheral slot in the wheel and when this cable is pulled the operative end of the pawl will be depressed by the action upon it of the cam, thereby causing the plunger to move downwardly so as to pierce the disc. A clock spring (not shown) is provided for returning the wheel to its original position when the pull on the Bowden cable is released. The chamber 44 is provided with a cover 51 which is displaceable about a pivot 52 in order to enable the apparatus to be re-set. The ratchet segment 42 which is located behind the wheel, carries a tail piece 53 which projects beyond the periphery of the wheel and so affords a finger grip by which the ratchet segment can be moved back against the action of its spring 45 to clear the pawl 39 and allow the plunger to be returned to its initial position.

The cylinder contains a ring 54 of rubber or like resilient material to serve as a cushion to arrest the forward movement of the plunger 31.

While the invention has been primarily described with reference to its application to flotation gear for aircraft it should nevertheless be understood that it is also applicable to pressure fluid containers for other purposes, in particular for fire extinguishing purposes.

What we claim as our invention and desire to secure by Letters Patent is:—

1. In a flotation gear for aircraft, a release mechanism comprising in combination a frangible closure for the container, a cutter, means for driving the cutter foward to pierce the closure and release the gas from the container, a pawl and cooperating ratchet one of which elements is fixed and the other movable with the means for actuating the cutter, said pawl and ratchet being capable of relative movement to allow the cutter to move forward and pierce the closure, and a spring adapted to hold the pawl and ratchet in locking engagement to prevent return movement of the cutter.

2. In a flotation gear for aircraft comprising a container for fluid under pressure, a hollow plug fitted to the outlet of the container, a frangible closure sealing the throughway of the plug, a cutter, a plunger movable within the throughway of the plug, and means to drive the plunger against the cutter and cause the latter to pierce the closure, the combination with a pawl pivoted at one end to the wall of the plug and linked centrally to the plunger, of a ratchet pivoted to the wall of the plug and engaging the end of the pawl remote from its pivot, and a spring holding the pawl and ratchet in engagement with one another, the ratchet teeth being so formed as to permit of forward movement of the plunger when the cartridge explodes but to prevent return movement of the plunger towards the cartridge.

3. In a flotation gear for aircraft comprising a container for fluid under pressure, a hollow plug fitted to the outlet of the container, a frangible closure sealing the throughway of the plug, a cutter, a plunger movable within the throughway of the plug, and means to drive the plunger against the cutter and cause the latter to pierce the closure, the combination with a pawl pivoted at one end to the wall of the plug and linked centrally to the plunger, a ratchet pivoted to the wall of the plug and engaging the end of the pawl remote from its pivot, a spring holding the pawl and ratchet in engagement with one another, the ratchet teeth being so formed as to permit of forward movement of the plunger when the cartridge explodes but to prevent return movement of the plunger towards the cartridge, and an arm external to the plug which partakes of the pivotal movements of the pawl to give a visual indication of whether or not the plunger has moved forward to actuate the cutter.

REGINALD FOSTER DAGNALL.
JAMES GRAHAM LAMBERT.