April 28, 1936. D. MAPES 2,039,014

RELEASE MECHANISM FOR AEROPLANE FLOTATION DEVICES

Original Filed June 12. 1930 2 Sheets-Sheet 1

Fig. 2.

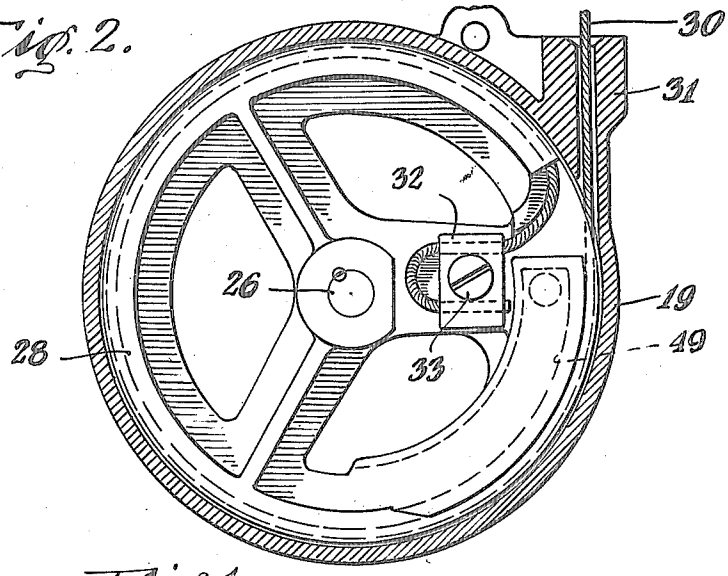
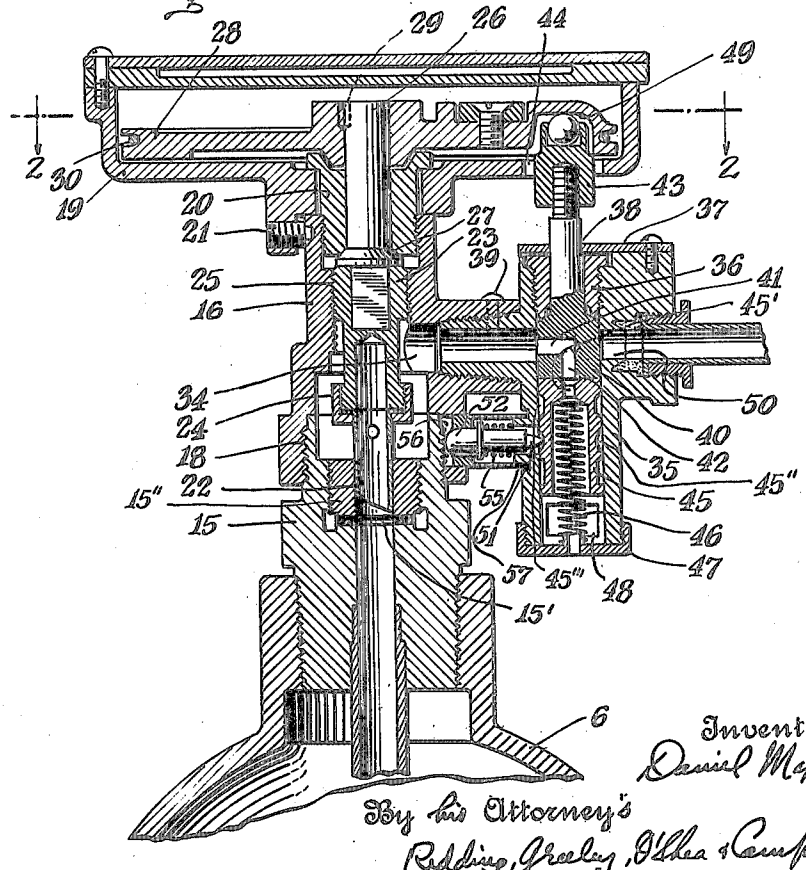


Fig. 1.



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Fig. 3.

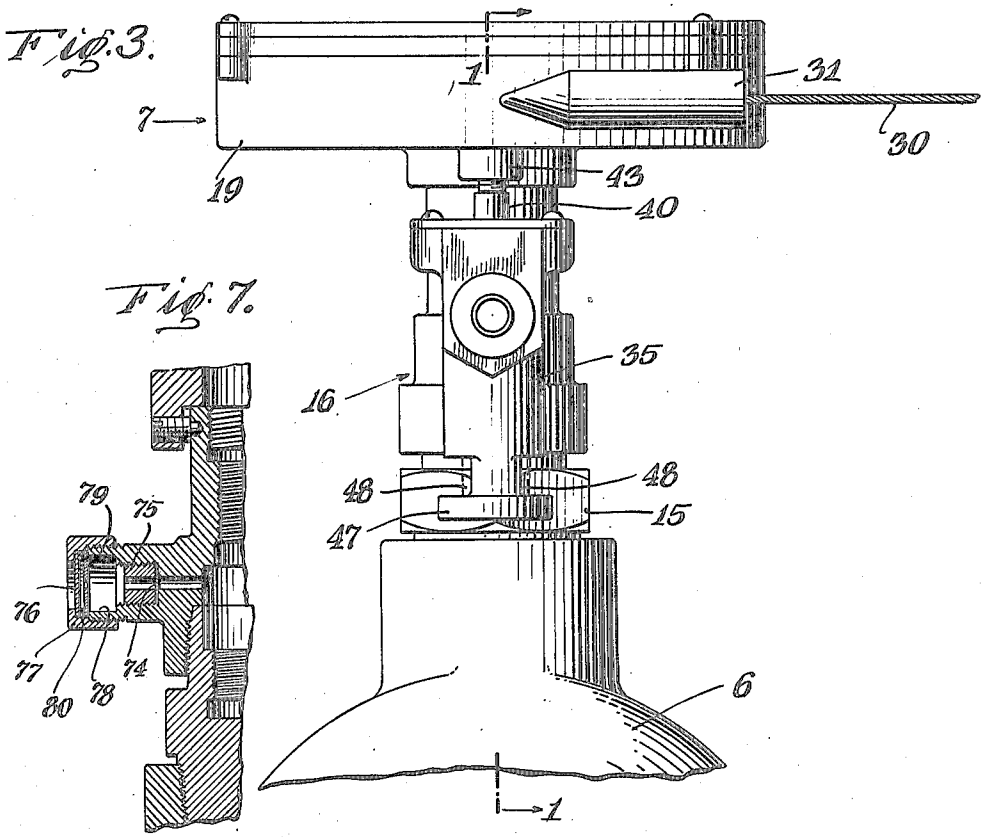


Fig. 7.

Fig. 5.

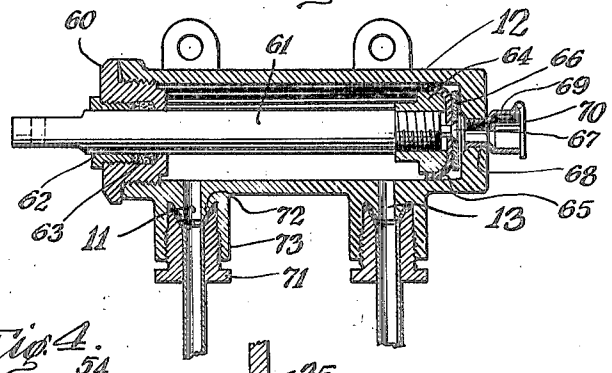


Fig. 6.

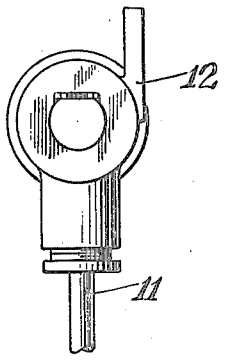
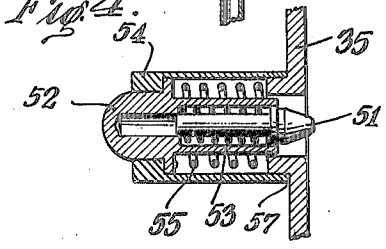


Fig. 4.



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UNITED STATES PATENT OFFICE

2,039,014

RELEASE MECHANISM FOR AEROPLANE FLOTATION DEVICES

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Application June 12, 1930, Serial No. 460,583
Renewed April 4, 1933

32 Claims. (Cl. 244—2)

The present invention relates to devices for utilizing a gas pressure to serve desired purposes and embodies, more specifically, an improved mechanism for utilizing a gas under pressure to inflate equipment designed primarily to serve as a flotation means for aeroplanes. More specifically, the invention embodies an improved device by means of which a source of a suitable fluid is maintained under pressure and released upon a desired manipulation to inflate flotation equipment upon an aeroplane, the releasing mechanism being such as to facilitate the actuation of the device and insure proper operation thereof.

Although the invention will be described in connection with a device for inflating aeroplane flotation equipment, it will be readily seen that the mechanism is well adapted for use in connection with the release and distribution of a fire extinguishing medium. The importance of providing a system, the proper actuation of which is absolutely insured upon a desired initiation, will be readily apparent, in view of the fact that the equipment described specifically herein is designed for use in connection with aeroplanes. Where the mechanism is used in connection with an aeroplane flotation equipment, it is highly important that the flotation bags remain uninflated while the aeroplane is in flight. If such bags were accidentally inflated, the plane would, in all probability, fall due to the enormous resistance offered by the inflated bags to the flight of the plane. On the other hand it is equally as important that the bags be inflated when the necessity therefor arises, to preserve the lives of the occupants of the plane as well as the plane itself.

An object of the invention, accordingly, is to provide a system by means of which a gas maintained under a suitable pressure may be released to effect a desired condition upon a predetermined manipulation.

A further object of the invention is to provide a system of the above character in which the releasing mechanism is provided with a device by means of which its actuation may be indicated.

A further object of the invention is to provide an indicating means of the above character by means of which an accidental operation of the system may be indicated.

A further object of the invention is to provide an indicating means for systems of the above character, such indicating means being capable of being reset only after a predetermined operation, thus insuring the reconditioning of the apparatus after it has once been actuated.

A further object of the invention is to provide an indicating device which is moved to an indicating position in which it is locked.

A further object of the invention is to provide a distribution system for a gas under pressure, the system being provided with a releasing mechanism and a safety or indicating mechanism by means of which the medium is diverted from the distribution system when it is released accidentally, but directed through the distribution system when it is intentionally released.

A further object of the invention is to provide release mechanism for flotation mechanism for aeroplanes which may be effectively operated upon the initiation of a predetermined actuation.

A further object of the invention is to provide release mechanism for flotation devices of the above character which is operated by a medium under pressure, the accidental inflation of the flotation device being prevented by means of a mechanism which indicates the condition of the system.

Further objects, not specifically enumerated above, will be apparent as the invention is described in greater detail in connection with the accompanying drawings, wherein:

Figure 1 is a view in section, taken on line 1—1 of Figure 3, and looking in the direction of the arrows, this view showing the releasing valve and indicating mechanism constructed in accordance with the present invention.

Figure 2 is a section along line 2—2, Fig. 1 showing the mechanism of Figure 1.

Figure 3 is a view in side elevation, showing the mechanism of Figure 1.

Figure 4 is a view in section, taken through the locking device shown in Figure 1.

Figure 5 is a view in section, taken through the piston bag release.

Figure 6 is a view in end elevation, showing the piston bag release of Figure 5.

Figure 7 is a view in section, showing a modified form of indicator.

Referring to the above drawings, an aeroplane is indicated at 17, being provided upon opposite sides of the fuselage with flotation bags f which are normally maintained in the envelopes indicated at 1. These flotation bags are normally deflated and retained within the envelope by means of wires 2 which pass through ringlets 3 to maintain the lid of each envelope closed. In order that the flotation bags may be secured effectively to the plane, rope loops f' are secured to the bags and passed through yokes f^2 which are secured to the fuselage of the plane. The yokes may be removably secured by providing brackets f^3 upon

the plane and securing yokes thereto by means of pins f^4. The envelope 1 is provided with flaps f^5 for the purpose described hereinafter. A cable or rod 4 operates all of the wires to disengage the ringlets 3, thus enabling the envelope to be opened. When a flotation bag is inflated by compressed air or carbon dioxide, the bag expands and frees itself from the envelope, the lid permitting it to assume its inflated position. For the purpose of expanding the flotation bags, conduits 5 are connected to the respective bags and to a manifold supply from a container 6.

A releasing mechanism 7, described in detail hereinafter, is actuated by a handle 8 which is connected to the device by a flexible cable 9 passing over a pulley 10. Upon release of the medium within the container, it passes through a pipe line 11 into one end of a piston bag release 12 (described in detail hereinafter) thus driving the piston toward the right, and disengaging the wires 2 from the ringlets 3. When the piston in the piston bag release 12 reaches the end of its stroke, the medium escapes through a connection 13, a check valve 14 and connection 5 into the flotation bag, thus causing it to expand in accordance with the pressure of the medium. During the inflation of the bag, the flap of the envelope containing such bag, lifts to permit the free inflation of the bag. By providing check valves as indicated at 14, the medium which has expanded into the flotation bags is prevented from escaping therefrom, continued passage of the medium into the bags being freely permitted.

With particular reference to Figures 1, 2, and 3, the releasing device for the medium in the container 6 will be seen to include a closure body 15 and bonnet 16. The closure body is threaded into the top of the container 6 and is provided with a frangible disc 15', secured in position by a nut 15''. Within the nut, a cutter 22 is movable, this cutter being of well known form and constituting no part of the present invention.

The bonnet is provided with threads 18 which engage cooperating threads formed on the closure body 15. A pulley case 19 is secured to the bonnet by a nut 20, as well as by a set screw 21. Obviously, prior to tightening the set screw 21 the pulley case is freely rotatable upon bonnet 16. In this fashion the pulley case can be initially adjusted rotatably and the securing means 21 then applied. The hollow tubular cutter 22 is part of a spindle and cutter assembly including a spindle 23 and a coupling nut 24. The spindle and cutter assembly is threaded for engagement with corresponding threads 25 in the bonnet 16 and a squared recess is provided in the upper part of the spindle for engaging a squared section on the lower end of a stem 26. The normal or inoperative position of the spindle and cutter is as shown in Figure 1, the spindle bearing against a shoulder 27 upon the stem 26, and the shoulder bearing against the bonnet nut 20.

With the spindle and cutter assembly in their uppermost positions, a pulley 28 is secured to the stem 26 by means of a set screw 29. The threads of this screw are tapped at the time the parts are assembled and in their correct relationship. An actuating cable is shown at 30, a lug 31 being formed on the pulley case 19 and provided with a suitable channel through which the cable passes. Pulley 28 is formed with a peripheral groove within which the cable 30 normally lies, the groove being formed preferably so that the cable may be turned under a cable clamp 32 and secured by means of a screw 33.

It will be apparent from the foregoing, that when the cable is pulled, the rotation of the pulley will cause a corresponding turning of the stem 26, thus causing the spindle 23 and cutter 22 to be advanced, the cutter rupturing the frangible disc 15' and permitting the escape of the medium in the container 6. The spindle 23 moves away from the stem 26, the squared connection therebetween permitting the relative axial movement between these elements.

An outlet 34 is formed in the bonnet 16 and the escaping medium passes from the bonnet at this point. Shoulder 27, being seated against nut 20 renders the joint gas tight. To provide the desired indication of the condition of the apparatus described herein, an indicator is included, this indicator comprising a body 35 into the upper end of which is threaded a piston guide nut 36. Plate 37 is secured to the upper side of the body, over the nut 36, and is provided with a hole 38 through which the stem of piston 40 may pass. This stem is provided with a flat side to engage the flat side of the hole 38, thus preventing rotation of the stem and piston.

Within the piston, passages 41 and 42 are formed, these passages communicating between outlet 34 and the interior of the indicator body 35. Upon the upper end of the piston stem is provided a ball and socket foot 43, this foot passing through an aperture 44 in the pulley case 19. The vertical position of the ball and socket foot is adjusted so that the ball just rests against the underside of pulley 28. This under portion of the pulley is formed with a sloping cam face 49, thus causing rotation of the pulley 28 to move the ball and socket foot axially with respect to the indicator housing 35.

Beneath the piston 40 is an indicator 45, a spring 46 and a cap 47 being provided to maintain the indicator normally against the piston 40. It is preferred that the cap be soldered in position. The lower end of the indicator is preferably painted red or may be formed with any other suitable warning indicia to indicate that the apparatus has been operated either intentionally or accidentally. In order that the lower end of the indicator may be visible, the body 35 is formed with openings 48 in the circumference thereof. Communicating with the indicator body 35 is an outlet 50 which is connected to the pipe leading to the flotation bags or to other distribution points.

From the foregoing, it will be seen that the intentional release of the pressure medium is accomplished by pulling upon the cable 30, thus advancing cutter 22 into the frangible disc 15 as described above. The released medium escapes through outlet 34 and enters the indicator body 35. Simultaneously, with the advance of the cutter 22, the cam surface 49 engages the ball foot 43 to move the piston 40 downwardly within the indicator body 35. As the medium escapes from the container, the passage 41 passes below the inlet to the indicator body and the outlet 50 communicates with outlet 34. In this manner, the medium passes into the distribution system and the indicator is moved to its engaging position, thus denoting the fact that a new container must be supplied to recondition the apparatus. In the event that the pressure of the medium within the container 6 should become dangerously high, and the frangible disc 15' ruptured accidentally, the medium escapes through the outlet 34 and passes through passages 41 and 42. The main portion of the piston 40 prevents com-

munication between the outlet 50 and the outlet 34 and thus directs the medium against a restricted aperture 45' formed axially within the indicator 45, the medium then being discharged through openings 48 after passing through such aperture. By reason of the flaring of the passage 45', sufficient pressure is developed on the upper surface of the indicator to force it into its lowermost or indicating position.

In order that the indicator may be positively retained in an indicating position until the apparatus is taken apart, a rounded groove 45'' is formed circumferentially of the indicator 45 and adjacent the median plane thereof. A parallel groove 45''' is provided with angular corners to be engaged by a catch or detent 51 which slides over the smooth surface of groove 45'', but engages positively against the shoulders of the groove 45'''. Thus when the indicator reaches its lowermost position the catch snaps into the groove 45''' and holds the indicator in its indicating position. A catch button is shown at 52 and is formed with a cylinder within which the catch 51 slides. Spring 53 normally urges the detent 51 outwardly against the grooves described above while spring 55 normally urges the button against the end of the spring housing 54, as shown in Figure 4. Button 52 thus is engaged by the threads on the closure body 15 and is forced into the position shown in Figure 1. In order to assemble the unit, the catch assembly and catch engaging spring 55 are passed from the left through a hole 56 formed in the bonnet. This is done after the indicator body assembly has been secured to the bonnet 16, in an obvious fashion. When the spring housing 54 is seated against the indicator housing 35, it may be soldered or otherwise secured thereto at one or a plurality of points 57, as indicated in Figure 4.

After the pressure medium has been released either intentionally or accidentally with the result that the indicator has been driven to its lowermost position and the catch 51 engages the groove 45''', the catch will hold the indicator in such position until such time as the bonnet 16 is removed from the disc body. At this time, the catch is withdrawn from the aforementioned groove and the indicator may be moved to its normal position as shown in Figure 1. The taking down of the mechanism in the manner described is, of course, necessary in substituting a charged container for an empty container.

With further reference to the piston bag release shown in Figure 5, the cylinder 12 is provided with a nut 60, within which rod 61 is slidably mounted. Packing nut 62 and packing 63 may be provided, piston head 64 being threaded upon the end of rod 61 and seating a leather cup 65, against which washer 66 engages. A screw 67 may be provided to secure the above elements in position.

An aperture 68 is formed in the right hand extremity of cylinder 12 in which a standard oil cup 69 is received, the cup being provided with a spring pressed detent 70 to prevent the accumulation of dirt, etc., therein. By means of the foregoing, the building-up of back pressure is prevented. The tubing is connected to the outlets 11 and 13 by means of follower nuts 71. Flared male members 72 are formed within the bushing 73 and the ends of the tubes are flared outwardly to engage the male projections 72. Follower nuts are threaded within the projections 73 and secure the flared extremities of the tubing to the members 72.

With reference to the modification shown in Figure 7, the indicator mechanism of Figure 1 is replaced by an indicator mechanism employing a series of discs, as described hereinafter. In this form, the piston 40 is not formed with the passages 41 and 42 but is solid. Upon rupture of disc 15', due to an excessive pressure within the container 6, the gas pressure within the valve body will exceed a predetermined maximum pressure which disc 74 is capable of withstanding. Disc 74 is seated by an apertured follower nut 75 and, when the disc 74 bursts the pressure of the medium is exerted upon a third disc 76 which is seated by a nut 77 against a threaded extension 78 on the bonnet 16. Between the threaded extension 78 and the frangible disc 76, an apertured disc 79 is seated, a washer 80 serving to space the discs 76 and 79.

It is preferred that the outer face of disc 79 be painted a distinctive color in order that it may be visible when disc 76 bursts. In this manner, bursting of discs 15', 74, and 76 expose the outer face of indicator disc 79, thus indicating that the gas within container 6 has been accidentally released.

From the foregoing, it will be apparent that a device has been provided for utilizing a medium under pressure, the release of such medium being indicated, whether effected accidentally or intentionally. Furthermore, a safety device is incorporated in the structure to prevent the accidental discharge of the medium into its distribution system when such is not desired. In the specific form shown, the medium has been utilized to effect the inflation of flotation bags for aeroplanes, means being provided for the release of such bags prior to their inflation. By causing the catch for the indicating mechanism to be seated by the threads of the disc body, resetting of the indicating mechanism will require the taking down of the unit, at which time, a new charged container may be substituted for the exhausted one.

While the invention has been described with specific reference to the accompanying drawings, it is not to be limited, save as defined in the appended claims.

I claim as my invention:

1. A container for a medium under pressure, means for maintaining the medium under pressure within the container, means for releasing the medium, an indicator, rotatable means for actuating the releasing means, a cam surface on the rotatable means, an indicator actuating means, a ball foot on the last named means for engaging the cam surface, and means to urge the foot against the surface.

2. A container for a medium under pressure, means for maintaining the medium under pressure within the container, means for releasing the medium, an indicator, rotatable means for actuating the releasing means, a cam surface on the rotatable means, and means engaging the cam surface for actuating the indicator.

3. A container for a medium under pressure, a removable body on the container, means to release the medium from the container, an indicator, means to actuate the indicator upon release of the medium, and means maintained in operative position by the removable body for holding the indicator in position.

4. A container for a medium under pressure, a removable body on the container, means to release the medium from the container, an indicator, means to actuate the indicator upon release

of the medium, a spring pressed detent, and means engaging the removable body to urge the detent against the indicator.

5. A container for a medium under pressure, a removable body on the container, means to release the medium from the container, an indicator, means to actuate the indicator upon release of the medium, and means engaged by the removable body to hold the indicator in an indicating position.

6. A container for a medium under pressure, a discharge line, means to release the medium, an indicator having an indicating and a non-indicating position, means to actuate the indicator upon release of the medium, the indicator being formed with a peripheral groove having rounded shoulders and a peripheral groove having angular shoulders, and yielding means to engage the grooves.

7. A container for a medium under pressure, a discharge line, means to release the medium, an indicator having an indicating and a non-indicating position, means to actuate the indicator upon release of the medium, the indicator being formed with peripheral grooves, and yielding means to engage the grooves.

8. A container for a medium under pressure, a discharge line, means to release the medium, an indicator housing communicating with the container and discharge line, a cylinder in the housing, an axially movable indicator in the cylinder, axially movable means in the cylinder to actuate the indicator, said axially movable means preventing communication between the discharge line and container when in a normally unactuated position, means operated by the releasing means to actuate the axially movable means, means to urge the indicator and axially movable means into an unactuated position, said indicator being formed with an axial passage and said axially movable means being formed with a passage communicating with the last named passage and the container when the axially movable means is in its unactuated position.

9. A container for a medium under pressure, a discharge line, means to release the medium, an indicator housing communicating with the container and discharge line, a cylinder in the housing, an axially movable indicator in the cylinder, axially movable means in the cylinder to actuate the indicator, said axially movable means preventing communication between the discharge line and container when in a normally unactuated position, means operated by the releasing means to actuate the axially movable means, said indicator being formed with an axial passage, and said axially movable means being formed with a passage communicating with the last named passage and the container when the axially movable means is in its unactuated position.

10. A container for a medium under pressure, a discharge line, means to release the medium, an indicator housing communicating with the container and discharge line, a cylinder in the housing, an axially movable indicator in the cylinder, axially movable means in the cylinder to actuate the indicator, said axially movable means preventing communication between the discharge line and container when in a normally unactuated position, and means operated by the releasing means to actuate the axially movable means.

11. A container for a medium under pressure, a discharge line, means to release the medium, an indicator housing communicating with the container and discharge line, a cylinder in the housing, an axially movable indicator in the cylinder, axially movable means in the cylinder to actuate the indicator, and means operated by the releasing means to actuate the axially movable means.

12. A container for a medium under pressure, a discharge line, means to release the medium, an indicator housing communicating with the container and discharge line, a cylinder in the housing, an axially movable indicator in the cylinder, and axially movable means in the cylinder to actuate the indicator.

13. A container for a medium under pressure, a discharge line, means to release the medium, an indicator housing communicating with the container and discharge line, a cylinder in the housing, an axially movable indicator in the cylinder, and means in the cylinder to actuate the indicator.

14. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, an axially movable means for preventing the flow of the released medium through the discharge line, means to mount the indicator and last named means whereby axial movement of the last named means actuates the indicator, the axially movable means being formed with ports to direct the discharged medium to the indicator, and the indicator being formed with a restricted passage.

15. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, an axially movable means for preventing the flow of the released medium through the discharge line, means to mount the indicator and last named means whereby axial movement of the last named means actuates the indicator, the axially movable means being formed with ports to direct the discharged medium to the indicator, and the indicator being formed with a passage to cause the flow of the medium therethrough to actuate the same.

16. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, an axially movable means for preventing the flow of the released medium through the discharge line, means to mount the indicator and last named means whereby axial movement of the last named means actuates the indicator, means to discharge the medium from the indicator, the axially movable means being formed with ports to direct the discharged medium to the indicator when the axially movable means is in a given position.

17. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, an axially movable means for preventing the flow of the released medium through the discharge line, means to mount the indicator and last named means whereby axial movement of the last named means actuates the indicator, the axially movable means being formed with ports to direct the discharged medium to the indicator when the axially movable means is in a given position.

18. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, means to actuate the indicator by pressure of the medium, axially movable means for preventing the flow of the released medium through the discharge line, and means to mount the indicator and last named means whereby axial movement of the last named means actuates the indicator.

19. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, means to actuate the indicator by pressure of the medium, means for preventing the flow of the released medium through the discharge line, and means for actuating the last named means and for actuating the indicator.

20. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, means to actuate the indicator by pressure of the medium, and mechanical means to actuate the indicator.

21. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, means to actuate the indicator by pressure of the medium, and separate means to actuate the indicator manually.

22. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, means to actuate the indicator by pressure of the medium, and means to actuate the indicator by the releasing means.

23. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, means to cause the released medium to actuate the indicator, means to prevent the flow of the medium through the discharge line, and means actuated by the releasing mechanism to render the flow preventing means inoperative.

24. A container for a medium under pressure, a discharge line, means to release the medium, an indicator, an axially movable means for preventing the flow of the released medium through the discharge line, means to mount the indicator and last named means whereby axial movement of the last named means actuates the indicator, the axially movable means being formed with ports to direct the discharge medium to the indicator, and the indicator being formed with a passage to permit the flow of the medium therethrough when the indicator is actuated.

25. A container for a medium under pressure, a discharge line, means to release the medium upon the development of a predetermined excess pressure in the container, indicating means, and means to cause the indicating means to assume an indicating condition when the medium is released due to excess pressure.

26. A container for a pressure medium, a supply pipe adapted to receive the medium, means coupling the container to the pipe, flow directing means associated with the coupling and movable to a position to direct the medium into the supply pipe and a position to discharge the medium in a different path, means associated with the coupling for releasing the medium in the container, and means actuated by the releasing means to operate the flow directing means.

27. A container for a pressure medium, a supply pipe adapted to receive the medium, means coupling the container to the pipe, a valve in the coupling movable to direct the medium into the pipe and movable to discharge the medium into the atmosphere, means for releasing the medium in the container, and means actuated by the last named means for actuating the valve.

28. A container for a pressure medium, a supply pipe adapted to receive the medium, means coupling the container to the pipe, a valve in the coupling movable to direct the medium into the pipe and movable to discharge the medium into the atmosphere, means for maintaining the valve normally in its position to discharge the medium into the atmosphere, means for releasing the medium in the container, and means actuated by the last named means for moving the valve into its position to direct the medium into the supply pipe.

29. A container for a medium under pressure, means to release the medium upon development of a predetermined pressure, an indicator comprising a member forming a portion of the wall of a chamber substantially closed off from the external atmosphere, the exposure of said member constituting the indication to be given, means normally concealing said member from observation, and means to conduct the medium into the said chamber upon its release under the predetermined pressure, the indicating means being rendered observable by the pressure introduced in said chamber.

30. A container for a medium under pressure, a discharge line, means to release the medium, reciprocatingly movable means for preventing the flow of the released medium through the discharge line when the medium is released due to excess pressure, said flow preventing means being rendered ineffective when the medium is released by actuation of the means to release the medium.

31. A container for a medium under pressure, a discharge line, means to release the medium, means for preventing the flow of the released medium through the discharge line when the medium is released due to excess pressure, said flow preventing means being rendered ineffective when the medium is released by actuation of the means to release the medium.

32. A container for a medium under pressure, a discharge line, means to release the medium, means for preventing the flow of the released medium through the discharge line when the medium is released due to excess pressure, and means to permit the escape of the medium when released due to excess pressure, said flow preventing means being rendered ineffective and said escape permitting means being closed off when the medium is released by actuation of the means to release the medium.

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