

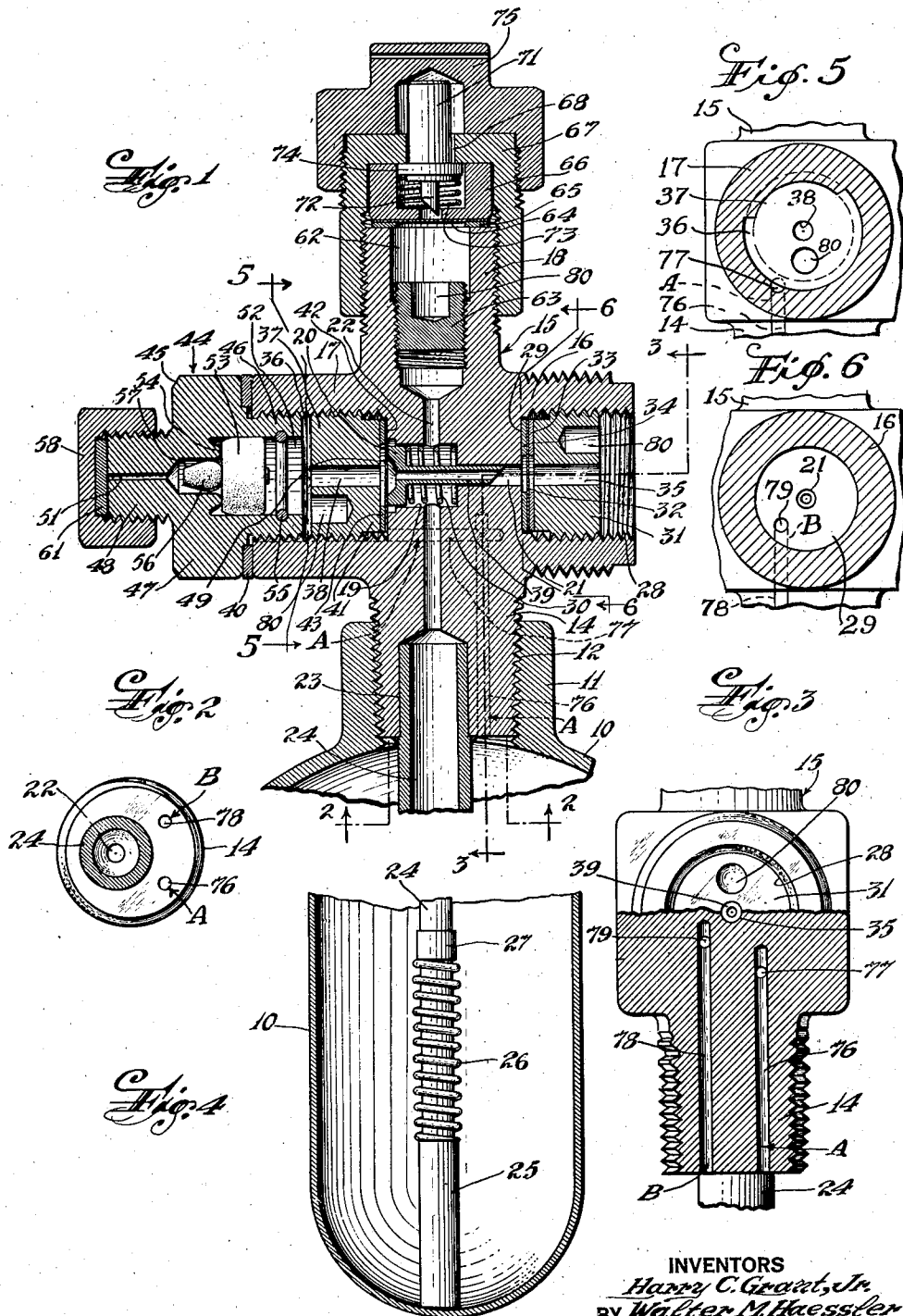
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DELAYED ACTION RELEASE DEVICE

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DELAYED-ACTION RELEASE DEVICE

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This invention relates to the dispensing of high pressure fluid media, and more particularly to a release device adapted to be used in connection with a container for a high pressure fluid medium.

Under certain conditions, it becomes necessary that there be a predetermined interval between the time the device for the release of the fluid medium is operated and the actual discharge of the medium.

An object of the present invention is to provide a release device for a container storing a high pressure fluid medium, which upon actuation will release the fluid pressure medium in the container after a predetermined interval of time.

Another object is to provide a release device which is operable substantially by the pressure of the fluid medium which it is adapted to release.

Another object is to provide a fluid pressure operated delayed action mechanism.

Another object is to provide a release device which is operable by means of a differential pressure mechanism.

Another object is to provide a release device which permits of the recharging of the container.

A further object is to provide a release device which is rugged, simple in construction, and easily serviced.

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.

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:

Figure 1 is a sectional view of a release device and a container (shown in part) in accordance with the invention;

Figure 2 is a sectional view taken along the line 2-2 on Figure 1;

Figure 3 is a fragmentary sectional view taken substantially along the line 3-3 on Figure 1; and

Figure 4 is a fragmentary view of the lower portion of the container of Figure 1, illustrating a detail shown in construction.

Figures 5 and 6 are detail sectional views taken on the lines 5-5 and 6-6 of Figure 1, respectively.

Referring now to the drawing in detail, a con-

tainer 10 is shown provided with a neck portion 11 which is interiorly threaded at 12 to receive a correspondingly shaped and threaded lower or inlet portion 14 of a valve body 15 or the like.

5 The body 15, in addition to the inlet portion 14, is formed with a lateral outlet portion 16, a lateral charging portion 17, and an upper control portion 18. The outlet and the charging portions communicate with one another by way of an horizontal passage 21, while the inlet and control portions are in communication through a vertical axial passage 22 intersecting the horizontal passage 21. The vertical passage 22 has an enlarged bore 23 at the inlet portion 14 adapted to receive, 10 for securement therein, the upper portion of an auxiliary or secondary container 24 for storing a high pressure fluid medium, the purpose of which will be explained hereinafter.

The container 24 is preferably tubular in form and has a small capacity as compared to that of the container 10. Its lower end may be supported with respect to the container 10, preferably, by means shown in Figure 4, comprising a tubular sleeve 25 slidably fitting over the lower portion of the container 24, and a spring 26 disposed between the sleeve and a collar 27 on the container 24 for urging the lower end of the sleeve 25 against inside end wall of the container. These means are adapted to form a shock and vibration absorbing support for the tubular container 24. 20

The outlet portion 16 is provided with a recess 28 forming a shoulder 29, and an outlet plug 31 is threadedly secured into the recess 28, adapted to hold in place a frangible outlet or closure disc 32 adjacent the shoulder 29. The disc 32 is disposed between washer type gaskets 33 and 34, respectively, and is adapted to close off the passage 21 to the atmosphere. The plug 31 has an axial passage 35 substantially in alignment with the passage 21 which serves as an outlet when the disc 32 has been apertured. 35

The charging portion 17, too, has a recess as at 36, into which is threaded a charging plug 37 provided with a charging passage 38 and a reduced end portion 41. A second frangible disc 49 is held by the plug 37 against a shoulder 42 formed by the recess 36. A washer type gasket 43, between the plug 37 and the disc 36, serves to effect a tight seal at this point. 40

A charging valve assembly 44 also is threaded into the recess 36 exteriorly of the plug 37. The assembly comprises a body 45 having a reduced and threaded portion 46 disposed in the recess 36, a manipulating portion 47, which may be of 55

an hexagonal nut form, and a reduced connecting portion 48 threaded on the outside to facilitate making a charging connection. The body 45 has an axially extending charging passage 51 which is enlarged to form a valve chamber 52.

A seat type check valve 53 is disposed in the valve chamber for reciprocal movement therein and is adapted to be urged by fluid pressure onto a valve seat 54 formed in the body 45 and surrounding the passage 51 adjacent the valve chamber 52. A valve retainer, preferably in the form of a split snap ring 55 may be provided in the valve chamber, so that the charging assembly 44 may be removed from the recess 36 as a unit. This construction also assures that the valve is not able to close the charging passage 38 during charging, as will appear more clearly when the operation of the device is described. A sealing gasket 40 is disposed between body 45 and the charging portion 17.

A projection 56 on the valve, in cooperation with a corresponding recess 57 in the passage 51, serves to guide the valve during its movements from and to its seat.

In Figure 1, the assembly 44 is shown sealed by a sealing cap 58 which is threaded over the connecting portion 48 and which carries a sealing gasket 61 adapted to tightly seal the charging passage 51.

The passage 21 is enlarged adjacent the shoulder 42, at the intersection with passage 22, to provide a chamber 19 in which a piston 20 is slidably mounted for actuating a hollow tubular cutter 39 disposed in the passage 21 and adapted to pierce the disc 32. A spring 30, abutting the piston 20 at one end, and a wall of the chamber 19 at the other end, is disposed in the chamber 19 to urge the cutter 39 away from the disc 32.

The vertical passage 22, in the control portion 18, is enlarged to provide a recess 62 which is threaded to receive a flow throttling or controlling member 63, preferably, such as a plug having threads which do not afford a complete seal. The recess 62 is closed off by a third frangible closure disc 64 which rests on a sealing gasket 65 and is held in place by a bushing member 66 and a cap member 67 threaded over the outside of the control portion 18.

The cap member 67 is apertured at 68 to permit an actuating knob portion 71 to movably project therethrough which is adapted to operate a cutter 72 for piercing the disc 64. A spring 73, disposed about the cutter 72 in the bushing member 66 and abutting a flange 74 on the body of the cutter 71, is adapted to urge the cutter away from the disc 64. The flange 74 bears against the inside of the apertured cap member 67.

The actuating knob portion 71 of the cutter is protected from undesired tampering by a protective cap 75 which is threadably secured over the cap member 67.

Communication between the container 10 and the valve chamber 52 of the charging assembly 44 is provided by means of a port A which comprises a vertical passage 76 and a horizontal passage 77 extending through the body 15, as shown in broken lines in Figure 1, and as shown in cross section in Figure 5 in the form of a groove extending through the threads of the body. A fluid flow connection from the container 10 to the passage 21 adjacent the outlet portion 16 is provided by port B (Figures 2 and 3) comprising a vertical passage 78 and a horizontal passage 79. The passage 79 terminates at the surface of the shoulder 29 and is normally sealed by the gasket 34.

When the plug 31 and the gasket 34 are backed away from the shoulder 29, the port B serves to connect the container 10 with the container 24 through the passage 21, the chamber 19, and the lower portion of passage 22. The plug members 31, 37 and 63 are provided with one or more recesses 80 adapted to accommodate corresponding lugs of a manipulating wrench when the removal or insertion of these members is desired.

Figure 1 illustrates the device when the container 10 is fully charged and the device is ready for operation to release the fluid medium. When such a release is desired, the protective cap 75 is removed and the knob portion 71 depressed by hand or by striking it with or against a hard object. As the knob portion 71 is depressed, the cutter 72 penetrates the disc 64 and then is retracted to its original position by action of the spring 73. Fluid medium is now enabled to escape from the auxiliary container 24 at a restricted and predetermined rate by way of passage 22, past the threads of the flow regulating and controlling member 63 and out through the pierced disc 64 and the aperture 68. The extent to which the controlling member 63 is screwed down, determines the rate at which the fluid medium is able to escape past the threads.

As there is normally an equilibrium on the disc 49, due to the effect of the pressure fluid in the auxiliary container acting through the chamber 19 on one side, and the pressure fluid in the main container 10 acting through the port A, the valve chamber 52 in communication therewith, and the passage 38, on the other side of the disc 49, the efflux to the atmosphere of the fluid medium from the container 24, will cause a pressure differential to be established with respect to the disc 49, and will eventually lead to its bursting due to the prevalence of the pressure on the side thereof adjacent the plug 37, effective from the container 10 through port A.

As the disc 49 bursts, the fluid pressure medium from the container 10 rushes into the chamber 19 and drives the piston 20, and with it the cutter 39, toward the right to puncture the outlet disc 32. The medium from the main container now passes out by way of the tubular cutter 39 through the discharge passage 35.

It will be apparent that a predetermined time interval may thus be obtained between the actuation of the cutter 72 and the actual discharge from the main container by retarding the establishment of the differential pressure condition just described.

When it is desired to recharge the container 10, the three destroyed discs 64, 49 and 32 are replaced. This requires, in the case of the disc 64, the removal of the cap member 67; in the case of the disc 49, the removal of the charging assembly 44 and of the plug 37; and in the case of the disc 32, the removal of the plug 31. In order to recharge the container, a charging fixture or tool (not illustrated) in the form of a lug wrench, which is adapted to coact with the recesses 80 is used to effect a backing off of the plug 31 by about half a turn. The lug wrench is provided with a connection leading to a pressure gauge (not shown), and the connection is adapted to be applied to the discharge or outlet portion 16 to form a leakproof pressure chamber with the portion 16 and the recess 28.

The cap 58, with its gasket 61, is then removed and a pressure fluid supply connection made to the connecting portion 48. Pressure fluid is then supplied slowly past the check valve 53 which is

now driven back and is supported in the valve chamber 52 by the ring 55. The pressure fluid enters through the passages 77 and 76 of the port A into the cylinder 10, out of the cylinder 10, through passages 78 and 79 of the port B, past the gasket 34, through passage 21 into the auxiliary container 24 by way of the passage 22.

Since the pressure fluid must enter the container 10 before it can reach the cylinder 24, the gauge associated with the charging fixture and in connection with the outlet portion 16 indicates the completeness of the charge of both the containers 10 and 24. This provision also serves to indicate that the pressure conditions are the same in both containers. As the charging is completed, the plug 31 is screwed down tightly and the charging fixture is removed from the portion 16. Then the supply is disconnected from the connecting portion 48, and the check valve 53 is driven back on its seat 54 by the fluid pressure in the container 10 which acts through the port A in communication with the chamber 52. The final seal against leakage is obtained by reinstalling the cap 58 and the gasket 61 over the connecting portion 48.

By screwing down the plug 31 and sealing the passage 79, the fluid flow connection between the two containers 10 and 24 is sealed off, and the space including the container 24, the passage 22 and the recess 62 is tightly sealed therefrom. A balanced pressure condition is thus reestablished on the two sides of the disc 49, each side being exposed separately and independently to the fluid pressure of the two containers, respectively.

The time required for the operation between the piercing of the disc 64 and the escape of the pressure fluid out of the discharge portion 16 for the construction shown here, is usually about two minutes, depending on the ambient temperature which determines the pressure values.

It will be noted that the area of each of the discs 64 and 32, which is exposed to bursting action by pressure is smaller than that of the disc 49 which, although all the discs are of identical design, will burst, accordingly, at a pressure differential substantially less than the value of the pressure to which discs 64 and 32 are normally exposed.

As the container 10 and the entire assembly may be subject to vibration and shock, the provision of the spring urged slidable sleeve 25 over the free end of the auxiliary container 24 insures that the auxiliary container is adequately supported at both ends, and that any shocks transmitted by the body of the main container 10 are received and dampened by the sleeve and the spring before they reach the auxiliary cylinder. The possibility of damage thereby to the secondary container, which may result in leakage of pressure fluid therefrom with resultant inoperativeness of the device as a whole, is thus greatly minimized.

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.

It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described, and all statements of the scope of the

invention which, as a matter of language, might be said to fall therebetween.

We claim:

1. In combination, a container for storing a fluid medium under pressure; a closure for said container; means for unclosing said closure adapted to be operated by the fluid pressure of the medium in said container; means preventing access of the fluid medium in said container to said unclosing means; an independent source of a fluid pressure medium normally closed and in fluid flow communication with said preventing means; and means to release the fluid pressure medium from said source, whereby upon release thereof said preventing means is adapted to become ineffective and said closure is adapted to be unclosed by said unclosing means.

2. In combination, a container for storing a fluid medium under pressure; a frangible disc closure for said container; cutter means for unclosing said disc closure operable by the pressure of the fluid in said container; a frangible disc preventing access of the fluid medium in said container to said cutter means, said disc being exposed to said fluid medium on one side thereof; an independent source of a fluid pressure medium normally closed and in fluid flow communication with the other side of said disc; and means to release the fluid pressure medium from said source, whereby upon release thereof said disc is adapted to be rendered ineffective by the pressure of the fluid medium in said container and said cutter means is operated to unclose said frangible disc closure.

3. In combination, a container for storing a fluid medium under pressure; a frangible disc closure for said container; cutter means for unclosing said disc closure operable by the pressure of the fluid in said container; a frangible disc preventing access of the fluid medium in said container to said cutter means, said disc being exposed to said fluid medium on one side thereof; an independent source of a fluid pressure medium normally closed and in fluid flow communication with the other side of said disc, whereby a balanced pressure condition is established on said disc; and means to release the fluid pressure medium from said source, whereby upon release thereof said balanced pressure condition is upset and said disc is adapted to be rendered ineffective by the pressure of the fluid medium in said container and said cutter means is operated to unclose said frangible disc closure.

4. In combination, a container for storing a fluid medium under pressure; a closure for said container; means for unclosing said closure adapted to be operated by the fluid pressure of the medium in said container; means preventing access of the fluid medium in said container to said unclosing means; an independent source of a fluid pressure medium normally closed and in fluid flow communication with said preventing means; means to release the fluid pressure medium from said source; and adjustable fluid flow throttle means associated with said releasing means, whereby upon release of said source said preventing means is adapted to become ineffective and said closure is adapted to be unclosed by said unclosing means after a predetermined time interval after said release.

5. In combination, a container for storing a fluid medium under pressure; a frangible disc closure for said container; cutter means for unclosing said disc closure operable by the pressure of the fluid in said container; a frangible

disc preventing access of the fluid medium in said container to said cutter means, said disc being exposed to said fluid medium on one side thereof; an independent source of a fluid pressure medium normally closed and in fluid flow communication with the other side of said disc; means to release the fluid pressure medium from said source; and fluid flow throttle means associated with said releasing means, whereby upon release of said source said disc is adapted to be rendered ineffective by the fluid medium in said container and said cutter means is operated to uncloset said frangible disc closure after a predetermined time interval after said release.

6. In combination, a container for storing a fluid medium under pressure; a frangible disc closure for said container; cutter means for unclosing said disc closure operable by the pressure of the fluid in said container; a frangible disc preventing access of the fluid medium in said container to said cutter means, said disc being exposed to said fluid medium on one side thereof; an independent source of a fluid pressure medium normally closed and in fluid flow communication with the other side of said disc, whereby a balanced pressure condition is established on said disc; means to release the fluid pressure medium from said source; and fluid flow throttle means associated with said releasing means, whereby upon release of said source said balanced pressure condition is upset and said disc is adapted to be rendered ineffective by the fluid medium in said container and said cutter means is operated to uncloset said frangible disc closure after a predetermined time interval after said release.

7. In combination, a container for storing a fluid medium under pressure; closure means for said container; means for unclosing said closure means; partition means exposed to the pressure of the fluid in said container; an independent source of a fluid pressure medium normally closed and in fluid flow communication with said partition means whereby a balanced pressure condition is established on said partition means; and means to release the fluid pressure medium from said source, whereby upon release thereof said balanced pressure condition is upset, and a pressure differential is created, and said partition means is rendered ineffective and said unclosing means is operated by the pressure of the fluid in said container.

8. A readily attachable unitary structure adapted to be secured to a container for storing a fluid medium under pressure and comprising closure means for said container; releasable means for unclosing said closure means; pressure means for operatively releasing said means to uncloset; means delaying said unclosing means from becoming operative, associated with said pressure means, whereby upon actuation of said pressure means said closure means is adapted to be unclosed after a predetermined time interval.

9. A readily attachable unitary structure adapted to be secured to a container for storing a fluid medium under pressure and comprising closure means for said container; releasable pressure operable means for unclosing said closure means; pressure means for preventing the release of said unclosing means; means for releasing said pressure means; means delaying the release of said pressure means; whereby upon operation of said means to release, said closure means is adapted to be unclosed after a predetermined time interval.

10. In combination, a container for storing a fluid medium under pressure; closure means for said container; releasable pressure operable means for unclosing said closure means exposed to the pressure of the fluid in said container; fluid pressure supply means within said container in fluid flow connection with said unclosing means adapted to prevent the operation thereof; means for operatively releasing said supply means; and means delaying the release of said fluid pressure supply means; whereby upon operation of said means for releasing, said closure means is adapted to be unclosed after a predetermined time interval.

11. In combination, a container for storing a fluid medium under pressure; closure means for said container; releasable pressure operable means for unclosing said closure means exposed to the pressure of the fluid in said container; an auxiliary container for a fluid pressure medium in fluid flow connection with said unclosing means adapted by fluid pressure to prevent the operation thereof; means for operatively releasing the pressure fluid from said auxiliary container; and means delaying the release of the pressure fluid from said auxiliary container; whereby upon operation of said releasing means, said closure means is adapted to be unclosed after a predetermined time interval.

12. In combination, a container for storing a fluid medium under pressure; closure means for said container; releasable piston operated means for unclosing said closure means; means forming a fluid flow connection from said container to said unclosing means; a frangible disc in said last named means forming a partition in said connection adapted to be exposed on one side thereof to the pressure of the fluid in said container; an auxiliary container for a fluid pressure medium in fluid flow connection with the other side of said disc adapted thereby to prevent the bursting thereof; means operable for releasing the pressure fluid from said auxiliary container; and means delaying the release of the pressure fluid from said auxiliary container for a given period in fluid connection with said disc; whereby upon operation of said releasing means, said disc is adapted to be ruptured and said piston is adapted to be operated to uncloset said closure means after a predetermined time interval.

13. A source of fluid pressure medium adapted for operating a mechanism; a frangible disc exposed on one side to the fluid pressure medium and preventing the flow thereof toward the mechanism; a second source of fluid pressure adapted to act on the other side of said disc and to oppose thereby the action thereon of the first fluid pressure medium; means to release said second source and thereby cause said first source to rupture said disc; and means to delay the release of said second source.

14. For use with a container storing a fluid pressure medium, a release device having an inlet portion and an outlet portion; a disc closing said outlet portion; a pressure operable piston cutter for unclosing said disc; a fluid flow connection from said inlet portion to said piston cutter; a disc disposed in said connection adapted to be acted on on one side thereof by fluid from said inlet portion and adapted to prevent flow of fluid from said inlet portion toward said piston cutter; means forming a fluid flow connection from the other side of said disc toward said inlet portion adapted for connection to a second source of fluid pressure medium; an outlet connection for the

second source of fluid pressure medium in communication with said other side of said second named disc; a third disc for closing said outlet connection; a fluid flow throttling member in said outlet connection; and means to uncloset said third named disc.

15. For use with a container adapted for storing a fluid pressure medium; a device having an inlet portion, an outlet portion, a charging portion and a control portion; a first flow connection for discharging from said inlet portion to said outlet portion; a second flow connection from said inlet portion to said control portion adapted for connection to an auxiliary source of a fluid pressure medium; a third connection for charging the container and the auxiliary source extending from said charging portion to said inlet portion and from said inlet portion to said second connection; a first disc for closing said discharge connection; a sealing member for closing said third connection between the container and the auxiliary source operatively associated with said first disc; a valve closing said charging connection at the charging portion; a second disc for closing said second connection at the control portion; a third disc for interrupting said discharge connection, one side thereof adapted to be exposed to fluid pressure from the container and its other side to fluid pressure from the auxiliary source; a piston cutter for unclosing said first disc adapted to be operated by fluid pressure acting through said first connection normally prevented from being acted on by fluid pressure by said third disc; a fluid flow throttling member in said second connection in said control portion; and means to uncloset said second disc.

16. In combination, a container for storing a fluid medium under pressure; valve means on said container; closure means in said valve means; movable means in said valve means for unclosing said closure means; means associated with said valve means for conditioning said unclosing means for operation thereof; means delaying said unclosing means from becoming operative, associated with said conditioning means, whereby, upon operation of said conditioning means, said

closure means is adapted to be unclosed after a predetermined time interval.

17. In combination, a container for storing fluid pressure medium; a closure for said container; pressure operable means for rendering said closure ineffective; partition means for preventing operation of said pressure operable means; a second container for a second fluid pressure medium normally confined and in fluid flow communication with said partition means; and means for releasing said second fluid pressure medium whereby upon release thereof, said partition means is rendered ineffective and said pressure operable means is operated.

18. In combination, a container for storing fluid pressure medium; closure means for said container and adapted to be rendered ineffective by the pressure medium acting on one side of said closure means; a second container for a second fluid pressure medium normally confined and in fluid flow communication with said closure means and acting on the other side of said closure means to maintain the latter effective; means for releasing said second fluid pressure means whereby to render said closure means ineffective; and fluid flow throttle means associated with said releasing means whereby upon release of said second fluid pressure medium, to extend the effectiveness of said closure means for a predetermined interval after release of said second fluid pressure medium.

19. In combination, a container for storing a fluid medium under pressure; valve means for said container; a frangible disc closure in said valve means adapted to be rendered ineffective by the pressure of the fluid in said container acting on one side thereof; a second container for a second fluid pressure medium normally confined and in fluid flow communication with the other side of said disc closure to maintain the latter effective; and means to release said second fluid pressure medium, whereby upon release thereof said disc closure is rendered ineffective by said first mentioned fluid medium.

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