April 10, 1956 S. E. ALLEN 2,741,318

CLOSURE FOR FLUID CONTAINER

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Fig. 1.

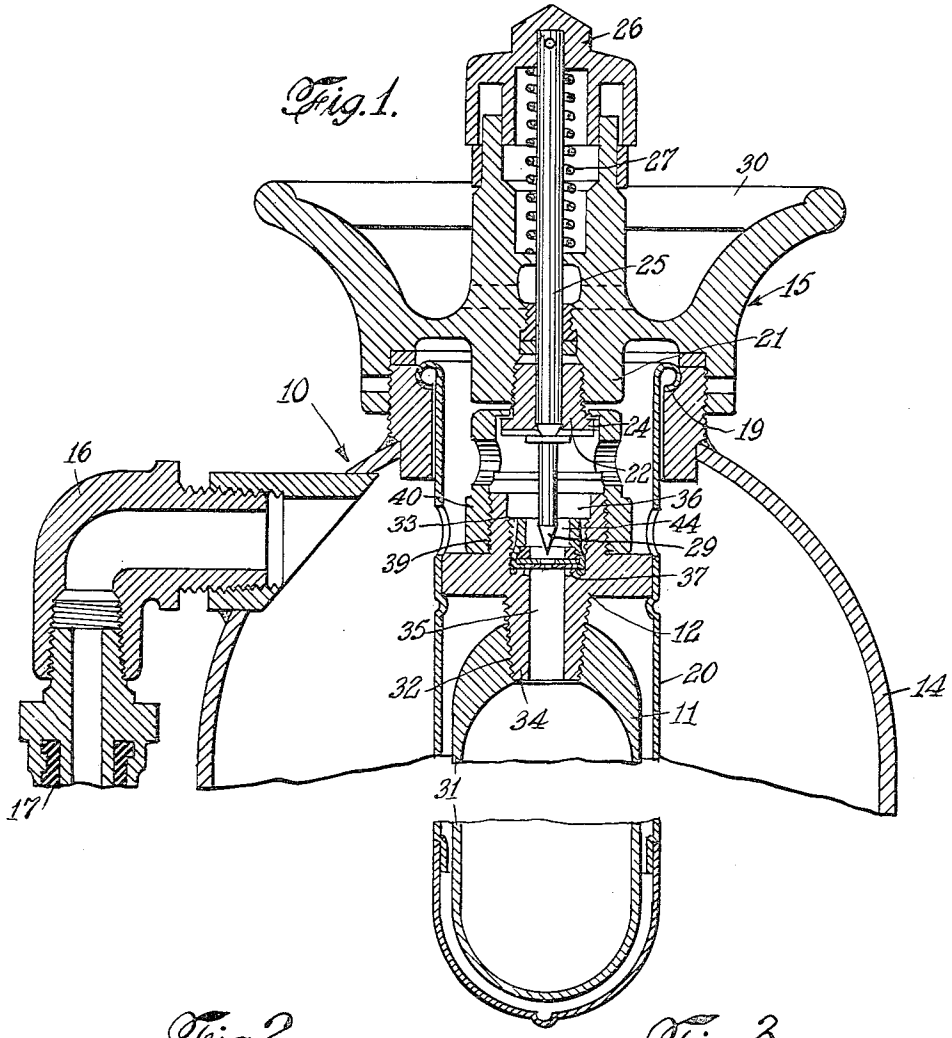


Fig. 2.

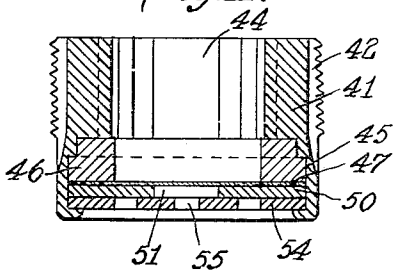
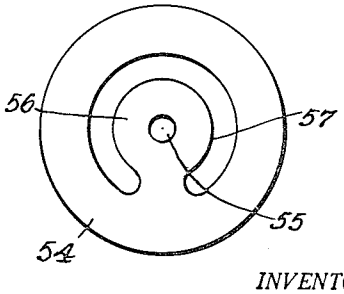


Fig. 3.



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CLOSURE FOR FLUID CONTAINER

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6 Claims. (Cl. 169—31)

The present invention relates to stored pressure fluid medium containers with discharge control such as are used principally for pressurizing fire extinguishers or other devices containing an agent to be expelled by pressure means, and more particularly to a closure for such containers.

The containers are charged with a compressible fluid at a high pressure and are provided with closure means so that the fluid may be released as desired at a predetermined and controlled rate of discharge.

The container utilizing a closure in accordance with the invention is particularly suitable for use as a pressurizing vessel for a dry powder fire extinguisher. It is important that the pressurizing vessel have a leak-proof seal as the extinguisher may not be used for sometime but must be available for instant use in the event of a fire.

While seat valve closures have been provided for some containers, it generally has been found desirable in the smaller units to provide a disc seal. Among the advantages of the disc seal is that when properly made it almost always remains leak-proof. Another advantage is that the disc provides a safety outlet for the release of the fluid in the event the pressure in the container builds up to an unsafe amount as when the temperature of the container is raised excessively. Still another advantage is that the stored fluid may be released instantly upon the rupturing of the disc by a puncturing member.

While the disc acts as a safety valve to relieve the excessive pressure, such as may occur in the container under high temperature conditions, so as to prevent the bursting of the wall of the container, there may be a hazard in that in an unsecured container, the recoil of the escaping fluid may cause the container to rocket about and possibly cause injury or damage.

Heretofore, in some cases, attempts have been made to overcome this difficulty by restricting the outlet passage of the closure for the container by making it of small diameter or by placing an orifice member therein so as to limit the rate of discharge of the fluid and thus limit the recoil. With such constructions difficulty has been found in some cases in that the charging rate is very slow, thus, considerably adding to the charging and recharging costs. Also, with the prior constructions, it is difficult to drain out any water or other material which may have entered the container either before its original charge, or in the case of a recharged extinguisher, during the period while its disc was ruptured. Of course, the water or foreign material may be removed by devalving the container, however, this entails additional work and each such devalving operation weakens the engagement of the threads of the closure with the threaded outlet of the container.

In the case wherein the container is used for the expulsion of a dry powder fire extinguishing agent, it is desirable that the pressurizing agent be discharged as rapidly as possible so as to fluff up and agitate the powder. In addition it is desirable that the expulsion agent

permeate the interstices of the powder rapidly in order to prevent the development of slugs or lumps which may impede a smooth discharge.

In Frank B. Allen application Serial No. 137,847, filed January 10, 1950, now Patent No. 2,684,180 issued July 20, 1954, there is shown a stored pressure medium container with a closure including a sealing disc and an apertured disc interposed between the sealing disc and the interior of the container. In this device upon rupture of the sealing disc under excessive temperature conditions the apertured disc restricts the outward flow of the stored medium to a safe amount, thus preventing an appreciable amount of recoil. Under conditions of normal operation as for expelling dry powder from a fire extinguisher, the puncturing member is adapted to rupture the sealing disc and extend through the apertured disc making an opening of a size such as will permit the rapid discharge of the pressurizing medium. While this device has been found generally satisfactory, some difficulty has been had in incorporating the device in fire extinguishers having a puncturing member of a short stroke so that the penetration of the orifice disc is insufficient to enlarge the opening thereof sufficiently to provide the desired high discharge rate.

Another device which has been provided to store the pressurizing medium for a dry powder fire extinguisher is disclosed in Scott E. Allen application Serial No. 141,539, filed January 31, 1950, now U. S. Patent 2,634,814 issued April 14, 1953. In this device an apertured valve member is positioned between the sealing disc and the interior of the container. This device provides for the rapid recharging of the pressurizing fluid container, and produces a restricted discharge upon the rupture of the sealing disc as under a condition of excessive temperature. In order to utilize this device for pressurizing a dry powder fire extinguisher, it is necessary that the puncturing member have a length sufficient to extend into the passage of the closure member a sufficient distance to unseat the apertured valve member and remain in that position during the discharge.

The present invention aims to overcome the difficulties and disadvantages of prior devices by providing a closure for a pressurizing fluid container in which the closure provides for the rapid charging and recharging of the container, provides a limited discharge rate under conditions of excessive temperature rise, and, when opened by a puncturing member, produces a high rate of discharge.

Another object of the invention is to provide a stored pressure medium container closure which is simple and economical in manufacture, efficient in operation, and durable in use.

These objects are accomplished by providing a stored pressure medium container having a closure member incorporating a sealing disc with a fluid flow limiting member in proximity thereto and removable therewith for ease and replacement. The fluid flow limiting member is normally in position to limit the outward flow yet may be readily moved out of flow blocking position so as to remain in a position to permit unrestricted flow through the outlet passage.

The invention is advantageous in that a disposable unit is provided at low cost, thus, rendering it feasible to provide a new closure including a new fluid flow limiting means with each recharge overcoming any possible difficulty which might arise as from damage to the orifice because of corrosion, dirt, or mishandling.

Other objects and advantages of the invention will be apparent from the following description and from the accompanying drawing which shows, by way of example, an embodiment of the invention.

In the drawing:

Figure 1 illustrates a fragmentary vertical sectional view of a powder fire extinguisher incorporating a stored fluid pressure medium container closure in accordance with the invention.

Figure 2 is an enlarged vertical sectional view of a unitary assembly of a sealing disc and a fluid flow limiting member in accordance with the invention.

Figure 3 is a plan view at enlarged scale illustrating the flap fluid flow limiting member in accordance with the invention.

Referring to the drawing, there is shown in Figure 1 a powder fire extinguisher **10** pressurized by a stored fluid pressure medium container **11** in which the contents thereof are retained by a closure **12** in accordance with the invention.

The powder fire extinguisher **10** is illustrated to show a use for the stored fluid pressure medium container **11** and its closure **12**. The extinguisher includes a standard shell **14** adapted to contain a fire extinguisher powder which is charged through a filling opening at the top of the container which is then closed by a conventional cap **15**. Upon the discharge of the extinguisher, the powder is pressurized by the fluid from the container **11** and expelled through an outlet elbow **16** and a discharge hose **17** through a suitable nozzle (not shown). Within the filling opening is a shoulder **19** to support an apertured casing **20** adapted to provide a space within the powder charge for the container **11**. Depending from the under surface of the cap **15** is a tubular portion **21** having a threaded interior surface to receive an apertured insert **22** with a flanged end **24**. A puncturing member **25** is adapted to slide within the apertured insert **22** upon pressure being applied to an actuating cap **26** at its top end. A spring **27** normally holds the puncturing member in upward position. The lower end of the puncturing member **25** is pointed as indicated at **29** to facilitate the rupturing of the closure member of the container as will later appear. The cap **15** is made with a conventional handle ring **30** for the easy transportation of the extinguisher and for use as a handle for engaging the cap **15** after the filling operation.

The stored fluid pressure medium container or pressure vessel **11** comprises a body or container portion **31** made of any suitable material such as steel to store the fluid medium under high pressure. The upper end of the container body is made with a threaded discharge opening **32** in which is secured lower end **34** of the closure fitting **12**, a fluid passage **35** extending therethrough.

The outer end of the fluid passage **35** is enlarged as indicated at **36** and formed with an outwardly directed main sealing seat **37**. The outer surface of the upper end of the closure fitting **34** is threaded as indicated at **39** so that the closure may be received in a cartridge cap **40** apertured as indicated at **33** for the discharge of gas therefrom. The cap member **40** has its upper end turned inwardly to engage over the flange **24** of the apertured insert **22** to swivelly hold the cartridge in position with its outlet adjacent the puncturing member **35**.

The enlarged outer portion **36** at the passage of the closure member **12** is threaded to receive a conventional sealing disc nut **41** having longitudinally extending filling grooves **42** cut through its threaded surface and having a passage **44** extending therethrough. The lower end of the sealing disc nut **41** is made with a recess **45** to receive a washer **46** and a conventional sealing disc **47**.

Adjacent the sealing disc **47** is a seat member or disc **50** having an aperture **51** extending therethrough. The seat disc **50** may be formed of any suitable material such as copper preferably easily deformable at its outer edges to provide a leak-proof seal with the surface of the sealing disc **47**. The size of the aperture **51** is predetermined to permit a desired high rate of flow from the container **11** after the sealing disc **47** has been ruptured.

On the inner side of the seat disc **50** is a recoil limiting orifice plate or disc **54** which is preferably made of cold rolled annealed copper or equivalent material. An aperture or flow limiting orifice **55** is preferably placed in the center of the recoil preventing disc **54**, the size of the opening **55** depending upon the desired rate of flow of the fluid from the container **11** in the event the disc **47** is ruptured under a condition of excessive pressure rise in the container **11** as might occur upon the exposure of the container to an excessively high temperature. A flap **56** is formed in the recoil preventing disc **54** preferably by cutting away a generally horseshoe-shaped portion **57**. The diameter of the flap **56** is made greater than the diameter of the aperture **51** in the seat disc **50** so that normally the flap member overlies the wall of the aperture **51** which acts as a seat for the flap member. In order to provide a unitary assembly with the sealing disc **47**, the lower end of the sealing disc nut **41** is turned inwardly to hold the various discs against each other. However, the turned-in end has a greater diameter than the diameter of the main seat **37** so as to provide space for the contact of the under side of the recoil preventing disc **54** with the seat **37**.

In operating the extinguisher **10** fitted with a stored fluid pressure medium container **11** having a closure member **12**, the extinguisher is inverted and its cap **26** struck against a surface to move the puncturing member **25** inwardly to rupture the sealing disc **47** releasing the stored fluid pressure medium to expel the fire extinguisher powder through the hose **17**. It will be seen that after the puncturing member ruptures the disc **47**, its point **29** passes through the aperture **51** and strikes the flap **56** of the recoil preventing disc **54**. The flap **56** is pushed away from contact with its seat disc **50** and by reason of its fabrication of soft material remains in the inwardly turned position after the puncturing member tip **29** has been withdrawn under the action of the spring **27**. Thus, it will be seen that an unrestricted passage is provided limited only by the size of the aperture **51** of the disc **50**. The fluid discharge medium is thus discharged at a rapid rate to fill the voids in the powder for the pressurization thereof and also to cause an initial agitation of the powder so that it may be readily expelled in an even flow.

It is customary in providing refill containers **11** for the recharging of the extinguishers **10** to store the cartridges prior to their use. Under such conditions of storage, or during the transportation thereof, in the event of an excessive temperature rise resulting in a pressure build up within the container **11** to a dangerous amount, the sealing disc **47** is adapted to rupture to release the stored fluid medium. Upon the rupture of the sealing disc **47**, the fluid medium is released at a rate limited by the size of the orifice **55** in the recoil preventing disc **54**. By reason of the small size of the orifice **55**, the recoil of the container **11** is held to a safe limit so that there is practically no movement thereof during the discharge. It will be seen that the pressure of the discharging fluid against the under side of the recoil preventing disc **54** firmly holds the flap portion **56** against the seat disc so that the entire flow is through the aperture **55**. A like slow rate of discharge will occur in the event the container **11** is installed in the extinguisher **10** and the extinguisher subjected to an excessive temperature rise.

While the invention has been described and illustrated with reference to a specific embodiment thereof, it will be understood that other embodiments may be resorted to without departing from the invention. For example, while the flap portion **56** has been illustrated as made by cutting away a portion of the disc **54**, it is obvious that an equivalent construction would be obained in the event no material were removed and a weakened portion formed by scoring the surface of the disc **54** or by utilizing other conventional means so that a weakened portion is formed outlining the flap portion **56** which then may be broken away under action of the puncturing

member as above described. Furthermore, an equivalent construction would result in the event the flap portion **56** were made as a separate member to be attached at its outer end to the underside of the seat disc **50** by riveting, welding, or the like. Furthermore, while aperture **55** is described and illustrated as being in the center of the flap portion **56**, in an equivalent construction it might be positioned at any location on the flap within the area exposed to the opening **51** of the seat disc **50**. Still another equivalent construction would result in the event the aperture **55** were to be made in the seat disc **50** at any suitable location, for instance, opposite the space provided by the cut away portion **57**. Therefore, the form of the invention set out above should be considered as illustrative and not as limiting the scope of the following claims.

I claim:

1. A closure for the outlet of a stored pressure fluid container adapted to be opened by a puncturing member, the closure having a passage therethrough, means to hold the closure in the outlet of the container, safety means closing the passage in the closure and adapted to be opened by a perdetermined container pressure below the bursting pressure of the container, flap seat means positioned about the passage, an apertured member, and a flap for the apertured member normally in contact with the seat means, so that outward flow resulting from the opening of the safety means by a pressure above the predetermined amount is limited by the size of the opening in the apertured member, the flap adapted to be swung away from the seat means by the puncturing member after the safety means has been opened, so that outward flow is limited only by the size of the passage in the closure.

2. A closure for the outlet of a stored pressure fluid container adapted to be opened by a puncturing member, the closure having a passage therethrough, means to hold the closure in the outlet of the container, a safety disc closing the passage in the closure and adapted to be ruptured by a predetermined container pressure below the bursting pressure of the container, flap seat means positioned about the passage and facing towards the interior of the container, an apertured disc, and a flap portion cut from the apertured disc normally in contact with the flap seat means, the aperture positioned in the flap portion, so that outward flow resulting from the rupturing of the safety disc by a pressure above the predetermined amount is limited by the size of the opening in the apertured disc, the flap adapted to be swung away from the flap seat means by the puncturing member after the safety disc has been ruptured, so that outward flow is limited only by the size of the passage in the closure.

3. A closure for the outlet of a stored pressure fluid container adapted to be opened by a puncturing member, the closure having a passage therethrough with a threaded portion, main seat means about the passage facing outwardly from the container, an apertured disc in the passage outwardly of the main seat, a safety disc in the passage outwardly of the apertured disc, a sealing disc nut adapted to engage the threaded portion of the outlet to urge the apertured and sealing discs towards the main seat, apertured disc seat means interposed between the apertured and sealing discs, and a flap portion for the apertured disc normally in engagement with the apertured disc seat means so that outward flow resulting from the rupturing of the safety disc by a pressure above the predetermined amount is limited by the size of the opening in the apertured disc, the flap adapted to be swung away from its apertured disc seat by the puncturing member after the safety disc has been ruptured so that outward flow is limited only by the size of the passage in the closure.

4. A closure for the outlet of a stored pressure fluid container adapted to be opened by a puncturing member, the closure having a passage therethrough with a threaded portion at its outer end, a main seat about the passage facing outwardly from the container, a sealing disc nut assembly adapted to engage the main seat, the sealing disc nut having a recess therein, a sealing disc in the recess, an apertured disc seat in contact with the sealing disc, an apertured disc in contact with the disc seat, the end of the nut turned in to form a unitary assembly, and a flap portion cut from the apertured disc, the aperture positioned in the flap portion, the flap portion normally in engagement with the apertured disc seat so that outward flow resulting from the rupturing of the safety disc by a pressure above the predetermined amount is limited by the size of the opening in the apertured disc, the flap adapted to be swung away from its apertured disc seat by the puncturing member after the safety disc has been ruptured so that outward flow is limited only by the size of the passage in the closure.

5. A sealing disc nut assembly for a container adapted to be opened by a puncturing member comprising a sealing disc nut having passage therethrough and a recess at one end thereof, a sealing disc in the recess, a seat member in the recess, and a flap apertured disc in the recess, the end of the nut turned inwardly to hold the parts in a unitary assembly.

6. A sealing disc nut assembly for a container adapted to be opened by a puncturing member comprising a sealing disc nut having a passage therethrough and a recess at one end thereof, a sealing disc in the recess, a seat member in the recess, and an apertured disc in the recess, the apertured disc having a flap cut therein, the aperture positioned in the flap portion, the end of the nut turned inwardly to hold the parts in a unitary assembly, the flap member normally engaging the seat member to limit outward flow depending upon the size of the aperture in the apertured disc, the flap adapted to be swung away from its seat by the puncturing member so that outward flow is limited only by the size of the passage in the sealing disc nut.

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