United States Patent

[11] 3,589,446

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[54] **SEAL RUPTURING AND DISPENSING FIXTURE FOR NORMALLY SEALED PREPRESSURIZED TANKS**
8 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **169/31,** 222/82, 239/309
[51] **Int. Cl.** **A62c 13/00**
[50] **Field of Search** 169/31; 239/309; 222/82, 83, 89

[56] **References Cited**

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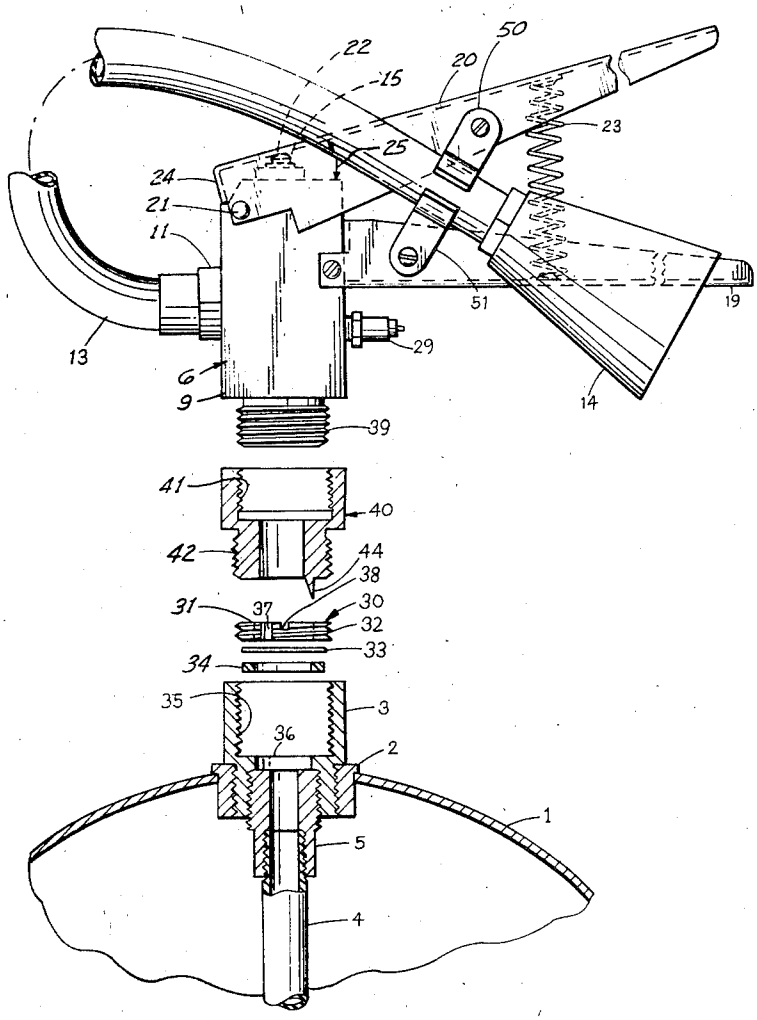
ABSTRACT: A pressurized tank charged with fire-extinguishing material is closed by a fitting having a discharge passage closed by a seal. The fitting is threaded for connection with one thread of a cutter. The cutter has a blade eccentric to the thread axis and normally spaced from the seal a distance such that it initially engages and pierces the seal only when the cutter has been screwed to within about three-quarters of a turn of its final position. During the last three-quarters of a turn, the blade cuts a kerf of about 270° through the seal, whereupon pressure of the charge bends the portion of the seal within the kerf outwardly and thereby opens a free passage through the seal. The bent portion is constrained by the uncut portion from bodily movement outwardly of the fitting. The cutter has another thread which is complementary to the thread of a valve body and is identical with the one thread. A dispensing hose has a portion which, when in one position, prevents opening of the valve.



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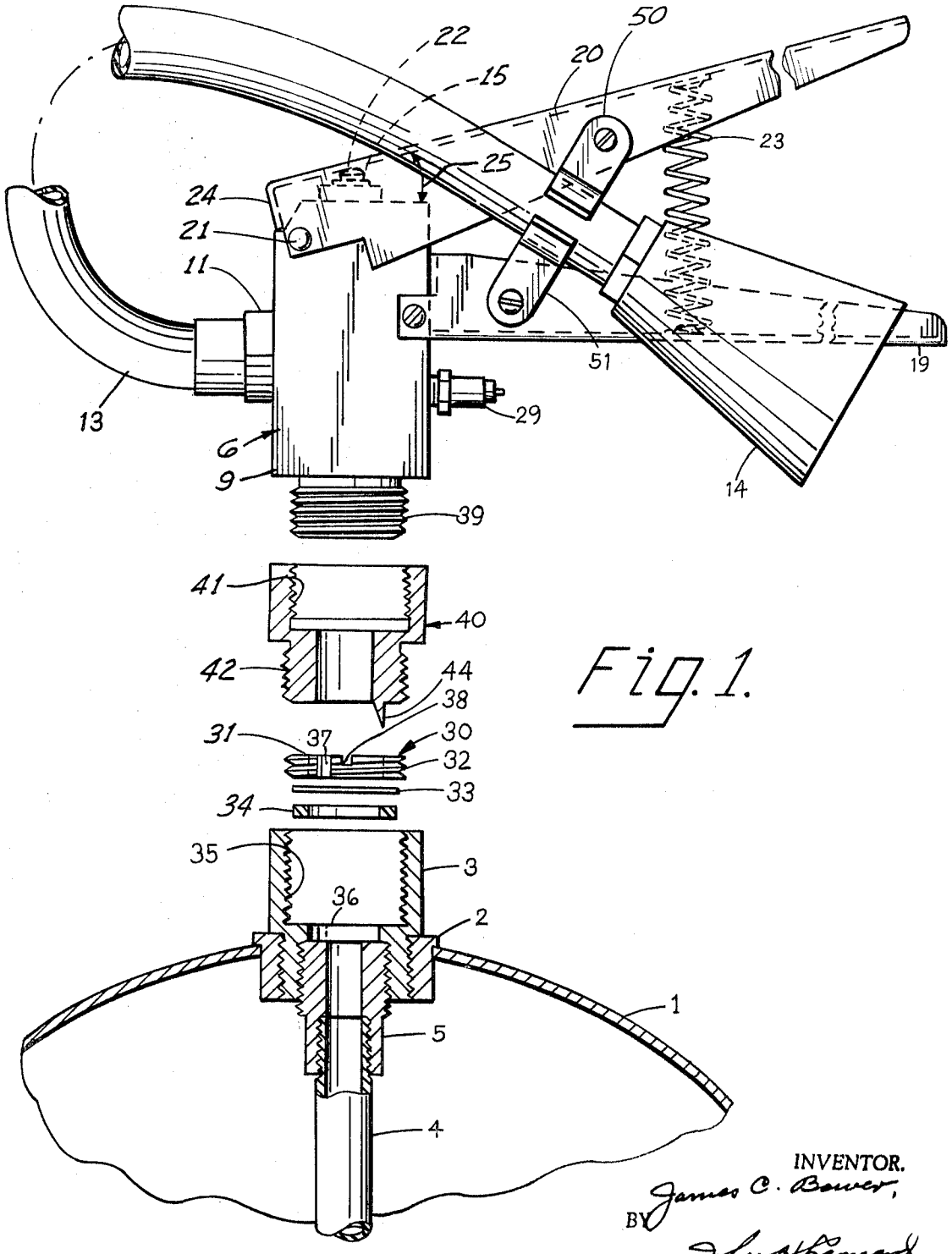

Fig. 1.

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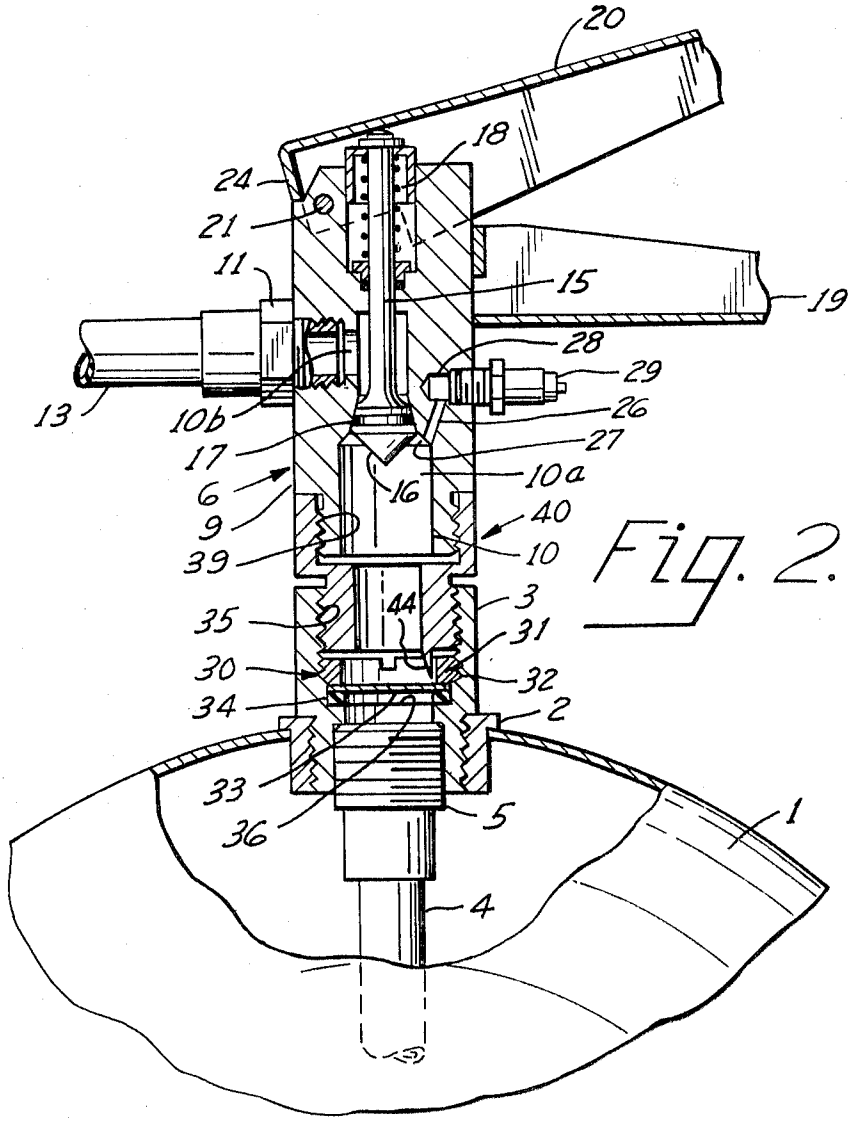

Fig. 2.

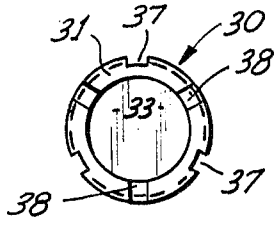

Fig. 3.

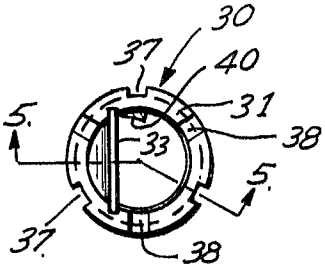

Fig. 4.

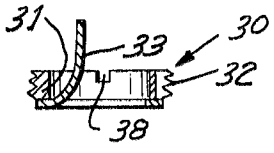

Fig. 5.

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SEAL RUPTURING AND DISPENSING FIXTURE FOR NORMALLY SEALED PREPRESSURIZED TANKS

This invention relates to a seal rupturing and dispensing fixture for normally sealed high pressure tanks. The fixture is disclosed herein as applied to a high-pressure fire extinguisher tank, containing a charge of fire-extinguishing material under exceeding high gaseous pressure, of which the seal is to be ruptured readily and the discharge from the tank delivered without loss of pressure to a manually controlled valve attached to the tank.

As to high pressure fire extinguishers, the practice is to provide a precharged tank carrying a syphon tube and a seal sealing the end of the tube. A detachable valve is carried by the tank and usually is provided with a hand lever which can be operated to force a discharge tube axially against the seal. The discharge tube has at its entrance end a cutting blade which, when the valve operating lever is operated to discharge material from the tank, cuts a hole in the seal and passes therethrough into the upper end of the syphon tube so that the material in the tank is discharged through the cutting tube and therefrom, through a suitable fitting, to a connected applicating hose. Generally the discharge tube is provided with a lateral port which, when the discharge tube is inserted sufficiently to cut a passage through the seal, is aligned with a discharge port of the fitting so that the discharge tube itself acts as a valve for controlling the discharge of material. Generally the tanks of these extinguishers are of the relatively low-pressure throwaway type and are not recharged after one use. The seal is installed as a permanent one by the fire extinguisher manufacturer after the tank is charged. If it is to be reused after rupture the tank has to be returned to the manufacturer for recharging.

For many industrial applications, however, it is desirable that the tank be capable of being recharged and sealed at the site of use. Further, it is desirable that a large number of standby tanks be arranged so that they can be precharged and held in readiness for attachment to the valve and operation thereby. For these purposes, the fixture of the present invention is provided.

The objects of the invention are: to provide a high-pressure fixture by which a sealed prepressurized fire extinguisher tank can be connected to a discharge control valve quickly for use without loss of pressure; by which the tank can be charged and pressurized at extremely high pressures at the site of use so as to be ready for immediate attachment of the control valve; as a result of the use of which a number of prepressurized and charged standby tanks can be put into use quickly successively, as desired, by securing to each, in turn, the fixture of the present invention; to provide a control valve and seal rupturing cutter of which the control valve can be left in connected relation to a tank for instant use, and removed and reincorporated manually in the fixture for cooperation with a sealed standby tank, whereby one tank and control valve are always in readiness for immediate use without the necessity for doing anything other than operating the control lever of the valve.

Various objects and advantages will become apparent from the following description wherein reference is made to the drawings, in which:

FIG. 1 is a front elevational exploded view, partly in section, showing the parts of the fixture of the present invention, including the control valve, and tank;

FIG. 2 is a front elevation, partly in section, of the tank and fixture parts in assembled relation, the seal on the tank being unbroken;

FIG. 3 is a top plan view of the seal used for the present tank in condition for sealing;

FIG. 4 is a view similar to FIG. 3 showing the seal after being ruptured for affording communication between the interior of the tank and the control valve; and

FIG. 5 is a cross-sectional view taken on the line 5–5 of FIG. 4.

For purposes of illustration, the valve shown for use in connection with the present invention is one such as disclosed in the copending application of James C. Bower, Ser. No. 824,797, filed May 15, 1969, now abandoned, and entitled Fire Extinguisher, the specific internal structure of the valve not being a part of the invention.

Referring to the drawings, the fixture is shown as connected to a high-pressure tank 1 which has an opening in the top in which is permanently mounted an internally threaded neck or collar 2 which is in sealed relation to the wall of the opening.

A discharge fitting, indicated generally at 3, is detachably mounted in the collar 2 in sealed threaded engagement therewith. A syphon tube 4 is connected to the fitting 3 by means of an exteriorly and internally threaded sleeve 5. The lower end of the tube 4 is open close to the bottom of the tank for receiving the fire extinguishing material, which is generally in the form of a dry powder, and for discharging the material from the tank due to the superimposed gaseous pressure in the tank above the level of the material.

As mentioned, it is desirable that the tank be such that it can be charged and pressurized at the site of use, as well as at the factory, and for this purpose a valve 6, such as disclosed in the above entitled pending application, is provided. The valve 6 comprises a body 9 having a through passage 10 formed by an upright bore 10*a* and a lateral bore 10*b*. The outlet of the lateral bore is connected to a suitable fitting 11 of a discharge hose 13 which has a conventional discharge nozzle 14 at its outer end.

A suitable valve having a stem 15 and plug 16 is mounted in the body 9, the plug 16 being seatable on a seat 17 for preventing escape of pressurized material from the tank.

The valve plug 16 is normally held in closed position by a seating spring 18 and is movable to open position by mean of a pair of hand grips, including one grip 19 secured to the body 9 in fixed position and a complementary movable hand grip or operating lever 20 which is pivotally secured to the body 9 by a suitable pivot 21.

The lever or grip 20 has a suitable abutment 22 which, when the handles are squeezed toward each other, engages the upper end of the stem of the valve 15 for depressing the stem and unseating the plug 16. A suitable biasing spring 23 is disposed between the grips 19 and 20 and biases them away from each other to an inoperative position. An abutment tab 24 is provided on the movable grip 20 and is positioned for engaging the valve body 9 to limit the movement of the grip 20 away from the grip 19 by the spring 23. A portion of the grip 20 engages the top of the valve body, as indicated at 25, to limit the movement of the grip 20 in the valve-opening direction.

The valve 6 is provided with means for pressurizing the tank 1 for recharging it at the work site. This is done by removing the valve 6 and syphon tube 4, introducing a charge of fire extinguishing material into the tank, reinstalling the valve, and then admitting the pressure fluid through the valve body 9 into the tank. For this latter purpose, the body 9 is provided with a gas inlet duct 26 which at one end opens into the passage 10*a* at a location at the side of the seat 17 at which the valve plug 16 is located, as indicated at 27. Thus, the duct 26 opens into the passage 10*a* at a location between the open discharge end of the syphon tube 4 and the plug 16 in the closed position of the plug 15 so that pressurized gaseous media can be supplied into the tank 1 through the syphon tube.

The duct 26 is connected to a lateral duct 28 which leads to a check valve 29 which is of the conventional type used in automobile tires and which opens inwardly for admitting pressure fluid through the ducts 28 and 26 when adequate fluid pressure is applied at the inlet of the valve 29.

Thus, the tank 1 can be charged and pressurized with the valve installed ready for instant use.

As mentioned, however, it is desirable that a large number of such rechargable tanks be charged and sealed in readiness for instant use and stored as standby tanks at the site of use, so that if the initial tank is exhausted, the present fixture can

readily be transferred to another tank, the seal of the other tank ruptured, and the contents of the other tank discharged under the control of the valve 6. It is necessary that this changeover be capable of being completed in a very few seconds.

For this purpose, a seal 30 is provided. The seal 30 comprises an annular metal retainer 31 which is externally threaded, as indicated at 32. At one end the annular retainer carries a thin metal sealing disc 33 which is juxtaposed against the inner end face of the retainer. The disc, in turn, carries an annular elastomeric seal ring 34. The fitting 3 is internally threaded with threads 35 for screw fitting engagement with the valve body 9. The threads 32 of the retainer 31 are complementary to the threads 35 and identical with those on the valve body 9 so that the retainer can be screwed into the fitting 3. The fitting 3 is provided with a sealing shoulder 36 which, when the seal 30 is screwed into final position in the fitting 3, engages the sealing ring 34 and provides an effective seal to prevent escape of the high pressure gaseous media from the tank 1. The exterior diameter of the annular retainer 30 is greater than the exterior diameter of the disc 33 and sealing ring 34, and is provided with longitudinal troughs 37 at its outer periphery such that when gaseous media under pressure is applied to the fitting 3 at the outer end of the seal 30, such gaseous media can flow through the troughs 37 past the retainer 30 and around the exterior of the disc 33 and seal 34. Thus, with the seal screwed into the fitting 3 almost to the seating position, pressurized air or fluid media supplied into the fitting 3 at the outer end of the fitting 3 can bypass the disc 33 and sealing ring 34. The seal is provided also with radial slots 38 which are positioned to receive suitable splines of a seating element of a conventional charging hood for screwing the seal into seating position while the gaseous media is being fed therethrough under high pressure into the outer end of the fitting 3. Such charging hoods are well known in the art and comprise generally a hood which can be screwed into the outer end of the fitting 3, and which has a manually rotatable stem axially movable extending from the exterior to the interior thereof and provided at its inner end with splines engageable with the radial slots 38 so as to rotate the seal 30 to seated position while the hood is in place. The hood is provided with an inlet check valve, similar to the valve 29 hereinbefore described, for admitting gaseous media under high pressure into the hood and thereby past the unseated seal 30. While the pressure is maintained within the hood and the tank is fully charged, the seal 30 is rotated by the stem and driven into sealing position in which position it remains permanently.

It is desirable that the valve 6 used for control of discharge of the tank also be readily attachable directly to a tank which is charged after the installation of the valve and is used as a standby ready for instant operation. Accordingly, the threads 35 of the fitting 3 are selected so that they are complementary to the threads 39 on the body 9. The threads 39 of the valve body and threads 32 of the seal 30 are identical.

Thus, the valve can be screwed into place in the fitting whether or not the seal 30 is installed.

In case of precharged pressurized tanks sealed by the seal 30, it is necessary to perforate the seal without a loss of pressure, and for this purpose a cutter 40 is provided. The cutter 40 is in the form of a sleeve internally threaded at one end, as indicated, with threads at 41 complementary with internal threads 39 of the valve body 9. The other end of the sleeve is provided with external threads 42 which are identical with the threads 39 on the valve body 9 and, therefore, complementary to the threads 35 of the fitting 3. The cutter 40 is provided at its inner end with a cutting blade 44 eccentric to the thread axis. This arrangement is such that the valve body 9 can be screwed into sealed relation to the cutter 40 and, with the valve 6 closed, the cutter 40 can be screwed into sealed relation to the fitting 3.

The blade 44 and the threads 41 of the cutter are all related to the threads 35 of the fitting 3 and to the position of the seal 30 when it is in sealing position that the cutter 40 can be screwed into the fitting 3 to cause piercing of the disc 33 of the seal only when the cutter 40 has been screwed to within about three quarters of a turn of its final position wherein it is seated firmly on the outer end of the retainer 31.

Only when the cutter is screwed into this position does the blade 44 pierce the disc 33. The blade 44 pierces the disc substantially at the inner periphery of the annular retainer 31. In this position of the cutter 30, there is substantially no chance for appreciable leakage between the fitting 3 and the cutter 40 along the threads 35 and 42.

Upon screwing the cutter through the final three quarters of a turn to final position, the blade 44 cuts an arcuate kerf in the disc 33, the kerf beginning at the point of initial penetration of the blade and extending less than the full circumference of the portion within the kerf. As mentioned, the threads are so located and preferably for three quarters of a complete circle. The exact extent of the kerf is variable, but it must be less than 360° and sufficient circumferentially of the axis of rotation that the central portion of the disc is cut free from the remainder throughout the major portion of its peripheral extent. It is not, however, cut through 360°, and thus the portion of the disc 33 within the kerf has a sufficient attachment to the remainder of the disc through the unkerfed portion so that the cut-loose portion cannot be driven bodily outwardly of the passage through the fitting 3 toward the valve, but instead can be bent outwardly readily about the connecting portion and constrained by the connecting portion from traveling bodily along the passage and fitting 3.

The blade 44 preferably is positioned near to the inner periphery of the retainer 31 so that the passage through the disc 33 is adequate to accommodate the full and free flow of material from the syphon tube 4 to the valve. Under no circumstances must the central portion of the disc 33 be completely severed from the portion thereof which is clamped in place between the sealed ring 34 and retainer 21.

It is apparent that with this arrangement the valve can be used on the container which can be recharged readily at the work site simply by removing the valve, introducing the fire extinguishing material, reinstalling the valve, and pressurizing it through the valve 29. On the other hand, it can readily be used and installed on tanks which have previously been sealed by the manufacturer, as by seals 30. Since generally the application of fire-extinguishing material to the flame at the initiation of the operation is more critical than subsequent applications, in general, the valve 6 with or without the cutter 40 and seal 30 is connected to one pressurized tank and so stands ready for instant use. Generally the cutter is left connected to the valve body so as to be ready for instant use. The standby tanks are sealed with the seal, such as the seal 30 above described, so that they can be connected to the valve in a very few seconds and used promptly in event of exhaustion of the contents of the original tank.

It is desirable that when the tank 1 with the valve 6 installed is not being operated, that means be provided to prevent initiating the operation of the valve 6 by operation of the hand grips 19 and 20 by squeezing them together either deliberately or accidentally. Heretofore, this has usually been done by providing a suitable split key or pin through aligned holes in the two hand grips or in the movable handle and a tab on the valve body, so as to interlock them. However, in the stress of an unexpected fire, an operator or inexperienced person may grab the extinguisher and try to force the handgrips together, not realizing that the locking pin must first be removed. Often this leads to damage of the hand grips or valve which could render the valve and extinguisher inoperative. However, it is desirable that the grips be prevented from movement to operating position accidentally or until the hose is directed toward the flame. In accordance with the present invention, the hose 13 itself is used as a means for preventing operation of the hand grips. It is instead mounted so that it must be removed from its normal standby position and directed into the flame before the valve 6 can be opened by squeezing the hand grips together. For this purpose, suitable complementary spring clips 50 and 51 are provided, the clip 50 being mounted

on the hand grip **20** and clip **51** on the handgrip **19**. These clips are such that when the handgrips **10** and **20** are in fully separated inoperative position with the stop **24** of the hand grip **20** in engagement with the hose fitting **11**, and the handgrip **19** in fixed position, a portion of the hose **13**, such as a portion adjacent the nozzle **14** or a portion of the nozzle **14**, can be snapped in between and resiliently held by the clips **50** and **51** in standby position. With the hose **13** thus held by the clips, hand grips **19** and **20** are prevented by the hose itself from being squeezed toward each other sufficiently to open the valve **6**. These clips usually hold the hose with the nozzle directed toward the operator and thus he is instantly made aware he should remove the hose and point it in some other direction before squeezing the grips to activate the extinguisher. Squeezing on the hand grips with the hose in place does not cause stresses so concentrated as to damage the grips or hose. Thus, a much higher degree of safety is provided with a much better chance that the hose will be removed and the handgrips **19** and **20** released before they are squeezed toward each other for operating the extinguisher.

The cutter preferably is made of stainless steel so that when left installed in a tank fitting **3** for long periods, no electrolytic action with the nonferrous fitting **3** of the tank will occur. Often times the fittings of the tank are made of aluminum and such electrolysis would cause severe corrosion.

The tank can be changed by installing the seal **30** and turning it almost to final seated position, pressurizing the tank, and while pressure is being applied, seating the seal. The valve body **9** and cutter **40** are then fully connected and the valve rotated to screw the cutter into the fitting **3** until they are fully seated whereby the cutter has cut the desired kerf. Thereupon upon operating the valve, the pressure in the tank blows the uncut portion of the kerf outwardly causing it to bend, leaving the passage defined by the kerf fully opened and the cut loose portion of the sealing disc **43** constrained by the attached uncut portion from passing to the valve and blocking it.

Having thus described my invention, I claim:

1. A fixture for dispensing flowable material from a high pressure storage tank, and comprising

a discharge fitting adapted for detachable connection at one end to the tank and having an axial discharge passage and an internal annular shoulder in the passage and facing toward the other end of the passage;

an imperforate seal of bendable material detachably secured on said shoulder and normally sealing the discharge passage;

a cutter disposed in the discharge passage of the fitting and rotatable relative to the fitting about a predetermined axis and movable for advancement parallel to the said axis toward the seal during said rotation, and having a passage therethrough in communication with the discharge passage;

a blade on the cutter, said blade being relatively short circumferentially of said axis and being spaced outwardly from said axis and projecting toward the seal and being shaped and positioned to engage and pierce said seal upon advancement of the cutter and then to progressively cut an arcuate kerf entirely through the seal from the point of initial piercing upon continued said rotation of the cutter and to leave the cut-loose portion of the seal movable outwardly toward said other end of the passage of the fitting free from obstruction by the blade;

constraining means to constrain the loose portion of the seal from movement into blocking relation with respect to said passage; and

a manually operable valve having a body detachably connected to the cutter and fitting; said body having a passage in communication with the passage in the cutter and being operable upon rotation to cause the cutter to rotate and advance concurrently.

2. The structure according to claim **1** wherein constraining means limit the rotation of the cutter so that the kerf extends less than 360° about said axis, but is of sufficient length so that the portion of the seal within the kerf is in the form of a tongue which can be bent outwardly by high pressure from the charge in the tank while being constrained by the remaining unkerfed portion of the seal.

3. The structure according to claim **2** wherein the constraining means limit the rotation of the cutter so that the kerf is about three-quarters of a complete circle in extent.

4. The structure according to claim **1** wherein the cutter has one thread portion which is connected to the fitting by complementary screw threads on the cutter and fitting, respectively;

the cutter has another threaded portion with a thread adapted for threaded connection with complementary threads on the control valve; and

the threads on one of said portions of said cutter are capable of complementary threaded engagement with a thread identical with the thread on the other of said portions, whereby the valve is threadably selectively to the cutter and to a fitting to which the cutter is threadably connectable, respectively.

5. The structure according to claim **1** wherein the seal comprises a retainer portion, in threaded engagement with the fitting, and a sealing portion;

the seal is movable to and from a sealing position relative to said shoulder in the fitting passage by rotation of the retaining portion about said axis; and

the retaining portion has bypass passage means operative to permit the flow of fluid in bypass relation to the sealing portion when the sealing portion is out of said sealing position.

6. The structure according to claim **5** wherein the constraining means are abutment means on the cutter and retainer portion, respectively, which limit the rotation of the cutter so that the kerf extends less than 360° about said axis, but is of sufficient length so that the portion of the seal within the kerf can be bent outwardly by a high pressure charge in the tank while the remaining unkerfed portion of the seal provides the constraining means.

7. The structure according to claim **1** wherein the valve is a normally closed stop valve;

a handgrip is mounted on the valve body;

said valve includes a manually operable handle pivotally mounted on the body to swing toward and away from the grip and positioned so that the handle and grip can be grasped concurrently in the hand of an operator and the handle squeezed toward the grip by the operator's hand to open the valve;

dirigible dispensing conduit means are connected to the valve and have an inlet end in communication with the valve passage;

characterized further in that

abutment means are provided on the handle and body, respectively;

obstructing means are carried by said conduit means and have a portion spaced from said inlet end and insertable between said abutment means and, when so inserted, cooperable with the abutment means, to resist opening of the valve by squeezing the handle toward the grip; and

detachable supporting means are provided and are detachably connected to the the conduit means, at a location spaced from the inlet of the conduit means so as to support said conduit means while said portion is in said predetermined position.

8. The structure according to claim **7** wherein the dirigible conduit means is a flexible hose;

said portion of the obstructing means is a portion of the hose;

said portion of the hose is insertable between said abutment means.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,589,446 Dated June 29, 1971

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It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 5,	For "exceeding" read --exceedingly--.
Col. 4, line 35,	For "retainer 21." read --retainer 31.--
Col. 5, line 2,	For numeral "10" read --19--.
Col. 6, line 20,	After "threadably" read --connectable--.
Col. 6, line 69,	Before "said portion" read --and--.

Signed and sealed this 4th day of January 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents

FORM PO-1050 (10-69)

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