May 28, 1968 W. D. LOE 3,385,475

CONTAINER PUNCTURING ASSEMBLY ASSOCIATED WITH A PUMP AND CHECK-VALVE MEANS

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FIG. 1.

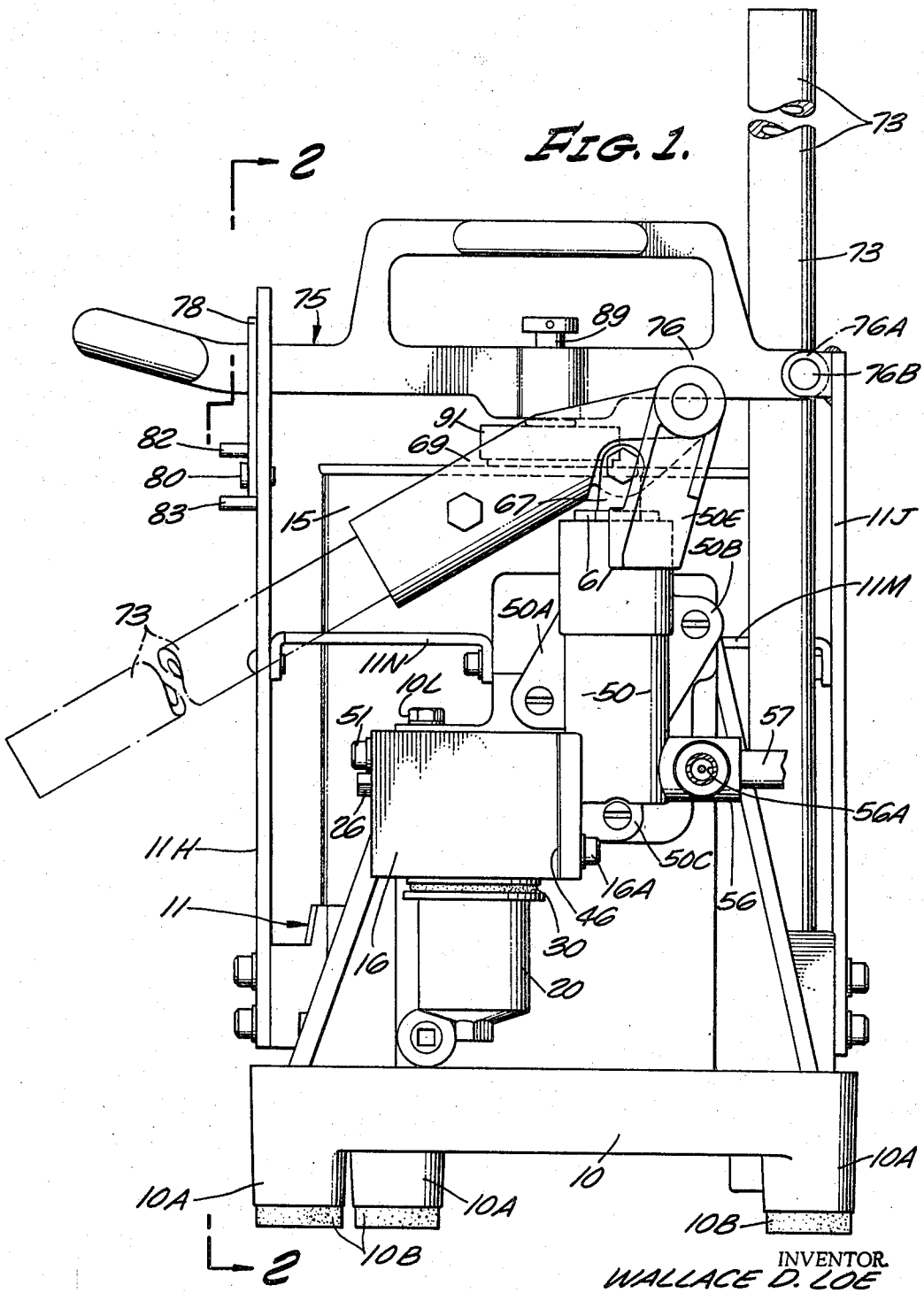

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FIG. 2.

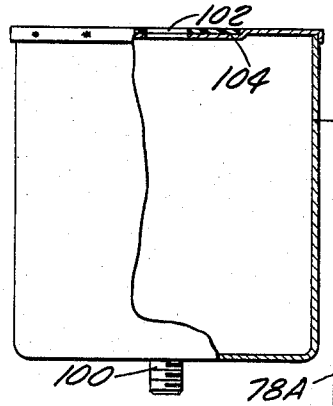

FIG. 9.

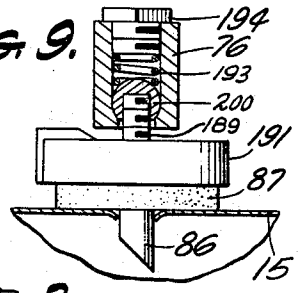

FIG. 7.

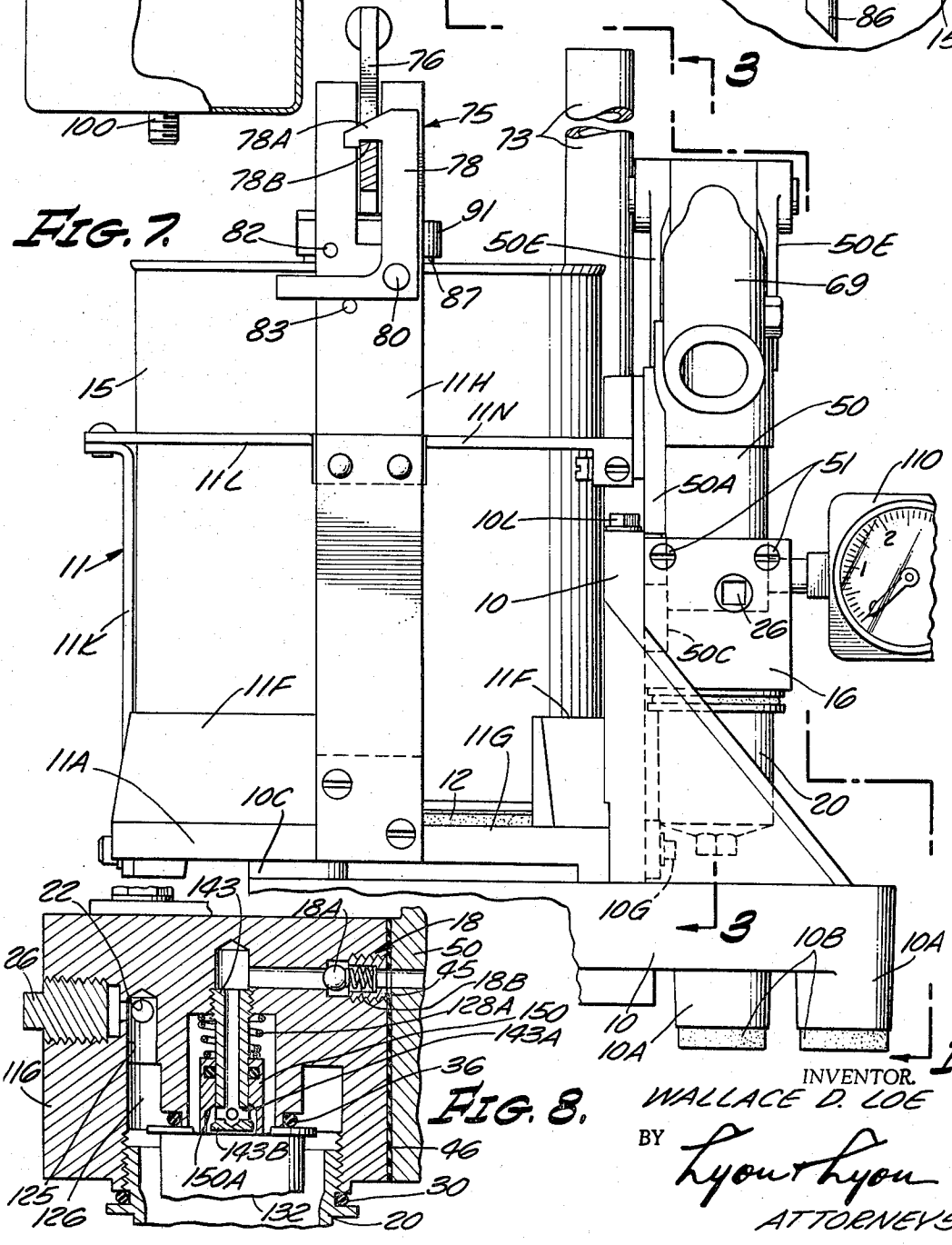

FIG. 8.

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FIG. 3.

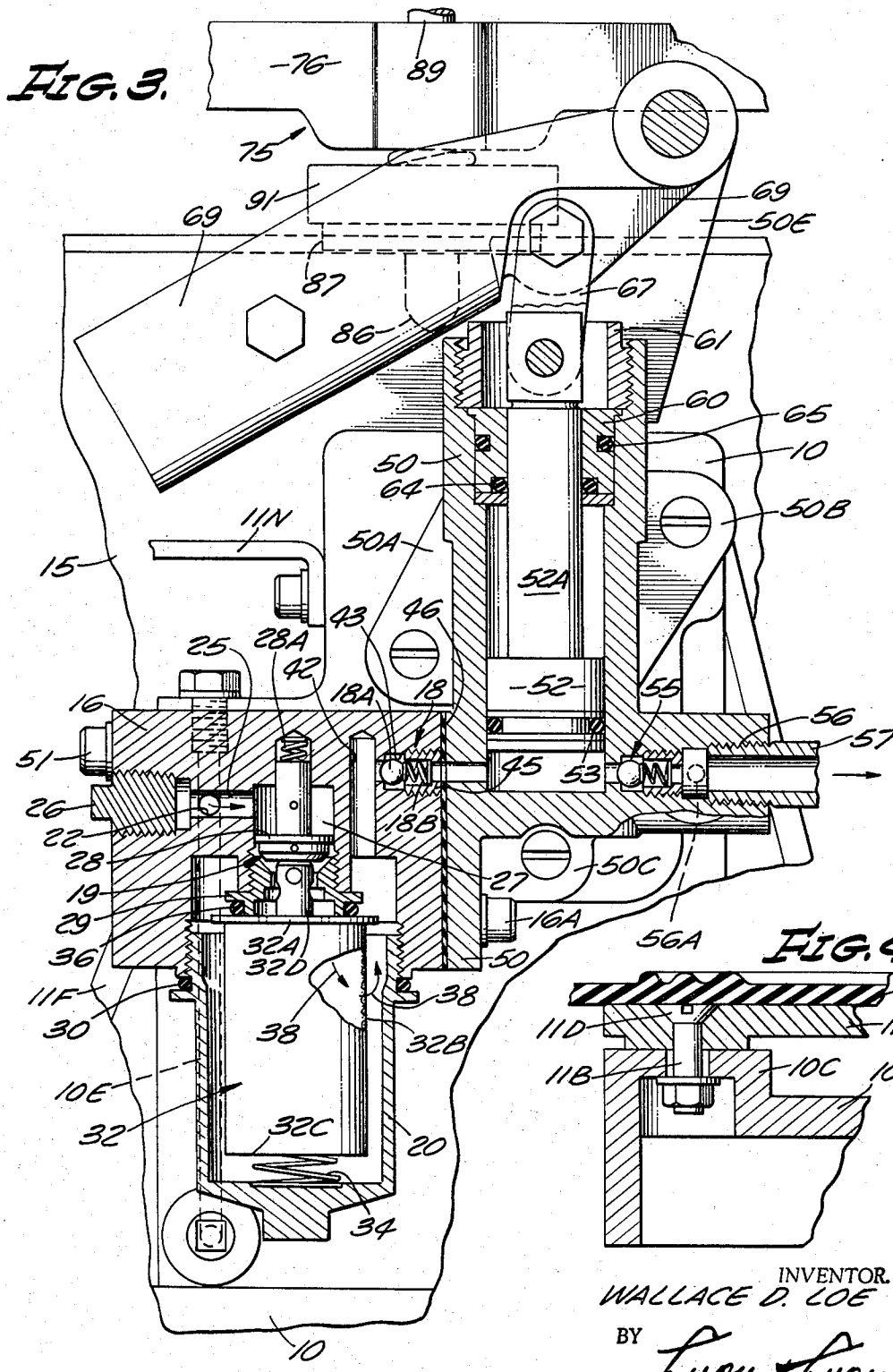

FIG. 4.

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FIG. 5.

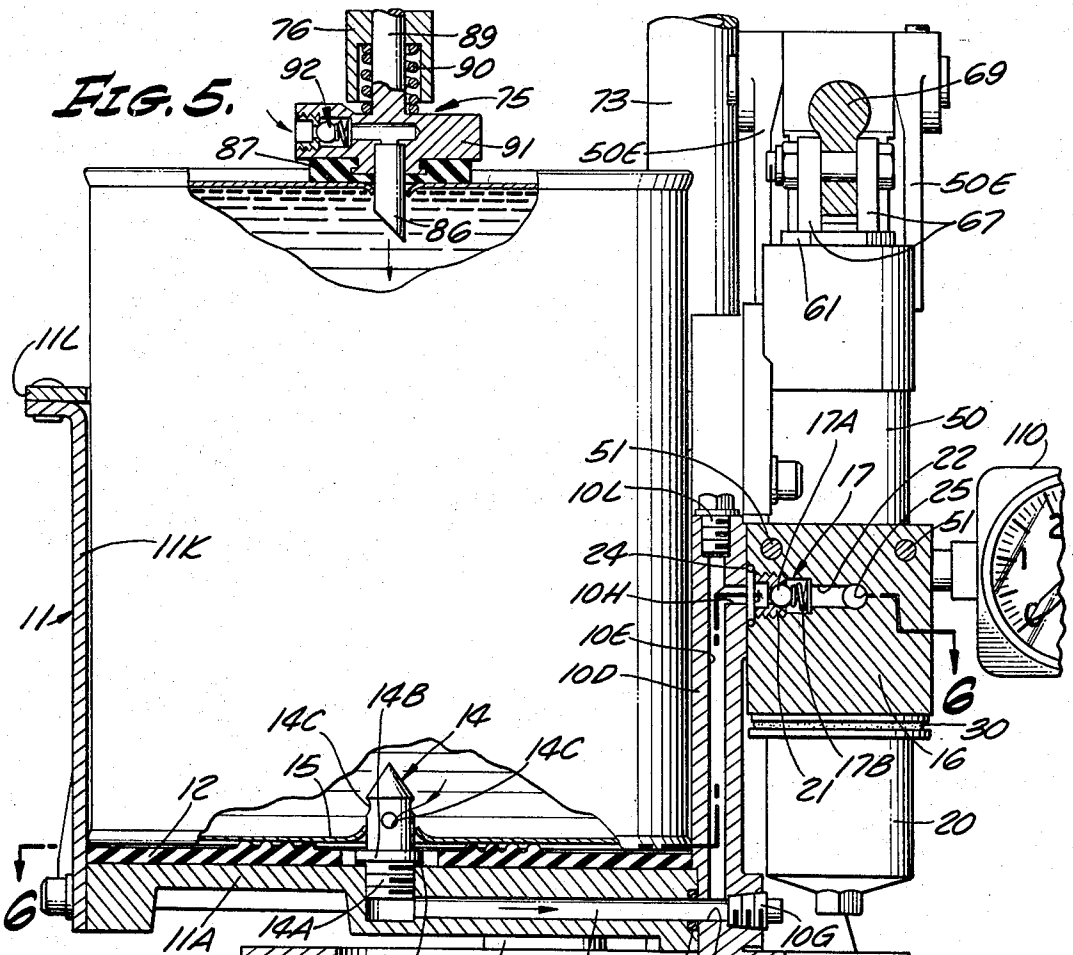
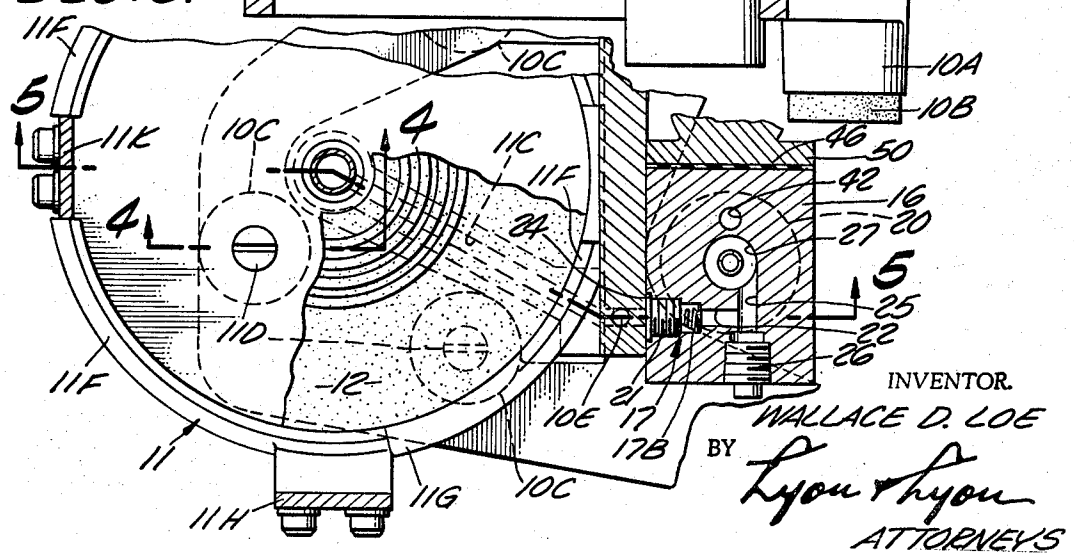


FIG. 6.



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United States Patent Office 3,385,475 Patented May 28, 1968

3,385,475

CONTAINER PUNCTURING ASSEMBLY ASSOCIATED WITH A PUMP AND CHECK-VALVE MEANS

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6 Claims. (Cl. 222—83.5)

ABSTRACT OF THE DISCLOSURE

Manually operated apparatus in which a closed can may be placed for piercing such that its fluid contents, then vented to the atmosphere through filter means, may be pumped by a manually operated pump, through a fluid channel which includes a filter element, into the hydraulic system of aircraft to replenish the same. Such filter element is on the suction side of the pump and includes means whereby removal of the filter element results in automatic sealing of such fluid channel from the atmosphere. A check valve is interposed in such fluid channel between the outlet of the pierced can and the inlet to the filter element and a removable plug is placed in the fluid channel between the check valve and the filter inlet such that the plug may be removed and connections made to recirculate fluids through the filter element by such pump without contaminating the fluid remaining in the pierced can.

The present invention relates to means and techniques useful in dispensing and/or circulating fluids and has particular usefulness in apparatus for servicing hydraulic equipment, particularly when the fluid in such equipment is above atmospheric pressure.

Briefly, the apparatus described herein incorporates a suitable receptacle for a sealed can which is punctured in the process of mounting the can in the receptacle. Sealing means are provided whereby the contents of the punctured can remains uncontaminated. Manually operated pump means is effective to pump or dispense the fluid from the punctured can to equipment in which pressures above atmospheric pressure exist. Means are also provided whereby the pumping means may be used to produce a circulation of fluid through the equipment, without the circulated fluid contaminating the contents of the punctured can. Also, novel filter means are provided whereby the fluid so circulated is cleaned of contaminating particles, with such filter means also being effective in normal operation wherein the pump instead of circulating fluids is used to dispense fluid from either an initially sealed can or from a receptacle filled with bulk fluid. Another constructional feature of the apparatus is that it is readily adapted to dispense fluids either from an initially sealed can or from a specially constructed receptacle which, when used, is used in lieu of the sealed can.

It is therefore a general object of the invention to provide improved apparatus of the character described.

A specific object of the present invention is to provide apparatus of this character which is particularly useful in dispensing fluids which are supplied in sealed cans.

Another specific object of the present invention is to provide an improved apparatus of this character that incorporates novel can puncturing and sealing means.

Another specific object of the present invention is to provide apparatus of this character which is adaptable either for dispensing fluid from a container or for circulating fluids through equipment, with or without the equipment being at pressures greater than atmospheric pressure.

Another specific object of the present invention is to provide apparatus of this character which eliminates contamination of the fluid by particles in the air and such that the hydraulic fluid need not and is indeed not exposed to the atmospheric air, the container from which the fluid is dispensed being sealed at all times when not in use.

Another specific object of the present invention is to provide apparatus of this character capable of supplying at all times clean hydraulic fluid under pressure in a range extending, for example, from zero to 3000 lbs. per square inch.

Another specific object of the present invention is to provide an improved filter construction particularly useful in apparatus of this character.

Another specific object of the present invention is to provide improved apparatus of this character which is small, compact and relatively inexpensive and rugged, considering in particular the various uses and advantages resulting therefrom.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a view taken substantially as indicated by the line 1—1 in FIG. 2.

FIG. 2 is a view taken as indicated by the line 2—2 in FIG. 1.

FIG. 3 is a view taken substantially as indicated by the line 3—3 in FIG. 2.

FIGS. 4 and 5 are sectional views taken substantially as indicated by the corresponding lines 4—4 and 5—5 in FIG. 6.

FIG. 6 is a view taken substantially as indicated by the line 6—6 in FIG. 5.

FIGS. 7, 8 and 9 each illustrate a different modification.

The apparatus as disclosed includes a base member **10** which is in the form of a special casting with three leg portions **10A**, each of such leg portions **10A** having a rubber foot **10B**.

The base portion **11A** of a can holder **11** is secured to the base member **10**, as illustrated in FIGS. 4, 5 and 6, using three bolts **11B**. Each of such three bolts **11B** extends through a corresponding circular raised portion or boss **10C** and through an apertured portion of the can base portion **11A**, the last mentioned apertured portion being countersunk to receive the countersunk head bolt **11D** whereby a flat surface is presented for a flat circular sealing pad **12**.

As seen in FIG. 5, this pad **12** is centrally apertured to accommodate a pointed post **14** used to puncture the central portion of a can **15**, the post **14** being formed with a threaded shank portion **14A** and a flanged portion **14B**, and is also provided with a plurality of radially extending apertured portions or openings **14C**, all of which are in communication with a blind bore in the post **14** so that liquid from the can **15** may flow through such openings **14C** and into a channel or bore **11C** formed in the base support portion **11A**. A sealing ring **14D** is interposed between the flange portion **14B** and the base portion **11A**; and also, as shown in FIG. 5, an O-ring **11E** is disposed between an annular grooved portion of the base portion **11A** to provide a fluid-tight connection between the base portion **11A** and a vertically extending base portion **10D**. This base portion **10D** formed as a part of a casting is provided with two intersecting bores **10E** and **10F** which, as shown in FIG. 5, are in communication with the bore **11C** and which are closed by threaded

plugs 10L and 10G, respectively. Also, as seen in FIG. 5, the casting 10 is provided with a bore 10H which intersects the bore 10E and provides a communication to a filter housing 16 containing a check valve 17, the filter housing 16 being secured to the pump housing 50, as illustrated in FIGS. 1 and 3, wherein a plurality of bolts 16A pass through a flanged portion of the pump housing 50 and are threaded in the filter housing 16.

The filter housing 16, as seen in FIGS. 3 and 5, includes the previously mentioned check valve 17 (FIG. 5), a check valve 18 and a valve 19 which is illustrated as being in its open position, but which automatically closes when and as the filter housing section 20 is screwed out of its housing 16.

The check valve 17 includes a ball 17A normally pressed by the coil compression spring 17B into engagement with a valve seat formed in the short sleeve 21 threaded in housing 16. This valve 17 is generally within a passage 22 communicable with the passage 10H, and the housing 16 is provided with an annular recessed portion within which an O-ring seal 24 is disposed to seal the connection between passageways 10H and 22. This other passageway 22 intersects with the passageway 25 which, as shown in FIG. 3, is closed by a plug 26 and which extends to an annular chamber 27 within which a piston-type valve element 28 is free to move. The valve element 28 is normally urged downwardly by a coil compression spring 28A whereby the valve 19 tends to close, such valve 19 being defined by an annular tapered portion of the piston 28 and a cooperating tapered portion of a tubular insert 29 threaded within the housing 16.

The housing section 20 is threaded within the housing 16 with an O-ring seal 30 therebetween, and within the housing section 20 there is disposed a filter element 32 which is in the general form of a drum having an open end 32A and an annular side wall 32B in the form of a filter screen. The closed end portion 32C of the filter 32 contacts a coil compression spring 34 that serves to urge and maintain the previously mentioned valve 19 open and to squeeze an O-ring seal 36 between a flanged portion of the insert 29 and filter end 32A. The filter end 32A carries a centrally disposed post 32D which contacts the spring-urged valve element 28 to move it upwardly against the action of spring 28A. Thus, the spring 34 is stronger than the spring 28A for these purposes.

This post portion 32D is suitable apertured to provide a passageway therethrough whereby fluid in the open condition of the valve 19 may flow through the filter as indicated by the arrows 38.

It will be observed that the flow of fluid through the filter 32 is first inwardly into the filter and then outwardly whereby larger solid particles in the fluid may be trapped and retained within the confines of the filter 32.

The housing section 20 is in communication with a channel 42 in the nature of a bore, such bore 42 being intersected by a bore 43 within which the check valve 18 is disposed. This check valve 18, as seen in FIG. 3, includes a ball 18A pressed by spring 18B into engagement with a seat formed internally of the filter housing 16, such spring 18B being seated against a hollow threaded insert 45 threaded in housing 16. A flat gasket 46 is interposed between the filter housing 16 and the pump housing 50.

Bolts 51 extend through the filter housing 16 and are threaded in the pump housing 50 and thus serve to squeeze the flat gasket 46 and provide a seal between these two housing elements. Bolts 16A also perform the same function of securing the filter housing.

The pump housing 50 is provided with three ears 50A, 50B and 50C, each of which is secured by a corresponding bolt to the upwardly extending portion of the base casting 10. A piston 52 carrying an O-ring seal 53 is used to pump fluid from channel 42, through check valve 18 and through check valve 55 to the outlet 56, such outlet 56 being illustrated as a threaded opening into which a pipe 57 may be threaded.

The rod 52A of piston 52 extends through a bearing or bushing 60 which is retained by an externally threaded nut 61, threaded within the housing 50 to retain the bearing or bushing 60 against a shouldered internal portion of the housing 50. O-ring seals 64, 65 recessed within the bearing or bushing element 60 and engaging respectively the piston rod 52A and an internal circular wall of the housing 50 serve to seal the unit.

The upper end of piston rod 52A is pin-connected to one end of a link 67 having its other end pin-connected to a lever 69, the lever 69 being pivotally mounted on a pair of arms 50E (FIG. 5) extending upwardly and formed integrally with the cylinder housing 50. This lever 69 is actually in the form of a cylindrical socket adapted to receive one end of a pipe 73 which is normally retained in a cylindrical socket portion of the base member 10, but which may be removed from such retained condition and inserted into the socket lever 69, as indicated by dotted lines in FIG. 1, whereby manual operation of the pump may thus be facilitated, as described later under the heading "Operation."

The can base portion 11A is formed with a circular base portion defined by upwardly extending circular portions 11F (FIGS. 2 and 6) that serve generally as a guide for the can during its downward movement during its puncturing by the centrally disposed pointed post 14 (FIG. 5), such circular base portion being interrupted, as shown, to provide an access opening 11G, as indicated in FIGS. 2 and 6. Rising above the base portion 11A and secured to the same are three vertically extending plates 11H, 11J, 11K, the plates 11H and 11J being diametrically disposed and being extended, as seen in FIG. 1, to provide a support at their upper ends for upper can puncturing and sealing means 75. The third strap 11K, as seen in FIG. 2, extends upwardly slightly less than the height of the can 15 and is interconnected to the support straps 11H and 11J by circumferentially extending straps 11L and 11M to brace the same, such support straps 11H and 11J also being braced by two other circumferentially extending straps 11N and 11P which are secured to the upwardly extending portion of the base casting 10.

The upper can puncturing and sealing means 75 includes a handle member 76 pivotally mounted on the vertically extending support 11J. For this purpose, the handle member 76 is formed with a sleeve portion 76A through which a pivot pin 76B extends, the ends of the pivot pin 76B being secured to spaced ear portions on the support member 11J. The other end of the handle member 76 is engageable with a pivoted latch member 78 which, as seen in FIG. 2, is pivotally mounted on the support member by pivot pin 80. Movement of this latch member 78 is confined between the pair of spaced stop members 82 and 83 on the support member 11H and such latch member has a cam portion 78A and a hook portion 78B engageable with the handle 76 which, as seen in FIG. 2 in cross-section, is in the nature of a bar that enters an upper bifurcated portion of the support member 11H to first cam the latch member 78 in a clockwise direction in FIG. 2 after which the hook portion 78B may then engage the handle portion 76 to hold it in its latched condition.

Mounted on an intermediate portion of the handle member 76, as seen in FIGS. 1 and 5, is a can puncturing and sealing means, the puncturing means being provided by the sharp edges of a bevelled cutting tube 86 and the sealing means being provided by the rubber seal 87 surrounding the tube. Both the tube 86 and rubber seal 87 are mounted on an annular flanged portion 91 of a rod 89 which is slidably mounted in the handle member 76. A coil compression spring 90 is disposed between the flanged portion 91 and an internal shouldered portion of the handle member 76. In the unlatched condition of

the handle **76**, the movement of the rod **89** within the handle is limited by engagement of the large portion of the rod with the handle. A check valve **92** is disposed within the flanged portion **91**, the check valve **92** being constructed generally, as previously described, and serving to allow atmospheric air to enter the top of the can as the fluid is being dispensed from the can to prevent any substantial subatmospheric pressure being developed inside the punctured can when and as fluid is dispensed therefrom.

Operation of FIGURES 1–9

Initially there is no can **15** in the apparatus, but a can **15** may be inserted by pivoting the handle member **76** to allow the can **15** to enter its receptacle, such receptacle being provided generally by the curved or arcuate base portion **11F** of the can support **11** which retains and guides the lower end of the can so that its central portion may be pierced by the pointed post **14**. This piercing operation is preferably accomplished using the pivoted handle **76** which is then pivoted to its latched position shown in FIGS. 1, 2 and 5. During the latching of the handle **76**, both the bottom and the top of the can are punctured and the apertured portions of the can are sealed against leakage. The lever extension **73** is then removed from its storage position shown in the drawings and placed in the dotted line position in FIG. 1 to facilitate operation of the manually operable pump which when operated causes the piston **52** to move up and down to cause flow of fluid from the can to the outlet opening **56** to occur through the following path, namely, through the post **14**, channels **11C**, **10F**, **10E**, through the check valve **17**, through the channels **22** and **25**, through the valve **19** which is, of course, open at this time, through the filter **32**, through the conduit **42** and check valve **18** and through the check valve **55** to the outlet opening **56**. During the dispensing of the fluid from the can **15** air enters the top of the can through the check valve **92** to vent the tank to atmospheric pressure.

In those conditions wherein it is desired to circulate fluids, for example, for conditioning the same, the plug **26** (FIG. 3) may be removed and it then provides an inlet opening **26A**, such inlet opening **26A** being connected to a container (not shown) containing such fluids and the outlet opening being also in communication either with this same or a different container. Operation of the pump under these conditions results in circulation of the fluid through the filter **32**, with the solid portions of the fluid being retained within the filter. During such circulation of fluids from and back to the same or to a different container, as desired, fluids are prevented from entering the can **15** because the check valve **17** permits fluid flow only from the can **15** into the channel **22** and prevents reverse flow.

The apparatus is also adapted to dispense bulk fluid, i.e. fluids which are not necessarily supplied in sealed cans and which thus do not require puncturing, and for this purpose the arrangement shown in FIG. 7 may be incorporated in the apparatus after first removing the threaded post **14** to allow the threaded nipple **100** of the container **101** to be threaded into the threaded opening **14A**. The container **101** is provided with a central opening **102** through which the cutting tube **86** may enter without damage to such container **101**. An annular seal gasket **104** surrounds the opening **102** and is squeezed between the container **101** and the rubber pad **87** to thereby provide a seal at the upper end of the container **101** when the handle **76** is latched in position, as described above.

Preferably the apparatus is fitted with a pressure gauge **110** which is in communication with the outlet opening **56** via port **56A** in FIG. 3 to provide an indication of the pressure within the pipe, tubing or hose **57** connected, for example, to a pressurized control to which the fluid is to be dispensed or through which fluid is to be circulated. The gauge may thus be used in many different circumstances to indicate initial, final and/or circulating fluid pressure.

The assembly may be serviced by removing a used filter element and replacing the same by a new filter element **32** (FIG. 3). This involves unscrewing the filter housing **20** after which element **32** may be removed. When the filter housing **20** is thus being unscrewed the valve element **19** is allowed to seat under the influence of spring **28A** to prevent fluid flow from the can **15**. This safety feature prevents fluid flow when either the unit is assembled without a filter element or during removal and replacement of the filter element.

It will be appreciated that the check valve **17** may be relocated so as to be embodied in the construction of the can piercing post **14**.

Also an air filter may be incorporated in the upper can piercing means **75** such that all air required for venting, i.e., anticavitation, is required to flow through such filter for removal of undesirable elements such as, for example, dust, dirt and moisture.

Further, the handle **73** may be made in telescopic sections for space conservation and convenience in which case one end of the same may be permanently secured in socket **69** if desired.

Further, for outdoor operations the structure may incorporate a shield, like an umbrella structure, over the top of the can to prevent, for example, rain water from accumulating on the top of the can **15**.

In the modification shown in FIGURE 8, the fluid flow through the filter element **132** is now radially inwardly through the filter element **132** instead of radially outwardly as in the embodiment shown in FIGURE 3. The bore **22** is now in communication with a bore **125** which in turn is in communication with an annular space **126** and the inside of removable filter casing **20**. The filter element **132** is normally urged upwardly by spring between the casing **20** and the filter element **132** in the manner illustrated in FIGURE 3, a like spring **34** being used for that purpose. In such case the filter element **132** is pressed against the O-ring seal **36** and against the action of a weaker spring **128A** (corresponding to the spring **23A** in FIGURE 3).

The fluid after leaving the filter **132** flows upwardly through a pipe-like element **143** threaded in the filter housing **116**, such element **143** having a central bore in communication with a pluurality of radially extending bores **143A** at the lower end. Such bores **143A** are, in the absence of the filter element **132**, closed by a sleeve-like valve element **150** which is normally urged in a downward direction by spring **128** against the lower flanged portion **133B** of pipe-like element **143**. For this latter purpose, the sleeve-like element **150** is provided with an internal flanged portion **150A** that seats against the flanged portion **143B** in the closed position of the valve **143, 150**, to achieve a safety feature described above in connection with the valve **19, 29**.

In the modified arrangement shown in FIGURE 9, the same incorporates a self-aligning can cutting element **86** like the cutting element having the same numeral **86** in FIGURE 5. In this case the assembly **191** that incorporates the air valve **92** of FIGURE 5 has a threaded stud **189** which is threaded in a ball **200** seated in a spherical seat internal of the bar **76**, such ball **192** being pressed downwardly on such seat by a spring **193** having its upper end engaging a plug **194** and its lower end engaging the ball **192** to thereby provide an arrangement wherein the assembly **191** self-aligns itself with respect to unevenness in the top of can **15** particularly in the latter stages of cutting the same.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. In apparatus of the character described, a base structure; receptacle retaining means on said base structure; pump means having an inlet and an outlet; conduit means in said base structure and having one of its ends terminating in a receptacle maintained by said retaining means and having the other one of its ends in communication with said pump means inlet; filter means having an inlet and an outlet; said filter means being in said conduit means between said one and the other end thereof; said retaining means including manually operated means for releasably securing a receptacle in said retaining means; receptacle venting means effective upon operation of said securing means to vent a receptacle retained by said retaining means; check valve means between said one end of said conduit means and said inlet of said filter means and functioning to prevent reverse flow from said filter means inlet to said one end of said conduit means; and a closable opening in communication with said inlet of said filter means and the downstream side of said check valve means.

2. Apparatus as set forth in claim 1 in which said filter means includes a removable filter element; and valve means controlling the flow of fluid to said filter means inlet; said valve means incorporating means for automatically closing said valve; and said filter means including means for disabling the last-mentioned means when said filter element is in position in said filter means.

3. Apparatus as set forth in claim 1 in which said one end of said conduit means is a threaded opening in said base structure within which a tubular can puncturing means is threaded.

4. Apparatus as set forth in claim 1 in which said one end of said conduit means includes a threaded opening in said base in which a nipple portion of a receptacle is threaded.

5. Apparatus as set forth in claim 1, in which said one end of said conduit means comprises a tubular can puncturing means for puncturing the lower end of a can; and said receptacle retaining means includes means movably mounted on said base structure, the last-mentioned means incorporating an assembly that punctures the top end of the can to vent said can to the atmosphere.

6. An arrangement as set forth in claim 5 in which said assembly is swivelly mounted on said movably mounted means.

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