

[54] **QUICK-RELEASE AERATOR FOR INTRODUCING HIGH PRESSURE AIR INTO A CONTAINER TO FACILITATE DISPENSING**

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[57] **ABSTRACT**

[52] **U.S. Cl.**..... 222/3; 124/11 R

[51] **Int. Cl.²** **B67B 7/24**

[58] **Field of Search** 222/3; 137/495, 494, 102;
251/30; 124/11 R

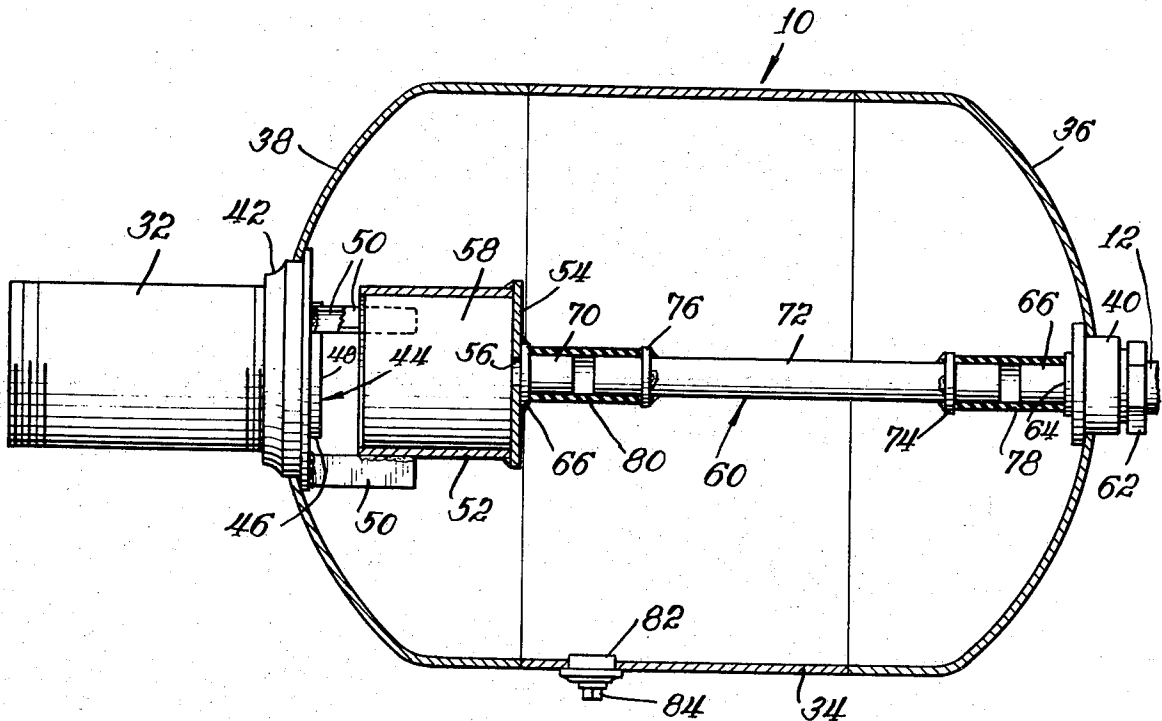
A container chargeable with air under pressure. A piston disposed therein is movable to a position closing air outlet means to condition the container for charging, and is movable away from such position after the container has been charged for suddenly releasing air under pressure through the air outlet means.

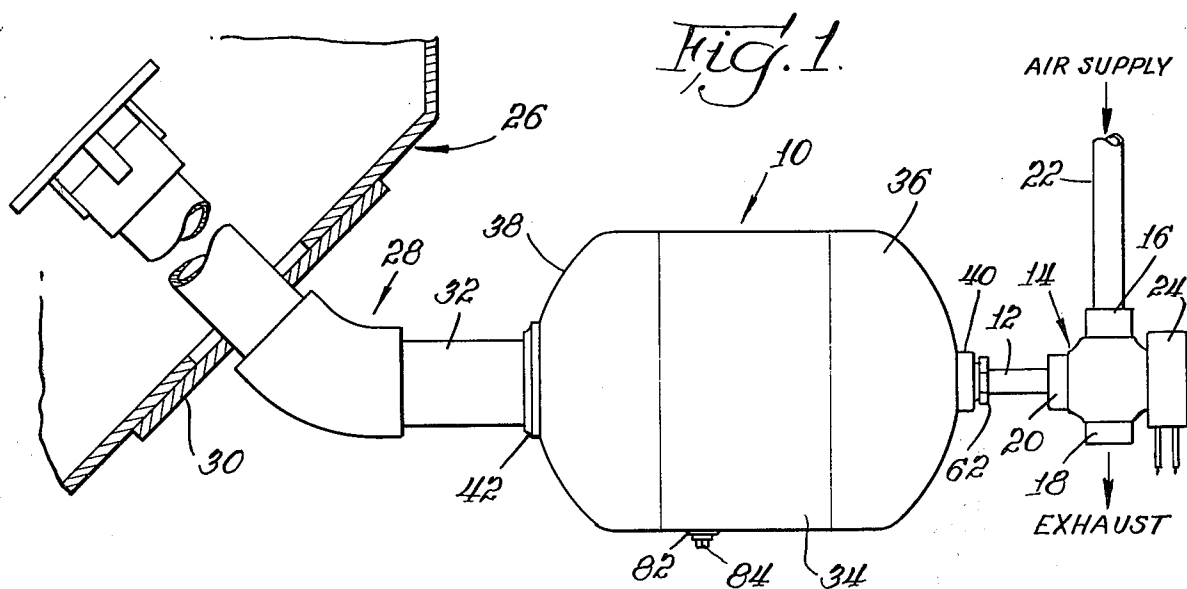
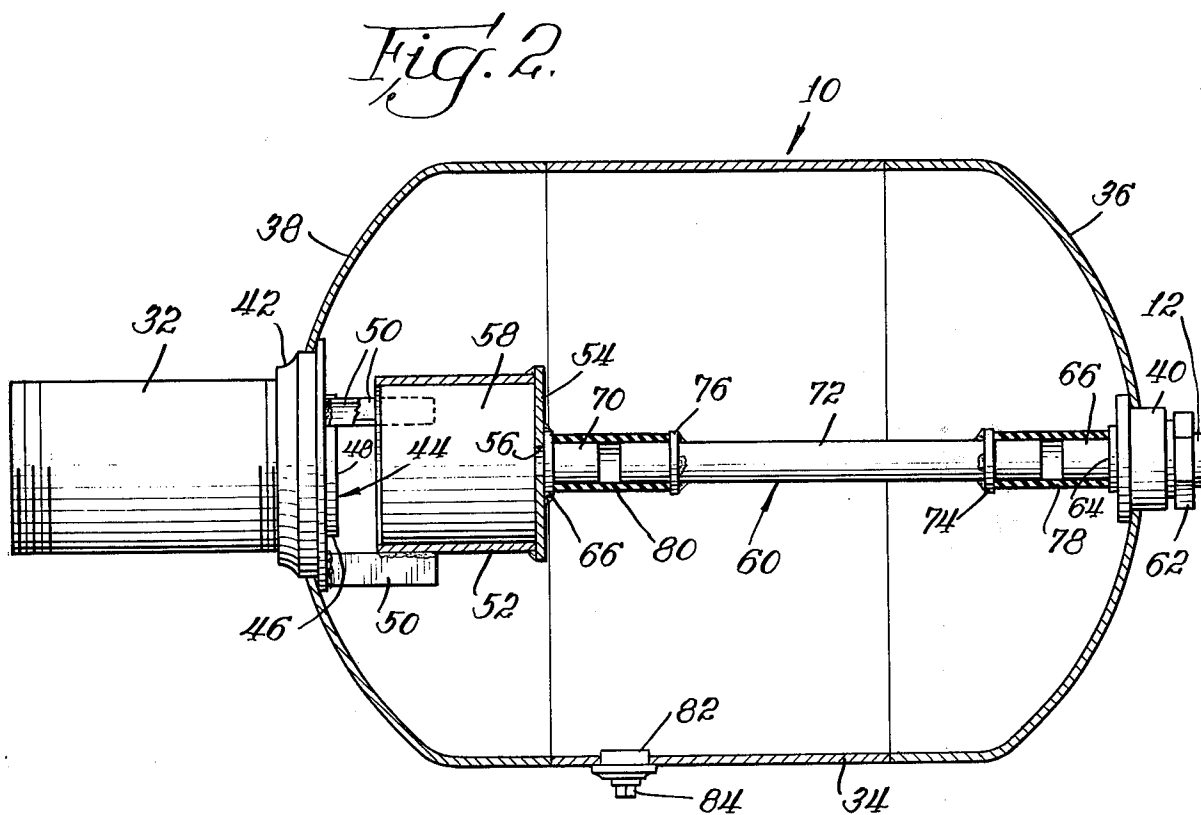
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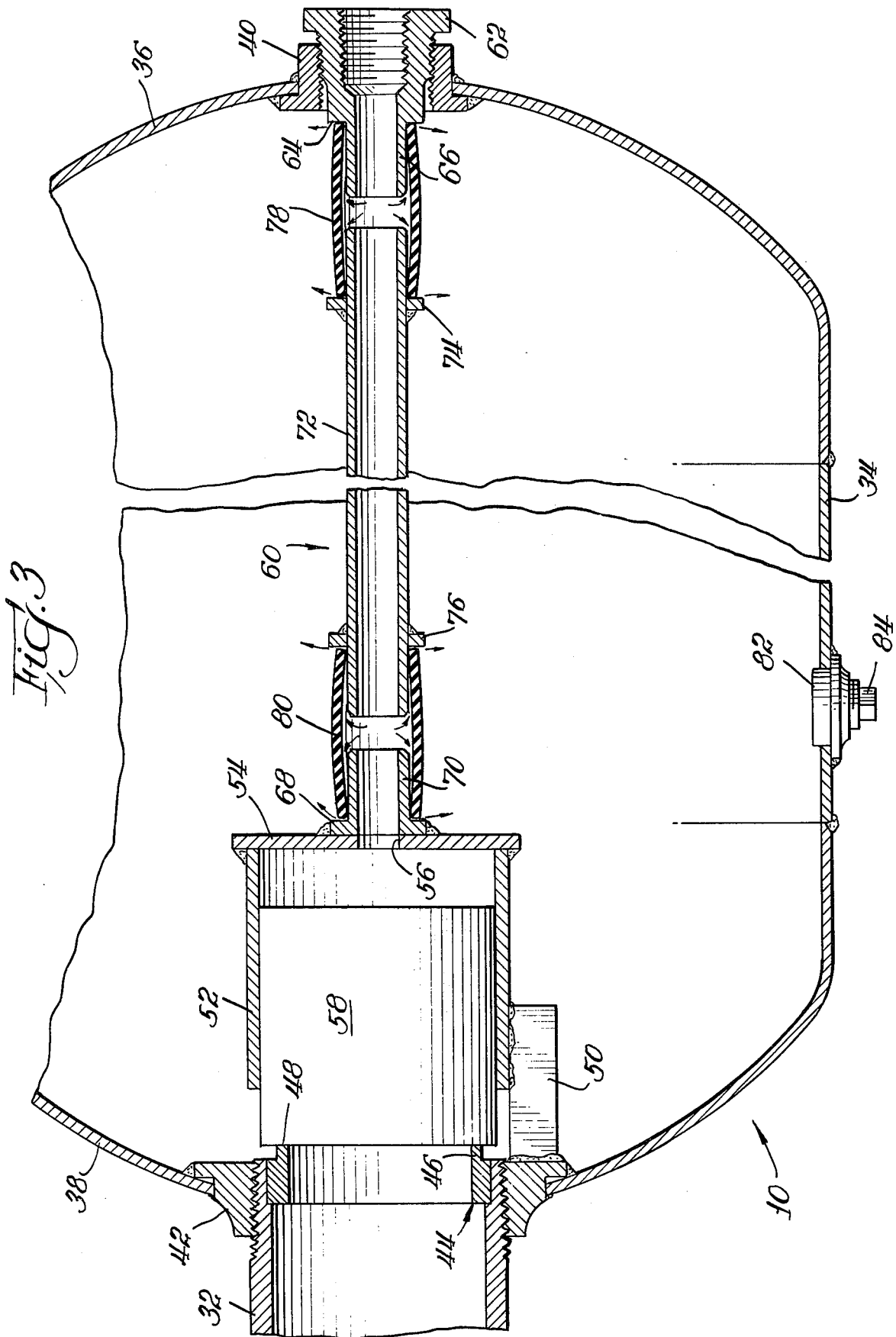
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9 Claims, 3 Drawing Figures







QUICK-RELEASE AERATOR FOR INTRODUCING HIGH PRESSURE AIR INTO A CONTAINER TO FACILITATE DISPENSING

BACKGROUND OF THE INVENTION

The quick-release aerator of the present invention is adapted to be associated with a storage bin or other receptacle containing granular and like materials. The container of the aerator is charged with air under pressure which is releasable in a sudden burst into the storage receptacle to loosen and cause free flow of material therein. The quick-release aerator disclosed herein is of the general type disclosed in U.S. Pat. No. 3,788,527.

SUMMARY OF THE INVENTION

The quick-release aerator of the present invention comprises a container having air inlet means and air outlet means. An annular valve seat is arranged at the air outlet means. A hollow cylinder is mounted within the container and has a closed end wall with an aperture and an open end facing and axially spaced from the valve seat. Air transmitting conduit means extends between the air inlet means and the aperture. A piston having an outer end of greater diameter than the valve seat is axially slidable in the cylinder between a first position where the outer end is spaced from the valve seat and a second position where the outer end is engaged with the valve seat.

The piston is movable from its first position to its second position by air under pressure introduced through the air transmitting conduit means to condition the container for charging with air under pressure. After the container has been charged with air under pressure, the piston is returnable to its first position by a combination of exhaust of air under pressure from the air transmitting conduit means and the resultant pressure differential established at the opposed ends of the piston for suddenly releasing air under pressure from the charged container through the air outlet means.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the quick-release aerator of the present invention, and a fragmentary sectional view of a receptacle with which the aerator is associated;

FIG. 2 is a longitudinal median sectional view, on an enlarged scale, of the aerator of FIG. 1, and shows the piston thereof in an open position; and

FIG. 3 is a longitudinal median sectional view, on a further enlarged scale, corresponding generally to FIG. 2, but shows the piston in a closed position.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to FIG. 1, there is indicated generally by the reference numeral 10 a quick-release aerator embodying the principles of the present invention. The aerator 10 is connected at one end through a pipe 12 with a conventional three-way valve 14. The valve 14 has an inlet side 16, an outlet side 18, and an intermediate side 20. The pipe 12 has connection with the intermediate side 20; a conduit 22 leading to a source of air under pressure is connected with the inlet side 16; the outlet side 18 is open to the atmosphere; and an electrical solenoid 24 is provided for placing the intermediate side 20 in communication either with the inlet side 16 or the outlet side 18. The aerator 10 is connected at the other end with a receptacle 26 through a pipe assembly

28 secured in place by a flange 30. The pipe assembly 28 includes a pipe section 32.

As shown in FIGS. 2 and 3, the aerator 10 comprises a generally cylindrical shell-like container 34 having opposed end walls 36 and 38. Secured in an opening in the end wall 36 is an internally threaded pipe fitting 40 which defines inlet means. Secured in an opening in the end wall 38 is an internally threaded pipe fitting 42 which threadingly receives the pipe section 32 and defines therewith outlet means.

An annular ring member 44 is secured in the end of the pipe section 32, is formed with a reduced neck portion 46, and presents an annular valve seat 48 spaced axially inwardly of the end of the pipe section 32 and the inner face of the pipe fitting 42. Secured to the pipe fitting 42, by means of a plurality of circumferentially spaced apart gussets 50, is a hollow cylinder 52. The cylinder 52 has a closed end wall 54 with a center aperture 56, and an open end facing and axially spaced from the valve seat 48. Axially slidable in the cylinder 52 is a solid cylindrical resilient piston 58 which is of greater diameter than that of the valve seat 48.

Extending between the inlet pipe fitting 40 and the cylinder aperture 56 is air transmitting conduit means 60. The conduit means 60 comprises a bushing 62 threaded in the pipe fitting 40 and having a radial shoulder 64 and a nose portion 66, a flange member 68 secured to the cylinder wall 54 and having a nose portion 70, and an intermediate pipe 72 to which stop collars 74 and 76 are secured. A resilient tube 78 is disposed about the bushing nose portion 66 and the adjacent end of the pipe 72 between the bushing shoulder 64 and the stop collar 74. A similar resilient tube 80 is disposed about the flange nose portion 70 and the adjacent end of the pipe 72 between the flange member 68 and the stop collar 76. The tubes 78 and 80 serve not only as connecting means which compensate for misalignment but also as check valve means as will be described more fully hereinafter.

When the aerator 10 is inactive, the piston 58 is disposed in the position shown in FIG. 2 where the outer end is spaced from the valve seat 48, and the intermediate side 20 of the valve 14 (FIG. 1) communicates with the outlet side 18.

To condition the container 34 for charging with air under pressure, the valve 14 is appropriately actuated for placing the intermediate side 20 in communication with the inlet side 16, and air under pressure is thereby introduced through the conduit means 60 to the interior of the cylinder 52 whereby the piston 58 is moved from the position shown in FIG. 2 to the position shown in FIG. 3 where the outer end is engaged with the valve seat 48. As air pressure builds up in the conduit means 60, air under pressure is released or escapes therefrom, past the resilient tubes 78 and 80 which swell up, into the container 34 for charging the same.

After the container 34 has been charged with air under pressure, and when it is desired to discharge such air under pressure from the container 34 into the receptacle 26, the valve 14 is appropriately actuated for again placing the intermediate side 20 in communication with the outlet side 18. When the valve 14 is thus actuated, air under pressure is exhausted to the atmosphere from the conduit means 60 and the interior of the cylinder 52. As a result, a pressure differential is established between the interior of the container 34 and the interior of the conduit means 60 which causes the

resilient tubes 78 and 80 to contract radially inwardly for preventing air under pressure from flowing therepast into the conduit means 60. Likewise, a pressure differential is established at the opposed ends of the piston 58 and the latter is returned from the position shown in FIG. 3 to the position shown in FIG. 2 where the outer end is disengaged from the valve seat 48. Thereupon, air under pressure is released in a sudden burst from the container 34 through the ring member 44 and the pipe assembly 28 into the storage receptacle 26 to loosen and cause free flow of material therein.

When desired, a pipe fitting 82, with a port adapted to be closed by a plug 84, may be secured in an opening in the container 34. Removal of the plug 84 permits the container 34 to be drained as may be required.

With regard to the construction of the aerator 10, the pipe fittings 40, 42 and 82 are standard commercial fittings, and the pipe section 32 is a standard commercial section. The resilient piston 58 (about 70-90 durometers) and the resilient tubes 78 and 80 (about 60 durometers) are fabricated of a material such as rubber or polyurethane. After the container 34, fittings 40, 42 and 82, cylinder 52, end wall 54, flange member 68 and gussets 50 have been properly secured by standard code welding, the partially assembled unit may be readily tested according to ASME requirements in the manner approved for this type of pressure vessel. Assembly of the aerator 10 may be conveniently completed by inserting the pipe 72 and tubes 78 and 80 through the fitting 40 and threading the bushing 62 in place, and then inserting the piston 58 through the fitting 42 and threading the pipe section 32 in place.

As will be observed, the valve seat 48 is located immediately inside the container end wall 38. With this arrangement, air under pressure being released or blasted from the container 34 travels a minimum distance to enter the pipe section 32 for quick passage to the receptacle 26. For optimum balanced movement of the piston 58, the area of the piston 58 beyond the circumference of the valve seat 48 approximates the area of the valve seat 48 itself. Operationally, the provision of a resilient piston 58 eliminates the need for lubrication or special clearance controls. Moreover, the resilient piston 58 inherently absorbs shock, and thus prevents damage to the aerator 10, during impacts at its terminal ends of movement. Furthermore, the length of the piston 58 is equal to the length of the cylinder 52; hence, the outer end of the piston 58 is flush with the open end of the cylinder 52 when the aerator 10 is inactive. As a consequence, any back flow of material between the receptacle 26 and the container 34 is prevented from entering the cylinder 52 and impairing operation of the piston 58. Also, when air under pressure is released or blasted from the container 34, any foreign material within the container 34 is blown out without coming into contact with the interior of the cylinder 52.

Should the valve seat 48 become worn or damaged, the pipe section 32 may be unthreaded and the ring member 44 replaced. Similarly, should the outer end of the piston 58 become worn or damaged, the pipe section 32 may be unthreaded, and the piston 58 withdrawn through the fitting 42, reversed and reinstalled. In addition, the ring member 44 and the piston 58 may be removed, machined and reinstalled, thereby allowing simple repairs in the field.

As will be appreciated from the foregoing description, the aerator 10 complies with all codes and certifications, is compatible with existing manufacturing procedures, is economical to fabricate and assemble, is highly effective in its release or blast of air, is exceptionally dependable, may be readily repaired, and offers a maximum service life.

In two modified embodiments of the aerator 10, the conduit means 60 shown is replaced by conduit means not having check valve means. With one modification, the piston 58 is mounted in the cylinder 52 with slight circumferential clearance for example of the order of 0.010 inch. This clearance accommodates the release of air under pressure past the piston 58 from the cylinder 52 into the container 34 for charging the same when air under pressure is introduced through the conduit means and the outer end of the piston 58 is engaged with the valve seat 48. With the other modification, air under pressure is introduced through the port in the pipe fitting 82 into the container 34 to charge the same when the outer end of the piston 58 is engaged with the valve seat 48 by reason of air pressure in the conduit means.

While there has been shown and described preferred embodiments of the present invention, it will be understood by those skilled in the art that various modifications and rearrangements may be made therein without departing from the spirit and scope of the invention.

The invention claimed is:

1. A quick-release aerator comprising a container having inlet means and outlet means; an annular valve seat arranged at said outlet means; a hollow cylinder mounted within said container and having a closed end wall with an aperture, and an open end facing and axially spaced from said valve seat; air transmitting conduit means extending between said inlet means and said aperture; said air transmitting conduit means comprising a bushing secured in said inlet means, a flange member secured to said closed end wall of said cylinder, an intermediate pipe extending between said bushing and said flange member, first connecting means connecting one end of said pipe to said bushing, and second connecting means connecting the other end of said pipe to said flange member; and a piston in said cylinder and having an outer end of greater diameter than said valve seat, said piston being axially slidable between a first position where said outer end is spaced from said valve seat and a second position where said outer end is engaged with said valve seat, said piston being movable from its first position to its second position by air under pressure introduced through said air transmitting conduit means to condition said container for charging with air under pressure, at least one of said connecting means being a resilient tube which serves as a check valve for releasing air under pressure therepast into said container for charging the same when air under pressure is introduced through said air transmitting conduit means and said piston is disposed in its second position, and said piston after said container has been charged with air under pressure being returnable to its first position by a combination of exhaust of air under pressure from the air transmitting conduit means and the resultant pressure differential established at the opposed ends of said piston for suddenly releasing air under pressure from said container through said outlet means.

2. The quick-release aerator of claim 1 wherein said outlet means comprises a pipe fitting secured in an opening in said container, and a pipe section threaded in said pipe fitting; and wherein said valve seat is presented by a ring member secured in the end of said pipe section.

3. The quick-release aerator of claim 1 wherein the area of said outer end of said piston beyond the circumference of said valve seat approximates the area of said valve seat.

4. A quick-release aerator comprising a container having inlet means and outlet means; an annular valve seat arranged at said outlet means; a hollow cylinder mounted within said container and having a closed end wall with an aperture, and an open end facing and axially spaced from said valve seat; air transmitting conduit means extending between said inlet means and said aperture; and a piston in said cylinder and having an outer end of greater diameter than said valve seat, said piston being axially slidable between a first position where said outer end is spaced from said valve seat and a second position where said outer end is engaged with said valve seat, said piston being movable from its first position to its second position by air under pressure introduced through said air transmitting conduit means to condition said container for charging with air under pressure, said piston being mounted in said cylinder with slight circumferential clearance for releasing air under pressure therepast from said cylinder into said container for charging the same when air under pressure is introduced through said air transmitting conduit means and said piston is disposed in its second position, and said piston after said container has been charged with air under pressure being returnable to its first position by a combination of exhaust of air under pressure from the air transmitting conduit means and the resultant pressure differential established at the opposed ends of said piston for suddenly releasing air under pressure from said container through said outlet means.

5. The quick-release aerator of claim 4 wherein said outlet means comprises a pipe fitting secured in an opening in said container, and a pipe section threaded in said pipe fitting; and wherein said valve seat is presented

by a ring member secured in the end of said pipe section.

6. The quick-release aerator of claim 4 wherein the area of said outer end of said piston beyond the circumference of said valve seat approximates the area of said valve seat.

7. A quick-release aerator comprising a container having inlet means and outlet means; an annular valve seat arranged at said outlet means; a hollow cylinder mounted within said container and having a closed end wall with an aperture, and an open end facing and axially spaced from said valve seat; air transmitting conduit means extending between said inlet means and said aperture; and a piston in said cylinder and having an outer end of greater diameter than said valve seat, said piston being a solid cylindrical resilient piston which may be reversibly mounted in said cylinder, said piston being axially slidable between a first position where said outer end is spaced from said valve seat and a second position where said outer end is engaged with said valve seat, said piston being movable from its first position to its second position by air under pressure introduced through said air transmitting conduit means to condition said container for charging with air under pressure, and said piston after said container has been charged with air under pressure being returnable to its first position by a combination of exhaust of air under pressure from the air transmitting conduit means and the resultant pressure differential established at the opposed ends of said piston for suddenly releasing air under pressure from said container through said outlet means.

8. The quick-release aerator of claim 7 wherein said outlet means comprises a pipe fitting secured in an opening in said container, and a pipe section threaded in said pipe fitting; and wherein said valve seat is presented by a ring member secured in the end of said pipe section.

9. The quick-release aerator of claim 7 wherein the area of said outer end of said piston beyond the circumference of said valve seat approximates the area of said valve seat.

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