Nov. 15, 1960 J. R. GOLDIE 2,960,369

PISTON FOR A POWDER FLUIDIZER

Filed Aug. 13, 1958

Fig. 1

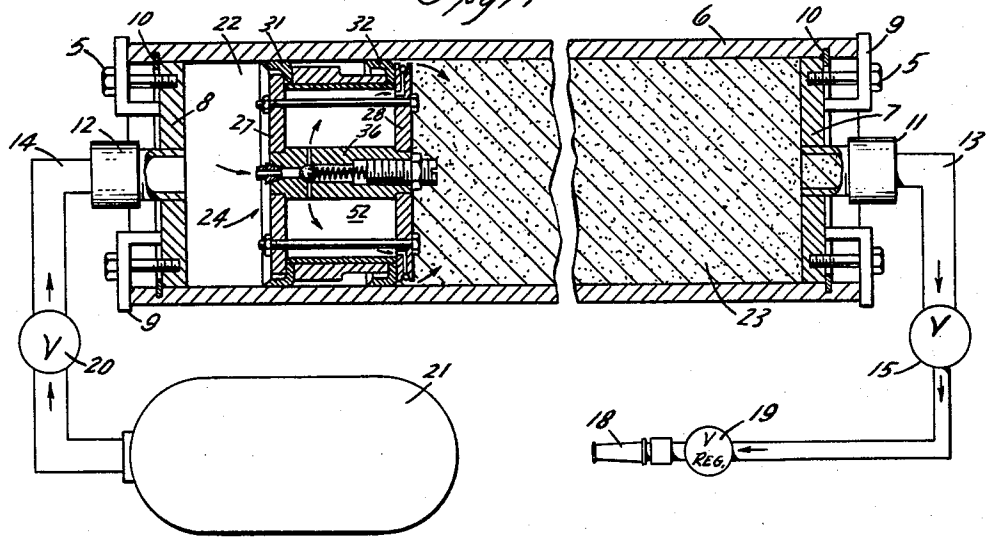
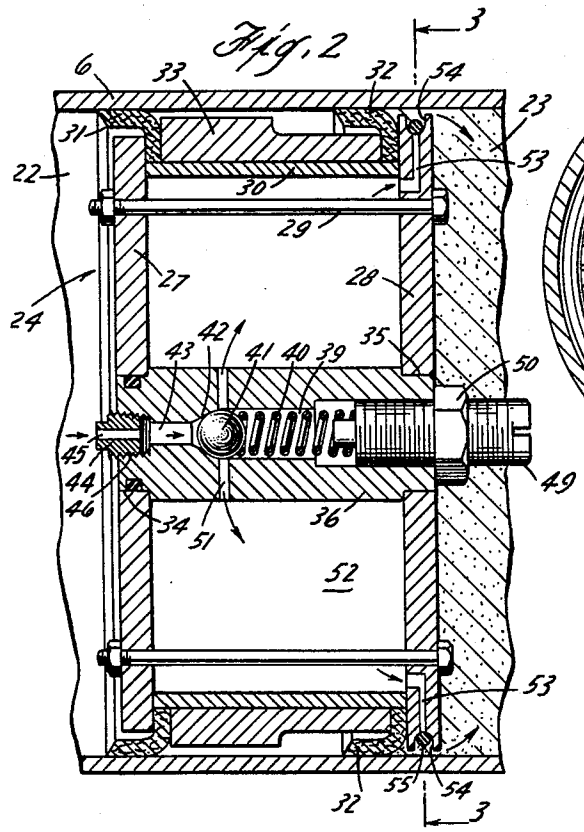


Fig. 2



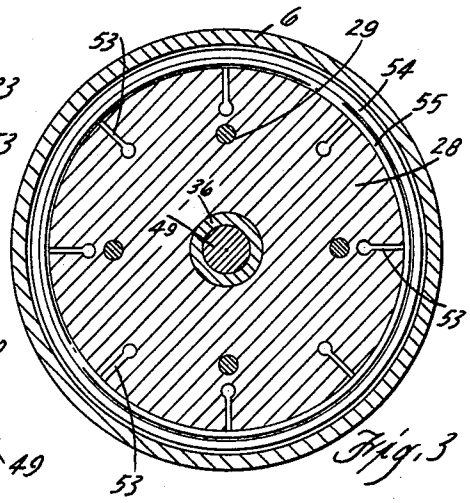


Fig. 3

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PISTON FOR A POWDER FLUIDIZER

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9 Claims. (Cl. 302—53)

This invention relates to a piston for a powder fluidizer.

While in its broad aspects the present invention is not limited to any particular field of use, the piston herein disclosed to exemplify the invention is specifically adapted to be incorporated in a powder fluidizing fire extinguisher of the type shown in Patent No. 2,856,010 dated October 14, 1958.

In the fire extinguisher aforesaid, gas is transferred from a pressurized chamber at one side of the piston to a dry chemical powder chamber at the other side of the piston for the purpose of fluidizing the powder and ejecting it from a nozzle. It is an object of the present invention to provide closer control over the rate of powder fluidization by adjustably regulating the pressure drop across the piston. For this purpose I incorporate in the piston an adjustable pressure valve through which all the gas transferred across the piston must flow.

In the piston of the present invention the transfer ports in the piston are so oriented as to flow gas against the wall of the powder chamber in advance of the packing between the piston and the wall. Accordingly, powder which might otherwise adhere thereto and interfere with sealing action is blown from the wall area over which the packing will have to move in the course of piston advance.

The specific piston structure herein disclosed is improved in other respects over the piston shown in the prior application aforesaid. The tail fins shown in the prior application are eliminated and the sealing surfaces are increased. The pressure regulator is incorporated in a valve housing located centrally with a hollow piston structure and between axially spaced end heads which are clamped to an intervening sleeve.

Other objects, advantages and features of the invention will appear from the following disclosure in which:

Fig. 1 is an axial cross section taken through a powder fluidizer embodying the invention, connections thereof to a source of gas pressure and connections to an ejecting nozzle being shown diagrammatically.

Fig. 2 is an enlarged cross section of a piston embodying the invention, the powder fluidizer wall being shown fragmentarily.

Fig. 3 is a cross section taken along the line 3—3 of Fig. 2.

The powder fluidizer comprises an elongated tank 6 which may have any cross section, but which is desirably circular as shown in Fig. 3. It is provided at its respective ends with end heads 7, 8 suitably fastened to the tube wall 6 by clamp bolts 5 which mutually engage the end heads and annular end brackets 9 to seat the heads 7 and 8 against snap rings 10. The heads 7, 8 are preferably identical for interchangeable connection thereto of the substantially identical couplings 11, 12 which respectively communicate with the powder discharge line 13 and the pressurized gas intake line 14.

Powder ejection line 13 may be provided with a normally open shut-off valve 15. At its end line 13 is provided a nozzle 18 controlled by regulating valve 19.

Gas pressure input line 14 is provided with a suitable pressure regulating valve 20, according to the prior application aforesaid, which regulates the pressure of the gas admitted to the gas chamber 22 from a source such as tank 21.

The fluidizer wall 6 encloses gas pressure chamber 22 and a dry chemical powder chamber 23 which communicates with the powder ejection line 13. Intervening between the chambers 22, 23 is piston 24 which desirably comprises axially spaced end heads 27, 28 which are clamped by tension bolts 29 against intervening sleeve 30. The respective heads 27, 28 are spaced peripherally from the tube wall 6 but are in gas tight engagement therewith by reason of the flexible annular packing seals 31, 32 which are also clamped against the end heads 27, 28 by the intervening spacing sleeve 33. Except for the valve structure now to be described the piston 24 is hollow within sleeve 30.

The respective end heads 27, 28 are centrally apertured at 34, 35 to receive reduced end portions of valve housing 36 seated therein. Housing 36 has a central chamber 39 which houses a spring 40 which normally biases valve ball 41 against its conically tapered seat 42 to normally close input port 43 with which the plug 44 having orifice 45 is in communication. Plug 44 may be conveniently threaded at 46 to the valve housing 36.

The pressure of spring 40 may be adjusted by means of the threaded stem 49, the setting of which may be fixed by the lock nut 50.

If the pressure in the gas chamber 22 exceeds the pressure for which the spring 40 is set, ball 41 will retract from its seat 42 to pass pressurized gas through the port 43 and through the radially disposed outlet ports 51 into the space or hollow 52 between the end heads 27, 28 of the piston 24.

Pressurized gas thus admitted to the space 52 is transferred to the powder chamber 23 through radial ports 53 communicating with the peripheral edge of end head 28. Ports 53 open into an annular groove 54 formed in the peripheral edge of the end head 28. Ports 53 are ordinarily closed against blow back of the powder in chamber 23 by an elastic check valve such as the rubber O-ring 55 which is disposed in the groove 54 and is held under its own resilient bias against said ports 53.

Pressurized gas flowing through the ports 53 will displace the O-ring check valve and will flow into the powder chamber 23 to fluidize the powder therein. Such gas will flow over the portions of the wall 6 in advance of piston packing seal 32, thus to scour from the wall such powder particles as might otherwise tend to adhere thereto and interfere with a close fit of the packing with the wall. Groove 54 helps to distribute peripherally the flow of gas which otherwise might be localized by the circumferentially spaced ports 53.

In operation, spring stem 49 is set at the pressure differential which it is desired to maintain across the piston when the device is in operation. When valve 19 is opened to discharge fluidized powder from nozzle 18, gas pressure in powder chamber will drop until valve ball 41 opens to transfer gas from chamber 24 to chamber 23. This gas will flow through the radially disposed ports 53 as aforestated, thus to sweep from the path of the packing ring 32 such powder particles as might otherwise adhere to the wall. The gas thus transferred will help fluidize the powder in the chamber 23, as described in the prior applicaion aforesaid. In the device of the present invention, the pressure drop across the piston will be accurately regulated by the valve 41, 42 for better control of the rate of powder fluidization.

I claim:

1. In a powder fluidizer having a housing, a piston within the housing, a powder chamber at one side of the piston and a pressurized gas chamber at the other side of the piston, the improvement in said piston for transferring gas from the pressurized chamber to the powder chamber and including pressure regulator means in said piston for adjustably regulating the gas pressure drop across the piston.

2. The device of claim 1 in which said pressure regulator means comprises a valve having a spring pressed valve member and means for adjusting the bias of the spring.

3. The device of claim 1 in which the fluidizer comprises a walled tube, said piston comprising a hollow body having sealing means in gas pressure retaining contact with the tube wall, said pressure regulator means comprising means for admitting pressurized gas from the gas chamber into the hollow of said body, said body having gas discharge ports at its periphery and adjacent said sealing means for flowing gas past said sealing means and against said wall.

4. The device of claim 3 in which said piston further comprises end heads axially spaced along said fluidizer tube, a sleeve intervening between said heads and against which said heads are clamped, said head adjacent the powder chamber having an annular peripheral groove, said gas discharge ports being formed radially in said head and opening into said groove.

5. The device of claim 4 in further combination with an elastic check valve band in said groove and normally sealing said ports against admission thereto of powder but subject to displacement under pressure of gas flowing through said ports.

6. A powder fluidizer comprising an elongated tube, a piston within said tube, said fluidizer having a pressurized gas chamber at one side of the piston and a powder chamber at the other side of the piston, said piston comprising axially spaced end heads, spacer means intervening between said end heads, means for clamping said end heads against said spacer means, gas pressure retaining seals adjacent each said end head and in gas pressure retaining contact with the tube wall, orifice means to admit gas from said gas chamber into the space between said heads and radial ports in the head next adjacent the powder chamber and adjacent one of said seals for flowing gas past said seal and against said wall in the course of transferring gas from said gas chamber to said powder chamber.

7. The device of claim 6 in which said orifice means comprises a pressure regulator for regulating the gas pressure drop across the piston.

8. The device of claim 7 in which said pressure regulator comprises a valve housing substantially on the axis of said tube, a spring pressed valve member within said housing and radially disposed outlet ports through said housing from said valve chamber into the space between said end heads.

9. A powder fluidizer comprising an elongated tube, a piston within the tube, packing between the piston and tube, said fluidizer having a pressurized gas chamber at one side of the piston and a powder chamber at the other side of the piston, said piston comprising orifice means for passing gas across the piston from the gas pressure chamber to the powder chamber and including radial ports in the piston directed to flow gas against the tube wall in advance of piston movement.

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UNITED STATES PATENTS

2,856,010 Brill et al. ---------- Oct. 14, 1958