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3,148,484

SANDBLAST GENERATOR

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8 Claims. (Cl. 51-12)

The present invention relates to an abrasive cleaning system and more particularly to a novel sandblast generator comprising an automatic sand valve and a single remote control.

The sandblast generators in use up to the present time have suffered from a plurality of disadvantages. These devices have embodied separate controls to allow sand to flow into the generator, to allow sand to flow out of the generator, and to allow air to flow under pressure to carry the sand flowing out of the generator. In addition, these plural controls have been placed in the vicinity of the generator for safety purposes while the operator of the device is often a distance away from the generator holding the hose nozzle. It is, therefore, desirable to provide a system which embodies a semi-automatic device having but a single control, which control is remotely operated from adjacent the nozzle of the device.

It is, therefore, an object of the present invention to provide a novel sandblast generator having but a single control means.

It is another object of the present invention to provide a sandblast generator remotely controlled from the nozzle.

It is another object of the present invention to provide a sandblast generator which operates simply and efficiently.

It is another object of the present invention to provide a sandblast generator in which no springs are required in the operation of the air inlet valve.

It is another object of the present invention to provide a device having an adjustable cycle time.

It is another object of the present invention to provide a device in which abrasive material flows only at air pressures sufficiently high for effective blasting.

It is another object of the present invention to provide a device in which abrasive fouling and damage to the vent valve is eliminated.

It is yet another object of the present invention to provide a sandblast generator having access to the interior of the sand container without the need for a conventional hand-hole.

These and other objects and the nature and advantages of the instant invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a front elevation of the apparatus showing the sand container partly in section;

FIG. 2 is a detailed view of the air valve in section;

FIG. 3 is a detailed view of the sand valve in section; and

FIG. 4 is a detailed view of the sand entrance valve in section.

The sandblast generator of the present invention comprises an abrasive container 10 formed generally as a cylindrical shell and having an upwardly facing concave end wall 12 in which is positioned an abrasive entrance valve 14, and having at its lower end an abrasive outlet valve 16. The abrasive container 10 is supported by legs 18 and is adapted to remain relatively immovable at its situs of use.

Adjacent to the abrasive container 10 is a source of fluid under pressure (not shown) which is connected to a fluid pressure valve 20 via an inlet port 30. Pipes 22, 24 and 26 exit from fluid pressure valve 20 and run re-

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spectively to the operator control 28, the abrasive-entrance valve 14 and the abrasive-outlet valve 16.

The fluid-pressure valve 20, shown in detail in FIG. 2, is provided with two valve sections 21 and 23. The valve section 21 is provided with a valve 37 which is adapted to seat against valve seat 40 when the valve is closed. The valve 37 is connected through a hollow valve stem 32 with a piston 36 which slidably fits into the upper valve body. The valve stem 32 is threadedly engaged with the valve 37 and the piston 36 so that the assembly moves as a unit within the valve body. Air at 125 p.s.i.g., for example, is delivered to port 30 of section 21 from the pressurized air source through any suitable piping or hose. This air passes up through hollow valve stem 32 of the valve 37 into cylinder chamber 34 above piston 36 and exerts a force sufficient to keep the valve disc 38 tightly closed against seat 40 thereby preventing the flow of air through port 42. A small orifice 44 is provided in piston 36 to allow air to bleed into the cylinder chamber 46 below piston 36 and thence escape to the atmosphere via port 48 and air pipes 50 and 22.

When vent pipe 22 is closed at the operator control 28, the pressure in chamber 46 builds up until it equals the pressure in chamber 34, thus eliminating the pressure differential which forces valve disc 38 against valve seat 40. The air pressure at port 30 then exerts force upwardly against valve 37 causing the disc 38 to withdraw from seat 40 and thereby permitting the air entering port 30 to flow through port 42.

Section 23 of air valve 20 comprises a cylinder 52 having compartments 54 and 56 separated by piston 62 which is rigidly attached through stem 63 to valve 58. When valve 37 in section 21 is opened (by closing pipe 22 at control 28), air pressure is exerted in chamber 54 (section 23) through port 60 and air pipe 50 thereby forcing piston 62 downwardly and valve disc 64 of valve 58 tightly against the valve seat 66. When air pressure is vented from chamber 54 by opening the vent pipe 22, the closing force is removed from the piston 62 and valve 58 is forced upwardly by the air pressure from port 68 thereby permitting flow of air from port 68 to port 70 which exits to the atmosphere.

Atmosphere vent section 23 is provided with an adjusting screw stop 53 which may be regulated to limit the movement of piston 62 vertically in relation to valve 58; this is done to adjust the amount of air escaping to the atmosphere through port 70 in relation to the amount that escapes through sandblast hose 26.

It is seen that by opening or closing vent pipe 22, at the control 28 remotely spaced from air valve 20, section 21 may be opened while simultaneously closing section 23 or section 21 may be closed while simultaneously opening section 23. By opening the valve 37, air under pressure flows into port 30, past valve 37, through port 42 into section 72 and out ports 73 and 74 and into pipes 24 and 26 respectively; the air is prevented from flowing through ports 68 and 70 to the atmosphere by closed valve 58.

The automatic abrasive outlet valve 16, shown in detail in FIG. 3, is attached to the funneled bottom of abrasive container 10 by threads 76 via knock-out reducing bushing 78 and is also directly connected to sand blast hose-pipe 26 by threads 80 via connector 82. The attachment of valve 16 to container 10 through threads 76 provides an additional opening for internal examination of the abrasive container 10. The abrasive outlet valve 16 comprises essentially a cylindrical tube closed at the top 84 and openly communicating with hose 26 at the bottom through an opening 86 and also opening communicating with the interior of abrasive container 10 through openings 88 spaced about the circumference of the abrasive valve cylinder. The interior of the cylinder is pro-

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vided at its upper end 90 with a piston 92 carrying a downwardly projecting rod 94 having an abrasive valve stop 96 at its lower end. Chamber 98, above piston 92, is vented to the atmosphere via vent 100. The rod 94 carries spring 102 which biases piston 92, rod 94 and abra-

sive valve stop 96 downwardly to effect closure of openings 88 to opening 86. The automatic abrasive-outlet valve 16 is opened when the internal air pressure in container 10 and in hose 26, acting on the bottom of piston 92, is great enough to overcome the tension of spring 102 and force piston 92, rod 94 and stop 96 upwardly so that abrasive, such as sand, may flow through openings 88 and fall into sand blast hose 26. The sand-stop 96 does not tightly seal against the interior wall 95 of the cylinder of sand-valve 16; this permits internal air pressure to act only upwardly against piston 92 but to escape in the downward direction rather than act against the top of stop 96. This provides equal air pressure in container 10, hose 26 and connector 82. When the pressure is reduced, the tension of spring 102 returns stop 96 to the closed position illustrated.

The abrasive admitting or entrance valve, shown in detail in FIG. 4, comprises a pop-up member 104 forced upwardly to close against seat 106 by the pressure of air from pipe 24 within the abrasive container. When pop-up valve 104 closes, the air in pipe 24 escapes through the holes in pipe tip 114 to pressurize container 10. The upwardly facing concave surface of abrasive container top 12 is adapted to receive and store the abrasive, such as sand (shown at 108). Pop-up member 104 is protected from the direct weight of great quantities of sand by shield 110, which is integral to seat support 116; the sand enters the loading port via openings 112 in shield 110. Seat support number 116, which carries shield 110, screws into the sand container top 12 at 118. When the internal pressure in container 10 is released by opening valve 58 in section 23 of air valve 20, pop-up member 104 drops onto the tip 114 of pipe 24 (as shown in phantom) thereby opening the loading port of sand entrance valve 14.

The operation of the device is as follows:

When an operator, standing remote from the sandblast generator, depresses control 28 thereby closing pipe 22, the air which is flowing through hollow valve stem 32 can no longer escape to the atmosphere through port 48 and pipe 50. Consequently, the air pressure on both sides of piston 36 equalizes, which allows valve 37 to open. Simultaneously, the air pressure in chamber 54 has closed vent valve 58. With valve 37 open and valve 58 closed, air at 125 p.s.i. flowing through port 30, port 42, chamber 72, port 73 and pipe 24 closes sand entrance pop-up valve 104 and pressurizes the blast generator sand container 10. Air is simultaneously flowing past port 74 into the hose 26 past the automatic sand valve 16 to the sandblast nozzle 120. When the pressure in the sandblast generator sand container 10 becomes great enough, the automatic sand valve 16 opens and allows the granulated abrasive in the container 10 to flow out the openings 88 into the air stream passing below through hose 26; this permits the sand to be discharged at high velocity from nozzle 120.

When the operator releases control valve 28, the air pressure backed up in chambers 46 and 54 are vented to the atmosphere via the vent pipe 22 which causes valve 37 to close and valve 58 to open; this in turn stops the air supply via port 42 and releases the pressure via port 70 from the sand container 10. When the pressure in container 10 is reduced sufficiently, the automatic sand valve 16 closes and the pop-up member 104 of sand entrance valve 14 drops, thereby opening the loading port.

The present device presents numerous advantages over any device known in the prior art. Some of these advantages are:

1. The provision of a device having but a single re-

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mote control, the device being simplified by the elimination of springs from the air inlet valve.

(2) The provision of an adjusting means on the vent valve to vary the amount of internal air escaping to the atmosphere via the vent valve in relation to that escaping through the sand blast hose, so that cycling time may be controlled as well as the amount of purge gas available to sweep the blast hose free of abrasive after the sand valve has closed. This prevents a build up of the blasting media in hose 26 and thus eliminates dangerous surging of the blast hose when blasting is resumed. Such surging has been known to knock an operator off the scaffolding.

(3) The provision of a sand valve which is opened by pressure in the sand container to prevent the flow of sand at air pressures too low for effective blasting.

(4) The provision of a single pipe to both pressurize and vent the sand container so that any sand entrained in the vented air passes from pipe 24 through ports 73 and 74 to the blast hose, by inertia, rather than to the vent valve through ports 68 and 70. This eliminated abrasive fouling and damage to the vent valve 58. This is accomplished by the downward extension of pipe 73' in section 72.

(5) The provision of a screw-on support for the sand-entrance pop-up valve seat so that access may be had to the interior of the sand container without making a separate hand-hole access.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. An automatic system for blasting abrasive comprising: an abrasive container; entrance valve means for admitting abrasive to said container; abrasive valve means for permitting abrasive to escape said container; fluid-pressure valve means for simultaneously opening one of said previously mentioned valve means and closing the other and for permitting the flow of high-pressure fluid past said abrasive-valve means while said abrasive-valve means is open and said entrance valve means is closed in order to effect blasting of abrasive escaping from said abrasive-valve; a pressure charging pipe leading from said fluid-pressure valve to said abrasive entrance valve means and pressurizing of said abrasive container; a blast hose leading from said fluid-pressure valve past said abrasive-valve means to an abrasive-blast nozzle; said fluid pressure valve means comprising a fluid inlet port, a first fluid passage communicating with said inlet port and leading to a first junction chamber, a first fluid valve in said first fluid passage, said junction chamber communicating with both said pressure charging pipe and said abrasive blast hose, a second fluid passage leading from said junction chamber to a vent port, and a vent valve in said second fluid passage; and remote means for effecting control of said fluid-pressure valve means.

2. A device in accordance with claim 1 wherein said means for effecting control of said fluid-pressure valve means effects simultaneous opening of said first fluid valve and closing of said vent valve and vice versa.

3. A device in accordance with claim 2 wherein said first fluid valve comprises a hollow valve stem, a piston at the far end of said hollow valve stem, a cylinder about said piston defining a first chamber on one side and a second chamber on the other side of said piston, an orifice in said piston to permit leakage of fluid pressure from said first chamber to said second; said vent valve comprises a valve stem, a piston at the far end of said valve stem, a cylinder about said piston defining a chamber above said adjustable piston; said means for effecting control comprises a fluid pressure line directly connected to both

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said second chamber in said first valve and said chamber in said vent valve.

4. A device in accordance with claim 3 wherein said vent valve includes a linearly adjustable piston stop.

5. An automatic system for blasting abrasive comprising: an abrasive container; abrasive valve means for permitting abrasive to escape said container; fluid-pressure valve means for pressurizing said abrasive container and for opening said abrasive valve means; a pressure charging pipe leading from said fluid-pressure valve to said abrasive container; a blast hose leading from said fluid pressure valve past said abrasive valve means to an abrasive-blast nozzle; said fluid-pressure valve means comprising a fluid inlet port, a first fluid passage communicating with said inlet port and leading to a first junction chamber, a first fluid valve in said first fluid passage, said junction chamber communicating with both said pressure charging pipe and said abrasive blast hose, a second fluid passage leading from said junction chamber to a vent port, and a vent valve in said second fluid passage; and remote means for effecting control of said fluid-pressure valve means.

6. A device in accordance with claim 5 wherein said abrasive valve means comprises an abrasive valve stop, an abrasive escape normally lying above said abrasive valve stop to effect closing of said escape, a rod connected to said abrasive valve stop, a solid imperforate piston attached to the opposite end of said rod, and spring means on said rod having sufficient tension to normally bias said abrasive valve closed but which spring has insufficient tension to overcome the internal air pressure in said abrasive container when pressurized.

7. A device in accordance with claim 6 wherein said abrasive valve means opens to said blast hose only when pressure in the system is sufficiently high for effective blasting.

8. An automatic system for blasting abrasive comprising: an abrasive container; entrance valve means for admitting abrasive to said container; abrasive valve means

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for permitting abrasive to escape said container; fluid-pressure valve means for providing pressure to pressurize said abrasive container and simultaneously open said abrasive valve means and close said entrance valve; and remote means for effecting control of said fluid-pressure valve means; said abrasive valve means comprising an abrasive valve stop, an abrasive escape port from said container, said valve stop normally lying below said port to effect closing of said port, a rod connected to said abrasive valve stop, a solid imperforate piston attached to the opposite end of said rod, and spring means on said rod having sufficient tension to normally bias said abrasive valve closed but which spring has insufficient tension to overcome the internal air pressure in said abrasive container when pressurized, wherein said abrasive valve means is sufficiently high for effective blasting.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

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It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 69, for "opening", second occurrence, read -- openly --; column 5, line 1, after "first" insert -- fluid --; column 6, line 16, after "means" insert -- opens only when pressure in the system --.

Signed and sealed this 29th day of December 1964.

(SEAL)

Attest:

ERNEST W. SWIDER
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