PRESSURE FEED FOR SAND BLAST ABRASIVE

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ABSTRACT

A check valve yields under weight of abrasive in a hopper to deliver abrasive into a pressure chamber from which it is fed by rotating feeder arms into metering orifices in a plate adjustable in the bottom of the chamber. A resilient valve retractable at an angle from the path of the grit permits the grit to issue through a selected metering orifice as needed for delivery into a convection air current en route to a blast gun or guns.

10 Claims, 5 Drawing Figures
PRESSURE FEED FOR SAND BLAST ABRASIVE

BACKGROUND OF INVENTION

The arrangement disclosed permits accurate regulation of grit of varying sizes in a continuous sand blast operation which replaces the batch feed systems heretofore common in this art.

SUMMARY OF INVENTION

A check valve yields from time to time to admit abrasive from a hopper to a pressure chamber which contains air or other convection fluid under the same pressures at which the convection current and entrained grit are conveyed to the gun.

It is an important feature of the invention that the dimensions of grit delivered from the chamber can be regulated by an adjustable plate in the bottom of the chamber over which feeder arms circulate at a slight spacing from the plate, delivery through the plate being controlled by a valve retractable at an acute angle to the path of grit flow from the metering plate to a diaphragm chamber which is a part of an air line to the blast gun. One wall of that chamber is preferably a diaphragm which actuates and provides a seal for the stem of the valve, the valve desirably being convex and compressible against a concave seat subject to the bias of a spring.

In an alternative embodiment, interchangeable posted inserts are used instead of a rotatable metering plate but, as in the first embodiment, the rotating feeder arms are spaced above the bottom of the hopper to avoid abrasion. In either embodiment the hopper may be under atmospheric pressure or under superatmospheric pressure.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a view in axial section through a device embodying the invention, portions being broken away.

FIG. 2 is a view in generally horizontal section on the line 2—2 of FIG. 1.

FIG. 3 is a detail view in vertical section on the line 3—3 of FIG. 1.

FIG. 4 shows a modified embodiment of the invention partially in side elevation and partially in axial section.

FIG. 5 is a fragmentary detail view taken in section on the line 5—5 of FIG. 4.

DETAILED DESCRIPTION

In the embodiment shown in FIGS. 1 to 3, abrasive is supplied to a hopper 6 provided with a valve seat 8 for valve 10 at or near the upper end of the charging tube 12 which leads to pressure chamber 14. Compression spring 16 on cross bar 18 acts on the valve stem 20 to urge the valve 10 toward its seat. Valve 10 opens to admit grit to the chamber when the weight of grit in the hopper acts on the valve with a force exceeding the valve-closing bias exerted on the valve by spring 16 and the pressure in the chamber 14.

The chamber 14 is supplied with pressure through a duct 22 which desirably is a branch pipe deriving convection fluid from the same source as pipe 24 hereinafter described.

The abrasive in the pressure chamber 14 is delivered into the convection line to blast gun (not shown) such line including the duct 24 and delivery duct 26 and an intervening diaphragm chamber 28. Abrasive from pressure chamber 14 is fed into the diaphragm chamber 28 of the convection line by means of radial arms 30 mounted on a power-driven shaft 32 with adequate seals 31 to protect bearings 33 thereof as shown. The arms 30 extend in a generally radial direction and are spaced slightly above a metering plate 34 adjustable in the bottom of the chamber 14 and having a series of holes 36 which are of graduated sizes as shown in FIG. 2 so that a hole of selected size may be made to register with the discharge duct 38 by turning the plate 34 upon its axis. It may be provided with a handle at 40 for this purpose.

The duct 38 leads to a concave seat at 42 which is disposed on an axis at an acute angle to the duct 38. Below the valve seat 42, the duct 44 continues into the diaphragm chamber 28 in the convection current line to the blast gun.

Reciprocable to and from the seat 42 is a valve 46 of natural or synthetic rubber. The stem 48 of this valve is sealed to close the diaphragm chamber 28, the seal being effected by the diaphragm 50. The portion of the stem beyond the diaphragm has a spring seat 52 subject to the bias of a compression spring 54. The diaphragm valve may be opened manually or may be made to open automatically when air pressure is supplied to the nozzle from pipe 24 (the nozzle 45 is shown only in the FIG. 4 embodiment). The valve is shown in FIG. 1 in a position in which it is retracted from the seat to permit flow through one of the oriﬁces 36 of grit urged toward the oriﬁce by means of the rotating arms 30. Retraction of the valve against the bias of spring 54 may be effected manually or by a solenoid (not shown) or by adjusting the pressure of convection fluid in the lines 24, 28, 26.

By virtue of that arrangement, it is unnecessary to interrupt the sand blast operation for the purpose of replenishing grit in the pressure chamber 14. The device will function continuously and indefinitely, additional grit being supplied as needed and clogging being prevented by the acute angular disposition of the seat 42 and the valve stem 48, the angle being such that in the open position of the valve there is virtually no obstruction in the path of grit supplied through one of the metering ports 36 to the convection chamber 14.

In the embodiment shown in FIGS. 4 and 5, the hopper 140 may be at atmospheric pressure when it receives sand through the supply pipe 120. Alternatively, this pipe may be valved as shown in FIG. 1 and the hopper may be supplied with pressure through the line 220.

Instead of having a rotatable valve port selecting disk, the hopper shown in FIG. 4 has a fixed bottom 340 beneath which there is an interchangeable insert 360 provided with a port 380 of the desired cross section. The arms 300 are preferably similar to those previously illustrated, being rotated by a shaft 320 having seals which may be as shown in FIG. 1. Clearance is provided between these arms and whatever surface is fixed at the bottom of the chamber 140.

The valve 460 is retracted at an acute angle to the axis of the delivery port 440, just as in the previously described embodiment. The valve stem 480 is sealed by diaphragm 500 which is subject to pressure communicated through the conduit 240 which leads to the blast gun 45.

In addition to the fact that the valve is biased toward closed position by spring 540, I may provide a pressure line 600 which leads to the lower side of the diaphragm...
chamber 280 and is supplied with pressure by pipe 620 subject to the control of a foot pedal actuated valve 640, the arrangement of control member 660 being such that when the pressure to the blast line 240 is cut off, pressure will be supplied to the valve closing pressure line 600. Conversely, when the pedal is operated to admit fluid to the blast line 240, the pressure will be vented from the pipe 600, thereby permitting the valve to open to supply abrasive to the conveyance air traversing the diaphragm chamber.

I claim:

1. In a sand blast device the combination with a feed chamber for supplying abrasive grit and having a bottom with a metering aperture, of means for maintaining grit in said chamber under pressure, means for providing a valved duct leading from said aperture, and a pressure line for conveyance air to receive grit from said duct and with which said duct communicates, a feed arm being mounted in said chamber has means for actuating it across said aperture for assuring delivery of grit to said duct.

2. A sand blast device according to claim 1 in which said bottom comprises at least a part which is adjustable and provided with a plurality of such apertures of differing diameters selectively registrable with said duct.

3. A sand blast device according to claim 2 in which said part is a disk rotatable in the chamber.

4. A device according to claim 1 in which said bottom comprises an insert selectively interchangeable to provide a metering orifice of selected cross section.

5. A sand blast device according to claim 1 in which said arm is mounted on a shaft having seal protected bearing means and spaced slightly from said bottom.

6. In a sand blast device the combination with a feed chamber for supplying abrasive grit and having a bottom with a metering aperture, of means for maintaining grit in said chamber under pressure, means for providing a valved duct leading from said aperture, and a pressure line for conveyance air to receive grit from said duct and with which said duct communicates, said duct being provided with an annular seat having an axis at an acute angle to said duct, and a valve having means mounting it for movement to and from said seat along said axis.

7. A sand blast device according to claim 6 in which said line has a diaphragm substantially normal to said axis and constituting part of said mounting means, the valve having a stem on said axis and connected with said diaphragm, and valve seating means sealed from said line by said diaphragm.

8. A sand blast device according to claim 6 in which said seat is concave and said valve is complementarily convex, the angle of said axis being such that said duct is substantially unobstructed when said valve is retracted from said seat.

9. A sand blast device according to claim 7 in which a housing is part of said line and has said diaphragm for one wall, the said line joining said duct at an acute angle.

10. A sand blast device according to claim 7 in which the valve is bulbous and consists of a rubber material.