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PORTABLE SAND BLASTER

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2 Sheets-Sheet 1

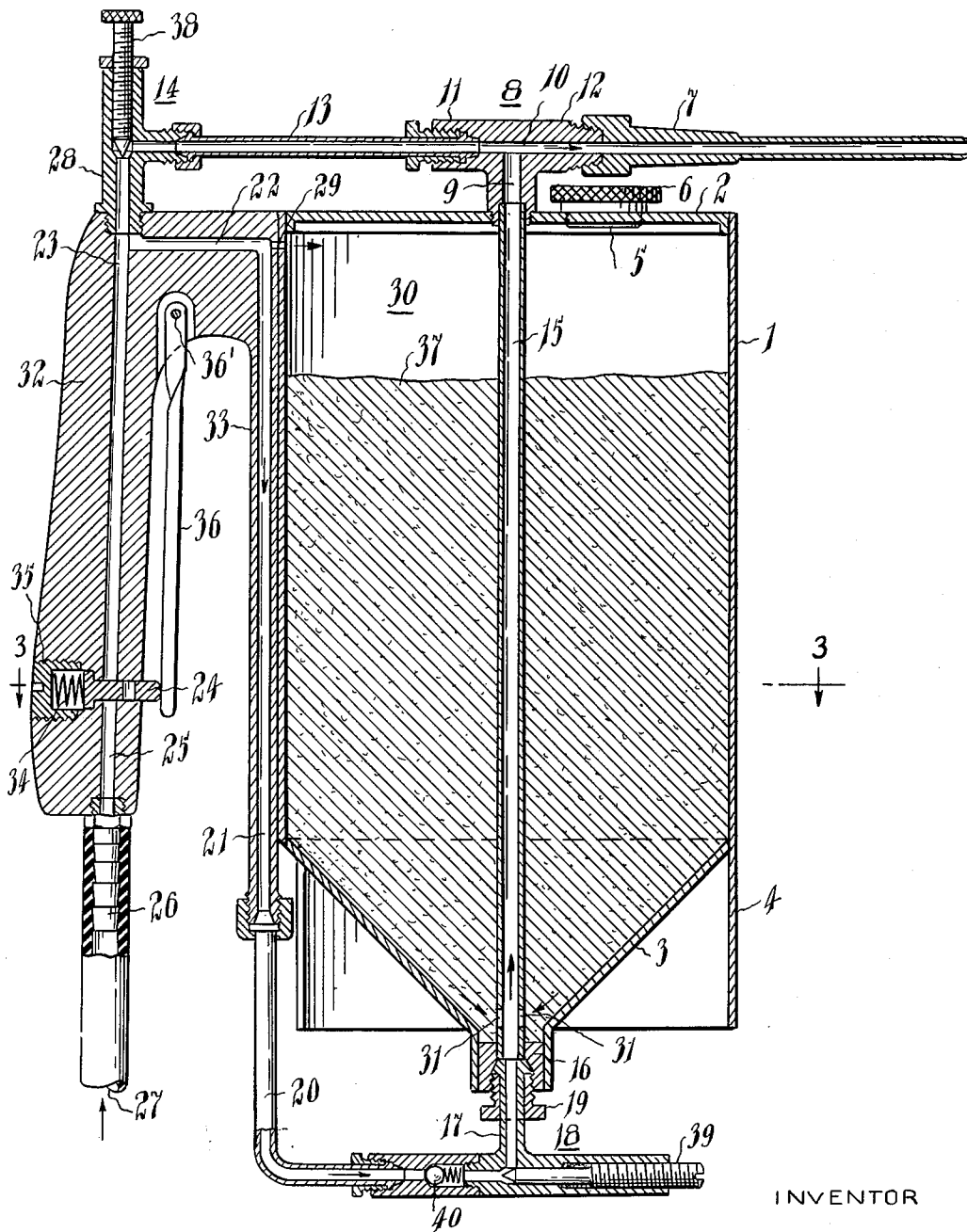


FIG. 1.

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2 Sheets-Sheet 2

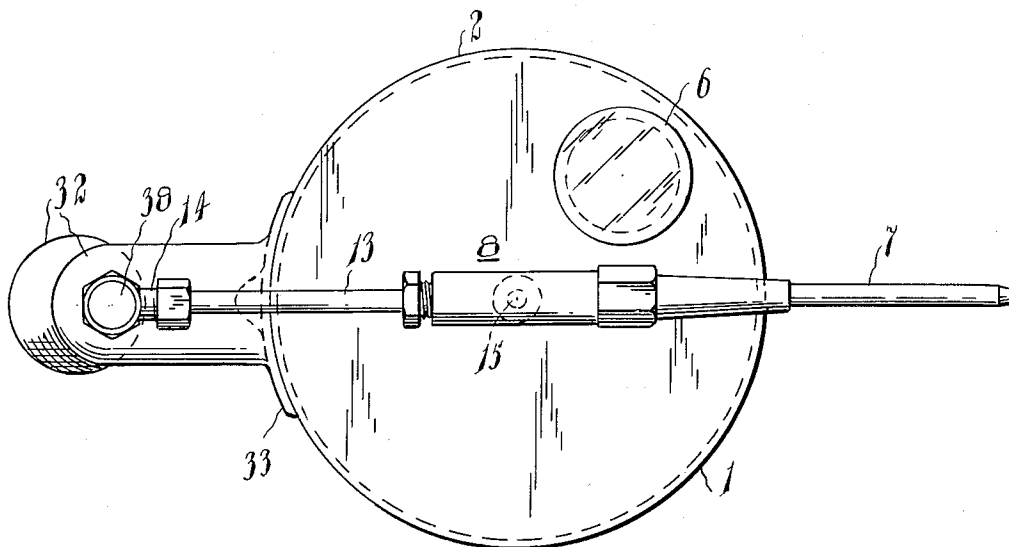


FIG. 2.

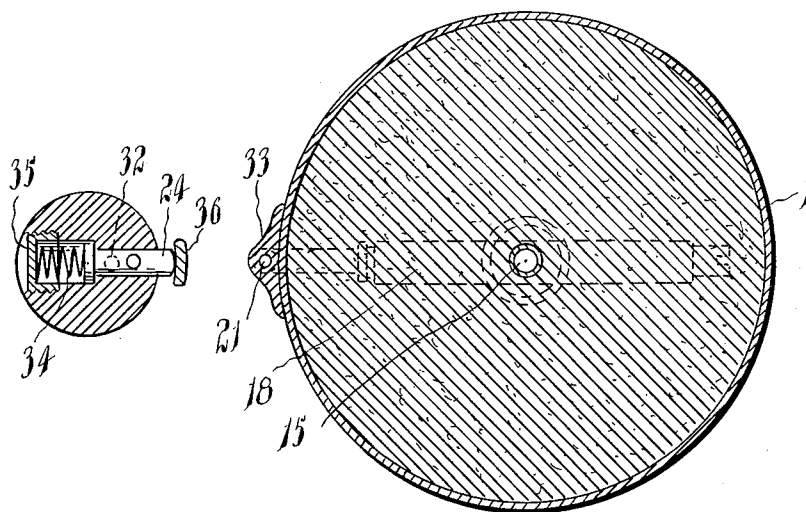


FIG. 3.

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PORTABLE SAND BLASTER

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7 Claims. (Cl. 51—3)

This invention relates to spraying apparatus of a kind suited for handling heavy and/or granular materials such as sand or the like.

In a particularly useful field of utility the invention may be operated as a sand blasting mechanism.

It is known to eject granular abrasive material at high velocity from a nozzle toward a target which may be a metal surface which it is desired to clean in preparation for the application of a finish.

It is customary to employ a modified form of spray gun wherein the abrasive material is sucked up through a tube into a duct in which a stream of air is passing at high velocity, the abrasive being carried along the air stream and ejected through a nozzle.

Prior art apparatus of this kind suffers from numerous disadvantages among which are: (a) difficulty of picking up abrasive granules from a container owing to their high unit mass and to the presence of air spaces between granules giving rise to inefficient suction; (b) necessity for resorting to extremely high nozzle velocities in order to overcome high suction-inertia in the stored abrasive; (c) fast rate of deterioration of spray gun parts owing to the high velocities of abrasive materials in the suction tubes and ventura gates.

It is an object of this invention to provide a mechanism of the kind discussed in which the aforementioned disadvantages are overcome.

It is a further object to provide a mechanism of the kind indicated which is capable of being adjusted to operate efficiently when handling any of a wide variety of granular materials having differing characteristics.

It is a still further object to provide a device of the kind indicated which will operate from normal sources of moderate air pressure and which can be handled with the same ease and convenience which characterizes so called paint spray guns of current usage.

Other objects and advantages will become apparent from the following description of a typical construction in accordance with my invention, the text being aided by reference to the accompanying drawings wherein:

Figure 1 is a vertical section of an improved spray gun in accordance with my invention.

Figure 2 is a top view looking down upon a tank and a gun assembly mounted thereon.

Figure 3 is a section taken along the line 3—3 of Figure 1.

Referring now to these figures, 1 is a container having a closed top 2, a cone or hopper shaped bottom 3 and a convenient guard-skirt 4. Sand or other granular material is stored in this container and may be inserted through the intake port 5 which, when the device is operative is preferably closed off in air-tight condition by a screw cap 6.

A blast-nozzle 7 preferably fabricated from a very hard material may be of conventional size and shape for spraying granular material in the manner well known. Nozzle 7 is attached to the exit arm of a blast header 8 comprising a cruciform conduit having a vertical leg fastened to the top 2 of container 1 and affording an air duct

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9 leading from within the container to the lateral air duct 10 which traverses the arms 11 and 12 of the header 8. The intake side of the blast header is connected to receive air from a duct 13 leading from a valve 14 whose function will be discussed later.

The duct 9 is joined to an elevator tube 15 which passes down through the interior of the container 1 and through a cork 16 to join an external duct 17 leading to a valve 18. The duct 17 is permanently connected to the valve 18 but is preferably detachable by such means as screw coupling 19 from the cork 16 and cone shaped bottom 3 of container 1.

The intake end of valve 18 is connected by means of preferably detachable duct 20 to duct 21, thence by duct 22 to duct 23 and by way of main control valve 24 and duct 25 to hose connector 26 and main air hose 27.

At the junction of ducts 22 and 23, another duct leads to the intake duct 28 of valve 14.

At the junction of ducts 21 and 22, a small duct 29 leads through the wall of container 1 into the cavity 30 thereof.

The elevator tube 15 includes near its base one or more apertures 31, cut in the side wall thereof.

As a preferred but not limiting feature, the ducts 23, 22, 21 are formed in a casting comprising a pistol-grip handle 32 and mounting bracket 33.

The manual valve assembly including valve 24, spring 34 and pressure plug 35 are mounted in the hand-grip 32 and a valve actuating arm 36 pivoted in a recess at 36' in the hand-grip and mounting bracket provides an easy means of manually actuating valve 24.

Valve 14 may be detachably fixed to the top of the hand-grip casting 32 so that its intake port forms the duct 28 at the junction of ducts 22, 23. The outlet side of valve 14 leads preferably detachably, into duct 13.

The duct 20 is shown as detachable both at the intake side of valve 18 and at its junction with duct 21.

The container 1 may be initially filled, or nearly so, by a material of utility 37, such as sand. It should not be filled beyond the level of the air intake duct 29.

Valve 24 is the main inlet valve for all air supply to the mechanism.

Valve 14 is normally adjustably open to a degree controlled by needle valve 38.

Valve 18 is normally adjustably open to a degree determined by needle valve 39 and is rendered one-way operative by spring urged check valve 40.

The operation of this exemplary construction of my invention will now be discussed.

Air entering the duct 23 when valve 24 is opened passes through duct 28 and valve 14, along duct 13, through ducts 11, 12 and exits through nozzle 7. This is the high velocity path.

Air in duct 23 also passes along duct 22 and through duct 29 into air cavity 30 to build up a pressure therein tending to compress the material 37 at the bottom 3 of container 1.

Air in duct 23 also passes along ducts 22, 21 and 20 into valve 18 whence it rises in the elevator tube 15 to join air passing through duct 12 and nozzle 7. This is a relatively low pressure circuit.

The duct 15 is larger in inside diameter than any of the other ducts, and duct 29 is made smaller than any of the other ducts.

By suitably adjusting needles 38 and 39, a phenomenon occurs wherein material 37 is forced through apertures 31 into elevator tube 15 where it is carried upward at relatively low velocity and is ejected into the high pressure air stream flowing along ducts 11 and 12 from valve 14.

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The check valve 40 prevents any material 37 from being driven into duct 20 and also prevents parasitic circulation of air backwards in the system so there can be no down draught in elevator tube 15.

There is no circuit from duct 29 to duct 9 except through the mass of material 37 and intake apertures 31. Therefore, whenever there is air pressure in space 30 there will be a tendency for material to move into elevator tube 15.

Air injected into tube 15 from valve 18 lifts this material upward at a velocity which is controllable by valve 18. As it rises in tube 15 the rush of air past the restricted duct 9 causes suction in the top portion of tube 15 whereby there is an acceleration of the granular material in its upward travel so that as it enters the air stream through 11, 12 its velocity has risen to a value near that of the air in 12. Thus it readily and quickly reaches the final velocity at the muzzle of nozzle 7 as determined by the setting of valve 14.

It is seen, therefore, that the material 37 in elevator tube 15 can be readily adjusted as to volume, density, velocity and acceleration by co-adjustment of valves 18 and 14 when 24 is wide open, and a specified pressure of air is supplied at 27. Differing types, shapes, grain meshes or densities of material 37 may be compensated by coadjustment of valves 14 and 18.

Higher or lower proportions of material in the blast from nozzle 7 may also be arrived at by co-adjustment of the said valves 14 and 18.

Exact adjustment of valves 14 and 18 is obtained by trial and error methods, initially; in general the heavier and more dense the material the more air must be admitted at valve 18 to provide a desirable density of blast.

Lighter materials require less velocity of air in tube 15 in order to raise a dense spray, and so a smaller opening of valve 18.

A very high velocity of air in 13 (valve 14 wide open) tends to rob the pressures in ducts 20, 21 and in cavity 30 thereby increasing the aperture demand at valve 18.

Increasing the velocity by opening valve 14 increases the cutting value of an abrasive in the blast from nozzle 7 but tends to reduce the density and effective coverage when carried too far.

A little experience in adjusting the valves 14 and 18 will enable one skilled in the art to arrive at the optimum co-action for a specified effect in the field of utility. Hose line 27 is connected to a source of compressed air.

The valves and the pipes are shown as of a detachable structure common to the art which provides for removal and replacement in case of wear. However, it will be evident that most of the wear due to erosion by the abrasive will occur in the forward end of the blast header 8 and in nozzle 7. Both of these can be made of highly resistant or even of refractory material. The remainder of the mechanism is not subject to excessive wear. The elevator tube 15 receives the abrasive at low velocity and the velocity of the abrasive does not reach dangerous values until it has reached the duct 9 which is part of the blast header. This latter part as previously suggested may be made insensitive to erosion by rendering it, for example, from the same basic material as that used as material 37.

Various modifications of the construction described will occur to those skilled in the art. For example in some cases the ducts may be further comprised of molded structures—even the container could be a molded part, on the other hand, all of the ducts could be separate pipes if desired.

All such and other modifications as lie within the broad spirit of my teachings are to be regarded as lying within the ambit of the appended claims.

What is claimed is:

1. Apparatus for spraying granular material comprising a cruciform blast header, first and second oppositely

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projecting and axially aligned ducts formed within said header, a third and downwardly projecting duct leading from a point medially of said axially aligned ducts, a pressure sealed container having a top closing member pierced by said third duct, a fourth duct comprising an elevator tube traversing the length of said container and piercing the bottom thereof and joined at its upper end to said third duct, a plurality of material entry ports positioned upon said fourth duct near its point of exit but within the bottom of said container, a first adjustable valve having an outlet port connected to the lower end of said fourth duct, a fifth duct having its output end connected to the input port to said first adjustable valve, a check valve incorporated in said first valve arranged to prevent any substantial flow of granular material or air backward therethrough, a sixth duct leading from a junction with said fifth duct and passing into said container near the top portion thereof, a seventh duct connected at its output end to the input end of said fifth duct, an eighth duct connectable at its input end to a source of air under pressure, a manually operable valve positioned medially along said eighth duct and arranged to control the passage of air therethrough, a second adjustable valve, connections joining the output of said eighth duct to the input of said second valve, connections joining the output of said eighth duct also to the input of said seventh duct, connections joining the output of said second valve to the first said aligned duct of said blast header and a blast nozzle having its input end connectable to the second duct of said blast header.

2. A construction according to claim 1 wherein the said container includes a downwardly extending cone-shaped bottom, the said material entry ports being positioned upon said elevator duct near the apex and within the said cone-shaped bottom.

3. A construction according to claim 1 wherein the said elevator tube is dimensioned to have a cross-section greater than that of any of the other said ducts.

4. A construction according to claim 1 wherein the said sixth duct is dimensioned to have an exit aperture smaller than that of any of the other said ducts.

5. A construction according to claim 1 including a handle and handle mounting bracket therefor, the said fifth, sixth, seventh and eighth ducts being substantially wholly incorporated therewithin, the bracket being attached to a side of said container, and an aperture in the top portion of said container being positioned to receive the outlet end of the sixth duct when the said mounting bracket is attached to said container.

6. A construction according to claim 5 comprising the modification wherein the said fifth duct is arranged partly within the structure of said mounting bracket and in remainder consists of a detachably connected extension duct leading from the outlet part incorporated within the said bracket to the inlet side of said first valve.

7. A construction according to claim 1 including a handle and handle mounting bracket therefor, the said handle including therein the said eighth duct and further including a spring loaded, hand-lever-actuated valve device positioned for controlling the flow of air under pressure in said eighth duct.

References Cited in the file of this patent

UNITED STATES PATENTS

794,122	Rosengarten	July 4, 1905
1,948,533	Neely	Feb. 27, 1934
2,133,149	Poncelet	Oct. 11, 1938
2,496,194	Bennett	Jan. 31, 1950
2,577,465	Jones	Dec. 4, 1951
2,675,147	Odum	Apr. 13, 1954

FOREIGN PATENTS

573,820	Germany	Apr. 6, 1933
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