

May 15, 1962

R. N. McDANIEL ET AL
SAND BLASTING APPARATUS

3,034,263

Filed Aug. 7, 1959

2 Sheets-Sheet 1

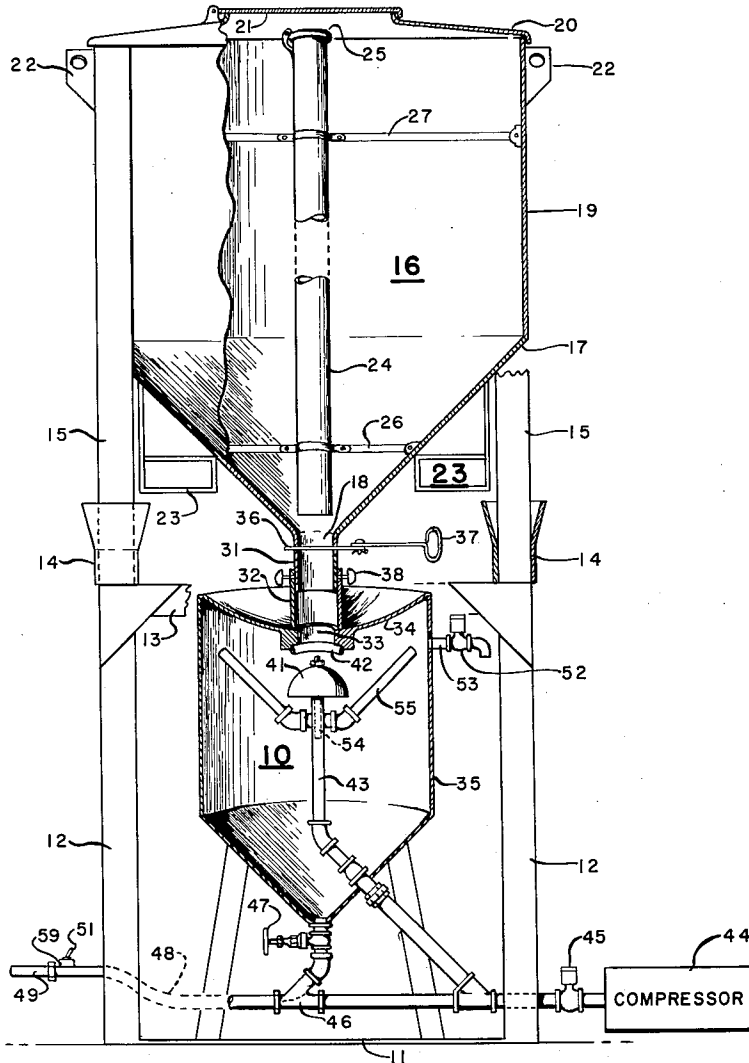


Fig. 1

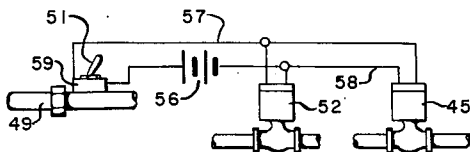


Fig. 3

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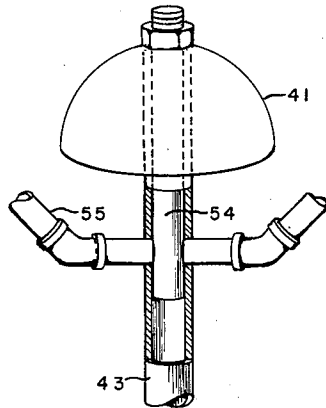
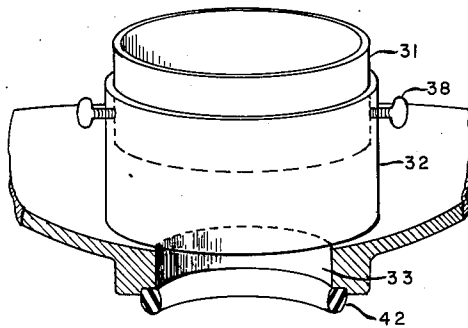


Fig. 2

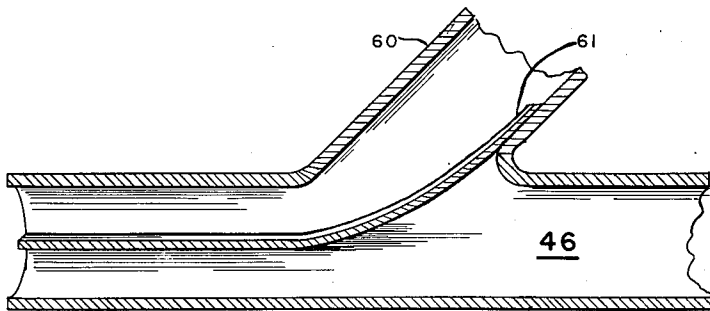


Fig. 4

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SAND BLASTING APPARATUS

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Filed Aug. 7, 1959, Ser. No. 832,415

1 Claim. (Cl. 51-12)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to sand blasting apparatus and more particularly to sand blasting apparatus having improved means for recharging the blasting tank.

Portable sand blast machines in general require in addition to the blaster the services of an operator for loading (usually by hand) the machine at the required intervals and when working outdoors as is commonplace exposure to inclement weather incurs loss of working time due to difficulties of keeping the sand dry for recharging the machine. Although arrangements are known whereby a blasting tank may be refilled without breaking its pressure or interrupting the blasting operation and other arrangements are known whereby a blasting tank may be refilled under the remote control of the blaster at the blasting nozzle, such arrangements appear to have been confined to highly specialized apparatus and not to have been adapted to the simple robust all-purpose equipment such as is in general use in naval shipyards.

An object of the invention is to provide a sand blast apparatus which can be loaded and operated by the blaster from the nozzle end of the blasting hose.

Another object of the invention is the provision of a sand hopper structure adapted to cooperate with different sand blasting machines having a certain type of feed passage and valve.

Other objects and attendant advantages of the invention will be apparent from the following description when read in connection with the accompanying drawing, and its scope will be pointed out in the appended claim.

In the drawing:

FIG. 1 is a view in elevation, partly in section, of a sand blasting apparatus incorporating the invention,

FIG. 2 is an enlarged view in elevation and in section of the passageway for sand from a hopper to a blasting machine,

FIG. 3 is a diagram of a valve controlling circuit which may be employed, and

FIG. 4 is a fragmentary sectional view of an arrangement for guiding abrasive into an air stream.

In the structural arrangement shown in FIGS. 1 and 2 a blasting machine 10 is mounted on a square platform 11 comprising the floor of an open frame structure having uprights 12 at the four corners of the platform 11 and connected together near their tops by stringers 13. On top of each upright 12 is secured a socket 14, preferably flared, adapted to receive the legs 15 of a square abrasive hopper 16 having bottom plates 17 sloping towards an outlet orifice or passageway 18, side walls 19 and a top cover 20 including a hinged portion 21 which may be opened for filling the hopper 16. The hopper 16 is equipped with four lifting pods 22 for handling by crane and with two channels 23 for handling by fork lift truck. A vertically extending tube 24 having a hinged top cap 25 is mounted on brackets 26 and 27 anchored in the bottom plates 17 and the hopper walls 19, respectively. The open lower end of the tube 24 is positioned in spaced aligned relation with the hopper outlet orifice 18 to permit gravity flow of abrasive material between the ends of the tube 24 and the wall of the orifice 18

and to receive abrasive displaced upwardly through the orifice 18 at the end of a blasting machine charging cycle as hereinafter described.

The orifice 18 in the bottom of the hopper 16 comprises the upper end of a tube 31 which together with a tube 32 telescoped thereon provides an adjustable feeding tube or passageway from the hopper 16 to an abrasive inlet opening 33 provided in the concave head 34 of the abrasive tank 35 of the blasting machine 10. A horizontally disposed sliding type gate or a valve such as a butterfly valve 36 in the feeding tube 31 retains abrasive in the hopper 16 until the hopper is seated on the foundation provided by the blasting machine frame structure at which time the valve 36 may be opened by proper movement of a handle 37 connected thereto. The telescoping tubes 31 and 32 are adjustably secured together as by wing nuts 38 in the position where the tube 32 is in contact with the head 34 of the tank 35.

The inlet opening 33 through which the blasting tank 35 is adapted to be filled with abrasive is provided with a cooperating valve cone or bell 41 which is vertically movable and seats upwardly against a seat 42 of resilient material surrounding the opening 33 to provide an airtight seal, the valve cone 41 being opened by gravity and the weight of the abrasive and being closed by air pressure in a pipe 43 from a source of compressed air 44 through a valve 45 which is preferably air or solenoid actuated. The air under pressure from the compressor 44 when the valve 45 is open also passes through an injector 46 where it entrains abrasive coming from the bottom of the tank 35 through a feed control valve 47 and then passes through a hose 48 to a blasting nozzle 49. A control member 51 near the nozzle 49 and within easy reach of the blaster is movable to control an air line or an electric circuit for the remote control of the valve 45 and an air or solenoid actuated pressure relief or vent valve 52 positioned in a nipple 53 in communication with the top portion of the tank 35. The nipple 53 is preferably provided with an abrasive trap not shown.

The valve 41 is carried on the upper end of a plunger 54 which extends into the pipe 43 and is lapped to close tolerance, say about .001 inch, so as to function efficiently as a piston for forcing the valve cone 41 against the seat 42. Valve closing movement of the plunger 54 admits the air under pressure in pipe 43 to the upper region of the tank 35 through at least one pipe 55 fitted in the pipe 43 at a location such that the bottom end of the plunger 54 clears an opening into the pipe 55, one thirty second of an inch being sufficient. The valves 52 and 45 are so connected to be controlled by the lever 51 that their actions are opposite, i.e., when one valve is closed the other is open and vice versa. An electrical circuit for controlling the valves 45 and 52 is shown in FIG. 3 as comprising a source of electric power 56 across which the solenoid valves 45 and 52 are connectable in parallel through leads 57 and 58 by a switch 59 adapted to be actuated by movement of the control member 51. If air actuation is utilized for the valves 45 and 52 the battery 56 will be replaced with a source of air pressure such as the compressor 44, the leads 57 and 58 become air hoses and an air valve replaces the switch 59.

With the hopper 16 filled with abrasive such as sand and in position over the blasting machine 10 as shown in FIG. 1 with the valve cone 41 in open position, opening of the valve 36 permits the gravity flow of sand around the lower end of the tube 24 into the tank 35 until the tank 35 is filled or the valve cone 41 is closed. If the tank 35 is permitted to fill, the angle of repose of the sand in the tank 35 will leave the upper ends of pipes 55 and the outlet or venting nipple 53 exposed to air. An operator or blaster at the nozzle 49 at a remote point may now move the control member 51 to the position

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where the valve 45 is opened and the valve 52 is closed. Opening of the valve 45 admits air under pressure to the pipe 43 and the valve cone 41 is immediately moved upwardly against its seat 42 and in so doing the sand in the telescoping tubes 31 and 32 is displaced upwardly into the tube 24 which is provided for the purpose of reducing the sand head against which the plunger 54 must work. The upward movement of the plunger 54 opened the pipes 55 so that the tank 35 is pressurized to help force the sand through the feed control valve 47 and the injector 46 in a well known manner. When the supply of sand in the tank 35 is exhausted, the blaster at the nozzle 49 returns the control member 51 to the position illustrated to close the valve 45 and open the valve 52 to vent the tank 35 and permit the valve cone 41 and its plunger 54 to drop under the force of gravity and the small sand head to recharge the tank 35 as at the beginning of the operation.

One very simple arrangement found useful for feeding pressurized abrasive into an air stream is illustrated in FIG. 4 wherein the injector 46 comprises a standard pipe Y fitting 60 provided with a steel tongue 61 separating the flow of air and abrasive until the two flows are parallel with the heavier material, i.e., the abrasive, uppermost.

While it is preferred to have the hopper 16 readily removable from the blasting machine 10, it will be evident that this feature is not essential to the substantial enjoyment of the invention and if for any reason it is desired to have the entire assembly of FIG. 1 unitary, it can be readily accomplished in an obvious manner requiring no present description. However, it is pointed out that in such a structure a permanent connection between the hopper 16 and the blasting machine 10 would not require the adjustable telescoping tubes 31 and 32 and the gate or valve 18 could be dispensed with.

While for the purpose of disclosing the invention, a preferred embodiment thereof has been described in detail, it will be evident to those skilled in the art that many

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modifications may be made without departing from the scope of the invention intended to be pointed out in the appended claim.

What is claimed is:

- 5 In a sand blasting apparatus, a sand hopper and a sand tank having a passageway therebetween arranged for the gravity flow of sand from said hopper into said tank, a normally open valve means movable under power upwardly against said passageway to close the same, an elongated tube mounted vertically in said hopper in axial alinement with said passageway and having an open lower end so spaced from said passageway as to allow gravity flow of sand from said hopper around said lower end into said passageway and to receive sand displaced by the upward movement of said valve means, and said valve means comprises a valve head mounted on top of a valve stem and having an upwardly directed valve face, a hollow cylinder supported within said sand tank and surrounding said valve stem, at least the lower portion of said valve stem fitting snugly in said cylinder to constitute a piston which will move upwardly to seat the valve head when air under pressure is admitted to said cylinder, and a lateral outlet in said cylinder positioned to be sealed by said piston when said valve means is open and to be openable to release pressurized air from said cylinder into said sand tank only after said piston has moved said valve head substantially to its seating position.

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