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Diehn

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[54] **PORTABLE APPARATUS FOR BLAST CLEANING**

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[52] **U.S. Cl.** ..... **51/9 M**

[51] **Int. Cl.** **B24c 3/06;** B24c 5/06; B24c 9/00

[58] **Field of Search** ..... 51/8 R, 9, 180; 114/222, 114/224

[56] **References Cited**

UNITED STATES PATENTS

2,628,456	2/1953	Berg	51/8 R
3,034,262	5/1962	Pawlson	51/9
3,566,543	3/1971	Fogle	51/9
3,609,916	10/1971	Hammelmann	51/8 R
3,747,277	7/1973	Carpenter	51/9
3,788,010	1/1974	Goff	51/9

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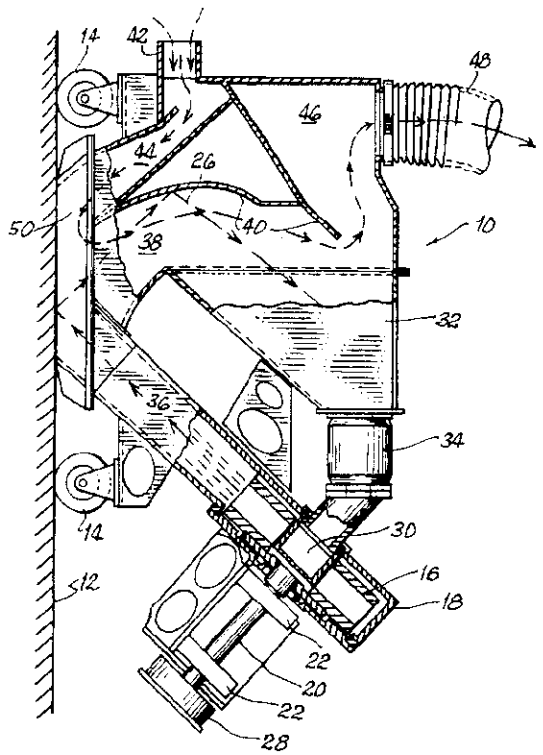
[57] **ABSTRACT**

An apparatus for blast cleaning a non-horizontal surface is disclosed. The device utilizes an airless blasting wheel to throw particulate abrasive upwardly against the surface to be cleaned with kinetic energy sufficient to insure rebound of the particulate material from the surface. A rebound corridor positioned to receive the rebounded particulate conducts the material back to a supply hopper for reuse. The supply hopper is located above the blast wheel and feeds it by gravity. An air stream is simultaneously passed through the rebound corridor for removing dust and fine particulate matter from the device.

10 Claims, 2 Drawing Figures



PORTABLE APPARATUS FOR BLAST CLEANING

BACKGROUND OF THE INVENTION

This invention relates to cleaning or surface finishing devices which utilize particulate material such as steel shot, grit or sand for cleaning or resurfacing. By causing the particulate material to strike the surface to be treated at sufficiently high velocities and in sufficient numbers, metal, concrete and other surfaces which require periodic maintainance can be cleaned or otherwise treated.

A particularly desirable form of apparatus for performing this task is one which is portable so that it may be utilized in circumstances where it would not be feasible to bring the surface to the machine for treatment. A specific use for such a portable apparatus is the cleaning of a vertical or other non-horizontal surface such as a wall, a platform or the like. Portable machines capable of performing abrasive blasting operations on such non-horizontal surfaces are known. For example, U.S. Pat. No. 3,034,262 to Pawlson discloses a portable finishing machine which may be utilized on a vertical surface. Pawlson's device throws sand against a surface to be treated in a downwardly direction for rebounding into a collection chamber. In order to reuse the sand a return hose is provided from the lower chamber to the blasting wheel. Sand is drawn upwardly through this hose by suction force created by high speed rotation of the blasting wheel. Pawlson does not disclose any means for removing dust or fine particulate from the closed system.

It is an object of the present invention to provide a portable apparatus for blast cleaning which projects the particulate material upwardly onto the surface to be treated.

It is another object of the present invention to provide a portable blast apparatus which utilizes a gravity feed hopper for continuously supplying the projecting means.

It is a further object of the present invention to provide a blast cleaning apparatus which is provided with exhaust means for removing dust and fine particulate matter from the device.

Other objects and advantages of the present invention will become apparent from the remaining portion of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional side view of the apparatus of the present invention showing the details of the inner chambers;

FIG. 2 is a plan view of the apparatus of FIG. 1.

DETAILED DESCRIPTION

Referring to the figures, a portable apparatus 10 for blast cleaning a non-horizontal surface is shown. In FIG. 1, the apparatus is shown tracking along a vertical wall 12 on a set of castor wheels 14. It will of course be recognized that the device is capable of operation on surfaces which are not vertical and in fact may be used on any skewed surface which is sufficiently angularly displaced from the horizontal so as to allow recirculation of the abrasive material in the manner described herein.

The apparatus 10 is provided with an airless centrifugal wheel 16 enclosed within a protective housing 18.

The wheel 16 may be any type of abrasive throwing wheel, but preferably it is a centrifugal blasting wheel of the type well known to the trade and which is marketed under the name of "Wheelabrator" by Wheelabrator-Frye, Inc. of Mishawaka, Ind. The wheel is rotated at high speed on an axle 20 which turns in antifriction bearings 22. The axle is rotated by a motor 24 connected to the axle by means of belt 26 and pulley wheel 28.

Particulate material to be thrown by the blasting wheel 16 is fed to the center of the wheel 30 from a supply hopper 32 filled with appropriate particulate material. The particulate is then accelerated to high velocity by the wheel blades and projected outwardly as indicated by the arrows. The choice of particulate material will depend upon the particular application and upon the specific surface composition of the material to be cleaned. Abrasive material may be used, for example, such as sand, steel shot or steel grit having various diameters or screen sizes as desired. The flow rate from the hopper 32 to the wheel 16 is controlled by a flow valve 34.

As illustrated in FIG. 1, the particulate material is thrown by the blast wheel 16 in a generally upwardly direction along a blast corridor 36. The corridor 36 terminates a short distance from the surface 12 and the abrasive material, upon striking the surface, rebounds therefrom at an obliquely upward angle as indicated. It should be noted that in order for the particulate material to rebound in this manner it is necessary that sufficient kinetic energy be imparted to the particulate by the wheel 16.

After striking the surface 12 for the purpose of treating or cleaning it, the rebounding particulate passes upwardly into a channel means. The channel means includes a rebound corridor 38 and one or more deflector plates 40 positioned in the corridor. The purpose of the deflector plates 40 is to focus or concentrate the travel of the dispersed particulate stream so that it may be directed back to the supply hopper 32 for subsequent reuse. For that purpose, the plates 40 are contoured as necessary and an exemplary set of plates are shown in FIG. 1. It will be apparent that other contours and arrangements would be utilized should the particular application so require.

As thus far described, it will be apparent that the device operates by supplying abrasive from a hopper 32 to a blast wheel 16 which throws abrasive upwardly through the blast corridor 36 where the abrasive impinges upon the surface to be cleaned. The abrasive then rebounds upwardly into the rebound corridor 38 where it is deflected by the plates 40 back to the gravity feed hopper 32.

In the course of utilizing such a device for treating a surface, there will be an accumulation of dust and spent fine particulate material which will accumulate in the system. In order to obtain optimum operating results it is desirable to provide means for exhausting these undesirable contaminants. For that purpose the present invention is provided with an air exhausting means. Air is pulled in by suction to an air inlet 42. The air flows via this inlet and a channel 44 to the impact area of the abrasive on the surface 12. The air flow then passes through the rebound corridor 38 as indicated, intermingling with the abrasive, then passes upwardly into a plenum chamber 46. As the air does so, it will carry, in suspension, dust particles and fine abrasive into the

plenum chamber and out through one or more exhaust ports **48** to a dust collector and a suction exhaust fan (not shown).

In order to prevent loss of abrasive from the system and to protect personnel in the area, the device is provided with a compliant seal **50** surrounding the impact area. The seal confines the abrasive particles and dust to the interior of the machine and is suitably formed of any compliant elastomeric material.

While I have shown and described embodiments of this invention in some detail, it will be understood that this description and illustrations are offered merely by way of example, and that the invention is to be limited in scope only by the appended claims.

I claim:

1. A portable apparatus for blast cleaning a nonhorizontal surface comprising:

means for upwardly projecting particulate material onto said surface with sufficient energy to rebound therefrom;

a gravity feed hopper supplying said projecting means with said particulate material; and

channel means disposed above said first means receiving the rebounded particulate material for directing it back to said hopper for reuse.

2. A portable apparatus according to claim **1** further including:

exhaust means for causing a stream of air to pass continuously through said channel means for removing dust and fine particles from the particulate material.

3. A portable apparatus according to claim **1** further including a compliant seal disposed about said apparatus for confining the particular blast to the apparatus interior.

4. A portable apparatus according to claim **1** wherein said upwardly projecting means is an airless centrifugal blasting wheel driven by a motor.

5. A portable apparatus according to claim **1** wherein said hopper is disposed above said projecting means.

6. A portable apparatus for blast cleaning a nonhorizontal surface comprising:

means for upwardly projecting particulate material onto said surface with sufficient energy to rebound therefrom;

a gravity feed hopper supplying said projecting means with said particulate material;

channel means receiving the rebounded particulate material for directing it back to said hopper for reuse including a rebound corridor receiving the rebounded particulate material; at least one deflector plate disposed in said corridor for focusing the rebound path of the particulate to the hopper.

7. A portable apparatus according to claim **2** wherein the exhaust means includes:

an inlet communicating with said channel means;

supply means for causing a stream of air to enter said channel means through said inlet; and

an outlet for exhausting dust and fine particles suspended in said stream of air.

8. In a portable apparatus for blast cleaning a nonhorizontal surface, the combination comprising:

means for upwardly projecting particulate material onto a surface with sufficient kinetic energy to rebound therefrom; and

collecting means disposed above said first means for receiving the rebounded particulate and directing it so that it falls by force of gravity back to said first means for reuse.

9. The apparatus of claim **8** further including means for causing a stream of air to pass through said collecting means for removing dust and fine particles from the particulate material.

10. A portable apparatus for blast cleaning a nonhorizontal surface comprising:

an airless centrifugal blasting wheel driven by a motor for upwardly projecting particulate material onto said surface with sufficient kinetic energy to rebound therefrom;

a gravity feed hopper supplying said blasting wheel with said particulate material;

a rebound corridor positioned above the impact area on said surface adapted to receive the rebound particulate matter;

at least one deflector plate disposed in said rebound corridor for focusing the rebound path of the particulate material back to said hopper;

exhaust means for causing a stream of air to pass continuously through said rebound corridor for removing dust and fine particles: and

a compliant seal disposed about said apparatus for confining the particulate blast to the apparatus interior.

* * * * *

FIG. 1

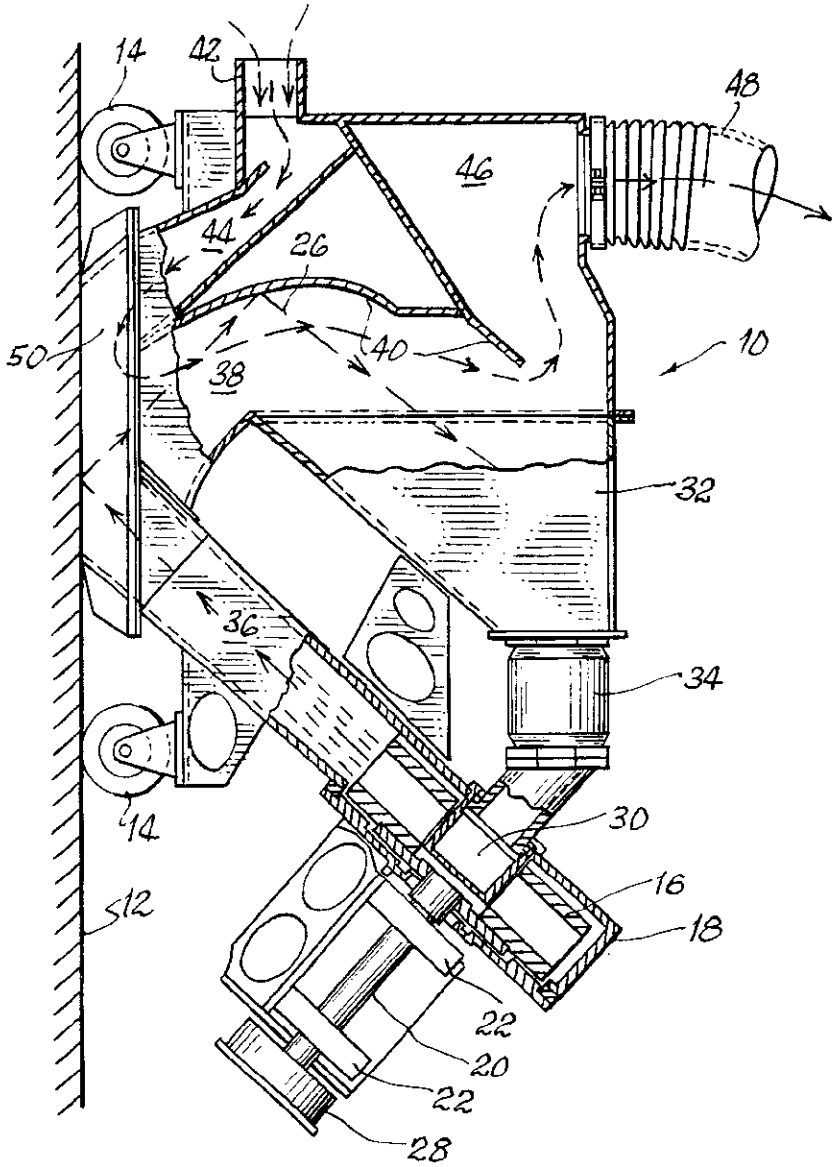


FIG. 2