

[54] CONVERTIBLE BLAST CLEANING UNIT

3,827,188	8/1974	Fuma	51/9 M X
3,906,673	9/1975	Goto	51/9 M
3,934,372	1/1976	Diehn	51/9 M X

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FOREIGN PATENTS OR APPLICATIONS

160,839	2/1954	Australia	51/8 R
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Primary Examiner—Gary L. Smith

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Related U.S. Application Data

[63] Continuation of Ser. No. 522,464, Nov. 11, 1974, abandoned.

[52] U.S. Cl. 51/9 M; 51/180; 51/8 SR

[51] Int. Cl.² B24C 9/00

[58] Field of Search 51/8 R, 8 SR, 9 R, 9 M, 51/180

[57] ABSTRACT

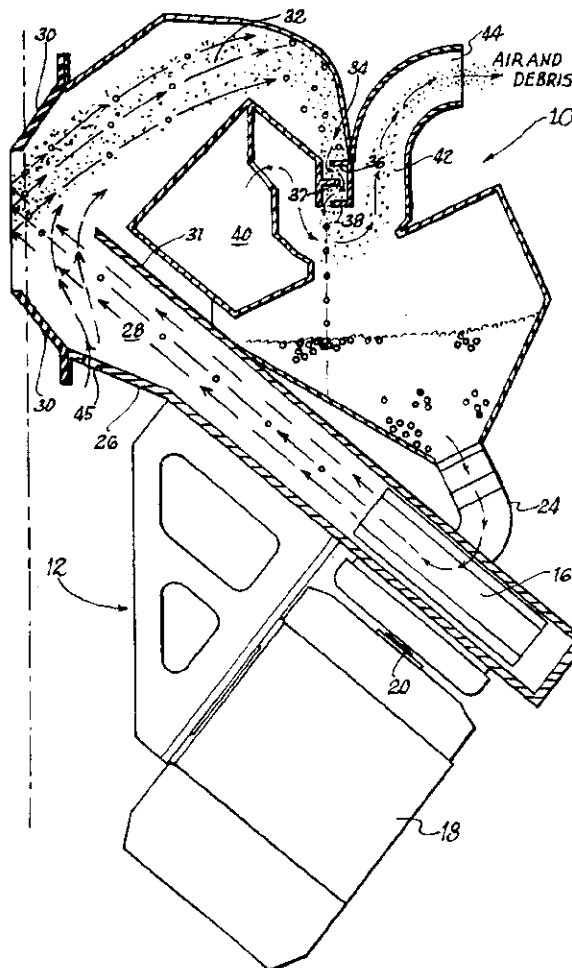
This invention relates to a portable blast cleaning unit employing one or more airless centrifugal blasting wheels for throwing particulate against a surface to be treated. By use of separate modules, the cleaning unit can be adapted for side cleaning of vertically disposed surfaces or upblast cleaning of horizontal surfaces. The cleaning unit includes means for effecting a sealing relation with the surface to be treated and for recovering and air washing the blast media to remove the debris generated by the blasting process. The air wash separating means is contained directly in the blasting head so that a completely portable and self-contained unit capable of recycling the particulate is obtained.

[56] References Cited

UNITED STATES PATENTS

1,342,488	6/1920	Woods	51/180 X
2,238,757	4/1941	Stevason	51/180 X
3,262,228	7/1966	Schenck	51/9 M
3,566,543	3/1971	Fogle	51/9 M

9 Claims, 4 Drawing Figures



CONVERTIBLE BLAST CLEANING UNIT

This is a continuation of application Ser. No. 522,464 filed Nov. 11, 1974 now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to portable blast cleaning devices. More particularly, it relates to a device of the type which utilizes one or more airless centrifugal blasting wheels for throwing particulate, such as steel shot, steel grit or other abrasives against a surface. Such devices are particularly adapted for cleaning large surfaces as, for example, the outside hull of a ship. The abrasive blasting process is effective for removing scales, paint chips, rust and miscellaneous debris, thereby restoring the surface in preparation for subsequent refinishing.

In previous blast heads of the type disclosed herein, it was not feasible to utilize one device to treat surfaces having different spatial orientations. For example, a ship's hull has vertically disposed portions as well as horizontal sections. Thus, a device designed to operate as an upblast cleaner could treat the horizontally disposed surfaces while a separate side blast cleaner was necessary to treat vertically disposed surfaces. Examples of these prior art devices are: U.S. Pat. No. 3,566,543 to Fogle (side blast); U.S. Pat. No. 3,788,010 to Goff (side blast); U.S. Pat. No. 3,034,262 to Paulson (side blast); copending U.S. application Ser. No. 443,389 to Diehn now U.S. Pat. No. 3,900,969 (side blast) and copending U.S. application Ser. No. 513,633 now U.S. Pat. No. 3,934,372 (upblast).

In a typical blast cleaning device, whether upblast or side blast, the device operates in sealing engagement with the surface to be treated as by a flexible seal disposed around the blast area. Usually, the seal is maintained in contact with the surface by various movable frame arrangements well known in the art. After striking the surface, the blasting particulate is reclaimed and reused in the device in order to effect economical operation.

In many of the existing devices, there exists a problem in recycling the particulate due to the contamination and buildup of foreign particles in the device. As buildup occurs, this debris from the blasting operation mixes with the abrasive and is recycled through the device, reducing its effectiveness and tending to clog or otherwise impair efficiency.

Another problem commonly experienced in devices of this type is heat buildup in the blasting area due to the dissipation of kinetic energy of the particulate against the surface being treated. A unique solution to both of these problems is the use of an air wash separator in the portable blasting head as disclosed in copending application Ser. No. 513,633. Such a design is incorporated into the present invention. The air wash separator is effective for separating material according to density, thereby permitting the heavier abrasive to pass downwardly into a recycling hopper while the lighter debris is blown out of the device. The air wash also effects cooling of the device to reduce heat buildup.

Perhaps the most serious drawback of such devices, however, is the lack of versatility due to the specialized design which each requires in order to perform efficiently. Thus, the side cleaners are incapable of performing their operation when used on a horizontally

disposed surface such as the underside of a ship's hull. For example, the Paulson device operates on a gravity rebound principal, and when that device is rotated 90° from its correct operating position, it will no longer function properly.

It is accordingly an object of the present invention to provide an abrasive cleaning device which recycles spent abrasive for reuse.

It is another object of the present invention to provide a portable blast cleaning head which prevents buildup of foreign matter in the returned abrasive to prevent gumming and sticking of the apparatus.

It is another object of the present invention to provide an air flow in the blast area of the device to prevent a heat buildup.

It is a further object of the present invention to provide directly in the blast head a compact and efficient means of air wash separating debris and foreign material from the abrasive.

It is another object of the present invention to provide a portable blast cleaning unit which is capable of cleaning both horizontally and vertically disposed surfaces.

It is a further object of the present invention to provide a portable blast cleaning unit which is in modular form, so that by substituting one module for another, the device is adapted to clean vertical and horizontally disposed surfaces.

Other objects and advantages of the invention will be apparent from the concluding portion of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of the blast cleaning unit with the side blast module installed on the blasting head;

FIG. 2 is a cross-sectional view of the blast cleaning unit with the upblast module installed on the blasting head;

FIG. 3 is a view similar to FIG. 1 showing the blasting head in phantom, thereby to highlight the details of the side blast module; and

FIG. 4 is a view similar to FIG. 2 again with the blasting head in phantom to highlight the details of the upblast module.

DETAILED DESCRIPTION

Referring to FIGS. 1 and 2, the convertible blast cleaning unit is illustrated. In the FIG. 1 illustration, it has a side cleaning module 10 attached to the blasting head structure 12. In the FIG. 2 illustration, the upblast module 14 is attached to the blasting head structure 12. As will be appreciated, the identical blasting head structure 12 is adapted to receive either of the two modules 10 or 14 depending upon the particular application. The blast cleaning head 12 comprises the basic cleaning structure of the device while the modules 10 and 14 contain a rebound corridor and air wash separator effective for cleaning and recycling abrasive to the blasting head for reuse.

The blasting head 12 comprises at least one and preferably two abrasive throwing wheels 16. These wheels are known in the art and are preferably airless centrifugal blasting wheels of the type manufactured by Wheelabrator-Frye Inc. of Mishawaka, Indiana. Each wheel is powered by a motor 18 coupled by means of a direct drive shaft 20. These wheels are rotated at high angular velocities effective for propelling abrasive par-

- a. hopper attached to said blasting means supplying particulate thereto; and
- c. two module means alternately attachable to said blasting means, one of which is always attached to said device, each module means having a different directionally oriented opening therein for defining a blast area for treatment of said vertical and said horizontal surfaces, said module means including:
 - i. means for recycling spent particulate to said hopper for reuse, and
 - ii. means for separating the spent particulate from debris generated by said surface treatment prior to returning the particulate to said hopper.
- 2. The device of claim 1 further including means for effecting a sealing relation between the blast cleaning device and the surface being treated to prevent loss of particulate.
- 3. The device of claim 1 wherein said blasting means includes:
 - a. a housing open at one end;
 - b. at least one means mounted in said housing for projecting particulate toward said open end, said module means being attached to said blasting means at the open end of said housing.
- 4. The device according to claim 3 wherein said means for projecting includes an airless centrifugal blasting wheel and a motor for driving said wheel.
- 5. The device according to claim 3 wherein said modules are attached to the open end of said housing by bolting.
- 6. The device according to claim 1 wherein said recycling means includes:

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- a. a rebound corridor into which debris and said particulate pass after impacting on said surface, said corridor communicating with said hopper to return said particulate thereto for reuse; and
- b. means for drawing air across said blast area and into said corridor to enhance passage of said particulate and debris into said corridor, and to prevent heat buildup in said blast area.
- 7. The device according to claim 1 wherein said separating means includes means for air washing said spent particulate and debris to effect separation thereof.
- 8. The device according to claim 7 wherein said air wash means includes:
 - a. means for removing kinetic energy from said particulate and debris to create a free falling curtain of material;
 - b. an air plenum and inlet in said module on one side of said curtain permitting entry of air to the module;
 - c. an exhaust plenum and outlet on the other side of said curtain through which said air is exhausted from said module; and
 - d. means for creating a suction at said outlet whereby a continuous and constant stream of air is caused to enter said inlet, flow across said curtain and out said outlet thereby to effect separation of said debris from said particulate.
- 9. The device according to claim 8 wherein said means for removing includes a plurality of ledges spatially arranged to form a labyrinth passage for said particulate and debris from said rebound corridor to said air wash means whereby said debris and particulate pass into said air wash means in a state of gravity-free fall.

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FIG. 2

