Abrasion Method and Apparatus

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2 Claims.

This invention relates to a method of and apparatus for abrading and has particular reference to a method of and apparatus for cleaning castings, forgings and the like, and similar operations.

The principal object of the invention is to secure more efficient results in operations of this type; this object is attained by the use of apparatus constituting a reversal in the trend of the art of cleaning castings. The tendency in this art has been toward the use of extremely high pressures, for example, 50 to 100 pounds per square inch and the use of small discharge nozzles, for example, less than one inch in diameter. I employ a fan for projecting abrasive against the castings to be cleaned and develop a pressure of only about 1 to 3 pounds, employing a nozzle having a discharge orifice of the order of three inches in diameter.

While some types of abrading have been performed by the use of an air blast produced by a fan, so far as I am aware no one, prior to my invention, has successfully used such mechanism for cleaning castings. Indeed, I am not aware of any mechanism of the type, produced before my invention, which could be successfully used for cleaning castings. Accordingly it is a further object of my invention to provide novel apparatus capable of successful use for this difficult work.

In my application Serial No. 716,289, of which this application is a continuation in part, I disclosed a means for introducing abrasive into the air stream which, while a considerable advance over the art prior to it, and productive of excellent results in the art of cleaning castings, was nevertheless not as effective as the mechanism herein disclosed for the same purpose. Inasmuch as the abrasive feed device disclosed in the drawing accompanying this application employs the same principle which was employed in the apparatus shown in the parent application, the specific apparatus therein illustrated is not repeated in the present drawing.

Further objects of the invention are reduction of the power cost and reduction in the amount of dust produced by the device as well as avoidance of the high cost of equipment, renewal of nozzles and frequent shut-downs which were unavoidable in the high pressure abrading devices.

50 With the foregoing and other objects in view, which will be more fully described and in part pointed out hereinafter, the invention consists in all the novel features and combinations of steps and arrangements of parts hereinafter described and shown in the accompanying drawing wherein

Fig. 1 is a schematic fragmentary elevational view of an abrading device used in carrying out my novel process and embodying the apparatus features of my invention; Fig. 2 is an enlarged fragmentary sectional view showing the abrasive feed and its relation to the air blast mechanism; Fig. 3 is a section on the line 3—3 of Fig. 2 and Fig. 4 is a section on the line 4—4 of Fig. 2.

The apparatus shown in the accompanying drawing will be first described, after which the process will be set forth in connection with the operation of the apparatus. The numeral 10 indicates schematically a tumbling barrel adapted to contain a charge of castings to be cleaned. It will be understood that this device will be provided with suitable means for support and rotation and may include abrasive elevating means such as, for example, is shown in my copending application Serial No. 721,291. The line c—a indicates the upper surface of a charge of castings contained in the tumbling barrel 10. It is to be understood that the invention, in its broader aspects, is not restricted to the use of a tumbling barrel but may be used in other relations. The numeral 11 indicates a fan housing containing a centrifugal fan element 12 which will be provided with suitable driving means, preferably an electric motor, not shown. Air from any suitable source enters the housing 12 from an inlet pipe 13 and is ejected therefrom through the extension 14 on the housing 12 and delivered into a nozzle 15 secured to the projection 14. The nozzle 15 may be frusto-conical in shape and may deliver through a discharge orifice 16 which may be about three inches in diameter. From this dimension, the dimensions of the remaining parts of this illustrative embodiment may be ascertained from the drawing which are made approximately to scale.

In the present preferred embodiment, the abrasive feed means comprises a continuously sealed, pocketed feed device made up of a cylindrical housing 17 having an upper abrasive inlet funnel 18 and a lower discharge conduit 19 sealed through the wall of the nozzle 15 and provided with a pocketed rotor 20, having a sufficient number of pockets to maintain the device continuously sealed against any substantial passage of air upwardly therethrough. The pockets, and the construction shown, are defined by a series of vanes 21 which ride against the inner surface of the housing 17 and form a seal therewith. The edges of the vanes 21 may be provided with any desired form of sealing means and a number of shorter vanes 22 may be interposed between the vanes 21.
so as to distribute the abrasive and more evenly provide for a substantially continuous abrasive flow through the feed mechanism. Abrasive may be supplied to the funnel 18 from a feed hopper 23 in the bottom of which may be placed a selected one of a plurality of plates 24 having varying sized central openings 25 whereby the feed may be regulated according to the type of abrasive used and the velocity of the air stream. I have found that there is a critical maximum quantity of abrasive which a given air stream will carry efficiently; and this means is provided for insuring that a greater quantity will not be introduced. When the air stream carries this maximum quantity it may be considered to be “saturated”. When more abrasive is added, the velocity of the discharged abrasive rapidly decreases.

In the device illustrated, I prefer to produce an air velocity of from about ten thousand to about thirty-five thousand feet per minute through a nozzle having a three inch discharge orifice. This will result in delivering a volume of air of the order of 1000 to 2000 cubic feet per minute and this blast can efficiently carry a quantity of abrasive about one-half of one percent of the volume of the air. The relative volume of abrasive may be less than the maximum which the stream can carry. For example, good results may be had with only one tenth of one percent abrasive by volume. It will be noted that the conduit 19 is cylindrical and presents an angular surface on the “upstream” side which will provide a degree of suction tending to produce an injector action for discharging the abrasive into the nozzle 15. The rotor 20 may be driven by means of a sprocket 26 fixed on its central shaft 27. The discharge orifice may vary, as illustrated. For example, good results may be had with an orifice of from about four to about fifty square inches and which need not be circular but may be oblong.

In order to overcome any tendency of the pressure from the nozzle 15 to force the abrasive upward or retard its descent into the nozzle, I provide an equalizing connection in the form of a pipe 28 communicating between the nozzle 15 and the interior of the housing 17 as best seen in Figs. 2 and 3. The port 29 by which the conduit 28 communicates with the housing 17 is so positioned and of such size that the pressure in each compartment will be equalized before that compartment registers with the upper end of the conduit 15. The elevated pressure thus introduced into the pocket will be relieved before the pocket registers with the funnel 18 by reason of a small outlet 30 positioned adjacent such funnel 18. In order that the rotor may be rotated in either direction, a similar opening 31 is provided at the other side of the funnel 18. The port 25 similarly is centrally positioned to provide for rotation in the opposite direction.

While I have shown and described the preferred embodiment of my invention I wish it understood that the same is not limited to the details disclosed but only in accordance with the spirit and scope of the appended claims.

Having thus described my invention, what I claim is:

1. An abrading device comprising, in combination, a fan, a housing surrounding said fan, a nozzle connected in communication with said housing and forming an outlet therefrom and means for supplying abrasive to the interior of said nozzle, said means comprising a continuously sealed, pocketed feed means and means for equalizing the air pressure between said nozzle and each pocket prior to its opening to discharge abrasive.

2. In an abrading device, in combination, a nozzle, a fan connected in communication therewith and an abrasive feed for delivering abrasive into said nozzle, said abrasive feed comprising a pocketed rotor, a housing therefor having an abrasive inlet and an abrasive outlet communicating with said housing and said nozzle, said rotor forming with said housing a continuous seal against the influence of said fan, and means for equalizing the pressure between said nozzle and each pocket of said rotor prior to its registration with the abrasive outlet.

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