CENTRIFUGAL BLASTING WHEEL

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This invention relates to a centrifugal blasting machine and more particularly to a device for accelerating the movement of particulate substances, such as metallic shot or grit, sand and similar non-metallic abrasives, crushed nut shells and the like, to impact surfaces for the purpose of peening, peening, eroding, deburring, finishing and the like.

More specifically, this invention relates to an improvement in blasting wheels of the type described wherein particulate substances are accelerated in radial movement as they travel outwardly along the blade of a wheel and are thrown with high centrifugal force from the periphery thereof against the object to be worked upon or abraded. Obviously in structures of the type described, it is desirable to embody means for limiting the direction of flow of the material thrown by the wheel in order to concentrate the substances onto the surface to be treated. Similarly, it is desirable to increase the capacity of the device as much as possible in order to make most efficient use of the device for the purpose for which it was intended.

As will appear hereinafter, directional control has been achieved by the use of a control cage which delivers the particulate substance to the inner ends of the blades at a determinable location calculated to throw the particulate substance in a predetermined direction by centrifugal force from the periphery of the wheel. While effective directional control has been achieved, it has been found that the characteristics of such control systems which have heretofore been used undesirably limit the amount of particulate substance which can be effectively thrown from the wheel and thereby limits the capacity thereof.

It is an object of this invention to produce a blasting wheel of the type described in which the capacity of the device is markedly increased over equivalent wheels of present construction.

Another object is to produce an improved blasting wheel of the type described having increased capacity thereby to increase the utility thereof without undesirably increasing the wear or break-down of parts.

A further object is to produce a bladed centrifugal blasting wheel of the type described capable of delivering considerably greater volumes of particulate material without loss of directional control and without loss of force thereby to increase the capacity of the machine for accomplishing the work for which it was intended.

A still further object is to produce a blasting wheel of the type described embodying a new and improved feed system to increase the flow rate of particulate substance through the wheel.

These and other objects and advantages of this invention will hereinafter appear and for purposes of illustration, and not of limitation, an embodiment of the invention is shown in the accompanying drawing in which—Figure 1 is a sectional elevational view of a part of a blasting wheel embodying features of this invention, and Figure 2 is a perspective view of the impeller device shown in the blasting wheel of Figure 1.

Briefly described, a blasting wheel of the type embodying features of this invention comprises a rotor 10 formed of a pair of spaced circular plates 11 and 12 fixed to each other by means of several spacer bolts or rivets (not shown) and fixed as by bolts 13 to hub 14. The hub is mounted onto a shaft 15 adapted to be turned at high speed by a power source (not shown). Fixed between the plates 11 and 12 are a plurality of radially extending blades or vanes 16 substantially equidistantly spaced to provide a balanced wheel. The blades are usually constructed of wear resistant materials and designed in such manner that they can easily be replaced when worn out through normal usage.

The blades 16 extend inwardly short of the axis of the rotor to provide a concentric opening 17 in which a device for feeding and controlling the direction of discharge of the particulate substance is positioned. The control device includes a control cage in the form of a hollow cylinder 18 positioned to occupy the opening defined by the inner ends of the blades and having an outside diameter slightly less than the diameter of the concentric opening defined by the blades. The control cage is provided with a discharge opening or port 18 in the peripheral wall of the cylinder through which the particulate substance introduced into the interior of the cage is passed onto the inner ends of the blades 16 at a definite controlled location as they rotate past the discharge opening. The control cage is stationarily mounted in the machine but in a manner to permit circumferential adjustment to position the discharge opening for causing the particulate substance to be thrown from the periphery of the bladed wheel in a predetermined direction. The control cage thus prevents the particulate substance from being sprayed indiscriminately from the periphery of the rotor and, instead, concentrates the delivery thereof to make most effective use in a limited area.

Particulate substance fed into the interior of the control cage is projected through the discharge opening by means of an impeller 21 preferably in the form of a small vased wheel secured to the end of the shaft 15 by bolt 14' for rotational movement with the rotor. The impeller used in a conventional centrifugal wheel is provided with a concentric opening 22 at its center through which the particulate substance is fed from one end into the wheel. In the conventional impeller, this opening, corresponding to opening 22 in the drawing, is in the form of a hollow cylinder rather than having the conical shape opening 22 shown in Figures 1 and 2. The particulate substance is actuated by the impeller vanes in the direction of rotation of the wheel and is caused to pass through the discharge opening or port 18 in the control cage onto the inner ends of the blades.

To the present, description has been made of a conventional bladed wheel of the type generally used in the industry for blasting with abrasive particles to clean metal castings and the like. For more detailed description, reference may be had to the Münch Patents No. 2,049,466 or No. 2,677,638, or the Unger Patent No. 2,162,139, or the Guenzl Patent No. 2,204,537, or the Keefer Patent No. 2,492,702.

It is well known that wear of the impeller, the control cage and the inner ends of the wheel throwing blades is somewhat proportional to the velocity of the particulate substance as it moves across the impeller vanes and through the control cage opening. Since the velocity of particulate substance leaving the impeller vanes is proportional to the outside diameter of the impeller, it has been the practice to keep the control cage and the impeller small in diameter as compared to the outside diameter of the impeller. To prevent the control cage opening from being too small in diameter as compared to the outside diameter of the impeller, the control cage opening is thereby handicapped.

It is also recognized that each wheel is somewhat limited
in the volume of particulate substance that can be delivered and therefore the amount of work capable of being performed by each machine is limited. The capacity of a given machine is determined by the maximum size and number of wheels in the direction of feed and by the number of a wheel of one size as compared to another but all wheels of a given type and size have been found to have a common limiting flow rate. When an attempt is made to increase the rate of flow of particulate substance through a wheel, a fairly uniform point is reached at which the wheel becomes choked and is incapable of handling more. When this point is reached, any increase in the direction of feed rate causes a noticeable decrease in the volumetric capacity of the wheel. In order to return the wheel to maximum efficiency, it is necessary first to drain the particulate substance from the feed device.

Thus it is an important object of this invention to increase the flexibility of a blasting wheel of the type described whereby the unit may be caused to maintain a high rate of flow of particulate substance over and beyond that of which it has heretofore been capable without increased proportional wear of parts relative to the amount of particulate substance blown by the wheel and yet remain capable of efficient operation with normal flow. Under such circumstances the amount of work which could be made available from a wheel might be increased to diminish the necessity for changing the wheels in certain operations and to increase the work available from a single wheel thereby to achieve the effect of two or more wheels without increased expense or wear on parts.

It has been found that the desired flexibility in operation of the blasting wheel markedly to increase the capacity thereof may be achieved by modification of the impeller as to provide for a feed section in advance of the bladed section in the form of a conical surface or other surface of revolution 24 gradually increasing in diameter toward the bladed portion whereby responsive to rotational movement of the impeller, particulate substance introduced into the feed section of the impeller is caused to flow smoothly along the conical wall to the vaned portion of the impeller unit. During inward movement of the particulate substance along the conical wall of the feed section, rotational movement is also imparted to the particulate substance whereby the degree of relative movement between the particles and the vanes of the impeller is greatly minimized. As a result, wear on the impeller vanes is markedly reduced and, more important, the increased impeller capacity is caused the vanes so minimizes turbulence within the impeller section that the possibility of choking is substantially eliminated even when the feed rate is markedly increased to almost twice or more than the amount capable of being fed directly into the vaned impeller, as in practices heretofore employed.

To achieve the desired improvement it is important that the feed section of the impeller be substantially free of vanes or other obstructing surfaces which might impact the particles upon introduction and cause turbulence. It is also important that the wall in the feed section increase in diameter from the feed end to the vaned section so as to cause the particulate substance to flow smoothly inwardly responsive to centrifugal force in the direction of feed. This increasing diameter in the wall of the feed section may be in the form of an arcuate section of spherical or elliptical contour or it may be a taper such as is formed of a conical section whereby the inner wall of the feed section will define a frusto-conical shape having the end of smallest diameter extending forwardly to provide a concentric opening through which the particulate substance may be fed and conveyed.

In operation, abrasive particles or other particulate substance is deposited from a feed spout 25 onto the inner surface 24 of the conical section forming the feed end of the impeller 21. As the particles engage the conical surface of the rapidly rotating impeller, frictional forces become effective to impart rotational move-
fectiveness thereby to embody greater flexibility in use in machines of the type described.

While description has been made of the application of this invention to a preferred form of wheel, it will be understood that the inventive concepts may be adopted for use with other types of centrifugal wheels such as those having circular side plates on one side only, as at 12 in Figure 1, with the blades being fastened on one side only to the side plate.

It will be understood that various changes may be made in the details of construction, arrangement and operation without departing from the spirit of the invention, especially as defined in the following claims.

I claim:

1. In a centrifugal blasting wheel, the combination of a rotor having a plurality of substantially equally spaced apart radially extending blades mounted for rotational movement at high speed about an axis and terminating short of the axis to provide a central opening, a control cage of cylindrical shape axially aligned with the rotor and stationarily mounted within the central opening between the rotor blades and having an opening extending through the wall thereof, and an impeller mounted within the stationary control cage for rotational movement at high speed about the axis, said impeller being formed with an inner section concentrically aligned with the control cage having a plurality of vanes with openings therebetween and an integral feed section in advance thereof having its interior walls free of vanes and smoothly decreasing in dimension from the inner vaned portion to the outer inlet portion, and means for introducing the particulate substance onto the outer inlet end portion of the feed section so as to cause the substance to flow smoothly toward the vaned section while acquiring rotational movement so that the substance flows smoothly into the vaned section.

2. A centrifugal blasting wheel as claimed in claim 1 in which the outer section of the impeller is formed with an interior wall of frusto-conical shape with the base adjacent the vaned section of the impeller.

3. In a centrifugal blasting wheel, the combination of a rotor having a plurality of substantially equally spaced apart radially extending blades mounted for rotational movement at high speed about an axis and terminating short of the axis to provide a central opening, a control cage of cylindrical shape axially aligned with the rotor and stationarily mounted within the central opening between the rotor blades and having an opening extending through the wall thereof, and an impeller mounted within the stationary control cage for rotational movement at high speed about the axis, said impeller being formed with an inner section dimensioned to correspond in length with the control cage opening and having radial vanes with openings therebetween and an outer feed section in the form of a hollow surface of revolution having an internal wall smoothly increasing in diameter from the outer inlet end portion inwardly toward the vaned section of the impeller, and a feed spout having its outlet end portion aligned with the feed section and terminating adjacent the inlet end to deposit the particulate substance onto the inlet end portion of the feed section so as to cause the substance to flow smoothly toward the vaned section while acquiring rotational movement so that the substance flows smoothly into the vaned section.

4. A centrifugal blasting wheel as claimed in claim 3 in which the interior wall of increasing dimension of the impeller defines a curvilinear section.

References Cited in the file of this patent

UNITED STATES PATENTS

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