Feb. 15, 1944. W. L. KEEFER 2,341,559

ABRADING APPARATUS

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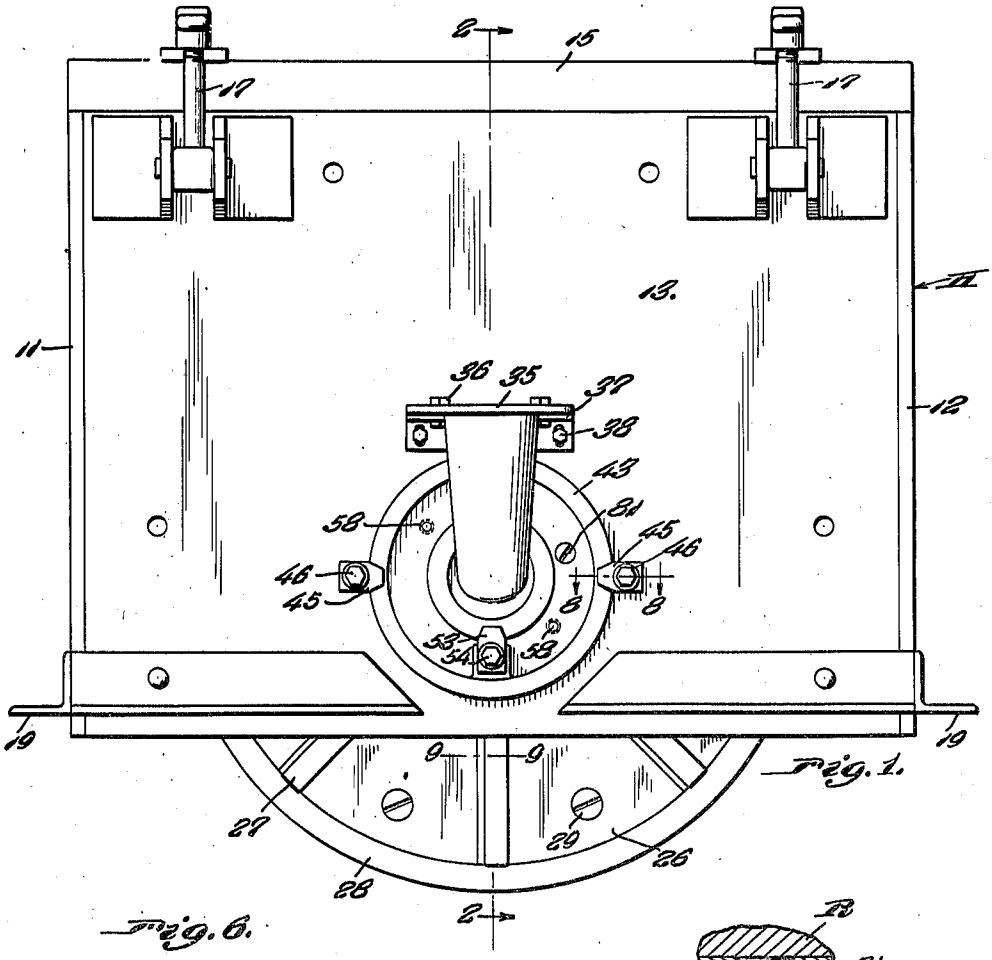
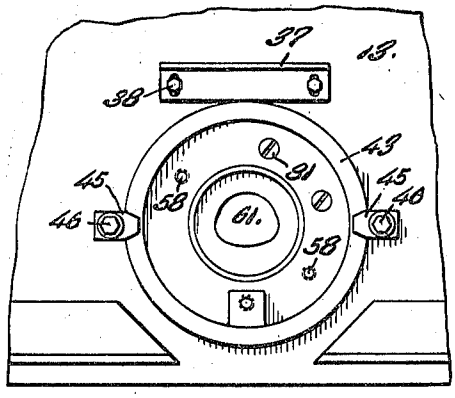


Fig. 1.

Fig. 6.



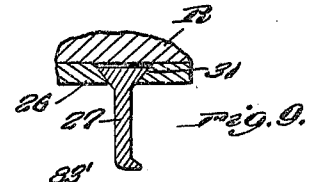


Fig. 9.

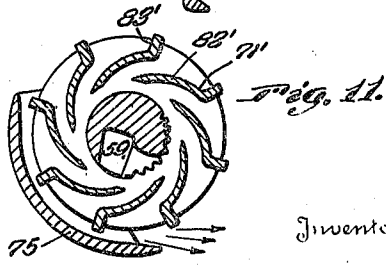


Fig. 11.

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Fig. 2.

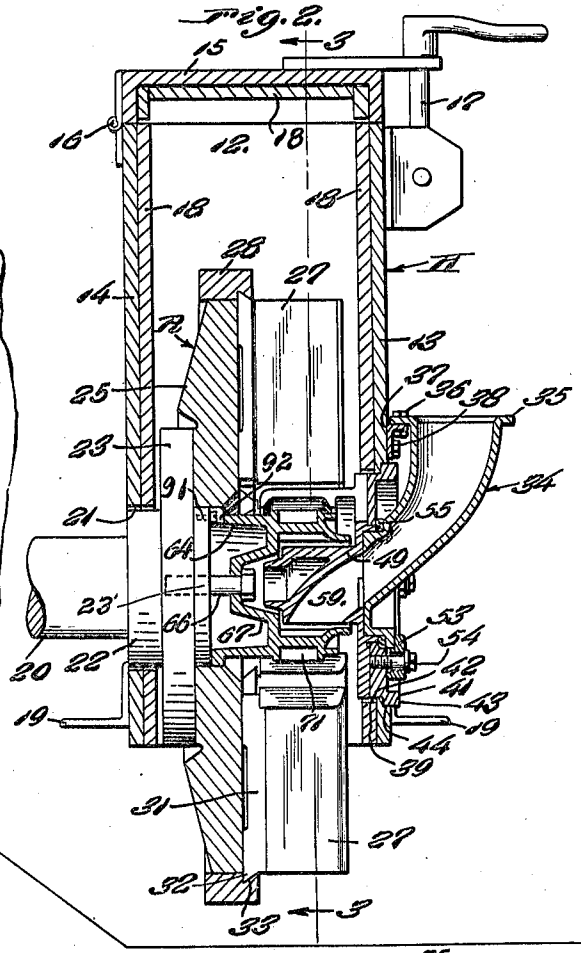


Fig. 5.

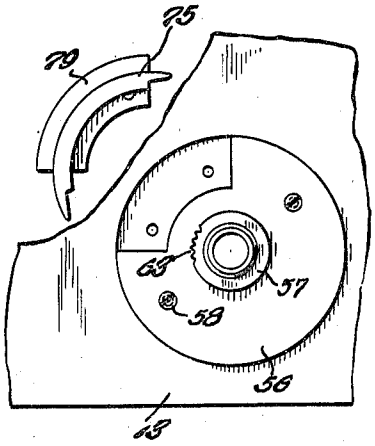
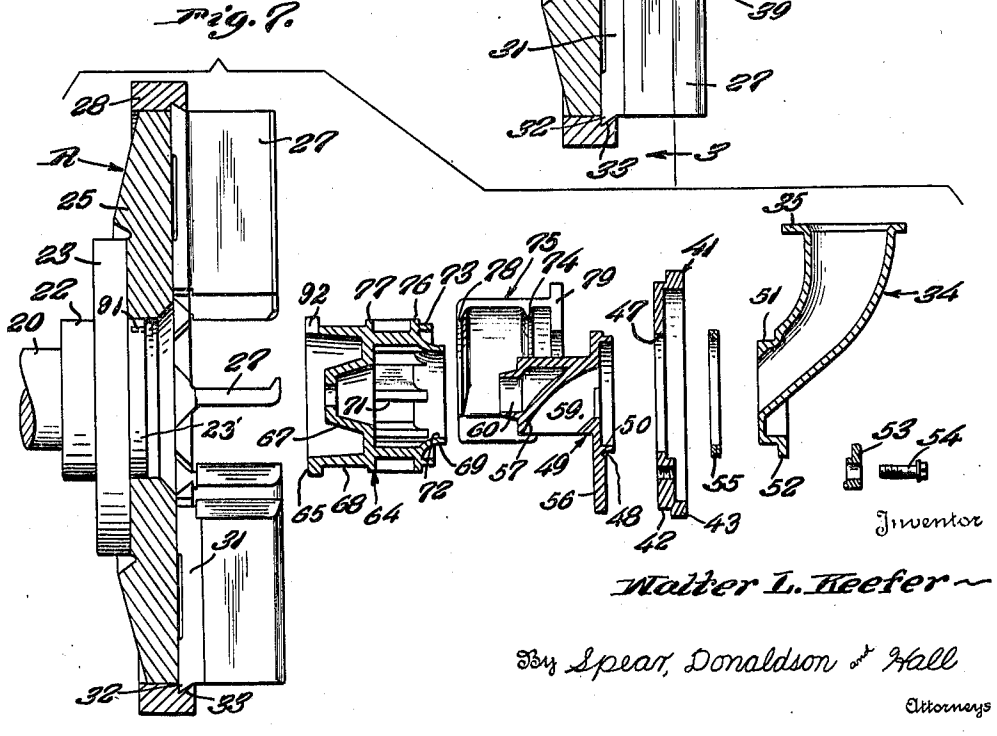


Fig. 7.



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Fig. 3.

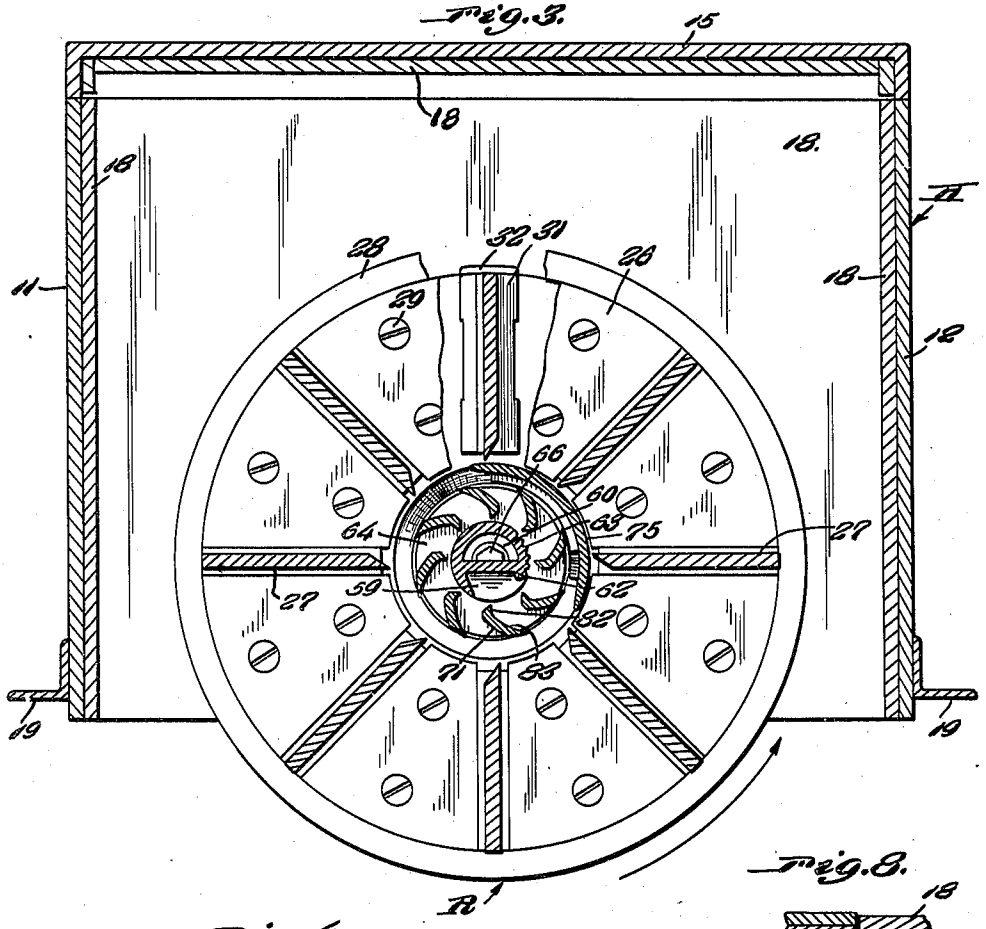


Fig. 8.

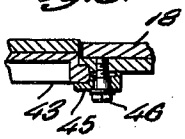


Fig. 4.

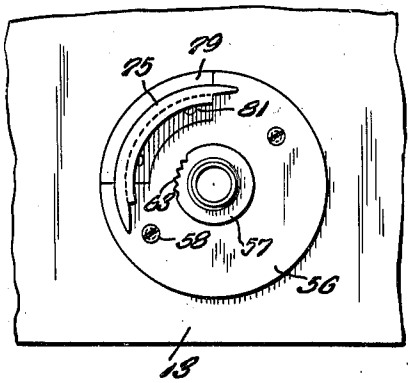
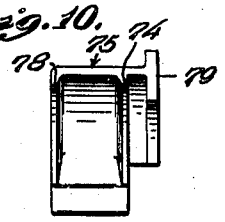


Fig. 10.



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ABRADING APPARATUS

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Application September 5, 1941, Serial No. 409,719

5 Claims. (Cl. 51—9)

This invention relates to abrading apparatus, and more particularly pertains to a centrifugal wheel for projecting abrasive such as steel grit and shot at an abrading velocity upon workpieces to be cleaned.

Machines of the type herein described may be said to consist of three main parts, namely, a rotor including one or more abrasive propelling blades, an abrasive supply means, and a transfer mechanism which functions to transfer the abrasive from the supply means to the blade, or blades, on the rotor in such manner that the abrasive is discharged onto the inner ends of the blades at a predetermined point or zone, the abrasive subsequently being discharged from the ends of the blades in a predetermined zone.

In providing an improved centrifugal wheel for throwing abrasive, it is a major object of this invention to provide a novel transfer mechanism which is inherently capable of being designed to discharge abrasive onto the inner ends of the rotor throwing blades at a predetermined point or zone without the use of a circumferentially extending slotted cage.

A further object of this invention is the provision of a novel transfer mechanism having abrasive distributing vanes adapted to collect the abrasive delivered thereto in a series of individual charges and deliver said charges of abrasive at a predetermined point or zone, the latter being predetermined by a selective shaping of the abrasive contacting surfaces of the vanes.

Still a further object of this invention is the provision of a novel transfer mechanism and feed means therefor, the two combining to deliver abrasive onto the inner ends of the main throwing blades of the rotor of a centrifugal wheel at a predetermined point or zone without the necessity for any circumferentially extending control means.

A further object of this invention is to provide a novel transfer mechanism having abrasive distributing vanes, the shapes of which may be designed to deliver abrasive onto the inner ends of the main throwing blades of a rotor at any predetermined point or zone relative to the point of feed to the transfer means.

Still a further object of this invention is the provision of a novel transfer mechanism wherein the abrasive is retained therein for a minimum of time, thus saving the mechanism from undue wear and reducing the power required to operate the mechanism.

A further object of this invention is the provision of a novel centrifugal wheel wherein the parts are of relatively simple construction, of long life, and easily accessible for replacement and repair.

Further objects and advantages of the invention will appear from the following description and claims taken in connection with the appended drawings, wherein:

Figure 1 is a front elevation of a preferred embodiment of the present invention illustrating the method of installation thereof in a housing.

Fig. 2 is a section taken on the line 2—2 of Fig. 1.

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

Fig. 4 is a front elevation of the spout extension and guard as normally assembled on the housing wall.

Fig. 5 is a view similar to Fig. 4 with the guard and spout extension disassembled.

Fig. 6 is an elevation of a portion of the front of the housing with the feed spout omitted.

Fig. 7 is an exploded view of the several parts of the wheel of Fig. 2 illustrating their method of assembly.

Fig. 8 is a section taken on the line 8—8 of Fig. 1.

Fig. 9 is a section taken on the line 9—9 of Fig. 1.

Fig. 10 is a side elevation of the guard.

Fig. 11 is a diagrammatic illustration of a modification of the transfer mechanism of Fig. 3.

Referring to Figures 1, 2, and 3, the present invention is illustrated therein as embodied in a centrifugal wheel of the downblast type. The wheel is preferably mounted in a housing H having side walls 11 and 12, front and rear walls 13 and 14, and a top 15 which is hinged at 16 and provided with fastening means at 17 to permit of access to the wheel. Suitable wear plates 18 are provided inside the housing to protect the interior surfaces of the side walls from the flying abrasive. The housing H may be supported on a suitable base by angle irons 19, the bottom of the housing being open to permit a portion of the wheel to project therethrough and discharge abrasive downwardly onto the workpiece.

While the illustrated embodiment is of the downblast type, it is to be understood that the invention herein described is universal in application in that it can be embodied in wheels arranged to discharge upwardly or to either side.

The wheel proper is mounted on a shaft 20, extending through an opening 21 in the housing H, and suitably supported for rotation in well known manner on suitable bearings and rotated

by suitable driving means, such as an electric motor (not shown). A flange 22 is secured to the end of the shaft 20, a second flange 23 of larger diameter being secured to the flange 22 to support a rotor assembly R. The rotor assembly R includes a disc 25, a series of sector plates 26 secured to the face of the disc, one or more abrasive propelling blades 27, and a circumferential ring 28 for securing the outer ends of the blades. To facilitate assembly, a third centering flange 23' is provided on the face of the flange 23.

The sector plates 26 (Fig. 3) are secured to the disc 25 by screws 29, the adjacent edges of the plates being spaced apart and beveled to form grooves to receive beveled flanges 31 on the abrasive propelling blades 27, as shown in Fig. 9. In securing the blades in the grooves, the ring 28 is slid toward the shaft side of the wheel to open the outer ends of the grooves between the sector plates 26. The blades 27 are inserted in the grooves, the ring 28 is then returned to its original position, and the blades moved radially outwardly until a projecting portion 32 on each blade locks in a groove 33 formed on the inside of the ring 28.

The abrasive feed means includes a feed spout 34, the upper end of which is formed with a flange 35 having holes therein to receive bolts 36, which engage corresponding holes in an angle bracket 37, secured as by bolts 38 to the wall 13 of the housing.

As shown in Figs. 2 and 7, the feed spout 34 is of a shape to permit a free, unobstructed flow of abrasive, the latter being fed into the open top of the spout by gravity from a suitable elevated hopper (not shown). The wall 13 of the housing H and the wear plate 18 secured thereto are formed with an opening 39 substantially coaxial with the opening 21 to receive a holder 41 having a cylindrical section 42 fitting within the opening 39 and a flange 43 positioned to engage a recess 44 in the wall 13 adjacent the opening 39. The holder 41 is preferably secured in position by clamps 45 (Figs. 1, 6, and 8) engaging the flange 43 and secured to the wall 13 of the housing by bolts 46.

The holder 41 is formed with an opening 47 to receive a flange 48 on the end of a feed spout extension 49, the latter having an opening 50 therein to receive a shoulder 51 on the lower end of the feed spout 34. A flange 52 is provided on the lower end of the feed spout 34 to be engaged by a clamp 53 (Fig. 1) secured to the holder 41 by a bolt 54. To prevent leakage around the connection between the lower end of the feed spout 34 and the end of the spout extension 49, a gasket 55 is preferably provided in the position shown in Fig. 2.

The spout extension 49 is provided with a flange 56 extending from a central boss 57 for about 270° as shown in Figs. 4 and 5, the flange being secured to the holder 41 as by bolts 58. The boss 57 is formed with a passage 59 therein arranged to substantially match with the discharge end of the feed spout 34 and direct the abrasive therefrom into the interior of the transfer means. It will be noted that the passage 59 is substantially straight and unobstructed, thus providing a relatively smooth and unobstructed path for the flow of abrasive into the transfer mechanism.

The boss 57 is preferably formed with a hollow section 60 immediately above the passage 59 to reduce weight and economize on material. It will also be noted that the exterior of the boss 57 immediately counterclockwise of passage 59 (Fig. 3) is formed with a series of serrations 63 for a purpose to be later described.

The shapes of the discharge opening at the lower end of the feed spout 34 and the entering end of the passage 59 is preferably of a shape resembling the cross-section of a flattened pear as shown in Fig. 6 at 61. This shape has been found to be productive of the highest rate of flow of abrasive and consequently greater efficiency of the wheel.

It has also been found desirable to remove a portion of the right wall of the discharge end of the passage 59, as viewed in Fig. 3 at 62, this construction permitting a greater unobstructed flow of abrasive in a path slightly inclined in the direction of rotation of the wheel.

The transfer mechanism proper includes a vaned member or impeller 64, having a face 65 arranged to abut against the outer end of the flange 23' of the rotor, and held in engagement therewith to rotate with the rotor by a bolt 66 (Fig. 2) or similar fastening means passing through a hole in an interior boss 67. The impeller or vaned member 64 is formed with a cylindrical portion 68 terminating adjacent the inner edges of the blades 27, and a second spaced hollow and generally frustum-shaped section 69 spaced therefrom and connected thereto by a series of impeller vanes 71. The inner surface of the section 69 is preferably curved at 72 to aid in the guiding of the abrasive onto the inner ends of the vanes 71. A projecting flange 73 is provided about the section 69 to cooperate with a rib 74 formed on the interior of a guard 75 of arcuate shape (Figs. 2 and 7). The section 69 is also provided with a radial flange 76 arranged to likewise cooperate with the rib 74 of the guard 75 and form a semi-closure obstructing the escape of abrasive. A radial flange 77 is also provided on the impeller or vaned member 64 to likewise cooperate with an arcuate rib or flange 78 on the guard 75.

The guard 75 is formed as an arcuate shield (Fig. 3) about a portion of the periphery of the impeller 64, and is provided with an arcuate flange 79 (Figs. 4 and 5), which is shaped to fit within the open section of the flange 56 of the spout extension 49, as shown in Fig. 4, the two elements is unassembled relation being shown in Fig. 5. The guard 75 is secured to the holder 41 by any suitable fastening means, such as screws 81.

The impeller vanes 71 are circumferentially spaced from one another as shown in Fig. 3, their forward surfaces comprising a substantially radial face 82 and a forwardly inclined surface 83. In the embodiment illustrated wherein the abrasive is fed downwardly from the passage 59 onto the inner ends of the vanes, the abrasive is collected in individual charges by faces 82 of the vanes, and subsequently discharged along surfaces 83 by centrifugal force. It has been found that by varying the inclination and curvature of the surfaces 83 which contact the abrasive, that the rate of flow of the abrasive thereover can be accelerated or retarded as desired. In the instant case, the inclination and curvature is such as to retard the discharge of the abrasive until the vanes 71 reach approximately the 12 o'clock position at the left end of guard 75, as viewed in Fig. 3. At this selected point, the abrasive is discharged onto the inner ends of the blades 27, the discharge therefrom beginning at approximately 90° further around the periphery of the wheel, and being in a downward direction.

The guard 75 functions to collect the stray par-

ticles of abrasive which are discharged from the vanes 71 at other than the desired point of discharge and return them to the main stream of abrasive.

The serrations 63 function as deflectors for the abrasive particles contacting the outside of the spout extension 49 immediately counterclockwise of the point of feed and return the particles back into the path of the vanes 71.

In operation, abrasive is fed through the feed spout 34 and the passage 59 of the spout extension 49 in a substantially continuous stream onto the inner ends of the vanes 71 of the impeller 64. By reason of its connection to the rotor R, the impeller 64 and the vanes 71 rotate at the same speed as the rotor, which is usually about 2200 R. P. M. By reason of their movement, the faces 82 of the vanes 71 divide and collect the abrasive stream into a series of individual charges which move outwardly on the forwardly curved surfaces 83 until discharged from the ends of the vanes at approximately the 12 o'clock position (Fig. 3). Any stray particles that are discharged prematurely are collected by guard 75 and returned to the path of the main flow of abrasive.

As the number of vanes 71 preferably corresponds to the number of blades 27 and the former are preferably positioned with their discharge ends immediately forward of the inner ends of the blades 27, the individual charges of abrasive from the several vanes 71 are discharged at the proper time and in a direction corresponding to the direction of movement of the blades 27, so that the abrasive encounters the inner ends of the blades with a minimum impact. This positioning of the impeller vanes 71 with reference to the blades 27 is insured by any suitable key and slot arrangement, as by the provision of a screw 91 in the flange 23' which engages a slot 92 in the face 65 of the impeller 64.

In addition, the abrasive charges have a considerable speed by reason of their being thrown from the vanes 71 by centrifugal force which speed increases the efficiency of the wheel both as to abrading characteristics and directional control.

If it is desired to change the direction of discharge of the wheel, either the curvature of the vanes 71 can be altered to discharge the abrasive charges at different points, or within a limited range, the position of the guard 75 can be changed. For instance, referring to Fig. 3, if it is desired to feed the abrasive onto the rotor blades at about the 10 o'clock position, vanes 71 of the type shown can be used, and the guard 75 rotated counterclockwise so that its left end terminates adjacent the desired point of discharge. Under these conditions, the abrasive charges will still be discharged from the vanes 71 at about the 12 o'clock position. However, the abrasive will be thrown against the inner surface of the guard in a direction nearly tangential to that surface, and will continue along the inner surface of the guard until discharged from the end thereof.

To discharge in a sidewise direction, as to the right, as viewed in Fig. 3, the guard 75 may be positioned as shown in Fig. 11, the passage 59 being adjusted clockwise a short distance to discharge abrasive at a point slightly forward of the position shown in Fig. 3. The impeller is provided with vanes 71' which are formed with rearwardly curved surfaces 82' terminating in substantially radial faces 83'. With this arrangement, the individual charges of abrasive pass rapidly along surfaces 82' to the surfaces 83' from which they are discharged onto the inner ends of the blades 27 in the direction indicated by the arrows. In this modification, the guard 75 functions to return stray particles of abrasive to the main stream.

It will be noted that the vaned impeller 64 of the present invention functions not only as an impeller, in imparting speed to the abrasive, but also to insure its discharge at a predetermined point or zone onto the inner ends of the rotor blades. Thus it performs a dual function. Moreover, by reason of the ability to change the curvature and shape of the impeller vanes, the direction of discharge onto the inner ends of the rotor blades can be varied so as to adjust the point or zone of discharge from the periphery of the wheel.

By reason of the fact that no circumferentially extending cage or the like is required in which the abrasive particles may be swirled around a number of times before being discharged, there is considerably less wear on the parts of the transfer mechanism contacting the abrasive, and less power is required for its operation.

It is to be understood that the invention may be embodied in specific forms other than that illustrated without departing from the principal or essential characteristics thereof. The embodiments shown are therefore to be considered as illustrative and not restrictive, the scope of the invention being defined by the appended claims rather than the foregoing description and drawings. All modifications and changes which come within the meaning and range of equivalency of the claims are therefore intended to be included therein.

I claim:

1. Apparatus for centrifugally propelling abrasive in a down blast direction without the use of a control cage comprising, a rotor, a plurality of radially arranged propeller blades carried by the rotor extending inwardly short of the axis of said rotor to define a central space, a feed spout for guiding abrasive into said central space, a feed spout extension mounted in said central space including a cylindrical boss having a passage therein in opening communication with said feed spout discharging the abrasive at the periphery of the boss in a downward direction radially towards the path described by the inner ends of said propeller blades, an impeller mounted in said central space rotating with the rotor, a plurality of circumferentially spaced radially inclined vanes carried by the impeller arranged around said boss, said vanes equalling the number of propeller blades and extending from points adjacent the periphery of said boss to points adjacent the inner ends of said propeller blades, an arcuate abrasive contacting surface on each vane curved forwardly with respect to the direction of rotation and with all axial dimensions thereon parallel with the axis of the impeller whereby the abrasive is picked up by said vanes and retarded by the arcuate surfaces thereon and thrown therefrom into the path of movement of the inner ends of the propeller blades at an uppermost point in the rotation thereof, and an arcuate shaped guard member extending over a fraction of the periphery of the impeller terminating adjacent said uppermost point.

2. In abrading apparatus, a rotor, a plurality of circumferentially spaced abrasive propelling blades carried by said rotor terminating to define a central opening between the inner ends thereof, a feed spout, a feed spout extension including a cylindrical boss arranged in said central opening and having a passage therein communicating with

said feed spout and discharging abrasive at the periphery of said boss, an impeller within said central opening and secured to said rotor, circumferentially spaced vanes carried by said impeller and arranged around said boss to pick up the abrasive issuing from said passage, an annular radial flange carried by the impeller at each end of said vanes, another annular flange projecting axially from one of said radial flanges, an arcuate shaped stationary guard member embracing a portion of the impeller, and inwardly projecting arcuate ribs carried by the guard member cooperating with said annular flanges to prevent the escape of abrasive axially of the impeller.

3. A mechanism for transferring abrasive particles from a feed spout to the blades of centrifugal abrading apparatus comprising, a feed spout extension including a cylindrical boss having a passage therein communicating with the feed spout and discharging abrasive at the periphery of said boss, a rotatable impeller including circumferentially spaced vanes inclined forwardly of radial positions arranged around said boss to pick up the abrasive issuing from said passage, an arcuate shaped surface on each of said vanes with all axial dimensions thereon parallel with the axis of the impeller adapted to engage the abrasive and control the movement of the abrasive thereon at speeds below abrading velocities and to transfer the abrasive to the inner ends of said blades at a predetermined point in the rotation thereof, and a stationary guard member embracing a portion only of the impeller.

4. In abrading apparatus, a rotor, a plurality of circumferentially spaced abrasive propelling blades carried by said rotor terminating to define a central opening between the inner ends thereof, a feed spout, a feed spout extension including a cylindrical boss arranged in said central opening and having a passage therein communicating with said feed spout and discharging abrasive at the periphery of said boss, an impeller within said central opening and secured to said rotor, circumferentially spaced vanes carried by said impeller and arranged around said boss to pick up the abrasive issuing from said passage, a flange carried by said boss having a peripheral opening therein, an arcuate shaped guard member extending around a portion of said impeller, and an arcuate flange carried by said guard member fitting within the opening in said flange.

5. In abrading apparatus, a feed spout, a feed spout extension including a cylindrical boss having a passage therein communicating with said feed spout for discharging abrasive at the periphery of said boss, a rotatable impeller including a plurality of vanes arranged to revolve around said boss and pick up the abrasive issuing from said passage, a radial flange carried by said boss adjacent one end of the impeller vanes, said flange having a sector-shaped opening therein, an arcuate shaped guard member extending circumferentially around a portion of the impeller, and a sector-shaped flange on the guard member fitting the sector-shaped opening in said radial flange.

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