Oct. 20, 1942. N. J. QUINN 2,299,491

MECHANICAL PROJECTING APPARATUS

Original Filed Nov. 2, 1936 2 Sheets-Sheet 1

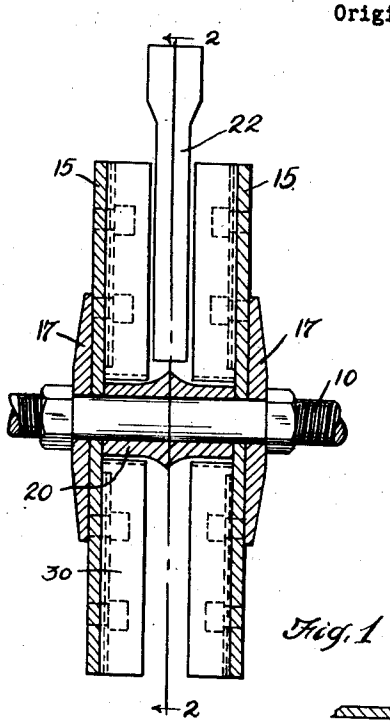


Fig. 1

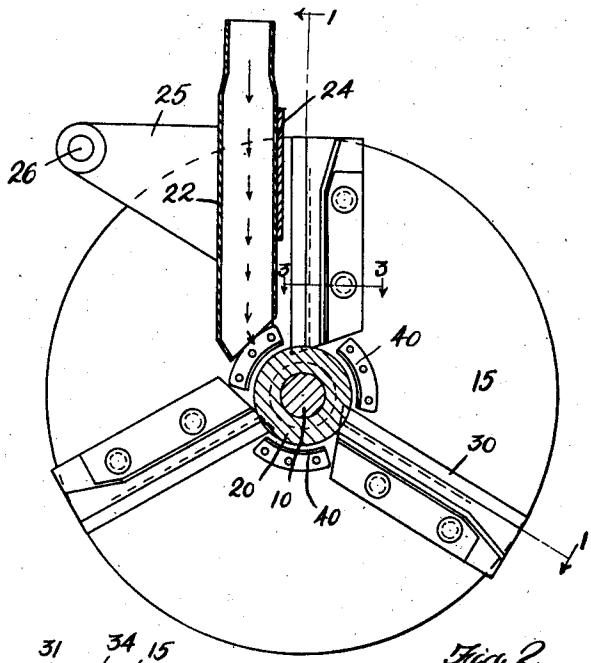


Fig. 2

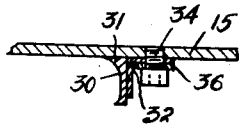


Fig. 3

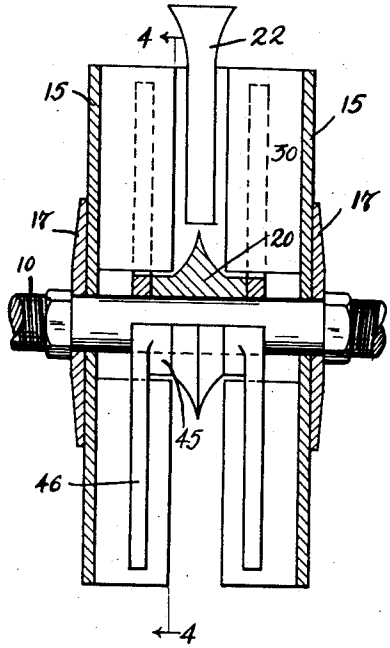


Fig. 5

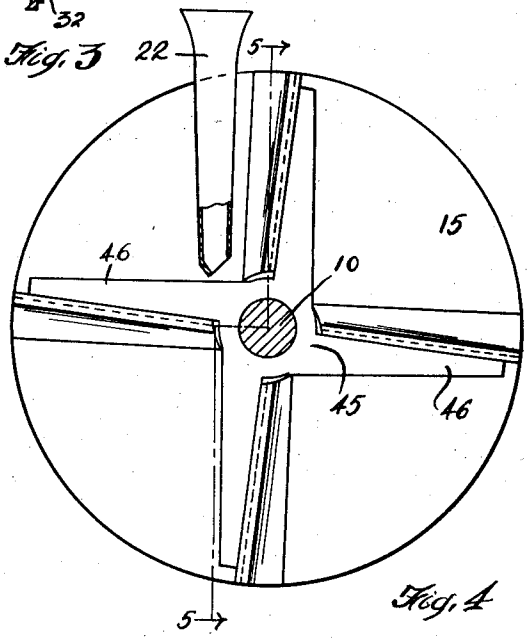


Fig. 4

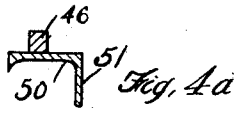


Fig. 4a

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MECHANICAL PROJECTING APPARATUS

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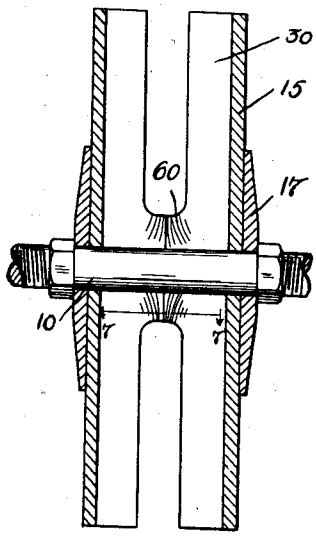


Fig. 6

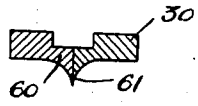


Fig. 7

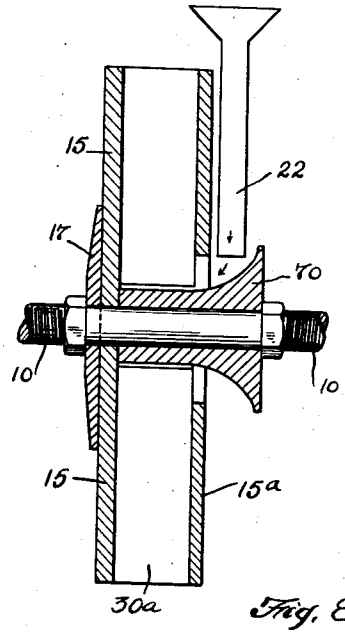


Fig. 8

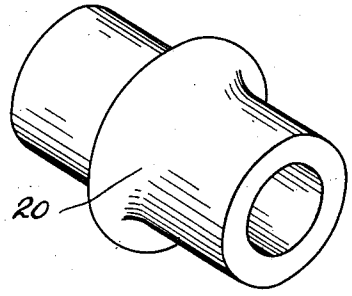


Fig. 9

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Patented Oct. 20, 1942 2,299,491

UNITED STATES PATENT OFFICE

2,299,491

MECHANICAL PROJECTING APPARATUS

Nelson J. Quinn, Toledo, Ohio, assignor, by mesne assignments, to Quinnex Corporation, Toledo, Ohio, a corporation of Delaware

Application November 2, 1936, Serial No. 108,802
Renewed August 5, 1938

20 Claims. (Cl. 51—9)

This invention relates to apparatus for projecting finely divided abrasive material as used in the removal of coatings from surfaces of various kinds, although the apparatus in question may be used for the projection of any sort of finely divided material.

The invention is partly a continuation of my copending application Serial No. 23,474, filed May 25, 1935, in so far as it relates to a pair of opposed disks with a feed pipe for admitting material therebetween, together with means for rotating the disks at a sufficient speed to project the abrasive material by reason of centrifugal force.

Before I invented my improved device, machines for mechanically throwing abrasive had been of one of two types. In one type of machine the abrasive was fed through the blade shaft to the heels of the projecting blades. Because of the construction necessary for delivering the abrasive from the shaft to the blades it was very difficult to control the effective area of the abrasive stream which resulted in a large loss due to inefficiently directing the abrasive against the surface to be cleaned. In order to produce a mechanically satisfactory machine, it is essential that the abrasive stream be controlled to throw a stream of uniform pattern and in a particular direction to gain the most efficiency from a given amount of grit. A second reason for controlling the stream is that otherwise an artificial shield must be placed beyond the blades to cut off portions of the stream and wear on this shield by the abrasive is so rapid that the replacement cost becomes prohibitive.

A second form of throwing machine heretofore used employed a plurality of revolving blades and means beyond the center and outside of the path of the blades to feed material thereto. By positioning the feeding device it was possible to control the point at which the abrasive stream left the blades. However, such a construction was not able to employ means at the sides of the blades to prevent the abrasive from merely pouring out over the paddle as it was fed thereto. The abrasive lost constituted such a high percentage of the whole that, for this reason, operation of the machine was not only inefficient but extremely expensive.

My invention is directed to a machine of the type employing a plurality of radial paddles with radially extending side walls at the side edges of the paddles to prevent emission of the abrasive at any point other than the outer periphery of the wheel. In this manner I have been able to eliminate the very high loss at the sides of the paddles in the machines of one type heretofore used. By employing two sets of paddles spaced slightly apart I have been able to position a feed pipe between such sets of paddles for delivering abrasive to the machine. With this construction I have eliminated the inefficient peripheral stream thrown by the type of machine fed by means adjacent the supporting shaft.

My machine therefore combines two very important advantages by reason of its two sets of spaced blades, each bounded on the outside by a solid disk. In a machine of my construction there is absolutely no loss of abrasive at the sides of the blades, but substantially all of the abrasive fed to the machine is ejected peripherally as an abrading stream. Furthermore, my machine combines with this advantage the features of a feed pipe which may be so positioned that a stream of the desired cross-section may be emitted from the wheel at any desired point about its circumference, thus eliminating a further very large abrasive loss and resulting in greatly increased efficiency.

The two sets of opposed blades coact with each other to pick up the material deflected from the one and emit it from the machine by a paddle of the other set. This is very important because as the inner sides of the blades are open, much material naturally falls off and would be lost unless it were picked up by the other blade and ejected.

It has been found in the construction of machines of this type that considerable difficulty is encountered in effecting a uniform division of the abrasive as it leaves the feed pipe and comes in contact with the heel of the projecting blades or recesses carried by the disks. In eliminating this unequal division of abrasive a further difficulty is developed, because the abrasive tends to leave the feed pipe alternately in a fine stream or in quantities so large that they are improperly handled by the projecting disks. The result of this action is that instead of a uniform stream of projected abrasive, there is an intermittent stream which considerably impairs the efficiency of the stream and results in a waste of the abrasive.

It has therefore been an object of this invention to devise a feeding means for directing the abrasive from the feed pipe into the blade pockets in a substantially continuous stream which is equally divided between the two opposed disks.

This is done by providing an open-ended feed pipe which drops the abrasive directly between the two disks. Between these disks an outwardly flared annular ring formed by two conical por-

tions in abutment at their base, is provided. A result of this construction is that the abrasive is continuously and evenly dispensed from the bottom of the feed pipe and is equally divided by the conical ring just described, whereby half of the abrasive is fed to each disk.

A more complete description of the apparatus involved will be found in the specification following and in the drawings hereto annexed. It will be apparent that other means of achieving the desired results hereinafter set out may be employed without departing from the spirit of this invention.

Referring now to the drawings:

Fig. 1 is a sectional view showing a portion of one machine embodying my device and illustrating the disks, the feed pipe and the outwardly flared shell member;

Fig. 2 is a vertical section of the machine as shown by the line 2—2 on Fig. 1;

Fig. 3 is a fragmentary section as indicated by the lines 3—3 on Fig. 2, showing in detail the manner in which a blade is secured to the disk;

Figs. 4 and 5 are an end elevation and transverse section respectively of a modified form of construction eliminating stress in the side plates; and Fig. 4a is a cross-section of the blade employed;

Fig. 6 is a transverse section through a pair of disks showing a modified form of construction for the V-shaped dividing ring;

Fig. 7 is a section, as indicated by the line 7—7 in Fig. 6, showing a blade construction employing a V-shaped heel as used in this modification;

Fig. 8 is a further modification shown in vertical section employing a single blade; and

Fig 9 is a perspective of the double conical diverting shell by which abrasive is fed to the heel of each of the projecting blades.

The projecting apparatus about to be described is supported in the usual form of stationary base, not shown, which carries a horizontal shaft 10 which may be rotated in any desired manner. A pair of disks 15, carried by the shaft, are fixed thereto by end plates 17, each of which is rigidly fastened to the shaft and to its respective disk 15. These disks act as an outside retaining wall to prevent an overflow of abrasive at the sides of the projection device and greatly increase the throwing efficiency by causing all ejection to take place at the blade periphery.

A cardinal feature of this invention is a double conical shell used to effect equal division of the abrasive. This comprises a member 20 surrounding the shaft 10 and serving to space the disks 15, as shown in Fig. 1.

A feed pipe 22 is provided, located as shown in Fig. 1 between the disks 15, and terminate above and to one side of the apex of the shell 20, as shown in Figs. 1 and 2.

A wear plate 24 is secured to the outside of the pipe 22, as shown in Fig. 2, to eliminate undue wear as any excess of abrasive is thrown thereagainst by the revolving disks. The feed pipe itself is suitably supported by a bracket 25, which in turn is secured, as at 26, to the frame of the machine, the bracket and feed pipe preferably being welded together.

Blades or paddles are provided to project abrasive after the same has been fed to the shell 20. As best shown in Fig. 3, these blades 30 comprise a hard metal trough-like portion with an upstanding wall portion 31 against the face of the supporting disk. The blade 30 is brazed to an angle bracket 32, which in turn lies against the disk 15 and is secured thereto by a suitable cap screw 34, which bears against a reenforcement 36 lying against the face of bracket 32, as shown. It will be noted in Fig. 2 that the outer portion of the blade 30 carries substantially no trough portion, and at the outer edge it is flat except for the upstanding edge 31. Also, at the outer edge portion the bottom of the blade flares outwardly and the flange 32 is shaped to conform therewith. It has been found that in practice the peculiar shape of this outer blade portion increases to a very considerable extent the blade life.

Any given number of blades may be employed, although three or four have been found to give satisfactory results, and any less than this number results in an intermittent projection of the abrasive, while a greater number increases the cost. As shown in Fig. 1, the blades carried by one disk are spaced opposite to the blades carried by the other disk and coact therewith to project a stream of abrasive from the machine. An important element of construction is presented by these opposed blades. Abrasive spilled off the inner edge of one blade spills onto a following blade of the coacting set and thus is efficiently thrown from the machine by that second blade.

It has been found that in the use of certain kinds of material there is a tendency for the same to be improperly guided to the heel of the blade. This may be eliminated by the provision of retaining flanges 40, as shown in Figs. 1 and 2; secured to the rotating disks and functioning to retain the abrasive adjacent the shell 20 until guided on to the heel of the blade 30.

A modification of my invention may be employed which provides spiders to carry the blades and thus lightens the load on the disks 15. This spider 45 has outwardly extending arms 46 spaced apart. Between the two sets of arms there is carried the usual conical shell member 20 which acts to divide the abrasive stream. L-shaped blades 50 are provided substantially similar to blades 30 with a vertical wall portion 51 at the outer edges to eliminate wear on the adjacent disk 15.

A further modification of my device is shown in Figs. 6 and 7. Here the usual disks 15 are employed, together with blades 30 mounted as heretofore described. In place of a shell 20, however, the lower portions of coacting blades project laterally, as shown at 60, and flare forwardly, as shown at 61, to provide a guide for the abrasive stream, which functions as heretofore stated in place of the shell 20. If desired, the opposing blades may be separate, or may be made as a single unit.

I have found in practice that for certain types of abrasive my machine may advantageously employ blades 30a retained between a pair of disks and fed by a pipe disposed outside of the disks. In this form of construction only half of the shell 20 is necessary, as shown in Fig. 8, to effect a uniform and proper distribution of the abrasive to the blades. This modification shown in Fig. 8 comprises a conical portion 70 carried by the shaft 10. The disk 15 is secured to the shaft 10 as heretofore described by a plate 17. Blades 30a, similar to those heretofore described, are provided and are secured to the disk 15. An auxiliary disk 15a is provided with a central aperture of enlarged diameter and is suitably carried by the disk 15. A feed pipe 22 extends below the conical flange portion of the shell 70 and slightly forward thereof, as shown in Fig. 2,

to feed abrasive to the blades **30***a*, by which said abrasive is ejected from the machine.

The retaining flanges **40** shown in the preferred form of construction may be employed in all the modifications.

From the foregoing description it will be apparent that I have provided a projecting machine which, by reason of the conical shell construction, accurately divides the abrasive stream fed to the device and, further, permits the projection from the blades of a uniform stream of material.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In apparatus for the projection of abrasive, a rotatable shaft, a shell portion carried by said shaft flaring outwardly and terminating in an annular ring, a normally stationary feed pipe having a dispensing opening adjacent said annular ring, a blade support carried by said shaft and rotatable with said shell, and blades of trough-shaped cross-section carried by said support and extending from a region adjacent said annular ring a substantial distance outwardly.

2. In projecting apparatus for abrasive material, the combination of two spaced coaxially mounted blade supports, projector blades carried by said supports, a feed pipe for feeding abrasive to said blades, a conical shell rotatable with said blades for guiding the fed abrasive from said feed pipe to said blades, and a disk adjacent the outer side edges of said blades to prevent sidewise projection of the abrasive.

3. In apparatus for the projection of abrasive, the combination of a shaft, a pair of outer retaining disks coaxially carried by said shaft and spaced apart, a feed pipe centrally located between said disks, a set of throwing blades carried by each of said disks, and means carried by the shaft to divert the abrasive leaving the feed pipe to the heels of respective throwing blades.

4. In projecting apparatus for abrasive material, the combination of two spaced coaxially mounted blade supports, abrasive throwing blades carried by said supports, a feed pipe for feeding abrasive to said blades, and a conical shell rotatable with said blades for guiding the abrasive from said feed pipe to said blades.

5. In apparatus for the projection of abrasive, the combination of a rotatable shaft, a double conical shell portion carried by said shaft, a feed pipe terminating above said shell portion adjacent its greatest diameter, a support for blades on each side of said shell portion, and blades carried by said supports.

6. In apparatus for the projection of abrasive, the combination of a rotatable shaft, a double conical shell portion carried by said shaft, a feed pipe terminating above said shell portion adjacent its greatest diameter, a support for blades on each side of said shell portion, blades carried by said supports, and means to prevent the projection of abrasive sidewardly from said blades.

7. In apparatus for the projection of abrasive, the combination of a double conical shell portion, supporting spiders on each side of said shell portion, trough-shaped blades carried by said spiders, and a feed pipe for delivering abrasive between said blades to said conical member.

8. In apparatus for the projection of abrasive, the combination of a rotatable shaft, a conical portion terminating in an annular rim carried by said shaft, a disk carried at the other end of said conical portion, blades carried by said disk and abutting said conical portion, a second disk carried by said first disk and having a central portion of enlarged diameter outstanding from said conical portion, a normally stationary feed pipe disposed at the outer side of said second disk and within the confines of the annular rim of said shell portion whereby abrasive fed from said pipe passes through the aperture of said second disk and is delivered to the heels of said projecting blades.

9. In apparatus for the projection of abrasive, a horizontal shaft, a throwing blade carried by said shaft, a feed pipe for feeding abrasive adjacent the heel of said blade, and an element rotatably carried by said shaft having a curved surface projecting laterally from the side edge of said blade and in the direction of rotation thereof, said element underlying the discharge end of the feed pipe and terminating adjacent the heel of said blade, said element being adapted to intercept the abrasive as it leaves the feed pipe and guide the same onto the heel of the blade.

10. In an abrading machine, a rotor having a plurality of blades terminating short of the axis of rotation of said rotor, a deflector device associated with each of said blades and rotatable therewith for guiding abrasive into the path of rotation of its associated blade, said deflector devices having a portion projecting laterally beyond the adjacent side edge of its associated blade, and an abrasive supply conduit having a discharge opening operative to discharge abrasive into the path of rotation of the projecting portion of said devices throughout a limited arc in the rotation thereof, said devices being operative to intercept the abrasive as it leaves the abrasive supply conduit and guide the abrasive axially inwardly onto the inner ends of said blades throughout a limited arc in the rotation thereof whereby to concentrate the abrasive thrown by said blades in a predetermined direction.

11. In an abrading machine, a disk-like member mounted for rotation at high speed, a plurality of abrasive propelling blades mounted on said member terminating short of the axis of rotation of said member, an abrasive deflecting element for each of said blades fixed to rotate with said member and positioned adjacent the inner end of its associated blade, each of said deflecting elements having a portion extending beyond the adjacent side edge of its associated blades, and an abrasive feed conduit having a discharge end arranged to deposit abrasive into the path of rotation of those portions of the abrasive deflecting elements which extend beyond the side edge of the said blades throughout a limited arc in the rotation thereof, said deflecting elements being operative to intercept the abrasive as it leaves the feed conduit and guide the abrasive onto the inner end of said blades throughout a limited arc in the rotation thereof whereby to concentrate the abrasive thrown by said blades in a predetermined direction.

12. In an abrading machine, a disk-like member mounted for rotation at high speed in a substantially vertical plane, a plurality of abrasive propelling blades mounted on said member terminating short of the axis of rotation of said member, an abrasive guiding device fixed to rotate with said member and positioned in close proximity to the inner ends of said blades with-

out intervening obstruction, said guiding device having a portion extending beyond the adjacent side edge of said blades, and a downwardly extending abrasive feed conduit having a discharge end arranged to deposit abrasive upon the upper arc of rotation of that portion of the abrasive guiding device which extends beyond the adjacent side edge of said blades, said guiding device being operative to intercept the abrasive as it leaves the feed conduit and guide the abrasive onto the inner ends of said blades during the upper arc of rotation thereof whereby to concentrate the abrasive thrown by said blades in a generally downward direction.

13. In an abrading machine, a disk-like member mounted for rotation at high speed in a substantially vertical plane, a device having an exterior abrasive guiding surface fixed to said member at the axis of rotation thereof, a plurality of abrasive propelling blades extending from said device without intervening obstruction radially outwardly in spaced relationship, said blades being fixed to rotate with said member, said device having a diameter less than the radius of said disk member, said device having an abrasive receiving portion extending beyond the adjacent side edges of said blades, and an abrasive feed conduit having the discharge end thereof positioned adjacent the upper arc of rotation of that portion of said abrasive guiding device which extends beyond the adjacent side edges of said blades, the abrasive guiding surface of said device being operative to intercept the abrasive as it leaves the feed conduit and guide the abrasive onto the inner ends of said blades during the upper arc of rotation thereof whereby to concentrate the abrasive thrown by said blades in a generally downward direction.

14. In an abrading machine, a disk-like member mounted for rotation at high speed, a plurality of abrasive propelling blades fixed to rotate with said member and terminating short of the axis of rotation of said member, an abrasive guiding device removably fixed to rotate with said member and positioned adjacent the inner ends of said blades, said guiding device having a portion extending beyond the adjacent side edges of the blades and another portion extending in close proximity to the inner end of each of said blades without intervening obstruction, and an abrasive feed conduit having a discharge end arranged to deposit abrasive onto the outer surface of that portion of the abrasive guiding device which extends beyond the adjacent side edges of said blades throughout a limited arc in the rotation thereof, said guiding device being operative to intercept the abrasive as it leaves the feed conduit and guide the abrasive onto the inner ends of said blades throughout a limited arc in the rotation thereof whereby to concentrate the abrasive thrown by said blades in a predetermined direction.

15. In an abrading machine, ,a substantially horizontally extending drive shaft, a disk-like member fixed to rotate with said drive shaft, a plurality of abrasive propelling elements generally radially arranged and fixed to rotate with said member, an abrasive deflecting portion associated with each of said abrasive propelling elements, each deflecting portion extending beyond the adjacent side edge of its associated elements and rotatable therewith, and a downwardly extending abrasive feed conduit having a discharge end arranged to deposit abrasive upon the upper arc of rotation of said abrasive deflecting portions throughout a limited arc to one side of the adjacent side edges of said propelling elements, each of said deflecting portions being operative to intercept the abrasive as it leaves the feed conduit and to guide the abrasive onto the inner end of its associated abrasive propelling element throughout a limited arc in the rotation thereof whereby to concentrate the abrasive thrown by said propelling elements in a generally downward direction.

16. In an apparatus for the projection of abrasive, the combination of a shaft, a disc carried by said shaft, a feed pipe, a plurality of blades carried by said disc, a deflector having a portion projecting laterally from the side edge of and adjacent the heel of each of said blades and rotatable therewith, the laterally projecting portion of each of said deflectors flaring forwardly from the plane of the abrasive receiving surface of its associated blade, the laterally projecting portions of said deflectors coacting with said feed pipe to receive abrasive therefrom throughout a limited arc in the rotation of said disc and to deflect the abrasive axially to be received by the inner ends of the blades and discharged thereby throughout a limited arc at the periphery of said disc.

17. In an apparatus for the projection of abrasive, the combination of a shaft mounted for rotation at high speed, a rotor carried by said shaft embracing a disc having a plurality of outwardly extending abrasive propelling blade units provided thereon, each blade unit having a comparatively long abrasive accelerating and propelling surface beginning near the inner end and extending to the outer end of the blade unit, the inner end of each blade unit embracing an axially directed deflector portion projecting laterally beyond the side edges of the abrasive accelerating and propelling surface thereof into an abrasive pick-up zone, said deflector portion extending forwardly from said surface and being curved to provide a deflecting surface, a feed pipe for feeding abrasive onto said deflecting surfaces only while passing through a limited arc of rotation whereby the abrasive is received by said curved deflecting surfaces, deflected axially thereby and passed onto the accelerating and propelling surfaces of the blade units and discharged from the rotor at an abrading velocity through a limited arc in the rotation thereof.

18. In an apparatus for the projection of abrasive, the combination of a shaft mounted for rotation at high speed, a rotor carried by said shaft embracing a disc having a plurality of outwardly extending abrasive propelling blades provided thereon, each blade having a comparatively long abrasive accelerating and propelling surface beginning near the inner end and extending to the outer end of the blade, an axially directed deflector projecting laterally beyond the side edges of each abrasive accelerating and propelling surface into an abrasive pick-up zone, said deflectors extending forwardly from said blade surfaces and being curved to provide deflecting surfaces, a feed pipe for feeding abrasive onto said deflecting surfaces only while passing through a limited arc of rotation whereby the abrasive is received by said curved deflecting surfaces, deflected axially thereby and passed onto the accelerating and propelling surfaces of the blades and discharged from the rotor at an abrading velocity through a limited arc in the rotation thereof.

19. In an abrading apparatus, a rotor mounted for rotation at high speed and having at least one abrasive deflecting blade unit provided there-

on; said unit having a comparatively long abrasive accelerating and propelling surface beginning near the inner end and extending into the outer end of said blade unit, the inner end of said blade unit having an axially directed deflector portion projecting laterally beyond the side edge of the abrasive accelerating and propelling surface thereof into an abrasive pick-up zone, said deflector portion having a generally curved deflecting surface, and means for feeding abrasive onto the curved surface of said deflector portion only while said curved surface is passing through a predetermined arc of rotation whereby said abrasive is rapidly deflected axially and introduced onto the inner end of said accelerating and propelling surface while the latter is passing through a predetermined arc of rotation and is discharged from the outer end thereof at an abrading velocity in a predetermined direction.

20. In apparatus for the projection of abrasive, the combination of a shaft, a pair of discs co-axially carried by said shaft and spaced apart, a feed pipe centrally located between said discs, blades carried by said discs in opposed relation, axially directed deflectors projecting laterally from the heels of and beyond the side edges of said blades, each of said deflectors having an abrasive deflecting surface flaring forwardly from the advancing face of its associated blade and co-acting with a similar deflector of the opposite blade carried by the opposite disc.

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