

W. A. ROSENBERGER

ABRADING APPARATUS

Filed Aug. 17, 1936

2 Sheets-Sheet 1

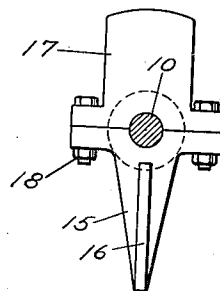


Fig. 1

Fig. 2

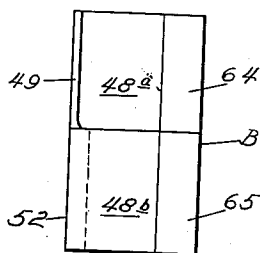


Fig. 8

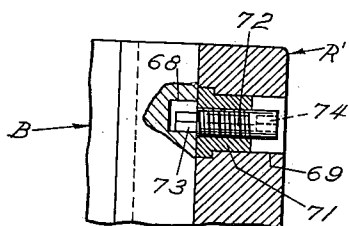


Fig. 9

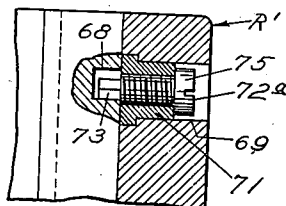


Fig 10

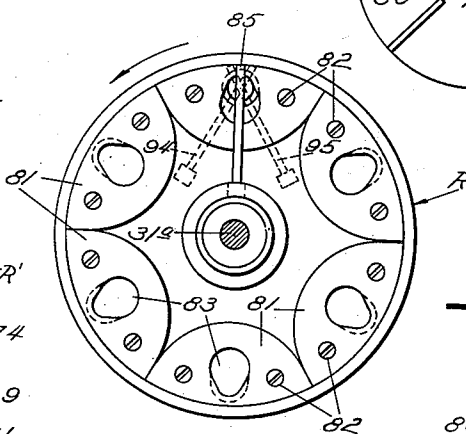
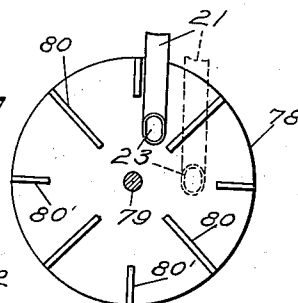


Fig. 12

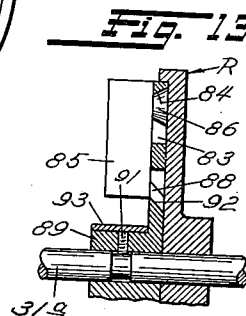


Fig. 13

Inventor

Attorneys

Nov. 4, 1941.

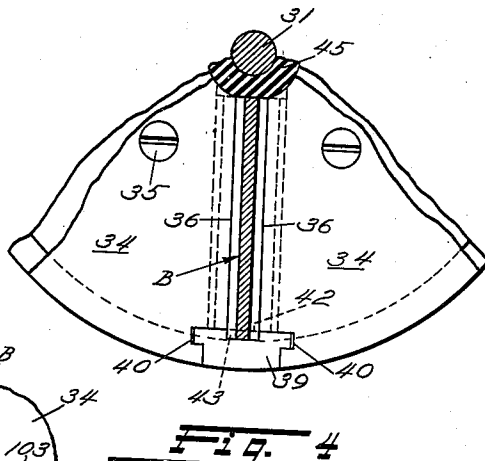
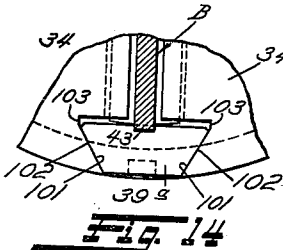
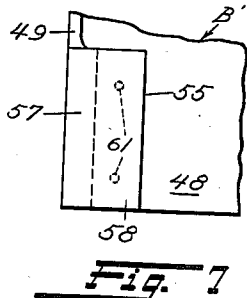
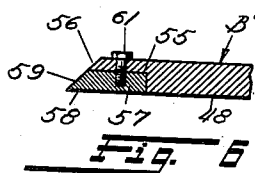
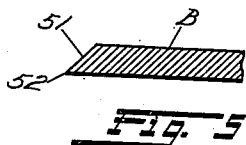
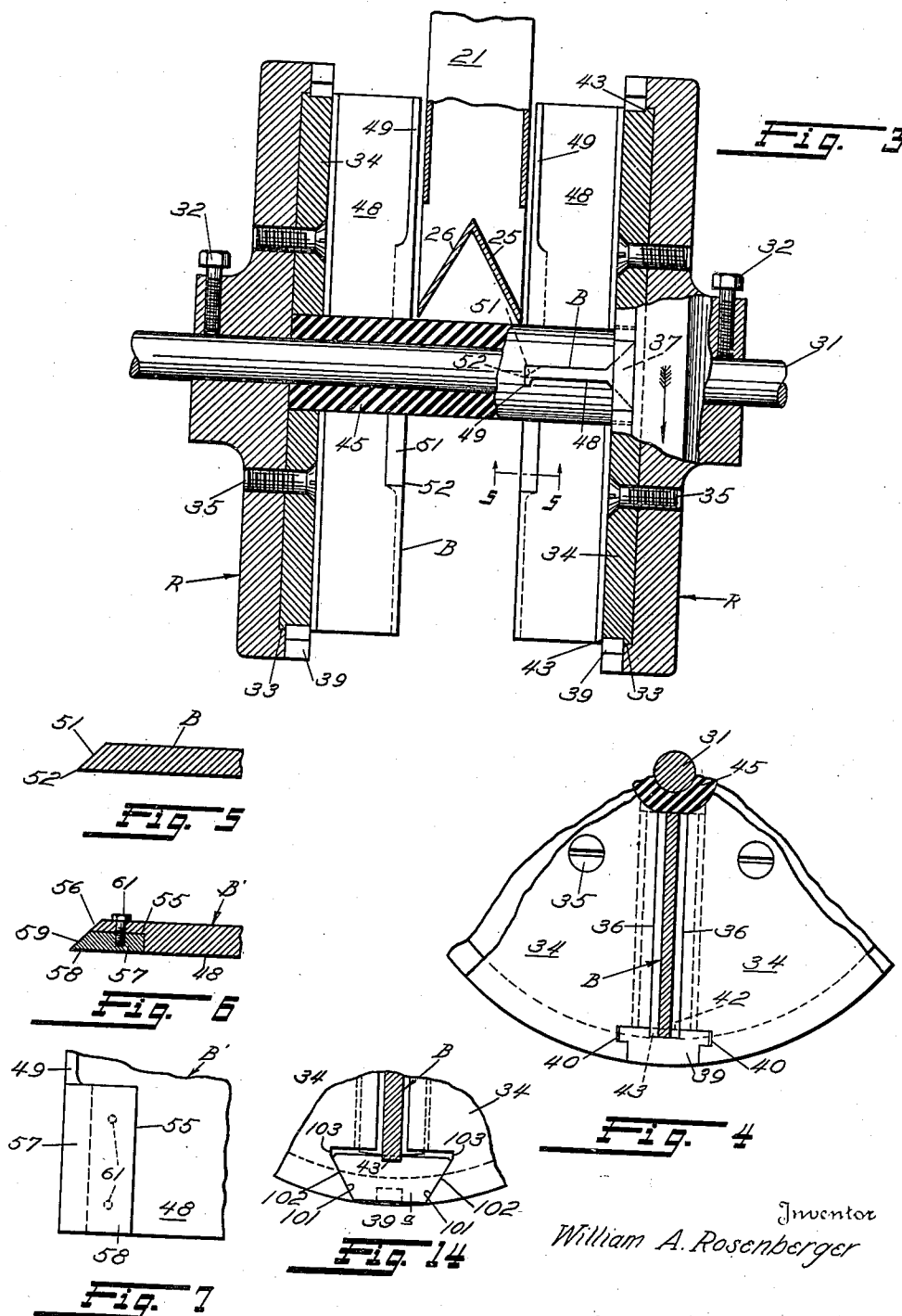
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2,261,185

ABRADING APPARATUS

Filed Aug. 17, 1936

2 Sheets-Sheet 2



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2,261,185

ABRADING APPARATUS

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Application August 17, 1936, Serial No. 96,505

13 Claims. (Cl. 51—9)

The present invention relates to abrading apparatus and more particularly to so-called "airless" abrading equipment of the character embodying mechanical means for propelling abrasives at abrading velocities.

It has been heretofore proposed to feed abrasives axially over the side edges of the blades of a single multi-bladed rotor operating at high speeds, but this method of feeding the abrasive is inefficient because the rapidly rotating blades present a barrier to, or "block" the abrasive flow over the blade edges and materially reduce the amount of abrasive that is fed over the side edges thereof.

In an effort to overcome the blocking effect of such prior apparatus, a single-bladed throwing wheel has been proposed in which the abrasive is fed over the inner side edge of the blade. While such single bladed wheels have successfully handled small quantities of abrasive in foreign use, they cannot throw the large quantities of abrasive required commercially of centrifugal abrasive throwing wheels in the American market.

In my copending application Serial No. 751,364, filed November 3, 1934, of which this application is a continuation-in-part, I have disclosed abrasive throwing wheels which overcome the disadvantages of the wheels of the prior art. In the present application I have included improvements and refinements of certain details of my prior apparatus.

It is accordingly the primary object of this invention to provide novel abrading apparatus having bladed rotors and which are so designed as to overcome all of the disadvantages of the apparatus of the prior art, are simple and rugged in design, and are efficient in operation and low in cost.

A further important object of my invention is to provide bladed abrasive propelling machines which are so constructed that the blades exert a minimum blocking action upon the abrasive fed to them, and which are also operable to pick up and propel at abrading velocities the greater part of any abrasive that may become initially blocked by the blades.

A further major object of this invention is to provide an abrading apparatus having a pair of rotatable abrasive propelling assemblies spaced apart and facing each other whereby, as abrasive is fed thereto, the major part of any abrasive that may ricochet from the side of one assembly is thrown into and is picked up and propelled by the other assembly. By my im-

proved double wheel construction, the efficiency of operation has in actual test been increased many times, the efficiency of a single wheel assembly due to the pick-up of the blocked abrasive by the opposing wheel blades providing a highly efficient abrading mechanism in which the need for central cages and impellers heretofore commercially used in this country in single abrasive throwing wheels of large capacity, is eliminated.

Another object is to provide an abrading apparatus embodying two bladed wheels between which the abrasive is adapted to be fed and having means for varying the ricochet characteristics thereof.

Another object is to provide a rotor for abrading apparatus having a plurality of blades which may be adjusted forwardly or rearwardly with respect to the direction of rotation of the rotor providing a wide range of abrading characteristics.

A further object of my invention is to improve and refine other features of the abrading apparatus of the prior art, and more specifically to provide novel abrasive propelling blades and blade holding means, novel abrasive feeding means and other more detailed features applicable to bladed abrasive propelling wheels of various well-known types.

Further objects of the invention will become apparent as the specification proceeds in connection with the annexed drawings, and from the appended claims.

In the drawings:

Figure 1 is a side view of one form of abrading apparatus of my invention and a part of the feeding device has been broken away in order to more clearly show the structure thereof.

Figure 2 is a transverse sectional view through the apparatus shown in Figure 1.

Figure 3 is a view similar to Figure 1 but illustrates a modified form of abrading apparatus forming part of my invention and parts thereof are shown in section in order to more clearly illustrate the structure involved.

Figure 4 is a front elevational view of a portion of one of the rotors of the apparatus shown in Figure 3 and illustrates the blade holding and guiding mechanism.

Figure 5 is a fragmental sectional view of a portion of the blade of Figures 3 and 4 and is taken on lines 5—5 of Figure 3 looking in the direction of the arrows.

Figure 6 is a view similar to Figure 5 but illus-

trates a modified form of blade of the invention embodying a removable wear plate.

Figure 7 is a front elevational view of a portion of the blade shown in Figure 6.

Figure 8 is a front elevational view of a further modified form of blade which is made in two parts.

Figures 9 and 10 are fragmental sectional views illustrating modified forms of blade locking mechanism also forming parts of the invention.

Figure 11 is a transverse sectional view illustrating a further modified form of wheel and in order to simplify the disclosure, certain of the parts have been diagrammatically illustrated.

Figure 12 is a transverse sectional view of a modified form of rotor assembly forming part of the invention and which makes it possible to adjust the blades for different angularity.

Figure 13 is a longitudinal sectional view through the rotor of Figure 12.

Figure 14 is a fragmental front elevational view similar to Figure 4 but illustrates a modified form of blade locking assembly forming part of my invention.

With continued reference to the drawings, wherein like reference characters have been employed to designate like parts throughout the several views thereof, and with particular reference to Figures 1 and 2, mounted on a shaft 10, which is journaled in the bearings 11 and 12, and which may be driven by any suitable prime mover by means of a pulley 13, are a pair of abrasive propelling assemblies designated as A.

Each abrasive propelling assembly is identical in character and comprises an arm 15 carrying a preferably integrally formed blade 16, and a counterweight portion 17. Parts 15 and 17 are of sufficient mass to dynamically balance each other and are provided with pairs of ears and are clamped together about shaft 10 by bolt and nut assemblies 18, or in any other suitable manner.

As seen in Figure 1, blade assemblies A are spaced apart on shaft 10 to provide an abrasive admitting space into which projects the reduced or spout portion 21 of a hopper 22. The lower end of spout portion 21 is provided with openings or ports 23 and 24, and the bottom is made up of a pair of surfaces 25 and 26 which inclines downwardly and outwardly toward the respective blade assemblies.

Each blade assembly is seen to comprise but a single blade 16. It has been found in practice that if a comparatively large number of blades are employed, and working speeds of approximately 2400 R. P. M. are used, the side edges of the blades adjacent the discharge ports 23 and 24 would form in effect a solid wall and block or seriously restrict the passage of abrasive from the discharge ports into the path of the rotating blades. However, where a single, comparatively thin, blade 16 is employed, passage of abrasive from the discharge ports into the path of the rotating blades is readily effected during the period of rotation in which the blade is remote from the discharge port. The blocking action is further minimized by making the blades thin as shown in Figure 2, and in feeding the abrasive to them at a point remote from the axis as seen in Figure 1. Each blade is accordingly insured of a full charge of abrasive.

Hopper 22 may be supported and mounted for vertical adjustment in any suitable manner, and as seen in Figure 1 it may assume various positions, depending upon the abrading action de-

sired. The abrasive is discharged from ports 23 and 24 of the hopper into the path of each rotating blade 16 during that period of rotation when the blade is remote from the discharge port. Abrasive so discharged is picked up by the inner end of the rotating blade and is centrifugally impelled toward the outer edge of the blade and is given a high final velocity.

Each of the blade assemblies A forms in effect an individual centrifugal wheel, and when dual centrifugal wheels are employed with twin discharge ports, as seen in Figures 1 and 2, a substantially greater quantity of abrasive may be handled than by two wheels otherwise arranged, and yet the device is compact. If desired, hopper 22 may be mounted for angular adjustment about the axis of shaft 10 to control the point on the circumference of the wheel from which the abrasive will be discharged.

Blades 16 may be removed by the simple expedient of unfastening bolts 18 and may thus be readily replaced. Since blades 16 are subjected into the severe wearing action of the abrasive, removable wear plates (not shown) may be used to cover their working surfaces.

Should it be desired, more than a single blade 16 may be provided on each wheel assembly A. In such case, counterweights 17 may be eliminated as a plurality of blades symmetrically disposed about shaft 10 will act to counterbalance each other. Furthermore, in such a design the blades do not of necessity need to be radial, but may curve forwardly or backwardly with respect to the direction of rotation, as found most desirable.

In Figures 3, 4 and 5 of the drawings, I have illustrated an abrading apparatus of the character just discussed. With continued reference to these figures, a shaft 31, which may be mounted for rotation and be driven in any suitable manner, carries a pair of identically similar rotors R, which carry the abrasive propelling blade assemblies. As the rotors R are identical in character, similar reference characters have been applied to corresponding parts thereof.

Each rotor is adjustably secured to shaft 31 by means of a set screw 32 threaded into its hub and engaging shaft 31. Rotor R is provided with an annular, axially directed flange providing an inwardly facing abutment wall 33. Four plates 34 of generally sector shape are disposed in surface engagement with rotor R and are secured thereto by screws 35.

The neighboring edges 36 of plates 34 are spaced apart to provide dove-tail shaped grooves as seen in Figure 3, and which constitute guideways for the abrasive propelling blades B, which are each provided with a dove tail shaped base 37, which fit into the grooves so formed. It will be noted that each blade of a disk forms a radial recess with the next adjacent blade of the same disk. The blades for the two rotors are right and left-handed as seen in Figure 3.

Blades B are accordingly mounted for guided sliding movement toward and away from shaft 31 and they are releasably held in place by means of key members 39 of generally T shape. Keys 39 fit into recesses 40 in the side edges of plates 34. As seen in Figure 4 each blade B is provided with an abutment wall 42 which abuts the key and also a wall 43, which as seen in Figure 3 restrains the keys against removal when the blades are disposed in their outermost position with their abutment walls 42 in engagement therewith. The blade securing means just dis-

cussed constitutes part of the subject matter of the co-pending application of Eric O. Hamren Serial No. 79,768 filed May 14, 1936, and accordingly no claim is made thereto in this case.

When the blades are pushed inwardly beyond the positions shown in Figures 3 and 4, keys 39 may be readily put in place in recesses 40. As soon as the wheel is brought up to speed, the centrifugal force will bring the blades out into contact with keys 39 and although centrifugal force and the friction of the parts may be relied to maintain the blades in this position, I preferably surround shaft 31 with a resilient sleeve 45 for this purpose. Sleeve 45 may be of any suitable material, such as rubber. Sleeve 45 engages the inner ends of blades B as seen in Figures 3 and 4 and resiliently urges them outwardly into firm engagement with their keys. If desired, however, spring or other means may be employed to urge the blades outwardly into engagement with their keys without departing from the spirit of my invention. For instance, a split ring encircling but spaced from the shaft and engaging the inner ends of the blades may be used.

Each blade B is provided with a preferably plane abrasive propelling surface 48 and a flange 49 for maintaining the abrasive on the blade as it travels outwardly thereover. The rear face of each blade B is provided with a bevelled inner portion 51 to provide a knife edge 52 in the region where the abrasive is initially picked up, or where the abrasive stream issuing from the abrasive feeding device is cut by the blades.

The abrasive feeding device 21 is related to the wheel in very much the same manner as it was associated with the wheel of Figures 1 and 2.

The abrasive is fed in predetermined quantities downwardly in spout 21 and as it slides over surfaces 25 and 26 it is thrown axially over the inner ends of blades B. As blades B are provided with knife edges 52, the streams issuing from ports 23 and 24 are cleanly cut, and there is accordingly a minimum blocking action. The abrasive admitted to the inner ends of the blades slides outwardly thereover under the influence of centrifugal force and is discharged from the blade tips at high velocity. Flanges 49 assist in maintaining the abrasive on the propelling surfaces 48, as it is being accelerated by moving outwardly thereover.

By providing sharp inner edges on the blades, it is thus possible to use four or more blades on each rotor as distinguished from the one-bladed rotor assemblies shown in Figure 1.

With both of the forms of wheel so far described, it has also been found that what blocking action does occur is compensated for because the abrasive which is blocked by, or which ricochets from the sides of the blades of one wheel, has been found to ricochet into the other wheel and into the path of movement of the blades thereof. The "blocked" or ricocheting abrasive of one wheel is accordingly for the most part picked up by and discharged from the other wheel. The abrasive is, accordingly, efficiently utilized and very little abrasive is "dropped" or thrown free of the machine by the side edges of the blade.

It has been found that in the wheel arrangement shown in Figure 3, with the wheels facing each other, that at least five times more abrasive than one of the wheels alone can handle, will be thrown, with many times the cutting efficiency of such a single wheel.

By loosening one of the screws 32 and adjust-

ing one rotor with respect to the other angularly about shaft 31, the machine can be so adjusted to give the best ricochet characteristics. For instance, the small quantity of abrasive that is blocked by the blades of one rotor, and thrown by the side edges of the blades towards the other rotor, may be caused to enter and be picked up by the blades of the other rotor by angularly adjusting the rotors with respect to each other.

This adjustment may vary from one speed to another and with various grades and types of abrasive, but it may be readily established by adjusting the rotors in one position and making a short trial run to ascertain the amount of abrasive that is thrown clear of the machine by the side edges of the blades. When the amount of stray abrasive thus discharged from the machine is found to be a minimum for a certain adjustment, the machine is ready for use.

When the adjustment has been completed as just described, the wheel is brought up to speed, the abrasive is fed into spout 21 and the work is passed under the wheel assembly. This arrangement will give a discharge downwardly when the wheel is rotated at any abrading speed. If desired, however, the wheel may be made to discharge sidewardly or even upwardly by adjusting the discharge points of the spout angularly about shaft 31 as an axis.

In the event that under some conditions of abrasive quality and volume the region of the blade where the abrasive is initially picked up is found to wear at a greater rate than the other part of the blade, the modified form of blade B', shown in Figures 6 and 7 may be employed. With reference to these figures, blade B' is provided with an angular recess 55 and a bevelled wall 56. A block 57 of wear resistant metal, having an abrasive pick up surface 58 and a bevelled surface 59, is secured to blade B' by means of a plurality of screws 61 or by any other suitable means. By using this construction, the life of the blades may, accordingly, be increased as it is only necessary to remove blocks 57 and replace them with new ones, after the surfaces 58 have become worn.

A further modified form of blade is shown in Figure 8. In this form of the invention, blade B is identically similar to the blades shown in Figures 3 and 4 and corresponding reference characters have accordingly been applied to the parts thereof. In this instance, the blade is made in two parts 64 and 65, having abrasive propelling surfaces 48a and 48b. Both sections of the blade are placed end-to-end in the guideways of the rotor and are maintained therein by keys 39 in the same manner as the blades of Figures 3 and 4 and constitute a single blade as their propelling surfaces are flush. When one part of the blade becomes worn to a greater extent than the other part, the worn part may be replaced by a new section, thereby making it unnecessary to replace a complete blade.

In Figures 9 and 10 of the drawings, I have illustrated further modified forms of mechanism for holding the blades in place in the wheel. In the form of the invention illustrated in Figure 9, blade B, which is the same as the blade shown in Figures 3 and 4, and which is mounted in guideways on the rotor in the same manner, is provided with a transversely extending recess 68. Frictionally fitted in bores 69 in rotor R' are bushings 71 and threaded within each bushing is a screw 72 having a preferably hexagon head 73 at one end and a socket 74 in its other end

in which a wrench may be inserted for manipulating the screw.

Bushings 71 are preferably made of hardened material and are preferably shrunk into bores 69 by cooling them in any suitable manner, such as by surrounding them with dry ice, so that when they are put in place and attain normal temperatures they expand to a tight fit in bores 69 and are thereby positively maintained in place therein. The tight fit of the parts also positively prevents any abrasive from working between the bushings and the bore, which would possibly abrade the parts. Rotor R is a permanent part, whereas bushings 71 and screws 72 are replaceable parts and therefore when the threads of bushings 71 become worn the bushings may be forced out and replaced by new bushings. The tight friction fit between the parts precludes wearing the wall of bore 69. Wear of the permanent parts of the structure is accordingly avoided.

The blades are inserted in their guideways in the manner previously described, screws 72 are then threaded into bushings 71 so as to project into recesses 68 as shown in Figure 9. In view of the fact that rubber sleeve 45 resiliently urges blades B outwardly and forces the flat wall of recess 68 into engagement with one of the flat sides of hexagon head 73, screws 72 cannot thread themselves out of the bushings in response to vibrations set up during operation of the rotor.

The structure shown in Figure 10 is somewhat similar to that just described but a screw 72a is employed which is provided with an enlarged head 75 which cooperates with the rear face of bushings 71 to prevent abrasive from getting into the threads.

In view of the fact that the desired characteristics of the abrasive blast depend upon the character of the work handled, and as it is now the practice to abrade wide varieties of work, it is desirable to provide a machine that is flexible in character. In Figures 11 I have illustrated a machine that has a rotor which imparts to the machine abrading characteristics which are somewhat different from those of the machines previously described.

With continued reference to Figure 11, I have, for the sake of simplicity, diagrammatically shown the wheel as comprising a rotor 78 mounted on a shaft 79 and having a plurality of long blades 80 and a plurality of short blades 80'. A dual wheel with the double feed spout assembly 21 has been shown, but it is understood that if desired a modified feed spout having but a single discharge port may be used if a single wheel is employed. Also, the rotor shown may be used in combination with a central feeding assembly of the character shown in my co-pending application Serial No. 751,364 filed November 3, 1934.

As the abrasive discharges from spout 21, it is fed over the side edges of blades 80 and, if desired, they may be bevelled and/or be provided with flanges in the same manner of those of Figures 3 and 4. The abrasive travels outwardly over the blades under the influence of centrifugal force and is discharged at a high velocity downwardly. The abrasive is also fed over the inner ends of blades 80' and is subjected to a short sliding action and then is discharged. If desired, however, blades 80' may be made still shorter so as to exert a purely impact or batting

action upon the abrasive, depending upon the wheel characteristics desired.

In Figures 12 and 13 I have illustrated a blade holding assembly that may be employed in any of the wheels shown in this application and also in other types of mechanical abrading apparatus embodying bladed rotors, and it enables the blades to be adjusted at any desired angle, either forwardly or rearwardly with respect to the direction of rotation.

With continued reference to Figures 12 and 13, rotor R, which is similar to the ones previously described, is provided with a plurality of sector-shaped plates 81 which are secured thereto by means of a pair of screws 82. Each plate 81 is provided with an elongated aperture 83 which is smaller at its outer end and is provided with an underneath surface 84.

A plurality of abrasive propelling blades 85 (only one has been shown in place) are mounted on the rotor and each is provided with a cone or dovetail-shaped portion 86 which cooperates with the apertures 83. Portions 86 are of sufficiently small diameter to enter the large ends of apertures 83, and when they are in place and are pushed outwardly they engage undercut surface 84 and are wedged firmly into engagement with rotor R.

The inner ends of blades 85 are provided with dovetail-shaped portions 88, which are adapted to engage the face of rotor R. A sleeve 89, mounted on shaft 31a and adapted to be secured thereto by means of a set screw 91, is provided with a flange having a plurality of inclined faces 92, which are adapted to engage portions 88 and clamp them in adjusted position against the face of the rotor. If desired, the flange of sleeve 89 may be provided with a plurality of recesses for receiving portions 88 of the blades, so as to positively lock them in the desired adjusted position. A sleeve 93 is preferably fitted over sleeve 89 so as to prevent abrasive from working into the threads of set screw 91.

As shown in Figures 12 and 13 the blade 85 is disposed in radial position and the machine accordingly has abrading characteristics similar to those of the apparatus hereinbefore described. When the blades are disposed in the dotted line position 94, and with the rotor rotating in the direction indicated in Figure 12, they are said to incline rearwardly with respect to the direction of rotation. When the blades are in dotted line position 95 they are said to incline forwardly with respect to the direction of rotation. Under either of these conditions the abrasive has a radial component velocity which is different from that when the blades are in the full line position.

These are preferably provided with a set of different sized sleeves 89 for each desired adjustment of the wheel, and it is thus seen that the wheel may be readily adjusted to adapt it to any desired abrading condition as both the direction and degree of inclination of the blades may be varied.

It is to be understood that the blade assembly just described may be applied to all of the forms of abrading apparatus herein disclosed, but that it is not limited to use therewith. For instance, it is clearly applicable to abrading apparatus of the character wherein the abrasive is fed over the inner ends of the blades, as shown in my co-pending application Serial No. 751,364, filed November 3, 1934, and the appended claims are intended to embrace it when it is used in this manner.

Although I have illustrated certain specific features in order to present the best mode of practicing the invention, it is to be understood that certain features may be altered without departing from the spirit of the invention. For instance, although I have shown a single feed spout 21 for feeding the abrasive to the two wheel assemblies, two independent pipes may be employed. Also, the blades may be secured directly to the shaft instead of to the rotors R. Moreover, if desired, the two rotors may be supported upon separate shafts for rotation at different rates of speed to give a different type of abrading action and the appended claims are intended to embrace my invention when it assumes these forms.

For instance, if it is desired to employ a separate shaft for each rotor and yet retain the general abrading characteristics of the abrading apparatus hereinbefore disclosed, two synchronous or other constant or variable speed motors may be used, with a rotor mounted on each motor shaft and with the rotors facing each other, as shown in Figure 3. Also, the motors may, if desired, be run at different speeds to give a different type of abrading action.

In Figure 14 I have illustrated a modified form of blade locking means which is somewhat similar to that shown in Figures 3 and 4, but employs a key 39a having inclined walls 101 which wedge-ingly engage inclined walls 102 provided by recesses 103 formed in plates 34. In this form of the invention during rotation the pressure of blades B upon keys 39a wedges their faces 101 into intimate frictional engagement with walls 102 and firmly locks the keys in place. Therefore, the provision of the abutments 43 on the blades constitutes a safety feature as the keys are frictionally wedged in place during normal operation.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In an abrading apparatus, a rotatable element, a pair of disc-like members mounted on said element for synchronous rotation therewith, said members being axially spaced from each other a substantial distance on said element to provide an abrasive-admitting space therebetween, the neighboring faces of each of said members being provided with at least two abrasive propelling blades, said blades being so disposed as to project axially toward each other, and abrasive feeding means projecting into said abrasive admitting space for simultaneously feeding abrasive to the blades of both of said members.

2. The abrading apparatus described in claim 1, wherein said feeding means comprises a feed conduit extending between said members into said abrasive admitting space and having abrasive directing means at its inner end for causing two streams of abrasive, disposed at approximately 90 degrees to each other, to be fed to said blades.

3. In an abrading apparatus, a shaft mounted for rotation, a rotor carried by said shaft and providing at least one outwardly extending guideway, an abrasive propelling blade mounted for sliding movement in said guideway, releasable abutment means for restraining said blade against outward movement in said guideway, and resilient means for yieldingly urging said blade into contact with said abutment means.

4. The abrading apparatus described in claim 3, wherein said resilient means comprises a resiliently deformable sleeve surrounding said shaft and engaging the inner end of said blade.

5. In an abrading apparatus, a shaft mounted for rotation, a pair of rotors mounted on said shaft in axially spaced relationship, each of said rotors having at least one outwardly extending guideway provided therein, an abrasive propelling blade mounted for sliding movement in said guideway, abutment means for releasably restraining said blades against outward movement, a resiliently deformable sleeve surrounding said shaft and engaging the inner ends of said blades for yieldingly urging the latter outwardly into engagement with said abutment means, and a feeding device extending into the space between said rotors for delivering abrasive over the side edges of said blades, said sleeve being operable to protect said shaft against wear by stray abrasive.

6. In an abrading apparatus, a rotor, an abrasive propelling blade, means for supporting said blade for pivotal rocking movement in a plane disposed normal to the axis of rotation of said rotor, and means for locking said blade in any one of a plurality of predetermined adjusted positions.

7. In an abrading apparatus, a rotor having at least one outwardly extending guideway provided thereon, a blade mounted for sliding movement in said guideway, a locking member operably associated with said rotor, bridging the outer end of said guideway and disposed in the path of outward movement of said blade for restraining the same against removal from said guideway, said locking member being slidable in an axial direction toward operative position and having inclined faces for wedging cooperation with a plurality of inclined walls provided on said rotor, said inclined faces converging outwardly.

8. In an abrading apparatus, a member mounted for rotation at comparatively high speed, at least two abrasive propelling assemblies mounted on said member for rotation therewith, said two abrasive propelling assemblies each comprising a disc-like element secured to said member, and having a plurality of outwardly extending abrasive propelling surfaces provided on one face thereof, said surfaces being disposed substantially normal to the plane of said disc-like element, said disc-like elements being axially spaced on said member with the abrasive propelling surfaces carried by one disc-like element extending toward the other disc-like element to define an abrasive admitting space between the free edges of said abrasive propelling surfaces, and a stationarily supported abrasive feeding device having a portion extending into said abrasive admitting space and operative to deliver abrasive streams in opposite axial directions to said abrasive propelling assemblies.

9. The abrading apparatus set forth in claim 1, wherein means are provided for adjusting the angular position of one of said disc-like members with respect to the other, whereby the ricochet

characteristics of the apparatus may be varied at will.

10. In an abrading apparatus, a member mounted for rotation at high speed, at least two abrasive propelling assemblies mounted on said member for rotation therewith, said assemblies each having at least one abrasive propelling surface of substantially flat configuration extending outwardly from a point adjacent the axis of rotation and disposed substantially normal to a plane of rotation passing through said surface, said abrasive propelling assemblies being axially spaced apart on said member with the abrasive propelling surface of one assembly extending toward the other assembly so as to define an abrasive admitting space between the planes of rotation of the neighboring free side edges of said abrasive propelling surfaces, and a stationarily supported abrasive feeding device having a portion extending into said abrasive admitting space and operative to deliver abrasive streams in opposite axial directions to said two abrasive propelling assemblies.

11. In abrasive projecting apparatus, the com-

bination of two spaced coaxially mounted rotatable disks having radial recesses in their adjacent surfaces and being arranged with such surfaces in opposed and cooperative relationship, means for feeding abrasive to the recesses in one of said disks, and means for rotating said disks.

12. In abrasive projecting apparatus, the combination of two spaced coaxially mounted rotatable disks having radial recesses in their adjacent surfaces and being arranged with such surfaces in opposed and cooperative relationship, means for feeding abrasive angularly to the recesses in each of said disks, and means for rotating said disks.

13. In abrasive projecting apparatus, the combination of two spaced coaxially mounted rotatable disks having radial recesses in their adjacent surfaces and being arranged with such surfaces in opposed and cooperative relationship, means for feeding abrasive to the recesses in said disks, and a frame engaging said disks and provided with means to synchronously rotate the same.

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