April 28, 1953 R. O. PETERSON 2,636,200

BRUSHING MECHANISM FOR METAL SHEETS AND THE LIKE

Filed Dec. 9, 1946 3 Sheets-Sheet 1

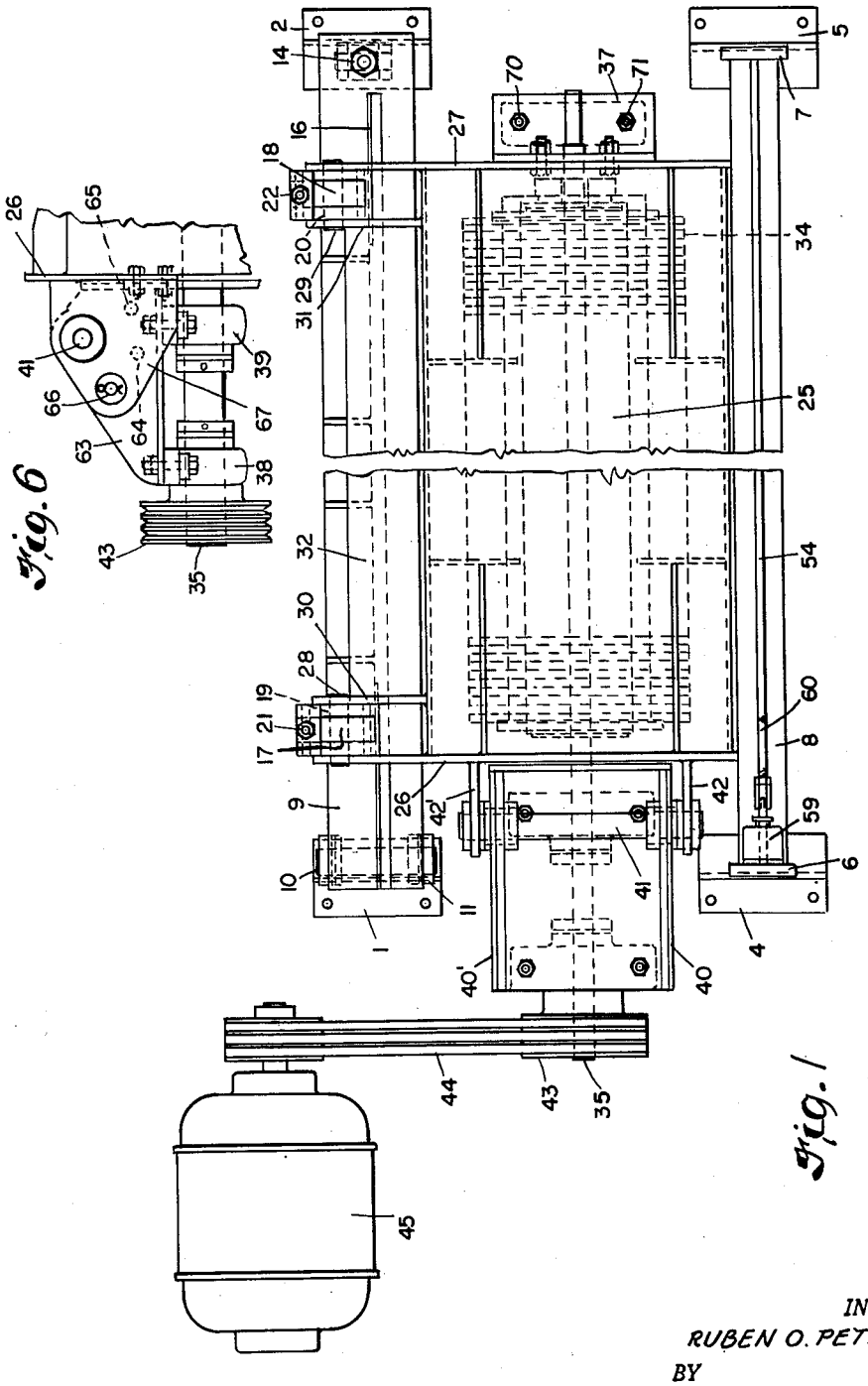


Fig. 6

Fig. 1

INVENTOR.
RUBEN O. PETERSON
BY
Oberlin & Limbach
ATTORNEYS.

April 28, 1953 R. O. PETERSON 2,636,200

BRUSHING MECHANISM FOR METAL SHEETS AND THE LIKE

Filed Dec. 9, 1946 3 Sheets-Sheet 2

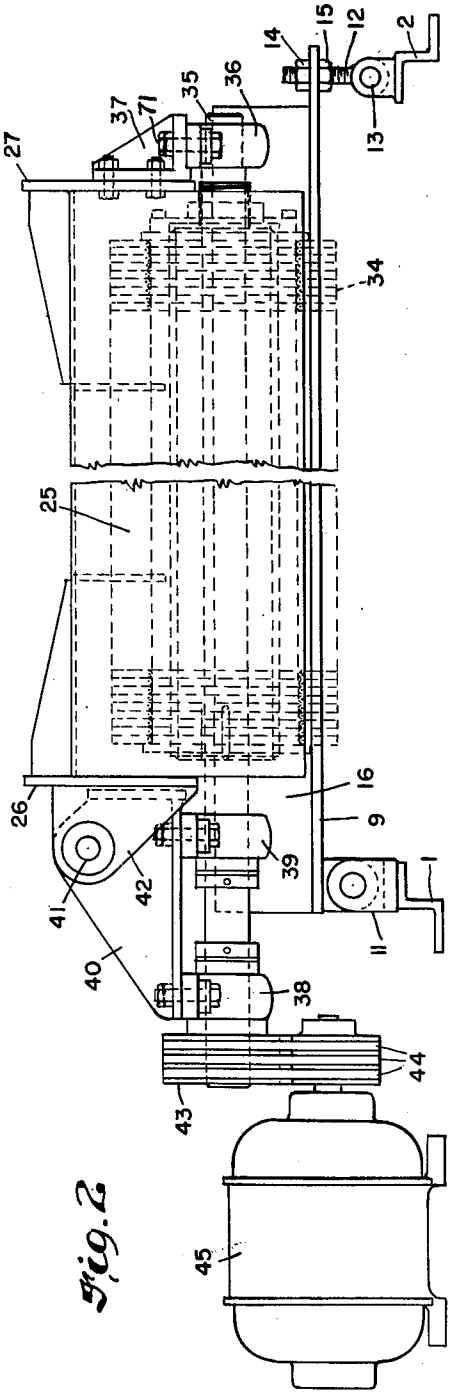


Fig. 2

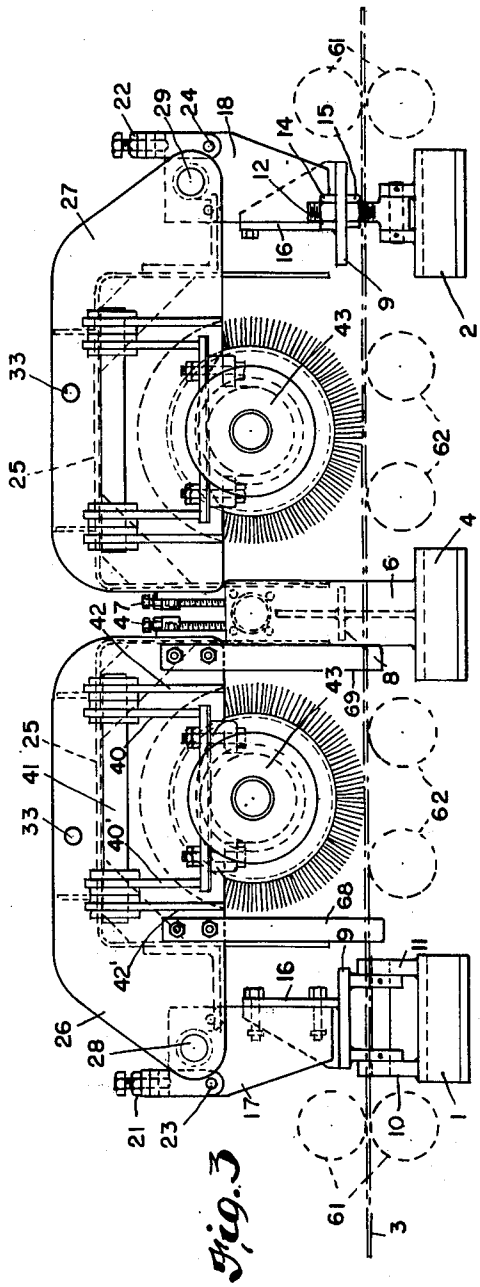


Fig. 3

INVENTOR.
RUBEN O. PETERSON
BY
Oberlin & Limbach
ATTORNEYS.

April 28, 1953 R. O. PETERSON 2,636,200

BRUSHING MECHANISM FOR METAL SHEETS AND THE LIKE

Filed Dec. 9, 1946 3 Sheets-Sheet 3

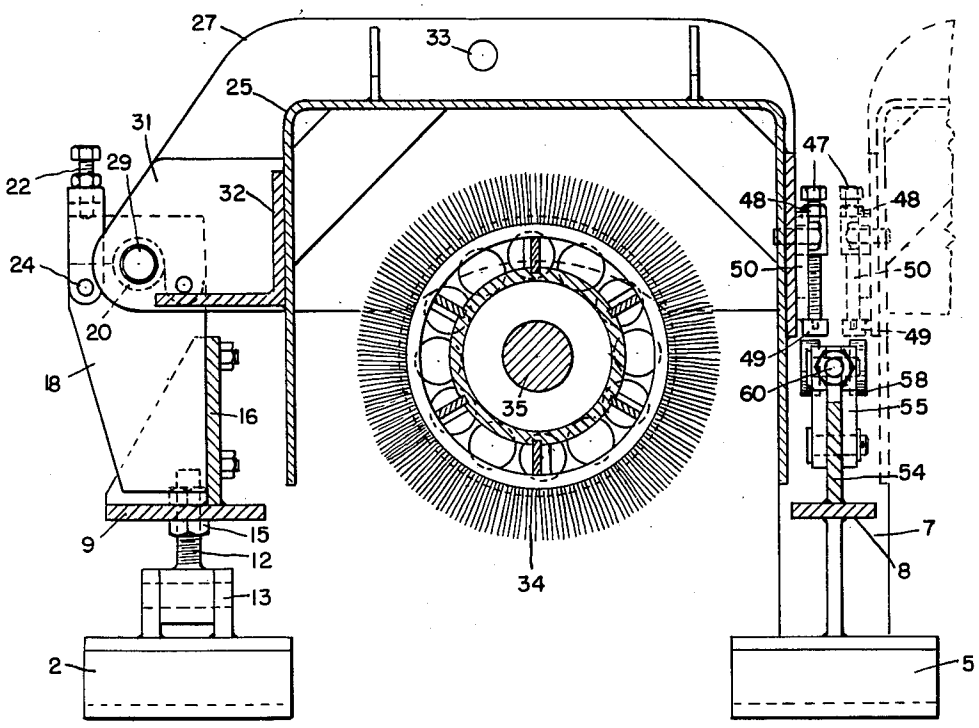


Fig. 4

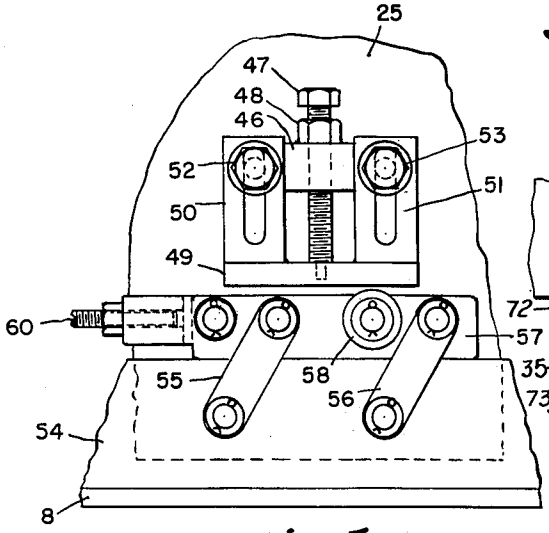


Fig. 5

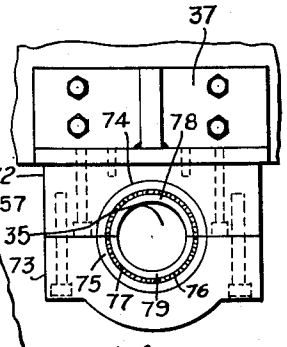


Fig. 7

INVENTOR.
RUBEN O. PETERSON
BY
Oberlin & Limbach
ATTORNEYS.

Patented Apr. 28, 1953

2,636,200

UNITED STATES PATENT OFFICE

2,636,200

BRUSHING MECHANISM FOR METAL SHEETS AND THE LIKE

Ruben O. Peterson, University Heights, Ohio, assignor to The Osborn Manufacturing Company, Cleveland, Ohio, a corporation of Ohio

Application December 9, 1946, Serial No. 714,939

17 Claims. (Cl. 15—77)

1

This invention relates to surface conditioning mechanism of the type generally employing rotary brushes or the like for surface conditioning metal sheets and other articles.

In the processing of metal strip or sheet, for example, it is general practice to pass the workpieces continuously or semi-continuously through a series of work stations where individual operations are sequentially performed thereon. The workpiece may be of a continuous nature, such as steel strip or rodding passing from a feed reel to a take-up reel or it may comprise a series of individual units transported on a continuous conveyor system as in the case of small sheets, plate and some partially fabricated articles. The operations performed thereon may include rolling, trimming, cutting, pickling, annealing, scouring and polishing, for example. In many instances such a line will desirably include a brushing unit for one of several purposes, including the removal of scale and the imparting of a high polish to the article. Various such units have been constructed in the past but have not gone into general usage for a number of practical reasons. A common disadvantage has been the lack of adequate means for adjusting the mechanism to align the brushing surface of the device with the surface of the workpiece and for maintaining a proper pressure between such surfaces without danger of damaging either the brush or the workpiece. A further serious difficulty has been encountered in devices of this nature employed in the past in that very considerable shut-down time has been necessary for the reconditioning and replacement of the brush when the same has become worn or damaged. Any appreciable stoppage of an otherwise continuously moving line of this nature is exceedingly expensive and militates against the use of the device responsible for the delay. Since brushes of the type employed in these units may be very large and heavy, but nevertheless easily damaged if improperly handled, a further problem is encountered in replacing the same with a minimum of delay. Occasionally also it is necessary to stop the movement of a continuous strip or conveyor and the workpiece may then be damaged by continued contact with the brushing means at one point thereon. There is, therefore, need for some means for promptly moving the brush out of contact with the work without necessarily stopping rotation of the brush.

A primary object of this invention is, therefore, to provide surface conditioning mechanism capable of rapid and precise adjustment to accommodate it to varying types and sizes of work.

2

Another object of this invention is to provide such mechanism which may be readily and rapidly removed from its position on the line and then replaced with a minimum of shut-down time.

A further object is to provide supporting means for the brush or other rotary tool which will afford protection to such tool when the same is removed for repair or replacement and at the same time will facilitate such removal and replacement.

Still another object is to provide means whereby the rotating tool may be quickly moved out of contact with the work when desired, due to stoppage of the line or introduction of a new workpiece.

Other objects of this invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

Fig. 1 is a top plan view of the surface conditioning mechanism and driving means therefor;

Fig. 2 is a front elevational view of such mechanism with the supporting means on the near side removed;

Fig. 3 is an end elevational view of such mechanism but showing two units arranged for combined operation;

Fig. 4 is a vertical cross section through such mechanism in the broken away portion approximately midway on Fig. 1;

Fig. 5 is a fragmentary detailed view of the adjusting and elevating means controlling the position of the brush relative to the work;

Fig. 6 is a fragmentary detailed view of a modification showing means for locking the hood or housing in open position to facilitate replacement of the brush; and

Fig. 7 is a fragmentary detail view of a split bearing for the arbor of such brush.

In general the mechanism of this invention comprises a base which may be mounted on the frame of the conveyor, for example, in conjunction with which it is designed to operate; a cross frame carried by such base; and a brush housing assembly mounted on such cross frame and

carrying the rotary brush or similar tool adapted to engage the work.

The base

Referring now more particular to the drawings, the base of the unit comprises Z-brackets 1 and 2 adapted to be mounted on opposite sides of the conveyor frame or the like with such conveyor or continuous workpiece 3 passing therebetween. Another pair of similarly spaced brackets 4 and 5 carry uprights 6 and 7 supporting a frame bar or bridge 8 therebetween. This bridge serves to carry the means by which the brush housing assembly is vertically positioned relative to the work, as described below:

The cross frame

A cross frame member 9 is pivotally attached to two spaced uprights or lugs 10 and 11 carried by bracket 1 and is supported at its other end by a threaded stud 12 pivotally mounted at 13 on bracket 2. Such stud is provided with large nuts 14 and 15 whereby this end of cross frame 9 may be elevated or lowered and held in desired position. It will be seen that a sturdy three-point suspension has thus been provided for such cross frame. A substantially vertical flange member 16 is welded to the upper surface of cross frame 9 and carries upstanding wings 17 and 18 provided with split journals or bushings 19 and 20. Screw clamps 21 and 22 may be released and swung back about their pivots 23 and 24 to permit the opening of such journals.

The brush housing assembly

The brush housing assembly comprises a hood 25 of sheet metal extending well downwardly on either side of the brush and enclosed at its ends by heavy side flanges 26 and 27 which also extend upwardly and beyond such housing for purposes to be described below. This housing assembly is pivotally secured to wings 17 and 18 by means of pins 28 and 29 passing through such flanges or extensions 26 and 27, journals 19 and 20, and flanges 30 and 31, respectively, such last-named flanges likewise being secured to hood 25 and strengthened by angle member 32 therebetween. Openings 33 are provided in the upwardly extending portions of side flanges 26 and 27 for the insertion of hoisting hooks or the like whereby the entire housing assembly may be lifted out of place after opening split journals 19 and 20.

A cylindrical rotary brush 34 is mounted on a shaft or arbor 35 for rotation therewith, one end of said arbor being journaled in a bearing 36 carried by bracket 37 mounted on side flange member 27 at the "service" end of the housing. Bolts 70 and 71 serve thus removably to secure such bearing to such bracket. The other or "drive" end of the shaft is journaled in two bearings 38 and 39 mounted in permanent alignment with each other on a bearing mount having upturned flanges 40 and 40' pivotally supported at 41 by spaced brackets 42 and 42' on side flange member 26 of the housing. By careful machining of these latter parts the automatic alignment of all three bearings is assured when bearing 36 is unbolted from bracket 37 and shaft 35 is swung out of and later returned to position. Alternatively, as shown in Fig. 7, a split bearing for arbor 35 may be mounted on end bracket 37, such split bearing comprising an upper bearing block 72 bolted and doweled to the bracket and a bearing cap 73 removably bolted to such block.

Such block and cap hold correspondingly split bearing retainers 74, 75, split ball bearing cages 76, 77, and split journals 78 and 79. Split bearings of this type are quite common and commercially available (a well-known make being that of Split Ballbearing Corporation of Lebanon, New Hampshire) and facilitate release of this end of shaft 35 so that the brush may be swung out of the housing as above described.

The end of shaft 35 is provided with a drive pulley 43 connected by means of V-belts 44 to the driving means which may be, as illustrated, an electric motor 45. The use of a belt drive permits of ready disconnection of the driving means when it is desired to remove the brush assembly for renewal or maintenance. With reference to Fig. 3 of the drawing, it will be noted that since two brushing units are illustrated facing each other, opposite ends are toward the viewer and certain parts are accordingly differently numbered. Inasmuch, however, as it is desirable ordinarily to have the driving means for both units on the same side of the mechanism, drive pulleys 43 are thus illustrated in the figure. It has also been found that generally greatly improved results are obtained if the brushes are rotated in opposite directions.

The rotary tool employed will depend on the operation in view and the mechanism of the present invention is adapted for use with brushes of various sorts, buffs, grinders and the like. The use of brushes is, however, particularly contemplated and especially brushes of the type disclosed in the co-pending application of Ruben O. Peterson, Ser. No. 632,831, filed December 5, 1945, now abandoned, which brush provides for the supplying of abrasive or other material internally of the brush and application thereby to the work. In the polishing of stainless steel strip and the like, powderous precipitated alumina or an aqueous slurry thereof may be thus supplied through the brush or sprayed on the strip in advance thereof. It has been found that when such polishing agents are employed in conjunction with brushing means having a plurality of units, such agent may be substantially entirely removed from the work by such brushes, thereby avoiding the necessity of a subsequent washing step which ordinarily deleteriously affects the high finish otherwise obtained. Depending upon the operation involved, the brush material may be selected from a wide assortment, including metal wire, cord, vegetable fibers such as Tampico fiber, animal bristles of various sorts, and synthetic bristles such as nylon. A self-ventilating brush construction is usually desirable as the brushes will be operating relatively continuously.

The height adjusting means

Referring now more particularly to Figs. 4 and 5, the depending front of hood 25 is provided with a boss 46 through which heavy screw 47 is threaded. Such boss will ordinarily be located about midway of the length of such hood (in the portion broken away on Fig. 1) but the exact position lengthwise of the hood is not material. A lock nut 48 may be tightened to lock such screw in adjusted position. A stop member 49 is carried by the lower end of such screw and is provided with two upstanding slotted flanges 50 and 51 through which pass screws 52 and 53, respectively. When such screws are tightened, the flanges serve to brace stop 49 in adjusted position. Frame bar or bridge 8 carries an upstanding flange 54 to which two pairs of links 55 and

56 are pivotally secured. Such links pivotally embrace a block 57 carrying a pair of concentrically mounted cam rollers 58, one on each side of block 57 (see Fig. 4), the peripheries of which extend above the upper surface of such block and are adapted to engage the respective under surfaces of stops 49 (two brushing units being shown in the embodiments illustrated in Figs. 3 and 4). An air cylinder 59 is connected to block 57 by means of rod 60. In order to limit the degree to which such brushes may be lowered, stop 49 will be adjusted and locked in position as above described. When the brush is not in engagement with the work and therefore not supporting the assembly, the under surface of such stop will rest on roller 58 of block 57 with such block in turn resting upon the upper surface of flange member 54. When, for any reason, it is desired to elevate the brush out of contact with the work, this is quickly accomplished by actuating air cylinder 59 (see Fig. 1) to move block 57 to the left, as viewed in Fig. 5, links 55 and 56 acting as eccentrics to elevate such block and thereby slightly elevate the entire brush housing assembly, such assembly being rocked upwardly about its pivots 28 and 29.

As diagrammatically illustrated in Fig. 3, a workpiece such as strip 3 may pass between pinch rolls 61 to either side of the unit and such strip will desirably be backed by rubber covered backing rolls 62 positioned adequately to support the strip, but spaced to avoid contact with the brushes should such brushes be lowered into position in the absence of such strip.

The brush housing assembly height adjusting means will ordinarily be set to allow most of the weight of the brush and housing to rest upon the work. The mechanism of this invention, suitably counterbalanced, is likewise adapted to be mounted to condition the under surface of the strip or other workpiece.

Operation

The operation of the mechanism of this invention is largely apparent from the foregoing description. Nuts 14 and 15 will first be adjusted to bring the brush or similar rotary tool into parallel with the surface of the work, if a continuous strip or the like is to be operated upon. Then screw 47 will be adjusted to properly position stop 49 so that the brush will rest as heavily as desired upon the work. The two brushes may then be operated, ordinarily at a high rate of speed and in opposite directions. Abrasives, polishing mediums, or the like may be fed either through or in advance of the brushes. As the brush wears, stop 49 will be correspondingly adjusted to maintain uniform pressure of the brush upon the work. Should the line be stopped momentarily, eccentric mounted block 57 may be actuated, as above explained, through cylinder 59 to raise the brush housing assembly and thereby lift the brush out of contact with the work. Motor 45 may be so positioned that all such adjustments have no appreciable effect upon the driving connections.

The entire brush housing assembly may be hoisted from its supporting frame after opening bushings 19 and 20 and another such assembly containing a new brush swung into place with a minimum of shut-down time.

It is, however, possible to remove and replace worn brushes themselves in a minimum of time. The entire brush housing assembly is first removed as described above and the assembly inverted, resting on end flanges 26 and 27. Bushing 36 may then be unbolted and shaft 35 with the brush thereon swung out of the housing, pivoting at 41. As shown in Fig. 6, the bearing mount 63 (corresponding to mount 40 in Fig. 2) may be provided with a plurality of apertures 64 and 65, adapted to be positioned opposite to apertures 66 in spaced brackets 67 (corresponding to brackets 42 in Figs. 1 and 2) when such shaft and brush are thus swung out of the housing. A pin may then be inserted through such aligned apertures to lock shaft 35 in open position while the brush is being removed and replaced. In this manner it will be seen that danger of damaging the brush is avoided and the ease with which it is replaced greatly facilitated.

As shown in connection with the left-hand housing illustrated in Fig. 3, four auxiliary legs such as 68 and 69 may desirably be bolted to housing-supporting side flanges 26 and 27 straddling the work. Such legs are suspended in space during operation of the machine but when the brush housing assembly is removed from the line such legs will serve to support the same with the brush or other rotary tool out of contact with the floor, preparatory to inverting the housing for removal of the brush.

The mechanism of this invention, therefore, while heavy and powerful, if desired, is nevertheless adapted to be quickly and positively adjusted to accommodate various types of work. Ready interchange of brushes or other rotary tools likewise adapts it for use in a line where the work is continuously traveling while a series of operations are performed thereon.

The term "surface conditioning" as used herein and in the claims refers to improving the surface of the article as by brushing, buffing, and the like. Such improvement may be in the form of removal of irregularities, obtaining of a high polish, removal of rust or mill scale, and the like.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

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

1. Surface conditioning mechanism comprising a cylindrical rotary brush, a housing for said brush, an arbor for said brush extending from each end thereof, bearings on said housing at each end of said brush in which said arbor is journalled, means operable to release said arbor from its bearing at one end of said brush, means pivotally mounting the bearing at the other end of said brush about an axis tranverse to the axis of said arbor whereby said brush may be swung out of said housing, a supporting member for said housing disposed parallel to said arbor, means pivotally connecting said member and said housing for arcuate swinging movement of said housing about an axis parallel to said arbor, means limiting the degree of such swinging movement of said housing relative to said member, a base for one end of said supporting member pivotally connected to such end at right angles to said last-named pivotal means, a base for the other end of said supporting member, and means for elevating and lowering such last-named end relative to its base.

2. Surface conditioning mechanism comprising a cylindrical rotary brush, a housing for said

brush in which said brush is journalled, a supporting member for said housing disposed parallel to the axis of said brush, means pivotally connecting said member and said housing, means limiting the degree of such pivotal movement of said housing relative to said member, a base for one end of said supporting member pivotally connected to such end at right angles to said first-named pivotal means, a base for the other end of said supporting member, and means for elevating and lowering such last-named end relative to its base.

3. Surface conditioning mechanism comprising a cylindrical rotary brush, supporting means for said brush, means mounting said brush on said supporting means for pivotal movement relative thereto about an axis parallel to the axis of said brush, and means for adjustably inclining said supporting means about an axis transverse to the axis of said brush.

4. Surface conditioning mechanism comprising a cylindrical rotary brush and supporting means therefor including means operative to swing said brush about an axis parallel to the axis of said brush and pivotal mounting means operative adjustably to incline the axis of said brush.

5. In surface conditioning mechanism, an arbor, a cylindrical rotary brush mounted on said arbor for rotation therewith, a housing for said brush, a split bearing carried by one end of said housing in which an end of said arbor is adapted to be removably journalled, a bracket on the other end of said housing, a bearing mount pivotally supported by said bracket, and two spaced bearings carried by said mount in alignment with said first-named bearing, whereby said arbor and brush may be swung out of said housing about such pivotal mounting and later returned to position with said bearings automatically aligned.

6. In surface conditioning mechanism, an arbor, a cylindrical rotary brush mounted on said arbor for rotation therewith, a housing for said brush, a bearing removably supporting one end of said arbor in said housing, and two bearings aligned with said first-named bearing supporting the other end of said arbor and pivotally mounted on said housing for movement as a unit, whereby said arbor and brush may be swung out of said housing and later returned to position with all of said bearings automatically aligned.

7. In surface conditioning mechanism, an arbor, a rotary tool mounted on said arbor for rotation therewith, a bearing removably supporting one end of said arbor, two spaced bearings aligned with said first-named bearing supporting the other end of said arbor, and a unitary support for said two spaced bearings mounted for pivotal movement about an axis transverse to the axis of said arbor, whereby said arbor and tool may be swung about such pivotal mounting after release from said first-named bearing and later returned to position with all of said bearing automatically aligned.

8. In surface conditioning mechanism, an arbor, a cylindrical rotary brush mounted on said arbor for rotation therewith, a housing for said brush in which said arbor is journalled, a support for said housing to which said housing is pivotally attached for movement about an axis parallel to the axis of said arbor toward and away from a workpiece, an adjustable stop limiting such movement of said housing and brush in a direction toward such workpiece, and eccentric means operative to move said stop and thereby said housing and brush away from such workpiece.

9. In surface conditioning mechanism, an arbor, a cylindrical rotary brush mounted on said arbor for rotation therewith, a housing for said brush in which said arbor is journalled, a support for said housing to which said housing is pivotally attached for movement about an axis parallel to the axis of said arbor, an adjustable stop limiting such movement of said housing in one direction, and eccentric means operative to move said housing in the other direction.

10. In surface conditioning mechanism, an arbor, a rotary tool mounted on said arbor for rotation therewith, a support for said arbor pivotally mounted for movement about an axis parallel to the axis of said arbor, means limiting such movement of said support and arbor in one direction, said support being freely rockable in the other direction, and means operative quickly to move said limiting means thus to rock said support.

11. In surface conditioning mechanism, a rotary brush, a support for said brush pivotally mounted for swinging movement about an axis parallel to the axis of said brush, means adjustably limiting downward movement of said support and brush toward the work, and power means operative quickly to elevate said support to raise said brush from such work.

12. In surface conditioning mechanism, a portable unit comprising a cylindrical rotary tool, the outer cylindrical surface of which is the working portion, a supporting and protective housing in which said tool is journalled, means operative to release one end of said tool from its respective bearing, means pivotally mounting a bearing for the other end of said tool on said housing whereby said tool may be swung out of said housing, a member adapted to support said housing, and means pivotally connecting said housing to said member for arcuate movement about an axis eccentric to the axis of said tool.

13. In surface conditioning mechanism, a portable unit comprising a cylindrical rotary tool, the outer cylindrical surface of which is the working portion, a supporting and protective housing in which said tool is journalled, means operative to release one end of said tool from its respective bearing means pivotally mounting a bearing for the other end of said tool on said housing whereby said tool may be swung out of said housing, a member adapted to support said housing, means pivotally connecting said housing to said member for arcuate movement about an axis eccentric to the axis of said tool, means limiting the degree of such pivotal movement of said housing, a base for one end of said supporting member pivotally connected thereto on an axis at right angles to the axis of such pivotal mounting of said housing, a base for the other end of said supporting member, and means operative to elevate and lower such latter end relative to said latter base.

14. In surface conditioning mechanism, a portable unit comprising a cylindrical rotary tool, the outer cylindrical surface of which is the working portion, a supporting and protective housing in which said tool is journalled, said housing enclosing less than the full diameter of said tool, a member adapted to support said housing, means pivotally connecting said housing to said member for arcuate movement about an axis eccentric to the axis of said tool, and supplementary feet on said housing extending beyond the por-

tion of the outer periphery left exposed by said housing and adapted to support the latter when said housing is separated from said supporting member by removal of such pivotal connection.

15. In brushing mechanism including a housing, bearing means carried by the respective ends of said housing, a brush arbor journalled in said bearing means, a cylindrical rotary brush mounted on said arbor with a portion of its periphery exposed for engagement with a work-piece, and housing supporting means adapted removably to support said housing with said brush in working position; means pivotally mounting said bearing means at one end of said housing for swinging movement of said arbor and brush outwardly of said housing, and means adapted to release said arbor at the other end of said housing to permit such outward swinging movement, whereby, when said housing has been removed from said supporting means said brush may readily be removed from and replaced on said arbor.

16. In brushing mechanism including a housing, a brush arbor rotatably carried by the respective ends of said housing, and a generally cylindrical rotary brush mounted on said arbor and partially enclosed by said housing with a portion of its periphery exposed for engagement with a work-piece; pivotal means on one end of said housing carrying said arbor for swinging movement of said arbor and brush outwardly of said housing, and arbor supporting means at the other end of said housing adapted to release said arbor from said housing to permit such outward swinging movement.

17. In brushing mechanism including a housing, a brush arbor rotatably carried by the respective ends of said housing, a generally cylindrical rotary brush mounted on said arbor, and supporting means adapted to support said housing for engagement of said brush with a travelling work-piece of flat strip material or the like; means adapted to move said housing relative to said supporting means toward and away from such work-piece, and mounting means adapted adjustably to incline said housing and thereby said arbor relative to said supporting means to bring the working face of said brush into parallel with the transverse surface of such work-piece engaged thereby.

RUBEN O. PETERSON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
934,084	Mills	Sept. 14, 1909
1,436,464	Sundh	Nov. 21, 1922
1,633,216	Lakeman	June 21, 1927
1,687,201	Hagen	Oct. 9, 1928
1,880,837	Dittmar	Oct. 4, 1932
2,156,881	Snyder	May 2, 1939
2,262,839	Fallon	Nov. 18, 1941
2,266,757	Holland	Dec. 23, 1941
2,293,865	Sykes	Aug. 25, 1942
2,307,046	Johnson et al.	Jan. 5, 1943
2,453,339	Peterson	Nov. 9, 1948