Oct. 19, 1943. H. W. PARRISH 2,332,251

SURFACE TREATING DEVICE

Filed Jan. 23, 1941 2 Sheets-Sheet 1

FIG. 1.

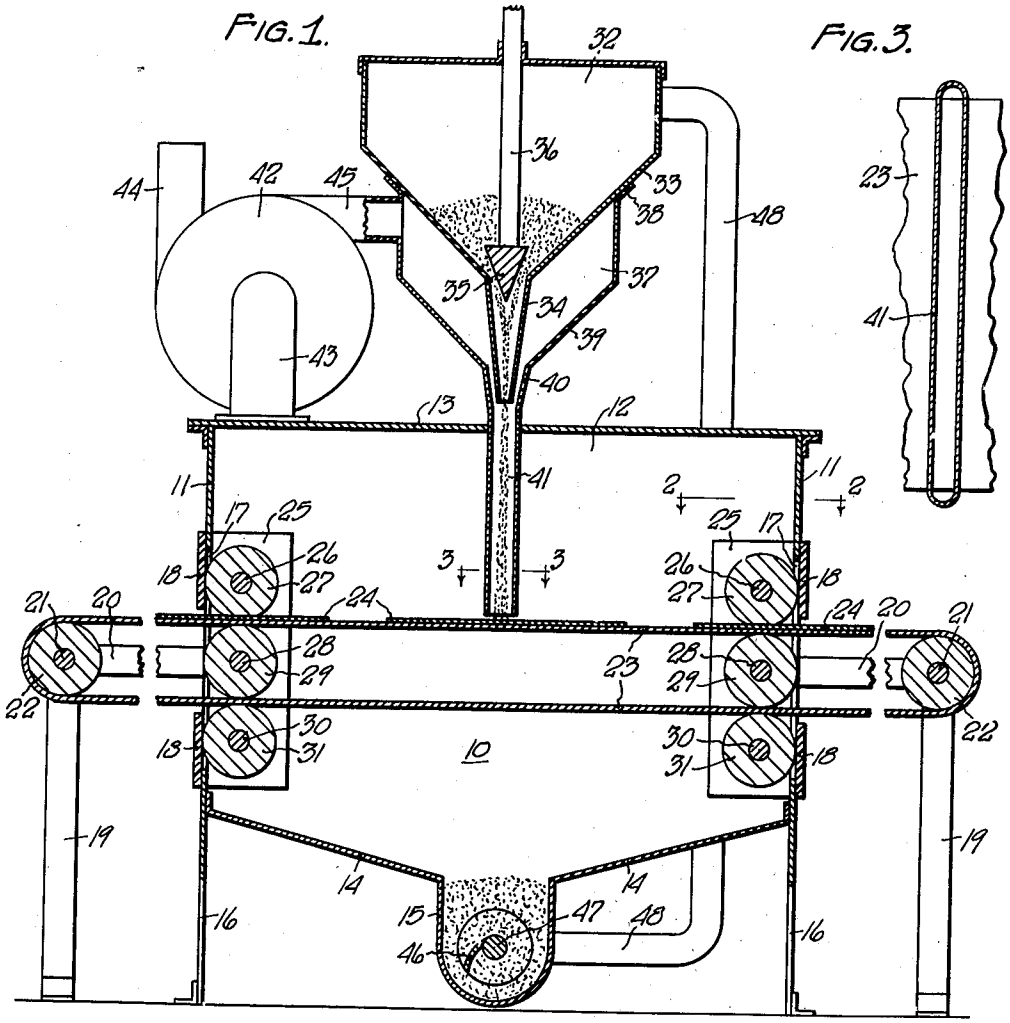
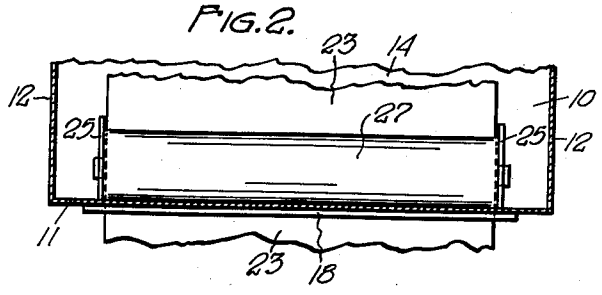


FIG. 3.

FIG. 2.



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FIG. 4.

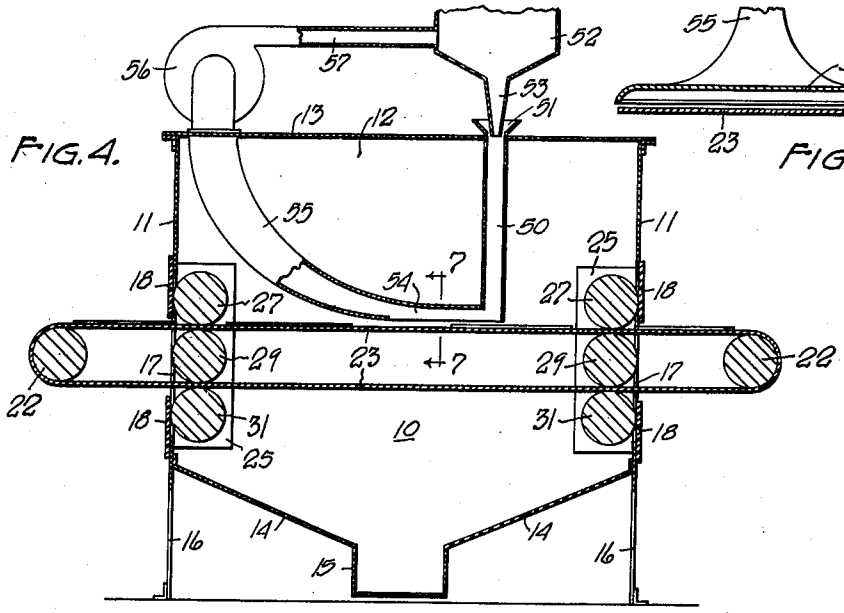


FIG. 7.

FIG. 6.

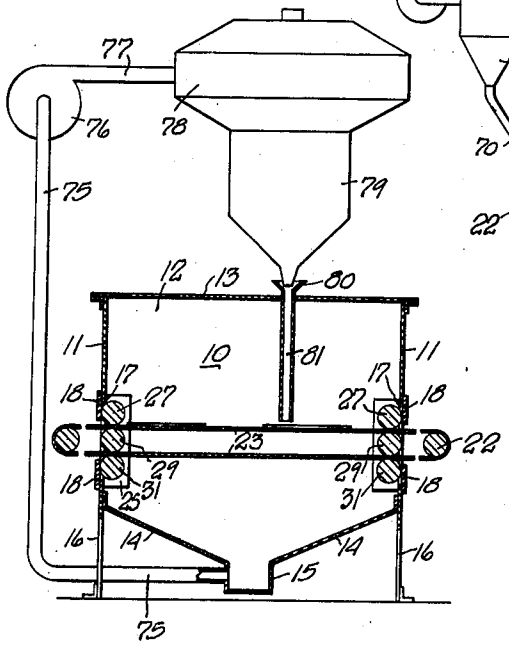
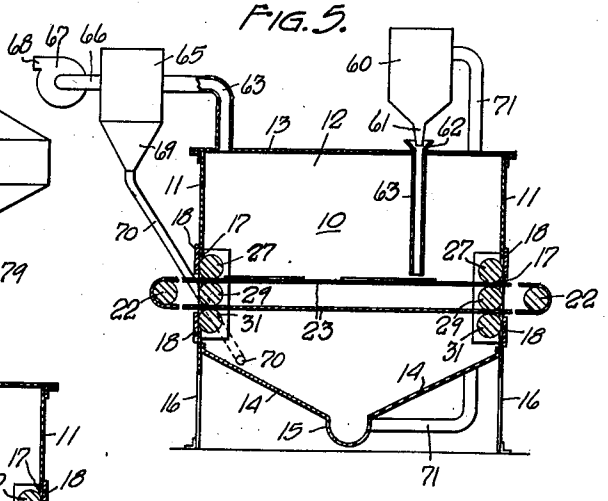


FIG. 5.



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SURFACE TREATING DEVICE

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Application January 23, 1941, Serial No. 375,587

6 Claims. (Cl. 51—14)

This invention relates to surface treating devices, and more particularly to surface treating devices of the so-called sand blast type. One purpose for which the instant device is especially adapted is the graining of metal printing plates.

An engraved or etched printing plate has shallow surface impressions. Hence, after the use of a plate having one impression is completed, the plate may be resurfaced and grained and a second impression made therein. By regraining plates, it is possible to use each plate a number of times and thus conserve the metal thereof. The present practices and devices conventionally employed for resurfacing and graining a plate are slow and expensive. For example, one method is to immerse plates in a liquid container and to roll shot or other spherical elements thereover to grind down the face impression and produce the desired grained effect.

Present sand blast devices are not adapted for plate graining because they do not operate successfully at low velocity feed of the abrasive as would be required to avoid undue abrasion and wear of the face and to obtain the proper grained effect. Also, conventional sand blast devices operate at high air pressures, which pressures cannot be sealed within the container or chamber of the device successfully and, hence, cause leakage of dust from the device. It will be obvious that sand blast devices operating at high air pressures cannot be installed near precision machinery, such as near the printing presses in a print shop, because of the abrasive dust which escapes to the atmosphere from such sand blast devices.

The primary object of this invention is to provide a novel sand blast device for projecting abrasive particles against a work piece at low velocities.

A further object is to provide a sand blast device with a work chamber wherein air pressure is below atmosphere, so that any air openings in the chamber will permit air to flow into the chamber, rather than outwardly therefrom.

A further object is to provide novel means for sealing the work chamber of a sand blast device.

A further object is to provide a sand blast device having a work chamber from which the air is partially evacuated, and means for feeding work into said chamber without destroying the evacuated condition therein.

A further object is to provide a sand blast device with novel means for collecting and discharging dust and abrasive particles from the work.

A further object is to provide a sand blast device with a work chamber having openings therein for passage of one or more runs of a flat feed web, and rollers bearing upon opposite faces of said web and against the walls of the chamber around the opening, at least the work-engaging roller being compressible.

A further object is to provide a sand blast device in which dust and abrasive particles are completely confined against leakage or discharge to atmosphere.

A further object is to provide a sand blast device with air-circulating means serving to withdraw air from the work chamber and connected with the abrasive feed means to return to the chamber a selected portion of the air withdrawn from the chamber.

A further object is to provide a sand blast device having a work chamber with means for partially evacuating air therefrom and means for feeding abrasive thereto by gravity.

Other objects will be apparent from the description, drawings, and appended claims.

In the drawings:

Fig. 1 is a vertical longitudinal sectional view of the preferred embodiment of my device.

Fig. 2 is a fragmentary horizontal sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary horizontal sectional detail view taken on line 3—3 of Fig. 1.

Fig. 4 is a longitudinal vertical section view of a modified embodiment of my invention.

Fig. 5 is a longitudinal vertical sectional view of another embodiment of my invention.

Fig. 6 is a longitudinal vertical sectional view of another embodiment of my invention.

Fig. 7 is a fragmentary transverse vertical sectional detail view taken on line 7—7 of Fig. 4.

Referring to the drawings, and particularly to Figs. 1 to 3, which illustrate the preferred embodiment of the invention, the numeral 10 designates a work chamber. Chamber 10 is formed from end walls 11, side walls 12, top 13, tapering bottom walls 14, and a downwardly extending central hopper 15. The chamber is preferably made of sheet metal, and all joints thereof are sealed, as by welding or by the use of sealing gaskets, etc. Chamber 10 is mounted upon suitable legs or supports 16 which position the hopper 15 above the level of the floor upon which the chamber is mounted.

Each of the end walls 11 of the chamber 10 is provided with a rectangular opening 17. The upper and lower portions of each opening 17 are spanned by sheets 18 formed of rubber or other

resilient material, secured to the walls 11 in sealing relation at their margins and drawn taut to maintain a desired substantially planar position.

In spaced relation to each end of the work chamber 10 are positioned vertical supports 19 which are connected with the chamber by horizontal frame elements 20. The supports 19—20 journal shafts 21. A pulley 22 is mounted upon each shaft 21. Suitable driving means (not shown) is associated with one of the shafts 21 to drive the same. A wide flat belt 23, preferably formed of rubber or composition material which will stand impact of abrasive material thereagainst, is trained around and between the pulleys 22, and passes through the work chamber 10 through the openings 17 between the inner edges of the sheets 18. The width of belt 23 is preferably substantially equal to the horizontal dimension of the openings 17 so that only a small clearance is provided between the edges of said belt and the side edges of said openings. The work pieces 24, such as flat metal printing plates, are adapted to be positioned in desired relation upon the belt 23 at one end thereof exteriorly of chamber 10, to be carried through the work chamber 10 to the discharge end of the belt exteriorly of the opposite end of the work chamber.

A pair of spaced parallel vertical metal plates 25 is carried by each end wall 11 in perpendicular relation thereto. Plates 25 are positioned with their inner faces substantially flush with the adjacent vertical edges of the openings 17, whereby said plates 25 are spaced apart a distance slightly wider than the belt 23 to accommodate free movement of said belt 23 therebetween. Plates 25 are preferably of a height greater than the vertical dimension of the openings 17, and project both above and below said openings. The ends of a shaft 26 are journaled in the plates 25 of each pair, and said shaft mounts a roller 27 preferably formed of rubber or other resilient and compressible material. The roller 27 is so positioned that its circumferential or cylindrical face bears against the belt 23 and also against the inner face of the upper closure sheet 18. The ends of a shaft 28 are journaled in plates 25 of each pair adjacent the center of said plates. Shaft 28 mounts a roller 29. If desired, roller 29 may be formed of rubber or other compressible, also. The diameter of the roller 29 is substantially equal to the diameter of the pulleys 22, and roller 29 is so positioned that it will engage the inner faces of both the upper and lower runs of the belt 23. The ends of a third shaft 30 are journaled in plates 25 of each pair, and said shaft mounts a roller 31. The cylindrical face of roll 31 bears against the lower face of the lower closure sheet 18. Each of the rollers 27, 29, and 31 is of a length equal to the spacing between the plates 25, so that the opposite ends of said rollers bear against said plates 25 at all times.

A hopper 32 for abrasive material is suitably supported in spaced relation above the container 10. The hopper preferably is provided with lower tapering walls 33 which merge with a downwardly tapering spout portion 34 at the center of the bottom of the hopper. Suitable means are provided for regulating the discharge of abrasive from hopper 32. As here illustrated, the regulating means may comprise a wedge member whose major transverse dimension is greater than the width of the opening between the bottom 33 of the hopper and the upper end hopper of spout 34. Wedge member 35 is preferably mounted upon a vertical shaft or support 36 which may be vertically adjusted relative to the hopper by suitable adjusting means (not shown).

A housing 37 is secured at 38 to the bottom of the hopper 32, as by welding, to render the joint between the housing 37 and hopper 32 air tight, for purposes to be set forth hereinafter. The housing 37 is provided with downwardly tapering bottom walls 39 which merge with a downwardly tapering neck 40 from which a feed nozzel 41 projects. Tapering portion 40 receives the lower end of the tapered spout 34 of the hopper. 32. It will be understood that the spout 34 of the hopper 32, and the nozzle 41 are both of elongated cross-sectional shape, and that the major horizontal dimension of the nozzle 41 extends transversely of and is preferably greater than the width of belt 23, as best illustrated in Fig. 3.

A fan or blower 42 of any desired or conventional character or construction is mounted upon the top 13 of the chamber 10. Blower 42 is provided with an intake conduit 43 which communicates with an opening (not shown) in the top 13 of chamber 10. Blower 42 is also provided with a pair of outlets 44 and 45. Outlet 44 is preferably open to atmosphere and outlet 45 communicates with chamber 37.

The hopper 15 at the bottom of the chamber 10 is provided with a suitable feed screw 46 mounted upon shaft 47 for discharging abrasive particles collected within the hopper 15 to a suitable elevator 48 which serves to convey the abrasive to the upper hopper 32.

It will be understood that the chamber 10 is of substantially air tight construction at all joints thereof, and is open only at opening 17 and at the opening communicating with intake 43 of blower 42. Hence, in the operation of the device, when blower 42 operates to withdraw air from the chamber, the only possibility for uncontrolled entry of air into the chamber is through the openings 17. These openings 17 are substantially sealed by the engagement of the belt 23 and plates 25 by the rollers 27, 29, and 31, and by the engagement of closure sheets 18 by the rollers 27 and 31 throughout the lengths of said rollers. This construction of the chamber 10 and of the multiple rollers relative to the feed belt 23 permits the feed belt 23 to operate to carry the work piece 24 into the chamber 10 without any substantial leakage of air through openings 17. It will be understood, of course, that this construction, entailing as it does the movement of the belt 23 and the rotation of the rollers 27, 26, and 31, does not effect a positive and hermetic seal for the chamber 10, but it does serve to reduce leakage to such a small amount that it can be economically overcome, and a small subatmospheric condition can be maintained in chamber 10, by operation of the blower 42. In this connection, note that the formation of the upper roller 27 particularly, and if desired, the rollers, 29 and 31, from rubber or other compressible material, serves to enhance the quality of the seal. Thus, Fig. 1 illustrates the engagement of rollers 27 with a work piece 24, wherein said rollers 27 are compressed and have a tight face engagement with the work piece. This construction, in which it will be understood that each roller 27, 29, and 31 is an idler, insures the air tight condition without interfering with the feed or discharge of the work relative to the chamber.

It will be observed that blower 42 may be made of a capacity to withdraw air from the chamber 10 at a much greater rate than air can enter

through such portions of the opening 17 of the chamber which are not positively sealed by the roller construction above described. Therefore, by dividing the flow of air withdrawn from chamber 10 by the blower 42 so that part thereof is discharged through outlet 44 and the remainder thereof through outlet 45, a condition is provided wherein the chamber 10 may be maintained at less than the atmospheric pressure.

The abrasive is fed by gravity from hopper 32, controlled by element 35, through spout 34 and into the nozzle 41. The flow of air at a slight pressure from fan or blower outlet 45, through housing 47, and into nozzle 41, disperses the abrasive in the nozzle and acts thereon with a force slightly increasing the force of gravity under which the abrasive is fed. Hence, the force of the abrasive is controlled by the combination of two factors, namely, the force of gravity, and the difference between the air pressure in housing 47 and in work chamber 10. The air pressure factor may be regulated by damper means within the fan outlets 44 and 45, as will be obvious. Hence, the force with which the abrasive passes through the nozzle 41 and impinges upon the work piece 24 may be regulated as required.

For the purpose of graining printing plates and for treating the surface of other soft metals, it is not necessary that the abrasive be fed at high velocities. Hence, this combined gravity and air feed into a chamber at subatmospheric pressure produces a sufficient velocity of the abrasive to do such work properly.

A slightly different arrangement or embodiment of the device is illustrated in Fig. 4. In this embodiment the construction and arrangement of the chamber 10, the feed belt 23, and the sealing rollers are substantially the same as illustrated in Fig. 1. Note, in this construction, that the abrasive nozzle 50 is vertically positioned and extends through the top wall 13 of chamber 10. The uppper end of the nozzle 50 terminates in an outwardly flaring or funnel shaped portion 51. The abrasive hopper 52 is suitably supported above the chamber 10 and has a feed spout 53 which extends into the funnel shaped upper end 51 of the nozzle 50. The arrangement of these parts is such that the funnel 51 is open to atmosphere. At its lower end the nozzle 50 has a hood portion 54 projecting therefrom in the direction of the travel of the belt 23. This hood is of a width approximately equal to the width of the belt 23 and is positioned only slightly thereabove. An air line 55 communicates with the hood 54 at the end of said hood opposite nozzle 50 and passes through the top of the chamber 10 to a fan or blower 56. The outlet line 57 of the blower is connected with the hopper 52.

The primary differences between this device and the preferred embodiment of the invention are as follows: The opening between hopper spout 53 and the funnel portion 51 of nozzle 50 feeds air into the nozzle at atmospheric pressure. Consequently, if the hopper 52 is sealed, the chamber 10 contains air at or slightly above atmospheric pressure. A further distinction is that the air line 55 draws air only from the area of the belt under the hood 54 by reason of the position, shape, and construction of the blast hood and, therefore, serves to pick up abrasive deposited on the belt 23. The abrasive is carried in the air stream through air line 55, blower 56, and outlet 57 for return to the hopper 52. Hence, separate elevating means as 48 in Fig. 1 is not required. One of the important features of this particular embodiment of the invention is that, while the pressure within the chamber 10 is at or above atmosphere, nevertheless, that pressure is substantially static. Consequently there is little abrasive material or dust in the air which leaks or escapes from container 10 at such small openings as might occur adjacent the belt 23 and the sealing rollers. It will be observed that hopper 52 may be open to atmosphere. In this event, by reducing the size of the air intake into nozzle 50 at 51 to small proportions, a sub-atmospheric pressure may be provided in chamber 10.

Another modified arrangement is illustrated in Fig. 5, wherein the chamber 10, conveyor belt 23, and rollers 27, 29, and 31 are constructed and arranged as in Fig. 1. In this embodiment a hopper 60 has a discharge spout 61 extending into the funnel shaped upper end 62 of a feed nozzle 63 whose discharge end is positioned above belt 23. Suitable elevating means 71 may be provided between the lower hopper 15 and the feed hopper 60. A conduit 63 communicates with the top 13 of the chamber 10 and leads to a dust arrester 65, and a line 66 leads from dust arrester 65 to a fan or blower 67 whose outlet 68 is open to atmosphere. Dust arrester 65 is provided with a tapered bottom 69, with which is connected a conduit 70 which communicates with the chamber 10 at one side of and preferably below the belt 23.

In this embodiment of the invention, the air pressure within the chamber 10 will be at or below atmospheric pressure, depending upon the relation between air intake at the nozzle and air suction of the fan. The principal advantage of this embodiment is that dust resulting from the operation of the device is drawn from the chamber 10 through the conduit 64 and to the dust arrester 65. The dust precipitates in the dust arrester and is collected within the tapering bottom 69 of the dust arrester and returned through the conduit 70 to the lower portion of the chamber 10 for discharge into hopper 15. The air withdrawn from chamber 10, when freed from dust, passes through the line 66, fan 67, and outlet 68, to atmosphere.

Another embodiment of the invention is illustrated in Fig. 6, wherein the chamber 10, belt 23, and belt sealing means are substantially the same as those previously described. In this embodiment, an air line 75 communicates with the lower hopper 15 of chamber 10 and extends upwardly to a fan or blower 76 positioned above the level of the top of the chamber 10. The outlet of the fan is connected, by a conduit 77, with a cyclone type of dust arrester 78. The dust arrester is mounted upon the abrasive hopper 79, which in turn, is positioned above the upper funnel portion 80 of a feed nozzle 81. The dust arrester 78 is open to atmosphere at its upper end. In this embodiment of the invention, the abrasive which collects in lower hopper 15 is drawn upwardly to and through the conduit 75 and fan 76, to be discharged through conduit 77 into the dust arrester 78. Being of the cyclone type, wherein the size of the dust arrester chamber is sufficiently large to reduce the pressure of air entering the same and to reduce the velocity of flow thereof, the particles of dust and abrasive entrained in the air line precipitate into the hopper 79 while the air is exhausted to atmosphere. In this embodiment of the invention, the relation of the free air inlet at 80 to the capacity of the fan or blower 76 determines the pressure condition which will exist within the container 10.

While each of the embodiments has been illustrated with both runs of work feed belt 23 passing through work chamber 10, it will be obvious that only the feed run need extend into said chamber to the abrasive nozzle. Also, the feed belt need not extend completely through chamber 10, but may terminate therein, if the belt drive is accommodated for reciprocation.

I claim:

1. A surface treating device comprising a chamber having at least one opening therein, a belt shiftable in said opening, a pair of rollers rotatably carried by said chamber adjacent said opening and bearing against opposite faces of said belt and against the walls of said chamber to seal said opening, at least the upper roller being formed from yieldable material, and abrasive feed means directed toward said belt.

2. A surface treating device comprising a chamber having an opening therein, a belt having spaced oppositely moving runs passing through said opening, an intermediate roller rotatably carried by said chamber and positioned between and engaged by both runs of said belt and bearing against said chamber at its ends, a pair of rollers rotatably carried by said chamber and engaging the outer faces of said runs and the chamber walls at the peripheries and ends thereof, at least the uppermost roller being resilient, and means for discharging abrasive on the upper run of said belt.

3. A surface treating device as defined in claim 2, and resilient strips covering the upper and lower portions of said opening and engaged by the last-named rollers.

4. In a surface treating device, a chamber having an opening in one wall thereof, a pair of vertical plates projecting inwardly from said wall at opposite edges of said opening, a flat web shiftable in said opening, means spaced from said wall for shifting and supporting said web, and a pair of idler rollers journaled in said plates to rotatably engage opposite faces of said web, said rollers bearing against said plates at their ends and against the inner face of said wall throughout their length.

5. The combination defined in claim 4, wherein rubber sheets carried by said wall close opposite portions of said opening and are engaged by the peripheries of said rollers.

6. A surface treating device comprising a chamber having openings in opposite walls, a belt shiftable through said openings, means spaced from said chamber for supporting and shifting said belt, means for substantially sealing said openings including idler rollers bearing against opposite faces of said belt and against the walls of said chamber adjacent said opening, means for discharging abrasive at low velocity onto said belt, and means for withdrawing air from said chamber in greater volume than supplied to said chamber by said abrasive discharging means.

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