

July 17, 1934.

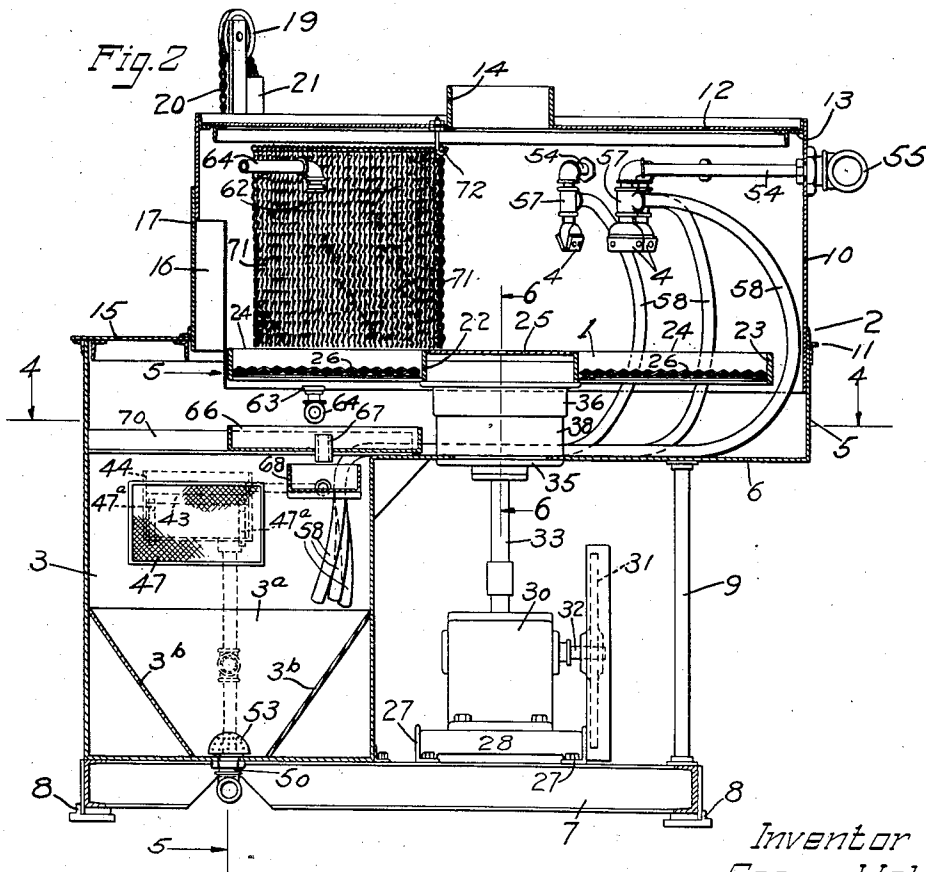
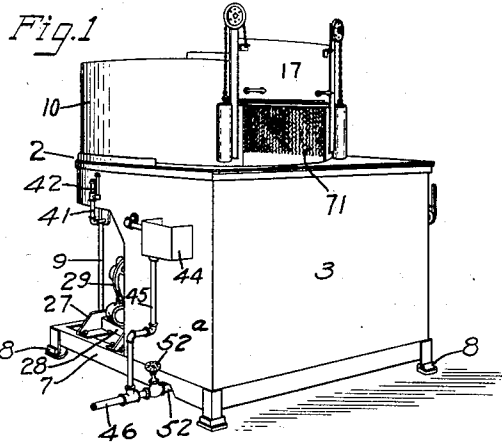
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WET SAND BLAST APPARATUS

Filed July 19, 1930

3 Sheets-Sheet 1



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July 17, 1934.

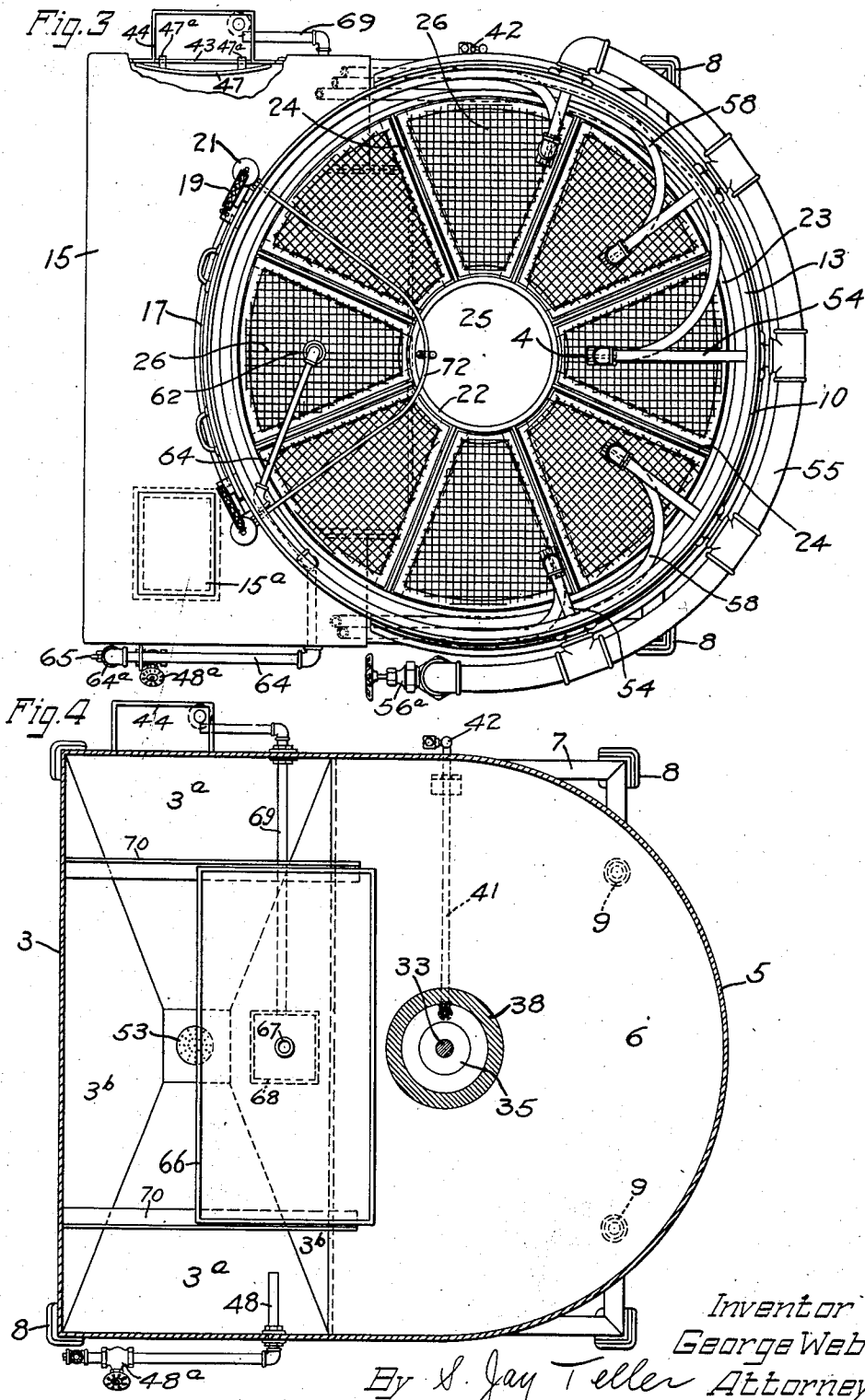
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WET SAND BLAST APPARATUS

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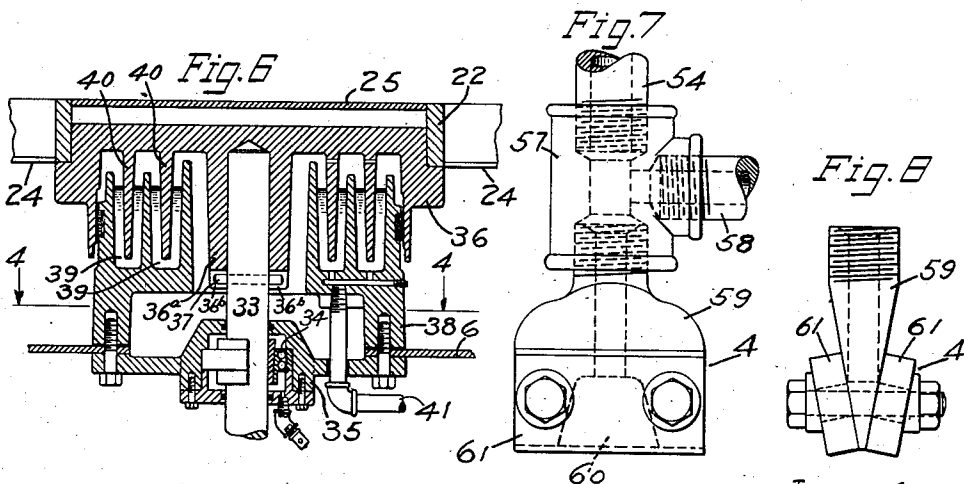
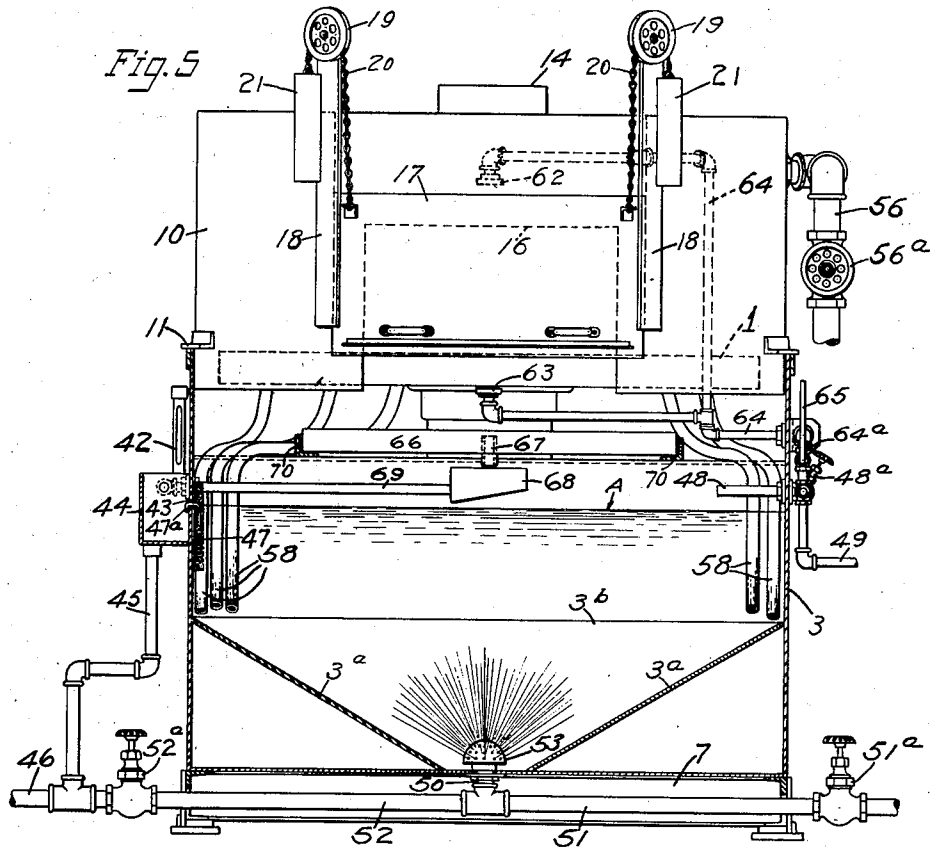
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WET SAND BLAST APPARATUS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

1,966,571

WET SAND BLAST APPARATUS

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Application July 19, 1930, Serial No. 469,141

17 Claims. (Cl. 51-15)

For some classes of sand-blasting work it is preferable to depart from the usual practice of using dry sand and to obtain the required abrasive effect by means of a blast or jet of a liquid mixture containing an abrasive, and the present invention, therefore, relates particularly to an apparatus wherein the abrasive effect is secured by such a liquid mixture. The procedure whereby such an abrasive mixture is used is commonly referred to as "mud blasting".

The general object of the invention is to provide a wet sand blast of "mud blast" apparatus having simple and reliable means for maintaining the liquid and abrasive mixture in proper condition for use, and for forcibly delivering it as a blast or jet against the articles to be treated.

A more specific object of the invention is to provide means for rinsing the articles after treatment by the liquid and abrasive mixture, such rinsing means being combined with means for preventing the dilution of the mixture by the rinse water.

Still another specific object of the invention is to provide an improved means for preventing the sprayed liquid and abrasive mixture from escaping and for preventing splash from the rinsing means from entering the main portion of the housing.

Still further objects of the invention will be apparent from the following specification and claims.

In the accompanying drawings I have shown the embodiment of the invention which I now deem preferable, but it will be understood that the drawings are intended for illustrative purposes only and are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Fig. 1 is a perspective view of an apparatus embodying the invention.

Fig. 2 is an enlarged central vertical sectional view of the apparatus.

Fig. 3 is a plan view on the same scale as Fig. 2, the top cover of the hood being omitted in order to show interior parts.

Fig. 4 is a horizontal sectional view taken along the lines 4-4 of Figs. 2 and 6. Parts carried by or connected with the upper section of the main housing are omitted from this view.

Fig. 5 is a front view partly in section along the line 5-5 of Fig. 2.

Fig. 6 is an enlarged fragmentary sectional view taken along the line 6-6 of Fig. 2.

Fig. 7 is an enlarged side view of one of the nozzles for the liquid and abrasive mixture.

Fig. 8 is an edge view of the nozzle shown in Fig. 7.

Referring to the drawings, 1 is a movable work support, 2 is a housing substantially enclosing the work support, 3 is a reservoir for a mixture of liquid and abrasive, and 4, 4 are nozzles for delivering the liquid and abrasive mixture against articles on the work support. These several parts and various other parts associated therewith will now be described in detail.

As shown the work support 1 is in the form of a horizontal rotatable table, but it will be understood that the invention is not necessarily limited to a work support of this particular type. The shape of the housing 2 will depend in part upon the character of the work support, but when the work support is a rotary circular table as shown, the lower section 5 of the said housing is preferably of semi-circular shape at the rear as clearly shown in Figs. 3 and 4. The lower section 5 of the housing may be formed with the reservoir 3, the main portion of the reservoir being below the bottom wall 6 of the said lower section. The position of the said bottom wall 6 makes it possible for liquids to drain from the housing into the reservoir. The front of the lower section of the housing may be rectangular in shape to conform to the shape of the reservoir 3 as shown in Figs. 3 and 4.

The housing 2 and the reservoir 3 are supported upon a rectangular framework 7 having feet 8, 8. The reservoir rests directly upon the framework and the rear part of the housing is supported thereon by means of rods 9, 9.

The housing 2 has an upper section or hood 10 which is preferably initially separate from the lower section. This upper section 10 is substantially cylindrical and as shown it fits within the lower section, being supported by means of angle bars 11 secured to the walls thereof and resting upon the top edges of the walls of the lower section. The upper section or hood 10 preferably has a removable cover 12 which rests upon a curved angle bar 13 at the top of the hood. The cover 12 is provided with a flanged opening at 14 for the connection of an exhaust pipe if desired. At the front of the lower section 5 there is provided a removable flat cover 15 which rests upon the top edges of the walls of the lower section 5 and which is shaped to conform to the circular outline of the upper section or hood 10. This cover

15 preferably has an inspection opening therein normally closed by a plate 15^a.

At the front immediately adjacent the flat cover or shelf 15, the hood 10 is provided with an opening 16 through which articles to be treated can be placed upon and removed from the work support or table 1. There is preferably provided a door 17 for closing the opening 16, this door being shown most clearly in Figs. 1 and 5. The door is curved to conform to the curvature of the hood 10 and it is guided for vertical movement by means of metallic strips 18, 18 secured to the hood adjacent the edges of the opening 16. At the upper ends of the strips 18, 18 are rotatable sheaves 19, 19 over which pass chains 20, 20. One end of each chain 20 is secured to the door as shown and at the other end thereof is secured a weight 21. The two weights 21, 21 serve to counter-balance the door 17 so that it will remain in a position to which it may be manually moved.

So far as the invention is concerned, the particular details of construction of the rotatable table or work support 1 are not important but as shown it comprises an inner ring 22, an outer ring 23 and a plurality of radial spokes 24, 24. Each of the spokes 24, 24 is preferably an inverted T. The space within the inner ring 22 may be closed by a flat plate 25 welded or otherwise secured in place. A plurality of open-work table sections are provided of such shape as to fit the several spaces formed by the two rings 22 and 23 and by the several spokes 24, 24. These sections are shown at 26, 26, each of them comprising an outer frame and a wire mesh or other open-work construction within the outline of the frame. These sections 26, 26 are subject to abrasive action and are therefore made readily removable so that they can be replaced from time to time as necessary.

The mechanism for operating the rotatable table 1 is preferably positioned in the space below the main housing and at the rear of the reservoir 3. As shown there are transverse angle bars 27, 27 supported at their ends upon the main frame 7. Supported upon the angle bars 27, 27 is a base 28 upon which rests an electric motor 29 and a gear box 30. The motor and gear box may be of any usual or preferred construction and they are not, therefore, shown in detail. Power is transmitted from the motor to the gear box by means of a chain (not shown) passing over a sprocket wheel 31 on the main drive shaft 32 of the gear box.

Extending vertically from the gear box 30 is a driven shaft 33 which serves to support and rotate the table 1. As shown most clearly in Fig. 6 the shaft 33 is guided by means of a ball bearing 34 held in a housing 35 which is secured to the bottom wall 6 of the main housing. At the upper end of the shaft 33 is a disc or plate 36 which has a central apertured boss 36^a into which the shaft fits. The boss 36^a is notched at 36^b, 36^b and a pin 37 on the shaft 33 extends into the notches. The inner ring 22 of the rotatable table rests directly upon the plate 36 and thus the plate serves as the means whereby the table is supported upon and made rotatable by the shaft 33.

Preferably in order to effectively exclude abrasive and other foreign material from the ball bearing 34 a suitable sealing means is provided. This consists in part of a casting 38 which is secured to the wall 6 of the main

housing and which cooperates with the plate 36. The casting 38 has annular grooves 39, 39 formed therein and the plate 36 has annular ribs 40, 40 formed thereon and projecting downward into the grooves 39, 39. The grooves 39, 39 are filled with oil which thus forms an effective seal to prevent abrasive from entering the space adjacent the ball bearing. Preferably in order that the oil level in the grooves 39, 39 may be maintained, the said grooves are connected with a pipe 41 which in turn is connected with a combined gauge and filling device 42 at one side of the machine. By this means the oil level in the grooves 39, 39 may be maintained at the proper height.

As already stated, a machine embodying the invention is intended to make use of a mixture of a liquid and an abrasive. I do not limit myself to the exact character of mixture that is used but this will ordinarily be a mixture of water and a suitable grade of fine sand. The water and sand in proper proportions are placed within the reservoir 3 and are maintained approximately at the level indicated at A in Fig. 5. In order that the level of the mixture may not rise above the position indicated, the reservoir has an overflow slot at 43 which communicates with an overflow basin 44 attached to the side of the reservoir. This overflow basin is connected by means of a pipe 45 with a main discharge pipe 46. Preferably the overflow slot 43 is protected by means of a screen 47 which is made detachable so that it can be easily removed for cleaning purposes. As shown the screen is held in place by means of hooks 47^a, 47^a which extend into the slot 43. Additional water may be supplied to the reservoir through a pipe 48 controlled by a valve 48^a and connected with a main water supply pipe 49.

The sand or other abrasive in the water or other liquid in the reservoir 3 tends to separate and settle to the bottom and it is necessary to provide a suitable means for so agitating the mixture as to maintain the abrasive continuously in suspension in the liquid. I do not necessarily limit myself to any one type of agitating means, but I prefer and have shown for this purpose means for introducing an expansive fluid under pressure into the reservoir at the bottom thereof. This expansive fluid may be compressed air. In order that the compressed air may act more effectively, the reservoir is provided with inclined bottom walls 3^a, 3^a and 3^b, 3^b which are arranged in the form of an inverted truncated pyramid. Extending into the reservoir 3 at the bottom thereof is a pipe 50 which is connected by means of a T-connection with a pipe line 51, 52. At the upper end of the pipe 50 and within the reservoir there is provided a distributor 53 having a convex upper surface which is perforated so as to be adapted to project jets of fluid in various directions as indicated. The pipe 51 is provided with a valve 51^a and is connected with a suitable source of supply for compressed air. The pipe 52 is provided with a valve 52^a and is connected with the main discharge pipe 46. When the valve 52^a is closed and the valve 51^a is open, compressed air is supplied to the distributor 53 through which it is forced in jets in various directions so as to thoroughly agitate the mixture in the reservoir. In this way the sand or other abrasive is uniformly mixed with the liquid.

If it is desired to drain the mixture from the reservoir, the valve 51^a may be closed and the

valve 52^a may be opened. This permits the mixture to flow through the pipe 52 into the main discharge pipe 46. If desired the flow of the mixture through the pipe 52 may be assisted by leaving the valve 51^a open or partly open so as to permit a flow of the compressed air.

Mention has already been made of the nozzles 4, 4 for forcibly delivering the liquid and abrasive mixture against articles on the work support. As shown these nozzles are supported upon pipes 54, 54 projecting radially into the hood 10 at the upper portion thereof. These pipes 54, 54 are of different lengths so that the several nozzles are arranged in different positions with respect to the path of movement of the articles on the work support. The pipes 54, 54 are connected with a curved manifold 55 which extends around the outside of the hood 10. The manifold is connected by means of a pipe 56 controlled by a valve 56^a with a suitable source of supply for an expansive fluid under pressure, such as compressed air. As shown most clearly in Figs. 2, 7 and 8, each nozzle 4 is connected with the corresponding pipe 54 and has a branch connection at 57. Leading to the branch connection at 57 is a pipe 58, the other end of which communicates with the reservoir 3. As shown each pipe 58 is a flexible hose which has certain advantages, but it will be understood that a pipe of some other type may be used if preferred. The details of construction of the nozzle do not constitute a part of the present invention but these details are shown in order to provide a complete disclosure. Each nozzle has a main body 59 which is closed at its opposite edges and which is formed with a recess 60 between the two closed edges. This recess communicates directly with the main opening into which the pipe connection 54 leads. The recess 60 is closed at its open sides by means of removable plates 61, 61 which are so placed as to provide a narrow discharge slot or orifice. The plates 61, 61 are subject to wear and may be replaced from time to time when necessary.

When the valve 56^a is opened to admit compressed air to the manifold 55, the said air passes through the several pipes 54, 54 and into the nozzles 4, 4. In rapidly moving past the branch connection of each nozzle at 57 the air creates a suction which draws some of the abrasive mixture from the reservoir through the corresponding pipe 58. The mixture sucked through the pipe 58 is mixed with the rapidly moving air and is then forcibly delivered through the slot or orifice between the two plates 61, 61 and thence moves at high velocity against the articles on the work support, abrading the said articles and producing the required dull finish thereon. The major portion of the abrasive mixture, after acting upon the articles on the work support, passes through the work support and is then returned by gravity to the reservoir 3 so that it may be again used.

It will be understood that the table 1 is rotated, and that the articles to be treated are introduced through the opening 16 and are then removed through the same opening after treatment. The plate or cover 15 is conveniently available for use as a shelf upon which the articles may be temporarily placed prior to or following their treatment in the machine. If an article is to be treated on one side only a single passage through the machine may be sufficient, but if it is to be treated all over it may be necessary for it to be passed through the ma-

chine two or more times so that all of the desired surfaces thereof may be suitably acted upon.

At the conclusion of the mud blasting operation, some of the abrasive will adhere to the articles which have been treated and I, therefore, prefer to provide means for rinsing the articles before they are removed from the machine. For this purpose I provide rinsing nozzles 62 and 63 which are located within the housing above and below the work support and adjacent the opening 16. As shown most clearly in Fig. 5 these nozzles are connected by means of suitable piping 64 with the water supply pipe 49, this piping including a valve 64^a adapted to be controlled by a lever 65. The valve 64^a is normally closed but when rinsing is desired the operator may open it by pressing on the lever 65.

It is desirable to prevent dilution of the mixture in the reservoir 3 by the water used for rinsing. I therefore provide means for intercepting the rinse water and conducting it to the overflow. As shown there is provided for this purpose a tray 66 which is located vertically beneath the rinse spray nozzles. It is desirable to retain the abrasive material that may be washed from the articles and the tray 66 is therefore so constructed as to serve as a settling pan. At or near the center of the tray 66 is a pipe or nipple 67, the upper end of which is above the bottom of the tray. This pipe or nipple 67 discharges into a catch basin 68 mounted at the end of a discharge pipe 69, which pipe extends through the wall of the reservoir and is connected with the basin 44. It will be apparent that the rinse water will fall directly into the tray 66 and will accumulate until it can overflow through the nipple 67 and into the basin 68. This gives an opportunity for the abrasive to settle to the bottom of the tray 66 from which it can be removed from time to time and returned to the reservoir.

To facilitate removal of the abrasive from the tray 66 the said tray is mounted on rails 70, 70 which extend across the top of the reservoir. When the tray is filled or substantially filled with abrasive, the operator can remove the cover or shelf 15 and can then slide the tray 66 forward to a position where it can be more easily reached. Then the tray can be picked up and dumped into the reservoir and thereafter returned to its normal position.

I preferably provide a flexible curtain adjacent the opening 16 in the upper wall of the hood 10. This curtain is so arranged as to provide a chamber at the front of the hood which is separate and distinct from the remainder of the hood. Preferably and as shown the curtain comprises a plurality of closely spaced vertical chains 71, 71 which are connected at their upper ends with a curved rod 72. This rod is connected at its ends with the hood 10 and at its center with the cover 12. The rod 72 is shown in Fig. 3 but the chains are omitted. The flexible curtain, made up of the chains 71, 71 serves two purposes. It prevents the abrasive mixture discharged from the nozzles 4, 4 from being thrown or splashed toward the front and out through the opening 16. Thus it is ordinarily unnecessary to close the door 17 except when the spray devices are being used. The flexible chains permit the articles on the work support to freely pass out of and into the separate chamber at the front.

The flexible curtain has the further purpose

of preventing splash from the rinse water from passing rearward into the main portion of the housing from which it would be drained into the reservoir so as to dilute the mixture therein. The flexible curtain maintains substantially all of the rinse water within the spray chamber at the front so that it will be drained into the tray 66 and disposed of as already described.

10 What I claim is:

1. In an apparatus of the class described, the combination of a reservoir at the front for containing a liquid and abrasive mixture, means in the reservoir for agitating the mixture, a housing open at the front and positioned with its front portion above the reservoir and with its rear portion projecting rearward beyond the reservoir, the said housing having a bottom draining into the reservoir, a drive mechanism behind the reservoir and below the housing with a vertical shaft extending upward into the housing, a horizontal work support in the housing rotatable concentrically with the shaft and driven thereby, the front portion of the work support being above the reservoir and adjacent the housing opening, and means in the rear portion of the housing for withdrawing abrasive mixture from the reservoir and forcibly delivering it against articles on the rotary work support.

2. An apparatus as set forth in claim 1, wherein the reservoir is provided with a removable top cover located in front of the housing and closely adjacent the housing opening.

3. In an apparatus of the class described, the combination of a reservoir for containing a liquid and abrasive mixture, means in the reservoir for agitating the mixture, a housing adjacent the reservoir and having a partly cylindrical side wall, a work support in the housing rotatable about a vertical axis coincident with the side wall axis, a substantially horizontal manifold connectible with a supply of expansive fluid under pressure and positioned adjacent the said side wall and following the curvature thereof, a plurality of nozzles at different positions in the housing, suction pipes extending from the reservoir to the several nozzles, and pressure pipes extending radially from the manifold to the several nozzles for delivering expansive fluid which serves to withdraw abrasive mixture from the reservoir through the suction pipes and to forcibly deliver it against articles on the work support.

4. In an apparatus of the class described, the combination of a reservoir for containing a liquid and abrasive mixture, means in the reservoir for agitating the mixture, a housing adjacent the reservoir and having a partly cylindrical side wall, a horizontal work support in the housing rotatable about a vertical axis coincident with the side wall axis, a substantially horizontal manifold connectible with a supply of expansive fluid under pressure and positioned adjacent the outer face of the said side wall and following the curvature thereof, a plurality of pressure pipes of different lengths spaced apart and extending radially inward from the manifold, nozzles in the housing at the inner ends of the several pressure pipes, and suction pipes extending from the reservoir to the several nozzles and adapted to deliver abrasive mixture which is forcibly delivered through the said nozzles against articles on the work support.

5. In a wet sand blast apparatus, the combi-

nation of a movable work support, a nozzle positioned and adapted to forcibly deliver a mixture of liquid and abrasive against articles carried by the work support, a reservoir adapted to contain a quantity of the said liquid and abrasive mixture, means for conducting the mixture from the reservoir to the nozzle, a housing substantially enclosing the work support and the nozzle, the said housing being constructed and positioned to drain the mixture back into the reservoir, means within the housing positioned and adapted to deliver rinse water against the articles after they have been acted upon by the liquid abrasive mixture, and an abrasive settling tray in the housing adjacent the rinse means and adapted to receive therefrom the rinse water and any abrasive contained therein, the said tray having overflow means discharging exteriorly of the reservoir and positioned to permit the water to escape while the abrasive is retained.

6. A wet sand blast apparatus as set forth in claim 5, wherein the abrasive tray is movable and wherein there is a drain basin in fixed position within the housing and adapted to normally receive drainage from the said abrasive tray and conduct it to a point exterior of the reservoir.

7. A wet sand blast apparatus as set forth in claim 5, wherein the abrasive tray is movable and is immediately adjacent the reservoir so that upon being moved its contents may be readily dumped into the reservoir.

8. The combination in an apparatus of the class described, of a reservoir for containing a liquid and abrasive mixture, a housing positioned with a portion thereof above the reservoir, a horizontal work support of openwork construction in the housing partly above the reservoir and rotatable about a vertical axis, means in the housing for withdrawing abrasive mixture from the reservoir and forcibly delivering it against articles on the rotary work support, means in the housing above the reservoir and spaced from the abrasive delivering means for delivering rinse water against the articles after they have been acted upon by the abrasive mixture, and means in the housing below the work support and above the reservoir and adapted to receive the rinse water and prevent it from passing into the reservoir.

9. An apparatus as set forth in claim 8, wherein the means for receiving the rinse water is a settling tray provided with overflow means discharging exteriorly of the reservoir and positioned to permit the water to escape while the abrasive is retained.

10. The combination in an apparatus of the class described, of a reservoir at the front for containing a liquid and abrasive mixture, a housing open at the front and positioned with its front portion above the reservoir, a horizontal work support of open work construction rotatable about a vertical axis and positioned in the housing with its front portion above the reservoir and adjacent the front opening, means in the rear portion of the housing for withdrawing abrasive mixture from the reservoir and forcibly delivering it against articles on the rotary work support, means in the front portion of the housing for delivering rinse water against the articles after they have been acted upon by the abrasive mixture, a settling tray in the housing below the work support and above the reservoir and accessible from the front of the

apparatus, the said tray being adapted to receive the rinse water and any abrasive carried thereby, and overflow means for the settling tray discharging exteriorly of the reservoir and positioned to permit the escape of water while the abrasive is retained.

11. An apparatus as set forth in claim 10, wherein the settling tray is readily movable to permit the abrasive contents thereof to be dumped into the reservoir.

12. An apparatus as set forth in claim 10, wherein there are horizontal parallel rails above the reservoir and wherein the settling tray is slidably supported upon the said rails.

13. An apparatus as set forth in claim 10, wherein the settling tray is readily movable to permit the abrasive contents thereof to be dumped into the reservoir, and wherein the overflow means includes a drain basin in fixed position below the normal position of the tray.

14. The combination in a wet sand blast apparatus, of a rotatable horizontal work support, a nozzle positioned and adapted to forcibly deliver a mixture of liquid and abrasive against articles carried by the work support, a housing substantially enclosing the work support and the nozzle and having an opening in one side thereof through which articles to be treated can be placed upon and removed from the work support, a flexible curtain within the housing providing a chamber adjacent the said opening, and means in the said chamber adapted to deliver water against the articles on the work support so as to rinse them.

15. The combination in a wet sand blast apparatus, of a rotatable horizontal work support, a nozzle positioned and adapted to forcibly deliver a mixture of liquid and abrasive against articles carried by the work support, a housing substantially enclosing the work support and the nozzle and having an opening in one side

thereof through which articles to be treated can be placed upon and removed from the work support, a flexible curtain within the housing providing a chamber adjacent the said opening, means in the said chamber adapted to deliver water against the articles on the work support so as to rinse them, and an abrasive settling tray adjacent the rinse means and adapted to receive therefrom the rinse water and any abrasive contained therein, the said tray having overflow means which permits the water to escape while retaining the abrasive.

16. The combination in an apparatus of the class described, of a reservoir at the front for containing a liquid and abrasive mixture, means in the reservoir for agitating the mixture, a housing open at the front and positioned with its front portion above the reservoir, a horizontal work support of openwork construction rotatable about a vertical axis and positioned in the housing with its front portion above the reservoir and adjacent the front opening, means in the rear portion of the housing for withdrawing abrasive mixture from the reservoir and forcibly delivering it against articles on the rotary work support, a flexible curtain within the housing providing a chamber adjacent the said front opening, means in the said chamber for delivering rinse water against the articles after they have been acted upon by the abrasive mixture, and means in the housing below the work support and above the reservoir and adapted to receive the rinse water and prevent it from passing into the reservoir.

17. An apparatus as set forth in claim 16, wherein the means for receiving the rinse water is a settling tray provided with overflow means discharging exteriorly of the reservoir and positioned to permit the water to escape while the abrasive is retained.

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