Aug. 2, 1966 L. V. ABRAMS ETAL 3,263,373

VIBRATORY FINISHING APPARATUS

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Fig. 1.

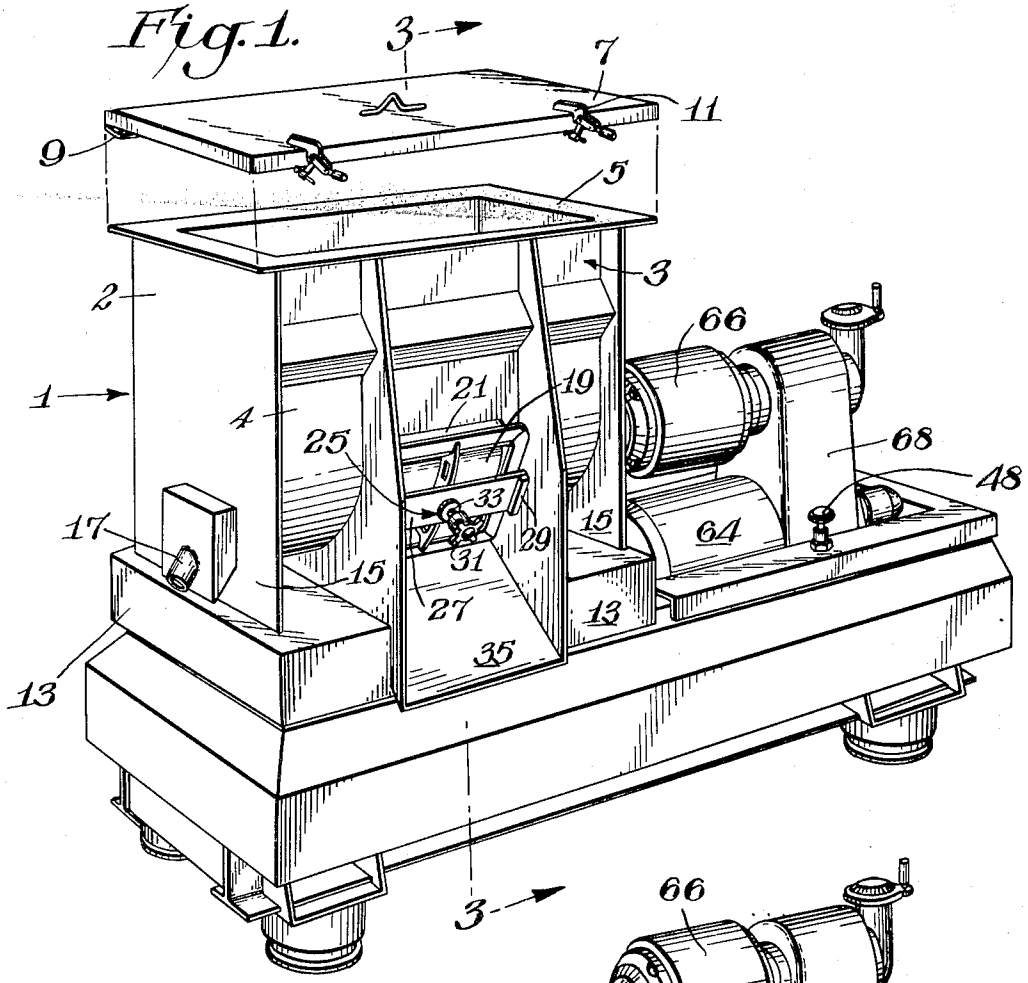

Fig. 2.

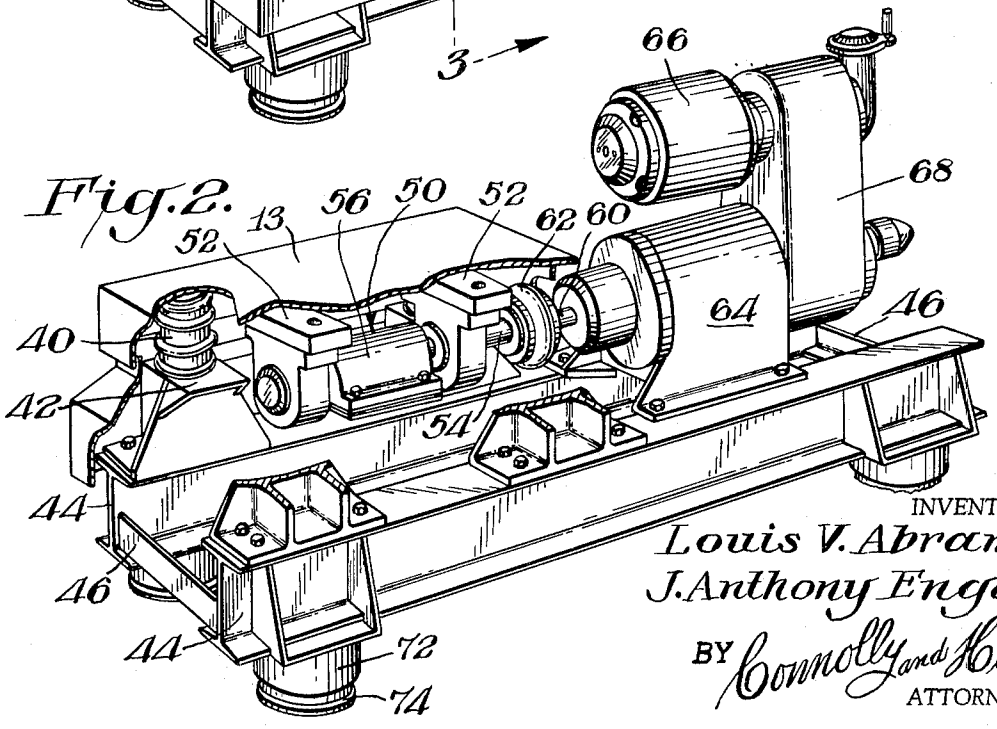

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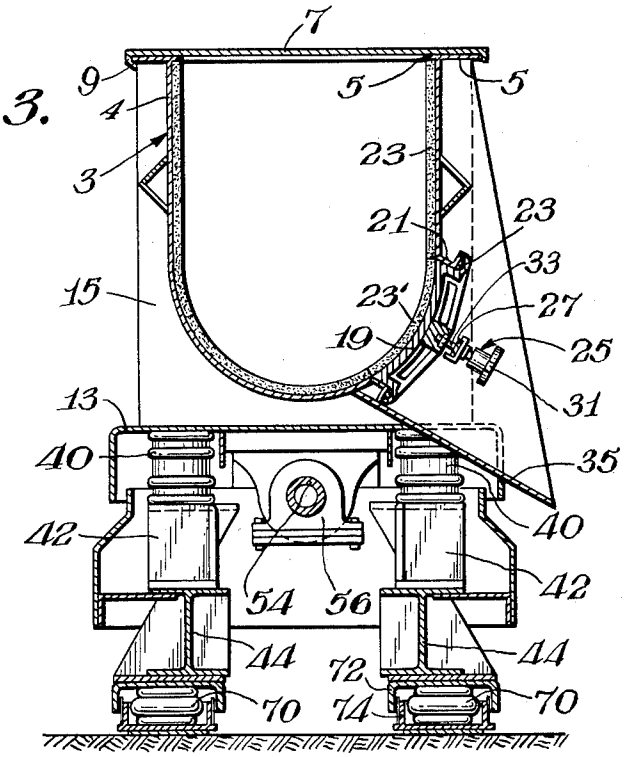
Fig. 3.



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VIBRATORY FINISHING APPARATUS

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This invention relates to vibratory finishing and more particularly to the type of vibratory finishing which is suitable for treating work pieces of metal or similar material with solid and/or liquid treating agents for the purpose of deburring, descaling, cleaning, polishing, burnishing, rounding corners and edges, etc.

The vibratory finishing apparatus of the present invention provides an improvement over prior vibratory apparatus. For instance, the apparatus is particularly adaptable for use with liquid treating agents as well as with solid treating agents for treating the work pieces in a vibratory operation for the purpose mentioned above.

In addition, the apparatus of the present invention is most suitable for ease of operation in that the vibrating tub of the apparatus need not be tilted or pivoted to empty the contents thereof after the operation has been completed. The contents can include liquid and/or solid treating agents as well as the work pieces.

It is, therefore, an object of the present invention to provide a new and novel vibratory apparatus for vibratory treatment of work pieces wherein the material being treated and any liquids contained in the vibratory tub can be discharged from the tub without tilting the tub after the vibratory operation is completed.

It is a further object of the invention to provide a vibratory apparatus of the above object wherein the top edge of the tub has an inwardly extending ledge to trap and prevent any foreign matter from entering the tub between the top edge of the tub and the lid or cover for the tub.

Another object of the invention is to provide a vibratory tub having a discharge door for the work pieces, and a drain for liquid treating agents.

A further object of the invention is to provide a vibratory apparatus of the above objects wherein the entire tub inner surface, including a discharge door for the tub, is lined with a suitable protective layer which prevents damage by the tub contents to the tub inner surface itself.

Still a further object of the invention is to provide an apparatus of the above objects wherein a chute extending from the outer surface of the tub extends below a discharge opening in the tub whereby the work pieces can be discharged directly from the tub, onto the chute, and into a suitable discharge or collecting unit.

Other objects and advantages of the invention will become more apparent from the study of the following description and drawings wherein:

FIG. 1 is a perspective of the apparatus of the present invention,

FIG. 2 is a detail partially in section of the lower portion of the apparatus of FIG. 1, and

FIG. 3 is a section taken along lines 3—3 of FIG. 1.

As seen in the drawings, the vibrator assembly **1** is formed of an open top tub **3** which has an inwardly and outwardly extending top ledge **5** extending along the sides and ends of the tub **3**. This ledge affords additional protection for preventing foreign matter from working its way into the tub between the top of the tub and a cover **7** which locks onto the externally extending portion of ledge **5** by virtue of the underslung lip **9** which fits over the outwardly extending portion of the ledge **5**, and the turn clamps **11** secured to the front of the top **7** which also fit under outwardly extending portion of ledge **5**.

Upon rotation of the clamp shafts, the top **7** is firmly clamped down against the ledge **5**.

The tub has vertically disposed end walls **2** and side walls **4** which side walls curve inwardly at the bottom to provide a curved bottom wall portion for the tub.

The tub **3** is fixed to a base support **13** (FIG. 2) by lower extensions **15** of the end panels of the tub **3**.

As seen in the drawings, a drain spout **17** for draining liquid from the tub is positioned at the free end of the tub near the bottom thereof. The drain can be of the type where it is opened and closed by rotating the spout from close to open position and vice versa. With this arrangement, the tub can be drained of liquid without tilting or pivoting the tub on its side. Also, other type drain opening and closing arrangements can be used such as a turn handle, etc.

Also, there is a tub discharge door **19** in the lower portion of the tub **3** on one side thereof. The discharge door structure is shown in better detail in FIG. 3. As shown in FIG. 3, the wall of the tub **3** flanges outwardly to form an outwardly extending flanged port **21**. The door **19** also flanges outwardly at its edges to form a cooperating flange fit with the flanged port **21** of the tub **3**. To seal the connection between the door and the flange port **21**, a rubber O ring **123** is sandwiched between the flange of the port **21** and the flange of the door **19** as shown in FIG. 3.

As shown better in FIG. 3, the tub **3** has a protective liner **23** which abuts against the inwardly extending portion of ledge **5** which is formed of a suitable hard metal and which is non-corrosive to liquids which may be used in the finishing treatment of the work pieces. The metal liner **23** also protects the inner surface of the tub **3** from any damage brought about by contact with the abrasive media or other finishing media for the work pieces which may knock or rub against the inner surface of the tub thus damaging the same.

In similar manner, the inner surface of the door **19** also has secured thereto a protective liner **23'** which mates with the liner **23** of the tub to form an uninterrupted protective liner surface along all areas of the tub.

The door includes an expansion lock arrangement **25** for locking the door in place prior to the vibratory operation and for removing the door after the vibratory treatment is completed. As seen in FIGS. 1 and 3, a lock plate **27** is placed behind lock blocks **29** secured to the inner surface of the side walls of a chute (to be described later). By rotating the turn handle **31**, and thus its threaded shaft **33**, the lock plate **27** can be moved outwardly tightly against the lock blocks **29**. This action also forces the discharge door **19** firmly into and against the flanged port **21** of the tub to form a tight fitting connection therebetween.

Conversely, upon rotation of the turn handle **31** and its threaded shaft **33** in the opposite direction, the lock plate **27** is moved away from the lock blocks **29** and the door **19** may be easily removed from the port **21** to gain access to the tub interior.

Another important feature of the invention is the chute **35** which extends outwardly from the external surface of the tub and surrounds and fits under the discharge door **19**. With this arrangement, the material being discharged through the tub port **21** will fall into the chute **35** and slide down into a suitable carry away or hoist lift without further manipulation. The lower portion of the chute **35** is cradled within a front cut out portion of the platform **13** as shown in FIGS. 1 and 3.

As shown better in FIGS. 2 and 3, the support platform **13** is supported at its four corners by expandable air cushions **40** which are connected at their upper and lower ends to the underside of the platform **13** and to pedestals **42** respectively. The pedestals **42** are in turn

connected to longitudinally extending rails **44** connected by cross struts **46**.

The air bags **40** are connected to air supply and discharge mechanisms (not shown) whereby the height of the air bag can be adjusted by adjusting the air pressure within the cushions. This is done through control valve **48** (see FIG. 1). By varying the height of the air bag and the air pressure therein, the rate and degree of gyration or vibration is varied as desired according to the particular requirements of the finishing operation. These air bags are better described in Patent No. 3,063,207.

Also connected in underslung manner to the undersurface of the platform **13** is the vibratory shaft arrangement generally identified as **50** which provides a gyratory motion or vibratory motion to the tub **3**, being transmitted through the rubber air cushions **40**.

As shown in FIG. 2, bearing supports or housings **52** are secured to the underside of platform **13**. A driven shaft **54** is supported by the supports **52**. An eccentric weight **56** is positioned around and secured to that portion of the shaft lying between the bearing supports **52**. The driven shaft **54** is connected to the drive shaft **60** by a flexible coupling arrangement **62**. The drive shaft **60** is housed in a bearing support **64** secured to the rails **44**. The drive shaft is connected with the electric motor **66** for driving the shaft **60** through a housing **68** which contains a variable speed drive arrangement such as a Reeves pulley type arrangement. Such a driving arrangement is also described and disclosed in Patent No. 3,063,207 referred to above.

The supporting rails **44** are in turn supported by air cushions **70** (FIG. 3) at each end of the rails. The cushions **70** are housed within telescoping upper and lower units **72** and **74**. This is necessary since the height of the air cushions **70** can also be varied by providing air supply connections with the cushions **70**.

In the operation of the above apparatus, the material or work pieces to be finished is loaded into the tub along with a suitable grit or other abrasive media, and a liquid treating agent, if desired. The top **7** is then firmly clamped on the tub and the electric motor **66** is started which then drives shafts **60** and **54** to place the eccentric weight **56** into rotation. In view of the eccentric weight, the vibration producing assembly **50** causes the platform **13** to vibrate because of the transmission of the vibratory motion from the assembly **50** and through the air bags **40** which support the platform **13**. Since the tub **3** is secured or fixed to platform **13** it also vibrates and the abrasive medium is made to follow a gyratory or vibratory motion along with the work pieces.

After the operation is completed, the electric motor is turned off, the top **7** removed and the drain spout **17** opened to remove liquid therefrom. When the liquid has drained, the discharge door **19** is removed and the work pieces along with the abrasive media and removed debris, fines, etc., is discharged through the tub port **21** into the chute **35** and into a suitable hoist or carry away (not shown). Additional vibration is, of course, given through the air cushion floor supports **70** which also pick up and transmit vibratory motion to the tub through the air cushions **40**.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

We claim:

1. A vibratory apparatus for treating work pieces comprising a base support, a tub supported in upright position by said base, said tub having vertically disposed end walls and side walls which curve inwardly at the bottom to provide a curved bottom wall portion for the tub, a liquid drain spout extending through and from one of the vertically disposed end walls, a work piece discharge door which fits in an opening therefor in the curved bottom wall portion of the tub to engage with said wall portion, said door when in closed position mating with the inner surface of the tub to provide a flush uninterrupted inner tub surface, a top cover for the tub, resilient means connecting the tub with said base support, and means connected with the base support for vibrating the tub.

2. The apparatus of claim **1** wherein the top edge of the tub has an inwardly extending ledge, and a protective liner covering the interior of said tub and abutting against said ledge.

3. The apparatus of claim **1** wherein the tub is supported by a platform, and air cushions support said platform.

4. The apparatus according to claim **3** wherein means are provided for varying the air pressure within said cushions.

5. The apparatus according to claim **3** wherein the means for vibrating the tub are fixed to the underside of the platform.

6. The apparatus according to claim **5** wherein the vibration producing means comprises a driven shaft having an eccentric weight mounted thereon.

7. The apparatus according to claim **5** wherein the means for vibrating the platform and tub is connected by flexible coupling to a drive means supported on the base support.

8. The apparatus according to claim **1** wherein a chute extends out from the curved bottom wall portion of the tub around and under the opening for said door in the tub for conveying discharged work pieces into a suitable receiver.

9. The apparatus according to claim **8** wherein a portion of said base support is recessed, and said chute is disposed in said recessed portion.

10. The apparatus according to claim **1** wherein said opening for said door has an outwardly extending flange, the door has an outwardly extending flange which fits within and against the port flange, and an expanding lock means is connected with the door which releases and tightens the door in said port.

11. The apparatus according to claim **10** wherein the expanding lock means includes a lock plate which cooperates with a pair of lock blocks supported on the inner wall of said chute.

12. The apparatus according to claim **1** wherein the inner surface of the tub and inner surface of the discharge door have a protective layer secured thereto for preventing damage to the inner surface of the tub, said layers mating when the door is in closed position to provide an uninterrupted protective surface along all inner surfaces of the tub.

13. The apparatus of claim **1** wherein the base support is also supported by air cushions connected with the floor.

14. The apparatus according to claim **13** wherein means are provided for varying the air pressure in said air cushions.

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