Nov. 5, 1968 J. A. ENGEL 3,408,774

VIBRATORY FINISHING APPARATUS

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Fig. 1.

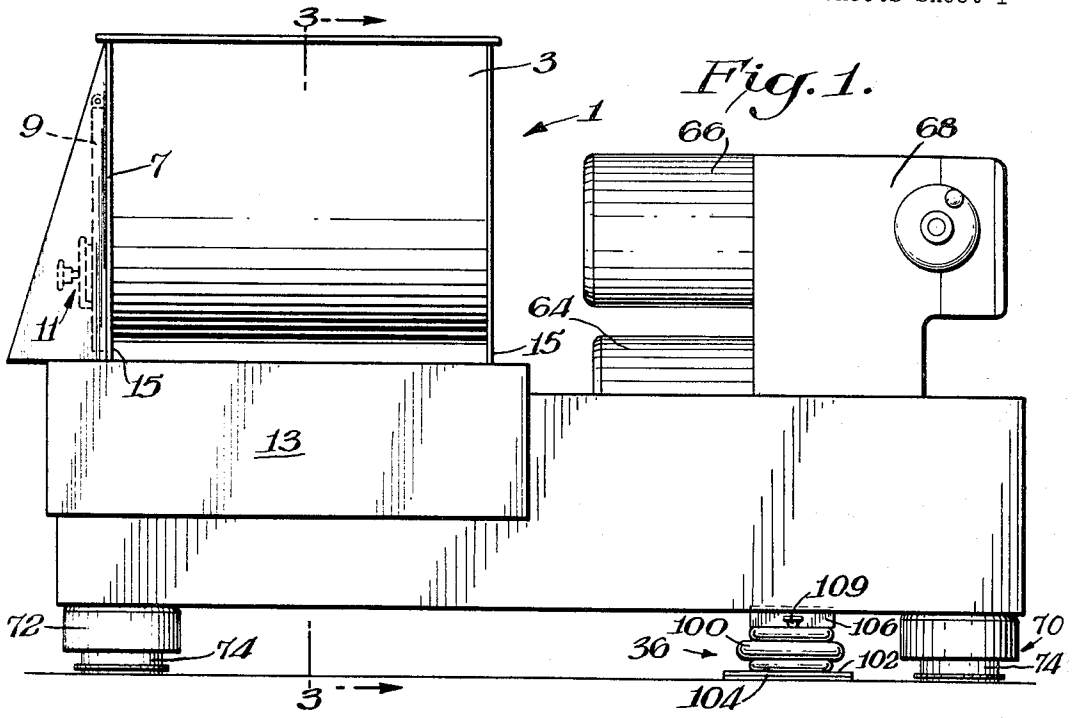
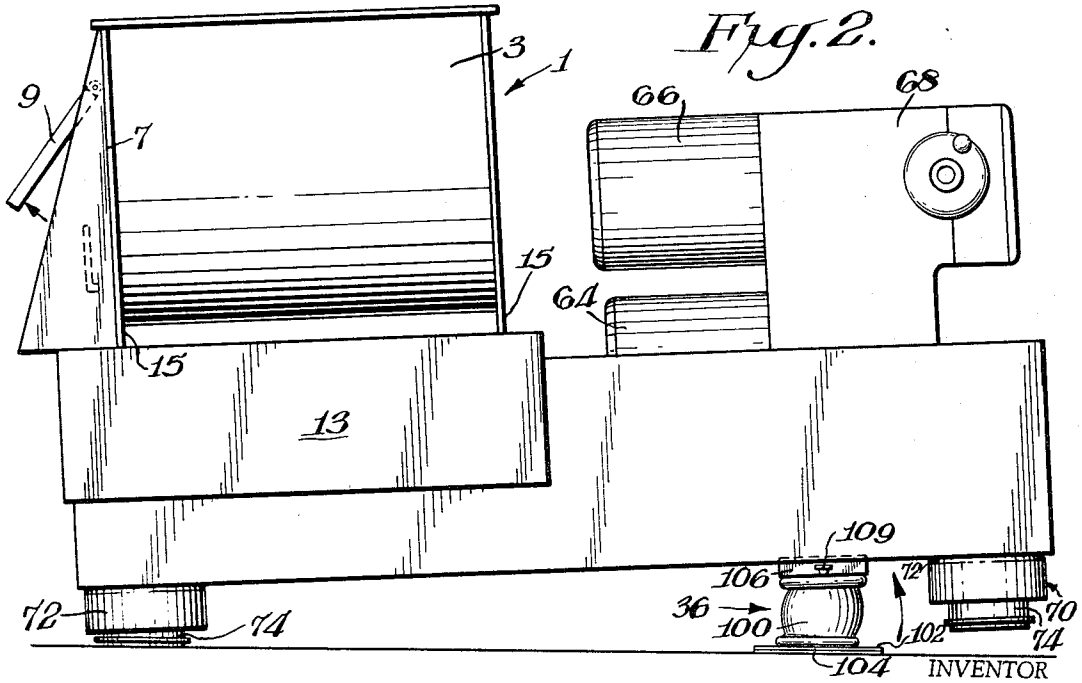


Fig. 2.



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Fig. 3.

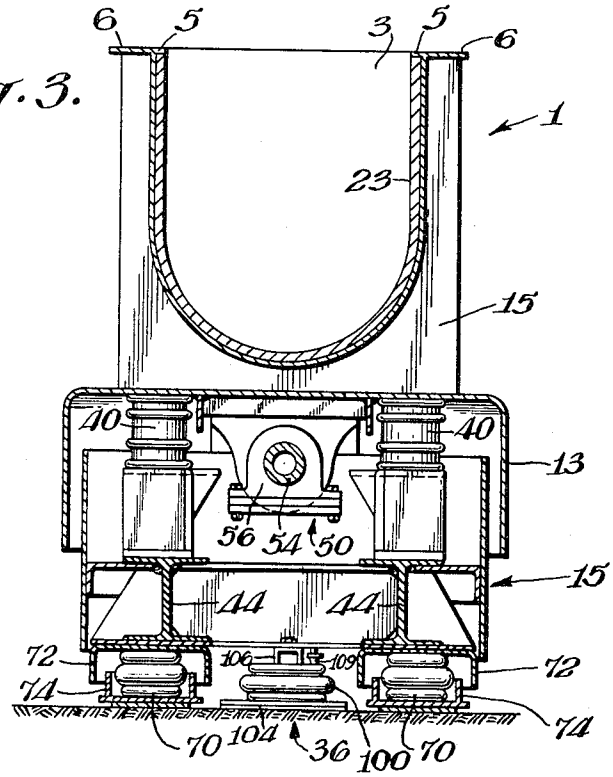


Fig. 4.

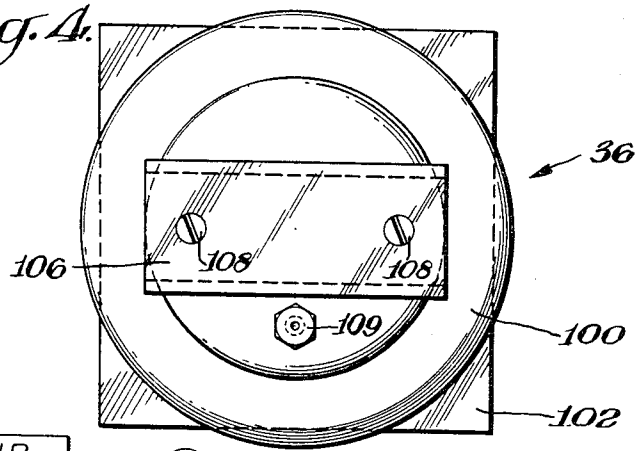
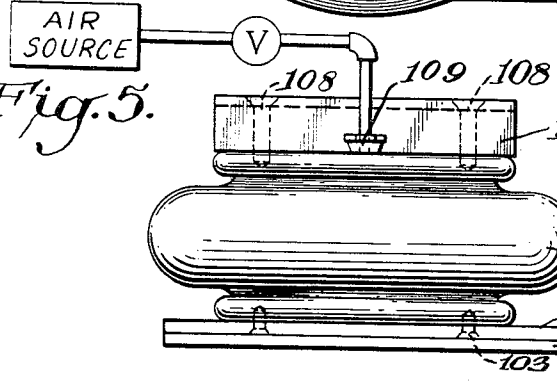


Fig. 5.



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VIBRATORY FINISHING APPARATUS

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4 Claims. (Cl. 51—163)

ABSTRACT OF THE DISCLOSURE

A vibratory apparatus includes a vibratory tub resiliently mounted upon a base support by inflatable cushions with a door being at one end of the tub extending substantially to the bottom thereof and with inflatable cushions resiliently supporting the base support; the tub is tilted for unloading by an additional inflatable cushion disposed remote from the door.

This invention relates to vibratory finishing and more particularly to the type of vibratory finishing which is suitable for treating pieces of metal of similar material for the purpose of deburring, descaling, burnishing, rounding corners and edges, etc.

The vibratory finishing apparatus of the present invention provides an improvement over prior vibratory finishing apparatus. For instance, in prior apparatus, a problem arises when the material has been finished and it is necessary to unload the parts and cleaning media. Various arrangements have been provided with limited success for accomplishing these functions.

An object of this invention is to provide a vibratory finishing apparatus which effectively unloads the finished parts and cleaning media.

A further object is to provide such a vibratory apparatus which performs the unloading operation automatically instead of manually.

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

FIG. 1 is a side view in elevation of one embodiment of this invention;

FIG. 2 is a side view similar to FIG. 1 in a different phase of operation;

FIG. 3 is a section taken alone 3—3 of FIG. 1;

FIG. 4 is a plan view of a portion of the apparatus shown in FIGS. 1–3; and

FIG. 5 is a side view of the portion of the apparatus shown in FIG. 4.

In accordance with this invention, the vibratory container is provided with an end door which extends substantially to the bottom of the container. When the finishing operation is completed the container and its entire support structure is tilted by, for example, an inflatable cushion disposed remote from the end door. Accordingly, the end of the container having the door is inclined at a lower level than the remainder of the container and both the finished parts and the cleaning media automatically flow through the door without the necessity of manual unloading.

As shown in the drawings, the vibrator assembly **1** is formed of an open end tub **3** which has a peripheral inwardly extending top ledge **5** and an outwardly extending top ledge **6**. Ledge **5** provides a convenient gauge for protective liner **23** as best shown in FIG. 3.

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

As shown in FIG. 3 protective liner **23** completely covers the interior of tub **3**. Protective liner **23** is formed

of a suitable rubber which is non-corrosive to the liquid which may be used in the finishing treatment of the workpieces. The rubber liner **23** also protects the inner surface of the tub **3** from damage brought about by contact with the abrasive media or other finishing media for the workpieces which may knock or rub against the inner surface of the tub and thus might damage it or the workpieces. As shown in FIGS. 1 and 2 and wall **7** of tub **3** includes a door **9** which extends substantially the entire length of wall **7**. Door **9** also has a protective liner which mates with liner **23** of the tub to form an uninterrupted protective liner surface along all areas of the tub. Additionally door **9** is edged with a sealing material to prevent leakage of liquids from tub **3** during operation when door **9** is closed by locking arrangement **11**.

Support **13** is resiliently mounted upon base **15** by a plurality of air bags **40**. Air bags **40** are connected to air supply and discharge mechanism (not shown) wherein which the height of the air bags can be adjusted by adjusting the air pressure within the cushions **40**. 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.

The vibration or gyration of tub **3** is accomplished for example in a manner described in co-pending application 340,225 filed Jan. 27, 1964, now Patent No. 3,263,373, issued Aug. 2, 1966. As shown in FIGS. 1–3 a vibratory shaft arrangement generally identified as **50** is connected in underslung manner to the undersurface of platform **13** to provide a gyratory motion to tub **3**; the motion being transmitted through air cushions **40**. This arrangement **50** includes electric motor **66** for driving a drive shaft **60** which is housed in a bearing support **64** through a variable speed drive arrangement such as a Reeves pulley type arrangement housed in housing **68**. Such a drive arrangement is also described and disclosed in Patent No. 3,063,207 referred to above.

The drive shaft operates a driven shaft **54** upon which is mounted an eccentric weight **56** to impart the gyratory motion to tub **3** as described in copending application S.N. 340,225 filed Jan. 27, 1964, now Patent No. 3,263,373, issued Aug. 2, 1966. Base support **15** includes a pair of supporting rails **44** (FIG. 3) which are in turn supported by air cushions **70**. The cushions **70** are housed within telescoping upper and lower units **72** and **74**. This is necessary since the height of the air cushion **70** may also be varied by providing an air supplying connection with the cushions **70**. This telescoping arrangement is also especially necessary for the pair of cushions disposed under end wall **7** of tube **3** to enable the entire assembly **1** to pivot about these air cushions.

In the operation of the above apparatus, the materials of workpieces to be finished are loaded into the tub along with a suitable grit or other abrasive media, and a liquid treating agent if desired. The workpieces and cleaning media are inserted into the open top of tub. This may be done either by hand or by conveyor arrangement (not shown). Electric motor **66** is then started which drives the drive shaft and driven shaft **54** to rotate the eccentric weight. In view of the eccentric weight **56**, the vibrator producing assembly **50** causes the platform **13** to vibrate because of the transmission of the vibratory motion from the assembly **50** and through the bags **40** which support the platform. Since the tub **3** is secured or fixed to the platform **13**, it also vibrates and the abrasive medium is made to follow a gyratory or vibratory motion along with the workpieces.

After the operation is completed the electric motor is

turned off and the locking mechanism **11** is disengaged from door **9**. The entire assembly is then lifted or tilted by inflating cushion or tilting mechanism **36** as later described so that the abrasive media and finished parts are completely unloaded through the open end **7** of tub **3** as shown in FIG. 2.

FIGS. 4–5 show the details of tilting mechanism **36**. As shown therein the tilting mechanism comprises a single airmount or cushion **100** which receives air through inlet **109**. Cushion **100** is secured to base plate **102** by means of a plurality of cap screws **103**. Base plate **102** is, in turn, mounted on pad **104**. The top of cushion **100** is secured to the upper surface of a dished spacer **106** by means of cap screws **108**, and spacer **106** is for example secured to a flange or bottom plate of base **15** as shown in FIG. 3. FIG. 5 shows tilting mechanism **36** in the deflated position while FIG. 2 shows cushion **100** expanded to elevate assembly as shown in FIG. 3. Tilting mechanism **36** is mounted on the center line of assembly **1** to uniformly raise the assembly and facilitate the discharge of media and parts from open end **7**.

FIG. 5 also schematically shows means for varying the amount of air in bag or cushion **100**.

Obviously, many modifications and variations of the present invention are possible in the 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.

What is claimed is:

1. A vibratory apparatus for finishing workpieces comprising a base support, a vibratory tub, inflatable cushion supports connecting said tub with said base support in a fixed upright position, means connected with said base support for vibrating said tub, a door at one end of said tub extending substantially to the bottom of said tub, a plurality of air cushion feet connected to and being below said base support, tilting means connected to said base support remote from said door for rotating said base support and said tub whereby the portion of said tub having said door is at a lower elevation than the remaining portions of said tub, said plurality of air cushion feet including at least one air cushion foot disposed at an end of said base support near said portion of said tub having said door, said tilting means including an inflatable air bag connected to said base support remote from said door, means for varying the amount of air in said air bag to control its height thereof, and said air cushion foot comprising pivot means whereby inflating said air bag causes said base support to rotate about said air cushion foot.

2. The apparatus of claim **1** wherein said tilting means cushion is disposed along the longitudinal axis of said base support.

3. The apparatus of claim **1**, wherein a pair of telescopic tubes encircles each of said air cushion feet, one of said telescopic tubes being secured to said base support to move therewith and being disposed over its respective air cushion, and the other of said telescopic tubes being disposed under its respective cushion whereby it remains relatively stationary with respect to said base support.

4. The apparatus of claim **1** wherein a liner is mounted in said tub, said tub having a peripheral flange extending inwardly thereof, the top edge of said liner contacting said peripheral flange, and a liner section on said door mating with the liner on the remainder of said tub to provide an uninterrupted liner for said tub and said door.

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