May 31, 1966 P. F. H. REICHERT ETAL 3,253,369

APPARATUS FOR CLEANING AND PROCESSING ARTICLES

Original Filed Aug. 17, 1961 2 Sheets-Sheet 1

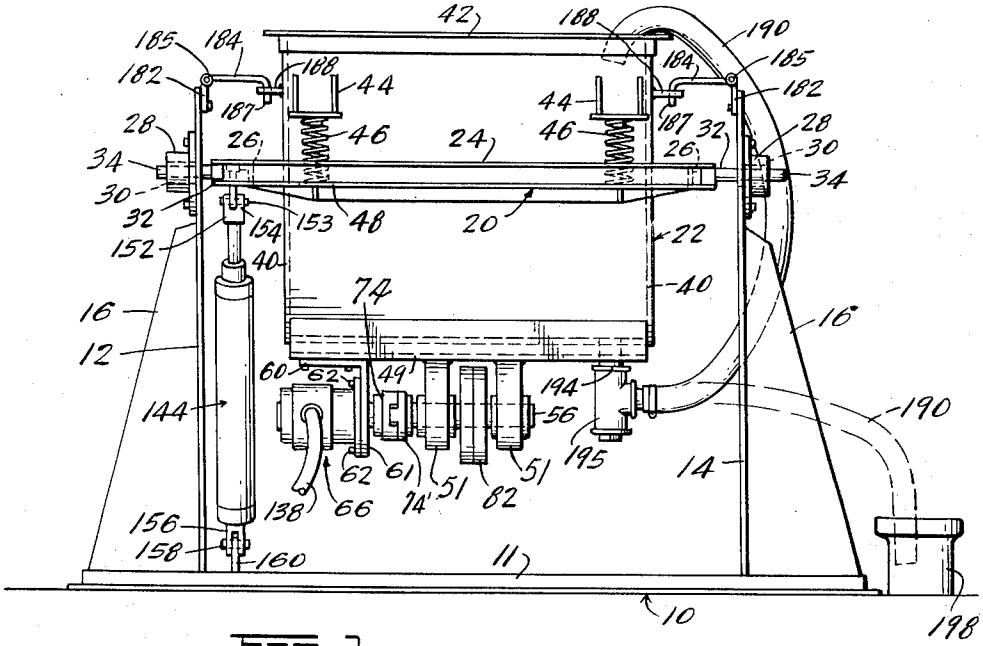


FIG-1-

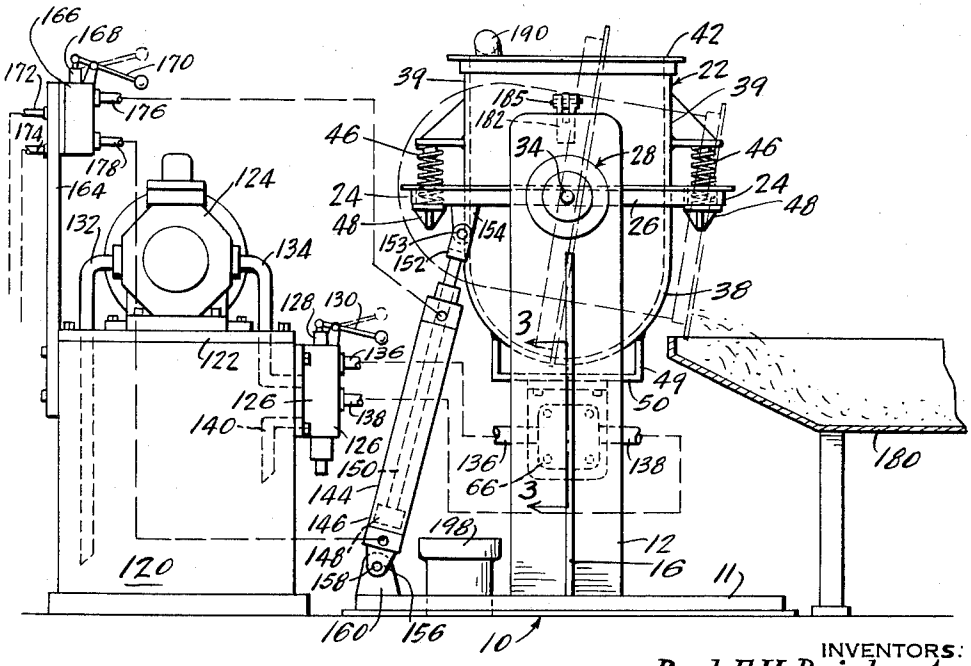


FIG-2-

INVENTORS:
Paul F.H. Reichert,
Thomas J. Dion.
BY
Harry O. Ernsberger
ATTORNEY

May 31, 1966 P. F. H. REICHERT ETAL 3,253,369

APPARATUS FOR CLEANING AND PROCESSING ARTICLES

Original Filed Aug. 17, 1961 2 Sheets-Sheet 2

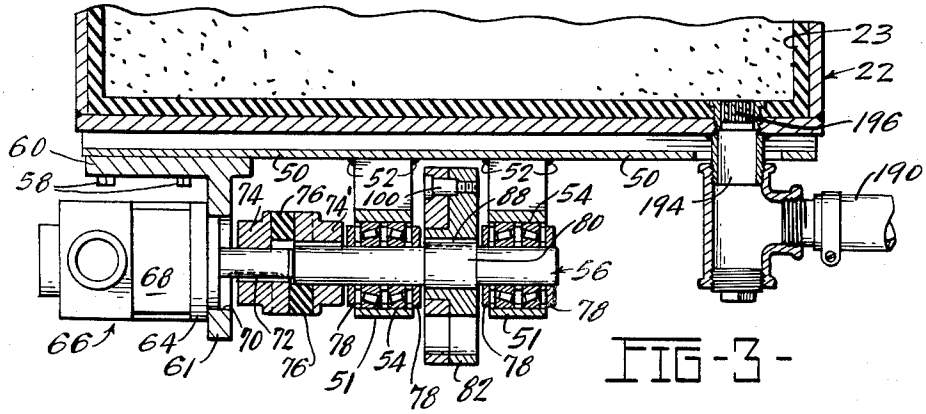


FIG-3-

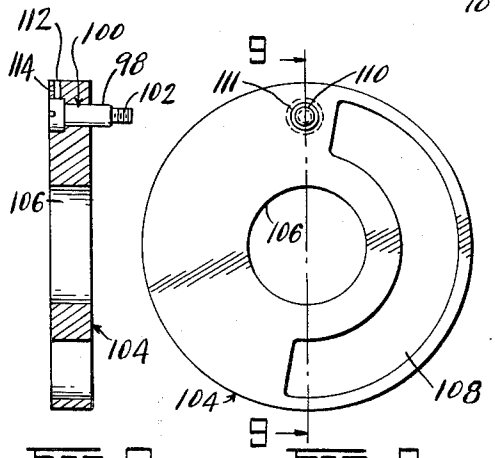


FIG-9-

FIG-8-

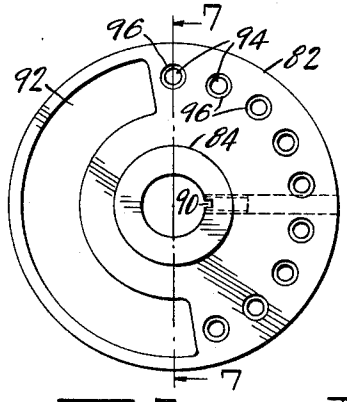


FIG-6-

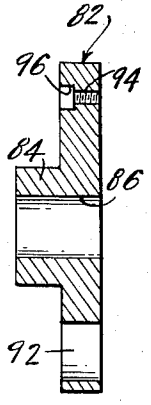


FIG-7-

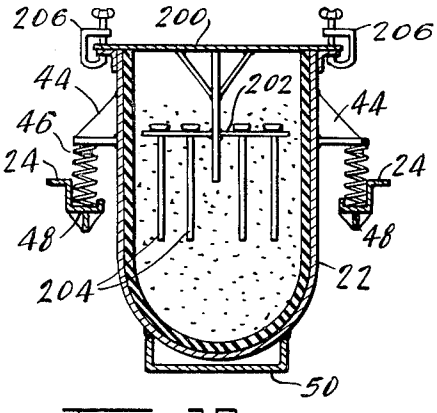


FIG-10-

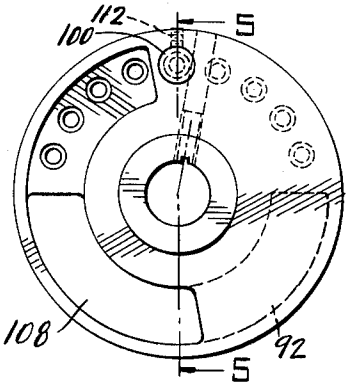


FIG-4-

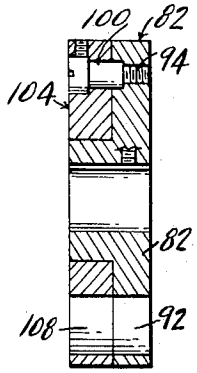


FIG-5-

INVENTORS:
Paul F.H. Reichert,
Thomas J. Dion.
BY
Harry O. Ernsberger
ATTORNEY

United States Patent Office 3,253,369 Patented May 31, 1966

3,253,369
APPARATUS FOR CLEANING AND PROCESSING ARTICLES

Paul F. H. Reichert and Thomas J. Dion, both of Toledo, Ohio, assignors to The Reichert Float & Manufacturing Company, Toledo, Ohio, a corporation of Ohio

Continuation of application Ser. No. 132,063, Aug. 17, 1961. This application Jan. 2, 1964, Ser. No. 335,289
12 Claims. (Cl. 51—163)

This application is a continuation of our application Serial No. 132,063, filed August 17, 1961, now abandoned.

This invention relates to apparatus for cleaning and processing articles or parts and more especially to apparatus for agitating or vibrating the articles or parts in the presence of a comminuted treating, cleaning or abrasive media.

The cleaning and finishing of articles or parts, particularly those of metal, such as castings, stampings and the like have heretofore been laborious and time consuming operations as such articles or parts are usually formed with sharp or irregular edges or surfaces which necessarily must be further processed or treated to enhance the use or saleability of the articles or parts. Endeavors have been made to agitate the parts in the presence of a cleaning or abrasive material in a receptacle by mechanical means to effect a finishing or cleaning of the parts but such devices have been unsatisfactory beacuse of lack of control of the frequency and amplitude of vibration and the severe wear of the components of a mechanical vibrating means.

The present invention embraces an apparatus particularly for use for cleaning, descaling, finishing, polishing, deburring, abrading or burnishing, articles, parts or components by vibration in the presence of a movable or flowable media wherein the amplitude and frequency of vibration may be varied and controlled to obtain the most efficient treating or processing action of the media on the articles, parts or components.

An object of the invention resides in an apparatus comprising a receptacle resiliently supported in combination with a variable speed fluid-actuated means for effecting vibratory movements of the receptacle whereby the most efficient frequency of vibration or agitation of the receptacle and the treating media may be attained and the articles, parts or components in the receptacle processed, cleaned or finished in a minimum of time.

A further object of the invention resides in a resiliently mounted receptacle arranged to be vibrated by a fluid actuated means wherein the frequency and amplitude of vibration may be varied to attain the most efficient processing of articles in the receptacle, the arrangement embodying motive means for tilting the receptacle relative to its support to discharge the articles from the receptacle.

Another object of the invention resides in a processing tank or receptacle arranged to be vibrated by variable speed fluid actuated means, the apparatus being adapted for treating or processing articles in a dry or wet media as may be required by the character of the articles.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawing of a form of the invention, which may be preferred, in which:

FIGURE 1 is a side elevational view of an apparatus of the invention;

FIGURE 2 is an end elevational view of the apparatus illustrating the fluid pressure system and actuators and controls therefor;

FIGURE 3 is an enlarged sectional view taken substantially on the line 3—3 of FIGURE 2;

FIGURE 4 is an elevational view of means for effecting vibration of the receptacle containing the articles to be processed;

FIGURE 5 is a sectional view taken substantially on the line 5—5 of FIGURE 4;

FIGURE 6 is an elevational view of one of the components of the vibration producing means;

FIGURE 7 is a vertical sectional view taken substantially on the line 7—7 of FIGURE 6;

FIGURE 8 is an elevational view of another of the components of the vibration producing means;

FIGURE 9 is a sectional view taken substantially on the line 9—9 of FIGURE 8, and

FIGURE 10 is a sectional view through the parts receiving receptacle illustrating a method of supporting certain articles or parts during vibratory processing operations.

While the apparatus of the invention are particularly usable for cleaning, deburring, descaling, abrading, burnishing, finishing or polishing articles or parts, particularly articles or parts of metal, it is to be understood that the apparatus may be utilized to advantage wherever it is desirable to vibrate, at comparatively high frequencies, a plurality of articles or parts formed of plastic or other materials and a treating media.

Referring to the drawings in detail, the apparatus includes a main frame or support **10** comprising a base plate **11** to which is secured spaced vertical frame members or plates **12** and **14** of substantially the same shape. The frame members **12** and **14** are respectively provided with reinforcing webs **16**. The main frame **10** supports a supplemental frame **20** forming a carriage or carrier for mounting the receptacle, tank or tumbler **22** provided with an inner liner **23** of nonmetallic material such as rubber, synthetic rubber or resinous material.

In the embodiment illustrated, the receptacle carrier or supplemental frame **20** comprises longitudinally extending bars **24** preferably of L-shape cross-section spaced to accommodate the tank **22** and joined at their ends by transverse members **26** which are welded or otherwise fixedly secured to the longitudinal bars **24**.

Secured to each of the vertical struts or frame members **12** and **14** are bearing supports or members **28** each provided with a bearing bushing or sleeve **30**. Secured to each of the transverse bars or members **26** of the carrier **20** are brackets **32**, each of the brackets being equipped with a tenon or shaft **34** journaled in and supported by the bearings **30** carried by the bearing supports **28**.

Through this form of mounting, the carrier **20** and receptacle or tank **22** may be tilted to facilitate discharge of contents from the tank. The receptacle or tank **22** is elongated lengthwise of the carrier **20** and is of generally U-shaped cross-section having a semi-cylindrically shaped bottom portion **38**, side walls **39**, end walls **40** and a rectangular flange structure **42** forming the perimeter of the entrance to the tumbler, the tumbler being open at the top, the opening being defined by the flange structure **42**. A removable cover may be provided for the tank, if desired.

The receptacle **22** is resiliently supported by the carrier **20** so as to be capable of oscillatory or vibratory movements. Welded or otherwise fixedly secured to each side wall **39** of the receptacle **22** are brackets **44** which form abutments for resilient means or coil springs **46**. The carrier **20** is provided with pads or brackets **48** forming seats or supports for the coil springs **46** in the manner shown in FIGURES 1 and 2. The springs **46** support the receptacle **22** and its contents whereby the receptacle may be vibrated or oscillated independently of the car-

rier **20** as the bars **24** and **26** are spaced from side and end walls of the tank **22**.

The arrangement of the invention is inclusive of an adjustable rotatable eccentric mass, weight or vibration producing means driven by reversible, variable speed fluid actuating means whereby the amplitude and frequency of vibration or oscillation of the tank or receptacle and its contents may be regulated and controlled. As shown in FIGURES 1, 2 and 3, there is welded to the bottom region of the receptacle **22** a member **49** having a planar or plate portion **50**. Disposed beneath the plate portion **50** are longitudinally spaced members **51** which are welded to the plate **50** as at **52**, shown in FIGURE 3.

Each member **51** is bored to accommodate and retain an anti-friction or taper roller bearing construction **54**. If desired, ball bearings may be employed in lieu of taper roller bearings. Journally supported in the bearings **54** is a shaft **56**. Also secured to the plate **50** by means of bolts **58** is an L-shaped bracket **60**, the depending portion **61** of which supports a flange **64** of a fluid or hydraulically actuated motor **66**, the flange **64** being a part of the housing **68** of the motor. The flange may be bolted to the depending portion **61** of bracket **60** by means of bolts **62**.

The depending portion **61** is bored as at **70** to accommodate a cylindrical portion of the housing **68** to properly align the axis of the motor **66** with the axis of the rotatable shaft **56**. The fluid motor **66** is of the reversible type of conventional character and is provided with a rotatable output shaft **72** equipped with a coupling member or section **74**, one end of the shaft **56** being equipped with a cooperating coupling or section **74'**.

The coupling construction is inclusive of flexible rubber inserts **76** forming components of the coupling to establish a flexible drive connection between the motor output shaft **72** and the driven shaft **56**, the coupling means being of conventional construction.

Spacer rings **78** are arranged at each side of the anti-friction bearings **54** carried by the shaft. The shaft **56** is equipped with an eccentric mass or weight provided by two discs adjustably mounted to regulate the magnitude of centrifugal force utilized to establish vibratory or oscilliatory movements of the receptacle **22**. The construction for accomplishing the vibration or oscillation of the receptacle or tank **22** is shown in FIGURES 4 through 9.

Mounted upon a portion **80** of the shaft **56** of slightly larger diameter than the remainder of the shaft is a member **82** preferably of circular disc-like configuration fashioned with a hub portion **84**. The disc or member **82** is provided with a bore **86** of a diameter whereby the disc is snugly fitted onto the portion **80** of the shaft **56** and is keyed to the shaft by means of a key **88** which fits into a groove in the portion **80** and in a keyway **90** formed in the hub portion **84**.

The disc or member **82** is fashioned with an opening **92** preferably of semi-annular shape, as shown in FIGURE 6, which subtends an angle of about 180° of the disc to thereby reduce the mass of the disc at one side of the axis of the disc providing an eccentric weight.

As shown in FIGURES 6 and 7, the remaining portion of the disc, which subtends an angle of about 180°, is substantially solid and fashioned with a plurality of threaded openings **94** preferably arranged at equal radial distances from the axis of rotation of the disc and spaced circumferentially as illustrated in FIGURE 6. Each of the openings in the disc **82** is counterbored as indicated at **96** to accommodate a tenon portion **98** of member **100**, shown in FIGURES 5 and 9, the latter having a threaded tenon **102** adapted to extend into one of the threaded openings **94** as shown in FIGURES 4 and 5.

As shown in FIGURES 8 and 9, a second disc or disc-like member **104** is provided with a central bore **106** of a diameter to snugly fit over the hub portion or tenon **84** of the disc **82** but with sufficient clearance to effect individual rotational adjustment of the disc **104** with respect to the disc **82**. The disc **104** is provided with a semi-annular open region **108** of substantially the same shape as the open region **92** in the disc **82**, the remaining portion of the disc being of solid construction.

The disc **104** is formed with an opening **110** and a counterbore **111** to accommodate the member **100** shown in FIGURES 5 and 9. The discs **82** and **104** are shown in assembled relation in FIGURES 4 and 5. By removing the threaded member **100** and adjusting the disc **104** relative to the disc **82** by rotating one disc with respect to the other, the amount of mass that is eccentric to the axis of rotation of the discs may be varied whereby the amplitude of centrifugal force generated or developed by rotation of the assembly of eccentrically weighted discs, shown in FIGURES 4 and 5, utilized to vibrate or oscillate the receptacle **22** may be varied and controlled.

Thus the disc **104** may be adjusted about the axis of the hub **84** to the desired position wherein the opening **110** in disc **104** registers with one of the threaded openings **94** formed in the disc **82** to provide the desired eccentric adjustment of the mass and the member **100** inserted through registering openings in the discs **104** and **82** as shown in FIGURES 5 and 6 to secure the discs together in adjusted positions. The disc **104**, at the region of the bore **110** accommodating member **100**, is formed with a threaded bore **112** to receive a locking or setscrew **114** which engages the head of member **100** to prevent dislodgment of the member **100** during rotation of the discs.

By rotating the discs in assembled relation, the eccentric mass provided thereby under the influence of rotation develops centrifugal forces for oscillating or vibrating the receptacle **22** and its contents. The fluid actuated motor **66** is of conventional construction and is of the variable speed reversible type and is preferably actuated by fluid such as oil. The arrangement for the delivery and control of oil flow or flow of other fluid to the motor **66** is shown in FIGURE 2. The fluid system is inclusive of a receptacle **120** forming a reservoir adapted to contain a supply of oil or other fluid.

Mounted upon the receptacle **120** is a cover plate **122** supporting a fluid pump **124** for developing fluid pressure for driving the fluid actuated motor **66**. Mounted by the receptacle **120** is a housing **126** enclosing a valve means **128** operated by a lever or member **130** for controlling the flow of fluid under pressure to the motor **66**.

The pump **124** is provided with an inlet or supply tube **132** in communication with the reservoir **120**, and an outlet tube **134** in communication with the valve means in the housing **126**. The valve housing **126** is connected with the fluid driven motor **66** by means of tubes **136** and **138**.

The valve mechanism in the housing **126** is associated with a fluid return tube **140** for returning fluid from the motor **66** into the reservoir or tank **120**. The valve means **128** is of a character which is movable to positions to regulate the amount or rate of fluid flow to the motor **66** and to reverse the direction of rotation of the motor **66**, if desired. Thus by providing a control over the rate of flow of liquid or fluid to the motor **66**, the rate or speed of rotation of the eccentric mass provided by the discs **82** and **104** may be controlled to thereby regulate and control the frequency of oscillation or vibration of the receptacle under the influence of centrifugal forces developed by the rotating eccentric mass.

The adjustment of the relative position of the disc **82** with respect to the disc **104** provides an adjustment of the mass that is eccentric to the axis of rotation and hence varies the amplitude of oscillation or vibration forces imparted to the receptacle **22**. Means is provided for tilting the receptacle or tank **22** in order to discharge the contents of the receptacle after the cleaning, burnishing, deburring or other processing operations have been completed upon the parts, components or articles contained in the receptacle.

Such means is preferably fluid actuated and, in the embodiment illustrated, comprises a fluid servo-motor **144** comprising a cylinder **146** in which is disposed a reciprocable piston **148** mounted upon a piston rod **150**. The upper end of the piston rod **150** is provided with a fitting **152** which is pivotally connected by a pivot **153** with a bracket **154** welded or otherwise secured to the receptacle carrier **20**. The opposite end of the cylinder is formed with a clevis portion **156** which is pivotally connected by means of a pivot **158** with a bracket **160** welded or otherwise secured to the base or frame plate **11**.

Mounted upon the receptacle or reservoir **120** is an upwardly extending member or strut **164** which supports a valve housing **166** containing a valve **168** which is adapted for manual manipulation by means of a lever or actuator **170**. A tubular means **172** connects the valve housing **166** with the pressure side of the pump **124**, and a second tube **174** provides a return line into the tank or receptacle **120**. The upper end of the cylinder **146** of the servo-motor **144** is connected by means of a tube **176** with the valve housing **166**, and the lower end of the cylinder **146** connected by a second tube **178** with the valve housing **166**.

When it is desired to tilt or partially invert the tank or receptacle **22**, the valve **168** is moved to a position to effect fluid flow to the lower end of the cylinder **146** through the tube **178**. The fluid pressure projects the piston **148** upwardly in the cylinder and effects a tilting of the receptacle **22** about the axis of its supporting shafts **34** to discharge the contents of the receptacle.

Manipulation of the valve **168** in the opposite direction effects fluid flow under pressure to the upper end of the cylinder through the tube **176** to move the piston **148** downwardly and restore the receptacle **22** to its upright position, as viewed in FIGURES 1 and 2.

A trough or table **180** is provided onto which the contents of the receptacle may be discharged so as to enable the separation of the parts or articles being treated from the abrasive or mobile treating material. The contents may, if desired, be delivered into a portable container disposed adjacent the tank **22**.

Various types of abrasive, polishing or cleaning materials or media may be employed in the receptacle **22** for the treatment or processing of parts contained therein. Material such as silicon carbide may be employed for metal parts, or hardened steel slugs of a size of from $\frac{1}{16}$ to $\frac{1}{2}$ inch, preferably of irregular shapes, may be used as a burnishing, deburring or cleaning material for metal parts. The arrangement also may be employed for cleaning, deflashing or deburring extruded or molded articles formed of plastics through the use of a suitable mobile media contained in the receptacle.

The nonmetallic liner **23** is preferably bonded or vulcanized to the inner surface of the receptacle **22**. Through the use of a nonmetallic liner, contact of the parts with the metal of the receptacle is prevented whereby the life of the apparatus is greatly prolonged.

Means is provided for maintaining the receptacle **22** in substantially upright or vertical position during article processing operations. As shown in FIGURES 1 and 2, each of the frame strut members **12** and **14** supports a bracket **182** to which is pivotally connected a hook-like element **184** by means of a pivot pin **185**. A depending portion **187** of each element **184** is normally adapted to extend into an opening formed in a bracket **188** secured to each of the end walls of the receptacle **22**. The openings in the brackets **188** are of a size to provide clearance for the portions **187** so as not to impair vibrations or oscillations of the receptacle. When it is desired to tilt the receptacle, the elements **184** are swung about the pivot pins **185** out of engagement with the brackets **188**.

It is usually desirable to employ water or liquid in the receptacle with the abrading or cleaning media. Water may be delivered into the receptacle **22**. As shown in FIGURES 1 and 3, a drain fitting **194** and a T-fitting **195** are provided for the receptacle for drawing off water therefrom, a screen or filter **196** being preferably provided in the drain fitting **194** to prevent the escape of the cleaning or abrasive material from the receptacle. A tube **190** is connected with the T-shaped fitting **195** and is normally hooked over the flange member **42** at the entrance of the receptacle and is maintained in such position during operation of the mechanism. The water in the receptacle may be drained out through the tube **190** by lowering the tube and inserting the end into a floor drain or sump **198** as shown in broken lines in FIGURE 1.

In processing certain parts, it is sometimes desirable to isolate the parts, one from another during processing operations in the receptacle **22**. FIGURE 10 illustrates an arrangement or fixture for supporting articles in spaced relation. A cover member or fixture **200** equipped with article supporting means **202** is configurated to support articles **204** in spaced relation as shown in FIGURE 10. The fixture or cover member **200** is removable and may be secured to the receptacle by means of clamps **206** or other securing means. It is to be understood that the article supporting fixture or means may be of a shape to accommodate particular articles to be processed.

The arrangement of the present invention provides a rapid and economical apparatus for processing or treating articles for the purposes hereinbefore mentioned. The rotation of the eccentric weight assembly provided by the discs **82** and **104** effects an oscillatory or vibratory action of the receptacle **22** and the mobile treating media and articles contained therein. The frequency of oscillation or vibration may be varied and controlled by varying the speed of the fluid actuated motor **66**. The amplitude of oscillation or vibration may be varied by adjusting the position of the disc **104** with respect to the disc **82**.

Through such arrangement, the most effective and efficient oscillating or vibrating action may be attained for the particular articles to be treated or processed.

For example, with small or delicate articles or parts, a low amplitude and high frequency oscillation or vibration may be most efficient. With castings or parts of substantial size or weight, a high amplitude low frequency may be most effective. The apparatus therefore provides, through the means hereinbefore described, for most efficient treating or processing of articles of various shapes and materials by varying, regulating or controlling the oscillation or vibration of the articles and the treating media in the receptacle.

It is believed that the rotation of the eccentric mass or body provided by the discs **82** and **104** establishes an oscillatory or orbital movement to the receptacle and its contents. When the receptacle and its contents are actuated by the centrifugal forces generated by rotation of the eccentric mass or body, the mobile article-treating media moves from one side wall of the receptacle to the other and accumulates at an increased depth adjacent the wall toward which the material is moving. This action of the comminuted treating material continues as long as the actuating forces are transmitted to the receptacle. It is found that by reversing the direction of rotation of the motor **66**, the article-treating material moves in the opposite direction in the receptacle. The rapidity of movement is in a measure dependent upon the frequency of vibration or oscillation of the receptacle.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than as herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

We claim:

1. Apparatus for treating discrete articles, in combination, a support, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, means mounted by the receptacle journally supporting the shaft, a first member mounted on said shaft for rotation therewith,

a second member mounted on said first member, each of said members having a semi-annular opening formed therein whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to said first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing said members together in adjusted position, and fluid-actuated means for rotating said shaft and members.

2. Apparatus for treating discrete articles, in combination, a main frame, a metal receptacle provided with an inner liner of nonmetallic material adapted to contain the articles and a mobile article-treating material, a supplemental frame pivotally mounted on the main frame; resilient means mounting the receptacle on the supplemental frame, a shaft, means mounted by the receptacle journally supporting the shaft, a first disc-like member mounted on said shaft for rotation therewith and having a hub portion, a second disc-like member mounted on the hub portion of the first member, each of said disc-like members being formed with a sector-like opening whereby its center of mass is spaced from the axis of rotation, said second member being rotatably adjustable relative to said first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing said members together in adjusted position, hydraulically actuated means for rotating said shaft and members, and valve means for varying flow of liquid to said hydraulically actuated means to control the speed of rotation of said shaft and members.

3. Apparatus for treating discrete articles, in combination, a support, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, a plate disposed longitudinally of the receptacle and fixedly secured thereto, bearing means mounted by the plate journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, each of said members having an open area formed therein at one side of the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing the members together in adjusted position, said members being disposed adjacent a transverse plane through the central region of the receptacle, and a fluid-actuated variable speed motor for rotating said shaft and members.

4. Apparatus for treating discrete articles, in combination, a support, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, means mounted by the receptacle journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, each of said members having an open area formed therein at one side to the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing the members together in adjusted position, a fluid-actuated variable speed motor for rotating said shaft and members, means connected with the motor arranged to supply fluid to the motor, and valve means associated with said fluid supply means for controlling fluid flow to regulate the speed of said motor.

5. Apparatus for treating discrete articles, in combination, a frame, a support pivotally mounted on the frame, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, a plate disposed longitudinally of the receptacle and fixedly secured thereto, bearing means mounted by the plate journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, each of said members having an open area formed therein at one side of the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing the members together in adjusted position, said members being disposed adjacent a transverse plane through the central region of the receptacle, a fluid actuated variable speed motor for rotating said shaft and members, tubular means connecting the motor with a supply of fluid, and valve means associated with said tubular means for controlling fluid flow to regulate the speed of said motor.

6. Apparatus for treating discrete articles, in combination, a frame, a support pivotally mounted on the frame, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, bearing means mounted by the receptacle journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, each of said member having an open area formed therein at one side of the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing the members together in adjusted position, said receptacle and support being tiltable about the pivotal mounting of the support, a drain fitting secured to a lower portion of the receptacle, a drain tube connected with the fitting, a fluid actuated variable speed motor for rotating said shaft and members, and means for effecting tilting movement of the support and receptacle.

7. Apparatus for treating discrete articles, in combination, a frame, a support pivotally mounted on the frame, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, bearing means mounted by the receptacle journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, each of said member having an open area formed therein at one side of the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing he members together in adjusted position, said receptacle support being tiltable about the pivotal mounting of the support, a drain fitting secured to a lower portion of the receptacle, a drain tube connected with the fitting and arranged whereby the distal end region of the tube is disposed adjacent the upper portion of the receptacle during treatment of the articles, a filter screen associated with said fitting, a first fluid actuated means for rotating said shaft and members, and a second fluid actuated means for effecting tilting movement of the support and receptacle.

8. Apparatus for treating discrete articles, in combination, a frame, a support pivotally mounted on the frame, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, a plate disposed longitudinally of the receptacle and fixedly secured thereto, bearing means mounted by the plate journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, each of said members having an open area formed therein at one side of the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative

to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing the members together in adjusted position, said receptacle support being tiltable about the pivotal mounting of the support, a drain fitting secured to a lower portion of the receptacle, a drain tube of flexible material connected with the fitting and arranged whereby the distal end region of the tube is disposed adjacent the upper portion of the receptacle during treatment of the bodies, a filter screen associated with said fitting, a variable speed fluid-actuated motor for rotating said shaft and members, and motive means for effecting tilting movement of the support and receptacle.

9. Apparatus for treating discrete articles, in combination, a frame, a support pivotally mounted on the frame, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, a plate disposed longitudinally of the receptacle and fixedly secured thereto, bearing means carried by the plate journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, fluid actuated means for rotating said shaft and members, each of said members having an open area formed therein at one side of the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, a bolt for securing the members together in adjusted position extending through an opening in one of said members, the other of said members having a plurality of circumferentially spaced threaded openings arranged for selective registration with the opening in the adjacent member to threadedly receive the bolt for securing the members together in a selected adjusted position, and a locking means engageable with the bolt.

10. Apparatus for treating discrete articles, in combination, a support, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, means mounted by the receptacle journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, fluid-actuated means for rotating said shaft and members, each of said members having an open area formed therein at one side of the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing the members together in adjusted position, said means including a cylindrically-shaped element extending through an opening in one of said members, the other of said members having a plurality of circumferentially spaced openings arranged for selective registration with the opening in the adjacent member, portions of said circumferentially spaced openings being threaded, said cylindrically-shaped element having a threaded tenon arranged to threadedly engage the threaded portion of a selected opening of the circumferentially spaced openings to secure the members together in a selected adjusted position.

11. Apparatus for treating discrete articles, in combination, a frame, a support pivotally mounted on the frame, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, means mounted by the receptacle journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, each of said members having an open area formed therein at one side of the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing the members together in adjusted position, a fluid-actuated variable speed motor for rotating said shaft and members, a fluid actuated means for tilting the receptacle about the axis of the pivotal mounting of the support including a cylinder element, a piston element reciprocable in the cylinder element, said elements being connected respectively to the frame and the support, means for conveying fluid into and out of the cylinder element for actuating the piston element to effect tilting movements of the receptacle, and means for controlling flow of fluid into and out of said cylinder element.

12. Apparatus for treating discrete articles, in combination, a frame, a support pivotally mounted on the frame, a receptacle adapted to contain the articles and a mobile article-treating material, resilient means mounting the receptacle on the support, a shaft, a plate disposed longitudinally of the receptacle and fixedly secured thereto, bearing means carried by the plate journally supporting said shaft, a first member mounted on said shaft for rotation therewith, a second member mounted on said first member, each of said members having an open area formed therein at one side of the axis of rotation thereof whereby its center of mass is spaced from the axis of rotation, said second member being adjustable relative to the first member to vary the distance of the center of mass provided by both members from the axis of rotation, means for securing the members together in adjusted position, a fluid-actuated variable speed motor for rotating said shaft and members, means arranged to convey fluid under pressure to said motor, valve means associated with said fluid conveying means for controlling fluid flow to the motor for varying the speed of the motor, a fluid actuated means for tilting the receptacle about the axis of the pivotal mounting of the support including a cylinder element, a piston element reciprocable in the cylinder element, said elements being connected respectively to the frame and the support, means for conveying fluid into and out of the cylinder element for actuating the piston element to effect tilting movements of the receptacle, and valve means for controlling flow of fluid into and out of said cylinder element.

References Cited by the Examiner

UNITED STATES PATENTS

2,677,967	5/1954	Galbreath	74—87
2,774,244	12/1956	Bergstrom et al.	74—61
2,973,606	3/1961	Brandt	51—7
2,997,813	8/1961	Brandt	51—7
2,997,814	8/1961	Brandt	51—7
3,063,207	11/1962	Moore	51—163
3,093,940	6/1963	Balz	51—163

FOREIGN PATENTS

919,519	11/1946	France.

LESTER M. SWINGLE, *Primary Examiner.*

J. SPENCER OVERHOLSER, *Examiner.*

J. L. TATE, *Assistant Examiner.*