

[54] APPARATUS FOR VIBRATORY FINISHING

3,811,231 5/1974 Kobayashi..... 51/163

[75] Inventors: William John Barlett, Hempstead; Frederick George Boniface, Hemel Hempstead, both of England

Primary Examiner—Harold D. Whitehead  
Attorney, Agent, or Firm—Brisebois & Kruger

[73] Assignee: Roto-Finish Limited, Hertfordshire, England

[57] ABSTRACT

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In a vibratory finishing machine of the type in which an annular tub is vibrated by a motor having a shaft with eccentric weights, reversal of the direction of movement of finishing media around the tub is effected by reversing the relative angular position of the weights, this weight reversal being effected automatically in response to reduction of the motor speed, without the usual requirement of reversing the direction of rotation of the motor. Weights reversal is preferably effected by centrifugal force against the action of a toggle spring device.

[21] Appl. No.: 419,660

[52] U.S. Cl. .... 51/163, 259/72

[51] Int. Cl. .... B24b 31/06

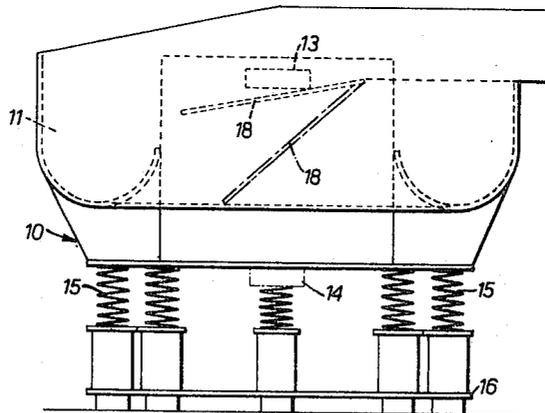
[58] Field of Search ..... 259/72; 241/175; 51/163

[56] References Cited

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5 Claims, 7 Drawing Figures



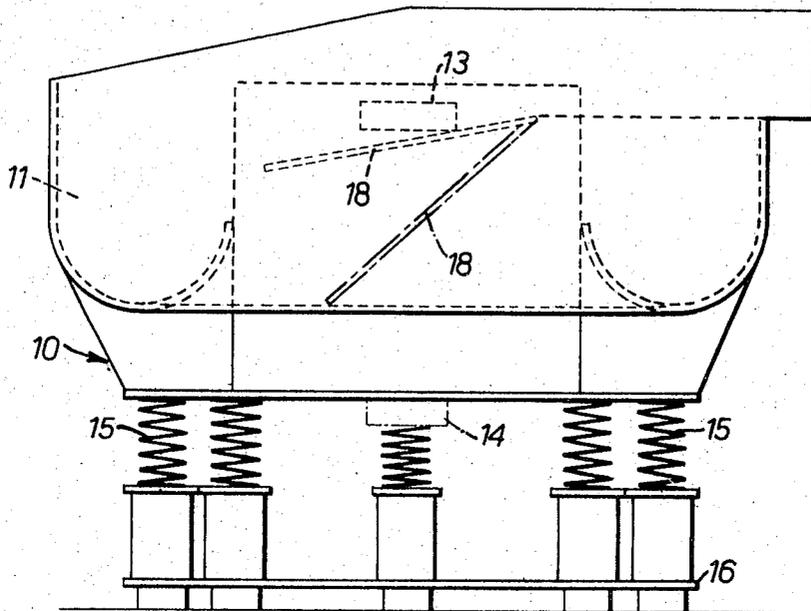


FIG. 1.

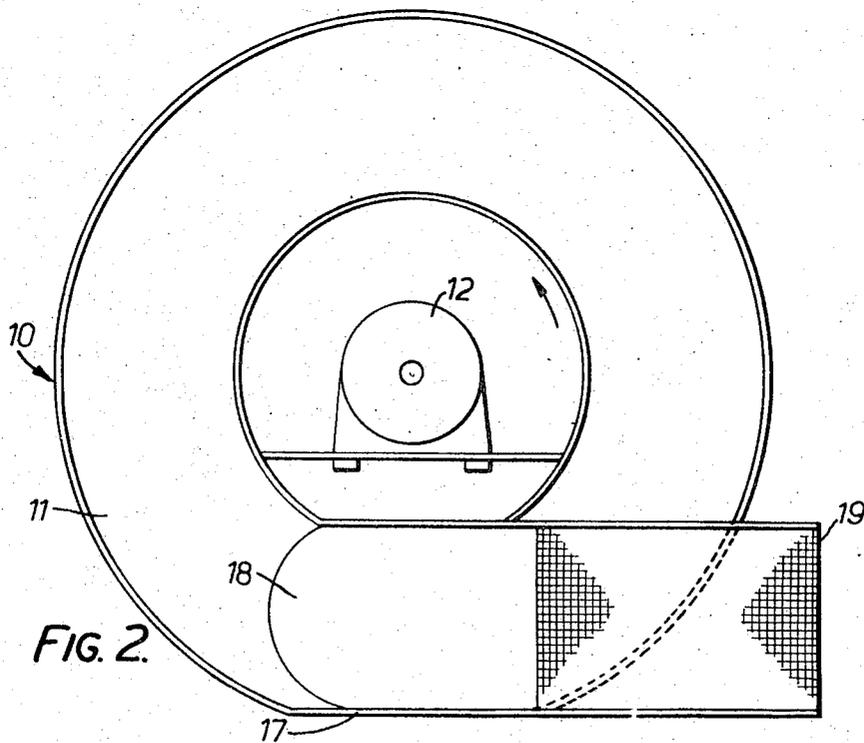


FIG. 2.

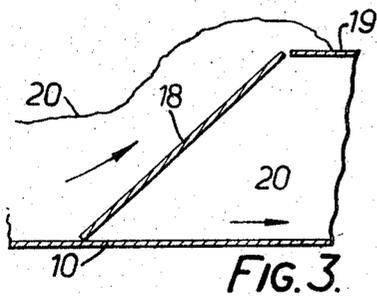


FIG. 3.

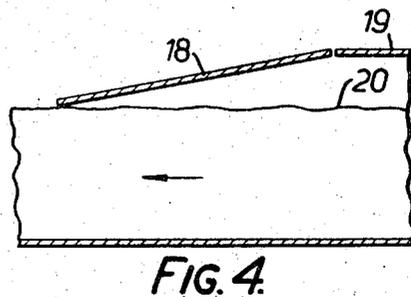


FIG. 4.

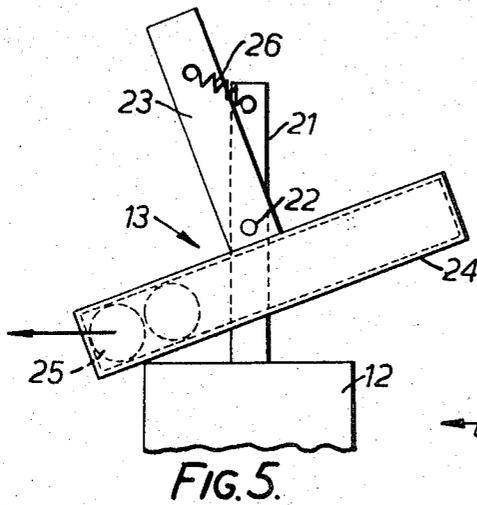


FIG. 5.

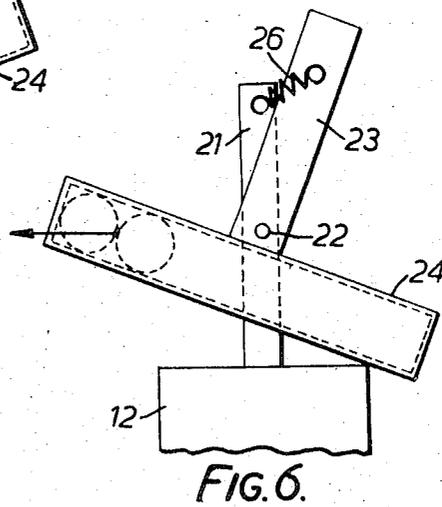


FIG. 6.

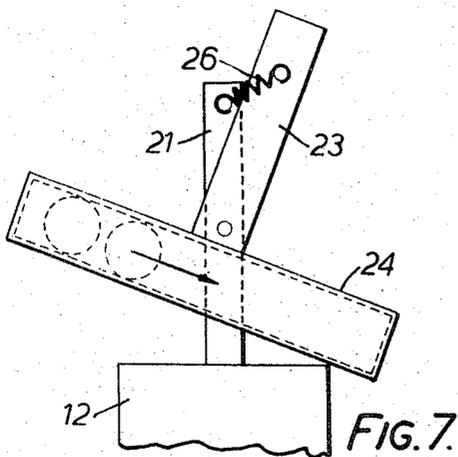


FIG. 7.

## APPARATUS FOR VIBRATORY FINISHING

A known form of apparatus for effecting the vibratory finishing of parts comprises a chamber which is annular in plan form and a rotary shaft disposed vertically on the axis of the chamber and carrying in axially spaced relation a pair of eccentric weights, one of which leads the other by a given angle, the chamber and the shaft being supported by spring means which allow them limited freedom of movement in all directions, the arrangement being such that, in use, a mixture of parts to be finished with a suitable finishing medium contained in the chamber is caused, upon rotation of the shaft to travel in generally helical paths around the chamber. Such apparatus is hereinafter referred to as being "of the type described".

When circulation has continued for long enough to complete the required finishing operation, the finished parts are removed from the finishing medium and fresh parts are introduced.

A variety of expedients have already been used and proposed for separating the parts from the mixture when the finishing operation is complete, the motion of the mixture resulting from continued operation of the apparatus being used to deliver the mixture on to a separating screen which retains the finished parts and allows the finishing medium to pass through and return (usually directly) to the chamber.

In particular, it has been proposed to effect such separation by reversing the direction of rotation of the shaft and arranging that this reversal shall cause an alteration in the relative angular positions of the weights so that the same weight still leads the other; the direction in which the mixture travels round the annular chamber is thus reversed and means such as a hinged flap then operate to direct the mixture onto a separating screen of the above character, the said means being inoperative while the mixture is travelling in the normal direction.

We have found that the direction in which the mixture travels around the annular chamber can be reversed (allowing separation to be effected as explained above) without the necessity for reversing the direction of rotation of the shaft (thus making it unnecessary to provide reversing gear, or a reversible driving motor) by appropriately altering the relative positions of the two weights.

The invention accordingly includes a method of operating a vibratory finishing machine of the type described, wherein the shaft is first driven in one direction with one weight leading the other, the relative angular position of the weights is then altered so that (for the same direction of rotation) the second mentioned weight leads the first, and the shaft is rotated in the same direction as before, whereby to impart to the mixture a reversed circulatory movement which facilitates delivery of the mixture on to a separating screen.

While it would be possible to effect the required alteration in the relative position of the weights by direct manual adjustment, this will not in general be very convenient.

The invention further provides a vibratory finishing machine of the type described, including means for reversing the relative angular position of the said weights in response to interruption of rotation of the shaft.

To effect finishing treatment, the shaft is rotated in a direction which will cause the mixture to travel round

the tub in one direction; when treatment is complete, rotation of the shaft is stopped, so that the weight shifting means operates to reverse the relative positions of the weights; renewed rotation of the shaft (in either direction) will then cause the mixture to travel in the opposite direction around the tub and thus to be delivered on to the separating screen.

The invention and presently preferred ways of carrying it into practice are further described below with reference to the drawings accompanying the provisional specification in which:

FIG. 1 is a side elevation of a vibratory finishing machine;

FIG. 2 is a plan view thereof;

FIGS. 3 and 4 are side views of a detail in two different conditions of operation;

FIGS. 5, 6 and 7 are diagrammatic side elevations of another detail in three different conditions of operation.

The machine illustrated in FIGS. 1 and 2 comprises a bowl tub 10 shaped to provide a treating chamber 11 which is annular in plan view and has in cross section the form of an open-topped channel with vertical side walls and a semi-circular base. On the vertical axis of the bowl there is mounted a shaft driven by an electric motor 12 and carrying eccentrically disposed top and bottom weights 13 and 14. The bowl, shaft and motor are supported by springs 15 from a base 16. During the finishing treatment, the material in the treating chamber is caused to travel clockwise around the chamber, as viewed from above. The chamber 11, instead of being completely circular, includes a short straight section 17 accommodating a flap 18, one end of which is hingedly supported by the tub 10 or the screen 19 at a level above the top of the material in the channel. As indicated in FIG. 1, this flap can swing between a substantially horizontal position and a position inclined at some 45° to the horizontal with the free end of the flap resting on the bottom of the chamber 11. The free end of the flap is shaped to fit the bottom of the chamber and the flap extends across the full width of the chamber, so that when lowered the flap forms a substantially complete barrier across the chamber. Adjacent the upper, hinged end of the flap there is mounted on the tub 10 a separating screen 19 which extends horizontally above the chamber 10 and projects beyond it.

While the finishing operation is being performed, the flap 18 rests on the top of the material 20 circulating in the chamber, as shown in FIG. 4, and allows the operation to proceed normally. When the finishing operation is complete and it is desired to discharge the finished parts, the material in the chamber is caused to circulate in a counter-clockwise direction. The action of the material 20 on the flap 18 forces the latter down into its inclined position, as shown in FIG. 3, so that the material travels up the ramp constituted by the flap and on to the separating screen 19. The finishing medium passes through the screen and drops back into the chamber 11, while the finished parts are retained on the screen and discharged over its outer projecting end.

The required reversal of the direction of circulation of the material in the chamber is obtained by giving one of the weights (say the top weight 13) the construction shown somewhat diagrammatically in FIGS. 5 to 7. The shaft 21 of motor 12 carries a transverse pivot 22 which supports for rocking movement an arm 23. Secured to

the lower end of arm 23 is a closed container 24, which is rectangular in plan view and is partly filled by a freely movable mass, such as a plurality of steel balls 25. A compression spring toggle 26, engaged between abutments on arm 23 and shaft 21, operates (when shaft 21 is stationary) to hold the container 24 tilted into one or other of the two extreme positions shown in FIGS. 5 and 7.

Assuming that the parts are initially in the position shown in FIG. 5, the balls 25 having rolled by gravity to the lower end of the container, rotation of shaft 21 gives rise to a centrifugal force acting on the balls 25 which causes container 24 and arm 23 to turn (clockwise in the figure) about pivot 22 into the position shown in FIG. 6. During the first part of this movement spring 26 is compressed, but having been moved over centre its expansive force assists in holding the parts in the position shown in FIG. 6. When the rotation of shaft 21 is stopped (or very greatly slowed down) so that centrifugal force ceases to act on the balls 25, spring 26 maintains the container in the position into which it has been tilted and the balls roll down by gravity into the opposite end of the container as indicated in FIG. 7. When next the shaft 21 is set into rotation, the movements are repeated in reverse.

Thus during rotation of shaft 21 the balls 25 occupy one or other of two positions lying on opposite sides of shaft 21 and they move from one position to the other automatically each time that the shaft is brought to a standstill. By disposing the other eccentric weight on the shaft in an angular position which is intermediate the two alternative positions of the balls 25, the required alteration in the relative positions of the two weights is thus obtained automatically.

It will be appreciated that the method of achieving weight reversal does not depend on the shaft being stopped completely, but that this will occur when the speed of rotation is sufficiently reduced to allow the mass to move to the opposite end of the container. It should also be understood that the shaft does not have to be seen in the same direction as before weight reversal, the latter being responsible for reversal of the circulatory motion of the mixture, irrespective of the direction of rotation of the shaft. However, the advantages of being able to run the shaft always in the same

direction make it highly desirable to do so when possible.

We claim:

1. A vibratory finishing machine comprising an annular treatment chamber for a finishing medium and workpieces non rotatably mounted on a spring suspension; a motor securely mounted to said chamber and having a motor shaft disposed vertically on the axis of said chamber; first and second eccentric weights mounted on said shaft in axially spaced relation and angularly spaced relation to each other; and means responsive to interruption of rotation of said motor shaft to effect reversal of the relative angular position of said weights.

2. A machine according to claim 1, wherein one of said weights is constituted by means operable to move the effective mass of said weight between alternate positions, lying on angularly opposite sides of the second weight, these means being operable automatically each time rotation of said shaft is interrupted.

3. A machine according to claim 1, wherein one said weight comprises a container, a loose mass partially filling said container, means pivotally supporting said container on said motor shaft for rocking movement about a transverse axis, the loose mass being adapted to occupy that end of said container which is lowermost with said shaft at rest at any time and said container being tilted about said transverse axis to cause the other end thereof to be lowermost when said shaft is rotating at its operating speed, by centrifugal forces acting on said mass.

4. A machine according to claim 3, further comprising toggle acting spring means acting between said shaft and said container and tending to hold the latter in the pivotal position to which it was last moved by the effect of centrifugal forces acting on said mass.

5. A machine according to claim 1 further comprising a pivoted flap mounted in the chamber, which flap is adapted to deflect freely to permit circulatory movement of the mixture in one direction around said chamber and which, upon reversal of the circulatory movement, is adapted to assume a position in which it deflects the mixture on to a separating screen which effects separation of the parts from the finishing medium.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,844,071 Dated October 29, 1974

Inventor(s) WILLIAM JOHN BARTLETT and FREDERICK GEORGE BONIFACE

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

[75] Inventors: William John Bartlett, Hemel Hempstead;  
Frederick George Boniface, Hemel Hempstead,  
both of England

Signed and sealed this 22nd day of April 1975.

(SEAL)  
Attest:

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Attesting Officer

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