Oct. 15, 1968 F. G. BONIFACE 3,405,483

VIBRATORY FINISHING MACHINE WITH SCREEN DISCHARGE

Filed Sept. 14, 1966 2 Sheets-Sheet 1

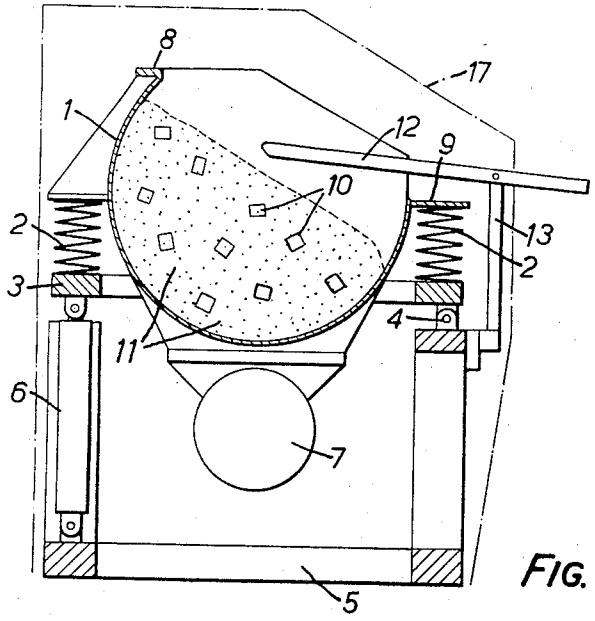


FIG. 1.

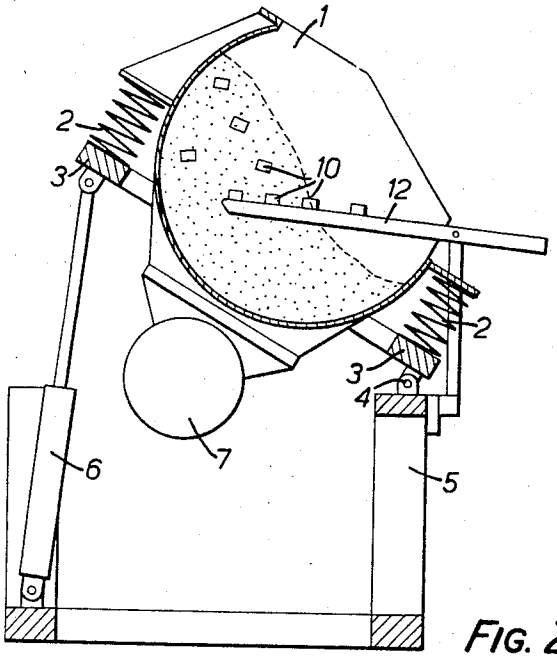


FIG. 2.

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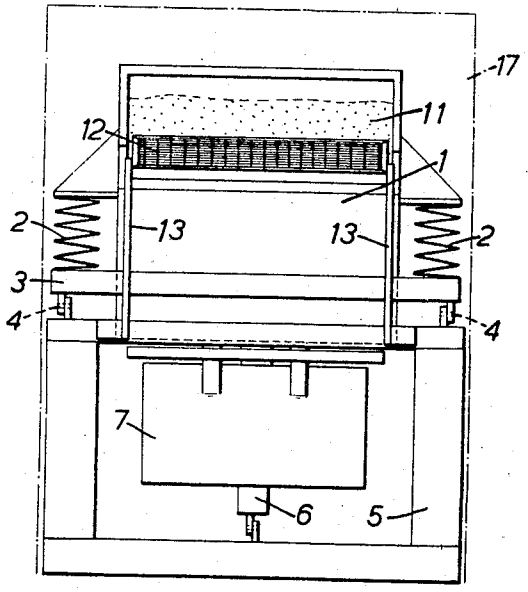


FIG. 3.

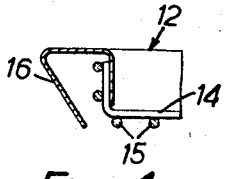


FIG. 4.

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VIBRATORY FINISHING MACHINE WITH SCREEN DISCHARGE

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5 Claims. (Cl. 51—163)

A known type of apparatus for polishing or otherwise finishing the surfaces of workpieces by abrasion comprises a resiliently supported tub disposed with its axis approximately horizontal, and a rotary vibrator mounted on the tub with its axis parallel to that of the tub. The workpieces together with a mass of processing media, such as loose chips of rock or ceramic pellets, are placed in the tub, either with or without a treating liquid. The circular vibrating movement imparted to the tub by the vibrator not only causes local relative movements between the workpieces and the media to produce the desired abrasive finishing action, but also causes the whole mass of material in the tub to circulate in an orbital path around the axis of the tub.

When the desired finishing treatment has been completed, it is necessary to separate the workpiece from the media and this has hitherto been effected either by picking out the individual workpieces by hand as they are successively brought to the surface by the orbital movement, or by discharging the mixture of workpieces and media from the tub onto a screen having openings of such size that it retains the workpieces but allows the media to pass through it, the media being subsequently returned to the tub for the treatment of further workpieces. The first method is of practical use only when the apparatus is employed for treating workpieces of relatively large size in relatively small numbers. The second method, while of general application, is a dirty and time-consuming operation.

It has also been proposed to separate out the finished workpieces by means of a screen which is pivotally or slidably mounted adjacent the tub, so that when desired it can be thrust into the descending part of the mass of material in the tub, the screen then intercepting the workpieces, while the media passes through the screen and continues to circulate in the tub. With this proposed arrangement it is difficult to control the rate at which the descending material falls onto the screen and if so much is received that the screen becomes choked with media, the screen must be partially withdrawn from the tub, with the result that only a small part of the screen still overhangs the tub and is available for effecting separation. Also, with this proposed arrangement, the screen is necessarily inserted into the upper part of the circulating mass, with the result that when a certain proportion of the mass has been removed by the action of the screen, the surface of the mass remaining in the tub falls below the level of the screen and separation ceases; the arrangement consequently cannot be used to achieve complete separation of workpieces when the proportion of workpieces to media is high, for example if the workpieces constitute more than 20% of the tub contents.

The vibratory finishing apparatus of the present invention also comprises a separating screen which can be brought to extend across the path of the circulating mass in the tub so that it will intercept the workpieces, while allowing the media to continue circulating in the tub, and is characterised by the fact that the separating screen is fixed in position and is brought into the path of the material circulating in the tub by an upward tilting of the tub about an axis parallel to the axis of the tub.

With this arrangement the rate at which material is received onto the screen can be controlled very simply by altering the inclination of the tub. Since the principal component of the relative movement between the tub and the screen is vertical rather than horizontal, a substantial part of the screen overhangs the tub at all times and a partial lowering of the tub to reduce the rate at which material is received onto the screen results in only a small reduction of the area of screen available for effecting separation. Also, the tub can be raised sufficiently to bring the screen below the surface of the circulating material even when the volume of material in the tub has been substantially reduced, thus allowing complete separation of workpieces to be obtained even if the workpieces form a high proportion of the tub contents, for example as much as 25%.

A particular form of vibratory, finishing machine in accordance with the invention is shown by way of example in the accompanying drawings, in which:

FIGURE 1 is a vertical cross section through the machine;

FIGURE 2 is a similar view of the machine with the parts in different relative positions;

FIGURE 3 is a front view of the machine; and

FIGURE 4 shows a detail of the machine.

In the apparatus illustrated, the tub **1** having the form of a part cylinder disposed with its axis horizontal, is resiliently supported by springs **2** upon a frame **3**, which is pivotally supported at **4** upon a stationary frame **5**. The frame **3** can be tilted to raise or lower the tub about an axis parallel to that of the tub by a hydraulic operating cylinder **6** connected between frames **3** and **5**. Secured to the tub is a vibrator **7**, comprising an eccentrically weighted rotary shaft and an electric motor for driving this shaft. The curved wall of the tub embraces some 240° of arc and one edge **8** of the opening left in the upper part of the tub is substantially higher than the opposite edge **9**. The vibrator runs in such a direction that the mass of material in the tub, comprising workpieces **10** and processing media **11** circulates clockwise (as viewed in FIGURES 1 and 2) and cascades from the upper edge towards the lower edge. A separating screen **12** extending the full length of the tub is mounted on a support **13** secured to the stationary frame **5**. The screen may be of mesh material or of any other suitable construction, such as a series of parallel rods extending radially of the tub. As shown in FIGURE 4 (which is a fragmentary section on a larger scale through the inner margin of the screen), it comprises radial rods **14**, longitudinal rods **15** and a peripheral sheet metal member **16** of inverted channel section, which covers and is secured to the upturned ends of the rods **14**, **15**, thus providing an imperforate rim or retaining wall. The machine may be enclosed in a casing (indicated by the chain line **17** in FIGURES 1 and 3) having an opening giving access to the interior of the tub.

While the finishing treatment is in progress, the cylinder **6** is retracted, so that the parts occupy the positions shown in FIGURE 1 with the screen **12** above and clear of the circulating mass in the tub. When the processing has been completed and it is desired to extract the workpieces from the tub, the cylinder **6** is extended to raise the frame **3**, carrying the tub and its vibrator, into the position shown in FIGURE 2, operation of the vibrator being continued, so that the material in the tub continues to circulate orbitally. The screen **12** now projects across the path of the mass as it cascades from the upper to the lower edge of the tub and the workpieces **10** are intercepted by and retained on the screen while the media passes through the screen and continues to circulate in the tub. The workpieces collected on the screen may be picked off by hand, or removed by conveyor means of any

kind, or caused to slide off the screen by suitably inclining it. After removal of the treated workpieces, the tub is returned to the position shown in FIGURE 1 and is then ready to receive a fresh batch of workpieces, which can simply be placed on the cascading surface of the media and left to distribute themselves through the media.

The removal of the workpieces reduces the total volume of material in the tub (the workpieces may in practice account for 25% by volume of the mass in the tub while finishing treatment is in progress) and to ensure that so large a proportion of the mass can be separated out in the way described, the extent of lifting movement effected by the cylinder **6** should be sufficient to raise the axis of the tub through a distance equal to about one quarter of the diameter of the tub. To assist in ensuring that the cascading action in the tub remains substantially the same throughout the volume change that occurs during separation, it has been found advantageous to make the length and the diameter of the tub approximately equal. To the same end, the suspension springs **2** are made somewhat stiffer than those previously used in otherwise similar apparatus with a fixed tub.

I claim:

1. A finishing machine comprising a stationary frame, a tilting frame supported on said stationary frame for upward and downward movement about a horizontal pivot axis between a lowered position and a raised position, an open-topped tub for receiving a mixture of parts to be finished and finishing media, said tub being supported for vibration on said tilting frame in a position to one side of said pivot axis, a rotary vibrator secured to said tub and adapted to subject said tub and its contents to vibration to cause finishing of said parts and circulation of said mixture about a horizontal axis parallel to said pivot axis, and a separating screen having openings of a size to permit passage of said media but not of said parts to be finished, said screen being fixedly supported on said stationary frame in a position extending from above said pivot axis to within the open top of said tub, said screen extending into the path of the mixture circulating in the tub when said tilting frame is in its raised position and said screen being clear of said mixture when said tilting frame is in its lowered position.

2. A machine according to claim **1** and comprising power means supported by said stationary frame for moving said tilting frame between its lowered and raised positions.

3. A machine according to claim **1** wherein said tub is of part circular cross section and movement of said tilting frame from its lowered to its raised position raises the axis of said tub through a distance at least equal to one quarter of the diameter of said tub.

4. A machine according to claim **1** wherein said tub is of part circular cross section and has an axial length substantially equal to the diameter of said tub.

5. A machine according to claim **1** wherein said screen is inclined downwardly at an angle to the horizontal in a direction away from said tub.

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