ABSTRACT OF THE DISCLOSURE

A vibratory motor assembly and finishing machine containing the same, having manually operable means, the manipulation of which both disengages an eccentric weight from a known point on the motor shaft and rotates the weight to a different rotative position, where the weight is operably re-engaged with the shaft.

The present invention relates to vibratory machines, and is especially concerned with such machines having a vibratory motor with a shaft oriented in a substantially vertical position, and means for readily adjusting the positions of the eccentric weights thereof.

Vibratory machines of several different types having vertically oriented motors are known in the art. Such machines are used for various purposes including finishing, such as grinding and polishing, screening, and other similar processes requiring a vibratory or gyratory motion. Among the most important of such machines are finishing machines for parts such as metal parts, as representatively disclosed in U.S. Patent No. 3,161,993. Machines of the type described are vibrated in such a manner that a gyratory motion is produced, that is, a motion wherein the axis of the vibrating portion of the machine is inclined from the vertical and describes substantially a pair of conical surfaces as it gyrates. As a result of this type of gyratory motion, when material such as parts and/or finishing material are placed in the vibrating chamber, orbital motion is imparted to the material so that it moves upwardly at the peripheral portion of the chamber and downwardly at the inner portion of the chamber. This results in relative movement between the finishing material and parts, causing the parts to be finished. Additionally, as for example in the apparatus described in the above-identified patent and application, it is desirable to cause processional or linear progression of the material in a circle around the chamber of the apparatus. This is desirable for example, where the parts are to be automatically discharged at a discharge station within the apparatus.

As is well known in the art, the production of linear motion and orbital motion in a mass confined in a chamber is dependent upon many factors, including the utilization of and the relative placement of eccentric weights, where such apparatus is employed. Moreover, the geometric relationship of the vibratory means including the motor and eccentric weights to the center of mass of the suspended apparatus is also a determining factor with regard to the nature of the motion imparted to the finishing mixture. Further important factors are the number of eccentric weights used, their relative positioning, their absolute mass, and their relative mass. Additionally, where two or more eccentric weights are utilized, their phase relationship is also a significant factor, particularly with regard to progression of the finishing mixture linearly along the finishing chamber, and to some degree with respect to the orbital motion of the mixture. Normally little difficulty is experienced in obtaining proper orbital motion of the finishing mixture. Even a single eccentric weight when properly displaced from the center of mass of the suspended system will provide suitable orbital motion. The direction of orbital motion is generally the same, regardless of the direction of linear motion, that is, in a direction such that the material rises in the outer or peripheral zone of the chamber or trough and descends at the inner or central zone thereof. However, in order to provide progression of the mixture in a linear direction, and in order to be able to determine and establish the direction of progression, it is desirable to utilize at least two separate eccentric weights, one affixed to each end of the motor shaft, and to establish the proper phase relationship between the eccentric weights.

The direction of linear motion depends upon whether the upper eccentric weight is displaced clockwise or counter-clockwise with respect to the lower weight. If the upper weight is displaced clockwise through an angle less than 180 degrees, the direction of linear motion is counter-clockwise, regardless of the direction of rotation of the motor. When the upper weight is displaced counter-clockwise through an angle less than 180 degrees with respect to the lower weight, the direction of linear motion of the grinding mixture is clockwise, regardless of the direction of rotation of the motor. The preferred positioning of the weights is usually about 45 degrees apart, either clockwise or counter-clockwise. Frequently, counter-clockwise rotation of the grinding mixture is desired, in which case the upper weight should be displaced about 45 degrees clockwise from the lower weight. Numerous other variations may be used to impart desirable linear and orbital motion to a finishing mixture and are well within the skill of the art.

In prior art finishing machines the eccentric weights are generally bolted or clamped to the motor shaft. Consequently, the adjustment of the eccentric weights to the proper relative positions is a difficult and time-consuming process. Moreover, after the position settings are changed from one position to another, in order to provide different finishing characteristics dependent upon the type of parts to be finished and the type of finishing material to be used, there is no provision for returning the settings to a previously determined position, and the operator must once again experiment with the settings in order to find the proper relative positions. This can be exceedingly time consuming.

It is accordingly an object of the present invention to provide an improved vibratory motor assembly adapted to be vertically mounted in a vibratory apparatus having a plurality of eccentric weights. It is a further object to provide a vibratory motor assembly wherein at least one of the eccentric weights is rotatively adjustable with respect to the other. It is a further object to provide a vibratory motor assembly of the type described having a fixed eccentric weight in addition to the two adjustable eccentric weights. It is a primary object to provide a vibratory motor assembly of the type described having means whereby the adjustable weights may be readily manually adjusted from the top of the apparatus, and whereby Index means are provided to indicate to the operator in what position the adjustable weights are placed. It is further an object to provide such an apparatus wherein the adjustable eccentric weights hold their position even when subjected to the vibration of normal operations. It is an additional object to provide various forms of vibratory apparatus embodying the vibratory motor assemblies of the invention. Additional objects and advantages will be apparent to one skilled in the art and still other advantages will become apparent hereinafter.

The invention in its preferred embodiment is illustrated by the accompanying drawings in which:
FIG. 1 is a side elevation of a vibratory motor assembly according to the invention.
FIG. 2 is a top view of the apparatus.
FIG. 3 is a sectional view taken at the line 3—3 of FIG. 1.
FIG. 4 is a cross-sectional view of the vibratory motor assembly mounted in a finishing apparatus.
FIG. 5 is a cross-sectional view of the motor and weight indexing arrangement according to a somewhat modified embodiment of the invention.
FIG. 6 is a top view of a portion of the apparatus of FIG. 5; and
FIG. 7 is a bottom view of a portion of the apparatus of FIG. 6.

According to the invention, a vibratory motor assembly is provided having at least one and preferably two adjustable eccentric weights, preferably one mounted at each end of the motor shaft. Means are provided for rotating the eccentric weights to one or a number of positions, as well as means for retaining the weights in any selected position. Additionally, index means are provided for indicating an operator in what position the eccentric weights are mounted and retained at any particular time.

Reference is now made to the accompanying drawings for a better understanding of the invention, wherein all of the parts are numbered and wherein the same numbers are used to refer to corresponding parts throughout.

Referring to FIGS. 1–3, the vibratory motor assembly is shown comprising a motor housing 1, mounting brackets 2 attached thereto for mounting on vibratory apparatus, and a tubular shaft 3. An eccentric weight 4 is fixedly mounted at the lower portion of the shaft. At the upper portion of the shaft an upper weight support or platform 5 is fixedly mounted supporting an upper adjustable eccentric weight 6 slideably mounted about the shaft. A handle 7 is affixed to the eccentric weight 6 for lifting and rotating. The eccentric weight 6 is maintained in place by means of a detent pin 8 adapted to be inserted in and engaged by a plurality of detent holes 9 arranged in the weight support 5 arranged in a circle concentric with the tubular shaft. An indicator 10 is mounted on the eccentric weight 6 for indicating the position of the weight in conjunction with index numerals 11 provided on the weight support or platform 5.

A lower weight support or platform 12 is affixed to the motor shaft 3 at the lower end thereof and supports a lower adjustable eccentric weight 13 mounted thereon. The eccentric weight 13 is maintained in place with respect to the support 12 by means of a detent pin 14 affixed to the weight positioned in a series of detent holes 15 provided in the weight support 12 and arranged in a circle concentric with the shaft 3. The lower eccentric weight 13 is lifted and rotated by means of a J-form lower weight control rod 16 comprising a handle 17 at one end, a major vertical portion 18 journaled in the axial channel of the tubular shaft 3, a horizontal arm 19, and a minor vertical rod 20 having its end affixed to the lower adjustable eccentric weight 13. In order that the operator may determine the position of the lower weight from the operating position, an indicator 21 is affixed to the rod 18 and cooperates with an index scale 22. Alternatively detent pin 14 may be placed in the weight supports and the holes 15 in the weights. Alternative means for accomplishing the releasable engagement of the weight or weights with respect to said shaft, such as depressible spring bias or pressure between the weight and the support member, may also be used and will be apparent to one skilled in the art. For example, equivalent to lifting the eccentric weights to disengage same from their support members, the pins or other engaging means, wherever located, may be spring-biased and the weights released therefrom by depressing, twisting, turning, or the like.

The upper adjustable eccentric weight 6 is adjusted by grasping the handle 7 and raising the weight as it slides along the shaft 3 until the pin is completely disengaged from the hole 9. The weight may then be rotated until the indicator points to the proper numeral on the index disk. The weight is then lowered until the pin enters and is engaged by another detent hole 9. The lower eccentric weight 13 may be adjusted by grasping the handle 17 and raising the weight 13 until it is completely disengaged from the detent hole 15. The weight may then be rotated by turning the handle 17 until the indicator 21 points to the proper position on the indexed disk 22. The handle is then lowered until the pin 14 again engages the proper hole 15. During operation of the vibratory motor the eccentric weights are maintained in position by means of the pins 8 and 14 and detent holes 9 and 15. However, where the vibratory motion is unusually severe, the weights may be spring-loaded against the weight supports or platforms by means known in the art.

The positioning of the adjustable eccentric weights is significant in at least two respects. The relative position of the bottom adjustable weight with respect to the fixed bottom weight 4 is significant in controlling the impact and roll rate of the apparatus to which the motor assembly is affixed. The top weight is significant in determining and controlling the feed rate of material moving linearly in a circle within the chamber of the vibratory apparatus.

Referring to FIG. 4, a finishing apparatus is shown comprising a base 25, a supporting plate 26 mounted on the base 25 by means of coil springs 27 and a tubular support 28 mounted on the plate 26. Mounted on the plate 26 and surrounding the supporting member 28 is a finishing chamber 29 in the form of an annular trough. The trough may be disposed in a horizontal plane or it may equally well be inclined, spiraled, heliced, or the like. An annular flange 30 is mounted within the tubular support 28, having affixed thereto a motor bracket 31. The bracket supports an adjustable vibratory motor assembly similar to that shown in FIGS. 1–3 and having structure similarly numbered.

In operation, electric current is applied to the motor causing gyratory vibration of the apparatus, as described above. The mixture within the finishing chamber 29 comprising parts to be finished and a finishing material is moved in an orbital path in a direction shown by the arrows. Additionally, depending upon the adjustment of the relative positions of the eccentric weights, the mixture is also caused to travel in a linear circular path along the trough, the direction depending upon the relative adjustment of the eccentric weights. The apparatus may be readily adjusted in the manner described above by manipulating the control handles 17 and 7 to obtain the proper type of vibration, depending upon the nature of the parts and finishing material. Moreover such adjustment of the eccentric weights may be readily accomplished by an operator from the top of the apparatus.

FIGS. 5–7 illustrate the motor and eccentric weight indexing arrangement in a somewhat modified embodiment of the invention. The apparatus shown comprises a motor housing 40 having mounting flanges 41, 42, 43, and 44, affixed to flanges 45, 46, 47, and 48 of brackets 49 and 50 affixing the motor and weight assembly to a vibratory apparatus such as a finishing machine (not shown).

Vertically mounted in the motor housing 40 is a tubular shaft 51 journaled in bearings 52 and 53. Also contained within the motor housing 40 are a rotor, stator, and accessory structure (not shown, for convenience). Fixedly mounted on the tubular shaft 51 is a collar 60 having an indexing disc 61 affixed thereto. The disc 61 is provided with a plurality of circumferentially arranged indexing holes 62. An eccentric weight 53 is slideably and rotatably journaled over the tubular shaft 51, and is
provided with a handle 64 for lifting the weight. An indexing pin 65 is affixed to the bottom of the weight and positioned to be inserted into the holes 62 of the indexing disc 61.

The assembly for providing adjustment and indexing of the lower adjustable weight assembly comprises a hand knob 70 affixed to the upper end of a lift rod 54 by means of a roll pin 71. A pointer 72 is affixed to the hand knob 70 by suitable means such as screws or rivets. A setting or indexing disc 73 is affixed to the shaft 51 by suitable means such as screws 74.

Affixed to the bottom of the shaft 51 is a non-adjustable eccentric weight assembly comprising a weight arm 81 split at one end and clamped to the shaft by means of a cap screw 83, a spring lock washer 83, a nut 84, and a locknut 85. A plurality of weights 86 are affixed to the other end of the weight arm 81 by means of a bolt 87 threadingly engaged within a hole provided in the arm.

The adjustable eccentric weight assembly 90 comprises a weight arm 91 rotatably journaled by means of a hole provided therein about the shaft 51. A plurality of weights 92 are mounted at the end of the weight arm 91 by means of cap screws 93. A drive pin 88 is affixed to the weight arm 91 in a hole provided therein. A spur gear 95 is mounted over the shaft 51 and comprises a collar portion 96 and a toothed portion 97. The spur gear 95 is separated from the weight arm 91 by means of a washer 98. The spur gear 95 is affixed to the shaft 51 by means of set screws 99.

Affixed to the lower end of the lift rod 54 by means of a roll pin 100 is an end cap having an opening 102 slideably receiving the drive pin 88. Mounted on the end cap 101 by suitable means such as screws 103 is a idler gear or internal spur gear 104 having teeth in engagement with the teeth of the spur gear 95. The sun gear 104 is also provided with an opening 105 in which the drive pin 88 is slideably positioned.

In operation, the position of the upper unbalance weight may be changed by grasping the handle 64 and lifting the weight until the indexing pin 65 is disengaged from the hole in which it was previously positioned. The weight may then be rotated about the shaft 51 until the desired position is reached. The weight is then lowered again, with the indexing pin being inserted into another one of the circumferential holes 62. The relative position between the weight 63 and the shaft 51 is maintained during rotation of the weight during the operation of the apparatus.

The position of the lower adjustable unbalance weight may be changed by grasping the hand knob 70 and raising the lift rod 54. As a result, the end cap 101 and sun gear 104 are raised, the drive pin 88 sliding through the openings 105 and 102 in the sun gear and end cap respectively. After the lift rod has been lifted a sufficient distance, the teeth of the sun gear 104 become disengaged from the teeth of the spur gear 95. As a result, the hand knob may be rotated, causing rotation of the adjustable eccentric weight assembly 90. When the desired position has been reached, as indicated by the pointer 72 and setting disc 73, the hand knob is lowered, causing the end cap and sun gear to be lowered until the teeth of the sun gear once again engage the teeth of the spur gear at 95, but now in a different rotative position, thus fixing the adjustable unbalance weight assembly 90 in rotative position with respect to the shaft 51 once more. This relative position remains unchanged during rotation of the shaft and operation of the apparatus used in conjunction with the vibratory motor.

Although the invention has been illustrated and described with respect to an apparatus in which the tubular shaft 51 is directly mounted on the motor, other arrangements may also be used. For example, a tubular shaft may be mounted in separate bearings for rotation about a vertical axis, the shaft having the upper adjustable weight assembly and lower fixed and adjustable weight assemblies mounted thereon in substantially the same manner as shown in the drawings. Power to rotate the shaft may be provided by a motor separately mounted at one side of the shaft and operatively connected thereto by means of pulleys and an endless belt. Although the invention has been particularly described and illustrated with respect to its application to the vibratory finishing art, numerous other applications in other fields and to other apparatus requiring a vertically oriented shaft and adjustable eccentric weights will be immediately apparent.

It is to be understood that the invention is not limited to the exact details of construction, operation, or exact materials or embodiments shown and described, as obvious modifications and equivalents as will appear to one skilled in the art, and the invention is therefore to be limited only by the scope of the appended claims.

I claim:

1. A vibratory motor assembly adapted to be vertically mounted in a vibratory apparatus, said assembly comprizing a motor, a shaft having an axial channel operatively connected to said motor, and a plurality of adjustable eccentric weights mounted in axially spaced relationship on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, a plurality of detent means and a detent engaging means associated with each of said weights and each of said weights being provided for retaining said adjustable weights in any of a plurality of fixed rotative positions, manually operable means affixed to said upper adjustable weight, a rod journaled in the axial channel of said shaft having its lower end affixed to said lower adjustable weight and having manually operable means affixed to the upper end of said rod, whereby each of said adjustable weights may be independently disengaged from said weight supporting means and rotated and reengaged in a different rotative position.

2. A vibratory motor assembly adapted to be vertically mounted in a vibratory apparatus, said assembly comprizing a motor, a shaft having an axial channel operatively connected to said motor, and a plurality of adjustable eccentric weights mounted on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, each of said supporting means being provided with a plurality of detent holes arranged in a circle concentric with said shaft and each of said weights being provided with a detent pin adapted to be inserted in said detent holes for retaining said weights in any of a plurality of fixed rotative positions, manually operable means affixed to said upper adjustable weight, a rod journaled in the axial channel of said shaft having its lower end affixed to said lower adjustable weight and having manually operable means affixed to the upper end of said rod, whereby each of said adjustable weights may be independently disengaged from said weight supporting means and rotated and reengaged in a different rotative position.

3. A vibratory motor assembly adapted to be vertically mounted in a vibratory apparatus, said assembly comprizing a motor, a shaft having an axial channel operatively connected to said motor, and a plurality of adjustable eccentric weights mounted on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, each of said supporting means being provided with a plurality of detent holes arranged in a circle concentric with said shaft and each of said weights being provided with a detent pin adapted to be inserted in said detent holes for retaining said weights in any of a plurality of fixed rotative positions, manually operable means affixed to said upper adjustable weight, a rod journaled in the axial channel of said shaft having its lower end affixed to said lower adjustable weight and having manually operable means affixed to the upper end of said rod, whereby each of said adjustable weights may be independently disengaged from said weight supporting means and rotated and reengaged in a different rotative position, and index means for indicating the rotative position of each of said adjustable weights.
4. A vibratory motor assembly adapted to be vertically mounted in a vibratory apparatus, said assembly comprising a motor, a shaft having an axial channel operatively connected to said motor, and a plurality of adjustable eccentric weights mounted on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, means biasing said adjustable weights against said weight supporting means, each of said supporting means being provided with a plurality of detent holes arranged in a circle concentric with said shaft and each of said weights being provided with a detent pin adapted to be inserted in said detent holes for retaining said weights in any of a plurality of fixed rotative positions, manually operable means affixed to said upper adjustable weight, a rod journaled in the axial channel of said shaft having its lower end affixed to said lower adjustable weight and having manually operable means affixed to the upper end of said rod, whereby each of said adjustable weights may be independently disengaged from said weight supporting means and rotated and reengaged in a different rotative position, and index means for indicating the rotative position of each of said adjustable weights.

5. A vibratory motor assembly adapted to be vertically mounted in a vibratory apparatus, said assembly comprising a motor, a shaft having an axial channel operatively connected to said motor, a fixed eccentric weight in a plurality of adjustable eccentric weights mounted on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, a plurality of detent means and a detent engaging means associated with each of said weights and supporting means for retaining said adjustable weights in any of a plurality of fixed rotative positions, manually operable means affixed to said upper adjustable weight, a rod journaled in the axial channel of said shaft having its lower end affixed to said lower adjustable weight and having manually operable means affixed to the upper end of said rod, whereby each of said adjustable weights may be independently disengaged from said weight supporting means and rotated and reengaged in a different rotative position.

6. A finishing machine for finishing the surface of a part comprising a housing mounted for vibration defining a finishing chamber and having vibratory means operatively associated with said housing for subjecting a mixture comprising said part and a finishing material to vibration, said vibratory means comprising a motor, a vertically oriented shaft having an axial channel operatively connected to said motor, and a plurality of adjustable eccentric weights mounted in axially spaced relationship on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, a plurality of detent means and a detent engaging means associated with each of said weights and supporting means for retaining said adjustable weights in any of a plurality of fixed rotative positions, manually operable means affixed to said upper adjustable weight, a rod journaled in the axial channel of said shaft having its lower end affixed to said lower adjustable weight and having manually operable means affixed to the upper end of said rod, whereby each of said adjustable weights may be independently disengaged from said weight supporting means and rotated and reengaged in a different rotative position.

7. A finishing machine for finishing the surface of a part comprising a housing mounted for vibration defining a finishing chamber and having vibratory means operatively associated with said housing for subjecting a mixture comprising said part and a finishing material to vibration, said vibratory means comprising a motor, a vertically oriented shaft having an axial channel operatively connected to said motor, and a plurality of adjustable eccentric weights mounted in axially spaced relationship on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, a plurality of detent means and a detent engaging means associated with each of said weights and supporting means for retaining said adjustable weights in any of a plurality of fixed rotative positions, manually operable means affixed to said upper adjustable weight, a rod journaled in the axial channel of said shaft having its lower end affixed to said lower adjustable weight and having manually operable means affixed to the upper end of said rod, whereby each of said adjustable weights may be independently disengaged from said weight supporting means and rotated and reengaged in a different rotative position, and index means for indicating the rotative position of each of said adjustable weights.

8. A finishing machine for finishing the surface of a part comprising a housing mounted for vibration defining a finishing chamber and having vibratory means operatively associated with said housing for subjecting a mixture comprising said part and a finishing material to vibration, said vibratory means comprising a motor, a vertically oriented shaft having an axial channel operatively connected to said motor, and a plurality of adjustable eccentric weights mounted in axially spaced relationship on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, each of said supporting means being provided with a plurality of fixed rotative positions, manually operable means affixed to said upper adjustable weight, a rod journaled in the axial channel of said shaft having its lower end affixed to said lower adjustable weight and having manually operable means affixed to the upper end of said rod, whereby each of said adjustable weights may be independently disengaged from said weight supporting means and rotated and reengaged in a different rotative position.

9. A finishing machine for finishing the surface of a part comprising a housing mounted for vibration defining a finishing chamber and having vibratory means operatively associated with said housing for subjecting a mixture comprising said part and a finishing material to vibration, said vibratory means comprising a motor, a vertically oriented shaft having an axial channel operatively connected to said motor, and a plurality of adjustable eccentric weights mounted in axially spaced relationship on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, each of said supporting means being provided with a plurality of fixed rotative positions, manually operable means affixed to said upper adjustable weight, a rod journaled in the axial channel of said shaft having its lower end affixed to said lower adjustable weight and having manually operable means affixed to the upper end of said rod, whereby each of said adjustable weights may be independently disengaged from said weight supporting means and rotated and reengaged in a different rotative position, and index means for indicating the rotative position of each of said adjustable weights.

10. A finishing machine for finishing the surface of a part comprising a housing mounted for vibration defining a finishing chamber and having vibratory means operatively associated with said housing for subjecting a mixture comprising said part and a finishing material to vibration, said vibratory means comprising a motor, a vertically oriented shaft having an axial channel operatively connected to said motor, a fixed eccentric weight and a plurality of adjustable eccentric weights mounted in axially spaced relationship on said shaft, weight supporting means affixed to said shaft below each of said adjustable weights, a plurality of detent means and a
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A vibratory assembly adapted to be mounted in a vibratory apparatus comprising a tubular shaft having an axial channel adapted to be rotated while in vertical orientation, a rod slidably and rotatively mounted in the axial channel of said shaft having handle means affixed to the upper end thereof, an adjustable eccentric weight assembly comprising an arm rotatably journaled at one end about said shaft, a weight affixed to the other end of said arm, and a detent pin affixed to said arm at an intermediate position, a retaining member comprising a supporting plate affixed to the lower end of said rod having an internal cog gear fixedly mounted thereon, an external cog gear affixed to said tubular shaft coaxially aligned with and normally engaging said internal cog gear, said supporting member having a channel provided therein slideably engaging said detent pin and being adapted to be moved axially thereby disengaging said internal cog gear from said external cog gear, whereby said handle means may be raised to disengage said weight from said shaft, rotated to a new rotative position with respect to said shaft, and lowered to reengage said weight at said new rotative position.

12. A vibratory assembly adapted to be vertically mounted in a vibratory apparatus comprising a motor having a tubular shaft with an axial channel in vertical orientation, a rod slidably and rotatively mounted in the axial channel of said shaft having handle means affixed to the upper end thereof, an adjustable eccentric weight assembly comprising an arm rotatably journaled at one end about said shaft, a weight affixed to the other end of said arm, and a detent pin affixed to said arm at an intermediate position, a retaining member comprising a supporting plate affixed to the lower end of said rod having an internal cog gear fixedly mounted thereon, an external cog gear affixed to said tubular shaft coaxially aligned with and normally engaging said internal cog gear, said supporting member having a channel provided therein slideably engaging said detent pin and being adapted to be moved axially thereby disengaging said internal cog gear from said external cog gear, whereby said handle means may be raised to disengage said weight from said shaft, rotated to a new rotative position with respect to said shaft, and lowered to reengage said weight at said new rotative position.

13. A finishing machine for finishing the surface of a part comprising a housing mounted for vibration defining a finishing chamber and having vibratory means operatively associated with said housing for subjecting a mixture comprising said part and a finishing material to vibration, said vibratory means comprising a motor having a tubular shaft with an axial channel in vertical orientation, a rod slidably and rotatively mounted in the axial channel of said shaft having handle means affixed to the upper end thereof, an adjustable eccentric weight assembly comprising an arm rotatably journaled at one end about said shaft, a weight affixed to the other end of said arm, and a detent pin affixed to said arm at an intermediate position, a retaining member comprising a supporting plate affixed to the lower end of said rod having an internal cog gear fixedly mounted thereon, an external cog gear affixed to said tubular shaft coaxially aligned with and normally engaging said internal cog gear, said supporting member having a channel provided therein slideably engaging said detent pin and being adapted to be moved axially thereby disengaging said internal cog gear from said external cog gear, whereby said handle means may be raised to disengage said weight from said shaft, rotated to a new rotative position with respect to said shaft, and lowered to reengage said weight at said new rotative position.

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