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DEVICE WITH AN UNBALANCE ELEMENT

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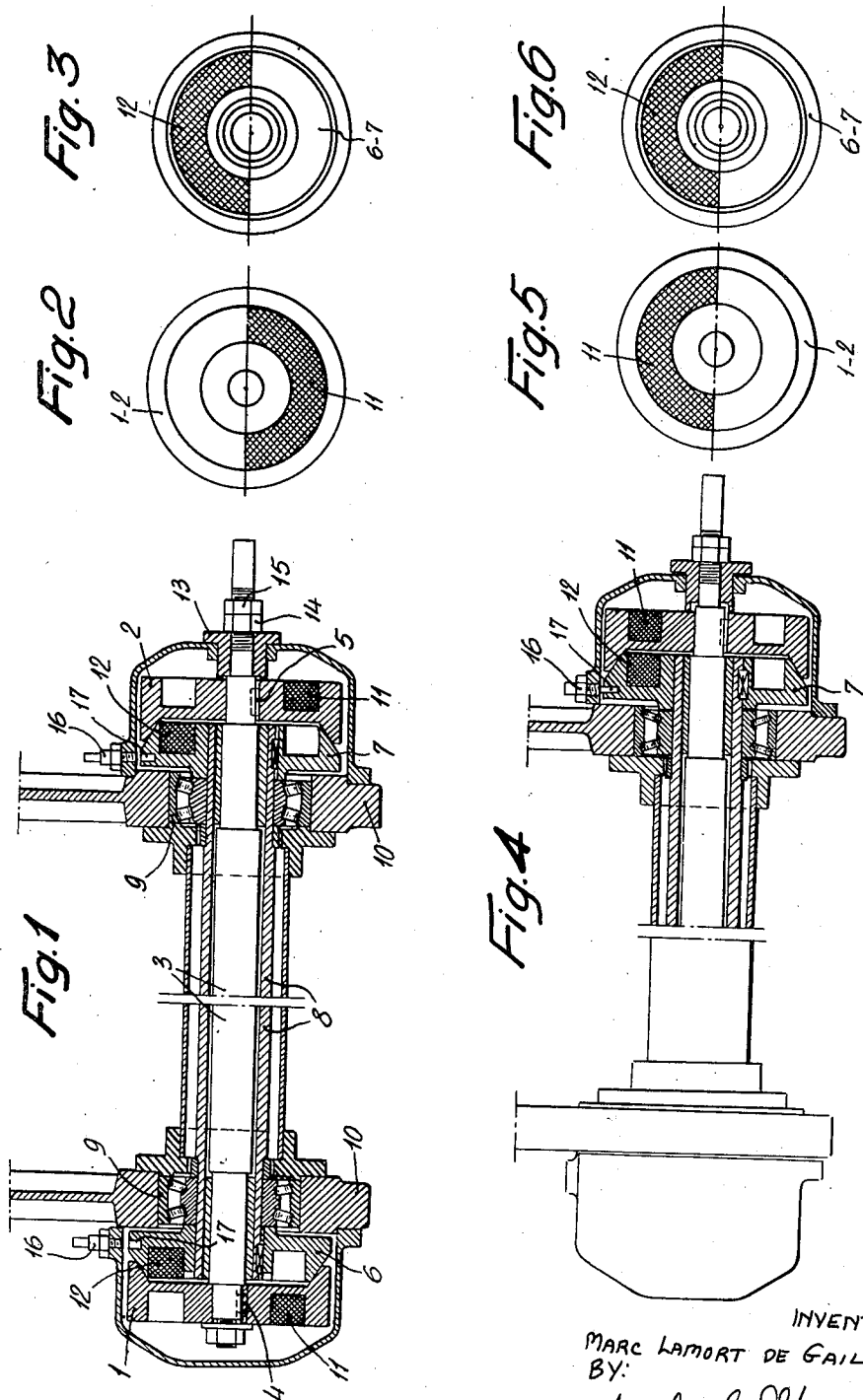
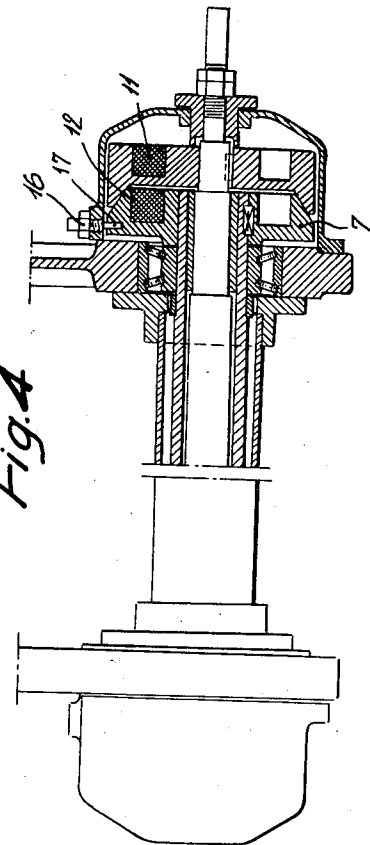


Fig. 4



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DEVICE WITH AN UNBALANCE ELEMENT

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The present invention relates to a device with an unbalanced element for vibrating apparatus, and particularly for flat or rotary sorting or purifying apparatus, such as are used in the paste or paper industries.

It is an object of the present invention to avoid the disadvantages inherent in vibrating apparatus according to the prior art.

It is another object of the invention to provide a device which is simple and which can be easily adjusted to various degrees of unbalance.

Yet another object of the invention is to provide a device which can be manufactured inexpensively and which requires a minimum of maintenance.

With the above objects in view the present invention mainly consists in a vibrating apparatus comprising a support, first eccentric flywheel means mounted on the support for rotation relative thereto about an axis, second eccentric flywheel means mounted on the support for rotation relative thereto about the same axis independently of said first flywheel means, and means for non-rotatably connecting the first and second flywheel means to each other. When the first and second flywheel means are non-rotatably connected to each other they rotate about said axis together while forming compound flywheel means having a predetermined degree of eccentricity. When the first and second flywheel means are disconnected from each other, one of the flywheel means can be angularly displaced about said axis independently of the other. The first and second flywheel means so displaced, can thereupon be reconnected and can rotate together while forming compound flywheel means having a different degree of eccentricity.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a sectional view of a device according to the present invention;

Fig. 2 is a side view showing a part of the device of Fig. 1;

Fig. 3 is a side view showing another part of the device of Fig. 1;

Fig. 4 is a side view partly in section showing the device of Fig. 1 in another position;

Fig. 5 is a side view of a part of the device as shown in Fig. 4; and

Fig. 6 is a side view of another part as shown in Fig. 4.

In the embodiment illustrated in the drawings, disk-shaped unbalanced elements or flywheel members 6 and 7 are mounted on a tube or support 8 at opposite ends thereof and together therewith form first compound flywheel means. Disk-shaped unbalanced elements or fly-

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wheel members 1 and 2 are mounted on a shaft or support 3 at opposite ends thereof and together therewith form second compound flywheel means.

The members 6 and 7 are rotatable with support 8 relative the members 1 and 2 and the shaft 3. A casing 10 having bearings 9 provides a support in which the flywheel means are mounted.

Slugs 11 and 12, provided in the respective flywheel members, may be opposed, as shown in Figs. 4-6, or they may be spaced from each other axially, as shown in Figs. 1-3, to provide different degrees of eccentricity for the compound flywheel means.

The flywheel members 1 and 2 each have, in the region of the respective inner end face thereof, a convex substantially frusto-conical engaging surface, while the flywheel members 6 and 7 have, in the region of the respective outer end faces thereof, a concave substantially frusto-conical engaging surface which has a shape corresponding substantially to that of the engaging surface of the adjacent flywheel members 6 and 7. These engaging surfaces provide friction clutch means by which the members 1 and 6 and 2 and 7 are respectively connected to each other for rotation as compound flywheels.

The member 1 is secured on the support 8 by a cotter pin 4 and the member 2 is secured on support 8 by a stud 5. The pin 4 and the stud 5 are so arranged as to permit longitudinal displacement of the member 2.

A push ring 13 and lock nuts 14 and 15 are located on support 8 and provide clutch means by which the members 6 and 7 are pushed against the members 1 and 2 so that the respective concave and convex engaging surfaces are in contact and maintain the first and second flywheel means coupled to each other for rotation.

The members 6 and 7 are each formed with a hole 17 into which a spindle 16 is movable. The elements 16 and 17 act as stop means and prevent axial turning of members 6 and 7 while the members 1 and 2 are being turned axially to change the position of slugs 11 and 12 relative to each other.

In operation of the device, the flywheel members are movable between an engaged position in which the engaging surfaces are in engagement, providing a compound flywheel of a first degree of eccentricity, and a disengaged position in which the engaging faces of members 1 and 2 are spaced from the engaging faces of members 6 and 7 and in which the members 1 and 2 and the members 6 and 7 are movable relative each other.

To vary the degree of eccentricity in the illustrated embodiment, the nuts 14 and 15 are unscrewed to release the ring 13 and the support 8 is turned with respect to the support 3 to orient the members 6 and 7 with respect to the members 1 and 2. Once the respective positions of the members have been set, the nuts 14 and 15 are tightened to cause the respective engaging faces of the members to be in frictional engagement.

It is clear from the foregoing, that the elements shown in the left hand of Fig. 1 can form compound flywheel means independently of the elements shown in the right hand of Fig. 1 and that the present invention is not limited to the form show in which there are flywheel members on both sides of the supports 3 and 4.

What I claim is:

1. In a vibrating apparatus, in combination, a support; first eccentric flywheel means mounted on said support for rotation relative thereto about an axis; second eccentric flywheel means mounted on said support for rotation relative thereto about said axis independently of said first flywheel means; and clutch means for non-rotatably connecting said first and second flywheel means to each other, whereby when said first and second flywheel means are non-rotatably connected to each other

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the same may rotate about said axis together while forming compound flywheel means having a predetermined degree of eccentricity and when said first and second flywheel means are disconnected from each other one of said flywheel means may be angularly displaced about said axis independently of the other of said flywheel means and may thereafter be non-rotatably connected to said one flywheel means so that said first and second flywheel means may thereupon rotate about said axis together while forming compound flywheel means having a different degree of eccentricity.

2. The combination defined in claim 1 wherein said clutch means are friction clutch means.

3. In a vibrating apparatus, in combination, a support; first eccentric flywheel means mounted on said support for rotation relative thereto about an axis; second eccentric flywheel means having a mass equal to the mass of said first flywheel means and mounted on said support for rotation relative thereto about said axis independently of said first flywheel means; and clutch means for non-rotatably connecting said first and second flywheel means to each other, whereby when said first and second flywheel means are non-rotatably connected to each other the same may rotate about said axis together while forming compound flywheel means having a predetermined degree of eccentricity and when said first and second flywheel means are disconnected from each other one of said flywheel means may be angularly displaced about said axis independently of the other of said flywheel means and may thereafter be non-rotatably connected to said one flywheel means so that said first and second flywheel means may thereupon rotate about said axis together while forming compound flywheel means having a different degree of eccentricity.

4. In a vibrating apparatus, in combination, a support; first eccentric flywheel means mounted on said support for rotation relative thereto about an axis, said first flywheel means having a center of gravity spaced a predetermined distance from said axis; second eccentric flywheel means having a mass equal to the mass of said first flywheel means and mounted on said support for rotation relative thereto about said axis independently of said first flywheel means, said second flywheel means having a center of gravity also spaced said predetermined distance from said axis; and clutch means for non-rotatably connecting said first and second flywheel means to each other, whereby when said first and second flywheel means are non-rotatably connected to each other in such a manner that said centers of gravity thereof are angularly displaced by 180° said first and second flywheel means may rotate about said axis together while forming balanced compound flywheel means and when said first and second flywheel means are disconnected from each other one of said flywheel means may be angularly displaced about said axis independently of the other of said flywheel means and may thereafter be non-rotatably connected to said one flywheel means so that said first and second flywheel means may thereupon rotate about said axis together while forming compound flywheel means having a predetermined degree of eccentricity.

5. In a vibrating apparatus, in combination, a support; first eccentric flywheel means mounted on said support for rotation relative thereto about an axis; second eccentric flywheel means mounted on said support for rotation relative thereto about said axis independently of said first flywheel means and for axial movement relative thereto between an operative position wherein said first and second flywheel means are adjacent to each other and an inoperative position wherein said first and second flywheel means are spaced from each other; clutch means on said first and second flywheel means for non-rotatably connecting the same to each other only when said second flywheel means is in said operative position thereof; and moving means for moving said second flywheel means between said operative and inoperative positions thereof,

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whereby when said second flywheel means is in said operative position thereof said first and second flywheel means may rotate about said axis together while forming compound flywheel means having a predetermined degree of eccentricity and when said second flywheel means is moved from said operative position thereof to said inoperative position thereof the same may be angularly displaced about said axis independently of said first flywheel means and may thereafter be moved into said operative position thereof so that said first and second flywheel means may thereupon rotate about said axis together while forming compound flywheel means having a different degree of eccentricity.

6. The combination defined in claim 5 wherein said clutch means are friction clutch means.

7. In a vibrating apparatus, in combination, a support; first eccentric flywheel means mounted on said support for rotation relative thereto about an axis; second eccentric flywheel means mounted on said support for rotation relative thereto about said axis independently of said first flywheel means; clutch means for non-rotatably connecting said first and second flywheel means to each other, whereby when said first and second flywheel means are non-rotatably connected to each other the same may rotate about said axis together while forming compound flywheel means having a predetermined degree of eccentricity and when said first and second flywheel means are disconnected from each other one of said flywheel means may be angularly displaced about said axis independently of the other of said flywheel means and may thereafter be non-rotatably connected to said one flywheel means so that said first and second flywheel means may thereupon rotate about said axis together while forming compound flywheel means having a different degree of eccentricity; and stop means for preventing rotation of said other flywheel means during angular displacement of said one flywheel means relative to said other flywheel means.

8. In a vibrating apparatus, in combination, a support; a first shaft mounted on said support for rotation relative thereto about an axis; a second shaft mounted on said support for rotation relative thereto about said axis independently of said first shaft; first flywheel means mounted on said first shaft for rotation therewith about said axis; second flywheel means mounted on said second shaft for rotation therewith about said axis; and clutch means for non-rotatably connecting said first and second flywheel means to each other, whereby when said first and second flywheel means are non-rotatably connected to each other the same may rotate about said axis together while forming compound flywheel means having a predetermined degree of eccentricity and when said first and second flywheel means are disconnected from each other one of said flywheel means may be angularly displaced about said axis independently of the other of said flywheel means and may thereafter be non-rotatably connected to said one flywheel means so that said first and second flywheel means may thereupon rotate about said axis together while forming compound flywheel means having a different degree of eccentricity.

9. In a vibrating apparatus, in combination, a support; a first shaft mounted on said support for rotation relative thereto about an axis; a second shaft mounted on said support for rotation relative thereto about said axis independently of said first shaft, said second shaft being longer than said first shaft and having opposite free ends extending beyond the opposite free ends of said first shaft; a pair of first eccentric flywheel members mounted on said first shaft for rotation therewith at said free ends thereof, respectively; a pair of second eccentric flywheel members mounted on said second shaft for rotation therewith at said free ends thereof, respectively; clutch means for non-rotatably connecting each of said first flywheel members to the corresponding second flywheel member, whereby when said pairs of first and second flywheel members are non-rotatably connected to each other the same may ro-

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tate together with said first and second shafts about said axis while forming compound flywheel means having a predetermined degree of eccentricity and when said pairs of first and second flywheel members are disconnected from each other one of said shafts and consequently the flywheel members carried thereby may be angularly displaced about said axis independently of the other of said shafts and consequently the flywheel members carried thereby and said pairs of first and second flywheel means may thereafter be non-rotatably connected to each other so that the same may thereupon rotate together with said first and second shafts about said axis while forming compound flywheel means having a different degree of eccentricity.

10. In a vibrating apparatus, in combination, a support; a first shaft mounted on said support for rotation relative thereto about an axis; a second shaft mounted on said support for rotation relative thereto about said axis independently of said first shaft, said second shaft being longer than said first shaft and having opposite free ends extending beyond the opposite free ends of said first shaft; a pair of first eccentric flywheel members mounted on said first shaft for rotation therewith at said free ends thereof, respectively; a pair of second eccentric flywheel members mounted on said second shaft for rotation therewith at said free ends thereof, respectively; clutch means for non-rotatably connecting each of said first flywheel members to the corresponding second flywheel member; and moving means for rotating said first and second shafts relative to each other when said pairs of first and second flywheel members are disconnected from each other, whereby when said pairs of first and second flywheel members are non-rotatably connected to each other the same may rotate together with said first and second shafts about said axis while forming compound flywheel means having a predetermined degree of eccentricity and when said pairs of first and second flywheel members are disconnected from each other one of said shafts and consequently the flywheel members carried thereby may be angularly displaced about said axis independently of the other of said shafts and consequently the flywheel members carried thereby and said pairs of first and second flywheel means may thereafter be non-rotatably connected to each other so that the same may thereupon rotate together with said first and second shafts about said axis while forming compound flywheel means having a different degree of eccentricity.

11. In a vibrating apparatus, in combination, a support; a first substantially disk-shaped eccentric flywheel mem-

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ber having in the region of one end face thereof a convex substantially frusto-conical engaging surface and mounted on said support for rotation relative thereto about an axis; a second substantially disk-shaped eccentric flywheel member having in the region of one end face thereof a concave substantially frusto-conical engaging surface having a shape substantially corresponding to the shape of said engaging surface of said first flywheel member and mounted on said support for rotation relative thereto independently of said first flywheel member, one of said flywheel members being mounted on said support for axial movement relative to the other of said flywheel members between an engaged position wherein said end faces of said flywheel members are near each other and said engaging surfaces thereof are in engagement with each other in such a manner that said flywheel members are non-rotatably connected to each other and a disengaged position wherein said end faces of said flywheel members are spaced from each other and said engaging surfaces are out of engagement with each other; and moving means for moving said one flywheel member axially relative to the other of said flywheel members, whereby when said one flywheel member is in said engaged position thereof both of said flywheel members may rotate about said axis together while forming a compound flywheel having a predetermined degree of eccentricity and when said one flywheel member is moved from said engaged position thereof to said disengaged position thereof said flywheel members may be angularly displaced about said axis relative to each other and said one flywheel member may thereafter be moved from said disengaged position thereof to said engaged position thereof so that both of said flywheel members may thereupon rotate about said axis together while forming a compound flywheel having a different degree of eccentricity.

12. The combination defined in claim 11 wherein said one flywheel member is said second flywheel member.

13. The combination defined in claim 11 wherein said engaging surfaces of said flywheel members are in frictional engagement with each other when said one flywheel member is in said engaged position thereof.

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