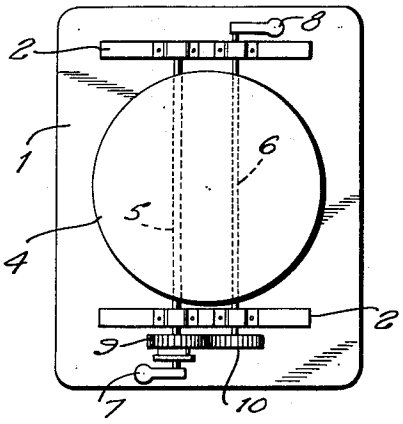
Dec. 22, 1953 L. H. DE LANGEN 2,663,554

APPARATUS FOR IMPARTING A VIBRATING MOVEMENT TO OBJECTS OR MATTERS

Filed Dec. 26, 1947

FIG. 1A.



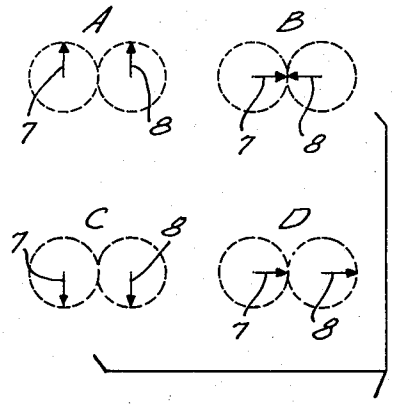


FIG. 2.

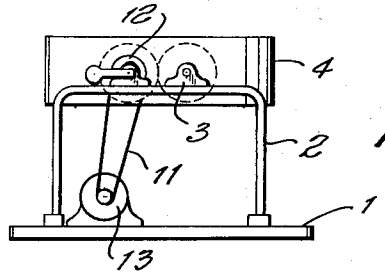


FIG. 1B.

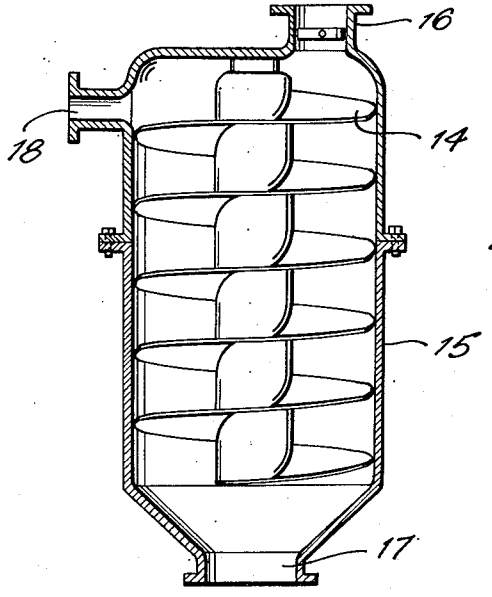


FIG. 3.

INVENTOR.

Lambertus Hendrikus de Langen

BY

Michael S. Johnson

agt

Patented Dec. 22, 1953

2,663,554

UNITED STATES PATENT OFFICE

2,663,554

APPARATUS FOR IMPARTING A VIBRATING MOVEMENT TO OBJECTS OR MATTERS

Lambertus Hendrik de Langen, Delft, Netherlands

Application December 26, 1947, Serial No. 794,334
In the Netherlands March 15, 1943

Section 1, Public Law 690, August 8, 1946
Patent expires March 15, 1963

6 Claims. (Cl. 259—72)

1

My present invention relates to a vibration apparatus and a method for imparting vibrating movements to objects of various kinds.

It is an object of my present invention to provide an apparatus for imparting movements to goods moving along a comparatively long path.

It is another object of my present invention to provide an apparatus whereby vibrations may be imparted to moving goods and wherein the movement of the goods extends beyond one cycle of vibrations.

It is a further object of my present invention to provide an apparatus by which vibrations may be imparted to goods and at the same time, the goods may be moved on predetermined paths.

With the above objects in view my present invention mainly consists in a vibration apparatus, and comprises the combination of a shaker frame and means for subjecting the frame to vibrations in two planes.

A preferred embodiment of my invention is an apparatus consisting in a shaker frame and means for subjecting said frame to vibrations in two planes, one of said vibrations being a straight line vibration, and the other being a curved line vibration.

A specific form of the apparatus consists in a base, a shaker frame, shaft means carrying said frame and freely revolvable with respect thereto, spaced spring means for revolvably supporting said shaft means on said base, eccentric masses associated with said shaft means on two opposite sides of said shaker frame, and means for imparting rotation to said shaft means and eccentric masses, the latter means imparting to said eccentric masses rotary movements of equal speed and opposite direction, whereby said shaft means and shaker frame are subjected to vibrations in two planes.

An embodiment which is particularly useful for the treatment of matters by gases or liquids consists in a shaker frame, a vertically extending receiving surface provided on said shaker frame, the said receiving surface having a straight helicoidal form, a casing for said shaker frame enclosing said receiving surface, spaced inlet and outlet means to said casing for admitting the material to be treated into said casing and onto said receiving surface, an additional inlet for a treating fluid, the latter inlet being disposed intermediately of said inlet and outlet means for the material to be treated, and means for subjecting said shaker frame and casing alternately to vibrations in two planes.

The novel features which I consider as characteristic of my 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:

2

Fig. 1A is a plan view of the apparatus according to my invention;

Fig. 1B is a side view of the apparatus;

Fig. 2 illustrates in diagrammatical form four distinct positions of the eccentrics employed in my apparatus for obtaining the vibration movements; and

Fig. 3 is a modified embodiment of the shaker frame provided in the apparatus for receiving the goods.

With reference to the drawings it will be seen that the apparatus is provided with a base 1 on which spaced spring supports 2 of U-shaped form are arranged. On these spring supports are provided bearings 3 for parallel shafts 5 and 6. The shafts are rotated at equal speed by gears 9 and 10 driven from an electro-motor 13 through belt 11.

A shaker frame 4 is carried on the shafts intermediately of the spring supports. The shafts extend through the frame in a manner to be freely revolvable relatively thereto. It will also be understood that the shafts are furthermore freely rotatable in the spring supports 2 by means of bearings 3.

On each of the shafts an eccentric mass is provided which is indicated by reference numerals 7 and 8. As appears, the two masses are on relatively opposite ends of the two shafts so that one mass is on each side of the shaker frame 4. The two masses are arranged so as to extend in opposite directions when in horizontal position. Since, as has been pointed out, the speed of the two shafts is equal the two eccentric masses will successively assume the positions designated A, B, C and D in Figure 2, upon opposite rotation of the shafts. Starting with A it will be understood that the two masses 7 and 8 when moving into this position will impart an upwardly directed movement to the shafts 5 and 6 and thus to the shaker frame 4. Thereupon when moving into position B the eccentric masses will subject the frame to a rotary movement in its plane since they are disposed on opposite sides of the frame (see Fig. 1A). The movement into position C will result in a downwardly directed movement of the shafts and the frame

oppositely to the movement consequent upon the position A. Thereafter the masses when moving into position D will impart a rotary movement to the frame in its plane but of a direction opposite to the movement produced in position B.

There is thus imparted to the shafts and frame a vibrating movement of opposite direction along a straight line and normal to the plane of the frame, and, in addition, the frame is subjected to vibrations on a curved line, i. e. to opposite rotary oscillations in the plane of the frame.

In other words, there is a rotary vibration in the general plane of the frame superposed on a vibration normal to such plane. Preferably both vibrations have equal frequencies and have a phase displacement of 90° or 270°, i. e. one vibration should be at zero when the other reaches a maximum value. If the amplitudes of the vibrations are selected equal the motion of each point of the shaker surface will be circular and, on the other hand, if the amplitudes are unequal the points will describe ellipses.

It is also possible to regulate the motion of the surface by changing the phase angle between both types of vibrations. For instance, if both vibrations reach their extreme values at one and the same time all points of the shaker surface will move on a helical path.

This would be particularly useful for processes wherein the goods are subjected to a relatively long chemical, thermal, liquid, drying or gas treatment being vibrated.

In general, it will be understood that by means of the apparatus described the goods can be moved along an extremely long or even unlimited path, depending on the duration only of the operation.

The apparatus is also extremely useful for sorting and separating processes, where the speed of the objects depends largely on their weight, specific gravity and coefficient of friction. For instance, gold may be separated from the ore or coal and stones may be separated from each other. The concentration of the gold can be determined according to the length of the path it has moved on.

The apparatus can be used with a band-shaped or disc-shaped shaker frame so that the goods move at slow speed. In this way, the equivalent to an endless conveyor may be formed with the goods moving in an arcuate path which would be impossible on the ordinary type of endless conveyor.

A circular or cylindrical frame may be employed in the manufacture of paper pulp. Thus, seamless objects made of paper can be manufactured.

With reference to the embodiment shown in Fig. 3 it will be seen that in this case the shaker frame comprises a casing 15 which may be air- or liquid-tight and which should be arranged in vertical position and in which a straight vertical axle with a helicoidal receiving surface around it is provided. The casing is provided with an inlet 16 and an outlet 17 for the goods. In addition the casing has an intermediate inlet 18 through which a treating substance, for instance, as gas may be introduced. The opening 16 may be controlled by a valve as indicated.

On this surface the goods can be caused to move slowly along the long path defined by the straight ellipse. The movement is accomplished by the combination of two types of vibrations as set forth.

This type of shaker frame is particularly useful for treating solid matters through rinsing and lixiviating. In this case the matters to be treated may be moved in the upward direction and the treating liquid may move downward.

It will also be understood that the frames may be formed in both embodiments as screens and that the openings of the frames may be of varying diameters. For instance, in case of a circular or cylindrical shaker surface the matters to be screened may be placed on the screen at a locality where the openings are relatively small and the screen may then be caused to move so that the matter gradually and consecutively becomes located on top of the larger openings. In this manner the matter passing through the screen will accumulate in a strip wherein the grains are of decreasing size.

It is also possible to provide for the removal of the goods from the shaker surface by the arrangement of partitions at specific points of the surface which are adapted to force the goods into conveying troughs.

It will also be understood that the shaker surface can be arranged and formed in such a way that the goods move on spiral paths of increasing or decreasing diameters. Thus a long path is obtained and the goods can be passed to the surface in the center and can be removed at the edge of the surface without special means therefor.

The apparatus may also be used for mixing two kinds of goods. In this case, one class of goods can be supplied through the central opening and the other can be supplied at the edge of the shaker surface.

It will furthermore be understood that the two types of vibration movements can be combined in any desired manner. It is for instance possible during a first period to apply the movements in such a way as to move the goods in spirals of increasing diameter, and then, to modify the vibrations in such a way that the goods describe circular paths or move in spirals of decreasing diameters.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of vibration apparatus differing from the types described above.

While I have illustrated and described the invention as embodied in a vibration apparatus and similar purposes, I do not intend to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of my invention.

Without further analysis, the foregoing will so fully reveal the gist of my invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What I claim as new and desire to secure by Letters Patent is:

1. A vibration apparatus, comprising in combination, a base; a shaker frame; shaft means carrying said frame and freely revolvable with respect thereto; spaced spring means for revolvably supporting said shaft means on said base; eccentric masses associated with said shaft means

on two opposite sides of said shaker frame; and means for imparting rotation to said shaft means and eccentric masses, the latter means imparting to said eccentric masses rotary movements of equal speed and opposite direction whereby said shaft means and shaker frame are subjected to vibrations in two planes.

2. A vibration apparatus, comprising in combination, a base; two spaced spring supports provided on said base; a shaker frame; two parallel shafts extending between said supports and carrying said shaker frame and being rotatable relatively thereto, the said shafts protruding with their ends to both sides of said shaker frame; bearings for rotatably supporting the ends of said shafts on said spring supports; eccentric masses, one for each of said shafts, fixed to inverse ends of said shafts and extending in at least two positions in opposite directions therefrom; and means for rotating said shafts in opposite directions with equal speed whereby said shafts and shaker frame are subjected successively to vibrations in two planes.

3. A vibration apparatus comprising in combination, a shaker frame; a part carried by said frame and having a receiving surface; a casing for said shaker frame enclosing said receiving surface; means for admitting a treating fluid to said casing; and means for subjecting said shaker frame and casing alternately to oppositely directed straight line oscillations in vertical direction and to oppositely directed rotary oscillations in horizontal direction about a vertical axis.

4. A vibration apparatus comprising in combination, a shaker frame; a part carried by said frame and having a receiving surface; a casing for said shaker frame enclosing said receiving surface; spaced inlet and outlet means to said casing for admitting the material to be treated into said casing and onto said receiving surface; an additional inlet for a treating fluid, the latter inlet being disposed intermediately of said inlet and outlet means for the material to be treated; and means for subjecting said shaker frame and casing alternately to oppositely directed straight line oscillations in vertical direction and to

oppositely directed rotary oscillations in horizontal direction about a vertical axis.

5. A vibration apparatus comprising in combination, a shaker frame; a part carried by said frame; a vertically extending receiving surface provided on said part, the said receiving surface having a straight helicoidal form; and means for subjecting said frame alternately to oppositely directed straight line oscillations in vertical direction and to oppositely directed rotary oscillations in horizontal direction about a vertical axis.

6. A vibration apparatus comprising in combination, a shaker frame; a part carried by said frame; a vertically extending receiving surface provided on said part, the said receiving surface having a straight helicoidal form; a casing for said shaker frame enclosing said receiving surface; spaced inlet and outlet means to said casing for admitting the material to be treated into said casing and onto said receiving surface; an additional inlet for a treating fluid, the latter inlet being disposed intermediately of said inlet and outlet means for the material to be treated; and means for subjecting said shaker frame and casing alternately to oppositely directed straight line oscillations in vertical direction and to oppositely directed rotary oscillations in horizontal direction about a vertical axis.

LAMBERTUS HENDRIK DE LANGEN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,392,345	Lowe	Oct. 4, 1921
1,668,984	Simpson	May 8, 1928
1,675,560	Jubian	July 3, 1928
2,174,013	Schrey	Sept. 26, 1939
2,230,325	Haver	Feb. 4, 1941
2,398,455	Unger	Apr. 16, 1946

FOREIGN PATENTS

Number	Country	Date
49,682	France (First addition to No. 821,936)	May 30, 1939
693,143	Germany	July 3, 1940