May 8, 1928. 1,668,984

L. SIMPSON

COUNTERBALANCING MEANS FOR VIBRATING DEVICES

Filed Oct. 3, 1924 3 Sheets-Sheet 1

Fig. 1.

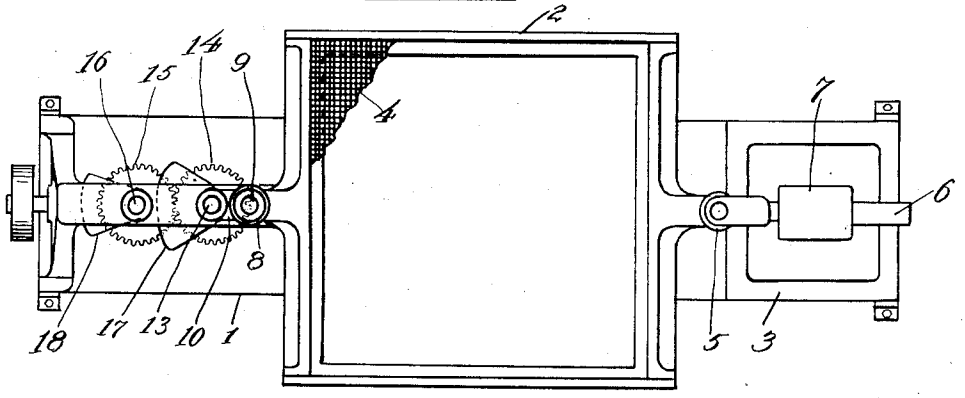
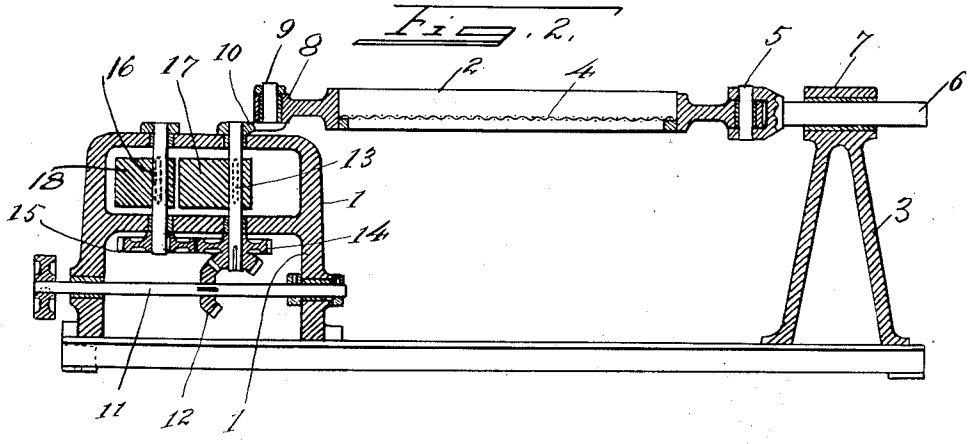


Fig. 2.



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Filed Oct. 3, 1924 3 Sheets-Sheet 2

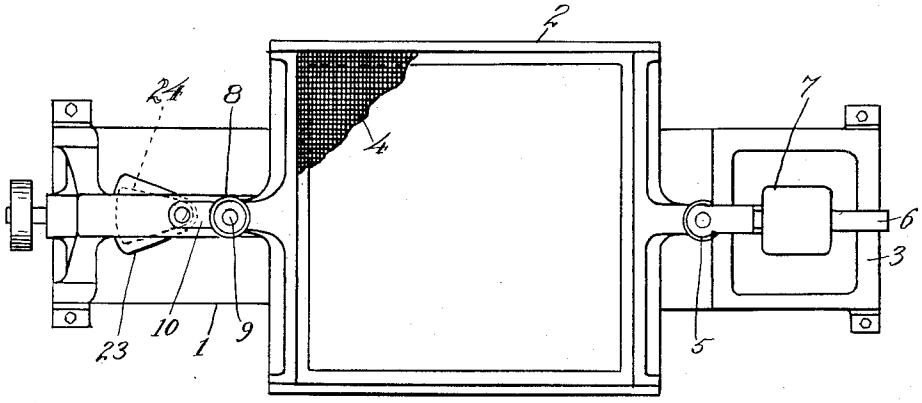


Fig. 3

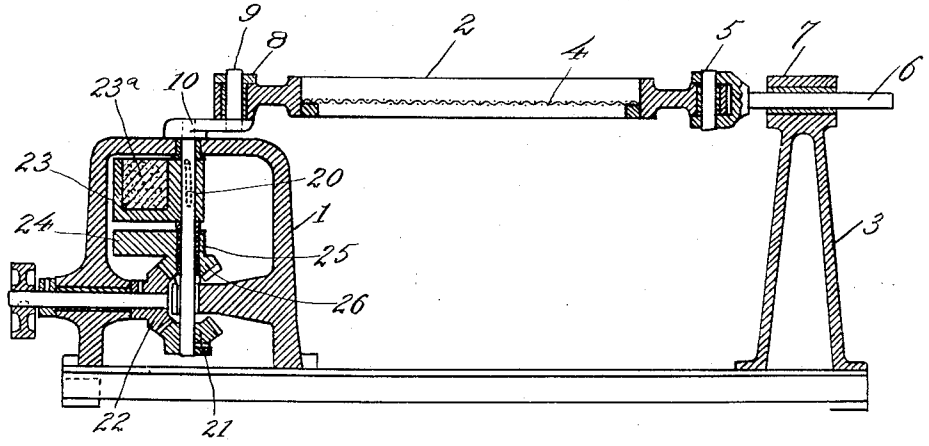


Fig. 4

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Filed Oct. 3, 1924 3 Sheets-Sheet 3

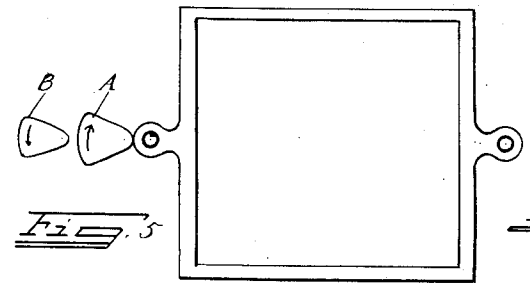


Fig. 5.

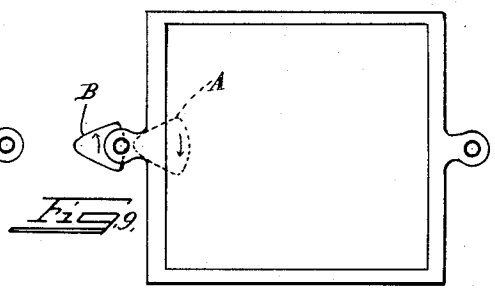


Fig. 9.

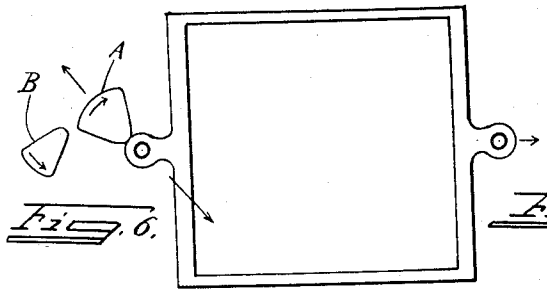


Fig. 6.

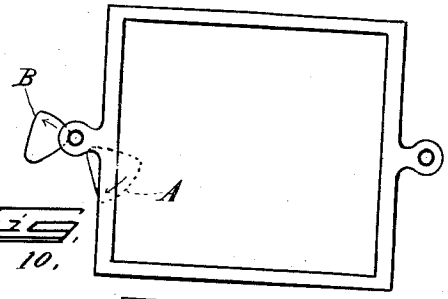


Fig. 10.

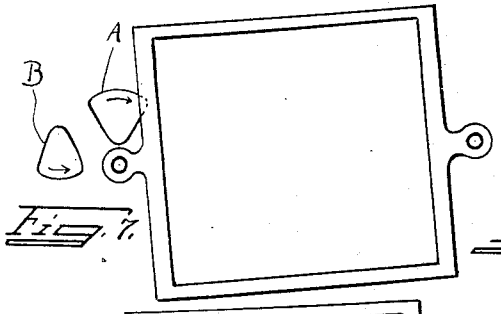


Fig. 7.

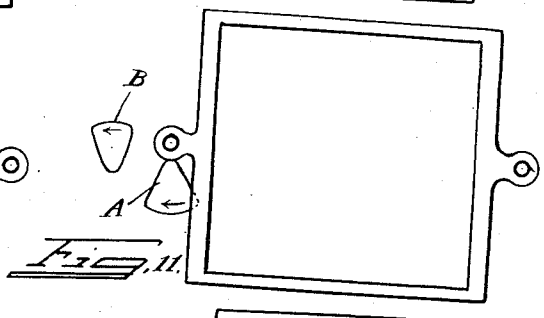


Fig. 11.

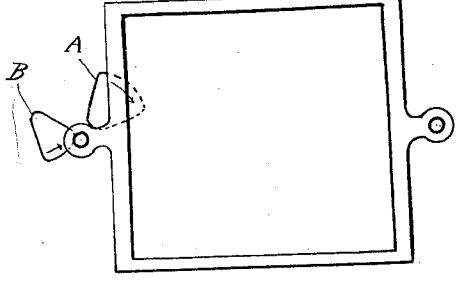


Fig. 8.

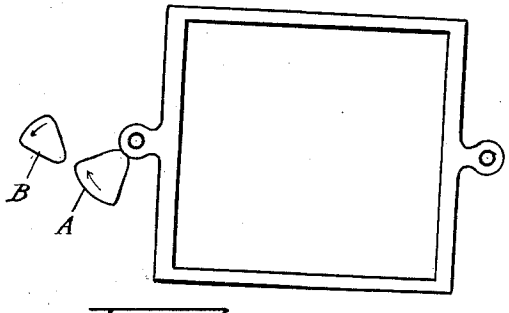


Fig. 12.

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UNITED STATES PATENT OFFICE.

LOWE SIMPSON, OF CINCINNATI, OHIO.

COUNTERBALANCING MEANS FOR VIBRATING DEVICES.

Application filed October 3, 1924. Serial No. 741,497.

My invention relates to vibrating devices such as sifting and sorting machines in which a frame holding a screen or sorting surface is provided; which is given a circular motion at one point and at another point is guided so as to be permitted to move reciprocally, either in a straight or arcuate path, while intermediate points in the frame, screen, or sorting surface, move in paths approximately elliptical.

In machines of this character, particularly those which have heavy moving parts, it has not been found possible to counterbalance the forces within the machines so as to avoid imparting destructive vibrations to their foundations or buildings in which they are located.

In the past it has been proposed to counterbalance the destructive forces in sifting and sorting machines of the particular type described, by means of a counterweight revolving in one direction only, but it has not appeared possible to accomplish the purpose in his way, since the weight, if arranged to counteract the result of motions of the screen in one direction, will not be correct to counteract it in other directions.

The object of my invention is to provide means for improving the counterbalancing of machines of the type in question, and I accomplish my object by that certain construction and arrangement of parts to be hereinafter more specifically pointed out and claimed.

In the drawings:

Figure 1 is a top plan view of a simple form of machine illustrating my invention.

Figure 2 is a central vertical secion of Figure 1.

Figure 3 is a plan view of another type of counterbalance, illustrating my invention in connection with the same form of machine.

Figure 4 is a central vertical section of Figure 3.

Figures 5 to 12 are diagrams illustrating the mode of counterbalancing the motion of a screen, or sorting surface, and showing the complete cycle of the screen, in eight stages.

In illustrating the machine, I have shown a very simple form, since the screen or sorting surface of itself and its mode of support, is a well known device for sifting and sorting machines, and its details of construction are not of importance to my invention.

I have shown a casing 1, for the drive box, which supports one end of the screen frame 2, and a standard 3 which supports the other end. The screen has a frame, to which the numeral 2 is applied, and some kind of a surface for sorting or selecting, such as I have illustrated as a fabric piece 4, although the surface need not be foraminated.

The frame has a hinge joint 5 connected to the one end, which joint includes a rod 6, which slides in a journal 7 on the standard 3. The other end of the frame is shown as provided with a journal 8 through which a post 9 extends. The post is mounted on a crank or eccentric 10, which provides the other support of the frame 2, and imparts a circular motion to the frame. The other end of the frame 2 has an established center formed by the hinge joint 5, which has but one line of movement, controlled by the rod and journal, shown at 6 and 7. The resulting movement of the screen is a well defined lengthwise movement throughout, and a circular motion confined mainly to one end, so that any counterbalance will have to be sufficient to make provision for the full weight of the screen as to its lengthwise movement, and only a part of the weight of the screen as to its circular movement, since the circular movement does not take place with regard to the entire screen in an equal manner.

Thus to place a single weighted member on the drive shaft of the crank (in the instance described) as has been the practice, can take care of the lengthwise movement for example, but if it does so, will be too heavy to take care of the circular movement.

In the past, it has been the practice, to effect a compromise, in counteracting vibrations in machines of the character described, with the result that some vibrations have been left in the machines, thereby making larger sizes impractical, and making it impractical to suspend the machines from ceilings, or place them in a location where vibrations could work damage or cause a nuisance by their noise.

The essential point of my invention is that I divide the counterbalance for machines of the kind of which a typical simple example has been described, into two parts of substantially unequal force, so driven in opposite directions that both are acting together when the counterforce must be great-

est, and the two are acting against each other, where the counterforce is not required to be so great, effecting a balance in all positions as nearly as is practical.

I have shown two typical examples of use of the double counterforce. Thus in Figures 1 and 2, the drive for the screen is shown as provided by a shaft 11, which by a beveled gear 12, drives a vertical shaft 13. This shaft has the crank at its upper end which supports and actuates the screen.

On the shaft 13 is a gear 14, which meshes with a gear 15, on a parallel vertical shaft 16. On the shaft 13 is a counterweight 17, set so that it will be directly opposed to the lengthwise movement of the screen. On the shaft 16 is another and lighter weight 18, set so as to be opposed to the lengthwise movement of the screen also. The two weights, however, revolve in opposite directions, as will be noted from the arrangement of gears.

In the other example (Figures 3 and 4) the shaft 20, which has the crank thereon, is driven from the beveled gear 21, meshing with the lower face of a beveled gear 22 on the power shaft. The weight 23 is fast to the shaft 20, and is set to oppose the screen's lengthwise movement. Set over the shaft is a weight 24, less than the weight 23, having a bearing 25 over the shaft 20, and having a beveled gear 26 which meshes with the upper face of the gear 22. The weight 24 is set to oppose the lengthwise movement of the screen, but revolves in the opposite direction to the weight 23.

The diagrams 5 to 12 will illustrate the action of either form, although they are diagrams of the one firstly described, since this is the easiest one to form into a diagram.

In the diagrams the weights have been indicated by letters A and B in which the heavier weight is at A, with the weights moving jointly so as to approximately balance the movement of the screen. The screen is shown in Figure 5, as at its extreme position to the right. The weights are shown as opposing this position, so as to take up the effect which the screen would have of forcing the machine to the right. In Figure 6 the screen starts to rock to one side, as well as to reciprocate, and the weight A moves to counteract this motion while the weight B so acts in opposition to weight A as to compensate for the out of balance relation in favor of weight A. As the screen comes to position in Figure 7, where it reaches the extreme of its circular component of movement at right angles to its reciprocation path, the weights A and B directly oppose each other, while weight A opposes the screen. Thus the force of weight B plus the force of the screen are made to equal the force of weight A so as to obtain a balance. When the screen is in position of Figure 8 where it is approaching its left hand limit of movement, the weights A and B jointly with the screen, effect a balance as in Figure 6, and in Figure 9 which is the extreme left hand position of the screen both weights have combined to oppose the screen in exactly the same direction.

The intermediate position of Figure 10 leads to that of Figure 11 in which weight A opposes the screen directly at the other end of its transverse arc of movement, while the weight B works against weight A. In Figure 12 the transition stage is indicated leading to the position of Figure 5 again.

The weights have been arranged so that they will pass each other, and either one or both may be made adjustable in weight, as illustrated in Figure 4 in which the weight 23 is shown as a hollow metal box, filled with the desired amount of shot 23^a.

While the word "screen" has been used in the specification, it is evident that a surface which has no holes in it, for sifting action, but is given the same motion, is equally applicable to my invention. Also it should be pointed out that the advantages of the peculiar motion of the said surface, in agitating a material placed upon it, will give greater effectiveness than a reciprocatory or purely circular motion, since the particles are rolled over with relation to each other, and shifted about, permitting a selective stratifying action to take place, and sifting or sorting action to be accelerated.

The force is applied to one end of the screen or surface to be agitated, which is the only practical way of accomplishing this movement, so far as I am advised, but my counterbalancing effect is applicable wherever a surface is given a motion which is confined substantially to reciprocation at one end, and revolution at the other.

Where the surface to be agitated is arranged in other than a horizontal plane, the mechanism for counterbalancing it should be in a substantially parallel plane.

The weights as shown are of different shape and size, but it will be understood that the degree of eccentricity of their mounting will also control in the amount of force set up thereby, in opposition to the force of the screen, and that the weights could be equal but of a different degree of eccentricity, with like results to the examples shown.

I have used the word "reciprocate" not in any technical sense, but as defining a movement of the one end of the screening or sorting surface, which so controls the movement of the surface as to oppose its lateral movement and accentuate an end for end movement thereof.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In combination with a frame mounted and actuated so as to move in a rotary manner at one end, and in a substantially reciprocatory manner at the other, and driving means therefor, and means for counterbalancing the movement of the frame comprising a plurality of weights moving in opposite directions operatively connected with said driving means.

2. In combination with a frame mounted and actuated so as to move in a rotary manner at one end, and in a substantially reciprocatory manner at the other, and means for counterbalancing the movement of the frame comprising a plurality of weights moving in opposite directions, said weights being arranged to rotate off center, and having unequal force with each weight set to oppose the lengthwise movement of the frame, and means for driving said weights together with the frame.

3. In combination with a frame having means for actuating said frame so as to move in a rotary manner at one end and in a substantially reciprocatory manner at the other, and means for counterbalancing the movement of the frame comprising unequal counterforce members, arranged to oppose the frame movement jointly, at the extremes of the reciprocatory component of its movement and to oppose each other at the intermediate extremes of the rotary component of its movement, with the greater of said members opposing the force of the frame at all times.

4. In combination with a frame, a driven shaft, rotary means actuated by said shaft, and engaging said frame at one end, means confining the movement of the surface substantially to reciprocation, at its other end, and weights energized together with said shaft, and arranged off center, said weights being unequal in force as so arranged, and the lesser weight in force rotating in an opposite direction to the frame, and the greater in force rotating in the same direction as the frame but 180 degrees from the rotary means.

5. In combination with a frame, a driven shaft, rotary means actuated by said shaft and engaging the frame at one end, means for confining the movement of the frame to reciprocation, at the other end, a weight arranged off center on said shaft with its force to oppose the frame movement, another weight driven by said shaft in the opposite direction, said latter weight being less than the former.

6. In combination with a frame, a driven shaft, rotary means actuated by said shaft and engaging the frame at one end, means for confining the movement of the frame substantially to reciprocation, at the other end, a weight arranged off center on said shaft with its force to oppose the frame movement, another weight driven by said shaft in the opposite direction, said latter weight being less than the former, said second weight having a shaft on which it is supported and said shaft and the shaft first mentioned being driven in opposite directions.

LOWE SIMPSON.