

March 6, 1934.

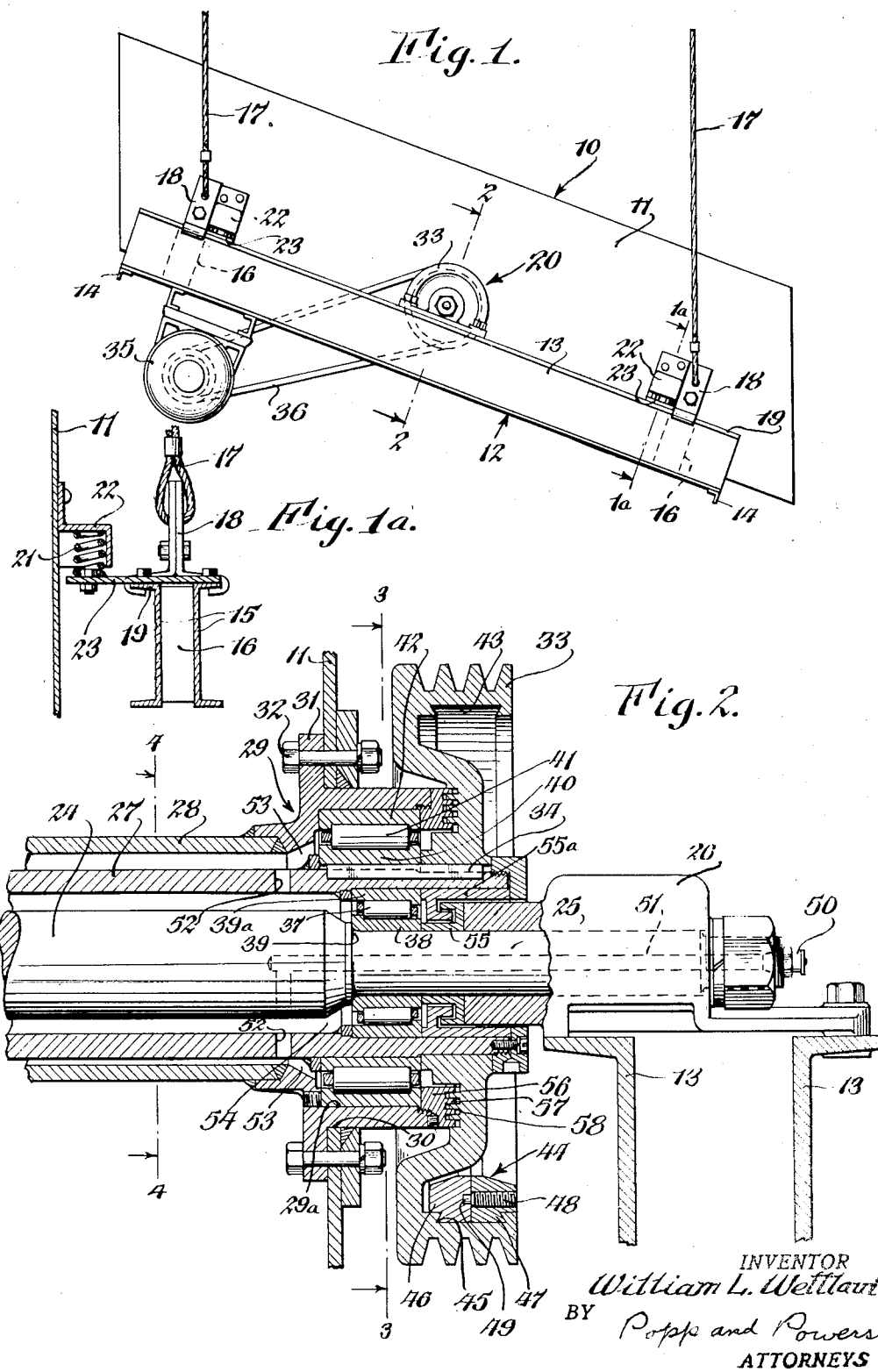
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1,949,703

BODY GYRATING MECHANISM

Filed July 16, 1932

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

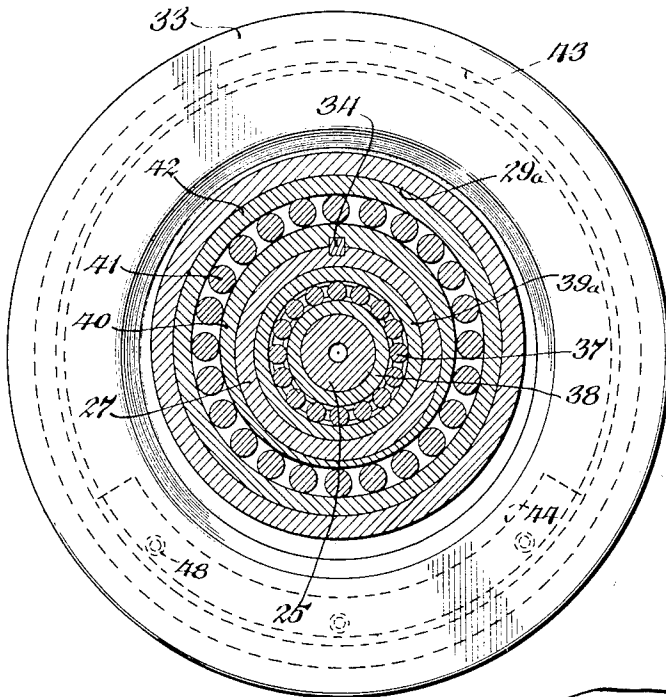


Fig. 3.

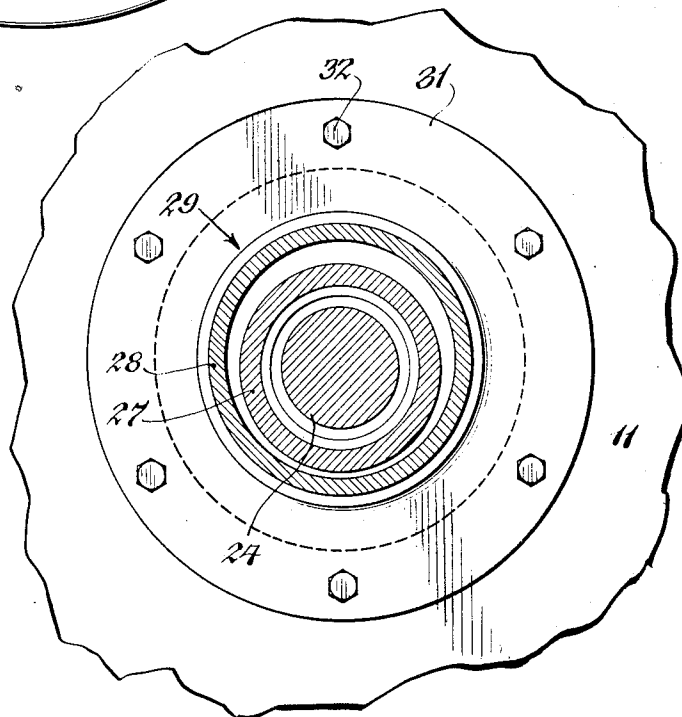


Fig. 4.

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3 Sheets-Sheet 3

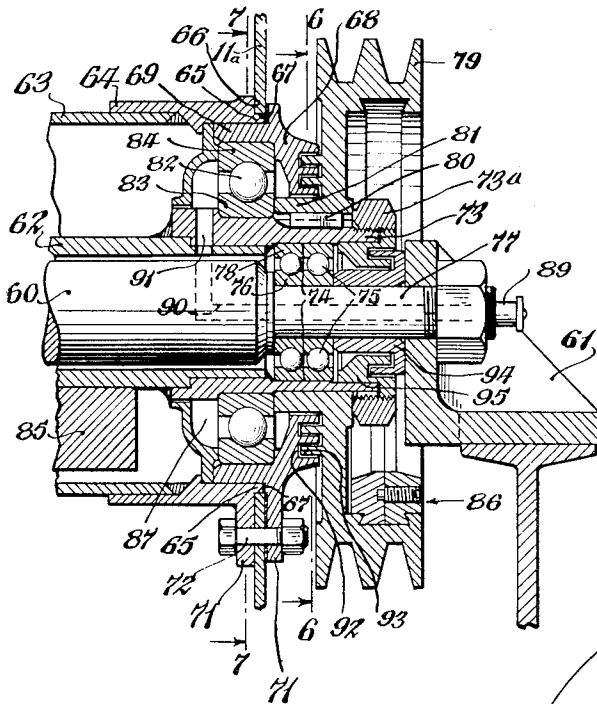


Fig. 5.

Fig. 6

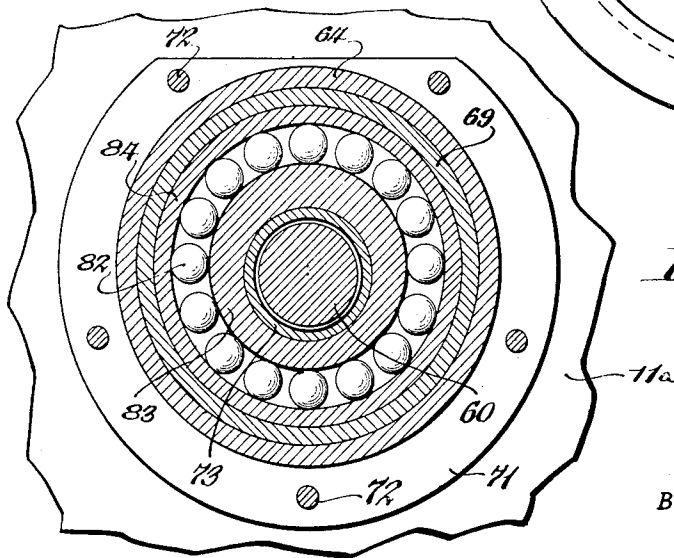
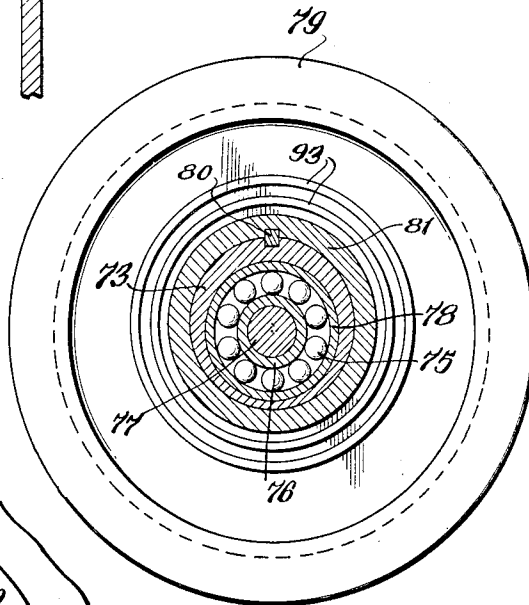


Fig. 7.

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1,949,703

BODY GYRATING MECHANISM

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Application July 16, 1932, Serial No. 622,920

20 Claims. (Cl. 74-14)

This invention relates to body gyrating mechanisms such as are employed, for example, in connection with vibrating screens. More particularly the invention is concerned with mechanisms of the type which utilize anti-friction bearings to maintain at a low value friction losses which would otherwise occur owing to the weight of the body and the centrifugal forces set up by its movement.

The principal object of the invention is to provide a novel arrangement of the bearings and associated parts, whereby to provide a simple and economical construction.

A further object is to provide a construction wherein the bearings are so arranged that their size may be determined solely by and in accordance with the load that they are to carry.

A still further object is to provide for the reinforcement of the drive shaft, whereby arrangement of the bearings in a common plane in order to avoid objectionable bending or flexing of the drive shaft is not essential.

A still further object is to provide for facility in lubricating the bearings.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of a vibrating screen in which features of the invention are incorporated.

Figure 1a is an enlarged fragmentary section taken along line 1a-1a of Figure 1.

Figure 2 is an enlarged sectional view taken along line 2-2 of Figure 1.

Figure 3 is a section taken along line 3-3 of Fig. 2.

Figure 4 is a section taken along line 4-4 of Fig. 2.

Figure 5 is a sectional view similar to Figure 2 of another embodiment of the invention.

Figure 6 is a section taken along line 6-6 of Fig. 5.

Figure 7 is a section taken along line 7-7 of Fig. 5.

The features by which the invention is characterized render it of particular advantage as the actuating mechanism of screens of the so-called vibrating type and it is, therefore, illustrated and described in connection with such a screen. It is to be understood, however, that the invention is not limited to such use, such illustration being by way of example only.

The screen which is illustrated in connection with the gyrating mechanism is of conventional construction. It comprises a body 10 between the side walls 11 of which the usual screen decks are

arranged and a supporting frame 12 upon which the body is mounted for vibratory movement. The frame is rectangular in form and consists of side members 13 and end members 14, the body being mounted between the former and above the latter. Each side member includes a pair of beams 15 of channel-shape cross-section (Figures 1a and 2) which are secured back to back against spacing blocks 16. The frame 12 is suspended by cables 17 at the angle necessary to insure flow of the material across the screen decks in the desired direction, the cables being secured to convenient overhead structure and being connected to the frame by clamps 18 which engage over the flanges 19 of the beams.

The gyrating mechanism which is indicated generally at 20 (Figure 1) is availed of, in the embodiment illustrated, to actuate the body 10 in the manner disclosed in my co-pending application, Serial No. 180,016, filed March 31, 1927, i. e. to gyrate it in circular paths at a relatively high speed thereby to facilitate rapid screening of the material introduced into the body. To this end the gyrating mechanism is, as disclosed in the said application, employed in connection with springs 21 (Figure 1a) one of which is arranged at each corner of the screen body. The said springs carry a substantial part of the load of the body and serve the further purpose of maintaining the latter in correct screening position while permitting its positive actuation in the manner described by the gyrating mechanism. The springs 21, as illustrated, fit within housings 22, the latter being suitably secured to the side walls 11 of the screen body. The side members 13 of the frame carry plates 23 which extend laterally beneath the housings 22 to co-operate with the springs. The latter are under compression and hence act against the plate 23 to urge their respective corners of the screen body upwardly.

The gyrating mechanism 20, as illustrated, includes a fixed shaft 24 (Figure 2) which extends through the screen body substantially coincident with the center of gravity thereof and which is supported by its reduced ends 25 upon the side members 13. For this purpose the latter carry blocks 26 of bearing-like construction which are suitably secured upon the side members and in which the reduced ends of the shaft 24 are mounted. The mechanism also includes a tubular shaft 27 which is co-axial with the shaft 24 and a tubular housing 28 which fits over the former. The housing is formed or provided at each end with a bearing chamber 29, the said chamber

being defined by an annular wall 29a which extends through an opening 30 provided for this purpose in a side wall 11 of the screen body. The chamber providing portion of the housing 28 is formed with an annular flange 31 by which the housing is secured to the wall 11 with suitable nut and bolt fastenings 32. The housing 28, therefore, is secured to the side walls of the screen body while the shaft 24 is secured to the supporting frame 12. The tubular shaft 27, on the other hand, extends beyond the annular walls 29a of the bearing housing and carries on the extension a drive wheel 33, the latter being fixed to the shaft by a key 34. The wheel 33 is adapted to be connected to an electric motor 35 (Figure 1) by suitable belt means 36, the said motor being suitably supported from the frame 12.

The drive shaft 27 is supported for concentric rotative movement about the shaft 24 by roller bearings 37, the inner ring 38 of which fits over the reduced end of the shaft against a shoulder 39 and the outer ring 39a of which fits snugly within the end of the shaft 27. The bearings 37 which will hereinafter, for convenience, be referred to as the main bearings are adapted to carry that part of the dead load represented by the screen body and contents which is not carried by the springs 21.

The inner ring 40 of a set of roller bearings 41, is keyed upon the shaft 27 by the key 34, the outer ring 42 of the said set fitting snugly within the bearing chamber 29 in substantially the same plane as that occupied by the main bearings 37. The inner ring 40 is formed to provide an eccentric enlargement or cam upon the shaft 27. In other words the peripheral surface of the ring 40 is eccentric to the axis of the drive shaft 27. The outer ring 42 is concentric with the periphery of the inner ring 40 and hence rotary movement of the drive shaft 27 is translated into a gyratory movement which is transmitted through the bearings 41 to the housing 28, and hence the screen body. The bearings 41 which will hereinafter, for convenience, be referred to as the eccentric bearings are adapted to carry the load which is created as a result of the screen body gyrating about the axis of the main bearing. This load varies directly as the eccentricity of the ring 40 and as the square of the angular speed of the shaft 27. The eccentric bearings, therefore, must be designed to carry the maximum of a variable load range. On the other hand the load on the main bearings is substantially always the same, the load being equal to the total load minus that part thereof which is carried by the springs 21. The maximum load which is carried by the eccentric bearings is considerably greater than the load which is carried by the main bearings. The latter are, therefore, in the interests of economy preferably correspondingly smaller than the former. It will be apparent that the transmission of power to the screen body in the manner described has the advantage that when the main and eccentric bearings are arranged in substantially the same plane in order to eliminate bending stresses, each of the bearings may be designed solely with reference to the load that it is to carry without regard to the size of the other. The cost of production, therefore, is maintained at a minimum. A further advantage obtained is that the shaft 24 provides a rigid mounting for the main bearings and hence the necessity of self-aligning bearings for this purpose is avoided.

The drive wheel 33 is availed of to counteract the centrifugal forces developed by the screen

body gyrating about the main bearing axis. To this end the rim thereof is formed with an annular slot or guideway 43 of dovetail cross-section. A counterbalance 44 is secured to the wheel by a tongue 45 of dovetail cross-section, the said tongue fitting within the guideway 43. The counterbalance consists of two sections 46 and 47 which are held against relative movement in the guideway by a set screw 48 carried by the section 47. The reduced end 49 of the set screw registers with a suitable opening formed in the section 46. By loosening the screw 48 slightly the section may be adjusted as a unit to the point desired while by tightening the said screw the sections may be locked in such position. By adjusting the set screw so that the end 49 thereof is completely withdrawn from the hole in the section 46, the two sections may be detached from the wheel by first slipping them apart in the guideway. The sections may be assembled when the set screw is in the same position by slipping them together in the guideway and then tightening it to wedge the tongue 45 firmly against the walls of the guideway. It will be apparent from the foregoing that the counterbalance 44 may be adjusted to eliminate the centrifugal forces developed by the screen body gyrating around the main bearing axis. In other words, the centrifugal forces pass through the eccentric bearings to the balance wheel and do not pass to the main bearings. In this connection it is understood, of course, that the drive shaft 27 is journaled at the end opposite from that shown in a similar bearing assembly and that a balance wheel similar to the wheel 33 is preferably employed therewith.

A suitable lubricant may be supplied to the bearings through a fitting 50 carried by the reduced end of the shaft 24. The fitting communicates through a duct 51 with the interior of the drive shaft in the vicinity of openings 52 which are formed therein. A portion of the lubricant which is discharged from the duct 51 may, therefore, pass by way of said openings through a passageway 53 to the eccentric bearings while another portion may flow along the drive shaft through a passageway 54 to the main bearings. Owing to centrifugal force the lubricant which is discharged into the drive shaft 27 is, during operation of the mechanism, forced under pressure to the eccentric bearings, while a part thereof which does not pass through the openings 52 is forced axially of the shaft toward the passageway 54. Lubrication of the bearings is thus facilitated. It will be apparent that the bearings may be lubricated either while the mechanism is running or while it is at rest. A further advantage which is obtained is that either oil or grease may be employed as the lubricating medium.

Means is provided for preventing escape of the lubricant from the bearing chamber. For this purpose a seal is employed in connection with each of the main and eccentric bearings. The seal employed in connection with the former includes a stationary part 55 which is carried by the reduced end of the shaft 24 and an interfitted part 55a carried by the drive shaft 27. The seal employed in connection with the eccentric bearings includes a ring 56 which is screwed in the open end of the wall 29a of the bearing housing and which is formed with a plurality of annular ribs 57 which fit in companion recesses 58 formed in the face of the wheel 33. The annular wall 29a of the tubular housing 28 moves eccentrically with respect to the axis of the wheel 33. The recesses 58, therefore, are formed eccentric with respect

to the axis of the wheel 33 to a corresponding degree.

From the foregoing it will be apparent that the construction described is simple and economical and that owing to the ease with which the bearings may be lubricated wearing of the latter may be maintained at a minimum.

In the embodiment illustrated in Figure 5 the side members 59 of the supporting frame are in the form of beams of standard construction and the fixed shaft 60 of the mechanism passes through the side walls 11a of the screen body and is secured at its ends to said beams by suitable brackets 61. The mechanism, similarly to that described in the first embodiment, includes a tubular drive shaft 62 which fits over the shaft 60 and a tubular housing 63. The latter carries a collar 64 which is suitably secured over the end of the said housing and which is formed with an annular axially extending rib 65 and a laterally extending shoulder 66. The rib fits in an opening 67 formed in the side wall 11a of the screen body while the shoulder abuts the inner face of that part of the wall which defines the opening. A cap piece 68 is formed with a body portion 69 which fits within the open end of the collar 64 and a flange 70 which abuts the outer face of that part of the side wall 11a which defines the opening 67. Securement of the housing to the side wall 11a of the screen body is effected by the collar 64 and cap piece 68 and to this end each is formed with co-operating laterally extending flanges 71 between which the side wall is secured by suitable nut and bolt fastenings 72.

The drive shaft 62 has a cam sleeve 73 fitted over and suitably secured to each of its ends, the inner walls 74 of the sleeves being concentric with the shaft 60. The drive shaft is supported for rotative movement upon the shaft 60 by ball bearings 75, the inner ring 76 of which is fitted over the reduced end 77 of the shaft 60 and the outer ring 78 of which is fitted within the end of the cam sleeve 73. The bearings 75 are adapted to carry that part of the dead load of the screen body which is not carried by the springs which are arranged at the four corners of the screen body and which function similarly to the springs described in connection with the embodiment first described. Power is transmitted to the drive shaft 62 through the agency of a drive wheel 79 which is fitted over the cam sleeve 73 and keyed thereto by a key 80, the said drive wheel being secured upon the sleeve by a nut 73a. Inasmuch as the wheel 79 is mounted upon the sleeve 73, the hub 81 of the wheel is formed correspondingly eccentric with the periphery of the wheel so that when the wheel is secured upon the sleeve 73 its periphery will be concentric with the axis of the shaft 60.

The eccentric motion of the cam sleeve 73 is transmitted to the housing 63, and hence the screen body, through the agency of ball bearings 82, the inner ring 83 of which fits over the sleeve 73 and the outer ring 84 of which fits snugly within the body portion 69 of the cap piece 68. The bearings 82 are adapted to transmit the centrifugal forces developed by the gyrating movement of the screen body to the counterbalancing means. They correspond, therefore, to and function similarly to the eccentric bearings described in the first embodiment. As distinguishing from the said first embodiment, however, the drive shaft 60 carries a counterbalance 85, the diameter of the tubular housing 63 being large enough to accommodate it while permitting the housing to gyrate about the drive

shaft 62 in the manner described. The counterbalance 85 is adapted to eliminate a substantial part of the centrifugal forces set up by the movement of the screen body. It is preferred, however, that the drive wheel 79 carry an auxiliary counterbalance 86 which in construction is similar to that described in connection with the first embodiment, the said counterbalance being adjustable to co-operate with the counterbalance 85 to counteract the centrifugal forces set up by the screen body.

The eccentric bearings 82 are encased within a lubricating chamber 87 which is provided by the cap piece 68 and a second cap piece 88, the latter fitting within the collar 64 and being secured in such position by the body portion 69 of the cap piece 68. Lubricant is introduced into the lubricating chamber 87 through a fitting 89 which communicates with the chamber through a duct 90 formed in the reduced end 77 of the shaft 60 and one or more openings 91 which extend through the drive shaft 62 and cam sleeve 73. A portion of the lubricant discharged from the duct 90 is forced along the shaft 60 to the main bearings 75 and lubricates the latter. In order to seal the lubricating chamber 87 the cap piece 68 is preferably formed with annular recesses 92 which co-operate with annular ribs 93 formed on the wheel 79, the said ribs having a running fit in the recesses. Lubricant from the main bearing 75 is prevented from escaping by a suitable seal which, as illustrated, includes a stationary member 94 carried by the reduced end 77 of the shaft 60 and a rotatable member 95 which is secured in the end of the cam sleeve 73 by the nut 73a, the said members being formed respectively with a co-operating recess and rib which function in the conventional manner. It will be noted that in this embodiment the main and eccentric bearings do not occupy the same vertical plane. They are, however, relatively close together and the shaft 60 and housing 63 are capable of counteracting to a high degree the tendency of the drive shaft to bend under the influence of the centrifugal forces developed by the moving screen body. In other respects the construction disclosed in Figure 5 is substantially the same as that described in Figure 1.

I claim as my invention:

1. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member and journaled thereon, means for rotating said shaft, eccentric means carried by said shaft and means carried by said body and journaled on said eccentric means, whereby upon rotation of said shaft a gyrating movement is imparted to said body.

2. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said shaft is supported upon said member, means for rotating said shaft, eccentric means carried by said shaft and anti-friction bearing means co-operating with said eccentric means and said body, whereby upon rotation of said shaft a gyrating movement is imparted to said body.

3. Mechanism for actuating a body in the manner described including a support, a shaft carried by said support and upon which said body is mounted, a hollow shaft fitting over said first mentioned shaft, an anti-friction bearing by

which said hollow shaft is supported upon said first mentioned shaft, means for rotating said hollow shaft, eccentric means carried by said hollow shaft and anti-friction bearing means co-

5 operating with said eccentric means and said body, whereby upon rotation of said hollow shaft a gyrating movement is imparted to said body.

4. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said hollow shaft is supported upon said member, means for rotating said hollow shaft, eccentric

15 means carried by said hollow shaft and anti-friction bearing means co-operating with said eccentric means and said body, whereby upon rotation of said hollow shaft a gyrating movement is imparted to said body, said anti-friction bearing and bearing means being located in a common plane.

5. Mechanism for actuating a body in the manner described including a support, a shaft carried by said support and upon which said body is mounted, a hollow shaft fitting over said first mentioned shaft, an anti-friction bearing by which said hollow shaft is supported upon said first mentioned shaft, said bearing being designed to carry the load represented by the dead weight of said body, means for rotating said hollow shaft, eccentric means carried by said hollow shaft, and anti-friction bearing means co-operating with said eccentric means and said body, whereby upon rotation of said hollow shaft a gyrating movement is imparted to said body, said anti-friction bearing means being designed to carry the load represented by the centrifugal forces set up by the movement of said body.

6. Mechanism for actuating a body in the manner described including a support, a shaft carried by said support and upon which said body is mounted, a hollow shaft fitting over said first mentioned shaft, an anti-friction bearing by which said hollow shaft is supported upon said first mentioned shaft, said bearing being adapted to transmit the dead weight of the body to said first mentioned shaft, means for rotating said hollow shaft, eccentric means carried by said hollow shaft, anti-friction bearing means co-operating with said eccentric means and said body, whereby upon rotation of said hollow shaft a gyrating movement is imparted to said body, and means for counterbalancing the centrifugal forces set up by said body, said anti-friction bearing means being adapted to carry the load represented by such forces.

7. Mechanism for actuating a body in the manner described including a support, a shaft carried by said support and upon which said body is mounted, a hollow shaft fitting over said first mentioned shaft, an anti-friction bearing by which said hollow shaft is supported upon said first mentioned shaft, said bearing being designed to carry the load represented by the dead weight of said body, means for rotating said hollow shaft, eccentric means carried by said hollow shaft, and anti-friction bearings means co-operating with said eccentric means and said body, whereby upon rotation of said hollow shaft a gyrating movement is imparted to said body, said anti-friction bearing means being designed to carry the load represented by the centrifugal forces set up by the movement of said body and both of said bearing means being located in a common plane.

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8. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said shaft is supported upon said member, means for rotating said hollow shaft, eccentric means carried by said shaft, a tubular housing fitting over said member and shaft and being secured to said body and anti-friction bearing means co-operating with said eccentric means and said housing, whereby upon rotation of said shaft a gyrating movement is imparted to said body.

9. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said shaft is supported upon said member, said bearing being designed to carry the load represented by the dead weight of said body, means for rotating said hollow shaft, eccentric means carried by said shaft, a tubular housing fitting over said member and shaft and being secured to said body and anti-friction bearing means co-operating with said eccentric means and said housing, whereby upon rotation of said shaft a gyrating movement is imparted to said body, said anti-friction bearing means being designed to carry the load represented by the centrifugal forces set up by the movement of the said body.

10. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said shaft is supported upon said member, a wheel carried by said hollow shaft which is adapted for connection to power to rotate said shaft, eccentric means carried by said shaft, anti-friction bearing means co-operating with said eccentric means and said body, whereby upon rotation of said shaft a gyrating movement is imparted to said body and an adjustable weight carried by said wheel for varying the counterbalancing effect of the latter.

11. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said shaft is supported upon said member, a wheel carried by said hollow shaft which is adapted for connection to power to rotate said shaft, eccentric means carried by said shaft, a tubular housing fitting over said member and said shaft and being secured to said body, anti-friction bearing means co-operating with said eccentric means and said housing, whereby upon rotation of said shaft a gyrating movement is imparted to said body and an adjustable weight carried by said wheel for varying the counterbalancing effect of the latter.

12. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said shaft is supported upon said member, a wheel carried by said shaft which is adapted for connection to power to rotate said shaft, eccentric means carried by said shaft, anti-friction bearing means co-operating with said eccentric means and said body, whereby upon rotation of said shaft a gyrating movement is imparted to said body and a weight secured to said shaft for counteracting the

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centrifugal forces set up by the movement of said body.

13. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said shaft is supported upon said member, a wheel carried by said shaft which is adapted for connection to power to rotate said shaft, eccentric means carried by said shaft, anti-friction bearing means cooperating with said eccentric means and said body, whereby upon rotation of said shaft a gyrating movement is imparted to said body, a weight secured to said shaft for counteracting the centrifugal forces set up by the movement of said body and an auxiliary adjustable weight carried by said wheel for co-operating with said first mentioned weight.

14. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said shaft is supported upon said member, a wheel carried by said shaft which is adapted for connection to power to rotate said shaft, eccentric means carried by said shaft, a tubular housing fitting over said member and shaft and being secured to said body, anti-friction bearing means co-operating with said eccentric means and said housing, whereby upon rotation of said shaft a gyrating movement is imparted to said body, a weight secured to said shaft within said housing for counteracting the centrifugal forces set up by the movement of said body and an adjustable auxiliary weight carried by said wheel for co-operating with said first mentioned weight.

15. Means for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, an anti-friction bearing by which said shaft is supported upon said member, means for rotating said shaft, eccentric means carried by said shaft, anti-friction bearing means co-operating with said eccentric means and said body, whereby upon rotation of said shaft a gyrating movement is imparted to said body and means, including a duct which is formed in said member, for providing a passage through which lubricant may be forced to said anti-friction bearing and bearing means.

16. Mechanism for vibrating a screen including a support, a shaft carried by said support and upon which said screen is mounted, a hollow shaft fitting over said first mentioned shaft, anti-friction bearings by which said hollow shaft is supported upon said first mentioned shaft, means for rotating said hollow shaft, bearing housings secured to the opposite sides of said screen, eccentric means carried by said hollow shaft and anti-friction bearing means co-operating with said eccentric means and said bearing housings, whereby upon rotation of said hollow shaft a gyrating movement is imparted to said screen.

17. Mechanism for vibrating a screen including

a support, a shaft carried by said support and upon which said screen is mounted, a hollow shaft fitting over said first mentioned shaft, anti-friction bearings by which said hollow shaft is supported upon said first mentioned shaft, means for rotating said hollow shaft, a tubular housing fitting over both of said shafts and secured at its opposite ends to opposite sides of said screen, the ends of said housing being formed to provide bearing chambers, eccentric means carried by said hollow shaft and anti-friction bearing means in said chambers for co-operating with said eccentric means, whereby upon rotation of said hollow shaft a gyrating movement is imparted to said screen.

18. Mechanism for vibrating a screen including a support, a shaft carried by said support and upon which said screen is mounted, a hollow shaft fitting over said first mentioned shaft, anti-friction bearings by which said hollow shaft is supported upon said first mentioned shaft, said bearings being designed to carry the load representative of the dead weight of said body, means for rotating said hollow shaft, a tubular housing fitting over both of said shafts and secured at its opposite ends to opposite sides of said screen, the ends of said housing being formed to provide bearing chambers, eccentric means carried by said hollow shaft and co-operating with said eccentric means, whereby upon rotation of said hollow shaft a gyrating movement is imparted to said screen, said bearing means in each housing being located in a common plane.

19. Mechanism for vibrating a screen including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, anti-friction bearings by which said shaft is supported upon said member, means for rotating said shaft, a tubular housing fitting over said member and shaft and secured at its opposite ends to opposite sides of said screen, the ends of said housing being formed to provide bearing chambers, eccentric means carried by said shaft, anti-friction bearing means carried by said shaft and located in said chambers, whereby upon rotating of said shaft a gyrating movement is imparted to said screen and means, including a duct which is formed in said member, for providing a passage through which lubricant may be forced into said bearing chambers.

20. Mechanism for actuating a body in the manner described including a support, a member carried by said support and upon which said body is mounted, a hollow shaft fitting over said member, anti-friction bearings by which said shaft is supported upon said member, eccentric means carried by said shaft, a wheel for rotating said shaft, said wheel being mounted upon said eccentric means, the hub of said wheel being eccentric relative to its periphery to a degree such that the latter is concentric with the axis of said member and anti-friction bearing means co-operating with said eccentric means and said body, whereby upon rotation of said shaft a gyrating movement is imparted to said body.

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