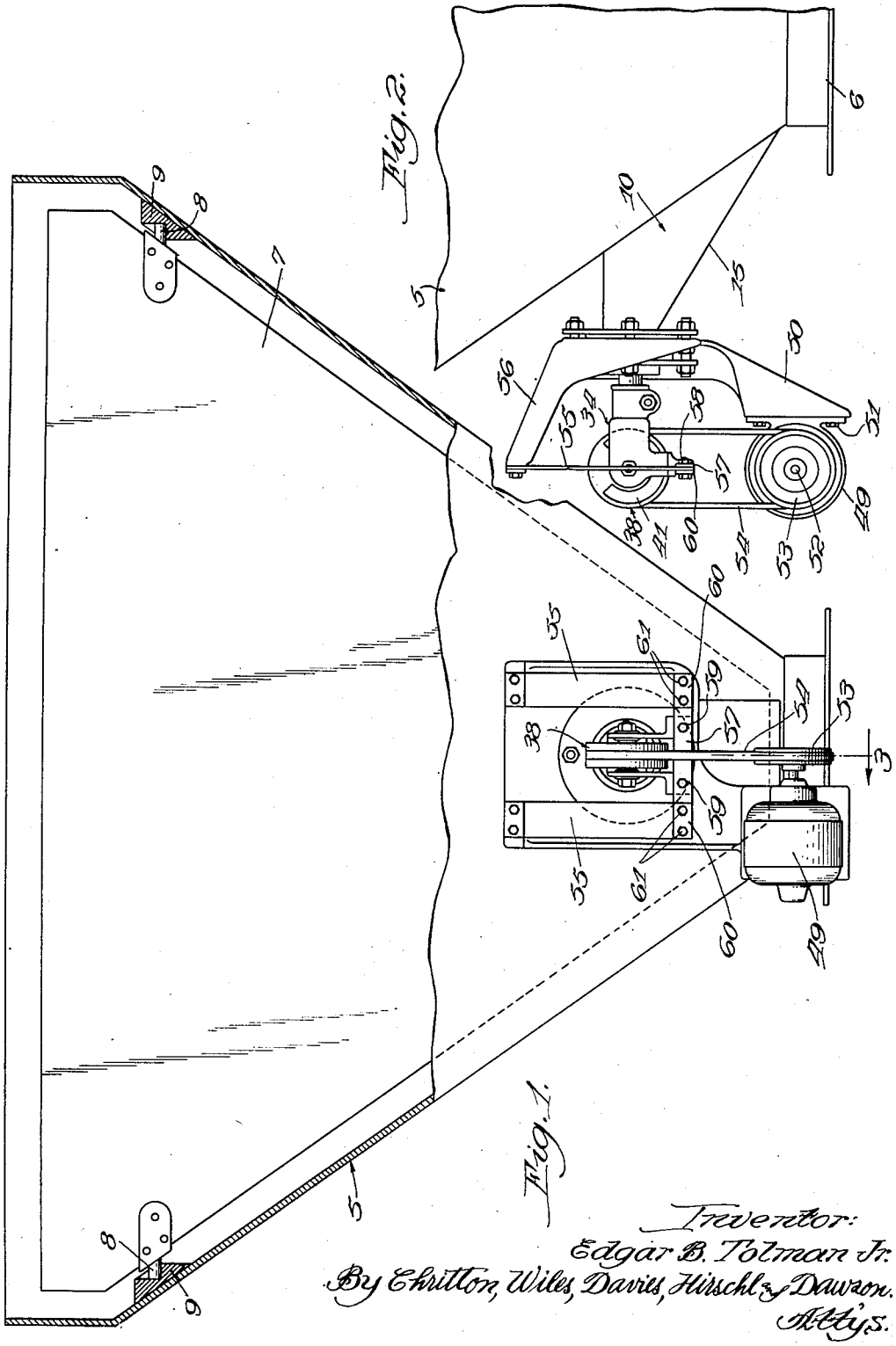
July 23, 1940. E. B. TOLMAN, JR 2,209,143

VIBRATOR APPARATUS

Filed Jan. 27, 1940 2 Sheets-Sheet 1



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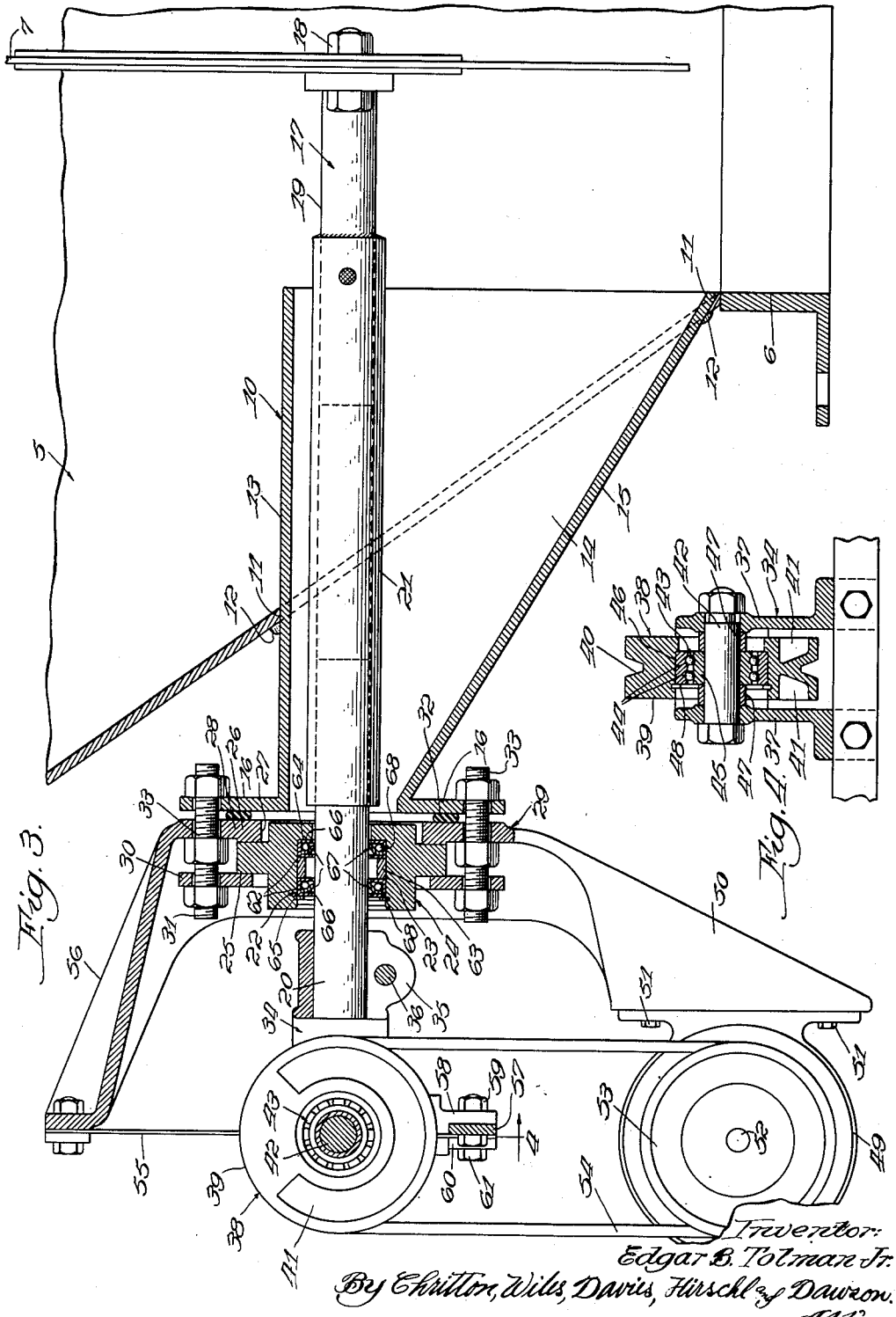


Fig. 3.

Fig. 4.

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VIBRATOR APPARATUS

Edgar B. Tolman, Jr., Chicago, Ill.

Application January 27, 1940, Serial No. 316,010

8 Claims. (Cl. 259—39)

My invention relates more particularly to hoppers for finely divided solid material having vibratory means for preventing the arching of the material in the hopper and interfering with the desired gravitation of the material therefrom.

My objects generally stated are to provide improvements in such apparatus to the end of rendering it better adapted for performing its intended functioning.

Certain of my more specific objects are:

To provide an improvement in the means for sealing the part of the vibrator apparatus which extends from the interior of the hopper to the exterior thereof, to the end of prolonging the life of such sealing means and maintaining an effective seal, through the continuing operations of the apparatus, for preventing the escape of the finely divided material to the atmosphere;

To provide an improvement whereby the tendency of the finely divided material to contact the sealing means referred to will be greatly reduced if not entirely overcome.

To provide novel means for mounting certain parts of the vibratory apparatus to permit of the alining of parts of the apparatus to compensate for wear without requiring access to the interior of the hopper for making adjustments and to simplify the connections of certain of other parts and eliminate objectionable stresses occurring in structures of this character as hitherto provided.

Referring to the accompanying drawings:

Figure 1 is a view in end elevation, partly sectional, of a hopper and vibratory apparatus therefor embodying my invention.

Figure 2 is a fragmentary view in elevation of the structure shown in Fig. 1, the structure being viewed from the right in Fig. 1.

Figure 3 is an enlarged fragmentary view in sectional elevation of the structure of Figs. 1 and 2, the section being taken at the line 3 on Fig. 1 and viewed in the direction of the arrow; and

Figure 4, a section taken at the line 4 on Fig. 3 and viewed in the direction of the arrow.

Referring to the particular apparatus shown, it comprises a hopper 5 for finely divided solid material, from which the material is to be fed through its lower discharge outlet 6.

The hopper 5 contains a vibratory plate 7 shown as pivoted, at trunnions 8 thereon, on stepped blocks 9 secured to the side wall of the hopper, whereby the plate 7 is adapted to be swung back and forth at its lower end and produce sufficient agitation of the contents of the hopper to prevent arching.

Associated with the hopper 5 is a housing 10 extending through an opening 11 in the inclined side wall of the hopper, with the continuous joint between the wall of the opening 11 and the surrounding wall of the housing 10 sealed, as for example by providing a continuous weld at this joint, as represented at 12.

The housing 10 is formed with a straight, substantially horizontal top wall 13, side walls 14 and an upwardly and outwardly inclined bottom wall 15, the outer end of the housing 10 being provided with an outwardly extending annular vertically disposed flange 16.

The plate 7 is vibrated through the medium of a rod 17 connected with the plate 7 as indicated at 18 and extending through the housing 10 closely adjacent the top wall 13 thereof and operated as hereinafter described, the rod 17 being shown as formed of rod sections 19 and 20 connected together by a sleeve section 21.

The end of the rod 17 adjacent the outer end of the housing 10 extends through a dust seal 22 mounted in an opening 23 in a seal block 24 having an annular circumferential flange 25 overlapping the wall 26 of an aperture 27 in the plate portion 28 of a bracket 29 and clamped to this wall by a ring 30 bearing against the flange 25 and clamp bolts 31 engaging the block 24 and ring 30, the plate 28 being clamped against an annnular gasket 32 between the plate 28 and flange 25, by clamp bolts 33.

The body portion of the block 24 is of less diameter than the openings in the ring 30 and plate 28 to adapt the block 24 to be vertically adjusted on the bracket 29.

The means for reciprocating the rod 17 comprises a coupler-head 34 rigidly connected with the rod, as by providing the head 34 with a split portion 35 which, by means of a clamp bolt 36, is clamped to the rod 17.

Journaled in arms 37 of the head 34 is an unbalanced wheel device 38 which operates, when rotated, to impart, through the head 34, longitudinal vibratory movement to the rod 17 and consequently to the plate 7.

The wheel device shown is formed of a wheel proper 39 provided with a continuous peripheral groove 40, to form a sheave wheel for belted connection with the drive means hereinafter described; the wheel 39 being rendered unbalanced by cutting away a portion of its side walls as shown at 41.

The wheel 39 is rotatably mounted on a stationary shaft 42 carried by arms 37 on the head 34, by means of a ball bearing 43 on the shaft 42 shown as having two annular series 44 of balls,

the retainers 45 and 46 for the balls being held in place on the shaft and wheel, by spacer sleeves 47 on the shaft 42 and a spring ring 48 interlocked with the inner peripheral portion of the wheel 39.

The drive means for the wheel 39, shown as an electric motor 49, is secured to a lower arm 50 forming a part of the bracket 29, as by screws 51, the armature shaft 52 of the motor 49 having a sheave 53 belted to the sheave wheel 39, as by the belt 54.

The rotation of the sheave wheel 39 tends to vibrate the rod 17 up and down, and to prevent this I provide a pair of flat springs 55 connected at their upper ends to an upwardly extending arm 56 forming a part of the bracket 29 and at their lower ends to the head 34.

The connections of the springs 55 with the head 34 is at the ends of a horizontal bar 57 secured between its ends to depending extensions 58 of the head 34, as by bolts 59, the springs 55 at one face overlying the bar 57 and held in place by short bars 60 applied to the other face of the springs and bolts 61 extending through the bars 57 and 60 and the springs 55.

As will be understood, the rod 17 when driven to vibrate the plate 7 is subject to slight rocking movement, especially after the hinge connection of the plate 7 with the hopper has become worn. Consequently it is necessary, in order to avoid leakage of dust along the rod through the seal 22 that the seal remain tight at all times.

The matter of sealing the reciprocatory rod 17 in apparatus of this general character has presented a problem which I have solved by providing the seal of such form that it will yield, without impairing its sealing function, in the various movements of the rod in actuating the plate 7. A form of such a seal which I have found to be highly practicable for use in such a situation is that shown, a description of which is as follows:

The seal comprises a pair of channel rings 62 held in place in the opening 23 in the seal block 22, with a spacer ring 63 interposed, by means of a shoulder 64 on the block 22 and a spring ring 65 interlocked with the block; sealing rings 66 of flexible material, as for example leather, located in the rings 62 and having continuous yielding curved flanges 67 at their inner peripheries which bear against the rod 17; and annular coil springs 68 located in the rings 62 and yieldingly pressing the flanges 67 of the rings 66 against the rod 17.

As will be understood, the flanges 67 of the sealing rings 66 will be maintained in contact with the rod 17 regardless of all movements of this rod, including those in a direction crosswise of the length of the rod.

The feature of providing the housing 10 is of great advantage inasmuch as by disposing its top and bottom walls 10 and 15 as shown and described, massing of the material in the hopper against the sealing means 22 is prevented thereby greatly minimizing the possibility of leakage of the dust through the sealing means.

The feature of providing the sealing means 22 on a part which is vertically adjustable relative to the hopper is also of practical advantage, particularly in the event of wear of the trunnions 8 on the plate 7, inasmuch as the sealing means 22 may be horizontally alined with the point of connection of the rod 17 with the plate 7, merely by vertically adjusting the block 24, on the bracket 29, thereby avoiding the necessity of an operator entering the hopper to make the necessary adjustments.

The feature of supporting the spring means 55 on a portion of the bracket 29 which is carried by the housing 10 is of advantage particularly as it eliminates a certain amount of field erection, as compared with prior devices, and loss of alinement were the spring means connected with the hopper, due to the warping of the hopper.

While I have illustrated and described a particular construction embodying my invention, I do not wish to be understood as intending it to be limited thereto, as the same may be variously modified and altered, and the invention embodied in other forms of structure, without departing from the spirit of the invention.

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

1. In combination with a hopper, a vibratory member in said hopper, a housing structure at one side of said hopper and having an upwardly and outwardly inclined bottom wall and a top wall, said walls extending into said hopper through a side thereof, the space between said walls opening into the space in the hopper, means for vibrating said member comprising a rod engaging said member and extending outwardly through said hopper and housing adjacent the top wall of said housing, means engaging the outer end of said rod for actuating it, and sealing means on said housing through which said rod extends.

2. In combination with a hopper, a hingedly supported vibratory member in said hopper, a housing structure opening at one end into said hopper through a side of the latter, means for vibrating said member comprising a rod connected with said member and extending through said housing structure and means for reciprocating said rod, a plate at the outer end of said housing structure adjustable crosswise of said rod, and sealing means on said plate for said rod.

3. In combination with a hopper, a hingedly supported vibratory member in said hopper, a housing structure opening at one end into said hopper through a side of the latter, means for vibrating said member comprising a rod connected with said member and extending through said housing structure and means for reciprocating said rod, said housing structure including a plate at the outer end of said housing structure adjustable crosswise of said rod, and sealing means on said plate for said rod, the means for reciprocating said rod being connected with a stationary part of said housing structure.

4. In combination with a hopper, a vibratory member in said hopper, means for vibrating said member comprising a rod engaging said member and means for reciprocating said rod, said second-named means comprising a sheave wheel, means, forming a part of the wheel, for eccentrically weighting said wheel, bearings for said wheel connected with said rod and by which said rod is actuated, a drive device, and an endless drive element connecting said drive device to said wheel for driving the latter.

5. In combination with a hopper, a hingedly supported vibratory member in said hopper, a housing structure opening at one end into said hopper through a side of the latter, means for vibrating said member comprising a rod connected with said member and extending through said housing structure and means for reciprocating said rod, comprising a motor connected with a stationary part of the housing structure,

said housing structure including a plate at the outer end of said housing structure adjustable crosswise of said rod, and sealing means on said plate for said rod.

6. In combination with a hopper, a hingedly supported vibratory member in said hopper, means for vibrating said member comprising a rod engaging said member and eccentric means exterior of said hopper for reciprocating said rod, a housing structure open to the interior of said hopper and through which said rod extends, a spring held at one end against movement crosswise of said rod and connected with said eccentric means for substantially restraining said last-named means from vibrating in a direction crosswise of said rod, a plate at the outer end of said housing structure adjustable crosswise of said rod and sealing means on said plate for said rod.

7. In combination with a hopper, a vibratory member in said hopper, means for vibrating said member comprising a rod engaging said member and means exterior of said hopper for reciprocating said rod, a housing structure open to the interior of said hopper and through which said rod extends, sealing means for said rod connected with said housing structure, and means for substantially restraining the means which reciprocate said rod from vibrating in a direction crosswise of said rod comprising a spring supported by said housing structure and connected with said first named means.

8. In combination with a hopper, a vibratory member in said hopper, means for vibrating said member comprising a rod engaging said member and means exterior of said hopper for reciprocating said rod, a housing structure open to the interior of said hopper and through which said rod extends, said housing structure having a bracket extension, sealing means for said rod connected with said housing structure, and means for substantially restraining the means which reciprocate said rod from vibrating in a direction crosswise of said rod comprising a spring supported on said bracket extension and connected with said first-named means.

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