

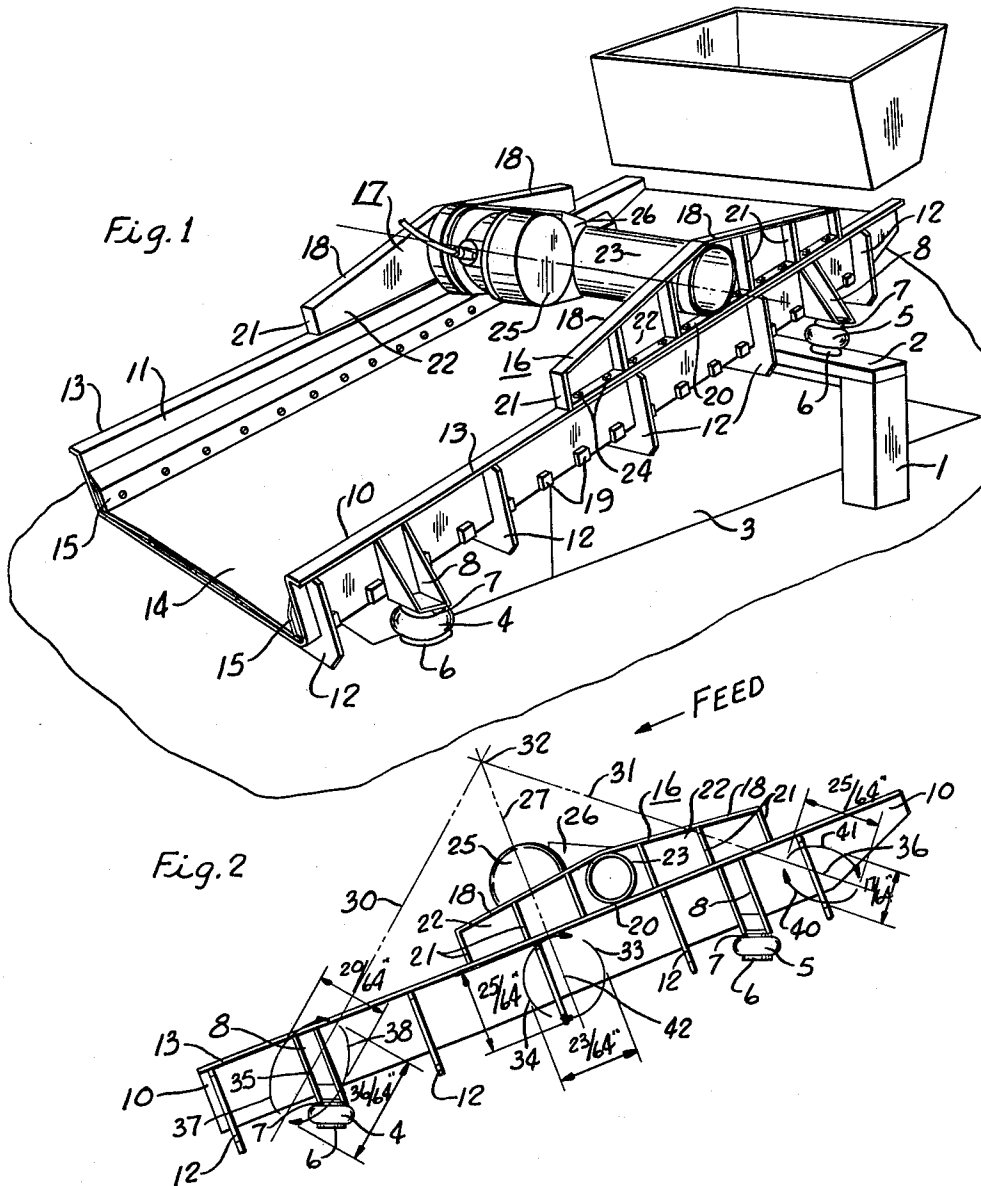
Dec. 26, 1961

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3,014,587

VIBRATORY SCREEN WITH SINGLE UNBALANCED VIBRATORY MOTOR

Filed Aug. 24, 1959



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VIBRATORY SCREEN WITH SINGLE UNBALANCED VIBRATORY MOTOR

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Filed Aug. 24, 1959, Ser. No. 835,478
7 Claims. (Cl. 209—326)

This invention relates generally to vibrating screens actuated by unbalanced rotary motors and more particularly to the mounting and disposition of the unbalanced rotary motor relative to the mass of the screen.

The principal object of this invention is to provide an unbalanced rotary motor operated screen which is attached directly to the screen with no intermediate spring system and relies solely upon the use of isolators for the support of the screen where the screen combined with the motor represents a single mass.

Another object is the provision of an unbalanced rotary motor vibrating screen wherein the axis of the motor lies transverse to the flow of the material along the screen and is placed in substantial alignment with the vertical plane passing through the center of the screen and the mounting for the motor being offset toward the inlet end of the screen.

Another object is the provision of an unbalanced rotary motor actuated screen wherein the screen is fixedly secured relative to the motor and the latter is mounted to provide a vibrating motion to aid the vibratory flow of the material onto the screen and a vibratory motion to retard the flow of material from the screen for the purpose of insuring maximum screening of the material intermediate the ends thereof.

Another object is the provision of an unbalanced rotary motor rigidly secured to a screen in such a manner as to provide a different magnitude of the vibratory feeding action at one end of the screen as differentiated from the opposite end of the screen and from the center of the screen, the screen being mounted on isolators and disposed at an angle to a horizontal to determine the amount of gravity feed that is aided or impeded by the action of the unbalanced rotary motor driving the same.

Another object is the provision of an unbalanced rotary motor screen wherein the motor is fixably secured relative to the screen and is supported on isolators to provide a vibratory motion that will retard the vibratory flow of material toward the center of the screen and increase the vibratory flow from the center of the screen to the discharge and assuring a maximum retention on the forepart of the screen for the purpose of dewatering or otherwise treating the material and providing for the maximum vibratory feeding movement toward the end of the screen to quickly remove the materials from the screen. The improvement comprising this feature of the invention induces the opposite flow characteristic to that previously mentioned.

Other objects and advantages appear hereinafter in the following description and claims.

The accompanying drawings show for the purpose of exemplification without limiting the invention or claims thereto certain practical embodiments illustrating the principles of this invention wherein:

FIG. 1 is a perspective view of the unbalanced rotary motor vibrating screen comprising this invention.

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FIG. 2 is a view in elevation of the screen structure shown in FIG. 1.

Referring to the drawings the screen is supported on the stand represented by the post member 1 having the transverse beam 2 extending over the pit 3 into which the screened material flows. The pit 3 may be a conveyor or hopper or other storage bin and if the material being screened is quite dusty it is frequently the practice to enclose the area with a flexible material to prevent the circulation of dust.

The screen proper is mounted on the isolators represented by two isolators 4 at the front or discharge end of the conveyor or two isolators 5 mounted on the beam structure 2 at the rear of the conveyor. These isolators may be springs but are preferably in the form of rubber donut-type members which are pneumatically expanded and the pressure therein is controlled so as to properly determine the amount of resiliency necessary for absorbing any vibration created by the screen. It will be noted that this screen does not have any mounting springs whatsoever. Thus the isolators 4 and 5 must function to support the whole of the mass for vibration.

The bottom of the isolators as indicated at 6 are secured to their respective mounting members whether it be the floor or the beam and the upper sections 7 are secured to the brackets 8 attached to the screen. This particular screen has the side members 10 and 11 supported by the gussets 12 which extend upwardly on each side and under the flange 13 and down across under the screen proper to the other side member and its flange 13. A screen mesh member such as indicated at 14 is clamped by the side clamping rails 15 which are screwed into the blocks 19 on the side members 10 and 11 and suspend the mesh for the full width of the frame created by the gusset members 12.

The flanges 13 of the side members 10 and 11 support the bridge members 16 and 17 on opposite sides of the screen which bridge members are provided with the upper and lower rails 18 and 20 braced by the set of six upright brace members 21 and the inner face of these bridge members are closed by the plates 22. Each bridge member is constructed so that the upper and lower rails 18 and 20 receive the tube 23 therebetween. This tube is a heavy wall tube and is secured preferably by welding to the upper members 18 and the lower members 20 of the bridge structures and to the walls 22 of these bridge members so that the tube together with the bridge members are quite rigid as a motor supporting element. These bridge members are bolted to the flanges 13 of the side members 10 and 11 by the bolts 24.

It will be noted that the bridge structure 16 which is connected to each side of the screen by means of the tube 23 which is very large in diameter to provide a stiffness that is unequaled in smaller transverse members, supports the motor 25. This motor is similar in design to that disclosed in United States Letters Patent 2,854,594 which provides a stator supported by enlarged bearings with an unbalanced weight at each end of the armature enclosed by the end bells. This motor may be varied in speed and may be reversed in direction to provide the proper controls for the operation of a screen of this character. As illustrated in the drawing the motor would be traveling in a clockwise direction as illustrated in FIG. 2. The motor 25 is supported by the saddle 26 which in turn is secured to the tube 23 intermediate the ends thereof and

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preferably at the center. When the motor is mounted as shown with the saddle leaning so to speak, to the front of the screen, the center or rotary axis of the motor is placed in alignment with a plane such as the construction plane 27 normal to the screen surface 14 at substantially the longitudinal center of the screen. A line drawn from a mass point adjacent the opposite ends of the screen such as illustrated by the construction lines 30 and 31 will intersect the line 27 at a point indicated at 32. Such mass centers, of course, are determined by the mass of the structure suspended which would include the whole of the screen, the bridge work and the motor which are all solidly tied together as one unit and suspended by the isolators 4 and 5 together with the tuning or shall we say, inflation of the pneumatic isolators 4 and 5. Thus by regulating the inflation of the isolators and disposing the mass of the whole of the unit in the manner shown, one may control the manner of vibration of the screen.

As diagrammatically illustrated in FIG. 2 directly under the motor the screen is given an almost circular motion in a clockwise direction as indicated by the arrows 33 and 34 and as a practical measure the amplitude of this circular motion indicated by the arrows both in a plane parallel with the screen and a plane vertical to the screen can be made in the amount of twenty-three sixty-fourths of the inch as indicated on the drawing. At the mass centers indicated at 35 and 36 the mass together with the tuning of the isolators may produce the arrows 37 and 38 at the point 35 and the arrows 40 and 41 at the mass center 36 and as shown the amplitude of the vibration of the mass center 35 along the construction line 30 is approximately thirty-six sixty-fourths, whereas the transverse amplitude at right angles thereto would be in the amount of twenty sixty-fourths. In view of the slope of the screen and in view of the weight distribution of the whole of the structure together with the tuning of the isolators 5, the mass center 36 provides a different vibratory pattern wherein the amplitude along the construction line 31 is in the order of twenty-five sixty-fourths and the amplitude at right angles thereto is in the order of seventeen sixty-fourths.

With this weight distribution and tuning system and location of the motor, it will be noted that the mass center 36 provides less feeding amplitude and in a clockwise direction which would tend to vibrate the screen so as to retard to some degree the movement of the material as it flows by gravity down the inclined surface of the screen. However, the magnitude of the feeding amplitude at this mass center is materially less than the magnitude of the feeding amplitude at the mass center 35 and the angle of the construction line 31 is on the order that it will not be effective in flowing the material backwards but the angle of the line 30 is such that the forces effective on the screen are such as to provide a greater retardation by producing a material feeding effect in the reverse direction. In other words, it may be said that the retardation of the mass center at 36 actually aids or does not hinder the flow of the material onto the screen but the components of the vibratory motion at the mass center 35 are disposed at an angle to have a greater or maximum effect in feeding the material back up the screen. Thus with this structure applicant is enabled to quickly load the screen and maintain the materials on the screen for a sufficient length of time that insures a high degree of screening action, thus not permitting any material to get off the screen that could in any way flow through the screen. This enhances the accuracy of the screening operation and also shortens the period of the screening step in the process to a material amount which is a considerable improvement in the art.

At eight hundred fifty r.p.m. and the proper tuning of the isolators, the central mass center such as indicated at 42 was provided with an orbit the amplitude of which was twenty-five sixty-fourths at an angle $22\frac{1}{2}^\circ$ from this mass center 42 toward the front of the screen from the

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vertical line 27, whereas the mass center 36 provided an orbital movement of twenty-five sixty-fourths along a line substantially 32° from a line normal to the surface of the screen passing through the mass center and directed toward the front of the screen, and the magnitude of the forces 90° therefrom was in the order of seventeen sixty-fourths which is substantially the same as that illustrated in FIG. 2 but disposed at a different angle. Under these same conditions, the amplitude of the orbital movement at the mass center 35 was nine sixteenths as against five sixteenths oriented at an angle of substantially 2° from a line normal to the surface of the screen and pitched toward the rear of the conveyor.

When the motor is operated at seven hundred fifty r.p.m. the magnitude will be the same but the orbital movements that change the magnitude about the mass centers 32 is circular and is five sixty-fourths. The same is true about the mass center 36, however, the mass center 35 under these conditions shifted to three thirty-seconds for the magnitude along the construction line 30 and one sixteenth of an inch for the magnitude at right angles thereto. Thus by changing the tuning and the speed, a material change may be made in a mass swing system of this character and a much greater amplitude is usually obtained at lower speeds of the unbalanced rotary vibratory motor.

I claim:

1. A material handling device including a frame having longitudinal side rails connected by a plurality of transverse members and supporting a material handling member, motor mounting means secured directly to each side rail on opposite sides of the frame across from each other, a cross member directly connecting both of said motor mounting means, tuned isolator means supporting said frame for vibration, characterized in that said cross member is a single element, and an unbalanced rotary motor means attached directly to the center of said cross member with its rotary axis disposed laterally of said single element and transversely of said side rails whereby said motor means reciprocates said frame and material handling device in an endless orbital path.

2. The material handling device of claim 1 characterized by a saddle member which directly connects said motor means to said cross member and disposing the axis of said motor spaced laterally from a plane in alignment with said cross member and normal to the material handling device.

3. The material handling device of claim 2 characterized in that the rotary axis of said motor means is disposed substantially in alignment with the center of said material handling device longitudinally of its axis.

4. The material handling device of claim 2 characterized by mounting means to position said isolators relative to said motor means to produce an elliptical reciprocating movement at the ends of said material handling device.

5. The material handling device of claim 4 characterized in that said mounting means of said motor means and isolators are positioned to slope the material handling device and tuning said isolators to produce elliptical reciprocating paths of movement at the ends of the material handling device, the longitudinal axes of the ellipses disposed in planes sloping upwardly toward each other and intersecting a transverse plane normal to the material handling device and passing through the rotary axis of said motor means, the elliptical reciprocation at the feeding end aiding the material flow and at the discharge end retarding the material flow.

6. A trough type material handling device comprising a plurality of brackets on the sides of the trough adjacent the four corners thereof, isolators secured to said brackets to support said trough for vibration, a bridge member secured along each side of said trough, and a tube connecting said bridge members, a saddle on said tube, and an unbalanced rotary motor means secured to said saddle to position the rotary axis of said motor means and the axis

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of said tube in a plane disposed at an angle relative to the plane normal to the material handling device which lies to one side of said tube.

7. A vibrating screen comprising a frame directly supporting a screen surface, isolators supporting said screen for vibration, a vibratory motor mounting secured directly to said frame and including a cross member bridging said screen and on one side of the center of mass of said frame and screen, an unbalanced rotary motor, an arm directly securing said motor to said cross member of said motor mounting to position said vibratory motor in alignment with the center of mass of said frame and screen

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to vibrate the opposite ends of the same in oppositely sloping elliptical paths.

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