Dec. 23, 1941. L. E. SOLDAN 2,267,143

VIBRATING SCREEN

Original Filed Aug. 22, 1938 3 Sheets-Sheet 1

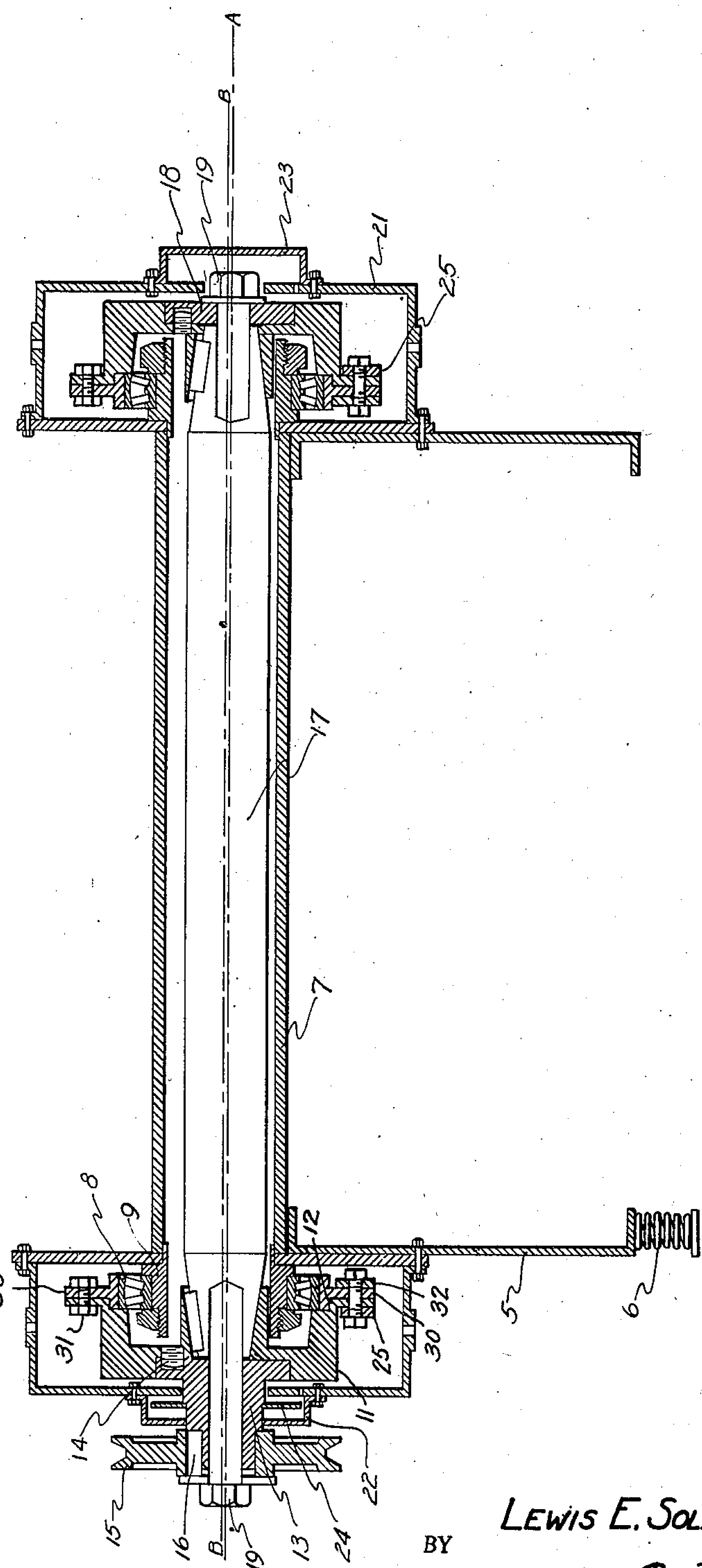

Fig. 1

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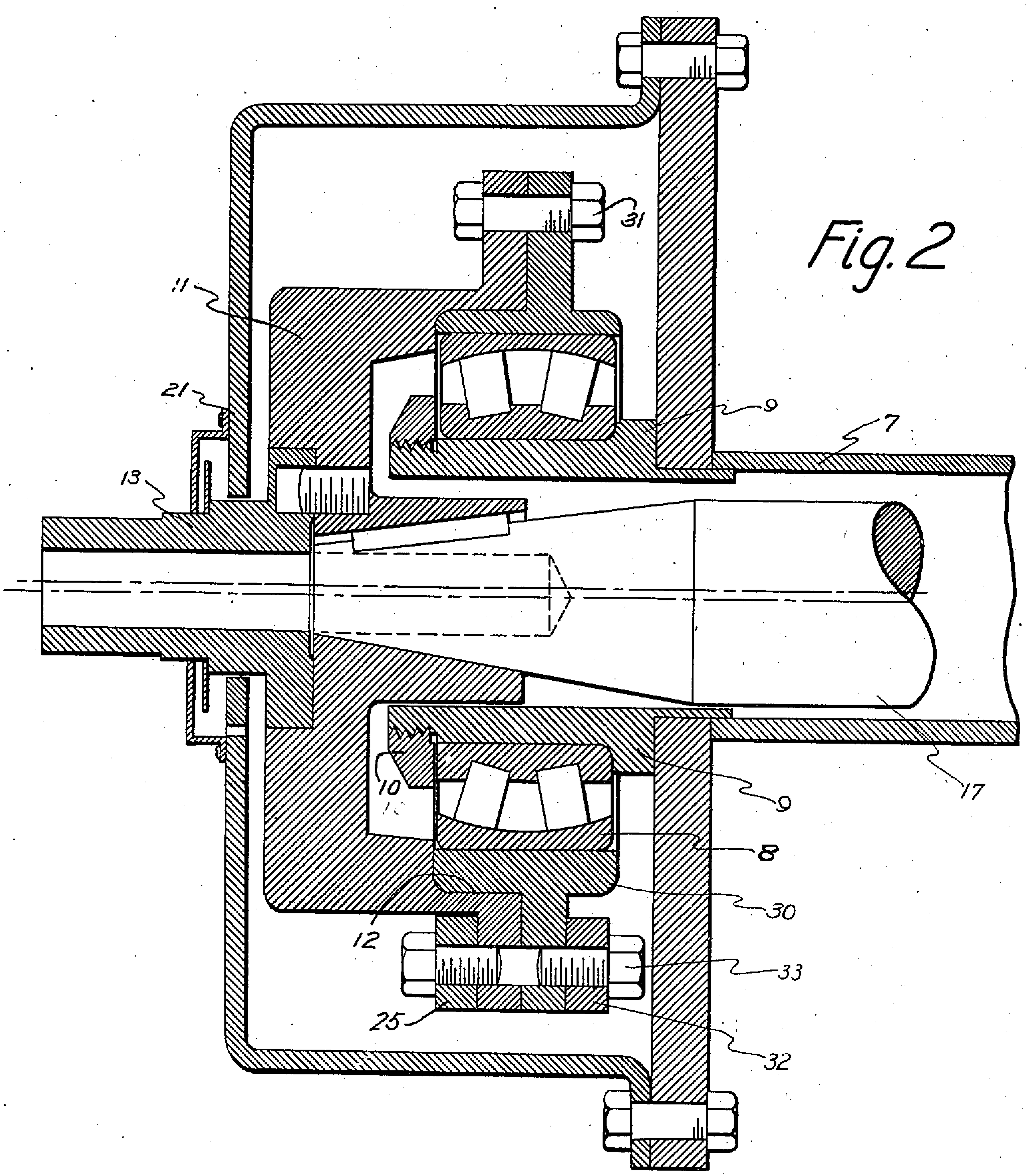

Fig. 2

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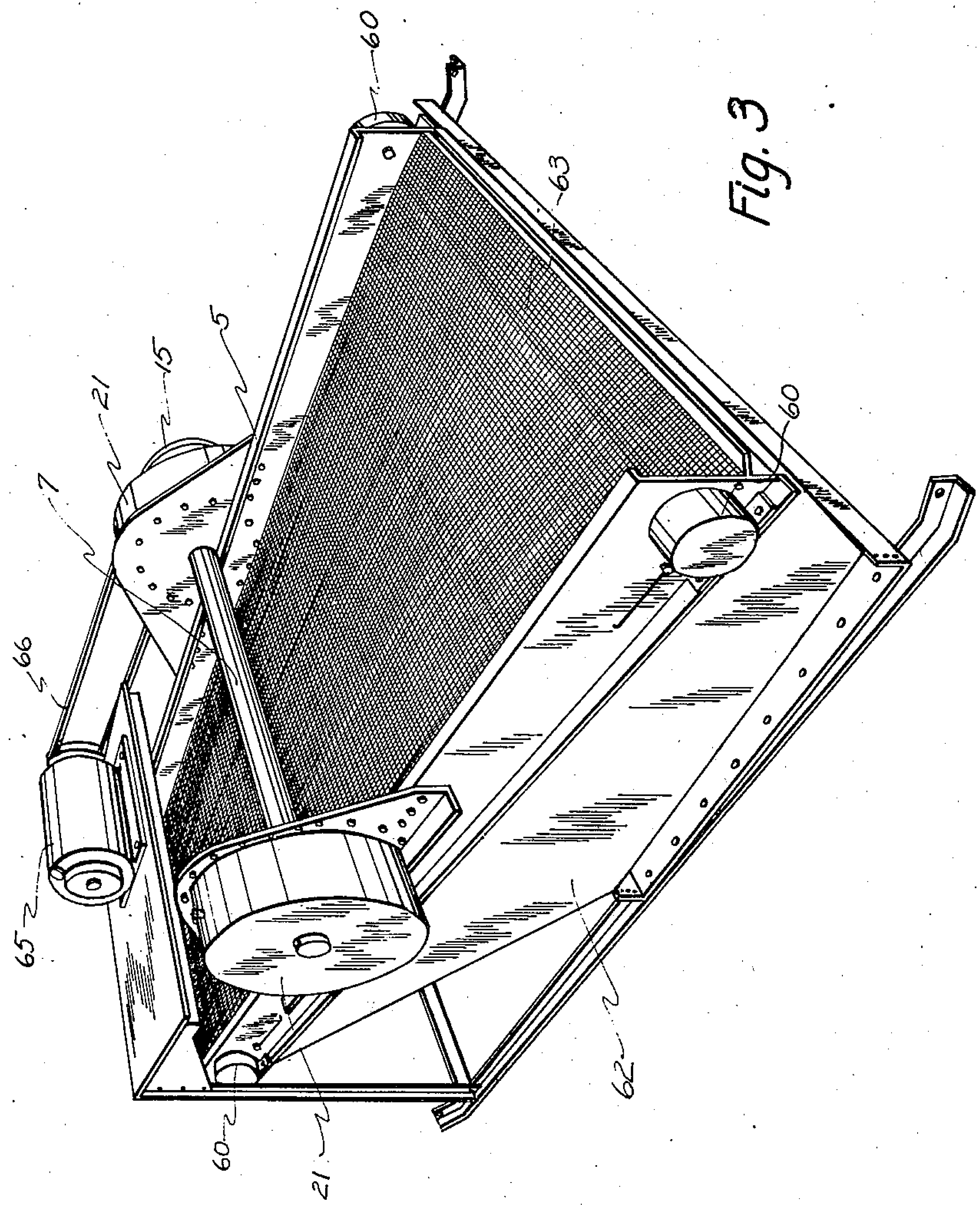

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Patented Dec. 23, 1941

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UNITED STATES PATENT OFFICE

2,267,143

VIBRATING SCREEN

Lewis E. Soldan, Chicago, Ill.

Original application August 22, 1938, Serial No. 226,131. Divided and this application June 3, 1939, Serial No. 277,731

3 Claims. (Cl. 209—366.5)

This application is a division of my co-pending application, Serial No. 226,131, filed August 22, 1938.

This invention relates to a vibrating device which may be used in various shaking and separating operations.

In high speed vibratory screens used with bulk or fine materials and in vibrating machines used to shake foundry castings free of sand, rotary action is converted into a vibratory or shaking motion.

There are at present two general types of high speed vibratory screens. In one of these types, the screen cloth or frame is vibrated by an eccentrically supported or over-centered weight supported by the screen cloth or frame. The other type of vibrating mechanism utilizes a rotatable eccentric, supported on pedestals to drive a resiliently supported screen frame or cloth. While the first type is considerably less complicated and costly than the second, the screen is not positively driven and a large load will have a damping effect on the vibration of the screen or frame. This invention provides a means whereby the eccentric mechanism may be supported on the screen frame without the use of independent bearings or pedestals but which will at the same time, positively and directly drive the screen frame so that variations in load will not seriously affect the vibratory characteristics of the screen.

It is an object of this invention to provide an improved mechanism for creating a vibratory or shaking motion.

Further objects and advantages will appear from the following detailed description and accompanying drawings.

For the purpose of illustrating my invention, I will now describe several embodiments of my invention as shown in the accompanying drawings.

Referring now to the drawings:

Fig. 1 is a cross-sectional view of a form of device embodying my invention as applied to a vibratory screen.

Fig. 2 is a cross-sectional view of a portion of another form of a device similar to that shown in Fig. 1.

Fig. 3 is a perspective view of one type of vibrating screen embodying my invention.

In all the drawings the same numerals are used to denote like parts. Referring now to the drawings and particularly to Fig. 1, 5 is a screen frame across which a screen cloth or other material may be secured. It is to be understood, of course, that while I describe this invention with reference to a vibratory screen, it may also be applied to other vibratory apparatus as, for instance, a vibrator for foundry castings.

The frame may be resiliently supported as by springs 6. Rubber supports enclosed in casings as indicated by numeral 60 in Fig. 3 may be used instead of the springs if desired. A cross tube 7 extends across the frame. A roller bearing 8 is positioned on a bearing seat 9 and held in place. A balance wheel weight or drum 11 is provided with an eccentric bore or inner face 12 in which an eccentric ring is slidably mounted. By rotating ring 30, its eccentricity may be effectively added to or subtracted from that of the inner face 12, and the resultant eccentric throw of the screen may be varied through a relatively wide range. Bolts 31 are provided to secure the eccentric ring to the balance wheel in the desired position. The counterweight 25 is secured to the balance wheel while a counterweight 32 is secured to the ring 30. A stub shaft 13 is secured to the balance wheel or drum as by a dowel pin 14 or other convenient means. A sheave 15 may be secured to the stub shaft as by a key 16. In the embodiment shown in Fig. 1, two similar and oppositely disposed motion-converting devices are used to vibrate one frame and the respective balance wheels are connected by a cross shaft secured to the stub shaft 13 and a stub shaft blank by a screw 19. The stub shaft blank and stub shaft may be interchangeable so that the sheave may be placed on either side of the frame. An oil casing or housing 21 is provided and completely covers the balance wheel and bearing. A cap 22 through which the stub shaft extends is provided on one casing and a blind cap 23 on the other. An oil slinger 24 may be secured to the stub shaft to prevent oil leakage between the stub shaft and the cap 22. Counterweights 25 are secured on the balance wheel and are of a size sufficient to counterbalance the eccentric thrown load of the screen frame and prevent vibration. The line A—A represents the axis of the sheave, stub shaft, and cross shaft while the line B—B represents the axis of the inner face or bore of the balance wheels.

The sheave may be driven by a belt or other suitable means or a motor may be connected directly to the stub shaft. The speed of rotation will, of course, depend on the material to be screened or vibrated and the results desired. For many operations a speed of approximately 1200 R. P. M. is used.

As the device is started, the speed of the rotating parts will be slow, and instead of the screen frame vibrating, the balance wheel supported on the bearing 8 will rotate eccentrically about the bearing seat 9 due to the eccentric bore 12. The stub shaft as well as the sheave will also rotate eccentrically with the balance wheel. During this starting period, the axis A—A will rotate about the axis B—B. As the speed of rotation increases, however, the rotating balance wheels 11 will soon establish their axis A—A as the stationary one and the axis B—B will then rotate about the axis A—A. This is brought about by the fact that all rotating parts tend to establish a neutral axis about which they rotate regardless of weight distribution. Thus the axis of the balance wheel and stub shaft will become stationary and the axis of the bearing seat 9 will rotate about it and cause the screen frame to vibrate. The result then is that while the balance wheel, stub shaft, and sheave are all supported on the vibrating frame, they will not vibrate with the frame but will rotate smoothly in a neutral axis formed by the rotating masses. This condition is quite different from the type of screen in which the eccentric weights supported on the screen frame as well as the entire mechanism including the sheaves or driving motor, vibrate with the screen.

In my device, I so arrange the weight of the balance wheel that on attaining its proper operating speed, it will establish a relatively stationary neutral axis about which it will rotate independently of the weight of the thrown load. I provide counterweights to counterbalance the weight of the eccentrically thrown parts so that the neutral axis will be maintained.

It can be seen that while no bearings or supports independent of the vibrating frame are used, nevertheless, the driving sheave and the balance wheels will rotate evenly and smoothly and all unnecessary vibration will be avoided. At the same time, the advantages of a positive drive eccentric are retained. When the screen is first started, the sheave vibrates instead of the load but as soon as the balance wheel comes up to operating speed, the sheave runs smoothly and the screen operates as satisfactorily as those in which positive drive eccentrics are supported independently of the screen frame.

It would, of course, be possible on small installations or on other applications of the device to use only one motion-converting device instead of the two shown in Fig. 1. In Fig. 1 the two eccentrics are connected and driven together by a cross shaft 17. It is, of course, possible to use means other than a cross shaft to drive the separate motion-converting devices. A separate electric motor could be used on each motion-converting device with an electrical interconnection to maintain the proper phase relation between the eccentrics.

Fig. 3 shows a complete vibrating screen embodying my invention. In this particular type of screen, the screen frame 5 is resiliently supported by enclosed rubber supports 60 mounted on a base frame 62. The screen frame is equipped with a screen cloth 63. A motor 65 furnishes power for driving the screen through a belt 66.

It can thus be seen that my invention provides means for supporting a motion-converting or eccentric vibratory mechanism on a vibrating frame and yet allows the pulley and cross shaft to rotate about a stationary neutral axis. My invention provides a positive eccentric drive which is not seriously affected by the amount of load on the vibrating screen or frame as are the present offset weight types of mechanisms which are wholly and freely supported on the vibrating frame.

While I have shown and described only several embodiments of my invention, it is to be understood that various applications, additions, modifications, substitutions, and omissions will become apparent to those skilled in the art. I do not intend my invention to be limited thereby but to be defined by the appended claims.

I claim:

1. A high speed vibrating device comprising a frame, a tubular member extending across the frame and secured thereto, a bearing surface at each end of the tubular member, oppositely disposed high speed revolving counter-weighted drums supported on the bearing surfaces, each of said high speed revolving counter-weighted drums being provided with an inner face near the edge thereof eccentric to the axis of said drums, counter-weighted rings provided with an inner and outer surface eccentric with respect to each other, the outer surface of each of said rings being rotatably supported in the inner face of one of the counter-weighted drums, a bearing interposed between each bearing surface at the end of the tubular members and the inner face of the ring positioned in the drum that is supported on that bearing surface, a floating drive shaft extending across the frame through the tubular member and concentric with the axis of the drums connecting the oppositely disposed drums for simultaneous rotation, said shaft and drums being supported solely by said frame, said high speed revolving drums being arranged to establish a stationary neutral axis of rotation around which the drive shaft and drums rotate concentrically when the shaft is rotating at its normal operating speed while the frame and tubular member vibrate, each of said rings being rotatably adjustable in the drum in which it is positioned, whereby the degree of frame vibration may be varied, and the weights on the said drums and rings being so positioned and proportioned that the said neutral axis of rotation will remain constant as said rings are adjusted relative to said drums.

2. A high speed vibrating device comprising a frame, a tubular member extending across the frame and secured thereto, a bearing surface at each end of the tubular member, oppositely disposed high speed revolving weighted drums supported on the bearing surfaces and provided with an inner bearing surface near the edge thereof eccentric to the axis of said drums, weighted rings provided with an inner and outer bearing surface eccentric with respect to one another; the outer surface of said rings being rotatably supported in the inner face of the weighted drums, a bearing interposed between each bearing surface at the end of the tubular members and the inner face of the ring of the drum supported on that bearing surface, a floating drive shaft extending across the frame through the tubular member concentric with the axis of the drums and connecting the oppositely disposed drums for simultaneous rotation, said shaft and drums being supported solely by the frame, said high speed revolving drums being arranged to establish a stationary neutral axis of rotation around which the drive shaft and drums rotate concentrically when the shaft is rotating at its normal operative speed while the frame and tubular member

vibrate, the ring being rotatably adjustable in the drum whereby the degree of frame vibration may be varied, and the weights on the said drums and rings being so positioned and proportioned that the said neutral axis of rotation will remain constant as said rings are adjusted relative to said drums.

3. A high speed vibrating device comprising a frame, a tubular member extending across the frame and secured thereto, a bearing surface at each end of the tubular member, oppositely disposed high speed revolving weighted drums supported on the bearing surfaces and provided with inner faces near the edge thereof eccentric to the axis of said drums, weighted rings provided with an inner and outer bearing surface eccentric to each other, the outer surface of said rings being slidably supported in the inner face of the weighted drums, a bearing interposed between each bearing surface and the ring carried by the eccentric face of the drum supported by the bearing surface, a floating drive shaft extending across the frame through the tubular member and concentric with the axis of the drums connecting the oppositely disposed drums for simultaneous rotation, said shaft and drums being supported solely by said frame, said high speed revolving drums being arranged to establish a stationary neutral axis of rotation around which the drive shaft and drums rotate concentrically when the shaft is rotating at its normal operative speed while the frame and tubular member vibrate, said weights on the drums and rings being so positioned and proportioned that the said neutral axis of rotation will remain constant as the rings are adjusted relative to the drums, and oppositely disposed oil tight casings secured to the frame and enclosing the revolving drums, the drive shaft extending through one of said casings, and an oil seal between the shaft and said casing.

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