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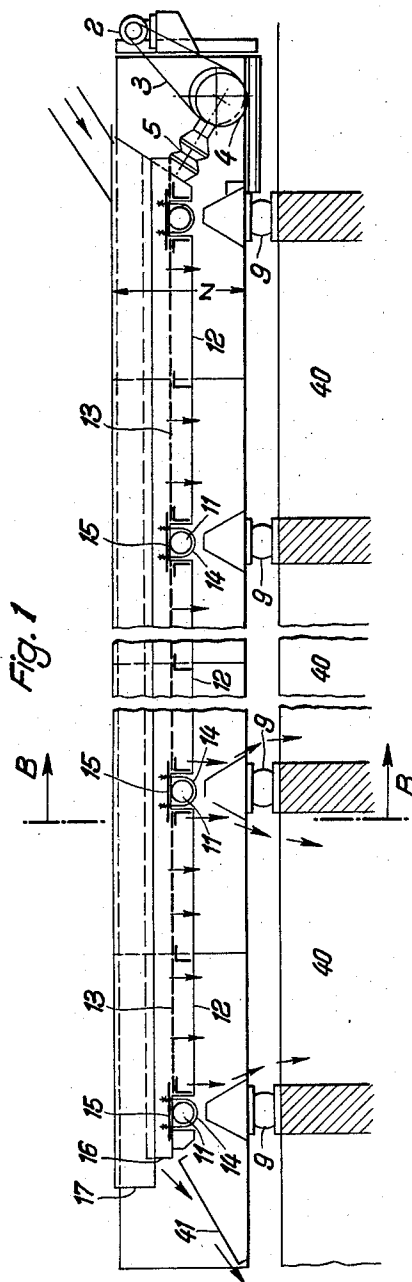
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2,920,762

HORIZONTAL SCREENING MACHINE

Filed Sept. 21, 1954

3 Sheets-Sheet 1



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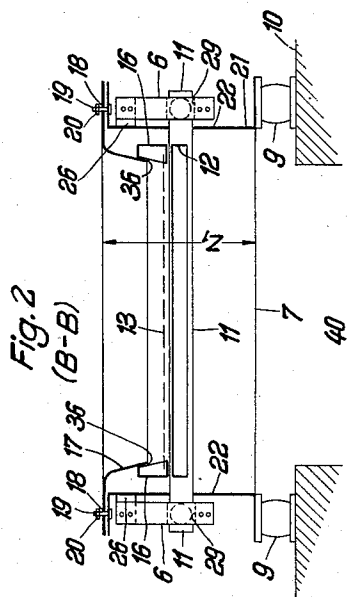
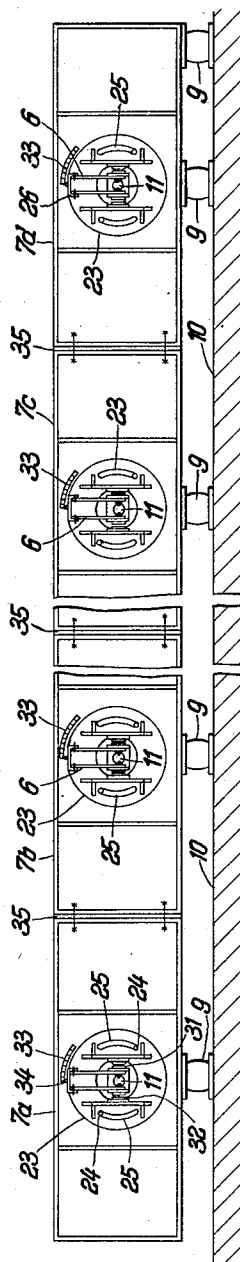


Fig. 5



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Fig. 3

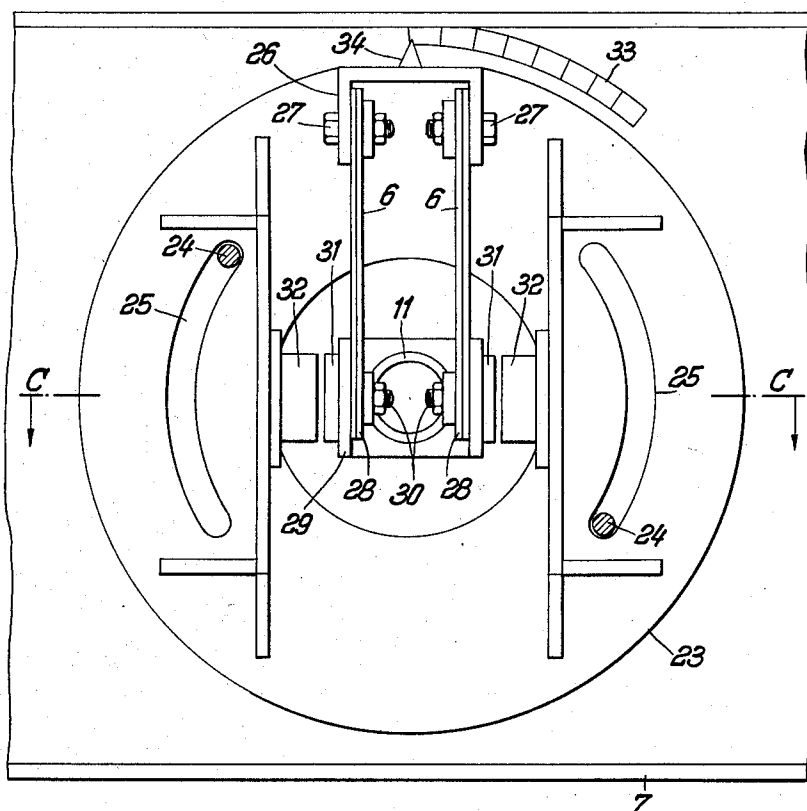
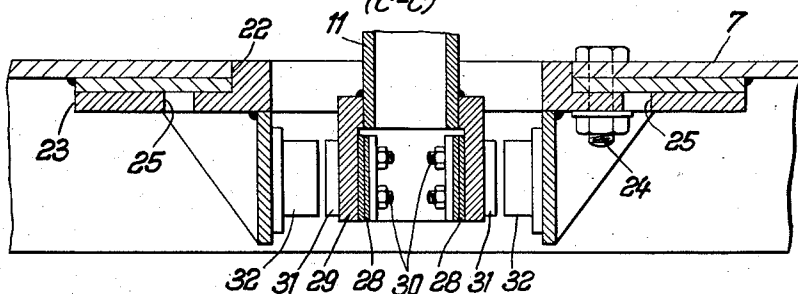


Fig. 4
(C-C)



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HORIZONTAL SCREENING MACHINE

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11 Claims. (Cl. 209—365)

This invention, relating as indicated to a horizontal screening machine, is particularly directed to a novel type of screening machine for aggregate, including coal and the like, in which the screen supporting structure is resiliently mounted on elastic means in order to produce both a horizontal and vertical component of movement, to sift the aggregate on the screen and incidental thereto cause the aggregate to move along the screen. The component of movement in both the vertical and horizontal plane must be adjustable to the type of material being screened, and up until the present time the Schieferstein system of screening, along with others, has been restricted in that there has been limited adjustability for the screen.

This invention incorporates means for varying the resultant direction of movement of the screen, which is periodically vibrated by vibrating means comprising an electric motor, an eccentric, and a coupling means to the vibrating screen body which is resilient. Other types of driving means of equivalent construction could also be used.

This invention is particularly directed to a novel type of horizontal screening machine which incorporates means for adjusting direction of the movement or stroke of the vibrating screen body with the means for conserving the energy of the vibration by a bounce-back or rebound device comprising one or more resilient members on oppositely disposed sides of a plate secured to the vibrating body. Said rebound means and the resilient arms, which are secured to the base frame, are incorporated in an integral structure on a circular plate, so that said plate may be adjusted to the correct angle to produce the desired direction of throw of the vibrating screen body. In this case the vibrating screen body and its end mounting means, comprising tubes, are mounted within the side plates and side frame structures in a manner so that the mass of the vibrating screen body is reduced. The incorporation of the bounce-back device and the resilient means for mounting the screen body in a single structure permits a multiplicity of units to be attached to one another to increase the length of the unit. Inherently this produces a unit which can be combined in multiple units and shipped to the point of installation as individual pieces, each of said sub-assembly being a complete unit in and of itself and are actuated by the vibrating means at the end of the screen body.

This structure would be much lighter in weight than known horizontal screens of the Schieferstein type, in addition to having the possibility of changing the angle of throw to the vibrating screen body.

An object of this invention is to produce an improved horizontal screening machine, incorporating features of adjustability of the direction or the throw of the vibrating screening body along with an improved resilient mounting means for the screen body intermediate the said frame elements, incorporating said resilient mounting means together with a bounce-back device, resulting in

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adjustability, greater length, and considerably reduced mass to the machine.

A further object of this invention is to improve the Schieferstein system of horizontal screening to produce quick adjustability in a vibrating screening device, to both the resilient springs and the rebound devices simultaneously.

A further object of this invention is to produce a vibrating screening device that can be made of individual components and added to as desired to produce a screening table of desired length for any screening operation, said intermediate sections or sub-assemblies being completely balanced in and of themselves and incorporating identical units for positioning the resilient means and the bounce-back devices for the vibrating screen body to the side framing members.

A further object of this invention is to produce an improved mounting means for a horizontal screening machine incorporating features of adjustability, reduced weight, in which the resilient means comprising steel springs are mounted intermediate the bounce-back device, resulting in lowered stresses in the vibrating screen body and reducing the weight of said screen body.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the vibrating screening body hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail one approved method of carrying out the invention, such disclosed method, however, constituting but one of the various ways in which the principles of the invention may be used.

In the drawings:

Fig. 1 is a side view of the improved vibrating structure of this invention,

Fig. 2 is a cross-sectional view along the lines B—B of Fig. 1,

Fig. 3 is an enlarged side view of the end mounting means for the vibrating screening apparatus,

Fig. 4 is a cross-sectional view along the lines C—C of Fig. 3 showing the supporting elements thereof, and

Fig. 5 is a fragmentary side elevation view of a multiplicity of units as combined in this invention.

For a better understanding of the Schieferstein system, a brief explanation of the relative size and weights of the components as well as a brief mathematical presentation may be necessary. In one example the amplitude of the vibration in the base frame may be designated as a_1 . The weight of the base frame may be expressed as M_1 and the amplitude of the screen body as a_2 and the weight of the screen M_2 . It will then be seen that the following formula will be true.

$$M_1 \times a_1 = M_2 \times a_2$$

From experience it is understood that the best results are obtained when the weight of the vibrating screen body to the base frame, i.e., M_2 to M_1 , is in the relationship of 1 to 4. It will further be appreciated that some spacing is required between the vibrating screen body and the base frame.

Figs. 1 and 2 show particularly the details of the invention, hereinafter to be more fully described. In this construction in the vibrating screen body we have framing elements 12 and cross supports 11, which are vibrated by means of a drive mechanism. This drive mechanism consists of an electric motor 2, connected by means of driving belts 3, to an eccentric driving mechanism 4, having a resilient coupling 5, said coupling being connected to the screen body. The eccentric drive operates the screen body and causes it to vibrate as soon as the motor is started. In this apparatus frames 12 are made from angle irons on the top, to which woven wire or screen plate section 13 are attached. A channel or bar element 16 of light con-

struction borders the longitudinal screen framing elements 12 and these are connected together by means of U bolts and clamps 14. The spacing between the screen members 13 are covered by plates 15. By this combination of parts the screen framing elements 12, the screen cloth 13, and the channel or bar elements 16 comprise the vibrating parts of the apparatus. The material or aggregate being screened will pass through screen 13 and go into the hopper 40 as shown by the arrows, but the coarser materials will travel along and go off the end of the screen as shown at 41. The vibrating parts of the apparatus are carried by base frame 7, which is positioned upon other supporting means, such as the ground shown at 10, and this is resiliently mounted by means of rubber buffers or cushions shown at 9.

This combination of units has some considerable advantages, as will be more fully considered, because the vibrating screen parts are so arranged with the supporting springs centrally located with respect to the rebound devices, that a long screen can be formed of a series of similar units, which are secured together. The arrangement of the individual components, screen body and supporting means, is such that there the stresses in the vibrating parts will be greatly reduced from those in the Schieferstein system, wherein the resilient spring means were physically spaced from the rebound elements and the latter was in the center of the large screen body. This new system now causes the rebound means to be on opposite sides of the resilient springs and the weight and size of the vibrating screen parts can be considerably reduced according to the formula, explained earlier. In order to give a specific example of the system and compare it with the old system, the following figures will be helpful.

The old Schieferstein system might in a particular example have a width of 4 ft. and a length of 13 ft. with a weight of one ton for the vibrating screen body, so the whole machine weighed five tons, i.e., the base frame weighed approximately four tons according to the formula earlier described. With the new and improved system of this invention the same size machine would have the vibrating frames 11, 12 and 16 and would weigh only 800 lbs., approximately 40% of the earlier weight, and the over-all machine weight would be two tons. This is a considerable advantage inasmuch as the lightness of construction in process equipment is of importance, since these machines are frequently assembled in structures one above the other, and a tremendous weight of equipment is undesirable from a structural standpoint, and is also very difficult to handle and assemble. Consequently this new unit, weighing as little as it does, can be made up of components and fabricated in very large screens. Needless to say, the power is in proportion to the weight being moved, and is considerably reduced in this construction.

In the drawings, Figs. 1 and 2 also show curved side plates 17, which are attached to the base frame element 7. These end above the wire mesh and will not be vibrated with the vibrating screen body. This construction is different and reduces the weight of the side plates in the vibrating screen body. These plates may be moved with screw fastening means 19 and adjusted in slots 18 as required.

A further advantage in this construction is that the vibrating screen body is fastened intermediate the ends, top and bottom of the base side frame elements and not above, as in the earlier Schieferstein construction, making the over-all assembly of considerably reduced height. By this construction the transverse support members of the vibrating screen body pass through the base frame element 7 at holes 22 in the base side framing members 21 and these members are connected together by means of the flat springs 6.

Figs. 3 and 4 show the attachment of these springs 6 to the frame 7 by means of steel disks 23. These are mounted on top of cylindrical openings 22 of the frame 7. The disks 23 will be pressed against the frame by means of

screw fastening means 24 and the entire assembly can be turned and adjusted by the slot 25.

On the disk is securely mounted a U-shaped support member 26, which holds the flat springs 6. Said springs are connected at their ends, shown at 28, to the transverse support means 11 of the vibrating screen body. These are welded onto flanges 29, and fastened by means of bolts 30. Said flanges carry on their oppositely disposed faces 31 a plate surface adapted to co-operate with the rebound mechanism and the rubber buffers or bumpers 32. By altering the position of the disks 23 in the slot 25, the angle can be changed, as may be seen by the indicator 34, and the dial 33, and any specific angle can be read on said dial. By this mechanism the throw angle is changed as desired to produce the necessary action for the aggregate being screened. The entire assembly and spring elements, as well as the rebound mechanism, are in a single unit, and they do not produce undesirable moments in the vibrating screen body or in the base frame elements. This permits each assembly, or sub-unit of the combination, to be separately supported so that multiple units can be assembled to form a single horizontal screening machine. Each unit may be fixed at a set angle as desired for the material being screened, and the assembly will operate in unison.

As an illustration of a unit comprising a number of segments, Fig. 5 is the side elevation view of an assembly comprising multiple units. Said assembly is comprised of similar parts, 7a—b—c and d, and these are connected by means of screws, or with other type, such as elastic. In the latter case rubber parts 35 would be put between the framing elements, 7a—b—c and d. Each segment of the side frame 7 would have a disk 23, with all of the other parts, including spring elements 6 and the rebound mechanism as shown in the previous views. It is possible to have more than one disk in an element, and two disks 23 may be assembled in one section, such as 7a, and these then could be connected in multiple units by the means previously described.

Having thus described our invention in its simplest form, variations and modifications may be resorted to by those skilled in the art without departing from the principles of the invention. All of these variations and modifications are considered to be within the true spirit and scope of the present invention, as disclosed in the foregoing description and defined by the appended claims.

We claim:

1. In a vibrating screening apparatus, a pair of longitudinal base side framing members, a vibrating screen body intermediate thereof having support members extending into the sides of said longitudinal base side framing members, each support member adjacent its end portions extending in structures carrying resilient spring elements and rebound plates and being supported by said spring elements, said structures being mounted to said base side framing elements and being capable of angular adjustments with respect thereto to thereby provide a varying direction of throw for the vibrating screen apparatus, and actuating means for the vibrating screen body.

2. The vibrating screening apparatus of claim 1 in which the apparatus is formed of a plurality of units, the vibrating screen bodies being coupled together and the longitudinal base side framing elements being coupled together to increase the overall length thereof, whereby the screening apparatus may be of indefinite extent with actuation from a common source because of the balanced action between the screen body units and the framing elements in each of the separate units.

3. In a vibrating screening apparatus, a pair of longitudinal support members, a vibrating screen body comprising an open screen surface and rigid support members therefor, means interconnecting the vibrating screen body and the pair of longitudinal support members, said means comprising a circular plate secured to said longitudinal support members, a pair of rebound plates on opposite

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sides thereof having a resilient cushioning means on the sides facing each other, a resilient spring mounting means connected to an extension of the vibrating screen body positioned intermediate said rebound plates, said springs being connected to the circular plate, adjustment means for said circular plate relative to the longitudinal support member, and means connected to the vibrating screen body for vibrating the screen with a horizontal and vertical component, the line of action of said actuating means for the vibrating screen body and the resilient spring means being at an angle relative to one another.

4. In a vibrating screen apparatus of the counter oscillating mass type comprising elastically supported base members and a screening surface connected thereto by means of resilient guide springs, the novel combination of a plurality of screening surfaces, a plurality of supporting frames therefor and resilient interconnection means between the contacting portion of the screen frame and of the base frame, and cross beams between each screening surface and its supporting frames, and guide springs connected to the ends of said cross beams and connected to the base frames, and resilient cushioning means and rebound plates engaged by the ends of the cross beams and resilient springs, and means connected to the vibrating screen body for vibrating the screen with a horizontal and vertical component.

5. In a horizontal screening apparatus of the counter oscillating mass type, a resiliently supported base frame, a plurality of vibrating screening surfaces connected thereto by means of rebound plates and resilient guide springs, cross beams on the end of said guide spring between the base frame supporting said vibrating screening surfaces, resilient springs between the base frame supporting the ends of said cross beams, and rebound plates and springs on said base frame adapted to engage the cross beam and resilient guide spring.

6. In a horizontal screening apparatus of the counter oscillating mass type, a base frame having a pair of longitudinal support members, a vibrating screen body, means interconnecting the vibrating screen body and the pair of longitudinal support members, said means comprising a pair of rebound plates on opposite sides thereof having a resilient cushioning means on the sides facing each other and a resilient spring to the longitudinal support members, said interconnecting means being positioned between intermediate rebound plates, and means connected to the vibrating screen body for vibrating the screen with a horizontal and vertical component.

7. The horizontal screening apparatus of claim 5, in which each of the vibrating screening surfaces is connected to a separate base frame and all of the components are interconnected.

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8. In a horizontal screening apparatus of the counter oscillating mass type, a resiliently mounted base frame having parallel sides, a screen frame therebetween and means interconnecting said screening frame and base frame and the parallel sides of said base frame centrally located in the sides thereof comprising resilient springs connected to the base frame and the sides thereof and to the screen frame, and rebound plates on said base frame adapted to be engaged by the resilient springs.

9. In a horizontal screening apparatus of the counter oscillating mass type, a base frame, a vibrating screening frame, and means interconnecting the screen frame and base frame centrally located on the sides thereof comprising a common support point for the screening frame, said interconnection combining a resilient spring on said base frame connected to the screen frame and rebound plates on the base frame on opposite sides of the end of the resilient spring and the support for the vibrating screen frame.

10. In a horizontal vibrating screening apparatus of the counter oscillating mass type, a base frame, a screen frame and means interconnecting the base frame and screen frame on the sides thereof on a transverse axis centrally located with respect to the center of the sides of the base and screen frame at the approximate transverse center of gravity thereof, said interconnecting means comprising a resilient spring connected to the base frame and to the screen frame and rebound plates on the base frame on opposite sides of the ends of said resilient spring whereby a single unit can have one point of connection between a screen frame and be vibrated with a horizontal and vertical component with respect thereto.

11. The horizontal screening apparatus of claim 10, in which a plurality of screen apparatus are interconnected having resilient means between the contacting portions of the screen frame and of the base frame, wherein an operating horizontal screening machine will be balanced with respect to each section with only a minimum amount of transverse loading through the resilient means.

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