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2,804,208

VIBRATING SCREEN

Filed July 14, 1953

2 Sheets-Sheet 1

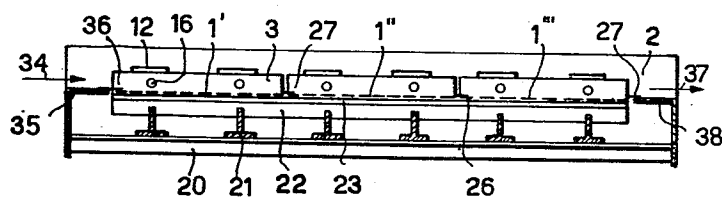


FIG. 1

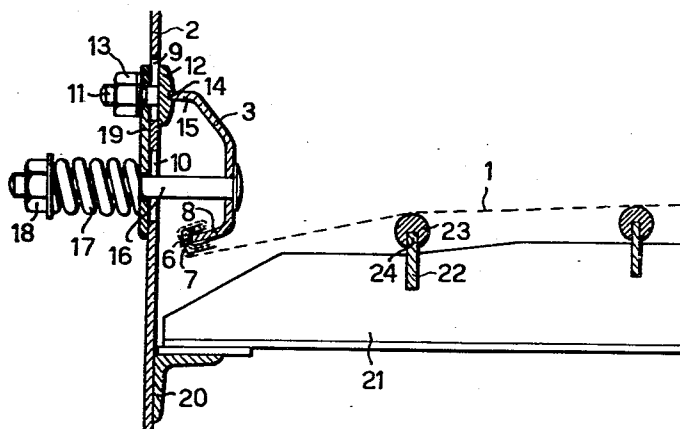


FIG. 2

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2 Sheets-Sheet 2

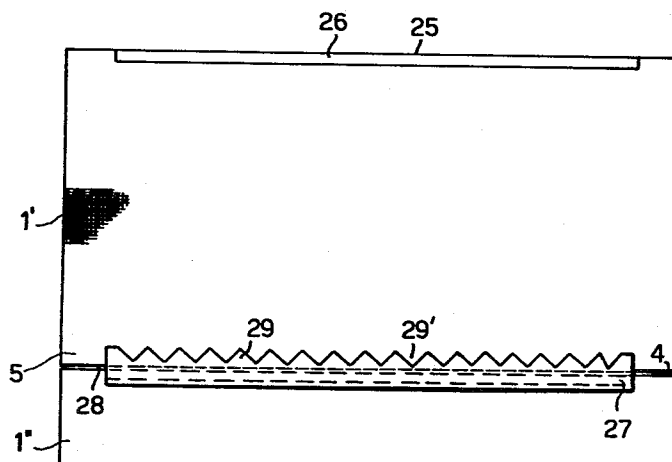


FIG. 3

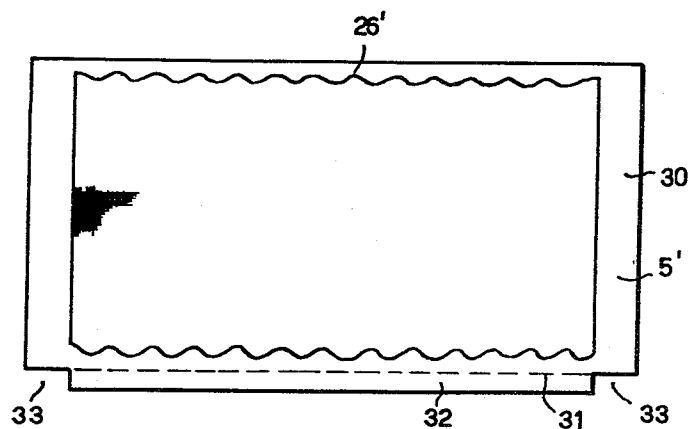


FIG. 4

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VIBRATING SCREEN

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Claims priority, application Netherlands July 19, 1952

11 Claims. (Cl. 209—403)

This invention relates generally to improvements in vibrating screens. More particularly, the invention relates to vibrating screens of the type having a number of wire screening cloths arranged in series in the direction in which material is transported when it is being screened, which screening cloths are pulled taut transversely by means of a stretching device.

In vibrating screens of the aforesaid type, employed hitherto, the successive screening cloths are arranged in such a way, that the adjacent edges of successive cloths overlap each other in order to avoid gaps between the cloths through which material being screened might fall. As each screening cloth has to be tensioned separately, only that part of the transverse edges of the cloths which is situated between the overlap zone ends of the cloths can be gripped by the stretching device in this arrangement. The result of this is that the overlapping front and rear edges of the cloths are unstressed, so that these edges will beat against each other and against the supporting structure of the screening deck during the screening operation. This will soon lead to wire breakage due to fatigue of the wire material. In consequence, the life of the screening cloths is comparatively short.

Having in mind the defects of the prior art of screening it is the primary object of the invention to provide a vibrating screen in which the life of the screening cloths is considerably increased compared with that of known screening apparatus.

Another object of the invention is to provide a vibrating screen in which the successive screening cloths of the screening deck are assembled in an improved manner.

Still another object of the invention is to provide a vibrating screen in which the risk of fatigue ruptures of the wires of the screening cloths is considerably decreased.

Still another object of the invention is to provide a vibrating screen in which beating of the adjacent front and rear edges of successive screening cloths against each other is prevented.

Still another object of the invention is to provide a vibrating screen in which the screening cloths are tensioned uniformly over their whole surface.

A further object of the invention is to provide a vibrating screen in which the transverse edges of the screening cloths are gripped over their whole length in the stretching device.

A still further object of the invention is to provide a vibrating screen in which the thickness of material clamped in the stretching device is equal at the whole length of the transverse edges of the screening cloths.

The foregoing and other objects of the invention we prefer to accomplish as follows:

According to a preferred embodiment of our invention, in a vibrating screen comprising a number of wire screening cloths arranged in series in the direction of travel of the material to be screened, the successive screening cloths are spaced apart edgewise in the screening box

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and rubber stripping is secured to one of the spaced edges of the successive screening cloths so that it bridges the gap between the adjacent edges and overlaps the confronting edge of the adjacent screening cloth.

In this way the adjacent edges of any of two adjacent screening cloths no longer overlap each other to give wire-to-wire contact. This makes it possible to tension the cloths uniformly over their whole length, so that fatigue ruptures due to the unstressed front and rear margins of the cloths beating against each other and against the supporting structure are avoided.

The overlapping stripping lies preferably in advance of the appertaining edge of the screening cloth with respect of the direction of travel of the material to be screened in order to prevent this material from passing under the overlapping portions of the stripping.

We prefer to provide both of the adjacent edges of successive screening cloths with rubber stripping, wherein one of the strippings coincides with its appertaining cloth edge and the other stripping extends beyond its appertaining cloth edge, so that it overlaps the coinciding rubber stripping.

The overlapping rubber strippings may be joined, for example, cemented together to prevent completely unscreened particles to pass underneath the overlapping. In prior constructions, where the adjacent edges of the screening cloths are connected by means of bolts or rivets, damage to the cloths will be caused, while connection by soldering will form stiff zones in the screening cloths, which soon will lead to wire breakage due to fatigue of the material, as in this case the wires of the cloths will be bent sharply up and down during operation of the screen.

To prevent in the present construction sharp bending of the longitudinal wires of the screening cloths at the border line between a rubber stripping and its cloth during the screening operation, the part of the strip which is secured to the cloth may be provided at its inner edge with an indented or serrated, or undulating or the like edge, so that the transition from rubber to cloth in longitudinal direction will be more gradual. This reduces the risk of fatigue ruptures of the wires of the cloth.

By making the length of the rubber stripping substantially equal to the distance between the margins engaged by the stretching devices on either side of the cloths the thickness of material in the marginal clamps is equal over the whole length of the transverse edges. As a result of this the screening cloths may be stressed uniformly over their whole surface, so that valleys in the screen surface, in which material piles into relatively thick layers difficult to screen, are eliminated.

In another embodiment of our invention we have the screening cloths surrounded at their edges by a marginal rubber stripping, which stripping at one of the four edges of the cloths extends beyond the cloth. Also in this case the thickness of material clamped in the stretching device is equal over the whole length of the transverse edges.

The term "rubber" as used in this specification includes natural and synthetic rubber and elastomers having like mechanical properties to rubber.

A vibrating screen in accordance with the above brief description is hereinafter more fully described, and is shown in the accompanying drawings in which:

Figure 1 is a longitudinal vertical sectional view of a vibrating screen according to the invention;

Figure 2 is an enlarged fragmentary sectional view of one side of the screen;

Figure 3 is a plan view of adjacent screening cloths of the screen deck; and

Figure 4 is a plan view of a wire screening cloth embodying a modification of the invention.

Referring to the drawings, reference numeral 1 designates a screening deck which in longitudinal direction is composed of a series of wire screening cloths 1', 1'' and 1'''. While only three cloths are shown in Figure 1 there may be any desired number of these cloths following each other in succession along the operative direction in which the material is to be screened is transported as indicated by the arrows in Figure 1. The number of cloths required depends upon the total length of the screening deck 1 and the individual length of the cloths available.

Screening deck 1 is detachably fastened in the frame or screen box 2 of the vibrating screen by means of clips or stretcher hooks 3 on each side of the screening deck. The frame 2 is resiliently suspended or mounted upon a support and caused to vibrate with small amplitude and comparatively high frequency by means of a vibrating mechanism, for instance a revolving unbalanced weight carried by a rapidly rotating shaft disposed transversely of the frame. The frame support and the vibrating mechanism may be of well known construction and are not shown in the drawings.

The screening cloths 1', 1'' and 1''' are separately clamped in the stretching devices 3 and so arranged that between adjacent cloths a small gap 4 is present as appears in Figure 3. The transverse edges 5 of each of the screening cloths 1', 1'' and 1''' are bent over an outer U-shaped nested edging 6 and reversed between the inner side of the edging 6 and the outer side of an inner U-shaped ending 7, which engages within the edging 6, as shown in Figure 2. The length of edging 6 and 7 is equal to the length of the transverse edges 5 of the screening cloths.

Stretcher hooks 3 have inwardly turned end portions 8, which engage within the inner U-shaped edging 7.

The vertical side walls of frame 2 are provided with slots 9 and 10. In the upper slots 9 bolts 11 having a plate-like head 12 are secured by means of a nut 13. The head 12 is provided with a horizontal groove 14 in which the upper end portion 15 of stretcher hooks 3 engages. Bolts 16, passing through the lower slots 10 and provided with a spring 17 and a nut 18, resiliently secure stretcher hooks 3 to the vertical side walls of frame 2. By means of spring bolts 16 screening deck 1 may be tensioned transversely and as the complete length of the transverse edges 5 is gripped by the stretching device 3 the screening cloths 1', 1'' and 1''' are stressed uniformly. Bolts 11 and 16 are spaced apart by means of plates 19 and vertical adjustment of stretching devices 3 is effected by securing bolts 11 in the desired height in slots 9.

Longitudinal hooks 20 are attached to the frame 2, on which hooks transverse beams 21 are mounted. Beams 21 carry longitudinal girders 22 provided with rubber linings 23 at their upper edges 24 for supporting screening deck 1.

Each of the screening cloths 1', 1'' and 1''' is provided along its rear edge 25 with a rubber strip 26 which is vulcanized into the screening cloth so as not to extend beyond said edge. A broader strip 27 is vulcanized to the front edge 28 of the cloths and extends beyond said edge so as to overlap and cover strip 26 on the rear edge 25 of the adjacent cloth. If desired the so overlapped rubber strips 26 and 27 may be joined, for example adhesively.

As the weight of the rubber lined edges 25 and 27 is greater than the uncoated portions of the screening cloths 1', 1'' and 1''' the amplitude of the margins differs from that of the uncoated portions during screening operation. This will result in a bending of the longitudinal wires of the screening cloths at the border line between the rubber strips 26 and 27 and the uncovered portion of the cloth which will give rise to fatigue ruptures in case this bending is effected over a small radius. To overcome this objection I prefer to provide the strips with a chamfered,

for instance an indented edge 29 at the border line between the rubber stripping and the uncovered cloth to avoid an abrupt transition from the strips to the uncovered portion of the screening cloths, as shown in Figure 3. In this case the wires of the cloths will be bent over a region defined by the depth of the recess 29' in the indented edge 29 which results in a much greater bending radius. As appears in Figure 3 only the larger strip 27 is provided with an indented edge 29, whereas the smaller strip 26, which is lighter in weight coincides with the stressed edge 25 of the cloth and which therefor has substantially the same amplitude as the uncovered portion of cloth 1' is unchamfered. It will however, be understood that it falls within the scope of this invention to provide also strip 26 with a chamfered edge, as shown in Figure 4 at 26'.

The length of the rubber strips 26 and 27 is such that the transverse margins 5 which are clamped in the stretching device 3 are uncovered. As a consequence, the thickness of material in the edgings 6 and 7 is equal along the entire length of the screen deck 1, so that the screening cloths 1', 1'' and 1''' can be readily tensioned uniformly. The same result can be obtained when, as shown in Figure 4, the screening cloths are surrounded at their edges by a marginal rubber lining 30, which at one of the edges 31 extends beyond the cloth. The width of the extending portion 32 is such that on both sides of the portion recesses 33 are present of a width substantially equal to the width of the transverse margins 5' which are to be clamped in the stretching device. When arranged in the screening box 2 the extending portion 32 of the rubber lining 30 overlaps the rubber lining of an adjacent screening cloth.

As appears in Figure 1 material to be screened is supplied at 34 on the entrance plate 35 mounted transversely in the screening box 2. Entrance plate 35 is provided at its front edge with a rubber strip 36 overlapping the first screening cloth 1' of the series. Strip 36 prevents material from passing unscreened through the gap between entrance plate 35 and screening cloth 1' and may be joined, for instance cemented, to the rubber strip 26 on the rear edge 25 of screening cloth 1'. The material to be screened passes subsequently the successive screening cloths 1', 1'' and 1''', whereby the undersize particles having a dimension smaller than the mesh of the screening cloths pass through the meshes of the screen and are collected in a receiver, not shown in the drawings, disposed below the screen box 2. The oversize particles are discharged at 37 over a discharge plate 38 arranged transversely at the end of the screening box 2. The larger rubber strip 27 at the front edge of the last screening cloth 1''' overlaps the discharge plate 38 and may be vulcanized thereto.

Example

A vibrating screen according to the invention operated with a frequency of 1200 vibrations per minute at an amplitude of 12 mm. was used for screening coal fines at an average capacity of 30 tons per hour.

The screening deck was composed of four screening cloths each of 914 x 1750 mm. and formed of stainless steel woven wire of 0.5 mm. in diameter and a width of mesh of 0.5 x 3.75 mm. The successive cloths were spaced at a distance of about 3 mm. At both shorter edges of the cloths a margin of 125 mm. was bent in reinforcing edgings and tensioned in the stretching device. Rubber strips having a thickness of 1.5 mm. and a length of 1500 mm. were vulcanized to the longer edges of each of the cloths, the strip on the rear edge coinciding with this edge and having a width of 20 mm., and the strip on the front edge having a width of 90 mm. of which 35 mm. extends beyond the front edge of the cloth. The portion of the larger strip vulcanized to the cloth was provided with an indented inner edge, the recesses therein having a depth of 45 mm.

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The screen was in use for 2200 hours before it became necessary to replace the screening deck.

In a customary screen, where the screening cloths overlapped each other in such a way as to give direct wire-to-wire contact of unstressed edges it became necessary to replace the screening deck after 300 operating hours, although the operating conditions were practically the same as those in the previous case.

The terminology used in the specification is for the purpose of description and not for limitation, the scope of the invention being defined in the claims.

We claim:

1. In a vibrating screen a screening box, a number of wire screening cloths arranged in series in said screening box, said successive screening cloths being spaced apart edgewise, reinforced margins provided on the whole length of the transverse edges of said cloths, stretching means attached to the side walls of said screening box and engaging said reinforced margins to apply tension to said cloths, and rubber strippings secured to the spaced edges of the cloths, the rubber stripping secured to one of said edges having a width substantially equal to the distance between said reinforced margins on either side of the cloths and a length sufficient to bridge the gap between adjacent cloths and to overlap the confronting edge of the successive cloth.

2. A vibrating screen comprising a number of wire screening cloths arranged in series in the direction of travel of the material to be screened, said successive screening cloths being spaced apart edgewise, and means for tensioning said screening cloths transversely, the confronting spaced edges of adjacent cloths both being provided with rubber stripping, the stripping on one of said cloths coinciding with its appertaining edge and the stripping on the other of said cloths extending beyond its appertaining edge, said extending rubber stripping bridging the gap between said adjacent cloths and overlapping said coinciding rubber stripping on the one of said cloths, the overlapping rubber strippings of adjacent cloths being joined together.

3. A vibrating screen comprising a number of wire screening cloths arranged in series in the direction of travel of the material to be screened, said successive screening cloths being spaced apart edgewise, stripping of a rubber-like material secured to one of the spaced edges of each of said successive screening cloths, and means secured to the transverse edges of said cloths for tensioning the latter transversely, said stripping of each cloth extending beyond its appertaining edge between the transverse edges of said cloth secured in said tensioning means and overlapping the confronting edge of the adjacent cloth whereby the transverse edges secured in said

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tensioning means are of uniform thickness, said overlapping stripping serving to prevent the material to be screened from entering between the spaced apart edges of said cloths.

4. A vibrating screen as defined in claim 3 wherein said confronting edge of each adjacent cloth is also provided with a stripping of rubber-like material coinciding with its appertaining edge, the stripping on the confronting edge of each cloth engaging the overlapping stripping of the adjacent cloth.

5. A vibrating screen as defined in claim 4 wherein said strippings of each cloth form a part of a marginal lining of rubber-like material surrounding each cloth.

6. A vibrating screen as defined in claim 3 wherein said stripping of each cloth overlaps the confronting edge of the adjacent cloth in the direction of transportation of the material to be screened.

7. A screen for use in a vibrating screen apparatus of the type having a number of such screens spaced apart edgewise and arranged in series in the direction of travel of the material to be screened and means for tensioning said screen transversely, said screen comprising a wire screening cloth having one of its longitudinal edges provided with a continuous stripping of rubber-like material, said stripping extending longitudinally beyond said edge between points spaced inwardly from the transverse edges thereof a short distance so as to overlie and engage the adjacent edge of the adjacent screen when arranged in series therewith and hence bridge the gap therebetween.

8. A screen as defined in claim 7 wherein the part of said stripping secured to said cloth is provided with a chamfered inner edge.

9. A screen as defined in claim 7 wherein the opposite longitudinal edge of said cloth is provided with a stripping of rubber-like material having an outer edge coincident with said edge.

10. A screen as defined in claim 9 wherein said strippings form a part of a marginal lining of rubber-like material surrounding said cloth.

11. A screen as defined in claim 9 wherein the part of both of said strippings secured to said cloth is provided with a chamfered inner edge.

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