United States Patent

Hahn

[15] **3,693,793**

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[54] **UNIT BODY VIBRATING SCREEN**

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[52] **U.S. Cl.** **209/326,** 209/366.5

[51] **Int. Cl.** **B07b 1/36**

[58] **Field of Search**.....209/366.5, 326, 332, 367

[56] **References Cited**

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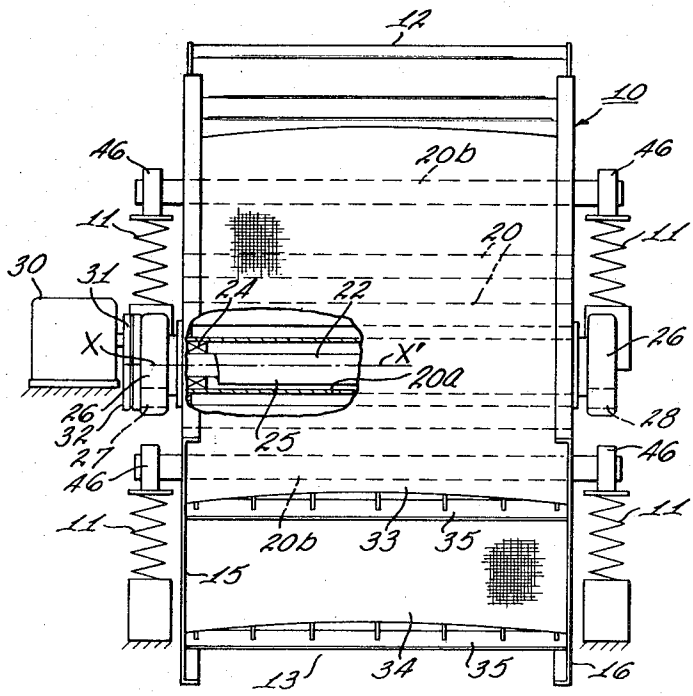
[57] **ABSTRACT**

A vibrating screen is disclosed which moves by gyrating in a circular path about a horizontal axis. The screen has an inclined body with an elevated feed end defined between a pair of side walls spaced apart by a plurality of rigid tubular cross members. One of the tubular cross members, centrally located, has a diameter large enough for a drive shaft and associated bearings to be mounted therein. Each of the tubular cross members projects on each end into an aperture cut in the adjacent side wall where each is joined to the adjacent side wall by a weld around the entire circumference thereof to provide an integral unitary assembly of light weight, great strength, high natural frequency and with the weld path joining the cross members to the side walls having a configuration which is the same, i.e., circular, as the path of motion of the screen in vertical planes defined by the weld paths.

3 Claims, 5 Drawing Figures



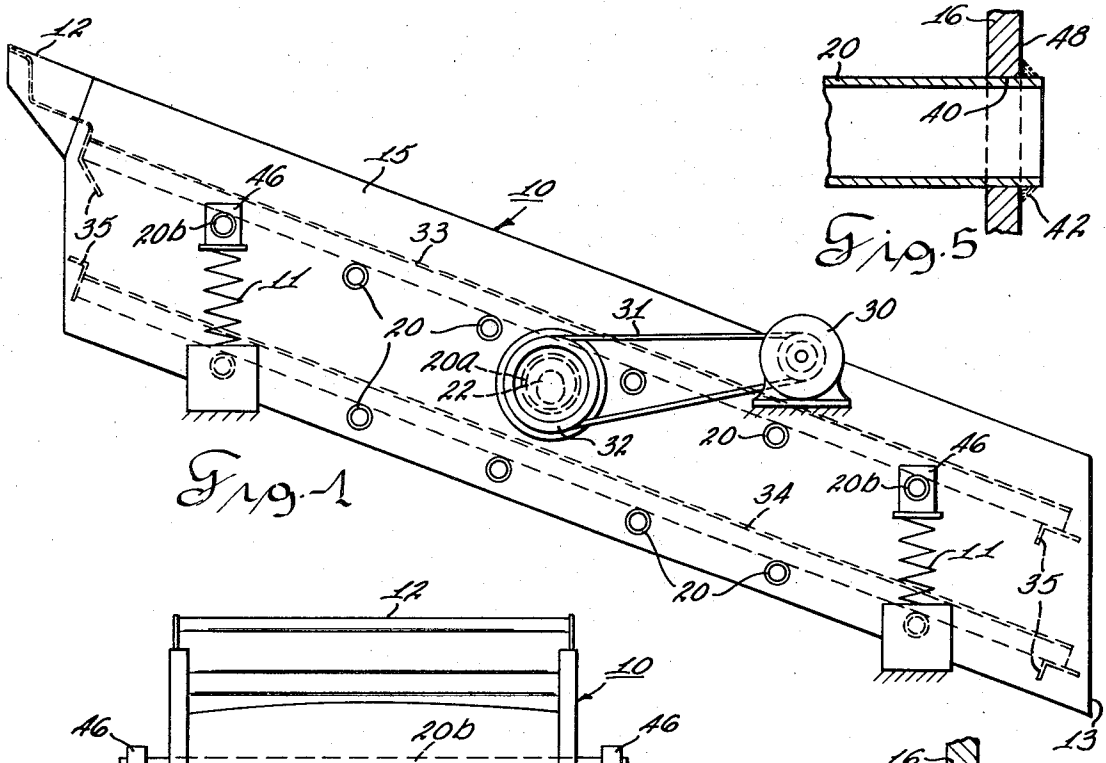


Fig. 1

Fig. 5

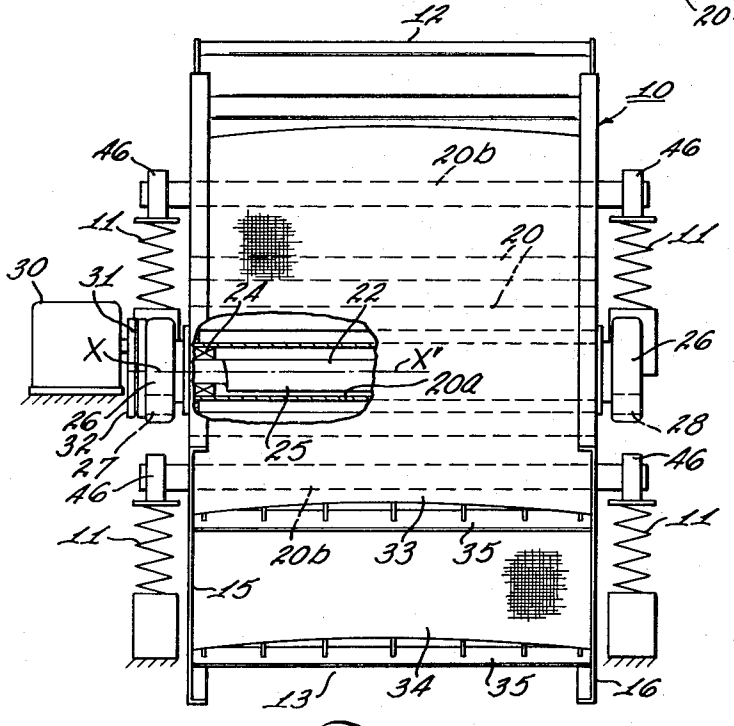


Fig. 2

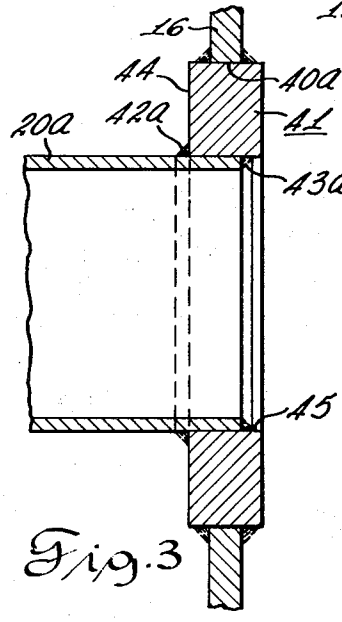


Fig. 3

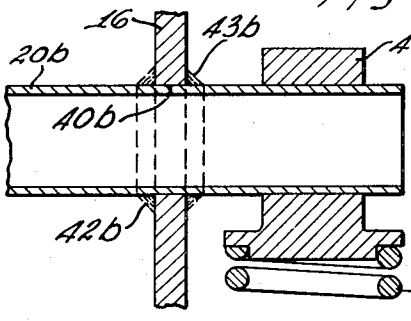


Fig. 4

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UNIT BODY VIBRATING SCREEN

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to material separating vibrating screens having a vibrator drive shaft journaled in screen body side walls and with the shaft carrying eccentric mass counterbalancing the screen body relative to an axis through the side walls and about which axis the screen gyrates.

Description of the Prior Art

Examples of screens which gyrate about an axis passing transversely through side walls of a screen body include such as is shown in U.S. Pat. No. 2,292,327 of 1942; U.S. Pat. No. 2,313,765 of 1943; U.S. Pat. No. 2,702,634 of 1955; and U.S. Pat. No. 2,751,080 of 1956. Each of these patents disclose such a screen in which a massive vibrator drive shaft is journaled in bearing assemblies which are in turn journaled in a housing around the drive shaft. The housing, the bearing assemblies or both are bolted to screen body side walls and the shaft, the bearing assemblies and the housing are carried by the screen body. The side walls of such screen bodies are bolted or riveted to cross beams. Screen constructed as shown in such prior art patents, when installed or after a period of operation, may have a natural frequency which is too low, that is if the natural frequency of the screen is not well above the operating frequency imposed thereon by the operation of the vibrator drive shaft, the screen will be subjected to violent vibration which can damage a screen or reduce its useful life. Usual solutions to such problems known to the prior art involve adding braces or heavier body components to stiffen the body. While such techniques are successful in raising the natural frequency above the operating frequency, mass is added to the screen, which must be counterbalanced, which results in an undesirably heavy and costly machine.

SUMMARY OF THE PRESENT INVENTION

It is among the objects of the present invention to provide a new and improved lightweight screen of great strength and high natural frequency well above operating frequency of the screen.

According to a preferred embodiment of the present invention screen body side walls are spaced apart by a plurality of rigid tubular cross members. One of the tubular cross members, centrally located with respect to both side walls, has a diameter larger than all others and large enough for a drive shaft and associated bearings to be mounted therein. The drive shaft carries eccentric mass counterbalancing the screen body relative to an axis transverse to both side walls and about which axis the screen gyrates. Each of the tubular cross members projects on each end into an aperture cut in the adjacent side wall where each cross member is joined to the adjacent side wall where each cross member is joined to the adjacent side wall by a weld around the entire circumference thereof to provide an integral unitary assembly of light weight, great strength, high natural frequency and with the weld path joining the cross members to the side walls having a configuration which is the same, i.e., circular, as the path of motion of the screen in vertical planes defined by the weld paths. At least one of the tubular cross members between the shaft enclosing cross member and each end of the screen body, project on both ends through and outwardly of both side walls to provide support arms for the screen which are a unitary part of a side wall spacing cross member.

Other features and objects of the invention that have been attained will appear from the more detailed description to follow with reference to an embodiment of the present invention shown in the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 of the accompanying drawing shows a side elevation of a vibratory screen according to the present invention;

FIG. 2 is an end view of the screen of FIG. 1; and

FIGS. 3, 4 and 5 are fragmentary views showing details of the construction of the screen of FIG. 1 to enlarged scale.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2, a vibrating screen is shown having a screen body 10 supported by springs 11 which are mounted on stationary support structures. The upper ends of springs 11 are connected to the screen body 10, in a manner that shall appear from description to follow, with the screen body 10 supported at an incline to a horizontal plane placing a feed end 12 at a higher level than a discharge end 13. The screen body 10 comprises vertical side walls 15, 16 spaced apart horizontally by a plurality of rigid tubular cross members 20. One of the tubular cross members 20*a* is located centrally with respect to both side walls, 15, 16. The tubular cross member 20*a* has a larger diameter than all other of the cross members 20 and cross member 20*a* has arranged within it a drive shaft 22 journaled in bearings 24. The drive shaft 22 carries eccentric mass 25 counterbalancing the screen body relative to an axis X—X′ transverse to side walls 15, 16 and about which (axis X—X′) the screen gyrates with substantially all points on the screen assembly moving to trace, in a vertical plane, a circular path of motion. Balance wheels 26 may be mounted on shaft 22 outboard of walls 15, 16 and weights 27, 28 may be attached thereto to provide eccentric counterbalancing mass to supplement the mass 25 or as an alternate to mass 25. The drive shaft 22 is driven by a motor 30 through belts 31 connected to drive a pulley 32 mounted on one end of the drive shaft 22. The screen body 10 is shown as being provided with two decks or screen surfaces 33, 34. The screen surfaces 33, 34 are supported at the feed and discharge ends 12, 13 by beams 35 and at locations intermediate the feed and discharge ends by the tubular cross members 20.

In the assembly of a screen as shown in FIGS. 1 and 2, apertures (40 in FIGS. 3, 4 and 5) for receiving end portions of the tubular cross members 20 are cut in both side walls 15, 16. The manner in which the tubular cross members 20 are connected to the side walls 15, 16 will be described with reference to FIGS. 3, 4 and 5.

Referring to FIG. 3, an aperture 40*a* in side wall 16 is shown fitted with an annular collar 41 welded thereto for receiving an end portion of the large diameter tubular cross member 20*a*. The end portion of cross

member **20***a* projects axially part way within collar **41**. Cross member **20***a* is connected to collar **41** by an annular weld **42***a* connecting the outer circumference of cross member **20***a* to an adjacent vertical surface **44** of collar **41** and by an annular weld **43***a* connecting the adjacent end of cross member **20***a* to an inner circumferential surface **45** of collar **41**.

As shown in FIGS. **1** and **2** one of the cross members **20**b at each end of the screen body **10** serves to connect the springs **11** to the screen body **10**. The manner in which the cross members **20***b* are connected to the screen body **10** and to the springs **11** is shown in FIG. **4**. As shown in FIG. **4**, an end portion of a cross member **20***b* projects through aperture **40***b* and beyond side wall **16** and a bracket **46** which is mounted on top of spring **11**. Cross member **20***b* is connected to side wall **16** by annular welds **42***b* and **43***b*. All other tubular cross members **20**, that is all tubular cross members **20** except cross member **20***a* and a pair of cross members **20***b*, are connected to the side walls **15**, **16** as shown in FIG. **5**. As shown in FIG. **5**, a cross member **20** projects through aperture **40** and beyond an outer surface **48** of side wall **16** and an annular weld **42** connects the cross member **20** to the side wall **16**.

By the construction that has been described a unitary screen body **10** is provided of which side walls **15**, **16** and all tubular cross members are integral parts. The screen body **10** of apertured side walls **15**, **16** and tubular cross members **20** is of light weight and great strength. The rigidity of the screen body **10** provided by such construction provides a screen body with a high natural frequency, well above the operating frequency of the screen about the axis X—X′. The screen body **10** is assembled with welds **42**, **43** that follow a circular path, as does every point on side walls **15**, **16** in the vertical planes defined by the welds, during operation of drive shaft **22**.

From the foregoing detailed description of the present invention it has been shown how the objects of the present invention have been attained in a preferred manner. However, modification and equivalents of the disclosed concepts such as readily occur to those skilled in the art are intended to be included in the scope of this invention. Thus, the scope of the invention is intended to be limited only by the scope of the claims such as are or may hereafter be, appended hereto.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a vibrating screen arranged to gyrate in a circular path about a horizontal axis of gyration and having a screen body with a feed end and a discharge end defined between a pair of horizontally spaced vertical side walls, and each side wall defining a centrally located aperture therethrough, said apertures being in horizontal and vertical register, a vibrator drive shaft arranged within the side wall apertures and having a journal on each end concentric thereto and carrying eccentric mass counterbalancing the screen body relative to said axis of gyration, and a bearing assembly mounted around each journal and projecting to the adjacent aperture, the improvement comprising:

A. the side walls of the screen body being spaced apart by a plurality of rigid tubular cross members; with

B. one of the cross members being of greater diameter than the other of said cross members and said larger diameter cross member being mounted about said vibrator drive shaft and bearing; and

C. each end of each said cross member being joined to an adjacent side wall by a weld around the entire circumference thereof to provide an integral unitary assembly of great strength and high natural frequency and with the welds having a circular configuration corresponding to the circular path of motion of the screen in vertical planes defined by the welds around the tubular cross members.

2. A vibrating screen according to claim **1** in which at least one tubular cross member between the drive shaft and said feed end and at least one tubular cross member between the drive shaft and said discharge end project on both ends thereof through and outwardly of both side walls to provide support arms for the screen which are a unitary part of a side wall spacing cross member.

3. A vibrating screen according to claim **1** in which the side walls each define a plurality of apertures therein with one of said apertures being provided for the adjacent end of each tubular cross member, and each tubular cross member projects on both ends thereof through one of the apertures in register therewith.

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