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(56) Documents Cited:  
GB 1469493 A JP 2001300426 A  
JP 2000189896 A

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(54) Title of the Invention: **Vibrating screen**  
Abstract Title: **Vibratory screen layered sidewall**

(57) A vibrating screen apparatus (10, fig.1) features a frame 14,16 (18,fig.2), an apertured deck 12, a base, vibration generation means, and side walls 14,16. Each of the side walls 14,16 is constructed of an apertured intermediate plate 34, sandwiched between two outer plates 30,32. This form of sidewall construction may aid the lightness, strength, and rigidity of the side walls 14,16. Also disclosed is a sidewall per se, not necessarily attached to the apparatus.

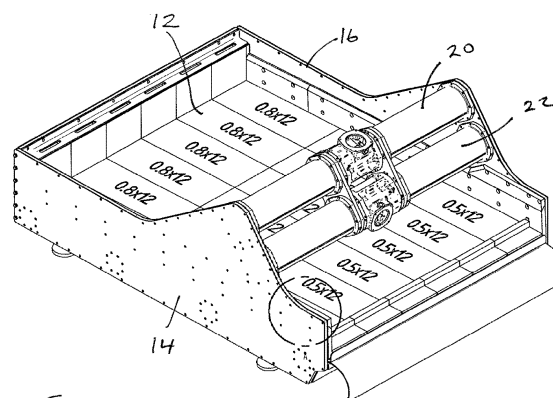


Figure 4

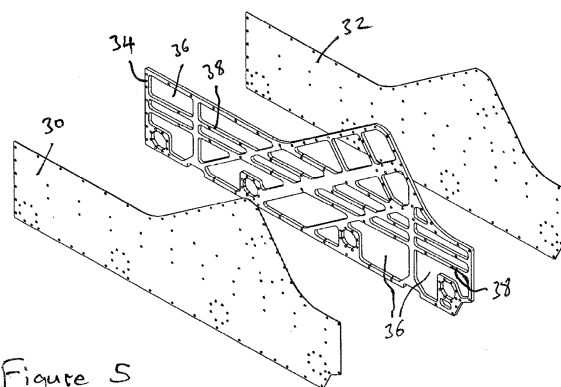
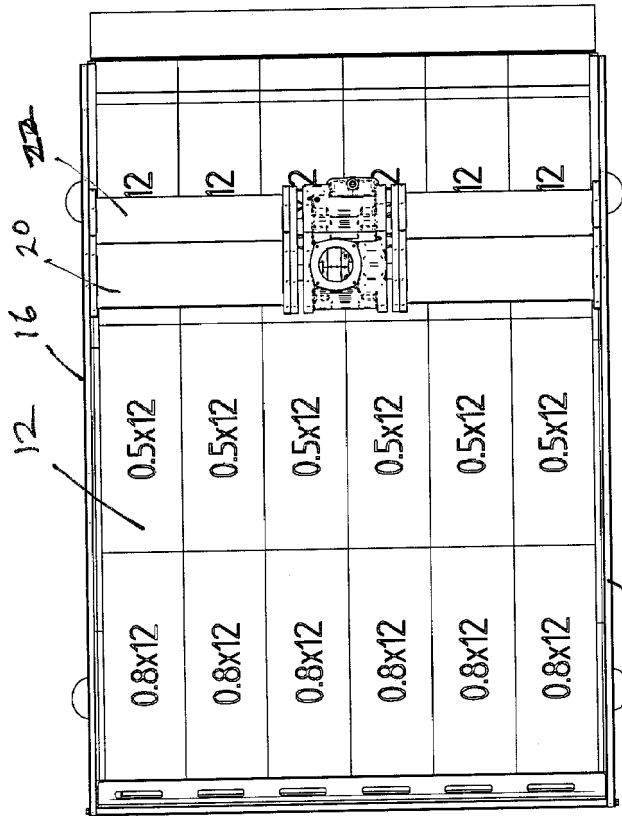
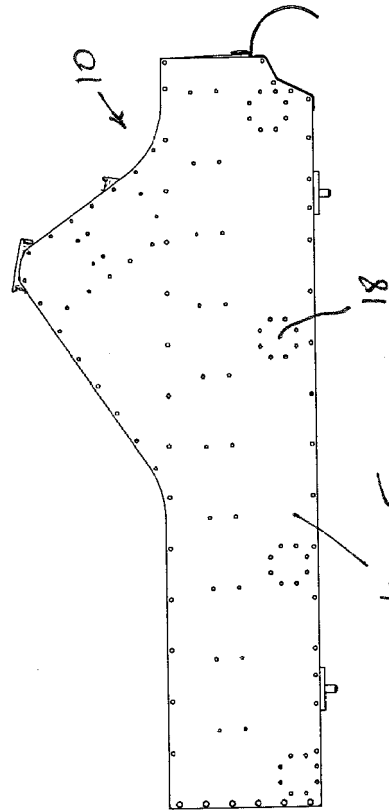


Figure 5

1/2



10  
14 Figure 1



14 Figure 2

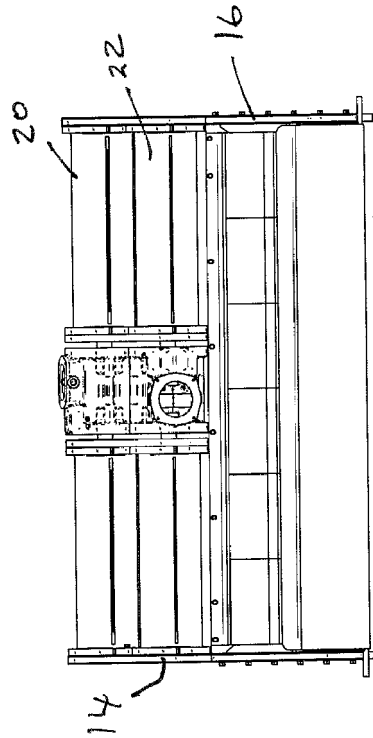


Figure 3

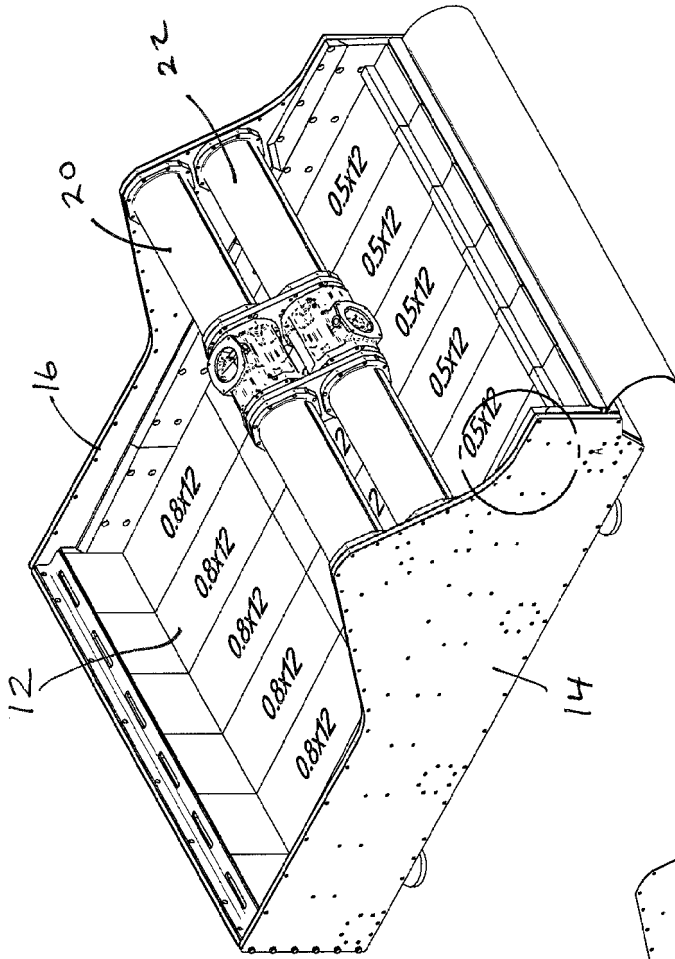


Figure 4

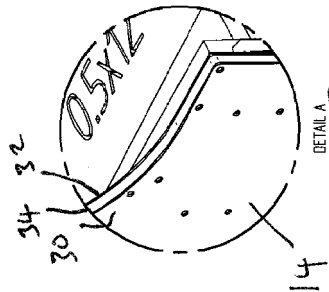


Figure 6

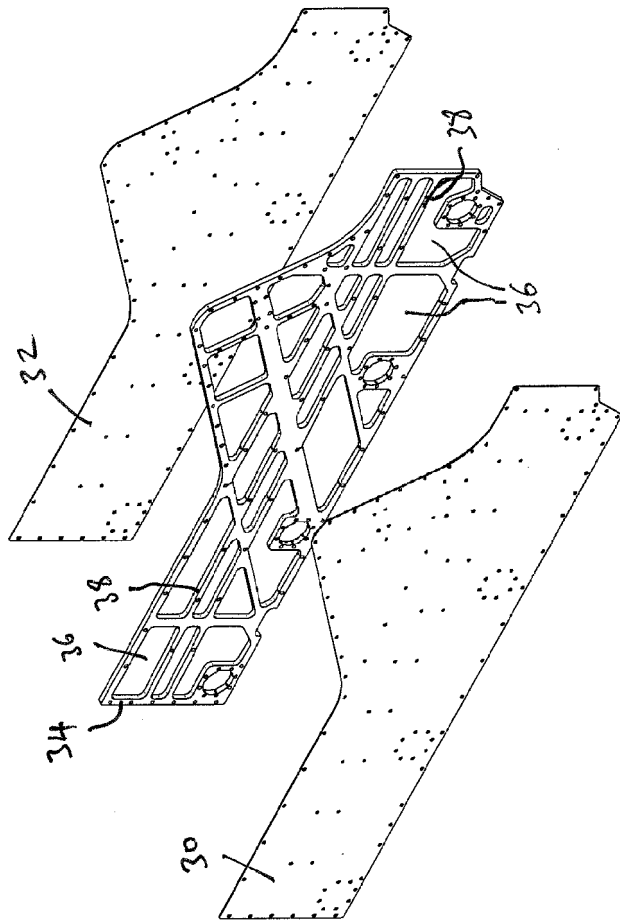


Figure 5

## **Vibrating Screen**

This invention relates to a vibrating screen and in particular to a vibrating screen for separating excess water from particulate material, such as sand, gravel, iron ore,  
5 sludge or other particulate material and/or for grading, classifying or sorting particulate material by size.

Vibrating screens are commonly used to separate excess water from particulate materials, for example in sand quarrying to remove excess water from sand  
10 following grading and/or washing processes, and are used to sort, grade or classify particulate material, such as sand.

A typical vibrating screen comprises a frame, defined by a pair of substantially parallel side walls interconnected by transversely extending bridging members,  
15 upon which is mounted a substantially horizontal polyurethane deck having small openings or slots for water and/undersize particles to pass through. The deck is vibrated at high frequency to shake out excess water and/or undersize material through the openings and to convey the material across the deck to one end of the screen whereby the dry and/or oversize material is discharged over the top of a  
20 dam bar onto a conveyor or into a collection bay or hopper. The frame is mounted on a base via resilient linkages, such as springs, and the frame, and thus the deck, is typically vibrated by means of a pair of counter rotating rotors defining eccentric masses, driven by one or more drive motors, to impart circular or reciprocating vibratory motion to the deck.

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The motors and rotors are typically are mounted on the frame by means of a heavy motor bridge attached to the side walls of the frame to extend over the deck. The motors and rotors are typically arranged side by side on the motor bridge in a plane extending transverse to the deck and are inclined relative to the deck to provide a  
30 reciprocating vibratory motion to the material on the deck to convey the material towards the dam bar. The rotors are typically arranged to rotate in opposite directions in phase with one another to generate vibrations in a plane substantially perpendicular to said inclined plane in which the motors are mounted.

Since the frame is subjected to vibrations, its must be constructed to be strong enough to withstand the dynamic stresses imparted due to vibrations generated by the rotors without undue stress or distortion. This requires the side walls in particular to be formed from a relatively heavy construction, typically comprising a plurality of steel plates and cooperating sections and reinforcing members welded together. However, increasing the strength of the frame, for example by increasing the thickness of the material from which the frame is made, also typically results in a corresponding increase in the weight of the frame, resulting in an increase in the stresses to which the frame is exposed and also increasing the load and stresses on the other components of the apparatus, in particular upon the base upon which the frame is supported. In addition, increasing the mass of the frame increases the vibration forces that must be generated by the rotors to achieve the required motion of the deck. Previous attempts to increase the strength of the frame without substantially increasing its weight have resulted in complex structures that are time consuming and costly to manufacture.

According to a first aspect of the present invention there is provided a vibrating screen comprising a frame upon which is mounted a deck having a plurality of apertures or slots therein, said frame being mounted on a base and being provided with vibration generating means for imparting vibration to said deck, wherein said frame comprises pair of substantially parallel side walls between which the screen is mounted, each side wall comprising a pair of spaced apart side members defining outer faces of the side wall, at least one intermediate member located between said side members, said at least one intermediate member incorporating a plurality of apertures and/or cut-outs therethrough.

The material of said at least one intermediate member surrounding said plurality of apertures and/or cut-outs may define a peripheral border region around the periphery of the intermediate member and a plurality of interconnected elongate webs and/or reinforcing members. Thus the apertures and/or cut-outs formed in the at least one intermediate member can be shaped to define a predetermined pattern of webs and reinforcing members therebetween to add stiffness and strength to the side walls while minimising the weight of the side walls of the frame.

In one embodiment said apertures and/or cut-outs comprise over 50% of the surface area of the at least one intermediate member. Said apertures and/or cut-outs may comprise over 75% of the surface area of the at least one intermediate member.

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Preferably each of said side members of said side walls comprise a planar plate, preferably formed from a sheet material, more preferably sheet steel.

In one embodiment said at least one intermediate member comprises a plate of  
10 sheet material, more preferably sheet metal, such as sheet steel, having apertures and/or cut-outs therethrough to define hollow regions separated by reinforcing webs within the assembled side wall. Preferably said at least one intermediate member is formed from a sheet material having a greater thickness than that of the adjacent side members, such that the side members define outer skins of each side wall  
15 while the at least one intermediate member provides structural strength to the respective side wall.

In one embodiment each side wall comprises a pair of side members and a single intermediate member located between said side members, said intermediate  
20 member having apertures and/or cut-outs therethrough to define hollow regions separated by reinforcing webs and elongate reinforcing members within the assembled side wall.

Preferably said side members and said at least one intermediate member of each  
25 side wall of the frame are clamped together by a plurality of mechanical fasteners extending between said side members. Thus each side wall defines a laminated construction. Preferably said fasteners comprise nut and bolts or similar threaded fasteners.

30 Preferably said side walls of the frame are interconnected by a plurality of bridge members extending therebetween. One or more of said bridge members may comprise an elongate beam or tubular member. Preferably said bridge members are connected to the side walls via mechanical fasteners, such as nuts and bolts or similar threaded fasteners.

By providing a bolted construction heat related problems associated with welded structures, such as the introduction of stress hot spots, are avoided and assembly and manufacture of the apparatus is greatly facilitated.

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Preferably said vibration generating means is mounted on or within a respective bridge member extending between said side walls of the frame. Said bridge member may be located above or beneath said deck.

- 10 According to a further aspect of the present invention there is provided a panel for an assembly comprising a pair of spaced apart side members defining outer faces of the side wall, at least one intermediate member located between said side members, said at least one intermediate member incorporating a plurality of apertures and/or cut-outs therethrough, wherein said apertures and/or cut-outs  
15 formed in the at least one intermediate member are shaped to define a predetermined pattern of webs and reinforcing members therebetween to add stiffness and strength to the panel while minimising the weight thereof.

An embodiment of the present invention will now be described, by way of example  
20 only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a dewatering screen in accordance with an embodiment of the present invention;

25 Figure 2 is a side view of the dewatering screen of Figure 1;

A dewatering screen in accordance with an embodiment of the present invention is illustrated in the drawings. The dewatering screen 10 comprises a modular polyurethane deck 12 having a plurality of small slots formed therein (of  
30 approximately 0.5 to 0.8mm width). The deck 12 is mounted on a support frame comprises spaced apart side walls 14,16 joined by transversely extending bridging members 18. The support frame may be mounted on a base frame (not shown) via resilient mountings to allow the support frame to move with respect to the base

frame. The support frame may be suspended from the base frame via suitable resilient mounts, such as springs.

A vibration generating means is mounted between the side plates 14,16 of the support frame, extending transverse to the deck 12 of the dewatering screen 10. The vibration generating means comprises a pair of motor driven eccentrically loaded rotors mounted in or on support pipes 20,22 mounted between the side plates 14,16 for rotation about substantially parallel rotational axes extending transverse to the deck 12. While the rotors are shown in drawings as being mounted above the deck 12, it is envisaged, that the rotors may be mounted beneath the deck 12.

Rotation of the rotors causes a rotating out of balance force to be applied to the support frame, imparting a vibratory motion to the deck 12 and to the material carried thereon. Such vibratory motion causes the material placed on the deck to be agitated, preventing blocking of the openings in the deck and causing material on the deck 12 to be conveyed towards one end of the screen 10.

The ends of each tubular support pipe 20,22 are bolted to the adjacent side plate. Thus the tubular support pipes 20,22 of the rotors form structural components of the frame of the dewatering screen, linking the side walls 14,16 of the frame.

In the embodiment illustrated in Figure 5, each side wall 14,16 of the frame is made up on a laminated assembly of approximately 4mm thick outer steel plates 30,32 defining outer skins of the respective side wall and an approximately 20mm thick intermediate steel plate 34 mounted therebetween. The outer skins 30,32 and intermediate plate 34 being clamped and connected together by nuts and bolts passing through the assembled plates. The intermediate plate 34 has a plurality of cut-outs 36 formed therein defining hollow regions surrounded by elongate reinforcing webs and members 38. The shape and positions of the cut-outs 36 can be selected to provide particular structural properties, such that the stiffness and strength of the side walls 14,16 can be optimised while minimising the weight of the side walls 14,16 of the frame.

The side walls 14,16 are interconnected by elongate bridging members 18 in the form of tubular beams. Again the ends of the beams are bolted to the side walls so that the frame can be assembled without welding, making the frame cheaper and easier to fabricate while avoiding the heat problems associated with welding (such as distortion and embrittlement of the steel components).

While the present invention has been described in the form of a dewatering screen, the invention could be applied to any type of vibrating screen, for example a vibratory screen for screening, grading or classifying particulate materials, such as sand, gravel, iron ore or any other particulate material. The dimensions of the side walls 14,16, in particular the thickness of the outer skins and intermediate plate and the pattern and arrangement of the cut-outs and apertures in the intermediate plate, may be adjusted to suit the application for which the vibratory screen is to be used.

The invention is not limited to the embodiment(s) described herein but can be amended or modified without departing from the scope of the present invention.

## Claims

1. A vibrating screen comprising a frame upon which is mounted a deck having a plurality of apertures or slots therein, said frame being mounted on a base and  
5 being provided with vibration generating means for imparting vibration to said deck, wherein said frame comprises pair of substantially parallel side walls between which the screen is mounted, each side wall comprising a pair of spaced apart side members defining outer faces of the side wall, at least one intermediate member being located between said side members, said at least one intermediate member  
10 incorporating a plurality of apertures and/or cut-outs therethrough.
2. A vibrating screen as claimed in claim 1, wherein the material of said at least one intermediate member surrounding said plurality of apertures and/or cut-outs defines a peripheral border region and a plurality of interconnected elongate webs and/or  
15 reinforcing members.
3. A vibrating screen as claimed in claim 2, wherein said apertures and/or cut-outs comprise over 50% of the surface area of the at least one intermediate member.
- 20 4. A vibrating screen as claimed in claim 2, wherein said apertures and/or cut-outs comprise over 75% of the surface area of the at least one intermediate member.
5. A vibrating screen as claimed in any preceding claim, wherein each of said side members of said side walls comprise a planar plate, preferably formed from a sheet  
25 material, more preferably sheet steel.
6. A vibrating screen as claimed in any preceding claim, wherein said at least one intermediate member comprises a plate of sheet material having apertures and/or cut-outs therethrough to define hollow regions separated by reinforcing webs within  
30 the assembled side wall.
7. A vibrating screen as claimed in claim 6, wherein said at least one intermediate member is formed from sheet metal, preferably sheet steel.

8. A vibrating screen as claimed in any preceding claim, wherein said at least one intermediate member is formed from a sheet material having a greater thickness than that of the adjacent side members, such that the side members define outer skins of each side wall while the at least one intermediate member provides structural strength.

9. A vibrating screen as claimed in any preceding claim, wherein each side wall comprises a pair of side members and a single intermediate member located between said side members, said intermediate member having apertures and/or cut-outs therethrough to define hollow regions separated by reinforcing webs and elongate reinforcing members within the assembled side wall.

10. A vibrating screen as claimed in any preceding claim, wherein said side members and said at least one intermediate member of each side wall of the frame are clamped together by a plurality of mechanical fasteners extending between said side members.

11. A vibrating screen as claimed in claim 10, wherein said fasteners comprise nut and bolts or similar threaded fasteners.

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12. A vibrating screen as claimed in any preceding claim, wherein said side walls of the frame are interconnected by a plurality of bridge members extending therebetween.

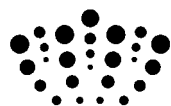
13. A vibrating screen as claimed in claim 12, wherein one or more of said bridge members comprise an elongate beam or tubular member.

14. A vibrating screen as claimed in claim 12 or claim 13, wherein said bridge members are connected to the side walls via mechanical fasteners, such as nuts and bolts or similar threaded fasteners.

15. A vibrating screen as claimed in any preceding claim, wherein said vibration generating means is mounted on a respective bridge member extending between said side walls of the frame.

16. A vibrating screen substantially as described herein with reference to the accompanying drawings.

- 5 17. A panel comprising a pair of spaced apart side members defining outer faces of the side wall, at least one intermediate member located between said side members, said at least one intermediate member incorporating a plurality of apertures and/or cut-outs therethrough, wherein said apertures and/or cut-outs formed in the at least one intermediate member are shaped to define a  
10 predetermined pattern of webs and reinforcing members therebetween to add stiffness and strength to the panel while minimising the weight thereof.



**Application No:** GB1215562.8

**Examiner:** Mr Michael Young

**Claims searched:** 1-17

**Date of search:** 19 December 2012

## Patents Act 1977: Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	JP 2000189896 A (NISSHIN..) Discloses "lamine sieve frame" structure.
A	-	GB 1469493 A (NISSHIN..) Discloses "box frame" structure.
A	-	JP 2001300426 A (NISSHIN..) Discloses "lamine frame" structure.

### Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>X</sup> :

Worldwide search of patent documents classified in the following areas of the IPC

B03B; B07B

The following online and other databases have been used in the preparation of this search report

WPI EPODOC

### International Classification:

Subclass	Subgroup	Valid From
B03B	0004/02	01/01/2006
B03B	0004/00	01/01/2006
B07B	0001/28	01/01/2006
B07B	0001/40	01/01/2006