(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 719 560 A2

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.11.2006 Bulletin 2006/45

(51) Int Cl.:
B07B 1/46 *(2006.01)*

(21) Application number: **06006669.3**

(22) Date of filing: **30.03.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **04.05.2005 IT MI20050810**

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(54) **High-performance vibration screen**

(57) A vibration screen comprises a case-shaped body (11) with parallel side walls (16) between which perforated screening surfaces (17) are disposed and which is suspended by spring means (12) over a base (13) and is provided with vibrating devices (14). The side walls (16) are each at least partly made up of two plate sheets (19, 20) closely spaced and parallel, so that each of them forms one of the two faces of the wall and delimits a hollow space (21) therebetween. The sheets are interconnected with each other by means of interconnecting elements (22, 23) disposed in the hollow space.

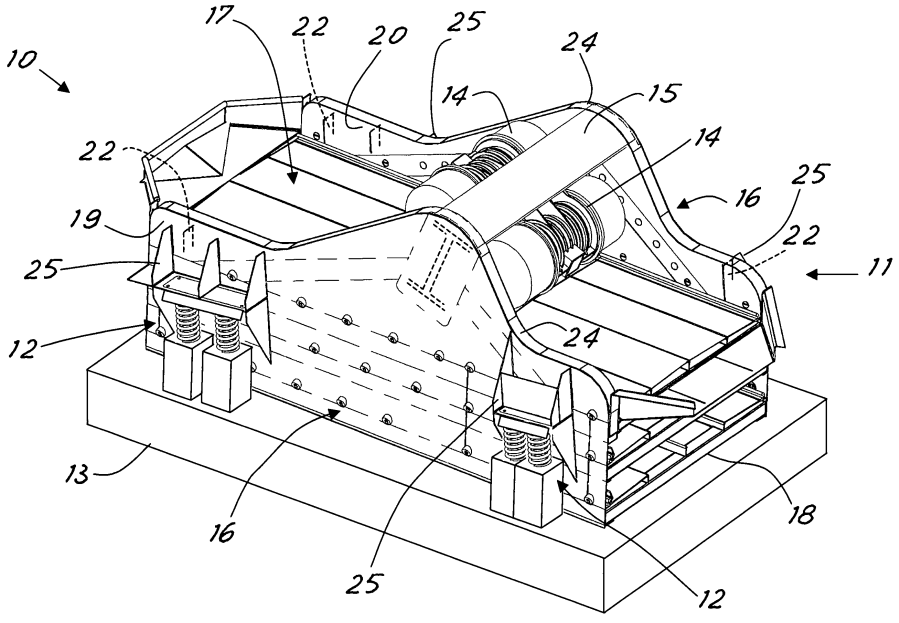

Fig.1

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Description

[0001] The present invention relates to a vibration screen of the type comprising a case-shaped structure or body provided with suitable screening surfaces and supported by a base through springs, to be set in vibration by a suitable vibrating device.

[0002] Screening is an operation done for the most different purposes. By way of example, the following purposes are mentioned: separating the biggest fragments (or refuse) contained in a mixture, either to eliminate them or to reduce them by crushing or grinding; separating the smallest (fine) fragments both to agglomerate them in the granulation workshops and to eliminate them as waste or recycle them for other uses; classifying the crushed goods according to their commercial sizes (materials for building roads, abrasives, coals, etc.); classifying the goods for operations of mechanical or physico-chemical treatment that shall take place with materials of homogeneous sizes (ore concentration, coal washing, selection of cube-shaped materials, etc.); material drying, etc.

[0003] In the vibration screens, transport of the material on the screening surface (grids, perforated plates, wire nets or meshes, for example) is obtained by impulse, while vibration of the mass gives rise to a stratification bringing the greatest sizes to the top surface and the smallest (the finest) ones to the layer base, which is very useful for screening.

[0004] The vibration-generating device can be a merely mechanical, electromechanical (motor and eccentric masses) or also electromagnetic device.

[0005] To make a screening machine capable of putting into practice the processes for selection or treatment of the materials at its best, it is necessary to carry out a dedicated planning of the machine itself. Planning of a vibrating machine is complicated because both criteria of static resistance and planning criteria for fatigue strength are required to be applied; in addition, determination of the loads acting on the machines appears to be a very hard task due to the difficulty of fully understanding the operating dynamics of the vibrating machines.

[0006] Since in the vibration screen of the above mentioned type the whole case-shaped body is submitted to vibrations, this body must be made strong enough to withstand the dynamic stresses due to vibration. On the other hand, the structure in known machines cannot be strengthened beyond a certain degree because the stresses that are harmful to the machine become more numerous and stronger as the weight of the structure set in vibration increases. In addition too big a mass brings to the necessity for vibrating devices having an unacceptable power and bulkiness.

[0007] Usually, the combination of the operating parameters makes these known machines reach accelerations that are of 4-5 G at most. However, the availability of vibrating screens with much greater accelerations would be of the greatest interest because the greater the acceleration is, the greater the screening yield. In addition, greater accelerations would also enable an optimal screening of big sizes to be obtained as well as an efficient unclogging of the screening surfaces. However, for the above reasons, a person skilled in the art deems it practically impossible to obtain such greater accelerations to acceptable costs.

[0008] It is a general aim of the present invention to obviate the above mentioned drawbacks by providing a vibration screening machine capable of withstanding high accelerations, even in the order of 18-20 G, with relatively low costs and reduced complexity.

[0009] In view of the above aim, in accordance with the invention, manufacture of a vibration screen has been conceived which comprises a case-shaped body with parallel side walls between which perforated screening surfaces are disposed and which is suspended over a base through spring means and is provided with vibrating devices, characterized in that the side walls are each made up at least partly of two plate sheets closely spaced and parallel so that each of them forms one of the two faces of the wall and both delimit a hollow space therebetween, the sheets being interconnected with each other by means of interconnecting elements disposed in the hollow space.

[0010] For better explaining the innovative principles of the present invention and the advantages it offers over the known art, a possible embodiment applying said principles will be described hereinafter, by way of example and with the aid of the accompanying drawings.

[0011] In the drawings:

- Fig. 1 is a diagrammatic perspective view of a screening machine with a vibration screen made in accordance with the invention;
- Fig. 2 is a diagrammatic elevation side view of a side wall of the machine;
- Fig. 3 is a partial sectioned view of the side wall seen in Fig. 2.

[0012] With reference to the drawings, shown in Fig. 1 is a screening machine generally identified with 10, which is made in accordance with the invention.

[0013] This machine comprises an upper portion or case-shaped body 11, supported by a base 13 through spring elements 12 (such as helical springs). The upper portion is set in vibration through a motor vibrating device or assembly 14 known in the art (of the rotating-mass type, for example) that is supported on top by an H-shaped beam 15 disposed transversely between the side walls 16 of the body. Present between the side walls are screening surfaces 17 (possibly made of several layers) consisting of nets or suitably perforated surfaces, for example. The case-shaped body also has a bottom 18, of a net-like type for example. The springs for elastic support are connected to brackets 25 symmetrically projecting from the side walls. Advantageously, the side walls have an intermediate "bulge" between the ends, close to which

the beam is connected.

[0014] As viewed from Fig. 3 too, each side wall 16 is at least partly made up, over an upper portion thereof, of two plate sheets 19, 20 (consisting of sheet steel, for example) that are parallel to each other and closely spaced so as to form the two faces of the wall and to delimit a narrow hollow space 21 therebetween. The sheets of each wall are interconnected with each other at several different points by interconnecting elements 22, 23 disposed in the hollow space. These elements can advantageously be plate baffles 22 and welded bolts or pins 23, as clearly shown in Fig. 2 as well. In addition, at least on the upper part, the hollow space is advantageously closed along the plate edges by a metal strap 24 suitably shaped and welded.

[0015] As shown in Fig. 2, said baffles can be disposed in right-angled net-like structures at least close to end regions of the wall where the elastic support brackets are placed.

[0016] It was found particularly advantageous for the two plate sheets forming the wall to have a thickness included between 2 and 8 mm and, more particularly, a different thickness values from each other. More specifically, a plate can advantageously have a thickness of approximately 1.5-2.5 times (preferably about twice) the other plate.

[0017] In the preferred embodiment, the thickness of the outer plate is greater than the thickness of the inner one and the beam 15 has its ends connected to the outer plate of each wall. In this preferred embodiment it was found advantageous for the inner plate to have a thickness of approximately 3 mm, the outer plate having a thickness of about 6 mm.

[0018] A thickness of approximately 5-10 times the plate thickness was found advantageous for the hollow space. In the preferred embodiment said thickness is included between 2 and 10 cm and, in particular, it is of about 8 cm.

[0019] Still advantageously, it is desirable for the whole side wall over the plane of the upper screening surface 17 to be made with two sheets, while under the plane 17 the inner sheet stops and the outer sheet alone goes on until the body bottom.

[0020] Surprisingly, with the relatively simple structure described above screens of good sizes (3x2 meters, for example) can be obtained which are able to work with much higher accelerations than those of the already known traditional screens, which accelerations were considered as unreachable by those skilled in the art. For instance, with the described structure it is possible to easily reach accelerations of 18-29 G or even higher.

[0021] Obviously, the above description of an embodiment applying the innovative principles of the present invention is given by way of non-limiting example and therefore must not be considered as a limitation of the scope of the patent rights herein claimed. For example, several superposed screening surfaces can be made for the different sizes, as known to a person skilled in the art. The screening planes can be inclined towards an end provided with a discharging chute to evacuate the material rather than through said planes. Proportions and sizes can vary depending on specific requirements.

[0022] An inert filling material or an antiresonance filling material can be advantageously inserted in the hollow space between the plates, which material can be rubber, polyurethane foam or the like. The filling material also aims at dampening detrimental vibrations and preventing or reducing undesirable sounds.

Claims

1. A vibration screen comprising a case-shaped body (11) with parallel side walls (16) between which perforated screening surfaces (17) are disposed and which is suspended over a base (13) through spring means (12) and is provided with vibrating devices (14), **characterized in that** the side walls (16) are each made up at least partly of two plate sheets (19, 20) closely spaced and parallel to each other so that each of them forms one of the two faces of the wall and both delimit a hollow space (21) therebetween, the sheets being interconnected with each other by means of interconnecting elements (22, 23) disposed in the hollow space.

2. A vibration screen as claimed in claim 1, **characterized in that** the two sheets (19, 20) of a wall have different thickness values from each other.

3. A vibration screen as claimed in claim 2, **characterized in that** one sheet has a thickness included between 1.5 and 2.5 times the thickness of the other sheet and, in particular, about twice the thickness of the other sheet.

4. A vibration screen as claimed in claim 2, **characterized in that** the sheet of greater thickness is the outer one.

5. A vibration screen as claimed in claim 4, **characterized in that** the outer sheet has a thickness of approximately 6 mm and the other sheet of approximately 3 mm.

6. A vibration screen as claimed in claim 1, **characterized in that** the sheets are 2 and 8 mm thick.

7. A vibration screen as claimed in claim 1, **characterized in that** a connecting beam (15) supporting the vibrating devices (14) is disposed on the upper part between the two walls.

8. A vibration screen as claimed in claim 7, **characterized in that** the side walls have an upper intermediate bulge between the ends, close to which the

beam is disposed.

9. A vibration screen as claimed in claim 6, **characterized in that** the ends of the beam (15) are connected to the outer sheet of the pair.

10. A vibration screen as claimed in claim 1, **characterized in that** the interconnecting elements comprise baffles (22) disposed transversely of the hollow space.

11. A vibration screen as claimed in claim 1, **characterized in that** the interconnecting elements comprise pins or bolts (23) transverse to the hollow space.

12. A vibration screen as claimed in claim 9, **characterized in that** at least some baffles are disposed in right-angled net-like structures at least close to the end regions of the side walls (16) where brackets (25) for attachment of the spring support means (12) of the case-shaped body to the base are placed.

13. A vibration screen as claimed in claim 1, **characterized in that** the spring support means comprises helical springs (25).

14. A vibration screen as claimed in claim 1, **characterized in that** the hollow space (21) has a thickness approximately of 5-10 times the plate thickness, in particular included between 2 and 10 cm and advantageously approximately of 8 cm.

15. A vibration screen as claimed in claim 1, **characterized in that** the whole side wall over the plane of the upper screening surface is made up of two sheets (19, 20) while under such a plane the inner sheet (20) is broken and the outer sheet (19) alone goes on until the body bottom (18).

16. A vibration screen as claimed in claim 1, **characterized in that** at least on the upper part the hollow space (21) is closed along the plate edges by a metal strap (24).

17. A vibration screen as claimed in claim 1, **characterized in that** an inert filling material is present in the hollow space between the plates.

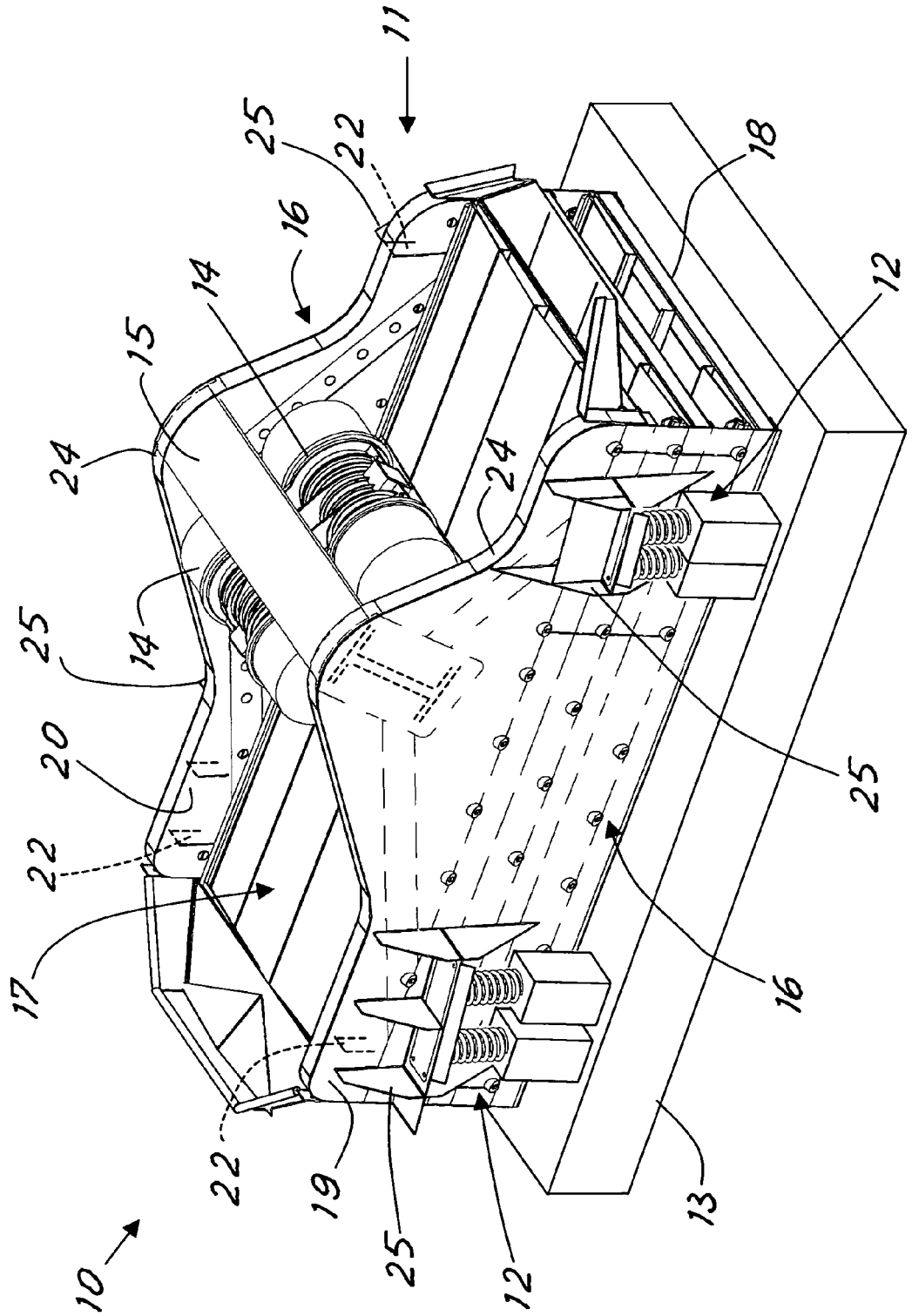

Fig. 1

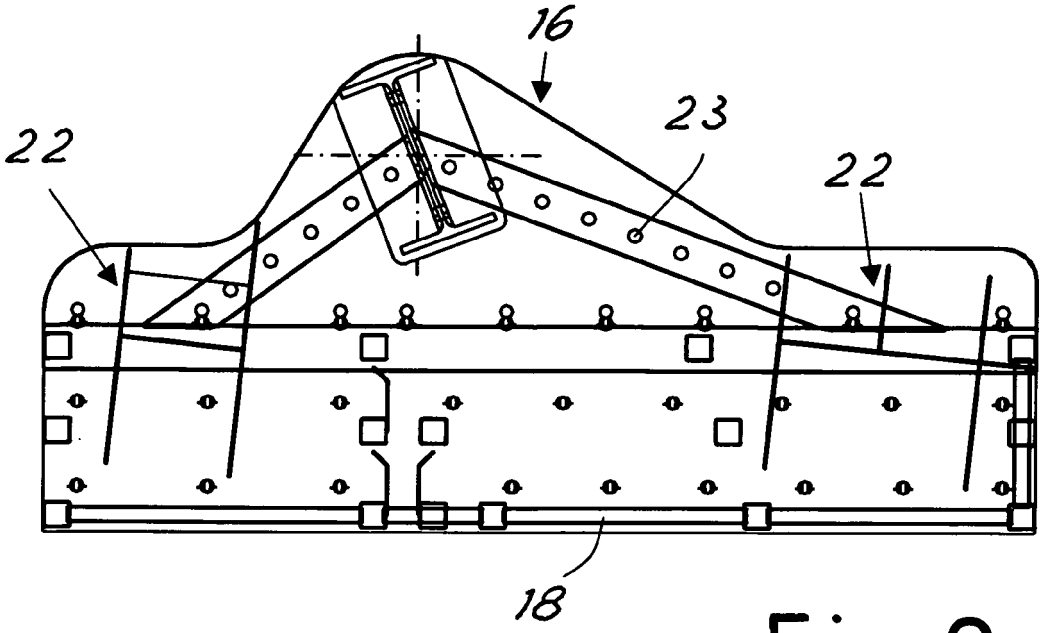

Fig.2

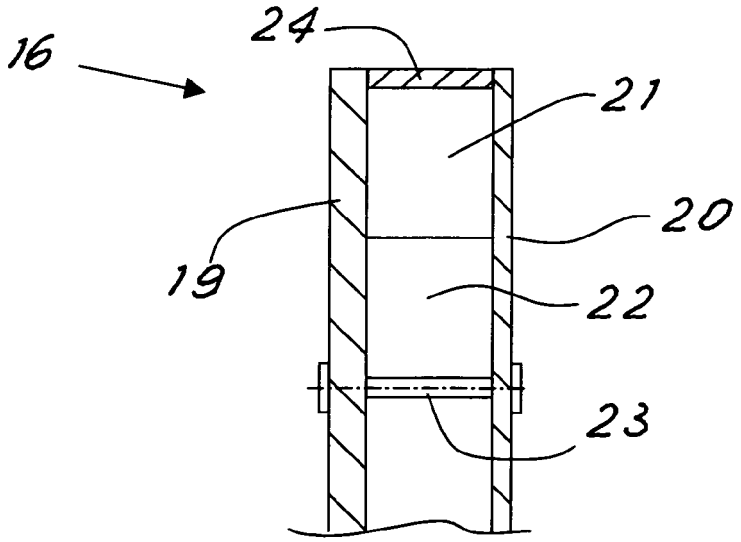

Fig.3