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(54) Vibrating screen

(57) The invention relates to a vibrating screen comprising a screen frame (2) and a screen mesh (3). The vibrating screen comprises at least two screen meshes (3) mounted angularly relative to each other, turning means (6) for turning the screen meshes by turns into the screening position, and tightening means for tightening the screen mesh being in the screening position.

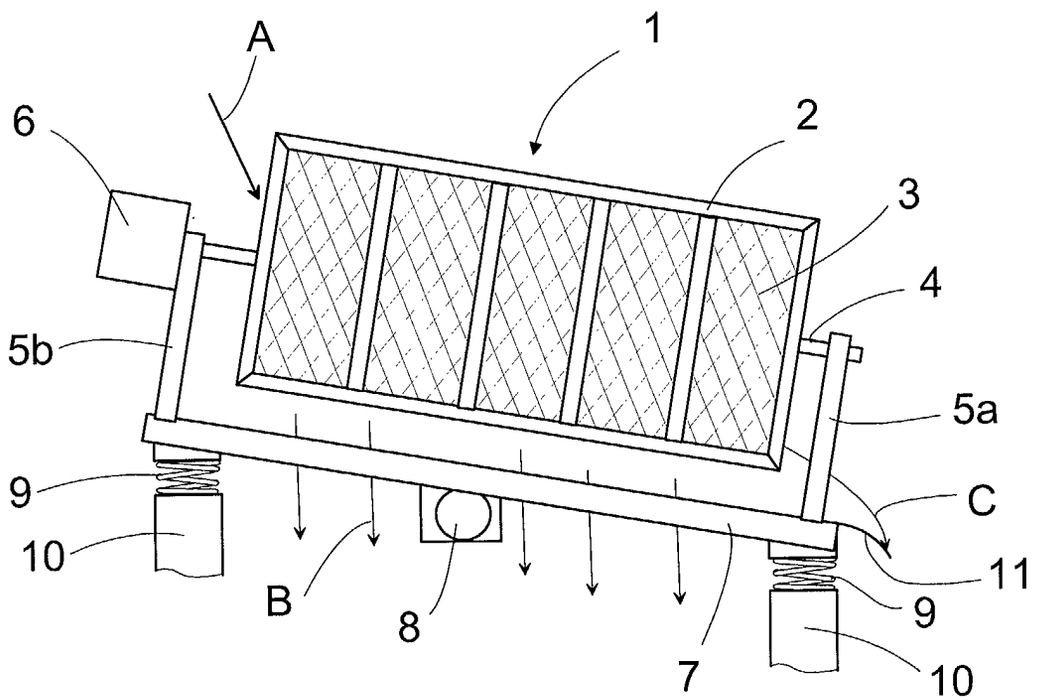

FIG. 1

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Description

[0001] The invention relates to a vibrating screen comprising a screen frame intended to be reciprocatingly movable and a screen mesh attached thereto, onto which the material to be screened is supplied, whereby the material passing the screen mesh falls below it and the material not passing it flows along the inclined screen mesh and discharges out of its lower end.

[0002] Different particle-like or granular materials, such as minerals, aggregates, powdery materials, grain, etc. are screened with vibrating screens. Vibrating screens comprise a substantially planar screen mesh, which is in known solutions tightly attached to the frame of the vibrating screen and mounted slightly inclined relative to the base. The material to be screened is supplied to the higher end of the screen mesh, and due to the vibration the finer material part falls through the screen mesh below it to be recovered, and correspondingly, coarser material not passing the holes of the screen mesh flows downwards along the screen mesh, discharging out of its lower end. The problem with vibrating screens is that part of such material that is not able to pass through the openings of the screen mesh is still able to fall so far into the opening that it does not move further downwards along the screen mesh but stays in the opening, clogging it. Clogging of the screen mesh, in turn, causes interruptions in operation, because the screen mesh must be cleaned in some way before the screening can be continued. Particularly when screening small materials having an elongated form, the cleaning of the screen mesh is difficult and may, in the worst case, even require that the screen mesh be detached or that the frame connected to it be turned upside down before the material stuck to the screen mesh can discharge.

[0003] An object of the present invention is to provide a vibrating screen with which the interruptions and maintenance measures due to clogging of the screen can be essentially reduced or even completely eliminated.

[0004] The vibrating screen according to the invention is characterized in that the vibrating screen comprising a screen frame intended to be reciprocatingly movable and a screen mesh attached thereto onto which the material to be screened is supplied, whereby the material passing the screen mesh falls below it and the material not passing it flows along the inclined screen mesh and discharges out of its lower end.

[0005] The essential idea of the invention is that two or more, preferably four, screen meshes are used in the vibrating screen, the screen meshes being mounted angularly relative to each other, preferably in such a way that they form a rectangular channel. Further, the vibrating screen according to the invention is characterized in that the screen meshes are attached to the frame of the vibrating screen only by two opposite edges in such a way that the sides between these edges can move relative to the screen frame. Further, the vibrating screen according to the invention is characterized in that each screen mesh is, in turn, turnable into the screening position, and correspondingly out of the position. Still further, the vibrating screen according to the invention is characterized in that it comprises separate tightening means connected to the screen meshes in such a way that the screen mesh turned into the screening position is tight in the screening position, enabling screening, but when being turned out of the screening position, it can be let loose, whereby the material that has stayed in the meshes, i.e. openings, of the screen mesh can easily discharge from the screen mesh, aided by the vibrating screen. The detachment of the material is particularly efficient when the screen mesh has turned completely upside down relative to the screening position, so that the material stuck to the holes can directly fall downwards onto the screen mesh below it and thus discharge out of the vibrating screen.

[0006] The invention is described in more detail in the attached drawings, in which:

[0007] Figure 1 shows a schematic side view of a vibrating screen according to the invention;

[0008] Figure 2 shows a schematic view of a vibrating screen according to the invention, sectioned in the cross-direction thereof;

[0009] Figure 3 shows a schematic longitudinal section view of a vibrating screen according to the invention.

[0010] A vibrating screen schematically shown in Figure 1, comprising a screen frame 2, to which screen meshes 3 are attached. The screen mesh 2 is connected to an axle 4 in such a way that it is rotational about the axle. The axle 4, in turn, is rotationally fitted with a bearing against supports 5a and 5b. Further, a turning motor 6 is connected to the axle 4 and the support 5b to turn the screen frame 2 and the screen meshes 3 on it about the axle 4. The supports 5a and 5b, in turn, are connected to a support frame 7, to which, in turn, a vibrating motor 8 is connected. Further, the support frame 7 is connected by its ends or close to its ends to springs 9 against support parts 10 of a separate base not illustrated, in such a way that the screen frame and the screen meshes are inclined relative to the horizontal plane, i.e. the base. There must be at least two springs 9, but usually there are four of them, so that the vibrating screen stays firmly in the right position and is able to move during the screening supported by the springs. The material to be screened is supplied onto the lowest screen mesh not illustrated in the figure, in the way indicated by arrow A, whereby the material passing the screen mesh falls through the opening in the support frame 7, in the way indicated by arrows B, to be recovered for instance to a suitable platform or other base, and the material not passing the screen mesh discharges in the way indicated by arrow C out of the other end of the screen frame 2 through a possibly used guiding plate 11 to a place different from the one where the material which has passed through the screen mesh discharges.

[0011] The vibrating motor 8 is an eccentric vibrator, which, when rotating, causes the whole vibrating screen supported by the springs 9 to vibrate reciprocatingly. Due to the effect of this reciprocating motion and gravity, the material supplied to the screen mesh flows gradually along the screen mesh towards its lower end, whereby the material passing the screen mesh falls on its way through the screen mesh, while the material not passing the screen mesh travels along the screen mesh until it falls out of the lower end of the vibrating screen when the screen mesh ends. As such, vibrating screen operation and vibrating motor operation like this are generally fully known and obvious to a person skilled in the art, so that there is no reason to explain them in more detail.

[0012] Figure 2 shows a schematic cross-section of an embodiment of the vibrating screen according to the invention in the longitudinal direction thereof. To clarify the structure, the screen mesh parts and screen frame parts on the sides have been omitted from the figure.

[0013] As seen from the figure, the screen frame 2 comprises cross-direction supports positioned on the opposite side of the screen mesh 3. These supports are positioned, relative to the screen mesh 3, on the other side than to which the material to be screened is supplied. In this way, the screen mesh gets support from below, as there is material to be screened upon it, pressing it downwards. In the way shown in the figure, the screen mesh 3 is attached to the screen frame 2 by its right edge, and correspondingly, to a tightening beam 12 by its left edge. The tightening beam 12, in turn, can move in the longitudinal direction of the screen frame 2, in other words in the horizontal direction of the figure in such a way that the screen mesh can be tightened with it. Correspondingly, in the figure the screen mesh is not attached to anything by its upper or lower edges, but can move freely relative to the screen frame 2.

[0014] The tightening beam 12, in turn, is attached to an anchor tie beam 14 with pre-tightening bolts 13. The anchor tie beam 14, in turn, is connected to a tightening cylinder 15, which is most preferably a hydraulic cylinder due to the tightening force being so great. Nuts 16 in the pre-tightening bolts 13 allow the pre-tightening of the screen mesh to be adjusted as desired, the actual tightening during the screening being performed with the tightening cylinder 15.

[0015] Further, the figure shows a support plate 17, by means of which the tightening cylinder 15 is connected to the screen frame 2.

[0016] Figure 3, in turn, shows a cross-section of the screen frame of the vibrating cylinder and of the screen meshes mounted on it. The screen frame 2 has in this embodiment a rectangular section and there are screen meshes 3 mounted on each side of it. Further, the figure shows a turning axle 4 and a support grid 18 between the screen frame and the turning axle 4. Further, the figure shows schematically an embodiment for supporting the edges of the screen meshes 3 against the screen frame. This has been done by using, for instance, Y-shaped support profiles 19 shown in the figure, which profiles extend in the direction of the loose sides of the screen meshes 3 over the length of their sides. Thus, between the support profiles 19 and the screen frame 2, there are grooves 20, where the edges of the screen meshes remain protected in such a way that the material to be screened is not allowed to flow between the edges of the screen meshes and thereby past the screen mesh. This can be implemented in a plurality of ways, but the essential thing is that the screen frame comprises grooves for the loose edges of the screen meshes, in which grooves the edges of the screen meshes 3 can be positioned in such a way that the material to be screened is prevented from travelling past the edges of the screen meshes.

[0017] When a vibrating screen according to the invention is used, the lowest screen mesh 3 must be tight in order to allow screening. This is done by tightening it by means of the tightening cylinder 15 shown in Figure 2. At the same time, the rest of the screen meshes can be as loose as is possible, taking the normal pre-tightening into account, whereby the material possibly stuck to their openings can fall more easily out of them, and in this way the screen meshes 3 remain clean. When screening has been performed for a predetermined time, the screen mesh is turned away by turning the screen frame 90°, whereby correspondingly another screen mesh 3, having remained on the side, is turned into the screening position. In order not to interrupt or disturb the screening in any way it is preferable to tighten the screen mesh to be turned into the screening position tight as early as before turning it into the screening position, so that the screening can be continued also during the turning motion. The screening mesh previously in the screening position is released from tightening by means of the tightening cylinder 15, whereby the material stuck to it can fall out. It is particularly preferable for the vibrating screen according to the invention that rather a short time of screening can be performed with one screen mesh at a time, whereby the material particles having stopped in the holes have no time to be stuck to the holes but remain loose and thus easily detach from the holes of the screen mesh when the screen mesh is turned upright and, correspondingly, upside down.

[0018] Most preferably, this rotational motion is implemented in such a way that the screen frame 2 and the screen meshes 3 are turned by means of the turning motor 6 with steps of 90°, in total at most 360°, whereby it is possible to use a fixed pressure medium hose system for the use of the tightening cylinders 15 without a need for separate sealed lead-through structures of pressure medium channels. Correspondingly, when this has been done, the screen frame and the screen meshes are turned the same amount by means of the turning motor 6 in the opposite direction, again with steps of 90°, whereby the vibrating screen still operates by means of reciprocating turning motions.

[0019] Naturally, the vibrating screen also comprises a separate control apparatus not shown, having a control member for controlling the turning motor 6 into the next screening position after a predetermined time, according to what has been described above. Correspondingly, the control apparatus preferably comprises control means for controlling the tightening cylinders of the screen meshes in such a way that each screen mesh is, as required, tightened into the screening tightness and correspondingly released from it when it is not in the screening position.

[0020] According to a preferred embodiment of the invention, shown in Figures 1 to 3, the screen frame has a substantially rectangular cross-section, and four screen meshes that form a substantially rectangular channel inside them. In practice, it would naturally be possible to use a structure including only two or three screen meshes, whereby the manufacturing costs would naturally be lower but the number of screen meshes would correspondingly be smaller. In the same way, it is naturally possible to use a structure with five or six screen meshes, for instance.

[0021] It is obvious to a person skilled in the art that with the advance of technology the basic idea of the invention can be implemented in a plurality of ways. The invention and its embodiments are thus not confined to the examples described above but can vary within the scope of the claims.

Claims

1. A vibrating screen comprising a screen frame intended to be reciprocatingly movable and a screen mesh attached thereto, onto which the material to be screened is supplied, whereby the material passing the screen mesh falls below it and the material not passing it flows along the inclined screen mesh and discharges out of its lower end, **characterized in that** the vibrating screen comprises at least two screen meshes mounted angularly relative to each other, turning means for turning, in turn, each screen mesh into the screening position and out of it, that the screen meshes are attached to the screen frame only by two opposite edges, and that the vibrating screen comprises tightening means for tightening each screen mesh tight between said two opposite edges when the screen mesh is in the screening position.

2. A method according to claim 1, **characterized in that** the screen frame comprises grooves on two opposite sides of each screen mesh, where the loose edges of the screen mesh can move in the longitudinal direction of the grooves, and that the frame comprises supports supporting the screen mesh on that side of the screen mesh that is positioned downwards when the screen mesh is in the screening position.

3. A vibrating screen according to claim 1 or 2, **characterized in that** the screen mesh in the screening position is in the inclined position relative to the base in such a way that the material to be screened is supplied to the vicinity of one end of the screen mesh, and the material not passing the screen mesh flows due to the vibration and gravity to the other end of the screen mesh, discharging out of that end.

4. A vibrating screen according to any one of claims 1 to 3, **characterized in that** it comprises four screen meshes, that the screen meshes, attached to the screen frame, form a channel having a substantially rectangular cross-section.

5. A vibrating channel according to any one of claims 1 to 4, **characterized in that** the turning means for turning the screen meshes by turns into the screening position and out of it comprise a turning motor, which is arranged to turn the screen frame reciprocatingly substantially the whole turn, each time approximately 90° at a time.

6. A vibrating screen according to claim 5, **characterized in that** the turning means comprise a control member, which connects the turning motor to turn the screen frame and screen meshes from one position into another after a predetermined time.

7. A vibrating screen according to any one of preceding claims 1 to 6, **characterized in that** the tightening means comprise, per each screen mesh, at least one pressure medium cylinder, which is connected to one edge of the screen mesh in question, and correspondingly to the screen frame to tighten the screen mesh.

8. A vibrating screen according to any one of the preceding claims, **characterized in that** it comprises control members for controlling the tightening means of the screen mesh to be turned next into the screening position in such a way that the screen mesh tightens into the screening tightness before it is turned into the screening position.

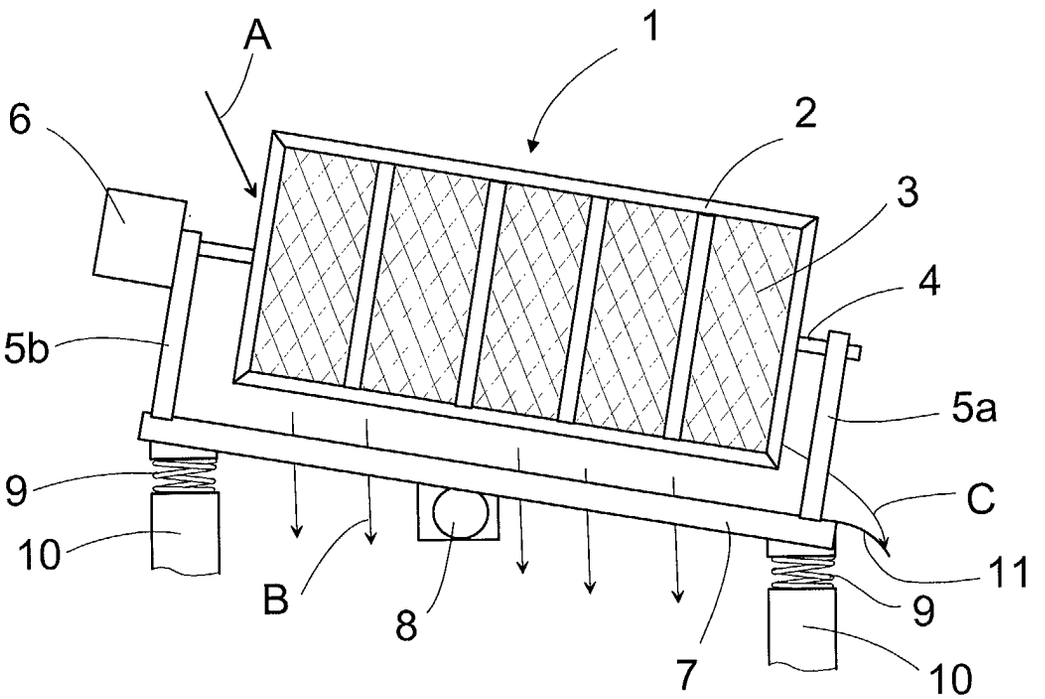

FIG. 1

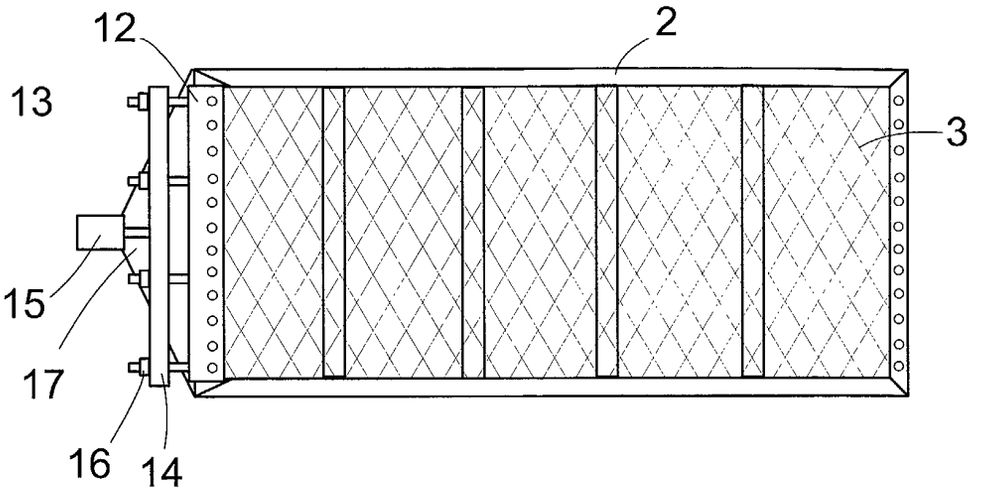

FIG. 2

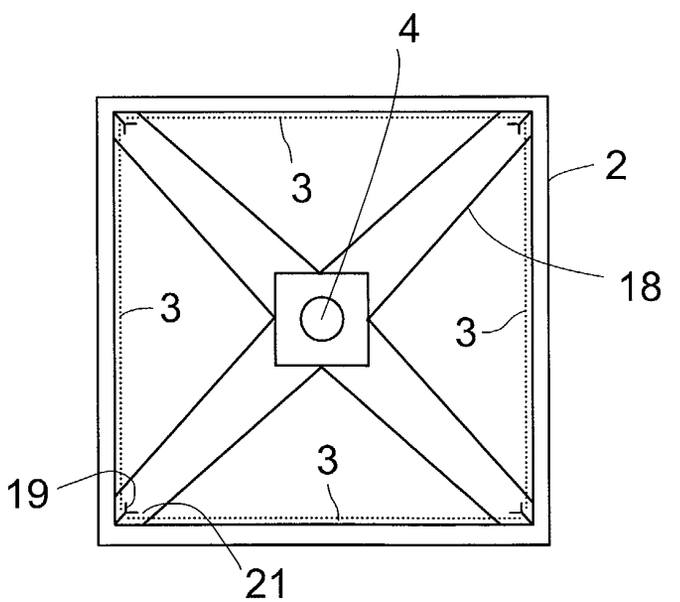

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 02 39 6147

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)
B07B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10 January 2003	Laval, J

CATEGORY OF CITED DOCUMENTS

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