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(54) **VIBRATING SCREEN**

SCHWINGSIEB

TAMIS VIBRANT

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EP-A2- 1 719 560 **GB-A- 2 134 214**
US-A1- 2012 111 774

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Description

[0001] This invention relates to a vibrating screen of the type comprising a base positioned in a lower part and a vibrating structure positioned in an upper part, with a plurality of elastic elements interposed between them, for connecting them and allowing the vibrating structure to elastically oscillate relative to the base. A vibrating unit is mounted on the vibrating structure to make the latter vibrate relative to the base. The upper structure comprises a plurality of sieves that are angled or parallel relative to a horizontal plane. They are positioned in such a way as to cause the outfeed of the material divided into different particle size measurement ranges.

[0002] In particular, this invention can be applied for vibrating screens intended for selecting aggregates to be used in applications such as the production of bituminous macadams and the production of concretes.

[0003] In order to be able to achieve high levels of productivity and good screening results, on one hand the screen must have relatively large dimensions and on the other hand a suitable vibration and acceleration must be imparted to it, which may therefore reach even very high values (preferably using a small slope for the various sieves).

[0004] Patent application EP 1 719 560 A2, which relates to the same type of screens as this invention, gives a rapid overview of known vibrating screen sizing and design problems.

[0005] As indicated in that patent application, in particular, without changing the overall structure too much, in order to be able to increase the performance of the vibrating screens, it would be necessary to pursue two contradictory courses of action. In fact, whilst on one hand it would be necessary to considerably stiffen their structure, on the other hand it would be appropriate to reduce their mass.

[0006] Whilst in traditional vibrating screens the vibrating structure comprises two mainly flat walls constituted of a single metal plate that is relatively thick, in an attempt to improve performance, patent application EP 1 719 560 A2 proposed an embodiment in which the walls are at least partly constituted of two plate sheets positioned side by side and close to each other for forming a narrow hollow space between them. A plurality of interconnecting elements is present in the hollow space. The two plate sheets also have different thicknesses. Preferably, one of the two sheets is twice as thick as the other.

[0007] Moreover, according to that document, the wall only comprises two sheets in the upper half, whilst only the outer sheet is present in the lower half. The beam that supports the vibrating unit is connected only to the outer sheets of the two walls.

[0008] Therefore, in other words, patent application EP 1 719 560 A2 suggests that the previously known screens be changed by applying on the upper part of the inner side of each wall a reinforcement constituted of an additional plate sheet drawn near to the self-same wall and

connected to it by means of various elements.

[0009] Although patent application EP 1 719 560 A2 boasts presumed advantages of the embodiment which forms its subject matter compared with prior art screens, on one hand as yet there are no known industrial applications that can effectively demonstrate actual achievement of such advantages, and on the other hand it has several obvious disadvantages at a construction level. In particular, the disadvantages are first linked to the need to apply a second plate sheet on the inner side of the vibrating structure, while leaving the structural functions (such as sustaining the beam that supports the vibrating unit or sustaining the sieves) to be performed by only the outer plate. In fact, to do that, the inner plate has to be prepared with a whole series of openings to allow the passage of the beam and of the supporting elements for the sieves. Moreover, inevitably, the presence of two sheets on the inner sides of the walls, however close they may be to the outer sheets, reduces the working width of the sieves.

[0010] Moreover, tests and simulation performed by the Applicant have allowed it to be established that the solution described in that patent application would not, in reality, be able to achieve the vibrating structure rigidity results claimed.

[0011] A different solution is proposed in EP 1 946 851 A1 where it is suggested to reinforce lateral walls of vibrating screens with C-shaped chamfered hollow profiles placed with their hollow space facing the lateral walls.

[0012] Another kind of vibrating screen without reinforcing structures for lateral walls is described in GB 2 134 214 A.

[0013] In this context the technical purpose which forms the basis of this invention is to provide a vibrating screen which overcomes the above-mentioned disadvantages.

[0014] In particular, the technical purpose of this invention is to provide a vibrating screen with simple construction and that has a structural rigidity considerably greater than the screens currently on the market and which can, therefore, be made to operate with performance that is better than the performance of prior art screens.

[0015] The technical purpose specified and the aims indicated are substantially achieved by a vibrating screen made as described in the appended claims.

[0016] Further features and the advantages of this invention are more apparent in the detailed description, with reference to the accompanying drawings which illustrate several preferred, non-limiting embodiments of a vibrating screen, in which:

- Figure 1 is a schematic side view of a vibrating screen made in accordance with this invention;
- Figure 2 is an axonometric view of a vibrating structure of the screen of Figure 1, longitudinally sectioned at a middle plane of it;
- Figure 3 is an axonometric view of the sectioned vibrating structure of Figure 2 from an opposite view-

- point;
- Figure 4 is a side view of the sectioned vibrating structure of Figure 2, highlighting with dashed lines a plurality of screening elements;
- Figure 5 is a side view of the sectioned vibrating structure of Figure 2, highlighting in transparency several inner reinforcing parts;
- Figure 6 is an axonometric view of a box-shaped reinforcing structure of the vibrating structure of Figure 3;
- Figure 7 is a side view of the box-shaped reinforcing structure of Figure 6, highlighting with dashed lines the inner parts;
- Figure 8 is a schematic cross-section of a preferred form of the box-shaped reinforcing structure; and
- Figures 9 and 10 are side views of two alternative embodiments of the vibrating structure, highlighting with dashed lines possible limited zones of application of a box-shaped reinforcing structure.

[0017] With reference to the above-mentioned figures, the numeral 1 denotes in its entirety a vibrating screen according to this invention.

[0018] Similarly to prior art screens, even the screen that forms the subject matter of this invention comprises a base 2 positioned in a lower part, a vibrating structure 3 positioned in an upper part, and a plurality of elastic elements 4 interposed between the base 2 and the vibrating structure 3 for connecting them and allowing the vibrating structure 3 to elastically oscillate relative to the base 2. In the preferred embodiment, in particular, there are four elastic elements 4 positioned at the four vertices of a rectangle, each of which comprises one or more helical springs placed side by side.

[0019] At least one vibrating unit 5 is mounted on the vibrating structure 3 for, in use, causing the vibrating structure 3 to vibrate relative to the base 2. In the preferred embodiment the vibrating unit 5 is of the mechanical type with eccentric rotating masses. But in general, it may be made in any way suitable for the purpose. However, preferably, it is a vibrating unit 5 able to generate reciprocating vibration. In the known way, it is also advantageously mounted in the highest part of the vibrating structure 3.

[0020] The vibrating structure 3 in turn comprises a supporting frame 6 which supports a plurality of screening elements 7 (typically perforated plates or nets that act as a sieve). The screening elements 7 are positioned on multiple levels one above the other and are vertically spaced. Moreover, a screening element 7 positioned at one level comprises screening openings having a size smaller than those of the screening elements 7 positioned at the higher levels. In this way, the screen causes division of the various particle size measurements of the aggregates being processed on the different levels with decreasing size from top to bottom.

[0021] Advantageously, the screening elements 7 are each supported by a plurality of elongate supporting el-

elements 8 positioned substantially horizontally and perpendicular to a main line of extension of the vibrating screen 1 (the length in the accompanying figures). The elongate supporting elements 8 of each screening element 7 are also positioned in such a way that the respective screening element 7 has a predetermined slope from the infeed section 9 of the vibrating screen 1 located near to one of the smaller sides, towards the outfeed section 10 located at the other small side (Figure 4).

[0022] The supporting frame 6 comprises two lateral walls 11. Each lateral wall 11 comprises an inner main surface 12 facing towards the other lateral wall 11, and an outer main surface 13 positioned on the opposite side to the inner main surface 12. The screening elements 7 are positioned between the inner main surfaces 12. Moreover, in the embodiment illustrated, the elongate supporting elements 8 are fixed to the lateral walls 11 at the inner main surfaces 12.

[0023] The vibrating structure 3 also comprises a load-bearing beam 14, which is rigidly interconnected between the lateral walls 11 and which extends horizontally above all of the screening elements 7. The vibrating unit 5 is advantageously mounted on the load-bearing beam 14. In particular, the load-bearing beam 14 is fixed to the lateral walls 11 at supporting portions 15 of the related inner main surfaces 12.

[0024] Moreover, according to a first innovative aspect of this invention, for each lateral wall 11 the supporting frame 6 comprises at least one box-shaped reinforcing structure 16 that is hollow inside and that is applied to the outer main surface 13 of the related lateral wall 11.

[0025] According to the preferred embodiment of this invention, each box-shaped reinforcing structure 16 is applied exclusively to a limited part 17 of the related outer main surface 13, in particular to a limited part 17 of the outer main surface 13 that forms at least one ring surrounding a portion of the self-same outer main surface 13 to which, in contrast, the box-shaped reinforcing structure 16 is not applied.

[0026] Depending on the embodiments, that limited part 17 of each outer main surface 13 may form either a single ring 18 or a plurality of rings 18 that each surround a portion of the self-same outer main surface 13 to which the box-shaped reinforcing structure 16 is not applied.

[0027] Therefore, seen from the side (as in Figures 7, 9 and 10), each box-shaped reinforcing structure 16 in turn also has a shape that forms at least one ring 18 (only one in Figures 7 and 10, but five in Figure 9). Depending on the embodiments, the reinforcing structure may be located only on part of the respective lateral wall 11 (in the upper part in Figure 7) or may affect the entire lateral wall as in Figures 9 and 10.

[0028] Moreover, advantageously, the box-shaped reinforcing structure 16 is present at supporting flanges 19 by means of which the vibrating structure 3 is connected to the elastic elements 4, and/or to the zones of the outer main surfaces 13 positioned at the supporting portions 15 made on the inner main surfaces 12. Those zones

are therefore part of the respective limited part 17 of the outer main surface 13 that forms at least one ring 18.

[0029] In the preferred embodiment, each box-shaped reinforcing structure 16 is connected to the related lateral wall 11 by means of a plurality of bolts 20. In particular, advantageously, for each box-shaped reinforcing structure 16, at least several bolts 20 connect the box-shaped reinforcing structure 16 both to the related lateral wall 11 and to one of the elongate supporting elements 8 of at least one screening element 7. In particular, in the preferred embodiment, two or more bolts 20 connect the box-shaped reinforcing structure 16 to the same elongate supporting element 8.

[0030] Also, preferably, at least several, but preferably all of the bolts 20 completely pass through the related box-shaped reinforcing structure 16. Furthermore, in this case, advantageously, at least for several of the bolts 20 that completely pass through the box-shaped reinforcing structure 16, the box-shaped reinforcing structure 16 internally comprises a tubular insert 21 extending perpendicularly to a main plane of extension of the lateral wall 11, the bolt 20 being positioned through the inside of this insert. Advantageously, the tubular insert 21 is welded to the rest of the box-shaped reinforcing structure 16.

[0031] As regards the form of each box-shaped reinforcing structure 16, in the preferred embodiment illustrated in the accompanying figures it comprises first a main reinforcing body 22 which, in a plane perpendicular to the main plane of extension of the outer main surface 13, has a C-shaped cross-section (the shape and the size of the C may vary from one zone to the next). In particular, the central part of the C is applied to the related outer main surface 13 whilst the two arms of the C extend substantially perpendicularly to, and away from, the main plane of extension of the related outer main surface 13. The box-shaped reinforcing structure 16 also comprises at least one closing element 23 applied to the main reinforcing body 22 so that together with the latter it forms a box-shaped element. Seen in cross-section, as in Figure 8, the closing element 23 is fixed to the arms of the C advantageously by welding.

[0032] To allow the passage of the bolts 20, suitable through holes are made in the main reinforcing body 22, the closing element 23, the lateral wall 11 and if necessary in the elongate element.

[0033] In general, both the main reinforcing body 22 and the closing element 23 may be made either as one piece or as a plurality of pieces that are drawn near each other and interconnected if necessary.

[0034] Depending on requirements and on the shape of the box-shaped reinforcing structure 16, there may be additional reinforcing and/or stiffening elements inside it.

[0035] For example, each box-shaped reinforcing structure 16 may comprise a plurality of stiffening walls 24 mounted inside the main reinforcing body 22 and welded to it. Advantageously, the stiffening walls 24 extend perpendicularly to the related outer main surface 13, preferably from one arm of the C to the opposite arm.

[0036] Furthermore, advantageously, the box-shaped reinforcing structure 16 comprises a plurality of stiffening walls 24 that are angled relative to one another and constrained to each other in order to form a stiffening frame 25, at the supporting flanges 19 and/or at the zones of the outer main surfaces 13 positioned at the supporting portions 15 made on the inner main surfaces 12.

[0037] Depending on requirements, the thicknesses of the various parts of the box-shaped reinforcing structure 16 may be different to one another (for example, in the same box-shaped reinforcing structure 16, 3 mm, 5 mm and 14 mm thicknesses may be used simultaneously).

[0038] Operation of the screen according to this invention is similar to that of conventional screens.

[0039] However, this invention brings important advantages.

[0040] Preliminary checks and tests carried out by the Applicant allowed it to be established that thanks to this invention it is possible to significantly increase the performance of a vibrating screen.

[0041] Moreover, it was possible to increase the structural resistance to fatigue of the screen without excessively altering its mass.

[0042] In particular, by applying a box-shaped reinforcing structure such as that in the figures to an existing vibrating screen having the following limit performance values (dictated by mechanical resistance):

- maximum acceleration achievable 4.8 g (where g, obviously, indicates the acceleration of gravity);
- mass (screen + material) 3446 kg;
- maximum intensity of the sinusoidal force applicable by the vibrating unit 85 kN;

it has been possible to increase those limit performance values to the following values:

- maximum acceleration achievable 12 g;
- mass (screen + material) 5240 kg;
- maximum intensity of the sinusoidal force applicable by the vibrating unit 220 kN.

[0043] Finally, it should be noticed that this invention is relatively easy to produce and that even the cost linked to implementing the invention is not very high.

Claims

1. A vibrating screen comprising:

a base (2) positioned in a lower part;
a vibrating structure (3) positioned in an upper part;

a plurality of elastic elements (4) interposed between the base (2) and the vibrating structure (3) for connecting them and allowing the vibrating structure (3) to elastically oscillate relative

to the base (2); and
at least one vibrating unit (5) mounted on the
vibrating structure (3);

wherein:

the vibrating structure (3) in turn comprises a
supporting frame (6) on which a plurality of
screening elements (7) is mounted, the screen-
ing elements being arranged on multiple levels
one above another and vertically spaced, a
screening element (7) positioned at one level
comprising screening openings having a size
smaller than those of the screening elements (7)
positioned at higher levels;

the supporting frame (6) comprises two lateral
walls (11) and, for each lateral wall (11), at least
one reinforcing structure (16) applied to that lat-
eral wall; and

the lateral walls (11) each comprising an inner
main surface (12) facing towards the other lat-
eral wall (11) and an outer main surface (13)
positioned on the opposite side to the inner main
surface (12), the screening elements (7) being
positioned between the inner main surfaces
(12); and **characterized in that** each reinforcing
structure (16) considered per se, is box-shaped,
is hollow inside and comprises a wall applied to
the outer main surface (13) of the related lateral
wall (11).

2. The vibrating screen according to claim 1, **characterised in that** each box-shaped reinforcing structure (16) is applied exclusively to a limited part (17) of the related outer main surface (13).
3. The vibrating screen according to claim 2, **characterised in that** said limited part (17) of each outer main surface (13) forms at least one ring (18) surrounding a portion of the self-same outer main surface (13) to which the box-shaped reinforcing structure (16) is not applied.
4. The vibrating screen according to claim 3, **characterised in that** said limited part (17) of each outer main surface (13) forms a plurality of rings (18) each surrounding a portion of the self-same outer main surface (13) to which the box-shaped reinforcing structure (16) is not applied.
5. The vibrating screen according to any of the preceding claims, **characterised in that** the vibrating structure (3) also comprises a load-bearing beam (14), rigidly interconnected between the lateral walls (11) and extending horizontally above all of the screening elements (7), the vibrating unit (5) being mounted on the load-bearing beam (14).

6. The vibrating screen according to claim 5 when it is dependent on claim 3, **characterised in that** the load-bearing beam (14) is fixed to the lateral walls (11) at supporting portions (15) of the related inner main surfaces (12), and **in that** on each outer main surface (13), at said supporting portions (15), it is possible to identify a zone that is part of said limited part (17) that forms at least one ring (18), and to which the box-shaped reinforcing structure (16) is applied.
7. The vibrating screen according to any of the preceding claims, **characterised in that** each box-shaped reinforcing structure (16) is connected to the related lateral wall (11) by means of a plurality of bolts (20).
8. The vibrating screen according to claim 7, **characterised in that** for each box-shaped reinforcing structure (16), at least several bolts (20) connect the box-shaped reinforcing structure (16) both to the related lateral wall (11) and to an elongate supporting element that rigidly connects the inner main surfaces to each other and supports at least one screening element (7).
9. The vibrating screen according to claim 7 or 8, **characterised in that** at least several of said bolts (20) completely pass through the related box-shaped reinforcing structure (16), and **in that**, at least for several of the bolts (20) that completely pass through it, the box-shaped reinforcing structure (16) also comprises, for each bolt (20), at least one tubular insert (21) that extends perpendicularly to a main plane of extension of the lateral wall (11) and inside which the bolt (20) is positioned.
10. The vibrating screen according to any of the preceding claims, **characterised in that** each box-shaped reinforcing structure (16) comprises a main reinforcing body (22) that, in a plane perpendicular to a main plane of extension of the outer main surface (13), is C-shaped with a central part of the C applied to the related outer main surface (13), and arms of the C extending substantially perpendicularly to, and away from, the main plane of extension of the related outer main surface (13), and at least one closing element (23) applied to the main reinforcing body (22) between the arms of the C, said wall of the reinforcing structure applied to the related outer main surface (13) of the related lateral wall (11) being constituted by said central part of the C.
11. The vibrating screen according to claim 10, **characterised in that** each box-shaped reinforcing structure (16) also comprises a plurality of stiffening walls (24) mounted inside the main reinforcing body (22) and welded to it, the stiffening walls (24) extending perpendicularly to the related outer main surface.

12. The vibrating screen according to claim 11 when it is dependent on claim 6, **characterised in that** each reinforcing structure comprises a plurality of stiffening walls (24) at the related supporting portion of the inner main surface (12), the stiffening walls (24) of said plurality being angled relative to one another and constrained to each other in order to form a stiffening frame (25).

Patentansprüche

1. Ein Schwingsieb, Folgendes umfassend:

eine Basis (2), die in einem unteren Teil positioniert ist;
eine Schwingstruktur (3), die in einem oberen Teil positioniert ist;
eine Mehrzahl elastischer Elemente (4), die zwischen der Basis (2) und der Schwingstruktur (3) eingefügt sind, um sie zu verbinden und der Schwingstruktur (2) zu erlauben, elastisch im Verhältnis zur Basis (2) zu schwingen; und mindestens eine Schwingeinheit (5), die an der Schwingstruktur (3) montiert ist;

wobei:

die Schwingstruktur (3) ihrerseits einen Stützrahmen (6) beinhaltet, an dem eine Mehrzahl von Siebelementen (7) montiert ist, die Siebelemente sind dabei auf mehreren Ebenen eines über dem anderen angeordnet und vertikal verteilt, ein Siebelement (7), das auf einer Ebene positioniert ist, beinhaltet dabei Sieböffnungen, die eine kleinere Größe haben als diejenigen der Siebelemente (7), die auf höheren Ebenen positioniert sind;

der Stützrahmen (6) zwei Seitenwände (11) beinhaltet und, für jede Seitenwand (11), mindestens eine Verstärkungsstruktur (16), die an dieser Seitenwand angebracht ist; und

die Seitenwände (11) dabei jeweils eine innere Hauptfläche (12) beinhalten, die zur anderen Seitenwand (11) gerichtet ist, und eine äußere Hauptfläche (13), die auf der gegenüberliegenden Seite zur inneren Hauptfläche (12) positioniert ist; die Siebelemente (7) sind dabei zwischen den inneren Hauptflächen (12) positioniert; und **gekennzeichnet dadurch, dass** jede Verstärkungsstruktur (16), für sich alleine genommen, kastenförmig ist, innen hohl ist und eine Wand beinhaltet, die an der äußeren Hauptfläche (13) der zugehörigen Seitenwand (11) angebracht ist.

2. Das Schwingsieb nach dem Patentanspruch 1, **gekennzeichnet dadurch, dass** jede kastenförmige Verstärkungsstruktur (16) ausschließlich an einem begrenzten Teil (17) der zugehörigen äußeren Hauptfläche (13) angebracht ist.

3. Das Schwingsieb nach dem Patentanspruch 2, **gekennzeichnet dadurch, dass** besagter begrenzter Teil (17) jeder äußeren Hauptfläche (13) mindestens einen Ring (18) bildet, der einen Abschnitt derselben äußeren Hauptfläche (13) umrundet, an dem die kastenförmige Verstärkungsstruktur (16) nicht angebracht ist.

4. Das Schwingsieb nach dem Patentanspruch 3, **gekennzeichnet dadurch, dass** besagter begrenzter Teil (17) jeder äußeren Hauptfläche (13) eine Mehrzahl von Ringen (18) bildet, von denen jeder einen Abschnitt derselben äußeren Hauptfläche (13) umringt, an dem die kastenförmige Verstärkungsstruktur (16) nicht angebracht ist.

5. Das Schwingsieb nach jedem der vorigen Patentansprüche, **gekennzeichnet dadurch, dass** die Schwingstruktur (3) auch einen Tragholm (14) beinhaltet, der starr zwischen den Seitenwänden (11) angebracht und mit diesen verbunden ist und sich horizontal über allen Siebelementen (7) erstreckt, die Schwingeinheit (5) ist dabei am Tragholm (14) montiert.

6. Das Schwingsieb nach dem Patentanspruch 5, wenn er vom Patentanspruch 3 abhängig ist, **gekennzeichnet dadurch, dass** der Tragholm (14) im Bereich von Stützabschnitten (15) der zugehörigen inneren Hauptflächen (12) an den Seitenwänden (11) befestigt ist, und darin, dass es an jeder äußeren Hauptfläche (13) an besagten Stützabschnitten (15) möglich ist, einen Bereich zu identifizieren, der Teil des besagten begrenzten Teils (17) ist, der mindestens einen Ring (18) bildet, und an dem die kastenförmige Verstärkungsstruktur (16) angebracht ist.

7. Das Schwingsieb nach jedem der vorigen Patentansprüche, **gekennzeichnet dadurch, dass** jede kastenförmige Verstärkungsstruktur (16) mit der zugehörigen Seitenwand (11) durch eine Mehrzahl von Bolzen (20) verbunden ist.

8. Das Schwingsieb nach dem Patentanspruch 7, **gekennzeichnet dadurch, dass** bei jeder kastenförmigen Verstärkungsstruktur (16) mindestens mehrere Bolzen (20) die kastenförmige Verstärkungsstruktur (16) sowohl mit der zugehörigen Seitenwand (20) als auch mit einem länglichen Stützelement verbinden, das die innere Hauptflächen starr miteinander verbindet und mindestens ein Siebelement (7) stützt.

9. Das Schwingsieb nach dem Patentanspruch 7 oder 8, **gekennzeichnet dadurch, dass** mindestens mehrere der besagten Bolzen (20) vollständig durch die zugehörige kastenförmige Verstärkungsstruktur (20) durchgehen, und dadurch, dass mindestens bei mehreren der Bolzen (20), die vollständig durch sie durchgehen, die kastenförmige Verstärkungsstruktur (16) für jeden Bolzen (20) auch mindestens einen rohrförmigen Einsatz (21) beinhaltet, der sich lotrecht zu einer Hauptstreckungsebene der Seitenwand (11) erstreckt und in dem der Bolzen (20) platziert ist.
10. Das Schwingsieb nach jedem der vorigen Patentansprüche, **gekennzeichnet dadurch, dass** jede kastenförmige Verstärkungsstruktur (16) einen Hauptverstärkungskörper (22) beinhaltet, der auf einer Ebene, die lotrecht zu einer Hauptstreckungsebene der äußeren Hauptfläche (13) verläuft, C-förmig ist, wobei ein mittlerer Teil des "C" an der zugehörigen äußeren Hauptfläche (13) angebracht ist und sich Arme des "C" im Wesentlichen lotrecht zu der Hauptstreckungsebene der zugehörigen äußeren Hauptfläche (13) erstrecken und sich von dieser entfernen, und mindestens ein Schließelement (23), das am Hauptverstärkungskörper (22) zwischen den Armen des besagten "C" angebracht ist, die besagte Wand der Verstärkungsstruktur, die an der zugehörigen äußeren Hauptfläche (13) der zugehörigen Seitenwand (11) angebracht ist, besteht dabei aus besagtem mittleren Teil des "C".
11. Das Schwingsieb nach dem Patentanspruch 10, **gekennzeichnet dadurch, dass** jede kastenförmige Verstärkungsstruktur (16) auch eine Mehrzahl von Versteifungswänden (24) beinhaltet, die im Inneren des Hauptverstärkungskörpers (22) montiert und damit verschweißt sind, die Versteifungswände (24) erstrecken sich dabei lotrecht zu der zugehörigen äußeren Hauptfläche.
12. Das Schwingsieb nach dem Patentanspruch 11, wenn er vom Patentanspruch 6 abhängig ist, **gekennzeichnet dadurch, dass** jede Verstärkungsstruktur eine Mehrzahl von Versteifungswänden (24) am zugehörigen Stützabschnitt der inneren Hauptfläche (12) beinhaltet, die Versteifungswände (24) der besagten Mehrzahl sind dabei voneinander abgewinkelt und fest miteinander verbunden, um einen Versteifungsrahmen (25) zu bilden.

Revendications

1. Un crible vibrant comprenant:

une base (2) positionnée dans une partie inférieure;

une structure vibrante (3) positionnée dans une partie supérieure;
une pluralité d'éléments élastiques (4) interposés entre la base (2) et la structure vibrante (3) pour les relier et permettre à la structure vibrante (3) d'osciller élastiquement par rapport à la base (2); et
au moins une unité vibrante (5) montée sur la structure vibrante (3);

dans lequel:

la structure vibrante (3) comprend à son tour un châssis de support (6) sur lequel est montée une pluralité d'éléments de criblage (7), les éléments de criblage étant disposés sur plusieurs niveaux les uns au-dessus des autres et espacés verticalement, un élément de criblage (7) positionné à un niveau comprenant des ouvertures de criblage ayant une taille inférieure à celle des éléments de criblage (7) positionnés à des niveaux supérieurs;

le châssis de support (6) comprend deux parois latérales (11) et, pour chaque paroi latérale (11), au moins une structure de renfort (16) appliquée à cette paroi latérale; et

les parois latérales (11) comprenant chacune une surface principale intérieure (12) orientée vers l'autre paroi latérale (11) et une surface principale extérieure (13) positionnée du côté opposé à la surface principale intérieure (12), les éléments de criblage (7) étant positionnés entre les surfaces principales intérieures (12); et

caractérisé en ce que chaque structure de renfort (16) considérée en soi, a la forme d'un caisson, est creuse à l'intérieur et comprend une paroi appliquée sur la surface principale extérieure (13) de la paroi latérale (11) correspondante.

2. Le crible vibrant selon la revendication 1, **caractérisé en ce que** chaque structure de renfort (16) en forme de caisson est appliquée exclusivement sur une partie limitée (17) de la surface principale extérieure (13) correspondante.

3. Le crible vibrant selon la revendication 2, **caractérisé en ce que** ladite partie limitée (17) de chaque surface principale extérieure (13) forme au moins un anneau (18) entourant une portion de cette même surface principale extérieure (13) sur laquelle la structure de renfort (16) en forme de caisson n'est pas appliquée.

4. Le crible vibrant selon la revendication 3, **caractérisé en ce que** ladite partie limitée (17) de chaque surface principale extérieure (13) forme une pluralité d'anneaux (18) entourant chacun une portion de cet-

- te même surface principale extérieure (13) sur laquelle la structure de renfort (16) en forme de caisson n'est pas appliquée.
5. Le crible vibrant selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la structure vibrante (3) comprend aussi une poutre porteuse (14), raccordée de façon rigide entre les parois latérales (11) et s'étendant horizontalement au-dessus de tous les éléments de criblage (7), l'unité vibrante (5) étant montée sur la poutre porteuse (14). 5
6. Le crible vibrant selon la revendication 5 lorsqu'il dépend de la revendication 3, **caractérisé en ce que** la poutre porteuse (14) est fixée aux parois latérales (11) au niveau de portions de support (15) des surfaces principales intérieures (12) correspondantes, et **en ce que**, sur chaque surface principale extérieure (13), au niveau desdites portions de support (15), il est possible d'identifier une zone qui fait partie de ladite partie limitée (17) qui forme au moins un anneau (18), et sur laquelle la structure de renfort (16) en forme de caisson est appliquée. 10
7. Le crible vibrant selon l'une quelconque des revendications précédentes, **caractérisé en ce que** chaque structure de renfort (16) en forme de caisson est fixée à la paroi latérale (11) correspondante au moyen d'une pluralité de boulons (20). 20
8. Le crible vibrant selon la revendication 7, **caractérisé en ce que**, pour chaque structure de renfort (16) en forme de caisson, au moins plusieurs boulons (20) raccordent la structure de renfort (16) en forme de caisson à la fois à la paroi latérale (11) correspondante et à un élément de support allongé qui raccorde de façon rigide les surfaces principales intérieures l'une à l'autre et supporte au moins un élément de criblage (7). 25
9. Le crible vibrant selon la revendication 7 ou 8, **caractérisé en ce que** au moins plusieurs desdits boulons (20) passent complètement à travers de la structure de renfort (16) en forme de caisson, et **en ce que**, au moins pour plusieurs des boulons (20) qui passent complètement à travers elle, la structure de renfort (16) en forme de caisson comprend aussi, pour chaque boulon (20), au moins un insert tubulaire (21) qui s'étend perpendiculairement à un plan principal d'extension de la paroi latérale (11) et à l'intérieur duquel le boulon (20) est positionné. 30
10. Le crible vibrant selon l'une quelconque des revendications précédentes, **caractérisé en ce que** chaque structure de renfort (16) en forme de caisson comprend un corps de renfort principal (22) qui, dans un plan perpendiculaire à un plan principal d'extension de la surface principale extérieure (13), est en forme de C avec une partie centrale du C appliquée sur la surface principale extérieure (13) correspondante, et des branches du C s'étendant perpendiculairement à et à l'opposé du plan principal d'extension de la surface principale extérieure (13) correspondante, et au moins un élément de fermeture (23) appliqué sur le corps de renfort principal (22) entre les branches du C, ladite paroi de la structure de renfort appliquée sur la surface principale extérieure (13) correspondante de la paroi latérale (11) correspondante étant constituée par ladite partie centrale du C. 35
11. Le crible vibrant selon la revendication 10, **caractérisé en ce que** chaque structure de renfort (16) en forme de caisson comprend aussi une pluralité de parois de consolidation (24) montées à l'intérieur du corps de renfort principal (22) et soudées à celui-ci, les parois de consolidation (24) s'étendant perpendiculairement à la surface principale extérieure correspondante. 40
12. Le crible vibrant selon la revendication 11 lorsqu'il dépend de la revendication 6, **caractérisé en ce que** chaque structure de renfort comprend une pluralité de parois de consolidation (24) au niveau de la portion de support correspondante de la surface principale intérieure (12), les parois de consolidation (24) de ladite pluralité étant inclinées les unes par rapport aux autres et assujetties les unes aux autres pour former un châssis de consolidation (25). 45
- 50
- 55

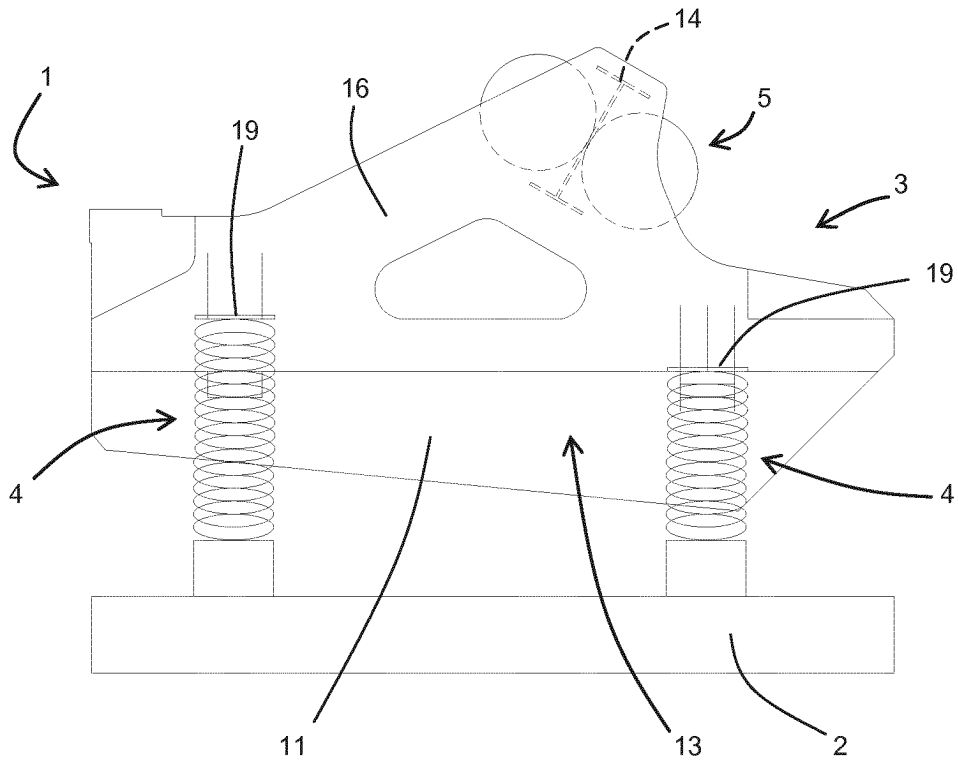


FIG. 1

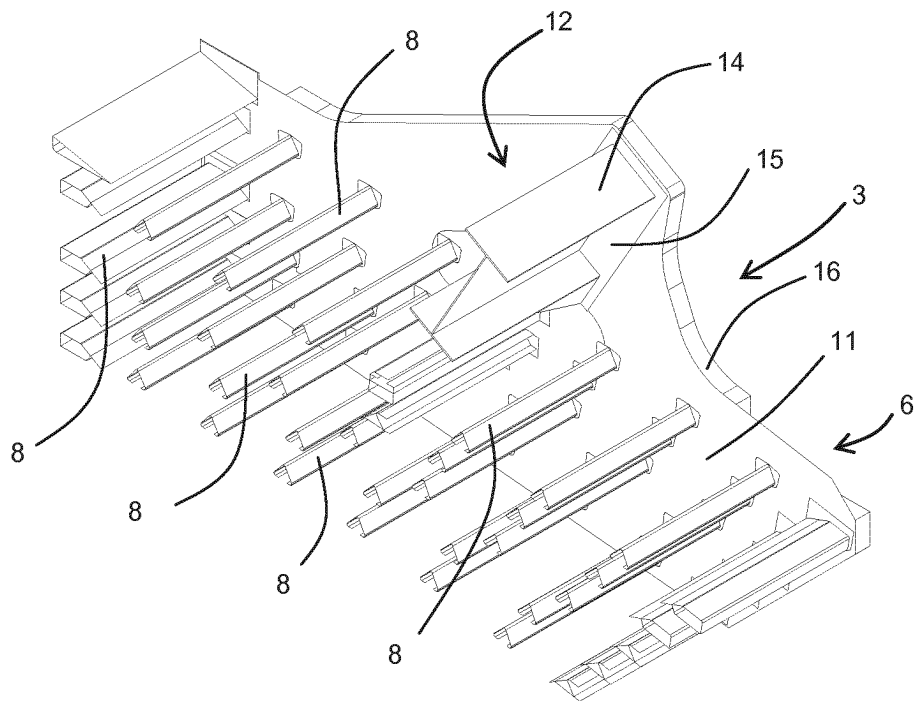
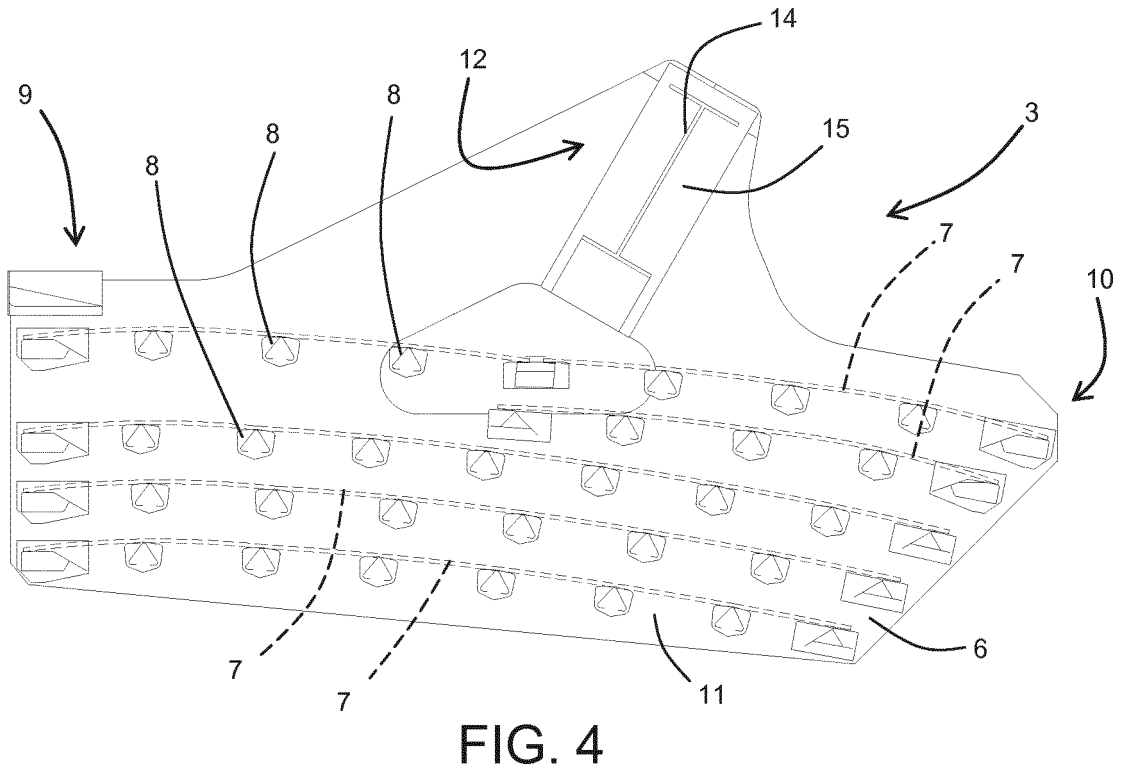
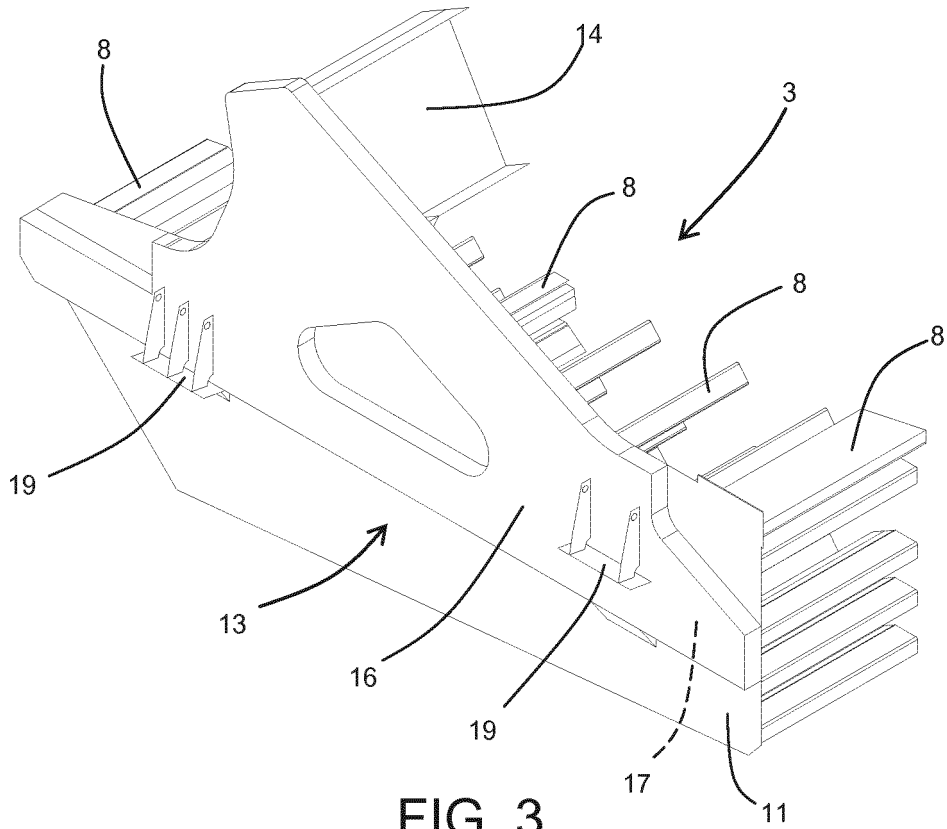


FIG. 2



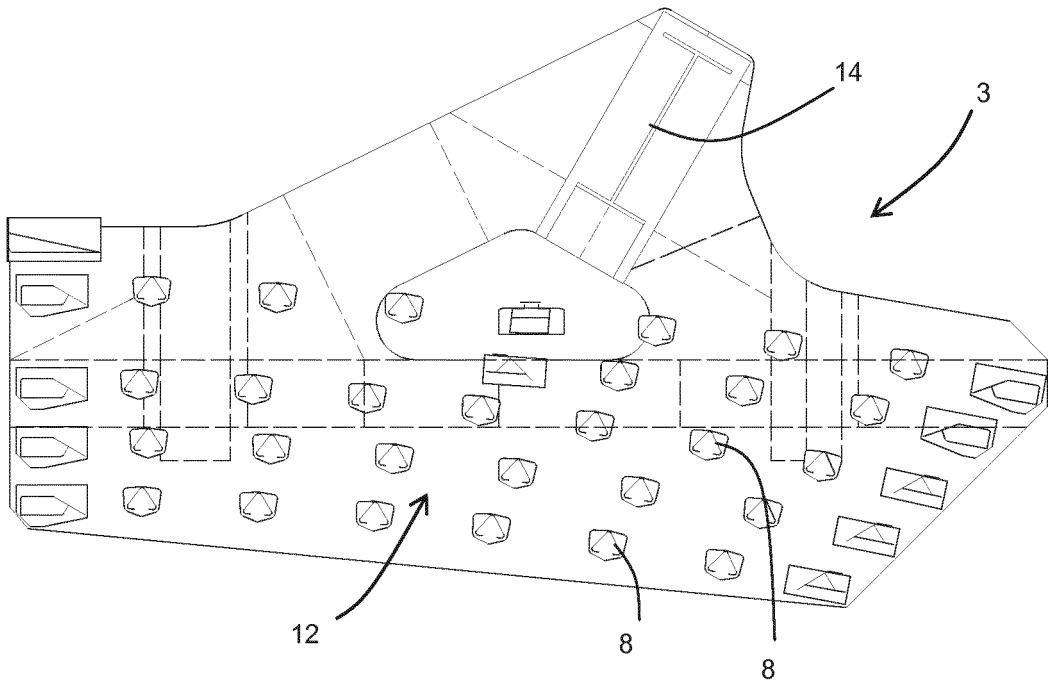


FIG. 5

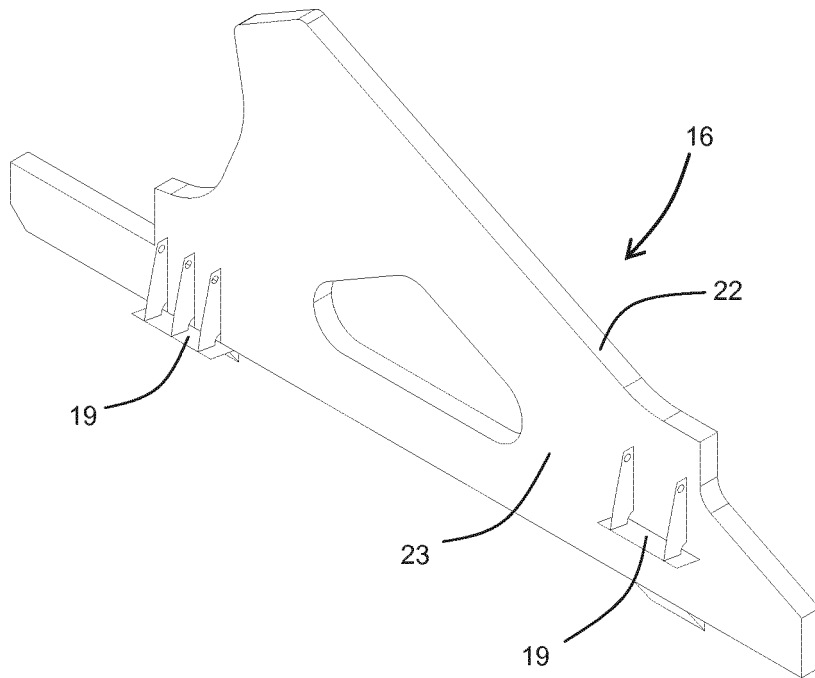


FIG. 6

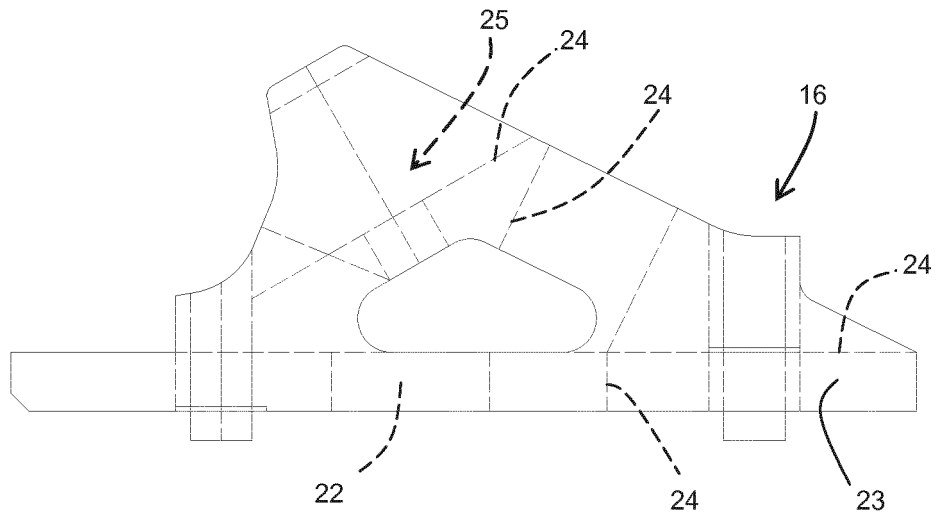


FIG. 7

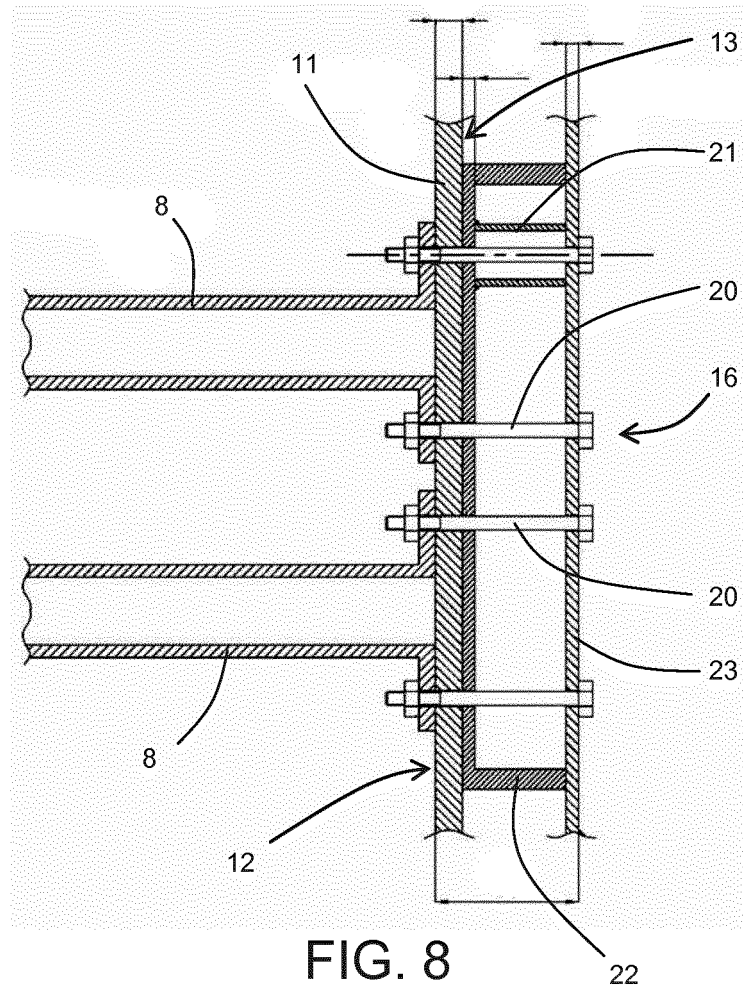


FIG. 8

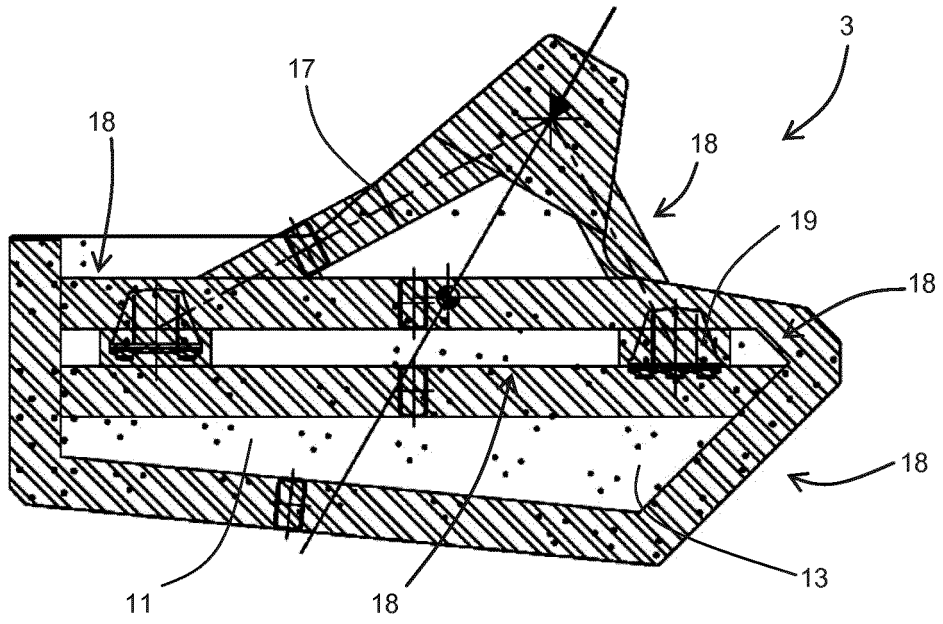


FIG. 9

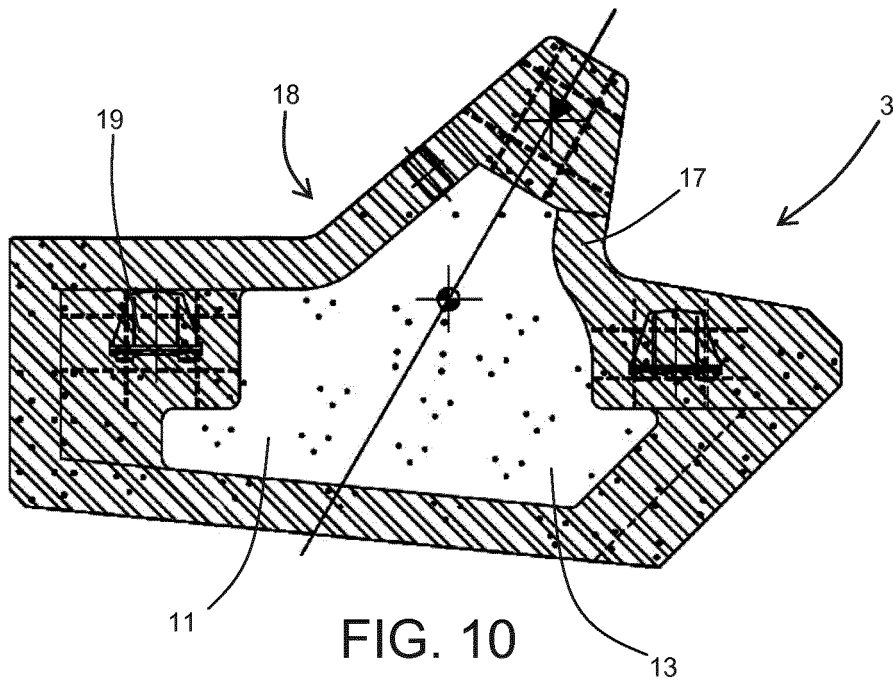


FIG. 10

REFERENCES CITED IN THE DESCRIPTION

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