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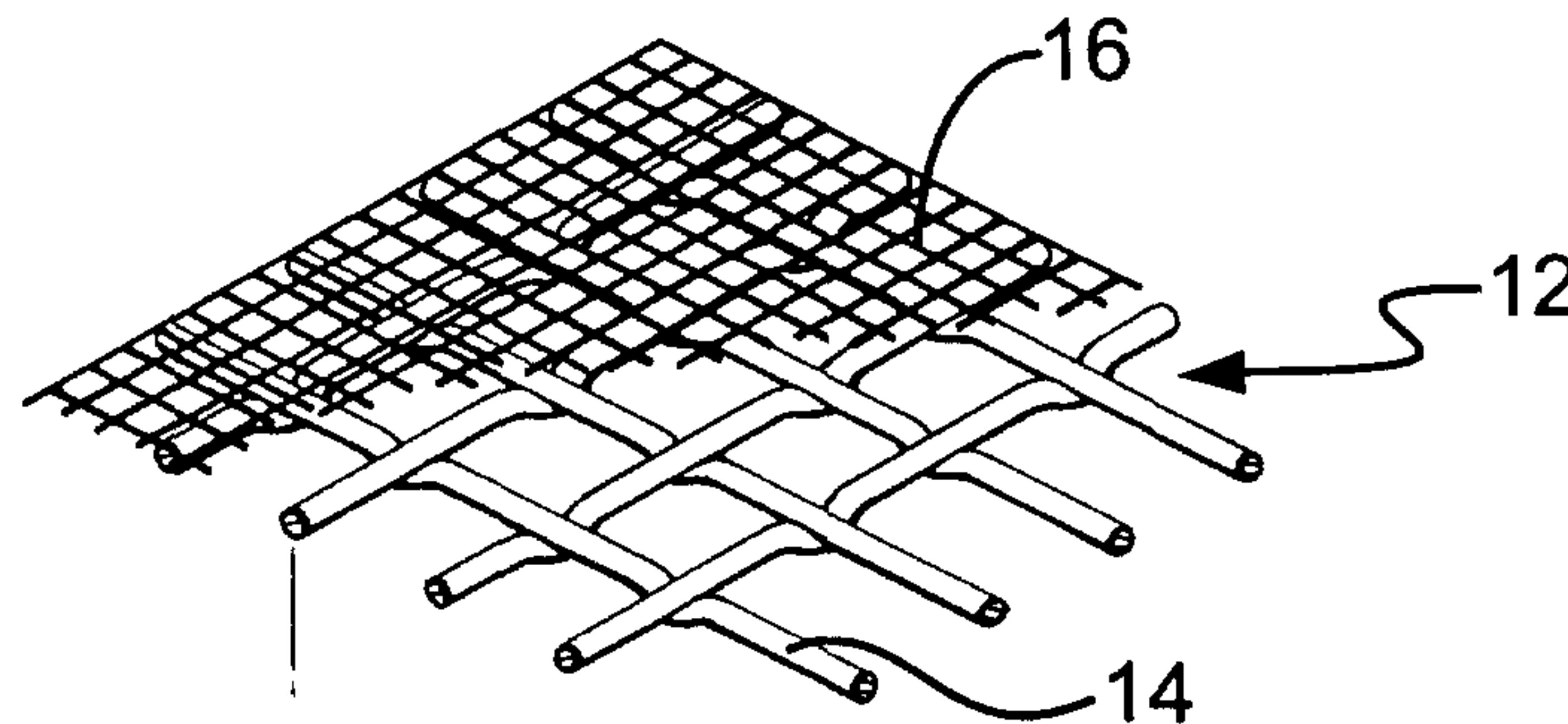
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(54) Title: A SCREEN FOR A VIBRATORY SEPARATOR AND METHOD OF SCREENING MATERIAL WITH A
VIBRATORY SEPARATOR



(57) Abrégé/Abstract:

A screen (10) for a vibratory separator which screen comprises screening material (16) and a support (12) comprising a plurality of wires (14) arranged in criss-cross configuration to define a plurality of holes therethrough, characterised in that said screening material (16) is supported substantially along the entire length of plurality of wires (14) forming said support (12).

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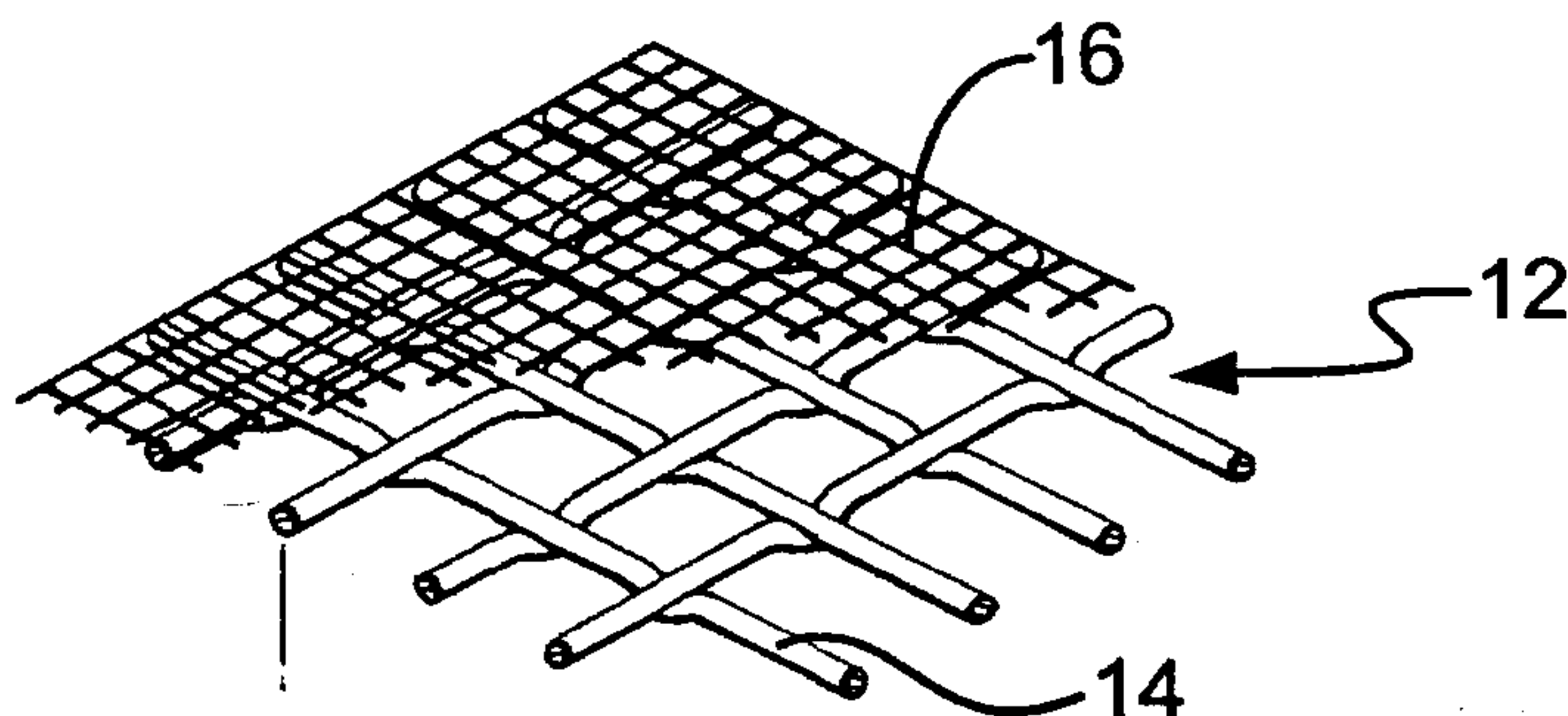
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tor which screen comprises screening material (16)
and a support (12) comprising a plurality of wires
(14) arranged in criss-cross configuration to define a
plurality of holes therethrough, characterised in that
said screening material (16) is supported substan-
tially along the entire length of plurality of wires
(14) forming said support (12).

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A Screen for a Vibratory Separator and Method of
Screening Material with a Vibratory Separator

This invention relates to a screen for a vibratory separator, to a vibratory separator provided with such a
5 screen and to a method of screening material with a vibratory separator.

Vibrating screens have been employed for many years to separate particles in a wide array of industrial and oilfield applications. One common application of
10 vibrating screens is in drilling operations to separate particles suspended in drilling fluids. The screens are generally flat or three-dimensional and are mounted generally horizontally on a vibrating mechanism or shaker that imparts either a rapidly reciprocating linear,
15 elliptical and/or circular motion to the screen. Material from which particles are to be separated is poured onto a back end of the vibrating screen. The material generally flows toward the front end of the screen. Large particles are unable to move through the screen, remaining on top
20 of the screen and moving toward the front of the screen where they are collected. The smaller particles and fluid flow through the screen and may be collected in a pan beneath the screen.

A vibrating screen may be formed from one or more
25 layers of screening material, screen and/or wire mesh, which are generally described with reference to the diameter of the wires from which they are woven, the number wires per unit length (called a "mesh count") and the shape or size of the openings between wires. The type
30 of mesh chosen depends on the application. The screening material in certain prior art screens is mounted on a frame, a perforated plate or perforated panel.

Some screens use wire mesh that is tensioned. Tensioning (accomplished in a variety of ways, e.g. with
35 hookstrips and/or pretensioned panels) restricts movement

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of the wires and assists in holding the shape of the wire mesh.

Many screens comprise screening material with a relatively high mesh count which is mounted on and supported by a support mesh having a relatively low mesh count. In turn this is supported on a frame, a perforated plate or perforated panel, as explained above. The support mesh comprises a number of interwoven wires which pass under and over surrounding wires of the support mesh. The nature of this weave is such as to produce raised portions of wire at the intersections of the wires. Such mesh is known in the art as "round top wire". The applicants have observed that the screening material is quickly worn due to friction between the support mesh constructed with this weave and the screening material. Thus the screening material is easily torn. The friction occurs due to the necessary vibration of the screen and the weight of the material on the screening material/support mesh. The weight of the screening material and the mud is transferred from the screening material to the support mesh substantially via these raised portions. Thus, the screening material is worn more quickly.

Tearing of the screen, referred to above, is especially acute in heavy duty applications such as drilling and mining. A torn screen must be replaced or repaired. To facilitate repair, the screen layers are bonded to a rigid or semi-rigid support panel that has a pattern of openings, forming on the screen a plurality of cells of wire mesh. When a tear occurs in the screen, the mesh remaining within the cell in which the tear occurred is cut out and the cell is plugged. The capacity of the screen is diminished but its life is extended. Typically, several cells of a screen can be repaired before its capacity drops far enough to require replacement.

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Unfortunately, bonding the screen all around the edges defining openings through the support panel further restricts relative movement of the layers and the wires in each mesh layer.

5 Blinding and tearing of a screen reduce the capacity of the screen continually through its useful life. Although efficiency can be increased by increasing the total area the screens, the size of the screen is limited in most applications, such as on drilling rigs,
10 especially those on offshore platforms. Thus there has been generally a trade-off between capacity, longevity, repairability and resistance to blinding of the screens.

 Another problem with which the present invention is concerned is obtaining a satisfactory bond between the
15 screening material and mesh support (accomplished by e.g bonding or sintering). The applicants have found that attempts to bond screening material to "round top wire" (as described above) have not produced screens with sufficient durability in the field. This is because the
20 raised portions of the "round top wire" do not have sufficient surface area available to produce satisfactory bond strength. Thus when vibrated, the mesh support has a tendency to work loose from the screening material, rendering its support function minimal and decreasing the
25 life of the screening material/screen.

 The present invention aims to alleviate the aforementioned difficulties.

 According to the present invention there is provided a screen for a vibratory separator which screen comprises
30 screening material and a support comprising a plurality of wires arranged in criss-cross configuration to define a plurality of holes therethrough, the arrangement being such that said screening material is supported substantially along the entire length of the plurality of
35 wires forming said support, characterised in that at

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intersections of the plurality of wires, only one wire is deformed to accommodate another wire.

The support is preferably "flat top screening cloth" one advantage of which is that, in use, the
5 aforementioned problem of friction is inhibited. It will be noted that screens in accordance with present invention are supported by the support over substantially their entire area, contrary to the "point" support provided by round top wire.

10 Heretofore, flat top screening cloth has been used as a screening material for filtering material. The function of the "flat tops" was to reduce friction between the material being filtered and the cloth to improve throughput. The applicants are unaware of flat
15 top cloth being used as a support for screening material.

In one embodiment the support has a mesh count lower than the mesh count of the screening material. In another embodiment the support has the same mesh count as the screening material. However, preferably the mesh count of
20 the support is lower than the mesh count of the screening material. The mesh count of the support could be greater than that of the screening material, although this would not be advisable in practice.

The criss-cross arrangement of the wires of the
25 support is substantially mutually perpendicular, although this is not essential.

Preferably, said screening material and said support are undulating.

Preferably, said support and said screening material
30 is substantially flat.

Advantageously, said screening material is bonded to said support.

The support is preferably "flat top screening cloth" one advantage of which is that the aforementioned problem
35 with bonding is inhibited.

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Preferably, said screening material is bonded to said support in points or lines across the screening area of said screen.

Advantageously, said support is held under tension.

5 One advantage of this is that relative movement between the screening material and support is inhibited, thus reducing the effects of friction on the screening material.

10 Preferably, said screening material is held under tension and the tension of said support is substantially the same as the tension of the screening material.

Advantageously said support comprises flat top screening cloth.

15 Preferably, the screen has two pairs of opposed spaced-apart sides and each side of one pair of sides comprises a respective side member.

Advantageously, said side member comprises a hookstrip.

20 Preferably, said hookstrip is formed on said support.

Advantageously, said side member or said hookstrip is connected to the screening material and the support.

25 Preferably, said side member or said hookstrip is made from at least one of metal, plastic, aluminium, steel, cured glue, rubber, PTFE, and/or seal material.

Advantageously, each of said plurality of wires is substantially circular in cross section.

Preferably, said wire has a diameter between 0.95mm and 4.11mm.

30 Alternatively, the wire may have a diameter between 0.79mm and 4.76mm.

Advantageously, the separation between adjacent wires of the plurality of wires is 29.51mm.

35 Preferably, said screen further comprises a plurality of layers of screening material.

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Advantageously, said plurality of layers of screening material comprise screening material of differing mesh sizes.

5 Preferably, said screen is supported by or mounted on a frame, a perforated panel or a perforated plate.

According to another aspect of the present invention there is provided a vibratory separator comprising a screen in accordance with the present invention.

10 According to another aspect of the present invention there is provided a method of screening material with a vibratory separator, which method comprises the steps of:
supplying material to a vibratory separator, and
screening said material with a screen in accordance with the present invention.

15 According to another aspect of the present invention there is provided a screen for a vibratory separator which screen comprises screening material and a support, the arrangement being such that, in use, said support contacts and supports said screening material,
20 characterised in that said support comprises flat top screening cloth.

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For a better understanding of the present invention, reference will now be made, by way of example, to the accompanying drawings, in which:

Fig. 1A shows an end view of a first embodiment of a
5 screen in accordance with the present invention;

Fig. 1B shows a top plan view of the screen of Fig 1A;

Fig. 1C shows a underneath plan view of the screen of Fig. 1A;

10 Fig. 1D shows a perspective view of part of the screen of Fig. 1A, part of screening material omitted for clarity;

Fig. 1E shows a side view of part of a second embodiment of a screen which is similar to that of Fig.
15 1A;

Figs. 2A - 2C show three embodiments of hook attachments and hookstrips for a screen in accordance with the present invention;

Fig. 3 is a perspective view of a vibratory
20 separator with a screen in accordance with the present invention;

Figs. 4 and 5 are schematic side views of part of two embodiments of screens in accordance with the present invention; and

25 Fig. 6 is a plan view of alternative screening material.

Referring to Figs. 1A - 1D a screen in accordance with the present invention is generally identified by reference numeral 10. Screen 10 has a lower support 12
30 constructed from wires 14. In certain preferred embodiments the wires 14 are 4.11mm in diameter and the distance between centres defined by the wires 14 is about 29.51mm. The screen 10 has, optionally, one or two pairs of opposed spaced apart sides 11 and 17. The sides 11 and
35 17 may be made of metal, plastic, aluminium, steel, PTFE,

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rubber, glue or other seal material.

The screen 10 further comprises screening material 16 mounted on the lower support 12. In one particular embodiment (see Fig. 1E), the screening material 16 includes two layers 13 of fine mesh screens (e.g. between 180 and 150 mesh), a layer 15 of wire mesh (e.g. about 32 mesh), all connected to and/or bonded together to the lower support 12. In certain aspects the lower support 12 is between .75 mesh to 4 mesh.

10 In one method according to the present invention a piece of pre-heated flat top wire cloth about 0.91m X 1.23m (38" X 48") (although any suitable size may be used) is hot dipped into a fluidised bed of powder coating to coat the wires. Screening material (one, two, 15 or more layers) is then placed on the flat top wire cloth to form a sandwich which is placed on an oven at about 505K (450°F) for about 7 minutes. In one aspect the screening material pressed down onto the flat-topped wire cloth. Alternatively or in addition to the method 20 described above, the screening material is sintered and/or welded to the flat-topped wire cloth, or adhered to it with spray-on glue.

The resulting screen is removed from the oven and cooled. Alternatively or in addition to such bonding any 25 two adjacent layers of material may be sintered together and/or sintered to the flat-topped wire cloth.

In one aspect a lip or hookstrip is made on two opposed sides of a screen according to the present invention by bending opposed screen sides. The screen's 30 edges may be finished by metal wrapping, welding, rubber or plastic wrapping or with glue. Fig. 2A shows a hookstrip 20 made e.g. of sheet metal as on the screen 10 in Fig. 1A. Fig. 2B shows a hook angle 22, made e.g. of steel or galvanized steel which can be used instead of 35 the hookstrip 20. Fig. 2C shows a channel hookstrip 24

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made, e.g. of metal, rubber, or plastic which may also be used. It will be noted that in the embodiments of Figs. 2A and 2C the hookstrip is formed from the lower support 12.

5 Fig. 3 shows a vibratory separator system 30 according to the present invention that has a screen 40 (like any screen disclosed herein) according to the present invention mounted on vibratable screen mounting apparatus or "basket" 42. The screen 40 may be any screen
10 disclosed herein or have any combination of any feature or features of any screen or screen part disclosed herein; and any such screen may be used with any appropriate shaker or screening apparatus. The basket 42 is mounted on springs 44 (only two shown; two as shown
15 are on the opposite side) which are supported from a frame 46. The basket 42 is vibrated by a motor 43 and interconnected vibrating apparatus 48 which is mounted on the basket 42 for vibrating the basket and the screens. Elevator apparatus 45 provides for raising and lowering
20 of the basket end. It is also within the scope of this invention to use flat-topped wire cloth as a lower support for a screen assembly with undulating screening material instead of (or in addition to) known lower apertured or perforated plates, support frames or other
25 lower support strips or members, including, but not limited to, a screen assembly with the flat-topped wire cloth instead of or in addition to the plate, frame etc..

 Fig. 4 shows schematically a screen 50 according to the present invention with screening material 52 (which
30 may be one, two, three or more layers of screening material, optionally bonded and/or glued and/or sintered together) on a lower flat-top wire screen material or wire cloth support 54 (e.g. but not limited to wire cloth as shown in U.S. Patent 1,814,598 or flat top screen
35 material as commercially available from Universal Wire

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Cloth of Morrisville, PA).

Fig. 5 shows a screen 50 with an optional support 56 (shown schematically) below the flat-top wire cloth 54. The item 56 represents any known lower support for a
5 screen, including, but not limited to an apertured plate, perforated plate, series of strips or straps, and/or strip support member.

Fig. 6 shows a different type of screening material 60 which can be used in place of or in addition to the
10 screening material 16 or 52.

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Claims:

1. A screen (10) for a vibratory separator which screen comprises screening material (16) and a support (12) comprising a plurality of wires (14) arranged in criss-cross configuration to define a plurality of holes therethrough, the arrangement being such that said screening material (16) is supported substantially along the entire length of the plurality of wires (14) forming said support (12), characterised in that at intersections of the plurality of wires, only one wire is deformed to accommodate another wire.
2. A screen as claimed in Claim 1, wherein said screening material (16) and said support (12) are undulating.
3. A screen as claimed in Claim 1, wherein said support (12) and said screening material (16) are substantially flat.
4. A screen as claimed in Claim 1, 2, or 3, wherein said screening material (16) is bonded to said support (12).
5. A screen as claimed in any of Claims 1 to 4, wherein said screening material (16) is bonded to said support (12) in points or lines across the screening area of said screen.
6. A screen as claimed in any of Claims 1 to 5, wherein said support (12) is held under tension.
7. A screen as claimed Claim 6, wherein said screening material (16) is held under tension and the tension of said support (12) is substantially the same as the tension of the screening material (16).
8. A screen as claimed in any preceding Claim, wherein said support (12) comprises flat top screening cloth.
9. A screen as claimed in any preceding Claim, wherein the screen has two pairs of opposed spaced-apart sides and each side of one pair of sides comprises a respective

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side member.

10. A screen as claimed in Claim 9, wherein said side member comprises a hookstrip (20; 22; 24).

11. A screen as claimed in Claim 10, wherein said
5 hookstrip (20; 24) is formed on said support (12).

12. A screen as claimed in Claim 10 or 11, wherein said side member or said hookstrip (20; 22; 24) is connected to the screening material (16) and the support (12).

13. A screen as claimed in 9, 10, 11, or 12, wherein
10 said side member or said hookstrip (20; 22; 24) is made from at least one of metal, plastic, aluminium, steel, cured glue, rubber, PTFE, and/or seal material.

14. A screen as claimed in any preceding Claim, wherein each of said plurality of wires (14) is substantially
15 circular in cross section.

15. A screen as claimed in Claim 14, wherein said wire has a diameter between 0.95mm and 4.11mm.

16. A screen as claimed in any preceding Claim, wherein the separation between the plurality of wires (14) is
20 29.51mm.

17. A screen as claimed in any preceding Claim, further comprising a plurality of layers (13, 15) of screening material (16).

18. A screen as claimed in Claim 17, wherein said
25 plurality of layers (13, 15) of screening material (16) comprise screening material (16) of differing mesh sizes.

19. A screen as claimed in any preceding Claim, wherein said screen is supported by or mounted on a frame, a perforated panel or a perforated plate.

30 20. A vibratory separator comprising a screen as claimed in any preceding Claim.

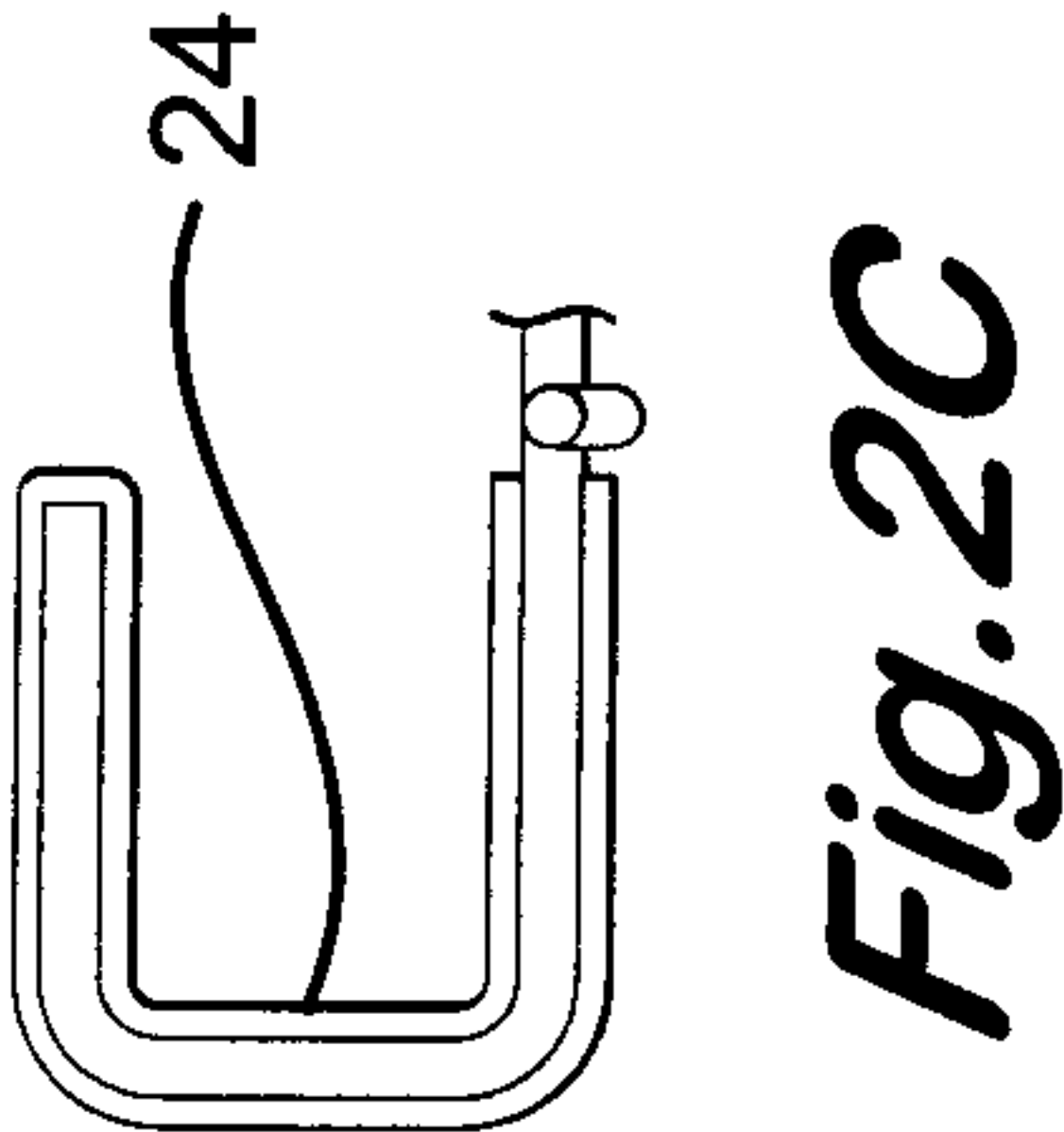
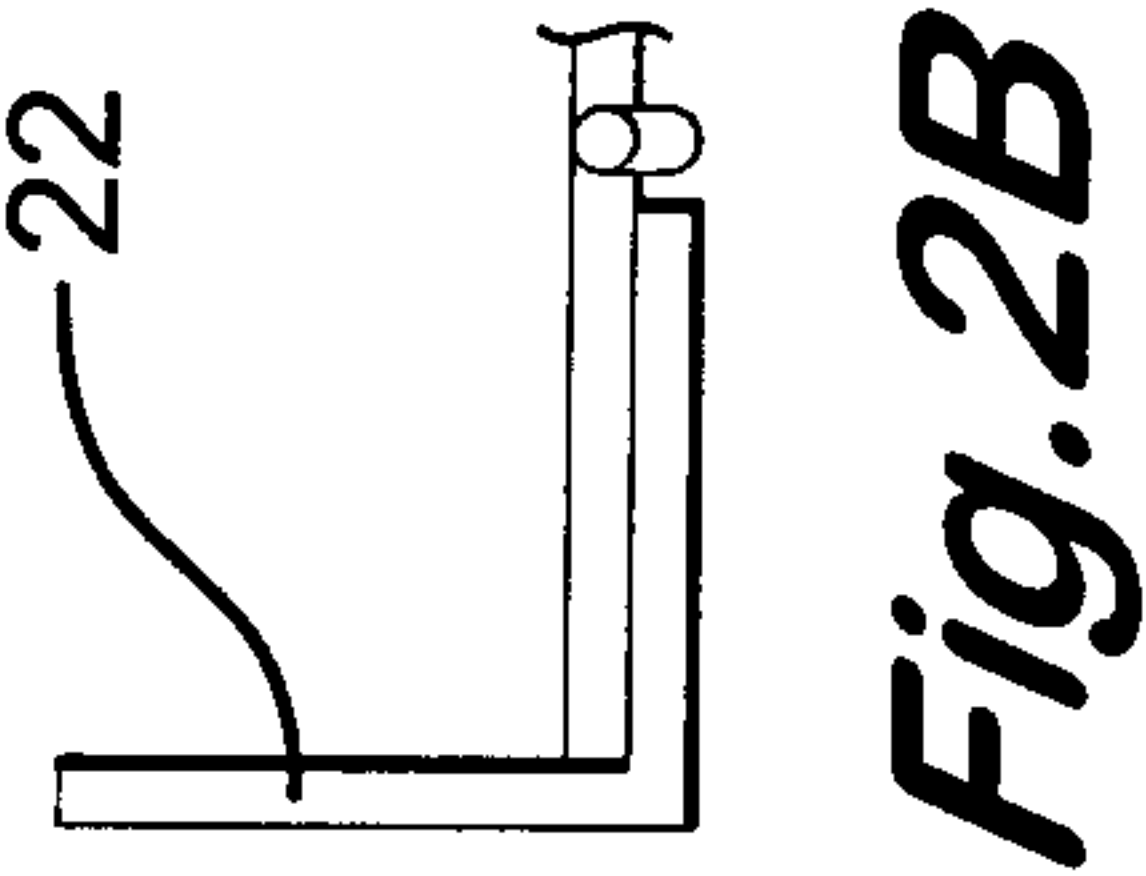
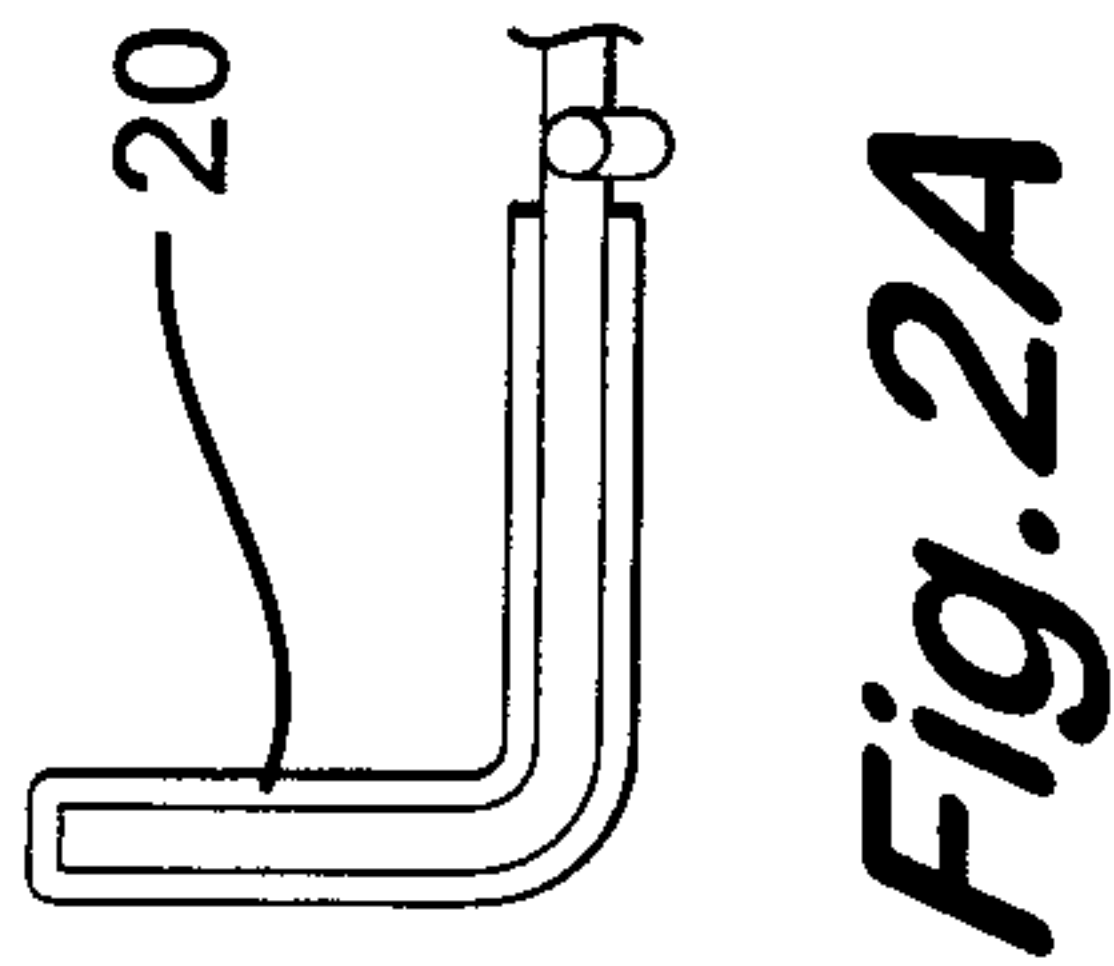
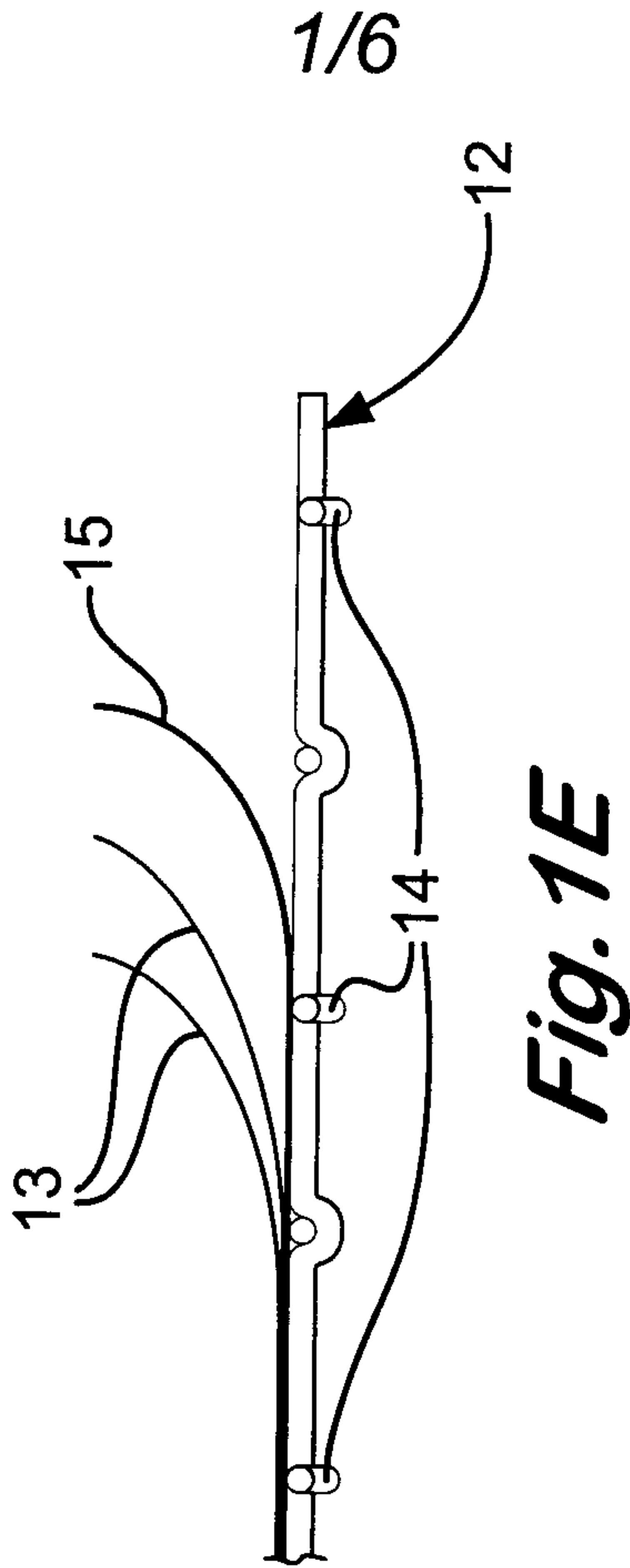
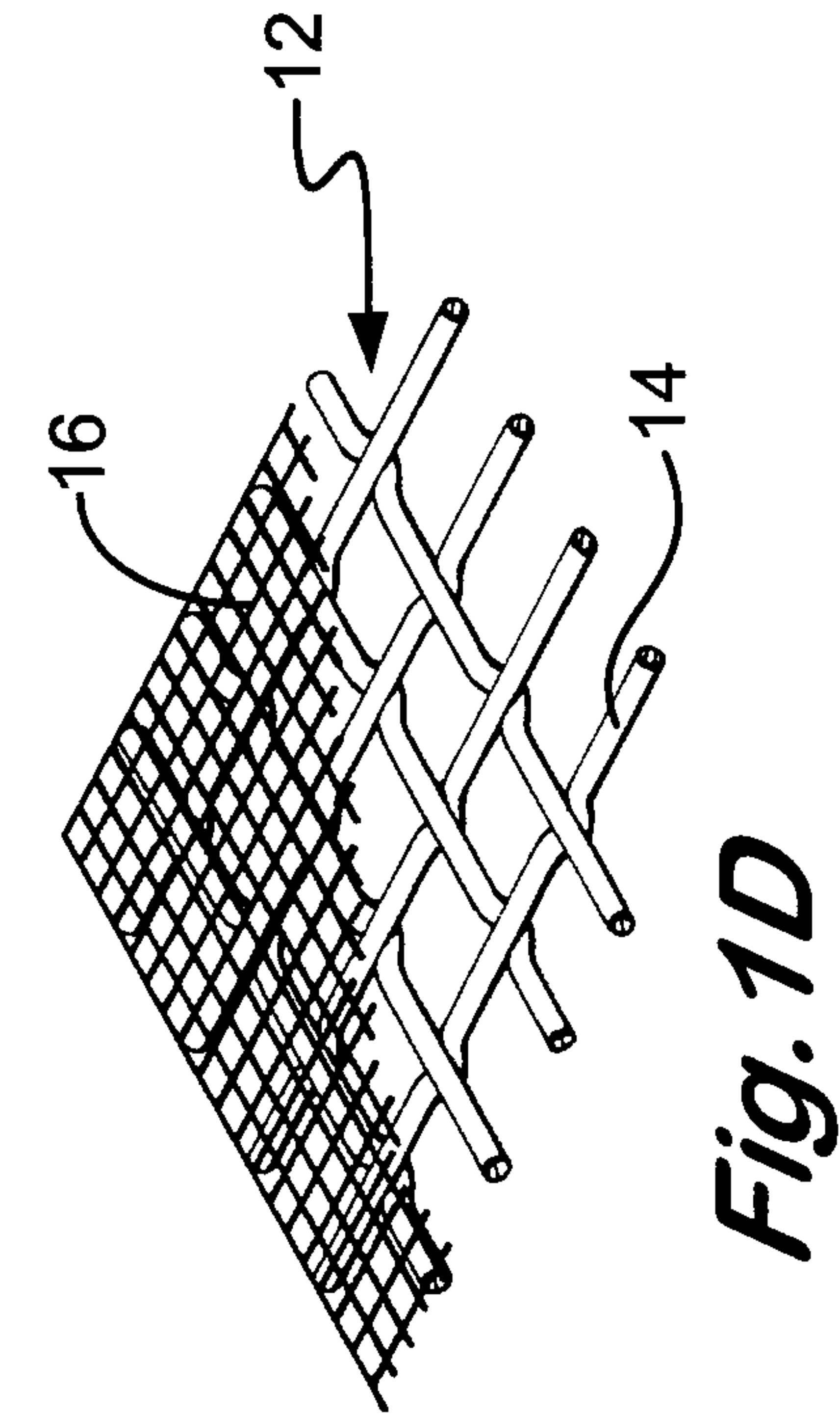
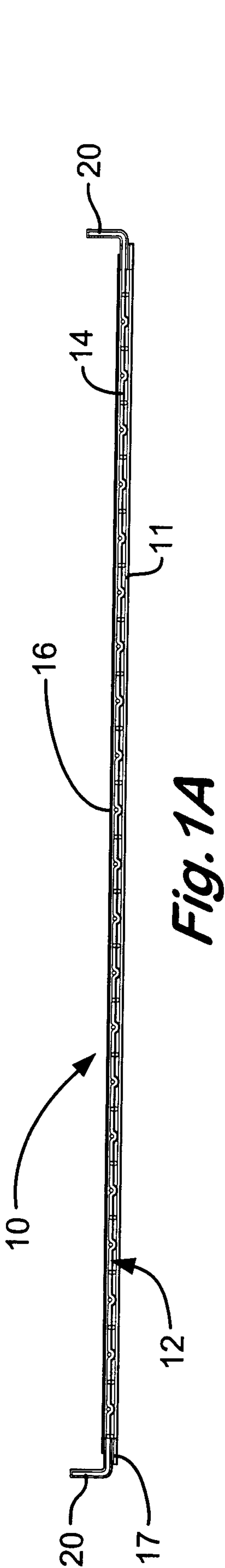
21. A method of screening material with a vibratory separator, which method comprises the steps of:

35 supplying material to a vibratory separator, and screening said material with a screen as claimed in

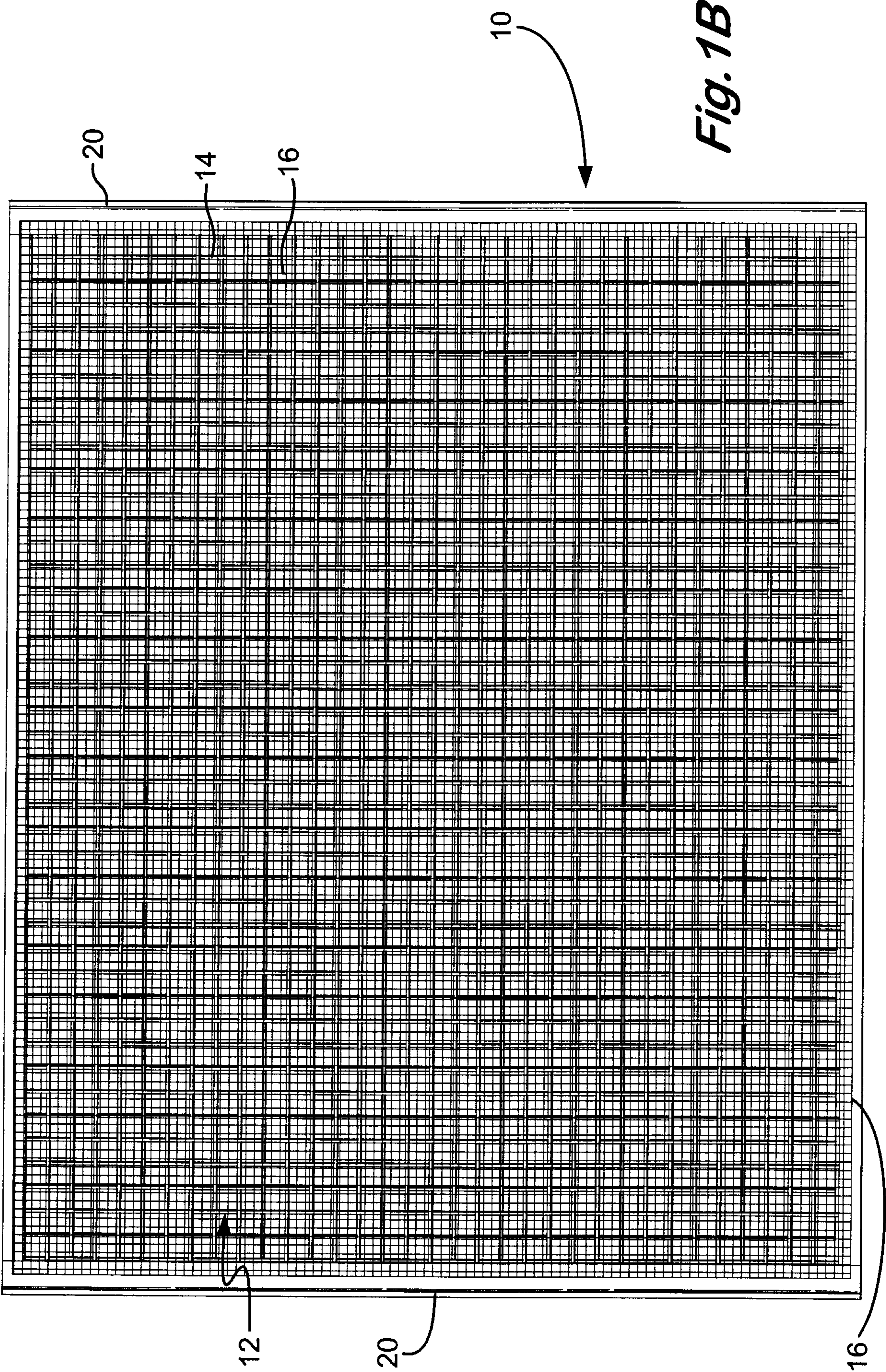
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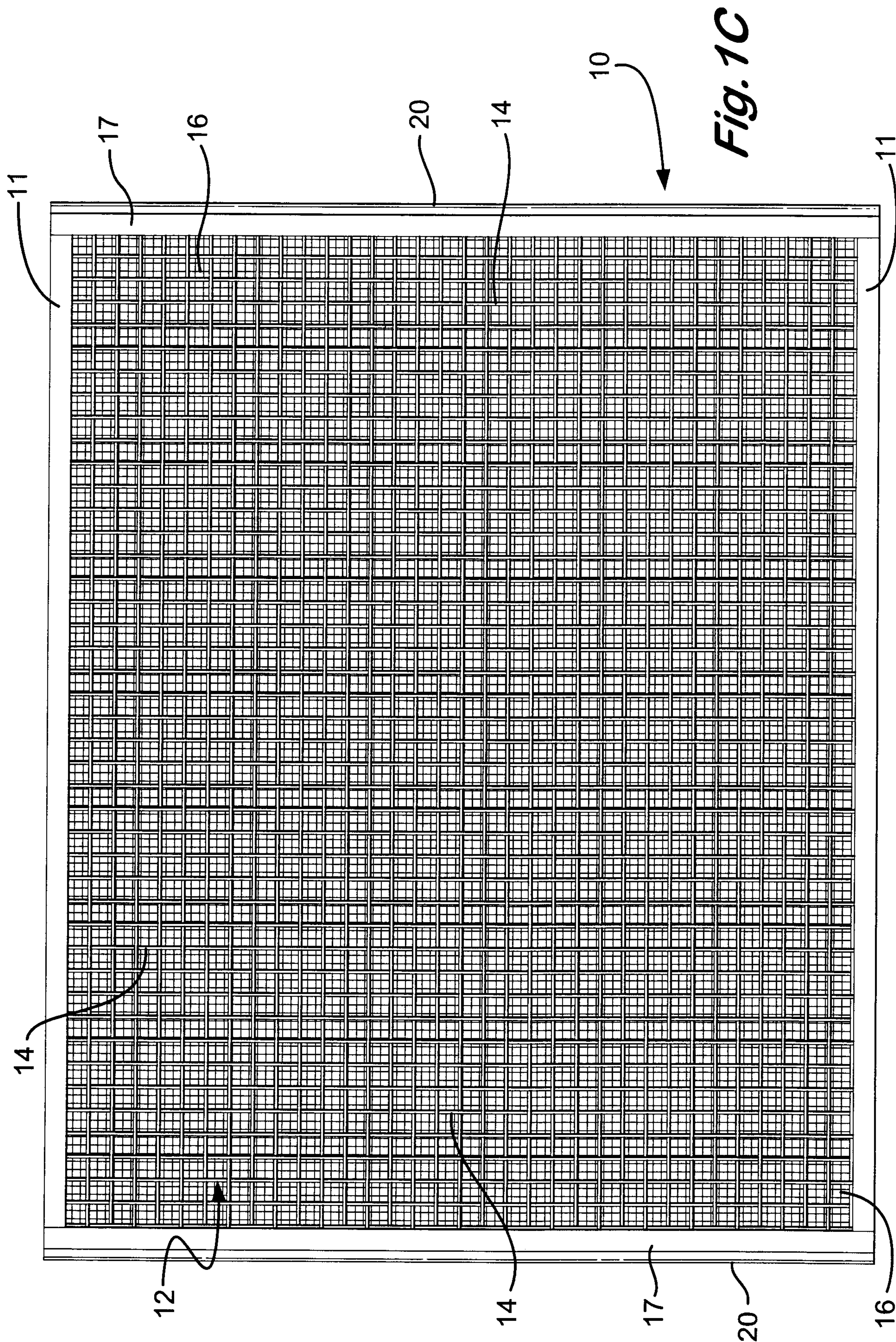
any of Claims 1 to 19.

22. A screen for a vibratory separator which screen
comprises screening material (16) and a support (12), the
arrangement being such that, in use, said support (12)
5 contacts and supports said screening material (16),
characterised in that said support (12) comprises flat
top screening cloth.



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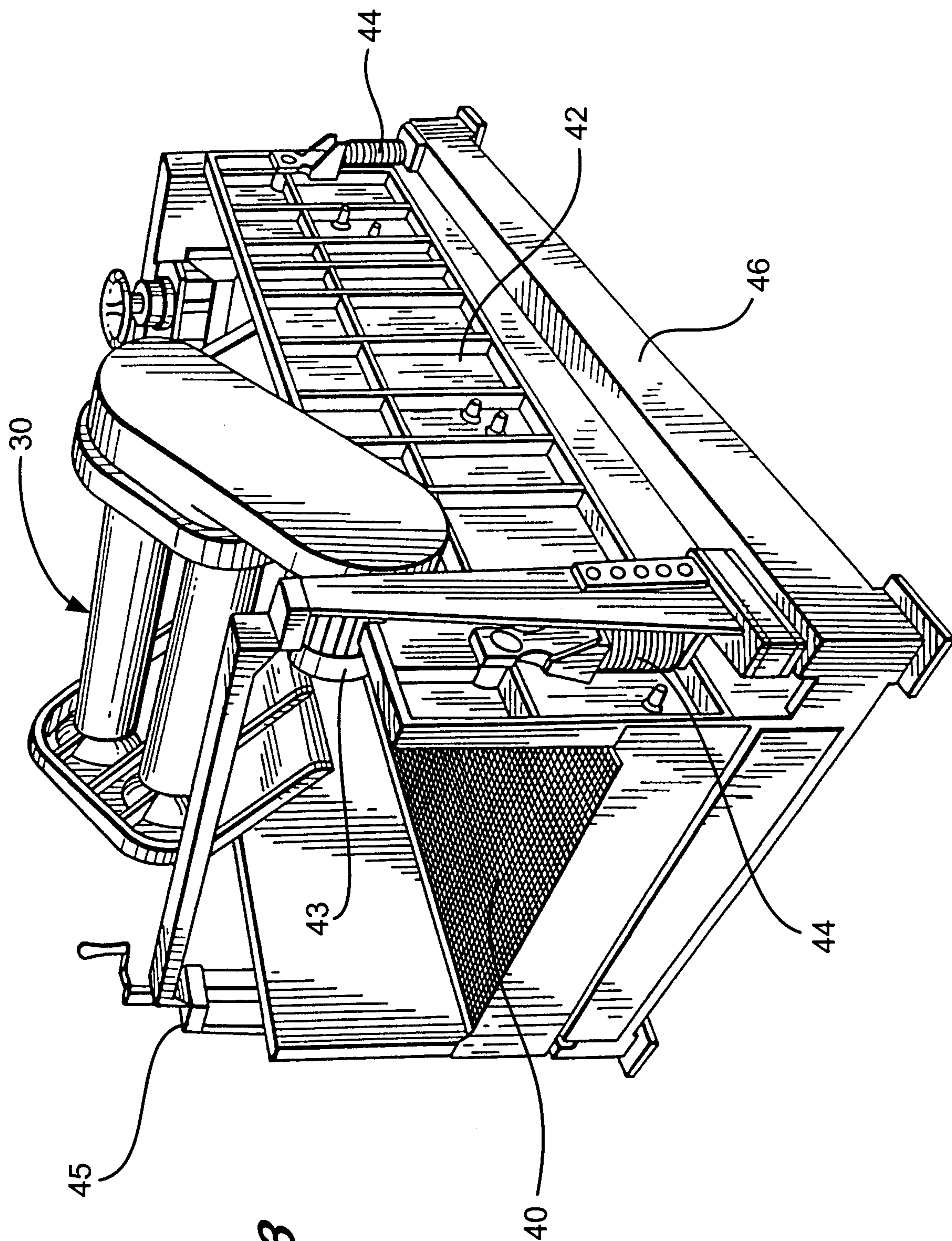


Fig. 3

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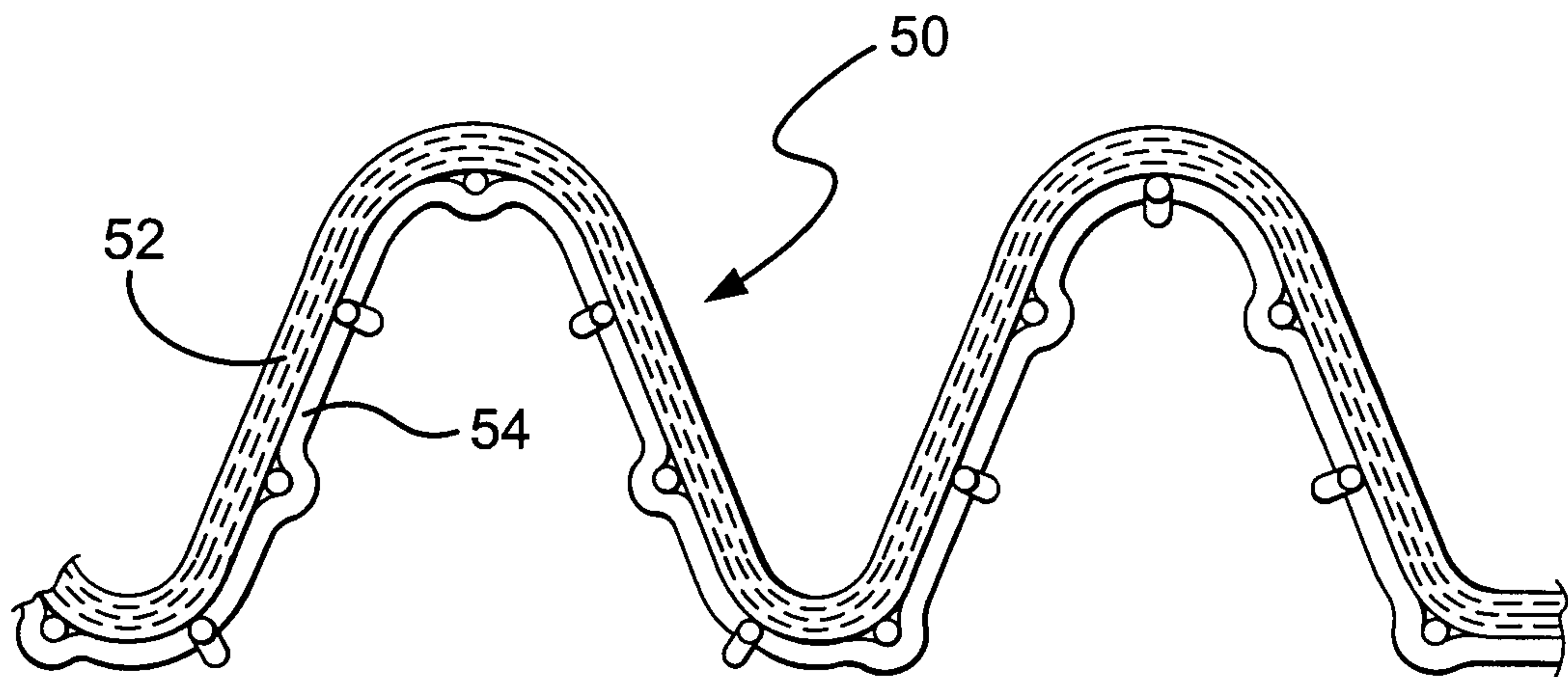


Fig. 4

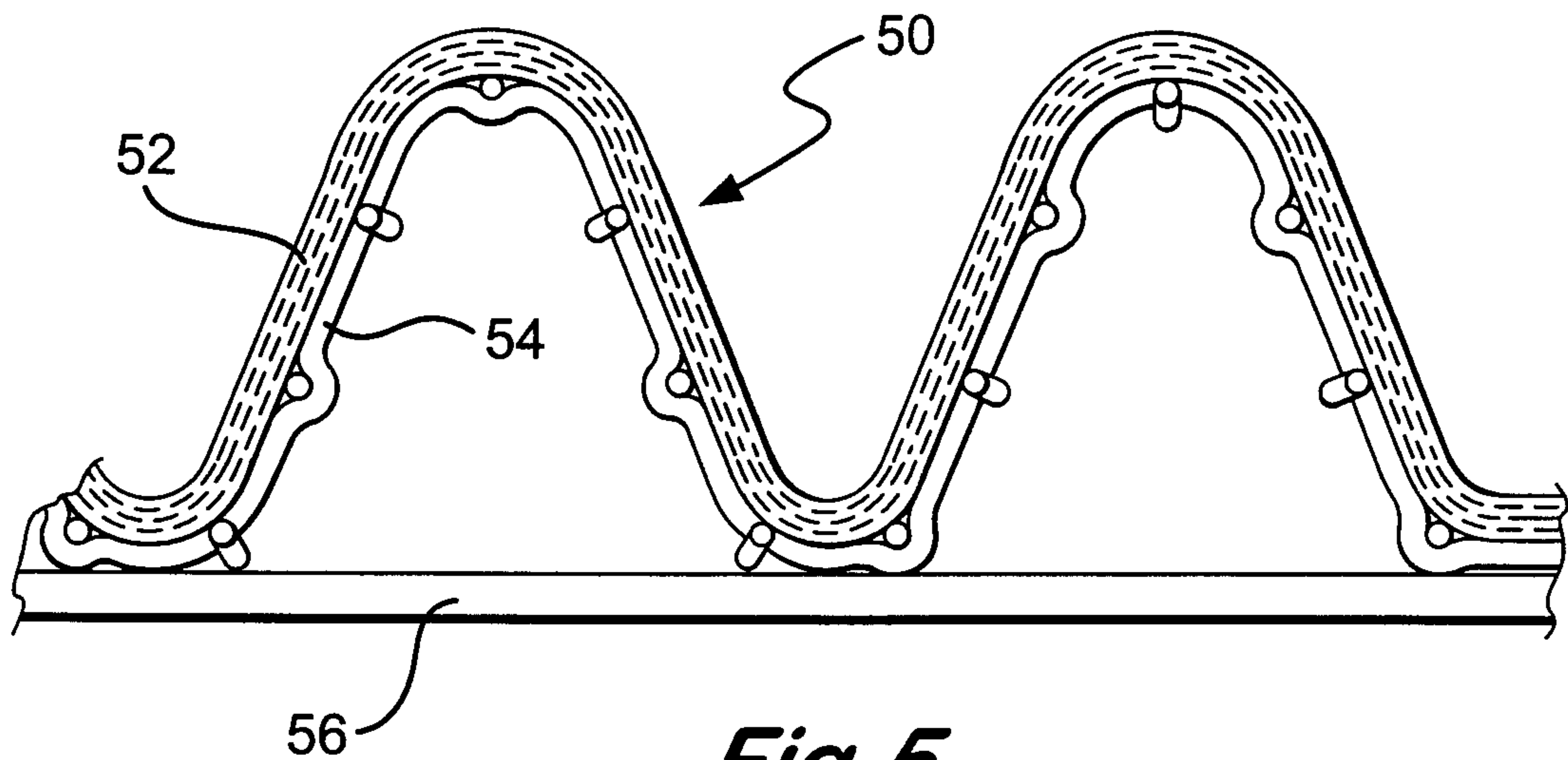


Fig. 5

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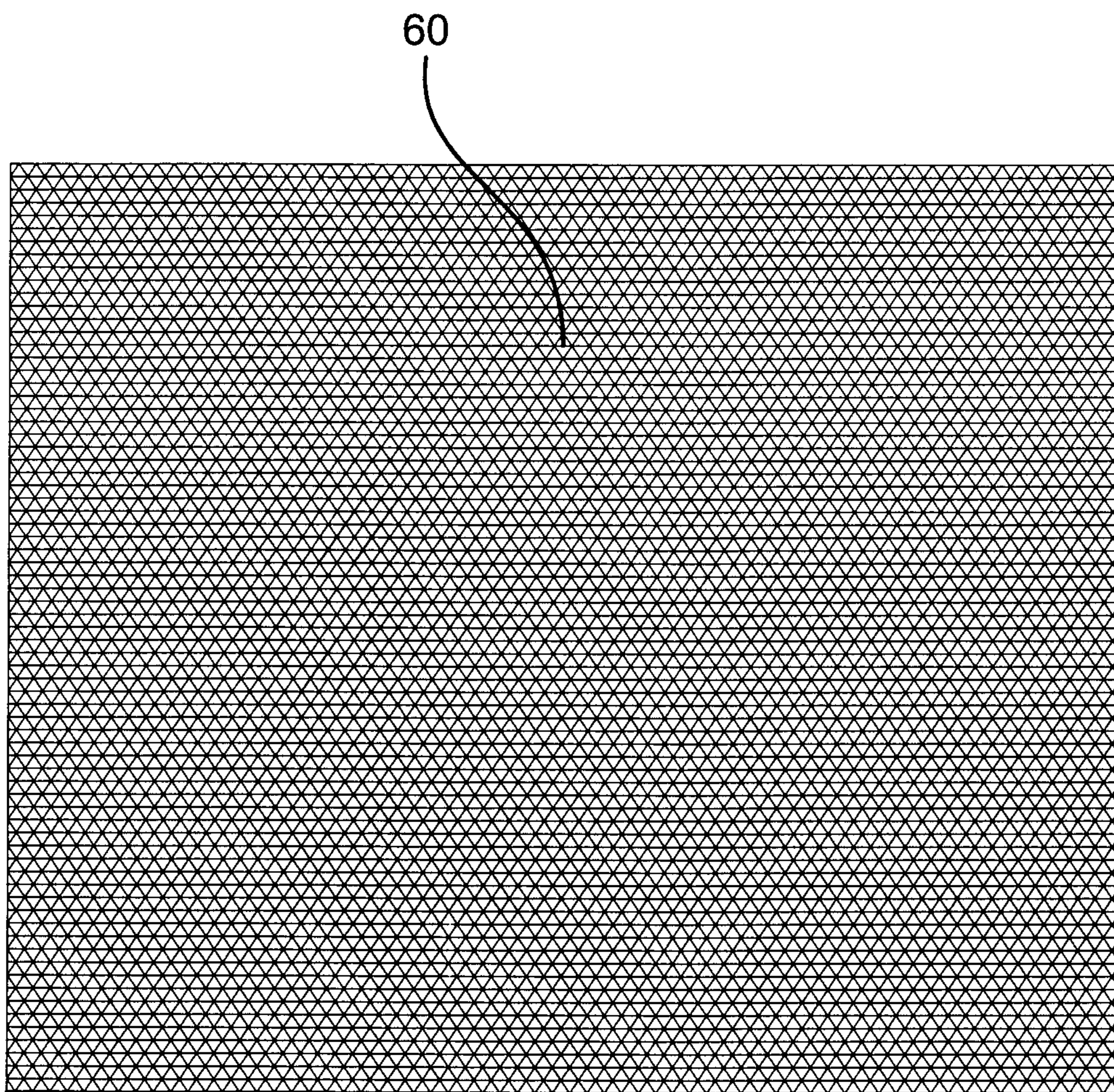


Fig. 6

