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EUROPEAN PATENT APPLICATION

②① Application number: **86304423.6**

⑤① Int. Cl.: **B 07 B 1/48**

②② Date of filing: **10.06.86**

③① Priority: **13.06.85 GB 8514982**
13.06.85 GB 8514983

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④③ Date of publication of application: **15.04.87**
Bulletin 87/16

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⑧④ Designated Contracting States: **FR IT NL**

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⑤④ **Improved screen clamp.**

⑤⑦ A basket (101) of vibratory screening apparatus comprises inflatable means (103) positioned to overlie a part of a screen member (105, 107) mounted in the basket. Inflation of the inflatable means (103) causes it to press against a screen frame (107) of the screen member, clamping it against a support (109, 129) of the basket (101).

The inflatable means (103) may be deflatable and a reservoir (119) may be provided for vented inflation fluid.

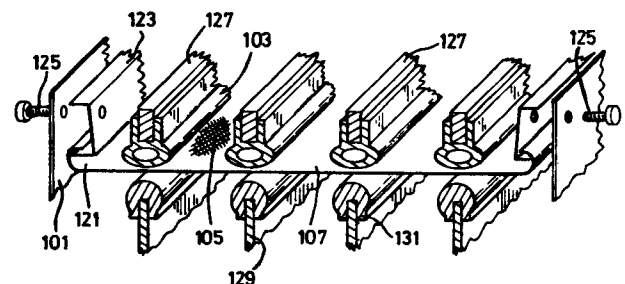
The screen member may be pre- or post-tensioned.

The basket (101) may comprise supports (129) and inflatable means (103) positioned to press against parts of the screen member remote from its periphery.

In another arrangement a clamping device for a screen member in vibratory screening apparatus comprises a frame member (1) on which is mounted an inflatable stocking (7). In use, the clamping device is inserted into the basket (21) of the screening apparatus so as to overlie the screen member, and the inflatable stocking (7) is expanded so as to press the screen member against a portion (17, 19, 31) of the basket (21) while the clamping device reacts against a further portion (17, 19, 33) of the basket (21). This pressure from the stocking (7) holds the screen member in place.

The screen member may have a screen (13) mounted in a frame (15) and the stocking (7) presses against this screen frame (15).

The stocking (7) may press against the periphery of the screen member only or may press against other parts of the screen member as well.



Title: Improved screen clamp

Field of Invention

This invention concerns the mounting of screens in vibratory apparatus such as is used for the sifting of mud
5 and the like materials derived from oil-well drilling.

Background to the invention

It is known to mount a screen in a frame and mount the latter in a basket mounted within a machine housing adapted to be oscillated or otherwise vibrated as by a cam
10 drive mechanism.

For servicing and replacement it is desirable to be able to remove the screen and its associated frame where provided, from the machine, and to this end the latter is adapted to be slid into and out of the basket and clamping
15 means is provided to hold the frame and screen in position. Clearly it is desirable that the clamping shall be effected as quickly as possible to reduce down time.

It is known to make the frame for the screen inflatable, in order to provide a means for tensioning the screen
20 within the vibratory apparatus. In EP-A-0130744 there is proposed a screen having an inflatable screen frame which on inflation both tensions the screen and clamps it in position in the screening device. However, this arrangement is of limited application. Since the
25 inflation of the screen frame both clamps the screen in position and tensions it, the arrangement cannot be used

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with screens which are to be tensioned in some other manner such as by a tensioning clip or screw on the basket of the vibratory apparatus or which are pretensioned within a rigid frame. Additionally, since the same act of inflation both clamps the screen and tensions it, the clamping force and the tensioning force cannot be controlled independently. Finally, it is necessary for each screen to be associated with its own respective clamping arrangement, since this is incorporated in the screen frame, even when the screen is not mounted within a vibratory screening apparatus, and thus it is necessary to fabricate as many inflatable frames as there are screens.

It is also known to mount a screen in a frame and mount the latter in a basket mounted within a machine housing adapted to be oscillated or otherwise vibrated as by a cam drive mechanism.

It is therefore an object of the present invention to provide an improved clamping mechanism.

Summary of the invention.

In accordance with a first aspect of the present invention there is provided a clamping device for a screen member in vibratory screening apparatus, the device comprising a frame member and inflatable means on the frame member, whereby the device can be inserted into said apparatus to overlie at least a part of a screen member and the inflatable means can be inflated to press against a part of the screen member so as to clamp the screen member in position in the apparatus.

In accordance with a second aspect of the present

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invention there is provided a method of clamping a screen member in vibratory screening apparatus in which a clamping device comprising a frame member and inflatable means on the frame member is inserted into the apparatus to overlies at least a part of the screen member and the inflatable means is inflated to press against a part of the screen member so as to clamp the screen member in position in the apparatus.

The clamping device may be arranged to be inserted either above or below the screen member.

Preferably the inflatable means comprises at least one inflatable member located around the periphery of the frame member. The inflatable means may also comprise a portion located within the area defined by the frame member and spaced from its periphery. Preferably the inflatable member overlies at least part of the edge region of the screen member.

The screen member may or may not include a screen frame in which the actual screen is located. However, in normal use a screen member comprising a screen in a frame will be used and the clamping device and the screen member are designed or selected relative to each other so that the inflatable means of the clamping device presses against the screen frame and not the screen itself.

Normally the screen member and the clamping device will be mounted in a basket of the vibratory screening apparatus and the inflatable means will press the screen member against part of the basket.

Hereinafter the frame member of the clamping device will

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be referred to as an intermediate frame member, for distinction over the screen frame.

The screen may be insertable into the apparatus untensioned, and may be tensioned subsequently (post-tensioning) against the body of the vibratory apparatus. Alternatively if the screen is located in a frame, the screen may be tensioned against the screen frame, and this may take the form of pre-tensioning the screen against the screen frame before insertion into the vibratory apparatus. Embodiments of the present invention may be used with pre-tensioned screens or post-tensioned screens. Our earlier applications GB-A-2161715 and GB-A-2162091 disclose permanently pre-tensioned screens with which embodiments of the present invention may be used.

Preferably means is provided to enable the inflated member to be deflated to enable the screen and if desired also the intermediate frame member to be withdrawn for servicing or replacement.

The inflatable member may for example be in the form of an elastomeric stocking which is secured to edge regions of the intermediate frame member so that when inflated and enlarged the increased cross-section of the stocking squeezes firmly against one surface of the screen or the frame surrounding the screen and clamps it securely in position against the peripheral regions of the supporting structure. In this way the screen and/or its bounding frame is/are sandwiched between the basket on the one hand and the intermediate frame member on the other.

Conveniently the stocking extends around at least three sides of the intermediate frame member and preferably also

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the fourth side.

The means for inflating the stocking or other device may be mounted on and form an integral part of the overall apparatus or a pressurized fluid or an airline connection
5 may be provided on the stocking or on its associated intermediate frame member to enable the stocking to be inflated from a separate air supply or hydraulic fluid supply.

Whichever arrangement is used there is preferably also
10 provided a venting device by which the pressure in the stocking can be relieved. Where the inflating fluid is a hydraulic oil or other liquid the venting device preferably communicates with a reservoir of the liquid so that as the latter is exhausted from the stocking the oil
15 can be returned to a common reservoir and is thereby saved.

In accordance with a third aspect of the present invention there is provided vibratory screening apparatus in which a screen member may be mounted, the apparatus having
20 inflatable means located within it to overlies at least a part of a screen member mounted in the apparatus so that inflation of the inflatable means clamps the screen member in place.

In accordance with a fourth aspect of the present
25 invention there is provided a method of clamping a screen member in place in a vibratory screening apparatus, the apparatus comprising inflatable means located within it to overlies at least a part of a screen member mounted in the apparatus, in which the inflatable means is inflated when

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the screen member is in place so as to clamp the screen member.

The inflatable means may comprise one or more inflatable members.

- 5 Preferably the inflatable means overlies at least a part of the edge region of the screen member.

The screen member may or may not include a screen frame in which the actual screen is located. However, in normal use a screen member comprising a screen in a frame will be
10 used and the screen member designed or selected so that the inflatable means of the vibratory screening apparatus acts on the screen frame and not on the screen itself.

Normally, the inflatable means will be located within a basket of the vibratory screening apparatus in which
15 basket the screen member may be mounted.

The screen may be inserted into the apparatus untensioned, and be tensioned subsequently (post-tensioning) against the body of the vibratory apparatus. Alternatively, if the screen is located in a frame, the screen may be
20 tensioned against the screen frame, and this may take the form of pre-tensioning the screen against the screen frame before insertion into the vibratory apparatus.

Embodiments of the present invention may be used with pre-tensioned screens or post-tensioned screens. Our earlier
25 applications GB-A-2161715 and GB-A-2162091 disclose permanently pre-tensioned screens with which embodiments of the present invention may be used.

Preferably means is provided to enable the inflated member

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to be deflated to enable the screen member to be withdrawn for servicing or replacement.

The inflatable member may for example be in the form of an elastomeric stocking which is secured to edge regions of the screen member supporting structure of the vibratory apparatus so as to overlie the peripheral region of the screen member. When it is inflated and enlarged the increased cross-section of the stocking pushes firmly against the upper (or lower) surface of the frame and screen and clamps it securely in position against the underside (or topside) supporting structure.

Conveniently the stocking extends around at least three sides of the frame and preferably also the fourth side.

Means for inflating the stocking or other device may be mounted on and form an integral part of the overall apparatus or a pressurized fluid or airline connection may be provided on the stocking or connected to the stocking so as to enable the latter to be inflated from a separate air supply or hydraulic fluid supply.

Whichever arrangement is used there is preferably also provided a venting device by which the pressure in the stocking can be relieved. Where the inflating fluid is a hydraulic oil or other liquid the venting device preferably communicates with a reservoir of the liquid so that as the latter is exhausted from the stocking the oil can be returned to a common reservoir and is thereby saved.

Embodiments of the present invention, given by way of non-limitative example, will now be described with reference

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to the accompanying drawings, in which:

Brief Description of the Drawings

Figure 1 is a schematic view of a first embodiment of the present invention;

- 5 Figure 2 is a schematic sectional view showing the embodiment of Figure 1 and a screen member mounted in a basket of vibratory apparatus;

Figure 3 is a schematic view of a second embodiment of the present invention;

- 10 Figure 4 is a schematic sectional view of the embodiment of Figure 3 and a screen member mounted in a basket of vibratory apparatus;

Figure 5 is a schematic view of a third embodiment of the present invention;

- 15 Figure 6 is a schematic sectional view of the embodiment of Figure 5 and a screen member mounted in a basket of vibratory apparatus;

Figure 7 is a schematic sectional view of a fourth embodiment of the present invention;

- 20 Figure 8 is a schematic sectional view of a fifth embodiment of the present invention;

Figure 9 is an end view of another form of inflatable hose, and

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Figure 10 is an end view of a screen assembly utilising different hose types.

Detailed Description of the Embodiments

- In Figures 1 and 2 a clamping device has an intermediate frame member 1 comprising an L-section portion 3 extending around three sides of a rectangle to form a U-shape, and a strut 5 across the mouth of the U to provide strength and rigidity. The frame member 1 is made of a relatively strong and rigid material such as steel.
- 10 The L-section 3 carries an inflatable tube or stocking 7 on its upper surface. One end of the stocking 7 is extended to provide a supply line 9 by means of which inflation fluid may be introduced as indicated by arrow 11.
- 15 In use, the clamping device of Figure 1 is inserted together with a screen member, comprising a screen 13 mounted in a screen frame 15, between two lateral projections 17, 19 of a basket 21 of a vibratory screening machine. As is shown in Figure 2, the screen member and the clamping device are arranged so that the screen frame 15 is opposed to the upper projection 17 of the basket and the L-section of the clamping device is opposed to the lower lateral projection 19 of the basket, with the inflatable stocking between the L-section 3 and the screen frame 15. For reasons of clarity, the vertical spacing of members has been exaggerated in Figure 2 (and also in Figures 4 and 6).

Inflation of the stocking 7 causes it to expand, so that it presses the screen frame 15 tightly against the upper

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projection 17 of the basket 21. The clamping device is prevented from moving downwardly away from the screen member by reaction between the L-section portion 3 and the lower projection 19 of the basket 21. In this manner, the
5 screen member comprising the screen 13 and the screen frame 15 is clamped in position in the basket 21.

In order to provide the said inflation of the stocking 7, pressurised fluid such as air or hydraulic fluid is provided through the supply line 9 as indicated by arrow
10 11. As shown in Figure 1, the supply line 9 also has a branch 23 leading to a pressure relief valve 25. Valve 25 is kept normally closed, and may be opened to allow deflation of the stocking 7. Deflation of the stocking 7 releases the clamping action on the screen frame 15, so
15 that the screen member can be removed from the basket 21 for cleaning, replacement etc.

It may be desirable, especially when the inflation fluid for the stocking 7 is not compressed air, for inflation fluid exhausted through the valve 25 to be recovered. For
20 this purpose, the branch 23 in the supply line may be extended beyond the valve 25 to a reservoir, indicated schematically in Figure 1 at 27, where exhausted fluid may be collected.

Figure 3 shows an alternative embodiment of the clamping
25 device of the present invention. In this embodiment, the intermediate frame member 1 is formed from a semi-circular section member 29, which again may be of steel. The inflatable stocking 7 lies within the concavity of the semi-circular section.

30 In Figure 3, the semi-circular sectioned portion 29 and

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the stocking 7 extend around three sides of a rectangle,
as did the L-section portion 3 and the stocking 7 in
Figure 1. However, in addition the semi-circular section
portion 29 and the stocking 7 have two longitudinal
5 portions extending across the rectangle thus defined.

The pressurised fluid supply line 9 extends along the
fourth side of the rectangle and is connected to the
stocking 7 at the ends of the adjacent two sides of the
rectangle and the ends of the two portions extending
10 across the rectangle. Preferably, the supply line 9 is
relatively rigid or is supported on a relatively rigid
member at least where it forms the fourth side of the
rectangle so as to increase the strength and rigidity of
the clamping device as a whole.

15 As shown in Figure 4, the clamping device of Figure 3 is
intended to be used with a basket 21 which provides
clamping support members 31, 33 for the screen member at
intermediate positions across the width of the screen
member. Although the screen 13 of the screen member may
20 extend across the positions of these intermediate support
members 31, 33, it is preferred that the screen frame 15
divides the screen 13 into separate regions, and portions
of the screen frame 15 are provided in the positions
opposed to the supporting members 31, 33.

25 In use, the clamping device of Figure 3 rests on the lower
support members 33 of the basket 21, and the screen member
is positioned between the stocking 7 of the clamping
member and the upper support members 31. Preferably, the
lower ends of the upper support members 31, which will
30 contact the screen member directly, are of a resilient
material such as rubber.

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The clamping device of Figure 3 is used in a manner similar to the clamping device of Figure 1. The stocking 7 may be inflated to press the screen member against the upper support members 31, and the clamping device is
5 itself supported by the lower support members 33.

Figure 5 shows a third embodiment of the clamping device of the present invention. In this embodiment the intermediate frame member 1 comprises an E-shape formed from flat strip portions 35. The stocking 7 is bonded to
10 the strip 35. The fluid supply line 9 is not shown in Figure 5 but may be provided in a manner similar to that of Figure 3.

As is shown in Figure 6, the basket 21 provides upper and lower lateral projections 17, 19 by means of which
15 expansion of the inflatable stocking 7 clamps the screen member to the basket 21. Additionally, the basket 21 has upper and lower support members 31, 33 in a manner similar to the arrangement of Figure 4, midway between the two sides of the screen member, and the screen member has a
20 portion of the screen frame 15 at this point, so that the middle arm of the E-shaped clamping device clamps the central portion of the screen member between the upper and lower support members 31, 33 of the basket 21.

Figure 7 shows a basket 101 of vibratory screening
25 apparatus in which is located an expansible elastomeric member 103. A removable screen member comprising a screen 105 and a screen frame 107 is mounted within the basket 101 and supported by lateral projections 109 of the basket.

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The lateral projections 109 support the screen member immediately below the elastomeric member 103. The elastomeric member is secured to the basket at its upper side, so that inflation of the elastomeric member causes
5 it to expand downwardly and press the screen member against the lateral projections 109 so as to hold the screen member firmly in place in the basket 101. The vertical spacing between members has been exaggerated in Figure 7 (and also in Figure 8) for clarity.

10 The elastomeric member 103 extends around the periphery only of the area defined by the basket 101. The screen frame 107 forms the periphery of the screen member, and when the elastomeric member 103 is inflated it presses against the screen frame 107 only, and does not contact
15 the screen 105.

A supply line 111 is provided in order to convey pressurised air, hydraulic oil or other suitable medium, to the elastomeric member 103, as indicated by the arrow 113, in order to inflate it. The supply line 111 has a
20 branch 115 leading to a pressure relief valve 117, whereby the inflation pressure in the inflatable member may be relieved and the member may be deflated. This releases the clamping effect on the screen member, so that it may be removed for replacement or cleaning.

25 When the inflation medium for the elastomeric member 103 is not air, it may be desirable to collect it as it is exhausted from the member 103 through the valve 117. Accordingly, the branch line 115 is shown in Figure 7 to extend beyond the valve 117 to a reservoir 119 where
30 vented inflation fluid may be collected.

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Typically, the embodiment of Figure 7 will be used with screens which are pre-tensioned against their screen frames.

Figure 8 shows another embodiment of the present invention being used with a screen member in which the screen is tensioned after insertion into the basket. At the periphery of the screen member, the screen frame 107 terminates in a turned back edge to form a hook strip 121. A tension rail 123 is attached to the side wall of the basket 101 by a tension bolt 125. The hook strip 121 is hooked around a part of the tension rail 123 when the screen member is inserted into the basket, and tightening of the tension bolt 125 moves the tension rail outwardly towards the side wall 101 of the basket so as to tension the screen member.

In this embodiment, the basket 101 also has steel support members 127, 129 extending across the screen member. Normally, the screen member will be selected so that portions of the screen frame 107 are opposed to these support members 127, 129, with strips of screen 105 in between.

The lower support members 125 terminate in solid rubber end pieces 131. The upper support members 127 terminate in hollow rubber end pieces which form inflatable members 103.

In order to clamp the screen member in position, the inflatable members 103 are inflated. On inflation, the members 103 expand and press the screen member downwardly against the rubber end pieces 131. In this way, the screen member is held securely between the upper and lower

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supports 127, 129 of the basket 121.

It should be noted that in Figure 8, the inflatable members 103 do not only extend alongside the walls of the basket 101 but also extend across the area defined by those walls in positions spaced therefrom.

Figure 9 shows a preferred hose design in which a flattened hose 132 is attached along a central linear region of its upper surface to the underside of a support member 134 and is held in place by a ring or the like 136. The latter may be elastic. The resilience of the ring 136 may help to deflate and flatten the hose 132 when the inflation fluid is vented.

Figure 10 shows how a combination of two different types of expansible hose can be used to secure a screen in place. The generally square section hoses 138, 140 serve to grip the opposed edge regions of the screen frame and the intermediate hoses 142, 144 are positioned across the width of the screen to engage stiffening ribs or other strengthening means 146, which may be parts of the screen frame 107, located at intervals across the screen.

Claims

1. A clamping device for a screen member in vibratory screening apparatus, the device comprising a frame member and inflatable means on the frame member, whereby the
5 device can be inserted into said apparatus to overlies at least a part of a screen member and the inflatable means can be inflated to press against a part of the screen member so as to clamp the screen member in position in the apparatus.
- 10 2. Vibratory screening apparatus in which a screen member may be mounted, characterised in that it comprises inflatable means located within it to overlies at least a part of a screen member mounted in the apparatus so that inflation of the inflatable means clamps the screen member
15 in place.
3. Vibratory screening apparatus according to claim 2 which comprises support members for the screen member positioned in opposed pairs above and below the position of a screen member mounted in the apparatus, at least one
20 of each said pair bearing an inflatable member of the said inflatable means.
4. A method of clamping a screen member in vibratory screening apparatus in which a clamping device comprising a frame member and inflatable means on the frame member is
25 inserted into the apparatus to overlies at least a part of the screen member and the inflatable means is inflated to

press against a part of the screen member so as to clamp the screen member in position in the apparatus.

5. A method of clamping a screen member in place in a vibratory screening apparatus, the apparatus comprising
5 inflatable means located within it to overlie at least a part of a screen member mounted in the apparatus, in which the inflatable means is inflated when the screen member is in place so as to clamp the screen member.

6. A method of according to claim 4 or claim 5 in which
10 the screen member comprises a screen located in a screen frame, and the inflatable means, when inflated in use, presses against the screen frame.

7. A device according to claim 1, apparatus according to claim 2 or claim 3 or a method according to any of claims
15 4 to 6 in which the inflatable means, when inflated in use, presses against a portion of the screen member spaced from its periphery.

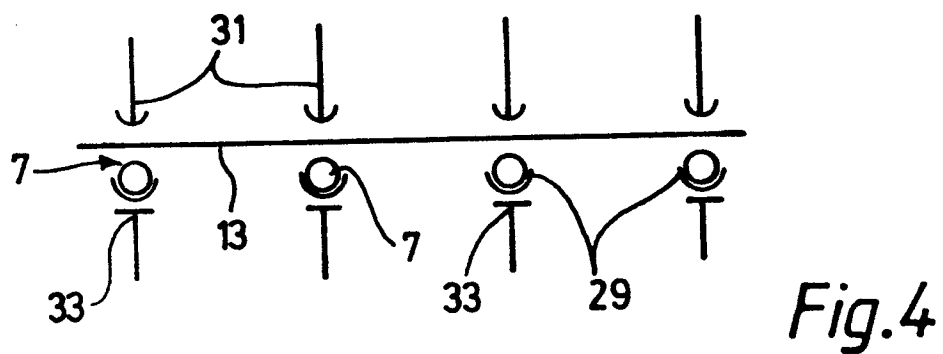
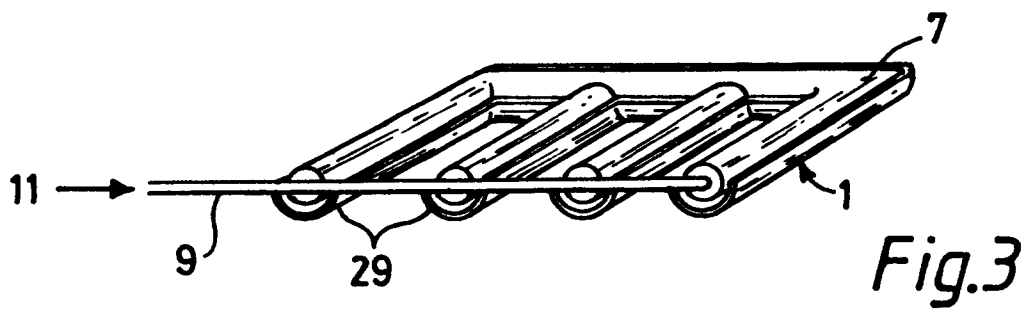
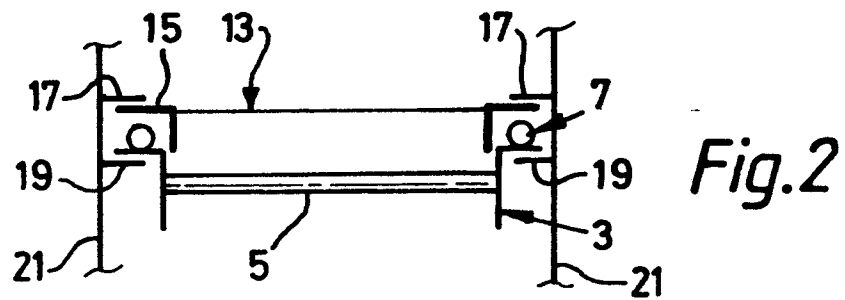
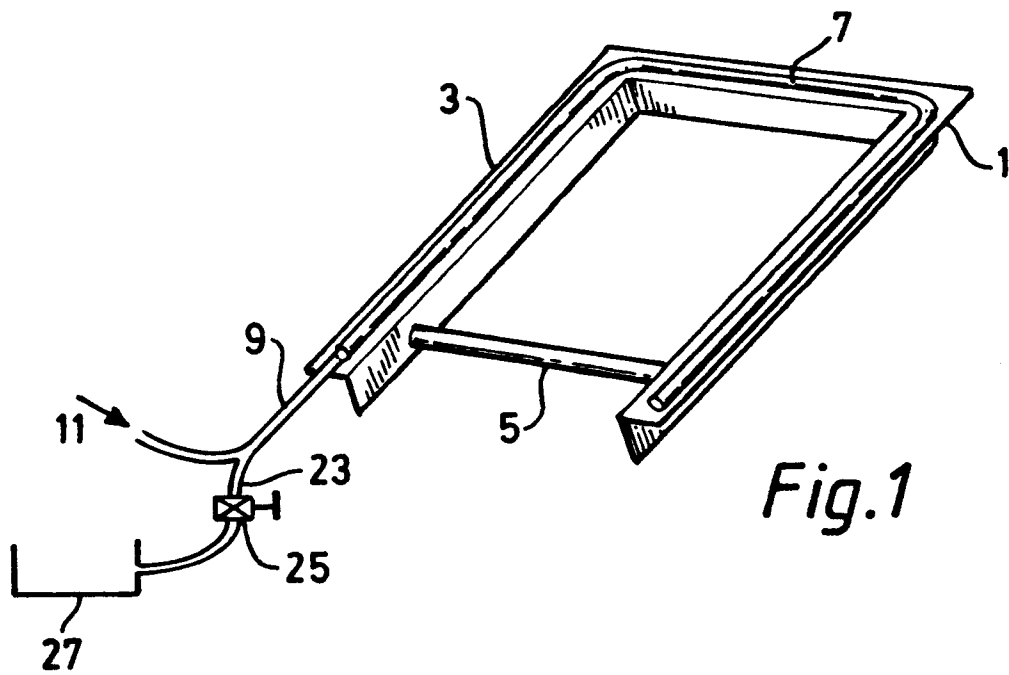
8. A device according to claim 1 or claim 7, apparatus according to any one of claims 2, 3 and 7 or a method
20 according to any one of claims 4 to 7 in which the inflatable means, when inflated in use, presses against at least a portion of the periphery of the screen member.

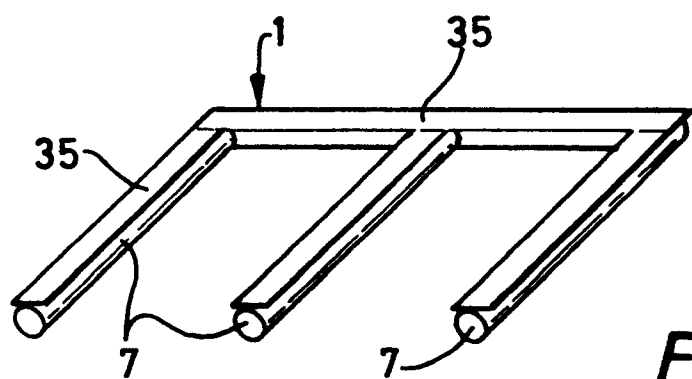
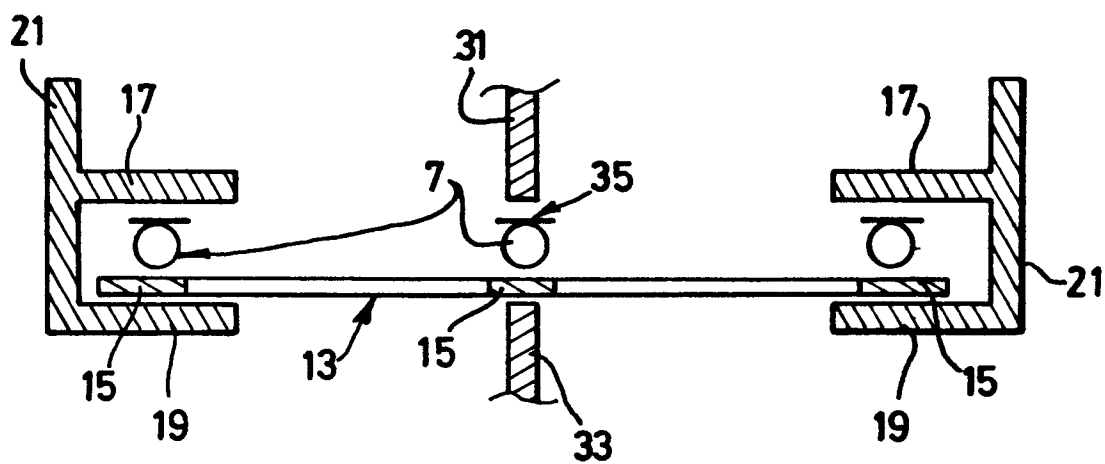
9. A device according to any of claims 1, 7 and 8, apparatus according to any one of claims 2, 3, 7 and 8 or
25 a method according to any one of claims 4 to 8 in which the inflatable means is deflatable to allow a clamped screen member to be released for withdrawal from the vibratory screening apparatus.

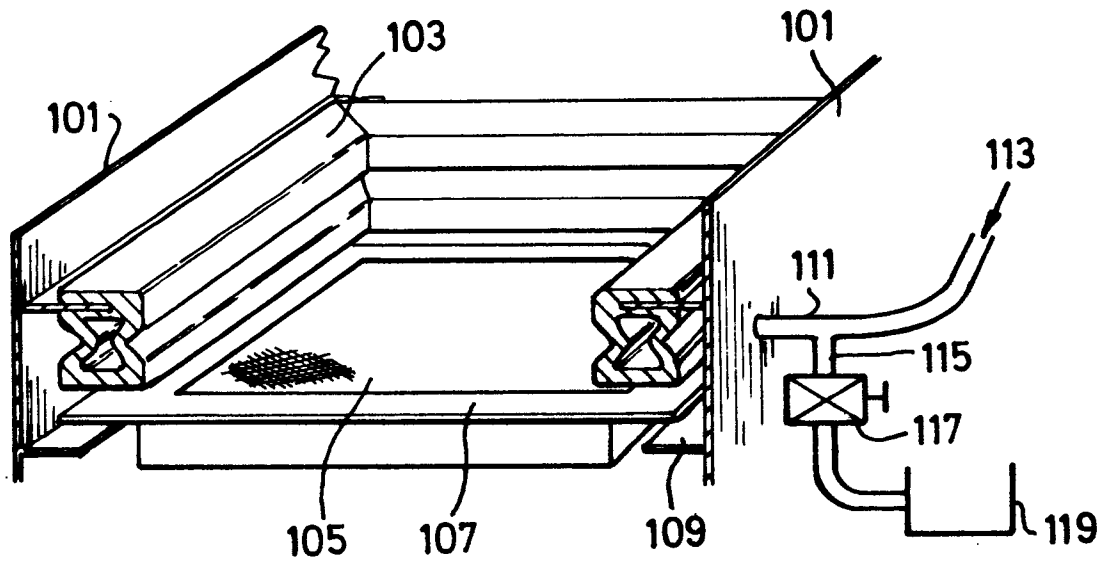
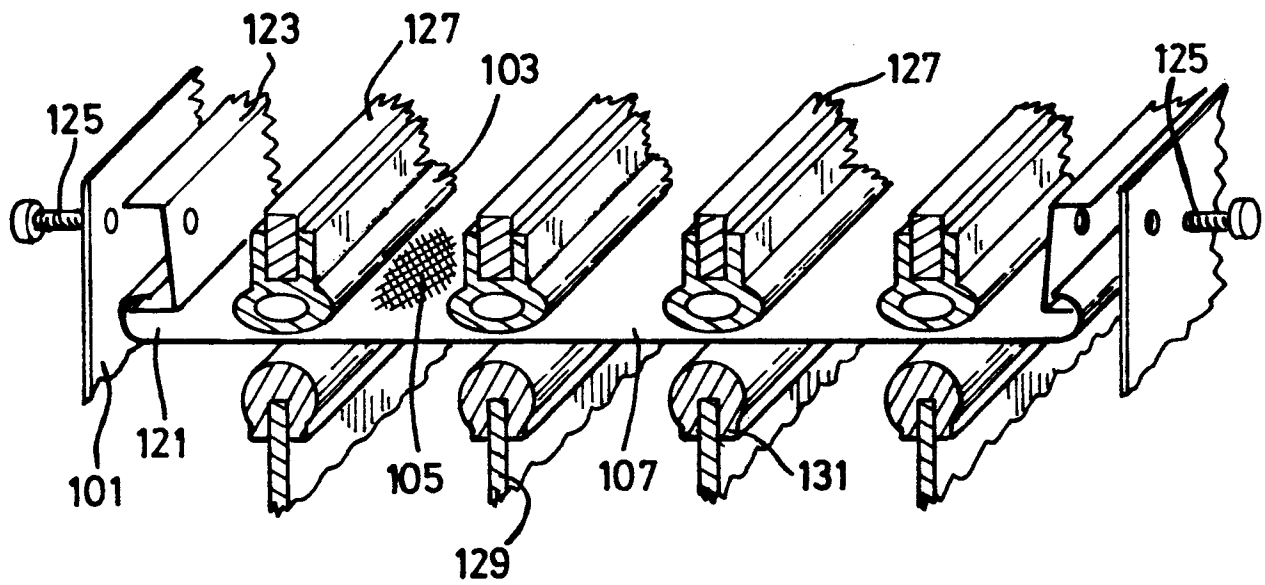
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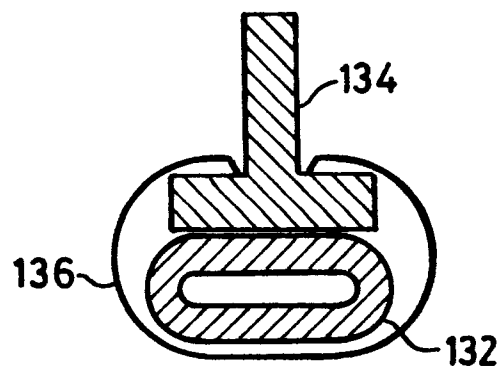
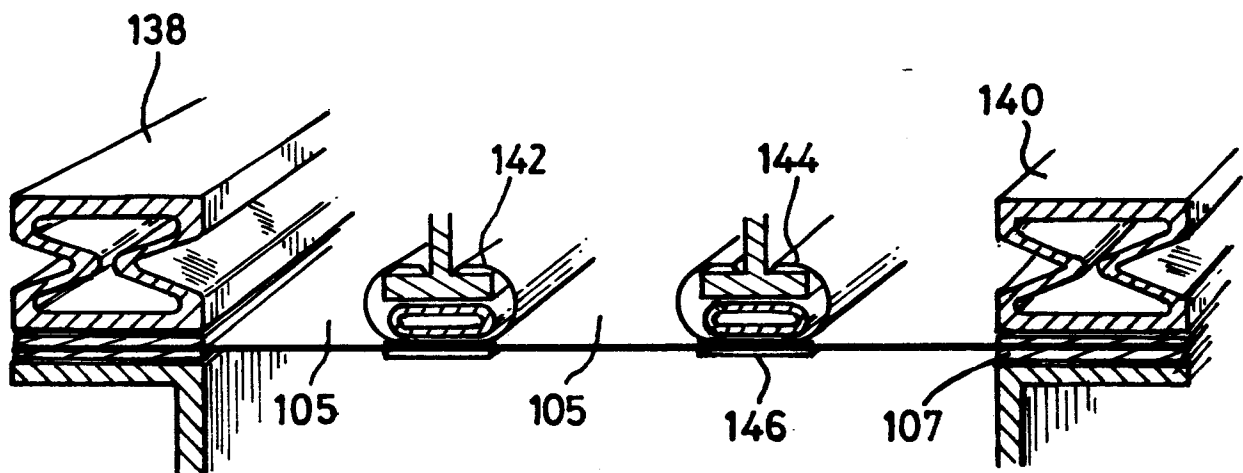
10. A device, apparatus or a method according to claim 9
in which a reservoir is provided for inflation fluid
exhausted from the inflatable means when it is deflated.

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*Fig. 5**Fig. 6*

*Fig. 7**Fig. 8*

*Fig. 9**Fig. 10*