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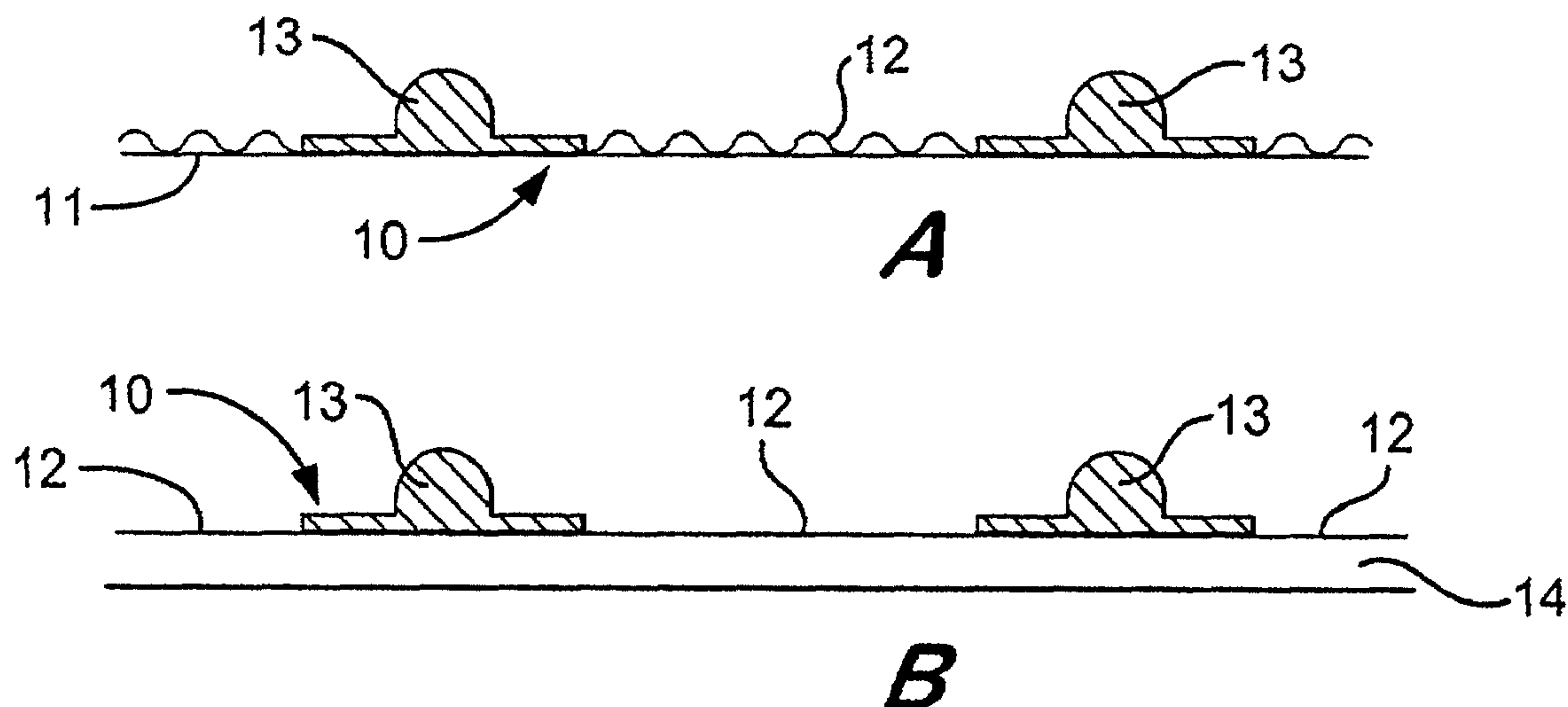
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(71) Demandeur/Applicant:
VARCO I/P, INC., US

(72) Inventeurs/Inventors:
SEYFFERT, KENNETH WAYNE, US;
ADAMS, THOMAS COLE, US;
WARD, KERRY THOMAS, US;
LARGENT, DAVID WAYNE, US;
SCHULTE, DAVID LEE, JR., US;
GRICHAR, CHARLES NEWTON, US;
LEONE, VINCENT DOMINICK, US;
...

(74) Agent: MCFADDEN, FINCHAM

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(54) Title: SCREEN ASSEMBLY AND METHOD FOR SCREENING



(57) Abrégé/Abstract:

A method for screening with a screen assembly (10), the screen assembly comprising screening material having non-flat areas of screening material therein, the non-flat areas of screening material between lines of glue (13) gluing together a plurality of layers (11, 12) of screening material, the plurality of glued-together layers of screening material secured to a frame, the method comprising the steps of mounting the screen assembly (10) on a vibratory separator, the vibratory separator located in an environment at an ambient temperature, vibrating the screen assembly with the vibratory separator for a period of time, feeding material to be treated onto the screen assembly, the material to be treated at a material temperature above the ambient temperature, the period of time of such a temporal length and the material temperature of such a temperature to effect flattening of the non-flat areas of screening material.



(72) Inventeurs(suite)/Inventors(continued): WALKER, JEFFERY EARL, US; MCCLUNG, GUY LAMONT, III, US

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(71) Applicants (*for all designated States except US*): **VARCO I/P, INC.** [US/US]; 2835 Holmes Road, Houston, TX 77051 (US). **LUCAS, Brian, Ronald** [GB/GB]; Lucas & Co., 135 Westhall Road, Warlingham, Surrey CR6 9HJ (GB).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **SEYFFERT, Kenneth, Wayne** [US/US]; 1019 LaMonte Lane, Houston, TX 77018 (US). **ADAMS, Thomas, Cole** [US/US]; 27306 Teepee Trail, Hockley, TX 77447 (US). **WARD, Kerry, Thomas** [US/US]; 13527 Post Oak Glen Lane, Cypress, TX 77429 (US). **LARGENT, David, Wayne** [US/US]; Route 4, Box 1017M, Cleveland, TX 77327

(US). **SCHULTE, David, Lee, Jr.** [US/US]; 101 Anti-etam Avenue, Broussard, LA 70518 (US). **GRICHAR, Charles, Newton** [US/US]; 303 Graceland, Houston, TX 77009 (US). **LEONE, Vincent, Dominick** [US/US]; 13603 Champions Centre Drive, Houston, TX 77069 (US). **WALKER, Jeffery, Earl** [US/US]; 205 Camberly Circle, Lafayette, LA 70508 (US). **MCCLUNG, Guy, Lamont, III** [US/US]; 18007 Pleasant Wood, Spring, TX 77379 (US).

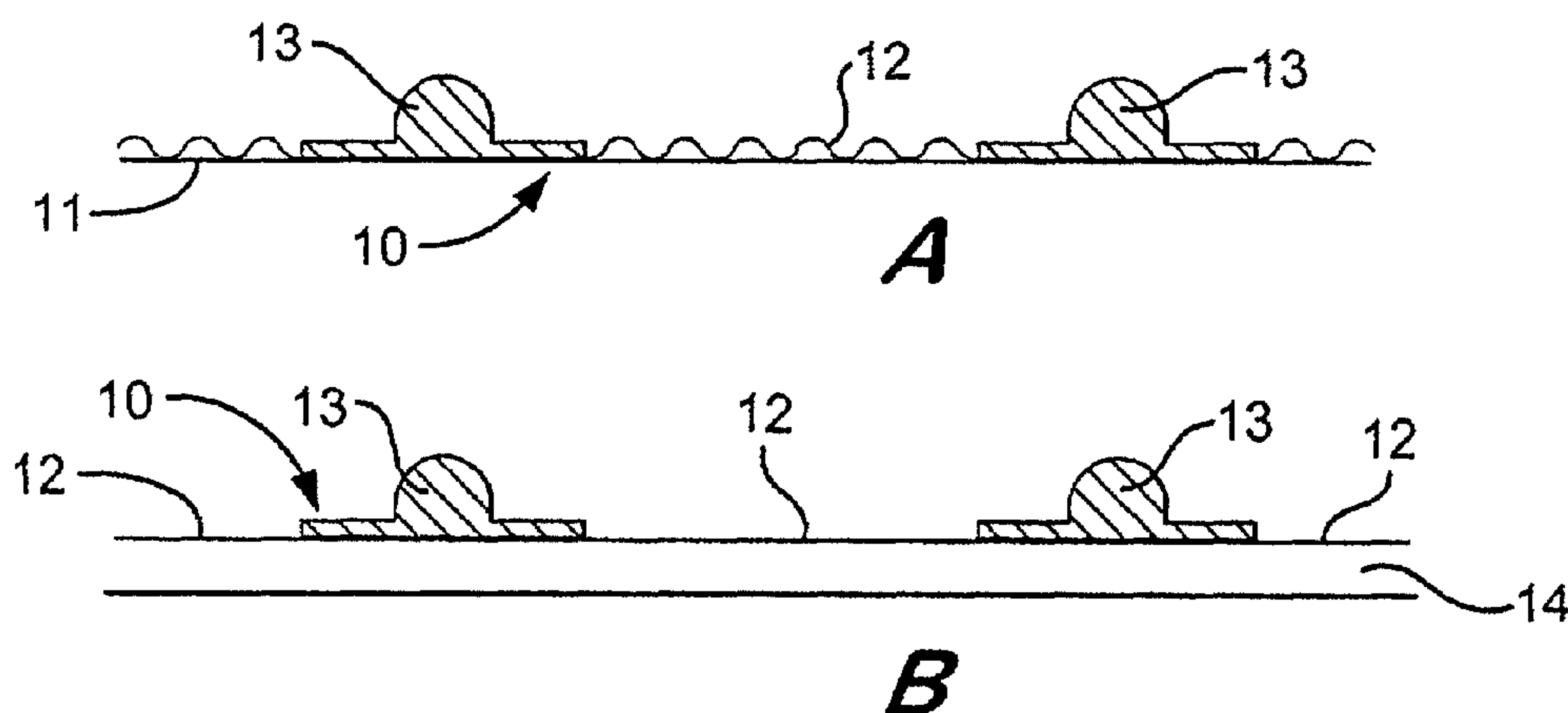
(74) Agent: **LUCAS, Brian, Ronald**; Lucas & Co., 135 Westhall Road, Warlingham, Surrey CR6 9HJ (GB).

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(54) Title: SCREEN ASSEMBLY AND METHOD FOR SCREENING



(57) Abstract: A method for screening with a screen assembly (10), the screen assembly comprising screening material having non-flat areas of screening material therein, the non-flat areas of screening material between lines of glue (13) gluing together a plurality of layers (11, 12) of screening material, the plurality of glued-together layers of screening material secured to a frame, the method comprising the steps of mounting the screen assembly (10) on a vibratory separator, the vibratory separator located in an environment at an ambient temperature, vibrating the screen assembly with the vibratory separator for a period of time, feeding material to be treated onto the screen assembly, the material to be treated at a material temperature above the ambient temperature, the period of time of such a temporal length and the material temperature of such a temperature to effect flattening of the non-flat areas of screening material.



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SCREEN ASSEMBLY AND METHOD FOR SCREENING

The present invention relates to a screen assembly and a method for screening.

5 In the drilling of a borehole in the construction of an oil or gas well, a drill bit is arranged on the end of a drill string and is rotated to bore the borehole. A drilling fluid known as "drilling mud" is pumped through the drill string to the drill bit to lubricate the drill
10 bit. The drilling mud is also used to carry the cuttings produced by the drill bit and other solids to the surface through an annulus formed between the drill string and the borehole. The drilling mud contains expensive synthetic oil-based lubricants and it is normal therefore
15 to recover and re-use the used drilling mud, but this requires the solids to be removed from the drilling mud. This is achieved by processing the drilling fluid. The first part of the process is to separate the solids from the solids laden drilling mud. This is at least partly
20 achieved with a vibratory separator, such as those shale shakers disclosed in US 5,265,730, WO 96/33792 and WO 98/16328.

Shale shakers generally comprise an open bottomed basket having one open discharge end and a solid walled
25 feed end. A number of rectangular screens are arranged in the basket, which are held in C-channel rails located on the basket walls, such as those disclosed in GB-A-2,176,424. The basket is arranged on springs above a receptor for receiving recovered drilling mud. A skip or
30 ditch is provided beneath the open discharge end of the basket. A motor is fixed to the basket, which has a drive rotor provided with an offset clump weight. In use, the motor rotates the rotor and the offset clump weight, which causes the basket and the screens fixed thereto to
35 shake. Solids laden mud is introduced at the feed end of

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the basket on to the screens. The shaking motion induces the solids to move along the screens towards the open discharge end. The recovered drilling mud is received in the receptor for further processing and the solids pass
5 over the discharge end of the basket into the ditch or skip.

WO 01/39862 co-owned by the applicants for the present application, discloses a method for producing glued together layers of screening material. The layers
10 of screening material glued with lines of glue applied in a pattern to form glued-together screening material, which is secured to a frame, perforated plate, or hook strips.

US-A-6,305,549 discloses a method for making a
15 screen assembly for use in a shale shaker. Stainless steel mesh held under tension in a jig and secured to the perimeter of an aluminium frame with epoxy. The aluminium frame comprises members around its perimeter and cross-members running between the members. A bead of urethane
20 is located on the perimeter of the frame inside the epoxy to provide damping. The urethane bead has no adhesive qualities. Once the epoxy is cured, the stainless steel mesh is released from the jig. In use in a shale shaker, differential expansion occurs between the frame, the
25 cross-members and the stainless steel mesh to further tension the stainless steel mesh.

In accordance with the present invention, there is provided a method for screening with a screen assembly, the screen assembly comprising at least two layers of
30 screening material having a perimeter secured to a frame, said at least two layers of screening material glued together with a plurality of lines of glue within said perimeter, characterised in that at least one of the two layers of screening material has non-flat areas between
35 said lines of glue, the method further comprising the

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steps of mounting the screen assembly on a vibratory separator, the vibratory separator located in an environment at an ambient temperature, vibrating the screen assembly with the vibratory separator for a period of time, feeding material to be treated onto the screen assembly, the material to be treated at a material temperature above the ambient temperature, the period of time of such a temporal length and the material temperature of such a temperature to effect flattening of the non-flat areas of screening material.

Following such vibration and flowing of fluid, the non-flat portions of the screening material are flattened out. The screen assembly can then be removed from the separator for later use or it can then remain in use on the vibratory device for a desired time period.

The material may be an aqueous fluid such as water, water with sand (or other solids), or drilling fluid with drilled cutting therein.

Preferably, the material temperature is at least five degrees above the ambient temperature. Advantageously, the material temperature is at least 100°F (37.8°C). Preferably, the material is drilling fluid from a drilled wellbore, the drilling fluid having solid drilled cuttings therein.

Advantageously, the glue is cured moisture-curing hot melt glue. Preferably, the glue is applied in a pattern. The pattern may comprise lines of glue forming a series of diamonds, squares, rectangles, waves or circles.

Preferably, the frame is comprised of two ends, each end connected to and spaced-apart by one of two spaced-apart sides. Advantageously, the ends and sides are tubular members. Preferably, the two spaced-apart sides include a first side and a second side and the frame includes a plurality of spaced-apart crossmembers, each

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crossmember extending from the first side to the second side. Advantageously, the glued-together layers of screening material are secured to the spaced-apart crossmembers with epoxy. Preferably, the glued-together
5 layers of screening material are secured to the spaced-apart crossmembers with glue. Advantageously, at least one of the plurality of spaced-apart crossmembers has at least one notch for receiving a portion of an upstanding member of a deck of the vibratory separator, the method
10 further comprising installing the screen assembly on the deck of the vibratory separator with a portion of the upstanding member projecting into the at least one notch.

Preferably, the glued-together layers of screening material are secured to the frame with epoxy.

15 Advantageously, the glued-together layers of screening material are secured to the frame with glue.

Preferably, the plurality of layers of screening material comprises at least a lower layer of coarse mesh and at least one layer of fine mesh.

20 Advantageously, the non-flat areas of screening material comprise portions of the at least one layer of fine mesh.

The present invention also provides a screen assembly comprising at least two layers of screening
25 material having a perimeter secured to a frame said at least two layers of screening material glued together with a plurality of lines of glue within the perimeter, characterised in that said at least two layers of screening material have non-flat areas between said lines
30 of glue, such that, in use, the screening material is subjected to a temperature differential, said screening material becomes taught and flattens in said frame.

Preferably, the screening material comprises at least two layers of fine mesh. Advantageously, the two
35 layers of screening material are glued together with

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lines of glue. Preferably, the screening material lies on a layer of a supporting mesh. Advantageously, the screening material lies on a layer of coarse mesh. Preferably, the frame comprises at least four tubes forming a rectangle. The frame may further comprise at least one cross-member, which may have upstanding members or recesses for upstanding members located on a deck of a vibratory separator.

The present invention also provides a method for making a screen comprising a frame and screening material secured thereto characterised in that said screening material comprises wrinkles or non-flat areas, such that, in use, said screening material flattens.

A method for making a screen assembly for a vibratory separator, said method comprising applying lines of heated moisture-curing hot melt glue within the perimeter of layers of screening material to form a glue pattern, curing said lines of heated moisture-curing hot melt glue to form glued-together layers of screening material, the layers of screening material having non-flat portions of screening material between cured lines, and securing the glued-together layers of screening material to the frame.

Preferably, the lines of heated moisture curing glue are portions or beads of the glue. Advantageously, the glued-together layers of screening material are secured to the frame by gluing, welding or using an epoxy. Preferably, the frame comprises tubular members.

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together.

Advantageously, the at least one notch is two spaced-apart notches, each notch positioned so that one of the two notches can receive the portion of the upstanding member when the screen assembly is emplaced on the deck.

The second aspect of the invention also provides a method for mounting a screen assembly on a deck of a vibratory separator, the deck having an upstanding member projecting above the deck, the screen assembly having a frame with at least one crossmember, the frame supporting screening material, the at least one crossmember having a notch therein for receiving a portion of the upstanding member, the method comprising emplacing the screen assembly on the deck with a portion of the upstanding member in the notch.

The second aspect of the invention provides a screen assembly and a vibratory separator for receiving said screen assembly. In certain aspects, the screen assembly has a tubular frame having four tubular frame sides in a generally rectangular configuration with one crossmember or a plurality of spaced-apart crossmembers extending between the peripheral tubular frame sides. For effective emplacement of such a screen assembly on a shale shaker whose bed or deck has an upstanding member projecting above the bed or deck (for example, a commercially available Cobra shale shaker), one or more (as required) of the crossmembers is notched or recessed to accommodate the upstanding member so that the screen assembly can lay flat on the bed or deck. The upstanding member projects into the notch, notches, recess, or recesses rather than abutting an unnotched, unrecessed part of the tubular crossmember and thereby preventing the screen assembly from laying flat on the deck or bed.

The invention also provides a screen assembly having

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the characteristics of the first aspect of the invention and the second aspect of the invention.

A screen assembly of the invention may be suitable for a shale shaker with a frame; a "basket" or screen
5 mounting apparatus; one or more screen assemblies in accordance with the present invention as described above and below; and basket vibrating apparatus.

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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:

5 Figure 1A is a view taken in cross-section of part of a screen assembly in accordance with the present invention, at a first stage of assembly;

Figure 1B is the same view of the part of the screen assembly shown in Figure 1A, at a second stage of assembly further comprising a frame;

10 Figure 2A is a top plan view of a frame for a screen assembly in accordance with the present invention;

Figure 2B is a top plan view of a layer of screening material for a screen assembly in accordance with the present invention;

15 Figure 2C is a top plan view of a screen assembly in accordance with the present invention incorporating a frame as shown in Figure 2A and a layer of screening material as shown in Figure 2B;

20 Figure 3 is a view taken in cross-section of a glue bead for use in a screen assembly in accordance with the present invention;

Figure 4A is a top plan view of a screen assembly in accordance with the present invention;

25 Figure 4B is an underneath view of the screen assembly shown in Figure 4A;

Figure 4C is an end view of the screen assembly shown in Figure 4A;

Figure 4D is a side view of one side of the screen assembly shown in Figure 4A;

30 Figure 4E is a perspective view of part of the screen assembly shown in Figure 4A showing part of the underneath, one side and one end of the screen assembly; and

35 Figure 4F is a perspective view of a part of the screen assembly of Figure 4A, showing a central part of

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the underneath of the screen assembly.

Figure 1A shows a glued-together screen combination 10 with lower coarse mesh 11 and upper fine mesh or mesh 12. Mesh 12 may comprise one or more layers of fine mesh sandwiched together. Following the gluing operation and curing of the glue 13, portions of the upper mesh or meshes are wrinkled, rippled, wavy, or non-flat (as shown). Following securing (for example, by welding, gluing, or epoxying) of such a screen combination 10 to a tubular frame and then subjecting the resulting screen assembly to vibration on a vibratory shaker while fluid at a temperature above ambient temperature, for example, at least five to twenty degrees Fahrenheit hotter than ambient and including, but not limited to drilling fluids from a wellbore with a temperature up to a temperature of drilling fluid exiting a wellbore with drilled cuttings therein, for example, in some cases up to 160°F (71°C) or higher is fed to the screen assembly, the non-flat portions of the screening material tighten and flatten, as shown in Figure 1B.

Figure 3 shows a cross-section of one glue bead's B profile applied to a screen S. The distance "a" is, in this embodiment, about 1.6mm (one-sixteenth of an inch) but may be any desired height as applied. Preferably the distance "b" is as thin as possible. Alternatively, the raised portion of glue (all above the level "b") is deleted.

Figure 2C shows a screen assembly 100 in accordance with the present invention which has screening material 102 (Figure 2B) secured onto a tubular frame 104 (Figure 2A). In other aspects the frame 104 is deleted and a hookstrip is connected to each of two spaced-apart sides of the screening material 102. The screening material is any multi-layer screen in accordance with the present invention with two, three or more layers glued together

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as referred to or as described herein with moisture curing hot melt glue in accordance with the present invention. The multiple layers of glued together screening material 102 and the tubular frame 104 are encapsulated with a powdered epoxy in a semi-cured state and then the semi-cured powdered epoxy is heated, bonding the screening material to the frame 104. Following cooling, the cured powdered epoxy encapsulates the screen material forming a unitary structure.

10 The tubular frame 104 has a plurality of crossmembers 106 that extend between and whose ends are connected to sides 107, 108 of the frame 104. End members 103, 105 are at the ends of the frame 104. In certain aspects there are nine crossmembers 106. The tubular frame 104 and its parts may be made of hollow or solids beams, tubes, bars, or rods of metal (for example, steel, aluminum, zinc, stainless steel and/or alloys of any of these), plastic, or fiberglass. Metal and/or plastic parts may be welded together.

20 In one particular aspect the frame 104 is made of hollow square cross-section tubes 103, 104, 107, 108 with a 0.766 inch square (4.94 square cm) cross-section and round cross-section tubes 106 with a 0.601 square inch (3.88 square cm) cross-section. The screen assembly 100 (and the frame 104) may have any suitable desired length and width. In one aspect the screening material is made of strands of 304, or 316 stainless steel and the frame is made of carbon steel. In another aspect the crossmembers 106 and/or end members 103, 105 are made of tubular members with a circular, oval, or elliptical cross-section. Any crossmember or multiple crossmembers may have one, two, or more notches as described below.

35 In one aspect the screening material is secured to the frame with a powdered epoxy material. The frame is heated then dipped into a fluidized bed of the powder

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which completely encapsulates the frame in a semi-cured state and, in one particular aspect, with a thickness of about 35 mils. The frame and screening material are put on a heated platen with the screening material (in one case three layers 170 x 105 mesh, 105 x 64 mesh and 19 mesh glued together with a method in accordance with the present invention) below the frame. Upon heating to about 450 degrees Fahrenheit (232°C), the powdered epoxy material is heated and flows down over the wires of the screening material. In one aspect the wires are partially coated and in another they are, preferably, completely encapsulated with the adhesive. The frame with the screening material on it is left on the heated platen until the coating is cured, being heated when it is curing. In one aspect the coating encapsulates the frame. Any glue bead pattern and application method described in the parent patent applications of this invention may be used in accordance with the present invention.

Figures 4A to 4F show a screen assembly 40 in accordance with the present invention which has a tubular frame 42 with ends 44 and interconnected sides 45. A screening material combination 50 is secured with cured epoxy to the tubular frame 42. A crossmember 41 (of a plurality of spaced-apart crossmembers 43 that extend between and have ends connected to the sides 45) has two notches 46, either of which is for receiving a portion of an upstanding member of a shale shaker deck.

In certain shale shakers in which screen assemblies without crossmembers such as the crossmember 41 are used, one or more upstanding members are located so that they do not push up on a screen assembly above them and such upstanding members are often used for proper screen assembly positioning, for preventing unwanted screen movement with respect to a shaker deck, or for

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stabilizing screen assemblies in position. Rather than removing such upstanding member(s) when a screen assembly is used that does have one or more crossmembers that would undesirably abut the top of an upstanding member (preventing correct screen assembly emplacement on a deck), a screen assembly in accordance with the present invention may be installed on such a shaker deck so that a portion of the upstanding member (which is perpendicular to the crossmember 41 as viewed from above or below) is received in and projects into one (or more) of the notches 46. With a screen assembly 40 as shown, the crossmembers 43 on either side of the crossmember 41 are sufficiently spaced-apart from the crossmember 41 that the upstanding member does not contact the adjacent crossmembers 43. Although only one notch 46 can accommodate an upstanding member, by using two notches 46, proper emplacement of the screen assembly 40 over the upstanding member is made "fool proof" - i.e. whichever side of the screen assembly is placed nearest the shaker's exit end (or fluid introduction end) one of the notches will be above the upstanding member. Of course it is within the scope of the present invention to place aligned notches on adjacent crossmembers to accommodate an upstanding member of such dimensions that it extends beyond the distance separating two, three, four or more crossmembers.

The screen assembly 40 as shown has a multi-layer combination 50 of layers of screening material glued together with moisture curing hot melt glue in a glue pattern 62. The multi-layer glued-together combination 60 is secured to the tubular frame 42 with cured epoxy. As shown the screen assembly 40 has not yet been vibrated with fluid flowing onto it and areas 64 of screening material between glue lines are non-flat or rippled (as shown). Subjecting the screen assembly 40 to vibration

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and fluid flow in accordance with the present invention will result, in accordance with the present invention, in the flattening of the non-flat screening material in the areas 64.

5 It is within the scope of the present invention to provide a screen assembly with a support for a glued-together combination of multiple layers of screening material (for example, any glued-together multi-layer
10 applications of this invention). In one respect such a support has a perforated plate (instead of the tubular frame, for example, instead of the tubular frame 14, Figure 1B; the tubular frame 42, Figure 4A; or the tubular frame 104, Figure 2A). Any suitable known
15 perforated plate may be used. Such a screen assembly with a perforated plate is within the scope of the present invention with or without non-flat screening areas; and such a screen assembly may have spaced-apart side hookstrips for mounting in a shale shaker.

20 Flattening and/or tightening of non-flat screening areas (for example, as in the screen assemblies of Figures 1A, 2A and 4A) may, in accordance with the present invention, be facilitated by flowing fluid at a temperature above ambient temperature onto the screen
25 assemblies. In certain aspects the fluid temperature is between five degrees to twenty degrees above ambient temperature. Such a temperature may be achieved using any known heater apparatus and/or by pumping fluid, for example,, but not limited to, pumping fluid with the
30 typical known fluid pumping apparatus associated with known shale shakers. In other aspects, when the fluid pumped onto the screen assemblies is drilling fluid from a wellbore being drilled, the drilling fluid having drilled cuttings, etc. therein, the fluid temperature may
35 be between 100 F and 160 F or higher.

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In one particular embodiment a screen assembly as in Figure 4A was run on two commercially available King Cobra shale shakers for a total of about 96 hours with 16 pound oil-based drilling fluid with drilled cuttings and shale solids therein being treated by the screen assembly. Following this use the screening material areas which were non-flat were flattened and tightened. In another embodiment, a screen assembly as in Figure 4A was run on a King Cobra shaker for 120 hours and fluid slightly above ambient temperature (for example, four to twelve degrees F above ambient) was fed to the screen assembly, the fluid weighing about nine pounds per gallon and containing sand, water, and bentonite (by weight, about 92% water, 4% sand and 4% bentonite). Following this use screening material areas that were non-flat were flattened and tightened.

It is within the scope of this invention to flatten non-flat screening material areas between glue lines of a multi-layer screening material combination of a screen assembly by vibrating the screen assembly for a sufficient time period on a shale shaker while feeding fluid thereto at a sufficiently high temperature to effect flattening and/or tightening of the non-flat areas. Such fluid may or may not contain drilled cuttings, sand, and/or other solids.

The present invention, therefore, in at least certain embodiments, provides methods for flattening non-flat areas of screening material of a screen assembly, the non-flat areas of screening material between lines of glue gluing together a plurality of layers of screening material, the plurality of glued-together layers of screening material secured to a frame, the methods including mounting the screen assembly on a vibratory separator (for example,, but not limited to a shale shaker), the vibratory separator located in an

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environment at an ambient temperature, vibrating the screen assembly with the vibratory separator for a period of time, feeding material to be treated onto the screen assembly, the material to be treated at a material
5 temperature above the ambient temperature, the period of time of such a temporal length and the material temperature of such a temperature to effect flattening of the non-flat areas of screening material. Such methods may include one or some (in any possible combination) of
10 the following: wherein the material temperature is at least five degrees above the ambient temperature; wherein the material temperature is at least 100 F; wherein the material is water with sand therein or drilling fluid from a drilled wellbore, the drilling fluid having solid
15 drilled cuttings therein; wherein the glue is cured moisture-curing hot melt glue; wherein the glue is applied in a pattern; wherein the frame is comprised of two ends, each end connected to and spaced-apart by one of two spaced-apart sides; wherein the ends and sides are
20 tubular members; wherein the two spaced-apart sides include a first side and a second side and the frame includes a plurality of spaced-apart crossmembers, each crossmember extending from the first side to the second side; wherein the glued-together layers of screening
25 material are secured to the frame with epoxy; wherein the glued-together layers of screening material are secured to the frame with glue; wherein the glued-together layers of screening material are secured to the spaced-apart crossmembers by welding, with epoxy or with glue; wherein
30 at least one of the plurality of spaced-apart crossmembers has at least one notch or multiple notches for receiving a portion of an upstanding member of a deck of the vibratory separator, the method including installing the screen assembly on the deck of the
35 vibratory separator with a portion of the upstanding

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member projecting into the at least one notch or in one of the notches; wherein the plurality of layers of screening material are at least a lower layer of coarse mesh and at least one layer of fine mesh or a lower layer
5 of coarse mesh and two or three layers of finer mesh above the layer of coarse mesh; wherein the non-flat areas of screening material are portions of the at least one layer of fine mesh.

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CLAIMS:

1. A method for screening with a screen assembly, the screen assembly comprising at least two layers of screening material having a perimeter secured to a frame, said at least two layers of screening material glued together with a plurality of lines of glue within the perimeter, characterised in that said at least one of the at least two layers of screening material has non-flat areas between said lines of glue, the method further comprising the steps of mounting the screen assembly on a vibratory separator, the vibratory separator located in an environment at an ambient temperature, vibrating the screen assembly with the vibratory separator for a period of time, feeding material to be treated onto the screen assembly, the material to be treated at a material temperature above the ambient temperature, the period of time of such a temporal length and the material temperature of such a temperature to effect flattening of the non-flat areas of screening material.
2. A method as claimed in Claim 1 wherein the material temperature is at least five degrees above the ambient temperature.
3. A method as claimed in Claim 1 or 2 wherein the material temperature is at least 100°F (37.8°C).
4. A method as claimed in Claim 1, 2 or 3 wherein the material is drilling fluid from a wellbore, the drilling fluid having solid drilled cuttings therein.
5. A method as claimed in any preceding claim, wherein the glue is cured moisture-curing hot melt glue.
6. A method as claimed in any preceding claim, wherein the glue is applied in a pattern.
7. A method as claimed in any preceding claim, wherein the frame is comprised of two ends, each end connected to and spaced-apart by one of two spaced-apart sides.
8. A method as claimed in Claim 7, wherein the ends and

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sides are tubular members.

9. A method as claimed in Claim 7 or 8, wherein the two spaced-apart sides include a first side and a second side and the frame includes a plurality of spaced-apart crossmembers, each crossmember extending from the first side to the second side.

10. A method as claimed in Claim 9, wherein the glued-together layers of screening material are secured to the spaced-apart crossmembers with epoxy.

10. 11. A method as claimed in Claim 9, wherein the glued-together layers of screening material are secured to the spaced-apart crossmembers with glue.

12. A method as claimed in Claim 9, wherein at least one of the plurality of spaced-apart crossmembers has at least one notch for receiving a portion of an upstanding member of a deck of the vibratory separator, the method further comprising installing the screen assembly on the deck of the vibratory separator with a portion of the upstanding member projecting into the at least one notch.

20 13. A method as claimed in any preceding claim, wherein the glued-together layers of screening material are secured to the frame with epoxy.

14. A method as claimed in any preceding claim, wherein the glued-together layers of screening material are secured to the frame with glue.

15. A method as claimed in any preceding claim, wherein the plurality of layers of screening material comprises at least a lower layer of coarse mesh and at least one layer of fine mesh.

30 16. A method as claimed in Claim 15, wherein the non-flat areas of screening material comprise portions of the at least one layer of fine mesh.

17. A screen assembly comprising at least two layers of screening material having a perimeter secured to a frame, said at least two layers of screening material glued

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together with a plurality of lines of glue within the perimeter, characterised in that said at least two layers of screening material have non-flat areas between said lines of glue, such that, in use, the screening material is subjected to a temperature differential, whereupon said screening material becomes taught and flattens in said frame.

18. A screen assembly as claimed in Claim 17, wherein said plurality of layers of screening material comprises at least two layers of fine mesh.

19. A screen assembly as claimed in Claim 17 or 18, wherein said screening material lies on a layer of a supporting mesh.

20. A screen assembly as claimed in Claim 17, 18 or 19, wherein said screening material lies on a layer of coarse mesh.

21. A screen assembly as claimed in any of Claims 17 to 20, wherein said frame comprises at least four tubes forming a rectangle.

22. A screen assembly as claimed in any of Claims 17 to 21, wherein the frame further comprise at least one cross-member.

23. A screen assembly as claimed in Claim 22, wherein said cross-member has an upstanding member or recesses for locating in a corresponding upstanding member or recess located on a deck of a vibratory separator.

24. A method for making a screen assembly for a vibratory separator, said method comprising applying lines of heated moisture-curing hot melt glue within the perimeter of layers of screening material to form a glue pattern, curing said lines of heated moisture-curing hot melt glue to form glued-together layers of screening material, the layers of screening material having non-flat portions of screening material between cured lines, and securing the glued to the frame.

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25. A method as claimed in Claim 24, wherein the lines of heated moisture curing glue are portions or beads of the glue.

26. A method as claimed in Claim 24 or 25, wherein the
5 glued-together layers of screening material are secured to the frame by gluing, welding or using an epoxy.

27. A method as claimed in Claim 24, 25 or 26, wherein the frame comprises tubular members.

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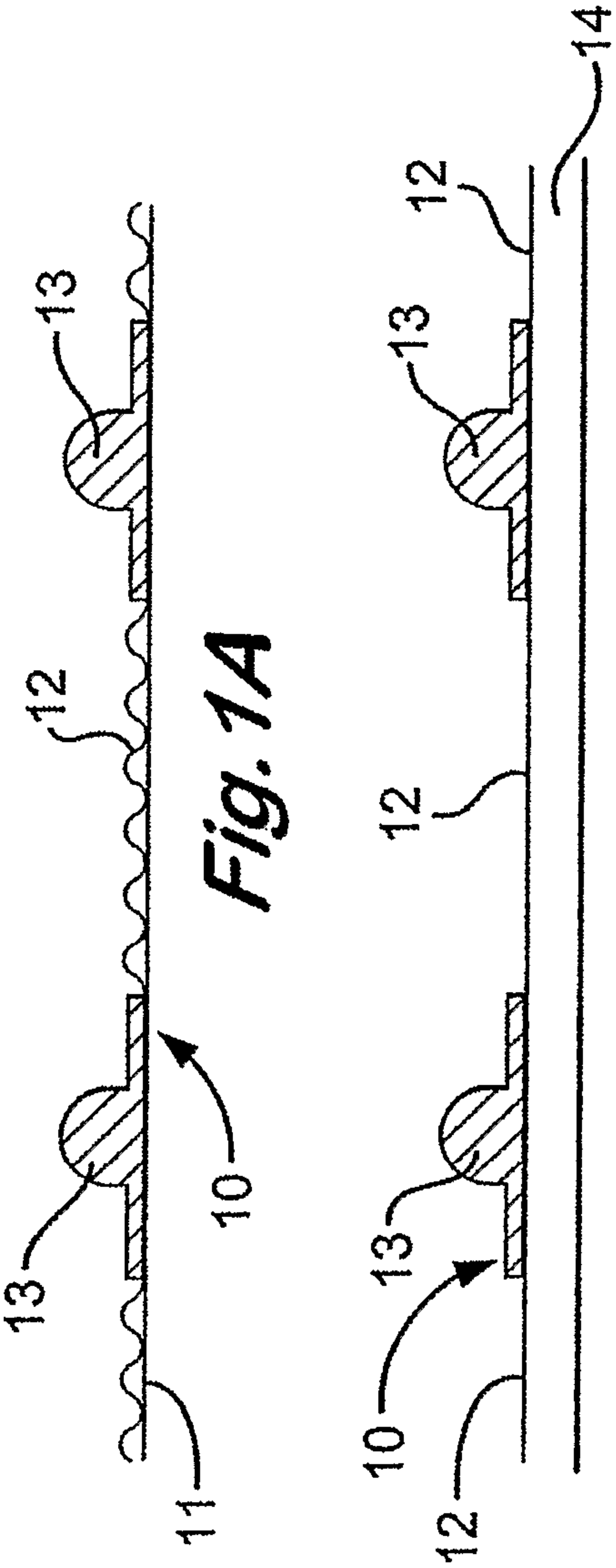


Fig. 1B

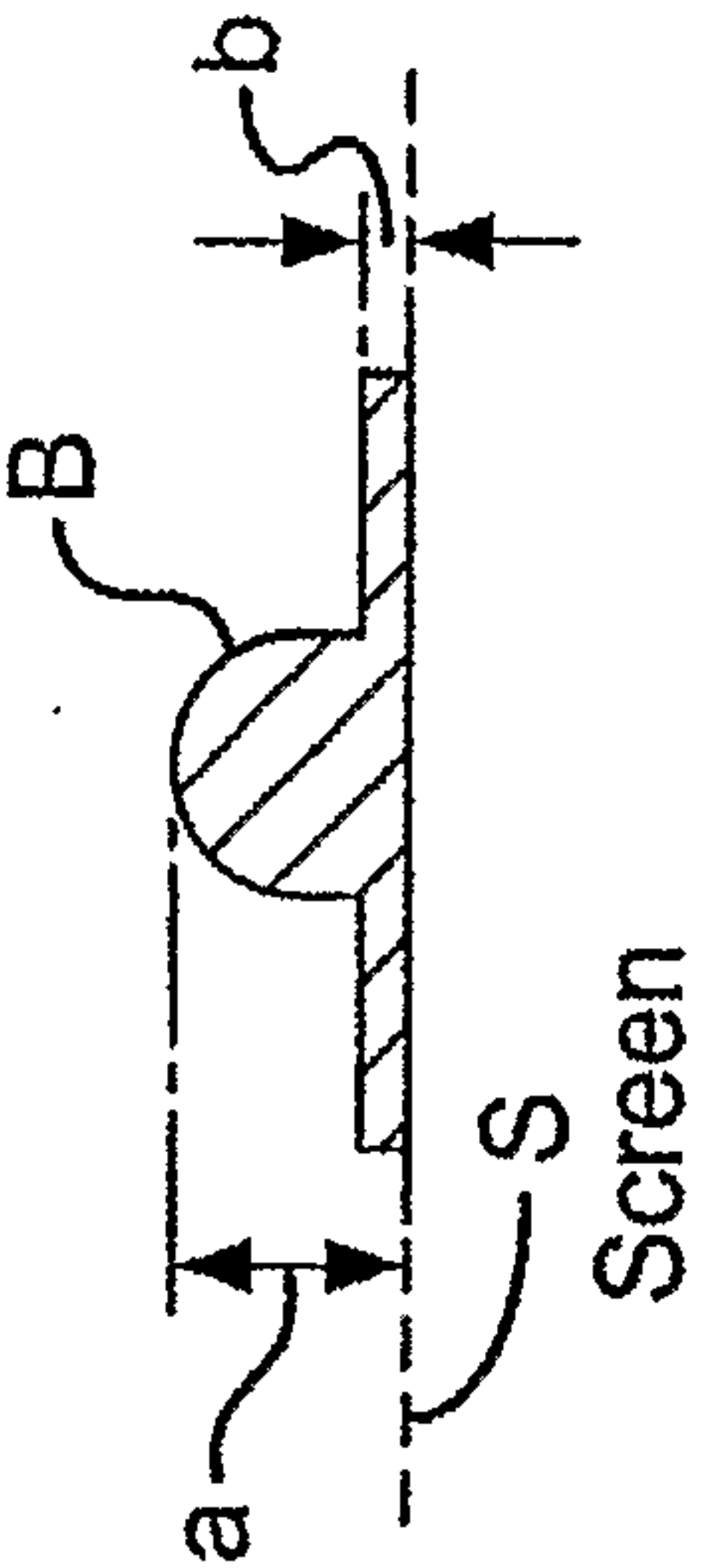


Fig. 3

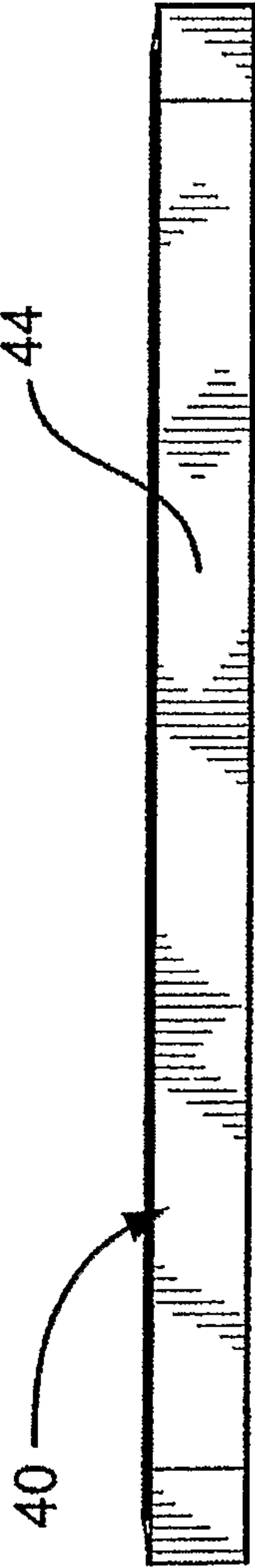


Fig. 4C



Fig. 4D

