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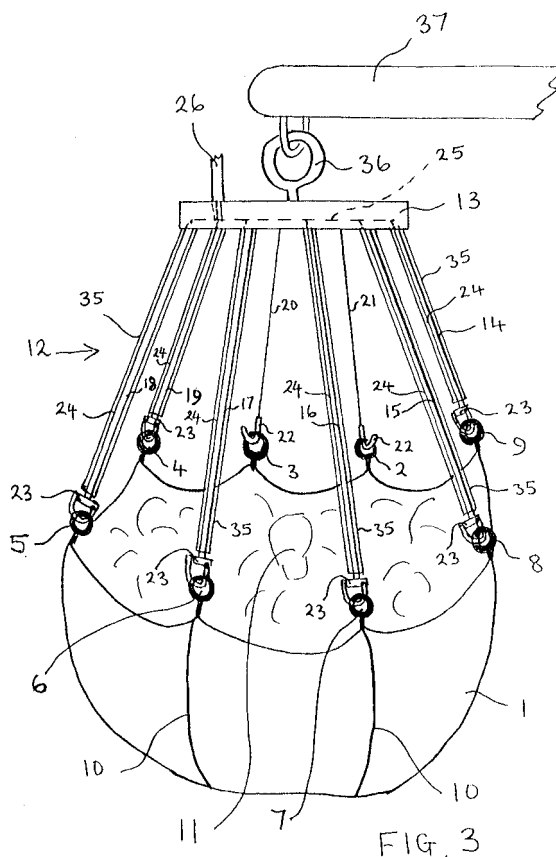
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(54) **Method of handling bulk material**

(57) Bulk material is handled by means of a sheet (1) of pliant heavy-duty material which incorporates a plurality of loop-form attachments (2 to 9) spaced apart around its peripheral edge. Bulk material (11) to be handled is placed on the sheet (1) and lifting means comprising a manifold (13) having deployed therefrom a plurality of straps (14 to 21) provided with hook means (22,23) at ends thereof engages with the plurality of loop-form attachments of the sheet. A majority, but not all, of the hook means (23) are provided with automatic release means, a minority of the hook means (22) being of fixed form.



Description

[0001] The present invention relates to a method of handling bulk material, such as household or industrial waste material, rubble, or building materials such as sand or gravel.

[0002] Methods are known for handling bulk material, such as for delivery or disposal. It is known to use large heavy metal skips for this purpose, but such skips are cumbersome, requiring considerable space for accommodation and heavy-duty vehicles for transportation.

[0003] It is also known to use pre-formed collapsible fabric bags for transporting bulk materials, but such bags are relatively expensive and inconvenient for filling and emptying.

[0004] It is an object of the present invention to overcome these disadvantages.

[0005] According to the present invention there is provided a method of handling bulk material comprising;

providing a sheet of pliant heavy-duty material incorporating a plurality of loop-form attachments spaced apart around a peripheral edge thereof;

providing on the sheet bulk material to be handled;

providing lifting means comprising a manifold having deployed therefrom a plurality of straps provided with hook means at ends thereof for engagement with the plurality of loop-form attachments of the sheet, a majority, but not all, of the hook means being provided with automatic release means, a minority of the hook means being of fixed form;

engaging the plurality of hook means with the plurality of loop form attachments and operating the lifting means to produce a bag-form arrangement of the sheet containing the bulk material for transportation;

operating the automatic release means at a selected location to cause the bulk material to slide from the sheet, with the sheet being held in an elevated position by the hook means of fixed form.

[0006] The hook means of fixed form may be one in number, preferably two in number. When a plurality of hook means of fixed form are provided, they may be arranged adjacent to one another, an essential requirement being that such hook means of fixed form should suitably hold one or more edge portions of the sheet in an elevated position while the sheet falls from the other hook means after operation of the automatic release means and such that the bulk material is not inhibited from sliding from the sheet.

[0007] The sheet may subsequently be detached from the one or more hook means of fixed form, for re-use.

[0008] The sheet may comprise a heavy-duty fabric material, which may be reinforced. Such fabric material may comprise nylon or canvas.

[0009] Reinforcing bands may be provided on the sheet, which may traverse the sheet and may be secured to or incorporated with the loop-form attachments.

[0010] The sheet may be of any desired shape, such as circular, rectangular, or multi-faceted shape.

[0011] The manifold of the lifting means may be arranged for securing to a crane, hoist or other lifting arrangement which may be provided on, or incorporated in a vehicle and which may include a boom arrangement.

[0012] The plurality of straps may be of fibre form, such as nylon, but may comprise metal, such as in chain form.

[0013] The plurality of straps each have one end secured to the manifold and an opposite end secured to the hook means.

[0014] The releasable hook means may each incorporate a pneumatic, hydraulic, mechanical or electro-mechanical release mechanism. The release mechanism may communicate with the manifold by link means. Such link means may be provided alongside the straps and each strap and its associated link means may be provided inside a flexible tube, such as of nylon.

[0015] In a preferred embodiment, the plurality of releasable hook means comprise pneumatically-operated hooks secured to the ends of the straps and connected to the manifold by link-means in the form of hoses. The manifold may have air distribution conduits incorporated therein having an inlet for pressurised air, which may be on an upper surface thereof, and a plurality of outlets for pressurised air connected to the hoses and which may be on a lower surface thereof.

[0016] The manifold may be of generally circular shape, such as a flat metal disc, and may incorporate air distribution conduits arranged in annular form.

[0017] The pneumatically operated hooks may each have an upper attachment point secured to its associated strap and a lower pivotal point for a hook portion, the hook portion having an apertured free end which is upwardly-directed when the hook is attached to the sheet in a lifting position and retained by a pin associated with a pneumatic piston operating in a cylinder means incorporated in the hook, the free end of the hook portion being releasable by retraction of the pin, allowing the hook portion to pivot about the lower pivotal point and to separate from its associated loop-form attachment on the sheet for discharging the bulk material from the sheet.

[0018] When the hoses are arranged with the straps inside flexible tubes, the hoses should preferably exit the tubes as close as possible to points of attachment of the straps to the hook means, to minimise relative movement.

[0019] A source of compressed air for the pneumatically-operated hooks may comprise a compressed air

supply provided for air-operated brakes of an associated vehicle, or may comprise a separate air compressor.

[0020] The sheet may incorporate eight loop-form attachments, with two adjacent loop-form attachment thereof arranged for engagement with two fixed hook means of the lifting means.

[0021] A protective cover may be provided, which may be of fluorescent material and/or provided with visible warning means, such as a light, and which may be used overlying a sheet bearing the bulk material, prior to disposal thereof.

[0022] By means of the method of the present invention up to 2 tonnes or more of bulk material can be handled and transported, without requiring pre-formed bags or skips, using simple re-usable sheets.

[0023] The bulk material, after disposal onto the sheet is readily lifted and discharged onto an adjacent vehicle or some other adjacent or remote discharge point.

[0024] The bulk material may be any desired material such as household or industrial waste material, rubble, or building materials such as sand or gravel.

[0025] For a better understanding of the present invention and to show more clearly how it may be carried into effect, reference will now be made by way of example to the accompanying drawings in which;

Figure 1 is a plan view of a sheet for use in an embodiment of the method of the present invention;

Figure 2 is a perspective view showing bulk material to be handled, on the sheet of Figure 1;

Figure 3 is a perspective view showing lifting means operating on the sheet material with the bulk material of Figure 2;

Figure 4 is a perspective view of the bulk material discharged from the sheet after handling by the lifting means of Figure 3;

Figure 5 is a side view of a pneumatically-operated hook in a closed position, for use in the method of the present invention;

Figures 5A and 5B are end and part cross-sectional views respectively of the hook of Figure 5, and

Figure 6 is a side view of the hook of Figure 5 in an open, or released, position.

[0026] Referring to Figure 1, in a method of handling bulk material according to the present invention, a sheet 1 of pliant heavy-duty material is laid flat on a surface such as the ground. The sheet 1 suitably comprises a fabric material, such as nylon or canvas.

[0027] A plurality of loop-form attachments 2 to 9 are disposed in spaced relationship around a peripheral edge of the sheet 1 and secured to the sheet 1. Rein-

forcing bands 10 are secured to the underside of the sheet 1 between pairs of opposed loop-form attachments 2 to 9. The loop-form attachments 2 to 9 and the reinforcing bands 10 suitably comprise nylon and are preferably made of a flat web of nylon fabric with the reinforcing bands and loop-form attachments being integral.

[0028] The sheet 1 may be of any desired shape, such as circular, rectangular, or multi-faceted form. As shown in Figure 1, eight loop-form attachments 2 to 9 are provided and the sheet 1 is conveniently of circular or octagonal shape. However arrangements with more or less than eight attachments could be considered.

[0029] Referring now to Figure 2, bulk material 11 to be handled is deposited on the sheet 1. Such bulk material may be any desired material, such as household or industrial waste material, or rubble, or building materials such as sand or gravel.

[0030] Referring now to Figure 3, lifting means 12 comprises a manifold 13 in the form of a substantially circular metal disc with eight straps 14 to 21 deployed therefrom and suitably comprising nylon. The straps 14 to 21 are secured at their upper ends to the manifold 13. Two of the straps 20, 21 have fixed metal hooks 22 of well-known form provided at the lower ends and engaging the loop-form attachments 3 and 2 respectively on the sheet 1. The remaining straps 14 to 19 have pneumatically-operated metal hooks 23 provided at their lower ends and engaging the loop-form attachments 4 to 9 on the sheet 1. The pneumatically-operated hooks 23 each have an air hose 24 extending therefrom and alongside an associated one of the straps 14 to 19 to the manifold 13. The manifold 13 has internal conduits 25 arranged internally in annular form and leading from an inlet 26 of compressed air, located on the upper surface of the manifold 13, to the air hoses 24 connected at the lower surface of the manifold 13.

[0031] One of the pneumatically-operated hooks 23 is shown in detail in Figures 5, 5A and 5B. Each hook 23 has an upper attachment point 27, secured to an associated one of the straps 14 to 19, and has a lower pivotal point 28 for a hook portion 29. The hook portion 29 is engaged with an associated one of the loop-form attachments 4 to 9 of the sheet 1. An upwardly-directed free end of the hook portion 29 has an aperture 30 which is engaged by a pin 31 of a pneumatically-operated piston 32 which is slidable in a cylinder 33 and supplied with compressed air through the hose 24. The pin 31 is maintained in engagement with the aperture 30 in the end of the hook portion 29 by pressure from a spring 34. When air pressure is applied through the hose 24 to the piston 32, the pin 31 is caused to be retracted from the aperture 30 in the hook portion 29. The hook portion 29 then falls into the position shown in Figure 6, pivoting about the lower pivotal point 28 and disengaging from the associated one of the loop-form attachments 4 to 9 on the sheet 1.

[0032] Each hose 24 and its associated strap 14 to 19

can be arranged inside a flexible tube 35, such as of nylon, it being preferred that the hose 24 should exit the tube 35 as close as possible to the point of attachment of the associated one of the straps 14 to 19 to the upper attachment point 27 on the hook 23, in order to minimise relative movement.

[0033] Referring again to Figure 3, the manifold 13 has an attachment point 36 secured to a lifting arrangement 37, which may include a boom component and may be a crane or hoist, which may be provided on, or incorporated in a vehicle.

[0034] Compressed air may be supplied to the inlet 26 on the manifold 13 from a compressor (not shown) or from a supply of compressed air provided for air-operated brakes in an associated vehicle such as involved with the lifting arrangement 37.

[0035] With the hooks 22, 23 of lifting means 12 engaged with the loop-form attachments 2 to 9 of the sheet 1 supporting the bulk material 11, the lifting arrangement 37 is activated. Upon lifting, the sheet 1 adopts a bag-like arrangement around the bulk material, enabling it to be transported to a desired location.

[0036] When it is desired to discharge the bulk material 11, for example onto a lorry, such as a tipper lorry, the pneumatically-operated hooks 23 are activated, releasing the hook portion 29 of each thereof, as shown in Figure 6 and allowing the loop-form attachments 4 to 9 of the sheet 1 to become disengaged therefrom under gravity. The bulk material 11 slides from the sheet 1, as shown in Figure 4, the sheet being held by the two fixed hooks 22 on the straps 20, 21 which remain engaged with the loop-form attachments 3 and 2 respectively on the sheet 1.

[0037] The empty sheet 1 can then be detached from the fixed hooks 22, for further use.

[0038] For simplicity in Figure 4, only one of the six disengaged hooks 23 on straps 14 to 19 is shown.

[0039] It would be possible to provide only one fixed hook 22 engaging one loop-form attachment 2 or 3 on the sheet 1. However, more efficient channelling of the bulk material 11 from the sheet 1 is obtained with the use of the two fixed hooks. More than two fixed hooks could be considered if desired.

[0040] Instead of the pneumatically-operated hooks 23, well-known alternative operating mechanisms could be considered for the hooks, such as hydraulic, mechanical or electro-mechanical operating mechanisms.

[0041] By means of the method of the present invention, bulk material 11 of up to 2 tonnes or more can be handled on a sheet 1.

[0042] If it is necessary to leave the sheet 1 with the bulk material 11 thereon for an extended period, such as overnight, prior to disposal, a protective cover 38 (Figure 2) can be provided. Such cover 38 could be of fluorescent material and/or provided with some form of visible warning means, such as a light 39.

Claims

1. A method of handling bulk material (11) comprising;

providing a sheet (1) of pliant heavy-duty material incorporating a plurality of loop-form attachments (2 to 9) spaced apart around a peripheral edge thereof;

providing on the sheet (1) bulk material (11) to be handled;

providing lifting means comprising a manifold (13) having deployed therefrom a plurality of straps (14 to 21) provided with hook means (22, 23) at ends thereof for engagement with the plurality of loop-form attachments (2 to 9) of the sheet (1), a majority, but not all, of the hook means (23) being provided with automatic release means, a minority of the hook means (22) being of fixed form;

engaging the plurality of hook means (22, 23) with the plurality of loop form attachments (2 to 9) and operating the lifting means to produce a bag-form arrangement of the sheet containing the bulk material for transportation;

operating the automatic release means at a selected location to cause the bulk material to slide from the sheet, with the sheet being held in an elevated position by the hook means of fixed form (22).

2. A method of handling bulk material according to claim 1, **characterised in that** the hook means of fixed form (22) is two in number, for example the plurality of hook means of fixed form (22) being arranged adjacent to one another.

3. A method of handling bulk materials according to any preceding claim, **characterised in that** such hook means of fixed form (22) hold one or more edge portions of the sheet (1) in an elevated position while the sheet falls from the other hook means (23) after operation of the automatic release means and the bulk material is not inhibited from sliding from the sheet.

4. A method of handling bulk materials according to any preceding claim, **characterised in that** the sheet (1) comprises a reinforced heavy-duty fabric material, selected from nylon and canvass, reinforcing bands (10) for example being secured to or incorporated with the loop-form attachments (2 to 9).

5. A method of handling bulk materials according to any preceding claim, **characterised in that** the

manifold (13) of the lifting means is arranged for securing to a crane, hoist or other lifting arrangement (37), such that the lifting means is provided on or incorporated in a vehicle and includes a boom arrangement.

6. A method of handling bulk materials according to any preceding claim, **characterised in that** the plurality of straps (14 to 21) are of fibre form, such as nylon, or comprise metal, such as in chain form. 10
7. A method of handling bulk materials according to any preceding claim, **characterised in that** the plurality of straps (14 to 21) each have one end secured to the manifold (13) and an opposite end secured to the hook means (22, 23). 15
8. A method of handling bulk materials according to any preceding claim, **characterised in that** the releasable hook means (23) each incorporate a pneumatic, hydraulic, mechanical or electro-mechanical release mechanism, the release mechanism communicating for example with the manifold (13) by link means (24) wherein the link means is provided alongside the straps, preferably inside a flexible tube (35), such as of nylon. 20 25
9. A method of handling bulk materials according to any preceding claim, **characterised in that** the plurality of releasable hook means (23) comprise pneumatically-operated hooks secured to the ends of the straps and connected to the manifold (13), which is of generally circular shape, such as a flat metal disc, by link-means in the form of hoses (24), the manifold (13) preferably having air distribution conduits incorporated therein having an inlet (26) for pressurised air, which are on an upper surface thereof, and a plurality of outlets for pressurised air connected to the hoses and which are on a lower surface thereof, such that the air distribution conduits are arranged in annular form. 30 35 40
10. A method of handling bulk materials according claim 9, **characterised in that** the pneumatically operated hooks (23) each have an upper attachment point (27) secured to its associated strap (14 to 19) and a lower pivotal point (28) for a hook portion (29), the hook portion (29) preferably having an apertured free end which is upwardly-directed when the hook is attached to the sheet in a lifting position and retained by a pin (31) associated with a pneumatic piston (32) operating in a cylinder means (33) incorporated in the hook. 45 50
11. A method of handling bulk materials according to claim 10, **characterised in that** the free end of the hook portion is releasable by retraction of the pin (31), allowing the hook portion to pivot about the 55

lower pivotal point (28) and to separate from its associated loop-form attachment on the sheet for discharging the bulk material from the sheet.

- 5 12. A method of handling bulk materials according to any one of claims 9, 10 or 11, **characterised in that**, when the hoses (24) are arranged with the straps inside flexible tubes (35), the hoses exit the tubes as close as possible to points of attachment of the straps to the hook means, to minimise relative movement. 10
13. A method of handling bulk materials according to any one of claims 9 to 12, **characterised in that** a source of compressed air for the pneumatically-operated hooks comprises a compressed air supply provided for air-operated brakes of an associated vehicle or a separate air compressor. 15 20 25 30 35 40 45 50 55

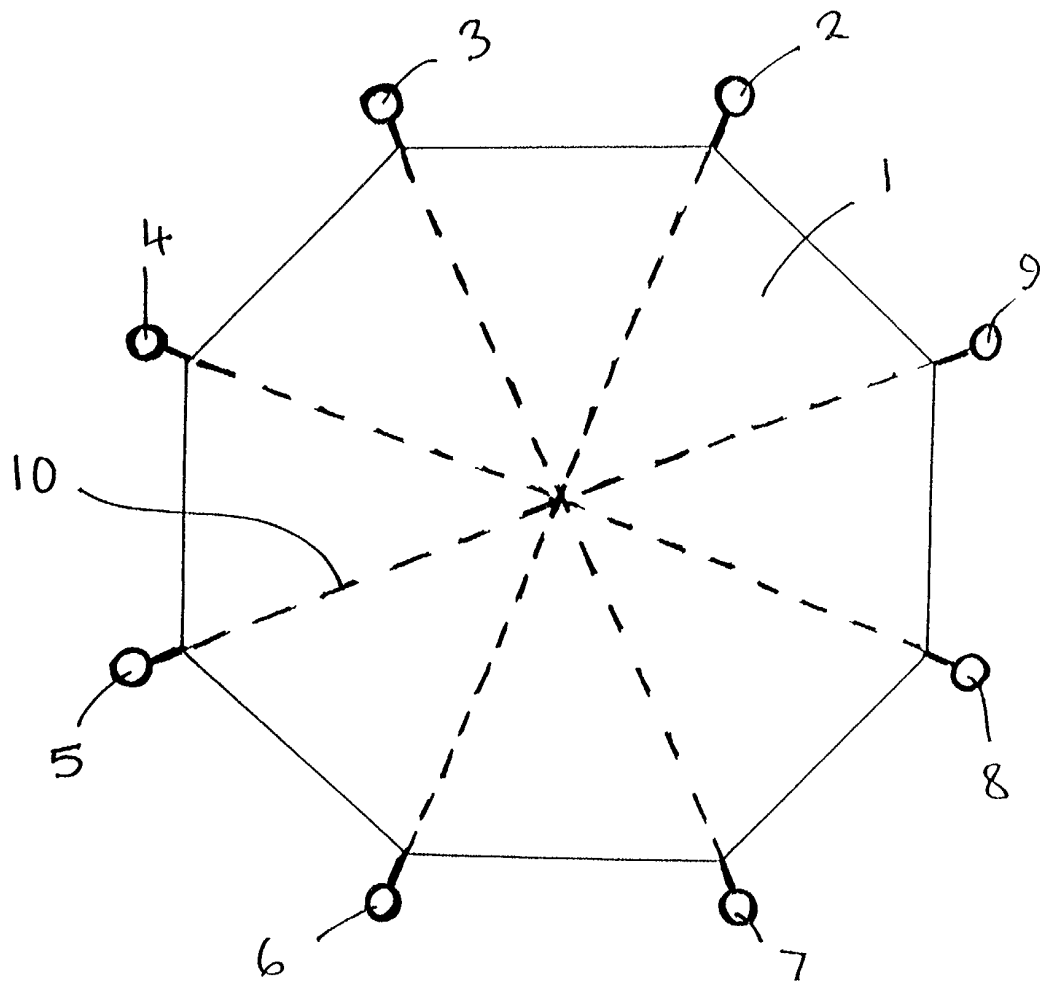


FIG. 1

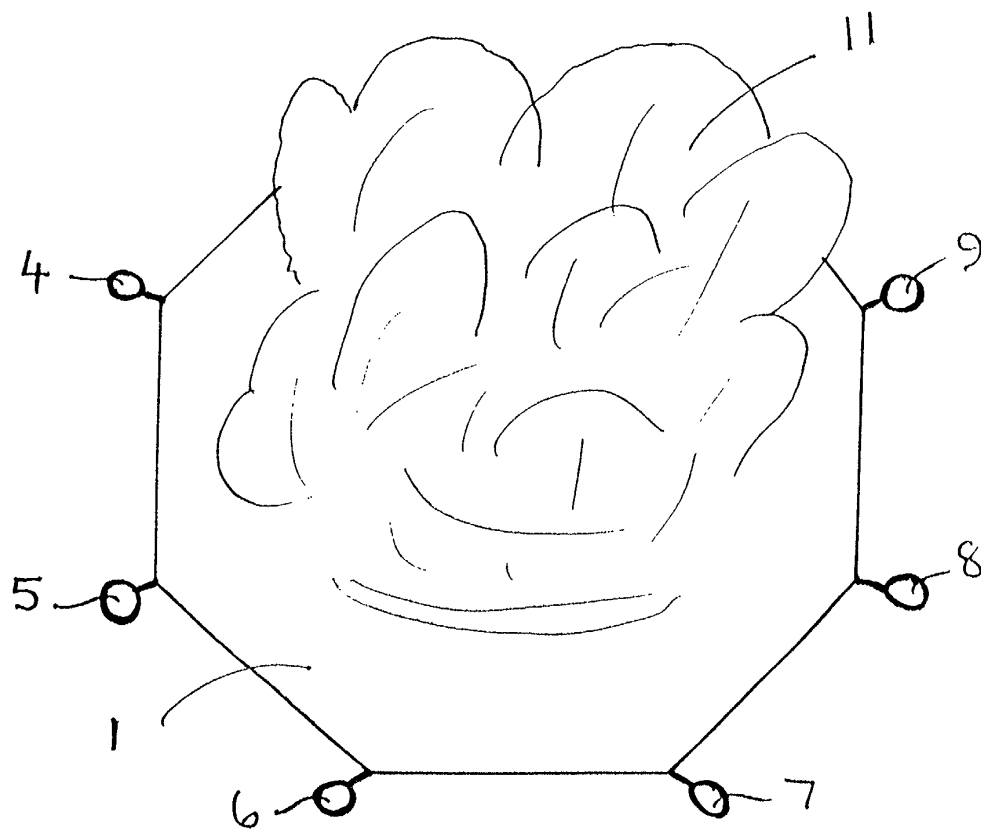
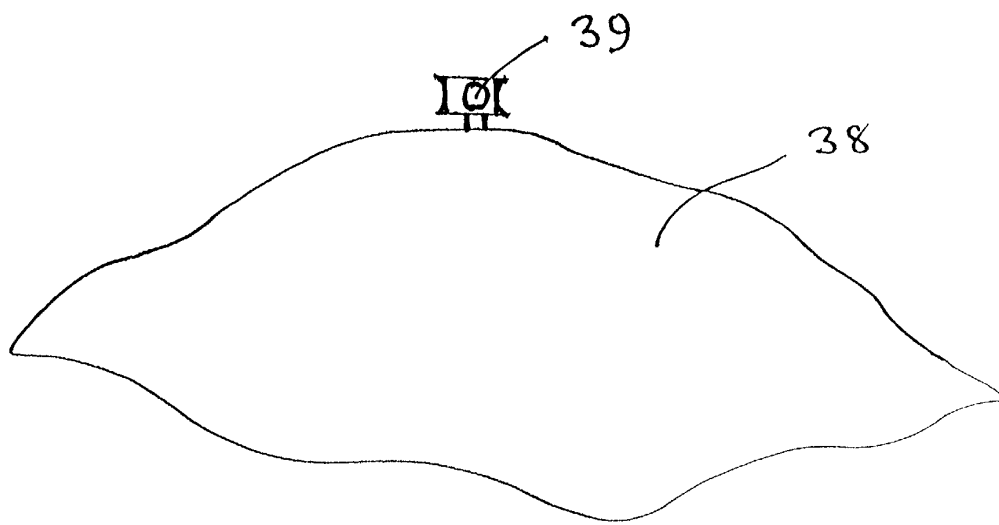
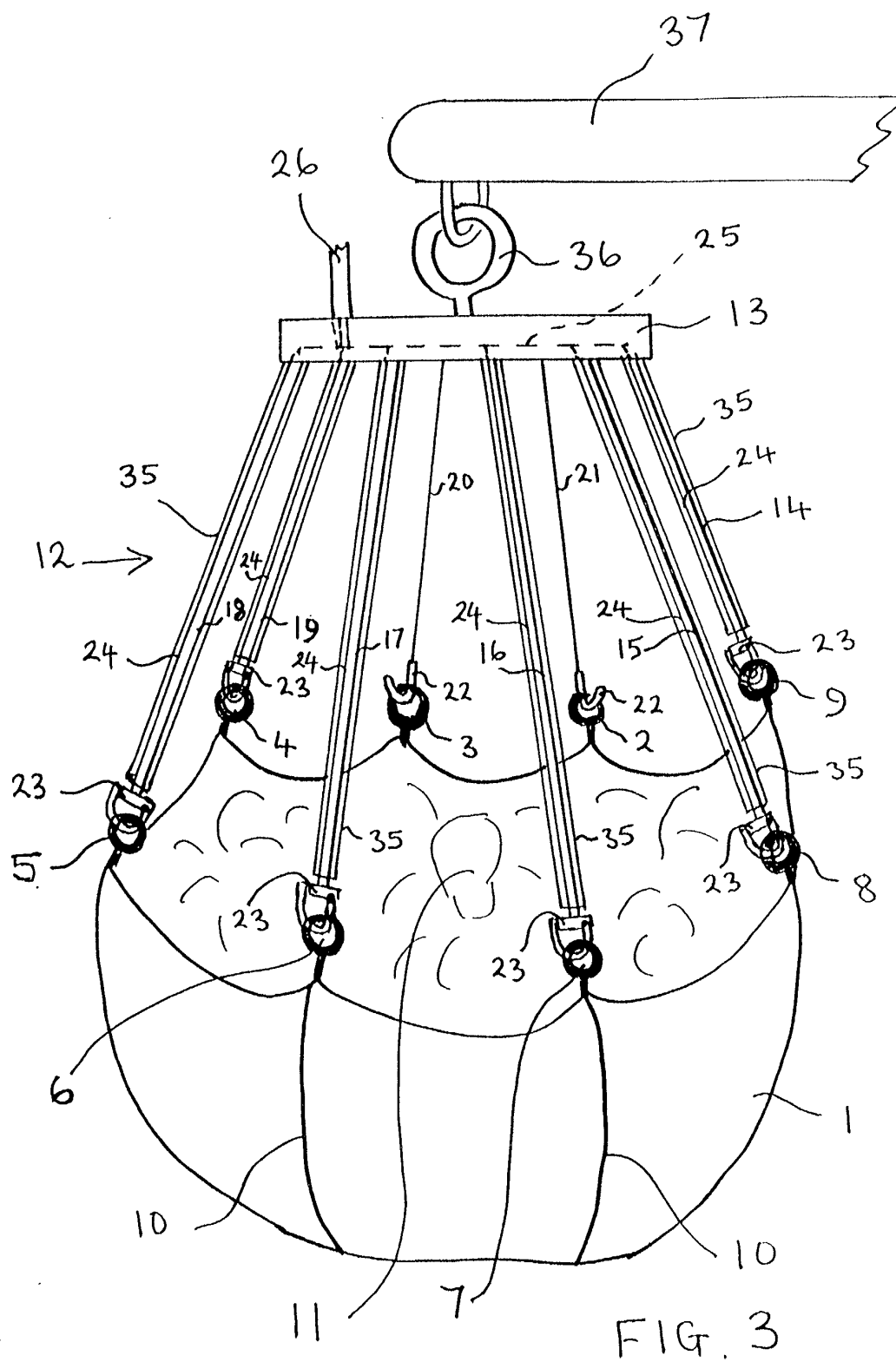


FIG. 2



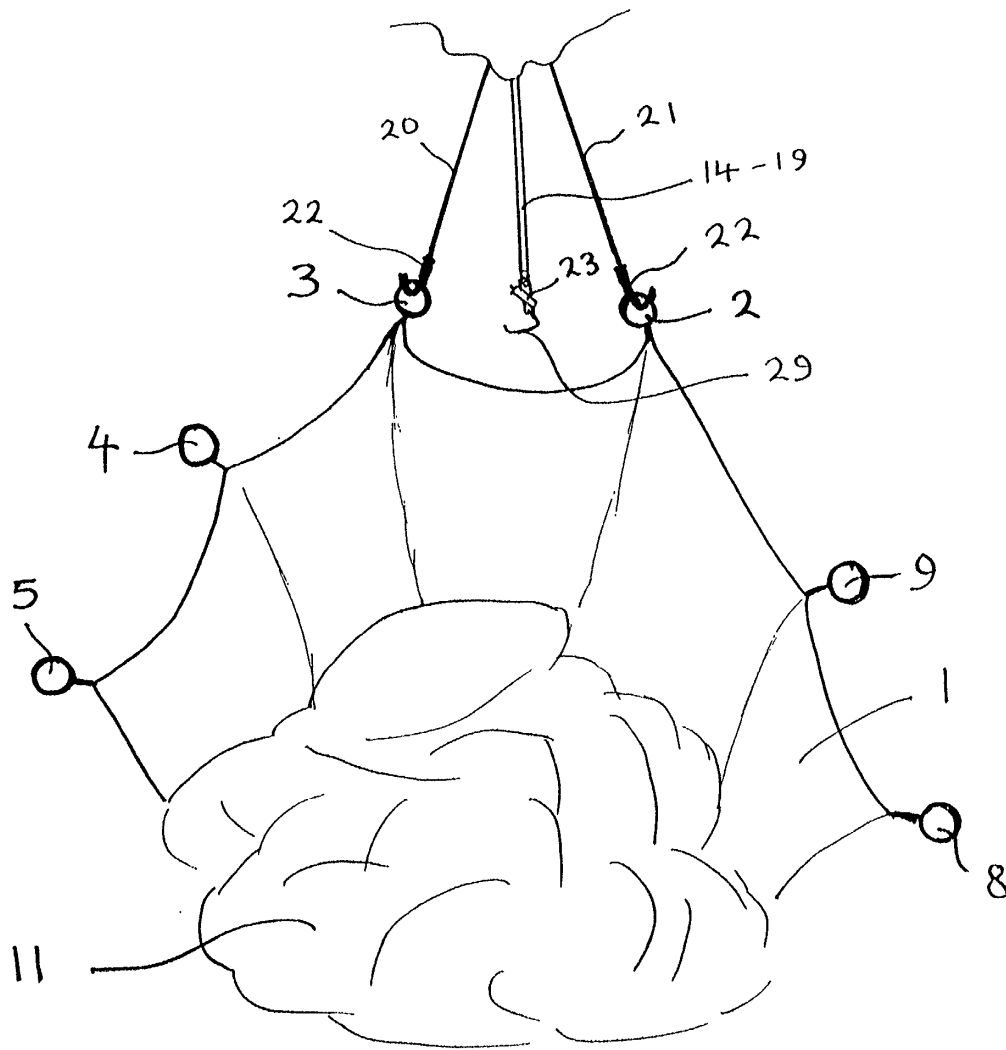


FIG. 4

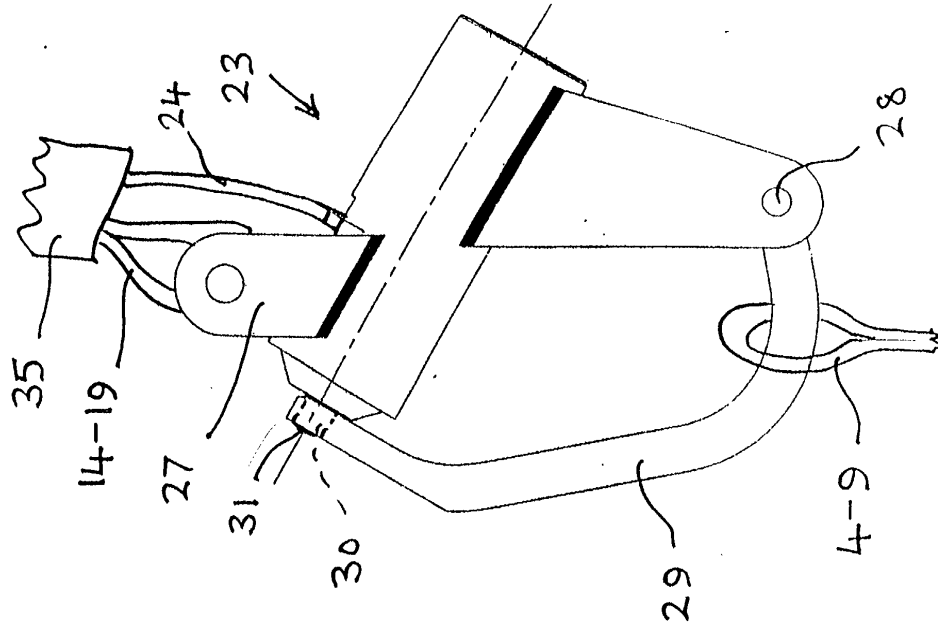


FIG. 5

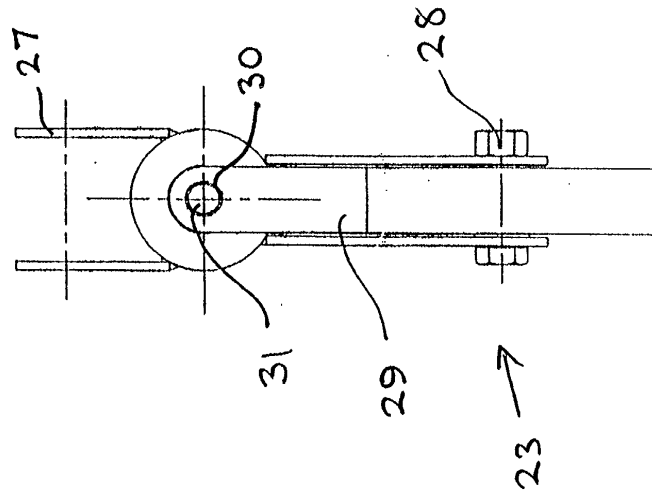


FIG. 5A

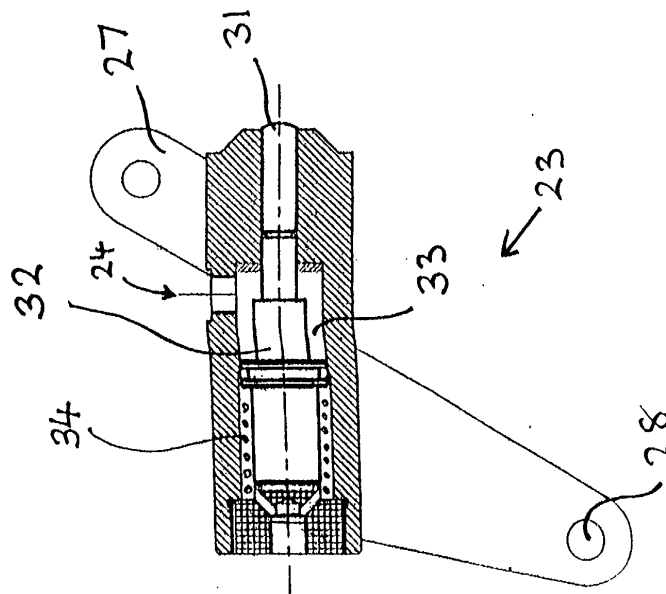


FIG. 5B

