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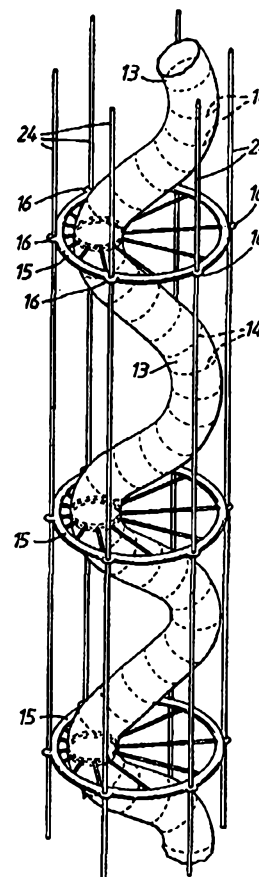
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(54) Title: MARINE ESCAPE SYSTEMS

(57) Abstract

A marine escape system has a passage (13; 30, 31, 32) extending between an evacuation point on a vessel and an inflatable life raft. The passage (13; 30, 31, 32) is arranged vertically and is connected to a succession of hoops (15). The connection between at least one of the hoops (15) and the life raft is by means of flexible elongate members (24) of differing flexibility. These are held in tension so that, as the life rafts move on swell, the passage extends and retracts from the lower end first. This allows the passage (13; 30, 31, 32) to have only one exit which can be within a life raft (12) so that persons can evacuate from the ship without ever being exposed to the elements. The passage may include a helical tube (13) or a tube (30, 31, 32) with angled panels (40).



MARINE ESCAPE SYSTEMS

The invention relates to marine escape systems.

5 A marine escape system is used for evacuating people from a structure at sea in the event of an emergency. Such a structure may be an oil rig or a ship.

10 One form of marine escape system includes liferafts into which the people are evacuated. Since, when liferafts are deployed on water, there is usually a significant difference in height (freeboard) between the point on the structure from which the people are evacuated and the liferafts, it is necessary to provide some form of passage between the two.

15 It is known to provide an angled chute, which may be formed from inflatable members, extending between the evacuation point and the liferafts. The chute can extend either direct to the liferafts or to an inflatable floating structure to which the liferafts are attached. In some vessels, the freeboard may be 14-15 metres and so the chute is of significant length.

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Recent sinkings of ships have placed greater emphasis on the need to evacuate marine structures quickly in the event of an emergency. It is likely to be a requirement that any sea-going vessel must be able to evacuate 400 people in 17 minutes 40 seconds. In addition, it is likely to be a requirement that any marine escape system must be able to operate in force six weather which will include a 3 metre swell and that the marine escape system must be usable for a considerable period of time with the vessel side-on to the sea.

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An angled chute is not readily able to meet such a requirement. Since the chute projects from the side of a vessel it requires stabilization in order to prevent significant lateral movements in heavy weather. Further, to accommodate such weather, the chute must be comparatively rigid and this can increase significantly the bulk of the chute.

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Marine escape systems have also been proposed in which the connection between the evacuation point and the inflatable liferafts is via a tube containing a helical slide passage. See, for example, WO-A-84/D2658, WO-A-94/01324 and US-A-3994366. A person entering the passage at the escape point

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travels in a helical path along the passage and emerges at an exit at the lower end of the tube.

5 A tube requires less stabilization than a chute against lateral movement in heavy weather. However, the tube has the problem of accommodating swell which, as mentioned above, may alter the freeboard of a vessel by six or more metres.

10 It has previously been proposed to accommodate this by making the tube of flexible material with a maximum length sufficient to accommodate the swell. The tube hangs from the evacuation point on the structure and has excess length heaped on a platform to which people are evacuated when the swell is less than the maximum. As the space in between the platform and
15 the evacuation point varies, more or less of the tube is either extended from or piled into the heap on the platform. This is disclosed in WO-A-94/01324.

20 It is a problem with such an arrangement that no single exit can be provided. In order to overcome this problem, such tubes have previously been provided with a plurality of exits spaced along their length; with evacuated persons emerging from the exit closest to the platform at the time they reach the platform. This is not, however, satisfactory because a

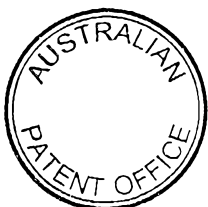


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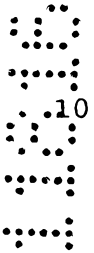
person may exit too soon or the position of the platform may change to make a selected exit suddenly inappropriate.

5 According to the invention, there is provided a marine escape system comprising a passage for persons and having an entrance at one end and an exit at an end opposite said one end, at least one support for the passage being provided between the entrance and the exit, the support being suspended by at least one first elongate elastic member, at least one second elongate elastic member extending from the support towards the exit, the at least one second elongate elastic member having a greater elasticity than the at least one first elongate elastic member, so that a portion of the passage between the exit and the support is extensible and contractible before the extension and contraction of a portion of the passage between the entrance and the support, the passage being extensible and contractible to accommodate changes in the spacing between the entrance and the exit.

20 By varying the length of the tube between the entrance and the exit, a swell can be accommodated while maintaining a single exit.

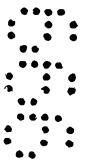


The following is a more detailed description of some embodiments of the invention, by way of example, reference being made to the accompanying drawings in which:-



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Figure 1 is a side elevation of a ship showing schematically a marine escape system including two escape chutes leading from an emergency exit to liferafts deployed on the sea,



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Figure 2 is a side elevation of a part of one of the escape chutes,



Figure 3 is a perspective view of part of the escape chute of Figure 2,

Figure 4 is a cross-section through the escape chute of Figures 2 and 3,

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Figure 5 is an elevation of one side of a right hand side cell of an alternative form of escape chute,

Figure 6 is a front elevation of the right hand cell shown in Figure 5,



Figure 7 is an elevation of the other side of the right hand cell of Figures 5 and 6,

Figure 8 is a rear elevation of the right hand cell of Figures 5 to 7,

5 Figure 9 is a schematic view of an outer wall of the right hand cell of Figures 5 to 8,

Figure 10 is a schematic view of the slide path assembly of the right hand cell of Figures 5 to 9,

10 Figure 11 is a partial section of the right hand cell of Figures 5 to 10 showing the slide path and the outer wall in an extended disposition,

Figure 12 is a similar view to Figure 11 showing the outer wall in a collapsed disposition,

15 Figure 13 is a similar view to Figure 12 but showing the whole of a right hand cell with the outer wall in a collapsed disposition,

Figure 14 is an elevation of one side of a left hand cell of the alternative form of chute,

Figure 15 is a front elevation of the left hand cell,

20 Figure 16 is an elevation of the other side of the left hand cell,

Figure 17 is a rear elevation of the left hand cell of Figures 14 to 16,

Figure 18 is a similar view to Figure 14 but showing the outer wall of the left hand cell of Figures 14 to 17 in a collapsed disposition,

Figure 19 is an elevation of one side of a bottom cell of the alternative escape chute,

Figure 20 is a front elevation of the bottom cell of Figure 19,

Figure 21 is an elevation of the other side of the bottom cell of Figures 19 and 20,

Figure 22 is a rear elevation of the bottom cell of Figures 19 to 21, and

Figure 23 is a similar view to Figure 19 but showing the outer wall of the bottom cell of Figures 19 to 22 in a collapsed disposition.

Referring first to Figure 1, the marine escape system comprises two emergency exits 10 each leading to a respective escape chute indicated generally at 11. Each escape chute terminates at a respective liferaft 12 with two further liferafts 12 also being provided. It will be appreciated that the marine escape system is normally held in a container at the side of the ship and deployed in an emergency, in a manner to be described below.

Referring now to Figures 2, 3 and 4, each escape chute 11 comprises a closed tube 13 of foldable material (such as a fabric) formed into a helix. The tube 13 may be provided with stiffening bands 14 at spaced intervals along its length in order to hold the tube 13 open.

The tube 13 is supported by a plurality of hoops 15 spaced apart along the length of the tube 13. As seen in Figure 2, there are eleven hoops 15, but there may be more or less hoops as required. Each hoop 15 is made from a rigid alloy or a carbon fibre material. A typical hoop diameter might be 2.3 metres.

As best seen in Figures 3 and 4, each hoop is provided with six fixing points 16 equiangularly spaced around the exterior of the hoop 15. The purpose of these will be described below.

As will be seen in Figures 2, 3 and 4, each hoop 15 is positioned at a point along the length of the tube 13 where the axis 17 of the tube is at a maximum spacing from the axis 18 of the hoop. The tube 13 is held in this position by five flexible but inelastic elongate members 19 and seven flexible and elastically elongatable members 20. The inelastic members

19 may be cords while the flexible members 20 are preferably formed from a resilient elastomeric material.

5 The inelastic members 19 extend between equiangularly spaced points 21 on the portion of the periphery of the tube 13 lying between two parallel planes, one extending through the tube axis 17 and the other extending through the hoop axis 18 and both being normal to a hoop radius extending between the hoop axis 18 and the tube axis 17. This is the portion of the tube 10 13 that faces the hoop axis 18. In this way, the inelastic members 20 fix the maximum spacing between the tube axis 17 and tube axis 18 so preventing the tube 13 moving any closer to the hoop 15.

15 The elastic members 20 are also connected between the tube 13 and the hoop 15. Two of the elastic members 20 extend from diametrically opposite points 22 on the periphery of the tube 13 and lying in a plane including the tube axis 17 and normal to a radius extending from the hoop axis through the tube 20 axis. The remaining elastic members 20 are equiangularly spaced around the periphery of the tube 13 between these two points 22.

The elastic members 20 thus allow the tube 13 to move so that the spacing between the axis of the tube 17 and the axis of the hoop 18 decreases. The elastic members 20 are permanently in tension and so they provide a force tending to restore the tube 13 to the position shown in Figure 3. This may be a position in which the helical tube 13 has a helix angle of 30°.

The hoops 15 themselves are also interconnected by flexible members of two kinds; inelastic flexible members 23 and elastic flexible members 24.

The inelastic flexible members 23 extend from a support 25 at the top of the escape chute 11 and the sixth hoop 15, as seen in Figure 2. There are six members 23 equiangularly spaced around these hoops 15 and connected at each hoop 15 to an associated one of the fixing points 16. Thus, the inelastic flexible members 23 fix the maximum spacing between the first and sixth hoops 15.

The sixth hoop 15 is connected to an associated liferaft 12 by the elastic flexible members 24. There are three different types of elastic flexible member 24, the types having

different elasticities. The first elastic members 24a are the least elastic and they extend between the sixth hoop 15 and the eighth hoop 15. There are six members 24a and they are attached to the fixing points 16 on the sixth, seventh and eighth hoops 15.

The second elastic flexible members 24b are more elastic than the first elastic flexible members 24a. There are six of these members 24b and they extend between the eighth hoop 15 and the tenth hoop 15 and are connected to the fixing points 16 on these hoops.

The third elastic flexible members are connected between the tenth hoop 15 and the associated liferaft 12. They are more elastic than the second elastic flexible members 24b. There are six of these members 24c and they are connected to the fixing points 16 on the tenth and eleventh hoops 15 and to fixing points (not shown) on the liferaft 12.

A typical first elastic flexible member 24a might have a diameter of 19mm and extend in excess of 4000mm under a load of about 7.5N. Each second elastic flexible member 24b might typically have a diameter of 16mm and extend in excess of

4000mm under a load of about 5.5N. Each third elastic flexible members 24c might have a diameter of 12.5mm and extend in excess of 4000mm under a load of 3.5N.

5 The outside of this structure may be covered by a fabric tube (not shown) of generally the same diameter as the hoops 15.

Each exit 10 is connected to the support 25 at the upper end of the escape chute 11. This provides an exit from the ship and leads to the entrance to the escape chute 11 at the upper
10 end of the escape chute 11.

The liferafts 12 are formed by inflatable tubes 26 and are provided with a fabric cover 27. The liferafts are generally
15 rectangular in plan view and, as shown in Figure 1, are held together in a rectangular array. Each escape chute 11 provides at its lower end an exit within an associated one of the liferafts 12.

20 In use, the liferafts 12 are deflated and are held with the escape chutes 11 in a container mounted at the exits 10 on the ship. It will be appreciated that the escape chutes 11 require very little space because the hoops 15 will collapse

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to lie on top of one another and the fabric of the tube 13 can readily be collapsed. The members 23,24 will also collapse into a comparatively small space.

5 In an emergency, the liferafts 12 and the escape chutes 11 are ejected from the container and the exits 10 opened. As they deploy, the liferafts 12 are inflated from a source of gas under pressure (not shown) in conventional fashion. The liferafts 12 are provided with water pockets (not shown)
10 which, as the liferafts 12 hit the sea, fill with water. The weight of the liferafts 12 and the length of the inelastic members 23 and the elastic members 24 are chosen so that, in a calm sea and with the ship normally loaded, the inelastic members 23 are fully extended and the elastic members 24 are
15 under tension. As indicated above, typical elastic members 24 may provide between them an extension in excess of 12000mm. In this case, the arrangement may be such that in calm sea the flexible members 24 are extended by 6000mm.

20 The extension of the members 24 increases the spacing between the sixth hoop 15 and the associated liferaft 12. This causes the tube 13 to have an increased helix angle, as seen in Figure 2. This in turn causes straightening of the tube

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and thus extension of the flexible elastic members 24 connecting the tube 13 to the hoops 15 with the tube 13 moving towards the axis 18 of the hoops 15.

5 When deployed in this way, persons can enter the entrance at one end of the tube 13, slide through the tube in a helical path and emerge within the liferaft. They are, therefore, never exposed to the outside elements in the whole of their travel between the ship and a liferaft 12.

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Sea swell will cause the liferafts 12 to move up and down relative to the exits 11 so increasing and decreasing the freeboard of the ship. This is accommodated by extension and retraction of the elastic members 24 and by extension and retraction of the tube 13. The third elastic members 24c will extend first followed by the second elastic members 24b and followed by the first elastic members 24a. The weight at the end of the tube 13, provided by the liferafts 32, is sufficient to cause this extension without the liferafts 12 lifting out of the sea. The position of the axis 17 of the tube 13 will also change, with such changes being accommodated by the flexible members 20. As this occurs, the helix angle of the tube 13 will vary.

It will be appreciated that there are a number of variations that can be made to the marine escape system described above with reference to the drawings.

5 There need not be two escape chutes 11; there could be one or three or more. The or each escape chute 11 need not terminate within a liferaft 12; it could terminate at a floating platform to which liferafts are attached.

10 In an alternative arrangement, the tube 13 may split at a point along its length into two parallel tubes so that persons evacuating the ship can pass successively down one and then the other of the tubes.

15 The connections between the hoops need not be formed by flexible members 24; they could be formed by any suitable extendible member such as a spring.

20 Although the arrangement described above is elastically extendible and retractible only from the sixth hoop 15 to the liferaft 12; it could be elastically flexible all the way along its length or between the liferafts and hoops other than the sixth hoop 15.

It will also be appreciated that the weight of the liferafts 12 at the end of the escape chutes 11 tend to keep the chutes in a vertical disposition. This minimizes the requirement for any stabilization of the position of the escape chutes 11 relative to the ship.

The escape path for evacuees need not be a helical tube; it could be an open-topped helical chute or a tube containing a succession of alternately oppositely facing panels spaced along the length of the tube, each panel being angled relative to the length of the tube. A person entering the tube slides down one panel and then turns to slide down an oppositely facing panel and so on until the end of the tube is reached. In this case, the panels may be of flexible material to accommodate extension and retraction of the tube.

Referring next to Figures 5 to 22, there will now be described an alternative form of the escape chute shown in Figure 1.

In this embodiment, the escape chute is formed from three different kinds of cell. A left hand cell 30 shown in Figures 5 to 13, a right hand cell 31 shown in Figures 14 to 18 and a bottom cell 32 shown in Figures 19 to 23. The right hand and

left hand cells 30,31 are joined end to end alternately to form the chute, in a manner to be described in more detail below, and the bottom cell 32 is attached at the end, again in a manner to be described in more detail below.

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Referring first to Figures 5 to 13, the left hand cell 30 is formed from a cell wall 33, best seen in Figure 9, and a slide path 34, best seen in Figure 10. The cell wall 33 is, as seen in Figure 9, generally cylindrical and formed of a high strength waterproof fabric. As best seen in Figures 5 to 8, the cell wall 33 has an upper edge 35 provided with a circumferentially spaced series of loops 36. The cell wall 33 also has a lower edge 37 with similar spaced loops 38. A series of tubular pockets 39 extend around the cell wall 33 intermediate the upper edge 35 and the lower edge 37 to form an interrupted annular passage around the cell wall.

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The function of the loops 36,38 and the pockets 39 will be described below.

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The cell wall 33 contains a slide path 34, best seen in Figure 10. The slide path 34 is also formed from strong waterproof fabric.

The slide path 34 comprises a back panel 40 which is generally elongate with a rounded upper end edge 41 and a convexly curved side edge 42. The edge of the side of the back panel 40 opposite the side edge 42 is straight and the lower edge 44 of the back panel 40 opposite the upper end edge 41 is also straight. A diverter panel has an edge connected to the straight edge 43 of the back panel 40 and lies in a plane that subtends an obtuse angle to the plane of the back panel 40. An outer skirt panel 46 curves between a lower portion of the outer edge 47 of the diverter panel 45 and a lower portion of the side edge 42 of the back panel. The back panel 40, the diverter panel 45 and the outer skirt 46 thus between them form a converging enclosed pathway or pocket. This terminates in an aperture 48.

The slide path 34 is connected inside the cell wall 33 in the following way.

The upper end edge 41 of the slide path 34 is connected to the interior surface of the cell with the apex of this edge 41 being adjacent the upper edge 35 of the cell wall 33. This connection continues around the upper end edge 41, the side edge and the outer edge 47 of the diverter panel 45, until

approximately the level of the pockets 35. In addition, the outer skirt 46 has an upper edge 50 that is also connected to the interior of the outer of the cell wall 33 also roughly at the level of the pockets 35.

5

Thus, as seen in Figures 5 to 8, the back panel 40 extends diagonally across the cell wall 33 between the upper edge 35 and the lower edge 37. As seen in Figure 7, the diverter panel 45 is at an obtuse angle relative to the back panel 40.

10 The funnel outlet 49 extends downwardly beyond the lower edge 37 of the cell wall 33. In this way, as seen in Figure 13, the lower part of the cell wall 33 can be collapsed upwardly without affecting the disposition of the slide path 34. The purpose of this will be described below.

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The right hand cell 31 will now be described with reference to Figures 14 to 18. As seen in these Figures, the cell is largely identical to the left hand cell 30 and the common parts will not be described in detail and will be given the same reference numerals. The difference between the right
20 hand cell 31 and the left hand cell 30 is that, in the right hand cell 31, the slide path 34 is rotated by 90° relative to the loops 36,38 as compared to the slide path 34 of the left

hand cell 30. This allows the loops 35,38 to form a passage in a manner to be described below.

The bottom cell 32 is formed by an annular cell wall 55 having an upper edge 56 provided with loops 57 which are the same as the loops 36 on the upper edge 35 of the cell wall 33 of the left hand cell 30. The cell wall 55 has, however, no pockets 35 and no loops on its lower edge 58. The length of the cell wall 55 between the upper edge 56 and the lower edge 58 is longer than the length of the cell wall 33 of the left hand cell 30 between its upper edge 35 and lower edge 37. The cell wall 55 contains a slide path 59 which is identical to the slide path 34 in the left hand cell 30 and is connected to the cell wall 55 in the same way as the slide path 34 is connected to the left hand cell 30. Thus, as seen in Figures 18 to 22, the funnel outlet 49 projects only a short distance below the lower edge 58 of the cell wall 55. However, the back panel 40 may be perforate to allow water to drain through the panel 40.

The chute is formed by connecting together left and right hand cells 30,31 alternately until a chute of the required length has been formed. The cells are so arranged that the back panel 40 of each slide path 34 is skewed by 90° relative to

the preceding and succeeding back panels 40. The skewing is successively in the same sense (either clockwise or anticlockwise).

5 The cells 30,31 are interconnected by hoops (not shown). The loops 38 at the lower edge 37 of one slide path 34 (of a left or right hand cell 30,31) fit between the spaces of the loops 36 of the upper edge of the next slide path 34 (of a right or left hand cell 31,30). There is thus formed a continuous
10 tubular passage through which a hoop extends to form the connection. The hoops may, for example, be made of metal.

The bottom cell 32 is connected to the lowermost left hand or right hand cell 30,31 in the same way; by a hoop passing
15 through the passage formed by the loops 36,38.

A hoop 53 is also passed through the tubular pockets 39 between the upper and lower edges 35,37 of each cell wall 33. The effect of these hoops 52,53 is to hold the cell walls 33,
20 55 open while permitting them to be collapsed.

The hoops 52 at the upper and lower edges 35,37 of the cell walls (but not the intermediate hoops 53) are connected

together by elastic members which are arranged in the same way as the elastic members 19 connecting the hoops 15 in the embodiment described above with reference to Figures 2 to 4. The escape chute so formed is connected between a ship and a life raft 12 in a manner of the escape chute described above with reference to Figures 2 to 4.

This embodiment of the escape chute forms, in essence, a spiral path between the uppermost cell 30,31 and the bottom cell 32. A person entering the uppermost cell 30,31 initially sits on the back panel 40 of the first slide path 34. As the person travels down the back panel 40, they engage the diverter panel 40 and this twists them in anticlockwise direction. They then pass through the funnel outlet 49 to engage the back panel 40 of the next succeeding cell 30,31 which is skewed by 90° to the back panel 40 the person has just left. The effect of the funnel outlet and the skewed arrangement of the back panels 40 is to cause the person to slow down by friction engagement with the material of the slide path and by the constriction provided by the funnel outlet. A person travelling through the escape chute thus reaches a safe speed at which the person passes in a spiral path through succeeding slide paths 34 until the bottom cell

32 is reached. As the person leaves the bottom cell 32 through the funnel outlet 49, they enter the life raft 12 as described above with reference to Figures 1 to 4.

5 As the spacing between the life raft 12 and the ship varies, such variation is accommodated by the collapse and extension of the chute under the control of the flexible members 20 which progressively collapses the chute from the bottom cell 32 upwards, as described above with reference to Figures 1 to
10 4.

As a result of the way in which the slide paths 34 are connected to the cell walls 33,55, such collapsing of the walls 33,55 does not collapse the slide paths 34. As the
15 escape chute length gets shorter, they merely concertina into one another so that, as a person leaves a funnel outlet 49 of one cell 30,31 they engage the back panel 40 of the next succeeding cell 30,31 at a position lower down the back panel 40 than the person would if the cells 30,31 were fully
20 extended.

It will be appreciated that there are a number of variations that can be made to this second form of escape chute. The

slide path 34 need not be formed as described. It could have any shape which guides and controls the path of a person through the chute. The cells 30,31,32 need not be connected by loops 36,38 as described above, they could be connected in any suitable way. The cell walls 33,55 need not be continuous; they may include cut-outs.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.



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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A marine escape system comprising a passage for persons and having an entrance at one end and an exit at an end opposite said one end, at least one support for the passage being
5 provided between the entrance and the exit, the support being suspended by at least one first elongate elastic member, at least one second elongate elastic member extending from the support towards the exit, the at least one second elongate elastic member having a greater elasticity than the at least one first elongate elastic member, so that a portion of the passage
10 between the exit and the support is extensible and contractible before the extension and contraction of a portion of the passage between the entrance and the support, the passage being extensible and contractible to accommodate changes in the spacing between the entrance and the exit.

2. A system according to claim 1 wherein a further support is provided between the first
15 mentioned support and the exit, the at least one second elongate elastic member being connected between the first-mentioned and the further supports, at least one third elongate elastic member extending from the further support towards the exit so that the passage extends and contracts initially between the exit and the further support and then between said support and the first-mentioned support and then between the first-mentioned support and the
20 entrance.

3. A system according to claim 1 or claim 2 wherein the at least one first elongate elastic member is connected between an upper support and the first-mentioned support, said upper support being spaced from the entrance of the passage, the connection between said entrance
25 and said upper support being non-elastic.

4. A system according to claim 3 wherein the connection between said entrance and said upper support comprises at least one elongate inelastic member.

30 5. A system according to any one of claims 1 to 4 wherein the or each support is formed by a hoop extending around the passage.



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6. A system according to claim 5 when dependent on any one of claims 2 to 4 wherein a plurality of hoops are provided at spaced locations along the passage between the entrance and the exit, said hoops forming said supports.

5 7. A system according to any one of claims 1 to 6 wherein each at least one elongate elastic member comprises a plurality of said elongate elastic members, each member extending generally parallel to the length of the passage and the members being spaced around the passage.

10 8. A system according to any one of claims 1 to 7 wherein the passage is formed from a tube of foldable material.

9. A system according to any one of claims 1 to 8 wherein the passage comprises a helical chute extending from the entrance to the exit.

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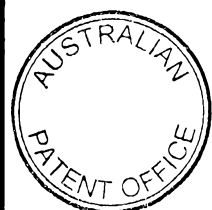
10. A system according to claim 9 wherein the chute is a closed helical tube.

11. A system according to claim 9 or claim 10 when dependent on claim 8, wherein the helical tube is connected to the hoops to position the helical chute relative to the hoops.

20

12. A system according to claim 11 wherein the helical chute, as the chute passes through at least one hoop has the centre line thereof eccentrically arranged relative to the axis of the hoop, the connection between the helical chute and the hoop allowing the centre line of the helical chute to move relative to the axis of the hoop between a maximum spacing and a
25 minimum spacing to accommodate extension and retraction of the helical chute.

13. A system according to claim 12 wherein, at said at least one hoop, a plurality of angularly spaced flexible connections extend between the hoop and the helical chute, the longer connections being inextensible to limit the maximum spacing of the centre line and the
30 axis and the shorter connections being elastically extensible to permit the centre line to move towards the axis.



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14. A system according to claim 9 wherein the passage includes a succession of alternately oppositely spaced facing panels spaced along the length of a tube each panel being angled relative to the length of the tube.

5 15. A system according to claim 14 wherein at least some of the panels are made from an elastically extendible material to accommodate extension and retraction of the tube.

16. A system according to any one of claims 1 to 15 wherein the exit is on an inflatable structure.

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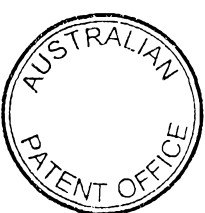
17. A system according to claim 16 wherein the inflatable structure is a liferaft, the tube exit being within the liferaft.

18. A system according to any one of claims 1 to 9, wherein the passage is formed by an escape chute comprising an elongate tube which is deployed generally vertically and a succession of spaced members within the tube, each spaced member being formed by a panel extending transversely across the tube, the panel having an upper edge connected to the tube and a lower edge spaced from the tube to define an aperture leading to the next panel, a funnel outlet depending from each aperture, the panels and the funnel outlet defining, with the tube, a path for the passage of a person through the tube, with each funnel outlet providing a vertical component of said path.

19. A system according to claim 18 wherein the panels and funnel outlets are arranged in succession along the tube such that a person passing through the tube contacts a succession of panels and funnel outlets.

20. A system according to claim 18 or claim 19 wherein each panel is rotated about the axis of the tube relative to the panels of the preceding and succeeding members.

21. A system according to claim 20 wherein successive panels are rotated in the same sense by 90° relative to one another so that the path is a spiral path.



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22. A system according to any one of claims 18 to 21 wherein each panel has spaced first and second side edges, at least a portion of the first side edge being connected to the tube and the second side edge being connected to a diverter panel which is connected to the tube and which lies in a plane at an obtuse angle to the plane of the associated transverse panel, the
5 diverter panel being arranged to impart to a person a twist in the same sense as the relative rotation between successive panels.

23. A system according to claim 21 or claim 22 wherein a skirt panel extends around a lower portion of each transverse panel to form, with the panel, a pocket terminating at a lower
10 end thereof in an aperture leading to the next panel.

24. A system according to claim 23 wherein each skirt panel has an upper edge connected to the tube and a lower edge forming an edge of said aperture.

15 25. A system according to claim 24 wherein each transverse panel is connected to the tube only along that portion of the edge of the transverse panel that is above the line along which the upper edge of the associated skirt panel is connected to the tube so that the portion of the tube below the upper edge of the skirt panel can collapse upwardly without collapsing the associated path member.

20 26. A system according to any one of claims 18 to 24 wherein at least one of said transverse panels is perforate.

27. A system according to any one of claims 18 to 26 wherein each funnel outlet is sized
25 to fit closely around a person passing therethrough so that the speed of the person is arrested during such passage.

28. A system according to any one of claims 18 to 27 wherein the tube is formed from a plurality of annular walls of flexible material, each wall surrounding an associated member,
30 the walls being connected end-to-end to form said tube.



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29. A system according to claim 28 wherein a hoop extends around the connection between successive walls.

30. A system according to claim 29 wherein each wall has an upper edge and a lower
5 edge, each said edge including a plurality of circumferentially spaced loops, the loops of each said edge forming, with the loops of an adjacent edge of an adjacent wall, a passage which receives said hoop.

31. A system according to claim 29 or 30 wherein at least some of the walls have an
10 additional hoop extending therearound at a position spaced between said connections.

32. A system according to claim 31 when dependent on claim 27 wherein said additional hoop is at a position level with the connection of the skirt panel with the wall.

15 33. A marine escape system, substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 9th day of September, 1999

WARDLE STOREYS (SAFETY & SURVIVAL EQUIPMENT) LIMITED

By his Patent Attorneys

DAVIES COLLISON CAVE



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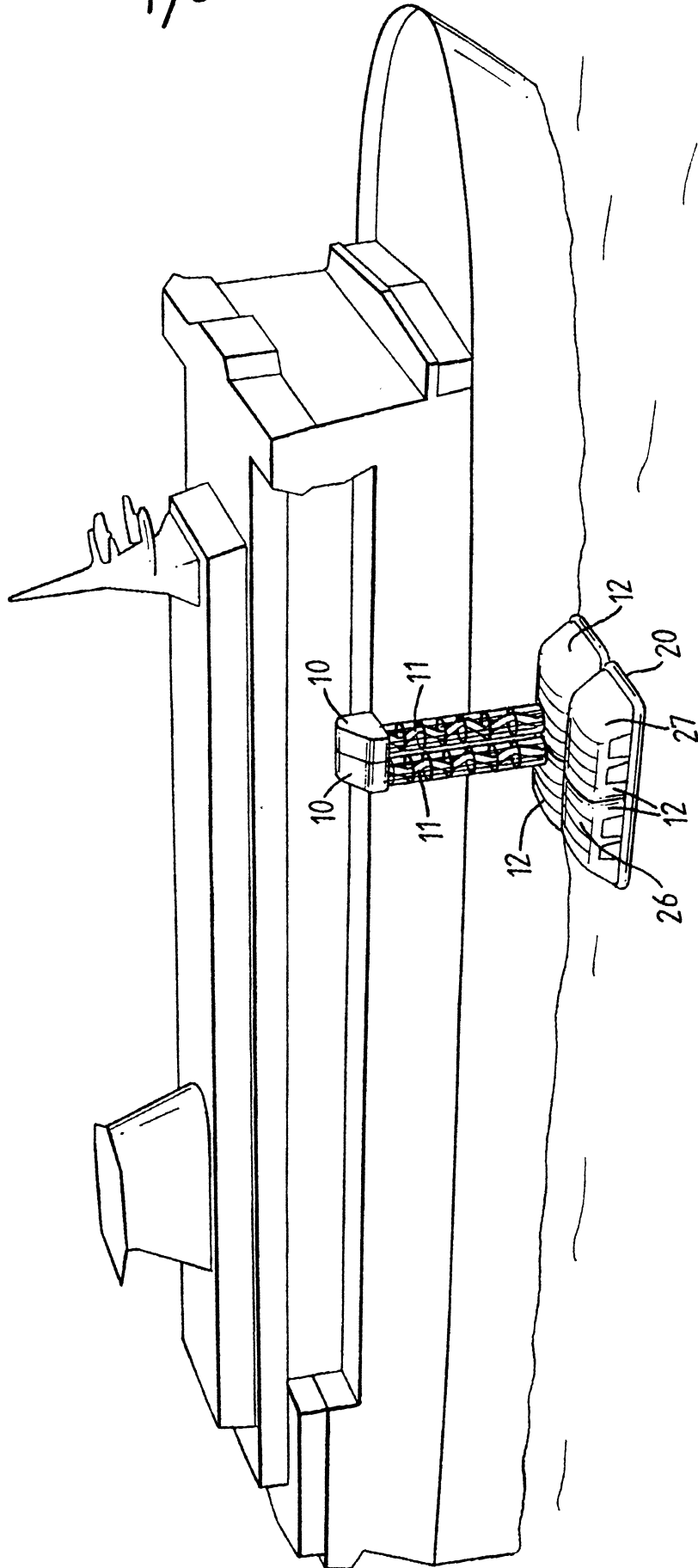


Fig.1

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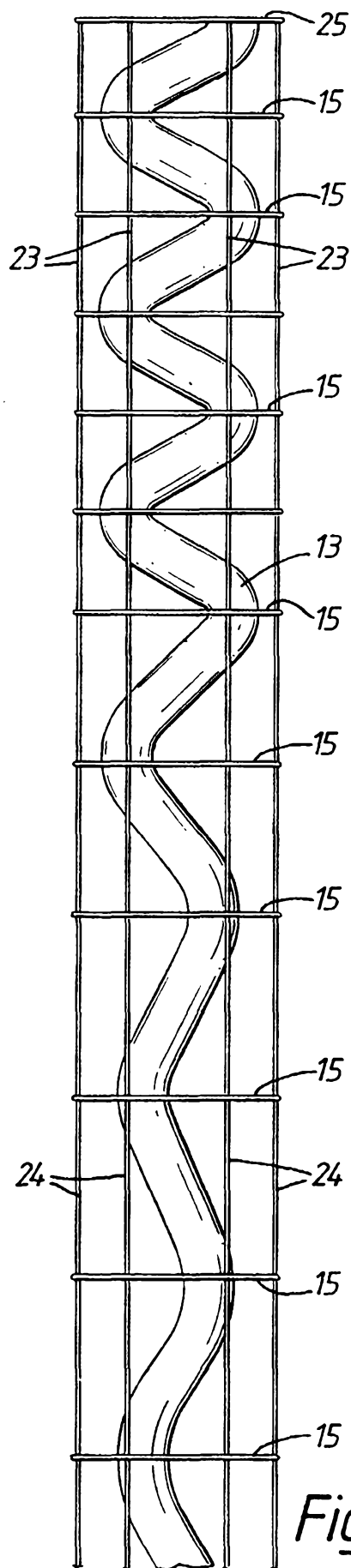


Fig. 2

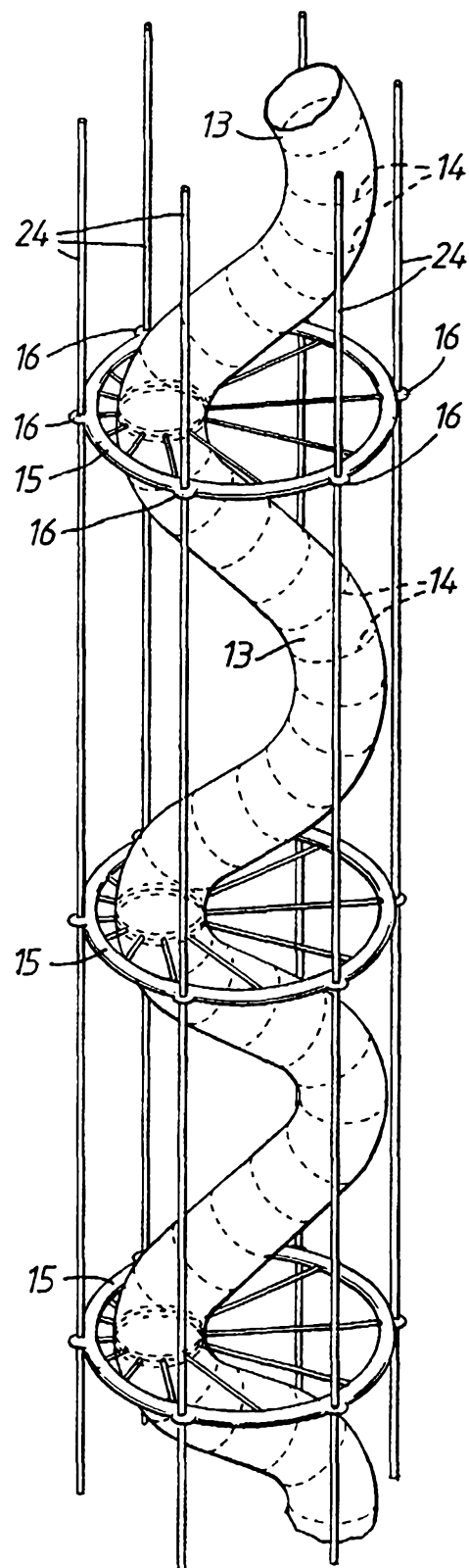


Fig. 3

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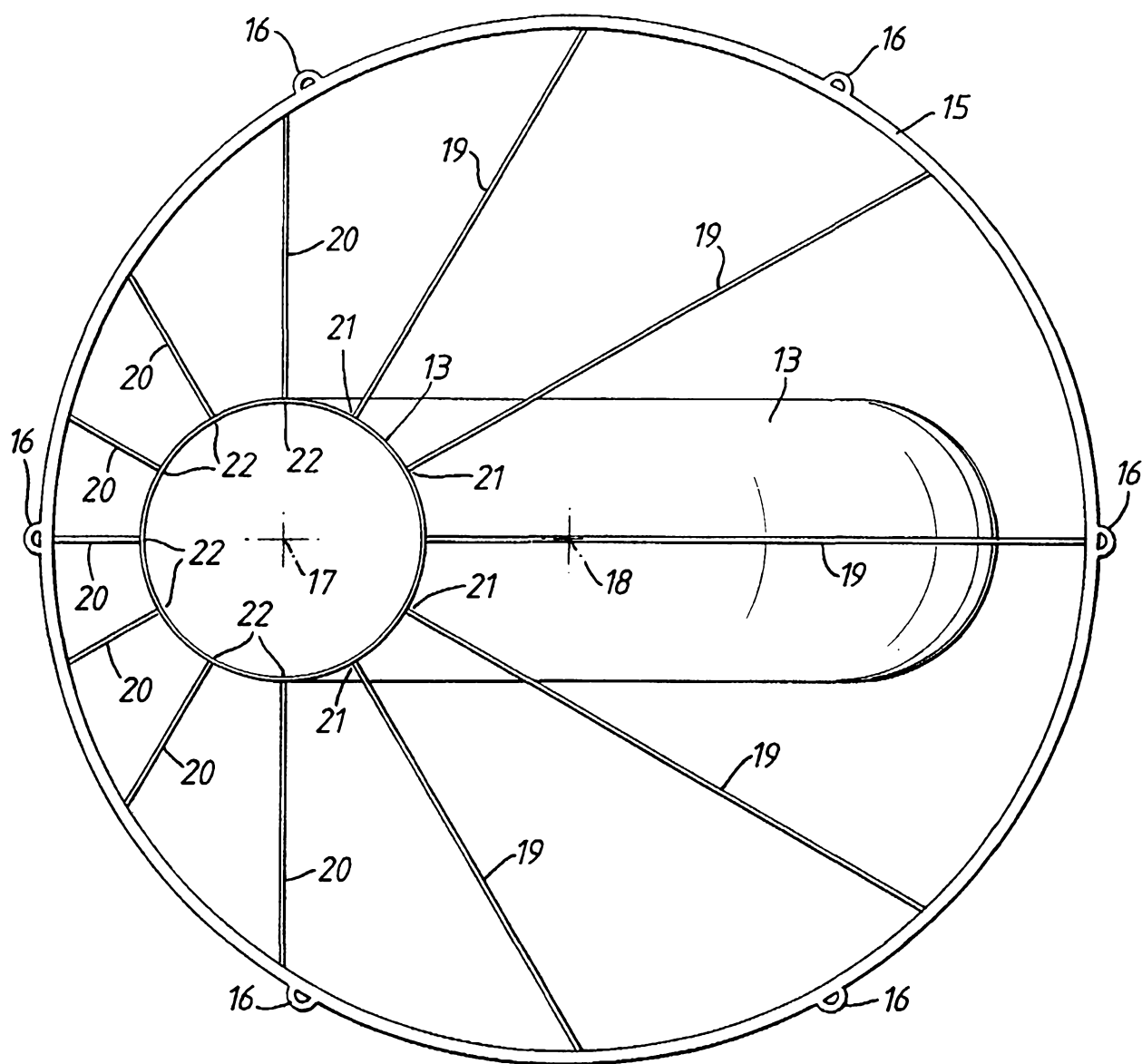


Fig. 4

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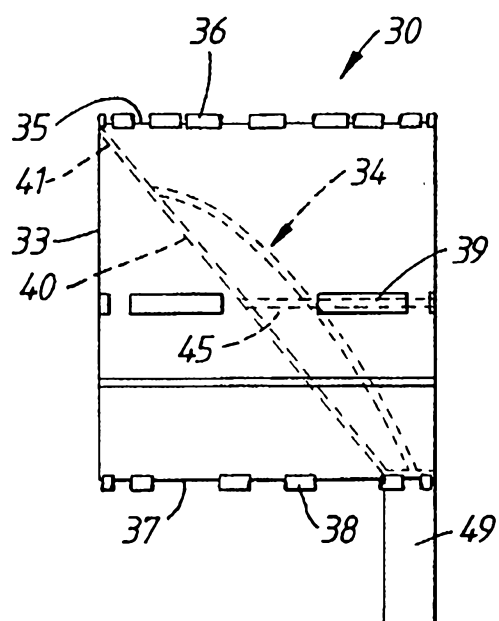


Fig. 5

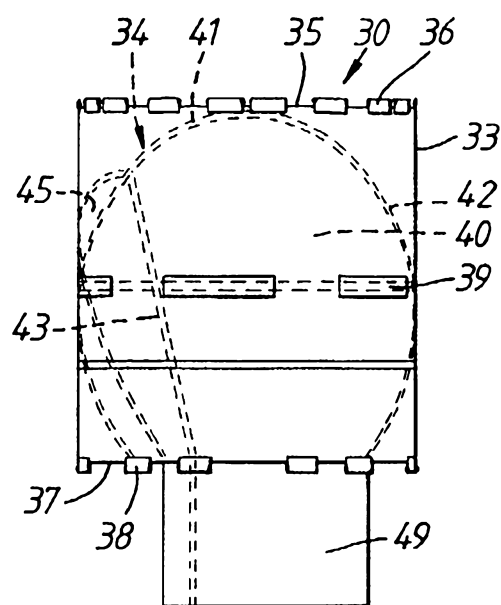


Fig. 6

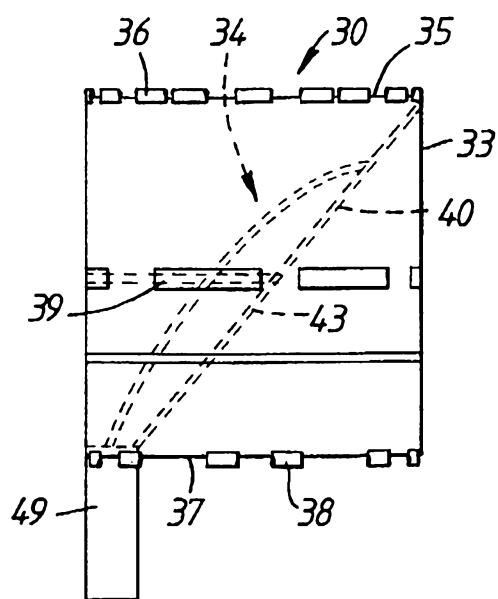


Fig. 7

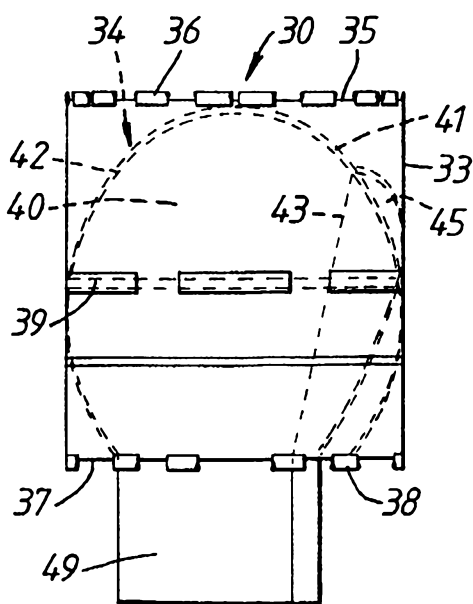


Fig. 8

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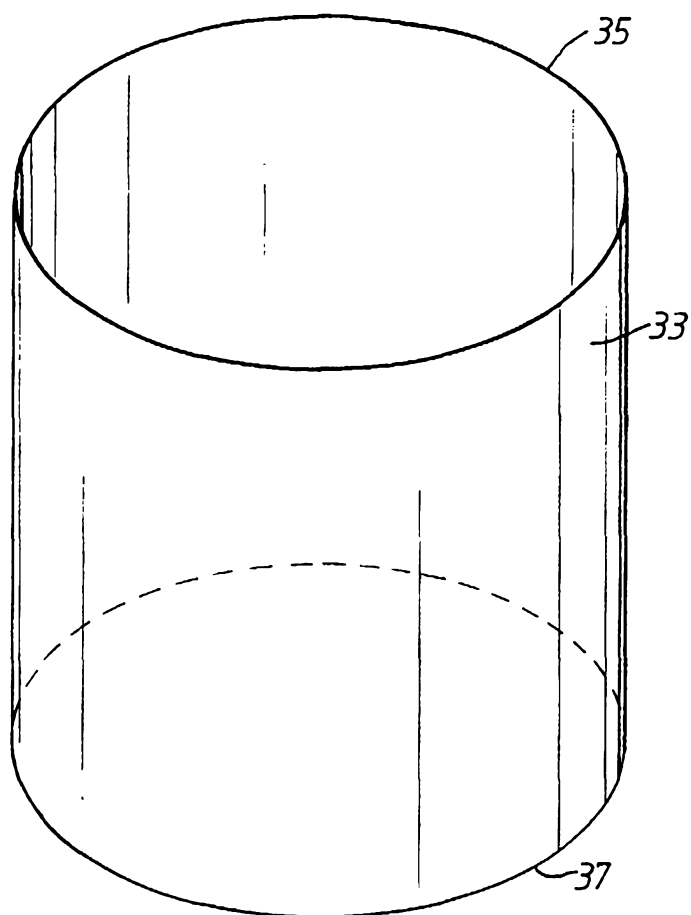


Fig. 9

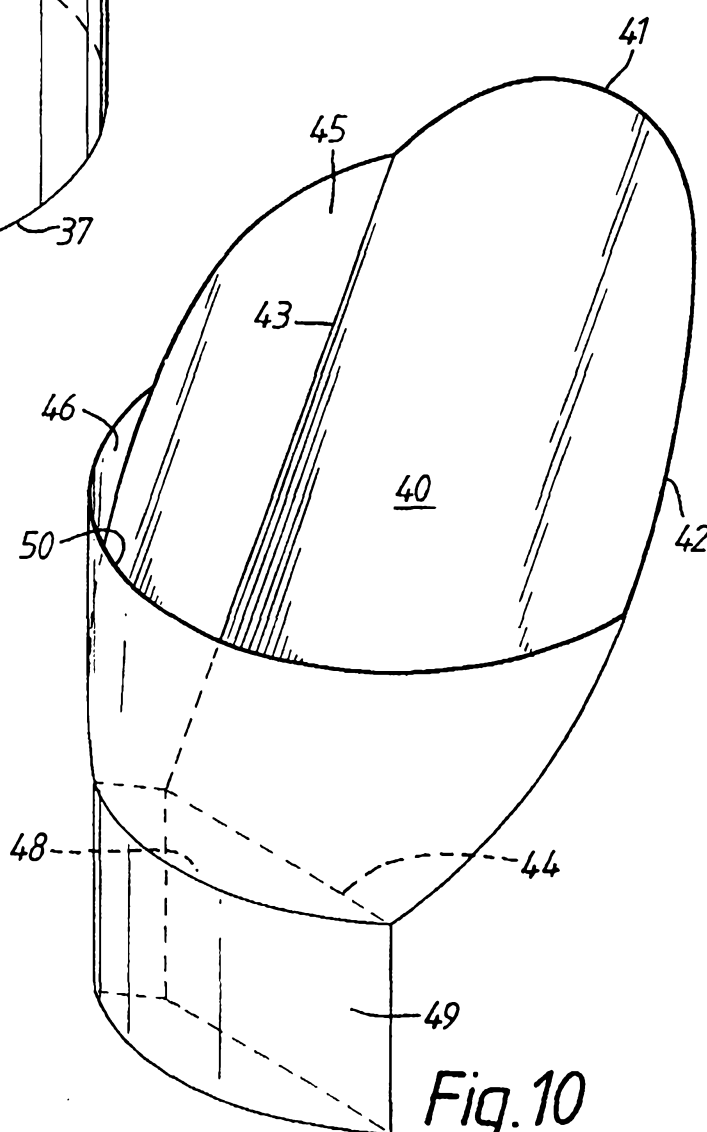
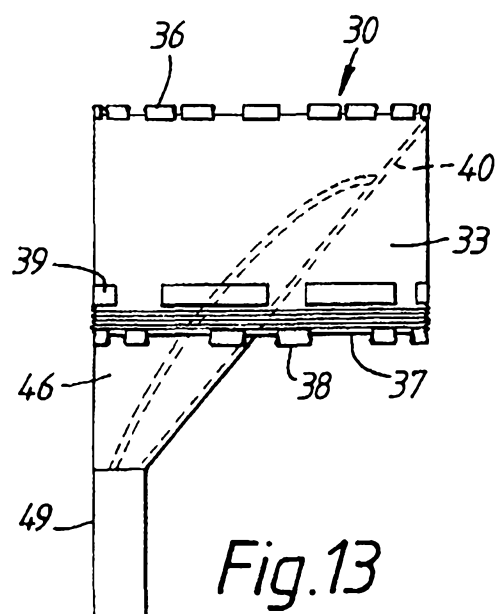
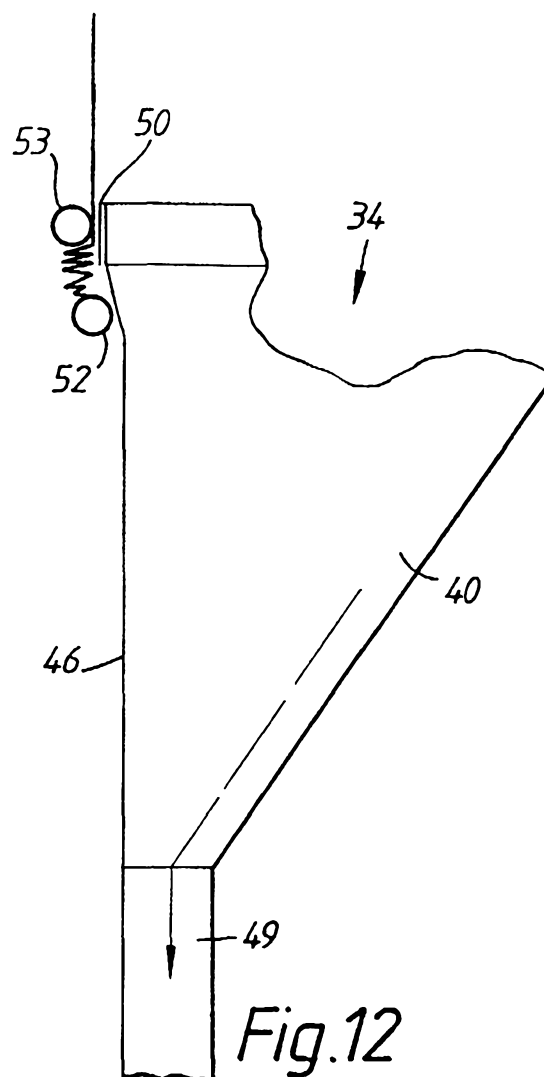
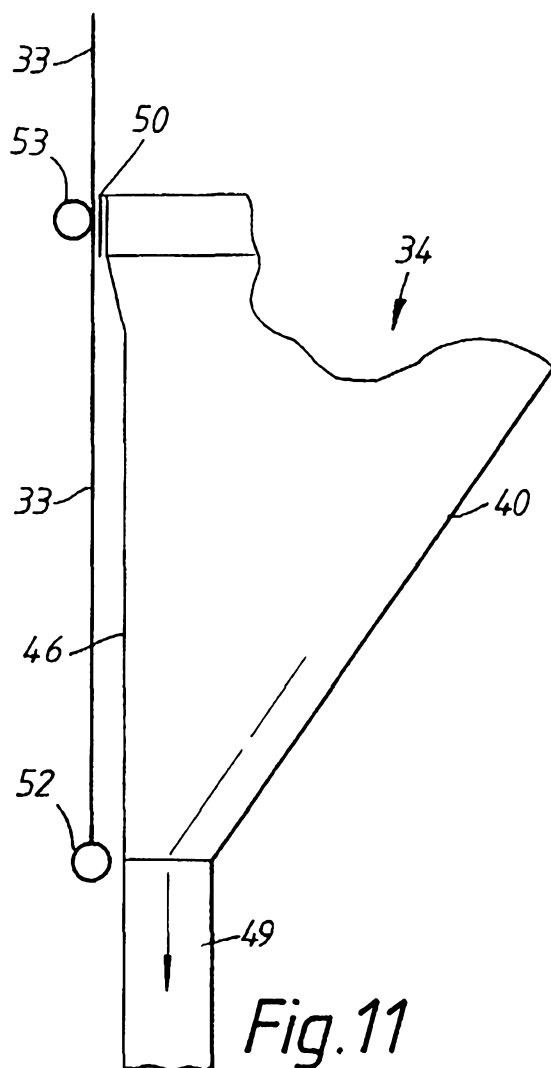
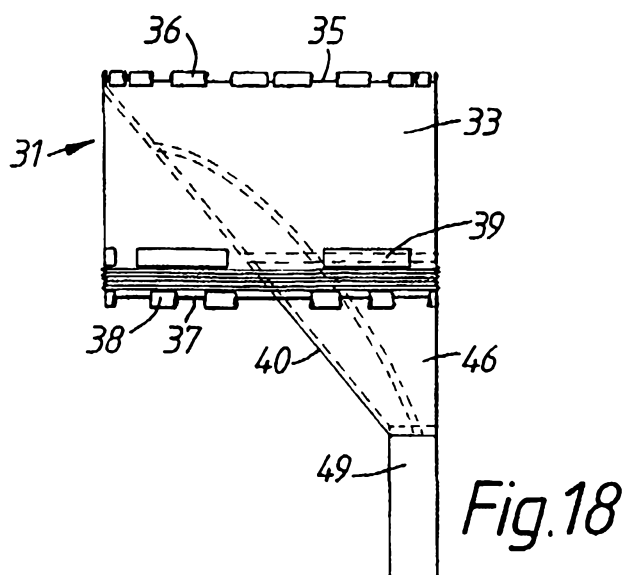
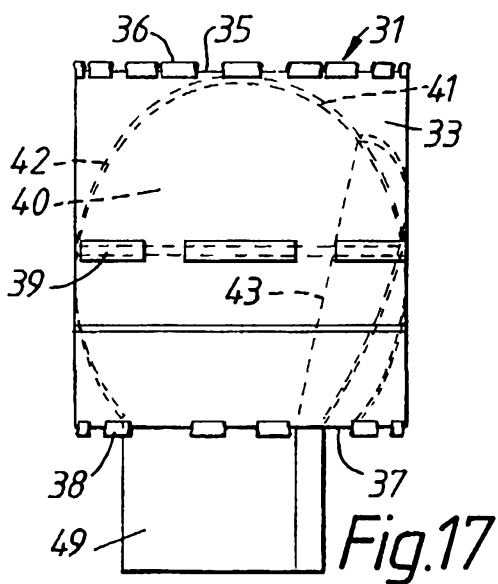
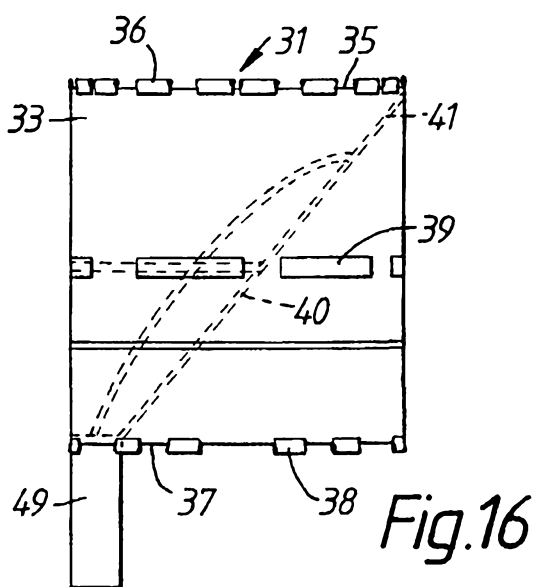
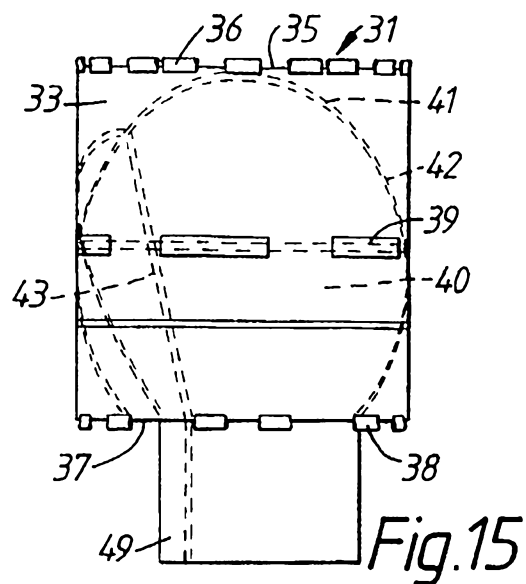
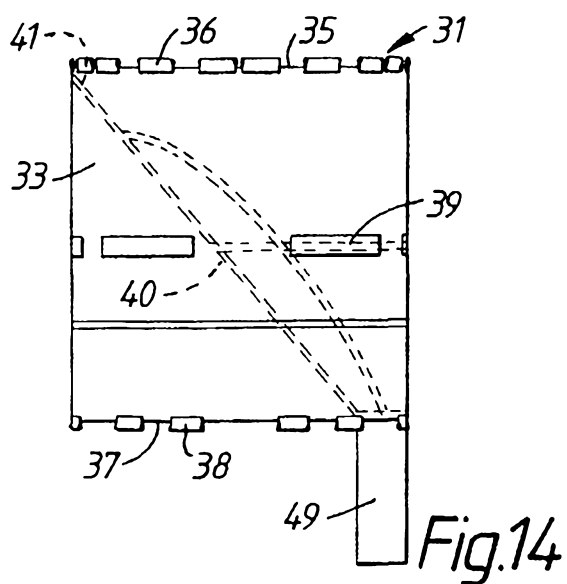


Fig. 10

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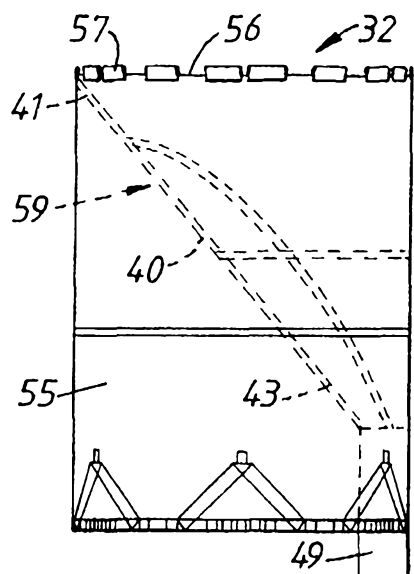


Fig 19

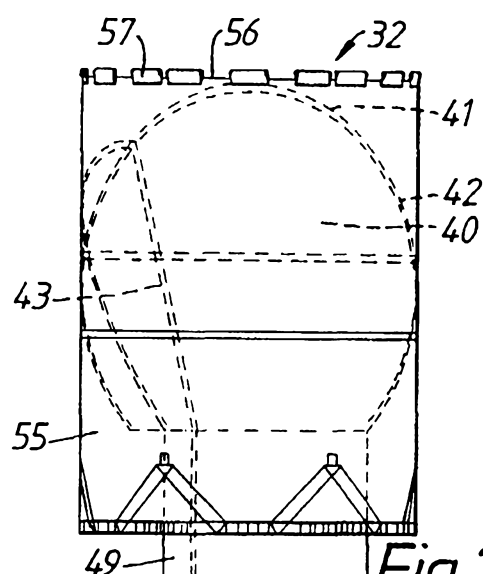


Fig 20

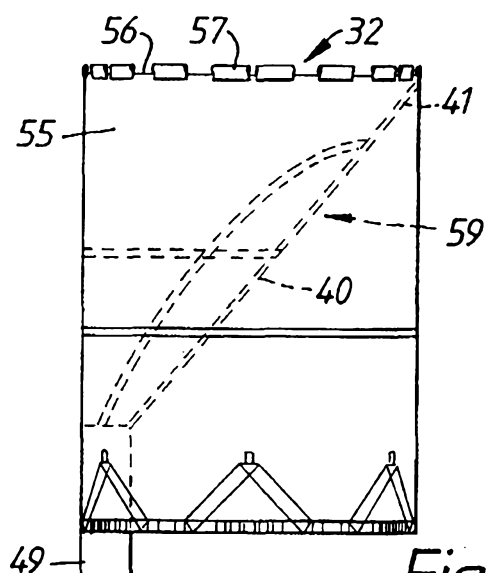


Fig 21

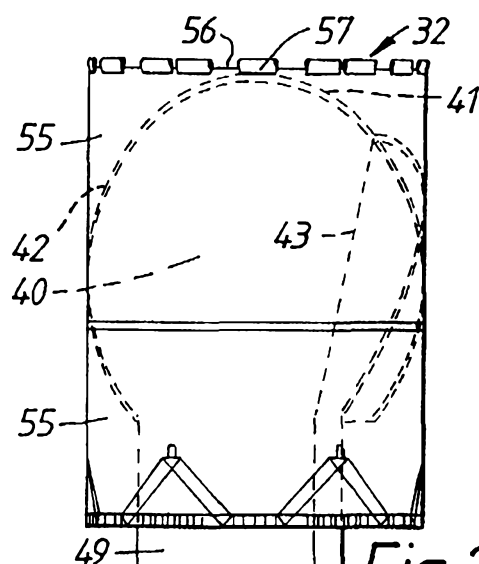


Fig 22

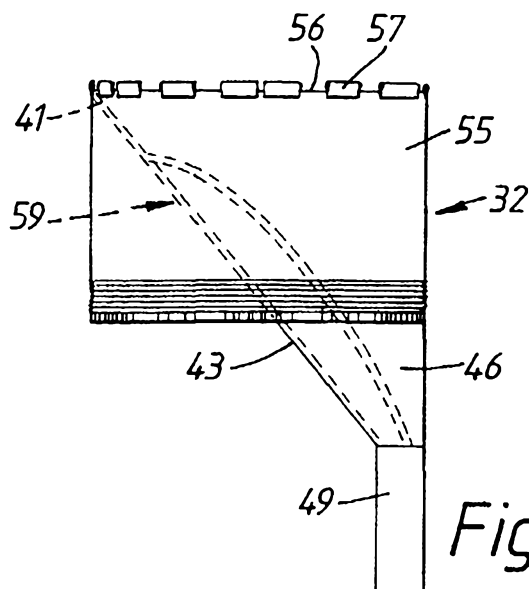


Fig 23