June 4, 1968 W. W. MOUNT 3,386,407

ANCHORS AND ANCHORING MECHANISMS

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Fig. 1.

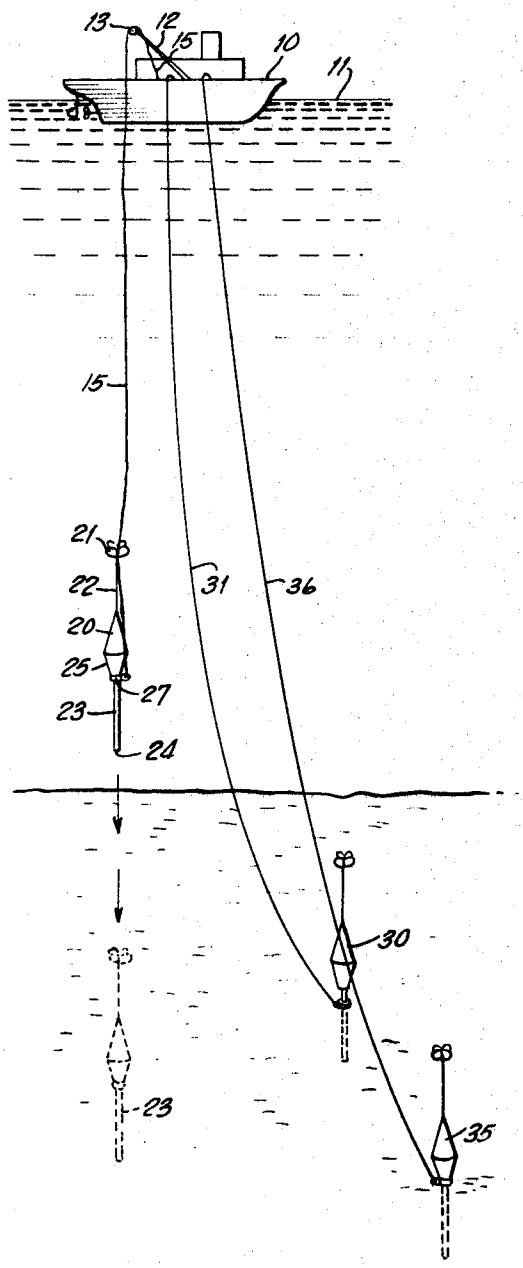

Fig. 2.

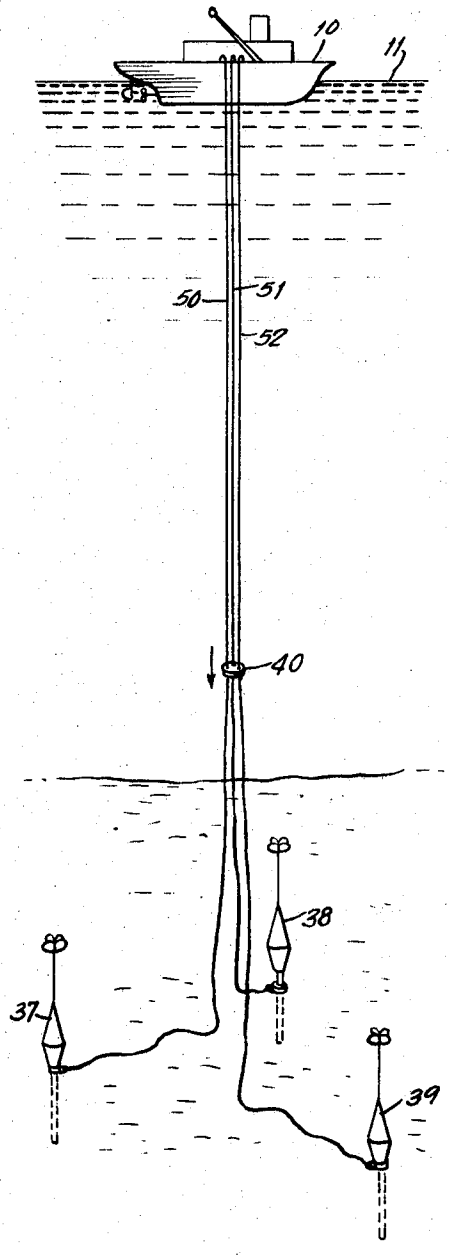

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Fig. 3.

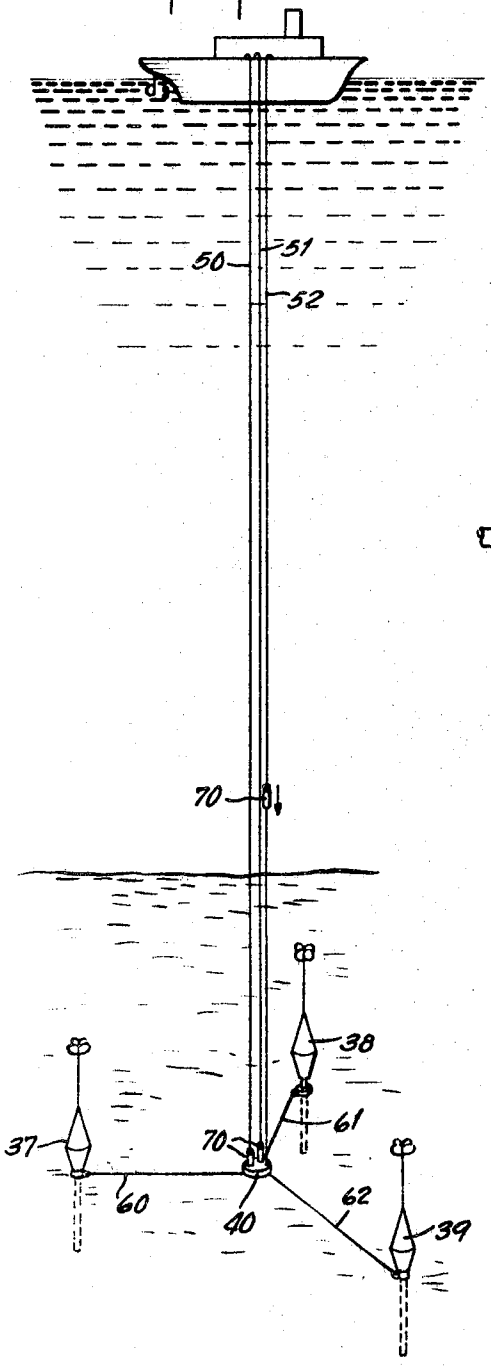

Fig. 4.

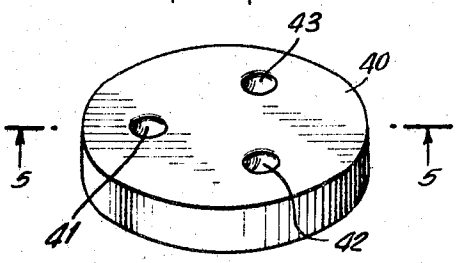

Fig. 5.

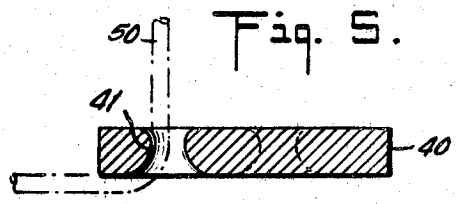

Fig. 6.

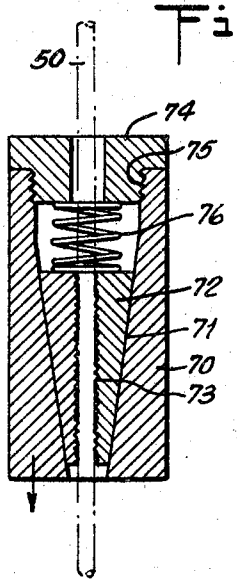

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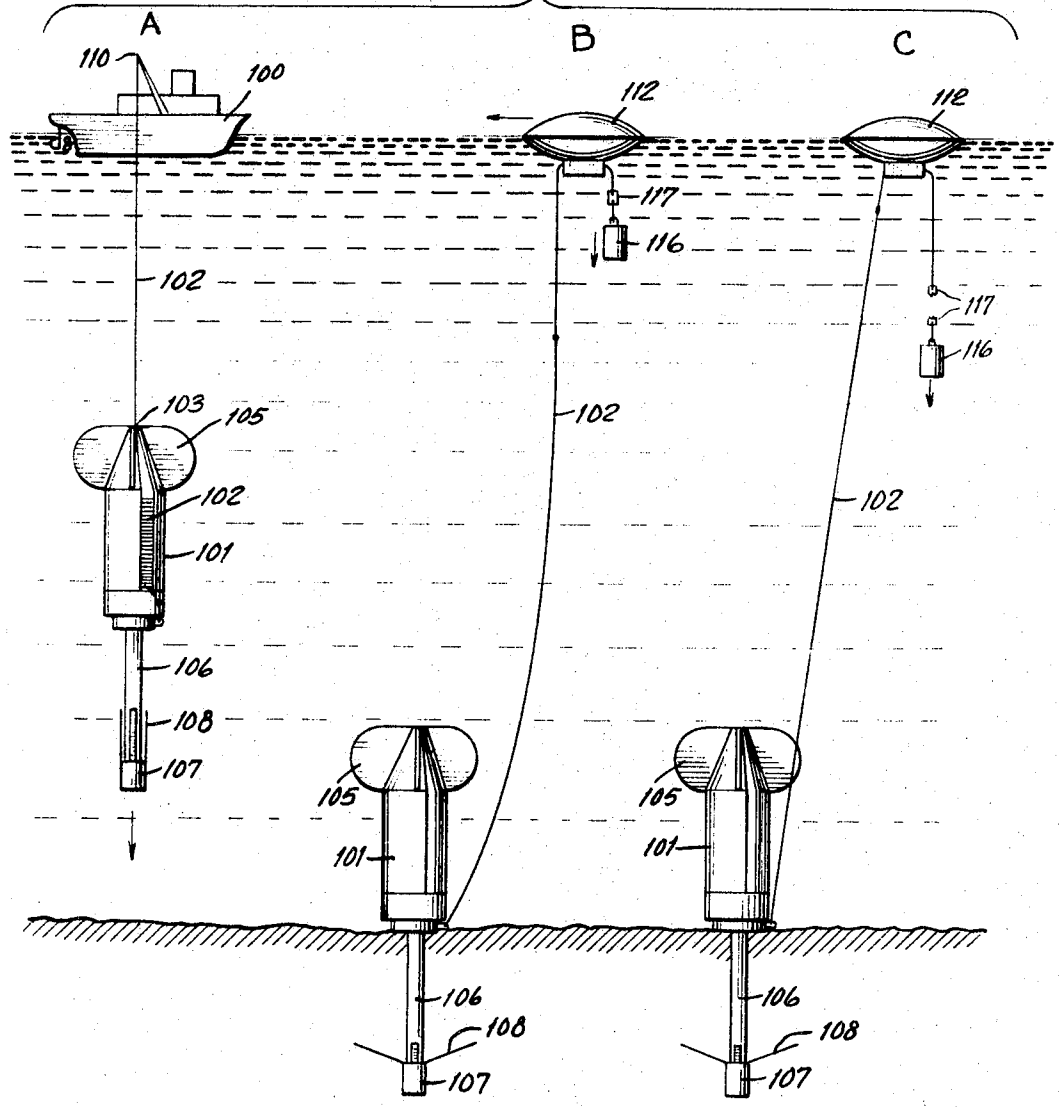
Fig. 7.



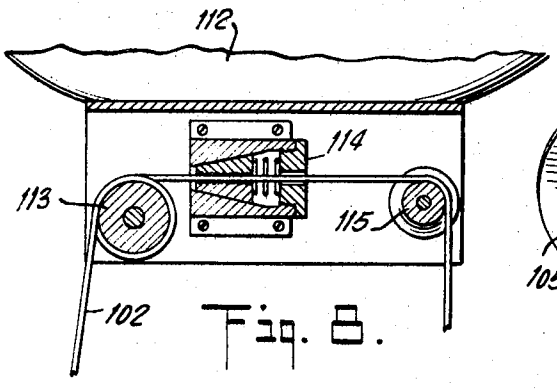


Fig. 8.

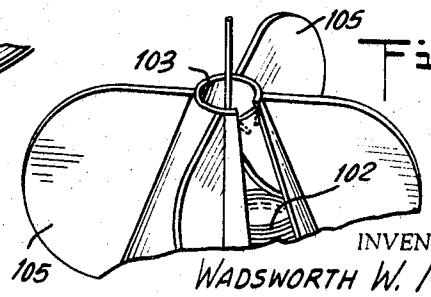


Fig. 9.

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United States Patent Office

3,386,407
Patented June 4, 1968

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ANCHORS AND ANCHORING MECHANISMS

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Filed Aug. 2, 1966, Ser. No. 569,642
7 Claims. (Cl. 114—206)

This invention pertains to anchors and anchoring mechanisms, and one object is to provide a suitable mechanism which is peculiarly effective for anchoring a buoy or a ship in waters of extreme depth, such as 100 to 3,000 fathoms.

There is a rapidly growing demand for the placing of antenna buoys or signal buoys at widely scattered points in the ocean, and the depths encountered are frequently as great as 3,000 fathoms.

The usual way is to drop an anchor whose flukes are to bite into the surface of the sea bottom, then lay out enough scope so that the anchor line will pull on the anchor in a substantially horizontal direction. To help it pull horizontally, weights or heavy lengths of chain are often connected near the anchor before the line turns upward to the moored ship or buoy. In very deep water, 100 to 3,000 fathoms, such methods use too much line and become impractical in many instances. Furthermore, such anchoring systems often drag across the bottom anyway, since the standard anchors do not bury themselves very deep.

For success in this field of endeavor there are several factors which I have found to be of outstanding importance, namely:

(a) A spear form of anchor is preferable.

(b) The end of the spear must be flat like the end of a cylinder and not tapered or pointed.

(c) The drag on the anchor should be at substantially right angles to the anchor or parallel to the bottom.

(d) A plurality of anchors should be used to hold a large ship, and three can be most usefully placed in a triangular arrangement, the spacing of the anchors being largely determined by the depth of the ocean at the place where the ship is to be moored.

(e) Each of the spear anchors is designed with fin means attached at the rear to keep the anchor in an upright position as it descends through the water and to insure that the front end of the spear will strike the bottom at substantially right angles thereto and at the maximum possible speed to provide the deepest penetration into the bottom of the ocean.

The invention will be better understood by reference to the accompanying drawings, and other objects and advantages will be apparent to those skilled in the art from the following specification and claims:

FIG. 1 is a diagram showing a ship at the surface connected to two anchors already placed in the ocean bottom and a third one sinking through the water and shown in broken line in its final position.

FIG. 2 is a diagrammatic view showing a ship at the surface and three anchors by which it is to be moored and the centering ring on its way down, through which the anchor cables pass from the anchors to the ship.

FIG. 3 is a modification of the arrangement of FIG. 2 in which the ring has, on account of its own weight, gone substantially to the ocean bottom and in which a

cable chuck is threaded onto each cable and allowed to fall through the water until it comes to rest on the ring. The cable chuck is so arranged that the cable can only be pulled in one direction through the chuck.

FIG. 4 is a greatly enlarged perspective view of the centering ring having holes through which the anchor cables are threaded.

FIG. 5 is a cross-sectional view of the ring taken on the line 5—5 of FIG. 4.

FIG. 6 is a cross-sectional view of a cable chuck on a much larger scale than that shown in FIG. 3.

FIG. 7 is a diagrammatic view illustrating three steps in the anchoring of a buoy at the surface of the water, the anchor cable passing through a cable chuck as shown in FIG. 8 and provided with a weight as shown in FIG. 7B, which is adapted to break away after a timed interval and drop the weight as shown in FIG. 7C.

FIG. 9 is an enlarged view of the top of one of the anchors shown in FIG. 7, and as here indicated the anchor cable may be coiled completely within the anchor tube from which it would be paid out as the anchor descends, as shown in FIG. 7A.

Referring to FIG. 1, a ship is here shown floating at the surface of the ocean **11**, provided with a yardarm **12** extending over the side of the boat and having a sheave or cable guide **13** at its outer end. A cable **15** is mounted on the ship **10** on a spool or in a skein so that it can be freely released and can pass over sheave or guide **13** and downwardly as fast as the anchor **20** goes downwardly in an upright position, as shown at the left in FIG. 1.

A freely rotatable fin assembly **21** is mounted on upper extension **22** of the anchor. The anchor also has a lower spear portion **23**, the bottom end of which is provided with a flat bottom surface **24** which corresponds to the end of a solid cylinder as illustrated in FIGS. 1 and 2 of my patent No. 2,522,685, and is not pointed or tapered in any way.

Between the upper extension **22** and the lower spear section **23** there is preferably a double tapered heavy stream-lined body **25**. A rotatable and slidable clamp **27** is attached around spear portion **23**, and the anchor cable **15** is affixed thereto. The cable clamp **27** then turns in the direction the cable is pulled and slides down to the ocean bottom around the spear portion **23**, as on anchor **30**, if the spear has not penetrated its full length.

The anchor cable is arranged on the ship so as to pay out very freely without friction and thus permit the anchor to descend vertically through the water, as indicated at the left in FIG. 1, and finally to strike the ocean bottom, sinking the spear section **23** into the bottom as far as it will penetrate.

In addition to the anchor **20**, two other anchors **30** and **35** are provided having respectively anchor cables **31** and **36**. As illustrated, the anchors **30** and **35** have already been set into the bottom of the ocean and the cables are fastened to the ship. They have been lowered into the sea by passing over the sheave or guide **13**, as already explained, but now they are free from the sheave and are attached to the ship by any suitable means.

Referring to FIG. 2, the ship **10** is riding at the surface of the ocean **11**, and the three anchors have been set in water of substantial depth. One anchor **37** was passed into the sea in the manner already described in connection with FIG. 1. Then the ship was moved for a distance varying from a quarter to a half a mile, and a

second anchor **38** was cast. The ship was then turned at a 120° angle to the first course and proceeded through an equal distance, whereupon the third anchor **39** was cast, thereby providing three anchors located approximately at the corners of a triangle on the bottom.

A strong cylindrical ring **40** having three holes **41**, **42** and **43** as shown in FIG. 4, is adapted to slide down the three anchor cables **50**, **51** and **52**, which are threaded through the holes **41**, **42** and **43** and thereby pulled to a central point near the bottom. As shown in FIG. 5, the holes are flared outwardly at the bottom thereby permitting the cables to slip smoothly through the ring and form an angle therewith without damage to the cables. The ring **40** may be formed with a single center hole through which the three cables would pass.

The ring **40** may have very considerable weight, and when it is cast overboard with the three cables threaded through the holes, or through the center hole, it will lower itself as shown in FIG. 2 and finally approach a position substantially at the bottom of the sea.

Assuming that the three lines are of equal length and held at the surface with substantially equal tension, as is preferable for the triangular arrangement of the anchors, the ring will finally hold the three cables in position, as shown in FIG. 3, and any upward pull of the cables will be transmitted to the horizontal connections **60**, **61** and **62**, thus insuring that the pull on the anchors **37**, **38** and **39** is a horizontal pull, or nearly so.

It has been well established that an anchor of the spear type, for example, will hold against a horizontal pull more than ten times what it would hold in a longitudinal direction, and the foregoing anchor arrangement maintains the great advantage of having an pull on the anchors horizontal, while the pull of the cables from the surface is vertical.

When the ring has settled into the position shown in FIG. 3, substantially on the bottom of the ocean, it is desirable to slip a cable chuck shown in FIG. 6 over each of the cables **50**, **51** and **52** and around them to sink by gravity to the ring **40**. The chuck is composed of an outer cylinder **70** having a frusto-conical tapered opening **71** into which three chuck jaws **72** are fitted. The jaws when assembled in the cylinder **70** have a cylindrical opening **73** with knurled or toothed surfaces. The chuck also has a cap **74** which is provided with threaded plug **75** which is screwed into the upper end of the cable chuck. A spring **76** is interposed between the cap **74** and the outer ends of the chuck jaws. The cable **50**, which is shown in broken lines in FIG. 6, passes through the chuck, the arrangement being such that it will freely pass upwardly through the chuck, or conversely the chuck will pass freely downwardly over the cable, but the jaws will lock on the cable if the cable is attempted to be pulley downwardly through the chuck. Consequently when the three cable chucks have reached the ring **40** at the bottom, as shown in FIG. 3, the ring will remain centered where it is in relation to the position of the three anchors, and the connections **60**, **61** and **62** cannot be pulled away from the ring and will remain quite taut, as the ring is restrained from lifting off the bottom by the locked cable chucks.

Turning to FIGS. 7, 8 and 9, FIG. 7A illustrates a ship **100** at the surface of the water engaged in discharging an anchor for mooring a buoy. The anchor in this case has a large cylindrical body **101** within which a great length of small cable **102** is wound, the outer end extending from the top of the anchor as shown at **103**. The cylinder **101** is tapered at its upper end and has fins **105** which are adapted to keep the cylinder in a vertical position as it falls by gravity through the water and into the bottom. Attached to the cylinder is a heavy downwardly extending cylindrical rod **106** having an enlargement **107** at the bottom with a series of hinged flukes **108**. While the anchor is dropping to the bottom of the ocean, the flukes lie close to the rod **106**.

As the anchor is released from the ship and sinks rapidly by gravity to the bottom of the ocean, the cable **102** is paid out from the cylinder **101**, its outer end being attached to a boom on the ship at **110**. The weight of the anchor and the force of its fall by gravity particularly in deep water will force the rod **106** into the ocean bottom, as shown in FIG. 7B. An upward pull on the anchor cable will cause the hinged flukes **108** to open and form a very substantial anchorage.

A line from the ship may be transferred to a buoy **112** by being passed one or more turns over a sheave **113** as shown in FIG. 8 and through cable chuck **114**, then over sheave **115**, the outer end being attached to a weight **116** by a soluble link **117** and the buoy and tension-adjusting weight dropped overboard.

As soon as the anchor is in place and the weight **116** has exerted a pull on the upper end of the cable sufficient to take up the required slack in the mooring cable, the chuck **114** will prevent the cable from being pulled back, and in a reasonable time the link **117** will be dissolved and broken, as shown in FIG. 7C. The weight is thus discarded and the buoy is anchored by a substantially vertical anchor line at a predetermined tension.

The parts as shown in FIG. 8 are an attachment to the bottom of the buoy **112**.

The anchors of the type shown in FIG. 7 may be employed instead of those shown in FIGS. 1, 2 and 3. In fact, any suitable form of anchor may be employed in the anchoring arrangement of this invention.

This invention provides a means of obtaining the advantages of long scope and therefore a horizontal pull by the dropping of two or more, preferably three, anchors of any type a distance apart, holding the lines at the surface at equal payed-out lengths, then dropping a centering ring around the three lines which will fall to the bottom with the multiple lines through its center. A pull on the three lines directs the pull to the embedded anchors, along the substantially horizontal path near the ocean floor, to the ring, thence vertically to the moored object on the surface of the water.

It will be understood that variations may be made without departing from the spirit of the invention and only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. An anchor mechanism for use in extreme ocean depths which comprises a ship at the surface, a plurality of anchors each having an anchor rod to vertically penetrate the ocean bottom and a cable attached to the anchor at one end and to the ship at the other, said anchors being cast at widely spaced points, and a ring releasable from the ship while the upper ends of the cables remain attached thereto, said ring having openings through which the cables pass whereby the ring holds the cables near the bottom and causes any upward pull on a cable to be transmitted in a substantially horizontal direction to the anchor to which it is attached.

2. The structure of claim **1** in which a cable chuck is located on each cable at the ring to prevent each cable from being pulled outwardly away from the ring, when the ring is in position adjacent the ocean floor.

3. The structure of claim **1** in which the ring openings are flared at their lower ends to permit the cable to slide freely therethrough when the cable portion beyond the ring is substantially at right angles to the cable portion above the ring.

4. An anchor mechanism for a floating body, comprising:

(a) a plurality of anchors, each adapted when dropped on the sea bottom to engage itself with the bottom;

(b) a corresponding plurality of cables, each connecting one anchor to the floating body;

wherein the improvement comprises:

(c) a ring encircling all said cables and releasable from the floating body while the upper ends of the cables

remain attached thereto, said ring being effective when dropped from the floating body to fall substantially to the bottom and to draw all the cables together at a point near the bottom.

5. An anchor mechanism as defined in claim 4, in which the ring has a plurality of holes, for receiving separately each of the cables.

6. An anchor mechanism as defined in claim 5, in which the holes in the ring are flared at their lower ends to provide smooth surfaces for free sliding movement of the cables.

7. An anchor mechanism as defined in claim 4, including a cable chuck for each cable, said cable chuck being slidable downwardly on its associated cable until it engages the ring, said chuck being effective to prevent the cable from being pulled outwardly through the ring toward the associated anchor.

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