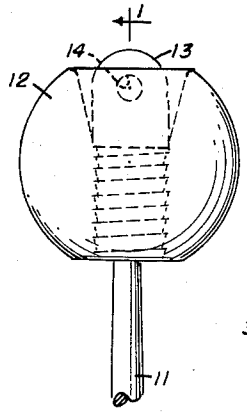
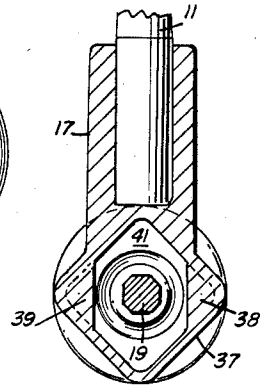
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MOORING WHIP

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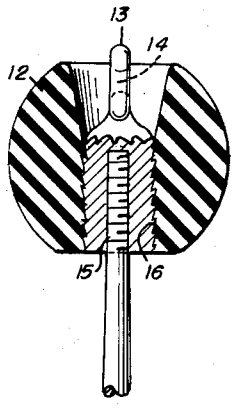


FIG. 3

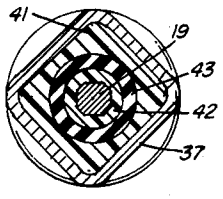


FIG. 4

FIG. 2

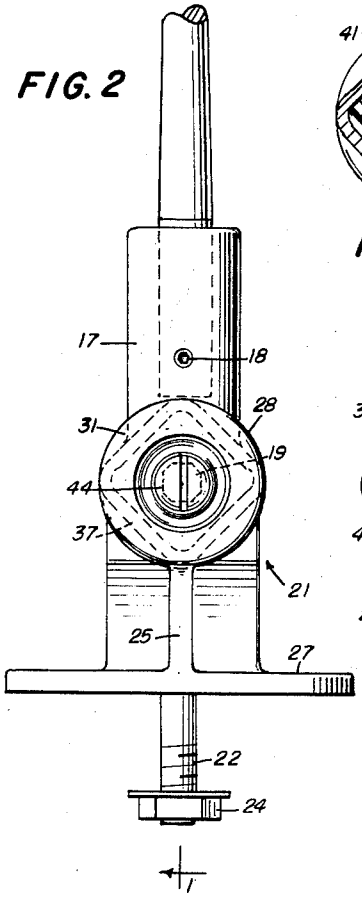


FIG. 1

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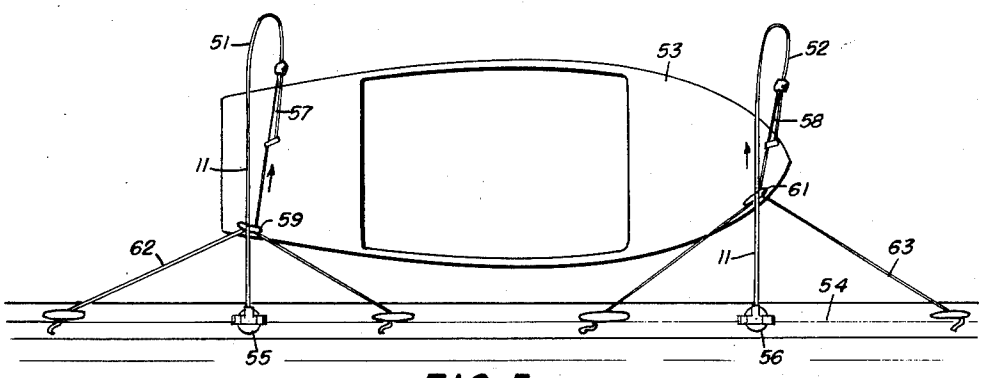


FIG. 5

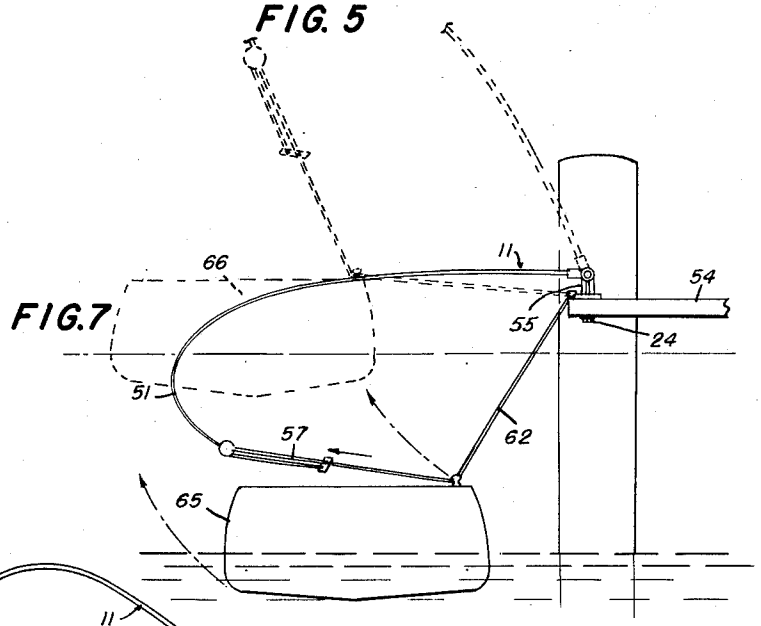


FIG. 7

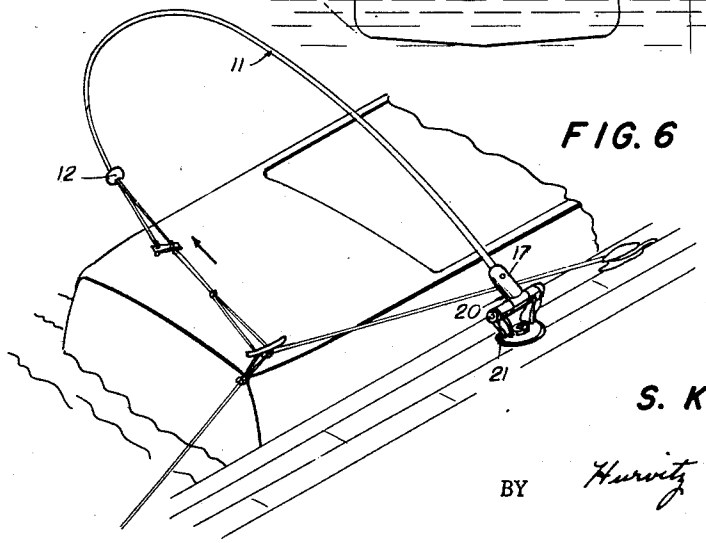


FIG. 6

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3,120,831

MOORING WHIP

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13 Claims. (Cl. 114—230)

The present invention relates generally to securing lighter than water vehicles and platforms in place and more particularly to mooring small platforms and boats, such as yachts, to a dock.

Prior apparatus for mooring small boats have frequently proven unsatisfactory because they permit the boat to hit the dock, causing possible damage to the boat being moored, the hardware on board the boat and the dock to which the boat is secured. As the boat strikes the dock to which it is moored, vibrations are transmitted to the boat and often cause additional unnatural boat motion thereby further increasing the number and severity of contacts between the boat and the dock. Most of the prior mooring devices cannot readily adjust to tides, resulting in further instability of the boat since it is not free to move about its own center of gravity. Attempts have been made to reduce vibrations between boats and mooring docks by utilizing so-called dolphin piles which are located away from the main portion of the dock. This arrangement is unsatisfactory since the moored boat is not easily accessible.

Although some systems have been developed for permitting adjustment between the dock and the boat as the tides vary, these arrangements have not received wide acceptance because they frequently require special equipment on board the boat. Further, this latter class of apparatus has not been successful in preventing vibrations of the boat.

Accordingly, it is an object of this invention to provide a new and improved method and apparatus for mooring boats, particularly to docks, wherein contact between the boat and the dock is minimized or completely eliminated.

It is another object of this invention to provide new and improved apparatus for mooring boats to docks which permits ready adjustment of the boat with respect to the dock as the tides rise and fall without disturbing movement of the boat about its center of gravity and wherein virtually no contact between the boat and the dock occurs.

It is a further object of this invention to provide new and improved apparatus for mooring a boat wherein the boat is easily accessible to personnel desiring to reach it and wherein virtually no damage occurs to the boat due to action of the sea.

It is still another object of this invention to provide a structure for securing a boat to a dock wherein the boat does not strike the dock to which it is tied, wherein the boat adjusts itself with respect to the dock as the tides rise and fall, and wherein no special equipment on board the boat is necessary in order to successfully utilize the structure.

It is an additional object of this invention to provide a device for securing a boat to a dock wherein the device is inexpensive, easy to handle, easy to use and which minimizes damage that might occur between contact of the boat and dock.

The present invention permits the above objects to be obtained by utilizing an elongated and tapered, flexible rod or whip that is secured at its larger end to a fixed structure such as a dock by means of a resilient mounting which maintains the rod in a particular position, such as the vertical position, when it is not in use. In use, the free end of the flexible rod is pulled downwardly so that a line secured to the free end may be secured

to a conventional fitting on the craft. The elastic functions of the rod and resilient mount are such that the rod is constrained to assume a curved configuration so that the free end of the rod is positioned on the seaward side of the fitting on the boat and in consequence pulls it away from the dock.

Due to the nature of the resilient mount, which is a torsioned unit, and the tapering of the flexible rod, the force tending to pull the boat away from the dock increases as a craft is moved toward the dock by wave or wind action. By properly proportioning the restoring forces developed by the unit, the tendency of the boat to strike the dock can be minimized. Normally at least two such rods are employed for each boat, these being secured to fore and aft locations. A single rod may be secured to the mid-portion of small boats having no superstructures. End movement of the boat is prevented by cables extending to the dock usually from the same fittings as are employed to secure the free end of the rod.

Since the rod is flexible in the vertical plane, its angular position, relative to the horizontal, varies as the tides rise and fall so as to adapt the apparatus to specific tidal conditions. The initial position of the rod relative to the vertical may, in one embodiment of the invention, be varied so as to adapt the apparatus to the height of the dock above the mean level of the sea. This feature also enables the complete assembly to be mounted in a vertical position on a sea wall or the side of a dock. This is accomplished by removing a multisided shaft from the apparatus used to secure the elongated rod to the resilient mount and turning the whip with respect to the mount until a suitable initial position is obtained. The shaft is then reinserted into the securing apparatus, thereby refixing the initial position of the rod.

The above and still further objects, features and advantages of the present invention will become apparent upon consideration of the following detailed description of one specific embodiment thereof, especially when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a partial sectional view taken along the lines 1—1 of FIGURE 2 of the structure utilized to moor boats in place in accordance with this invention;

FIGURE 2 is a side view of the apparatus illustrated in FIGURE 1;

FIGURE 3 is a sectional view taken along the lines 3—3 in FIGURE 1;

FIGURE 4 is a sectional view taken along the lines 4—4 in FIGURE 1;

FIGURE 5 discloses the manner in which two of the mooring devices shown in FIGURES 1 and 2 may be utilized in tying a boat to a dock;

FIGURE 6 is an illustration of how one of the whip assemblies disclosed in FIGURE 3 may be utilized in tying the boat to the dock; and

FIGURE 7 discloses the manner in which the whip assembly rotates as the tide rises and falls with respect to a dock.

Referring now to FIGURE 1 of the accompanying drawings, there is illustrated a partial sectional view of the apparatus utilized to secure boats in place according to the present invention. The apparatus comprises an elongated, solid, flexible rod 11, constructed out of glass fiber material or any other suitable flexible material, such as steel. For diagrammatical purposes, the whip 11 is illustrated as a broken rod but of course it is to be understood that it is one long continuous tapered structure. Rubber sphere 12 with two opposite sectors removed is located at one end of rod or whip 11 and is secured to a member 13 having an eye 14 for receiving a rope or line.

The partial spherical member 12 is made of rubber, a soft plastic or other flexible material so that humans and the boat structure that may come into contact with the end of the whip are not injured or damaged. This member also permits rod 11 to be easily manipulated by personnel handling it. The eye carrying member 13 is secured to the narrow end of the whip by any suitable means, such as threads 15. Frustumed sphere 12 is fixed in place by inserting its bore over member 13. The interior bore of member 13 is serrated so that spherical member 12 is fixed in place thereto.

The other end of rod 11 is secured in a hollow leg 17 of a generally T-shaped member 20 having a cross member 31, by means of a set screw 18. This construction permits rod 11 to be removed from leg 17 permitting ease of storing, transportation and installation. Leg 17 and one end of whip 11 are normally maintained integral with a housing 21 by means of octagonal shaft 19.

The housing 21 contains a pair of oppositely positioned arms 25 and 26 having a plate 27 located at one end thereof, said plate having a bore for receiving bolt 22. Housing 21 may be secured to a dock by means of bolt 22 which is inserted in an appropriate hole in the dock. The bolt 22 may engage an expansion nut positioned in the aperture, in the dock or may extend through the dock and be engaged by a nut 24.

Block 17 and housing 21 are constructed of durable material, such as steel, that is capable of withstanding the elements and which is sturdy enough to support the forces exerted thereon by whip 11.

Annular cylinders 28 and 29 are located respectively at the upper ends of the arms 25 and 26 as viewed in FIGURE 1. Shoulder 31 (FIGURES 1 and 2) and shoulder 32 are formed on one end of cylinders 28 and 29, respectively, so as to retain members 33, 34, 35, and 36 having substantially square cross sections within the cylinders and the cross member 37 of T-shaped member 20; members 33 and 36 being contained within cylinders 28 and 29, respectively, while members 34 and 35 are located inside of cross member 37. The interior bores of cylinders 28 and 29 as well as cross piece 37 are substantially square in order to properly receive members 33—36, as can best be seen by reference to FIGURE 4. A major portion of square members 34 and 35 are separated from each other in cross piece 37 by flanges 38 and 39 centrally located within the cross piece bore, as can best be seen in FIGURE 3. The spacing between flanges 38 and 39 is such as to allow a shaft 19 and a portion of blocks 34 and 35 to extend therein.

Since each of the rectangular members 33—36 is identical, it is deemed necessary to describe only one of these elements. Member 35 comprises an outer nylon sleeve 41, an inner nylon sleeve 42, and a rubber bushing or torsion spring 43 secured to the inner bore of sleeve 41 and the outer wall of sleeve 42 by any suitable means, such as bonding. Sleeve 41 has a rectangular outer periphery designed to fit closely against the inner bore of cross piece 37 and a circular inner wall to which bushing 43 is bonded. Sleeve 42 is of circular outer periphery and contains an inner bore for receiving shaft 19 and having the same number of sides as the shaft. The inner sleeve of each rectangular member 33—36 extends beyond the rubber bushing with which it is associated so that the inner sleeves of members 33 and 34 are in close proximity to each other and those of members 35 and 36 are likewise in close proximity to each other. The distance between adjacent sleeves is normally very small but is greatly magnified on FIGURE 1. One end of the outer sleeves contained by members 33 and 36 contacts shoulders 31 and 32, respectively, thus securing members 33—36 within housing 21 and cross piece 37. Similarly, the other ends of the outer sleeves contained by members 34 and 35 are inserted against flanges 38 and 39. By inserting shaft 19 through the inner bores of members 33—36 and threading screws 44 and 45 into the threaded bores at either end of the shaft, linear and rotational movement of members 33—36 with respect to the shaft is almost completely impeded. The collars on screws 44 and 45 communicating with the inner nylon sleeves of members 33 and 36 further minimize any linear movement of members 33—36.

The rubber bushings associated with members 33—36 serve as torsion springs which resist movement of the rod 11 in a plane perpendicular to the axis of the shaft 19. These bushings serve to provide a complete floating rubber cushion for shaft 19 and the nylon sleeves secured thereto. When rod 11 is rotated the torsional forces exerted thereby are distributed equally in the bushings carried by T-shaped member 20 and those carried by housing 21. This permits the rod to be rotated 90° and even beyond without damaging the rubber bushings. Consequently, the structure described above tends to maintain the rod 11 at right angles to bore 27 as illustrated in FIGURES 1 and 2.

The rod 11 can assume a plurality of different angular positions relative to the vertical by virtue of shaft 19 having a plurality of finite sides. By withdrawing shaft 19 so that cross member 37 of member 20 no longer surrounds the shaft, T-shaped member 20 may be rotated one-eighth of a turn, one-quarter of a turn or any other multiple of the number of sides that shaft 19 has. After the block 17 has been rotated to the desired extent with respect to housing 21, shaft 19 is reinserted through the bores of all of members 33—36 so that it extends from one side of housing 21 to the other side thereof. Screws 44 and 45 are reinserted into the appropriate bores on shaft 19 thereby fixing the relative position of the rod 11 with respect to the vertical.

As indicated above, the rod 11 may be rotated in response to forces applied to the eye 14 located at its other end. Forces exerted on member 13 are transmitted through elongated rod 11 and block 17 to the outer nylon sleeves and rubber bushings of members 34 and 35. Such forces cause block 17 to rotate since the rubber bushings of members 34 and 35 are placed in torsion through their cross sections extending between the nylon sleeves. Since both the outer and inner walls of the torsion bushings remain fixed with respect to the members with which they are in contact, torsional shearing of the bushings carried by members 34 and 35 occurs causing relative rotation between the T-shaped member 20 and the shaft 19. Further, the bushings of members 33 and 36 are placed in torsion by rotation of member 20 relative to the housing 21. In consequence, the force transmitted to the end of the rod 11 adjacent member 20 is equally distributed between the bushings carried by each of members 33—36. When the force being exerted on the rod 11 is released, the forces stored in the bushings restore the rod to its initial position.

The construction employed by applicant is superior to previous apparatus of this type utilizing a rubber bushing having a rectangular exterior surface because in the prior configurations extremely high shearing forces were developed across the narrowest portions of the bushing at the centers of the sides of the square metal housing. The concentration of shearing forces at the sections of reduced thickness as well as the binding action of the rubber in its norrowest portion materially reduced the wear life and elasticity of the bushing. By using a circular rubber bushing adapted to the outer and inner members by nylon sleeves, the shearing forces in the rubber bushings are equally distributed and regions of excess wear are eliminated.

If it is not necessary to have a number of predetermined initial positions between the rod 11 and the housing 21, octagonal shaft 19 and the inner nylon sleeves may be combined into a single circular unit. With this type of unitary construction, the initial setting of rod 11 with respect to housing 21 may be varied by using pins or by presetting the shaft to the bushings.

FIGURE 5 of the drawings discloses the use of two whip assemblies 51 and 52 for mooring boat 53 to a fixed structure 54 which may be a dock. Whip assemblies 51 and 52 are respectively secured to dock 54 by means of housings 55 and 56 which are of the type illustrated in FIGURES 1 and 2. It is to be understood, however, that the whip housings may be fastened to the side of a dock or to a sea wall and the whip 11 will be normally retained in a substantially vertical position by properly rotating shaft 19. The other ends of whip assemblies 51 and 52 extend beyond the portion of boat 53 in proximity to the dock and are connected to this portion by means of ropes 57 and 58. Ropes 57 and 58 are secured to conventional binding posts or fittings 59 and 61 located at opposite ends of the boat. The effective length of these ropes can be varied to adjust the tension on rod 11 as desired. Ropes 62 and 63 are respectively secured to binding posts 59 and 61 to prevent any great amount of longitudinal motion of the boat relative to the dock to which it is to be secured and to maintain the boat in proximity to the dock.

Whips 51 and 52 pull the boat away from the dock thereby preventing almost all contact between the boat and the dock and possibly even totally eliminating vibrations therebetween.

Although ropes 62 and 63 have been illustrated as being connected to the same points on the boat as ropes 57 and 58, it is to be understood that this is not necessarily true and that ropes 57 and 58 may be placed at any suitable point on the boat. Also, small boats having no superstructures in the middle thereof may be secured to a dock by connecting a single whip to the center thereof.

FIGURE 6 of the drawings is an illustration, with greater magnification, of the connection between the whip members and the boat to which it is to be connected. T-shaped member 20 is rotatable with respect to housing 21, and therefore, the end of the whip in proximity to member 20 will rotate with respect to the housing as the boat rises and falls with the swells or the tides. Flexible, elongated rod 11 is tapered from the end in contact with block 17 to the other end, where member 12 is located, so that greater force will be exerted on the boat as it comes closer to the dock and the rod is flexed to a greater degree. This construction permits the boat to be maintained a safe distance away from the dock to which it is moored under almost all conditions and allows it to freely move about its center of gravity in a normal fashion.

FIGURE 7 is an illustration of the manner in which rod 11 can rotate with respect to housing 21 as the tides rise and fall. At very low tide the boat 65 causes rod 11 to be rotated with respect to housing 21 and dock 54 to which it is fixed, so that the end of the rod in contact with housing 21 is almost perpendicular thereto and is parallel to the dock 54. The rope 62 also has a tendency to pull the boat towards the dock. Since rod 11 is flexed to a greater degree, however, it will exert a greater force on the boat than under normal conditions and will overcome the forces caused by rope 62 thus pulling the boat away from the dock and maintaining it at maximum distance from the dock for all water levels. As the tide rises, the boat assumes a new position, shown as 66, causing the inclination between the flexible rod 11 and dock 54 to be altered so that the angle between housing 21 and the rod is greatly decreased. In this manner, the boat is always maintained at a sufficiently safe distance away from the dock and the mooring piles and provision is provided for raising and lowering the boat with the tides. An important feature of the invention is that the force produced by the rod 11 is generally outward from the dock and relatively little vertical lifting force is transmitted to the craft; as a result the boat is at all times free, regardless of the level of the tide, to float about its natural center of gravity and the ability of the boat to ride the waves is unimpaired. This feature also greatly reduces the tendency of the boat to go into forced oscillations in response to wave or wind action.

Although flexible rod 11 and the rubber bushings will usually assume the same initial position, they may have a tendency to assume a slight set if maintained in one position for a great length of time. To prevent any permanent set in these elements, it may be desirable to reverse the position of rod 11 by removing set screw 18 and turning the rod 180° from its initial position or by rotating base 21 180° by proper adjustment of screw 22 and bolts 23 and 24.

When the whip and its associated components are not being used to tie a boat to a dock, it may be utilized as a convenient and easily accessible means for securing tie lines 62 or 63. The lines may be tied through eye 14 or to a line inserted therethrough, such as 57, thus permitting them to be maintained at a constant effective length for any particular boat because the rod can be bent to accommodate any height which the ties between the ropes might assume. This alleviates one of the major hazards associated with boat mooring, i.e. improper tying due to incorrect tie line length.

It should now be apparent that there has been herein disclosed a new and improved apparatus for mooring boats to docks or other easily accessible structures, wherein the boat is pulled away from the dock with a force that increases rapidly as the boat approaches the dock, thereby substantially preventing all contact which might occur between the boat and the dock due to water and wind disturbances. Further, the boat rides the waves in a natural fashion.

It should be apparent that this structure may be utilized for many different sized boats without changing the size of any casted pieces, such as T-shaped member 20 or housing 21. It is only necessary to change the strength of the various torsion members and the length and width of the rod in redesigning the structure for crafts of various sizes.

While I have disclosed various specific forms of the invention it will be clear that variations thereof may be resorted to without departing from the true scope of the invention as defined in the appended claims.

What I claim is:

1. Apparatus for mooring a boat to a fixed structure comprising a flexible elongated bendable rod mounted to solely pull the boat away from the structure and means connected to one end of said rod for securing said rod to the structure, said securing means including means to provide relative rotation between said securing means and said one end of said rod and means coupled to the boat to maintain the rod in a bent state, said rod being flexible along its entire length.

2. The apparatus of claim 1 wherein said rod is tapered from said one end to the other end.

3. The apparatus of claim 1 wherein means are provided at the other end of said rod for securing a line thereto.

4. The apparatus of claim 1 wherein said securing means comprises a shaft and a torsion spring structure secured between said shaft and said rod.

5. Apparatus for mooring a boat to a fixed structure comprising a flexible, elongated, rod tapered from one end to the other end; means connected to said one end of said rod for securing said rod to the structure; means at the other end of said rod for securing a line thereto; said first named securing means comprising a shaft, a pliable bushing structure secured between said shaft and said rod and wherein said shaft and bushing structure include means to preset a plurality of initial angles between said rod and said bushing structure.

6. A method for mooring a boat to a fixed structure by means of an elongated flexible rod comprising securing one end of the rod to the structure, bending the rod so that the other end thereof extends beyond a predetermined location on the boat, connecting said other end of the rod to said location on the boat, and maintaining the rod in a bent state to pull the boat from the structure.

7. A method for mooring a boat to a fixed structure with an elongated, flexible rod comprising securing one end of the rod to the structure, pulling the boat away from the dock by means of a connection between the boat and the other end of the rod, and maintaining the boat in proximity with the structure to orient the rod in a bent condition to pull the boat away from the structure.

8. The method of claim 7 wherein said maintaining step comprises tying a line between the boat and the structure.

9. Apparatus for mooring a boat to a fixed structure comprising a flexible, elongated bendable rod mounted to pull the boat away from the structure, means connected to one end of said rod for securing said rod to the structure and means for permitting the portion of the rod in proximity to said one end to assume different angular positions with respect to said securing means and means coupled to the boat to maintain the rod in a bent state.

10. An apparatus for mooring a boat to a structure comprising at least two flexible rods each having a first end and a second end, a torsional mount for securing each of said first ends of said rods to the structure, at spaced points thereon, said torsional mounts restraining movement of said first ends of said rods relative to the structure to a plane perpendicular to a line between said spaced points, means for securing said second ends of said rods to the boat at locations opposite said spaced points on said structure, cables secured to said boat to prevent substantial movement of said boat generally parallel to the line between the spaced points on the structure, the resiliency of said torsional mounts and said rods being such that said rods assume a curved configuration which places said second ends of said rods on a side of said locations on the boat opposite from the structure.

11. Apparatus for securing a boat to a dock or sea wall, so as to develop a pull on the boat away from the sea wall, said apparatus comprising a flexible elongated rod, a torsional mount for securing one end of the rod to the dock, said torsional mount restraining movement of said one end of said rod to a plane perpendicular to the dock and maintaining said rod in a generally upright position in the absence of a force applied to the other end thereof, means provided for securing said other end of said rod to a fitting on the boat, and means for causing said other end of said rod to assume a position on an opposite side of the fitting from said dock when said rod is secured to the fitting, said means for causing comprising the resilient properties of said rod and said torsional mount which cause said rod to assume a specific curved configuration when said other end is moved into the vicinity of the fitting.

12. Apparatus for mooring a boat to a structure comprising a flexible, elongated, bendable rod torsionally mounted at one end to said structure and extending beyond a point on the boat, and means for connecting the other end of said rod to said point to maintain said rod in a bent condition to pull the boat from the structure, said rod being flexible over its entire length, said rod being tapered to smaller diameter in proceeding along its length from said one end to said other end, whereby the flexibility of said rod increases in proceeding from said one end to said other end, the flexibility of said rod at least adjacent to said other end being sufficient to enable more than a ninety degree bend, and said means for connecting being a line.

13. Apparatus for mooring a boat to a fixed structure comprising a flexible elongated rod mounted to pull the boat away from the structure and means connected to one end of said rod for securing said rod to the structure, said securing means including means to provide relative rotation between said securing means and said one end of said rod, said securing means including a torsionally resilient mount having its axis of torsion perpendicular to the axis of said rod, said rod being flexible along its entire length, and the flexibility of said rod at least adjacent to the end of said rod remote from said securing means being sufficient to enable more than a ninety degree bend.

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