May 19, 1964 R. G. CAPPEL 3,133,521

QUICK RELEASE MOORING DEVICE

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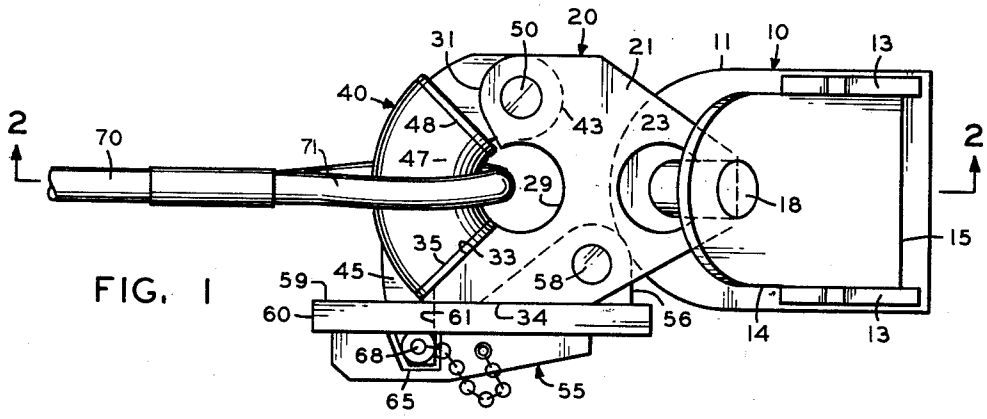


FIG. 1

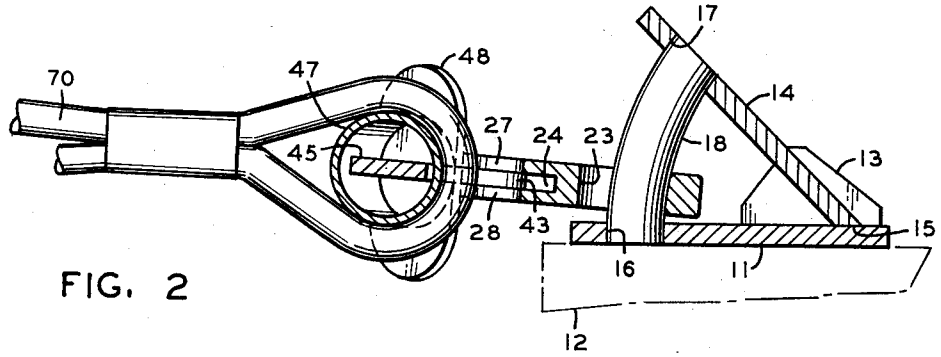


FIG. 2

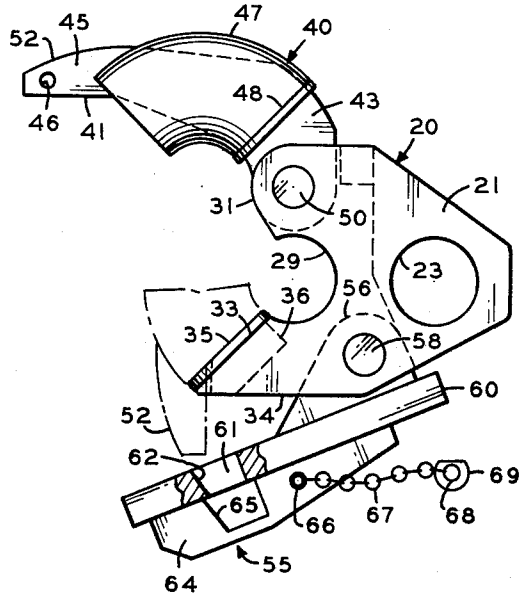


FIG. 3

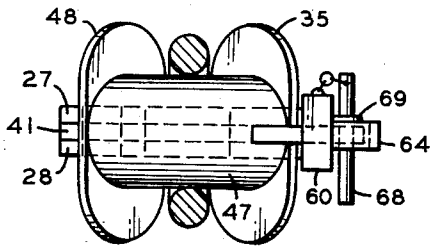


FIG. 4

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2 Sheets-Sheet 2

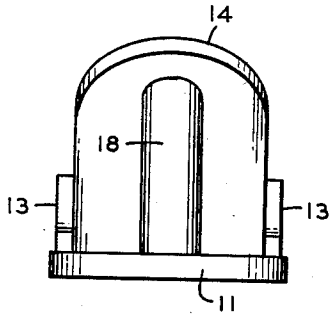
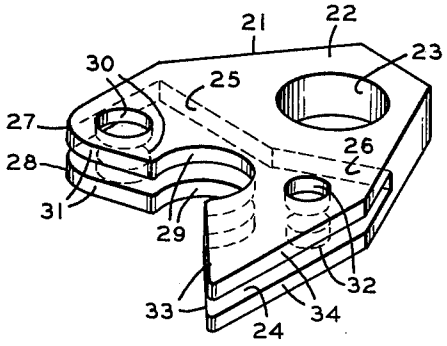


FIG. 5

FIG. 6



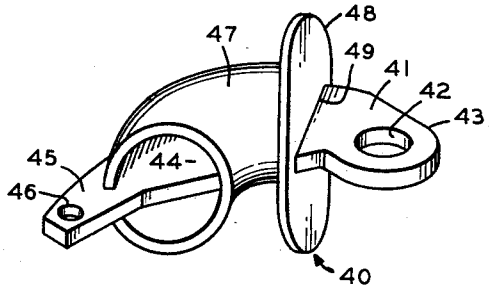


FIG. 7

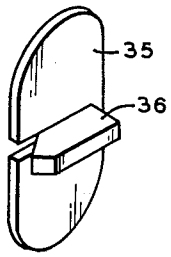


FIG. 8

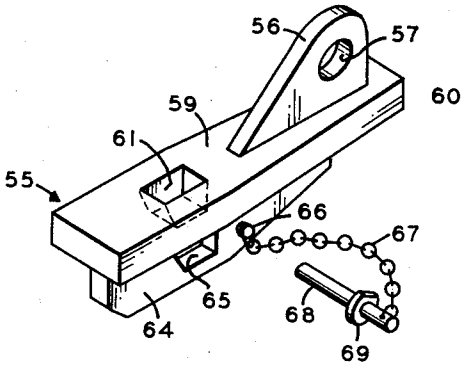


FIG. 9

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United States Patent Office 3,133,521 Patented May 19, 1964

3,133,521

QUICK RELEASE MOORING DEVICE

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Filed Aug. 4, 1961, Ser. No. 129,414
8 Claims. (Cl. 114—230)

This invention relates to a marine mooring device, and particularly to a mooring device that provides a quick release to a ship's line with high load capacity and safe operating mechanism.

The invention includes a hold-down pin assembly that is attached to a ship's deck or to a mooring dock and pivotally supports the body of the operating assembly of the device. The body of the operating assembly has a swing arm pivotally attached to one side of the line of force applied to the device and locking arm pivotally attached to the other side of the line of applied force. The swing arm has a section for retaining the spliced loop of a ship's line with a plate portion for extending through a hole in the locking arm. The forces that are applied by the ship's line are transmitted to the body of the operating assembly through the swing arm at its point of connection to the body and through the locking arm at its point of connection to the body. Hence the loads are applied symmetrically upon the body.

The swing arm and the locking arm pivot in the same or parallel planes, and the operating assembly is attached to the hold-down pin assembly in such a manner that these arms swing in horizontal planes. The relationship between the locking arm and the swing arm is such that when a load is applied to the device, the locking arm must be kicked away from the swing arm before the swing arm is released. However, there is a pin for holding the locking arm in place under slack load conditions. When it is desired to release the ship's line, the removal of the pin and pivoting of the locking arm automatically releases the swing arm for withdrawal from the loop of the ship's line.

The principal object of this invention is to provide a mooring device that has a swing arm with a locking arm that can release the swing arm for quick release of a ship's line held by the swing arm.

Another object of the invention is to provide a mooring device having a swing arm and a locking arm, both of which are pivotal in horizontal planes, thereby eliminating potential damage to surfaces below the device when it is opened.

Still another object of the invention is to provide a quick release mooring device having a swing arm and a locking arm pivotally attached to a body, with loads being applied by a ship's line to the swing arm and transmitted symmetrically to the body through the swing arm and the locking arm, thereby providing a greater load capacity of the device.

Yet another object of the invention is to provide a quick release mooring device in which the part that contacts the ship's line is of large toroidal shape to ease the strain and wear on the ship's line.

Yet another object of the invention is to provide a mooring device that includes an operating assembly and a hold-down pin assembly to which the operating assembly is pivotally mounted, wherein the hold-down pin assembly has a built-in safety factor to prevent damage to the structure to which the hold-down pin assembly is mounted, should the applied loads exceed the design capacity of the device.

Other objects and advantages will be apparent to those skilled in the art.

In the drawings:

FIGURE 1 is a plan view of the mooring device;

FIGURE 2 is a side elevation view in section taken along the line 2—2 of FIGURE 1;

FIGURE 3 is a plan view partly in section of the mooring device in an open condition with the hold-down or mounting pin removed;

FIGURE 4 is a front elevation view of the mooring device with the hold-down pin removed and the mooring device in the closed condition;

FIGURE 5 is a front elevation view of the hold-down pin assembly;

FIGURE 6 is an isometric view of the body of the mooring device;

FIGURE 7 is an isometric view of the locking arm;

FIGURE 8 is an isometric view of a keeper plate; and

FIGURE 9 is an isometric view of the locking arm and pin.

Referring now to the drawings, the mooring device includes a hold-down pin assembly **10** having a base plate **11** that can be welded or otherwise anchored to the horizontal surface of a dock or to the deck of a ship, either of these mounting surfaces being indicated schematically in FIGURE 2 by the numeral **12**.

A pair of side plates **13** are welded at their bottom edges to the base plate **11** and extend upwardly therefrom. These side plates **13** are welded to the side edges of another plate **14** that is disposed at an angle to the base plate **11** and has its lower edge **15** welded to the base plate. The angle between the base plate **11** and the slanted plate **14** is about 45°.

The base plate **11** and the slanting plate **14** have holes **16** and **17**, respectively, through them, and the ends of a curved steel pin **18** are welded within these holes **16** and **17**. The pin **18** defines a segment of an arc with the axis of its portion that is within the hole **17** being at about 45° angle to the base plate **11**. Hence, horizontal forces applied to the pin **18** will be resisted by the forward edges of the holes **16** and **17**, but if these forces are sufficiently great, the pin **18** will fail in bending or shear.

An operating assembly **20** is supported by the hold-down pin assembly **10**. The operating assembly has a body **21** as illustrated in FIGURE 6. The body **21** has a fixed plate portion **22** adjacent its rearward side with a hole **23** through it. The hole **23** receives the curved hold-down pin **18** to provide the connection between the operating assembly and the hold-down pin assembly. The forward side of the body plate **21** has a horizontal slot **42** formed in it that extends to a back edge portion **25** adjacent one side of the body **21** and another back portion **26** adjacent the other side of the body. Hence, above the slot **24**, there is an upper plate extension **27** and below the slot there is a lower plate extension **28**.

The shapes of these plate extensions **27** and **28** are substantially identical, with each having a central cut-away portion **29** that preferably forms a portion of a circular hole through the plate extensions, interrupted by the termination of the plate extensions at their forward edges. The cut-away portions **29** are in line with the hole **23** along the line of force to be applied to the mooring device, as will be described. This body may be made as a casting, but is preferably made from two plates **27** and **28** separated by plate spacers.

Spaced to the side of the cut-away portions **29**, opposite the end portions **25** of the slot **24**, are a pair of coaxial holes **30**. The holes **30** are disposed such that a plane through their axes and the axis of the cut-away portions is at right angles to the line of applied force. The portions **31** of the plate extensions **27** and **28** im-

mediately forward of the holes 30 are extended forwardly somewhat of the front edges of the central cut-away portions 29 to assure adequate strength of the plate extensions adjacent the holes 30.

On the side of the plate extensions 27 and 28, opposite the cut-away portions 29 from the holes 30, are another pair of co-axial holes 32. These holes 32 are positioned rearwardly of the holes 30 and slightly closer to the plane defined by the axes of the hole 23 and the cut-away portions 29. The front edges 33 of the plate extensions 27 and 28 forward of the holes 32 are disposed at about a 45° angle to the line of force that extends through the center of the hole 23 and the cut-away portions 29. The side edges 34 of the plate extensions 27 and 28 adjacent the forward edges 33 are substantially parallel to this line of force.

A keeper plate 35 (FIGURE 8) has a block 36 welded to it and projecting outwardly at right angles. The block 36 is of the same thickness as the slot 24 and fits within the slot adjacent the edges 33 and 34. In this position, the keeper 35 and its block 36 are welded to the plate extensions 27 and 28.

A swing arm assembly 40 is illustrated in FIGURE 7. The swing arm assembly includes a plate 41 having a hole 42 through one end that may be of the same diameter as the holes 30 through the body 21. The portion 43 through which the hole 42 is cut is at approximately a right angle to the major portion 44 of the plate 41, and the opposite end 45 has a smaller hole 46 through it.

There is a hollow, curved cylinder 47 having a slot through its convex side for receiving the plate 41 as clearly shown in FIGURE 7. The plate 41 projects through the cylinder 47 as illustrated in FIGURES 7 and 3 and is welded thereto. The cylinder 47 defines approximately one-quarter of a toroid. A keeper plate 48 having a slot 49 through which the plate 41 projects, is welded to the plate 41 and to the end of the cylinder 47 nearest the hole 42.

The swing arm assembly 40 is fastened to the body 21 by a pin 50 that extends through the holes 30 and 42 and is fitted within the hole 42 welded within the holes 30. The end portion 43 of the plate 41 extends within the slot 24 of the body, so that the plate extensions 27 and 28 act as guides to restrict the swinging movement of the swing arm assembly 40 to a substantially horizontal plane. When the swing arm assembly 40 is in the closed position illustrated in FIGURE 1, the cylindrical portion 47 cooperates with the cutout portions 29 in the plate extensions 27 and 28 to define a closed hole with the end of the toroidal section 47 bearing against the keeper plate 35. Also, as illustrated in FIGURE 1, the end 45 of the plate 41 extends beyond the edges 34 of the body 21. This portion 45 of the plate 41 has an arcuate forward edge 52 of rather large radius and a straight, rearward edge 53 that is far enough from the arcuate edge 52 to extend a portion of the plate into the space 24 between the forward tips of the plate extensions 27 and 28 at the juncture of the edges 33 and 34.

FIGURE 9 illustrates a locking arm 55. The locking arm 55 has a plate flange 56 with a hole 57 through it of about the same diameter as the holes 32. The flange 56 fits within the slot 24 with the hole 57 between the holes 32. A pin 58 is fitted within the hole 57 and is welded within the holes 32 to allow horizontal pivotal movement of the locking arm 55. The plate extensions 27 and 28 operate as horizontal guides for the locking arm.

The plate flange 56 is welded to the inner side 59 of a block 60. The block 60 has a hole 61 through it having an arcuate forward side wall 62 of the same radius as the radius of the arcuate edge 52 of the swing arm plate 41. When the locking arm 55 is in the closed position illustrated in FIGURE 1, the block face 59 bears against the side edges 34 of the plate extensions 27 and 28 and the portion 45 of the swing arm plate 41 projects through the hole 61. In this position, the center of the radius of the arcuate edge 52 substantially coincides with the center of the arcuate side wall 62 of the hole 61. Both centers are located approximately at the axis of the holes 32.

There is another plate 64 welded to the outer side of the block 60 and having a recess 65 opposite the hole 61 to prevent interference with the end 45 of the swing arm plate 41. The plate 64 anchors the end of a chain 67, the other end of which is fastened to a pin 68. The pin 68 fits into the hole 46 in the end 45 of the swing arm plate 41, with a stop washer 69 being attached to the pin 69 to position the pin within the hole 46.

In Operation

The mooring device is intended to provide a quick release connection to a ship's line 70. These lines 70 are usually formed with a spliced loop 71, as generally illustrated in the drawings. The mooring device is opened by removal of the pin 68, pivoting the locking arm 55 away from the swing arm 40, and then pivoting the swing arm 40 away from the opening defined by the cutaway portions 29 and the base 21. The loop 71 is placed about the cylindrical segment 47 of the swing arm between the keeper plates 35 and 48. Then the operating parts of the device are again closed to the condition illustrated in FIGURE 1.

The forces upon the mooring device are caused by the tension on the line 70. These forces pull the operating assembly 20 against the hold-down pin 18. The forces are applied by the line 70 directly to the cylindrical segment 47 of the swing arm 40. The swing arm 40 then transmits these forces on opposite sides of the opening through which the loop 71 is passed. On the one side, the forces are applied through the pin 50 to the side of the body 21 surrounding the pin 50. On the other side of the operating assembly, the force of the line 70 is applied through the plate extension 45 to the arcuate side wall 62 of the locking arm 55. The locking arm 55 transmits this force through its pin connection 58 to the body 21. Hence, the application of the load applied by the line 70, as transmitted to the body 21, is approximately symmetrical, thereby minimizing moment arm forces. This symmetrical application of loads to the body 21 allows much greater loads to be applied than would otherwise be possible.

Another feature of the mooring device that allows the application of greater load, is the toroidal shape of the segment 47 against which the loop 71 pulls. This toroidal section 47 presents no sharp edges and corners that traditionally strain and wear the ship's lines. The keeper plates 35 and 48 assure that the loop 71 will remain upon the toroidal section 47 under slack load conditions.

The construction of the hold-down pin assembly 10 provides a safety factor should the load applied exceed the design capacity of the mooring device. If the applied load is too great, the operating assembly 20 will not pull apart or break, nor will the hold-down pin assembly break away from the mounting surface 12, because the arcuate hold-down pin 18 is designed to fail before greater destruction can take place. What is especially important in this feature of the mooring device is that costly damage to a ship's deck or mooring structure 12 is prevented.

This mooring device provides a quick release of its connection to the ship's line. First the pin 68 is withdrawn from the hole 46 in the swing arm 40. (Actually, the purpose of the pin 68 is to keep the locking arm 55 in place under slack load conditions. When the line 70 is applying a load, there is no tendency of the locking arm 55 to swing away from the locking position, because the arcuate edge 52 and the arcuate side wall of the hole 61 have a common center at the center of the pin 68. Hence, the swing arm 40 pulls against the locking arm 55 in a direction normal to the face 62 of the hole 61.)

Once the pin 68 has been withdrawn, the walking arm 55 can be kicked away from the swing arm 41. The swing arm 40 will then immediately pivot forwardly under the force of the ship's line 70 and the ship's line will slip off of the toroidal segment 47. One of the advantages of this quick release action is that all pivotal movements take place in a horizontal plane. Therefore, there is no vertical banging of any parts against the deck of the ship or mooring structure.

Another advantage is in the short swings of both the locking arm 55 and the swing arm 40, which reduce the possibilities of injury to the operator.

Various changes and modifications may be made within the process of this invention as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is:

1. A mooring device comprising a body having first and second pivot points spaced from one another, a swing arm, means for pivotally connecting the swing arm to the first pivot point, a locking arm, means for pivotally connecting the locking arm to the second pivot point, the swing arm having an extension from its end opposite its pivotal connection, the locking arm having a hole for receiving the extension when the two arms are pivoted toward one another, the swing arm having a central portion for receiving a ship's line or the like, the extension receiving hole in the locking arm having a side against which the swing arm bears that is on the same side of the extension as is the direction of the load exerted by the ship's line, the first and second pivot points on the body of the device being positioned on opposite sides of the line of force exerted by the ship's line, and means for pivotally mounting the body to a stationary support at a point on the body between the said first and second pivot points, whereby tension on the ship's line will always pivot the body to a position that puts the line of force exerted by the ship's line between the said first and second pivot points.

2. The mooring device of claim 1 wherein the side of the extension adjacent the bearing side of the locking arm hole within which it is received is convex to facilitate withdrawal of the extension, but the area of engagement between the extension and the bearing side is substantially normal to the pivotal connection of the locking arm and the body so that normally the locking arm must be forced away from the extension.

3. The mooring device of claim 2 with a pin for releasably blocking removal of the extension from the hole in the locking arm.

4. A mooring device comprising a body having a swing arm pivotally connected to one side of it and pivoted between open and closed positions, a locking arm pivotally connected to the other side, the swing arm having a large central portion of curved cross-section for receiving the loop of a ship's line, a keeper plate on the swing arm adjacent the end of the central portion nearest the pivotal connection of the swing arm, a keeper plate on the body against which the other end of the central portion abuts when the swing arm is in the closed position, and means on the locking arm for locking the swing arm in the closed position against the application of loads by the ship's line.

5. The mooring device of claim 4 including an extension on the swing arm having an arcuate forward edge, and a hole through the locking arm for receiving the swing arm extension, the hole having an arcuate forward wall corresponding to the forward edge of the swing arm, the centers of the arcs of the forward edge of the extension and the forward wall of the hole being substantially coincident at the pivotal connection of the locking arm.

6. The mooring device of claim 5 with a small hole in the swing arm extension and a pin for insertion within the hole to releasably lock the locking arm about the extension under slack line load conditions.

7. A mooring device comprising a generally flat body having a support end, an operating end, and sides, a hole through the support end for receiving a support pin to support the body in a substantially horizontal position, a swing arm pivotally connected adjacent one side of the body to pivot parallel to the body, a locking arm pivotally connected adjacent the other side of the body to pivot parallel to the body, the locking arm having a hole in it for receiving the free end of the swing arm, the pivotal connections of the locking arm and swing arm to the body being substantially equidistant from the line of force exerted by a line on the swing arm, the support pin being arcuate and being connected between a pair of base plates, one of the base plates being adapted for horizontal mounting, the other base plate having a lower end connected to the one base plate, the said other base plate extending angularly upwardly from the one base plate.

8. The mooring device of claim 7 wherein the body has horizontal slots extending from its operating end, and the swing arm and locking arm have plate portions received within the slots, whereby the swing arm and locking arm are restricted to movement in planes substantially parallel to the slots.

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