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Allens et al.

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[54] **SYSTEM AND METHOD FOR BUOYING THE END OF A WIRE MOORING LINE**

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[52] **U.S. Cl.** ..... **114/230,** 114/206 R, 9/8 R, 24/124

[51] **Int. Cl.** **B63b 21/00**

[58] **Field of Search** ..... 114/230, 206 R, 235 R, 114/235 F, 235 B, 215, 216, 217, 221 A, 114/179, 180; 9/8 R, 9, 33, 46; 24/124, 126 R

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Assistant Examiner—Edward R. Kazenske
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[57] **ABSTRACT**

A system for buoying the end of a wire mooring line cast off from a floating vessel includes an annular stopper loosely fitted around the mooring line onboard the vessel between the fairlead of the vessel and a winch drum to which the end of the line is releasably attached. An annular receptacle is loosely fitted around the mooring line outboard of the vessel and has a bore shaped to be engageable with the exterior configuration of the stopper. The receptacle is lashed lightly to the hull of the vessel and carries a shackle to which a buoyant line and buoy are connected. When the vessel mooring station is to be abandoned, the stopper is fixed to the mooring line by forcing a clamping device between the mooring line and the interior of the stopper. The mooring line is then cast off from the winch drum, allowing the line to run through the fairlead and the receptacle until the stopper mates with the bore in the receptacle. The engagement of the mooring line with the receptacle breaks the lashing of the receptacle to the vessel, and the buoy and its line follow the receptacle. The buoy supports the end of the mooring line and marks its location in the water so the line may be recovered later and reconnected to the vessel to reestablish its desired mooring.

15 Claims, 10 Drawing Figures

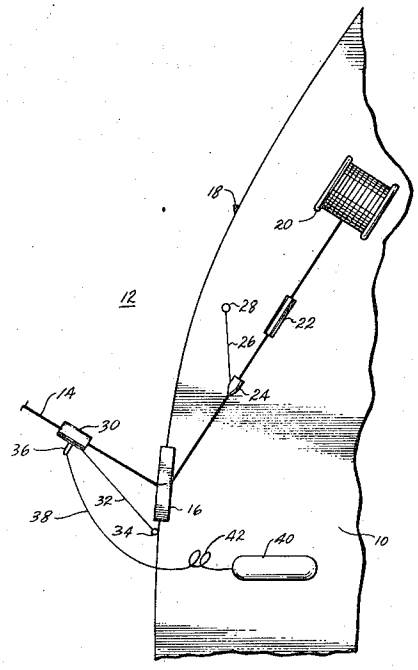


Fig. 1

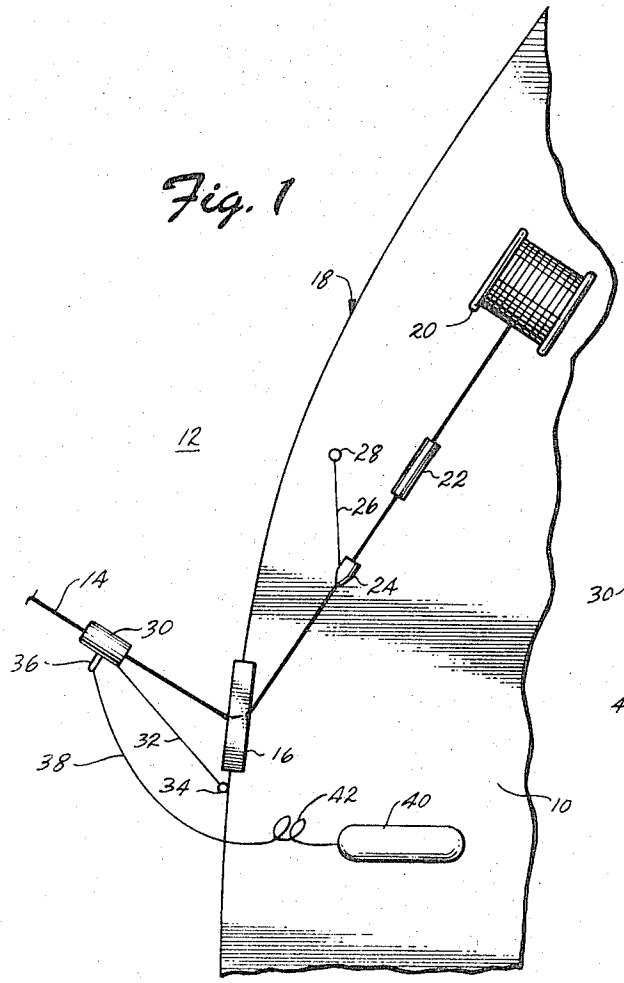


Fig. 2

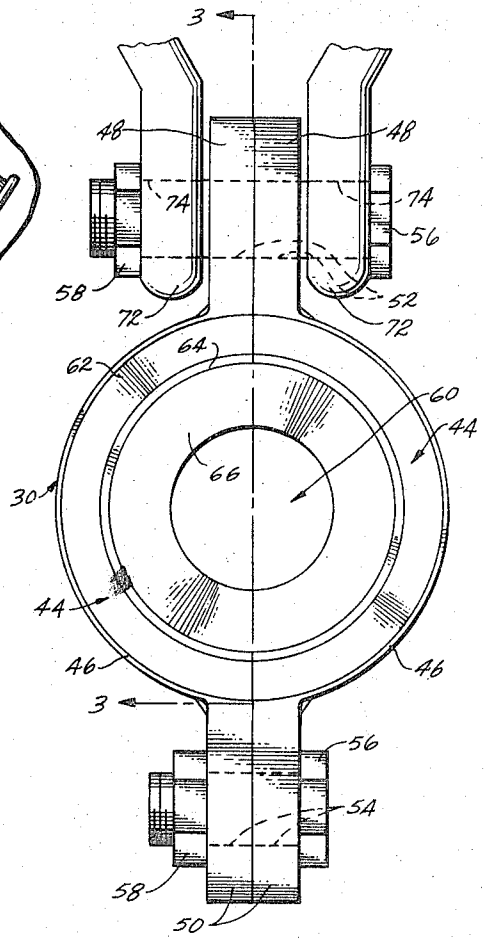
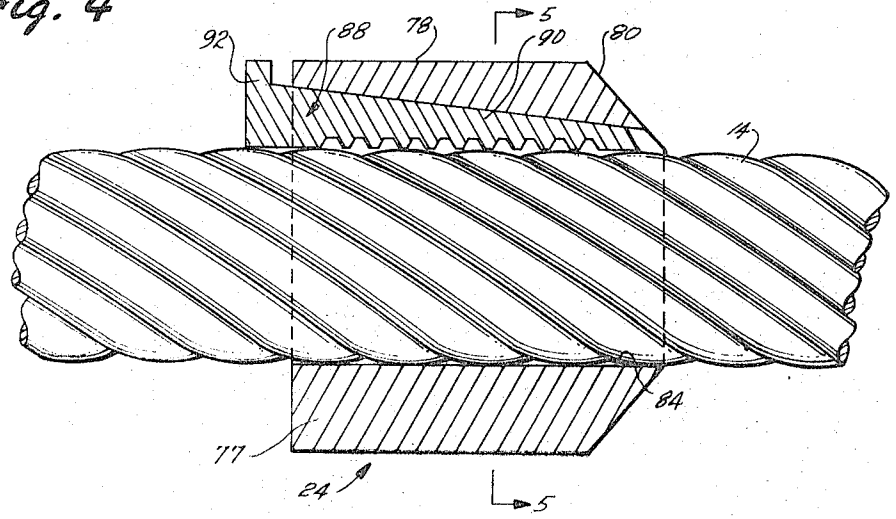


Fig. 4



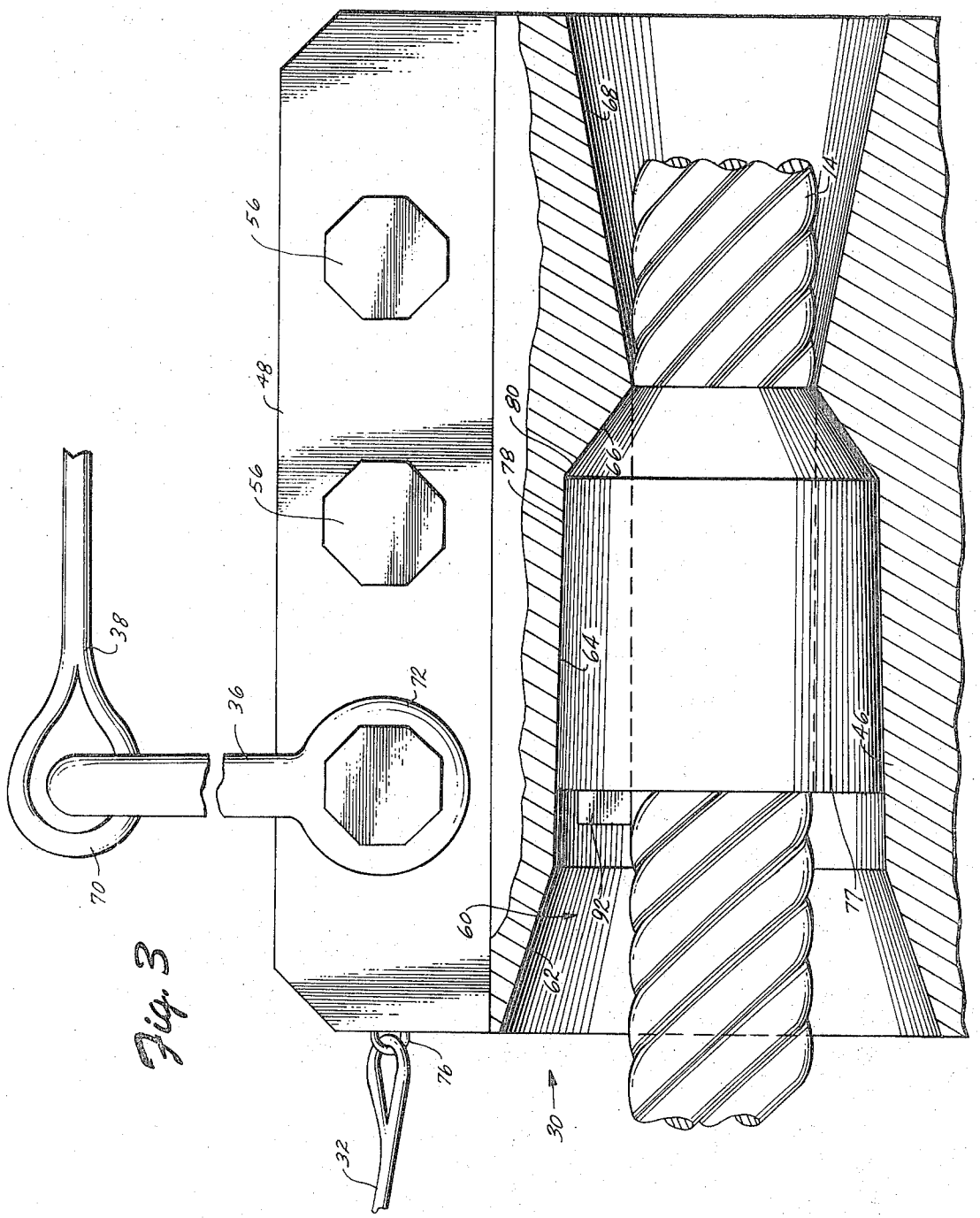


Fig. 3

Fig. 5

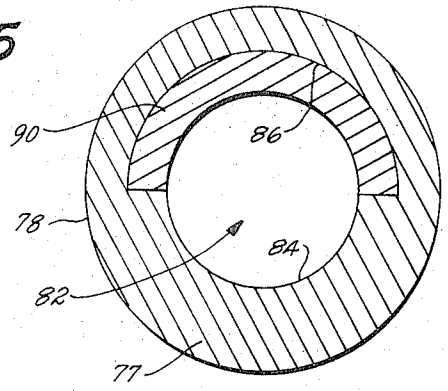


Fig. 6

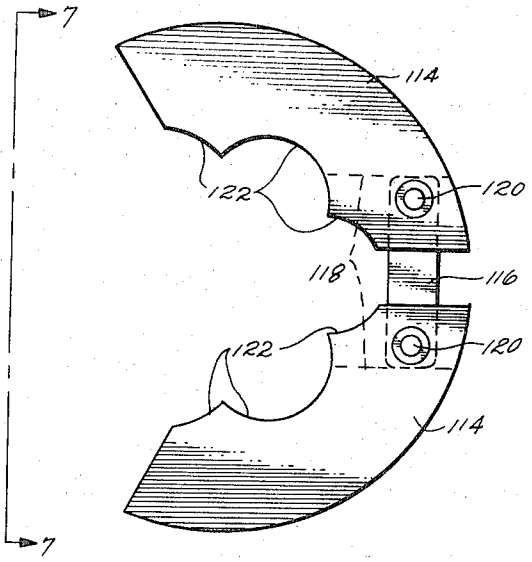


Fig. 7

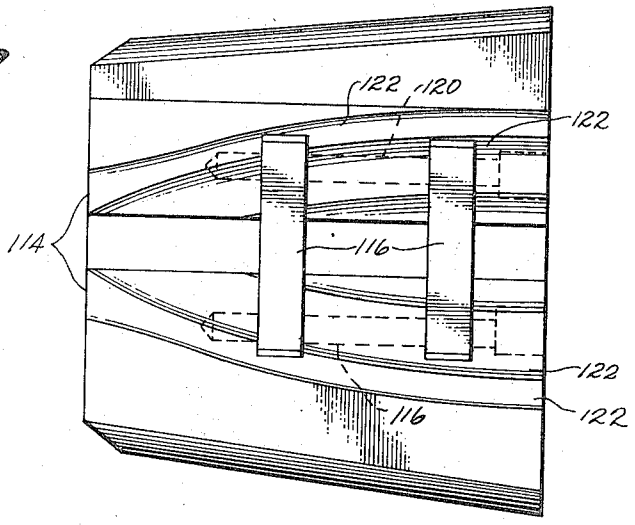


Fig. 8

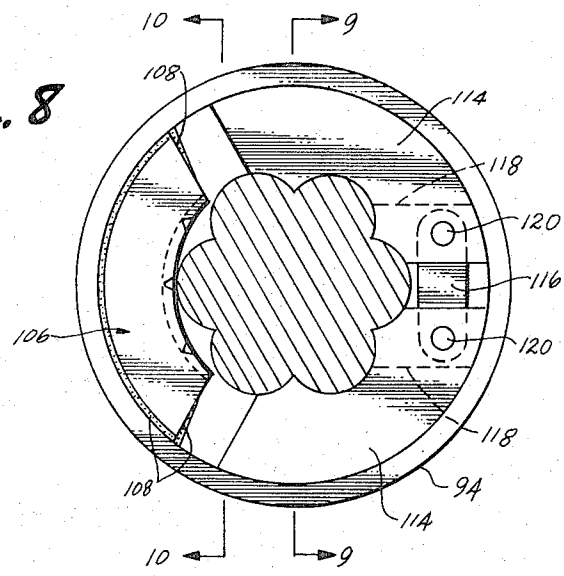


Fig. 9

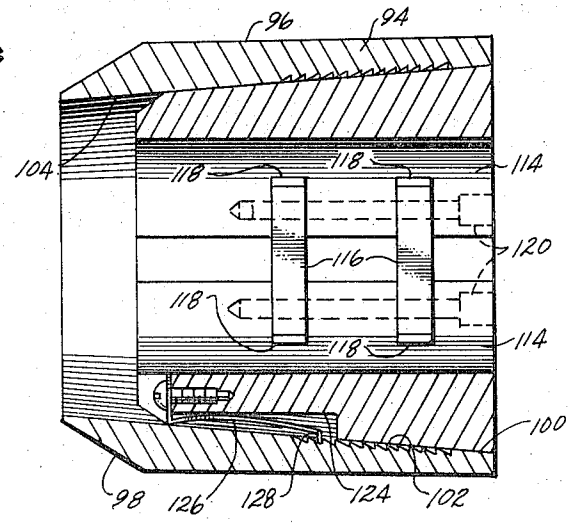
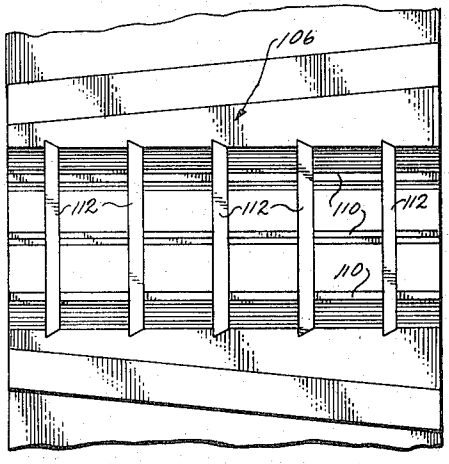


Fig. 10



SYSTEM AND METHOD FOR BUOYING THE END OF A WIRE MOORING LINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to mooring systems for floating vessels, and more particularly to a system and method for buoying a wire mooring line to mark its location in the water after it is cast off from the vessel.

2. Description of the Prior Art

Oil exploration and drilling operations are often carried out in water depths between several hundred to several thousand feet. A floating drilling ship generally is anchored by a mooring system which usually includes several strategically positioned mooring lines. During exploration and drilling operations, the heading of the anchored vessel is continuously adjusted by reeling in and paying out certain lengths of the mooring lines to keep the vessel headed into approaching waves.

A wire rope mooring line is commonly used to anchor the floating vessel. The wire line generally passes through a fairlead, or chock, located adjacent the gunwale, with the end of the wire line being attached to a winch drum onboard the vessel for reeling in and paying out desired lengths of the line.

Weather conditions or emergency situations often require the drilling ship to move off station on relatively short notice. Sometimes the nature of the emergency, such as when a blow-out occurs, allows the ship operator only a few minutes to cast off the mooring lines and abandon the area.

Generally, the mooring lines are cast off by disconnecting each line from its associated winch drum and then attaching a buoyant line and buoy to the end of each mooring line. Each buoy preferably is marked with a code number corresponding to the number of the wire mooring line with which the buoy is associated. The buoy supports the end of the mooring line and marks its location so the lines can later be retrieved when the drilling vessel returns to the area to reestablish its mooring. When the mooring is to be abandoned, each mooring line is payed out slowly through the fairlead, and the buoy is then attached to an end portion of the line outboard of the fairlead. (The buoy cannot be attached to the mooring line onboard the vessel because it will not fit through the relatively small opening in the fairlead or chock.) This procedure of casting off the mooring lines is unduly time consuming, and usually cannot be completed in time when a serious emergency requires the vessel to abandon an area on short notice. This often results in the loss of expensive mooring lines and anchors in the effort to abandon the area before the emergency situation jeopardizes the safety of the vessel and its crew.

SUMMARY OF THE INVENTION

This invention provides a system which can be quickly and easily put into use to automatically buoy the wire mooring lines of a floating vessel after the lines are cast off from the vessel. The system can be readily put into use even during heavy weather or emergency conditions, which results in a saving of expensive mooring lines and anchors, and also improves the reliability of relocating the mooring station.

Briefly, the system includes a receptacle unit loosely secured around a given mooring line at a point outboard of the vessel so the mooring line can be reeled in and payed out through the receptacle. A stopper unit is loosely disposed around a portion of the wire line onboard the vessel. The stopper unit has a configuration which enables it to be engageable with the receptacle in a mating fit. When the mooring line is to be cast off from the vessel, clamping means are forced into cooperation between the stopper unit and the line to hold the stopper in a fixed position relative to the line. The mooring line is then released from its point of attachment to the vessel to allow the line to pass through the receptacle until the stopper unit mates with the receptacle to hold the end of the mooring line in a fixed position in the receptacle. A buoy attached to the receptacle supports the end of the mooring line and marks its location in the water.

In a preferred form of the invention, the receptacle is lightly lashed to the vessel to prevent the receptacle from sliding lengthwise along the mooring line away from the vessel. The lashing is of sufficient tensile strength that its connection to the vessel can be broken by the engagement of the stopper unit and the receptacle once the mooring line is cast off from the vessel.

Preferably, the stopper unit includes an annular collar loosely fitted around the mooring line, and a clamping device which is slidable into the bore of the collar to form a wedge between the mooring line and the interior of the collar. The clamping device can be easily applied by a workman within seconds after an emergency situation arises. Thereafter, the mooring line can be simply cast off from the vessel, allowing the mooring line and the collar to run through the fairlead, or chock, until the collar automatically engages with the receptacle, which in turn, breaks the lashing of the receptacle to the vessel, causing the buoy and its line to follow the receptacle into the water and mark the location of the mooring line.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects of the invention will be more fully understood by referring to the following detailed description and the accompanying drawings in which:

FIG. 1 is a schematic plan view showing a floating vessel anchored by a mooring line which contains the buoy-off system of this invention;

FIG. 2 is an elevation view showing a receptacle adapted to be disposed around a mooring line outboard of the vessel;

FIG. 3 is a fragmentary elevation view, partly in section and partly broken away, taken on line 3—3 of FIG. 2;

FIG. 4 is a sectional elevation view showing a wedge-type stopper unit attached to the mooring line onboard the vessel;

FIG. 5 is a sectional elevation view taken on line 5—5 of FIG. 4;

FIG. 6 is an elevation view showing movable clamping segments for use in an alternate stopper unit;

FIG. 7 is an elevation view taken on line 7—7 of FIG. 6;

FIG. 8 is an elevation view showing the clamping segments of FIG. 6 disposed within a collar for the alternate stopper unit;

FIG. 9 is a sectional elevation view taken on line 9—9 of FIG. 8; and

FIG. 10 is an elevation view taken on line 10—10 of FIG. 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a schematic illustration of a mooring line buoy-off system used in conjunction with a vessel **10** floating on a body of water **12.** The vessel is anchored by a mooring system which includes several mooring lines arranged in a suitable pattern around the vessel. FIG. 1 illustrates the buoy-off system of this invention used in conjunction with one mooring line **14** of the mooring system. Preferably, mooring line **14** is a braided wire rope line, one end of which is connected to a suitably deployed anchor (not shown).

The mooring line is shown threaded through a fairlead **16** located at gunwale **18** of the vessel, although the present invention also can be used on a mooring line threaded through a chock located in the hull of the vessel. The "bitter end" of the mooring line is releasably attached to a winch drum **20** mounted onboard the vessel. The winch drum reels in and pays out lengths of the mooring line through the fairlead. The fairlead includes a puleey (not shown) pivotally mounted in an annular casting in the hull of the ship. The mooring line is reeved over the pulley and passes through the casting as it is reeled in and payed out by the winch drum. The mooring line is threaded through a tension sensator or load cell **22** prior to being attached to the winch drum.

An annular stopper unit **24** is disposed around the mooring line onboard the vessel between the fairlead and tension sensator. A light hemp cord or line **26** lashes the stopper unit to a fixture **28** onboard the vessel to hold the stopper unit in a substantially fixed position relative to the mooring line. The bore of the stopper unit is sufficiently greater than the outside diameter of the mooring line that the mooring line can be reeled in and payed out through the stopper unit as desired during normal operation of the mooring system. The details of construction of the stopper unit are described below.

A receptacle **30** is disposed around the mooring line just outboard of fairlead **16.** A line **32** (such as a light hemp line) lightly lashes the receptacle to a fixture **34** on the hull of the vessel to prevent the receptacle from sliding lengthwise along the mooring line away from the vessel. Generally, the receptacle is a two-part clam shell type housing which makes a loose fit around the outside diameter of the mooring line so the mooring line can be reeled in or payed out through the receptacle without the receptacle interrupting movement of the line. The bore of the receptacle is configured so as to match the outer configuration of the stopper unit, which allows the stopper unit to be slidably engageable with the interior of the receptacle in a snug mating fit. The details of construction of the receptacle unit are described below.

A shackle **36** carried on the receptacle attaches one end of a buoyant line **38** to the receptacle. The opposite end of the buoyant line is connected to a buoy **40** located onboard the vessel. A major portion of the buoyant line is coiled onboard the vessel at **42** to pay out when the buoy is pulled into the water, as described below.

In use, when the mooring station of the vessel is to be abandoned, each mooring line in the mooring system is cast off the vessel in accordance with the following procedure. Each mooring line **14** is payed out from its corresponding winch drum **20** until about one-half a turn of line remains on the drum. A brake (not shown) is then applied to the winch drum to hold the drum in a fixed position. Stopper unit **24** is then fixed to mooring line **14** by driving a clamping device (to be described in detail below) between the mooring line and the bore of stopper unit **24.** Lashing **26** is then broken as the brake is released and the mooring line is payed out at a moderate rate until stopper unit **24** passes through fairlead **16.** The bitter end of the mooring line is then released from attachment to winch drum **20** and cast off, allowing the remaining end portion of the mooring line to run at a relatively high speed through fairlead **16.** As the mooring line falls away from the vessel, stopper unit **24** mates with the bore of receptacle **30.** This seating of the stopper in the receptacle generates an immediate tug on lashing **32** which automatically breaks the lashing of the receptacle to the vessel. This frees the receptacle and the mooring line from the vessel, and also causes buoyant line **38** to unreel and pull buoy **40** into the water. The buoy supports the end of the mooring line in the water and also marks the location of the line. Thus, when the vessel subsequently returns to the mooring station, the mooring lines can be recovered and reconnected to the vessel to reestablish the desired mooring. The floating buoy preferably is marked with a code number corresponding to the number of the wire mooring line to which the buoy is connected.

FIGS. 2 and 3 show the detailed construction of receptacle **30** which includes a pair of opposed elongated shell halves **44** attached to each other to form an elongated tubular housing disposed loosely around mooring line **14.** Each shell half includes an elongated intermediate portion **46** which is generally C-shaped in transverse cross-section, a longitudinally extending elongated top flange **48** projecting upwardly along one end of the C, and a longitudinally extending elongated bottom flange **50** projecting downwardly along the other end of the C. Each top flange has a series of longitudinally spaced apart holes **52** which are adapted to be collinear with respect to matching holes in the other top flange, and each bottom flange likewise has a series of longitudinally spaced apart holes **54** adapted to be collinear with matching holes in the other bottom flange.

The C-shaped intermediate portions **46** of shell halves **44** are fitted around the mooring line outboard of the fairlead so that both top flanges **48** and both bottom flanges **50** abut against each other. The opposed matching flanges are aligned with each other to automatically align matching holes **52** and **54** in the top and bottom flanges, respectively. Separate bolts **56** are threaded into the matching holes and tightened with the aid of nuts **58** so that the intermediate portions of the shell halves cooperate to form a cylindrical-shaped housing extending lengthwise along the mooring line.

The cylindrical housing formed by the matching shell halves fits loosely around the mooring line and defines an elongated passage **60** through which the mooring line passes. As shown best in FIG. **3,** passage **60** includes a first inwardly tapering bore **62** which extends from one end of the housing for about one-fifth the length of the housing and is continued as a second elongated bore **64** which tapers slightly inwardly to approximately the mid-point of the housing. The taper of the second bore is relatively small, being about 2½° with

respect to the longitudinal axis of the housing. The second bore terminates at the wide end of a relatively short third bore 66 which tapers inwardly at a relatively steep angle. The third bore extends for approximately one-eighth the length of the housing and tapers about 30° with respect to the longitudinal axis of the housing. The third bore terminates at the inner end of an outwardly tapering fourth bore 68 opening outwardly at the opposite end of the housing. The second and third bores of passage 60 are configured to match the outer surface configuration of stopper unit 24 so that in use, stopper unit 24 will be slidably engaged in the interior of the receptacle in a snug mating fit.

As described above, the location of the mooring line, after it is cast off from the vessel, is marked by buoy 40 which is attached to shackle 36 by buoyant line 38. As shown best in FIGS. 2 and 3, shackle 36 includes a downwardly opening U-shaped bracket which is fitted through a loop 70 at one end of the buoyant line. Each end of the U-shaped bracket has an enlarged section 72 with a respective transverse bore 74. End sections 72 are fitted around top flange 48, and bores 74 are aligned with one matching pair of the holes 52 to receive a corresponding bolt 56 and nut 58 for securing the bottom of the shackle to the top flange.

An eye 76 is connected to one edge of one of the top flanges to provide means for attaching lashing 32 between receptacle 30 and the vessel.

FIGS. 4 and 5 show one embodiment of stopper unit 24 which includes an elongated annular collar 77 having an exterior surface configuration defining an elongated transversely circular first section 78 at one end of the collar which tapers slightly narrower toward the intermediate portion of the collar and extends for approximately four-fifths the length of the collar. First section 78 terminates at the large end of a second relatively steeply tapered second section 80 which tapers smaller toward the other end of the collar. Sections 78 and 80 mate in receptacle bores 64 and 66, respectively.

A passage 82 extending through collar 77 is defined by a straight cylindrically curved bore 84 extending around approximately one-half the diameter of the passage, and an enlarged tapered bore 86 extending around the remaining one-half of the inside diameter of the passage. The inside diameter of bore 84 matches the general exterior curvature of mooring line 14. The overall cross-sectional area of passage 82 is greater than the cross-sectional area of the mooring line by virtue of a C-shaped space formed between the mooring line and the inside diameter of tapered bore 86. Thus, collar 77 makes a loose fit around the mooring line which enables the mooring line to be easily threaded through the bore in collar 77 prior to when the mooring line is made up to its anchor (not shown). Collar 77 is lashed to the vessel by line 26 after the mooring line is made up, and the mooring line thereafter can be easily reeled in and payed out through the bore in the collar.

The stopper unit is fixed to the mooring line by means of a movable wedge 88 which includes a tapered section 90 having a C-shaped cross-sectional configuration with an exterior surface matching the tapered configuration of the inside diameter of bore 86. In use, the stopper unit is fixed to the mooring line simply by slipping wedge 88 into the C-shaped space between the mooring line and the tapered bore 86, and hammering a flange 92 at the end of the wedge to jam the wedge between collar 77 and the mooring line to thereby clamp the collar to the line. Thus, when an emergency situation arises requiring the mooring area to be abandoned immediately, the stopper unit can be quickly and easily fixed to the mooring line.

As illustrated in FIG. 3, the external configuration of tapered sections 78 and 80 of collar 77 match the configuration of bores 64 and 66, respectively, of receptacle 30, with the inside diameter of the bore of the receptacle being slightly oversized relative to the exterior configuration of the collar. Thus, the collar can make a snug mating fit inside the receptacle once lashing 26 is broken and the mooring line is cast off from the winch drum and allowed to run through the fairlead and the receptacle. The stopper unit is of such configuration that it easily passes through the interior of the fairlead when the mooring line is being payed out from the winch drum prior to when the mooring line is cast off.

FIGS. 6 through 10 show an alternate embodiment of stopper unit 24 which includes an elongated annular collar 94 having tapered outer surface portions 96 and 98 identical to the configuration and size of the tapered outer surfaces 78 and 80, respectively, of collar 77 described above. The passage through collar 94 comprises a straight smooth bore 100 at one end of the housing which extends inwardly for about one-fifteenth the length of the housing, and which is followed by a threaded bore 102 which tapers inwardly to about the mid-point of the housing. The passage is continued as a smooth bore 104 with the same taper angle as bores 100 and 102.

An elongated C-shaped locking segment 106 disposed within the bore of collar 94 is rigidly secured therein by welding at 108. Locking segment 106 extends the entire length of the bore and occupies slightly less than one-third the inside circumference of the bore.

Locking segment 106 includes surface irregularities in the form of a grid pattern shown best at FIG. 10. The grid includes several longitudinally extending and radially spaced apart elongated linear indentations 110 intersected at right angles by a series of longitudinally spaced apart curved indentations 112 formed in the curved inner surface of the locking segment.

In use, mooring line 14 is threaded through the bore of collar 94 as the mooring line is being made up. The collar is then secured to a suitable point onboard the vessel by lashing 26, as described above in connection with stopper unit collar 77. When collar 94 is to be fixed to the mooring line, a pair of movable locking segments 114 are forced into the space between the mooring line and the bore of collar 94 to clamp the collar to the mooring line.

Each movable locking segment 114 comprises an elongated body having a generally C-shaped cross-sectional configuration and a length approximately four-fifth the length of collar 94. The exterior configuration of each C-shaped segment is tapered so it matches the tapered interior surface of the passage in collar 94.

As shown best in FIGS. 6 and 7, locking segments 114 are pivotally interconnected by a pair of longitudinally spaced apart elongated hinge links 116. The ends of each hinge link are fitted in a corresponding pair of slots 118 formed in opposed edges of the locking seg-

ments. A pair of elongated hinge pins **120** are fitted through corresponding ends of the two hinge links to hold the locking segments together so that each locking segment can pivot about a longitudinal axis through its corresponding hinge pin. Slots **118** are sufficiently oversized with respect to the ends of their associated hinge links to enable the movable locking segments to pivot away from each other to an open position which allows the locking segments to be readily fitted around the wire rope mooring line as will be described in greater detail below.

The inner C-shaped surface of each movable locking segment **114** contains several laterally spaced apart, diagonally extending and cylindrically curved indentations **122** shaped to match the outer contour of the helically wound and cylindrically curved braided wire rope sections of the mooring line.

The movable locking segments **114** are used by initially fitting them around the mooring line adjacent collar **94,** with the wire rope sections of the mooring line being seated in corresponding indentations **122** of the locking segments, as shown best in FIG. **8.** The movable locking segments are then held in a fixed position, while collar **94** is slipped over them so that locking segments **114** are fitted into the C-shaped space between the mooring line and the interior of collar **94.** As force is being applied to the collar to move it axially relative to locking segments **114,** the tapered interior of the collar progressively squeezes movable locking segments **114** tighter around the exterior of the mooring line so that locking segments **114** and fixed locking segment **106** act as a wedge to tightly clamp the line inside the collar.

As shown best in FIG. **9,** one movable locking segment **114** contains an elongated recess **124** formed in its outer surface, and an elongated leaf spring **126** is disposed in the recess. The leaf spring includes an outwardly projecting ridge **128** to be spring biased into contact with the threads of bore **102** of collar **94** as the collar is slipped over the movable locking segments. The spring therefore acts as a ratchet to lock the movable locking segments in collar **94** once the stopper unit has been clamped to the mooring line.

Thus, a system is provided which can be easily and quickly put into operation to buoy the ends of all mooring lines on the floating vessel at a moment's notice. Each buoy can be fixed in advance to a corresponding receptacle outboard of the fairlead when the mooring lines are first made up. Thereafter, when an emergency condition arises requiring immediate abandonment of the mooring station, each stopper unit is quickly fixed to its respective mooring line and the mooring line is then payed out through the fairlead. The mooring lines are then released from attachment to their corresponding winch drums, and the end of each mooring line allowed to run through its corresponding fairlead. Engagement of the fixed stopper unit with the receptacle automatically frees the mooring line from its lashing to the vessel, and also draws the buoy into the water to mark the location of the mooring line.

We claim:

1. Apparatus for buoying a cast off mooring line comprising

a receptacle defining a conical bore therethrough of minimum diameter greater than the diameter of the mooring line for loosely fitting around the mooring line to allow normal in and out movement therethrough of the mooring line relative to the vessel through the receptacle bore,

means for connecting a buoy to the receptacle,

a collar member arranged for surrounding the mooring line and, when disposed to surround the mooring line, for defining a bore therethrough of minimum diameter greater than the diameter of the mooring line for loosely fitting around the mooring line to allow normal in and out movement of the mooring line relative to the vessel through the bore in the surrounding collar member, and

a clamping member insertable into the bore of the collar member, when disposed to surround the mooring line, to cooperate between the mooring line and the collar member for fixing the collar member to the mooring line,

the collar member being sufficiently small in diameter to pass, when fixed to the mooring line by the clamping member, through a fairlead, chock or the like with the mooring line,

the collar member, when disposed to surround the mooring line, having a conical exterior configuration arranged in cooperation with the conical configuration of the receptacle bore for self-engagement of the collar member in the receptacle bore, irrespective of the angular relationship between the collar member and the receptacle, in response to the mooring line being payed out through the receptacle bore after the collar member is fixed to the mooring line by the clamping member.

2. Apparatus according to claim **1** in which the clamping member comprises a wedge shaped to be fitted between the mooring line and the bore of the collar member to tightly clamp the collar member onto the mooring line.

3. Apparatus according to claim **1** in which the clamping member comprises a pair of locking segments shaped to fit between the interior of the collar member and the mooring line to tightly clamp the collar onto the mooring line.

4. Apparatus according to claim **3** in which the bore of the collar member is tapered, and in which the locking segments are correspondingly tapered.

5. Apparatus according to claim **4** including ratched means cooperating between the locking segments and the collar member to lock the locking segments in line fixing cooperation between the collar member and the mooring line.

6. Apparatus according to claim **5** in which the ratchet means comprises a threaded portion in the collar bore, and a spring carried on the locking segments and biased toward the collar member interior to interlock with the threads and prevent movement of the locking segments out of the collar member bore.

7. Apparatus according to claim **4** in which the locking segments are pivotally interconnected to move from an open position to a closed position matching the contour of the mooring line, the segments in their closed position having an exterior surface which is tapered to match the tapered contour of the collar bore.

8. Apparatus according to claim **1** including means for attaching the receptacle to a fixed point on the vessel to constrain movement of the receptacle along the mooring line away from the vessel, the attaching means having a sufficiently low tensile strength that the connection between the receptacle and vessel can be bro-

ken by engagement of the collar member and the receptacle.

9. A method for casting off a wire rope mooring line from an anchored vessel and for buoying the cast off end of the line comprising the steps of

disposing around the mooring line outboard of the vessel a receptacle arranged for free passage of the line therethrough,

connecting a suitable buoy to the receptacle,

loosely disposing around the mooring line aboard the vessel, at a location on the line between a mooring winch and a gunwale fairlead or the like for the line, a stopper member configured to mate with the receptacle and to pass through the fairlead when fixed to the line,

fixing the stopper member to the line adjacent the bitter end thereof only in preparation for disconnecting the line from the winch, and

disconnecting the line from the winch after fixing the stopper member to the line,

whereby the stopper member passes with the line through the fairlead or the like and engages the receptacle so that the buoy is pulled from the vessel by the falling line.

10. The method according to claim 9 including tethering the receptacle and the stopper member to the vessel sufficiently strongly that they maintain predetermined locations relative to the vessel during normal operation of the winch but insufficiently strongly to support loads applied thereto by the line following disconnection of the line from the winch.

11. The method according to claim 9 including storing the buoy on the vessel after connection thereof to the receptacle in such manner that the buoy is pulled from the vessel by the line following engagement of the stopper member with the receptacle.

12. The method according to claim 9 wherein the stopper member is fixed to the line by applying wedging means between the line and the stopper member.

13. Apparatus for buoying a mooring line extending from a point of attachment onboard a floating vessel through a fairlead, chock or the like of the vessel following casting off of the mooring line from the vessel in an emergency or the like, the apparatus comprising

a receptacle adapted to be located outboard of the vessel and defining a tapered bore therethrough of minimum diameter greater than the diameter of the mooring line for free passage of the mooring line through the receptacle bore to an anchor,

means for connecting a buoy to the receptacle,

a collar member adapted to be located on the vessel inboard of the fairlead and arranged for surrounding the mooring line and, when disposed to surround the mooring line, for defining a bore therethrough of minimum diameter greater than the diameter of the mooring line for free passage of the mooring line therethrough, the collar member also having a tapered exterior configuration arranged in cooperation with the tapered configuration of the receptacle bore for locking cooperation of the collar member within the receptacle bore,

a clamping member insertable into the bore of the collar member, when disposed to surround the mooring line, to cooperate between the mooring line and the collar member for fixing the collar member to the mooring line at a location inboard of the fairlead,

the collar member being sufficiently small in diameter to pass, when fixed to the mooring line by the clamping member, through the fairlead, chock or the like with the mooring line,

the collar member, when disposed to surround the mooring line, having its tapered exterior configuration arranged in cooperation with the tapered configuration of the receptacle bore for self-engagement of the collar member in the receptacle bore, irrespective of the angular relationship between the collar member and the receptacle, in response to the mooring line being payed out through the bore in the receptacle after the collar member is fixed to the mooring line by the clamping member, and

means for attaching the receptacle to a fixed point on the vessel to constrain movement of the receptacle along the mooring line away from the vessel in normal use thereof, the attaching means having a sufficiently low tensile strength that the connection between the receptacle and vessel can be broken by engagement of the collar member and the receptacle in response to the mooring line being payed out after the collar member is fixed to the mooring line by the clamping member.

14. Apparatus for buoying a cast off mooring line comprising

a receptacle defining a conical bore therethrough of minimum diameter greater than the diameter of the mooring line for loosely fitting around the mooring line to allow normal in and out movement of the mooring line relative to the vessel,

means for connecting a buoy to the receptacle,

a collar member having a tapered bore therethrough of minimum diameter greater than the diameter of the mooring line for loosely fitting around the mooring line to allow normal in and out movement of the mooring line relative to the vessel through the receptacle bore,

clamping means comprising a pair of locking segments shaped to fit between the bore of the collar member and the mooring line to tightly clamp the collar onto the mooring line,

the collar member having a tapered exterior configuration arranged in cooperation with the tapered configuration of the receptacle bore for self-engagement of the collar member in the receptacle bore in response to the mooring line being payed out after the collar member is fixed to the mooring line by the clamping means, and

ratchet means cooperating between the locking segments and the collar member to lock the locking segments in line-fixing cooperation between the collar member and the mooring line, the ratchet means comprising a threaded portion in the collar bore, and a spring carried by the locking segments and biased toward the collar member interior to interlock with the threads thereof and prevent movement of the locking segments out of the collar member bore.

15. A system for buoying the end of a mooring line cast off from an anchored floating vessel, the apparatus of the system normally being installed on the vessel in association with the line for normal use of the line but

in readiness for an emergency casting off of the line, the apparatus comprising

a receptacle located outboard of the vessel and defining a tapered bore therethrough of minimum diameter greater than the diameter of the mooring line and through which the mooring line is loosely fitted for free passage of the line relative to the vessel through the receptacle bore,

means connecting a buoy to the receptacle,

a collar member located onboard the vessel and loosely surrounding the mooring line at a location on the line between a mooring winch and a fairlead, chock, or the like of the vessel for free passage of the mooring line therethrough, the collar member having a tapered exterior configuration arranged in cooperation with the tapered configuration of the receptacle bore for locking cooperation of the collar member within the receptacle bore,

clamping means insertable into the bore of the collar member to cooperate between the mooring line and the collar member for fixing the collar member to the mooring line adjacent the bitter end thereof in preparation for disconnecting the line from the winch,

the collar member being sufficiently small in diameter to pass, when fixed to the mooring line by the clamping member, through the fairlead, chock, or the like with the mooring line,

the collar member, when disposed to surround the mooring line, having its tapered exterior configuration arranged in cooperation with the tapered configuration of the receptacle bore for self-engagement of the collar member in the receptacle bore in response to the line being disconnected from the winch and payed out through the bore in the receptacle after the collar member is fixed to the mooring line by the clamping member, and

means releasably attaching the receptacle to a fixed point on the vessel to constrain movement of the receptacle along the mooring line away from the vessel in normal use thereof, the receptacle attaching means being releasable from the vessel by self-engagement of the collar member and the receptacle in response to the mooring line being disconnected from the winch.

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