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Wilson, Jr.

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[54] **AUTOMATIC DOCKING SYSTEM**

[76] Inventor: **Clyde H. Wilson, Jr.**, P.O. Box 1635, Sarasota, Fla. 33578

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[52] **U.S. Cl.** ..... **114/230**, 49/115, 49/263, 114/.5 BD

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

[58] **Field of Search** ..... 114/.5 BD, 230, 231, 114/43.5; 49/115, 105, 263; 244/115, 116

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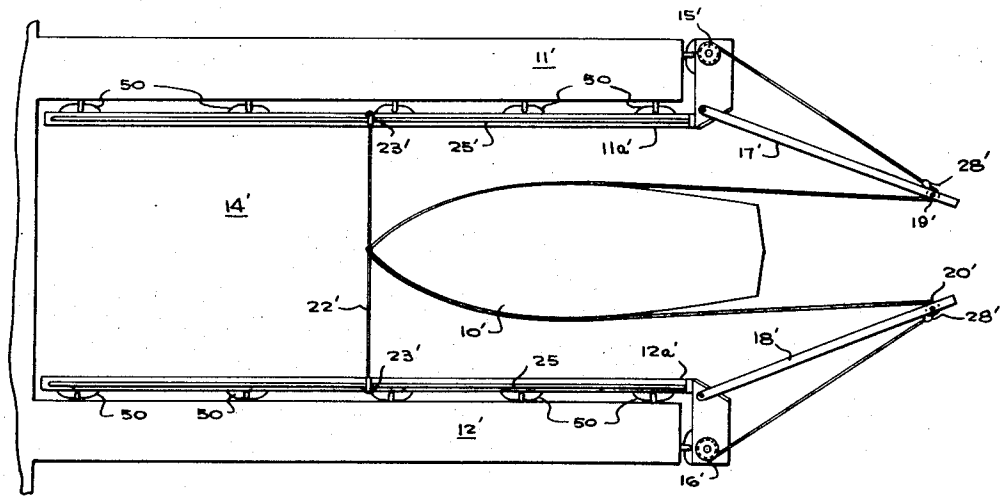
Primary Examiner—Duane A. Reger
Assistant Examiner—Galen L. Barefoot
Attorney—Thomas B. Van Poole et al.

[57] **ABSTRACT**

An automatic boat docking system for guiding and docking a boat in a boat slip; including a pair of laterally spaced dock structures defining a boat slip therebetween and having a pair of pivoted retaining booms at the outer ends of the dock structures adjacent the entrance to the slip movable between a closed position transversely spanning the slip entrance and an open position. A cross-rope movable along the slip and a harness rope are engaged by an entering boat to swing the booms to the closed position behind the boat and wrap the boat in transversely centered position by the harness rope.

25 Claims, 8 Drawing Figures



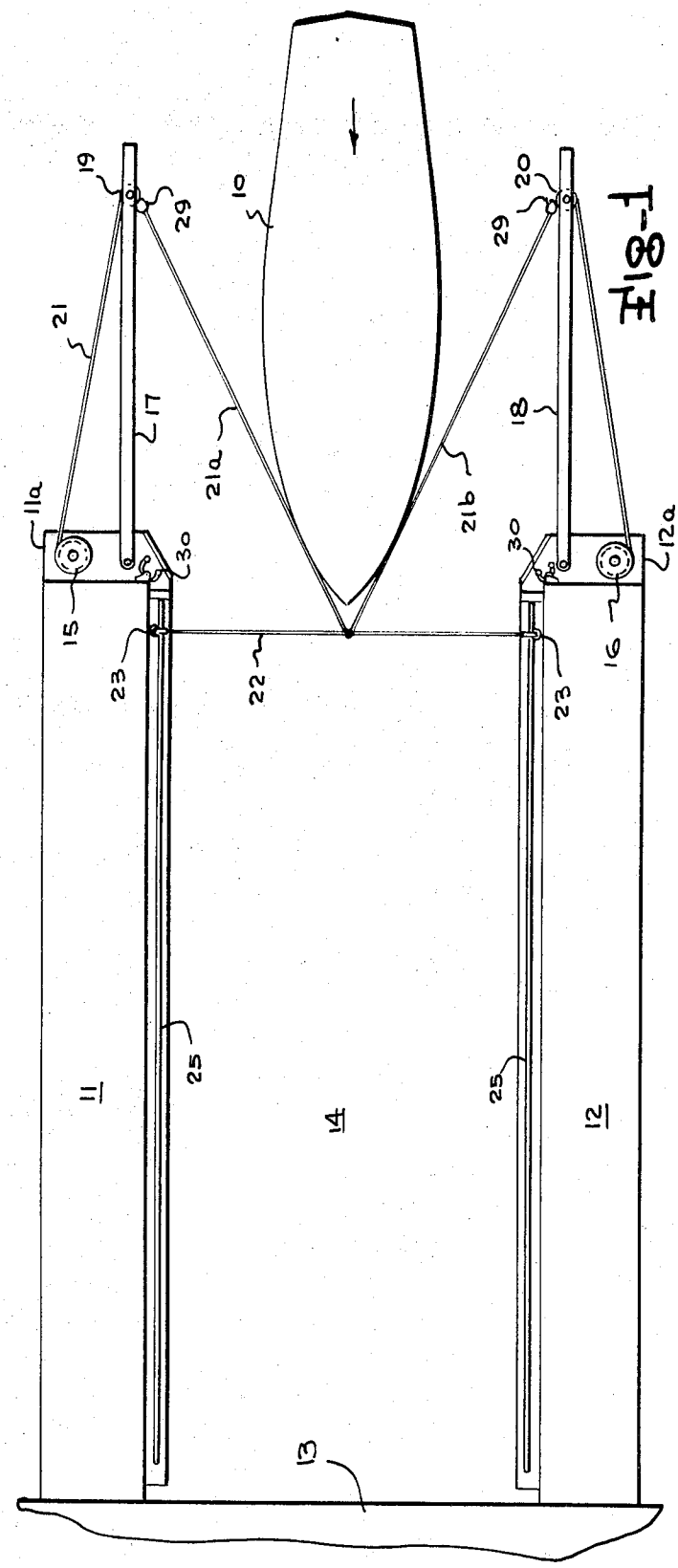


FIG-1
10
11
11a
12
12a
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17
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19
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21
21a
21b
22
23
25
29
30

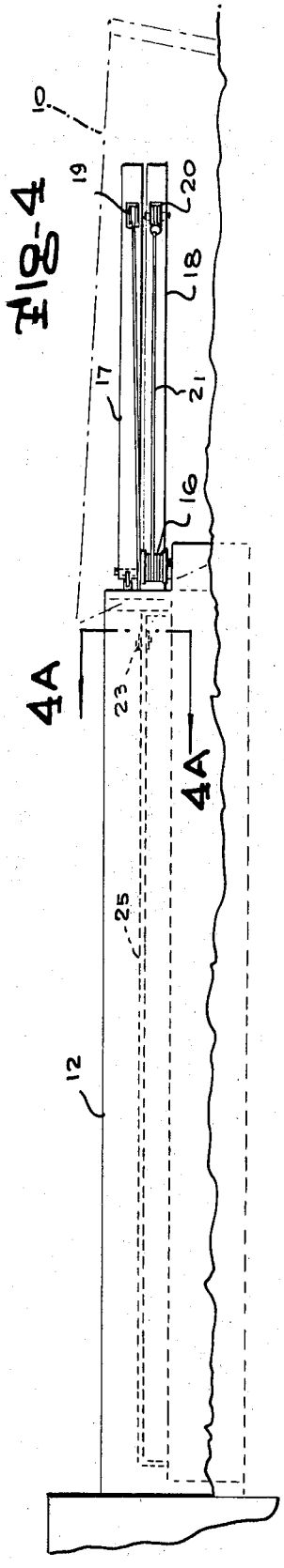
FIG-4
0
4A
4A
12
16
17
18
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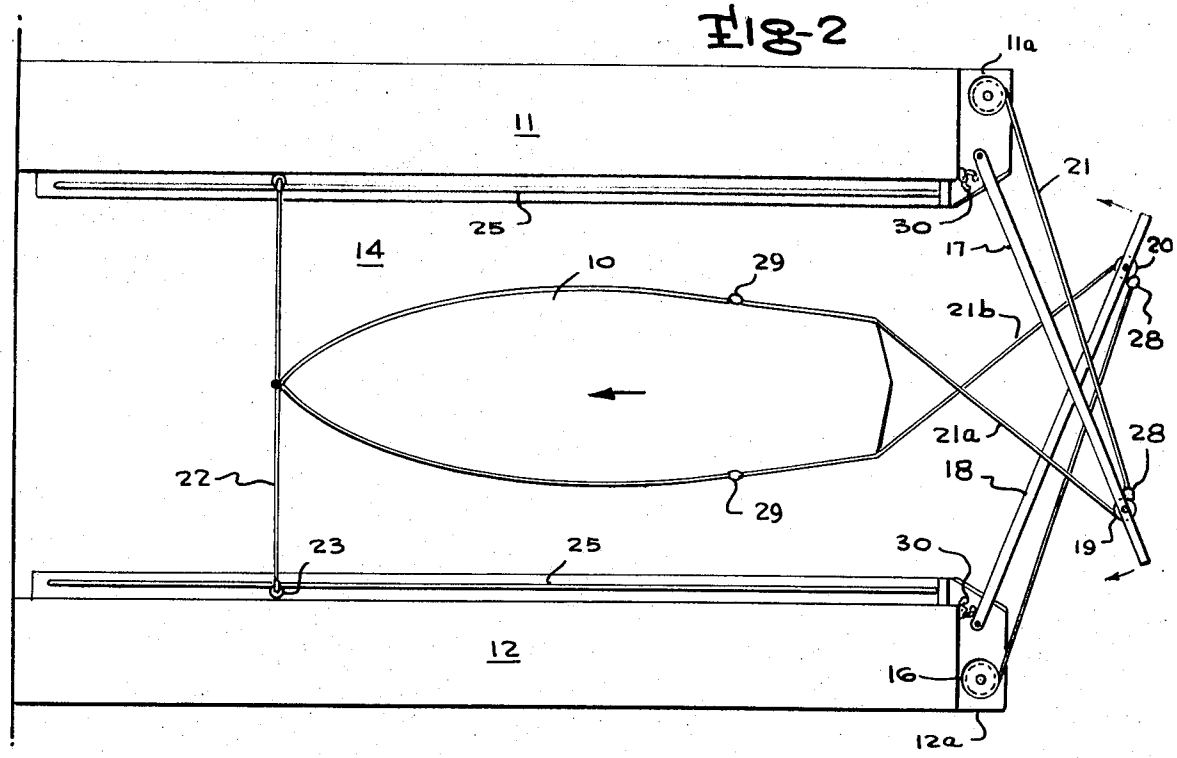
21
23
25

FIG-2


11a
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21
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30
17
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21b
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21a
28
22
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23
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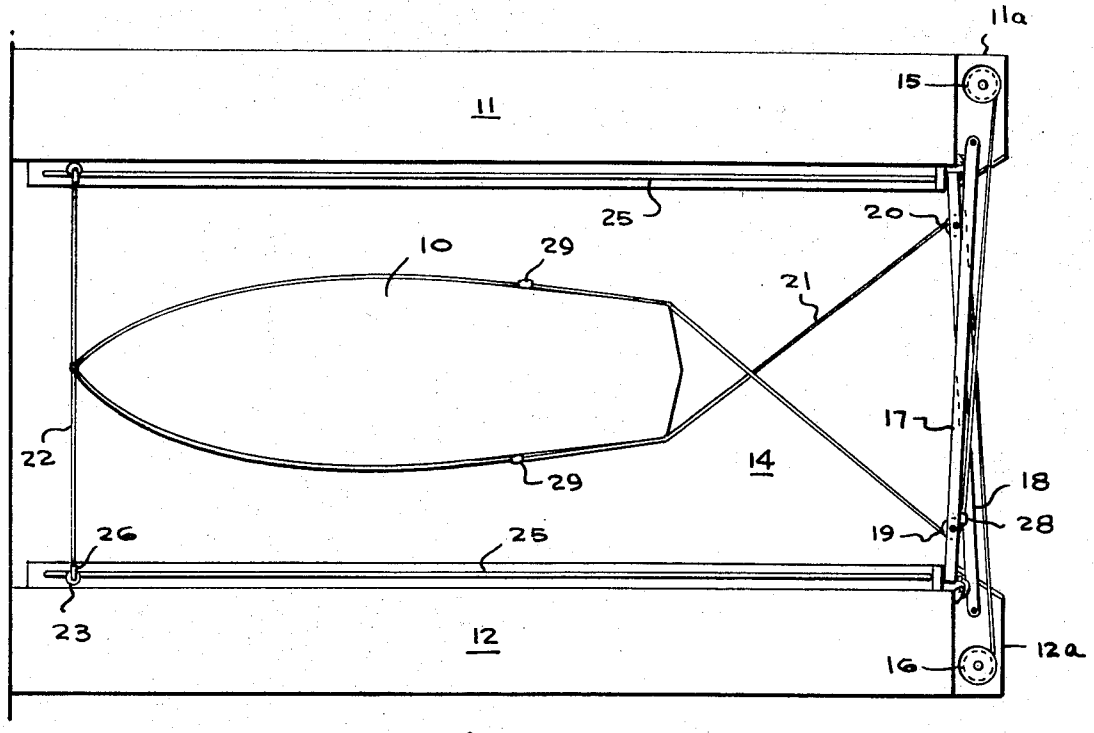
30
12
16
12a


11a
15
11
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12a

FIG-3

FIG-7

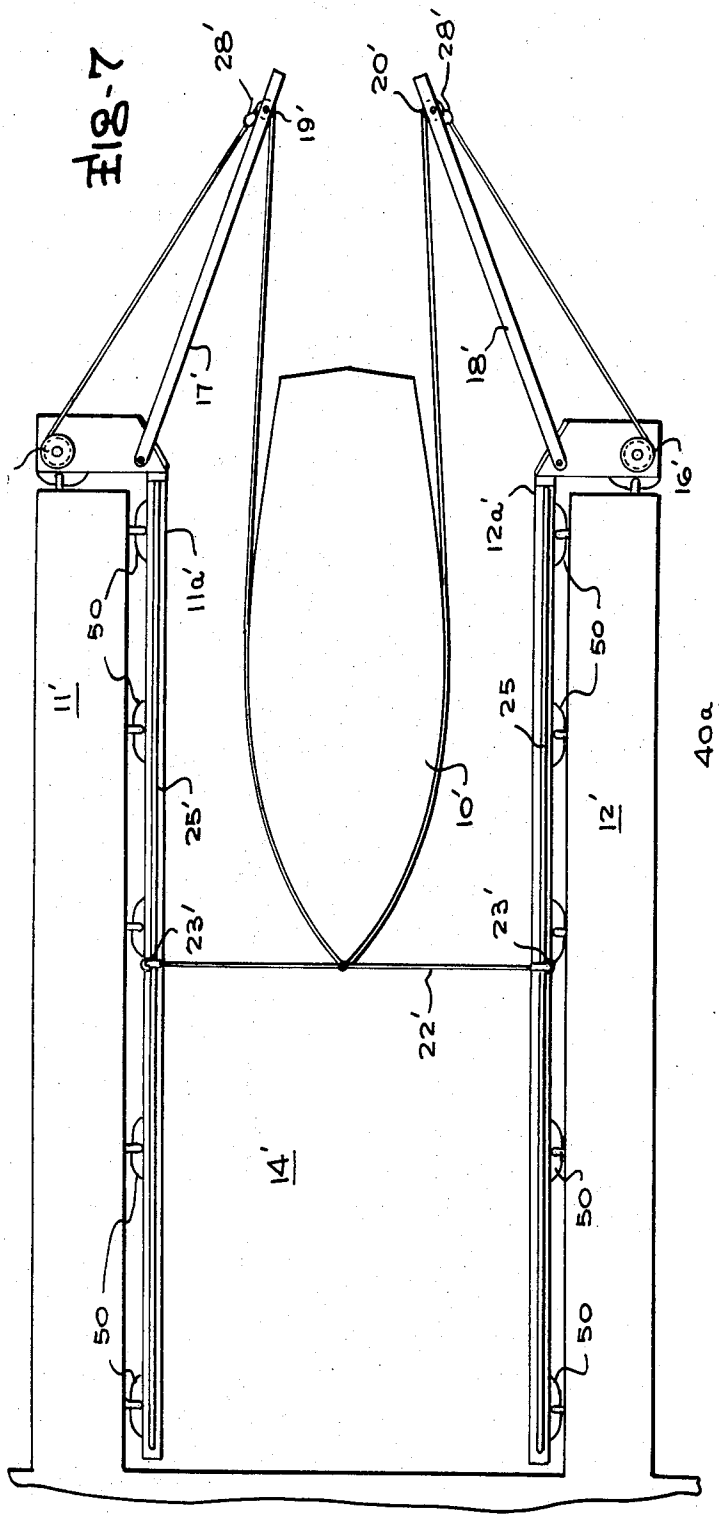


FIG-4A

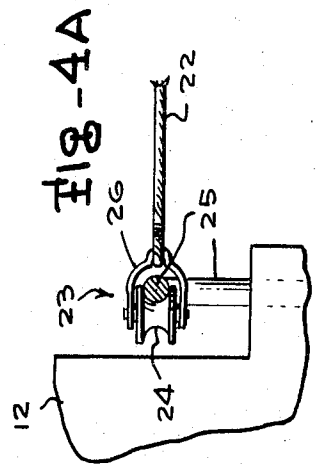


FIG-6

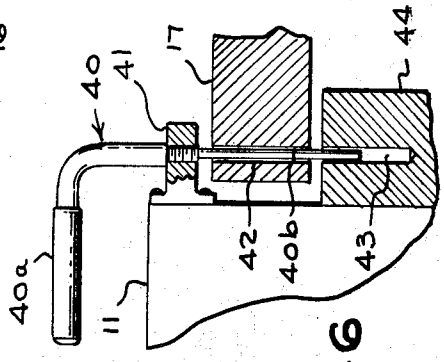
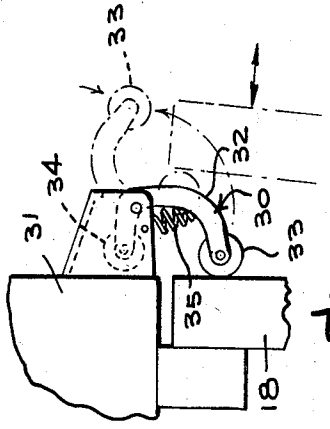


FIG-5



AUTOMATIC DOCKING SYSTEM

BACKGROUND AND OBJECTS OF THE INVENTION

The present invention relates in general to boat fending and docking aids, and more particularly to an automatic docking system employing apparatus which allows a boat to be automatically guided into proper mooring relationship in a slip and docked in the slip responsive to merely driving the boat into the slip, without requiring work by attendants to achieve the docking.

Heretofore, it has usually been required to employ one or more attending personnel, usually skilled help, to assist in guiding boats which are approaching a dock or slip into proper mooring relationship in the docking facility and to tie the boat in the slip by securing lines around cleats or other securing facilities on the dock side. Frequently, attending personnel on each side of the slip are employed with boat fending poles to keep the entering boat properly centered in the slip while it is advancing into docking or mooring position, to avoid possibly damaging collisions between the side of the craft and the sides of the slip. Such attending personnel are also needed to receive the lines being tossed from the pilot or operator of the boat to secure them to stationary fastening means on the dock or slip for tying the craft in proper position.

An object of the present invention is the provision of a novel automatic docking structure which maintains the craft properly centered as it advances into desired docking position within a slip and which automatically closes booms at the entrance end of the slip when the boat has entered into proper docking position to restrain the boat in the slip.

Another object of the present invention is the provision of a novel automatic docking system for boats having structure for automatically guiding a boat moving into a slip or docking well into proper mooring relationship therein and maintaining the boat properly centered between the opposite walls of the slip or well.

Another object of the present invention is the provision of automatic docking structure for docking a boat in a slip or boat well, adapted to continuously position the boat in properly centered relationship in the slip or boat well and minimizing the need for conventional fender devices and other boat positioning aids.

Other objects, advantages and capabilities of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings illustrating preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a plan view of an automatic boat docking system embodying the present invention, the boat being shown approaching the slip with the bow of the boat just entering the entrance opening to the slip;

FIG. 2 is a top plan view of the automatic boat docking system, showing the boat in process of progressing toward the rear portion of the slip;

FIG. 3 is a top plan view of the automatic docking system, showing the boat fully moved to the rear end of the slip wherein the retaining booms are in fully closed position;

FIG. 4 is a fragmentary side elevation view of the entrance or front portion of the slip and the retaining booms;

FIG. 4A is a section view to enlarged scale, taken along line 4A–4A of FIG. 4;

FIG. 5 is a fragmentary top plan view illustrating a form of construction of the friction locks or catches which are provided, the lock being shown in solid lines in the normal locking position and in brokenlines in the open position;

FIG. 6 is a fragmentary vertical section view illustrating a type of manual lock which may be employed to restrain the retaining booms in closed position; and

FIG. 7 is a top plan view of an alternate embodiment employing stationary right and left hand dock sections.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to the drawings, wherein like reference characters designate corresponding parts throughout the several figures, there is shown in FIGS. 1 through 4 a first embodiment of the automatic docking system of the present invention, for achieving automatic docking of a boat, indicated generally by the reference character **10**, which in the drawings is illustrated as an outboard motor boat of small conventional type, but, it should be understood, that the automatic docking system herein described is applicable to boats of all sizes and to either inboard or outboard type power craft. The automatic docking system comprises a pair of laterally spaced, elongated floating deck structures indicated by the reference characters **11** and **12**, provided with flotation devices or structure and decking of any desired type, arranged to protrude out into the water from a base dock, bulkhead or other structure, indicated generally by the reference character **13**. The two outwardly protruding right and left hand floating dock structures **11** and **12** are spaced apart to form a standard boat slip or boat well, indicated by the reference character **14**. The right and left hand floating deck structures **11** and **12** may be formed, for example, of conventional wooden decking resting on oil drums or the like to form raft-type dock structures.

The outer end portions of the side dock structures **11** and **12** have end formations **11a** and **12a** defining deck surfaces or shoulders which may be at a somewhat lower level than the top surfaces of the dock structures **11** and **12**, on which a pair of spring loaded reels **15** and **16** are mounted. A pair of pivoting retaining booms **17** and **18**, each of a suitable length to span entirely across the entrance of the slip **14**, are also pivotally supported on the end formations **11*a***, **12*a*** for swinging movement about vertical axes, with one of the retaining booms, for example the right hand retaining boom **17** positioned at a horizontal level just above the horizontal level of the left hand retaining boom **18**. The booms **17** and **18** each carry idler pulleys **19** and **20** adjacent their outer free ends.

A rope **21** wound at one end on the spring loaded reel **15** leads from the reel **15** to the pulley **19** adjacent the outer end of the right hand retaining boom **17** and is trained about the pulley **19** and then inclines inwardly to the mid point of a cross rope **22**. The rope **21** is connected to the mid point of a rope **22** and then inclines outwardly toward the end of the left hand retaining boom **18** where it is trained about the pulley **20** and then extends inwardly to be wound at its opposite end

portion upon the spring loaded reel **16** on the opposite or left hand floating dock structure **12.**

The opposite ends of the cross rope **22** are secured to traveling anchors **23,** such as pulley type travelers shown more clearly in FIG. **4A** having a pulley wheel **24** rolling against a track forming rod **25** fixed to the respective floating dock structure **11** or **12** and extending the length thereof, and including a U-shaped member **26** having end portions supporting the axle for the respective pulley **24** and having the end of the cross rope **22** connected to the bridge portion of the U-shaped member **26.** It will be understood that the ropes **21** and **22** may be ropes, cables, hawsers, or nautical lines of any type, the term "rope" being used herein in its broad generic sense to include all types of nautical lines.

Suitable stops of any desired construction, indicated by reference character **28** (which may be merely two knots properly placed on the rope **21**) are located along portions of the rope **21** outboard of the arms **17** and **18** when in their open position of FIG. **1,** to make contact with the outside of the pulleys **19** and **20** when the stern of the boat passes the pivot point of the booms **17, 18** upon entering the slip, to prevent further rope from passing through the pulleys and thus force the booms to swing inwardly upon further inward movement of the boat, thereby providing a lost motion coupling. Similarly, other stops **29** (such as large knots), may be provided on the harness rope **21** inboard of the booms **17** and **18,** to engage the pulleys **19** and **20** at an appropriate time,as later described, to facilitate pulling of the retaining booms **17, 18** outwardly to open position.

In the operation of the automatic docking system, the boat **10** is steered by the pilot or operator to approach the "V" rope formation defined by the sections **21***a* and **21***b* of the harness rope **21** extending from the pulleys on the free ends of the retaining booms to the connection with the center point of the cross rope **22** when the retaining booms are in the outwardly projecting perpendicular position. As the boat moves forward into the entrance or front of the boat slip **14,** the boat makes contact with the harness rope sections **21***a* and **21***b* and then with the cross rope **22** where it is joined by the harness rope **21,** and the forward motion of the boat begins to wind out the harness rope **21** from the spring loaded reels **15, 16** and push the cross rope **22** toward the rear of the boat slip, causing the traveling rollers **23** at the opposite ends of the cross rope to track rearwardly along the rod tracks **25.** As the boat **10** passes the retaining booms **17, 18** during its forward or inward motion, they remain open. As the boat reaches a position approaching the rear portion of the slip so that the stern of the boat passes inwardly or rearwardly of the location of the pivot points of the retaining booms **17, 18,** the two stops **28** make contact with the outside of the pulleys **19,20** on the retaining booms **17** and **18,** to prevent further harness rope from passing through these pulleys. This causes the retaining booms **17, 18** to become "snagged" on the harness rope **21** and the continued rearward movement of the boat acting on the cross rope **22** and the harness rope **21** forces the retaining booms **17, 18** to swing inwardly about their pivots. Since one of the retaining booms is at a higher horizontal level than the other, the two booms **17, 18** swing inwardly without colliding until they reach a position perpendicular to the longitudinal axes of the dock structures **11, 12,** executing an inward motion similar to two swinging gates pivoting to closing position. When each of the retaining booms **17, 18** reaches a position perpendicular to the associated dock structure **11, 12,** the free end of the retaining boom engages a spring loaded friction lock, such as indicated at **30** in FIG. **5,** pivotally mounted on a standard or stop member **31** on the end portion of the opposite floating dock structure. As the retaining booms **17, 18** reach this perpendicular, closing position, their end portions activate the spring loaded friction locks **30** to flip them over and hold the retaining booms in closed position. As the retaining booms **17, 18** cross in swinging shut, the halves of the harness rope **21** extending from their connection with the cross rope **22** cross behind the boat, thereby encircling the entire boat in the harness thus created by the rope **21.** The cross rope **22** continues to serve to hold the bow of the boat at the transverse center of the boat slip. The boat pilot or operator then turns off the engine or motor and allows the spring loaded reels **15, 16** to rewind the harness rope **21** to the extent they are capable of doing so, and thereby pull the boat rearwardly or outwardly toward the entrance end of the slip until the boat is close to the entrance portion.

When the boat pilot or operator decides to leave the slip, he merely starts the boat engine or motor, puts it in reverse gear, and operates the boat to press gently against the retaining booms **17, 18** until the pressure unlocks the spring loaded friction locks **30.** Then, the retaining booms **17, 18** are pushed open by the rearward motion of the boat and the boat is free to back out of the slip. As the spring loaded reels **15,16** wind back the harness rope **21,** during the exit of the boat from the slip,two other stops **29,** such as large knots, on the harness rope **21** catch in the pulleys on the free end portions of the retaining booms **17** and **18** and pull them outward to draw them to the fully open position illustrated in FIG. **1** where the gate formed by the retaining booms is fully open to receive another boat and repeat the process.

An example of the spring loaded friction lock **30** is illustrated in FIG. **5,** showing the spring lock to be of the type which includes an arcuate frame **32** extending over a substantially semi-circular arcuate path and having opposite end portions mounting roller members **33, 34** and a spring **35** of the overcenter type designed to resiliently position the arcuate carrier **32** in either the release position indicated in broken lines in FIG. **5** or the holding position indicated in solid lines in FIG. **5.** When the restraining booms **17, 18** have been swung to the open position of FIG. **1,** the friction locks **30** assume the release position illustrated in broken lines in FIG. **5,** so that one of the rollers **34** is in position to be engaged by the end portion of the opposite restraining boom when the latter approaches closed position to swing the spring loaded friction lock to the holding position illustrated in FIG. **5.**

As an additional feature, there may be optionally provided a manually operable safety lock as illustrated in FIG. **6,** wherein a locking pin **40** having an angularly disposed handle portion **40***a* extending from the stem portion **40***b* is inserted through a threaded opening in a stationary bracket member **41** fixed to the associated dock structure and extends through an opening **42** in the end portion of one of the retaining booms **17, 18** and thence into an opening or socket **43** in a portion **44** of the adjacent dock structure disposed below the end

portion of the retaining boom. The opening in the mounting member **41** may be threaded, and a portion of the stem **40***b* of the locking pin **40** may be similarly threaded, to facilitate threading of the locking pin into the holding position illustrated in FIG. **6**.

In cases where the boat owner may wish to install an automatic docking system incorporating the principles of the present invention in conjunction with non-floating docks, an arrangement may be provided of the type illustrated in FIG. **7**, wherein the dock structures **11'** and **12'** are stationary docks defining a slip therebetween, and the rod tracks **25'**, the spring loaded reels **15'**, **16'**, and the mounts for the retaining booms **17'**, **18'** are mounted on a frame work **11***a'* and **12***a'* having flotation facilities **50** located on the inside of each of the stationary dock structures **11'**, **12'** and slidably or movably coupled to the stationary dock structures in any conventional manner, such as by beams or channels and brackets interfitting with the beams or channels. The purpose of providing for flotation of the rod tracks and the mounting structure for the retaining booms is that it is necessary for the harness rope and the retaining booms and the cross rope to move up and down with the boat as the tides change in tidal waters.

What is claimed is:

1. In a boat docking system for docking boats in a boat slip defined between two laterally spaced elongated dock sections and having an entrance portion through which a boat enters and leaves the slip, an automatic docking structure comprising a pair of elongated retaining booms having a length to transversely span said entrance portion, entrance stations associated with each of said dock sections in laterally flanking relation to said entrance portion including means for pivotally supporting the respective booms adjacent an end of the booms for swinging movement about vertical pivot axes between an open position spaced laterally for admission of the boat therebetween and a closed position cross-wise spanning said entrance portion disposing free end portions of the booms adjacent the opposite dock sections, and harness rope means having lost motion couplings with the free end portions of the booms and extending therebetween to be engaged by the bow portion of a boat entering between said booms in open position and draw the booms to said closed position behind the boat when it reaches a docking position within the slip.

2. A boat docking system as defined in claim **1**, including spring loaded reels associated with each of said dock sections and located adjacent said entrance portion, said harness rope means having its opposite end wound on said reels and extending to the free end portions of said booms and therefrom in a V-section converging inwardly toward the rear of said slip to receive the bow portion of the entering boat in the V-section of the rope means.

3. A boat docking system as defined in claim **1**, including a cross member laterally spanning the slip in cross-wise relation and coupled to said harness rope means mid-way of the slip, and movable coupling means secured to the opposite ends of the cross-member and guided along track formations associated with said dock sections to permit translation movement of the cross-member toward the rear of the slip responsive to engagement by the bow of the entering boat.

4. A boat docking system as defined in claim **2**, including a cross member laterally spanning the slip in cross-wise relation and coupled to said harness rope means at the apex of said V-sections, and movable coupling means secured to the opposite ends of the cross-member and guided along track formations associated with said dock sections to permit translation movement of the cross-member toward the rear of the slip responsive to engagement by the bow of the entering boat.

5. A boat docking system as defined in claim **3**, wherein said cross member is a cross-wise rope having rollers connected to opposite ends thereof forming said coupling means in rolling contact with said track formations.

6. A boat docking system as defined in claim **4**, wherein said cross member is a cross-wise rope having rollers connected to opposite ends thereof forming said coupling means in rolling contact with said track formations.

7. A boat docking system as defined in claim **2**, wherein the free end portions of said retaining booms include pulleys about which said harness rope means is trained, said rope means including stop formations located outboard of the pulleys to snag rope portions in the pulleys when selected lengths of rope are withdrawn from the reels and draw the booms to said closed position responsive to further movement of the boat toward the rear of the slip.

8. A boat docking system as defined in claim **4**, wherein the free end portions of said retaining booms include pulleys about which said harness rope means is trained, said rope means including stop formations located outboard of the pulleys to snag rope portions in the pulleys when selected lengths of rope are withdrawn from the reels and draw the booms to said closed positon responsive to further movement of the boat toward the rear of the slip.

9. A boat docking system as defined in claim **2**, wherein the free end portions of said retaining booms include pulleys about which said harness rope means is trained, said rope means including stop formations located outboard of the pulleys to snag rope portions in the pulleys when rope lengths are withdrawn from the reels corresponding to entering movement of a boat which locates its stern near said entrance portion and draw the booms to said closed position responsive to further movement of the boat toward the rear of the slip.

10. A boat docking system as defined in claim **4**, wherein the free end portions of said retaining booms include pulleys about which said harness rope means is trained, said rope means including stop formations located outboard of the pulleys to snag rope portions in the pulleys when rope lengths are withdrawn from the reels corresponding to entering movement of a boat which locates its stern near said entrance portion and draw the booms to said closed position responsive to further movement of the boat toward the rear of the slip.

11. A boat docking system as defined in claim **1**, including spring loaded catch members located at each of said entrance stations normally in release condition when said booms occupy said open position and engaged by free end portions of the booms pivoted on the opposite entrance station means to shift to releasible latching relation with such free end portions when the booms reach said closed position.

12. A boat docking system as defined in claim **2**, including spring loaded catch members located at each

of said entrance stations normally in release condition when said booms occupy said open position and engaged by free end portions of the booms pivoted on the opposite entrance station means to shift to releasible latching relation with such free end portions when the booms reach said closed position.

13. A boat docking system as defined in claim **8**, including spring loaded catch members located at each of said entrance stations normally in release condition when said booms occupy said open position and engaged by free end portions of the booms pivoted on the opposite entrance station means to shift to releasible latching relation with such free end portions when the booms reach said closed position.

14. A boat docking system as defined in claim **1**, wherein said retaining booms are located in different vertically spaced horizontal planes so as to be disposed in close proximity one over the other at said closed position.

15. A boat docking system as defined in claim **2**, wherein said retaining booms are located in different vertically spaced horizontal planes so as to be disposed in close proximity one over the other at said closed position.

16. A boat docking system as defined in claim **8**, wherein said retaining booms are located in different vertically spaced horizontal planes so as to be disposed in close proximity one over the other at said closed position.

17. A boat docking system as defined in claim **11**, wherein said retaining booms are located in different vertically spaced horizontal planes so as to be disposed in close proximity one over the other at said closed position.

18. An automatic docking system as defined in claim **1**, wherein said harness rope means are positioned by the free end portions of said booms when the booms swing from open to closed positions so that the rope portions aft of the boat during movement of the boat within and toward the rear of the slip are caused to cross-over each other aft of the stern to form a harness embracing the whole sides of the boat.

19. An automatic docking system as defined in claim **2**, wherein said harness rope means are positioned by the free end portions of said booms when the booms swing from open to closed positions so that the rope portions aft of the boat during movement of the boat within and toward the rear of the slip are caused to cross-over each other aft of the stern to form a harness embracing the whole sides of the boat.

20. An automatic docking system as defined in claim **8**, wherein said harness rope means are positioned by the free end portions of said booms when the booms swing from open to closed positions so that the rope portions aft of the boat during movement of the boat within and toward the rear of the slip are caused to cross-over each other aft of the stern to form a harness embracing the whole sides of the boat.

21. In a boat docking system for docking boats in a boat slip defined between two laterally spaced elongated dock sections and having an entrance portion through which a boat enters and leaves the slip, an automatic docking structure comprising a pair of elongated retaining booms having a length to collectively span said entrance portion, entrance stations associated with each of said dock sections in laterally flanking relation to said entrance portion including means for pivotally supporting the respective booms adjacent an end of the booms for swinging movement about vertical pivot axes between an open position spaced laterally for admission of the boat therebetween and a closed position extending cross-wise of said entrance portion, and harness rope means having lost motion couplings with free end portions of the booms remote from their pivoted ends and extending therebetween to be engaged by the bow portion of a boat entering between said booms in open position and draw the booms to said closed position behind the boat when it reaches a docking position within the slip.

22. A boat docking system as defined in claim **21**, including spring loaded reels associated with each of said dock sections and located adjacent said entrance portion, said harness rope means having its opposite end wound on said reels and extending to the free end portions of said booms and therefrom in a V-section converging inwardly toward the rear of said slip to receive the bow portion of the entering boat in the V-section of the rope means.

23. A boat docking system as defined in claim **21**, including a cross-member laterally spanning the slip in cross-wise relation and coupled to said harness rope means at the apex of said V-sections, and movable coupling means secured to the opposite ends of the cross-member and guided along track formations associated with said dock sections to permit translation movement of the cross-member toward the rear of the slip responsive to engagement by the bow of the entering boat.

24. A boat docking system as defined in claim **21**, wherein the free end portions of said retaining booms include pulleys about which said harness rope means is trained, and rope means including stop formations located outboard of the pulleys to snag rope portions in the pulleys when rope lengths are withdrawn from the reels corresponding to entering movement of a boat which locates its stern near said entrance portion and draw the booms to said closed position responsive to further movement of the boat toward the rear of the slip.

25. An automatic docking system as defined in claim **21**, wherein said harness rope means are positioned by the free end portions of said booms when the booms swing from open to closed positions so that the rope portions aft of the boat during movement of the boat within and toward the rear of the slip are caused to cross-over each other aft of the stern to form a harness embracing the whole sides of the boat.

* * * * *