

[54] **WATERCRAFT COUPLING SYSTEM**

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FOREIGN PATENTS OR APPLICATIONS

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[21] Appl. No.: **362,185**

Related U.S. Application Data

[63] Continuation of Ser. No. 104,249, Jan. 6, 1971, abandoned.

[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **114/235 R**

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

[58] **Field of Search** 114/235 R, 77 R

[56] **References Cited**

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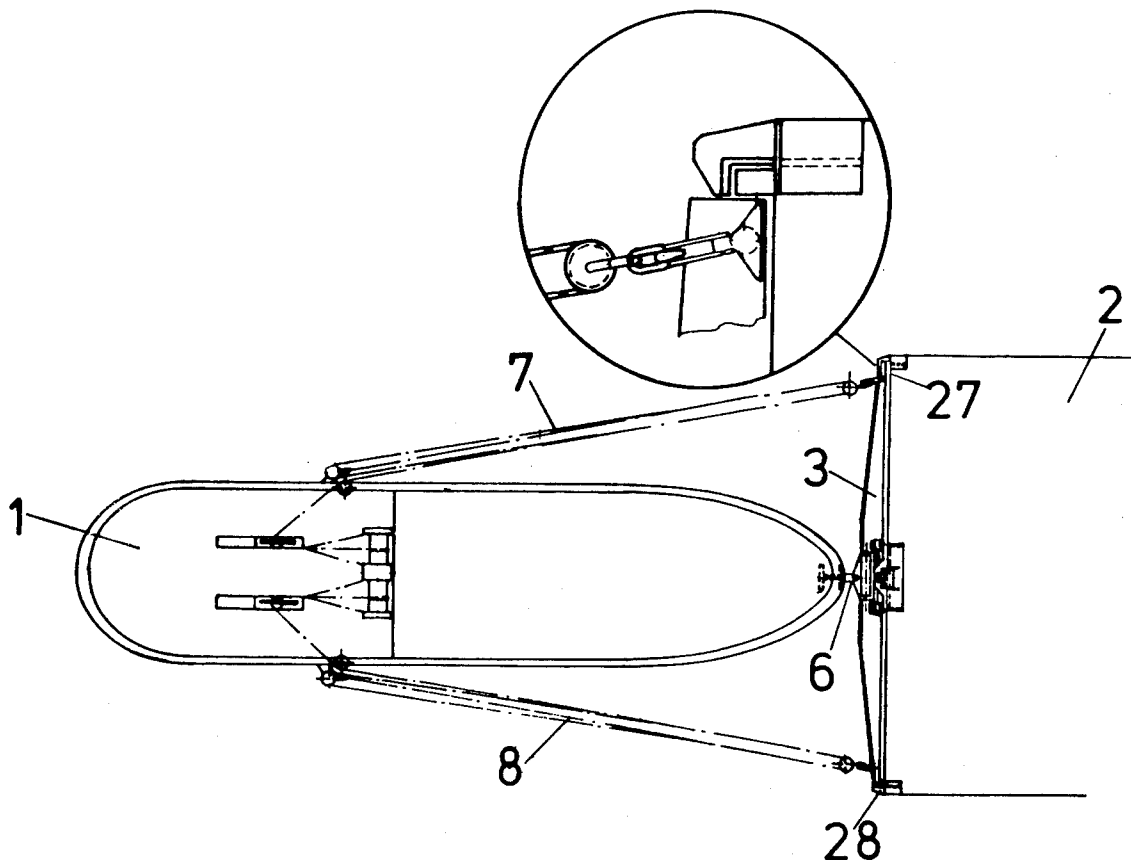
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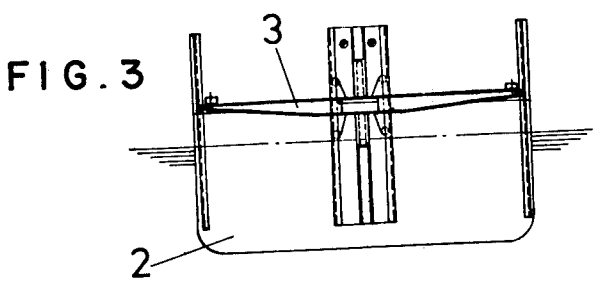
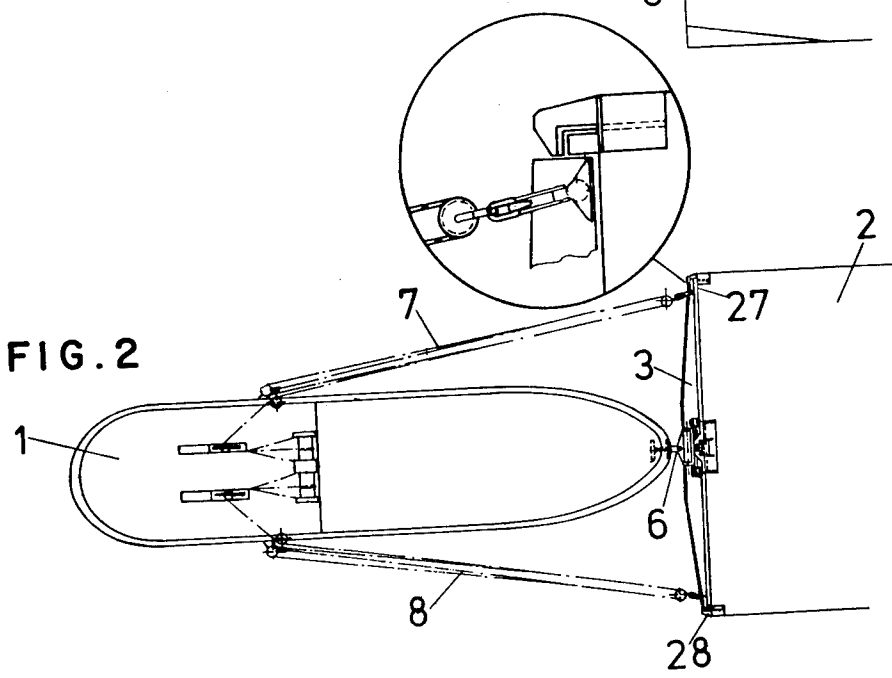
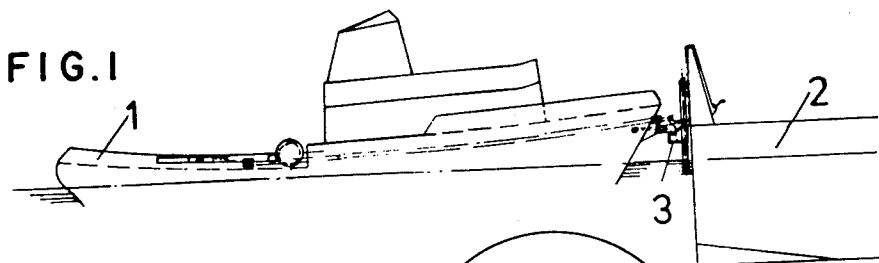
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[57] **ABSTRACT**

A barge has a stern and a tug has a bow. Tension coupling elements are connected to the barge and extend along laterally of the tug, being connected with the same. A pushtype coupling element is releasably and articulately connected with the bow and with the stern, respectively, in such a manner as to permit relative vertical movements of the watercrafts with reference to one another.

1 Claim, 12 Drawing Figures





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FIG. 4

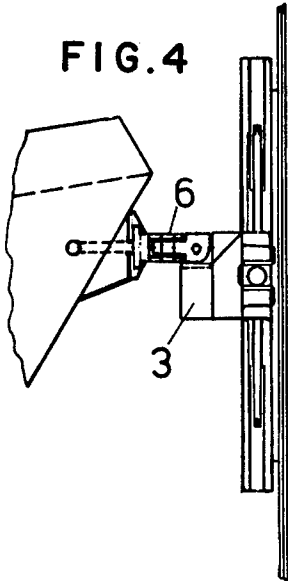


FIG. 5

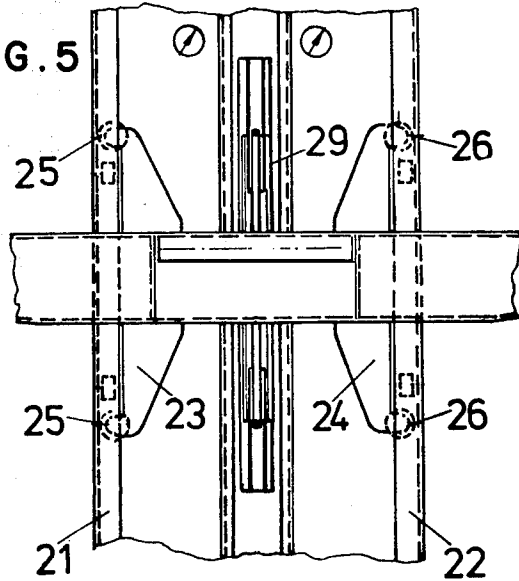


FIG. 6

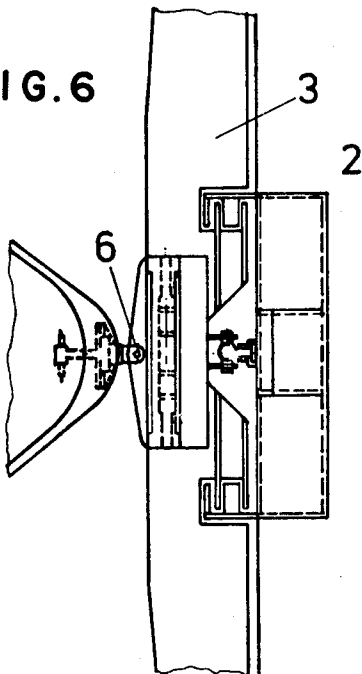
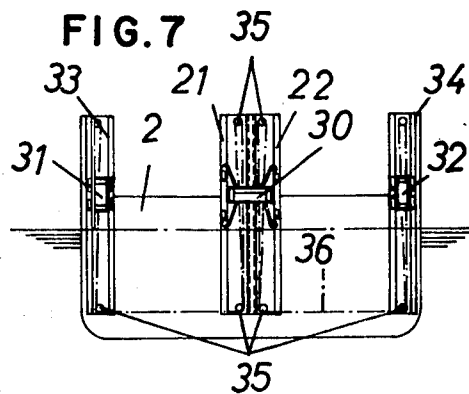
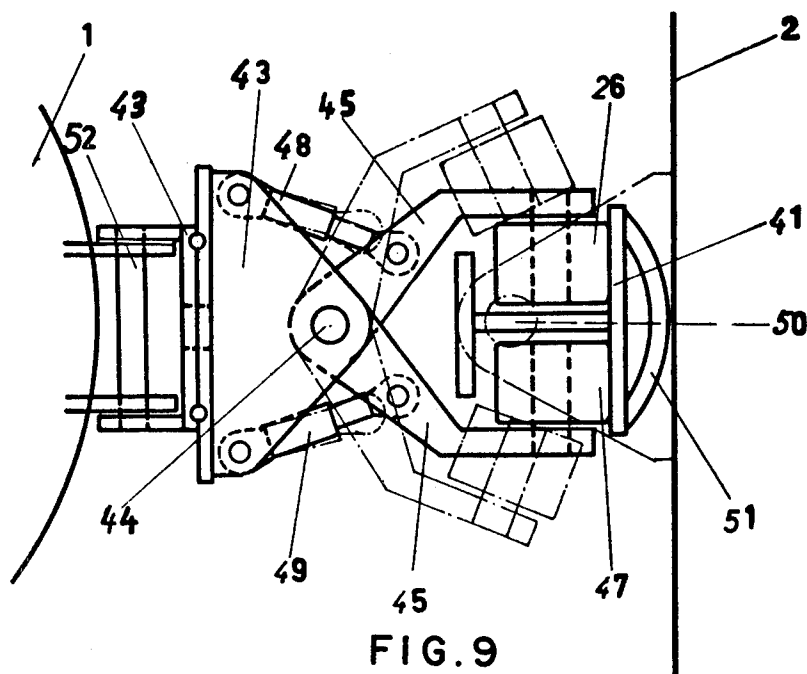
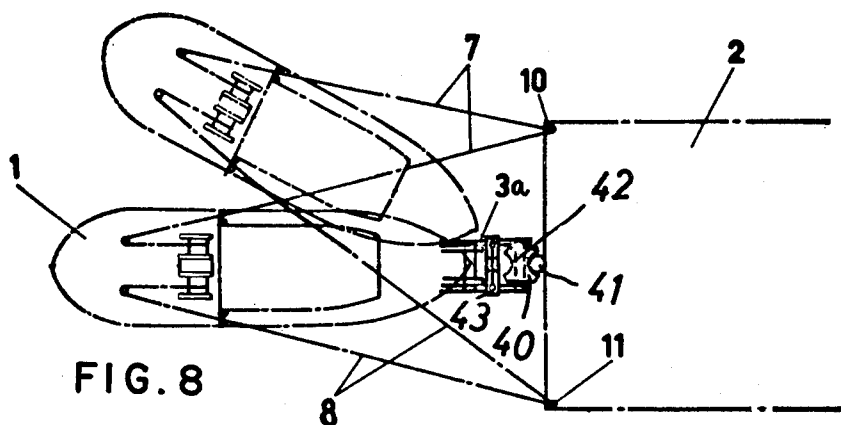


FIG. 7



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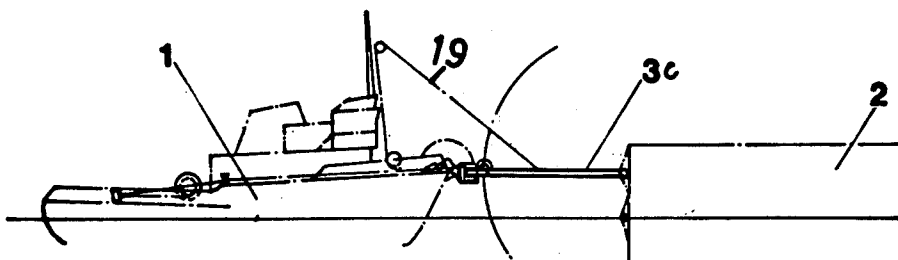


FIG. 10

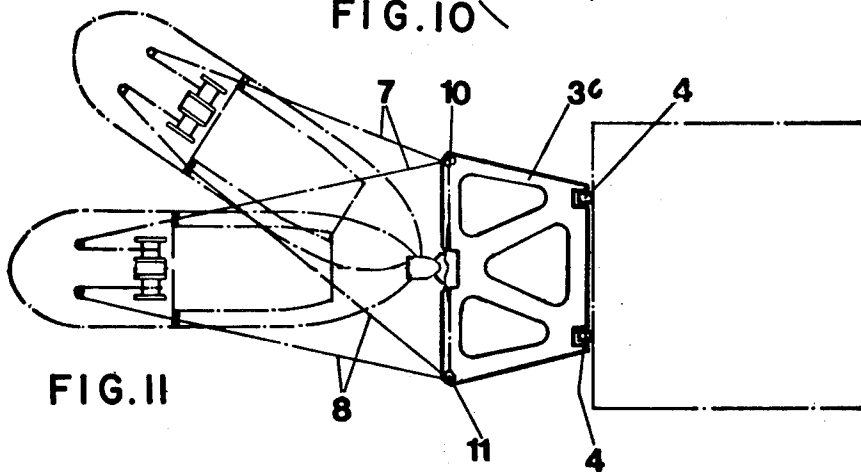


FIG. 11

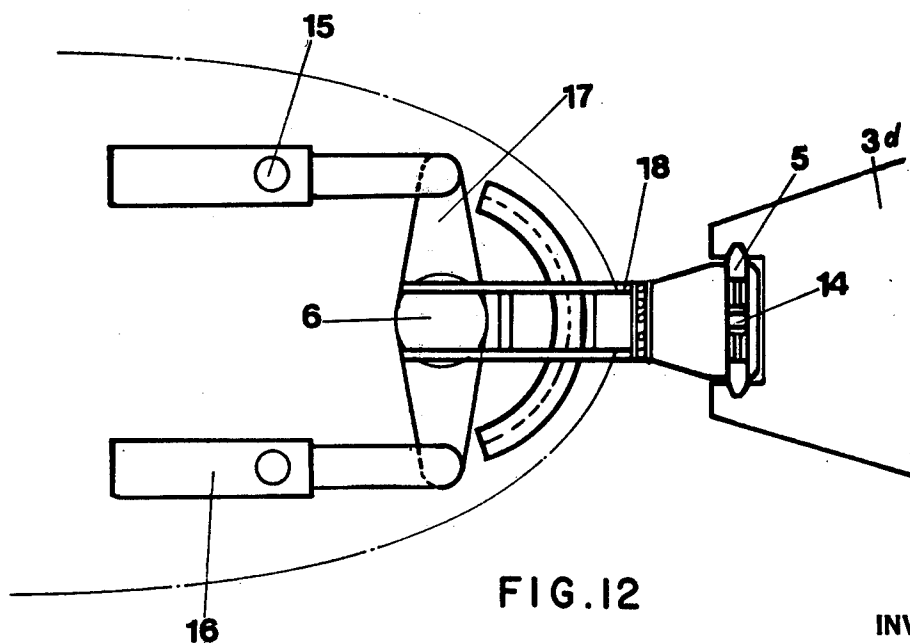


FIG. 12

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WATERCRAFT COUPLING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

This application is continuation of my co-pending application Ser. No. 104,249, filed Jan. 6, 1971, entitled "Watercraft Coupling System," and now abandoned.

BACKGROUND OF THE INVENTION

The invention relates generally to a watercraft coupling system, and more particularly to a push-type coupling for connecting two watercraft with one another, particularly tugs and barges or lighters.

Arrangements or systems of this type are already known. Thus, it is known to provide a coupling element of substantially pyramid-shaped configuration which is arranged on its side and is connected at its tip by means of a ball joint coupling with the bow of the tug whereas its space is connected with the stern of the barge via a vertically movable sliding coupling. However, this sliding coupling is operative only during the actual coupling process and subsequently is jammed or locked by means of a suitable tackle so that a vertical movement of the pyramid-shaped coupling element with reference to the barge during the actual movement of the barge is not possible. This construction further comprises a tackle located at opposite sides of the tug with the tackle lines extending from and originating at a winch and being connected at opposite lateral sides with spacing from the longitudinal center line of the stern of the barge, the purpose being to prevent an angular displacement of the tug with reference to the direction of elongation of the coupled unit (consisting of the tug and the barge) by requisite operation of the winches on the tug so that the latter in effect acts as a rudder for the unit to steer it.

This type of prior art construction affords considerably improved maneuverability as compared to other prior art teachings where the bow of the tug is inserted into a recess provided in the stern of the barge or in a structure secured to the stern for this purpose, whereupon the two watercraft are so connected that they cannot move apart longitudinally. It is also advantageous over the other prior art in that the construction of the coupling arrangement itself is simpler and that the loss of space in the holds of the barge (due to the presence of the recess in the stern) is avoided.

However, even this rather advantageous prior-art construction still has certain disadvantages which require correction. Thus, the bow of the tug and the stern of the barge can perform vertical movements only in unison, so that the unit—once connected—can be utilized only in relatively quiet waters. If the swell of the sea increases, the tug is pulled along by the barge which usually has a considerably greater displacement, so that it is no longer possible to properly maneuver the unit. A further disadvantage is that the tackle or the like which connects the tug and the barge against longitudinal movement away from one another, must be anchored to the barge, which means that the coupling between the two craft can be carried out only if a crew is on board the barge. Inasmuch as barges are frequently operated without a crew—being connected as part of a string of barges which are pulled by another vessel—this often involves putting a crew on board the barge before a coupling can be established and this, in turn, is quite frequently almost impossible in the open sea so that the necessary coupling frequently cannot be estab-

lished, or can be established only under great difficulties.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the present invention to provide the aforementioned disadvantages.

More particularly, it is an object of the present invention to provide an improved watercraft coupling system which is not possessed of the advantages outlined above.

A concomitant object of the invention is to provide such an improved watercraft coupling system which is simpler than what is heretofore known, inexpensive to construct, and very simple to connect and disconnect.

In pursuance of the above objects, and of others which will become apparent hereafter, one feature of the invention resides in a watercraft coupling system, particularly for coupling tugs and barges, which, briefly stated, comprises a first watercraft having a bow and a second watercraft having a stern. First coupling elements are releasably secured to the first and second watercrafts and extend laterally along the first watercraft so as to connect the watercrafts against longitudinal movement away from each other. A second coupling element is releasably and articulately connected with the bow and the stern, respectively, for enabling relative vertical movement of the watercraft with reference to one another.

This second coupling element is advantageously an approximately horizontally oriented traverse member one portion of which is connected with a sliding-carriage type of connection to the stern of the barge so as to be free to perform vertical movements with reference thereto. To the other end connecting elements are secured which in turn are connected with the wall of the tug. Such an arrangement according to the present invention permits vertical movements between the bow of the tug and the stern of the barge without hindrance and with a wide range of latitude so that the position of the tug in the water is not influenced by movements of the barge with reference to it. Thus, movements of the barge can no longer adversely influence the maneuverability of the tug, and therefore of the unit composed of the connected tug and barge.

In addition, the essential components of the coupling are permanently connected with the tug because all that is required for establishing a connection on the barge is vertical guide means provided on the stern of the barge. This makes it possible to establish a coupling connection from the tug alone without any necessity for a crew to be on board of the barge and to help in establishing the connection. In particular the construction according to the present invention is highly advantageous for establishing a coupling connection with barges with drift without a crew in the open sea, either by being cast loose from a string of barges or perhaps by having become inadvertently separated from this string. At this same time, the utilization of a traverse member makes it possible to provide a particularly strong construction and to utilize stable guide means for connecting the traverse member with the stern of the barge.

In accordance with the invention it is also possible to use instead of the traverse member for the second coupling element a pressure member which is secured to the bow of the tug and which acts against an upright post secured to the stern of the barge and which is at

least partially embraced by a suitably profiled recess provided in the pressure member. Such a pressure member may be in the form of a roll which is mounted for free turning movement about a horizontal axis and which is provided in its circumferential edge face with a circumferential recess having at opposite lateral sides beaded edges to prevent inadvertent disengagement with the post which is completely or partly received in this recess. The pressure member may also engage behind a vertically oriented profile portion of the post with rollers which are freely turnably mounted for movement about horizontal axis. Vertical relative movements between the stern of the barge and the bow of the tug can also be permitted, according to a further concept of the invention, with an arrangement in which the second coupling element is constructed as an articulated link which is connected with the stern of the barge for pivot movement at a horizontal axis and which has a point connection with the bow of the tug for universal movement relative thereto, with the first coupling elements being connected to this articulated link such that they are laterally spaced at opposite sides of the vertical axis about which it is desired to connect at relative movement of the barge and tug in order to enable steering of the unit by angular inclination of the tug with reference to the elongation of the unit composed of the tug and the barge.

The first coupling elements may be simple rope tackles, they may be winding tackles or other elements, including and in particular fluid-pressure operated cylinder and piston units.

It is also advantageous to utilize damping devices which counteract the vertical movements of the traverse member or the pressure member with reference to the barge. The arrangement should be such that within a predetermined range such vertical movements can take place freely with the damping devices becoming active only when the vertical movements exceed the predetermined range. It may be advantageous to use damping arrangements which act progressively in dependence upon the length of such vertical movement.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side view of one embodiment of the invention;

FIG. 2 is a top plan view of the embodiment of FIG. 1;

FIG. 3 is a rear view of the actual coupling arrangement utilized in FIGS. 1 and 2;

FIG. 4 is a view, on an enlarged scale, in side elevation of the arrangement shown in FIG. 3;

FIG. 5 is a view similar to FIG. 4 but showing a rear view;

FIG. 6 is a view similar to FIG. 4 but showing a top view of the arrangement in FIG. 3;

FIG. 7 is a view similar to FIG. 3 but of a different embodiment;

FIG. 8 illustrates a further embodiment of the invention;

FIG. 9 is a view similar to FIG. 8 but illustrating another embodiment of the invention;

FIGS. 10 and 11 are illustrative of yet an additional embodiment of the invention in a side view and a top plan view, respectively; and

FIG. 12 is a top plan view illustrating still another embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before discussing the drawing in detail, it is pointed out that in the various views of the drawing the invention has been illustrated in diagrammatic form, in order to de-emphasize non-essential features and in order to more clearly show the essential features of the invention as well as to emphasize more specifically the operation of the invention.

Keeping this in mind, and firstly discussing the embodiment illustrated in FIGS. 1-6, it will be seen that reference numeral 1 identifies a tug which may be of the conventional harbor tug type. Reference numeral 2 identifies a lighter or barge, and the bow of the tug 1 and the stern of the lighter 2 are to be connected by a push-type coupling according to the invention.

In the embodiment of FIGS. 1-6 there is provided a coupling member in the form of a substantially horizontally oriented traverse member 3. It is connected with the bow of the tug 1 via a combination of joints utilizing a vertical and two horizontal pivot axes which cross one another and of which one extends in the longitudinal direction of the unit composed of the tug 1 and the barge 2, whereas the other extends at right angles thereto, as illustrated in FIG. 4.

The tug 1 is provided with winches arranged astern and from which extend ropes or similar tackles 7 and 8 which are respectively located at opposite lateral sides of the tug 1. These may be simple tackles or winding tackles and are of course secured to the tug whereas their free ends are secured to the ends of the traverse member 3, being connected laterally from the longitudinal center line of the unit as possible. The purpose here is to make possible and to facilitate an angular displacement of the tug 1 with reference to the barge 2 about the vertical axis 6 of the pivot connection for steering purposes.

The traverse member 3 is connected with the stern of the barge by means of two vertical guides 21 and 22 which are centrally arranged, and a roller carriage 23 and 24 utilizing two vertically spaced rollers 25 and 26 for each of the guides provided, so that the rollers which are mounted on the traverse and identified with reference numerals 25 and 26 can accept such forces as act vertically to the horizontal center line. In addition, the traverse member 3 is provided at its ends on opposite sides with further rollers 27 which engage in associated vertical guides 28 provided on the stern of the barge. It is emphasized that although the traverse has been illustrated as extending over the entire width of the barge, other possibilities exist and that this is not to be considered as limiting.

FIG. 5 shows a damping device 29 which either linearly or, preferably, progressively dampens the vertical movements of the traverse member 3 with reference to the barge 2. The device 29 may be of any known construction which will be readily apparent to those skilled

in the art, and it may also be of the known type which permits movements vertically between the traverse member 3 and the stern of the barge 2 within a predetermined range without dampening such movements, and which will act only when this range is exceeded.

Coming now to the embodiment illustrated in FIG. 7 it will be seen that in this embodiment the traverse member 3 is omitted. Here, the coupling element which couples the bow of the tug with the stern of the barge is not illustrated, but will be understood to be provided with rollers for its carriage guide 30, which engage in central vertical guides 21 and 22 provided on the stern of the barge. Additional guides 31 and 32 are provided and are vertically movable in laterally spaced guides 33 and 34. Reversing rollers 35 are provided and a tackle rope 36 or the like is turned about these and assures that the vertical movements of the carriage guides 30, 31 and 32 take place approximately in synchronism with one another.

In the embodiment illustrated in FIG. 8 the intermediate coupling element is identified with reference numeral 3a and constructed as a presser element utilizing a relatively large roller 40, and the stern of the barge 2 is provided with an upright post 41 configured as a tube or pipe.

The roller 40 is freely turnably mounted for movement about a horizontal axis and provided in its circumferential edge face with a substantially semi-circular recess 42 which is provided at opposite sides with beads and has a radius which is greater than the radius of the post 41. Thus, the recess 42 can embrace the post 41 whereby the transmission of longitudinal stresses is possible as well as of lateral stresses. Tackles 7 and 8 are provided which are secured to winches on the tug 1 and which are connected to the stern of the barge at 10 and 11, in order to maintain the post 41 in the recess 42 of the roller 40. Relative movements acting in longitudinal direction about a horizontal axis are compensated by a vertically arranged turntable 43 one component of which is fast with the bow of the tug 1 and the other component of which is fast with the journals of the roller 40. Height differentials are compensated by rolling of the roller 40 along the post 41. When the tug 1 moves laterally to an angularly inclined position with reference to the barge 2, the roller 40 slips correspondingly on the post 41 in lateral direction.

FIG. 9 shows an additional embodiment in which the upright post 41 has the form of a double-T-shaped profile, whereby in a horizontal cross-section two undercut vertical profiles are formed behind which correspondingly configured pressure members can engage in order to be able to transmit pressures which may act oppositely to the normal direction, for instance when the tug 1 pulls the unit rather than pushing it. In the embodiment of FIG. 9 the presser member is composed of two arms 45 which are mounted on the intermediate coupling element 43, each being turnable about a vertical axis 44. Their free ends carry rollers 46 and 47 which are respectively freely turnable about horizontal axis. The rollers 46 and 47 have cylindrical circumferential faces which abut against the inner surface of one flange when the tug pushes, and against the inner surface of the opposite flange of the double-T-shaped profile when the tug 1 pulls. The arms 45 are mechanically displaceable for engagement and disengagement of the coupling, and in the illustrated embodiment the means for this purpose is illustrated in the

form of cylinder and piston units 48 and 49 which may be of the hydraulic or of the pneumatic type. However, other means can also be provided for this purpose.

In order to make possible lateral angular displacements of the tug 1 with reference to the barge 2 it is necessary that the post in this embodiment be turnable about a vertical axis 50 and it must be so journaled. For better transmission of more substantial forces resulting from pushing of the barge by the tug 1, it is advantageous if the surface of the post 1 which faces the stern of the barge is rounded as illustrated at 51, so that in case of lateral tilting about the vertical axis 50 there will always be maintained a contact between the post 51 and the stern of the barge 2 over the entire length of the post 41. A turntable 51 is provided for pivoting movements about a horizontal axis.

Coming now to the embodiments of FIGS. 10, 11 and 12, it is pointed out that here the intermediate coupling element 3c (in FIGS. 10 and 11) and 3d (in FIG. 12) is configured as an articulated link. It may be in form of a plate, of a flat plate-like grid construction or of a similar configuration. In any case, the element 3c is connected advantageously at the stern of the latter by means of eyes 4 and push-through bolts 5 so as to be articulated in such a manner that free movement in vertical direction about an axis extending transversely to the elongation of the barge 2 is possible. However, in the direction of elongation of this axis the connection is stiff, that is not articulated. The other side of the element 3c has a point-type universally pivotable connection with the bow of the tug 1. Again, tackles 7 and 8 are provided which are trained about the drums of preferably automatically controlled winches. Each tackle is connected at the one hand on the tug 1 and on the other hand with the element 3c such that it is connected with the latter as far as possible from the pivotal connection between the element 3c and the tug 1. Rapid-release hooks are provided at 10 and 11 on the element 3c so that in case of danger the connection between this element and the tackles 7 and 8 can be terminated quickly.

The embodiment of FIG. 12, finally, shows an embodiment wherein the tackle in the other embodiments is replaced with cylinder and piston units 15 and 16 which may but need not be of the hydraulic type. In this embodiment, also, there is provided a double-armed lever 17 mounted on the vertical turning axis about which the tug 1 and the element 3d can turn with reference to one another. Connected to the free ends of the lever 17 are the units 15 and 16, respectively, which are located at opposite sides (laterally) of the tug 1.

The intermediate coupling element 3d is connected with the vertical turning axis 6 by and element 18. In order to permit establishment and release of a coupling between the tug 1 and the barge 2 without any aid from on board the latter, a winding tackle 19 may be provided between the element 3d and a higher point on the tug 1, with the rope of the tackle also being convoluted on a winch as shown in FIG. 10. A similar arrangement may also be provided on the barge itself if it is desired that at the time of decoupling the element 3c is to be and remain connected with the barge rather than with the tug.

The remote operation of the various coupling elements can be carried out with known means without any difficulty, such means being known to those skilled

in the art and therefore not being illustrated in the drawing.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of construction differing from the types described above.

While the invention has been illustrated and described as embodied in a watercraft coupling system, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claim as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. A watercraft coupling system, particularly for cou-

pling tugs and barges, comprising a first watercraft having a bow; a second watercraft having a stern; a plurality of vertical guide tracks on said stern, including a center guide track and a pair of lateral guide tracks at opposite sides of said center guide track and located in the respective edge regions of the stern; a traverse member articulately connected to said bow and extending transversely of said guide tracks and having end portions located adjacent to the respective lateral guide tracks; guided elements mounted on said transverse member and extending into the respective tracks, so that said traverse member is guided by all of said tracks for vertical displacement relative to said stern; elongated flexible coupling elements releasably secured to and extending along said first watercraft and having free ends located adjacent the respective end portions of said traverse member; and connecting means connecting each of said free ends with one of said end portions so as to move with said traverse member when the latter becomes displaced along said guide tracks in response to vertical movements of said watercraft relative to one another.

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