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(54) Jib with guy tensioner

(57) A jib is fixed to a vessel by means of a front guy and a rear guy. A tension spring-like element in the rear guy ensures that the rear guy will be taut at all times and that as a result the end of the jib will at all times be pulled to such a position by the rear guy fitted with the tension spring-like element that the front guy will also be taut. Upon lowering of the jib, the front guy and the rear guy will remain taut, in spite of the fact that the points of attachment for the front guy and the rear guy and the jib pivot, by means of which the jib is attached to the mast, are not aligned.

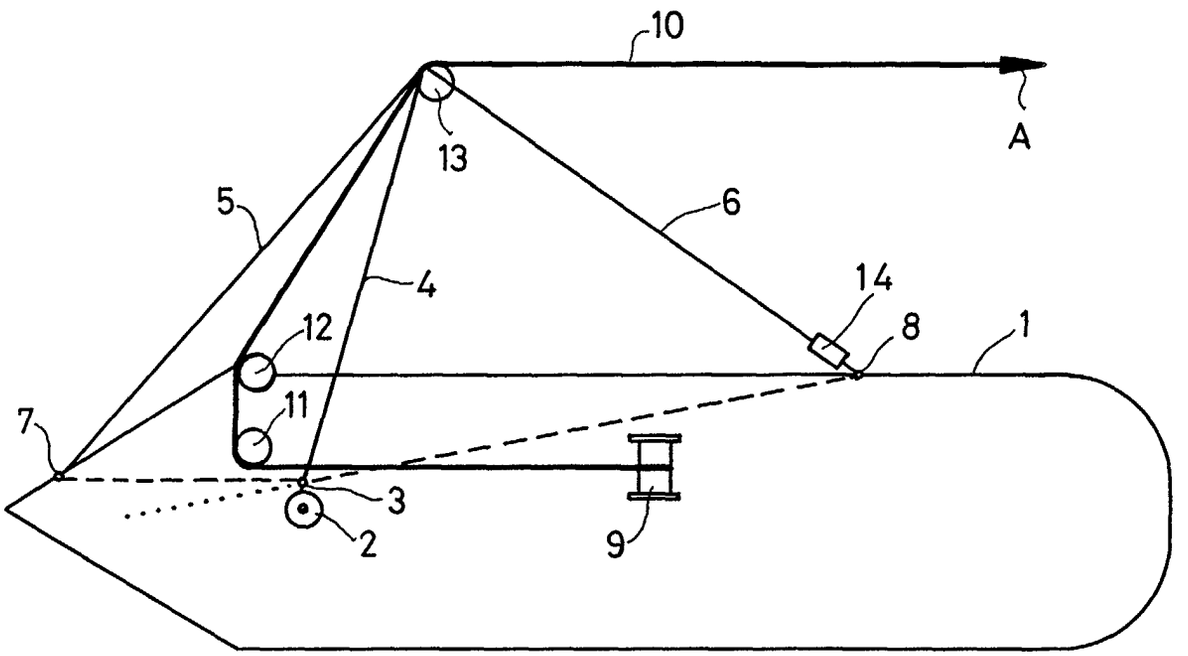

FIG. 1

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Description

[0001] The invention relates to a jib with a front guy and a rear guy, which is attached to a mast on a vessel.

[0002] On many vessels, but especially on fishing vessels, a jib is attached to a mast by means of a jib pivot, which is known per se. The jib can extend upwards along the mast and be lowered to a substantially horizontal position by means of a hoist rope. Especially on fishing vessels, said lowering takes place at sea in order to pass a cable along the end of the jib, by means of which cable the fishing net is dragged by the vessel. In order to be able to keep the jib in a particular position with respect to the vessel, the top of the jib the is connected to the vessel by means of guys. A front guy and a rear guy are used. The front guy is attached between one end of the jib and a point on the forward part of the vessel, and the rear guy is attached between the top of the jib and a fixed point near the stern of the vessel. The guy ropes have a fixed length and the points of attachment of the front guy and the rear guy to the vessel and the jib pivot are not aligned. As a consequence, the distance from the top of the jib to each of the points of attachment varies along the path of movement of the top of the jib from the substantially vertical position to the substantially horizontal position, and vice versa. There is a point in said path of movement at which the distances in question are greatest. The length of the guy is selected such that the greatest length in question can just be spanned, as a result of which the guy ropes will be taut with that position of the jib. In other positions of the jib, the guy ropes are slack to a certain extent and the jib can move forward and rearward within the limits defined by the length of the front guy and the rear guy.

[0003] On rough seas, fishing vessels exhibit a tendency of being more stable in the water when the jib or the jibs, generally two jibs are present on a fishing vessel, are lowered to a position between approximately 45 degrees and a substantially horizontal position. Generally, that is not the position in which the guys are fully taut, and especially on rough seas the jib or jibs will swing to and fro between the uttermost positions defined by the length of the guys, which are slack to a certain extent. This leads to extra wear on the jib pivot and on the guys.

[0004] The object of the invention is to provide a guy rope arrangement in which the guys are taut independently of the angle through which the jib has been lowered with respect to the mast, and which can easily be fitted in existing rigging. Another object of the invention is to design such a guy rope arrangement such that there will be no projecting parts, or at least as few as possible.

[0005] This objective is accomplished in that a tension spring-like element is fitted in at least one of said guys.

[0006] The term tension spring-like element is understood to mean an element which exhibits springiness in the longitudinal direction of the guy and which also exerts a pulling force in the longitudinal direction of the guy.

[0007] Preferably, the tension spring-like element is fitted in the rear guy. As a result, a maximum angle is achieved between the direction of pulling at the top of the jib and the longitudinal direction of the jib, so that a maximum stabilising force of the tension spring-like element on the jib position is achieved, in any case a force greater than the force that can be achieved with a similar tension spring-like element in the front guy.

[0008] Another preferred embodiment of a jib according to the invention is characterized in that the tension spring-like element is fitted near the board of the vessel.

[0009] As a result, it is only necessary to shorten existing guys near their point of attachment to the vessel, whilst the tension spring-like element in question is easy to fit, in any case easier than in the case that the tension spring-like element were fitted centrally in the guy or near the top of the guy.

[0010] Another embodiment of a jib according to the invention is characterized in that the tension spring-like element is fitted between the jib and a fixed part of the vessel, which jib and which fixed part of the vessel form connecting elements, in that the tension spring-like element comprises a cylinder and a piston, which piston is connected to a first end of a tie rod, in that a space sealed by the piston in the cylinder is connected to a pressure vessel, in that at least one compressible fluid is present in said pressure vessel under a pressure greater than the atmospheric pressure, in that the second end of said tie rod is connected to a first of said two connecting elements, in that the cylinder is connected to the second of said two connecting elements and in that a force is exerted on the piston or on the cylinder by said at least one compressible fluid from the connecting element to which the piston or the cylinder is connected.

[0011] It is noted that the term fluid is a collective term, which comprises both a gas (compressible) and a liquid (non-compressible).

[0012] As a result, the springing aspect of the tension spring-like element is obtained from the compressibility of said at least one fluid and the pulling aspect of the tension spring-like element is effected in that the force on the piston or on the cylinder by the fluid is exerted from the connecting element to which the piston or the cylinder is connected. That is, the jib and a fixed part of the vessel are pulled towards each other by the tension spring-like element as a result of the force exerted on the piston or on the cylinder by the fluid.

[0013] Another preferred embodiment of a jib according to the invention, in which said at least one compressible fluid comprises a gas and a liquid lubricant, is characterized in that a connecting line is present between the connection of the sealed space in the cylinder to the pressure vessel on the one hand and a place inside the pressure vessel where the liquid lubricant is present in the operating position on the other hand.

[0014] As a result, the gas that is present in the pressure vessel will first force the liquid lubricant through the con-

necting line into the sealed space upon movement of the piston. Thus, lubricant will first be carried to the piston at all times, so that sufficient lubrication is provided between the cylinder wall and the piston.

[0015] Another preferred embodiment of the jib according to the invention is characterized in that the volume of liquid lubricant is greater than the stroke volume of the piston.

[0016] As a result, only liquid lubricant is transported to and fro through the connecting line between the sealed space and the interior of the pressure vessel upon reciprocating movement of the piston. In the case of the guy being pulled taut, the pulling force exerted by the piston on the guy will ensure that the volume of the sealed space will become smaller, as a result of which the liquid lubricant is forced from the sealed space into the pressure vessel through the connecting line. In the case of the required guy length decreasing as a consequence of movement of the jib, the pressure of the gas in the pressure vessel will force the liquid lubricant through the connecting line into the sealed space and keep the sealed space completely filled with liquid lubricant. Thus, lubricant will be present between the cylinder wall and the piston at all times.

[0017] Another preferred embodiment of the jib according to the invention is characterized in that the pressure vessel is fitted in such a manner that it can rotate through less than half a turn round the direction of pulling.

[0018] As a result, the end of the connecting line in the pressure vessel will not be moved outside the volume where liquid lubricant is present as a result of rotation of the pressure vessel round the direction of pulling.

[0019] It will be understood that the tension spring-like element as described above can also be used as a tensioning device in other applications than the one described above.

[0020] The invention also relates to a tensioning device comprising a cylinder and a piston which is movable within the cylinder, to which a piston rod is attached, whilst the cylinder and the piston rod have been provided with attachment means and the part of the cylinder through which the piston rod extends is in communication with a pressure vessel in which a compressible fluid is present, which fluid is under a pressure higher than the atmospheric pressure during operation.

[0021] The invention will now be explained in more detail with reference to the accompanying drawings, in which:

Figure 1 is a schematic top plan view of a vessel with a mast and an at least partially lowered jib;
Figure 2 is a view, partially in section, of the tension spring-like element according to the invention;
Figure 3 shows the attachment of the tension spring-like element to the vessel.

[0022] In Figure 1 a vessel, in particular, but not exclusively, a fishing vessel, indicated by reference numeral 1, is shown in top plan view. A mast 2 is disposed near the bow. A jib 4 is attached to the mast by means of a jib pivot construction 3. The end of the jib 4 is attached to points of attachment 7 and 8 of the vessel 1 by means of a front guy 5 and a rear guy 6. A winch, schematically indicated by numeral 9, is mounted on the vessel 1. A cable 10 extends from the winch in the direction indicated by the arrow A, over pulleys 11 and 12 on the vessel 1 and a pulley 13 near the end of the jib 4, to a fishing net (not shown). A tension spring-like element 14 is fitted in the rear guy 6. Preferably, but not necessarily, the tension spring-like element 14 is located near the point of attachment 8 on the vessel. The term "tension spring-like element" is understood to mean that the element 14 exerts a tensioning force on the rear guy 6 and that the exertion of said tensioning force takes place in a springing manner, that is, that the length of the element 14 can increase and decrease in dependence on the tensioning force in the rear guy 6.

[0023] As is known, the points of attachment 7 and 8 and the jib pivot 3 are not aligned. As a consequence, the total distance from the point of attachment 7 via the end of the jib 4 to the point of attachment 8, that is, the joint length of the front guy 5 and the rear guy 6, is not constant upon lowering of the jib 4. Up to now, the joint length of the front guy 5 and the rear guy 6 has therefore been selected so that the front guy 5 and the rear guy 6 are just taut in a position of the jib 4 in which the aforesaid joint length is maximal. In other positions of the jib 4, the front guy 5 and/or the rear guy 6 are not taut and exhibit some degree of slackness, therefore. This allows the jib 4 to move forward and backward in such a position, resulting in wear on the jib pivot 3, additional forces on the points of attachment 7 and 8 and additional forces in the guys 5 and 6.

[0024] The tension spring-like element 14 causes that the rear guy 6 exerts the force on the end of the jib 4 in the direction of the rear guy 6. As a result, not only the rear guy 6 but also the front guy 5 will be taut at all times.

[0025] In rough weather, the vessel experiences substantial retardation forces. Without the presence of the tension spring-like element 14 according to the invention, this will cause the "loose" jibs to swing forward and rearward, which is experienced as very objectionable by the fishermen and which leads to significant wear on the guys and the pivots. As a result of the tension in the rear guy 6 created by the tension spring-like element 14, the jib 4 will no longer swing forward and backward in rough weather, or at least to a much smaller extent.

[0026] Figure 2 shows an embodiment of a tension spring-like element 14 in more detail. The tension spring-like element 14 in Figure 2 extends between a first eye 15 for attachment to the vessel, in particular for attachment to the point of attachment 8 for the rear guy, and an eye 16 for attachment to the end of the jib 4 via the rear guy 6. The eye 15 is connected to a cylinder 17. The cylinder 17 is provided with a vent hole 18. The end of the cylinder 17 remote

from the eye 15 is sealed with a stop 19. A connecting channel 20 is formed through the stop 19. The stop 19 is furthermore provided with a through opening, through which a rod 21 can move reciprocatingly in the directions indicated by the arrow B. The eye 16 is attached to one end of the rod 21. A piston 22 is attached to the other end of the rod 21. The piston 22 is capable of reciprocating movement within the cylinder 17. A pressure vessel 23 is arranged round the cylinder 17. A line 24 extends within the pressure vessel 23. The line 24 is connected in an airtight manner to the channel 20 in the stop 19 with one end. The other end of the line 24 is located near one end 25 of the pressure vessel 23. In a preferred embodiment of a tension spring-like element 14 according to the invention, a space 26 between the piston 22 and the stop 19, the channel 20, the line 24 and a part 27 of the pressure vessel 23 are filled with a liquid lubricant. The other part of the pressure vessel 23 is filled with a gas under pressure.

[0027] The liquid lubricant is present in the tension spring-like element 14 in such an amount that the end 28 of the line 24 will remain immersed in liquid lubricant when the piston 21 makes a maximum stroke in the direction of the eye 15.

[0028] Within the framework of the attachment of the tension spring-like element 14 to the vessel, it will now be explained with reference to Figure 3 that the tension spring-like element 14 is attached to the vessel in such a manner that the end 28 of the line 24 will remain immersed in liquid lubricant at all times.

[0029] In Figure 2, the dotted line 29 schematically indicates the position of the liquid lubricant in the situation in which the piston 22 is located as far to the left as possible, seen in Figure 2, whilst the dotted line 30 indicates the position of the liquid lubricant in the pressure vessel 23 in the situation in which the piston 22 has moved as far to the right as possible, seen in Figure 2.

[0030] It should be noted that in this preferred embodiment of the invention liquid lubricant is present in the space 26, the channel 20 and the line 24 at all times. Only the remaining space 31 in the pressure vessel 23 is filled with a gas.

[0031] The gas in the space 31 is compressible, whilst the liquid lubricant is hardly compressible, if at all. Preferably, but not necessarily, the gas in the space 31 is dry air.

[0032] The gas in the space 31 is under pressure. The pressure on the gas in the space 31 is transmitted to the side 32 of the piston 22 by means of the liquid lubricant, which is hardly compressible, if at all, via the line 24 in the channel 20 and the space 26, exerting a pressure on said side in the direction of the eye 15. From Figure 2 it is apparent that the further on the piston 22 is located to the right, seen in Figure 2, the greater the amount of liquid lubricant that has been driven from the space 26 and found its way into the pressure vessel 23, the smaller the remaining space 31 in the pressure vessel 23, the higher the pressure of the gas in the remaining space 31 and consequently the higher the pressure on the surface 32 of the piston 22.

[0033] The operation of the tension spring-like element 14 is as follows: the eye 15 is attached to the vessel in such a manner that the tension spring-like element 14 cannot rotate, or only to a limited extent, round the connecting line between the eyes 15 and 16 and round the direction in which the rear guy 6 extends, therefore. A rotation through an angle of 10 degrees in one direction and 10 degrees in the other direction is possible. The maximally acceptable angle of rotation is determined by the fact whether the end 28 is still immersed in the liquid lubricant. The liquid lubricant functions to ensure that the piston 22 within the cylinder 17 will be properly lubricated at all times. This reduces the amount of wear on the piston 22 and on the inner side of the cylinder 17 to a significant extent.

[0034] In a less attractive embodiment of the tension spring-like element 14 according to the invention, the liquid lubricant can be left out, as can the line 24, and a space 26 will be filled with the same gas as the space 31. In itself, this does not affect the tension spring effect provided by the tension spring-like element 14, but a significant amount of wear on the piston 22 and on the inner side of the cylinder 17, and consequently a significantly shorter life, must be taken into account in that case, however.

[0035] As a result of the pressure exerted on the piston 22 in the direction of the eye 15 by the gas in the space 31 via the liquid lubricant, the rear guy will be pulled taut at all times via the rod 21 and the eye 16, independently of the extent to which the jib 4 is lowered. This is the pulling aspect of the tension spring-like element 14.

[0036] As soon as the jib 4 attempts to move under the influence of external forces, the force in question will be transmitted to the piston 22 via the rear guy 6, the eye 16 and the rod 21. Assuming that the force in question is such that the length of the rear guy 6 would have to increase, this means a force on the piston 22 to the right, seen in Figure 2. The force in question causes the volume of the space 26 to become smaller and liquid lubricant to be forced to the inside of the pressure vessel 23, via the channel 20 and the line 24, and the pressure of the gas in the space 31 to become higher. The pressure increase in question continues until a new equilibrium is reached between the pressure of the gas in the space 31 and the force exerted on the piston 22 by the rear guy 6. If the force with which the end of the jib 4 pulls at the rear guy 6 varies, also the position of the piston 22 in the cylinder 17 will vary as a result of the compressibility of the gas in the space 31, with the extent of the variation increasing in proportion to the increase in the force. This is the springing aspect of the tension spring-like element 14.

[0037] It is noted that the stop 19 may be provided with a bronze steel guide 33.

[0038] In the table 1 below, several dimensions of the relevant elements of the tension spring-like element 14 are shown by way of example.

stroke length piston 22 (in mm)	diameter piston 22 (in mm)	diameter rod 21 (in mm)	force on piston/ tension in rear guy 6 (in tonnes)	attachments (15 and 16)/ ø rope (in mm)
500	110	50	3	33/45
650	135	55	5	36/50
800	165	60	8	42/60

[0039] As is apparent from the above table, different stroke lengths and extension resistance values for the tension spring-like element 14 are possible, so that it can be used on vessels of different types and dimensions.

[0040] It can be simply verified via vent valve 18 whether the seal between the piston 22 and the inner wall of the cylinder 17 is sufficiently tight for the liquid lubricant. If said seal is no longer sufficient, liquid lubricant will move between the piston 22 and the inner wall of the cylinder 17 and end up near the vent valve 18. If liquid lubricant emerges from the vent valve 18, this is a sign that the seal between the piston 22 and the cylinder wall 17 is no longer optimal and that it may be necessary to replace or repair the tension spring-like element 14 in that regard.

[0041] In Figure 3, reference numeral 34 indicates a fixed part of the vessel. An attachment 35 for the rear guy 6 is present on the fixed part of 34 of the vessel in a manner which is known per se. The eye 15 is connected to the attachment 35 by means of two fasteners 36 and 37 and a link 38.

[0042] When the jib 4 is being lowered, the rear guy 6 will move along a conical surface, the apex being in the point of attachment 8 or the attachment 35. The connection by means of fasteners 36, 37 and the link 38 through the eye 15 and the attachment 35 readily allows such a movement of the rear guy 6 along a conical surface. Furthermore, the rear guy 6 will be taut at all times, and consequently the fasteners 36 and 37 and the link 38 will also be tensioned between the eye 15 and the attachment 35. This reduces the possibility of rotation of the tension spring-like element 14 round its longitudinal axis between the eye 15 and the eye 16.

[0043] The tension spring-like element 14 as described with reference to Figure 2 and the attachment thereof as described with reference to Figure 3 have the advantage that no alterations on the existing arrangement of the vessel 1 are required, that the tension spring-like element 14 can be fitted in the rear guy 6 in a simple manner, that the tension spring-like element 14 does not have any projecting parts and that no additional equipment on board the vessel 1 is required to enable the tension spring-like element 14 to operate.

[0044] For the sake of compactness, the pressure vessel 23 is arranged around the cylinder 17. Within the framework of the invention it is also possible, however, to arrange the pressure vessel 23 in line with the cylinder 17, round the rod 21, rather than around said cylinder. Furthermore it is possible within the framework of the invention to fix the pressure vessel 23 to the vessel 1 and connect it to the cylinder 17 by means of a hydraulic line. The hydraulic line is arranged between the pressure vessel 23 and the connecting channel 20 in that case, preferably between the line 24 and the connecting channel 20. It is noted that the connecting channel 20 need not necessarily extend through the stop 19 in that case, but that it may also be formed in the wall of the cylinder 17.

[0045] A great many embodiments and modifications will be apparent to a person skilled in the art after having perused the above. Such embodiments and modifications are all considered to fall within the scope of the invention.

Claims

1. A jib with a front guy and a rear guy, which is attached to a mast on a vessel, **characterized in that** a tension spring-like element is fitted in at least one of said guys.

2. A jib according to claim 1, **characterized in that** the tension spring-like element is fitted in the rear guy.

3. A jib according to claim 1 or 2, **characterized in that** the tension spring-like element is fitted near the board of the vessel.

4. A jib according to any one of the claims 1 - 3, **characterized in that** the tension spring-like element is fitted between the jib and a fixed part of the vessel, which jib and which fixed part of the vessel form connecting elements, **in that** the tension spring-like element comprises a cylinder and a piston, which piston is connected to a first end of a tie rod, **in that** a space sealed by the piston in the cylinder is connected to a pressure vessel, **in that** at least one compressible fluid is present in said pressure vessel under a pressure greater than the atmospheric pressure, **in that** the second end of said tie rod is connected to a first of said two connecting elements, **in that** the cylinder is

connected to the second of said two connecting elements and **in that** a force is exerted on the piston or on the cylinder by said at least one compressible fluid from the connecting element to which the piston or the cylinder is connected.

5. A jib according to claim 5, **characterized in that** said at least one fluid comprises a gas and a liquid lubricant.

6. A jib according to claim 5, **characterized in that** a connecting line is present between the connection of the sealed space in the cylinder to the pressure vessel on the one hand and a place inside the pressure vessel where the liquid lubricant is present in the operating position on the other hand.

7. A jib according to claim 6, **characterized in that** the volume of liquid lubricant is greater than the stroke volume of the piston.

8. A jib according to claim 7, **characterized in that** an open end of the connecting line is present within a volume that is filled with liquid lubricant in the operative position of the pressure vessel.

9. A jib according to any one of the claims 4 - 8, **characterized in that** said pressure vessel and said cylinder are fixedly interconnected.

10. A jib according to claim 9, **characterized in that** the pressure vessel is arranged round the cylinder.

11. A jib according to claim 9 or 10, **characterized in that** the pressure vessel is fitted in such a manner that it is at most rotatable to a limited extent round the direction of pulling.

12. A jib according to claim 11, **characterized in that** the pressure vessel is fitted in such a manner that it can rotate through less than half a turn round the direction of pulling.

13. A jib according to any one of the claims 4 - 8, **characterized in that** the pressure vessel is fixed to the vessel and is connected to the cylinder by means of a hydraulic line.

14. A jib according to any one of the claims 5 - 13, **characterized in that** said gas is dry air.

15. A jib according to any one of the claims 5 - 14, **characterized in that** said liquid lubricant is lubricating oil.

16. A tensioning device comprising a cylinder and a piston which is movable within the cylinder, to which a piston rod is attached, whereby the cylinder and the piston rod have been provided with attachment means **characterized in that** the part of the cylinder through which the piston rod extends is in communication with a pressure vessel in which a compressible fluid is present, which fluid is under a pressure higher than the atmospheric pressure during operation.

17. A tensioning device according to claim 16, **characterized in that** said pressure vessel surrounds said cylinder.

18. A tensioning device according to claim 16 or 17, **characterized in that** the pressure is partially filled with a liquid lubricant.

19. A tensioning device according to any one of the preceding claims, **characterized in that** a connecting line is connected to the part of the cylinder through which the piston rod extends, wherein the end of the connecting line remote from the cylinder is present during operation in the part of the pressure vessel that is filled with liquid lubricant.

20. A tensioning device according to any one of the preceding claims 17 - 19, **characterized in that** the volume of liquid lubricant is greater than the stroke volume of the piston.

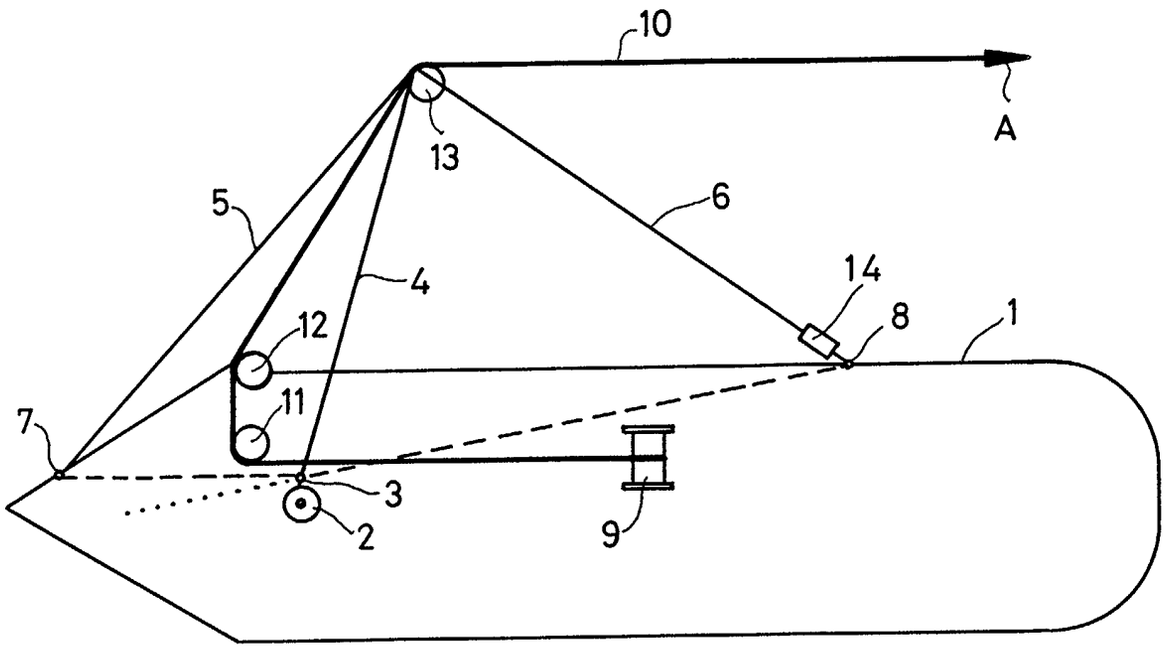

FIG. 1

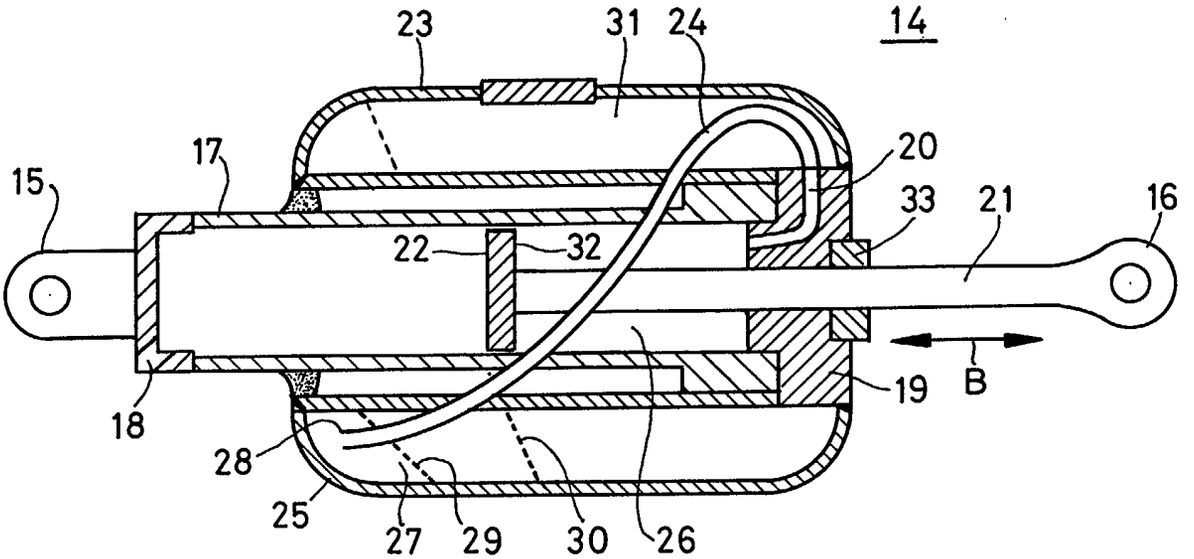
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FIG. 2

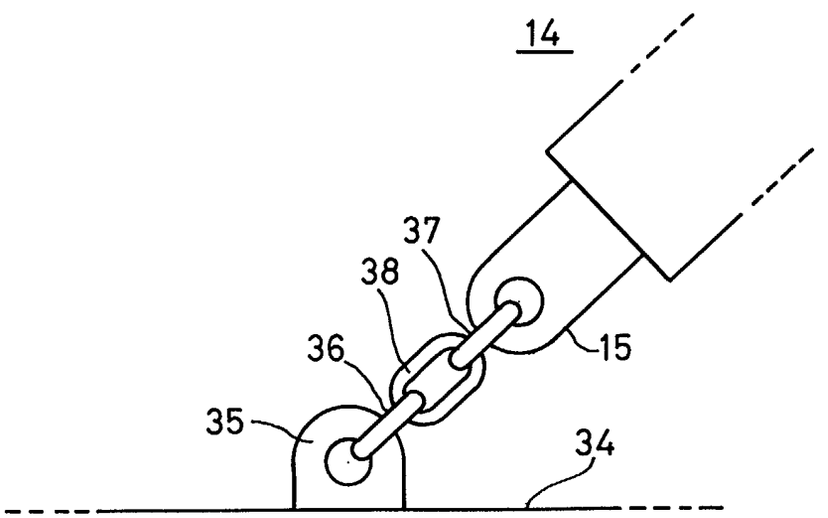
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FIG.3