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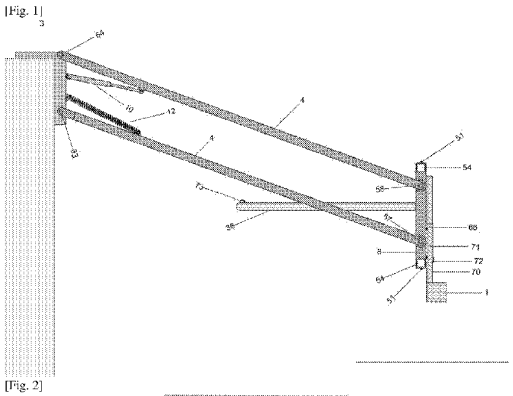
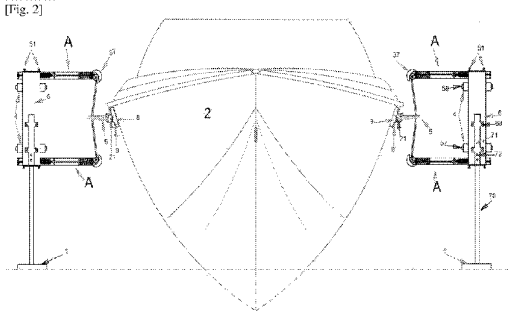
(54) **Title:** AUTOMATIC BOAT MOORING DEVICE

[Fig. 1]



[Fig. 2]



(57) **Abstract:** An automatic boat mooring device is fixed to the dock and has arms (4) that extend towards the boat and move up and down keeping the connectors (A) always vertically level with the moored or unmoored boat as the water level rises and falls. The device is designed with different connectors that are used depending on the model of the boat and each mooring is done so that the boat approaching the device is automatically moored efficiently and safely.

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# AUTOMATIC BOAT MOORING DEVICE

## Technical Field

[0001] The invention in a broader sense belongs to the field of Nautics, and specifically relates to the mooring of boats to the port as well as to fixed and floating surfaces. (IPC B63B21/00;)

## Detailed description of the invention

[0002] This device is only used for parallel mooring in the front part of the ship, the "bow of the boat", in a safe and efficient way, so that while parking we automatically moor to the device which is fixed on the dock. In order to achieve maximum efficiency, this device is designed to be used with two different connectors, so that users of the device, depending on the model of the vessel, have the opportunity to choose the necessary connector as the best option for mooring their boat. The device can be used for mooring all standard boats that have a front part with a steep and sharp bow, [Fig.2]. This device has two legs (3), four arms (4), two connector bridges (9), two heads (6), two floaters (1), the connector (A and B) and hooks (5 and 7). The head (6) has square profiles above and below it (54) for mounting the connectors (A and B). The legs (3) are made to be fixed with screws (55) to the dock which on the front vertical side has a lower axis (63) and an upper axis (64) to connect the hands (4), [Fig.1], which connect with a bridge (9). Two identical hands (4), stay parallel and are connected with a bridge (9) near the legs (3), [Fig.7]. When using the connector (A), we fix the hands (4) with the bridge (9) so that they extend away from the head (6), [Fig.7]. When we use the connector (B), we fix the hands in the opposite direction, so that they approach the head (6), [Fig.8]. Two joined hands are fixed on two legs on the lower shafts (63), on the side where they are connected with the bridge (9), and the other two hands are fixed on the upper axes (64) placed in parallel to the lower hands, and on the other side the hands are connected vertically with the two heads (6) on the lower shafts (57) and the upper shafts (58) with the same distance as the legs, so that the front of the device, the head and the connectors during the up and down movement are always vertical, [Fig.12]. Two shock absorbers (10) are attached to the legs and upper arms and two springs (12) are attached to the legs and lower arms, [Fig.1].

[0003] For the connector (A) we use two hooks (5). The efficient place for connection is in the middle of the bow part of the boat, on the left and right side under the protective tire (14) [Fig.7]. In that place the hooks (5) are mounted, one on the left side and the other on the right side . The hooks (5), [Fig.14], have their own brackets (8) which are fixed with 4 screws (61) to the boat, picture 11. The hooks and brackets are connected by toothed hinges (21), which serve to strongly fix the hooks with screws (66) in a

horizontal position during use, Figs 2 and 3, and to lower them in a vertical position when not in frequent use, Fig 11. The hooks (5 and 7) are formed from stainless steel plates tightened at the beginning and widened at the bottom in the shape of a triangle, where in the outer part, widened in the form of an arc, they have an open hook (67) with a mechanism for closing the hook, which is fixed in the inner part of the hooks (5). The hook mechanism (5), [Fig.14], consists of a safeguard (46) which is attached to a shaft (50) where there is a spring (47) to hold the safeguard in the closed position and a lever (49) with which we push the safeguard to release it from the device. The hook (7), [Fig.15], has a mechanism similar to the hook (5), except that instead of the lever (49) there is a cable (48), which is mounted on the upper part of the bow of the boat in order to, by pulling the cable, release the safeguard and disconnect the boat from the device. The connector (A), figures 2 and 3, is part of the device to which the boat is automatically connected by using the hooks (5). The connector (A) consists of two identical mechanisms which are connected by a cable. The mechanism of connector (A) consists of a cable (22), a tension spring (23), a thrust spring (24), a wheel (25), a protective rubber (37), a cable and spring connector (45), a square tube housing (27), cap (69 and 74) and screws (26). The screw (26) passes through the back cover (69) and is screwed into the nut (65) which is fixed at the beginning of the tension spring (23) which is attached on the other side to the cable (22) with a square connector (45) ) which moves freely back and forth through the housing (27), but cannot rotate, so we can use the screws (26) to tighten the springs and cables as needed. On the square profiles (54) on the left and right heads (6), the connectors (A) are mounted and fixed with screws (51) so that the distance between the two connectors is equal to the distance between the two hooks (5) which are fixed on the boat, figures 2 and 3. The floats (1) with their housing (71) are mounted on the left and right heads(6) with screws (68). The float has a telescopic holder (70) that passes through its housing (71) and is fixed with screws (72) which serves to keep the connector at the correct height of the boat. The tension spring (12) serves to lighten the front part of the device enabling us to use a smaller float. The shock absorbers (10) have the same two-sided resistance and eliminate uncontrolled oscillations of the device during waves, making it more stable, [Fig.1]. When the device is mounted and fixed on the dock, we measure the height between the water surface and the hooks (5 ) to the boat and fix the float (1) so that the center of the head (6) stands straight with the hooks (5) which are fixed to the boat.

[0004] To connect the boat to the connector (A), it is important to guide the boat towards the center of the device slowly between the two connectors (A) which are always vertical and at the height of the hooks (5). If we do not move in the right direction, the cables (22) serve as guides and help to guide and moor to the device. Firstly, we pull the boat

(2) with a rod towards the device, [Fig.13], to verify the tuning, and after that we can connect to the device directly by driving the boat slowly towards the device. After connecting the boat to the connector (A), we secure the front of the boat with a rope (34) that is fixed to the rings (73) on the holder (36) where there are springs (11) and in the middle there is a hook (35) ) that we tie to the top of the boat. When we untie the boat, we do the opposite: we release the hook (35) and the hooks (5). The boat connected to the device with the connector (A) (figures 2 and 3) oscillates in a controlled and limited manner by the cables (22) by tensioning the springs (23) that control the movements of the boat and the springs (24) that serve to stop the stronger movements with a slight up and down movement of the front of the device.

[0005] The connector (B), [Fig.6], is designed for connection to the boat, at the beginning of the bow on the lower front of the boat where the hook (17), is usually location [Fig.12] . In the boat we remove the bow hook (17) and in its place we mount the hook (7), [Fig.15]. The hook (7) is dedicated to the automatic connection to the connector (B) and in the lower part there is a closed hook (13), which replaces the old hook (17) of the bow of the boat. The hook (7), for mounting on the boat has a hole for the screw (18), a cutout for the second screw (19) so that the screw can be furthered away and brought closer to fit the same holes where the hook was (17 ) and at the tip of the hook, a hole for the third screw (20 ). When mounting the device, the holder (15) of the connector (B) is inserted into the square profiles (54) on the left and right head (6), figure (5). In the middle of the holder (15), the spiral spring (28) is fixed in a vertical position with the lower holder (56) with screws (65). At the tip of the spring the upper holder (16) is fixed, which is connected to the shaft (62) with the seat (38), which can move up and down on the shaft and be fixed in the right position depending on the angle of the front of the boat. The seat has four wheels (39) on which the boat rests, two arms (40) that are attached to the seat with screws (53). The arms (40) are spread out in the shape of the letter V, at the beginning they each have one joint (52), in the middle there is a joint (41) to be tuned according to the boat and they serve to steer the boat straight to the device (B). For connection (B), the float (1) can be mounted on the opposite side, on its box (71), especially when it comes to a low boat, and it is necessary to lower the connector (B) to level it with the hook (7), [Fig.5]. The connector device (B) is leveled by adjusting the float (1) so that the height of the rod (29) is level with the top of the hook (7), picture 9. In the central part of of the seat (38) [Fig.6], in the cutout (42) a mechanism with a toothed rod (30) is installed, which moves back and forth through the cutout (42) On the front side, this rod is attached to another rod (29) in the form of the letter T, which is reinforced laterally with the rods (43) in the form of the letter V, and moves by sliding between the hands (40) and the limiter ( 59). On the back side of the cutout (42), on the shaft (60) a toothed safeguard

(31) is fixed on the toothed rod (30) that limits its movement in one direction only, so that the boat moving towards the device, [Fig.9], with the hook (7) is connected to the rod (29) picture 4, and pushes the triangular mechanism forward until the boat is completely fixed with the seat (38), picture 5. The tension spring (75) serves to keep the mechanism in a position ready for mooring which is fixed to the seat (38) and the end of the rod (30). The safeguard (31) keeps the boat tight on the seat. This safeguard on the upper side has a ring (32) to which the cable (33) is attached and serves to pull the safeguard from the toothed rod (30). At the beginning of the cut (42) a gear (44) is fixed with which we can manually move the mechanism and tighten the boat on the seat if necessary, [Fig.6]. The moored boat with the connector (B) during waves and winds sways in a controlled and limited manner.

[0006] Since the spring (28) is fixed up and down so as not to rotate, the spring keeps the rear of the boat in check by allowing minimal left and right movement and keeps the boat in a parallel position. For mooring a boat up to two tons, the suitable dimensions of the spring (28) are: height 40 cm, length 11 cm and thickness 12 mm.

## Technical Problem

[0007] Older methods of mooring boats, mainly using buoys, anchors and ropes are most frequently used, which means that new research have not brought an effective solution. The essence is that every previous method of mooring boats has its shortcomings, and the result is a large number of damaged vessels at the docks. The most frequently used method of mooring boats is with buoys that serve to prevent the moored boat from coming into direct contact with the dock. Buoys often do not help under the influence of weather conditions such as winds, waves, and fluctuating water levels. Another commonly used method is to use the anchor on the opposite side, to keep the boat away from the dock, but it is not an adequate solution because occasionally the anchor loosens, which causes the boat to come into direct contact with the surface where it is moored. Also, old methods of mooring require a lot more time and effort as well as more human assistance. New research on mooring boats is most often based on suspending boats and keeping them away from the dock. The published U.S. Patent Application 4,250,827 describes a device that uses telescopes with springs to buffer forward-backward motion, this and all other models that use springs in a similar way do not give a good result because the spring has the certain strength, and the boat has uncertain strength when swinging, meaning that the spring cannot be adjusted since a strong spring is useless and a soft one will shrink to the end, transferring the impact and thus damaging the device and the boat. The published U.S. application, patent 5,361,716 shows a device having a spring fixed to the base on one side and fixed to the handle attached to the boat on the other side by bending the spring at an angle of 90 o or semicircular depending on the water level, which means that the spring must be so

weak that we can bend it in a semicircle with one hand to tie it to the boat with the other, and the movement of the middle boat under the influence of the wave can have as much as 20 times more force than that spring and will not be bothered by it while impacting the port. The published application US2938492A shows the device that uses the spring that is installed on the vessel, on the top of which the telescopic tube is fastened and attached to the dock. The device is not efficient because during waves and boat lowering the telescopic tube and spring touch the boat and damage it and it also is not esthetic when the spring is on a vessel, and it is not efficient to dismantle it every time.

## Solution of Problem

[0008] This invention solves a technical problem with a new device that is easily manufactured and practical for use. The essence of the invention is a new device for the mooring of boats to docks, whose connectors ensure the necessary height of the boat even when it is not moored, so that when the boat approaches the device it is automatically moored efficiently and safely. The device monitors and controls the movements of the moored boat during waves and winds, tides, ebbs, and when the water level falls and rises.

[0009] The device is designed to secure the boat at the same time with several mechanisms that activate based on the strength of the boat's movement and allow the boat to rock in a controlled manner under the influence of smaller waves and control the movement of the boat under the influence of medium and strong waves, making the device efficient.

[0010] When the weather conditions are good and there are no waves, this device with the connectors (A and B) always keep the boat moored in the same position, which means that less space is needed on the dock compared to other mooring methods.

[0011] During waves and storms, the device with connector (A) monitors and limits the movements of the boat with cables attached to the springs, while the connector (B) monitors and limits the movements of the boat with a spring in a flexible way, on which the boat is connected to the front part.

[0012] When it comes to stronger waves, the connector (A) also has a pressure spring that is activated to soften the strong movements, while the connector (B) has a spring that moves flexibly and attractively to absorb the movements.

[0013] The arms of the device are connected to the base of the shaft and equipped with shock absorbers so that they move up and down during the waves, tracking and limiting the movements of the moored boat.

## Brief description of draft images

[0014] [Fig.1] shows the side view of the device. [Fig.2] shows the frontal view of the boat moored to the device with the connector (A). [Fig.3] shows in detail the connector (A)

in the cross-section, outside of the device and connected to the device. [Fig.4] shows the first stage of connecting the boat to the connector (B). [Fig.5] shows the boat fully connected to the connector (B). [Fig.6] shows the side and front view, detailing the connector (B). [Fig.7] shows a top view of the boat moored to the device with the connector (A). [Fig.8] shows the device from above with the connector (B). [Fig.9] shows the tuning of the device with the connector (B) and the boat. [Fig.10] shows the front view of the device with the connector (B). Fig 11 shows the hook (5) in the position when it is not in use. [Fig.12] shows the boat moored to the device with the connector (A) when the water level lowers and rises. [Fig.13] shows the boat and the device with the connector (A) during tuning and when we manually test the anchor for the first time. [Fig.14] shows the hook (5) in detail. [Fig.15] shows the hook (7) in detail.

# Claims

[Claim 1] The device with automatic connectors for mooring boats is **characterized** by the fact that there are two hands (4) connected to a bridge (9), on one side they are connected horizontally to two legs (3) on the lower shafts (63), and the two other hands are connected to the legs (3) on the upper shafts (64), which on the other side are vertically connected each by a head (6) to the lower shafts (57) and the upper shafts (58) with the same distance in between as the legs (3), the heads (6) on the upper and lower sides have square profiles (54) for mounting the connectors (A and B) and screws (51) for fixing, two floats (1) in the frontal side of the head (6) with telescopic holders (70), which pass through their housings (71), fixed on the head (6) with screws (68), two springs connected (12) to the lower legs and hands (4) and two shock absorbers (10) connected to the legs and upper arms (4). Figure (1 and 7).

[Claim 2] The connector (A) is **characterized** in that the screw (26) passes through the cover (69) on the back side of the square housing (27) and is screwed into the nut (65) which is fixed at the beginning of the tension spring (23), on the other side, the tension spring is connected with a square connector (45) with the cable (22) which passes through the compression spring (24), through the front cover (74) and through the wheel (25), exits the first housing (27) with a length equal to the distance between the two profiles (54) and is connected to the second housing (27) which has the same mechanism as the first one. Figure (3).

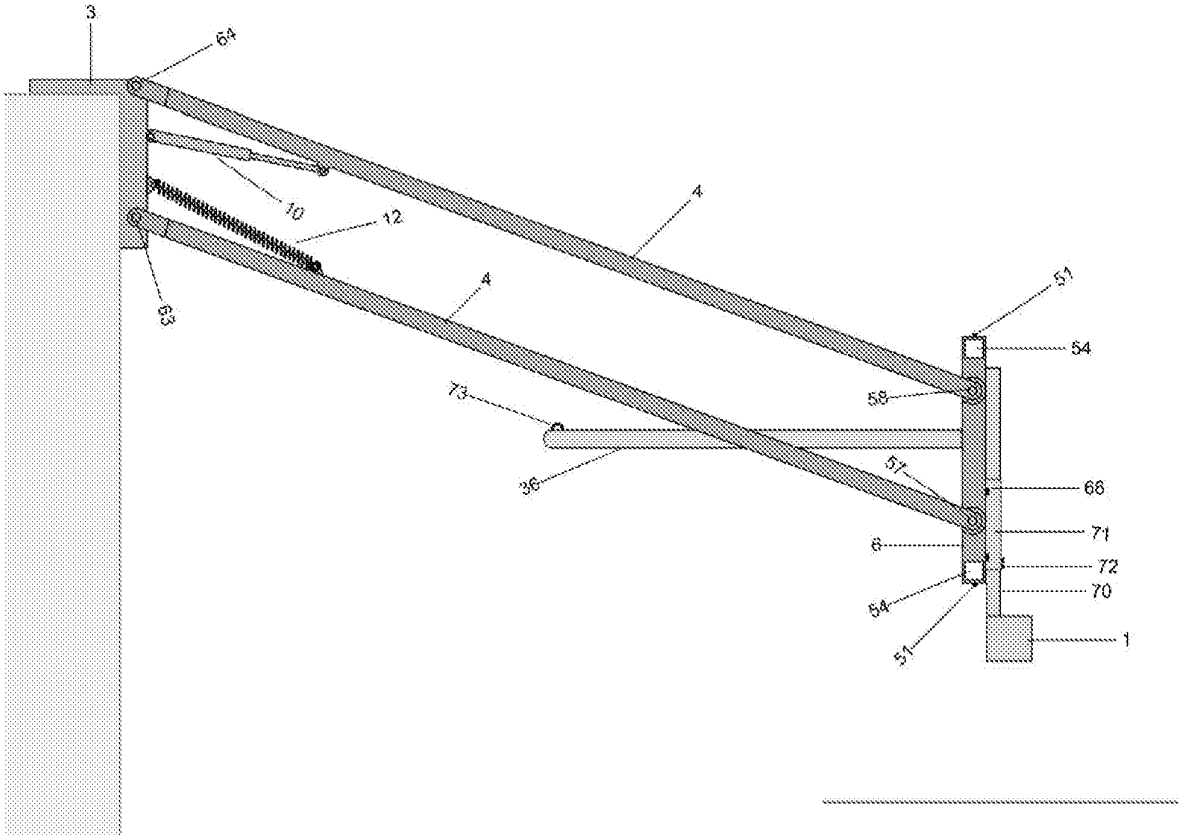
[Claim 3] The connector (B) is **characterized** by the fact that the coil spring (28) is fixed on the lower side of the holder (15), on the upper side of the support (16) which has the shaft (62) on the upper side, where the seat (38) is connected so that it can move up and down and be fixed in the right position with screws (62), the seat (38) has 4 wheels (39) at the ends, in the middle there is a cut (42) through which a toothed rod (30) passes, on the front part of which is another rod (29) is attached in the shape of the letter T, which is reinforced laterally with rods (43) in the form of a triangle with the end of the rod (30), at the rear end of the cut (42) there is a toothed safeguard (42) that allows the movement of the rod (30) only in one direction, at the front end of the cut a gear (44) and two hands ( 40) which are fixed with screws (53) laterally on the seat

(38) in the shape of the letter V and have on the upper side the limiter (58), at the beginning they each have a joint (52) and in the middle the hands each extend with a joint (41). Figure (6).

[Claim 4] The hooks (5) are **characterized** by the fact that a stainless steel plate has a triangular shape, sharp at the beginning and a bow shaped open hook (67) in the widened lower part, in the middle there is an internal cut and the mechanism with the safeguard (46) fixed on the shaft (50), a spring (47), a lever (49) and on the upper side two holders (8) connected by toothed hinges (21). Figure (14).

[Claim 5] The hook (7) is **characterized** by the fact that a stainless steel plate in the shape of a triangle with a sharp beginning and an extended end in the form of a bow with a closed hook (13), before the end on the lower side an open hook (67 ), an internal cutout in the middle and the mechanism with a safeguard (46) fixed on the shaft (50), with a spring (47), a cable (48), on the upper side a hole for a screw (18), a hole for a screw (20) and a cutout for a tuning screw (19). Figure (15)

[Fig. 1]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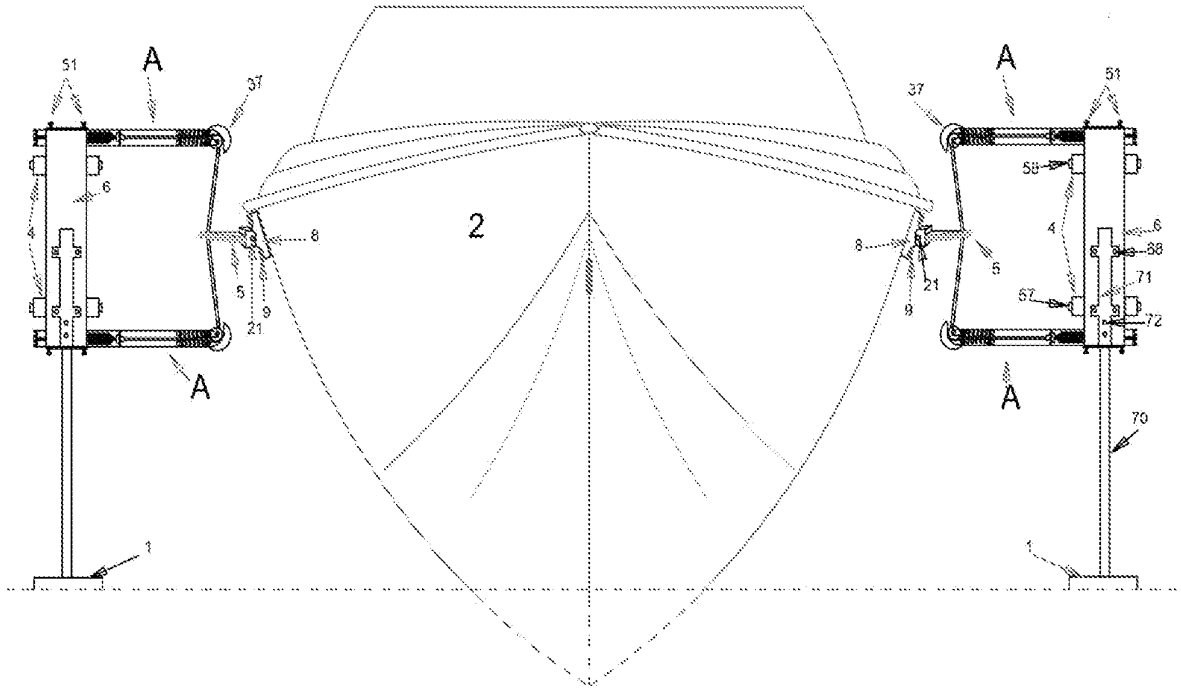
[Fig. 2]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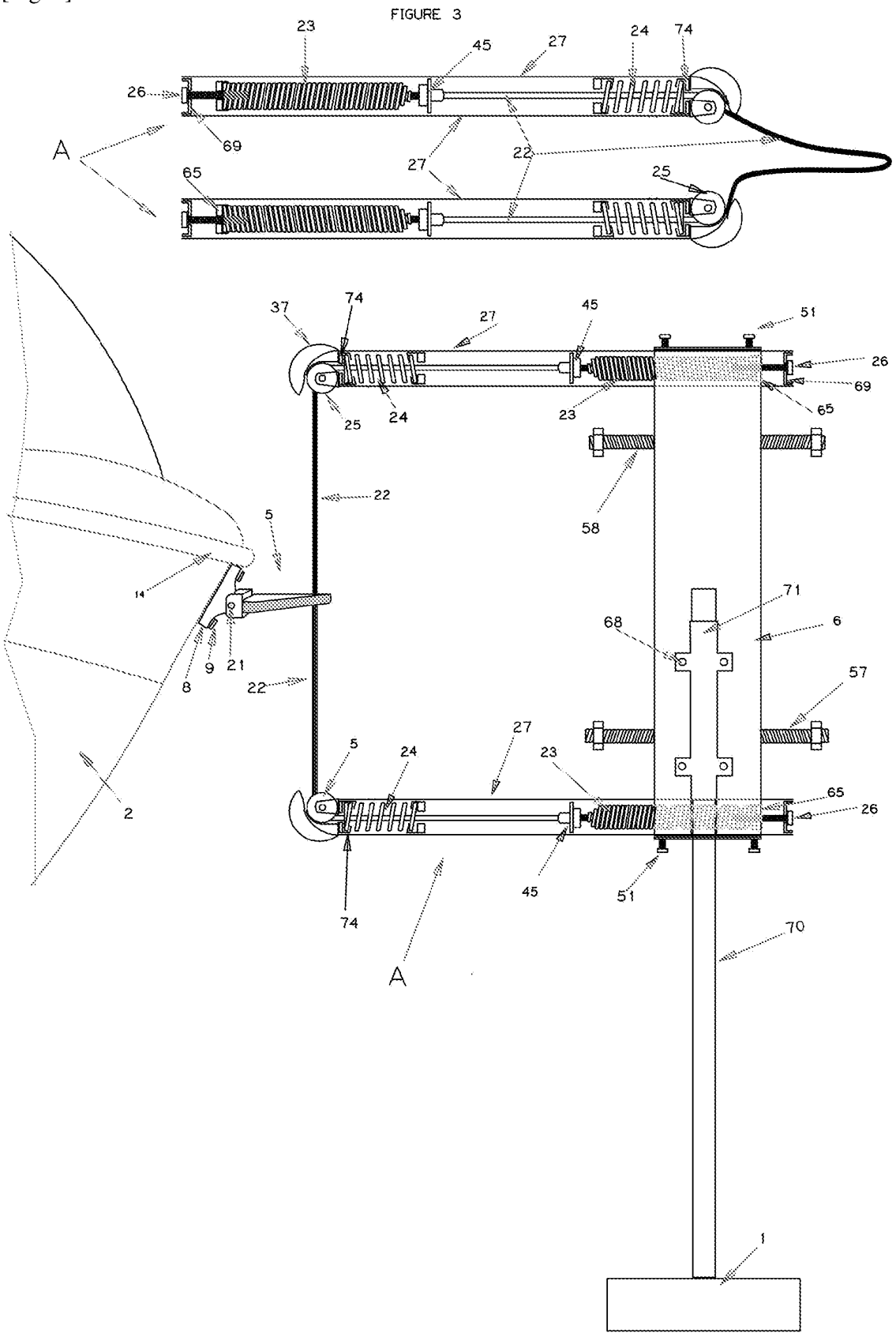
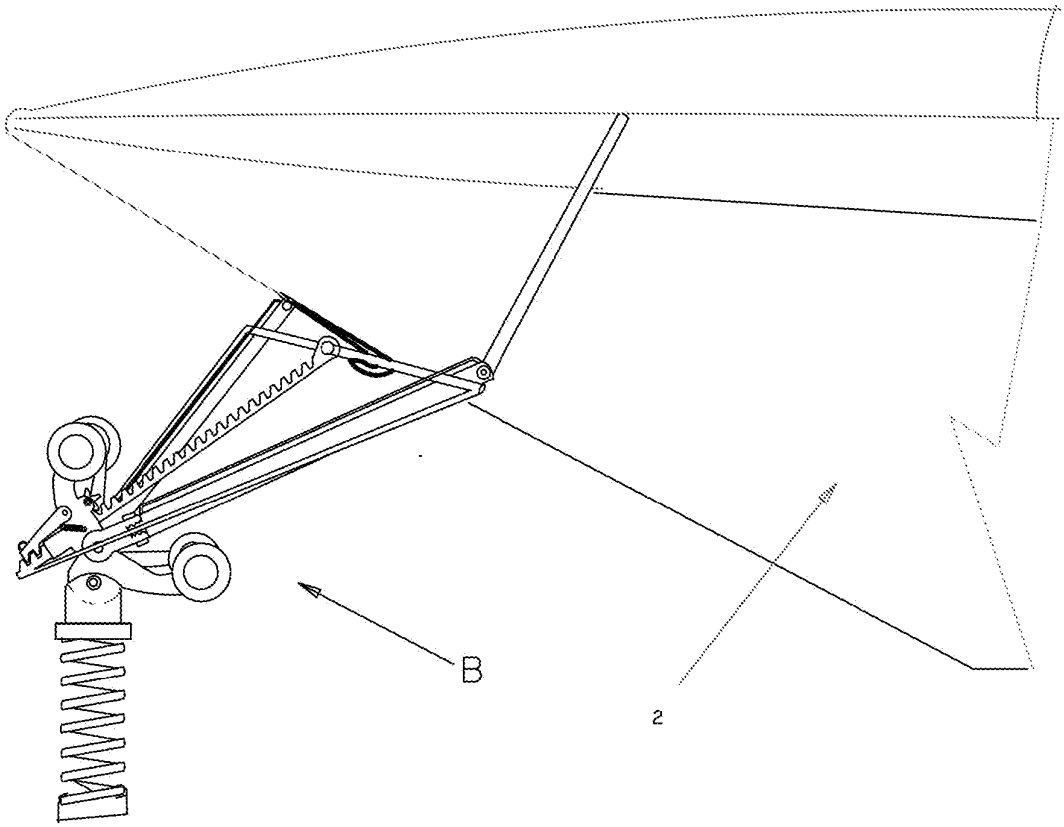
[Fig. 3]

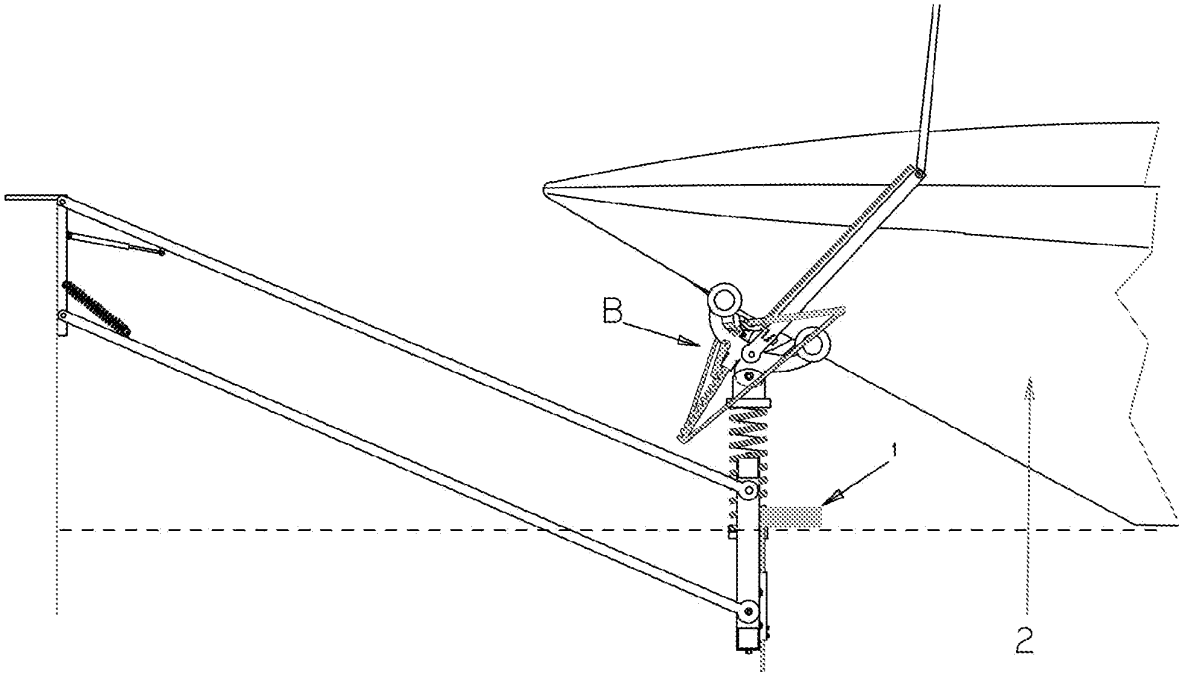
FIGURE 3



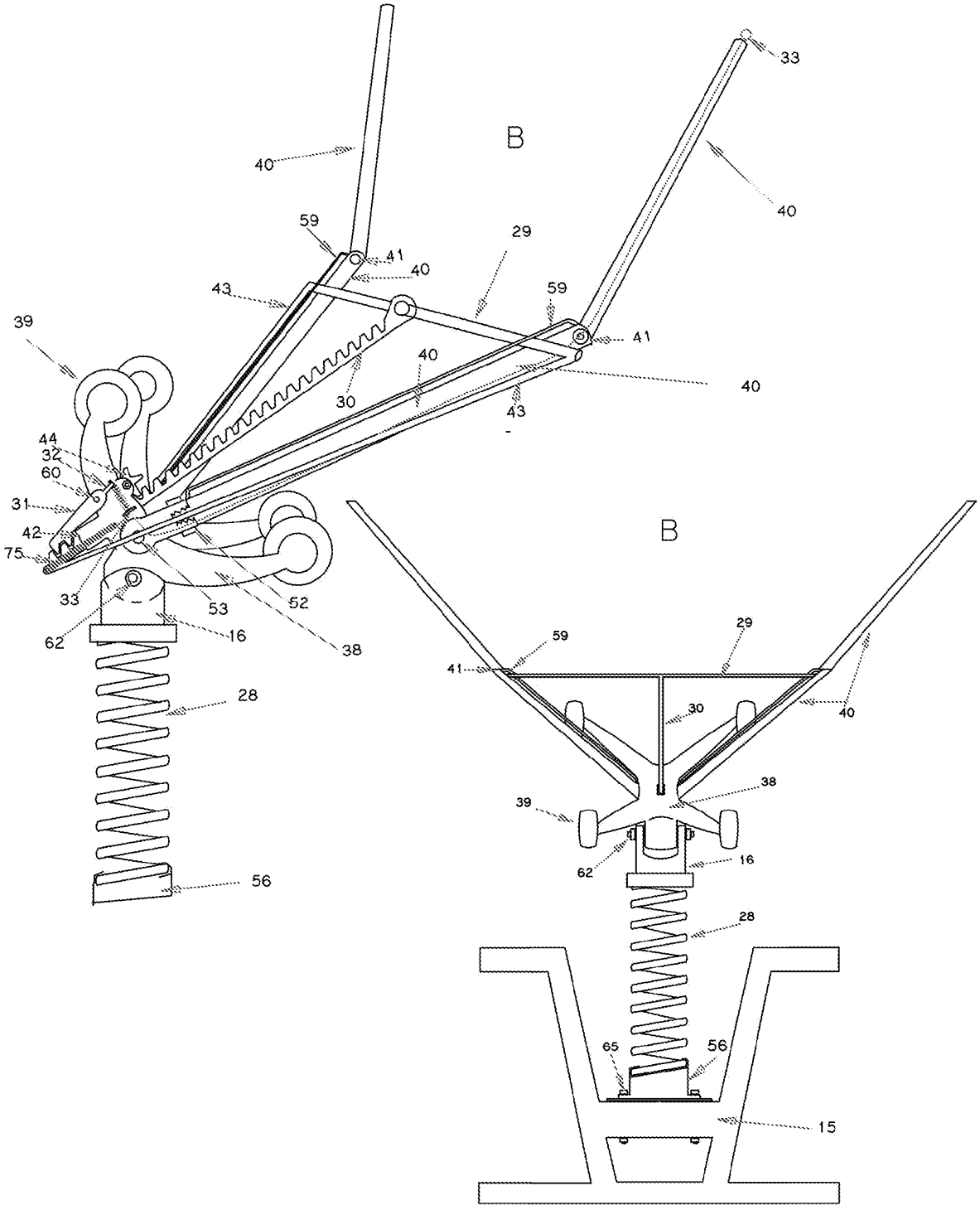
[Fig. 4]




[Fig. 5]

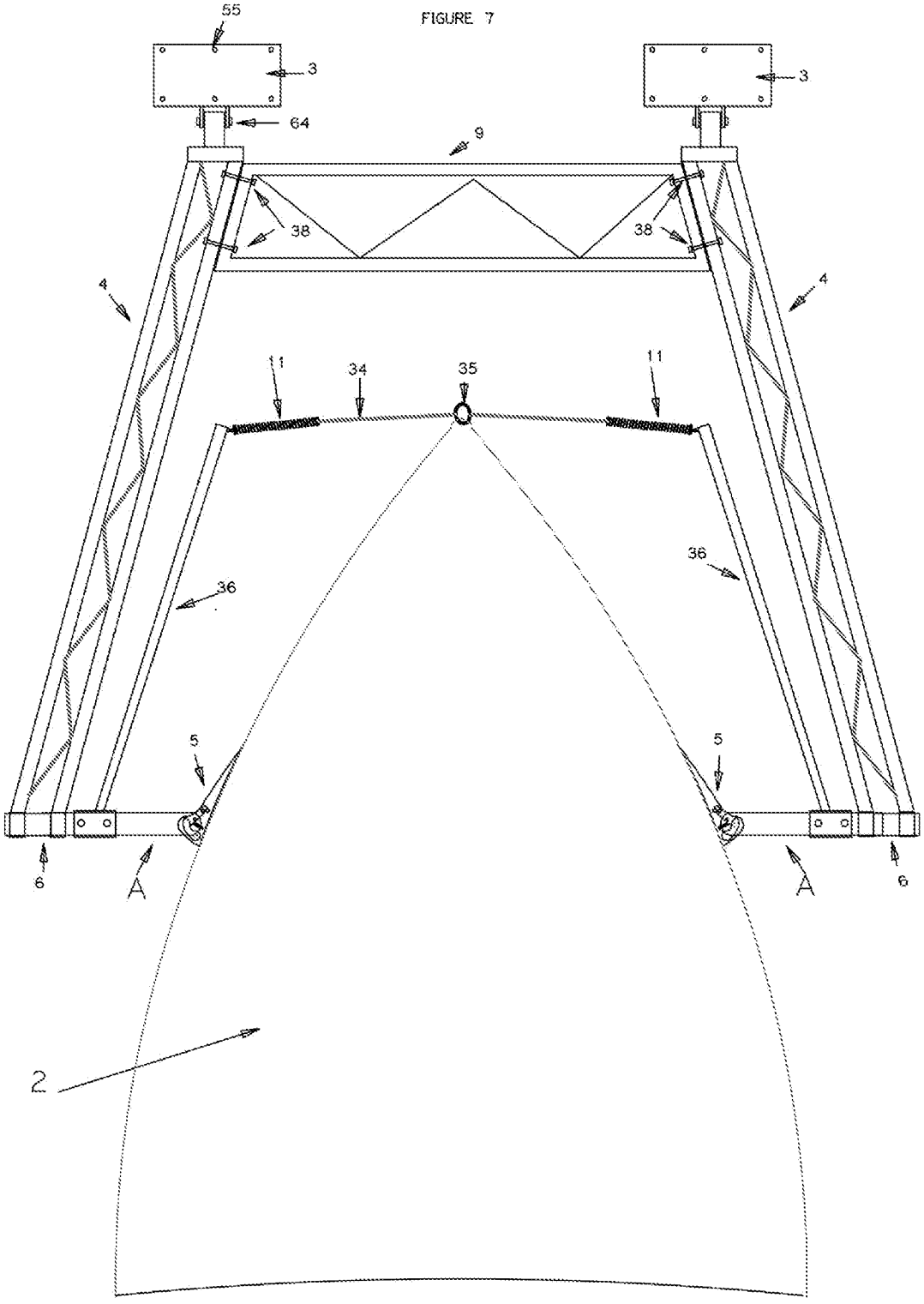


[Fig. 6]

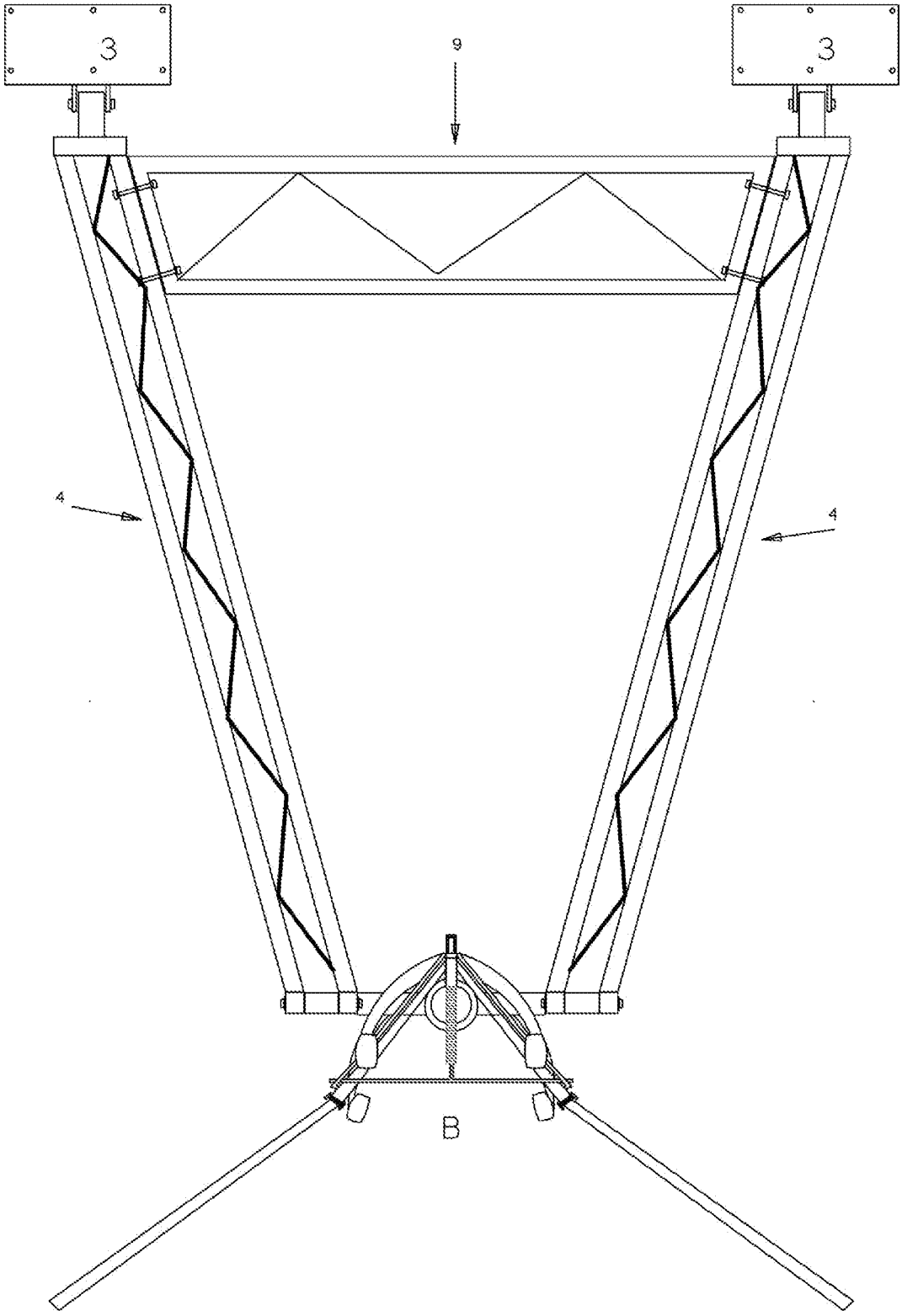


[Fig. 7]

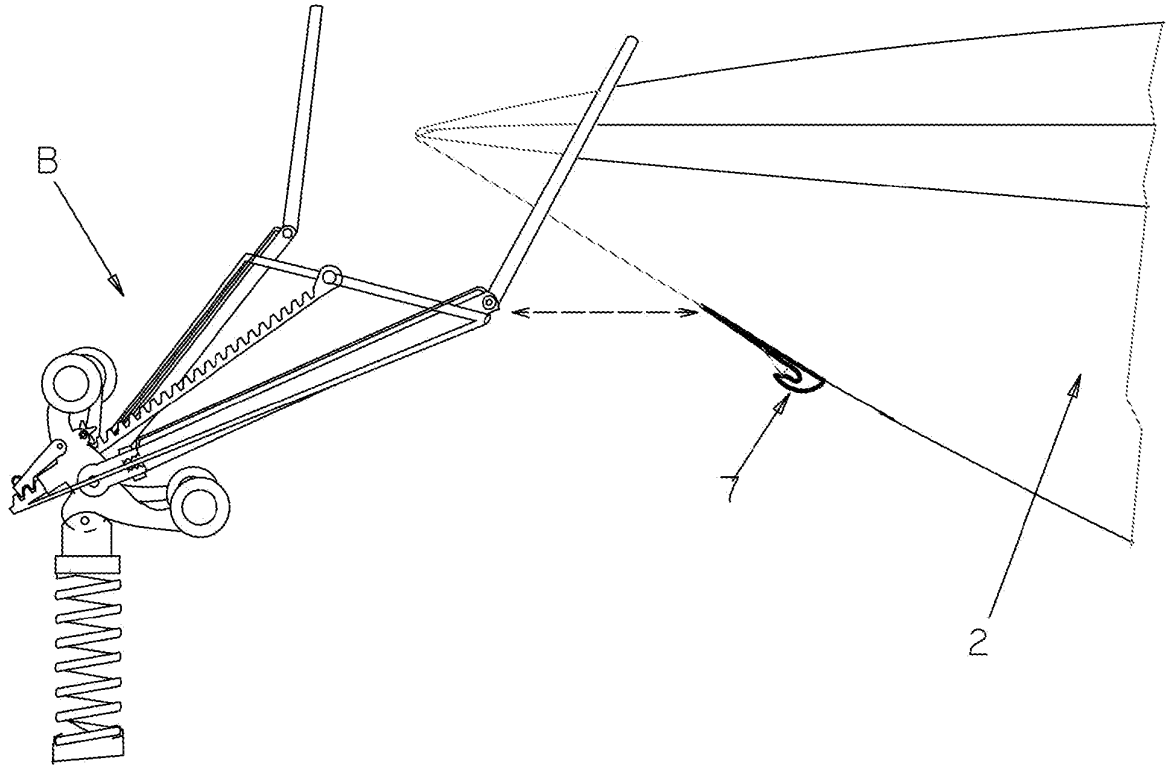
FIGURE 7



[Fig. 8]



[Fig. 9]



[Fig. 10]

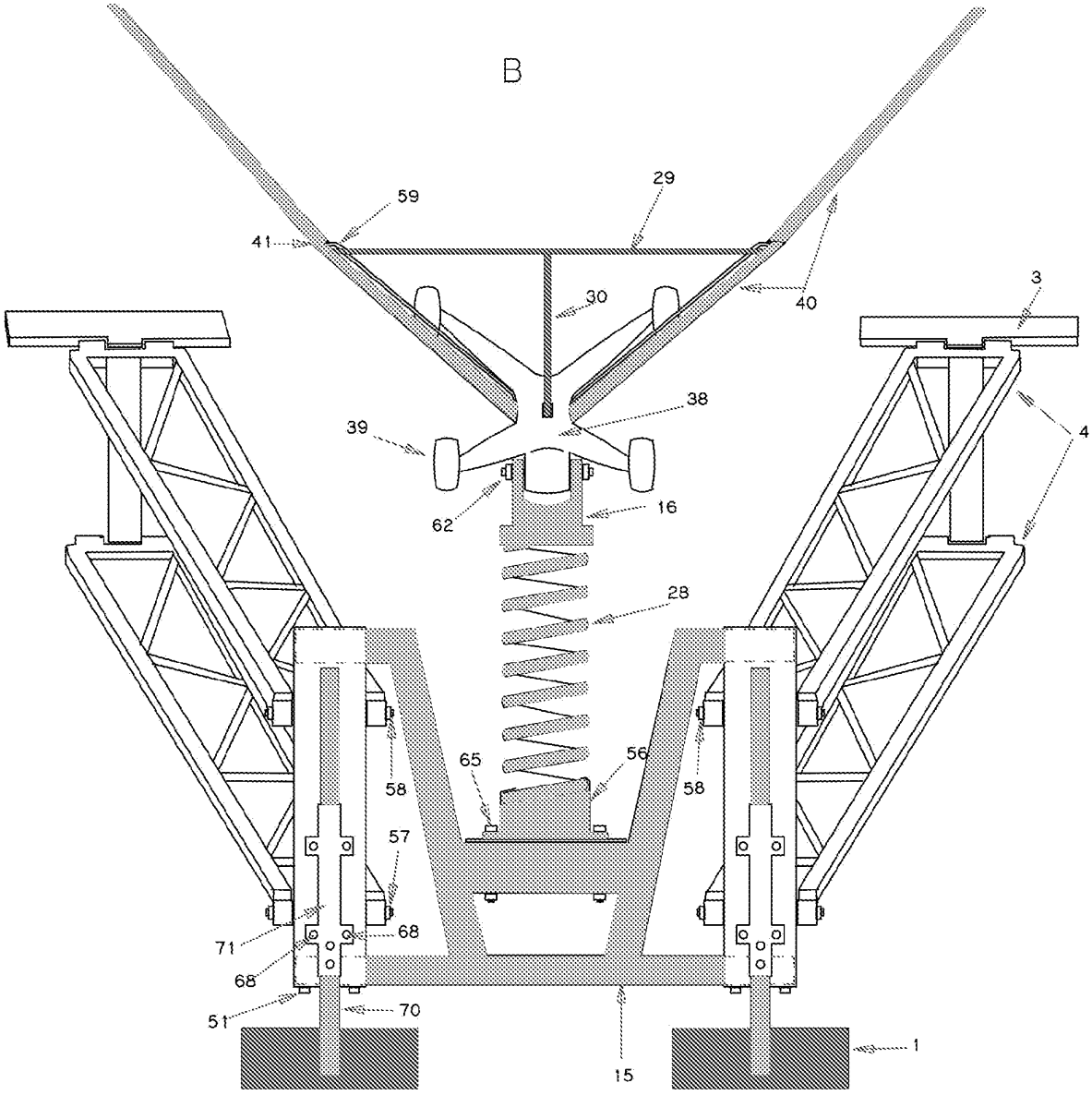
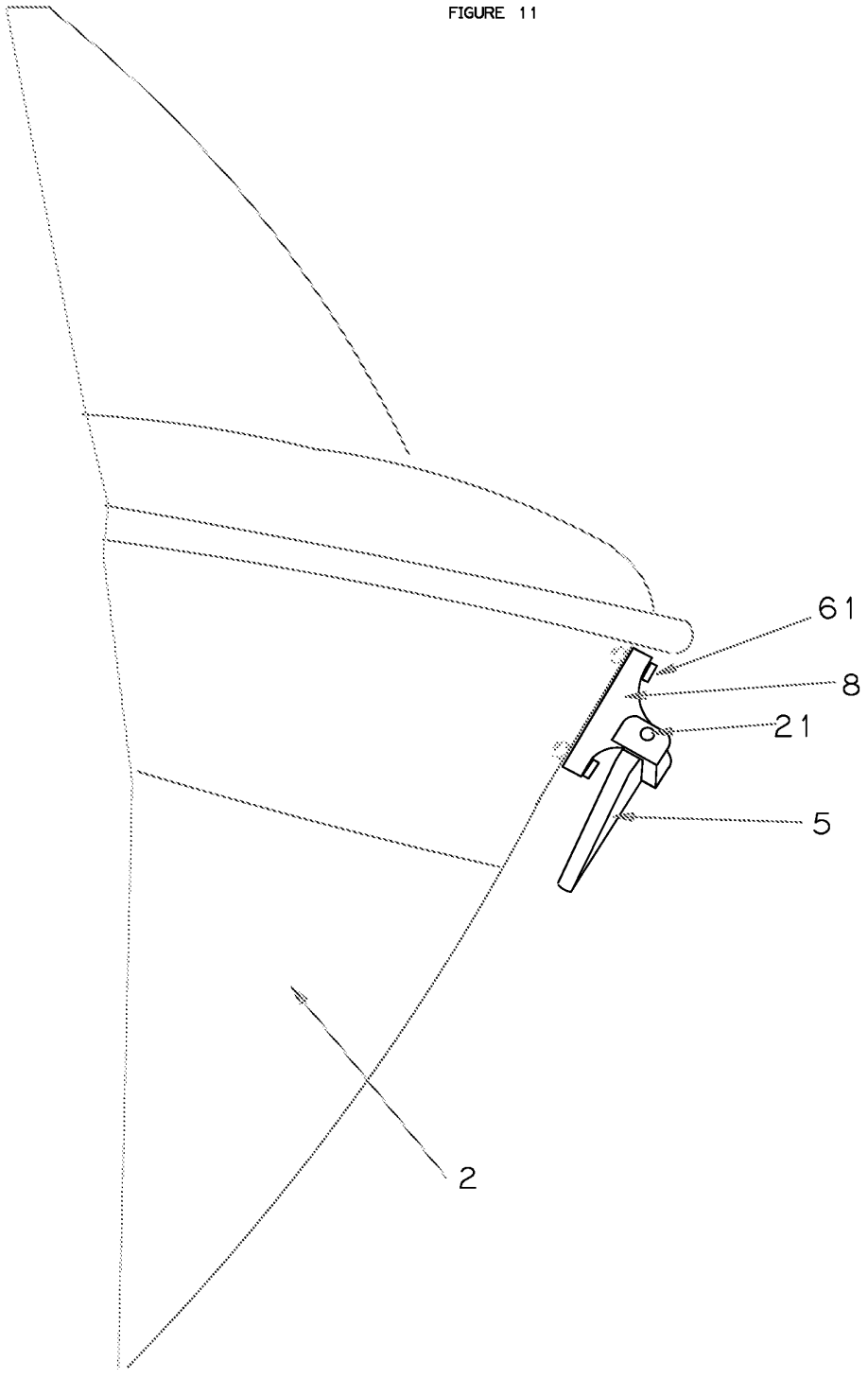
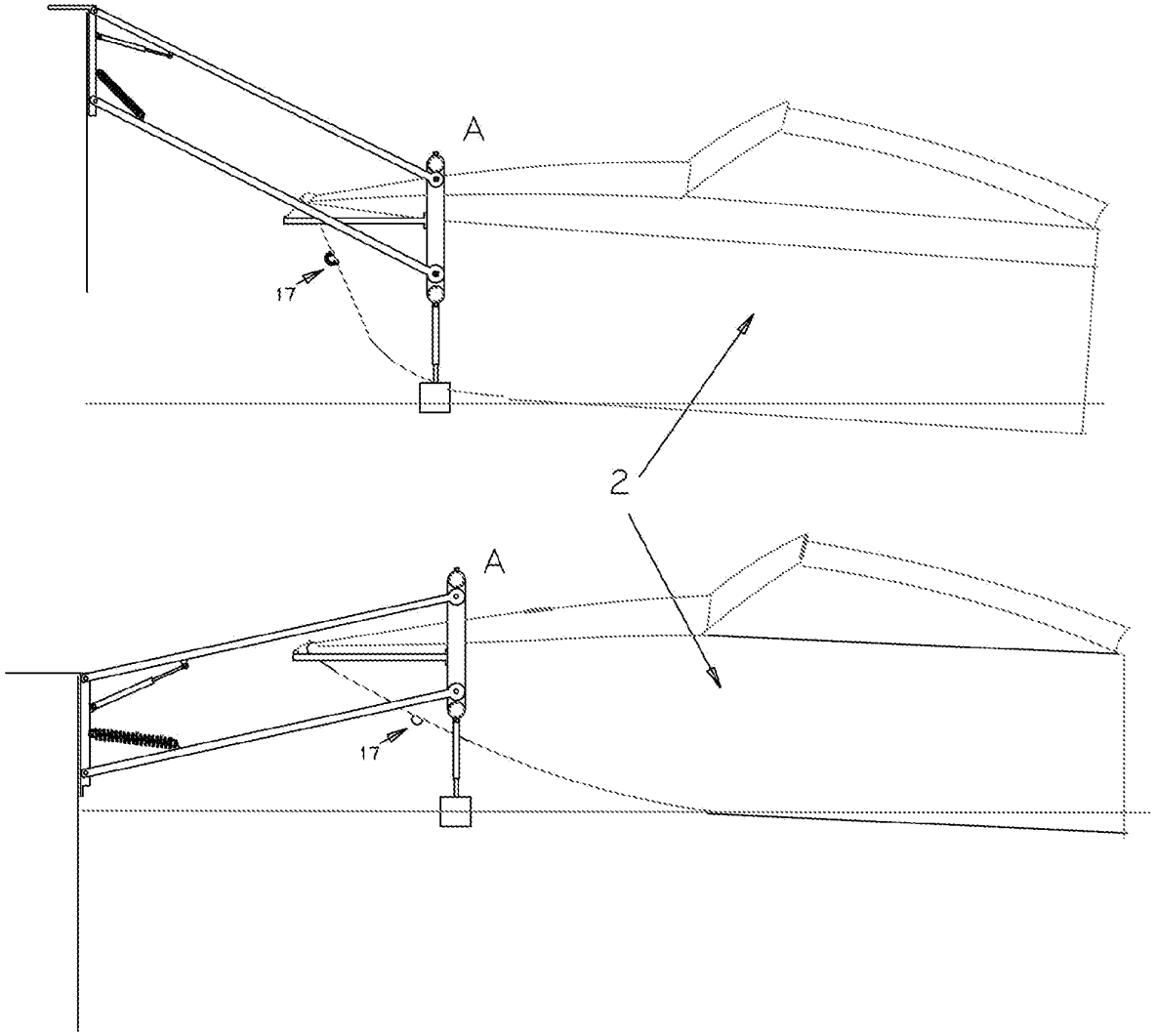


Figure 11.

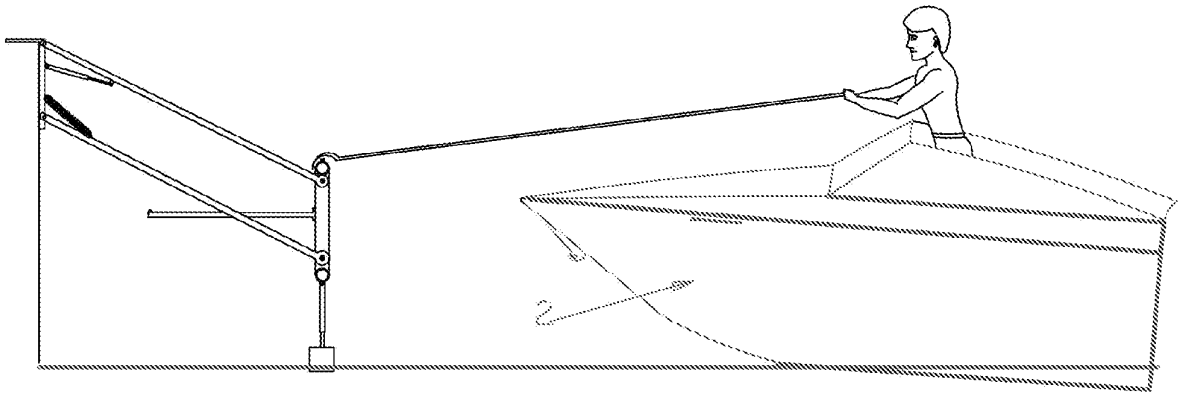
FIGURE 11



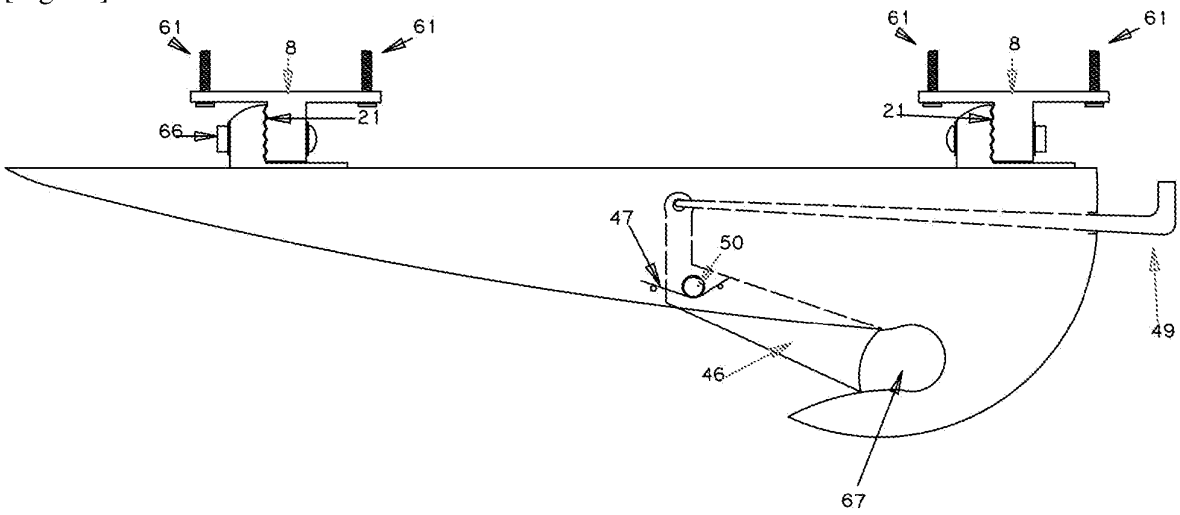
[Fig. 12]



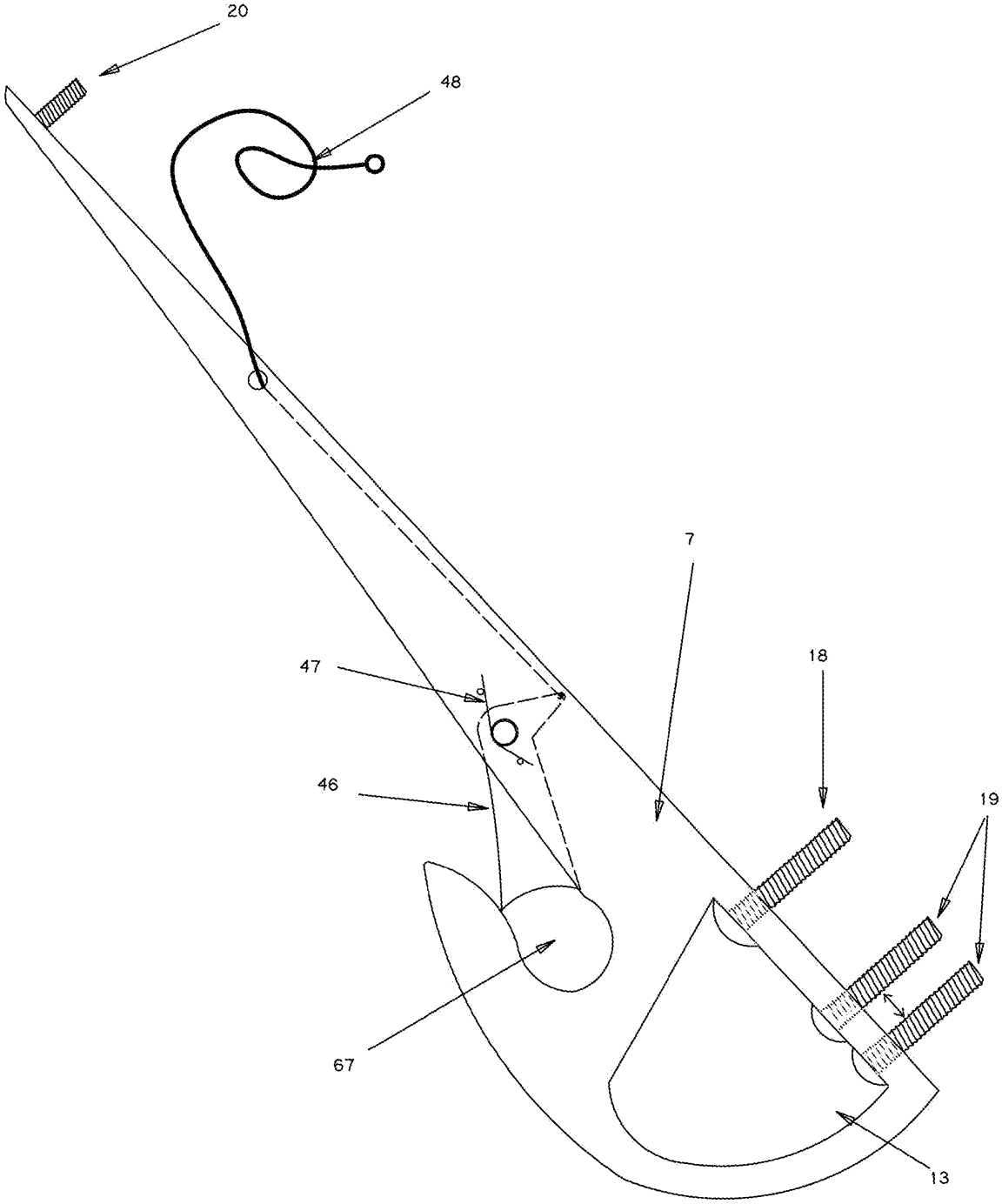

[Fig. 13]



[Fig. 14]



[Fig. 15]



# INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2023/053009

A. CLASSIFICATION OF SUBJECT MATTER
INV. B63B21/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | CN 112 942 252 A (UNIV GUANGDONG OCEAN)<br>11 June 2021 (2021-06-11)<br>figures 1-4, 7 | 1-3 |
| A | WO 2021/017483 A1 (UNIV DALIAN TECH [CN])<br>4 February 2021 (2021-02-04)<br>figure 1 | 1,2 |
| A | US 3 155 069 A (WILLIAM ROSS JOHN ET AL)<br>3 November 1964 (1964-11-03)<br>figures 2,3 | 1,3 |
| A | WO 2009/058977 A2 (EBBENGA MARK [US])<br>7 May 2009 (2009-05-07)<br>figures 1-3 | 4 |
| A | US 4 751 892 A (SECHEL DANIEL [US] ET AL)<br>21 June 1988 (1988-06-21)<br>figures 1-6 | 5 |

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 23 October 2023 | 06/11/2023 |

| Name and mailing address of the ISA/ | Authorized officer |
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| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Székely, Zsolt |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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