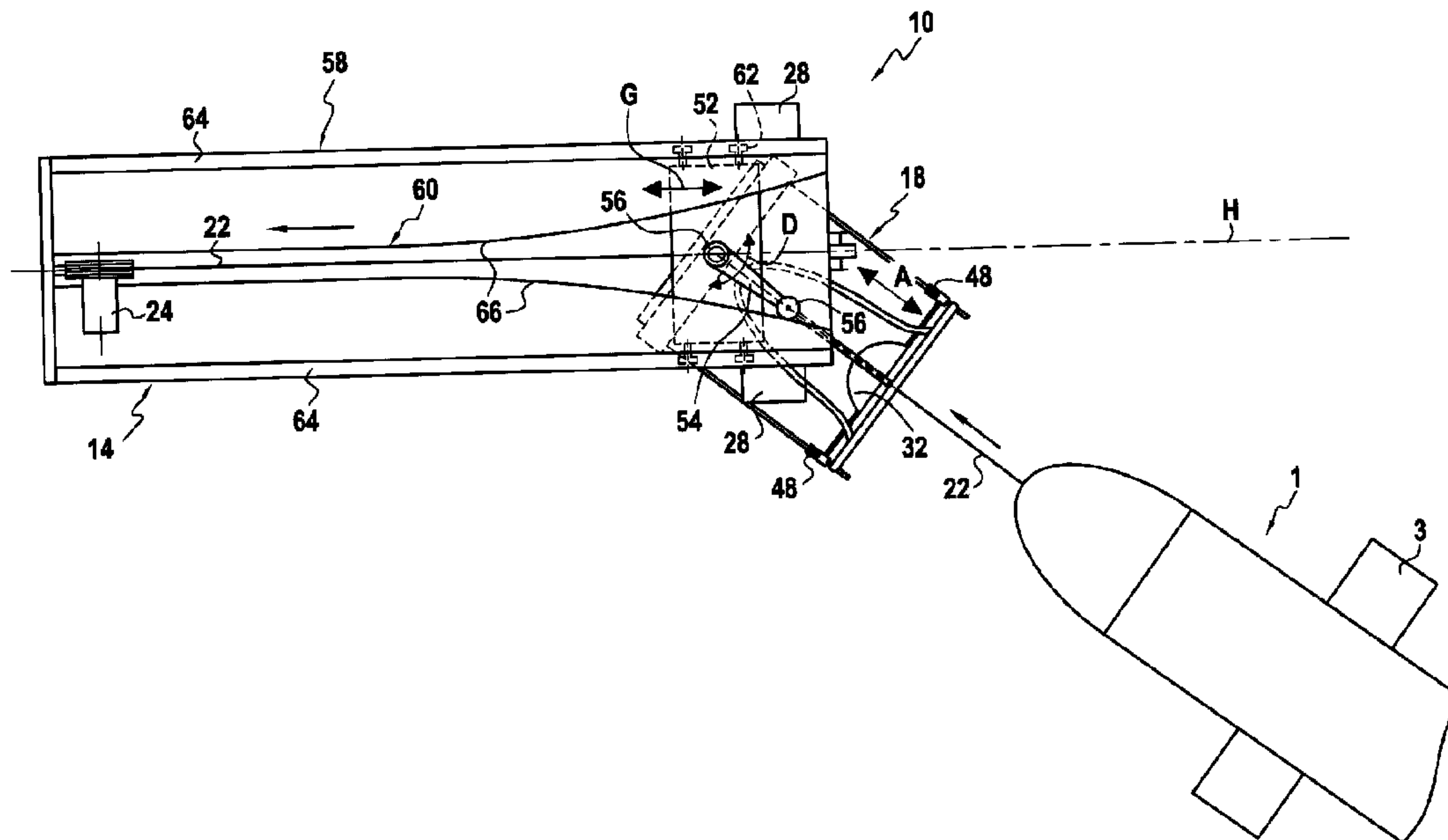




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(54) Titre : APPAREIL DE RECUPERATION D'UN VEHICULE MARIN DE SURFACE OU D'UN VEHICULE SOUS-MARIN  
(54) Title: APPARATUS FOR RECOVERING A SURFACE MARINE VEHICLE OR AN UNDERWATER VEHICLE



(57) Abrégé/Abstract:

Apparatus for recovering an underwater or marine vehicle, particularly an AUV, comprising a chassis (14) defining a housing that the vehicle (1) can enter, via an entrance, and comprising: receiving means (18) for receiving the nose of the vehicle (1), these means being capable of moving along the length of said housing as the vehicle enters it, these receiving means (18) having sufficient freedom of movement relative to the chassis (14) that they can accompany the movement of the vehicle, when they lie near the entrance to the housing; and guide means (58, 60) for guiding the receiving means (18) when the vehicle enters the housing, and for orientating these receiving means (8), and the vehicle (1), by restricting their freedom of movement relative to the chassis as the vehicle gradually enters the housing.



## A B S T R A C T

## APPARATUS FOR RECOVERING A SURFACE MARINE VEHICLE OR AN UNDERWATER VEHICLE

5

Apparatus for recovering a surface marine vehicle or an underwater vehicle, in particular an AUV, the apparatus comprising a frame (14) defining a housing into which the vehicle (1) can penetrate via an entrance, and

10 further comprising:

• reception means (18) for receiving the nose of the vehicle (1), reception means being capable of moving along said housing when the vehicle penetrates therein, said reception means (18) possessing sufficient freedom

15 of movement relative to the frame (14) to be able to follow the movement of the vehicle while the reception means and the vehicle are situated in the vicinity of the entrance of the housing; and

• guide means (58, 60) for guiding the reception means (18) when the vehicle penetrates into the housing, and for causing the reception means (18) and the vehicle (1) to become aligned therealong by progressively limiting their freedom to move relative to the frame as the vehicle penetrates into the housing.

25

30

Translation of the title and the abstract as they were when originally filed by the

35 Applicant. No account has been taken of any changes that might have been made subsequently by the PCT Authorities acting ex officio, e.g. under PCT Rules 37.2, 38.2, and/or 48.3.

# APPARATUS FOR RECOVERING A SURFACE MARINE VEHICLE OR AN UNDERWATER VEHICLE

The invention relates to apparatus for recovering a surface marine vehicle or an underwater vehicle.

5 The apparatus can be used in particular for recovering an autonomous underwater vehicle (AUV).

More particularly, the invention relates to apparatus of the type comprising a frame defining a housing into which said vehicle can penetrate in order to  
10 be recovered.

Document WO 00/71415 describes apparatus of this type, which apparatus can be thought of as being a cage that serves to receive an AUV. The cage is fully submerged. The AUV of WO 00/71415 is torpedo-shaped, it  
15 possesses its own propulsion means, and it is remotely controlled. The AUV approaches the cage and penetrates therein autonomously. Blades fixed at the entrance to the cage and disposed like the petals of a flower form a frustoconical ring through which the AUV passes in order  
20 to penetrate into the cage.

The apparatus of WO 00/71415 presents the following drawbacks. Firstly it is necessary for the AUV to be brought sufficiently closely into alignment with the cage to enable it to penetrate therein. If the AUV is  
25 excessively offset (whether angularly or radially) relative to the main axis of the cage, it cannot go through the above-mentioned frustoconical ring. It is difficult to obtain correct alignment in rough water, because of the movements (oscillations) of the cage.  
30 This is made even more difficult when the cage floats on the surface of the water (instead of being submerged), since it is then tossed about by the waves and the swell.

In addition, the apparatus of WO 00/71415 is not suitable for recovering AUVs that have large fins, since  
35 the fins would be damaged on passing through said frustoconical ring.

An object of the invention is to provide recovery apparatus that does not have the above-mentioned drawbacks.

This object is achieved by an apparatus for recovering a surface marine vehicle or an underwater vehicle, the apparatus comprising a frame defining a housing into which the vehicle can penetrate via an entrance, the apparatus being characterized in that it further comprises:

• reception means for receiving a portion of the vehicle and capable of moving along said housing when the vehicle penetrates therein, said reception means having sufficient freedom of movement relative to the frame to follow the movement of the vehicle while the reception means and the vehicle are situated in the vicinity of the entrance to the housing; and

• guide means for guiding the reception means along said housing and for causing the reception means together with the vehicle to become aligned therealong by progressively limiting their freedom to move relative to the frame as the vehicle penetrates into the housing.

It should be observed that the apparatus of the invention may be fitted with floats that enable it to stay on the surface of the water, or on the contrary it may be fully submerged. The apparatus can be used for recovering various types of vehicle, whether floating or submerged in controlled manner, and in particular an AUV, a torpedo, a surface drone, or a vehicle of similar architecture.

The freedom of movement of said reception means makes it easier to recover the vehicle and is found to be particularly useful in rough water, because:

• firstly it enables the reception means to be positioned in such a manner as to receive the vehicle correctly; and

• secondly it limits or even avoids mechanical stresses appearing in the vehicle when a portion of the

vehicle is held in the reception means and the vehicle begins to penetrate into said housing.

5 In addition, the way the vehicle is guided and aligned inside the housing of the apparatus by said reception means makes it easier for the vehicle to penetrate and limits or even avoids impacts between fragile portions of the vehicle (and in particular its fins or any other projecting portion) and the frame of the apparatus.

10 In an embodiment, the apparatus of the invention includes puller means mounted on the frame for pulling said vehicle into the housing and advantageously, said puller means comprise a cable winder device enabling said vehicle to be pulled into the housing via a cable  
15 connected to the vehicle.

The vehicle therefore does not need to travel autonomously right up to the cage. It is thus possible to recover an autonomous vehicle (i.e. a vehicle fitted with its own propulsion means), and also to recover an  
20 autonomous vehicle that is adrift (i.e. having propulsion means that have broken down or run out of energy) or a vehicle that is not autonomous (i.e. that does not have any propulsion means).

The apparatus of the invention can be used equally  
25 well for recovering a vehicle or for launching one.

The invention also provides an installation for recovering a surface marine vehicle or an underwater vehicle from a recovery base, the installation comprising a recovery apparatus of the invention and puller means  
30 designed to be mounted on the recovery base and capable of pulling said apparatus (together with the vehicle housed therein) via a flexible connection.

Said recovery base may be a boat, a quay, an off-shore platform, etc.

35 The term "flexible connection" is used to designate any type of connection capable of being tensioned and of relaxing as a function of the traction exerted thereon.

When relaxed, the flexible connection enables the recovery apparatus to move freely relative to said base. In particular when the recovery base is a boat, the flexible connection serves to avoid the boat entraining the cage together therewith whenever the boat oscillates in rough water (pitching, rolling, heaving).

Typically, the flexible connection of the installation is a cable, and the puller means comprise a cable winder device.

10 In addition, in an embodiment, handling equipment is generally used in association with the puller means mounted on the recovery base, the handling equipment also being mounted on said base. The equipment may be a crane, a gantry, or a jib. The puller means and the  
15 handling means enable the recovery apparatus to be lifted, together with the vehicle, onto the recovery base and enable them to be placed easily on an appropriate support.

The invention and its advantages can be better  
20 understood on reading the following detailed description. The description is given with reference to the accompanying sheets of figures, in which:

- Figures 1 to 3 show an example of a recovery installation of the invention respectively in side view,  
25 plan view, and end view;

- Figure 4 shows the installation of Figures 1 to 3 in side view when the vehicle for recovery is taken out of the water;

- Figures 5 to 7 show, in part only, an example of  
30 recovery apparatus of the invention, respectively in side view in longitudinal section, in plan view, and in end view; and

- Figure 8 shows the apparatus of Figures 5 to 7 being used, in this example, to launch a vehicle.

35 The installation of Figures 1 to 4 serves to recover a vehicle 1 from the water and/or to launch it.

By way of example, the vehicle 1 is an AUV that is torpedo-shaped. It should be observed that it has two large side fins in its middle portion.

5 The installation comprises a boat 5 as a recovery base. The boat 5 is fitted with a winch 7 for winding a cable 9 in and out. The cable is preferably a textile cable.

10 The installation also comprises a recovery apparatus within which the vehicle 1 can be received, at least in part.

To refer to the recovery apparatus, the term "cage" 10 is used below. The cage 10 is fitted on its sides with floats 12 that enable it to remain at the surface of the water and to adjust its immersion depth.

15 In a particular embodiment, the floats 12 are connected to said cage via hinges that allow the floats to flap up and down. On the surface of the water, the floats thus move away from the cage so as to maximize stability and avoiding impeding entry of the vehicle 1.  
20 Advantageously, when not in the water, the floats 12 extend along the cage 10 on either side thereof in such a manner as to protect it (and also the vehicle 1) from possible lateral impacts. Such lateral impacts may occur, in particular, while the cage 10 is being hoisted  
25 on board the boat 5. The floats 12 are for example boat fenders.

The cage 10 comprises:

• A frame 14 defining a housing 16 with an entrance through which the vehicle 1 can penetrate. In Figures 1  
30 and 2, this entrance is to the right of the cage, and in Figure 3, the entrance is seen end on.

• Receiver means 18 suitable for receiving the front portion of the vehicle 1, referred to below as its "nose". The receiver means 18 define a cavity 20 of  
35 shape that is complementary to the shape of the nose of the vehicle 1. These receiver means 18 have a cable 22 passing therethrough, a passage 23 being formed for this

purpose in the receiver means 18 through the end of the cavity 20 (see Figures 5 and 7).

• Guide means for guiding and aligning the receiver means 18 together with the vehicle 1 relative to the frame 14 so as to facilitate penetration of the vehicle 1 into the cage 10.

• Puller means fastened to frame 14 enabling the vehicle 1 to be pulled into the housing 16 inside the cage 10, via a flexible connection, typically the cable 22, connected to the vehicle 1. These puller means comprise a winder device for winding the cable 22 in and/or out, which device is formed by a winch 24. The cable 22 may be a textile cable or a metal cable. The winch 24 may be remotely controlled, and in particular controlled from the boat.

• Holder means for holding the vehicle 1 inside the housing 16 and suitable for preventing the vehicle 1 from moving back out from the cage 10 once it has entered it.

• At least one energy source (e.g. at least one battery 25) for powering the puller means and, if necessary, the holder means. It is possible to provide holder means that are not powered with energy, being triggered mechanically by the vehicle 1 going past.

It should be observed that Figures 5 to 9 do not show all of the portions of the cage 10. In particular, the bottom portions of the cage are not shown. These figures seek to show more particularly the reception means and the guide means.

Said reception means 18 comprise an element 32 that is movable between the entrance and the end of the cavity 20. The cable 22 passes through this movable element 32, preferably through its center. In this example, the movable element 32 comprises a cup 34 suitable for receiving the nose of the vehicle 1 (see Figure 7), and presenting a central hole 35 through which the cable 22 passes. A plurality of guide branches 36 (generally at least two diametrically-opposite branches) extend from

the periphery of the cup 34 and connect it to the structure 37 of the reception means 18. The end of each branch 36 can slide relative to said structure 37 so that the movable element 32 can slide between the entrance and the end of the cavity 20, as represented by double-headed arrow A in Figure 5.

The cage 10 includes first blocking means 38 (see Figure 5) for holding said reception means 18 in the vicinity of the entrance to the housing 16, before the vehicle 1 reaches the cage. Thus, said reception means 18 are in position for receiving the vehicle 1 when it arrives. In addition, insofar as the vehicle 1 is being pulled and is coming closer, the portion of the cable 22 that extends between the winch 24 and the reception means 18 (more precisely between the pulley 40, the passage 23, and the nose of the vehicle 1 - see Figures 5 and 6) forms a lever arm that serves to cause the cage 10 to point towards the nose of the vehicle 1, thereby making it easier to recover. It should be observed that the cage is capable of being aligned since it can move freely in the water, the cable(s) 9 (70) connecting the cage 10 to the boat 5 being slack.

The first blocking means 38 release said reception means 18 only when the nose of the vehicle 1 is fully engaged in the reception means 18 (more precisely in the cavity 20) and is about to penetrate into the housing 16. In this example, the first blocking means 38 comprise an abutment capable of retracting when the vehicle 1 exerts a thrust force thereon that is greater than a predetermined force. In practice, the abutment is formed by an arm 42 pivotally mounted on the frame 14, with a wheel 46 mounted at the end of the arm. The arm 42 is connected to a spring 44 of stiffness that is selected such that beyond a certain thrust force exerted by the vehicle 1 on the arm 42 via the reception means 18, the spring 44 deforms and allows the arm to retract by

pivoting as represented by arrow B (see Figure 5). Other types of blocking means could naturally be envisaged.

5 The cage also has second blocking means 48 (see Figure 6) for holding the moving element 32 of the reception means 18 at the entrance of the cavity 20, these second blocking means 48 releasing the movable element 32 when the vehicle 1 comes into contact with the movable element 32 (more precisely with the cup 34). By way of example, these second blocking means 48 operate on  
10 the same principle as the first blocking means 38 and comprise an abutment capable of retracting when the vehicle 1 acts thereon, via the movable element 32, to exert a thrust force that is greater than a predetermined force.

15 The presence of the movable element 32 and the blocking of the movable element at the end of the cavity 20 enable the portion of cable 22 that is tensioned between the end of the cavity 20, the entrance to said cavity, and the nose of the vehicle 1, to behave like a  
20 lever arm, thereby pointing said cavity 20 to face the vehicle 1, as the vehicle approaches. This makes the vehicle easier to recover.

The blocking force of the second blocking means 48 is less than the blocking force of the first blocking  
25 means 38, such that when the vehicle 1 penetrates into the reception means 18 (more precisely into the cavity 20), the second blocking means 48 give way before the first blocking means 38 give way.

Said reception means 18 are secured to a rod 50.  
30 When the cage 10 is in the water and floating, the rod 50 extends vertically (relative to the horizontal defined by the water). The rod 50 is mounted on a carriage 52 so as to be capable of pivoting about its axis C as represented by double-headed arrow D in Figures 5 to 7. The carriage  
35 52 is guided along the housing 16 of the cage 10 by said guide means.

The reception means 18 are mounted on the rod 50 in such a manner:

- as to be driven by the rod 50 when it pivots as represented by double-headed arrow D, referred to below as "horizontal" pivoting; and
- as to be capable of pivoting about an axis perpendicular to the axis C of the rod, as represented in Figures 5 and 7 by double-headed arrow E, referred to below as "vertical" pivoting.

These freedoms to move in vertical and horizontal pivoting enable the reception means 18 to point to face the nose of the vehicle 1 as it approaches, and once the nose of the vehicle 1 is received in the cavity 20, to follow the oscillations of the vehicle 1, until it comes to bear against the cradles of the rocker 29 (described below).

In this example, the bottom end of the rod 50 carries a fork 51, and between the two branches of the fork 51 there extends an axis F perpendicular to the axis C of the rod, about which the reception means are pivotally mounted. Abutments 53 limit the vertical pivot angle of the reception means 18.

A guide arm 54 is fastened to the end of the rod 50 so as to enable it to be entrained and pivoted about its axis C as represented by double-headed arrow D. The arm 54 presents a first end engaged with the rod 50 and a second end having a wheel 56 mounted thereon.

Said guide means comprise first and second superposed guides 58 and 60 extending along the housing 16.

The first guide 58 guides the carriage 52 along the housing 16. It is formed by a pair of parallel rails 64, and the carriage 52 is fitted with wheels 62 enabling it to move along the rails 64 as represented by double-headed arrow G shown in Figure 6.

The second guide 60 guides the guide arm 54 and, as a result, turns the rod 50 and the reception means 18 by

causing them to pivot horizontally as represented by double-headed arrow D. It is situated above the first guide 58. It is formed by a pair of rails 66 that come closer to each other on going away from the entrance to the cage 10. The guide arm 54 can pivot between these rails 66 as represented by double-headed arrow D, between a first position in which the wheel 56 is in contact with one of the rails 66, and a second position in which the wheel 56 is in contact with the other rail 66. The greater the spacing between the rails 66 the greater the freedom of the arm 54, and thus of the rod 50 and of the reception means 18 to pivot horizontally. Conversely, the further the vehicle 1 penetrates into the cage 10, the more the carriage 52 advances along the rails 66 that approach each other, and the smaller the freedom of the reception means 18 to pivot horizontally. Thus, as the vehicle 1 penetrates into the cage 10, the arm 54 and the reception means 18 are brought progressively into alignment along the main axis H of the cage 10. The reception means 18 entrain the vehicle 1 via its nose, and the vehicle 1 is likewise brought into alignment along the axis H (see Figure 6). It thus penetrates easily into the cage 10.

In its sides, the frame 14 of the cage 10 presents notches 68 that are open towards the entrance of the cage 10, serving to allow the lateral fins 3 of the vehicle 1 to pass therethrough (see Figures 1 and 4). Since the vehicle 1 is guided and correctly aligned on penetrating into the cage 10, the fins 3 are received in the notches 68 and are therefore not damaged.

In this example, said holder means comprise two rods 26 fitted with shoes at their ends, together with a mechanism for raising/lowering the rods. The rods 26 slide inside two boxes 28 containing said mechanism. These boxes 28 are fastened on either side of the frame 14 in the vicinity of the entrance to the cage 10. In the lowered position, the rods 26 are in contact with the

top face of the vehicle 1, as shown in Figures 4 and 8. It should be observed that the pressure exerted by the rods 26 on the vehicle 1 needs to be controlled so as to avoid damaging the vehicle.

5           In another embodiment (not shown), the holder means comprise a rod that is pivotally mounted on the frame 14 together with a mechanism, e.g. an actuator, for causing the rod to pivot. At its end, the rod carries a cradle that surrounds the top face of the vehicle 1. The  
10 vehicle 1 may possibly present a member that projects from its top face. After the vehicle has penetrated into the housing 16, the cradle is lowered and takes up position behind the projecting member, thereby enabling the vehicle 1 to be held inside the cage 10.

15           Other types of holder means could be envisaged. Advantageously, such means are remotely controlled, and preferably they are controlled from the boat 5.

          Furthermore, the bottom face of the vehicle 1 bears against a rocker 29 mounted on the frame. This rocker 29  
20 carries at each of its ends a respective cradle 30 on which the vehicle 1 rests. As shown in Figures 1 and 3, the cradles 30 extend transversely relative to the cage 10, under the housing 16. These cradles are easily withdrawn when the vehicle 1 is placed on a suitable  
25 working support present on the boat 5.

          An example of the method for recovering a surface marine vehicle or an underwater vehicle from a recovery base is described below, which method makes use of the above-described cage 10. In this example, the recovery  
30 base is the boat 5, and the vehicle to be recovered is the vehicle 1.

          Depending on the embodiment of the vehicle 1 and depending on operating circumstances, a cable 22' connected to the nose of the vehicle 1 is recovered from  
35 on board the boat 5. Thereafter, the cable 22' is connected to a cable 22" that is waiting in the cage 10. The cables 22' and 22" then form the above-mentioned

cable 22 that is caused to pass through the movable element 32, the passage 23 in the reception means 18, and around the pulley 40 situated at the end of the housing 16, and that is connected to the winch 24 of the cage 10  
5 (see Figure 5).

In the following step, the cage 10 is launched into the water. It remains connected to the boat 5 via the traction cable 9, also referred to as hoist cable, and via other cables 70 referred to as guide cables. At this  
10 stage, the cables 9 and 70 are relaxed such that the boat 5 does not entrain the cage 10 in its own movement. The cage 10 thus moves freely in the water.

In the following step, the winch 24 is remotely controlled to wind in the cable 22 so as to pull the  
15 vehicle 1, the reception means 18 situated at the entrance of the cage 10, and the winch 24 (in fact the pulley 40) situated at the end of the cage 10, forms a lever arm that causes the cage 10 to turn so that the axis H of the cage approaches the nose of the vehicle 1.  
20 In the same manner, the reception means 18 turn to face the nose of the vehicle 1 as it approaches because of the length of the cable 22 that extends from the end of the cavity 20 (i.e. the passage 23), via the movable element 32, to the nose of the vehicle 1.

25 The nose of the vehicle 1 initially comes into contact with the movable element 32, and as traction continues on the vehicle 1 it exerts thereon an ever increasing thrust force. Beyond a limit force, the second blocking means 48 release the movable element 32,  
30 which then moves in translation together with the nose of the vehicle 1 to the end of the cavity 20. The nose of the vehicle 1 then occupies the cavity 20. Relative movements between the reception means 18 and thus the vehicle 1 and the cage 10 are still allowed at this  
35 stage. The reception means can pivot vertically and horizontally as represented by double-headed arrows E and D. This limits the stresses that are exerted on the nose

of the vehicle 1, associated with the relative movement between the vehicle 1 and the cage 10.

As traction continues, the vehicle 1 exerts an ever increasing thrust force on the reception means 18.

5 Beyond a limit force, the first blocking means 38 release the carriage 52 to which the reception means 18 are connected via the rod 50. The carriage 52 then runs along the first guide 60 towards the end of the housing 16. Simultaneously, the guide arm 54 is guided along the  
10 first guide 58 and its freedom to move as represented by double-headed arrow D decreases progressively. The reception means 18 and the vehicle 1 thus become progressively aligned along the main axis H of the cage.

Once the nose of the vehicle 1 reaches the end of  
15 the housing 16, the rods 26 are remotely controlled to move down so as to hold the vehicle 1 in the cage. In this example, it should be observed that only a fraction of the vehicle 1 penetrates into the cage 10.

In the following step, the cage 10 together with the  
20 vehicle 1 is pulled by the cable 9 towards the boat 5 in order to be hoisted on board the boat 5. The guide cables 70 can also be used for pulling the cage 10 and the vehicle 1. For this purpose, the guide cables 70 can be pulled by hand or they may be connected to a cable  
25 winder device, e.g. winches analogous to the winch 7. Under such circumstances, the cables 70 and their winder devices form part of the puller means mounted on the recovery base, in the meaning of the invention.

When, as in this example, the cable 9 is associated  
30 with a gantry crane 72, the guide cables 70 are used to direct the cage 10 and the vehicle 1 so as to pass through the gantry 72. The cage 10 and the vehicle 1 are extracted from the water using the cable 9, while the cables 70 are used for guiding and passing the cage 10  
35 and the vehicle 1 through the gantry 72 prior to placing them on the deck of the boat 5.

An example of the method for launching a vehicle from a recovery base is described below, which method makes use of the above-described cage 10.

5 In this example, the recovery base is the boat 5 and the vehicle to be recovered is the vehicle 1. To begin with the vehicle 1 is held in the cage 10 and the cage is on board the boat 5.

10 In a first step, the winch 7, the traction cable 9, the gantry crane 72, and possibly the guide cables 70 are used to launch the cage 10.

15 Once the cage 10 is in the water, the vehicle previously held relative to the cage 10 (by the above-mentioned holder means) is released with the help of release means. In this example, the release means comprise a mechanism enabling the rods 26 to be raised. These release means are controlled remotely, advantageously from the launching base (i.e. the boat 5).

20 In the following step, the vehicle 1 is pulled out from the cage 10 with the help of puller means mounted on the cage. With reference to Figure 8, these puller means comprise a cable winder device, i.e. the winch 24 and the cable 22 as described above, together with a pulley 74 situated level with the entrance to the housing 16 of the cage 10. The cable 22 is connected to the winch 24, 25 extends as far as the pulley 74, passes round the pulley, and extends back to the carriage 52 to which it is connected. To extract the vehicle 1 from the cage 10, the winch 24 is actuated so that the carriage 52, the reception means 18, and the nose of the vehicle 1 are 30 pulled by the cable 22 towards the entrance of the housing 16. When the reception means 18 come close to the entrance of the housing 16, their freedom to move in pivoting (associated with the freedom of the guide arm 54) increases because of the wider spacing between the 35 rails 66 of the second guide 60. Thus, the freedom of the vehicle 1 to move relative to the cage 10 increases as the vehicle 1 is extracted from the cage 10, thereby

limiting or even avoiding mechanical stresses appearing in the nose of the vehicle 1. Said puller means are controlled remotely, advantageously from the launching base. When the vehicle 1 is fully extracted from its housing, it moves away from the cage 10 on its own since it is no longer connected thereto.

Depending on operating conditions, the vehicle 1 may be secured to the reception means 18 until the end of the extraction movement. It is then finally released either on command from the boat 5, as is advantageous, or else by means of a mechanical device placed on the reception means 18 and triggered automatically at the end of the stroke of said reception means.

## CLAIMS

1. Apparatus for recovering a surface marine vehicle or an underwater vehicle (1), the apparatus comprising a frame (14) defining a housing (16) into which the vehicle  
5 can penetrate via an entrance, the apparatus being characterized in that it further comprises:
- reception means (18) for receiving a portion of the vehicle (1) and capable of moving along said housing (16) when the vehicle penetrates therein, said reception  
10 means (18) having freedom of movement in pivoting relative to the frame (14) to follow the movement of the vehicle while the reception means and the vehicle are situated at the entrance of the housing; and
  - guide means (58, 60) for guiding the reception  
15 means (18) along said housing (16) and for causing the reception means together with the vehicle (1) to become aligned therealong by progressively limiting their freedom to move in pivoting relative to the frame (14) as the vehicle penetrates into the housing (16).
- 20
2. Apparatus according to claim 1, including puller means mounted on the frame (14) for pulling said vehicle (1) into the housing (16).
- 25
3. Apparatus according to claim 2, wherein said puller means comprise a cable winder device (24) enabling said vehicle (1) to be pulled into the housing (16) via a cable (22) connected to the vehicle.
- 30
4. Apparatus according to claim 3, wherein said reception means (18) define a cavity (20) suitable for receiving said portion of the vehicle (1), and having said cable (22) passing therethrough.
- 35
5. Apparatus according to any one of claims 1 to 4, including first blocking means (38) for holding said reception means (18) at the entrance of the housing (16),

said first blocking means releasing said reception means when said portion of the vehicle (1) is engaged in said reception means.

- 5 6. Apparatus according to claim 4 or 5, wherein said reception means (18) comprise a movable element (32) movable between the entrance and the end of said cavity (20) with said cable (22) passing therethrough.
- 10 7. Apparatus according to claim 6, including second blocking means (48) for holding said movable element (32) at the entrance of said cavity (20), said second blocking means releasing the movable element when the vehicle (1) comes into contact with said movable element.
- 15 8. Apparatus according to any one of claims 1 to 7, wherein said reception means (18) are secured to a rod (50), said rod being mounted on a carriage (52) in such a manner as to be capable of pivoting about its axis (C),
- 20 said carriage being guided along said housing by said guide means (58, 60).
9. Apparatus according to claim 8, wherein said reception means (18) are pivotally mounted on said rod (50) to
- 25 pivot about an axis (F) perpendicular to the axis (C) of the rod.
10. Apparatus according to claim 8 or claim 9, wherein a guide arm (54) is fastened to the end of said rod (50),
- 30 and the guide means comprise first and second superposed guides (58, 60) extending along said housing (16), the first guide (58) guiding the carriage (52) along said housing and the second guide (60) guiding the guide arm, thereby orienting the rod and the reception means (18).
- 35 11. Apparatus according to claim 10, wherein the second guide (60) is formed by a pair of rails (66), these rails

coming closer together as the distance from the entrance of the housing (16) increases, so as to limit the freedom of said guide arm (54) to move, thereby orienting the rod (50) and of the reception means (18).

5

12. Apparatus according to any one of claims 1 to 11, suitable for floating on water.

13. The use of apparatus according to any one of claims 1  
10 to 12 for recovering and/or launching a surface or underwater vehicle (1).

14. An installation for recovering a surface or  
underwater vehicle (1), from a recovery base (5), the  
15 installation comprising a recovery apparatus according to any one of claims 1 to 12 together with puller means (7) designed to be mounted on the recovery base and capable of pulling said apparatus via at least one flexible connection (9, 70).

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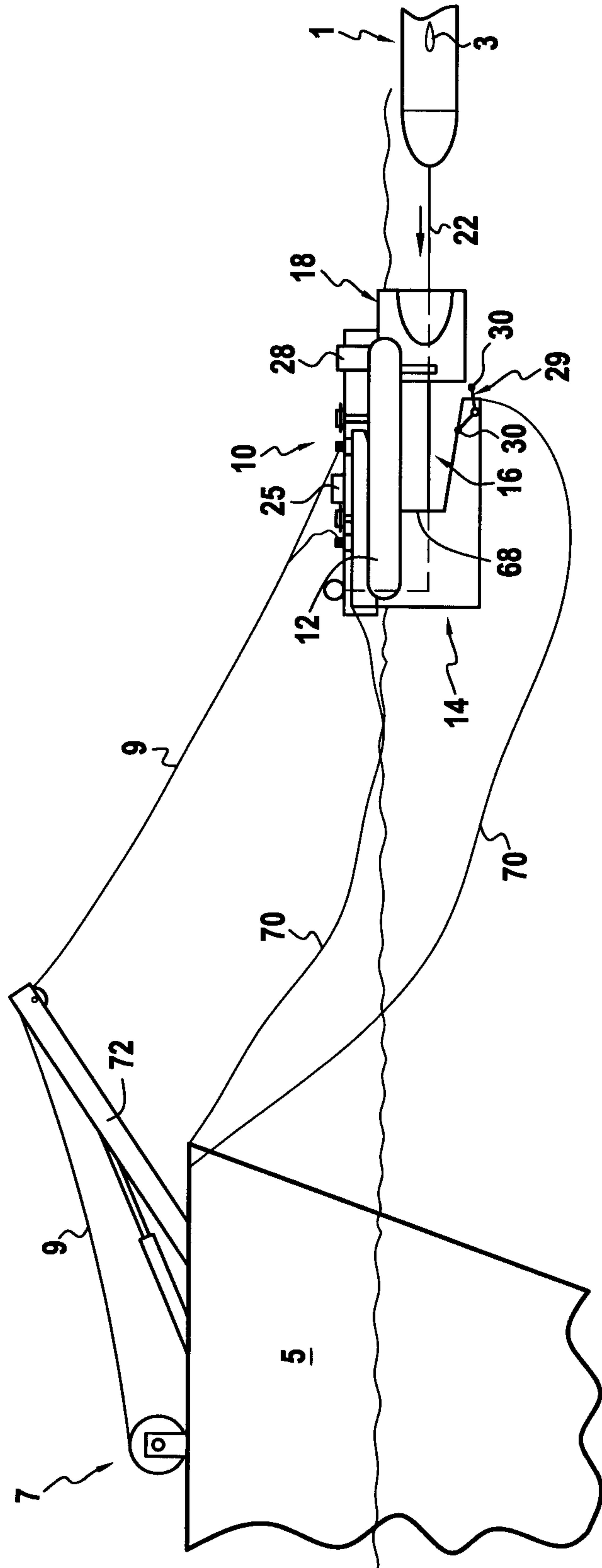


FIG.1

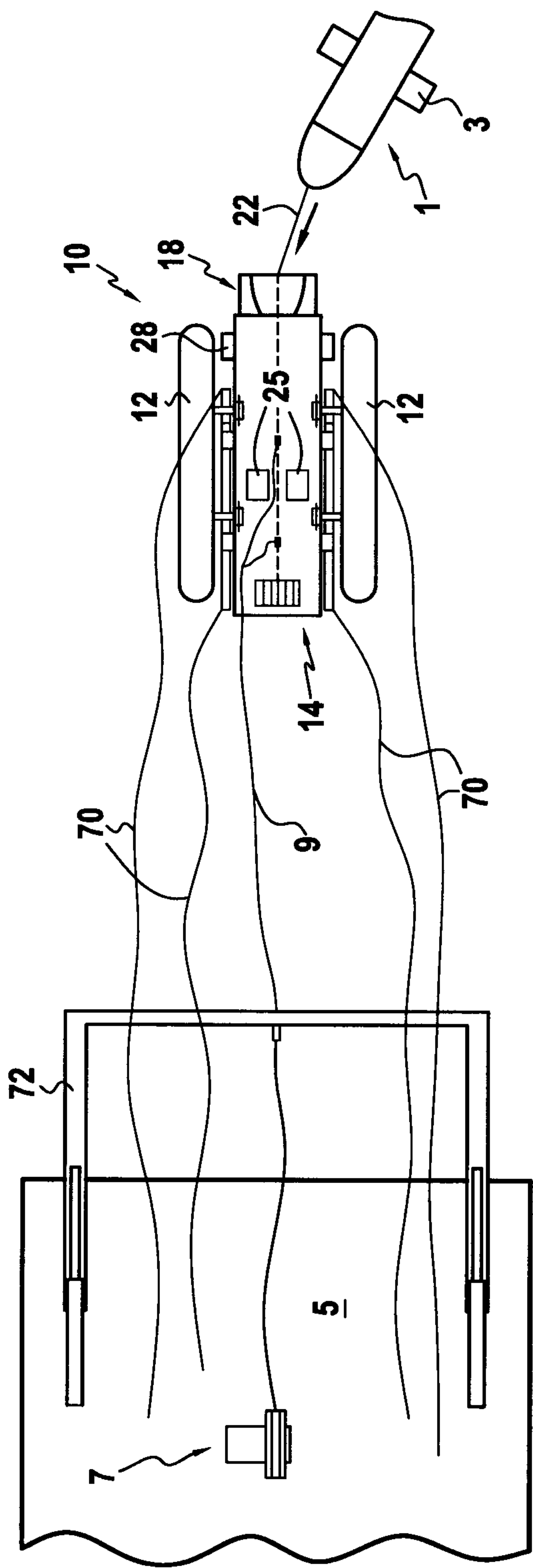


FIG. 2

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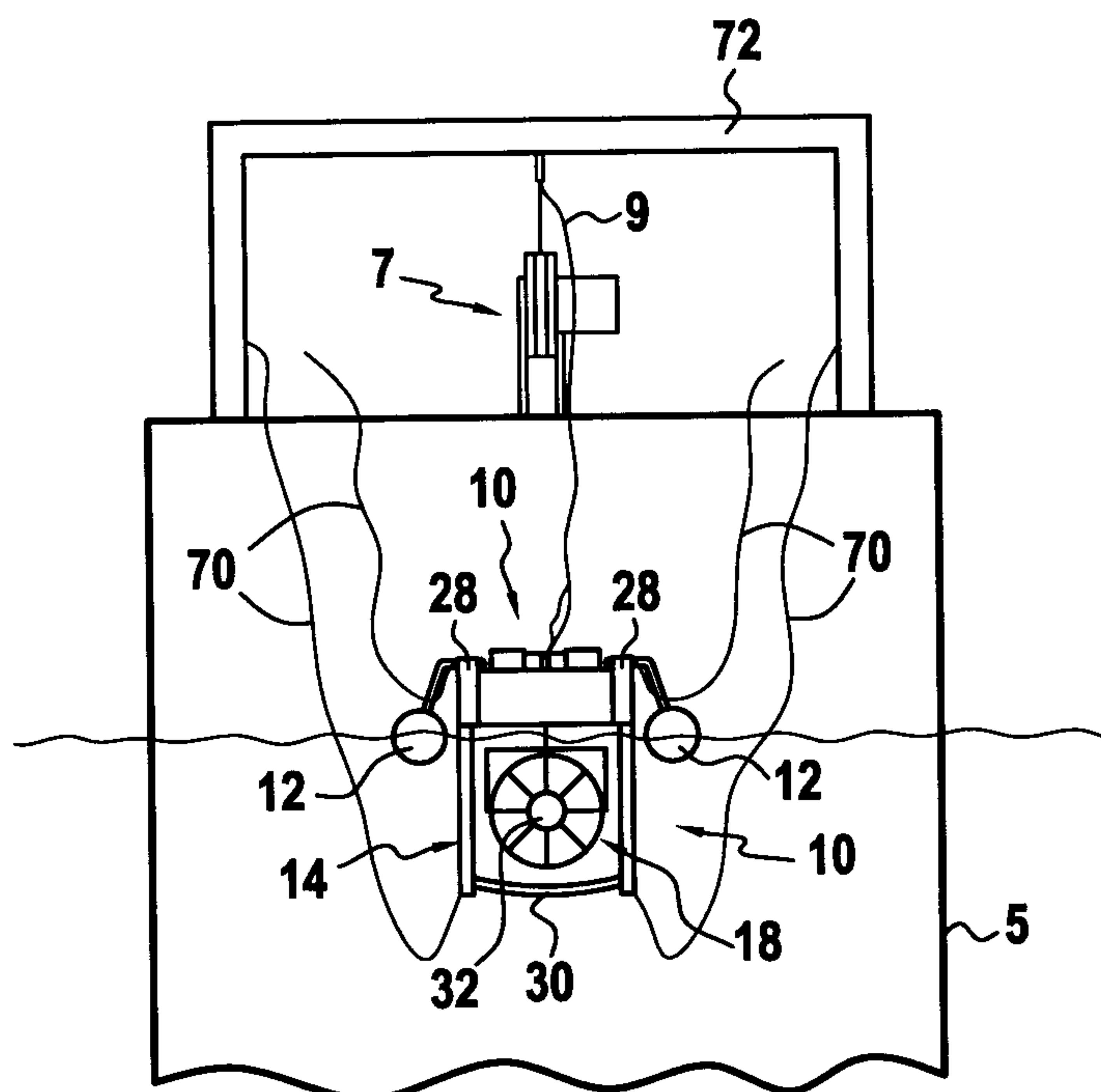


FIG.3

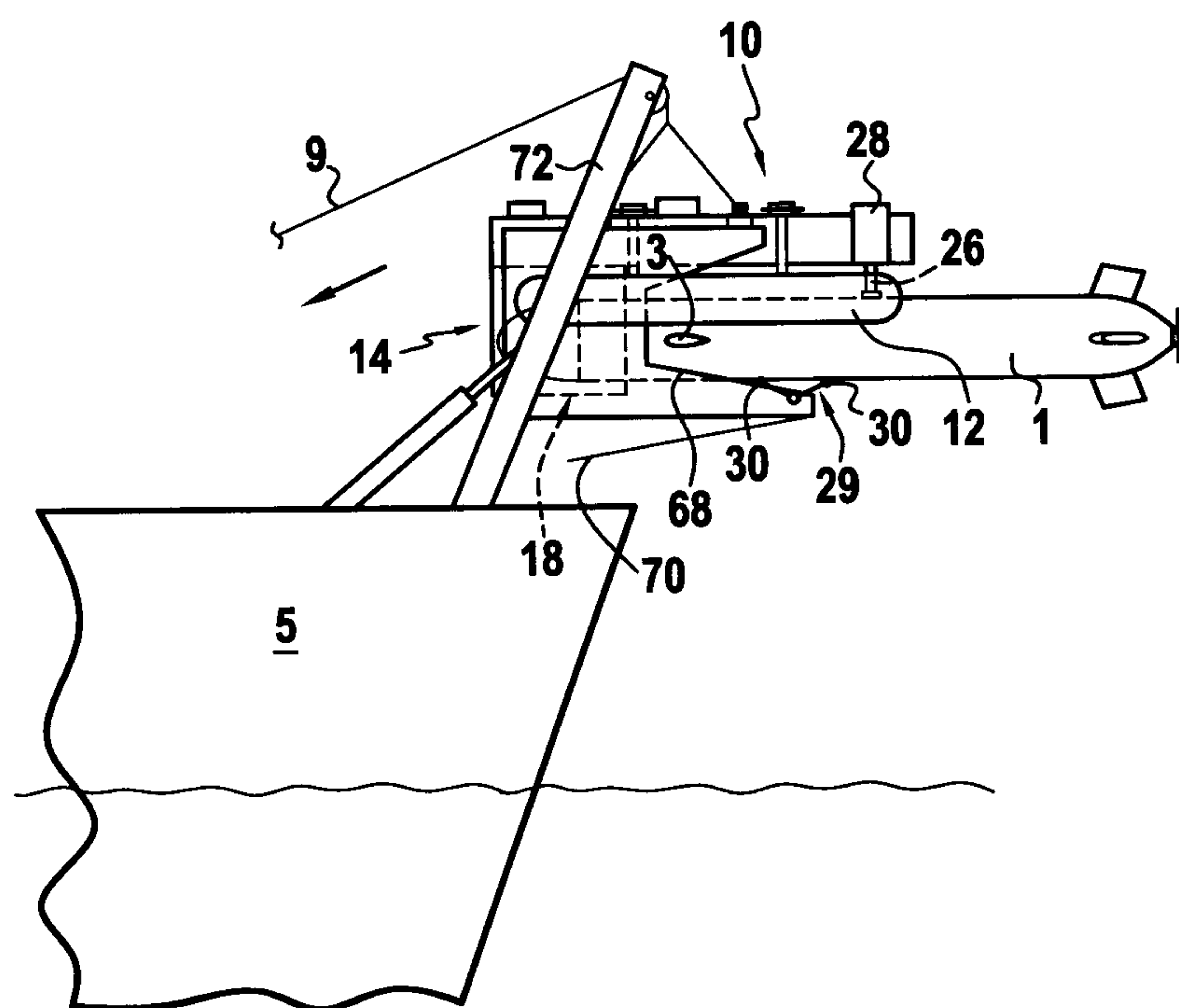


FIG.4

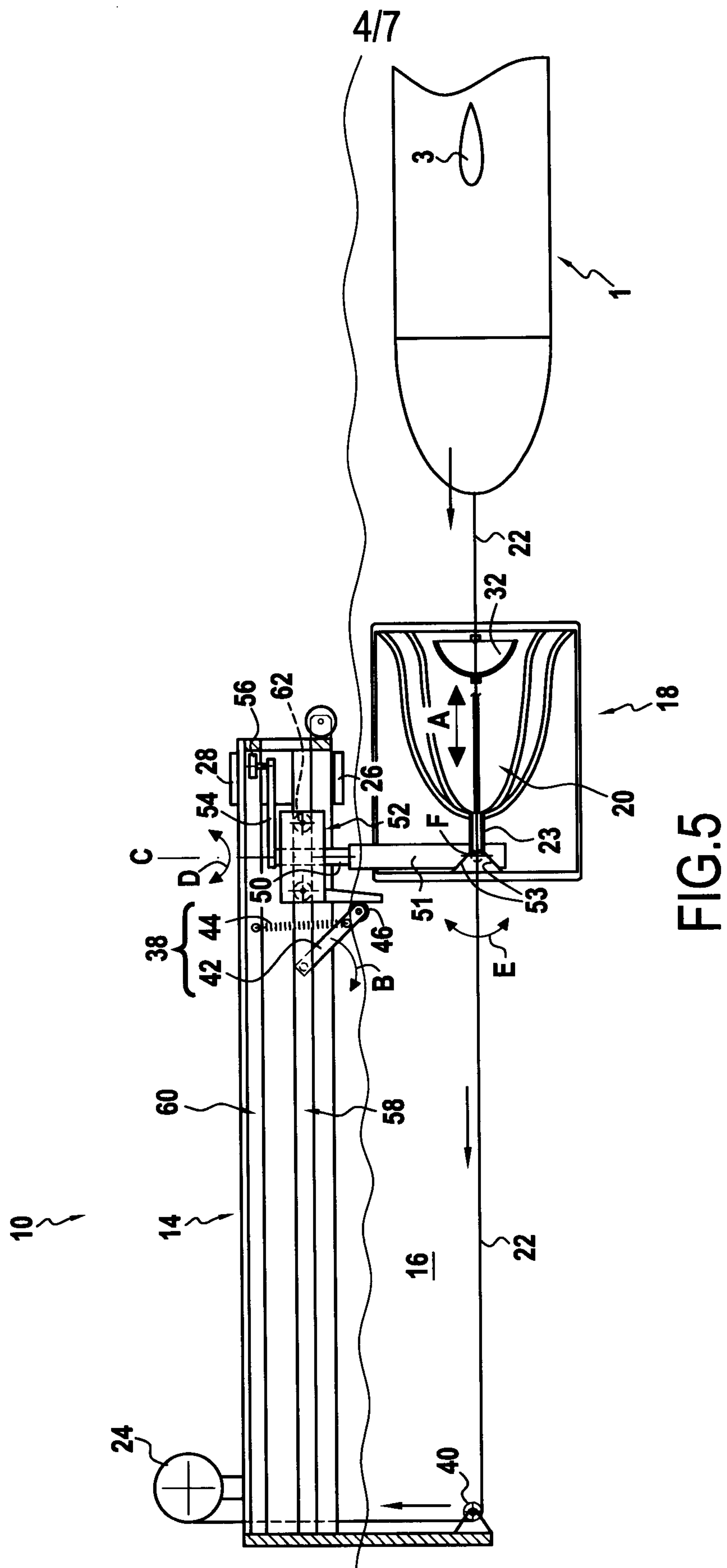


**FIG. 5**

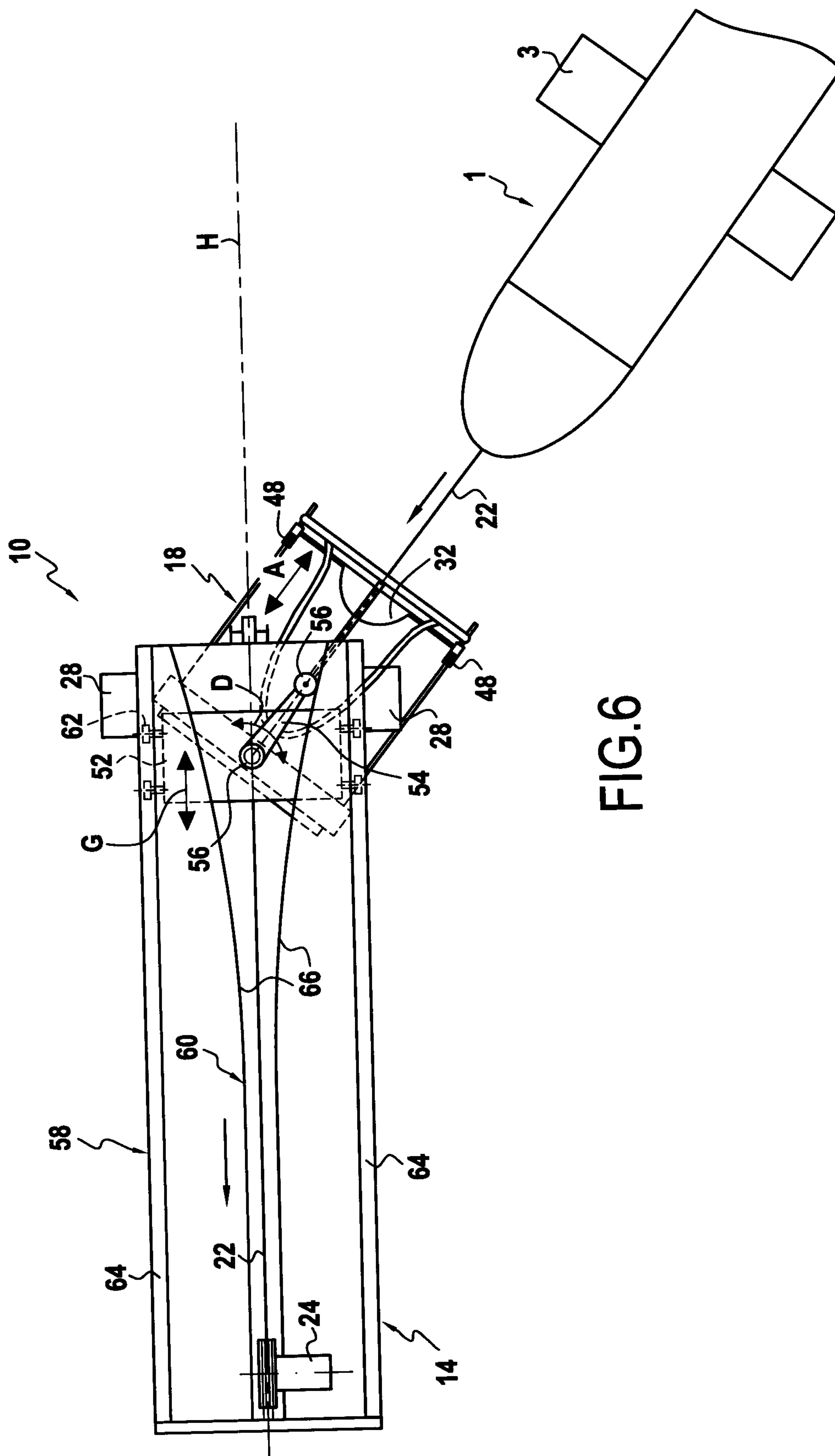


**FIG. 6**

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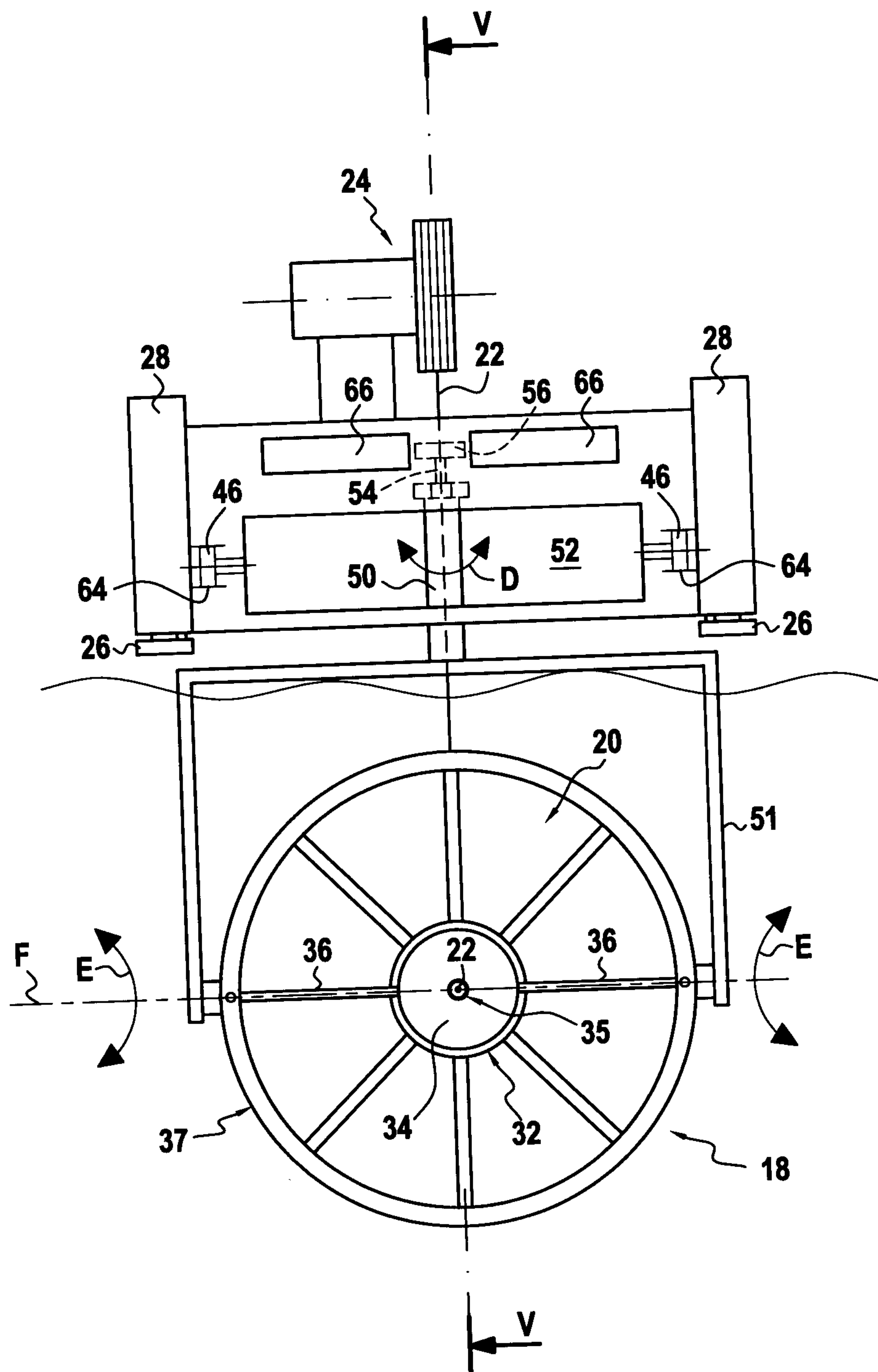


FIG.7

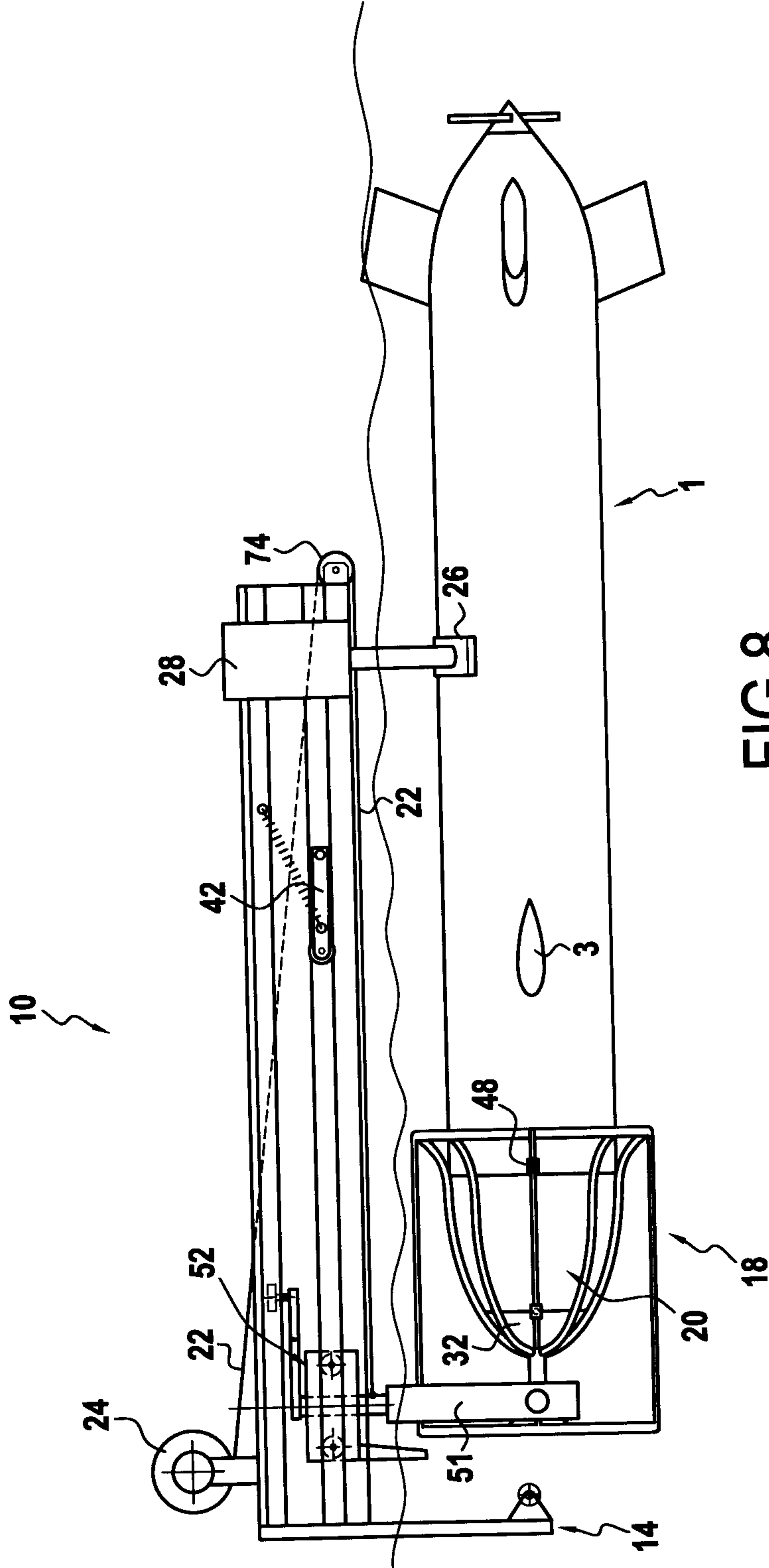


FIG. 8

