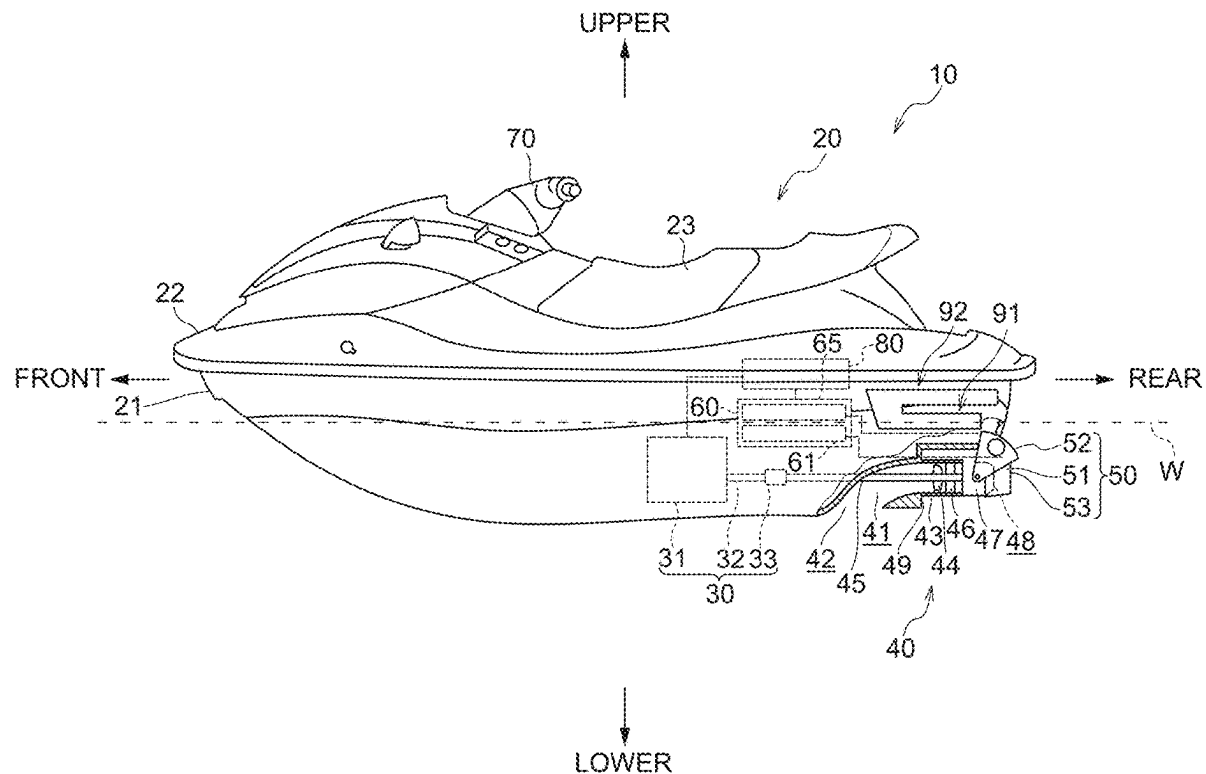
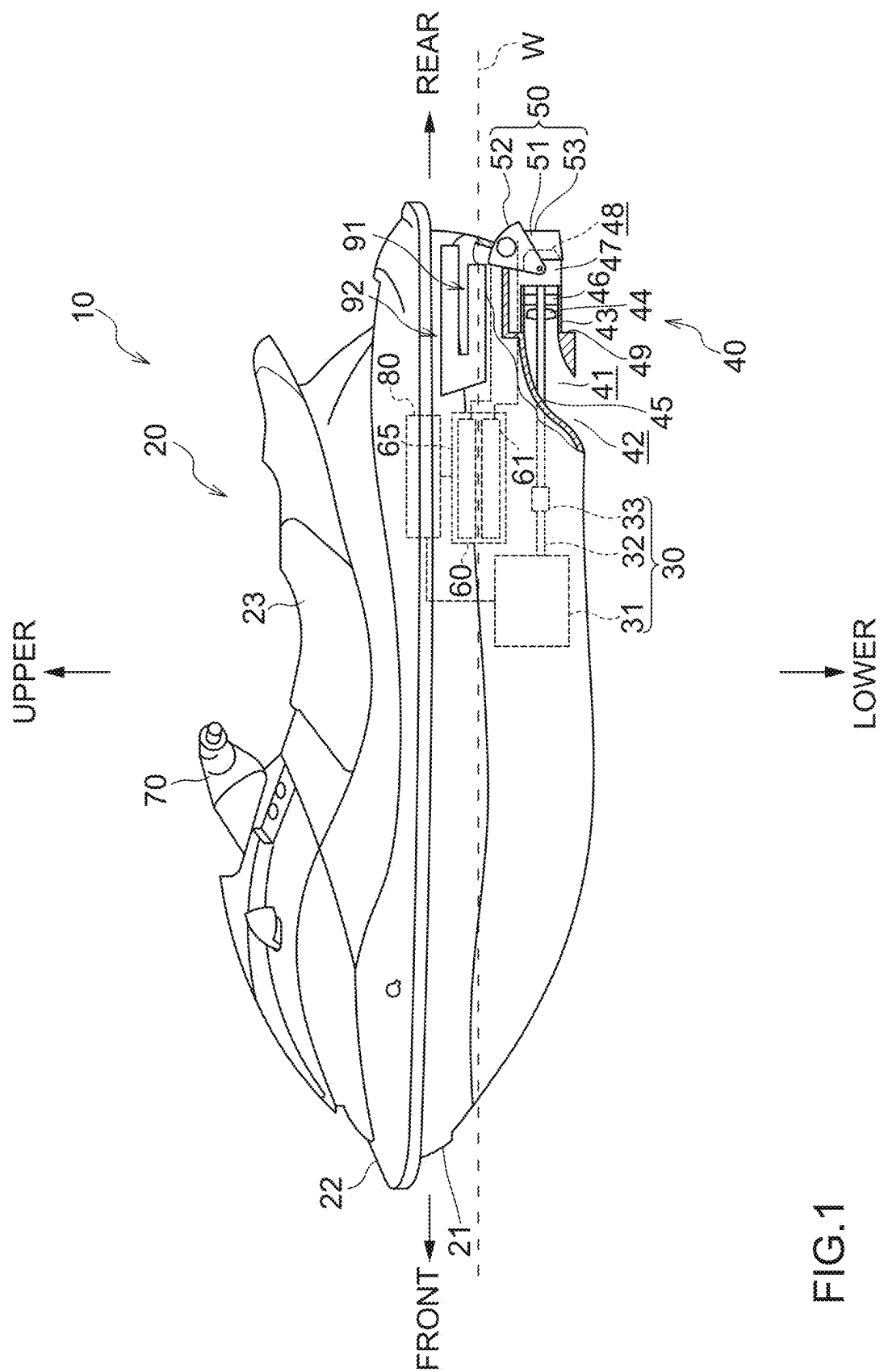
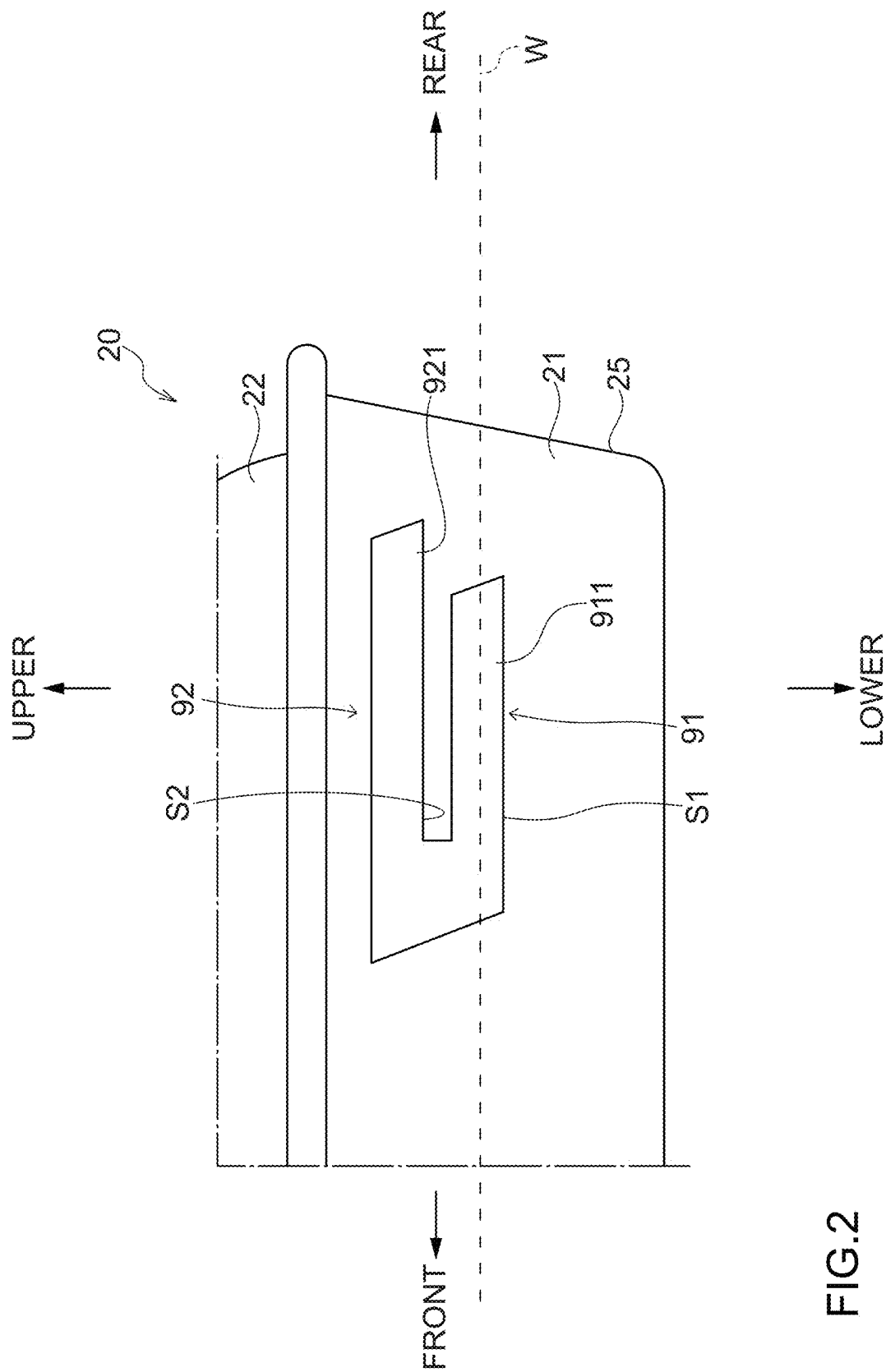
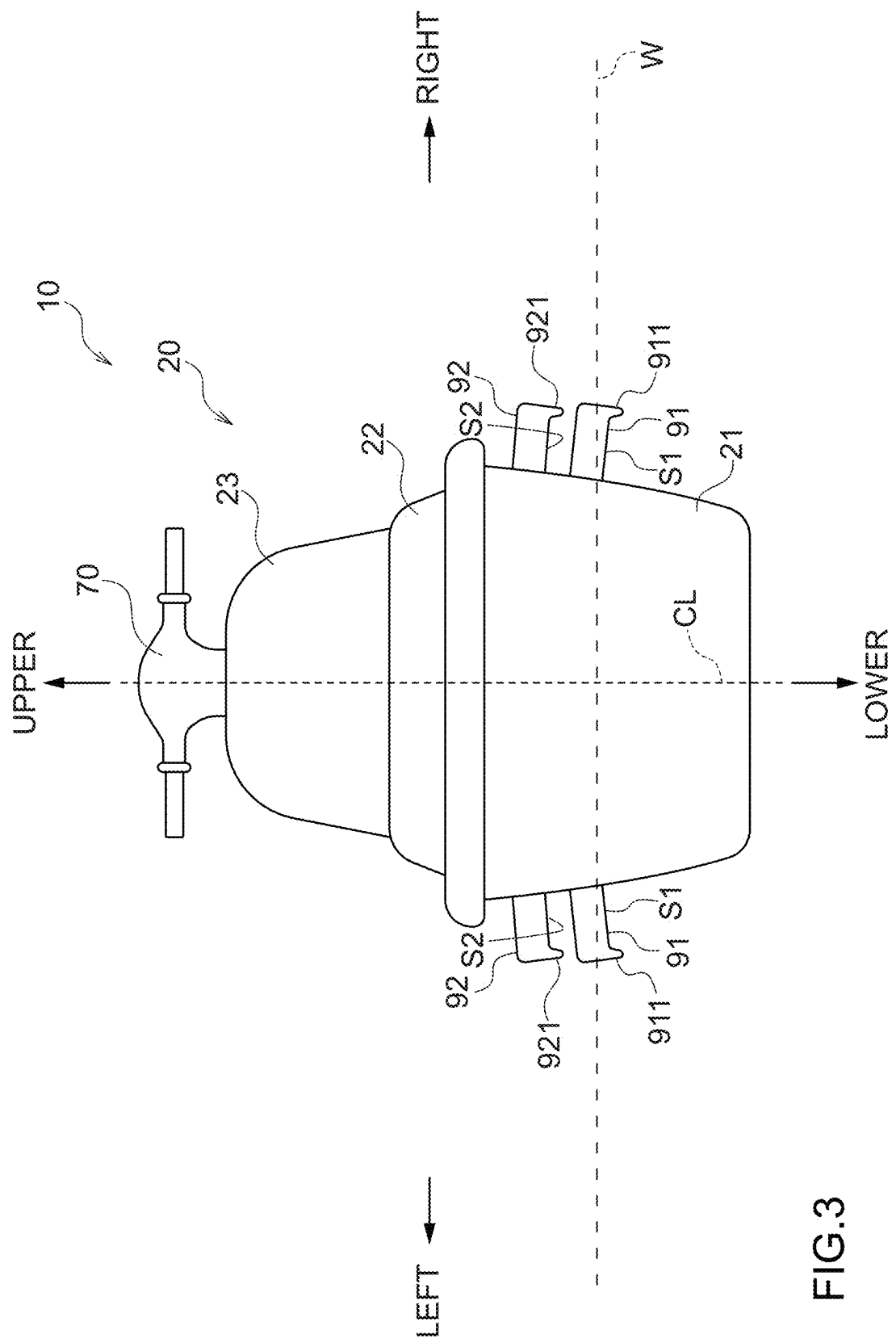


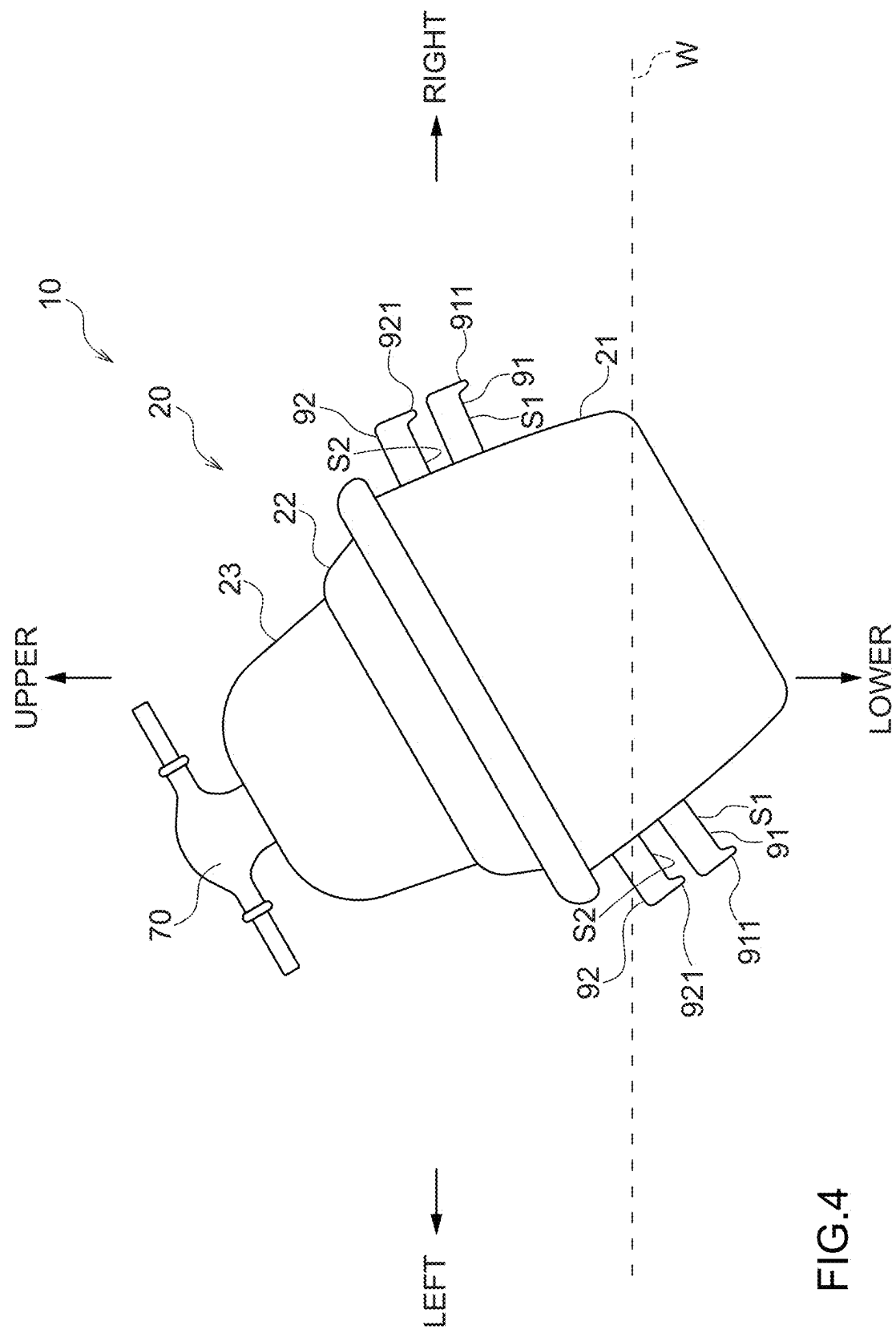
(43) **Pub. Date:** **Aug. 14, 2025**











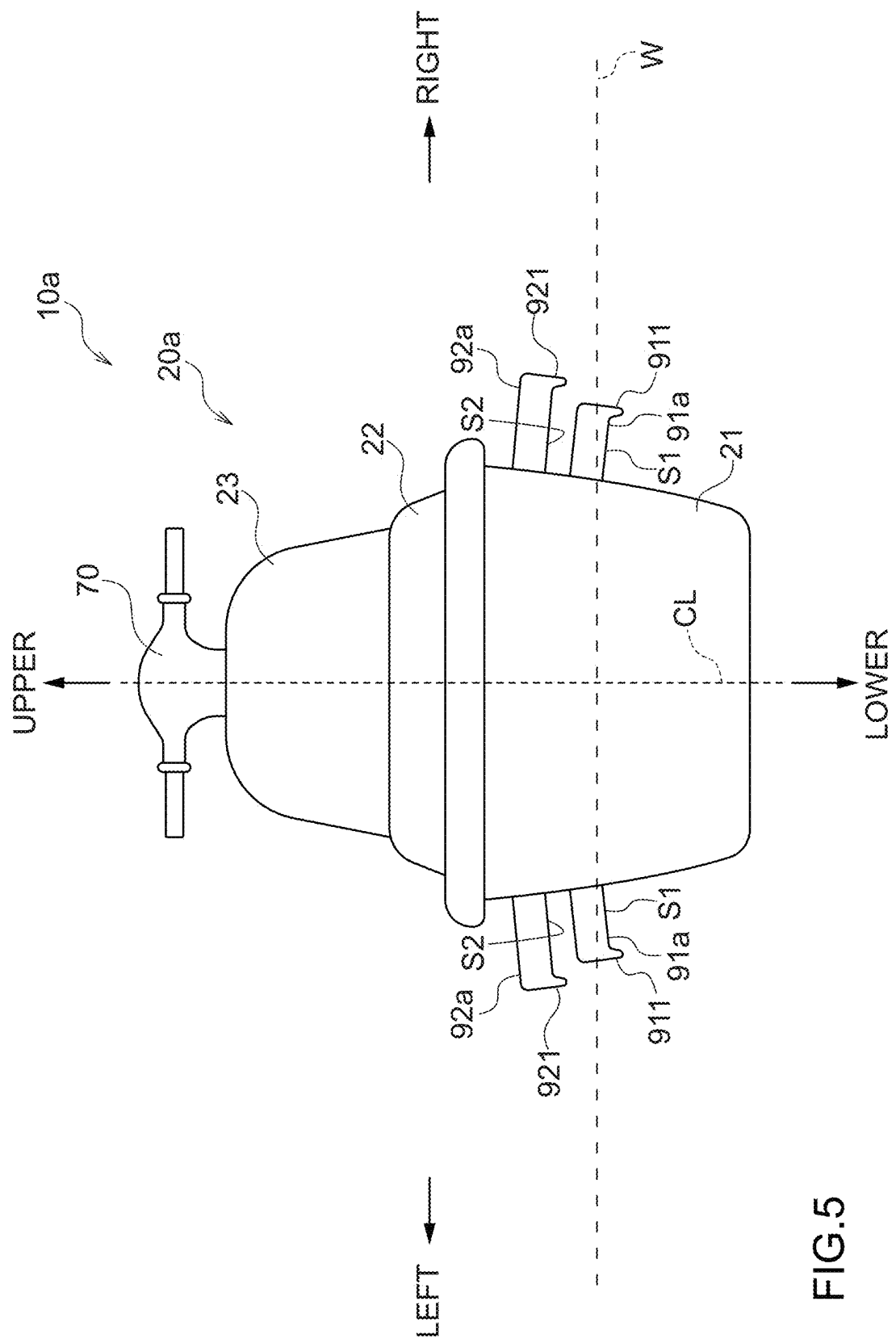
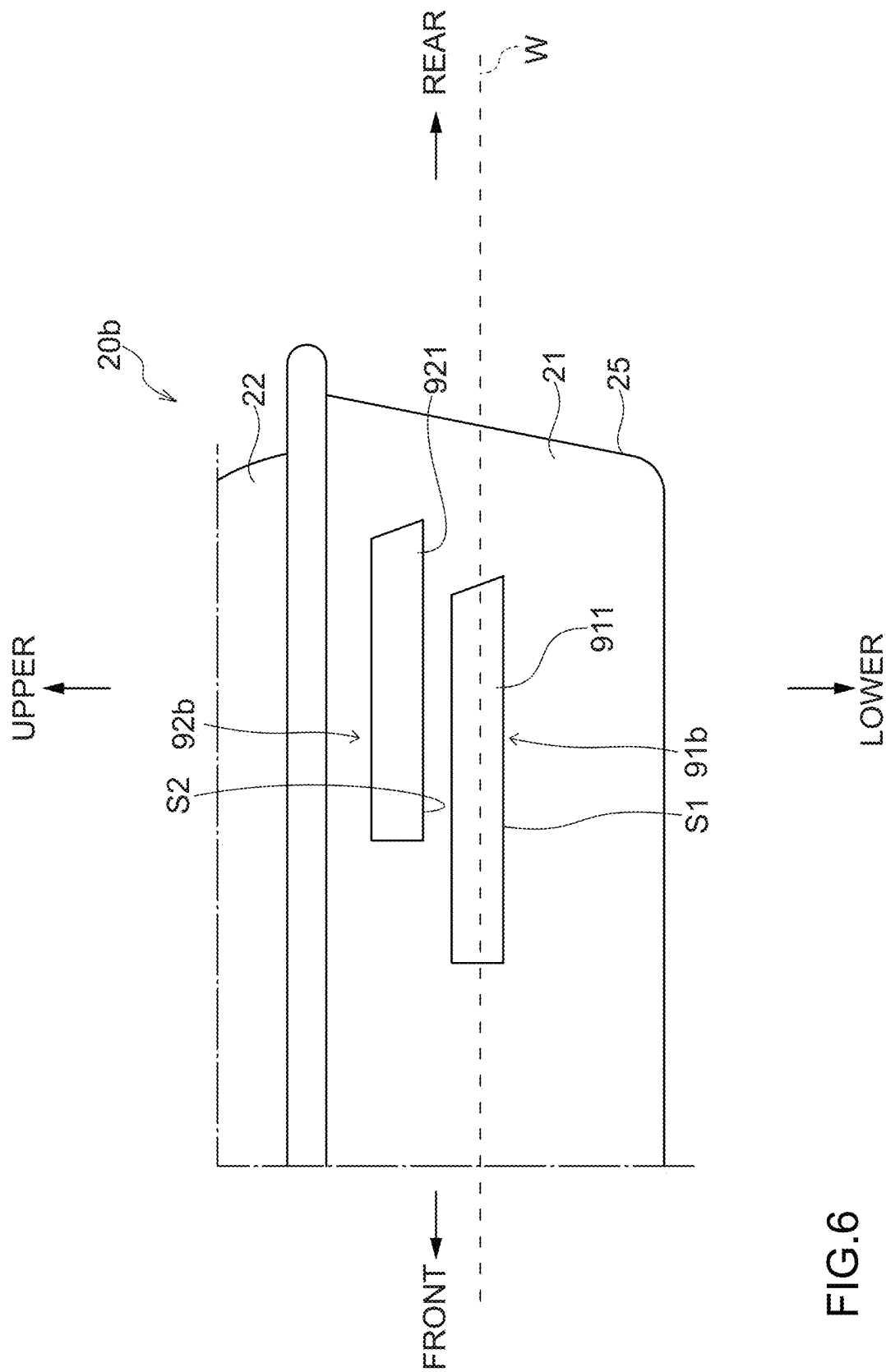


FIG.5



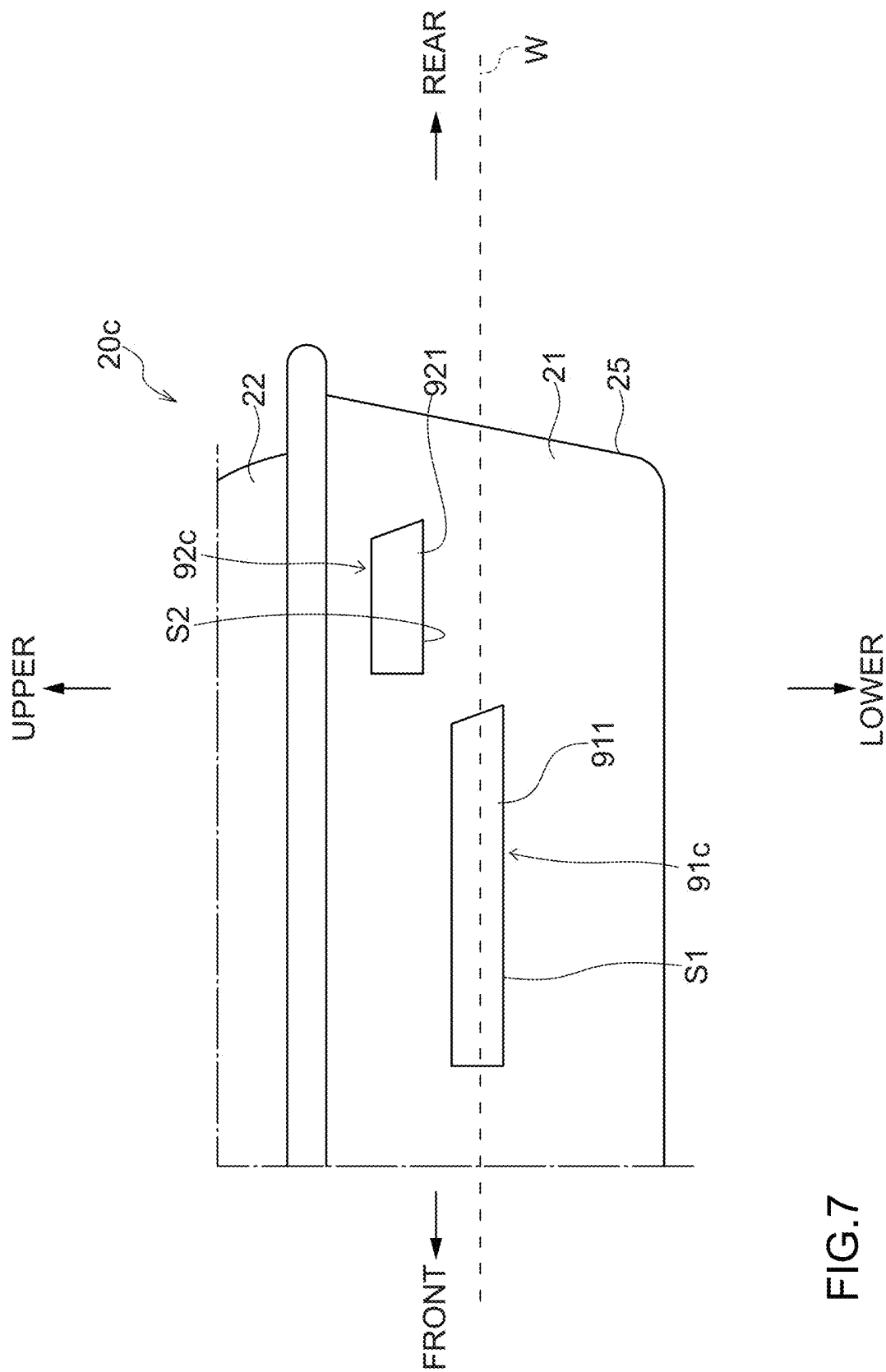
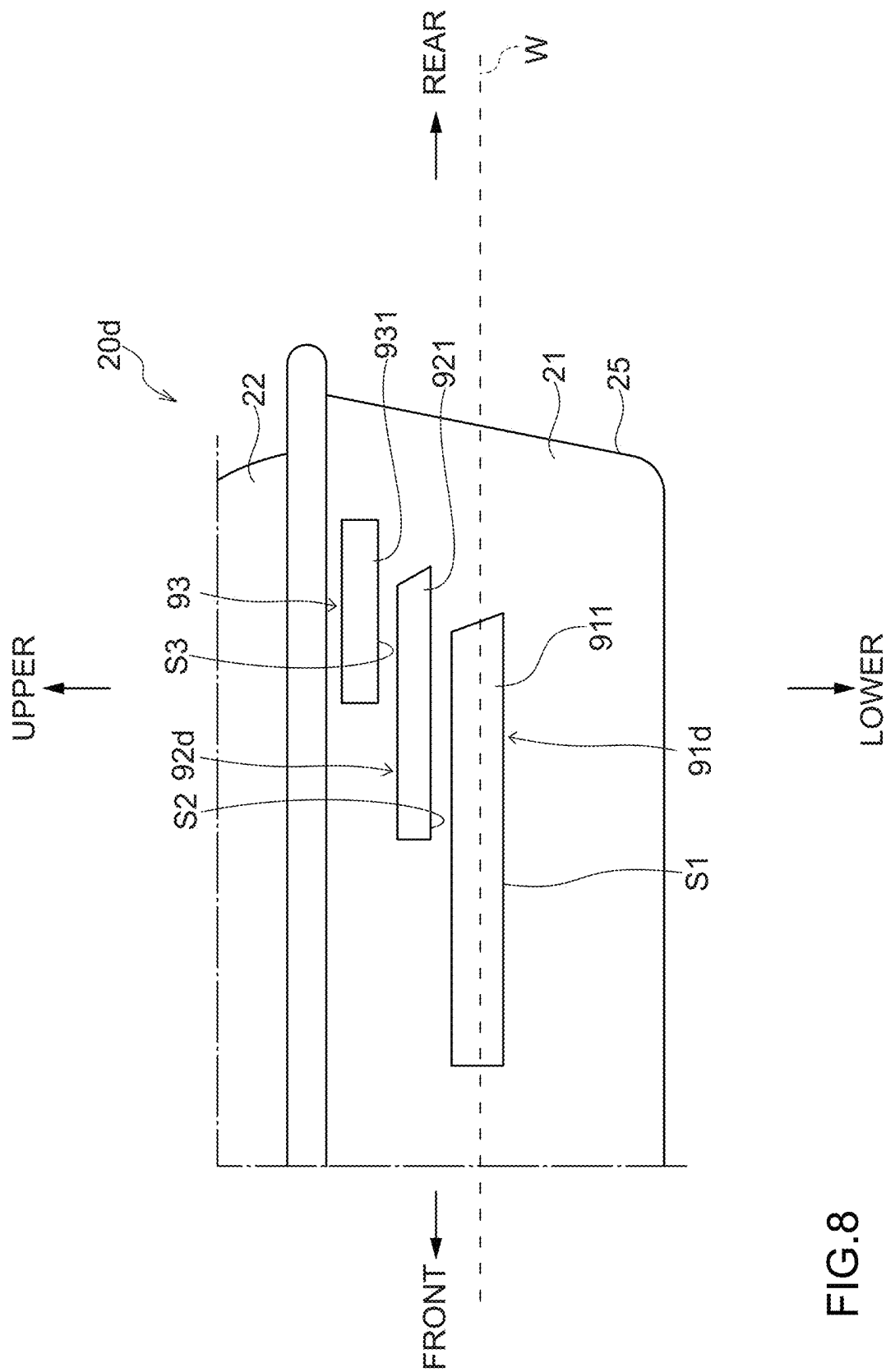


FIG. 7



WATER JET PROPULSION BOAT AND BOAT

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of priority to Japanese Patent Application No. 2024-018241 filed on Feb. 9, 2024. The entire contents of this application are hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The technologies disclosed herein relate to water jet propulsion boats and boats.

2. Description of the Related Art

[0003] Water jet propulsion boats are equipped with a boat body and generate propulsion of the boat body by generating a water flow directed rearward of the boat body. Water jet propulsion boats are equipped with sponsons at the rear portion of the left and right walls of the boat body (see, e.g., JP 2003-205888 A).

[0004] A sponson can reduce the turning radius of a water jet propulsion boat by generating resistance between the water jet propulsion boat and the water when the water jet propulsion boat turns. However, there is room for water jet propulsion boats to further reduce the turning radius.

SUMMARY OF THE INVENTION

[0005] Example embodiments of the present invention disclose technologies that can solve one or more of the above-mentioned problems.

[0006] The technologies of example embodiments of the present invention disclosed herein can be implemented, e.g., in the following example embodiments.

[0007] A water jet propulsion boat according to an example embodiment of the present invention includes a boat body, a first sponson on a first side of a rear portion of the boat body, and a second sponson on the first side of the rear portion of the boat body. A lower surface of the second sponson is higher than a lower surface of the first sponson, and a rear end of the second sponson is rearward of a rear end of the first sponson.

[0008] Since this water jet propulsion boat includes the first sponson and the second sponson, the resistance between the water jet propulsion boat and the water increases when the water jet propulsion boat turns so that the turning radius of the water jet propulsion boat can be reduced compared to a water jet propulsion boat including only the first sponson, for example.

[0009] The technologies disclosed herein can be implemented in various example embodiments, e.g., as water jet propulsion boats, boats, methods for manufacturing water jet propulsion boats, and methods for manufacturing boats.

[0010] Since the water jet propulsion boat includes the first sponson and the second sponson, the resistance between the water jet propulsion boat and the water increases when the water jet propulsion boat turns so that the turning radius of the water jet propulsion boat can be reduced compared to a water jet propulsion boat including only the first sponson, for example.

[0011] The above and other elements, features, steps, characteristics and advantages of the present invention will

become more apparent from the following detailed description of the example embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a side view schematically illustrating a water jet propulsion boat.

[0013] FIG. 2 is an enlarged side view of a rear portion of a boat body in an example embodiment of the present invention.

[0014] FIG. 3 is a rear view of the water jet propulsion boat in an example embodiment of the present invention during straight travel.

[0015] FIG. 4 is a rear view of the water jet propulsion boat in an example embodiment during turning.

[0016] FIG. 5 is a rear view of the water jet propulsion boat of another example embodiment of the present invention during straight travel.

[0017] FIG. 6 is an enlarged side view of the rear portion of the boat body in a modified example embodiment.

[0018] FIG. 7 is an enlarged side view of the rear portion of the boat body in another modified example embodiment.

[0019] FIG. 8 is an enlarged side view of the rear portion of the boat body in another modified example embodiment.

DETAILED DESCRIPTION OF THE EXAMPLE EMBODIMENTS

[0020] FIG. 1 is a side view schematically illustrating a water jet propulsion boat 10. In each of the following figures, arrows representing each direction with respect to the position of the water jet propulsion boat 10 are indicated as appropriate. More specifically, each figure shows arrows representing the front direction (FRONT), rear direction (REAR), left direction (LEFT), right direction (RIGHT), upper direction (UPPER), and lower direction (LOWER), respectively, as appropriate. The front-rear direction, left-right direction, and upper-lower (vertical) direction are orthogonal to each other. FIG. 1 also shows a waterline W of the water jet propulsion boat 10 when it is travelling straight ahead.

[0021] The water jet propulsion boat 10 in the present example embodiment is, e.g., a personal watercraft (PWC). The water jet propulsion boat 10 includes a boat body 20, a drive device 30, a jet propulsion mechanism 40, a jet stream adjustment mechanism 50, a displacement mechanism 60, a steering device 70, a control device (ECU) 80, a first sponson 91, and a second sponson 92.

[0022] The boat body 20 is the main structure of the water jet propulsion boat 10. The boat body 20 includes a hull 21, a deck 22, and a seat 23. The hull 21 defines a bottom of the boat body 20. The deck 22 defines a top portion of the boat body 20. The seat 23 is disposed in the center or substantial center of the boat body 20 in the front-rear direction. The seat 23 can be used to seat a user (crew member), not shown.

[0023] The drive device 30 is located at a lower portion of the boat body 20. The drive device 30 includes an engine 31, a crank shaft 32, and a coupling 33. The engine 31 may be a spark-ignition multi-cylinder internal combustion engine. The crank shaft 32 is a rotation shaft that outputs a drive torque generated by the engine 31. The crank shaft 32 extends rearward from the engine 31. The coupling 33 connects the crank shaft 32 to an impeller shaft 45 described

below. The coupling 33 transmits the drive torque of the crank shaft 32 to the impeller shaft 45.

[0024] The jet propulsion mechanism 40 is located in the rear portion of the hull 21 of the boat body 20. The jet propulsion mechanism 40 includes an impeller housing 43, an impeller 44, an impeller shaft 45, a stator blade 46, and a nozzle 47. The jet propulsion mechanism 40 includes a flow path 41 therein.

[0025] The flow path 41 is located in the rear portion of the hull 21 of the boat body 20 and in a center portion in the left-right direction. One end of the flow path 41 opens downward from the hull 21 as a water inlet 42 for intaking water. The flow path 41 extends rearward from the water inlet 42. The other end 49 of the flow path 41 opens rearward from the hull 21.

[0026] The impeller housing 43 is a cylindrical or substantially cylindrical body extending in the front-rear direction. The impeller housing 43 protrudes from the other end 49 of the flow path 41 rearward of the hull 21. The impeller 44 is housed within the impeller housing 43. The impeller 44 is connected to a rear end portion of the impeller shaft 45. The impeller 44 rotates integrally with the impeller shaft 45 about the central axis of the impeller shaft 45. The stator blade 46 is located behind the impeller 44 in the impeller housing 43. The nozzle 47 has a cylindrical shape. The nozzle 47 is fixed to the rear end of the impeller housing 43. The rear end of the nozzle 47 is open as a jetting port 48 for ejecting water.

[0027] When the drive torque generated by the engine 31 is transmitted to the impeller shaft 45 and the impeller 44 rotates accordingly, water from outside of the boat body 20 is drawn into the flow path 41 through the water inlet 42. The water drawn into the flow path 41 is supplied by the impeller 44 to the stator blade 46. The water supplied by the impeller 44 is rectified by passing through the stator blade 46. The rectified water passes through the nozzle 47 and is ejected from the jetting port 48 to the rearward of the boat body 20. In this way, the jet propulsion mechanism 40 generates a jet stream directed rearward of the boat body 20.

[0028] The jet stream adjustment mechanism 50 includes a deflector 51 and a reverse gate 52. The displacement mechanism 60 includes a deflector moving mechanism 61 and a reverse gate moving mechanism 65.

[0029] The deflector 51 is substantially cylindrical (conical) in shape, with an inner diameter thereof decreasing toward the rear. The deflector 51 is positioned behind the nozzle 47. The deflector 51 covers the jetting port 48 of the nozzle 47. The jet stream ejected from the jetting port 48 passes through the deflector 51 and is ejected from the outlet 53. The deflector 51 is rotatable about a vertical and horizontal axis behind the jetting port 48. Depending on its rotational position, the deflector 51 can change the left-right direction and the upper-lower direction of the jet stream ejected from the jetting port 48 to the rearward of the boat body 20. The deflector moving mechanism 61 displaces the deflector 51 in response to operation by the steering device 70.

[0030] The reverse gate 52 is located behind the deflector 51. The reverse gate 52 is displaceable to a forward movement position, a neutral position, and a backward movement position. The forward movement position is the position that does not cover the outlet 53 of the deflector 51. The neutral position is a position that partially covers the outlet 53 of the

deflector 51. The backward movement position is the position that covers the entire outlet 53 of the deflector 51.

[0031] The steering device 70 includes, e.g., a steering handle. The user of the water jet propulsion boat 10 can grasp the grips provided at both ends of the steering handle and rotate the steering handle. When the user rotates the steering handle, the deflector 51 can be rotated left or right via the displacement mechanism 60. The steering device 70 includes a plurality of manual operators (not shown). The user can start and stop the engine 31, rotate the deflector 51 in the upper-lower direction, or rotate the reverse gate 52 by operating the manual operators.

[0032] The ECU 80 includes, e.g., a CPU, a multi-core CPU, or a programmable device (e.g., field programmable gate array (FPGA) and programmable logic device (PLD)). The ECU 80 operates the deflector moving mechanism 61 and the reverse gate moving mechanism 65 in response to operations by, e.g., the steering device 70.

[0033] FIG. 2 is an enlarged side view of the rear portion of the boat body 20 according to an example embodiment of the present invention. The first sponson 91 is provided on a side of the rear portion of the boat body 20. The second sponson 92 is provided on a side of the rear portion of the boat body 20. Specifically, the first sponson 91 protrudes outwardly from a side of the rear portion of the hull 21 of the boat body 20. The second sponson 92 protrudes outwardly from a side of the rear portion of the hull 21 of the boat body 20. The first sponson 91 extends substantially in the front-rear direction. The second sponson 92 extends substantially in the front-rear direction. The first sponson 91 is preferably provided on both the left side and the right side of the boat body 20. The second sponson 92 is preferably provided on both the left side and the right side of the boat body 20.

[0034] As shown in FIG. 2, the second sponson 92 is positioned above the first sponson 91. In other words, a lower surface S2 of the second sponson 92 is positioned higher than the lower surface S1 of the first sponson 91. The lower surface S2 of the second sponson 92 is positioned higher than the upper surface of the first sponson 91. The lower surface S2 of the second sponson 92 is spaced apart from the upper surface of the first sponson 91 in the upper-lower direction. The rear end of the second sponson 92 is positioned rearward of the rear end of the first sponson 91. In the present example embodiment, the front portion of the first sponson 91 and the front portion of the second sponson 92 are connected to each other. In other words, in the present example embodiment, the first sponson 91 and the second sponson 92 are formed as one piece, or separate pieces connected together.

[0035] The first sponson 91 includes a first fin 911 (see FIG. 3). The first fin 911 includes a downwardly protruding portion at an outward end farthest outward from the boat body 20 in the left-right direction. The first fin 911 extends in the front-rear direction. The second sponson 92 includes a second fin 921 (see FIG. 3). The second fin 921 includes a downwardly protruding portion at an outward end farthest outward from the boat body 20 in the left-right direction. The second fin 921 extends in the front-rear direction.

[0036] The lower surface S1 of the first sponson 91 generates a resistance between the water jet propulsion boat 10 and the water to prevent the water jet propulsion boat 10 from skidding when the water jet propulsion boat 10 turns. Similarly, the lower surface S2 of the second sponson 92 generates a resistance between the water jet propulsion boat

10 and the water to prevent the water jet propulsion boat 10 from skidding when the water jet propulsion boat 10 turns. Specifically, the lower surface S1 of the first sponson 91 comes into contact with the water when the water jet propulsion boat 10 turns, thus generating resistance between the water jet propulsion boat 10 and the water to reduce the turning radius of the water jet propulsion boat 10. Similarly, the lower surface S2 of the second sponson 92 comes into contact with the water when the water jet propulsion boat 10 turns, thus generating resistance between the water jet propulsion boat 10 and the water to reduce the turning radius of the water jet propulsion boat 10. In the present example embodiment, since the water jet propulsion boat 10 includes the first sponson 91 and the second sponson 92, the resistance between the water jet propulsion boat 10 and the water increases when the water jet propulsion boat 10 turns so that the turning radius of the water jet propulsion boat 10 can be reduced accordingly compared to a water jet propulsion boat including only a first sponson, for example.

[0037] In the water jet propulsion boat 10 of the present example embodiment, the turning radius of the water jet propulsion boat 10 can be further reduced because the first sponson 91 includes a first fin 911 and the second sponson 92 includes a second fin 921. That is, in the water jet propulsion boat 10, each of the first fin 911 and the second fin 921 comes into contact with the water when the water jet propulsion boat 10 turns, thus increasing the resistance between the water jet propulsion boat 10 and the water and more effectively reducing the turning radius of the water jet propulsion boat 10.

[0038] As shown in FIG. 2, the front end of the second sponson 92 is positioned forward of the rear end of the first sponson 91. In other words, the first sponson 91 and the second sponson 92 face each other in the upper-lower direction. The rear end of the first sponson 91 is positioned forward of the transom 25 at the rear end of the boat body 20. The rear end of the second sponson 92 is positioned forward of the transom 25 at the rear end of the boat body 20. The first sponson 91 is arranged such that the front end and the rear end are aligned horizontally, or the front end is positioned higher than the rear end when the water jet propulsion boat 10 is travelling straight ahead. The second sponson 92 is arranged such that the front end and the rear end are aligned horizontally, or the front end is positioned higher than the rear end when the water jet propulsion boat 10 is travelling straight ahead. The first sponsons 91 and the second sponsons 92 may be parallel or substantially parallel with each other when viewed in the left-right direction.

[0039] FIG. 3 is a rear view of the water jet propulsion boat 10 during straight travel. As shown in FIG. 3, the first sponson 91 on the left side of the boat body 20 and the first sponson 91 on the right side of the boat body 20 are symmetrical about the centerline CL of the boat body 20 in the left-right direction. Similarly, the second sponson 92 on the left side of the boat body 20 and the second sponson 92 on the right side of the boat body 20 are symmetrical about the centerline CL of the boat body 20 in the left-right direction. The lower surface S1 of the first sponson 91 is located so as to be lower than the waterline W when the water jet propulsion boat 10 is travelling straight ahead. The lower surface S2 of the second sponson 92 is located so as to be higher than the waterline W of the water jet propulsion boat 10 when the water jet propulsion boat is travelling straight ahead. In the left-right direction, the outward end of

the second sponson 92 farthest outward from the boat body 20 is at the same or substantially the same location as the outward end of the first sponson 91 farthest outward from the boat body 20. In other words, the first sponson 91 and the second sponson 92 project outward to the same or substantially the same location or position as each other in the left-right direction.

[0040] FIG. 4 is a rear view of the water jet propulsion boat 10 during turning. FIG. 4 shows the water jet propulsion boat 10 banked (tilted) to the left. In other words, FIG. 4 shows the state of the water jet propulsion boat 10 when turning to the left. The lower surface S2 of the second sponson 92 on the left side of the boat body 20 comes into contact with the water when the bank angle reaches a certain angle when the water jet propulsion boat 10 turns to the left. That is, the water jet propulsion boat 10 includes two sponsons, the first sponson 91 and the second sponson 92, that come into contact with the water when the bank angle reaches or exceeds a certain angle. The above “certain angle” is not particularly limited, but it is preferably about 20 degrees or more and about 40 degrees or less. The action of the water jet propulsion boat 10 when turning to the right is the same as when turning to the left.

[0041] As shown in FIGS. 3 and 4, the lower surface S2 of the second sponson 92 does not come into contact with the water when the water jet propulsion boat 10 is travelling straight ahead, but does come into contact with the water when turning and the bank angle exceeds a certain angle. Therefore, the sponsons 90 can reduce the turning radius of the water jet propulsion boat 10 while maintaining a light travelling performance or resistance of the water jet propulsion boat 10 when traveling straight ahead. Furthermore, even when the water jet propulsion boat 10 is turning, the lower surface S2 of the second sponson 92 does not come into contact with the water when the bank angle is less than a certain angle. Therefore, the sponsons 90 can maintain a light travelling performance or resistance when the water jet propulsion boat 10 is turning gently.

[0042] FIG. 5 is a rear view of the water jet propulsion boat 10a according to another example embodiment during straight travel. In the following, portions of the water jet propulsion boat 10a of the present example embodiment that are common to the water jet propulsion boat 10 of the example embodiments described above will be marked with the same symbols, and their description will be omitted as appropriate.

[0043] The water jet propulsion boat 10a of the present example embodiment differs from the water jet propulsion boat 10 of the example embodiments described above in the shape and dimensions of the sponsons. Specifically, in the left-right direction, the outward end of the second sponson 92a farthest outward from the boat body 20a extends farther from the centerline CL of the boat body 20a than the outward end of the first sponson 91a farthest outward from the boat body 20a. In other words, the second sponson 92a projects farther outward than the first sponson 91a in the left-right direction.

[0044] The water jet propulsion boat 10a of the present example embodiment also has the same effects as the water jet propulsion boat 10 of the above described example embodiments. That is, because the water jet propulsion boat 10a includes the first sponson 91a and the second sponson 92a, there is a resistance between the water jet propulsion boat 10a and the water increases when the water jet prop-

pulsion boat **10a** turns so that the turning radius of the water jet propulsion boat **10a** can be reduced compared to a water jet propulsion boat including only the first sponson, for example. According to the water jet propulsion boat **10a** of the present example embodiment, the second sponson **92a** projects farther outward than the first sponson **91a** in the left-right direction. Therefore, the first and second sponsons can contact the water even at a relatively shallow bank angle, e.g., compared to a configuration in which the first and second sponsons project outward to the same location as each other in the left-right direction.

[0045] The technologies disclosed herein are not limited to the above-described example embodiments and may be modified in various ways without departing from the gist of the present invention, including the following modifications.

[0046] FIG. 6 is an enlarged side view of the rear portion of the boat body **20b** in a modified example embodiment. In the following, portions of the boat body **20b** in the present example embodiment that are common to the boat body **20** of the example embodiments described above will be marked with the same symbols, and their description will be omitted as appropriate.

[0047] In the example embodiment shown in FIG. 6, the first sponson **91b** and the second sponson **92b** are not formed as or connected to be one piece. In other words, the first sponson **91b** and the second sponson **92b** are entirely separate and spaced apart from each other. The front end of the second sponson **92b** is positioned rearward of the front end of the first sponson **91b**. Thus, the first and second sponsons are separate from each other.

[0048] FIG. 7 is an enlarged side view of the rear portion of the boat body **20c** in another modified example embodiment. In the following, portions of the boat body **20c** in the present example embodiment that are common to the boat body **20** of the example embodiments described above will be marked with the same symbols, and their description will be omitted as appropriate.

[0049] In the present example embodiment shown in FIG. 7, the first sponson **91c** and the second sponson **92c** are not formed as or connected to be one piece. In other words, the first sponson **91c** and the second sponson **92c** are entirely separate and spaced apart from each other. The front end of the second sponson **92c** is positioned rearward of the rear end of the first sponson **91c**. In other words, the first sponson **91c** and the second sponson **92c** do not overlap each other in the upper-lower direction. Thus, the front end of the second sponson may be positioned more rearward than the rear end of the first sponson. In other words, the first and second sponsons may not overlap each other in the upper-lower direction.

[0050] FIG. 8 is an enlarged side view of the rear portion of the boat body **20d** in another modified example embodiment. In the following, portions of the boat body **20d** in the present example embodiment that are common to the boat body **20** of the example embodiments described above will be marked with the same symbols, and their description will be omitted as appropriate.

[0051] In the present example embodiment shown in FIG. 8, in addition to the first sponson **91d** and the second sponson **92d**, a third sponson **93** is provided on a side of the rear portion of the boat body **20d**. The third sponson **93** includes a third fin **931**, which is a downwardly protruding portion at the outward end of the third sponson **93** farthest

outward from the boat body **20d** in the left-right direction. Thus, the water jet propulsion boat may include three or more sponsons.

[0052] In the above example embodiments, the engine **31** is illustrated as the drive source of the drive device **30**, but an electric motor or the like may be provided together with or instead of the engine **31**.

[0053] In the left-right direction, the outward end of the second sponson may be closer to the centerline of the boat body than the outward end of the first sponson.

[0054] In the above example embodiments, the first sponson **91** is arranged such that the front end and the rear end are aligned horizontally, or the front end is positioned higher than the rear end, but the first sponson may be arranged such that the front end is positioned lower than the rear end.

[0055] In the above example embodiments, the second sponson **92** is arranged such that the front end and the rear end are aligned horizontally, or the front end is positioned higher than the rear end, but the second sponson may be arranged such that the front end is positioned lower than the rear end.

[0056] In the above example embodiments, the first sponson **91** and the second sponson **92** are parallel or substantially parallel with each other when viewed in the left-right direction, but the first and second sponsons may not be parallel or substantially parallel with each other when viewed in the left-right direction.

[0057] In the above example embodiments, a PWC is shown as an example of the application of the technologies disclosed herein, but the technologies disclosed herein can be applied to vessels in general, such as sport boats, for example.

[0058] While example embodiments of the present invention have been described above, it is to be understood that variations and modifications will be apparent to those skilled in the art without departing from the scope and spirit of the present invention. The scope of the present invention, therefore, is to be determined solely by the following claims.

What is claimed is:

1. A water jet propulsion boat comprising:

a boat body;

a first sponson provided on a first side of a rear portion of the boat body; and

a second sponson provided on the first side of a rear portion of the boat body; wherein

a lower surface of the second sponson is higher than a lower surface of the first sponson; and

a rear end of the second sponson is rearward of a rear end of the first sponson.

2. The water jet propulsion boat according to claim 1, wherein

the lower surface of the first sponson is located so to be below a waterline of the water jet propulsion boat when the water jet propulsion boat is travelling straight; and the lower surface of the second sponson is located so to be above the waterline of the water jet propulsion boat when the water jet propulsion boat is travelling straight.

3. The water jet propulsion boat according to claim 1, wherein a front end of the second sponson is forward of the rear end of the first sponson.

4. The water jet propulsion boat according to claim 1, wherein an outward end of the second sponson farthest outward from the boat body is at a same location as an

outward end of the first sponson farthest outward from the boat body in a left-right direction.

5. The water jet propulsion boat according to claim 1, wherein an outward end of the second sponson farthest outward from the boat body is farther from a centerline of the boat body than an outward end of the first sponson farthest outward from the boat body in a left-right direction.

6. The water jet propulsion boat according to claim 1, wherein the first sponson is oriented such that the front end and the rear end are aligned horizontally, or the front end is higher than the rear end.

7. The water jet propulsion boat according to claim 1, wherein the second sponson is oriented such that a front end and the rear end are aligned horizontally, or the front end is higher than the rear end.

8. The water jet propulsion boat according to claim 1, wherein the first sponson and the second sponson are parallel or substantially parallel to each other when viewed in a left-right direction.

9. The water jet propulsion boat according to claim 1, wherein the first sponson and the second sponson are not parallel to each other when viewed in a left-right direction.

10. The water jet propulsion boat according to claim 1, wherein the rear end of the first sponson and the rear end of the second sponson are forward of a transom positioned at a rear end of the boat body.

11. A boat comprising:

a boat body;

a first sponson on a first side of a rear portion of the boat body; and

a second sponson on the first side of the rear portion of the boat body; wherein

a lower surface of the second sponson is higher than a lower surface of the first sponson; and

a rear end of the second sponson is rearward of a rear end of the first sponson.

* * * * *