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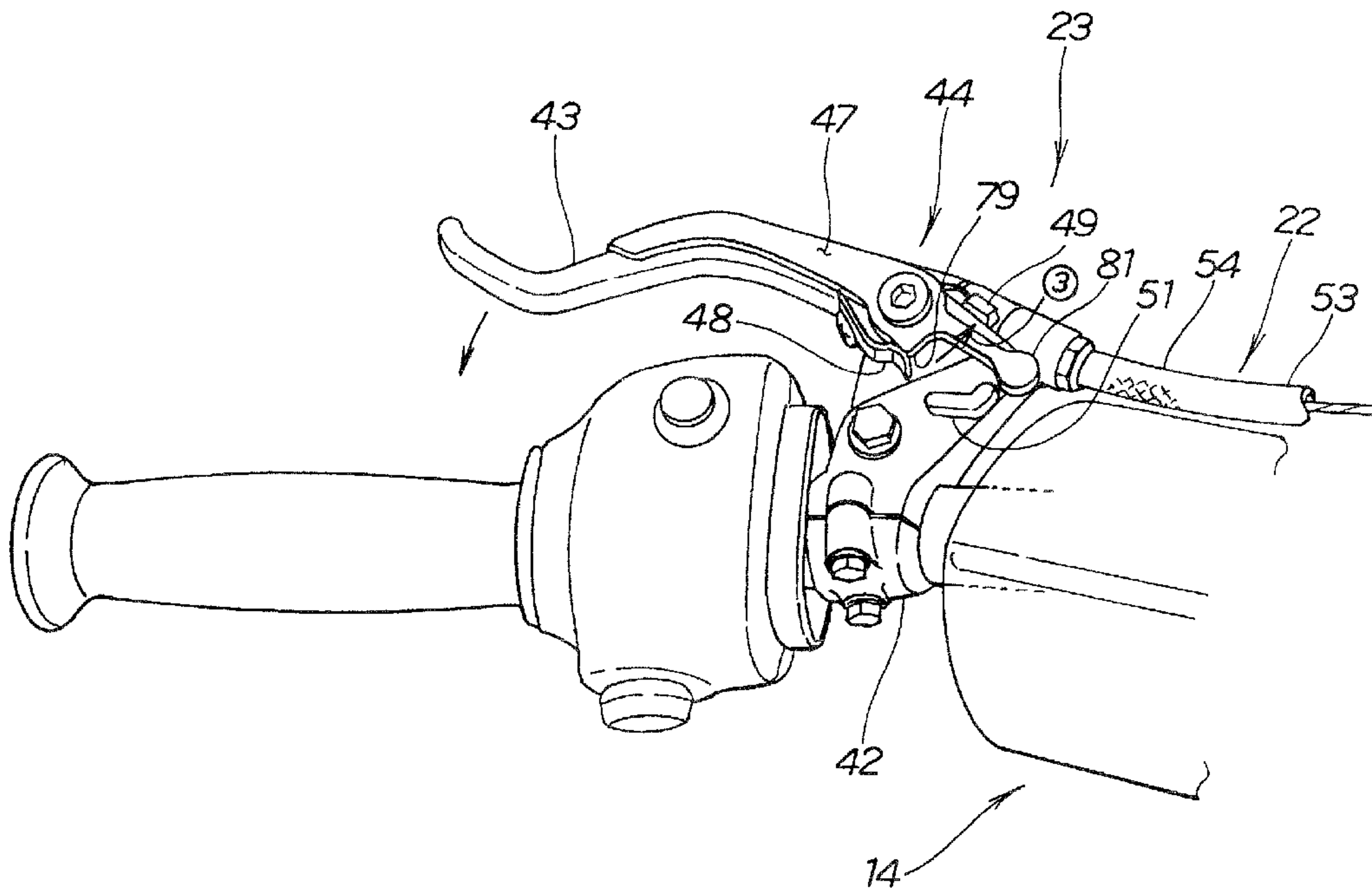
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(54) Title: TRIM OPERATING LEVER DEVICE FOR PERSONAL WATERCRAFT



(57) Abrégé/Abstract:

A trim operating lever device 23 which can downwardly swing a nozzle, capable of adjusting the jet direction of jet water, from an ordinary direction and which can return the nozzle into the ordinary direction when a grip thereon is released has a structure in which a lever lock means 44 capable of locking a trim operating lever 43 in a grip position is provided additionally to a steering handle 14. When the trim operating lever is gripped with a finger of the hand which is gripping the steering handle, a lever of the lever lock means can be substantially simultaneously operated with the finger, to effect locking. Therefore, the number of times of operation by the left hand necessary for swinging the nozzle is only two. Besides, since the trim operating lever makes it possible to enlarge the operating force, the nozzle can be swung swiftly.

ABSTRACT OF THE DISCLOSURE

A trim operating lever device 23 which can downwardly swing a nozzle, capable of adjusting the jet direction of jet water, from an ordinary direction and which can return the nozzle into the ordinary direction when a grip thereon is released has a structure in which a lever lock means 44 capable of locking a trim operating lever 43 in a grip position is provided additionally to a steering handle 14. When the trim operating lever is gripped with a finger of the hand which is gripping the steering handle, a lever of the lever lock means can be substantially simultaneously operated with the finger, to effect locking. Therefore, the number of times of operation by the left hand necessary for swinging the nozzle is only two. Besides, since the trim operating lever makes it possible to enlarge the operating force, the nozzle can be swung swiftly.

TRIM OPERATING LEVER DEVICE FOR PERSONAL WATERCRAFT

FIELD OF THE INVENTION

- 5 The present invention relates to a trim operating lever device for a personal watercraft.

BACKGROUND OF THE INVENTION

- 10 In the conventional trim operating lever device, a handle grip provided additionally to a left portion of a steering handle is turned by hand (see, for example, Japanese Patent Laid-open No. Hei 9-281132 (p. 5; Fig. 16)

Patent Reference will be described in detail, referring to a drawing.

- 15 Fig. 9 is an illustration of a conventional left-side grip portion (a copy from Fig. 16 of Patent Reference).

- The conventional left-side grip 8b is for vertically oscillating a nozzle deflector provided at a jet port (for obtaining a trim angle) by being turned to a predetermined angle position, and comprises a trigger lever 91 for locking the left-side grip 8b in the predetermined angle position. With the left-side grip 8b turned to the predetermined angle position, the trim angle of the nozzle deflector can be set to any one of a neutral position (horizontal), an up position (upwards) and a down position (downwards).
- 20
- 25 In the turning operation, first, the trigger lever 91 is pulled in, the left-side grip 8b is turned to the predetermined angle position, and the trigger lever 91 is released, upon which the left-side grip 8b is locked.

- In the conventional left-side grip 8b as above-mentioned, it takes labor for the action of hand at the time of turning thereof. Specifically, first, the
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trigger lever 91 is pulled by an index finger (first action), subsequently the left-side grip 8b is turned to the predetermined angle position (second action), and finally the index finger is released from the trigger lever 91 (third action). At the time of returning the left-side grip 8b reversely, also,
5 the first to third operations are carried out. Thus, the three operations are necessary, which takes labor, and operability is poor.

In addition, in the turning of the left-side grip 8b, it is difficult to enlarge the operating force, so that it is difficult to vertically oscillate the nozzle
10 deflector swiftly.

Accordingly, it is an object of the present invention to provide a trim operating lever device for a personal watercraft such that the number of times of operation by the left hand necessary for swinging a nozzle is only
15 two and that the nozzle can be swung swiftly.

SUMMARY OF THE INVENTION

In order to attain the above object, the present invention is characterized in that, in a personal watercraft comprising a jet propeller for ejecting jet
20 water, a nozzle capable of adjusting the jet direction of the jet water, the nozzle being arranged for the jet propeller, and a trim operating lever provided additionally to a steering handle, the nozzle being downwardly swingable from an ordinary direction when the trim operating lever is gripped, and the nozzle returning to the ordinary direction when the grip
25 on the trim operating lever is released, a lever lock means capable of locking the trim operating lever in a grip position is provided additionally to the steering handle.

When the trim operating lever is gripped by a finger of the left hand
30 which is gripping the steering handle, a lever of the lever lock means can be substantially simultaneously operated by the finger, to effect locking. Therefore, the number of times of operation by the left hand necessary for swinging the nozzle is only two.

35 Furthermore, the trim operating lever makes it possible to enlarge the operating force, so that the nozzle can be swung swiftly.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

5 Fig. 1 is a side view of a personal watercraft using a rear grip structure according to the present invention

Fig. 2 is a sectional view of a steering nozzle according to the present invention

10

Fig. 3 is a perspective view of a trim operating lever device according to the present invention

15 Fig. 4 is a side view of a trim operating wire according to the present invention

Fig. 5 is an exploded view of the trim operating lever device and the trim operating wire according to the present invention

20 Fig. 6 is a sectional view of an elongation adjusting means according to the present invention

Fig. 7 is a first function view of the trim operating lever device according to the present invention

25

Fig. 8 is a second function view of the trim operating lever device according to the present invention

Fig. 9 is an illustration of a conventional left-side grip portion

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention will be described below based on the accompanying drawings. The drawings are to be looked at according to the posture of symbols.

35 Fig. 1 is a side view of a personal watercraft using a rear grip structure according to the present invention. The personal watercraft 10 comprises a craft body 11 composed of a hull 12 and a deck 13 jointed to the upper

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side of the hull 12, a steering handle 14 disposed roughly at the center of the deck 13, a seat 15 provided on the rear side of the steering handle 14 and mounted on the deck 13, a fuel tank 16 and an engine 17 mounted on the center of the hull 12, a water jet propeller 18 as a jet propeller
5 connected to the engine 17, a steering nozzle 21 as a nozzle provided on the rear side of the water jet propeller 18, a trim operating wire 22 connected to the steering nozzle 21, and a trim operating lever device 23 provided additionally to the steering handle 14 for connection of the trim operating wire 22. Symbol 24 denotes a bow, and 25 denotes an axis located
10 directly under the steering handle 14.

The water jet propeller 18 ejects jet water.

Fig. 2 is a sectional view of the steering nozzle according to the present
15 invention, and shows the condition where the steering nozzle 21 is directed in an ordinary direction.

The steering nozzle 21 comprises a ring member 26 mounted onto the water jet propeller 18 so as to be oscillatable in the downward direction
20 (the direction of arrow ①), and a nozzle main body 27 mounted onto the ring member 26 so as to be oscillatable in the left-right direction (the directions of arrows ②), and has the function of adjusting the jet direction of jet water.

25 The ring member 26 has a structure in which first receiving portions 31, 31 (not shown) are provided on the left and right sides (the face and back sides of the figure) of the ring main body 28 so as to be in connection with the water jet propeller 18, and second receiving portions 32 and 33 are provided on the upper and lower sides so as to be in connection with the
30 nozzle main body 27. Symbol 34 denotes a push wire 57 connected to the second receiving portion 32, and $\emptyset$ denotes the trim swing angle at the time when the nozzle main body 27 is swung downwards from the ordinary direction together with the ring member 26.

Fig. 3 is a perspective view of the trim operating lever device according to
35 the present invention, and shows the condition where the trim operating lever device 23 is not being operated. The ring member 26 (see Fig. 2) and the nozzle main body 27 (see Fig. 2) of the water jet propeller with the trim

operating wire 22 connected thereto are directed in the ordinary direction indicated by solid line.

5 The trim operating lever device 23 is comprised of a support member 42 attached to the steering handle 14, a trim lever main body 43 as a trim operating lever oscillatably mounted onto the support member 42, and a lever lock means 44 for locking the trim lever main body 43.

10 The lever lock means 44 is for locking the trim lever main body 43 in a grip position, and is comprised of a lock lever 47 oscillatably mounted onto the trim lever main body 43, a spring plate 48 fixed to the trim lever main body 43 so as to latch the lock lever 47 therewith, an origin stopper 49 formed on the trim lever main body 43, and an latch projected portion 51 formed on the support member 42.

15 Fig. 4 is a side view of the trim operating wire according to the present invention. The trim operating wire 22 has a structure in which one end 54 of the pull wire 53 which is thin and rich in flexibility is connected to the trim operating lever device 23 (see Fig. 3), the other end 55 of the pull wire 53 is connected to one end 61 of a push wire 57 which is thick and poor in flexibility through a push-pull converter 56, and the other end 62 (see Fig. 2) of the push wire 57 is connected to the steering nozzle 21 (see Fig. 2) as the nozzle, and has the function of transmitting a force for operating the steering nozzle.

25 The pull wire 53 is comprised of a wire cable outer 65 and an inner wire 68. The diameter of the inner wire 66 has been set to be D_f .

30 As the material of the inner wire 66, for example, stainless steel is used.

The push wire 57 is comprised of a wire cable outer 67 and an inner wire 68. The diameter of the inner wire 68 has been set to be D_r . The diameter D_r satisfies the relation $D_r > D_f$.

35 As the material of the inner wire 68, for example, stainless steel is used.

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The push-pull converter 56 has a structure in which a conversion link lever 72 is oscillatably mounted in a box 71, a tension spring 73 is hooked on the conversion link lever 72, the inner wire 66 of the pull wire 53 is connected to one end of the conversion link lever 72, and the inner wire 68 of the push wire 57 is connected to the other end of the conversion link lever 72, whereby a pulling force of the pull wire 53 is converted into a pushing force acting on the push wire 57. Incidentally, the wire cable outer 65 of the pull wire 53 is fixed to one side of the box 71, whereas the wire cable outer 67 of the push wire 57 is connected to the other side of the box 71, and the respective inner wires 66 and 68 are slid.

As shown in Fig. 1, the push-pull converter 56 is disposed in the craft body on the bow 24 side of the axis 25 located directly under the steering handle 14 of the personal watercraft 10, at a position spaced from the axis 25 by a distance L. Incidentally, the position of arrangement of the push-pull converter 56 may be directly under the steering handle 14, namely, on the axis 25.

Fig. 5 is an exploded view of the trim operating lever device and the trim operating wire according to the present invention, shows the support member 42 of the trim operating lever device 23, and the trim lever main body 43 oscillatably mounted onto the support member 42, and also shows the lock lever 47, the spring plate 48, and the origin stopper 49 formed on the trim lever main body 43, of the lever lock means 44.

The trim lever main body 43 is provided with a female screw 75 for a small screw 74 for mounting the lock lever 47, and is provided with a female screw 77 for a small screw 76 for mounting the spring plate 48.

The lock lever 47 is provided on its one side with a finger hook portion 78 for hooking of a finger, is provided at its center with a projected portion 79, and is provided on its other side with a latch end portion 81 to be latched on the latch projected portion 51 (see Fig. 3).

Fig. 5 further shows the pull wire 53 of the trim operating wire 22, the push-pull converter 56 (the box 71, the conversion link lever 72, and the

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tension spring 73), the push wire 57, and an elongation adjusting means 82 provided at the center of the pull wire 53.

Fig. 6 is a sectional view of the elongation adjusting means according to the present invention. The elongation adjusting means 82 has a structure in which the wire cable outer 65 of the pull wire 53 is divided into two portions, an adjusting nut 84 is attached to a first wire cable outer 83 located on the side of the trim operating lever device 23 (see Fig. 5), an adjusting bolt 86 is attached to a second wire cable outer 85 located on the side of the push-pull converter 56 (see Fig. 5), and a jam nut 87 is used. Symbol S denotes an adjustment margin.

Functions of the trim operating lever device for the personal watercraft as described above will be described below.

15

In the trim operating lever device 23 which is not being used as shown in Fig. 3, the lock lever 47 is in an unlocking condition, and the spring plate 48 presses a projected portion 79 of the lock lever 47 as indicated by arrow ③, whereby the lock lever 47 is stopped by the origin stopper 49, and maintains the condition of integral close contact.

20

From the position of the trim lever main body 43 shown in Fig. 3, gripping of the trim lever main body 43 by a left-hand finger as indicated by the arrow is started. The subsequent process will be described referring to the next drawing.

25

Fig. 7 is a first function view of the trim operating lever device according to the present invention.

The trim lever main body 43 is gripped, and when the trim lever main body 43 has reached a grip position (the condition shown in Fig. 7), the lock lever 47 is pushed out with a finger against the spring plate 48 as indicated by arrow ④.

30

Fig. 8 is a second function view of the trim operating lever device according to the present invention.

35

With the lock lever 47 pushed out as indicated by arrow ④, a latch end portion 81 of the lock lever 47 makes contact with a latch projected portion 51, and the spring force of the spring plate 48 acts on the projected portion 79 at the center of the lock lever 47 as indicated by arrow ⑤, so that the lock lever 47 is stopped even when the finger is released from the lock lever 47, and the trim lever main body 43 can be locked in the grip position. Therefore, the number of times of operation by the left hand necessary for swinging the steering nozzle 21 (see Fig. 2) is only two.

10 In the case of unlocking, the lock lever 47 is gripped. Specifically, the lock lever 47 is gripped with a finger against the spring plate 48 as indicated by arrow ⑥, upon which the latch end portion 81 of the lock lever 47 is disengaged from the latch projected portion 51, so that the unlocking can be achieved.

15 Furthermore, the trim operating lever makes it possible to enlarge the operating force, so that the nozzle can be swung swiftly.

Incidentally, the constitution of the lever lock means 44 for locking the trim lever main body 43 of the trim operating lever device 23 shown in the embodiment of the present invention is merely an example, and other mechanisms may be used for locking. For example, a pin inserting/drawing-out mechanism or a hook engaging/disengaging mechanism may be used, or a lock member may be inserted between the support member 42 and the trim lever main body 43.

The present invention, constituted as described above, displays the following effects.

30 According to the present invention, the trim operating lever device which can downwardly swinging the nozzle, capable of adjusting the jet direction of jet water, from an ordinary direction and which can return the nozzle into the ordinary direction when the grip thereon is released has a structure in which the lever lock means capable of locking the trim operating lever in the grip position is provided additionally to the steering handle. Therefore, when the trim operating lever is gripped with a finger of the hand which is gripping the steering handle, the lever of the lever

lock means can be substantially simultaneously operated by the finger, to effect locking. Accordingly, the number of times of operation by the left hand necessary for swinging the nozzle is only two.

- 5 In addition, since the trim operating lever makes it possible to enlarge the operating force, the nozzle can be swung swiftly.

10 Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. A trim operating lever device for a personal watercraft
5 comprising a jet propeller for ejecting jet water, a nozzle capable of
adjusting the jet direction of said jet water, said nozzle being arranged for
said jet propeller, and a trim operating lever provided additionally to a
steering handle, said nozzle being downwardly swingable from an
ordinary direction when said trim operating lever is gripped, and said
10 nozzle returning to said ordinary direction when said grip on said trim
operating lever is released, wherein a lever lock means capable of locking
said trim operating lever in a grip position is provided additionally to said
steering handle.

FIG. 1

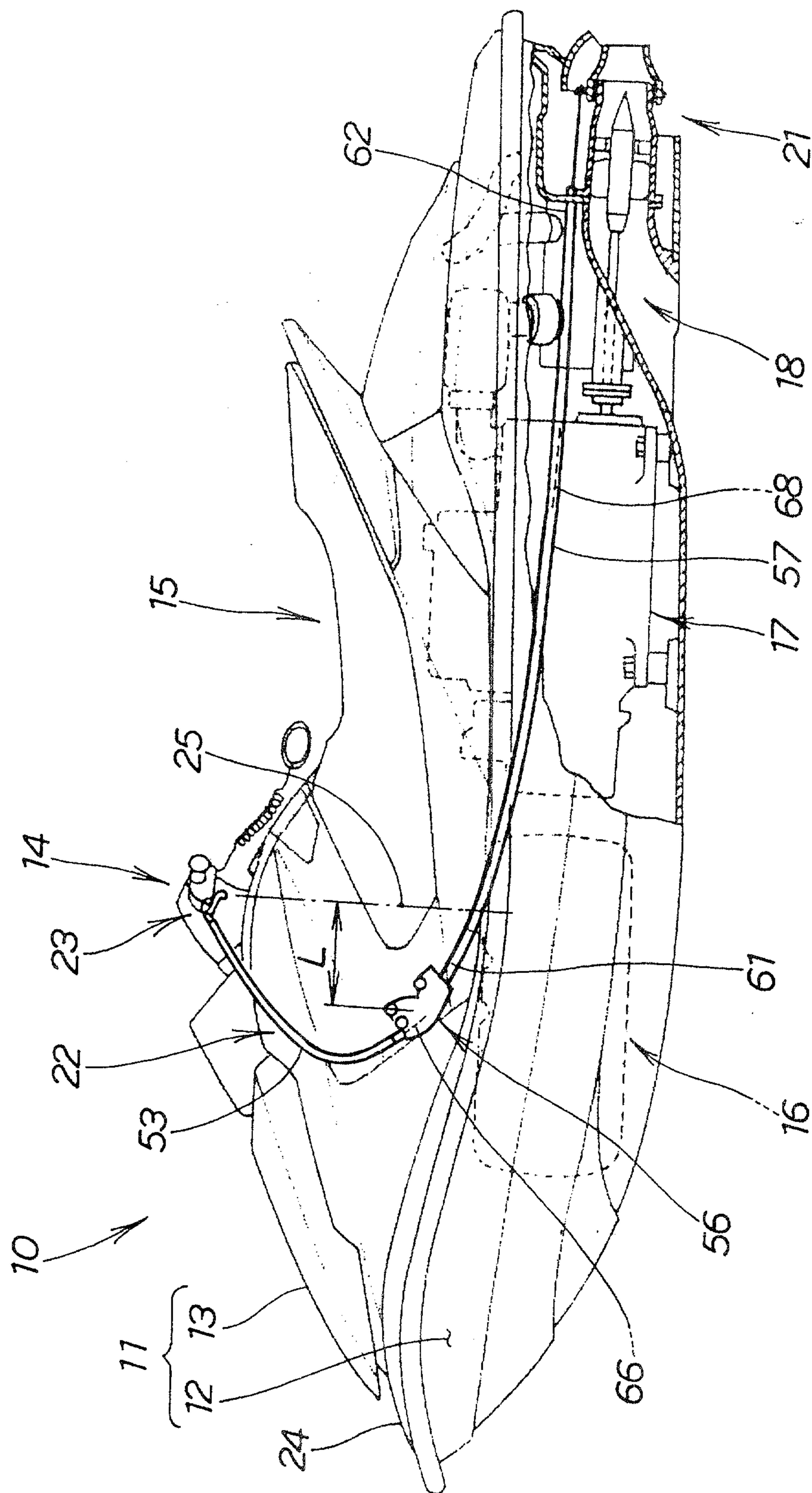


FIG. 2

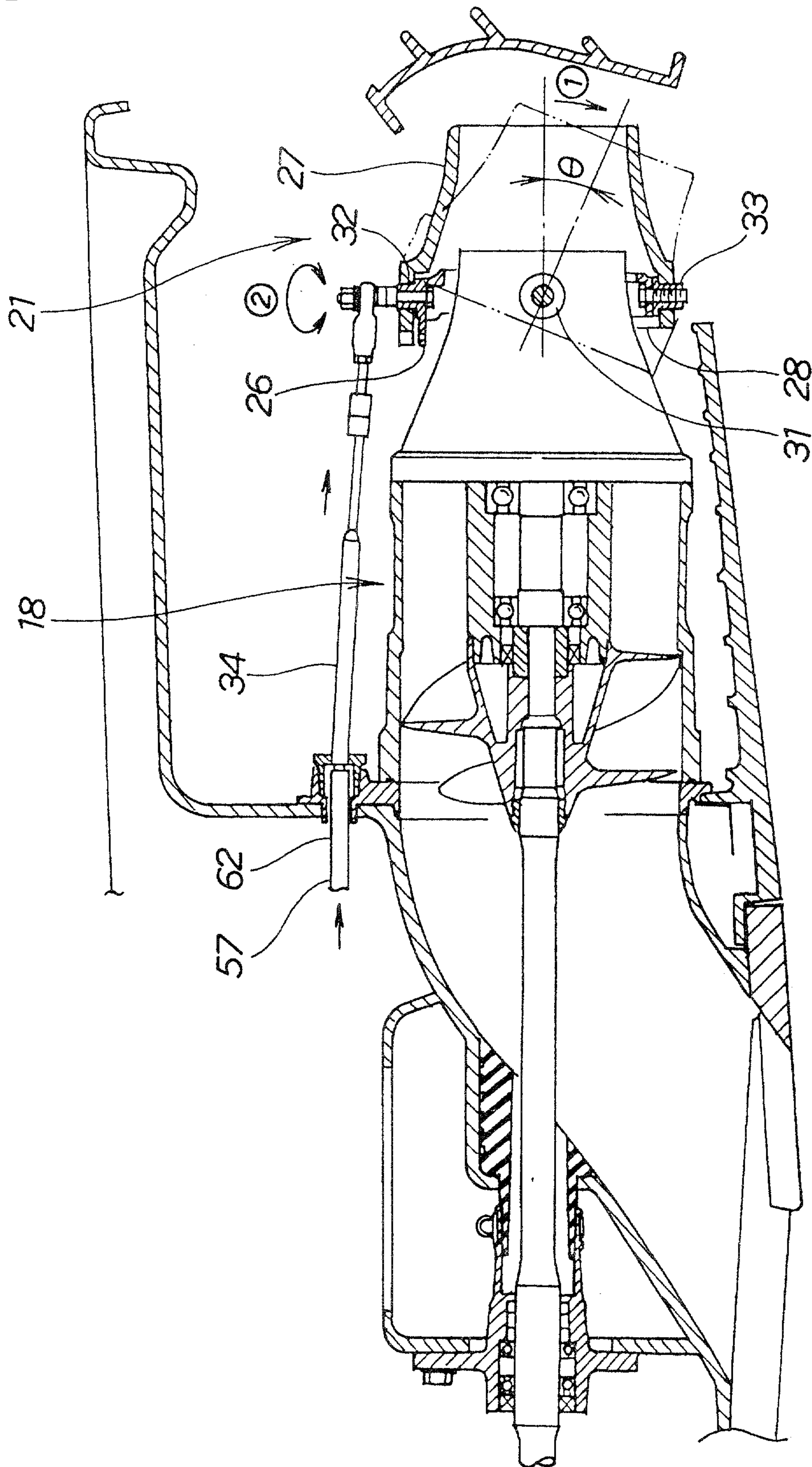


FIG. 3

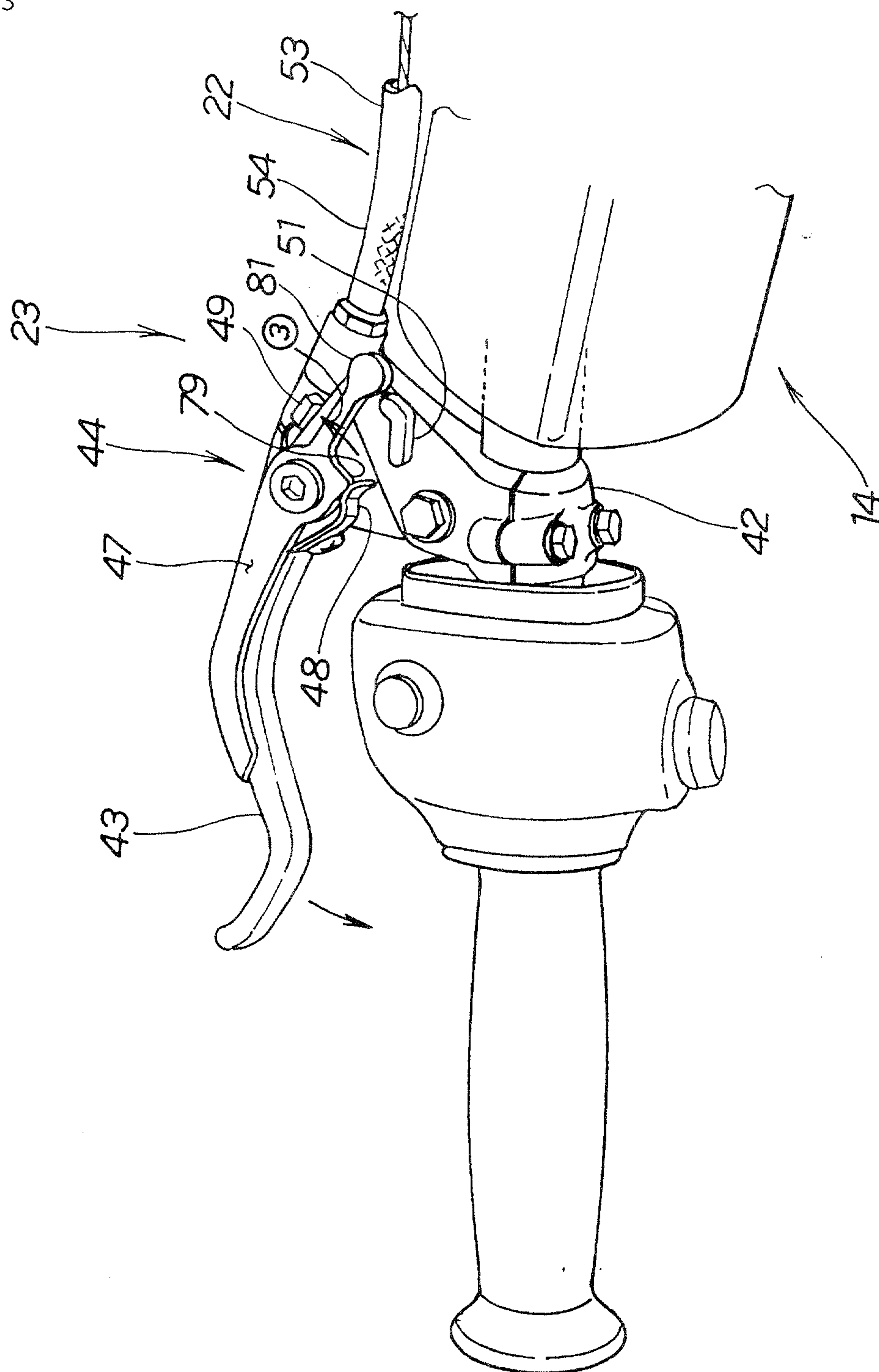


FIG. 4

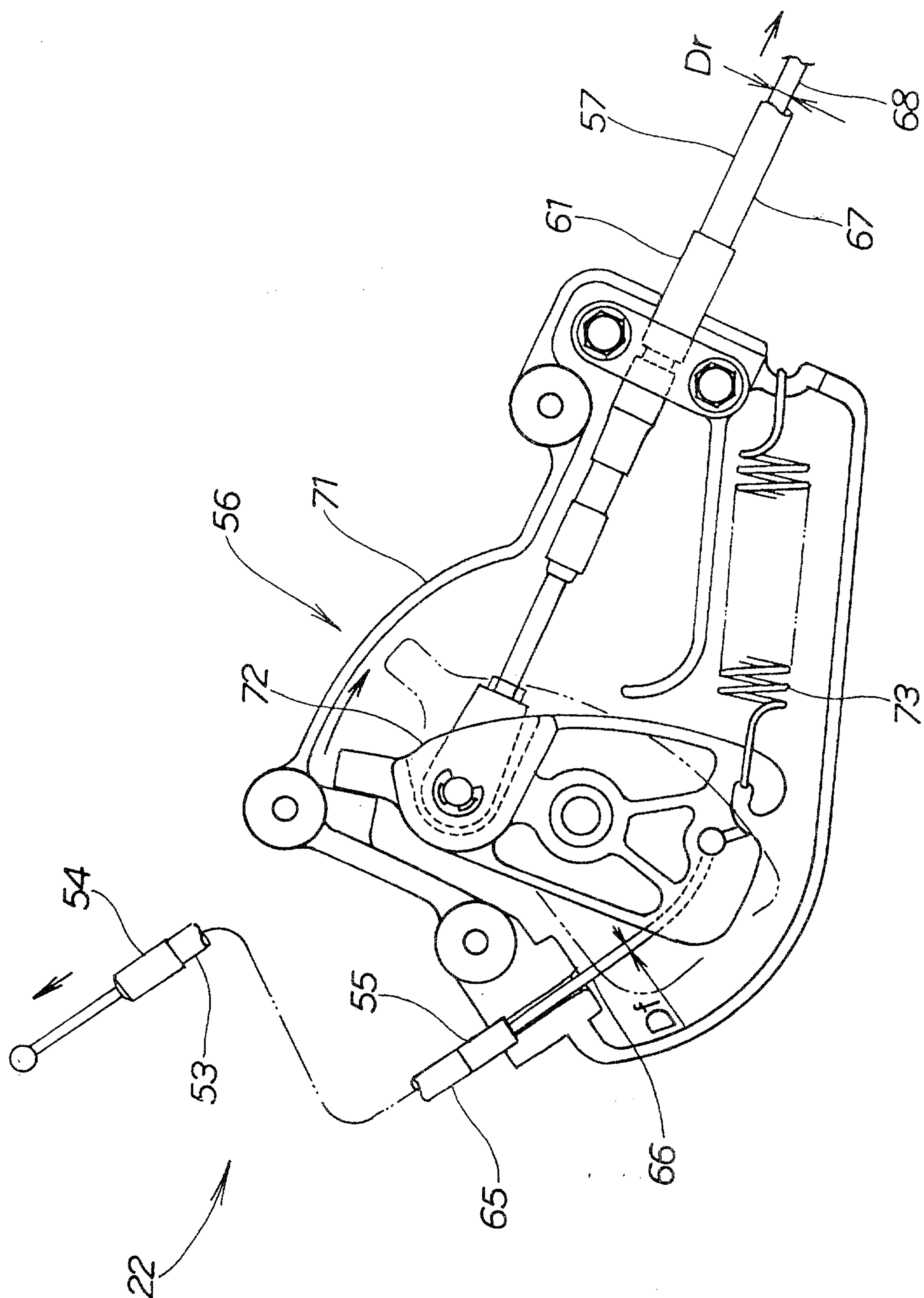


FIG. 5

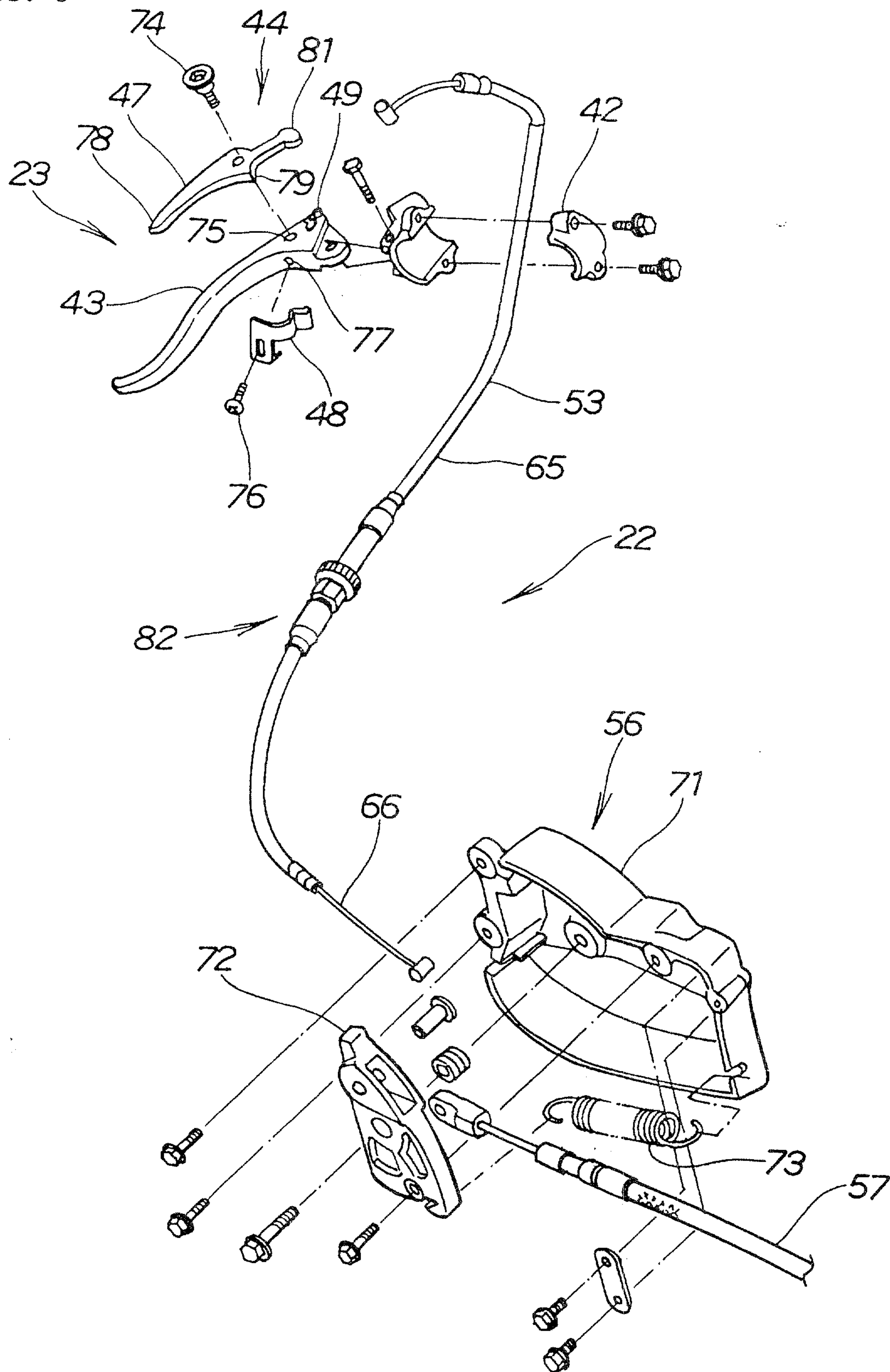


FIG. 6

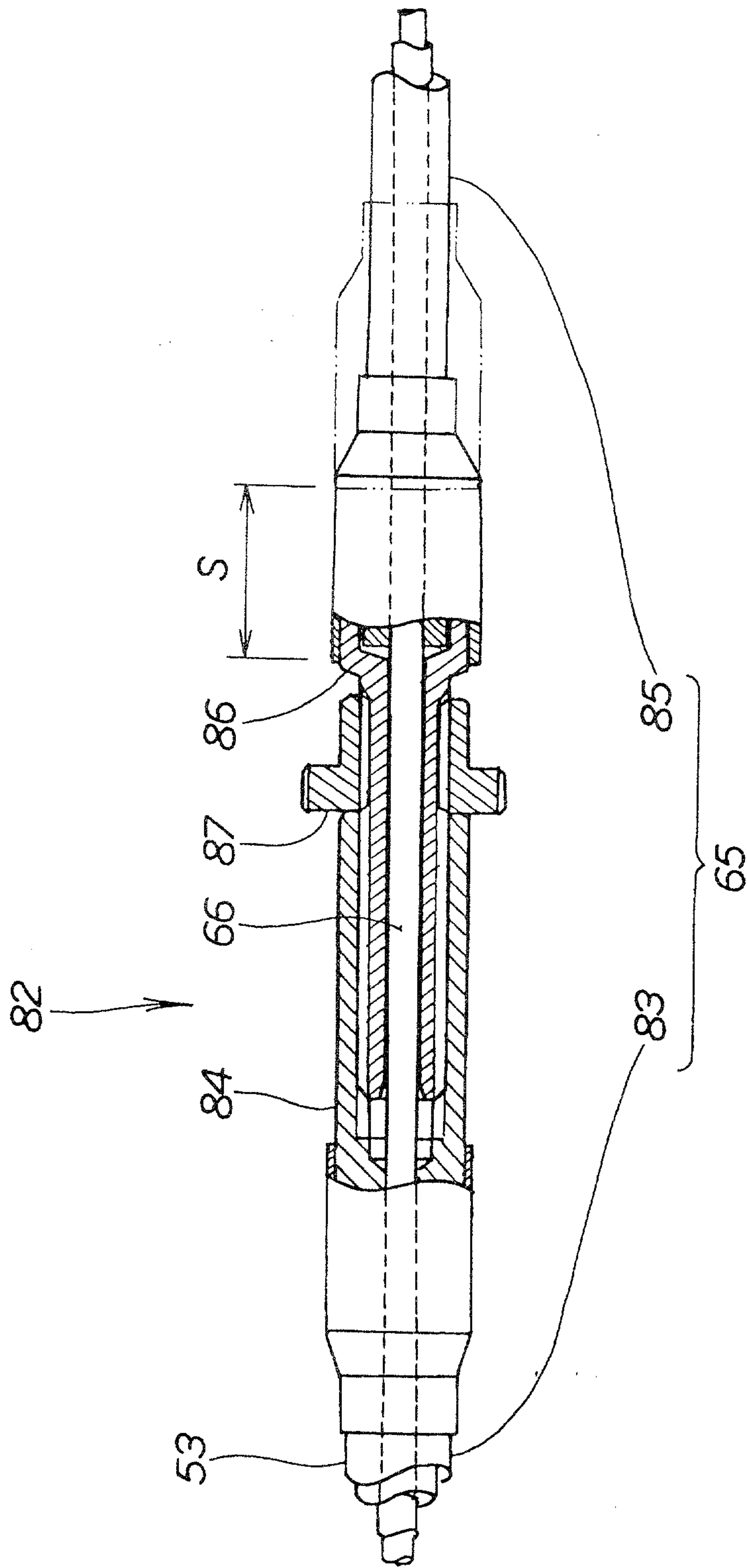


FIG. 7

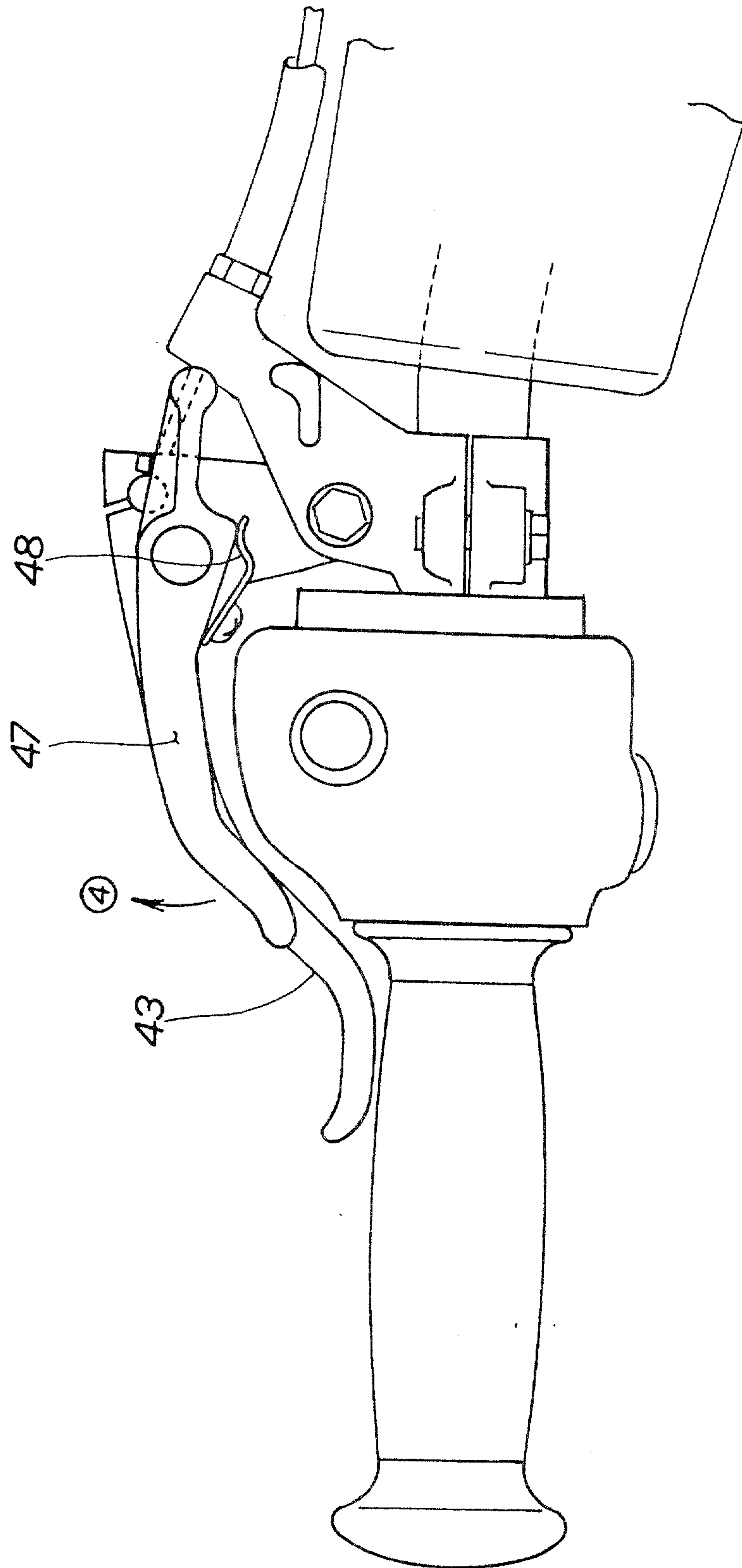


FIG. 8

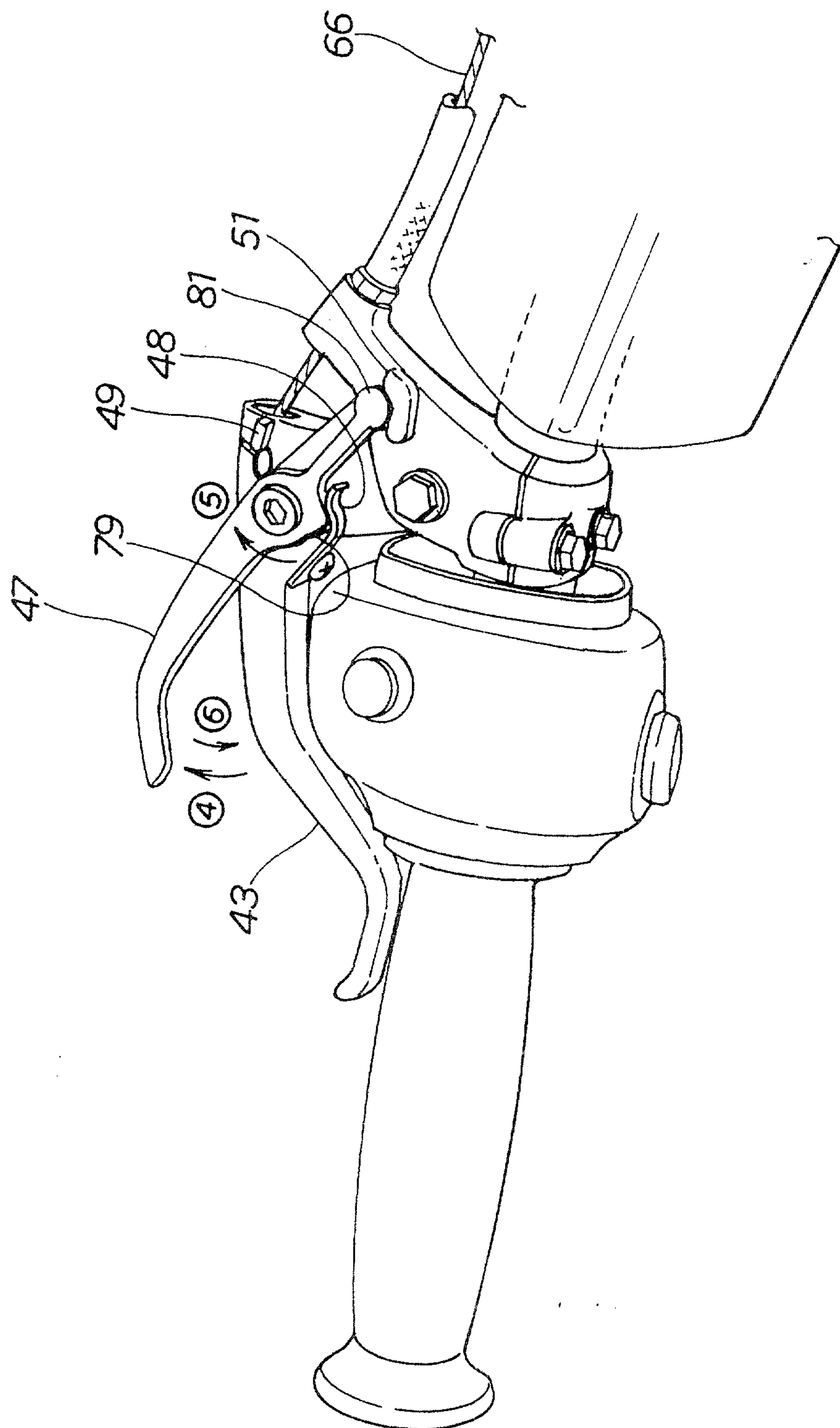


FIG. 9

