Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2403590 A1 2003/03/18

(21) 2 403 590

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(22) Date de dépôt/Filing Date: 2002/09/16

(41) Mise à la disp. pub./Open to Public Insp.: 2003/03/18

(30) Priorité/Priority: 2001/09/18 (2001-284180) JP

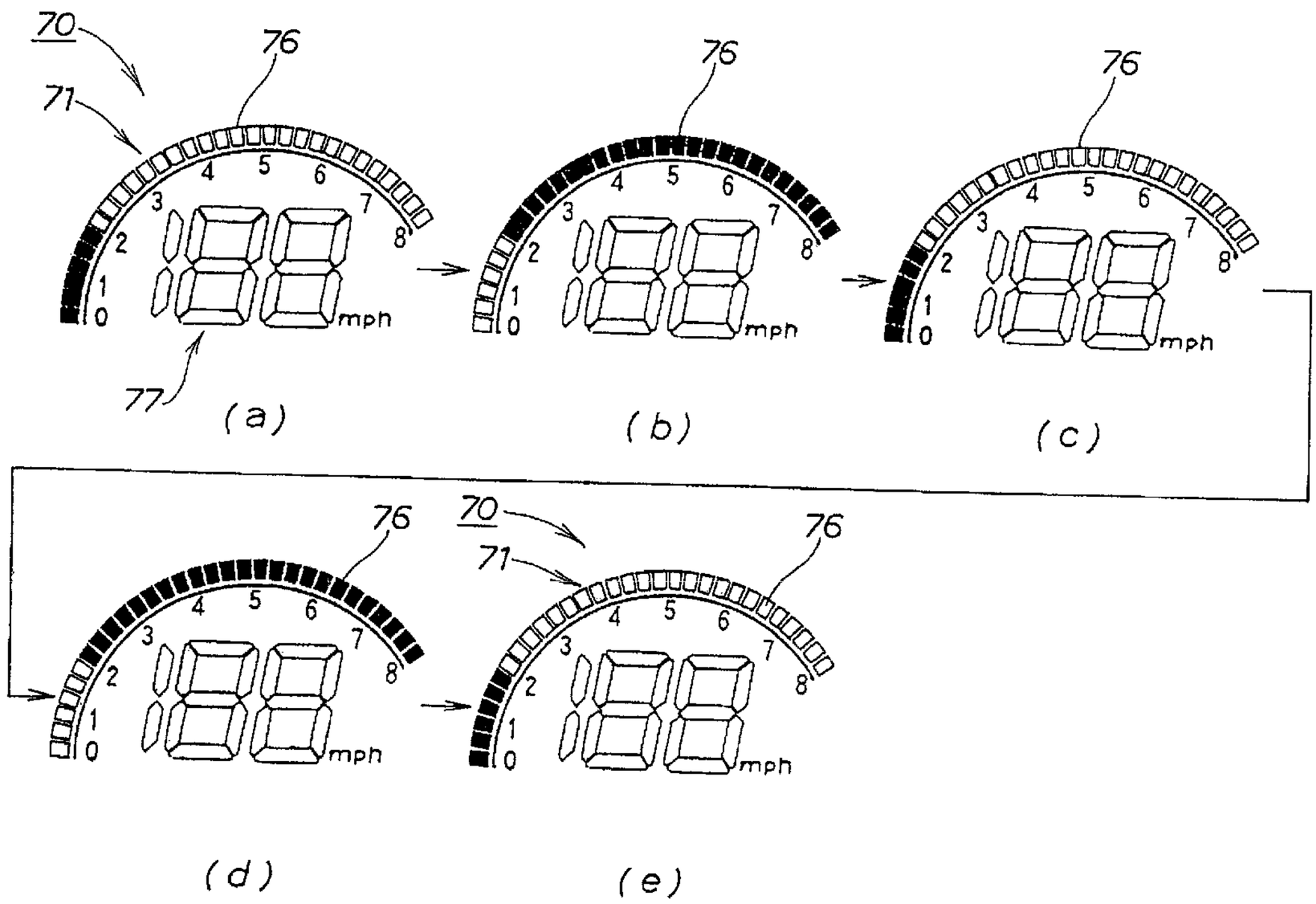
(51) Cl.Int.$^{7}$/Int.Cl.$^{7}$ B60K 35/00

(71) Demandeur/Applicant:
HONDA GIKEN KOGYO KABUSHIKI KAISHA, JP

(72) Inventeurs/Inventors:
FUNAYOSE, YUSUKE, JP;
HASEGAWA, TORU, JP;
YASHIRO, TOMOHIKO, JP

(74) Agent: DENNISON ASSOCIATES

(54) Titre : DISPOSITIF D'AFFICHAGE POUR MOYEN DE TRANSPORT
(54) Title: DISPLAY DEVICE FOR TRANSPORTATION MEANS




(57) Abrégé/Abstract:
In transportation means (jet propulsion boat 10) equipped with a liquid crystal display unit (liquid crystal device 71) displaying operation information, an ordinary movement of the transportation means is regarded as an ordinary state; and when a case where the need arises for abruptly reducing the speed of the transportation means or abruptly changing the direction of the transportation means, and the like are distinguished as a non-ordinary state, the liquid crystal display unit (liquid crystal device 71) has been caused to reverse a white-and-black display thereof when the transportation means shifts from the ordinary state to the non-ordinary state. It is possible to sensitively and directly notify the driver that the transportation means is in a non-ordinary state. As a result, it becomes easier to recognize that the transportation means is in a non- ordinary state.

## ABSTRACT OF THE DISCLOSURE

In transportation means (jet propulsion boat 10) equipped with a liquid crystal display unit (liquid crystal device 71) displaying operation information, an ordinary movement of the transportation means is regarded as an ordinary state; and when a case where the need arises for abruptly reducing the speed of the transportation means or abruptly changing the direction of the transportation means, and the like are distinguished as a non-ordinary state, the liquid crystal display unit (liquid crystal device 71) has been caused to reverse a white-and-black display thereof when the transportation means shifts from the ordinary state to the non-ordinary state. It is possible to sensitively and directly notify the driver that the transportation means is in a non-ordinary state. As a result, it becomes easier to recognize that the transportation means is in a non-ordinary state.

# DISPLAY DEVICE FOR TRANSPORTATION MEANS

## FIELD OF THE INVENTION

The present invention relates to a display device for transportation means, for example, a jet propulsion boat and the like of the form in which a jet water stream is caused to be discharged through a nozzle to thereby advance a boat hull, and when the boat hull is caused to take a turn to the left or right, the direction of the nozzle is changed by steering. In this respect, the transportation means means general transportation means including ships, airplanes, railroads or vehicles and the like.

## BACKGROUND OF THE INVENTION

The jet propulsion boat obtains a propulsive force by discharging a jet water stream, and changes the direction of the jet water stream to thereby change the direction of the boat hull. Therefore, it cannot change the direction without any jet water stream.

When avoiding, for example, an obstacle, a human being tends to reduce the boat speed and at the same time, to turn the steering wheel to the left or right as a human general action. To reduce the boat speed means closing the throttle, and even though the steering wheel is turned to the left or right in a state in which this throttle has been closed, it becomes impossible to change the direction of the boat hull at will because there is no jet water stream.

As technique for complementing such a characteristic of the jet propulsion boat, there is known, for example, U.S. Patent No. 6159059.

The above-described technique is, according to Figs. 2 and 3 of the official gazette, such that one end of throttle cable 44 is connected to a throttle regulator 46; to the other end of this throttle cable 44, a throttle lever 34 is connected; there is arranged a throttle return spring 49 for returning this throttle lever 34 to its original state; there is arranged compressible material 52 at the base of the throttle lever 34, whereby consideration has been given such that when the throttle lever 34 is released, the throttle regulator 46 is prevented from being abruptly closed, and even when the throttle lever 34 is returned, a predetermined jet water stream can be maintained for a short while.

The above-described control type thrust steering gear for a ship mechanically controls in such a manner that when the throttle lever 34 is returned, a predetermined jet water stream can be maintained for a little while.

More specifically, in transportation means for performing such control, there is preferably a display device capable of sensitively and directly notifying the driver that the transportation means is under control.

Thus, it is an object of the present invention to provide a display device capable of sensitively and directly notifying in what condition the transportation means is.

## SUMMARY OF THE INVENTION

According to the present invention, there is provided a display device of transportation means, characterized in that in transportation means equipped with a liquid crystal display unit displaying operation

information, an ordinary movement of the transportation means is regarded as an ordinary state; and when a case where the need arises for abruptly reducing the speed of the transportation means or abruptly changing the direction of the transportation means, and the like are distinguished as a non-ordinary state, a liquid crystal display unit reverses a white-and-black display thereof when the transportation means shifts from the ordinary state to the non-ordinary state.

When the transportation means shifts from the ordinary state to the non-ordinary state, the white-and-black display of the liquid crystal display unit is reversed, to thereby sensitively and directly notify the driver that the transportation means is in a non-ordinary state.

According to an aspect of the invention, there is provided a display device of transportation means, characterized in that a white-displayed portion in an ordinary state is caused to reverse and blink in the order of black-white-black in a non-ordinary state, and a black-displayed portion in the ordinary state is caused to reverse and blink in the order of white-black-white in the non-ordinary state.

In the non-ordinary state, reversion and blinking is caused to thereby strongly give the impression on the driver that the transportation means is in the non-ordinary state.

## BRIEF DESCRIPTION OF THE DRAWINGS

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

Fig. 1 is a side view showing a jet propulsion boat onto which a display device according to the present invention has been mounted;

Fig. 2 is a plan view showing a jet propulsion boat onto which a display device according to the present invention has been mounted;

Fig. 3 is a plan view showing a steering mechanism of a jet propulsion boat onto which a display device according to the present invention has been mounted;

Fig. 4 is a block diagram showing an OTS control device of a jet propulsion boat onto which a display device according to the present invention has been mounted;

Fig. 5 is an arrow view taken on line 5 of Fig. 1;

Fig. 6 is a plan cross-sectional view showing a display device for transportation means according to the present invention;

Fig. 7 is a block diagram showing a power source system for a jet propulsion boat onto which a display device according to the present invention has been mounted;

Fig. 8 is a side view showing a main switch with lanyard switch for a jet propulsion boat onto which a display device according to the present invention has been mounted;

Fig. 9 is an operation view showing a main switch with lanyard switch for a jet propulsion boat onto which a display device according to the present invention has been mounted;

Fig. 10 is a control flow chart for a jet propulsion boat onto which a display device according to the present invention has been mounted;

Fig. 11 is an operation explanatory view for a jet propulsion boat onto

which a display device according to the present invention has been mounted;

Fig. 12 is an explanatory view for a display pattern for a display device of transportation means according to the present invention;

Fig. 13 is an explanatory view showing a start-up inspection procedure of a jet propulsion boat onto which a display device according to the present invention has been mounted; and

Fig. 14 is a control system view for a jet propulsion boat onto which a display device according to the present invention has been mounted.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, with reference to the accompanying drawings, the description will be made of embodiments according to the present invention. In this respect, the drawings are to be viewed in accordance with the direction of the symbol.

Fig. 1 is a side view showing a jet propulsion boat onto which a display device according to the present invention has been mounted, and a jet propulsion boat 10 as the transportation means is composed of: a fuel tank 14 mounted to a front part 11a of a boat hull 11; an engine 15 provided behind this fuel tank 14; a pump chamber 16 provided behind the engine 15; a jet propeller 17 provided in this pump chamber 16; an exhaust unit 18, the suction side of which is mounted to the engine 15, and the exhaust side of which is mounted to the pump chamber 16; a steering 28 mounted above the fuel tank 14; and a seat 29 mounted behind this steering 28.

The jet propeller 17 has a housing 21 extending backward from an opening 13 in a hull bottom 12, and is constructed such that an impeller 22 is rotatively mounted within this housing 21 and the impeller 22 is coupled

to a driving shaft 23 of the engine 15.

In the jet propeller 17, the engine 15 is driven to rotate the impeller 22, whereby water sucked through the opening 13 in the hull bottom 12 can be injected backward of the boat hull 11 through a steering pipe 25 as a nozzle through an opening at rear end of the housing 21.

The steering pipe 25 is a member mounted to the rear end of the housing 21 so as to be able to freely swing in the lateral direction, and is a nozzle for steering which controls the steering direction of the boat hull 11 by swinging in the lateral direction in the operation of the steering 28.

In this jet propulsion boat 10, fuel is supplied to the engine 15 from the fuel tank 14 to drive the engine 15; a driving force of this engine 15 is transmitted to the impeller 22 through the driving shaft 23 to rotate the impeller 22, whereby water is sucked from the opening 13 in the hull bottom 12 and the water thus sucked can be injected through the steering pipe 25 through the rear end of the housing 21 for propelling.

Also, as described later, the jet propulsion boat 10 is a boat hull equipped with a control unit in order to precisely control an amount of jet water stream or a duration during which jet water stream can be injected. Further, this is also a boat hull capable of being switched into a limited operation mode in which the engine output can be controlled so as not to exceed predetermined output.

In the figure, a reference numeral 26 designates a reverse bucket which when reversing the boat hull, is put over the steering pipe 25 to flow the jet water stream forward obliquely downward; 33, an operating knob for operating the reverse bucket 26; 34, an exhaust pipe; 35, an exhaust body; 27, a battery which is a power source for the boat hull 11; 36, a water muffler; 37, a water lock pipe; 38, a tail pipe; 39, a resonator; and 45, a main

switch with lanyard switch.

Fig. 2 is a plan view showing a jet propulsion boat onto which a display device according to the present invention has been mounted, and the steering 28 is composed of: a steering shaft 41 rotatively mounted onto the boat hull; a steering wheel bar 43 to be mounted to the top end of this steering shaft 41; right and left steering wheel grips 44L, 44R mounted onto the left and right end portions of this steering wheel bar 43; a main switch 45 with lanyard switch provided at the base of the left steering wheel grip 44L; a throttle lever 46 mounted on the base of the right steering wheel grip 44R in such a manner as to be able to freely swing; a throttle cable 47 extending to the throttle from this throttle lever 46; and a steering detection mechanism 48 provided at the lower end of the steering shaft 41.

Fig. 3 is a plan view showing a steering mechanism for a jet propulsion boat onto which a display device according to the present invention has been mounted, and the steering detection mechanism 48 is composed of: a bracket 51 mounted onto the boat hull 11 (See Fig. 1); a switch cam 52 mounted to the lower end of the steering shaft 41; a steering switch 53 for turning ON/OFF through the use of this switch cam 52; and a cam plate 54 mounted to the lower end of the steering shaft 41. In this respect, a reference numeral 55 designates a driving link for driving the steering pipe 25 (See Fig. 1) by rotatively mounting to the end portion of the cam plate 54; 53a, a switch lever for the STEERING switch 53; and 53b, the body portion of the steering switch 53.

Fig. 4 is a block diagram showing an OTS control device for a jet propulsion boat to which a display device according to the present invention has been mounted. In this case, OTS is the abbreviated name for an off Throttle Steering System, and is a device in which even when the throttle 34 has been returned, a predetermined jet water stream is rendered capable of being maintained for a little while.

An OTS control device 60 for a jet propulsion boat is a system composed of: the steering wheel 28 for steering the boat hull 11 (See Fig. 1); a fuel injection system 61 for supplying fuel to the engine 15 (See Fig. 1); a control unit (ECU) 101 for controlling the boat hull 11; and a display device 70 equipped with a display control unit 74 as a control unit, for displaying a state of the boat hull 11. This system is a system for raising the number of revolutions of the engine 15 to a predetermined number of revolutions irrespective of the throttle 64 when on condition that the engine 15 rotates at a predetermined number of revolutions or higher for a predetermined time period or more, and the throttle 64 is opened at a predetermined opening or more for a predetermined time period or more, the throttle 64 is closed and at the same time, the steering wheel 28 is turned to the left or right more than a predetermined angle.

The fuel injection system 61 is composed of: a solenoid 62 for controlling negative pressure on the basis of information from the control unit (ECU) 101; the throttle 64 provided in an intake air passage 63, for adjusting an amount of an air-fuel mixture to supplied to the engine 15 (See Fig. 1); a diaphragm 65 provided between these solenoids 62 and the throttle 64 for adjusting throttle opening; a throttle position sensor 66 for detecting the throttle opening; an one-way valve 67 provided between the solenoid 62 and the intake air passage 63, for preventing negative pressure from reverse-flowing, and pressure from entering; a surge tank 68 provided between this one-way valve 67 and the solenoid 62, for relaxing negative pressure fluctuation; and an injector 69 for causing fuel to be in a fine spray state to supply to the intake air passage 63. In the figure, _ designates the throttle opening.

Fig. 5 is an arrow view taken on line 5 of Fig. 1, and shows a front surface of a display device 70 (hereinafter, will be abbreviated as "display device 70") of transportation means according to the present invention.

The display device 70 is composed of: a liquid crystal device 71 as a liquid crystal display unit for displaying operation information; a warning lamp 72 for lighting or blinking when various warning is needed; an operating switch 73 for performing a switching operation or an input operation; a display control unit 74 for driving the liquid crystal device 71 and the warning lamp 72 and controlling the boat hull 11; a housing 75 for collectively covering these liquid crystal device 71, warning lamp 72 and display control unit 74; and a buzzer 79 for giving a warning sound when lighting or blinking the warning lamp 72.

The liquid crystal device 71 is obtained by forming a tachometer 76 for indicating a number of revolutions of the engine 15 (See Fig. 1), a speed meter 77 for indicating the boat speed, and a multifunctional display unit 78 for displaying operation information and various warning.

The multifunctional display unit 78 is composed of: a charging mark 78a for blinking when the battery 27 (See Fig. 1) is lower than predetermined voltage; a water temperature warning mark 78b for blinking when cooling water temperature exceeds a predetermined temperature; an oil warning mark 78c for blinking when an amount of engine oil is lower than a predetermine amount, or when engine oil pressure is lower than a predetermined value; a fuel injection system warning mark 78d (hereinafter, will be abbreviated as "FI warning mark 78d") for blinking when abnormal conditions are encountered with the fuel injection system 61 (See Fig. 3); a limit mode indicating mark 78e as an indicating lamp indicating that a limited operation mode which limits the engine output so as not to exceed the predetermined output has been set; a remaining quantity indicator 78f for indicating the remaining fuel quantity; a fuel replenish warning mark 78g for urging to replenish fuel when the remaining fuel quantity is small; an ID number mark 78h for blinking when an ID (Identification) number as a secret number for theft

prevention is set and is locked; a key mark 78i; a key mark 78i for lighting when the theft-prevention function has been released; a selector display unit 78j for displaying after switched to time indication, hours underway indication, the number of engine revolutions (hereinafter, will abbreviated as "Ne tacho-indication"), navigation distance indication or cumulative hours underway indication.

In other words, the jet propulsion boat 10 (See Fig. 1) is also a propulsion boat equipped with a theft-prevention function, the power source of which can be turned ON or OFF by inputting the ID number.

The operating switch 73 is composed of: a set switch 73a to be used when setting time and the like; the mode switch 73b to be used when switching the selector display unit or when setting the limited operation mode; and the ID set switch 73c and the ID number switch 73d to be used when encoding with an ID number for determination.

Fig. 6 is a plan cross-sectional view showing a display device of transportation means according to the present invention, and a housing 75 is composed of: a lower case 81 for mounting a display control unit 74; an upper case 83 mounted to this lower case 81 through a packing 82; a display window 84 mounted onto an opening 83a of this upper case 83; and a bush 86 provided to draw out a harness 85 obtained by tying up in a bundle from the bottom 81a of the lower case 81.

A reference numeral 81b designates a boss for supporting the display control unit 74 by standing it in the lower case 81; 81c, a set boss for fastening the display control unit 74 by standing it in the lower case 81; 87a, 87b, connectors connected to the display control unit 74; and 88a, 88b, a plurality of harness extending from the display control unit 74.

Fig. 7 is a block diagram showing a power source system for a jet

propulsion boat onto which a display device according to the present invention has been mounted, and the power source system 90 is comprised of: a main switch 45 with lanyard switch connected to a battery 27 power source in parallel; a main relay 91 for turning ON/OFF the battery 27 power source for supplying to the fuel injection system 61 and other accessories 92 (fuel pump to be described later) by connecting a coil portion 91a to this main switch 45 in series and connecting a switch portion 91b to the battery 27 in series; the display control unit 74 which connects to the main switch 45 in parallel in order to control this main relay 91; and the control unit (ECU) 101 for controlling the engine 15 (See Fig. 1) having the fuel injection system 61 and the like.

The control unit (ECU) 101 is a portion which controls the engine 15 and controls the jet propulsion boat 10 (See Fig. 1) which controls the fuel injection system 61 and other accessories 92.

The display control unit 74 is equipped with: a microcomputer 74A which forms the heart; a switch circuit 93 which turns ON/OFF the power source of the display control unit 74 itself by inputting information of the main switch 45 with lanyard switch and a predetermined ID number; and delay means 94 for delaying the operation of this switch circuit 93 for a predetermined time period, inputs ID information for theft prevention; information of the main switch with lanyard switch; speed information of the boat hull; fuel information for displaying the remaining fuel quantity; engine number of revolutions information; and warning lamp display information and the like for lighting the multifunctional function display unit 78 shown in Fig. 5 and the warning lamp 72, and outputs limited operation information when the fuel injection system 61 (See Fig. 4) is controlled for control operation; and lock information which has turned OFF the main relay 91, and the like. In this respect, a reference numeral 92 designates other accessories.

In other words, in a power source system of a small boat equipped with the main switch 45 with lanyard switch capable of turning OFF the power source in an emergency by connecting to an occupant through a wire, which supplies power source to accessories including the fuel injection system 61, and the like, and equipped with a control unit for controlling the engine, the power source system 90 can be said to be equipped with a main relay 91 for turning ON/OFF the power source to be supplied to the accessories, and control units (display control unit 74) which are connected to the main switch 45 in parallel in order to control this main relay 91, to supervise the ON/OFF state of the main switch 45, through the use of the control unit (display control unit 74) and to ON/OFF control the main relay 91 based on the ON/OFF state.

The structure is arranged such that in order to turn ON/OFF the power source to be supplied to the accessories including the fuel injection system 61, there is provided the main relay 91; in order to control this main relay 91, there are provided control units (display control unit 74) to be connected to the main switch 45 in parallel; and an ON/OFF state of the main switch 45 is supervised by the control unit (display control unit 74) in such a manner that the main relay 91 is turned ON/OFF on the basis of the ON/OFF state. Therefore, ON/OFF of the power source to be supplied to the accessories including the fuel injection system 61 can be collectively controlled. As a result, the power source system 90 can be simplified.

Also, the display control unit 74 outputs to the control unit (ECU) 101 lock information when the main relay 91 is OFF. Therefore, since the control unit (ECU) 101 has the lock information, the engine 15 (See Fig. 1) cannot be started even though the main relay 91 is directly connected.

More specifically, the power source system 90 is characterized in that it has a theft-prevention function in the control unit (display control unit 74), and that when the control unit (ECU) 101 outputs information to turn

OFF the main relay 91 from the control unit (display control unit 74), it is caused to output a stop signal to stop the engine 15 on the basis of this OFF signal.

When information to turn OFF the main relay 91 is outputted from the control unit (display control unit 74), the stop signal to stop the engine 15 is outputted on the basis of this OFF signal, whereby there is no possibility that the engine 15 is started even when, for example, the main relay 91 is directly coupled. Therefore, it is possible to prevent the small boat (jet propulsion boat 10) from being thieved.

Fig. 8 is a side view showing a main switch with lanyard switch of a jet propulsion boat onto which a display device according to the present invention has been mounted, and the main switch 45 with lanyard switch is composed of: a lanyard switch portion (switch operation strap) 57 to be connected to the occupant during navigation; and a main switch body portion 58 capable of being ON/OFF operated by this lanyard switch.

The lanyard switch portion 57 is composed of: a clip portion 57a for turning ON/OFF the power source by sandwiching it in the main switch body portion 58 or removing; a flexible wire 57b extending from this clip 57a; and a hand strap 57c to be worn on the occupant's arm by mounting to the tip end of this wire 57b.

The main switch portion 58 is composed of: a housing 58a to be mounted on the boat hull 11 (See Fig. 1) side; a switch 58b housed in this housing 58a; an outer knob 58c for operating this switch 58b; a stop button 58d provided inside this outer knob 58c; and a start switch 58e for starting the engine 15 (See Fig. 1).

This is a switch which turns ON the switch 58b when the outer knob 58c is pulled outward, maintains ON when the clip 57a of the lanyard switch

portion 57 is sandwiched, automatically returns to the initial position to turn OFF when the clip 57d comes off, and can turn OFF the power source by pressing the stop button 58d with the clip 57a sandwiched. Hereinafter, the detailed description will be made of an operation of the main switch 45 with lanyard switch.

Figs. 9(a) to 9(c) are operating views of the main switch with lanyard switch for a jet propulsion boat onto which a display device according to the present invention has been mounted.

In Fig. 9(a), the clip 57a of the lanyard switch portion 57 is pressed into between the housing 58a of the main switch body portion 58 and the outer knob 58c as indicated by an arrow ①, whereby the outer knob 58c moves as indicated by an arrow ②, and the switch 58b can be turned ON.

In Fig. 9(b), the stop button 58d is pressed as indicated by an arrow ③ with the lanyard switch portion 57 fitted in the main switch body portion 58, whereby the switch 58b can be turned OFF.

[0035]

In Fig. 9(c), when the clip 57a of the lanyard switch portion 57 is pulled out between the housing 58a of the main switch body portion 58 and the outer knob 58c as indicated by an arrow ④, the outer knob 58c automatically returns together with the stop button 58d as indicated by an arrow ⑤, and the main switch body portion 58b turns OFF.

Hereinafter, the description will be made of a control flow of the jet propulsion boat 10.

Fig. 10 is a control flow diagram for a jet propulsion boat according to the present invention. In this respect, STxx designates a step No.(for symbols, refer to Fig. 4)

ST01: Assuming the number of revolutions of an engine to be Ne, and that of a predetermined engine to be N1 (hereinafter, it will be described as "predetermined number of revolutions N1"), it is examined whether or not the number of revolutions of an engine Ne exceeds the predetermined number of revolutions N1 (Ne_N1). If YES, the sequence will proceed to ST02, and if NO, the sequence will return to the start. In this case, the predetermined number of revolutions N1 is set to 3,700 rpm.

ST02: Assuming a throttle opening to be θ, and a predetermined throttle opening to be θ1 (hereinafter, it will be described as "predetermined opening θ1"), it is examined whether or not the throttle opening _ exceeds the predetermined opening θ1. If YES, the sequence will proceed to ST03, and if NO, the sequence will return to the ST01. In this case, the predetermined opening θ1 is set to 13°.

ST03: Assuming a time period to be T, and a predetermined time period to be T1, it is examined whether or not both a state of the predetermined number of revolutions N1 or higher and a state of the predetermined opening θ1 or larger exceed the predetermined time period T1. If YES, the sequence will proceed to ST04, and if NO, the sequence will return to the ST01. In this case, the predetermined time period T1 is set to 2sec.

ST04: It is examined whether or not the throttle 64 has been closed (throttle opening θ=0). If YES, the sequence will proceed to ST05, and if NO, the ST04 will be repeated.

ST05: Has a steering switch 53 turned ON? If YES, the sequence will proceed to ST06, and if NO, the sequence will return to ST04.

ST06: Assuming the predetermined delay time to be Td, has the delay time Td elapsed ($T \geqq Td$)? In this case, the delay time Td is set to 0.7sec. If YES, the

sequence will proceed to ST07, and if NO, the ST06 will be repeated.

ST07: Assuming the predetermined maintenance number of revolutions to be N2, the engine number of revolutions Ne is raised to the maintenance number of revolutions N2 to maintain the number of revolutions. In this case, the maintenance number of revolutions N2 is set to 2100 rpm.

ST08: Assuming the predetermined maintenance time to be T2, has the maintenance time T2 elapsed? If YES, the step will be completed, and if NO, the ST08 will be repeated. In this case, the maintenance time T2 is set to 7sec.

In other words, in a jet propulsion boat of the form in which a jet water stream is caused by a jet propeller 17 having an engine 15 as a driving source, and this jet water stream is caused to be discharged through a steering pipe 25 (nozzle), whereby the boat hull 11 is caused to advance, and when the boat hull 11 is caused to take a turn to the left or right, the direction of the nozzle is changed by the steering 28, the jet propulsion boat 10 (See Fig. 1) can be said to be a boat equipped with a control unit 74 (See Fig. 4) for raising the number of revolutions of the engine to a predetermined number of revolutions (maintenance number of revolutions N2) irrespective of the throttle 64 and at the same time, for maintaining it only for a predetermined maintenance time period T2 when on condition that the engine 15 rotates at a predetermined number of revolutions N1 or higher for a predetermined time period T1 or more, and the throttle 64 (See Fig. 4) is opened at a predetermined opening θ1 or more for a predetermined time period T1 or more, the throttle 64 is closed and at the same time, the steering wheel 28 is turned to the left or right more than a predetermined angle.

When the throttle is closed to turn the steering wheel 28 (See Fig. 4) in

order to avoid an obstacle appeared in front of the boat hull 11 (See Fig. 1), the amount of jet stream is reduced, and therefore, the maneuverability is deteriorated. Thus, under certain conditions, the number of revolutions of the engine is raised to a predetermined number of revolutions to increase the amount of jet stream.

In this case, when the throttle 64 is closed in order to perform driving at slow speed such as entry in port, and when the number of revolutions of the engine is reduced, it is not necessary to increase the number of revolutions Ne of the engine. Also, since it is the maneuverability that matters, it is not necessary to increase the number of revolutions of the engine when the steering wheel 28 is not turned.

Accordingly, when on condition that the engine 15 rotates at a predetermined number of revolutions N1 or higher for a predetermined time period T1 or more, and the throttle 64 (See Fig. 4) is opened at a predetermined opening θ1 or more for a predetermined time period T1 or more, the throttle 64 is closed and the steering wheel 28 is turned to the left or right more than a predetermined angle, the above-described condition has been set.

Thereby, only when necessary, the number of revolutions Ne of the engine can be raised to a predetermined number of revolutions (maintenance number of revolutions N2).

In other words, there is provided a control unit 74 (See Fig. 4) which raises the number of revolutions Ne of the engine to a predetermined number of revolutions (maintenance number of revolutions N2) and maintains it only for a predetermined maintenance time period T2, whereby an amount of jet stream is secured. Thus, the steering response of the jet propulsion boat 10 (See Fig. 1) can be improved.

Fig. 11 is an operation explanatory view of a jet propulsion boat onto which a display device according to the present invention has been mounted. In this respect, the figure of the jet propulsion boat 10 which moves with elapsed time is indicated by the jet propulsion boat 10A to 10D.

In the jet propulsion boat 10A, it is assumed to be under navigation in a state in which the predetermined number of revolutions N1 and the predetermine opening θ1 has been exceeded as shown in Fig. 10 and in a state in which the precondition for control for more than the predetermined time period T1 has been satisfied. At the time, an avoidance buoy M is detected, and the need of avoiding this avoidance buoy M becomes pressing.

In the jet propulsion boat 10B, in order to avoid the avoidance buoy M, the throttle 64 is closed to use the steering wheel 28 (See Fig. 4) for a steering operation. In the jet propulsion boat 10B, however, as described above, the direction cannot be changed without any jet water stream. Thus, on condition that the throttle 64 is turned OFF and the steering switch 53 is turned ON, after a lapse of a predetermined delay time period Td, the number of revolutions Ne of the engine is raised to N2 to generate a jet water stream (control start). In this respect, as regards the OFF timing of the throttle 64 and the ON timing of the steering switch 53, whichever is earlier, there is no problem.

Also, since it is a ship which navigates in a sliding state in 10B, the jet propulsion boat sideslips frequently. Accordingly, to perform a control start after a predetermined delay time period is preferable in order to efficiently steer the boat hull 11 (See Fig. 1).

The jet propulsion boat starts changing the direction in 10C. As a result, the jet propulsion boat can avoid the avoidance buoy M in 10D along the

driver's will.

Figs. 12(a) to 12(e) are explanatory views for display patterns of the display device of the transportation means according to the present invention.

Fig. 12(a) shows a display pattern of a tachometer 67 in the display device 70 under navigation (hereinafter, referred to as "ordinary state" here), and shows that when the number of revolutions Ne of the engine is raised to 2000 rpm, black is indicated between 0 and 2, and white is indicated between 2 and 8.

Figs. 12(b) to 12(e) show display patterns of the tachometer 67 under control (hereinafter, referred to as "non-ordinary state" here), and the tachometer 67 of a liquid crystal display unit (liquid crystal device 71) reverses and blinks.

More specifically, when it shifts from the ordinary state to the non-ordinary state, a white-and-black display of the liquid crystal display unit (liquid crystal device 71) is reversed. A white-indicated portion in the ordinary state is caused to reverse and blink in the order of black-white-black in the non-ordinary state, and a black-indicated portion in the ordinary state is caused to reverse and blink in the order of white-black-white in the non-ordinary state.

In other words, in the transportation means (jet propulsion boat 10) equipped with the liquid crystal display unit (liquid crystal device 71) displaying the operation information, ordinary movement of the transportation means is regarded as the ordinary state, and when a case where the need arises for abruptly reducing a speed of the transportation means or abruptly changing the direction of the transportation means, and the like are distinguished as a non-ordinary state, the liquid crystal display unit (liquid crystal device 71) reverses a white-and-black display thereof

when the transportation means shifts from the ordinary state to the non-ordinary state.

When the transportation means (jet propulsion boat 10) shifts from the ordinary state to the non-ordinary state, the white-and-black display of the liquid crystal display unit (liquid crystal device 71) is caused to reverse, whereby it is possible to sensitively and directly notify the driver that the transportation means is in a non-ordinary state. As a result, it becomes easier to recognize that the boat hull 11 is in a non-ordinary state.

Also, in other words, a white-displayed portion in the ordinary state is caused to reverse and blink in the order of black-white-black in the non-ordinary state, and a black-displayed portion in the ordinary state is caused to reverse and blink in the order of white-black-white in the non-ordinary state.

In the non-ordinary state, reversion and blinking is caused to thereby strongly give the impression on the driver that the transportation means (jet propulsion boat 10) is in the non-ordinary state.

Fig. 13 is an explanatory view showing a start-up inspection procedure for the jet propulsion boat onto which a display device according to the present invention has been mounted. In this respect, STxx designates a step No. (for symbols, refer to Fig. 4).

ST11: Start the engine 15 (See Fig. 1).

ST12: The precondition for control is satisfied. That is, maintains at a predetermined number of revolutions N1 of 3700 rpm or over, and at a predetermined opening $\theta 1$ of 13° or over for a predetermined time period of 2sec or over.

ST13: Turn OFF the throttle 64, and turn ON the steering switch 53.

ST14: Delay time period Td is normal (normal at Td=0.7sec)? If YES, the sequence will proceed to ST15. If NO, the control unit 74 may be out of order.

ST15: Is the number of revolutions Ne of the engine raised to N1=2100 rpm? If YES, the sequence will proceed to ST16. If NO, the solenoid 62, the intake air passage 63 or a throttle link 47 (See Fig. 3) may be out of order.

ST16: Maintenance time period T2 is normal (normal at Td=7sec)? If YES, the sequence will proceed to ST17. If NO, the control unit 74 may be out of order.

ST17: If NO, the display device 70 blinks? If YES, finish the start-up inspection. If NO, the display device 70, the steering switch 53 or the throttle position sensor 66 may be out of order.

Fig. 14 is a view showing a control system for a jet propulsion boat onto which a display device according to the present invention has been mounted.

The control system 100 for the jet propulsion boat is mainly composed of: a battery 27, which is a power source supply source; an injector 69 (displayed as "injector 69A to 69D" here) of the fuel injection system 61 (See Fig. 4); a main relay 91; a display control unit 74 mounted on the display device 70 (See Fig. 5); and a control unit (ECU) 101 to be controlled by the engine 15 (See Fig. 1).

In Fig. 14, a reference numeral 102 designates a starter; 103, a starter relay for turning ON/OFF the starter 102; 104, a generator; 105, a regulator for regulating voltage generated by the generator; 107, a buzzer connected to

the display control unit 74; 108, a speed sensor connected to the display control unit 74; 109, a fuel sensor connected to the display control unit 74; 111, a temperature sensor connected to the control unit (ECU) 101; 112, a water temperature sensor connected to the control unit (ECU) 101; 113, an exhaust temperature detection sensor connected to the control unit (ECU) 101; 114, an oil temperature sensor for detecting the engine oil temperature by connecting to the control unit (ECU) 101; 116A to 116D, ignition system member (ignition plug and ignition coil); 117, an oil pressure sensor; 118, a knock sensor for detecting knocking of the engine 15; 121, a fuel pump; and 122, a relay for turning ON/OFF the fuel pump.

A flow indicated by an arrow A indicates engine oil information, temperature information, fuel information, engine number of revolutions information, warning lamp display information, and OTS (Off Throttle Steering System) which are transmitted from the control unit (ECU) 101 to the display control unit 74.

Also, a flow indicated by an arrow B indicates lock information and limited operation information which are transmitted from the display control unit 74 to the control unit (ECU) 10.

In this respect, in the embodiments, it has been arranged such that as shown in Fig. 12, a white-displayed portion in the ordinary state is caused to reverse and blink in the order of black-white-black in the non-ordinary state, and a black-displayed portion in the ordinary state is caused to reverse and blink in the order of white-black-white in the non-ordinary state. However, the present invention is not limited thereto, but when for example, color liquid crystal is used for the liquid crystal display unit, gradations of color do not matter.

In the embodiments, the description has been made of the display device under OTS control of the jet propulsion boat as shown in Fig. 12, as an

example of the non-ordinary state, but the present invention is not limited thereto, but the non-ordinary state may be during operation of ABS of the vehicle, during operation of the traction control, or during operation of an attitude control device. Also, it may be when important parts (engine, driving system, steering system and the like) are out of order.

The present invention exhibits the following effects due to the above-described structure.

According to the invention, an ordinary movement of the transportation means is regarded as an ordinary state; and when a case where the need arises for abruptly reducing the speed of the transportation means or abruptly changing the direction of the transportation means, and the like are distinguished as a non-ordinary state, a liquid crystal display unit reverses a white-and-black display thereof when the transportation means shifts from the ordinary state to the non-ordinary state. Therefore, the driver can be sensitively and directly notified that the transportation means is in a non-ordinary state. As a result, it becomes easier to recognize that the transportation means is in a non-ordinary state.

In a preferred aspect of the invention, a white-displayed portion in an ordinary state is caused to reverse and blink in the order of black-white-black in a non-ordinary state, and a black-displayed portion in the ordinary state is caused to reverse and blink in the order of white-black-white in the non-ordinary state. Therefore, it is possible to strongly give the impression on the driver that the transportation means is in the non-ordinary state.

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 display device for transportation means, characterized in that in transportation means equipped with a liquid crystal display unit displaying operation information, an ordinary movement of said transportation means is regarded as an ordinary state, and when a case where the need arises for abruptly reducing a speed of said transportation means or abruptly changing direction of said transportation means, and the like are distinguished as a non-ordinary state, said liquid crystal display unit reverses a white-and-black display thereof when said transportation means shifts from the ordinary state to the non-ordinary state.

2. The display device for transportation means according to claim 1, characterized in that a white-displayed portion in said ordinary state is caused to reverse and blink in the order of black-white-black in a non-ordinary state, and a black-displayed portion in said ordinary state is caused to reverse and blink in the order of white-black-white in the non-ordinary state.

Fig. 1

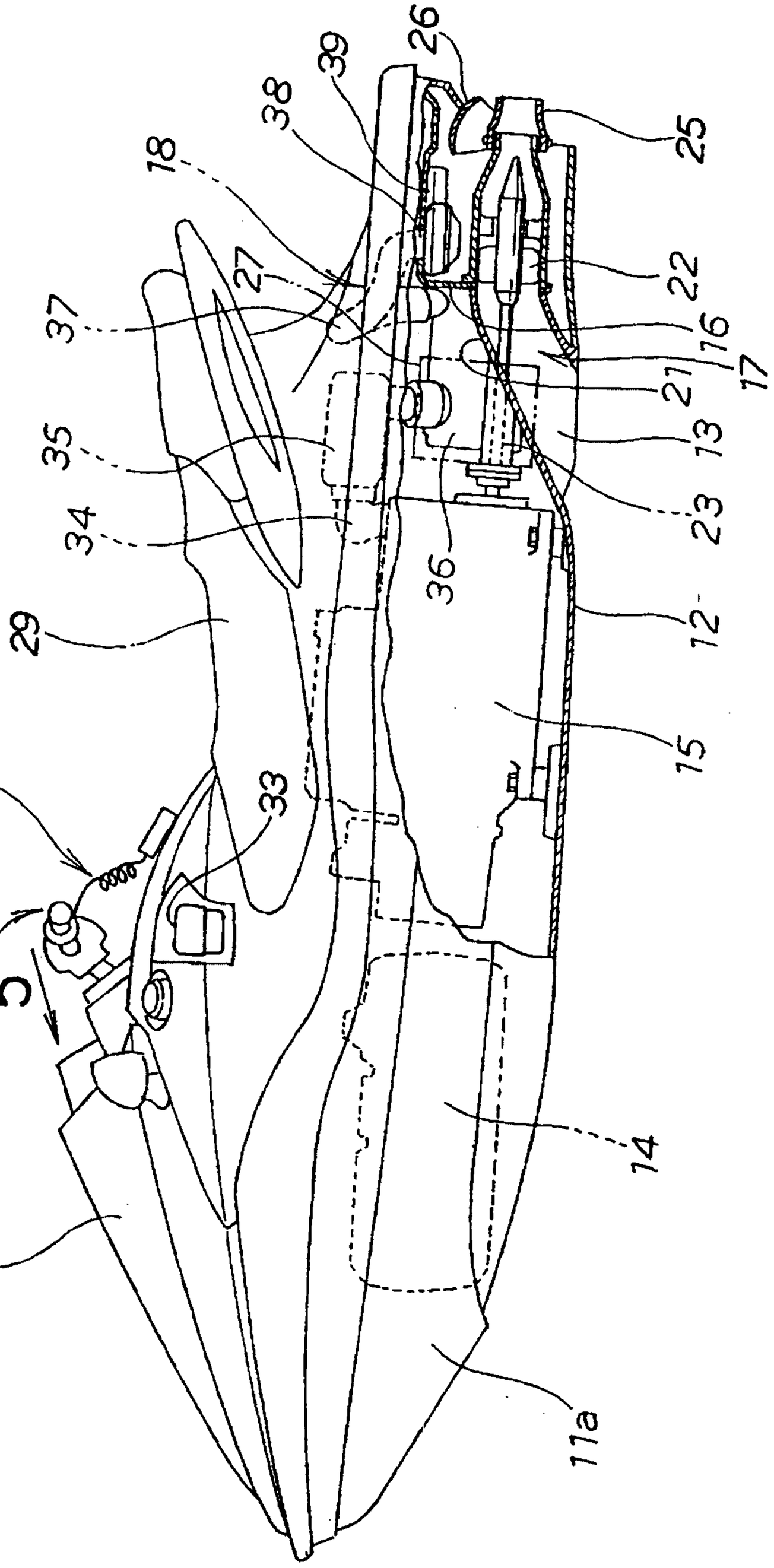

39
26
38
25
18
22
27
37
16
17
21
35
13
23
34
36
12
29
15
45
33
28
5
10
14
11
11a

Fig. 2

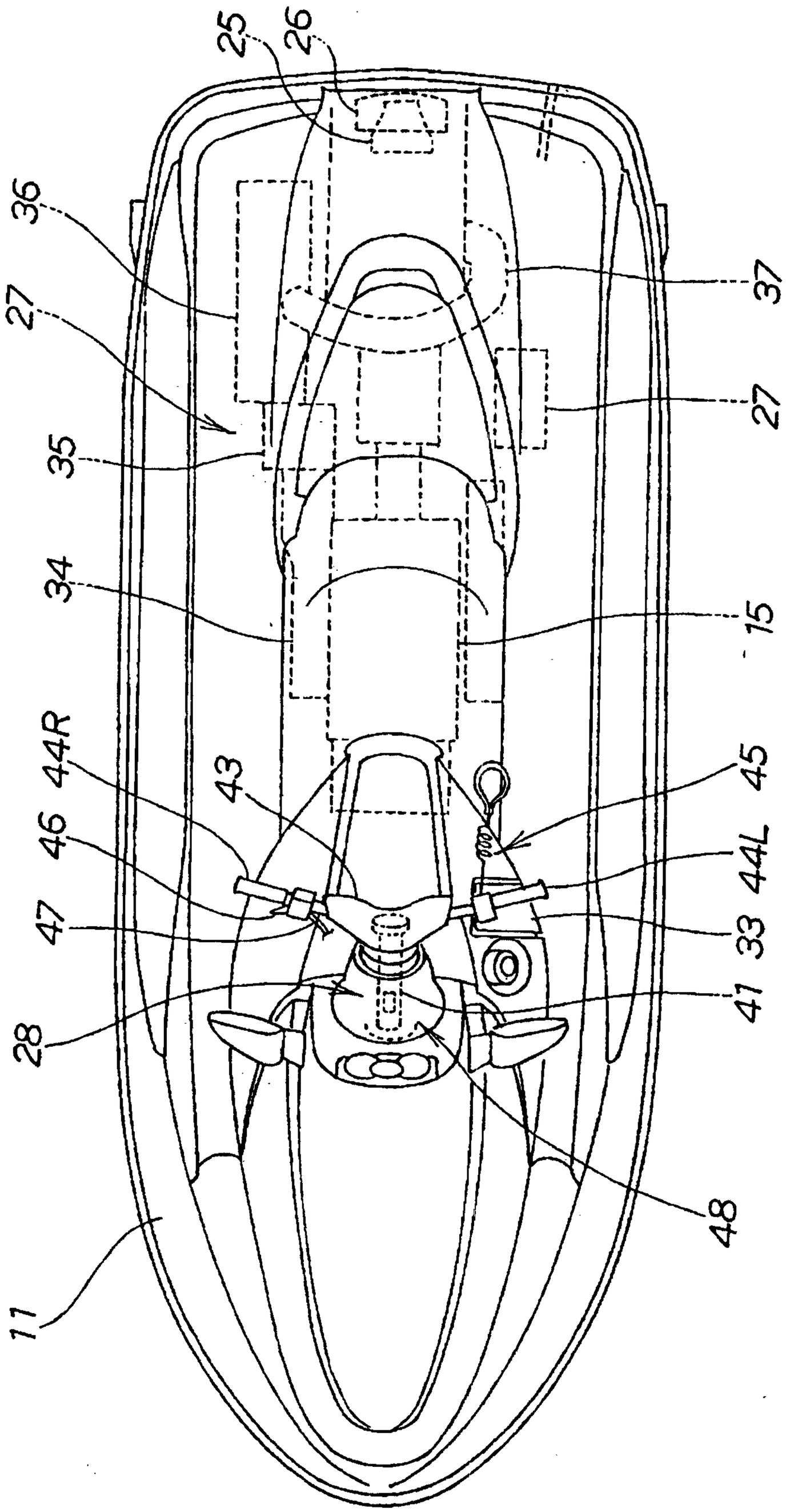


Fig. 3

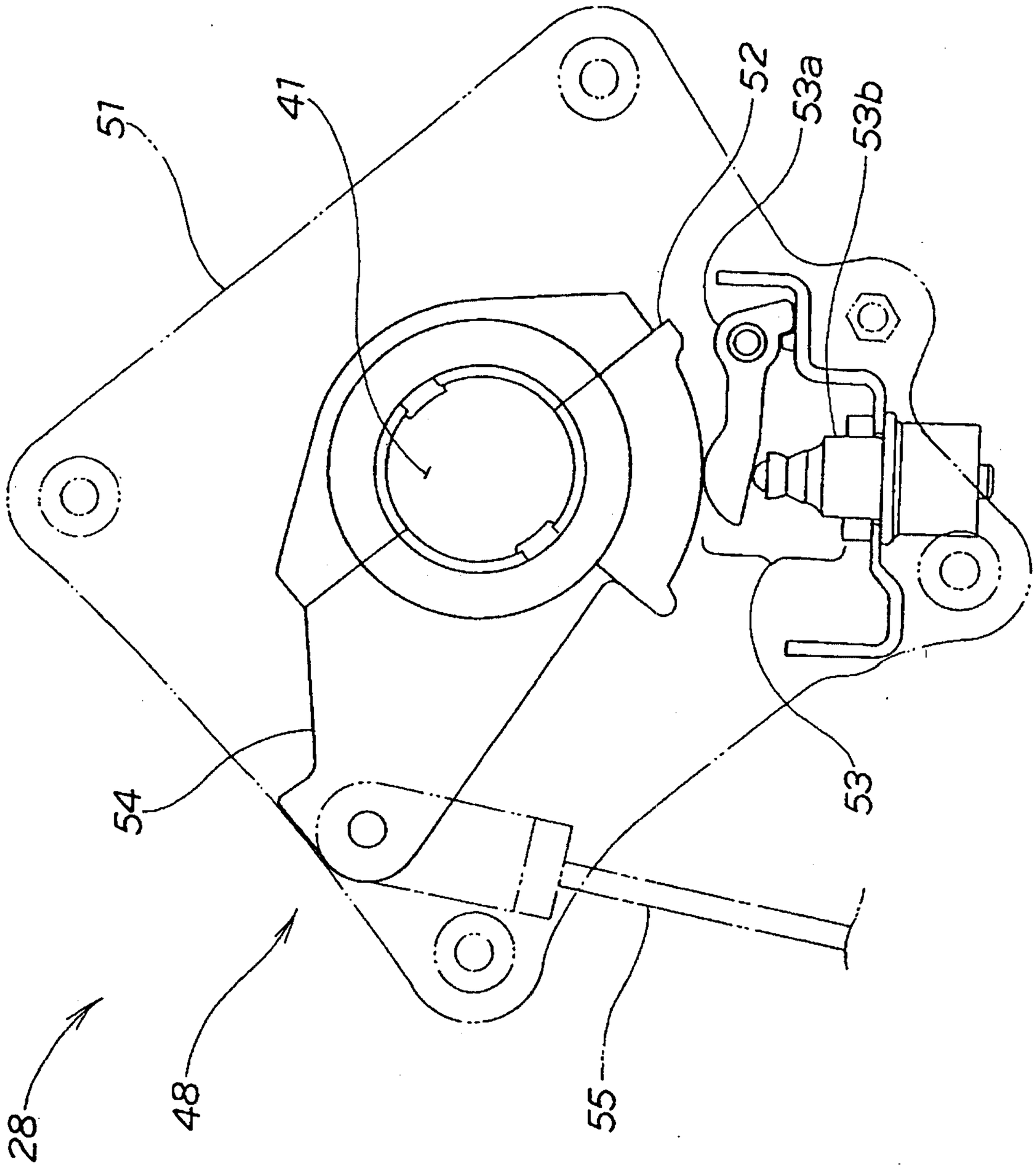


Fig. 4

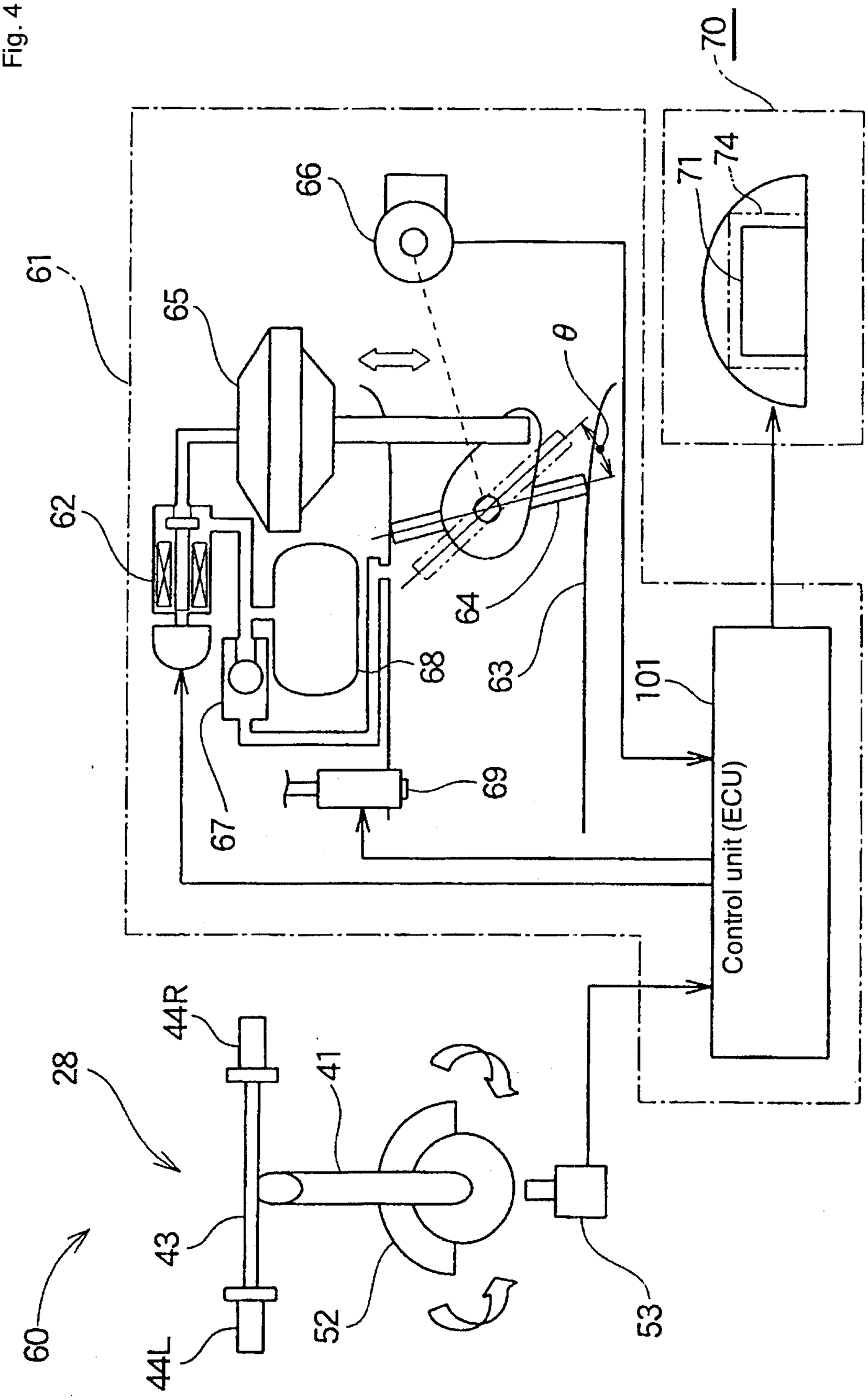

70
71
74
66
61
65
θ
62
64
63
68
101
69
67
Control unit (ECU)
44R
28
41
43
52
53
60
44L

Fig. 5

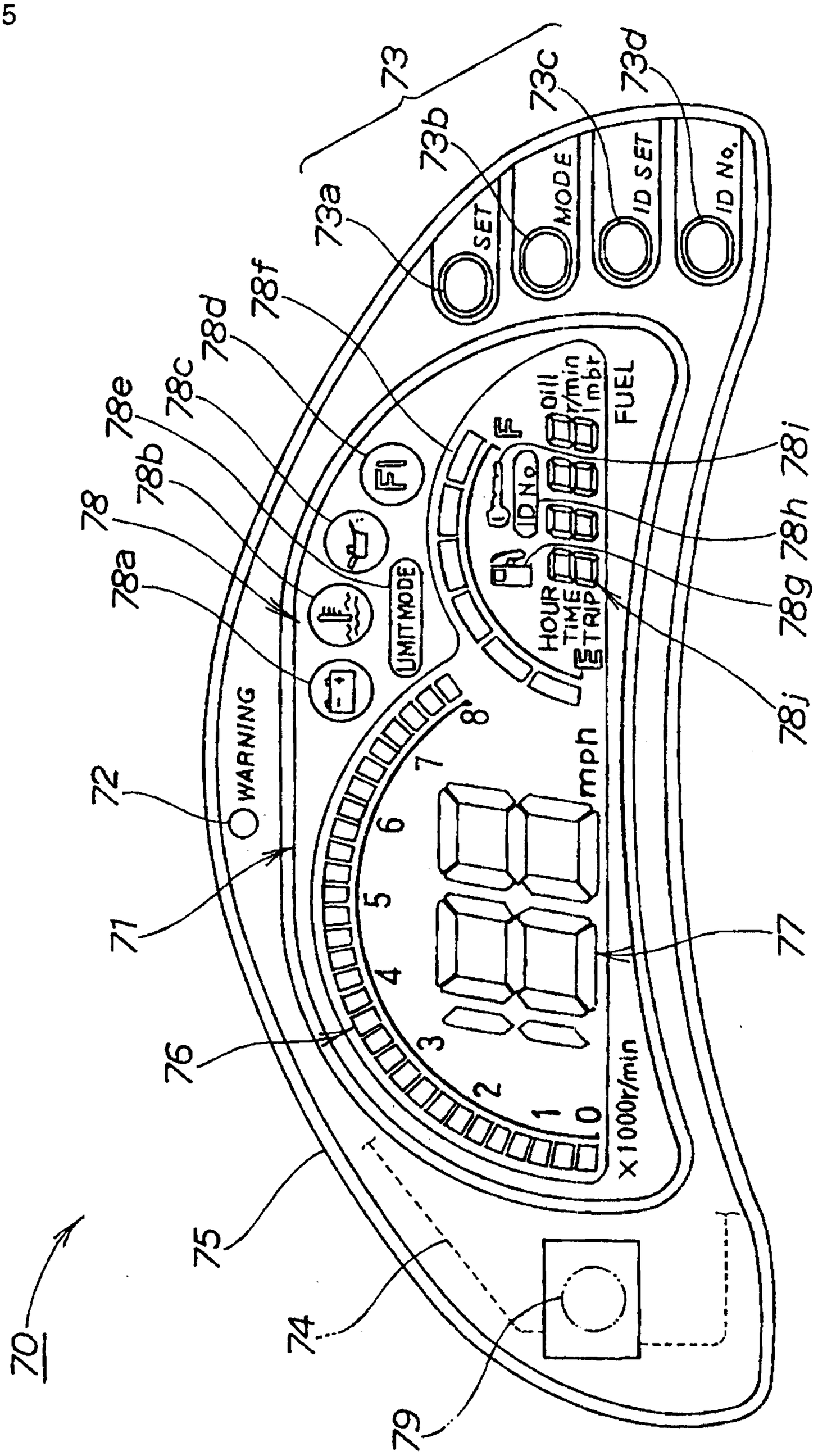

73
73b
73c
73d
73a
78
78a
78b
78c
78d
78e
78f
78g
78h
78i
78j
72
71
76
75
74
79
70
WARNING
LIMIT MODE
FI
SET
MODE
ID SET
ID No.
ID No
oil
r/min
mbr
FUEL
HOUR
TIME
TRIP
mph
×1000r/min

Fig. 6

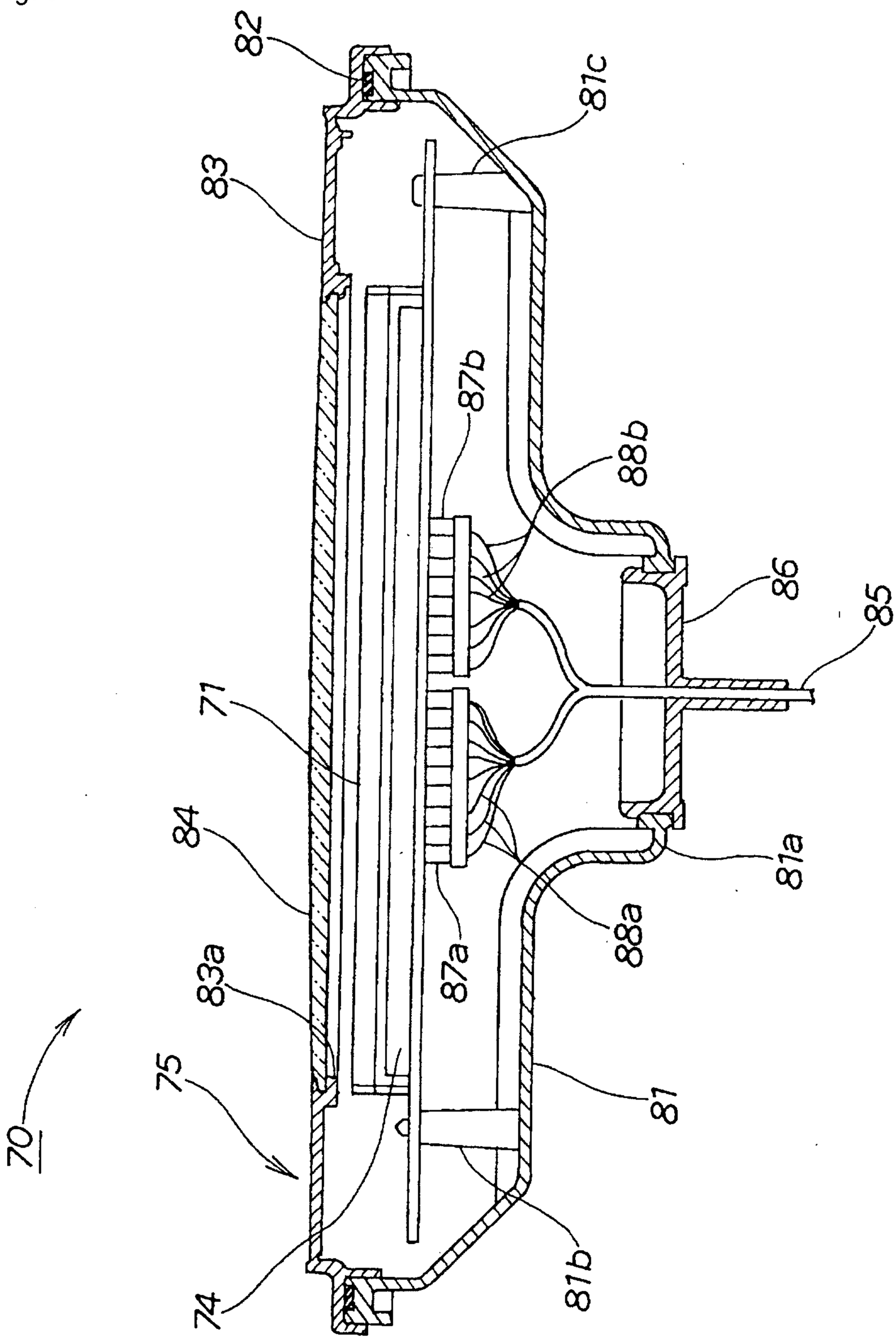


Fig. 7

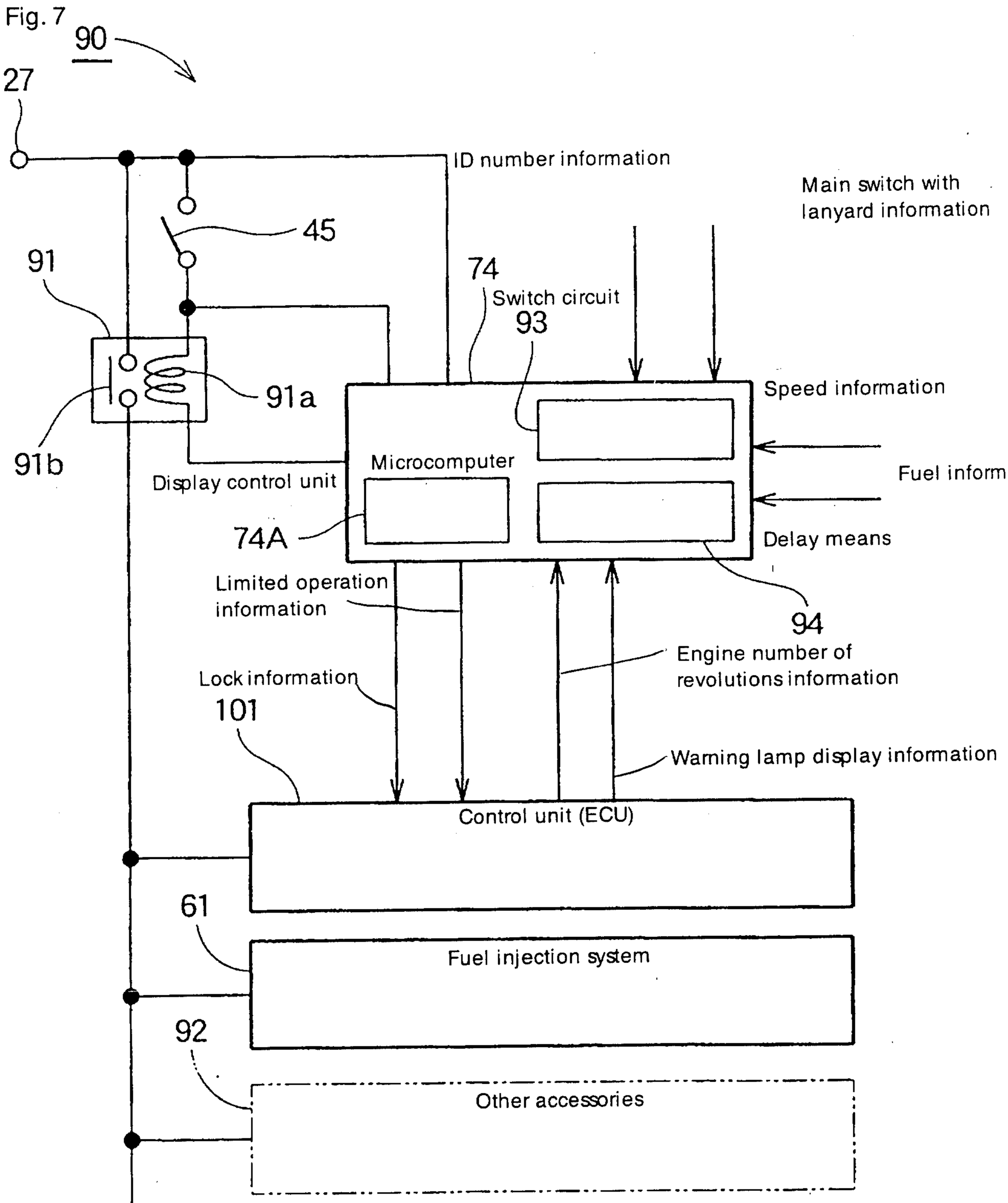

90
27
ID number information
Main switch with
lanyard information
45
91
74
Switch circuit
93
91a
Speed information
91b
Microcomputer
Fuel informatio
Display control unit
74A
Delay means
Limited operation
information
94
Engine number of
revolutions information
Lock information
101
Warning lamp display information
Control unit (ECU)
61
Fuel injection system
92
Other accessories

Fig. 8

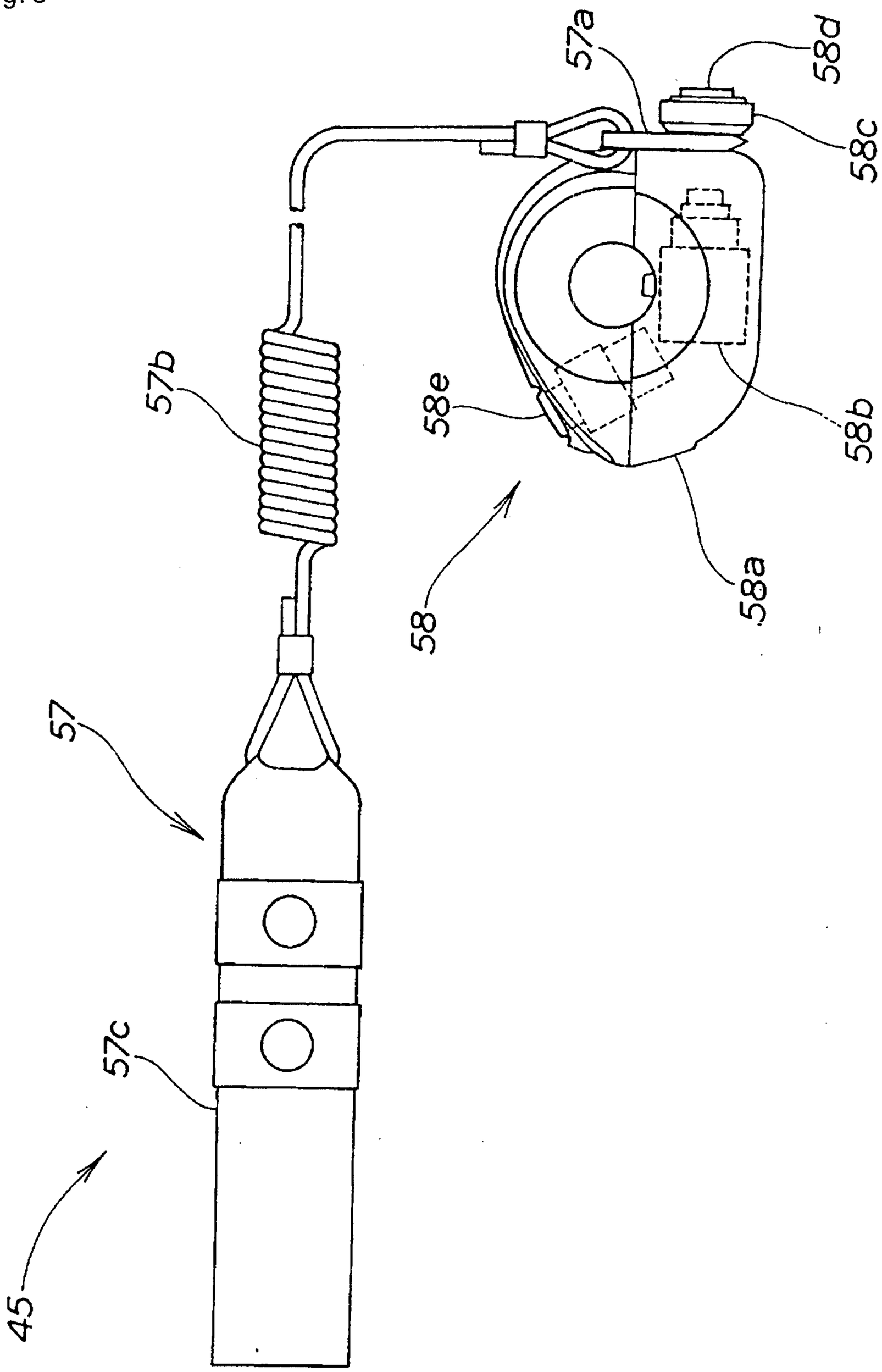
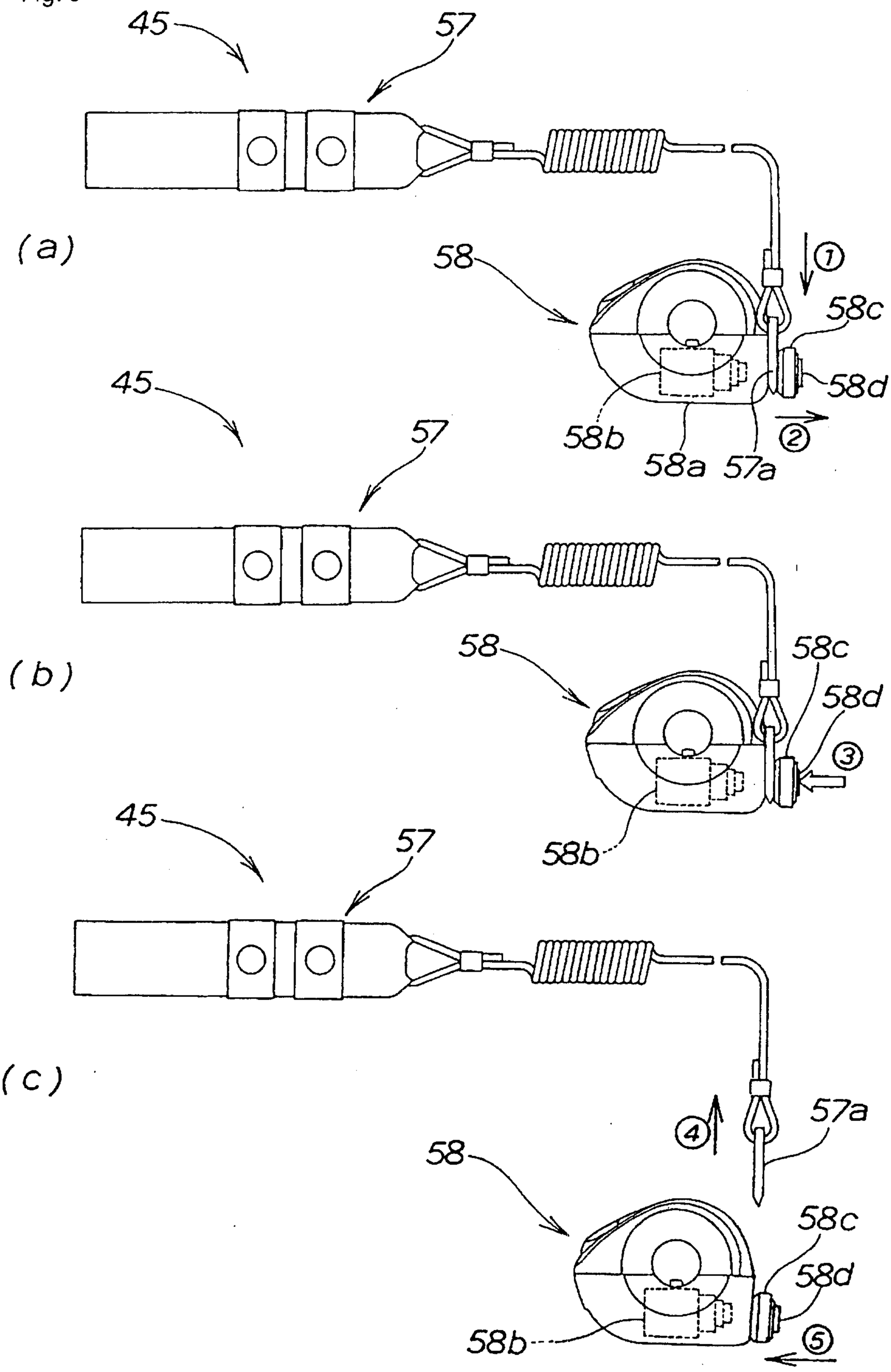


Fig. 9




(a)

(b)

(c)

Fig. 10

Ne: Engine number of revolutions
N1: Predetermined number of revolutions

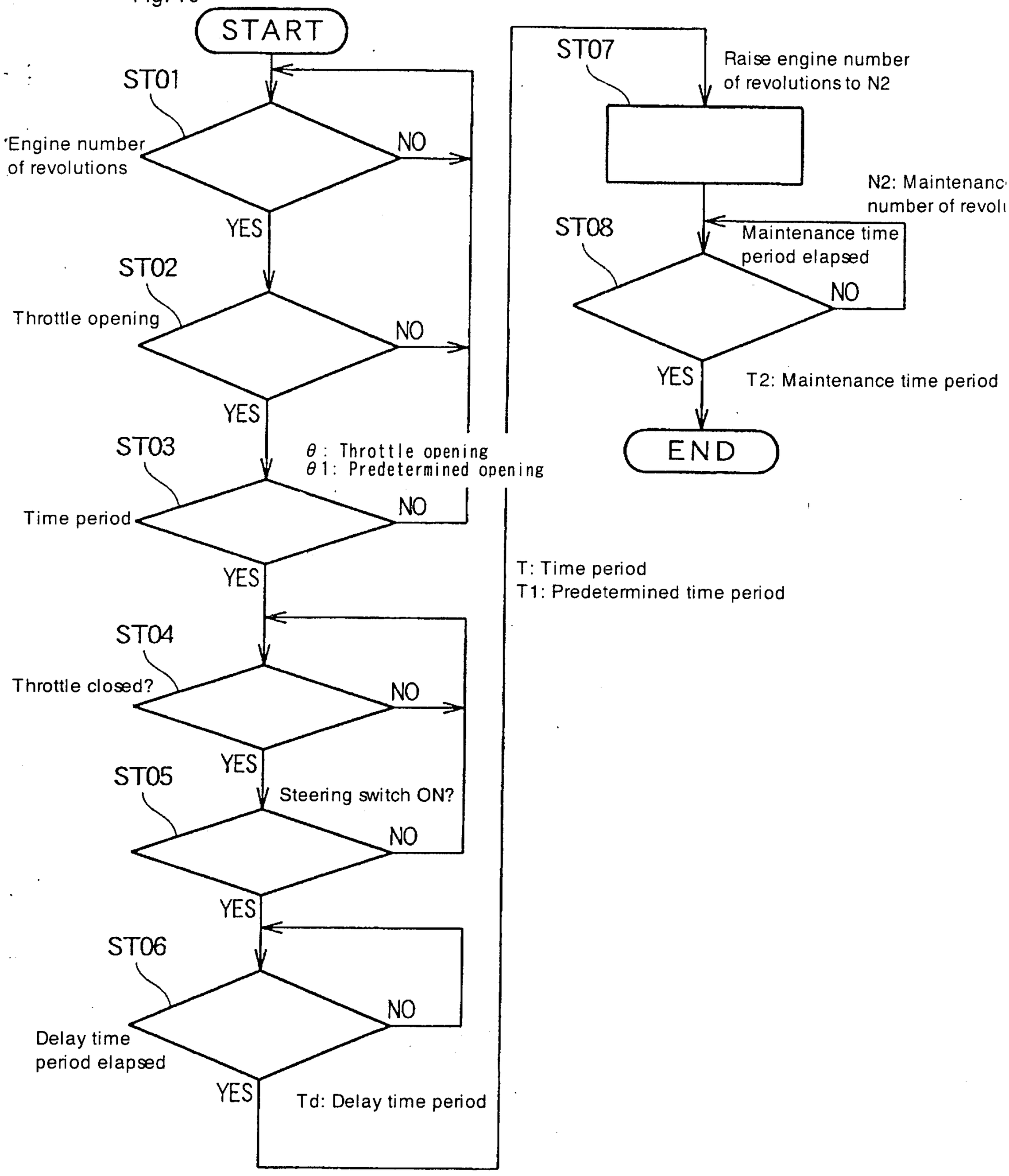


Fig. 11

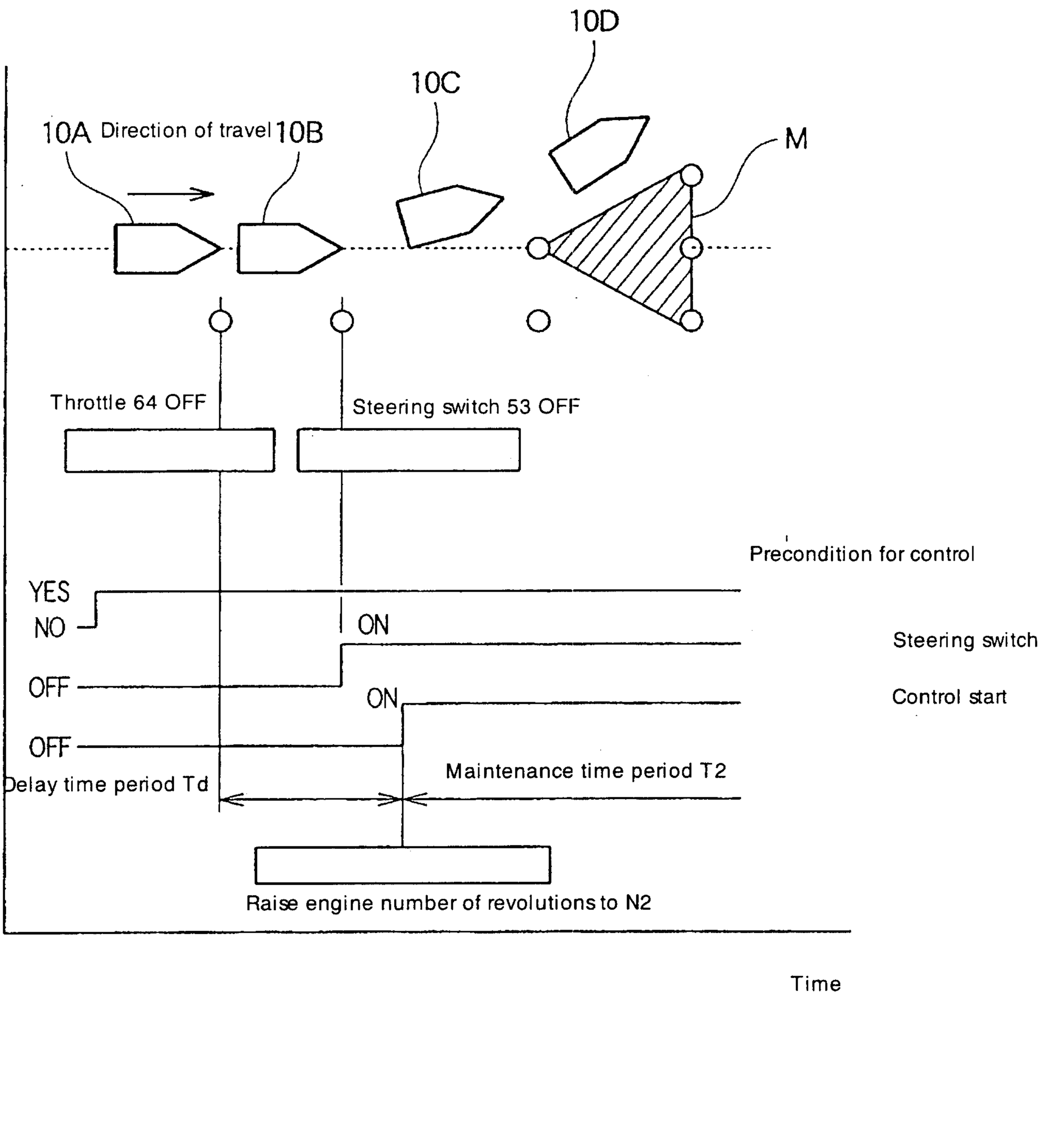

10A
Direction of travel
10B
10C
10D
M
Throttle 64 OFF
Steering switch 53 OFF
Precondition for control
YES
NO
ON
Steering switch
OFF
ON
Control start
OFF
Maintenance time period T2
Delay time period Td
Raise engine number of revolutions to N2
Time

Fig. 12

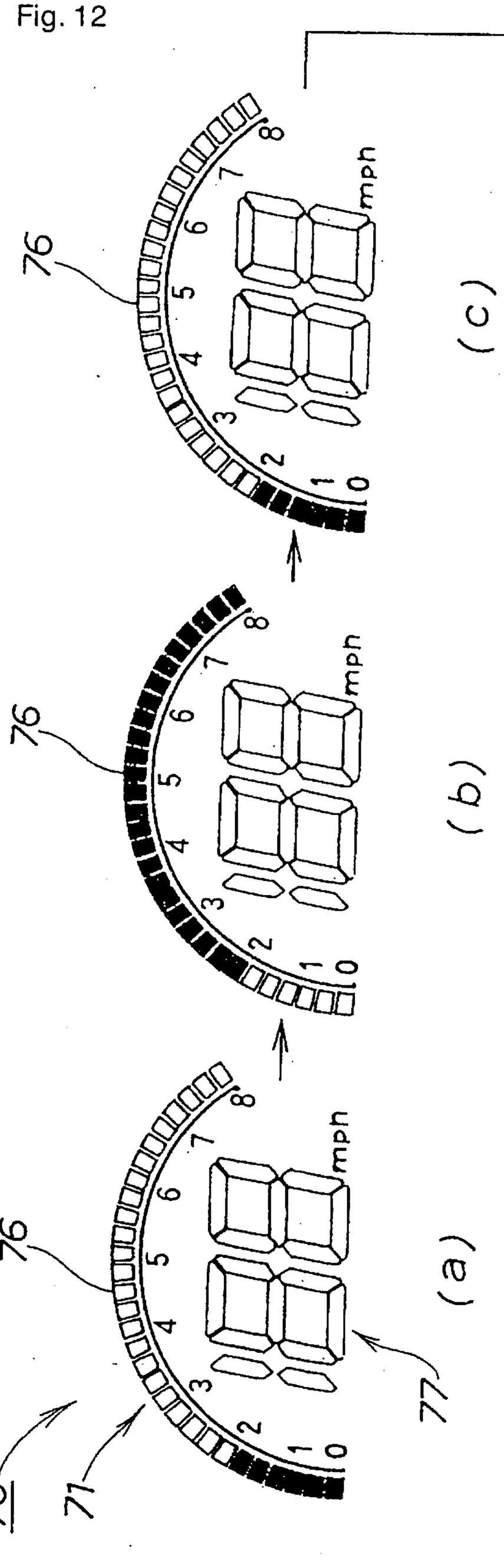


Fig. 13

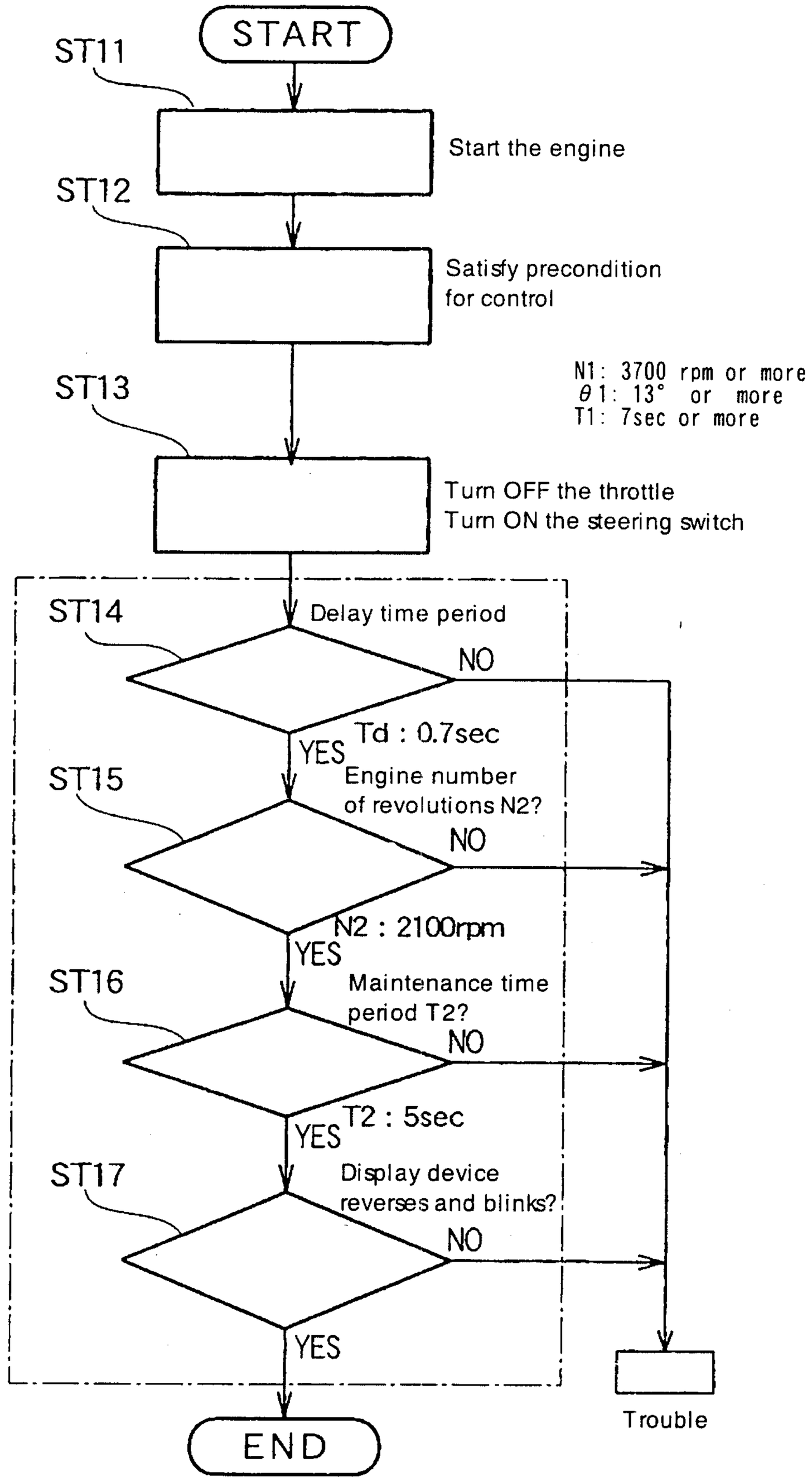
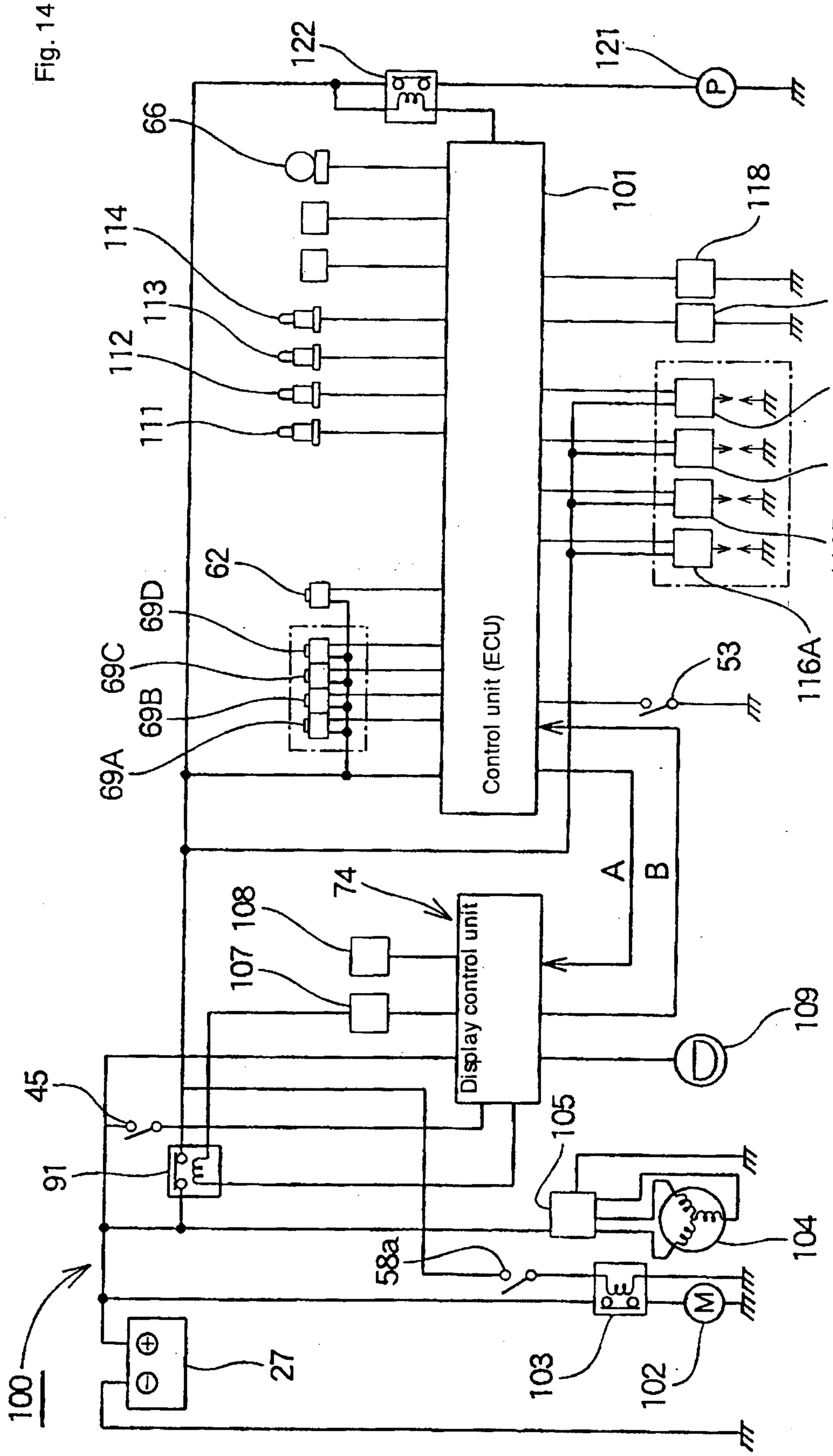
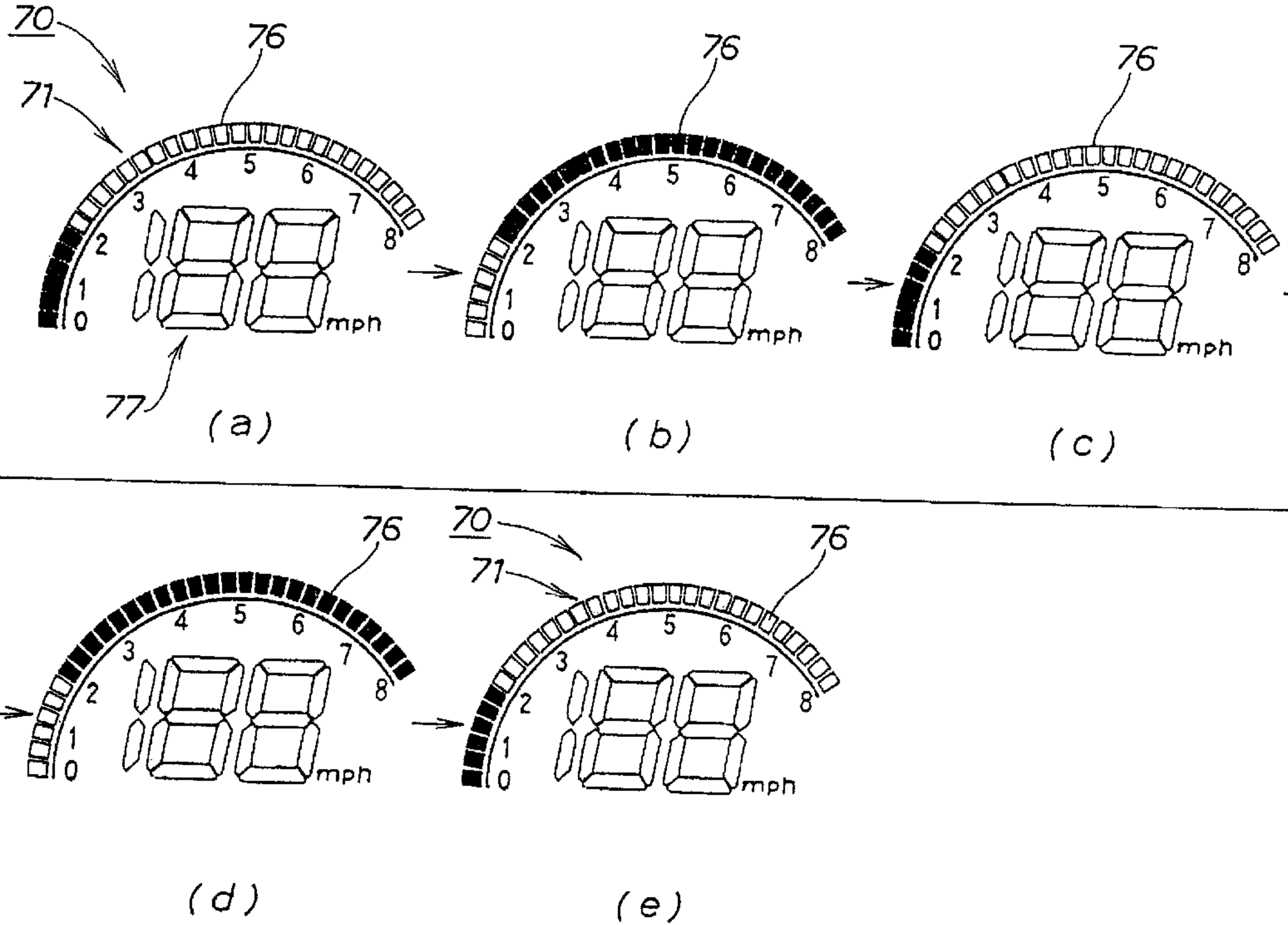

START
ST11
Start the engine
ST12
Satisfy precondition
for control
N1: 3700 rpm or more
θ1: 13° or more
T1: 7sec or more
ST13
Turn OFF the throttle
Turn ON the steering switch
ST14
Delay time period
NO
Td : 0.7sec
YES
ST15
Engine number
of revolutions N2?
NO
N2 : 2100rpm
YES
ST16
Maintenance time
period T2?
NO
T2 : 5sec
YES
ST17
Display device
reverses and blinks?
NO
YES
Trouble
END

Fig. 14


122
121
66
101
118
114
113
112
111
62
69D
69C
69B
69A
Control unit (ECU)
116B 116C 116D 117
116A
53
A
B
74
108
107
Display control unit
109
45
91
105
1
104
58a
103
102
27
100


70
71
76
77
0
1
2
3
4
5
6
7
8
mph
(a)
(b)
(c)
(d)
(e)