English translation sample: JP2007-50881A

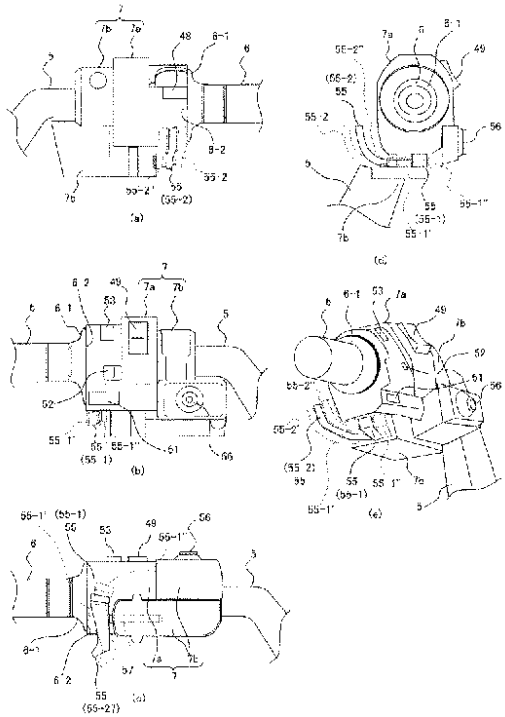
(19) **Issuing Country**: Japan Patent Office (JP)
(12**) Publication Category**: Publication of Unexamined Patent Application (A)
(11) **Publication Number:** Japanese Patent Application Laid-open Number 2007-50881 (P2007-50881A)
(43) **Date of Publication of Unexamined Patent Application**: March 1, 2007 (3.1.2007)
(54) **Title**: Handlebar Switch for Shifting Gears
(51) **International Classification**
B62J 6/16 (01.2006)
B60K 20/02 (01.2006)
B62K 23/06 (01.2006)
B62M 25/04 (01.2006)
FI
B62J 6/16
B60K 20/02 Z
B62K 23/06
B62M 25/04 C
Request for Examination: Not requested
No. of Claims: 14
No. of Pages: 20
(21) **Application No.**: Japanese Patent Application Number 2006-197478 (P2006-197478)
(22) **Application Date**: July 19, 2006 (7.19.2006)
(31) **Priority No**.: Japanese Patent Application Number 2005-212140 (P2005-212140)
(32) **Priority Date**: July 22, 2005 (7.22.2005)
(33) **Priority Country**: Japan (JP)
(71) **Applicant**
Identification No.: 000010076
Name: Yamaha Motor Co., Ltd.
Address: 2500 Shingai, Iwata-shi, Shizuoka
(74) **Agent**
Identification No.: 100074099
Patent Attorney:
Name: Yoshiyuki Osuga
(72) **Inventor**
Name: Michiya Hayashi
Address: Yamaha Motor Co., Ltd., 2500 Shingai, Iwata-shi, Shizuoka
(72) **Inventor**
Name: Yoshihiko Takeuchi
Address: Yamaha Motor Co., Ltd., 2500 Shingai, Iwata-shi, Shizuoka
Theme Code (Reference):
3D013
3D040
F-term (Reference):
3D013 CJ06
3D040 AA01 AA10 AA22 AA34 AB10 AC02 AF07

(57) **ABSTRACT**

Problem to be solved: To provide a handlebar switch for shifting gears having a simple configuration and superior operability.

Means of solving the problem: A first switch box 7a and a second switch box 7b are arranged adjacent to a flange section 6-1 of a handle grip section 6, around the periphery of a handlebar 5. On the first switch box 7a are arranged a set of switches including a passing switch 48, a windshield moving switch 49, a horn switch 51, a flasher switch 52, a dimmer switch 53, etc., and on the second switch box 7b are provided a handlebar switch for shifting gears and a manual selection switch 56. The handlebar switch for shifting gears comprises a switch section inside the box, a rocker lever 57, and an operation section 55, wherein the operation section 55 (a first operation section 55-1 for shifting up-down, and a second operation section 55-2 for shifting down-up) is arranged at the bottom and front surface of the first switch box 7a, separate from the first switch box 7a.

Selected Drawing: FIG.5



What is claimed is:

1. A handlebar switch for shifting gears that changes via an actuator the transmission gear ratio of a gear shifter on a vehicle equipped with a handlebar extending horizontally from a rotating shaft that controls the travel direction, said handlebar switch for shifting gears comprising:

a handle grip section that is assembled to an end of said handlebar;

a switch box that is arranged between said handle grip section and said rotating shaft;

and an operation section provided on a rocker lever that extends from said switch box and is capable of movement in two directions from a neutral position, wherein:

said neutral position of the operation section is arranged farther on the anterior side of the vehicle body posterior-anterior direction than a virtual vertical plane that includes the center line of said handle grip section, in a location that enables operation in two directions from the neutral position by the index finger of the hand griping said handle grip section.

2. The handlebar switch for shifting gears according to claim 1, wherein said operation section of the rocker lever has a neutral position established in a location that enables flipping in the vehicle body anterior direction by said index finger.

3. The handlebar switch for shifting gears according to claim 1, wherein said operation section of the rocker lever has a neutral position established in a location that enables flipping in the vehicle body posterior direction by said index finger.

4. The handlebar switch for shifting gears according to claim 1, wherein said operation section of the rocker lever has a neutral position established in a location that enables flipping in the vehicle body upward direction by said index finger.

5. The handlebar switch for switching gears according to claim 1, wherein said operation section of the rocker lever has a neutral position established in a location that enables flipping in the vehicle body downward direction by said index finger.

6. The handlebar switch for shifting gears according to claim 1, wherein said operation section of the rocker lever has a neutral position established in a location that enables flipping in the vehicle body diagonally upward direction by said index finger.

7. The handlebar switch for shifting gears according to claim 1, wherein said operation section of the rocker lever has a neutral position established in a location that enables flipping in the vehicle body diagonally downward direction by said index finger.

8. The handlebar switch for shifting gears according to claim 1, wherein said operation section of the rocker lever has a neutral position established in a location that enables operation in the shift-up or shift-down direction by said index finger.

9. The handlebar switch for shifting gears according to claim 1, wherein said operation section of the rocker lever is arranged in a location that overlaps with said handle grip section in the vehicle body anterior direction.

10. The handlebar switch for shifting gears according to claim 1, wherein said operation section of the rocker lever is arranged in a location that overlaps with said switch box in the vehicle body anterior direction.

11. The handlebar switch for shifting gears according to claim 1, wherein said operation section of the rocker lever has a neutral position established in a location that does not permit operation by the thumb of the hand gripping said handle grip section.

12. The handlebar switch for shifting gears according to claim 1, wherein said two directions are two directions within an identical virtual circular arc, or two directions within an identical virtual plane.

13. he handlebar switch for shifting gears according to claim 1, wherein said two directions are two directions within different virtual planes that intersect at the neutral position.

14. A saddle-riding type vehicle comprising a handlebar switch for shifting gears according to one of the claims of claims 1 to 13.

DETAILED DESCRIPTION OF THE INVENTION

Technical Field

[0001]

The present invention relates to a handlebar switch for shifting gears that changes the transmission gear ratio of a gear shifter when an operation section arranged near a grip section at the end of the handlebar of a vehicle provided with a handlebar is operated by a finger tip.

Background Art

[0002]

Conventionally, to prevent erroneous operation of a shift lever that extends to a grip section of a motorcycle provided with an old-style electric gear shifter, for example, there has been proposed a mechanism for performing a gearshift operation of a motorcycle, wherein the grip is designed to be movable in the axial direction and the electric gear shifter is activated by a slide operation in the grip axial direction. (Refer to Patent Document 1, for example.)

There has also been proposed, for example, a mechanism that provides an operation section equipped with a seesaw type switch that activates an electric shifter of a saddle-riding type vehicle between a grip section and a switch box for turning each operating part on and off. (Refer to Patent Document 2, for example.)

[0003]

Further, there has been proposed as a manual type switch mechanism of a motorcycle, etc., a mechanism that provides a box next to a hand grip and, on this box, a switch for

turning other operating parts on and off as well as a rocker type gear switch for providing shift-up and shift-down instructions. (Refer to Patent Document 3, for example.)
Patent Document 1: Japanese Examined Utility Model Application Publication No. H01-041679 (from Section 3, Line 43 to Section 4, Line 23, FIG.2)
Patent Document 2: US Patent Application 2004/0093974A1 (Abstract, FIG.5)
Patent Document 3: Japanese Patent Application Laid-open No. 2003-226278 (Abstract, FIG.1)

DISCLOSURE OF THE INVENTION

Problems to be Solved by the Invention

[0004]
Nevertheless, the technique of Patent Document 1 involves a configuration wherein the grip is slid in the axial direction, causing the handlebar axis to be pushed in the horizontal direction each time the shift operation is performed, thereby deteriorating operability.
[0005]
Further, in the technique of Patent Document 2, the operation section of the seesaw type switch that activates the shifter is arranged in a position far away from the grip, thereby significantly deteriorating operability.
[0006]
Further, the technique of Patent Document 3 involves a configuration wherein the various switches are centrally located on a box adjacent to the grip, more particularly a configuration wherein a horn pushbutton and thumb gear switch are positioned adjacent to each other, thereby requiring the vehicle driver to perform operations while being careful not to make a mistake, thereby very much deteriorating operability.
[0007]
In view of the above-described problems existing in prior art, it is an object of the present invention to provide a handlebar switch for shifting gears having a simple configuration and superior operability.

Means for Solving the Problem

[0008]
The handlebar switch for shifting gears of the present invention changes via an actuator the transmission gear ratio of a gear shifter on a vehicle equipped with a handlebar that extends horizontally from a rotating shaft that controls the travel direction, the handlebar switch for shifting gears comprising a handle grip section that is assembled to an end of the handlebar, a switch box that is arranged between the handle grip section and the rotating shaft, and an operation section provided on a rocker lever that is capable of movement in two directions from a neutral position and extends from the switch box, wherein the neutral position of the operation section is arranged farther on the anterior side of the vehicle body posterior-anterior direction than a vertical virtual plane that includes the center line of the handle grip section, in a location that enables operation in two directions from the neutral position by the index finger of the hand gripping the handle grip section.
[0009]
The above-described operation section of the rocker lever is configured so that the neutral position is set in a location that enables flipping in the vehicle body anterior

direction by the index finger, for example, or in a location that enables flipping in the vehicle body posterior direction by the index finger, for example.

[0010]

The above-described operation section of the rocker lever may be configured so that the neutral position is set in a location that enables flipping in the vehicle body upward direction by the index finger, for example, or in a location that enables flipping in the vehicle body downward direction by the index finger, for example.

[0011]

Furthermore, the above-described operation section of the rocker lever may be configured so that the neutral position is set in a location that enables flipping in the vehicle body diagonally upward direction by the index finger, for example, or in a location that enables flipping in the vehicle body diagonally downward direction by the index finger, for example.

[0012]

Further, in the handlebar switch for shifting gears, the above-described operation section of the rocker lever is configured so that the neutral position is set in a location that enables operation in the shift-up and shift-down directions using the index finger, for example.

[0013]

In this case, the above-described operation section of the rocker lever may be configured so that the operation section is arranged in a location that overlaps with the handle grip section in the vehicle body anterior direction, for example, or arranged in a location that overlaps with the switch box in the vehicle body anterior direction.

[0014]

Further, in the handlebar switch for shifting gears, the above-described operation section of the rocker lever is configured so that the neutral position is set in a location that does not permit operation by the thumb of the hand gripping the handle grip section, for example.

[0015]

Further, in the handlebar switch for shifting gears, the above-described two directions may be two directions within an identical virtual circular arc or two directions within an identical virtual plane, or two directions that branch into different virtual planes that intersect at the neutral position, etc.

[0016]

The handlebar switch for shifting gears is ideal for a saddle-riding type vehicle, for example. The saddle-riding type vehicle may be, for example, a two-wheeled motor vehicle (motorcycle, scooter, etc.), a four-wheeled buggy, a snowmobile, etc.

Advantageous Effect of the Invention

[0017]

The present invention sets the neutral position of an operation section of a rocker lever in a location farther on the vehicle body anterior side than a vertical plane that includes the center line of a handle grip section, said location that also enables operation in two directions from the neutral position using an index finger, making it possible to operate a switch for shifting gears using an index finger which, in comparison to other fingers, can be moved with dexterity and high flexibility in a case of a saddle-riding type vehicle, thereby significantly improving the operability of the switch for shifting gears.

BEST MODE FOR CARRYING OUT THE INVENTION

[0018]

Embodiments of the present invention will now be described with reference to attached drawings.

Embodiment 1

[0019]

FIG.1 is a side view of the outer appearance of a two-wheeled motor vehicle given as an example of a vehicle provided with a handlebar switch for shifting gears of Embodiment 1. In this figure, two-wheeled motor vehicle 1 comprises a front wheel 2 and a rear wheel 3.

[0020]

A handlebar 5 that extends horizontally with respect to the traveling direction of the vehicle is installed at the top of a front fork rotating shaft 4 installed on the front wheel 2.
A handle grip section 6 and a switch box 7 are installed on one end (the end toward the paper surface in FIG.1) of the handlebar 5, and an acceleration grip and a brake lever are installed on the other end (the end in the shadows on the opposite side of the paper surface in FIG.1; not visible).

[0021]

Further, a windshield 8 is arranged in front of the handlebar 5 (on the left in FIG.1) so that it is movable in the vertical direction. Furthermore, in FIG.1, the windshield 8 is shown in the upper position.
Then, a flasher rear mirror 9 is arranged on each lower side of the windshield 8 that is in the upper position, and a headlamp 11 is arranged at a distance below the windshield 8.

[0022]

Further, a fuel tank 12 is installed immediately behind the handlebar 5 at the top of the two-wheeled motor vehicle 1 between the front wheel 2 and the rear wheel 3, and a seat 13 is installed adjacent to the fuel tank, toward the rear.
The rider (driver) rides the two-wheeled motor vehicle 1 by straddling the seat 13. That is, the two-wheeled motor vehicle 1 is a saddle-riding type two-wheeled motor vehicle and has a configuration that is generally the same as known two-wheeled motor vehicle configurations.

[0023]

However, as a special characteristic of the present illustration, a clutch actuator 15 that activates a clutch installed inside a crank case of an engine 14 using a motor is installed above and behind the engine 14, that is below the fuel tank 12, on the two-wheeled motor vehicle 1.

[0024]

As another special characteristic, a shift actuator 16 that activates a gear shifter installed in a mission case of the engine 14 using a motor is provided on the two-wheeled motor vehicle 1.

[0025]

The operation of the above-described clutch actuator 15 is controlled by a control device 20 described later, and the disconnection operation of the clutch is performed by this clutch actuator 15.

[0026]

The operation of the shift actuator 16 is also controlled by the control device 20, and the shift operation of the gear shifter is performed by this shift actuator 16.
FIG.2 is a drawing showing the general configuration of a control system mounted on the two-wheeled motor vehicle 1. As shown in the drawing, the control device 20 comprises a configuration that includes a main microcomputer 21, a power supply circuit 22, and motor drive circuits 23 and 24.

[0027]

In the main microcomputer 21 are inputted from a sensor and switch group 25 connected to the control device 20 the respective detection signals, which are described in detail later.
Power is supplied from a battery 26 connected to the control device 20 to a power supply circuit 22 and motor drive circuits 23 and 24 of the control device 20, and from the battery 26 via the power supply circuit 22 to the main microcomputer 21.

[0028]

The main microcomputer 21 operates using the power supplied from the battery 26 via the power supply circuit 22, controls the power supply circuit 22 via a self-storage circuit 27 of the power supply circuit 22, and controls the clutch actuator 15 and the shift actuator 16 connected to the control device 20.

[0029]

Based on the control from the main microcomputer 21, the motor drive circuit 23 supplies driving power to the clutch actuator 15, and the motor drive circuit 24 supplies driving power to the shift actuator 16.

[0030]

The clutch actuator 15 comprises a configuration including a DC motor in the present illustration, and disconnects the clutch by rotating the DC motor in the normal direction, and connects the clutch once again by rotating the DC motor in the reverse direction. Furthermore, the clutch position can be set to any arbitrary state between the disconnection state and connection state.

[0031]

Further, a clutch potentiometer 28 comprising a resistor, etc., is installed on the clutch actuator 15.
The voltage that indicates the state of the clutch actuator 15, that is, the voltage that indicates the clutch position, is fed back from the clutch potentiometer 28 to the main microcomputer 21. The main microcomputer 21 uses the above voltage value as clutch position information, thereby controlling the operation of the clutch actuator 15.

[0032]

Further, the shift actuator 16 comprises a configuration including a DC motor and is installed on a shift arm of the gear shifter. Normal rotation of the above DC motor rotates the shift arm in one direction, resulting in a shift-up, and reverse rotation of the DC motor rotates the shift arm in the reverse direction, resulting in a shift-down.

[0033]

Further, a shift potentiometer 29 comprising a resistor, etc., is installed on the shift actuator 16.
The voltage that indicates the state of the shift actuator 16, that is, the voltage that indicates the angle of rotation of the shift arm, is fed back from the shift potentiometer 29 to the main microcomputer 21. The main microcomputer 21 uses the above voltage value as shift actuator angle of rotation information, thereby controlling the operation of the shift actuator 16.

[0034]
FIG.3 is a block diagram of the configuration of the above-described sensor and switch group 25. As shown in FIG.3, the sensor and switch group 25 includes a gear position sensor 31, a shift-up switch 32, a shift-down switch 33, a clutch rotational speed sensor (engine side clutch rotational speed sensor) 34 installed on a member on the engine side of the clutch, a clutch rotational speed sensor (main shaft side clutch rotational speed sensor) 35 installed on a member on the main shaft side of the clutch, and a key switch 36.
[0035]
The gear position sensor 31 is installed on the gear shifter, and inputs the voltage value corresponding to the angle of rotation of the shift camshaft to the main microcomputer 21 as gear position information.
The shift-up switch 32 inputs gearshift instruction information indicating a driver shift-up instruction to the main microcomputer 21 of the control device 20. Similarly, the shift-down switch 33 inputs gearshift instruction information indicating a driver shift-down instruction to the main microcomputer 21.
[0036]
The engine side clutch rotational speed sensor 34 detects and inputs the rotational speed of a member on the engine side of the clutch to the main microcomputer 21 as engine side clutch rotational speed information.
Further, the main shaft side clutch rotational speed sensor 35 detects and inputs the rotational speed of a member on the main shaft side of the clutch to the main microcomputer 21 as main shaft side clutch rotational speed information.
[0037]
An ignition key of the two-wheeled motor vehicle 1 is inserted in the key switch 36 and, when the ignition key is turned to the ON side, the key switch 36 outputs a signal (switch ON signal) indicating the ON state to the main microcomputer 21. When the switch ON signal is inputted, the main microcomputer 21 starts.
[0038]
The control device 20 shown in FIG.2 mainly operates the main microcomputer 21 and, in the above configuration, controls the operation of the clutch actuator 15 and the operation of the shift actuator 16 based on the various information indicating the state of each part of the vehicle that is inputted from the sensor and switch group 25, the clutch potentiometer 28, and the shift potentiometer 29.
[0039]
Specifically, once a gearshift is instructed by a driver operation, the control device 20 activates the clutch actuator 15 and transitions the clutch from a connected state to a disconnected state. Then, after the gear switch is completed, the control device 20 once again activates the clutch actuator 15 and transitions the clutch to a connected state.
[0040]
Further, after a gearshift is instructed by an operation of the driver, the control device 20 activates the shift actuator 16 and rotates the shift camshaft, thereby switching the gear. In this manner, the gearshift intended by the driver is realized by the control device 20.
[0041]
The power supply circuit 22 shown in FIG.2 comprises a configuration including the self-maintenance circuit 22 and a switch not shown in FIG.2 that is set to ON based on an interlock with the key switch 36. When the switch interlocked with the key switch 36 is set to ON, the power supply circuit 22 transforms the voltage of the battery 26 to a

driving voltage of the main microcomputer 21, and begins supplying the driving voltage to the main microcomputer 21.

[0042]

Then, even after the key switch 36 has been set to OFF, the ON state of the switch is maintained by the self-maintenance circuit 27. The power supply circuit 22 then continues supplying driving voltage until the shutdown process of the main microcomputer 21 has been completed.

[0043]

When the shutdown process is completed, the main microcomputer 21 instructs the self-maintenance circuit 27 to stop supplying power, and the power supply from the power supply circuit 22 to the main microcomputer 21 is stopped.

Further, the motor drive circuit 23 comprises configuration including a known H bridge circuit, and current is supplied from the battery 26. Then, the motor drive circuit 23 supplies current that rotates the DC motor of the clutch actuator 15 to that DC motor, in the direction and at the speed corresponding to the clutch actuator control signal supplied from the main microcomputer 21.

[0044]

Similarly, the motor drive circuit 24 also comprises a configuration including a known H bridge circuit, and current is supplied from the battery 26. Then, the motor drive circuit 24 supplies current that rotates the DC motor of the shift actuator 16 to that DC motor, in the direction and at the speed corresponding to the shift actuator control signal supplied from the main microcomputer 21.

[0045]

The main microcomputer 21 is configured using a known computer, and controls the operation of the clutch actuator 15 and the shift actuator 16 based on the various information indicating the state of each part of the vehicle that is inputted from the sensor and switch group 25, the clutch potentiometer 28, and the shift potentiometer 29 as described above.

[0046]

Further, after the key switch 36 has been set to OFF, the main microcomputer 21 executes the shutdown process and, upon completion, instructs the self-maintenance circuit 27 to stop supplying power.

[0047]

FIG.4 is a drawing that explains in detail the function of the above-described main microcomputer 21. The drawing is a block diagram that shows the functions of the main microcomputer 21, focusing on those related to the present invention.

[0048]

As shown in FIG.4, the main microcomputer 21 comprises a configuration including a clutch actuator control section 37 and a shift actuator control section 38.

The clutch actuator control section 37 activates the clutch actuator 15 and connects or disconnects the clutch when the shift-up switch 32 or the shift-down switch 33 is set to ON by the driver and notification of the gearshift instruction information instructing a shift-up or a shift-down is received.

[0049]

The operation of the clutch actuator 15 is executed by the clutch actuator control section 37 outputting a clutch actuator control signal to the motor drive circuit 23.

[0050]

The shift actuator control section 38 activates the shift actuator 16 and rotates the shift arm in one direction or in the reverse direction upon notification of gearshift instruction information instructing a shift-up or a shift-down.

[0051]

The rotation of the shift arm rotates the shift camshaft connected to the shift arm, thereby switching the gear.

The operation of the shift actuator 16 is executed by the shift actuator control section 38 outputting a shift actuator control signal to the motor drive circuit 24.

[0052]

The control of the clutch actuator 15 performed by the clutch actuator control section 37 will now be further described.

The clutch actuator control section 37 activates the clutch actuator 15 and transitions the clutch from a connected state to a completely disconnected state when gearshift instruction information is inputted from the shift-up switch 32 or the shift-down switch 33. Here, the completely disconnected state refers to a clutch position where the driving power of the engine is not at all transmitted to the vehicle.

[0053]

Subsequently, the clutch actuator control section 37 acquires the gear position information from the gear position sensor 31, and starts transition from the clutch completely disconnected state to a connected state (clutch connection operation) from the moment gear movement has been assessed as completed.

[0054]

In the clutch connection operation, the clutch actuator control section 37 initially connects the clutch at a first connection speed (first connection operation). Here, the first connection speed refers to the connection speed of the clutch that has been stored in advance by the clutch actuator control section 37, and is a temporarily constant connection speed.

[0055]

Next, the clutch actuator control section 37 starts connecting the clutch at a second connection speed (second connection operation) from the moment the clutch position reaches a predetermined clutch position (second connection operation starting clutch position) determined according to the clutch rotational speed difference. Here, the second connection speed is set later than the first connection speed, and is changed by the clutch actuator control section 37 every predetermined time period based on clutch rotational speed difference information.

[0056]

Now, the second connection operation performed by the clutch actuator control section 37 will be further described.

In the second connection operation, the clutch actuator control section 37 acquires a clutch rotational speed difference every predetermined time period (every 1msec, for example).

[0057]

The clutch actuator control section 37 matches in advance clutch rotational speed differences and second connection speed values and stores a second connection speed map.

Then, each time the clutch actuator control section 37 acquires a clutch rotational speed difference, the clutch actuator control section 37 sequentially acquires the second

connection speed corresponding to the clutch rotational speed difference from the second connection speed map.

[0058]

Then, the clutch actuator control section 37 connects the clutch at the acquired second connection speed.

As a result, in the second connection operation, if the clutch rotational speed difference changes, the second connection speed also changes according to that change.

[0059]

Subsequently, in the second connection operation, the clutch actuator control section 37 finishes the second connection operation (upon second connection operation completion) the moment both the clutch position and clutch rotational speed difference meet predetermined conditions (second connection operation completion conditions).

[0060]

Then, after second connection operation completion, clutch connection is performed at a third connection speed (third connection operation).

Here, the third connection speed is set to a speed that is faster than the second connection speed and is a temporally constant clutch connection speed.

[0061]

Furthermore, the second connection operation completion conditions are a clutch rotational speed difference that is less than or equal to the allowable second operation completion rotational speed difference, and a clutch position that is less than or equal to the allowable second operation completion position.

The function of the clutch actuator control section 37 will now be described in further detail.

[0062]

The clutch actuator control section 37 comprises a clutch disconnection operation section 41, a clutch connection operation section 42, a clutch connection speed changing section 43, a clutch rotational speed difference calculation section 44, a gear movement completion assessment section 45, and a second connection operation starting clutch position acquisition section 46.

[0063]

The clutch rotational speed difference calculation section 44 acquires the clutch rotational speed difference, which is the rotational speed difference between the clutch driving side and the clutch driven side.

Specifically, the clutch rotational speed difference calculation section 44 acquires clutch rotational speed information from the clutch rotational speed sensor 34 installed on a member on the engine side of the clutch and the clutch rotational speed sensor 35 installed on a member on the main shaft side, and acquires the difference in the rotational speeds as clutch rotational speed difference information.

[0064]

The clutch rotational speed difference calculation section 44 notifies the second connection operation starting clutch position acquisition section 46 and the clutch connection speed changing section 43 of the calculated clutch rotational speed difference information.

The clutch disconnection operation section 41 activates the clutch actuator 15 and transitions the clutch from a connected state to a completely disconnected state (clutch disconnection operation) in a case where gearshift instruction information is inputted from the shift-up switch 32 or the shift-down switch 33.

[0065]
The clutch disconnection operation section 41, in the clutch disconnection operation, acquires the clutch position information from the clutch potentiometer 28 and assesses whether or not the clutch has reached the completely disconnected state. Then, the moment the clutch reaches the completely disconnected state, the clutch disconnection operation section 41 stops the operation of the clutch actuator 15.
[0066]
The clutch connection operation section 42, in the clutch connection operation, activates the clutch actuator 15 based on the connection speed notified from the clutch connection speed changing section 43. In a case where the connection speed notifications from the clutch connection speed changing section 43 stop, the clutch connection operation section 42 stops the operation of the clutch actuator 15.
[0067]
The gear movement completion assessment section 45 acquires the gear position information from the gear position sensor 31. Then, after the clutch starts the disconnection operation, the gear movement completion assessment section 45 monitors the gear position based on the gear position information and assesses whether or not gear movement is completed.
[0068]
Then, the gear movement completion assessment section 45 assesses that gear movement is completed at the stage where the gear reaches the position corresponding to the gearshift level. The gear movement assessment section 45 that has assessed that gear movement is completed notifies the clutch connection speed changing section 43 and the second connection operation starting clutch position acquisition section 46 of gear movement completion.
[0069]
The second connection operation starting clutch position acquisition section 46 acquires the second connection operation starting clutch position based on the clutch rotational speed difference at the moment gear movement is completed. The second connection operation is started the moment this second connection operation starting clutch position is reached.
[0070]
Here, the acquisition of the second connection speed operation clutch position by the second connection operation starting clutch position acquisition section 46 will be further explained.
The second connection operation starting clutch position acquisition section 46 stores in advance a second connection operation starting clutch position map that matches second connection operation starting clutch positions and clutch rotational speed differences.
[0071]
The second connection operation starting clutch positions on the second connection operation starting clutch position map are set between the clutch completely disconnected state and the clutch completely connected state.
[0072]
The second connection operation starting clutch position acquisition section 46 that has received notification of gear movement completion from the gear movement completion assessment section 45 acquires clutch rotational speed difference information from the clutch rotational speed difference calculation section 44.

[0073]
Then, the second connection operation starting clutch position acquisition section 46 acquires the second connection operation starting clutch position corresponding to the acquired clutch rotational speed difference from the second connection operation starting clutch position map. Then, the second connection operation starting clutch position is notified to the clutch connection speed changing section 43.
[0074]
Here, the acquisition of the second connection speed of the second connection operation by the clutch connection speed changing section 43 will be described. The second connection speed is acquired based on a second connection speed map stored in advance in a clutch connection speed storage section 47 of the clutch connection speed changing section 43.
[0075]
Specifically, the stored second connection speed map matches clutch rotational speed differences and second connection speeds. The clutch connection speed changing section 43 acquires from the second connection speed map the second connection speed corresponding to the clutch rotational speed difference actually acquired from the clutch rotational speed difference calculation section 44.
[0076]
The acquired second connection speed is notified to the clutch connection operation section 42 and the clutch actuator 41 starts the second connection operation.
Then, during the second connection operation, the second connection speed is changed every predetermined time period. That is, the clutch connection speed changing section 43 acquires clutch rotational speed difference information from the clutch rotational speed difference calculation section 44 every predetermined time period (every 1msec, for example).
[0077]
Then, the clutch connection speed changing section 43 acquires the second connection speed corresponding to the clutch rotational speed difference information from the second connection speed map, and sequentially notifies the clutch connection operation section 42 of the second connection speed.
The clutch connection operation section 42 activates the clutch actuator 15 based on the sequentially notified second connection speed. In this manner, in the second connection operation, the clutch is connected at the clutch connection speed corresponding to the clutch rotational speed difference, thereby achieving a smooth clutch connection.
[0078]
FIG.5 (a) to (e) are drawings showing the configuration of the handlebar switch for shifting gears of the present embodiment. Furthermore, (a) to (e) of this same figure show a section of the handlebar 5 and a section of the handle grip section 6 that are nearby, focusing on the switch box 7 shown in FIG.1.
[0079]
FIG.5 (a) shows a view from the front of the two-wheeled motor vehicle 1, (b) shows a view from the driver's side, (c) shows a view from below the handlebar 5 and the handle grip section 6, (d) shows a view edge-on from the handle grip section 6 (a view without the handle grip section 6 removed, similar to other diagrams), and (e) shows a diagonal view upward from the bottom right.
[0080]

As shown in FIG.5 (a), (b), and (c), the switch box 7 comprises a first switch box 7a and a second switch box 7b.
These switch boxes (7a and 7b) are arranged around the periphery of the handlebar 5, between the flange section 6-1 of the handle grip section 6 and the front fork rotating shaft 4 (see FIG.1).

[0081]

Then, the first switch box 7a is arranged adjacent to the end surface facing the direction of the front fork rotating shaft 4 (see FIG.1) of the flange section 6-1 of the handle grip section 6.
The first switch box 7a comprises a passing switch 48 that makes at least the headlamp 11 flicker, a windshield moving switch 49 that moves the windshield 8 that protects the driver's face up and down, a horn switch 51 that sounds a horn, a flasher switch 52 that makes a flasher flicker when changing lanes or turning left or right, and a dimmer switch 53 that switches the upward/downward orientation of the headlamp.

[0082]

Of course, on the first switch box 7a, other switches may also be arranged as necessary, and switches deemed unnecessary may be removed or moved to the other switch box.
The other second switch box 7b comprises an operation section 55 of the handlebar switch for shifting gears of the present invention, and a manual selection switch 56 that switches the manual operation of the handlebar switch for shifting gears on and off.

[0083]

The switch section of the handlebar switch for shifting gears drives the shift actuator 16 and, although not shown in the drawing, is arranged in the second switch box 7b.

[0084]

The handlebar switch for shifting gears comprises below the handlebar a rocker lever 57 that extends from the above-described switch section along the handlebar toward the end of the handlebar to the outside of the second switch box 7b. The outer end of this rocker lever 57 is integrated with the above-described operation section 55.

[0085]

The operation section 55 comprises a first operation section 55-1 for performing a shift up-down operation using the thumb of the left hand of the driver that is gripping the handle grip section 6, and a second operation section 55-2 for performing a shift down-up operation using the index finger of the left hand of the driver that is similarly gripping the handle grip section 6.

[0086]

The operation section 55 of the handlebar switch for shifting gears moves in position from the neutral position prior to operation toward the vehicle traveling direction when the first operation section 55-1 is pressed by the left thumb of the driver.

[0087]

As a result, the rocker lever 57 integrated with the operation section 55 rocks in the counterclockwise direction of FIG.5 (c), setting the shift up-down switch 3233 of the switch section to ON.
The operation section 55 of the handlebar switch for shifting gears moves in position from the neutral position prior to operation toward the driver direction when the second operation section 55-2 is pressed by the index finger of the driver.

[0088]

As a result, the rocker lever 57 integrated with the operation section 55 rocks in the clockwise direction of FIG.5 (c), setting the shift down-up switch 3332 of the switch section to ON.
The operation range of the operation section 55 (the first operation section 55-1 and the second operation section 55-2), as shown in FIG.5 (a), (b), and (c), is set so that the operation section 55 is always positioned on the rotating shaft 4 side of a rotating shaft side surface 6-2, which is the end surface facing the direction of the above-described front fork rotating shaft 4 (see FIG.1) of the flange section 6-1 of the handle grip section 6.

[0089]

Further, the operation range of the first operation section 55-1, as shown in FIG.3 (d), is the area toward the vehicle travel direction from the surface of the first switch box 7a that is on the driver's side, i.e., a range that ensures that the first operation section 55-1 does not extend in the direction of the driver's side beyond the surface of the first switch box 7a that is on the driver's side.

[0090]

A layout of the first operation section 55-1 and the second operation section 55-2 such as described above ensures that the driver can unfailingly perform a finger operation or, alternatively, perform a finger operation while checking accuracy.

[0091]

The handlebar switch for shifting gears according to the above-described Embodiment 1 of the present invention is, in other words, a handlebar switch for shifting gears that changes via an actuator the transmission gear ratio of a gear shifter on a vehicle equipped with a handlebar that extends horizontally from a rotating shaft that controls the travel direction, is assembled to an end section of the handlebar, and comprises a configuration including at least a switch section that drives the actuator and is arranged in a switch box positioned around the periphery of the handlebar between the rotating shaft and a handle grip section that form a flange section on the rotating shaft side; a rocker lever that extends from the switch section along the handlebar toward the end of the handlebar to the outside of the switch box; and a switch operation section that has a first operation section and a section operation section and is provided on the outer end of the rocker lever, always positioned more toward the rotating shaft side than the surface of the flange section on the rotating shaft side.

[0092]

The handlebar switch for switching gears, for example, is configured so that the first operation section is for performing a shift up-down operation by the thumb of the driver's left hand gripping the handle grip section of the vehicle, and the second operation section is for performing a shift down-up operation by the index finger of the driver's left hand gripping the handle grip section

[0093]

In this case, for example, the first operation section is configured to move in position in the vehicle traveling direction from the position prior to operation while pressed by the thumb, and the second operation section is configured to move in position toward the driver direction from the position prior to operation while pressed by the index finger. Further, the position prior to operation is configured to be a neutral position.

[0094]

Further, in this handlebar switch for shifting gears, for example, the switch box comprises a first switch box and a second switch box, wherein the first switch box is

arranged adjacent to the flange and comprises at least a passing switch, a windshield moving switch, a horn switch, a flasher switch, and/or a dimmer switch, and the second switch box comprises in its interior at least the switch section.

[0095]

In this case, the rocker lever is configured to extend along the first switch box. Further, the position prior to operation for the first operation section is configured to be toward the vehicle traveling direction from the driver's side surface of the first switch box.

Further, on the handlebar switch for shifting gears, the rocker lever is configured to be arranged below the handlebar.

[0096]

Further, when viewed from another aspect, the handlebar switch for shifting gears may be configured to be a handlebar switch for shifting gears that changes via an actuator the transmission gear ratio of a gear shifter on a vehicle equipped with a handlebar that extends horizontally from a rotating shaft that controls the traveling direction, is assembled on an end of the handlebar, and comprises at least a switch section that drives the actuator and is arranged in a switch box positioned around the periphery of the handlebar between the rotating shaft and a handle grip section that form a flange section on the rotating shaft side; and a rocker lever that is arranged from the switch section along the handlebar in the vehicle anterior direction from the handlebar, the switch box, and the handle grip section center, wherein a neutral position of an operation section is set in a location that enables operation by the index finger of the hand gripping the handle grip section.

[0097]

The operation section of the above-described rocker lever is configured so that the neutral position is set in a location that enables flipping in the vehicle body anterior direction by the index finger, for example, or in a location that enables flipping in the vehicle body posterior direction by the index finger, for example.

[0098]

Further, the operation section of the above-described rocker lever may be configured so that the neutral position is set in a location that enables operation in the shift-up and shift-down directions using the index finger, for example.

In this case, the operation section of the above-described rocker lever may be configured so that the neutral position is set in a location that does not permit operation by the thumb of the hand gripping the handle grip section, for example.

[0099]

The handlebar switch for shifting gears is ideal for a saddle-riding type vehicle, for example. The saddle-riding type vehicle, for example, may be a two-wheeled motor vehicle (motorcycle, scooter, etc.), or may be a three-wheeled or four-wheeled buggy, for example, or may be a snowmobile, for example.

[0100]

In this manner, the handlebar switch for shifting gears of Embodiment 1 of the present invention comprises a rocker lever that extends along the handlebar toward the handlebar end to the outside of a switch box, and a first operation section and a second operation section that are always positioned more on the rotating shaft side than the rotating shaft side surface of the flange section, thereby enabling operation of the switch at an easy-to-operate location using a seesaw type operation method from both sides of the handlebar, and thus improving operability.

[0101]

Further, because the rocker lever and finger operation section are arranged separately from a switch box wherein another switch group is arranged, the switch is easily distinguishable from other switches, thereby improving operability from this point as well.
Further, because a rocker lever switch is used, the configuration is simple, contributing to cost reductions, and the stroke of the operation section is deep, ensuring driver operation awareness and eliminating the trouble of taking care not to make operational errors, thereby improving operability from this standpoint as well.

[0102]

Further, the layout is arranged so that the first operation section used for performing a shift-down operation is pressed by the thumb in the vehicle traveling direction, and the second operation section for performing a shift-up operation is pressed by the index finger in the driver direction, resulting in ease of operation during a gearshift, thereby improving operability from this standpoint as well.
Further, the switch box is divided into a first switch box and a second switch box, wherein the first switch box is arranged adjacent to the flange of the handle grip section and comprises, similar to a conventional switch box, at least a passing switch, a windshield moving switch, a horn switch, a flasher switch, and/or a dimmer switch, the second switch box is arranged adjacent to the first switch box and provides in its interior a switch section of a rocker switch, and a rocker lever from the switch section is extended along the first switch box below the handlebar to the outside, making it easy to operate the switches of the first switch box as well as the switches of the second switch box, thereby improving operability from this standpoint as well.

[0103]

Further, the position prior to operation of the first operation section that performs a shift-down operation is in the vehicle traveling direction of the driver's side surface of the first switch box, allowing the driver to naturally turn his or her handgrip downward when shifting down, thereby making it possible for the driver to sufficiently respond to a speed reduction at the time the handgrip on the handle grip section performs a shift-down operation.

[0104]

Furthermore, while the gear shifter that performs gear shift-up and shift-down operations using the handlebar switch for shifting gears was not particularly described in the above embodiment, the gear shifter to which the handlebar switch for shifting gears is applied in the present illustration may be applied to a multistage gear shifter as well as a continuously variable gear shifter. Of course, the continuously variable gear shifter may be controlled in a multistage format via the handlebar switch for shifting gears of the present illustration.

Embodiment 2

[0105]

However, in the embodiment described above, operation of the first operation section and operation of the second operation section are exclusively performed using the thumb and index finger, respectively.
Basically, while naturally the handlebar switch for shifting gears may be operated using a plurality of fingers or a thumb, the inventors of the present invention realized that, in the case of a saddle-riding type vehicle, the index finger has high flexibility and can be moved with dexterity in a case of a saddle-riding type vehicle in comparison with other fingers.

[0106]
Here, as a result of much devoted research, the inventors arrived at the idea that operation of a switch for shifting gears using an index finger would dramatically improve operability, something not realized by researches heretofore.
As a result, a switch having a neutral position of an operation section of a rocker lever set farther on the vehicle body anterior side than a vertical plane that includes the center line of a handle grip section, in a location that enables operation in two directions from the neutral position using an index finger was discovered. The following describes Embodiments 2 to 5 in relation thereto.
[0107]
FIG.6 (a) and (b) are drawings showing a configuration of a handlebar switch for shifting gears of Embodiment 2. Furthermore, FIG.6 (a) shows a section of the handlebar 5 and the handle grip section 6 located nearby, focusing on the switch box 7 shown in FIG.1.
[0108]
Further, FIG.6 (a) shows a view from behind the two-wheeled motor vehicle 1, and FIG.6 (b) shows a cross-sectional view of A-A' of FIG.6 (a).
The switch box 7 shown in FIG.6 (a) and (b) comprises the rocker lever 57 of the handlebar switch for shifting gears. The operation section 55 is integrated with the outer end of the rocker lever 57.
[0109]
Of course, the rocker lever 57 and the operation section 55 may be integrated as described above or may be assembled as separate members.
Furthermore, a switch section 58 of the handlebar switch for shifting gears is a switch section cable of driving not only the shift actuator 16 but also the clutch actuator 15, and is arranged inside the switch box 7.
[0110]
Further, although not shown in FIG.6 (a) and (b), the same various switches as those shown in FIG.5 (a) to (e) are arranged on the outer surface of the switch box 7 in addition to the rocker lever 57.
[0111]
The rocker lever 57 shown in FIG.6 extends from the switch box 7 arranged between the front fork rotating shaft 4 (see FIG.1) and the handle grip section 6 assembled to the end of the handlebar 5, and is arranged as a whole so that the operation section 55 can be moved in two directions from a neutral position.
[0112]
The neutral position of the operation section 55 is set farther on the anterior side of the vehicle body posterior-anterior direction than a vertical virtual plane that includes a center line 59 of the handle grip section 6 (the direction toward the back of the paper in the figure).
Then, the operation section 55 is arranged in a position that enables operation in two directions from a neutral position using the index finger of the hand gripping the handle grip section 6.
[0113]
That is, when the operation section 55 of the rocker lever 57 is in a neutral position 55-1, a gap d of at least one shift stroke to a position 55-2 in one direction (the direction of the shift down-up operation in the figure) is formed between the operation section 55 and the handle grip section 6.

[0114]
This gap d is a gap that only enables the operation section 55 to be flipped to a position 55-3 in the vehicle body anterior direction (the direction of the shift up-down operation) using the index finger.
Further, when the operation section 55 of the rocker lever 57 is in the neutral position 55-1, the operation section 55 can be pulled back in the vehicle body anterior direction using the index finger, based on the relationship with the distance from the handle grip section 6.
[0115]
That is, the neutral position of the operation section 55 of the rocker lever 57 is set in a location that enables operation in the two shift-up and shift-down directions using the index finger.
Note that, in the above-described Embodiment 2, the rocker lever 57 and the operation section 55 extend from the bottom of the switch box 7 along the components around the periphery of the handlebar and wrap upward so that the operation section 55 is arranged farther in the vehicle body anterior direction than the members around the periphery of the handlebar.
[0116]
However, as described above, if operations are performed using solely the index finger, the switch section of the handlebar switch for shifting gears may be arranged in the vehicle body anterior direction of the switch box 7 rather than on the bottom of the switch box 7. This is described below as Embodiment 3.

Embodiment 3
[0117]
FIG.7 (a), (b), and (c) are drawings showing a configuration of a handlebar switch for shifting gears of Embodiment 3. Furthermore, FIG.7 (a) shows a section of the handlebar 5 and the handle grip section 6 located nearby, focusing on the switch box 7 shown in FIG.1.
[0118]
Further, FIG.7 (a) shows a view from the driver's seat of the two-wheeled motor vehicle 1, FIG.7 (b) shows a cross-sectional view of B-B' of FIG.7 (a), and FIG.7 (c) shows a view of the rocker lever 57 and the operation section 55 from the vehicle body anterior direction.
[0119]
Furthermore, FIG.7 uses the same call-outs as those of FIG.1 to FIG.6 for those components and functions that are the identical to those described in FIG.1 to FIG.6.
Further, although not shown in FIG.7 (a), (b), or (c), the same various switches as those shown in FIG.5 (a) to (e) are arranged in the switch box 7 of the present illustration in addition to the rocker lever 57.
[0120]
As shown in FIG.7 (a), (b) and (c), the switch section of the handlebar switch for shifting gears is arranged in the vehicle body anterior direction of the switch box 7, and the rocker lever 57 and the operation section 55 are arranged in the vehicle body anterior direction of the switch box 7.
[0121]
In this illustration as well, the neutral position of the operation section 55 is set farther on the anterior side of the vehicle body posterior-anterior direction than the vertical virtual

plane that includes the center line 59 of the handle grip section 6 (the direction toward the back of the paper in the figure).
Then, the operation section 55 is arranged in a location that enables operation in two directions from a neutral position using the index finger of the hand gripping the handle grip section 6.

[0122]

Note, however, that in the present illustration, the operation section 55, as shown by both directional arrows a in FIG.7 (b) and (c), is designed so that the shift operation is performed by the index finger in the vehicle body vertical direction, rather than in the vehicle body posterior-anterior direction.

Embodiment 4

[0123]

FIG.8(a) and (b) are drawings showing examples of the various operation positions of the operation section 55 of the rocker lever 57 of the handlebar switch for shifting gears of Embodiment 4.
In FIG.8 (a) and (b) as well, the operation section 55 is set farther on the anterior side of the vehicle body posterior-anterior direction than the vertical virtual plane that includes the center line 59 of the handle grip section 6 (the direction toward the back of the paper in the figure).

[0124]

As shown in FIG.8 (a), the two operational directions of the operation section 55 may be set to a variety of two directions as shown by the eight arrows from the center of the operation section 55 located in a neutral position, including upward and downward, forward and backward, diagonally upward and downward in the forward direction, and diagonally upward and downward in the rearward direction.

[0125]

Furthermore, although the eight arrows in the figure are indicated using straight lines, the operation section 55 is provided at the end of the rocker lever 57, rendering the actual movement in the two directions that of a circular arc rather than a straight line.

[0126]

In this case, the two directions may be within the identical virtual circular arc or within the identical virtual plane [the directions of two arrows pointing in linearly reverse directions in FIG.8 (a)] or may be within different virtual planes that intersect at the neutral position.

[0127]

That is, the design may be configured so that operation is performed using a combination of two of eight directions indicated by the eight arrows in FIG.8 (a). What matters is that the combination of the two directions enables operation in two directions from the neutral position using an index finger.

[0128]

Further, the neutral position of the operation section 55 is not necessarily limited to directly across from the handle grip section 6 and switch box 7, but may be set above or below the location directly across from the handle grip section 6 and switch box 7, as shown in FIG.8 (b). What matters is that the location enables operation in two directions from the neutral position using the index finger.

Embodiment 5

[0129]

FIG.9 (a) and (b) are drawings that show examples of the various operational positions of the operation section 55 of the rocker lever 57 of the handlebar switch for shifting gears of Embodiment 5.
FIG.9 (a), for the purpose of comparison with FIG.9 (b), shows the same layout as FIG.7 (a) of the operation section 55. That is, the operation section 55 of the rocker lever 57 is arranged in a position that overlaps in the vehicle body anterior direction with the handle grip section 6.
[0130]
Conversely, in FIG.9 (b), the operation section 55 of the rocker lever 57 is arranged in a position that overlaps in the vehicle body anterior direction with the switch box 7.
Whether the operation section 55 is arranged in one or the other above-described locations, what matters is that the location enables operation in two directions from the neutral position using the index finger.

BRIEF DESCRIPTION OF DRAWINGS

[0131]
FIG.1is a side view of the outer appearance of a two-wheeled motor vehicle given as an example of a vehicle provided with a handlebar switch for shifting gears of Embodiment 1.
FIG.2 is a drawing showing the general configuration of a control system mounted on a two-wheeled motor vehicle.
FIG.3 is a configuration block diagram of the sensor and switch group connected to a control device in a control system.
FIG.4 is a drawing that explains in detail the function of a main microcomputer of the control device.
FIG.5 (a) to (e) are drawings showing a configuration of a handlebar switch for shifting gears of Embodiment 1.
FIG.6 (a) and (b) are drawings showing a configuration of a handlebar switch for shifting gears of Embodiment 2.
FIG.7 (a), (b), and (c) are drawings showing a configuration of a handlebar switch for shifting gears of Embodiment 3.
FIG.8 (a) and (b) are drawings showing examples of the various operation positions of a rocker lever of a handlebar switch for shifting gears of Embodiment 4.
FIG.9 (a) and (b) are drawings showing examples of the various operation positions of a rocker lever of a handlebar switch for shifting gears of Embodiment 5.

Call-outs
[0132]

1	TWO WHEELED MOTOR VEHICLE
2	FRONT WHEEL
3	REAR WHEEL
4	FRONT FORK ROTATING SHAFT
5	HANDLEBAR
6	HANDLE GRIP SECTION
6-1	FLANGE SECTION
6-2	ROTATING SHAFT SIDE SURFACE
7	SWITCH BOX
7a	FIRST SWITCH BOX

7b	SECOND SWITCH BOX
8	WINDSHIELD
9	FLASHER REARVIEW MIRROR
11	HEADLAMP
12	FUEL TANK
13	SEAT
14	ENGINE
15	CLUTCH ACTUATOR
16	SHIFT ACTUATOR
20	CONTROL DEVICE
21	MAIN MICROCOMPUTER
22	POWER SUPPLY CIRCUIT
23, 24	MOTOR DRIVE CIRCUIT
25	SENSOR AND SWITCH GROUP
26	BATTERY
27	SELF-MAINTENANCE CIRCUIT
28	CLUTCH POTENTIOMETER
29	SHIFT POTENTIOMETER
31	GEAR POSITION SENSOR
32	SHIFT UP-DOWN SWITCH
33	SHIFT DOWN-UP SWITCH
34	ENGINE SIDE CLUTCH ROTATIONAL SPEED SENSOR
35	MAIN SHAFT SIDE CLUTCH ROTATIONAL SPEED SENSOR
36	KEY SWITCH
37	CLUTCH ACTUATOR CONTROL SECTION
38	SHIFT ACTUATOR CONTROL SECTION
41	CLUTCH DISCONNECTION OPERATION SECTION
42	CLUTCH CONNECTION OPERATION SECTION
43	CLUTCH CONNECTION SPEED CHANGING SECTION
44	CLUTCH ROTATIONAL SPEED DIFFERENCE CALCULATION SECTION
45	GEAR MOVEMENT COMPLETION SECTION
46	SECOND CONNECTION OPERATION STARTING CLUTCH POSITION ACQUISITION SECTION
47	CLUTCH CONNECTION SPEED STORAGE SECTION
48	PASSING SWITCH
49	WINDSHIELD MOVING SWITCH
51	HORN SWITCH
52	FLASHER SWITCH
53	DIMMER SWITCH
55	OPERATION SECTION
56	MANUAL SELECTION SWITCH
57	ROCKER LEVER
58	SWITCH SECTION OF HANDLEBAR SWITCH FOR SHIFTING GEARS
59	CENTER LINE

[0131]

FIG.1 is a side view of the outer appearance of a two-wheeled motor vehicle given as an example of a vehicle provided with a handlebar switch for shifting gears of Embodiment 1.

FIG.2 is a drawing showing the general configuration of a control system mounted on a two-wheeled motor vehicle.

FIG.3 is a configuration block diagram of the sensor and switch group connected to a control device in a control system.

FIG.4 is a drawing that explains in detail the function of a main microcomputer of the control device.

FIG.5 (a) to (e) are drawings showing a configuration of a handlebar switch for shifting gears of Embodiment 1.

FIG.6 (a) and (b) are drawings showing a configuration of a handlebar switch for shifting gears of Embodiment 2.

FIG.7 (a), (b), and (c) are drawings showing a configuration of a handlebar switch for shifting gears of Embodiment 3.

FIG.8 (a) and (b) are drawings showing examples of the various operation positions of a rocker lever of a handlebar switch for shifting gears of Embodiment 4.

FIG.9 (a) and (b) are drawings showing examples of the various operation positions of a rocker lever of a handlebar switch for shifting gears of Embodiment 5.

FIG.1

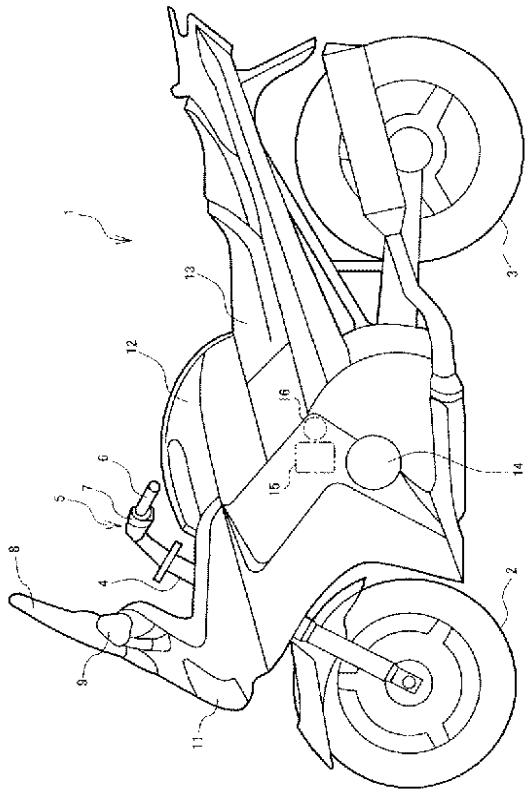
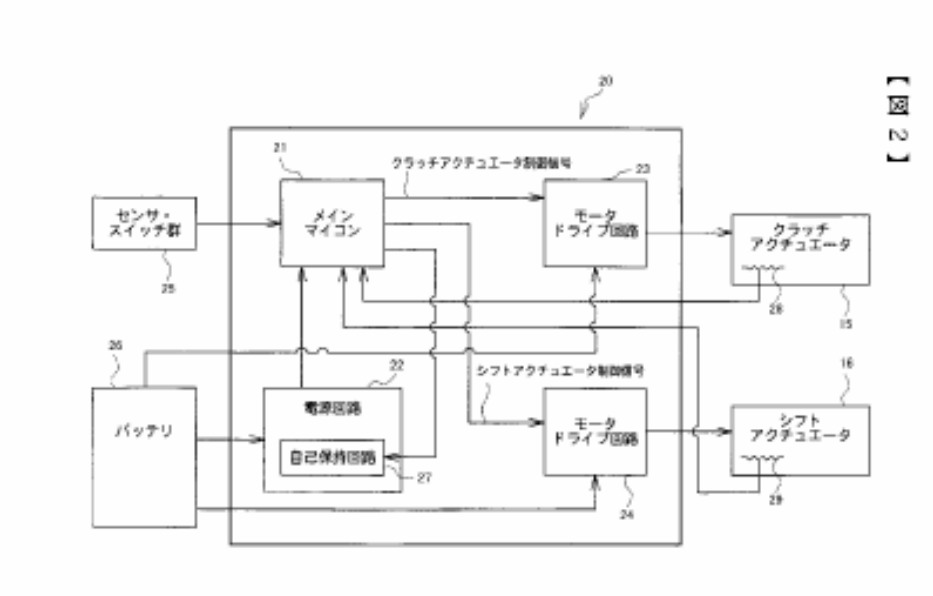
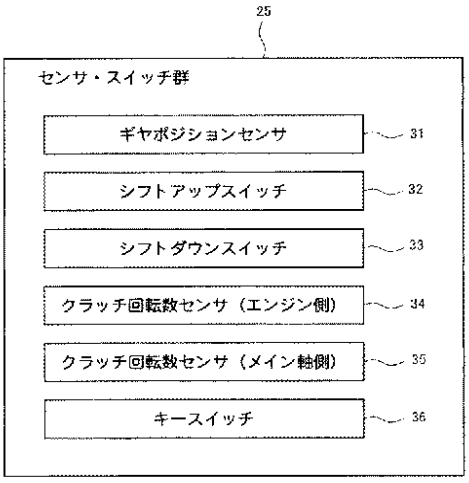


FIG.2



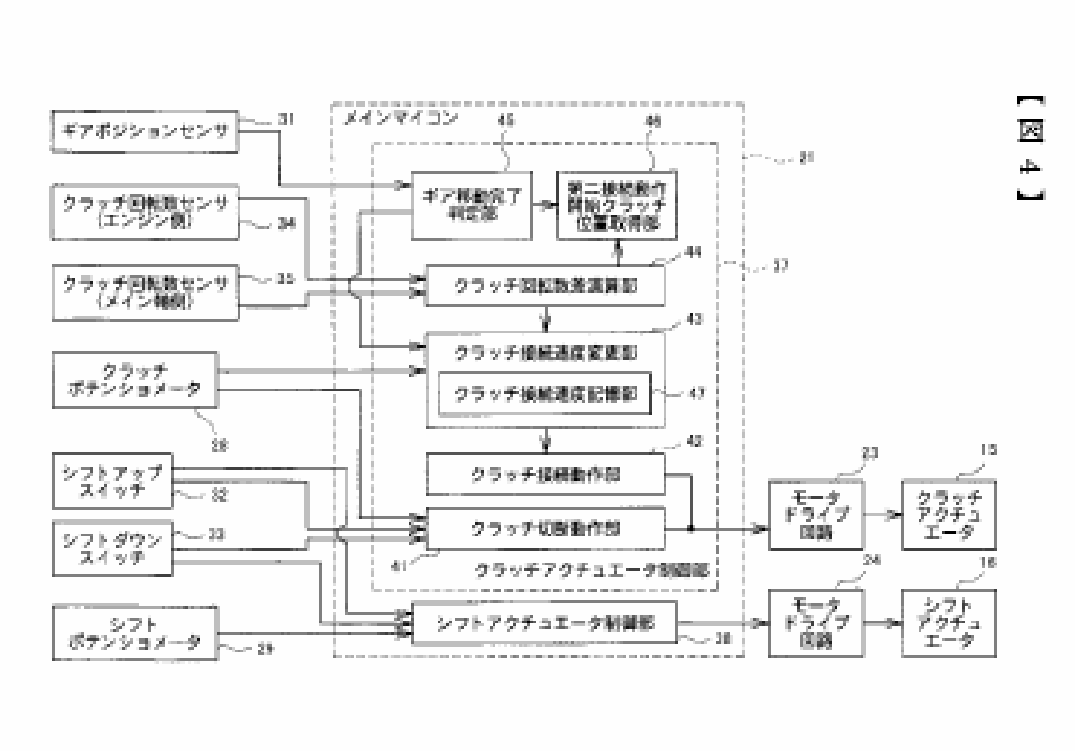
15 CLUTCH ACTUATOR
16 SHIFT ACTUATOR
21 MAIN MICROCOMPUTER
22 POWER SUPPLY CIRCUIT
23 MOTOR DRIVE CIRCUIT
24 MOTOR DRIVE CIRCUIT
25 SENSOR AND SWITCH GROUP
26 BATTERY
27 SELF-MAINTENANCE CIRCUIT
CLUTCH ACTUATOR CONTROL SIGNAL
SHIFT ACTUATOR CONTROL SIGNAL

FIG.3



SENSOR AND SWITCH GROUP
31 GEAR POSITION SENSOR
32 SHIFT-UP SWITCH
33 SHIFT-DOWN SWITCH
34 CLUTCH ROTATIONAL SPEED SENSOR (ENGINE SIDE)
35 CLUTCH ROTATIONAL SPEED SENSOR (MAIN SHAFT SIDE)
36 KEY SWITCH

FIG.4



15 CLUTCH ACTUATOR
16 SHIFT ACTUATOR
21 MAIN MICROCOMPUTER
23 MOTOR DRIVE CIRCUIT
24 MOTOR DRIVE CIRCUIT
28 CLUTCH POTENTIOMETER
29 SHIFT POTENTIOMETER
31 GEAR POSITION SENSOR
32 SHIFT-UP SWITCH
33 SHIFT-DOWN SWITCH
34 CLUTCH ROTATIONAL SPEED SENSOR (ENGINE SIDE)
35 CLUTCH ROTATIONAL SPEED SENSOR (MAIN SHAFT SIDE)
37 CLUTCH ACTUATOR CONTROL SECTION
38 SHIFT ACTUATOR CONTROL SECTION
41 CLUTCH CONNECTION SPEED STORAGE SECTION
42 CLUTCH CONNECTION OPERATION SECTION
43 CLUTCH CONNECTON SPEED CHANGING SECTION
44 CLUTCH ROTATIONAL SPEED DIFFERENCE CALCULATION SECTION
45 GEAR MOVEMENT COMPLETION ASSESSMENT SECTION
46 SECOND CONNECTION OPERATION STARTING CLUTCH POSITION ACQUISITION SECTION

FIG.5

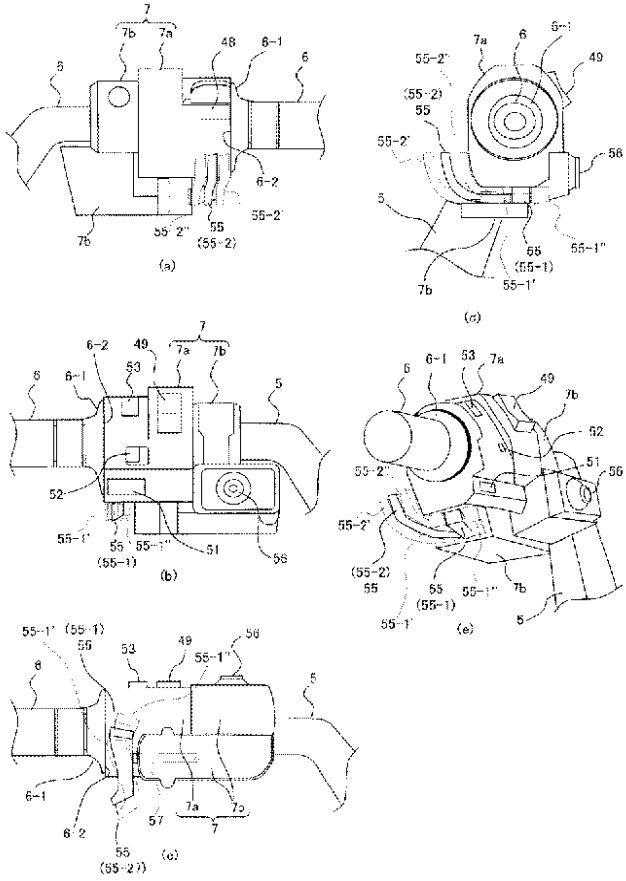


FIG.6

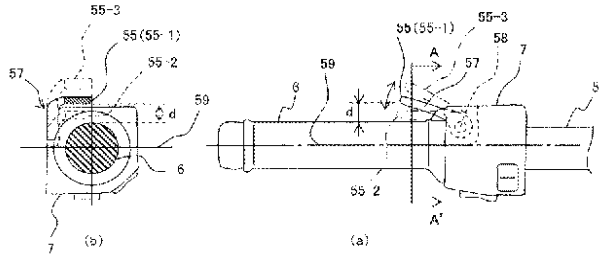


FIG.7

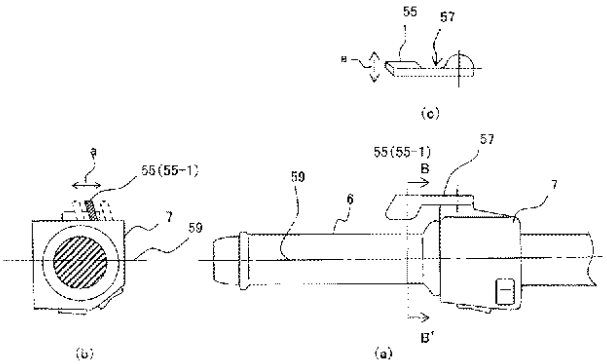
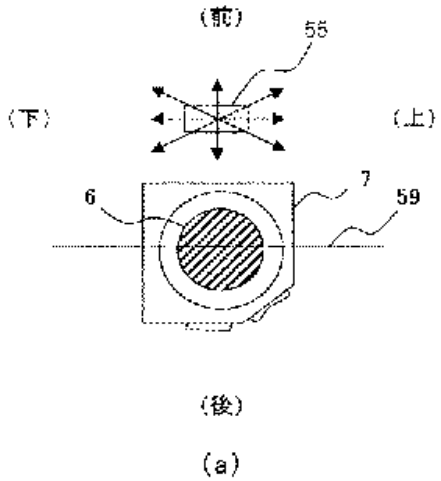
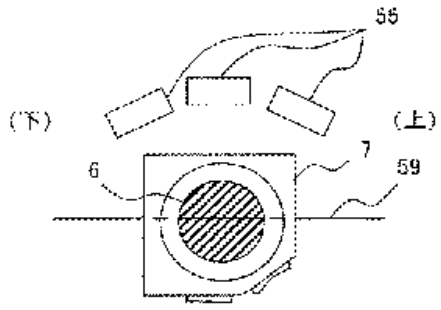


FIG.8



(a)

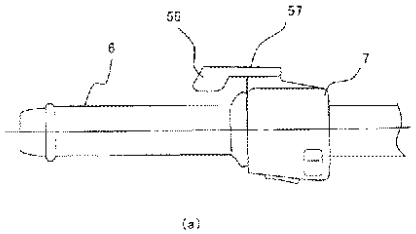
FIG.8 (a)
(FRONT)
(BACK)
(DOWN)
(UP)



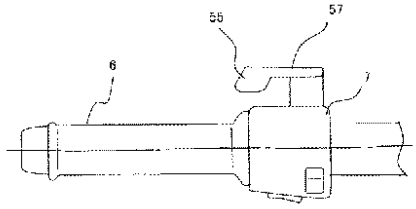
(b)

FIG.8 (b)
(DOWN)
(UP)

FIG.9



(a)



(b)