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(54) HANDLE OPERATING DEVICE FOR TELEVISION GAME MACHINE

HANDSTEUERGERÄT FÜR VIDEOSPIEL

DISPOSITIF DE COMMANDE A MANCHE POUR JEU VIDEO

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- **PATENT ABSTRACTS OF JAPAN vol. 14, no. 299 (C-733), 27 June 1990 & JP-A-02 098392 (TAITO CORP.), 10 April 1990,**
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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a steering wheel control apparatus that is connected to a home television game machine by a cable or by radio and that is manipulated by a player.

BACKGROUND OF THE INVENTION

[0002] Conventional television game machines that simulate the operations of vehicles, such as automobiles, airplanes and ships, are used as is shown in Fig. 1, for example.

[0003] More specifically, a television game machine 1 transmits video image signals and speech signals to a television set 2, via a cable, for a game program that is contained in a game cartridge, which is installed in the television game machine 1, and thus provides a game on the television set 2. A steering wheel control apparatus 3 for a car race game is connected to the television game machine 1 and outputs a drive signal to the television game machine 1 to control the game.

[0004] In the steering wheel control apparatus 3, its body 4 corresponds to the instrument panel of an automobile, and a steering wheel 6 is attached to the distal end of a steering shaft 5, which is so provided that it projects diagonally upward from the body 4.

[0005] During the game, the player needs only manipulate the steering wheel control apparatus 3, while the steering wheel control apparatus 3 is placed either on a table 7, as is shown in Fig. 1, or directly on a floor. In addition, when the player sits on a sofa, etc., to play a game, he can place the steering wheel control apparatus 3 on his lap. Under such conditions, the player commonly manipulates a button switch or a shift lever (not shown), which are provided on the body 4, while operating the steering wheel 6.

[0006] Such a conventional steering wheel control apparatus, however, does not provide excellent usability, and has the following shortcomings.

[0007] The first problem is concerned with the positions of the various switches that are located on a steering wheel control apparatus. More specifically, for the television game machine that simulates the operations of vehicles, such as cars, airplanes and ships, by manipulating a steering wheel while watching a monitor screen, in addition to a steering wheel, which is employed to indicate the direction of travel, a steering wheel control apparatus normally includes various switches that are mounted on the body. There are steering apparatuses that resemble a control stick for an airplane, where one push button switch is provided on the top of the control stick or where a button switch is provided on the reverse side of the control stick.

[0008] The above television game, however, requires not only the operation of a steering device to indicate the direction of movement, but also the manipulation of switches for accelerating, for braking and for shifting gears, or for offensive and defensive maneuvering and for changing a field view. As these switches are arranged on the body 4 of the steering wheel control apparatus 3, as is shown in the above prior art, a player must remove one hand from the steering wheel 6 to manipulate the switches during the game, so that prompt reaction is difficult and usability is degraded.

[0009] It is possible for a player to hold a steering wheel with one hand and to place the other hand on the switches in advance; however, the driving posture will be uncomfortable and the operation will be carelessly performed.

[0010] While, as is described above there are control stick steering devices that have a single button switch, there are no such control apparatuses that have a plurality of switches that can be selected and manipulated while a control stick is being held. The above described control stick steering devices, therefore, are not appropriate for games that require multiple operation switches.

[0011] However, if a control apparatus has only one operation switch that is located out of sight, it will not cause any problems during operation. Whereas if there are a plurality of switches that are positioned out of sight, since they are outside the field of vision, when they are used operating errors can occur.

[0012] The second problem is related to a gearshift lever that is frequently used during a car race game. Primarily, the operation switch that corresponds to a gearshift lever is attached to the body 4.

[0013] Since a player needs to remove one hand from the steering wheel 6 to manipulate a gearshift lever during the game, there is loss of time at the shift operation. Thus, in a car race game in which quick responses are required, a player can not cope with the speed at which the game progresses.

[0014] For large game machines that are installed in a game center, etc., gearshift levers are so provided for a steering wheel as to resemble the arrangement for a real racecar. This gearshift lever is called a seesaw gearshift lever, or a so-called a butterfly gearshift lever, which is so designed that a shift-up operation and a shift-down operation can not be performed at the same time.

[0015] The butterfly gearshift lever is so designed that it is large and the periphery of the steering wheel is accordingly complicated and does not have an attractive appearance.

[0016] The butterfly gearshift lever is not appropriate for installation on a steering wheel control apparatus for home use that must be compactly made.

[0017] The third problem arises when, as is shown in Fig. 1, a game is played while the steering wheel control apparatus 3 is positioned on the table 7, and the manipulation of the steering wheel 6 must be performed as quickly as possible for a car racing game, etc. When a

player is engaged in such a game, extra force is imposed on the steering wheel 6, with the result that the steering wheel control apparatus 3 is moved.

[0018] When the steering wheel control apparatus 3 is moved, it is impossible to control the direction of travel by using the steering wheel 6, and it is necessary to halt the game during play.

[0019] As a player must therefore constantly take care not to move the steering wheel control apparatus 3 while handling the steering wheel 6, the player can not concentrate on the game.

[0020] The same conditions are encountered when the steering wheel control apparatus 3 is placed on a floor and used. Further, when the steering wheel control apparatus 3 is held on the lap and used, the steering wheel control apparatus 3 is not stably supported and a player has to take so much care not to move the control apparatus 3 that the player can not concentrate on the game that is being played.

[0021] Since the player must pay attention to matters other than those concerned with the playing of a game, the player is prevented from concentrating fully on playing the game, and can not, therefore, thoroughly enjoy it.

[0022] The fourth problem is related to the position of the steering wheel 6. The steering wheel 6 is fixed in a standard position on the steering wheel control apparatus 3 for a television game machine. When the position of the steering wheel 6 is so fixed, the operation of the steering wheel 6 may be difficult for a player whose size does not correspond to the average, or for a player who has a unique operating posture. To provide realism in the procedures for the game, some conventional control apparatuses 3 vibrate the steering wheel 6 by causing the steering wheel 6 to slide up and down and to be extended upward and retracted. Such a performance is only for causing the vibration, and under normal conditions, when vibration is not required, the steering wheel 6 returns to the standard position, which is not always the position that is appropriate for a player.

[0023] From JP 2-098392 A a steering wheel control apparatus for a game machine is known. The steering wheel control apparatus comprises a steering column, a steering shaft rotatably provided to the steering column and a steering wheel. The steering wheel includes a center portion provided on a top end of the steering shaft and a ring-like gripping member.

[0024] From JP 62-55263 A a steering control apparatus of a motor vehicle is known, wherein a rotational steering wheel with a pair of grips at symmetrically located positions to the center of rotation is provided. A button switch at a position on a front portion of the left part and a button switch on a position on a front portion of the right part are provided. A plurality of switches is located near the center of a front face of the steering wheel.

[0025] It is the object of the invention to provide a steering wheel control apparatus for a game machine wherein a player, in particular a premature child can selectively manipulate easily a plurality of switches while holding a steering wheel.

[0026] This object is solved by a steering wheel control apparatus as set forth in claim 1.

[0027] Preferred developments of the invention are given in the subclaims.

[0028] Since a player can securely hold the base casing between the thighs, and the player does not, therefore, have to be careful about shifting the steering wheel control apparatus unnecessarily while manipulating the steering wheel, then engaged in a game, the player can concentrate on and fully enjoy playing the game.

[0029] A plate is extended to the right and to the left along the bottom face of the base casing. The player can hold the base casing between the thighs, and at the same time, can press down on the plate, which extends outward to either side, with the thighs from above, so that the base casing can be held more securely.

[0030] As a result, a player can selectively manipulate a plurality of button switches while holding the steering wheel. The steering wheel control apparatus, therefore, possesses excellent usability, and is appropriate for television games that require quick control responses. Thus it is possible for games to provide progressively greater gratification for players as skill is acquired in their use, and the players can enjoy the games more.

[0031] A plurality of button switches are located at the front of the steering wheel and within sight of the player, so that a player can observe the manipulation of switches and can prevent errors during their operation.

[0032] For a rotary steering wheel that has a pair of grip portions, the arrangement of a plurality of button switches on the grip portions can facilitate a more complex and a higher level switch manipulation.

[0033] With the arrangement of claim 3, since to manipulate that switch one hand must be removed from the steering wheel, manipulation errors can be prevented.

[0034] According to claim 4 a pair of shift levers are provided on a reverse surface of the steering wheel, with the pair of shift levers having manipulable segments, which are near the pair of grip portions, whereat, when fingers of both hands holding the pair of grip portions are in contact with the manipulable segments, a signal to shift up a gear is generated by actuation of one of the gearshift levers and a signal to shift down a gear is generated by actuation of the other gearshift lever.

[0035] Since the steering wheel control apparatus according to claim 4 is so designed that the individual shift levers on the reverse surface of a steering handle are operated independently, the shift lever mechanism can be compactly and simply constructed around the steering wheel, and is appropriate for employment with the steering wheel control apparatus for home use. Even in with a television game that is played at home, a player can enjoy a sense of control that is similar to that which is experienced when actually driving a racecar.

[0036] A signal processing means for processing signals from the shift levers is provided so that, even when both the shift levers are being operated, it is assumed that the control that is imposed by one of the gearshift levers is valid and that the result of the operation of the other is invalid. Errors that occur during the operation of the gearshift levers can be automatically eliminated. Further, the control apparatus can be thus fixed in place, and the operation of the apparatus that has button switches and the shift levers on the obverse and reverse sides of the steering wheel can be performed perfectly.

[0037] When the locking means of claim 6 has been released, the steering column is temporarily held by the temporary holding means so that it can be inclined. The steering column is freely inclined by moving a steering wheel and can be maintained at a proper inclination. Then, the steering wheel can be secured in an optimal inclined position by setting and locking the locking means.

[0038] In the temporary holding means of claim 7, the external bottom wall face of the steering column is virtually formed in a curved shape, and a plurality of grooves that extend toward the sides are formed along the circumference of the curved face. An engagement member is formed that extends outward from the base casing and that has an engagement protrusion at its distal end, which is displaced downward by elastic deformation. When the engagement protrusion engages one of the grooves in the steering column, the inclined steering column is temporarily held at that position. In the locking means, the active portion of an inclination locking member, which is provided for the base casing, can be freely engaged downward with, and disengaged from the engagement protrusion. When the active portion of the inclination locking member engages the engagement protrusion, the locking means inhibits the downward displacement of the engagement protrusion and thus provides the locked state. When the active portion of the inclination locking member is separated from the engagement protrusion, the locking means permits the downward displacement of the engagement protrusion and thus provides the lock released state.

[0039] With this arrangement, if the locking is released by operating the inclination locking member, the downward displacement of the engagement protrusion is permitted. In this condition, when the steering column is inclined, at its distal end the engagement protrusion is disengaged from the groove in the steering column by the elastic deformation of the engagement member, and engages another groove, after sliding over the cylindrical portion between the grooves, to hold the steering column temporarily.

[0040] In the lock released state, the steering column can be freely inclined by moving the steering wheel and can be temporarily held at a desired position. Further, when the inclination locking member is operated and it is set in the locked state, the downward displacement of the engagement protrusion is inhibited. The engagement protrusion is therefore securely fitted in the groove in the steering column and the inclination of the steering wheel is fixed.

[0041] When the locking means of claim 9 is set in the lock released state, the steering shaft is temporarily held by the temporary holding means so that it can be freely extended or depressed. The steering shaft can therefore be freely extended or depressed with the steering handle and can be temporarily maintained at a desired height. When the steering shaft is locked by the locking means, the steering wheel can be fixed at an optimal vertical position.

[0042] For the temporary holding means of claim 10, a plurality of grooves that extend in a direction that is perpendicular relative to the axial direction of the steering shaft are formed in the surface of and around the steering shaft. An engagement piece is provided on the end of a cylindrical engagement member that engages the steering shaft, which can be freely extended and depressed in the axial direction, and that rotates with the steering shaft. The engagement piece can be displaced by the elastic deformation in the direction of the greatest diameter of an inward protruding engagement paw] that is provided at the distal end of the engagement piece. When the engagement pawl engages one of the grooves in the steering shaft, the extension/depression position of the steering shaft is temporarily determined. In the locking means, a circular extension/depression locking member, which rotatably engages the end of the cylindrical engagement member, is so operated that the active portion of the extension/depression locking member can be externally connected to, or disconnected from, the engagement piece of the engagement member. And the cylindrical engagement member is rotatably supported by the steering column. When the active portion of the extension/depression locking member contacts the engagement piece of the engagement member, the expansion of the diameter of the engagement piece is inhibited and the engagement member is locked in place. When the active portion of the extension/depression locking member is separated from the engagement piece of the engagement member, the expansion of the diameter of the engagement piece is permitted and the locked state is released.

[0043] When the locking condition is released by the operation of the extension/depression locking member, the displacement of the engagement pawl in the direction in which the diameter is expanded is permitted. Under this condition, when the steering shaft is extended or depressed, the engagement pawl at the end is removed from the groove in the steering shaft by the elastic deformation of the engagement piece, and engages another grove after sliding over the side face between the grooves, so that the steering shaft is thus temporarily held.

[0044] As is described above, in the lock released

state, the steering shaft can be freely extended and depressed with the steering wheel, and can be temporarily held at a desired position. Further, since, in the locked state that is provided by the operation of the extension/depression locking member, the displacement of the engagement piece is inhibited in the direction in which the diameter is expanded, the engagement pawl is securely fitted into the groove of the steering shaft and the vertical position of the steering wheel is fixed.

[0045] The inclination and the extension/depression of the steering wheel can be adjusted by the provision of the steering wheel inclination position adjustment structure and the steering wheel extension/depression position adjustment structure.

[0046] According to the present invention, a plurality of button switches are provided above and on the right and the left sides at given positions on a steering wheel, and a gearshift lever pair is arranged on the reverse side. While a steering wheel is being handled, these button switches and the gearshift lever pair can be manipulated by the thumbs and the other fingers. In addition, for increased usability, the base casing of the steering wheel control apparatus can be securely positioned by its being held between the thighs of a player. Further, since the vertical position and the rotational position of the steering wheel can be adjusted, a player can more easily handle the steering wheel while manipulating the button switches and the gearshift levers.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047] The accompanying drawings are provided as reference material for enhanced comprehension of the present invention and to accompany the explanation of the present invention. The present invention, however, is not limited to the structure that are depicted in the accompanying drawings.

Fig. 1 is a sketch illustrating a conventional steering wheel control apparatus that is being used;

Fig. 2 is a rear view of a steering wheel control apparatus according to one embodiment of the present invention;

Fig. 3 is a top view of a steering wheel control apparatus according to the embodiment of the present invention;

Fig. 4 is a side view of a steering wheel control apparatus according to the embodiment of the present invention;

Fig. 5 is a sketch illustrating a right hand holding the right grip portion of the steering wheel in Figs. 2, 3 and 4;

Fig. 6 is a partially exploded perspective view of a steering wheel showing a gearshift lever according to the embodiment of the present invention;

Fig. 7 is a partial cross sectional view of the steering wheel in Fig. 6;

Fig. 8 is a diagram illustrating a simultaneous driving processor for the gearshift levers in Fig. 6;

Fig. 9 is a sketch showing the steering wheel control apparatus according to the embodiment of the present invention while it is in use;

Fig. 10 is a side view of the steering wheel control apparatus with the base casing in its cross section, showing the inclination locked state of the embodiment of the present invention;

Fig. 11 is a side view of the steering wheel control apparatus in Fig. 10 when it is temporarily held;

Fig. 12 is an exploded perspective view of a steering shaft, an extension/depression locking member, and an engagement cylinder member that constitute an extension/depression adjustment mechanism according to the embodiment of the present invention;

Fig. 13 is a cross sectional view of the steering wheel control apparatus when the extension/depression portion adjustment structure is locked by the mechanism in Fig. 12;

Fig. 14 is a cross sectional view of the steering wheel control apparatus when the extension/depression portion adjustment structure is temporarily held by the mechanism in Fig. 12;

Fig. 15 is a bottom view of an extension/depression locking member 38 in Fig. 12;

Fig. 16 is a partially cutaway side view of a centering mechanism of the steering wheel control apparatus according to the embodiment of the present invention;

Fig. 17 is a side view of the centering mechanism when the steering wheel is rotated to the right;

Fig. 18 is a side view of the centering mechanism when the steering wheel is rotated to the left;

Fig. 19 is a top view of the steering wheel of the steering wheel control apparatus according to the embodiment of the present invention;

Fig. 20 is a top view of a handlebar control apparatus according to another embodiment of the present invention;

Fig. 21 is a perspective view of a control column control apparatus according to an additional embodiment of the present invention;

Fig. 22 is a rear view of a steering wheel control apparatus according to a further embodiment of the present invention;

Fig. 23 is an exploded diagram of a steering wheel showing shift levers according to still another embodiment of the present invention; and

Fig. 24 is a cross sectional view of the steering wheel in Fig. 23.

BEST MODES FOR CARRYING OUT THE INVENTION

[Outline of a steering wheel control apparatus]

[0048] Figs. 2 through 4 are a rear view, a top view and a side view for a steering wheel control apparatus according to one embodiment of the present invention.

[0049] The steering wheel control apparatus of the embodiment is employed by being connected to a home television game. As is shown in Fig. 1 for the prior art, a television game machine 1 transmits an image signal and a speech signal to a television 2 to develop a game. A steering wheel control apparatus 3 according to the embodiment, which is used for a driving game, such as a car racing game, is connected for control to the television game machine 1 via a cable 16, and outputs drive control signals to the television game machine 1 to control the progress of the game. In this embodiment, the steering wheel control apparatus 3 may also output the drive control signals to the television game machine 1 through radio.

[0050] A player needs only to operate the steering wheel control apparatus 3, and may use it by placing it on a table 4, as is shown in Fig. 1, or directly on a floor.

[0051] The player installs a software cartridge for a driving game, such as a car racing game, in the television game machine 1, holds a steering wheel 14 of the steering wheel control apparatus 3, and starts the game.

[0052] For a car racing game, a scene representing a race track as it is viewed from the operator's seat of a racecar and that includes images representing competitors' cars appears on a television 2 that is in front of the player. The video scene changes in response to the manipulation of the driving controls, so that the player is given the sense of driving as a participant in a car race.

[0053] The basic structure of the steering wheel control apparatus 3 in this embodiment will now be explained.

[0054] For a base casing 10 of the steering wheel control apparatus 3, an upright front wall 10a inclines slightly to the rear up to its top rear edge, a top wall 10b is formed so that it inclines diagonally downward to the rear until it reaches a bottom wall and thus serves as a rear wall, and side walls 10c cover the right and the left sides.

[0055] The side walls 10c approach each other as they extend to the rear.

[0056] The lower ends of the side walls extend horizontally to the right and left, and the rear edge of the top wall 10b extends backward horizontally so together they form a single plate 10d. The plate 10d is substantially rectangular in shape and creping is performed on the surface.

[0057] The lower face of the base casing 10 is covered with a bottom plate 11.

[0058] A cylindrical steering column 12 is fitted to an opening in the center of the inclined top wall 10b, and a steering shaft 12 is inserted into the steering column 12 to rotatably support the shaft 12. A steering wheel 14 is integrally formed at the upper end of the steering shaft 13 that projects upward.

[0059] The steering wheel 14 extends to the right and to the left and has hand grips 14a at the edge portions. These grips 14a are formed via upper and lower posts 14b and 14c that extend radially to the right and to the left from the steering wheel center portion 14d. Three push button switches 15 are arranged on the upper post 14b that is located in front of each of the grips 14a. Gearshift levers 125 and 126 that control gears during a car racing game are provided on the rear side of the steering wheel 14, so that the operating portion for each of the gearshift levers 125 and 126 is positioned in an arched opening 14e that lies between the steering wheel center portion 14d and the hand grip 14a. Another button switch 19 is located above the steering wheel center portion 14d.

[0060] A cable 16 that extends from the steering column 12 is connected to the television game machine 1.

[0061] The steering wheel control apparatus 3 in the embodiment has the above described appearance and its base casing 10 is formed in the above shape. To use such a steering wheel control apparatus 3, as will be explained while referring to Fig. 9, a player who is seated on, a piece of furniture, such as a sofa, places the steering wheel control apparatus 3 between the thighs. Then, while holding the side walls 10c of the base casing 10 with the thighs, at the same time the player sandwiches the horizontally extending plate 10d between the thighs and the seat so as to stabilize the steering wheel control apparatus 3.

[Button switches on the steering wheel control apparatus]

[0062] In Fig. 5 is shown the state when the right hand grip 14a is held by the right hand. The hand grip 14a can be securely held with the fingers, except for the thumb, and the proximal joint of the thumb. The three push button switches 15 are so arranged that they lie within a range where the thumb can move freely, and especially at positions where the pad of the right thumb (the palmar surface of the thumb where the curved ridges that produce a fingerprint are located) can easily be brought into contact with the buttons 15. Though not shown, the three push button switches on the left side are also arranged at the positions where the pad of the left thumb can easily be brought into contact with the button switches while the left hand holds the hand grip 14a.

[0063] A player, therefore, can selectively depress the switches in the two three push button sets with the right or the left thumb, while exercising control by securely holding the hand grips 14a with both hands.

[0064] On the other hand, the push button switch 19 that is located above the steering wheel center portion

14d can not be depressed unless one or the other of the hands releases a hand grip 14a.

[0065] The push button switches 15 and 19 are located on the front face of the steering wheel 14 that is in sight of an operator with a common posture. In addition, the button switches 15 are located on either upper posts 14b between the right and left hand grips 14a. Therefore, a player look at these button switches 15 while depressing them with the thumbs and without releasing the hand grips.

[0066] An example where the present invention is applied for a car racing game will now be explained.

[0067] In this game, acceleration, braking, gear changing and jumping can be performed, and an image on a television screen can be altered so that a scene can be viewed from various angles.

[0068] Various viewing angles can be selected: an angle at which an operator is commonly looking straight forward from an operator's seat; an angle at which an operator is looking to the rear; and an angle for a view point that is different from the view from the view point of the operator and that is upward and diagonally to the rear of the car.

[0069] Among the three push button switches 15 on the right side, the rightmost bush button switch is an acceleration switch, the middle push button switch is a brake switch, and the leftmost push button switch is a jump switch. These switches are manipulated frequently during the game. While the hand grip 14a is held by the right hand, the right thumb can be employed to selectively depress the push button switches 15.

[0070] Among the three push button switches 15 on the left side, the leftmost push button switch is, for example, a gear change switch and the other two are switches for changing the view angle. While the hand grip 14a is held by the left hand, the left hand thumb can be employed to selectively depress the three push button switches 15.

[0071] The push button switch 19 that is located above the steering wheel center portion 14d is a game start switch.

[0072] After a player starts the game by depressing the push button switch 19 that is above the steering wheel center portion 14d, the player grasps the hand grips 14a with both hands, controls the steering wheel 14 for driving while watching the image on the television screen, and selectively employs his thumbs to depress the three push button switches 15 on either side without releasing either hand from the hand grips 14a. Thus, usability is excellent and quick operating responses are possible; and as the player gains proficiency, his enjoyment of the game increases.

[0073] The thumb of the right hand, especially, is frequently employed in consonance with race conditions to change the driving speed or to make a jump, so that a player's skill is best demonstrated by its use.

[0074] The gear change switch that is depressed by the thumb of the left hand is used rather frequently. The remaining push button switches, which are employed to change the view angle, are operated to acquire information about the position of the player's car and about how the race is progressing.

[0075] Since the push button switches that are to be depressed by the thumbs can be visually identified, erroneous selections can be avoided.

[0076] Further, since the push button switches are located within the range where the thumbs of the hands on the hand grips can contact them, not much space for the installation of these switches is required and the periphery of a steering wheel can be compactly designed.

[0077] On the other hand, as there is no need to depress the push button switch 19 during a game, and since if the switch 19 is mistakenly depressed it will cause an annoying interruption, i.e., the halting of the game. The switch 19 is so positioned that a hand must be removed from a grip to depress it in order to prevent it from being mistakenly depressed.

[Shift levers for the steering wheel control apparatus]

[0078] Conventionally, multiple operating switches of various types are provided for the base casing 10 of the steering wheel control apparatus 3, and a switch for instructing the shifting of a gear in a game is also provided on the base casing 10. In the steering wheel control apparatus 3 of this embodiment, the shift levers 125 and 126 are provided for the steering wheel 14.

[0079] The driving mechanism of the shift levers 125 and 126 will be described while referring to Figs. 6 and 7.

[0080] In Figs. 6 and 7 is shown the structure of the right shift lever 126; the left shift lever 125 has the same structure. The right shift lever 126 is used to instruct a shift up and the left shift lever 125 is employed to instruct a shift down.

[0081] The steering wheel 14 is constituted by joining casings 120a and 120b that are an obverse half and a reverse half (an upper half and a lower half), which are substantially symmetrical.

[0082] In the reverse side casing 120b, the circumference of a bottom wall 130 is enclosed within an external wall 131 and an internal wall 132 that is formed around the opening 14e.

[0083] One part of the bottom wall 130 projects inward (upward) along the internal wall 132, at the opening 14e, which is near the center, to form a recessed rectangular step wall 133. At the front and the rear of the step wall 133 are side walls that extend the front and the rear internal walls 132. In the center of the step wall 133, a perpendicular rectangular opening 134 is formed that extends longitudinally to the front and to the rear.

[0084] Circular holes 135 and 136 that are positioned in line are provided in the step wall 133, and upright cylindrical portions 135a and 136a are provided around the circular holes 135 and 136, respectively.

[0085] A boss 137, in which a screw hole is formed, and a pin 138 project upward near the rear circular hole 136.

[0086] A pair of bearings 139 are located upright on the bottom wall 130 at a position that faces a rectangular opening 134. The paired bearings 139 are rectangular pieces that face each other, and that have a recess 139a formed in each upper edge.

[0087] In the obverse side casing 120a, to correspond to the reverse side casing 120b, a bottom wall 140 is enclosed within an external wall 141, and an opening 14e is defined by an internal wall 142. A pair of front and rear pressure pieces 143 that correspond to the bearings 139 project downward from the bottom wall 140.

[0088] A rubber contact piece 150 is fitted into and around the cylindrical portion 136a of the step wall 133 in the reverse side casing 120b. The cone shaped rubber contact piece 150 is inserted into the cylindrical portion 136a with a distal cone end 150a facing downward. A flange 150b at its circumference is positioned and supported on the upper edge of the cylindrical portion 136a and a rectangular switch base plate 151 is pressed against it.

[0089] The switch base plate 151 includes circular holes 151a and 151b that are located at diagonally facing corners. The upper end of the pin 138 is fitted into the circular hole 151b, while a screw 152 is fitted into the other circular hole 151a and into the boss 137. The switch base plate 151 is thus fixed to the casing 120b while pressing against the rubber contact piece 150.

[0090] Electric cords 151d extend from the switch base plate 151.

[0091] A tactile or a micro switch may be employed instead of the rubber contact 150.

[0092] As is shown in Fig. 7, the distal end portion 150a of the rubber contact piece 150 projects downward a little through the circular hole 136, and a contact terminal 150c is provided on the reverse side of the distal end portion 150a.

[0093] A contact terminal 151c is located on the switch base plate 151 opposite to the contact terminal 150c. When the distal end portion 150a of the rubber contact 150 is pushed up from below and elastic deformation moves the contact terminal 150c upward and brings it into contact with the contact terminal 151c, the switch is turned on.

[0094] A spring 153 is inserted in the cylindrical portion 135a on the step wall 133.

[0095] With this arrangement, the shift lever 126 is attached under the step wall 133, for which the rubber contact piece 150 and the spring 153 are provided.

[0096] The shift lever 126 is formed as though a rectangle plate were folded to form three steps, as is shown in Fig. 6. Assuming that the left side is the base end side, a base end horizontal portion 126a; an inclination portion 126b, which is folded diagonally downward; a horizontal center portion 126c, which is so folded that it runs horizontally; a perpendicular portion 126d, which is folded vertically downward; and a horizontal distal end portion 126e, which is so folded that it runs horizontally, are formed in the named order from the base end toward the opposite, the distal end.

[0097] A rotary shaft 127 is securely attached to the edge of the base end horizontal portion 126a. The projecting ends 127a are rotatably fitted into the recesses 129a in the bearings 139. The horizontal center portion 126c, which the bottom wall 130 of the casing 120b contacts, is located at a position that is one step lower than the base end horizontal portion 126a and the inclined portion 126b is between them. The horizontal distal end portion 126e is located at the position that is lower by the thickness of the bottom wall 130 than the horizontal center portion 126c, and the perpendicular portion 126d is between them (see Fig. 7).

[0098] The positions of cylinders 128 and 129, which project upward from the distal end horizontal portion 126e, correspond to the positions of the circular holes 135 and 136 in the step wall 133 of the casing 120b, and a vertically elongated stopper 126f is provided outward of the cylinders 128 and 129.

[0099] To assemble the shift lever 126, the base end horizontal portion 126a is inserted into the rectangular opening 134 below the step wall 133 of the reverse side casing 120b, and both ends 127a of the rotary shaft 127 are fitted into the recesses 139a of the bearings 139. Then, as is shown in Fig. 7, the horizontal center portion 126c rests on the bottom wall 130, the perpendicular portion 126d extends outward from the rectangular opening 134, and the distal end horizontal portion 126e lies in the same plane as the bottom wall 133, while the distal end of the portion 126e projects slightly into the opening 14e.

[0100] The cylinder 129 stands opposite the distal end portion 150a of the rubber contact 150, which is exposed and extends downward through the circular hole 136. The other cylinder 128 stands opposite the circular hole 135.

[0101] The stopper 126f is opposite the inner edge of the internal wall 132 along the opening 14e.

[0102] When the spring 153 is inserted into the cylinder 135a around the edge of the circular hole 135 and the distal end reaches the horizontal portion 126e of the lower shift lever 126, the cylinder 128 is inserted into the spring 153 to serve as the core for the spring.

[0103] When the obverse side casing 120a is coupled with the thus structured reverse side casing 120b, the external walls 131 and 141 and the internal walls 132 and 142 abut against each other and form a continuous surface. The ends 127a of the rotary shaft 127 of the shift lever 126 are pressed down lightly, so that presser pieces 143 and the bearings 139 are slightly shifted relative to each other and overlapped, and the position of the rotary shaft 127 is so fixed that it can be rotated.

[0104] The spring 153 is situated between the obverse casing 120a and the shift lever 126 and pushes the shift lever 126 down.

[0105] Therefore, the shift lever 126 can swing vertically around the rotary shaft 127, and when no external force is applied, the shift lever 126 is driven down by the spring 153 so as to provide a surface that is in the same plane as the reverse side casing 120b of the steering wheel, as is indicated by the solid lines in Fig. 7. When the end (operating point) of the distal end horizontal portion 126e, which extends slightly into the opening 14e of the shift lever 126, is pushed upward, as is indicated by the chain double-dashed line in Fig. 7, the shift lever 126 is raised against the downward pressure that is exerted by the spring 153. The cylinder 129 pushes the distal end portion 150a of the rubber contact 150 upward so that the contact terminal 150c is brought into contact with the contact terminal 151c on the switch base plate 151 and the switch is turned on.

[0106] The stopper 126f abuts upon the step wall 133 to prevent unnecessary movement of the shift lever.

[0107] Although only the driving mechanism for the right shift lever 126 has been explained, the driving mechanism for the left shift lever 125 is the same. When the control apparatus is actually operated by a player, the player grasps both hand grips 14a of the steering wheel 14 to rotate the steering wheel 14, and to operate the shift levers 125 and 126, places the fingers other than the thumbs at points where they may be lifted.

[0108] The right shift lever 126 may be operated to shift up, while the left shift lever 125 may be operated to shift down.

[0109] Although the right and left shift levers 125 and 126 are independently provided in this embodiment, according to another embodiment of the present invention, the right and left shift levers may be integrally formed. That embodiment will now be explained while referring to Figs. 23 and 24.

[0110] Fig. 23 is a bottom view of a steering wheel 14 with a lower casing 120b removed. Fig. 24 is a cross sectional view taken along the line A-A showing the state when the lower casing 120b is attached. The right and left shift levers 125 and 126 are integrally formed as is denoted by reference number 170 in this embodiment. In other words, the portion that extends from a right operating portion 170R to a left operating portion 170L is integrally formed. For the shift lever 170, a rotary shaft 171 that is provided in the center is fixed between a shaft support portion 172a, which is provided on an upper casing 120a, and a shaft support portion 172b, which is provided on the lower casing 120b. The operating portions 170R and 170L of the shift lever 170 are respectively projected into the right and the left openings 14e through gaps between an internal wall 142 of the upper casing 120a and a bottom wall 130 of the lower casing 120b.

[0111] Further, upright stoppers 173 that are formed on the shift lever 170 are located opposite stoppers 174 on the upper casing 120a. In Fig. 24, the left operating portion 170L has been pulled up, while the right operating portion 170R has been accordingly lowered because they are integrally formed.

[0112] Right and left limit switches 178 provided on the upper casing 120a. Windows 175 for switches are so provided in the shift lever 170 that they match the positions of the limit switches 178. In addition, switch manipulation portions 176 are so provided in the shift lever 170 that they match the positions of switch operating pieces 179 of the limit switches 178. As is apparent from Figs. 23 and 24, the limit switches 178 are inserted into the switch windows 175. The switch manipulation portion 176 of one of the operating portions 170R and 170L that is pulled up presses the operating piece 179 of the corresponding limit switch 178, so that the switch is turned on.

[0113] With the integrally formed structure, right and left shift levers can be prevented, to a degree, from being pulled up at the same time.

[0114] As is described above, the shift levers can be located at the reverse of a steering wheel for the television game machine for home use. A player can perform a shift change without removing his hands from the steering wheel, and can experience a feeling that is similar to the sensation that is encountered during actual operation of a racecar.

[0115] Since, as is described above, the steering wheel control apparatus has a compact structure with which the operation of the right and left shift levers is performed independently, the apparatus is optimal for a home television game machine, and has a good appearance because of the simplified periphery of the steering wheel.

[0116] Since the points at which operation of the shift levers 125 and 126 is possible are the edges of the horizontal distal end portions 126e, the shift lever can be actuated by touching it with one of the fingers other than a thumb. A player therefore can easily operate the shift levers and avoid operation errors.

[0117] As the right and left shift levers 125 and 126 are independently operated, even though they are usually not actuated at the same time, there is a chance that the shift levers 125 and 126 can through error be operated erroneously at the same time. In such a case, a shift up signal and a shift down signal are generated at the same time, and therefore specific processing is required. In the modification shown in Figs. 23 and 24, the integrally formed shift lever will be elastically deformed if a player pushes up on both sides of the shift lever with a stronger than usual pressure, and the operation for the right and left shift lever portions will be initiated at the same time and instruction signals for both operations will be generated.

[0118] The steering wheel control apparatus 3 in this embodiment has an electric processor that is employed when both the right and the left shift levers 125 and 126 are in the operational state.

[0119] The processor is shown in Fig. 8.

[0120] A shift down switch 160 for the left shift lever 125 and a shift up switch 161 for the right shift lever 126

are connected to the ground terminal at one ends and are connected to input terminals of respective OR gate type NAND gates 162 and 163 at another ends with being pulled up to voltage V_{cc}.

[0121] The output terminals of the NAND gates 162 and 163 are respectively connected to one input terminals I_1 and I_4 of AND gate type NAND gates 164 and 165. Output terminals O_1 and O_2 of the NAND gates 164 and 165 are connected to another input terminals I_3 and I_2 of the NAND gates 165 and 164.

[0122] A signal indicating a shift down is output from the output terminal O_1 of the NAND gate 164, and a signal indicating a shift up is output from the output terminal O_2 of the NAND gate 165.

[0123] With a high voltage level as 1 and a low voltage level as 0, when both switches 160 and 161 are off, the input terminals I_1 and I_4 of the NAND gates 164 and 165 are at 0 and the output terminals O_1 and O_2 are at 1 (it should be noted that when the output is a 0 an instruction signal is generated).

[0124] If one of the switches, for example, the shift down switch 160 is turned on first, the voltage level at the input terminal I_1 of the NAND gate 164 is changed to 1, and the voltage level at the other input terminal I_2 is 1. Thus, the voltage level at the output terminal O_1 becomes 0 and a shift down instruction signal is output.

[0125] At this time, the input terminal I_3 of the NAND gate 165 has a voltage level of 0. Even if the shift up switch 161 is turned on later so that both switches are in the ON state at the same time and the voltage level at the input terminal I_4 becomes 1, the output terminal O_2 remains at 1, and a shift up instruction is not issued.

[0126] Therefore, priority is given to the switch that is turned on first and that switch is regarded as the valid one, while the switch that is turned on later is invalid.

[0127] As is described above, when the switches are placed in the operating state at the same time, and when the shift down switch 160 is turned off first, the voltage at the input terminal I_1 of the NAND gate 164 is set to 0. Accordingly, the voltage level at the output terminal O_1 becomes 1 and the instruction for a shift down is not generated. At the same time, the voltage level at the input terminal I_3 of the NAND gate 165 becomes 1 and the voltage level at the input terminal I_4 is 1. The voltage level of the output terminal O_2 is changed to 0 and an instruction signal for a shift up is output.

[0128] When the switches are placed in the ON state at the same time, the switch that is turned off first is regarded as the invalid one and the switch that is maintained on is regarded valid. Such processing substantially matches the intent of a player.

[0129] Thus, even if a player erroneously operates the right and left shift levers 125 and 126 at the same time, the operation progresses automatically in consonance with the intent of the player, and excellent usability is provided.

[Fixed structure of the base casing of the steering wheel control apparatus]

[0130] Figs. 2 through 4 will be referred to again for the explanation of the fixed structure of the base casing 10 of the steering wheel control apparatus in this embodiment.

[0131] The front wall 10a, the top wall 10b, the side walls 10c and the plate 10d constitute the structure as shown. To use the steering wheel control apparatus 3, as is shown in Fig. 9, the steering wheel control apparatus 3 is placed, with the steering wheel 14 held by the hands, between thighs PF of a player P who is seated on the sofa 9. The thighs contact the side walls 10c of the base casing 10 to hold the base casing 10, and at the same time, the thighs are mounted on the horizontally extending plate 10d to hold it between the thighs and the sofa 9, so that the steering wheel control apparatus is securely held in place.

[0132] Since both front ends 10dc of the plate 10d are diagonally cut back (see the broken line in Fig. 3), the back of the knees of the player P does not touch the plate 10d and the player feels comfortable while using it. Further, as the surface of the plate 10d is processed by creping to prevent it from sliding, the steering wheel control apparatus 3 is securely held in place by the pressure of the thighs.

[0133] The side walls 10c of the base casing 10 that is held between the thighs are so provided that their interval is reduced toward the rear. That is, the side walls 10c are so provided that they form a shape that is similar to an opened fan from the juncture of to legs outward toward the knees, so that it is easy to hold the steering wheel control apparatus 3 between the thighs while using it. As is described, the steering wheel control apparatus 3 is securely fixed by the thighs PF of the player P. The player P does not, therefore, have to worry about the base casing 10 shifting during the operation of the steering wheel, and can thus concentrate on playing and can fully enjoy the game.

[0134] In this embodiment, the creping is performed on the surface of the plate 10d. The formation of protrusions, and dimple processing or knurling, which are effective for the prevention of sliding, may be performed, or a coating of rubber to prevent sliding may be applied.

[0135] If rubber feet or sucking disks are attached to the bottom plate 11 on the lower face of the plate 10d, the rubber feet or the sucking disks will perform effectively with some types of chairs in which the player P sits, and the steering wheel control apparatus 3 can be held more securely.

[0136] The steering wheel control apparatus 3 of this embodiment is so designed that a plurality of the button switches 15, and the shift levers 125 and 126 are provided on the steering wheel 14 so that the player P can control the game while P holding the steering wheel 14. If the base casing 10 is adequately secured by the thighs of the player P, as is described above, the usabil-

ity of the apparatus can be enhanced.

[Steering wheel position adjustment mechanism]

[0137] The steering wheel control apparatus 3 of this embodiment permits the position of the steering wheel 14 to be changed and adjusted to a position that is appropriate for a player. The adjustment mechanism will now be explained while referring again to Figs. 2, 3 and 4, and to Figs. 10 through 15.

[0138] First, the position adjustment mechanism for the inclination angle of the steering column 12 will be explained.

[0139] As is shown in Figs. 10 and 11, between the side walls 10c of the base casing 10, the slightly lower end center portion of the steering column 12 is pierced by a shaft 20 that passes through it horizontally and supports the steering column 12 and permits it to incline freely.

[0140] A bottom wall 12a of the cylindrical steering column 12 serves as a part of a cylindrical wall that employs the shaft 20 as a center axis. Three grooves 21, which are extended horizontally, are formed at equal intervals along the external circumference of the cylinder. In the embodiment, the boundary portions at the grooves 21 are formed smoothly and thus the external circumference of the bottom wall 12a has a wave shape.

[0141] In the opening, of the top wall 10b of the base casing 10, into which the steering column 12 is fitted, a flat engagement member 22 that has a predetermined width extends from the lower edge of the opening. As is shown in Figs. 10 and 11, the engagement member 22, which is extended downward from the opening edge, is bent forward and extends horizontally, and its distal end is curved upward to form an engagement protrusion 23.

[0142] The engagement member 22 that has a long length from the front to the rear is flexible, and the engagement protrusion 23 at the distal end can be displaced downward by elastic deformation. The engagement protrusion 23 of the engagement member 22 is fitted into one of the grooves 21 in the bottom wall 12a of the steering column 12 to temporarily hold the steering column 12 at a current inclined position.

[0143] A cylindrical inclination locking member 25 is inserted along the top face of the bottom wall 11 through a round hole, which is located in the lower end center of the front wall 10a of the base casing 10, and is rotatably supported while it is directed to the front and to the rear.

[0144] A knob 25a is formed at the portion, of the inclination locking member 25, that extends forward from the front wall 10a of the base casing 10. An operating portion 25b that projects to the side is formed at the distal end of the member 25 that is inserted into the base casing 10. The operating portion 25b can engage the recess that is defined by the lower face of the engagement protrusion 23 of the engagement member 22, which is curved upward.

[0145] In Fig. 10 is shown the locking state for the inclination locking member 25. In this condition, the engagement protrusion 23 of the engagement member 22 is fitted into the center groove 21 in the bottom wall 12a of the steering column 12, and the operating portion 25b of the inclination locking member 25 engages the recess that is formed at the distal end of the engagement protrusion 23. The downward displacement of the engagement protrusion 23 is inhibited by the operating portion 25b that engages it. Even if a player desires to change the inclination of the steering column 12, the engagement protrusion 23 can not be removed from the groove 21 in the bottom wall 12a of the steering column 12 by which the steering column 12 is held in the inclined position, and the inclination of the steering column 12 can not be changed.

[0146] When the knob 25a of the inclination locking member 25 is rotated about 90 degrees, the inclination locking member 25 rotates the same distance. As is shown in Fig. 11, the operating portion 25b is thereby disengaged from the engagement protrusion 23 and the engagement member 22 is therefore susceptible to elastic deformation, enabling the engagement protrusion 23 to be displaced downward.

[0147] At this time, the steering column 12 is temporarily held by the engagement protrusion 23. As is shown in Fig. 11, if the steering column 12 is inclined further, the engagement protrusion 23, which is fitted into the groove 21 by the elastic deformation of the engagement member 22, is thereby disengaged from that groove 21, travels along the circumference of the cylinder, and engages the next groove 21. The inclination angle of the steering column 12 is thus changed and the steering column 12 is temporarily held in position (see the chain double-dashed lines in Fig. 11).

[0148] Such a state is shown in Fig. 11. When the steering column 12 is held temporarily, the steering column 12 can be inclined and its inclination angle can be changed and set at three different angles by engaging the three individual grooves 21 with the engagement protrusion 23. In other words, the inclination angle of the steering wheel 14 can be adjusted and set at three separate angles.

[0149] When the inclination locking member 25 is rotated and the operating portion 25b engages the engagement protrusion 23 to lock the steering column 12, the inclination angle of the steering wheel 14 is fixed.

[0150] The adjustment of the positioning distance for the steering wheel 14, i.e., the extension and depression structure of the steering shaft 13, will now be described while referring to Figs. 12 through 15.

[0151] The steering shaft 13, to which the steering wheel 14 is integrally fixed at its top end, is formed in a substantially parallelepiped shape, and three grooves 30 that extend perpendicular to the axial direction are formed, in a row along the shaft, in side faces that are opposite to each other. The steering shaft 13 is fitted into an engagement cylinder 31.

[0152] The engagement cylinder 31 is hollow, and the opening in its lower half has a substantially parallelepiped shape that is the same as the cross section of the steering shaft 13. The steering shaft 13 is fitted into and slides in the axial direction within that lower half and the two rotate together.

[0153] The upper half of the engagement cylinder 31 is cylindrical, and in it two pairs of engagement pieces 32 and 34, in which each piece faces a like piece, are formed by the provision of a plurality of slits in the axial direction.

[0154] The engagement pieces 32 each have an engagement pawl 33 that protrudes inward, and the other engagement pieces 34 each have an engagement pawl 35 that projects outward.

[0155] An annular member 36 is fitted around the external surface of the engagement cylinder 31 at a location that is slightly lower than the center.

[0156] A ring shaped extension/depression locking member 38 is rotatably fitted over the top end of the engagement cylinder 31, and the steering shaft 13 is passed through the extension/depression locking member 38.

[0157] The extension/depression locking member 38 consists of a tapered external wall 38a and a circular portion 38b, with the diameter at its top edge being the smallest. Slits 38c are formed on opposite sides in the tapered external wall 38a, and a plurality of grooves 38d are formed in the external surface. The configuration of the interior of the extension/depression locking member 38 is apparent from the description in Fig. 15 that illustrates its structure from below. More specifically, four operating portions 39, each of which projects inward toward another from the internal surface of the wall 38a, are arranged parallel to the center axis. Further, engagement portions 40 that are perpendicular to the center axis are provided via walls 40a that extend downward from the circular portion 38b (that extend upward in the diagram). While the wall 40a is provided at one end of each engagement portion 40, a stopper wall 40b is provided at the other end of the engagement portion 40 in parallel to the operating portion 39. With this arrangement, the circular portion 38b, the walls 40a, the engagement portions 40 and the stopper walls 40b define spaces, and the engagement pawls 35 can be rotated, which will be described later.

[0158] The distance between the opposing operating portions 39 and the distance between the engagement portions 40 are slightly greater than the outer diameter of the engagement cylinder 31. The inner diameter of the circular portion 38a is smaller than the outer diameter of the engagement cylinder 31 and greater than the outer diameter of the steering shaft 13.

[0159] In the extension/depression locking member 38 that covers the top end of the engagement cylinder 31, the engagement pieces 32 and 34 that are arranged in a circle around the engagement cylinder 31 are fitted into the corresponding operating portions 39 and the engagement portions 40. By displacing the engagement piece 34 inward, each engagement pawl 35 whose distal end faces outward is engaged in the portion that is defined by the engagement portion 40. The engagement pawls 35 can move within this space in the direction indicated by the arrow B in Fig. 15, and as a result, the extension/depression locking member 38 can be rotatably attached to the engagement cylinder 31.

[0160] When the steering shaft 13 is inserted, the engagement pieces 32 of the engagement cylinder 31 are elastically displaced outward by the engagement pawls 33 that extend inward. When the engagement pawls 33 reach opposing grooves 30, together they engage the grooves 30 and the engagement pieces 32 return to their original positions relative to the cylinder.

[0161] In this manner, the steering shaft 13 is inserted into the engagement cylinder 31, and the extension/depression locking member 38 is fitted over the top end of the engagement cylinder 31. This state is shown in Figs. 13 and 14. As is shown in Fig. 15, the operating portions 39 of the extension/depression locking member 38 are set in the locked state (the state as indicated by the chain double-dashed lines) when the operating portions 39 are positioned at the distal ends of the engagement pieces 32 (indicated by the chain double-dashed lines), and in the released state when the operating portions 39 are removed from the distal ends of the engagement pieces 32 by the rotation of the extension/depression locking member 38 in the direction indicated by the arrow A in Fig. 15.

[0162] In Fig. 13 is shown the locked state. The engagement pawls 33 at the distal ends of the engagement pieces 32 of the engagement cylinder 31 are fitted into the grooves 30 in the steering shaft 13, and the operating portions 39 are positioned at the edge of the engagement pieces 32, which inhibits the disengagement of the engagement pawls 33 from the grooves 30 with the engagement pieces 32 opening outward. The steering shaft 13, therefore, can not be extended or depressed, and the operating distance for the steering wheel 14 (the height position of the steering wheel 14) is fixed.

[0163] In this condition, when the extension/depression locking member 38 rotates in the direction indicated by the arrow A in Fig. 15 to set the released state, the engagement pieces 32 are shifted in the direction indicated by the arrow B, and they can be spread outward, as is indicated by the double-headed arrow C. Then, the steering shaft 13 is extended or depressed by holding the steering wheel 14 and pulling or pushing it. The engagement pieces 32 are elastically deformed, and the engagement pawls 33 are removed from the grooves 30. Then, as is shown by the chain double-dashed lines in Fig. 14, the engagement pawls 33 slide over the side faces between the grooves 30 and engage other grooves 30, so that the steering shaft 13 is temporarily held in place. The solid lines in Fig. 14 indicate the temporary holding state.

[0164] In this state, the position of the steering wheel 14 can be freely changed. In this embodiment, three sets of opposed grooves 30 are formed in the steering shaft 13 to enable it to be moved forward and backward and positioned the three different levels.

[0165] When the steering shaft 13 is temporarily held at a proper position, the extension/depression locking member 38 is rotated in the direction opposite to the arrow A so as to provide the locked state with the operating portions 39 positioned at the distal ends of the engagement pieces 32. Since the engagement pawls 35 are sandwiched between the walls 40a and the stopper walls 40b, movement in the direction that is indicated by the arrow B and the range is limited, as is described above.

[0166] The position of the steering wheel 14 can be adjusted and fixed in the above described manner.

[Centering mechanism]

[0167] The steering wheel control apparatus 3 in this embodiment has a centering mechanism by which, when a steering wheel is released, it is automatically returned to a center portion for straight forward driving. The centering mechanism will now be described while referring to Figs. 16 through 18.

[0168] The steering column 12 is indicated by the chain double-dashed lines in Figs. 16 through 18, and stoppers 50 and 51 project inward at given positions inside the steering column 12. The stoppers 50 and 51 are located at positions along the upper and lower faces 36a and 36b of the annular member 36, which is fitted over the engagement cylinder 31 that rotates with the steering shaft 13.

[0169] Protrusions 55 and 56 are provided at predetermined positions on the upper and lower faces 36a and 36b of the annular member 36.

[0170] In Fig. 16 is shown a steering wheel 14 when it is in the center position for straight forwarding driving. The protrusions 55 and 56 of the engagement cylinder 31 are positioned side by side with the respective stoppers 50 and 51 of the steering column 12. A torsion spring 52 is so provided around the external surface of the annular member 36, with its top end 52a abutting upon the stopper 50 and the protrusion 55 and its bottom end 52b abutting upon the stopper 51 and the protrusion 56, that the torsion sprint 52 exerts a slight urging force in the closing direction.

[0171] As is shown in Fig. 17, therefore, when the steering wheel 14 is rotated clockwise, the engagement cylinder 31 is also rotated clockwise with the steering shaft 13 and the protrusions 55 and 56 are rotated clockwise as is indicated by the arrow D. The top end 52a of the torsion spring 52 is held stationarily by the stopper 50, and the bottom end 52b is driven by the protrusion 56. As a result, the torsion spring 52 is gradually opened, while a reaction force acts on the steering wheel 14 to return it to its original position.

[0172] When the steering wheel 14 is rotated counterclockwise, the protrusions 55 and 56 are turned in the direction indicated by the arrow E, as is shown in Fig. 18. The bottom end 52b of the torsion spring 52 is held stationary by the stopper 51, and the top end 52a is driven by the protrusion 55, so that the torsion spring 52 is gradually opened. A reaction force acts on the steering wheel 14 to return it to its original position.

[0173] The reaction force that acts on the steering wheel 14 increases in consonance with an increase in the steering angle.

[0174] When the player P rotates the steering wheel 14, he is aware of a reaction force that is consonant with the steering angle. When the player P releases the steering wheel 14, it is automatically returned to the center position for straight forwarding driving, thus imparting to the player P a sensation of actually driving a car.

[0175] The steering wheel control apparatus in this embodiment has the above described arrangement. The player P sits down on the seat 9 while holding the steering wheel control apparatus 3 between the thighs, and fixes the base casing 10. First, the knob 25a of the inclination locking member 25 is manipulated to release the steering wheel 14 from a fixed inclination and to temporarily hold it in position. The steering column 12 is inclined with the steering wheel 14 and is adjusted to the most appropriate inclination angle. Then, the inclination locking member 25 is manipulated again to the locked position to fix the inclination of the steering wheel 14. Following this, the extension/depression locking member 38 is rotated to release the steering wheel 14 from the position in which it is fixed and to temporarily hold it in position. The steering shaft 13 is extended or depressed with the steering wheel 14 to adjust the position (the height) of the steering wheel 14 so as to obtain the most appropriate position. The extension/depression locking member 38 is operated and locked, and the position of the steering wheel 14 is fixed.

[0176] As is described above, since the inclination and the position of the steering wheel 14 can be adjusted, the steering wheel 14 can be set at an optimal position for each player and can be controlled easily, and a player can always enjoy a game under the best conditions. Especially when a plurality of operational button switches 15 and the shift levers 125 and 126 are provided on the steering wheel 14, a steering wheel 14 can be fixed at an optimal position for a player, and its usability can be increased.

[0177] Since the centering mechanism is provided for the steering wheel, a player can experience a feeling that is similar to actually driving a car, and can thus enjoy the game more.

[0178] The steering control in this embodiment is performed by a control disk DISC, which is provided around the engagement cylinder 36, and a light transmitter/detector PD, which is provided adjacent to the disk DISC, as is shown in Fig. 13. A plurality of holes are

formed intermittently around the circumference of the control disk DISC. Light that is emitted by the transmitter/detector PD on one side of the disk passes through these holes and is acquired on the other side to detect the rotational direction and the angle of the steering wheel.

[0179] In Fig. 19 is shown another embodiment where button switches 19a and 19b are provided on the upper and lower sides of a center portion 14d of a steering wheel 14. A game start switch and a game stop switch are provided in the steering wheel center portion 14d and serve as button switches that are not used during the playing of the game.

[0180] Figs. 20 and 21 show an example where a plurality of button switches are provided on a handlebar that is employed for motorcycles, and an example where a plurality of button switches are provided on a control stick.

[0181] Fig. 20 is a top view of a handle bar 250. Handlebars 252 and 253 that extend to the left and to the right from a rotary shaft 251 have grips 254 and 255 at their distal ends. Push button sets 256 and 257, in each of which are three push buttons, are respectively located at the roots of the grips 254 and 255, toward the front of the handlebar. The push button switch sets 256 and 257 are in sight of a player, enabling the player to visually select a button and to depress the button with a thumb while holding the grips 254 and 255. Another push button switch 258 is also provided near the rotary shaft 251. These push button switches can function the same as those in the previous embodiment.

[0182] As is shown in Fig. 21, which shows a control stick 260, three push button switches 262 are arranged across the top end of a grip 261, and a player can selectively depress the push button switch 262 with a thumb while holding the grip 261.

[0183] A modification of the embodiment in Fig. 2 is shown in Fig. 22. Although a base casing 10 is structured the same as that in the previous embodiment, a steering wheel 14 has a simple circular shape, rather than having a shape wherein the right and the left sides of the steering wheel are symmetrically formed.

INDUSTRIAL APPLICABILITY

[0184] First, according to the present invention, a player can selectively manipulate a plurality of button switches while holding the steering wheel. The steering wheel control apparatus, therefore, possesses excellent usability, and is appropriate for television games that require quick control responses. Thus it is possible for games to provide progressively greater gratification for players as skill is acquired in their use, and the players can enjoy the games more.

[0185] A plurality of button switches are located at the front of the steering wheel and within sight of the player, so that a player can observe the manipulation of switches and can prevent errors during their operation. For a rotary steering wheel that has a pair of grip portions, the arrangement of a plurality of button switches on the grip portions can facilitate a more complex and a higher level switch manipulation.

[0186] Further, a switch that is not used during a game is located in the center, or in the vicinity of center, at the front of the steering wheel. With this arrangement, since one hand must be removed from the steering wheel in order to manipulate that switch, manipulation errors can be prevented.

[0187] Second, since a steering wheel control apparatus according to the present invention is so designed that the individual shift levers on the reverse surface of a steering handle are operated independently, the shift lever mechanism can be compactly and simply constructed around the steering wheel, and is appropriate for employment with the steering wheel control apparatus that is to be connected to a television game machine for home use. Even in with a television game that is played at home, a player can enjoy a sense of control that is similar to that which is experienced when actually driving a racecar.

[0188] Further, when both the shift levers are being operated, electric processing is performed so that it is assumed that the control that is imposed by one of the shift levers is valid and that the result of the operation of the other is invalid. Therefore, errors that occur during the operation of the shift levers can be automatically eliminated so as to follow the desire of a player as much as possible.

[0189] Third, according to the present invention, since a player can securely hold the base casing of the steering wheel control apparatus between the thighs, and the player does not, therefore, have to be careful about shifting the steering wheel control apparatus unnecessarily while manipulating the steering wheel, the player concentrate on and fully enjoy playing the game.

[0190] A plate is extended to the right and to the left along the bottom face of the base casing. The player can hold the base casing between the thighs, and at the same time, can press down on the plate, which extends outward to either side, with the thighs from above, so that the base casing can be held more securely. With the securing mechanism, a player can manipulate the structure wherein a plurality of button switches and the shift levers are provided on the steering wheel.

[0191] Fourth, according to the present invention, when the locking means has been released, the steering column is temporarily held by the temporary holding means so that it can be inclined. The steering column is freely inclined by moving a steering wheel and can be maintained at a proper inclination. The steering wheel can be secured in an optimal inclined position by setting and locking the locking means, and such a condition that the steering wheel is easily operated at an optimal inclined position can be provided.

[0192] In addition, when the locking means is set in the lock released state, the steering shaft is temporarily

held by the temporary holding means so that it can be freely extended or depressed. The steering shaft can therefore be freely extended or depressed with the steering handle and can be temporarily maintained at a desired height. When the steering shaft is locked by the locking means, the steering wheel can be fixed at an optimal vertical position for easy operation.

[0193] The inclination and the extension/depression of the steering wheel can be adjusted by the provision of the steering wheel inclination position adjustment structure and the steering wheel extension/depression position adjustment structure. The usability is therefore enhanced.

Claims

1. A steering wheel control apparatus (3) for a game machine, which supplies a control signal to the game machine, comprising:

   (a) a base casing (10) including side walls (10c) provided at the right and left sides of the base casing (10) as defined in use, and a plate (10d) extending in the left and right directions at the bottom surface of the base casing (10) for holding the side walls (10c) between thighs of a player (P) and for pressing the plate (10d) with the thighs from above;
   (b) a steering column (12) supported by the base casing (10) at a predeterminded inclination;
   (c) a steering shaft (13) rotatably provided to said steering column (12);
   (d) a steering wheel (14) including

      (aa) a center portion provided on a top end of the steering shaft (13),
      (bb) upper and lower posts (14b, 14c), each extending to the right and left directions from the steering wheel center portion,
      (cc) a pair of grips (14a) provided between the upper posts (14b) and the lower posts (14c) at the outer edge portions thereof, and
      (dd) a plurality of button switches (15) provided on the upper face of the right upper post (14b) as defined in use and a plurality of button switches (15) provided on the upper face of the left upper post (14b) as defined in use, provided within a range to which a thumb of the player (P) holding the grip (14a) can reach, and supplying the control signals to the game machine.

2. A steering wheel control apparatus according to claim 1, wherein said steering wheel (14) is a rotational steering wheel and has said pair of grips (14a) at symmetrically located positions to the center of said rotation.

3. A steering wheel control apparatus according to claim 2, wherein a switch (19) which is not employed while playing a game is arranged in a center, or near said center, of a front face of said steering wheel.

4. A steering wheel control apparatus according to claim 1, further comprising:

   right and left shift levers (125, 126, 170), provided at a reverse side of said steering wheel center portion (14d), having right and left operation portions which are near said right and left grips and project into substantially arched openings (14e) are formed between said steering wheel center portion (14d) and said grips (14a), so that finger of the player (P) holding said grip (14a) reaches thereto, and supplying said control signal to said game machine.

5. A steering wheel control apparatus according to claim 4, wherein:

   said steering wheel (14) is constituted by an upper casing (120a) and lower casing (120b),
   the shift lever (170) is provided between said upper and lower casings (120a, 120b) and rotatably supported by shaft support portions (172a, 172b) provided at center of the upper and lower casings (120a, 120b), wherein a center portion supported by the shafts support portions (172a, 172b) and right and left operating portions extending toward said grips (14a) and positioned near said grips (14a) and in said openings (14e) are integrally formed,
   and said shift lever (170) controls right and left switches (178) in said steering wheel (14) by being pulled up with fingers of said right and left hands holding said grips (14a).

6. A steering wheel control apparatus according to claim 1, wherein said base casing (10) rotatably supports said steering column (12) to be inclined freely, further comprising

   a steering wheel position adjusting structure which includes:

      temporary holding means (22) for permitting said steering column (12) to be rotated and for temporarily holding said steering column (12) at a desired angle; and
      locking means (25) for inhibiting the rotation of said steering column (12).

7. A steering wheel control apparatus according to claim 6, wherein, in said steering wheel position adjusting structure,

said temporary holding means (22) includes an external bottom wall face (12a) of said steering column (12) virtually formed in a curved shape, a plurality of grooves (21) extending toward the sides on the external bottom wall face (12a) being formed along a circumference of the face, an engagement member (22) extending from the base casing (10) and having an engagement protrusion (23) at the distal end thereof which can be deplaced downward by elastic deformation is formed, and the engagement protrusion (23) of said engagement member (22) engaging one of said grooves (21) in said steering column (12) so that said inclined steering column (12) is temporarily held at the position;
said locking means (25) includes
an inclination locking member (25) provided to the base casing (10), so that an active portion (25b) thereof can be freely engaged upward with and disengaged from said engagement protrusion (23) by an operation of the inclination locking member (25),
whereby when said active portion (25b) of said inclination locking member (25) engages with said engagement protrusion (23) of said engagement member (22), a downward displacement of said engagement protrusion (23) is inhibited and thus said locked state is provided, and when said active portion (25b) of said inclination locking member (25) is separated from said engagement protrusion (23), said downward displacement of said engagement protrusion (23) is permitted and thus a lock released state is provided.

8. A steering wheel control apparatus, according to claim 7, wherein said external bottom wall face(12a) of said steering column is formed in substantially a wave shape due to the provision of said plurality of grooves (21).

9. A steering wheel control apparatus according to claim 1, further comprising

a steering wheel position adjusting structure which includes:
temporary holding means (33) for permitting said steering shaft (13) to be extended or depressed and for temporarily holding said steering shaft (13) at a desired position; and
locking means (39) for inhibiting said steering shaft (13) from being extended or depressed.

10. A steering wheel control apparatus according to claim 9, wherein, in said steering wheel control position adjusting structure,

said temporary holding means (33) includes
a plurality of grooves (30) extending in a direction vertical to an axial direction of said steering shaft (13) and formed on a surface of said steering shaft (13) and along the axial direction,
a cylindrical engagement member (31) inserted extendingly or depressingly along the axial direction by the steering shaft (13), being rotated together therewith, and having an engagement piece (32) which includes an engagement pawl (33) whose distal end is bent inward, said engagement piece (32) being displaced by elastic deformation thereof in a direction of the greatest diameter of the cylindrical engagement member (31),
whereby, when said engagement pawl (33) engages with one of said grooves (30) in said steering shaft (13), said extension/depression position of said steering shaft (13) is temporarily determined;
said locking means (39) includes
a circular extension/depression locking member (38) rotatably engaging with an end of said cylindrical engagement member (31) operated that operating portion (39) thereof externally contacts to, or separates from, said engagement piece (32) of said engagement member (31),
said cylindrical engagement member (31) being rotatably supported by said steering column (12),
whereby when said operating portion (39) of said extension/depression locking member (38) contacts said engagement piece (32) of said engagement member (31), an expansion of said diameter of said engagement piece (32) is inhibited and a locked state is provided, and when said operating portion (39) of said extension/depression locking member (38) separates from said engagement piece (32) of said engagement member (31), said expansion of said diameter of said engagement piece (32) is permitted and an unlocked state is provided.

11. A steering wheel control apparatus according to one of claims 1 to 10, comprising:

a cylinder rotatable together with the steering shaft (13) and provided in the steering column (12); and
a spring (52) provided around the cylinder and having an upper terminal (52a) and lower terminal (52b) which are abutted between an

upper protrusion (55) and a lower protrusion (56) provided to the surface of the cylinder and to an upper stopper (50) and a lower stopper (51) provided to the inter-face of the steering column (12);
whereby when the steering wheel (14) is rotated to clockwise or counterclockwise, the steering wheel (14) has a centering function for returning to the other direction through an elasticity of the spring (52) generated between the upper protrusion (55) and the lower stopper (51) or between the lower protrusion (56) and the upper stopper (50).

Patentansprüche

1. Lenkradbedienungsgerät (3) für eine Spielmaschine, das ein Steuersignal an die Spielmaschine anlegt, mit:

   (a) einem Sockelgehäuse (10) mit Seitenwänden (10c), die an der rechten und linken Seite des Sockelgehäuses (10) vorgesehen sind, wie sie in Benutzung definiert sind, und einer Platte (10d), die sich in die linke und rechte Richtung an der Bodenoberfläche des Sockelgehäuses (10) zum Halten der Seitenwände (10c) zwischen den Oberschenkeln eines Spielers (P) und zum Pressen der Platte (10d) mit den Oberschenkeln nach unten erstreckt;
   (b) einer von dem Sockelgehäuse (10) mit einer vorbestimmten Neigung getragenen Lenksäule (12);
   (c) einer drehbar für die Lenksäule (12) vorgesehenen Lenkwelle (13);
   (d) einem Lenkrad (14) mit:

      (aa) einem auf dem oberen Ende der Lenkwelle (13) vorgesehenen Mittelabschnitt,
      (bb) oberen und unteren Stützen (14b, 14c), die sich jeweils von dem Lenkradmittelabschnitt in die rechte und linke Richtung erstrecken,
      (cc) einem Paar von Griffen (14a), die zwischen den oberen Stützen (14b) und den unteren Stützen (14c) an dem äußersten Kantenabschnitt davon vorgesehen sind, und
      (dd) einer Mehrzahl von Tastschaltern (15), die auf der oberen Fläche der rechten oberen Stütze (14b), wie sie bei der Benutzung definiert ist, vorgesehen sind, und einer Mehrzahl von Tastschaltern (15), die auf der oberen Fläche der linken oberen Stütze (14b), wie sie bei der Benutzung definiert ist, Vorgesehen sind, die innerhalb eines Bereiches vorgesehen sind, den ein Daumen des den Griff (14a) haltenden Spielers (P) erreichen kann, und die die Steuersignale zu der Spielmaschine senden.

2. Lenkradbedienungsgerät nach Anspruch 1, bei dem das Lenkrad (14) ein Drehlenkrad ist und das Paar von Griffen (14a) an symmetrisch angeordneten Positionen relativ zu dem Rotationszentrum aufweist.

3. Lenkradbedienungsgerät nach Anspruch 2, bei dem ein Schalter (19), der nicht während des Spielens eines Spieles verwendet wird, in einer Mitte oder nahe der Mitte einer Vorderfläche des Lenkrades angeordnet ist.

4. Lenkradbedienungsgerät nach Anspruch 1, weiter mit:

   einem rechten und einem linken Schalthebel (125, 126, 170), die an einer Rückseite des Lenkradmittelabschnittes (14d) vorgesehen sind, mit einem rechten und einem linken Betätigungsabschnitt, die nahe dem rechten und linken Griff sind und in im wesentlichen bogenförmige Öffnungen (14e) vorstehen, die zwischen dem Lenkradmittelabschnitt (14d) und den Griffen (14a) gebildet sind, so daß Finger des Spielers (P), der die Griffe (14a) hält, dahin reichen, und die das Steuersignal an die Spielmaschine liefern.

5. Lenkradbedienungsgerät nach Anspruch 4, bei dem:

   das Lenkrad (14) durch ein oberes Gehäuse (120a) und ein unteres Gehäuse (120b) zusammengesetzt ist,
   der Schalthebel (170) zwischen dem oberen und dem unteren Gehäuse (120a, 120b) vorgesehen ist und drehbar von Wellentragabschnitten (172a, 172b) getragen ist, die an der Mitte des oberen und des unteren Gehäuses (120a, 120b) vorgesehen sind, wobei ein Mittelabschnitt, der von den Wellentragabschnitten (172a, 172b) getragen ist, und ein rechter und ein linker Betätigungsabschnitt, die sich zu den Griffen (14a) erstrecken und nahe den Griffen (14a) und in den Öffnungen (14e) positioniert sind, einstückig gebildet sind,
   und der Schalthebel (170) einen rechten und einen linken Schalter (178) in dem Lenkrad (14) steuert, in dem er mit den Fingern der rechten und linken Hand, die die Griffe (14a) halten, gezogen wird.

6. Lenkradbedienungsgerät nach Anspruch 1, bei

dem das Sockelgehäuse (10) drehbar die Lenksäule (12) zum freien Neigen trägt, weiter mit:

einem Lenkradpositionseinstellaufbau, der aufweist:
ein zeitweiliges Haltemittel (22) zum Ermöglichen, daß die Lenksäule (12) gedreht werden kann, und zum zeitweiligen Halten der Lenksäule (12) an einem gewünschten Winkel; und
ein Verriegelungsmittel (25) zum Verhindern der Drehung der Lenksäule (12).

7. Lenkradbedienungsgerät nach Anspruch 6, bei dem in dem Lenkradpositionseinstellaufbau

das zeitweilige Haltemittel (22) aufweist:
eine äußere Bodenwandfläche (12a) der Lenksäule (12), die praktisch in einer gekrümmten Form gebildet ist, eine Mehrzahl von Rillen (21), die sich zu den Seiten auf der äußeren Bodenwandfläche (12a) erstrecken und entlang des Umfanges der Fläche gebildet sind,
ein gebildetes Eingriffsteil (22), das sich von dem Sockelgehäuse (10) erstreckt und einen Eingriffsvorsprung (23) an seinem entfernten Ende aufweist, der nach unten durch elastische Verformung verschoben werden kann, und wobei der Eingriffsvorsprung (23) des Eingriffsteiles (22) in eine der Rillen (21) in der Lenksäule (12) so eingreift, daß die geneigte Lenksäule (12) zeitweilig an der Position gehalten wird; das Verriegelungsmittel (25) aufweist:
ein Neigungsverriegelungsteil (25), das für das Sockelgehäuse (10) vorgesehen ist, so daß ein aktiver Abschnitt (25b) davon frei nach oben in Eingriff mit dem Eingriffsvorsprung (23) durch eine Betätigung des Neigungsverriegelungsteiles (25) kommen kann und frei davon kommen kann,
wobei, wenn der aktive Abschnitt (25b) des Neigungsverriegelungsteiles (25) mit dem Eingriffsvorsprung (23) des Eingriffsteiles (22) steht, eine Abwärtsverschiebung des Eingriffsvorsprunges (23) verhindert wird und somit der verriegelte Zustand vorgesehen wird, und wenn der aktive Abschnitt (25b) des Neigungsverriegelungsteiles (25) von dem Eingriffsvorsprung (23) getrennt ist, die Abwärtsverschiebung des Eingriffsvorsprunges (23) erlaubt ist und somit ein Verriegelungsfreigabezustand vorgesehen wird.

8. Lenkradbedienungsgerät nach Anspruch 7, bei dem die äußere Bodenwandfläche (12a) der Lenksäule im wesentlichen in einer Wellenform aufgrund des Vorsehens der Mehrzahl von Rillen (21) gebildet ist.

9. Lenkradbedienungsgerät nach Anspruch 1, weiter mit einem Lenkradpositionseinstellaufbau, der aufweist:

ein zeitweiliges Haltemittel (33) zum Ermöglichen, daß die Lenkwelle (13) herausgezogen oder niedergedrückt wird, und zum zeitweiligen Halten der Lenkwelle (13) an einer gewünschten Position; und
ein Verriegelungsmittel (29) zum Verhindern, daß die Lenkwelle (13) herausgezogen oder niedergedrückt wird.

10. Lenkradbedienungsgerät nach Anspruch 9, bei dem in dem Lenkradsteuerpositionseinstellaufbau

das zeitweilige Haltemittel (33) aufweist
eine Mehrzahl von Rillen (30), die sich in eine Richtung vertikal zu einer axialen Richtung der Lenkwelle (13) erstrecken und auf einer Oberfläche der Lenkwelle (13) und entlang der Axialrichtung gebildet sind,
ein zylindrisches Eingriffsteil (31), das herausziehend oder niederdrückend entlang der Axialrichtung durch die Lenkwelle (13) eingeführt ist, damit zusammen gedreht wird und ein Eingriffsstück (32) aufweist, das eine Eingriffsklaue (33) enthält, deren entferntes Ende nach innen gebogen ist, wobei das Eingriffsstück (32) durch elastische Verformung davon in eine Richtung zum dem größten Durchmesser des zylindrischen Eingriffsteiles (31) verschoben wird,
wobei, wenn die Eingriffsklaue (33) in Eingriff mit einer der Rillen (30) in der Lenkwelle (13) steht, die Herauszieh-/Niederdrückposition der Lenkwelle (13) zeitweilig bestimmt ist;
das Verriegelungsmittel (39) aufweist,
ein kreisförmiges Herauszieh-/Niederdrückverriegelungsteil (38), das drehbar in Eingriff mit einem Ende des zylindrischen Eingriffsteiles (31) steht und so betätigt wird, daß ein Betätigungsabschnitt (39) davon extern das Eingriffsstück (32) des Eingriffsteiles (31) berührt oder davon getrennt ist,
wobei das zylindrische Eingriffsteil (31) drehbar von der Lenksäule (12) getragen ist,
wodurch, wenn der Betätigungsabschnitt (39) des Herauszieh-/Niederdrückverriegelungsteil (38) das Eingriffsstück (32) des Eingriffsteiles (31) berührt, eine Ausdehnung des Durchmessers des Eingriffsstückes (32) verhindert wird und ein verriegelter Zustand vorgesehen wird, und wenn der Betätigungsabschnitt (39) des Herauszieh-/Niederdrückverriegelungsteiles (38) von dem Eingriffsstück (32) des Eingriffsteiles (31) getrennt ist, die Ausdehnung des Durchmessers des Verriegelungsstückes (32)

erlaubt wird und ein entriegelter Zustand vorgesehen wird.

11. Lenkradbedienungsgerät nach einem der Ansprüche 1 bis 10, mit:

einem zusammen mit der Lenkwelle (13) drehbaren und in der Lenksäule (12) vorgesehenen Zylinder und
einer um den Zylinder vorgesehenen Feder (52), die ein oberes Ende (52a) und ein unteres Ende (52b) aufweist, die gegen einen oberen Vorsprung (55) und einen unteren Vorsprung (56), die auf der Oberfläche des Zylinders vorgesehen sind, und gegen einen oberen Stopper (50) und einen unteren Stopper (51), die auf der Innenfläche der Lenksäule (12) vorgesehen sind, stoßen;
wodurch, wenn das Lenkrad (14) in die Richtung des Uhrzeigersinnes oder in die Richtung entgegengesetzt zu dem Uhrzeigersinne gedreht wird, daß Lenkrad (14) eine Zentrierfunktion zum Zurückkehren zu der anderen Richtung durch eine Elastizität der Feder aufweist, die zwischen dem oberen Vorsprung (55) und dem unteren Stopper (51) oder zwischen dem unteren Vorsprung (56) und dem oberen Stopper (50) erzeugt ist.

Revendications

1. Dispositif de commande à volant de direction (3) pour jeu vidéo, qui délivre un signal de commande au jeu vidéo, comprenant :

(a) un boîtier de base (10) comprenant des parois latérales (10c) disposées sur les côtés droit et gauche du boîtier de base (10) comme défini en utilisation, et une plaque (10d) s'étendant dans les directions gauche et droite au niveau de la surface inférieure du boîtier de base (10) pour maintenir les parois latérales (10c) entre les cuisses d'un joueur (P) et pour appuyer sur la plaque (10d) avec les cuisses par le dessus ;
(b) une colonne de direction (12) supportée par le boîtier de base (10) selon une inclinaison prédéterminée ;
(c) un arbre de direction (13) disposé en rotation sur ladite colonne de direction (12) ;
(d) un volant de direction (14) comprenant

(aa) une partie centrale prévue sur l'extrémité supérieure de l'arbre de direction (13),
(bb) des montants supérieur et inférieur (14b, 14c), chacun s'étendant sur la droite et la gauche à partir de la partie centrale du volant de direction,
(cc) une paire de poignées (14a) prévues entre les montants supérieurs (14b) et les montants inférieurs (14c) au niveau de leurs parties de bord extérieur, et
(dd) une pluralité de boutons-poussoirs (15) prévue sur la face supérieure du montant supérieur droit (14b) tel que défini en utilisation et une pluralité de boutons-poussoirs (15) prévue sur la face supérieure du montant supérieur gauche (14b) comme défini en utilisation, disposés de manière à être à portée du pouce du joueur (P) qui tient la poignée (14a) et délivrant au jeu vidéo les signaux de commande.

2. Dispositif de commande à volant de direction selon la revendication 1, dans lequel ledit volant de direction (14) est un volant de direction rotatif et présente ladite paire de poignées (14a) à des positions situées symétriquement par rapport au centre de ladite rotation.

3. Dispositif de commande à volant de direction selon la revendication 2, dans lequel un bouton (19) qui n'est pas utilisé pendant une partie de jeu est agencé dans un centre ou à proximité dudit centre d'une face avant dudit volant de direction.

4. Dispositif de commande à volant de direction selon la revendication 1, comprenant en outre :

des leviers de changement de vitesse droit et gauche (125, 126, 170) prévus à l'envers de ladite partie centrale de volant de direction (14d), présentant des parties de fonctionnement droite et gauche qui sont à proximité desdites poignées droite et gauche et font saillie dans des ouvertures sensiblement arquées (14e) qui sont formées entre ladite partie centrale de volant de direction (14d) et lesdites poignées (14a) de telle sorte que le doigt du joueur (P) maintenant ladite poignée (14a) les atteigne et délivrant ledit signal de commande audit jeu vidéo.

5. Dispositif de commande à volant de direction selon la revendication 4, dans lequel :

ledit volant de direction (14) se compose d'un boîtier supérieur (120a) et d'un boîtier inférieur (120b),
le levier de changement de vitesse (170) est prévu entre lesdits boîtiers supérieur et inférieur (120a, 120b) et supporté en rotation par des parties de support d'axe (172a, 172b) prévues au centre des boîtiers supérieur et infé-

rieur (120a, 120b), dans lequel une partie centrale supportée par les axes supporte les parties (172a, 172b) et les parties de fonctionnement droite et gauche s'étendant vers lesdites poignées (14a) et positionnées à proximité desdites poignées (14a) et dans lesdites ouvertures (14e) sont formées d'un seul tenant,

et ledit levier de changement de vitesse (170) commande des boutons droit et gauche (178) dans ledit volant de direction (14) en étant tiré vers le haut avec les doigts desdites mains droite et gauche maintenant lesdites poignées (14a).

6. Dispositif de commande à volant de direction selon la revendication 1, dans lequel ledit boîtier de base (10) supporte en rotation ladite colonne de direction (12) pour qu'elle soit inclinée librement, comprenant en outre

une structure de réglage de position de volant de direction qui comprend :

des moyens de maintien provisoire (22) pour permettre à ladite colonne de direction (12) de tourner et pour maintenir provisoirement ladite colonne de direction (12) selon un angle souhaité ; et

des moyens de verrouillage (25) pour empêcher la rotation de ladite colonne de direction (12).

7. Dispositif de commande à volant de direction selon la revendication 6, dans lequel, dans ladite structure de réglage de position de volant de direction, lesdits moyens de maintien temporaire (22) comprennent

une face de paroi inférieure extérieure (12a) de ladite colonne de direction (12) quasiment de forme incurvée, une pluralité de rainures (21) s'étendant vers les côtés de la face de paroi inférieure extérieure (12a) étant formée sur la circonférence de la face, un élément de mise en prise (22) s'étendant depuis le boîtier de base (10) et présentant une saillie de mise en prise (23) à son extrémité distale qui peut être déplacée vers le bas sous l'effet d'une déformation élastique étant formé et la saillie de mise en prise (23) dudit élément de mise en prise (22) mettant en prise une desdites rainures (21) dans ladite colonne de direction (12) de telle sorte que ladite colonne de direction inclinée (12) soit maintenue temporairement dans cette position ;

lesdits moyens de verrouillage (25) comprennent

un élément de verrouillage d'inclinaison (25) prévu sur le boîtier de base (10) de telle sorte qu'une partie active (25b) de celui-ci puisse être mise en prise librement vers le haut avec et désolidarisée de ladite saillie de mise en prise (23) en actionnant l'élément de verrouillage d'inclinaison (25),

si bien que, lorsque ladite partie active (25b) dudit élément de verrouillage d'inclinaison (25) vient en prise avec ladite saillie de mise en prise (23) dudit élément de mise en prise (22), un déplacement vers le bas de ladite saillie de mise en prise (23) est empêché et ainsi, on obtient ledit état verrouillé et lorsque ladite partie active (25b) dudit élément de verrouillage d'inclinaison (25) est séparée de ladite saillie de mise en prise (23), ledit déplacement vers le bas de ladite saillie de mise en prise (23) est permis et ainsi, on obtient un état déverrouillé.

8. Dispositif de commande à volant de direction selon la revendication 7, dans lequel ladite face de paroi inférieure extérieure (12a) de ladite colonne de direction est dotée d'une forme sensiblement ondulée en raison de la présence de ladite pluralité de rainures (21).

9. Dispositif de commande à volant de direction selon la revendication 1, comprenant en outre

une structure de réglage de position du volant de direction qui comprend :

des moyens de maintien provisoire (33) pour permettre audit arbre de direction (13) d'être étendu ou enfoncé et pour maintenir provisoirement ledit arbre de direction (13) dans une position souhaitée ; et

des moyens de verrouillage (39) pour empêcher ledit arbre de direction (13) d'être étendu ou enfoncé.

10. Dispositif de commande à volant de direction selon la revendication 9, dans lequel, dans ladite structure de réglage de position de commande de volant de direction,

lesdits moyens de maintien provisoire (33) comprennent

une pluralité de rainures (30) s'étendant dans une direction verticale par rapport à une direction axiale dudit arbre de direction (13) et formées sur une surface dudit arbre de direction (13) et le long de la direction axiale,

un élément de mise en prise cylindrique (31) inséré de manière à être étendu et enfoncé le long de la direction axiale par l'arbre de direction (13), tournant conjointement avec celui-ci, et présentant une pièce de mise en prise (32) qui comprend un cliquet de mise en prise (33)

dont l'extrémité distale est incurvée vers l'intérieur, ladite pièce de mise en prise (32) étant déplacée sous la déformation élastique de celle-ci dans la direction du plus grand diamètre de l'élément de mise en prise cylindrique (31),
si bien que, lorsque ledit cliquet de mise en prise (33) vient en prise avec l'une desdites rainures (30) dans ledit arbre de direction (13), ladite position d'extension/enfoncement dudit arbre de direction (13) est provisoirement déterminée ;
lesdits moyens de verrouillage (39) comprennent
un élément de verrouillage circulaire de la position d'extension/enfoncement (38) venant en prise de manière rotative avec une extrémité dudit élément de mise en prise cylindrique (31) et actionné de telle sorte que la partie de fonctionnement (39) de celui-ci vienne en contact sur ou se sépare de ladite pièce de mise en prise (32) dudit élément de mise en prise (31), ledit élément de mise en prise cylindrique (31) étant supporté en rotation par ladite colonne de direction (12),
si bien que, lorsque ladite partie de fonctionnement (39) dudit élément de verrouillage de la position d'extension/enfoncement (38) vient au contact de ladite pièce de mise en prise (32) dudit élément de mise en prise (31), un agrandissement dudit diamètre de ladite pièce de mise en prise (32) est empêché et on obtient un état verrouillé et lorsque ladite partie de fonctionnement (39) dudit élément de verrouillage de la position d'extension/enfoncement (38) se sépare de ladite pièce de mise en prise (32) dudit élément de mise en prise (31), ledit agrandissement dudit diamètre de ladite pièce de mise en prise (32) est permis et on obtient un état déverrouillé.

11. Dispositif de commande à volant de direction selon l'une des revendication 1 à 10, comprenant :

un cylindre pouvant tourner conjointement avec l'arbre de direction (13) et disposé dans la colonne de direction (12) ; et
un ressort (52) prévu autour du cylindre et présentant une extrémité supérieure (52a) et une extrémité inférieure (52b) qui viennent en butée entre une saillie supérieure (55) et une saillie inférieure (56) prévues sur la surface du cylindre et contre un butoir supérieur (50) et un butoir inférieur (51) prévus sur la face intermédiaire de la colonne de direction (12) ;
si bien que, lorsque le volant de direction (14) tourne dans le sens des aiguilles d'une montre ou dans le sens contraire, le volant de direction (14) possède une fonction de centrage pour repartir dans l'autre direction grâce à l'élasticité du ressort (52) générée entre la saillie supérieure (55) et le butoir inférieur (51) ou entre la saillie inférieure (56) et le butoir supérieur (50).

FIG. 1

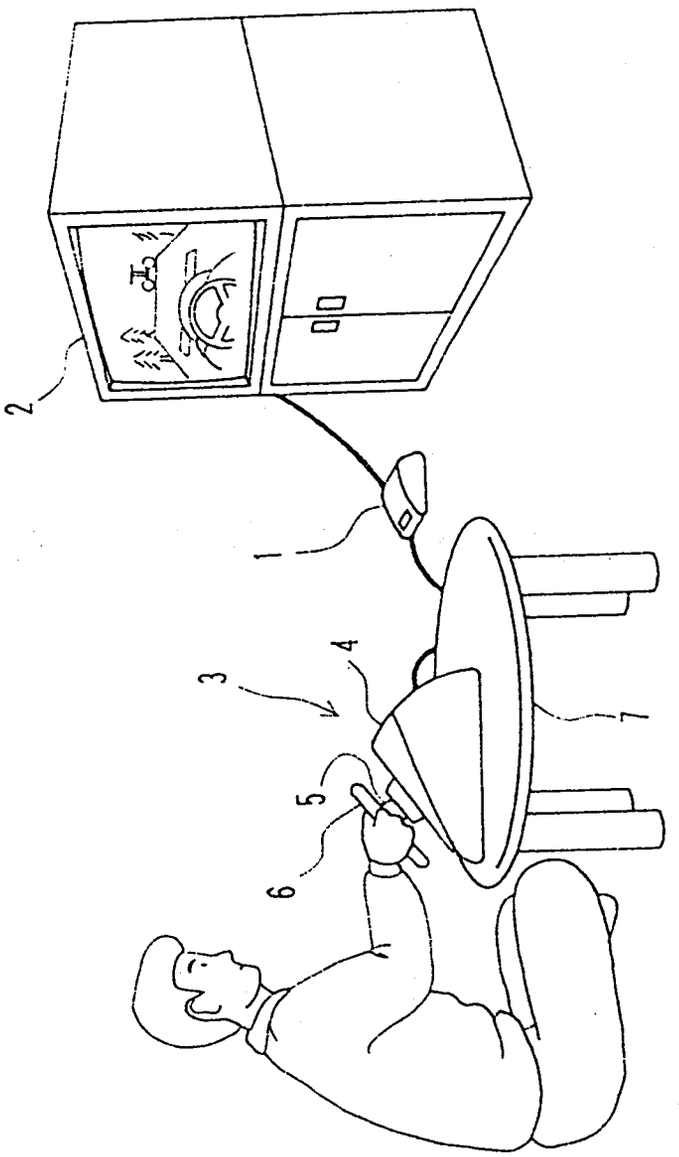
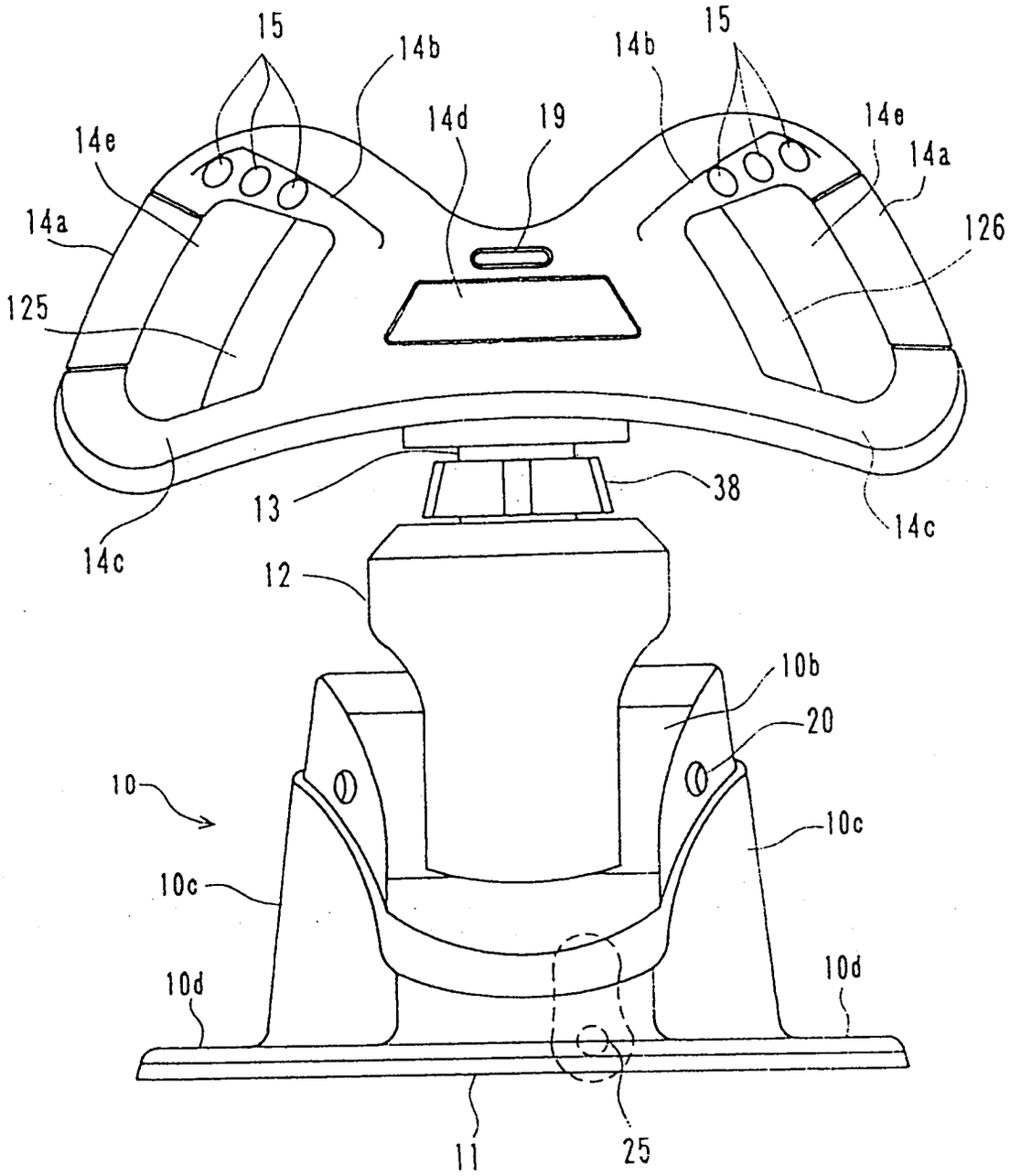


FIG. 2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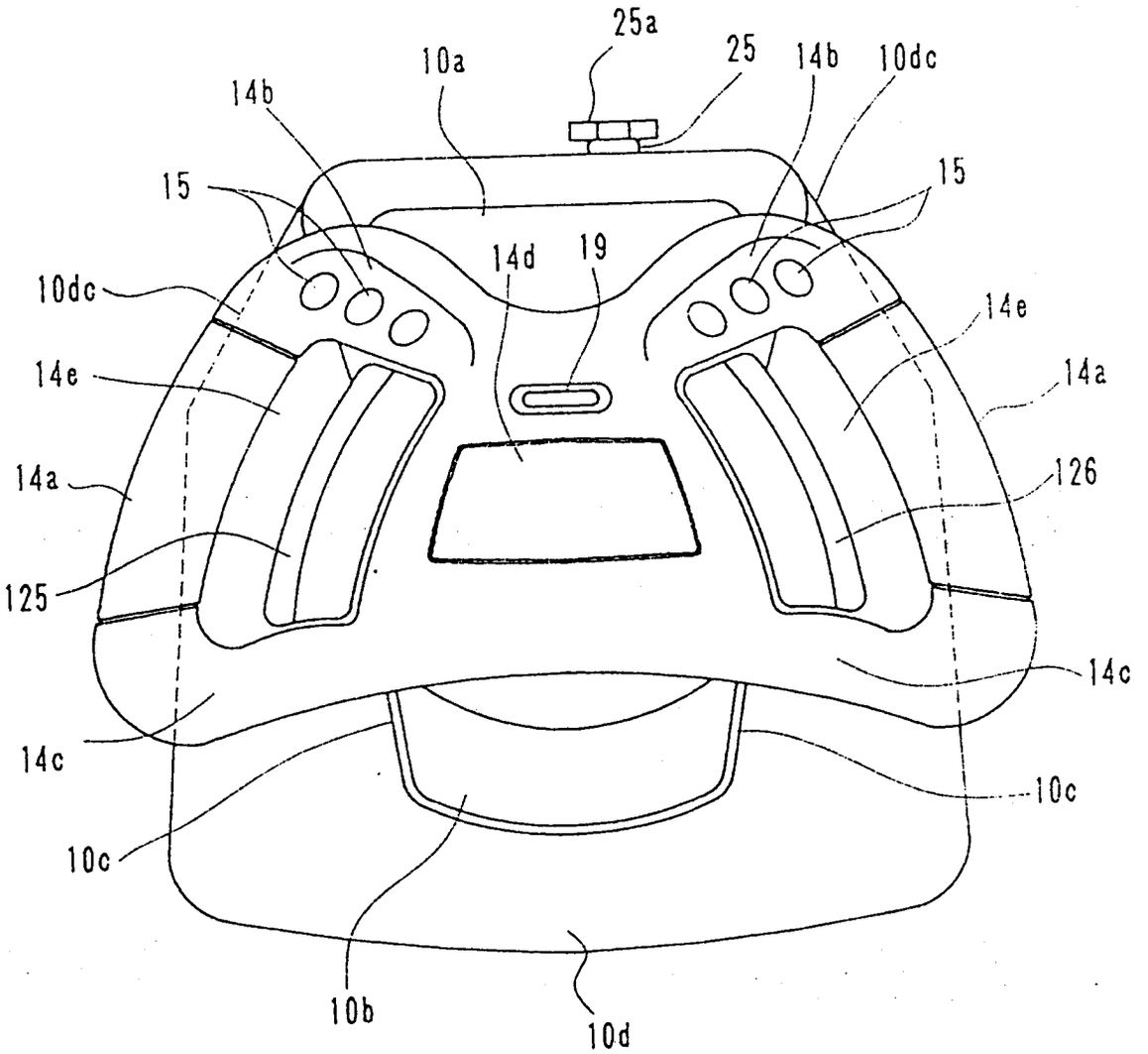
10
10c
10c
10d
10d
11
25

FIG. 3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14a
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125
14c
14c
10c
10c
10b
10d

FIG. 4

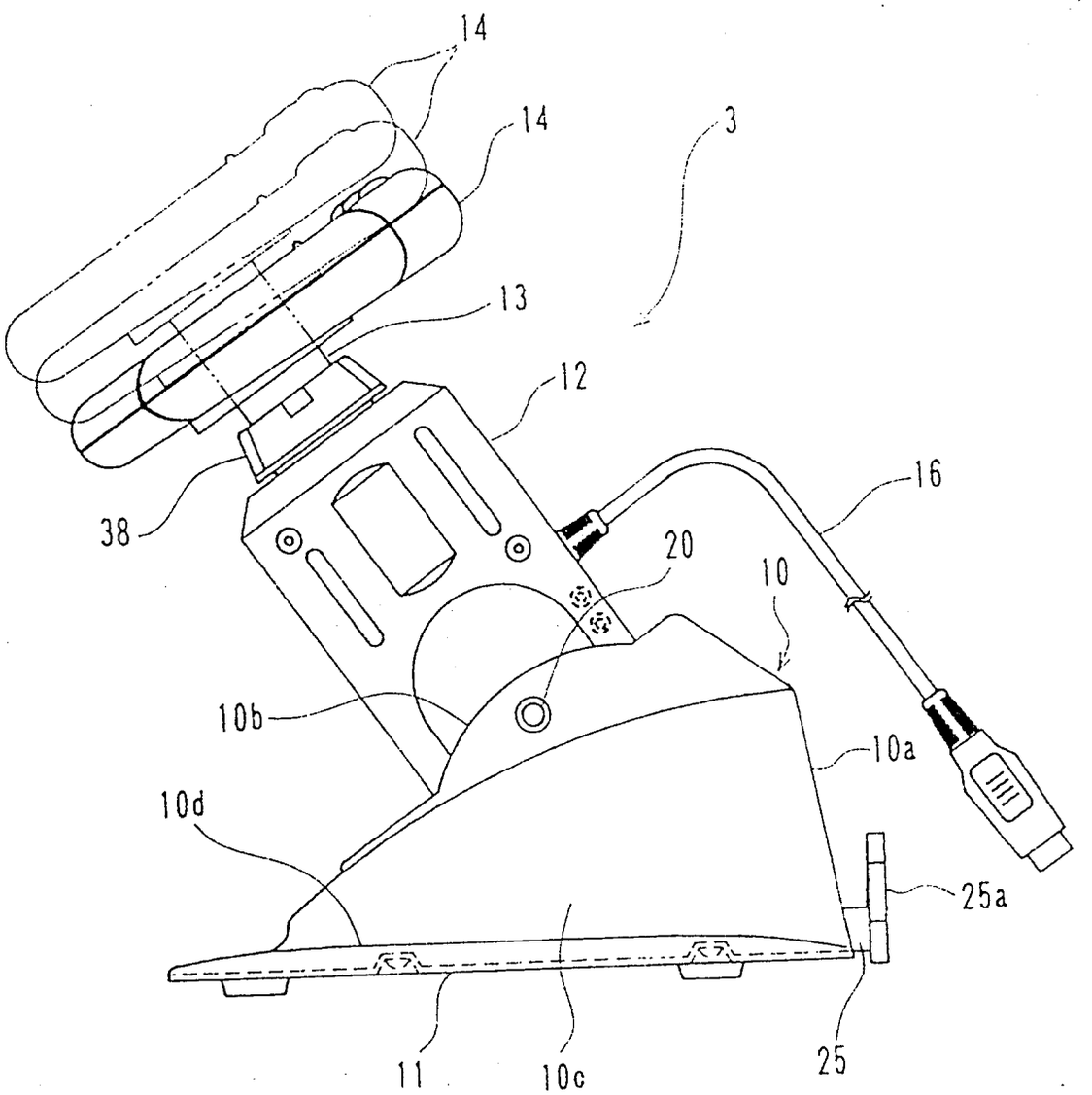


FIG. 5

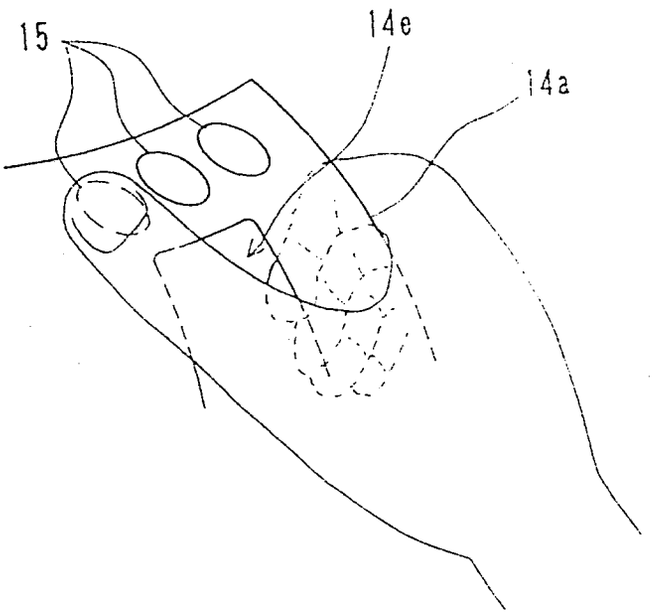
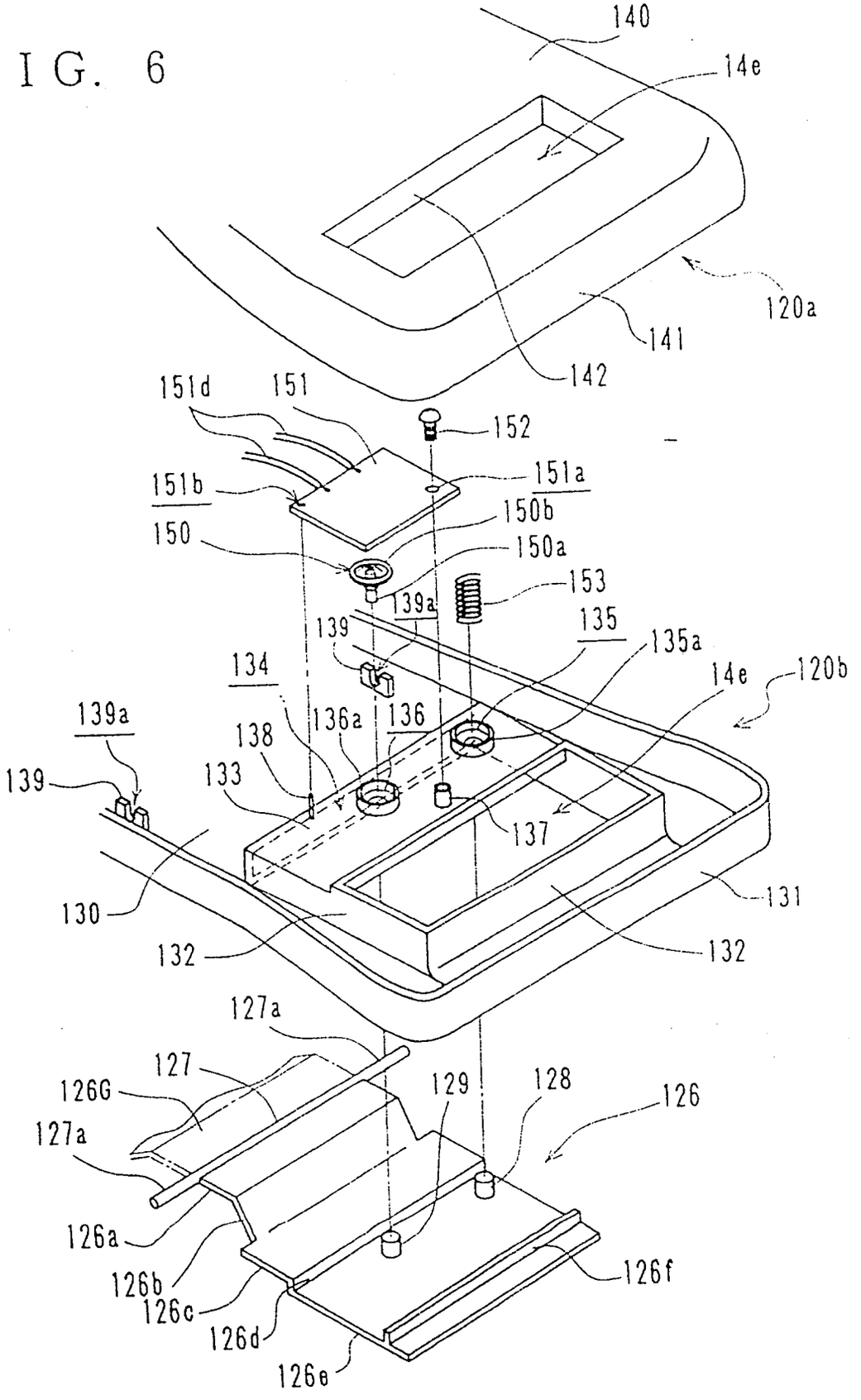


FIG. 6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139
133
137
130
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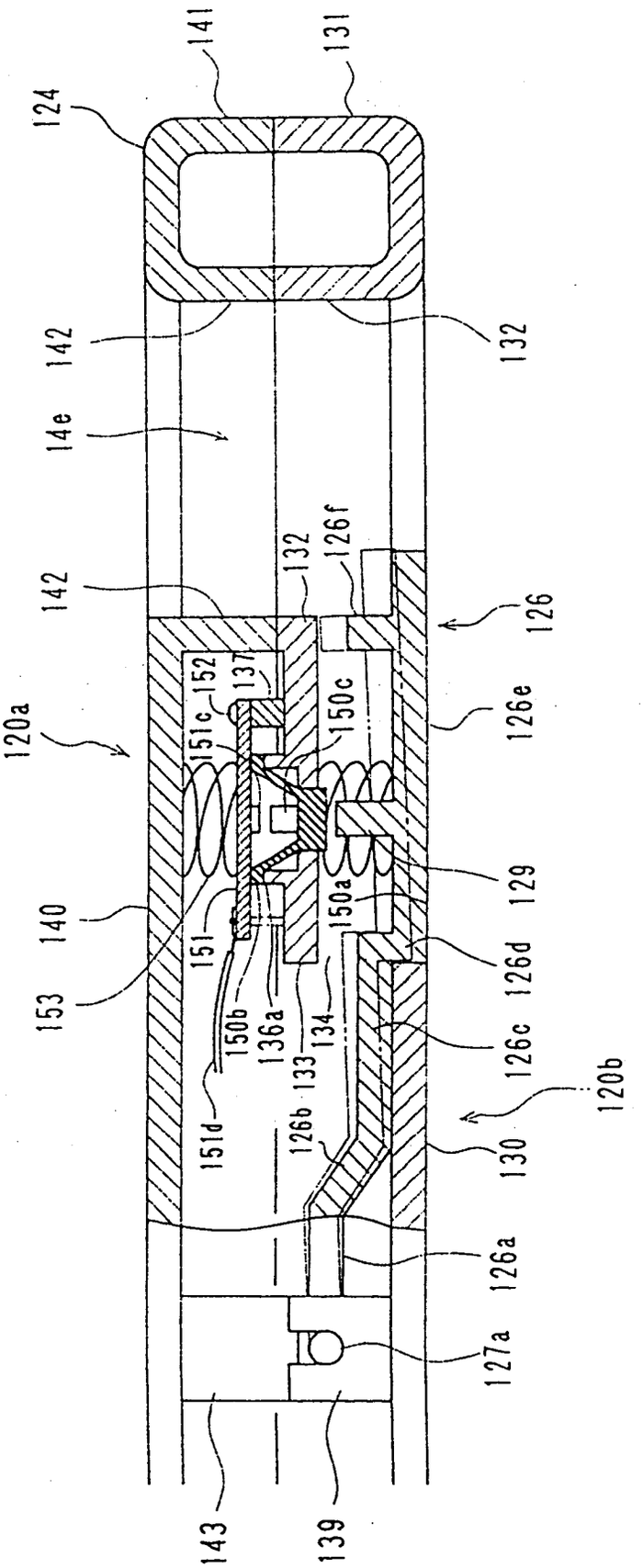
126c
126d
126e
126f

FIG. 7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126c
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151d
126b
130
126a
127a
143
139

FIG. 8

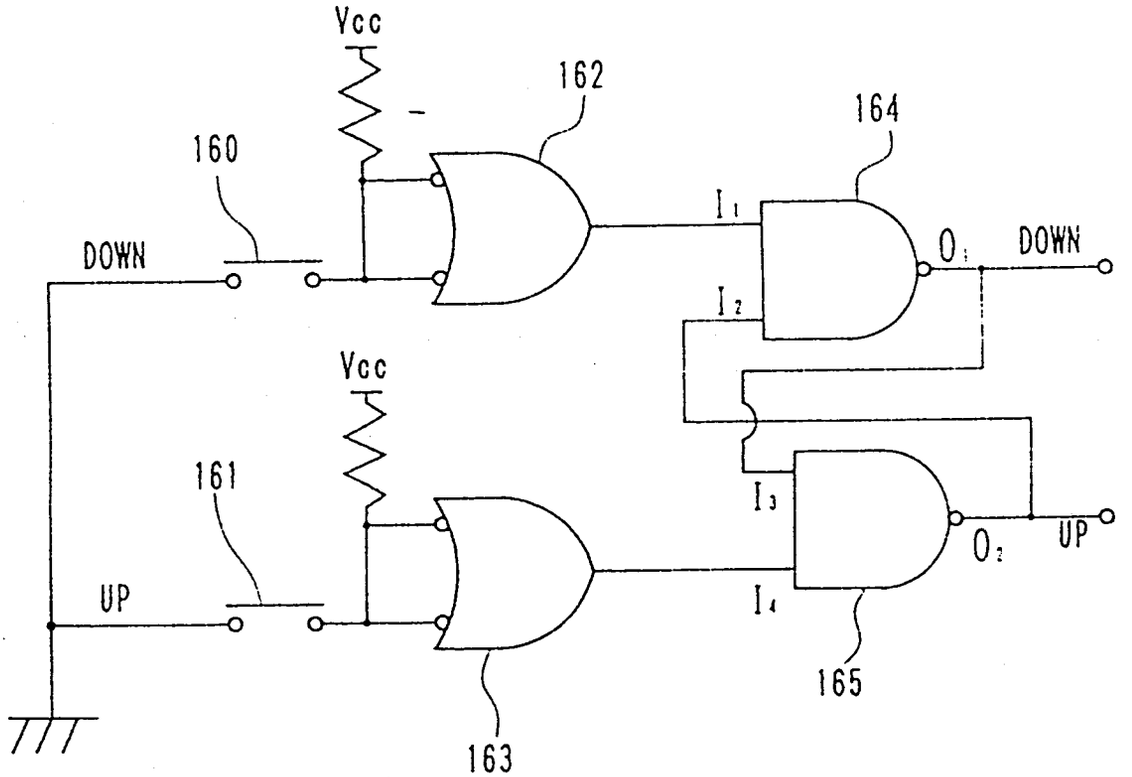


FIG. 9

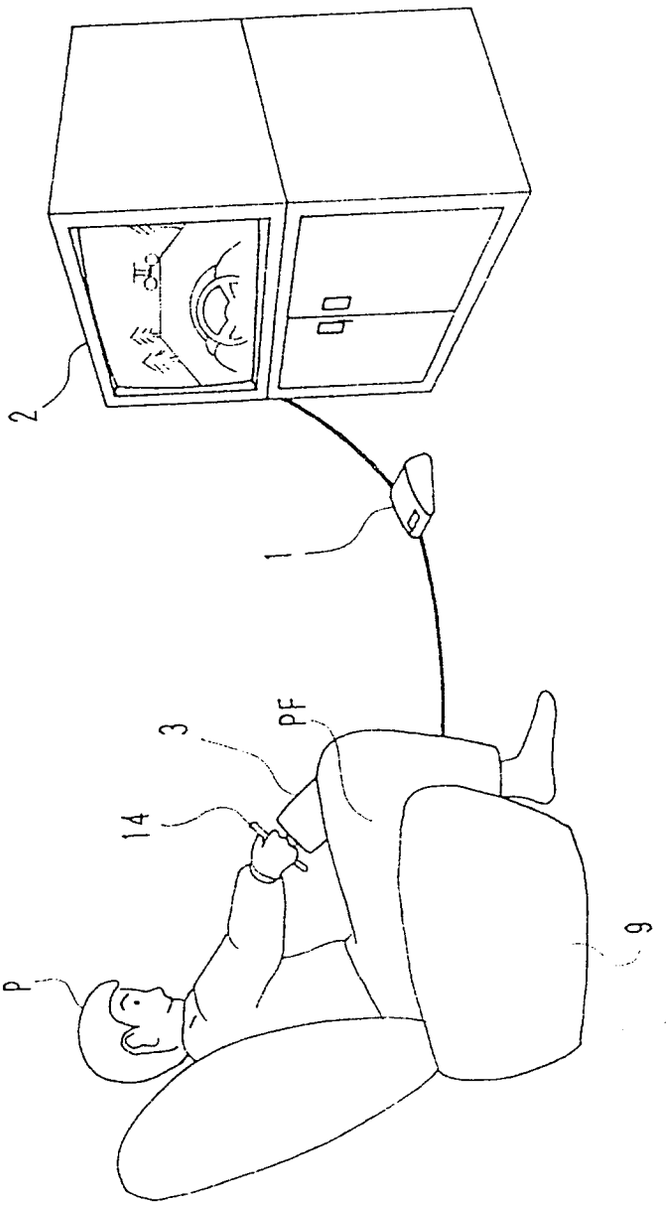


FIG. 10

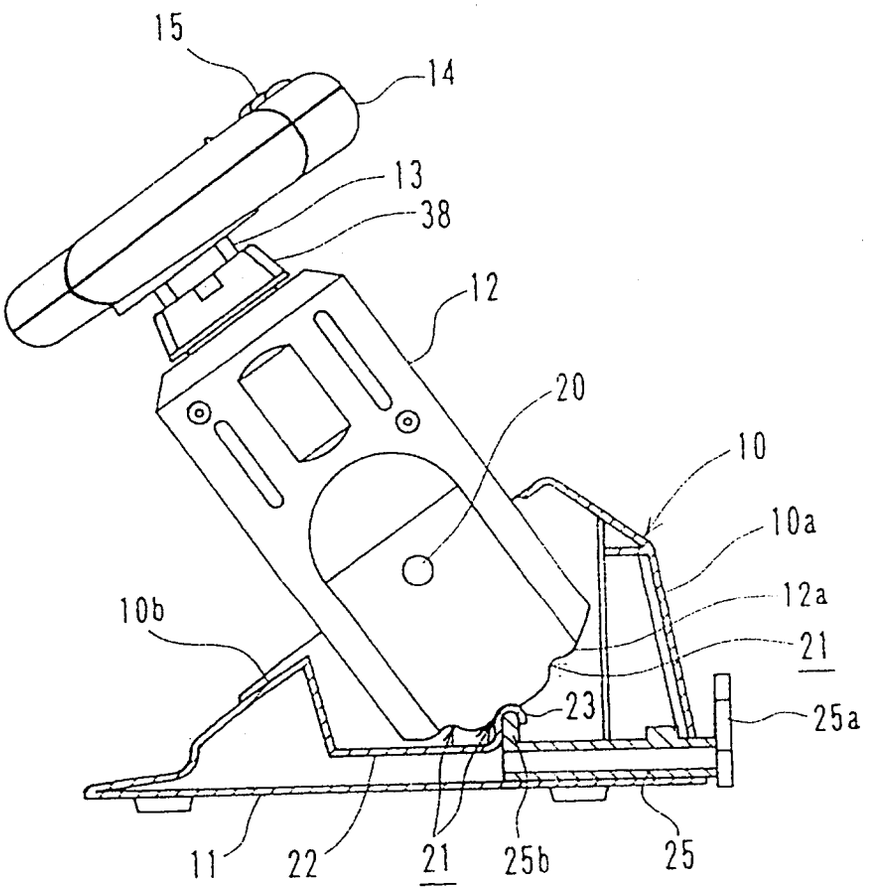
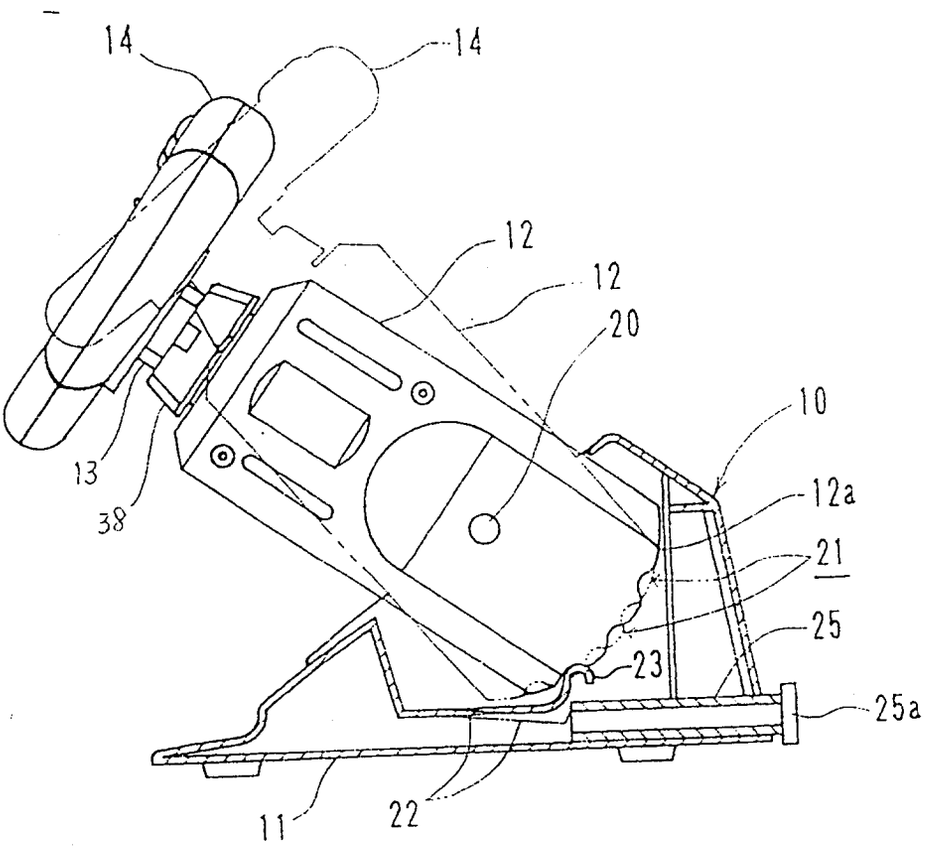
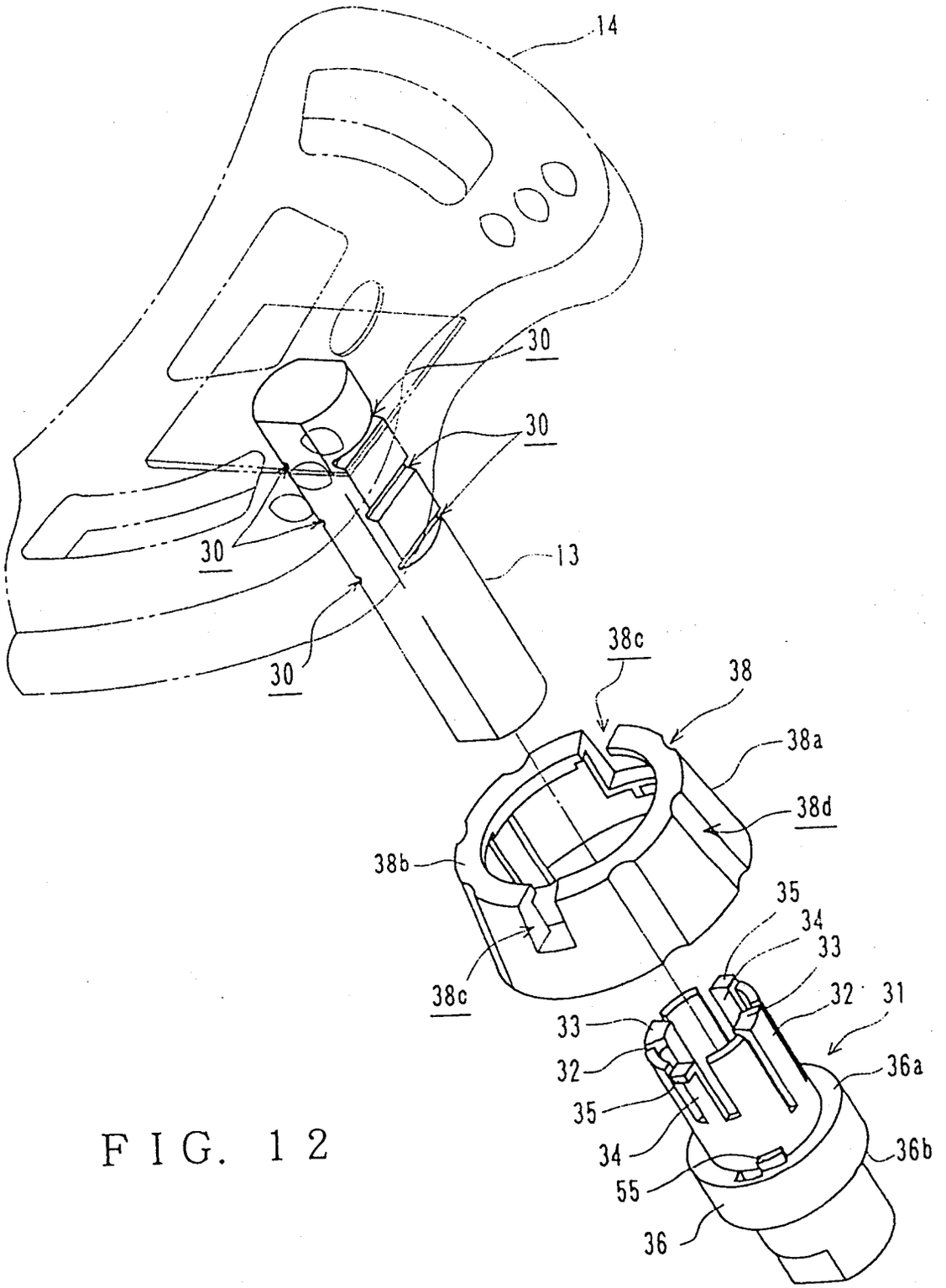


FIG. 11

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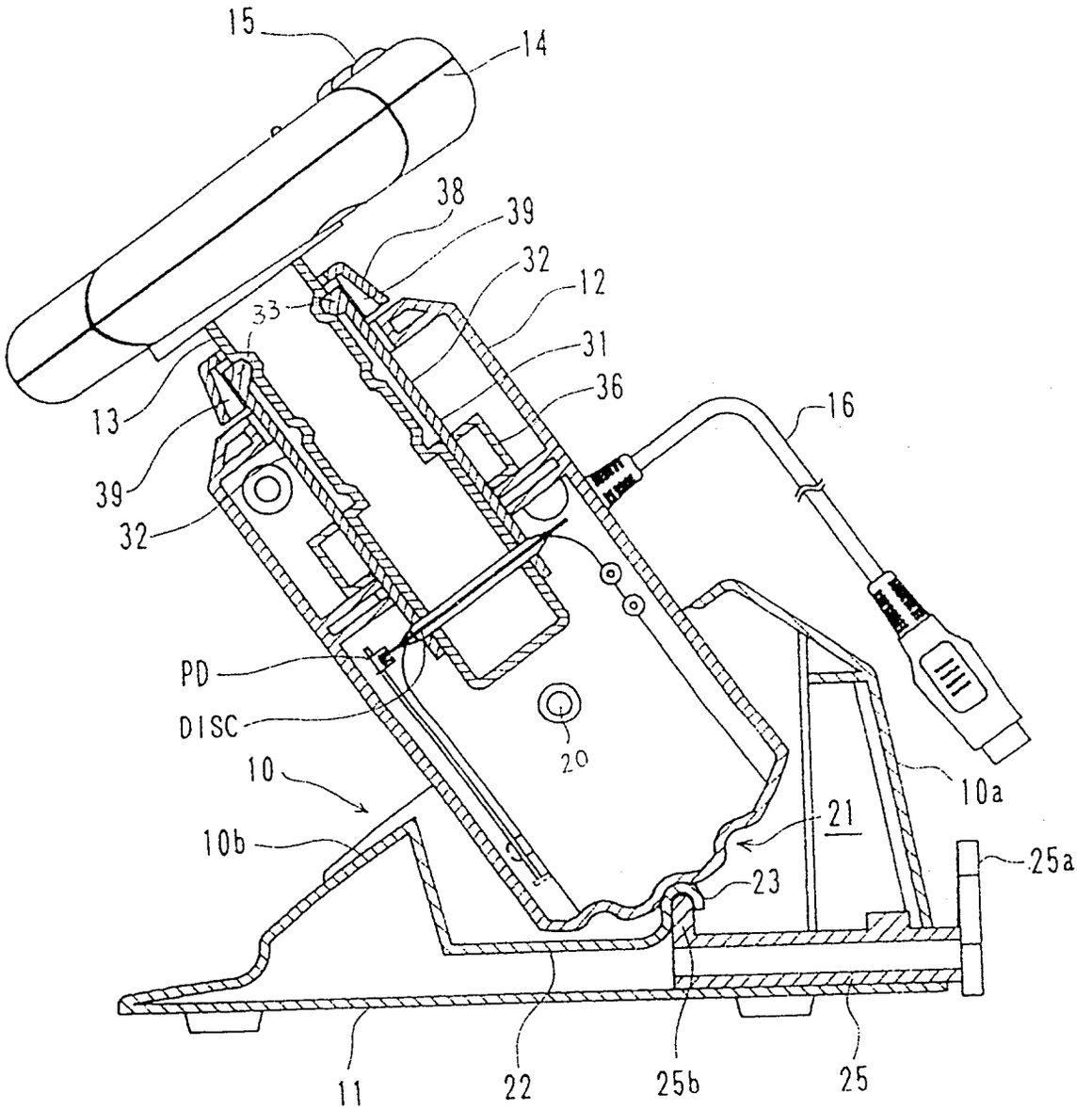
34
55
36
36a
36b

FIG. 12

FIG. 13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10b
25a
23
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22
25b
25

FIG. 14

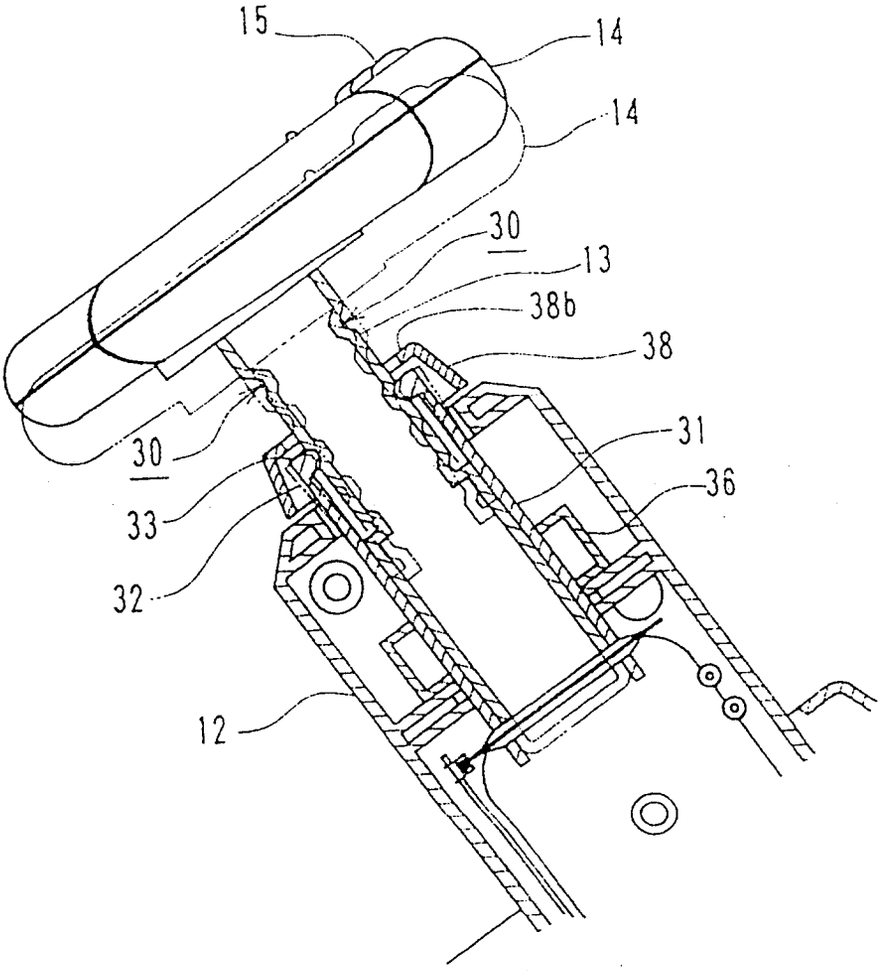
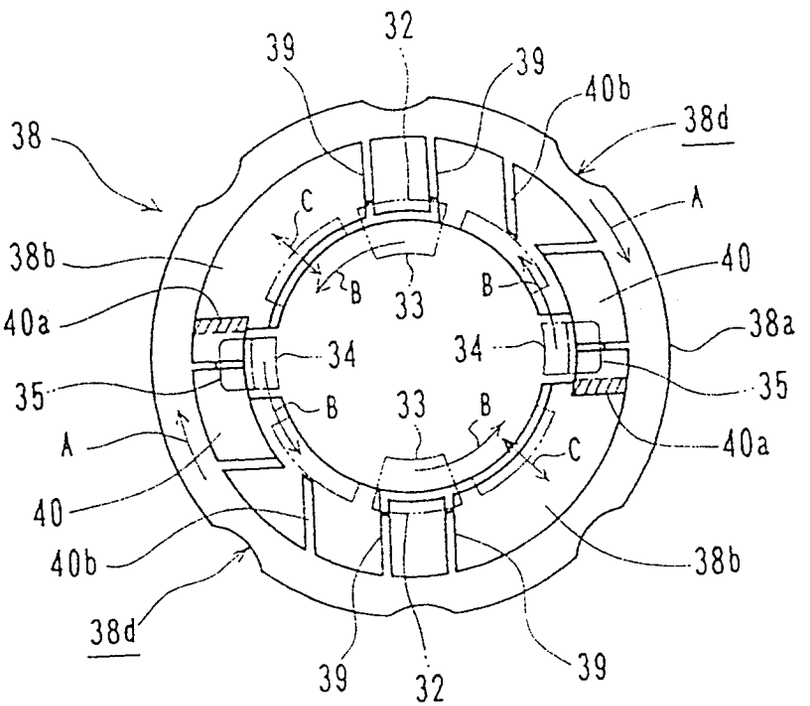


FIG. 15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B
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38b
38d
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32
39

FIG. 16

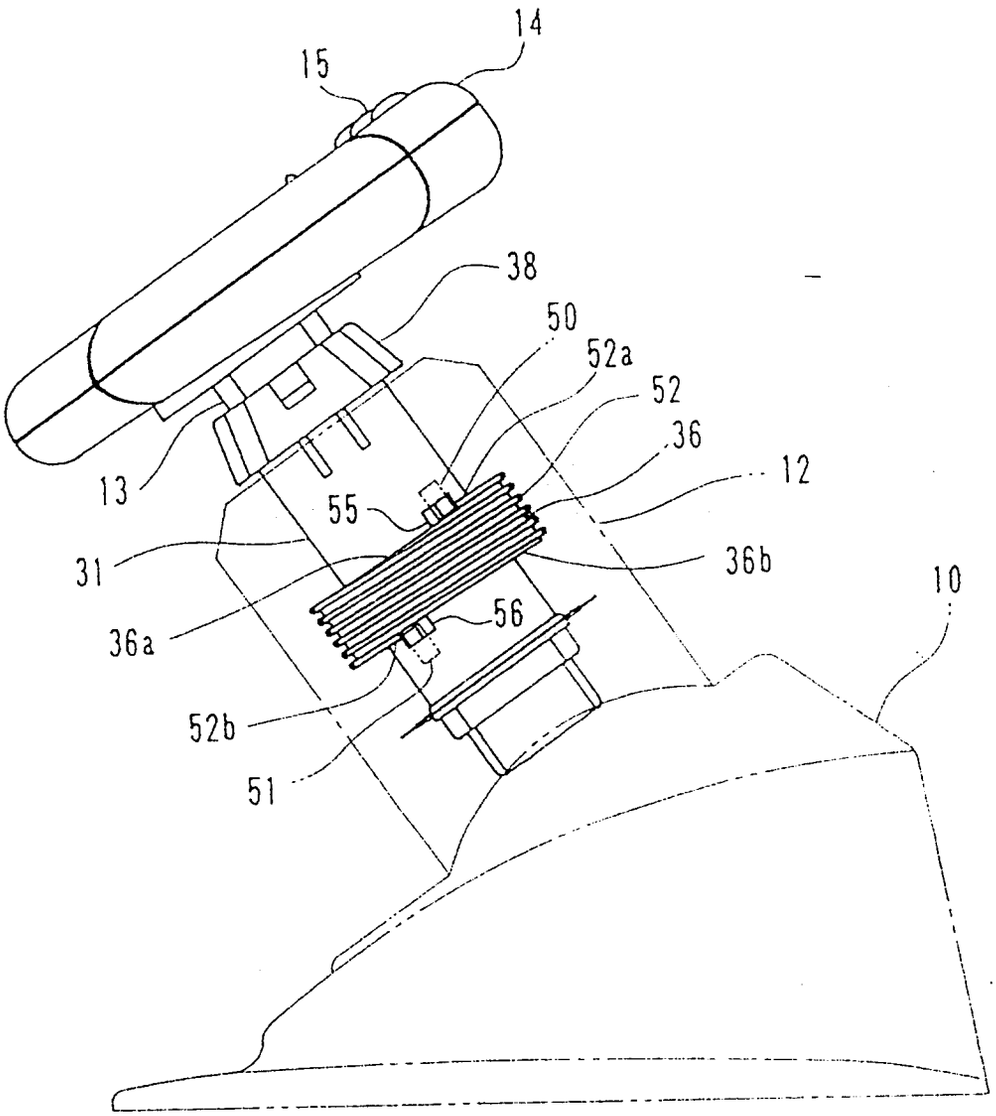


FIG. 17

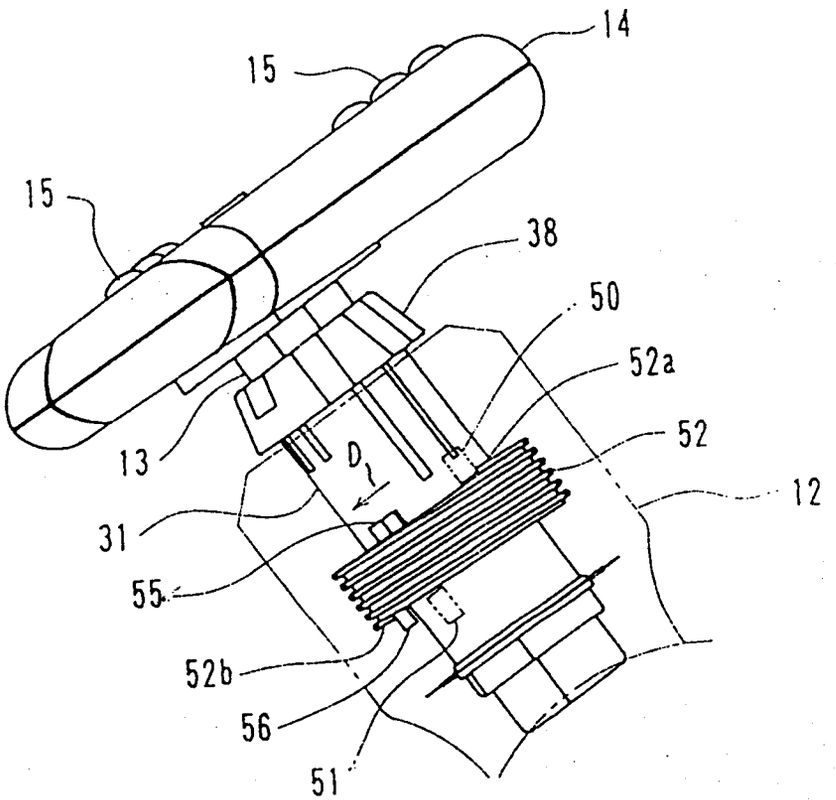


FIG. 18

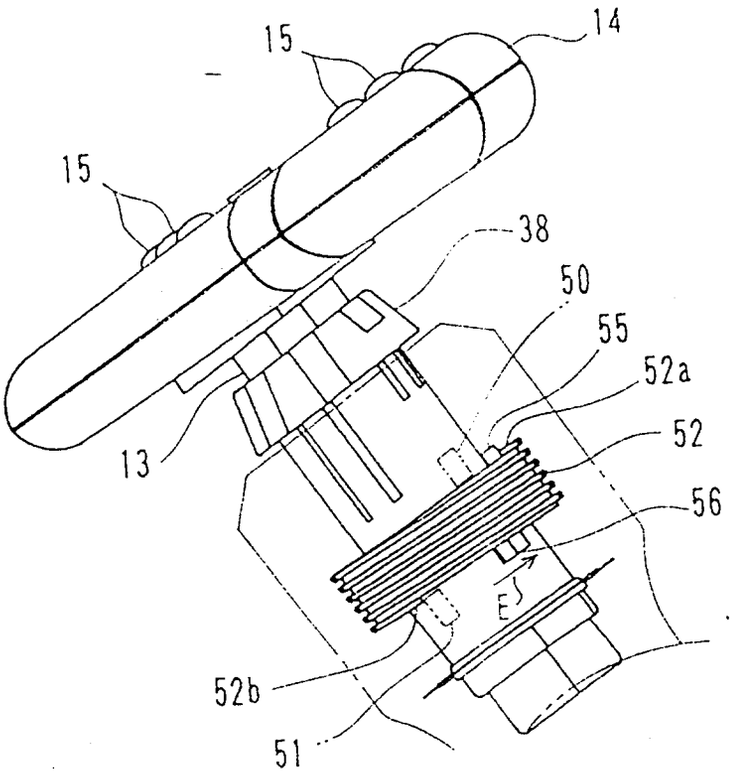


FIG. 19

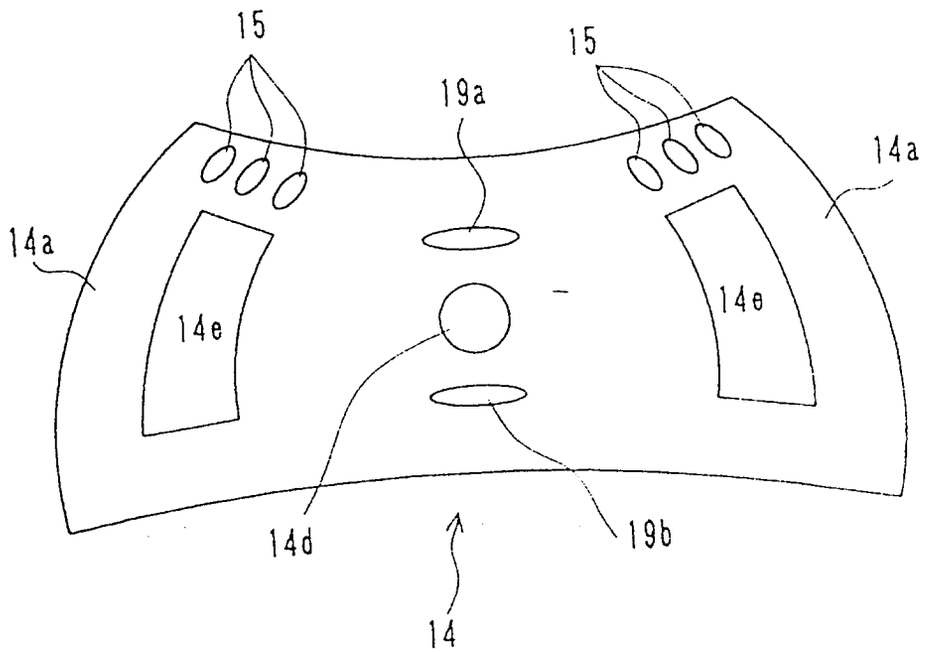


FIG. 20

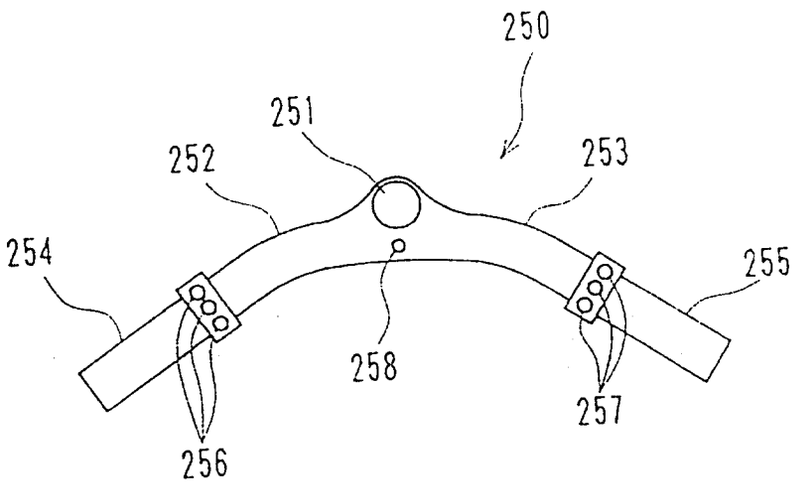


FIG. 21

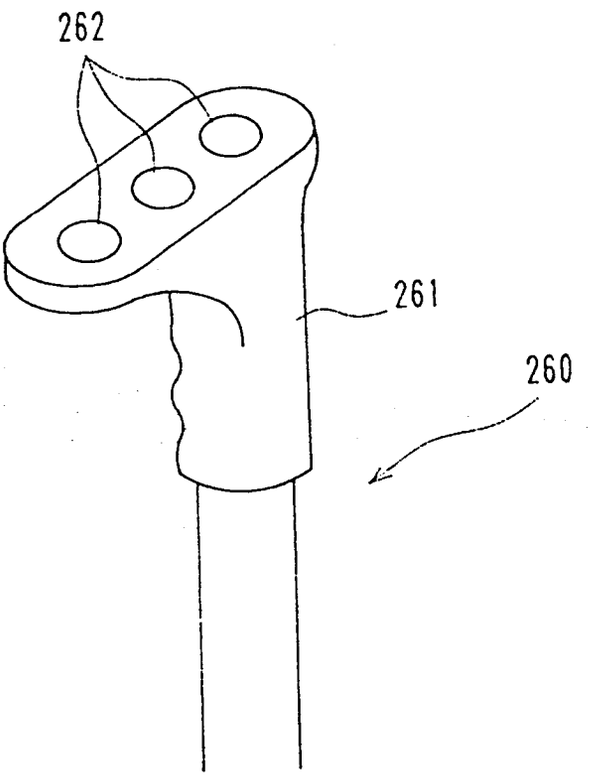


FIG. 22

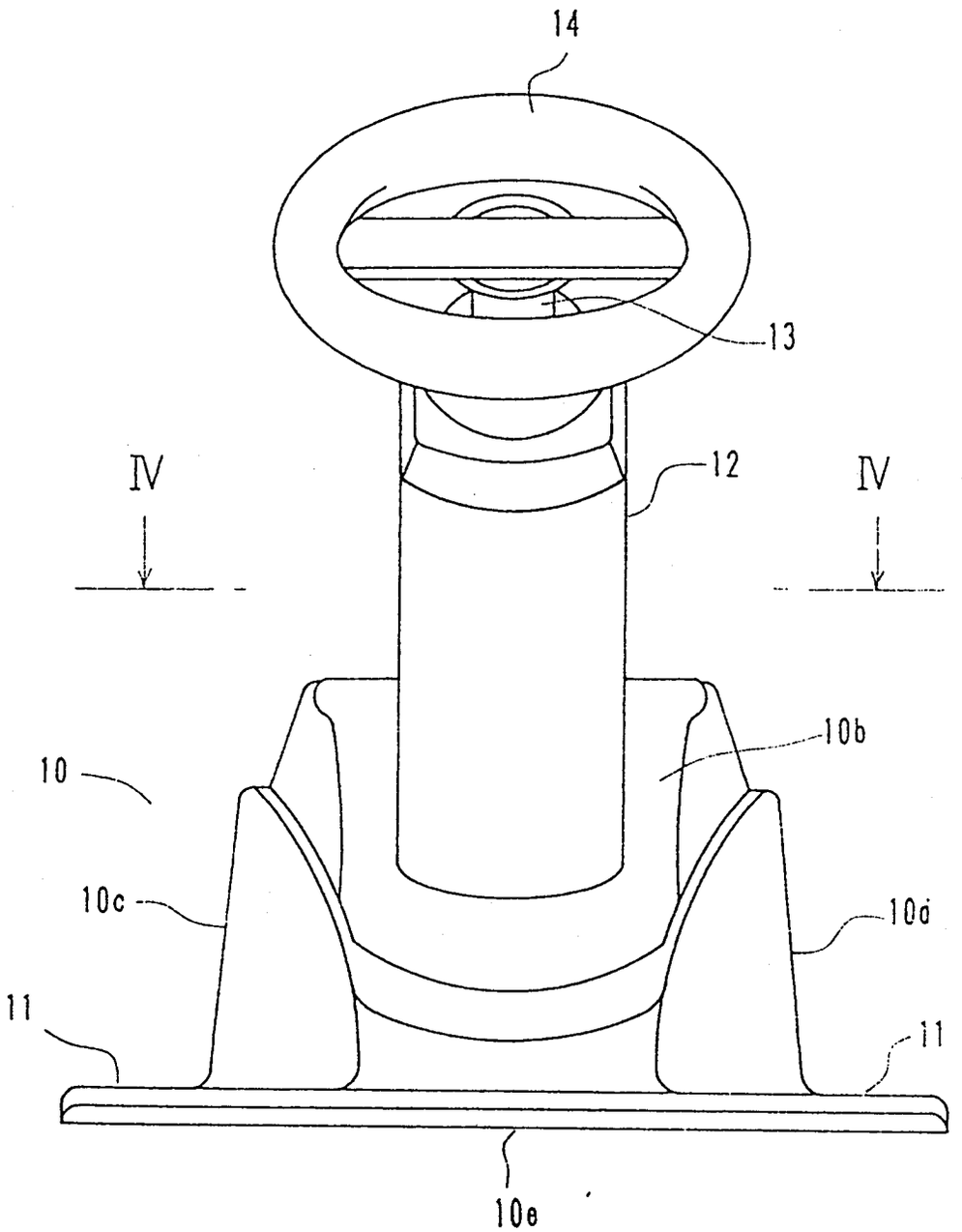
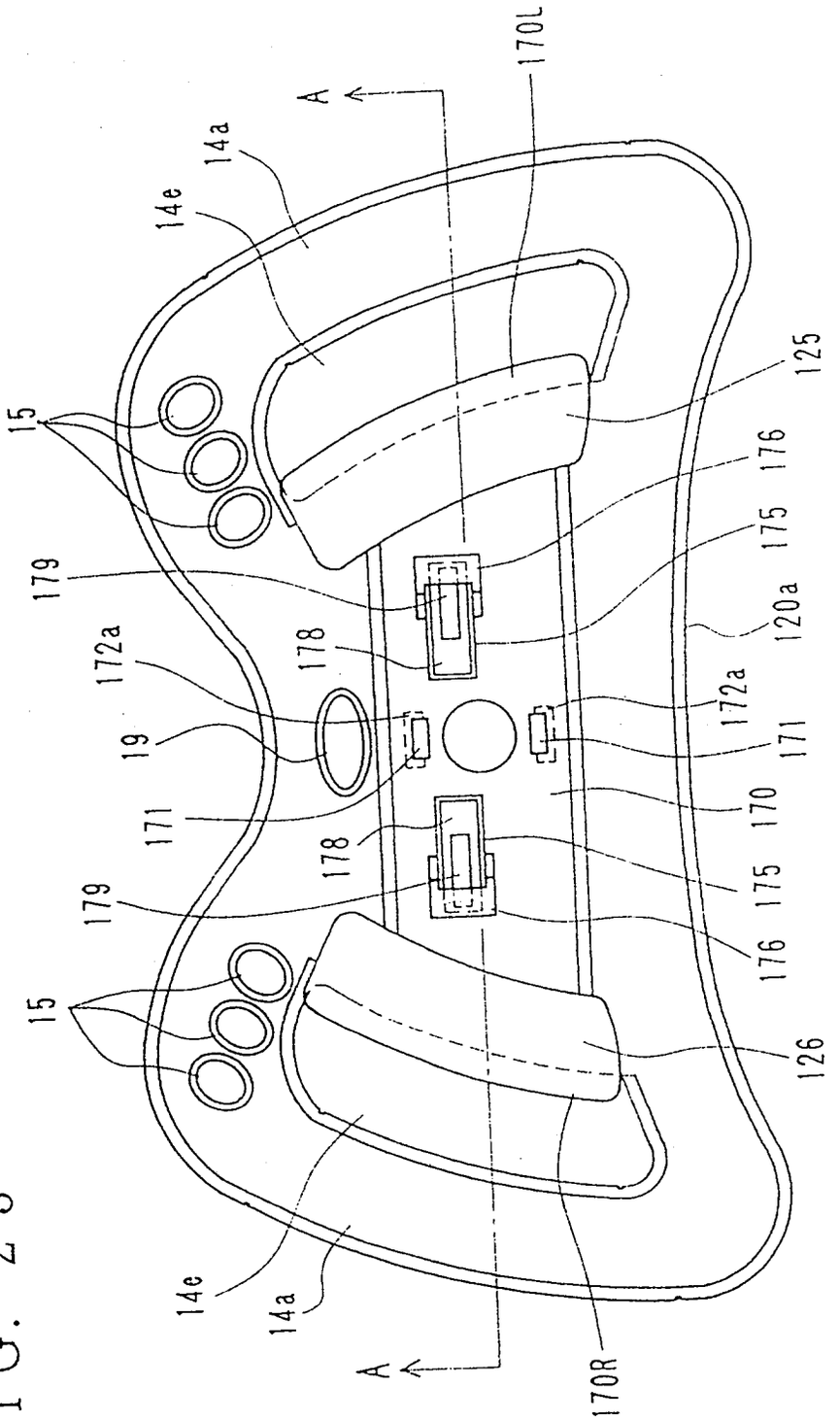


FIG. 23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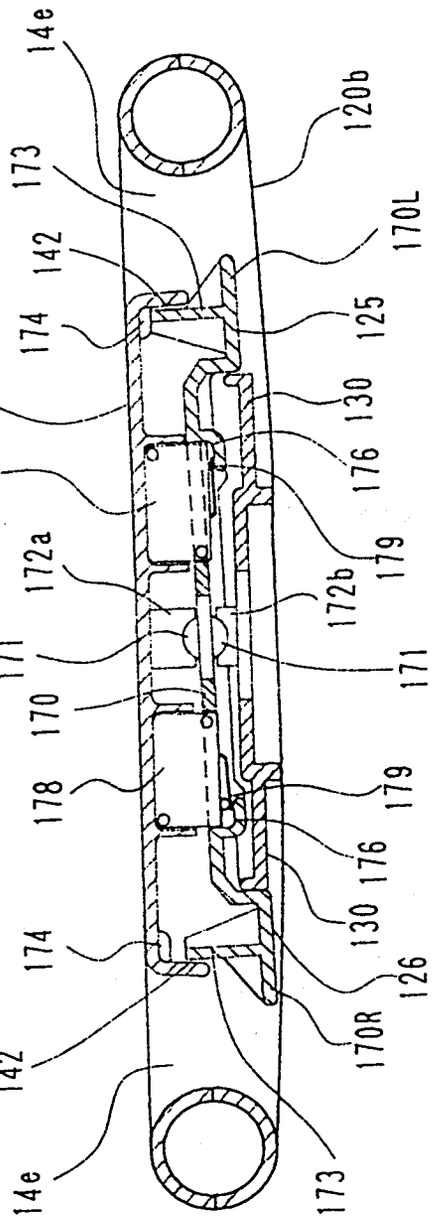
170R

FIG. 24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