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PORTABLE GAME DEVICE

Abstract

The portable game device includes a display, a first button, a second button, and a housing having a main surface, a back surface and a side surface. The side surface has an upper surface on which the first button and the second button are arranged. The first button has a first exposed part exposed from the housing and a first shaft serving as a rotation center of the first button. The first exposed part has, on the right side of the first exposed part, a first inclined part inclined from the right side toward the left side in a direction away the upper surface. The first shaft is arranged in the same position as the first exposed part in a left-right direction, and is accommodated in the housing so as to be rotatable in a direction in which a left end part of the first exposed part sinks when the first exposed part is pressed downward and so as to prevent an entirety of the first exposed part from moving downward. The second button is configured in the same way as the first button.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This application is a continuation application of International Patent Application No. PCT/JP2022/042094 filed on Nov. 11, 2022, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to a portable game device.

BACKGROUND ART

[0003] Conventionally, in a portable game device, providing operation buttons on an upper surface of a housing in addition to on a main surface of the housing, where the display is provided, is well known (for example, Japanese Unexamined Patent Publication No. 2021-12652).

SUMMARY

[0004] The summary of the present disclosure is as follows.

[0005] (1) A portable game device, comprising: a display, a first button and a second button to be operated by a user, and a housing having a main surface in which the display is provided, a back surface positioned on an opposite side of the main surface, and a side surface connecting the main surface and the back surface, wherein the side surface has an upper surface positioned upward when viewed by the user in a state in which the portable game device is held by the user such that the user faces the main surface, a lower surface positioned on an opposite side of the upper surface, a left surface positioned left when viewed by the user in the state, and a right surface positioned on an opposite side of the left surface, the first button is arranged on the upper surface in an area closer to the left surface than the right surface, and the second button is arranged on the upper surface in an area closer to the right surface than the left surface, the first button has a first exposed part exposed from the housing, and a first shaft serving as a rotation center of the first button, the first exposed part has, on the right surface side of the first exposed part, a first inclined part inclined from the right surface side toward the left surface side in a direction away from the upper surface, the first shaft is provided on the lower surface side of the first inclined part, in the same position as a position where the first inclined part is provided relative to the upper surface in a left-right direction between the left surface and the right surface, and is accommodated in the housing so as to be rotatable in a direction in which an end part on the left surface side of the first exposed part sinks when the first exposed part is pressed toward the lower surface side and so as to prevent an entirety of the first exposed part from moving toward the lower surface side, the second button has a second exposed part exposed from the housing, and a second shaft serving as a rotation center of the second button, the second exposed part has, on the left surface side of the second exposed part, a second inclined part inclined from the left surface side toward the right surface side in a direction away from the upper surface, and the second shaft is provided on the lower surface side of the second inclined part, in the same position as a position where the second inclined part is provided relative to the upper surface in the left-right direction, and is accommodated in the housing so as to be rotatable in a direction in which an end part on the right surface side of the second exposed part sinks when the second exposed part is pressed toward the lower surface side and so as to prevent an entirety of the second exposed part from moving toward the lower surface side.

[0006] (2) The portable game device described in above (1), further comprising a third button and a fourth button to be operated by a user, wherein the third button has a third exposed part exposed from the housing, and the fourth button has a fourth exposed part exposed from the housing, and on the upper surface, an end part on the right surface side of the third exposed part is arranged closer to the left surface than the end part on the left surface side of the first exposed part, and on the

upper surface, an end part on the left surface side of the fourth exposed part is arranged closer to the right surface than the end part on the right surface side of the second exposed part.

[0007] (3) The portable game device described in above (2), wherein the third button is capable of moving linearly so that an entirety of the third exposed part sinks when the third exposed part is pressed toward the lower surface side, and the fourth button is capable of moving linearly so that an entirety of the fourth exposed part sinks when the fourth exposed part is pressed toward the lower surface side.

[0008] (4) The portable game device described in above (3), wherein the third button has a third shaft serving as a rotation center of the third button, the third shaft is accommodated in the housing so as to be capable of moving linearly so that the entirety of the third exposed part sinks when the third exposed part is pressed toward the lower surface side, and so as to be rotatable so that an end part on the left surface side of the third exposed part sinks when the third exposed part is pressed toward the lower surface side, and the fourth button has a fourth shaft serving as a rotation center of the fourth button, the fourth shaft is accommodated in the housing so as to be capable of moving linearly so that the entirety of the fourth exposed part sinks when the fourth exposed part is pressed toward the lower surface side, and so as to be rotatable so that an end part on the right surface side of the fourth exposed part sinks when the fourth exposed part is pressed toward the lower surface side.

[0009] (5) The portable game device described in above (4), wherein the upper surface has an upper left corner connected to the left surface and having a round shape or a chamfered shape, and an upper right corner connected to the right surface and having a round shape or a chamfered shape, the third exposed part extends along the upper left corner outside the housing, and the fourth exposed part extends along the upper right corner outside the housing.

[0010] (6) The portable game device described in any one of above (2) to (5), wherein the first exposed part and the third exposed part are arranged in a range where an index finger of a left hand of a user extends when the left hand is placed on the left surface, and the second exposed part and the fourth exposed part are arranged in a range where an index finger of a right hand of a user extends when the right hand is placed on the right surface.

[0011] (7) The portable game device described in any one of above (2) to (5), wherein a distance from an end part on the right surface side of the first exposed part to an end part on the left surface side of the third exposed part in the left-right direction is 30 mm to 40 mm, and a distance from an end part on the left surface side of the second exposed part to an end part on the right surface side of the fourth exposed part in the left-right direction is 30 mm to 40 mm.

[0012] (8) The portable game device described in above (6) or (7), wherein in a front-rear direction between the main surface and the back surface, a length of the first exposed part is longer than a length of the third exposed part, and in the front-rear direction, a length of the second exposed part is longer than a length of the fourth exposed part.

[0013] (9) The portable game device described in above (8), wherein in the front-rear direction, a position of an end part on the main surface side of the first exposed part is equivalent to a position of an end part on the main surface side of the third exposed part, and in the front-rear direction, a position of an end part on the main surface side of the second exposed part is equivalent to a position of an end part on the main surface side of the fourth exposed part.

[0014] (10) The portable game device described in any one of above (7) to (9), wherein an interval between the first exposed part and the third exposed part in the left-right direction is 3 mm to 10 mm, and an interval between the second exposed part and the fourth exposed part in the left-right direction is 3 mm to 10 mm.

[0015] (11) The portable game device described in above (10), wherein a length of the first exposed part in the left-right direction is longer than the interval between the first exposed part and the third exposed part in the left-right direction, and a length of the second exposed part in the left-right direction is longer than the interval between the second exposed part and the fourth exposed part in

the left-right direction, and a length of the third exposed part in the left-right direction is longer than the length of the first exposed part in the left-right direction, and a length of the fourth exposed part in the left-right direction is longer than the length of the second exposed part in the left-right direction.

Description

BRIEF DESCRIPTION OF DRAWINGS

[0016] Embodiments of the present disclosure are best understood from the following detailed description when read with the accompanying figures. It is noted that, in accordance with the standard practice in the industry, various features are not drawn to scale. In fact, the dimensions of the various features may be arbitrarily increased or reduced for clarity of discussion.

[0017] FIG. 1 is a front view of a portable game device according to a first embodiment of the present disclosure.

[0018] FIG. 2 is a top view of the portable game device according to the first embodiment of the present disclosure.

[0019] FIG. 3 is a rear view of the portable game device showing the interior of the housing in a state in which a second housing is removed.

[0020] FIG. 4 is a front view of a second housing showing an inner surface of the second housing.

[0021] FIG. 5 is a front view of a first operation button.

[0022] FIG. 6 is a rear perspective view of the first operation button.

[0023] FIG. 7 is an enlarged view of the portion of FIG. 3 where the first operation button is provided.

[0024] FIG. 8 is a front view of a second operation button.

[0025] FIG. 9 is a front view of a portable game device according to a second embodiment of the present disclosure.

[0026] FIG. 10 is a top view of the portable game device according to the second embodiment of the present disclosure.

[0027] FIG. 11 is a rear view of the portable game device showing the interior of the housing in a state in which a second housing is removed.

[0028] FIG. 12 is a front view of the second housing showing an inner surface of the second housing.

[0029] FIG. 13 is a front view of a third operation button.

[0030] FIG. 14 is a rear perspective view of the third operation button.

[0031] FIG. 15 is an enlarged view of the portion of FIG. 11 where the third operation button is provided.

[0032] FIG. 16 is a front view of a fourth operation button.

[0033] FIG. 17 is a partially-enlarged front view of the portable game device showing the portion where the first operation button and the third operation button are arranged.

DETAILED DESCRIPTION

[0034] The embodiments of the present disclosure will be described with reference to the drawings. Note that in the following description, similar constituent elements have been assigned the same reference signs.

First Embodiment

[0035] Initially, a first embodiment of the present disclosure will be described with reference to FIGS. 1 to 8. FIG. 1 is a front view of a portable game device 1 according to the first embodiment of the present disclosure, and FIG. 2 is a top view of the portable game device 1 according to the first embodiment of the present disclosure. The portable game device 1 is a game device which can be hand-held, and is powered by, for example, an integrated battery.

[0036] The portable game device **1** has a substantially rectangular parallelepiped shape and can be held by a user. The user holds the portable game device **1** in the orientation shown in FIG. **1**, and FIG. **1** shows the portable game device **1** on the side facing the user. In the present description, the direction of the portable game device **1** is defined in a state in which the portable game device **1** held by the user is facing the user. In the present embodiment, the length of the portable game device **1** in the left-right direction is longer than the length of the portable game device **1** in the upward-downward direction, and the portable game device **1** has a horizontally elongated shape.

[0037] As shown in FIG. **1**, the portable game device **1** includes a housing **2**, a display **3**, and operation members. The housing **2** has a substantially rectangular parallelepiped shape, and forms the outer surface of the portable game device **1**. The housing **2** includes a main surface **21** in which the display **3** is provided, a back surface **22** positioned on the opposite side of the main surface **21**, and a side surface connecting the main surface **21** and the back surface **22**. The main surface **21** of the housing **2** faces the user when the portable game device **1** is operated by the user.

[0038] The side surface includes an upper surface **23**, a lower surface **24**, a left surface **25**, and a right surface **26**. The upper surface **23** is positioned upward when viewed by the user in a state (hereinafter referred to as the “held state”) in which the portable game device is held by the user so that the main surface **21** faces the user, and the lower surface **24** is positioned on the opposite side of the upper surface **23**, and is positioned downward when viewed by the user in the held state. The left surface **25** is positioned left when viewed by the user in the held state, the right surface **26** is positioned on the opposite side of the left surface **25**, and is positioned right when viewed by the user in the held state. In the present embodiment, an exhaust port **231** for exhausting air from the inner space of the housing **2** to the outside of the housing **2**, and an earphone jack **232** are provided in the upper surface **23** of the housing **2**.

[0039] Note that in the present description, “up” means the direction from the lower surface toward the upper surface, “down” means the direction from the upper surface toward the lower surface, “left” means the direction from the right surface toward the left surface, “right” means the direction from the left surface to the right surface, “front” means the direction from the back surface toward the main surface, and “rear” means the direction from the main surface toward the back surface. Thus, for example, the terms upper side, lower side, right side, left side, front side, and back side can respectively be interpreted to mean the upper surface side, the lower surface side, the right surface side, the left surface side, the main surface side, and the back surface side. Furthermore, the terms upward-downward direction, left-right direction, and front-rear direction can respectively be interpreted to mean the upward-downward direction between the upper surface and the lower surface, the left-right direction between the left surface and the right surface, and the front-rear direction between the main surface and the back surface. Furthermore, the terms upward, downward, forward, and rearward can respectively be interpreted to mean the upper surface side direction, the lower surface side direction, the main surface side direction, and the back surface side direction.

[0040] The housing **2** includes a first housing **27** and a second housing **28**, and is formed by assembling the first housing **27** and the second housing **28**. As shown in FIG. **2**, the first housing **27** is arranged on the front side of the portable game device **1**, and the second housing **28** is arranged on the rear side of the game device **1**. The first housing **27** and the second housing **28** define the inner space of the housing **2** when the first housing **27** and the second housing **28** are assembled. p The first housing **27** and the second housing **28** are constructed from resin, metal, etc., and are formed by extrusion molding, die-casting, etc.

[0041] The display **3** is provided on the main surface **21** of the housing **2** so that the display surface thereof can be viewed by the user, and displays visual information (character, images, etc.). In the present embodiment, the display **3** is arranged in a center area of the portable game device **1** in the left-right direction. The display **3** is, for example, a liquid crystal display (LCD), an organic EL display, etc. Note that the display **3** may be a touch panel-type display.

[0042] In the portable game device **1**, the operation members are provided so that at least a part thereof are exposed to the outside and are operated by the user. In the present embodiment, as shown in FIG. **2**, the portable game device **1** includes, as operation members which are provided in the upper surface **23** of the housing **2**, a first operation button **4**, a second operation button **5**, a power button **6**, and a volume button **7**. The first operation button **4** is arranged on the upper surface **23** in an area closer to the left surface **25** than the right surface **26**, i.e., in an area on the left side of a left-right center line CL of the portable game device **1**. On the other hand, the second operation button **5** is arranged on the upper surface **23** in an area closer to the right surface **26** than the left surface **25**, i.e., in an area on the right side of the left-right center line CL of the portable game device **1**. The volume button **7**, the power button **6**, the exhaust port **231**, and the earphone jack **232** are arranged between the first operation button **4** and the second operation button **5**, and the first operation button **4** is adjacent to the volume button **7**. Note that the left-right center line CL of the portable game device **1** means a line which separates the portable game device **1** in two in the left-right direction.

[0043] Furthermore, as shown in FIG. **1**, the portable game device **1** includes, as operation members provided on the main surface **21** of the housing **2**, a stick member **8** and a button group **9**. For example, the button group **9** consists of four buttons including an A button, a B button, an X button, and a Y button. The stick member **8** is arranged in an area on the left side of the left-right center line CL of the portable game device **1**, and the button group **9** is arranged in an area on the right side of the left-right center line CL of the portable game device **1**. The portable game device **1** may further include, as operation members provided on the main surface **21** of the housing **2**, a cross button arranged in an area on the left side of the left-right center line CL, and an analog stick arranged in an area on the right side of the left-right center line CL. The operation members are constructed from resin, metal, etc., and are formed by injection molding, die casting, etc.

[0044] Further, as shown in FIGS. **1** and **2**, the first housing **27** has holes **271a** to **271d** through which the operation members provided on the upper surface **23** of the housing **2** pass, a hole **271e** for accessing the earphone jack **232**, and holes **271f** to **271j** through which the operation members provided in the main surface **21** of the housing **2** pass. The holes **271a** to **271e** open in the upper surface **23** of the housing **2**, and the holes **271f** to **271j** open in the main surface **21** of the housing **2**.

[0045] Note that the configurations and arrangements of the operating members shown in FIGS. **1** and **2** are merely examples, and some of the operation members may be omitted or other operation members may be added. For example, the portable game device **1** may further include, as operation members provided on the main surface **21** of the housing **2**, an additional stick member other than the stick member **8**, a plus button, a minus button, a capture button for capturing an image displayed on the display **3**, a home button for displaying a home menu, etc.

[0046] FIG. **3** is a rear view of the portable game device **1** showing the interior of the housing **2** in a state in which the second housing **28** is removed. The housing **2** houses the internal components of the portable game device **1**. In the present embodiment, the internal components are attached to the first housing **27**, and the second housing **28** covers the internal components attached to the first housing **27**. FIG. **3** shows the portable game device **1** in a state in which the second housing **28** is removed. Note that some of the internal components of the portable game device **1** are omitted from FIG. **3**.

[0047] As shown in FIG. **3**, the portable game device **1** includes a first switch **171**, a second switch **172**, a first spring **100**, and a second spring **200** as internal components. The first switch **171** is arranged directly below the first operation button **4** in the internal space of the housing **2**, and is pressed by the first operation button **4**. The second switch **172** is arranged directly below the second operation button **5** in the internal space of the housing **2**, and is pressed by the second operation button **5**. The first switch **171** and the second switch **172** have the same shape and are arranged at positions which are symmetrical relative to the left-right center line CL of the portable

game device **1**. The first switch **171** is arranged to the left of the first spring **100**, and the second switch **172** is arranged to the right of the second spring **200**. The first switch **171** and the second switch **172** are mounted on, for example, a substrate (specifically, the rear surface of the substrate) accommodated in the housing **2**. The first switch **171** and the second switch **172** are, for example, tactile switches. Note that the first switch **171** and the second switch **172** may have shapes which are different from each other.

[0048] The first spring **100** is arranged directly below the first operation button **4** in the internal space of the housing **2** and biases the first operation button **4** upward. The second spring **200** is arranged directly below the second operation button **5** in the internal space of the housing **2** and biases the second operation button **5** upward. The first spring **100** and the second spring **200** have the same shape and are arranged at positions which are symmetrical relative to the left-right center line CL of the portable game device **1**. The first spring **100** and the second spring **200** are, for example, compression coil springs. The first spring **100** and the second spring **200** may have different shapes. In another embodiment, the first operation button **4** and the second operation button **5** may be biased upward by other elastic bodies or other structures instead of or in addition to springs. For example, if the first switch **171** and the second switch **172** are tactile switches, they may be biased upward by dome parts, and if the first switch **171** and the second switch **172** are rubber switches, they may be biased upward by key rubbers.

[0049] As shown in FIG. **3**, the first housing **27** has a main surface side first shaft accommodation part **272**, a main surface side second shaft accommodation part **273**, a first spring support part **274**, and a second spring support part **275**. The main surface side first shaft accommodation part **272**, the main surface side second shaft accommodation part **273**, the first spring support part **274**, and the second spring support part **275** are provided on the rear surface (back surface) of the first housing **27**. The main surface side first shaft accommodation part **272**, the main surface side second shaft accommodation part **273**, the first spring support part **274**, and the second spring support part **275** each protrude from the back surface of the first housing **27** toward the internal space of the housing **2**. Furthermore, at least some of the main surface side first shaft accommodation part **272**, the main surface side second shaft accommodation part **273**, the first spring support part **274**, and the second spring support part **275** may be separate from the first housing **27** and be attached to the back surface of the first housing **27** by fasteners (for example, screws), adhesive members (for example, an adhesive, an adhesive tape, etc.), etc.

[0050] The main surface side first shaft accommodation part **272** and the main surface side second shaft accommodation part **273** have the same shape and are arranged at positions which are symmetrical relative to the left-right center line CL of the portable game device **1**. The functions of the main surface side first shaft accommodation part **272** and the main surface side second shaft accommodation part **273** will be described later.

[0051] The first spring support part **274** and the second spring support part **275** have the same shape and are arranged in positions which are symmetrical relative to the left-right center line CL of the portable game device **1**. The first spring support part **274** is arranged to the left of the main surface side first shaft accommodation part **272**, and the second spring support part **275** is arranged to the right of the main surface side second shaft accommodation part **273**. The first spring support part **274** supports the first spring **100**, and the second spring support part **275** supports the second spring **200**. Note that the first spring support part **274** and the second spring support part **275** may have shapes which are different from each other.

[0052] FIG. **4** is a front view of the second housing **28** showing the inner surface of the second housing **28**. As shown in FIG. **4**, the second housing **28** has a back surface side first shaft accommodation part **281** and a back surface side second shaft accommodation part **282**. The back surface side first shaft accommodation part **281** and the back surface side second shaft accommodation part **282** are provided on the front surface (inner surface) of the second housing **28**. The back surface side first shaft accommodation part **281** and the back surface side second shaft

accommodation part **282** each protrude from the inner surface of the second housing **28** toward the internal space of the housing **2**. At least one of the back surface side first shaft accommodation part **281** and the back surface side second shaft accommodation part **282** may be separate from the second housing **28** and be attached to the inner surface of the second housing **28** by a fastener (for example, a screw), an adhesive member (for example, an adhesive, an adhesive tape, etc.), etc. [0053] The back surface side first shaft accommodation part **281** and the back surface side second shaft accommodation part **282** have the same shape and are arranged at positions which are symmetrical relative to the left-right center line CL of the portable game device **1**. When the first housing **27** and the second housing **28** are assembled, the back surface side first shaft accommodation part **281** faces the main surface side first shaft accommodation part **272**, and the back surface side second shaft accommodation part **282** faces the main surface side second shaft accommodation part **273**. The back surface side first shaft accommodation part **281** supports the first operation button **4** together with the main surface side first shaft accommodation part **272**, and the back surface side second shaft accommodation part **282** supports the second operation button **5** together with the main surface side second shaft accommodation part **273**. The main surface side first shaft accommodation part **272** and the main surface side second shaft accommodation part **273** may have shapes which are different from each other. The back surface side first shaft accommodation part **281** and the back surface side second shaft accommodation part **282** may have shapes which are different from each other.

[0054] The configurations of the first operation button **4** and the second operation button **5** will be described in detail below. The first operation button **4** is rotatably supported by the housing **2**, and when rotated by the user, presses the first switch **171**. The second operation button **5** is rotatably supported by the housing **2**, and when rotated by the user, presses the second switch **172**.

[0055] FIG. **5** is a front view of the first operation button **4**, and FIG. **6** is a rear perspective view of the first operation button **4**. The first operation button **4** has a first keytop part **40**, a first base part **43**, a first protrusion **44**, a first shaft **45**, and a first shaft base part **46**. The first keytop part **40**, the first base part **43**, the first protrusion **44**, the first shaft **45**, and the first shaft base part **46** are integrally molded.

[0056] The first keytop part **40** is positioned at the top of the first operation button **4** and is a part positioned outward when the first operation button **4** is provided on the portable game device **1**. The first keytop part **40** is contacted by a finger of the user (typically the index finger of the left hand) when the user operates the first operation button **4**. The first keytop part **40** is smaller than the hole **271a** of the housing **2**. The first keytop part **40** passes through the hole **271a** and is partially exposed from the housing **2**.

[0057] The first keytop part **40** is composed of a first exposed part **41** which is exposed from the housing **2**, and a first non-exposed part **42** which is not exposed from the housing **2**. The first exposed part **41** is positioned outside the upper surface **23**, and the first non-exposed part **42** is positioned to the internal space side relative to the upper surface **23**. In FIG. **6**, the first exposed part **41** is represented by diagonal lines for convenience in order to distinguish between the first exposed part **41** and the first non-exposed part **42**.

[0058] FIG. **7** is an enlarged view of the portion of FIG. **3** where the first operation button **4** is provided. As shown in FIGS. **5** to **7**, the first exposed part **41** has a first inclined part **411** and a first flat part **412**. The first inclined part **411** is inclined from the right side to the left side at the right side of the first exposed part **41** in a direction away from the upper surface **23**. That is, the first inclined part **411** is inclined so as to be away from the upper surface **23** outwardly in the left-right direction. In the present embodiment, the first inclined part **411** is inclined from the right side to the left side at the right end part of the first exposed part **41** in a direction away from the upper surface **23**, and has a round shape.

[0059] The first flat part **412** has a flat surface and extends parallel to the upper surface **23** of the housing **2** when the first operation button **4** is supported by the housing **2**. In the present

description, the term “flat” means approximately flat, and the first flat part **412** may have a slightly curved surface or inclination. The first flat part **412** is adjacent to the first inclined part **411** and is smoothly connected to the first inclined part **411**. The first exposed part **41** may have another inclined part having an inclination angle different from that of the first inclined part **411** between the first inclined part **411** and the first flat part **412**. The first exposed part **41** may have a flat part other than the first flat part **412** or another inclined part having an inclination angle different from that of the first inclined part **411** on the right side of the first inclined part **411**. The first inclined part **411** may have another shape such as an inclined surface instead of the round shape.

[0060] The first base part **43** is positioned below the first keytop part **40**, and the first keytop part **40** protrudes outward from the upper surface of the first base part **43**. The first base part **43** is larger than the hole **271a** of the housing **2** and is arranged in the internal space of the housing **2**. The first base part **43** has a flat plate shape and is biased by the first spring **100** so that the upper surface thereof abuts against the inner surface of the housing **2**. As a result, the first operation button **4** can be prevented from falling into the internal space of the housing **2** and becoming unable to return to its original position when the first operation button **4** is pressed downward.

[0061] The first protrusion **44** has a cylindrical shape and protrudes downward from the lower surface of the first base part **43**. The first protrusion **44** faces the first spring support part **274** in the internal space of the housing **2**. As shown in FIG. 7, one end part (lower end part) of the first spring **100** is accommodated in the recess of the first spring support part **274**, and the other end part (upper end part) of the first spring **100** surrounds the first protrusion **44** and abuts against the lower surface of the first base part **43**. That is, the first protrusion **44** is inserted into the annular end part of the first spring **100**. The first spring support part **274** of the housing **2** and the first protrusion **44** of the first operation button **4** restrict the movement of the first spring **100** in the left-right direction while allowing the first spring **100** to expand and contract. As a result, position deviation of the first spring **100** can be prevented.

[0062] The first shaft base part **46** protrudes downward from the lower surface of the first base part **43**. The first shaft **45** protrudes forward from the front surface of the first shaft base part **46** and protrudes rearward from the rear surface of the first shaft base part **46**. That is, the first shaft **45** extends from the first shaft base part **46** in the front-rear direction (the direction perpendicular to the left-right direction and the upward-downward direction). The first shaft **45** is coupled to the first base part **43** and the first keytop part **40** via the first shaft base part **46**. The first shaft **45** has a cylindrical shape and serves as the rotation center of the first operation button **4**. That is, the first operation button **4** rotates about the first shaft **45** relative to the housing **2**.

[0063] The first shaft **45** is positioned at the bottom of the first operation button **4**, and is arranged in the internal space of the housing **2**. The first shaft **45** is positioned in the left-right direction between the boundary between the first inclined part **411** and the first flat part **412**, and the right end part of the first exposed part **41**. One end part (front end part) of the first shaft **45** is accommodated in the main surface side first shaft accommodation part **272** of the first housing **27**, and the other end part (rear end part) of the first shaft **45** is accommodated in the back surface side first shaft accommodation part **281** of the second housing **28**. Specifically, the main surface side first shaft accommodation part **272** has an accommodation hole extending in the upward-downward direction, in which the front end part of the first shaft **45** is accommodated, and the back surface side first shaft accommodation part **281** has an accommodation hole extending in the upward-downward direction, in which the rear end part of the first shaft **45** is accommodated.

[0064] When the first operation button **4** is attached to the housing **2**, first, the front end part of the first shaft **45** is accommodated in the main surface side first shaft accommodation part **272**, and the first shaft **45** moves upward within the accommodation hole of the main surface side first shaft accommodation part **272** to expose the first exposed part **41** from the housing **2** through the hole **271a**. When the first base part **43** is biased by the first spring **100** in a state in which the first exposed part **41** is exposed from the housing **2**, the state of the first operation button **4** is

maintained. Next, when the second housing **28** is fastened to the first housing **27**, the rear end part of the first shaft **45** is accommodated in the back surface side first shaft accommodation part **281**. As a result, the main surface side first shaft accommodation part **272** and the back surface side first shaft accommodation part **281** restrict the movement of the first shaft **45** in the left-right direction, and the back surface side first shaft accommodation part **281** restricts the downward movement of the first shaft **45**. Furthermore, the upward movement of the first shaft **45** is restricted by the abutment of the first base part **43** with the housing **2**, and the main surface side first shaft accommodation part **272** and the back surface side first shaft accommodation part **281** allow the rotation of the first shaft **45**. Thus, the first shaft **45** has one degree of freedom for rotation only. Note that the first operation button **4** may have a shaft accommodation part, and the housing **2** may have a first shaft which serves as the rotation center of the first operation button **4**.

[0065] As shown in FIG. 7, the first shaft **45** extends in the front-rear direction, and is arranged to the right of the first spring **100** and the first switch **171** in the internal space of the housing **2**. The first switch **171** has a protrusion **1711** extending toward the first base part **43** of the first operation button **4**. The first shaft **45** is accommodated in the housing **2** so as to be capable of rotating in a direction in which the first shaft **45** rotates clockwise when viewed from the back surface of the portable game device **1** shown in FIG. 7, i.e., in a direction in which the left end part of the first exposed part **41** sinks when the first exposed part **41** is pressed downward.

[0066] When the first shaft **45** rotates in the direction described above, the first spring **100** is compressed by the first base part **43**, and the first base part **43** presses the protrusion **1711** of the first switch **171**. Note that instead of the first switch **171** having the protrusion **1711**, the first operation button **4** may have a protrusion for pressing the first switch **171**.

[0067] In order to effectively generate a force for rotating the first shaft **45**, it is desirable that the first exposed part **41** is pressed at a position distant from the first shaft **45**. Thus, in order to promote the rotation of the first shaft **45** in the direction described above, arranging the first shaft **45** to the right of the first exposed part **41** has been considered. However, in this case, the length of the first operation button **4** in the left-right direction becomes longer, whereby the space for providing the first operation button **4** becomes larger.

[0068] On the other hand, in the present embodiment, the first shaft **45** is provided below the first inclined part **411** of the first exposed part **41**, in the same position as the position where the first inclined part **411** is provided relative to the upper surface **23** in the left-right direction. That is, the first shaft **45** is arranged on the inside of both ends of the first exposed part **41**. As a result, the space required to provide the first operation button **4** can be reduced as compared to the case in which the first shaft **45** is arranged on the outside of both ends of the first exposed part **41**.

[0069] However, if the first shaft **45** is arranged on the inside of both ends of the first exposed part **41**, the first exposed part **41** may be pressed directly above the first shaft **45**. In the case in which the upper surface of the first exposed part **41** is flat, when the first exposed part **41** is pressed directly above the first shaft **45**, a force for rotating the first operation button **4** is not generated or is difficult to generate. Conversely, in the present embodiment, since the first operation button **4** is formed so that the position of the first shaft **45** and the position of the first inclined part **411** in the left-right direction are the same, when the user presses the first inclined part **411** directly above the first shaft **45** vertically downward, a force in a direction for rotating the first operation button **4** can easily be generated. Thus, according to the present embodiment, the space required for providing the first operation button **4** can be reduced while suppressing a decrease in the operability of the first operation button **4**, whereby a portable game device **1** having an improved configuration of the operation buttons provided on the upper surface **23** of the housing **2** is provided.

[0070] Furthermore, in the present embodiment, the housing **2** restrains movement other than rotation of the first shaft **45** via the main surface side first shaft accommodation part **272** and the back surface side first shaft accommodation part **281**. That is, the first shaft **45** is accommodated in the housing **2** so as not to move downward when the first exposed part **41** is pressed downward.

[0071] In other words, the first shaft 45 is accommodated in the housing 2 so as to prevent an entirety of the first exposed part 41 from moving downward when the first exposed part 41 is pressed downward. Thus, no space is required for the first shaft 45 to move in the upward-downward direction, and the space required for providing the first operation button 4 can be further reduced.

[0072] FIG. 8 is a front view of the second operation button 5. As shown in FIG. 3, the first operation button 4 and the second operation button 5 are arranged at positions which are symmetrical relative to the left-right center line CL of the portable game device 1, and have shapes which are symmetrical relative to the left-right center line CL. That is, the second operation button 5 includes a second keytop part 50, a second base part 53, a second protrusion 54, a second shaft 55, and a second shaft base part 56, in the same manner as the first operation button 4. The second keytop part 50, the second base part 53, the second protrusion 54, the second shaft 55, and the second shaft base part 56 are integrally formed. Furthermore, the second keytop part 50 is composed of a second exposed part 51 and a second non-exposed part 52, in the same manner as the first keytop part 40. In FIG. 8, the second exposed part 51 is represented by diagonal lines for convenience in order to distinguish between the second exposed part 51 and the second non-exposed part 52.

[0073] The second operation button 5 is supported by the housing 2 in the same manner as the first operation button 4, and has the same characteristics as the first operation button 4. For example, the second exposed part 51 has a second inclined part 511 which is inclined from the left side to the right side on the left side of the second exposed part 51 in a direction away from the upper surface 23, and a second flat part 512 adjacent to the second inclined part 511. In the present embodiment, the second inclined part 511 is inclined from the left side to the right side on the left end part of the second exposed part 51 in a direction away from the upper surface 23. Furthermore, the second shaft 55 is provided below the second inclined part 511 of the second exposed part 51, in the same position as the position where the second inclined part 511 is provided relative to the upper surface 23 in the left-right direction. The second shaft 55 is accommodated in the housing 2 so as not to move downward when the second exposed part 51 is pressed downward. In other words, the second shaft 55 is accommodated in the housing 2 so that the entirety of second exposed part 51 does not move downward when the second exposed part 51 is pressed downward. Due to these characteristics, the second operation button 5 has the same effects as the first operation button 4.

[0074] Note that the configurations related to the second operation button 5 (for example, the configurations of the second operation button 5, the main surface side second shaft accommodation part 273, the second spring support part 275, the back surface side second shaft accommodation part 282, the second spring 200, the second switch 172, etc.) can be modified in the same manner as the configurations related to the first operation button 4 (for example, the configurations of the first operation button 4, the main surface side first shaft accommodation part 272, the first spring support part 274, the back surface side first shaft accommodation part 281, the first spring 100, the first switch 171, etc.).

Second Embodiment

[0075] The portable game device according to a second embodiment is basically identical to the portable game device according to the first embodiment, except for the points described below. Thus, the second embodiment of the present disclosure will be described below, focusing on the differences from the first embodiment.

[0076] FIG. 9 is a front view of a portable game device 1' according to the second embodiment of the present disclosure, and FIG. 10 is a top view of the portable game device 1' according to the second embodiment of the present disclosure. In the same manner as in the first embodiment, a housing 2' of the portable game device 1' has a main surface 21', a back surface 22', and a side surface, and the side surface has an upper surface 23', a lower surface 24', a left surface 25', and a right surface 26'. The housing 2' includes a first housing 27' and a second housing 28', and is

formed by assembling the first housing **27'** and the second housing **28'**.

[0077] In the second embodiment, the upper surface **23'** of the housing **2'** has an upper left corner **233**, an upper right corner **234**, and a horizontal part **235** between the upper left corner **233** and the upper right corner **234**. The upper left corner **233** has a round shape and is connected to the left surface **25'**. The upper right corner **234** has a round shape and is connected to the right surface **26'**. The horizontal part **235** is a flat surface and is smoothly connected to the upper left corner **233** and the upper right corner **234**. Note that the upper left corner **233** and the upper right corner **234** may each have a chamfered shape.

[0078] In the second embodiment, the portable game device **1'** further includes a third operation button **11** and a fourth operation button **12** as operation members provided on the upper surface **23'** of the housing **2'**. The third operation button **11** is arranged to the left of the first operation button **4** on the upper surface **23'** of the housing **2'**. In the present embodiment, the first operation button **4** is arranged on the horizontal part **235** of the upper surface **23'**, and the third operation button **11** is arranged on the upper left corner **233** of the upper surface **23'**. On the other hand, the fourth operation button **12** is arranged to the right of the second operation button **5** on the upper surface **23'** of the housing **2'**. In the present embodiment, the second operation button **5** is arranged on the horizontal part **235** of the upper surface **23'**, and the fourth operation button **12** is arranged on the upper right corner **234** of the upper surface **23'**. By arranging the first operation button **4**, the second operation button **5**, the third operation button **11**, and the fourth operation button **12** in the left-right direction on the upper surface of the housing **2'** in this manner, an increase in the thickness of the portable game device **1'** can be prevented. Furthermore, since the first operation button **4**, the second operation button **5**, the third operation button **11**, and the fourth operation button **12** do not protrude from the housing **2'** in the front-rear direction (thickness direction), the back surface of the portable game device **1'** can be made flat.

[0079] Furthermore, in the second embodiment, as shown in FIG. **10**, the first housing **27'** has, in addition to the holes **271a** to **271j**, a hole **271k** through which the third operation button **11** passes and a hole **271l** through which the fourth operation button **12** passes. The hole **271k** opens at the upper left corner **233** of the housing **2'**, and the hole **271l** opens at the upper right corner **234** of the housing **2'**.

[0080] FIG. **11** is a rear view of the portable game device **1'** showing the interior of the housing **2'** in a state in which the second housing **28'** is removed. FIG. **11** shows the portable game device **1'** in a state in which the second housing **28'** is removed. Note that some of the internal components of the portable game device **1'** are omitted in FIG. **11**.

[0081] As shown in FIG. **11**, the portable game device **1'** includes a third switch **173**, a fourth switch **174**, a third spring **300**, and a fourth spring **400**, in addition to a first switch **171**, a second switch **172**, a first spring **100**, and a second spring **200**, as internal components. The third switch **173** is arranged directly below the third operation button **11** in the internal space of the housing **2'** and is pressed by the third operation button **11**. The fourth switch **174** is arranged directly below the fourth operation button **12** in the internal space of the housing **2'** and is pressed by the fourth operation button **12**. The third switch **173** and the fourth switch **174** have the same shape and are arranged at positions which are symmetrical relative to the left-right center line CL of the portable game device **1'**. In the present embodiment, the third switch **173** and the fourth switch **174** have the same shape as the first switch **171** and the second switch **172**. The third switch **173** is arranged to the left of the third spring **300**, and the fourth switch **174** is arranged to the right of the fourth spring **400**. The third switch **173** and the fourth switch **174** are mounted on, for example, a substrate (specifically, the rear surface of the substrate) accommodated in the housing **2'**. The third switch **173** and the fourth switch **174** are, for example, tactile switches. Note that the third switch **173** and the fourth switch **174** may have shapes which are different from each other.

[0082] The third spring **300** is arranged directly below the third operation button **11** in the internal space of the housing **2'** and biases the third operation button **11** upward. The fourth spring **400** is

arranged directly below the fourth operation button **12** in the internal space of the housing **2'** and biases the fourth operation button **12** upward. The third spring **300** and the fourth spring **400** have the same shape and are arranged at positions which are symmetrical relative to the left-right center line CL of the portable game device **1**. The third spring **300** and the fourth spring **400** are, for example, compression coil springs. The third spring **300** and the fourth spring **400** may have different shapes. In another embodiment, the third operation button **11** and the fourth operation button **12** may be biased upward by other elastic bodies or other structures instead of or in addition to springs. For example, if the third switch **173** and the fourth switch **174** are tactile switches, they may be biased upward by dome parts, and if the third switch **173** and the fourth switch **174** are rubber switches, they may be biased upward by key rubbers.

[0083] As shown in FIG. **11**, the first housing **27'** further has a main surface side third shaft accommodation part **276** and a main surface side fourth shaft accommodation part **277**. The main surface side third shaft accommodation part **276** and the main surface side fourth shaft accommodation part **277** are provided on the rear surface (back surface) of the first housing **27'**. The main surface side third shaft accommodation part **276** and the main surface side fourth shaft accommodation part **277** each protrude from the back surface of the first housing **27'** toward the internal space of the housing **2'**. At least one of the main surface side third shaft accommodation part **276** and the main surface side fourth shaft accommodation part **277** may be separate from the first housing **27'** and be attached to the back surface of the first housing **27'** by a fastener (for example, a screw), an adhesive member (for example, an adhesive, an adhesive tape, etc.), etc.

[0084] The main surface side third shaft accommodation part **276** and the main surface side fourth shaft accommodation part **277** have the same shape and are arranged at positions which are symmetrical relative to the left-right center line CL of the portable game device **1'**. The functions of the main surface side third shaft accommodation part **276** and the main surface side fourth shaft accommodation part **277** will be described later.

[0085] FIG. **12** is a front view of the second housing **28'** showing the inner surface of the second housing **28'**. As shown in FIG. **12**, the second housing **28'** further has a back surface side third shaft accommodation part **283** and a back surface side fourth shaft accommodation part **284**. The back surface side third shaft accommodation part **283** and the back surface side fourth shaft accommodation part **284** are provided on the surface (inner surface) on the main surface **21'** side of the second housing **28'**. The back surface side third shaft accommodation part **283** and the back surface side fourth shaft accommodation part **284** each protrude from the inner surface of the second housing **28'** toward the internal space of the housing **2'**. At least one of the back surface side third shaft accommodation part **283** and the back surface side fourth shaft accommodation part **284** may be separate from the second housing **28'** and be attached to the inner surface of the second housing **28'** by a fastener (for example, a screw), an adhesive member (for example, an adhesive, an adhesive tape, etc.), etc.

[0086] The back surface side third shaft accommodation part **283** and the back surface side fourth shaft accommodation part **284** have the same shape and are arranged at positions which are symmetrical relative to the left-right center line CL of the portable game device **1'**. When the first housing **27'** and the second housing **28'** are assembled, the back surface side third shaft accommodation part **283** faces the main surface side third shaft accommodation part **276**, and the back surface side fourth shaft accommodation part **284** faces the main surface side fourth shaft accommodation part **277**. The back surface side third shaft accommodation part **283** supports the third operation button **11** together with the main surface side third shaft accommodation part **276**, and the back surface side fourth shaft accommodation part **284** supports the fourth operation button **12** together with the main surface side fourth shaft accommodation part **277**. The main surface side third shaft accommodation part **276** and the main surface side fourth shaft accommodation part **277** may have shapes which are different from each other. Furthermore, the back surface side third shaft accommodation part **283** and the back surface side fourth shaft accommodation part **284** may have

shapes which are different from each other.

[0087] The configurations of the third operation button **11** and the fourth operation button **12** will be described in detail below. The third operation button **11** is supported in the housing **2'** so as to be linearly and rotatably movable, and presses the third switch **173** when linearly or rotatably operated by the user. The fourth operation button **12** is supported in the housing **2'** so as to be linearly and rotatably movable, and presses the fourth switch **174** when linearly or rotatably operated by the user.

[0088] FIG. **13** is a front view of the third operation button **11**, and FIG. **14** is a rear perspective view of the third operation button **11**. The third operation button **11** has a third keytop part **110**, a third base part **113**, a third protrusion **114**, a third shaft **115**, and a third shaft base part **116**. The third keytop part **110**, the third base part **113**, the third protrusion **114**, the third shaft **115**, and the third shaft base part **116** are integrally molded.

[0089] The third keytop part **110** is a part which is positioned outward when the third operation button **11** is provided on the portable game device **1'**. The third keytop part **110** is contacted by a finger of the user (typically the index finger of the left hand) when the user operates the third operation button **11**. The third keytop part **110** is smaller than the hole **271k** of the housing **2'**. The third keytop part **110** passes through the hole **271k** and is partially exposed from the housing **2'**.

[0090] The third keytop part **110** is composed of a third exposed part **111** which is exposed from the housing **2'**, and a third non-exposed part **112** which is not exposed from the housing **2**. The third exposed part **111** is positioned outside the upper surface **23'**, and the third non-exposed part **112** is positioned to the internal space side relative to the upper surface **23'**. In FIG. **13**, the third exposed part **111** is represented by diagonal lines for convenience in order to distinguish between the third exposed part **111** and the third non-exposed part **112**. FIG. **15** is an enlarged view of the portion of FIG. **11** where the third operation button **11** is provided. As shown in FIG. **15**, the third exposed part **111** extends along an upper left corner **233** of the housing **2'** outside the housing **2'**.

[0091] As is clear from FIG. **9**, the right end part of the third exposed part **111** of the third operation button **11** is arranged to the left of the left end part of the first exposed part **41** of the first operation button **4** on the upper surface **23'**. When the first operation button **4** is operated by the user, the first operation button **4** rotates so that the left end part of the first exposed part **41** moves downward. In such a rotational operation, the fingers of the left hand of the user tend to move to the left side as compared to an operation in which the first operation button **4** is pressed vertically downward. Thus, by arranging the third exposed part **111** to the left of the first exposed part **41** of the first operation button **4**, which can only rotate, continuous button operation from the first operation button **4** to the third operation button **11** can be facilitated.

[0092] The third base part **113** is positioned below the third keytop part **110**, and the third keytop part **110** protrudes outward from an upper surface of the third base part **113**. The third base part **113** is larger than the hole **271k** of the housing **2'** and is arranged in the internal space of the housing **2'**. The third base part **113** has a shape which conforms to the upper left corner **233** of the housing **2'**, and the upper surface thereof abuts against the inner surface of the housing **2'** due to the biasing force of the third spring **300**. As a result, the third operation button **11** can be prevented from falling into the internal space of the housing **2'** and becoming unable to return to its original position when the third operation button **11** is pressed downward.

[0093] The third protrusion **114** has a substantially cylindrical shape and protrudes downward from the lower surface of the third base part **113**. The third protrusion **114** faces the third switch **173** in the internal space of the housing **2'**. As shown in FIG. **15**, the third switch **173** has a protrusion **1731** extending toward the third base part **113** of the third operation button **11**. The third protrusion **114** presses the protrusion **1731** of the third switch **173** when the third operation button **11** is operated. Note that the third switch **173** may have a shape which is different from that of the first switch **171**, and the third protrusion **114** may be omitted as long as the protrusion **1731** of the third switch **173** is formed so as to be pressed by the third base part **113**, etc.

[0094] The third shaft base part **116** protrudes downward from the lower surface of the third base part **113**. The third shaft **115** protrudes forward from the front surface of the third shaft base part **116** and protrudes rearward from the rear surface of the third shaft base part **116**. That is, the third shaft **115** extends in the front-rear direction from the third shaft base part **116**. The third shaft **115** is connected to the third base part **113** and the third keytop part **110** via the third shaft base part **116**. The third shaft **115** has a cylindrical shape and serves as the rotation center of the third operation button **11**. That is, the third operation button **11** rotates about the third shaft **115** relative to the housing **2'**.

[0095] The third shaft **115** is arranged in the internal space of the housing **2'**. The third shaft **115** extends in the front-rear direction and is arranged to the right of the third switch **173** in the internal space of the housing **2'**. As shown in FIG. **15**, one end part (lower end part) of the third spring **300** is accommodated in a recess of the main surface side third shaft accommodation part **276**, and the other end part (upper end part) of the third spring **300** abuts against the third shaft **115**. That is, the third shaft **115** is supported by the housing **2'** via the third spring **300**. The main surface side third shaft accommodation part **276** restricts movement of the third spring **300** in the left-right direction while allowing the third spring **300** to expand and contract. As a result, position deviation of the third spring **300** can be prevented.

[0096] Further, one end part (front end part) of the third shaft **115** is accommodated in the main surface side third shaft accommodation part **276** of the first housing **27'**, and the other end part (rear end part) of the third shaft **115** is accommodated in the back surface side third shaft accommodation part **283** of the second housing **28'**. Specifically, the main surface side third shaft accommodation part **276** has an accommodation hole extending in the upward-downward direction, in which the front end part of the third shaft **115** is accommodated, and the back surface side third shaft accommodation part **283** has an accommodation hole extending in the upward-downward direction, in which the rear end part of the third shaft **115** is accommodated. When the third operation button **11** is attached to the housing **2'**, first, the front end part of the third shaft **115** is accommodated in the main surface side third shaft accommodation part **276**, and the third shaft **115** moves upward within the accommodation hole of the main surface side third shaft accommodation part **276** to expose the third exposed part **111** from the housing **2'** through the hole **271k**. When the third shaft **115** is biased by the third spring **300** in a state in which the third exposed part **111** is exposed from the housing **2'**, the state of the third operation button **11** is maintained. Next, when the second housing **28'** is fastened to the first housing **27'**, the rear end part of the third shaft **115** is accommodated in the back surface side third shaft accommodation part **283**. As a result, the main surface side third shaft accommodation part **276** and the back surface side third shaft accommodation part **283** restrict the movement of the third shaft **115** in the left-right direction while allowing the third shaft **115** to move linearly (in the upward-downward direction) and rotate. Thus, the third shaft **115** has two degrees of freedom for linear movement and rotation. Note that the third operation button **11** may have a shaft accommodation part, and the housing **2'** may have a third shaft which serves as a rotation center of the third operation button **11**.

[0097] When a force for moving the third shaft **115** downward against the biasing force of the third spring **300** is applied to the third operation button **11**, for example, when the third exposed part **111** is pressed vertically downward near directly above the third shaft **115**, the third shaft **115** moves downward within the accommodation holes of the main surface side third shaft accommodation part **276** and the back surface side third shaft accommodation part **283**. On the other hand, when such a force is released, the third shaft **115** moves upward within the accommodation holes of the main surface side third shaft accommodation part **276** and the back surface side third shaft accommodation part **283**. Thus, the third shaft **115** is accommodated in the housing **2'** so that the entirety of the third exposed part **111** sinks when the third exposed part **111** is pressed downward. That is, the third operation button **11** can be linearly moved so that the entirety of the third exposed part **111** sinks when the third exposed part **111** is pressed downward, and the third switch **173** is

pressed by the linear operation by the user. In this case, a different sense of operation is created between the first operation button **4** to which the linear operation is not applied and the third operation button **11** to which the linear operation is applied. Thus, the user can be prevented from confusing the first operation button **4** with the third operation button **11**, whereby the user can be prevented from erroneously operating the buttons.

[0098] On the other hand, when a force for rotating the third shaft **115** so that the left end part of the third exposed part **111** sinks is applied to the third operation button **11**, for example, when the third exposed part **111** is pressed downward on the left side of the third shaft **115**, the third shaft **115** rotates within the accommodation holes of the main surface side third shaft accommodation part **276** and the back surface side third shaft accommodation part **283**. Thus, in the present embodiment, the third shaft **115** is accommodated in the housing **2'** so as to be linearly movable so that the entirety of the third exposed part **111** sinks when the third exposed part **111** is pressed downward, and so as to be rotatable so that the left end part of the third exposed part **111** sinks when the third exposed part **111** is pressed downward. That is, the third operation button **11** can move linearly so that the entirety of the third exposed part **111** sinks when the third exposed part **111** is pressed downward, and can rotate so that the left end part of the third exposed part **111** sinks when the third exposed part **111** is pressed downward, and the third switch **173** is pressed by a linear operation or rotational operation by the user. Thus, the third operation button **11** can be operated in two types of operation modes, and the operability of the third operation button **11** can be further improved.

[0099] Furthermore, as described above, the third exposed part **111** extends along the upper left corner **233** of the housing **2** outside the housing **2**. As a result, a force in a direction for rotating the third shaft **115** can be more easily generated when the third exposed part **111** is pressed, thereby further improving the operability of the third operation button **11**.

[0100] Further, the third shaft **115** is arranged between the right end part of the third exposed part **111** and the center of the third exposed part **111** in the left-right direction. Thus, the space required for providing the third operation button **11** can be made smaller than when the third shaft **115** is arranged outside both ends of the third exposed part **111**. Furthermore, the distance from the first operation button **4** to the third shaft **115** in the left-right direction can be shortened, making it easier to operate (linear operation) by pressing down the third operation button **11** after operating the first operation button **4**.

[0101] FIG. **16** is a front view of the fourth operation button **12**. As shown in FIG. **11**, the third operation button **11** and the fourth operation button **12** are arranged at positions which are symmetrical relative to the left-right center line CL of the portable game device **1'**, and have shapes which are symmetrical relative to the left-right center line CL. That is, the fourth operation button **12** has a fourth keytop part **120**, a fourth base part **123**, a fourth protrusion **124**, a fourth shaft **125**, and a fourth shaft base part **126**, in the same manner as the third operation button **11**. The fourth keytop part **120**, the fourth base part **123**, the fourth protrusion **124**, the fourth shaft **125**, and the fourth shaft base part **126** are integrally molded. Furthermore, the fourth keytop part **120**, in the same manner as the third keytop part **110**, is composed of a fourth exposed part **121** and a fourth non-exposed part **122**. In FIG. **16**, the fourth exposed part **121** is represented by diagonal lines for convenience in order to distinguish the fourth exposed part **121** from the fourth non-exposed part **122**.

[0102] The fourth operation button **12** is supported by the housing **2'**, in the same manner as the third operation button **11**, and has the same characteristics as the third operation button **11**. For example, as is clear from FIG. **9**, the left end part of the fourth exposed part **121** of the fourth operation button **12** is arranged to the right of the right end part of the second exposed part **51** of the second operation button **5** on the upper surface **23'**. The fourth exposed part **121** extends along the upper right corner **234** of the housing **2'** outside the housing **2'**. The fourth shaft **125** is accommodated in the housing **2'** so as to be linearly movable so that the entirety of fourth exposed

part **121** sinks when the fourth exposed part **121** is pressed downward, and so as to be rotatable so that the right end part of the fourth exposed part **121** sinks when the fourth exposed part **121** is pressed downward. That is, the fourth operation button **12** can move linearly so that the entirety of fourth exposed part **121** sinks when the fourth exposed part **121** is pressed downward, and can rotate so that the right end part of the fourth exposed part **121** sinks when the fourth exposed part **121** is pressed downward, and the fourth switch **174** is pressed by the linear or rotational operation by the user. Due to these characteristics, the fourth operation button **12** has the same effect as the third operation button **11**.

[0103] Note that the configurations related to the fourth operation button **12** (for example, the configurations of the fourth operation button **12**, the main surface side fourth shaft accommodation part **277**, the back surface side fourth shaft accommodation part **284**, the fourth spring **400**, the fourth switch **174**, etc.) can be modified in the same manner as the configurations related to the third operation button **11** (for example, the configurations of the third operation button **11**, the main surface side third shaft accommodation part **276**, the back surface side third shaft accommodation part **283**, the third spring **300**, the third switch **173**, etc.).

[0104] Further, in the present embodiment, the first operation button **4** and the third operation button **11** are arranged within a range where the index finger of the left hand of the user extends when the left hand of the user is placed on the left surface **25'** of the housing **2**. As a result, the first operation button **4** and the third operation button **11** can be operated with the index finger, improving the operability of the portable game device **1'**. Additionally, both the first operation button **4** and the third operation button **11** can be operated simultaneously with one finger by operating in such a manner that the third operation button **11** is pressed downward with the pad of the finger while rotating the first operation button **4** with the fingertip. Furthermore, both the first operation button **4** and the third operation button **11** can be operated simultaneously with one finger by operating in such a manner that the first operation button **4** is rotated with the fingertip or pad of the finger, and the third operation button **11** is rotated with the part between the first joint and the third joint of the finger.

[0105] The second operation button **5** and the fourth operation button **12** are arranged within a range where the index finger of the right hand of the user extends when the right hand of the user is placed on the right surface **26'** of the housing **2**. As a result, the second operation button **5** and the fourth operation button **12** can be operated with one finger, improving the operability of the portable game device **1'**. Further, both the second operation button **5** and the fourth operation button **12** can be operated simultaneously with one finger by operating in such a manner that the fourth operation button **12** is pressed downward with the pad of the finger while rotating the second operation button **5** with the fingertip. Furthermore, both the second operation button **5** and the fourth operation button **12** can be operated simultaneously with one finger by operating in such a manner that the second operation button **5** is rotated with the fingertip or pad of the finger, and the fourth operation button **12** is rotated with the part between the first joint and the third joint of the finger.

[0106] When the index finger is placed at an angle to the upper surface **23'**, the tip of the index finger is displaced from the center of the upper surface **23'** in the front-rear direction more than the base of the index finger. Thus, in the present embodiment, as shown in FIG. **10**, the length in the front-rear direction of the first exposed part **41** of the first operation button **4** distant from the left surface **25'** is longer than the length in the front-rear direction of the third exposed part **111** of the third operation button **11** close to the left surface **25'**, and the length in the front-rear direction of the second exposed part **51** of the second operation button **5** distant from the right surface **26'** is longer than the length in the front-rear direction of the fourth exposed part **121** of the fourth operation button **12** close to the right surface **26'**. That is, the length of the first exposed part **41** is longer than the length of the third exposed part **111** in the front-rear direction, and the length of the second exposed part **51** is longer than the length of the fourth exposed part **121** in the front-rear

direction. As a result, a decrease in the operability of the first operation button **4** and the second operation button **5** when the index finger is placed at an angle to the upper surface **23'** can be suppressed.

[0107] Furthermore, in the present embodiment, as shown in FIG. **10**, the position of the front end part of the first exposed part **41** in the front-rear direction is equivalent to the position of the front end part of the third exposed part **111**, and the position of the front end part of the second exposed part **51** in the front-rear direction is equivalent to the position of the front end part of the fourth exposed part **121**. As a result, both the first operation button **4** and the third operation button **11** can be operated simultaneously with the index finger, whereby both the second operation button **5** and the fourth operation button **12** can be operated simultaneously with the index finger.

[0108] Specific examples of dimensions relating to the arrangements of the first operation button **4**, the second operation button **5**, the third operation button **11**, and the fourth operation button **12** will be described below. Note that the following dimensions are merely examples, and the dimensions relating to the arrangements of the first operation button **4**, the second operation button **5**, the third operation button **11**, and the fourth operation button **12** may be outside the ranges of values given below. FIG. **17** is a partially-enlarged front view of the portable game device **1'** showing the portion where the first operation button **4** and the third operation button **11** are arranged.

[0109] In the present embodiment, the distance (distance **D** in FIG. **17**) from the right end part of the first exposed part **41** to the left end part of the third exposed part **111** in the left-right direction is set to 30 mm to 40 mm. This dimension enables a typical user to operate the first operation button **4** and the third operation button **11** with the index finger, improving the operation of the portable game device **1'**.

[0110] Furthermore, the interval (distance **B** in FIG. **17**) between the first exposed part **41** and the third exposed part **111** in the left-right direction is set to 3 mm to 10 mm. This dimension enables the first operation button **4** and the third operation button **11** to be operated continuously, while preventing the user from unintentionally pressing the first operation button **4** and the third operation button **11** simultaneously. This dimension also enables the index finger to be in contact with both the first operation button **4** and the third operation button **11** when the first operation button **4** and the third operation button **11** are not pressed. This allows the user to intuitively understand the positions of the first operation button **4** and the third operation button **11** with the index finger, enabling the first operation button **4** and the third operation button **11** to be operated quickly.

[0111] Furthermore, the length (distance **C** in FIG. **17**) of the first exposed part **41** in the left-right direction is set to 10 mm to 15 mm and is made longer than the interval between the first exposed part **41** and the third exposed part **111** in the left-right direction. As a result, the surface area of the first exposed part **41** can be secured within a limited space, whereby the operability of the first operation button **4** is improved.

[0112] Furthermore, the length (distance **A** in FIG. **17**) of the third exposed part **111** in the left-right direction is set to 15 mm to 20 mm. By setting the distance of the third exposed part **111** of the third operation button **11** configured to be linearly movable and rotatable to 15 mm to 20 mm, the third operation button **11** can easily be operated in two types of operation modes, linear operation and rotational operation (for example, linear operation by the pad of the finger and rotational operation by the part between the first joint and third joint of the finger).

[0113] Furthermore, the length of the third exposed part **111** in the left-right direction is made longer than the interval between the first exposed part **41** and the third exposed part **111** in the left-right direction and the length of the first exposed part **41** in the left-right direction. As a result, the surface area of the third exposed part **111** can be secured within a limited space, thereby improving the operability of the third operation button **11**. The surface length of the third exposed part **111** along the shape of the upper left corner **233** of the housing **2** is set to 20 mm to 25 mm.

[0114] The second operation button **5** and the fourth operation button **12** are arranged in positions

which are symmetrical with the first operation button **4** and the third operation button **11** relative to the left-right center line CL of the portable game device **1'**. Thus, the dimensions relating to the arrangements of the second operation button **5** and the fourth operation button **12** are identical to the dimensions relating to the arrangements of the first operation button **4** and the third operation button **11**, and the same effects as those described above are achieved.

[0115] As an example, the distance from the left end part of the second exposed part **51** to the right end part of the fourth exposed part **121** in the left-right direction is set to 30 mm to 40 mm. The interval between the second exposed part **51** and the fourth exposed part **121** in the left-right direction is set to 3 mm to 10 mm. The length of the second exposed part **51** in the left-right direction is set to 10 mm to 15 mm and is made longer than the interval between the second exposed part **51** and the fourth exposed part **121** in the left-right direction. The length of the fourth exposed part **121** in the left-right direction is set to 15 mm to 20 mm and is made longer than the interval between the second exposed part **51** and the fourth exposed part **121** in the left-right direction and the length of the second exposed part **51** in the left-right direction. The surface length of the fourth exposed part **121** along the shape of the upper right corner **234** of the housing **2** may be set to 20 mm to 25 mm.

[0116] Note that in the second embodiment, the third operation button **11** and the fourth operation button **12** may be configured so as to not rotate. That is, the third operation button **11** and the fourth operation button **12** may have one degree of freedom of linear movement only (movement in the upward-downward direction). In this case, the third shaft **115** of the third operation button **11** is omitted, and the third operation button **11** is supported by the housing **2'** so that the entirety of third exposed part **111** sinks downward when the third exposed part **111** is pressed downward. For example, the third base part **113** of the third operation button **11** is supported by the housing **2'** via the third spring **300**. Furthermore, the fourth shaft **125** of the fourth operation button **12** is omitted, and the fourth operation button **12** is supported by the housing **2'** so that the entirety of fourth exposed part **121** sinks downward when the fourth exposed part **121** is pressed downward. For example, the fourth base part **123** of the fourth operation button **12** is supported by the housing **2'** via a fourth spring **400**.

Other Embodiments

[0117] Though the preferred embodiments of the present disclosure have been described above, the present disclosure is not limited to these embodiments, and various modifications and changes can be made.

[0118] For example, in the first embodiment, the upper surface **23** of the housing **2** may have an upper left corner, an upper right corner, and a horizontal part between the upper left corner and the upper right corner in the same manner as the second embodiment. In this case, the first operation button **4** may be arranged in the upper left corner, and the second operation button **5** may be arranged in the upper right corner. Furthermore, in the second embodiment, the entirety of upper surface **23** of the housing **2'** may be a flat surface in the same manner as the first embodiment. In this case, the third exposed part **111** of the third operation button **11** and the fourth exposed part **121** of the fourth operation button **12** extend along the flat surface.

[0119] Furthermore, the housings **2**, **2'** may include three or more members (for example, a main surface member, a back surface member, and a connection member) and may be formed by assembling these members. Furthermore, an air intake port or the like for drawing air into the internal space of the housings **2**, **2'** may be formed on the lower surfaces **24**, **24'** of the housings **2**, **2'**. Furthermore, internal components may be attached to the second housings **28**, **28'**, and the first housings **27**, **27'** may cover the internal components attached to the second housings **28**, **28'**.

Claims

1. A portable game device, comprising: a display, a first button and a second button to be operated by a user, and a housing having a main surface in which the display is provided, a back surface positioned on an opposite side of the main surface, and a side surface connecting the main surface and the back surface, wherein the side surface has an upper surface positioned upward when viewed by the user in a state in which the portable game device is held by the user such that the user faces the main surface, a lower surface positioned on an opposite side of the upper surface, a left surface positioned left when viewed by the user in the state, and a right surface positioned on an opposite side of the left surface, the first button is arranged on the upper surface in an area closer to the left surface than the right surface, and the second button is arranged on the upper surface in an area closer to the right surface than the left surface, the first button has a first exposed part exposed from the housing, and a first shaft serving as a rotation center of the first button, the first exposed part has, on the right surface side of the first exposed part, a first inclined part inclined from the right surface side toward the left surface side in a direction away from the upper surface, the first shaft is provided on the lower surface side of the first inclined part, in the same position as a position where the first inclined part is provided relative to the upper surface in a left-right direction between the left surface and the right surface, and is accommodated in the housing so as to be rotatable in a direction in which an end part on the left surface side of the first exposed part sinks when the first exposed part is pressed toward the lower surface side and so as to prevent an entirety of the first exposed part from moving toward the lower surface side, the second button has a second exposed part exposed from the housing, and a second shaft serving as a rotation center of the second button, the second exposed part has, on the left surface side of the second exposed part, a second inclined part inclined from the left surface side toward the right surface side in a direction away from the upper surface, and the second shaft is provided on the lower surface side of the second inclined part, in the same position as a position where the second inclined part is provided relative to the upper surface in the left-right direction, and is accommodated in the housing so as to be rotatable in a direction in which an end part on the right surface side of the second exposed part sinks when the second exposed part is pressed toward the lower surface side and so as to prevent an entirety of the second exposed part from moving toward the lower surface side.

2. The portable game device according to claim 1, further comprising a third button and a fourth button to be operated by a user, wherein the third button has a third exposed part exposed from the housing, and the fourth button has a fourth exposed part exposed from the housing, and on the upper surface, an end part on the right surface side of the third exposed part is arranged closer to the left surface than the end part on the left surface side of the first exposed part, and on the upper surface, an end part on the left surface side of the fourth exposed part is arranged closer to the right surface than the end part on the right surface side of the second exposed part.

3. The portable game device according to claim 2, wherein the third button is capable of moving linearly so that an entirety of the third exposed part sinks when the third exposed part is pressed toward the lower surface side, and the fourth button is capable of moving linearly so that an entirety of the fourth exposed part sinks when the fourth exposed part is pressed toward the lower surface side.

4. The portable game device according to claim 3, wherein the third button has a third shaft serving as a rotation center of the third button, the third shaft is accommodated in the housing so as to be capable of moving linearly so that the entirety of the third exposed part sinks when the third exposed part is pressed toward the lower surface side, and so as to be rotatable so that an end part on the left surface side of the third exposed part sinks when the third exposed part is pressed toward the lower surface side, and the fourth button has a fourth shaft serving as a rotation center of the fourth button, the fourth shaft is accommodated in the housing so as to be capable of moving linearly so that the entirety of the fourth exposed part sinks when the fourth exposed part is pressed toward the lower surface side, and so as to be rotatable so that an end part on the right surface side

of the fourth exposed part sinks when the fourth exposed part is pressed toward the lower surface side.

5. The portable game device according to claim 4, wherein the upper surface has an upper left corner connected to the left surface and having a round shape or a chamfered shape, and an upper right corner connected to the right surface and having a round shape or a chamfered shape, the third exposed part extends along the upper left corner outside the housing, and the fourth exposed part extends along the upper right corner outside the housing.

6. The portable game device according to claim 2, wherein the first exposed part and the third exposed part are arranged in a range where an index finger of a left hand of a user extends when the left hand is placed on the left surface, and the second exposed part and the fourth exposed part are arranged in a range where an index finger of a right hand of a user extends when the right hand is placed on the right surface.

7. The portable game device according to claim 2, wherein a distance from an end part on the right surface side of the first exposed part to an end part on the left surface side of the third exposed part in the left-right direction is 30 mm to 40 mm, and a distance from an end part on the left surface side of the second exposed part to an end part on the right surface side of the fourth exposed part in the left-right direction is 30 mm to 40 mm.

8. The portable game device according to claim 6, wherein in a front-rear direction between the main surface and the back surface, a length of the first exposed part is longer than a length of the third exposed part, and in the front-rear direction, a length of the second exposed part is longer than a length of the fourth exposed part.

9. The portable game device according to claim 8, wherein in the front-rear direction, a position of an end part on the main surface side of the first exposed part is equivalent to a position of an end part on the main surface side of the third exposed part, and in the front-rear direction, a position of an end part on the main surface side of the second exposed part is equivalent to a position of an end part on the main surface side of the fourth exposed part.

10. The portable game device according to claim 7, wherein an interval between the first exposed part and the third exposed part in the left-right direction is 3 mm to 10 mm, and an interval between the second exposed part and the fourth exposed part in the left-right direction is 3 mm to 10 mm.

11. The portable game device according to claim 10, wherein a length of the first exposed part in the left-right direction is longer than the interval between the first exposed part and the third exposed part in the left-right direction, and a length of the second exposed part in the left-right direction is longer than the interval between the second exposed part and the fourth exposed part in the left-right direction, and a length of the third exposed part in the left-right direction is longer than the length of the first exposed part in the left-right direction, and a length of the fourth exposed part in the left-right direction is longer than the length of the second exposed part in the left-right direction.
