US011966248B2

(12) **United States Patent**
Ishihara et al.

(10) **Patent No.: US 11,966,248 B2**
(45) **Date of Patent: Apr. 23, 2024**

(54) **OPERATION DEVICE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/179,888**

(22) Filed: **Mar. 7, 2023**

(65) **Prior Publication Data**

US 2023/0297129 A1 Sep. 21, 2023

(30) **Foreign Application Priority Data**

Mar. 15, 2022 (JP) 2022-040799

(51) **Int. Cl.**
G05G 1/02 (2006.01)
H01H 3/02 (2006.01)

(52) **U.S. Cl.**
CPC ***G05G 1/02*** (2013.01); ***H01H 3/02*** (2013.01); *H01H 2003/028* (2013.01); *H01H 2003/0293* (2013.01)

(58) **Field of Classification Search**
CPC G05G 1/02; H01H 3/02; H01H 2003/028; H01H 2003/0293; H01H 2235/004; H01H 13/00; H01H 13/14; H01H 13/20; H01H 13/28; H01H 13/50; H01H 13/52; H01H 13/70; H01H 13/7065; H01H 2221/058; H01H 3/00; H01H 3/04; H01H 3/06; H01H 3/12; H01H 3/122; H01H 3/125; H01H 3/32; H01H 3/46; H01H 2221/00; H01H 2221/05
USPC 200/341
See application file for complete search history.

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(57) **ABSTRACT**

An operation device includes an operating portion to receive a push-in operation, a lessening member to lessen tilt movement of the operating portion associated with the push-in operation, a supporting portion to support the lessening member, a base portion on which the supporting portion is provided, and at least one placement portion that is provided on the base portion, includes a placing surface to place an end portion of the lessening member, and holds the lessening member on the base portion by the placing surface and the supporting portion in a preparation stage for assembling the operating portion to the base portion.

8 Claims, 7 Drawing Sheets

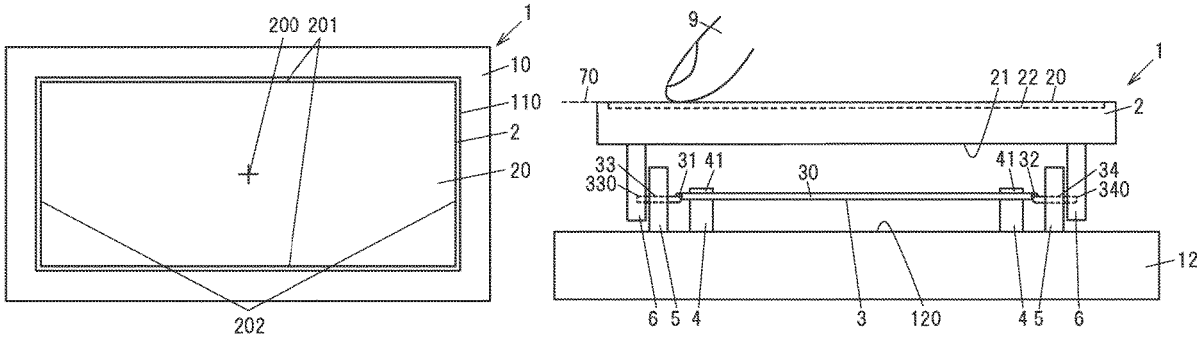


FIG. 1A

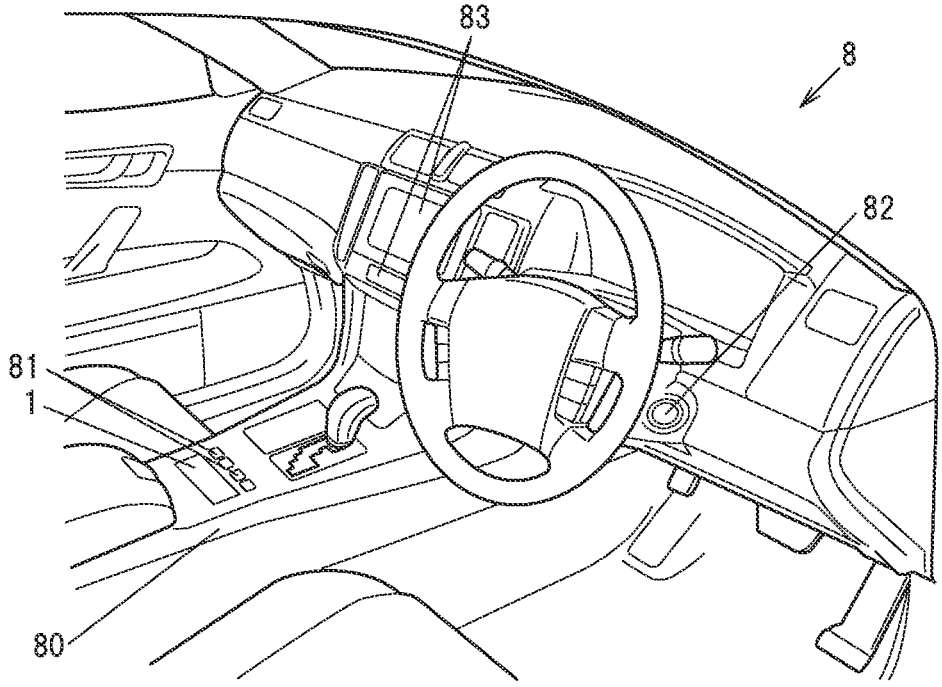


FIG. 1B

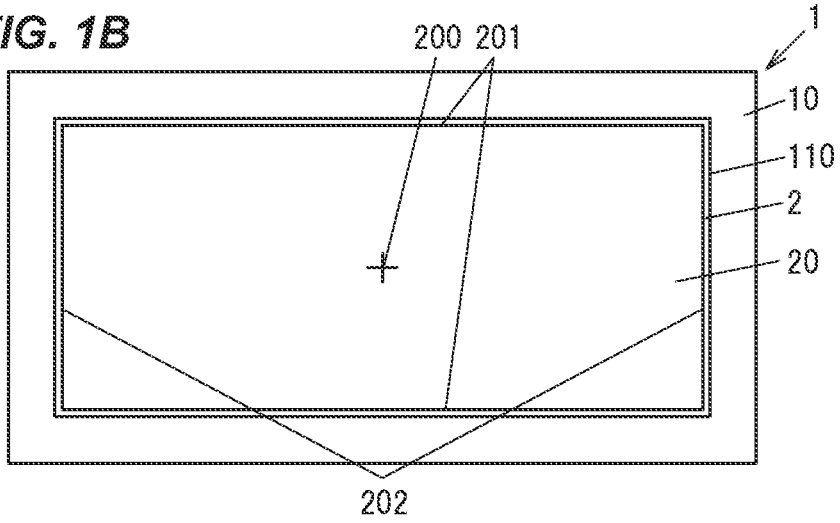


FIG. 1C

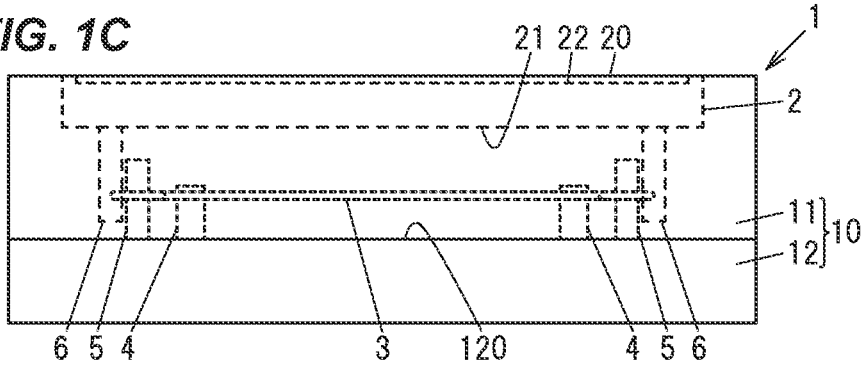


FIG. 2A

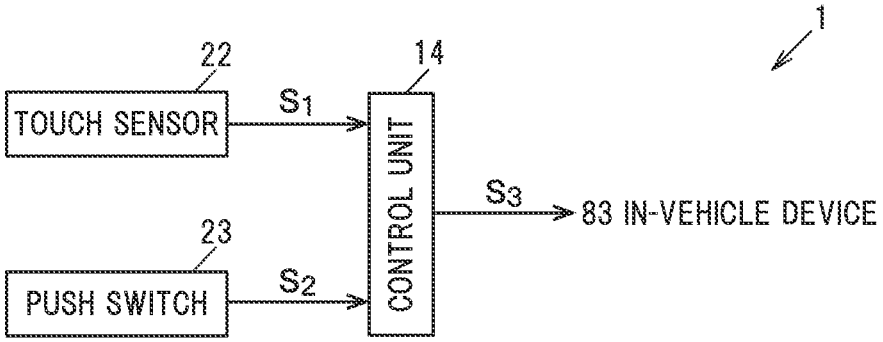


FIG. 2B

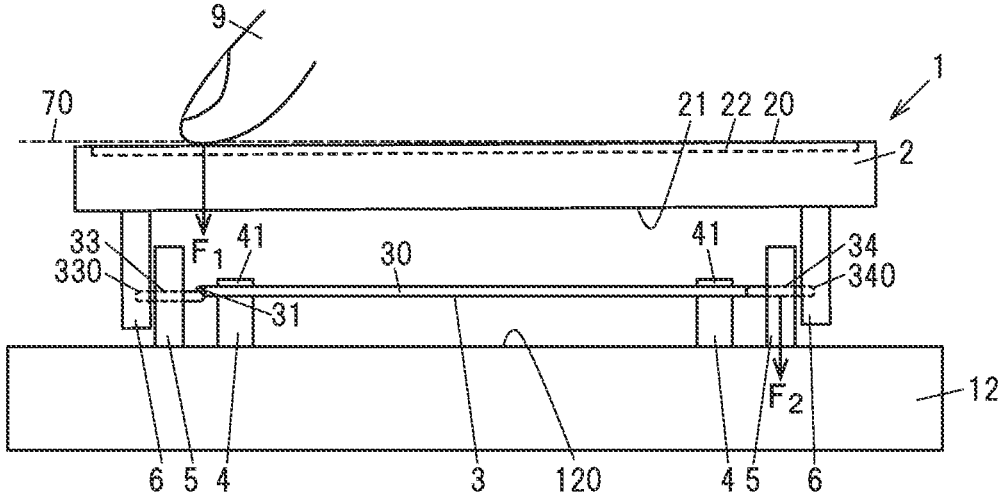


FIG. 2C

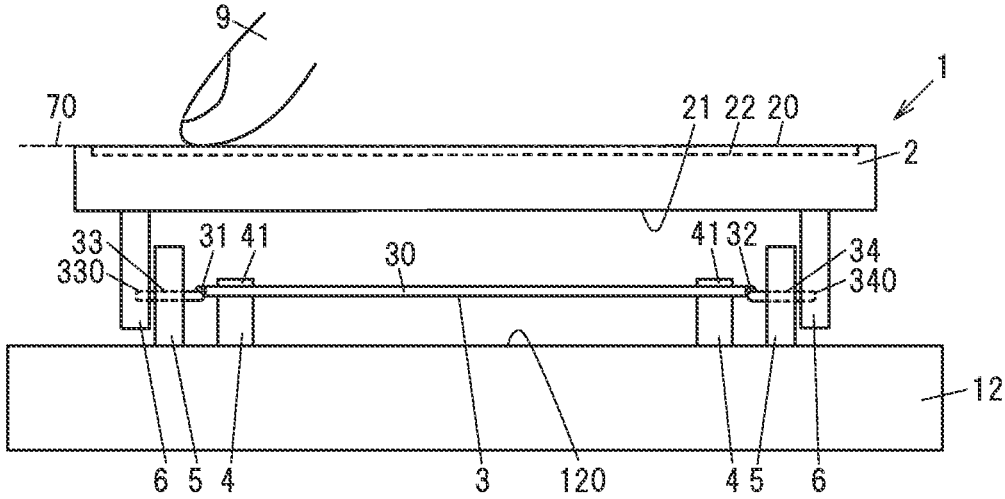


FIG. 3A

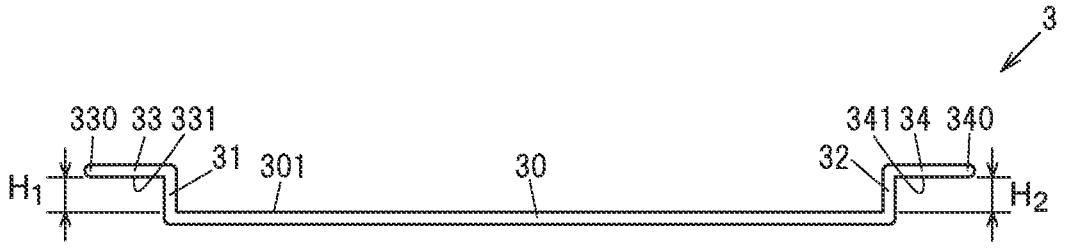


FIG. 3B

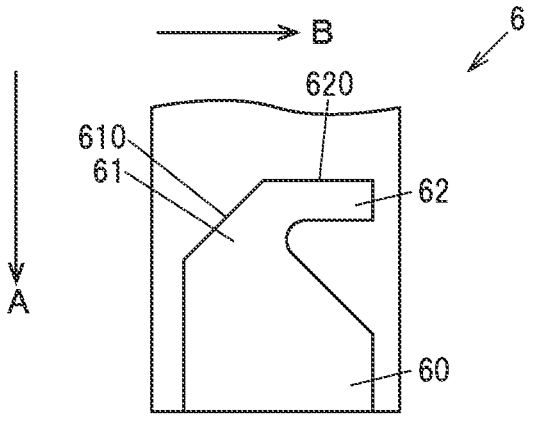


FIG. 4A

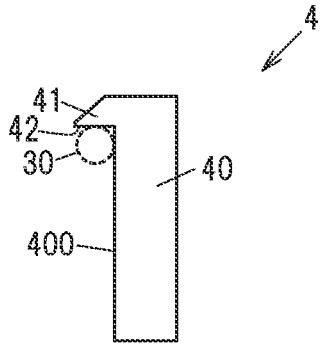


FIG. 4B

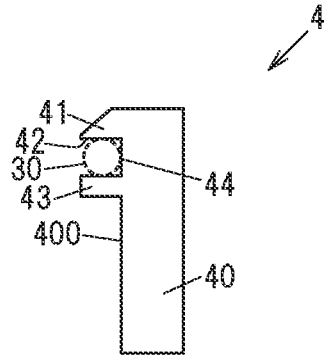


FIG. 4C

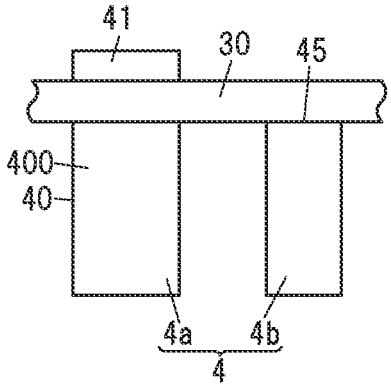


FIG. 5A

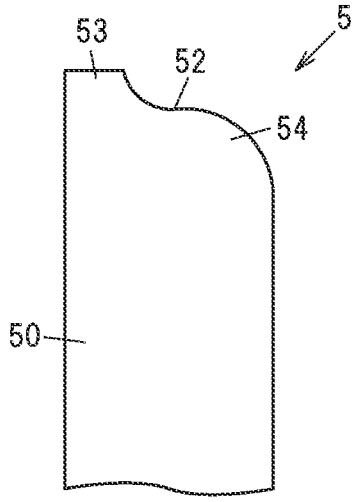


FIG. 5B

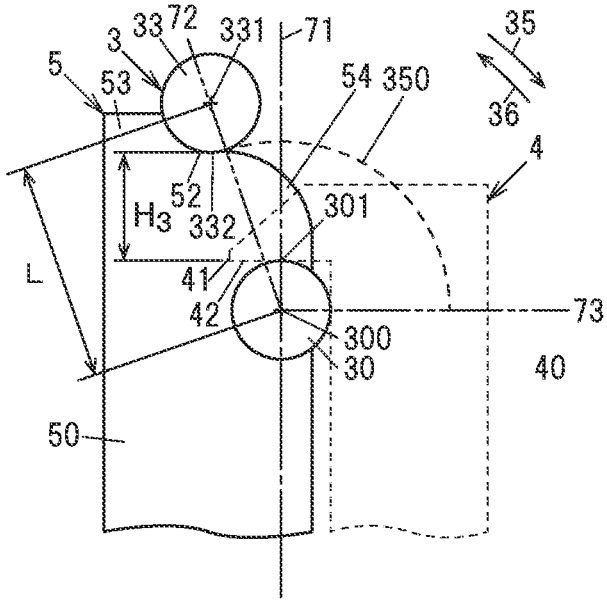


FIG. 5C

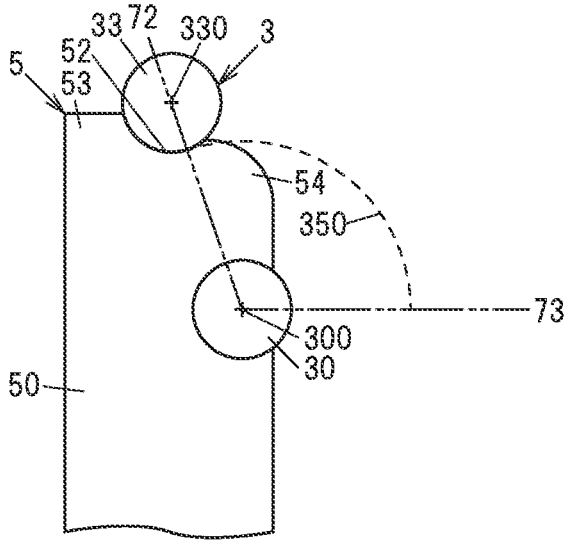


FIG. 6A

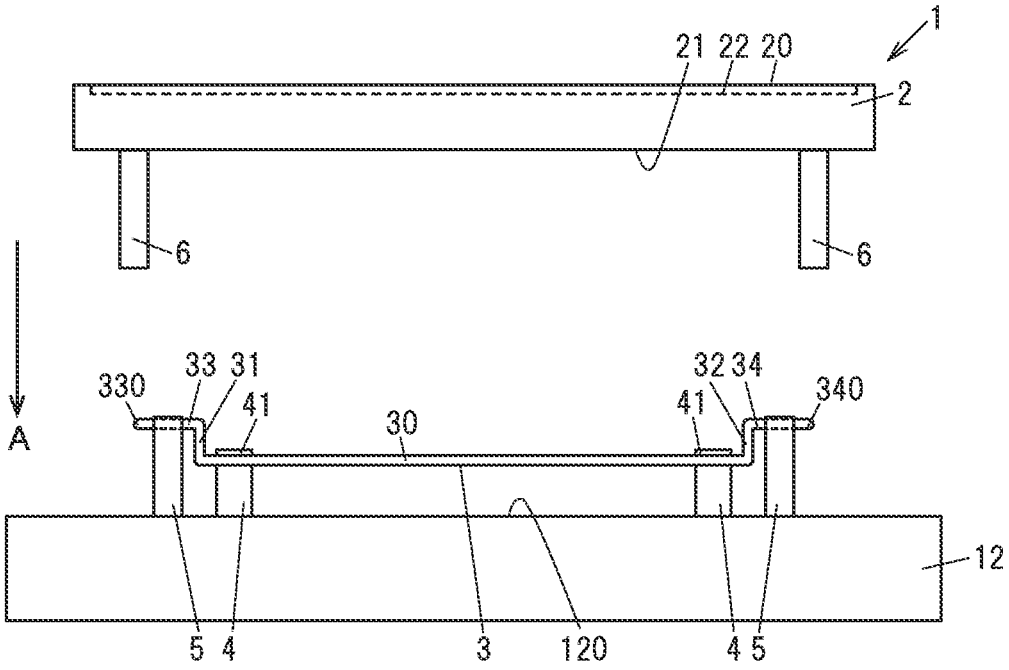

1
21 22 20
2
6
6
A
330
33 31
41
30
32 34
41
340
12
5 4
3
120
4 5

FIG. 6B

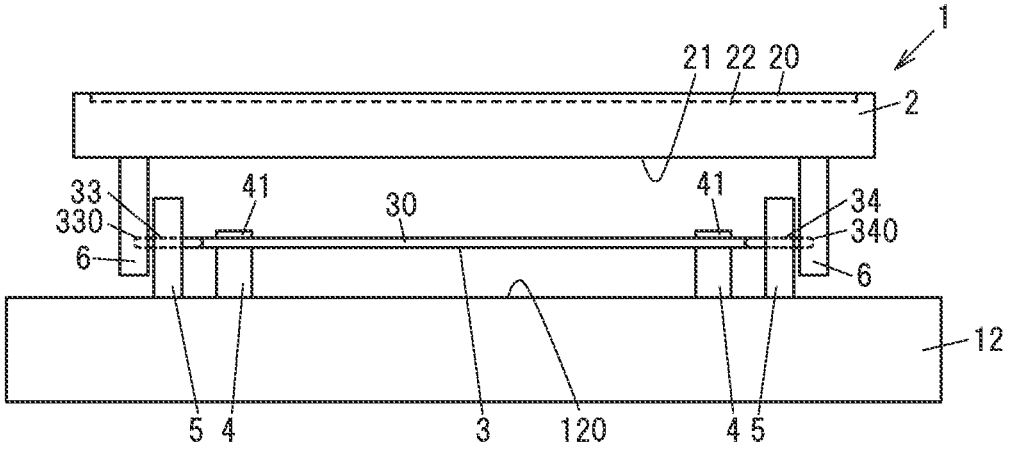

1
21 22 20
2
33
330
6
41
30
41
34
340
6
12
5 4
3
120
4 5

FIG. 7A

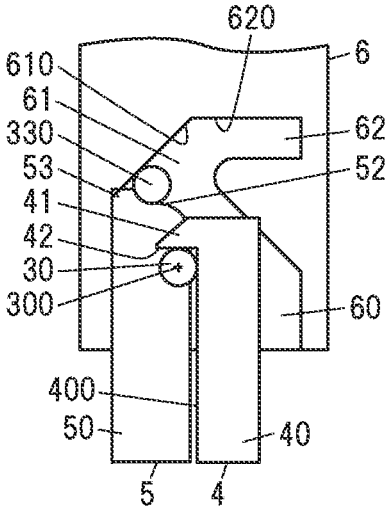


FIG. 7B

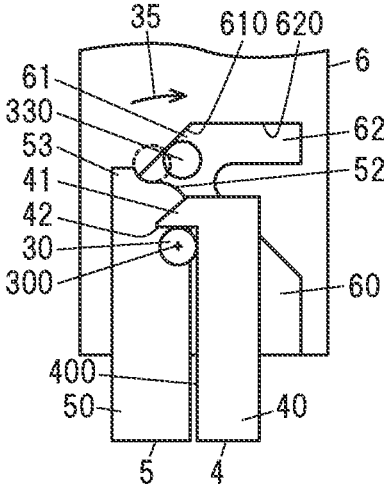


FIG. 7C

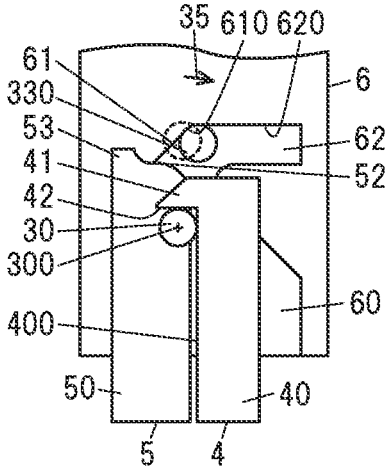


FIG. 7D

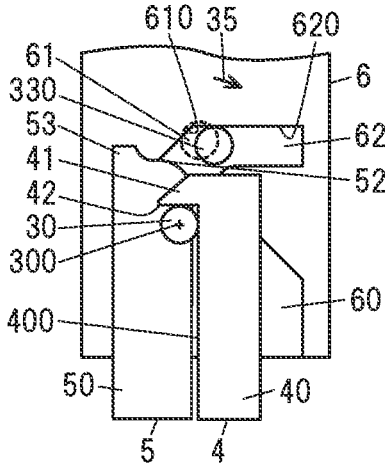


FIG. 7E

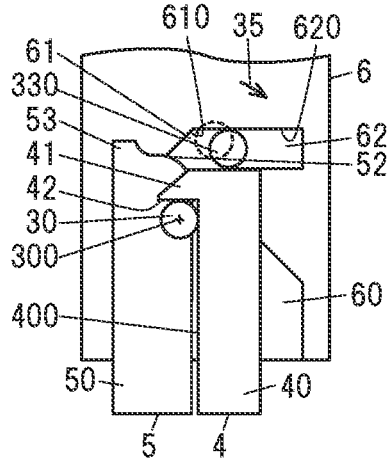
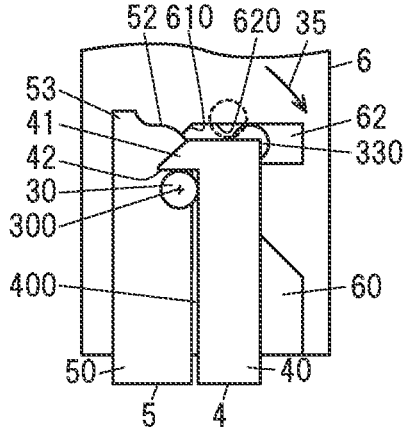


FIG. 7F



OPERATION DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

The present patent application claims the priority of Japanese patent application No. 2022/040799 filed on Mar. 15, 2022, and the entire contents of Japanese patent application No. 2022/040799 are hereby incorporated by reference.

TECHNICAL FIELD

The present invention relates to an operation device.

BACKGROUND ART

A push button switch is known which includes a push button, an escutcheon with a hole to insert the push button, a substrate attached to the back side of the escutcheon and having upper and lower elastic-force applying portions to elastically press the push button from the back surface side toward the front surface side and an electrical switch unit, and a stabilizer attached in a swingable manner between the push button and the escutcheon (see, e.g., Patent Literature 1).

The stabilizer is configured such that a linear locking portion and two arm portions bent 90 degrees from both ends of the locking portion form a squared U-shape and two engagement portions are also provided so as to be bent 90 degrees respectively from ends of these arm portions and extend in directions parallel to the locking portion as well as away from each other. The stabilizer suppresses tilt movement of the push button since it supports the push button from its left and right while keeping its posture so that the two engagement portions are always aligned in a straight line.

CITATION LIST

Patent Literature

Patent Literature 1: JP 2005/11746 A

SUMMARY OF THE INVENTION

Since the stabilizer suppresses, e.g., movement of the push button in a tilted state by an elastic force, there is a problem that a jig to hold the stabilizer against this elastic force is required when attaching the stabilizer and it thus takes time and effort.

It is an object of the invention to provide an operation device that is easy to assemble.

An aspect of the invention provides an operation device, comprising:

an operating portion to receive a push-in operation;

a lessening member to lessen tilt movement of the operating portion associated with the push-in operation;

a supporting portion to support the lessening member;

a base portion on which the supporting portion is provided; and

at least one placement portion that is provided on the base portion, comprises a placing surface to place an end portion of the lessening member, and holds the lessening member on the base portion by the placing surface and the supporting portion in a preparation stage for assembling the operating portion to the base portion.

Advantageous Effects of Invention

According to the invention, an operation device can be provided that is easy to assemble.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1**A is a diagram illustrating an example of the inside of a vehicle.

FIG. **1**B is an example top view showing an operation device.

FIG. **1**C is an example side view showing the operation device.

FIG. **2**A is an example block diagram illustrating the operation device.

FIGS. **2**B and **2**C are explanatory diagrams illustrating an example of lessening action of a stabilizer.

FIG. **3**A is a diagram illustrating an example of the stabilizer.

FIG. **3**B is a diagram illustrating an example of a guide portion.

FIG. **4**A is a diagram illustrating an example of a supporting portion.

FIGS. **4**B and **4**C are diagrams illustrating examples of the supporting portion in modifications.

FIG. **5**A is a diagram illustrating an example of a placement portion.

FIG. **5**B is an explanatory diagram illustrating an example of a placing surface.

FIG. **5**C is an explanatory diagram illustrating an example of the placing surface in a modification.

FIG. **6**A is a diagram illustrating an example of a preparation stage.

FIG. **6**B is a diagram illustrating an example of a state after being assembled.

FIGS. **7**A to **7**F are explanatory diagrams illustrating an example of movement of the stabilizer during assembling an operating portion to the supporting portion.

DETAILED DESCRIPTION OF THE INVENTION

Short Summary of the Embodiment

An operation device in the embodiment generally includes an operating portion to receive a push-in operation, a lessening member to lessen tilt movement of the operating portion associated with the push-in operation, a supporting portion to support the lessening member, a base portion on which the supporting portion is provided, and at least one placement portion that is provided on the base portion, comprises a placing surface to place an end portion of the lessening member, and holds the lessening member on the base portion by the placing surface and the supporting portion in a preparation stage for assembling the operating portion to the base portion.

Since the lessening member can be held on the base portion by means of the placing surface of the at least one placement portion and the supporting portion without having to hold the lessening member by a jig prior to assembly, this operation device is easier to assemble than when using a jig.

EMBODIMENT

General Configuration of an Operation Device 1

FIG. **1**A is a diagram illustrating an example of the inside of a vehicle in which an operation device in an embodiment is arranged, FIG. **1**B is an example top view showing the operation device, and FIG. **1**C is an example side view showing the operation device. FIG. **2**A is an example block diagram illustrating the operation device in the embodiment, and FIGS. **2**B and **2**C are explanatory diagrams illustrating an example of an action to lessen tilt movement of an operating portion by a stabilizer. FIG. **3**A is a diagram illustrating an example of the stabilizer of the operation device in the embodiment, and FIG. **3**B is a diagram illustrating an example of a guide portion. FIG. **4**A is a diagram illustrating an example of a supporting portion of the operation device in the embodiment, and FIGS. **4**B and **4**C are diagrams illustrating examples of the supporting portion in modifications. FIG. **5**A is a diagram illustrating an example of a placement portion of the operation device in the embodiment, FIG. **5**B is an explanatory diagram illustrating an example of a placing surface, and FIG. **5**C is an explanatory diagram illustrating an example of the placing surface in a modification.

In each drawing of the embodiment described below, a scale ratio or shape may be different from an actual ratio or shape. In addition, in FIG. **2**A, flows of main signal and information are indicated by arrows.

As shown in FIG. **1**A, the operation device **1** in the present embodiment is arranged on a floor console **80** located between the driver's seat and the front passenger seat of a vehicle **8**, as an example. The operation device **1** is configured, e.g., to operate in-vehicle devices **83** mounted on the vehicle **8**. The in-vehicle devices **83** are, as an example, a vehicle control device that controls settings for the entire vehicle and self-driving functions, an air conditioner that adjusts temperature inside the vehicle, a navigation device that shows a map of the current location and guides to a destination, a display device that displays images, a seat device to control position and inclination of seats, and a music and video playback device to play back music and video, etc. The operation device **1** can also operate, e.g., a mobile device, etc., connected to these in-vehicle devices **83** by wire or wirelessly.

As shown in FIGS. **1**B to **4**A, the operation device **1** generally includes an operating portion **2** to receive a push-in operation, a stabilizer **3** as a lessening member to lessen tilt movement of the operating portion **2** associated with the push-in operation, a supporting portion **4** to support the stabilizer **3**, a base portion **12** on which the supporting portion **4** is provided, and at least one placement portion **5** that is provided on the base portion **12**, has a placing surface **52** to place an end portion (described later) of the stabilizer **3**, and holds the stabilizer **3** on the base portion **12** by the placing surface **52** and the supporting portion **4** in a preparation stage for assembling the operating portion **2** to the base portion **12**.

As shown in FIG. **3**B, the operation device **1** also includes guide portions **6** that are provided on the operating portion **2** so as to respectively correspond to the left and right end portions of the stabilizer **3**, guide the inserted end portions of the stabilizer **3** from an assembly direction (from an arrow A direction) to a direction intersecting the assembly direction (to an arrow B direction) to cause rotation of the stabilizer **3** in the intersecting direction at the time of assembling the operating portion **2** to the base portion **12**, and, together with the supporting portion **4**, hold the stabilizer **3** after the operating portion **2** is assembled to the base portion **12**.

As shown in FIGS. **1**C and **2**A, the operation device **1** in the present embodiment includes a touch sensor **22** to detect a detection target coming into contact with or proximity to an operating surface **20**, a push switch **23** to detect a push-in operation on the operating portion **2**, and a control unit **14** that outputs operation information S**3** to the in-vehicle devices **83** according to detection by the touch sensor **22** and the push switch **23**.

The touch sensor **22** detects an operating position of the detection target using a capacitive sensing method, generates detection information S_1, and outputs it to the control unit **14**. This detection information S_1 includes information of coordinates of the position on the operating surface **20** at which the detection target has been detected, as an example. The detection target is an operating finger of a user, as an example.

The push switch **23** detects a push-in operation on the operating portion **2**, i.e., a push operation performed on the operating surface **20**, generates a switch signal S**2**, and outputs it to the control unit **14**. The push switch **23** is a microswitch, as an example. The push switch **23** is provided, e.g., on the base portion **12** below at least one of the guide portions **6**, and is configured to turn on with movement of said guide portion **6** caused by a push operation.

The control unit **14** is, e.g., a microcomputer composed of a CPU (Central Processing Unit) performing calculation and processing, etc., of the acquired data according to a stored program, and a RAM (Random Access Memory) and a ROM (Read Only Memory) as semiconductor memories, etc.

The control unit **1** can, e.g., move the cursor displayed on the display screen of the in-vehicle device **83** or change setting values, based on a touch operation or tracing operation performed on the operating surface **20**. The control unit **1** can also control the in-vehicle devices **83** to execute a selected function, e.g., upon a push operation performed on the operating surface **20**.

In other words, the operation device **1** in the present embodiment is configured to detect touch operations, etc. performed on the operating surface **20** by the touch sensor **22** and also detect push operations performed on the operating surface **20**.

As a modification, the operation device **1** may be configured as, e.g., a switch that receives only push operations, such as a switch **81** or a start switch **82** shown in FIG. **1**A. The switch **81** is, e.g., assigned a function of the in-vehicle device **83** and causes said function to be executed by a received push operation. The start switch **82** can, e.g., drive the driving device of the vehicle **8** or stop the driving device which is operating, based on a received push operation.

Configuration of the Operating Portion 2

As shown in FIGS. **1**B and **1**C, the operating portion **2** has a plate shape, and the guide portions **6** are provided on its back surface **21** at both end portions in a longitudinal direction. The operating portion **2** is configured to receive touch operations and tracing operations, etc., on the operating surface **20** and also receive push operations on the operating surface **20**. Since this operating surface **20** has a rectangular shape which is long in the horizontal direction on the paper of FIG. **1**B, sides **201** facing in a lateral direction is longer than sides **202** facing in a longitudinal direction.

The longitudinal direction is a left-right direction on the paper of FIG. **1**B. The lateral direction is an up-down direction on the paper of FIG. **1**B. Both end portions in the longitudinal direction are end portions near the sides **202** facing each other. The operating surface **20** may have a square shape. In this case, the stabilizers **3** are arranged along the up-down direction and the left-right direction, as an example.

The operating portion **2** has the touch sensor **22** at the top. The front surface of the operating portion **2** is the operating surface **20** of the touch sensor **22**.

The operating portion **2** is attached to a housing **10**. As shown in FIG. **1**C, the housing **10** is composed of an upper housing **11** and the base portion **12**, as an example. The upper housing **11** has an opening **110** in which the operating surface **20** is exposed.

As an example, two supporting portions **4** and two placement portions **5** are provided on an installation surface **120** of the base portion **12**. In this regard, it may be configured to include only one of the placement portions **5**. The upper housing **11** is attached to the base portion **12** by screws, etc. The upper housing **11** and the base portion **12** are formed using, e.g., a resin material.

Configuration of the Stabilizer **3**

As shown in FIG. **3**A, the stabilizer **3** is formed using a metal material and has a long bar shape. The stabilizer **3** includes a supported portion **30** supported by the supporting portions **4**, first and second bent portions **31** and **32** formed by bending from both ends of the supported portion **30** in an opposite direction where the bend portions are opposed to each other, and first and second end portions **33** and **34** as the end portions bent from ends of the first and second bent portions **31** and **32** in directions away from each other.

As shown in FIG. **3**A, the supported portion **30** has a linear shape. The supported portion **30**, when attached to the base portion **12**, is in contact with lower surfaces **42** of protruding portions **41** (described later) of the supporting portions **4**.

The first bent portion **31** is located on the left side on the paper of FIG. **3**A and is formed by upwardly bending from the supported portion **30**. The first bent portion **31** forms an angle of 90° with the supported portion **30** as an example, but it is not limited thereto.

The second bent portion **32** is located on the right side on the paper of FIG. **3**A and is formed by upwardly bending from the supported portion **30**. The second bent portion **32** is formed by bending at the same angle as the first bent portion **31** so as to face the first bent portion **31**, as an example.

The first end portion **33** is located on the left side on the paper of FIG. **3**A and is formed by bending from the first bent portion **31** toward the left. The first end portion **33** forms an angle of 90° with the first bent portion **31** and is parallel to the supported portion **30** as an example, but it is not limited thereto.

The second end portion **34** is located on the right side of the paper of FIG. **3**A and is formed by bending from the second bent portion **32** in a direction opposite to the first end portion **33**, i.e., toward the right. The second end portion **34** forms an angle of 90° with the second bent portion **32** and is parallel to the supported portion **30** as an example, but it is not limited thereto.

As shown in FIG. **5**B, in case that the stabilizer **3** rotates in a first direction **35** about a center **300** of a lateral cross section of the supported portion **30** serving as a center of rotation, the end portion of the stabilizer **3**, which is placed on the placing surface **52** in the preparation stage, is supported at a position shifted in a second direction **36**, which is opposite to the first direction **35**, from the 12 o'clock position with respect to the center of rotation.

In particular, when the placement portion **5** is arranged on the first end portion **33** side of the stabilizer **3** and is viewed from the supported portion **30** side, the first end portion **33** in a state of being placed on the placing surface **52** in the preparation stage is supported in a preparation position **72** rotated in the second direction **36** from a reference line **71** indicating the 12 o'clock position, as shown in FIG. **5**B. A dash-dot-dot line shown in FIG. **5**B is a straight line connecting the center of the supported portion **30** to the center of the first end portion **33**.

When the placement portion **5** is arranged on the second end portion **34** side of the stabilizer **3** and is viewed from the supported portion **30** side, the second end portion **34** in a state of being placed on the placing surface **52** in the preparation stage is supported in the preparation position **72** rotated in the second direction **36** from the reference line **71** indicating the 12 o'clock position. Furthermore, when the placement portions **5** are arranged on the first end portion **33** side and the second end portion **34** side of the stabilizer **3**, the first end portion **33** and the second end portion **34** are supported in the preparation position **72** rotated in the second direction **36** in the same manner.

When setting the operating portion **2** on the base portion **12**, the stabilizer **3** rotates in the first direction **35** to an assembled position **73** at which the first and second end portions **33**, **34** and the supported portion **30** are substantially in a horizontal plane, as shown in FIG. **6**B. At this time, the supported portion **30** rotates in the first direction **35** while being in contact with the supporting portions **4**. That is, due to the rotation of the first and second end portions **33** and **34**, the entire stabilizer **3** rotates in the first direction **35** about the center **300** serving as the center of rotation.

Configuration of the Supporting Portion **4**

As shown in FIG. **4**A, the supporting portion **4** has a support base **40** rising from the base portion **12**, and the protruding portion **41** that protrudes in a direction opposite to the intersecting direction (an intersecting direction B) in which the stabilizer **3** rotates at the time of assembling the operating portion **2** to the base portion **12**.

The support base **40** is formed using, e.g., a resin material and has a plate shape. The protruding portion **41** protrudes from a side surface **400** of the support base **40** and suppresses upward movement of the supported portion **30**. The stabilizer **3** rotates in the first and second directions **35** and **36** while keeping contact with the side surface **400** and the lower surface **42**. As a modification, the lower surface **42** of the protruding portion **41** may be a recessed surface corresponding to the shape of the supported portion **30**.

As shown in FIGS. **2**B and **2**C, the supporting portions **4** are provided on the base portion **12** on the left and right in the longitudinal direction so as to correspond to the guide portions **6** of the operating portion **2**, as an example. The supporting portions **4** support rotation of the stabilizer **3** and thus are arranged close to the first and second bent portions **31** and **32**.

As a modification, a recessed portion to rotatably fit the stabilizer **3** may be provided on the lower surface **42** of the supporting portion **4**. In addition, it may be configured to

include one supporting portion **4** to support the center of the supported portion **30**, instead of having plural supporting portions **4**.

As another modification, the supporting portion **4** may further include a projecting portion **43** projecting from the side surface **400** below the protruding portion **41**, and a recessed portion **44** provided between the protruding portion **41** and the projecting portion **43**, as shown in FIG. **4**B. This recessed portion **44** supports the inserted supported portion **30** of the stabilizer **3** and suppresses movement of the supported portion **30** in the up-down direction. Alternatively, the supporting portion **4** may be configured to have the recessed portion **44** on the side surface **400** of the support base **40**.

As yet another modification, the supporting portion **4** may be configured to have a first supporting portion **4***a* and a second supporting portion **4***b*, as shown in FIG. **4**C. The first supporting portion **4***a* is the same as the supporting portion **4** in the embodiment. The second supporting portion **4***b* has an upper surface **45** that supports the supported portion **30** of the stabilizer **3** and suppresses downward movement of the supported portion **30**. The stabilizer **3** is held by the first supporting portion **4***a* and the second supporting portion **4***b*.

Configuration of the Placement Portion **5**

As shown in FIGS. **2**B and **2**C, two placement portions **5** are arranged on the installation surface **120** of the base portion **12** so as to be each located between the supporting portion **4** and the guide portion **6**, as an example. The placement portion **5** is formed using, e.g., a resin material and has a plate shape. This placement portion **5** is configured such that an upper surface of a placement base **50** serves as the placing surface **52**. The placing surface **52** has a recessed surface which is located on a raised portion **53** (described later) side and corresponds to the shape of the stabilizer **3**.

As shown in FIG. **5**A, the placement portion **5** has the raised portion **53** at an end of the placing surface **52** to inhibit the stabilizer **3** placed on the placing surface **52** from rotating in the second direction **36**. As shown in FIG. **5**B, the stabilizer **3** in a state of being placed on the placing surface **52** is inhibited from rotating in the second direction **36** since the raised portion **53** becomes a wall obstructing rotation of the first end portion **33** in the second direction **36**.

In addition, as shown in FIGS. **5**A and **5**B, the placement portion **5** is configured such that a corner **54** on a side in the first direction **35** has a curved surface such that rotation of the stabilizer **3** is not inhibited. If the corner **54** does not have a curved surface, a trajectory **350** of a lowest point **332** of the stabilizer **3** when rotating in the first direction **35** may intersect the non-curved corner **54**, making it difficult to assemble the operating portion **2** to the base portion **12**. The lowest point **332** is a contact point of the first end portion **33** with the placing surface **52**.

A distance H_1 from a highest point **301** of the supported portion **30** to the lowest point **332** of the first end portion **33** of the stabilizer **3** is not less than a distance H_3 from the lower surface **42** of the protruding portion **41** in contact with the stabilizer **3** to the placing surface **52**. Likewise, a distance H_2 from the highest point **301** of the supported portion **30** to a lowest point **341** of the second end portion **34** of the stabilizer **3** is not less than the distance H_3 from the lower surface **42** of the protruding portion **41** in contact with the stabilizer **3** to the placing surface **52**. The distance H_1 is equal to the distance H_2.

In the present embodiment, the distance H_1 from the highest point **301** of the supported portion **30** to the lowest point **332** of the end portion is equal to the distance H_3. That is, the stabilizer **3** when placed on the placing surface **52** is not elastically deformed with no change in a distance L between the center **300** of the supported portion **30** and a center **331** of the first end portion **33**, and thus easily rotates in the first and second directions **35** and **36**.

As a modification, the placing surface **52** may have a recessed shape corresponding to the shape of the stabilizer **3**, as shown in FIG. **5**C. In this case, the placing surface **52** has a position higher than the trajectory **350** of the lowest point **332** of the first end portion **33**. Therefore, the stabilizer **3** is elastically deformed when placed on the placing surface **52**, and is then supported and stabilized.

As yet another modification, the placement portion **5** does not need to have a curved surface at the corner **54** as long as the end portion does not come into contact with the corner **54**.

As shown in FIGS. **2**B and **2**C, when the first end portion **33** and the second end portion **34** of the stabilizer **3** are placed on the placing surfaces **52**, an endmost portion **330** of the first end portion **33** and an endmost portion **340** of the second end portion **34** are exposed on the outside of the placing surfaces **52**. The endmost portions **330** and **340** are inserted into the guide portions **6**.

Configuration of the Guide Portion **6**

As shown in FIGS. **2**B and **2**C, the guide portions **6** are arranged so as to face in the longitudinal direction of the operating portion **2**. The guide portion **6** is formed using, e.g., a resin material and has a plate shape.

The guide portions **6** may be formed integrally with the operating portion **2** or may be attached to the operating portion **2** by screws, etc. Since the left and right guide portions **6** have the same configuration, the guide portion **6** to which the first end portion **33** of the stabilizer **3** is attached will be described.

As shown in FIG. **3**B, the guide portion **6** has an insertion groove **60** to insert the end portion of the stabilizer **3** at the time of assembling the operating portion **2** to the base portion **12**, an inclined groove **61** having an inclined surface **610** inclined from the insertion groove **60**, and an intersecting groove **62** that extends in a direction intersecting the insertion groove **60** (the intersecting direction B) and is connected to the inclined groove **61**. The insertion groove **60**, the inclined groove **61** and the intersecting groove **62** are not limited to those having a groove shape and may be configured as through-holes.

The insertion groove **60** is a linear groove which is provided in the up-down direction on the paper of FIG. **3**B and into which the endmost portion **330** of the stabilizer **3** is inserted at the time of assembling the operating portion **2** to the base portion **12**.

The inclined groove **61** is inclined with respect to an assembly direction A on the paper of FIG. **3**B and comes into contact with the inserted endmost portion **330** of the stabilizer **3** to cause the stabilizer **3** to move in the intersecting direction B, i.e., to rotate in the first direction **35**.

The intersecting groove **62** is a groove that extends in the left-right direction on the paper of FIG. **3**B. The endmost portion **330** of the inserted stabilizer **3** is held by the intersecting groove **62**. The endmost portion **340** is held by the intersecting groove **62** of the guide portion **6** on the second end portion **34** side.

Lessening of Tilt Movement of the Operating Portion **2**

The operating surface **20** of the operation device **1** has a rectangular shape in which a length in the left-right direction

is larger than a length in the up-down direction on the paper of FIG. **1**B. Even if the operating portion **2** is push-operated at a position that is off-center on the up, down, left, or right side, tilt movement of the operating portion **2** is small as long as the position is close to a center **200** of the operating surface **20**.

However, when, as an example, a push operation is performed on a left end portion of the operating surface **20** on the paper of FIG. **2**B, this end portion moves downward and the operating portion **2** moves while tilting. When moving while tilting, and in case that the push switch **23** is arranged below the guide portion **6** located at an end portion opposite to said end portion, it is difficult to detect the push operation.

When a push operation is performed on said end portion, an upper surface **620** of the intersecting groove **62** of the guide portion **6** presses the first end portion **33** due to a load F_1 generated by a push operation of an operating finger **9** as shown in FIG. **2**B and the stabilizer **3** moves downward. Since this movement causes the stabilizer **3** to twist, the second end portion **34** moves downward so as to follow the first end portion **33** due to an elastic force F_2 generated by this twist. In other words, the stabilizer **3** rotates in the first direction **35** following the first end portion **33**. Thus, movement of the operating portion **2** is free from tilt, as shown in FIG. **2**C.

Assembly

FIG. **6**A is a diagram illustrating an example of a preparation stage for the operation device in the embodiment, and FIG. **6**B is a diagram illustrating an example after assembling the operating portion to the supporting portion. FIGS. **7**A to **7**F are explanatory diagrams illustrating an example of movement of the stabilizer of the operation device in the embodiment during assembling the operating portion to the supporting portion.

In the preparation stage, as shown in FIG. **6**A, the first end portion **33** and the second end portion **34** are placed on the placing surfaces **52** of the left and right placement portions **5** by rotating the stabilizer **3** in the second direction **36** while keeping contact between the supported portion **30** of the stabilizer **3** with the lower surfaces **42** and the side surfaces **400** of the protruding portions **41** of the supporting portions **4**, thereby setting the stabilizer **3** on the base portion **12**.

Next, to assemble the operating portion **2** to the base portion **12**, the first end portion **33** is aligned with the insertion groove **60** of the left guide portion **6** and the second end portion **34** with the insertion groove **60** of the right guide portion **6**, and the operating portion **2** is then moved in the assembly direction A. In the following description, the movement of the endmost portion **330** of the first end portion **33** will be mainly described.

As shown in FIG. **7**A, the endmost portion **330** comes into contact with the inclined surface **610** of the inclined groove **61** after being inserted into the insertion groove **60**.

Then, when the operating portion **2** is further moved in the assembly direction A, the endmost portion **330** is pressed by the inclined surface **610** as shown in FIG. **7**B and the supported portion **30** and the first end portion **33** rotate in the first direction **35**. In other words, the stabilizer **3** rotates in the first direction **35**. This rotation causes the first and second end portions **33** and **34** to move away from the placing surfaces **52**.

Then, when the operating portion **2** is further moved in the assembly direction A, the endmost portion **330** is pressed by the inclined surface **610** and moves to a position where the endmost portion **330** is in contact with the inclined surface **610** as well as the upper surface **620** of the intersecting groove **62**, as shown in FIG. **7**C. The stabilizer **3** further rotates in the first direction **35**.

Then, when the operating portion **2** is further moved in the assembly direction A, the endmost portion **330** is pressed by the upper surface **620** and moves in the intersecting groove **62** toward the right, i.e., in the intersecting direction B, as shown in FIG. **7**D. The stabilizer **3** further rotates in the first direction **35**.

Then, when the operating portion **2** is further moved in the assembly direction A, the endmost portion **330** is further pressed by the upper surface **620** and moves in the intersecting groove **62** in the intersecting direction B, as shown in FIG. **7**E. The stabilizer **3** further rotates in the first direction **35**.

Then, when the operating portion **2** is further moved in the assembly direction A, the endmost portion **330** is further pressed by the upper surface **620**, moves in the intersecting groove **62** in the intersecting direction B, and reaches the assembled position **73** as shown in FIG. **7**F, and the assembly is thereby completed.

Effects of the Embodiment

The operation device **1** in the present embodiment is easy to assemble. In particular, since the stabilizer **3** can be set on the base portion **12** by means of the placing surfaces **52** of the placement portions **5** and the supporting portions **4** without having to hold the stabilizer **3** by a jig prior to assembly, the operation device **1** is easier to assemble than when using a jig.

By rotating the stabilizer **3** in the second direction **36** while keeping contact between the stabilizer **3** with the lower surfaces **42** and the side surfaces **400** of the supporting portions **4** and thereby placing the first end portion **33** and the second end portion **34** on the placing surfaces **52**, the stabilizer **3** can be set on the supporting portions **4**. Therefore, the operation device **1** does not require a process using a jig and the manufacturing cost can thus be reduced. In addition, since the stabilizer **3** can be easily set on the base portion **12**, the operation device **1** can be easily assembled by hand.

By moving the operating portion **2** in the assembly direction A relative to the base portion **12** after setting the stabilizer **3** on the base portion **12**, the stabilizer **3** is guided by the guide portions **6** and set in the assembled position **73**. Therefore, the operation device **1** can be assembled easily as compared to when such a configuration is not adopted.

When assembling the operation device **1**, the stabilizer **3** can be easily set on the base portion **12** and the operating portion **2** can also be easily assembled to the base portion **12**. Therefore, it is possible to suppress the use of tools, such as jig, or machine, and thereby suppress the manufacturing cost. In addition, since the stabilizer **3** can be easily set on the base portion **12** and the operating portion **2** can also be easily assembled to the base portion **12**, automated machine assembly of the operation device **1** without using jigs is facilitated.

In the operation device **1**, the preparation position **72** of the first end portion **33** of the stabilizer **3** is a position rotated in the second direction **36** from the reference line **71**. Therefore, as compared to when such a configuration is not adopted, it is possible to make it difficult for the stabilizer **3** to come off from the base portion **12** without applying an elastic force for holding the stabilizer **3**, and it is also easy to rotate the stabilizer **3**, facilitating assembly.

In the operation device **1**, the distance H_1 from the highest point **301** of the supported portion **30** to the lowest point **332** of the first end portion **33** of the stabilizer **3** is not less than the distance H_3 from the lower surface **42** of the protruding portion **41** to the placing surface **52**. Therefore, it is easier to set the stabilizer **3** as compared to when such a configuration is not adopted.

Since the operation device **1** does not require a jig to support the stabilizer **3** from below, the base portion **12** does not need to have an opening for the jig, which improves the degree of freedom in design.

Although some embodiment and modifications of the invention have been described, these embodiment and modifications are merely examples and the invention according to claims is not to be limited thereto. These new embodiment and modifications may be implemented in various other forms, and various omissions, substitutions and changes, etc., can be made without departing from the gist of the invention. In addition, not all combinations of the features described in these embodiment and modifications are necessary to solve the problem of the invention. Further, these embodiment and modifications are included within the scope and gist of the invention and also within the invention described in the claims and the range of equivalency.

REFERENCE SIGNS LIST

1 OPERATION DEVICE
2 OPERATING PORTION
3 STABILIZER
4 SUPPORTING PORTION
5 PLACEMENT PORTION
6 GUIDE PORTION
12 BASE PORTION
30 SUPPORTED PORTION
31 FIRST BENT PORTION
32 SECOND BENT PORTION
33 FIRST END PORTION
34 SECOND END PORTION
35 FIRST DIRECTION
36 SECOND DIRECTION
40 SUPPORT BASE
41 PROTRUDING PORTION
42 LOWER SURFACE
52 PLACING SURFACE
53 RAISED PORTION
54 CORNER
60 INSERTION GROOVE
61 INCLINED GROOVE
62 INTERSECTING GROOVE
610 INCLINED SURFACE

The invention claimed is:

1. An operation device, comprising:

an operating portion to receive a push-in operation;

a lessening member to lessen tilt movement of the operating portion associated with the push-in operation;

a supporting portion to support the lessening member;

a base portion on which the supporting portion is provided;

at least one placement portion that is provided on the base portion, comprises a placing surface to place an end portion of the lessening member, and holds the lessening member on the base portion by the placing surface and the supporting portion in a preparation stage for assembling the operating portion to the base portion, and

guide portions that are provided on the operating portion so as to respectively correspond to left and right end portions of the lessening member, guide the inserted end portions of the lessening member from an assembly direction to a direction intersecting the assembly direction to cause rotation of the lessening member in the intersecting direction at the time of assembling the operating portion to the base portion, and, together with the supporting portion, hold the lessening member after the operating portion is assembled to the base portion,

wherein the guide portions each comprise an insertion groove to insert the end portion of the lessening member at the time of assembling the operating portion to the base portion, an inclined groove comprising an inclined surface inclined from the insertion groove, and an intersecting groove that axially extends in one direction intersecting the insertion groove and is connected to the inclined groove.

2. The operation device according to claim **1**, wherein the placement portion comprises a curved surface so as not to inhibit a rotation of the lessening member, where the lessening member rotates about a center of a lateral cross section of the supported portion serving as a center of rotation.

3. The operation device according to claim **1**, wherein the lessening member has a long bar shape, and comprises a supported portion supported by the supporting portion, first and second bent portions formed by bending from both ends of the supported portion in an opposite direction, and first and second end portions as the end portions bent from ends of the first and second bent portions in directions away from each other.

4. The operation device according to claim **3**, wherein the first and second bent portions of the lessening member are each disposed between the supporting portion and the placement portion in a longitudinal direction of the lessening member.

5. The operation device according to claim **3**, wherein the supporting portion, the placement portion and each of the guide portions are disposed in the order of the supporting portion, the placement portion and each of the guide portions in a direction from a center of the lessening member in a longitudinal direction thereof toward the first or second end portion.

6. The operation device according to claim **3**, wherein where the lessening member rotates in a first direction about a center of a lateral cross section of the supported portion serving as a center of rotation, the end portion of the lessening member, which is placed on the placing surface in the preparation stage, is supported at a position shifted in a second direction, which is opposite to the first direction, from a 12 o'clock position with respect to the center of rotation.

7. The operation device according to claim **6**, wherein the placement portion comprises a raised portion at an end of the placing surface to inhibit the lessening member placed on the placing surface from rotating in the second direction.

8. The operation device according to claim **7**, wherein the supporting portion comprises a support base rising from the base portion, and a protruding portion that protrudes in a direction opposite to the intersecting direction in which the lessening member rotates at the time of assembling the operating portion to the base portion, and wherein a distance from a highest point of the supported portion to a lowest point of the end portion of the lessening member is not less

than a distance from a lower surface of the protruding portion in contact with the lessening member to the placing surface.

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