(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 733 715 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
21.05.2014 Bulletin 2014/21

(21) Application number: **12824977.8**

(22) Date of filing: **16.08.2012**

(51) Int Cl.:
H01H 13/14 *(2006.01)* ***H01H 13/70*** *(2006.01)*

(86) International application number:
PCT/JP2012/005172

(87) International publication number:
WO 2013/027376 (28.02.2013 Gazette 2013/09)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **23.08.2011 JP 2011181239**

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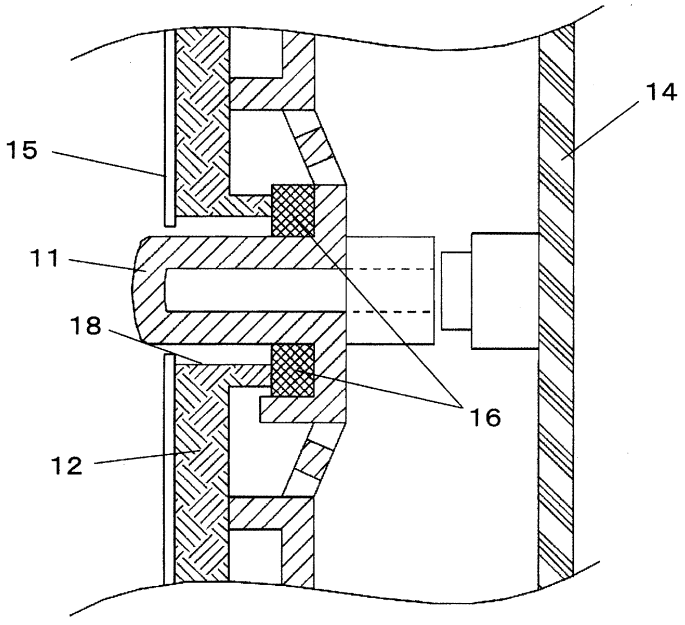
(54) **OPERATING DEVICE**

(57) An operating panel includes: an operating unit for supporting an operating board; at least two integrated operating buttons supported on the operating unit and laterally arranged for selecting an operation; operating switches provided on the operating board coaxially with the operating buttons; an opening portion for placing the operating buttons of the operating unit; and a peripheral edge portion provided around the opening portion. Buttons at ends of the operating buttons include protruding portions having tips which contact the peripheral edge portion to intentionally bend the operating buttons into a bow shape.

FIG. 4



EP 2 733 715 A1

Description

Technical Field

[0001] The present invention relates to an operating device configuring an operating unit provided in an electronic apparatus.

Background Art

[0002] In recent years, an operating button structure independent of an operating unit is widely used in an operating panel of an electronic apparatus such as an audio equipment, a video equipment, and home electric appliances such as a microwave oven.

[0003] As a generally known independent operating button structure, there is a structure in which a plurality of buttons are disposed in separated positions from one another, or a structure in which a plurality of buttons are arranged laterally and in parallel with one another without gaps (for example, see Patent Document 1). In the button structure in which the buttons are disposed in the separated positions, the use of an integral molded resin for the buttons can comparatively easily solve a problem in an external appearance, for example, a parallelism of the button.

[0004] Fig. 7 is a perspective view showing an external appearance of an operating device according to the related art. As shown in Fig. 7, an operating buttons 11 are configured independent of an operating unit 12. The operating buttons 11 separately protrude from an external surface through opening portions formed on the operating unit 12 for respective operating buttons 11. On a front surface of the operating unit 12, an operating sheet 15 is adhered to a front surface of the operating unit 12.

[0005] Fig. 8 is a front view showing an example of the operating buttons of the operating device having the structure. As shown in Fig. 8, the operating buttons can be integrated comparatively easily by a button layout in which the buttons are spaced from one another with a certain distance.

[0006] In the button structure in which the buttons are arranged laterally and in parallel with one another without gaps, for integrating the operating button 11 shown in Fig. 7, there is a problem with molding, and a gap is formed between the buttons to some degree (generally, approximately 1 mm). In order to solve the problem, generally, configuring each of the buttons as an independent component is widely used.

[0007] Fig. 9 is a perspective view showing an external appearance having a button layout in which a plurality of buttons are laterally arranged without gaps. As shown in Fig. 9, the operating buttons 11 are configured such that a gap between the adjacent operating buttons 11 is small. In order to implement the structure, the operating buttons 11a, 11 b, 11c are independently provided on the operating unit 12 as shown in Fig. 10. An operating board 14 is supported on the operating unit 12. An operating switch 13 is provided on a surface of the operating board 14 opposing the operating button 11.

Related Art Documents

Patent Documents

[0008] Patent Document 1: JP-A-2006-269286

Summary of the Invention

Problem to be Solved by the Invention

[0009] However, in the structure in which the operating buttons 11 are arranged laterally and in parallel with each other without gaps, configuring an independent component for each of the operating buttons 11 has a problem of a cost or assembly man-hour such as increase in the number of molded components or increase in assembly works. In order to solve the problem, it is necessary to integrally mold the operating buttons 11, but there is a problem of increase of the gap between the adjacent operating buttons 11 due to the problem with molding when the operation buttons 11 are integrally molded.

[0010] The present invention has been made in order to solve the problem in the related art, and an object thereof is to provide an operating device having a structure in which operating buttons are arranged laterally and in parallel with each another without a gap, which can reduce the number of components and can simplify assembly by integrally molding the operating buttons, that is, configuring them as a single component and by reducing a gap between the adjacent buttons which is caused by the integration.

Means for Solving the Problem

[0011] In order to solve the problem of the related art, the present invention provides an operating device including: an operating board for controlling an electronic apparatus; an operating unit which supports the operating board; two or more integrated operating buttons supported on the operating unit for operation and selection; operating switches provided on a surface of the operating board opposing the operating buttons; an opening portion for placing the operating buttons of the operating unit; and a peripheral edge portion provided around the opening portion, wherein buttons at ends of the operating buttons include protruding portions having tips which contact the peripheral edge portion to intentionally bend the operating buttons into a bow shape.

[0012] According to the above-described invention, since the gap between the adjacent operating buttons can be reduced by bending the operating buttons, the shape of the operating buttons laterally arranged without gaps can be formed by a single component, whereby it is possible to reduce the number of components and to enhance an assembling property.

Advantages of the Invention

[0013] According to the operating device of the present invention, since the gap between the adjacent operating buttons can be reduced, the shape of the operating buttons laterally arranged without gaps can be formed by a single component, whereby it is possible to reduce the number of components and to enhance an assembling property.

Brief Description of the Drawings

[0014]

Fig. 1 shows an external appearance of a heat cooking device having the operating device according to an embodiment of the invention.
Fig. 2 is a front view showing operating buttons configured in an operating device.
Fig. 3 is a longitudinal sectional view showing operating switch portions in the operating device.
Fig. 4 is a longitudinal sectional view showing protruding portions of the operating buttons of the operating device.
Fig. 5 is a cross-sectional view showing the operating switch portions of the operating device before deformed into a bow shape.
Fig. 6 is a cross-sectional view showing the operating switch portions of the operating device after deformed into the bow shape.
Fig. 7 shows an external appearance in an example in which operating buttons of an operating device of the related art are disposed in separated positions from one another.
Fig. 8 is a front view showing the operating buttons of the operating device shown in Fig. 7.
Fig. 9 is a view showing an external appearance of the operating device of the related art in which the operating buttons are disposed close to each other.
Fig. 10 shows a structure of the operating device of the related art in which the operating buttons are disposed close to each other.

Mode for Carrying Out the invention

[0015] A first invention provides an operating device comprising: an operating board for controlling an electronic apparatus; an operating unit disposed on an operation side of the operating board for supporting the operating board; a plurality of operating buttons supported on the operating unit and connected linearly; operating switches provided on a surface of the operating board opposing the operating buttons; an opening portion formed on the operating unit for placing the operating buttons; and a peripheral edge portion which protrudes toward the operating buttons around the opening portion, wherein buttons at ends of the operating buttons comprise protruding portions having tips which contacts the peripheral edge portion to intentionally bend the operating buttons into a bow shape, thereby reducing a gap between adjacent buttons of the operating buttons. Consequently, it is possible to reduce the number of components for the operating buttons and to simplify assembly.

[0016] A second invention particularly provides the operating device according to the first invention, wherein the operating buttons are previously formed to be uneven in conformity with a shape of the operation buttons bent into the bow shape such that the operating buttons are flat in a state in which the adjacent protruding portions of the buttons are bent into the bow shape. Consequently, a difference between the buttons including the protruding portions of the operation buttons is eliminated, and it is possible to improve an external appearance and to enhance a user's operational feeling.

[0017] A third invention particularly provides the operating device according to the first or second invention, wherein a plurality of combinations each comprising at least two operating buttons laterally arranged are integrally formed in a longitudinal direction. Consequently, a layout of a plurality of combinations of the operating buttons can be provided, and it is possible to improve the design, to further decrease the number of components and to simplify assembly.

[0018] An embodiment according to the invention will be described below with reference to the drawings. The present invention is not limited to the embodiment.

(First Embodiment)

[0019] Fig. 1 is a perspective view showing an external appearance of a microwave oven (an electronic apparatus) as an example of an apparatus including an operating device according to a first embodiment of the invention. Fig. 2 is a front view showing operating buttons in the operating device. Fig. 3 is a longitudinal sectional view showing operating switch portions in the operating device. Fig. 4 is a longitudinal sectional view showing protruding portions of the operating device and in the vicinity thereof. Fig. 5 is a cross-sectional view showing the operating switch portions of before the operating buttons are deformed into a bow shape. Fig. 6 is a cross-sectional view showing the operating switch portions of the operating device after deformed into the bow shape.

[0020] In the drawings, a microwave oven 20 serving as an electronic apparatus includes a heating chamber 21. The heating chamber 21 accommodates an object to be heated such as a food in order to heat and cook an ingredient. On the front side of the heating chamber 21, an outlet for taking out the object to be heated is formed. A side hinged door 22 is provided to open and close the outlet. An observation window is formed in a center portion of the door 22 and a heating state of the object to be heated which is being cooked can be viewed.

[0021] A machine chamber is provided on a right side of the microwave oven 20 in a front view. The machine chamber contains magnetron (not shown) serving as a

high frequency generating device, and high frequency power generated by the magnetron is propagated through a waveguide and supplied into the heating chamber 21.

[0022] An operating panel 30 serving as an operating device is provided adjacently to the door 22 on the front side of the microwave oven 20 and on a right side of the door 22. The operating panel 30 includes an operating unit 12, an operating board 14 and operating buttons 11. An operating sheet 15 is adhered to a front surface of the operating unit 12, i.e., on a side where a user of the microwave oven 20 carries out an operation. On the operating sheet 15, an indication for explaining a function assigned to each operating button 11 is printed.

[0023] The operating unit 12 is formed by polycarbonate ABS resin. Five operating button inserting opening portions 18 (opening portions) are arranged in a vertical direction on the front side of the operating unit 12. Each of the operating button inserting opening portions 18 is formed in a slot shape extending in a transverse direction of the operating unit 12. By pressing down the operating button 11 of the operating unit 12, the user can select a cooking menu and start heating.

[0024] A rib-shaped peripheral edge portion 17 is formed over a whole periphery of each of the operating button inserting opening portions 18 on a rear side of the operating button inserting opening portions 18. Although the polycarbonate ABS resin is used as a material of the operating unit 12 in the embodiment, other resins may be used.

[0025] The operating board 14 is attached to the operating unit 12. The operating board 14 is provided with operating switches 13 using fourteen tactile switches and a liquid crystal display panel (not shown) which are provided on the front side (operating side) of the microwave oven 20 thereof. The operating switches 13 are disposed to oppose the respective operating buttons 11 which will be described below.

[0026] A circuit pattern is printed on the rear surface of the operating board 14 and is connected to an IC (not shown). The operating board 14 performs input processing in response to operation to the operating switch 13, and outputs a signal to a control device provided on another board. Then, the operating board 14 receives a signal from the control device, and displays operation contents of the operating switch 13 and a progress status of selected cooking contents (e.g., the time remaining before the end of cooking) on the liquid crystal display panel.

[0027] The operating buttons 11 are produced by injection molding an ABS resin and is attached to the operating unit 12. Three operating buttons 11 are laterally arranged in the operating unit 12, and a possible gap is formed between adjacent operating buttons 11 in respect of metal molding. Similar arrays are arranged in five stages in a longitudinal direction.

[0028] Each of the operating buttons 11 has a hinge mechanism formed thereon. The hinge mechanism is operated independently. For example, when the user presses down any of the operating buttons 11, the operating buttons 11 provided therearound are not moved but only the pressed operating button 11 is pressed down rearward.

[0029] Moreover, protruding portions 16 are formed to extend in a vertical direction so as to be perpendicular to the operating buttons 11 on two of the three operating buttons 11. The tow operating buttons 11 are provided at both ends of the three operating buttons 11. In each of the two operating buttons 11, the protruding portion 16 is provided close to a center of the laterally-arranged three operating buttons 11. The protruding portion 16 has a rib shaped and protrudes frontward to have a predetermined height. The protruding portions 16 are formed similarly in other stages in which the three operating buttons 11 are laterally arranged. In a lowermost stage, only two operating buttons 11 are laterally arranged, and the protruding portions 16 are formed close to a center of the two operating buttons 11.

[0030] Referring to the operating device having the structure described above, attachment thereof will be described below.

[0031] As shown in Fig. 4, the integrally-formed operating buttons 11 are inserted into the operating button inserting opening portions 18 from a rear side to a front side of the operating unit 12. At this time, the protruding portions 16 formed integrally with the operating buttons 11 butt the peripheral edge portion 17 of the operating button inserting opening portion 18 (the protruding portions 16 contact the peripheral edge portion 17).

[0032] The operating buttons 11 having the hinge mechanisms formed thereon are necessarily moved rearward (a right direction in Fig. 4) (the operating buttons 11 are pushed rearward by the peripheral edge portion 17). As described above, the operating buttons 11 are separately movable, respectively. Therefore, the center side of the operating button 11 is moved (rotated) rearward around an end side of the operating button 11.

[0033] In a view showing a state in which the operating buttons 11 are laterally arranged, the operating button 11 in the vicinity of the rib-shaped protruding portion 16 provided in a line with the operating buttons 11 is moved (rotated) rearward by a height of the protruding portion 16. Consequently, the gap between the operating buttons 11 laterally arranged is reduced as compared with that in the molding.

[0034] Moreover, the heights of the protruding portion 16 and the peripheral edge portion 17 are set such that frontward protrusion heights of the operating buttons 11 are almost equal to one another. Consequently, the protrusion heights of surfaces of the operating buttons 11 are coincident with one another, and unevenness is eliminated, whereby beauty of an external appearance can be enhanced.

[0035] The operating button 11 and the peripheral edge portion 17 of the operating unit 12 are close to each other so that the gap is reduced, whereby water hardly

enters into the operating board 14 from the operating button inserting opening portion 18. Consequently, it is possible to prevent a malfunction.

[0036] Referring to the operating device having the structure described above, an operation and effect thereof will be described below.

[0037] When the operating button 11 supported on the operating unit 12 is pressed down, the operating switch 13 using the tactile switch provided on an opposing surface is turned ON. The operating substrate board 14 provided with the operating switch 13 transmits the signal to the IC (not shown) by the operating board 14, and control is performed.

[0038] As described above, according to the embodiment, in the operating panel 30 including the integral operating buttons 11 laterally arranged without a gap, the protruding portions 16 formed integrally with the operating buttons 11 butt the peripheral edge portion 17 of the operating button inserting opening portion 18 of the operating unit 12. Therefore, one end of the operating button 11 can move rearward, whereby it is possible to reduce the gap between the adjacent operating buttons 11. Consequently, the operating buttons 11 laterally arranged do not need to be independent buttons, whereby it is possible to reduce the number of components and to enhance an assembling property.

[0039] Although the embodiment has describes an example in which the operating device according to the invention is applied to a microwave oven as an electronic apparatus, the invention is not limited to the microwave oven and may be applied to uses in the field possessing an operating device which performs electronic control.

[0040] Although the invention has been described in detail with reference to the specific embodiment, it is apparent to the skilled in the art that various changes or modifications may be made without departing from the spirit and scope of the invention.

[0041] The application is based on Japanese Patent Application (No. 2011-181239) filed on August 23, 2011, entire contents of which are incorporated herein by reference.

Industrial Applicability

[0042] The operating device according to the invention relates to an optimum shape of the operating buttons as described above, and is applicable to uses in the field possessing an operating device having the similar button layout.

Description of Reference Signs

[0043]

11 Operating Button
12 Operating Unit
13 Operating Switch
14 Operating Board
15 Operating Sheet
16 Protruding Portion
17 Peripheral Edge Portion
18 Operating Button Inserting Opening Portion (Opening Portion)
20 Microwave Oven
21 Heating Chamber
22 Door
30 Operating Panel (Operating Device)

Claims

1. An operating device comprising:

an operating board for controlling an electronic apparatus;
an operating unit disposed on an operation side of the operating board for supporting the operating board;
a plurality of operating buttons supported on the operating unit and connected linearly;
operating switches provided on a surface of the operating board opposing the operating buttons;
an opening portion formed on the operating unit for placing the operating buttons; and
a peripheral edge portion which protrudes toward the operating buttons around the opening portion,
wherein buttons at ends of the operating buttons comprise protruding portions having tips which contact the peripheral edge portion to intentionally bend the operating buttons into a bow shape, thereby reducing a gap between adjacent buttons of the operating buttons.

2. The operating device according to claim 1, wherein the operating buttons are previously formed to be uneven in conformity with a shape of the operation buttons bent into the bow shape such that the operating buttons are flat in a state in which the adjacent protruding portions of the buttons are bent into the bow shape.

3. The operating device according to claim 1 or 2, wherein a plurality of combinations each comprising at least two operating buttons laterally arranged are integrally formed in a longitudinal direction.

FIG. 1

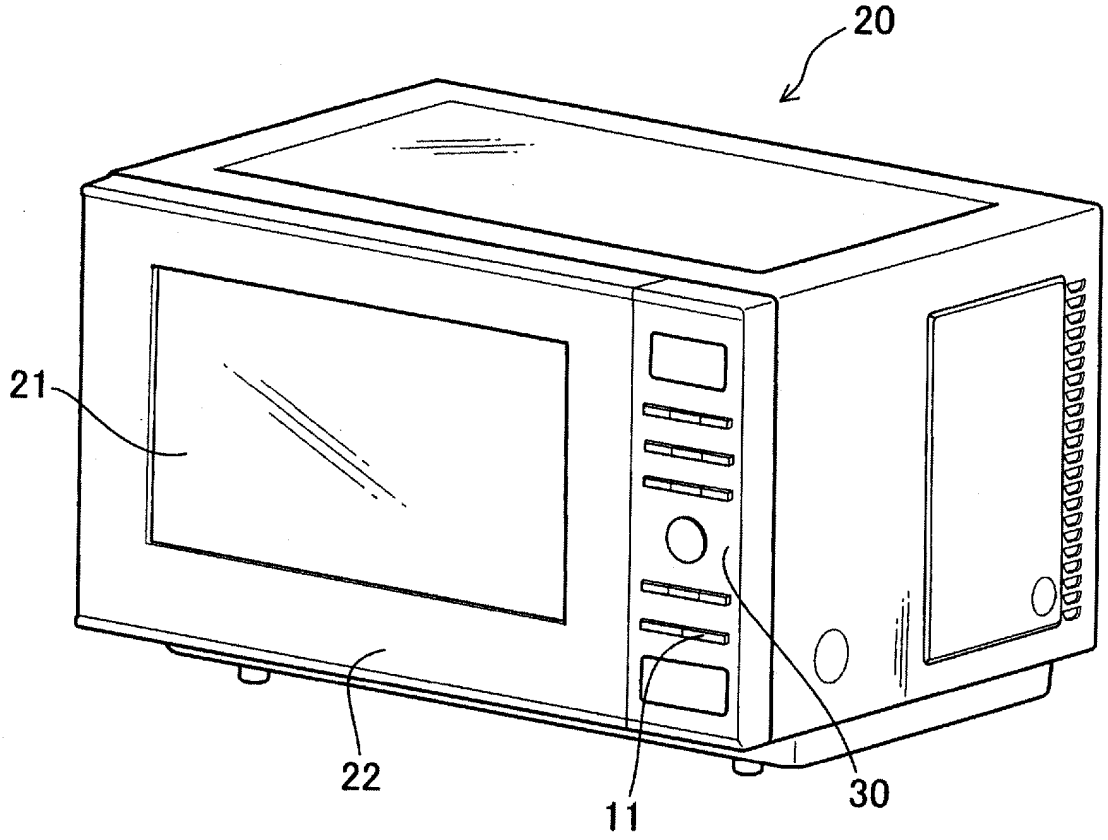


FIG. 2

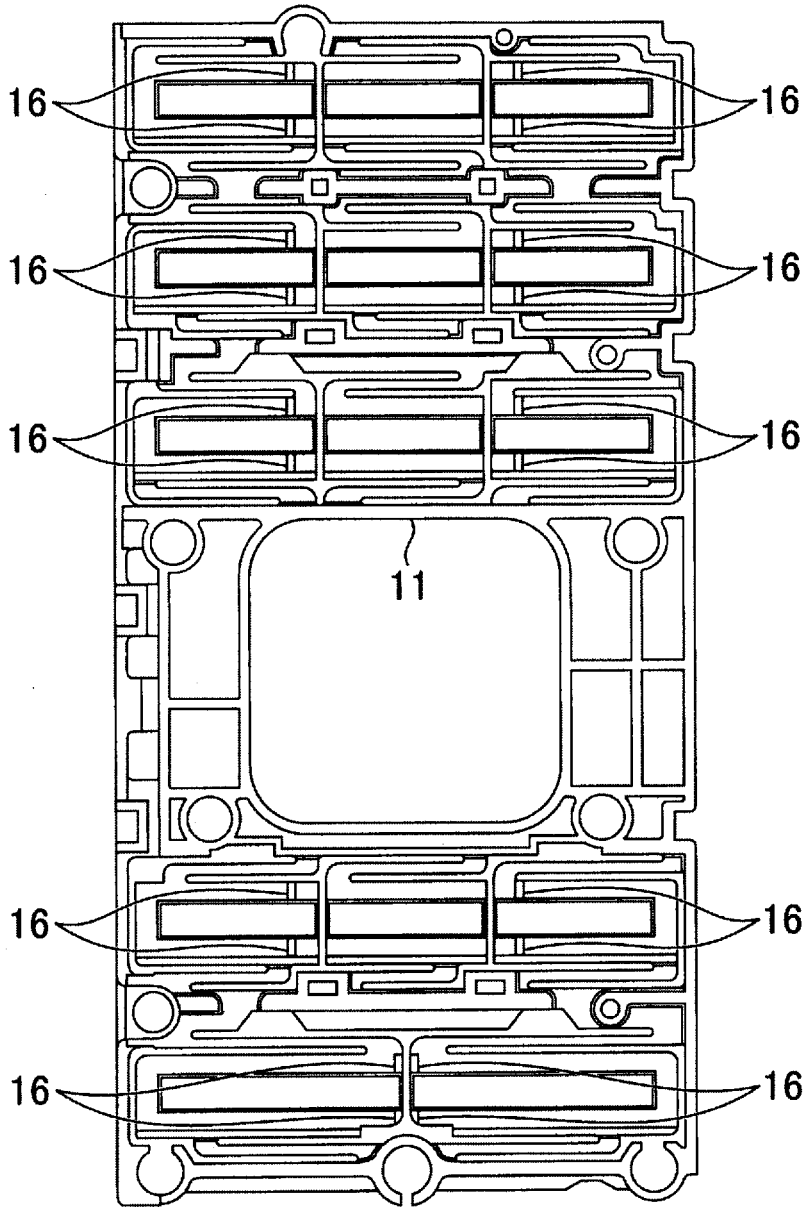


FIG. 3

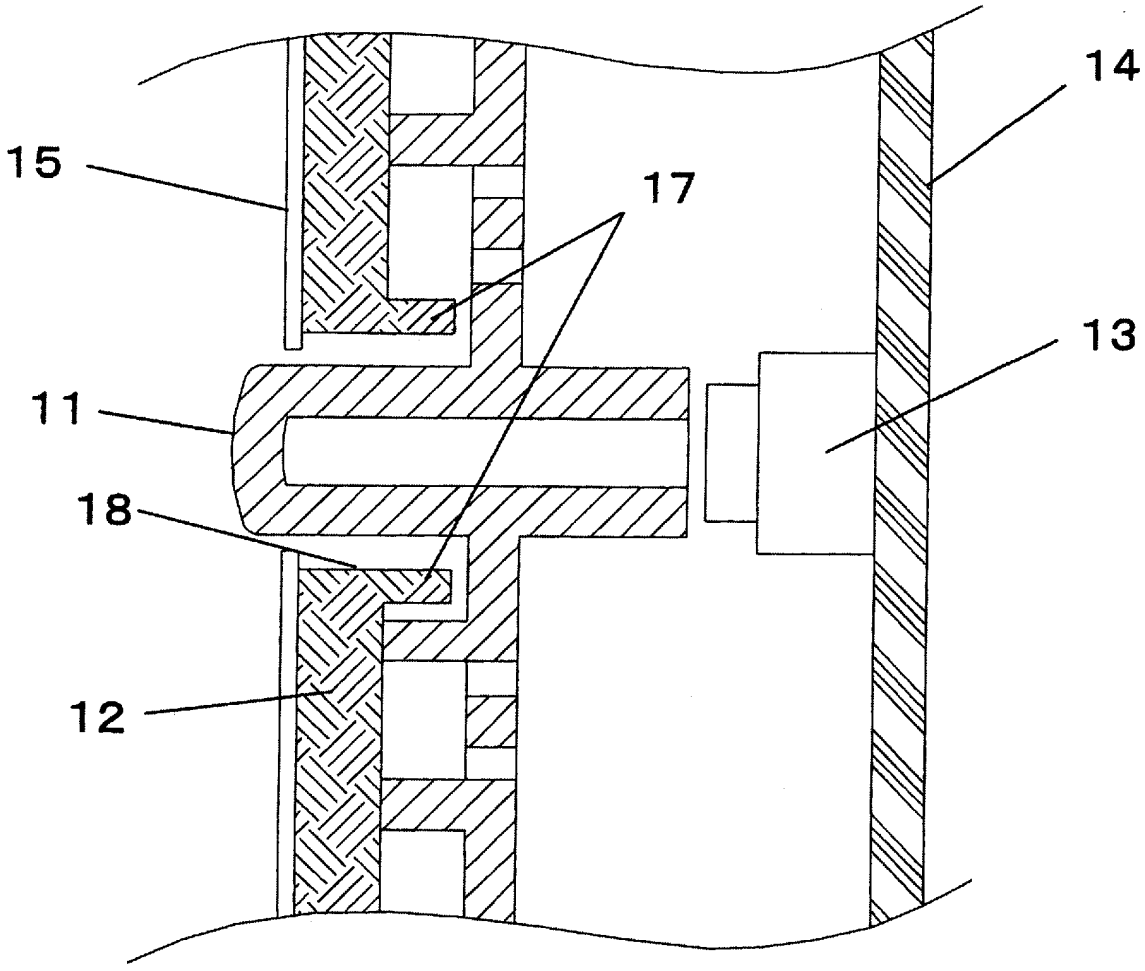
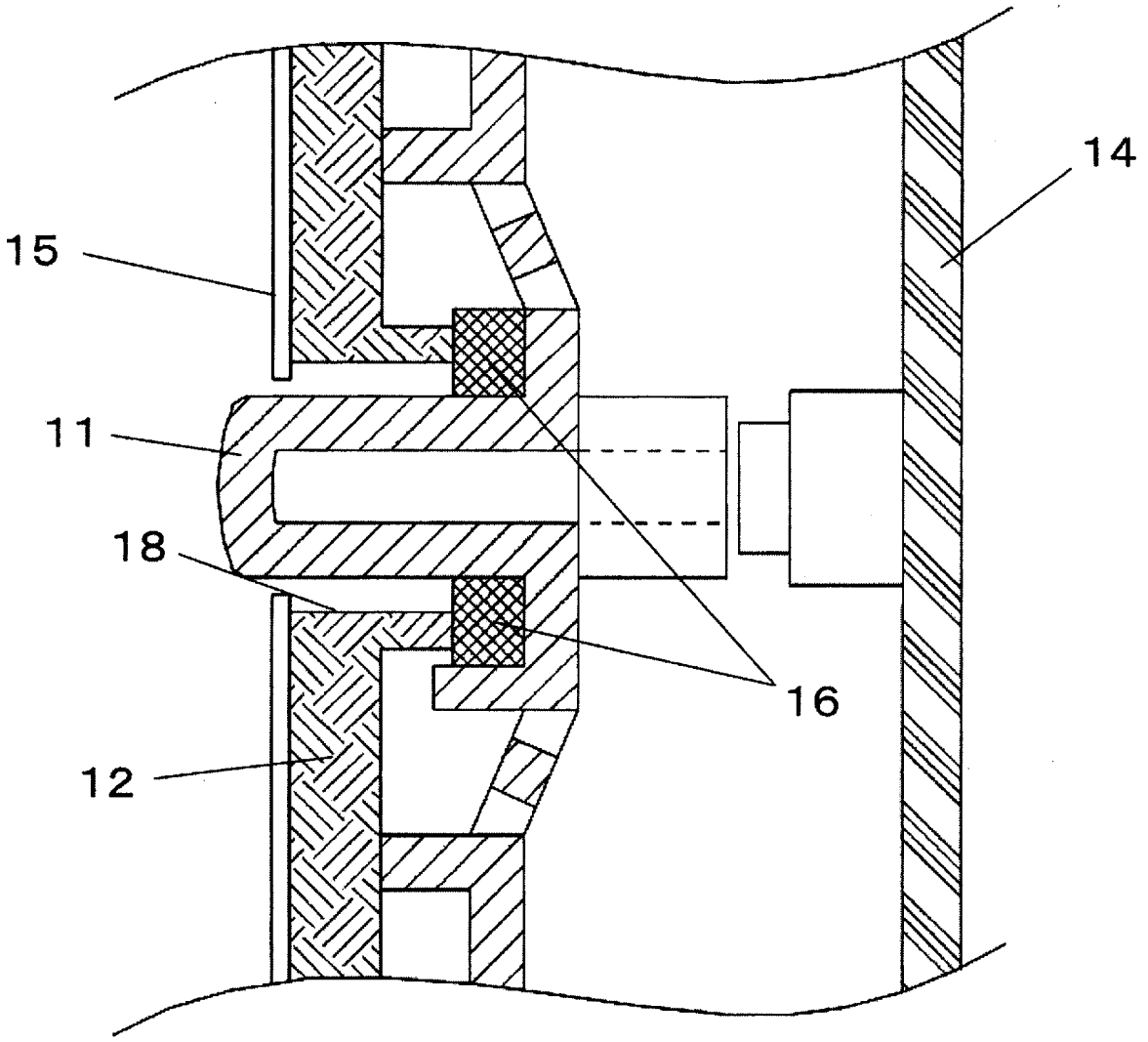


FIG. 4



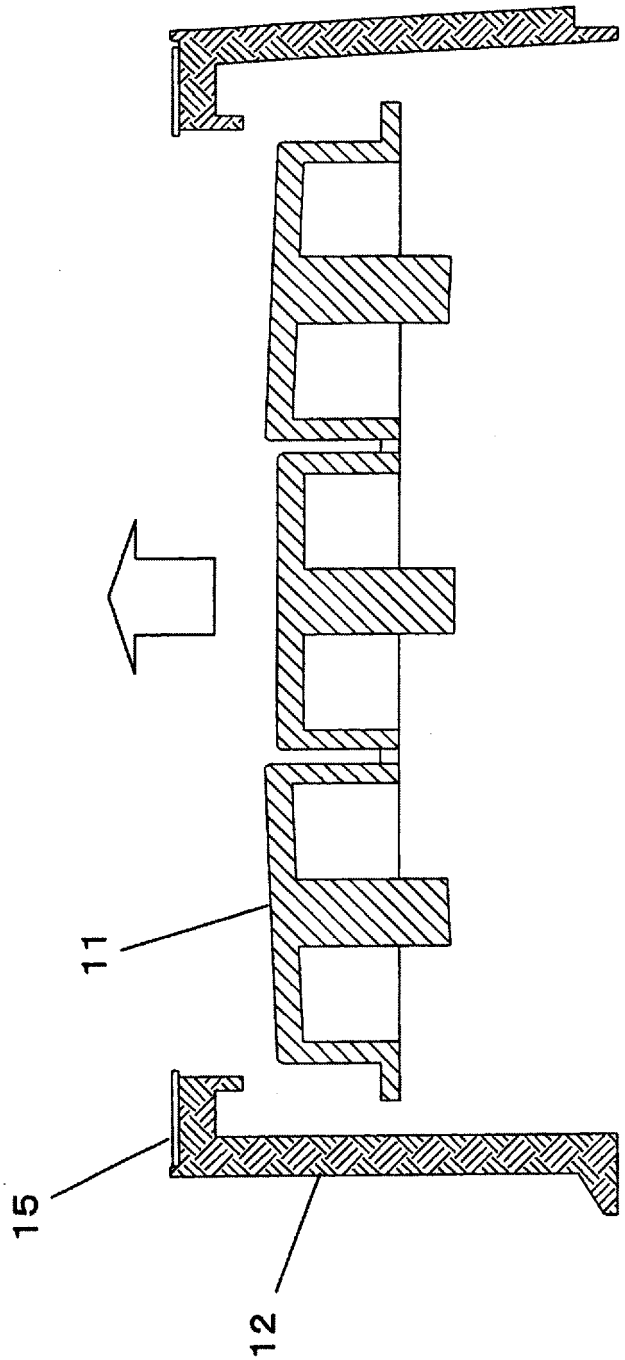


FIG. 5

FIG. 6

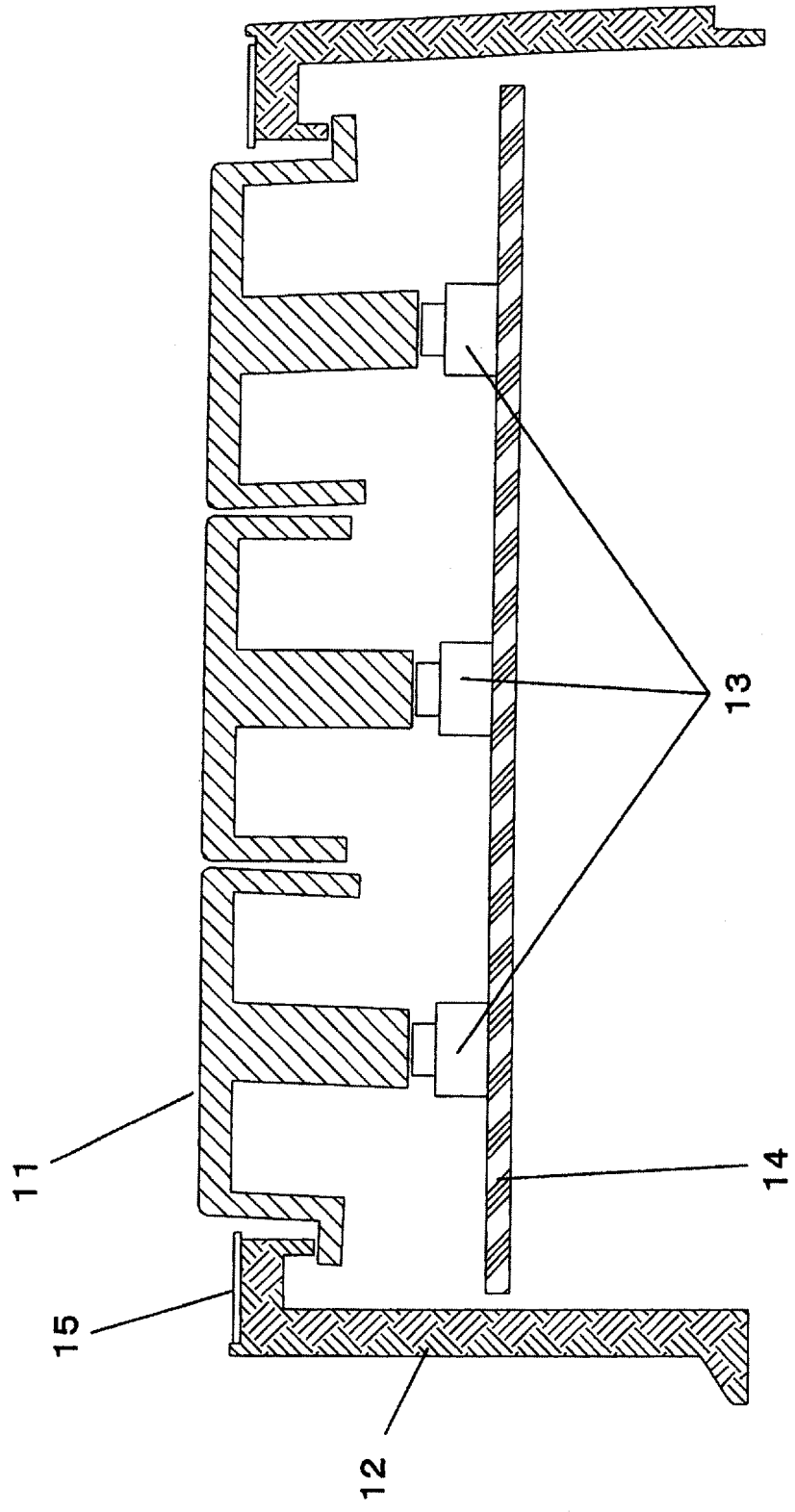


FIG. 7

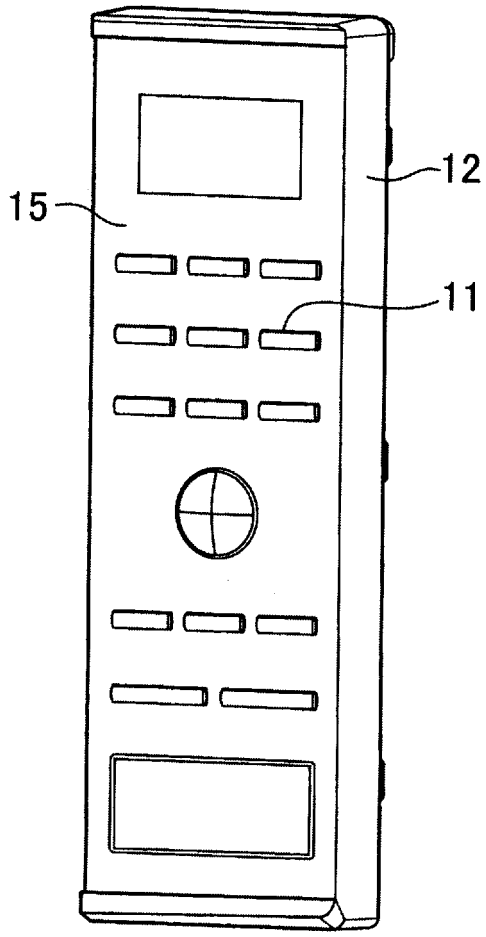


FIG. 8

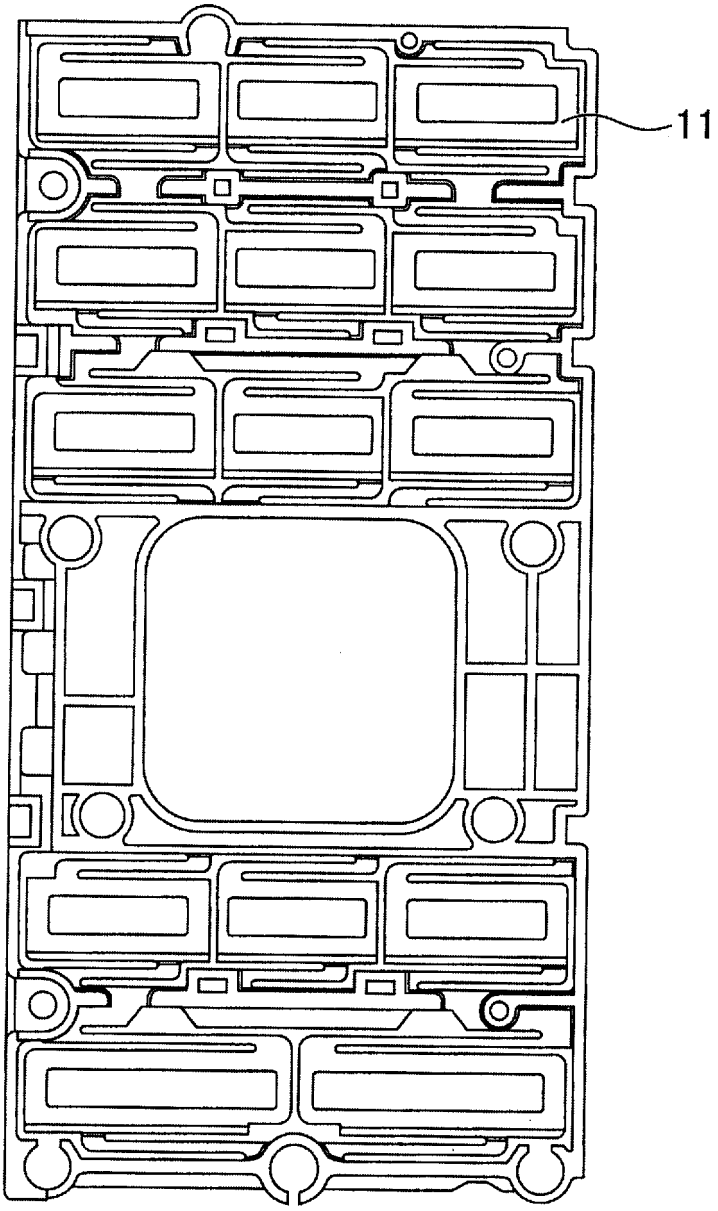


FIG. 9

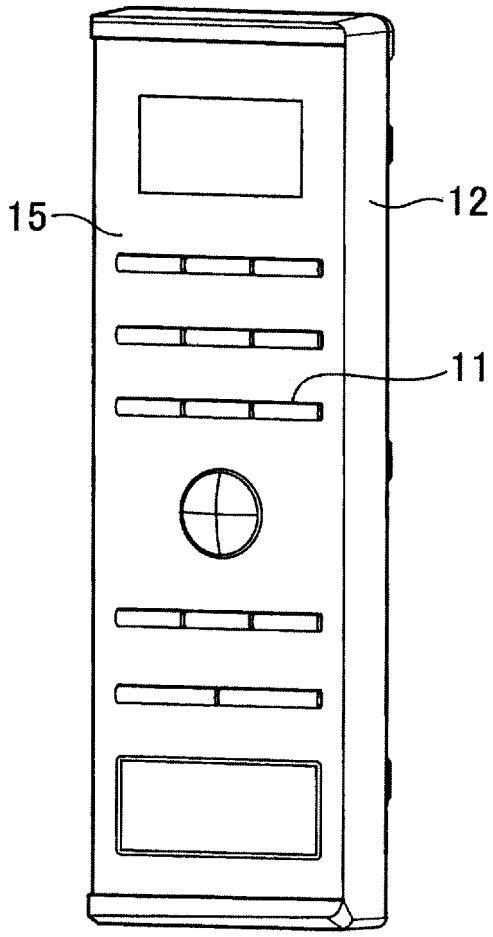
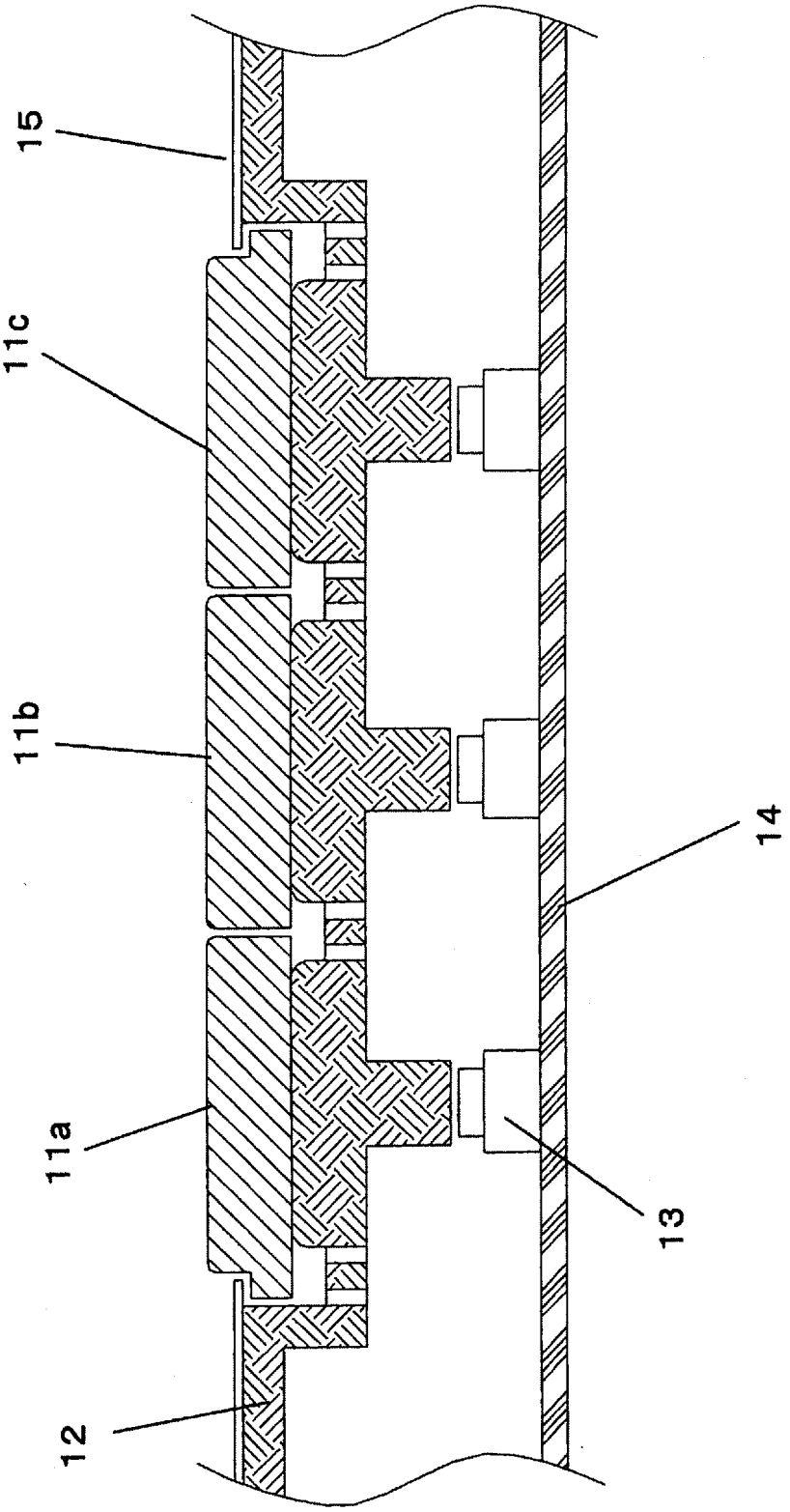


FIG. 10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/005172

A. CLASSIFICATION OF SUBJECT MATTER
H01H13/14(2006.01)i, *H01H13/70*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01H13/14, H01H13/70

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2012
Kokai Jitsuyo Shinan Koho	1971-2012	Toroku Jitsuyo Shinan Koho	1994-2012

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 7-302526 A (Teikoku Tsushin Kogyo Co., Ltd.), 14 November 1995 (14.11.1995), entire text; all drawings (Family: none)	1-3
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 186903/1985(Laid-open No. 094522/1987) (Alps Electric Co., Ltd.), 16 June 1987 (16.06.1987), entire text; all drawings (Family: none)	1-3

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 August, 2012 (29.08.12)	02 October, 2012 (02.10.12)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/005172

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 016181/1978(Laid-open No. 120328/1979) (NEC Corp.), 23 August 1979 (23.08.1979), entire text; all drawings (Family: none)	1-3

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006269286 A **[0008]**
- JP 2011181239 A **[0041]**