



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

(43) Date of publication:
05.08.2015 Bulletin 2015/32

(51) Int Cl.:
H01H 21/00 (2006.01)

(21) Application number: **13840324.1**

(86) International application number:
PCT/JP2013/005443

(22) Date of filing: **13.09.2013**

(87) International publication number:
WO 2014/050006 (03.04.2014 Gazette 2014/14)

(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
Designated Extension States:
BA ME

- **SHIBATA, Kiwamu**
Osaka-shi, Osaka 540-6207 (JP)
- **NAKAMURA, Atsushi**
Osaka-shi, Osaka 540-6207 (JP)
- **KUSAGAWA, Takashi**
Osaka-shi, Osaka 540-6207 (JP)
- **BABA, Kazuya**
Osaka-shi, Osaka 540-6207 (JP)

(30) Priority: **28.09.2012 JP 2012215840**

(71) Applicant: **Panasonic Intellectual Property Management Co., Ltd.**
Osaka-shi, Osaka 540-6207 (JP)

(74) Representative: **Müller-Boré & Partner**
Patentanwälte PartG mbB
Friedenheimer Brücke 21
80639 München (DE)

(72) Inventors:
• **OKUNO, Hirohisa**
Osaka-shi, Osaka 540-6207 (JP)

(54) **SWITCH**

(57) [PROBLEMS]

In a switch using a piano handle as for an operation handle, it enables the visceral operation and enables to increase the usability with keeping the suitable operatinality.

[SOLUTION MEANS]

A switch (1) comprises an operation handle (11) operated by a user, LEDs (4, 7) for indicating operation state of a load, and a first light guide member (41). The operation handle (11) is rotatably pivoted by a main body (10) of the switch at a side of the LEDs (4, 7), and output lights of the LEDs (4, 7) is guided to a side of the operation handle (11) distant from the LEDs (4, 7) by the first light guide member (41) and exit from an indication portion (11a) provided at an operating portion (11c).

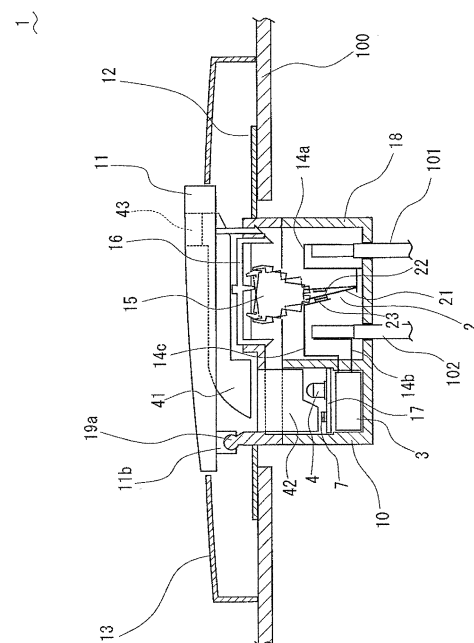


FIG 3

Description

TECHNICAL FIELD

[0001] The present invention relates to a switch suitable for an operation of lighting/extinction of a lighting installation.

BACKGROUND ART

[0002] Conventionally, a switch, which comprises a light source for indication to indicate an operation state of a load such as a lighting installation, and is used for an operation of lighting/extinction of the lighting installation, is known. Such a kind of the switch is typically buried in a building surface such as a wall surface via an installation frame.

[0003] For example, Japanese Patent Publication Bulletin No. 2003-272481 discloses a technology using an LED (Light Emitting Diode) as a light source for indication in a piano handle type switch. The piano handle type switch is a switch to which a piano handle pushed by a piano touch operation is applied as an operation handle. The operation handle is rotatably pivoted by bearing shafts protruded from an edge portion of a main body of the switch, and transmits a driving force to a push button handle installed in the main body of the switch.

[0004] In addition, Japanese Patent Publication Bulletin No. 2011-243295 discloses a switch comprises a light guide member of a vertically oblong shape which guides a light emitted from an LED to a lighting indication portion which is formed as a longer shape in a longitudinal direction of the operation handle of a longitudinally long shape.

[0005] In the conventional piano handle type switch, the push button handle is formed at an opposite edge portion to the bearing shafts. Accordingly, the LED for indication to indicate an operation state of the load and the indication portion to indicate an output light therefrom are disposed in the vicinity of the bearing shafts so as to avoid the interference with the push button handle and an inversion handle and so on which are driven by the push button handle. Since the operation handle has a structure to be rotated around the bearing shafts, an operating portion is located at a region distant from the bearing shafts, that is, at a front end region of the operation handle. Therefore, it is necessary to operate the operating portion located at the position distant from the indication portion of the LED for indication, so that visceral operation is difficult, and thus, usability is not so good.

[0006] On the other hand, if the push button handle is disposed near to the bearing shafts in order to dispose the LED for indication at an edge portion opposite to the bearing shafts, and a reciprocating stroke of the push button handle is secured equivalent to that of the conventional switch, a stroke of the operation handle becomes larger, and the operability becomes worse. In addition, since the LED for indication is located in the

vicinity of the operating portion that a quantity of movement thereof is larger, it is highly possible that the output light of the LED for indication leaks from the periphery of the operation handle.

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0007] The present invention is conceived to solve the above mentioned problems and purposed to provide a switch which enables the visceral operation and enables to increase the usability with keeping the suitable operability.

MEANS TO SOLVE THE PROBLEMS

[0008] In order to achieve the above mentioned purpose, a switch in accordance with the present invention comprises: an operation handle which is operated by a user; a switching section which controls power supply to a load responding to a displacement of the operation handle; a light source for indication which indicates an operation state of the load; and a main body of the switch which contains the switching section and the light source for indication, and characterized by that the operation handle is rotatably pivoted by the main body of the switch at a side of the light source for indication, and an output light of the light source for indication exits at a side of an operating portion distant from the light source for indication in the operation handle.

[0009] In this invention, it is preferable that the operation handle has a first light guide member which guides the output light of the light source for indication to the side of the operating portion.

[0010] In this invention, it is preferable that the main body of the switch has a second light guide member which guides the output light of the light source for indication to the first light guide member.

[0011] In this invention, it is preferable that the first light guide member has a first entrance portion through which the output light of the light source for indication enters, a first reflection portion which changes a direction of the output light entered through the first entrance portion toward the operating portion, a first light guide portion which guides the output light reflected by the first reflection portion to the side of the operating portion, and a first exit portion through which the output light guided by the first light guide portion exits, and wherein a thickness dimension of the first light guide portion in a depth direction of the switch is smaller than a thickness dimension of a portion from the first entrance portion to the first reflection portion in the depth direction of the switch.

[0012] In this invention, it is preferable that a plurality of kinds of the light sources for indication is provided.

[0013] In this invention, it is preferable that the plurality of kinds of the light sources for indication is mounted so that bottom faces of them in height direction are uni-

formed, and second entrance portions of the second light guide member, through which output lights of the light sources for indication enter, are formed at different heights corresponding to top ends of the light sources for indication.

[0014] In this invention, it is preferable that the first reflection portion is a parabolic surface.

[0015] In this invention, it is preferable that the first reflection portion is an elliptic surface.

[0016] In this invention, it is preferable that the first reflection portion is disposed on an optical axis of at least one of the light sources among the plurality of kinds of the light sources for indication.

[0017] In this invention, it is preferable that the operation handle has a light distribution member which distributes and emits the output light to be distributed in a desired area.

[0018] In this invention, it is preferable that prisms are formed on a surface of the light distribution member.

[0019] In this invention, it is preferable that the light distribution member is formed of a transparent material including light diffusing material.

EFFECT OF THE INVENTION

[0020] According to the switch of the present invention, the output light of the light source for indication exits from the side of the operating portion distant from the light source for indication in the operation handle, so that it is possible to enable the visceral operation and enables to increase the user-friendly with keeping the suitable operability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

[FIG. 1] A circuit diagram of a lighting system using a switch in accordance with an embodiment of the present invention

[FIG. 2] An assembling perspective view showing a configuration of the switch

[FIG. 3] A cross-sectional view of the switch

[FIG. 4] An assembling perspective view showing a configuration of a main body of the switch

[FIG. 5] A perspective view showing a configuration of a first light guide member applied to the switch

[FIG. 6] A perspective view showing a configuration of a second light guide member applied to the switch

[FIG. 7] A plain view showing a condition that an output light of an LED for on-indication passes through the second light guide member and the first light guide member and exits from a light distribution member

[FIG. 8] A plain view showing a condition that an output light of an LED for off-indication passes through the second light guide member and the first light guide member and exits from a light distribution

member

MODE FOR CARRYING OUT THE INVENTION

[0022] A switch in accordance with an embodiment of the present invention is described with reference to the drawings. FIG. 1 shows a circuit configuration of a lighting system using the switch. The switch 1 is connected between a load L such as an incandescent lamp, a fluorescent lamp or an LED lamp and an alternating current power source in series, and controls power supply to the load L. The switch 1 comprises a switching section 2, a transformer 3, an LED 4 for on-indication (a light source for indication), a diode 5, a resistor 6, an LED 7 for off-indication (a light source for indication), a resistor 8, a diode 9 and so on.

[0023] The switching section 2 is connected to a circuit, which is configured by the load L, the alternating current power source and a primary coil 3a of the transformer 3, in series. The transformer 3 is excited by an alternating electric current inputted into the primary coil 3a and outputs an alternating electric current from a secondary coil 3b, while the switching section 2 is on. The LED 4 for on-indication emits light by receiving power supply from the secondary coil 3b so as to indicate that the load L is in active state. As for the LED 4 for on-indication, an LED of red color or orange color is applied, for example. The diode 5 is connected in parallel with the LED 4 for on-indication in back-to-back for responding to the alternating electric current. The resistor 6 is connected between the secondary coil 3b and the LED 4 for on-indication in series and limits a current flowing into the LED 4 for on-indication so as to control brightness of the LED 4 for on-indication. The LED 7 for off-indication is connected in parallel with the switching section 2 and emits light while the switching section 2 is off so as to indicate that the load L is in nonactive state. As for the LED 7 for off-indication, an LED of green color or blue color is applied, for example. The resistor 8 is connected to the LED 7 for off-indication in series so as to limit a current flowing into the LED 7 for off-indication. The diode 9 is connected in parallel with the LED 7 for off-indication in back-to-back for responding to the alternating electric current. In order to prevent malfunction of the load L (lighting in case of a lighting installation, for example) while the switching section 2 is off, an impedance of the resistor 8, which is connected to the LED 7 for off-indication in series, is set to be larger. In addition, since induced electromotive force is rarely induced in the secondary coil 3b of the transformer 3, the LED 4 for on-indication does not emit light.

[0024] FIG. 2 shows a schematic configuration of the switch 1. The switch 1 is called piano handle type switch, which is a switch switched on and off by piano touch operation. The switch 1 is configured of a main body 10 of the switch, an operation handle 11, an installation frame 12, a decorated plate 13, and so on. The operation handle 11 is formed of an insulative resin material, and

installed on a front face of the main body 10 of the switch, and operated by a user. The installation frame 12 is formed by press working of a metal plate and fixed on a building wall 100 (see FIG. 3). The main body 10 of the switch is installed on an inner side of the installation frame 12, so that the main body 10 of the switch is supported by the installation frame 12. Although, FIG. 2 shows a mode that two sets of the main bodies 10 of the switch and the operation handles 11 are installed on the installation frame 12, a number of set of the main body 10 of the switch and the operation handle 11 may be only one or more than two. The decorated plate 13 is formed of a resin material or the like and installed on a front face of the installation frame 12 so as to decorate a periphery of the installation frame 12, in particular.

[0025] FIG. 3 shows a cross section of the switch 1. The main body 10 of the switch has the switching section 2, the transformer 3, the LED 4 for on-indication, the diode 5, the resistor 6, the LED 7 for off-indication, the resistor 8, the diode 9 and so on, as shown in FIG. 1. In this embodiment, a cannonball shaped LED is applied for the LED 4 for on-indication, and a chip type LED is applied to the LED 7 for off-indication. The cannonball shaped LED applied for the LED 4 for on-indication can emit a high-intensity light in a direction of the optical axis by light concentration behavior, so that the output light is visible easily even in a state that the lighting installation as the load L is lit on (in a state that the periphery of the switch 1 is bright). On the other hand, the chip type LED is used for the LED 7 for off-indication, because it is sufficient that the output light is visible in a state that the light installation as the load L is lit out (in a state that the periphery of the switch 1 is dark).

[0026] In addition, the main body 10 of the switch further has terminal plates 14a, 14b, 14c, an inversion handle 15, a push button handle 16, a circuit board 17, an outer peripheral body 18, a cover 19, and so on. The terminal plate 14a is connected so that an end thereof is connected to an electric wire 101 which connects the alternating current power supply and the switch 1 and the other end is connected to the switching section 2, respectively. A top portion of the electric wire 101 is biased by a spring member (not illustrated), so that the connection state of the electric wire 101 and the terminal plate 14a is maintained. The terminal plate 14b is connected so that an end thereof is connected to the primary coil 3a of the transformer 3 and the other end is connected to an electric wire 102 which connects the switch 1 and the load L, respectively. A top portion of the electric wire 102 is biased by a spring member (not illustrated), so that the connection state of the electric wire 102 and the terminal plate 14b is maintained, too. The terminal plate 14c is connected so that an end thereof is connected to the primary coil 3a of the transformer 3 and the other end is connected to the switching section 2, respectively. The transformer 3 may be provided in the vicinity of the switching section 2 (between the electric wire 101 and the electric wire 102).

[0027] The inversion handle 15 is rotatably pivoted by the outer peripheral body 18, converts a driving force in a reciprocal direction inputted by the push button handle 16 to a driving force in a rotation direction and transmits it to the switching section 2. The push button handle 16 is supported reciprocally movable by the cover 19 and transmits a driving force inputted from the operation handle 11 to the inversion handle 15.

[0028] The LED 4 for on-indication, the diode 5, the resistor 6, the LED 7 for off-indication, the resistor 8 and so on, are mounted on the printed circuit board 17. A mounting member, into which metal sheets (leads) connecting the above mentioned elements are inserted, may be used instead of the printed circuit board 17. In such a case, the mounting member is formed of an insulative resin material into a block shape. The LED 4 for on-indication and the LED 7 for off-indication are disposed on a front face side of the switch 1. The LED 4 for on-indication and the LED 7 to be mounted on the printed circuit board 17 are disposed on a surface of the board in a manner so that bottom faces of them are uniformed in height direction. The same goes for the case of using the block shaped mounting member. Output lights outputted from the LED 4 for on-indication and the LED 7 are observed from outside of the switch 1 through a first light guide member 41, a second light guide member 42, a light distribution member 43, and so on, which are described later, so that an operation of the load L can be confirmed. The LED 4 for on-indication and the LED 7 for off-indication may be mounted on a mounting member formed of an insulation material such as a resin material.

[0029] The outer peripheral body 18 is formed of an insulative resin material, and contains the switching section 2, the transformer 3, the terminal plates 14a, 14b, 14c, the inversion handle 15, and the circuit board 17, and block outs the outer periphery of the main body 10 of the switch. The cover 19 is formed of an insulative resin material and attached to an opening on a front face of the outer peripheral body 18.

[0030] In FIG. 3, an off state of the switching section 2 is shown by solid lines, and an on state of the switching section 2 is shown by dotted lines. The switching section 2 is configured of a movable plate 21 and a movable contact 22, a fixed contact 23, and so on. The movable plate 21 is rotatably contained in the outer peripheral body 18, and electrically connected to the terminal plate 14a. The movable contact 22 is formed at a top side of the movable plate 21. The fixed contact 23 is formed on the terminal plate 14c to face the movable contact 22. A top of the inversion handle 15 and a top of the movable plate 21 are engaged with each other, so that the movable plate 21 rotates coupled with a rotation of the inversion handle 15, and thus, the switching section 2 is switched on and off.

[0031] In each case that the user performs a push operation of the operation handle 11, a driving force thereof is serially transmitted to the push button handle 16 and the inversion handle 15, so that the movable plate 21 is

driven to switch on or off the switching section 2. These motions are the same as those shown in the patent document 1, so that the description of them is omitted.

[0032] The switch 1 has the first light guide member 41, the second light guide member 42 and the light distribution member 43 as a configuration to emit the output lights of the LED 4 for on-indication and the LED 7 for off-indication to outside of the switch 1. When the LED 4 for on-indication or the LED 7 for off-indication is lit following to the switching on and off of the switching section 2, the output light thereof transmits through the second light guide member 42 and the first light guide member 41 in sequence, and exits from the light distribution member 43.

[0033] FIG. 4 shows the main body 10 of the switch and the operation handle 11 which is to be installed on a front face of the main body 10 of the switch. A housing of the main body 10 of the switch is configured of the outer peripheral body 18, the cover 19, and so on. The outer peripheral body 18 contains main elements constituting the switch 1 such as the switching section 2, the transformer 3, the terminal plates 14a, 14b, 14c, the inversion handle 15, the circuit board 17 and the second light guide member 42 and so on, as shown in FIG. 3. The second light guide member 42 is formed of a transparent resin material or the like, and guides the output lights of the LED 4 for on-indication and the LED 7 to the first light guide member 41. The second light guide member 42 is fit into a through hole 19b formed on a front face of the cover 19. The push button handle 16 is built onto the cover 19. The push button handle 16 is disposed on a side of an operating portion 11c of the operation handle 11, that is, a side distant from bearing portions 11b. Therefore, a stroke of the operation handle 11 can be set to a proper value, and thus, good operability can be obtained.

[0034] The cover 19 has the bearing shafts 19a and the through hole 19b. The bearing shafts 19a are formed at an edge of the cover 19 in the vicinity of the second light guide member 42, engaged with the bearing portions 11b of the operation handle 11, and support the operation handle 11 rotatably. The through hole 19b penetrates a front wall face of the cover 19 in the vicinity of the bearing shafts 19a. The second light guide member 42 is fit into the through hole 19b, so that the output lights of the LED 4 for on-indication and the LED 7 for off-indication exit therefrom.

[0035] The operation handle 11 has an indication portion 11a, the bearing portions 11b, the operating portion 11c, the first light guide member 41 and the light distribution member 43. The indication portion 11a is formed at a side of the operating portion 11c distant from the bearing portions 11b. Hereupon, the side distant from the bearing portions 11b is defined as a side near to a front end rather than a central portion of the operation handle 11 when the bearing portions 11b is disposed at a base end of the operation handle 11, and it is not necessarily the edge portion of the operation handle 11. The

light distribution member 43 is fit into a through hole formed on the indication portion 11a, so that the output lights of the LED 4 for on-indication and the LED 7 for off-indication exit from the light distribution member 43. One set of the bearing portions 11b is formed to interleave the first light guide member 41 between them in the vicinity of an edge of a back face of the operation handle 11 corresponding to the bearing shafts 19a. The operation handle 11 is rotatably pivoted by the main body 10 of the switch by engaging the bearing portions 11b with the bearing shafts 19a. The operating portion 11c is a portion to which the push operation is performed by the user, and provided at a side distant from the bearing portions 11b. In other words, the light distribution member 43 is fit into the through hole of the indication portion 11a formed in a part of an area constituting the operating portion 11c. The first light guide member 41 is conjugated to the operation handle 11 by heat welding such as an ultrasonic heat welding, for example. Thereby, no fixing member is needed to conjugate both elements, so that the configuration of the switch 1 can be made simple. Since the first light guide member 41 and the light distribution member 43 are provided on the operation handle 11, they are integrally rotated with the rotation of the operation handle 11.

[0036] The first light guide member 41 is formed of a transparent resin material or the like, and built in a rear face of the operation handle 11. The first light guide member 41 guides the output lights of the LED 4 for on-indication and the LED 7 for off-indication to the light distribution member 43 which is disposed at the side distant from the bearing portions 11b, that is, the side of the operating portion 11c.

[0037] The light distribution member 43 distributes and exits the output lights of the LED 4 for on-indication and the LED 7 for off-indication into a desired area. Since the light distribution member 43 is provided in the region constituting the operating portion 11c, the user can operate the operating portion 11c relying on the output lights of the LED 4 for on-indication and the LED 7 for off-indication. For example, by relying on the output light of the LED 7 for off-indication in darkness, he or she can operate the operating portion 11c easily.

[0038] FIG. 5 shows the first light guide member 41. The light guide member 41 has a first entrance portion 41a, a first reflection portion 41b, a first light guide portion 41c, a second reflection portion 41d and a first exit portion 41e. The first entrance portion 41a is provided at an end of the first light guide member 41, and the output lights of the LED 4 for on-indication and the LED 7 for off-indication exit from the second light guide member 42 enters therefrom. The first reflection portion 41b is provided between the first entrance portion 41a and the first light guide portion 41c so as to change the direction of the light toward the first light guide portion 41c, that is, to the direction toward the operating portion 11c by reflecting the output lights entering from the first entrance portion 41a. The first light guide portion 41c is provided between

the first reflection portion 41b and the second reflection portion 41 d so as to guide the output lights reflected by the first reflection portion 41 b to the second reflection portion 41d disposed at the side of the operating portion 11c. The second reflection portion 41d is provided between the first light guide portion 41 c and the first exit portion 41e so as to change the direction of the light to a direction toward the first exit portion 41e by reflecting the output lights guided from the first light guide portion 41 c. The first exit portion 41e is provided at the other end of the first light guide member 41 so that the output lights reflected by the second reflection portion 41 d exit therefrom.

[0039] The first light guide member 41 is built into the operation handle 11 in a manner so that the first entrance portion 41 a faces a second exit portion 42c of the second light guide member 42 when the operation handle 11 is installed on the main body 10 of the switch. A thickness dimension T1 of the first light guide portion 41 c in a depth direction of the switch 1 is set to be smaller than a thickness dimension T2 of a portion from the first entrance portion 41 a to the first reflection portion 41b in the depth direction of the switch 1. Thereby, the first light guide portion 41 c can be disposed between the operation handle 11 and the push button handle 16, so that it is possible to prevent blocking of rotation of the operation handle 11 due to interference of the first light guide portion 41c with the cover 19 and so on, when the operation handle 11 is operated. By the way, it may be configured that a driving force applied to the operating portion 11c of the operation handle 11 is transmitted to the push button handle 16 via the first light guide portion 41c. In addition, by disposing the first entrance portion 41 a of the first light guide member 41 near to the second exit portion 42c of the second light guide 42, the light exit from the second exit portion 42c can enter into the first entrance portion 41 a effectively. Furthermore, it is possible to restrain the leakage of the light exit from the second exit portion 42c from the periphery of the operation handle 11.

[0040] FIG. 6 shows the second light guide member 42. The second light guide member 42 has second entrance portions 42a, a second light guide portion 42b and the second exit portion 42c. The second entrance portions 42a are formed at different heights (in a staircase pattern) corresponding to the LED 4 for on-indication (cannonball shaped LED) and the LED 7 for off-indication (tip shaped LED), top ends of which are at different height. Thereby, it is possible that the lights exit from the light sources can enter into the second entrance portions 42a effectively by disposing the second entrance portions 42a of the second light guide member 42 near to exit portions of the LED 4 for on-indication and the LED 7 for off-indication.

[0041] In addition, the first reflection portion 41 b of the first light guide member 41 is disposed on an optical axis of any one of the light sources (for example, the LED 4 for on-indication) among a plurality of the light sources. On the other hand, the first reflection portion 41b is not

disposed on an optical axis of the LED 7 for off-indication. Thereby, it is possible to indicate the output light of the LED 4 for on-indication bright and the output light of the LED 7 for off-indication dimly and softly. Alternatively, by disposing the first reflection portion 41b on the optical axis of the LED 7 for off-indication, the output light of the LED 7 for off-indication can be indicate bright, too.

[0042] In order not to block the rotation of the operation handle 11 due to interference of the first entrance portion 41 a of the first light guide member 41 with the second exit portion 42c of the second light guide member 42, the first entrance portion 41 a and the second exit portion 42c are disposed with a predetermined distance. In this embodiment, since the first entrance portion 41 a is positioned in the vicinity of the bearing shafts 19a serving as a center of the rotation of the operation handle 11, a movement of the first entrance portion 41a following to the rotation of the operation handle 11 is restrained. Accordingly, the interference of the first entrance portion 41 a with the second exit portion 42c rarely occurs, so that the distance between the first entrance portion 41 a and the second exit portion 42c can be set smaller and the light exiting from the second exit portion 42c can enter into the first entrance portion 41 a effectively.

[0043] FIG. 7 shows a condition that the output light of the LED 4 for on-indication is guided by the second light guide member 42 and the first light guide member 41 and exits from the light distribution member 43. In addition, FIG. 8 shows a condition that the output light of the LED 7 for off-indication is guided by the second light guide member 42 and the first light guide member 41 and exits from the light distribution member 43. The output lights of the output light of the LED 4 for on-indication and the output light of the LED 7 for off-indication enter into the first light guide member 41 while being reflected by end faces of the second light guide member 42 in proper manner. The output light entering into the first light guide member 41 enters into the light distribution member 43 while being reflected by end faces of the first light guide member 41 further to the first reflection portion 41b and the second reflection portion 41d in proper manner.

[0044] The first reflection portion 41b of the first light guide member 41 is constituted by a parabolic surface or an elliptic surface. According to the mode that the first reflection portion 41b is constituted by the parabolic surface, it is possible to guide the output lights exiting from a plurality of light sources to the first light guide portion 41 c by reflecting them effectively. Alternatively, according to the mode that the first reflection portion 41b is constituted by the elliptic surface, it is possible to guide an output light exit from one of the light sources to the first light guide portion 41c by reflecting them effectively in particular.

[0045] In addition, prisms are formed on a surface of the light distribution member 43. Thereby, it is possible to blind the internal structure of the switch 1 from outside of the light distribution member 43 without reducing amount of light passing through the light distribution

member 43. Alternatively, the light distribution member 43 may be formed of a transparent material including a light diffusion material, for example. Thereby, it is possible to blind the internal structure of the switch 1 from outside of the light distribution member 43. In addition, it is possible to exit a uniform, dim and soft light because the output lights of the LED 4 for on-indication and the LED 7 for off-indication are diffused by the light diffusion material, when passing through the distribution member 43.

[0046] According to the switch 1 having the above mentioned constitution of this embodiment, the output lights of the LED 4 for on-indication and the LED 7 for off-indication exit at the side of the operating portion 11c distant from the light sources in the operation handle. Thereby, it enables the visceral operation and enables to increase the usability with keeping the suitable operability. In addition, since the LED 4 for on-indication and the LED 7 for off-indication are disposed at positions distant from the operating portion 11c of large displacement, it is possible to restrain leakage of the output lights of the LED 4 for on-indication and the LED 7 for off-indication from the periphery of the operation handle 11.

[0047] In addition, since the operation handle 11 has the first light guide member 41 which guides the output lights of the LED 4 for on-indication and the LED 7 for off-indication to the side of the operating portion 11c, it is possible to indicate the operation state of the load L at the side of the operating portion 11c distant from the light sources, though it is a simple configuration.

[0048] Since the second light guide member 42 is provided between the first light guide member 41 which rotates and the LED 4 for on-indication and the LED 7 for off-indication as the light sources, it is possible to guide the output lights of the light sources into the first light guide member 41, effectively.

[0049] Since the first light guide member 41 has the first entrance portion 41a, the first reflection portion 41b, the first light guide portion 41c and the first exit portion 41e, it is possible to guide the output lights of the light sources to the first exit portion 41e with changing the direction of the output lights, though it is a simple configuration. In addition, since the thickness dimension T1 of the first light guide portion 41c is smaller than the thickness dimension T2 of the portion from the first entrance portion 41a to the first reflection portion 41b, it is possible to prevent blocking of the rotation of the operation handle 11 due to interference of the first light guide portion 41c with the main body 10 of the switch, and so on.

[0050] Since a plurality of kinds of the LEDs 4, 7 is provided as the light sources for indication, indication of the indication portion can be switched responding to the operation state of the load L, and thus, usability of the switch can be increased.

[0051] In addition, since a plurality of kinds of the LEDs 4, 7 is mounted on the circuit board 17, the LEDs 4, 7 can easily be mounted by the simple configuration, and thus, and cost reduction of the switch 1 is enabled. In

addition, since the second entrance portions 42a of the second light guide member 42 are formed at different heights, it is possible that the output lights exiting from the light sources enter into the second entrance portions 42a effectively by disposing the second entrance portions 42a near to the exit portions of the LEDs 4, 7, respectively.

[0052] In addition, since the first reflection portion 41b of the first light guide member 41 is constituted by a parabolic surface or an elliptic surface, it is possible to guide the output lights exiting from a plurality of light sources or the output light exiting from one of the light sources to the first light guide portion 41c by reflecting it or them effectively.

[0053] In addition, since the first reflection portion 41b of the first light guide member 41 is disposed on the optical axis of the LED 4 for on-indication, it is possible to indicate the output light of the LED 4 for on-indication brightly. Alternatively, since the first reflection portion 41b of the first light guide member 41 is not disposed on the optical axis of the LED 7 for off-indication, it is possible to indicate the output light of the LED 7 for on-indication dimly and softly. In this manner, by disposing the first reflection portion 41b on an optical axis of any light source, it is possible to indicate the output light of the light source brightly. In addition, by disposing the first reflection portion 41b on the optical axis of the LED 7 for off-indication, too, it is possible to indicate the LED 7 for off-indication brightly, too.

[0054] In addition, since the operation handle 11 has the light distribution member 43, it is possible to distribute and exit the output lights of the LEDs 4, 7 in a desired area, and thus, usability of the switch 1 can be increased. In addition, since the prisms are formed on the surface of the light distribution member 43, the internal structure of the switch 1 becomes blind from the outside of the light distribution member 43 without reducing amount of light passing through the light distribution member 43, and thus, the commercial value of the switch 1 is increased. Alternatively, since the light distribution member 43 is formed of a transparent material including a light diffusion material, the internal structure of the switch 1 becomes blind from the outside of the light distribution member 43. In addition, it is possible to exit a uniform, dim and soft light because the output lights of the LED 4 for on-indication and the LED 7 for off-indication are diffused by the light diffusion material, when passing through the light distribution member 43, and thus, the commercial value of the switch 1 is increased.

[0055] Besides, the present invention is not limited to the above mentioned configuration of the embodiment, it may be constituted that at least the operation handle 11 is rotatably pivoted by the main body 10 of the switch at the side of the LEDs 4, 7, and the output lights of the LEDs 4, 7 exit at the side of the operating portion 11c of the operation handle 11 distant from the LEDs 4, 7.

[0056] In addition the present invention can be modified in various modes. For example, the LED 4 for on-indication and the LED 7 for off-indication used as the

light sources of indication are not limited to the cannonball shape and the tip shaped LEDs, and they may be LEDs of different shapes. In addition, the light sources for indication are not limited to the LEDs, and they may be other light sources such as neon bulbs, organic EL (Electro-Luminescence), or the like.

[0057] In addition, the light sources may be disposed nearly to face the first entrance portion 41a of the first light guide member 41, and thus, the second light guide member 42 may be disestablished. In addition, the first light guide member 41 and the distribution member 43 may be formed integrally with each other.

[0058] In addition, since the load L is not limited to the lighting installation such as the incandescent lamp, the fluorescent lamp or the LED lamp, it may be another electric installation. In addition, since the main body 10 of the switch is not limited to the mode constituted by the outer peripheral body 18 and the cover 19, it may be a mode replaced by other elements or a mode that another element is added.

EXPLANATION OF THE NUMERIAL REFERENCES

[0059]

1	Switch	
2	Switching section	
4	LED for on-indication (Light source for indication)	
7	LED for off-indication (Light source for indication)	
10	Main body of switch	
11	Operation handle	
11c	Operating portion	
41	First light guide member	
41 a	First entrance portion	
41b	First reflection portion	
41c	First light guide portion	
41e	First exit portion	
42	Second light guide portion	
42a	Second entrance portion	
43	Light distribution member	
L	Load	

Claims

1. A switch comprising:

an operation handle which is operated by a user;
 a switching section which controls power supply to a load responding to a displacement of the operation handle;
 a light source for indication which indicates an operation state of the load; and
 a main body of the switch which contains the switching section and the light source for indication, and **characterized by** that the operation handle is rotatably pivoted by the main body of the switch at a side of the light

source for indication, and

an output light of the light source for indication exits at a side of an operating portion distant from the light source for indication in the operation handle.

2. The switch in accordance with claim 1, wherein the operation handle has a first light guide member which guides the output light of the light source for indication to the side of the operating portion.

3. The switch in accordance with claim 2, wherein the main body of the switch has a second light guide member which guides the output light of the light source for indication to the first light guide member.

4. The switch in accordance with claim 2, wherein the first light guide member has a first entrance portion through which the output light of the light source for indication enters, a first reflection portion which changes a direction of the output light entered through the first entrance portion toward the operating portion, a first light guide portion which guides the output light reflected by the first reflection portion to the side of the operating portion, and a first exit portion through which the output light guided by the first light guide portion exits, and wherein a thickness dimension of the first light guide portion in a depth direction of the switch is smaller than a thickness dimension of a portion from the first entrance portion to the first reflection portion in the depth direction of the switch.

5. The switch in accordance with one of claims 1 to 4, wherein a plurality of kinds of the light sources for indication is provided.

6. The switch in accordance with claim 5, wherein the plurality of kinds of the light sources for indication is mounted so that bottom faces of them in height direction are uniformed, and second entrance portions of the second light guide member, through which output lights of the light sources for indication enter, are formed at different heights corresponding to top ends of the light sources for indication.

7. The switch in accordance with claim 5 or 6, wherein the first reflection portion is a parabolic surface.

8. The switch in accordance with claim 5 or 6, wherein the first reflection portion is an elliptic surface.

9. The switch in accordance with claim 5 depending on claim 4, wherein the first reflection portion is disposed on an optical axis of at least one of the light sources among the plurality of kinds of the light sources for indication.

10. The switch in accordance with one of claims 1 to 3, wherein the operation handle has a light distribution member which distributes and emits the output light to be distributed in a desired area.

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11. The switch in accordance with claim 10, wherein prisms are formed on a surface of the light distribution member.

12. The switch in accordance with claim 10 or 11, wherein the light distribution member is formed of a transparent material including light diffusing material.

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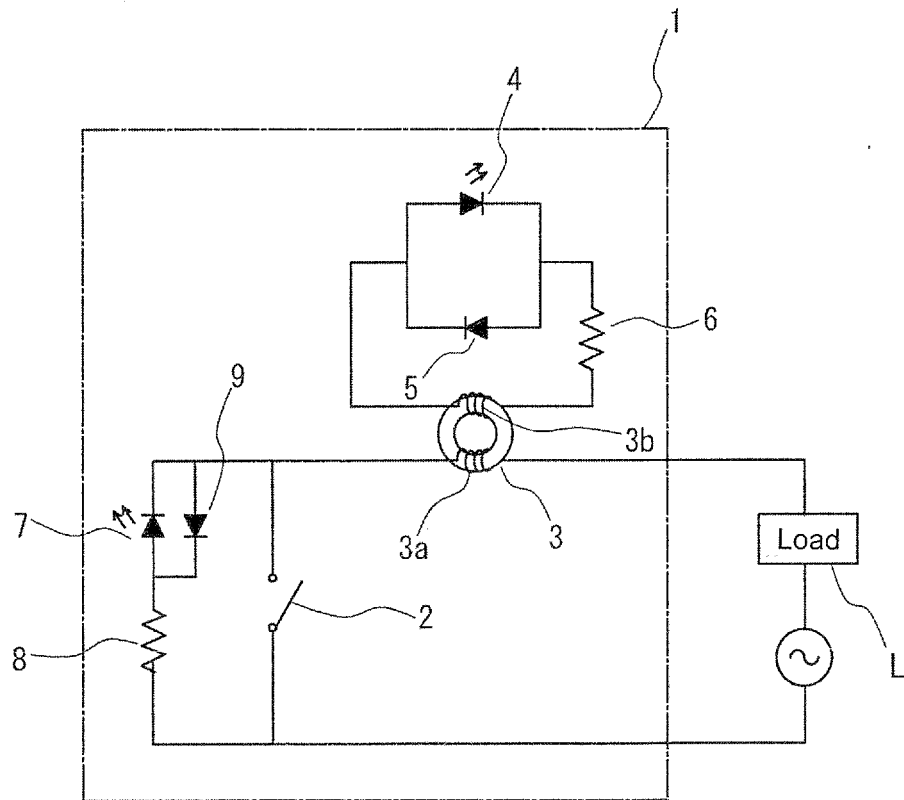


FIG 1

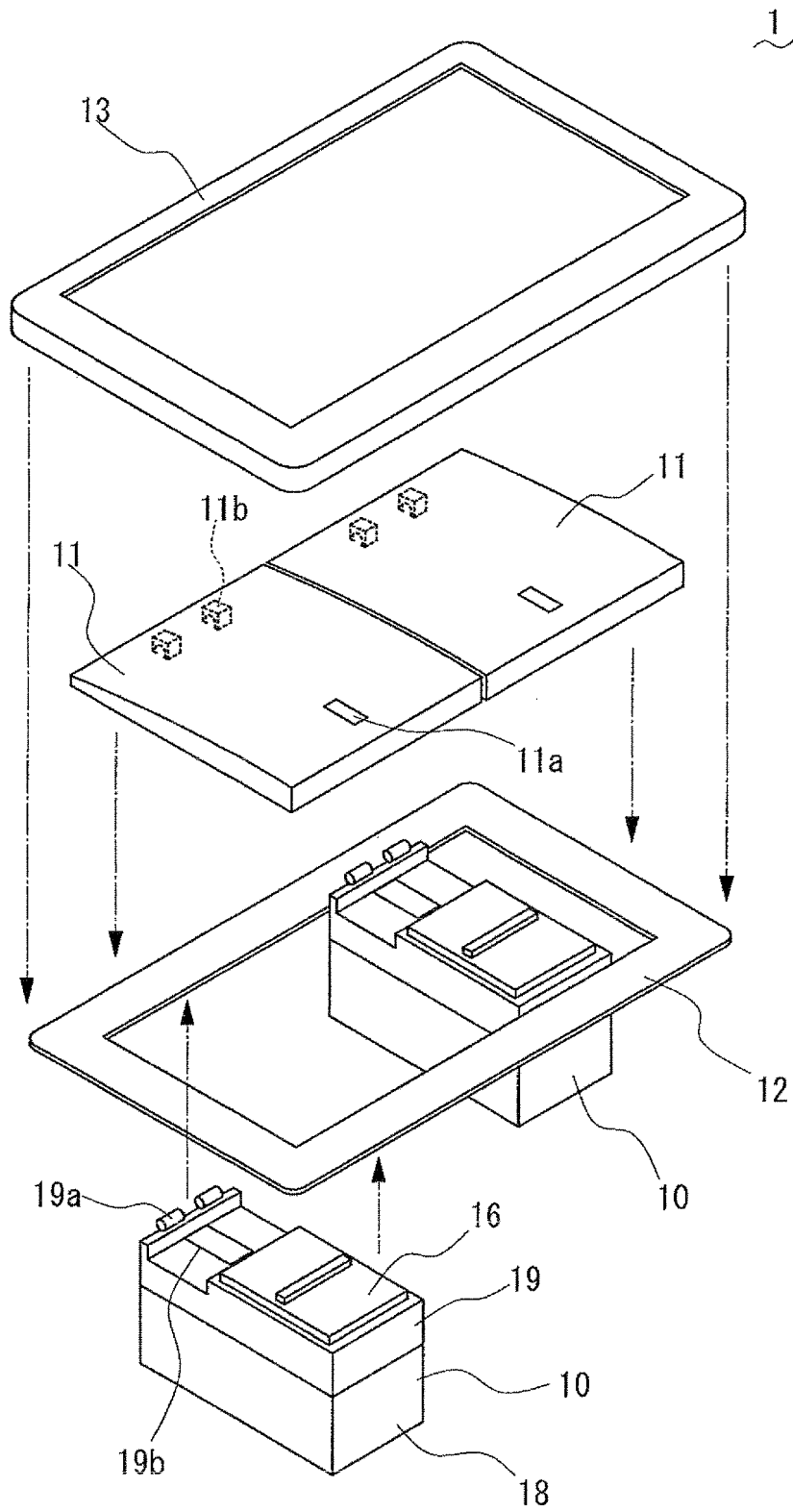


FIG 2

1

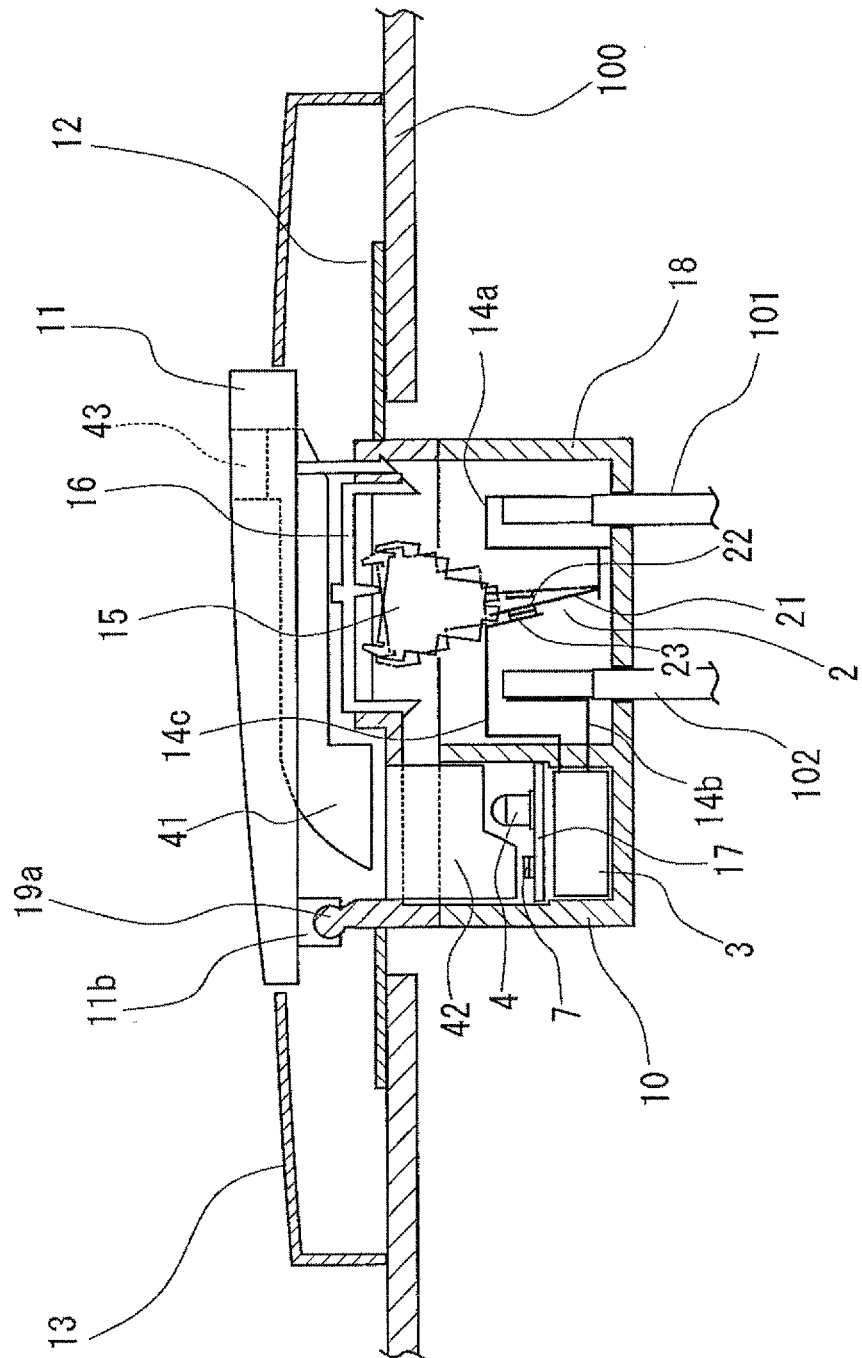


FIG 3

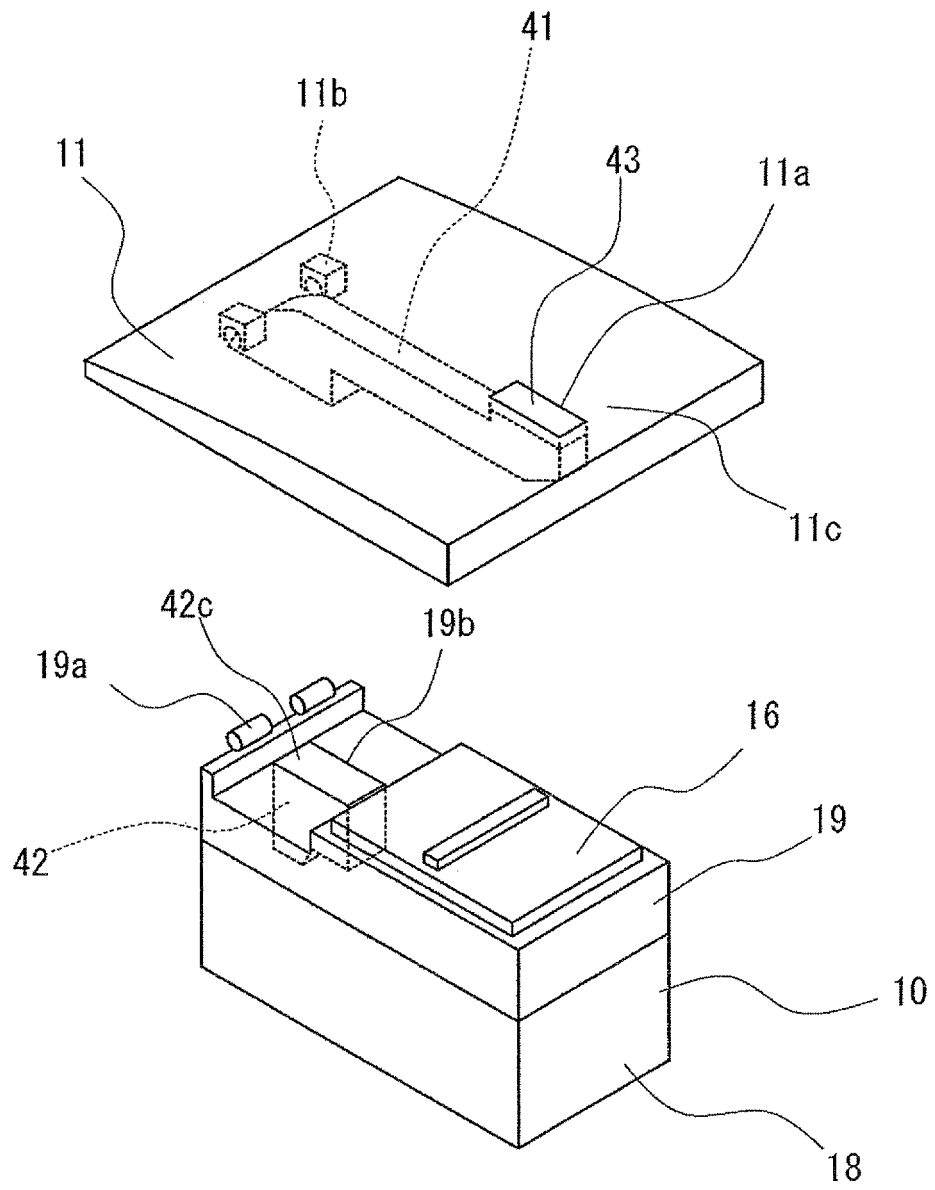


FIG 4

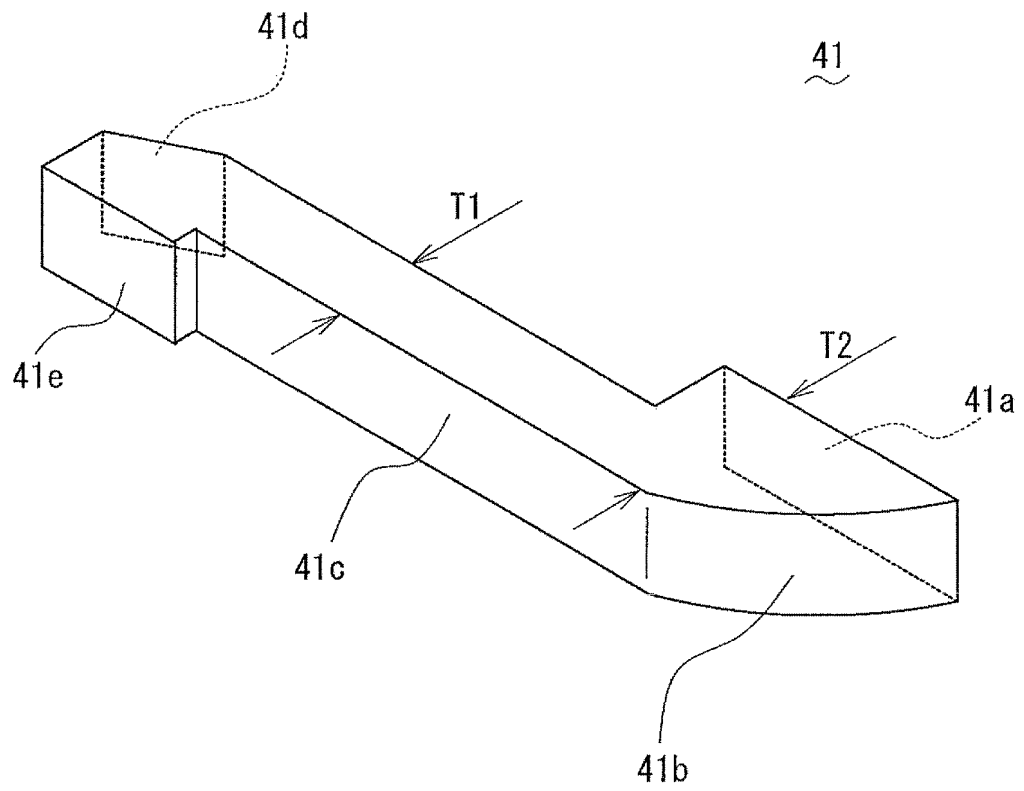


FIG 5

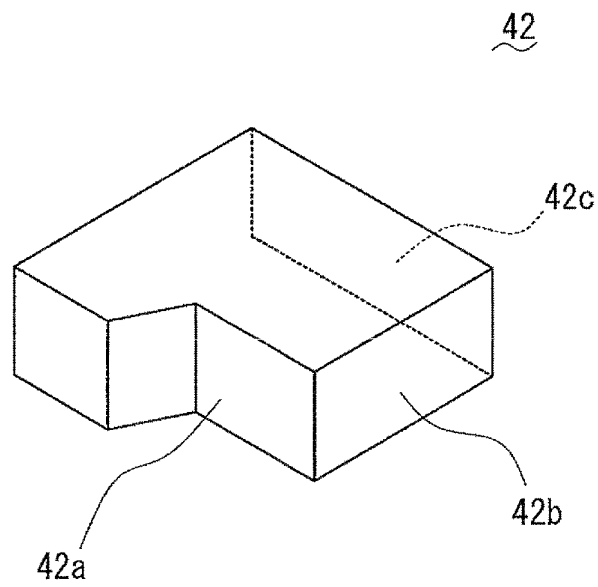


FIG 6

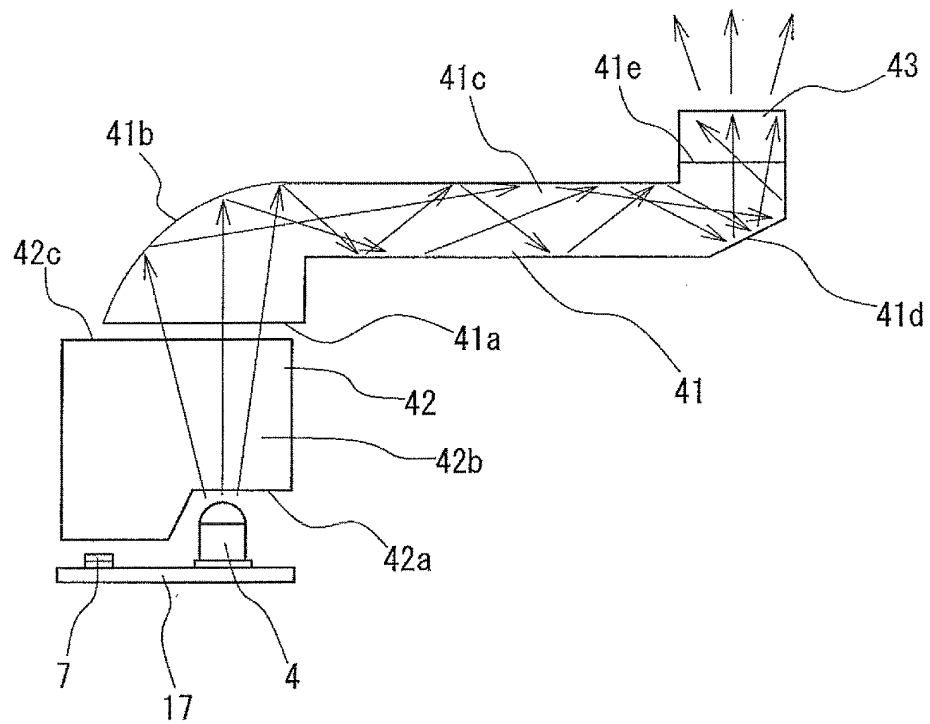


FIG 7

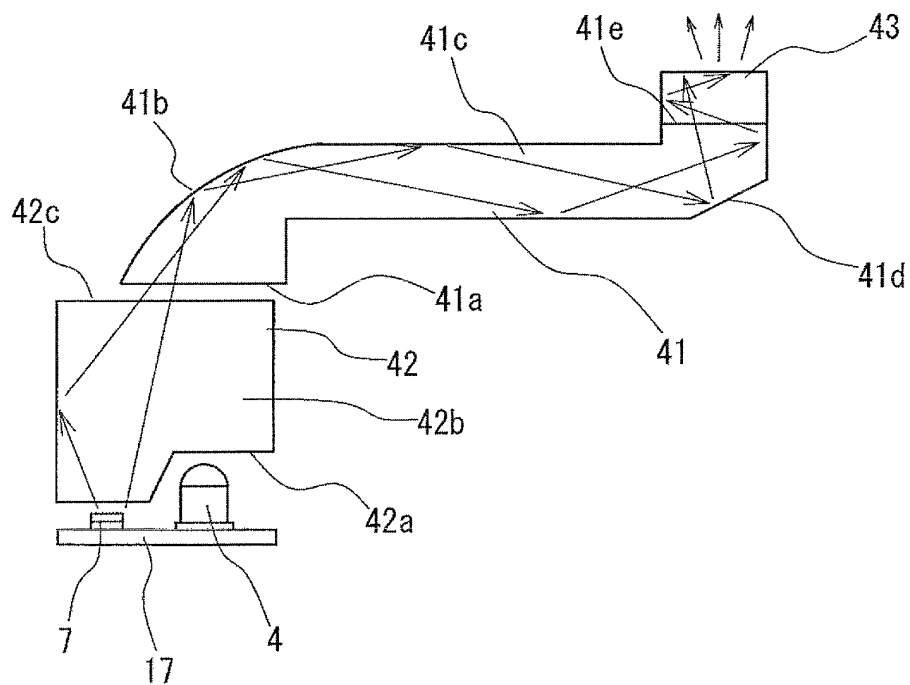


FIG 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/005443

A. CLASSIFICATION OF SUBJECT MATTER

H01H21/00(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)

H01H21/00

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	1996-2013
Kokai Jitsuyo Shinan Koho	1971-2013	Toroku Jitsuyo Shinan Koho	1994-2013

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.
X Y A	JP 2008-177133 A (Onkyo Corp.), 31 July 2008 (31.07.2008), entire text; all drawings (Family: none)	1-2, 4 3, 5, 7-12 6
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 067264/1988(Laid-open No. 170922/1989) (Alps Electric Co., Ltd.), 04 December 1989 (04.12.1989), entire text; fig. 3 (Family: none)	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
08 October, 2013 (08.10.13)Date of mailing of the international search report
05 November, 2013 (05.11.13)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/005443

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2006-059561 A (Tokai Rika Co., Ltd.), 02 March 2006 (02.03.2006), entire text; fig. 1 (Family: none)	3
Y	JP 2007-280714 A (Matsushita Electric Works, Ltd.), 25 October 2007 (25.10.2007), paragraph [0041]; fig. 3 (Family: none)	5, 7-9
Y	JP 2001-118463 A (Yazaki Corp.), 27 April 2001 (27.04.2001), paragraphs [0002] to [0006]; fig. 9 (Family: none)	10, 12
Y	JP 10-106393 A (Matsushita Electric Works, Ltd.), 24 April 1998 (24.04.1998), paragraph [0031]; fig. 13 to 14 (Family: none)	11

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

REFERENCES CITED IN THE DESCRIPTION

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