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(54) **HOUSEHOLD APPLIANCE**

HAUSHALTSGERÄT

APPAREIL MÉNAGER

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Description

[0001] The present invention relates to components of a household appliance, and in particular, to a light-emitting apparatus of the household appliance.

To achieve some decorative or functional indication effects, light-emitting apparatuses are disposed on enclosures of some household appliances. The light-emitting apparatus includes a light source such as an LED lamp, and a light guide element that guides the light source to a target position or converts the light source to a target shape.

For some household appliances, a light source is disposed on an enclosure, while a light guide element is disposed on a part that is movable relative to the enclosure, for example, a drawer. A position of the light source is opposite to that of the light guide element, so that light emitted from the light source can be received by the light guide element. By using that a light guide element is disposed on a drawer as an example, if a light source is in an on state, and in this case, the drawer is pulled out, the light source is exposed, and may emit light directly into eyes of a user, which therefore brings discomfort and damage to the user, and is not beneficial to saving energy either.

[0002] DE 196 49 039 discloses a household appliance according to the preamble of claim 1.

An objective of the present invention is to prevent a light source of a household appliance from emitting light directly into eyes of a user when the light source is exposed. For the above objective, the technical solutions used in the present invention are: A household appliance, including a housing that forms an appearance body of the household appliance, where the housing has an opening portion, the household appliance further includes a cover that is movably disposed on the housing to open or close the opening portion and forms a part of appearance of the household appliance, a light source controlled by a control apparatus is provided in the housing, and a light guide element is provided in the cover, where when the cover closes the opening portion, a position of the light source is opposite to that of the light guide element, and the control apparatus is configured so as to close the light source when a relative distance between the light source and the light guide element is greater than or equal to a preset value.

[0003] This operation of the control apparatus is usually performed in a process in which the light source is in an on state, and the relative distance between the light source and the light guide element gradually increases.

[0004] The household appliance may be embodied as, but is not limited to, a washing machine, a refrigerator, a range hood, an air conditioner, a dishwasher, a microwave oven, a vacuum cleaner, and the like. The cover may refer to external mechanical parts installed on the enclosure, such as a door, windows, a drawer panel, and the like. The light source may include a light-emitting element that produces light and a translucent cover that

covers the light-emitting element.

[0005] According to the foregoing technical solutions in the present invention, when the cover is opened, the light source is turned off, and is therefore prevented from causing direct damage to eyes of a user, and can also save energy better.

[0006] As an optional implementation manner, the control apparatus is further configured to turn on the light source when the relative distance between the light source and the light guide element is less than or equal to the preset value. In this case, the control apparatus is powered on. This operation of the control apparatus is usually performed in a process in which the light source is in an off state, and the relative distance between the light source and the light guide element gradually reduces. After the user completes a related operation and closes the cover again, the light source is automatically turned on under the action of the control apparatus, and thus, light may be displayed on the cover through the light guide element, thereby achieving an aesthetic or state indication effect.

[0007] As an optional implementation manner, the relative distance between the light source and the light guide element is obtained through measurement by a sensor.

[0008] As an optional implementation manner, when the relative distance between the light source and the light guide element is greater than or equal to the preset value, a micro switch connected to a circuit of the light source is triggered, so as to turn off the light.

[0009] The following further describes the present invention by using a washing machine as an example, with reference to the figures of the accompanying drawing. In the drawing,

FIG. 1 is a front schematic diagram of a washing machine;

FIG. 2 is a schematic partial diagram, obtained after a door body and a case body are cut at a hinge, of a light guide bar and a light-emitting module in a first assembling mode;

FIG. 3 is an enlarged front diagram of a cut part in FIG. 2;

FIG. 4 is a schematic partial diagram, obtained after the door body and the case body are cut at the hinge, of the light guide bar and the light-emitting module in a second assembling mode;

FIG. 5 is a schematic diagram of a light-emitting module close to the hinge, and a receiving end of a light guide bar on the door;

FIG. 6 is a schematic diagram of an emitting surface of the light-emitting module around the hinge;

- FIG. 7 is a rear schematic diagram of the receiving end of the light guide bar on the door;
- FIG. 8 is a schematic diagram of a receiving surface of the receiving end of the light guide bar on the door;
- FIG. 9 is a schematic diagram of an installation structure of the light guide bar;
- FIG. 10 is a schematic diagram of an internal structure of the door body, where to clearly display a key portion, the middle of the schematic diagram is omitted, and two ends are close to each other; and
- FIG. 11 is a schematic diagram of an overlapping part of light guide bars.

[0010] As shown in FIG. 1, a washing machine 100 has a housing 2, a control panel 4 installed on the housing 2, a drawer 6 disposed on the housing 2, and a door 10 that is installed on the housing 2 to close a laundry delivery and fetch opening 3 on the housing 2. The door 10 is connected to the housing 2 by using a hinge 12. The drawer 6 has a drawer panel 8 that fits with the housing 2. The washing machine 100 further has a control apparatus 1 that controls various circuit modules within the washing machine 100, thereby controlling running of the washing machine 100.

[0011] The door 10 has an enclosed circular light-emitting ring, where an elongated first light-emitting segment a1, a second light-emitting segment of a2, a third light-emitting segment a3, and a fourth light-emitting segment a4 are continuously connected to form the enclosed circular light-emitting ring. Four light sources 14 are provided at a position close to the hinge 12 on the housing 2. Each light source 14 corresponds to one of light-emitting segments of a1 to a4. The control apparatus 1 controls the light source 14 to be turned on or turned off.

[0012] Moreover or alternatively, there is a fifth light-emitting segment b1 and a sixth light-emitting segment b2 on the drawer panel 8, to separately indicate different laundry processing solvents stored in the drawer 6.

[0013] Moreover or alternatively, there is a seventh light-emitting segment c1 on the control panel 4.

[0014] Moreover or alternatively, there is an eighth light-emitting segment d1 on the housing 2.

[0015] The seventh light-emitting segment c1 and the eighth light-emitting segment d1 may also be formed by connecting multiple light-emitting segments.

[0016] Light-emitting states of the forgoing light-emitting segments of a1 to a4, b1, b2, c1, and d1 are controlled by the control apparatus 1, so that the light-emitting segments are turned on or turned off at the same time or at different times, or gradually become brighter or gradually fade away at the same time or at different times, or emit light in different colors, so as to produce a decorative

effect, and/or indicate different running states of the washing machine 100 to a user that or send warning information. For example, the first light-emitting segment a1, the second light-emitting segment a2, the third light-emitting segment a3, and the fourth light-emitting segment a4 on the door 10 are sequentially turned on and turned off to indicate running of a program, or the first light-emitting segment a1, the second light-emitting segment a2, the third light-emitting segment a3, and the fourth light-emitting segment a4 are turned on at the same time and turned off at the same time at a preset frequency to prompt ending of a program.

[0017] The following describes forming principles and structure features of the light-emitting segments of a1 to a4 by using the door 10 as an example. Principles and structures of other light-emitting segments can be easily understood according to the following description.

[0018] As shown in FIG. 2 and FIG. 3, a light-emitting module 140 is fixed on the housing 2, and the light-emitting module 140 is connected to the control apparatus 1 (not shown in the accompanying drawings) by using a wire (not shown in the accompanying drawings). A light guide bar 16 is fixed on door 10, and a light receiving end 161 thereof passes through a hole or gap 18 on the hinge 12 to approach the light-emitting module 140, and is opposite to the light-emitting module 140, so as to receive light emitted from the light-emitting module 140. The light guide bar 16 is fixed relative to the hinge 12, for example, the light guide bar 16 is clamped in the hole or gap 18 on the hinge 12, and the light receiving end 161 of the light guide bar 16 is not directly connected to the light-emitting module 140. The light receiving end 161 of the light guide bar 16 leaves or approaches the light-emitting module 140 as the door 10 is opened or closed. When the door 10 is closed, a gap is reserved between the light receiving end 161 of the light guide bar 16 and the light-emitting module 140.

[0019] As shown in FIG. 4, a light receiving end 1610 of the light guide bar and a light-emitting module 1400 may have another assembling mode: the light-emitting module 1400 is fixed on the door 10, and a wire 20 connected to the light-emitting module 1400 passes through the hinge 12 and then is connected to the control apparatus 1 disposed in the housing 2.

[0020] As shown in FIG. 5 to FIG. 8, the light-emitting module 140 around the hinge 12 includes a light-emitting base 141, and four light sources 14 are fixed in the light-emitting base 141. A translucent plate or translucent film 142 is provided in a light emitting direction of the light source 14. The light receiving end 161 of the light guide bar 16 is disposed opposite to the light-emitting module 140. Light receiving ends 161 of the four light guide bars 16 are also integrated on one light guide base 162, and a translucent plate or translucent film 163 is also provided in a light receiving direction thereof. When the light-emitting module 140 and the light receiving end 161 of the light guide bar 16 approach each other, the light receiving end 161 of each light guide bar 16 is separately opposite

to one of the light sources 14, so as to receive light from the light source 14.

[0021] Under control of the control apparatus 1, when a relative distance D between the light source 14 and the light guide element 16 is greater than or equal to a preset value D0, the light source 14 is to be closed. Thus, it can be imaged that when the light source 14 is in an on state, if the door 10 is opened, the relative distance D between the light guide element 16 and the light source 14 increases, so that the light source 14 is turned off.

[0022] In addition, when the door 10 is gradually closed, and the relative distance D between the light source 14 and the light guide element 16 gradually reduces to become less than or equal to the preset value D0, the light source 14 is turned on. It may be understood that, a prerequisite is that the control apparatus is powered on.

[0023] The relative distance D between the light source 14 and the light guide element 16 may be measured by using a sensor (not shown in the accompanying drawings), or a micro switch (not shown in the accompanying drawings) electrically connected to the light source 14 is disposed at a suitable position. When the relative distance D between the light source 14 and the light guide element 16 reaches a critical value, the micro switch is triggered, so that the light source 14 is turned off.

[0024] As shown in FIG. 2 to FIG. 4 and in FIG. 9 to FIG. 11, the light guide bar 16 is preferably a flexible fiber whose side surface is optical transmittable, and is in an elongated and cylindrical structure. Light is uniformly emitted from the side surface after entering the light guide bar 16 from the receiving end 161, so that the side surface of the entire light guide bar 16 is luminous. A light guide fiber with this feature may be purchased from the market.

[0025] To define an extension path of the light guide bar 16 and make the extension path form a particular preset shape, for example, to obtain a circular light ring on the door 10 shown in FIG. 1, a guide slot 22 whose entirety extends in an arc is provided in the door 10. In addition, a cross sectional shape of the guide slot 22 is an arc that matches a cross sectional shape of the light guide bar 16. A translucent plate 24 covers an outer side of the light guide bar 16, so that light that passes through the light guide bar 16 can be emitted from the translucent plate 24. The translucent plate 24 forms at least one part of an outer surface of the door 10.

[0026] To obtain light with a clearer edge, light shading plates 26 may be disposed at two sides of the translucent plate 24. The shape of the translucent plate 26 may adapt to the shape of the light guide bar 16.

[0027] Because the light receiving ends 161 of the four light guide bars 16 on the door 10 are centralized together, to obtain the light-emitting segments of a1 to a4 that are connected to each other but independent of each other, the light guide bars 16 needs to be specially arranged. As an example, FIG. 10 shows arrangement structures of two light guide bars of 16a and 16b, which is described in detail below.

[0028] The door 10 has a translucent outer surface 101. The most part of the first light guide bar 16a is directly located below the translucent plate 24, and light emitted from the most part may pass through the outer surface 101 of the door, and form, on the outer surface 101 of the door 10, the first light-emitting segment a1. An axial first part 16b1 of the second light guide bar 16b extends within an opaque mechanical part 30, and light emitted from the first part 16b1 cannot pass through the outer surface 101 of the door. The second light guide bar 16b further has an axial second part 16b2, where the part is not shaded by the opaque mechanical element 30, and is directly located below the translucent plate 24, and light emitted from the second part 16b2 can pass through the outer surface 101 of the door, and form, on the outer surface 101 of the door 10, the second light-emitting segment a2. The second part 16b2 of the second light guide bar 16b is way from a light receiving end 161b of the second light guide bar 16b.

[0029] An end 162a, away from a light receiving end 161a thereof, of the first light guide bar 16a overlaps a connection 160b of the first part 16b1 and the second part 16b2 on the second light guide bar 16b, so that projections of the translucent part of the first light guide bar 16a, and the second part 16b2 of the second light guide bar 16b onto the outer surface 101 of the door 10 are connected to each other. Thus, the first light-emitting segment a1 and the second light-emitting segment a2 are connected to each other. An overlapping area 32 of the first light guide bar 16a and the second light guide bar 16b corresponds to a connection area 34 of the first light-emitting segment a1 and the second light-emitting segment a2.

[0030] As shown in FIG. 11, after the first light guide bar 16a and the second light guide bar 16b are overlapped, each of the first light guide bar 16a and the second light guide bar 16b deviates from an axial direction to deflect at a specific angle, where a deflection direction for example, is shown in the embodiment shown in the figure: the first light guide bar 16a laterally deflects at a specific angle and then deflects downward, so that an end surface 1600a thereof deviates from a direction of the outer surface 101 of the door 1; and the second light guide bar 16b directly deflects downward, so that an end surface 1600b thereof also deviates from the direction of the outer surface 101 of the door 1.

[0031] Various specific implementation manners described in the foregoing and shown in the accompanying drawings are only used to illustrate the present invention, and are not considered as the entirety of the present invention. Within the scope of the basic technical thought of the present invention, any type of modifications for the present invention made by persons of ordinarily skills in the related technical field shall fall within the protection scope of the present invention.

Claims

1. A household appliance, comprising a housing (2) that forms an appearance body of the household appliance, wherein the housing has an opening portion (3), the household appliance further comprises a cover (4, 8, 10) that is movably disposed on the housing (2) to open or close the opening portion (3) and forms a part of appearance of the household appliance, a light source (14, 140, 1400) controlled by a control apparatus (1) is provided in the housing (2), and a light guide element (16, 16a, 16b, 1610) is provided in the cover (4, 8, 10), wherein when the cover (4, 8, 10) closes the opening portion (3), a position of the light source is opposite to that of the light guide element, **characterized in that** the control apparatus (1) is such configured so as to close the light source when a relative distance D between the light source (14, 140, 1400) and the light guide element (16, 16a, 16b, 1610) is greater than or equal to a preset value D0.
2. The household appliance according to claim 1, wherein the control apparatus (1) is further configured to turn on the light source when the relative distance D between the light source (14, 140, 1400) and the light guide element (16, 16a, 16b, 1610) is less than or equal to the preset value D0.
3. The household appliance according to claim 1, wherein the relative distance D between the light source (14, 140, 1400) and the light guide element (16, 16a, 16b, 1610) is obtained through measurement by a sensor.
4. The household appliance according to claim 1, wherein when the relative distance D between the light source (14, 140, 1400) and the light guide element (16, 16a, 16b, 1610) is greater than or equal to the preset value D0, a micro switch connected to a circuit of the light source is triggered.

Patentansprüche

1. Haushaltsgerät mit einem Gehäuse (2), das einen äußeren Gehäusekasten des Haushaltsgeräts bildet, wobei das Gehäuse einen Öffnungsabschnitt (3) aufweist, wobei das Haushaltsgerät ferner eine Abdeckung (4, 8, 10) umfasst, die an dem Gehäuse (2) so beweglich angeordnet ist, dass sie den Öffnungsabschnitt (3) öffnet oder verschließt, und Bestandteil eines Gehäusekastens des Haushaltsgeräts ist, eine von einer Steuervorrichtung (1) gesteuerte Lichtquelle (14, 140, 1400) in dem Gehäuse (2) und ein Lichtleiterelement (16, 16a, 16b, 1610) in der Abdeckung (4, 8, 10) vorgesehen ist, wobei, wenn die Abdeckung (4, 8, 10) den Öffnungsabschnitt (3) ver-

schließt, eine Position der Lichtquelle der des Lichtleiterelements gegenüberliegt, **dadurch gekennzeichnet, dass** die Steuervorrichtung (1) so konfiguriert ist, dass sie die Lichtquelle ausschaltet, wenn ein relativer Abstand D zwischen der Lichtquelle (14, 140, 1400) und dem Lichtleiterelement (16, 16a, 16b, 1610) größer gleich einem voreingestellten Wert D0 ist.

2. Haushaltsgerät nach Anspruch 1, wobei die Steuervorrichtung (1) ferner so konfiguriert ist, dass sie die Lichtquelle einschaltet, wenn der relative Abstand D zwischen der Lichtquelle (14, 140, 1400) und dem Lichtleiterelement (16, 16a, 16b, 1610) kleiner gleich dem voreingestellten Wert D0 ist.
3. Haushaltsgerät nach Anspruch 1, wobei der relative Abstand D zwischen der Lichtquelle (14, 140, 1400) und dem Lichtleiterelement (16, 16a, 16b, 1610) durch Messen mit einem Sensor ermittelt wird.
4. Haushaltsgerät nach Anspruch 1, wobei, wenn der relative Abstand D zwischen der Lichtquelle (14, 140, 1400) und dem Lichtleiterelement (16, 16a, 16b, 1610) größer gleich dem voreingestellten Wert D0 ist, ein mit einem Schaltkreis der Lichtquelle verbundener Mikroschalter ausgelöst wird.

Revendications

1. Appareil ménager comprenant un corps (2) qui constitue une carcasse visible de l'appareil ménager, dans lequel le corps possède une partie ouvrante (3), l'appareil ménager comprenant en outre un capot (4, 8, 10) disposé de façon amovible sur le corps (2) afin d'ouvrir ou de fermer la partie ouvrante (3) et faisant partie de l'aspect de l'appareil ménager, une source de lumière (14, 140, 1400) commandée par un appareil de commande (1) est prévue dans le corps (2) et un élément de guidage de la lumière (16, 16a, 16b, 1610) est prévu dans le capot (4, 8, 10), dans lequel, lorsque le capot (4, 8, 10) ferme la partie ouvrante (3), une position de la source de lumière est opposée à celle de l'élément de guidage de la lumière, **caractérisé en ce que** l'appareil de commande (1) est configuré de sorte à désactiver la source de lumière lorsqu'une distance relative D entre la source de lumière (14, 140, 1400) et l'élément de guidage de la lumière (16, 16a, 16b, 1610) est supérieure ou égale à une valeur préalablement déterminée D0.
2. Appareil ménager selon la revendication 1, dans lequel l'appareil de commande (1) est en outre configuré afin d'activer la source de lumière lorsque la distance relative D entre la source de lumière (14, 140, 1400) et l'élément de guidage de la lumière (16,

16a, 16b, 1610) est inférieure ou égale à la valeur préalablement déterminée D0.

3. Appareil ménager selon la revendication 1, dans lequel la distance relative D entre la source de lumière (14, 140, 1400) et l'élément de guidage de la lumière (16, 16a, 16b, 1610) est obtenue par mesure à l'aide d'un capteur. 5
4. Appareil ménager selon la revendication 1, dans lequel un microrupteur connecté à un circuit de la source de lumière est déclenché lorsque la distance relative D entre la source de lumière (14, 140, 1400) et l'élément de guidage de la lumière (16, 16a, 16b, 1610) est supérieure ou égale à la valeur préalablement déterminée D0. 10 15

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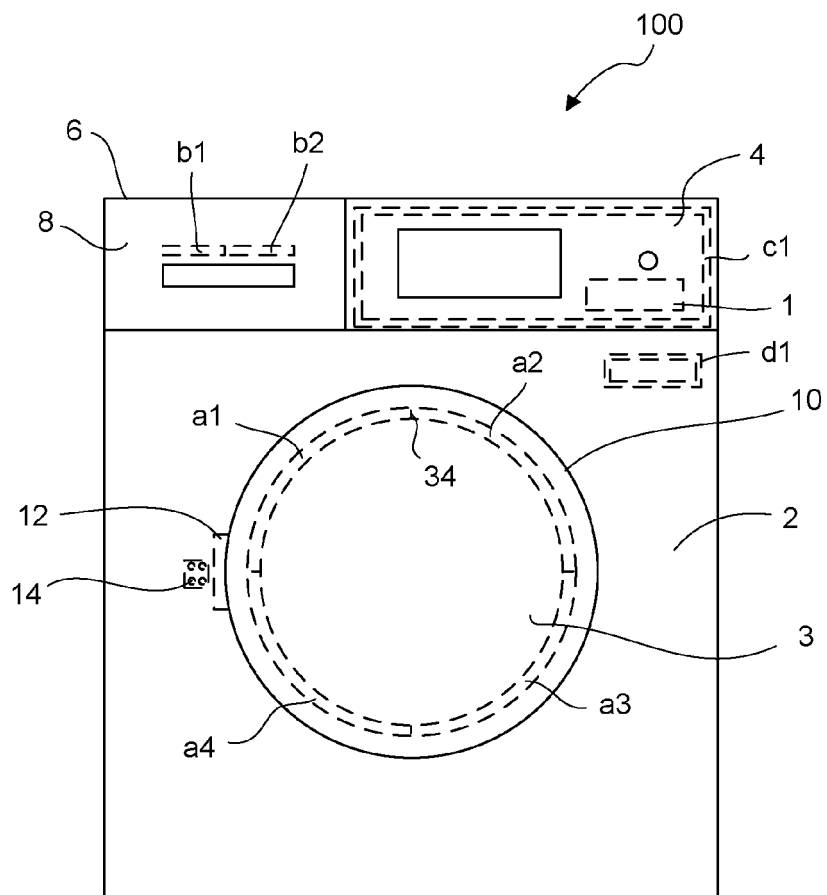


FIG. 1

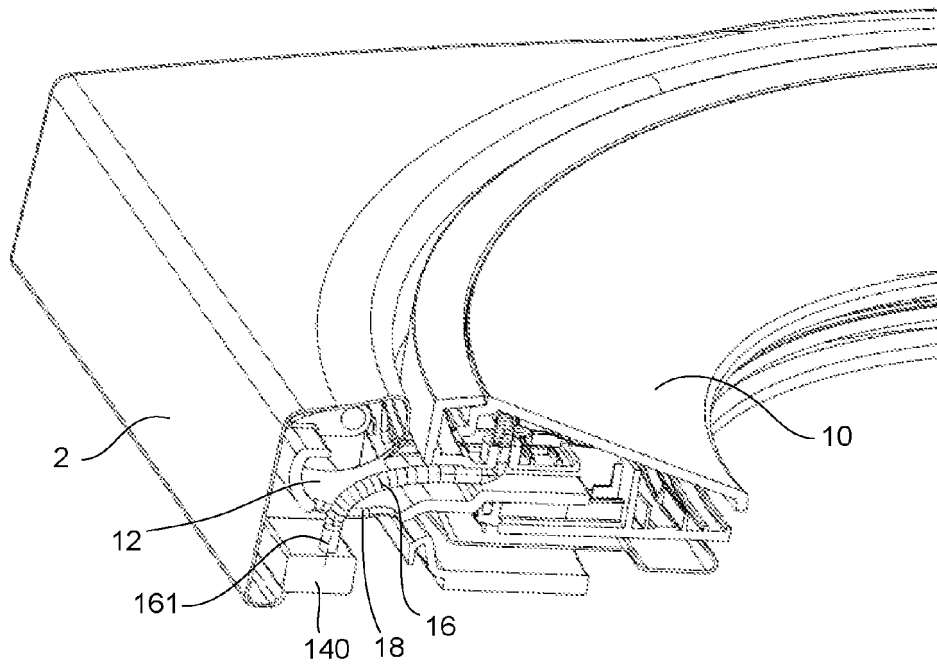


FIG. 2

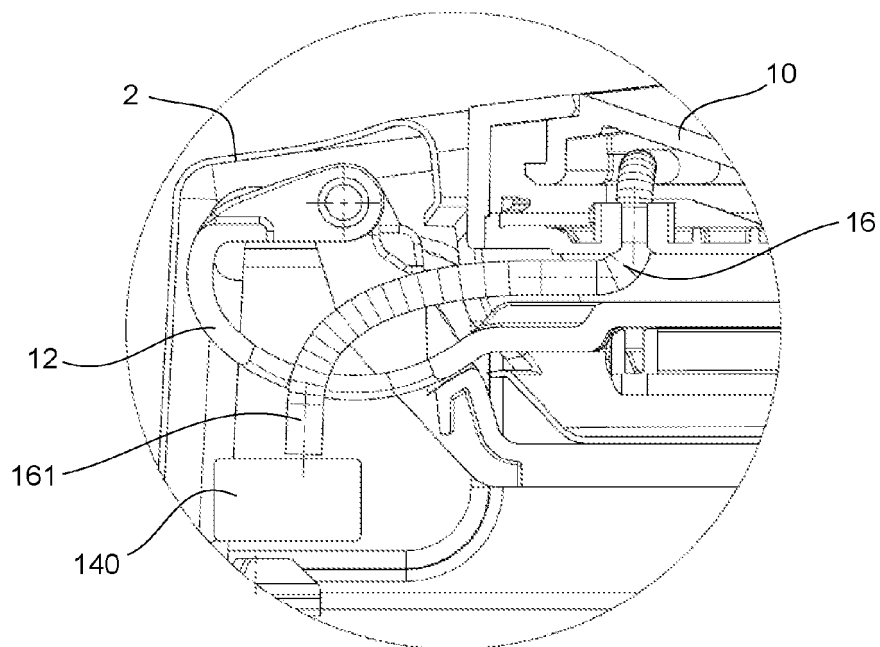


FIG. 3

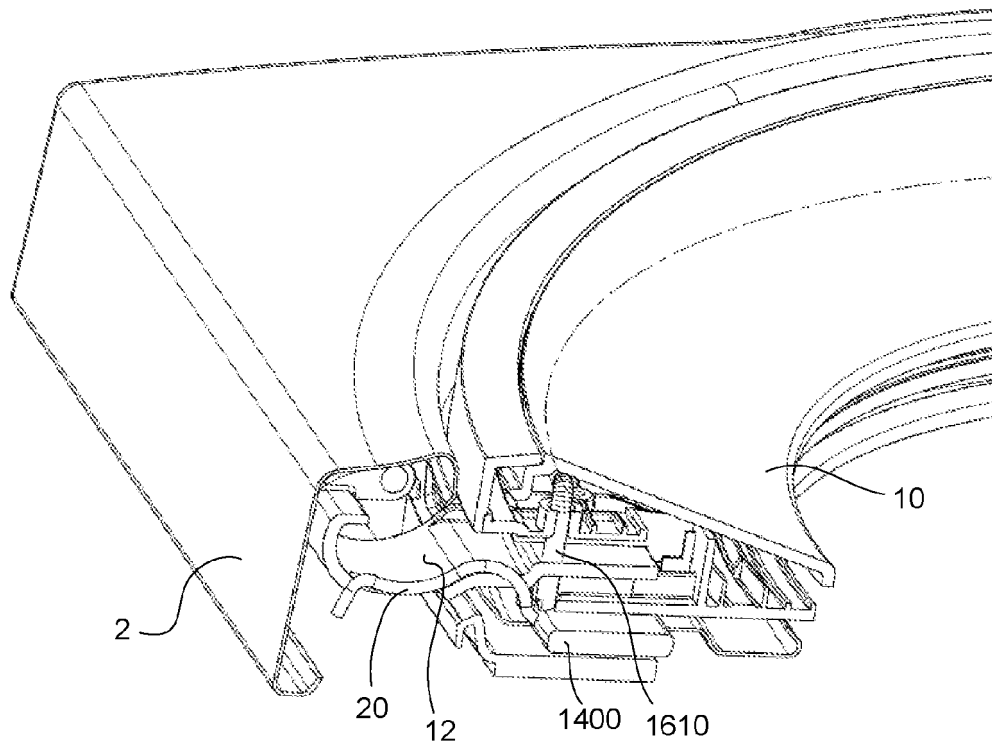


FIG. 4

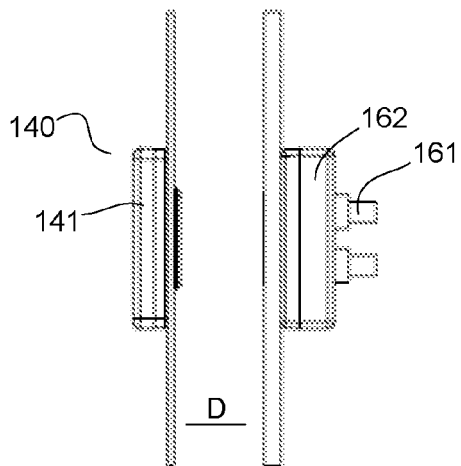


FIG. 5

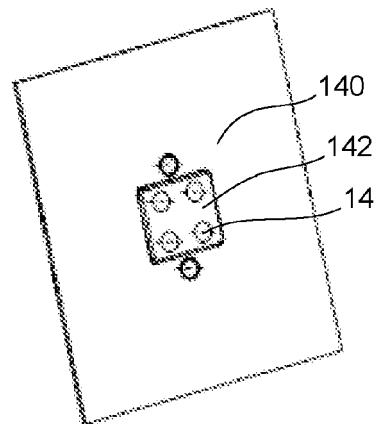


FIG. 6

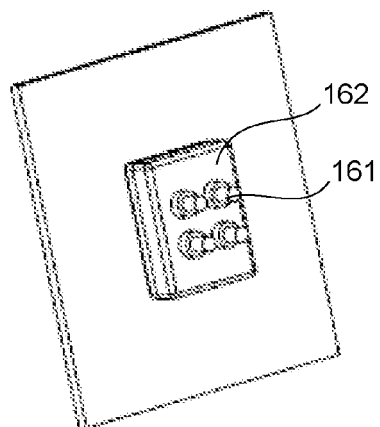


FIG. 7

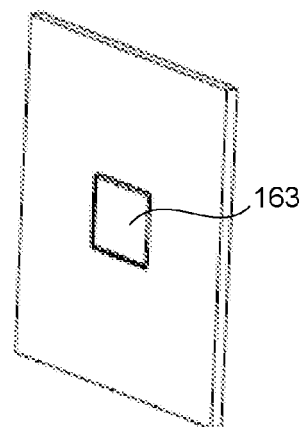


FIG. 8

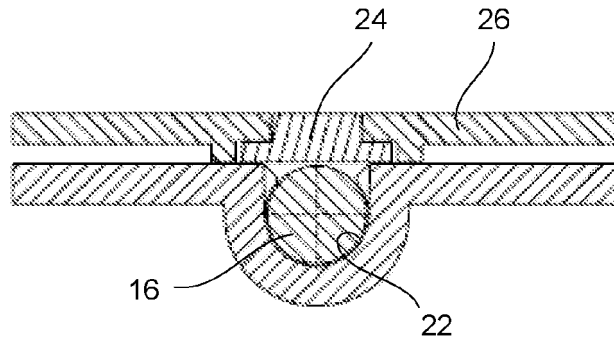


FIG. 9

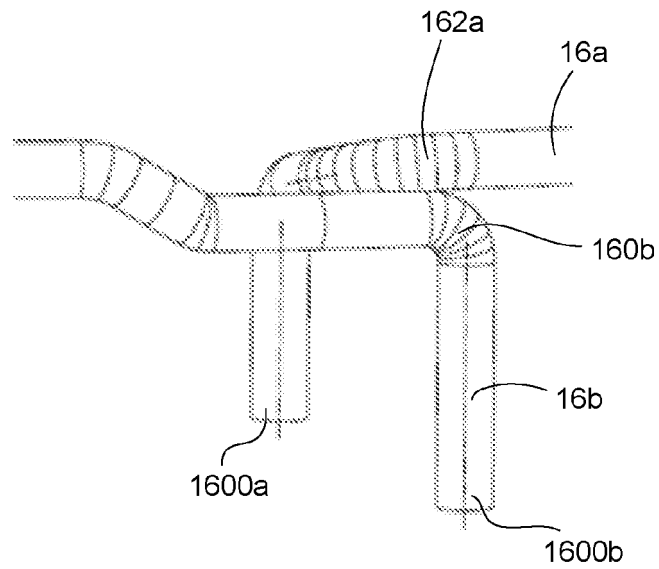


FIG. 11

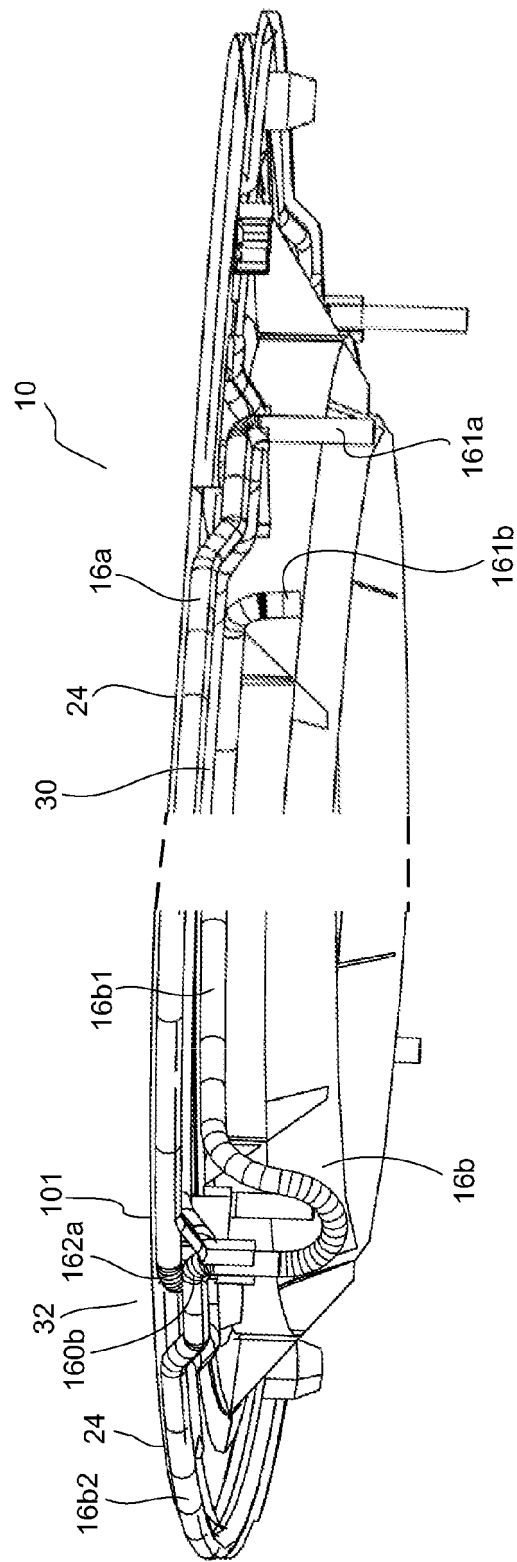


FIG. 10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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