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(54) **INDICATION APPARATUS, AIR HYGIENE APPARATUS, AND HOUSEHOLD APPLIANCE**

(57) The disclosure relates to an indication apparatus, an air hygiene apparatus, and a household appliance. The indication apparatus includes a panel (2) and an optical assembly (3) located at an inner side of the panel, the panel having a first light outlet portion (21) and a second light outlet portion (22). The optical assembly (3) includes a circuit substrate (4), at least one first light emitting element (5) and at least one second light emitting element (6) integrated on the circuit substrate (4), and a light guide sheet (7). The first light emitting element (5) correspond to the first light outlet portion (21). The light guide sheet (7) is configured to receive light of the second light emitting element (6) and to guide the light to the second light outlet portion (22). The light guide sheet (7) is carried on a carrying frame (8), the carrying frame (8) being fixed on the circuit substrate (4).

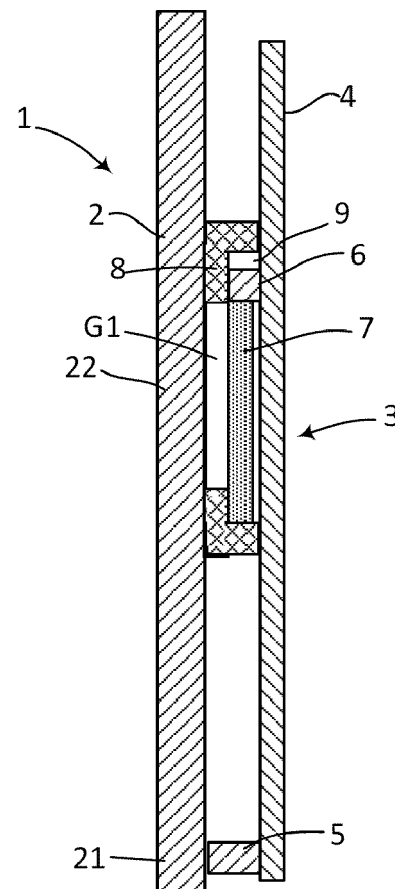


FIG. 1

Description

TECHNICAL FIELD

[0001] Embodiments of the present utility model relate to an indication apparatus, an air hygiene apparatus, and a household appliance, and in particular, to an indication apparatus for a household appliance, an air hygiene apparatus with the indication apparatus, and a household appliance.

BACKGROUND

[0002] CN110878998A discloses a refrigerator, including a storage compartment with a front opening, a door configured to close the storage compartment, and an air hygiene apparatus fixed on a top wall of the storage compartment. The air hygiene apparatus includes a housing, an air detection unit and/or a purification unit located in the housing, and an indication apparatus located in the front of the housing.

SUMMARY

[0003] An objective of embodiments of the present utility model is to provide an improved indication apparatus, an air hygiene apparatus, and a household appliance.

[0004] An aspect of the embodiments of the present utility model relates to an indication apparatus for a household appliance. The indication apparatus includes a panel and an optical assembly located at an inner side of the panel, the panel having a first light outlet portion and a second light outlet portion. The optical assembly includes: a circuit substrate; at least one first light emitting element and at least one second light emitting element integrated on the circuit substrate, the first light emitting element being corresponding to the first light outlet portion; a light guide sheet, configured to receive light of the second light emitting element and to guide the light to the second light outlet portion; and a carrying frame, the light guide sheet being carried on the carrying frame, and the carrying frame being fixed on the circuit substrate.

[0005] In this way, it is possible to form different indication modes and/or different indication ranges through the light emitting elements disposed on the same circuit substrate. In another aspect, positions of the light guide sheet and the second light emitting elements can be determined relatively accurately through the carrying frame and the circuit substrate. Therefore, it is expectable that a compact indication apparatus with a good indication effect is provided.

[0006] In a possible embodiment, the carrying frame is opaque, and configured to stop light of the first light emitting element from entering the second light outlet portion and to stop the light of the second light emitting element from entering the first light outlet portion. Illumination ranges of different light emitting elements are determined through the carrying frame of the light guide

sheet, and it is expectable that light interference among the different light emitting elements can be reduced without using additional light blocking members.

[0007] In a possible embodiment, the carrying frame is disposed around the second light outlet portion and abuts against the inner side of the panel. This is particularly beneficial for light emitted by the light guide sheet to emit toward the second light outlet portion, which can significantly reduce influence of the light of the second light emitting elements on other regions of the panel.

[0008] In a possible embodiment, the indication apparatus includes a slot configured to fix the circuit substrate and a pressing portion abutting against an inner side of the circuit substrate to enable the carrying frame to abut against the inner side of the panel. Therefore, the optical assembly can be reliably fixed and the light guide sheet can accurately correspond to the second light outlet portion.

[0009] In a possible embodiment, the carrying frame is clamped on the circuit substrate.

[0010] In a possible embodiment, the light guide sheet is located between the carrying frame and the circuit substrate, and a gap is disposed between the light guide sheet and the panel. This is beneficial to reduce damage to the light guide sheet due to manufacturing/assembly tolerances.

[0011] In a possible embodiment, an accommodation space is formed by a gap between an end face of the light guide sheet and the carrying frame along a direction parallel to the panel, and the second light emitting element is located in the accommodation space. Therefore, when the carrying frame is installed on the circuit substrate, the second light emitting element integrated on the circuit substrate can correspond to the end face of the light guide sheet, which is simple and efficient in assembly.

[0012] In a possible embodiment, the first light emitting elements are distributed in rows, and the first light emitting elements and the second light emitting elements are distributed apart in a direction perpendicular to an arrangement direction of the first light emitting elements.

[0013] In a possible embodiment, the panel includes a base plate and an indicator plate, the first light outlet portion includes a first through hole located on the base plate and a first light transmitting portion located on the indicator plate and covering the first through hole, the second light outlet portion includes a second through hole located on the base plate and a second light transmitting portion located on the indicator plate and covering the second through hole, and the carrying frame stops the light of the first light emitting element from entering the second through hole and stops the light of the second light emitting element from entering the first through hole.

[0014] Another aspect of the embodiments of the present utility model relates to an air hygiene apparatus, including the indication apparatus according to any one of the foregoing embodiments.

[0015] In a possible embodiment, the air hygiene ap-

paratus includes a housing, an air passageway located in the housing, and an air detection apparatus and/or an air purification apparatus located in the air passageway, where the indication apparatus is located in the front of the housing.

[0016] In a possible embodiment, the air hygiene apparatus includes a carrying bracket configured to carry the air detection apparatus and/or the air purification apparatus, where the optical assembly is located between the carrying bracket and the panel.

[0017] In a possible embodiment, the carrying bracket abuts against a side of the circuit substrate facing away from the panel to apply a force toward the panel to the circuit substrate.

[0018] Still another aspect of the embodiments of the present utility model relates to a household appliance, including the indication apparatus according to any one of the foregoing embodiments.

[0019] Additional features of the present utility model will be presented from the claims, the accompanying drawings, and the brief description of the drawings. The features and feature combinations specified in the above description, the features and feature combinations specified in the following description of the accompanying drawings, and/or the features and feature combinations briefly shown in the accompanying drawings not only can be respectively presented in the combination methods as described, but also can be presented in other combinations or solely without departing from the scope of the present utility model. Embodiments of the present utility model that are not described and not specifically shown in the accompanying drawings, but are conceivable from the embodiments described in detail and can be obtained from combination of features are hereby considered to be included and disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The following accompanying drawings, as a part of the specification and provided to further understand the present utility model, describe specific implementations of the present utility model and are used to describe the principle of the present utility model along with the specification, where:

FIG. 1 is a schematic cross-sectional view of an indication apparatus according to an embodiment of the present utility model;

FIG. 2 is a schematic exploded view of an indication apparatus according to an embodiment of the present utility model;

FIG. 3 is a schematic cross-sectional view of an indication apparatus according to another embodiment of the present utility model;

FIG. 4 is a schematic cross-sectional view of an air hygiene apparatus with an indication apparatus according to an embodiment of the present utility model; and

FIG. 5 is a schematic exploded view of an air hygiene apparatus according to an embodiment of the present utility model.

DETAILED DESCRIPTION

[0021] FIG. 1 is a schematic cross-sectional view of an indication apparatus 1 for a household appliance according to an embodiment of the present utility model. As shown in FIG. 1, the indication apparatus 1 includes a panel 2 and an optical assembly 3 located at an inner side of the panel 2. The panel 2 has a first light outlet portion 21 and a second light outlet portion 22.

[0022] The indication apparatus 1 according to this embodiment of the present utility model may be applied to different household appliances such as a refrigeration appliance, a dishwasher, a washing machine, a sterilizing cabinet, an oven, a steamer, a cooker hood, a cooktop, an air purifier, and the like.

[0023] The panel 2 may be located in a housing of the household appliance, or inside the household appliance to be visible after a door is opened.

[0024] The first light outlet portion 21 and/or the second light outlet portion 22 may include a through hole to allow light to pass through, and/or include a light transmitting portion to allow the light to pass through a solid portion.

[0025] At least one of the first light outlet portion 21 and the second light outlet portion 22 itself or in the vicinity thereof may include an indication text and/or pattern. At least one of the first light outlet portion 21 and the second light outlet portion 22 may not be provided with any pattern, but may be indicated by a light emitting mode of the optical assembly 3. In some embodiments, the first light outlet portion 21 and/or the second light outlet portion 22 may be formed into a hollow shape with a text and/or a pattern, so that the illuminated first light outlet portion 21 and/or second light outlet portion 22 itself has an indication meaning.

[0026] The optical assembly 3 may include a circuit substrate 4, and at least one first light emitting element 5 and at least one second light emitting element 6 integrated on the circuit substrate 4. The first light emitting element 5 is configured to illuminate the first light outlet portion 21, and the second light emitting element 6 is configured to illuminate the second light outlet portion 22. The circuit substrate 4 may be a printed circuit board.

[0027] In some embodiments, the optical assembly 3 may include a plurality of first light emitting elements 5 and a plurality of second light emitting elements 6.

[0028] The optical assembly 3 includes a light guide sheet 7. The light guide sheet 7 is configured to receive light of the second light emitting elements 6 and to guide the light to the second light outlet portion 22. The optical assembly 4 includes a carrying frame 8, and the light guide sheet 7 is carried on the carrying frame 8.

[0029] In assembly, after the light guide sheet 7 is assembled on the carrying frame 8, the carrying frame 8 is fixed on the circuit substrate 4. In this way, positions of

the light guide sheet 7 relative to the circuit substrate 4 and the second light emitting elements 6 are accurately determined.

[0030] The carrying frame 8 may be opaque, so as to stop light of the first light emitting elements 5 from entering the second light outlet portion 22 and stop the light of the second light emitting elements 6 from entering the first light outlet portion 21.

[0031] The carrying frame 8 may be disposed around the second light outlet portion 22 and abut against the inner side of the panel 2. The light guide sheet 7 is located between the carrying frame 8 and the circuit substrate 4. A gap G1 is disposed between the light guide sheet 7 and the panel 2.

[0032] An accommodation space 9 is formed by a gap between an end face of the light guide sheet 7 and the carrying frame 8 along a direction parallel to the panel 2, and the second light emitting elements 6 extend into the accommodation space 9. Periphery of the light guide sheet 7 may be surrounded by the carrying frame 8, which is beneficial to irradiate light of the light guide sheet 7 toward the second light outlet portion 22.

[0033] The carrying frame 8 has an approximately U-shaped section, so that the light guide sheet 7 can be accommodated on a side of the carrying frame 8, and another side of the carrying frame 8 abuts against the panel 2. The carrying frame 8 has a central hole 81, and light transmitted from the light guide sheet 7 is irradiated toward the second light outlet portion 22 through the central hole 81.

[0034] FIG. 2 is a schematic exploded view of an indication apparatus for a household appliance according to an embodiment of the present utility model. Referring to FIG. 2 in conjunction with FIG. 1, the panel 2 may have an elongated board shape, and the first light outlet portion 22 may be constructed as a bar shape extending along a length direction of the panel 2, as shown in a dashed box in FIG. 2.

[0035] A plurality of first light emitting elements 5 are located on the circuit substrate 4 in rows. A controller may selectively enable the plurality of first light emitting elements 5 to be lit up in a certain order, brightness, and/or color, so that the first light outlet portion 21 is illuminated by dynamic light. Therefore, the first light outlet portion 21 may have a dynamic light indicating effect, so as to be configured to indicate a level/grade of a selected parameter of the household appliance, or a state of a specific function being run.

[0036] The second light outlet portion 22 can be constructed as a hollow structure indicating a pattern or a text, and the second light emitting elements 6 can illuminate the second light outlet portion 22 with constant brightness or brightness that varies according to a predetermined mode, so that the second light outlet portion 22 can be configured to indicate a function, purpose, and/or logo.

[0037] The first light emitting elements 5 and the second light emitting elements 6 are distributed apart in a

direction perpendicular to an arrangement direction of the first light emitting elements 5.

[0038] As shown in FIG. 2, the carrying frame 8 can be clamped on the circuit substrate 4. To this end, the carrying frame 8 may have a plurality of hooks 82 configured to connect to the circuit substrate 4, the circuit substrate 42 may be provided with a corresponding hole (not shown) or a notch 41, and the hooks 82 are matched with the hole or the notch 41, so as to connect the carrying frame 8 to the circuit substrate 4.

[0039] FIG. 3 is a schematic cross-sectional view of an indication apparatus according to another embodiment of the present utility model. A main difference between this embodiment and the embodiment shown in FIG. 1 is that the panel 2 includes a base plate 24 and an indicator plate 23, and the indicator plate 23 is visible to a user. The indicator plate 23 may be made of a light transmitting base material. The indicator plate 23 may have an opaque layer or an opaque film to allow the indicator plate 23 to transmit light only in a specific region. The base plate 24 may be made of an opaque material. The base plate 24 may be formed by a housing of a device with the indication apparatus 1.

[0040] The first light outlet portion 21 includes a first through hole 241 located on the base plate 24 and a first light transmitting portion 231 located on the indicator plate 23 and covering the first through hole 241. The second light outlet portion 22 includes a second through hole 242 located on the base plate 24 and a second light transmitting portion 232 located on the indicator plate 23 and covering the second through hole 242.

[0041] The carrying frame 8 stops light of the first light emitting elements 5 from entering the second through hole 242 and stops light of the second light emitting elements 6 from entering the first through hole 241.

[0042] In order to prevent light from being leaked between the base plate 24 and the indicator plate 23, the indicator plate 23 includes a protrusion 233 that matches the second through hole 242 in shape and size. The protrusion 233 extends into the second through hole 242 and transmits light at least partially.

[0043] FIG. 4 is a schematic exploded view of an air hygiene apparatus 100 with an indication apparatus 1 according to an embodiment of the present utility model. As shown in FIG. 4, the air hygiene apparatus 100 includes a housing 102, and an air detection apparatus 105 and/or an air purification apparatus 106 located in the housing 102.

[0044] In some embodiments, the air hygiene apparatus 100 is only configured to detect air hygiene related parameters. In some other embodiments, the air hygiene apparatus 100 has a purification apparatus, for example, any one of apparatuses suitable for sterilization and deodorization. In still some other embodiments, the air hygiene apparatus 100 may include an air detection apparatus and an air purification apparatus.

[0045] In an exemplary embodiment, the air hygiene apparatus 100 includes an air passageway 103 located

in a housing 102, and an air detection apparatus 105 and an air purification apparatus 106 located in the air passageway 103.

[0046] Air from the outside (for example, a storage compartment 101) may enter the air passageway 103 through an air inlet 131, and be discharged out of the air passageway 103 through an air outlet 132. The air inlet 131 and the air outlet 132 may be formed on the housing 102.

[0047] The air hygiene apparatus 100 includes a fan 104 located in the air passageway 103, so as to force external air to enter the air passageway 103 and flow through the air detection apparatus 105 and the air purification apparatus 106, and then be discharged out of the housing 102. A flow direction of air in the air passageway 103 may be indicated by an arrow a.

[0048] The air detection apparatus 105 may be configured to detect at least one gas parameter. The gas parameter may include, for example, whether one or more types of gas exist, and/or content or concentration of one or more types of gas components. The air detection apparatus 105 may be further configured to detect parameters related to germs in the air.

[0049] In an embodiment, the air detection apparatus 105 detects total volatile organic compound (TVOC) concentration in the storage compartment 101.

[0050] The air detection apparatus 105 may include a first circuit substrate 150 and an odor sensor 151 fixed on the first circuit substrate 150. The odor sensor 151 may be, but is not limited to, a metal oxide semiconductor gas sensor, which may include a semiconductor sensing element and a heater configured to heat the semiconductor sensing element.

[0051] The air purification apparatus 106 may include any one or more of an air filter, an ultraviolet sterilization apparatus, an ion generator, an ozone generator, or the like. Different purification apparatuses can be integrated into one module or disposed separately.

[0052] The air purification apparatus 106 may be located in a down stream of the air detection apparatus 105 and disposed in the air passageway 103. Therefore, the air purification apparatus 106 may be located between the air detection apparatus 105 and the air outlet 132. In an exemplary embodiment, the air purification apparatus 106 includes an ion generator 161. The ion generator 161 is configured to release ions into the air passageway 103. A power supply 163 configured to supply power to the ion generator 161 is located in the housing 102.

[0053] The air purification apparatus 106 may further include an air filter 162. The air filter 162 may be a physical and/or chemical filter, for example, an adsorption filter, a catalytic enzyme filter (for example, a Pt filter), or the like.

[0054] The air hygiene apparatus 1 may include a control unit 16 operatively connected to the air detection apparatus 5. The control unit 16 is configured to receive a signal from the air detection apparatus 5. The control unit

16 may be further configured to be configured to transmit an instruction to the air detection apparatus 5.

[0055] The control unit 16 may be operatively connected to the fan 104. The fan 104 may be activated or deactivated based on an instruction of the control unit 16. The control unit 16 may be operatively connected to the power supply 163. The power supply 163 may supply power to the ion generator 61 based on an instruction of the control unit 16.

[0056] The air hygiene apparatus 100 includes an indication apparatus 1. The indication apparatus 1 may be disposed on a side of the air hygiene apparatus 100 facing a user. For example, the indication apparatus 1 is disposed in the front of the air hygiene apparatus 100.

[0057] In this embodiment, the panel 2 of the indication apparatus 1 includes a base plate 24 formed by a wall 121 of the housing 102 and an indicator plate 23 attached to the base plate 24. The optical assembly 3 is at least partially located in the housing 102.

[0058] As shown in FIG. 4, the circuit substrate 4 is located at an inner side of the wall 121 and in the housing 102. The carrying frame 8 abuts against an inner surface of the indicator plate 23, and the light guide sheet 7 is located between the indicator plate 23 and the circuit substrate 4.

[0059] As shown in FIG. 5, the housing 102 may include a slot 125 configured to fix the circuit substrate 4 and a pressing portion 126 abutting against the inner side of the circuit substrate 4 (a side facing away from the panel 2) to enable the carrying frame 8 to abut against the inner side of the panel 2.

[0060] The slot 125 is formed between a front wall 121 of the housing 102 and a carrying bracket 127 located in the housing 102. The carrying bracket 127 is configured to fix the air purification apparatus 106, the air detection apparatus 105, the fan 104, and the control unit 116. The carrying bracket 127 abuts against a rear side of the circuit substrate 4 to apply a force toward the indicator plate 23 to the circuit substrate 4. For example, a pressing portion 126 is formed on the carrying bracket 127.

[0061] The indication apparatus 1 is connected to the control unit 116. The control unit 116 determines a light emitting mode of the first light emitting elements 5 according to a signal of the air purification apparatus 106 and/or the air detection apparatus 105. The second light emitting elements 6 may be configured to indicate a function and/or logo of the air hygiene apparatus 100.

[0062] The embodiments of the present utility model further relate to a household appliance with the foregoing indication apparatus 1. The indication apparatus 1 may be disposed on a household appliance body, door, or functional module of the household appliance.

[0063] Various embodiments illustrated with reference to FIG. 1 to FIG. 5 may be combined with each other in any given manner to realize the advantage of the present utility model. In addition, the present utility model is not limited to the shown embodiments. Usually, apart from the shown means, other means can also be used as long

as the means can also achieve the same effect.

Claims

1. An indication apparatus (1), comprising a panel (2) and an optical assembly (3) located at an inner side of the panel, the panel having a first light outlet portion (21) and a second light outlet portion (22); and the optical assembly (3) comprising:
 - a circuit substrate (4);
 - at least one first light emitting element (5) and at least one second light emitting element (6) integrated on the circuit substrate (4), the first light emitting element (5) being corresponding to the first light outlet portion (21);
 - a light guide sheet (7), configured to receive light of the second light emitting element (6) and to guide the light to the second light outlet portion (22); and
 - a carrying frame (8), the light guide sheet (7) being carried on the carrying frame (8), and the carrying frame (8) being fixed on the circuit substrate (4).
2. The indication apparatus according to claim 1, **characterized in that** the carrying frame is opaque, and configured to stop light of the first light emitting element from entering the second light outlet portion and to stop the light of the second light emitting element from entering the first light outlet portion.
3. The indication apparatus according to any one of the foregoing claims, **characterized in that** the carrying frame is disposed around the second light outlet portion and abuts against the inner side of the panel.
4. The indication apparatus according to any one of the foregoing claims, **characterized by** comprising a slot (125) configured to fix the circuit substrate and a pressing portion (126) abutting against an inner side of the circuit substrate to enable the carrying frame to abut against the inner side of the panel.
5. The indication apparatus according any one of the foregoing claims, **characterized in that** the carrying frame is clamped on the circuit substrate.
6. The indication apparatus according to any one of the foregoing claims, **characterized in that** the light guide sheet is located between the carrying frame and the circuit substrate, and a gap (G1) is disposed between the light guide sheet and the panel.
7. The indication apparatus according to any one of the foregoing claims, **characterized in that** an accommodation space (9) is formed by a gap between an end face of the light guide sheet and the carrying frame along a direction parallel to the panel, and the second light emitting element extends into the accommodation space.
8. The indication apparatus according to any one of the foregoing claims, **characterized in that** the first light emitting elements are distributed in rows, and the first light emitting elements and the second light emitting elements are distributed apart in a direction perpendicular to an arrangement direction of the first light emitting elements.
9. The indication apparatus according to any one of the foregoing claims, **characterized in that** the panel comprises a base plate (24) and an indicator plate (23), the first light outlet portion comprises a first through hole (241) located on the base plate and a first light transmitting portion (231) located on the indicator plate and covering the first through hole, the second light outlet portion comprises a second through hole (242) located on the base plate and a second light transmitting portion (232) located on the indicator plate and covering the second through hole, and the carrying frame stops the light of the first light emitting element from entering the second through hole and stops the light of the second light emitting element from entering the first through hole.
10. An air hygiene apparatus, comprising the indication apparatus according to any one of the foregoing claims.
11. The air hygiene apparatus according to claim 10, **characterized by** comprising a housing (102), an air passageway (103) located in the housing, and an air detection apparatus (105) and/or an air purification apparatus (106) located in the air passageway, wherein the indication apparatus is located in the front of the housing.
12. The air hygiene apparatus according to claim 11, **characterized by** comprising a carrying bracket (127) configured to carry the air detection apparatus and/or the air purification apparatus, wherein the optical assembly is located between the carrying bracket and the panel.
13. The air hygiene apparatus according to claim 12, **characterized in that** the carrying bracket abuts against a side of the circuit substrate facing away from the panel to apply a force toward the panel to the circuit substrate.
14. A household appliance, comprising the indication apparatus according to any one of the foregoing claims.

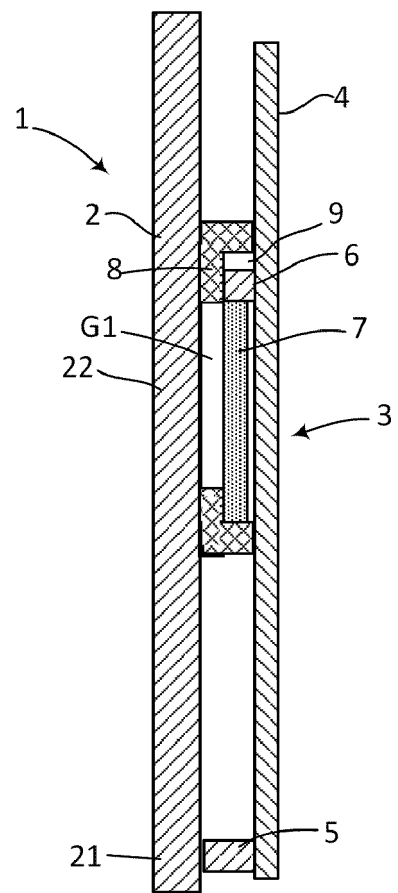


FIG. 1

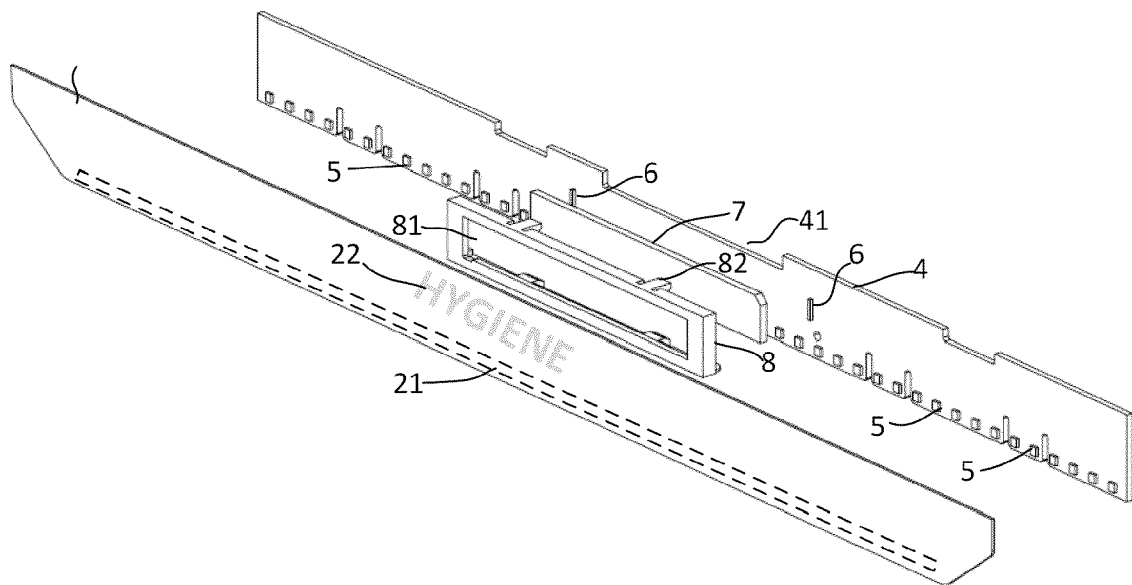


FIG. 2

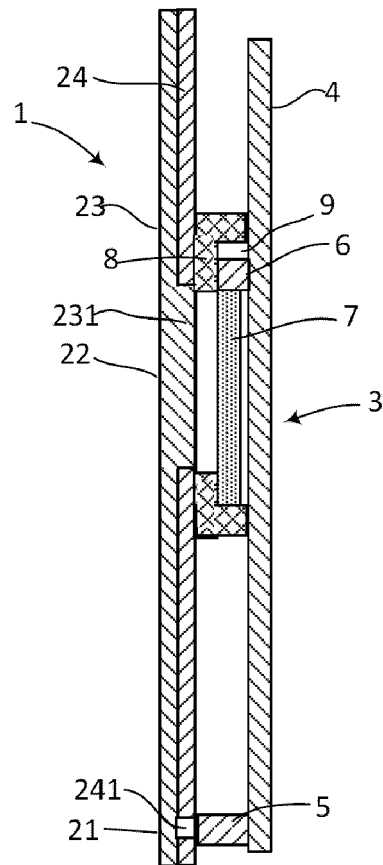


FIG. 3

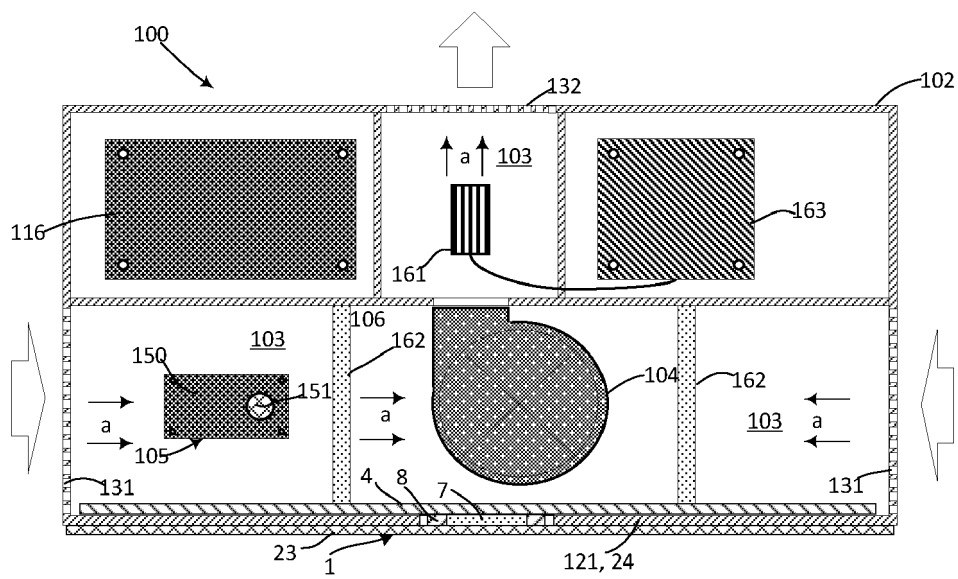


FIG. 4

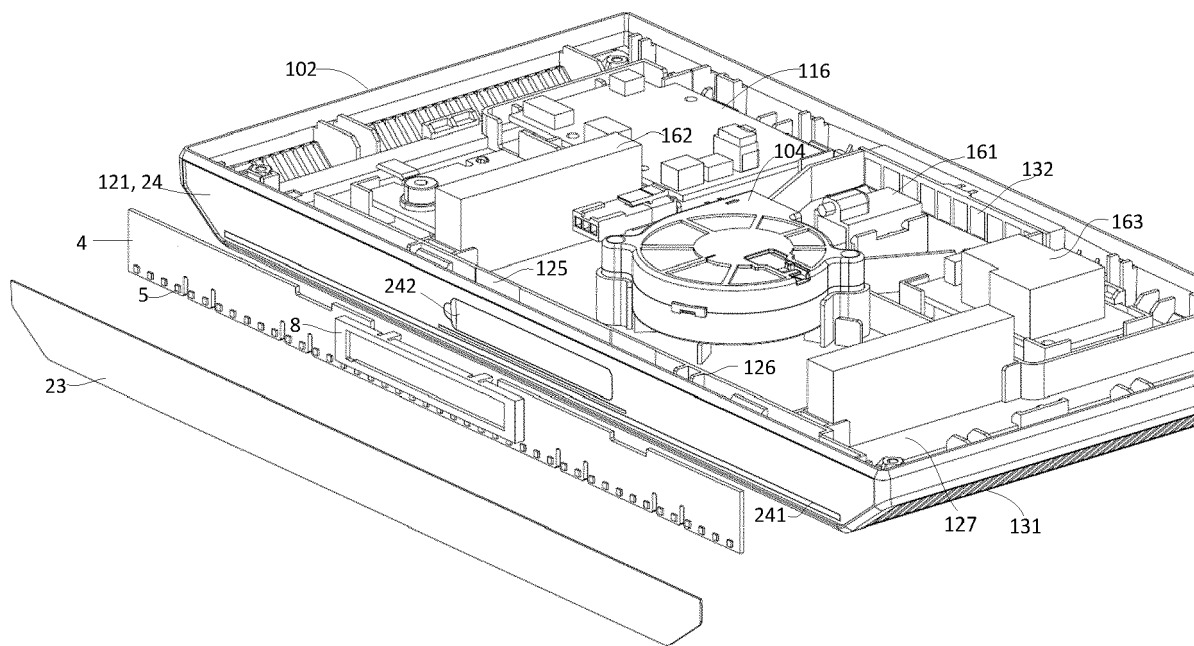


FIG. 5



EUROPEAN SEARCH REPORT

Application Number

EP 22 15 8035

DOCUMENTS CONSIDERED TO BE RELEVANT

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		15 July 2022	Kuljis, Bruno
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		& : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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