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(72) Inventors:
• **BAI, Yufa**
Chuzhou
Anhui 239016 (CN)
• **MA, Jingdong**
Chuzhou
Anhui 239016 (CN)
• **YANG, Zhenyu**
Chuzhou
Anhui 239016 (CN)

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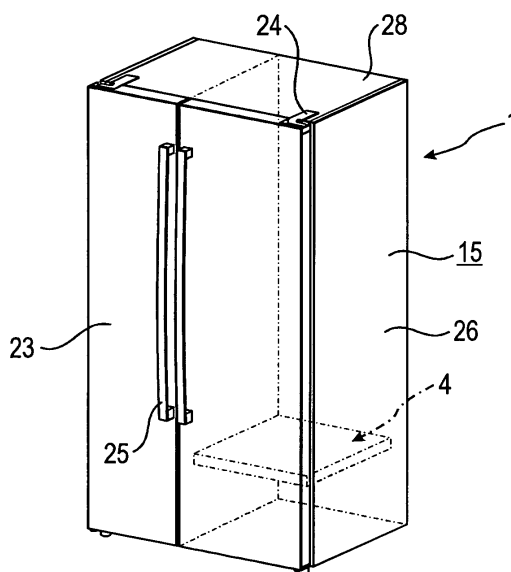
(71) Applicant: **BSH Bosch und Siemens Hausgeräte GmbH**
81739 München (DE)

(54) **REFRIGERATOR**

(57) The present invention relates to a refrigerator. The refrigerator comprises a first storage space (2); a second storage space (3), at least one parameter of which is controlled independent of the first storage space

(2); and a partition element (4) which separates the first storage space (2) from the second storage space (3). According to the present invention, the partition element (4) comprises a thermally insulated space (5) which is hermetically enclosed and which is filled with inert gas.

Fig.1



Description

FIELD OF THE INVENTION

[0001] The present invention relates to a refrigerator, more particularly to a house-hold or commercial refrigerator comprising at least two storage spaces.

BACKGROUND

[0002] Refrigerators are conventionally well known. In a refrigerator, items requesting for various storage conditions are stored in two or more regions having different temperatures and/or humidities. A typical refrigerator is provided with a freezing compartment in which temperature is maintained below 0°C (such as between -18°C and 0°C) and a refrigerating compartment in which temperature is maintained above 0°C (such as it is 4°C). The freezing compartment and the refrigerating compartment are formed by an inner liner of the refrigerator body, which has a foam-insulation layer, and are arranged with doors respectively. The freezing compartment and the refrigerating compartment can be arranged one above the other or side-by-side.

[0003] It is also well known in the art that the refrigerating compartment in the refrigerator is divided into one or more storage spaces so that a user can appropriately use these storage spaces to storage different foodstuffs. For example, US 7,021,334 B2 discloses a side-by-side combination refrigerator comprising a freezing compartment and a refrigerating compartment which are arranged side-by-side, and a temperature controllable chamber which is formed by appropriately dividing the refrigerating compartment. There is a temperature sensor provided in the temperature controllable chamber. A control unit of the refrigerator can control the temperature of the temperature controllable chamber in a manner irrespective of the refrigerating compartment. The temperature controllable chamber is provided in the lower portion of the refrigerating compartment. Upper and lower walls of the temperature controllable chamber are provided with foam-insulation layers respectively so that the temperature controllable chamber is thermally insulated from the refrigerating compartment.

[0004] In a conventional refrigerator, a partition plate independent of the refrigerator body is used to thermally isolate the temperature controllable chamber from the refrigerating compartment. The mentioned partition plate comprises an accommodating space to accommodate a thermally insulated foam plate. However, a gap is likely to be created between the foam plate and the accommodating space so that the thermally insulated effect will be significantly poor. Furthermore, during manufacturing, the foam plate is prone to be impacted by some items and thus to be damaged. The manufactory will have to take appropriate measurement to render the foam plate invisible.

SUMMARY OF THE INVENTION

[0005] An objective of the present invention is to provide a refrigerator wherein the thermal isolation between two storage spaces is reliably carried out.

[0006] Therefore, the present invention relates to a refrigerator comprising a first storage space; a second storage space, at least one of storage parameters of which is controlled independent of the first storage space; and a partition element which separates the first storage space from the second storage space; characterized in that, the partition element comprises a thermally insulated space which is hermetically enclosed and which is filled with inert gas.

[0007] By this way, even in the case of a foam plate being not used, the first storage space and the second storage space can be thermally isolated from each other reliably and uniformly.

[0008] Other individual technical features or technical features which can be combined with the other individual technical features and thus are regarded as belonging to the characteristic of the present invention are recorded in the dependent claims as below.

[0009] According to a preferred embodiment of the present invention, the partition element is removably mounted in the refrigerator.

[0010] According to a preferred embodiment of the present invention, the partition element is at its two sides fixed on side walls of the first storage space in an insertable manner such that the partition element can be easily mounted and detached.

[0011] According to a particularly preferred embodiment of the present invention, the thermally insulated space is comprised of a hollow glass assembly, which assembly is comprised of at least two glass plates. This contributes to the aesthetic of the storage compartment.

[0012] According to a preferred embodiment of the present invention, the hollow glass assembly comprises a first glass plate and a second glass plate which is located below the first glass plate. The upper surface of the first glass plate is at least partially exposed in the first storage space so as to form a support face for supporting an item to be cooled thereon.

[0013] According to a preferred embodiment of the present invention, the refrigerator further comprises a freezing compartment isolated from the first storage space, and a fluid path for allowing cool air from the freezing compartment to enter the second storage space.

[0014] According to a particularly preferred embodiment of the present invention, the partition element comprises a passage fluidly communicating with the second storage space to allow gas to leave out of or to enter into the second storage space via the passage.

[0015] According to a preferred embodiment of the present invention, the partition element further comprises a bottom plate located below the second glass plate, the bottom plate being at a distance from the second glass plate so as to form the passage between the bottom plate

and the second glass plate.

[0016] According to a preferred embodiment of the present invention, the passage comprises an inlet fluidly communicating with the second storage space, the inlet being far away from a cooling source for the second storage space.

[0017] According to a preferred embodiment of the present invention, the inlet is formed on the lower surface of the partition element.

[0018] According to a particularly preferred embodiment of the present invention, the passage comprises a plurality of inlets fluidly communicating with the second storage space. The bottom plate comprises a first region in which the inlets are arranged and a second region in which the inlets are not arranged. The first region is farther away from the cooling source for the second storage space than the second region.

[0019] According to a preferred embodiment of the present invention, the partition element further comprises a filter element for adjusting the storage condition of the second storage space.

[0020] The construction of the present invention and other objectives and benefit effects of the present invention will be well understood by means of the description of the preferred embodiments in connection with attached figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] As a part of the description and in order to further understanding of the present invention, embodiments of the present invention are illustrated by figures and they together with the description are used to describe the present invention. In the figures:

Figure 1 shows an exemplary perspective view of a refrigerator according to a preferred embodiment of the present invention;

Figure 2 shows an exemplary perspective view of a part of the refrigerator according to the preferred embodiment of the present invention;

Figure 3 shows an exemplary perspective view of a partition element according to a preferred embodiment of the present invention;

Figure 4 shows an exemplary exploded perspective view of the partition element according to a preferred embodiment of the present invention; and

Figure 5 shows an exemplary section view of the partition element according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0022] In the followed description of preferred embodiments, the same or similar features are referred by the same reference numerals.

[0023] Please refer to attached figures; especially refer to figures 1 and 2 at first. A refrigerator 1 comprises a refrigerator body 15 and two side-by-side combination doors 23 which are connected to the refrigerator body 15. Each of the doors 23 is pivotally connected at a corresponding side of the refrigerator body 15 by means of one or more hinges 24, and can be rotated around a rotation shaft parallel with a longitudinal axis.

[0024] The refrigerator body 15 comprises left and right side walls 26, a rear wall 30 connecting between the left and right side walls 26, a top wall 28, and a bottom wall 29. The refrigerator body 15 further comprises a partition wall 27 which is located between the left and right side walls 26 and which is substantially parallel with the left and right side walls 26. The partition wall 27 is connected with the top wall 28 and the bottom wall 29 respectively. The left and right side walls 26, the rear wall 30, the top wall 28, the bottom wall 29 and the partition wall 27 are each comprised of a foam insulation layer (not shown) which is formed by foaming of an insulation foaming material.

[0025] By use of the side walls 26, the rear wall 30, the top wall 28, the bottom wall 29 and the partition wall 27, the refrigerator body 15 defines a freezing compartment 22 and a refrigerating compartment 6 which are arranged side by side. The freezing compartment 22 and the refrigerating compartment 6 are respectively opened at their front ends, and are closed by the corresponding doors 23. The door 23 is provided with a foam insulation layer therein, which foam insulation layer is formed by integral foaming of thermal insulation foams. Usually, the doors 23 are closed to prevent cool air from leaving out of the freezing compartment 22 and the refrigerating compartment 6. If necessary, the user can open the corresponding one of the doors 23 to for example remove food stuff from the freezing compartment 22 or from the refrigerating compartment 6. The user can use handles 25 to open and close the doors 23.

[0026] The refrigerating compartment 6 comprises a partition element 4 which is removably mounded in the refrigerating compartment. The partition element 4 extends in a horizontal direction. The partition element 4 is at its two sides fixed on the partition wall 27 and the corresponding side wall 26 in an insertable manner. By means of the partition element 4, the refrigerating compartment 6 is divided into a first storage space 2 and a second storage space 3 which are independent of each other. The partition element 4 is provided to prevent air from flowing between the first storage space 2 and the second storage space 3 and to thermally isolate the two storage spaces 2 and 3. Therefore, storage parameters such as temperature and/or humidity of the first storage

space 2 and the second storage space 3 can be independently controlled. In this embodiment, the first storage space 2 is located above the second storage space 3.

[0027] Preferably, the refrigerator 1 comprises measuring means for respectively measuring the parameters (such as temperature and/or humidity and so on) of the first storage space 2 and of the second storage space 3. Based on the measured parameters, a control unit of the refrigerator 1 can control the first storage space 2 and the second storage space 3 respectively. In this embodiment, the first storage space 2 is used as a commonly-used refrigerating chamber, and the second storage space 3 is used as a temperature controllable chamber, whose temperature can be adjusted in a large range (such as from -10°C to 14°C).

[0028] In this embodiment, the partition wall 27 is provided with a fluid path 11 at the location of the second storage space 3, which fluid path is adapted for fluidly communicating the freezing compartment 22 with the second storage space 3. Preferably, the fluid path 11 can be opened or closed by the control unit of the refrigerator 1, which is dependent on whether the second storage space 3 requires cool air introduced from the freezing compartment 22 or not. The opening and closing of the fluid path 11 can be carried out by a leaf blade which is located in the fluid path 11 and which is associated with the control unit. Preferably, a fan is provided in the fluid path 11 to suck cool air from the freezing compartment 22 as the fluid path 11 is opened such that the temperature of the second storage space 3 is lowered. In an alternative embodiment, the refrigerator 1 can be provided with an individual refrigeration system adapted for the second storage space 3.

[0029] As shown in figures 3, 4 and 5, the partition element 4 comprises a hollow glass assembly 7 which is used to prevent the heat exchanging between the first storage space 2 and the second storage space 3. The hollow glass assembly 7 is in a flat, rectangular shape and extends in a horizontal direction.

[0030] The hollow glass assembly 7 comprises a first glass plate 8 and a second glass plate 9 located below the first glass plate 8. The distance between the first glass plate 8 and the second glass plate 9 can be defined by a separating device 21 located between the first glass plate 8 and the second glass plate 9. A hermetically enclosed, thermally insulated space 5 is formed between the first glass plate 8 and the second glass plate 9 so that the thermoresistance between the first storage space 2 and the second storage space 3 is greatly reduced. The thermally insulated space 5 is filled with inert gas such as argon or krypton. This can enhance the thermal insulation performance of the hollow glass assembly 7 and can prevent moist/condensation/dew from being generated in the hollow glass assembly 7. The hollow glass assembly 7 preferably comprises a sealing device (not shown) provided along the separating device so as to prevent leakage of inert gas and to prevent air from entering into the thermally insulated space 5.

[0031] The partition element 4 comprises a frame 30 provided along the edge of the hollow glass assembly 7. The frame 30 has an opening 31, the shape of which corresponds with that of the hollow glass assembly 7 but the size of the opening is slightly smaller than that of the hollow glass assembly. Therefore, an upper surface of the first glass plate 8 is exposed in the first storage space 2 so as to form a support face for placing item to be cooled thereon for example.

[0032] The partition element 4 comprises stop means 32 to prevent the partition element 4 from being forwardly drawn out. In this embodiment, the stop means 32 is embodied as a projection extending downwards from a side of the frame 30. The partition wall 27 and/or the associated side wall 26 are/is provided with a stop groove (not shown) for receiving the stop means. When the projection is inserted in the stop groove, the horizontal movement of the partition element 4 is limited by the stop groove such that the partition element 4 can be reliably secured in the refrigerator 1 to isolate the first storage space 2 from the second storage space 3. In an alternative embodiment, a stop groove can be provided on the partition element 4 and a projection can be provided on the partition wall 27 and/or the side wall 26 such that the projection can be inserted into the stop groove to implement the securing of the partition element 4.

[0033] The partition element 4 comprises a bottom plate 17 located below the hollow glass assembly 7. The bottom plate 17 is substantially parallel with the second glass plate 9 and is connected to the frame 30 by means of a mounting frame 33 extending upwards from an edge of the bottom plate. The bottom plate 17 is provided at an interval from the second glass plate 19 such that a passage 12 is formed to enable air in the second storage space 3 to leave out of the second storage space 3.

[0034] The hollow glass assembly 7 has a length in a front-to-back direction smaller than the depth of the second storage space 3. Therefore, the partition element 4 has an insulation strip 14 which is provided between a rear end of the hollow glass assembly 7 and a rear surface of the second storage space 3. In this embodiment, the insulation strip 14 is made of EPS material.

[0035] Gas in the second storage space 3 flows into the passage 12 via a plurality of inlets 13 formed on the bottom plate 17. The bottom plate 17 comprises a first region 18 and a second region 19, the first region 18 being far away from the partition wall 27 which is provided with the fluid path 11 (which serves as a cooling source for the second storage space 3), and the second region 19 being adjacent to the partition wall 27. The first region 18 and the second region 19 are substantially divided by a centerline in a front-to-back direction in the bottom plate 17. In this embodiment, the inlets 13 are mainly provided in the first region 18 and the second region 19 is free of the inlets 13 such that cool air from the freezing compartment 22 can be uniformly distributed in the second storage space 3. Each of the inlets 13 is elongate in shape, and the inlets 13 are arranged on the first region 18 in a

two-row arrangement.

[0036] An outlet 16 of the passage 12 is oriented toward the rear of the partition element 4 such that the inlets 13 and the outlet 16 are respectively oriented in planes which are substantially vertical with respect to each other. In this embodiment, by means of an appropriate pipeline (not shown), the outlet 16 is preferably connected to a chamber for accommodating an evaporator (not shown) for the freezing compartment 22. The outlet 16 is provided at a position corresponding to the second region 19 of the bottom 17 so that the flowing path through which air derived from the inlets 13 flows in the passage 12 can be enlarged.

[0037] Preferably, the partition element 4 comprises a separator sheet 34 provided along one side of the outlet 16 which is adjacent to the first region 18. As shown in figure 5, the separator sheet 34 extends into the passage 12 such that air entering from the inlets 13 arranged adjacent to the outlet 16 is prevented from flowing out of the outlet 16 in a very short flowing path.

[0038] As shown in figure 5, the partition element 4 comprises a filter element 20 for adjusting at least one storage parameter of the second storage space 3. In this embodiment, the filter element 20 comprises a filtration fabric for filtrating water so as to maintain the humidity of the second storage space 3. In this embodiment, the inlets 13 are covered by the filter element 20.

[0039] The partition element 4 comprises a holding plate 35 for securing the filtration fabric on the partition element 4. The holding plate 35 is secured onto the bottom plate 17 and has a shape corresponding with that of the first region 18. The holding plate 35 comprises a plurality of through-holes associated with the inlets 13.

[0040] Although the hollow glass assembly 7 is comprised of only two glass plates in the above-mentioned embodiment, it should be understood that in an alternative embodiment, the hollow glass assembly 7 can be comprised of more than two glass plates such as three glass plates.

Claims

1. A refrigerator (1) comprising:

a first storage space (2);
a second storage space (3), at least one storage parameter of which is controlled independent of the first storage space (2); and
a partition element (4), which isolates the first storage space (2) from the second storage space (3);
characterized in that, the partition element (4) comprises a thermally insulated space (5) which is hermetically enclosed and which is filled with inert gas.

2. The refrigerator (1) according to claim 1, **character-**

ized in that, the partition element (4) is removably mounted in the refrigerator (1).

3. The refrigerator (1) according to claim 1 or 2, **characterized in that**, the partition element (4) is fixed to side walls of the storage space (2) in an insertable manner.

4. The refrigerator (1) according to any one of the previous claims, **characterized in that**, the thermally insulated space (5) is formed by a hollow glass assembly (7), which is comprised of at least two glass plates (8, 9).

5. The refrigerator (1) according to claim 4, **characterized in that**, the hollow refrigerator (7) comprises a first glass plate (8) and a second glass plate (9) located below the first glass plate (8), and an upper surface of the first glass plate (8) is at least partially exposed in the first storage space (2) so as to form a support face for supporting an item to be cooled thereon.

6. The refrigerator (1) according to any one of the previous claims, **characterized in that**, further comprises a freezing compartment (10) isolated from the first storage space (2) and a fluid path (11) enabling cool air to enter the second storage space (3) from the freezing compartment (10).

7. The refrigerator (1) according to any one of the previous claims, **characterized in that**, the partition element (4) comprises a passage (12) fluidly communicating with the second storage space (3) to allow gas to leave out of or to enter into the second storage space (3) via the passage (12).

8. The refrigerator (1) according to claim 7, **characterized in that**, the partition element (4) further comprises a bottom plate (17) which is located below the second glass plate (9), and the bottom plate (17) is provided at an interval from the second glass plate (9) so that the passage (12) is formed.

9. The refrigerator (1) according to claim 7 or 8, **characterized in that**, the passage (12) comprises an inlet (13) fluidly communicating with the second storage space (3), which inlet (13) is far away from a cooling source for the storage space (3).

10. The refrigerator (1) according to claim 9, **characterized in that**, the inlet (13) is formed on a lower surface of the partition element (4).

11. The refrigerator (1) according to claim 8, **characterized in that**, the passage (12) comprises a plurality of inlets (13) fluidly communicating with the second storage space (3), the bottom plate (17) comprises

a first region (18) in which the inlets (13) are arranged and a second region (19) which is free of the inlets (13), and the first region (18) is farther away from the second storage space (3) than the second region (19).

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12. The refrigerator (1) according to any one of the previous claims, **characterized in that**, the partition element (4) further comprises a filter element (20) for adjusting the at least one parameter of the second storage space (3).

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Fig.1

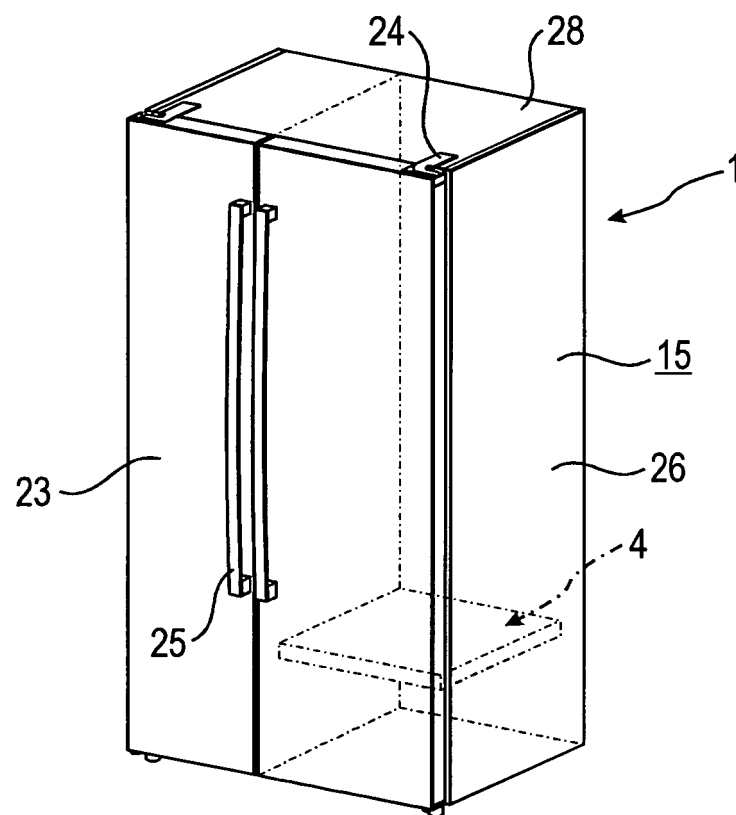


Fig.2

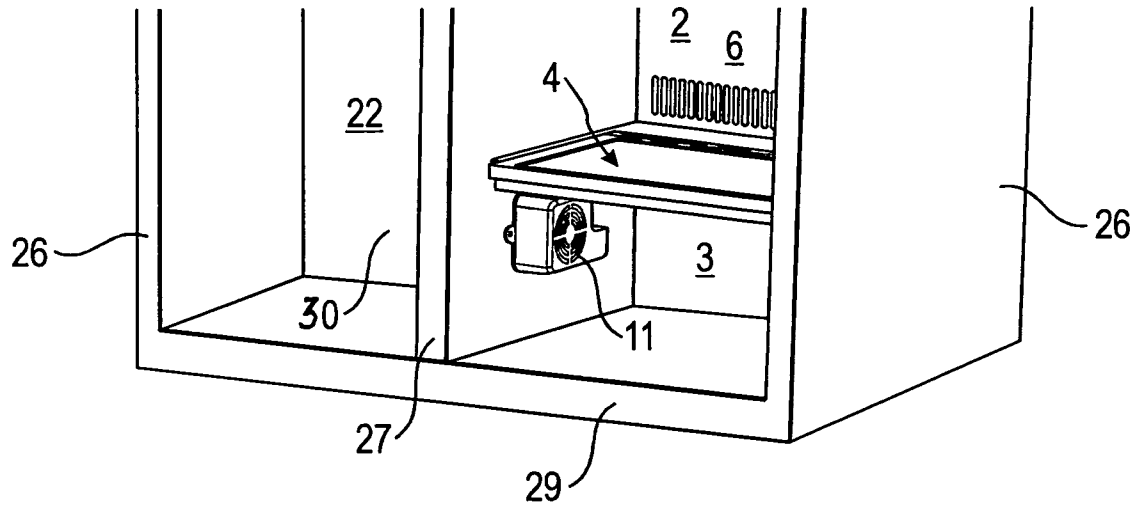


Fig.3

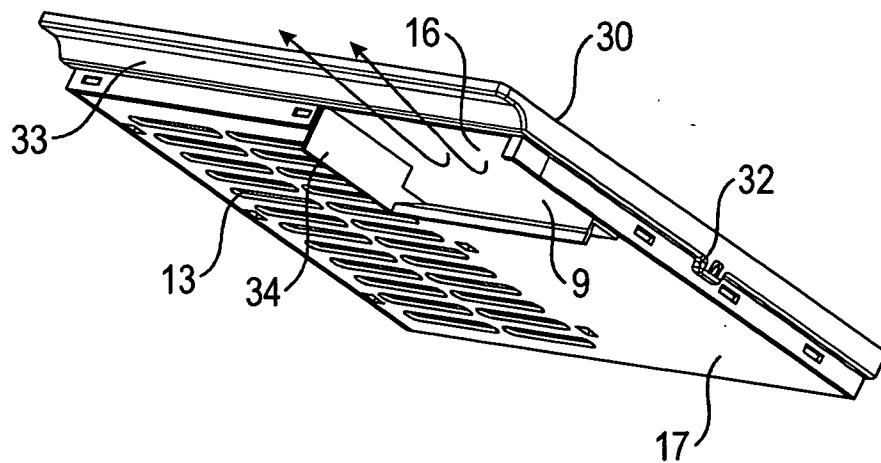


Fig.4

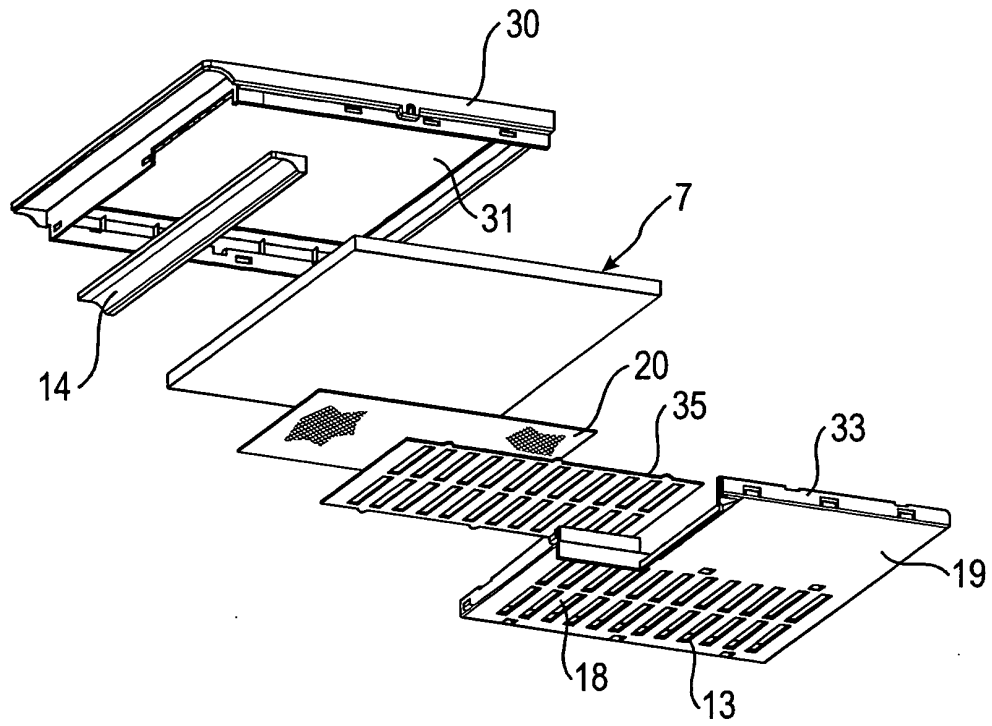
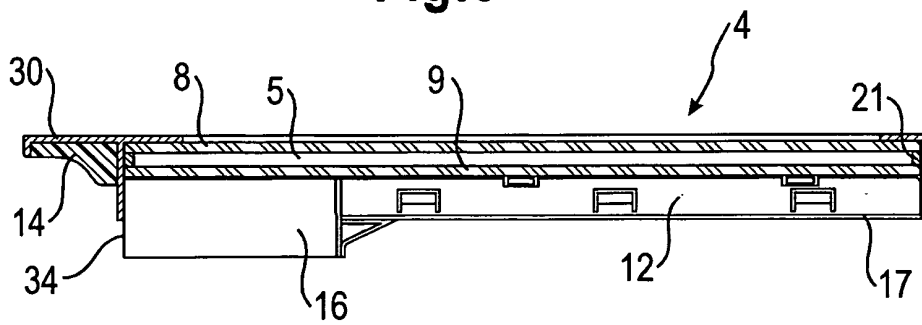


Fig.5



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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