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(54) **REFRIGERATOR**

(57) The present invention relates to a refrigerator provided with a storage compartment (1) defined by thermally-insulating walls (21, 22, 23, 5), wherein a back wall (5) of said thermally-insulating walls has a channel suitable to receive a flow of cold air. The back wall (5) has one or more shutters (7) movable from a closed position, wherein they are aligned with it, to an open position, wherein they are arranged transverse to the channel and

establish fluid communication between the latter and the storage compartment (1). At least one heat conduction medium (4) having a thermal conduction plate (41) and thermal convection fins (42) is associated with the back wall (5), said thermal conduction plate (41) being arranged together with thermal convection fins (42) at a through span of the back wall (5).

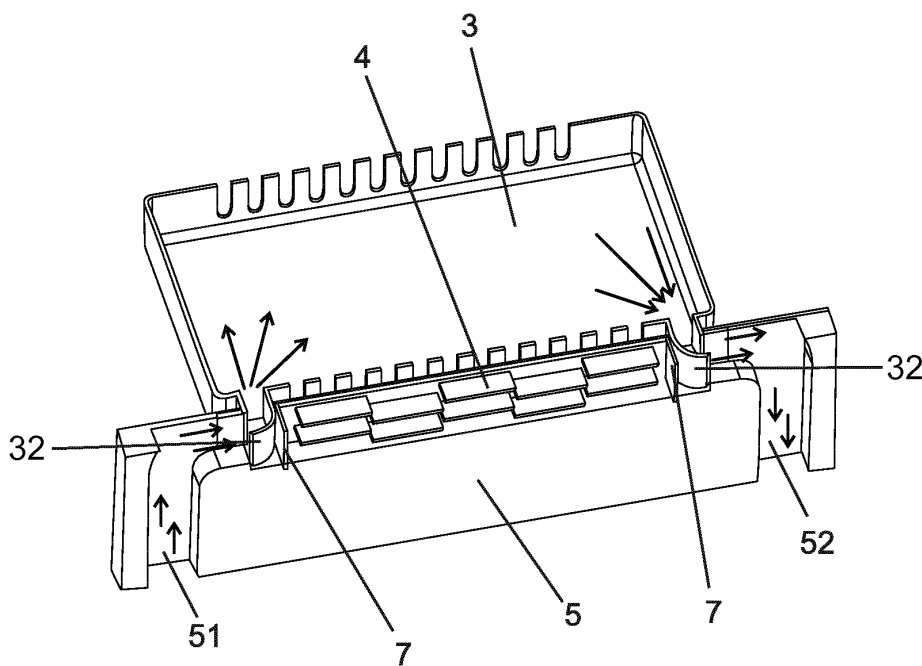


FIG. 6

Description

FIELD OF THE DEVICE

[0001] The present invention relates to a refrigerator and, more particularly, a refrigerator provided with a storage compartment capable of being cooled directly or indirectly, the form of cooling of said storage compartment being selectively defined either by a user or automatically.

[0002] The storage compartment is preferably, but not limited to, used for storing fruits when set in an indirect refrigerating condition, and used for rapid cooling food in general when set in a direct refrigerating condition.

BACKGROUND

[0003] As it is well known to those skilled in the art, the present state of the art comprises a wide range of refrigerators, which comprise equipment commonly used for cooling, refrigerating or freezing food items in general. In this sense, it is possible to find ample technical description of functional principles and possibilities of refrigeration systems applied in refrigerators in specific technical literature and even in patent literature.

[0004] Within this context, refrigerators which comprise refrigeration chambers for the rapid refrigeration and/or rapid freezing of specific food items, usually of small sizes, are widely known. Typically, this type of compartment is directly refrigerated, that is, the cold air generated in the vicinity of the evaporator is directly, e.g. through forced ventilation, supplied to the compartment, directly contacting the food items to be quickly cooled or frozen. Generally, it is observed that the internal environment of this type of compartment presents low temperature and low relative humidity.

[0005] Refrigerators which comprise refrigeration chambers for the storage of fruits and similar food items are also widely-known. Typically, this type of compartment is directly refrigerated, that is cold air generated in the vicinity of the evaporator is directly conveyed, by way of forced ventilation, into the compartment, directly contacting the food items to be quickly cooled or frozen. Generally, it is observed that the internal environment of this type of compartment presents mild temperature and high relative humidity.

[0006] Refrigerators which comprise multifunctional compartments, i.e. compartments that can be either directly or indirectly refrigerated for the storage of fruit and similar food items or for the rapid cooling/freezing of specific food items are also known.

[0007] For example, patent document EP1813893 briefly describes a refrigerator including a compartment for rapid refrigeration of packaged food items.

[0008] According to this document, a compartment is provided inside a cooling/freezing chamber. Said compartment is composed of a shutter and the cooling/freezing chamber is composed of a fan capable of conducting

icy air (near the evaporator) to the vicinity of the compartment or into the compartment depending on the position (open/closed) of the shutter. In addition, it is further described that said shutter, which is disposed in the upper wall of the housing, may be selectively operated by an automated control based on temperature measurement.

[0009] While the compartment described in patent document EP1813893 is of interest for the rapid cooling/freezing of food items when the shutter is open, it is noted, however, that it is not particularly suitable for the storage of fruits, vegetables and similar food items; finally, in addition to the compartment exchanging heat with the internal environment of the cooling/freezing chamber, no medium is provided for the heat transfer when the shutter is open.

SUMMARY OF THE INVENTION

[0010] Thus, a main purpose of the invention is to provide a refrigerator having a compartment which can be used both to accelerate cooling/freezing of food items in general and to store specifically fruits, vegetables and similar food items.

[0011] The compartment comprises means dedicated to the optimization of heat transfer when used for the specific storage of fruits, vegetables and similar food items.

[0012] According to an embodiment of the invention, the internal temperature of the compartment is largely not associated with the internal temperature of the other chambers which comprise the refrigerator.

[0013] According to the aspects of the invention, the refrigerator comprises a storage compartment provided with thermally-insulating walls, at least one shutter and at least one air-blowing duct capable of blowing cold air from at least one source of cold air to the surroundings of the storage compartment.

[0014] According to an embodiment of the invention, the refrigerator comprises at least one heat conduction medium solidly disposed in the storage compartment, said heat conduction medium being arranged between at least one of the walls forming part of the storage compartment and at least one of the thermally-insulating walls. In addition, said heat conduction medium is composed of at least one thermal conduction plate and at least one thermal convection fin.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The device in question will now be detailed in depth based on the following Figures, where:

Figure 1 schematically shows a partial cross-section of a refrigerator according to the invention;

Figure 2 shows an embodiment of a thermal transfer optimization medium associated with the storage compartment;

Figure 3 shows an embodiment of the ice air distri-

bution arrangement of the refrigerator according to the device in question;

Figure 4 shows an embodiment of the inside of the storage compartment of the refrigerator; and

Figures 5 and 6 schematically show a cross-section of an assembly made up of the air distribution arrangement, the heat transfer optimization medium and the storage compartment of the refrigerator.

DESCRIPTION OF THE INVENTION

[0016] In a preferred embodiment of the invention the refrigerator is a no-frost or frost-free type refrigerator, i. e. it comprises a unified cold air production unit (not shown) and air-blowing ducts (not shown) by way of which it is possible to supply cold air to any chambers (not shown) of the refrigerator. The constructive possibilities of this type of refrigerator are widely known to those skilled in the art.

[0017] The refrigerator of the invention comprises at least one storage compartment 1 that can be configured to be used as a fruit compartment, featuring a moderate internal temperature and a high relative humidity, or as a fast cooling/freezing compartment, featuring a low internal temperature and a low relative humidity.

[0018] When configured to store fruit, the storage compartment 1 assumes an "isolated mode of operation" whereby its internal environment is fully separated from the other environments of the refrigerator.

[0019] When configured as a fast cooling/freezing compartment, the storage compartment 1 assumes an "equalized mode of operation" whereby its internal environment receives cold air from the unified cold air production unit from at least one air-blowing duct 6 fluidly communicating with the storage compartment 1.

[0020] As schematically shown in Figure 1, which illustrates an embodiment of the invention, the storage compartment 1 is formed by separate walls, which are integrally attached to thermally-insulating walls 21, 22, 23, 5.

[0021] As particularly shown in Figure 1, the thermally-insulating front wall 23 comprises the door itself which gives access to the interior of the storage compartment 1. The thermally-insulating upper 21 and lower 22 walls comprise mere sheets of thermal insulation material such as, for example, Expanded Polystyrene (EPS).

[0022] A heat conduction medium 4 is associated with the thermally-insulating back wall 5 and is arranged in the storage compartment 1 as shown in Figure 1.

[0023] More particularly, the heat conduction medium 4 is preferably attached to the thermally-insulating back wall 5 of the storage compartment 1. To this aim conventional fastening means such as, for example, glutinous resins in general may be used.

[0024] As shown in Figure 2, said heat conduction medium 4 comprises a thermal conduction plate 41, preferably made of a metallic material, provided with multiple thermal convection fins 42, also preferably made of a metallic material.

[0025] The thermal conduction plate 41 of the heat conduction medium 4 may be smaller than the thermally-insulating back wall 5 of the storage compartment 1 and, in this situation, the heat conduction medium 4 may further comprise a thermally-insulating frame 43 specially adapted to occupy the missing space.

[0026] As shown in Figure 5, it is preferred that the thermally-insulating back wall 5 is specially adapted to optimize the thermal exchange between the surroundings of the storage compartment 1 (region in which the air-blowing duct 6 directs the cold air of the unified air production unit cold) and the heat conduction medium 4, in the isolated mode of operation, or between the surroundings of the storage compartment 1 (region in which the air-blowing duct 6 directs the cold air of the unified unit of cold air production) and the interior of the storage compartment 1, in the "equalized mode of operation".

[0027] To that end, the thermally-insulating back wall 5 comprises a cold airflow channel provided with at least one inlet 51 and at least one outlet 52, in addition to having a through span centrally arranged in a stretch of the cold airflow channel.

[0028] In addition, as shown in Figures 3, 5 and 6, the storage compartment 1 further comprises shutters 7, e. g. two shutter 7 as shown in the drawings, which, when opened, define fluid communication between the channel of the back wall 5 and the storage compartment 1. The shutters 7 may be of a pivotable type, which allows to have a simple and cheap structure. Moreover, the shutter can be advantageously biased in a closed position, wherein they are aligned with the back wall 5.

[0029] As particularly shown in Figure 3, the back wall 5 has a through span at which the thermal conduction plate 41 of the heat conduction medium 4 is accommodated together with thermal convection fins 42 so that cold air flowing through the channel contacts the thermal convection fins 42 thus exchanging thermal energy in the form of heat with the storage compartment 1.

[0030] According to a preferred embodiment of the invention, the inlet end 51 of the cold airflow channel of the thermally-insulating back wall 5 is aligned with the air-blowing duct 6, and the outlet end 52 of the cold airflow channel of the thermally-insulating back wall 5 is aligned with some other chamber of the refrigerator that can benefit from this cold airflow through said cold airflow channel of the thermally-insulating back wall 5.

[0031] Now particularly referring to Figures 3, 5 and 6, it will be appreciated that the shutters 7 can selectively prevent or allow fluid communication between the storage compartment 1 and the cold airflow channel of the thermally-insulating back wall 5. It will also be appreciated that this arrangement makes it possible to selectively configure the storage compartment 1 either in the "isolated mode of operation" or in the "equalized mode of operation" defined above, as it will be explained in greater detail in the following.

[0032] Figure 5 shows the storage compartment 1 in the "isolated mode of operation", whereby the shutters 7

are in a closed position aligned with the back wall, and cold air flows within the channel of the thermally-insulating back wall 5, but cannot enter the storage compartment 1. In this configuration the storage compartment 1 can be used as a fruit compartment, because the separation from the cold air flowing in the channel of the back wall 5 allows to maintain an internal temperature e.g. around 4°C and a high relative humidity.

[0033] Figure 6 shows the storage compartment 1 in an "equalized mode of operation", whereby the shutters 7 are arranged transverse to the channel of the back wall 5 thus establishing fluid communication between the channel and the storage compartment 1. In this configuration cold air can enter the storage compartment through one of the shutters 7, thus allowing to promote cooling of the food items stored therein.

[0034] It will be appreciated that the storage compartment 1 selectively assumes one of these two configurations depending on the position of the shutters 7.

[0035] Considering that said shutters 7 may comprise traditional shutters, the selection among the modes of operation of the storage compartment 1 can be performed manually (manual operation of the shutters 7) or in an automated manner (electronic operation of the shutters 7).

[0036] According to an embodiment of the invention, the operation mode of the storage compartment 1 can be manually changed by way of a movable utensil arranged inside the storage compartment 1, for example a basket 3 configured to be accommodated therein.

[0037] As shown in figure 4, the basket 3 comprises a plurality of slots 31 which allow air to flow therein.

[0038] As shown in Figures 5 and 6, the basket 3 comprises at least two projections 32 space apart from each other and arranged so as to cooperate with the shutters 7. As discussed above the shutters 7 can be advantageously configured as pivotable members and are normally biased in a closed position, e.g. by way of respective torsion springs, whereby the channel of the back wall 5 is normally fluidly separated from the storage compartment 1. By fitting the basket 3 into the storage compartment 1, the projections 32 contact the shutters 7 and push them open into the channel of the back wall 5, thus establishing fluid communication between the channel and the storage compartment 1 and therefore changing its configuration from the isolated mode of operation (Figure 5) to the equalized mode of operation (Figure 6). The arrows in Figures 5 and 6 show the airflow path. By removing the basket 3 from the storage compartment 1, the shutters 7 rotate back to their original position, thus restoring the isolated mode of operation.

Claims

1. A refrigerator, comprising:

at least one storage compartment (1) defined by

thermally-insulating walls (21, 22, 23, 5) of the refrigerator, wherein a back wall (5) of said thermally-insulating walls has a channel suitable to receive a flow of air;

at least one air-blowing duct (6) configured to blow cold air from a source of cold air to said channel;

the refrigerator being **characterized in that**

the back wall has one or more shutters (7) movable from a closed position, wherein they are aligned with it, to an open position, wherein they are arranged transverse to the channel and establish fluid communication between the latter and the storage compartment (1),

and **in that** at least one heat conduction medium (4) having a thermal conduction plate (41) and thermal convection fins (42) is associated with the back wall (5) and arranged in the storage compartment (1), said thermal conduction plate (41) being arranged together with thermal convection fins (42) at a through span of the back wall (5),

the overall configuration being such that, depending on the position of the shutters (7), cold air flowing through the channel of the back wall (5) crosses it from an inlet (51) to an outlet (52) thereof thus contacting the thermal convection fins (42), or is diverted by one of the shutters (7) and enters the storage compartment (1).

2. The refrigerator according to claim 1, further comprising a basket (3) configured to be fitted in the storage compartment (1), wherein said basket (3) comprises a plurality of slots (31) formed in its walls, said slots (31) allowing fluid communication with the storage compartment (1).

3. The refrigerator according to claim 2, wherein the basket (3) further comprises projections (32) formed on a wall thereof intended to face the back wall (5) of the storage compartment (1), said projections (32) being arranged such that they contact the shutters (7) by moving the basket (3) into the storage compartment (1) and push them open thus establishing fluid communication between the latter and the channel of the back wall (5).

4. The refrigerator according to any one of claims 1 to 3, wherein the shutters (7) are biased in the closed position.

5. The refrigerator according to any one of claims 1 to 4, wherein the shutters (7) are pivotable members.

6. The refrigerator according to any one of claims 1 to 5, wherein the thermal conduction plate (41) and the thermal convection fins (42) of the heat conduction medium (4) are made of a metallic material.

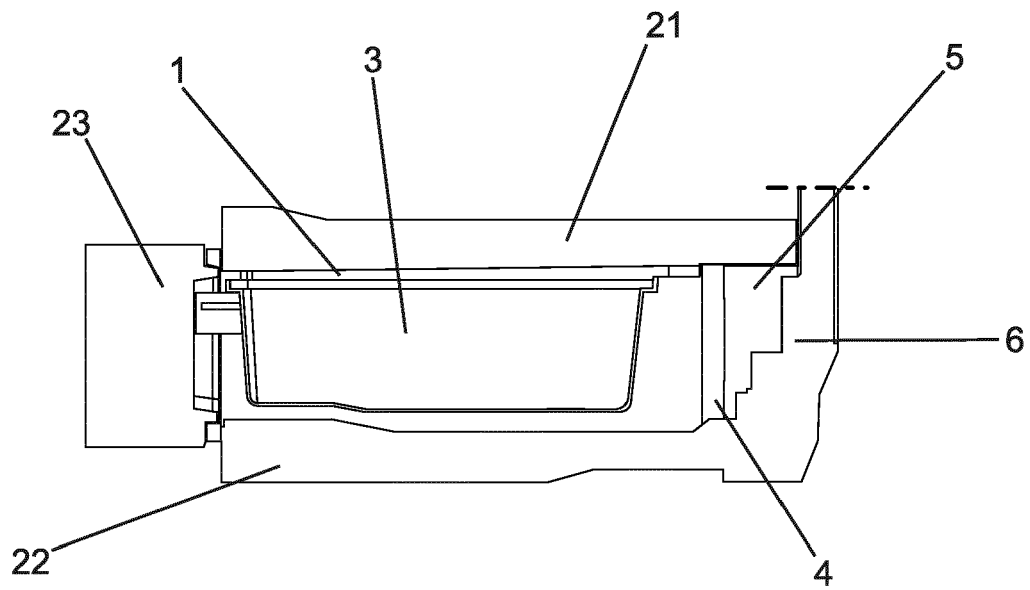


FIG. 1

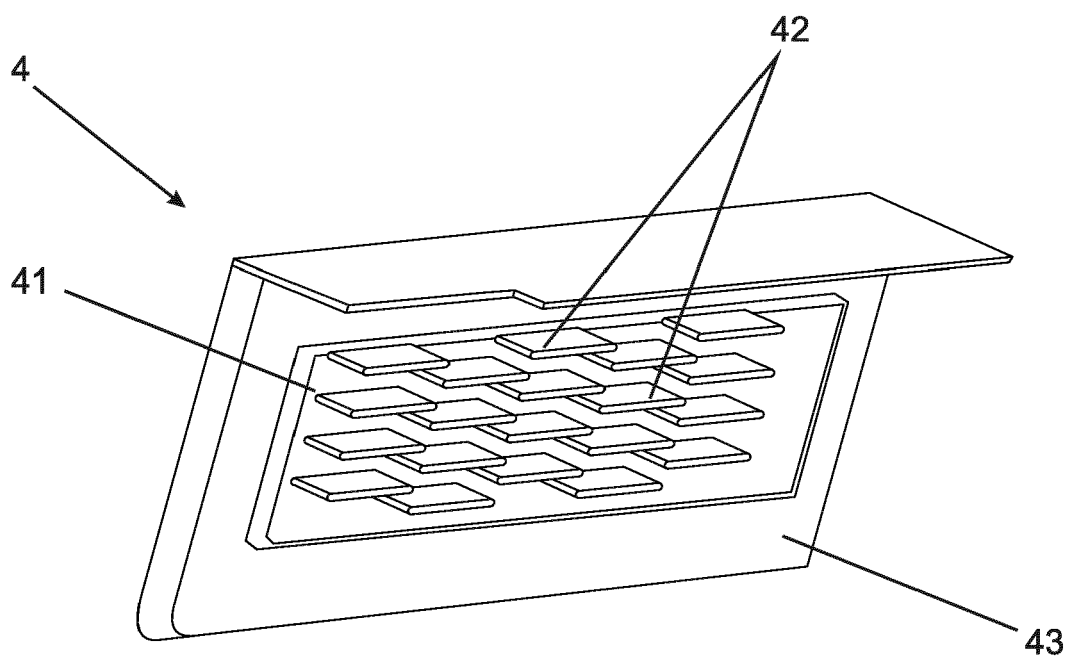


FIG. 2

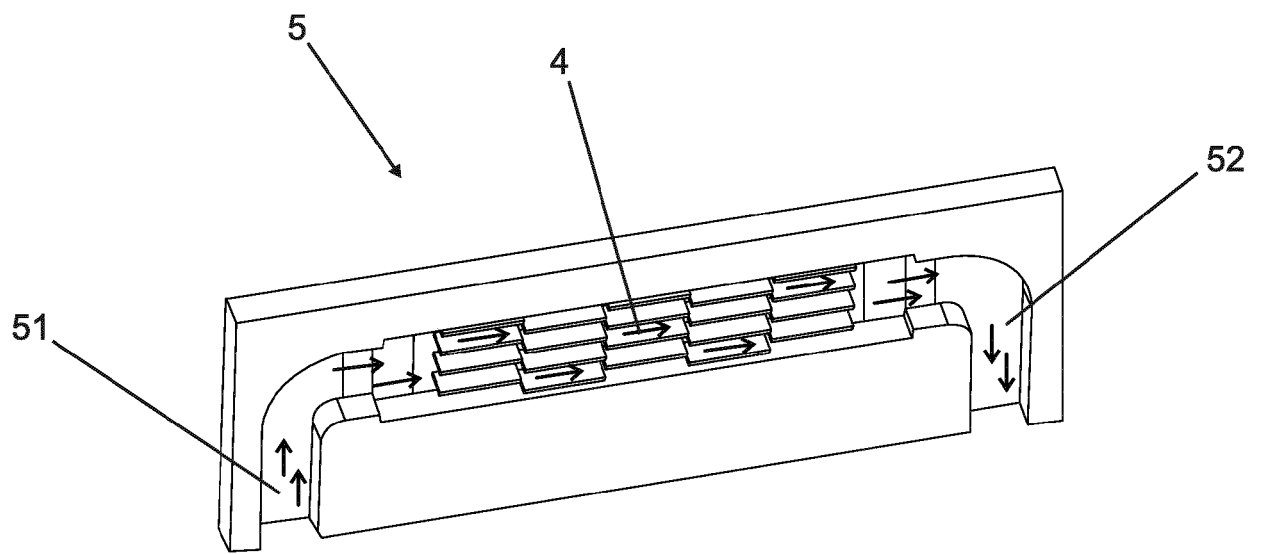


FIG. 3

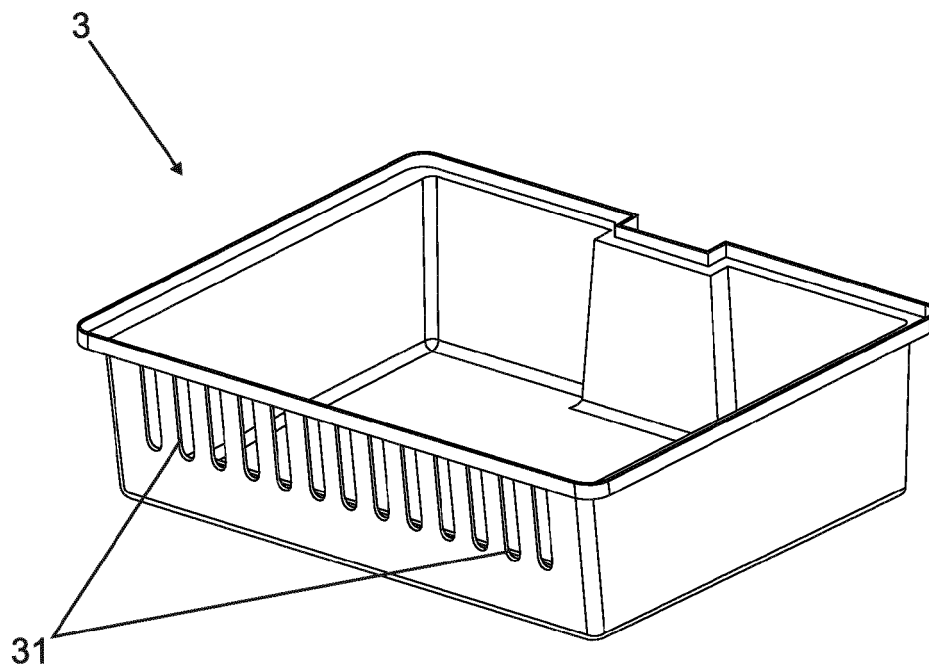


FIG. 4

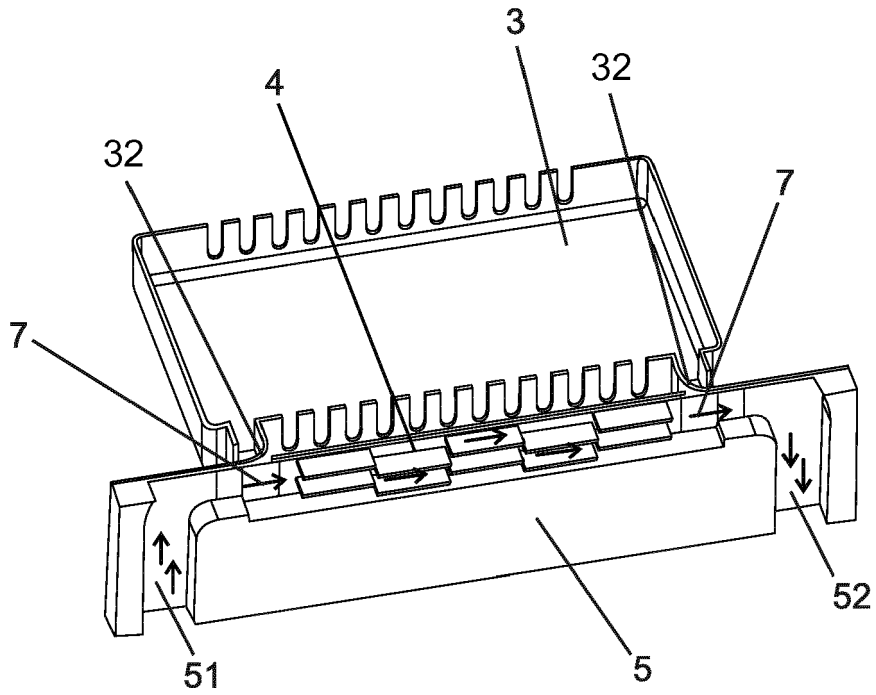


FIG. 5

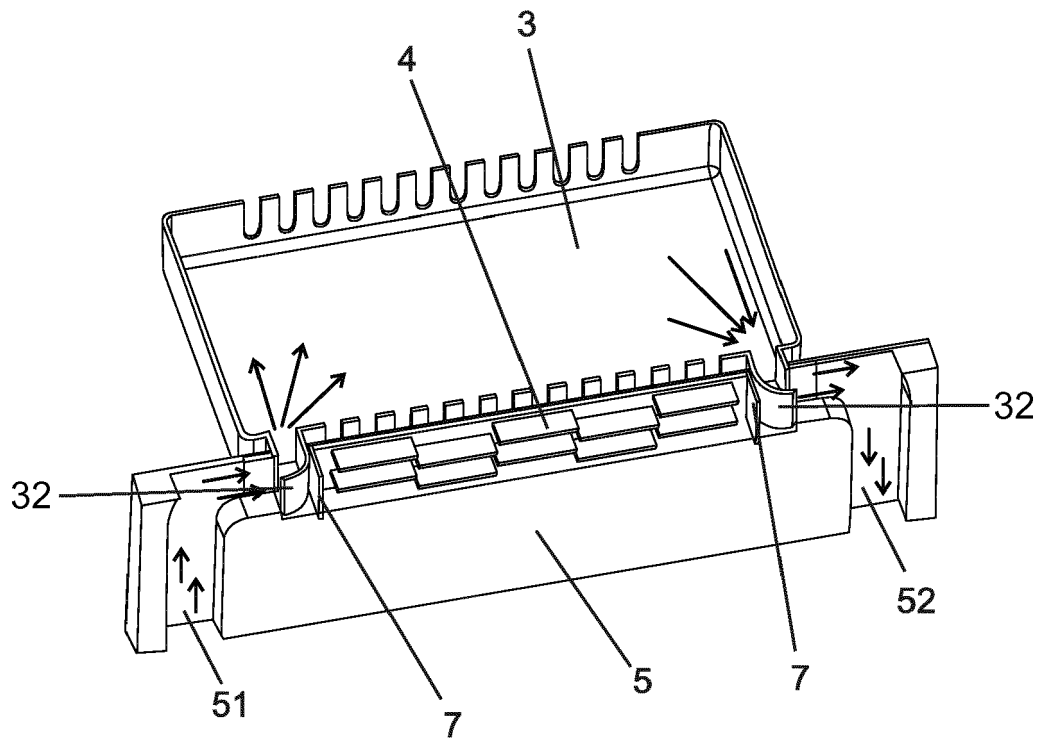


FIG. 6



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Application Number
EP 18 18 8112

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 January 2019	Examiner Vigilante, Marco
CATEGORY OF CITED DOCUMENTS 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 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 & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 18 8112

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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