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A HEAT PUMP SYSTEM WITH A PROTECTIVE GRILLE

- (57) Providing an apparatus for heating water in a building, such as an air source heat pump, wherein the apparatus comprises a fan, a heat exchanger, a first fixing means, and a second fixing means wherein a first grille is compatible to the first and second fixing means. The first grille may protect the fan and the heat exchanger

from external impact and/or prevent access to the fan and the heat exchanger from an outer side. This way, the first grille may be construed as a common part capable of reversibly fixing to either the first or second fixing means.

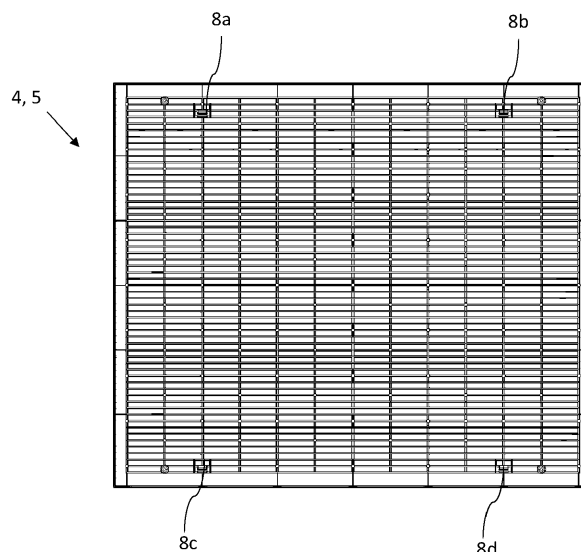


FIG. 3

Description

[0001] The invention relates to an apparatus for heating water in a building, such as an air source heat pump, wherein the apparatus comprises a fan, a heat exchanger, a first fixing means, and a second fixing means wherein a first grille is compatible to the first and second fixing means. The first grille may protect both the fan and the heat exchanger from external impact and/or prevent access to the fan and the heat exchanger from an outer side. This way, the first grille may be construed as a common part capable of reversibly fixing to either the first or second fixing means. The invention further relates to a grille for protecting a fan or a heat exchanger to be fixed to an aforementioned apparatus.

[0002] Heating of water in buildings, such as heating water of a central heating system or heating of water for domestic use, may be accomplished by means of a heat pump system. Such a heat pump system may either be a ground source heat pump (GSHP) system or an air source heat pump (ASHP) system. In a GSHP system, calories are exchanged between the ground, or ground water, and a fluid, the fluid in particular being air or water. The calories in the ground may be extracted by capturing calories in a water table or by circulating a water-based circuit in the ground. In an ASHP system calories are exchanged between the air and a fluid, in particular air or water.

[0003] A heat pump system may comprise an outdoor unit for extracting heat from an external source. In case of an ASHP system, such an outdoor unit may extract heat from the air by having an airflow pass over, a part of, a heat exchanger which transfers the heat calories in the air via the surface of the heat exchanger to a refrigerant fluid within the heat exchanger. Such an outdoor unit thus usually comprises a fan and a heat exchanger.

[0004] The fan is a moving part, activated by a motor. The blades of the fan may be relatively sharp, especially when the fan is turning around. To prevent a user from accidentally touching the fan or inserting an object between the fan blades, a grille has to be placed in front of the fan to limit access to the fan while ensuring sufficient air flow to pass through the fan.

[0005] The heat exchanger, or at least the evaporator part of the heat exchanger, is typically a heatsink with a fin stack, made of a thermally conductive material or materials. The fins in such a fin stack usually are very thin, often a few tenths of a millimeter, and are thus fragile. To prevent deformation of these fins due to external objects exerting a force onto the fins, it is necessary to place a grille in front of the heat exchanger as deformation of these fins could reduce the performance of the heat exchange or increase the noise of the air flow due to additional perturbations.

[0006] A heat pump system may thus comprise two or more grilles to protect a variety of components against insertion of external objects. Depending on the design of the heat pump system, this requires different designs for

each grille. This may lead to improper installation of the grille when the wrong grille is attached to a particular side of the heat pump system. Also, having multiple design variants of each grille requires different production processes, or at least different processing steps or tools, thus leading to an increase of production and supply chain costs. A standardized design would be preferred as it reduces production costs, enables optimization of transportation and storage, and reduces the risk of too much stock at the end of a product range's life, thus being more eco-friendly. It is therefore desired to have a single grille design and a heat pump system that can be equipped and provided with such a standard grille design.

[0007] The object of the invention is obtained by providing an apparatus for heating water in a building, such as an air source heat pump, wherein the apparatus comprises: a fan on a first side of the apparatus, a heat exchanger on a second side of the apparatus, a first grille on the first side of the apparatus close to the fan, a first fixing means on the first side of the apparatus close to the fan, and a second fixing means on the second side of the apparatus close to the heat exchanger, wherein the first grille is compatible to both the first fixing means and second fixing means.

[0008] The first grille protects the fan on the first side, and is attached to the first fixing means on the first side. The first and second fixing means may be all identical and the spacing between the first fixing means on the first side may be the same spacing between the second fixing means on the second side. The first and second fixing means may also be different from each other. The first and second fixing means may be situated on a panel already present on the apparatus or on the frame of the apparatus. The first grille has interlocking means that is compatible to the both the first and second fixing means. When the first and second fixing means are identical to each other, the first grille has only one kind of interlocking means. When the first and second fixing means differ from each other, the first grille may have two kinds of interlocking means or an interlocking means that can be used on either the first or second fixing means without any modifications. Thus, the first grille could be, for any reason, detached from the first side of the apparatus and attached to the second side of the apparatus. As the first and second fixing means may be situated on a panel or on the frame of the apparatus, the first grille may be attached onto the panel or may be installed as a replacement of the panel. The first grille may be a grid-like grille. As such, a standard grille design can be provided and the object of the invention is thereby achieved.

[0009] In an embodiment, the apparatus further comprises a second grille on the second side of the apparatus close to the heat exchanger, and wherein the second grille is compatible to both the first fixing means and the second fixing means. The second grille is identical to the first grille. This way, the first and second grille are interchangeable with each other meaning the first grille can be attached to the second side of the apparatus while

the second grille can be attached to the first side of the apparatus. As the first and second fixing means may be situated on a panel or on the frame of the apparatus, the second grille may be attached onto the panel or may be installed as a replacement of the panel.

[0010] In an embodiment, the first fixing means and the second fixing means essentially are the same fixing means on each side. By having both the first and second fixing means similar or identical, only one set of interlocking means on either the first or second grille has to be provided.

[0011] In an embodiment, the first fixing means comprises opening for clips, screwing points, tapping, ribbing, protuberances or a combination thereof, and wherein the first fixing means preferably are removable fixing means. The first fixing means may allow the reversible attachment of any compatible interlocking means to be attached to the first fixing means. For instance, the first fixing means may be an opening that allows for a clip, a screw, a tap or the like to be inserted and attach to the first fixing means.

[0012] In an embodiment, the second fixing means comprises opening for clips, screwing points, tapping, ribbing, protuberances or a combination thereof, and wherein the second fixing means preferably are removable fixing means. The second fixing means may allow the reversible attachment of any compatible interlocking means to be attached to the second fixing means. For instance, the second fixing means may be an opening that allows for a clip, a screw, a tap or the like to be inserted and attach to the second fixing means. The second fixing means may be similar or identical to the first fixing means of the previous embodiment.

[0013] In an embodiment, the first grille is made from plastic, metal or a combination of both, wherein the first grille comprises interlocking means such as clips, openings for screws, taps, ribs, protrusions, or a combination thereof to reversibly attach to the first fixing means. The first grille has to be able to withstand certain external force and as such is made from plastic or metal. The first grille may be made from a combination of plastic and metal, for example the first grille may have an outer edge made from plastic and an inner wire frame made from metal.

[0014] In an embodiment, the second grille is made from plastic, metal or a combination of both, and the second grille comprises interlocking means such as clips, openings for screws, taps, ribs, protrusions, or a combination thereof to reversibly attach to the second fixing means. The second grille has to be able to withstand certain external force and as such is made from plastic or metal. The second grille may be made from a combination of plastic and metal, for example the second grille may have an outer edge made from plastic and an inner wire frame made from metal.

[0015] In an aspect of the invention, a grille for protecting a fan or a heat exchanger of an apparatus is provided, wherein the grille comprises interlocking means such as

clips, openings for screws, taps, ribs, protrusions, or a combination thereof to reversibly attach to a fixing means. The interlocking means may reversibly attach to a fixing means situated on an apparatus for heating water in a building, such as an air source heat pump. The interlocking means may thus reversibly attach to a first and/or second fixing means of any of the previous embodiments.

[0016] In an embodiment, the grille is made from plastic, metal or a combination of both. The grille has to be able to withstand certain external force and as such is made from plastic or metal. The grille may be made from a combination of plastic and metal, for example the grille may have an outer edge made from plastic and an inner wire frame made from metal.

[0017] In the figures, the subject-matter of the invention is schematically shown, wherein identical or similarly acting elements are usually provided with the same reference signs.

Figure 1 shows a schematic representation of a first side of an apparatus according to the present invention.

Figure 2 shows a schematic representation of a second side of an apparatus according to the present invention.

Figure 3 shows a schematic representation of a heat pump system according to an aspect of the present invention.

Figure 4 shows another schematic representation of a first side of an apparatus according to the present invention.

Figure 5 shows another schematic representation of a second side of an apparatus according to the present invention.

[0018] With reference to Figure 1, an apparatus 1 for heating water in a building is shown on a first side comprising a fan 2 and first fixing means 6a to 6d. The first fixing means 6a to 6d are openings to accommodate for interlocking means 8a to 8d of a protective grille not shown in this figure.

[0019] In Figure 2, the apparatus 1 is shown again but now on a second side comprising a heat exchanger 3 and second fixing means 7a to 7d. The second fixing means 7a to 7d are openings to accommodate for interlocking means 8a to 8d of a protective grille not shown in this figure.

[0020] In Figure 3, a grille 4, 5 is shown comprising interlocking means 8a to 8d. Said grille may be used as first grille 4 and/or as second grill 5. The interlocking means 8a to 8d are clips that may be reversibly attached to the first fixing means 7a to 7d and/or to the second fixing means 8a to 8b of an apparatus 1 not shown in this figure.

[0021] Figures 4 and 5 both show the apparatus 1 again on both sides, but with the grille 4, 5 attached to the first fixing means 6a to 6d and the second fixing

means 7a to 7d, respectively. As can be seen, the interlocking means 8a to 8d are attached to the first fixing means 6a to 6d and to the second fixing means 7a to 7d. The grille 4, 5 protects the fan 2 and the heat exchanger 3, respectively.

Reference Signs

[0022]

1	apparatus
2	fan
3	heat exchanger
4	first grille
5	second grille
6a-6d	first fixing means
7a-7d	second fixing means
8a-8d	interlocking means

Claims

1. An apparatus (1) for heating water in a building, such as an air source heat pump, wherein the apparatus (1) comprises:

- a fan (2) on a first side of the apparatus (1);
- a heat exchanger (3) on a second side of the apparatus (1);
- a first grille (4) on the first side of the apparatus (1) close to the fan (2);
- a first fixing means (6a-6d) on the first side of the apparatus (1) close to the fan (2); and
- a second fixing means (7a-7d) on the second side of the apparatus (1) close to the heat exchanger (3);

wherein the first grille (4) is compatible to both the first fixing means (6a-6d) and the second fixing means (7a-7d).

2. The apparatus (1) according to claim 1, wherein the apparatus (1) further comprises a second grille (5) on the second side of the apparatus (1) close to the heat exchanger (3), and wherein the second grille (5) is compatible to both the first fixing means (6a-6d) and the second fixing means (7a-7d).
3. The apparatus (1) according to claim 1 or 2, wherein the first fixing means (6a-6d) and the second fixing means (7a-7d) essentially are the same fixing means on each side.
4. The apparatus (1) according to any of the claims 1 to 3, wherein the first fixing means (6a-6d) comprises opening for clips, screwing points, tapping, ribbing, protuberances or a combination thereof, and wherein the first fixing means (6a-6d) preferably are re-

movable fixing means.

5. The apparatus (1) according to any of the claims 1 to 3, wherein the second fixing means (7a-7d) comprises opening for clips, screwing points, tapping, ribbing, protuberances or a combination thereof and wherein the second fixing means (7a-7d) preferably are removable fixing means.
6. The apparatus (1) according to any of the claim 1 to 3, wherein the first grille (4) is made from plastic, metal or a combination of both, and wherein the first grille (4) comprises interlocking means (8a-8d) such as clips, openings for screws, taps, ribs, protrusions, or a combination thereof to reversibly attach to the first fixing means (6a-6d).
7. The apparatus (1) according to any of the claims 1 to 3, wherein the second grille (5) is made from plastic, metal or a combination of both, and wherein the second grille (5) comprises interlocking means (8a-8d) such as clips, openings for screws, taps, ribs, protrusions, or a combination thereof to reversibly attach to the second fixing means (7a-7d).
8. A grille (4,5) for protecting a fan or a heat exchanger of an apparatus according to claim 1, wherein the grille (4, 5) comprises interlocking means (8a-8d) such as clips, openings for screws, taps, ribs, protrusions, or a combination thereof to reversibly attach to a fixing means (6a-6b, 7a-7d).
9. The grille (4,5) according to claim 8, wherein the grille (4,5) is made plastic, metal or a combination of both.

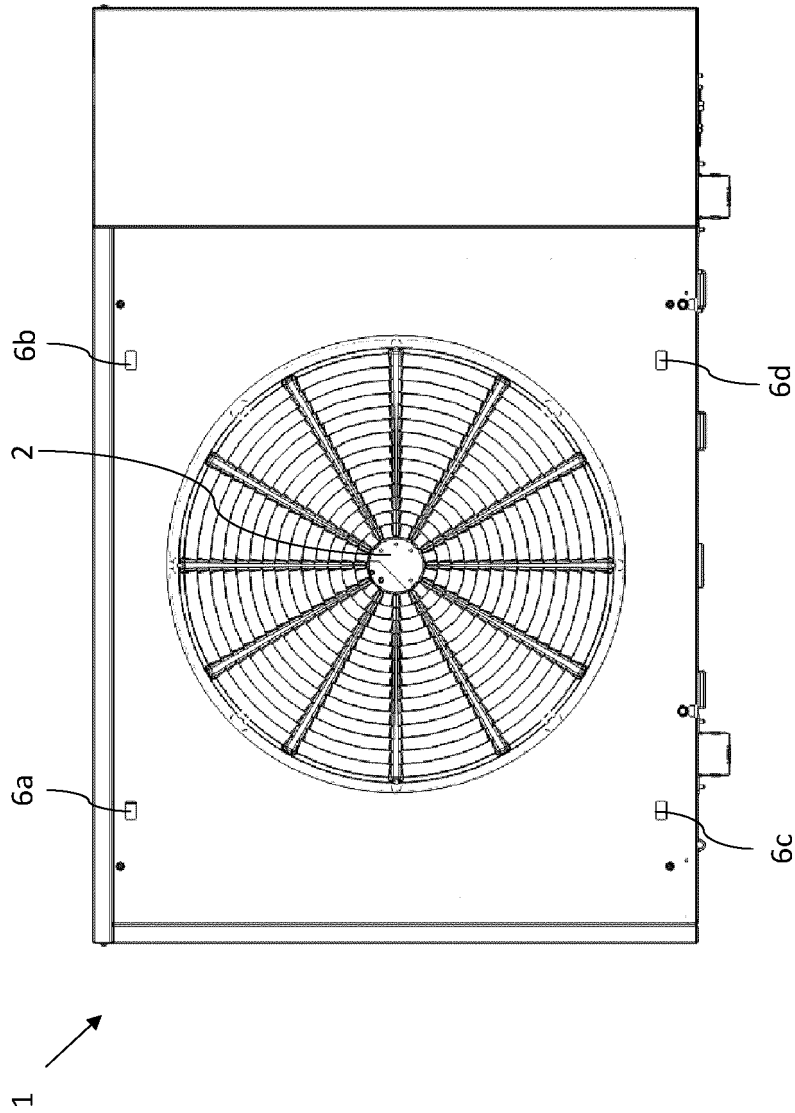


FIG. 1

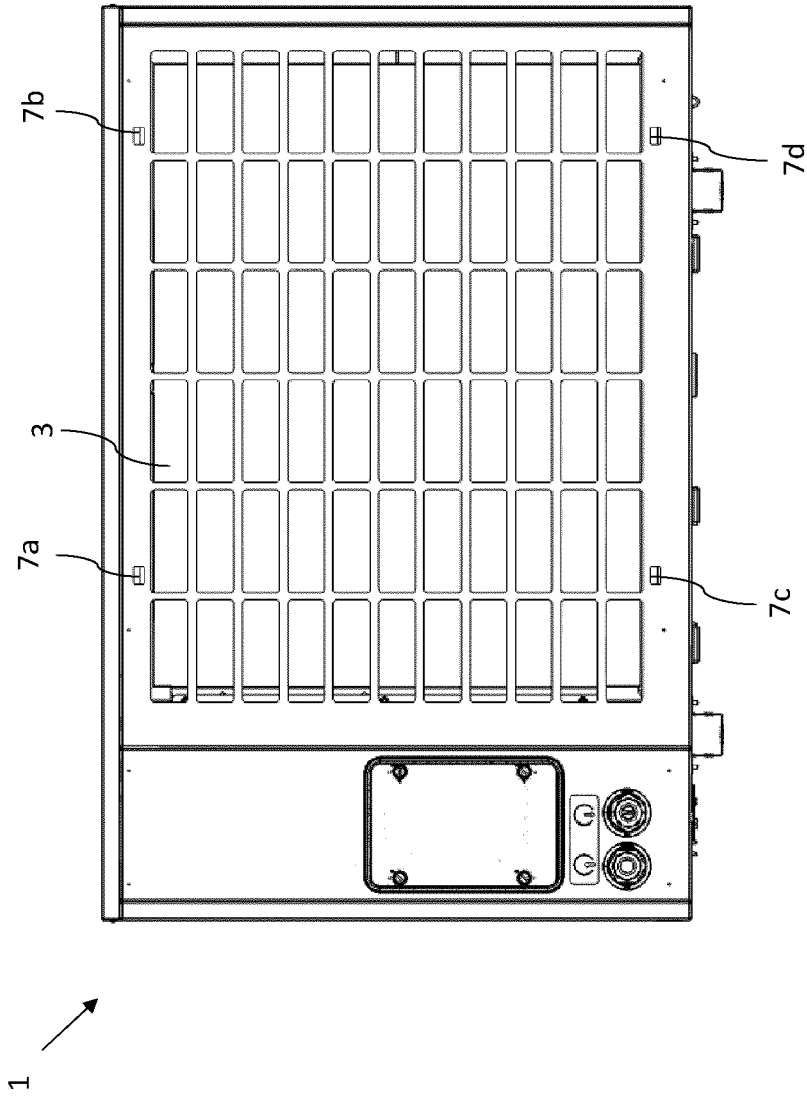


FIG. 2

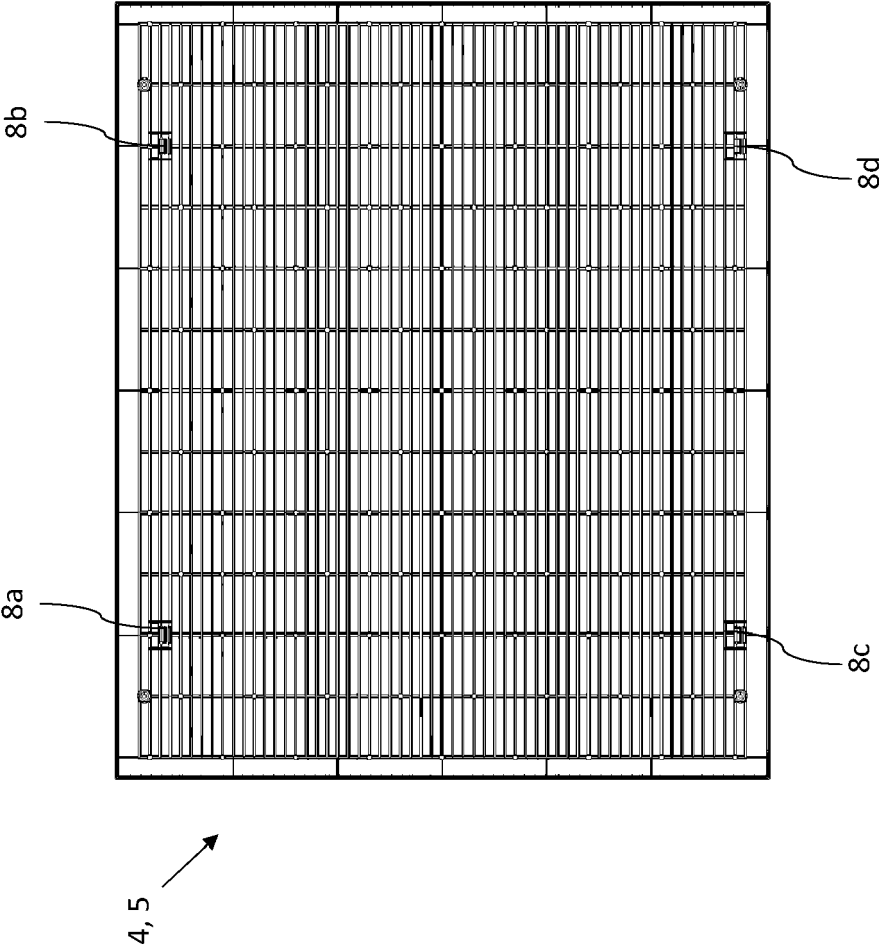


FIG. 3

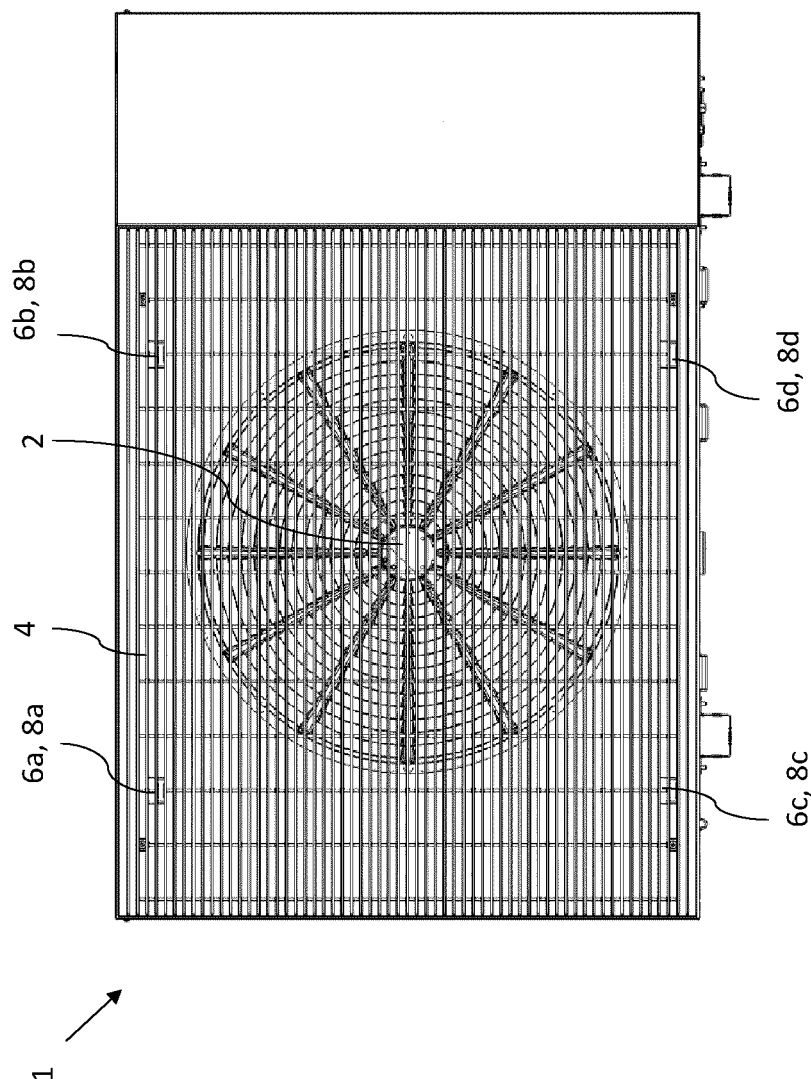


FIG. 4

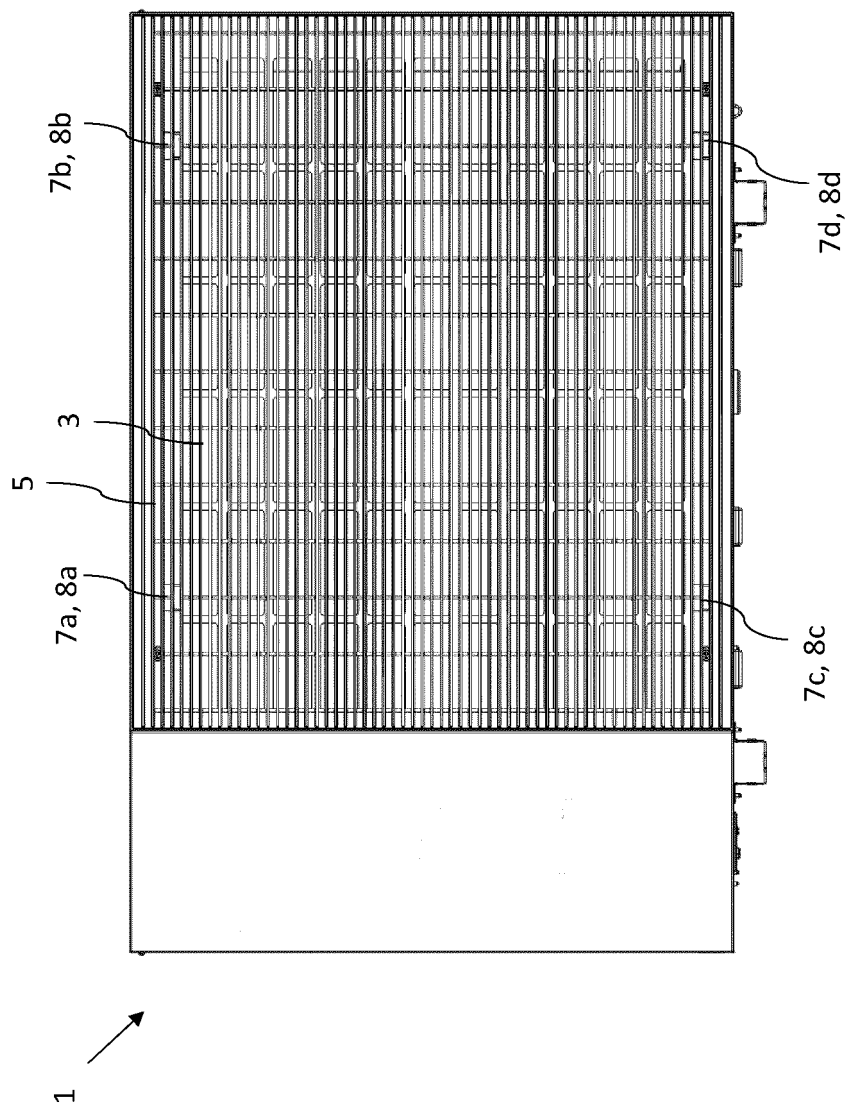


FIG. 5



EUROPEAN SEARCH REPORT

Application Number

EP 23 15 3903

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			TECHNICAL FIELDS SEARCHED (IPC)
			F24F F04D F24H
The present search report has been drawn up for all claims			

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Place of search	Date of completion of the search	Examiner
Munich	28 June 2023	Riesen, Jörg
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.

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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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