[0004]

When separation plates are adhered to the partition plates with an adhesive such as in the heat exchanger of Patent Document 1, the adhesive may spread beyond the areas of the partition plates facing the separation plates. The adhesive which has spread beyond the areas covers the surfaces of the partition plates, thereby hindering heat transfer between the air and the partition plates. Therefore, in the commonly used heat exchanger, the adhesive used for assembling the heat exchanger may cause a performance degradation of the heat exchanger.

[0005]

Embodiments of the present disclosure improve the performance of the heat exchanger.

SOLUTION TO THE PROBLEM

[0006]

According to a first aspect of the present disclosure, there is provided a heat exchanger including: a plurality of flow pass elements each including a moisture permeable, sheet-like partition member and a frame forming an air flow path by joining to the partition member; the heat exchanger being configured by stacking the plurality of flow pass elements, in each of the plurality of flow pass elements, the partition member being joined to the frame in direct contact, the frame being a grid-like member made of a resin, a joining strength of the partition member to the frame being smaller than a breaking strength of the partition member.

[0006a]

According to a second aspect of the present disclosure, there is provided a heat exchanger including: a plurality of flow pass elements each including a moisture permeable, sheet-like partition member and a frame forming an air flow path by joining to the partition

member; the heat exchanger being configured by stacking the plurality of flow pass elements, in each of the plurality of flow pass elements, the partition member being joined to the frame in direct contact, the frame being a grid-like member made of a resin, a joining strength of the partition member to the frame being a joining strength at which the partition member is not broken when the partition member is peeled off from the frame.

[0007]

In the above aspects, in each of the flow pass elements, the partition member is joined to the frame in direct contact. Thus, the portion of the partition member that is in contact with the air flowing through the air flow path is larger than that in the case where the partition member is adhered to the frame with an adhesive, thereby improving the heat exchange performance of the heat exchanger.

[0008]

In an embodiment of the above aspects, the partition member includes a sheet-like porous base and a moisture permeable layer covering a surface of the porous base, and the moisture permeable layer of the partition member faces the frame, and only the moisture permeable layer out of the porous base and the moisture permeable layer is in direct contact with the frame.

[0009]

In the above embodiment, the moisture permeable layer of the partition member is joined to the frame. The porous base of the partition member is not in contact with the frame.

[0010]

In an embodiment of the above aspects, a flat joining surface to which the partition member is joined is provided on the frame.

[0011]

In the above embodiment, the partition member is joined to the flat joining surface provided on the frame. This increases the joining strength of the partition member to the frame.

[0012]

[0013]

[0014]

In the second aspect, the partition member can be peeled off from the frame without breaking the partition member. This facilitates the operation of separating the partition member and the frame from each other when the heat exchanger is discarded.

[0015]

In an embodiment of the above aspects, the partition member is joined to the frame by entering fine irregularities on a surface of the frame.

[0016]

In the above embodiment, the partition member enters fine irregularities on the surface of the frame, so that the partition member is fixed to the frame in direct contact with the frame without an adhesive being interposed therebetween.

[0017]

According to a third aspect of the present disclosure, there is provided a ventilator including: the heat exchanger of the above aspects, the ventilator is configured to cause the heat exchanger to exchange heat between supply air supplied into a room from outside and exhaust air exhausted out of the room from inside.

[0018]

In the above embodiment, the supply air and exhaust air exchange heat with each other

in the heat exchanger provided for the ventilator.

[0019]

Disclosed herein is a method for manufacturing a heat exchanger, including: a first step of assembling each of a plurality of flow pass elements by joining a moisture permeable, sheet-like partition member to a frame forming an air flow path; and a second step of stacking the plurality of flow pass elements assembled in the first step. the partition member includes a sheet-like porous base and a moisture permeable layer covering a surface of the porous base, and the first step is a step of stacking the partition member on the frame such that the moisture permeable layer faces the frame, temporally dissolving or softening portion of the moisture permeable layer facing the frame, and solidifying the portion of the moisture permeable layer which has been temporally dissolved or softened, to join the partition member to the frame .

[0020]

In the above disclosure, portion of the moisture permeable layer forming the partition member, facing the frame is temporally dissolved or softened, and then, the portion of the moisture permeable layer which has been temporally dissolved or softened is solidified, so that the partition member is fixed to the frame without an adhesive intervened therebetween.

[0021]

In an embodiment, the moisture permeable layer of the partition member is formed by applying a raw material liquid to the porous base, the raw material liquid is a mixture of a first substance forming the moisture permeable layer and a solvent containing a second substance as a main component, the first step includes: a first substep of causing a treatment liquid containing the second substance as a main component to adhere to the frame; and a second substep of stacking the moisture permeable layer of the partition member to a surface of the

frame on which the treatment liquid has been adhered and temporally dissolving portion of the moisture permeable layer facing the frame.

[0022]

In the above embodiment, the moisture permeable layer forming the partition member is temporally dissolved by the treatment liquid containing a second substance as a main component. The second substance is a main component of a solvent composing a raw material liquid used to form the moisture permeable layer. Thus, even when the moisture permeable layer is temporally dissolved and then solidified to fix the partition member to the frame, the moisture permeable layer is not deteriorated. Accordingly, the moisture permeability of the partition member can be kept from decreasing, and as a result, the performance of the heat exchanger can be kept from decreasing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

FIG. 1 is a schematic diagram illustrating a ventilator.

FIG 2 is a perspective view of a heat exchanger.

FIG. 3 is a plan view of the heat exchanger.

FIG. 4 is a plan view of a first frame according to the heat exchanger.

FIG. 5 is a plan view of a second frame of the heat exchanger.

FIG. 6 is a cross-sectional view of portion of the heat exchanger taken along line VI-VI in FIG. 3.

FIG. 7 is a cross-sectional view corresponding to FIG. 6 with first elements and second elements separated from each other.

CLAIMS

1. A heat exchanger comprising:

a plurality of flow pass elements each including a moisture permeable, sheet-like partition member and a frame forming an air flow path by joining to the partition member;

the heat exchanger being configured by stacking the plurality of flow pass elements,

in each of the plurality of flow pass elements, the partition member being joined to the frame in direct contact,

the frame being a grid-like member made of a resin,

a joining strength of the partition member to the frame being smaller than a breaking strength of the partition member.

2. A heat exchanger comprising:

a plurality of flow pass elements each including a moisture permeable, sheet-like partition member and a frame forming an air flow path by joining to the partition member;

the heat exchanger being configured by stacking the plurality of flow pass elements,

in each of the plurality of flow pass elements, the partition member being joined to the frame in direct contact,

the frame being a grid-like member made of a resin,

a joining strength of the partition member to the frame being a joining strength at which the partition member is not broken when the partition member is peeled off from the frame.

3. The heat exchanger of claim 1 or 2, wherein

the partition member includes a sheet-like porous base and a moisture permeable layer covering a surface of the porous base, and

the moisture permeable layer of the partition member faces the frame, and only the moisture permeable layer out of the porous base and the moisture permeable layer is in direct contact with the frame.

4. The heat exchanger of any one of claims 1 to 3, wherein

a flat joining surface to which the partition member is joined is provided on the frame.

5. The heat exchanger of any one of claims 1 to 3, wherein

the partition member is joined to the frame by entering fine irregularities on a surface of the frame.

6. A ventilator comprising:

the heat exchanger of any one of claims 1 to 3,

the ventilator is being configured to cause the heat exchanger to exchange heat between supply air supplied into a room from outside and exhaust air exhausted out of the room from inside.