the spacer prevents drainage of condensation water or meltwater of frost through the air passage between the fins but also a problem is caused in that heat transfer performance of the fins reduces as a hole is provided in the plate surface of the fin.

[0007]

In Patent Literature 3, by raising the portion of the rim of the insertion portion for the flat tube, which is a portion that faces the long side of the section of the flat tube, the spacer is formed. In recent years, however, as the thickness of the flat tube has been reduced, the width of the insertion portion is small and hence, it is difficult to raise the spacer from the plate surface of the fin up to a required height. In a case where the height of the spacer from the plate surface is insufficient, the interval between the fins disposed next to each other is small. Drainage properties of condensation water may thus reduce and ventilation properties may be reduced by, for example, the clogging of the air passage when frost forms. A problem therefore is caused in that the heat exchanger does not effectively produce heat exchange performance.

[0008]

~~The present disclosure has been made to solve the above-mentioned problems, and i~~It is an object of the present disclosure to provide a heat exchanger, a heat exchanger unit, and a refrigeration cycle apparatus where deterioration in drainage properties and ventilation properties ~~is~~ may be prevented, an air passage ~~is~~ may not be easily clogged when frost forms, and both defrosting properties and heat exchange performance ~~are~~ may be achieved.

Solution to Problem

[0009]

A heat exchanger according to one embodiment of the present disclosure includes a flat tube and a plurality of fins that are each a plate having a plate surface extending in a longitudinal direction and in a width direction orthogonal to the longitudinal direction. The plate surface intersects a pipe axis of the flat tube. The plate extends in the width direction between a first end edge and a second end edge opposite the first end edge. The plurality of fins are arranged at an interval from one another. The plurality of fins each have an insertion portion in which the flat tube is inserted, a first spacer formed

at a rim of the insertion portion and maintaining the interval, and a second spacer formed at a portion of the plate ~~other than~~which is spaced from the rim of the insertion portion and maintaining the interval. The first spacer is positioned at ~~one end portion in~~ a longitudinal ~~direction~~ end portion of a cross section of the rim of the insertion portion, and the cross section is perpendicular to the pipe axis of the flat tube. The first spacer is located closer to the first end edge than the second end edge, and is positioned between the rim of the insertion portion and the first end edge.

[0010]

A heat exchanger unit according to another embodiment of the present disclosure includes the above-mentioned heat exchanger, and a fan configured to send air to the heat exchanger. The above-mentioned first spacer is positioned upwind of the above-mentioned second spacer in a direction of a flow of air sent to the heat exchanger.

[0011]

A refrigeration cycle apparatus according to still another embodiment of the present disclosure includes the above-mentioned heat exchanger unit.

Advantageous Effects of Invention

[0012]

According to an embodiment of the present disclosure, with the above-mentioned configuration, the interval between the fins is appropriately maintained. It is therefore possible to prevent the clogging of the air passage when frost forms, and drainage properties of meltwater ~~are~~ may be ensured during the defrosting process. Further, as the first spacer is positioned at an end portion of the insertion portion in the longitudinal direction of the flat tube, it is possible to prevent the reduction of ventilation properties between the fin and the flat tube. Resistance against frost and drainage properties of the heat exchanger and the heat exchanger unit ~~are~~ may therefore be enhanced while heat exchange performance ~~is~~ may be maintained.

Brief Description of Drawings

[0013]

[Fig. 1] Fig. 1 is a perspective view showing a heat exchanger according to Embodiment 1.

CLAIMS

~~[Claim 1]~~

~~A heat exchanger, comprising:~~

~~a flat tube; and~~

~~a plurality of fins each comprising a plate having a plate surface extending in a longitudinal direction and in a width direction orthogonal to the longitudinal direction, the plate surface intersecting a pipe axis of the flat tube,~~

~~the plurality of fins being arranged at an interval from one another,~~

~~the plurality of fins each having~~

~~an insertion portion in which the flat tube is inserted,~~

~~a first spacer formed at a rim of the insertion portion and maintaining the interval, and~~

~~a second spacer formed at a portion of the plate other than the rim of the insertion portion and maintaining the interval,~~

~~the first spacer being positioned at one end portion in a longitudinal direction of a section of the rim of the insertion portion, the section being perpendicular to the pipe axis of the flat tube.~~

~~[Claim 2]~~

~~The heat exchanger of claim 1, wherein a height of the first spacer from the plate surface to a distal end of the first spacer and a height of the second spacer from the plate surface to a distal end of the second spacer are each larger than a transverse axis of a section of the flat tube, the section being perpendicular to the pipe axis of the flat tube.~~

~~[Claim 3]~~

~~The heat exchanger of claim 1 or 2, wherein the second spacer is disposed downwind of the first spacer in a direction of a flow of air passing through between the plurality of fins.~~

~~[Claim 4]~~

~~The heat exchanger of any one of claims 1 to 3, wherein the number of the second spacers disposed is smaller than the number of the first spacers disposed.~~

~~[Claim 5]~~

~~The heat exchanger of any one of claims 1 to 4, wherein a width of the second spacer is smaller than a width of the first spacer.~~

~~[Claim 6]~~

~~The heat exchanger of any one of claims 1 to 5, wherein a gravity center axis passing through a gravity center of each of the plurality of fins and extending parallel to the longitudinal direction of each of the plurality of fins intersects an imaginary line connecting the first spacer and the second spacer when the gravity center axis is viewed from a direction perpendicular to the plate surface.~~

~~[Claim 7]~~

~~The heat exchanger of any one of claims 1 to 6, wherein the insertion portion is a cut-out extending from one end edge of each of the plurality of fins in the width direction of each of the plurality of fins.~~

~~[Claim 8]~~

~~The heat exchanger of any one of claims 1 to 7, wherein the insertion portion is inclined to the width direction of each of the plurality of fins.~~

~~[Claim 9]~~

~~A heat exchanger unit, comprising:~~

~~the heat exchanger of any one of claims 1 to 8; and~~

~~a fan configured to send air to the heat exchanger,~~

~~the first spacer being positioned upwind of the second spacer in a direction of a flow of air sent to the heat exchanger.~~

~~[Claim 10]~~

~~A refrigeration cycle apparatus comprising the heat exchanger unit of claim 9.~~

1. A heat exchanger, comprising:

a flat tube; and

a plurality of fins each comprising a plate having a plate surface extending in a longitudinal direction and in a width direction orthogonal to the longitudinal direction, the plate surface intersecting a pipe axis of the flat tube, the plate extending in said width direction between a first end edge and a second end edge opposite the first end edge,

the plurality of fins being arranged at an interval from one another,

the plurality of fins each having

an insertion portion in which the flat tube is inserted,

a first spacer formed at a rim of the insertion portion and maintaining the interval, and

a second spacer formed at a portion of the plate which is spaced from the rim of the insertion portion and maintaining the interval,

the first spacer being positioned at a longitudinal end portion of a cross section of the rim of the insertion portion, the cross section being perpendicular to the pipe axis of the flat tube, the first spacer being located closer to the first end edge than the second end edge, and being positioned between the rim of the insertion portion and the first end edge.

2. The heat exchanger of claim 1, wherein a height of the first spacer from the plate surface to a distal end of the first spacer and a height of the second spacer from the plate surface to a distal end of the second spacer are each larger than a transverse axis of a section of the flat tube, the section being perpendicular to the pipe axis of the flat tube.

3. The heat exchanger of claim 1 or 2, wherein the second spacer is disposed downwind of the first spacer in a direction of a flow of air passing through between the plurality of fins.

4. The heat exchanger of any one of claims 1 to 3, wherein the number of the second spacers disposed is smaller than the number of the first spacers disposed.

5. The heat exchanger of any one of claims 1 to 4, wherein a width of the second spacer is smaller than a width of the first spacer.

6. The heat exchanger of any one of claims 1 to 5, wherein a gravity center axis

passing through a gravity center of each of the plurality of fins and extending parallel to the longitudinal direction of each of the plurality of fins intersects an imaginary line connecting the first spacer and the second spacer when the gravity center axis is viewed from a direction perpendicular to the plate surface.

7. The heat exchanger of any one of claims 1 to 6, wherein the insertion portion is a cut-out extending from one end edge of each of the plurality of fins in the width direction of each of the plurality of fins.

8. The heat exchanger of any one of claims 1 to 7, wherein the insertion portion is inclined to the width direction of each of the plurality of fins.

9. A heat exchanger unit, comprising:

the heat exchanger of any one of claims 1 to 8; and

a fan configured to send air to the heat exchanger,

the first spacer being positioned upwind of the second spacer in a direction of a flow of air sent to the heat exchanger.

10. A refrigeration cycle apparatus comprising the heat exchanger unit of claim 9.