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Kim(10) **Pub. No.: US 2008/0121385 A1**(43) **Pub. Date: May 29, 2008**(54) **HEAT DISSIPATION FIN FOR HEAT EXCHANGERS**(30) **Foreign Application Priority Data**

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RESTON, VA 20191(51) **Int. Cl.**
F28D 1/047 (2006.01)(52) **U.S. Cl.** **165/151; 165/152**(57) **ABSTRACT**

A heat dissipation fin for heat exchangers disposed between tubes for heat exchangers includes pluralities of louvers arranged in several layers. The louvers of the respective layers are inclined toward the middle of the heat dissipation fin in a straight line in a symmetrical fashion, and the distance between the louvers is gradually increased from the outermost end of a first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the air resistance is decreased and the heat dissipation efficiency is improved.

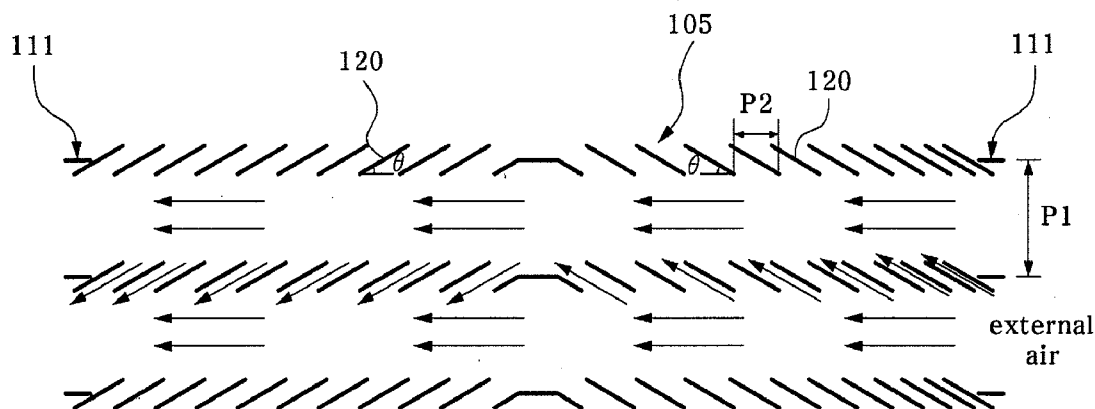
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Seoul (KR)(21) Appl. No.: **11/691,038**(22) Filed: **Mar. 26, 2007**

Fig.1

(Prior Art)

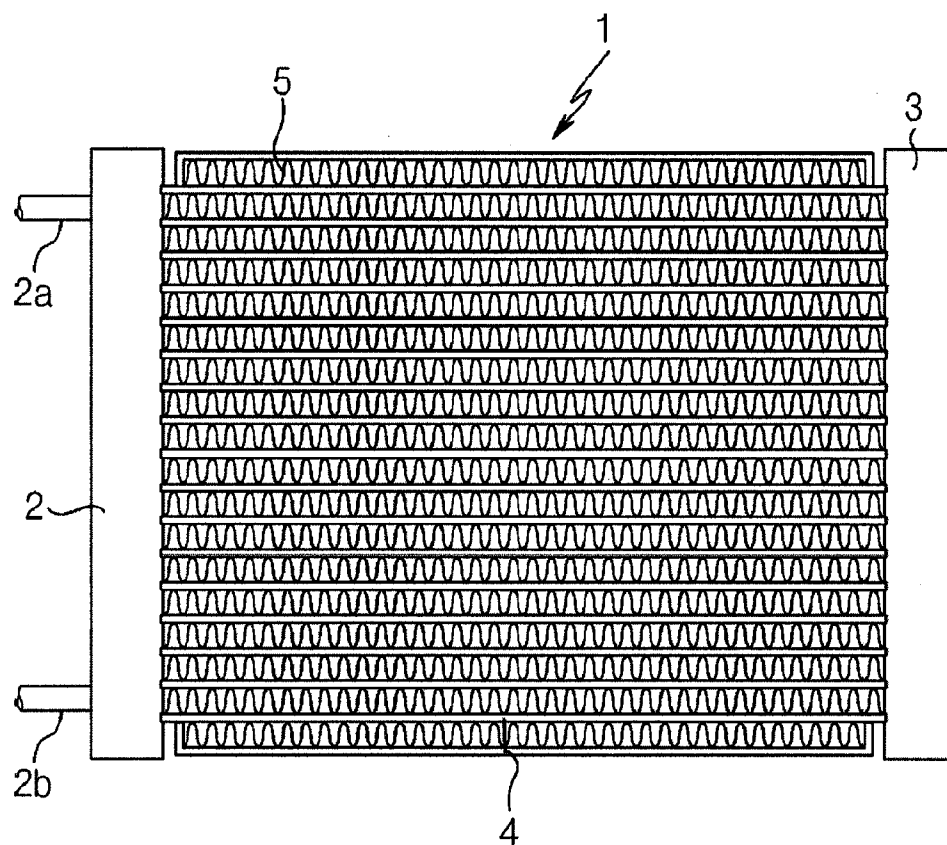


Fig.2a
(Prior Art)

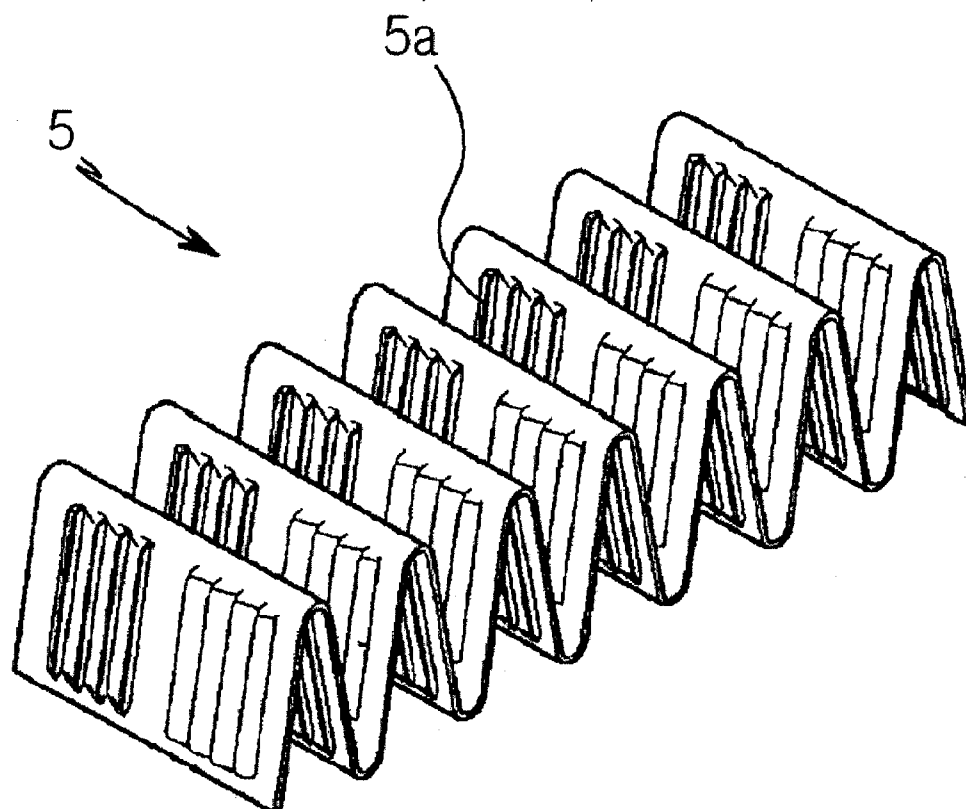


Fig.2b
(Prior Art)

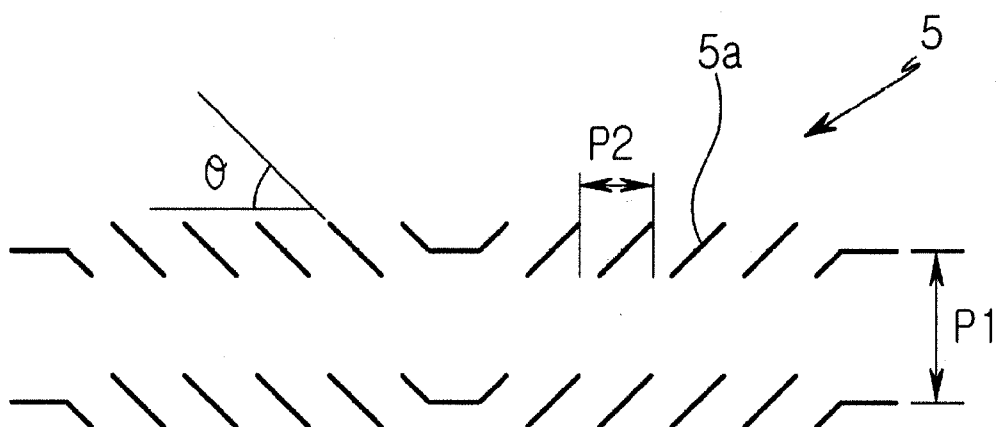


Fig.3

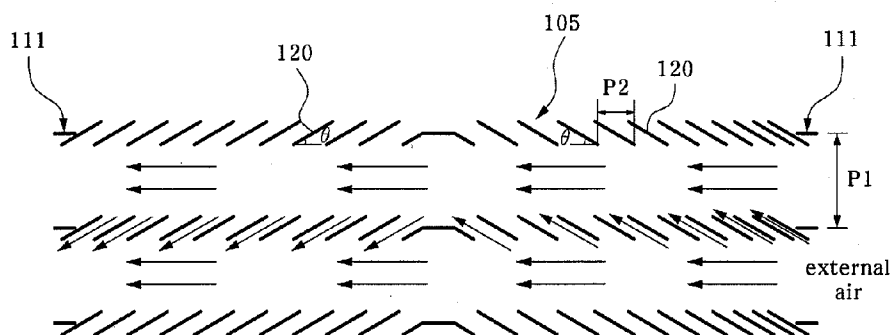


Fig.4

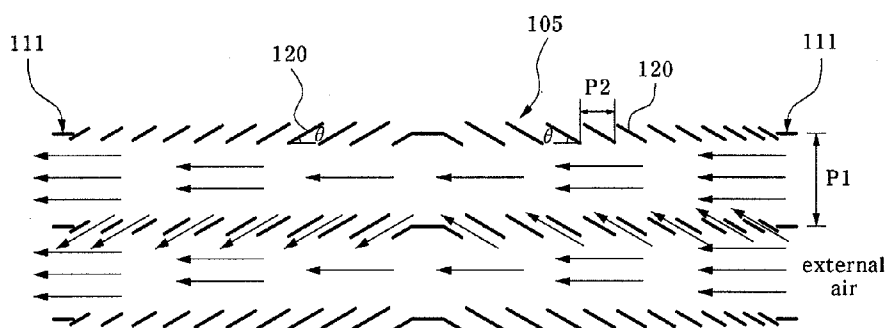
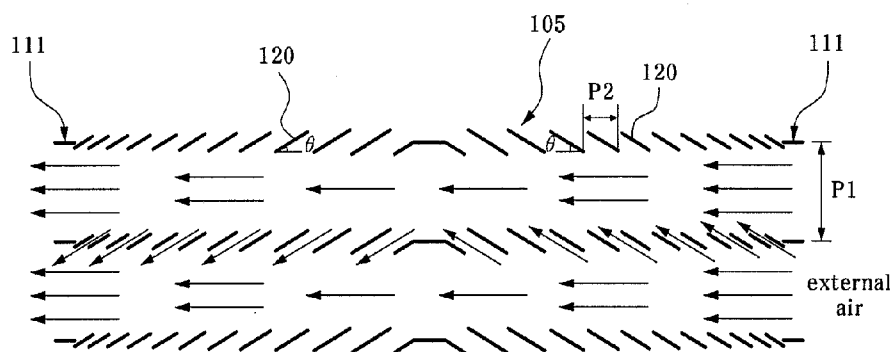


Fig.5



HEAT DISSIPATION FIN FOR HEAT EXCHANGERS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a heat dissipation fin for heat exchangers, and, more particularly, to a heat dissipation fin for heat exchangers wherein the distance between and the height of louvers arranged in line are adjusted, and, in addition, the interlayer distance between louvers arranged in layers is adjusted, whereby the air resistance is minimized, and therefore, the heat exchange efficiency is improved.

[0003] 2. Description of the Related Art

[0004] Generally, a heat exchanger, including a radiator and a condenser, is mounted in an engine compartment of a vehicle.

[0005] The radiator and the condenser are individually manufactured as single units, and then the radiator is mounted to a frame of the vehicle while the condenser is assembled to the radiator.

[0006] FIG. 1 is a front view illustrating a general heat exchanger. As shown in FIG. 1, a condenser 1 of the conventional heat exchanger includes a first header tank 2 having a coolant inlet port 2a and a coolant outlet port 2b, a second header tank 3 arranged in parallel with the first header tank 2, a plurality of coolant tubes 4 connected between the first and second header tanks 2 and 3 for allowing coolant to flow therethrough, and heat dissipation fins 5 disposed between the respective coolant tubes for performing heat exchange with air flowing between the coolant tubes 4 to cool the coolant.

[0007] Although not shown, a radiator includes upper and lower tanks, a plurality of cooling water tubes connected between the upper and lower tanks for allowing cooling water to flow therethrough, and heat dissipation fins disposed between the respective cooling water tubes.

[0008] The cooling water and the coolant flowing respectively through the cooling water tubes and the coolant tubes of the heat exchanger perform heat exchange with air passing through the heat dissipation fins.

[0009] FIG. 2A is a perspective view, in part, illustrating a conventional heat dissipation fin 5, and FIG. 2B is a longitudinal sectional view illustrating the arrangement of louvers of the conventional heat dissipation fin 5.

[0010] As shown in FIG. 2A, the heat dissipation fin 5 is a corrugated type fin.

[0011] The corrugated type heat dissipation fin 5 is formed by folding a plate-shaped member in the form of a wave. The corrugated type heat dissipation fin 5 is provided at the surface thereof with louvers 5a.

[0012] As shown in FIG. 2B, the bending pitch P1 of the heat dissipation fin 5 is adjusted to increase the area for heat dissipation, and the louver angle Θ or the louver pitch P2 of the heat dissipation fin 5 is adjusted to improve heat dissipation to air, thereby reducing discharge pressure of a compressor.

[0013] However, the louvers of the conventional heat dissipation fin are arranged with the same bending pitch P1 with the result that the improvement of the heat dissipation efficiency is limited.

[0014] The louver pitch P2 of the heat dissipation fin may be decreased to increase the number of the louvers 5a and thus to improve the heat dissipation efficiency. As the number of the louvers 5a is increased, however, the pressure drop

amount of air is increased, and therefore, the heat dissipation efficiency is reduced at low speed.

SUMMARY OF THE INVENTION

[0015] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a heat dissipation fin for heat exchangers wherein the distance between and the height of louvers arranged in line are adjusted, and, in addition, the interlayer distance between louvers arranged in layers is adjusted, whereby the air resistance is minimized, and therefore, the heat exchange efficiency is improved.

[0016] In accordance with one aspect of the present invention, the above and other objects can be accomplished by the provision of a heat dissipation fin for heat exchangers disposed between tubes for heat exchangers and having pluralities of louvers arranged in several layers, wherein the louvers of the respective layers are inclined toward the middle of the heat dissipation fin in a symmetrical fashion, and the distance between the louvers is gradually increased from the outermost end of a first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the air resistance is decreased and the heat dissipation efficiency is improved.

[0017] In accordance with another aspect of the present invention, there is provided a heat dissipation fin for heat exchangers disposed between tubes for heat exchangers and having pluralities of louvers arranged in several layers, wherein the louvers of the respective layers are inclined toward the middle of the heat dissipation fin in a straight line in a symmetrical fashion, and the height of the louvers is gradually increased from the outermost end of a first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the contact area between external air and the louvers at the middle region of the heat dissipation fin is increased, and therefore, the heat dissipation efficiency is maximized.

[0018] In accordance with a further aspect of the present invention, there is provided a heat dissipation fin for heat exchangers disposed between tubes for heat exchangers and having pluralities of louvers arranged in several layers, wherein the louvers of the respective layers are inclined toward the middle of the heat dissipation fin in a straight line in a symmetrical fashion, the distance between the louvers is gradually increased from the outermost end of a first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the air resistance is decreased and the heat dissipation efficiency is improved, the height of the louvers is gradually increased from the outermost end of the first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the heat dissipation efficiency at the middle region of the heat dissipation fin is maximized, and the interlayer distance between the louvers of the respective layers is gradually decreased from the outermost end of the first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the flow rate of external air flowing between the louvers of the respective layers arranged in a straight line is increased.

[0019] Preferably, the louvers are inclined by the same angle.

[0020] Preferably, the louvers are arranged such that the louvers formed at the first half part of the heat dissipation fin are symmetrical to the louvers formed at a second half part of the heat dissipation fin, the distance between the louvers is

gradually decreased from the middle of the heat dissipation fin to the outermost end of the second half part of the heat dissipation fin, and the height of the louvers is gradually decreased from the middle of the heat dissipation fin to the outermost end of the second half part of the heat dissipation fin such that the interlayer distance between the louvers of the respective layers is increased, whereby the flow resistance of the external air is reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[0022] FIG. 1 is a front view illustrating a general heat exchanger;

[0023] FIG. 2A is a perspective view, in part, illustrating a conventional heat dissipation fin;

[0024] FIG. 2B is a longitudinal sectional view illustrating the arrangement of louvers of the conventional heat dissipation fin;

[0025] FIG. 3 is a longitudinal sectional view illustrating the arrangement of louvers of a heat dissipation fin for heat exchangers according to a first embodiment of the present invention;

[0026] FIG. 4 is a longitudinal sectional view illustrating the arrangement of louvers of a heat dissipation fin for heat exchangers according to a second embodiment of the present invention; and

[0027] FIG. 5 is a longitudinal sectional view illustrating the arrangement of louvers of a heat dissipation fin for heat exchangers according to a third embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] Now, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0029] FIG. 3 is a longitudinal sectional view illustrating the arrangement of louvers of a heat dissipation fin 105 for heat exchangers according to a first embodiment of the present invention.

[0030] As shown in FIG. 3, the heat dissipation fin 105 for heat exchangers according to the first embodiment of the present invention includes a body 111 bent in the form of a wave and a plurality of louvers 120 formed at the surface of the body

[0031] In this embodiment, the louvers 120 are arranged in large numbers in a straight line such that the louvers 120 are inclined toward the middle of the heat dissipation fin 105 in a symmetrical fashion.

[0032] Consequently, external air flows upward through the louvers 120 in an inclined fashion at the first half part of the heat dissipation fin 105 in the flowing direction of the external air, and then the external air flows downward through the louvers 120 in an inclined fashion at the second half part of the heat dissipation fin 105 in the flowing direction of the external air. As a result, the contact area between the air and the louvers is increased, and therefore, the heat dissipation efficiency of the heat dissipation fin 105 is improved.

[0033] Especially, the louvers 120 are inclined by the same angle Θ so as to uniformly maintain the flow of the external air.

[0034] The louvers 120 are arranged in several layers on the heat dissipation fin 105. For convenience, the louvers 120 are shown to be arranged in three layers.

[0035] A region between one end, through which external air is introduced, of the heat dissipation fin 105 and the middle of the heat dissipation fin 105 will be referred to as a first half part of the heat dissipation fin, and a region between the middle of the heat dissipation fin 105 and the other end, through which the external air is discharged, of the heat dissipation fin 105 will be referred to as a second half part of the heat dissipation fin.

[0036] Preferably, the louvers 120 of the respective layers are arranged such that the distance between the louvers 120 at the first half part of the heat dissipation fin 105 is gradually increased from the air introduction end to the middle of the heat dissipation fin 105 in the flowing direction of the external air.

[0037] Specifically, the distance between the louvers 120 is gradually increased from the air introduction end to the middle of the heat dissipation fin 105 to gradually decrease resistance of air flowing between the louvers 120.

[0038] The distance between the louvers 120 is indicated by louver pitch P2.

[0039] More specifically, the louver pitch P2 is gradually increased at the first half part of the heat dissipation fin 105 in the flowing direction of the external air.

[0040] Consequently, the amount of contact between the air and the louvers 120 at the first half part of the heat dissipation fin 105 is increased, and therefore, the heat dissipation efficiency of the heat dissipation fin 105 is improved.

[0041] When the louver pitch P2 of the heat dissipation fin 105 at the second half part of the heat dissipation fin 105 is increased in the flowing direction of the external air, however, the distance between the respective louvers 120 is excessively widened. As a result, the flowing speed of the external air is reduced, and therefore, the heat dissipation efficiency of the heat dissipation fin 105 is decreased.

[0042] Consequently, it is preferable to uniformly maintain the louver pitch P2 of the heat dissipation fin 105 at the second half part of the heat dissipation fin 105.

[0043] Arrows indicate the flowing direction and the flow rate of the external air.

[0044] FIG. 4 is a longitudinal sectional view illustrating the arrangement of louvers of a heat dissipation fin 105 for heat exchangers according to a second embodiment of the present invention.

[0045] As shown in FIG. 4, the heat dissipation fin 105 for heat exchangers according to the second embodiment of the present invention is characterized in that pluralities of louvers 120 formed at a body 111 of the heat dissipation fin 105 are arranged in three layers, the louvers 120 of the respective layers are inclined by the same angle Θ , and the height of the louvers 120 is gradually increased from opposite ends to the middle of the heat dissipation fin 105.

[0046] Specifically, the height of the louvers 120 of the respective layers is gradually decreased from the middle to opposite ends of a central line of each layer parallel with the flowing direction of the external air.

[0047] The central lines of the respective layers are parallel with each other. Consequently, the interlayer distance between the louvers 120 of the respective layers, i.e., the

bending pitch P1, is gradually increased from the middle of the heat dissipation fin 105 to the outermost end of the heat dissipation fin 105.

[0048] Specifically, the interlayer distance between the louver 120 of the first layer and the louver 120 of the second layer at the middle of the heat dissipation fin 105, i.e., the bending pitch P1 at the middle of the heat dissipation fin 105, is less than the interlayer distance between the louver 120 of the first layer and the louver 120 of the second layer at the outermost end of the first half part of the heat dissipation fin 105, i.e., the bending pitch P1 at the outermost end of the first half part of the heat dissipation fin 105.

[0049] Furthermore, the louvers 120 of the respective layers are arranged such that the louver pitch P2 is gradually increased from the outermost end of the first half part of the heat dissipation fin 105 to the middle of the heat dissipation fin 105.

[0050] Consequently, a large amount of external air is introduced due to the bending pitch P1 sufficiently widened at the outermost end of the first half part of the heat dissipation fin 105, and the amount of contact between the external air and the louvers 120 is increased due to the louver pitch P2 sufficiently widened at the middle of the heat dissipation fin 105, whereby the heat dissipation efficiency of the heat dissipation fin 105 is improved.

[0051] In this embodiment, the louvers 120 of the respective layers are arranged such that the louver pitch P2 of the heat dissipation fin 105 is uniformly maintained at the second half part of the heat dissipation fin 105, and, at the same time, the bending pitch P1 is gradually increased from the middle of the heat dissipation fin 105 to the outermost end of the second half part of the heat dissipation fin 105.

[0052] Consequently, external air uniformly flows between the louvers 120 at the second half part of the heat dissipation fin 105. At this time, interference to the flow of the external air does not occur due to the gradual increase of the bending pitch P1, i.e., the interlayer distance between the louvers 120 of the respective layers. As a result, the air resistance is decreased, and the flow rate of the external air is increased, whereby the heat dissipation efficiency of the heat dissipation fin 105 is improved.

[0053] Arrows indicate the flowing direction and the flow rate of the external air.

[0054] FIG. 5 is a longitudinal sectional view illustrating the arrangement of louvers of a heat dissipation fin 105 for heat exchangers according to a third embodiment of the present invention.

[0055] As shown in FIG. 5, the heat dissipation fin 105 for heat exchangers according to the third embodiment of the present invention is characterized in that pluralities of louvers 120 formed at a body 111 of the heat dissipation fin 105 are arranged in three layers, the louvers 120 of the respective layers are inclined by the same angle Θ , the height of the louvers 120 is gradually increased from opposite ends to the middle of the heat dissipation fin 105, and the distance between the louvers 120 is gradually decreased from the middle of the heat dissipation fin 105 to the opposite ends of the heat dissipation fin 105.

[0056] Specifically, the louvers 120 of the respective layers are arranged such that the distance between the louvers 120, i.e., the louver pitch P2, is gradually increased from the outermost end, through which external air is introduced, of the first half part to the middle of the heat dissipation fin 105 in the

flowing direction of the external air, whereby resistance of air flowing between the louvers is gradually decreased.

[0057] At the same time, central lines interconnecting the louvers 120 of the respective layers are parallel with each other. Also, the height of the louvers 120 of the respective layers is gradually increased from the outermost end of the first half part to the middle of the heat dissipation fin 105, and therefore, the interlayer distance between the louvers 120 of the respective layers, i.e., the bending pitch P1, is gradually increased from the middle of the heat dissipation fin 105 to the outermost end of the heat dissipation fin 105.

[0058] Specifically, the interlayer distance between the louver 120 of the first layer and the louver 120 of the second layer at the middle of the heat dissipation fin 105, i.e., the bending pitch P1 at the middle of the heat dissipation fin 105, is less than the interlayer distance between the louver 120 of the first layer and the louver 120 of the second layer at the outermost end of the first half part of the heat dissipation fin 105, i.e., the bending pitch P1 at the outermost end of the first half part of the heat dissipation fin 105.

[0059] Consequently, a large amount of external air is introduced due to the bending pitch P1 sufficiently widened at the outermost end of the first half part of the heat dissipation fin 105, and the amount of contact between the external air and the louvers 120 is increased due to the louver pitch P2 sufficiently widened at the middle of the heat dissipation fin 105, whereby the heat dissipation efficiency of the heat dissipation fin 105 is improved.

[0060] In this embodiment, the louvers 120 of the respective layers are arranged such that the louver pitch P2 of the heat dissipation fin 105 is gradually decreased from the middle of the heat dissipation fin 105 to the outermost end of the second half part of the heat dissipation fin 105 in the flowing direction of the external air, and, at the same time, the bending pitch P1 is gradually increased from the middle of the heat dissipation fin 105 to the outermost end of the second half part of the heat dissipation fin 105.

[0061] More specifically, the louver pitch P2 is gradually decreased from the middle of the heat dissipation fin 105 to the outermost end of the second half part of the heat dissipation fin 105, and, at the same time, the bending pitch P1 is gradually increased from the middle of the heat dissipation fin 105 to the outermost end of the second half part of the heat dissipation fin 105.

[0062] Consequently, external air uniformly flows between the louvers 120 at the second half part of the heat dissipation fin 105. At this time, interference to the flow of the external air does not occur due to the gradual increase of the bending pitch P1, i.e., the interlayer distance between the louvers 120 of the respective layers. As a result, the air resistance is decreased, and the flow rate of the external air is increased, whereby the heat dissipation efficiency of the heat dissipation fin 105 is improved.

[0063] The reason why the louvers 120 of the respective layers are arranged such that the louver pitch P2 is gradually decreased from the middle of the heat dissipation fin 105 to the outermost end of the second half part of the heat dissipation fin 105 is to arrange the louvers of the respective layers in a symmetrical fashion and thus to remove the orientation of the louvers during the assembly of the heat dissipation fin 105, thereby accomplishing easy assembly of the heat dissipation fin 105.

[0064] Also, as the bending pitch P1 is gradually increased from the middle of the heat dissipation fin 105 to the outer-

most end of the second half part of the heat dissipation fin **105**, the increase of resistance due to the decrease of the distance between the louvers **120** of the respective layers is restrained. **[0065]** Arrows indicate the flowing direction and the flow rate of the external air.

[0066] As apparent from the above description, the pitch and height of the louvers of the heat dissipation fin for heat exchanger according to the present invention are adjusted in the flowing direction of external air. As a result, the air resistance is decreased, and the amount of contact between the louvers and the external air is increased, whereby the heat dissipation efficiency of the heat dissipation fin is improved. **[0067]** Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

What is claimed is:

1. A heat dissipation fin for heat exchangers disposed between tubes for heat exchangers and having pluralities of louvers arranged in several layers, wherein

the louvers of the respective layers are inclined toward the middle of the heat dissipation fin in a straight line in a symmetrical fashion, and

the distance between the louvers is gradually increased from the outermost end of a first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the air resistance is decreased and the heat dissipation efficiency is improved.

2. A heat dissipation fin for heat exchangers disposed between tubes for heat exchangers and having pluralities of louvers arranged in several layers, wherein

the louvers of the respective layers are inclined toward the middle of the heat dissipation fin in a straight line in a symmetrical fashion, and

the height of the louvers is gradually increased from the outermost end of a first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the contact area between external air and the louvers at the middle region of the heat dissipation fin is increased, and therefore, the heat dissipation efficiency is maximized.

3. A heat dissipation fin for heat exchangers disposed between tubes for heat exchangers and having pluralities of louvers arranged in several layers, wherein

the louvers of the respective layers are inclined toward the middle of the heat dissipation fin in a straight line in a symmetrical fashion,

the distance between the louvers is gradually increased from the outermost end of a first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the air resistance is decreased and the heat dissipation efficiency is improved,

the height of the louvers is gradually increased from the outermost end of the first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the heat dissipation efficiency at the middle region of the heat dissipation fin is maximized, and

the interlayer distance between the louvers of the respective layers is gradually decreased from the outermost end of the first half part of the heat dissipation fin to the middle of the heat dissipation fin, whereby the flow rate of external air flowing between the louvers of the respective layers arranged in a straight line is increased.

4. The heat dissipation fin according to any one of claims 1, wherein the louvers are inclined by the same angle.

5. The heat dissipation fin according to any one of claims 1, wherein

the louvers are arranged such that the louvers formed at the first half part of the heat dissipation fin are symmetrical to the louvers formed at a second half part of the heat dissipation fin,

the distance between the louvers is gradually decreased from the middle of the heat dissipation fin to the outermost end of the second half part of the heat dissipation fin, and

the height of the louvers is gradually decreased from the middle of the heat dissipation fin to the outermost end of the second half part of the heat dissipation fin such that the interlayer distance between the louvers of the respective layers is increased, whereby the flow resistance of the external air is reduced.

6. The heat dissipation fin according to claim 2, wherein the louvers are inclined by the same angle.

7. The heat dissipation fin according to claim 3, wherein the louvers are inclined by the same angle.

8. The heat dissipation fin according to claim 2, wherein the louvers are arranged such that the louvers formed at the first half part of the heat dissipation fin are symmetrical to the louvers formed at a second half part of the heat dissipation fin, the distance between the louvers is gradually decreased from the middle of the heat dissipation fin to the outermost end of the second half part of the heat dissipation fin, and

the height of the louvers is gradually decreased from the middle of the heat dissipation fin to the outermost end of the second half part of the heat dissipation fin such that the interlayer distance between the louvers of the respective layers is increased, whereby the flow resistance of the external air is reduced.

9. The heat dissipation fin according to claim 3, wherein the louvers are arranged such that the louvers formed at the first half part of the heat dissipation fin are symmetrical to the louvers formed at a second half part of the heat dissipation fin,

the distance between the louvers is gradually decreased from the middle of the heat dissipation fin to the outermost end of the second half part of the heat dissipation fin, and the height of the louvers is gradually decreased from the middle of the heat dissipation fin to the outermost end of the second half part of the heat dissipation fin such that the interlayer distance between the louvers of the respective layers is increased, whereby the flow resistance of the external air is reduced.

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