A heat exchange chamber for liquid state cooling fluid is provided, which comprises a thermal dissipation device, and the thermal dissipation device sites in a cavity of the heat exchange chamber for liquid state cooling fluid. The thermal dissipation device comprises a plate and a plurality of heat dissipating fins formed on the plate, and the thermal dissipation device comprises at least one groove. After flowing through the heat dissipating fins, partial cooling fluid absorbs the heat of the heat dissipating fins and gasifies to bubbles. The design of the groove can discharge the bubbles trapped between heat dissipating fins helpfully and improve the efficiency of heat dissipation.
HEATING EXCHANGE CHAMBER FOR LIQUID STATE COOLING FLUID

CROSS-REFERENCE TO RELATED APPLICATIONS


FIELD OF THE INVENTION

[0002] The present invention relates to a heat dissipation module using cooling fluid, and more particularly, to a heat exchange chamber capable of discharging bubbles trapped between its heat dissipating fins smoothly and easily whereas the bubbles are the partially gasified cooling fluid after or during the flowing through of the heat dissipating fins.

BACKGROUND OF THE INVENTION

[0003] In many typical mainframe computers such as servers, poor heat dissipation performance is usually the case that cause the computer to malfunction so that how to design a heat dissipating fin or heat dissipating device with optimized heat dissipation performance is becoming the key issue in modern electronic computing industry. In addition, taking the power consumed by servers of any common data center for instance, the power used by the heat dissipation system for maintaining the operation of such servers is also twice as much. And not to mention that the complexity of the heat dissipation system for modern cloud data centers that are crowded with servers in high density is generally almost double comparing with those for common data centers. That is, in the enclosed space of a server room of a cloud data center, the heat that all those boxes generate can quickly increase the ambient temperature beyond equipment specifications. The results can be ugly if there is no proper heat dissipation system with good performance available and consequently all distinct possibilities can be caused, such as the operation of the servers may be unstable or even fail, energy can be wasted, the performance of the personnel working in the server room may be poor since an uncomfortable working environment can be resulted, the cost for managing the server room may increase, and so on.

[0004] Among those many conventional apparatus for heat dissipation, the heat dissipating fan is the one that is commonly seen and used for blowing cold air toward electronic devices, such as servers, for lowering the temperature thereof. However, for facilitating the operation efficiency of the heat dissipating fan, certain air conditioning devices are generally being used to work in conjunction with the heat dissipating fan, by that ambient temperature can be lowered to a point that the temperature of the air being blown toward the electronic devices by the heat dissipating fan is lower than the temperature of the electronic devices so as to enable a heat exchange process therewith. In addition, it is common to install metal heat dissipating fins, such as heat dissipating fins, on heat sources for dissipating heat from the heat sources through the large heat dissipating area created by the heat dissipating fins while the heat is being conducted to the metal heat dissipating fins as the heat dissipating fins are made of a metal whose specific heat capacity is lower than air. Moreover, the heat exchange chamber for liquid state cooling fluid is another heat dissipating apparatus that is commonly seen and used. By allowing a cooling fluid to flow into the heat exchange chamber, a heat exchanging process will be enabled between the cooling fluid and a heat source, and thus the temperature of the heat source is reduced. However, during the heat exchanging process, a portion of such liquid state cooling fluid flowing in the heat exchange chamber will be vaporized by the heat absorbed thereby, and since the bubbles resulting from the vaporized cooling fluid will massively accumulated inside the heat exchange chamber and trapped between its heat dissipating fins, the flowing of the cooling fluid inside the heat exchange chamber can be blocked or even clogged and thus the heat dissipation performance of the heat exchange chamber is adversely affected.

[0005] Therefore, it is in need of a heat exchange chamber capable of discharging bubbles trapped between its heat dissipating fins smoothly and easily whereas the bubbles are the partially gasified cooling fluid after or during the flowing through of the heat dissipating fins.

SUMMARY OF THE INVENTION

[0006] In view of the disadvantages of prior art, the primary object of the present invention is to provide a heat exchange chamber capable of discharging bubbles trapped between its heat dissipating fins smoothly and easily whereas the bubbles are the partially gasified cooling fluid after or during the flowing through of the heat dissipating fins.

[0007] To achieve the above object, the present invention provides a heat exchange chamber for liquid state cooling fluid, which comprises: a casing, configured with a cavity, an inlet and an outlet in a manner that the inlet is provided for allowing a cooling fluid to flow into the cavity and the outlet is provided for allowing the cooling fluid to flow out of the cavity as the cooling fluid is enabled to flow in a flowing direction in and out of the cavity; and a thermal dissipation device, configured with a plate, a plurality of heat dissipating fins formed on the plate, and at least one groove configured for discharge bubbles trapped between heat dissipating fins wherein during the flowing of the cooling fluid through the thermal dissipation device, partial such cooling fluid is gasified into the bubbles after absorbing heat from the plural heat dissipating fins, and the bubbles are enabled to be guided by the at least one groove so as to be discharged while preventing the same from being trapped by the plural heat dissipating fins.

[0008] Further scope of applicability of the present application will become more apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present invention will become more fully understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention and wherein:
FIG. 1A and FIG. 1B are schematic diagrams showing a heat exchange chamber for liquid state cooling fluid according to the present invention.

FIG. 2A is a schematic diagram showing a thermal dissipation device according to a first embodiment of the invention.

FIG. 2B is a schematic diagram showing a thermal dissipation device according to a second embodiment of the invention.

FIG. 3 is a schematic diagram showing a thermal dissipation device according to a third embodiment of the invention.

FIG. 4A is a schematic diagram showing a thermal dissipation device according to a fourth embodiment of the invention.

FIG. 4B is a schematic diagram showing a thermal dissipation device according to a fifth embodiment of the invention.

DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

For your esteemed members of reviewing committee to further understand and recognize the fulfilled functions and structural characteristics of the invention, several exemplary embodiments cooperating with detailed description are presented as the follows.

Please refer to FIG. 1A and FIG. 2B, which are schematic diagrams showing a heat exchange chamber for liquid state cooling fluid according to the present invention. As shown in FIG. 1A and FIG. 1B, the heat exchange chamber comprises: a casing 1 and a thermal dissipation device 2. The casing 1 is configured with a cavity 10, an inlet 11 and an outlet 12 in a manner that the inlet 11 is provided for allowing a cooling fluid 0 to flow into the cavity 10 and the outlet 12 is provided for allowing the cooling fluid 0 to flow out of the cavity 10 as the cooling fluid is enabled to flow in a flowing direction through the cavity 10, as the arrow 00 shown in FIG. 1A. In this embodiment, the diameter of the outlet 12 is larger than that of the inlet 11, by that the inlet 11 can be prevented from having too much gas being accumulated therein, and thus the boiling point of the cooling fluid 0 can be prevented from raising with the increasing of the pressure inside the cavity 10 caused by the gas accumulation, so that the heat dissipating efficacy of the cooling fluid is prevented from reducing. The thermal dissipation device 2 is configured with a plate 20, a plurality of heat dissipating fins 21 formed on the plate 20, and at least one groove 22 configured for discharge bubbles resulting from the cooling fluid 0 being gasified by the heat dissipating fins 21 that are trapped between heat dissipating fins 21. That is, during the flowing of the cooling fluid 0 through the heat dissipating fins 20 of the thermal dissipation device 2, partial such cooling fluid 0 will be gasified into bubbles after absorbing heat from the plural heat dissipating fins 20, after that the bubbles will be guided by the at least one groove 22 so as to be discharged while preventing the same from being trapped by the plural heat dissipating fins 20 and thus preventing the flow of the cooling fluid 00 from being clogged or even blocked by the bubbles for causing the heat dissipating efficiency of the heat exchange chamber to drop.

Please refer to FIG. 2A, which is a schematic diagram showing a thermal dissipation device according to a first embodiment of the invention. As shown in FIG. 2A, the thermal dissipation device 2 is configured with a plurality of grooves 22, which are substantially recesses formed from the height variation of the plural heat dissipating fins 21. In FIG. 2A, the plural heat dissipating fins 21 are dented at exactly the same positions corresponding to each other for conjunctively forming the grooves 22 while enabling the grooves 22 to extend in a direction perpendicular to the flowing direction 00 and the length of each groove 22 to equal to the length of the thermal dissipation device 2 measured in a direction perpendicular to the flowing direction 00. Please refer to FIG. 2B, which is a schematic diagram showing a thermal dissipation device according to a second embodiment of the invention. As shown in FIG. 2B, each of the grooves 22 is substantially a gap enclosed between any two neighboring heat dissipating fins 21 of the plural heat dissipating fins 21 that are coplanar disposed while enabling the length of each groove 22 to be smaller than the length of the thermal dissipation device 2 measured in a direction perpendicular to the flowing direction 00. Nevertheless, the formation of the grooves 22 is not limited by the aforesaid embodiments. Please refer to FIG. 3, which is a schematic diagram showing a thermal dissipation device according to a third embodiment of the invention. As shown in FIG. 3, the plural heat dissipating fins 21 are dented at different positions that are still corresponding to each other. Thereby, the grooves 22 being formed on the thermal dissipation device 2 by the heat dissipating fins 21 can substantially be the indentations distributed everywhere on the thermal dissipation device 2. Please refer to FIG. 4A, which is a schematic diagram showing a thermal dissipation device according to a fourth embodiment of the invention. As shown in FIG. 4A, the grooves are formed in a manner combining the grooves of FIG. 2A and the grooves of FIG. 3, so that they includes recesses formed from the height variation of the plural heat dissipating fins 21 that are dented at exactly the same positions corresponding to each other, and indentations distributed everywhere on the thermal dissipation device 2 that are formed from the denting of the plural heat dissipating fins 21 at different positions but still corresponding to each other. Please refer to FIG. 4B, which is a schematic diagram showing a thermal dissipation device according to a fifth embodiment of the invention. As shown in FIG. 4B, the grooves are formed in a manner combining the grooves of FIG. 2B and the grooves of FIG. 3, so that they includes the grooves 22 being substantially gaps enclosed between any two neighboring heat dissipating fins 21 of the plural heat dissipating fins 21 that are coplanar disposed, and the grooves 22 substantially being the indentations distributed everywhere on the thermal dissipation device 2 that are formed from the denting of the plural heat dissipating fins 21 at different positions but still corresponding to each other. It is noted that the positions, the orientations and the shapes of the grooves are not limited by the aforesaid embodiment.

In this embodiment, the casing 1 further comprises: a base 13, being provided for thermal contacting a heat source 3, by that the heat emitted from the heat source can be transmitted to the heat exchange chamber through the base 13. It is noted that the heat source 3 can be a center processing unit or a chip module, but is not limited thereby. In addition, the base 13 is also being arranged in thermal contact with the thermal dissipation device 2 so as to transmit heat thereto.

Moreover, the inlet 11 of the casing 1 can be shaped as a circle or an oval. But in this embodiment, the inlet 11 is shaped like a square. Correspondingly, for enabling the cooling fluid 0 to contact with the thermal dissipation device 2 uniformly after flowing into the cavity 10 through the inlet 11,
there is a flow resisting portion 14 being disposed inside the cavity 10 at a position proximate to the inlet 11. In this embodiment, the flow resisting portion 14 is substantially a block hanging on the top panel of the casing 1, by that a neck is formed inside the cavity 10 at the position proximate to the inlet 11. Accordingly, as soon as the cooling fluid 0 flows through the neck, it is forced to distribute uniformly and flows into a plurality of channels formed between the plural heat dissipating fins 20 of the thermal dissipation device 2. Thus, by the disposition of the block 14, the heat dissipating effect of the thermal dissipation device 2 can be ensured as the cooling fluid 0 is distributed uniformly with respect to the plural heat dissipating fins 20 while preventing the same from being concentrated to the center channel of the plural channels. It is noted that the flow resisting portion 14 can be formed in various manner that it is not limited by the aforesaid embodiment.

[0021] With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of the invention, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present invention.

What is claimed is:
1. A heat exchange chamber for liquid state cooling fluid, comprising:
   a casing, configured with a cavity, an inlet and an outlet in a manner that the inlet is provided for allowing a cooling fluid to flow into the cavity and the outlet is provided for allowing the cooling fluid to flow out of the cavity; and
   a thermal dissipation device, configured with a plate, a plurality of heat dissipating fins formed on the plate, and at least one groove configured for discharge bubbles resulting from the gasification of the cooling fluid inside the heat exchange chamber that are trapped between heat dissipating fins.
2. The heat exchange chamber of claim 1, wherein each of the at least one groove is substantially a recess from the height variation of the plural heat dissipating fins.
3. The heat exchange chamber of claim 1, wherein each of the at least one groove is substantially a gap enclosed between any two neighboring heat dissipating fins of the plural heat dissipating fins that are coplanar disposed.
4. The heat exchange chamber of claim 1, wherein each of the at least one groove is formed extending in a direction perpendicular to a flowing direction of the cooling fluid inside the cavity.
5. The heat exchange chamber of claim 1, wherein the length of the at least one groove is not larger than the length of the thermal dissipation device measured in a direction perpendicular to the flowing direction.
6. The heat exchange chamber of claim 1, wherein the casing further comprises: a base, being provided for thermal contacting a heat source while being arranged in thermal contact with the thermal dissipation device.
7. The heat exchange chamber of claim 1, further comprising:
   a flow resisting portion, being disposed inside the cavity at a position proximate to the inlet, for enabling the cooling fluid to contact with the thermal dissipation device uniformly after flowing into the cavity through the inlet.
9. The heat exchange chamber of claim 8, wherein the flow resisting portion is substantially a block hanging on the top panel of the casing to be used for enabling a neck to be formed inside the cavity at the position proximate to the inlet.