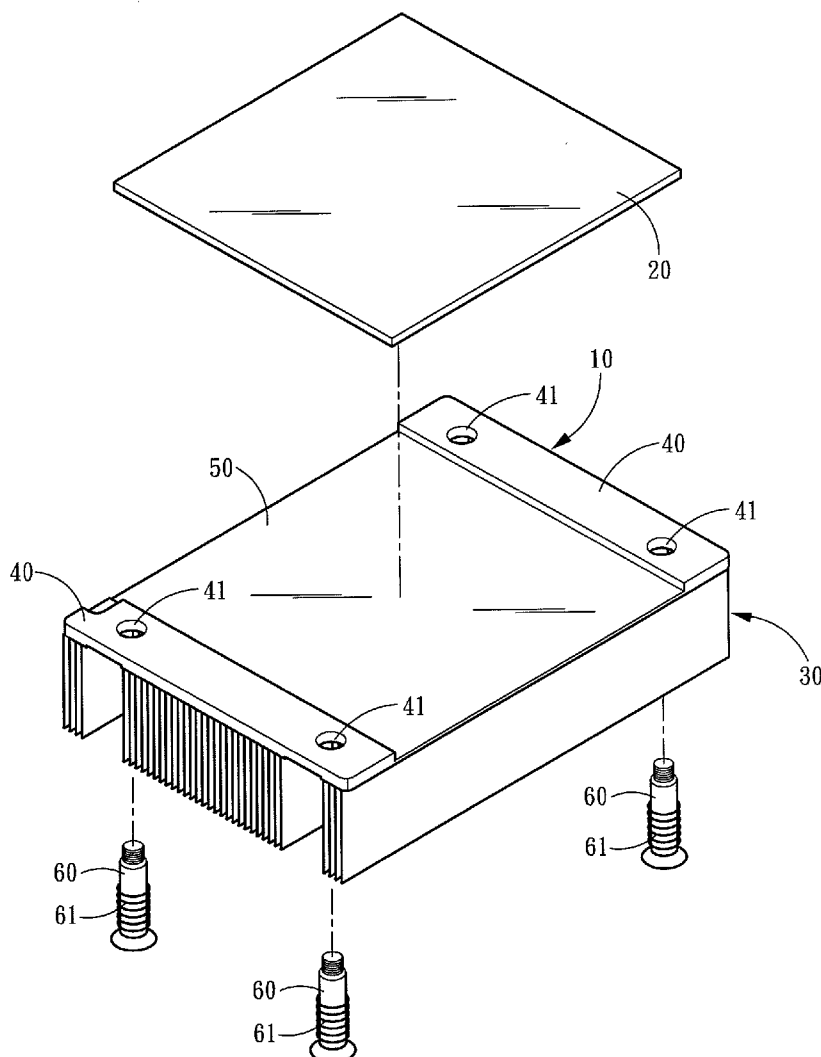




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(19) **United States**(12) **Patent Application Publication**
SHIH(10) **Pub. No.: US 2012/0211211 A1**(43) **Pub. Date: Aug. 23, 2012**(54) **HEAT SINK EQUIPPED WITH A VAPOR CHAMBER**(76) Inventor: **David SHIH**, Chang Hwa City
(TW)(21) Appl. No.: **13/029,878**(22) Filed: **Feb. 17, 2011****Publication Classification**(51) **Int. Cl.**
F28F 7/00 (2006.01)(52) **U.S. Cl.** **165/185**(57) **ABSTRACT**

A heat sink equipped with a vapor chamber includes a heat conduction plate and a vapor chamber. The heat conduction plate has one side formed integrally a plurality of radiation fins and another side with two lateral edges formed respectively and integrally a fastening portion. The two fastening portions are interposed by a recess to bond the vapor chamber. Each fastening portion is fastened to a printed circuit board through at least one screw to allow the vapor chamber to contact a heat generation element. The fastening portion is integrally formed at a desired thickness, thus has sufficient strength to withstand the fastening force of the screw to prevent tight sealing between the vapor chamber and heat generation element affected by deformation of the heat conduction plate. Thereby the vapor chamber can smoothly contact the heat generation element to rapidly transfer heat outside.



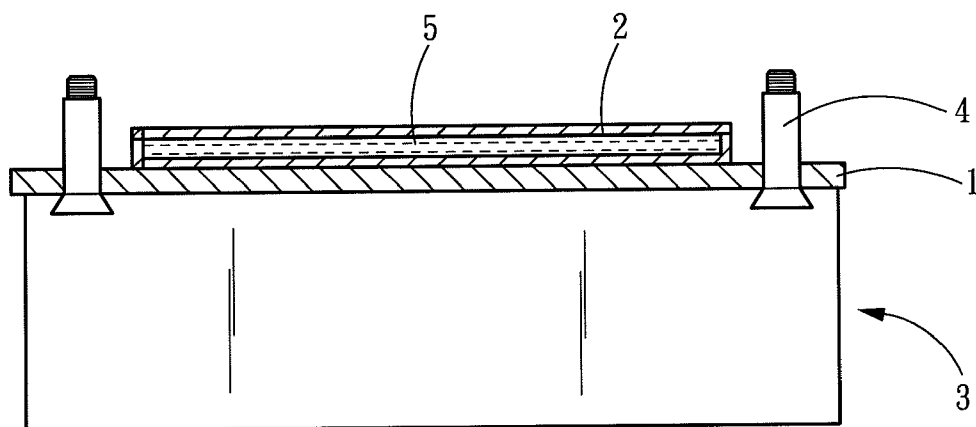


Fig . 1
PRIOR ART

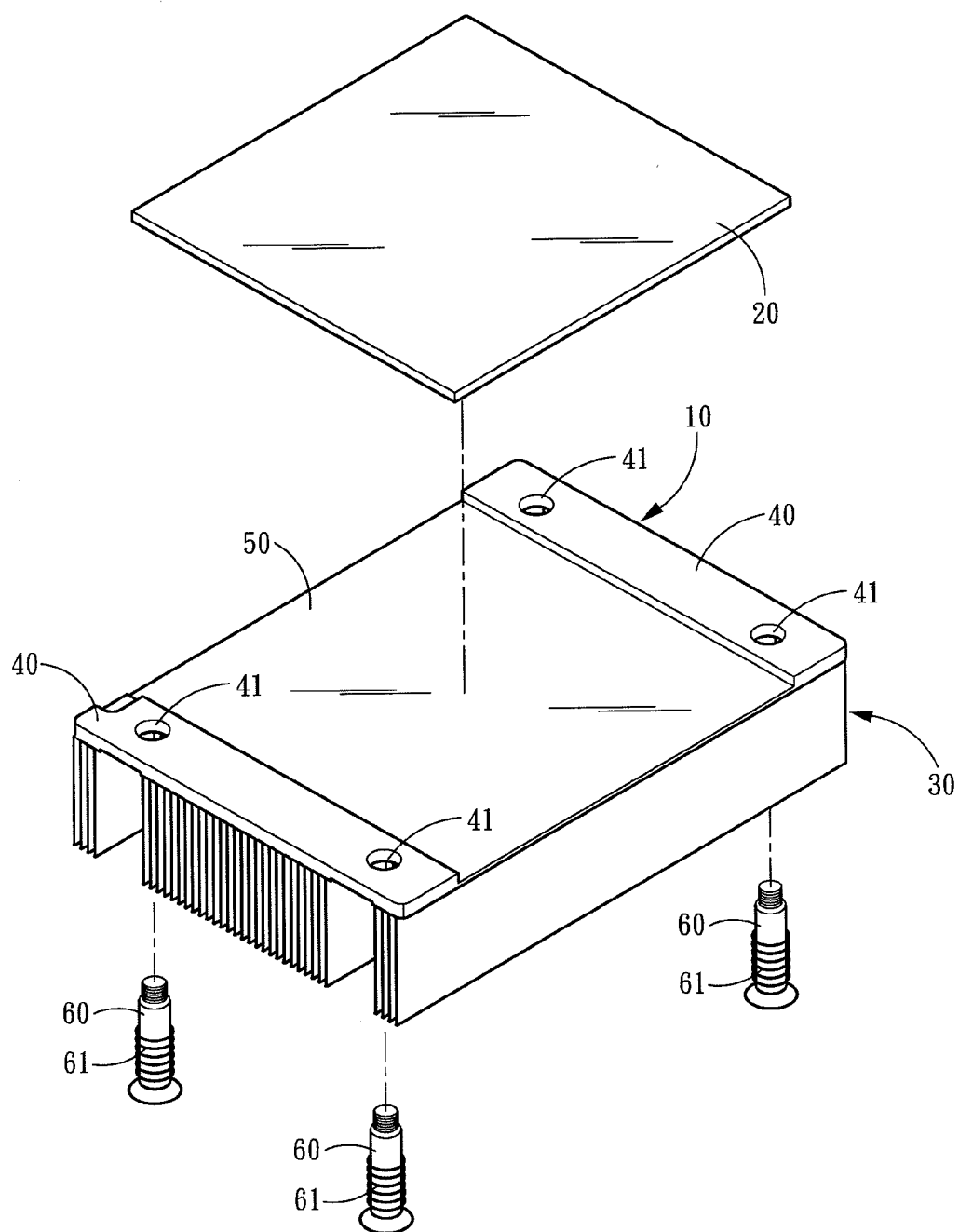


Fig . 2

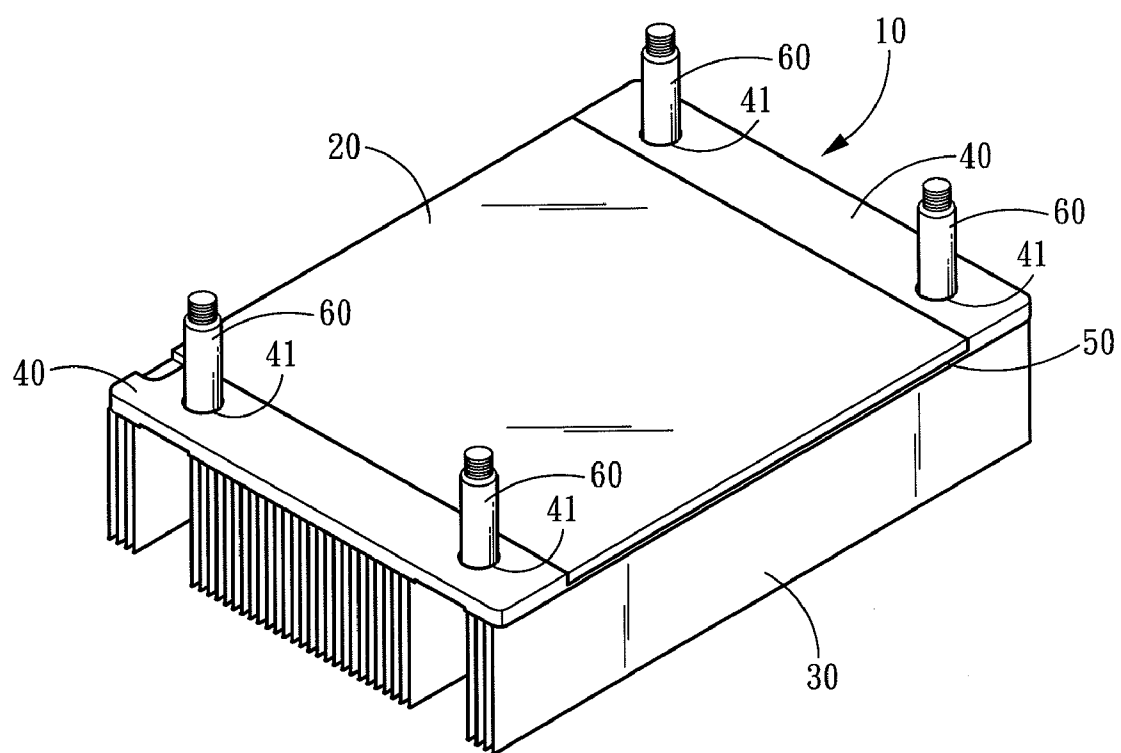


Fig . 3

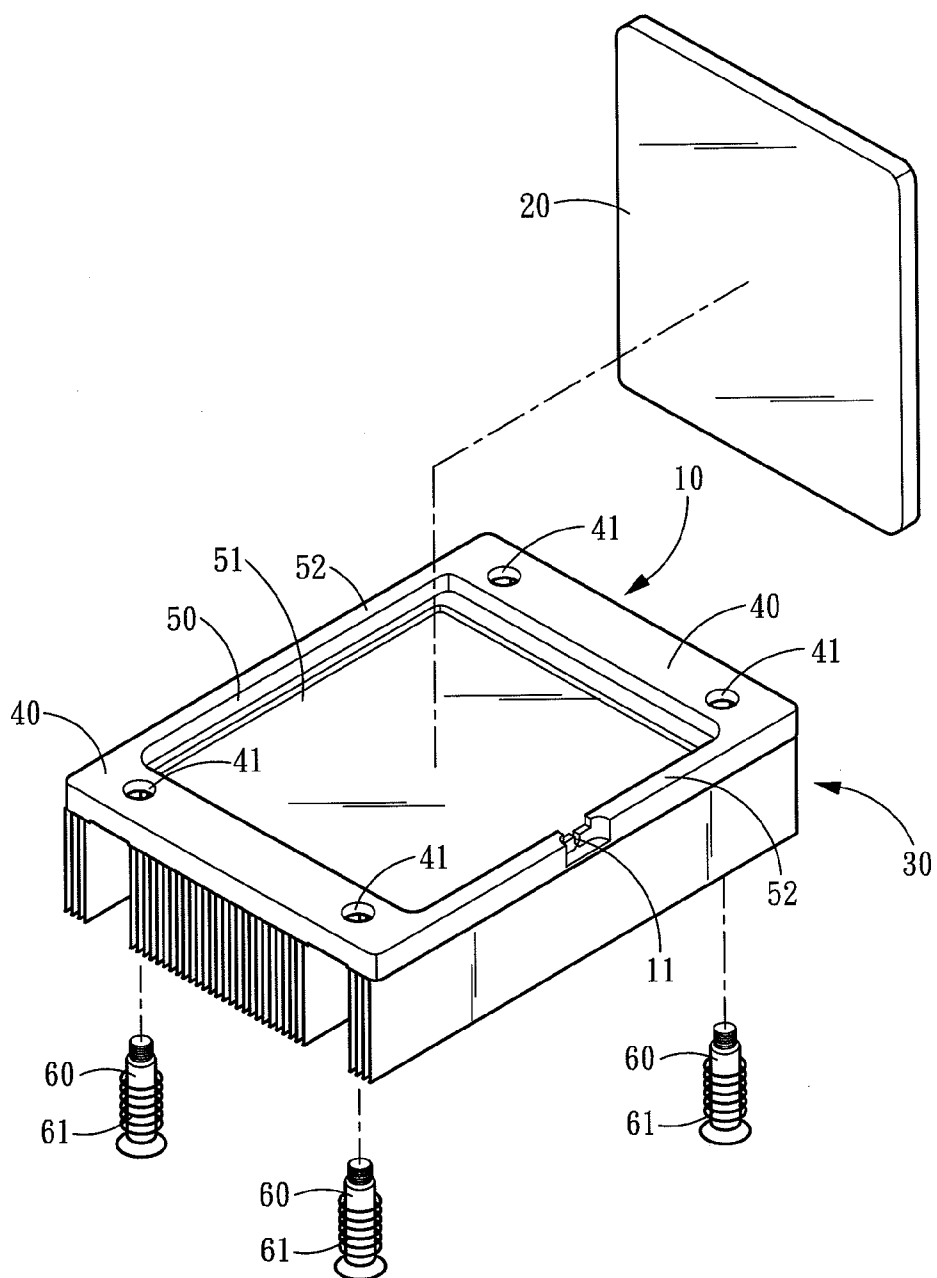


Fig . 4

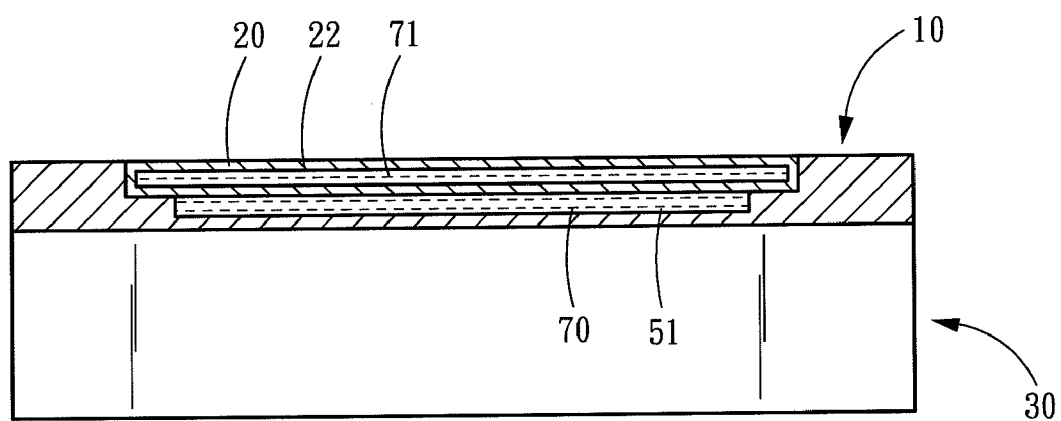


Fig . 5

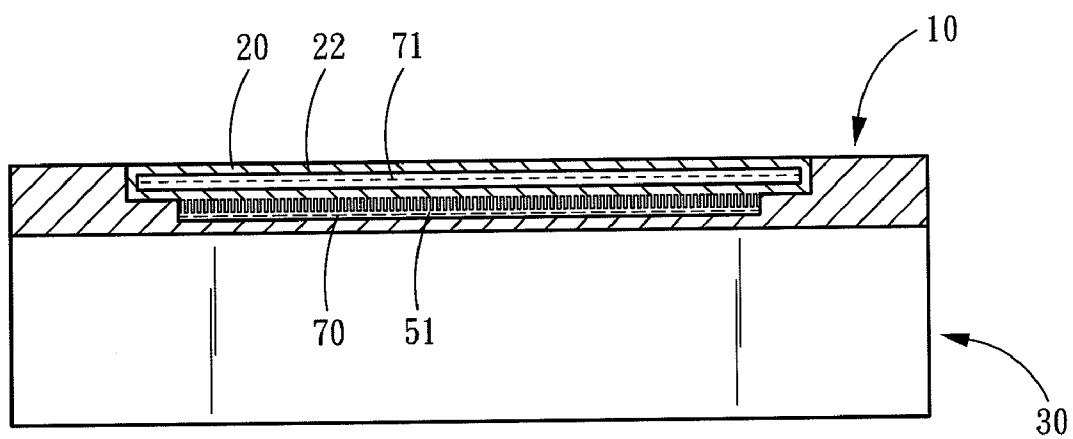


Fig . 6

HEAT SINK EQUIPPED WITH A VAPOR CHAMBER

FIELD OF THE INVENTION

[0001] The present invention relates to a heat sink and particularly to a heat sink equipped with a vapor chamber.

BACKGROUND OF THE INVENTION

[0002] Please refer to FIG. 1, a conventional heat sink includes a heat conduction plate 1 and a vapor chamber 2. The heat conduction plate 1 has one side formed a plurality of radiation fins 3 and another side bonded to the vapor chamber 2, and two lateral sides fastened to a printed circuit board (PCB in short, not shown in the drawing) through at least one screw 4. The vapor chamber 2 is in contact with a heat generation element (not shown in the drawing) of the PCB, and is hollow and vacuumed to seal heat transfer fluid 5 (pure water) inside which can rapidly transfer heat through phase transition between liquid and gas states. Hence the heat generated by the heat generation element can be quickly spread by the vapor chamber 2 to the radiation fins 3 to dissipate the heat to lower the temperature.

[0003] To save material, reduce weight and also accelerate heat transfer, the heat conduction plate 1 usually is fabricated at a small thickness. Hence when the heat conduction plate 1 is fastened to the PCB at the two lateral sides through the screws 4, the fastening force tends to cause distortion and deformation of the heat conduction plate 1 that could also result in deformation of the vapor chamber 2 without closely contacting the heat generation element. As a result, heat transfer effect suffers.

[0004] Moreover, a gap is easily generated between the vapor chamber 2 and heat conduction plate 1 due to the aforesaid deformation. That also diminishes the heat transfer effect and slows heat transfer from the vapor chamber 2 to the heat conduction plate 1. All these hamper heat dissipation effect of the heat sink.

SUMMARY OF THE INVENTION

[0005] Therefore, the primary object of the present invention is to provide a heat sink that can quickly and effectively transfer heat outside to achieve desired cooling effect.

[0006] To achieve the foregoing object, the present invention provides a heat sink equipped with a vapor chamber. The heat sink includes a heat conduction plate and a vapor chamber. The heat conduction plate has one side formed integrally a plurality of radiation fins and another side with two lateral edges formed respectively and integrally a fastening portion. The two fastening portions are interposed by a recess to bond the vapor chamber.

[0007] The fastening portion is fastened to a PCB through at least one screw to make the vapor chamber in contact with a heat generation element. As the fastening portion is formed integrally at a desired thickness, it has a sufficient strength to withstand the fastening force of the screw, thus tight sealing between the vapor chamber and heat generation element affected by deformation of the heat conduction plate can be prevented, and the vapor chamber can smoothly contact the heat generation element to quickly and effectively transfer heat outside.

[0008] The foregoing, as well as additional objects, features and advantages of the invention will be more readily

apparent from the following detailed description, which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a sectional view of a conventional heat sink equipped with a vapor chamber.

[0010] FIG. 2 is an exploded view of the invention.

[0011] FIG. 3 is a perspective view of the invention.

[0012] FIG. 4 is an exploded view of another embodiment of the invention.

[0013] FIG. 5 is a sectional view of another embodiment of the invention.

[0014] FIG. 6 is a sectional view of yet another embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] Please refer to FIGS. 2 and 3, the present invention aims to provide a heat sink equipped with a vapor chamber. The heat sink includes a heat conduction plate 10 and a vapor chamber 20. The heat conduction plate 10 has one side formed integrally a plurality of radiation fins 30 and another side with two lateral edges formed respectively and integrally a fastening portion 40. The two fastening portions 40 are interposed by a recess 50 to bond the vapor chamber 20. Each fastening portion 40 has at least one aperture 41 run through by at least one screw 60 coupled with a spring 61 to fasten to a printed circuit board (PCB in short, not shown in the drawings) to allow the vapor chamber 20 in contact with a heat generation element (not shown in the drawings).

[0016] Refer to FIGS. 4 and 5 for another embodiment of the invention. The heat conduction plate 10 has a latch flange 52 respectively on a front side and a rear side of the recess 50, and an airtight compartment 51 dug downwards. The vapor chamber 20 is positioned and surrounded by the two latch flanges 52 and the two fastening portions 40 to cover and seal the airtight compartment 51. The heat conduction plate 10 has an air extraction vent 11 communicating with the airtight compartment 51 to extract air therefrom and inject into a heat transfer fluid 70 which can be pure water capable of quickly transferring heat through phase transition between liquid and gas states of the heat transfer fluid 70. The vapor chamber 20 also has a sealed compartment 22 holding heat conduction fluid 71 to quickly transfer heat through phase transition between liquid and gas states of the heat conduction fluid 71 to rapidly transfer heat from the vapor chamber 20 to the heat conduction plate 10.

[0017] Refer to FIG. 6 for yet another embodiment of the invention. The vapor chamber 20 further includes a plurality of heat conduction fins 21 extended into the airtight compartment 51 to contact the heat transfer fluid 70 to increase the contact area with the vapor chamber 20, thereby to further enhance heat transfer effect to better meet use requirements.

[0018] By means of the structures set forth above, the fastening portion 40 is integrally formed at a desired thickness, thus has sufficient strength to withstand the fastening force of the screw 60 to prevent tight sealing between the vapor chamber 20 and heat generation element affected by deformation of the heat conduction plate 10, thus the vapor chamber 20 can smoothly contact the heat generation element. With rapid heat transfer of the heat conduction fluid 70, heat transfer effect can be further enhanced to meet use requirements.

What is claimed is:

1. A heat sink equipped with a vapor chamber, comprising:
a heat conduction plate which includes one side formed integrally a plurality of radiation fins and another side with two lateral edges formed respectively and integrally a fastening portion, the two fastening portions being interposed by a recess; and
a vapor chamber being bonded to the recess.
2. The heat sink of claim 1, wherein the heat conduction plate includes a latch flange respectively on a front side and a rear side of the recess and an airtight compartment dug downwards, such that the vapor chamber is positioned and surrounded by the two latch flanges and the two fastening portions to cover and seal the airtight compartment.
3. The heat sink of claim 2, wherein the vapor chamber includes a plurality of heat conduction fins extended into the airtight compartment.
4. The heat sink of claim 2, wherein the heat conduction plate includes an air extraction vent communicating with the airtight compartment.
5. The heat sink of claim 1, wherein each fastening portion includes at least one aperture run through by at least one screw.
6. The heat sink of claim 5, wherein the screw is coupled with a spring.

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