Heat sink having a heat pipe protection mechanism includes a heat pipe, a metallic sleeve and a plurality of heat-dissipating fins. The heat pipe has an evaporating section and a condensing section. The evaporating section is combined with a heat-dissipating base. The metallic sleeve has a closed end and an open end opposite to the closed end. The condensing section is disposed through the open end of the metallic sleeve. Each of the heat-dissipating fins has a through-hole corresponding to the heat pipe. The metallic sleeve having the condensing section disposed therein is fitted in the through-hole. By this arrangement, the condensing section is completely separated from the outside, so that the heat pipe can be protected from suffering damage due to external impacts or getting rusty. Thus, the lifetime of the heat pipe is maintained, and the frequency of repairing the heat sink is reduced.
HEAT SINK HAVING HEAT PIPE PROTECTION MECHANISM

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention
The present invention relates to a heat sink, and in particular to a heat sink having a heat pipe protection mechanism.

[0002] 2. Description of Prior Art
Heat pipe has a light weight, a simple structure, a high heat conductivity, and multiple functions, so that the heat pipe can transfer a great amount of heat without any electricity. Thus, heat pipes have been widely used in the heat dissipation of electronic products.

[0005] A common heat sink having heat pipes is used in such a manner that one end (evaporating section) of the heat pipe is disposed in thermal contact with a heat-conducting base adhered to a heat-generating element, and the other end (condensing section) of the heat pipe is combined with a heat-dissipating body (such as heat-dissipating fins) having a large heat-dissipating area. By this arrangement, the heat generated by the heat-generating element can be transferred to the heat-dissipating body and dissipated to the outside rapidly.

[0006] However, most of the existing heat pipes are made of copper. If the heat pipe is disposed outdoors or subjected to water, the surface of the heat pipe may suffer damage or become rusty, which shortens the lifetime of the heat pipe. Further, after being used for a long period of time, the heat pipe becomes aged easily to suffer damage, which increases the cost for maintenance. Even, other elements in the heat sink may thus suffer damage, which becomes a big problem for the user.

[0007] In view of the above, the present Inventor proposes a novel and reasonable structure based on his expert knowledge and deliberate researches.

SUMMARY OF THE INVENTION

[0008] The present invention is to provide a heat sink having a heat pipe protection mechanism, in which the condensing sections of the heat pipes penetrating the heat-dissipating fins will not suffer damage due to external impacts and will not get rusty. In this way, the lifetime of the heat pipes can be maintained, and the frequency of repairing the heat sink is reduced.

[0009] The present invention provides a heat sink having a heat pipe protection mechanism, which includes a heat pipe, a metallic sleeve, and a plurality of heat-dissipating fins. The heat pipe comprises an evaporating section and a condensing section. The evaporating section is combined with a heat-dissipating base. The metallic sleeve has a closed end and an open end opposite to the closed end. The condensing section is disposed through the open end of the metallic sleeve. Each of the heat-dissipating fins has a through-hole corresponding to the heat pipe. The metallic sleeve having the condensing section disposed therein is fitted in the through-hole.

[0010] The present invention provides a heat sink having a heat pipe protection mechanism, which includes a heat-dissipating base, a heat pipe, a partitioning plate, a metallic sleeve, and a plurality of heat-dissipating fins. The heat pipe comprises an evaporating section and a condensing section. The evaporating section is combined with the heat-dissipating base. The partitioning plate is fixed to the heat-conducting base and provided with a penetration hole corresponding to the heat pipe. The condensing section of the heat pipe penetrates beyond the penetration hole. The metallic sleeve has a closed end and an open end opposite to the closed end. The condensing section is disposed through the open end of the metallic sleeve. Each of the heat-dissipating has a through-hole corresponding to the heat pipe. The metallic sleeve having the condensing section disposed therein is disposed through the through-hole.

[0011] The present invention is to provide a heat sink having a heat pipe protection mechanism, which includes a partitioning plate for better separation and installation, thereby forming a modular heat sink. The partitioning plate is configured to prevent external foreign matters from entering the inside of the partitioning plate.

[0012] The present invention is to provide a heat sink having a heat pipe protection mechanism, in which the penetration hole of the partitioning plate and the periphery of the partitioning plate are formed into a stepped shape respectively for acting as a stopping portion, thereby increasing the degree of separation between the inside and the outside of the partitioning plate.

[0013] In comparison with prior art, the present invention has the following advantageous features. The condensing section of the heat pipe is disposed through the metallic sleeve, so that the structural strength of the condensing section of the heat pipe can be increased. To thereby protect the heat pipe from suffering damage due to external impact. Further, since the condensing section is completely separated from the outside, the heat pipe can be protected from getting rusty due to moisture. In this way, the lifetime of the heat pipe is maintained, and the frequency of repairing the heat sink is reduced.

BRIEF DESCRIPTION OF DRAWING

[0014] FIG. 1 is an exploded perspective view showing the heat sink having a heat pipe protection mechanism according to the present invention;

[0015] FIG. 2 is an assembled perspective view showing the heat sink having a heat pipe protection mechanism according to the present invention;

[0016] FIG. 3 is a perspective view showing the external appearance of the heat sink having a heat pipe protection mechanism according to the present invention;

[0017] FIG. 4 is an assembled cross-sectional view showing the heat sink having a heat pipe protection mechanism according to the present invention;

[0018] FIG. 5 is a schematic view showing an operating state of the heat sink having a heat pipe protection mechanism according to the present invention; and

[0019] FIG. 6 is a view showing the heat sink having a heat pipe protection mechanism according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0020] The detailed description and technical contents of the present invention will become apparent with the following detailed description accompanied with related drawings. It is noteworthy to point out that the drawings is provided for the illustration purpose only, but not intended for limiting the scope of the present invention.

[0021] Please refer to FIGS. 1 and 4, which are an exploded perspective view, an assembled perspective view, a perspec-
The heat-conducting base \(10\) is provided with at least one trough \(11\) to correspond to the heat pipe \(20\). The heat pipe \(20\) is positioned in the trough \(11\). The trough \(11\) can be made by stamping or other machining processes. The number of the troughs \(11\) can be decided based on the number of the heat pipes \(20\).

The heat pipe \(20\) comprises an evaporating section \(21\) and a condensing section \(22\). The evaporating section \(21\) is combined with the heat-conducting base \(10\) via soldering, bonding or mechanical engagement. The condensing section \(22\) protrudes from an end surface of the heat-conducting base \(10\) to be disposed into the metallic sleeve \(30\). In the present embodiment, the evaporating section \(21\) of the heat pipe \(20\) has a flat surface \(21\). When the evaporating section \(21\) is combined with the trough \(11\) of the heat-conducting base \(10\), the flat surface \(21\) is in flush with the surface of the heat-conducting base \(10\), thereby increasing the contact area with a heat-generating element and increasing the heat-conducting efficiency.

The metallic sleeve \(30\) is made of materials different from that of the heat pipe \(20\). For example, the metallic sleeve \(30\) is made of aluminum or stainless steel. The metallic sleeve \(30\) has a closed end \(31\) and an open end \(32\) opposite to the closed end \(31\). The condensing section \(22\) of the heat pipe \(20\) is disposed through the open end \(32\) of the metallic sleeve \(30\). Further, a heat-conducting medium \(35\) such as a heat-conducting paste or heat-conducting glue can be applied between the heat pipe \(20\) and the metallic sleeve \(30\), thereby increasing the heat-conducting effect there between.

The heat-dissipating fins \(40\) are arranged in parallel to each other. The surface of each of the heat-dissipating fins \(40\) is subjected to a post treatment (such as coating or electroplating) to increase its resistance to corrosion. Each of the heat-dissipating fins \(40\) has a through-hole \(41\) corresponding to the heat pipe \(20\). The metallic sleeve \(30\) having the condensing section \(22\) disposed therein is fitted in the through-hole \(41\). A gap \(400\) is formed between the adjacent two heat-dissipating fins \(40\). In the present embodiment, the periphery of the through-hole \(41\) of each heat-dissipating fin \(40\) is formed with an annular flange \(42\) for maintaining the gap \(400\). Each of the gaps \(400\) acts as a heat-dissipating channel.

The heat sink \(1\) further comprises a partitioning plate \(50\). Both sides of the partitioning plate \(50\) are referred as an inside and an outside respectively, thereby preventing external foreign matters from entering the inside of the partitioning plate \(50\). The partitioning plate \(50\) is fixed onto the heat-conducting base \(10\) and provided with a penetration hole \(51\) corresponding to the heat pipe \(20\).

In the present embodiment, the condensing section \(22\) of the heat pipe \(20\) penetrates beyond the penetration hole \(51\). The partitioning plate \(50\) is located near the open end \(32\) of the metallic sleeve \(30\). That is, the partitioning plate \(50\) is located on one side of the heat-conducting base \(10\), so that the partitioning plate \(50\) can be integrally formed with the heat-conducting base \(10\). Preferably, the penetration hole \(51\) of the partitioning plate \(50\) is formed into a stepped shape. The open end \(32\) of the metallic sleeve \(30\) abuts against the penetration hole \(51\), thereby increasing the degree of separation of the penetration hole \(51\). Further, the periphery of the partitioning plate \(50\) is formed with a stepped stopping portion \(52\). The stopping portion \(52\) has the same function as that of the penetration hole \(51\). The stopping portion \(52\) is configured to increase the degree of separation on the periphery of the partitioning plate \(50\).

Please refer to FIG. 5, which is a schematic view showing an operating state of the heat sink having a heat pipe protection mechanism according to the present invention. The heat sink \(1\) of the present invention is used to dissipate the heat generated by a heat-generating element \(2\) such as a communication apparatus. In use, the partitioning plate \(50\) is mounted on a fixing surface \(3\) such as a wall or a casing. The partitioning plate \(50\) divides the heat sink \(1\) into an inside (indoor) and an outside (outdoor). The heat-conducting base \(10\) and the evaporating section \(21\) of the heat pipe \(20\) are located in the inside (indoor). The heat-generating element \(2\) is adhered to the flat surface \(21\) of the evaporating section \(21\) and a portion of the heat-conducting base \(10\). On the other hand, the heat-dissipating fins \(40\) and the condensing section \(22\) of the heat pipe \(20\) are located in the outside (outdoor). It should be noted that, the stopping portion \(52\) of the partitioning plate \(50\) will abut against the fixing surface \(3\) to separate the inside from the outside of the partitioning plate \(50\).

When the heat sink \(1\) is operated, the heat generated by the heat-generating element \(2\) is transferred from the heat-conducting base \(10\) and the evaporating section \(21\) of the heat pipe \(20\) to the condensing section \(22\). Then, the heat is transferred to the heat-dissipating fins \(40\) via the metallic sleeve \(30\) and finally dissipated to the outside via the heat-dissipating fins \(40\). In this way, the temperature of the heat-generating element \(2\) can be lowered. Although a portion (i.e. the condensing section \(22\)) of the heat pipe \(20\) is exposed to the outside of the partitioning plate \(50\), the exposed portion of the heat pipe \(20\) is protected by the metallic sleeve \(30\), so that the heat pipe \(20\) can be completely separated from the outside. Thus, the heat pipe \(20\) can be protected from suffering damage due to external impacts and protected from getting rusty due to moister. Therefore, the lifetime of the heat pipe is maintained, and the frequency of repairing the heat sink \(1\) is reduced.

Please refer to FIG. 6, which is a view showing the heat sink having a heat pipe protection mechanism according to another embodiment of the present invention. The present embodiment is substantially the same as the previous embodiment. The heat sink \(1\) includes a heat-conducting base \(10\), at least one heat pipe \(20\), a metallic sleeve \(30\), and a plurality of heat-dissipating fins \(40\). The difference between the present embodiment and the previous embodiment lies in that: both ends of the metallic sleeve \(30\) are formed with a first opening \(301\) and a second opening \(302\). The second opening \(302\) is an open end \(32\) combined with a plug \(31\). The plug \(31\) seals the first opening \(301\) to form a closed end \(31\).

Although the present invention has been described with reference to the foregoing preferred embodiments, it will be understood that the invention is not limited to the details thereof. Various equivalent variations and modifications can still occur to those skilled in this art in view of the teachings of the present invention. Thus, all such variations and equivalent modifications are also embraced within the scope of the invention as defined in the appended claims.

What is claimed is:

1. A heat sink having a heat pipe protection mechanism, including:
at least one heat pipe comprising an evaporating section and a condensing section;

a metallic sleeve having a closed end and an open end opposite to the closed end, the condensing section being disposed through the open end of the metallic sleeve; and

a plurality of heat-dissipating fins each having a through-hole corresponding to the heat pipe, the metallic sleeve having the condensing section disposed therein being fitted in the through-hole.

2. The heat sink having a heat pipe protection mechanism according to claim 1, further including a heat-conducting base, and the evaporating section being combined with the heat-conducting base.

3. The heat sink having a heat pipe protection mechanism according to claim 2, wherein the heat-conducting base is provided with at least one trough corresponding to the heat pipe, and the heat pipe is located in the trough.

4. The heat sink having a heat pipe protection mechanism according to claim 2, wherein the condensing section protrudes out of an end surface of the heat-conducting base.

5. The heat sink having a heat pipe protection mechanism according to claim 2, wherein the condensing section protrudes out of an end surface of the heat-conducting base.

6. The heat sink having a heat pipe protection mechanism according to claim 1, wherein both ends of the metallic sleeve have an opening respectively, one of two openings is combined with a plug, and the plug is configured to seal the opening to form the closed end.

7. The heat sink having a heat pipe protection mechanism according to claim 1, wherein the metallic sleeve is made of materials different from that of the heat pipe.

8. The heat sink having a heat pipe protection mechanism according to claim 7, wherein the metallic sleeve is made of aluminum or stainless steel.

9. The heat sink having a heat pipe protection mechanism according to claim 1, wherein a heat-conducting medium is applied between the heat pipe and the metallic sleeve.

10. The heat sink having a heat pipe protection mechanism according to claim 1, wherein a gap is formed between adjacent two of the heat-dissipating fins, and the periphery of the through-hole of each heat-dissipating fin is formed with an annular flange for maintaining the gap.

11. A heat sink having a heat pipe protection mechanism, including:

a heat-conducting base;

at least one heat pipe comprising an evaporating section and a condensing section, the evaporating section being combined with the heat-conducting base;

a partitioning plate fixed to the heat-conducting base and provided with at least one penetration hole corresponding to the heat pipe, the condensing section of the heat pipe protruding beyond the penetration hole;

a metallic sleeve having a closed end and an open end opposite to the closed end, the condensing section being disposed through the open end of the metallic sleeve; and

a plurality of heat-dissipating fins each having a through-hole corresponding to the heat pipe, the metallic sleeve having the condensing section disposed therein being fitted in the through-hole.

12. The heat sink having a heat pipe protection mechanism according to claim 11, wherein the heat-conducting base is provided with at least one trough corresponding to the heat pipe, and the heat pipe is located in the trough.

13. The heat sink having a heat pipe protection mechanism according to claim 11, wherein the heat pipe has a flat surface in flush with a surface of the heat-conducting base.

14. The heat sink having a heat pipe protection mechanism according to claim 11, wherein the condensing section protrudes out of an end surface of the heat-conducting base.

15. The heat sink having a heat pipe protection mechanism according to claim 11, wherein the partitioning plate is located near the open end of the metallic sleeve.

16. The heat sink having a heat pipe protection mechanism according to claim 15, wherein the penetration hole of the partitioning plate is formed into a stepped shape, and the open end of the metallic sleeve abuts against the penetration hole.

17. The heat sink having a heat pipe protection mechanism according to claim 11, wherein the partitioning plate is provided on an end surface of the heat-conducting base.

18. The heat sink having a heat pipe protection mechanism according to claim 11, wherein the partitioning plate is integrally formed together.

19. The heat sink having a heat pipe protection mechanism according to claim 11, wherein the partitioning plate and the heat-conducting base are integrally formed together.

20. The heat sink having a heat pipe protection mechanism according to claim 11, wherein both ends of the metallic sleeve have an opening respectively, one of the openings is combined with a plug, and the plug is configured to seal the opening to form the closed end.

21. The heat sink having a heat pipe protection mechanism according to claim 11, wherein the metallic sleeve is made of materials different from that of the heat pipe.

22. The heat sink having a heat pipe protection mechanism according to claim 21, wherein the metallic sleeve is made of aluminum or stainless steel, and a heat-conducting medium is applied between the heat pipe and the metallic sleeve.

23. The heat sink having a heat pipe protection mechanism according to claim 11, wherein a gap is formed between adjacent two of the heat-dissipating fins, and the periphery of the through-hole of each heat-dissipating fin is formed with an annular flange for maintaining the gap.

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