

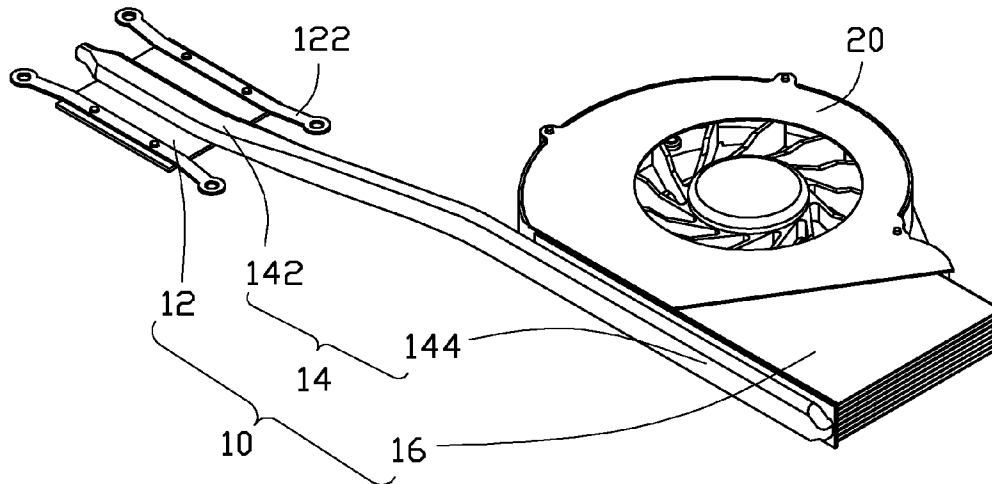


US 20120043058A1

(19) **United States**(12) **Patent Application Publication**
HWANG et al.(10) **Pub. No.: US 2012/0043058 A1**(43) **Pub. Date: Feb. 23, 2012**(54) **HEAT DISSIPATION DEVICE****Publication Classification**(75) Inventors: **CHING-BAI HWANG**, Tu-Cheng (TW); **BEN-FAN XIA**, KunShan City (CN)(51) **Int. Cl.**
F28D 15/04 (2006.01)(52) **U.S. Cl.** **165/104.26**(73) Assignees: **FOXCONN TECHNOLOGY CO., LTD.**, Tu-Cheng (TW); **FURUI PRECISE COMPONENT (KUNSHAN) CO., LTD.**, KunShan City (CN)(57) **ABSTRACT**(21) Appl. No.: **12/894,166**(22) Filed: **Sep. 30, 2010**(30) **Foreign Application Priority Data**

Aug. 20, 2010 (CN) 201010258891.2

An exemplary heat dissipation device includes a centrifugal fan comprising an air outlet, a fin assembly arranged at the air outlet, and a heat pipe comprising an evaporating section and a condensing section. The fin assembly comprises fins. The fins are stacked together with one above another along a central axis of the centrifugal fan. Each of the fins has at least a flange bent at a lateral side thereof. The flanges of the fins abut against each other and form a side face parallel to the central axis of the centrifugal fan. The condensing section is attached to and thermally contacts the side face of the fin assembly.



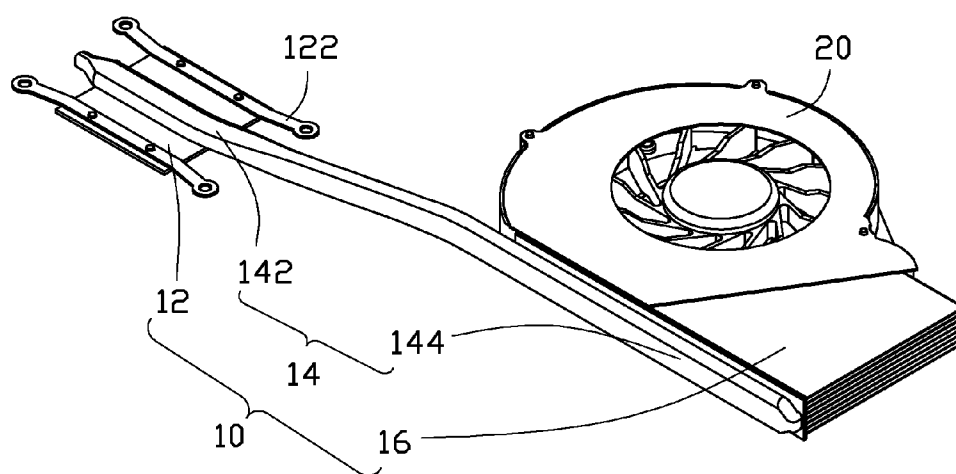


FIG. 1

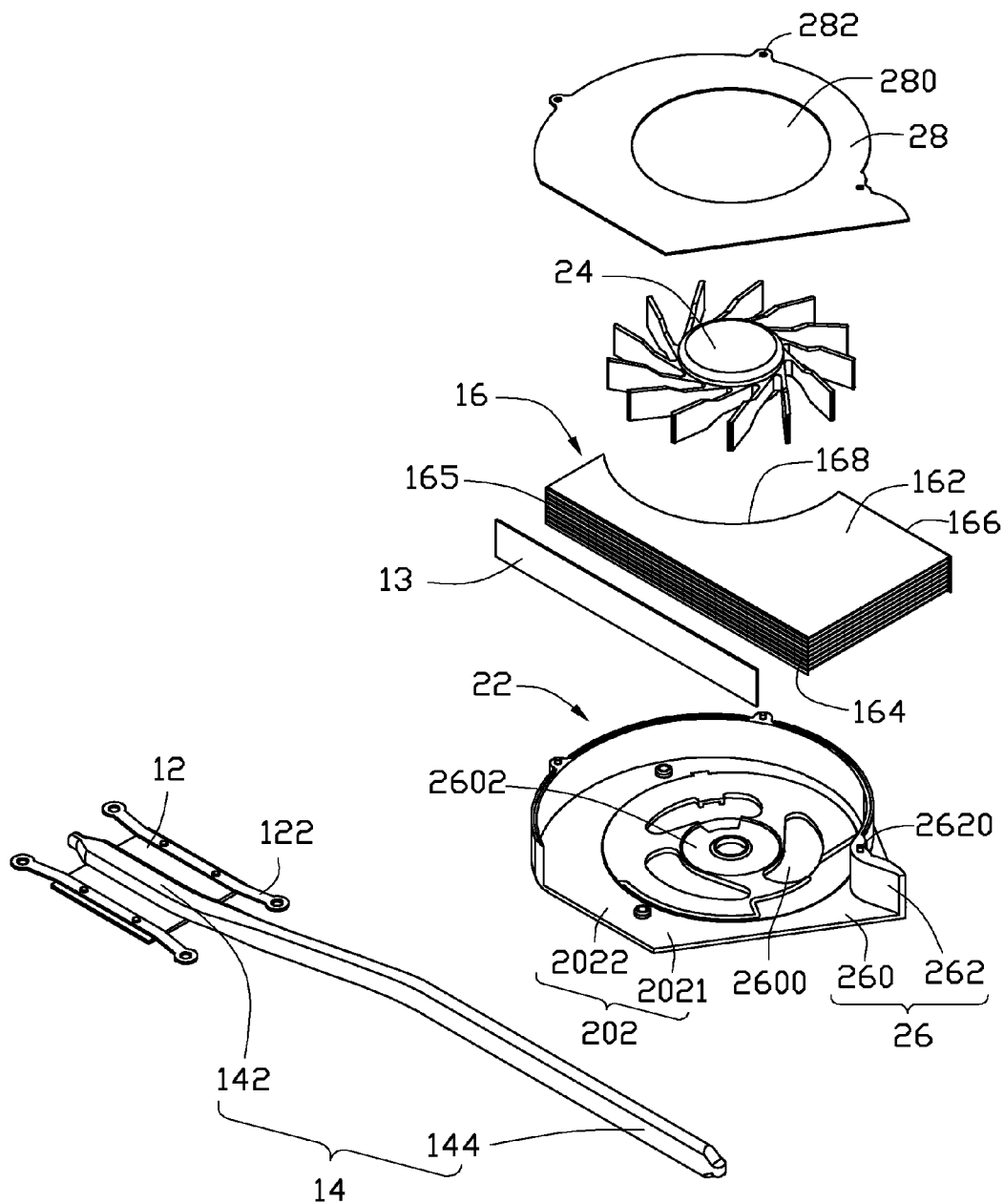


FIG. 2

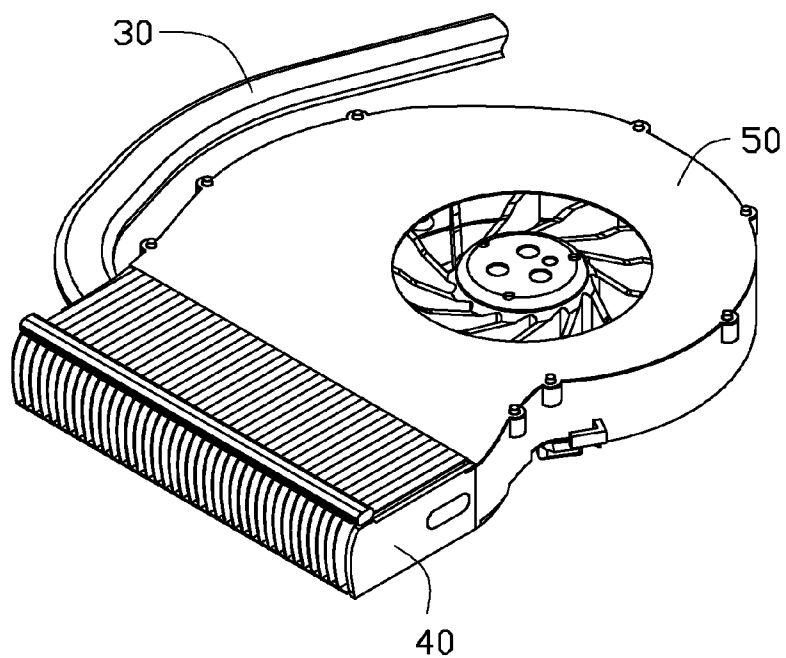


FIG. 3 (RELATED ART)

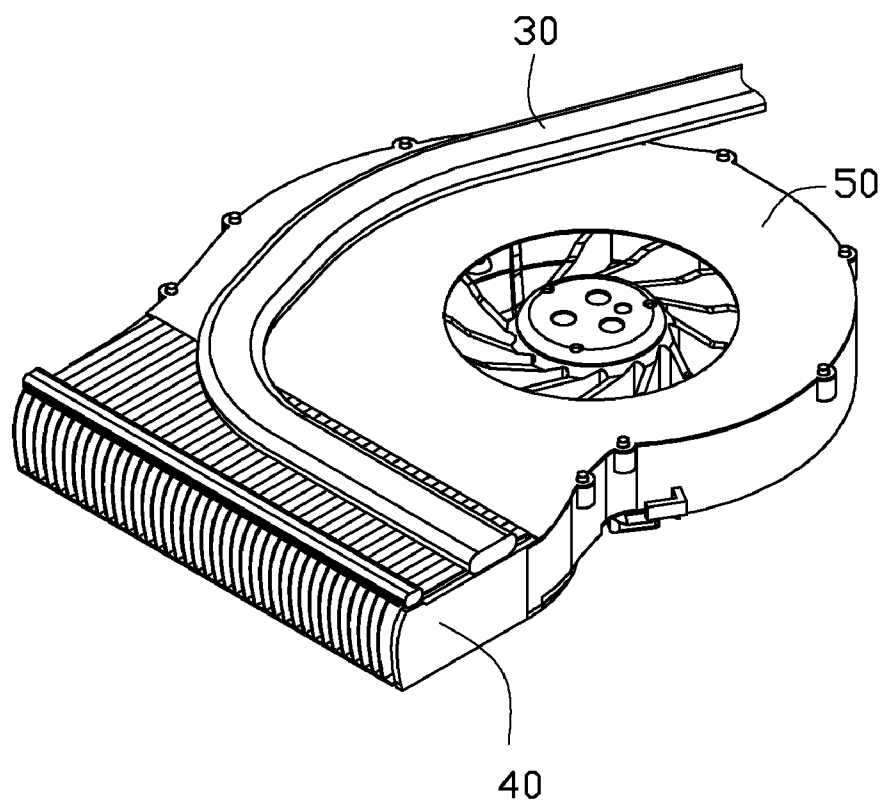


FIG. 4 (RELATED ART)

HEAT DISSIPATION DEVICE

BACKGROUND

[0001] 1. Technical Field

[0002] The disclosure relates to heat dissipation devices, and particularly to a heat dissipation device for dissipating heat generated from an electronic component.

[0003] 2. Description of Related Art

[0004] Nowadays, with the development of electronics technology, an electronic device such as a computer or a server is much thinner and smaller than before. Yet the device is able to hold many more electronic components than before. The electronic components generate a large amount of heat during operation. Usually a heat sink assembly is installed on a printed circuit board for cooling a major heat-generating electronic component mounted on the printed circuit board.

[0005] Referring to FIG. 3, a conventional heat sink assembly is shown. The heat sink assembly includes a heat pipe 30 thermally contacting the electronic component, a fin assembly 40 thermally connecting the heat pipe 30, and a centrifugal fan 50 located at a side of the fin assembly 40. The fin assembly 40 includes a plurality of fins stacked together. The centrifugal fan 50 has an air inlet and an air outlet. The centrifugal fan 50 draws cool air through the air inlet. The cool air under the action of an impeller in the centrifugal fan 50 is blown through and out of the air outlet towards the fins, and turns into hot air at the fins. The hot air then flows out of the fin assembly 40. However, the heat pipe 30 is attached to the fin assembly 40 by inserting and soldering an end of the heat pipe 30 inside the fin assembly 40. Therefore when the air flows through the fins of the fin assembly 40, the heat pipe 30 in the fin assembly 40 blocks some of the air from flowing out of the fin assembly 40.

[0006] FIG. 4 shows another conventional heat sink assembly, which is similar to the above-described heat sink assembly. In this other heat sink assembly, the heat pipe 30 is attached to the fin assembly 40 by soldering an end of the heat pipe 30 on a top face of the fin assembly 40. However, this solution increases the thickness of the entire heat sink assembly and correspondingly the thickness of the electronic device.

[0007] What is needed, therefore, is a heat dissipation device which can overcome the limitations described.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Many aspects of the present embodiments can be better understood with reference to the following drawings. The components in the drawings are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of the present embodiments. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the views.

[0009] FIG. 1 is an isometric, assembled view of a heat dissipation device in accordance with an embodiment of the disclosure.

[0010] FIG. 2 is an exploded view of the heat dissipation device of FIG. 1.

[0011] FIGS. 3-4 are isometric views of two heat sinks in accordance with related art.

DETAILED DESCRIPTION

[0012] Referring to FIG. 1, a heat dissipation device in accordance with an embodiment of the present disclosure is

shown. The heat dissipation device is adapted for cooling an electronic device (not shown) mounted on a printed circuit board (not shown), and includes a heat sink 10 and a centrifugal fan 20.

[0013] Also referring to FIG. 2, the centrifugal fan 20 includes a fan frame 22, and an impeller 24 mounted in the fan frame 22. The fan frame 22 includes a base 26, and a cover plate 28 covering the base 26. A first air inlet 280 is defined in a central portion of the cover plate 28. A plurality of through holes 282 is defined in a periphery of the cover plate 28. The base 26 includes a base plate 260, and a side wall 262 extending vertically upwardly from an outer edge of the base plate 260. The base plate 260 includes a fixing seat 2602 near a center thereof. Three second air inlets 2600 are defined in the base plate 260 around the fixing seat 2602, corresponding to the first air inlet 280 of the cover plate 28. The impeller 24 is fixed on the fixing seat 2602 of the base plate 260. An air outlet 202 is defined in the side wall 262 of the base 26, and includes a first portion 2021 and a second portion 2022. An angle between the first portion 2021 and the second portion 2022 is an obtuse angle. The air outlet 202 is perpendicular to the first air inlet 280 and the second air inlet 2600. A plurality of protruding posts 2620 protrude from a top face of the side wall 262, corresponding to the through holes 282 of the cover plate 28. The protruding posts 2620 extend through the through holes 282 of the cover plate 28 to fasten the cover plate 28 on the side wall 262. Thereby, the cover plate 28 and the base 26 cooperatively form a space (not labeled) where the impeller 24 is received.

[0014] The heat sink 10 includes a heat spreader 12, a heat pipe 14, and a fin assembly 16. The heat pipe 14 is flat, and includes an evaporating section 142 attached to the heat spreader 12 and a condensing section 144 attached to the fin assembly 16. The evaporating section 142 has a flat top face and a flat bottom face. The top and bottom faces of the evaporating section 142 are parallel to each other. The bottom face of the evaporating section 142 thermally contacts a top face of the heat spreader 12. The condensing section 144 has an inner side face and an outer side face. The inner side face and the outer side face of the condensing section 144 are parallel to each other. The inner and outer side faces of the condensing section 144 are perpendicular to the top and bottom faces of the evaporating section 14.

[0015] The heat spreader 12 is made of metal such as aluminum, copper or an alloy thereof. A bottom of the heat spreader 12 thermally contacts the electronic device to absorb heat from the electronic device. Two fastening elements 122 are disposed at two lateral sides of the top face of the heat spreader 12, for fastening the heat spreader 12 on the printed circuit board on which the electronic device is mounted.

[0016] The fin assembly 16 includes a plurality of spaced, parallel fins 162. Two opposite flanges 164 are bent and formed at two opposite lateral sides (i.e., inner and outer sides) of each fin 162. The fins 162 are stacked together one above another along a direction parallel to a central axis of the centrifugal fan 20. A plurality of horizontal airflow channels (not labeled) are formed between adjacent fins 162 of the fin assembly 16. The flanges 164 of adjacent fins 162 abut against each other and form first and second side faces 165, 166 at the outer and inner sides of the fin assembly 16. The first and second side faces 165, 166 are respectively parallel to the central axis of the centrifugal fan 20. A portion at an end of each fin 162 which is located adjacent to the impeller 24 is cut

away to thereby form an arc-shaped cutout **168**, making a length of the second side face **166** smaller than that of the first side face **165**.

[0017] In assembly, the fin assembly **16** is disposed at the air outlet **202**. The first side face **165** of the fin assembly **16** is in alignment with the second portion **2022** of the air outlet **202**, the second side face **166** of the fin assembly **16** is disposed in the first portion **2021** of the air outlet **202** and abuts against the side wall **262** of the base **26**, and the cutout **168** of the fin assembly **16** is disposed near the impeller **24** of the centrifugal fan **20**. The inner side face of the condensing section **144** of the heat pipe **14** is attached to and thermally contacts the first side face **165** of the fin assembly **16** via a heat conductive material **13**. In the illustrated embodiment, the heat conductive material **13** is a thermal tape.

[0018] During operation of the heat dissipation device, the heat spreader **12** absorbs heat generated from the electronic device, and the heat pipe **14** transfers heat in the heat spreader **12** to the fin assembly **16**. The centrifugal fan **20** draws air through the first air inlet **280** and the second air inlets **2600** into the space formed by the cover plate **28** and the base **26**. The air under the action of the impeller **24** is blown from the first portion **2021** of the air outlet **202** and out of the fin assembly **16**. Since the condensing section **144** of the heat pipe **14** is attached on the first side face **165** of the fin assembly **16**, the heat pipe **14** does not block the air flowing through the fin assembly **16**, and yet the thickness of the entire heat dissipation device is kept to a minimum.

[0019] It is believed that the embodiments and their advantages will be understood from the foregoing description, and it will be apparent that various changes may be made thereto without departing from the spirit and scope of the disclosure or sacrificing all of its material advantages, the examples hereinbefore described merely being preferred or exemplary embodiments of the disclosure.

What is claimed is:

1. A heat dissipation device comprising:
 - a centrifugal fan comprising an air outlet at a lateral side thereof;
 - a fin assembly arranged at the air outlet, the fin assembly comprising a plurality of fins, the fins being stacked together one above another along a direction substantially parallel to a central axis of the centrifugal fan, each of the fins having at least a flange bent at a lateral side thereof, the flanges of the fins abutting each other and forming a side face substantially parallel to the central axis of the centrifugal fan; and
 - a heat pipe comprising an evaporating section and a condensing section, the condensing section being attached to and thermally contacting the side face of the fin assembly.
2. The heat dissipation device of claim 1, wherein the centrifugal fan comprises a fan frame and an impeller mounted in the fan frame, the fan frame comprising a base plate, a side wall extending from an outer edge of the base plate and a cover plate connecting the side wall, the air outlet being defined in the side wall of the base, an air inlet is defined in the cover plate corresponding to the impeller.
3. The heat dissipation device of claim 1, wherein the evaporating section and the condensing section each are flat, the evaporating section comprising a flat bottom face adapted for absorbing heat generated from a heat source, the condensing section comprising a flat side face perpendicular to the

bottom face of the evaporating section, the flat side face of the condensing section thermally contacting the side face of the fin assembly.

4. The heat dissipation device of claim 3, wherein the centrifugal fan comprises a fan frame and an impeller mounted in the fan frame, the fan frame comprising a base plate, a side wall extending from an outer edge of the base plate and a cover plate connecting the side wall, the air outlet being defined in the side wall of the base, an air inlet is defined in the cover plate corresponding to the impeller.

5. The heat dissipation device of claim 3, further comprising a heat spreader, the bottom face of the evaporating section thermally contacting a top face of the heat spreader, a bottom face of the heat spreader being adapted for thermally contacting the heat source.

6. The heat dissipation device of claim 5, wherein the centrifugal fan comprises a fan frame and an impeller mounted in the fan frame, the fan frame comprising a base plate, a side wall extending from an outer edge of the base plate and a cover plate connecting the side wall, the air outlet being defined in the side wall of the base, an air inlet is defined in the cover plate corresponding to the impeller.

7. The heat dissipation device of claim 6, wherein the base plate comprises a fixing seat at a center thereof, and the impeller is fixed on the fixing seat.

8. The heat dissipation device of claim 7, wherein a plurality of air inlets are defined in the base plate around the fixing seat, corresponding to the air inlet of the cover plate.

9. The heat dissipation device of claim 8, wherein the air outlet is perpendicular to the air inlet of the cover plate and the air inlets of the base plate.

10. The heat dissipation device of claim 6, wherein each fin forms an arc-shaped cutout at an end, the arc-shaped cutout is disposed near the impeller of the centrifugal fan.

11. The heat dissipation device of claim 6, wherein the air outlet comprises a first portion and a second portion, an angle between the first portion and the second portion is an obtuse angle, the side face of the fin assembly being disposed in alignment with the second portion of the air outlet, air under an action of the impeller being blown to the fin assembly from the first portion of the air outlet.

12. The heat dissipation device of claim 1, wherein the condensing section is flat and has a flat side face, and the flat side face of the condensing section is attached to and thermally contacts the side face of the fin assembly.

13. A heat dissipation device comprising:

- a centrifugal fan comprising an air outlet at a lateral side thereof;
- a fin assembly arranged at the air outlet, the fin assembly comprising a plurality of fins, the fins being stacked together one above another along a direction substantially parallel to a central axis of the centrifugal fan, each of the fins having at least a flange bent at a lateral side thereof, the flanges of the fins abutting each other and forming a side face parallel to the central axis of the centrifugal fan;
- a heat pipe comprising a flat evaporating section and a flat condensing section, the evaporating section comprising a flat bottom face, the condensing section comprising a flat side face thermally contacting the side face of the fin assembly; and
- a heat spreader, the bottom face of the evaporating section thermally contacting a top face of the heat spreader, a

bottom face of the heat spreader being adapted for thermally contacting a heat source.

14. The heat dissipation device of claim **13**, wherein the side face of the condensing section is vertical to the bottom face of the evaporating section.

15. The heat dissipation device of claim **14**, wherein the centrifugal fan comprises a fan frame and an impeller mounted in the fan frame, the fan frame comprising a base plate, a side wall extending from an outer edge of the base plate and a cover plate connecting the side wall, the air outlet being defined in the side wall of the base, an air inlet is defined in the cover plate corresponding to the impeller.

16. The heat dissipation device of claim **15**, wherein the base plate comprises a fixing seat at a center thereof, and the impeller is fixed on the fixing seat.

17. The heat dissipation device of claim **16**, wherein a plurality of air inlets are defined in the base plate around the fixing seat, corresponding to the air inlet of the cover plate.

18. The heat dissipation device of claim **17**, wherein the air outlet is perpendicular to the air inlet of the cover plate and the air inlets of the base plate.

19. The heat dissipation device of claim **15**, wherein each fin forms an arc-shaped cutout at an end, the arc-shaped cutout is disposed near the impeller of the centrifugal fan.

20. The heat dissipation device of claim **15**, wherein the air outlet comprises a first portion and a second portion, an angle between the first portion and the second portion is an obtuse angle, the side face of the fin assembly being disposed in alignment with the second portion of the air outlet, air under an action of the impeller being blown to the fin assembly from the first portion of the air outlet.

* * * * *