A heat dissipation device includes a heat sink, a fan mounted on a top side of the heat sink and a fan holder connecting the heat sink with the fan. The fan includes a blade assembly and a frame enclosing the blade assembly. The fan holder includes a supporting portion engaging with the heat sink. A connecting plate extends upwardly from an edge of the supporting portion. A ridge extends angularly and downwardly from an inner surface of the connecting plate. An operating plate extends downwardly from a bottom end of the connecting plate. The operating plate is pressed inwardly or pulled outwardly to make the ridge of the connecting plate space from or engage with the frame of the fan.
FIG. 2
FAN ASSEMBLY AND HEAT DISSIPATION DEVICE HAVING THE SAME

BACKGROUND

[0001] 1. Technical Field

[0002] The present invention relates to heat dissipation devices and, particularly, to a fan assembly capable of being conveniently assembled to and disassembled from a heat sink, and a heat dissipation device having such a fan assembly and a heat sink.

[0003] 2. Description of Related Art

[0004] A heat sink is usually placed in thermal contact with a heat generating electronic device such as a central processing unit (CPU), and transfers heat through conduction away from the heat generating electronic device so as to prevent overheating of the heat generating electronic device.

[0005] Typically, a fan is mounted on a side of a heat sink by a fan holder to improve heat dissipation efficiency of the heat sink. The fan comprises a blade assembly and a frame enclosing the blade assembly. Diagonally corners of the frame define two mounting holes, respectively. Two elastic pins extend upwardly from diagonally corners of the fan holder and corresponds to the mounting holes of the frame. The elastic pins of the fan holder are pressed into the mounting holes of the frame. When the elastic pins extend through the mounting holes, the elastic pins expand and firmly contacts the frame. In that state, the fan and the fan holder are assembled together. However, it is difficult to disassemble the fan from the fan holder, and technical tools may be used. This is very time-consuming and troublesome.

[0006] For the foregoing reasons, there is a need in the art for a heat dissipation device which can overcome the limitations described.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a perspective view of a heat dissipation device in accordance with an embodiment of the present disclosure, in which the heat dissipation device is mounted on a printed circuit board.

[0008] FIG. 2 is an exploded view of the heat dissipation device in FIG. 1.

[0009] FIG. 3 is an inverted view of FIG. 2.

DETAILED DESCRIPTION

[0010] Referring to FIGS. 1-2, an embodiment of a heat dissipation device comprises a heat sink 20, a fan 40 mounted on a top side of the heat sink 20 and a fan holder 30 connecting the heat sink 20 with the fan 40.

[0011] Referring to FIG. 3 also, the heat sink 20 comprises a cylindrical heat absorbing portion 21, a number of first fins 23 and a number of second fins 24 extending outwardly and radially from a periphery of the heat absorbing portion 21. The first fins 23 are divided into four groups which are equidistantly spaced from each other and oriented toward different directions by four mounting arms 26 extending evenly from the periphery of the heat absorbing portion 21. Each of the first fins 23 comprises an elongated first connecting plate 231 connected to the heat absorbing portion 21 and two elongated and angled first extending plates 233 extending outwardly from the outermost end of the first connecting plate 231. The second fins 24 are divided into four groups also. Each group of the second fins 24 comprises two adjacent second fins 24 positioned between the two adjacent groups of the first fins 23. Each second fin 24 comprises an elongated second connecting plate 241 extending from the heat absorbing portion 21 and two elongated and angled second extending plates 243 extending outwardly from the outermost end of the second connecting plate 241. A height of the first connecting plate 231 is equal to that of the second connecting plate 241. Heights of the first and second extending plates 233, 243 are less than that of the heat absorbing portion 21. A width of the first connecting plate 231 is equal to that of the second connecting plate 241. A width of the first extending plate 233 is larger than that of the second extending plate 243. Tops of the first and second fins 23, 24 and a top surface of the heat absorbing portion 21 are coplanar. The bottom portion of the heat absorbing portion 21 is below bottom ends of the first and second fins 23, 24; thus a step 25 is defined at a bottom portion of the heat sink 20.

[0012] A height of the mounting arm 26 is equal to that of the first fin 23. A width of the mounting arm 26 is equal to that of the first fin 23. A thickness of the mounting arm 26 is larger than that of the first and second fins 23, 24. Each of the mounting arms 26 is sandwiched between the two adjoining second fins 24. An inner section of the mounting arm 26 and the second connecting plate 241 of the two adjoining second fins 24 are integrated, and an outer section of the mounting arm 26 is spaced from the second connecting plates 241 of the two adjoining second fins 24. An outmost end of the mounting arm 26 defines two spaced first engaging portions 261 to engage with the fan holder 30 and a second engaging portion 263 to engage with a printed circuit board.

[0013] Each of the first engaging portions 261 is an elongated groove and extends along a height direction of the mounting arm 26. The eight first engaging portions 261 are divided into first and second groups. The first engaging portions 261, which are located at front sides of the mounting arms 26, respectively, along a clockwise direction, as viewed from FIG. 2, belong to the first group. The first engaging portions 261, which are located at rear sides of the mounting arms 26, respectively, belong to the second group. The first and second groups of the first engaging portions 261 are engaged with the fan holder 30. The second engaging portion 263 is positioned between the two first engaging portions 261 and has a C-shaped configuration. Four screws 50 extend through the second engaging portions 263 and engage with the printed circuit board 10 to mount the heat sink 20 on the printed circuit board 10.

[0014] The fan holder 30 is integrally formed by a plastic material and comprises an annular engaging member 31 and four supporting portions 33 extending outwardly from a top end of the engaging member 31. The four supporting portions 33 are equidistantly spaced from each other. The two adjacent supporting portions 33 are connected by a linking plate 35 which extends inwardly from an edge of the engaging member 31. The supporting portion 33 is a triangular plate and is beyond the engaging member 31. A connecting plate 331 extends upwardly from an edge of the supporting portion 33. A ridge 3312 extends angulately and downwardly from a top end of the connecting plate 331 to press the fan 40. An operating plate 333 extends downwardly from a bottom end of the connecting plate 331. The connecting plate 331, the operating plate 333 and the ridge 3312 are integrally made of elastic material. The operating plate 333 is pressed inwardly or pulled outwardly to make the ridge 3312 of the connecting plate 331 space from or engage with the fan 40. A through hole 332 is defined in the supporting portion 33 and is adjacent to a joint of the supporting portion 33 and the connecting plate 331. An elastic pin 335 extends upwardly from a top surface of the supporting portion 33 and is located at an outer side of the connecting plate 331. The pins 335 engage with the fan 40. A screw hole 339 is defined at a corner of the support-
Four screws extend through the screw holes and engage with the first or second group of the first engaging portions of the first group of the first engaging portion to mount the fan holder on the heat sink. A triangular reinforcing rib is formed at a bottom surface of the supporting portion and connects with the engaging member.

The fan comprises a cubical bracket and a blade assembly received in the bracket. Central portions of four corners of the bracket are recessed; thus, four triangular mounting portions are formed at bottom end of the bracket. Central portion of the mounting portion defines a hole to receive the pin of the fan holder.

In assembly, the screws extend through the second engaging portions of the mounting arms and engage with the printed circuit board to mount the heat sink. The engaging member of the fan holder encloses a top end of the heat sink and the screw hole of the supporting portion aligns with the corresponding first engaging portion of the mounting arm. The screws extend through the screw holes and engage with the first or second groups of the first engaging portion to mount the fan holder on the heat sink. The operating plates of the fan holder are subjected to an external force, which presses the connecting plates inwardly to make the connecting plates run outwardly. Then, the external force of the operating plates is released; a resilience of the operating plates impels the connecting plates to move towards the fan holder. As a result, the ridges of the connecting plates press the top surfaces of the supporting portions. Therefore, the heat dissipation device is assembled completely.

In disassembly, the operating plates are pressed inwardly to make the connecting plates run outwardly until the ridges of the connecting plates are separated from the supporting portions. Thereafter, the fan holder is taken out from the fan holder. Thus, the fan is disassembled.

It is to be understood, however, that even though numerous characteristics and advantages of the disclosure have been set forth in the foregoing description, together with details of the structure and function of the disclosure, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the disclosure to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

What is claimed is:

1. A fan assembly comprising:
   a fan comprising a blade assembly and a frame supporting the blade assembly; and
   a fan holder comprising a supporting portion, a connecting plate extending upwardly from an edge of the supporting portion, a ridge extending angularly and downwardly from the top end of the connecting plate, an operating plate extending downwardly from a bottom end of the connecting plate; wherein the operating plate is pressed inwardly or pulled outwardly to make the ridge of the connecting plate space from or engage with the frame of the fan.

2. The fan assembly as claimed in claim 1, wherein the connecting plate and the operating plate are integrally made of an elastic material.

3. The fan assembly as claimed in claim 1, wherein a pin extends upwardly from a top surface of the supporting portion and extends through the frame of the fan.

4. The fan assembly as claimed in claim 1, wherein an engaging member connects with the supporting portion, the engaging member adapted for engaging with a heat sink.

5. The fan assembly as claimed in claim 4, wherein the engaging member is annular and the supporting portion extends outwardly from a top of the engaging member.

6. The fan assembly as claimed in claim 5, wherein a reinforcing rib is formed at a bottom of the supporting portion and connects with the engaging member.

7. The fan assembly as claimed in claim 5, wherein a plurality of supporting portions are formed at the top of the engaging member.

8. The fan assembly as claimed in claim 1, wherein a through hole is defined in the supporting portion and is adjacent to a joint of the supporting portion and the connecting plate.

9. A heat dissipation device comprising:
   a heat sink; a fan mounted on a top side of the heat sink, the fan comprising a blade assembly and a frame enclosing the blade assembly; and
   a fan holder comprising a supporting portion engaging with the heat sink, a connecting plate extending upwardly from an edge of the supporting portion, a ridge extending angularly and downwardly from a top end of the connecting plate, an operating plate extending downwardly from a bottom end of the connecting plate; wherein the operating plate is pressed inwardly or pulled outwardly to make the ridge of the connecting plate space from or engage with the frame of the fan.

10. The heat dissipation device as claimed in claim 9, wherein a pin extends upwardly from a top surface of the supporting portion and through the frame of the fan.

11. The heat dissipation device as claimed in claim 10, wherein an engaging member connects with the supporting portion, and the engaging member encloses a top end of the heat sink thereina.

12. The heat dissipation device as claimed in claim 9, wherein the heat sink comprises a heat absorbing portion and a plurality of mounting arms extending outwardly and radially from a periphery of the heat absorbing portion, a screw extends through the supporting portion of the fan holder and engages with a corresponding mounting arm to mount the fan holder on the heat sink.

13. The heat dissipation device as claimed in claim 12, wherein each of the fins comprises a plurality of fins extending outwardly and radially from a periphery of the heat absorbing portion, and a bottom end of the heat absorbing portion is below bottom ends of the fins.

14. The heat dissipation device as claimed in claim 13, wherein each of the fins comprises a connecting plate connected to the heat absorbing portion and two angled extending plates extending outwardly from an outmost end of the connecting plate.

15. The heat dissipation device as claimed in claim 14, wherein the fins are divided a plurality of groups and each group of the fins is sandwiched between two adjacent mounting arms.