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(54) **HEAT DISSIPATION DEVICE**

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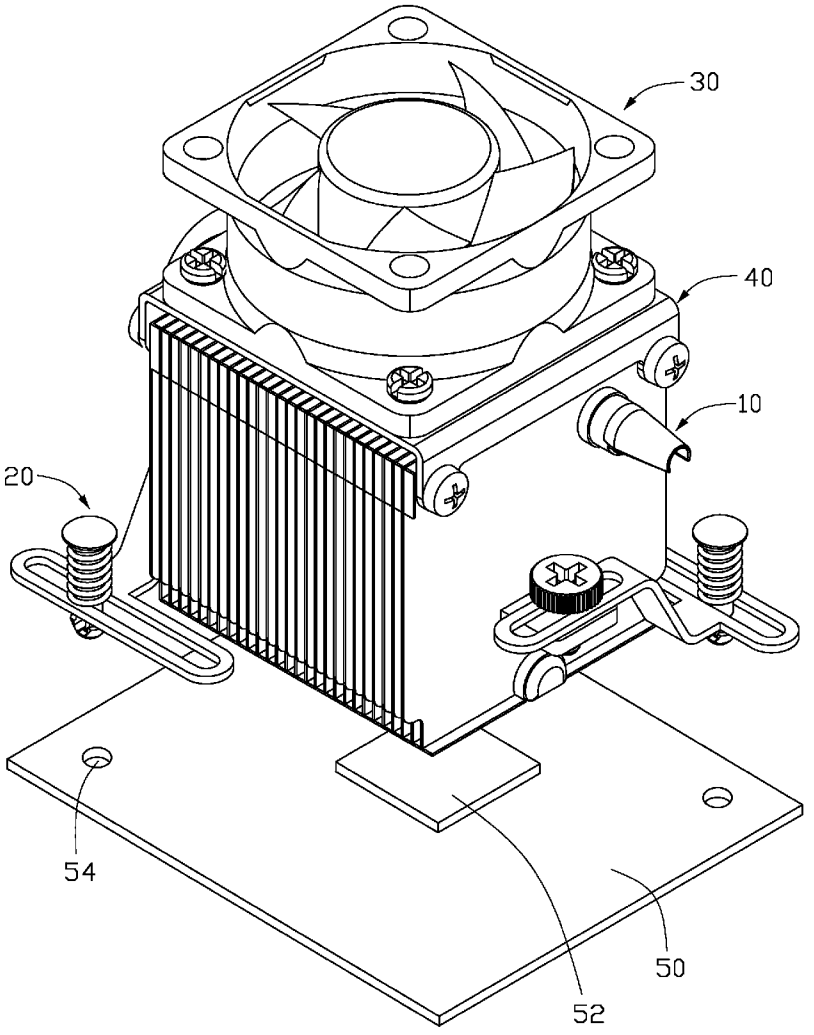
(57) **ABSTRACT**

A heat dissipation device used for dissipating heat from an electronic device mounted on a printed circuit board (PCB), includes a heat sink contacting with the electronic device, a locking device mounted on the heat sink and securing the heat sink onto the PCB. The locking device comprises a supporting plate extending through the heat sink, two arms respectively and slidably fixed on two opposite ends of the supporting plate and two fastening devices respectively slidably fixed to the two arms. The two arms can move along a first direction about the heat sink, and the two fastening devices can move along a second direction about the arms, thereby aligning the two fastening devices with two through holes defined in the printed circuit board, respectively.



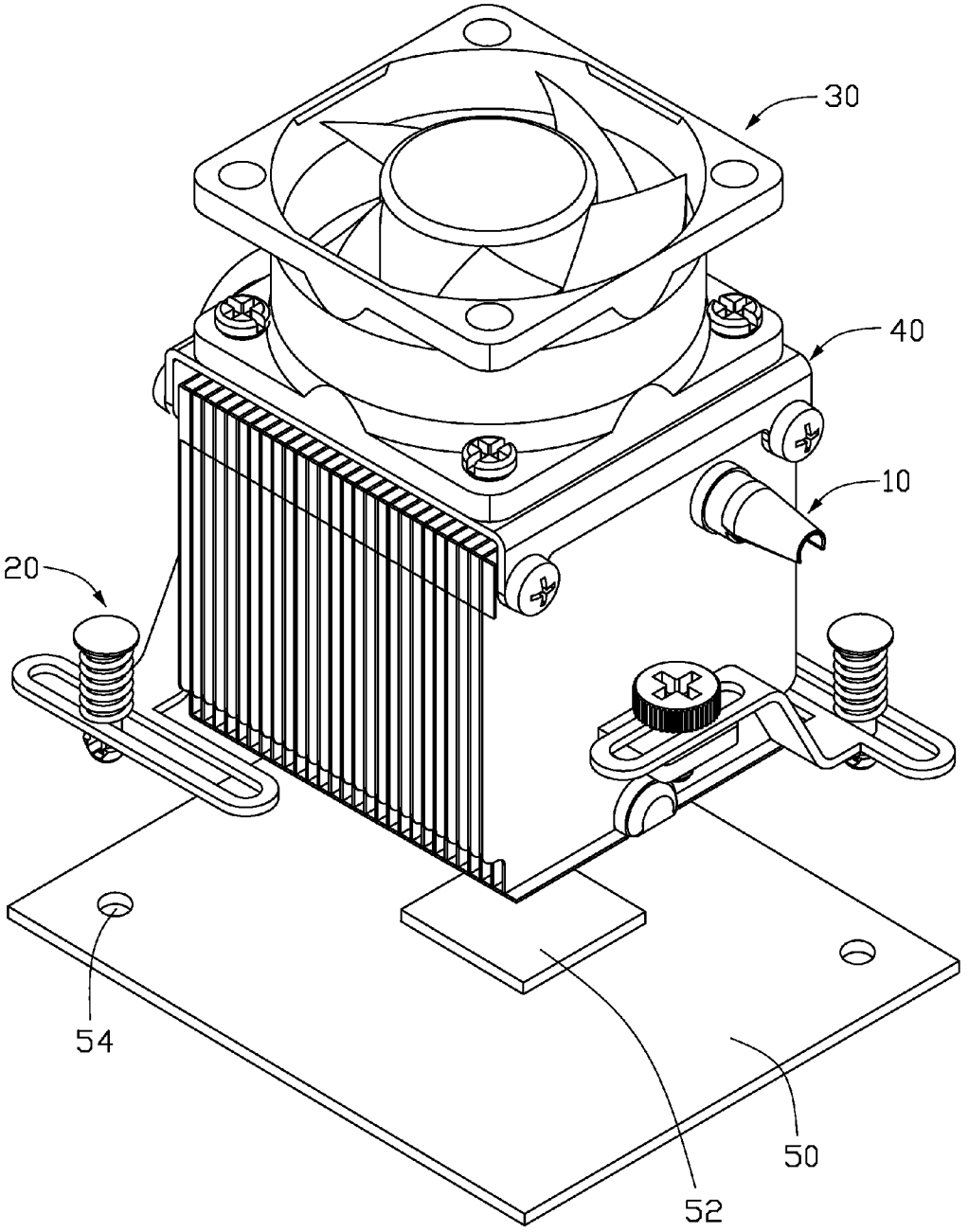



FIG. 1

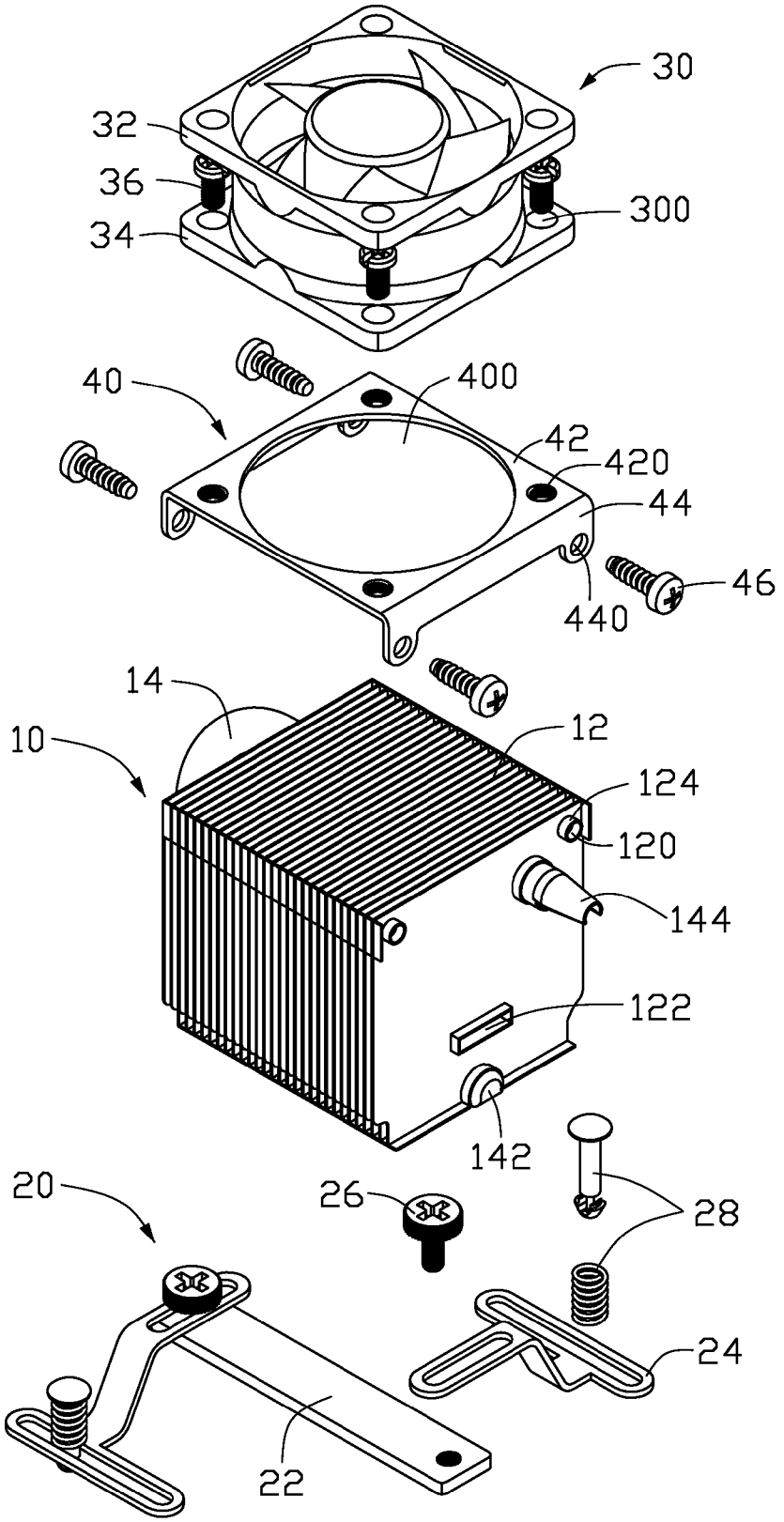

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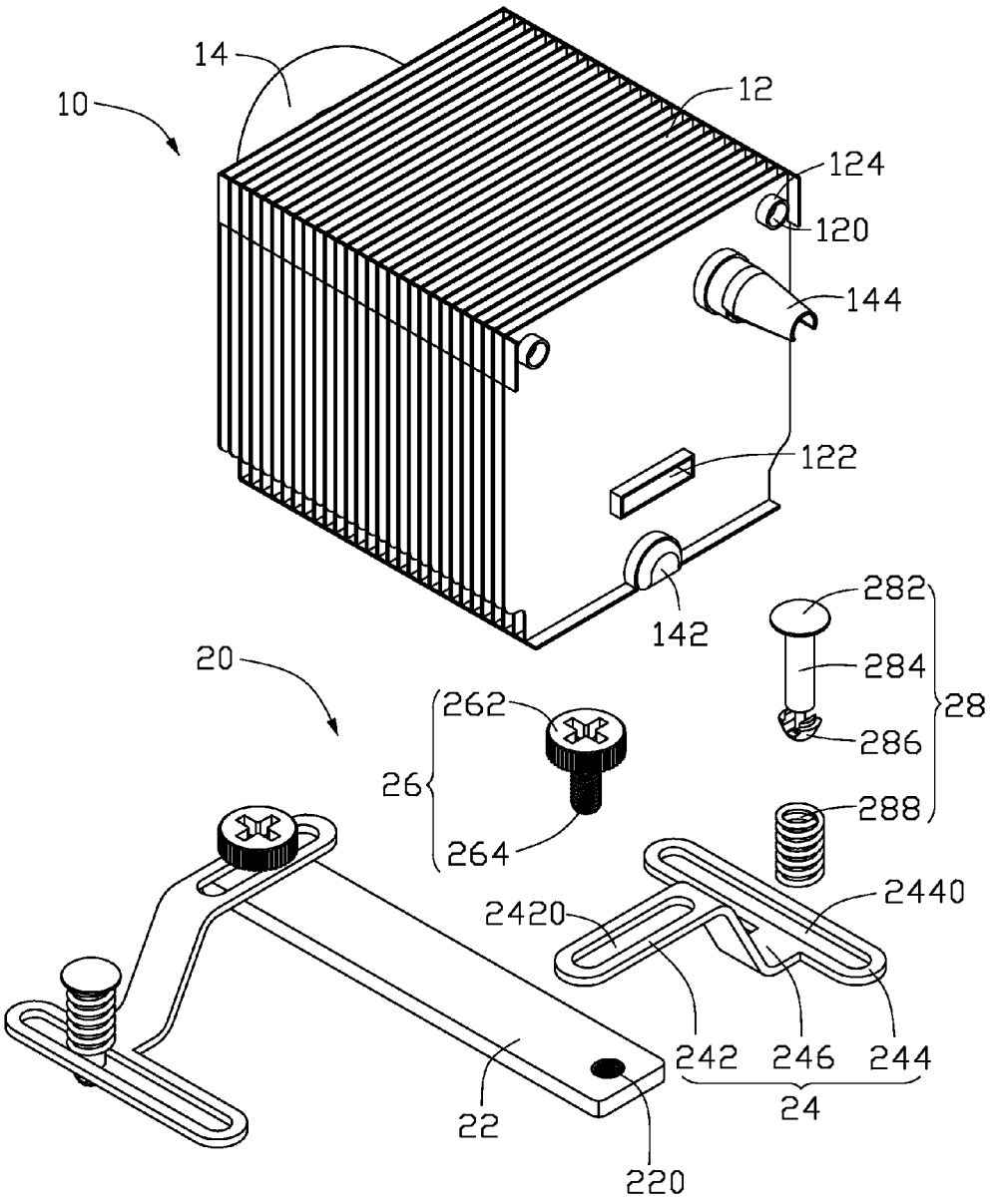
FIG. 2


14
10
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124
120
144
122
142
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284
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242
246
244
24
22
220

FIG. 3

# HEAT DISSIPATION DEVICE

## BACKGROUND OF THE INVENTION

**[0001]** 1. Field of the Invention

**[0002]** The present invention relates generally to a heat dissipation device, and more particularly to a heat dissipation device compatible with differently-configured printed circuit boards.

**[0003]** 2. Description of Related Art

**[0004]** With development in computer technology, electronic devices operate at high speed. It is well known that higher speed the electronic devices operate at, more heat they generate. If the heat is not dissipated duly, the stability of the operation of the electronic devices will be impacted severely. Generally, in order to ensure the electronic device to run normally, a heat sink is used to dissipate the heat generated by the electronic device.

**[0005]** Conventionally, in order to keep the heat sink intimately contacting with the electronic device mounted on a printed circuit board (PCB), a securing mechanism is utilized to secure the heat sink to the PCB. The heat sink generally has a fixing bracket mounted on a bottom thereof. The fixing bracket defines a plurality of through holes at corners thereof. A plurality of retaining pillars each having a threaded hole defined therein, is provided at the PCB, surrounding the electronic device. The plurality of through holes of the fixing bracket is in alignment with the threaded holes of the retaining pillars, respectively. In assembly, a plurality of screws extends through the through holes of the fixing bracket and further engages in the threaded holes of the retaining pillars of the PCB, respectively, thereby securing the heat sink to the PCB. However, the heat sink is only compatible with the PCB with the threaded holes completely in alignment with the through holes of the fixing bracket of the heat sink. When a PCB having a layout of threaded holes different from that of the above-mentioned PCB due to different standards, is used, the pillars on the printed circuit board cannot be aligned with the through holes of the heat sink any more, and an engagement of the heat sink on the printed circuit board becomes impossible.

**[0006]** What is needed, therefore, is a heat dissipation device which can overcome the above disadvantages.

## SUMMARY OF THE INVENTION

**[0007]** A heat dissipation device used for dissipating heat from an electronic device mounted on a printed circuit board (PCB), includes a heat sink contacting with the electronic device, a locking device mounted on the heat sink and securing the heat sink onto the PCB. The locking device comprises a supporting plate extending through the heat sink, two arms respectively fixed on two opposite ends of the supporting plate and two fastening devices respectively mounted at the two arms. The two arms can move along a first direction about the heat sink, and the two fastening devices can move along a second direction about the arms which is perpendicular to the first direction. Since the arms and the fastening devices are all movable with respect to the heat sink, the fastening devices can be adjusted to be accurately locked into through holes in the printed circuit board, and accordingly, the locking device is able to be suitable for printed circuit boards with different layouts.

**[0008]** Other advantages and novel features will become more apparent from the following detailed description of preferred embodiments when taken in conjunction with the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** 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 several views.

**[0010]** FIG. **1** is an assembled view of a heat dissipation device in accordance with an embodiment of the present invention, with a printed circuit board located therebelow.

**[0011]** FIG. **2** is an exploded view of the heat dissipation device of FIG. **1**.

**[0012]** FIG. **3** is an enlarged view of a heat sink and a locking device of the heat dissipation device of FIG. **2**.

## DETAILED DESCRIPTION OF THE INVENTION

**[0013]** Referring to FIG. **1**, a heat dissipation device in accordance with an embodiment of the present invention is used for dissipating heat from an electronic device **52** mounted on a printed circuit board (PCB) **50**. The heat dissipation device includes a heat sink **10** contacting with the electronic device **52**, a locking device **20** mounted on the heat sink **10** and securing the heat sink **10** onto the PCB **50**, a fan **30**, and a fixture **40** connecting the fan **30** with the heat sink **10**.

**[0014]** Also referring to FIG. **2**, the heat sink **10** includes a plurality of fins **12** connected together and a heat pipe **14** extending through the fins **12**. Each fin **12** is made of a metal having a high heat conductivity, such as aluminum or copper. The heat pipe **14** is U-shaped and has an evaporating section **142** and a condensing section **144**. The evaporating section **142** of the heat pipe **14** is inserted into a center of a bottom of the fins **12** and has a bottom surface coplanar with that of the fins **12**. The condensing section **144** of the heat pipe **14** is inserted into an upper part of the fins **12**. Two annular flanges **124** are extended horizontally from two opposite ends of an upper part of each fin **12** to define two threaded holes **120** surrounded by the two annular flanges **124**, respectively. The fins **12** cooperatively define a channel **122** located above the evaporating section of the heat pipe **14**.

**[0015]** Also referring to FIG. **3**, the locking device **20** is used for securing the heat sink **10** to the PCB **50**. The locking device **20** includes a rectangular supporting plate **22**, two arms **24** respectively secured to two ends of the supporting plate **22** by two screws **26**, and two fastening devices **28** respectively and engagingly retained in the two arms **24** for engaging in two through holes **54** in the PCB **50**. The supporting plate **22** can extend through the channel **122** of the heat sink **10** and expose the two ends thereof out of two lateral sides of the heat sink **10**. The two ends of the supporting plate **22** each define a threaded hole **220**. Each of the two arms **24** is integrally formed of a metal plate and includes a first mounting portion **242**, a second mounting portion **244** and a connecting portion **246** extending slantwise and downwardly from one end of the first mounting portion **242** to connect one side of the second mounting portion **244**. The first mounting portion **242** and the second mounting portion **244** are perpen-

dicular to each other, whereby the arm **24** has a T-shaped projection at a horizontal plane. The first mounting portion **242** defines an elongated through hole **2420** therein, which extends a length substantially the same as that of the first mounting portion **242**. The elongated through holes **2420** are positioned to be aligned with the threaded holes **220** of the supporting plate **22**. The screws **26** can extend through the elongated through holes **2420** of the first mounting portions **242** and threadedly engage with the threaded holes **220** of the supporting plate **22** to fix the first mounting portions **242** on the two ends of the supporting plate **22**. Since the elongated through hole **2420** has a relatively large length, the screw **26** can freely move within the first mounting portion **242** along the length of the elongated through hole **2420**, whereby the position of each arm **24** along a first direction, i.e., a front-to-rear direction of the heat sink **10** is adjustable. The second mounting portion **244** has an elongated through hole **2440** therein, which has a length substantially the same as that of the second mounting portion **244**. The elongated through holes **2440** are positioned to be aligned with the through holes **54** in the PCB **50**. The fastening devices **28** can extend through the elongated through holes **2440** of the second mounting portions **244** and engage in the through holes **54** in the PCB **50**, to mount the second mounting portions **244** to the PCB **50**. Like the screws **26**, each fastening device **28** is also capable of freely moving within the second mounting portion **244** along the elongated through hole **2440**, thereby adjusting the position thereof along a second direction, i.e., a lateral direction of the heat sink **10**. The two fastening devices **28** each include a body and a spring **288** encircling the body. The body is integrally made of plastic and includes a head **282**, a shaft **284** extending downwardly from a center of the head **282** and a wedge-shaped and elastic retaining block **286** formed at a distal end of the shaft **284**. The two screws **26** each include a head **262** and a threaded shaft **264** extending downwardly from a center of the head **262**.

**[0016]** The fixture **40** is used for fixing the fan **30** on the heat sink **10** and includes a main body **42** and two mounting plates **44** extending perpendicularly and downwardly from two lateral edges of the main body **42**. The main body **42** defines a circular inlet **400** in a center thereof for allowing an airflow generated by the fan **30** therethrough. The main body **42** defines four threaded holes **420** at four corners thereof around the inlet **400**, corresponding to four through holes **300** of the fan **30**. Four screws **36** extend through the through holes **300** of the fan **30** and threadedly engage in the four threaded holes **420** of the main body **42** to attach the fan **30** to the fixture **40**. The two mounting plates **44** each define two through holes **440** at two ends thereof corresponding to the two threaded holes **120** of the heat sink **10**. Four screws **46** extend through the through holes **440** of the two mounting plates **44** and threadedly engage in the threaded holes **120** of the flanges **124** of the heat sink **10** to attach the fixture **40** to the heat sink **10**.

**[0017]** The fan **30** is attached to a top surface of the fixture **40** and includes an upper flange **32** and a lower flange **34**. The four through holes **300** are defined in each of the upper flange **32** and the lower flange **34**. The screws **36** extend through the through holes **300** in the lower flange **34**.

**[0018]** In assembly, the fan **30** is attached to the fixture **40** by the four screws **36**; and the fixture **40** is then attached to the heat sink **10** by the four screws **46**. The supporting plate **22** is brought to extend through the channel **122** of the heat sink **10** with the two ends thereof extending out of the two lateral sides of the heat sink **10**. The screws **26** are brought to extend through the elongated through holes **2420** of the first mounting portions **242** and are driven to threadedly engage in the threaded holes **220** of the supporting plate **22**. Before the first mounting portions **242** are firmly fixed on the two ends of the supporting plate **22**, the first mounting portions **242** can move along the front-to-rear direction by moving the elongated through holes **2420** relative to the screws **26**, to adjust the positions of the elongated through holes **2440** of the second mounting portions **244** until they are in alignment with the through holes **54** of the PCB **50**. Then, the two screws **26** are screwed tightly into the threaded holes **220**. Thereafter, the two fastening devices **28**, which have been already inserted into the elongated through holes **2440** in a manner that the springs **288** are compressed between the heads **282** and the second mounting portions **244**, are brought to slide within the elongated through holes **2440** so as to be aligned with the two through holes **54** in the PCB **50**, respectively. The fastening devices **28** are pushed downwardly toward the through holes **54** in the PCB **50** by depressing the heads **282** of the fastening devices **28**. The springs **288** are further depressed by the heads **282** of the fastening devices **28** toward the PCB **50**, exerting downward pressing forces on top faces of the second mounting portions **244**. Meanwhile, the retaining blocks **286** of the fastening devices **28** are inserted into the through holes **54** in the PCB **50** to engage with a bottom face of the PCB **50**, thereby locking the fastening devices **28** to the PCB **50**. Thus, the heat dissipation device is secured to the PCB **50**, and the heat sink **10** has an intimate contact with the electronic device **52**.

**[0019]** Due to the adjustable design of the fastening devices **28**, the heat dissipation device can be compatible with PCBs having different layouts, thereby increasing the flexibility of the locking device **20**.

**[0020]** It is believed that the present invention and its 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 invention or sacrificing all of its material advantages, the examples hereinbefore described merely being preferred or exemplary embodiments of the invention.

What is claimed is:

**1**. A heat dissipation device for dissipating heat generated by an electronic device mounted on a printed circuit board, the heat dissipation device comprising:

a heat sink; and

a locking device for mounting the heat sink on the printed circuit board, the locking device comprising two arms respectively slidably mounted at two opposite lateral sides of the heat sink and two fastening devices respectively slidably mounted to the two arms, wherein the two arms can move on the heat sink along a first direction, and the two fastening devices can move on the arms along a second direction different from the first direction.

**2**. The heat dissipation device as claimed in claim **1**, wherein the first direction is perpendicular to the second direction.

**3**. The heat dissipation device as claimed in claim **1**, wherein the locking device further comprises a supporting plate attached to the heat sink, two ends of the supporting plate being respectively located out of the two opposite lateral sides of the heat sink and respectively connecting the two arms.

**4**. The heat dissipation device as claimed in claim **3**, wherein each of the two arms comprises a first mounting portion fixed on a corresponding one of the two ends of the supporting plate and a second mounting portion, the two fastening devices being respectively inserted thought the second mounting portions of the arms.

**5**. The heat dissipation device as claimed in claim **4**, wherein the first mounting portion and the second mounting portion respectively define an elongate first through hole and an elongate second through hole, and the elongate first holes of the two arms can move over the supporting plate, and the two fastening devices can move along the second elongate through holes of the two arms.

**6**. The heat dissipation device as claimed in claim **5**, wherein the two ends of the supporting plate each define a threaded hole, a screw extending through the elongate first through hole of the first mounting portion and engaging in the threaded hole of the supporting plate.

**7**. The heat dissipation device as claimed in claim **4**, wherein the first mounting portion and second mounting portion are perpendicular to each other, the two arms each further comprising a connecting portion interconnecting the first mounting portion and the second mounting portion.

**8**. The heat dissipation device as claimed in claim **7**, wherein the first mounting portion and the second mounting portion are respectively located at two adjacent sides of the heat sink.

**9**. The heat dissipation device as claimed in claim **8**, wherein the connecting portion extends slantwise and downwardly from the first mounting portion to connect with the second mounting portion.

**10**. The heat dissipation device as claimed in claim **4**, wherein the two fastening devices each comprise a head, a shaft extending downwardly from the head, a retaining portion formed at a distal end of the shaft and a spring encircling the shaft, the spring being compressed between the head and a top surface of the second mounting portion, the shaft extending through the second mounting portion.

**11**. The heat dissipation device as claimed in claim **3**, wherein the heat sink comprises a plurality of fins connected together, and the first direction is parallel to the plurality of fins.

**12**. The heat dissipation device as claimed in claim **11**, wherein the plurality of fins defines a channel along the second direction, the supporting plate being inserted into the channel in the plurality of fins, a fan being mounted on a top of the heat sink.

**13**. The heat dissipation device as claimed in claim **11**, wherein the heat sink further comprises a heat pipe which comprises an evaporating section and a condensing section, the evaporating section being inserted into a center of a bottom of the plurality of fins and having a bottom surface coplanar with that of the plurality of fins, the condensing section being inserted into the plurality of fins and located above the evaporating section.

**14**. A heat dissipation device comprising:

a heat sink; and

a locking device for mounting the heat sink on a printed circuit board, comprising an arm movably attached to the heat sink and a fastening device movably attached to the arm, wherein the arm and the fastening device are movable along different directions to align the fastening device with a selected part of the printed circuit board, whereby the fastening device can be accurately secured with the selected part of the printed circuit board.

**15**. The heat dissipation device as claimed in claim **14**, wherein the arm is movable along a first direction perpendicular to a second direction along which the fastening device is movable.

**16**. The heat dissipation device as claimed in claim **14**, wherein the arm comprises a first mounting portion slidably mounted to the heat sink and a second mounting portion to which the fastening device is slidably attached.

**17**. The heat dissipation device as claimed in claim **16**, wherein the second mounting portion is located at a level lower than that where the first mounting portion is located.

**18**. The heat dissipation device as claimed in claim **15**, wherein the locking device further comprises a plate horizontally extending through the heat sink along the second direction, the arm being attached to an end of the plate which extends beyond the heat sink.

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