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(54) **Fins-type heat sink and method for assembling the same**

(57) In a heat sink and a method for assembling the same, the heat sink includes a base (10), a heat pipe (11), fins (12), a presser (13) and caps (14). The presser (13) is provided with through-holes (130). The periphery of the through-hole (130) is provided with an annular neck (131), so that the distal end of the heat pipe (11) can penetrate the through-hole (130). The periphery of each annular neck (131) is provided with notches (132) on the presser (13). Each cap (14) covers on the annular neck (131), and it extends downwards to form protruding flaps (140). The flap (140) penetrates the notch (132) and is folded outwards to abut the bottom surface of the presser (13). According to the assembling method, via the presser (13) and the caps (14), the fins (12) can be assembled with the heat pipe (11) tightly.

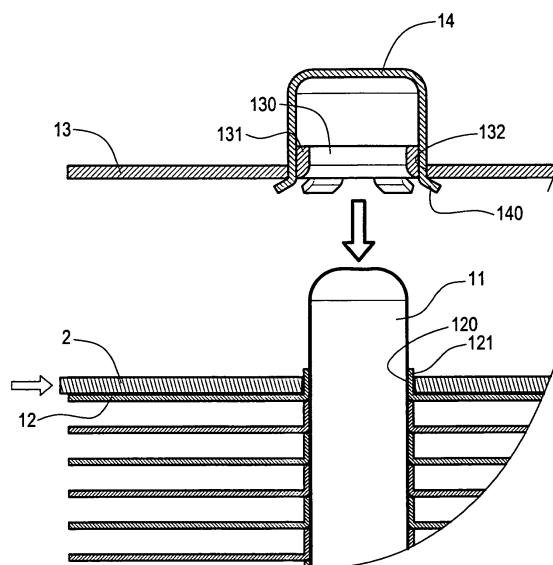


FIG.8

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a technique of assembling a heat sink, and in particular to an assembling structure for reinforcing heat pipes and fins and a method for assembling the same.

2. Description of Prior Art

[0002] As shown in Fig. 1, the conventional heat sink 1a includes a base 10a, at least one heat pipe 11a that is bent to upright on the base 10a, and a plurality of fins 12a provided on the heat pipe 11a. With the base 10a being brought into thermal contact with a heat source (not shown), the heat generated by the heat source can be transferred to the heat pipe 11a via the thermal contact with the base 10a. Then, the heat pipe 11a conducts the heat to the respective fins 12a, thereby dissipating the heat. Via this arrangement, a heat-dissipating effect can be achieved.

[0003] However, in the above-mentioned heat sink 1a, one end of the heat pipe 11a is an inactive end 110a because the diameter of the inactive end 110a is reduced when the heat pipe 11a is subjected to a sealing process. As a result, when the fins 12a are disposed on the heat pipe, this inactive end 110a cannot fit with the fins 12a tightly. Therefore, after the fins 12a are disposed on the heat pipe 11a piece by piece orderly, the fins 12a can be only fitted tightly with the heat pipe 11a via the other end rather than the inactive end 110a. Thus, the fins 12a may fall off the heat pipe 11a easily.

[0004] Therefore, in order to overcome the above problems, the present Inventor proposes a reasonable and novel structure based on his delicate researches and expert experiments.

SUMMARY OF THE INVENTION

[0005] The present invention is to provide a fins-type heat sink and a method for assembling the same. A presser and a plurality of caps are further disposed over the respective fins of the heat sink. The presser provides a pressing force to prevent the fins from falling off the heat pipe. Further, via the caps, the presser can press the distal ends of the heat pipe, thereby preventing the separation of the presser from the heat pipe.

[0006] The present invention is to provide a fins-type heat sink, which includes a base, a heat pipe thermally connected on the base, a plurality of fins disposed on the heat pipe at intervals, a presser and a plurality of caps. Each of the fins is provided with penetrating holes. The outer periphery of the penetrating hole is formed with an annular wall. The presser is provided with through-holes for cooperating with the penetrating holes respectively.

The periphery of the through-hole is provided with an annular neck for allowing the distal end of the heat pipe to penetrate. The outer periphery of each annular neck is provided with notches on the presser. Each of the caps covers the annular neck, and it extends downwards to form protruding flaps. The flap passes through the notch to be folded outwards so as to abut the bottom surface of the presser.

[0007] The present invention is to provide a method for assembling a fins-type heat sink, which includes the steps of:

(a) A heat sink, a presser and a plurality of caps are provided. The heat sink has a heat pipe and a plurality of fins disposed on the heat pipe. The presser is provided with through-holes allowing the distal end of the heat pipe to be inserted therein. The periphery of each through-hole is provided with an annular neck. The presser is provided with notches that are arranged circumferentially outside the annular neck.
(b) The caps are covered on the annular necks of the presser. The caps each extend downwards to form protruding flaps penetrating the notches respectively.

(c) A plate-like die is disposed on the topmost fin of the heat sink.

(d) The distal end of the heat pipe penetrates the through-hole of the presser to abut inside the cap. At the same time, the flap is folded outwards by means of the plate-like die.

[0008] According to the present invention, the respective fins of the heat sink can be pressed by the presser, so that these fins cannot be detached from the heat pipe easily. By means of the pressing force exerted by the presser to the respective fins, the distal end of the heat pipe can abut inside the cap. Also, the annular neck of the presser is shrunk on the heat pipe due to the inward pressing of the cap, thereby reinforcing the strength of connection between the fins and the heat pipe and avoiding the separation of the presser from the heat pipe.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a cross-section view showing a conventional heat sink;

Fig. 2 is an exploded view showing the heat sink of the present invention;

Fig. 3 is an assembled view showing the heat sink of the present invention;

Fig. 4 is a cross-sectional view showing the heat sink of the present invention;

Fig. 5 is a flow chart showing the steps of the assembling method of the present invention;

Fig. 6 is an exploded view showing the presser and the cap of the present invention;

Fig. 7 is a schematic view showing the assembly of the presser and the cap of the present invention; Fig. 8 is a schematic view showing the operating state before the assembly of the heat sink with the presser and the cap of the present invention; Fig. 9 is a schematic view showing the operating state during the assembly of the heat sink with the presser and the cap of the present invention; and Fig. 10 is a schematic view showing the operating state after the assembly of the heat sink with the presser and the cap of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0010] In order to make the Examiner to further understand the characteristics and technical contents of the present invention, a detailed description relating thereto will be made with reference to the accompanying drawings. However, the drawings are illustrative only but not used to limit the present invention.

[0011] The present invention provides a fins-type heat sink and a method for assembling the same. Please refer to Figs. 2 and 3, which are an exploded view and an assembled view of the heat sink of the present invention respectively. The heat sink 1 includes a base 10, at least one heat pipe 11, a plurality of fins 12, a presser 13 and a plurality of caps 14.

[0012] The base 10 is made of a heat-conducting material and is attached to a heat source (not shown) for dissipating the heat generated by the heat source. The heat pipe 11 is thermally connected on the base 10. The fins 12 penetrate the heat pipe 11 and are overlapped with each other. Each of the fins 12 is made of a heat-conducting material, and it is provided with penetrating holes 120 for allowing the heat pipe 11 to penetrate therein. The periphery of each penetrating hole 120 is formed with an annular wall 121, so that the fins 12 are separated from each other via the respective annular walls 121.

[0013] Please refer to Fig. 4. In the present invention, the presser 13 and the caps 14 are further provided over the fins 12, thereby preventing the fins 12 from falling off the heat pipe 11. The presser 13 is also made of a heat-conducting material. The thickness of the presser 13 can be larger than that of the respective fins 12, thereby providing a better structural strength. The steps for assembling the heat sink will be described as follows.

[0014] Please refer to Fig. 5. In the step S1, at first, a heat sink 1, a presser 13 and a plurality of caps 14 are provided. The heat sink 1 has a structure of the above-mentioned characteristics. The presser 13 is provided with through-holes 130 that correspond to the penetrating holes 120 of each fin 12 respectively and allow the distal ends of the heat pipe 11 to be inserted therein. The periphery of each through-hole 130 is provided with an annular neck 131. The presser 13 is provided with notches 132 that are arranged circumferentially outside the annular neck 131.

[0015] Please refer to Figs. 5 and 6. In the step S2,

the caps 14 are covered on the annular neck 131 of the presser 13 respectively. The caps 14 each extend downwards to form protruding flaps 140 penetrating the notches 132 respectively (Fig. 7). When the flap 140 penetrates the notch 132, it is slightly folded into an inclined orientation.

[0016] Please refer to Figs. 5 and 8. In the step S3, a plate-like die 2 is disposed on the topmost fin 12 of the heat sink 1. The thickness of the plate-like die 2 is substantially identical to the pitch between the respective fins 12.

[0017] Please refer to Figs. 5 and 9. In the step S4, finally, the distal end of the heat pipe 11 penetrates the through-hole 130 of the presser 13 to abut inside the corresponding cap 14. At the same time, by means of the plate-like die 2, the flap 140 is folded outwards at a right angle so as to abut the bottom surface of the presser 13 (Fig. 10).

[0018] According to the present invention, the respective fins 12 can be pressed by the presser 13, so that these fins 12 cannot be detached from the heat pipe 11 easily. By means of the pressing force exerted by the presser 13 to the respective fins 12, the distal ends of the heat pipe 11 can abut inside the caps 14. Also, the annular neck 131 of the presser 13 is shrunk on the heat pipe 11 due to the inward pressing of the cap 14, thereby reinforcing the strength of connection between the fins 12 and the heat pipe 11 and avoiding the separation of the presser 13 from the heat pipe 11.

[0019] Therefore, via the above arrangement, the fins-type heat sink and the method for assembling the same according to the present invention can be obtained.

[0020] According to the above, the present invention achieves the expected effects and overcomes the drawbacks of prior art. Further, the present invention really demonstrates novelty and inventive steps and thus conforms to the requirements for an invention patent.

Claims

1. A fins-type heat sink, comprising:

a base(10);
a heat pipe (11) thermally connected on the base (10);
a plurality of fins (12) each provided with penetrating holes (120), an outer periphery of each penetrating hole (120) being formed with an annular wall (121), the plurality of fins (12) being overlapped on the heat pipe (11) at intervals;
a presser (13) provided with through-holes (130) for cooperating with the penetrating holes (120) of each fin (12) respectively, a periphery of each through-hole (130) being provided with an annular neck (131) for allowing a distal end of the heat pipe (11) to penetrate, an outer periphery of each annular neck (131) being provided with

- notches (132) on the presser (13); and
 a plurality of caps (14) covering the annular
 necks (131) of the presser (13), each cap (14)
 extending downwards to form protruding flaps
 (140), the flap (140) passing through the notches
 (132) to be folded outwards so as to abut a bot-
 tom surface of the presser (13). 5
2. The fins-type heat sin according to claim 1, wherein
 the distal end of the heat pipe (11) abuts inside the
 corresponding cap (14). 10
3. The fins-type heat sin according to claim 1, wherein
 the presser (13) is made of a heat-conducting ma-
 terial. 15
4. The fins-type heat sin according to claim 1, wherein
 a thickness of the presser (13) is larger than that of
 each fin (12) 20
5. A method for assembling a fins-type heat sink, com-
 prising the steps of:
- (a) providing a heat sink (1), a presser (13) and
 a plurality of caps (14), the heat sink (1) having 25
 a heat pipe (11) and a plurality of fins (12) dis-
 posed on the heat pipe (11), the presser (13)
 being provided with through-holes (130) allow-
 ing the distal ends of the heat pipe (11) to be
 inserted therein, a periphery of each through- 30
 hole (130) being provided with an annular neck
 (131), the presser (13) being provided with
 notches (132) that are arranged circumferential-
 ly outside the annular neck (131);
- (b) covering the caps (14) on the annular necks 35
 (131) of the presser (13) respectively, rach caps
 (14) extending downwards to form protruding
 flaps (140) penetrating the notches (132);
- (c) disposing a plate-like die (2) on the topmost
 fin (12) of the heat sink (1); 40
- (d) inserting a distal end of the heat pipe (11)
 through the through-hole (130) of the presser
 (13) to abut inside the cap (14), while folding the
 flaps (140) outwards via the plate-like die (2). 45
6. The method according to claim 5, wherein in the step
 (b), each of the flaps (140) is folded outwards after
 penetrating the notch (132).
7. The method according to claim 5, wherein in the step 50
 (c), a thickness of the plate-like die (2) is substantially
 identical to the pitch between the respective fins (12).

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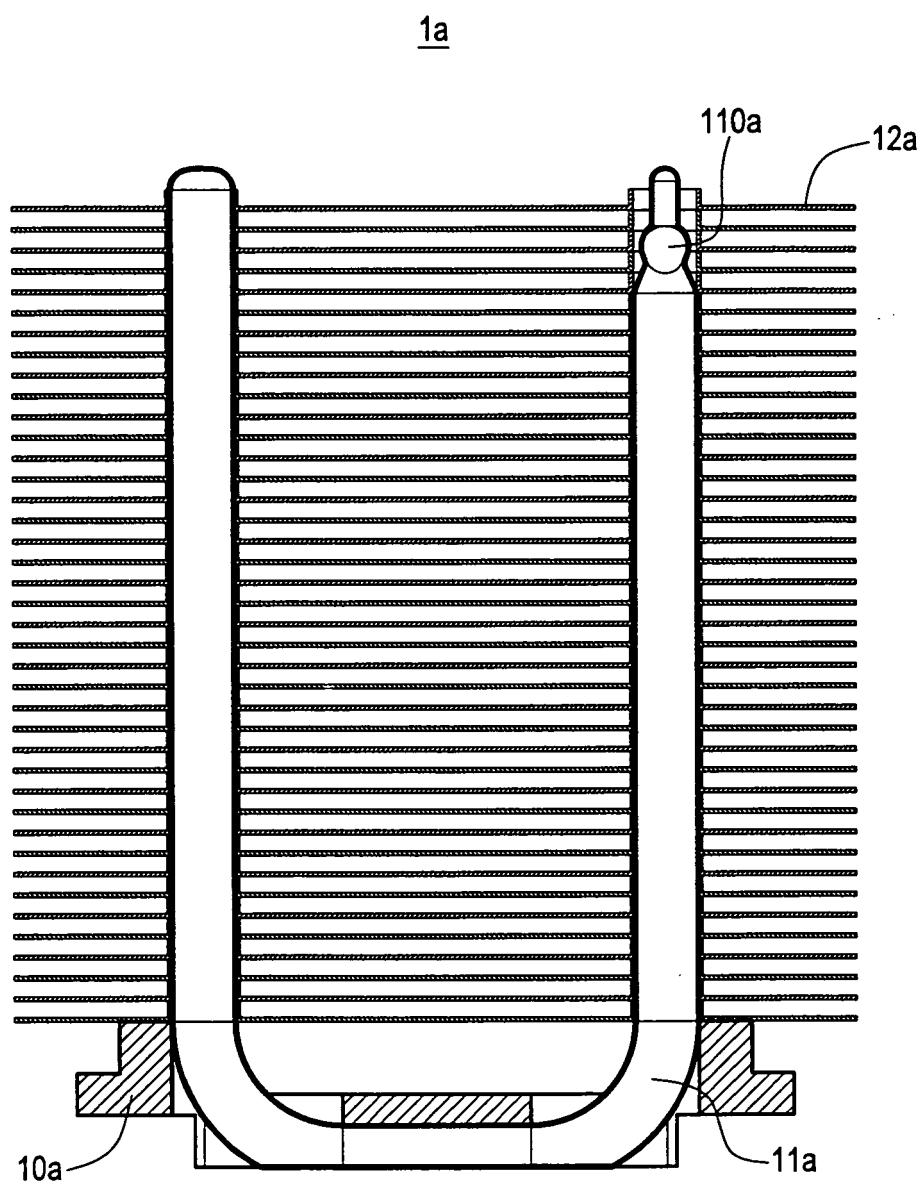


FIG.1
PRIOR ART

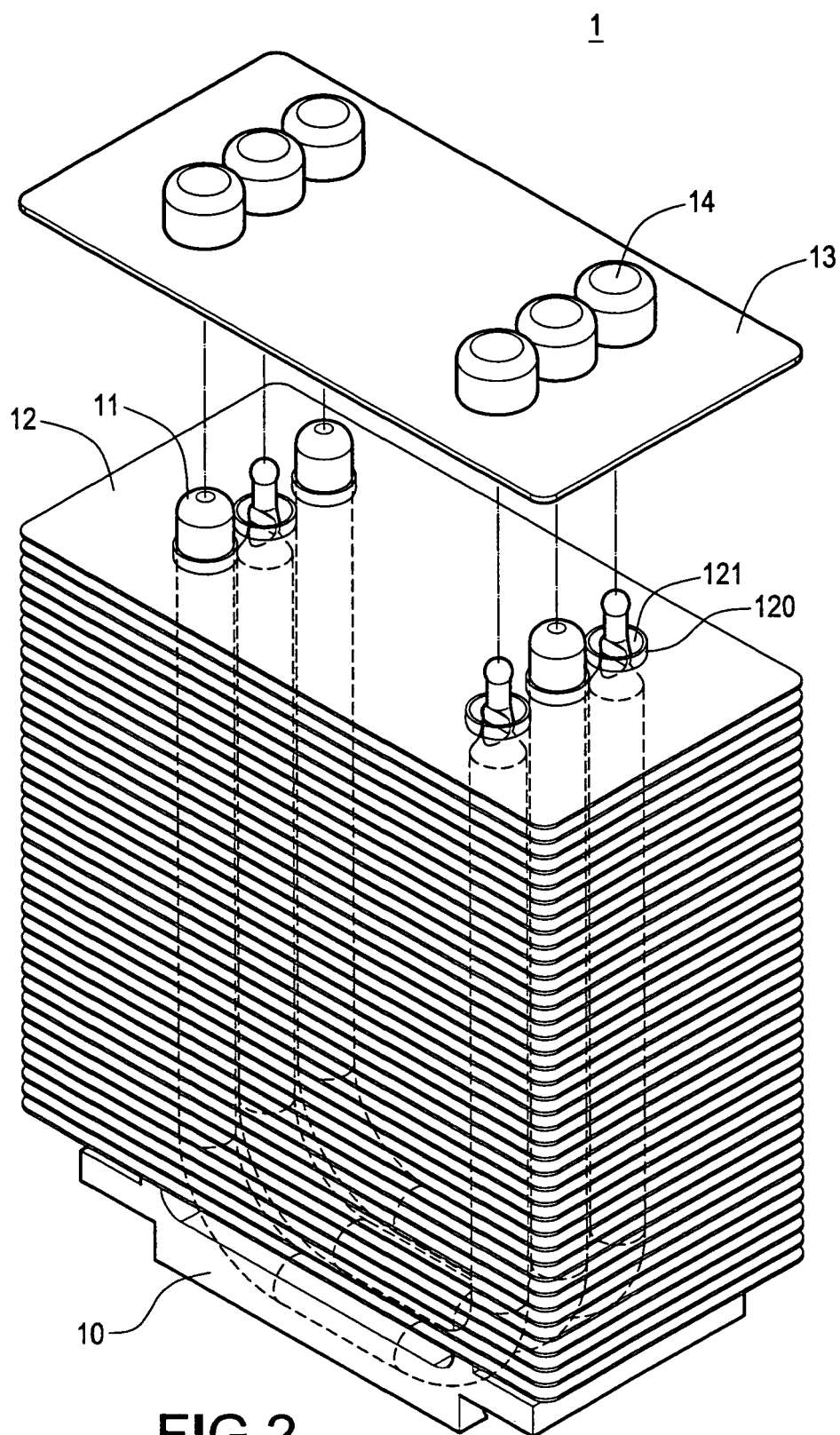


FIG.2

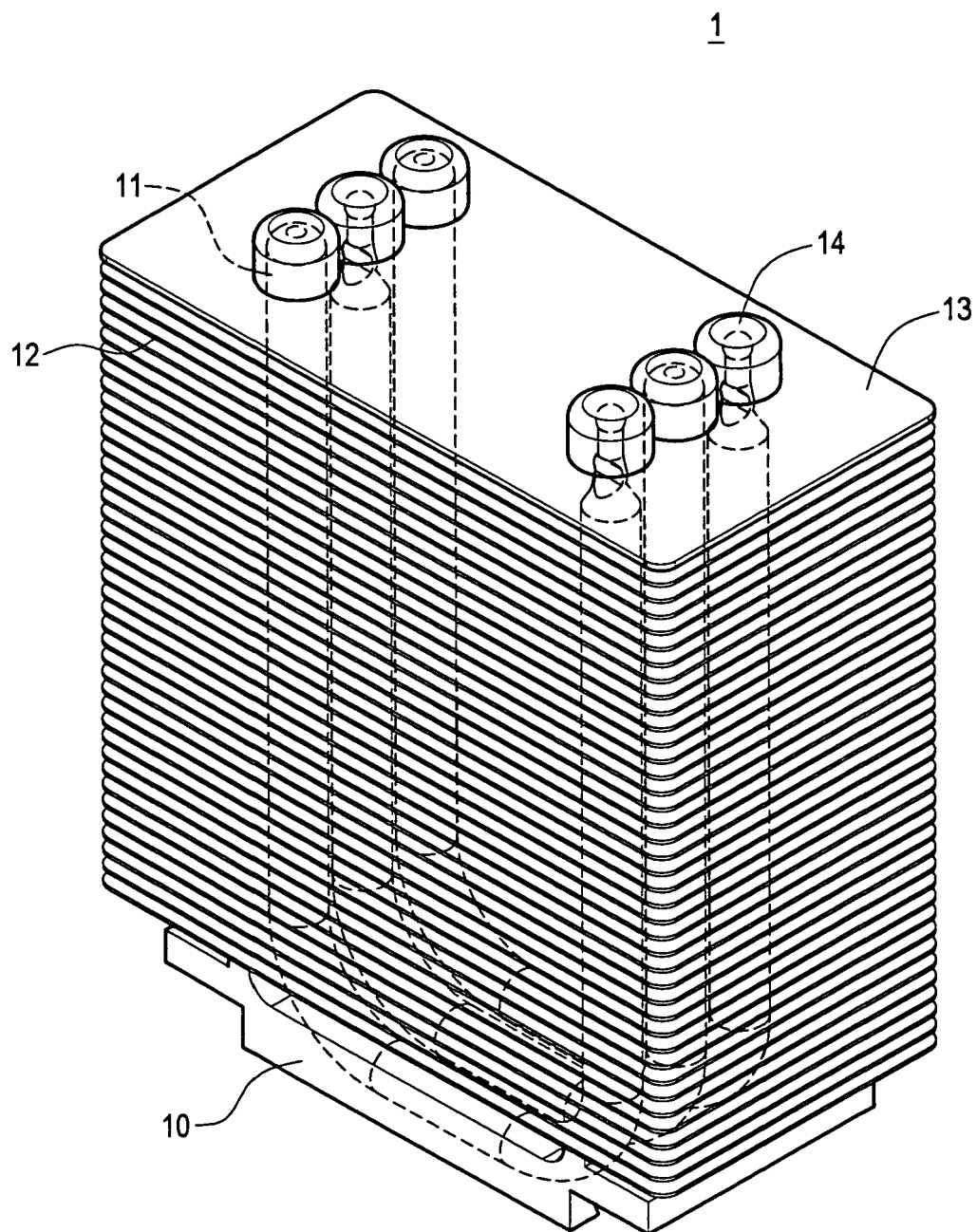


FIG.3

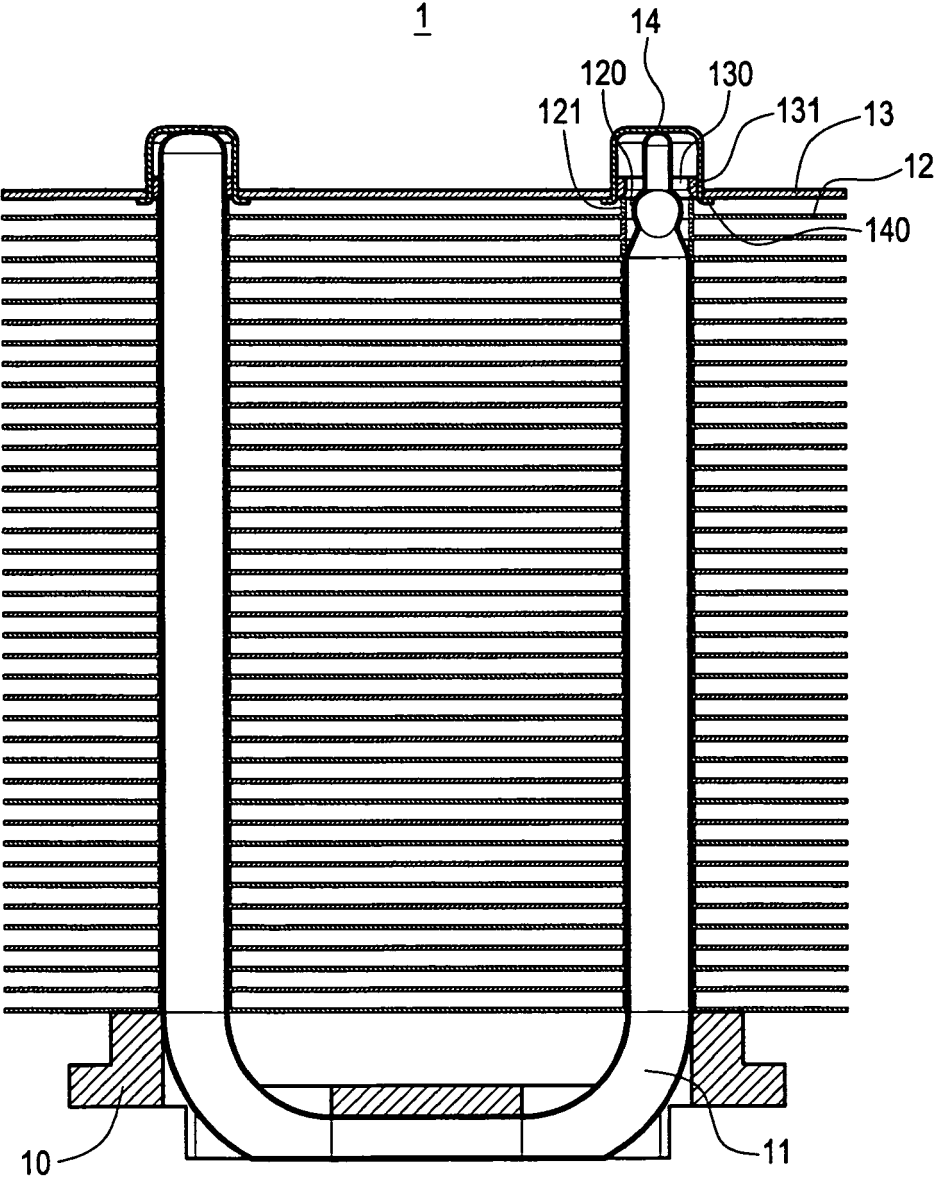


FIG.4

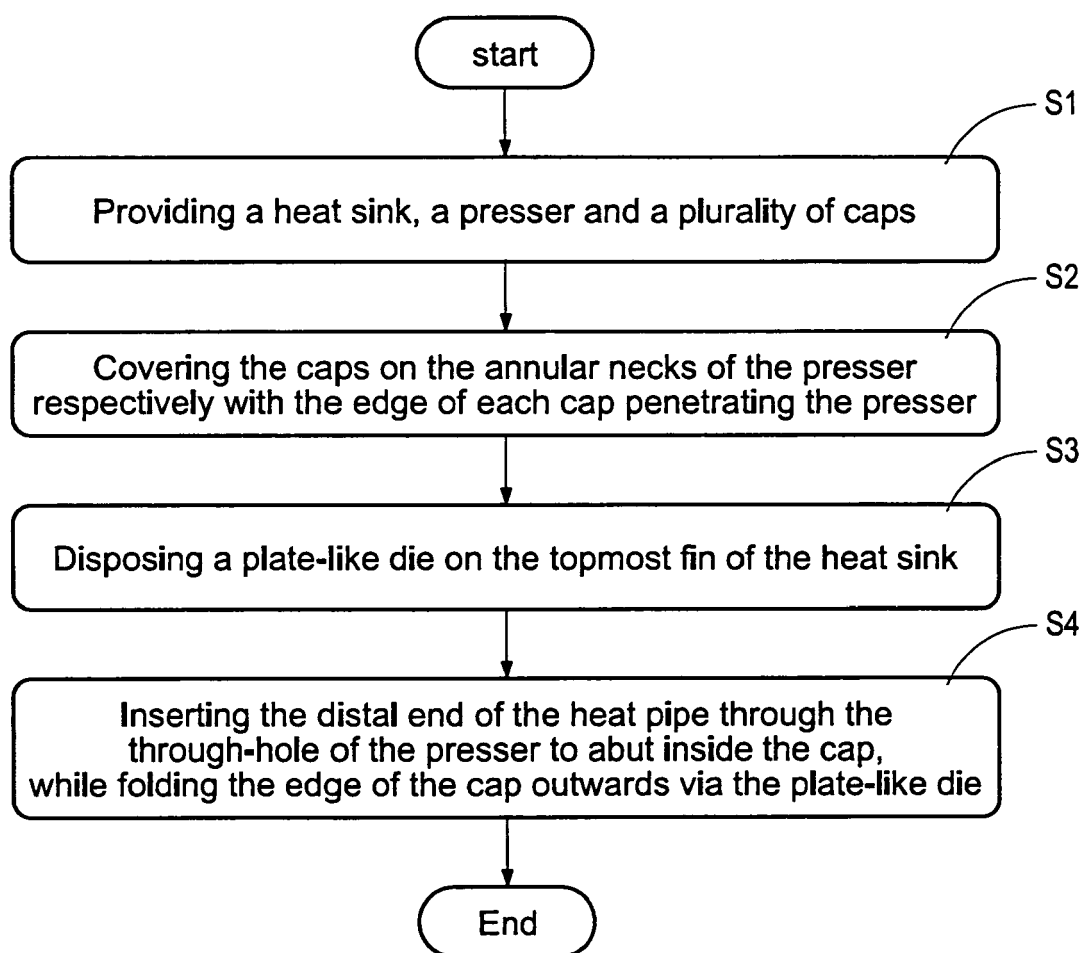


FIG.5

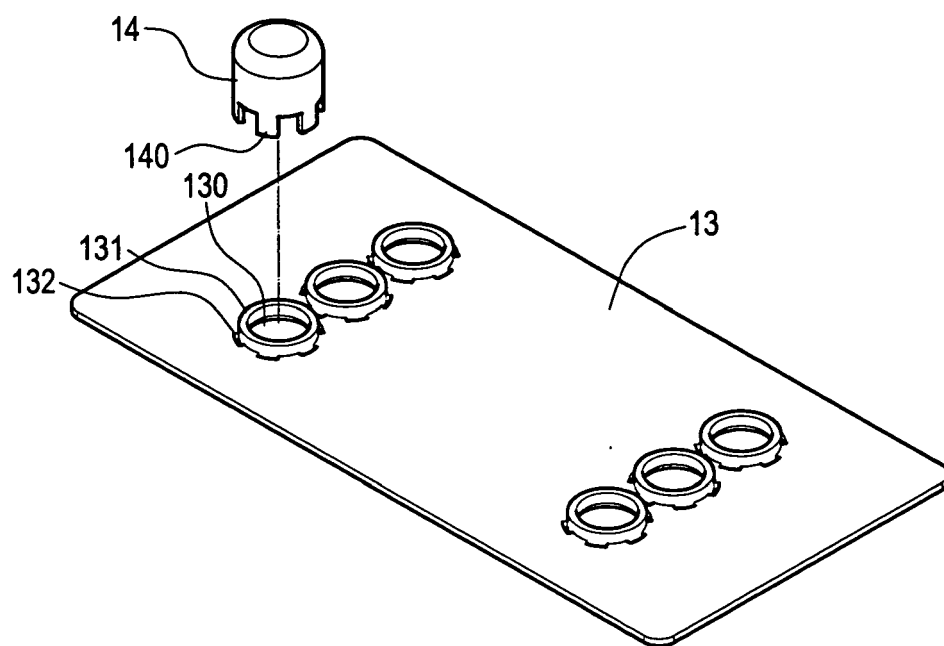


FIG. 6

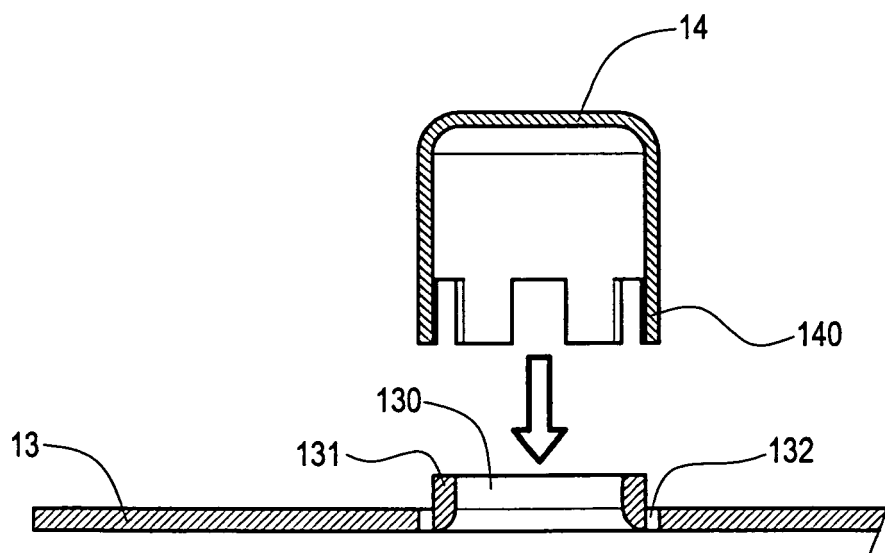


FIG. 7

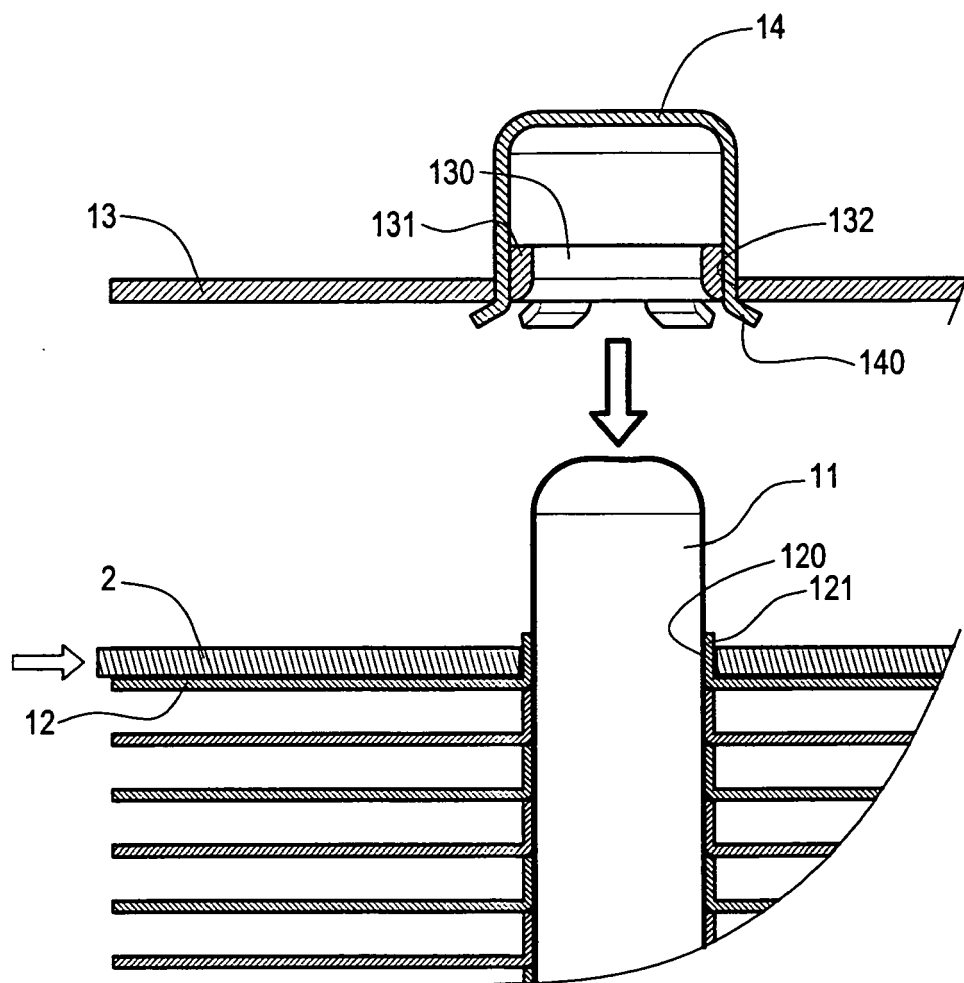


FIG.8

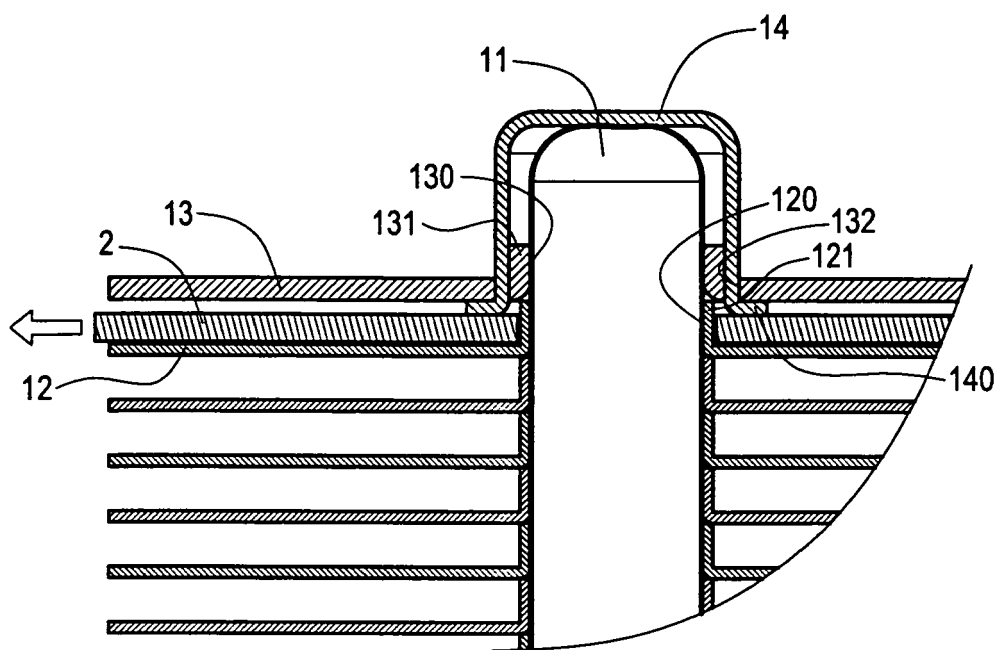


FIG. 9

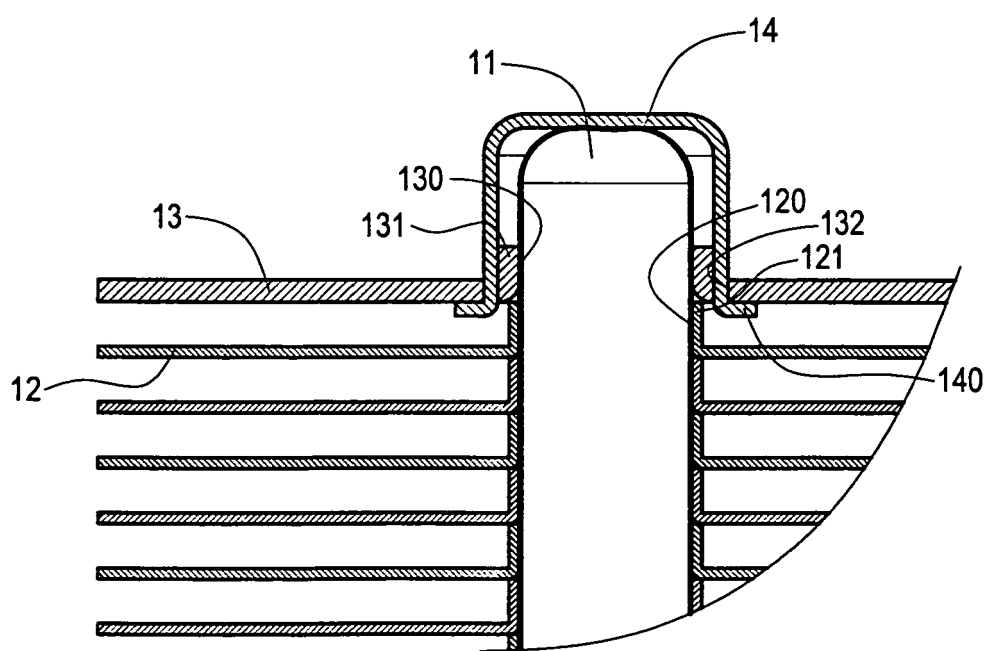


FIG. 10



EUROPEAN SEARCH REPORT

Application Number
EP 09 00 0860

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2008/105408 A1 (ZHANG JING [CN] ET AL) 8 May 2008 (2008-05-08) * the whole document *	1-7	INV. F28D15/02
A	US 2005/167087 A1 (SHENG JIAN-QING [CN] ET AL) 4 August 2005 (2005-08-04) * the whole document *	1-7	
A	US 2008/301943 A1 (LIU KO-PIN [TW]) 11 December 2008 (2008-12-11) * the whole document *	1-7	
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			TECHNICAL FIELDS SEARCHED (IPC)
			F28D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 June 2009	Examiner Bain, David
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 00 0860

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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16-06-2009

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