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(54) **Illumination device**

(57) An illumination device (100) includes a heat sink (10), at least one heat transfer member (20), at least one solid-state light source (40) and a printed circuit board (30). The heat sink (10) includes a support portion (11). The heat transfer member (20) is mounted on the support portion (11) of the heat sink (10). The printed circuit board (30) is mounted on the heat transfer member (20). The printed circuit board (30) is thermally connected with the heat transfer member (20). The solid-state light source (40) is mounted on the printed circuit board (30). The circuit of the printed circuit board (30) is electrically connected to an electrode of the solid-state light source (40).

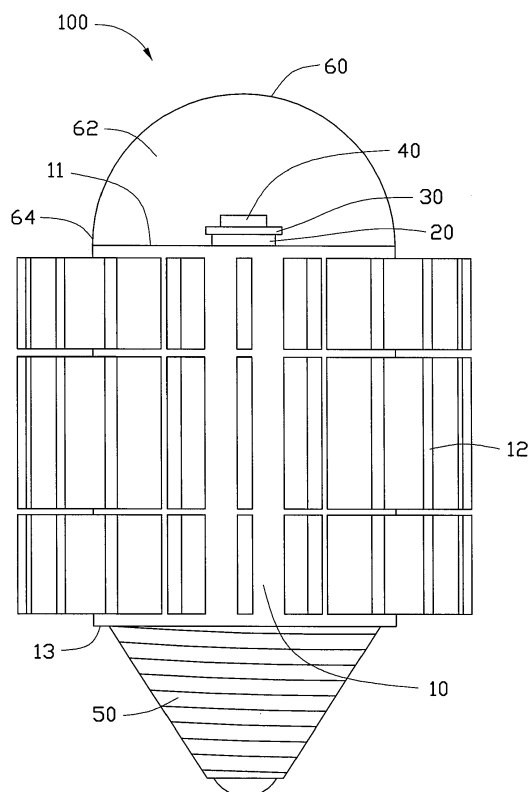


FIG. 1

## Description

**[0001]** The present disclosure relates to illumination devices, and more particularly to an illumination device providing efficient heat dissipation.

**[0002]** A LED lamp includes a heat sink, a printed circuit board and a plurality of LEDs. The printed circuit board is mounted on a central portion of the heat sink. The LEDs are mounted on the printed circuit board. Because the heat transfer coefficient of the printed circuit board is poor it is difficult for the heat sink to dissipate the heat from the LEDs in a timely manner.

**[0003]** It is thus desirable to provide an illumination device which can overcome the described limitations.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0004]** Many aspects of the present disclosure can be better understood with reference to the following drawings. The components in the drawings are not necessarily drawn to scale, the emphasis instead placed upon clearly illustrating the principles of the present disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

**[0005]** FIG. 1 is a schematic view of an illumination device in accordance with a first embodiment.

**[0006]** FIG. 2 is a schematic view of an illumination device in accordance with a second embodiment.

**[0007]** FIG. 3 is a schematic view of an illumination device in accordance with a third embodiment.

## DETAILED DESCRIPTION

**[0008]** Referring to FIG. 1, an illumination device 100 according to a first embodiment includes a heat sink 10, a heat transfer member 20, a printed circuit board 30, at least one solid-state light source 40, a connecting member 50 electrically connecting to a power source (not shown), and a transparent or translucent envelope 60 which is glass or plastic.

**[0009]** The heat sink 10 includes a support portion 11, a connecting portion 13 and a plurality of fins 12. The fins 12 are radially aligned about an outer circumferential surface of the heat sink 10 to dissipate the heat therefrom. The support portion 11 of the heat sink 10 is a flat surface to support the heat transfer member 20 thereon. The heat sink 10 is made of aluminum or copper.

**[0010]** The heat transfer member 20 is mounted on the support portion 11 of the heat sink 10. The heat transfer member 20 is made of thermal conductive adhesive.

**[0011]** The printed circuit board 30 is mounted on the heat transfer member 20. In this embodiment, a gap is provided between the printed circuit board 30 and the support portion 11 of the heat sink 10.

**[0012]** The solid-state light source 40 is mounted on the printed circuit board 30. In this embodiment, the solid-state light source 40 is a LED.

**[0013]** The connecting member 50 is mounted on the

connecting portion 13 of the heat sink 10. The connecting member 50 is electrically connected with the printed circuit board 30 by a wire (not shown). The connecting member 50 is a standard element with a thread formed thereon, so the illumination device 100 can be directly connected to a standard socket matching the standard connecting member 50 to electrically connect with the power source. The illumination device 100 thus can replace an incandescent lamp or a compact lamp having a connector configuration matching that of the connecting member 50.

**[0014]** The envelope 60 includes a receiving space 62 and an open end 64. The open end 64 of the envelope 60 is mounted on the support portion 11 of the heat sink 10 and covers the solid-state light source 40. The envelope 60 is hollow, substantially hemispherical, and of a light permeable material. The envelope 60 is an optical element, which can be used to adjust the illumination pattern from the solid-state light source 40.

**[0015]** The heat transfer member 20 is interposed between the printed circuit board 30 and the support portion 11 of the heat sink 10, whereby the printed circuit board 30 is securely and directly mounted on the support portion 11 and thermally connects therewith. The solid-state light source 40 and the printed circuit board 30 easily dissipate heat to the heat sink 10 through the heat transfer member 20. Thus, efficiency of heat dissipation is enhanced and lifespan of the illumination device 100 is increased in daily use.

**[0016]** FIG. 2 illustrates an illumination device 100a of a second embodiment of the disclosure, differing from the first embodiment only in that a plurality of heat transfer members 20a is interposed between the printed circuit board 30a and the support portion 11 of the heat sink 10. A plurality of solid-state light sources 40a is mounted on the printed circuit board 30a corresponding the heat transfer members 20a. Each electrode of the solid-state light sources 40a is electrically connected with a circuit on the printed circuit board 30a.

**[0017]** FIG. 3 illustrates an illumination device 100b of a third embodiment of the disclosure, differing from the second embodiment only in that the support portion 11 includes two angled planes 14 and 16. Each heat transfer member 20b is connected with a corresponding one of the angled planes 14 and 16 of the heat sink 10. The shape of the printed circuit board 30b is corresponding to the angled planes 14 and 16 of the heat sink 10. The printed circuit board 30b is mounted on the heat transfer members 20b. The solid-state light sources 40b are mounted on the printed circuit board 30b corresponding the heat transfer members 20b.

**[0018]** It is to be understood, however, that even though numerous characteristics and advantages of various embodiments have been set forth in the foregoing description, together with details of the structures and functions of the embodiments, the disclosure is illustrative only; and that changes may be made in detail, especially in matters of arrangement of parts within the prin-

ciples of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

support portion of the heat sink.

11. The illumination device of claim 1, wherein the at least one solid-state light source is a LED.

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## Claims

1. An illumination device comprising:

a heat sink comprising a support portion; 10  
 at least one heat transfer member mounted on the support portion of the heat sink;  
 a printed circuit board mounted on the at least one heat transfer member, the printed circuit board thermally connecting with the heat transfer member; 15  
 at least one solid-state light source mounted on the printed circuit board, the at least one solid-state light source electrically connected with the printed circuit board. 20

2. The illumination device of claim 1, wherein the heat sink comprises a plurality of fins radially aligned about an outer circumferential surface of the heat sink. 25

3. The illumination device of claim 1, wherein the heat sink is made of aluminum or copper.

4. The illumination device of claim 1, wherein the support portion of the heat sink is a flat surface. 30

5. The illumination device of claim 1, wherein the support portion comprises an angled plane on which the at least one heat transfer member is mounted. 35

6. The illumination device of claim 1, further comprising a connecting member mounted on a connecting portion of the heat sink and electrically connected to the printed circuit board. 40

7. The illumination device of claim 1, further comprising an envelope comprising a receiving space and an open end, the open end of the envelope mounted on the support portion of the heat sink and covering the at least one solid-state light source. 45

8. The illumination device of claim 7, wherein the envelope is made of a light permeable material and acts as an optical element for adjusting illumination pattern of the at least one solid-state light source. 50

9. The illumination device of claim 1, wherein the at least one heat transfer member is made of a thermally conductive adhesive. 55

10. The illumination device of claim 1, wherein a gap is defined between the printed circuit board and the

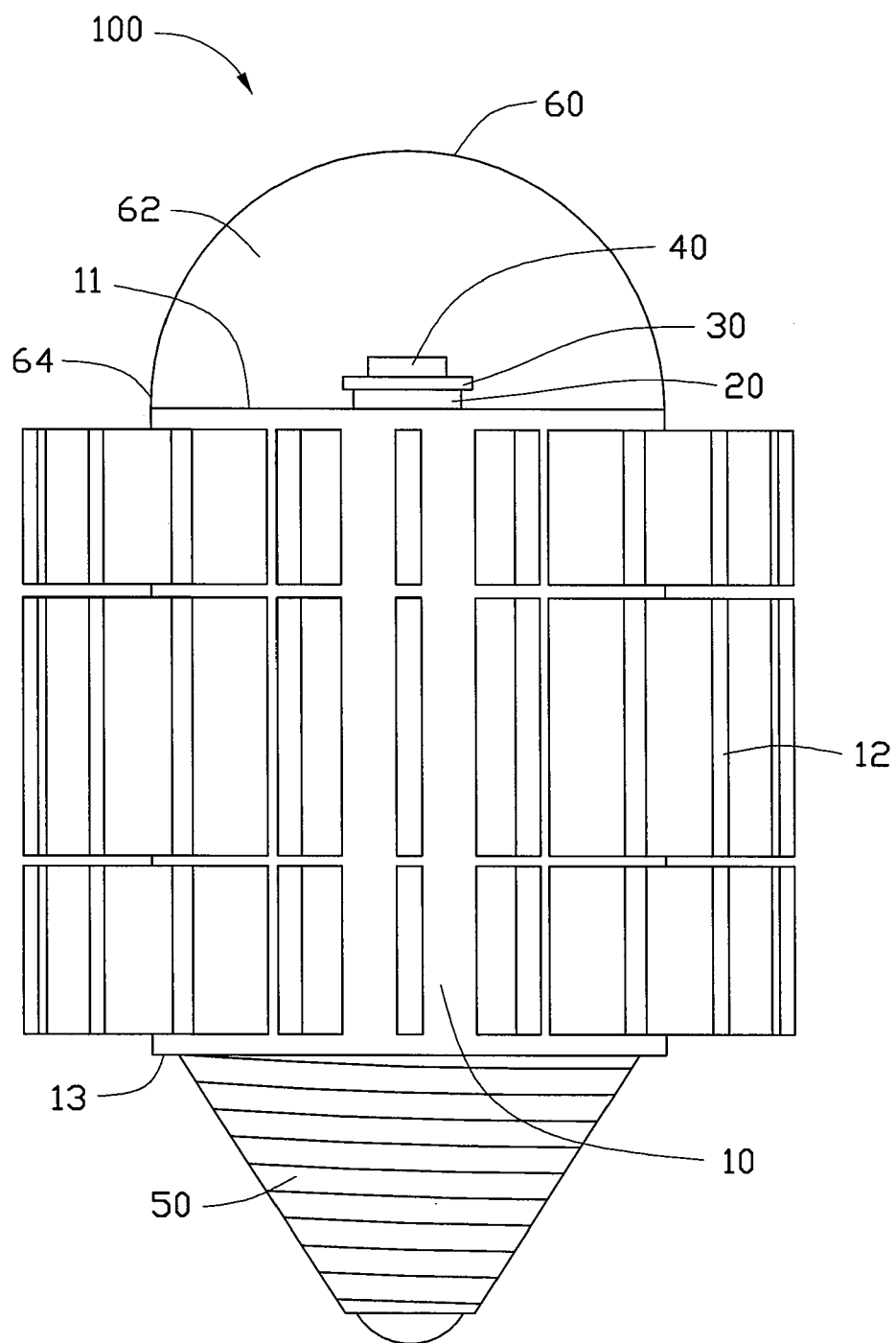


FIG. 1

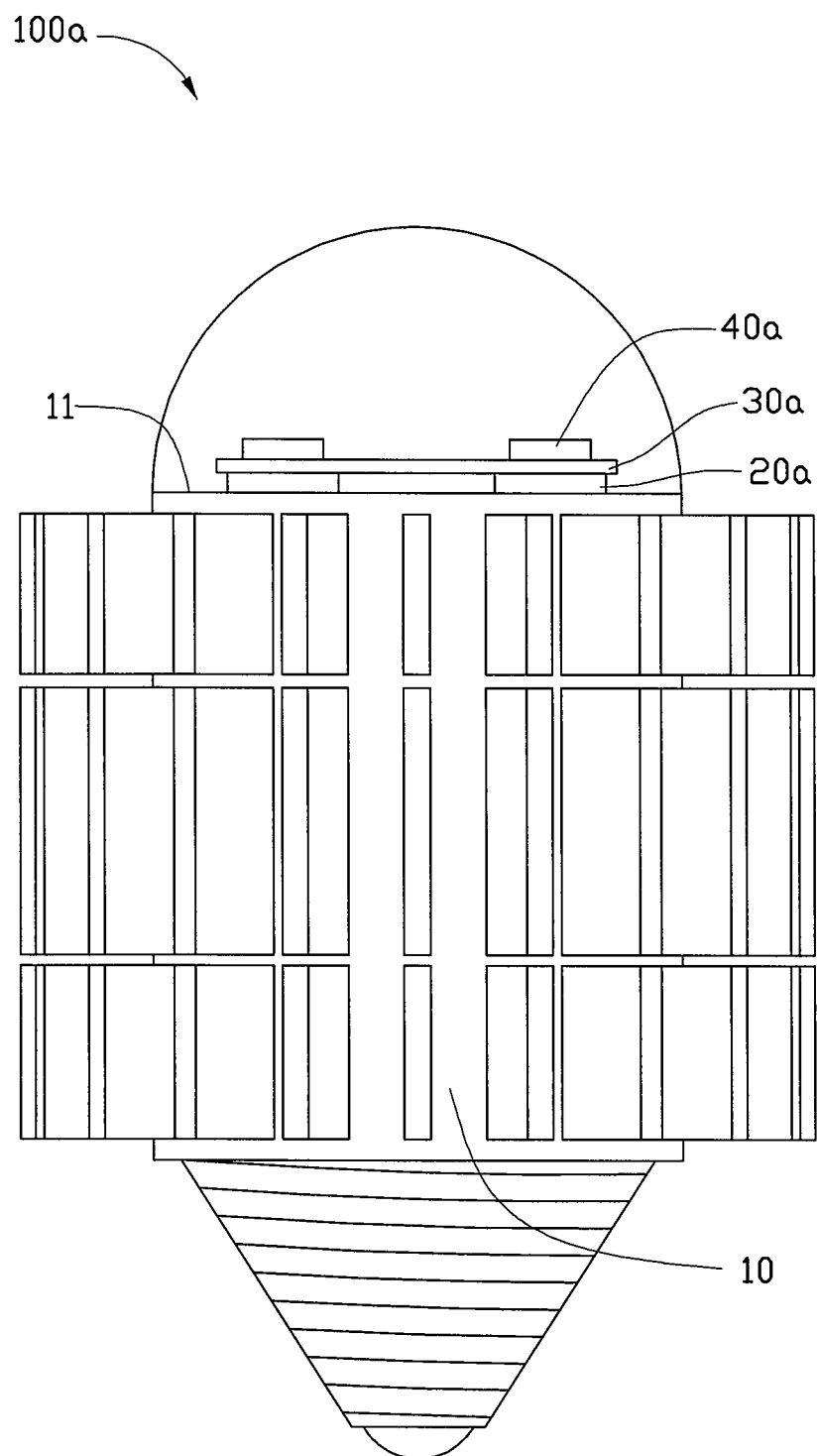


FIG. 2

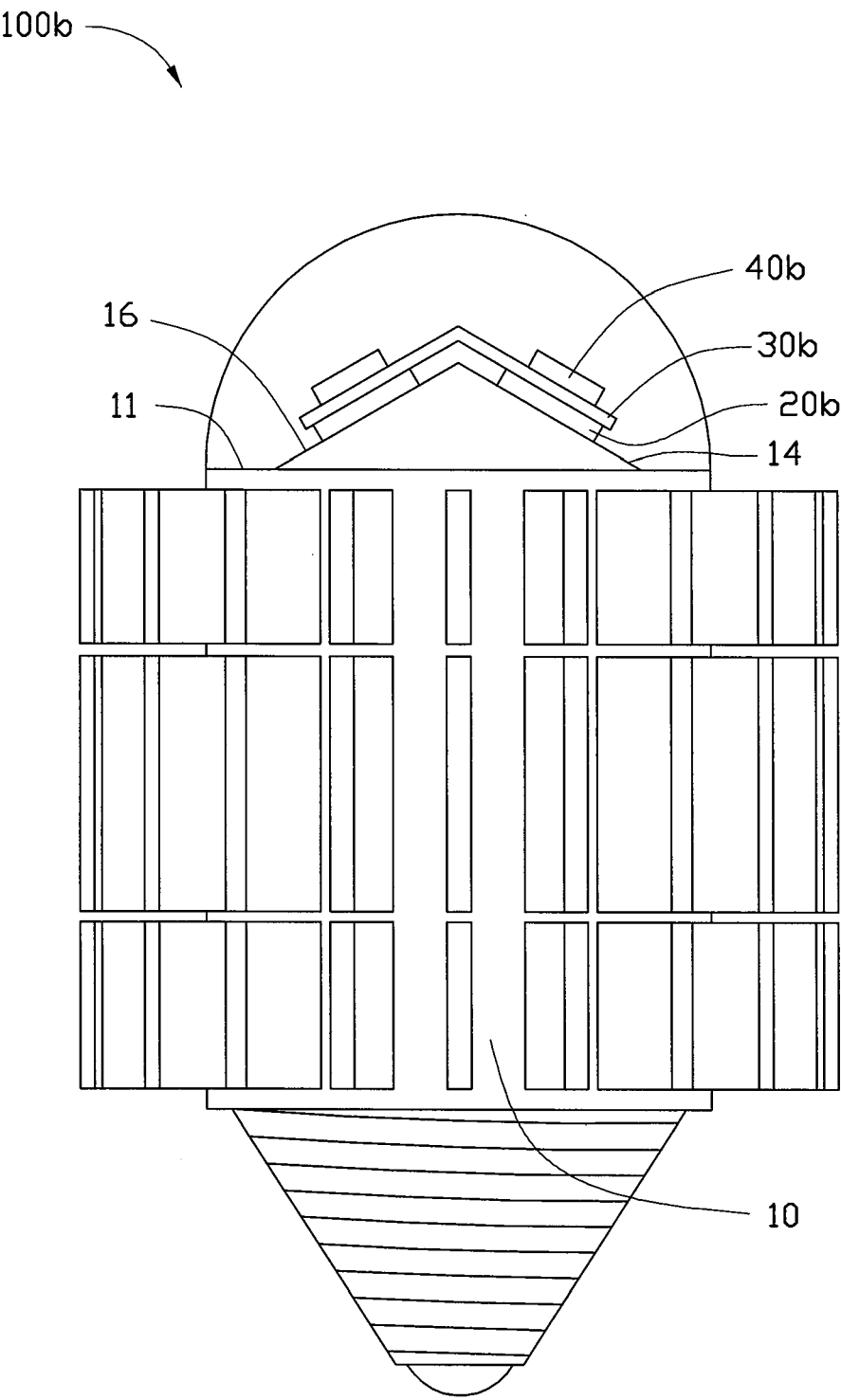


FIG. 3



## EUROPEAN SEARCH REPORT

Application Number  
EP 10 18 7284

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2006/193130 A1 (ISHIBASHI KAZUO [JP]) 31 August 2006 (2006-08-31) * paragraph [0039] - paragraphs [0041], [0 43] * * figures 1-3 * -----	1,3,5-11	INV. F21K99/00 F21V29/00
X	US 2004/066142 A1 (STIMAC TOMISLAV J [US] ET AL) 8 April 2004 (2004-04-08) * paragraphs [0028], [0 30], [0 34] * * figure 1 * -----	1-4,6-11	
X	WO 2008/093978 A1 (ZALMAN TECH CO LTD [KR]; YOON SUN-GYU [KR]; NAM YOUNG-WOO [KR]; SEO MI) 7 August 2008 (2008-08-07) * paragraph [0036] - paragraph [0041] * * paragraph [0044] - paragraph [0045] * * figures 1-4 * -----	1-4,6,9-11	
X	EP 1 914 470 A1 (PATRA PATENT TREUHAND [DE]; OSRAM S P A SOCIETA RIUNITE OS [IT]) 23 April 2008 (2008-04-23) * paragraphs [0032], [0 43], [0 46], [0 51], [0 64] * * figures 1A, 2, 3 * -----	1-4,6-11	TECHNICAL FIELDS SEARCHED (IPC) F21V F21K
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 30 November 2010	Examiner Allen, Katie
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 10 18 7284

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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30-11-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006193130 A1	31-08-2006	JP 2006244725 A	14-09-2006
US 2004066142 A1	08-04-2004	AT 401760 T	15-08-2008
		AU 2003272439 A1	04-05-2004
		CN 1689376 A	26-10-2005
		EP 1547447 A1	29-06-2005
		ES 2315528 T3	01-04-2009
		JP 4350648 B2	21-10-2009
		JP 2006502551 T	19-01-2006
		WO 2004034748 A1	22-04-2004
WO 2008093978 A1	07-08-2008	KR 20080071812 A	05-08-2008
EP 1914470 A1	23-04-2008	CN 101165396 A	23-04-2008
		US 2008157112 A1	03-07-2008