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(72) Inventors:
• **Chen, Sheng-Ping**
806 Kaohsiung City (TW)
• **Yang, Ho-Shun**
Hsinchu County 302 (TW)

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(74) Representative: **von Kreisler Selting Werner**
Deichmannhaus am Dom
Bahnhofsvorplatz 1
50667 Köln (DE)

(71) Applicant: **Lextar Electronics Corp.**
30075 Hsinchu (TW)

(54) **Light emitting device**

(57) A light emitting device (100) including a transparent tube (110); a heat dissipating board (130) disposed in the transparent tube (110); a light emitting element (120) disposed on the heat dissipating board (130); a fastening member (140) disposed in the transparent tube (110) and having a fastening opening (141); and an end cap (150) having an inner sidewall (151) and a fastening part (152). The fastening part (152) has a fixing

plane (152a) and a chamfering plane (152b). The fastening part (152) is fixedly disposed on the inner sidewall (151) via the fixing plane (152a). The chamfering plane (152b) inclines towards the fixing plane (152a) as getting closer to an opening of the end cap (150). When the end cap (150) covers the transparent tube (110), the fastening part (152) is buckled into the fastening opening (141) via the chamfering plane (152b).

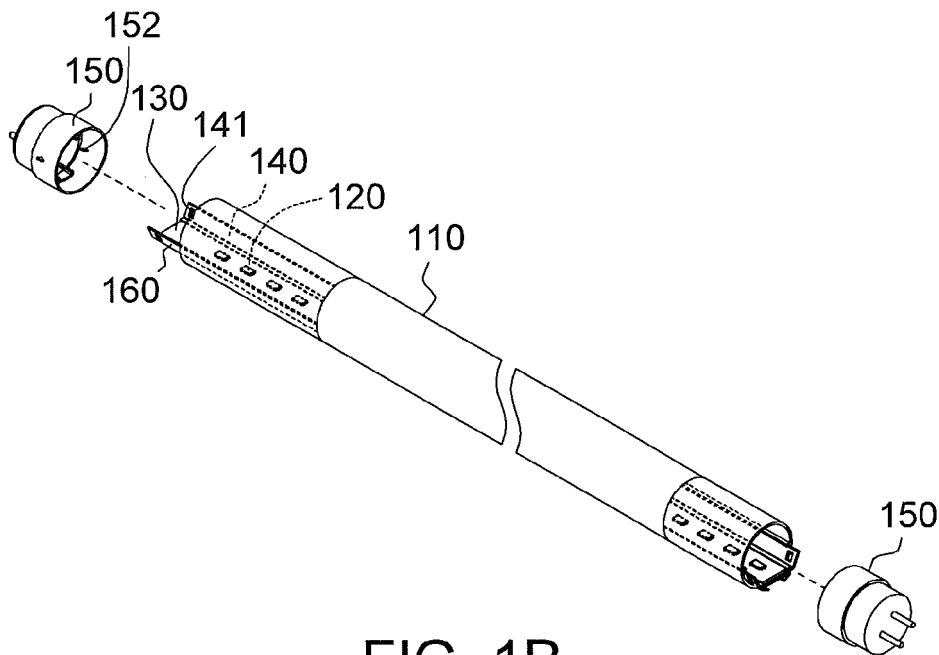


FIG. 1B

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The invention relates in general to a light emitting device, and more particularly to a light emitting device assembled by buckling.

Description of the Related Art

[0002] Sizes and specifications of conventional light emitting devices are regulated by national/international standards such as CNS 691 and IEC 60081. A light emitting device includes a light emitting element, a transparent tube and two end caps. The light emitting element is disposed in the transparent tube, and the two end caps respectively cover two ends of the transparent tube.

[0003] The end caps are generally engaged to the transparent tube via screw. Structural strength of the above structure is good, but assembly time and costs are increased. Further, additional parts may be needed to cover the screw, or to cover a hole for passing assembly tool (e.g., a screw driver) during an assembly process.

SUMMARY OF THE INVENTION

[0004] The invention is directed to a light emitting device, in which an end cap is assembled by buckling for increasing an assembly speed.

[0005] According to an embodiment of the present invention, a light emitting device is provided. The light emitting device comprises a transparent tube, a heat dissipating board, a light emitting element, a fastening member and an end cap. The heat dissipating board is disposed in the transparent tube. The light emitting element is disposed on the heat dissipating board. The fastening member is disposed at one end of the transparent tube and has a fastening opening. The end cap has an inner sidewall and has a fastening part. The fastening part has a fixing plane and a chamfering plane. The fastening part is fixedly disposed on the inner sidewall via the fixing plane. The chamfering plane inclines towards the fixing plane as getting closer to an opening of the end cap. When the end cap covers the transparent tube, the fastening part is buckled into the fastening opening via the chamfering plane.

[0006] The above and other aspects of the invention will become better understood with regard to the following detailed description of the preferred but non-limiting embodiments. The following description is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1A is an appearance of a light emitting device according to an embodiment of the present inven-

tion.

[0008] FIG. 1B is an exploded view of the light emitting device in FIG. 1A.

[0009] FIG. 2 is an enlarged partial view of the transparent tube in FIG. 1A.

[0010] FIG. 3 is a partial view of the end cap in FIG. 1B.

[0011] FIG. 4 is a top view of the end cap in FIG. 3.

[0012] FIG. 5 is a schematic diagram of a fastening part of an end cap assembled to a fastening opening of a fastening member.

[0013] FIG. 6 is an enlarged view of an end cap of a light emitting device according to another embodiment of the present invention.

15 DETAILED DESCRIPTION OF THE INVENTION

[0014] FIG. 1A shows an appearance of a light emitting device according to an embodiment of the present invention. FIG. 1B shows an exploded view of the light emitting device in FIG. 1A. Referring to FIGS. 1A and 1B, for example, a light emitting device 100 is a light tube, and comprises a transparent tube 110, a light emitting element 120 (FIG. 1B), a heat dissipating board 130 (FIG. 1B), a first fastening member 140 (FIG. 1B), a second fastening member 160 (FIG. 1B), and two end caps 150. As shown in FIG. 1A, the two end caps 150 are disposed at two ends of the transparent tube 110, respectively.

[0015] As shown in Fig. 1B, the first fastening member 140 has a first fastening opening 141, and the end caps 150 has a first fastening part 152. When the end caps 150 covers one end of the transparent tube 110, the first fastening part 152 of the end cap 150 is bucked into the first fastening opening 141 of the first fastening member 140 via a first chamfering plane 152b (FIG. 2) of the first fastening part 152. With such buckling means, the end caps 150 are assembled to the first fastening member 140 with enhanced assembly readiness.

[0016] Details of the structure of the light emitting device 100 are further described with reference to FIGS. 2 to 5.

[0017] FIG. 2 shows an enlarged partial view of the transparent tube 110 in FIG. 1A (section 2').

[0018] Referring to FIG. 2, for example, the transparent tube 110 may be a long or short transparent tube, with a length thereof unlimited by the embodiment of the present invention. The transparent tube 110 has an internal space 111 for accommodating the light emitting element 120, the heat dissipating board 130, the first fastening member 140 and the second fastening member 160. To increase the amount of light emitted from light emitting device 100, the transparent tube 110 is made of a material having a high transparency, e.g., glass or plastic. It should be noted that, instead of a circular cross-sectional shape, the transparent tube 110 may have other cross-sectional shapes. In an alternative embodiment, the cross-sectional shape of the transparent tube 110 may be modified according to actual application requirements. For example, the cross-sectional shape of the

transparent tube may be a rectangle or an ellipsoid.

[0019] The light emitting element 120 is disposed on the heat dissipating board 130, and is a strip-like light source module or another appropriate light source. In the embodiment, a light emitting diode (LED) light bar is given as an example. The light emitting element 120 may be fixed on the heat dissipating board 130 through adhering, fastening or buckling means, or may simply be placed on the heat dissipating board 130.

[0020] The heat dissipating board 130 is for dissipating heat generated by the light emitting element 120, and may be made of a material having good heat conductivity, e.g., a heat dissipating fin formed from aluminum extrusion. Further, the heat dissipating board 130 may also be formed by a material having good workability through a curving or stamping process.

[0021] The first fastening member 140 and the second fastening member 160 are continual long strips, which have a length greater than that of the transparent tube 110, with two ends of the first fastening member 140 and the second fastening member 160 exceeding the two ends of the transparent tube 110 (FIG. 1B). In an alternative embodiment, two first fastening members 140 having a shorter length may be adopted and disposed at the two ends of the transparent tube 110, with the two ends of the first fastening members 140 exceeding the two ends of the transparent tube 110.

[0022] The first fastening member 140 and the second fastening member 160 have a first fastening opening 141 and a second fastening opening 161, respectively. The first fastening member 140 has a protruding end 142 exceeding one end of the transparent tube 110. The first fastening opening 141 is disposed on the protruding end 142. In an embodiment, the first fastening opening 141 is spaced from an end plane 110s of the transparent tube 110 by approximately 1 to 3 mm, for example. As the first fastening opening 141 is disposed on the protruding end 142 such that the protruding end is exposed outside the transparent tube 110, the assembly of the end caps 150 are promoted.

[0023] Similarly, the second fastening member 160 has another protruding end 162 exceeding one end of the transparent tube 110. The second fastening opening 161 is disposed on the protruding end 162. In an embodiment, the second fastening opening 161 is spaced from an end plane 110s of the transparent tube 110 by approximately 1 to 3 mm, for example.

[0024] The first fastening member 140 and the second fastening member 160 respectively have one side connected to two sides of the heat dissipating board 130, in a way that the first fastening member 140, the second fastening member 160 and the heat dissipating board 130 jointly form a U-shaped-like structure. The other side of the first fastening member 140 and the second fastening member 160 are respectively abutted against a rib 112 of the transparent tube 110. The rib 112 limits the amount of rotation of the first fastening member 140 and the second fastening member 160 to thus stabilize the

first fastening member 140 and the second fastening member 160. The first fastening member 140 and the second fastening member 160 may be engaged to the heat dissipating board 130 through assembly or buckling means, or may be integrally formed with the heat dissipating board 130. Further, the first fastening member 140, the second fastening member 160 and the heat dissipating board 130 may be made of a same material or different materials. In the embodiment, the first fastening member 140 and the second fastening member 160 are made of a material having good heat conductivity, so as to increase an overall heat dissipating area of the first fastening member 140, the second fastening member 160 and the heat dissipating board 130.

[0025] FIG. 3 shows an enlarged view of the end cap 150 in FIG. 1B. FIG. 4 shows a top view of the end cap 150 in FIG. 3.

[0026] The end cap 150 has an inner sidewall 151, a first fastening part 152 and a second fastening part 153. The first fastening part 152 has a first fixing plane 152a and a first chamfering plane 152b. The second fastening part 153 comprises a second fixing plane 153a and a second chamfering plane 153b. The first fastening part 152 is disposed on the inner sidewall 151 via the first fixing plane 152a, and the first chamfering plane 152b inclines towards the first fixing plane 152a as approaching closer to an opening 150p of the end cap 150.

[0027] Similarly, the second fastening part 153 is disposed on the inner sidewall 151 via the second fixing plane 153a, and the second chamfering plane 153b inclines towards the second fixing plane 153a as approaching closer to the opening 150p of the end cap 150.

[0028] In the embodiment, the first chamfering plane 152b and the second chamfering plane 153b are inclined planes, for example. In an alternative embodiment, the first chamfering plane 152b and the second chamfering plane 153b may respectively be an inclined plane, a curved plane, or a combination thereof. For example, the inclined plane may be a flat surface, and the curved plane may be a circular cylindrical surface or an ellipsoidal cylindrical surface. Further, geometric outlines of the surfaces of the first chamfering plane 152b and the second chamfering plane 153b may be identical or different.

[0029] The first chamfering plane 152b and the second chamfering plane 153b are spaced by a second distance L2 (FIG. 4), and the first fastening opening 141 and the second fastening opening 161 are spaced by a first distance L1 (FIG. 2), with the second distance L2 being smaller than the first distance L1. FIG. 5 shows a schematic diagram of an assembly of the fastening parts of the end caps and the fastening openings of the fastening members described above. With such design, when the end cap 150 covers one end of the transparent tube 110, the first chamfering plane 152a of the first fastening part 152 pushes the first fastening member 140 inwards, such that the first fastening part 152 is allowed to enter the first fastening opening 141. After the first fastening part 152 insert into the first fastening opening 141, the first

fastening part 152 protrudes to exceed the first fastening opening 141 and is thus unlikely to disengage from the first fastening member 140. In another embodiment, the first fastening member 140 is flexible so that the first fastening member 140 can be more easily pushed inwards by the first chamfering plane 152b. Details of the process of the second fastening part 153 inserting into the second fastening opening 161 are similar to those of the first fastening part 152 entering the first fastening opening 141, and shall be omitted herein.

[0030] To provide a more reliable engagement between the fastening members and the fastening parts, the light emitting device of the embodiment further comprises an adhesive (not shown) for adhering the first fastening member 140 with the first fastening part 152 of the end cap 150, and for adhering the second fastening member 160 with the second fastening part 153 of the end cap 150.

[0031] In the embodiment, the light emitting device 100 comprises, for example, two sets of fastening structures formed by the fastening members and the fastening parts. In an alternative embodiment, one of the two sets of the fastening structures may be omitted. That is to say, either the first fastening part 152 and the first fastening opening 141 (or the first fastening member 140) or the second fastening part 153 and the second fastening opening 161 (or the second fastening member 160) may be omitted.

[0032] Further, given that the fastening part of the end cap can be buckled into the fastening opening of the fastening member, the fastening part of the end cap of the present invention may have different designs. An example of such is to be described in the following embodiment.

[0033] FIG. 6 shows an enlarged view of an end cap of a light emitting device according to another embodiment of the present invention. In the embodiment, the light emitting device comprises a transparent tube 110 (not shown), a light emitting element 120 (not shown), a heat dissipating board 130 (not shown), a first fastening member 140 (not shown), and an end cap 250.

[0034] The end cap 250 comprises two sets of fastening parts, each comprising a first fastening part 152 and a lower plate 154. Each of the first fastening parts 152 has an end 152c facing an inner side of the end cap 250. The lower plate 154 is connected to the two ends 152c of the two first fastening parts 152 to reinforce overall rigidity of the two first fastening parts 152 and the lower plate 154. When the end cap 250 covers one end of the transparent tube 110, two first chamfering planes 152b of the two first fastening parts 152 are simultaneously buckled into the first fastening opening 141. The number of sets of the fastening parts is not limited by the embodiment of the present invention, and may be one or more sets.

[0035] Comparing with the assembly method by screw, the fastening approach of buckling the fastening opening of the fastening member with the fastening part of the

end cap described above significantly reducing time and costs of the assembly process.

[0036] While the invention has been described by way of example and in terms of the preferred embodiments, it is to be understood that the invention is not limited thereto. On the contrary, it is intended to cover various modifications and similar arrangements and procedures, and the scope of the appended claims therefore should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements and procedures.

Claims

1. A light emitting device (100), comprising:

a transparent tube (110);
 a heat dissipating board (130), disposed in the transparent tube;
 a light emitting element (120), disposed on the heat dissipating board;
 a first fastening member (140), disposed at one end of the transparent tube and having a first fastening opening (141); and
 an end cap (150), having an inner sidewall (151) and comprising a first fastening part (152) on the inner sidewall, wherein the first fastening part has a fixing plane (152a) and a first chamfering plane (152b);
 wherein, the first fastening part is fixedly disposed on the inner sidewall via the first fixing plane, and the first chamfering plane inclines towards the first fixing plane as getting closer to an opening of the end cap; when the end cap covers one end of the transparent tube, the first fastening part is buckled into the first fastening opening via the first chamfering plane.

2. The light emitting device according to claim 1, wherein the first chamfering plane is an inclined plane, a curved plane, or a combination thereof.

3. The light emitting device according to claim 1, further comprising:

two first fastening parts (152), disposed opposite each other and respectively comprising an end facing an internal of the end cap; and
 a lower plate (154), connected to the ends of the two first fastening parts.

4. The light emitting device according to claim 1, wherein the first fastening member is connected to the heat dissipating board.

5. The light emitting device according to claim 1, wherein the first fastening member and the heat dissipating

board are integrally formed.

- 6. The light emitting device according to claim 1, further comprising:

a second fastening member (160), having a second fastening opening (161);
 wherein, the end cap further comprises a second fastening part (153), the second fastening part has a second fixing plane (153a) and a second chamfering plane (153b), the second fastening part is fixedly disposed on the inner sidewall via the second fixing plane, and the second chamfering plane inclines towards the second fixing plane as getting closer to the opening of the end cap; when the end cap covers the end of the transparent tube, the second fastening part is buckled into the second fastening opening via the second chamfering plane.

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- 7. The light emitting device according to claim 6, wherein the first fastening member and the second fastening member are respectively connected to two sides of the heat dissipating board.

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- 8. The light emitting device according to claim 6, wherein the first fastening member, the second fastening member and the heat dissipating board are integrally formed.

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- 9. The light emitting device according to claim 6, wherein the first fastening opening and the second fastening opening are spaced by a first distance, and the first chamfering plane and the second chamfering plane are spaced by a second distance, with the first distance being greater than the second distance.

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- 10. The light emitting device according to claim 1, wherein the light emitting device is a light emitting diode (LED) lamp tube, the light emitting element is an LED light bar, and the transparent tube is a long transparent tube.

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- 11. The light emitting device according to claim 1, wherein the first fastening member comprises a protruding end (142) protruding and exceeding an end plane of the transparent tube, and the first fastening opening is located at the protruding end.

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- 12. The light emitting device according to claim 11, wherein the first fastening opening and the end plane are spaced by a distance.

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- 13. The light emitting device according to claim 1, wherein the transparent tube comprises a rib (112), and the first fastening member has one side neighboring to the rib and one other side connected to the heat dissipating board.

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- 14. The light emitting device according to claim 1, further comprising:

an adhesive, for adhering the first fastening member with the first fastening part of the end cap.

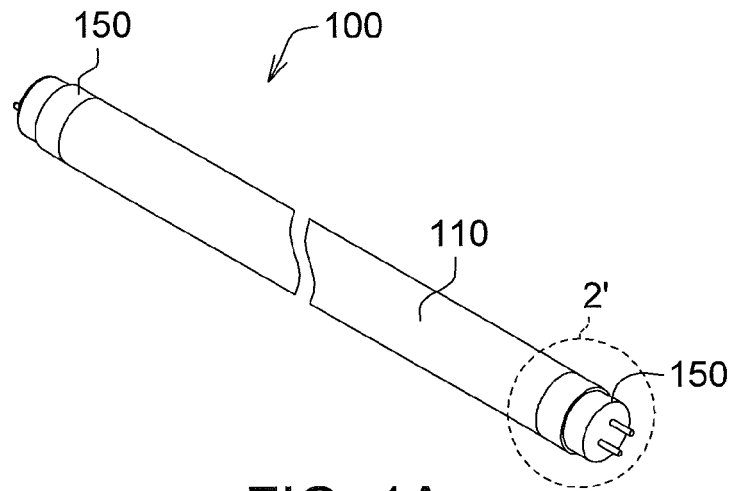


FIG. 1A

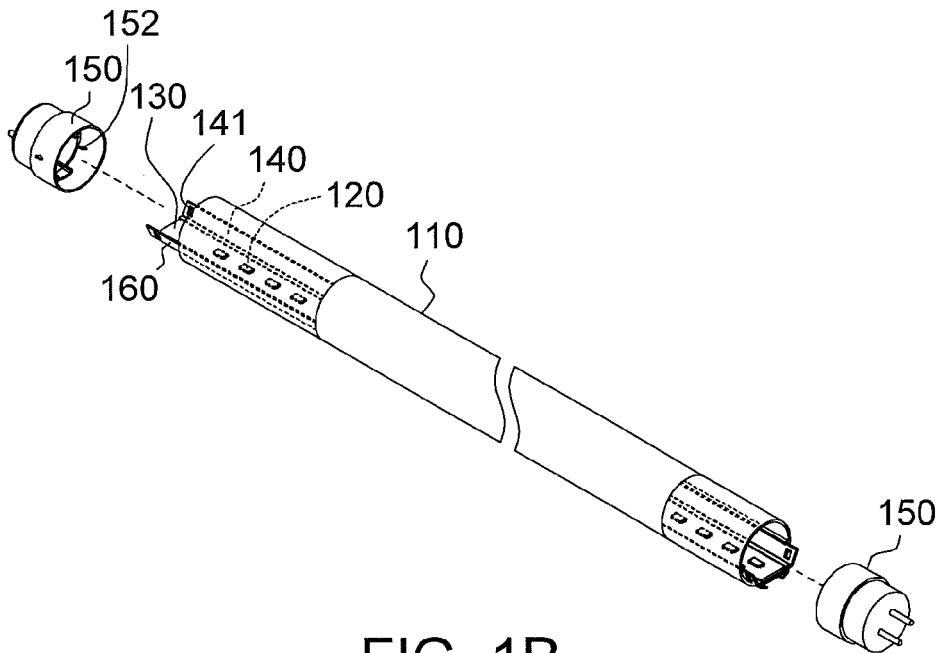


FIG. 1B

2'

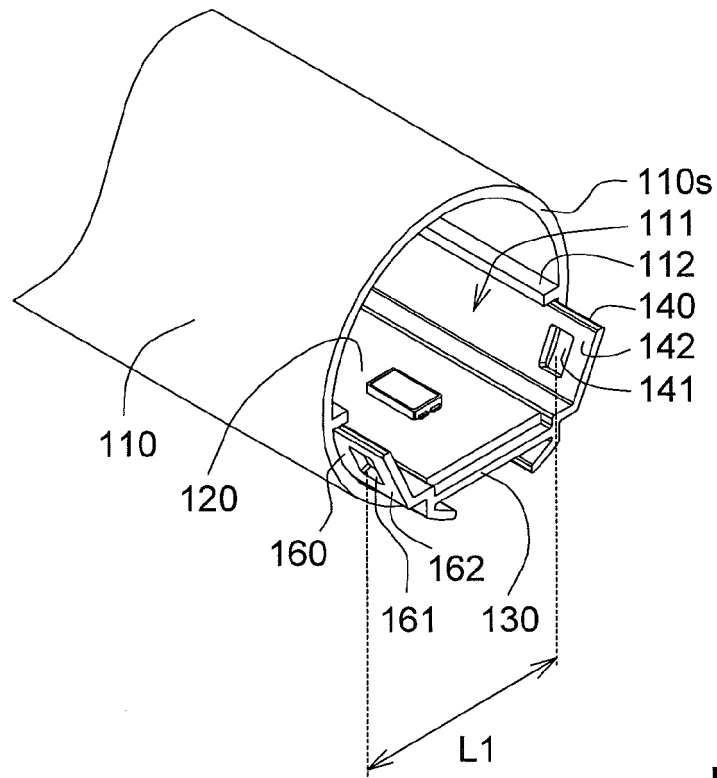


FIG. 2

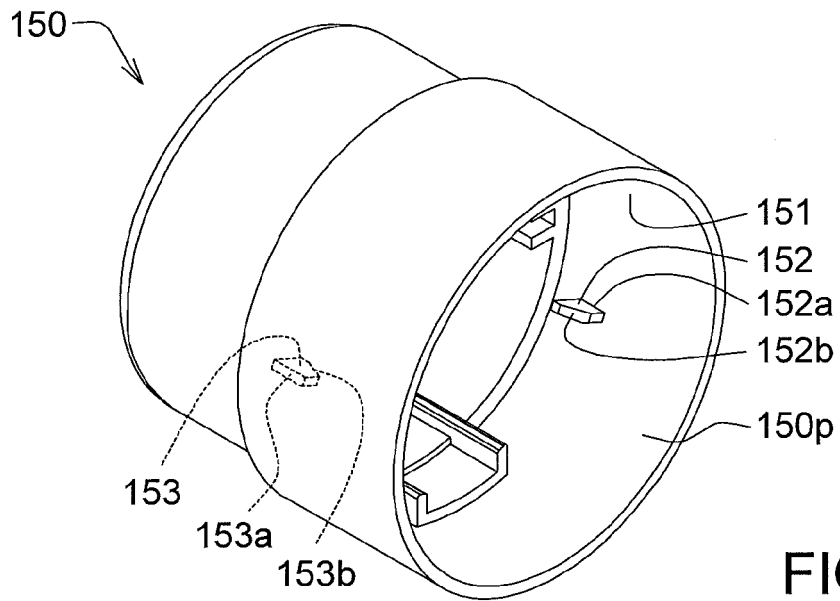


FIG. 3

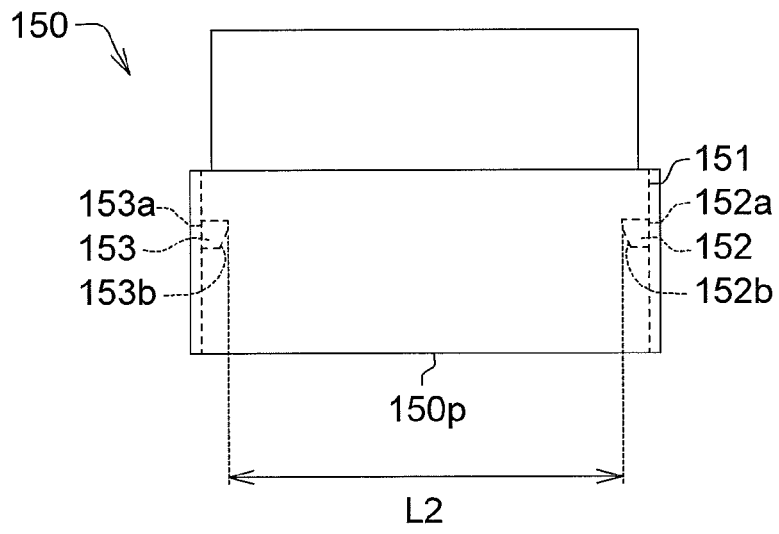


FIG. 4

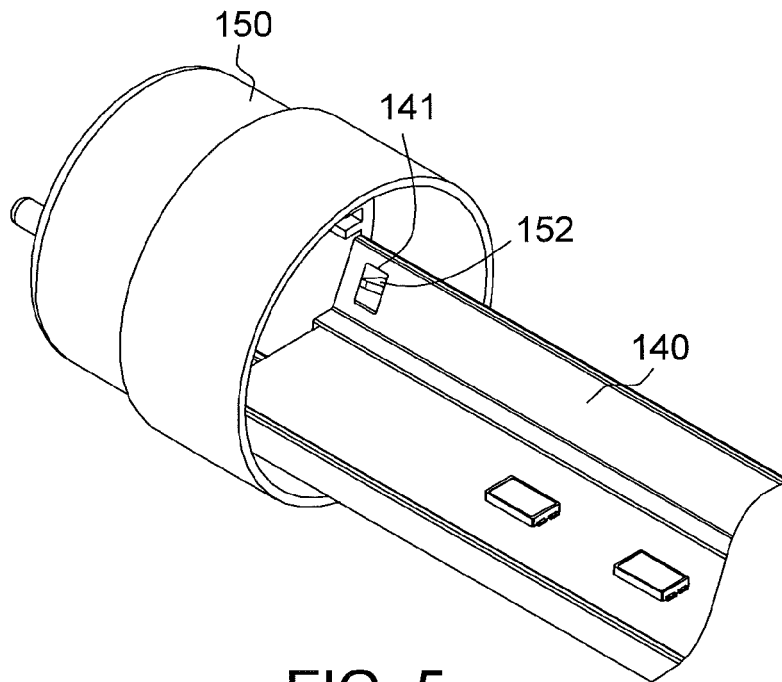


FIG. 5

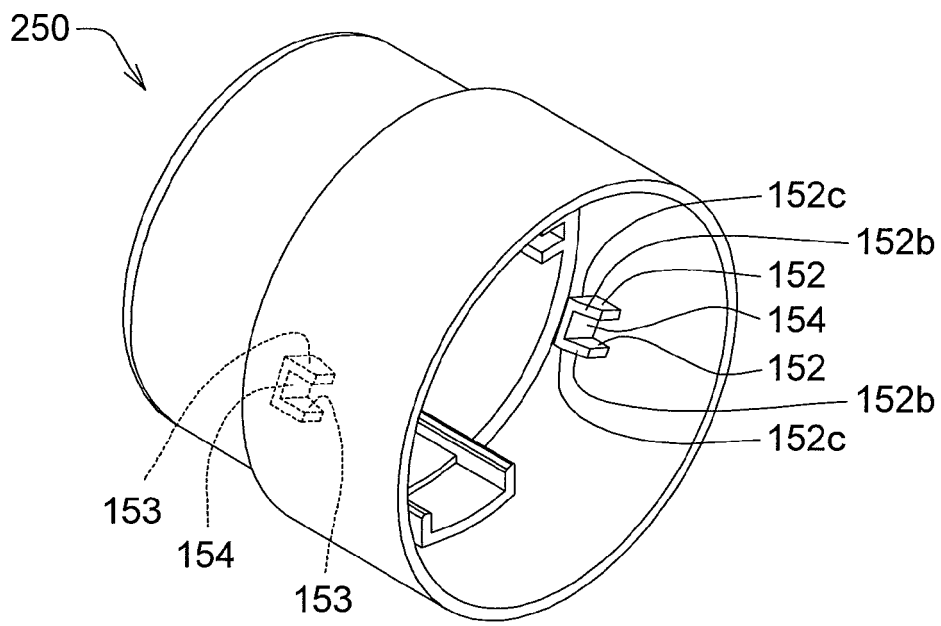


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 13 17 2327

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	DE 20 2011 107492 U1 (ALDER OPTOMECHANICAL CORP [TW]) 1 March 2012 (2012-03-01)	1-3,6, 10-12,14	INV. F21V15/015 F21K99/00 F21V17/16
Y	* paragraphs [0026] - [0028]; figures 4-6 *	1-14	
Y	----- EP 2 216 859 A1 (TYCO ELECTRONICS CORP [US]) 11 August 2010 (2010-08-11) * paragraphs [0069] - [0075]; figures 15,16 *	1-14	
Y	----- CN 102 032 478 A (SSEC CO LTD) 27 April 2011 (2011-04-27)	1-5, 10-14	
A	* figures 30-46 * -----	6-9	
			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 1 October 2013	Examiner Menn, Patrick
CATEGORY OF CITED DOCUMENTS		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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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01-10-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 202011107492 U1	01-03-2012	NONE	

EP 2216859 A1	11-08-2010	AT 540453 T	15-01-2012
		CN 101825261 A	08-09-2010
		EP 2216859 A1	11-08-2010
		JP 2010182673 A	19-08-2010
		TW 201030278 A	16-08-2010
		US 2010201239 A1	12-08-2010

CN 102032478 A	27-04-2011	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82