(54) Title: A LED LAMP

(57) Abstract: The invention provides a LED lamp comprising one or more
LEDs (10), an electric driving unit (30), and a housing (20). The electric
driving unit serves to supply a certain electric power to the one or more LEDs.
The housing comprises a side wall (211) and a top wall (212), wherein a
chamber (210) is formed by the side wall and the top wall and is capable of
accommodating the electric driving unit, and the top wall is capable of accom-
modating the one or more LEDs. The side wall is assembled by at least two
parts in such a manner that the electric driving unit can be introduced into the
chamber through an opening which is formed when at least one part of the at
least two parts has not been assembled with other parts of the side wall.

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- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
A LED lamp

FIELD OF THE INVENTION

The present invention relates to a LED lamp comprising one or more LED lighting elements, an electric driving unit for supplying a certain electric power to the one or more LED lighting elements, and a housing in which the electric driving unit is accommodated.

BACKGROUND OF THE INVENTION

Light emitting diodes (LEDs) are widely applied in various applications including utility lighting. LED lamps are regarded as representing the future of light sources and have been applied on a worldwide scale in recent years, and they will become even more popular in the future as they will replace traditional lamps because of the advantages of high efficiency and a potentially long lifetime.

Commonly, a LED lamp comprises a housing, which comprises a side wall and a top wall, LED elements or chips are mounted on the top wall and the electric driving unit is positioned in a chamber formed by the side wall and the top wall. Currently, there are two ways to manufacture the chamber. In a first way, the chamber is made in one piece (e.g. a metallic sheet) for example by means of die casting or deep drawing, which means that the side wall and the top wall are integrally formed. In a second way, the chamber is formed by assembling together the side wall and the top wall, which means that the side wall and the top wall are interconnected via a connecting means, like glue.

As regards the chamber made in the first way, there is an opening in the bottom of the chamber and the electric driving unit is placed in the chamber by inserting it through this opening. Commonly, this opening is small-sized due to the size limitation of the whole lamp. Thus, the outer dimension of the electric driving unit is limited, which leads to the electronic components being placed very close together and an increase in the complexity of the layout of the electric driving circuit.

As regards the chamber made in the second way, the electric driving unit is commonly placed in the chamber before the top wall is connected to the side wall. In this way, it is easy to place the electric driving unit in the chamber, as the opening resulting from the top wall not being connected to the side wall is generally large. However, the heat dissipating performance is not good, as the thermal resistance between the top wall and the side wall is high and heat generated by the LED cannot be smoothly transferred from the top wall to the side wall.
Therefore, there is a desire to develop a housing for a LED lamp, which housing has a good performance in terms of heat dissipation and also has a convenient structure for receiving the electric driving unit.

**SUMMARY OF THE INVENTION**

It is an object of the present invention to provide a LED lamp having a housing, which housing has a convenient structure for receiving the electric driving unit.

It is another object of the present invention to provide a LED lamp having a housing, which housing has a convenient structure for receiving the electric driving unit and also has a good performance in terms of heat dissipation.

According to an embodiment of the present invention, a LED lamp is provided and comprises one or more LED lighting elements, an electric driving unit, and a housing. The electric driving unit supplies a certain electric power to the one or more LED lighting elements. The housing comprises a side wall and a top wall, wherein a chamber is formed by the side wall and the top wall and said chamber is capable of accommodating the electric driving unit, and the top wall is capable of accommodating the one or more LED lighting elements. The side wall is assembled from at least two parts in such a manner that the electric driving unit can be placed in the chamber through an opening which is formed when at least one part of the at least two parts has not been assembled with other parts of the side wall.

By assembling the side wall from at least two parts in a particular manner as proposed above, an opening in the side wall can be formed by leaving at least one part unassembled with respect to other parts. Thus, the electric driving unit can be placed in the chamber through this opening and then this opening can be closed by assembling the at least one part with other parts.

According to another embodiment of the present invention, the side wall is assembled from two parts, each of the two parts being approximately vertical to the top wall. Alternatively, the top wall is assembled from two parts in such a manner that when one part of the top wall is not connected with the other part of the top wall there will be an opening to the chamber, and one part of the top wall and one part of the side wall are formed into one piece. Alternatively, the top wall comprises two layers and is formed by overlapping the two layers, and one part of the side wall and one layer of the top wall are integrally formed into one piece. In such an embodiment, as each part or layer of the top wall is formed integrally with a corresponding part of the side wall, and except the thermal resistance inherent in the top wall and side wall, there is no additional thermal resistance between such part of the top wall and its corresponding part of the side wall, the heat received by
the top wall can be quickly transferred to the side wall. Therefore, the thermal performance of the housing is good.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The above and other objects and features of the present invention will become apparent from the following detailed description of the various aspects of embodiments with reference to the accompanying drawings.

Fig. 1 is an exploded perspective view of the LED lamp according to a first embodiment of the invention;

Fig. 2 is a perspective view of the housing of the LED lamp shown in Fig.1;

Fig. 3 is a perspective view of one half of the housing of the LED lamp shown in Fig.1;

Fig. 4 is a perspective view of the housing of the LED lamp according to a second embodiment of the invention;

Fig. 5 is a perspective view of one part of the housing shown in Fig.4.

Fig. 6 is a perspective view of one half of the housing shown in Fig.4.

**DETAILED DESCRIPTION OF EMBODIMENTS**

Figs. 1 through 3 illustrate a LED lamp 1 according to a first embodiment of the invention. The LED lamp 1 comprises one or more LED lighting elements 10 positioned on a printed circuit board (PCB), a housing 20, an electric driving unit 30, a bulb 40 for covering the LED lighting elements 10 and a socket 50 for electrically connecting the LED lamp 1 to an external electric power source like the mains. The electric driving unit 30 is positioned on a printed circuit board (PCB) and located in the internal space of the housing 20, and can be electrically connected to the external electric power source via the socket 50 and supply a certain electric power to the one or more LED lighting elements 10.

The housing 20 comprises a chamber 210 which is formed by a side wall 211 and a top wall 212 and which is capable of accommodating the electric driving unit 30 in the internal space of the chamber 210. The top wall 212 is capable of accommodating the one or more LED lighting elements 10.

Alternatively, a thermal pad 70 or other thermal conductive structure is put between the printed circuit board containing the LED lighting elements 10 and the top wall 212 of the chamber 210. Such a thermal pad 70 or other thermal conductive structure has a high heat dissipation performance, so that heat generated by the LED can be quickly transferred to
the housing 20.

As shown in Figs. 2 and 3, the chamber 210 is assembled from a first part 213 and a second part 214. In this embodiment, parts 213 and 214 are deemed to be the two halves of the chamber 210, which division is achieved by cutting the chamber 210 along its longitudinal section. Thus, the side wall 211 is assembled from a first part 2111 and a second part 2112, and the top wall is assembled from a first part 2121 and a second part 2122. Each of the first part 2111 and the second part 2112 of the side wall 211 is approximately vertical to the top wall 212. Correspondingly, the first part of the chamber 213 is assembled from the first part of the top wall 2121 and the first part of the side wall 2111, and the second part of the chamber 214 is assembled from the second part of the top wall 2122 and the second part of the side wall 2112. When the first part of the chamber 213 and the second part of the chamber 214 have not been connected together, a large opening can be left allowing the electric driving unit 30 to be placed in the chamber 210. Thus, the electric driving unit 30 can be easily placed in the chamber 210. Once the electric driving unit 30 has been fixed within the chamber 210, the first part of the chamber 213 and the second part of the chamber 214 can be connected together. The chamber 210 may only leave a relatively small opening at its bottom end for allowing passage of an electric wire so as to achieve an electric connection between the electric driving unit 30 and the external power source by means of this electric wire.

Alternatively, the first part of the top wall 2121 and the first part of the side wall 2111 can be connected by means of a connecting means to form the first part of the chamber 213, and similarly the second part of the top wall 2122 and the second part of the side wall 2112 can be connected by means of a connecting means to form the second part of the chamber 214.

Alternatively, the first part of the chamber 213 and the second part of the chamber 214 can be made integrally, for instance, from one piece of metallic sheet by means of die casting. Thus, there is no connection between the first part of the top wall 2121 and the first part of the side wall 2111, and the same applies to the second part of the top wall 2122 and the second part of the side wall 2112. Consequently, the first part of the chamber 213 and the second part of the chamber 214 in this configuration will have a better heat dissipation performance as compared to the structure where the first part of the top wall 2121 and the first part of the side wall 2111 are interconnected to form the first part of the chamber 213, and the second part of the top wall 2122 and the second part of the side wall 2112 are interconnected to form the second part of the chamber 214, due to a lower thermal resistance.

Alternatively, the housing 20 further comprises a jacket 220 which may be employed to enclose the chamber 210 so that the housing 20 has a strong mechanical fixation. The
jacket 220 can be a plastic shell. Alternatively, the housing 20 further comprises a plurality of heat dissipation fins (not shown) which are positioned on the side wall 211, so that the heat dissipation area is enlarged and consequently the heat dissipation performance of the housing 20 is improved.

Figs 4-6 illustrate another embodiment of the housing according to the present invention. Please note that only the chamber 210 is shown, and other accessories like the jacket 220 or heat dissipation fins described above are omitted.

The chamber 210 is also formed by the side wall 211 and the top wall 212 and its internal space can be used to accommodate the electric driving unit 30. The side wall 211 is assembled from a first part 2131 and a second part 2141, and each of the two parts is approximately vertical to the top wall 212. The top wall 212 comprises a first layer 2132 and a second layer 2142 and is formed by overlapping the two layers. Thus, a first part of the chamber 213 is formed by the first part of the side wall 2131 and the first layer of the top wall 2132, and a second part of the chamber 214 is formed by the second part of the side wall 2141 and the second layer of the top wall 2142. When the first part of the chamber 213 and the second part of the chamber 214 are not assembled together, there will be a large opening for receiving the electric driving unit 30, and the electric driving unit 30 can be easily placed in the chamber. After the electric driving unit 30 has been fixed within the chamber, the first part of the chamber 213 and the second part of the chamber 214 can be connected together.

Preferably, the first part of the chamber 213 and the second part of the chamber 214 are made integrally, for instance, from one piece of metallic sheet via die casting, which means that there is no connection between the first layer of the top wall 2132 and the first part of the side wall 2131, and neither between the second part of the side wall 2141 and the second layer of the top wall 2142. In this configuration, except the thermal resistance inherent in top wall 212 and side wall 211, there is no additional thermal resistance between the part of the top wall and its corresponding part of the side wall 211, so that the heat received by the top wall 212 can be quickly transferred to the side wall 211. As a result, the heat performance of the housing is good.

The above embodiments only give examples of configurations of the housing 20, and there may be many variations.

For example, the side wall 211 can be assembled from two parts, and each of the two parts is approximately parallel to the top wall 212. In this embodiment, each of the two parts can be deemed to be one half of the chamber 210, which is achieved by cutting the chamber 210 along its horizontal section. Preferably, the upper part of the side wall 211 is formed integrally with the top wall 212 so as to improve the heat dissipation efficiency due to a
lower thermal resistance.

Generally, the side wall 211 can be assembled from two or more parts, as long as the electric driving unit 30 can be placed in the chamber 210 through an opening which is formed when at least one part of the two or more parts has not been assembled with other parts of the side wall 211. In the case, that the side wall 211 is assembled from two parts, which are vertical or parallel to the top wall 212, there are the additional advantages of a simple structure and low manufacturing cost.

Accordingly, the top wall 212 can be assembled from two or more parts in such a manner that when one part of the top wall is not connected with the other part of the top wall there will be an opening to the chamber. Preferably, one part of the top wall 212 and one part of the side wall 211 are formed in one piece so as to improve the heat dissipation efficiency due to a lower thermal resistance.

Alternatively, a thermally conductive structure, for instance, a thermal pad, interface or grease for heat conduction, can be employed in the connection between two parts of the side wall or the top wall so as to improve the heat dissipation performance.

Alternatively, the LED lamp 1 provided by the present invention is specially suitable for use as a LED retrofit lamp for replacing a traditional fluorescent or incandescent lamp; the LED retrofit lamp is commonly small-sized, however, the difficulties encountered in installing the electric driving unit into the housing are easily solved by the configuration of the housing proposed by the invention.

The embodiments described above are merely preferred embodiments of the present invention. Other variations of the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. These variations shall also be considered to be within the scope of the present invention. In the claims and description, use of the verb "comprise" and its conjugations does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality.
CLAIMS

1. A LED lamp comprising:
   one or more LED lighting elements,
   an electric driving unit for supplying a certain electric power to the one or more LED lighting elements, and
   a housing comprising a side wall and a top wall, wherein a chamber is formed by the side wall and the top wall and is capable of accommodating the electric driving unit, and the top wall is capable of accommodating the one or more LED lighting elements,
   characterized in that the side wall is assembled from at least two parts in such a manner that the electric driving unit can be placed in the chamber through an opening which is formed when at least one part of the at least two parts has not been assembled with other parts of the side wall.

2. The LED lamp according to claim 1, wherein the side wall is assembled from two parts, each of the two parts being approximately vertical to the top wall.

3. The LED lamp according to claim 2, wherein the top wall is assembled from two parts in such a manner that when one part of the top wall is not connected with the other part of the top wall there will be an opening to the chamber, and one part of the top wall and one part of the side wall are formed into one piece.

4. The LED lamp according to claim 2, wherein the top wall comprises two layers and is formed by overlapping the two layers, and one part of the side wall and one layer of the top wall are formed into one piece.

5. The LED lamp according to claim 1, wherein a thermally conductive structure is employed in the connection between two parts of the side wall.

6. The LED lamp according to claim 1, wherein the side wall is assembled from two parts, each of the two parts being approximately parallel to the top wall.

7. The LED lamp according to claim 1, wherein the housing further comprises a plurality of heat dissipation fins which are positioned on the side wall.
8. The LED lamp according to claim 1, wherein the housing further comprises a jacket which encloses the chamber.

9. The LED lamp according to claim 1, wherein the LED lamp is a LED retrofit lamp for replacing a traditional fluorescent or incandescent lamp.
FIG. 2

FIG. 3
**INTERNATIONAL SEARCH REPORT**

**International application No**
PCT/IB2011/053525

**A. CLASSIFICATION OF SUBJECT MATTER**

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According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

F21K  F21V

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal , WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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**Date of the actual completion of the international search**

24 November 2011

**Date of mailing of the international search report**

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Prevot, Eric
### DOCUMENTS CONSIDERED TO BE RELEVANT

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