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(54) **MOUNTING ELEMENT FOR LED FILAMENTS AND LED LAMP COMPRISING A MOUNTING ELEMENT**

(57) A mounting element for mounting LED filaments in an LED lamp comprises a clamping portion and one or more arms extending from the clamping portion. The mounting element may be attached by clamping to a mounting stem.

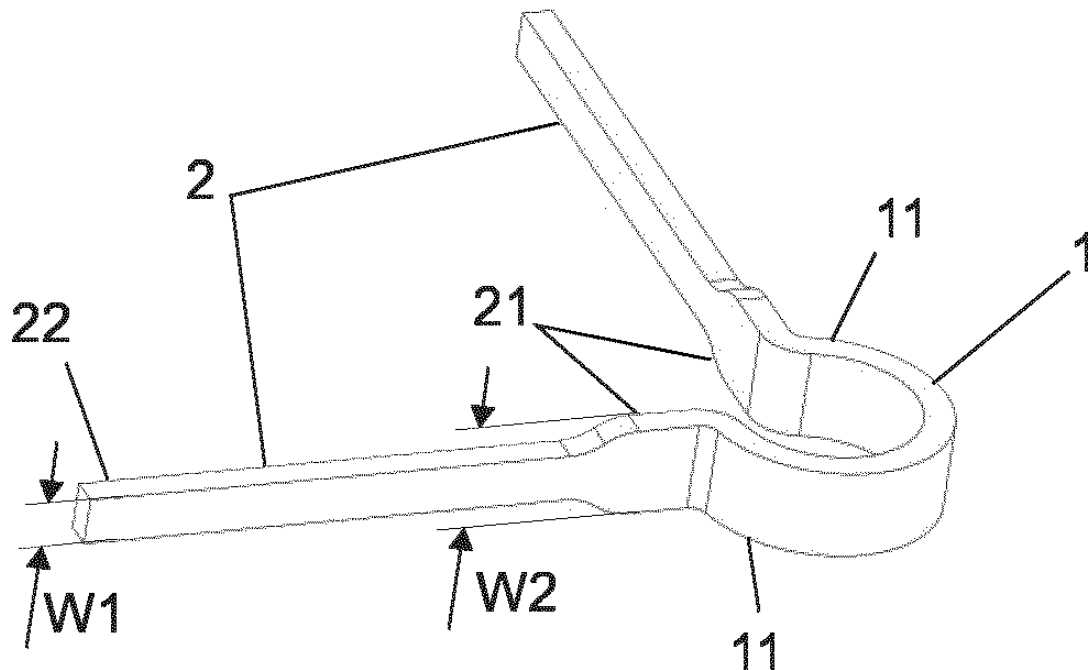


Fig. 1b

EP 3 608 581 A1

Description

Technical Field

[0001] The present invention relates to LED lamps, in particular to LED lamps using LED filaments for light generation.

Background

[0002] A specific type of LED lamps uses LED filaments, i.e. strip-like LED elements which typically comprise a plurality of LEDs arranged in a row on a strip-like carrier (e.g. metal, glass, or sapphire materials). The LEDs may be coated by a coating for converting the light generated by the LEDs into a desired wavelength range. Multiple LED filaments are usually arranged inside a bulb of a lamp (e.g. a LED retrofit lamp having an Edison type lamp base, such as E27 or E14). LED filaments usually are arranged essentially parallel to the longitudinal axis of the lamp. In order to minimize the generation of shadows, the LED filaments in a lamp can be arranged with a slight deviation from said longitudinal direction, such that not all LED filaments are positioned parallel to each other.

[0003] In known LED filament lamps, the LED filaments usually are mounted using a mounting stem made from an electrically nonconductive material, for example glass or plastics, extending from the lamp base essentially parallel to the longitudinal axis of the lamp. At the upper end of the mounting stem (i.e. at the end opposite the lamp base) a plurality of holding wires extends essentially perpendicular to the mounting stem. These wires are fused into the mounting stem, in a part called "lens". The LED filaments are fixed with their upper terminals to these holding wires in order to hold them and provide an electrical connection between the LED filaments, for example by soldering or welding the terminals to the respective holding wires.

[0004] The lower terminals of the LED filaments are fixed to another set of holding wires extending from the mounting stem at a position closer to the lamp base than the upper end of the mounting stem. These wires are also fused into the mounting stem, in a part called "pinch".

[0005] An electrical connection from the lamp base to the LED filaments usually is provided by connection wires from the lamp base (either from the electrical contacts on the lamp base or from a driver located in the lamp base) to the lower terminals of two of the LED filaments (either directly or via the lower holding wires).

[0006] Such a mounting of LED filaments in an LED lamp is rather complex, in particular when an automated assembly is to be achieved.

Summary of the Invention

[0007] In view of the known prior art, it is an object of the present invention to simplify the mounting of LED

filaments in an LED lamp, while ensuring good electrical conductivity as well as good mechanical stability.

[0008] This object is solved by a mounting element for mounting LED filaments in an LED lamp and by an LED lamp comprising such a mounting element according to the independent claims. Preferred embodiments are given by the dependent claims.

[0009] A mounting element for mounting LED filaments in an LED lamp according to the present invention comprises a clamping portion and one or more arms extending from the clamping portion. With the clamping portion, the mounting element may be mounted (i.e. clamped) to a holding structure such as a mounting stem in an LED lamp. The arms may then extend from the holding structure, for example radially outwards, and provide mounting points for the LED filaments.

[0010] Clamping the mounting element to the holding structure simplifies assembly of the LED lamp and also allows using a much simpler holding structure, as no holding wires need to be fixed to the holding structure beforehand. The mounting structure may at least partially be made from an electrically conductive material and, thus, provide an electrical connection between two LED filaments mounted to the mounting element.

[0011] In an embodiment, the mounting element has two arms and the arms enclose an angle of about 90° (for a lamp with four LED filaments, see below) or of about 120° (for a lamp with three LED filaments).

[0012] In an embodiment, the clamping portion comprises a lateral wall. The lateral wall at least partially surrounds a central opening of the clamping element. The central opening may receive the holding structure so that, when the mounting element is clamped to the holding structure, the lateral wall at least partially surrounds the holding structure.

[0013] The central opening may define a center point. In an embodiment, the lateral wall surrounds the central opening over an angle of at least 180°, preferably over an angle of about 240° to about 270°. Said angle is measured from the two ends of the clamping portion as seen from the center point of the central opening. A bigger angle means that the lateral wall surrounds the central opening further. However, a bigger angle may make clamping of the mounting element to a holding structure more difficult, as the space through which the holding structure may be inserted into the central opening becomes smaller.

[0014] The shape of the central opening may be circular or polygonal. In an embodiment, the lateral wall has at least partially a cylindrical form. In other words, the lateral wall corresponds to a section of a cylinder wall.

[0015] In an embodiment, the lateral wall comprises two free ends, i.e., the lateral wall surrounds the central opening from one of the free ends to the other of the free ends. At least one of the arms is attached to the lateral wall at one of the free ends. In an embodiment, the mounting element has exactly two arms, both of which are attached to the lateral wall at the free ends thereof. "At-

tached" herein means that the lateral wall and the arms can be made as a single piece or as separate pieces, which are then connected to each other (e.g. by welding, gluing, etc.).

[0016] In an embodiment, each arm has a first end, with which the respective arm is attached to the clamping portion, and a free second end. The free second end (or the portion of the arm near the free second end) may serve as a holding point for attaching the terminal of an LED filament thereto, e.g. by soldering or welding.

[0017] In an embodiment, a width of at least one arm at the second end (i.e. free end) is smaller than a width of the same arm at the first end where the arm is attached to the clamping portion. This reduces the amount of material needed for the mounting element while, at the same time, ensuring mechanical stability of the mounting element at the connection between arm and clamping portion.

[0018] In an embodiment, at least the clamping portion is resilient. This enables the clamping portion to act like a spring, thereby allowing the clamping portion to be clamped to a holding structure.

[0019] The mounting element may be formed in one piece, in particular from a sheet metal by a stamping and bending process. This allows easily manufacturing the mounting element. The material of the mounting element may be spring steel.

[0020] The invention also relates to an LED lamp comprising at least one mounting element as described above. The mounting element may be mounted to a holding structure of the LED lamp and provide mounting points for mounting LED filaments.

[0021] In an embodiment, the holding structure is a mounting stem. An inner shape of the clamping portion may be conformed to an outer shape of the mounting stem, thus allowing the clamping portion to be clamped to the mounting stem.

[0022] One or more LED filaments may be attached each with one of its electrically conductive terminals to an arm of the mounting element. The other electrically conductive terminals of the LED filaments may be attached to one or more further mounting elements as described above or to one or more conventional holding wires.

Brief Description of the Drawings

[0023] Preferred embodiments of the invention will be explained in the following, having regard to the drawings. It is shown in:

- Figs. 1a, 1b an embodiment of a mounting element according to the present invention;
- Figs. 2a, 2b the mounting element of Figs. 1a, 1b clamped to a holding structure;
- Figs. 3a, 3b the mounting element of Figs. 1a, 1b

clamped to a holding structure with LED filaments; and

Fig. 4 an embodiment of an LED lamp according to the present invention.

[0024] Figs. 1a, 2a, and 3a are wireframe views showing hidden lines. Figs. 1b, 2b, and 3b are perspective views and do not show hidden lines.

Detailed Description of the Invention

[0025] In the following, preferred embodiments of the invention will be described with reference to the drawings. The same or similar elements or elements having the same effect may be indicated by the same reference number in multiple drawings. Repeating the description of such elements may be omitted in order to prevent redundant descriptions.

[0026] Figs. 1a and 1b show an embodiment of a mounting element according to the present invention. The mounting element comprises a clamping portion 1 and two arms 2 extending radially outward from the clamping portion 1. The clamping portion 1 is formed as a portion of a cylindrical wall and surrounds a circular central opening. The clamping portion 1 surrounds the central opening over an angle of about 270° (seen from a center point of the central opening). In other words, the angle between the two arms 2 is about 90°.

[0027] The clamping portion 1 comprises two ends 11. At each end 11 one of the arms 2 is attached to the clamping portion 1.

[0028] Each arm 2 comprises a first end 21 and a second end 22. The first end 21 of each arm is attached to the corresponding end 11 of the clamping portion 1. The second end 22 of each arm is a free end and may be used for attaching a terminal of an LED filament thereto.

[0029] The width W1 of each arm at the first end 21 is larger than the width W2 of the arm at the second end 22. Herein, the width is measured along the direction of the cylinder axis A of the cylindrical wall of the clamping portion 1. In a portion of the arm between the first end 21 and the second end 22, the width of the arm tapers from the width W1 at the first end 21 to the width W2 at the second end 22. In other embodiments, the width of the arm may be constant or may taper (linearly or otherwise) from a first width to a second width over the whole length (or at least a significant portion thereof) of the arm.

[0030] The mounting element may be made from electrically conductive spring steel by a stamping and bending process.

[0031] In Figs. 2a and 2b, the mounting element of Figs. 1a and 1b is shown attached to a holding structure in the form of a mounting stem 3. The mounting stem 3 comprises an essentially cylindrical body portion 31 and a top portion 32 ("lens"), to which two holding wires 4 are attached. At the lower end, the body portion 31 is attached to a base portion 33 that may be fixed to a lamp

base.

[0032] Two connection wires 5 are fused into and held in place by the base portion 33 ("pinch"). The upper ends of the connection wires 5 may be electrically connected to LED filaments, the lower ends of the connection wires 5 may be electrically connected either to electrical contacts on the lamp base or to a driver located in the lamp base.

[0033] The inner shape of the lateral wall of the clamping portion 1 corresponds to the outer shape of the body portion 31 (at least in the position where the mounting element 1 is to be mounted to the mounting stem 3). This ensures that the clamping portion 1 and thus the mounting element may be fixedly held on the mounting stem 3 by the clamping force alone (frictional connection).

[0034] In Figs. 3a and 3b, the assembly of Figs. 2a and 2b is shown with four LED filaments 6 attached thereto. Each LED filament 6 comprises a lower terminal 61 and an upper terminal 62. The lower terminals 61 of two of the LED filaments 6 are mechanically and electrically connected to the arms 2, in particular at locations near the free second ends 22. The lower terminals 61 of the other two LED filaments 6 are mechanically and electrically connected to the connection wires 5. The upper terminals 62 of all four LED filaments 6 are mechanically and electrically connected to the holding wires 4. All connections may be made for example by soldering or welding.

[0035] In other embodiments, instead of holding wires 4 at the top portion 32 of the mounting stem 3, two further mounting elements identical or similar to the one shown in Fig. 1 may be used. While in such a case the mounting elements would be positioned one above the other (and not in the same plane, as the holding wires 4), such an offset may be compensated for by the shape or direction of the arms or by the length of the terminals of the LED filaments.

[0036] The arrows in Fig. 3b schematically indicate the direction of current flowing through the assembly. The current flows from one of the connection wires 5 through the first LED filament 6, via one of the holding wires 4 towards the second LED filament 6 and through said LED filament, via the mounting element towards the third LED filament 6 and through said LED filament, via the second of the holding wires 4 towards the fourth LED filament 6 and through said LED filament, and finally to the second connection wire 5.

[0037] The four LED filaments, thus, are serially connected to each other and may be operated at a voltage corresponding to four times the operating voltage of a single LED filament. Using LED filaments having an operating voltage of about 60 V, such a serial connection of four LED filaments may, therefore, be supplied by mains voltage without the need for an additional driving circuit.

[0038] As can be understood from the above, a mounting element according to the present invention securely holds the LED filaments in place while, at the same time,

providing an electrical connection between at least some of the LED filaments.

[0039] In an embodiment with three LED filaments, the angle between the two arms of the mounting element may be about 120°. In other words, the clamping portion may surround the central opening over an angle of about 240° (seen from a center point of the central opening). In such an embodiment, one of the connection wires 5 may contact the lower terminal 61 of one LED filament 6 and the other connection wire 5 may extend towards the top portion 32 of the mounting stem 3 and contact the upper terminal 62 of another LED filament 6, either directly or indirectly via a holding wire 4.

[0040] Fig. 4 shows an embodiment of an LED lamp according to the present invention. The assembly shown in Figs. 3a and 3b is mounted to a lamp base 7 having electrical contacts 71, 72. The connection wires 5 are connected at their lower end to the electrical contacts 71, 72. The whole assembly fits into a standard size bulb 8, which is fastened to the lamp base 7. Preferably, the bulb 8 is fastened (for example glued) to the lamp base 7 in a gas-tight manner and the lamp is filled with a gas having high thermal conductivity, such as hydrogen or helium, or a mixture thereof or with other gases to improve dissipation of the heat generated by the LED filaments during operation.

[0041] If it is intended that the LED filaments are arranged obliquely with respect to (i.e. not parallel to) the longitudinal axis of the lamp in order to reduce shadows, the mounting element may be clamped to the mounting stem in a rotated orientation, such that the arms of the mounting element and the holding wires extend in different directions.

[0042] Although the invention has been illustrated and described in detail by the embodiments explained above, it is not limited to these embodiments. Other variations may be derived by the skilled person without leaving the scope of the attached claims.

[0043] Generally, "a" or "an" may be understood as singular or plural, in particular with the meaning "at least one", "one or more", etc., unless this is explicitly excluded, for example by the term "exactly one", etc.

[0044] In addition, numerical values may include the exact value as well as a usual tolerance interval, unless this is explicitly excluded.

[0045] Features shown in the embodiments, in particular in different embodiments, may be combined or substituted without leaving the scope of the invention.

List of Reference Numerals

[0046]

1	clamping portion
11	ends of clamping portion
2	arms
21	first end of arm
22	second end of arm

3 mounting stem
 31 body portion of mounting stem
 32 top portion of mounting stem
 33 base portion of mounting stem
 4 holding wires
 5 connection wires
 6 LED filaments
 61 lower terminal of LED filament
 62 upper terminal of LED filament
 7 lamp base
 71 electrical contact of lamp base
 72 electrical contact of lamp base
 8 bulb
 A longitudinal axis
 W1 width of first end of arm
 W2 width of second end of arm

Claims

1. Mounting element for mounting LED filaments (6) in an LED lamp, the mounting element comprising a clamping portion (1) and one or more arms (2) extending from the clamping portion (1).
2. Mounting element according to claim 1, wherein the clamping portion (1) comprises a lateral wall, the lateral wall at least partially surrounding a central opening of the clamping element (1).
3. Mounting element according to claim 2, wherein the lateral wall surrounds the central opening over an angle of at least 180°.
4. Mounting element according to any one of claims 2-3, wherein the lateral wall has at least partially a cylindrical form.
5. Mounting element according to any one of claims 2-4, wherein the lateral wall comprises two free ends (11), wherein at least one of the arms (2) is attached to the lateral wall at a free end (11).
6. Mounting element according to any one of the previous claims, wherein each arm (2) has a first end (21), with which the respective arm (2) is attached to the clamping portion (1), and a free second end (22).
7. Mounting element according to claim 6, wherein a width (W2) of at least one arm (2) at the second end (22) is smaller than a width (W1) of the same arm (2) at the first end (21).
8. Mounting element according to any one of the previous claims, wherein at least the clamping portion (1) is resilient.
9. Mounting element according to any one of the previous claims, wherein the mounting element is formed in one piece.
10. Mounting element according to any one of the previous claims, wherein the mounting element is formed from a sheet metal by a stamping and bending process.
11. LED lamp comprising at least one mounting element according to any one of the previous claims.
12. LED lamp according to claim 11, further comprising a mounting stem (3), wherein an inner shape of the clamping portion (1) is conformed to an outer shape of the mounting stem (3), wherein the clamping portion (1) is clamped to the mounting stem (3).
13. LED lamp according to any one of claims 11-12, the LED lamp further comprising one or more LED filaments (6), wherein at least one LED filament (6) is attached with one of its electrically conductive terminals (61) to an arm (2) of the mounting element.

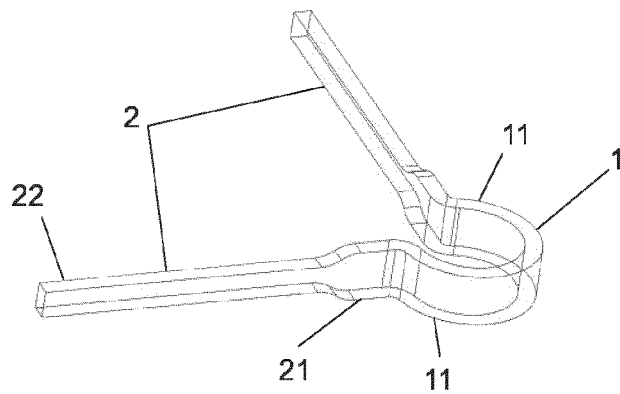


Fig. 1a

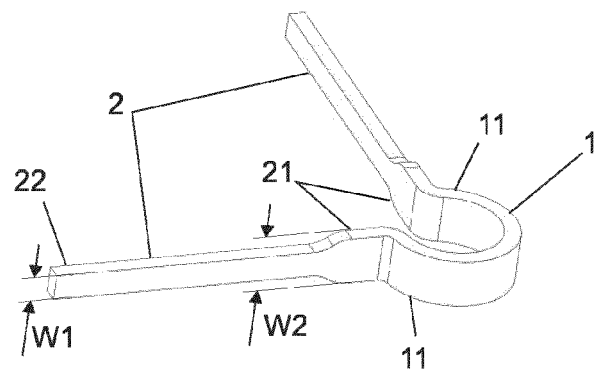


Fig. 1b

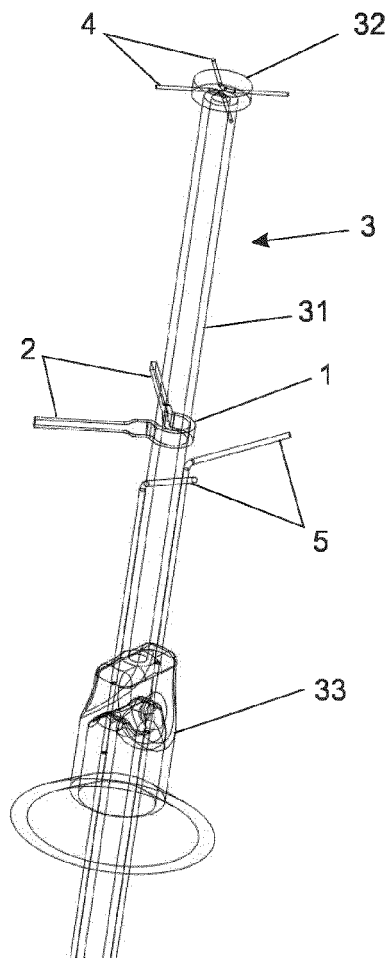


Fig. 2a

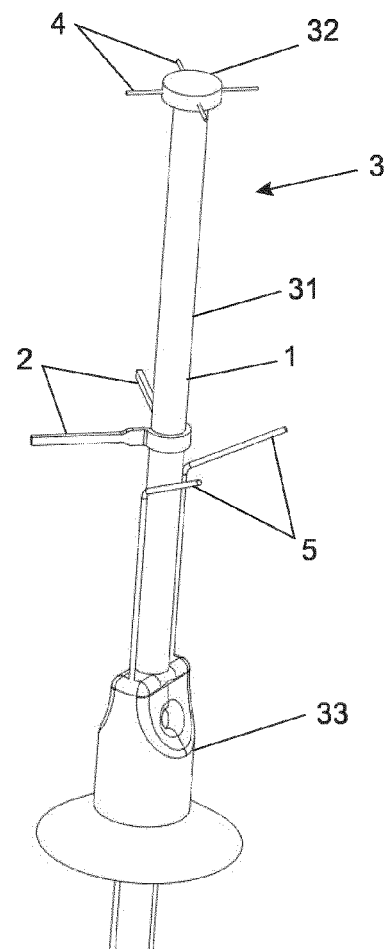


Fig. 2b

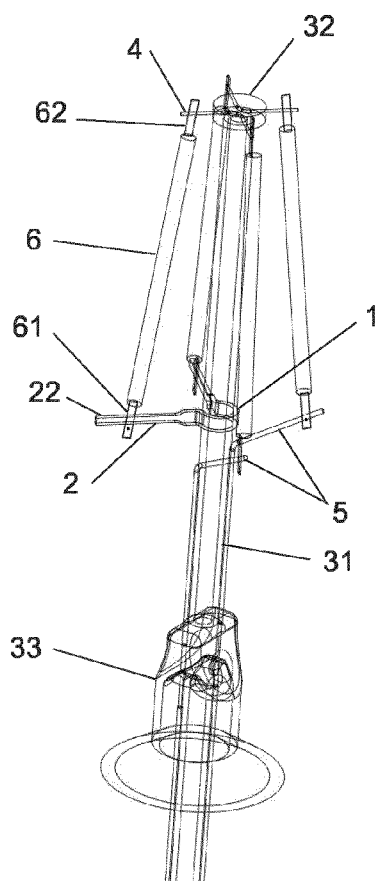


Fig. 3a

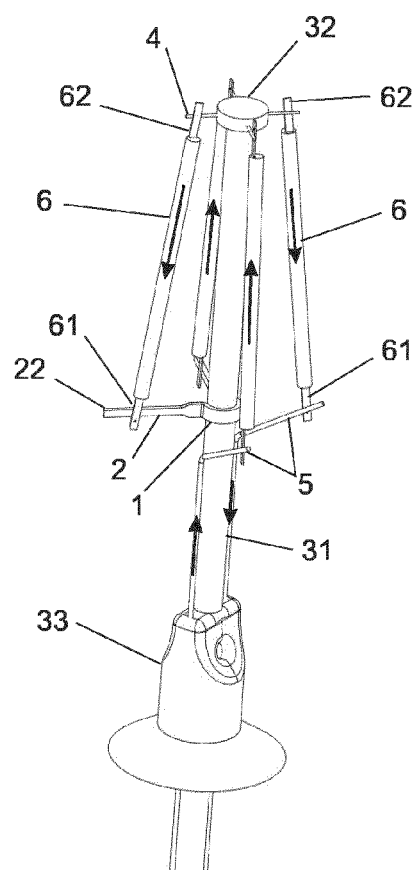


Fig. 3b

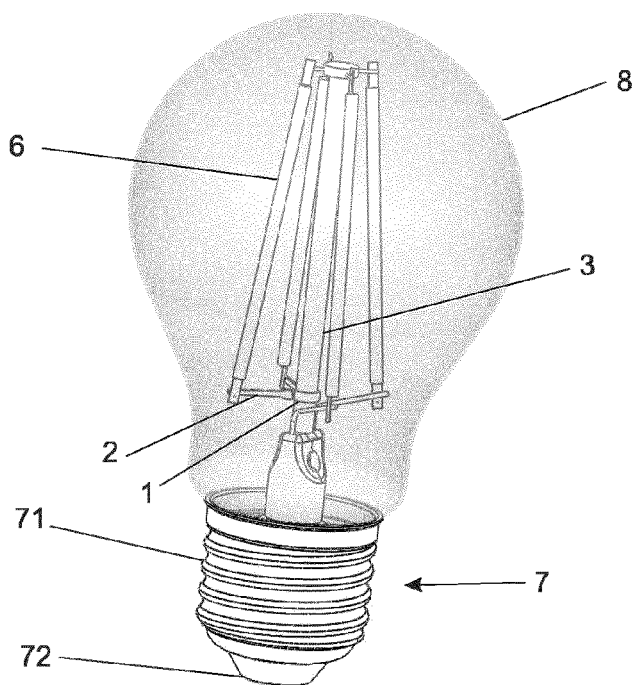


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 18 18 8333

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			F21K F21Y F21S
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 November 2018	Examiner Kebemou, Augustin
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 18 18 8333

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CN 203907283	U	29-10-2014	NONE	

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