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(54) Title: LIGHT EMITTING DIODE (LED) FILAMENT LIGHT BULB WITH SECURED ANTENNA

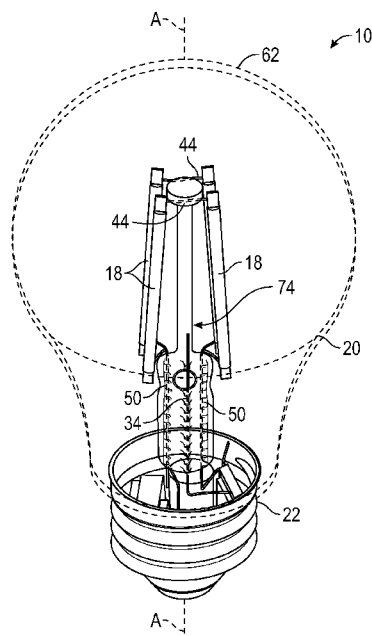


FIG. 1

(57) Abstract: A light emitting diode (LED) filament light bulb is disclosed. The LED filament light bulb includes a plurality of LED filaments, an RF driver, an antenna, and a cover. The antenna defines a first end portion and a second end portion, where the first end portion of the antenna is electrically connected and in signal communication with the RF driver. The cover defines an external wall and a support structure. The external wall defines an interior volume and the support structure defines an evacuation passageway and a cavity. The evacuation passageway and the antenna are both received within the cavity of the support structure and the evacuation passageway is fluidly connected to the interior volume of the cover.

**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

**Published:**

- *with international search report (Art. 21(3))*
- *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))*

**(88) Date of publication of the international search report:**

25 April 2019 (25.04.2019)

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 18/51114

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I: claims 1-16: drawn to a light emitting diode (LED) filament light bulb.

Group II: claims 17-20: drawn to a method of producing a LED filament light bulb.

—see extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
1-16

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 18/51114

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - F21V 23/00; H05B 33/00 (2018.01)

CPC - F21V 23/00; F21V 19/00; F21V 19/001; H05B 33/0803

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)

See Search History Document

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

See Search History Document

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

See Search History Document

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 2017/0130906 A1 (ZHEJIANG SUPER LIGHTING ELECTRIC APPLIANCE CO, LTD) 11 May 2017 (11.05.2017), entire document, especially; para [0003], [0149], [0164], [0173], [0198], [0199]	1, 5-9, 11, 12, 16 ----- 2-4, 10, 13-15
Y --- A	US 2016/0341409 A1 (TECHNICAL CONSUMER PRODUCTS, INC.) 24 November 2016 (24.11.2016), entire document, especially; para [0022], [0023], [0026], [0032], [0033]	1, 5-9, 11, 12, 16 ----- 2-4, 10, 13-15
Y --- A	US 2016/0366746 A1 (CI HOLDINGS, C.V) 15 December 2016 (15.12.2016), entire document, especially; para [0035], [0212]	11, 12
A	US 2016/0227631 A1 (WEEDON, III et al.) 04 August 2016 (04.08.2016), entire document	1-16
A	US 2016/0135270 A1 (CREE, INC) 12 May 2016 (12.05.2016), entire document	1-16
A	US 2015/0043212 A1 (SMARTBOTICS INC) 12 February 2015 (12.02.2015), entire document	1-16

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

\* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&amp;” document member of the same patent family

Date of the actual completion of the international search

09 December 2018

Date of mailing of the international search report

13 MAR 2019

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 18/51114

### Continuation of Box III -- Observations where unity of invention is lacking

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

#### Special technical features:

Group I includes the special technical feature of a RF driver, not found in the other group.

Group II includes the special technical feature of closing an evacuation tube with a gas-tight seal, not found in the other group.

#### Shared Features:

The only technical features shared by Groups I and II that would otherwise unify the groups are a LED filament light bulb comprising a plurality of LED filaments, a cover of the LED filament light bulb, an antenna, a non-reactive gas filling an interior volume of the cover, an evacuation tube that is fluidly connected to the interior volume of the cover.

However, these shared technical features do not represent a contribution over prior art, because the shared technical features are disclosed by US 2017/0130906 A1 to ZHEJIANG SUPER LIGHTING ELECTRIC APPLIANCE CO., LTD (hereinafter 'ZHEJIANG') 11 May 2017 (11.05.2017) and US 2016/0341409 A1 to Technical Consumer Products, Inc. (hereinafter 'Technical') 24 November 2016 (24.11.2016).

Zhejiang discloses a LED filament light bulb (para [0003] -The present invention relates to LED luminaries. More particularly, this invention describes an LED filament for LED light bulbs.) comprising a plurality of LED filaments (para [0134] -The linear array of LED devices includes a linear array of single-die devices, multi-die devices or both to enable the LED filament 500 to glow across a broad field of angle. ), a cover of the LED filament light bulb (para [0136] -In FIG. 4, the LED filament 500 is radially severed into two sections. One of the sections is further axially sliced and disemboweled to show the inner surface 5022 of the tubular enclosure 502.), a non-reactive gas filling an interior volume of the cover, an evacuation tube that is fluidly connected to the interior volume of the cover (para [0149] - Usually, the mount surface 528 is a substantially planar surface. In some embodiments, the mount surface 528 is a three dimensional surface whose shape depends on a desired totality of considerations such as: the posture the LED filament 500 is expected to maintain in the LED light bulb; the posture each individual LED device 504 is expected to maintain in relation to the rest of the linear array of LED devices 504; the shape of the tubular enclosure 502; the texture of the outer surface of the tubular enclosure 502; and the position of the linear array of LED devices 504 in the tubular enclosure 502. Each one of the linear array of LED devices 504 is properly aligned with the adjacent LED device 504 on the mount surface 528 depending on the location of the anode and cathode contacts on the LED device 504 and depending on the type of electrical connection to be made for the linear array of LED devices 504 in S22. In S22, the electrical connection is made with bond wire, conductive glue, FPC film or a combination of the above. The linear array of LED devices 504 is electrically connected in parallel, in series or in a combination of both ways).

Technical discloses a housing with a lighting fixture (Abstract -A method for assembling a first housing, a second housing, and a driver board of a directional lighting fixture to one another is disclosed.) which includes an antenna (para [0026], [0027] -Moreover, although only one antenna element 56 is discussed, those skilled in the art will readily appreciate that more than one antenna element may also be included on the driver board 26 as well in order to receive RF signals of varying frequencies. Alternatively, in another embodiment, the antenna element 56 may be a multi-band antenna that operates at different RF frequency bands.).

It would have been obvious to one of ordinary skill to combine the teachings of Zhejiang and Technical to include all of the elements of the shared technical features including an antenna as disclosed by Technical as this would have allowed the lamp to be controlled by wireless remote control (Technical para [0003]).

As the shared technical features were known in the art at the time of the invention, they cannot be considered special technical features that would otherwise unify the groups.

Groups I and II therefore lack unity under PCT Rule 13.