(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 January 2019 (24.01.2019)

WIPO | PCT

(10) International Publication Number
WO 2019/015763 A1

(51) International Patent Classification:
F21V 3/04 (2006.01) *F21K 9/90* (2016.01)
F21K 9/237 (2016.01) *F21Y 115/10* (2016.01)
F21K 9/235 (2016.01) *F21Y 103/30* (2016.01)

(21) International Application Number:
PCT/EP2017/068402

(22) International Filing Date:
20 July 2017 (20.07.2017)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **EXPLORENTIS** [BE/BE]; Langendaallaan 106, 3001 Leuven (BE).

(72) Inventors: **RENDERS, Yoeri Bertha Jozef**; Generaal de Wittestraat 4 B001, 3545 Halen (BE). **LEIRS, Olivier**; Langendaallaan 106, 3001 Heverlee (BE).

(74) Agent: **NEDERLANDSCH OCTROOIBUREAU**; P.O. Box 29720, 2502 LS The Hague (NL).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*

WO 2019/015763 A1

(54) Title: LED LAMP WITH FLEXIBLE LED FILAMENT, AND MANUFACTURING METHOD

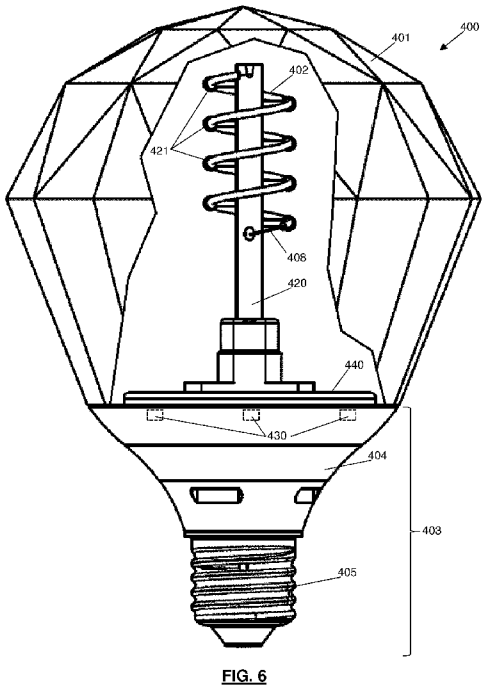


FIG. 6

(57) Abstract: LED lamp, comprising: a transparent housing having a bulbous shape manufactured in a transparent plastic material; a flexible LED filament, mounted in a curved shape inside the transparent housing; a standard light fitting part, adapted for mounting the LED lamp in a standard light fixture;a base part, contained within the standard light fitting part and comprising a voltage conversion circuit adapted for converting an input voltage applied via the standard light fitting part to an output voltage suitable for the flexible LED filament; and a filament holder, mounted on the base part and extending into the transparent housing, the filament holder having a plurality of holding parts which are positioned to hold the flexible LED filament at a plurality of spaced-apart locations along its length and thereby define the curved shape of the flexible LED filament.

LED lamp with flexible LED filament, and manufacturing method

Field of the invention

[0001] The present invention relates to LED lamps of the type comprising one or more LEDs mounted in a transparent housing having a bulbous shape with a standard light fitting, and a method for manufacturing such LED lamps.

Background art

[0002] A LED filament light bulb is an electric light bulb which produces light with a LED that is shaped to look like the filament of an incandescent light bulb, sometimes called an Edison light bulb. Such LED filaments are for example described in US2009184618, US20140362586 and US20140369036.

[0003] The known LED filament light bulbs generally have a glass housing and a number of hard, rigid, bar-shaped LED filaments mounted inside their housing.

[0004] It has been found that such known LED filament light bulbs break easily, for example when they are accidentally dropped.

Summary of the invention

[0005] It is a first aim of the present invention to provide a more robust LED lamp which breaks less easily.

[0006] It is a second aim of the present invention to provide a LED lamp which has a construction with which retro designs as well as more creative designs can be achieved.

[0007] It is a third aim of the present invention to provide a simpler manufacturing process for manufacturing such LED lamps.

[0008] These and other aims may be achieved by the LED lamp and the manufacturing process as defined in the claims.

[0009] The invention provides, in a first aspect, a LED lamp, comprising: a transparent, or at least substantially transparent housing having a bulbous shape, the transparent housing being manufactured in a transparent plastic material, or at least substantially transparent plastic material; a flexible LED filament, mounted in a curved shape inside the transparent housing; a standard light fitting part, adapted for mounting the LED lamp in a standard light fixture, the transparent housing being fixed to the standard light fitting part; a base part, contained within the standard light fitting part and comprising a voltage conversion circuit adapted for converting an input voltage applied via the standard light fitting part to an output voltage suitable for the flexible LED filament; and a filament holder, mounted on the base part and extending into the transparent housing, the filament holder having a plurality of holding parts which are positioned to hold the flexible LED filament at a plurality of spaced-apart locations along its length and thereby define the curved shape of the flexible LED filament.

[0010] The LED lamp with the construction of the invention may be more robust by the fact that the (substantially) transparent housing is manufactured in a (substantially) transparent plastic

material, such as for example PET (polyethylene terephthalate) or PC (polycarbonate), which is less prone to breakage than glass which is commonly used in the prior art. Furthermore, by the use of the flexible LED filament mounted in curved form instead of a rigid LED filament, the LED filament may be better capable of absorbing shocks and consequently the risk that the LED filament itself breaks or comes loose from its connections can be reduced. Further, by the use of the filament holder which supports the flexible LED filament on multiple locations along its length, it can be better ensured that the LED filament is held and maintained in the desired shape.

[0011] The LED lamp according to the invention comprises one or more flexible LED filaments, also known as soft LED filaments, mounted in the (substantially) transparent housing in a bent shape which is defined by the filament holder(s). This construction allows to manufacture LED lamps with a vintage or retro design such as for example Edison light bulbs with one or more helical filaments, but also more creative designs such as for example light bulbs in which the flexible LED filament is bent to virtually any shape.

[0012] By the use of the standard light fitting part, the LED lamp according to the invention can be retro-fitted into existing standard light fixtures.

[0013] In embodiments according to the invention, the transparent housing may have a fixing part by means of which the transparent housing is fixed to the standard light fitting part, the fixing part having an outer screw-thread complementary to an inner screw thread of the standard light fitting part. The fixing part may be an integral part of the housing, i.e. be part of the same unit as the bulbous shaped part of the housing and manufactured from the same material. This embodiment may simplify the construction of the lamp of the invention, in particular the manufacturing process as such a housing can easily be manufactured using a blow-moulding process starting from a plastic preform (which already has the screw-threaded fixing part), as well as the assembly due to the complementary screw threads.

[0014] In embodiments according to the invention, the transparent housing may be fixed to the standard light fitting part by means of an adhesive, such as for example a one component silicon adhesive, which simultaneously acts as a sealant to seal the interior of the lamp from the exterior.

[0015] In embodiments according to the invention, the filament holder may comprise a central post and a plurality of branches extending sideways from the central post, each branch comprising one of the holding parts. The holding parts may for example be formed by circular elements with a central opening through which the flexible LED filament passes. The filament holder may for example be configured for holding the flexible LED filament in a helical shape with at least two windings, in which case the filament holder may for example have two holding parts per winding, spaced 180° from each other, or three holding parts per winding, spaced 120° from each other.

[0016] In embodiments according to the invention, the filament holder may comprise a bendable support wire. The bendable support wire may be (preferably) embedded or incorporated in the flexible LED filament, or a separate element attached to the flexible LED filament. By means of this bendable support wire, the flexible LED filament can be bent to any desired shape and the

wire will afterwards ensure that this shape is maintained. The wire thus has properties (material, diameter, ...) for being bendable and for maintaining the shape afterwards. The wire may for example be an aluminium wire. The bendable support wire may be the only support which is provided for supporting the flexible LED filament, or may be mounted on a further support or post.

[0017] In embodiments according to the invention, the standard light fitting part may be a standard part according to one of the following group of standard parts: Bayonet Cap, Small Bayonet Cap, Lilliput Edison Screw, Miniature Edison Screw, Candelabra Edison Screw, Small Edison Screw, Edison Screw, Giant Edison Screw.

[0018] In embodiments according to the invention, the LED lamp may further comprise at least one LED element mounted on the base part. This embodiment enables further creative designs in which for example vintage and modern elementes may be combined, such as for example a helical filament with one or more coloured LEDs.

[0019] In embodiments according to the invention, the at least one LED element on the base part may be variable colour LED elements and a controller may be provided on the base part for controlling the colour of the at least one variable colour LED element.

[0020] In embodiments according to the invention, the controller may be adapted for receiving control signals which are transmitted via the standard light fitting part using a power line communication protocol.

[0021] In embodiments according to the invention, the controller may be adapted for receiving control signals which are transmitted via a wireless communication protocol, such as for example Zigbee, Bluetooth, Wifi, or other.

[0022] In embodiments according to the invention, the base part may comprise a translucent cover which covers the at least one LED element.

[0023] In a second aspect, which may be combined with the other aspects and embodiments described herein, the invention provides a process for manufacturing a LED lamp as described herein, wherein the (substantially) transparent housing is manufactured using a blow-moulding step starting from a plastic preform. The preform already has the screw-threaded fixing part by means of which the housing may be screwed into the standard light fitting part. Preferably, an adhesive as described herein is applied on the screw-threaded fixing part before this part is screwed into the standard light fitting part, to ensure a strong fixation of these parts onto each other.

Brief description of the drawings

[0024] The present invention will be discussed in more detail below, with reference to the attached drawings.

[0025] Fig. 1 shows a side view of first embodiment of a LED lamp according to the invention.

[0026] Fig. 2 shows a side view of another embodiment of a LED lamp according to the invention.

[0027] Fig. 3 shows a side view of another embodiment of a LED lamp according to the invention.

[0028] Fig. 4 shows a perspective view of another embodiment of a LED lamp according to the invention.

[0029] Fig. 5 shows a perspective view of parts mounted inside the housing of the LED lamp of Fig. 4.

[0030] Fig. 6 shows a side view of the LED lamp of Fig. 4 with part of the housing broken away to show its interior.

[0031] Fig. 7 schematically shows a first embodiment of a base part with voltage conversion circuitry for use in LED lamps according to the invention.

[0032] Fig. 8 schematically shows a second embodiment of a base part with voltage conversion circuitry for use in LED lamps according to the invention.

Description of embodiments

[0033] The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes. The dimensions and the relative dimensions do not necessarily correspond to actual reductions to practice of the invention.

[0034] Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. The terms are interchangeable under appropriate circumstances and the embodiments of the invention can operate in other sequences than described or illustrated herein.

[0035] Moreover, the terms top, bottom, over, under and the like in the description and the claims are used for descriptive purposes and not necessarily for describing relative positions. The terms so used are interchangeable under appropriate circumstances and the embodiments of the invention described herein can operate in other orientations than described or illustrated herein.

[0036] Furthermore, the various embodiments, although referred to as “preferred” are to be construed as exemplary manners in which the invention may be implemented rather than as limiting the scope of the invention.

[0037] The term “comprising”, used in the claims, should not be interpreted as being restricted to the elements or steps listed thereafter; it does not exclude other elements or steps. It needs to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other features, integers, steps or components, or groups thereof. Thus, the scope of the expression “a device comprising A and B” should not be limited to devices consisting only of components A and B, rather with respect to the present invention, the only enumerated components of the device are A and B, and further the claim should be interpreted as including equivalents of those components.

[0038] Fig. 1 shows a first embodiment of a LED lamp 100 according to the invention. The LED lamp 100 comprises a transparent, or substantially transparent housing 101 having a bulbous shape. A flexible LED filament 102 is mounted inside the transparent housing 101. The housing 101 may be manufactured in a transparent, or substantially transparent plastic material, such as for example PET or PC. The interior of the housing is preferably clearly visible to users, i.e. vision is not blurred, so that the users can clearly see the shape of the flexible LED filament at least when the flexible LED filament emits light.

[0039] The LED lamp 100 comprises a standard light fitting part 103, adapted for mounting the LED lamp 100 in a standard light fixture. The housing 101 is fixed to the standard light fitting part 103. The fixture may be carried out by means of a screw-threaded fitting part (not shown) of the housing 101, which is complementary to the inner screw-thread of the standard light fitting part 103, and/or by means of a suitable adhesive for adhering the materials of these parts together, namely the plastic material of the housing 101 and the metal of the standard light fitting part 103. A suitable adhesive is for example a one component silicon adhesive, which simultaneously acts as a sealant to seal the interior of the lamp from the exterior.

[0040] The LED lamp 100 comprises a base part 105, an embodiment of which is schematically shown in Fig. 7. The base part is contained within the standard light fitting part 103 and comprises a voltage conversion circuit 106 adapted for converting an input voltage “IN”, which is applied via the (standard) input terminals 107 of the standard light fitting part and input conductors, to an output voltage “OUT” suitable for the flexible LED filament 102, which is applied to output terminals and/or conductors 108 to which the filament 102 is connected. In the embodiment of Fig. 7, the voltage conversion circuit 106 may simply be a rectifier circuit to rectify AC mains voltage (e.g. 230 V AC) to a DC voltage, in which case the filament 102 may comprise one or more sets of LEDs in series, each set having a number of LEDs adapted to the output voltage.

[0041] In alternative embodiments, the input voltage may also be a DC voltage, for example a 24 V DC voltage. In such cases, the standard light fitting part 103 may be made of an insulating material, e.g. a suitable plastic, to provide insulation should a user accidentally use the lamp in a light fixture which is connected to AC mains voltage, and/or a fuse may be provided on the base part to interrupt the current in such cases.

[0042] The LED lamp 100 comprises a filament holder 120, mounted on the base part 105 and extending into the transparent housing 101. The filament holder has a plurality of holding parts which are positioned to hold the flexible LED filament 102 at a plurality of spaced-apart locations along its length and thereby define the curved shape of the flexible LED filament 102, in this case a helical shape in height direction of the LED lamp 100. The LEDs of the LED filament 102 may be provided to emit “warm white” light. In this way, the LED lamp 100 resembles a vintage incandescent light bulb (Edison light bulb).

[0043] In alternative embodiments, the LED filament may be a flexible LED filament of which the emitted light colour is tunable, for example a flexible LED filament with two interior circuits, for

example such that the colour temperature is tunable between 1900 K and 3200 K. In this case, the base part 105 comprises a voltage conversion circuit with a controller adapted to provide controllable voltages to both interior circuits and to thereby tune the colour temperature.

[0044] Fig. 2 shows another embodiment of a LED lamp 200 according to the invention. The LED lamp 200 is similar to the LED lamp 100 in many ways, so only differences will be described. The LED lamp 200 has a transparent housing 201 with a slightly different bulbous shape and a flexible LED filament 202 mounted inside the housing in a helical shape extending in width direction of the lamp. The filament holder 220 comprises a horizontal post 221 on which a plurality of branches are provided, each with a holding part for holding a part of the flexible LED filament in such a way that it is held in the desired shape.

[0045] Fig. 3 shows another embodiment of a LED lamp 300 according to the invention. The LED lamp 300 is similar to the LED lamp 100 in many ways, so only differences will be described. The LED lamp 300 has a transparent housing 301 of similar shape and a flexible LED filament 302 mounted inside the housing in a shape surrounding the filament holder 320. The filament holder 320 comprises a vertical post with a plurality of branches 321 which extend sideways from the post and have ends which form holder parts for holding a part of the flexible LED filament in such a way that it is held in the desired shape. In alternative embodiments, the post 320 and branches 321 could be replaced by a bendable support wire which is embedded or incorporated in the flexible LED filament 302, or attached thereto.

[0046] Figs. 4-6 show another embodiment of a LED lamp 400 according to the invention. The LED lamp 400 comprises a transparent, or substantially transparent housing 401 having a bulbous shape, in this case a diamond-like shape. A flexible LED filament 402 is mounted inside the transparent housing 401, in this case in a helical shape extending in height direction of the lamp. The housing 401 may be manufactured in a transparent, or substantially transparent plastic material, such as for example PET or PC, possibly containing a colour component to obtain a coloured transparent appearance. The interior of the housing is preferably clearly visible to users, i.e. vision is not blurred, so that the users can clearly see the shape of the flexible LED filament 402 at least when the flexible LED filament emits light.

[0047] The LED lamp 400 comprises a standard light fitting part 403, adapted for mounting the LED lamp 400 in a standard light fixture. In this embodiment, the standard light fitting part 403 comprises a standard fitting cap 405 and an intermediate part 404, which tapers in height direction of the lamp and forms a transition between the housing 401 and the cap 405. In this way, the standard light fitting part 403 has a larger volume, sufficient for containing additional circuitry as will be described below. The housing 401 is fixed to the intermediate part 404, which is in turn fixed to the standard fitting cap 405. The fixtures may be carried by means of complementary screw-threaded parts and/or adhesives, as described elsewhere herein.

[0048] The LED lamp 400 comprises a base part 415, an embodiment of which is schematically shown in Fig. 8. The base part is contained within the standard light fitting part 403 and comprises

a first voltage conversion circuit 406 adapted for converting an input voltage "IN", which is applied via the (standard) input terminals 407 of the standard light fitting part and input conductors, to a first output voltage "OUT1" suitable for the flexible LED filament 402, which is applied to output terminals and/or conductors 408 to which the filament 402 is connected. In the embodiment of Fig. 8, the voltage conversion circuit 406 may simply be a rectifier circuit to rectify AC mains voltage (e.g. 230 V AC) to a DC voltage, in which case the filament 402 may comprise one or more sets of LEDs in series, each set having a number of LEDs adapted to the output voltage "OUT1".

[0049] The base part 415 comprises a second voltage conversion circuit 409 which is also connected to the input voltage "IN" via conductors 412. The second voltage conversion circuit 409 is adapted for converting the input voltage to a set of voltages "OUT2" to be applied via output terminals and/or conductors 413 to a set of variable colour LEDs 430, for example RGB LEDs, which may be provided in or on the LED lamp 400 in addition to the flexible LED filament 402. The second voltage conversion circuit 409 may be provided with a controller 410 for controlling the colour of the variable colour LEDs 430 by controlling the "OUT2" voltages in ways known to the person skilled in the art. Control signals for the controller 410 may be transmitted by means of power line communication via the input terminals 407 or by means of wireless transmission in ways known to the person skilled in the art. The circuit 409 may comprise an appropriate transceiver 411 to enable receipt of such control signals.

[0050] In alternative embodiments, the input voltage may also be a DC voltage, for example a 24 V DC voltage. In such cases, the standard light fitting part 403 may be made of an insulating material, e.g. a suitable plastic, to provide insulation should a user accidentally use the lamp in a light fixture which is connected to AC mains voltage, and/or a fuse may be provided on the base part to interrupt the current in such cases.

[0051] The LED lamp 400 comprises a filament holder 420, mounted on the base part 415 and extending into the transparent housing 401. The filament holder has a plurality of branches 421 with holding parts which are positioned to hold the flexible LED filament 402 at a plurality of spaced-apart locations along its length and thereby define the helical shape of the flexible LED filament 402. The LEDs of the LED filament 402 may be provided to emit "warm white" light. Alternatively, a bendable support wire may be embedded or incorporated in the LED filament 402 to hold the filament in its helical shape on the vertical post 420, in which case the branches 421 may be omitted.

[0052] In alternative embodiments, the LED filament 402 may be a flexible LED filament of which the emitted light colour is tunable, for example a flexible LED filament with two interior circuits, for example such that the colour temperature is tunable between 1900 K and 3200 K. In this case, the first voltage conversion circuit 406 may be provided with a controller and adapted to provide controllable voltages to both interior circuits of the flexible LED filament and to thereby tune the colour temperature.

[0053] The set of variable colour LEDs 430 may for example be mounted on a top side of the base part 415 in a circle around the filament holder 402, preferably covered by a translucent cover 440 to blur the emitted light. This is shown in Fig. 5 and 6. The variable colour LEDs may however also be mounted on other positions on the lamp.

[0054] The LED lamp 400 thus has a combination of a vintage element, namely the helical filament 402 and more modern elements, namely the variable colour LEDs 430. A first controller may be provided on the base part 415 for controlling the LED filament 402 (on/off and/or colour temperature) and a second controller may be provided on the base part 415 for controlling the variable colour LEDs 430. The first and second controllers may also be combined in a single controller. Control signals may be transmitted via power line communication and/or via wireless communication, as described elsewhere herein.

[0055] In embodiments according to the invention, the standard light fitting part may be a light bulb fitting according to any standard known to the person skilled in the art, such as for example a Bayonet Cap or an Edison Screw Cap, examples of which are given in Table 1 below:

Designation	Diameter	Name	Abbreviation
B22d	22mm	Bayonet Cap	BC
B15d	15mm	Small Bayonet Cap	SBC
E5	5mm	Lilliput Edison Screw	LES
E10	10mm	Miniature Edison Screw	MES
E12	12mm	Candelabra Edison Screw	CES
E14	14mm	Small Edison Screw	SES
E27	27mm	Edison Screw	ES
E40	40mm	Giant Edison Screw	GES

Table 1: Overview of Bayonet Caps and Edison Screw Caps

Claims

1. A LED lamp comprising:

a transparent housing having a bulbous shape, the transparent housing being manufactured in a transparent plastic material;

a flexible LED filament, mounted in a curved shape inside the transparent housing;

a standard light fitting part, adapted for mounting the LED lamp in a standard light fixture, the transparent housing being fixed to the standard light fitting part;

a base part, contained within the standard light fitting part and comprising a voltage conversion circuit adapted for converting an input voltage applied via the standard light fitting part to an output voltage suitable for the flexible LED filament; and

a filament holder, mounted on the base part and extending into the transparent housing, the filament holder having a plurality of holding parts which are positioned to hold the flexible LED filament at a plurality of spaced-apart locations along its length and thereby define the curved shape of the flexible LED filament.

2. The LED lamp according to claim 1, wherein the transparent housing has a fixing part by means of which the transparent housing is fixed to the standard light fitting part, the fixing part having an outer screw-thread complementary to an inner screw thread of the standard light fitting part.

3. The LED lamp according to claim 1 or 2, wherein the transparent housing is fixed to the standard light fitting part by means of an adhesive, preferably a one component silicon adhesive.

4. The LED lamp according to any one of the preceding claims, wherein the filament holder comprises a central post and a plurality of branches extending sideways from the central post, each branch comprising one of the holding parts.

5. The LED lamp according to any one of the preceding claims, wherein the holding parts are circular elements with a central opening through which the flexible LED filament passes.

6. The LED lamp according to any one of the preceding claims, wherein the filament holder is configured for holding the flexible LED filament in a helical shape with at least two windings.

7. The LED lamp according to claim 6, wherein the filament holder comprises at least two holding parts per winding.

8. The LED lamp according to claim 7, wherein there are two holding parts per winding, spaced 180° from each other.

9. The LED lamp according to claim 7, wherein there are three holding parts per winding, spaced 120° from each other.

10. The LED lamp according to any one of the preceding claims, wherein the filament holder comprises a bendable support wire.

11. The LED lamp according to any one of the preceding claims, wherein the transparent housing is entirely made of PET or PC.

12. The LED lamp according to any one of the preceding claims, wherein the standard light fitting part is a standard part according to one of the following group of standard parts: Bayonet Cap, Small Bayonet Cap, Lilliput Edison Screw, Miniature Edison Screw, Candelabra Edison Screw, Small Edison Screw, Edison Screw, Giant Edison Screw.

13. The LED lamp according to any one of the preceding claims, further comprising at least one LED element mounted on the base part.

14. The LED lamp according to claim 13, wherein said at least one LED element comprises at least one variable colour LED element and wherein a controller is provided on the base part for controlling the colour of the at least one variable colour LED element.

15. The LED lamp according to claim 14, wherein the controller is adapted for receiving control signals which are transmitted via the standard light fitting part using a power line communication protocol.

16. The LED lamp according to claim 14, wherein the controller is adapted for receiving control signals which are transmitted via a wireless communication protocol.

17. The LED lamp according to any one of the claims 13-16, wherein the base part comprises a translucent cover which covers the at least one LED element.

18. A process for manufacturing a LED lamp according to any one of the preceding claims, wherein the transparent housing is manufactured by means of a blow-moulding step starting from a plastic preform.

19. The manufacturing process of claim 18, wherein the plastic preform comprises a screw-threaded fixing part having an outer screw-thread complementary to an inner screw thread of the standard light fitting part.

20. The manufacturing process of claim 19, wherein an adhesive is applied on the screw-threaded fixing part after the blow-moulding step and before the screw-threaded fixing part is screwed into the standard light fitting part.

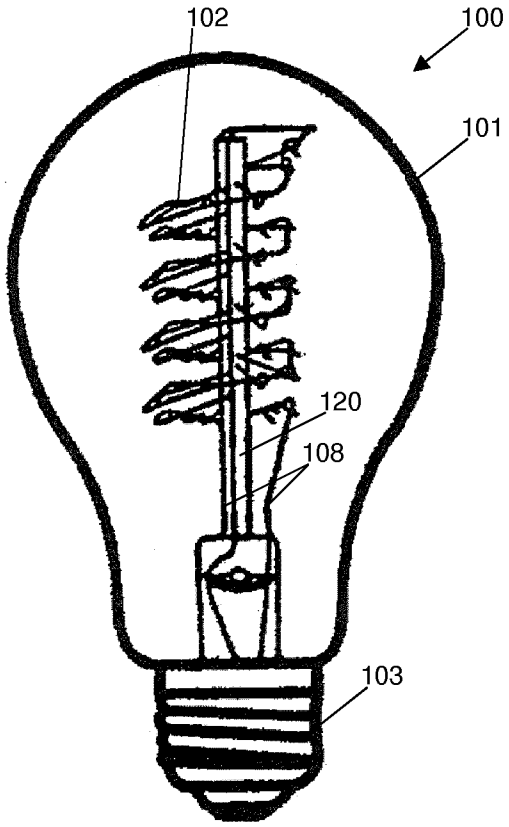


FIG. 1

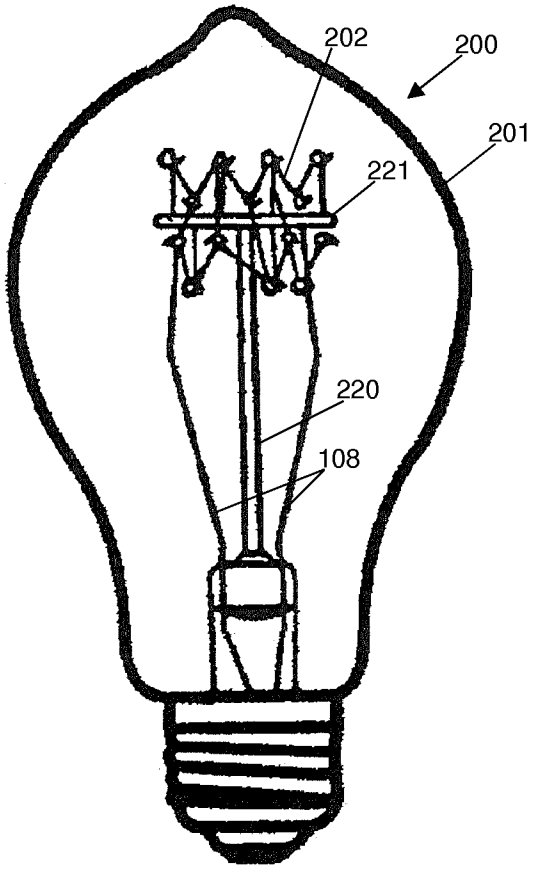


FIG. 2

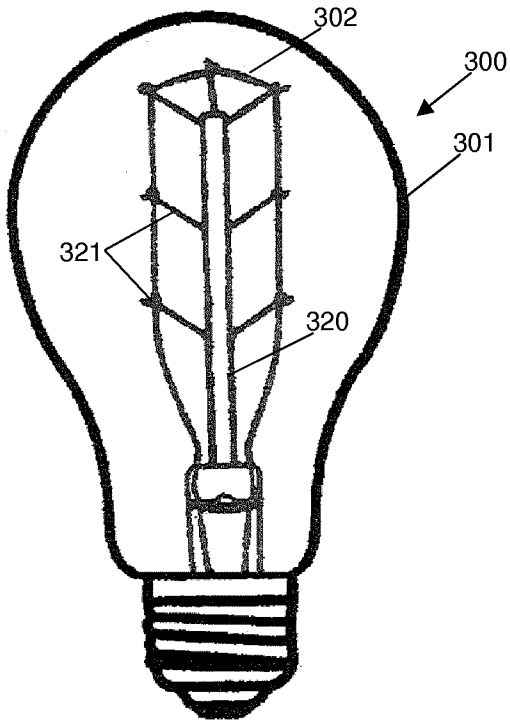


FIG. 3

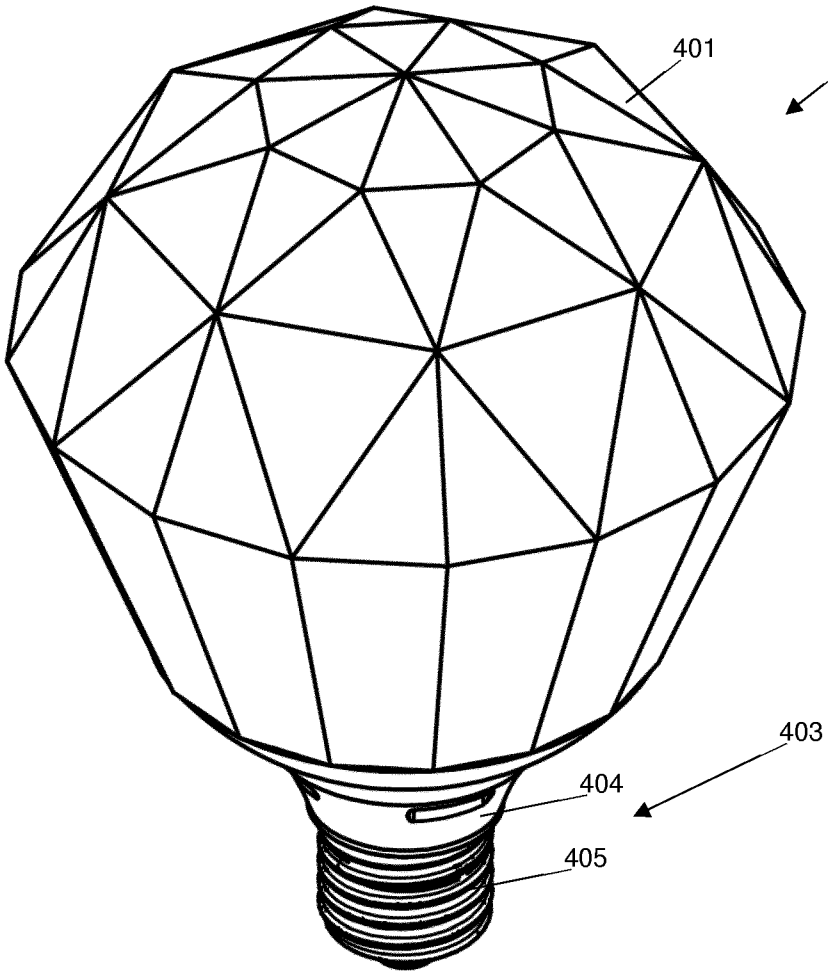


FIG. 4

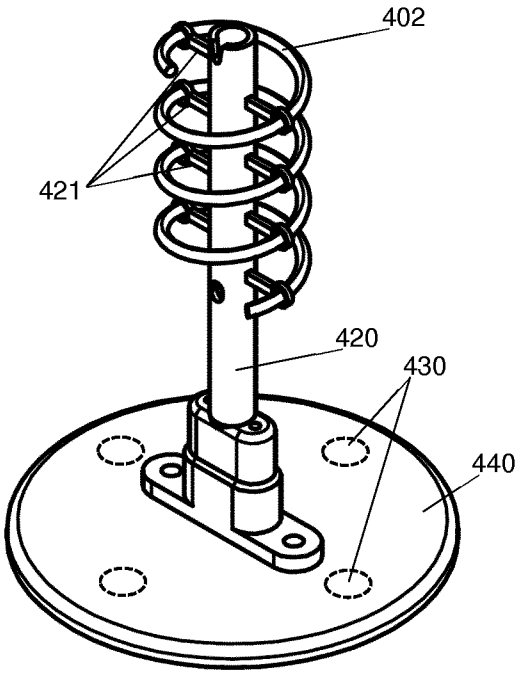


FIG. 5

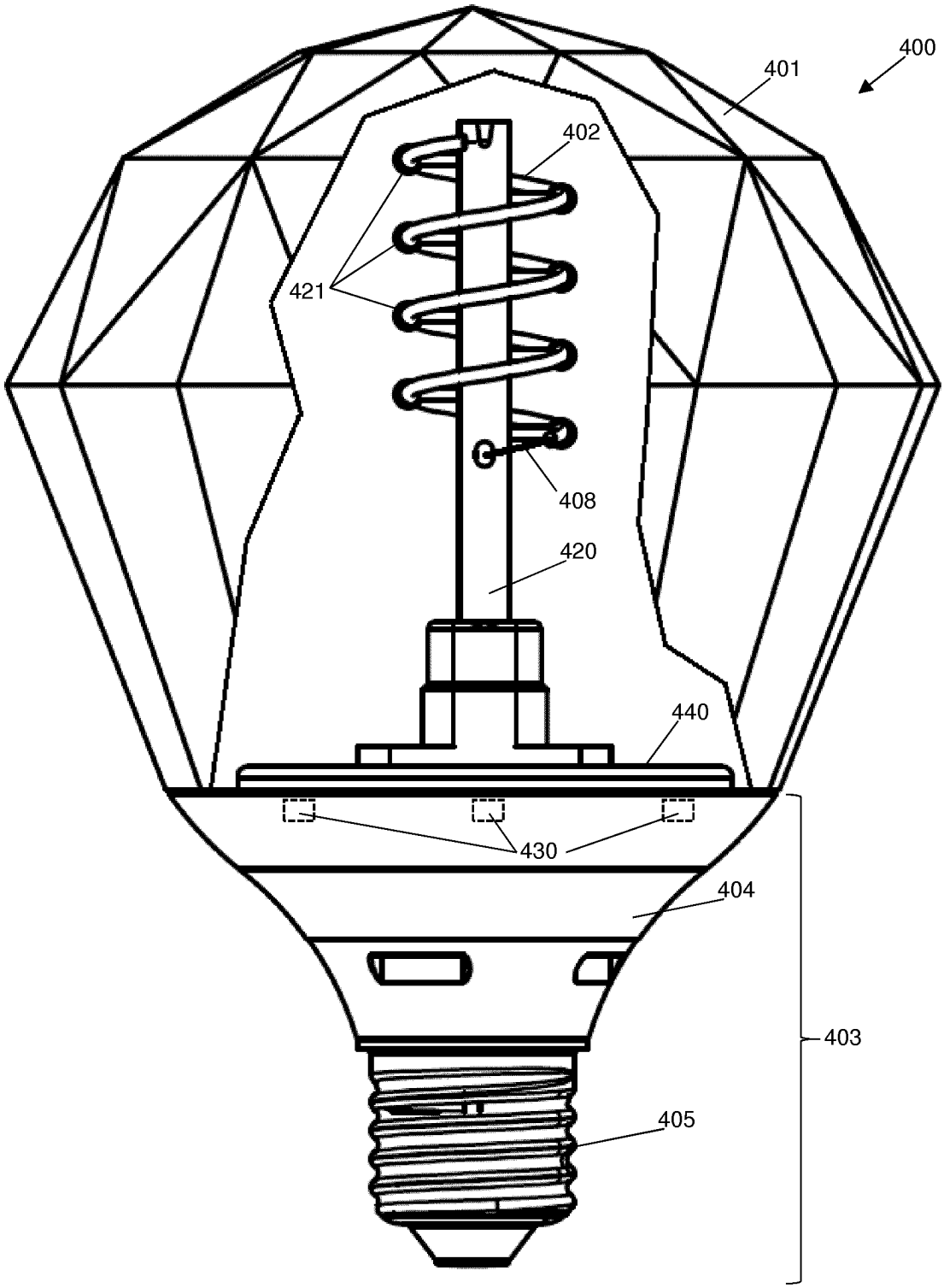


FIG. 6

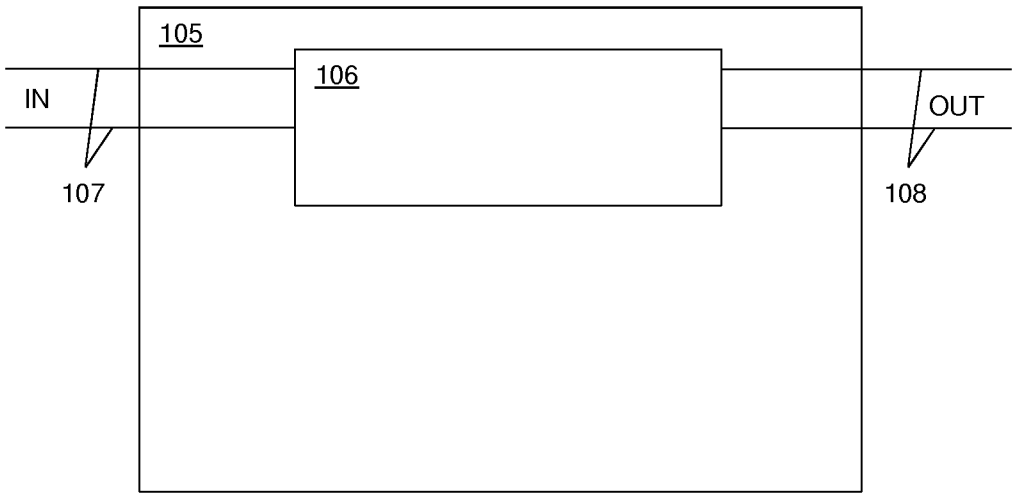

105
106
IN
OUT
107
108

Fig. 7

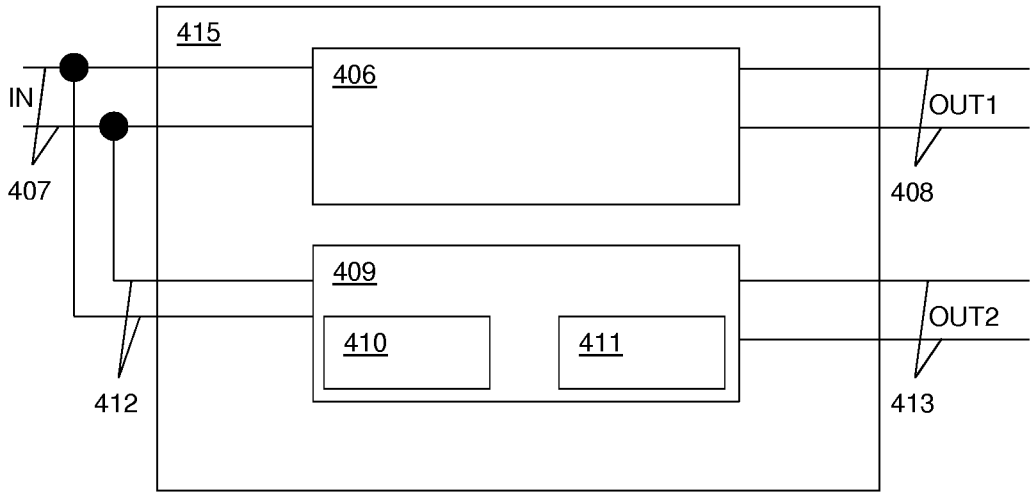

415
406
IN
OUT1
407
408
409
410
411
OUT2
412
413

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/068402

A. CLASSIFICATION OF SUBJECT MATTER
INV. F21V3/04 F21K9/237 F21K9/235 F21K9/90
ADD. F21Y115/10 F21Y103/30

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)
F21V F21Y F21K

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 practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2017/084809 A1 (JIANG TAO [CN] ET AL) 23 March 2017 (2017-03-23) figures 12-14 -----	1,3-12 2,13,14, 17
X	US 2010/314808 A1 (CHUANG SHENG-YI [TW]) 16 December 2010 (2010-12-16) figure 5 paragraph [0028] - paragraph [0029] -----	18-20
X	CN 203 571 486 U (HANGZHOU LIN AN STAR LIGHTING ELECTRIC CO LTD) 30 April 2014 (2014-04-30) figure 1 ----- -/--	1,4-12

[X] Further documents are listed in the continuation of Box C.

[X] 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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 October 2017	13/10/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Sacepe, Nicolas

1

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 203 517 451 U (JIANGSU K LED SCIENCE & TECHNOLOGY CO LTD) 2 April 2014 (2014-04-02) figure 1	1,4-12
X	US 2017/051878 A1 (JIANG TAO [CN] ET AL) 23 February 2017 (2017-02-23) figures 12-14 paragraph [0115] - paragraph [0133]	1,3-12
X	CN 204 459 844 U (SUNNY WORLD SHAOXING GREEN LIGHTING CO LTD) 8 July 2015 (2015-07-08) figure 5	1,4-6, 10-12
X	CN 204 962 343 U (SUZHOU ZIYU TIANCHENG PHOTOELECTRIC CO LTD) 13 January 2016 (2016-01-13) the whole document	1,4-6, 10-12
X	CN 205 065 335 U (CIXI RUIEN ELECTRONIC TECH CO LTD) 2 March 2016 (2016-03-02) the whole document	1
X	CN 205 350 910 U (ZHEJIANG SUNSHINE MEIJIA LIGHTING CO LTD) 29 June 2016 (2016-06-29) the whole document	1,4,5, 10-12
X	EP 3 188 264 A1 (LIQUIDLEDS LIGHTING CORP [TW]) 5 July 2017 (2017-07-05) figures 1-3	1,6-9
Y	WO 2012/085736 A1 (KONINKL PHILIPS ELECTRONICS NV [NL]; KWISTHOUT CORNELIS WILHELMUS [NL]) 28 June 2012 (2012-06-28) figures 1, 3	13,14,17
Y	CN 205 678 458 U (FANG SHILIANG) 9 November 2016 (2016-11-09) figure 1	2
X	CN 205 388 241 U (TANG XIONG) 20 July 2016 (2016-07-20) figures 1-6	1-6,8,9
X	CN 105 226 167 A (UNIV HANGZHOU DIANZI) 6 January 2016 (2016-01-06) figure 7	1-9
A	US 2017/012177 A1 (TROTTIER TROY A [US]) 12 January 2017 (2017-01-12) the whole document	15,16

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2017/068402

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2017084809 A1	23-03-2017	NONE	
US 2010314808 A1	16-12-2010	DE 102009050281 A1	30-12-2010
		TW 201043856 A	16-12-2010
		US 2010314808 A1	16-12-2010
CN 203571486 U	30-04-2014	NONE	
CN 203517451 U	02-04-2014	NONE	
US 2017051878 A1	23-02-2017	CN 106468405 A	01-03-2017
		CN 106838660 A	13-06-2017
		CN 106939973 A	11-07-2017
		CN 107035978 A	11-08-2017
		GB 2543139 A	12-04-2017
		US 2017051878 A1	23-02-2017
		WO 2017028787 A1	23-02-2017
CN 204459844 U	08-07-2015	NONE	
CN 204962343 U	13-01-2016	NONE	
CN 205065335 U	02-03-2016	NONE	
CN 205350910 U	29-06-2016	NONE	
EP 3188264 A1	05-07-2017	EP 3188264 A1	05-07-2017
		JP 2017152357 A	31-08-2017
		KR 20170101137 A	05-09-2017
		TW 201621210 A	16-06-2016
		US 2017248277 A1	31-08-2017
WO 2012085736 A1	28-06-2012	BR 112013015643 A2	11-10-2016
		CN 103270363 A	28-08-2013
		CN 105864664 A	17-08-2016
		EP 2655956 A1	30-10-2013
		JP 5952828 B2	13-07-2016
		JP 2014500605 A	09-01-2014
		RU 2013133913 A	27-01-2015
		US 2013265796 A1	10-10-2013
		US 2016116120 A1	28-04-2016
		WO 2012085736 A1	28-06-2012
CN 205678458 U	09-11-2016	NONE	
CN 205388241 U	20-07-2016	NONE	
CN 105226167 A	06-01-2016	NONE	
US 2017012177 A1	12-01-2017	NONE	