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(54) **LIGHTING APPARATUS**

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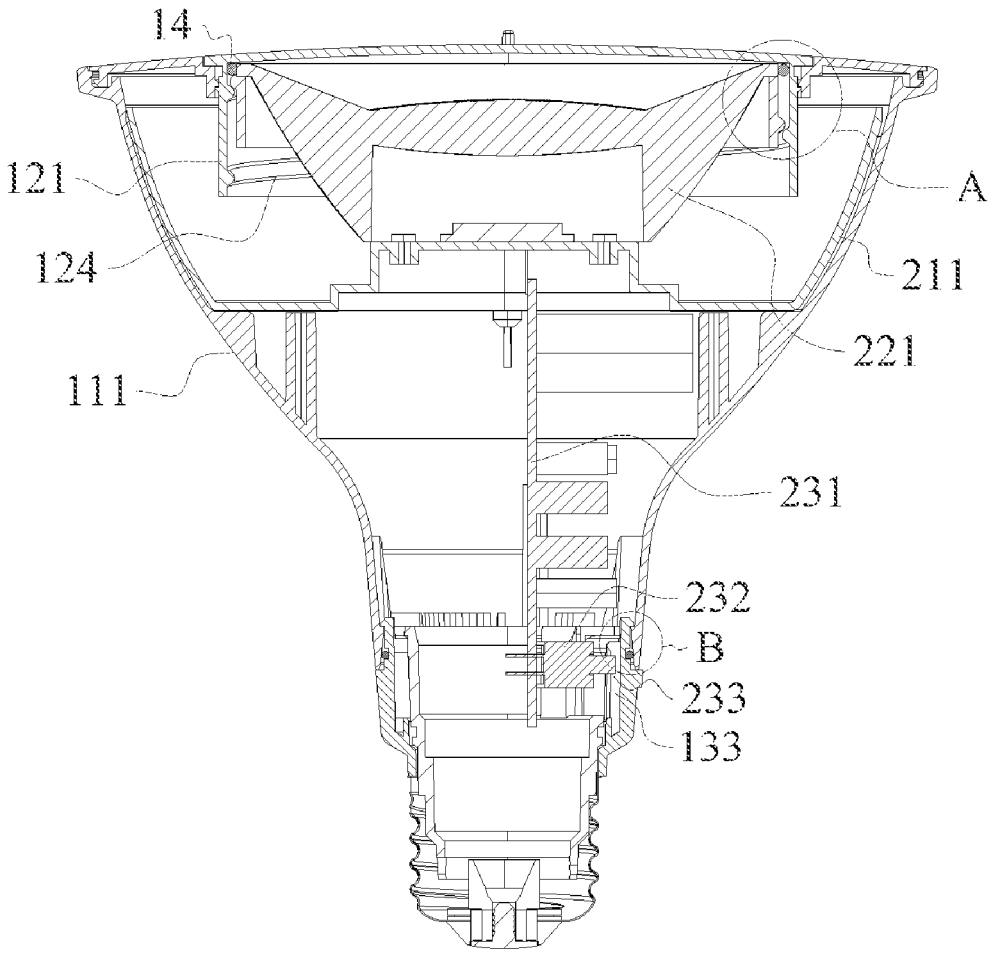
(57) **ABSTRACT**

A lighting apparatus includes a lens, a cup housing, a light source and a top cover. The cup housing has a surrounding wall and a light source holder. The cup housing is installed on a fixed platform. The light source is placed on the light source holder. The cup housing and the top cover form a container space for storing the lens and the light source. A top end of the lens is attached to the top cover. A second end of the lens faces to the light source. A relative distance between the lens and the light source is adjustable to change a light pattern of a output light of the light source. The output light is a light of the light source passing through the lens.



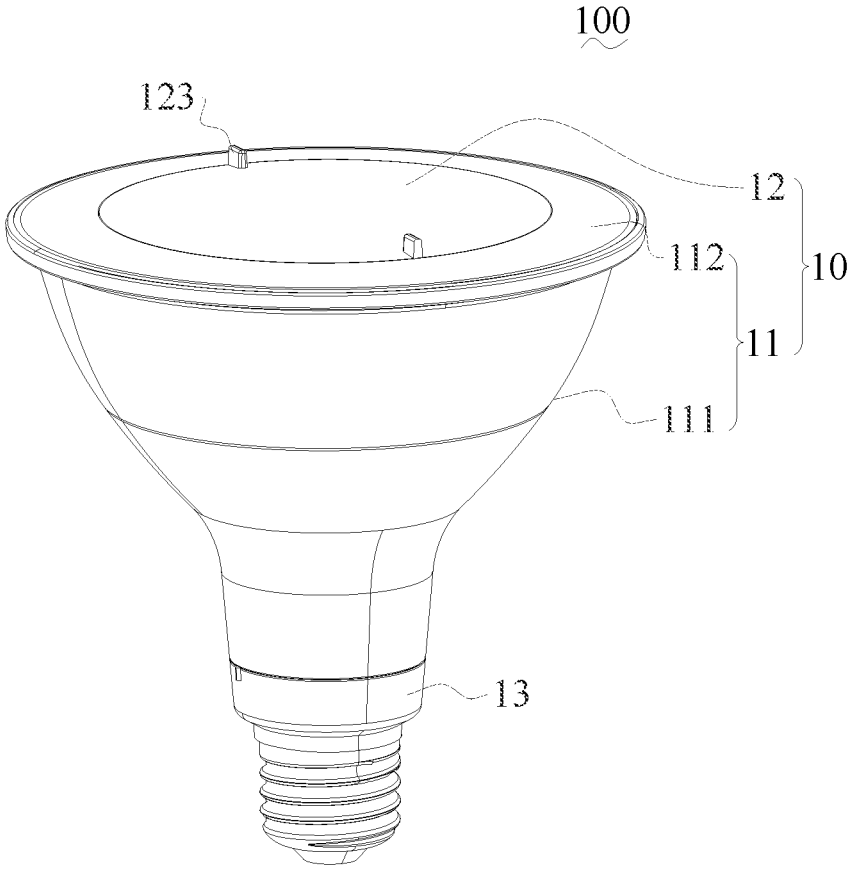


Fig. 1

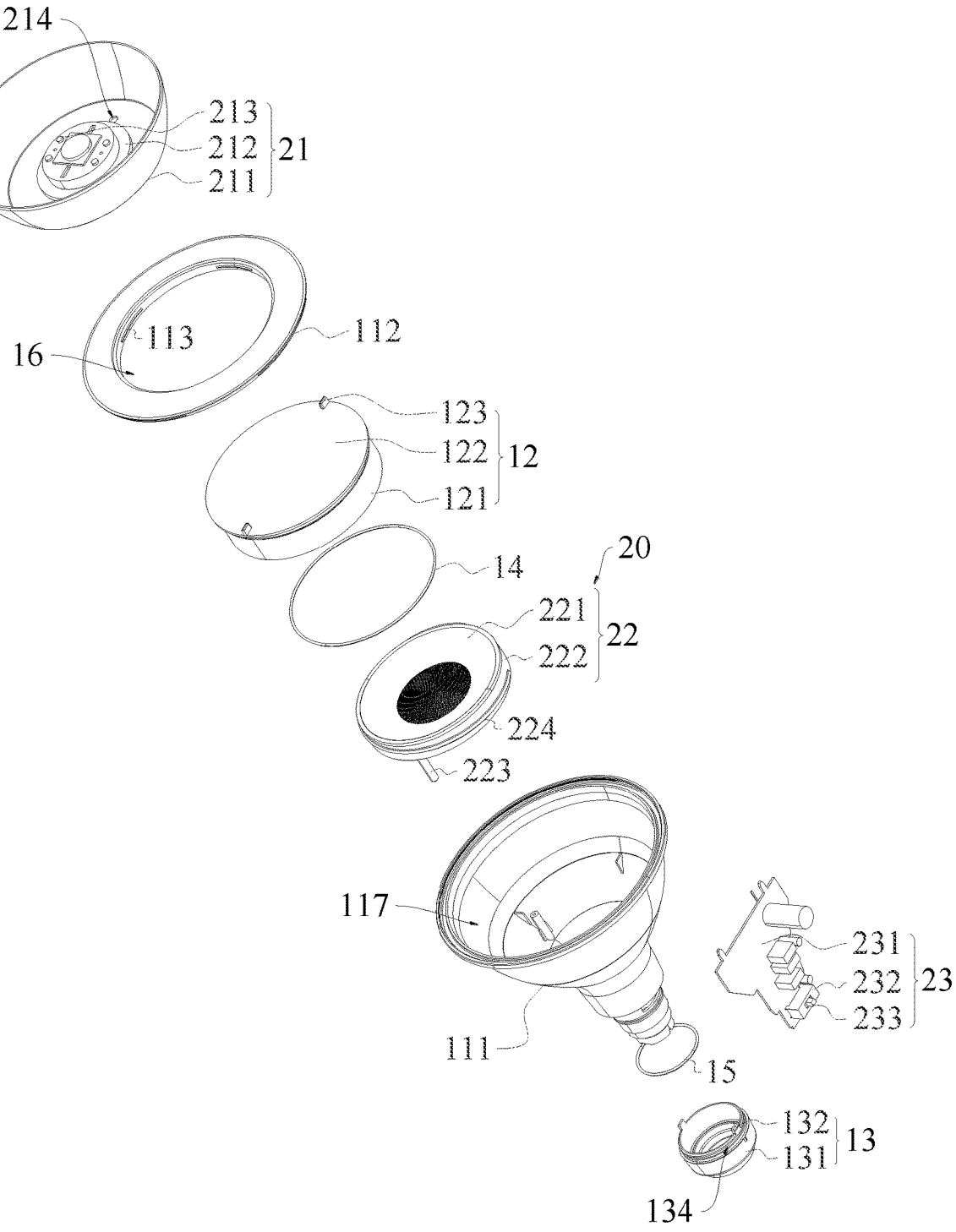

214
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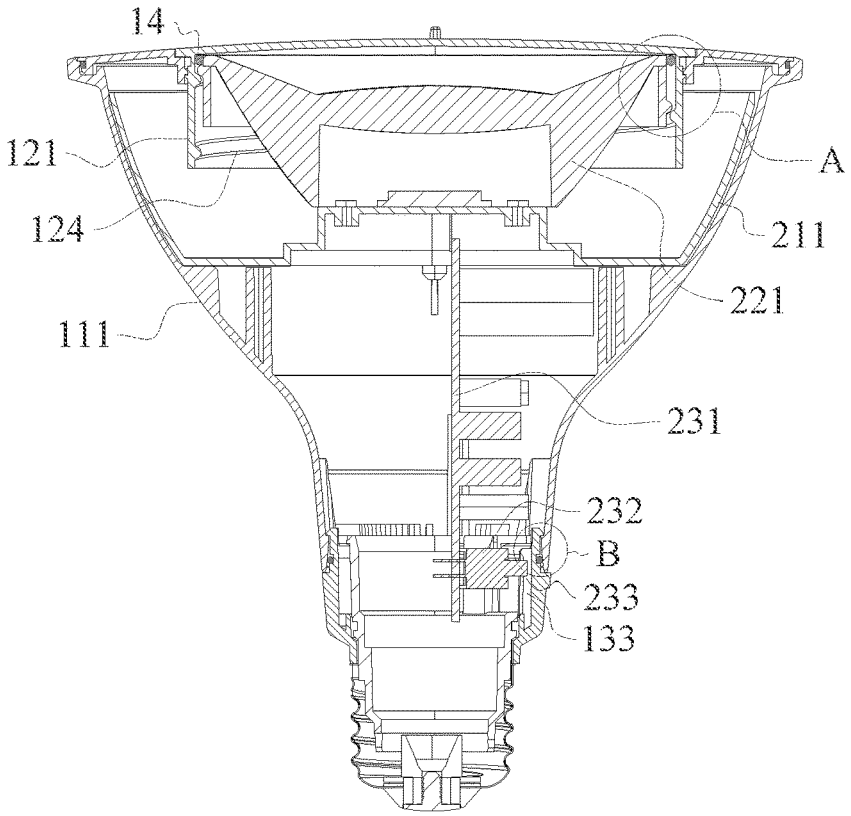
Fig. 2


14
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124
111
A
211
221
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232
B
233
133

Fig. 3

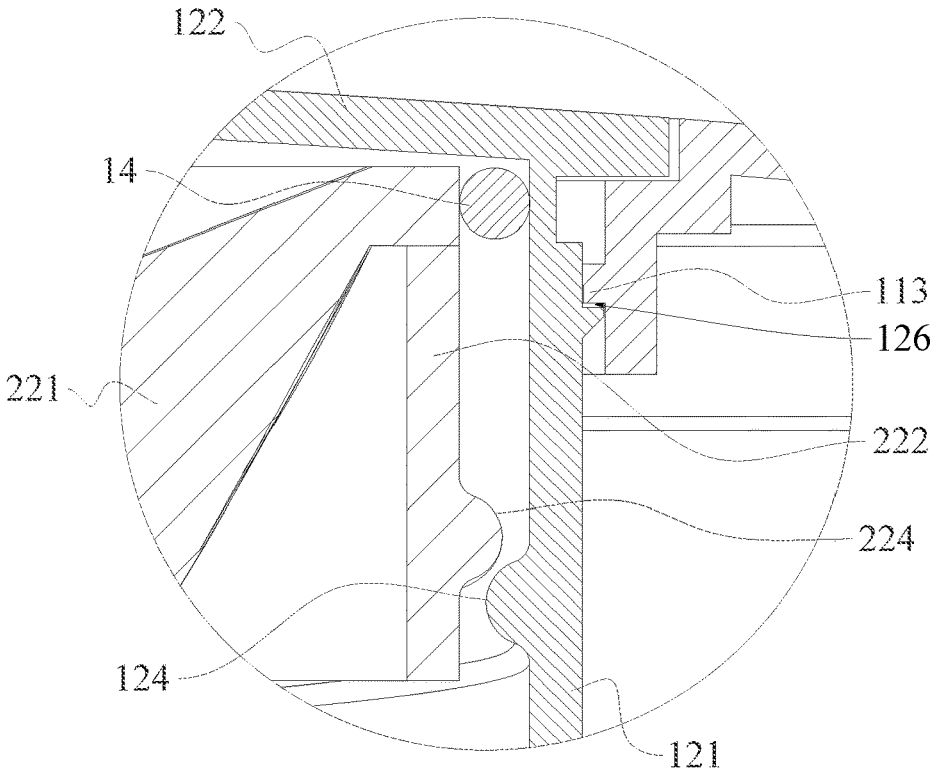
122
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Fig. 4

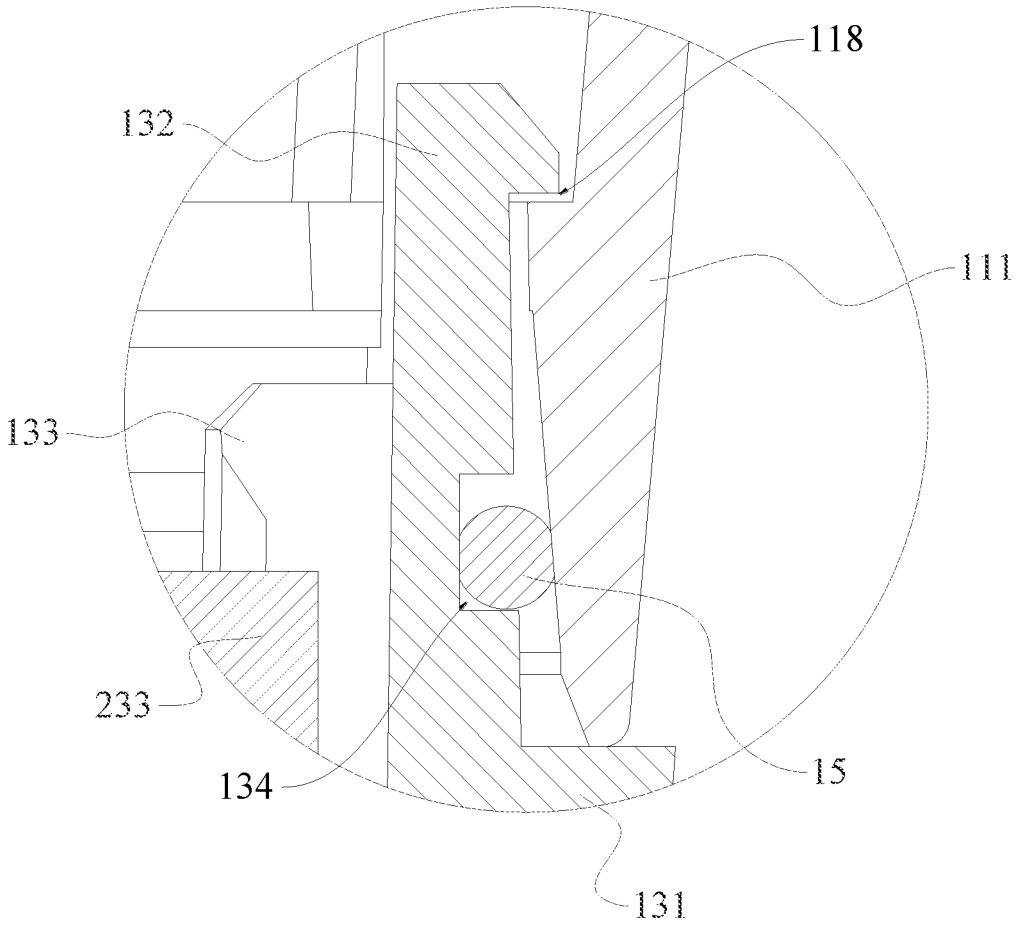
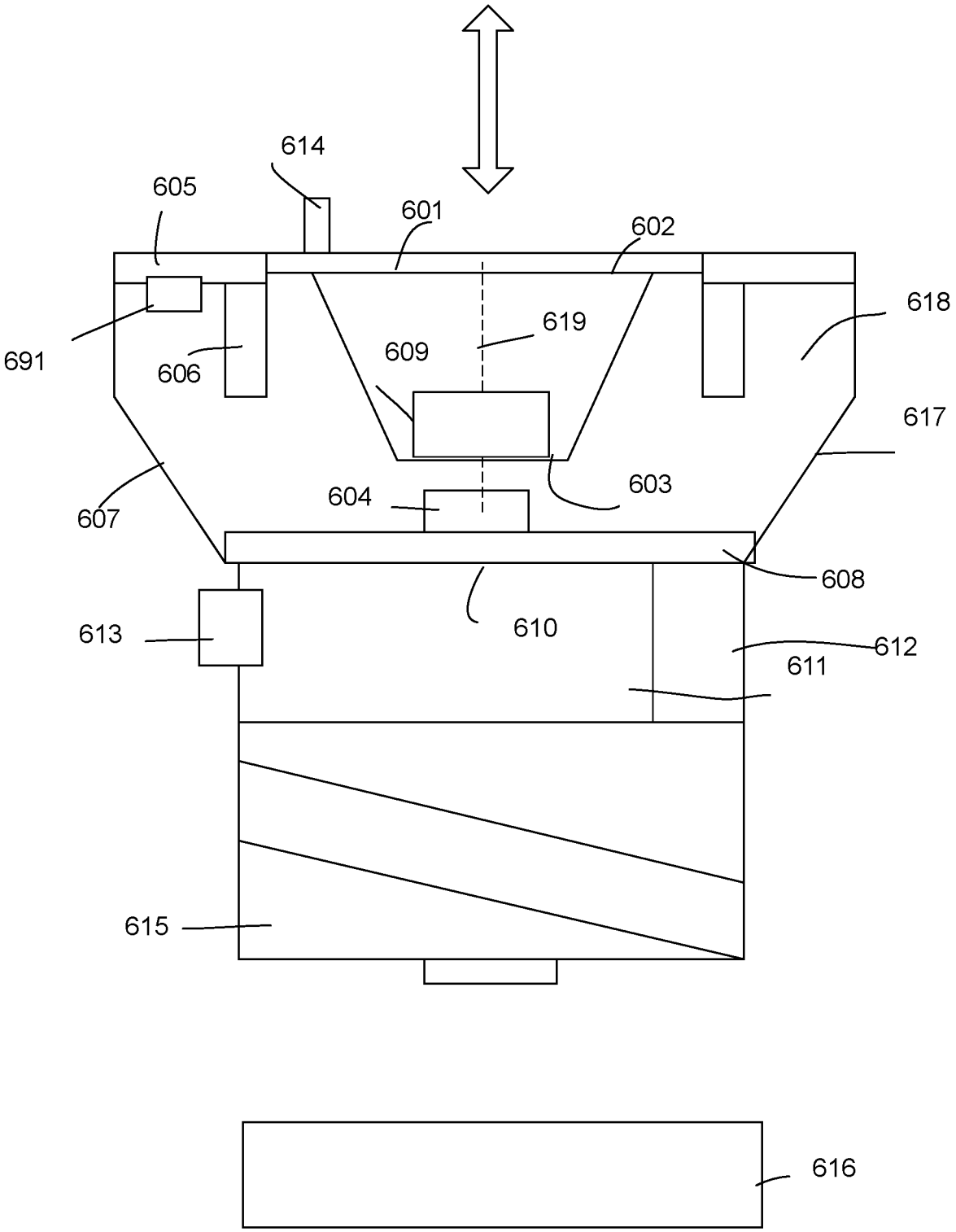


Fig. 5


614
605
601
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618
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619
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606
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603
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616

Fig. 6

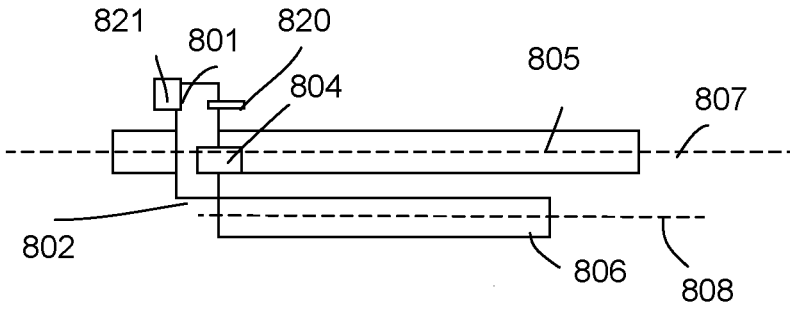

Fig. 7A

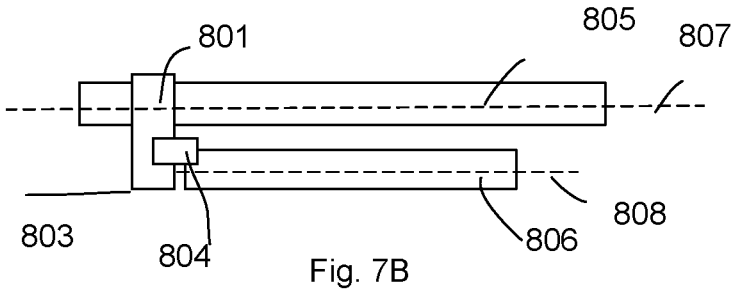

Fig. 7B

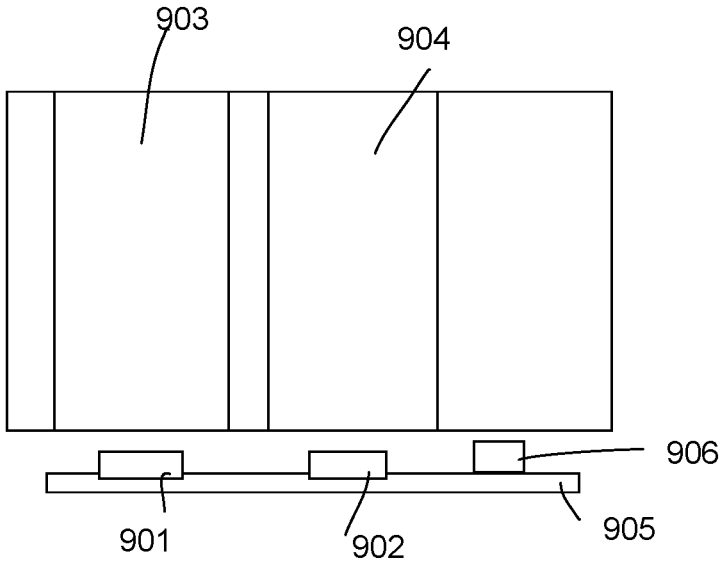

Fig. 8

LIGHTING APPARATUS

RELATED APPLICATION

[0001] The present application is a continued application of U.S. patent application Ser. No. 17/393,167.

FIELD

[0002] The present invention is related to a lighting apparatus, and more particularly related to a lighting apparatus with light pattern adjustment.

BACKGROUND

[0003] The time when the darkness is being lighten up by the light, human have noticed the need of lighting up this planet. Light has become one of the necessities we live with through the day and the night. During the darkness after sunset, there is no natural light, and human have been finding ways to light up the darkness with artificial light. From a torch, candles to the light we have nowadays, the use of light have been changed through decades and the development of lighting continues on.

[0004] Early human found the control of fire which is a turning point of the human history. Fire provides light to bright up the darkness that have allowed human activities to continue into the darker and colder hour of the hour after sunset. Fire gives human beings the first form of light and heat to cook food, make tools, have heat to live through cold winter and lighting to see in the dark.

[0005] Lighting is now not to be limited just for providing the light we need, but it is also for setting up the mood and atmosphere being created for an area. Proper lighting for an area needs a good combination of daylight conditions and artificial lights. There are many ways to improve lighting in a better cost and energy saving. LED lighting, a solid-state lamp that uses light-emitting diodes as the source of light, is a solution when it comes to energy-efficient lighting. LED lighting provides lower cost, energy saving and longer life span.

[0006] The major use of the light emitting diodes is for illumination. The light emitting diodes is recently used in light bulb, light strip or light tube for a longer lifetime and a lower energy consumption of the light. The light emitting diodes shows a new type of illumination which brings more convenience to our lives. Nowadays, light emitting diode light may be often seen in the market with various forms and affordable prices.

[0007] After the invention of LEDs, the neon indicator and incandescent lamps are gradually replaced. However, the cost of initial commercial LEDs was extremely high, making them rare to be applied for practical use. Also, LEDs only illuminated red light at early stage. The brightness of the light only could be used as indicator for it was too dark to illuminate an area. Unlike modern LEDs which are bound in transparent plastic cases, LEDs in early stage were packed in metal cases.

[0008] In 1878, Thomas Edison tried to make a usable light bulb after experimenting different materials. In November 1879, Edison filed a patent for an electric lamp with a carbon filament and keep testing to find the perfect filament for his light bulb. The highest melting point of any chemical element, tungsten, was known by Edison to be an excellent material for light bulb filaments, but the machinery needed to produce super-fine tungsten wire was not available in the late 19th century. Tungsten is still the primary material used in incandescent bulb filaments today.

[0009] Early candles were made in China in about 200 BC from whale fat and rice paper wick. They were made from other materials through time, like tallow, spermaceti, colza oil and beeswax until the discovery of paraffin wax which made production of candles cheap and affordable to everyone. Wick was also improved over time that made from paper, cotton, hemp and flax with different times and ways of burning. Although not a major light source now, candles are still here as decorative items and a light source in emergency situations. They are used for celebrations such as birthdays, religious rituals, for making atmosphere and as a decor.

[0010] Illumination has been improved throughout the times. Even now, the lighting device we used today are still being improved. From the illumination of the sun to the time when human can control fire for providing illumination which changed human history, we have been improving the lighting source for a better efficiency and sense. From the invention of candle, gas lamp, electric carbon arc lamp, kerosene lamp, light bulb, fluorescent lamp to LED lamp, the improvement of illumination shows the necessity of light in human lives.

[0011] There are various types of lighting apparatuses. When cost and light efficiency of LED have shown great effect compared with traditional lighting devices, people look for even better light output. It is important to recognize factors that can bring more satisfaction and light quality and flexibility.

SUMMARY

[0012] In some embodiments, a lighting apparatus includes a lens, a cup housing, a light source and a top cover.

[0013] The cup housing has a surrounding wall and a light source holder.

[0014] The cup housing is installed on a fixed platform.

[0015] The light source is placed on the light source holder.

[0016] The cup housing and the top cover form a container space for storing the lens and the light source.

[0017] A top end of the lens is attached to the top cover.

[0018] A second end of the lens faces to the light source.

[0019] A relative distance between the lens and the light source is adjustable to change a light pattern of a output light of the light source.

[0020] The output light is a light of the light source passing through the lens.

[0021] In some embodiments, a connector couples the top cover and the lens for selecting the relative distance from multiple discrete values.

[0022] In some embodiments, the cup housing has a bottom part attached to an Edison cap to be installed to an Edison socket of the fixed platform.

[0023] In some embodiments, the cup housing has a neck part for connecting the Edison cap.

[0024] A manual switch is disposed on the neck part engaging a driver stored inside the cup housing.

[0025] The manual switch is operated to change a setting of the driver.

[0026] In some embodiments, the lens is rotated with respect to the top cover to change the relative distance to the light source.

[0027] In some embodiments, the lens has a handle to be held for rotating the lens with respect to the top cover.
[0028] In some embodiments, the handle is moved to a first position for engaging the lens to a first rotation track for rotating the lens with respect to the top cover.
[0029] The handle is moved to a second position for escaping the lens from the first rotation track.
[0030] In some embodiments, the first rotation track is formed on the top cover for the lens to rotate along the first rotation track to change the relative distance between the light source and the lens.
[0031] In some embodiments, the handle is rotated with respect to the top cover in a second rotation track to select a setting of a driver to drive the light source
[0032] In some embodiments, the setting is corresponding a continuous value of a light intensity of the light of the light source within a predetermined range.
[0033] In some embodiments, the handle has a manual switch for changing a setting of a driver for driving the light source.
[0034] In some embodiments, an antenna is disposed on the handle.
[0035] In some embodiments, the top cover is a light passing cover.
[0036] In some embodiments, the top cover includes a ring surrounding the lens.
[0037] The light source has a light module for separately emitting a second light passing through the ring.
[0038] In some embodiments, the light source is fixed to the top cover.
[0039] The top cover is moved with respect to the lens to change the relative distance of the lens to the light source.
[0040] In some embodiments, the light source has a light source plate mounted with a first LED module and a second LED module.
[0041] The lens engages a pressure sensor.
[0042] The lens is pressed to select turning on the first LED module or the second LED module.
[0043] The lens has a first part facing to the first LED module and a second part facing to the second LED module.
[0044] The first LED module and the second LED module render different light patterns via the first part of the lens and the second part of the lens respectively.
[0045] In some embodiments, the lens has an inner wall at the second end for surrounding the light source.
[0046] In some embodiments, the light source has a light source plate mounted with a LED module.
[0047] The second end of the lens engages the light source plate.
[0048] In some embodiments, the top cover includes a ring surrounding the lens.
[0049] The light of the light source does not pass through the ring.
[0050] An inner diameter of the ring is adjustable.
[0051] In some embodiments, the top cover includes a ring surrounding the lens.
[0052] The ring is disposed with a speaker.

BRIEF DESCRIPTION OF DRAWINGS

[0053] FIG. **1** illustrates a lighting apparatus embodiment.
[0054] FIG. **2** illustrates an exploded view of the embodiment in FIG. **1**.
[0055] FIG. **3** illustrates a cross-sectional view of the example in FIG. **1**.
[0056] FIG. **4** illustrates a zoom-up view of a portion of components in the example of FIG. **1**.
[0057] FIG. **5** illustrates a manual switch example.
[0058] FIG. **6** shows another embodiment.
[0059] FIG. **7** shows two rotation tracks.
[0060] FIG. **8** shows different lens parts.

DETAILED DESCRIPTION

[0061] In FIG. **6**, a lighting apparatus includes a lens **601**, a cup housing **607**, a light source **604** and a top cover **605**.
[0062] The cup housing **607** has a surrounding wall **617** and a light source holder **610**.
[0063] The cup housing **607** is installed on a fixed platform, like an Edison socket **616** on a ceiling.
[0064] The light source **604** is placed on the light source holder **610**.
[0065] The cup housing **607** and the top cover **605** form a container space **618** for storing the lens **601** and the light source **604**.
[0066] A top end **602** of the lens **602** is attached to the top cover **605**, e.g. via a connector **606**. The connector **606** may include a screw groove and corresponding screw protruding structures on the connecting area of the lens **601** and the top cover **605** for the lens **601** to move with respect to the top cover **605** to change a relative distance **619** between the lens **601** and the light source **604**.
[0067] A second end **603** of the lens **601** faces to the light source **604**.
[0068] A relative distance **619** between the lens **601** and the light source **604** is adjustable to change a light pattern of a output light of the light source. For example, the lens is a condensing lens. By changing the position of the light source **604** relative to the lens **601**, a different light pattern of light beam may be formed, e.g. a different light diameter.
[0069] The output light is a light of the light source passing through the lens **602**.
[0070] In some embodiments, a connector **606** couples the top cover **605** and the lens **601** for selecting the relative distance **619** from multiple discrete values. For example, the connector **606** may have several segment points for the lens **601** to stay unless an external force larger than a predetermined value is applied on the lens **601**. Some labels may be provided to indicate different candidate values corresponding to the positions.
[0071] In some embodiments, the cup housing **607** has a bottom part **610** attached to an Edison cap **615** to be installed to an Edison socket **616** of the fixed platform.
[0072] In some embodiments, the cup housing **607** has a neck part **612** for connecting the Edison cap **615**.
[0073] A manual switch **613** is disposed on the neck part **612** engaging a driver **611** stored inside the cup housing **607**.
[0074] The manual switch **613** is operated to change a setting of the driver **611**. For example, the manual switch **613** may include a slider for indicating one from several color temperatures for indicating how the driver **611** to generate corresponding driving currents to different types of LED modules of the light source **604** to mix a corresponding light color temperature.
[0075] In some embodiments, the lens **601** is rotated with respect to the top cover **605** to change the relative distance **619** to the light source. For example, the connector **606** includes a screw groove as a rotation track for rotating the lens **601** with respect to the top cover **605** to change the relative distance **619**.

[0076] In some embodiments, the lens **601** has a handle **614** to be held for rotating the lens with respect to the top cover **605**.

[0077] In FIG. **7**A and FIG. **7**B, the handle **801** is moved to a first position **802** for engaging the lens **805**, e.g. with a pin **804**, to a first rotation track **807** for rotating the lens **805** with respect to the top cover.

[0078] The handle **801** is moved to a second position **803** for escaping the lens **805** from the first rotation track **807**.

[0079] In FIG. **6**, the first rotation track is formed on the top cover **605** for the lens **601** to rotate along the first rotation track to change the relative distance **619** between the light source and the lens.

[0080] In FIG. **7**A and FIG. **7**B, the handle **801** is rotated with respect to the top cover in a second rotation track **808** to select a setting of a driver to drive the light source.

[0081] In other words, FIG. **7**A and FIG. **7**B show an embodiment of a handle that is used for selectively changing the relative distance between the lens and the light source or changing a setting for a driver to control the light source, e.g. to change a different color or a color temperature.

[0082] In some embodiments, the setting is corresponding a continuous value of a light intensity of the light of the light source within a predetermined range. For example, the setting may correspond to a maximum light intensity of the light source.

[0083] Usually, people buy a light device from a market by recognizing a label showing what light intensity of the light intensity, e.g. 8 W or 12 W. However, people may want to change the setting of the light intensity to a lower value, to fit the environment or to save energy. With such design, people may select a value within a range, e.g. 8 W to 10 W. The continuous value refer to any value within the range, which means unlimited options, instead of several candidate values to be selected. A rotation is helpful on doing such work.

[0084] In FIG. **7**A, the handle **801** has a manual switch **820** for changing a setting of a driver for driving the light source. For example, the manual switch **820** may include a button, a sliding switch or any other switch for selecting a value. The manual switch **820** may be electrically connected to a driver that is used for control the light source.

[0085] In FIG. **7**A, an antenna **821** is disposed on the handle **801**. Because the handle **801** is exposed outside the lighting apparatus, it is a good position to install an antenna **821** that avoids interference of other components of the lighting apparatus or the platform.

[0086] In some embodiments, the top cover is a light passing cover, e.g. allowing light to pass through.

[0087] In some embodiments, the top cover includes a ring surrounding the lens.

[0088] The light source has a light module for separately emitting a second light passing through the ring. For example, there is a ring of light source disposed on the light source **604** in FIG. **6** for emitting light to the top cover **605**.

[0089] In some embodiments, the light source is fixed to the top cover. Unlike the setting above, the light source may be moved with respect to the lens to change the relative distance.

[0090] The top cover is moved with respect to the lens to change the relative distance of the lens to the light source.

[0091] In FIG. **8**, the light source has a light source plate **905** mounted with a first LED module **901** and a second LED module **902**.

[0092] The lens engages a pressure sensor **906**.

[0093] The lens is pressed to select turning on the first LED module **901** or the second LED module **902**. For example, the first time, the lens is pressed on the sensor **905** indicates the driver to turn on the first LED module **901**. The next time when the lens is pressed on the sensor **905**, the driver turns on the second LED module **902**.

[0094] The lens has a first part **903** facing to the first LED module **901** and a second part **904** facing to the second LED module **902**.

[0095] The first LED module **901** and the second LED module **902** render different light patterns via the first part of the lens and the second part of the lens respectively.

[0096] In FIG. **6**, the lens **601** has an inner wall **609** at the second end **603** for surrounding the light source **604**.

[0097] In some embodiments, the light source **604** has a light source plate **608** mounted with a LED module, e.g. at the position showing the light source **604**.

[0098] The second end **603** of the lens engages the light source plate **608**.

[0099] In some embodiments, the top cover includes a ring surrounding the lens.

[0100] The light of the light source does not pass through the ring.

[0101] An inner diameter of the ring is adjustable. For example, a light shielding ring like the one used in a camera to change a diameter of light passing area.

[0102] In some embodiments, the top cover includes a ring surrounding the lens.

[0103] In FIG. **6**, the ring is disposed with a speaker **691**. For example, a smart light device receives a music stream and plays the music stream via the speaker. The position is a nice position to install the speaker while providing an adjustment of the light pattern.

[0104] Please refer to FIG. **1** to FIG. **5**, which shows a detail embodiment.

[0105] In FIG. **1**, a lighting apparatus **100** includes a handle **123** for adjusting a light cover **12**. There is a cup housing **111** connected to a top cover **112** forming a housing body **11**. The light cover and the housing **11** body forms a main housing **10** of the lighting apparatus. There is manual switch **13** disposed on a neck part of the main housing **10**.

[0106] FIG. **2** shows an exploded view of the example in FIG. **1**.

[0107] In FIG. **2**, there is a positioning hole **214** for aligning the light source module **21** to other components. The light source module **21** has a LED module **213**, a heat sink cup **211**, and a light source plate **212**.

[0108] There is a light opening **16** defined by a top cover **112**. The cover **112** has a first buckle part **113**.

[0109] There is a handle **123** connecting to a light plate **122** with a lateral wall **121** forming the light cover **12**. A concealing ring **14** is used for preventing water to move in the lighting apparatus.

[0110] The lens **22** has a lens body **221** and a lens ring **222**. There is a screw protruding structure **224** to move along a rotation track. There is a positioning column **223** for keeping a relative position of the lens **22**.

[0111] A heat dissipation cavity **117** is provided in the cup housing **111**. There is a driver **23** with a switch **232** and a switch handle **233** mounted on a driver printed circuit board **231**. A concealing ring **15** is used for preventing water to move in the lighting apparatus. A concealing groove **134** is

used for installing the concealing ring **15**. There is a second buckle part **131** and a adjusting sleeve **131** to form a manual switch **13**.

[0112] FIG. **3** show a cross-sectional view of the example in FIG. **2**. The same reference numerals refer to the same components and are not described again.

[0113] FIG. **4** show a zoom-up view of the example how the lens is moved relative to the top cover.

[0114] In FIG. **4**, there is a concealing ring **14**. The light plate **122** has a first sliding groove **126** with a corresponding sliding structure **113**. The lens body **221** has a lateral wall **222** that has a protruding screw unit **224** to move along an inner groove unit **124** on the lateral wall **121**.

[0115] FIG. **5** shows a zoom-up view of the manual switch on the neck part.

[0116] In FIG. **5**, the cup housing **111** has a second concealing ring disposed in a concealing groove **134**. A moving plate **133** is used for triggering a handle **233** to change a setting. There is a second buckle part **132** to connect the components.

[0117] The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings.

[0118] The embodiments were chosen and described in order to best explain the principles of the techniques and their practical applications. Others skilled in the art are thereby enabled to best utilize the techniques and various embodiments with various modifications as are suited to the particular use contemplated.

[0119] Although the disclosure and examples have been fully described with reference to the accompanying drawings, it is to be noted that various changes and modifications will become apparent to those skilled in the art. Such changes and modifications are to be understood as being included within the scope of the disclosure and examples as defined by the claims.

1. A lighting apparatus, comprising:

a lens;

a cup housing having a surrounding wall and a light source holder, wherein the cup housing is installed on a fixed platform;

a light source placed on the light source holder; and

a top cover, wherein the cup housing and the top cover form a container space for storing the lens and the light source, wherein a top end of the lens is attached to the top cover, wherein a second end of the lens faces to the light source, wherein a relative distance between the lens and the light source is adjustable to change a light pattern of a output light of the light source, wherein the output light is a light of the light source passing through the lens, wherein the lens is rotated with respect to the top cover to change the relative distance to the light source, wherein a connector couples the top cover and the lens for selecting the relative distance from multiple discrete values, wherein the connector has several segment points for the lens to stay unless an external force larger than a predetermined value is applied on the lens.

2. The lighting apparatus of claim **1**, wherein the lens has a handle to be held for rotating the lens with respect to the top cover.

3. The lighting apparatus of claim **1**, wherein the cup housing has a bottom part attached to an Edison cap to be installed to an Edison socket of the fixed platform.

4. The lighting apparatus of claim **3**, wherein the cup housing has a neck part for connecting the Edison cap, wherein a manual switch is disposed on the neck part engaging a driver stored inside the cup housing, wherein the manual switch is operated to change a setting of the driver.

5. The lighting apparatus of claim **1**, wherein the handle is moved to a first position for engaging the lens to a first rotation track for rotating the lens with respect to the top cover, wherein the handle is moved to a second position for escaping the lens from the first rotation track.

6. The lighting apparatus of claim **1**, wherein the first rotation track is formed on the top cover for the lens to rotate along the first rotation track to change the relative distance between the light source and the lens.

7. The lighting apparatus of claim **1**, wherein the handle is rotated with respect to the top cover in a second rotation track to select a setting of a driver to drive the light source

8. The lighting apparatus of claim **7**, wherein the setting is corresponding a continuous value of a light intensity of the light of the light source within a predetermined range.

9. The lighting apparatus of claim **1**, wherein the handle has a manual switch for changing a setting of a driver for driving the light source.

10. The lighting apparatus of claim **1**, wherein an antenna is disposed on the handle.

11. The lighting apparatus of claim **1**, wherein the top cover is a light passing cover.

12. The lighting apparatus of claim **13-11**, wherein the top cover comprises a ring surrounding the lens, wherein the light source has a light module for separately emitting a second light passing through the ring.

13. The lighting apparatus of claim **1**, wherein the light source is fixed to the top cover, wherein the top cover is moved with respect to the lens to change the relative distance of the lens to the light source.

14. The lighting apparatus of claim **1**, wherein the lens has an inner wall at the second end for surrounding the light source.

15. The lighting apparatus of claim **14**, wherein the light source has a light source plate mounted with a LED module, wherein the second end of the lens engages the light source plate.

16. The lighting apparatus of claim **1**, wherein the top cover comprises a ring surrounding the lens, wherein the ring is disposed with a speaker.

* * * * *