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(54) **PANEL LIGHT APPARATUS**

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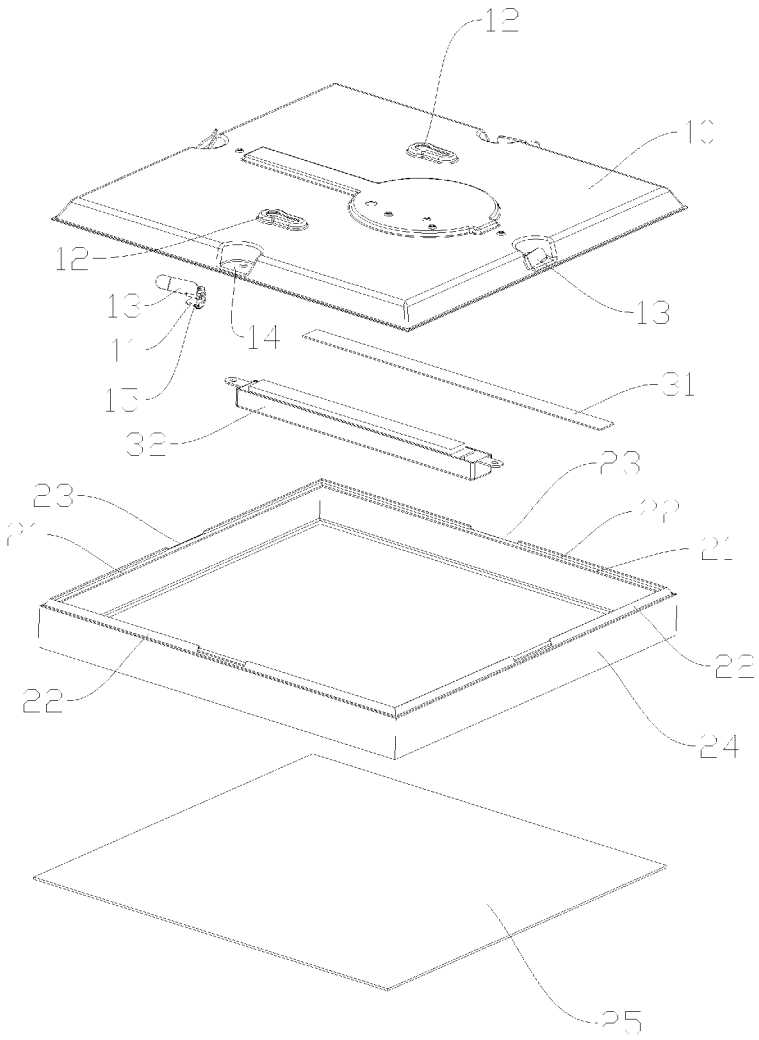
(57) **ABSTRACT**

A panel light apparatus includes a base plate, a light source, a frame and a light passing cover. The base plate has a fixing unit for fixing the base plate to a platform. The base plate has multiple rotation units to switch between a lock mode and a release mode. The light source is disposed on the base plate. The frame has multiple attaching units to attach to the rotation units in the lock mode for fixing the frame to the base plate. The multiple attaching units are released from the rotation units in the release mode. The frame has a light opening. The light passing cover attached to the frame for covering the light opening for a light of the light source to pass through.



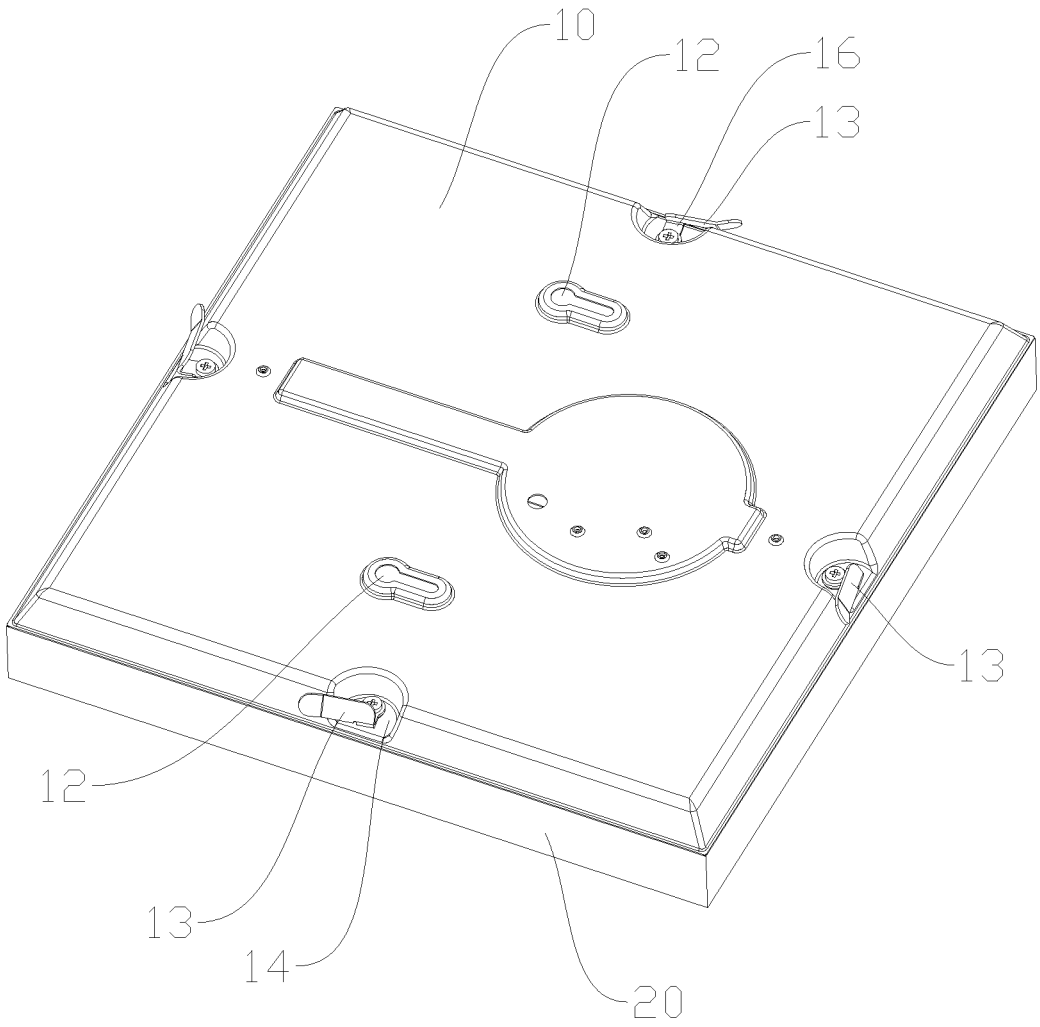



Fig. 1

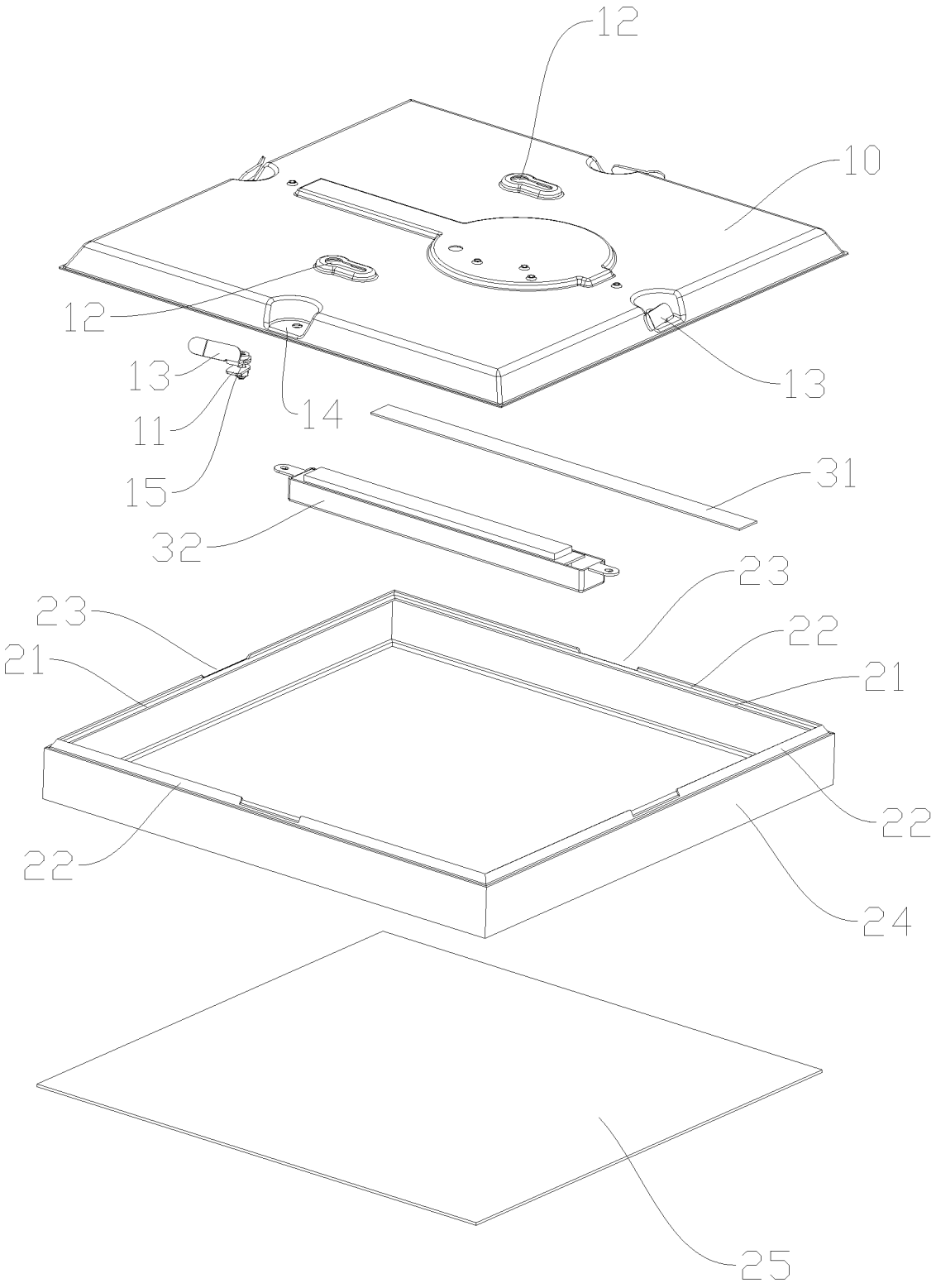



Fig. 2

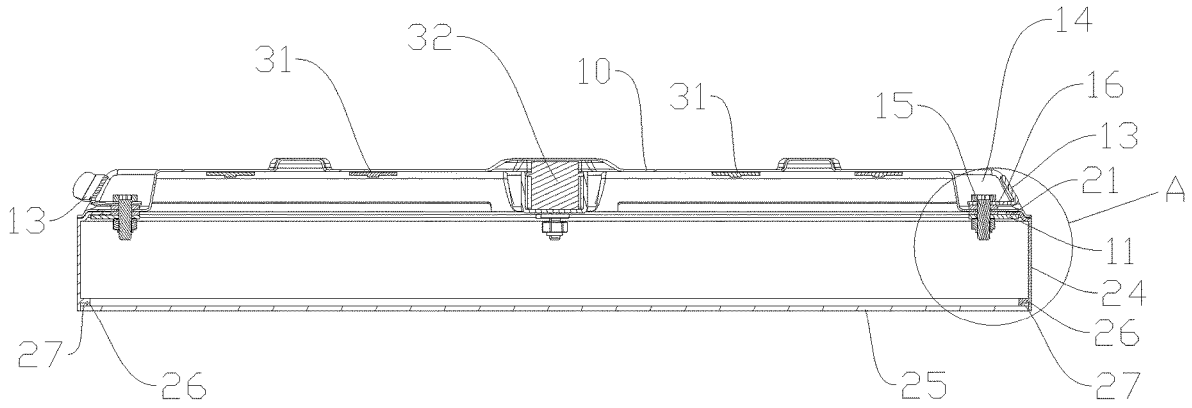



Fig. 3

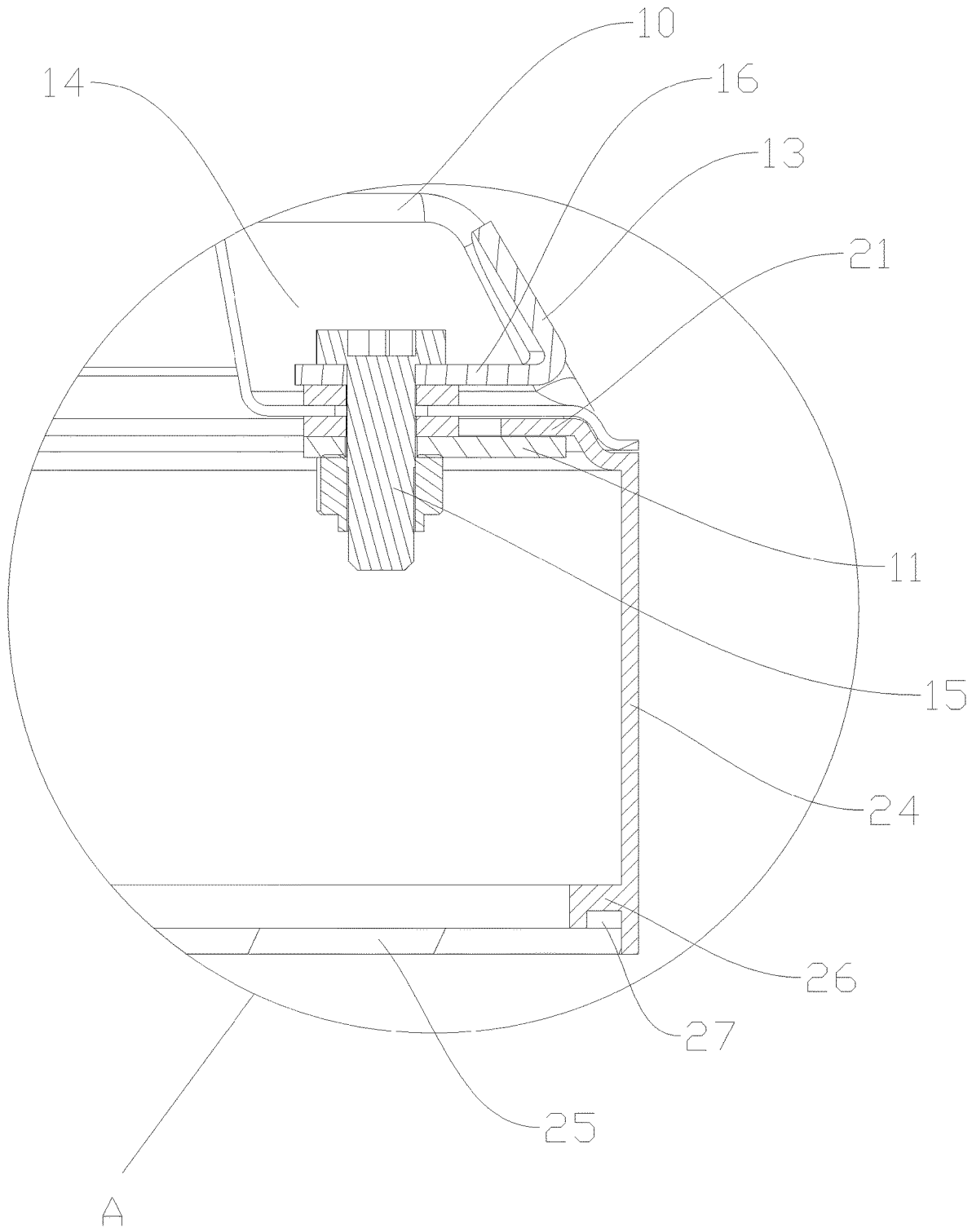



Fig. 4

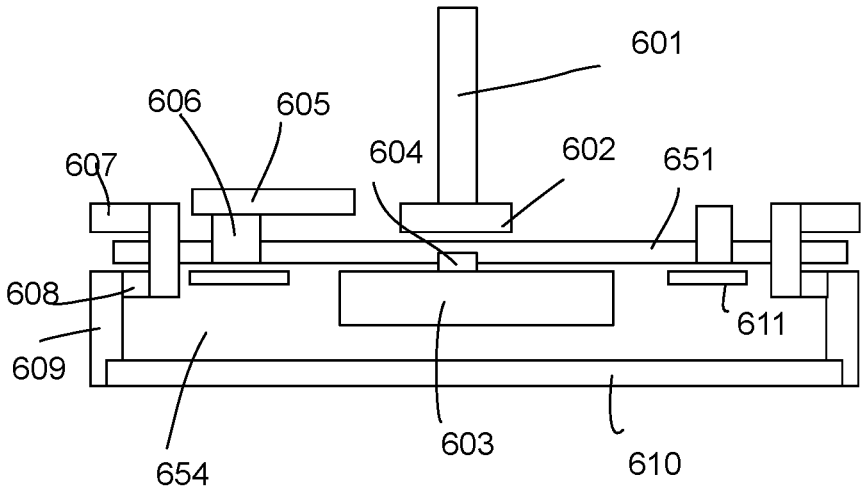



Fig. 5

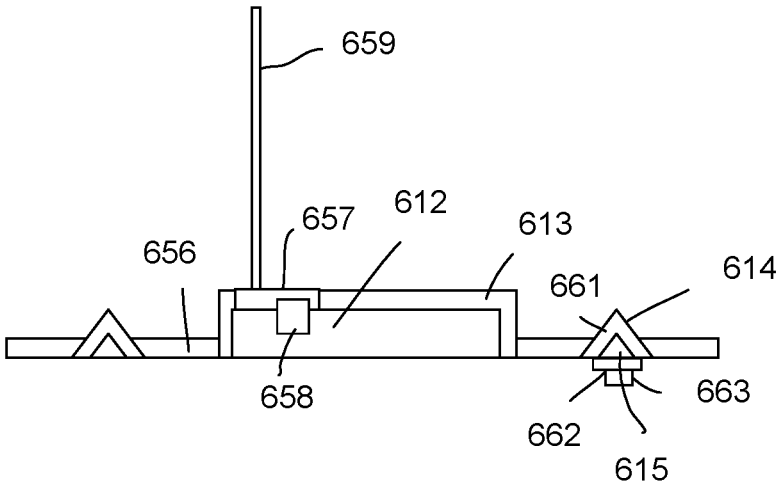



Fig. 6

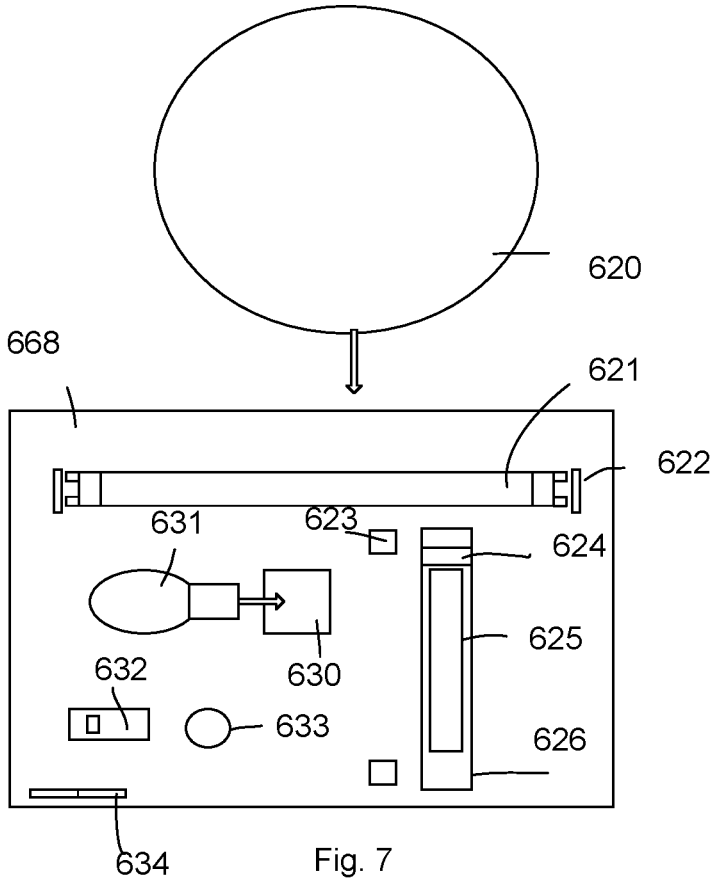



Fig. 7

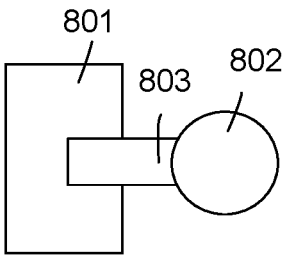



Fig. 8A

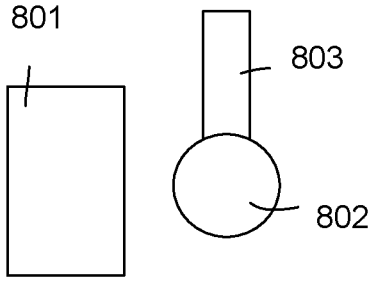



Fig. 8B

# PANEL LIGHT APPARATUS

## FIELD

**[0001]** The present invention is related to a panel light apparatus, and more particularly related to a panel light apparatus with an easy assembly structure.

## BACKGROUND

**[0002]** 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.

**[0003]** 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.

**[0004]** 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.

**[0005]** 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.

**[0006]** 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.

**[0007]** 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.

**[0008]** 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.

**[0009]** 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.

**[0010]** 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.

**[0011]** Panel light devices are widely used in various places. Panel light devices have advantages of smaller size and large area of light output.

**[0012]** It is important to design a better way to clean panel light devices to increase the life span of such devices.

**[0013]** It is also important to keep the manufacturing cost as low as possible while providing more flexibility and convenience to users.

## SUMMARY

**[0014]** In some embodiments, a panel light apparatus includes a base plate, a light source, a frame and a light passing cover.

**[0015]** The base plate has a fixing unit for fixing the base plate to a platform.

**[0016]** The base plate has multiple rotation units to switch between a lock mode and a release mode.

**[0017]** The light source is disposed on the base plate.

**[0018]** The frame has multiple attaching units to attach to the rotation units in the lock mode for fixing the frame to the base plate.

**[0019]** The multiple attaching units are released from the rotation units in the release mode.

**[0020]** The frame has a light opening.

**[0021]** The light passing cover attached to the frame for covering the light opening for a light of the light source to pass through.

**[0022]** In some embodiments, the base plate has a central groove for holding a driver.

**[0023]** In some embodiments, the base plate has a conductive path and a driver connector.

**[0024]** The driver is connected to the driver connector to electrically connected to an external power wire.

**[0025]** The external power wire and the driver are placed on opposite sides of the base plate.

**[0026]** In some embodiments, the driver has a manual switch for changing a setting of the driver.

**[0027]** In some embodiments, the manual switch has a rotation switch and a discrete switch.

**[0028]** The rotation switch is used for changing a continuous value and the discrete switch is used for setting a discrete value.

**[0029]** In some embodiments, the manual switch is concealed by the light passing cover.

**[0030]** In some embodiments, the base plate has multiple light grooves for disposing multiple light strips of the light source.

**[0031]** In some embodiments, the light groove has a reflective surface.

**[0032]** In some embodiments, the light strip has an electric insulation surface.

**[0033]** In some embodiments, the electric insulation surface includes a lens for diffusing a light of the light strip.

**[0034]** In some embodiments, the driver detects a number of connected light strips to automatically adjust an operation parameter.

**[0035]** In some embodiments, if the driver detects a failure light strip, the driver turns off the failed light strip and increases light intensities of other light strips.

**[0036]** In some embodiments, the light source has multiple light strips.

**[0037]** The light strip has an internal driver and a LED module.

**[0038]** The internal driver generates a separate driving current to the LED module.

**[0039]** In some embodiments, the base plate has multiple light strip connectors for attaching the light strip.

**[0040]** In some embodiments, the frame and the light passing cover are integrated as a replaceable module to be replaced by a user.

**[0041]** In some embodiments, the fame has a different geometric shape as the base plate.

**[0042]** In some embodiments, the base plate has multiple traditional light tube connectors for selectively connecting traditional light tubes as the light source or light strips with LED modules on the base plate as the light source.

**[0043]** In some embodiments, the base plate has an Edison socket for connecitng a light bulb.

**[0044]** In some embodiments, the driver turns off electricity when the rotation units are placed in the release mode.

**[0045]** In some embodiments, a temperature indicator is placed on the frame for indicating an alarm message when a working temperature is higher than a threshold.

## BRIEF DESCRIPTION OF DRAWINGS

**[0046]** FIG. **1** illustrates a top view of a panel light apparatus embodiment.

**[0047]** FIG. **2** illustrates an exploded view of a panel light apparatus embodiment.

**[0048]** FIG. **3** illustrates a cross-sectional view of the example in FIG. **1**.

**[0049]** FIG. **4** illustrates a zoom-up view of a connection of components in the example of FIG. **1**.

**[0050]** FIG. **5** shows another panel light apparatus embodiment.

**[0051]** FIG. **6** shows a base plate example.

**[0052]** FIG. **7** shows another embodiment of a panel light embodiment.

**[0053]** FIG. **8**A and FIG. **8**B show two modes of a rotation unit.

## DETAILED DESCRIPTION

**[0054]** In FIG. **5**, a panel light apparatus includes a base plate **651**, a light source **611**, a frame **609** and a light passing cover **610**.

**[0055]** The base plate **651** has a fixing unit **606** for fixing the base plate **651** to a platform **605**.

**[0056]** The base plate **651** has multiple rotation units **607** to switch between a lock mode and a release mode.

**[0057]** FIG. **8**B shows that the rotation unit **802** is rotated to move the pin **803** to release the attaching unit **801** of the frame in a release mode.

**[0058]** In FIG. **5**, the light source **611** is disposed on the base plate **651**.

**[0059]** The frame **609** has multiple attaching units **608** to attach to the rotation units **607** in the lock mode for fixing the frame **609** to the base plate **651**.

**[0060]** The multiple attaching units are released from the rotation units in the release mode.

**[0061]** FIG. **8**A and FIG. **8**B illustrate an example. In FIG. **8**A, a rotation unit **802** has a pin **803**. The pin **803** is moved by rotating the rotation unit **802** to engage and hold the attaching unit **801** of the frame **609** in a lock mode.

**[0062]** The frame **609** has a light opening **654**.

**[0063]** The light passing cover **610** attached to the frame **609** for covering the light opening **654** for a light of the light source **611** to pass through.

**[0064]** In FIG. **6**, the base plate **656** has a central groove **613** for holding a driver **612**.

**[0065]** In some embodiments, the base plate **656** has a conductive path **657** and a driver connector **658**.

**[0066]** The driver **612** is connected to the driver connector **658** to electrically connected to an external power wire **659** via the conductive path **657**. The conductive path **657** may include wire or metal layers for guiding electricity and signals among components.

**[0067]** The external power wire **659** and the driver **612** are placed on opposite sides of the base plate **656**.

**[0068]** In FIG. **5**, the external power wire **601** is connected to a connector **602** which further routes the electricity to the driver **603** via the connector **604**.

**[0069]** In some embodiments, the driver has a manual switch for changing a setting of the driver.

**[0070]** In FIG. **7**, the manual switch has a rotation switch **633** and a discrete switch **632**.

**[0071]** The rotation switch **633** is used for changing a continuous value and the discrete switch is used for setting a discrete value.

**[0072]** For example, the rotation switch **633** is used for a user to adjust a maximum light intensity. Even the light source may output to a first light intensity, users may have some concern like energy saving or light effect, the light intensity may be decrease to a desired level. The rotation switch **633** may be used to set a continuous value within a range.

**[0073]** In contrast, the discreate switch **632**, e.g. a sliding switch, may be used for assigning a working mode, a color temperature or other parameter among several candidate discrete values.

**[0074]** In some embodiments, the manual switch is concealed by the light passing cover. For example, the manual switch is placed upon the driver or on the base plate concealed by the light passing cover.

**[0075]** In FIG. **6**, the base plate **656** has multiple light grooves **614** for disposing multiple light strips **615** of the light source.

**[0076]** In FIG. **6**, the light groove has a reflective surface **661**.

**[0077]** In FIG. **6**, the light strip **615** has an electric insulation surface **662**.

**[0078]** In some embodiments, the electric insulation surface **662** includes a lens **663** for diffusing a light of the light strip **615**.

**[0079]** In some embodiments, the driver detects a number of connected light strips to automatically adjust an operation parameter. For example, users or manufacturers may install a desired number of light strips and the driver detects the number of the light strips to determine how to generate corresponding driving currents.

**[0080]** In some embodiments, if the driver detects a failure light strip, the driver turns off the failed light strip and increases light intensities of other light strips.

**[0081]** In some embodiments, the light source has multiple light strips.

**[0082]** In FIG. **7**, the light strip **626** has an internal driver **624** and a LED module **625**.

**[0083]** The internal driver **624** generates a separate driving current to the LED module **625**.

**[0084]** In some embodiments, the base plate has multiple light strip connectors **623** for attaching the light strip **626**.

**[0085]** In some embodiments, the frame and the light passing cover are integrated as a replaceable module to be replaced by a user. For example, the frame is made of aluminum or other metal material while the light passing cover is made of a transparent material. The frame is fixed to the light passing cover, e.g. via glue or screws. The frame and the light passing cover may be easily detached from the base plate by rotating the rotation units in a release mode. Users may replace the original frame and light passing cover with another frame with another light passing cover.

**[0086]** In some embodiments, the fame has a different geometric shape as the base plate.

**[0087]** For example, in FIG. **6**, the base plate **668** has a rectangular shape while the frame with the light passing cover has a circular shape. The rotation units are placed to align with corresponding attaching units to perform the assembly of the frame **620** with the light passing cover with the base plate **668**.

**[0088]** In some embodiments, the base plate **668** has multiple traditional light tube **621** connectors for selectively connecting traditional light tubes as the light source or light strips with LED modules on the base plate as the light source. For example, an A**8** socket **622** is placed on the base plate **668** to insert a traditional A**8** light tube **621** or a A**8** LED light tube.

**[0089]** In some embodiments, the base plate **668** has an Edison socket **630** for connecitng a light bulb **631** with an Edison plug.

**[0090]** In some embodiments, the driver turns off electricity when the rotation units are placed in the release mode. For example, the rotation unit has a switch to send a signal to the driver to deactivate the power supply when the rotation unit is in a release mode. With such design, users may be kept safe on detaching the frame from the base plate.

**[0091]** In FIG. **7**, a temperature indicator **634**, like a temperature sensor sticker that changes color under different temperature, is placed on the frame for indicating an alarm message when a working temperature is higher than a threshold.

**[0092]** Please refer to FIG. **1** to FIG. **4**, which show another embodiment. In FIG. **1** to FIG. **4**, the same reference numerals refer to the same components and may not be repeated again when describing each drawing.

**[0093]** In FIG. **1**, the panel light apparatus has two installation holes **12** as the fixing units to be fixed to a ceiling or a bracket.

**[0094]** There are multiple rotation units **13** to be switched between a lock mode and a release mode. In the lock mode, the rotation unit keeps the frame **20** fixing to the base plate **10**. The rotation unit **13** is placed in an installation groove **14**. There is a connection plate **16** fixed to the rotation unit **13**. The rotation unit **13** may have a handle to be rotated.

**[0095]** FIG. **2** shows an exploded view of the example in FIG. **1**.

**[0096]** In FIG. **2**, there is rotation shaft **15** and a locking unit **11** placed on the rotation unit **13**. There is a driver **32** placed inside the containing space between the base plate **10** and the frame wall **24**. The frame wall **24** has guiding protruding structures **22** facing to the base plate **10**. There is an escape groove **23** to align with the rotation unit **13**. There is a support plate **21** for fixing to the base plate **10**.

**[0097]** There is a light strip **31** fixed to the base plate **10**. A light passing cover **25** is fixed to the frame wall **24**.

**[0098]** FIG. **3** shows a cross-sectional view of the example in FIG. **1**.

**[0099]** In FIG. **3**, the light passing cover **25** is fixed to the frame wall **24** with glues **27** on the glue groove **26**.

**[0100]** FIG. **4** further provides a zoom-up view to show the relation among the components mentioned above.

**[0101]** 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.

**[0102]** 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.

**[0103]** 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 panel light apparatus, comprising:

a base plate with a fixing unit for fixing the base plate to a platform, wherein the base plate has multiple rotation units to switch between a lock mode and a release mode;

a light source disposed on the base plate;

a frame with multiple attaching units to attach to the rotation units in the lock mode for fixing the frame to the base plate, wherein the multiple attaching units are released from the rotation units in the release mode, wherein the frame has a light opening; and

a light passing cover attached to the frame for covering the light opening for a light of the light source to pass through.

**2**. The panel light apparatus of claim **1**, wherein the base plate has a central groove for holding a driver.

**3**. The panel light apparatus of claim **2**, wherein the base plate has a conductive path and a driver connector, wherein the driver is connected to the driver connector to electrically connected to an external power wire, wherein the external power wire and the driver are placed on opposite sides of the base plate.

**4**. The panel light apparatus of claim **2**, wherein the driver has a manual switch for changing a setting of the driver.

**5**. The panel light apparatus of claim **4**, wherein the manual switch has a rotation switch and a discrete switch, wherein the rotation switch is used for changing a continuous value and the discrete switch is used for setting a discrete value.

**6**. The panel light apparatus of claim **4**, wherein the manual switch is concealed by the light passing cover.

**7**. The panel light apparatus of claim **1**, wherein the base plate has multiple light grooves for disposing multiple light strips of the light source.

**8**. The panel light apparatus of claim **7**, wherein the light groove has a reflective surface.

**9**. The panel light apparatus of claim **7**, wherein the light strip has an electric insulation surface.

**10**. The panel light apparatus of claim **9**, wherein the electric insulation surface comprises a lens for diffusing a light of the light strip.

**11**. The panel light apparatus of claim **7**, wherein the driver detects a number of connected light strips to automatically adjust an operation parameter.

**12**. The panel light apparatus of claim **11**, wherein if the driver detects a failure light strip, the driver turns off the failed light strip and increases light intensities of other light strips.

**13**. The panel light apparatus of claim **1**, wherein the light source has multiple light strips, wherein the light strip has an internal driver and a LED module, wherein the internal driver generates a separate driving current to the LED module.

**14**. The panel light apparatus of claim **13**, wherein the base plate has multiple light strip connectors for attaching the light strip.

**15**. The panel light apparatus of claim **1**, wherein the frame and the light passing cover are integrated as a replaceable module to be replaced by a user.

**16**. The panel light apparatus of claim **1**, wherein the fame has a different geometric shape as the base plate.

**17**. The panel light apparatus of claim **1**, wherein the base plate has multiple traditional light tube connectors for selectively connecting traditional light tubes as the light source or light strips with LED modules on the base plate as the light source.

**18**. The panel light apparatus of claim **1**, wherein the base plate has an Edison socket for connecitng a light bulb.

**19**. The panel light apparatus of claim **1**, wherein the driver turns off electricity when the rotation units are placed in the release mode.

**20**. The panel light apparatus of claim **1**, wherein a temperature indicator is placed on the frame for indicating an alarm message when a working temperature is higher than a threshold.

* * * * *