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**Gu et al.**

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(54) **HEAT DISSIPATION DEVICE AND LIGHTING DEVICE**

(71) Applicant: **APUTURE IMAGING INDUSTRIES CO., LTD.**, Guangdong (CN)

(72) Inventors: **Haijun Gu**, Guangdong (CN); **Chongbo Huang**, Guangdong (CN); **Xiangjun Zhou**, Guangdong (CN); **Yi Xie**, Guangdong (CN)

(73) Assignee: **APUTURE IMAGING INDUSTRIES CO., LTD.**, Guangdong (CN)

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(52) **U.S. Cl.**
CPC ..... ***F21V 29/76*** (2015.01)

(58) **Field of Classification Search**
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See application file for complete search history.

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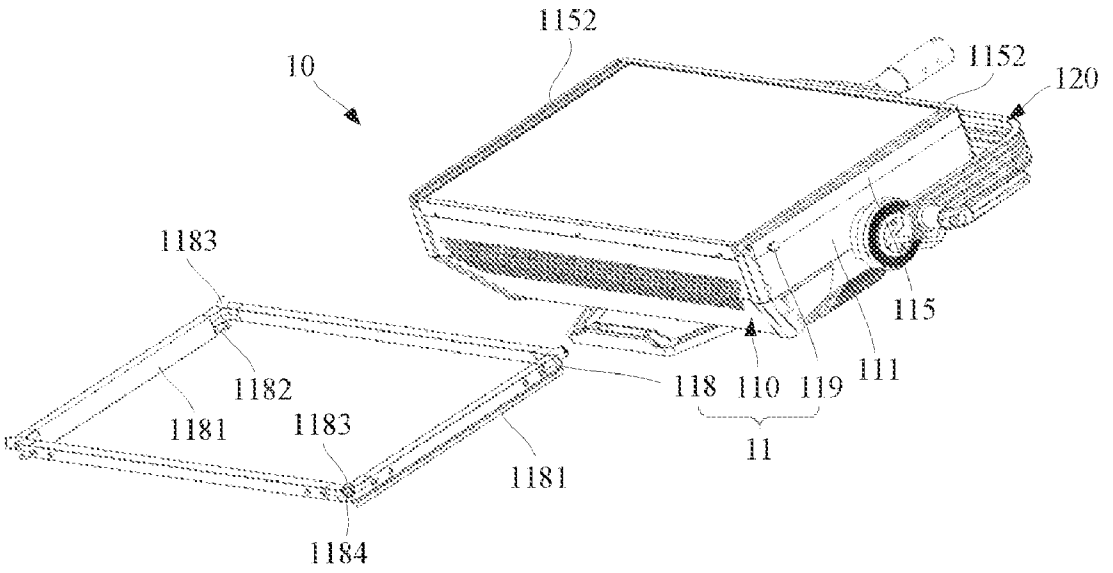
*Primary Examiner* — Thomas M Sember
(74) *Attorney, Agent, or Firm* — Mark M. Friedman

(57) **ABSTRACT**

Disclosed are a heat dissipation device (**140**) and a lighting device (**10**). The heat dissipation device (**140**) comprises a substrate (**141**), a plurality of fins (**1431**) and at least one airflow generating device (**145**), wherein the plurality of fins (**1431**) are arranged on the substrate (**141**) at certain intervals and are connected to the substrate (**141**); and the at least one airflow generating device (**145**) is arranged at the ends of the plurality of fins (**1431**) away from the substrate (**141**), and an airflow generated by the airflow generating device (**145**) flows through at least some gaps of the plurality of fins (**1431**) in the direction of the substrate (**141**) and is jointly guided by the substrate (**141**) and the plurality of fins (**1431**) to be diffused.

**15 Claims, 13 Drawing Sheets**



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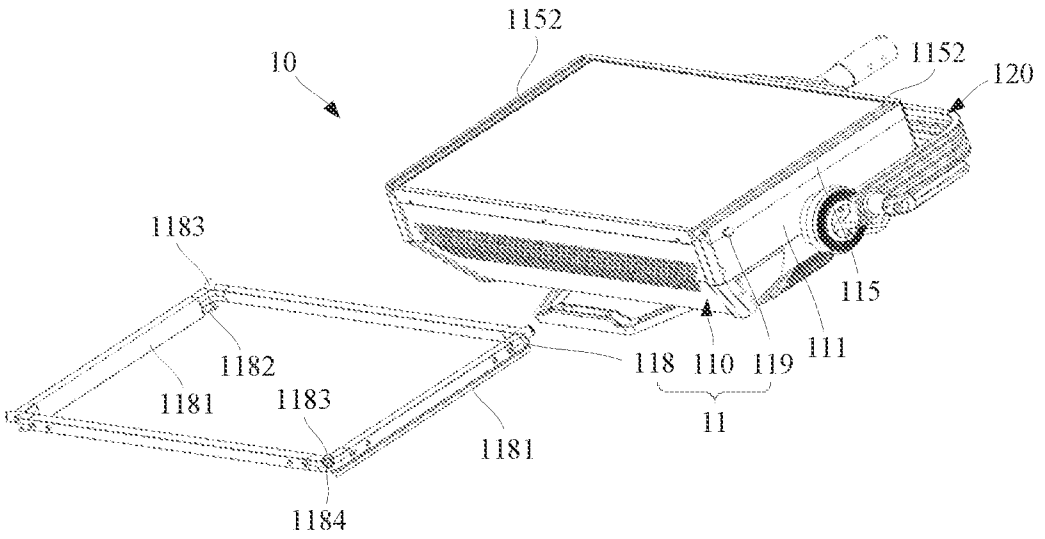
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120
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FIG. 1

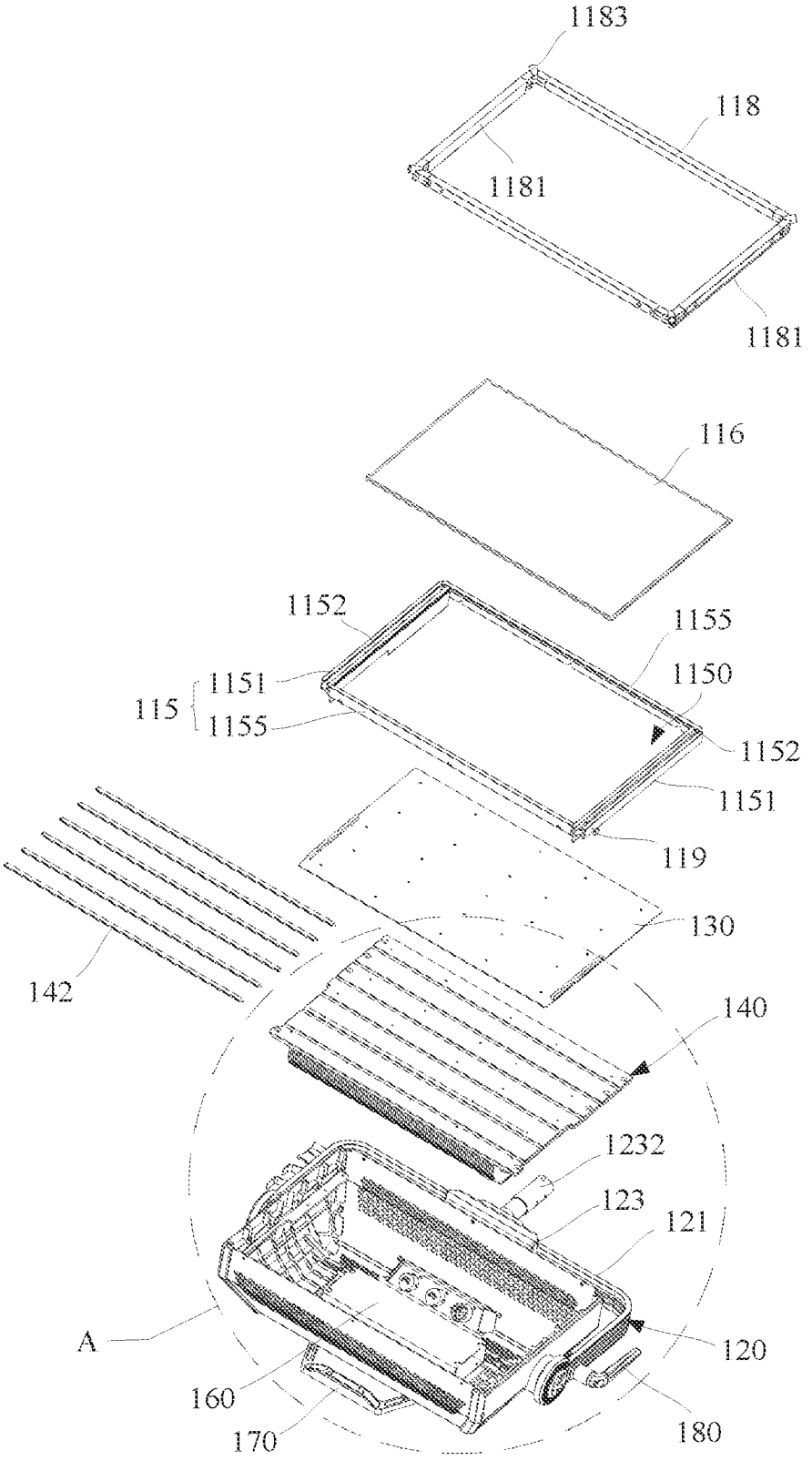
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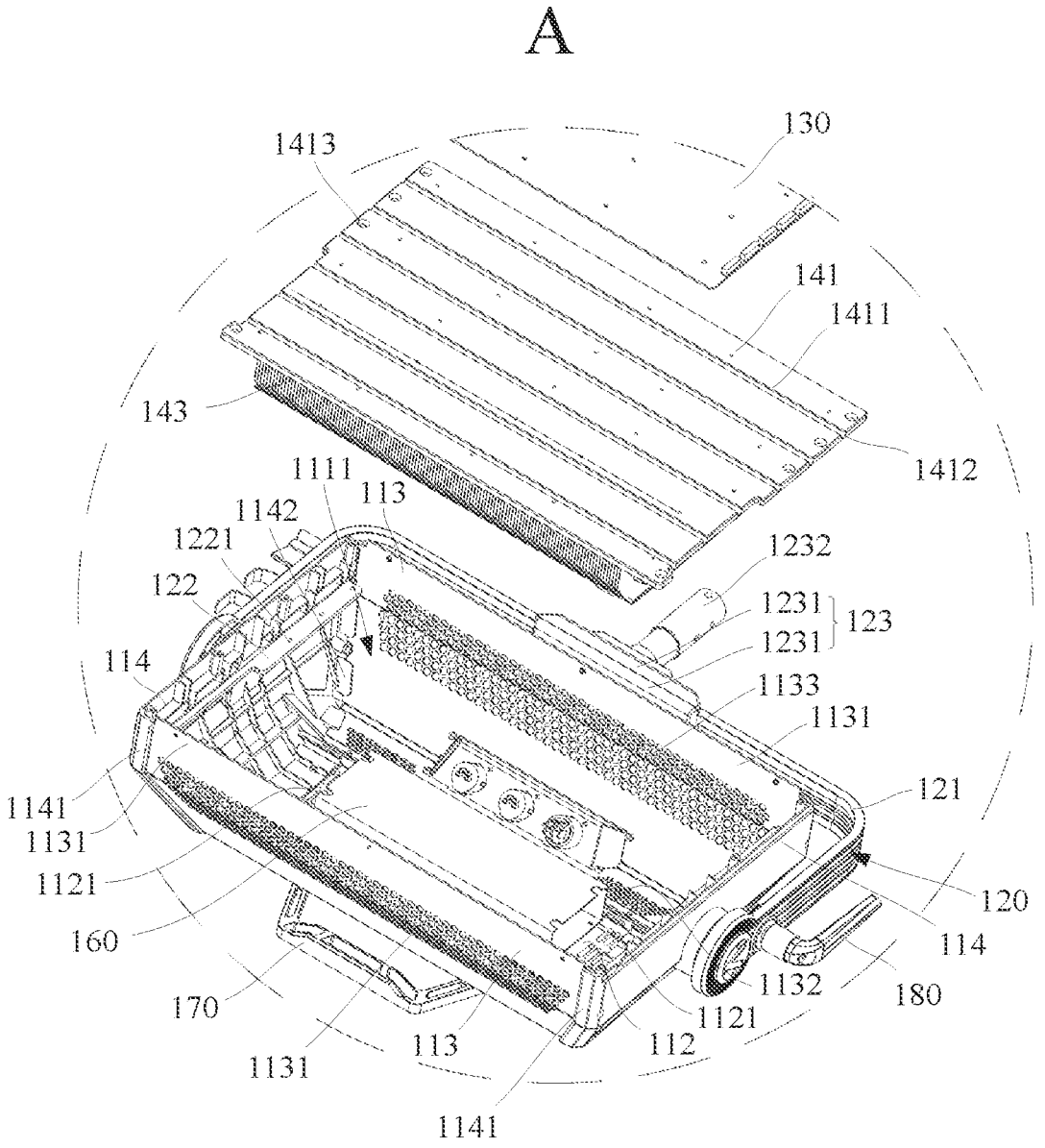
FIG. 2


A
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1413
141
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143
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1142
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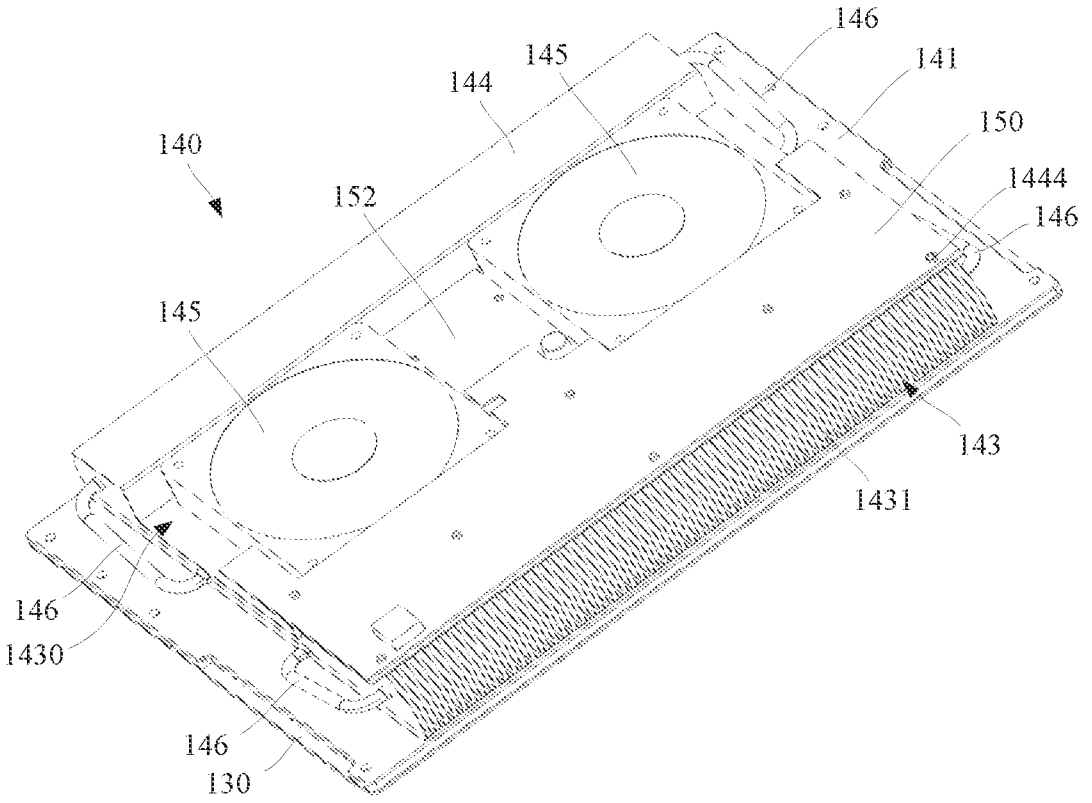
FIG. 3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1444
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143
1431
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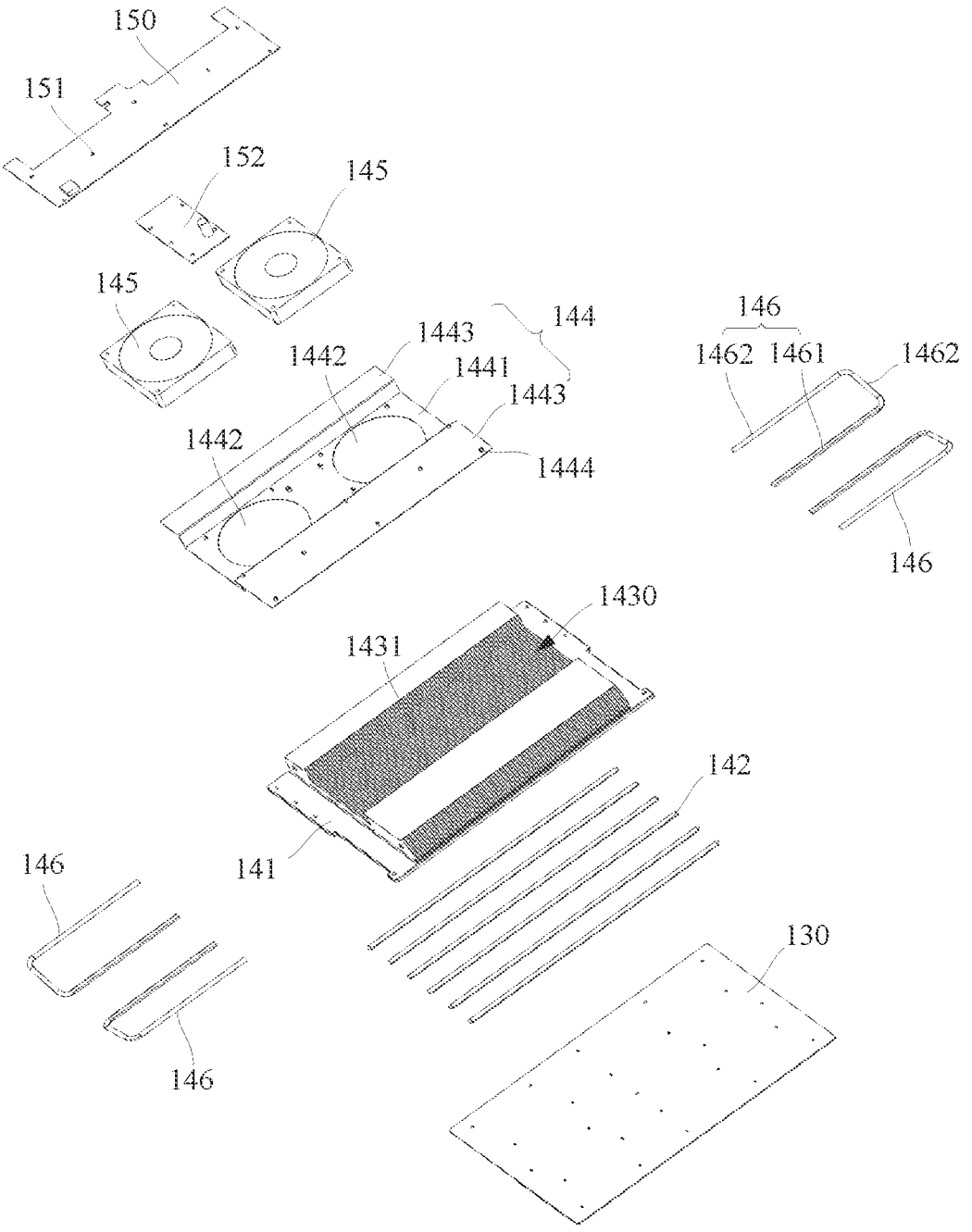
1430
146
130

FIG. 4


150
151
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1443
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130
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FIG. 5

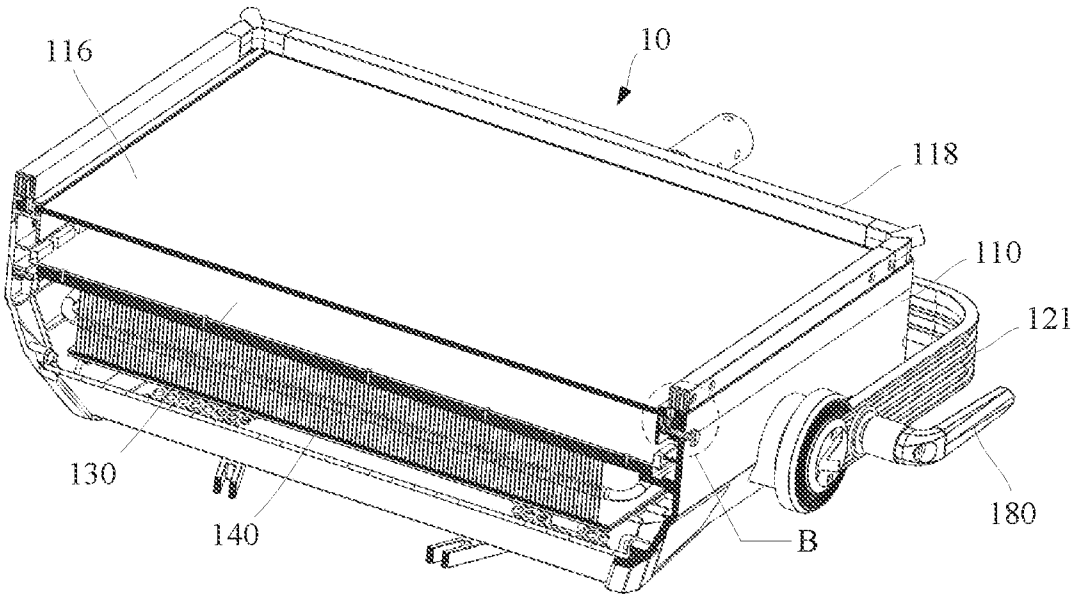


FIG. 6

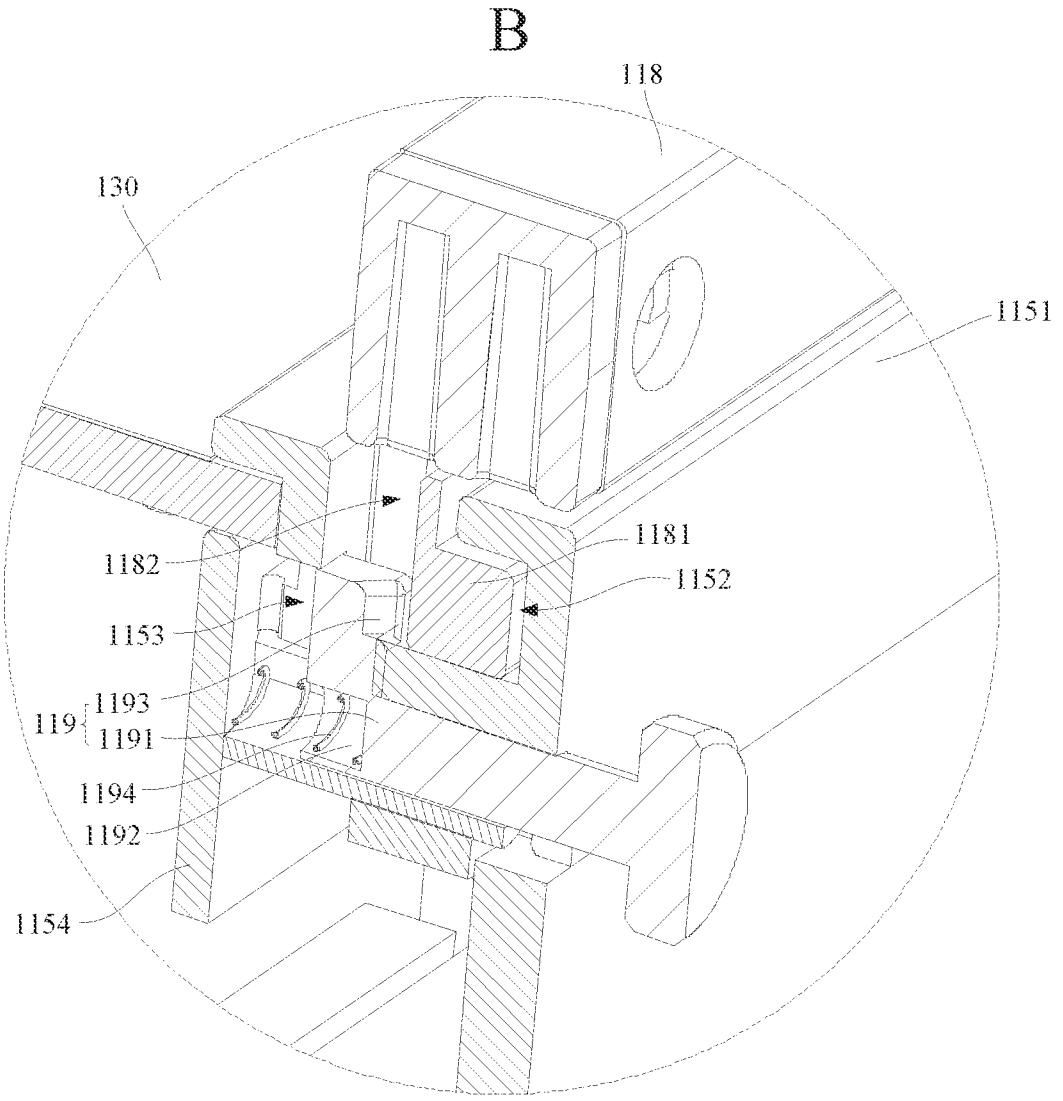
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FIG. 7

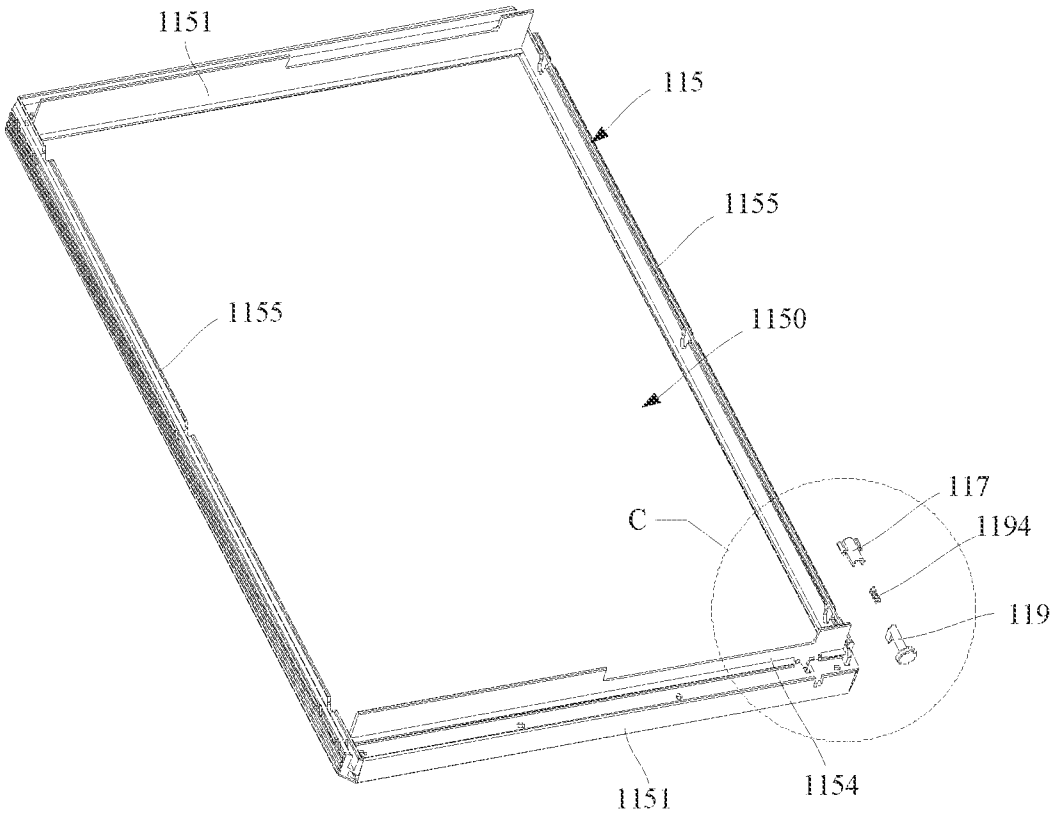


FIG. 8

C

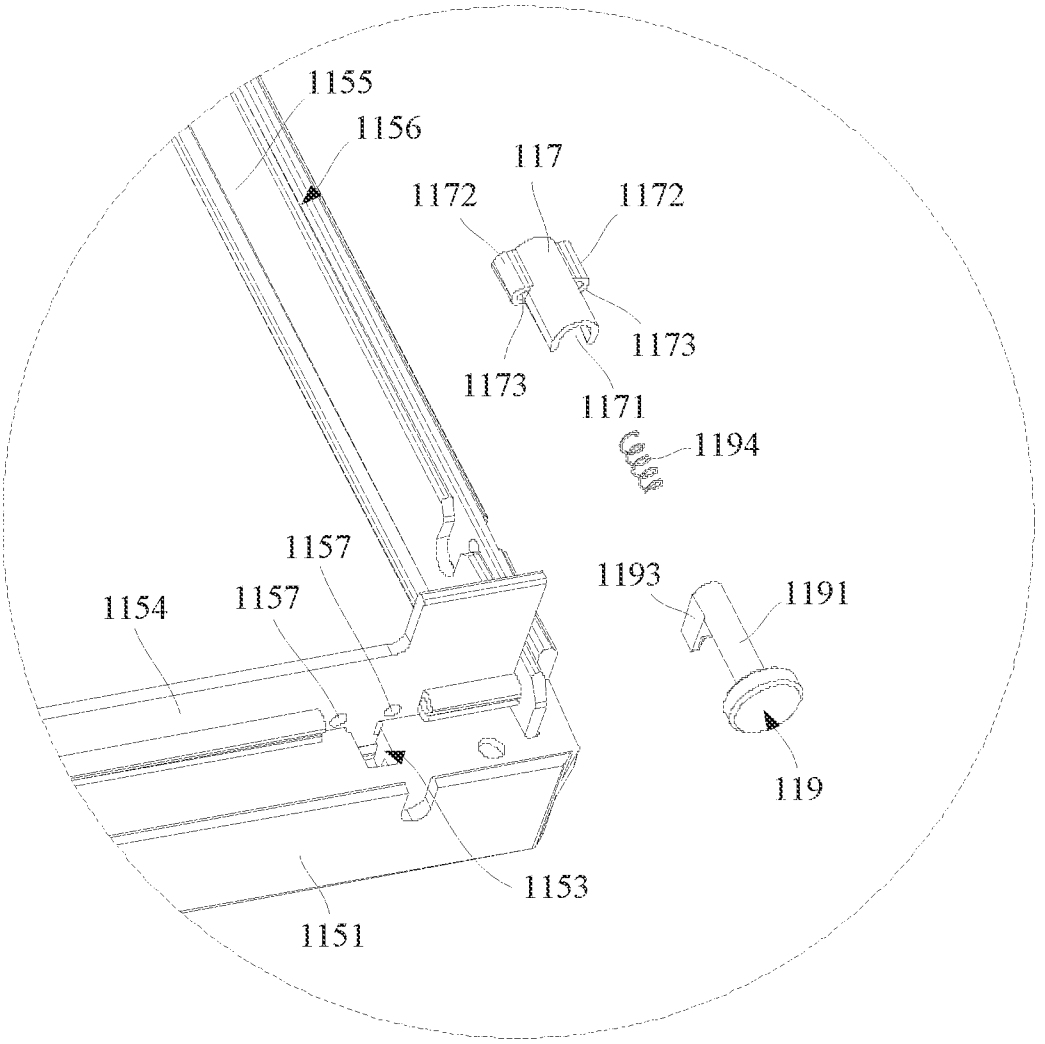
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FIG. 9

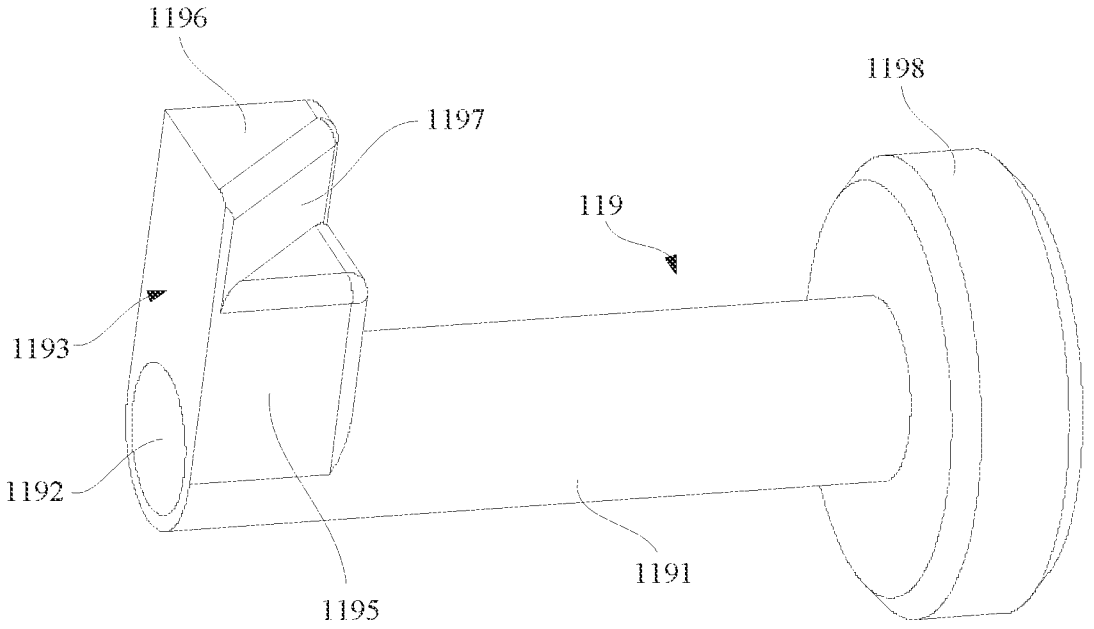


FIG. 10

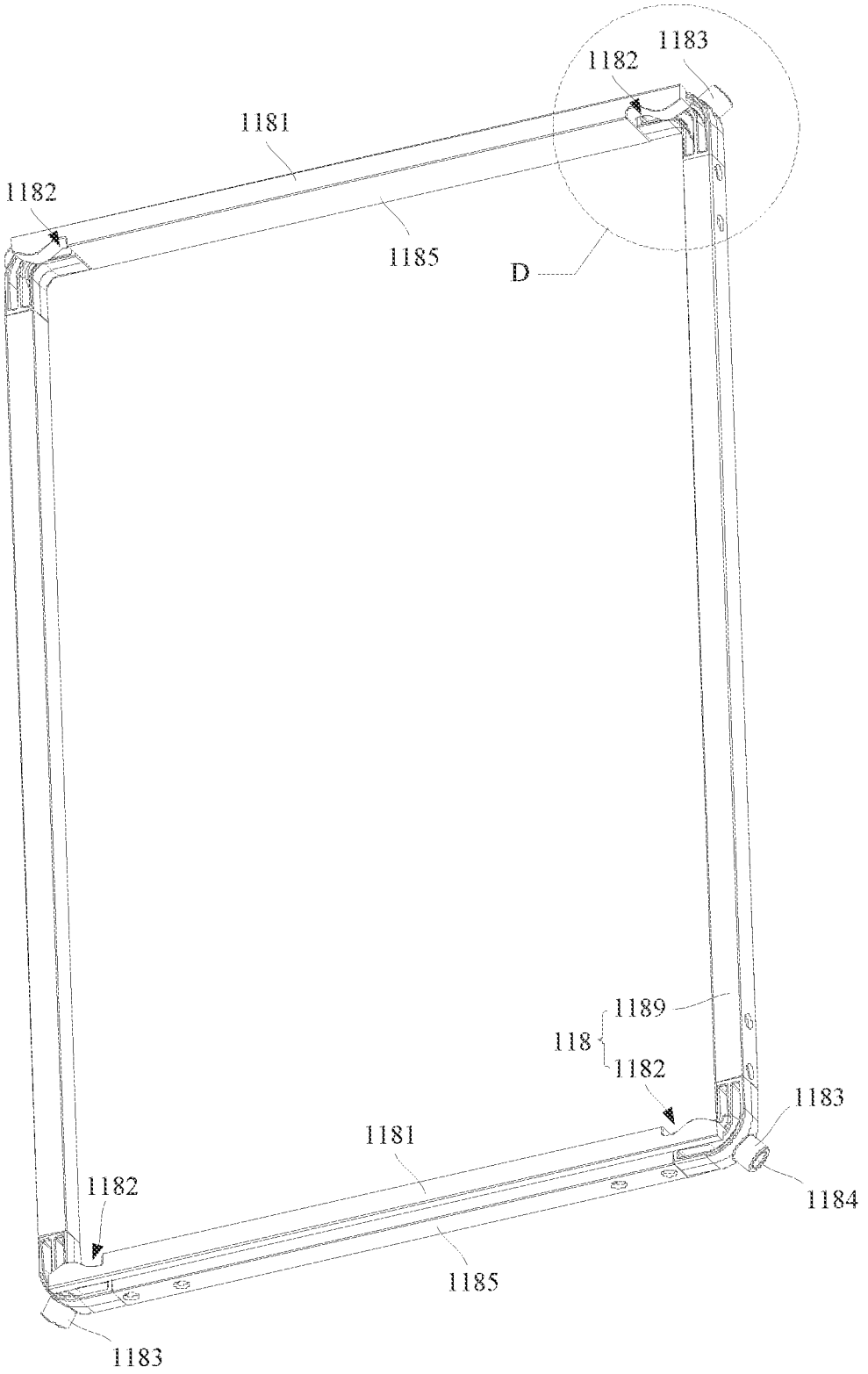
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FIG. 11

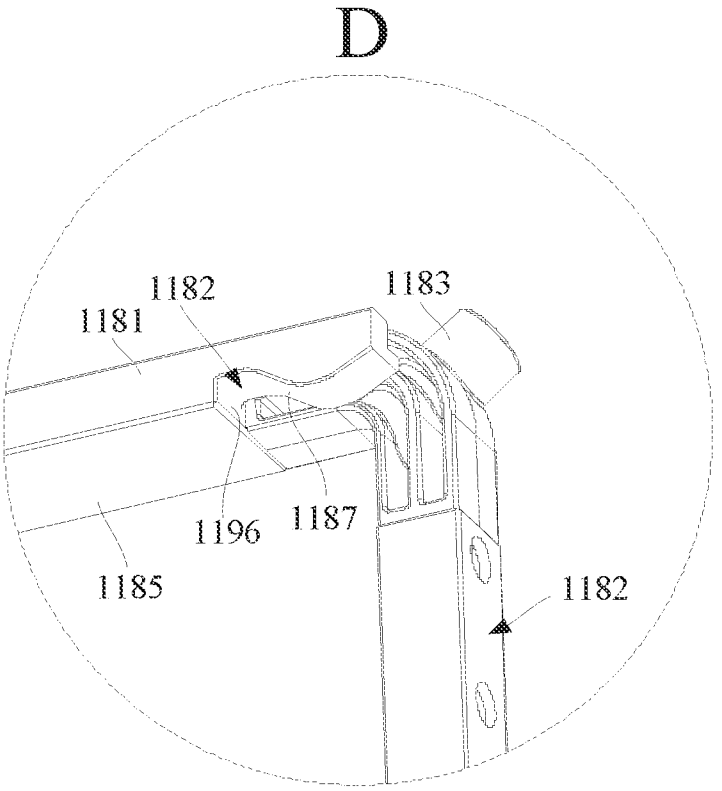
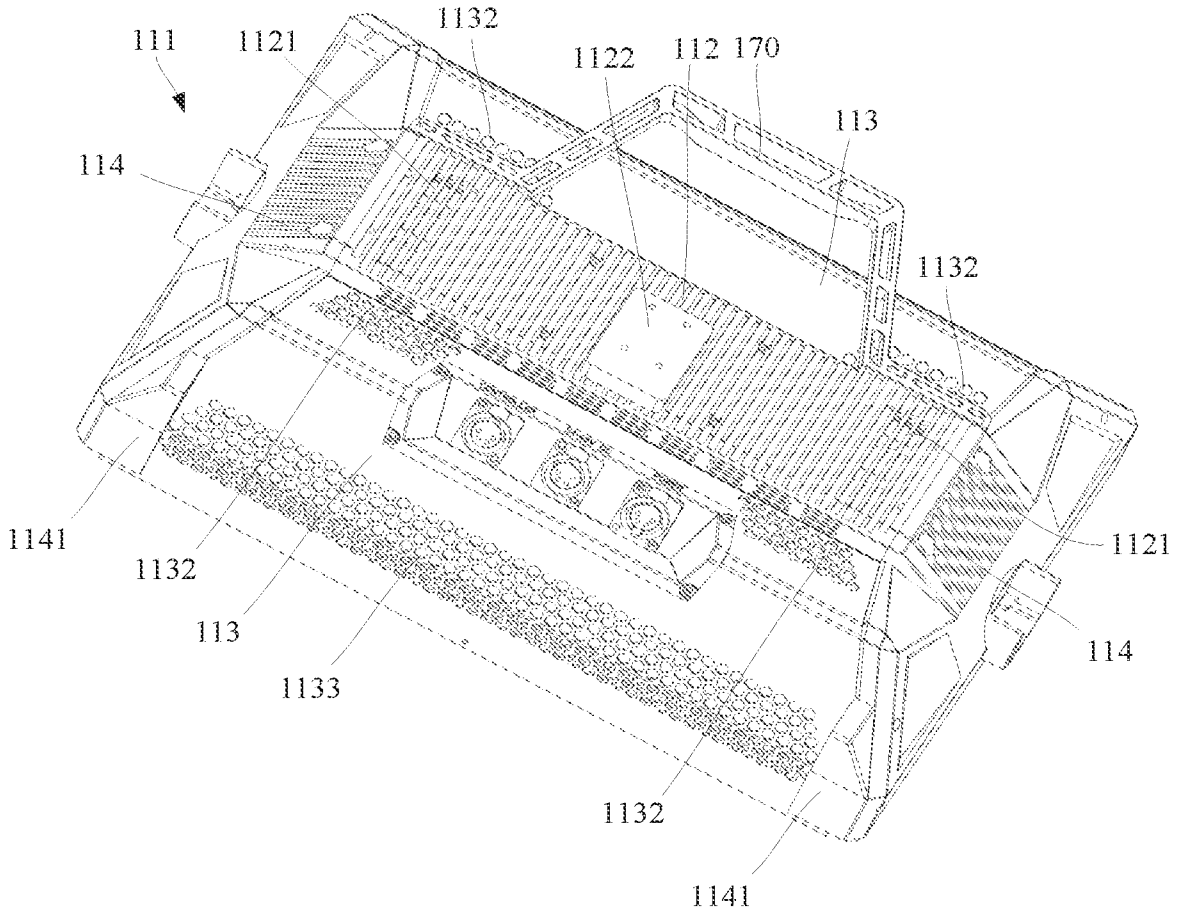



FIG. 12


111
1121
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1122
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FIG. 13

# HEAT DISSIPATION DEVICE AND LIGHTING DEVICE

## BACKGROUND OF INVENTION

### Field of Invention

The present application relates to a field of lighting technology, in particular to a heat dissipation device and a lighting device.

### Description of Prior Art

Lighting devices such as light emitting diode (LED) lamps and film and television lamps generally emit light through light sources equipped with the LED lamps. With power of the light sources is more greater, integration of the light sources is more higher, a lot of heat will be generated by the light sources in a process of emitting light. In order to avoid damage to the light sources caused by the heat generated by the light sources, the heat generated by the light sources are generally dissipated by heat dissipation devices.

However, the existing heat dissipation devices have poor heat dissipation effect on the light sources, the heat generated by the light sources can not be timely dissipated, resulting in an unstably work of the lighting devices for a long time.

## SUMMARY OF INVENTION

An embodiment of the present application provides a heat dissipation device and a lighting device, which aims to improve heat dissipation devices, so as to improve a heat dissipation effect of the heat dissipation devices, so that when the heat dissipation device is applied into the lighting device, the lighting device can work stably for a long time.

An embodiment of the present application provides the heat dissipation device, which comprises:

a substrate;

a plurality of fins, the plurality of fins arranged on the substrate with certain gaps therebetween and connected to the substrate; and

at least one airflow generating device disposed at an end of the plurality of fins away from the substrate, airflow generated by the airflow generating device flowing from at least a part of the gaps of the plurality of fins and along a direction toward the substrate, and the airflow being guided to diffuse through the substrate together with the plurality of fins.

An embodiment of the present application further provides the lighting device, the lighting device comprises:

a light source; and

the heat dissipation device described above, wherein the lighting device comprises:

the substrate;

the plurality of fins, the plurality of fins arranged on the substrate with certain gaps therebetween and connected to the substrate; and

the at least one airflow generating device disposed at the end of the plurality of fins away from the substrate, the airflow generated by the airflow generating device flowing from at least the part of the gaps of the plurality of fins and along the direction toward the substrate, and the airflow being guided to diffuse through the substrate together with the plurality of fins; and



wherein a side of the substrate of the heat dissipation device away from the plurality of fins is thermally connected to the light source.

By disposing the plurality of fins on the substrate, after heat generated by a heat element to be dissipated is absorbed by the substrate, the heat dissipation device provided by the embodiment of the present application can quickly conduct the heat to the plurality of fins. At a same time, by controlling an operation of the airflow generating device located at the end of the fins away from the substrate, the airflow generated from the airflow generating device flow from at least the part of the gaps of the plurality of fins and along the direction toward the substrate, and the airflow is guided to diffuse through the substrate together with the plurality of the fins, then heat generated by the fins and the substrate is taken away, thereby effectively improving a heat dissipation efficiency of the heat dissipation device.

When the heat dissipation device is applied into the lighting device, the side of the substrate away from the plurality of the fins can be connected to the light source of the lighting device, so that heat generated by the light source can be rapidly dissipated by the heat dissipation device, so that the lighting device can work stably for a long time.

## BRIEF DESCRIPTION OF DRAWINGS

Technical solutions and other beneficial effects of the present application will be obvious through a detailed description of specific embodiments of the present application in combination with accompanying drawings.

FIG. **1** is a schematic structural diagram of an embodiment of a lighting device provided by an embodiment of the present application, wherein a bracket is not disposed on a housing.

FIG. **2** is a disassembled schematic structural diagram of the lighting device in FIG. **1**.

FIG. **3** is an enlarged view at a position of A in FIG. **2**.

FIG. **4** is a schematic structural diagram of an embodiment of a heat dissipation device provided by the embodiment of the present application.

FIG. **5** is a disassembled schematic structural diagram of the heat dissipation device in FIG. **4**.

FIG. **6** is a sectional view of the lighting device in FIG. **1**, wherein the bracket is disposed on the housing.

FIG. **7** is an enlarged view at a position of B in FIG. **6**.

FIG. **8** is a schematic structural diagram of an embodiment of a diffuser installing frame and a locating element provided by the embodiment of the present application.

FIG. **9** is an enlarged view at a position of C in FIG. **8**.

FIG. **10** is a schematic structural diagram of an embodiment of the locating element provided by the embodiment of the present application.

FIG. **11** is a schematic structural diagram of an embodiment of the bracket provided by the embodiment of the present application.

FIG. **12** is an enlarged view at a position of D in FIG. **11**.

FIG. **13** is a schematic structural diagram of an embodiment of a main housing provided by the embodiment of the present application.

A lighting device **10**; a housing **11**; a main housing **111**; a cavity **1111**; a back plate **112**; first air inlets **1121**; a fixing block **1122**; first side plates **113**; a clamping plate **1131**; second air inlets **1132**; air outlets **1133**; second side plates **114**; an assembly plate **1141**; limiting plates **1142**; a diffuser installing frame **115**; a light outlet **1150**; first frames **1151**; a chute **1152**; a via **1153**; a connecting plate **1154**; second frames **1155**; a clamping groove **1156**; a second fixing hole

1157; a diffuser 116; a guide element 117; a guide groove 1171; connecting components 1172; a first fixing hole 1173; a bracket 118; a slide rail 1181; a card slot 1182; a installing column 1183; installing holes 1184; frame bars 1185; a butting surface 1186; an arc-shaped surface 1187; a locating element 119; a connecting rod 1191; an accommodation hole 1192; a clamping component 1193; an elastic element 1194; a limiting portion 1195; a clamping protrusion 1196; a guide surface 1197; a pressing component 1198; a support frame 120; a U-shaped bracket 121; a support plate 122; a third fixing hole 1221; a fixing component 123; fixing elements 1231; a support rod 1232; a light source 130; a heat dissipation device 140; a substrate 141; a strip-shaped groove 1411; sockets 1412; a fourth fixing hole 1413; a second heat dissipation pipe 142; a fin 143; a groove 1430; fins 1431; a baffle 144; a U-shaped plate 1441; a through hole 1442; installing plates 1443; locating protrusions 1444; airflow generating devices 145; a first heat dissipation pipe 146; a first section 1461; a second section 1462; a connecting pipe 1463; a first circuit board 150; locating holes 151; a second circuit board 152; a power adapter 160; a handle 170; a knob 180.

## DETAILED DESCRIPTION OF EMBODIMENTS

Technical solutions in embodiments of the present application will be described clearly and completely in combination with drawings in the embodiments of the present application. Obviously, the described embodiments are only part of the embodiments of the present application, not all of them. Based on the embodiments in the present application, all other embodiments obtained by those skilled in the art without creative work belong to the scope of protection in the present application.

In the description of the present application, it should be understood that orientation or position relationships indicated by terms "center", "longitudinal", "transverse", "length", "width", "thickness", "top", "bottom", "front", "back", "left", "right", "vertical", "horizontal", "top", "bottom", "inside", "outside", "clockwise", and "counterclockwise" are based on orientation or position relationships shown in the drawings, which are only for a convenience of describing the present application and simplifying the description, rather than indicating or implying that devices or elements referred to must have a specific orientation, structure, and operation in a specific orientation, so it cannot be understood as a limitation of the present application. In addition, terms "first" and "second" are only used for describing purposes and cannot be understood as indicating or implying relative importance or implicitly indicating a number of indicated technical features. Thus, features defined as "first" and "second" can explicitly or implicitly include one or more of the said features. In the description of the present application, "plurality" means two or more, unless otherwise specified.

In the description of the present application, it should be noted that, unless otherwise specified and defined, terms "installation", "connection", and "connection" should be understood broadly, for example, they can be a fixed connection, a removable connection, or an integrated connection; It can be a mechanical connection, an electrical connection, or a mutual communication; It can be directly connected or indirectly connected through an intermediate media. It can be an internal connection of two components or an interaction between two components. For ordinary technicians in the art, specific meanings of the above terms in the present application can be understood according to specific situations.

In the present application, unless otherwise specified and defined, a first feature is disposed "on" or "below" a second feature can include a direct contact between the first feature and the second feature, or a contact between the first feature and the second feature through other features rather than the direct contact. Moreover, the first feature is disposed "on", "upper", and "up" the second feature include that the first feature is disposed directly above and obliquely above the second feature, or only indicates that a horizontal height of the first feature is higher than a horizontal height of the second feature. The first feature "below" of the second feature include the first feature is disposed directly below and obliquely below the second feature, or only indicate that the horizontal height of the first feature is less than the horizontal height of the second feature.

Following disclosure provides many different embodiments or examples to realize different structures of the present application. In order to simplify the disclosure of the present application, components and arrangements of specific examples will be described below. Of course, they are only examples and are not intended to limit the present application. In addition, the present application can repeat reference numerals and/or reference letters in different examples for a purpose of simplification and clarity, which does not in itself indicate a relationship between various embodiments and/or arrangements discussed. In addition, the present application provides examples of various specific processes and materials, but those skilled in the art can be aware of the present application of other processes and/or use of other materials.

The embodiments of the present application provide a heat dissipation device, a bracket, and a lighting device. Details are as follows.

FIG. 1 is a schematic structural diagram of an embodiment of the lighting device provided by an embodiment of the present application, wherein a bracket is not disposed on a housing, and FIG. 2 is a disassembled schematic structural diagram of the lighting device in FIG. 1. As shown in FIG. 1 and FIG. 2, the lighting device 10 includes the housing 11, a light source 130 arranged in the housing 11, and a heat dissipation device 140. The light source 130 is used to emit light, and the light source 130 can be arranged on a light source substrate such as a metal substrate or a ceramic substrate, which has high thermal conductivity. The light source substrate can be provided with a light emitting diode (LED) array, wherein the array includes a plurality of independent light emitting diodes, so as to form a single emitting surface having high brightness light; of course, other types of light sources such as organic light emitting diodes or laser diode arrays are also feasible. The heat dissipation device 140 is thermally connected to the light source 130, so as to dissipate heat generated by the light source 130. Wherein the lighting device 10 can be applied into scenes such as film, television, photography, etc, and there is no limitation here.

First, the embodiment of the present application provides the heat dissipation device 140, as shown in FIG. 4 and FIG. 5. The heat dissipation device 140 includes a substrate 141, a plurality of fins 1431, and at least one airflow generating device 145. The substrate 141 includes a first side and a second side disposed opposite to each other. The first side of the substrate 141 is used to be thermally connected to a heat element to be dissipated; the plurality of fins 1431 are arranged on the substrate 141 with certain gaps therebe-

tween and are connected to the substrate **141**, wherein the plurality of fins **1431** are connected to the second side of the substrate **141**, so that heat absorbed by the substrate **141** from the heat element to be dissipated can be conducted to the plurality of fins **1431**, and then the heat will be dissipated into the gaps therebetween the plurality of fins **1431** by the plurality of fins **1431**. The at least one airflow generating device **145** (for example, a fan, etc.) is arranged at an end of the plurality of fins **1431** away from the substrate **141**, an air outlet of the at least one airflow generating device **145** faces the gaps therebetween the plurality of fins **1431**. Airflow generated by the airflow generating device **145** flows from at least a part of the gaps of the plurality of fins **1431** and along a direction toward the substrate **141**, and the airflow is guided to diffuse through the substrate **141** together with the plurality of fins **1431**.

Wherein the substrate **141** can be made of materials having good thermal conductivity such as copper, and the plurality of fins **1431** can be made of materials such as aluminum, wherein a weight of aluminum is less than a weight of copper, which can effectively reduce an overall weight of the fins **1431**. Of course, it will be obvious for those skilled in the art that the plurality of fins **1431** can alternatively be made of other suitable materials (having sufficiently high thermal conductivity and a low weight). For example, other metals (such as iron or nickel alloy) can be suitable, or even non-metallic materials (including graphite or other carbon-based materials having high heat conductivity).

The heat element to be dissipated can be the light source **130** or a circuit board, etc. A side (the first side) of the substrate **141** away from the plurality of fins **1431** is thermally connected to the light source **130** or the circuit board, so as to absorb heat generated by the light source **130** in a process of light emission, thereby reducing a temperature of the light source **130**.

When the heat dissipation device **140** is applied into the lighting device **10**, the airflow generating device **145** can be controlled to operate, so that cold airflow generated by the airflow generating device **145** flows from at least a part of the gaps of the plurality of fins **1431** and along the direction toward the substrate **141**, so that the cold airflow flow through a surface of the plurality of fins **1431** and the second side of the substrate **141**, and then take away heat generated by the fins **1431** and the substrate **141**, thereby effectively improving a heat dissipation efficiency of the heat dissipation device **140**.

In the embodiment of the present application, by connecting the plurality of fins **1431** with the second side of the substrate **141**, that is, the plurality of fins **1431** are connected to a side of the substrate **141** away from the light source **130**, so as to increase a heat dissipation area of the heat dissipation device **140**, and then the airflow generating device **145** is used to perform a wind cooling to the fins **143** and the substrate **141**, the heat generated by the fins **1431** and the substrate **141** can be quickly taken away, thereby effectively improving the heat dissipation efficiency of the heat dissipation device **140**. When the heat dissipation device **140** is applied into the lighting device **10**, the side of the light source **130** of the lighting device **10** can be thermally connected to the first side of the substrate **141**, so that heat generated by the light source **130** can be rapidly dissipated by the heat dissipation device **140**, thereby ensuring a stable work of the lighting device **10** for a long time.

It should be noted that the heat dissipation device **140** can be connected with other types of components to be heat dissipated, in addition to being used for heat dissipation of the light source **130** in the lighting device **100**, so as to effectively perform heat dissipation on the heat element to be dissipated.

In some embodiments, as shown in FIG. **5**, the plurality of fins **1431** are arranged in parallel, and the plurality of fins **1431** are disposed perpendicular to a second plane of the substrate **141**. A side edge of the plurality of fins **1431** close to the substrate **141** is welded and fixed with the second plane of the substrate **141**, so that heat can be quickly conducted from the substrate **141** to the plurality of fins **1431**.

Bending plates (not shown in the drawings) are formed by bending from an end of the plurality of fins **1431** away from the substrate **141** along a same direction, and a bending direction of the bending plates are consistent with an arrangement direction of the plurality of fins **1431**. In the plurality of fins **1431**, a bent plate of each of the fins **1431** is fixedly connected to an adjacent one of the fins **1431** along the bending direction of the bending plates, so as to improve structural stability of a fin **143**.

Since the gaps are defined therebetween the plurality of fins **1431**, an opening is defined by the gaps at the end of the plurality of fins **1431** away from the substrate **141**. When the airflow generated by the airflow generating device **145** flows from at least the part of the gaps of the plurality of fins **1431** and along the direction toward the substrate **141**, and the airflow is guided to diffuse through the substrate **141** together with the plurality of fins **1431**, the airflow will leak out from the opening defined at the end of the plurality of fins **1431** away from the substrate **141**, therefore, a heat dissipation effect of the airflow generating device **145** on the plurality of fins **1431** will be affected.

To avoid the above problem, in some embodiments, as shown in FIG. **4** and FIG. **5**, the heat dissipation device **140** also includes a baffle **144**, the baffle **144** is arranged on the end of the plurality of fins **1431** away from the substrate **141**, and covers the plurality of fins **1431**, so that the baffle **144** can block at least a part of the opening defined at a side of the plurality of fins **1431** away from the substrate **141**. Wherein the airflow generating device **145** is arranged on a side of the baffle **144** away from the plurality of fins **1431**, and a through hole **1442** is defined at a position of the baffle **144** corresponding to an air outlet of the airflow generating device **145**, so that the airflow generated by the airflow generating device **145** flows from at least the part of the gaps of the plurality of fins **1431** and along the direction toward the substrate **141**, and the airflow diffuses out through an end of the fins **1431**, thereby improving the heat dissipation effect of the airflow generating device **145** on the fin **143**.

Wherein the baffle **144** can be disposed to cover all of the fins **1431**, and only the through hole **1442** defined on the baffle **144** exposes a part of the plurality of fins **1431**, so that the opening defined on the side of the plurality of fins **1431** away from the substrate **141** can be covered as much as possible.

In some embodiments, as shown in FIG. **4** and FIG. **5**, a groove **1430** is also defined at the end of the fins **1431** away from the substrate **141**. The at least one airflow generating device **145** is provided in the groove **1430**, so as to reduce an overall thickness of the heat dissipation device **140**. Wherein the groove **1430** is defined at a middle part in a length direction of the fins **1431**.

It can be understood that when the heat dissipation device **140** perform heat dissipation on the heat element to be dissipated, a temperature at a middle part of the substrate **141** will be greater than a temperature at surrounding edges of the substrate **141**, and a temperature at a middle part of

the fins **1431** will also be greater than a temperature at two ends of the fins **1431**. By defining the groove **1430** using for providing the airflow generating device **145** at the middle part of the fins **1431** in the length direction, after the airflow generated by the airflow generating device **145** flows from at least the part of the gaps of the plurality of fins **1431** and along the direction toward the substrate **141**, the airflow will flow out along a direction from the middle part to the two ends of the fins **1431**, so that heat generated by the middle part of the substrate **141** and the middle part of the fins **1431** can be quickly taken away, thereby improving a cooling effect of the airflow generating device **145** on the fins **1431** and the substrate **141**.

It should be noted that the groove **1430** is defined at the middle part of the fins **1431** in the length direction, wherein the groove **1430** can be located at a precise middle part of the fins **1431** in the length direction, or can be located at a position defined by a middle part of the fins **1431** deviating a certain distance toward a certain end of the fins **1431**, that is, lengths of the fins **1431** defined at two sides of the groove **1430** are not equal.

In some embodiments, distances between the two ends of the fins **1431** and the groove **1430** defined at the middle part of the fins **1431** are not equal, and an installing area for installing a first circuit board **150** can be defined between the groove **1430** and an end of the fins **1431** farther away.

In some embodiments, the above at least one airflow generating device **145** includes a plurality of airflow generating devices **145**, and the plurality of airflow generating devices **145** are distributed in sequence along an arrangement direction of the plurality of fins **1431**, so as to ensure that an installation of airflow entering the gaps therebetween the plurality of fins **1431** is sufficient. At a same time, a diameter of each of the airflow generating devices **145** can be defined smaller, and a width of the groove **1430** defined on the fins **1431** can be reduced accordingly, thus, an area of each of the fins **1431** can be increased, thereby improving a heat dissipation effect of the fins **1431**.

Specifically, as shown in FIG. **4** and FIG. **5**, a rectangular notch is defined at a side of a middle part of each of the fins **1431** away from the substrate **141**. The notches defined on the plurality of fins **1431** defines a rectangle-shaped groove **1430**. The baffle **144** covers the side of the plurality of fins **1431** away from the substrate **141**, and the baffle **144** includes a U-shaped plate **1441** adapted to the groove **1430** and installing plates **1443** connected to two side edges of the U-shaped plate **1441**, wherein the two installing plates **1443** cover bending plates of the plurality of fins **1431**. Heights of the airflow generating devices **145** can be equal to a height of the installing plates **1443** or be less than the height of the installing plates **1443**; of course, the heights of the airflow generating devices **145** can also be greater than the height of the installing plates **1443** if a thickness problem is not considered. The installing plates **1443** is provided with a plurality of locating protrusions **1444**, locating holes **151** are defined at a position of the first circuit board **150** corresponding to the locating protrusions **1444**; the first circuit board **150** is disposed on the installing plates **1443**, and the locating protrusions **1444** located on the installing plates **1443** are inserted into the locating holes **151** defined in the first circuit board **150**, so as to locate the first circuit board **150**. Of course, in order to make heat dissipation of the first circuit board **150** better and fixation more stable, the first circuit board **150** can also be glued to the installing plates **1443**. Wherein the locating protrusions **1444** located on the installing plates **1443** can be formed by pressing the installing plates **1443**, or the locating protrusions **1444** can be fixed on the installing plates **1443** by a welding or pasting method.

The U-shaped plate **1441** covers a bottom surface and two opposite sides of the groove **1430**, two through holes **1442** are defined at a bottom part of the U-shaped plate **1441**, and the two through holes **1442** are distributed in sequence along the arrangement direction of the plurality of fins **1431**. A number of the airflow generating devices **145** is two, the two airflow generating devices **145** are disposed at the bottom part of the U-shaped plate **1441** and are directly opposite to the two through holes **1442**. Wherein the airflow generating devices **145** can be axial flow fans, an air inlet and an air outlet of each of the axial flow fans are distributed along a rotation axis of fan blades itself, the air outlet of each of the axial flow fans faces the through holes **1442** defined in the U-shaped plate **1441**, and the air inlet of each of the axial flow fans is defined at a side of the axial flow fans away from the U-shaped plate **1441**.

The U-shaped board **1441** is also provided with a second circuit board **152**, the second circuit board **152** is located between the two through holes **1442**, and a installing method of the second circuit board **152** and the bottom part of the U-shaped board **1441** can refer to a installing method of the first circuit board **150**, which will not be repeated here.

In some embodiments, as shown in FIG. **4** and FIG. **5**, the heat dissipation device **140** also includes at least one first heat dissipation pipe **146**, the at least one first heat dissipation pipe **146** passes through the plurality of fins **1431** in sequence, so as to conduct heat generated by the middle part of the plurality of fins **1431**, thereby improving the heat dissipation efficiency of the fins **1431**. Wherein the first heat dissipation pipe **146** includes a first section **1461** and a second section **1462** connected to each other and passing through the plurality of fins **1431** in sequence along a distribution direction of the plurality of fins **1431**, and the first section **1461** and the second section **1462** of the first heat dissipation pipe **146** are distributed in sequence along a direction from the middle part to the end of the fins **1431**.

Since a temperature at the middle part of the fins **1431** is higher than a temperature at the two ends of the fins **1431**, by enabling the first section **1461** and the second section **1462** of the first heat dissipation pipe **146** to be distributed in sequence along the direction from the middle part to the end of the fins **1431**, so that heat generated by a part close to the middle part of the fins **1431** can be conducted to the first section **1461** of the first heat dissipation pipe **146**, then the heat is conducted from the first section **1461** to the second section **1462**, and finally, the heat is conducted from the second section **1462** to a part close to the end of the fins **1431**. Therefore, the heat generated by the middle part of the fins **1431** can be conducted faster, thereby improving the heat dissipation efficiency of the fins **1431**.

Wherein a side surface of the first section **1461** of the first heat dissipation pipe **146** can be attached to the second side surface of the substrate **141**. Therefore, the first heat dissipation pipe **146** can also absorb heat generated by the substrate **141**, and to dissipate the heat generated by the substrate **141**.

Specifically, the first section **1461** and the second section **1462** of the first heat dissipation pipe **146** are both straight pipes, and a U-shaped pipe structure is formed by connecting an end of the first section **1461** with an end of the second section **1462** through a connecting pipe **1463**. Both of a free end of the first section **1461** and a free end of the second section **1462** of the first heat dissipation pipe **146** pass through the plurality of fins **1431** in sequence from an end of the substrate **141** along the arrangement direction of the

plurality of fins **1431**; and the first section **1461** of the first heat dissipation pipe **146** is located at the middle part of the fins **1431**, a second end of the first heat dissipation pipe **146** is disposed close to the end of the fins **1431**, and the connecting pipe **1463** is located outside the plurality of fins **1431**.

It should be noted that the first section **1461** of the first heat dissipation pipe **146** is located at the middle part of the fins **1431**, wherein the first section **1461** can be located at a precise middle part of the fins **1431** in the length direction, or can be located at a position defined by the precise middle part of the fins **1431** deviating a certain distance.

Wherein a cross-sectional shape of the first section **1461** of the first heat dissipation pipe **146** is rectangular, and a side of the first section **1461** is attached to the second side of the substrate **141**, so as to increase a contacting area between the first section **1461** of the first heat dissipation pipe **146** and the substrate **141**, thereby improving a heat conducting efficiency between the substrate **141** and the first section **1461** of the first heat dissipation pipe **146**.

A cross-sectional shape of the second section **1462** of the first heat dissipation pipe **146** and a cross-sectional shape of the connecting pipe **1463** can be circular, square, or other shapes, and there is no restriction here.

In some embodiments, the above at least one first heat dissipation pipe **146** can include a plurality of first heat dissipation pipes **146**, and the plurality of first heat dissipation pipes **146** are distributed in sequence along the length direction of the fins **1431**. The plurality of first heat radiating pipes **146** can guide the heat generated by the middle part of the fins **1431** to the two ends of the fins **1431** at a same time, so as to improve the heat dissipation efficiency of the fins **1431**.

Specifically, the heat dissipation device **140** includes four first heat dissipation pipes **146**, two first heat dissipation pipes **146** are arranged at each of two ends of the substrate **141** along the arrangement direction of the plurality of fins **1431**, and the two first heat dissipation pipes **146** located at each of the two ends of the substrate **141** are distributed along the length direction of the fins **1431**. Wherein first sections **1461** of the two first heat dissipation pipes **146** are both located below the groove **1430**, and second sections **1462** of the two first heat dissipation pipes **146** are arranged close to the two ends of the fins **1431**, respectively.

In some embodiments, as shown in FIG. **2** and FIG. **3**, at least one strip-shaped groove **1411** is defined by recessed from a side (the first side) of the substrate **141** away from the plurality of fins **1431**, the at least one strip-shaped groove **1411** extends along the arrangement direction of the plurality of fins **1431**, and a second heat dissipation pipe **142** is provided in the at least one strip-shaped groove **1411**. Therefore, the second heat dissipation pipe **142** can conduct heat generated by a middle part of the substrate **141** to an end of the substrate **141** and an end of the second heat dissipation pipe **142**, so that the heat generated by the middle part of the substrate **141** can be conducted more quickly.

Wherein the above at least one strip-shaped groove **1411** can include a plurality of strip-shaped grooves **1411**, and the plurality of strip-shaped grooves **1411** are distributed in sequence along the length direction of the fins **1431**. Each of the plurality of strip-shaped grooves **1411** is provided with the second heat dissipation pipe **142**, so as to improve a heat dissipation effect of the second heat dissipation pipe **142** on the substrate **141**.

Specifically, the substrate **141** is a rectangular plate made of aluminum alloy by a smooth processing. Six strip-shaped grooves **1411** are defined on the first side of the substrate **141**, and the six strip-shaped grooves **1411** are evenly distributed along the length direction of the fins **1431**, the six strip-shaped grooves **1411** pass through the entire substrate **141** along the arrangement direction of the plurality of fins **1431**, and sockets **1412** are defined on a side surface of the substrate **141**, wherein an end of each of six second heat dissipation pipes **142** is inserted into a corresponding strip-shaped groove **1411** from a corresponding one of the sockets **1412** of the six strip-shaped grooves **1411**.

Wherein a rabbet of the strip-shaped groove **1411** is defined at the first side of the substrate **141**, and a part of the second heat dissipation pipe **142** is exposed at a position the rabbet is located, and is flush with the first side of the substrate **141**. Therefore, when the first side surface of the substrate **141** is connected to the heat element to be dissipated, the second heat dissipation pipe **142** can also be connected to the heat element to be dissipated, so that heat generated by the heat element to be dissipated can be dissipated directly.

In addition, the strip-shaped groove **1411** is closely matched with the second heat dissipation pipe **142**, so that the strip-shaped groove **1411** can be attached more closely to an outer surface of the second heat dissipation pipe **142**, so that heat conduction of the substrate **141** is faster and more uniform, and at a same time, it is easier for heat generated by the substrate **141** to be conducted to the second heat dissipation pipe **142**. It should be understood that after the strip-shaped groove **1411** is closely matched with the second heat dissipation pipe **142**, a side surface of the substrate **141** defined with the strip-shaped groove **1411** is still a flat surface, which can facilitate a thermal connection with the light source.

In some embodiments, the first heat dissipation pipe **146** and the second heat dissipation pipe **142** can be made of materials having good thermal conductivity, such as copper, or be made of materials such as aluminum, which has a weight less than a weight of copper, so as to effectively reduce an overall weight. Of course, it will be obvious for those skilled in the art that the first heat dissipation pipe **146** and the second heat dissipation pipe **142** can alternatively be made of other suitable materials (having sufficiently high thermal conductivity and low weights). For example, other metals (such as iron or nickel alloy) can be suitable, or even non-metallic materials (including graphite or other carbon-based materials having high thermal conductivity).

In some embodiments, the light source **130** of the lighting device **10** includes a light source substrate, and a LED array arranged on a side of the light source substrate. A side of the light source substrate away from the LED array is attached to the first side of the substrate **141** through thermal conductive silicone grease (glue), so that heat generated by the light source **130** is conducted to the heat dissipation device **140**. Of course, the light source substrate and the substrate **141** can be further fixed with screws, etc.

Wherein during an assembly process, a side of a light source plate away from LED lamps or a side of the substrate **141** facing the light source **130** can be coated with thermal conductive silicone grease, the thermal conductive silicone grease is sandwiched between the light source plate and the substrate **141**, since the thermal conductive silicone grease can quickly conduct heat generated by the light source plate to the substrate **141**, thereby improving a heat dissipation effect on the light source **130**.

The embodiment of the present application also provides a bracket **118**, as shown in FIG. **1** and FIG. **2**. The lighting device **10** includes the light source **130**, a housing **11**, and the bracket **118**. The bracket **118** is used to support a light

soften-light box (not shown in the drawings, the light soften-light box can also be a light soft cloth or a light diffuser, etc.) or other structures capable of softening light emitted by the light source **130**. The light source **130** is arranged in the housing **11**, and a light outlet **1150** is defined in the housing **11**, the light outlet **1150** is disposed opposite to the light source **130**, light emitted by the light source **130** shines outside the housing **11** through the light outlet **1150**. The bracket **118** is connected to the housing **11**, so as to support the light soften-light box on the housing **11** and enable the light soften-light box to be opposite to the light source **130**, so as to perform a softening treatment on the light emitted by the light source **130**.

In order to facilitate an installation of the light soften-light box of the lighting device **10** on the housing **11**, as shown in FIG. **1** and FIG. **2**, a chute **1152** is defined at each of two opposite sides of the light outlet **1150** of the housing **11**; a slide rail **1181** is defined at each of two opposite sides of the bracket **118** and is connected to the corresponding chute **1152** in a sliding way. By inserting an end of two slide rails **1181** defined on the bracket **118** into two corresponding chutes **1152**, the bracket **118** can be connected to the housing **11** together, and by enabling the light soften-light box located on the bracket **118** to correspond to a position of the light outlet **1150**, so that the light soften-light box can perform a softening treatment on light emitted by the light source **130**.

Wherein the lighting device **10** also includes a locating element **119**, the locating element **119** is arranged on the housing **11** and is connected to the bracket **118** when the bracket **118** is installed on the housing **11**, so as to locate the bracket **118** and prevent the bracket **118** from separating from the housing **11**.

It should be noted that the locating element **119** can only be disposed corresponding to one of the two slide rails **1181**, or the locating element **119** can be disposed corresponding to each of the two slide rails **1181** at a same time, and two locating elements **119** can locate the two slide rails **1181**, respectively.

In some embodiments, as shown in FIG. **6** to FIG. **9**, at least one of the slide rails **1181** is provided with a card slot **1182**, and a clamping component **1193** is disposed on the locating element **119**, the locating element **119** corresponds to the card slot **1182** defined on the slide rail **1181**. A part of the locating element **119** extends out of the outer surface of the housing **11**, and the locating element **119** is connected to the housing **11** in a sliding way, so that a first position of the clamping component **1193** is defined to avoid the slide rail **1181**, and a second position of the clamping component **1193** used for inserting the card slot **1182** is defined to block the slide rail **1181** (positions of the locating element **119** as shown in FIG. **6** and FIG. **7**).

Before inserting the slide rail **1181** of the bracket **118** into the corresponding chute **1152** defined on the housing **11**, the locating element **119** can be controlled to slide relative to the housing **11**, so that the clamping component **1193** disposed on the locating element **119** is at the first position, so as to avoid the slide rail **1181**, so that the slide rail **1181** of the bracket **118** can be smoothly inserted into the chute **1152** defined on the housing **11**. When the bracket **118** slides to a preset position, by controlling the locating element **119** to slide relative to the housing **11**, the clamping component **1193** disposed on the locating element **119** is at the second position, so that the clamping component **1193** is inserted into the card slot **1182** of the slide rail **1181**, which can block the slide rail **1181** disposed on the bracket **118**, and prevent the bracket **118** and the slide rail **1181** of the bracket **118** from sliding relative to the housing **11**, so as to ensure a stable connection between the bracket **118** and the housing **11**, thereby preventing the housing **11** from separating from the bracket **118**.

Wherein a part of the locating element **119** can extend out of the outer surface of the housing **11**, so that the locating element **119** can be manually controlled to slide relative to the housing **11**, which makes a structure of the locating element **119** simpler, and makes an installation of the light soften-light box connected to the bracket **118** of the lighting device **10** simpler and more convenient.

In some embodiments, as shown in FIG. **7**, a cross-sectional shape of the slide rail **1181** disposed on the bracket **118** is a "L"-shaped, and a cross-sectional shape of the chute **1152** defined on the housing **11** matches the shape of the slide rail **1181**. Therefore, when the slide rail **1181** disposed on the bracket **118** is inserted into the chute **1152** defined on the housing **11** and the slide rail **1181** is not located by the locating element **119**, the slide rail **1181** can only slide along an extension direction of the chute **1152**.

In some embodiments, as shown in FIG. **7**, FIG. **8**, and FIG. **9**, the lighting device **10** also includes an elastic element **1194**, one end of the elastic element **1194** is connected to the housing **11**, and another end of the elastic element **1194** is connected to the locating element **119**, so as to apply an elastic force using for making the locating element **119** slide from a first position to a second position.

Before inserting the slide rail **1181** of the bracket **118** into the corresponding chute **1152**, the locating element **119** can be manually pressed to make the locating element **119** slide relative to the housing **11**, so that the clamping component **1193** disposed on the locating element **119** is at the first position, so as to avoid the slide rail **1181**, and so that the slide rail **1181** of the bracket **118** can be smoothly inserted into the corresponding chute **1152** defined on the housing **11**. When the bracket **118** slides to a preset position, the locating element **119** can be loosened, then the locating element **119** automatically slides to the second position under an action of the elastic element **1194**, and the clamping component **1193** disposed on the locating element **119** is inserted into the card slot **1182** of the slide rail **1181**, so as to block the slide rail **1181** disposed on the bracket **118**.

Wherein when the locating element **119** is not pressed manually, acting force applied by the elastic element **1194** on the locating element **119** can make the clamping component **1193** disposed on the locating element **119** always insert into the card slot **1182** stably, which can improve a locating effect of the locating element **119** on the bracket **118** and the slide rail **1181**.

It should be noted that an elastic force applied by the elastic element **1194** on the locating element **119** can be either a thrust force or a tension force, as long as the elastic force can make the locating element **119** slide from the first position to the second position.

As shown in FIG. **2** and FIG. **3**, the housing **11** includes a main housing **111** for accommodating the light source **130**, and a diffuser installing frame **115** connected to the main housing **111** and defined with the light outlet **1150**. The diffuser installing frame **115** is used to install a diffuser **116** at a position the light outlet **1150** is located, and the diffuser **116** is used to perform a preliminary subdued light treatment on light emitted by the light source **130**.

Wherein the diffuser installing frame **115** has two opposite first frames **1151**, the light outlet **1150** is located between the two first frames **1151**, and the chute **1152** is defined at a side of each of the two first frames **1151** away from the main housing **111**, so that the chute **1152** defined on

the housing **11** is located on a surface of the housing **11**, so that it is convenient for the slide rail **1181** disposed on the bracket **118** to be inserted into the corresponding chute **1152** defined on the housing **11**.

The locating element **119** is connected to a side of the first frames **1151** facing the main housing **111** in a sliding way, so that in a process of enabling the sliding rail **1181** disposed on the bracket **118** to insert into the corresponding chute **1152** defined on the housing **11**, the locating element **119** will not interfere with the sliding rail **1181**.

In some embodiments, as shown in FIG. **7**, FIG. **8**, and FIG. **9**, a via **1153** is defined on an inner wall of a side of the chute **1152** close to the light outlet **1150**, an included angle is defined between a sliding direction of the locating element **119** and an extension direction of the chute **1152**, and the clamping component **1193** is disposed corresponding to a position of the via **1153**. Wherein the included angle defined by the sliding direction of the locating element **119** and the extension direction of the chute **1152** can be an acute angle or a right angle, so that the sliding direction of the locating element **119** crosses the extension direction of the chute **1152**. By controlling the locating element **119** to slide relative to the first frames **1151**, the clamping component **1193** can pass through the via **1153** and extend into the chute **1152**, so that the clamping component **1193** can be inserted into the card slot **1182** defined on the slide rail **1181**, so as to locate the slide rail **1181**; alternatively, the clamping component **1193** can exit from the via **1153** to dodge the slide rail **1181**, so that the slide rail **1181** can be smoothly inserted into the chute **1152** or be taken out from the chute **1152**.

Correspondingly, the card slot **1182** can be defined by recessed from a surface of a side of the slide rail **1181** close to the light outlet **1150**, so that the clamping component **1193** can be inserted into the card slot **1182** after passing through the via **1153**.

In some embodiments, as shown in FIG. **9**, a guide element **117** is connected to a side of the first frames **1151** facing the main housing **111**, and the locating element **119** is connected to the first frames **1151** through the guide element **117** in a sliding way. Therefore, it is unnecessary to define a guide groove **1171** structure slidably connected to the guide element **117** disposed on the first frames **1151**, thereby simplifying a structure of the first frames **1151**, and making a processing of the first frames **1151** more convenient.

Wherein the guide groove **1171** is defined on the guide element **117**, and an included angle is defined between an extension direction of the guide groove **1171** and an extension direction of the chute **1152**. The locating element **119** includes a connecting rod **1191** slidably connected to the guide groove **1171**, the clamping component **1193** of the guide element **117** is connected to an end of the connecting rod **1191** close to the light outlet **1150**. The connecting rod **1191** can slide along the extension direction of the guide groove **1171**, so that the clamping component **1193** connected to the connecting rod **1191** is accurately inserted into the via **1153** or is withdrawn from the via **1153**. Wherein the included angle defined by the extension direction of the guide groove **1171** and the extension direction of the chute **1152** can be an acute angle or a right angle, so that a sliding direction of the locating element **119** along the guide groove **1171** crosses the extension direction of the chute **1152**.

Wherein an end of the connecting rod **1191** away from the clamping component **1193** can extend to a surface of a side of the first frames **1151** away from the light outlet **1150**, so that the connecting rod **1191** can be pressed manually, so as to make the connecting rod **1191** slide relative to the first frames **1151**.

In some embodiments, as shown in FIG. **7** and FIG. **9**, a side of the first frames **1151** facing the main housing **111** extends out to form a connecting plate **1154**, and the guide element **117** is fixedly connected to a side of the connecting plate **1154** away from the light outlet **1150**, so that a fixing of the guide element **117** is more convenient.

Wherein one end of the elastic element **1194** can be butted with the connecting plate **1154**, and another end of the elastic element **1194** can be butted with an end of the connecting rod **1191** close to the light outlet **1150**, so as to make an installation of the elastic element **1194** more convenient, and an elastic force applied by the elastic element **1194** on the connecting rod **1191** can be more stable.

In some embodiments, an accommodation hole **1192** is defined by recessed from an end surface of an end of the connecting rod **1191** close to the light outlet **1150**, and another end of the elastic element **1194** is inserted into the accommodation hole **1192** and is butted with a bottom surface of the accommodation hole **1192**, so that the elastic element **1194** is more stably connected to the connecting rod **1191**. Wherein the elastic element **1194** can be a spring, rubber, etc., which is not limited here.

Specifically, as shown in FIG. **10**, the connecting rod **1191** of the locating element **119** is a straight rod. One end of the connecting rod **1191** is provided with the clamping component **1193**, and another end of the connecting rod **1191** is connected to a pressing component **1198**. The pressing component **1198** extends out of the outer surface of the housing **11**, and the locating element **119** can be pushed to slide as a whole by a manual pressing to the pressing component **1198**.

The clamping component **1193** includes a limiting portion **1195** extending from a peripheral wall of the connecting rod **1191**, and a clamping protrusion **1196** arranged on an end of the limiting portion **1195** away from the connecting rod **1191**. When the locating element **119** is installed on the housing **11**, the limiting portion **1195** disposed on the locating element **119** is matched with two opposite walls of the via **1153**, so as to prevent the locating element **119** from rotating around an axis of the connecting rod **1191**.

The clamping protrusion **1196** disposed on the limiting portion **1195** is used for inserting into the card slot **1182** of the slide rail **1181**, so as to block the slide rail **1181**. Wherein a side of the clamping protrusion **1196** is defined with a guide surface **1197**, the guide surface **1197** inclines inward along a direction from the clamping component **1193** to the pressing component **1198**. When the slide rail **1181** is inserted into the chute **1152**, the slide rail **1181** will abut with the guide surface **1197** and apply a force on the guide surface **1197**, wherein the force is perpendicular to the guide surface **1197**, and has a component force along a direction from the pressing component **1198** to the clamping component **1193**, so as to push the locating element **119** to slide along the direction from the pressing component **1198** to the clamping component **1193**, so that the clamping protrusion **1196** can automatically dodge the slide rail **1181** without manually pressing the pressing component **1198**.

A limiting surface (not shown in the drawings) is also defined on a side of the clamping protrusion **1196** away from the guide surface **1197**. When the clamping protrusion **1196** is inserted into the card slot **1182** of the slide rail **1181**, the limiting surface of the clamping protrusion **1196** can be butted with an inner wall of the card slot **1182** to block the slide rail **1181**. Wherein the limiting surface inclines out-

ward along a direction from the clamping component **1193** to the pressing component **1198**, or is parallel to the direction from the clamping component **1193** to the pressing component **1198**, so that the limiting surface can have a better blocking effect on the slide rail **1181**.

The accommodation hole **1192** is further defined by recessed from the end surface of the end of the connecting rod **1191** provided with the clamping component **1193**. Wherein shapes of the connecting rod **1191** and the pressing component **1198** are both cylindrical, a diameter of the pressing component **1198** is greater than a diameter of the connecting rod **1191**, and the accommodation hole **1192** is a cylindrical hole coaxial with the connecting rod **1191**.

The guide groove **1171** defined on the guide element **117** penetrates the guide element **117** and is perpendicular to the length direction of the first frames **1151**. a strip-shaped opening is defined by the guide groove **1171** on a surface of a side of the guide element **117** facing the first frames **1151**, so that a cross-sectional shape of the guide element **117** is a U-shaped. The guide element **117** are also provided with two connecting components **1172**, and the two connecting components **1172** are distributed on two opposite sides of the guide groove **1171**, and a first fixing hole **1173** is defined on each of the two connecting components **1172**.

The connecting plate **1154** extends along the length direction of the first frames **1151**. A through second fixing hole **1157** is defined at a position of the connecting plate **1154** corresponding to the first fixing hole **1173**. A fastening element pass through the second fixing hole **1157** and the first fixing hole **1173** from a side of the connecting plate **1154** facing the light outlet **1150** in sequence, so as to fixedly connect the connecting components **1172** with the connecting plate **1154**. Wherein the fastening element includes screws, bolts, etc., which are not limited here.

In some embodiments, as shown in FIG. **2**, one end of the chute **1152** is closed, and an entrance used for the slide rail **1181** to be inserted is defined on another end. The locating element **119** can be provided in a middle part of the chute **1152**, or be provided close to an entrance of the chute **1152** or a closed end of the chute **1152**. Of course, when the locating element **119** is provided close to the entrance of the chute **1152**, it is more convenient to manually press the locating element **119**.

In some embodiments, the card slot **1182** can be defined on the slide rail **1181** disposed on each of the two opposite ends of the bracket **118**. In this way, when the bracket **118** is installed on the housing **11** by users, the bracket **118** can be installed on the housing **11** without distinguishing a positive direction and a negative direction (the users can install it at will without following a fixed direction), thereby enabling the locating element **119** to block the slide rail **1181** of the bracket **118**.

Wherein two card slots **1182** can be defined on the slide rails **1181** disposed on each of the two opposite ends of the bracket **118**, and the two card slots **1182** defined on each of the slide rails **1181** are both located at two ends of each of the slide rails **1181**. Alternatively, the locating element **119** can also be provided in a middle part of the chute **1151**, and a middle part of each of the two sliding rails **1181** is defined with one card slot **1182**, respectively. When the user is performing an installation operation, the bracket **118** can be installed on the housing **11** without distinguishing a positive direction and a negative direction (the user can freely install it without following a fixed direction), thereby enabling the locating element **119** to block the slide rail **1181** of the bracket **118**.

In addition, the card slot **1182** can be defined at two ends of one slide rail **1181**, or only one card slot **1182** is defined on one slide rail **1181**, which can also enable the clamping component **11** of the locating element **119** to be inserted into the card slot **1182** and to block the slide rail **1181**. At this time, the positive direction and the negative direction (that is, the user must install it according to a fixed direction) of the bracket **118** need to be distinguished.

Specifically, as shown in FIG. **11** and FIG. **12**, the bracket **118** is a rectangular frame, and two fixed slide rails **1181** are located on two opposite frame bars **1185**, respectively; two ends of each of the slide rails **1181** disposed on the bracket **118** are both defined with the card slot **1182**, the card slot **1182** is defined by recessed from a surface of the slide rails **1181** facing a side of the light outlet **1150**. When the bracket **118** is installed on the housing **11** along a positive direction, the clamping component **1193** disposed on the locating element **119** will be inserted into the card slot **1182** corresponding to one of the slide rails **1181**, so as to locate the one of the slide rails **11811**; when the bracket **118** is rotated with an angle of 180° and is installed on an upper side in reverse, the clamping component **1193** disposed on the locating element **119** will be inserted into the clamping slot **1182** corresponding to another one of the slide rails **1181**, so as to locate the another one of the slide rails **1181**.

In addition, a butting surface **1186** is defined at a side of the card slot **1182** close to a middle part of the slide rails **1181**. When the clamping component **1193** is inserted into the card slot **1182**, the limiting surface of the clamping component **1193** is opposite to the butting surface **1186**, and can be butted with the butting surface **1186**, so as to prevent the slide rail **1181** of the bracket **118** from sliding. Wherein the butting surface **1186** is perpendicular to the length direction of the slide rail **1181**, or an inclined direction of the butting surface **1186** is same as an inclined direction of the limiting surface, so as to improve a blocking effect of the clamping component **1193** on the slide rail **1181**.

A side surface of the card slot **1182** opposite to the butting surface **1186** is an arc-shaped surface **1187**. A distance between the arc-shaped surface **1187** and the butting surface **1186** gradually increases in a direction from a bottom part of the card slot **1182** to an opening of the card slot **1182**. In a process of making the clamping protrusion **1196** exit from the card slot **1182** at an end of the slide rail **1181**, and controlling the slide rail **1182** to slide outside the slide rail **1152**, the clamping component **1193** will be inserted into the card slot **1182** defined at another end of the slide rail **1181** under an action of the elastic element **1194**. At this time, the arc-shaped surface **1187** of the card slot **1182** defined at the another end of the slide rail **1181** will be butted with the clamping protrusion **1196**, and the clamping protrusion **1196** will be squeezed, so that the clamping protrusion **1196** will slide along the direction from the pressing component **1198** to the clamping component **1193**, so as to dodge the slide rail **1181**, so that the slide rail **1181** can slide out of the chute **1152** smoothly.

In some embodiments, as shown in FIG. **11**, the bracket **118** includes a support frame **1189** and an installing column **1183**. The slide rail **1181** is arranged at two opposite ends of the support frame **1189**, the installing column **1183** is connected to the support frame **1189**, and the installing column **1183** is configured to be connected to the soften-light box, so that the bracket **118** can support the soften-light box.

As shown in FIG. **11**, a shape of the support frame **1189** of the bracket **118** is rectangular, and four corners of the support frame **1189** are all provided with the installing

column **1183**. Four installing columns **1183** extend from the bracket **118** toward a side of the bracket **118** away from the housing **11**. Installing holes **1184** are also defined on the installing columns **1183** extending along a length direction of the installing columns **1183**. The soften-light box (not shown in the drawings) includes reflective cloth, soften-light cloth, and a support structure supporting the reflective cloth and the soften-light cloth. The support structure includes four support columns (not shown in the drawings), which are inserted into the installing holes **1184** of the four installing columns **1183**, respectively, so that the soften-light box is fixedly connected to the bracket **118**.

As shown in FIG. **2**, FIG. **8**, and FIG. **9**, the diffuser installing frame **115** also includes two second frames **1155** disposed opposite to each other and connected between the two first frames **1151**, and the two first frames **1151** and the two second frames **1155** are enclosed to define the light outlet **1150**.

In some embodiments, a clamping groove **1156** is defined at a side of each of the two second frames **1155** facing the main housing **111**, and the main housing **111** is provided with a clamping plate **1131** at a position corresponding to the clamping groove **1156**. When the diffuser installing frame **115** is connected to the main housing **111**, the clamping plate **1131** disposed on the main housing **111** is inserted into the clamping groove **1156** of the second frames **1155**, so that the main housing **111** is firmly connected to the diffuser installing frame **115**.

As shown in FIG. **3** and FIG. **13**, the main housing **111** includes a back plate **112**, two first side plates **113** and two second side plates **114** connected to a side of the back plate **112**. The two first side plates **113** and two second side plates **114** are distributed around the back plate **112**, and the two first side plates **113**, two second side plates **114**, and the back plate **112** are enclosed together to define a cavity **1111** accommodating the heat dissipation device **140** and the light source **130**.

In some embodiments, the back plate **112** includes two opposite first sides and two opposite second sides, the two second sides are located between the two first sides, and two ends of the second side are connected to an end of the two first sides, respectively.

An edges of the two first side plates **113** close to the back plate **112** are connected to the two first sides of the back plate **112**, respectively, edges of the two second sides close to the back plate **112** are connected to the two second sides, respectively, and side edges of the first side plates **113** and side edges of the second side plates **114** close to each other are connected together, so that the two first side plates **113**, the two second side plates **114**, and the back plate **112** are enclosed together to define the cavity **1111**.

The clamping plate **1131** disposed on the main housing **111** is located at edges of the two first side plates **113** away from the back plate **112**. When the diffuser installing frame **115** is installed on the main housing **111**, the edges of the two first side plates **113** away from the back plate **112** are inserted into the clamping groove **1156** of the two second frames **1155**, respectively, so that a connection between the main housing **111** and the diffuser installing frame **115** is more stable.

In some embodiments, the back plate **112** is defined with through first air inlets **1121**, and each of the two first side plates **113** is defined with through second air inlets **1132**, and the second air inlets **1132** defined on the first side plates **113** are defined close to the back plate **112**. After the heat dissipation device **140** is installed in the main housing **111**, the first air inlets **1121** and the second air inlets **1132** correspond to the air inlet of the airflow generating device **145**, so that cold air outside the main housing **111** can quickly enter the main housing **111** through the first air inlets **1121** and the second air inlets **1132**.

A side of the back plate **112** facing the heat dissipation device **140** is also provided with a power adapter **160**. A number of first air inlets **1121** defined on the back plate **112** is two, and the two first air inlets **1121** are distributed at two ends of the back plate **112** along arrangement direction of the two second sides, so as to stagger the first air inlets **1121** and the power adapter **160**, and prevent the power adapter **160** from blocking the first air inlets **1121**.

In some embodiments, the first air inlets **1121** can be arranged as a mesh or honeycomb array.

Similarly, the second air inlets **1132** can be arranged in a grid or honeycomb array. Wherein the second air inlets **1132** can be arranged extending along an arrangement direction of the two second sides of the back plate **112**, or a plurality of second air inlets **1132** can be distributed in sequence along the arrangement direction of the two second sides of the back plate **112**, so as to increase an air inlet area of the second air inlets **1132**. In addition, a certain distance exists among the first air inlets **1121**, the second air inlets **1132**, and the airflow generating device **145**, which can effectively reduce a generation of air duct noise.

As shown in FIG. **3** and FIG. **13**, the two first side plates **113** are defined with through air outlets **1133**, the air outlets **1133** can be arranged in a grid or honeycomb array. The air outlets **1133** and the second air inlets **1132** are distributed in sequence along a direction away from the back plate **112**. When the heat dissipation device **140** is installed in the main housing **111**, the air outlets **1133** defined on the two first side plates **113** correspond to two ends of the fins **1431**, wherein a length direction of the air outlets **1133** correspond to the arrangement direction of the fins **1431**. For example, an arrangement length of the air outlet **1133** can be equal to or greater than an arrangement length of the fins **1431**, which is conducive to flow of air, so that hot air blown from the two ends of the fins **1431** can be quickly distributed to outside of the main housing **111** through the air outlet holes **1133**.

Wherein the air outlets **1133** can extend along the arrangement direction of the two second sides of the back plate **112**, so as to increase an air outlet area of the air outlets **1133**. In addition, the first air inlets **1121**, the second air inlets **1132**, and the air outlets **1133** can also be provided (for example, bonded or screwed) with a grid like protective screen (not shown in the drawings) towards an inside of the housing, so as to prevent impurities outside the main housing **111** from entering the main housing **111** through the first air inlets **1121**, the second air inlets **1132**, and the air outlets **1133**.

In some embodiments, as shown in FIG. **13**, an external surface of the back plate **112** is also provided with a fixing block **1122**, the fixing block **1122** is used to connect to other support devices, so as to support the lighting device **10** on the support device. In addition, a handle **170** is also arranged on the outer surface of the back plate **112**, so as to facilitate operators to move the lighting device **10**.

In some embodiments, as shown in FIGS. **3** and **13**, a side of the second side plates **114** close to the first sides extends toward the first sides to form an assembly plate **1141**, and edges of the first side plates **113** close to the second side plates **114** are located at an inner side of the assembly plate **1141**, so as to avoid an inconvenient connection between the first side plates **113** and the second side plates **114** caused by excessive segment differences (deviations or steps caused by a connection and a matching of adjacent components) at a connection position defined by the first side plates **113** and

the second side plates **114**. In addition, disposing the first side plates **113** on the inner side of the second side plates **114** can also effectively improve assembly efficiency.

As shown in FIG. **13**, limiting plates **1142** can also be disposed on the sides of the second side plates **114** close to the first side plates **113**. The edges of the first side plates **113** close to the second side plates **114** are located between the assembly plate **1141** and the limiting plates **1142**, so that fits between the first side plates **113** and the second side plates **114** are more stable. Wherein a number of the limiting plates **1142** is multiple, and the multiple limiting plates **1142** are distributed in sequence along an extension direction of the assembly plate **1141**.

As shown in FIG. **3**, the lighting device **10** also includes a support frame **120**, the support frame **120** is used to connect to the housing **11** and the heat dissipation device **140** of the lighting device **10**, so as to support the housing **11** and the heat dissipation device **140**.

In some embodiments, the support frame **120** includes support plates **122**, and the support plates **122** are arranged in the housing **11**. Both the heat dissipation device **140** and the housing **11** are fixedly connected to the support plates **122**, so that the support plates **122** supports the housing **11** and the heat dissipation device **140**, respectively. It can be understood that weights of the heat dissipation device **140** and the light source **130** (wherein a weight of the heat dissipation device accounts for a majority of an entire part of a weight of the lighting device) are heavy, if the heat dissipation device **140** and the light source **130** are directly disposed on the housing **11**, the housing **11** may be crushed. In this embodiment, the support plates **122** are arranged on the housing **11**, and the heat dissipation device **140** is fixedly connected to the support plates **122**, so as to prevent the heat dissipation device **140** from directly pressing on the housing **11** and damaging the housing **11**.

A number of support plates **122** is two, and the two support plates **122** are installed on the two second side plates **114** of the main housing **111**, respectively. The substrate **141** of the heat dissipation device **140** is fixedly connected to the two support plates **122** close to two sides of the two second side plates **114**, so as to make an installation of the heat dissipation plate **140** more stable.

In some embodiments, an intensity of the support plates **122** is greater than an intensity of the housing **11**, so as to improve bearing capacity of the support plates **122**. Specifically, the support plates **122** can be made of metal materials such as steel, iron, or alloy, etc, or can be made of other materials having a higher intensity and rigidity, and there is no restriction here. In addition, a thickness of the support plates **122** can be greater than a thickness of an inner wall of the housing **11**, so as to improve the intensity of the support plates **122**.

Specifically, as shown in FIG. **3**, the support plates **122** extends along the length direction of the sides of the substrate **141** close to the second side plates **114**, a lower surface of the support plates **122** is supported on an inner surface of the second side plates **114**, and a side of the substrate **141** close to the second side plates **114** is supported on an upper surface of the support plates **122**. Third fixing holes **1221** are defined on the support plates **122**, fourth fixing holes **1413** are defined on the side of the substrate **141** close to the second side plates **114**, and fifth fixing holes (not shown in the drawings) are also defined at a position of the second side plates **114** corresponding to the third fixing holes **1221**. Screws pass through the fourth fixing holes **1413**, the third fixing holes **1221**, and the fifth fixing holes in sequence, so as to fixedly connect the heat dissipation device **140** and the housing **11** with the support plates **122**, respectively.

In some embodiments, as shown in FIG. **3**, the support frame **120** also includes a U-shaped bracket **121** located outside the housing **11**. Two free ends of the U-shaped bracket **121** are rotationally connected to two support plates **122** through the two second sides **114**, respectively. Therefore, the U-shaped bracket **121** supports the housing **11** and the heat dissipation device **140** through the support plates **122**, respectively, and a gravity of the heat dissipation device **140** will not act on the housing **11**, so as to avoid damage caused by insufficient bearing capacity of the housing **11**.

Specifically, the support plates **122** extends along the length direction of the side of the substrate **141** close to the second side plates **114**. A middle part of the support plates **122** passes through the second side plates **114** and is rotationally connected to the free ends of the U-shaped bracket **121**. A surface of one side of the support plates **122** is fixedly connected to an inner surface of the second side plates **114**, so as to support the second side plates **114**, thereby supporting the entire housing **11**. A surface of another side of the support plates **122** is fixedly connected to the two ends of the substrate **141** along the arrangement direction of the plurality of fins **1431**, so as to support the substrate **141**, thereby supporting the heat dissipation device **140** and the light source **130**. It can be understood that the heat dissipation device **140** and the light source **130** (wherein the weight of the heat dissipation device **140** accounts for the majority of the whole weight of the lighting device **10**) is supported by the support plates **122**, thereby avoiding a direct bearing by the main housing **111**. The support plates **122** further transfers gravity generated by the weight of the heat dissipation device **140** and the weight of the light source **130** on the housing **11** to the U-shaped bracket **121**, thus effectively dispersing the gravity generated by the weight of the heat dissipation device **140** and the weight of the light source **130**, thereby reducing damage to the housing **11**.

In some embodiments, as shown in FIG. **3**, the U-shaped bracket **121** is also provided with a knob **180**, the knob **180** is used to control a rotation angle of the housing **11** relative to the U-shaped bracket **121**. That is, when the knob is rotated in a certain direction (e.g. clockwise), the knob can be rotated relative to the support **121**. At this time, an angle can be adjusted (that is, a luminous orientation angle of the lighting device **10** can be adjusted). After a required angle is adjusted, the knob **180** is rotated in an opposite direction (e.g. counterclockwise), so that the knob **180** can be fixed with the bracket **121**; and at this time, the angle cannot be adjusted.

In some embodiments, as shown in FIG. **3**, a middle part of the U-shaped bracket **121** is also fixedly connected to a support rod **1232**, a shape of the support rod **1232** can be, for example, cylindrical. The U-shaped bracket **121** can be conveniently fixed by the support rod **1232**.

Wherein a fixing component **123** can be arranged in the middle part of the U-shaped bracket **121**. The fixing component **123** includes two fixing elements **1231** distributed on two sides of the support frame, and the two fixing elements **1231** are connected together by the connecting element, so as to clamp the middle part of the U-shaped bracket **121** between the two fixing elements **1231**, so that the fixing component **123** is fixedly connected to the U-shaped bracket **121**. The support rod **1232** is fixedly connected to the fixing elements **1231** located on a side of the U-shaped bracket **121** away from the main housing **111** of the fixing component

123, so as to make a connection between the support rod 1232 and the middle part of the U-shaped bracket 121 more stable.

One of the two fixing elements 1231 of the fixing component 123 is a plastic element, and another one is a hardware pressing element, so as to avoid a deformation of the U-shaped bracket 121 after the U-shaped bracket 121 is directly supported by the support rod 1232.

It can be understood that due to a large weight of the heat dissipation device 140 and the housing 11, gravity generated by the weight of the heat dissipation device 140 and the weight of the housing 11 is directly conducted to the U-shaped bracket 121 by the support plates 122. If the support rod 1232 is directly used to support, a contacting area between the support rod 1232 and the bracket 121 is small, which is easily to cause deformation at a position of a part connecting the U-shaped bracket 121 with the support rod 1232.

An embodiment of the present application also provides a lighting device, the lighting device includes a heat dissipation device. A side of a substrate of the heat dissipation device away from a plurality of fins is thermally connected to the light source. A specific structure of the heat dissipation device can refer to the above embodiments. Since the lighting device the present application adopts all technical solutions of all the above embodiments, it has at least all the beneficial effects brought by the technical solutions of the above embodiments, which will not be described here.

In the above embodiments, the description of each of the embodiments has its own emphasis. For the part not detailed in an embodiment, please refer to relevant description of other embodiments.

The heat dissipation device, the bracket, and lighting device provided by the embodiments of the present application are described in detail above. In this paper, specific examples are used to explain a principle and an implementation mode of the present application. The description of the above embodiments is only used to help understand a technical scheme and a core idea of the present application; those skilled in the art should understand that they can still modify the technical solutions recorded in the aforementioned embodiments, or equivalent replace some of the technical features; however, these modifications or substitutions do not make a nature of the corresponding technical solutions separate from the scope of the technical solutions of the embodiments of the present application.

What is claimed is:

1. A heat dissipation device, comprising:

a substrate;

a plurality of fins arranged on the substrate with certain gaps therebetween and connected to the substrate; and

at least one airflow generating device disposed at an end of the plurality of fins away from the substrate, airflow generated by the airflow generating device flowing from at least a part of the gaps of the plurality of fins and along a direction toward the substrate, and the airflow being guided to diffuse through the substrate together with the plurality of fins,

wherein at least one strip-shaped groove is defined by recessed from a side of the substrate away from the plurality of fins, the at least one strip-shaped groove extends along an arrangement direction of the plurality of fins, and a second heat dissipation pipe is provided in the at least one strip-shaped groove.

2. The heat dissipation device according to claim 1, wherein the heat dissipation device further comprises a baffle, the baffle is disposed on the end of the plurality of fins away from the substrate and covers at least a part of the plurality of fins; the airflow generating device is arranged on a side of the baffle away from the plurality of fins, and a through hole is defined at a position of the baffle corresponding to an air outlet of the airflow generating device.

3. The heat dissipation device according to claim 1, wherein a groove is defined on the end of the fins away from the substrate, the groove is located at a middle part of the fins in a length direction, and the at least one airflow generating device is provided in the groove.

4. The heat dissipation device according to claim 3, wherein the at least one airflow generating device comprises a plurality of airflow generating devices, and the plurality of airflow generating devices are distributed in sequence along an arrangement direction of the plurality of fins.

5. The heat dissipation device according to claim 1, wherein the heat dissipation device further comprises at least one first heat dissipation pipe, the at least one first heat dissipation pipe comprises a first section and a second section connected to each other and passing through the plurality of fins in sequence along a distribution direction of the plurality of fins, and the first section and the second section of the at least one first heat dissipation pipe are distributed in sequence along a direction from a middle part to an end of the fins.

6. The heat dissipation device according to claim 5, wherein the at least one first heat dissipation pipe comprises a plurality of first heat dissipation pipes, the plurality of first heat dissipation pipes are distributed in sequence along a length direction of the fins; a side surface of the first section of the at least one first heat dissipation pipe is attached to a side surface of the substrate.

7. The heat dissipation device according to claim 1, wherein the at least one strip-shaped groove comprises a plurality of strip-shaped grooves, the plurality of strip-shaped grooves are distributed in sequence along a length direction of the fins, and each of the plurality of strip-shaped grooves is provided with the second heat dissipation pipe.

8. An illumination device, wherein the illumination device comprises:

a light source;

a heat dissipation device, wherein the heat dissipation device further comprises:

a substrate;

a plurality of fins arranged on the substrate with certain gaps therebetween and connected to the substrate; and

at least one airflow generating device disposed at an end of the plurality of fins away from the substrate, airflow generated by the airflow generating device flowing from at least a part of the gaps of the plurality of fins and along a direction toward the substrate, and the airflow being guided to diffuse through the substrate together with the plurality of fins; and

wherein a side of the substrate of the heat dissipation device away from the plurality of fins is thermally connected to the light source; and

wherein at least one strip-shaped groove is defined by recessed from a side of the substrate away from the plurality of fins, the at least one strip-shaped groove extends along an arrangement direction of the plurality of fins, and a second heat dissipation pipe is provided in the at least one strip-shaped groove.

9. The illumination device according to claim 8, wherein the illumination device further comprises:

a housing, the light source and the heat dissipation device being accommodated in the housing; and

a support plate disposed in the housing, both of the heat dissipation device and the housing being fixedly connected to the support plate.

**10**. The illumination device according to claim **8**, wherein the heat dissipation device further comprises a baffle, the baffle is disposed on the end of the plurality of fins away from the substrate and covers at least a part of the plurality of fins; the airflow generating device is arranged on a side of the baffle away from the plurality of fins, and a through hole is defined at a position of the baffle corresponding to an air outlet of the airflow generating device.

**11**. The illumination device according to claim **8**, wherein a groove is defined on the end of the fins away from the substrate, the groove is located at a middle part of the fins in a length direction, and the at least one airflow generating device is provided in the groove.

**12**. The illumination device according to claim **11**, wherein the at least one airflow generating device comprises a plurality of airflow generating devices, and the plurality of airflow generating devices are distributed in sequence along an arrangement direction of the plurality of fins.

**13**. The illumination device according to claim **8**, wherein the heat dissipation device further comprises at least one first heat dissipation pipe, the at least one first heat dissipation pipe comprises a first section and a second section connected to each other and passing through the plurality of fins in sequence along a distribution direction of the plurality of fins, and the first section and the second section of the at least one first heat dissipation pipe are distributed in sequence along a direction from a middle part to an end of the fins.

**14**. The illumination device according to claim **13**, wherein the at least one first heat dissipation pipe comprises a plurality of first heat dissipation pipes, the plurality of first heat dissipation pipes are distributed in sequence along a length direction of the fins; a side surface of the first section of the at least one first heat dissipation pipe is attached to a side surface of the substrate.

**15**. The illumination device according to claim **8**, wherein the at least one strip-shaped groove comprises a plurality of strip-shaped grooves, the plurality of strip-shaped grooves are distributed in sequence along a length direction of the fins, and each of the plurality of strip-shaped grooves is provided with the second heat dissipation pipe.

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