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(54) **Recovery system of the heat dissipated by luminaires, lamps and led devices**

(57) Recovery system of the heat dissipated by luminaires, comprising at least one lighting appliance (1), or luminaire, which has a LED lamp (2), or a lamp or bulb, or other light generating means, featuring a thermal transmission means near the source of light, such a thermal transmission means being associated to a heat exchanger through which circulates a fluid (8), where in the

case of using LEDs, the thermal transmission means is a transmitter or radiator (4) in contact with the base or supporting plate of the LEDs, and arranged at the bottom of a heat exchanger (5), while if the luminaire has lamps or bulbs, the thermal transmission means is a reflector, upon which in a surrounding manner a casing leaving an interior space defining a heat exchanger is provided.

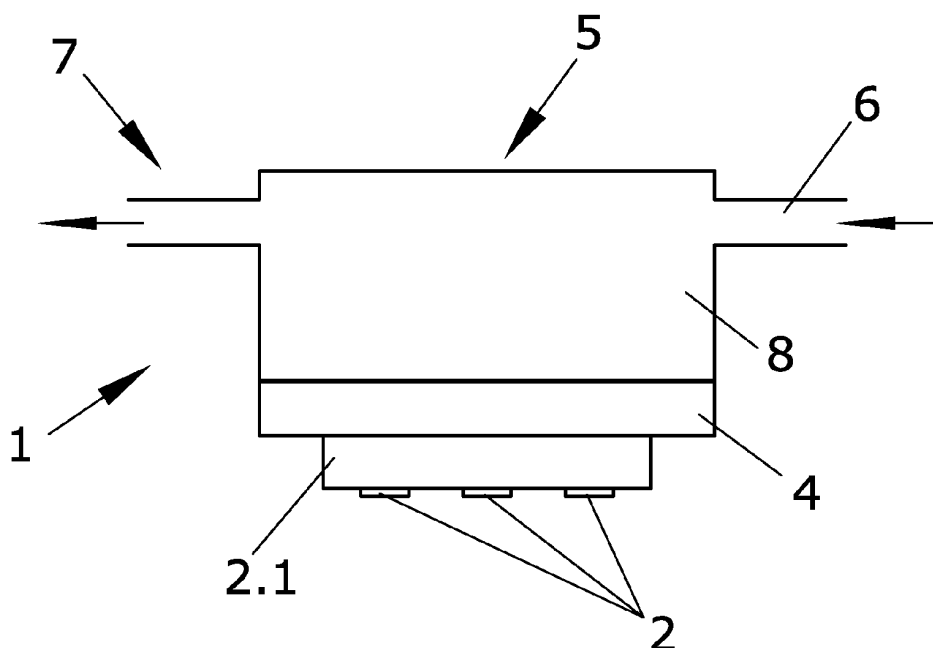


FIG. 1

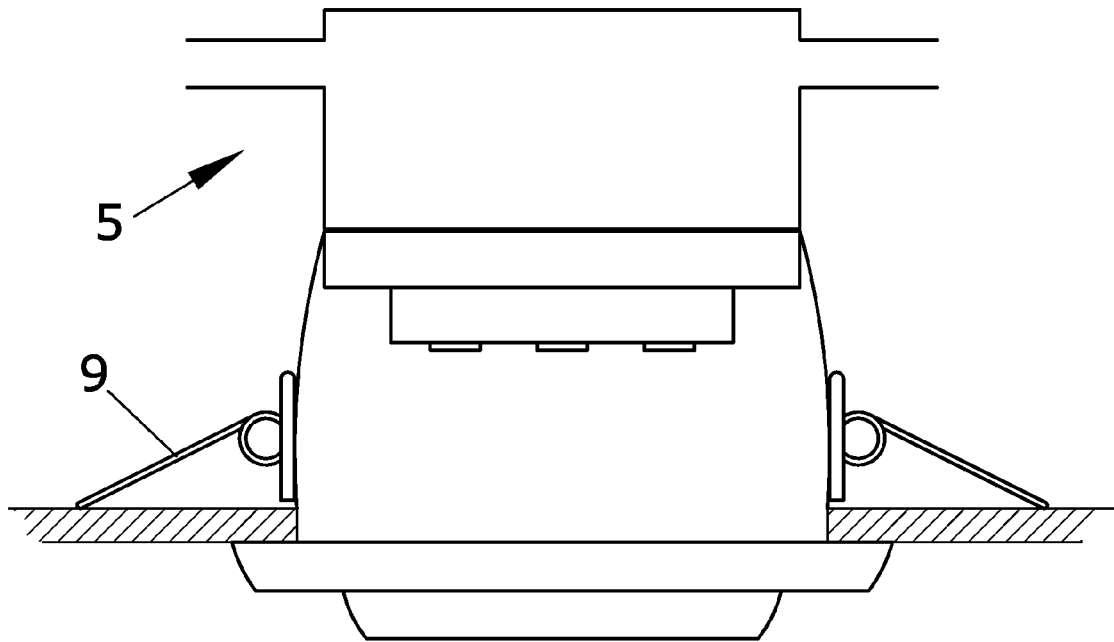


FIG.2

Description**OBJECT OF THE INVENTION**

[0001] It is the object of the present invention, as the title of the same states, a recovery system of the heat dissipated by lighting appliances, lamps and luminaires, understanding as such those appliances which serve as support and connection to the mains to light generating devices, also called lamps, bulbs, lamp bulbs or LED (Light Emitting Diodes).

[0002] The present invention characterizes the particular design and the association of lighting appliances together with means of exchange of heat, in such a way that allows the recovery of the heat dissipated by the lighting appliances, as well as cooling the source of light. In particular, since LED lamps require cooling by radiation or contact, the present invention provides an innovative solution for cooling them.

[0003] Therefore, the present invention is circumscribed within the scope of the lighting appliances or lamps, and in particular from the means or structural associations with other means which allow recovering the heat dissipated.

BACKGROUND OF THE INVENTION

[0004] So far many attempts have been made to reduce power consumption in lighting. One of the first initiatives adopted has been, and is being to replace lamps currently used in lighting, especially the incandescent ones, by low consumption lamps, whether these are the so-called compact fluorescent type or LED ones, getting a similar lighting with power consumption in the order of up to 6 times less.

[0005] However, while with the replacement of a set of lamps by others the intended purpose is achieved, no action has been carried out yet with the heat dissipated by the lamps. This is particularly onerous in the case of those using LED technology. LED lamps, unlike other sources of light, need radiator or forced cooling, since otherwise their half-life is considerably reduced. Without cooling, LED lamps are unusable.

[0006] From the power provided to lamps, part is dedicated to its conversion into a beam of light, and the rest is dissipated as heat in the air. It is common to observe around the lighting appliances, particularly the built-in ones, a black ring, produced by the movement of the air and the deposition of particles, as a result of the temperature difference generated in the nearest surroundings of the lighting appliance.

[0007] Therefore, it is the object of the present invention to develop a system that allows the recovery of the heat dissipated into the environment, developing a system like the one described in the following and reflected in its essence in the first claim.

DESCRIPTION OF THE INVENTION

[0008] The object of the present invention is a recovery system of the heat dissipated by luminaires or lighting appliances, in particular, although not exclusive of any other, those using LED technology.

[0009] Lighting appliances can consist of one, several or all the following elements:

- base or pole, and arm, the load-bearing elements, which in some forms of installation, for example, built-in, would be the fixing means to the false ceiling.
- screen or lamp shade that diffuses light and protects the eyes from intense lighting, or a reflector, responsible for reflecting the light emitted.
- radiators, heat sinks and other elements for a radiation cooling of the lamp.
- bulb or lamp, which in variable number provides lighting.

[0010] The screen or lamp shade, parabolic reflector and/or radiator of the LED lamps, in addition to serving for the purposes mentioned above, acquires a fairly high temperature, when being close to a source of heat.

[0011] The present recovery system of the heat dissipated by a lamp, is intended for lighting appliances having parable, parabolic reflector, radiator in LED systems, and any metallic element or not likely to be heated by the source of light, and can be implemented in built-in or other lighting systems.

[0012] The reflector device, the radiator, or another element or metallic component of the luminaire, as a consequence of receiving beams of light or the radiation heat of the source of light, raises its temperature and by convection heats the surrounding air. Therefore, in order to capture the heat of the source of light, thermal transmission means are used, which in the case of LED luminaires, it will be a thermal transmitter or radiator, while in the case of luminaires with lamps or bulbs it will be the reflector itself which will serve as a thermal transmission means.

[0013] Associated with the thermal transmission means a heat exchanger is provided which is responsible for capturing and transporting the heat transmitted towards the thermal transmission means from the source of light.

[0014] In the case of LED luminaires, these are mounted on a supporting or mounting plate, which is a source of considerable heat, by using as a thermal transmission means a transmitter or radiator in contact with the base or supporting plate, and in turn said transmitter or radiator is arranged at the bottom of a heat exchanger.

[0015] In the case of luminaires with lamps or bulbs, the heat transmission means is the reflector itself, forming a heat exchanger by means of the reflector itself and a casing covering the reflector, defining an interior space through which a coolant circulates.

[0016] The heat exchanger, in the case of LED lamps,

has an inlet and an outlet located at the same level, to encourage the flow of a fluid through the interior of the heat exchanger. The coolant can be water. Fluid passing through the interior of the heat exchanger flows to capture the heat dissipated or radiated by the thermal transmitter and radiated towards the interior of the heat exchanger.

[0017] In the exchanger, in the case of luminaires with lamps or bulbs, the inlet and outlet ducts do not necessarily have to be at the same level.

[0018] The inlet and outlet ducts allow the connection of several lighting appliances, the heat collector fluid being conducted up a later point of exchange or towards a place of use, as for example domestic water heating means.

[0019] Thanks to the described means, not only the use the heat dissipated by luminaires is achieved but the cooling of LED lamps and the replacement of costly radiators and other cooling mechanisms such as fans, which add power consumption.

EXPLANATION OF THE FIGURES

[0020] In order to complement the following description and in order to help a better understanding of their features, a set of plans is herein appended whose figures, by way of illustration and not restrictively, represent the most significant details of the invention.

Figure 1 shows a simplified representation of a LED luminaire associated with the recovery means of the heat dissipated by the lighting appliance.

Figure 2, shows a LED luminaire associated with a structure or casing for fixing to the false ceiling.

Figure 3, shows a simplified representation of a luminaire with conventional incandescent, discharge or fluorescent lamp associated with recovery means of the heat dissipated by the lighting appliance.

EXPLANATION OF A PREFERRED EMBODIMENT

[0021] In view of the figures a preferred embodiment of the proposed invention is next described.

[0022] In Figure 1, a lighting appliance (1), or luminaire, having an LED lamp (2) can be seen, featuring several LEDs mounted on a supporting plate (2.1), which is in contact with a thermal transmission means, in this case a thermal transmitter or radiator (4), which in turn is associated with a heat exchanger (5).

[0023] The base or supporting plate (2.1) where the LEDs are mounted is a source of considerable heat. The heat is dissipated by contact from the supporting plate towards the heat transmitter (4), which is associated in the bottom of a heat exchanger (5) through which circulates a fluid (8).

[0024] The surface of the supporting plate (2.1) where the LEDs are mounted, as well as that of the thermal

transmitter (4) are not of perfect planimetry, so in the embodiment where they come into contact, there are a few internal intermediate spaces between the two surfaces, which are occupied by air. Since the air is not a good heat conductor, in a possible embodiment conductive grease is applied, which would fill the intermediate spaces between the two surfaces, avoiding the presence of air, and therefore improving the heat conduction.

[0025] Figure 2 shows a complementary and alternative embodiment of the above, which does not change the essence of the invention, wherein a casing (9) or a structure (9) which allows securing the LED luminaire assembly to the false ceiling is used.

[0026] Heat exchanger (5) is basically a closed assembly, having associated in its lower part the thermal transmitter (4), and having an inlet duct (6) and an outlet duct (7), serving for circulating a heat collector fluid.

[0027] As can be seen in Figure 1, ducts (6) and (7) are located at the same level although they could also be located at different levels. Ducts are arranged at different levels when they are aimed to take advantage of the upward motion of hot fluids and thus cause a turbulence that impels the coolant, preferably water, at their evacuation driven by the contribution of a low temperature refrigerant, where as when they are at equal levels they are aimed to facilitate the flow of fluid through the interior of the chambers of the heat exchangers.

[0028] Figure 3 shows an embodiment designed for the case of luminaires with bulbs or similar means of lighting and which is based on the same principles of the invention. In this case the luminaire has a reflector (3) as a thermal transmission means, through which there is a bulb or lamp (10).

[0029] Light reflector (3) acquires a certain temperature as a result of its proximity to a source of heat resulting from the light radiation emitted and reflected on its surface. In order to be able to recover a considerable amount of heat dissipated or radiated by the lamp, associated with the luminaire a structure or casing (11) covering reflector (3) is provided, defining an interior chamber through which circulates a fluid (8), evacuator of the heat collected by the heat transmission element, in this case reflector (3), forming a heat exchanger.

[0030] Therefore, in this case the heat exchanger consists of the walls of the reflector, and the structure or casing (11) covering the previous, and inlet and outlet ducts (6) and (7) respectively. This prevents the dissipation of the heat into the surrounding environment, which would be to the entire volume of the false ceiling in an installation with false ceiling.

[0031] Ducts (6) and (7), both of the heat exchanger shown in Figure 1, and corresponding to a LED luminaire, as well as of the exchanger of Figure 3, which corresponds to a luminaire with lamps or bulbs, can connect with other luminaires. So a network that incorporates each of the luminaires of an installation can be set, allowing the recovery of the heat dissipated in a considerable proportion.

[0032] The essence of this invention is not affected by variations in the materials, shape and size of its component elements, described in a non-limiting manner such that it allows its reproduction by an expert.

Claims

1. Recovery system of the heat dissipated by luminaires comprising at least one lighting appliance (1), or luminaire, which has a LED lamp (2), or a lamp or bulb (10), or lighting generation means, **characterized in that** it has a thermal transmission means near the source of light, such a thermal transmission means being associated to a heat exchanger through which circulates a fluid (8). 10
2. Recovery system of the heat dissipated by luminaires, according to claim 1, **characterized in that** if a LED lamp (2) is used as a lighting generation means, the associated LEDs are arranged on a supporting plate (2.1) in contact with the thermal transmission means, which is a thermal transmitter or radiator (4) and which in turn is arranged at the bottom of heat exchanger (5). 20 25
3. Recovery system of the heat dissipated by luminaires, according to claim 2, **characterized in that** associated with the luminaire structure (9) or casing for fixing to the false ceiling is provided which in addition links luminaire (1) with thermal transmitter assembly (4) and heat exchanger (5). 30
4. Recovery system of the heat dissipated by luminaires, according to claim 2, **characterized in that** the space left between thermal transmitter or radiator (4) and base or supporting plate (2.1) of the LEDs is filled with conductive grease. 35
5. Recovery system of the heat dissipated by luminaires, according to claim 1, **characterized in that** where the luminaire has a lamp or bulb (10), the thermal transmission means is a reflector (3) associated with the luminaire and the heat exchanger would be comprised of the reflector and a structure or casing (11) covering reflector (3), defining an interior chamber through which circulates a fluid (8) evacuator of the heat collected by the heat transmission element. 40 45
6. Recovery system of the heat dissipated by luminaires, according to claim 2 or 5, **characterized in that** heat exchanger (5) has an inlet duct (6) and an outlet duct (7). 50
7. Recovery system of the heat dissipated by luminaires, according to claim 6, **characterized in that** the inlet and outlet ducts are located at different levels to take advantage of the upward motion of the 55

hot fluids.

8. Recovery system of the heat dissipated by luminaires, according to claim 6, **characterized in that** the inlet and outlet ducts are located at equal levels. 5
9. Recovery system of the heat dissipated by luminaires, according to claim 1, **characterized in that** heat collector fluid (8) is water. 10

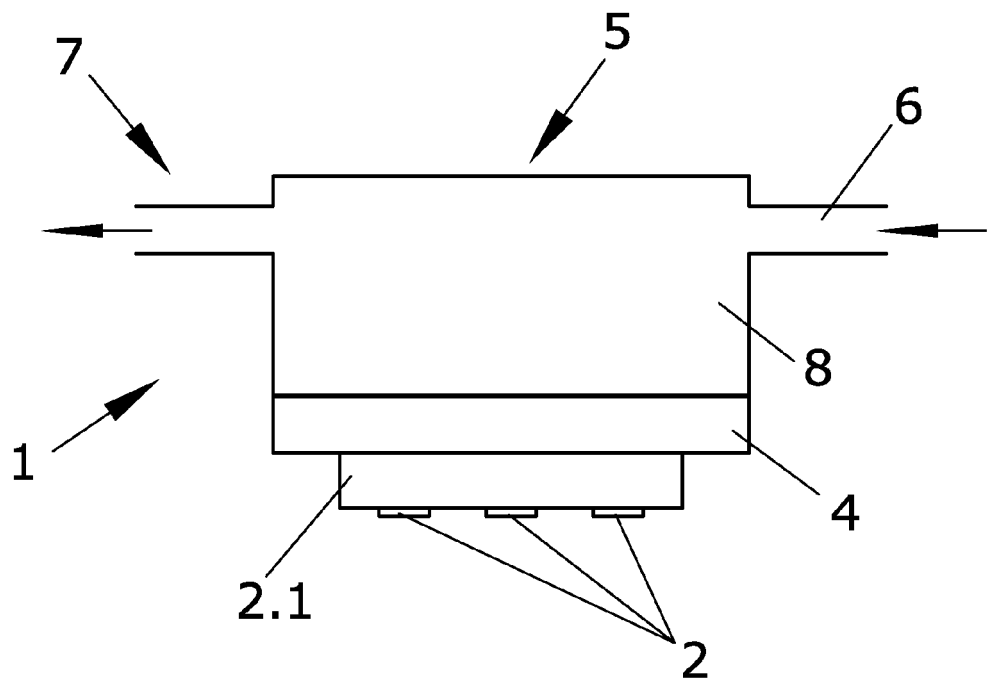


FIG.1

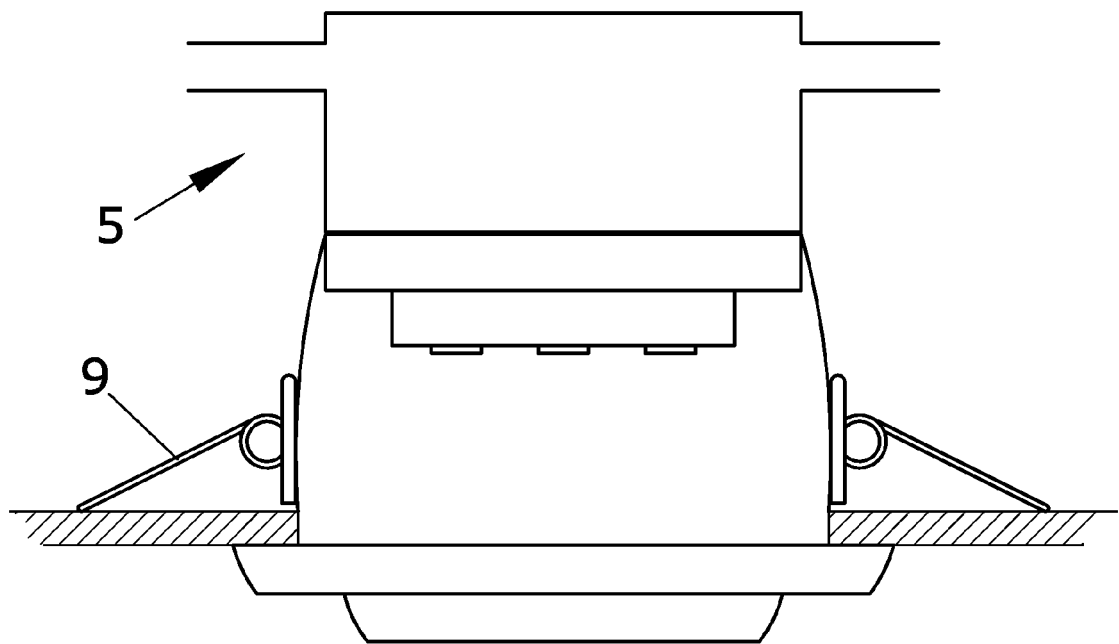


FIG.2

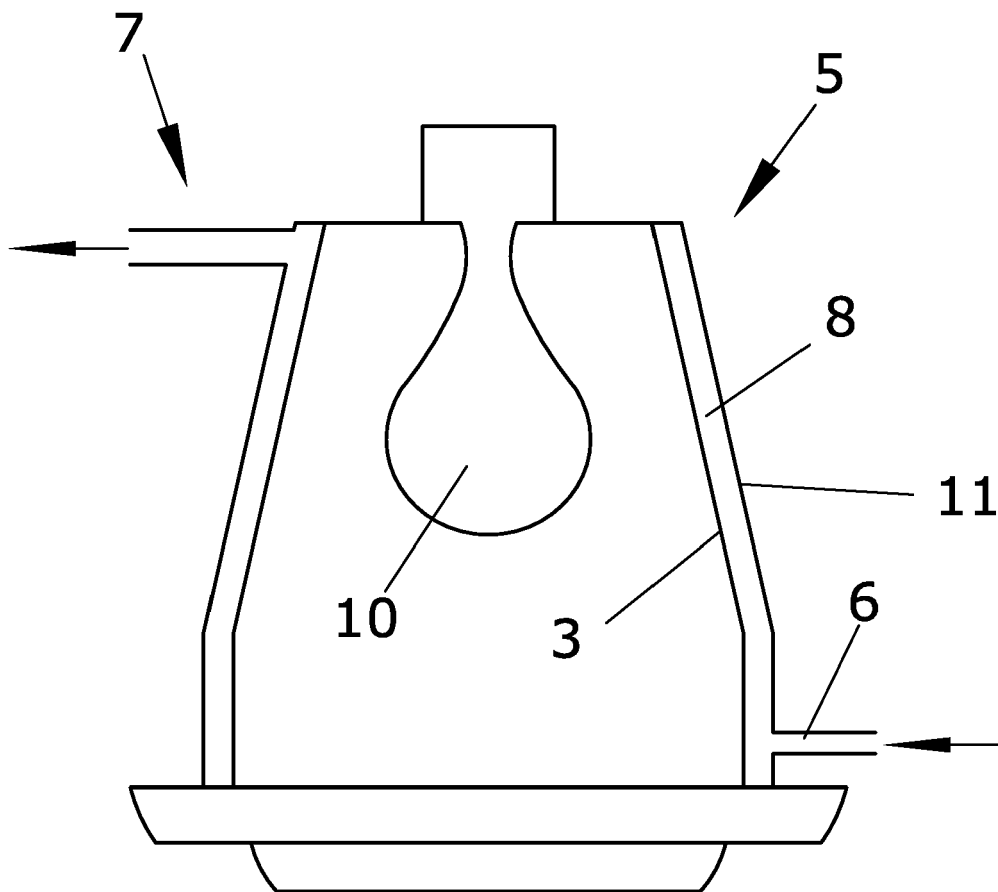


FIG.3