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(54) **LUMINAIRE WITH ADJUSTABLE LIGHT OUTPUT**

(57) A luminaire comprising:
an elongate light source (1);
a light shielding cover (2) comprising an elongate cavity (7) for receiving the elongate light source, the cavity terminating at an opening (8) through which the elongate light source is received; and
an adjustable mounting system (3, 4, 5) for mounting the light source in the cavity in a depth direction (11), wherein the adjustable mounting system is capable of adjusting a depth of the elongate light source within the cavity, in the depth direction, in a continuous range between a minimum depth and a maximum depth.

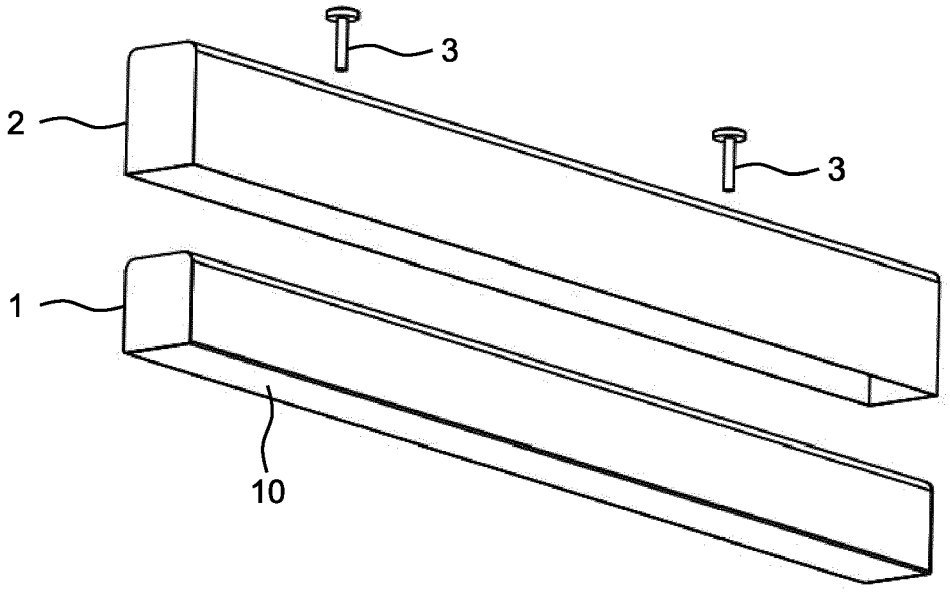

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The invention relates to luminaires and in particular, the invention relates to the luminaires with light output characteristics that can be adjusted.

BACKGROUND OF THE INVENTION

[0002] At present, most existing luminaires have fixed light output characteristics. Thus, the luminaire can only meet a specific application choice of some users and does not give users more lighting design choices. This limits the design inspiration of many lighting designers and can limit an artistic space lighting design.

[0003] For example, wide beam angle luminaires are typically used to illuminate a room or a large area (i.e., so-called ambient lighting). In contrast, spotlights (i.e., narrow beam angle lights) are typically used to illuminate particular locations or objects (i.e., so-called task lighting).

[0004] As such, if a user wishes to use two different lighting configurations, they are required to buy two different luminaires which can fulfil both lighting configurations separately. Thus, there is a need to improve lighting fixtures to provide different lighting configurations.

SUMMARY OF THE INVENTION

[0005] The invention is defined by the claims.

[0006] According to examples in accordance with an aspect of the invention, there is provided a luminaire comprising:

an elongate light source;
a light shielding cover comprising an elongate cavity for receiving the elongate light source, the cavity terminating at an opening through which the elongate light source is received; and
an adjustable mounting system for mounting the light source in the cavity in a depth direction, wherein the adjustable mounting system is capable of adjusting a depth of the elongate light source within the cavity, in the depth direction, in a continuous range between a minimum depth and a maximum depth.

[0007] Typically, luminaires are limited to a particular lighting configuration. In some cases, it may be possible to change the general direction of the light output from a typical luminaire, but the lighting configuration (e.g., beam width) itself does not change. The invention provides a luminaire which can be easily changed between task lighting (i.e., higher light density, lower illuminated area) and ambient lighting (i.e. lower light density, higher illuminated area).

[0008] The light shielding cover is opaque. The cavity is a volume formed within the light shielding cover and the cavity ends at the opening. Thus, the cavity defines an open channel and the elongate light source can be slid in and out of the channel through the opening. The position within the cavity influences the light output characteristics, in particular a beam width.

[0009] The elongate light source may comprise a main light output face which is parallel with the opening of the cavity, wherein the main light output face protrudes out of the cavity through the opening when the elongate light source is mounted at the minimum depth.

[0010] By protruding out of the cavity (though the opening) the sides of the light source are no longer covered by the shielding cover, so that a wider beam is able to leave the light luminaire.

[0011] When the elongate light source is mounted at the maximum depth, the main light output face may protrude out of the opening of the cavity by a lesser amount than when mounted at the minimum depth. Thus, the adjustment provides different amounts by which the light source protrudes out of the cavity.

[0012] Alternatively, when the elongate light source is mounted at the maximum depth, the main light output face may be flush with the opening of the cavity. As another alternative, when the elongate light source is mounted at the maximum depth, the main light output face may be recessed behind the opening of the cavity.

[0013] Thus, at the maximum depth, i.e. the elongate light source is received to a maximum extent in the cavity, the main light emitting face of the light source may still protrude a small amount, or it may be flush or recessed within the cavity. In all cases, the directionality of the light is more limited when the light source is mounted at a greater depth.

[0014] A dimension of the elongate light source, in the mounting direction, is for example smaller than a corresponding dimension of the cavity of the light shielding cover so that the elongate light source can be received fully in the cavity.

[0015] The elongate light source may comprise further lateral light emitting faces perpendicular to the light emitting face.

[0016] The elongate light source may comprise a tube with omnidirectional light output in a plane perpendicular to a length direction of the elongate light source.

[0017] The elongate light source may be a linear light source. The elongate light source and the light shielding cover are, for example, cuboidal.

[0018] The adjustable mounting system may comprise one or more screws or bolts configured to pass through one or more channels in the light shielding cover and adjustably attach to the elongate light source.

[0019] Use of screws or bolts enables the user to change the configuration of the luminaire with ease and with the continuous adjustment. Users are likely to be used to using screws and bolts and thus there is a minimal learning curve. In this case, the amount by which the screws or bolts are screwed into the luminaire results in a different configuration for the luminaire.

[0020] The elongate light source may comprise one or more threaded bores for receiving the one or more screws or bolts of the adjustable mounting system.

[0021] Other continuous adjustment mechanisms may be used, such as cooperating rails and sliders, or gears. The adjustment is typically manual but it may also be electric for example using a linear motor.

[0022] An inner surface of the light shielding cover, defining the cavity, may be reflective. The reflectivity (e.g. using reflective paint) enables more of the light from the light source to escape the cavity after reflecting within the shielding cover instead of being absorbed by the shielding cover (and possibly heating the shielding cover up). This increases the light output efficiency. This may be especially advantageous when using an omnidirectional light emitting surface as the light source.

[0023] When the elongate light source is mounted at the maximum depth, the luminaire may be configured to provide an illumination field of view in a plane perpendicular to a length axis of the elongate light source less than or equal to 120 degrees.

[0024] When the elongate light source is mounted at the minimum depth, the luminaire may be configured to provide an illumination field of view in a plane perpendicular to a length axis of the elongate light source of more than 120 degrees.

[0025] Thus, the beam angle of the light output may be adjusted between a relatively narrow beam and a relatively wide beam.

[0026] Changing the illumination field of view of the luminaire changes the amount of light at any point illuminated by the luminaire. This is change is enabled because the light from the light source is constrained to travel in a limited range of directions by the cover. This increases the light density and reduces the area which is illuminated by the luminaire. The illumination field of view may be considered to be the illumination beam width.

[0027] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments) described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] For a better understanding of the invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings, in which:

Fig. 1 shows a first view of a luminaire for an elongate light source;

Fig. 2 shows a second view of the luminaire for an elongate light source;

Fig. 3 shows the luminaire in a task lighting configuration;

Fig. 4 shows the luminaire in an ambient lighting configuration;

Fig. 5 shows a cross section of the luminaire in a task lighting configuration;

Fig. 6 shows a cross section of the luminaire in an ambient lighting configuration;

Fig. 7 shows a cross section of the light shielding cover;

Fig. 8 shows a cross section of a luminaire using a gear driven mechanism;

Fig. 9 shows a luminaire using a gear driven mechanism in the ambient lighting configuration; and

Fig. 10 shows an exploded view of a luminaire with a gear driven mechanism.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0029] The invention will be described with reference to the Figures.

[0030] It should be understood that the detailed description and specific examples, while indicating exemplary embodiments of the apparatus, systems and methods, are intended for purposes of illustration only and are not intended to limit the scope of the invention. These and other features, aspects, and advantages of the apparatus, systems and methods of the present invention will become better understood from the following description, appended claims, and accompanying drawings. It should be understood that the Figures are merely schematic and are not drawn to scale. It should also be understood that the same reference numerals are used throughout the Figures to indicate the same or similar parts.

[0031] The invention provides a luminaire comprising an elongate light source, a light shielding cover and an adjustable mounting system. The light shielding cover comprises an elongate cavity for receiving the elongate light source which terminates at an opening through which the elongate light source is received. The adjustable mounting system is used to mount the light source in the cavity in a depth direction. The adjustable mounting system is capable of adjusting a depth of the elongate light source within the cavity in a continuous range between a minimum depth and a maximum depth.

[0032] Figure 1 shows a first view of a luminaire comprising an elongate light source 1, a light-shielding cover 2 and an adjustable mounting system. In this exemplary luminaire, the adjustable mounting system comprises a set of adjustable screws 3. There may be one or more screws (or bolts, equivalently). The light shielding cover comprises an elongate cavity with an opening (the bottom face in the orientation shown).

[0033] Figure 2 shows a second view of the luminaire. The light source 1 is omnidirectional and can emit light in all directions within a plane perpendicular to the length direction of the light source. The light source 1 can be recessed in the light shielding cover 2. The adjustable screws 3 each connect to a threaded bore 4 on the back of the light source 1 through a channel 5 in the light shielding cover 2. Thus, the amount by which the adjustable screws 3 are screwed into the threaded bores 4 of the

light source 1 determines the depth of the light source 1 inside the light shielding cover 2. This depth is in a direction perpendicular to the elongate direction of the luminaire. It corresponds to a direction of insertion of the light source 1 into the opening into the cavity.

[0034] An inner surface of the light shielding cover 2, facing the light source 1, is reflective, for example sprayed with high-reflection paint. Thus, the light shielding cover 2 can adjust the width of the output illumination beam by blocking the light escaping but the inner surface reflects the blocked so that it can exit the luminaire after one or more reflections.

[0035] The adjusting screws 3 pass through the channels 5 of the shielding cover 2 and connect with the threaded bores 4 on the back of the light source 1. By rotating the adjusting screws 3, the light source 1 can move up and down in the shielding cover 2, thereby adjusting the amount of the light source 1 which protrudes from the shielding cover 2 through the cavity opening. Changing the amount of the light source 1 which protrudes from the shielding cover can achieve a change in lighting configuration between ambient lighting and task lighting so as to meet different lighting design requirements.

[0036] For example, a minimum depth results in a relatively wide beam for ambient lighting, and a maximum depth results in a relatively narrow beam for task lighting. At the minimum depth, the light source protrudes so that a larger part of the body of the light source is exposed and is used to provide a wide beam of illumination. The wide beam for example has a beam spread of more than 120 degrees (in a plane perpendicular to the elongate direction). At the maximum depth, the outermost surface of the light source is used to provide a narrow beam of illumination. The narrow beam for example has a corresponding beam spread of less than 120 degrees.

[0037] Figure 3 shows the luminaire in a task lighting configuration. The light source is fully within the cavity formed by the shielding cover 2. Thus, a main light output face 10 is the only surface of the light source which faces an opening in the shielding cover 2. In other words, the light source does not protrude from the shielding cover 2.

[0038] Figure 4 shows the luminaire in an ambient lighting configuration. The light source 1 is only partially within the cavity formed within the shielding cover 2. Thus, the main light output face 10 is not the only surface of the light source 1 which is not blocked by the shielding cover 2. In other words, the light source protrudes from the shielding cover 2.

[0039] Thus, the luminaire provides an adjustable lighting configuration which is suitable for the design of various lighting spaces. The user can conveniently and freely adjust the lighting area and space lighting according to their own design by adjusting the screws 3 without the need for special customization of luminaire. Thus, the luminaire provides convenience, ease of customization and a wide range of customization for the luminaire.

[0040] In summary, a linear luminaire is provided with an omnidirectional light engine (i.e. light source 1) that can be mounted in a housing (i.e. the light shielding cover 2) at different depths, allowing part of the light source 1 to protrude from the shielding cover 2 at least when the light source is mounted at a minimum depth. This provides the user with multiple uses for the same luminaire as it can be adjusted based on the application.

[0041] Figure 5 shows a cross section of the luminaire in a task lighting configuration.

[0042] Other continuously adjustable systems could be used to mount the light source 1 to the light shielding cover 2. For example, vertical rails, linear motors, gears or any system which can achieve continuous and linear movement of the light source within the light shielding cover 2 could be used.

[0043] The light source 1 is mounted in a depth direction 11 which is perpendicular to the elongate direction of the luminaire and the light source. The depth may be defined as the amount of the light source 1 which is within the cavity formed by the light shielding cover 2. Alternatively, for this case, the depth could also be defined as the distance of the screws 3 within the threaded bores 4.

[0044] In this example, when the light source 1 is mounted at the maximum depth shown in Figure 5, the main light output face 10 does not protrude from the light shielding cover 2. This results in a relatively narrow beam of light 6 generated by the luminaire. In other words, the "illumination field of view" of the luminaire is relatively small, thereby providing a task lighting configuration.

[0045] Task lighting provides a narrow beam of light 6 with a typically brighter light. The narrow beam 6 can typically illuminate objects further away but illuminates a generally small area.

[0046] In a different example, when the light source 1 is mounted at the maximum depth, the main light output face 10 could be flush with the opening of the light shielding cover or even slightly protrude from the cavity. These luminaire configurations could still provide task lighting depending on the design of the light source and light shielding cover.

[0047] The narrow beam of light 6 for task lighting could have an angle of less than or equal to 120 degrees, 110 degrees, 100 degrees, 90 degrees or 80 degrees. The task lighting configurations of the luminaire could provide a narrow beam of light 6 having angle ranges of between 15 degrees to 120 degrees, 25 degrees to 110 degrees, 35 degrees to 100 degrees etc. Of course, the exact angle ranges may depend on the envisioned usages of the luminaire (e.g. long distance spot light with a small angle vs ceiling mounted spot light with a wider angle). The minimum angle in the range of angles could be defined by the maximum depth.

[0048] The light source 1 could also have further lateral light emitting faces perpendicular to the light emitting face. The light from these lateral faces, in the task lighting configuration, could reflect from inner surfaces of the shielding cover 2 and add to the brightness of the narrow beam of light 6. Similarly, a back light emitting surface,

perpendicular to the main light emitting surface 10 and facing in the opposite direction, could also be provided such that the light it emits is reflected by the top of the shielding cover 2.

[0049] This forms a cuboidal light source where the body of the light source emits light in all directions around the light source, from the four faces. The cuboidal light source could have a tube with omnidirectional light output, in a plane perpendicular to a length direction of the elongate light source, positioned in the center of the light source. The light from the tube can be diffused through diffusion panels within the light source, thereby providing the four light emitting faces.

[0050] The light source may use any type of lighting technology such as solid state lighting (e.g. a tubular LED) or body-emitting lighting such as a fluorescent tube.

[0051] The light source may be cylindrical or any other appropriate shape. The shape of the light shielding cover 2 will be matched to the shape of the light source. However, the shape of the light shielding cover 2 should always allow the light source 1 to be adjusted in a continuous manner, in the depth direction, within an allowed range of depths (i.e. from maximum depth to minimum depth). Similarly, multiple light emitting diodes (LEDs) could be used for omnidirectional lighting.

[0052] Figure 6 shows a cross section of the luminaire in an ambient lighting configuration. In the ambient lighting configuration, the screws 3 are only partially screwed into the threaded bores 4 of the light source 1. If the luminaire is ceiling mounted, gravity could be used to ensure the head of the screw/bolt 3 is pushed against the shielding cover 2. Alternatively, clips, or otherwise, could be used to hold the head of the screw against the shielding cover 2.

[0053] In the ambient lighting configuration, the main light output face 10 protrudes out of the light shielding cover 2. In other words, the light source is mounted at, or near, a minimum depth. The minimum depth may be defined by the adjustable mounting system. For example, the screw 3 must be screwed in by at least the minimum depth in order to hold the light source 1.

[0054] When the luminaire is in the ambient lighting configuration, the beam of light 6 is typically much broader than in the task lighting configuration. This is because the light from the main light emitting face 10 is not limited by the sides of the shielding cover and, additionally, the lateral sides of the light source can also directly illuminate the area. As such, the light source will not be as bright in the ambient lighting configuration but it will cover a larger area than in the task lighting configuration.

[0055] Similarly to the task lighting configuration, the ambient lighting configuration could be defined by the angle of the light beam 6. Generally, the ambient lighting could be defined as having a beam of light larger than 120 degrees. However, it will be appreciated that the exact angle will depend in the particular needs (e.g. depending on the height of a ceiling onto which it is mounted).

[0056] Thus, in general, the luminaire enables the user to easily change the lighting configuration by providing an adjustable mounting system which can continuously adjust the depth of the light source within the shielding cover. At a minimum depth, the user is able to choose to have an ambient lighting configuration. At a maximum depth, the user is able to choose to have a task lighting configuration. However, the continuously adjustable depth also enables the user to configure the lighting configuration to any desired configuration between the task lighting configuration and the ambient lighting configuration without being limited to pre-defined lighting configurations.

[0057] Figure 7 shows a cross section of the light shielding cover 2. The light shielding cover is provided with one or more channels 5 for the screws/bolts. A cavity 7 is defined by the inner surfaces 9 of the light shielding cover 2. The inner surfaces may be reflective, for example, by being coated with a reflective paint/material. Additionally, an opening 8 is defined at the bottom of the light shielding cover 2 which allows light through. The opening 8 is designed to enable the light source to protrude from the light shielding cover 2 through the opening.

[0058] Instead of using screws, the adjustable mounting system may comprise a gear-driven mechanism.

[0059] Figure 8 shows a cross section of a luminaire using a gear-driven mechanism. The gear driven mechanism uses a rack 13 and pinion 12 to move the light source 1 linearly in the depth direction. The rack 13 and pinion 12 convert rotational motion (e.g. manual or motor driven) into linear motion of the light source 1. This is achieved by attaching the rack 13 to the light source 1.

[0060] Figure 9 shows a luminaire using a gear-driven mechanism in the ambient lighting configuration. The rack 13 and pinion 12 shown in Figure 8 can be driven manually using the knob 14. For example, a user could rotate the knob 14, which is mechanically connected to the pinion 12 of Figure 8, and thereby cause light source 1 to move in the depth direction into, or away from, the housing 2. Alternatively, the pinion could be driven by a motor (or similar).

[0061] The gear driven mechanism could also use one or more gears mechanically connected to the pinion 12. The use of the gears could provide a more precise control of the motion of the light source 1 relative to the housing 2.

[0062] Figure 10 shows an exploded view of a luminaire with a gear-driven mechanism. As shown, the gear-driven mechanism is in this example positioned on both sides of the luminaire in order to provide further stability to the motion of the light source 1 relative to the housing 2. In this case, two knobs 14 are attached to respective pinions 12 and the respective racks 13 are attached to the light source 12. A hole 15 is provided in the housing 2 which allows the pinion to pass through the housing 2 without allowing the knob 14 through the housing 2. The pinion 12 can thus mechanically connect to the rack 13 within the housing 2 whilst the motion can be controlled from outside the housing 2.

[0063] Variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality.

[0064] The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

[0065] If the term "adapted to" is used in the claims or description, it is noted the term "adapted to" is intended to be equivalent to the term "configured to". If the term "arrangement" is used in the claims or description, it is noted the term "arrangement" is intended to be equivalent to the term "system", and vice versa.

[0066] Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. A luminaire comprising:

an elongate light source (1);
a light shielding cover (2) comprising an elongate cavity (7) for receiving the elongate light source, the cavity terminating at an opening (8) through which the elongate light source is received; and
an adjustable mounting system (3, 4, 5) for mounting the light source in the cavity in a depth direction (11), wherein the adjustable mounting system is capable of adjusting a depth of the elongate light source within the cavity, in the depth direction, in a continuous range between a minimum depth and a maximum depth.

2. The luminaire of claim 1, wherein the elongate light source comprises a main light output face (10) which is parallel with the opening of the cavity, wherein the main light output face protrudes out of the cavity through the opening when the elongate light source is mounted at the minimum depth.

3. The luminaire of claim 2, wherein when the elongate light source is mounted at the maximum depth, the main light output face protrudes out of the opening of the cavity by a lesser amount than when mounted at the minimum depth.

4. The luminaire of claim 2, wherein when the elongate light source is mounted at the maximum depth, the main light output face is flush with the opening of the cavity.

5. The luminaire of claim 2, wherein when the elongate light source is mounted at the maximum depth, the main light output face is recessed behind the opening of the cavity.

6. The luminaire of any one of claims 2 to 5, wherein the elongate light source comprises further lateral light emitting faces perpendicular to the light emitting face.

7. The luminaire of claim 6, wherein the elongate light source comprises a tube with omnidirectional light output in a plane perpendicular to a length direction of the elongate light source.

8. The luminaire of any one of claims 1 to 7, wherein the elongate light source is a linear light source.

9. The luminaire of any one of claims 1 to 8, wherein the adjustable mounting system comprises one or more screws or bolts (3) configured to pass through one or more channels (5) in the light shielding cover and adjustably attach to the elongate light source.

10. The luminaire of claim 9, wherein the elongate light source comprises one or more threaded bores (4) for receiving the one or more screws or bolts of the adjustable mounting system.

11. The luminaire of any one of claims 1 to 10, wherein an inner surface (9) of the light shielding cover, defining the cavity, is reflective.

12. The luminaire of any one of claims 1 to 11, wherein, when the elongate light source is mounted at the maximum depth, the luminaire is configured to provide an illumination field of view (6) in a plane perpendicular to a length axis of the elongate light source less than or equal to 120 degrees.

13. The luminaire of any one of claims 1 to 12, wherein, when the elongate light source is mounted at the minimum depth, the luminaire is configured to provide an illumination field of view (6) in a plane perpendicular to a length axis of the elongate light source of more than 120 degrees.

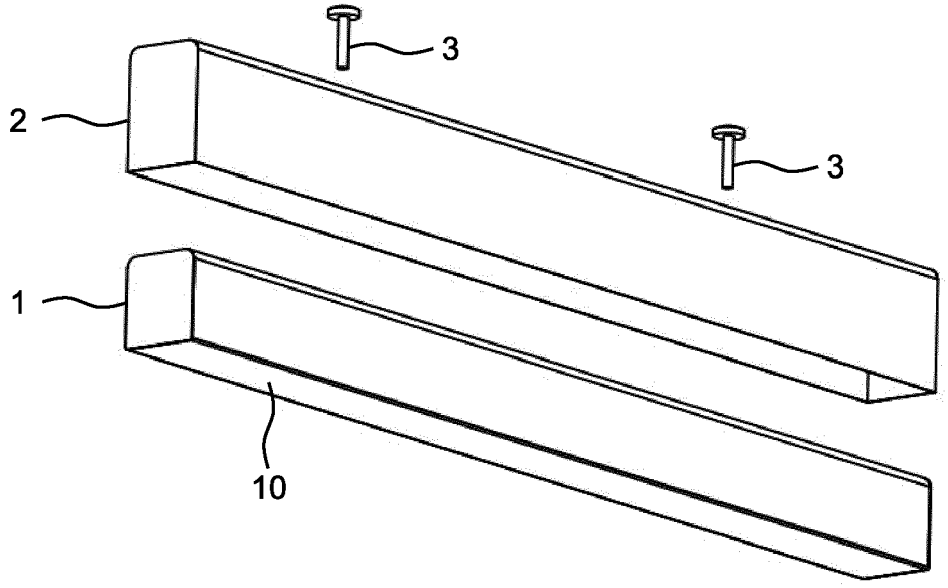

FIG. 1

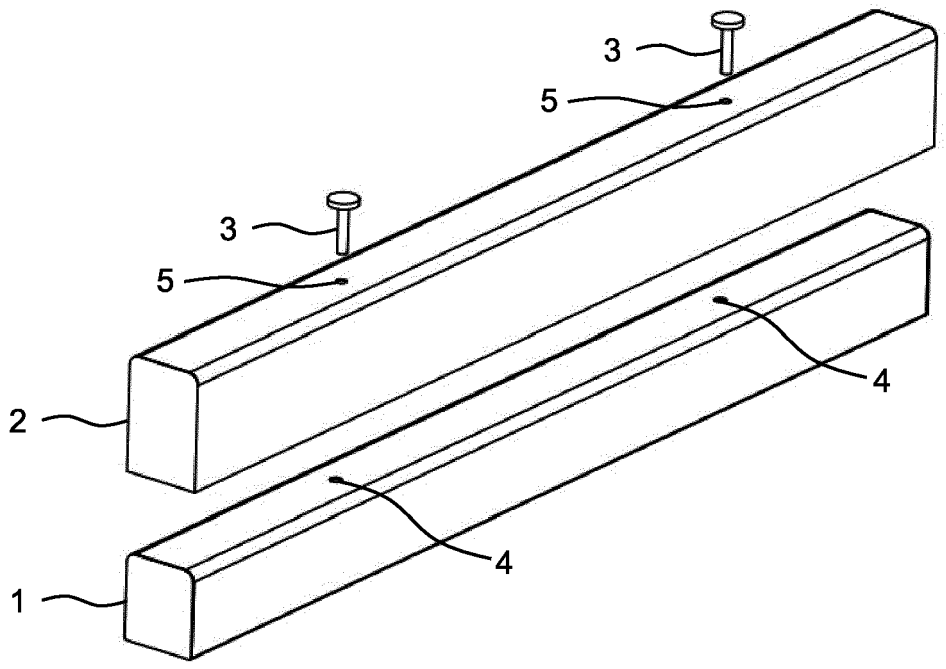

FIG. 2

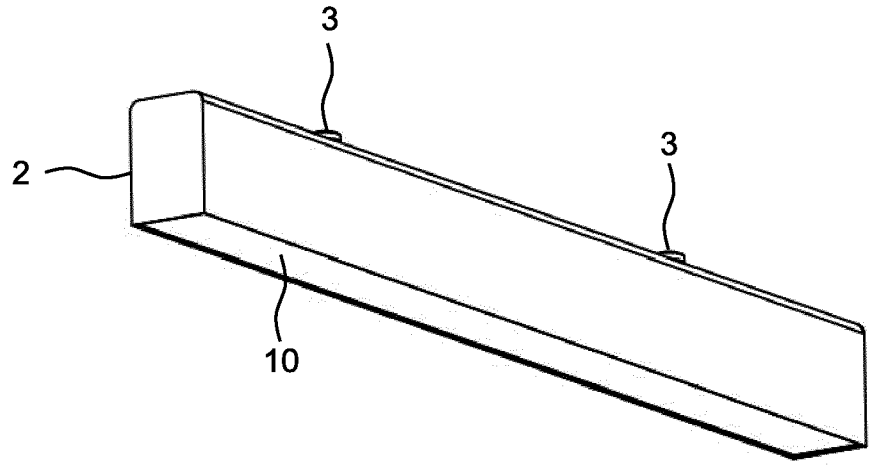

FIG. 3

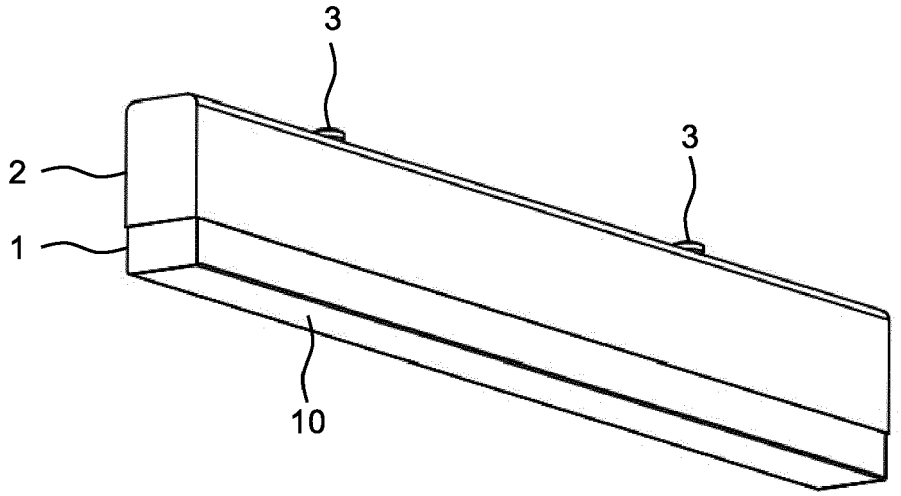

FIG. 4

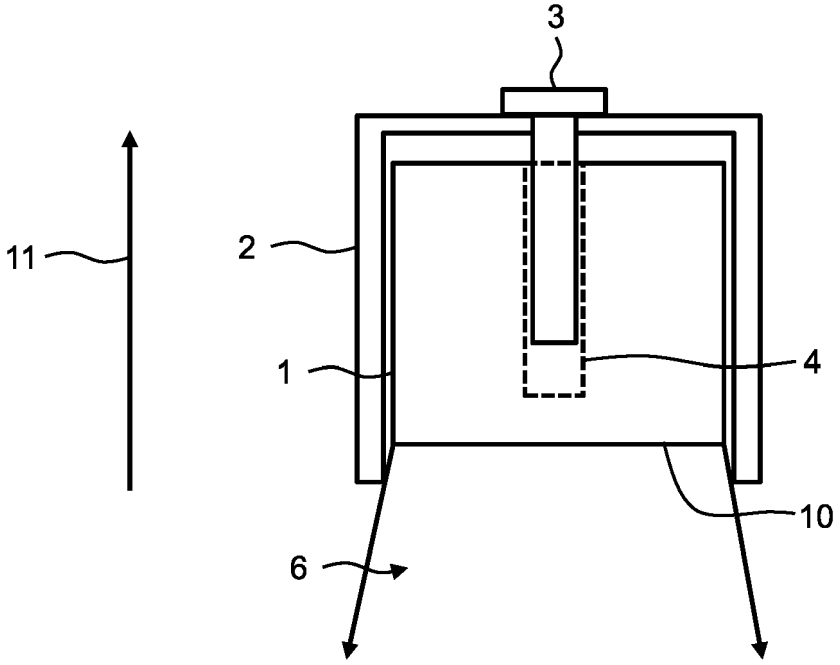

FIG. 5

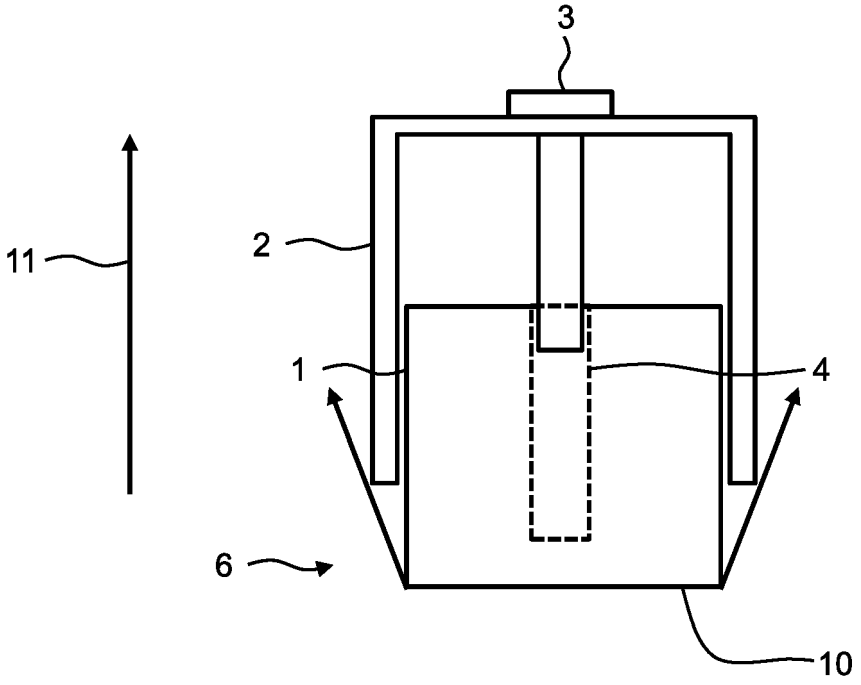

FIG. 6

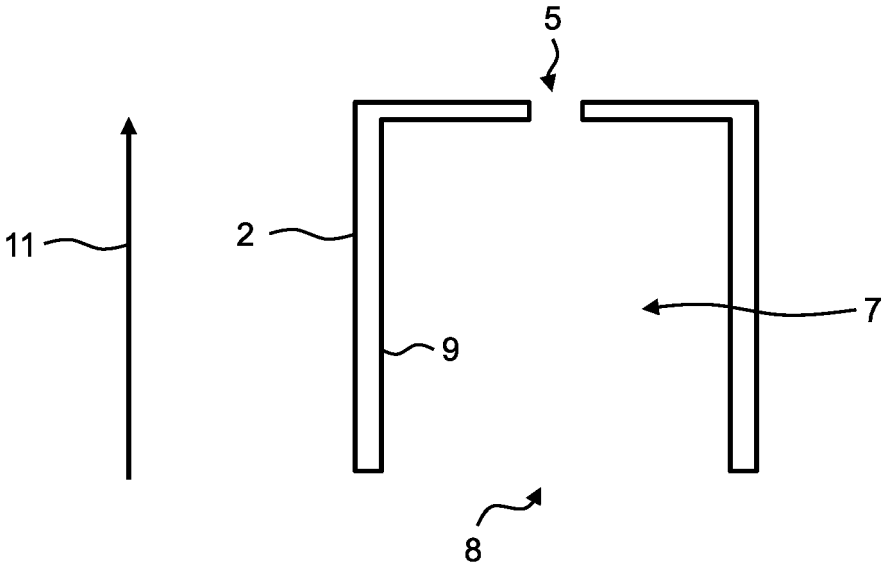

FIG. 7

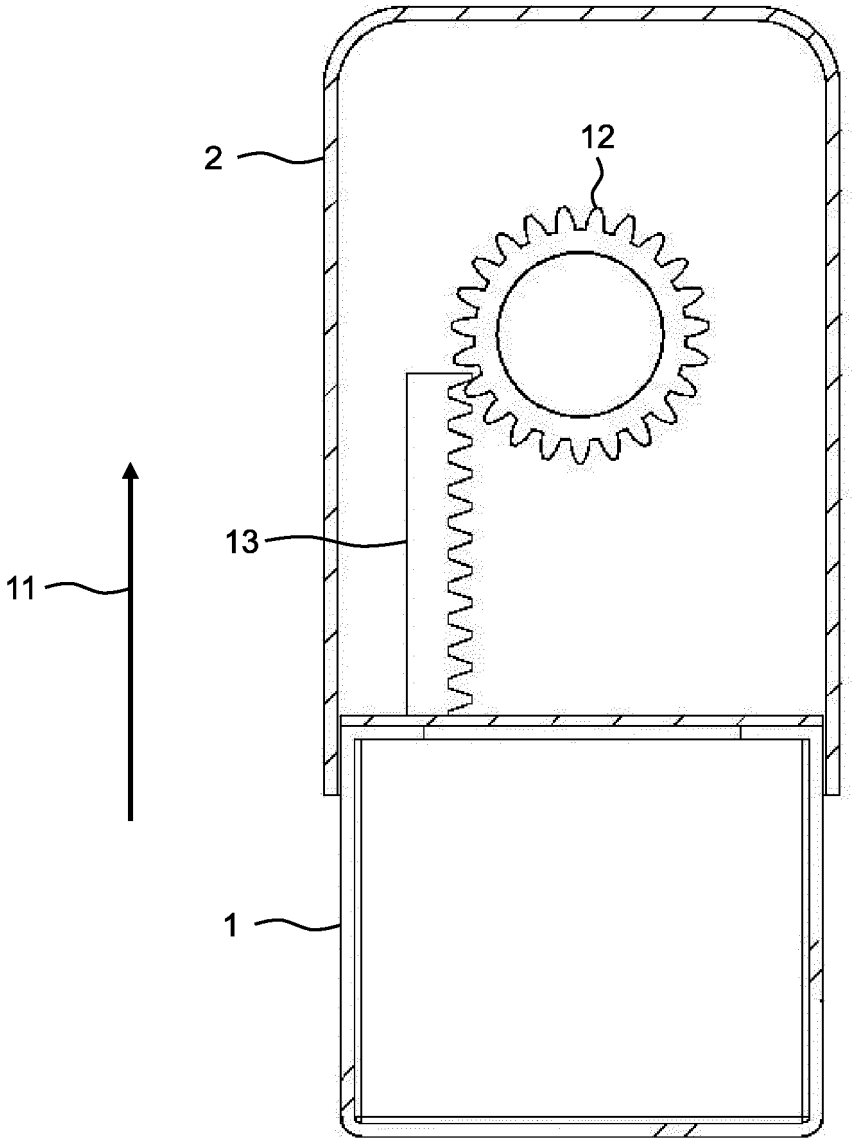

FIG. 8

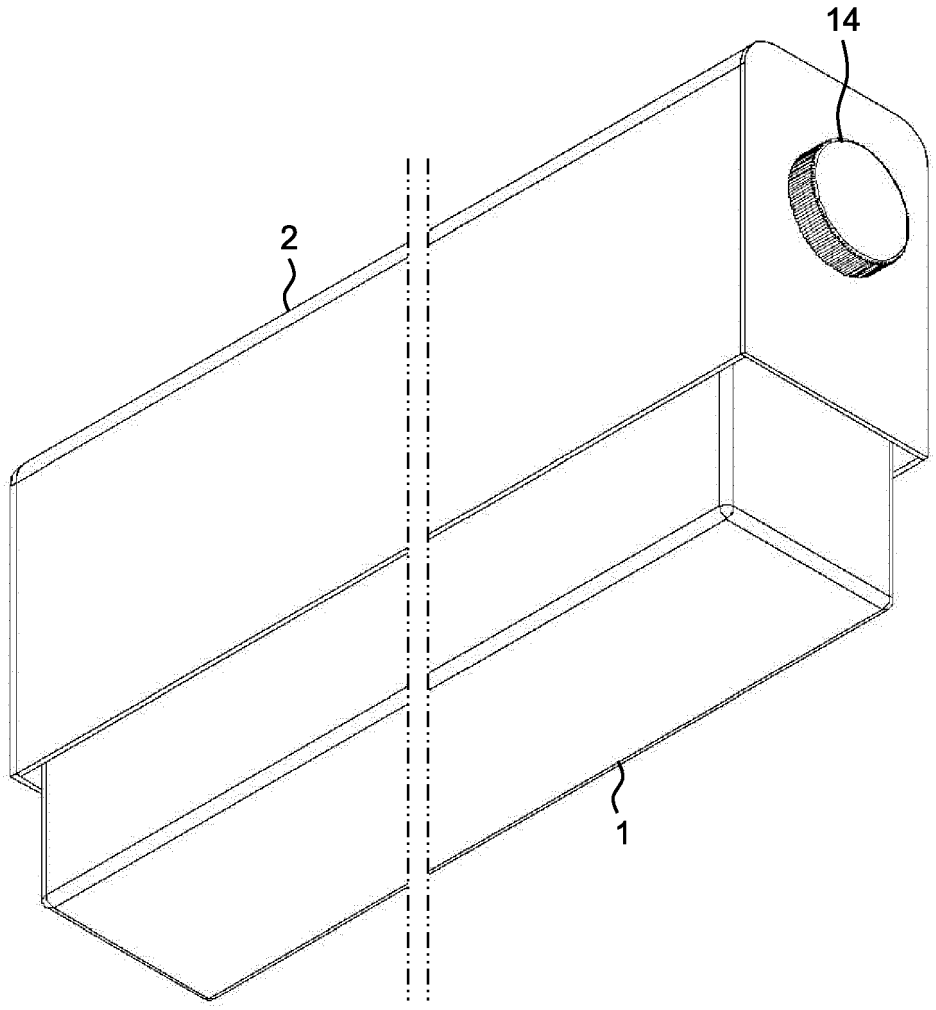

FIG. 9

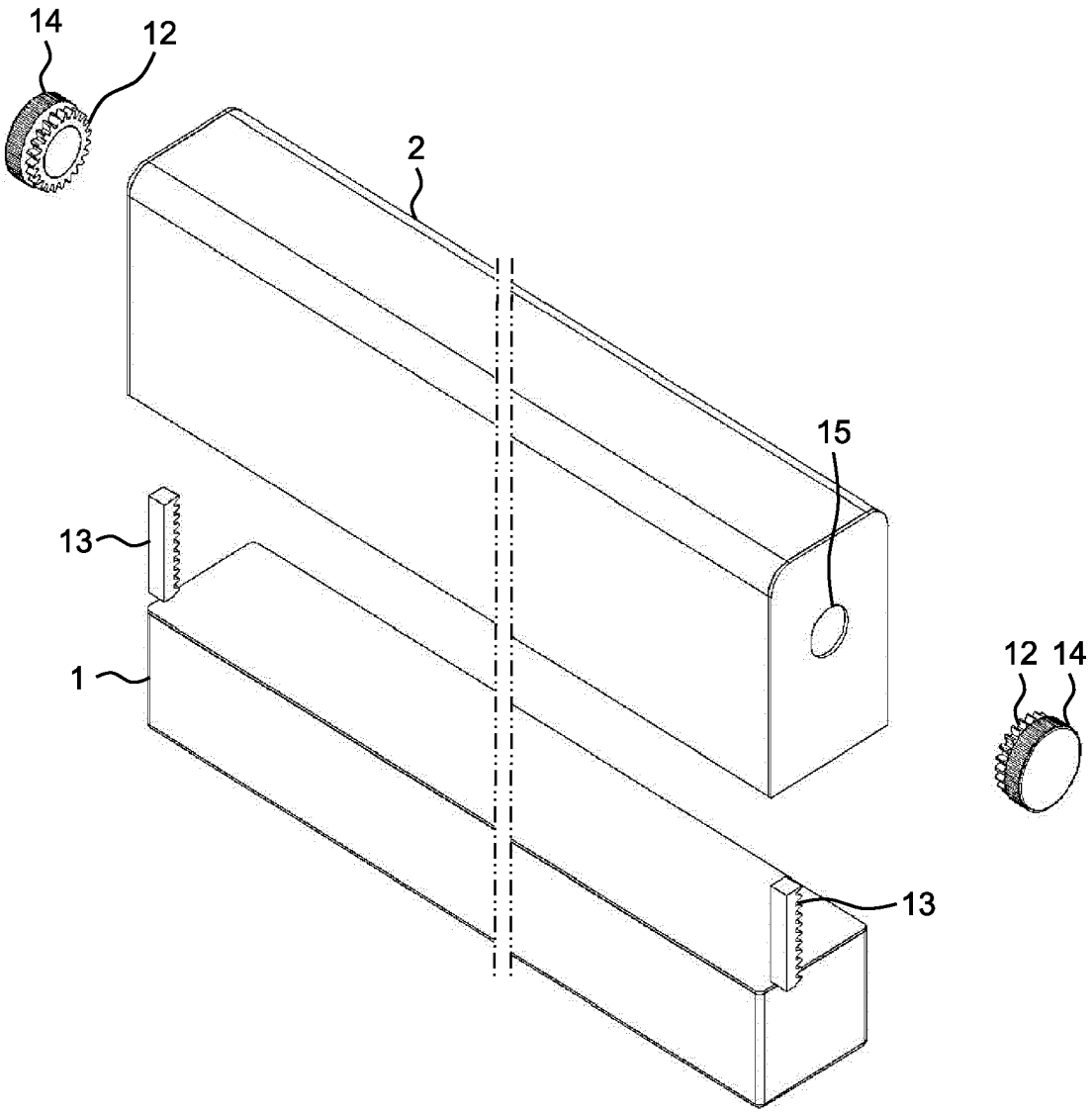

FIG. 10

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 22 19 2149

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 01/20223 A2 (BRIGHTLINE L P [US]; CERCONE SAMUEL P [US]; KATZ KATHERINE [US]) 22 March 2001 (2001-03-22) * page 8, line 11 - page 18, line 29 * * figures 1,2, 4,12 *	1-8,11, 13	INV. F21V14/02 ADD. F21Y103/00
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