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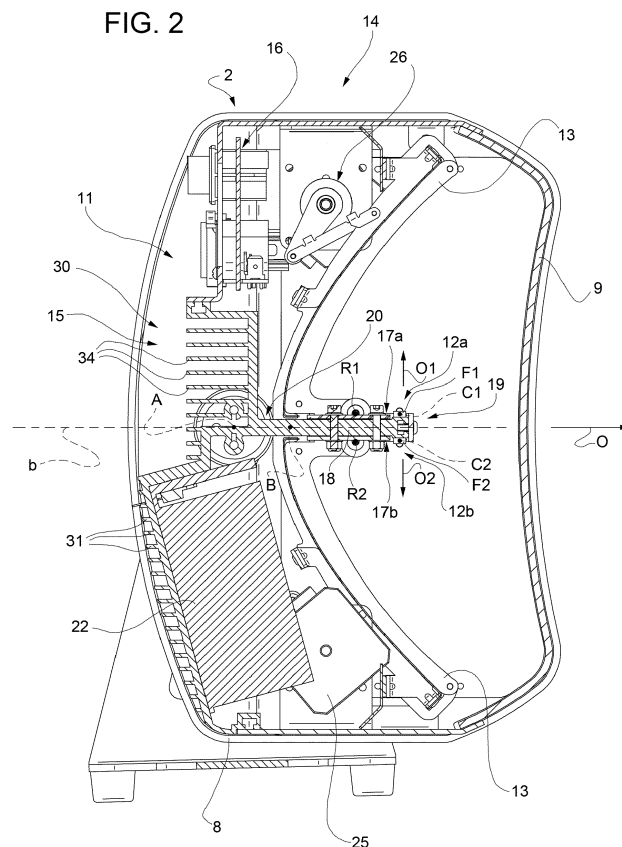
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LIGHTING DEVICE

- (57)

A lighting device for producing scenographic effects is provided with a frame (11); at least a first light source (12a; 12b) supported by the frame (11) and designed to emit a light beam; two reflectors (13), which are facing each other and are arranged so as to reflect,

at least in part, the light beam emitted by the first light source (12a; 12b); the reflectors (13) are hinged to the frame (11) and are selectively movable to enlarge and close the light beam between a maximum opening position and a minimum opening position.



Description

[0001] The present invention relates to a lighting device for producing scenographic effects.

[0002] The lighting devices of the above type are used in the entertainment industry to achieve spectacular light effects by using light beams.

[0003] In particular, pulsed-light lighting devices are normally defined as "strobe" and are mainly used in the entertainment industry to obtain the slow-motion effect. The strobe light, in fact, gives the spectator the illusion that the actor is moving in slow motion.

[0004] However, the pulsed-light lighting devices of known type are not able to achieve particular light effects different from the emission of high-intensity and high-frequency light flashes.

[0005] It is therefore an object of the present invention to provide a device, which can create new light effects.

[0006] In accordance with these purposes, the present invention relates to a lighting device for producing scenographic effects comprising a frame; at least a first light source supported by the frame and designed to emit a light beam; two reflectors, which are facing each other and are arranged so as to reflect, at least in part, the light beam emitted by the first light source; the reflectors being hinged to the frame and being movable to enlarge and close selectively the light beam between a maximum opening position and a minimum opening position.

[0007] The lighting device is thus capable of producing a pulsed light beam having a variable size.

[0008] According to a preferred embodiment of the present invention, the first light source is elongated along a first longitudinal axis.

[0009] Thanks to the elongated shape of the light source, the optical effect obtainable in the minimum opening position is even more innovative. In the minimum opening position, in fact, the beam is a highly concentrated light blade.

[0010] According to a preferred embodiment of the present invention, the light source comprises at least a plurality of LEDS or laser diodes aligned along the first longitudinal axis. The light source is therefore linear and can emit a light beam elongated along the longitudinal axis.

[0011] According to a preferred embodiment of the present invention, the light source comprises at least one collimator associated with one or more LEDS or laser diodes. The light beam emitted by each LED/laser diode or by a group of LEDS/laser diodes can therefore be captured and concentrated to increase the brightness of the lighting device.

[0012] According to a preferred embodiment of the present invention, the LEDS or laser diodes are white and/or red and/or green and/or blue. Therefore, the light beam can be white or take all the desired hues depending on the scenic requirements.

[0013] According to a preferred embodiment of the present invention, the lighting device comprises a second

light source elongated along a second longitudinal axis. The presence of a second elongated source increases the lighting power of the device.

[0014] According to a preferred embodiment of the present invention, the first longitudinal axis and the second longitudinal axis are parallel to each other. The two sources are thus elongated and parallel and together they generate a highly intense and concentrated light blade. According to a preferred embodiment of the present invention, the first light source and the second light source are respectively fastened to the two opposite faces of a supporting element of the frame extending along a main plane. The first source and the second source therefore have an opposite direction of propagation of the beam and determine the emission of an evenly distributed beam. According to a preferred embodiment of the present invention, the second light source is substantially identical to the first light source. The costs and times of the lighting device are thus reduced.

[0015] According to a preferred embodiment of the present invention, the first light source and the second light source are symmetrical with respect to the main plane. The beam generated by the sources is therefore symmetrical. According to a preferred embodiment of the present invention, the reflectors are symmetrical with respect to the main plane in the maximum opening position and in the minimum opening position. Each reflector thus reflects the beam coming from a respective light source and contributes to the generation of a symmetrical beam in the maximum and minimum opening positions.

[0016] According to a preferred embodiment of the present invention, each reflector is hinged about a respective axis parallel to the first longitudinal axis. In this way, the reflectors move uniformly around the respective light source and are able to reflect the light emitted by the light source and generate a beam suitably concentrated even during the movement of the reflectors.

[0017] According to a preferred embodiment of the present invention, each reflector has a shape defined by a generatrix parallel to the first longitudinal axis. The reflector therefore extends parallel to the linear light source to obtain a suitable projection of the beam. According to a preferred embodiment of the present invention, the generatrix extends along a curved profile, in particular along a parabolic profile. The reflector therefore extends parallel to the light source along a curved profile in order to obtain a desired reflection and concentration of the beam.

[0018] According to a preferred embodiment of the present invention, the reflectors have the same shape. In this way, the generated light beam is uniform and symmetric when the reflectors are symmetrical and the structure of the lighting device is simplified.

[0019] According to a preferred embodiment, each reflector, in the minimum opening position, has a section that approximates a parabola having a respective focus; the first source and the second source being arranged respectively in correspondence of the focus of the re-

spective reflector. In this way, in the minimum opening position there is the maximum efficiency in the spotlight thanks to the fact that the light source is arranged in the focus of the respective reflector. Consequently, in the minimum opening position, the generated light beam is very intense and concentrated so as to generate a highly intense and concentrated light blade.

[0020] According to a preferred embodiment of the present invention, the lighting device comprises at least one moving assembly for operating the reflectors. In this way, the movement of the reflectors is automated and controllable.

[0021] According to a preferred embodiment of the present invention, the lighting device comprises a control device configured to adjust the moving assembly so as to determine a simultaneous or independent operation of the reflectors. In this way, the movement of the reflectors is adjusted to obtain the desired scenic effect and to orient the beam in multiple directions. The simultaneous movement of the reflectors determines a variation of the amplitude of the beam, which is symmetric if the reflectors are symmetrical, while the independent operation of the reflectors can determine an asymmetric variation of the beam. According to a preferred embodiment of the present invention, the lighting device comprises a heat dissipator, mounted on the chassis and associated with the light source. In this way, the light source is cooled and there is no risk of overheating.

[0022] According to a preferred embodiment of the present invention, the lighting device comprises a casing, which houses the frame, the light source and the reflectors, and a support assembly configured to move the casing. The beam generated by the lighting device can thus be oriented.

[0023] According to a preferred embodiment of the present invention, the light source emits an intermittent light beam. The lighting device can thus generate a pulsed light beam.

[0024] According to a preferred embodiment of the present invention, the lighting device comprises a control device configured to adjust the intensity and the frequency of the light pulses emitted by the light source. In this way, the light source is adjusted to obtain the desired scenic effect.

[0025] Further characteristics and advantages of the present invention will become apparent from the following description of its non-limiting examples of embodiment with reference to the Figures of the accompanying drawings, wherein:

- Figure 1 is a perspective view, with parts removed for clarity's sake, of the lighting device in accordance with the present invention;
- Figures 2 and 3 are side views, with parts in section and parts removed for clarity's sake, of the lighting device of Figure 1, respectively in a first and in a second operating position;

[0026] Figures 4a and 4b schematically show the lighting device of Figure 1, respectively in two operating positions.

[0027] Figure 1 indicates with the reference number 1 a lighting device, preferably a pulsed-light device, comprising a casing 2 and a support assembly 3 configured for supporting the casing 2.

[0028] Preferably, the support assembly 3 is configured to support the casing 2 and comprises two uprights 4 (only one of them being visible in Figure 1) and a base 5 (partially visible in Figure 1) coupled to the two uprights 4.

[0029] The casing 2 is fastened to the uprights 4. The coupling between the housing 2 and the uprights 4 allows the rotation of the casing 2 with respect to an axis A substantially parallel to the base 5 to adjust the inclination of the casing 2 with respect to the uprights 4. The axis A is commonly called tilt axis.

[0030] A variant not shown provides that the supporting unit 3 is configured to allow the rotation of the base 5 about a further axis, commonly said pan axis, orthogonal to the tilt axis. Preferably, the movement of the casing 2 around the tilt and/or pan axes is regulated by a movement control device also remotely manageable, preferably through communications with the DMX protocol.

[0031] The casing 2 has an elongated shape along a longitudinal axis B.

[0032] In the non-limiting example described and shown herein, the longitudinal axis B is parallel to the tilt axis.

[0033] The casing 2 comprises a main body 6 open on both sides and two covers 7, designed to close the main body 6. The main body 6 is defined by an opaque and substantially C-shaped 8 and by a transparent wall 9 coupled to the shell 8. The wall 9 defines the projection opening of the light beam. The light beam leaving the lighting device 1 through the wall 9 has a direction of propagation O (schematically indicated by an arrow in Figure 2 and in Figure 3).

[0034] A variant not shown provides that the wall 9 is configured so as to have an optically active portion to change the optical characteristics of the light beam which passes through the wall.

[0035] With reference to Figures 2 and 3, the lighting device 1 also comprises a frame 11 (partially visible in Figures 2 and 3) coupled to the casing 2, a first light source 12a, a second light source 12b, two reflectors 13 facing each other, a moving assembly 14, a cooling assembly 15 and a control device 16.

[0036] The frame 11 is integral with the casing 2 and comprises a plurality of elements (some of which are partially visible in Figures 2 and 3) mutually coupled and configured to define a support structure for the components arranged in the casing 2, such as the first light source 12a and the second light source 12b, the reflectors 13, the moving assembly 14, the cooling unit 15 and the control device 16.

[0037] With reference to Figures 2 and 3, the first light

source 12a and the second light source 12b are arranged in the casing 2 and are mounted on the frame 11.

[0038] The first light source 12a is elongated along a first longitudinal axis C1 and the second light source 12b is elongated along a longitudinal axis C2.

[0039] The first light source 12a and the second light source 12b are substantially linear light sources capable of generating a light beam distributed along the respective longitudinal axis C1 and C2.

[0040] The longitudinal axis C1 and the longitudinal axis C2 are parallel to each other and, preferably, are also parallel to the longitudinal axis B along which the casing 2 extends.

[0041] The first light source 12a and the second light source 12b are preferably fastened to two opposite faces 17a and 17b of a supporting plate 18 of the frame 11, which is elongated along the longitudinal axis B of the casing 2 and extends along a main plane b.

[0042] Preferably, the first light source 12a and the second light source 12b are fastened to the two opposite faces 17a and 17b at the free end 19 of the supporting plate 18.

[0043] The supporting plate 18, in fact, extends from the frame 11 and has a free end 19 and an end 20 coupled to further support elements of the frame 11. The shape of the supporting plate 18 allows arranging the first light source 12a and the second light source 12b within the space defined by the opposite reflectors 13.

[0044] Preferably, the first light source 12a and the second light source 12b are symmetrical with respect to the main plane b of the supporting plate 18.

[0045] The first light source 12a and the second light source 12b are fastened to the supporting plate so that the light beam generated by them has same propagation direction but opposite sense.

[0046] Figures 2 and 3 indicate with the arrow O1 the direction of propagation of the beam generated by the first light source 12a and with the arrow O2 the direction of propagation of the beam generated by the second light source 12b. The direction of propagation O1 and the direction of propagation O2 are substantially aligned and have opposite sense.

[0047] Preferably, the first light source 12a and the second light source 12b are configured to emit an intermittent light beam to generate a pulsed light beam.

[0048] Preferably, the first light source 12a and the second light source 12b respectively comprise at least one row of LEDS (partially visible in the accompanying Figures), respectively aligned along the longitudinal axis C1 and the longitudinal axis C2.

[0049] Each LED is configured to emit a light beam.

[0050] The LEDS are white and/or red and/or green and/or blue and can be combined and adjusted so as to obtain a beam having the desired colouring depending on the scenic requirements. For example, the first light source 12a and the second light source 12b can be adjusted to emit a monochrome or multicolour pulsed beam or to generate a beam that changes colour to generate

a sequence of white and coloured flashes.

[0051] The LEDS may also be of the COB (Chip on Board) type.

[0052] The first light source 12a and the second light source 12b are fed by a feeder 22, which, as explained in detail hereinafter, is regulated by the control device 16.

[0053] A variant not shown provides that each LED is associated with a respective lens.

[0054] A further variant not shown provides that each LED or group of LEDS is associated with a respective optical collimator. In this way, the brightness of the light beam is increased.

[0055] A further variant provides that the first light source 12a and the second light source 12b are arranged side by side along a longitudinal axis parallel to the longitudinal axis B of the casing 2.

[0056] A variant not shown provides that the first source and the second light source 12b respectively include at least one row of laser diodes, respectively aligned along the longitudinal axis C1 and the longitudinal axis C2. The laser diodes can be white and/or red and/or green and/or blue.

[0057] A further variant not shown provides that the first light source 12a and the second light source 12b are respectively defined by a xenon lamp.

[0058] A variant not shown provides that the lighting device comprises a single light source defined, for example, by a row of LEDS extending along a longitudinal axis preferably parallel to the longitudinal axis B of the casing 2. The light source could also be defined by a xenon lamp or by a row of laser diodes.

[0059] The reflectors 13 are facing each other and arranged on opposite sides with respect to the plane b of the supporting plate 18 B of the casing 2.

[0060] The reflectors 13 are hinged to the frame 11 so as to intercept the light beam emitted by the first light source 12a and by the second light source 12b.

[0061] In the non-limiting example here described and shown, the reflectors 13 are respectively hinged to the opposite faces 17a and 17b of the supporting plate 18 of the frame 11.

[0062] In particular, the reflectors 13 are hinged at a central portion of the supporting plate 18 of the frame 11.

[0063] In other words, the reflectors 13 are hinged to the frame 11 respectively behind the first light source 12a and the second light source 12 with respect to the direction of propagation of the whole beam O.

[0064] The reflectors 13 are movable to selectively enlarge and close the light beam between a maximum opening position (configuration of Figure 2) and a minimum opening position (configuration of Figure 3).

[0065] Each reflector 13 is hinged about a respective axis of rotation R1, R2.

[0066] The axes of rotation R1 and R2 are respectively parallel to the longitudinal axes C1 and C2.

[0067] Preferably, the reflectors 13 have the same shape and are symmetrical with respect to the supporting plate 18 and to the longitudinal axis B.

[0068] More preferably, each reflector 13 has a shape defined by a respective generatrix parallel to the longitudinal axis C1 or C2 along a curved profile, in particular along a parabolic profile.

[0069] In particular, in the minimum opening position (configuration of Figure 3), the section of each reflector 13 approximates a parabola having a respective focus F1 and F2.

[0070] The first light source 12a and the second light source 12b are respectively arranged substantially at said focuses F1 and F2.

[0071] A variant not shown provides that the reflectors 13 have a shape defined by a hyperbolic profile.

[0072] A further variant not shown provides that the reflectors 13 have a profile such as to determine an arbitrary distribution of the reflected light beam.

[0073] In use, the light beam emitted by the first light source 12a and by the second light source 12b is reflected by the reflectors 13 and directed out of the lighting device 1 through the transparent wall 9.

[0074] The beam emitted by the lighting device 1 is thus composed of the sum of the light beams emitted by the first light source 12a and by the second light source 12b and reflected by the reflectors 13.

[0075] The position of the reflectors 13 therefore influences the opening of the light beam emitted by the lighting device 1. Here and below, the opening of the beam means the dihedral angle between two planes where the light beam has a halved brightness with respect to the maximum brightness.

[0076] The moving assembly 14 comprises two actuators 24, each of which is configured to move a respective reflector 13.

[0077] In particular, each actuator 24 comprises a motor 25 and a movement transmission mechanism 26, preferably of the rod-crank type.

[0078] Preferably, the motor 25 is an electric motor of the stepper type.

[0079] The activation and the adjustment of the moving assembly 14 are entrusted, as described hereinafter, to the control device 16.

[0080] The cooling assembly 15 comprises a heat dissipator 30, mounted on the frame 11 behind the light source 12 and the reflectors 13 with respect to the direction of propagation of the beam O. The heat dissipator 30 is connected to the supporting plate 18 of the light source 12 and to the feeder 22 and is defined by a plurality of cooling blades 31 designed to define an adequate heat exchange surface. The control device 16 is configured to adjust the first light source 12a and the second light source 12b and to regulate the movement of the reflectors 13. In the non-limiting example herein described and shown, the control device 16 is a control board.

[0081] In particular, the control device 16 is configured to adjust the feeder 22 so as to vary the intensity, duration and frequency of the light pulses emitted by the first light source 12a and by the second light source 12b.

[0082] The frequency, duration and intensity of the light

pulses are adjusted according to the scenic requirements and to the desired scenographic effects.

[0083] In particular, the frequency of the light pulses can vary from 0 to 30 flashes/s with a pulse duration varying between 0-1000 ms.

[0084] The frequency of the pulses can be lowered and raised in accordance with a ramp.

[0085] A variant provides a random variation of the frequency and the duration of the pulses.

[0086] A further variant provides that, in terms of intensity, frequency and duration, the LEDS are controlled singularly or in groups to obtain particular scenic effects.

[0087] Moreover, the first light source 12a and the second light source 12b may be differently configured to have different characteristics, for example in terms of colour, intensity, frequency and duration of the pulses.

[0088] A variant provides that the frequency and/or intensity of the light pulses may vary depending on the position of at least one of the reflectors 13. The control device 16 is also configured to simultaneously or independently adjust the movement of the reflectors 13.

[0089] The movement of the reflectors 13 determines a variation of the opening of the light beam.

[0090] In the maximum opening position shown in Figure 2, the reflectors 13 are arranged at the maximum distance from one another and the lighting device 1 defines an open light beam. In this position, the emission of the intermittent light pulses creates a strobe beam to obtain the typical "slow-motion" effect.

[0091] In the non-limiting example herein described and shown in the maximum opening position, the light beam has an opening α between 100° and 120°, preferably 110° as shown in Figure 4a.

[0092] In the minimum opening position shown in Figure 3, the reflectors 13 are arranged at the minimum distance from one another and the lighting device 1 defines a highly concentrated and narrow pulsed light beam. In this way, it generates a highly concentrated light blade, which can be well perceived on the scene.

[0093] In the non-limiting example herein described and shown in the minimum opening position, the light beam has an opening α comprised between 6° and 10°, preferably about 8°, as shown in Figure 4b.

[0094] The passage from the minimum opening position to the maximum opening position and vice versa can be carried out by simultaneously or independently moving the reflectors. The simultaneous movement causes a variation of the amplitude of the beam that preserves the symmetry of the beam of light.

[0095] The independent movement can determine an intentionally asymmetric variation of the amplitude of the beam, for example due to the scenic requirements.

[0096] The lighting device 1 can be powered by batteries or connected to the electrical power network.

[0097] The control device can adjust the movement of the reflectors 13 and of the light sources 12a and 12b even remotely by using DMX or wireless signals.

[0098] The control device may also be configured so

as to adjust the activation and/or intensity and/or frequency and/or duration of the light pulses on the basis of acoustic signals coming from sensors or from triggering devices which are able to follow the rhythm of the music or of other light sources, or the heart beat or other biosignals of one or more actors (measured for example by means of a wrist detector) or on the basis of one or more external signals of the IFTTT (If this then that) type.

[0099] Finally, it is evident that the lighting device herein described may be subject to modifications and variations without departing from the scope of the appended claims.

Claims

1. A lighting device for producing scenographic effects; the lighting device (1) comprising a frame (11); at least a first light source (12a; 12b) supported by the frame (11) and able to emit a light beam; two reflectors (13), which are facing each other and are arranged so as to reflect, at least in part, the light beam emitted by the first light source (12a; 12b); the reflectors (13) being hinged to the frame (11) and being movable to selectively enlarge or close the light beam between a maximum opening position and a minimum opening position.
2. A lighting device according to claim 1, wherein the first light source (12a; 12b) is elongated along a first longitudinal axis (C1; C2).
3. A lighting device according to claim 2, wherein the first light source (12a; 12b) comprises a plurality of LEDs or laser diodes aligned along the first longitudinal axis (C1; C2).
4. A lighting device according to claim 3, wherein the first light source (12a; 12b) comprises at least a collimator associated to one or more LEDs or laser diodes.
5. A lighting device according to claim 3 or 4, wherein the LEDs or laser diodes are white and/or red and/or green and/or blue.
6. A lighting device according to anyone of the preceding claims, comprising a second light source (12b; 12a) elongated along a second longitudinal axis (C2; C1).
7. A lighting device according to Claim 6, wherein the second light source (12b; 12a) is substantially identical to the first light source (12a; 12b).
8. A lighting device according to claim 6 or 7, wherein the first longitudinal axis (C1; C2) and the second longitudinal axis (C2; C1) are parallel.
9. A lighting device according to claim 7 or 8, wherein the first light source (12a; 12b) and the second light source (12b; 12a) are respectively fastened to two opposed faces (17a; 17b) of a supporting element (18) of the frame (11) extending along a main plane (b).
10. A lighting device according to claim 9, wherein the first light source (12a; 12b) and the second light source (12b; 12a) are symmetrical with respect to the main plane (b).
11. A lighting device according to claim 9 or 10, wherein the reflectors (13) are symmetrical with respect to the main plane (b) in the maximum opening position and in the minimum opening position.
12. A lighting device according to any one of claims from 2 to 11, wherein each reflector (13) is hinged to the frame (11) about a respective rotation axis (R1; R2) which is parallel to the first longitudinal axis (C1; C2).
13. A lighting device according to any one of claims from 2 to 12, wherein each reflector (13) has a shape defined by a generatrix, which is parallel to the first longitudinal axis (C1; C2).
14. A lighting device according to claim 12, wherein the generatrix extends along a curved profile, in particular along a parabolic profile.
15. A lighting device according to any one of the preceding claims, wherein the reflectors (13) have the same shape.
16. A lighting device according to any one of the preceding claims, wherein each reflector (13), in the maximum opening position, has a section which is proximate to a parabola having a focus (F1; F2); the first light source (12a; 12b) and the second light source (12b; 12a) being respectively arranged in the focus (F1; F2) of the respective reflector (13).
17. A lighting device according to any one of the preceding claims, comprising at least a moving assembly (14) for moving the reflectors (13).
18. A lighting device according to any one of the preceding claims, comprising a control device (16) configured to regulate the moving assembly (14) to move the reflectors (13) simultaneously or independently.
19. A lighting device according to any one of the preceding claims, comprising a heat dissipator (20) coupled to the frame (11) and associated at least to the first light source (12a; 12b).
20. A lighting device according to anyone of the preceding

ing claims, comprising a casing (2), which houses the frame (11), the first light source (12a; 12b) and the reflectors (13), and a support assembly (3) configured to move the casing (2).

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- 21.** A lighting device according to any one of the preceding claims, wherein the first light source (12a; 12b) emits a blinking light beam.

- 22.** A lighting device according to claim 21, comprising a control device (16) configured to regulate the intensity and the frequency of the light pulses emitted by the first light source (12a; 12b).

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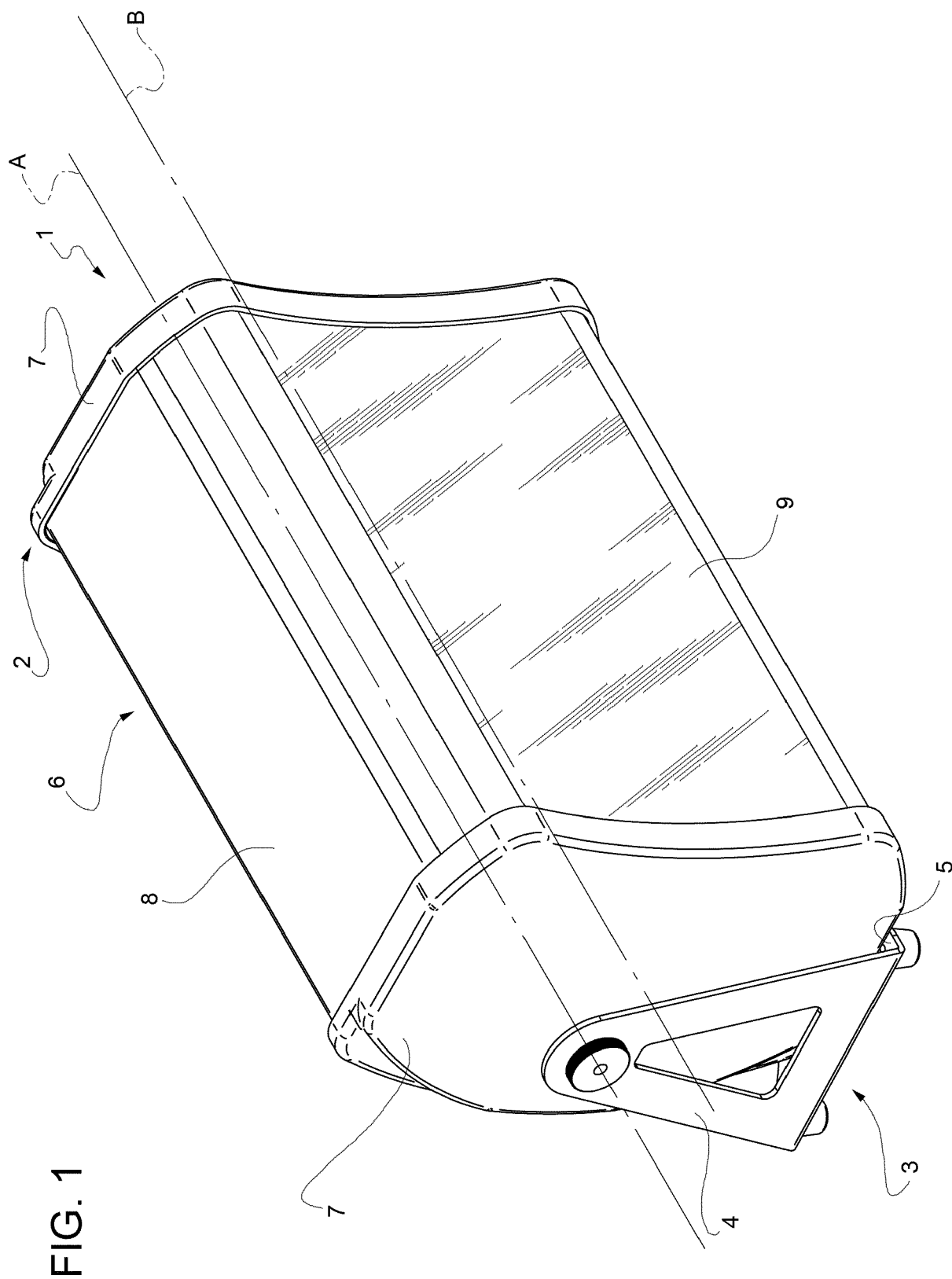


FIG. 2

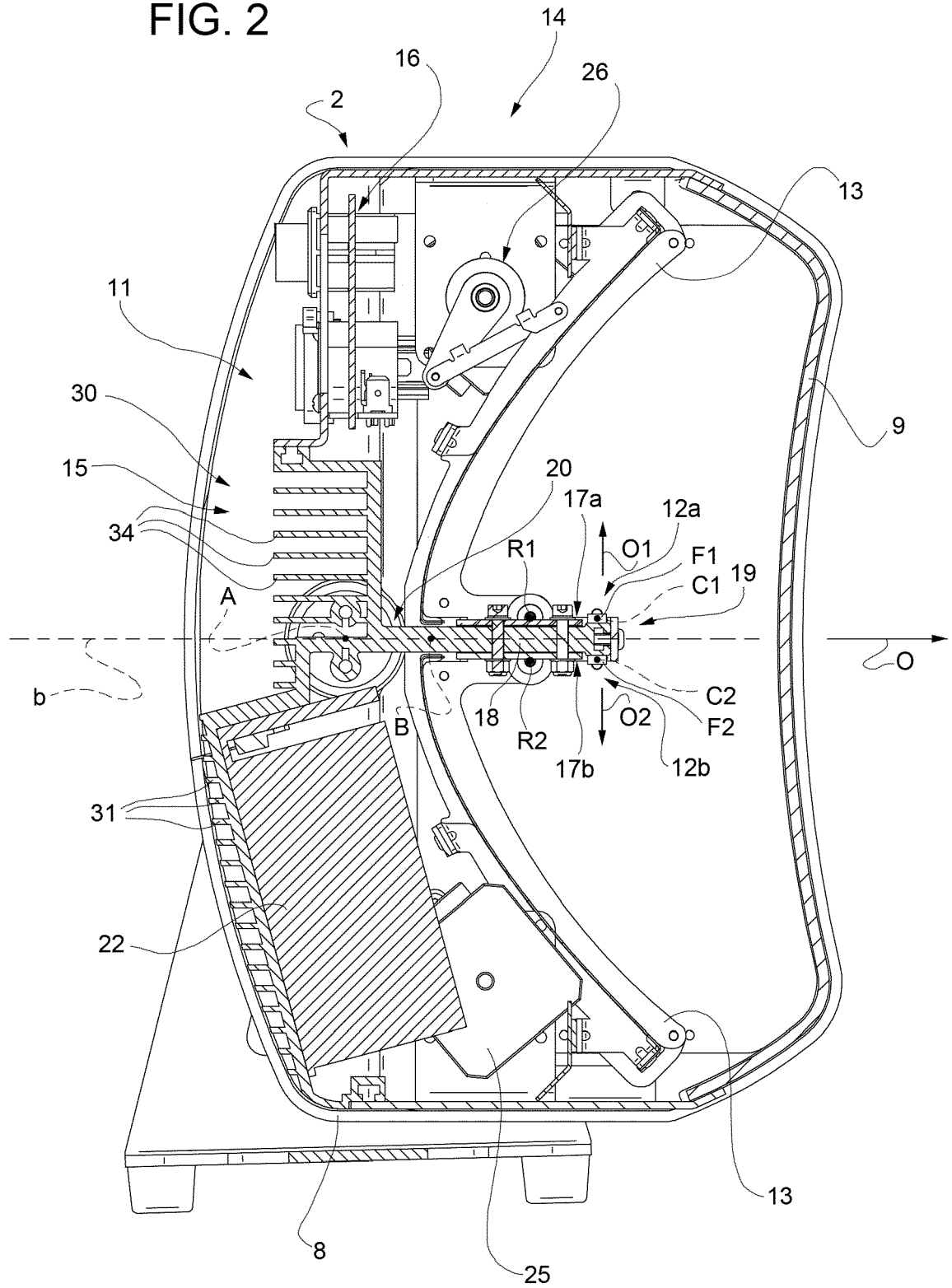


FIG. 3

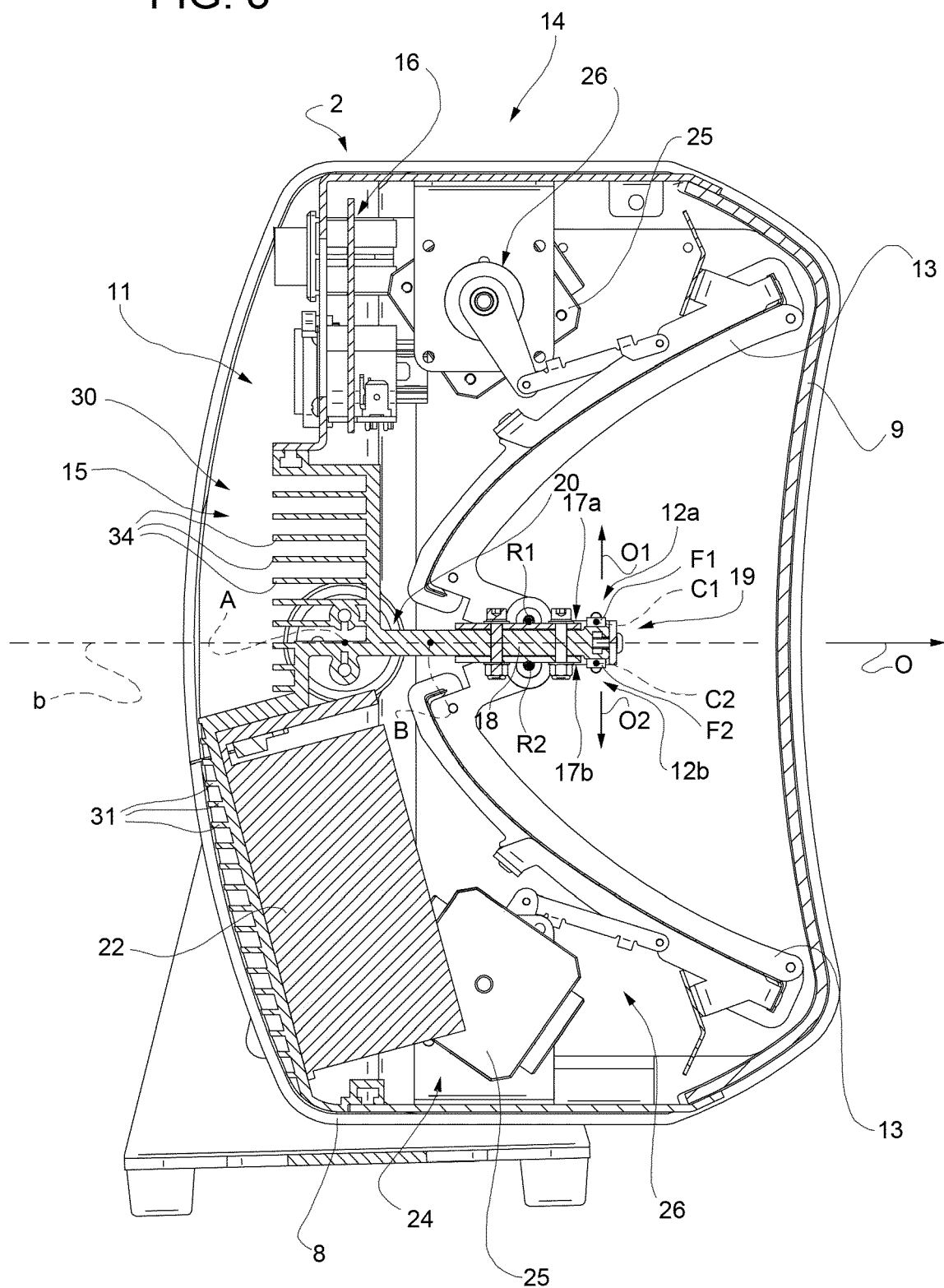


FIG. 4a

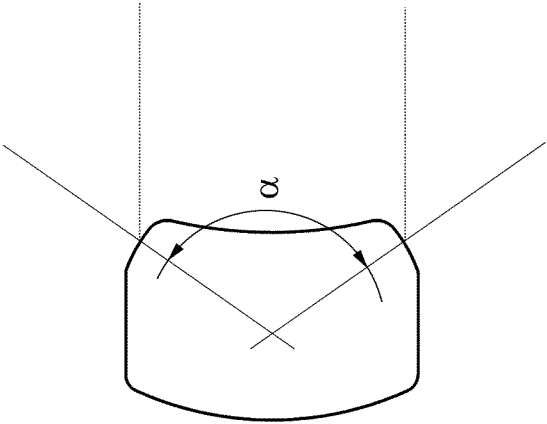
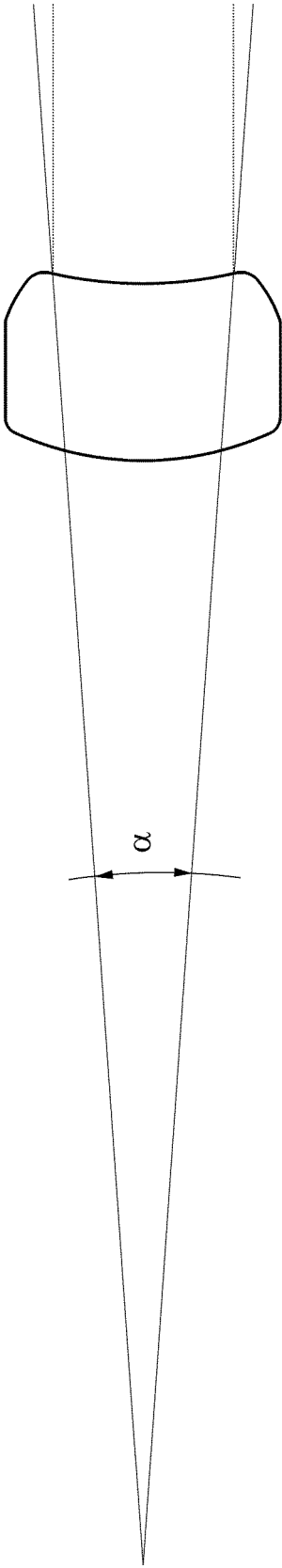


FIG. 4b





EUROPEAN SEARCH REPORT

Application Number
EP 16 20 2086

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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Y	* the whole document *	3-11,19, 21,22	F21V14/04 F21V7/00
X	EP 2 390 558 A1 (IAG GROUP LTD [CN]) 30 November 2011 (2011-11-30)	1,15, 17-20	ADD. F21Y115/10
Y	* paragraph [0015] - paragraph [0024]; figures 1-3 *	21,22	F21V7/06 F21W131/406
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X	US 5 539 622 A (ISHIKAWA TUYOSHI [JP]) 23 July 1996 (1996-07-23)	1-3, 12-15, 17-22	TECHNICAL FIELDS SEARCHED (IPC)
	* column 26, line 19 - column 27, line 67; figures 34-37 *		F21S
	* column 12, line 28 - column 15, line 16; figures 14-16 *		F21V
			F21W
			F21Y
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	* paragraph [0002] - paragraph [0007]; figures 1-3 *		
	* paragraph [0016] *		
	* paragraph [0026] *		
	-/--		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 January 2017	Examiner Thibaut, Arthur
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 16 20 2086

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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