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Amended claims in accordance with Rule 137(2) EPC.

(54) **LIGHT DEVICE FOR VEHICLE**

(57) A light device for vehicle comprises an emitting module (30), a light condensing lens (20) and a light guide (10), the light guide (10) devised of a hollow column defining a light incident side and a light output side away from each other, both sides respectively faced to the emitting module (30) and the light condensing lens (20), and the hollow column in help of the light guide (10) avoiding material degradation phenomena and structure deforming problem and prolonging the life usage compared with other materials such as solid-transparent plastic or silicone.

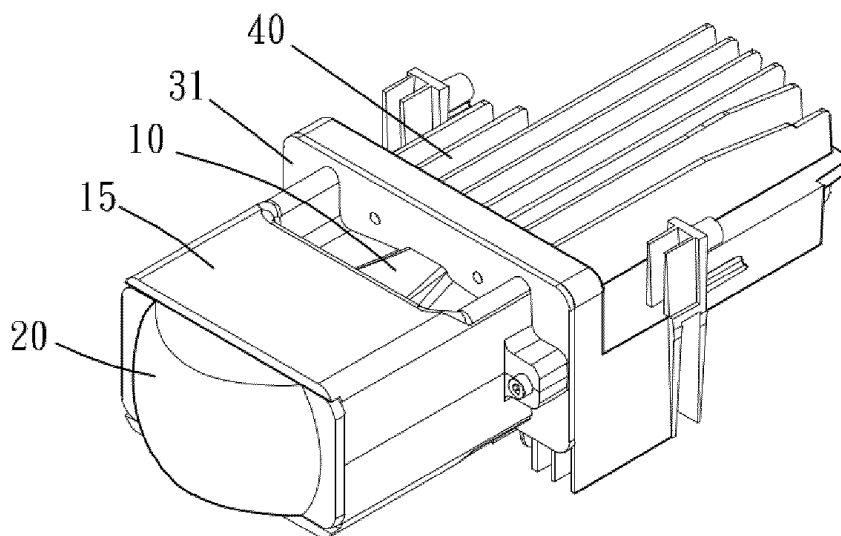


Fig. 1

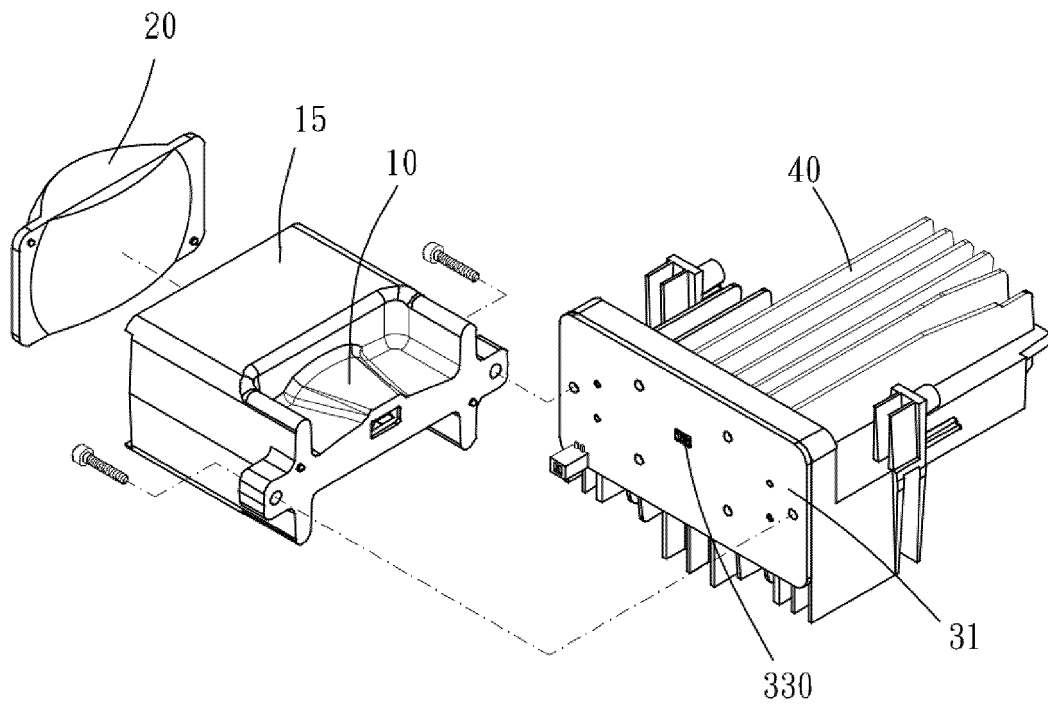


Fig.2

Description**BACKGROUND OF THE INVENTION****1. Field of the Invention**

[0001] This invention pertains to a light device for vehicle; especially to a light source capable of casting a desirable illumination for the automobile.

2. Description of the Related Art

[0002] Recently, in compliance with the traffic regulation, the vehicles are requested to deploy main beams, low beams, turn signals at both sides of front along with the prevailing daytime running lights (DRL) in the limited areas for headlight installation. Along with the changeable vehicle outlooks and a growing number of headlights items, the spaces for each lamps have largely been reduced which also shrinks the illumination areas. Even so, the headlight installation still need to conform to the regulatory norms on the light luminance, distribution pattern and the irradiation angle for the sake of driving safety.

SUMMARY OF THE INVENTION

[0003] This invention pertains to a light device for vehicle capable of distributing an elongated narrow pattern with desirable luminance.

[0004] To achieve this goal, the light device for vehicle comprises an emitting module, a light condensing lens and a light guide. The light guide forms a hollow column defining one light incident side and one light output side away from each other, and each sides are respectively deployed with the emitting module and the light condensing lens.

[0005] Besides, the light guide has a housing consisted of at least two chassis, and each of the chassis has a number of adjacent side walls.

[0006] The hollow column of light guide provide illumination guidance having an interior geometrically shaping the light boundary for casting an appropriate distribution pattern and waiving the element degradation caused from overheated. Furthermore, the devise of a solid column deployed in the light guide is as well a recommendation providing for a light blending purpose or as a structural support avoid a overheated deformation.

[0007] The light device for vehicle may be equipped with a modularized construct. The emitting module may be deployed with only one emitting element having quantity in correspondence with that of the light guide and that of the light condensing lens, or the emitting module may be arranged with a main source located at the center bilaterally arranged with two secondary elements for light compensation in order to generate an elongated distribution pattern and to provide a sufficient illumination in a confined spaces of the light device for vehicle. Furthermore, the emitting element may be electrically connected

to a dimmer for adjusting the light intensity compensation.

BRIEF DESCRIPTION OF THE DRAWINGS**5 [0008]**

Fig. 1 illustrates a perspective view of low beam for vehicle.

Fig. 2 illustrates an explosive view of the device for vehicle shown in Fig. 1.

Fig. 3 illustrates a cross-sectional view of the hollow column of the light guide.

Fig. 4 illustrates another perspective view of the light device for vehicle in another embodiment.

Fig. 5 illustrates another explosive view of the device for vehicle shown in Fig. 4.

Fig. 6 illustrates another cross-sectional view of the hollow column of the light guide in Fig. 4

Fig. 7 illustrates another cross-sectional view of the hollow column of the light guide in Fig. 4.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0009] Below description proceeds following a direction of headlight projection for a better understanding by the technicians in related arts; to be more specifically elaborate the invention, construction and achievement, the drawings will be mentioned along with the embodiment as below.

[0010] Fig. 1 to Fig. 3 illustrate a low beam device for vehicle is arranged, from front to rear, with a light condensing lens 20, a housing 15 integrated with a light guide 10, an emitting module 30 and a radiating fins 40. The light guide 10 has an interior of hollow column applied with a reflective film, and the housing 15 and the light guide form into an integral deployable for the light condensing lens 20 and the emitting module 30. And the radiating fins 40 is perpendicular to the emitting module 30.

[0011] In this embodiment, the emitting module 30 has a base 31 to accommodate an emitting elements 330, and the light guide 10 has an hollow interior defining a light incident side and a light output side away from each other. The emitting module 30 is mounted on the light output side and the light condensing lens 20 is deployed nearby the light incident side and welded on the housing 15 by way of ultrasonic. Besides, the hollow interior of light guide converges in shape from the light incident side toward the light output side, and both of them are respectively responsible for the light intensity and the distribution pattern. The light beam outputs from the emitting elements 330 having been concentrated and modified by the light condensing lens 20 in exchange for a uniformity light intensity in order to project out a desirable distribution pattern.

[0012] By modularizing the emitting module 30 and the light guide 10 into a light device of miniature is adaptable

for a light compensation or for other illumination purposes.

[0013] As shown in Fig. 4 to Fig. 7, the light device for vehicle with differences from the previous embodiment lie in the emitting module 30 comprising a main emitting element 332 and two secondary emitting elements 331, 333 bilaterally arranged beside the main emitting element 332. Three emitting elements 331, 332, 333 are disposed at equal distance on the base 31 in an elongated formation about 2 cm. The light condensing lens 20 has a quantity in correspondence with that of the emitting elements to be disposed at relative positions and arranged in alignment. In this embodiment, the light guide 10 includes an upper chassis 11 and a lower chassis 12, and the upper chassis 11 and the lower chassis 12 can be assembled into a hollow column by the connection of their linking edges where is deployed with a plurality of protruding or indenting side walls 111, 112, 113, 121, 122, 123, 111 pairing with 121, 112 pairing with 122, and 113 pairing with 123. The hollow column has a quantity and position in correspondence with that of the emitting elements. The side walls 111, 112, 113, 121, 122, 123, applied with metallic reflective film, constitute the hollow column and define a light incident side and a light output side. The emitting elements 331, 332, 333 and the curve surfaces of the light condensing lens 20 respectively direct to the light incident side and the light output side of the hollow column. The light condensing lens 20 concentrates and modifies the propagated from the light output side before projecting out a distribution pattern.

[0014] By deploying a main emitting element and two bilateral emitting elements for light compensation in order to generate an elongated distribution pattern can not only satisfy the illumination intensity but also reduce the installation area of light device for vehicle. Furthermore, the employment of a hollow column enables the light guide not only guide the light source propagated from the emitting module to process light uniformity and shape the distribution pattern of desire by the internal contour of side walls, but also prolong the life time for usage compared with the other adoption of materials such as solid-transparent plastic or silicone.

[0015] In this embodiment as shown in Fig. 6 and Fig. 7, the hollow column of the light guide forms a closed cylindrical deployed in front of the emitting module 30, wherein the surfaces of the upper and lower chassis 11, 12 is respectively divided into linking edges and side walls. The reflective film may be applied to the side walls or applied together with the adjacent surfaces of the upper chassis 11 and the lower chassis 12. Moreover, the linking edges and the side walls of the light guide share the same boundary for sealing possible exposure, and the chassis may be made of a heat dispersion material avoiding an overheated module.

[0016] In this embodiment, the upper chassis 11 and the lower chassis 12 respectively protrude forward holding panels 13, 14 deployable for the light condensing lens 20 in help of dwindling the required elements and sim-

plifying the assembly steps.

[0017] In this embodiment, the main emitting element 332 is a double-chip LED facing to the light guide equipped with a geometrical interior in assistance of casting a higher-right and lower-left light of distribution pattern. The secondary emitting elements 331, 333 are triple-chip LED projecting a distribution pattern with different optical lengths in order to provide a bilateral compensation for the main emitting element 332. Moreover, the emitting elements 331, 332, 333 may be connected to a dimmer for adjusting the light intensity emitted from emitting elements 331, 333 as a light compensation.

[0018] An additional explanation is that the interior of light guide 10 may be a solid column for light blending and for structural supporting purposes avoiding possible overheated deformation.

Claims

1. A light device for vehicle comprising:
 - an emitting module (30);
 - a light condensing lens (20); and
 - a light guide (10), deployed with a hollow column defining a light incident side and a light output side away from each other, the emitting module (30) and the light condensing lens (20) respectively mounted on the light incident side and the light output side.
2. A light device for vehicle as in claim 1, wherein the light guide (10) is composed of at least two chassis (11,12), and each of the chassis (11,12) has a plurality of adjacent side walls assembling the light guide (10).
3. A light device for vehicle as in claim 2, wherein the two chassis (11,12) have interior surfaces applied by a reflective material for light propagation.
4. A light device for vehicle as in claim 3, wherein the chassis (11,12) respectively protrude forward holding panels (13, 14) deployable for the light condensing lens (20).
5. A light device for vehicle as in claim 3, wherein the side walls (111, 112, 113, 121, 122, 123) of the light guide (10) contour the light distribution pattern.
6. A light device for vehicle as in claim 3, wherein the side walls (111, 112, 113, 121, 122, 123) is devised of protruding or indenting shapes.
7. A light device for vehicle as in claim 1, wherein the emitting module (30) is electrically connected to a dimmer.

8. A light device for vehicle as in claim 1, wherein the light guide (10) has an interior deployed with a column.
9. A light device for vehicle as in claim 1, wherein the emitting module (30) has a main emitting element (332) and two secondary emitting elements (331, 333) for light compensation bilaterally arranged beside the main emitting element (332).
10. A light device for vehicle as in claim 9, wherein the light condensing lens (20) has a quantity in correspondence with that of the light guide (10) and that of the emitting elements (331, 332, 333).

of protruding or indenting shapes.

6. A light device for vehicle as in claim 1, wherein the emitting module (30) is electrically connected to a dimmer.
7. A light device for vehicle as in claim 1, wherein the light condensing lens (20) has a quantity in correspondence with that of the emitting elements (331, 332, 333).

Amended claims in accordance with Rule 137(2) EPC.

1. A light device for vehicle comprising:

an emitting module (30) comprising a main emitting element (332) and two secondary emitting elements (331, 333) bilaterally arranged beside the main emitting element (332) for light compensation;

a light condensing lens (20);

a light guide (10), deployed with a hollow column defining a light incident side and a light output side away from each other, the emitting module (30) and the light condensing lens (20) being respectively mounted on the light incident side and the light output side; and

a quantity of hollow columns of the light guide (10) corresponding to the quantity of emitting elements (331, 332, 333),

characterized in that

the light guide (10) is composed of at least two chassis (11, 12), and each of the chassis (11, 12) has a plurality of adjacent side walls (111, 112, 113, 121, 122, 123) assembling the hollow columns of the light guide (10),

wherein a solid column is deployed in each hollow column of the light guide (10) .

2. A light device for vehicle as in claim 1, wherein the two chassis (11,12) have interior surfaces applied by a reflective material for light propagation.
3. A light device for vehicle as in claim 2, wherein the chassis (11,12) has respectively forward-protruding holding panels (13, 14) deployable for the light condensing lens (20).
4. A light device for vehicle as in claim 2, wherein the side walls (111, 112, 113, 121, 122, 123) of the light guide (10) contour the light distribution pattern.
5. A light device for vehicle as in claim 2, wherein the side walls (111, 112, 113, 121, 122, 123) are devised

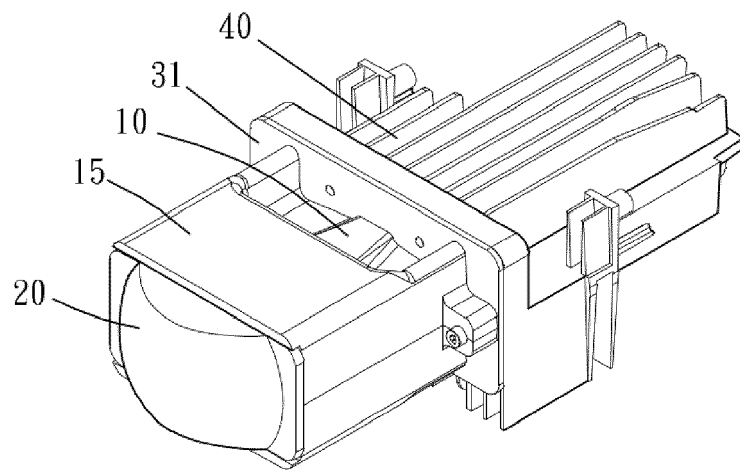


Fig.1

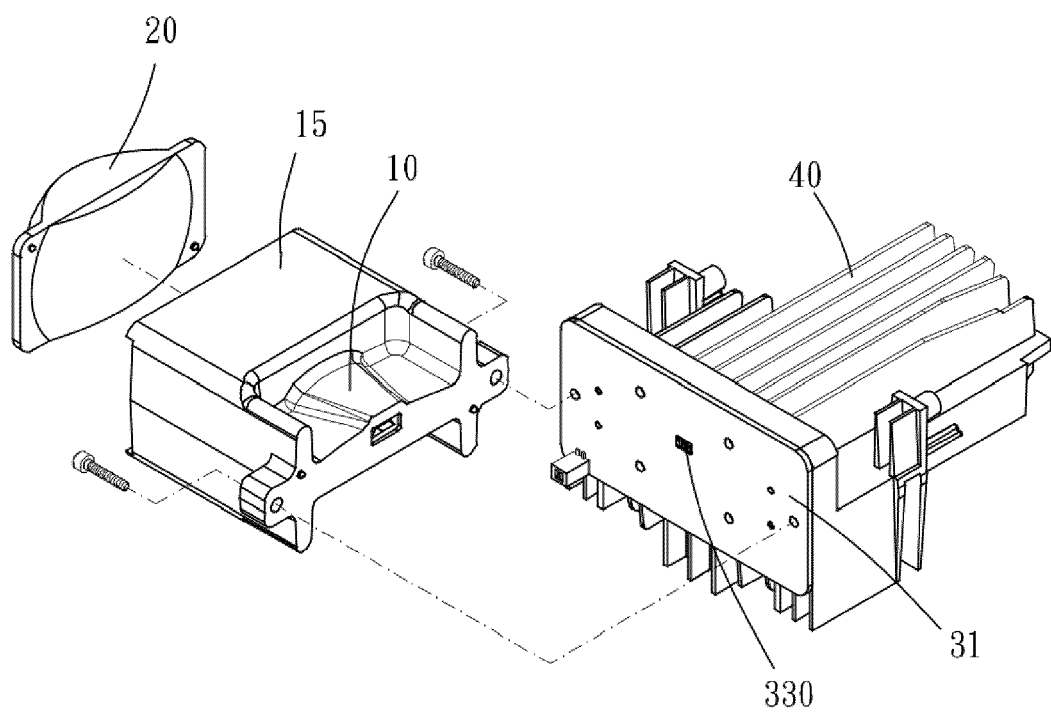


Fig.2

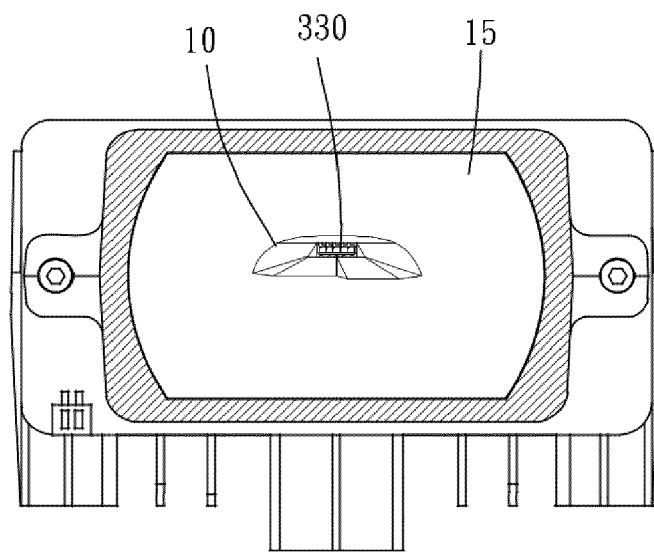


Fig.3

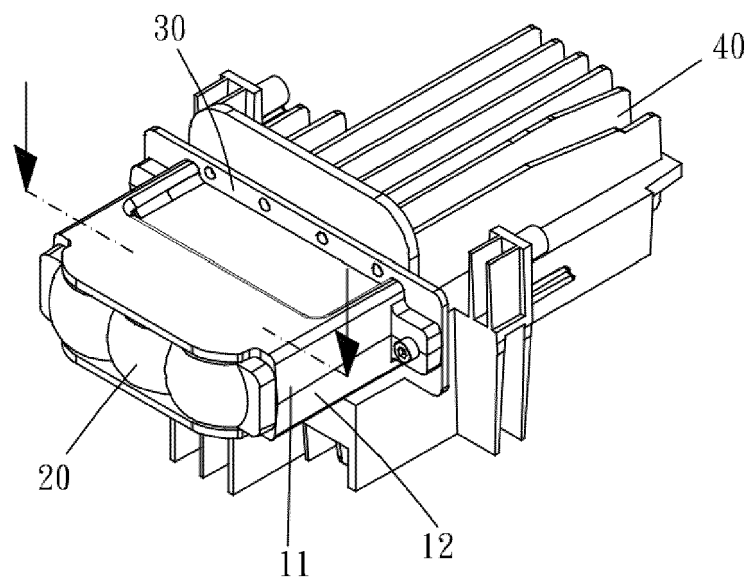


Fig.4

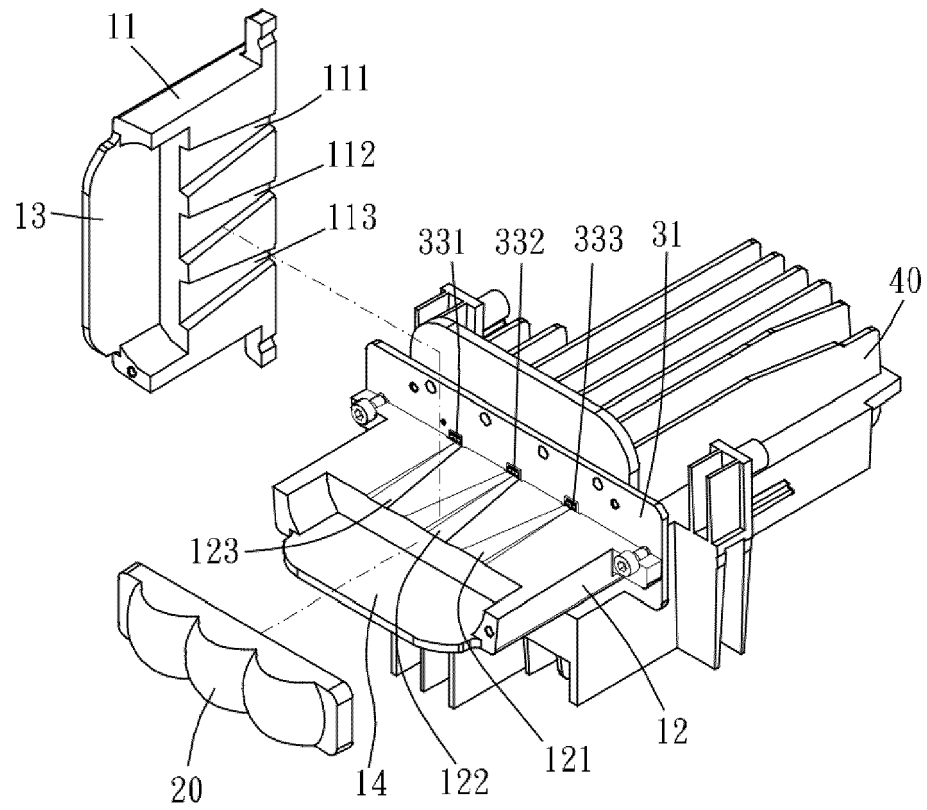


Fig.5

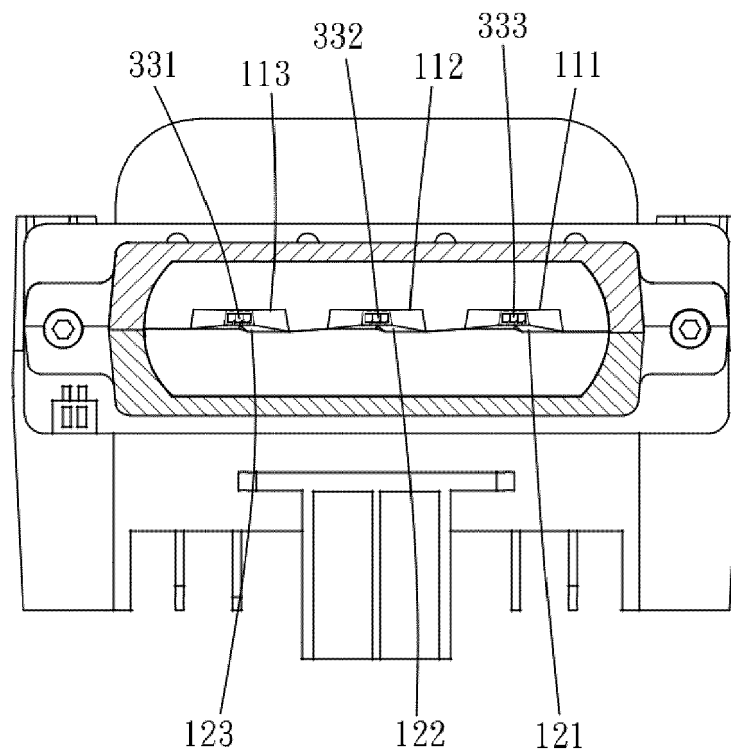


Fig.6

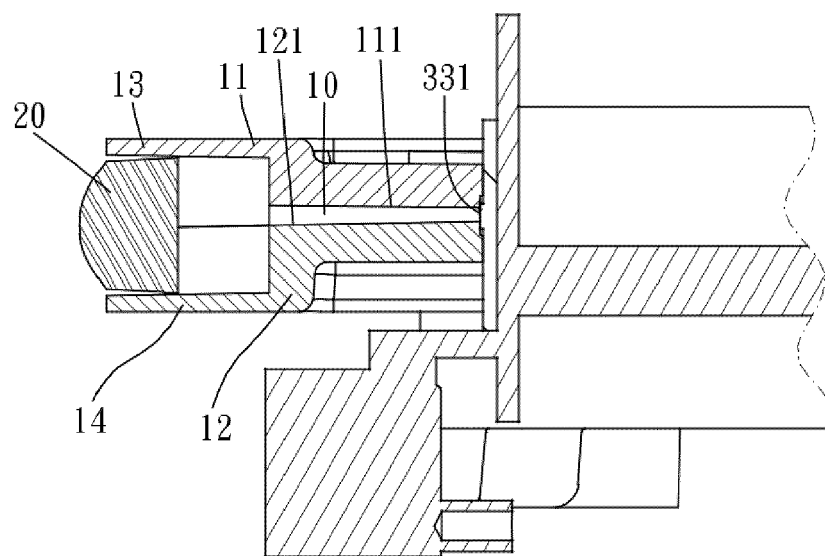


Fig.7



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 15 7539

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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	US 2009/290372 A1 (KOTAJIMA TAKUYA [JP] ET AL) 26 November 2009 (2009-11-26) * paragraphs [0024] - [0069]; figures 1-7 *	1-5,7-10	INV. F21S41/143 F21S41/151 F21S41/24 F21S41/255 F21S41/26 F21S41/265 F21S41/32 F21S41/37 F21S41/43 F21S41/663
X	EP 2 561 268 A2 (KONINKL PHILIPS ELECTRONICS NV [NL] ET AL.) 27 February 2013 (2013-02-27) * paragraphs [0001], [0013] - [0041], [0044] - [0066]; figures 1-11 *	1-3,5,6,8	
X	US 2010/020561 A1 (AN YOU KUN [KR]) 28 January 2010 (2010-01-28) * paragraphs [0027] - [0064]; figures 1-6 *	1-6,8	
X	EP 2 101 107 A2 (KOITO MFG CO LTD [JP]) 16 September 2009 (2009-09-16) * paragraphs [0011] - [0013], [0049] - [0081]; figures 1,11-19 *	1,7-9	
X	US 2005/207162 A1 (KOMATSU MOTOHIRO [JP]) 22 September 2005 (2005-09-22) * paragraphs [0052] - [0101]; figures 1-13 *	1,8	TECHNICAL FIELDS SEARCHED (IPC) F21S
X	US 2013/120988 A1 (WOODWARD RONALD OWEN [US]) 16 May 2013 (2013-05-16) * paragraphs [0020] - [0037]; figures 1-11 *	1,8	
X	EP 2 525 141 A1 (KOITO MFG CO LTD [JP]) 21 November 2012 (2012-11-21) * paragraphs [0001], [0012] - [0041]; figures 1-6(c) *	1,8	
		-/--	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 April 2020	Examiner Goltes, Matjaz
CATEGORY OF CITED DOCUMENTS 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 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			

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EUROPEAN SEARCH REPORT

Application Number
EP 20 15 7539

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40

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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	JP 2009 134964 A (STANLEY ELECTRIC CO LTD) 18 June 2009 (2009-06-18) * see attached machine translation; paragraphs [0022] - [0048]; figures 1-15 * -----	1,8	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 April 2020	Examiner Goltes, Matjaz
CATEGORY OF CITED DOCUMENTS 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 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			

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 20 15 7539

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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25

30

35

40

45

50

55

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2009290372	A1	26-11-2009	CN 101596880 A	09-12-2009
			DE 102009021046 A1	10-12-2009
			FR 2931536 A1	27-11-2009
			JP 2009283408 A	03-12-2009
			KR 20090122885 A	01-12-2009
			US 2009290372 A1	26-11-2009

EP 2561268	A2	27-02-2013	CN 102844617 A	26-12-2012
			EP 2561268 A2	27-02-2013
			JP 6010021 B2	19-10-2016
			JP 2013525968 A	20-06-2013
			US 2013033864 A1	07-02-2013
			WO 2011132111 A2	27-10-2011

US 2010020561	A1	28-01-2010	CN 101639186 A	03-02-2010
			KR 20100012391 A	08-02-2010
			US RE45618 E	21-07-2015
			US 2010020561 A1	28-01-2010

EP 2101107	A2	16-09-2009	EP 2101107 A2	16-09-2009
			JP 5255301 B2	07-08-2013
			JP 2009218155 A	24-09-2009
			US 2009231866 A1	17-09-2009

US 2005207162	A1	22-09-2005	CN 1670425 A	21-09-2005
			DE 102005012649 A1	13-10-2005
			FR 2867839 A1	23-09-2005
			GB 2412159 A	21-09-2005
			JP 4339156 B2	07-10-2009
			JP 2005267998 A	29-09-2005
			US 2005207162 A1	22-09-2005

US 2013120988	A1	16-05-2013	CA 2806160 A1	26-01-2012
			US 2013120988 A1	16-05-2013
			WO 2012011947 A1	26-01-2012

EP 2525141	A1	21-11-2012	CN 102713420 A	03-10-2012
			EP 2525141 A1	21-11-2012
			JP 5442463 B2	12-03-2014
			JP 2011146133 A	28-07-2011
			WO 2011086969 A1	21-07-2011

JP 2009134964	A	18-06-2009	JP 5152487 B2	27-02-2013
			JP 2009134964 A	18-06-2009

EPO FORM P0459

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