(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
20 June 2019 (20.06.2019)

WIPO | PCT

(10) International Publication Number
WO 2019/118100 A1

(51) International Patent Classification:
B60Q 1/26 (2006.01) *F21S 43/20* (2018.01)
B60Q 1/30 (2006.01) *F21W 103/00* (2018.01)
F21S 43/13 (2018.01)

(21) International Application Number:
PCT/US2018/059750

(22) International Filing Date:
08 November 2018 (08.11.2018)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/597,871 12 December 2017 (12.12.2017) US
16/177,995 01 November 2018 (01.11.2018) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: BACKLIT 3D LAMP

(57) Abstract: A backlit three-dimensional lamp for a vehicle includes an indicia rendering disposed on a transparent lenticular sheet, an outer lens positioned in front of the transparent lenticular sheet, and a light source positioned behind the transparent lenticular sheet. The light source provides backlighting of the indicia rendering such that the lenticular sheet projects a forward image that hovers beyond the outer lens. A vehicle light assembly includes a light source adapted to produce a substantially homogeneous light, a rendering of indicia located adjacent the light source and facing away from the light source such that the rendering of indicia is backlit by the light source, and an array of light-modifying elements aligned with the light source to at least partially cover the rendering of indicia for creating a projection of the rendering of indicia outside the vehicle light assembly.

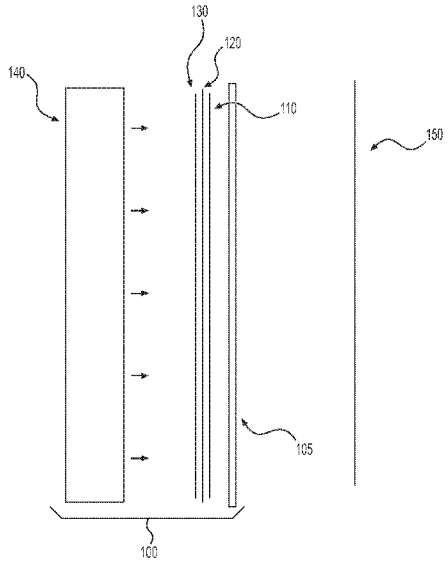


FIG. 1

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[Continued on next page]

Published:
— *with international search report (Art. 21(3))*

BACKLIT 3D LAMP

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application Serial No. 62/597,871 entitled Backlit 3D Lamp and filed December 12, 2017 and U.S. Non-Provisional Patent Application Serial No. 16/177,995 entitled Backlit 3D Lamp and filed November 1, 2018, the disclosures of which are herein incorporated by reference in their entirety.

BACKGROUND

1. Field of the Disclosure

[0002] Embodiments of this disclosure are in the field of light assemblies for use in vehicles. More specifically, embodiments of this disclosure include backlit three-dimensional markings integrated within vehicle light assemblies.

2. Description of the Related Art

[0003] None.

SUMMARY

[0004] In an embodiment, a backlit three-dimensional lamp for a vehicle includes an indicia rendering disposed on a transparent lenticular sheet, an outer lens positioned in front of the transparent lenticular sheet, and a light source positioned behind the transparent lenticular sheet to provide backlighting of the indicia rendering such that the lenticular sheet projects a forward image that hovers beyond the outer lens.

[0005] In another embodiment, a vehicle light assembly includes a light source adapted to produce a substantially homogeneous light, a rendering of indicia located adjacent the light source and facing away from the light source such that the rendering of indicia is backlit by the light source, and an array of light-modifying elements aligned with the light source to at least partially cover the rendering of indicia for creating a projection of the rendering of indicia outside the vehicle light assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Illustrative embodiments of the present disclosure are described in detail below with reference to the attached drawing figures, which are incorporated by reference herein and wherein:

[0007] FIG. 1 is a cross-sectional side view of a backlit three-dimensional (3D) lamp, in an embodiment;

[0008] FIG. 2 is a perspective view of a backlit three-dimensional (3D) lamp, in an embodiment;

[0009] FIG. 3 shows a two-dimensional (2D) marking for displaying, in an embodiment;

[0010] FIG. 4 shows a 3D rendering of the marking of FIG. 3 for a 3D projection, in an embodiment;

[0011] FIG. 5 shows a perspective view of a 3D projection from a backlit 3D lamp, in an embodiment; and

[0012] FIG. 6 shows another perspective view of the 3D projection of FIG. 5.

DETAILED DESCRIPTION

[0013] In certain lighting applications, markings may be incorporated into a lamp of a light assembly for producing a desired visual effect. Some examples of markings include logos, designs, emblems, geometric shapes, graphics, images, text, indicia, renderings, etc. Markings traditionally appear in a standard two-dimensional (2D) format within a light assembly. In other words, the markings have a flat appearance and the markings appear to be located behind or within an outer lens of the light assembly.

[0014] What is disclosed is a way to create different kinds of visual effects to provide customization for light assemblies. Embodiments of the present disclosure provide a lamp that projects a backlit three-dimensional (3D) image (e.g., an automotive manufacturer logo) to provide a unique visual effect for a light assembly.

[0015] FIG. 1 shows a cross-sectional side view of an exemplary backlit 3D lamp 100 for a vehicle light assembly. The side view depicted in FIG. 1 represents a cross-section at or near a center of a lift-gate lamp assembly of a vehicle. However, the same basic arrangement, including minor variations thereof, may be used to provide a backlit 3D lamp for other lighting applications. Backlit 3D lamp 100 provides a marking that hovers outside the lamp such that the marking appears to be floating outside of the lamp when viewed from outside the lamp. The marking also appears to move as the viewer moves from side-to-side with respect to the image (see e.g., the differing appearance between FIGs. 5 and 6). At night, the 3D marking is visible when backlit via a light source. During the day, the 3D marking is visible due to reflection of ambient light without a dedicated light source.

[0016] Backlit 3D lamp 100 includes an outer lens 105, a lenticular sheet 110, a rendering 130, and a light source 140, which are structurally supported and held in alignment with one another via a lamp housing (not shown). In the embodiment depicted in FIG. 1, rendering 130 is attached to lenticular sheet 110 via an adhesive 120.

[0017] Outer lens 105 is made of a transparent material configured to protect inner portions of lamp 100 from outdoor elements while allowing light from the light source 140 to pass through. In certain embodiments, light source 140 is a homogenous light source that produces a uniform and homogenous appearing light output without the appearance of hot spots. In certain embodiments, light source 140 is one or more light-emitting diodes (LEDs). In some embodiments, light source 140 is a light bulb.

[0018] Lenticular sheet 110 is for example an optically clear sheet made of plastic with a lenticular pattern molded into one side and a flat surface on the opposite side. The lenticular pattern is an array of light-modifying elements, such as an array of convex lenses that focus light according to a particular prescription. Lenticular sheet 110 is adapted to at least partially cover the marking creating a projection of the marking outside lamp 100.

[0019] Rendering 130 is for example an interlaced image (see e.g., FIG. 3) of a marking configured to produce a 3D projection of the marking. Rendering 130 may be formed (e.g., printed) on an opaque material and aligned adjacent lenticular sheet 110. Rendering 130 may include a marking or indicia that covers at least a portion of light source

140 to receive light emitted from the light source 140, and to create a projection of the rendering outside the lamp 100.

[0020] Adhesive 120 is for example an optically clear adhesive, such as an adhesive film. In certain embodiments, rendering 130 is fixed to the flat side of lenticular sheet 110 via adhesive 120. With homogenous light source 140 positioned behind rendering 130, backlighting is provided and rendering 130 is said to be "backlit". When backlit, lenticular sheet 110 is configured to project the marking outside lamp 100 as a 3D floating image 150 that hovers outside lamp 100, as further described below in connection with FIG. 3.

[0021] FIG. 2 is a perspective view of backlit 3D lamp 100, FIG. 1. A lamp housing 160 is adapted to provide structural support and to align outer lens 105 with lenticular sheet 110 and light source 140. An exemplary 3D floating image 150 is depicted in FIG. 2. The 3D floating image 150 hovers between about 0.1-inch to about 3-inches in front of outer lens 105, depending on characteristics of lenticular sheet 110, rendering 130 and light source 140, and the distances therebetween. In certain embodiments, the 3D floating image 150 hovers between about 0.5-inch to about 2.5-inches in front of outer lens 105. In some embodiments, the 3D floating image 150 hovers between about 1-inch to about 2-inches in front of outer lens 105.

[0022] FIG. 3 shows an exemplary two-dimensional (2D) marking 200 for displaying. For the 2D marking 200 to be used in backlit 3D lamp 100 of FIG. 1, the 2D marking is converted into a 3D rendering of marking 200, as depicted in FIG. 4.

[0023] FIG. 4 shows an exemplary 3D rendering 300 of the marking of FIG. 3. The 3D rendering 300 is an example of rendering 130, FIG. 1. In certain embodiments, 3D rendering 300 is an interlaced image configured for 3D projection via lenticular sheet 110. Conversion of a 2D marking to a 3D rendering may be performed using specialized software, as known to one of skill in the art of producing 3D images. The 3D rendering 300 is disposed adjacent to lenticular sheet 110 via adhesive 120. The array of convex lenses of lenticular sheet 110 face away from 3D rendering 300 such that a 3D floating image (e.g., 3D floating image 150, FIG. 1) of 3D rendering 300 is projected outside lamp 100 when backlit. The prescription of the convex lenses is adapted such that each eye of a person viewing the 3D

rendering sees separate images, and the person's mind creates an illusion that appears as a 3D image hovering outside the lamp 100.

[0024] FIG. 5 shows a perspective view of an exemplary 3D projection 400 from a backlit 3D lamp. The 3D projection 400 is an example of an indicia rendering projected outside a vehicle lamp. FIG. 6 shows another perspective view of 3D projection 400. The two perspective views of FIGs. 5 and 6 illustrate how the appearance of the 3D projection 400 changes depending on the angle by which the projected indicia rendering is viewed. For example, FIG. 5 illustrates 3D projection 400 as viewed from about plus thirty degrees to one side, whereas FIG. 6 illustrates 3D projection 400 as viewed from about minus thirty degrees (e.g., thirty degrees from the opposite side).

[0025] Features described above as well as those claimed below may be combined in various ways without departing from the scope hereof. The following examples illustrate some possible, non-limiting combinations:

[0026] (A1) A backlit three-dimensional lamp for a vehicle includes an indicia rendering disposed on a transparent lenticular sheet. An outer lens is positioned in front of the transparent lenticular sheet. A light source is positioned behind the transparent lenticular sheet to provide backlighting of the indicia rendering such that the lenticular sheet projects a forward image that hovers beyond the outer lens.

[0027] (A2) For the backlit three-dimensional lamp denoted as (A1), a housing may be adapted to structurally support the transparent lenticular sheet, the outer lens, and the light source in alignment with one another.

[0028] (A3) For the backlit three-dimensional lamp denoted as (A1) or (A2), the light source may include a homogenous light source providing a uniform and homogenous appearing light output that lacks hot spots.

[0029] (A4) For the backlit three-dimensional lamp denoted as any of (A1) through (A3), the indicia rendering may be printed on an opaque material and aligned adjacent the transparent lenticular sheet.

[0030] (A5) For the backlit three-dimensional lamp denoted as any of (A1) through (A4), the transparent lenticular sheet may include a plastic optically clear sheet with a lenticular pattern molded into one side and a flat surface on the opposite side. The flat

surface may be positioned to face the light source and the lenticular pattern may be positioned to face the outer lens.

[0031] (A6) For the backlit three-dimensional lamp denoted as any of (A1) through (A5), the indicia rendering may be fixed to the flat surface of the transparent lenticular sheet with an optically clear adhesive film.

[0032] (A7) For the backlit three-dimensional lamp denoted as any of (A1) through (A6), the indicia rendering may be an interlaced image of a marking adapted to produce a three-dimensional projection of the marking.

[0033] (A8) For the backlit three-dimensional lamp denoted as any of (A1) through (A7), the transparent lenticular sheet may at least partially cover the indicia rendering creating a projection of the indicia rendering outside the backlit three-dimensional lamp.

[0034] (A9) For the backlit three-dimensional lamp denoted as any of (A1) through (A7), the projection of the indicia rendering may appear to change based on a changing angle by which the backlit three-dimensional lamp is viewed.

[0035] (B1) A vehicle light assembly has a light source adapted to produce a substantially homogeneous light. A rendering of indicia is located adjacent the light source and facing away from the light source such that the rendering of indicia is backlit by the light source. An array of light-modifying elements is aligned with the light source to at least partially cover the rendering of indicia for creating a projection of the rendering of indicia outside the vehicle light assembly.

[0036] (B2) For the vehicle light assembly denoted as (B1), an outer lens may be positioned adjacent the array of light-modifying elements. The outer lens may be made of transparent material adapted to protect the array of light-modifying elements, the rendering of indicia, and the light source from outside elements while allowing light from the light source to pass through.

[0037] (B3) For the vehicle light assembly denoted as (B1) or (B2), the array of light-modifying elements may be formed of a plastic optically clear lenticular sheet.

[0038] (B4) For the vehicle light assembly denoted as any of (B1) through (B3), the array of light-modifying elements may be an array of convex lenses that focus light according to a particular prescription.

[0039] (B5) For the vehicle light assembly denoted as any of (B1) through (B4), the array of convex lenses may be arranged such that a convex face of each of the convex lenses is oriented away from the rendering of indicia such that a three-dimensional floating image of the rendering of indicia is projected outside the outer lens of the vehicle light assembly.

[0040] (B6) For the vehicle light assembly denoted as any of (B1) through (B5), the three-dimensional floating image may hover in front of the outer lens of the vehicle light assembly.

[0041] (B7) For the vehicle light assembly denoted as any of (B1) through (B6), the three-dimensional floating image may hover between about one-inch outside the outer lens surface to about two-inches outside the outer lens surface.

[0042] Many different arrangements of the various components depicted, as well as components not shown, are possible without departing from the spirit and scope of the present disclosure. Embodiments of the present disclosure have been described with the intent to be illustrative rather than restrictive. Alternative embodiments will become apparent to those skilled in the art that do not depart from its scope. A skilled artisan may develop alternative means of implementing the aforementioned improvements without departing from the scope of the present disclosure.

[0043] It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations and are contemplated within the scope of the claims. Not all operations listed in the various figures need be carried out in the specific order described.

CLAIMS

1. A backlit three-dimensional lamp for a vehicle, comprising:
an indicia rendering disposed on a transparent lenticular sheet;
an outer lens positioned in front of the transparent lenticular sheet; and
a light source positioned behind the transparent lenticular sheet to provide backlighting of the indicia rendering such that the lenticular sheet projects a forward image that hovers beyond the outer lens.

2. The backlit three-dimensional lamp of claim 1, further comprising a housing adapted to structurally support the transparent lenticular sheet, the outer lens, and the light source in alignment with one another.

3. The backlit three-dimensional lamp of claim 1, wherein the light source comprises a homogenous light source providing a uniform and homogenous appearing light output that lacks hot spots.

4. The backlit three-dimensional lamp of claim 1, wherein the indicia rendering is printed on an opaque material and aligned adjacent the transparent lenticular sheet.

5. The backlit three-dimensional lamp of claim 1, wherein the transparent lenticular sheet comprises a plastic optically clear sheet with a lenticular pattern molded into one side and a flat surface on the opposite side, the flat surface being positioned to face the light source and the lenticular pattern being positioned to face the outer lens.

6. The backlit three-dimensional lamp of claim 1, wherein the indicia rendering is fixed to the flat surface of the transparent lenticular sheet with an optically clear adhesive film.

7. The backlit three-dimensional lamp of claim 1, wherein the indicia rendering is an interlaced image of a marking adapted to produce a three-dimensional projection of the marking.

8. The backlit three-dimensional lamp of claim 1, wherein the transparent lenticular sheet at least partially covers the indicia rendering creating a projection of the indicia rendering outside the backlit three-dimensional lamp.

9. The backlit three-dimensional lamp of claim 8, wherein the projection of the indicia rendering appears to change based on a changing angle by which the backlit three-dimensional lamp is viewed.

10. A vehicle light assembly, comprising:

a light source adapted to produce a substantially homogeneous light;

a rendering of indicia located adjacent the light source and facing away from the light source such that the rendering of indicia is backlit by the light source; and

an array of light-modifying elements aligned with the light source to at least partially cover the rendering of indicia for creating a projection of the rendering of indicia outside the vehicle light assembly.

11. The vehicle light assembly of claim 10, further comprising an outer lens positioned adjacent the array of light-modifying elements, the outer lens being made of transparent material adapted to protect the array of light-modifying elements, the rendering of indicia, and the light source from outside elements while allowing light from the light source to pass through.

12. The vehicle light assembly of claim 10, wherein the array of light-modifying elements are formed of a plastic optically clear lenticular sheet.

13. The vehicle light assembly of claim 10, wherein the array of light-modifying elements is an array of convex lenses that focus light according to a particular prescription.

14. The vehicle light assembly of claim 13, wherein the array of convex lenses is arranged such that a convex face of each of the convex lenses is oriented away from the rendering of indicia such that a three-dimensional floating image of the rendering of indicia is projected outside the outer lens of the vehicle light assembly.

15. The vehicle light assembly of claim 14, wherein the three-dimensional floating image hovers in front of the outer lens of the vehicle light assembly.

16. The vehicle light assembly of claim 15, wherein the three-dimensional floating image hovers between about one-inch outside the outer lens surface to about two-inches outside the outer lens surface.

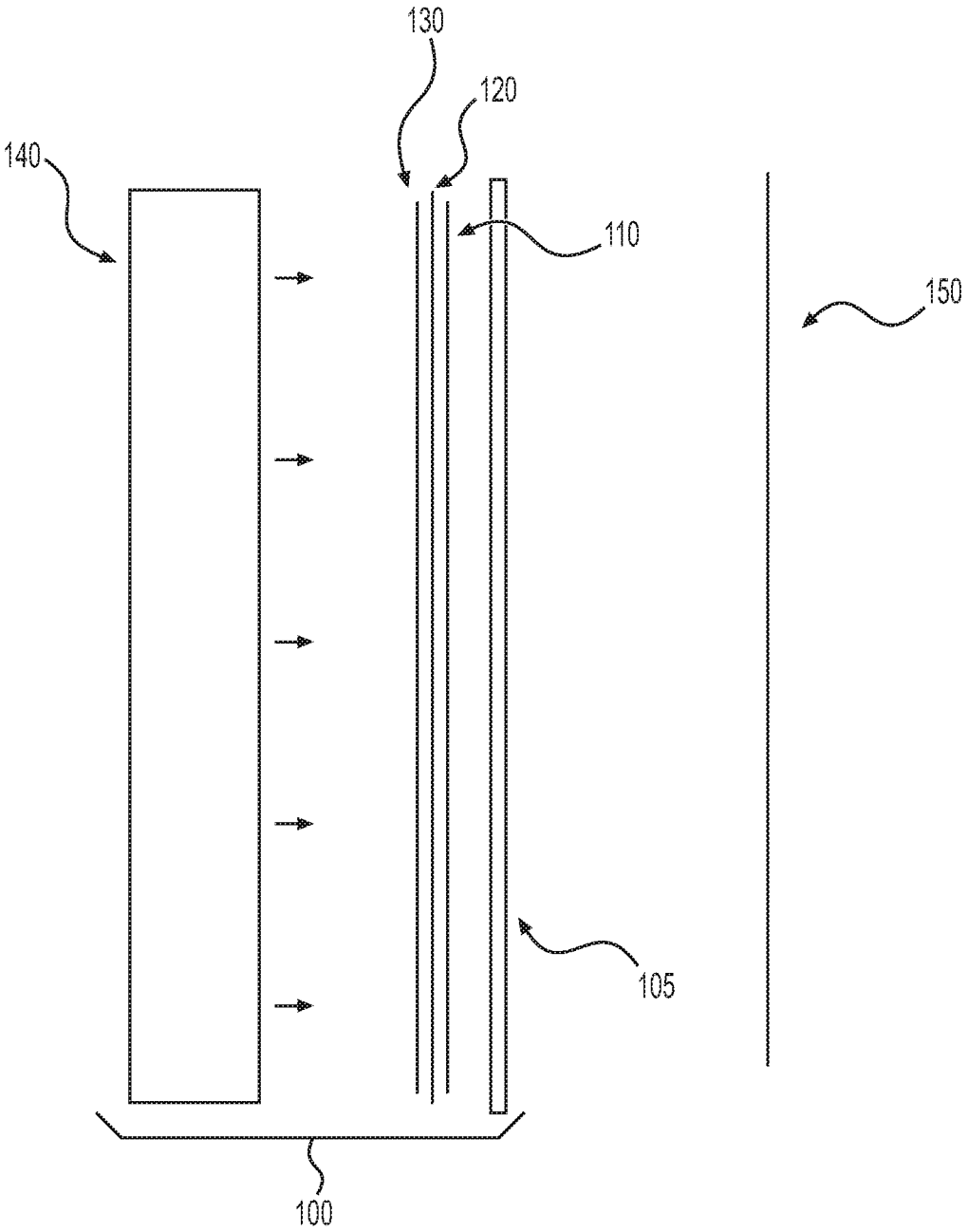


FIG. 1

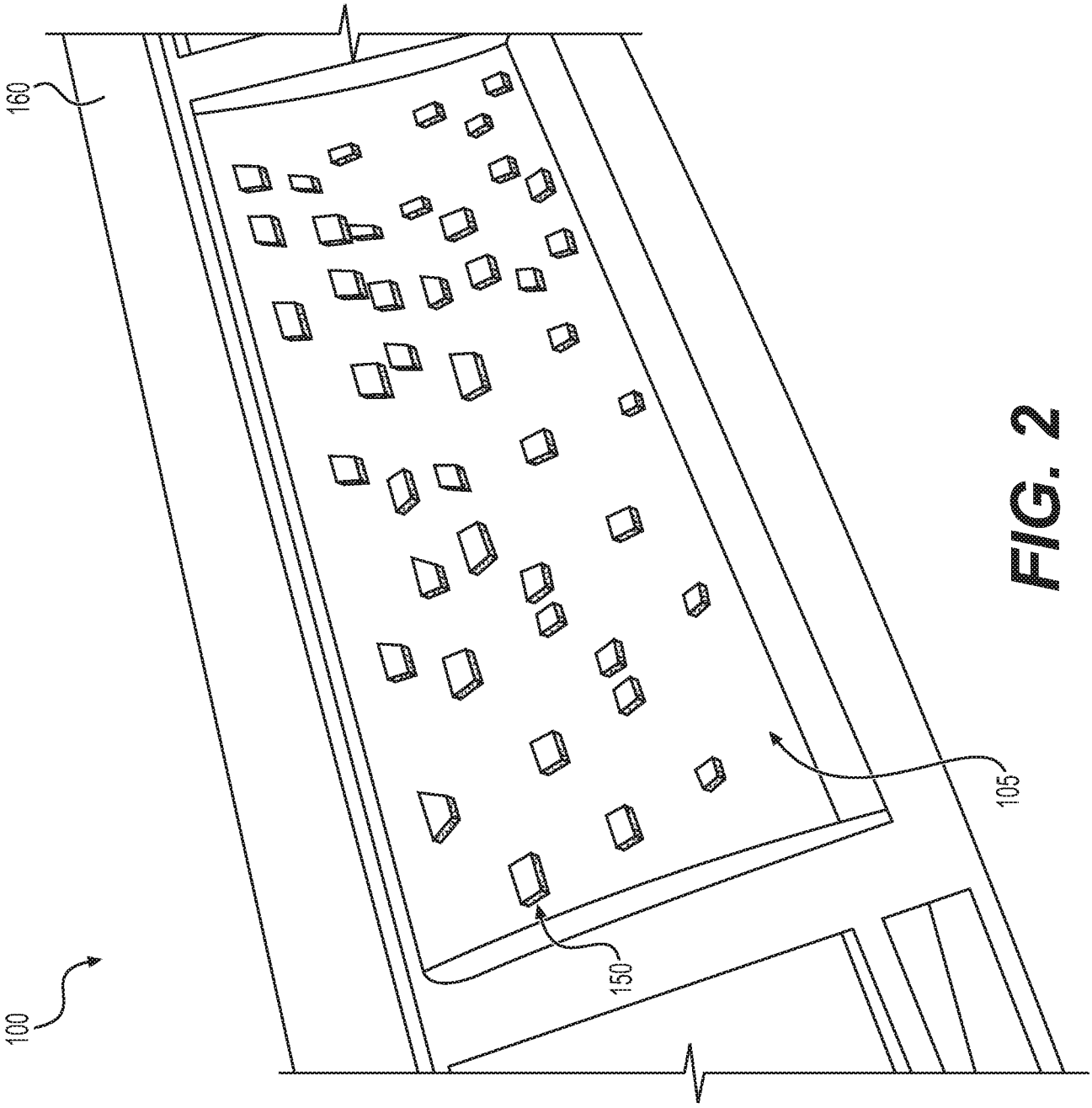


FIG. 2

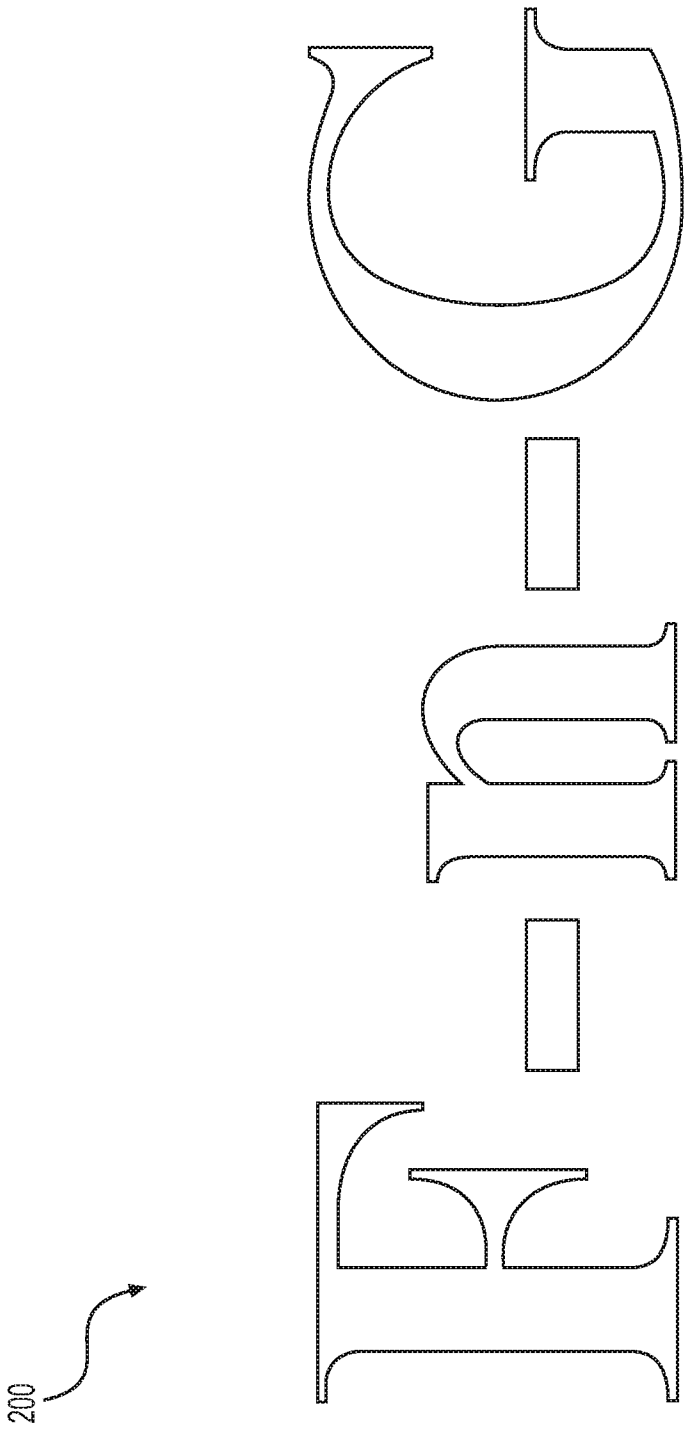


FIG. 3

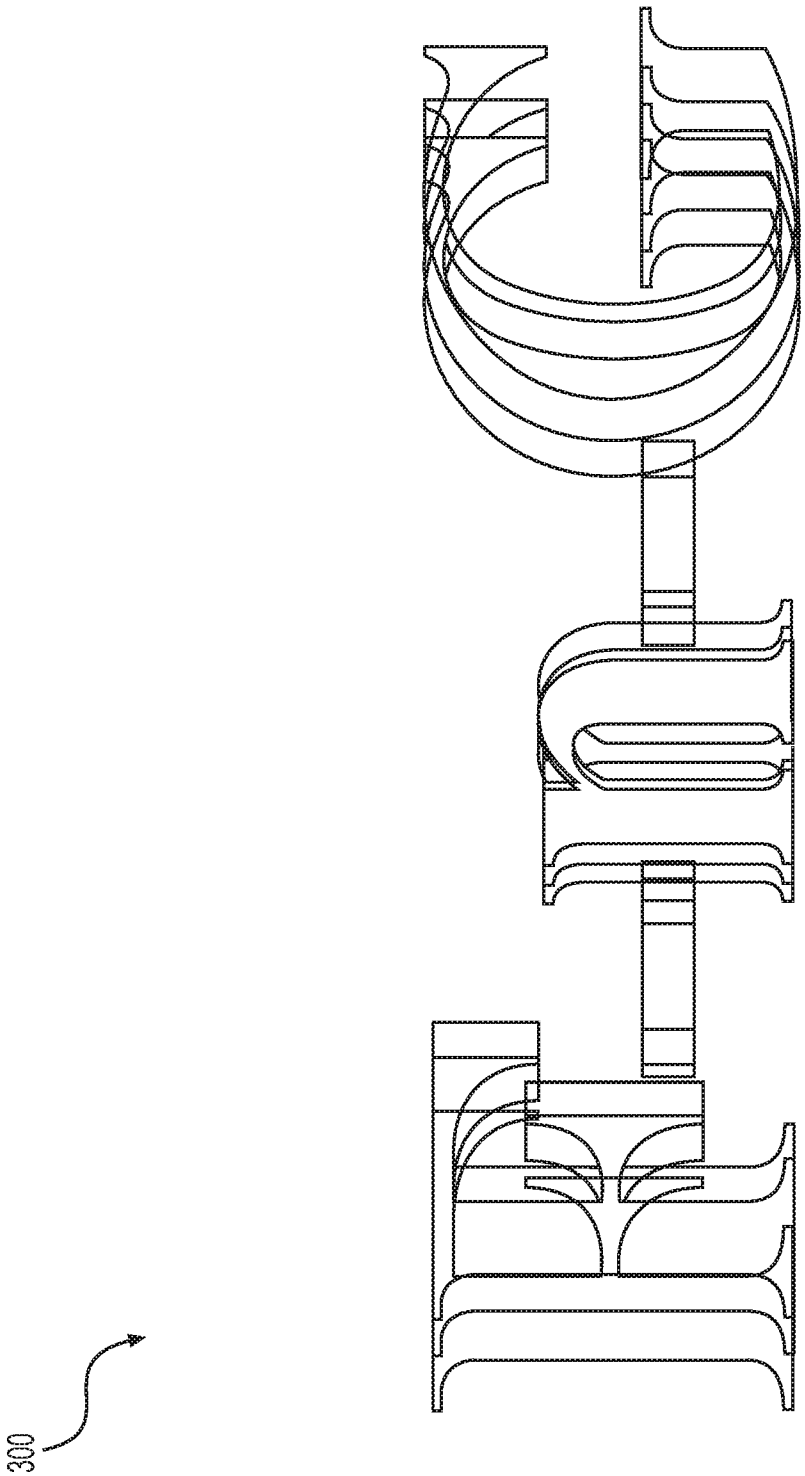


FIG. 4

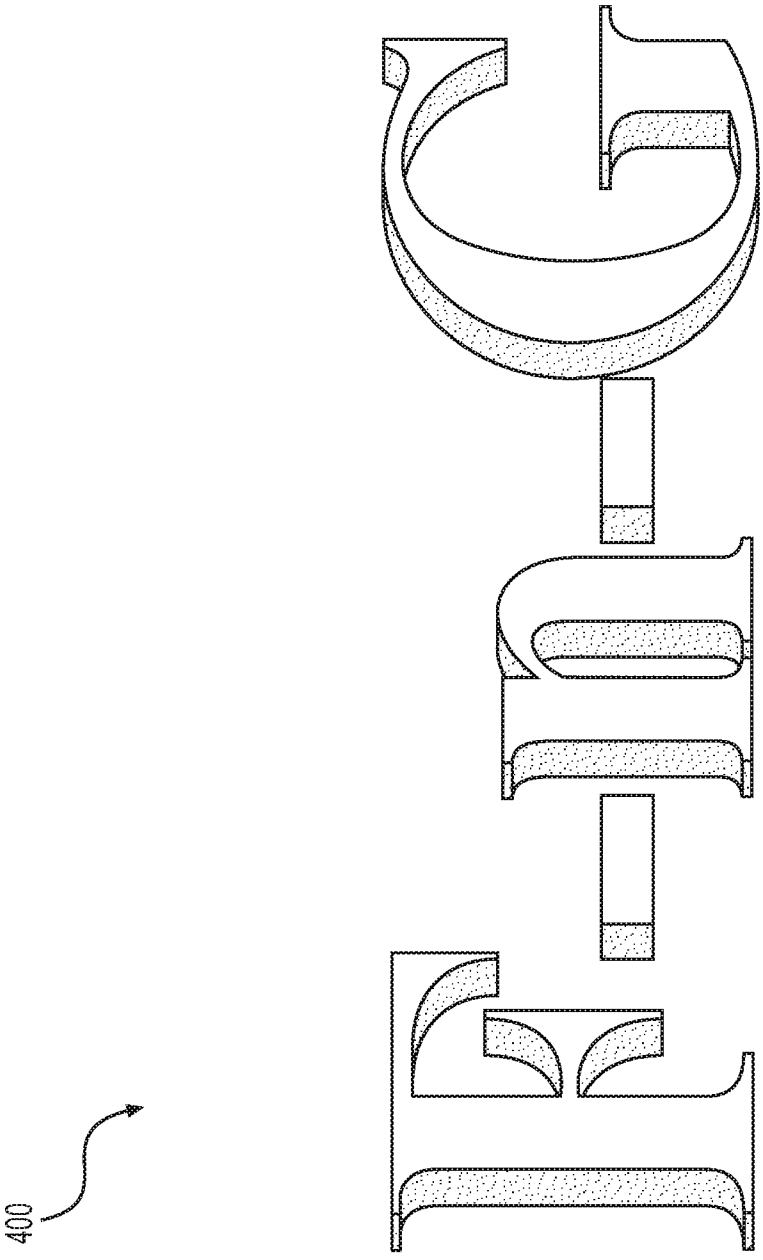


FIG. 5

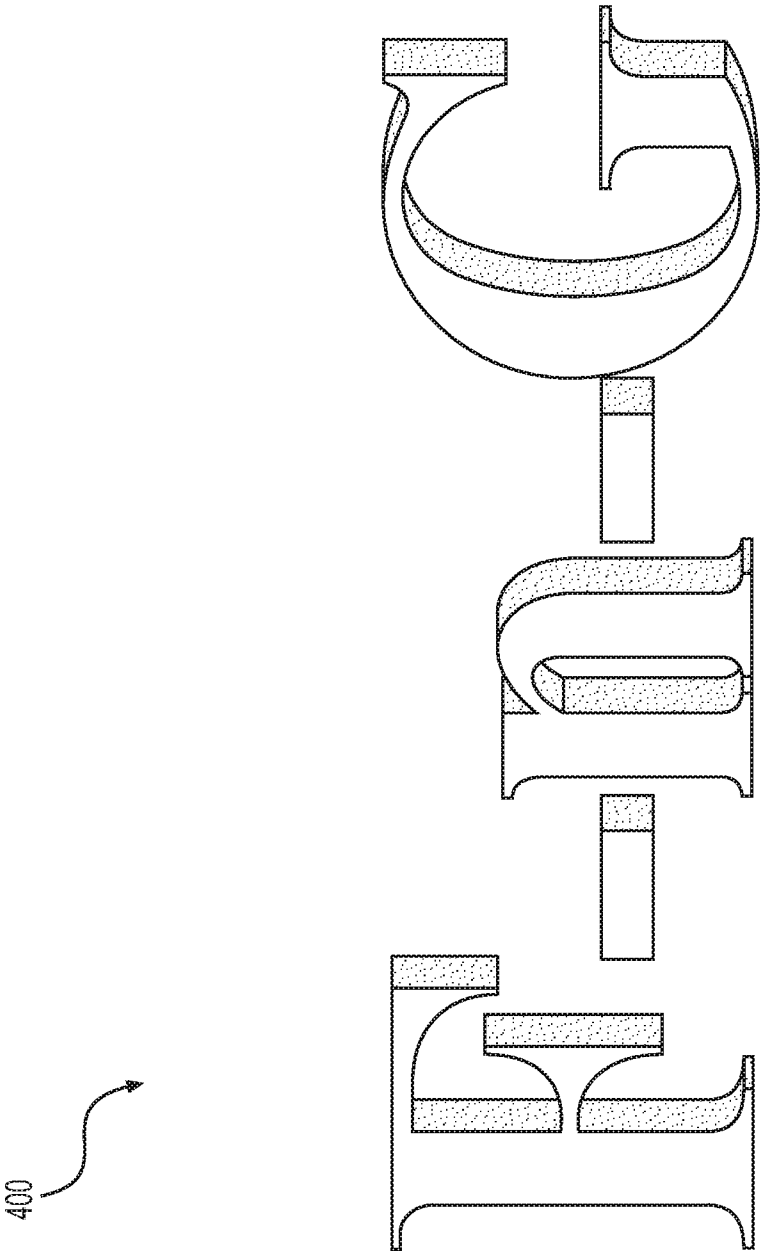


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2018/059750

A. CLASSIFICATION OF SUBJECT MATTER

B60Q 1/26 *(2006.01)*
B60Q 1/30 *(2006.01)*
F21S 43/13 *(2018.01)*
F21S 43/20 *(2018.01)*
F21W 103/00 *(2018.01)*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B60Q 1/00-1/54, 3/00, F21S 8/00-8/08, 41/00-41/60, 43/00-43/50, F21W 103/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatSearch (RUPTO Internal), USPTO, PAJ, Espacenet, Information Retrieval System of FIPS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2017/0314759 A1 (FLEX-N-GATE ADVANCED PRODUCT DEVELOPMENT, LLC) 02.11.2017, paragraphs [0045] - [0096], fig. 1-33	1-16
A	US 2014/0133128 A1 (NAM SEOK OH) 15.05.2014, paragraphs [0055] - [0170], fig. 1A-2A, 36	1-16
A	CN 202188325 U (ZHONGSHAN LIANGYI LIGHTING CO LTD) 11.04.2012, abstract, fig. 1-5	1-16

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search	Date of mailing of the international search report
11 February 2019 (11.02.2019)	21 March 2019 (21.03.2019)

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