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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 December 2021 (16.12.2021)

WIPO | PCT

(10) International Publication Number
WO 2021/249979 A1

(51) International Patent Classification:
G02B 3/00 (2006.01) *F21V 5/04* (2006.01)

(21) International Application Number:
PCT/EP2021/065236

(22) International Filing Date:
08 June 2021 (08.06.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
20179495.5 11 June 2020 (11.06.2020) EP

(71) Applicant: **SIGNIFY HOLDING B.V.** [NL/NL]; High Tech Campus 48, 5656 AE Eindhoven (NL).

(72) Inventor: **ZAREMBA, Krzysztof, Cezary**; c/o High Tech Campus 7, 5656 AE Eindhoven (NL).

(74) Agent: **STIL, Lambert, Johannes** et al.; High Tech Campus 7, 5656 AE Eindhoven (NL).

(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, IT, 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, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, 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).

Declarations under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

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

(54) **Title:** LENS PLATE

(57) **Abstract:** The present invention relates to a lens plate (10) for an LED device (100), comprising: a plurality of lens elements (12a-e); and a flexible connection (24a-d) between two lens elements of the plurality of lens elements so that at least one of a distance (P_{11}) and an angle between the two lens elements can be adjusted, wherein the two lens elements and the flexible connection are made of the same material.

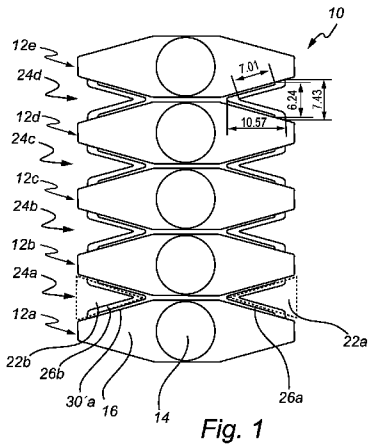
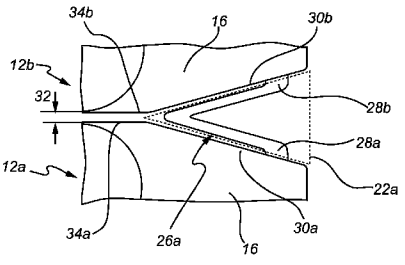


Fig. 1



WO 2021/249979 A1

LENS PLATE

FIELD OF THE INVENTION

The present invention relates to a lens plate for an LED (light emitting diode) device. The present invention also relates to an LED device comprising such a lens plate, use of such a lens plate, and a method of manufacturing such a lens plate.

BACKGROUND OF THE INVENTION

A lens plate with a plurality of lens elements may be used over an LED board (i.e. a board or carrier with light emitting diodes mounted thereon) in various LED devices to influence the light distribution of the light emitting diodes. However, each change in LED pitch (distance between LEDs) on an LED board requires investment into a new manufacturing tool, even if one wants to keep light distribution (the shape of the lenses of the lens plate) the same. For example, if one changes the LED pitch only by 0.05 mm in a 2 ft LED device with 48 light emitting diodes, the position of the last light emitting diode changes by 0.05 x 47 = 2.35 mm, which is critical from an optical point of view.

US2012189800 discloses an element array in which an error in pitch among elements in the element array is absorbed surely in a step of laminating a plurality of element arrays so that each group of the elements arrayed in the laminating direction can be aligned with high accuracy. The element array has a plurality of lenses arrayed one-dimensionally or two-dimensionally, and a flexible support formed out of a material richer in elasticity than a material forming the lenses. The lenses are coupled with one another through the support. The lenses and the support are formed integrally by double molding.

SUMMARY OF THE INVENTION

It is an object of the present invention to overcome or at least alleviate the above-mentioned problems, and to provide an improved lens plate.

According to a first aspect of the invention, this and other objects are achieved by a lens plate for an LED device, the lens plate comprising: a plurality of lens elements; and a flexible connection between a further plurality of two consecutive lens elements of the plurality of lens elements so that at least one of a distance and an angle between each of said

two lens elements can be adjusted, wherein each of said two lens elements and the flexible connection are made of the same material.

The present invention is based on the understanding that flexible connections between lens elements allows a lens plate of one type to suit LED boards with different LED pitches and/or even different shapes, by stretching (or possibly squeezing) these connections. Hence, the present lens plate is versatilely applicable, which saves cost when manufacturing many different types of LED devices/boards. Furthermore, since the lens elements and the flexible connections of the lens plate are made of the same material, the construction of the adjustable lens plate is simplified, and manufacturing may be facilitated.

The flexible connection may for example be molded together with the two lens elements, e.g. by injection molding.

The flexibility of the flexible connection may be achieved by at least one of the shape, dimension, and position of the flexible connection, rather than selecting a different material (e.g. richer in elasticity) for the flexible connection compared to the lens elements.

The flexible connection may comprise two (parallel) spring members.

The flexible connection may for example comprises two V-shaped members. V-shaped members are advantageous in that they could be both stretched and squeezed. Also, the V-shaped members need not overlap, which enables easy molding. The V-shaped members preferably lie in a plane which is perpendicular to the plurality of lens elements' optical axes, because then they may not cover a lens (portion) of the lens element or a beam of light emitted from the lens (portion). They also need less material.

Other shapes of the flexible connections are possible, for example W- or U- or ⊓-shapes. Other orientations/positions of the flexible connections are (also) possible, like standing in a plane which is parallel to the plurality of lens elements' optical axes.

Furthermore, the two lens elements may each have a base portion, wherein the two base portions at least partly define two triangular- or isosceles trapezoid-shaped spaces pointing towards each other between the two base portions, and wherein each of the two triangular- or isosceles trapezoid-shaped spaces accommodates one of the two V-shaped (or W-shaped) members of the flexible connection. An advantage of this is that a relatively short minimum distance between the (two) lens elements can be realized despite the flexible connection between them. To achieve the two triangular- or isosceles trapezoid-shaped spaces, the base portions could be hexagonal or octagonal, for example.

A gap may exist between the two lens elements when no force is applied to the flexible connection. In this way, the lens element pitch may be both increased or decreased,

whereby the lens plate may fit a great variety of LED boards. The gap may for example be present between a side of the aforementioned hexagonal or octagonal base portion of one of the two lens elements and an opposing side of a hexagonal or octagonal base portion of the other lens element. In another embodiment, there is (substantially) no gap between the two lens elements when no force is applied to the flexible connection.

In one embodiment, each lens element of the plurality of lens elements includes two protrusions adapted to engage with corresponding notches in an LED board of the LED device for positioning of the lens plate on the LED board. Such positioning is solving the issue with influence of thermal elongation on light distribution as positions of the lens elements relative to light emitting diodes of the LED board are stable. In another embodiment, each lens element includes two notches adapted to engage with corresponding protrusions on the LED board. Also combinations of these two embodiments are possible. An additional element, e.g. a frame, could also be used for positioning.

The plurality of lens elements may be arranged in a linear array. The array may be a rectilinear (straight) array. In another embodiment, the linear array is curved in a plane perpendicular to the plurality of lens elements' optical axes.

According to a second aspect of the invention, there is provided an LED device, comprising: a board with a plurality LED light sources; and a lens plate according to the first aspect, wherein a pitch of the plurality of lens elements of the lens plate match a pitch of the plurality of LED light sources of the board.

Each lens element of the plurality of lens elements may include two protrusions engaging with corresponding notches in the board for positioning of the lens plate on the board.

A third aspect of the invention pertains the use of a lens plate according to the first aspect with any one of at least two LED boards with different LED pitches and/or different shapes.

According to a fourth aspect of the invention, there is provided a method of manufacturing an LED device, which method comprises: providing a lens plate according to the first aspect; providing a board with a plurality of LED light sources; if needed, stretching and/or compressing the flexible connection(s) by applying a force such that a pitch of the plurality of lens elements of the lens plate matches a pitch of the plurality of LED light sources of the board; and positioning the lens plate on a board.

It is noted that the invention relates to all possible combinations of features recited in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects of the present invention will now be described in more detail, with reference to the appended drawings showing embodiment(s) of the invention.

Figs. 1 and 3a are top views of a lens plate according to an embodiment of the present invention when no force is applied to its flexible connections.

Fig. 2 is a side view of the lens plate of fig. 1.

Fig. 3b is a top view of the lens plate of fig. 3a, with its flexible connections stretched.

Fig. 3c is an exploded perspective view of an LED device comprising the lens plate of fig. 3a positioned on an LED board.

Fig. 3d is an exploded perspective view of an LED device comprising the lens plate of fig. 3b positioned on another LED board.

Figs. 4a-d show alternative flexible connections.

Fig. 5 is a top view of the lens plate of fig. 1 in a curved configuration.

Fig. 6 is a flow chart of a method according to an embodiment of the present invention.

Like reference numerals refer to like elements throughout.

DETAILED DESCRIPTION

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which currently preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided for thoroughness and completeness, and fully convey the scope of the invention to the skilled person.

Figures 1 and 2 (and 3a) show a lens plate 10 according to an embodiment of the present invention.

The lens plate 10 comprises a plurality of lens elements 12a-e. The (plurality of) lens elements 12a-e may be (substantially) rigid. The (plurality of) lens elements 12a-e are here arranged in a rectilinear array. Each lens element 12a-e comprises a lens portion 14 and a base portion 16. The lens portion 14 may for example be dome-shaped, but other shapes are possible. Each lens portion 14 has an optical axis 18. For a non-imaging lens portion, the optical axis 18 may be construed as a line which coincides with the axis of an

associated light emitting diode (see e.g. LED light sources 104 discussed hereinbelow), i.e. the axis of the light emitting diode the lens portion was designed for. The base portions 16 are here octagonal, in a plane 20 perpendicular to the optical axes 18. Each two adjacent base portions 16, for example the base portions of lens elements 12a and 12b, may at least partly define two triangular- or isosceles trapezoid-shaped spaces 22a-b pointing towards each other between the two base portions 16.

The lens plate 10 further comprises a flexible connection 24a-d between each two consecutive lens elements 12a-e, for example flexible connection 24a between lens elements 12a-b, flexible connection 24b between lens elements 12b-c, and so on. The number of lens elements of the lens plate 10 may be N, and the number of flexible connections of the lens plate 10 may be N-1, wherein N is an integer, for example in the range 2-200. An exemplary approx. 2 ft lens plate could for example have 48 lens elements and 47 flexible connections. Another exemplary approx. 1 ft lens plate could for example have 24 lens elements and 23 flexible connections. Each flexible connection 24a-d allows at least one of a distance and an angle between its two lens elements 12a-e to be adjusted, as will be further described hereinbelow.

The lens elements 12a-e and the flexible connections 24a-d are made of the same material. That is, the lens plate 10 can be made from one material. The lens elements 12a-e and the flexible connections 24a-d can be made of a none elastic material. The lens elements 12a-e and the flexible connections 24a-d may for example be made of PC (polycarbonate) (which is a none elastic material). Alternatively, the lens elements 12a-e and the flexible connections 24a-d could be made of silicone. The flexible connections 24a-d may for example be molded together with the lens elements 12a-e. Thus, the lens elements 12a-e and the flexible connections 24a-d of the lens plate 10 can be made in one piece. Furthermore, the lens elements 12a-e and the flexible connections 24a-d can be made in one manufacturing process, e.g. injection molding or injection of liquid silicone (LSR).

Each flexible connection 24a-d may comprise two V-shaped members 26a-b. The V-shaped members 26a-b lie in the plane 20. The V-shaped members 26a-b (generally) point towards each other. As may be seen in particular in the magnified portion of fig. 1, one end 28a of each V-shaped member 26a-b is connected to one lens element 12a, and the other end 28b of each V-shaped member 26a-b is connected to an adjacent lens element 12b. Specifically, the V-shaped members 26a-b may be accommodated in the aforementioned triangular- or isosceles trapezoid-shaped spaces 22a-b, wherein said end 28a is connected to a side 30a of the base portion 16 of lens element 12a, which side 30a partly define the space

22a, and wherein end 28b is connected to a side 30b of the base portion 16 of lens element 12b, which side 30b also partly define the space 22a. Exemplary dimensions (in mm) of the V-shaped member are shown in fig. 1.

Various alternative flexible connections are shown in figures 4a-d. In fig. 4a, the flexible connection comprises a V-shaped member 26' which stands in a plane perpendicular to the plane 20. In fig. 4b, the flexible connection comprises a V-shaped member 26'' which lies in the plane 20 but points away from the opposing flexible connection member. Compared to fig. 1, V-shaped members 26'' could be made longer and hence more flexible. In fig. 4c, the flexible connection comprises a W-shaped member 26''' which may lie in the plane 20. In fig. 4d, the flexible connection comprises a ⊓-shaped member 26'''' ("three sided rectangle") which may lie in the plane 20 and point away from the opposing flexible connection member.

Returning to fig. 1, a gap 32 may exist between each two consecutive lens elements, like lens elements 12a-b, when no force is applied to the flexible connections 24a-d. Specifically, the gap 32 may be present between a side 34a of the octagonal base portion 16 of one lens element 12a and an opposing (and here parallel) side 34b of the octagonal base portion 16 of an adjacent lens element 12b. Notably, side 34a sits between side 30a partly defining space 22a and the corresponding side 30'a partly defining space 22b.

As mentioned above, each flexible connection 24a-d allows a distance between its two lens elements 12a-e to be adjusted. Specifically, by stretching the flexible connections 24a-d (by applying an external force F), the distance between the lens elements 12a-e may be increased, as shown in fig. 3b. Namely, a pitch of the lens elements 12a-e may be increased up to e.g. 40%, for example from P_{11}=12 mm to P_{12}=14 mm. It is noted that the distance (pitch) between the lens elements is adjusted in the plane 20, here along the rectilinear direction of the aforementioned rectilinear array.

The lens plate 10 in the state shown in fig. 3a may be positioned on a board 102 with a plurality of LED light sources 104 having a pitch P_{21} equal to P_{11}, as shown in fig. 3c, wherein the lens plate 10 and the board 102 with the LED light sources 104 form part of an LED device 100. However, a/the lens plate 10 in the state shown in fig. 3b could likewise be position on another board 102' with a different (greater) LED pitch P_{22} equal to P_{12}, as shown in fig. 3d, wherein the lens plate 10 and the board 102' with LED light sources 104' form part of an LED device 100'. Hence, the lens plate 10 can suit LED boards 102, 102' with different LED pitches P_{21} and P_{22}, making the present lens plate 10 versatilely applicable.

The board 102 (102') could be a printed circuit board. The board 102 (102') could be rectangular. The plurality of LED light sources 104 (104') could be mounted on a surface of the board 102 (102'). The plurality of LED light sources 104 (104') could be arranged in a rectilinear array. The number of LED light sources 104 (104') could be N. The LED device 100 (100') may be or form part of a luminaire.

Furthermore, each lens element 12a-e of the lens plate 10 may include two protrusions 36a-b adapted to engage with corresponding notches 106a-b (106'a-b) in the board 102 (102') for positioning of the lens plate 10 on the board 102 (102'). Specifically, one protrusion 36a may be located at a lateral side 38a of the octagonal base portion 16, and the other protrusion 36b may be located at the opposite lateral side 38b. The corresponding notches 106a-b (106'a-b) may be located at longitudinal edges 108a-b (108'a-b) of the board 102 (102'). Such positioning is solving the issue with influence of thermal elongation on light distribution as positions of the lens elements 16 relative to LED light sources 104 (104') of the board 102 (102') are stable.

Turning to fig. 5, the lens plate 10 could also be positioned on a curved board 102''. Here, the linear array of lens elements 16 is curved (in plane 20). This may be achieved by applying an external force such that only (or mostly) the V-shaped members 26b at one side of the lens plate 10 are stretched, while the V-shaped members 26a at the other side of the lens plate 10 may be (slightly) squeezed, compared to the state shown in figures 1 and 3a. As shown in fig. 5, the angle between each two consecutive lens elements has been adjusted (over fig. 1), as appreciated by the non-aligned dashed lines.

Fig. 6 is a flow chart of a method of manufacturing an LED device 100, 100' according to an embodiment of the present invention.

At S1, the method comprises providing the lens plate 10, e.g. as shown in figures 1 and 3a.

At S2, the board 102, 102' with the plurality of LED light sources 104 (104') is provided.

At S3, the method comprises – if needed – stretching and/or compressing the flexible connections 24a-d by applying a force F such that the pitch P_{12} of the plurality of lens elements 12a-e of the lens plate matches the pitch P_{22} of the plurality of LED light sources 104'. Here it is noted that step S3 needs not to be performed if the lens plate 10 as shown in figures 1 and 3a is to be positioned on the board 102, but is indeed performed (stretching the flexible connections 24a-d) if that lens plate 10 is to be positioned on the board 102'.

At S4, the lens plate 10 is positioned on the board 102 (102'), e.g. using the aforementioned protrusions/notches.

The person skilled in the art realizes that the present invention by no means is limited to the preferred embodiments described above. On the contrary, many modifications and variations are possible within the scope of the appended claims. For example, in the embodiment shown in figures 1 and 2 and 3a, the gap 32 is relatively small, but if the gap is wider when no force is applied to the flexible connections, the flexible connections may (also) be compressed allowing the pitch of the lens elements to be decreased.

Additionally, variations to the disclosed embodiments can be understood and effected by the skilled person 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. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measured cannot be used to advantage.

CLAIMS:

1. A lens plate (10) for an LED device (100), the lens plate comprising:

a plurality of lens elements (12a-e); and

a flexible connection (24a-d) between a further plurality of two consecutive lens elements of the plurality of lens elements so that at least one of a distance (P_{11}) and an angle between each of said two lens elements can be adjusted, wherein each of said two lens elements and the flexible connection are made of the same material.

2. A lens plate according to claim 1, wherein the flexible connection is molded together with the two lens elements.

3. A lens plate according to claim 1 or 2, wherein the flexibility of the flexible connection is achieved by at least one of the shape, dimension, and position of the flexible connection.

4. A lens plate according to any one of the preceding claims, wherein the flexible connection comprises two V-shaped members (26a-b).

5. A lens plate according to claim 4, wherein the two lens elements each has a base portion (16), wherein the two base portions at least partly define two triangular- or isosceles trapezoid-shaped spaces (22a-b) pointing towards each other between the two base portions, and wherein each of the two triangular- or isosceles trapezoid-shaped spaces accommodates one of the two V-shaped members of the flexible connection.

6. A lens plate according to any one of the preceding claims, wherein a gap (32) exists between the two lens elements when no force is applied to the flexible connection.

7. A lens plate according to any one of the preceding claims, wherein each lens element of the plurality of lens elements includes two protrusions (36a-b) adapted to engage

with corresponding notches (106a-b) in an LED board (102) of the LED device for positioning of the lens plate on the LED board.

8. A lens plate according to any one of the preceding claims, wherein the plurality of lens elements are arranged in a linear array.

9. A lens plate according to claim 8, wherein the linear array is curved in a plane (20) perpendicular to the plurality of lens elements' optical axes (18).

10. An LED device (100; 100'), comprising:
a board (102; 102') with a plurality of LED light sources (104; 104'); and
a lens plate (10) according to any one of the preceding claims, wherein a pitch (P_{11}; P_{12}) of the plurality of lens elements (16) of the lens plate matches a pitch (P_{21}; P_{22}) of the plurality of LED light sources of the board.

11. An LED device according to claim 10, wherein each lens element of the plurality of lens elements includes two protrusions (36a-b) engaging with corresponding notches (106a-b; 106'a-b) in the board for positioning of the lens plate on the board.

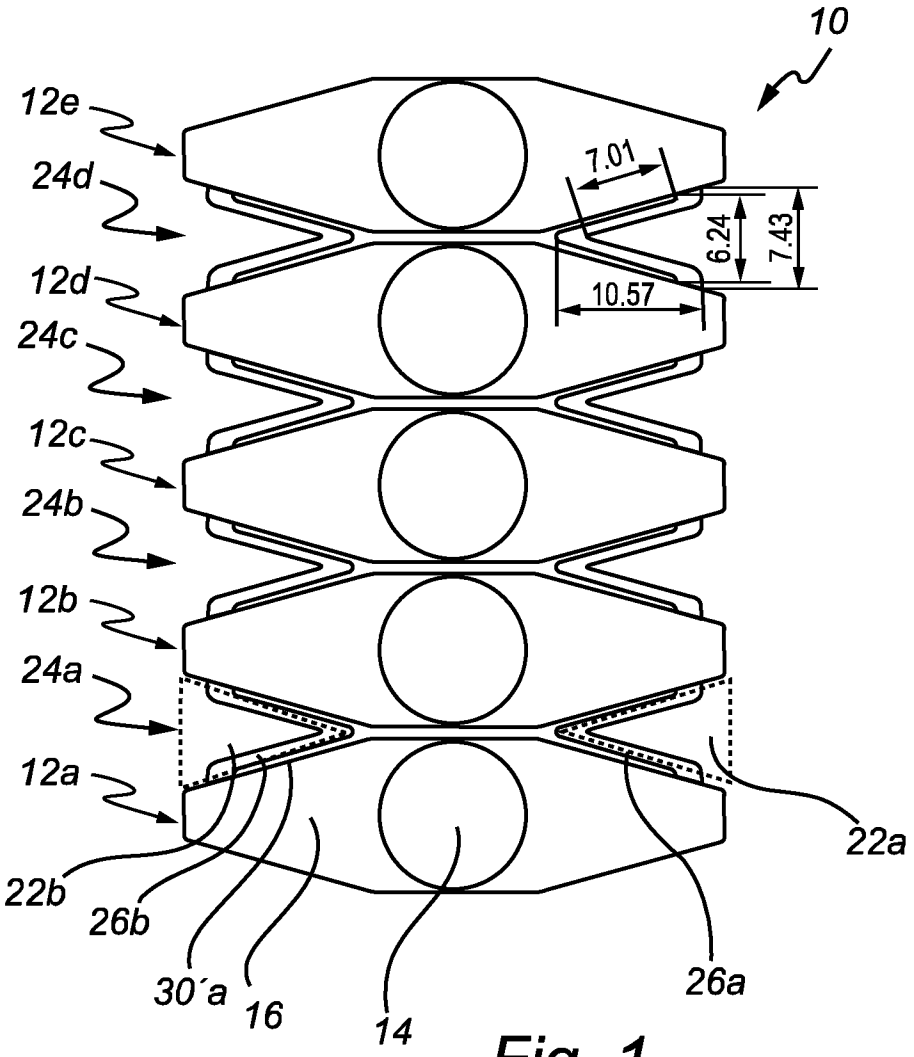
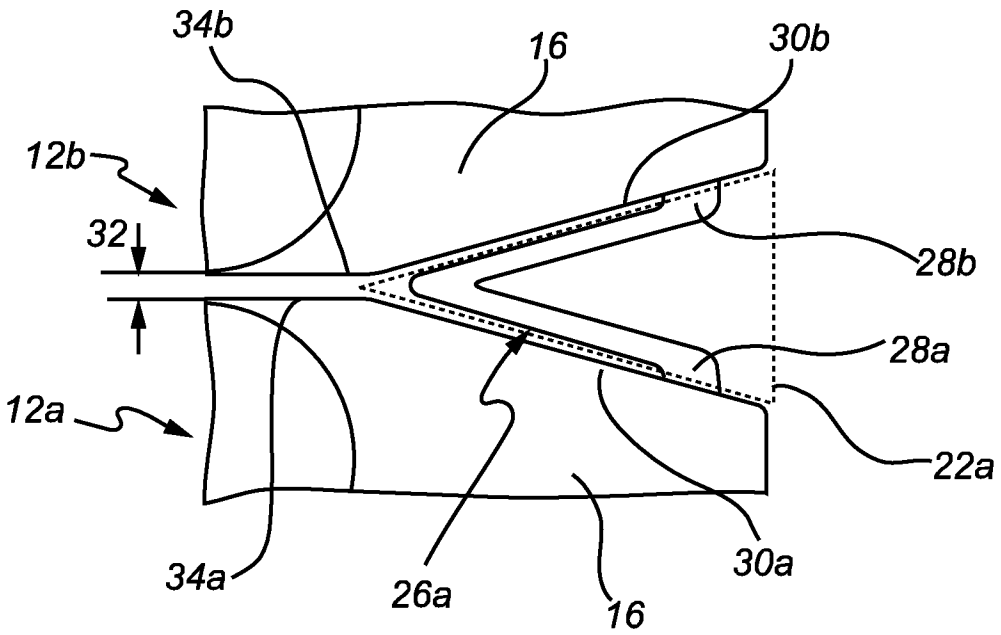

10
12e
24d
12d
24c
12c
24b
12b
24a
12a
7.01
6.24
7.43
10.57
22a
22b
26b
30´a
16
14
26a

Fig. 1


34b
16
30b
12b
32
28b
28a
12a
22a
34a
26a
16
30a

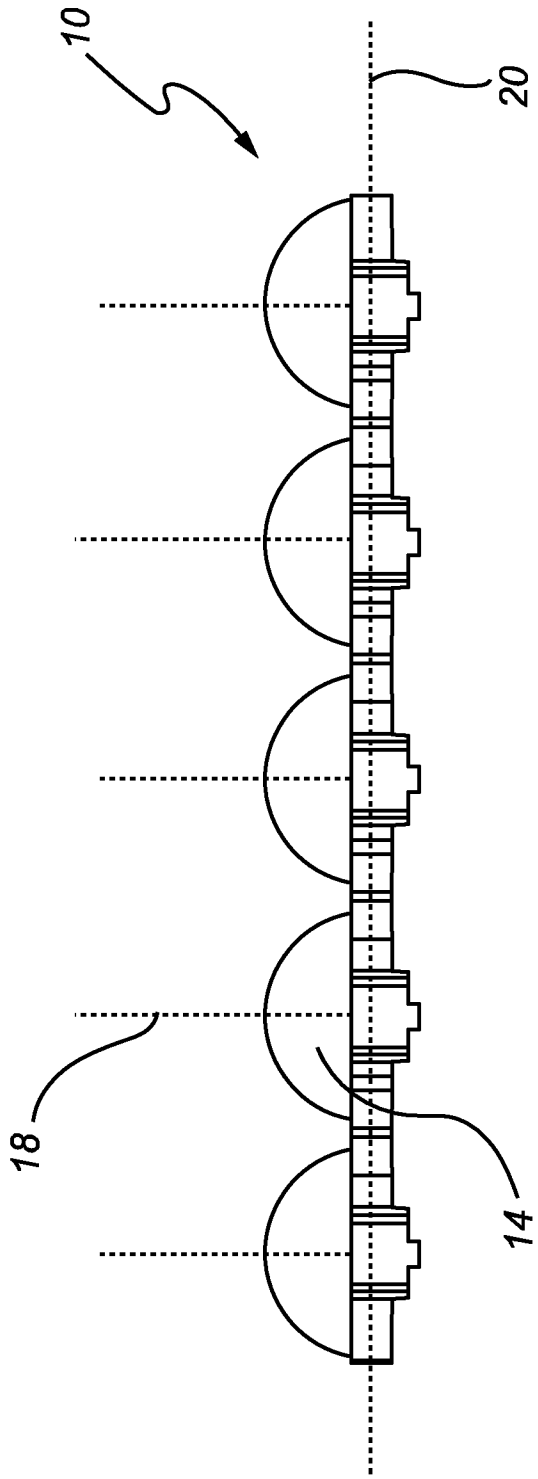


Fig. 2

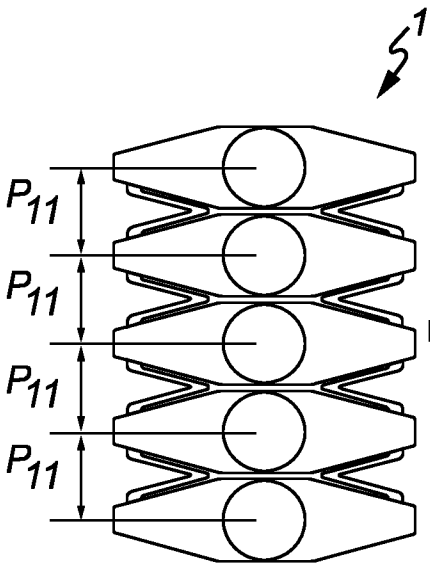


Fig. 3a

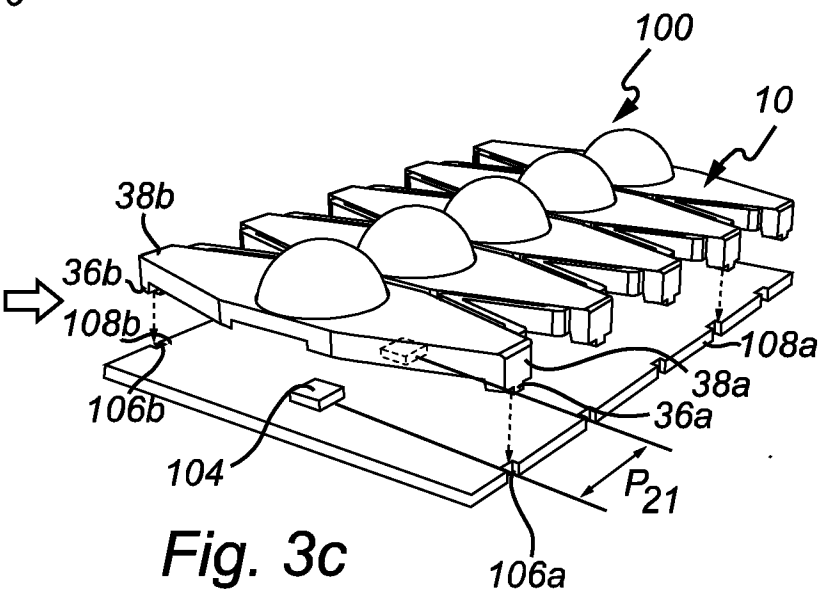


Fig. 3c

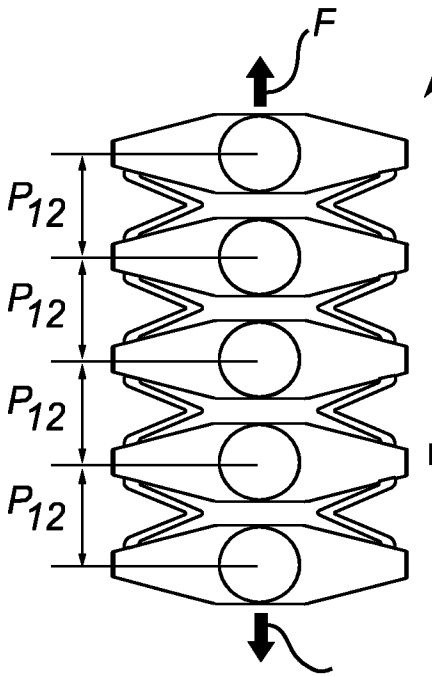


Fig. 3b

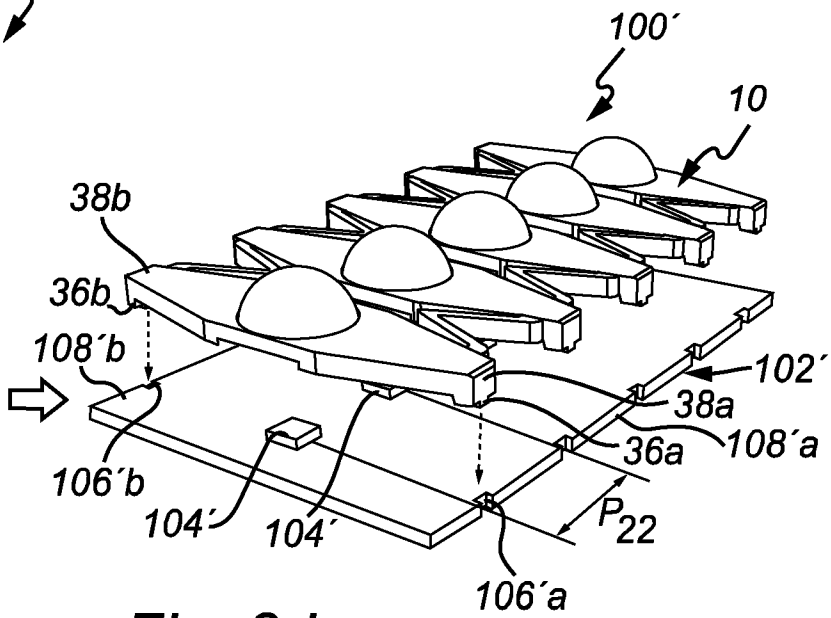


Fig. 3d

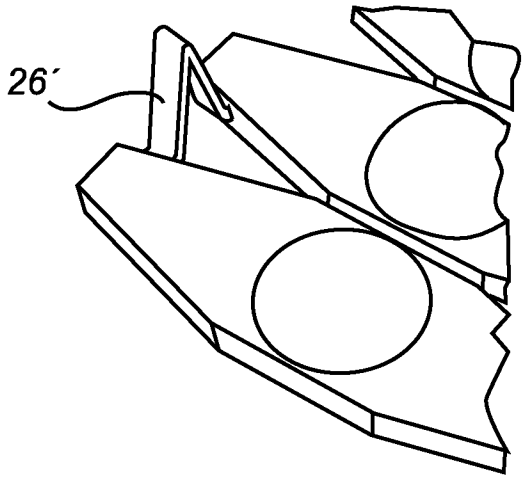


Fig. 4a

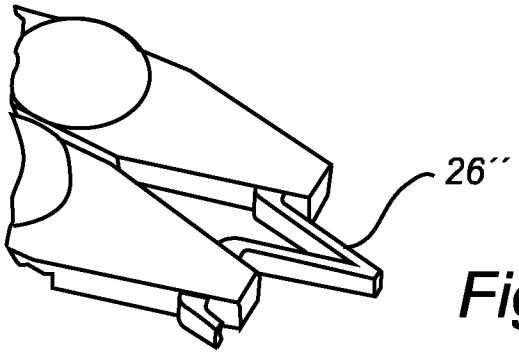


Fig. 4b

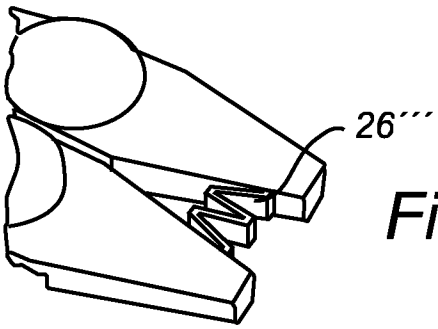


Fig. 4c

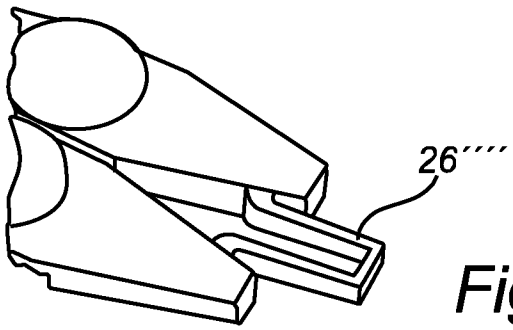


Fig. 4d

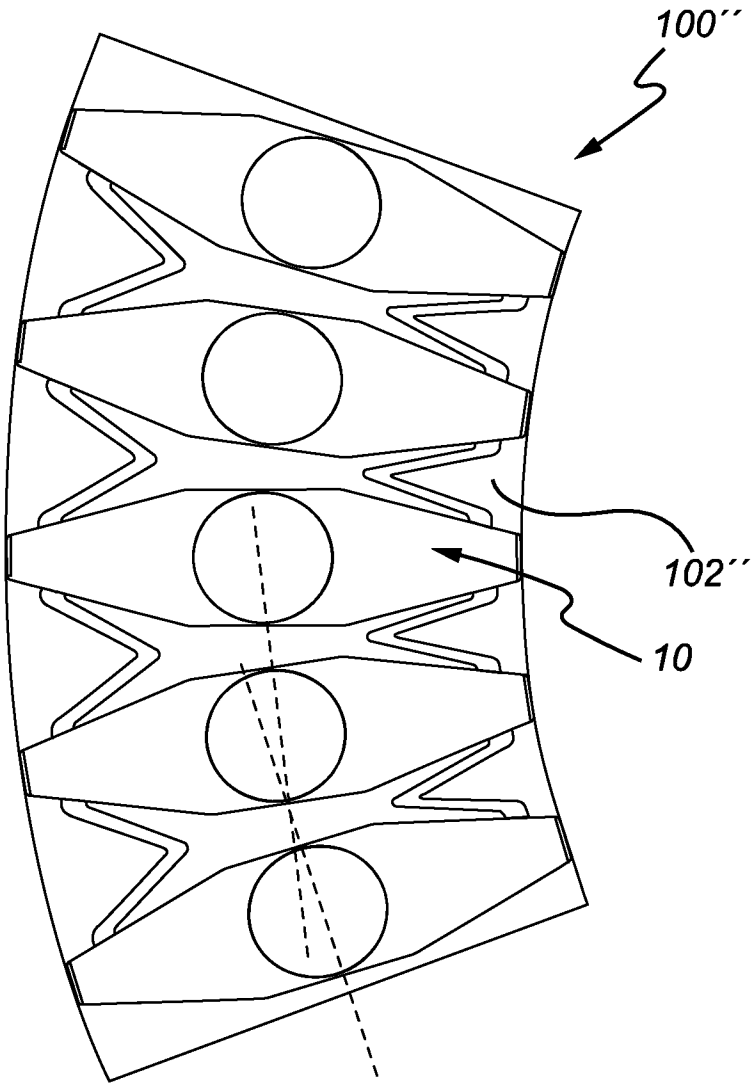


Fig. 5

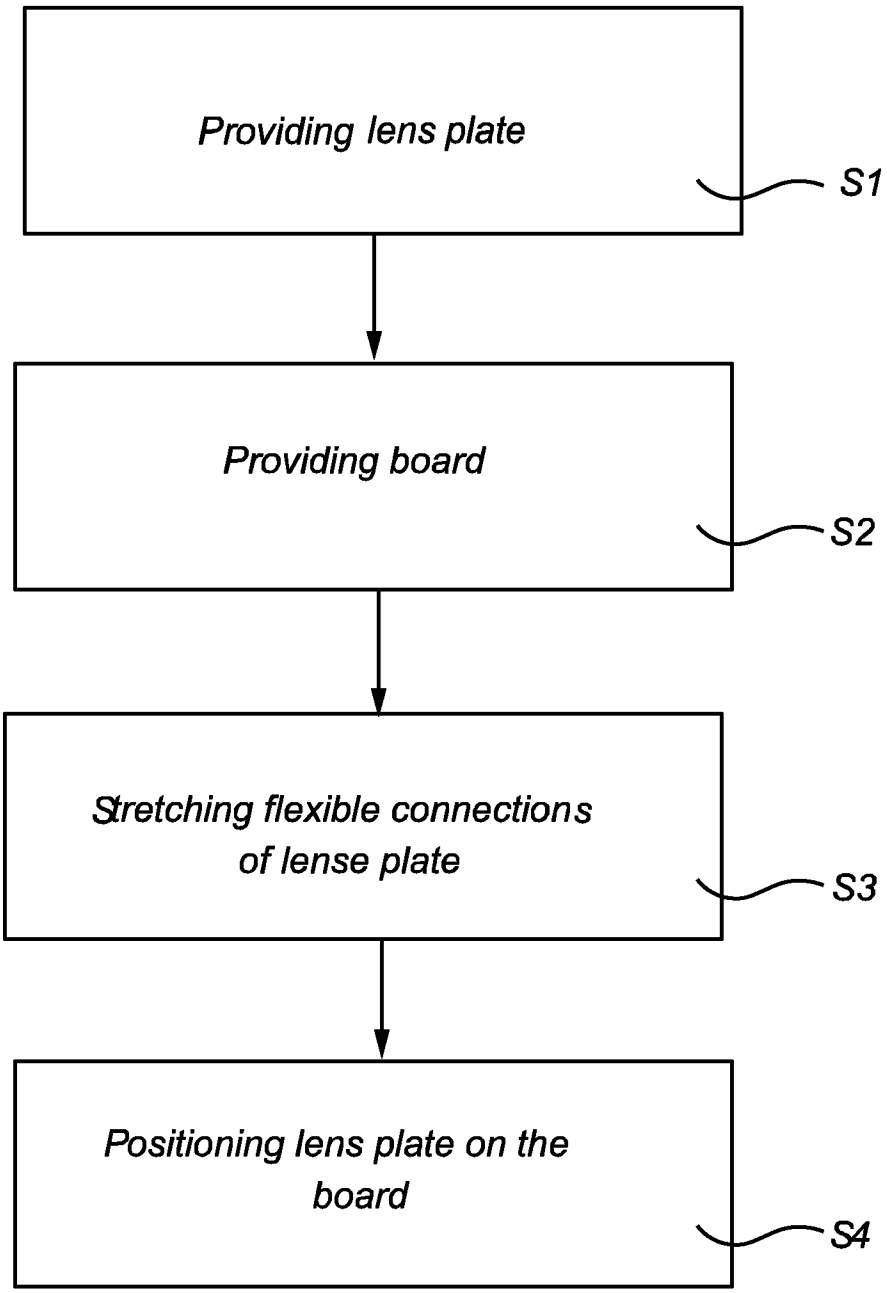

Providing lens plate
S1
Providing board
S2
Stretching flexible connections of lense plate
S3
Positioning lens plate on the board
S4

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/065236

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02B3/00 F21V5/04
ADD.

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)
G02B F21V

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2007 199495 A (PIONEER ELECTRONIC CORP) 9 August 2007 (2007-08-09)	1-3,8,9
Y	abstract; figures 1,2	4-6
Y	US 2020/011521 A1 (JOIRIS SAMUEL [BE]) 9 January 2020 (2020-01-09) paragraph [0070] - paragraph [0090]; figures 1,2	7,11
X	WO 2020/052235 A1 (GUANGZHOU UNIONLUX ELECTRONIC TECH CO LTD [CN]) 19 March 2020 (2020-03-19)	1,10
Y	abstract; figures 1,2	4-7,11

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

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 August 2021	09/09/2021

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Feeney, Orla

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2021/065236

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2007199495 A	09-08-2007	JP 4641950 B2	02-03-2011
		JP 2007199495 A	09-08-2007
US 2020011521 A1	09-01-2020	CN 106439507 A	22-02-2017
		DK 3128231 T3	17-12-2018
		EP 3128231 A1	08-02-2017
		ES 2699527 T3	11-02-2019
		JP 2017037841 A	16-02-2017
		KR 20170017812 A	15-02-2017
		PL 3128231 T3	29-03-2019
		PT 3128231 T	05-12-2018
		US 2017038056 A1	09-02-2017
		US 2020011521 A1	09-01-2020
WO 2020052235 A1	19-03-2020	CN 209101217 U	12-07-2019
		WO 2020052235 A1	19-03-2020