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(54) LAMP FOR USE IN A DISPLAY CABINET AND DISPLAY CABINET THEREOF

(57) The present invention relates to the technical field of lighting equipment, in particular to a lamp for use in a display cabinet, it comprises a bracket (1), arranged on a bottom plate of the display cabinet; a circuit board (2), provided on the bracket (1); a plurality of point-like light sources (3), arranged on the circuit board (2) at intervals along the length direction of the circuit board (2); a lens structure (8), which is arranged along the length direction of the circuit board (2) in the light output direction of the point-like light sources (3) and is connected with the bracket (1) to cover a plurality of the point-like light sources (3); the lens structure (8) comprises an integrated formed light distribution lens (8) and a lens array (9) for extending two adjacent point-like light sources (3) to form a line light source. The lamp for use in a display cabinet is high in optical efficiency.

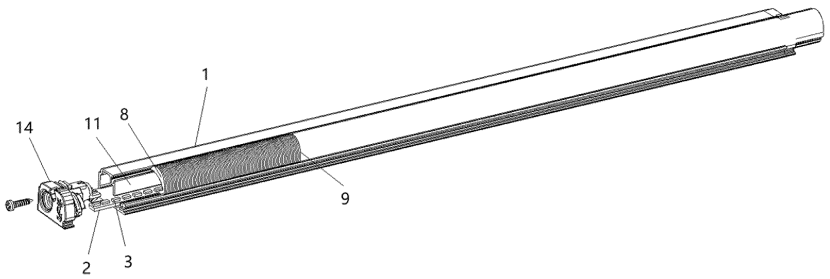

Fig. 1

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Description

RELATED APPLICATION

[0001] This application claims priority to Chinese Patent Application No. CN 202122875691.8, filed on November 22, 2021, the whole content of which is hereby incorporated by reference.

FIELD OF THE TECHNOLOGY

[0002] The invention relates to the technical field of lighting equipment, in particular to a lamp used in a display cabinet and a display cabinet.

BACKGROUND

[0003] In order to solve the glare problem of the existing lamps, a line-shaped (linear) light source is used to replace the conventional point-like light source. The main procedure to implement such a configuration is as follows: The optical diffusion film is interspersed to the lampshade to form a line-shaped (linear) light source. The light of this kind of lamp passes through the lens, optical diffusion film and lampshade, resulting in a large loss of optical efficiency of the lamp. Optical efficiency may be only about 0.75. Another problem is that the light passes through the lens and then passes through the lampshade with a micro-convex lens structure. Although the optical efficiency of this kind of configuration is higher than that of the previous form, only a certain improvement can be achieved, as the optical efficiency will only be of the order of about 0.8. In this configuration, the light still passes through a two-layer structure, which cannot meet the actual demand for higher optical efficiency of lamps in display cabinets.

BRIEF SUMMARY THE TECHNOLOGY

[0004] Therefore, the technical problem to be solved by the present invention is to provide a lamp for use in a display cabinet, which in particular enables a higher optical efficiency to thereby overcome the afore-mentioned deficiencies of conventional lamps of low optical efficiency of the array-type for display cabinets.

[0005] This problem is solved by a lamp for use in a display cabinet as claimed in claim 1, and by a display cabinet as claimed in claim 9. Further advantageous embodiments are the subject-matter of the dependent claims.

[0006] A lamp for use in a display cabinet according to the present invention can meet the actual needs with an efficient and low-cost configuration, and enables in particular a high optical efficiency for display cabinets.

[0007] A lamp for use in a display cabinet comprises: a bracket, arranged on a bottom plate of the display cabinet; a circuit board, provided on the bracket; a plurality of point-like light sources arranged on the circuit board at intervals along the length direction of the circuit board, preferably at equidistant intervals. A lens structure extends (is arranged) along the length direction of the circuit board and is disposed in the light output direction of the plurality of point-like light sources and is connected with the bracket to cover a plurality of the plurality of point-like light sources. The lens structure comprises an integrally formed light distribution lens and a lens array for extending respective two adjacent point-like light sources of the plurality of point-like light sources to form a line (linear-shaped) light source.

[0008] According to a further embodiment, the light distribution lens and the lens array are both convex lenses.

[0009] According to a further embodiment, the lamp further comprises a reflection structure provided on a side surface of the lens structure and extending in the longitudinal direction, wherein the reflection structure and the lens structure enclose an accommodating space accommodating the plurality of the point-like light sources.

[0010] According to a further embodiment, the reflection structure comprises a first reflector and a second reflector provided on opposite sides of the lens structure.

[0011] According to a further embodiment, the first reflector is a diffuse reflector plate and the second reflector is a non-transparent lens integrally formed with the lens structure.

[0012] According to a further embodiment, the bracket is provided with a support plate extending toward the circuit board, wherein the first reflector is attached to the support plate.

[0013] According to a further embodiment, the first reflector is formed integrally with the lens structure and the first reflector is provided with a connecting portion connected with the bracket and a reflection portion extending toward the plurality of point-like light sources.

[0014] According to a further embodiment, the bracket is provided with a plug-in board extending toward the lens structure, and one end of the first reflector is inserted with the plug-in board, and the other end abuts on the circuit board.

[0015] A display cabinet according to the present invention comprises at least one lamp as described above and hereinunder in more details.

[0016] The technical scheme of the present invention has the following advantages:

1. In the lamp for use in a display cabinet provided by the present invention, the light emitted by the plurality of point-like light sources directly passes through the lens structure, so that the two adjacent point-like light sources are elongated by the lens array to form a line (linear) light source, and because the output light only pass through one layer of the lens structure, the optical efficiency can be enhanced and the lighting needs of display cabinets can be easily met.

2. The lamp for use in a display cabinet provided by

the present invention is provided with a reflection structure on the side of the lens structure, which extends along the length direction. The reflection structure can further utilize the light emitted by the plurality of point-like light sources that does not enter (is not received by) the lens structure, and then the light is emitted through the lens structure after reflection, so as to guide this part of the light to the near end of the irradiation surface and improve the overall light efficiency of the lamp.

3. In the lamp for use in a display cabinet provided by the present invention, the reflection structure includes a first reflector and a second reflector respectively arranged on opposite sides of the lens structure. Thus, the light emitted from the plurality of point-like light sources that does not illuminate to both sides of the lens structure can be utilized to the maximum extent to further improve the light efficiency.

4. In the lamp for use in a display cabinet provided by the present invention, the first reflector is a diffuse reflector, which can reflect the light not received by the lens structure at multiple angles and increase the irradiation area; the second reflector is a non-transparent lens integrally formed with the lens structure, which reduces the assembly process, reduces the assembly cost and improves the assembly efficiency, thereby providing a low-cost and efficient set-up.

5. In the lamp for use in a display cabinet provided by the present invention, the first reflector has various forms, which can be flexibly selected according to actual needs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] In order to more clearly illustrate the specific embodiments of the present invention or the technical solutions as compared to the prior art, the following will briefly introduce the accompanying drawings that need to be used in the description of the specific embodiments or the prior art. Obviously, the following descriptions of the accompanying drawings are some embodiments of the present invention. For those of ordinary skill in the art, other drawings can also be obtained based on these drawings without creative efforts.

Fig.1 is a schematic diagram of a lamp for use in a display cabinet provided by the present invention;

Fig.2 is a schematic cross-sectional view of the lamp shown in the Fig. 1 perpendicular to the length direction;

Fig.3 is a schematic cross-sectional view of a lamp for use in a display cabinet according to a second embodiment of the present invention;

Fig.4 is a schematic cross-sectional view of a lamp for use in a display cabinet according to a third embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The technical solutions of the present invention will be clearly and completely described below with reference to the accompanying drawings. Obviously, the described embodiments are a part of the embodiments of the present invention, and the present invention shall not be construed to be delimited to only these specific embodiments. Based on the embodiments of the present invention, a person skilled in the art will become aware of additional embodiments including equivalent solutions without being inventive, and such embodiments shall fall under the scope of protection of the present invention as well.

[0019] In addition, the technical features involved in the different embodiments of the present invention described below can be combined with each other as long as there is no conflict with each other.

[0020] As shown in Figs. 1 and 2, a specific embodiment of the lamp for use in a display cabinet includes a bracket 1 configured to be arranged horizontally on the bottom plate of a display cabinet (not shown). In particular, the bracket 1 may include a more or less flat, planar surface for mounting on such a bottom plate of a display cabinet. The lamp further comprises a circuit board 2 and a lens structure arranged on the bracket 1, and a plurality of point-like light sources 3 arranged on the circuit board 2 at intervals, preferably at equidistant intervals, along the length direction of the circuit board 2.

[0021] The bracket 1 is integrally processed and preferably made of aluminum. The bracket 1 includes a base 4 for fixing with the bottom plate of the display cabinet, a support portion 5 for installing the circuit board 2, and a first installation portion 6 and a second installation portion 7 for connecting with the two ends of the lens structure respectively. The base 4 preferably has a flat, planar surface, and is configured to match the bottom plate of the display cabinet. The support portion 5 may be formed as an integrally formed boss or protrusion, and preferably includes a groove for accommodating an end surface of the circuit board 2 for mounting. The circuit board 2 may be tightly accommodated in such a groove. Moreover, the first installation portion 6 and the second installation portion 7 are preferably grooves integrally formed with the bracket.

[0022] More specifically, the first and second installation portion 6, 7 may be configured to accommodate a respective end surface of the lens structure in a form-fitting manner, in particular by snap-fitting.

[0023] The circuit board 2 is a printed circuit board mounted on the support portion 5 of the bracket 1

[0024] Each point-like light source 3 may be an LED chip.

[0025] The lens structure extends along the length direction of the circuit board 2 and is disposed in the light output direction of the point-like light sources 3 and connected with the bracket 1 to cover a plurality of the point-like light sources 3, thereby reducing the lampshade set-up and volume. The lens structure includes an integrally formed light distribution lens 8 of an appropriate shape for light distribution and a lens array 9 for extending two adjacent point-like light sources 3 to form a line-shaped light source. Specifically, the light distribution lens 8 and the lens array 9 are both convex lenses, which are processed and formed by an extrusion process, particularly a plastic extrusion process. One end of the light distribution lens 8 connected with the bracket 1 may be provided with a protruding portion 10, and the protruding portion 10 may be inserted in a form-fitting manner into the first installation portion 6 of the bracket 1 to be fixed at least in a direction in parallel with the light output direction. The lens array 9 is arranged on the light exit surface of the light distribution lens 8. As an alternative, the lens array 9 may also be arranged on the light entrance surface of light distribution lens 8.

[0026] In order to improve the optical light efficiency of the lamp, reflection structures may be arranged on each of the opposite sides of the lens structure along the length direction of the circuit board 2, namely the first reflector 11 and the second reflector 12. As shown in Fig. 2, the first reflector 11 and second reflector 12 are each linear structure extending along the length direction of the bracket 1. As shown in Fig. 2, the first reflector 11, the second reflector 12 and the lens structure enclose an accommodating space for the plurality of the point-like light sources 3, which is more or less of triangular shape, if viewed in a cross-sectional view and extends along the length direction of the bracket 1.

[0027] More specifically, the first reflector 11 may be a diffuse reflector plate and the second reflector 12 may be a non-transparent lens integrally formed with the lens structure, which may be accomplished e.g. by means of a two-color extrusion process. Preferably, the lens structure is a transparent part and the second reflector 12 is a white part. Most of the light emitted by the point-like light sources 3 is guided to the far end of the illuminated surface through the light distribution lens 8. The first reflector 11 and the second reflector 12 reflect a small portion of the light not received by the light distribution lens 8 and then emit or guide this light portion towards and through the light distribution lens 8 so that it is guided towards the near end of the illuminated surface.

[0028] As shown in Fig. 2, a first plug portion 13 may be provided at an end of the second reflector 12, which is preferably formed of a plastic material and includes a resilient hook that extends into a groove provided at the second installation portion 7. More specifically, the first plug portion or its resilient hook may be snap-fitted into the groove shown in Fig. 2, and grips behind a corresponding protrusion formed in the second installation portion 7 of the bracket 1, so as to install and fix the lens structure with the bracket 1.

[0029] In order to prevent dust from entering the accommodating space, an end cover 14 may be provided at each end of the bracket 1, and each end cover 14 may be detachably connected to the bracket 1, e.g. by means of screws.

[0030] As shown in Fig. 2, the bracket 1 is provided with a support plate 15 extending toward the circuit board 2, and the support plate 15 is connected with the first installation portion 6 and is set at an angle without contacting the circuit board 2. The first reflector 11 is attached to the support plate 15, e.g. by means of an adhesive. The supporting plate 15 and the first reflecting plate 11 are inclined and extend towards the point-like light sources 3 to collect the light emitted by the point-like light sources 3 away from the irradiating surface as much as possible, and the reflected light is emitted through the light distribution lens 8 to minimize the energy loss and improve the light efficiency. According to a further embodiment, the first reflector 11 may also be replaced by diffuse paper.

[0031] In the second embodiment as shown in Fig. 3, the first reflector 11 is integrally formed with the lens structure, and the first reflector 11 is provided with a connecting portion 16 connected with the bracket 1. The front end of the connecting portion may be formed as a resilient hook, configured to be snap-fitted into a groove of the first installation portion. The reflection portion 17 extends toward the point-like light source 3. The connecting portion 16 of the first reflector 11 is inserted into the first installation portion 6 of the bracket 1, more particularly into a groove disposed therein, to be fixed. The connecting portion 16 may approximately horizontally arranged, and the reflection portion 17 is arranged obliquely.

[0032] As to the third embodiment as shown in Fig. 4, the bracket 1 is provided with a plug-in board 18 extending toward the convex lens structure, and one end of the first reflector 11 is provided with a second plug-in portion 18 which is fixed with the plug-in board 18 in a form-fitting manner, and the other end abuts on the circuit board 2. One end of the light distribution lens 8 connected with the bracket 1 is provided with a protruding portion 10, which is inserted into the first installation portion 6 of the bracket 1 and fixed, more specifically into a groove provided therein.

[0033] The present invention also provides a display cabinet, which includes the lamp used for the display cabinet, and the display cabinet is a vertical freezer, a refrigerator, and the like.

[0034] The above are only preferred embodiments of the present invention, and are not used to limit the protection scope of the present invention. Any modification, equivalent replacement or improvement within the spirit of the present invention is covered by the scope of the claims of the present invention.

Claims

1. A lamp for use in a display cabinet, comprising:

   a bracket (1) configured to be arranged on a bottom plate of the display cabinet;
   a circuit board (2) provided on the bracket (1);
   a plurality of point-like light sources (3) arranged on the circuit board (2) at intervals along the length direction of the circuit board (2);
   a lens structure (8) extending along the length direction of the circuit board (2) and disposed in the light output direction of the point plurality of point-like light sources (3), wherein
   the lens structure is connected with the bracket (1) to cover the plurality of the point-like light source (3);
   characterized in that the lens structure comprises an integrally formed light distribution lens (8) and a lens array (9) for extending respective two adjacent point-like light sources (3) of the plurality of point-like light sources (3) to form a line light source.

2. The lamp for use in a display cabinet as claimed in claim 1, wherein the light distribution lens (8) and the lens array (9) are both convex lenses.

3. The lamp for use in a display cabinet as claimed in any of the preceding claims, further comprising a reflection structure (11, 12) provided on a side surface of the lens structure and extending along the longitudinal direction, wherein the reflection structure (11, 12) and the lens structure enclose an accommodating space accommodating the plurality of the point-like light sources (3).

4. The lamp for use in a display cabinet as claimed in claim 3, wherein the reflection structure comprises a first reflector (11) and a second reflector (12) provided on opposite sides of the lens structure.

5. The lamp for use in a display cabinet as claimed in claim 4, wherein the first reflector (11) is a diffuse reflector plate and the second reflector (12) is a non-transparent lens integrally formed with the lens structure.

6. The lamp for use in a display cabinet as claimed in claim 4 or 5, wherein the bracket (1) is provided with a support plate (15) extending toward the circuit board (2), wherein the first reflector (11) is attached to or provided on the support plate (15).

7. The lamp for use in a display cabinet as claimed in claim 4 or 5, wherein the first reflector (11) is formed integrally with the lens structure, and the first reflector (11) is provided with a connecting portion (16) configured to be connected with the bracket (1) and a reflection portion (17) extending toward the plurality of point-like light sources (3).

8. The lamp for use in a display cabinet as claimed in claim 4 or 5, wherein the bracket (1) is provided with a plug-in board (18) extending toward the lens structure, and one end of the first reflector (11) is inserted with the plug-in board (18), and the other end abuts on the circuit board (2).

9. A display cabinet comprising at least one lamp for use in a display cabinet as claimed in any of the preceding claims.

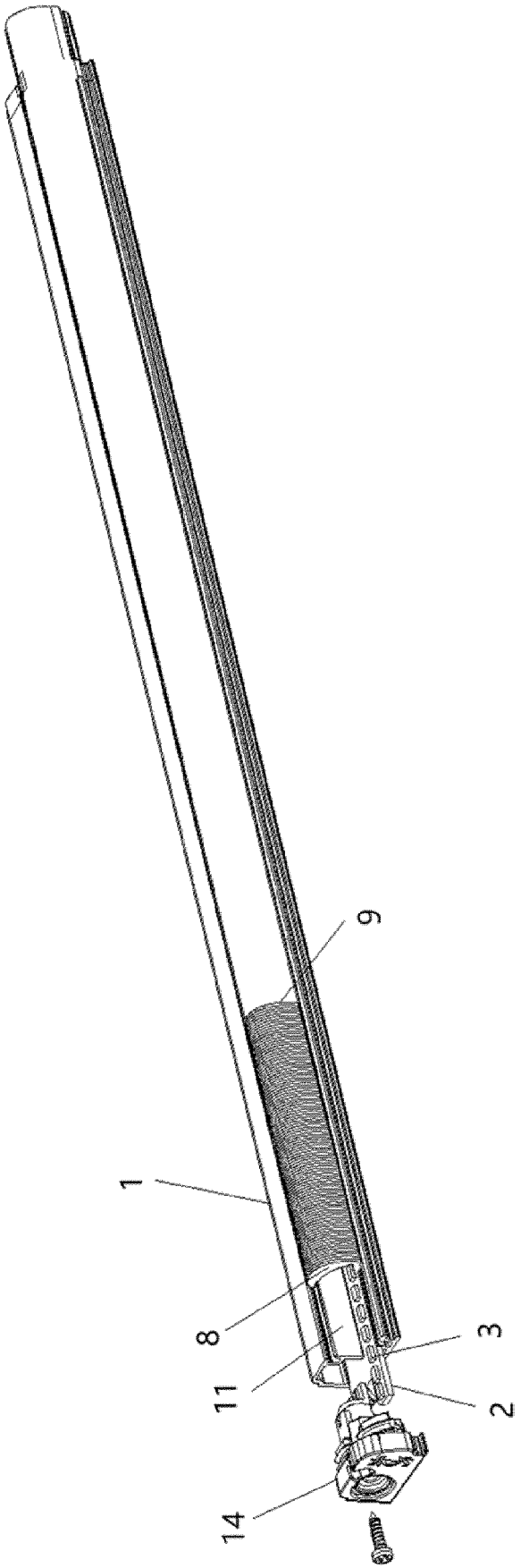

Fig. 1

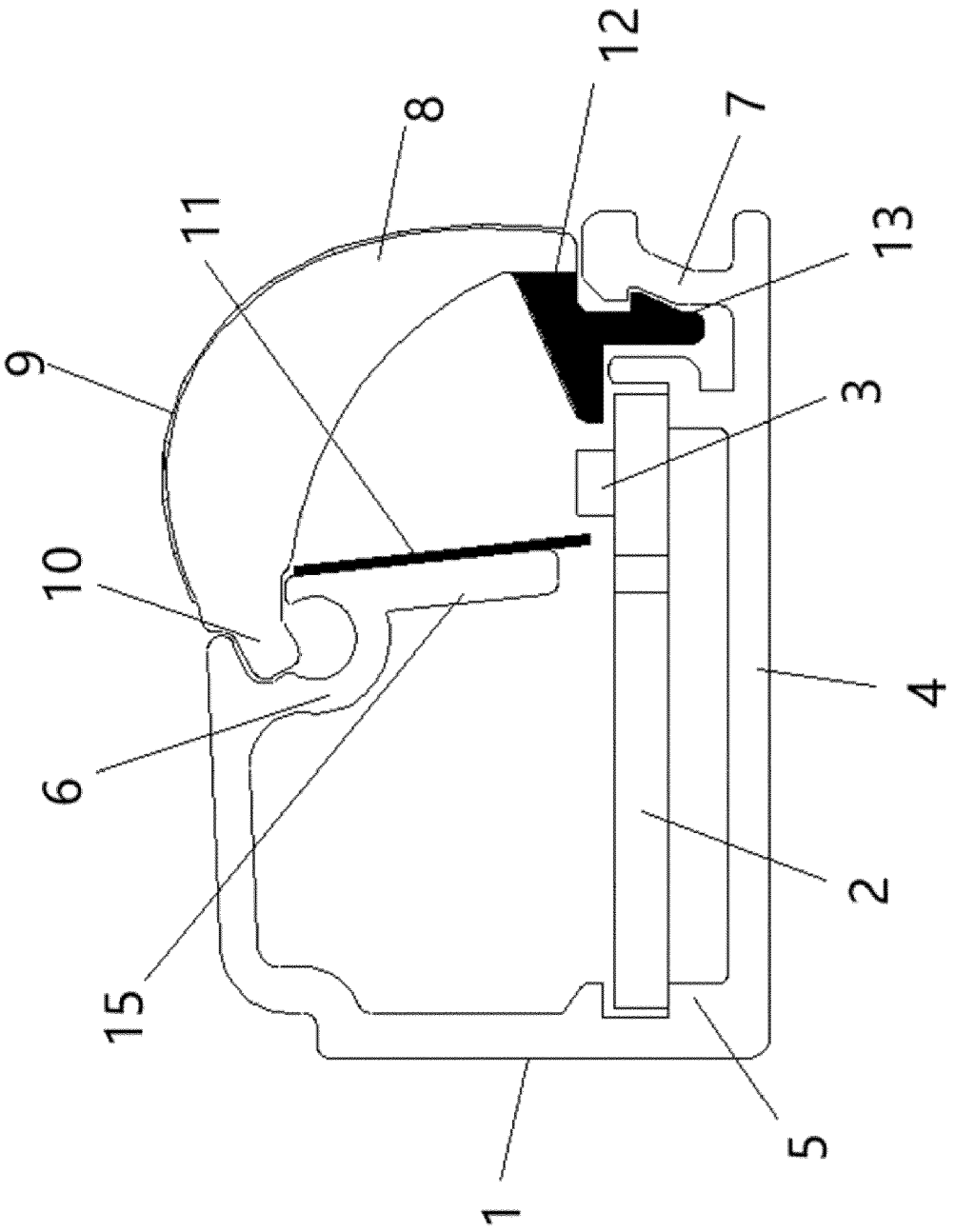

Fig. 2

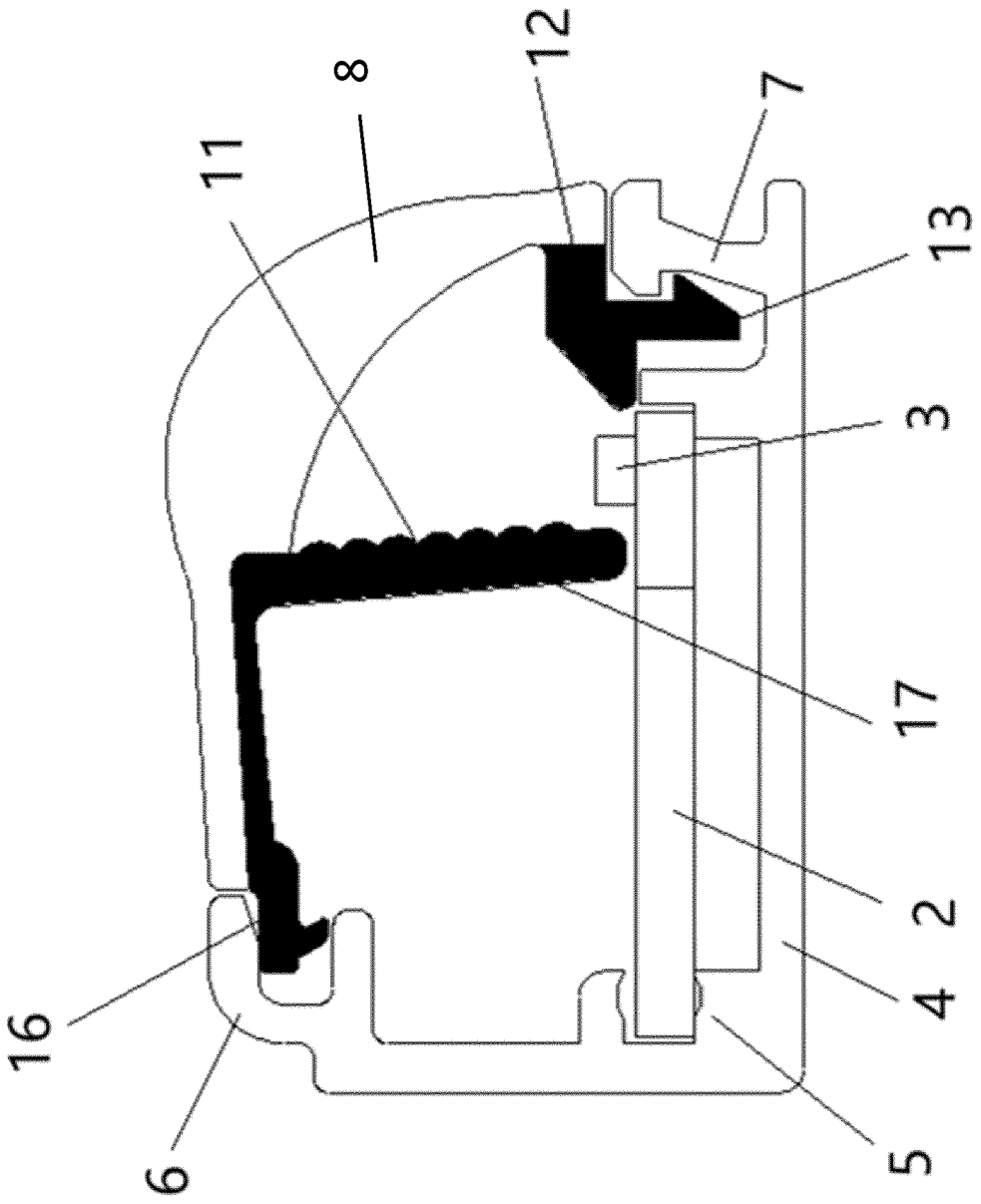

Fig. 3

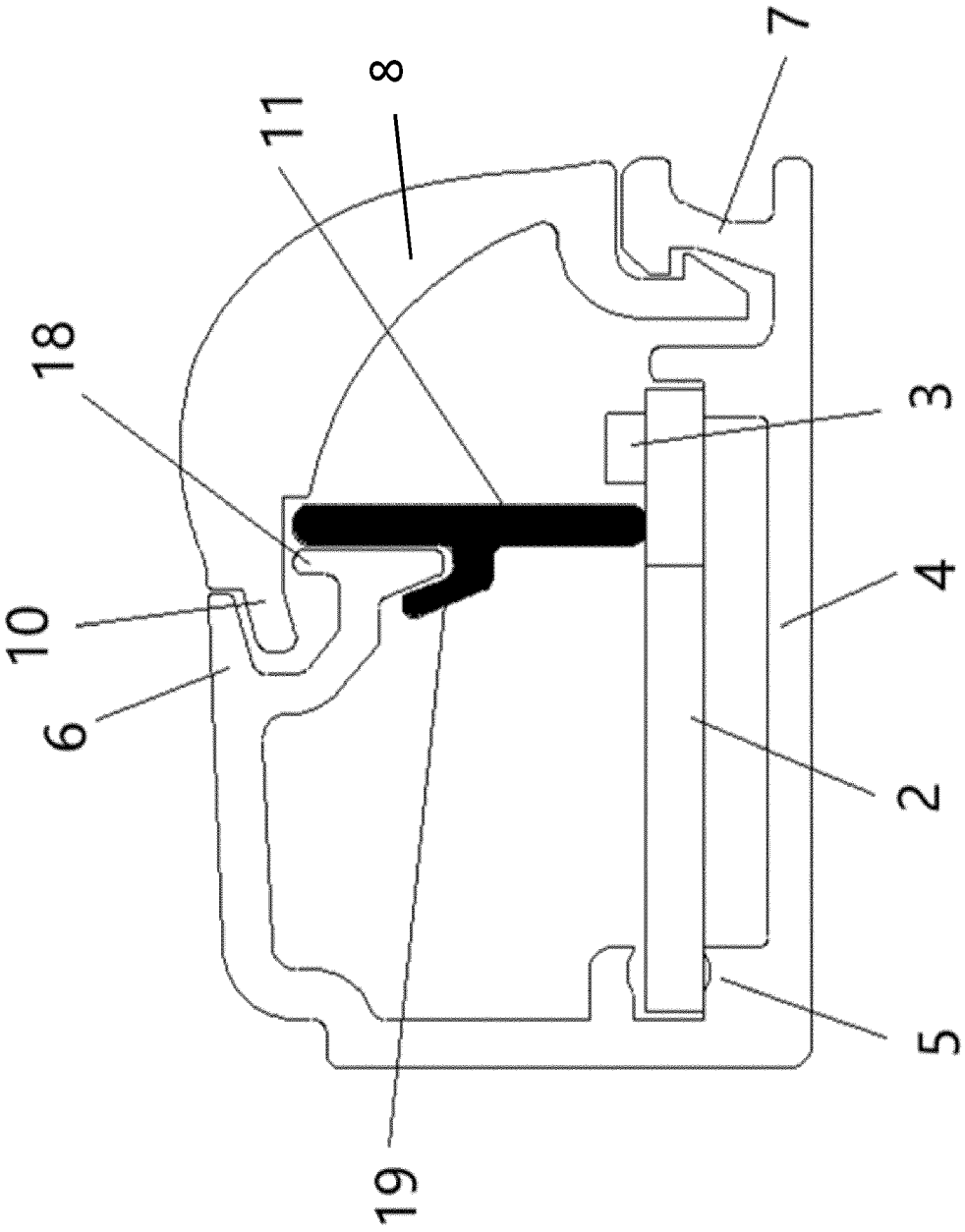

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 22 20 8115

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 March 2023	Soto Salvador, Jesús

CATEGORY OF CITED DOCUMENTS

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