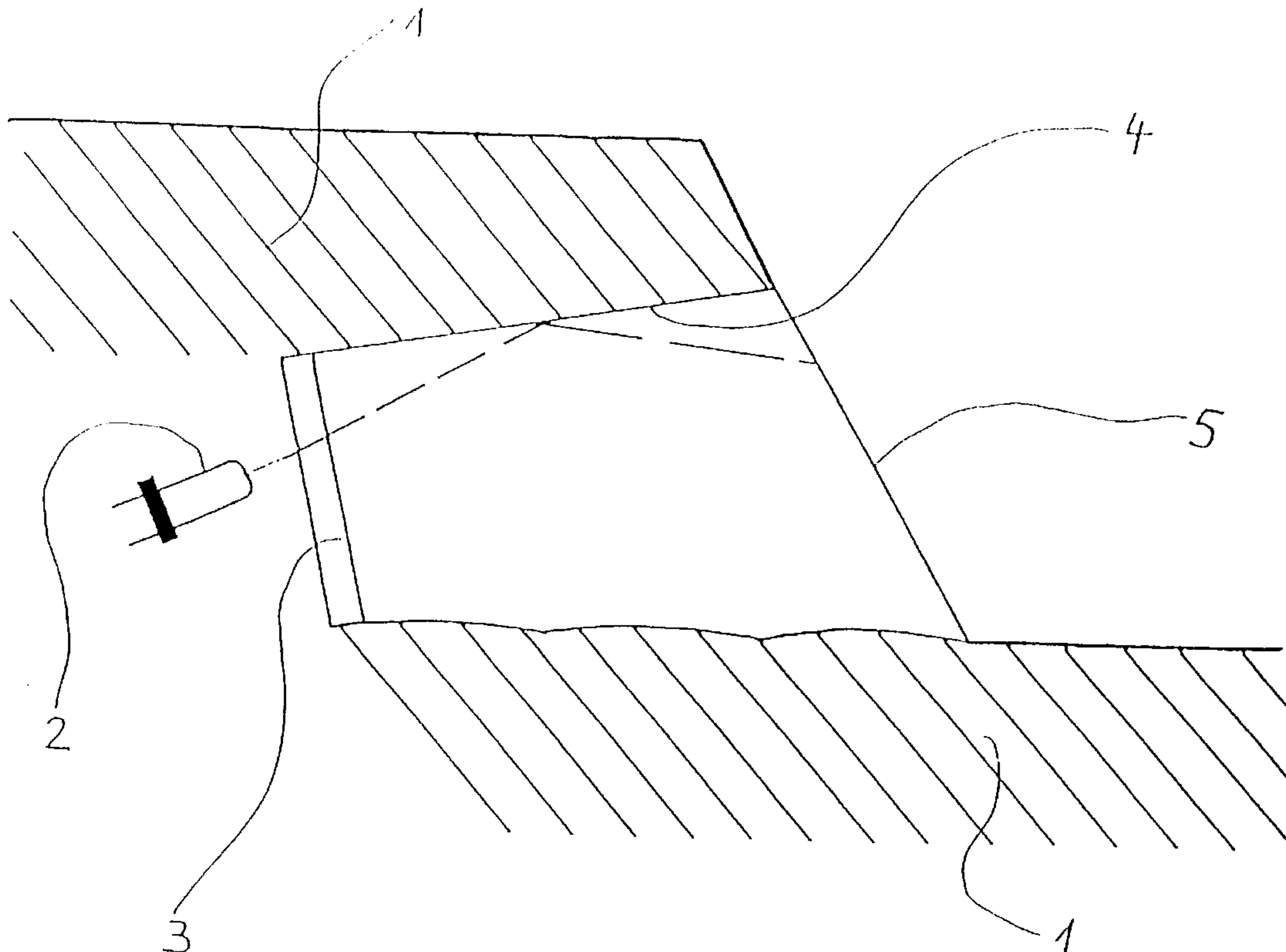




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(54) Titre : DISPOSITIF D'ECLAIRAGE POUR AEROPORTS, EN PARTICULIER FEU ENCASTRE
(54) Title: LIGHTING DEVICE FOR AIRPORTS, IN PARTICULAR FLUSH LIGHTING



(57) **Abrégé/Abstract:**

The invention relates to a lighting device for airports, in particular flush lighting, but also limitation obstacle or warning light means in white or in signal colours such as red, blue or yellow. Semiconductor components, in particular LEDs are used for the light source and are arranged in at least one cluster.



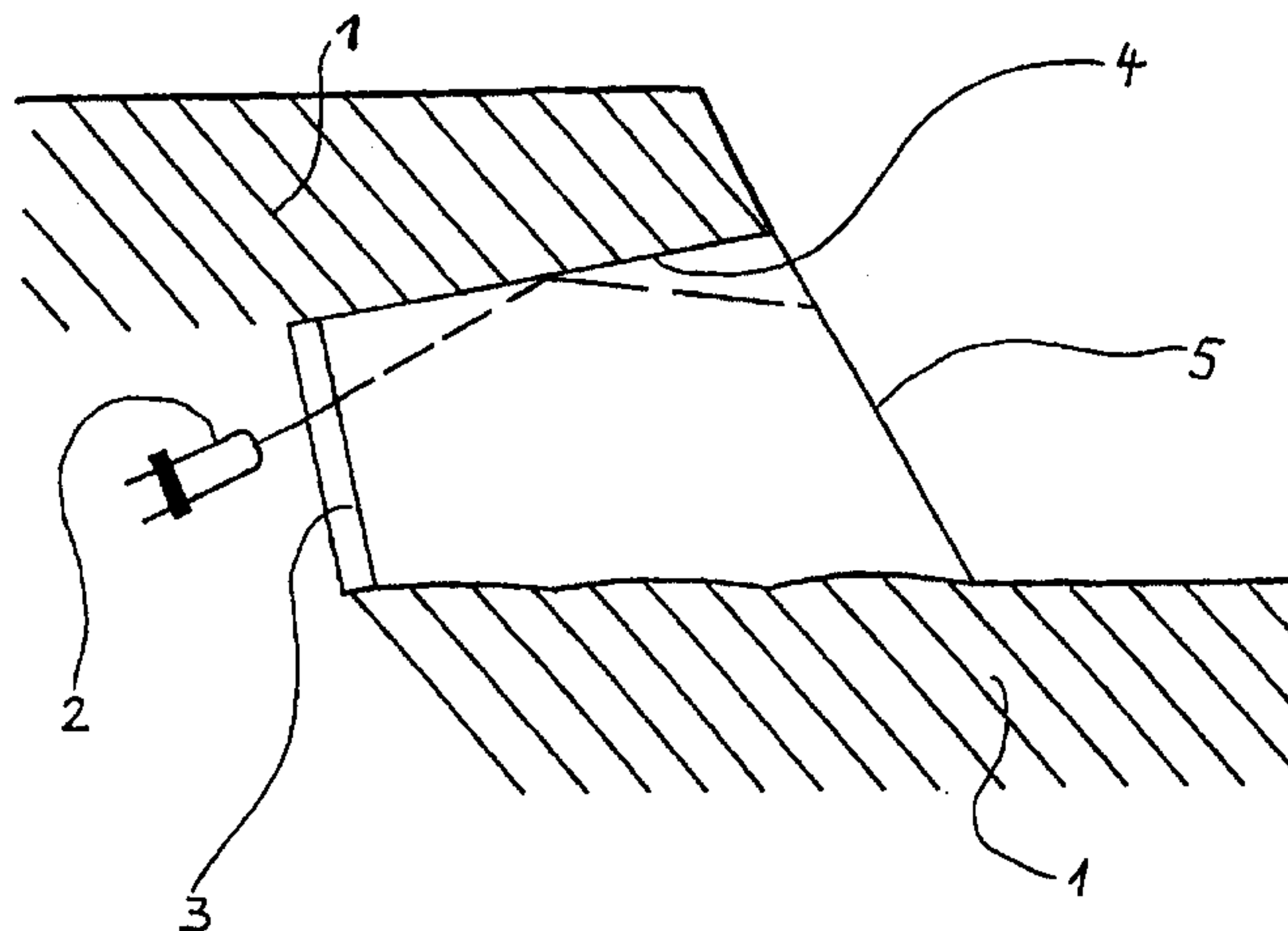


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(54) Title: LIGHTING DEVICE FOR AIRPORTS, IN PARTICULAR FLUSH LIGHTING

(54) Bezeichnung: LEUCHTEINRICHTUNG FÜR FLUGHÄFEN, INSBESONDERE UNTERFLURFEUER



(57) Abstract

The invention relates to a lighting device for airports, in particular flush lighting, but also limitation obstacle or warning light means in white or in signal colours such as red, blue or yellow. Semiconductor components, in particular LEDs are used for the light source and are arranged in at least one cluster.

(57) Zusammenfassung

Leuchteinrichtung für Flughäfen, insbesondere Unterflurfeuer, aber auch Begrenzungs-Hindernis oder Warnleuchteinrichtung in der Farbe weiß oder in Signalfarben, wie rot, grün, blau oder gelb, wobei als Lichtquelle Halbleiterelemente, insbesondere LED's, verwendet werden, die in zumindest einem Bündel (Cluster) angeordnet sind.

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Description

Flush-marker light

5 The invention relates to a flush-marker light in the colour of white or in signalling colours such as red, green, blue or yellow.

Known flush-marker lights of this type, for airports, for example, which are used, in particular, for marking runways and taxiways, have conventional incandescent lamps or tungsten-arc lamps as light sources.

10 Such light sources must be used in combination with optical radiation filters when lighting or signalling devices are to emit light of a specific colour, and this is of the highest significance, in particular, in controlling the traffic occurring at airports. Since
15 there is a need to filter sometimes substantial components, intended for colour production, of the light emitted from incandescent lamps or tungsten-arc lamps, such lighting devices must be configured such that they can dissipate comparatively large quantities of heat
20 which arise from the production of light which is not actually required. Moreover, such lighting devices have a comparatively low energy efficiency, since only a comparatively small component of the light generated overall in the lighting device is required for emission
25 in the respectively required colour.

It is the object of the invention to provide a flush-marker light of the type outlined at the beginning, which has a higher energy efficiency,

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and which can have a more compact configuration and has a longer lifetime.

The object is achieved according to the invention by virtue of the fact that semiconductor elements, in particular LEDs, which are arranged in at least one cluster and in front of which a cover plate is arranged which influences the emission optically, are used as the light source of the flush-marker light. Bright and super-bright LEDs currently available can be used as such semiconductor elements capable of use as a light source. Such flush-marker lights are intended, in particular, to be installed at airports. Using the flush-marker lights according to the invention opens up the possibility that the light sources of the lighting device generate the required colour signal without additional optical radiation filtering. Such semiconductor elements can be electrically controlled between very low potentials and a very high potential, the range of wavelengths in which the respective semiconductor element emits light remaining constant throughout with respect both to its position and to its width. The result of this, inter alia, is that the semiconductor elements used according to the invention as light source generate only optical energy in the colour which corresponds to the required colour signal. Outside the visible range, the semiconductor elements which are used according to the invention as light sources generate scarcely any energy; this holds, in particular, for infrared radiation or ultraviolet radiation, which are generated only in imperceptible quantities. Thus, a higher efficiency in converting into light energy the energy operating the flush-marker light is achieved in the flush-marker light according to the invention. This effect is increased by the renunciation of colour filters, which is rendered possible by the invention, since the use of colour filters would necessarily be accompanied by an attenuation of energy.

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Because of their configuration as semiconductor elements, the light sources of the flush-marker light according to the invention can be controlled within microseconds, by comparison with seconds in the case of incandescent lamps or tungsten-arc lamps; this property is of particular significance in the case of airport signalling and marking installations which are formed by flush-marker lights. Light sources designed as semiconductor elements have a life expectation which is in the region of an order of magnitude above that of tungsten-arc lamps and incandescent lamps. The outlay for maintenance and replacement of flush-marker lights according to the invention can thus be substantially reduced by comparison with the prior art.

A further simplification of the servicing occurs in the case of an advantageous embodiment of the flush-marker light according to the invention in which in each case a cluster represents an exchangeable unit which can be designed, in particular, in the form of a cartridge. The replacement or exchange of a defective cluster can then be carried out with the minimum of outlay.

The individual clusters or cartridges are advantageously constructed by being cast or injected, it being possible to use as the material, in particular, a recyclable plastic. Such a non-metallic material can be used to fill up and, if appropriate, also to configure the basic body or the housing of the flush-marker lights according to the invention, since owing to the semiconductor elements provided according to the invention as light source only average temperatures occur, which can be withstood by such materials even in the long term without functional impairment. Thus, according to the invention, corrosion-resistant flush-marker lights can be produced whose production is far less expensive than that of flush-marker lights in accordance with the prior art, the use

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of the abovementioned materials for the last mentioned flush-marker lights not being practicable, since the tungsten-arc lamps and incandescent lamps used there as light sources generate excessively high temperatures.

5 Owing to the advantageous use of nonmetallic materials to fill up and, if appropriate, also to produce the flush-marker lights according to the invention, electrical corrosion is virtually completely excluded, since the materials used are electrically insulating. Because of

10 the advantageous properties of formability of the materials which can be used, there is a substantial reduction in the costs to be incurred. The materials used can advantageously serve as thermal conductor, as a result of which the heat emitted from the light sources

15 can be dissipated to the outer housing wall of the flush-marker lights and to the roadway. Since, as already mentioned, the entire body or, if appropriate, the entire housing of the flush-marker lights according to the invention is an insulator, there is no need for a

20 separate insulator, which is of costly configuration.

If the clusters or cartridges of the flush-marker lights according to the invention are designed as components of a redundantly operating system, a configuration of the flush-marker lights according to the invention is

25 achieved which is assembled from arrangements of electronically controlled individual devices, it being possible, because of the redundant operation of these electronically controlled devices reliably to exclude a total failure of the flush-marker lights according to the

30 invention. With the redundant design, at least a considerable number of clusters always remain operable.

When the flush-marker lights according to the invention generate white light by mixing different colours and coloured light with the aid of appropriately

35 emitting special semiconductor elements, it is possible, given appropriate control, for the light emitted from the flush-marker light to be set arbitrarily with regard to

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its colour and/or its intensity.

In this case, the flush-marker lights according to the invention advantageously have a controllable power supply by means of which it is possible to dim and/or quickly switch the flush-marker lights.

A flush-marker light according to the invention can be realized with a low outlay when the individual semiconductor elements are used without mountings.

The individual semiconductor elements should expediently be constructed such that they can be manipulated in a fully or partly automatic fashion.

When the semiconductor elements of the flush-marker lights according to the invention are arranged embedded in a filler member, which exposes a light-emitting opening, the result is a substantially improved transmission of the light between an aircraft and the roadway, since no hollow convection space is required, which was the case for flush-marker lights in accordance with the prior art, which generally had metallic housings.

If cover plate, which is in front of the semiconductor elements forming the flush-marker lights the and is, in particular easy to clean, is suitable for focussing and determining the direction of emission, beam refraction and total reflection can be used in order optimally to form the light beam leaving the flush-marker light. It is possible in this way to meet the most varied requirements. If the outer surfaces of the optical elements are of a smooth and hard configuration, the flush-marker light according to the invention can be cleaned with a low outlay.

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In accordance with this invention, there is provided an airport flush-marker light in the colour white or in signal colours such as red, green, blue or yellow, characterized in that present as light source are

5 semiconductor elements which are arranged in at least one cluster and arranged in front of which is a cover plate optically influencing the emission and suitable for focusing and determining the direction of emission.

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In accordance with an advantageous embodiment of the flush-marker light according to the invention, the semiconductor elements combined to form clusters, in particular in the form of a cartridge, the said semiconductor elements being, for example, LEDs, are designed as a compact unit with the housing of the flush-marker light.

The LEDs can advantageously also be produced from an organic material, for example from plastic.

The invention is explained in more detail below with the aid of an embodiment and with reference to the drawing, in which:

Figure 1 shows a representation of the principle of a flush-marker light according to the invention;

Figure 2 shows a representation of the principle of a front view of a cluster of the flush-marker light according to the invention;

Figure 3 shows a representation of the principle of a side view of the cluster shown in Figure 2, and

Figure 4 shows a representation of the principle of a top view of the cluster represented in Figures 2 and 3.

A flush-marker light according to the invention and represented in principle in Figure 1 has a semiconductor light source 2 which is held inside an installation body or an installation housing 1. A beam-forming optical device 3 is arranged in front of the semiconductor light source 2. The light generated by the semiconductor light source 2 is totally reflected at a total reflection surface 4 before it emerges from the flush-marker light through a smooth outer surface 5.

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The semiconductor light source 2 is assembled from clusters 6 of which one is represented in principle with the aid of Figures 2 to 4. Belonging to a cluster 6 are semiconductor elements 7 which, in the exemplary embodiment represented, are arranged in two rows, arranged one above another, of semiconductor elements 7 arranged next to one another. The semiconductor elements 7 of a cluster 6 are seated on a common element holder 8, whose surface on the semiconductor element side is constructed as a reflection surface 9, in order to deflect the small radiation component, which is emitted in the backward direction from the semiconductor elements 7, in the direction of a front opening surface of the cluster 6. The front opening surface is closed by means of a glass plate 10.

The space holding the semiconductor elements 7 arranged as described above is filled up as far as possible by a transparent plastic material 11, there being provided in front of the ends, on the output side and directed onto the glass plate 10, of the semiconductor elements 7 a cavity 12 which is small by comparison with the space occupied by the cluster 6 outlined above.

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CLAIMS:

1. Airport flush-marker light in the colour white or in signal colours such as red, green, blue or yellow, characterized in that present as light source are
5 semiconductor elements (7) which are arranged in at least one cluster (6) and arranged in front of which is a cover plate (3) optically influencing the emission and suitable for focusing and determining the direction of emission.
2. Flush-marker light according to Claim 1,
10 characterized in that each cluster constitutes an exchangeable unit designed in cartridge form.
3. Flush-marker light according to Claim 1 or 2, characterized in that the individual clusters are cast or injection moulded.
- 15 4. Flush-marker light according to Claim 3, characterized in that the individual clusters are cast or injection moulded from a recyclable plastic.
5. Flush-marker light according to Claim 4,
20 characterized in that the plastic is designed as a good thermal conductor.
6. Flush-marker light according to any one of Claims 3 to 5, characterized in that the plastic is of pressure-resistant design.
7. Flush-marker light according to any one of Claims
25 1 to 6, characterized in that the clusters are designed as components of a redundantly operating system.
8. Flush-marker light according to any one of Claims 1 to 7, characterized in that it is used to produce white

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light by mixing different colours or coloured light with the aid of appropriately emitting special semiconductors.

9. Flush-marker light according to any one of Claims 1 to 8, characterized in that it has a controllable energy supply which permits dimming or quick switching.

10. Flush-marker light according to any one of Claims 1 to 8, characterized in that it has a controllable energy supply which permits dimming and quick switching.

11. Flush-marker light according to any one of Claims 1 to 10, characterized in that the individual semiconductors are designed without holders.

12. Flush-marker light according to any one of Claims 1 to 11, characterized in that the individual semiconductors are designed with the capacity to be handled entirely automatically or semiautomatically.

13. Flush-marker light according to any one of Claims 1 to 12, characterized in that the semiconductors are arranged embedded in a filling body which exposes a light exit opening.

14. Flush-marker light according to any one of Claims 1 to 13, characterized in that the cover plate arranged in front of the semiconductors is easily cleaned.

15. Flush-marker light according to any one of Claims 1 to 14, characterized in that the semiconductor elements (7) are LED's.

16. Flush-marker light according to any one of Claims 1 to 15, for use at an airport and characterized in that semiconductors elements united to form clusters in cartridge

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form, are arranged as light sources and form a compact unit with a housing of the flush-marker light.

17. Flush-marker light according to Claim 16, characterized in that the semiconductor elements are LED's.

5 18. Flush-marker light according to Claim 16 or 17, characterized in that the LED's are made from inorganic or organic material.

FETHERSTONHAUGH & CO.

PATENT AGENTS

OTTAWA, CANADA

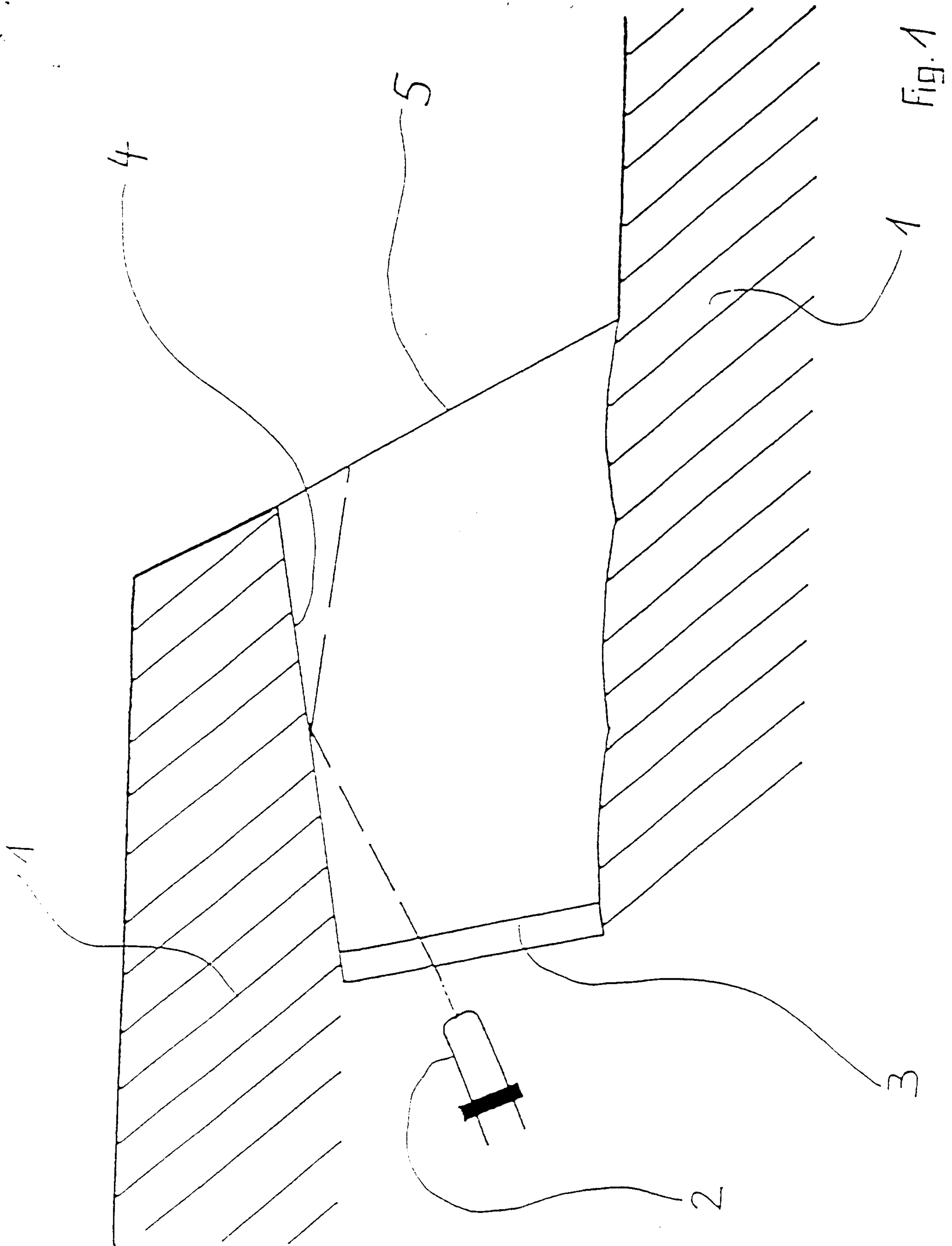


Fig. 2

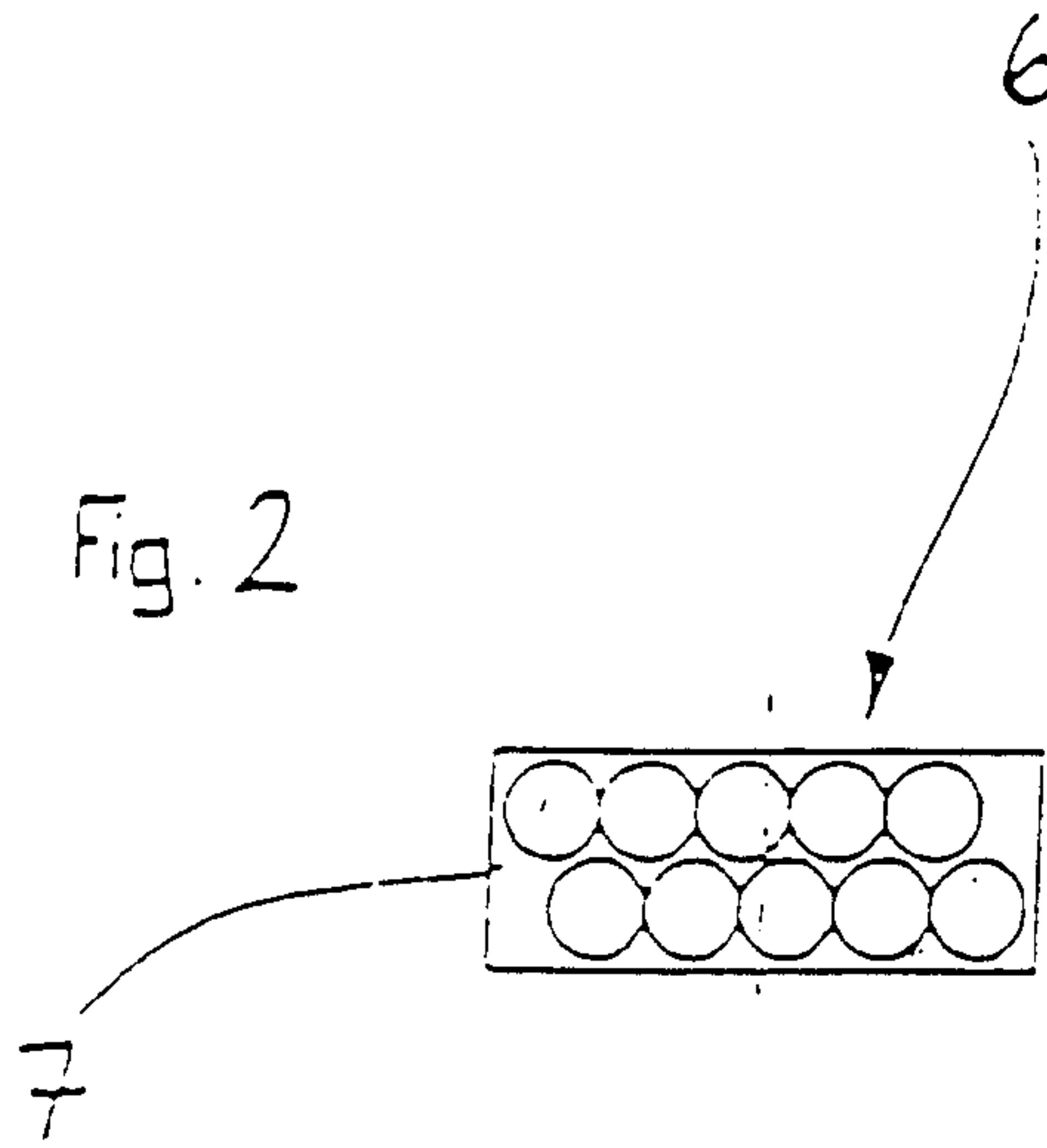


Fig. 3

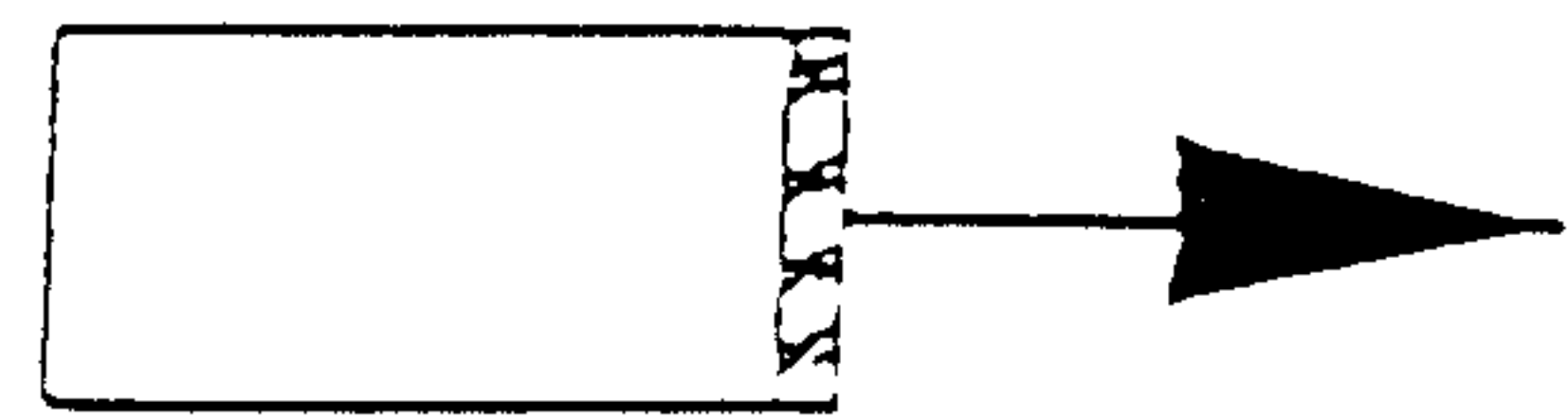


Fig. 4

