

LIGHTNING DEVICE

The present invention is for a lightning device by means of which a controlled light pattern is obtained from a specific light source. Controlled means that the light as projected on a flat surface produces a light pattern of a predetermined intensity and shape. The device according to the invention is primarily intended to be used for traffic light posts.

It is often desirable that the light from a light source is recognized by individuals or other means primarily when these are at a specific position within a defined area. The effective output required from the light source may be reduced if the light from the light source is concentrated to the desired area.

It is known to make use of different kinds of light sources as well as light reflecting and refracting devices in order to obtain a desired light pattern. Thus it is known to have the light from an electric bulb to be reflected by a preferably parabolic reflector and then pass through a lens or prism setup. This may comprise a single lens or prism but there may also be several of these, functioning together in different ways. In stead of electric bulbs light emitting diodes may be used. Different kinds of these are available which emit light as a concentrated, directed beam of specific intensity, spreading angle and wave length span.

Devices of the kind mentioned above are found both as headlights and lamps for different kinds of vehicles and as traffic signal lights. Especially for the last mentioned application known devices have primarily been intended to give an acceptably concentrated light beam have an essentially circular cross section, whereby a comparatively large border area with diffuse light refraction is obtained.

The object of the present invention is to provide a lightning device, by means of which a carefully controlled light pattern of predetermined intensity and shape is obtained. The device according to the invention also makes individual variations and adaptations to specific applications possible. This is obtained thereby that the device comprises a light source which emits a number of parallel light beams. A prism is arranged for each light beam which passes through the prism. All of the prisms are integral parts of a common disc. Preferably the light source comprises a number of light emitting diodes, each of them emitting one light beam. The light emitting diodes, which in one device may be individually different in respect of e. g. luminance, are suitably mounted onto a common flat plate.

The common disc of the prisms has one preferably flat surface on the side facing away from the light source. A smooth, flat surface brings advantages, e. g. by being dirt repellant and easy to clean if necessary. Also from a production point of view a flat surface is advantageous as compared to e. g. a curved, smooth surface, making it possible to keep down the costs for moulds and tooling. This surface will be one outer side of the lightning device and be turned towards a viewer. Each one of all of the prisms is an integrated part of this common disc, which means that they are parts of the fixed disc construction and in a preferred embodiment the prisms and the disc constitute one piece of homogenous goods. In other embodiments individual prisms may be mounted into holes intended for this purpose in the disc. Disc and prisms may then be made from the same or from different materials. Essentially all of light which is emitted from the device passes through the prisms. Suitably the prisms - at least those parts thereof which protrude from the common disc - are shaped as straight circular cylinders. Each such prism has one end surface which is essentially at right angle to the axis of the cylinder and one end surface which is oblique thereto. The surface which is at right angle to the axis preferably coincides with the flat surface of the common disc, i. e. its outer surface. The

complete device thus has a common flat outer surface. If the common disc e. g. has a curved outer surface the ends of the prisms which coincide with this surface will not be at exactly right angle to the axis of the cylinder. The oblique surface may have a freely variable angle relative to the axis of the cylinder and freely variable direction of its slope whereby the direction of the corresponding light beam is controlled.

The invention will below be further illustrated by the examples of embodiments thereof which are shown in the enclosed figures.

Figure 1 shows a disc with prisms as seen from the inside of the device.

Figure 2 shows a cross section through a part of the disc and corresponding light sources.

Figure 3 shows an example of a light pattern.

Figure 4 shows some different designs of prisms at the disc.

The common disc 2 as shown in figure 1 has a flat outer surface facing downwards in the figure. At the disc and protruding upwards from its surface are several prisms 3 having circular cross sections. The number of prisms and there positions at the disc may vary due to the application. One example of a design is a disc with an outer diameter of about 200 mm. At this disc there are 260 prisms, each having an outer diameter of about 8 mm.

The disc and the prisms may be made from the same or different materials. Preferably they are made as one piece from polycarbonate, which has properties as required in many applications regarding index of refraction, light transmission and mechanical strength. Another possible embodiment is a disc from a freely choosen material having a number of holes which corresponds to the number of prisms and a separate prism

inserted into each hole.

Figure 2 shows a cross section of a part of the disc with prisms, four of which are shown in the figure, and with light sources connected with the prisms. These are light emitting diodes 1 each of which emits a well concentrated light beam. The spread of the light beam is often about 2-4° from the centre axis of the diode. The light beam is directed onto the oblique surface 6 of each prism and is refracted by this surface. Thereupon the light beam passes through the prism and is again refracted by the outer surface 5, which may be common with the outer surface 4 of the disc. For the surface which is designated 6a also the outermost light is shown and it is seen that all of the emitted light passes through the prism. Only insignificant quantities of stray light finds itself other paths.

The oblique surfaces 6 of each prism may be varied in respect of both the angle at the centre axis of the prism and the direction of the surface. In the figure the surfaces 6a and 6d have the same direction but different angles, while the surfaces 6b and 6c have a somewhat different direction.

One example of a desired light pattern is shown in figure 3, which in the form of a diagram shows the desired light strength in a vertical plane at a certain distance from the lightning device. The rectangular, full lines indicated the desired values and the broken irregularly shaped lines show the results of a metering of the strength of the light emitted from a device according to the invention.

Figure 4a-4c shows different designs of the prisms and the corresponding disc. Preferably the prisms and the disc are made as one unit by injection molding of polymer, where polycarbonate has turned out to have the most suitable combination of properties. The oblique surface of the prism touches the inner surface of the disc and then protrudes

therefrom, so that there is no pit or the like in the unit. Alternatively the the disc and prisms unit may be produced by drilling holes into an all over flat disc whereupon individual prisms are placed in these holes. The prisms may then be of different size as shown in figures 4b and 4c. The last mentioned embodiment will preferably be used only when a very small number of identical devices shall be produced and the costs for making a mould or adaption of an existing mould for injection moulding are too high. When making these moulds it is preferred that the oblique surfaces of the prisms are formed on the surfaces of small, exchangeable parts of the mould. In this way changes and adaptations are possible easily and at a much lower cost than if the complete mould would have to be replaced. The replaceable details of the mould are controlled in some way, e. g. by means of a flattened surface, so that they can not freely be turned around there axis when they are mounted into the mould. This also applies to individual prisms when these are made as inserts into holes in a common disc.

The invention makes it possible to obtain a desired light pattern with much increased precision. Adjustments as desired are easily made and e g left and right designs are easily obtainable. One plate with light emitting diodes may produce different light patterns which may be exchanged and adapted to changing conditions.

CLAIMS

1. A device for obtaining a light pattern having predetermined intensity and shape comprising a light source, which emits several parallel light beams, a prism (3) corresponding to each light beam through which the beam passes, all of the prisms being integral parts of a common disc (2) characterized therein that the for all of the prisms (3) common disc (2) has a flat surface (4) over which the prisms are distributed and which also forms one surface of the prisms and that the surfaces (6) of the prisms which are oblique thereto are positioned adjacent the opposite surface of the disc.

2. A device according to claim 1 characterized therein that each prism is a straight circular cylinder having one end surface (5) at right angle to the axis of the cylinder and one end surface (6) oblique to the axis of the cylinder.

3. Device according to claim 1 or 2 characterized therein that each prism is mounted into a corresponding hole in the common disc (2).

