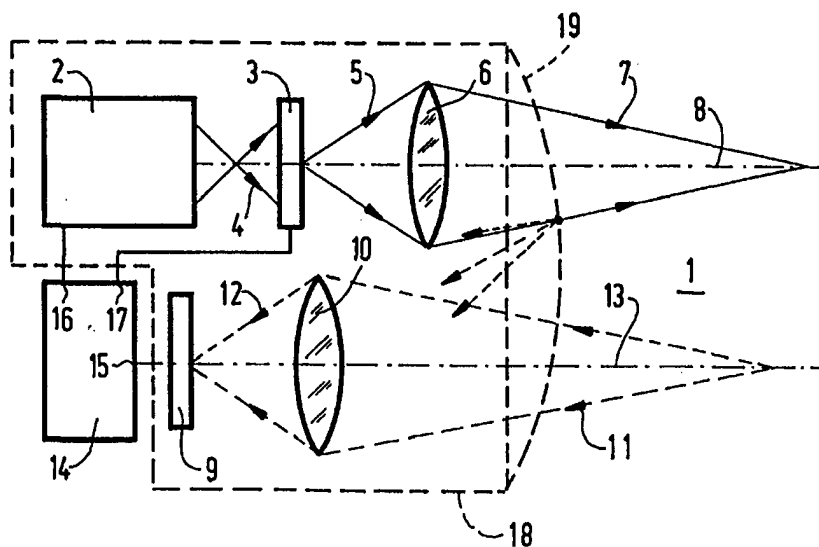


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(54) Title: A LIGHTING DEVICE HAVING A CONTROLLABLE LIGHTING PATTERN



(57) Abstract

A lighting device, in particular a headlight of a motor vehicle, comprising lighting means (27) arranged for producing a light beam (7) to be emitted by the lighting device in response to a control signal delivered by light-sensitive sensor means (23) during operation. The lighting device comprises means (28) for intermittently, repeatedly controlling the intensity of the light (4) emitted by the lighting means (27) in a manner which is not visible to the human eye. Control means connect to the sensor means (23) in such a manner that the control signal delivered by the sensor means (23) during a period of low intensity of the lighting means (27) is processed so as to vary the pattern of the light beam (7). In this manner an accurate measurement of ambient light (11), which is not disturbed by the lighting device's own lighting means (27), is provided, for example for detecting light from oncoming traffic. As a result, the lighting pattern and the lighting intensity are automatically adjusted, in such a manner that oncoming traffic will not be blinded, thus permitting a light intensity which is generally higher than that of conventional dipped headlights, for example. More in particular, a lighting device which is built up of spotlight beams and spotlight sensors is provided.

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A lighting device having a controllable lighting pattern.

5 The invention relates to a lighting device, in particular a headlight of a motor vehicle, comprising lighting means arranged for generating and varying the pattern of a light beam to be emitted by the lighting device in response to at least one control signal delivered by light-sensitive sensor means during operation.

10 A lighting device of this type is known from international patent application WO 86/05147.

Lighting devices, such as headlights of motor vehicles, have to comply with specified national and/or international regulations, in particular with regard to preventing the blinding or glare of oncoming traffic.

15 In accordance with said regulations, a headlight of a motor vehicle, such as a car, is not allowed to emit light exceeding a specified intensity in specified directions. During normal use of the car, when driving with dipped headlights, the risk of blinding oncoming traffic as defined in the respective regulations is practically zero. When driving with main-beams, however, oncoming traffic is easily blinded, since
20 the main-beams are designed and optimized for long-range illumination. In many cases, in particular when driving on dark, unilluminated roads, it is highly desirable to be able to utilize the higher light intensity and the longer-range main-beam constantly, which contributes towards increased road safety and driving comfort. This raises the problem of
25 blinding oncoming traffic which, in turn, may lead to a hazardous situation.

Blinding of traffic on the other side of the road may occur not only when driving with high beams or main-beams, but also when driving with low beams or dipped headlights, for example in the case of
30 quick acceleration of the vehicle. In the latter case, the position of the vehicle, as well as that of the headlights, with respect to the road surface, will deviate from the normal horizontal position and, consequently, also the inclination of the light beam being emitted with respect to the road surface will be different. This phenomenon also occurs
35 when vehicles are overloaded or when headlights are badly adjusted. When taking a bend there is also the problem that the road ahead of the vehicle is insufficiently lit, because the light beam is generally optimized for

straight movement (rather than turning movement) of the vehicle.

The prior art lighting device comprises a light-sensitive sensor, which detects the distribution and the intensity of light in the area ahead of a vehicle. The pattern of the light beam being emitted by the lighting device is automatically and dynamically adapted in dependence on the intensity and the direction of the light being detected. That is, that part of the light beam which might cause inconvenience to oncoming traffic is automatically suppressed, whilst retaining an optimum lighting effect for the driver of the vehicle himself.

It has been proposed to dispose the light sensor near the windscreen of the vehicle, for example, such that each headlight is controlled by its own sensor.

From an assembly point of view, the separate mounting of the headlights and the sensors is not to be preferred, because this requires additional assembly time, additional wiring, additional alignment operations and the like, which significantly adds to the cost of production, in particular in the case of mass production, for example in the automotive industry.

From European patent application No. 0 541 491 a lighting device is known, wherein the lighting means and a light-sensitive sensor are disposed in one housing, which facilitates assembly. In this arrangement, however, the sensor is exposed to diffuse light and to undesirable reflected light, inter alia from the lighting device's own lighting means.

In particular when the lighting device is used in a headlight of a vehicle, the presence of dirt on the headlight causes a substantial degree of reflection of light from the device's own lighting means and attenuation of the external light detected by the sensor, which has an adverse effect on the sensitivity of the device.

Consequently, the objective of the invention is to provide a lighting device, in particular a headlight of a motor vehicle, wherein the pattern of the emitted light beam is varied automatically in an efficient manner and with maximum sensitivity in response to at least one control signal delivered by light-sensitive sensor means during operation.

In order to accomplish that objective the lighting device according to the invention comprises control means for

intermittently, repeatedly controlling the intensity of the light emitted by the lighting means in a manner which is not visible to the human eye, wherein the control means connect to the sensor means in such a manner that the control signal delivered by the sensor means during a period of
5 low intensity of the lighting means is processed for the purpose of varying the pattern of the light beam.

In accordance with the invention a partial dimming system is provided, wherein the possibly disturbing influence of the lighting device's own lighting means on the sensor means is effectively
10 reduced by decreasing the light intensity of the lighting means during the detection by the light sensor means, or, as in another embodiment of the invention, by even switching off the light altogether. By varying the light intensity in such a rhythm or for such a short time period that the variations in the light intensity are not visible to the human eye, a
15 quasi-continuous light beam can be provided, whereby only ambient light and/or light from oncoming traffic is reliably detected.

International patent application WO 95/12502 discloses switching on and off of a headlight of a motor vehicle, however not for the purpose of accurately measuring ambient light and light of oncoming
20 traffic preventing glare caused by the light source of the headlight itself, according to the present invention.

In conjunction with the switched headlight, WO 95/12502 discloses switching on and off an anti-dazzle mirror to allow the driver of the vehicle to see its own light pulse and not the light of other
25 vehicles equipped with conventional headlights or with pulsed or flashing headlights.

The sensor means and the lighting means according to the present invention can be advantageously combined into a single integrated lighting device, whereby the field of view of the light-
30 sensitive sensors and the illumination field of the light beam to be emitted, will coincide. It will be appreciated that this gives designers a high degree of freedom, which is in particular desirable when the lighting device is used as a headlight in motor vehicles of different types and dimensions, whereby it is furthermore possible to comply with relevant
35 national and international regulations.

In case there is no other lighting system present on the vehicle the control means for controlling the lighting means are

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