



US006227691B1

(12) **United States Patent**  
**Hogrefe et al.**

(10) **Patent No.:** **US 6,227,691 B1**  
(45) **Date of Patent:** **May 8, 2001**

(54) **HEADLIGHT ARRANGEMENT FOR MOTOR VEHICLE**

1,834,542 \* 12/1931 Karlebo .  
4,987,521 \* 1/1991 Fratty et al. .... 362/284  
5,130,903 \* 7/1992 Fast et al. .... 362/284

(75) Inventors: **Henning Hogrefe**, Walddorfhaeslach;  
**Friedemann Schlien**, Tuebingen, both  
of (DE)

**FOREIGN PATENT DOCUMENTS**

43 07 110 A1 9/1994 (DE) .

(73) Assignee: **Robert Bosch GmbH**, Stuttgart (DE)

\* cited by examiner

(\* ) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

*Primary Examiner*—Y. Quach

(74) *Attorney, Agent, or Firm*—Michael J. Striker

(57) **ABSTRACT**

(21) Appl. No.: **09/348,589**

A headlight arrangement of a vehicle having a reflector subdivided into a plurality of reflector regions, a light source arranged in a region of an apex of the reflector so that a light emitted by the light source is reflected by the reflector onto a roadway in front of the vehicle, at least one screening device associated with at least one of the reflector regions, the screening device being adjustable between a position in which the light emitted by the light source can reach a selected one of the reflector regions, and a position in which a light emitted by the light source is at least partially screened from a selected one of the reflector regions, and a control unit which controls the screening device in dependence on vehicle sensor signals and adjusts the screening device so that in each vehicle situation an optimal light distribution is provided.

(22) Filed: **Jul. 6, 1999**

(30) **Foreign Application Priority Data**

Jul. 7, 1998 (DE) ..... 198 30 298

(51) **Int. Cl.**<sup>7</sup> ..... **F21V 14/08**; B60Q 1/04

(52) **U.S. Cl.** ..... **362/539**; 362/465; 362/514

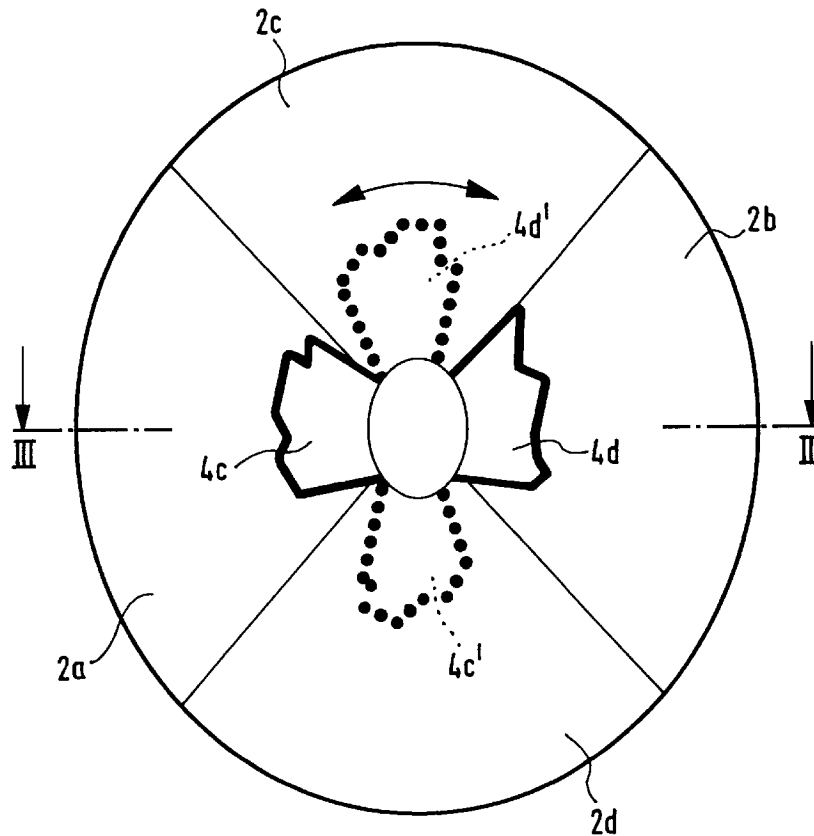
(58) **Field of Search** ..... 362/276, 280,  
362/281, 282, 284, 322, 323, 324, 464,  
465, 467, 512, 513, 514, 539

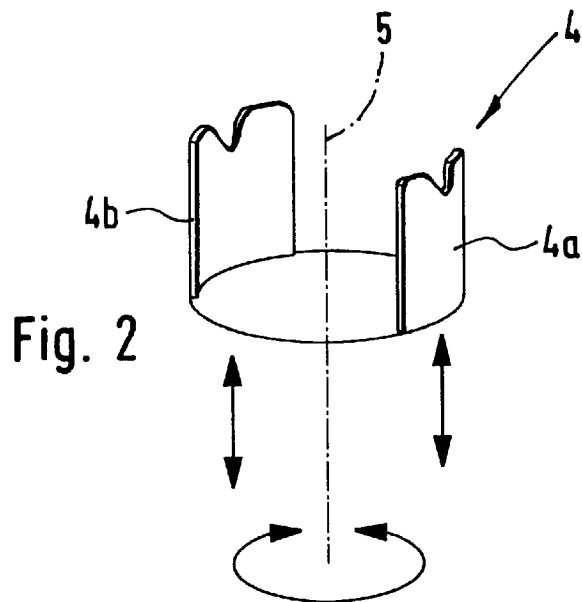
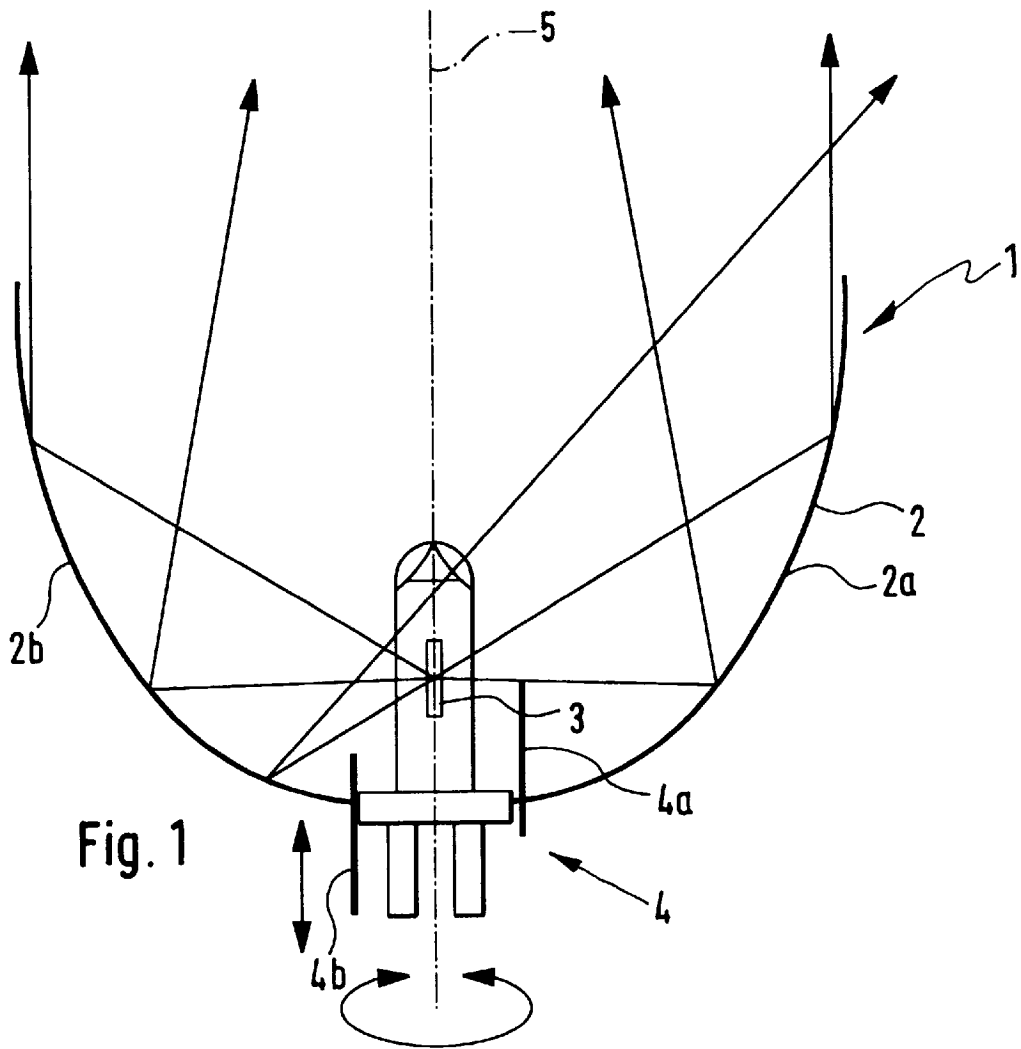
(56) **References Cited**

**U.S. PATENT DOCUMENTS**

1,305,498 \* 6/1919 Schroeder .

**15 Claims, 3 Drawing Sheets**





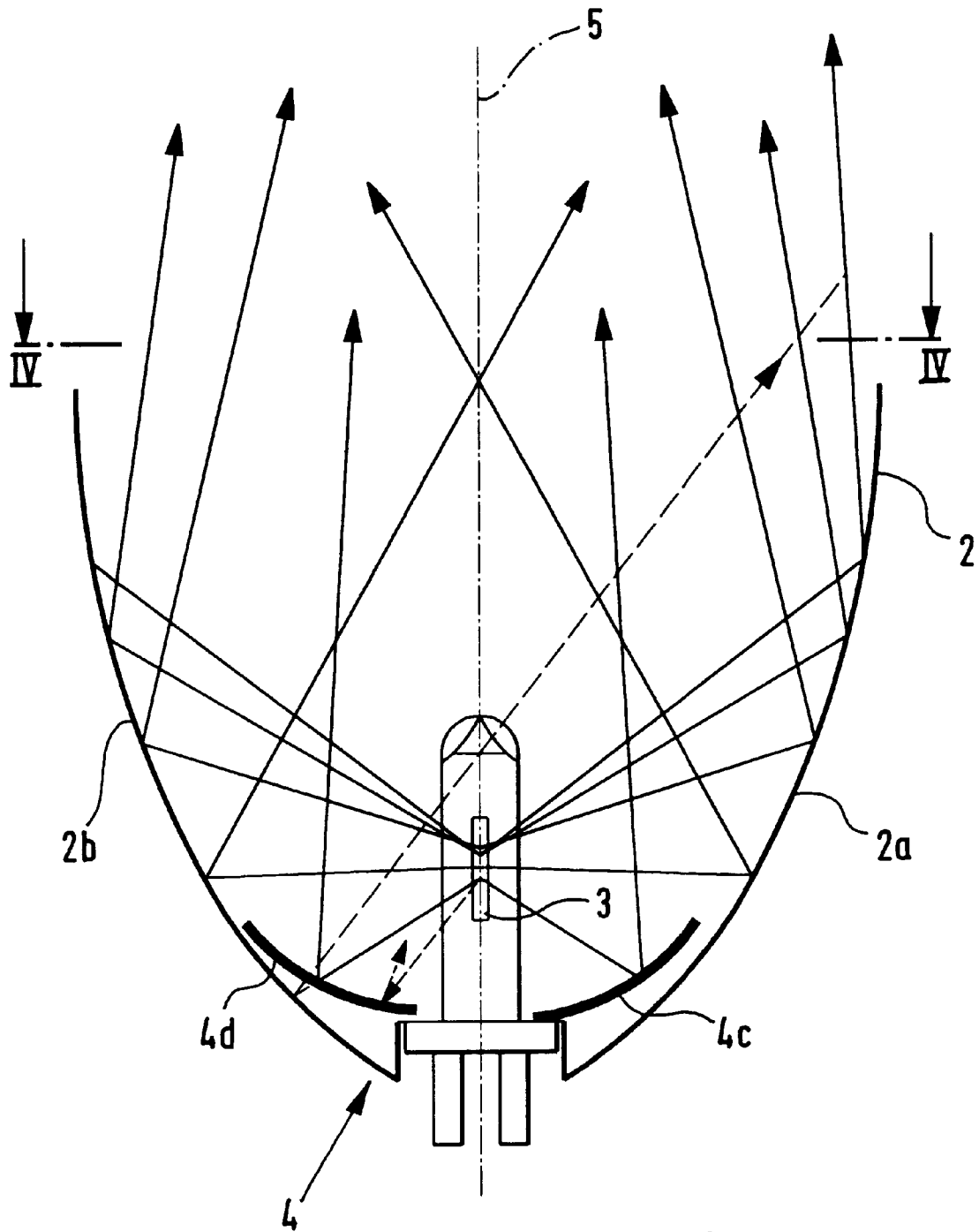


Fig. 3

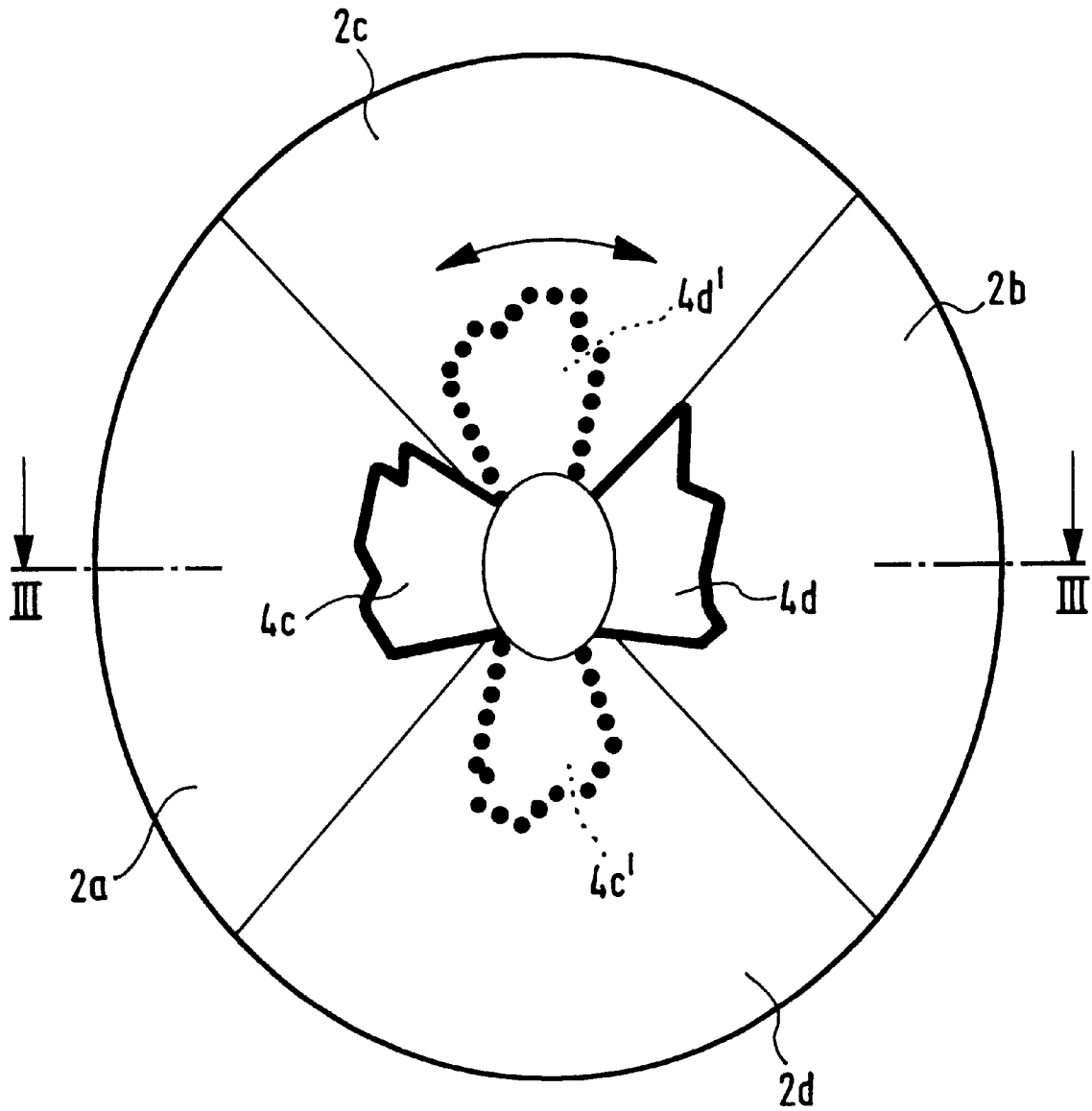


Fig. 4

## HEADLIGHT ARRANGEMENT FOR MOTOR VEHICLE

### BACKGROUND OF THE INVENTION

The present invention relates to a headlight arrangement for a motor vehicle.

More particularly, it relates to such a headlight arrangement which has a reflector subdivided into several reflector regions, a light source arranged in the region of the apex of the reflector, so that light which is emitted by the light source is reflected by the reflector on a roadway in front of the motor vehicle, and at least one screening device associated with at least one selected reflector region. The screening device is adjustable between a passage position in which the light emitted by the light source can reach the selected reflector region, and a screening position in which it screens the reflector region from the light emitted by the light source.

In such headlight arrangements, the reflector can be subdivided however into several desired functional reflector regions. The subdivision must not be visible from outside, for example as steps between the reflector regions. Such headlight arrangement is disclosed for example in the German patent document DE 43 07 110 A1. The lateral reflector regions of the open headlight arrangement disclosed in this reference influence the side dispersion, the upper and lower reflector region influence the pre-field illumination.

For switching of the known headlight arrangement from the right side traffic to the left side traffic and vice versa, the headlight arrangement is provided with at least one screening device which screens the lateral reflector regions from the light source so that an asymmetric illumination intensity distribution is produced with the bright-dark limit increasing toward the roadway edge at the road side itself (in other words right for the right side traffic and left for the left side traffic).

While the screening devices in accordance with the prior art can be switched between the passage position and the screening position, an intermediate position is not provided in them. The screening device disclosed in the German patent document DE 43 07 110 A1 can be switched between the two positions for the right side traffic and left side traffic. The headlight arrangement has the same statistic light distribution for the right side traffic and the left side traffic. However, for an asymmetrical illumination intensity distribution the bright-dark limit at the roadway side raising toward the roadway edge can be switched for the right side traffic to the right and for the left side traffic to the left.

It has been however recognized that there is no optimal statistic illumination which can be correct for all road and traffic situations. For example, during driving on a speedway with a high speed another optimal light distribution is required by governmental regulations that during driving with a lower speed. Therefore, a headlight arrangement would be desirable, in which the light distribution can be controlled adaptively, or in other words in correspondence with the road and traffic situations.

A so-called curve headlight is known from the prior art and has turnable reflectors for variation of the dispersion width. With such a curve headlight the roadway edges during driving over curves can be illuminated wider. Moreover, free-standing individual headlights are known, which are arranged at the right side and the left side of the motor vehicle and provide illumination in the side regions. By turning on and turning off of the individual headlights, the side width of the vehicle can be illuminated as desired

In the known curve headlights disclosed in the prior art, the construction is substantially large because of the adjustment mechanism and the turnable reflectors. Moreover they take into consideration only the steering angle as a single control value for the light distribution. Finally, the turnable reflectors are subjected to wear and must be maintained in regular time intervals. Due to the turnable reflectors and the broadly fluctuating environmental conditions (temperature, air moisture, dirt) in the headlights, the known curve headlight is especially sensitive.

The lateral single headlights in accordance with the prior art has a disadvantage that they are fixedly mounted on the motor vehicle. They have no flexibility with regard to the light distribution. They are either turned on and illuminate the side regions or they are turned off and do not illuminate the side regions. Intermediate positions which can be desirable for illumination of only predetermined parts of the side regions for illumination of side regions with variable intensity, are not provided. The known single headlights require a mounting space in the motor vehicle.

### SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a headlight arrangement for a vehicle, which avoids the disadvantages of the prior art.

More particularly, it is an object of present invention to provide a headlight arrangement for a vehicle, which makes possible an adaptive light distribution, has a simple construction, operates reliably and at the same time has small dimensions.

In keeping with these objects and with others which will become apparent hereinafter, one feature of present invention resides, briefly stated, in a headlight arrangement which it has a control unit controlling the screening device in dependence on vehicle sensor signals and the screening device is adjusted steplessly so that for each vehicle situation an optimal light distribution is provided.

Vehicle sensor signals which can be considered for use for the control unit to control the screening device include for example the vehicle speed, the motor rotary speed, the selected gear, the steering angle, the vehicle inclination, the yawing rate, the spring path, the adjustment of the gas pedal, the adjustment of the brakes, the outside temperature and/or the air moisture. In a particularly advantageous manner, as a vehicle sensor signal also a street traffic can be introduced, which is determined by a navigation system. Basically, all physical conditions which can have an influence on the vehicle condition can be determined by a sensor and supplied to the control unit. From the steering angle course in connection with the vehicle speed, for example the roadway course can be determined. In particular, curves can be recognized and the headlight arrangement can illuminate the curves correspondingly. From the spring path, for example the roadway quality can be determined and the light distribution can be correspondingly controlled.

The control unit determines from the vehicle sensor signals the vehicle situation and correspondingly controls the screening device. For example low speeds mean frequently changing actuation of the gas pedal and the brake pedal and frequent curves during a city driving. High speeds over a long time interval with insignificant steering wheel action means the speedway driving, and corresponding greater steering wheel action means driving on a highway. Further vehicle situations include for example the vehicle inclination about the longitudinal axis during driving over curves, or the vehicle inclination about the transverse axis

# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.