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Datasheet for the decision of 4 April 2008

Case Number: T 1949/07 - 3.4.03

Application Number: 03005256.7

Publication Number: 1345479

IPC: H05B 41/288

Language of the proceedings: EN

Title of invention:
Electric discharge lamp device

Applicant:
Denso Corporation

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 52(1), 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Inventive step (yes) - after amendment"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1949/07 **-** 3.4.03

D E C I S I O N
of the Technical Board of Appeal 3.4.03
of 4 April 2008

Appellant: Denso Corporation
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Kariya-city
Aichi-pref. 448-8661 (JP)

Representative: TBK-Patent
Bavariaring 4-6
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 25 May 2007 refusing European application No. 03005256.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: V. L. P. Frank
Members: R. Q. Bekkering
U. Tronser

Summary of Facts and Submissions

I. This is an appeal against the refusal of application 03 005 256 for lack of clarity, added subject-matter and lack of inventive step over

D1: JP-A-07 176 388

II. The appellant requested that the decision under appeal be set aside and a patent granted in the following version:

Main request:

Claim 1 submitted during oral proceedings on 4 April 2008;

Description pages 1a, 2, 3, 4a, 5, 10, 13 and 18 submitted during oral proceedings, pages 1, 4, 4b submitted with a letter dated 7 February 2006 and pages 6 to 9, 11, 12, 14 to 17 and 19 to 25 as originally filed;

Drawings as originally filed.

Auxiliary request:

Claim 1 submitted during oral proceedings on 4 April 2008;

Description and drawings as for the main request.

III. Claim 1 of the main request reads:

"*1. An electric discharge lamp device (10) for controlling the power supplied to a mercury less discharge lamp comprising:*
lamp voltage detection means (200) for detecting a current voltage (VL) of said lamp
storage means (320) for storing a lamp voltage (V_L) after an elapse of a predetermined period of time (B) from a start of lighting said lamp (2),
change detection means (350) for detecting a current change (ΔVL) in said lamp voltage by subtracting the lamp voltage (VL_S) stored in the storage means after said elapse of said predetermined period of time from said current lamp voltage (VL),
wherein a decrease of power supplied to said lamp from a higher power level, higher than a rated power level of said lamp, down to the rated power level is controlled on the basis of said current change in said lamp voltage,
wherein said lamp voltage being stored in said storage means is maintained during the decrease of power, and wherein said control of said decrease of power is started when said current change voltage reaches a level (ΔVL1) corresponding to about 80% of the light flux and ends when said current change voltage is at a level (ΔVL2) corresponding to about 100% of the light flux."

IV. Claim 1 of the auxiliary request differs from claim 1 of the main request in that the storage means are defined as:

"*storage means (320) for storing a lamp voltage (V_L), said lamp voltage stored in said storage means (320) being a minimum voltage value in an initial stage of lighting said lamp (2) after start of lighting the lamp*".

V. The following prior art document is also referred to:

D2: US-A-4 839 566

VI. The appellant applicant argued as follows:

The subject-matter of claim 1 was new and involved an inventive step over the cited prior art, in particular D1.

Document D1 disclosed a device for controlling the power supplied to an electric discharge lamp in which the lamp voltage in stable operation was stored and in which, when subsequently lighting the lamp the appropriate power control mode was selected based on the ratio between the stored lamp voltage and the current lamp voltage after the start of lighting the lamp. There was no reason to store instead the lamp voltage at the start of lighting the lamp.

As far as the second embodiment of D1 was concerned, in this case at regular intervals a new value for the lamp voltage was stored and subtracted from the current lamp voltage. The power supplied to the lamp was controlled based on whether the lamp voltage change over such an interval, ie the rise rate, was below a given threshold corresponding to an inflection point in the lamp voltage. This power control was inadequate for mercury-

less lamps for which the change in lamp voltage between start-up and stable operation was only 15 V.

Document D2 disclosed a read only memory for storing in tabular form a dependency represented by instantaneous values of lamp current and lamp voltage. This read only memory was not able to store the lamp voltage temporarily.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 *Amendments*

Amended claim 1 is based on claims 1 and 2 as originally filed and the original description, page 4, line 10 to page 6, line 8 and figures 11 and 12.

The amendments thus comply with Article 123(2) EPC.

2.2 *Novelty, inventive step*

2.2.1 *Document D1*

Document D1 discloses a device for controlling the power supplied to an electric discharge lamp. The device provides a controlled decrease of the power supplied to the lamp from an initial high power level, larger than the rated power of the lamp, down to the rated power.

Depending on whether it is a cold, a medium or a hot start of the lamp, different power control modes are required. Furthermore, account is taken of the variability of the lamp voltage between lamps.

D1 notes that the initial lamp voltage does not help to select the appropriate power control mode (see translation [0027]), as eg the initial lamp voltage for a given hot lamp having a generally lower lamp voltage may be identical to that of an other lamp having a generally higher lamp voltage when medium hot.

In order to address this problem, the lamp voltage during normal operation of the lamp at the rated power level is measured and stored. When the lamp is switched on, in a first stage, the instantaneous lamp voltage is measured and compared with the stored lamp voltage at the rated power. Depending on the ratio between the lamp voltage and the stored lamp voltage at the rated power, the appropriate power control mode is selected.

2.2.2 *Decision under appeal*

According to the reasoning in the decision under appeal it was obvious to store the initial lamp voltage, instead of the lamp voltage at the rated power from a previous operation time, and to compare the instantaneous lamp voltage with the stored initial lamp voltage. Moreover, the difference between the consideration of a voltage ratio and a voltage difference was considered devoid of any technical significance.

However, the board notes that in this case the stored lamp voltage would correspond to the instantaneous lamp voltage, rendering a comparison between the two pointless.

2.2.3 *Document D1 - second embodiment*

In D1, according to a second embodiment, in a second stage the power control involves a recurring measurement of the lamp voltage at fixed intervals. At the end of each interval the change of the lamp voltage with respect to the lamp voltage stored at the end of the previous interval is determined. To this end immediately after switching on the lamp, the change of the lamp voltage ΔVL is set to the instantaneous lamp voltage VL1 and the stored lamp voltage VOLD is set to zero. After a first time interval the instantaneous lamp voltage VL is measured, ΔVL (defined as VL - VOLD) is computed and VOLD is updated to VL etc. (see translation, figures 11, 14 and paragraphs [0053] to [0059]). The lamp voltage change thus corresponds to a time derivative and allows the detection of an inflection point in the lamp voltage (see translation, figures 16 to 18 and paragraphs [0048] and [0049]). According to D1, the point where the rise rate of the discharge lamp voltage becomes smaller than a given value is in agreement with an inflection point of the luminous efficiency. The relationship between the rise rate of the discharge lamp voltage and the inflection point is not affected by dispersion or aging of the high-voltage lamps.

2.2.4 *Differences of claim 1 over D1*

Thus, the subject-matter of claim 1 of the main request differs from D1 in that the power control in claim 1 is based on the lamp voltage change from its initial value, whereas in D1 it is based on the derivative of the lamp voltage. Moreover, according to claim 1 the corresponding power control is started when the current change voltage reaches a level corresponding to about 80% of the light flux and ends when the current change voltage is at a level corresponding to about 100% of the light flux.

Furthermore, the device of claim 1 is for controlling the power supplied to a mercury-less discharge lamp.

Conventional mercury-containing electric discharge lamps with a rated power of 35 W as typically used in car headlights give rise to a lamp voltage at start-up of about 27 V and of about 85 V in stable operation, whereas their mercury-free counterparts give rise to a lamp voltage at start-up of about 27 V and of about 42 V in stable operation.

The subject-matter of claim 1 of the main request is therefore new over document D1 (Articles 52(1) and 54(1) and (2) EPC).

2.2.5 *Remaining available prior art*

Novelty is also confirmed over the remaining available, more remote prior art.

In particular, document D2 discloses a circuit for supplying power to a low-voltage lamp. The parameters determining the power supplied to the lamp are retrieved from a two dimensional table stored in a read only memory, wherein the instantaneous values of the lamp voltage and current as measured are used to address the memory. A storage of the lamp voltage or a detection of any change of the instantaneous lamp voltage relative to a stored value is not disclosed.

2.2.6 *Inventive step*

The above differences with respect to document D1, which provides the closest prior art, according to the appellant applicant provide a more accurate power control, in particular where mercury-less lamps are used. Whereas the lamp voltage for mercury-containing lamps rises from 27 V to 85 V and thus by 58 V, the lamp voltage for mercury-less lamps only rises from 27 V to 42 V and thus by a mere 15 V. An accurate detection of the lamp voltage change is thus necessary as it is used to control a power reduction from an initial 90 W down to the rated power of 35 W for these lamps. Any imprecision would result either in high power, above the rated power, being supplied for too long to the lamp, or in the power being reduced to the rated power before a light flux up to 100% is achieved. A power control based on the lamp voltage change relative to its initial value rather than on its time derivative provides the required accuracy.

Thus the objective problem to be solved with respect to D1 is to provide a more accurate power control. The solution as provided by claim 1, in the board's

judgement, cannot be considered obvious to the skilled person as there is nothing in the available prior art suggesting a detection of the lamp voltage change relative to an initial value of the lamp voltage for controlling the power between 80 and 100% light flux.

Accordingly, the subject-matter of claim 1 involves an inventive step in the sense of Article 56 EPC.

2.3 The appellant's main request is therefore allowable.

3. As a consequence there is no need to go into the merits of the appellant's auxiliary request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of the first instance with the order to grant a patent on the basis of:

   Claim 1 of the main request submitted during oral proceedings;

   Description pages 1a, 2, 3, 4a, 5, 10, 13 and 18 as submitted during oral proceedings, and pages 1, 4, 4b submitted with a letter dated 7 February 2006 and pages 6 to 9, 11, 12, 14 to 17 and 19 to 25 as originally filed;

   Drawings as originally filed.

Registrar Chair

S. Sánchez Chiquero V. L. P. Frank