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**Datasheet for the decision
of 25 June 2013**

Case Number: T 1983/09 - 3.5.02

Application Number: 04769910.3

Publication Number: 1665893

IPC: H05B 33/08

Language of the proceedings: EN

Title of invention:

LED temperature-dependent power supply system and method

Applicant:

Koninklijke Philips Electronics N.V.

Headword:

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Relevant legal provisions:

EPC Art. 123(2), 56

Keyword:

"Amendments - added subject-matter (no)"

"Inventive step - main and first auxiliary requests (no)"

"Remittal to the department of first instance - (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 1983/09 - 3.5.02

D E C I S I O N
of the Technical Board of Appeal 3.5.02
of 25 June 2013

Appellant:
(Applicant)

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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 9 March 2009
refusing European patent application
No. 04769910.3 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: R. Lord
Members: M. Léouffre
P. Mühlens

Summary of Facts and Submissions

- I. The applicant appealed on 12 May 2009, against the decision of the examining division, posted on 9 March 2009, to refuse the European application No. 04769910.3.
- II. The examining division held that the subject-matter of independent claims 1 and 17 as filed on 12 November 2008 extended beyond the content of the application as filed, contrary to Article 123(2) EPC. The examining division considered that the expression "controlling the light output of the LED load at a required level" constituted an unallowable generalisation, and that the introduction of the term "exclusively" in the expression "a LED driver module operable to regulate a flow of a LED current through the LED load exclusively as a function of the temperature and current-dependent feedback signal" resulted in an unallowable extension because the regulation depended on both the fault status and the temperature and current-dependent feedback signal.
- III. With the statement setting out the grounds of appeal, received on 9 July 2009, the appellant maintained his request as addressed in the decision under appeal.
- IV. In a communication attached to the summons to oral proceedings dated 21 March 2013, the board expressed the preliminary opinion that the contested amendments appeared to infringe Article 123(2) EPC and that the subject-matter of claims 1 and 17 might not be novel having regard to document D5 = US 6 400 101 B1.

- V. With letter of 23 May 2013, the appellant withdrew the previous request and filed claims according to a new main request and three auxiliary requests.
- VI. Oral proceedings were held before the board on 25 June 2013.
- VII. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request or on the basis of one of the first, second or third auxiliary requests, all filed with letter dated 23 May 2013.
- VIII. *Main request*

Claim 1 of the main request reads as follows:

"A system (20) for supplying power to an LED load (10), the system (20) comprising:

a LED driver module (30) operable to regulate a flow of a LED current (I_{LED}) through the LED load (10) as a function of a temperature and current-dependent feedback signal (TDFS); and

a current controller module (60) in electric communication with said LED driver module (30) to communicate the temperature and current-dependent feedback signal (TDFS) to said LED driver module (10), wherein said current controller module (60) is operable to generate the temperature and current-dependent feedback signal (TDFB) as a function of an operating temperature of the LED load (10) and the flow of the LED current (I_{LED}) through the LED load (10), and wherein said current controller module (600) includes:

means for generating a temperature feedback signal (V_{TF}) as a function of a sensed operating temperature of the LED load (10);

wherein the temperature feedback signal is a temperature feedback voltage (V_{TF}) and said current controller module (600) includes:

a first operational amplifier (U1) operable to generate the temperature feedback voltage (V_{TF}) as a function of the operating temperature of the LED load (10);

means for generating a current feedback signal (V_{CF}) as a function of a sensed flow of the LED current (I_{LED}) through the LED load (10); wherein the current feedback signal is a current feedback voltage (V_{CF}) and said current controller module (60) includes:

a second operational amplifier (U2) operable to generate the current feedback voltage (V_{CF}) as a function of the flow of the LED current (I_{LED}) through the LED load (10); and

means for mixing the temperature feedback signal (V_{TF}) and the current feedback signal (V_{CF}) to yield the temperature and current-dependent feedback signal (TDFB), wherein the temperature and current-dependent feedback signal (TDFB) is a feedback voltage generated as a mixture of the temperature feedback voltage (V_{TF}) and the current feedback voltage (V_{CF})."

Claims 2 to 14 are dependent on claim 1.

Claim 15 of the main request reads as follows:

"A method for supplying power to an LED load (10), the method comprising:

generating a current-sensing signal (CSS) indicative of a flow of a LED current (I_{LED}) through the LED load (10);

generating a current feedback voltage (V_{CF}) based on said current-sensing signal (CSS);

generating a temperature-sensing signal (TSS) indicative of an operational temperature of the LED load (10);

generating a temperature feedback voltage (V_{TF}) based on said temperature-sensing signal (TSS);

mixing the temperature feedback voltage (V_{TF}) and the current feedback voltage (V_{CF}) to yield a temperature and current-dependent feedback voltage (TDFB);

and

regulating the flow of the LED current (I_{LED}) through the LED load (10) as a function of said temperature and current-dependent feedback voltage (TDFB)."

Claims 16 and 17 are dependent on claim 15.

IX. *First auxiliary request*

Claim 1 of the first auxiliary request adds to claim 1 of the main request that the temperature feedback signal (V_{TF}) is generated as a function "having a negative temperature coefficient".

Correspondingly, independent method claim 15 of the first auxiliary request adds to claim 15 of the main request that the temperature feedback voltage is one "having a negative temperature coefficient".

The objected term "exclusively" was also reintroduced into the last two features of claim 15, so that they read:

"mixing exclusively the temperature feedback voltage (V_{TF}) and the current feedback voltage (V_{CF}) to yield a temperature and current-dependent feedback voltage (TDFB); and

regulating the flow of the LED current (I_{LED}) through the LED load (10) exclusively as a function of said temperature and current-dependent feedback voltage (TDFB)."

X. *Second and third auxiliary requests*

These requests correspond respectively to the main and first auxiliary requests except that the method claims 15 to 17 have been deleted.

XI. The applicant essentially argued as follows:

D5 was unclear about the temperature feedback signal and the current feedback signal. D5 was silent about the type of signal generated by the NTC sensor and the temperature regulation means shown in figure 8.

The temperature feedback signal of D5 was rather used to prevent destruction of the circuit (cf. column 4, lines 10 to 54). It was not used for regulation as in the present invention. The temperature feedback signal of D5 might be seen as being somehow combined with the current feedback sensing signal. The current feedback sensing signal however represented a mean current value (cf. column 2, line 63 to column 3, line 2) having been pre-processed in a complicated circuit. The current feedback sensing signal was passed through a

proportional integrator (PI) circuit and it was unclear if the current information produced was a voltage or a current.

According to the invention (cf. bottom of page 8 of the description), the temperature feedback signal and the current feedback sensing signal were voltages which did not require any pre-processing. The voltages were simply mixed and the circuit was consequently much simpler.

Starting from D5, there was no motivation to provide a simpler solution and no motivation to remove the PI circuit. The simpler circuit according to the invention was therefore not obvious in the light of D5.

Finally the temperature and current signals of D5 were combined in an unclear way. Document D5, column 3 and column 7, first three paragraphs, raised more questions than they answered. Representing a temperature value with a voltage rather than a current, as claimed in claim 15, might not be inventive as such. Nevertheless the choice of a voltage as a temperature feedback signal enabled mixing the said temperature feedback voltage with a current feedback voltage in a much simpler circuit structure.

Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility of the amended requests*

Claim 1 of the main request is based on original claims 1, 2, 3 and 6 and page 8, lines 17 to 20 of the original published application, and claim 15 is

formulated as a method claim limited to the functional features recited in claim 1.

The request overcomes the objections which formed the basis of the decision under appeal, since the expression "for controlling the light output of the LED load at a required level" and the term "exclusively" have been excised from the independent claims 1 and 15. Therefore the main request is considered as complying with the requirements of Article 123(2) EPC. Moreover, since it was submitted in reaction to the objection of lack of novelty raised by the board in the communication accompanying the summons to oral proceedings, the board decided to admit it into the proceedings.

That decision applied also to the auxiliary requests.

3. *Article 56 EPC (main request)*

Document D5 discloses a system and method for supplying power to an LED load (cf. column 5, line 51 and figure 8) e.g. traffic lights (cf. column 4, lines 33 and 34).

The system comprises:

a LED driver module (comparator and transistor T) operable to regulate a flow of a LED current (i_{LED}) through the LED load as a function of a temperature and current-dependent feedback signal U_{REG} (cf. figure 8 and column 7, lines 13 to 27); and

a current controller module (Regulator) in electric communication with said LED driver module to communicate the temperature-dependent feedback signal U_{REG} to said LED driver module.

Said current controller module operates by carrying out the following method steps:

generating a current sensing signal (cf. column 2, lines 57 to 62) indicative of a flow of the LED current (i_{LED}) through the LED load;

generating a current feedback voltage based on said current sensing signal (output of the integrator is necessarily a voltage since it is applied to an input of an operational amplifier);

generating a temperature-sensing signal (cf. column 7, lines 13 to 16 and figure 8: NTC and temperature regulation module) indicative of an operational temperature of the LED load; and

mixing the temperature feedback signal (adder at the input of the regulator and operational amplifier) and the current feedback voltage to yield a temperature and current-dependent feedback voltage U_{REG} ;

to regulate the flow of the LED current (i_{LED}) through the LED load as a function of said temperature and current-dependent feedback voltage.

The method of claim 15 of the main request differs from the known method only in that the claim specifies further that the method comprises the step of "generating a temperature feedback voltage based on said temperature sensing signal (TSS)."

D5 is indeed silent about the type of signal generated by the temperature regulation means and about the adder connected to the inverting input of the regulator means. A straightforward solution for a person skilled in the art would be to generate and apply a current as a temperature sensing signal to the middle tap of the resistor divider (R_i and R_{ext} on figure 8), modifying thereby the voltage applied to the inverting input of

the operational amplifier used as regulator means. Actually mixing currents is always easier than mixing voltages. The board therefore disagrees with the appellant about the degree of complexity of the circuit of D5 compared with the one of the present invention. Furthermore a person skilled in the art knows how to mix voltages. The regulator means of D5 is an example of a circuit based on an operational amplifier to mix voltages representing a feedback current sensing signal and a temperature and current-reference information. Therefore it would be obvious for a person skilled in the art to provide as an alternative to a current, a temperature feedback voltage and to mix this voltage with the voltage available at the middle tap of the resistor divider in an adder realised with an operation amplifier and connected to the regulator. Hence the method of claim 15 of the main request does not involve an inventive step in the sense of Article 56 EPC having regard to D5. The main request is consequently not allowable.

4. *First auxiliary request*

Claim 15 of the first auxiliary request differs from claim 15 of the main request in that the temperature feedback voltage has "a negative temperature coefficient" and in that the term "exclusively" remained in the last two features.

The added feature concerning the temperature sensor is known from D5 wherein the letters NTC attached to the temperature sensor can only be interpreted as "negative temperature coefficient".

The other features are also known from the current controller module of D5, which mixes exclusively the

temperature sensing signal and the current feedback signal to yield a temperature and current-dependent feedback signal U_{REG} and regulates the flow of the LED current through the LED load exclusively as a function of said temperature and current-dependent feedback signal. This is apparent from the fact that in figure 8 it can be seen that there is no other feedback input to the regulator means.

Hence the subject-matter of claim 15 of the first auxiliary request lacks an inventive step having regard to D5 for the same reasons that claim 15 of the main request does. The first auxiliary request is therefore not allowable.

5. *Second auxiliary request*

The second auxiliary request is limited to independent claim 1 of the main request and the corresponding dependent claims, so that the above objections to the main and first auxiliary requests do not apply to this request.

5.1 The subject-matter of claim 1 differs from the system of D5 in that:

"the current controller module includes:
a first operational amplifier (U1) operable to generate the temperature feedback voltage (V_{TF}) as a function of the operating temperature of the LED load (10); and
a second operational amplifier (U2) operable to generate the current feedback voltage (V_{CF}) as a function of the flow of the LED current (I_{LED}) through the LED load".

The first and second operational amplifiers were the subject of original claims 3 and 6, which were not been discussed in the proceedings before the examining division.

Thus, the amendments made at the appeal stage have not only substantially changed the factual framework of the contested decision, they also might require an additional search to determine the relevant prior art.

For these reasons, and to guarantee the appellant's right to appeal against a decision based on new facts, the board exercises its power under Article 111(1) EPC, to remit the case to the department of first instance for further prosecution on the basis of the second 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 first instance for further prosecution.

The Registrar:

The Chairman

C. Rodríguez Rodríguez

R. Lord