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Datasheet for the decision of 10 June 2020

Case Number: T 1568/15 - 3.4.01

Application Number: 10766043.3

Publication Number: 2489242

IPC: H05B33/08

Language of the proceedings: EN

Title of invention:
PHASE CUT DIMMING OF LEDS

Applicant:
Tridonic UK Limited

Headword:
Phase cut dimmer / Tridonic

Relevant legal provisions:
EPC Art. 83, 84

Keyword:
Sufficiency of disclosure - (no)
Claims - clarity (no)

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Case Number: T 1568/15 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 10 June 2020

Appellant: (Applicant)	Tridonic UK Limited Aurora House Hampshire International Business Park Crockford Lane Chineham Basingstoke Hampshire RG24 8LB (GB)
Representative:	Rupp, Christian Mitscherlich PartmbB Patent- und Rechtsanwälte Sonnenstraße 33 80331 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 10 March 2015 refusing European patent application No. 10766043.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	P. Scriven
Members:	T. Alecu
	J. Geschwind

Summary of Facts and Submissions

I. The appeal was filed against the decision of the Examining Division to refuse European patent application 10 766 043.

II. The Examining Division held that the subject-matter of the independent claims of all requests before them lacked compliance with Articles 83 and 84 EPC. They also considered that the independent claims of the main and second auxiliary requests were in breach of the provisions of Article 123(2) EPC.

III. The Examining Division's decision referred to the following documents:

D1: US 2007/182347 A1
D2: WO 2009/121956 A1
D3: RAND D ET AL: "Issues, Models and Solutions for Triac Modulated Phase Dimming of LED Lamps", POWER ELECTRONICS SPECIALISTS CONFERENCE, 2007
D4: WO 2005/115058 A1
D5: US 2009/184662 A1
D6: EP 1 016 062 A1

IV. With the grounds of appeal, the appellant requested that the decision of the Examining Division be set aside and that a patent be granted on the basis of their main request, or one of eight auxiliary requests. The main request and the first auxiliary request were filed with the grounds of appeal. The second to eighth auxiliary requests were the same as the main and first to sixth auxiliary requests before the Examining

Division. The appellant also put forward arguments to show compliance with the provisions of Articles 83, 84 and 123(2) EPC.

V. In a communication under Article 15(1) RPBA, the appellant was informed of the Board's provisional opinion. The Board was of the opinion that the newly filed requests were not admissible under RPBA 2007. The Board also agreed with the grounds for refusal and considered that all the objections stemmed from an unclear and incomplete disclosure of the invention (Article 83 EPC).

VI. In reply, the appellant maintained its requests and provided arguments on disclosure (Article 83 EPC) and on compliance with Articles 84 and 123(2) EPC.

VII. Oral proceedings before the Board took place on 10 June 2020.

VIII. The appellant initially withdrew the main and first auxiliary requests and maintained all the other requests. After the discussion of the second auxiliary request in respect of Articles 83 and 84 EPC, the appellant withdrew the third to sixth and the eighth auxiliary requests, thus maintaining only the second and the seventh auxiliary requests.

IX. Claim 1 of the second auxiliary request reads:

A dimmable LED module, the module being designed for being dimmed using a dimmer controlling a phase cut of an AC supply voltage supplied to the LED module, the module comprising:

- a bleeding circuit (6) adapted to selectively draw a bleeding current in periods when the AC supply voltage amplitude is below a threshold value,
- a control circuit (7) being supplied with a sensed signal indicating the activity of the bleeding circuit (6), the control circuit (7) being adapted to determine, based on the signal indicating the activity of the bleeding circuit (6), a value representing the phase cut present in the AC supply voltage and to issue a control signal as a function of the value representing the phase cut, and
- at least one driver circuit (11) being supplied with said control signal and being adapted to adjust the power supplied to associated LED lighting means (5),
characterized in that
the signal indicating the activity of the bleeding circuit (6) is a pulse signal.

X. Claim 1 of the seventh auxiliary replaces the final three lines with:

... wherein
the signal indicating the activity of the bleeding circuit (6) is a pulse signal, and wherein the phase cut is determined by performing a trailing or leading edge algorithm, deriving a timing of the phase cut from current pulse information, comprising a pulse width or a timing of pulses, to compute a timing of zero crossings of the AC supply voltage as well

as an operating frequency of the AC supply voltage, wherein narrower pulses indicate a position of the phase cut, while broader pulses indicate the bleeding current."

Reasons for the Decision

Second auxiliary request

Sufficiency of disclosure (Article 83 EPC)

1. The application relates to the field of phase cut dimming of LEDs. Standard triac-based dimmers do not function correctly in combination with LED light sources, because the LEDs do not draw sufficient current to recharge the capacitor of the RC timer circuitry triggering the triac.

2. It is known to solve this problem by using a bleeding circuit, which ensures that enough current flows. In its simplest form, it can be just a dummy load (a resistor - D3, page 1403, right hand column), in parallel with the LEDs, which continuously bleeds some current. Active current sources are also used (D1 abstract, D2 abstract, D3 Figure 12). Furthermore, bleeding can be selectively activated to bleed just in periods close to the zero-crossings of the mains supply, when the drawn current would otherwise be too low.

3. The invention relies on the idea that the activity of the bleeding circuit can be sensed and used to compute the phase cut. This phase cut information is then used

to control the power provided to the LEDs through a DC-DC converter (claim 1; page 3; Figures 1 and 2).

4. In this generality, the idea is problematic. The claim defines the bleeding circuitry to be of the selectively-activated type. If the phase cut is changed, but remains outside the activation time, then there should be no effect on the bleeding activity, irrespective of where the cut is placed. The bleeding will not take place outside the activation time, and inside that time the input voltage to the bleeding circuitry will remain unchanged, as the triac will still be conducting. In such a configuration, the activity of the bleeding circuitry is independent of the phase cut.

5. If the phase cut information is to be derived from a signal indicating the bleeding activity, either the bleeding circuitry is configured such that the timing of the bleeding is also dependent on other parameters than the zero crossings of the supply voltage, or the signal must also be indicative of other things than the bleeding activity (e.g. the rectified voltage), or both.

6. The description provides for three different embodiments, detailing the bleeding circuit and the signal indicating its activity, represented in Figures 3, 4, and 6. In the Board's view, none of them provides a clear disclosure of a circuitry outputting the desired phase cut information.

7. The embodiments of Figures 3 and 4 use a timed logic unit to enable bleeding by activating the transistors R_1 and M_1, respectively. The enablement period is determined by the timed logic unit in synchronization

with the AC supply voltage (description page 16, paragraph 2).

8. As to how the synchronization is achieved, the appellant submitted that this would be commonly known by the skilled person, e.g. by bleeding continuously for a few cycles (see the paragraph bridging pages 18 and 19 of the description).

9. It is, however, noteworthy that the only input to the timed logic unit is a measure of the voltage across resistor R_{SHUNT}. There is no input from the supply voltage. This means that whichever methods were known by the skilled person, they would require at least some adaptation to the nature of the measured signal here - i.e. the bleeding current.

10. Further, in Figure 3, a DC voltage is connected to the output of the timed logic. The role of this voltage is not clear. There is no explanation in the text as to its function but it implies that some DC voltage is always present at the output, potentially enabling the bleeding.

11. The appellant submitted, during the oral proceedings, that this was not the case and that the description made it clear that it was the timed logic that enabled the bleeding. How this is done, however, remains unclear.

12. The embodiment of Figure 4 differs from that of Figure 3 in that the DC source is no longer present, and in that the enable signal is a PWM signal, integrated by an RC filter on output. This latter modification does not raise any questions; the former removes one

apparent lack of clarity, but still does not explain how the enable signal is generated.

13. Figure 5 of the application shows a bleeding current obtained with the circuitry of Figures 3 or 4. The shape or amplitude of this current should contain the information as to the phase cut.

14. According to the appellant, the pulse on the left (the narrow pulse) is the result of a transient effect, and it indicates the position of the phase cut (description page 18, first two lines). It is unclear, though, why this transient effect is present if the voltage on the transistor base remains zero.

15. The appellant submitted, during oral proceedings before the Board, that the width of the window in which the transistor was activated could be large enough to cover the phase cut. But then it is unexplained why the current immediately transitions to zero.

16. The appellant further submitted that the broad pulse on the right, in any case, contained enough information (e.g. in terms of amplitude or width) to allow the computation of the phase cut, which meant that the phase cut position influenced the parameters of the pulse. But this is not the case (point 4. above).

17. On the extraction of the phase cut information from the pulses, the application states (bottom of page 17) that: *A trailing or leading edged detection algorithm can be divided in the LED ballast deriving the timing of the phase cut from the current pulse information by looking at the pulse width or the timing of the pulses* .... However, these algorithms are not provided.

18. Assuming that the sensed signal does contain the necessary information, the question then arises of which unit is responsible for extracting it.

19. According to claim 1, it is the control unit 7 that is responsible for the derivation of the phase cut: *the control circuit (7) being adapted to determine, based on the signal indicating the activity of the bleeding circuit (6), a value representing the phase cut present in the AC supply voltage and to issue a control signal as a function of the value representing the phase cut.*

20. This is, however, prima facie at odds with the description. The first paragraph on page 18 (which applies to Figures 3 and 4) states: : *This detection of the broad current pulses(bleed current) and the narrow pulses (art of the phase cut by the triac or thyristor in the dimmer), respectively, can be performed by the timed logic unit 21, 21'.*

21. Figures 1 and 2, which show a general scheme of functioning, do not show any information being sent from the bleeding circuitry (6) to the control circuitry (7). The appellant was of the opinion that it was not essential what signal was sent or where the operations took place: the timed logic could send the whole sensed input signal, or just the information on the phase cut.

22. The Board disagrees: to implement the invention, the skilled person needs to know where to implement which operations and what signal is transmitted between the timed logic and the control circuitry 7.

23. To sum up on the embodiments of Figures 3 to 5: it is not clear how the enabling periods are set, it is not

clear how the enable signal is conditioned and provided, it is not clear how or why the narrow pulse indicating the phase cut is obtained, it is not clear how the phase cut information is derived, it is not clear where (in which unit) it is derived, and it is not clear which signal is sent from the bleeding circuitry to the LED control circuitry.

24. The appellant relies on the skilled person's common general knowledge to clarify and implement each of these issues.

25. Firstly, the Board considers that, even if each of the issues taken separately could be satisfactorily solved by the skilled person, their accumulation poses an undue burden.

26. Secondly, for a sufficient disclosure, it is also necessary that the application provide a detailed disclosure of all the non-trivial features of the invention that are required to obtain the technical effect sought. More details would have been necessary, at least as to how the enable signal is conditioned so as to obtain a sensed signal containing the desired information on the phase cut, and how the phase cut is actually determined from the sensed current signal.

27. It is concluded that these two embodiments do not teach, in a clear and sufficient manner, how, or even if, information on the phase cut is present in the signal output of their respective circuits. Furthermore, even if they did, the skilled person is not taught how to derive a value representing the phase cut from it.

28. Consequently claim 1 is not disclosed (Article 83 EPC) over the whole scope, in that at least these two covered embodiments are not sufficiently disclosed.

29. Moreover, had the disclosure of these embodiments been sufficient, it would have remained nonetheless the case that the disclosure would not allow for the claimed generalization which goes beyond them, as the activity of a generic bleeding circuit need not contain the information required to recover the phase information (points 4. and 5. above).

30. It is further noted that the embodiment of Figure 6 is also, to some good measure, unclear.

31. Depending on the input voltage in relation to Vcc, transistor Q4 is on or off. Either way, Vout is some fraction of the rectified input voltage.

32. It is, then, not clear why this output should be a *digital* high or low, which is essential to derive the phase cut information, as the description explains (page 21, lines 15-22). Depending on the values of the different resistors, which are not given, it might indeed be that one ratio is much larger than the other, but the shape of the curve would anyway not be flat, but would follow the form of the AC supply voltage.

33. Furthermore, as for the first two embodiments, no algorithm for deriving the phase cut is provided.

Clarity (Article 84 EPC)

34. The discussion on the embodiment of Figure 6 brings up a clarity issue. The claim defines a *pulse* signal.

35. In the Board's view, the primary meaning of a *pulse* is that of a signal that transitions from a low value to a certain high value (or vice versa), stays to a certain extent flat, and then transition backs.

36. If this is the case, then the embodiment of Figure 6 is not covered by the current claim. Firstly, it is noted that the description does not use the word *pulse* in connection with Figure 6, and secondly, as explained above, the signal Vout is not flat, because it is one of two fractions of the rectified AC voltage.

37. The appellant argued that a pulse was not necessarily flat. It was rather just the fast transition that was characteristic of a pulse.

38. The appellant also submitted that the feature was actually redundant, as it would be inherently produced by the selective nature of the bleeding circuit.

39. In Board's view, when a feature is recited in a claim, the skilled person has every reason to believe that it has a meaning. Although the interpretation provided by the appellant is technically plausible, the skilled person would at least hesitate to take an interpretation that makes the feature redundant and does not restrict the claimed scope.

40. When trying to understand the feature by its function, which here is to encode information on the phase cut, and thus to derive a meaning from the desired

properties of the pulse, the skilled person also arrives at an impasse, due to the insufficiency of disclosure, noted above, as to the relationship between the phase cut and the shape of the sensed signal.

41. Thus the skilled person cannot understand if or how the feature *the signal indicating the activity of the bleeding circuit (6) is a pulse signal* restricts the claim scope.

42. Furthermore, the claim is also in apparent contradiction with the description - see points 19. and 20. above, which makes the functions of the control circuit, the relationship between the bleeding circuit and the control circuit, and the meaning of the sensed signal remains unclear.

43. Thus claim 1 does not clearly define the scope of protection as required by Article 84 EPC.

Seventh auxiliary request

44. All of the above objections apply (the substance of the amendment has already been considered, see point 17. above).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Meyfarth P. Scriven

Decision electronically authenticated