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Datasheet for the decision of 12 June 2017

Case Number: T 0603/12 - 3.5.02

Application Number: 07397003.0

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IPC: H05B41/295

Language of the proceedings: EN

Title of invention:
Electronic ballast for fluorescent lamp

Patent Proprietor:
Helvar Oy Ab

Opponent:
TridonicAtco GmbH & Co.KG

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
Inventive step - (yes)

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Case Number: T 0603/12 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 12 June 2017

Appellant: (Opponent)	TridonicAtco GmbH & Co.KG Färbergasse 15 6851 Dornbirn (AT)
Representative:	Barth, Alexander TridonicAtco GmbH & Co KG Färbergasse 15 6851 Dornbirn (AT)
Respondent: (Patent Proprietor)	Helvar Oy Ab Yrittäjäntie 23 03600 Karkkila (FI)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 16 January 2012 rejecting the opposition filed against European patent No. 1811817 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	R. Lord
Members:	G. Flyng
	W. Ungler

Summary of Facts and Submissions

I. The opponent is appealing against the decision of the opposition division rejecting the opposition against European Patent number EP 1 811 817 B1. Claim 1 of the patent reads as follows (feature reference letters as used in the contested decision added by the Board):

"1. An electronic ballast for a fluorescent lamp, the ballast comprising

[a] an inverter which is supplied from a DC voltage source (V_{DC}) and includes two power switch devices (Q_1, Q_2) operating in a push-pull mode for generating a high-frequency voltage,

[b] a lamp load circuit which is connected to the inverter and comprises a primary inductor (L_{1pri}) and a capacitor (C_1) and to which load circuit the fluorescent lamp can be connected,

[c] a heating circuit of the fluorescent lamp cathodes, the heating circuit including a transformer (T_1) having a primary winding (T_{1pri}) and secondary windings (T_{1secA}, T_{1secB}) connected to the cathodes of the fluorescent lamp for feeding a heating current thereto,

[d] a secondary inductor (L_{1sec}) cofunctioning with the primary inductor (L_{1pri}) and connected to the same circuit with the transformer primary winding (T_{1pri}) for supplying the heating current energy from the secondary Inductor (L_{1sec}) to the transformer primary winding (T_{1pri}), the voltage over the secondary inductor (L_{1sec}) being, defined by the turns ratio, smaller than the voltage over the primary inductor (L_{1pri}), and

[e] a controllable switch (Q_3) in the same circuit for controlling the level of the heating current,

characterized in that

[f] the switch (Q_3) is in series with the primary winding (T_{1pri}) of the transformer (T_1)

[g] whereby the cathodes are not being heated when the switch (Q_3) is in cut-off state,

[h] and that the heating current is adapted controllable to a desired level by driving the switch (Q_3) ON and OFF with a pulse-width-controlled drive signal under, an active control dependent on the desired lamp intensity level,

[i] the switch (Q_3) being driven synchronized with the operating frequency of the inverter switches (Q_1, Q_2),

[j] whereby the width of its drive signal pulses are made narrower than the drive pulses of the Inverter switch devices".

The remaining claims 2 and 3 of the patent are dependent on claim 1.

II. In the contested decision the opposition division found that the subject-matter of the independent claim 1 of the patent was novel and involved and inventive step over the prior art documents cited by the opponent, which included:

E1: DE102004009995 A1;
E2: EP1191824 A2; and
E5: DE10102940 A1.

The opposition division presented detailed reasoning for these findings, taking account of the various lines of argumentation of the opponent, in particular novelty over E1, E5 and E6 as well as inventive step:

- starting from E1 and in combination with E6 or common general knowledge
- starting from E1 and in combination with E5

- starting from E5 and in combination with E6
- starting from E6 and in combination with E5.

III. In the grounds for appeal the appellant argued that the subject-matter of claim 1 lacked an inventive step, Article 56 EPC, starting from document E1 and in combination with E5 or E2.

IV. In the reply to the appeal the respondent (patent proprietor) argued that the subject-matter of claim 1 was new and involved an inventive step.

Arguments were presented as to why the combination of E1 with E5 or E2 would not lead to the subject-matter of claim 1.

The respondent also filed sets of claims according to three auxiliary requests and presented brief arguments in respect of these.

V. The Board summoned the parties to attend oral proceedings. With a response to the summons dated 12 May 2017 the respondent filed sets of claims according to first to third auxiliary requests.

VI. Oral proceedings were held on 12 June 2017. The appellant argued that claim 1 of the patent lacked an inventive step, Article 56 EPC, starting from document E1 and in combination with E5. The respondent contested this, arguing that E1 did not disclose a switch in series with the primary winding of the transformer (i.e. feature f) and that it was not obvious to combine E1 and E5 because the circuits they disclosed operated differently.

The appellant (opponent) requested finally that the decision under appeal be set aside and that the European patent be revoked.

The respondent (patent proprietor) requested finally that the appeal be dismissed (main request), auxiliarily that the decision under appeal be set aside and the patent be maintained in amended form on the basis of one of the first to third auxiliary requests filed with the letter dated 12 May 2017.

The present decision was pronounced at the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

2. The appellant has not contested the finding of the opposition division, that the subject-matter of the claims is novel, Article 54 EPC 1973, and the Board agrees with this finding.

3. Inventive Step - Article 56 EPC 1973

3.1 Document E1 discloses all of the features of the preamble of claim 1. That has not been disputed.

3.2 In the contested decision the opposition division found that in the circuit of E1, figure 2 the switch S3 was in series with the primary winding Lh1 of the heating transformer and hence the feature f of the characterising portion of claim 1 of the patent was

known from E1. The respondent contests this finding, arguing that the switch S3 is not in series with the primary winding Lh1 of the heating transformer. For the following reasons the Board agrees with the respondent on this point.

3.2.1 According to paragraph [0026] of E1 (translation by the Board), the circuit of figure 2 includes:

> *an intermediate circuit Z which is inductively coupled to the load circuit. To this end, a coupling transformer is provided whose primary winding is formed by the output inductor Lop of the series resonant circuit and which has a secondary winding Los within the intermediate circuit Z. Further components of the intermediate circuit Z are the primary winding Lh1 of the heating transformer as well as a series connection of two capacitors C5 and C6, the second capacitor C6 being able to be bridged by a controllable switch S3.*

3.2.2 The switch S3 is able to bridge the second capacitor C6 because it is connected in parallel with it. As can be readily seen in figure 2 of E1, this parallel arrangement of the second capacitor C6 and the switch S3 is connected in series with the other components of the intermediate circuit Z, namely the first capacitor C5, the secondary winding Los of the coupling transformer and the primary winding Lh1 of the heating transformer.

3.2.3 In electrical engineering, components are said to be connected in series if they are connected along a single path, so that the same current flows through all of the components. That is clearly not the case for the switch S3 and the primary winding Lh1 of the heating transformer because some of the current flowing through

the primary winding Lh1 will flow not through the switch S3, but through the second capacitor C6, which always forms a second current path in parallel with the switch S3.

3.2.4 Hence, the Board finds that in figure 2 of E1, the switch S3 is not in series with the primary winding Lh1 of the heating transformer and hence feature f of claim 1 of the patent is not known from E1.

3.2.5 The appellant argued that it was common to place a snubber capacitor in parallel with a switch and that in such an arrangement the switch would still be considered to be in series with the rest of the circuit because the effect of the snubber capacitor can be ignored. Based on this the appellant argued that the switch S3 could be considered to be in series with the primary winding Lh1. The Board was not persuaded by this argument because the second capacitor C6 of E1 is not a snubber capacitor; it is a capacitor which has a capacitance value sufficient to cause a significant change in the impedance of the intermediate circuit Z and hence a significant change in the level of heating when the switch S3 bridging it is opened and closed (cf. paragraphs [0027] to [0029]). The current passing through such a capacitor cannot be ignored in the way that the current through a snubber capacitor might.

3.3 As to the question whether the subject-matter of claim 1 of the patent is rendered obvious by a combination of the disclosure of E1 with that of E2 or E5, the Board concurs with respondent that the circuits disclosed and the manner in which they operate are so different that it would not be obvious to combine them in a way that would lead to the claimed subject-matter. The reasons for this conclusion are as follows.

3.3.1 In document E1, the alleged invention solves the problem of enabling the electrodes (cathodes) of a lamp to be optimally heated to take account of the different demands during heating (start-up) and dimming - see paragraph [0013]. This problem is solved by providing an intermediate circuit which comprises the primary winding of a heating transformer and which is galvanically separated from the lamp load circuit (rather than electrically connected to it as in the prior art arrangement described in figure 1 of E1) and by the impedance of the intermediate circuit being adjustable (cf. paragraphs [0014] and [0015] as well as claims 1 and 10). As discussed above, in the disclosed embodiment of E1 the impedance of the intermediate circuit is rendered adjustable by providing two capacitors C5, C6 in series in the intermediate circuit and by placing a controllable switch in parallel with the second capacitor to form a bridge across it when the switch is closed, thereby reducing the impedance of the intermediate circuit and increasing the heating current.

3.3.2 In document E5 (see figure 2) the intermediate circuit which provides power to heat the lamp electrodes E1 to E4 comprises the primary winding of a heating transformer L3 and a controllable switch V4, connected in series. The primary winding of the heating transformer L3 is not galvanically separated from the lamp load circuit, but electrically connected to it at the point connecting the switching transistors V2, V3 and the inductor L4. Such a direct electrical connection is what E1 teaches to avoid when going from the prior art arrangement it shows in figure 1. The Board considers that the skilled person aiming to improve the electrode heating circuit in the ballast of

E1 would not readily consider the electrode heating circuit of E5 because it is connected in a way that E1 teaches to avoid.

3.3.3 Furthermore, in E5, the switch V4 and the primary winding of the heating transformer L3 are also not connected in series with one another. When the switch V4 is closed (i.e. on), current flows from the lamp load circuit (i.e. the point between V2 and V3), through the primary winding of the heating transformer L3 to ground (i.e. the rail at the bottom of figure 2, which continues in figure 1 as the rail referenced J26). When the switch V3 is open, the current through the heating transformer primary winding L3 is able to continue flowing, passing through the diode D8 to the positive DC rail J10 and decaying as it does so. With the diode D8 connected to a point in between the switch V4 and the primary winding of the heating transformer L3, it cannot be said that these are connected in series. Hence, if the skilled person were to modify the circuit of E1 by mimicking the way the controlled switch of E5 controls the current flowing through the primary winding of the heating transformer, this would still not lead the controlled switch being connected in series with the primary winding of the heating transformer.

3.3.4 Also, the manner in which the controlled switch V4 of E5 controls the power to heat the lamp electrodes is quite different to the way the the controlled switch S3 in figure 2 of E1 does so.

In E5, the switch V4 operates by switching on and off the flow of current from the lamp load circuit, through the primary winding of the heating transformer L3 to ground, whereas in E1 the controlled switch S3 controls

the power to heat the lamp electrodes by adjusting the impedance and hence the resonance of the intermediate circuit, as discussed above. No plausible explanation has been given as to why it would be obvious for the skilled person to completely change the manner in which the circuit of E1 operates.

3.3.5 The Board considers the disclosure of document E2 to be no more relevant than that of E1 or E5 because it also does not disclose a controlled switch in series with the primary winding of a lamp electrode heating transformer. From figure 1 it can be readily seen that the switch S3 and the primary winding T1a of the heating transformer are not connected along a single path, such that the same current would flow through them. Hence, a combination of E2 with E1 would also not lead to the claimed subject-matter.

4. For the reasons set out above the Board finds that the arguments advanced by the appellant do not give cause to set aside the contested decision. The appeal is therefore dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed

The Registrar: The Chairman:

U. Bultmann R. Lord

Decision electronically authenticated