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Datasheet for the decision of 14 June 2019

Case Number: T 1117/15 - 3.4.03

Application Number: 03727717.5

Publication Number: 1523753

IPC: H01J23/22, H01J25/587

Language of the proceedings: EN

Title of invention:
MAGNETRONS

Applicant:
Teledyne e2v (UK) Limited

Headword:

Relevant legal provisions:
EPC 1973 Art. 54(1)

Keyword:
Novelty - all requests (no)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 1117/15 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 14 June 2019

Appellant: (Applicant)	Teledyne e2v (UK) Limited 106 Waterhouse Lane Chelmsford Essex CM1 2QU (GB)
Representative:	Loveless, Ian Mark Reddie & Grose LLP The White Chapel Building 10 Whitechapel High Street London E1 8QS (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 24 November 2014 refusing European patent application No. 03727717.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Eliasson
Members:	M. Papastefanou
	T. Bokor

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division refusing the European patent application No. 03 727717.5 (published as WO 03/103130 A2) on the grounds that the subject-matter of claim 1 both of the Main and the Auxiliary requests then on file lacked novelty (Article 54(1) EPC).

II. The appellant-applicant (hereafter "appellant") requested that the decision under appeal be set aside and that a patent be granted on the basis of the Main request or one of the First to Fourth Auxiliary requests, all filed with the statement of the grounds of appeal.

III. Reference is made to the following documents:
D1: JP H5 266816 A;
D2: US 2,766,403.

IV. Claim 1 of the **Main request** has the following wording:

A magnetron of the type having a cathode and a surrounding anode, and a plurality of cavities defined by anode vanes comprising at least a first ring strap (32) arranged generally around the cathode and in electrical contact with alternate ones of the vanes, characterised in that the first ring strap (32) has one or more protruding regions (34-40) which protrude:

- *in a radial direction between the cathode and anode at one or more positions so as to be nearer a second strap so as to increase the capacitance between the first ring strap and a second strap (31); or*

- *between the first strap and anode vanes to which the first strap is not connected so as to be nearer anode vanes,*
  thereby causing localised variations in capacitance around the first strap ring.

V. Claim 1 of the **First Auxiliary request** has the same wording as claim 1 of the Main request with the addition of the following feature at the end:

"wherein the variations in capacitance have a stabilising effect on the magnetron".

VI. Claim 1 of the **Second Auxiliary request** has the same wording as claim 1 of the Main request with the additional specification regarding the protruding regions (added part underlined by the board) that:

"*the first ring strap (32)has one or more protruding regions (34-40) which are arranged between the parts of the first ring strap that are attached to the anode veins* [sic] *and which protrude:"*

VII. Compared with claim 1 of the Main request, claim 1 of the **Third Auxiliary request** has the additional specification regarding the protruding regions of the first strap ring as in claim 1 of the Second Auxiliary request while the following feature has been added at the end:

"wherein the capacitance change to increase the capacitance has the same sense as the direction of protrusion."

VIII. Claim 1 of the **Fourth Auxiliary request** has the same wording as claim 1 of the Main request with the

additional specification, before the characterising part:

"wherein the first strap comprises an open ring".

IX. The decision under appeal is based on lack of novelty with respect to document D1. The appellant's arguments in the statement of grounds of appeal relate to the disclosure of D1.

The board in its preliminary opinion referred to document D2 (see point 8 of the board's communication dated 24 January 2019).

The appellant did not react to the board's preliminary opinion at all. It did not attend the oral proceedings before the board, which were held in its absence, and at the end of which the chairman of the board announced the decision.

Reasons for the Decision

1. The duly summoned appellant did not attend the oral proceedings before the board, as it had already announced in advance. According to Rule 71(2) EPC 1973, the proceedings could continue without the appellant. In accordance with Article 15(3) of the Rules of Procedure of the Boards of Appeal (RPBA), the board relied in its decision only on the appellant's written submissions. The board being in a position to decide the case at the conclusion of the oral proceedings (Articles 15(5) and (6) RPBA), the voluntary absence of the appellant was not a reason for delaying the decision (Article 15(3) RPBA).

2. The invention

2.1 The invention relates to a magnetron comprising a cylindrical cathode surrounded by a cylindrical anode in which a plurality of resonant cavities are formed by vanes (see Figures 1 and 4 of the published application). Each pair or vanes forms a resonant cavity.

2.2 One of the problems with such magnetrons is caused by significant cavity responses occurring at frequencies other than the frequency for which the magnetron is designed to operate (called "moding").

2.3 A known solution to this problem is the so-called "strapping", which consists in joining alternate anode vanes by a means of a closed ring. In this way, all cavities are maintained at the same electrical potential and all the vanes are locked into operation in the desired mode, called the π mode.

2.4 A known problem with strapping is that the current that circulates in the straps may generate an electromagnetic field which may interfere with the operation and performance of the magnetron. A known solution to this problem is to provide a break (gap) in the strap so that no flow of current through it can occur. This solution, however, creates further problems in that it increases the frequency separation of the modes of operation and may cause oscillation at undesired frequencies (see page 1, line 9 to page 2, line 24, Figures 2 and 3).

2.5 The claimed invention proposes a solution to this problem by providing protrusions projecting from one of the straps. These protrusions are either directed

towards the other strap (see Figure 4) or towards the anode vane (see Figure 7). In this way, the capacitance around the first strap (the one with the protrusions) is increased, increasing the stability of the magnetron in the desired mode, limiting oscillations at undesired frequencies and reducing the coupling of harmonics into the cathode structure (see page 2, line 31 to page 3, line 5 and Figure 5).

3. Main request

3.1 The Main request corresponds to the Auxiliary request underlying the decision under appeal.

3.2 In the impugned decision, the examining division was of the opinion that D1 disclosed a magnetron with all the features of claim 1 of the Auxiliary request (point 3 of the decision).

3.2.1 The appellant contested the interpretation of the disclosure of D1 by the examining division (see pages 2 to 4 of the statement of grounds of appeal).

3.2.2 The board agrees with the appellant in that the distance (and the capacitance) between the first and second ring straps (2a and 3a in Figure 1 of D1) is constant along the circumference of the magnetron.

3.2.3 Hence, the board, contrary to the examining division, is of the opinion that the features of claim 1 that "*the first ring strap has one or more protrusions which protrude in a radial direction between the cathode and anode at one or more positions so as to be nearer a second strap so as to increase the capacitance between the first ring strap and a second strap*" and "*thereby causing localised variations in capacitance around the*

first strap ring" are not disclosed in D1 and that the subject matter of claim 1 is therefore new over D1.

3.3 Document D2 was introduced into the appeal proceedings by the board with its communication dated 24 January 2019.

3.3.1 D2 relates to magnetrons of the same type as the one described in the application (see Figure 1 of D2). The magnetron (10) in D2 comprises a cathode (11) surrounded by an anode block (12) including a plurality of anode vanes (14a, 14b, 14c etc.). The magnetron comprises further two annular straps 15 and 16 arranged concentrically between the upper faces of the anode vanes 14. One strap (15) is attached to alternate vanes 14a, 14c, 14e etc. and the other strap (16) to those vanes to which the first strap is not attached (see column 2, line 57 to column 3, line 4).

3.3.2 As it can be seen in Figure 2, the two straps have protrusions, which modify the capacitance around the straps in order to modify the resonant frequency and thereby to improve the performance of the magnetron (see column 4, lines 55 to 64).

3.4 D2 discloses the second alternative of claim 1 of the Main request, according to which the (first) strap ring has one or more protruding regions which protrude between the first strap and the anode vanes to which the first strap is not connected (see Figure 2: strap ring 15 is connected to vanes 14e and 14g and the protrusion is over vane 14f, to which the strap ring is not connected) so as to be to the nearer anode vanes, thereby causing localised variations in the capacitance of the first strap ring.

3.5 Since D2 discloses all the features of claim 1 of the Main request, the board concludes that the subject-matter of claim 1 of the Main request is not new in the sense of Article 54(1) EPC 1973.

4. First Auxiliary request

4.1 Compared to claim 1 of the Main request, claim 1 of the First Auxiliary request comprises the additional feature that the variations in capacitance have a stabilising effect on the magnetron.

4.2 According to the board, this feature refers to the technical effect obtained by the other technical features of the claim. Since all the other features of the claim are disclosed in D2, the same technical effect is also obtained in the magnetron of D2.

Moreover in D2 it is also indicated that stabilisation of the magnetron is aimed at by the introduced variations in capacitance *"In order to eliminate the ...difficulty inherent to unequal loading..."* (see column 4, lines 23-24).

4.3 Hence, the subject-matter of claim 1 of the First Auxiliary request is not new, either.

5. Second Auxiliary request

5.1 In addition to the features of claim 1 of the Main request, claim 1 of the Second Auxiliary request additionally specifies that the protrusions are arranged between the parts of the first string strap that are attached to the anode vanes (in the claim it is written "veins", but the board considers this an obvious typing error in the context of the

application).

5.2 As explained previously (see point 3.4 above) this feature is disclosed in D2 (see Figure 2).

5.3 The subject-matter of claim 1 of the Second Auxiliary request is, hence, not new, either.

6. Third Auxiliary request

6.1 Compared to claim 1 of the Second Auxiliary request, claim 1 of the Third Auxiliary request additionally specifies that the capacitance change to increase the capacitance has the same sense as the direction of the protrusion.

6.2 As it is explained in the description of the present application (first lines on page 9 of the published application), the capacitance increases at the protruding portions, which protrude so as to be nearer either another strap or anode vane.

6.3 According to the board's opinion, this feature merely reflects the physical laws governing capacitance between two conductive plates. It is well known that the capacitance between two plates is inversely proportional to the distance between them. Hence, when the distance between the plates decreases (with a region of one plate protruding towards the other plate for example) the capacitance between the plates will increase.

6.4 The board considers, therefore, that this feature is implicitly disclosed in D2, since the first strap ring comprises portions protruding towards an anode vane.

6.5 Consequently, the subject-matter of claim 1 of the Third Auxiliary lacks novelty as well.

7. Fourth Auxiliary request

7.1 Compared to the claim 1 of the Main request, claim 1 of the Fourth Auxiliary additionally specifies that the first strap comprises an open ring.

7.2 Independently of the doubts raised by the board regarding the admission of this request into the proceedings (see points 7.1 to 7.5 of the board's communication dated 24 January 2019), it is noted that, according to D2, the straps of the magnetron do not have to be solid rings, but they can consist of any number of separate straps, i.e. they can include open rings in the sense of the application (see column 4, lines 29 to 39).

7.3 This feature is thus disclosed in D2 and the subject-matter of claim 1 of the Fourth Auxiliary request is not new, either.

8. Since none of the requests on file fulfils the requirements of Article 52(1) EPC because of lack of novelty (Article 54(1) EPC 1973), the appeal must fail.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero G. Eliasson

Decision electronically authenticated