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File Number: T 552/89 - 3.4.1

Application No.: 83 305 775.5

Publication No.: 0 106 589

Title of invention: Method of cold cathode replenishment in electron beam
apparatus and replenishable cold cathode assembly

Classification: H01J 37/06

D E C I S I O N
of 27 August 1991

Applicant: Tetra Pak Finance & Trading S.A.

Headword:

EPC Article 56

Keyword: "Inventive step (No)";
"Permissible combination of documents"

Headnote



Case Number : T 552/89 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 27 August 1991

Appellant : Tetra Pak Finance & Trading S.A.
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Decision under appeal : Decision of Examining Division of the European
Patent Office dated 10 March 1989 refusing
European patent application No. 83 305 775.5
pursuant to Article 97(1) EPC.

Composition of the Board :

Chairman : G.D. Paterson
Members : R.K. Shukla
H.J. Reich

Summary of Facts and Submissions

- I. European patent application No. 83 305 775.5 (publication No. 106 589) was refused by a decision of the Examining Division.
- II. The reason given for the refusal was that the subject-matter of the application did not involve an inventive step having regard to the prior art disclosed in US-A-3 864 572 (D2) and the routine competence of a skilled person.
- III. The Applicant lodged an appeal. In his written statement of the grounds of appeal, the Appellant effectively argued that the Examining division had failed to show that the difference between the invention as claimed and the only prior art document cited was known in the art, and had merely alleged that this difference was within the purview of the notionally skilled person. In one of its communications the Board expressed its provisional opinion that the subject-matter of claim 1 as amended appeared to lack an inventive step having regard to the disclosures in document D2 and the prior art documents set out below, which had been cited in the European Search Report.

US-A-3 925 670 (D3)

FR-A-2 105 407 (D4)

The Appellant submitted, both in his letter dated 17 April 1991 and during the oral proceedings that the fact that the Board had to resort to a complex mosaicing of three documents to arrive at the claimed subject-matter indicated that the invention was non-obvious.

- IV. During the oral proceedings, the Appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents:

Claims : 1 to 3 as filed on 20 April 1991;
and 4 to 6 as filed on 2 July 1990;

Description : pages 6,7,9, and 11 to 13 as originally
filed;
pages 1,2,5,8 and 10 as filed on
20 January 1990;
pages 4 and 14 as filed on 2 July 1990;
and
page 3 as filed on 14 August 1990
and amended further as per request by
telephone on 17 October 1990;

Drawings : Figures 1 to 7 as filed.

V. The only independent claim 1 reads as follows:

1. Apparatus for generating an electron beam comprising an evacuated housing, a cathode structure extending longitudinally in said housing, and anode means extending longitudinally of said housing and spaced from said cathode structure, wherein said cathode structure has a plurality of substantially parallel cathode rods (1, 1' 10, 10') spaced along the length of said cathode structure with the length of the rods transverse to said cathode structure, characterised in that the apparatus further comprises roller means (SH, S, I, R, D, G) for advancing said rods toward said anode (W) in response to a control signal to provide replacement of eroded cathode material, said roller means including a series of roller pairs (R) between which respectively each of said rods (1, 1') extend and are held, and monitoring means (M) for monitoring variations in electron beam performance caused by erosion of the cathode material to produce said control signal,

whereby the electron beam performance may be maintained substantially constant.

- VI. At the conclusion of the oral proceedings, the Board announced its decision to dismiss the appeal.

Reasons for the decision

1. Allowability of Amendments

The question of allowability of the amendments pursuant to Article 123(2) need not be discussed in detail here, since the application is to be refused under Articles 52(1) and 56 EPC for the reasons given below. It suffices to mention that the application documents as amended comply with the requirements of Article 123(2) EPC.

2. Inventive step

The only issue to be examined in the present appeal is the question of inventive step.

- 2.1 The present application relates to an electron beam apparatus comprising an elongate cathode structure having a series of roller pairs between which a plurality of parallel cathode rods are held. During the operation, the tips of the cathode rods erode due to evaporation, and the cathode rods need to be advanced incrementally to compensate for the eroded material so that the electron beam performance along the length of the cathode structure is maintained substantially constant. To this end, the electron beam performance is monitored, and when a predetermined variation in the electron beam performance is detected, a control signal is produced, which in turn causes the rollers to advance the cathode rods.

- 2.2 When assessing inventive step, it is of course not permissible to combine the teachings of different documents within the state of the art in order to establish obviousness of a claimed invention, unless it would have been obvious at the filing date for the skilled person to do that. In accordance with the jurisprudence of the Boards of Appeal, when the objective problem established having regard to the closest prior art as disclosed in a primary document is formed of individual problems, then the skilled person can be expected to take account of solutions to the individual problems proposed in different secondary documents in the same or neighbouring technical fields. Thus the teaching of secondary documents may be combined with the disclosure of the closest prior art, if such secondary documents provide solutions to specific individual problems forming parts of the objective problem in progressing from the closest prior art, in particular when such individual solutions are merely aggregated together in the claimed invention.
- 2.3 In the Board's opinion, contrary to the submission by the Appellant, the prior art coming closest to the claimed invention is disclosed in document D3, since the electron beam apparatus described in this document is structurally more similar to the electron beam apparatus according to the invention than those disclosed in the remaining cited prior art documents. The apparatus of document D3 comprises an elongate cathode blade (46) extending longitudinally in an evacuated housing (16), an electron permeable anode window (36) extending longitudinally of said housing and spaced from the cathode, and a push rod (53) slidably mounted in a mounting (54) whereby the extent of projection of the cathode blade from a cathode housing (65) is controlled by sliding movement of the push rod so as to compensate for erosion of cathode material (column 3, lines

39 to 56; column 4, line 55 to column 5, line 61; figures 1 to 3). As disclosed in column 8, lines 17 to 25 of the description, the single cathode blade (46) may be replaced by steel needles whereby the latter are necessarily arranged in parallel in a row to provide an elongate electron beam similar to the one produced by the cathode blade. Also in the apparatus disclosed, not only current density and energy distribution of the electron beam can be measured, but these are dependent, inter alia, on the cathode projection. In the Board's view, a skilled person is able to derive from document D3, column 5, lines 14 to 24, the teaching that in order to maintain the electron beam performance constant, the cathode to anode distance should be maintained constant. The fact that any variation in electron beam performance due to cathode erosion should be compensated by advancing the cathode needles simultaneously is self-evident to a skilled person. It follows implicitly from the above that the above measurements are at least carried out from time to time so that the apparatus is provided with means for monitoring variations in the electron beam performance.

- 2.4 The subject-matter of claim 1 of the application in suit is therefore distinguished from the above prior art in that (i) the monitoring means produce a control signal when a variation in electron beam performance is detected, (ii) the cathode rods extend and are held between a series of roller pairs and (iii) the cathode rods are advanced by the action of the latter in response to the control signal to compensate for the erosion of the cathode rods.
- 2.5 Referring to the cathode assembly of document D3, the elongate cathode (46) in the form of an elongate strip is mounted on a cylindrical replaceable cathode holder (50), which in turn is mounted on an inner sleeve (70). Although

the position of the cathode with respect to the anode (36) is adjustable by sliding movement of the push rod (53), the cathode holder requires replacement from time to time (column 5, lines 3 to 24). Also for the adjustment of overall positioning of the cathode in the housing, adjusting sleeves (62) of different lengths are required (column 5, lines 32 to 36, 54 to 62).

In the apparatus as claimed in claim 1 on the other hand, the parallel cathode rods extend between a series of roller pairs so that relatively long cathode rods extending behind the roller pairs can be used. The cathode rods are also held between the roller pairs and are advanced by the actuation of the latter. Thus in the present invention not only the cathode assembly including the advancing arrangement is simplified in relation to the one known from D3, but automatic replenishment of the cathode over a relatively long period of time is possible.

In view of the above, the objective problem, as correctly stated in the application (see in particular page 2, lines 10 to 22), underlying the present invention can be seen as providing in the known electron beam generating apparatus (a) automatic replenishment of the cathode material and (b) a simplified or modified cathode structure which enables automatic replenishment of the cathode material over a relatively long period of time thereby reducing the number of shut downs of the apparatus. The objective problem confronting the skilled person is thus formed of individual problems (a) and (b).

- 2.6 In documents D2 and D4, both relating to an electron beam apparatus, the aspects (a) and (b), respectively, of the above problem are dealt with. Also the normal activities of one skilled in the art include, inter alia, improvements or

simplification in the known cathode structures (aspect (b) of the problem). In the Board's view, therefore, no contribution to inventive step can be seen in the formulation of the above problem.

2.7 In document D2 there is described an electron beam apparatus which is provided with monitoring means for detecting variation in the performance of the electron beam and for producing a control signal in response to such a variation (column 3, lines 11 to 53; and figure 2) so that a cathode wire (2) is advanced automatically in response to the control signal to replace the eroded cathode material. To a skilled person, in the Board's view, it was therefore obvious to provide in the apparatus of D3 monitoring means which also produced a control signal as set out in the claim with a view to replenishing the eroded cathode material automatically.

2.8 Also having regard to the aspect (b) of the problem, in the Board's view the skilled person would realise that the mechanism for advancing the cathode involving the use of spring operated clamping jaws (50,51; 59,60; figure 3), disclosed in D2 is complicated and therefore would take advantage of the teaching of document D4 wherein a cathode wire for producing an electron beam extends, and is held, between a pair of rollers (without a reference numeral in Figure 4) which are operated by a servo-motor (11) to advance the cathode wire in order to compensate for the eroded cathode material (page 4, lines 11 to 15). It also follows from the statement on page 4, lines 15 and 16 of D4 that, depending upon the length of the cathode wire employed, the described cathode structure employing rollers enables cathode replenishment over a relatively long period of time, so that there is a clear incentive in this document for the skilled person to use the disclosed

cathode structure. Although in this known arrangement only one pair of rollers for a single cathode wire is used, when a plurality of parallel cathode rods are to be advanced as in the apparatus of D3, in the Board's view the use of a series of roller pairs would be regarded by the skilled person as an obvious alternative.

- 2.9 For the foregoing reasons, in the Board's judgement the subject-matter of claim 1 does not involve an inventive step within the terms of Article 56 EPC and, therefore, does not comply with the requirement of Article 52(1) EPC.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar

The Chairman

M. Beer

G.D. Paterson