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Aktenzeichen / Case Number / N° du recours : T 177/85 - 3.2.1

Anmeldenummer / Filing No / N° de la demande : 81 303033.5

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Bezeichnung der Erfindung: Fluid drop recording apparatus

Title of invention:

Titre de l'invention :

Klassifikation / Classification / Classement : B 41 J3/04, G01D 15/18

### ENTSCHEIDUNG / DECISION

vom / of / du 25 April 1988

Anmelder / Applicant / Demandeur : XEROX CORPORATION

Patentinhaber / Proprietor of the patent /  
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPO / EPC / CBE Art. 56 EPC

Kennwort / Keyword / Mot clé : Inventive step (yes)

Leitsatz / Headnote / Sommaire



Case Number : T 177/85 - 3.2.1

**DECISION**  
of the Technical Board of Appeal  
of 25 April 1988

**Appellant :** XEROX CORPORATION  
Xerox Square  
Rochester  
New York 14644  
USA

**Representative :** Frain, Timothy John  
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**Decision under appeal :** Decision of Examining Division 086  
of the European Patent Office  
dated 21.02.85 refusing European  
patent application No. 81 303033.5  
pursuant to Article 97(1) EPC

**Composition of the Board :**

**Chairman :** P.E.M. Delbecque  
**Members :** M.H.M. Liscourt  
G.D. Paterson

### Summary of facts and submissions

I. The European patent application No. 81 303 033.5 received on 2 July 1981 and published on 6 January 1982 under No. 0 043295 and claiming priority of 2 July 1980 from a prior application in the United States, was refused by a decision of the Examining division of the European Patent Office dated 21 February 1985.

The reason given for the refusal was that in view of the state of the art disclosed in US-A- 3 786 517, US-A-4 035 811 and US-A-3 798 656, the subject-matter of claim 1 as it stood at the time that the application was refused did not involve an inventive step (Article 52(1) in conjunction with Article 56 EPC) and was therefore not allowable.

II. On 12 March 1985, the Appellant lodged an appeal against the decision to refuse the application, at the same time paying the fee for appeal, and his written statement of grounds was received on 24 June 1985, in which a new Claim 1 was proposed. In reply to a communication issued by the Board pursuant to Article 110(2) EPC in which i.a. an objection based on Article 123(2) EPC was communicated, the Appellant filed an amended version of pages 7 and 8 of the description and of claims 1 to 5, which was received on 30 July 1987. The main claim reads as follows and is accompanied by 8 sub-claims numbered 2 to 9 :

"Ink drop recording apparatus including means (1) for generating a plurality of ink jets (2) which are directed towards a record surface (27) and which break up into streams of ink drops (4), means(14) for selectively charging drops in each stream, and alternating deflection (20, 22) and gutter (19, 21) electrodes spaced apart along the line of streams so that each electrode is positioned between two drop streams, with the electric field between each pair of deflection and gutter electrodes being effective to deflect all those intervening charged drops which are intended to hit the respective gutter electrode and thus fail to reach

the record surface, in which each gutter electrode has two major upright impact surfaces (35) each contiguous with one of two upright end surfaces (43) which are curved towards each other and around and down which the liquid from an impacting ink drop will flow to a collection port (48) common to both end surfaces and bridging the space between them so as to receive all the liquid from ink drops impacting both impact surfaces from the respective two streams."

III. The appellant requests that the decision under appeal be set aside and that the patent be granted on the basis of the documents at present on file.

#### Reasons for the decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is admissible.
2. The main claim now contains all the features which were present in original claim 1, and there is no longer any objection according to Article 123(2) EPC.
3. In relation to novelty and inventive step the following is observed:
  - 3.1 Document US-A-3 786 517 (which represents the nearest state of the art) describes an ink drop recording apparatus (see figure 3) which includes means (70, 72, 74) for generating a plurality of ink jets (76) which are directed towards a record surfaces (90) and which break up into streams of ink drops (82), means for selectively charging drops in each stream and alternating deflection electrodes (71, 73) spaced apart along the line of streams so that each electrode is positioned between two drop streams, with the electric field between each pair of deflection electrodes being

effective to deflect all those intervening charged drops which are intended to hit the respective gutter (56) and thus fail to reach the record surface, in which each electrode has two major surfaces.

3.2 The apparatus according to claim 1 differs from this state of the art by the following features :

- every second electrode fullfills the function of a gutter,
- in each gutter-electrode the two major surfaces are impact surfaces, each contiguous with one of two upright end surfaces which are curved towards each other, and around and down which the liquid from an impacting ink drop will flow to a collection port common to both end surfaces and bridging the space between them, so as to receive all the ink from drops impacting both impact surfaces from the respective two streams.

3.3 Because of these differences with the nearest state of the art, the apparatus which is the subject-matter of claim 1 is novel.

3.4 As regards inventive step, in the same field of fluid printing apparatus devices were known (such as the one described in document US-A-4 035 811 cited in the description of the present application), wherein fluid from impacted drops is depicted as flowing around a curved end surface integral with the catching surface which also fullfills the function of deflection electrode. In such devices all the ink nozzles are also disposed in rows, but the deflecting electrodes are disposed parallel to these rows and the record surface is moved along a path perpendicular to the length of said common electrodes. As a result of this, the room for positioning the gutter-electrodes is not limited.

- 3.5 It has to be considered if the man skilled in the art who knew these two documents would have been able to combine their teachings and to obtain the apparatus according to claim 1 of the present application without performing any inventive activity.
- 3.6 The question to be considered is whether a skilled person, confronted with the problem of improving the device described in US-A-3 786 517 by providing a more compact arrangement whereby the flight distance of the drops is reduced so as to diminish the aerodynamic effects acting on the drops as well as the charge interaction between them, would have been led to the solution of claim 1.
- Such a problem had already been raised in this technical field and cannot therefore be considered as inventive per se. Furthermore, document US-A-4 035 811 shows that compactness was a known aim (see column 2, line 60 to 65).
- 3.7 It is evident that the gutter electrode according to said document could not be directly adapted to the apparatus described in US-A-3 786 517, mainly because its dimensions and general structure make it insuitable for being interposed between two consecutive ink-drop streams. To do so it would have had to be noticed that as the ink migrates along the curved end of the gutter electrode surfaces as shown in figure 6 of US-A-4 035 811, two such electrode surfaces could be disposed back to back in order to build the gutter void between them and to obtain thereby a gutter electrode which could be interposed between two consecutive ink-drop streams. There is nothing to suggest to a skilled man that he should attempt to combine and rearrange structural features from these documents.

- 3.8 Furthermore, the fact that in the device according to the present invention the curved ends of the electrodes have their edge disposed vertically, enables the ink droplets to run around and down the end-surfaces and to tend to flow naturally into the collection port, so that sucking means applied to the gutter collection port is no longer absolutely necessary. Such a result was not foreseeable for the skilled person.
- 3.9 It is noticed that one of the documents cited in the search report, US-A-3 798 656, describes a printing device which is similar to the one described in US-A-3 786 517 but wherein the deflection electrodes fulfill the function of gutters composed of two surfaces between which a collection port is formed and to which all the drops are directed, only the drops intended to reach the recording surface being deviated by the electric field. The Board of Appeal is of the opinion that this document, also, if read together with the two other cited documents, did not give any hint to the man skilled in the art in the direction of the proposed solution, because the solution proposed in said document did not allow the distance between the nozzles and the record surface to be reduced and did not therefore lead the man skilled in the art in the direction of the invention.
- 3.10 For all these reasons, in the Board's judgement the subject-matter of claim 1 does involve an inventive step and is allowable pursuant to Article 52(1) and Article 56 EPC.
- 3.11 Dependent claims 2 to 9 cover more detailed embodiments of the apparatus according to claim 1. These claims are thus also allowable.

Order

For these reasons, it is decided that:

1. The Decision of the Examining Division dated 21 February 1985 is set aside.
2. The case is remitted to the first instance with the order to grant a European patent on the basis of the following documents:

Description, pages 1-6, 9 and 10 received on  
23 november 1983

pages 7 and 8 received on 30 July 1987, the  
words "single radius" being reintroduced on  
page 8, line 3 of the third paragraph;

Claims 1-5 received on 30 July 1987

6-9 received on 23 November 1983

Drawings sheet 1/2 and 2/2 as filed

The Registrar

The Chairman

S. Fabiani

P. Delbecque