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D E C I S I O N
of 11 September 2001

Case Number: T 0644/99 - 3.2.5

Application Number: 94109794.1

Publication Number: 0633142

IPC: B41M 5/00

Language of the proceedings: EN

Title of invention:
Process for alleviating bleed and improving color in printed elements

Patentee:
E.I. DU PONT DE NEMOURS AND COMPANY

Opponent:
Manfred Kirchhoff

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0644/99 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 11 September 2001

Appellant 01: (Proprietor of the patent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 20 April 1999 concerning maintenance of European patent No. 0 633 142 in amended form.**

Composition of the Board:

Chairman: A. Burkhart
Members: W. R. Zellhuber
S. C. Perryman

Summary of Facts and Submissions

I. Appellant 01 (patent proprietor) and appellant 02 (opponent) both lodged an appeal against the decision of the Opposition Division maintaining the European patent No. 0 633 142 in amended form.

II. Opposition was filed against the patent as a whole and based on Article 100(a) EPC (lack of inventive step). The Opposition Division held that the ground for opposition prejudiced the maintenance of the patent as granted having regard to the cited prior art and found that the patent as amended according to the Second Auxiliary Request filed on 2 February 1999 met the requirements of the EPC.

III. Oral proceedings were held before the Board of Appeal on 11 September 2001.

(i) Appellant 01 (hereinafter "the proprietor") requested that the decision under appeal be set aside and that

- the patent be maintained as main request as granted or

- on the basis of the set of claims 1 to 25 submitted as First Auxiliary Request on 11 August 2001, or

- the set of claims 1 to 24 filed as Second Auxiliary Request on 2 February 1999 or

- the set of claims 1 to 24 submitted as Third Auxiliary Request on 11 August 2001.

(ii) Appellant 02 (hereinafter "the opponent") requested that the decision under appeal be set aside and the patent be revoked.

IV. The independent claims 1 and 17 according to the patent in suit as granted read as follows:

"1. A process for creating a multicolor printed element having reduced color bleed comprising:

(a) providing at least one anionic ink and at least one cationic ink, both of said inks comprising an aqueous medium and a colorant, at least one of said inks containing approximately 0.1 to 30% by weight of a polymer having the same ionic character as said ink; and

(b) applying said anionic and cationic inks in contact with each other on said element."

"17. An inkset adapted for use together to minimize bleed, said ink set comprising:

(a) at least one anionic ink comprising an aqueous medium and a colorant, and

(b) at least one cationic ink comprising an aqueous medium and a colorant,

wherein at least one of said inks contains approximately 0.1 to 30% by weight of a polymer having the same ionic character as said ink."

V. With regard to the subject-matter of claims 1 and 17 of

the patent in suit as granted, in particular the following documents have been referred to in the appeal procedure:

D1: US-A 5 198 023;

D3: JP-A 62-38155 with English translation filed on 9 July 1997; and

D10: Journal of Imaging Science, Vol. 35, No. 3, May/June 1991, pages 179 to 181.

VI. The opponent essentially argued as follows:

Document D1, which represented the closest prior art, suggested a process for alleviating colour bleed in ink printing systems. That problem was solved by the use of an ink system comprising an anionic ink and a cationic ink and by adding a precipitating agent in the form of a multivalent salt to the cationic ink.

Document D3 disclosed a process for alleviating ink blurring and making water based ionic inks water resistant by applying a precipitating agent. It particularly taught that multivalent salts or ionic polymers were suitable precipitating agents.

Since the problem of ink bleeding, on the one hand, and the problem of water fastness or ink blurring, on the other, could not be completely separated from each other, and since document D3 suggested as a solution the use of a polymer as precipitating agent, it was obvious to use an ionic polymer as a precipitating agent instead of a multivalent salt in a process as described in document D1.

Furthermore, the prior art did not show the existence of any prejudice against the use of a polymer as a precipitating agent in an ink system. On the contrary, document D10 referred to ink systems comprising polymers and made mention of the effect of polymer precipitation.

The subject-matter of claims 1 and 17 of the patent in suit as granted therefore did not involve an inventive step.

VII. The proprietor essentially argued as follows:

Document D1 represented the closest prior art. Ink bleeding was defined as the migration of colorants into unwanted areas during the printing process. It occurred at the interface of different colour regions and on a millisecond time scale during the printing process. Document D1 suggested the use of an anionic black and a cationic yellow ink, the last one comprising a multivalent salt as precipitating agent which is effective in precipitating out the anionic dye of the adjacent ink.

The disadvantages of multivalent salts were the occurrence of corrosion and clogging of the ink jet nozzles. Therefore, there had been a high need to provide an alternative system.

The patent in suit suggested an ink system comprising at least one anionic ink and at least one cationic ink, wherein, at least one of these inks contained a polymer having the same ionic character as the ink. The polymer would cause the formation of a physical barrier at the interface of the two adjacent inks which would prevent

the inks from intermingling. Polymers had been found more efficient than multivalent salts.

Waterfastness, on the other hand, related to a different problem. It concerned the migration of a colorant as a result of the posterior application of water. In order to solve that problem, document D3 suggested that a printed image comprising, for example, a cationic dye could be made water resistant by applying an anionic compound, salt or polymer, capable of forming a water insoluble lake with cationic groups of the dye. The agent conferring water resistance was applied separately as a second solution on a printed sheet after ink-jet recording. The agent was thus not part of the ink system.

A person skilled in the art would not expect a polymer to be suitable for solving the problem of ink bleeding which occurred at the interface of two adjacent inks and during printing. Furthermore, he/she would not consider the application of a polymer to an ink system as disclosed in document D1, because of the generally known low migration speed of polymers in aqueous solutions compared to that of multivalent salts, and because of the adverse effects polymers might have in inks, such as viscosity increase, which was documented by document D10.

The subject-matter of claims 1 and 17 of the patent in suit as granted therefore involved an inventive step.

Reasons for the Decision

Inventive step

1. *The problem of "colour bleed"*

The general problem underlying the patent in suit is the problem of "colour bleed". It is described in the patent in suit as follows:

"... a common problem can arise when a multi-colored element is desired in which a printing liquid of one color is placed in abutting relationship to a printing liquid of another color. This problem is manifested in a mixing or "bleeding" of the two printing liquids at their interface, whereby the line of demarcation between the two printing liquids is obscured. Bleeding may cause undesired color formation at the interface and a concurrent loss of resolution, color separation, edge acuity and color purity in the image. The more contrasting the two adjacent liquids are in color (such as black and yellow), the more visual the bleed. Bleed is also particularly noticeable when the mixing of two inks produces a secondary color, such as when blue and yellow mix to produce green.

Bleed is a particular problem in ink jet printing because the relatively low viscosity inks used therein tend to spread and because ink jet printers have the capability of printing three or four primary colors in simultaneous (or near simultaneous) fashion", cf. page 2, lines 19 to 29 of the patent in suit.

2. *Closest prior art*

Document D1, which represents the closest prior art, relates to that problem, cf. column 1, lines 44 to 54 and, as a solution to that problem, suggests the use of an anionic black ink and a cationic yellow ink. This

ink formula is said to be very effective in reducing the most apparent black-to-yellow bleed without requiring the black ink to penetrate the paper or other medium quickly, cf. column 2, lines 14 to 16. Furthermore, document D1 makes mention that a precipitating agent had been found, which when added to yellow ink further reduces bleed. This precipitating agent comprises a multi-valent salt, cf. column 2, lines 64 to 66. The concentration of the precipitating agent ranges between 1 to 10 wt % of the ink composition. Within that range the precipitating agent had been found to be effective in precipitating out the anionic dyes invading the cationic ink.

3. *Problem - solution*

3.1 The problem underlying the patent in suit can be seen in providing an improved method for printing multi-coloured images that does not have the bleed problem described above, cf. page 3, lines 12 and 13 of the patent in suit.

The problem is solved by a process as defined in claim 1 and an inkset as defined in claim 17 of the patent in suit as granted, in particular by providing an ink system comprising an anionic ink and a cationic ink wherein at least one of the inks comprises a polymer having the same ionic character as the ink.

3.2 This solution is not suggested in the cited prior art.

3.2.1 Document D3 relates to the problem that ink jet recordings printed with conventionally known water-based inks mostly are not water-resistant so that the

recordings blur or disappear when splashed with water, or when stored at a high humidity for a long period of time, cf. page 3, second paragraph of the English translation of document D3.

In order to solve that problem, document D3 discloses a process wherein a water-based ink comprising an ionic dye, for example an anionic dye, is made water-resistant by combining it with a cationic substance such as a multivalent salt or a cationic polymer. The cationic substance is an agent conferring water resistance by forming a water-insoluble lake with anionic groups in the dye. The agent combines with a dye in the water-based ink by ionic or covalent bonds so as to make the dye insoluble in water, cf. page 4, second paragraph.

The cationic substance is applied to the recording sheets separately from the ink after ink jet recording, for example by spraying, cf. page 6, last paragraph.

In each of the examples 1 and 4, which relate to multi-colour ink-jet printing, all the inks have the same respective ionic character. They are either anionic (example 1) or cationic (example 4).

3.2.2 Document D3 thus relates to a problem which is different from that underlying the patent in suit, and suggests a different solution, namely the treatment of a printed surface with a precipitating agent, which is applied separately from the ink.

The situation is different in a system where ink bleed should be avoided, in particular, in a system according to document D1 and the patent in suit, wherein,

contrary to the teaching of document D3, an anionic ink together with a cationic ink are present. As mentioned above, ink bleed occurs at the interface between these inks and during printing. Consequently, the time scale and the reactions at the interface between the two inks play important roles.

The patent in suit explains the mechanism of preventing bleed by using a polymer in that the polymer flocculates or precipitates at the interface of the two adjacent inks, thus building up a barrier which prevents the inks from intermingling, cf. page 5, lines 27 to 29. In addition, the interaction of the polymer with the counter ion of the adjacent ink may cause a rise in viscosity at the interface, thus further preventing mixing and bleed of the inks.

However, a person skilled in the art would not have expected from the fact that a precipitating agent like a ionic polymer was suitable for conferring water resistance, when subsequently added as a separate component as in document D3, that it could also be added to the ink itself to prevent colour bleed within the short time scale necessary.

3.2.3 The diffusion coefficients of polymers in aqueous solutions are far below those of the ionic salts suggested in document D1, and document D10 makes mention of adverse effects of polymers in inks, like viscosity increase and of the danger of polymer precipitation. Thus, for those reasons, a skilled person would not assume that ionic polymers were suitable substitutes for the ionic salts of document D1 for the purpose of preventing colour bleed at the interface of two adjacent colours.

3.2.4 Further, in the ink system of the patent in suit, the ionic polymer is contained in one of the inks, whereas according to document D3, the ionic polymer is applied separately and the inks all have the same and, with regard to the polymer, inverse ionic character. Thus, the teaching of document D3 of making a multi-colour printed image water resistant is incompatible with the teaching of document D1, which relates to an ink system comprising at least an anionic and at least a cationic ink.

In the process according to the patent in suit, there is essentially no precipitation in the polymer-containing ink, because the polymer is of the same ionic character as the ink. Consequently, the process according to the patent in suit does not necessarily make the printed image water-resistant.

3.2.5 To sum up, a person skilled in the art had no reason to combine the teachings of documents D1 and D3, in particular he/she would not consider using an ionic polymer in an ink system as disclosed in document D1 in order to further prevent ink bleed at the interface between adjacent inks.

The prior art as disclosed in documents D1 and D3 thus does not suggest a process and an ink system as defined in the patent in suit in claim 1 and claim 17, respectively.

3.2.6 Document D10 neither relates to the problem of colour bleed nor hints at the solution suggested in the patent in suit. The other documents cited in the course of the appeal procedure are of less relevance than the documents cited above.

4. Therefore, the subject-matter of claim 1 and the subject-matter of claim 17 of the patent in suit as granted involve an inventive step with regard to the available prior art.

The subject matter of claims 2 to 16 and 18 to 25 which are appendant to either claim 1 or claim 2 similarly involves an inventive step.

Consequently, the auxiliary requests of the proprietor that the patent be maintained in amended form did not have to be considered.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar: The Chairman:

M. Dainese A. Burkhart