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D E C I S I O N
of 22 June 1994

Case Number: T 0369/92 - 3.3.1

Application Number: 87310574.6

Publication Number: 0274216

IPC: C09D 11/00

Language of the proceedings: EN

Title of invention:

Ink and ink-jet recording process employing the same

Applicant:

Canon Kabushiki Kaisha

Opponent:

-

Headword:

Ink/CANON

Relevant legal norms:

EPC Art. 56, 84

Keyword:

"Inventive step (yes)"

"Clarity (yes); use of functional parameters"

Decisions cited:

-

Catchword:

-



Case Number: T 0369/92 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 22 June 1994

Appellant:

Canon Kabushiki Kaisha
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Tokyo (JP)

Representative:

Beresford, Keith Denis Lewis
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Decision under appeal:

Decision of the Examining Division of the European Patent Office of 13 November 1991 with written reasons posted on 5 December 1991 refusing European patent application No. 87310574.6 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: A. Jahn
Members: P.P. Bracke
R. Teschemacher

Summary of Facts and Submissions

- I. European patent application No. 87 310 574.6 (publication No. 0 274 216) was filed on 1 December 1987.
- II. By a decision announced orally on 13 November 1991, with written reasons delivered on 5 December 1991, the Examining Division refused the application on the ground that the independent claims according to the main request (Claims 1 and 2 filed with letter of 26 February 1991 and Claims 3 to 21 filed with letter of 20 September 1990) and according to the auxiliary request (Claims 1 to 12 filed with letter of 5 November 1991) did not meet the requirement of inventive step according to Article 56 EPC in the light of:

D1: IBM Technical Disclosure Bulletin, Vol. 23, No. 4, September 1980, page 1387, New York, US;
W.T. Pimbley: "Leuco dye system for ink jet printing", and

D2: Patent Abstracts of Japan, Vol. 8, No. 145 (C-232)[1582], 6 July 1984, of JP-A-59 53 567.

The replacement of a water-soluble dye in the jet ink compositions of D2 by a solubilised vat or sulphur dye or a leuco salt thereof in order to combine the anti clogging effect of the antioxidant, known from D2, and the water fastness of the oxidised dyes, known from D1, was considered obvious. Additionally, it was argued that it was current practice to add an antioxidant or a reducing substance in order to protect the solubilised vat or sulphur dyes or their leuco salts from premature oxidation.

Furthermore, it was argued that the optimisation of the ratio of dye and antioxidant was self-evident for a skilled worker and that the comparative data, filed with letter of 5 November 1991 and showing that the amounts of dye and antioxidant specified in Claim 1 are critical values, could not be used for showing a surprising effect.

III. An appeal was filed against this decision on 4 February 1992 and the appeal fee was paid on the same date.

In the Statement of Grounds of appeal filed on 2 April 1992 the Appellant contested that the claimed jet ink compositions were obviously derivable from D1 and D2. He submitted that D1 should not be considered as an enabling disclosure and that there was nothing in D2 suggesting that adding an antioxidant to a jet ink composition containing a solubilised vat or sulphur dye or a leuco salt thereof could prevent nozzle clogging because the nature of the dye is different and the purpose of adding an antioxidant in D2 is to improve lightfastness, not to prevent nozzle clogging.

In addition, the Appellant criticised the Examining Division for relying on current practice without citing any document in support. However, the Appellant's own comprehensive search revealed only one document,

D5: R.C. Shah "Antioxidants in vat dyebaths", Textile Dyer and Printer, Vol. 5, No. 6, pages 107 to 110 (1972),

which supported his case.

The Appellant filed three sets of claims, specified as main request and auxiliary requests 1 and 2 and requested that the decision under appeal be set aside and a patent be granted on the basis of claims according to the main request or auxiliary request 1 or 2.

IV. As the result of the telephone conversation on 19 May 1994, wherein Appellant's approval of the text of the claims according to the main request was asked, the Appellant filed with letter received on 10 June 1994 Claims 1 to 13 and an adapted page 31 and he expressly approved the text of the specification.

The only independent claims according to the main request read as follows:

"1. An ink for ink-jet recording on a recording medium, said ink comprising a solubilized vat dye, a solubilised sulphur dye, a leuco salt of a vat dye, or a leuco salt of a sulphur dye, characterised in that the ink comprises:

- (a) water;
- (b) an organic solvent;
- (c) 0.1 to 15% by weight, based on the total weight of the ink, of the dye, said dye being in solution but being oxidizable to be water-insoluble; and
- (d) 0.1 to 10% by weight, based on the total weight of the ink, of an antioxidant which inhibits clogging of the ink feeding paths and nozzles of the printer but which does not inhibit change of the dye from its water-soluble to its water-insoluble form after the ink has been adhered onto the recording medium."

"8. An ink-jet recording process, comprising carrying out the recording by adhering ink on a recording medium, characterised in that said ink is as defined in any of Claims 1 to 7, and said recording medium has a recording face on which fibres are exposed."

Dependent Claims 2 to 7 and 9 to 13 define preferred subject-matter of the independent claims.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. *Amendments*

There are no objections under Article 123(2) EPC since the claims do not contain subject-matter which extends beyond the content of the application as filed.

In particular, Claim 1 is based on the Claims 1, 2, 3 and 4, combined with page 4, lines 18 to 20, page 5, lines 11 to 21, and page 6, lines 3 to 11; Claim 2 is based on page 13, lines 8 to 11; Claims 3 to 8 correspond to Claims 5 to 10; Claim 9 is based on page 15, line 19; and Claims 10 to 13 correspond to Claim 16 to 19.

3. *Clarity*

One of the essential features of the ink compositions claimed in Claim 1 is the presence of 0.1 to 10% by weight, based on the total weight of the ink, of an antioxidant, which is further defined by a functional

parameter, specifying that such antioxidant must meet two requirements: on the one hand, the antioxidant must inhibit clogging of the ink feeding paths and nozzles of the printer and, on the other hand, the antioxidant may not inhibit change of the dye from its water-soluble to its water-insoluble form after the ink has been adhered onto the recording medium.

The Board is unable to see how the antioxidants meeting both requirements could have been defined in a more precise way without unduly limiting the scope of the invention.

Not only are "antioxidants" a well-known group of organic compounds described, for example, in

D7: Ullmanns Encyklopädie der technischen Chemie, 4. neubearbeitete und erweiterte Auflage, Band 8, pages 19 to 45, Verlag Chemie GmbH (1974),

but it has also been specified in the description (page 5, lines 19 to 29, of the printed application) that three groups of antioxidants can be used for preparing the claimed inks, namely free radical chain terminators, peroxide decomposers and metal inactivators and a number of typical examples therefore have been cited.

Thus, the patent application provides sufficient guidance to select without undue difficulty the appropriate antioxidants falling within the terms of Claim 1.

Consequently, Claim 1 meets the requirement of clarity according to Article 84 EPC.

4. *Novelty*

After examination of the cited prior art, the Board has reached the conclusion that the claimed subject-matter according to the main request is novel. Since the Examining Division acknowledged the novelty of the claimed subject-matter, it is not necessary to give detailed reasons for this finding.

5. *Inventive step*

The issue which remains to be decided is that of inventive step.

The present application relates to ink compositions for ink-jet recording, which recordings have excellent fastness of every kind, particularly water resistance. They are based on a solubilised vat or sulphur dye or a leuco salt thereof.

6. The Examining Division considered D2 to be the closest state of the art. The Board does not endorse this approach, because D2 is concerned with ink compositions based on water-soluble dyes which are not oxidisable to water-insoluble dyes, and, due to their water-solubility after recording, are not comparable with the water-insoluble dyes of the present application.

Therefore, the Board considers D1 to be the closest prior art, because it is concerned with inks based on leuco or vat dyes having good waterproof and lightfast properties.

The Appellant suggested that D1 should not be considered as state of the art, because, in the absence of any example or other detailed instructions, this document fails to present an enabling disclosure. Although the

technical information provided in D1 is very scant, in the Board's judgment, it provides the skilled person with clear and reproducible instructions on how to use the soluble leuco form of vat dyes for ink jet printing and how to convert this form after printing into the insoluble dye-form, as in the present application. Certainly, a special paper containing an oxidising agent is therefore necessary.

However, according to the present application, the use of such special paper would be superfluous (see page 2, lines 48 to 53 of the printed application).

Additionally, the originally filed application contains the experimental proof that the dyes described in D1 do not have good storage stability and cause clogging of the nozzles during printing (see comparative Example 1 and Example 1 in Table 1). Consequently, starting from D1 the technical problem lies in the provision of dyes with good storage stability which could be used for printing on normal paper without the nozzles of the printer becoming clogged (see also page 2, lines 48 to 55 of the printed patent application).

This solution is essentially solved by the use of the antioxidants defined in Claim 1. The Board is satisfied that this technical problem has been plausibly solved.

7. Consequently, in assessing inventive step, the main question is whether it could be expected that by adding an antioxidant to an ink containing a solubilised vat or sulphur dye or a leuco salt thereof such advantageous properties could be achieved.

8. It is the Board's position that, starting from D1, a person skilled in the art looking for inks, which do not cause clogging of the feeding paths and nozzles of the printer, would not take the teaching of D2 into consideration.

It is the teaching of D2 in the form of its English translation, already available to the Examining Division, that the combined use of an antioxidant and a quencher in ink containing a conventional water-soluble non-oxidisable dye improves the light fastness of the ink, **not** that the clogging of nozzles may be inhibited by using an antioxidant. This clearly follows from the paragraph bridging pages 5 and 6, where it is said that an effect of improving light fastness is not obtained when the amount of antioxidant is too low, suggesting that the improvement of the light fastness is effected by the antioxidant. In the same paragraph it is also said that clogging of the nozzles results when the amount of antioxidant is too high; this passage certainly does not suggest that the presence of an antioxidant would prevent clogging on nozzles.

Furthermore, the requirement for avoiding precipitation in ink compositions containing oxidisable dyes are different from those in ink compositions containing conventional water soluble dyes, which are not sensitive to precipitation due to oxidation, as is confirmed by the data in Table 1 in D2, clearly showing that the presence of an antioxidant does not have any influence on the clogging on nozzles.

Consequently, the Board finds that Claim 1 is not made obvious by the teachings of D1 and D2.

9. The mere assertion by the Examining Division that it is current practice to add to a solubilised vat or sulphur dye or to their leuco form an antioxidant or a reducing substance to protect the dye from premature oxidation, without citing any document supporting this allegation is contrary to the principle that in proceedings before the EPO objections against patentability have to be based on verifiable facts.

It may be observed that the Examining Division did not differentiate between antioxidants and reducing substances. This cannot be accepted by the Board, because, while the term "reducing substance" embraces "any substance capable of bringing about the chemical change known as reduction" (definition from Chambers Science and Technology Dictionary (1984) page 986), the term "antioxidant" refers to a well defined group of organic compounds, as may be concluded from D7 (see the complete document and, especially, the first paragraph in the left-hand column on page 19).

Since the Examining Division did not differentiate between reducing substances, such as, dithionites, which are known reducing agents for converting vat or sulphur dyes to their leuco form, and antioxidants and since such differentiation is essential for assessing inventive step, it appears that the scope for which protection is sought was misinterpreted by the Examining Division.

10. Although this was the duty of the Examining Division, the Appellant has carried out an extensive search through Chemical Abstracts and through textbooks in order to verify whether the allegation of the Examining Division according to the current practice was correct. As a result of this search, the Appellant found D5 which relates to the stabilisation of oxidisable dyes by

antioxidants. D5 discloses that the addition of an antioxidant to an aqueous composition containing a vat dye solubilised by way of sodium hydrosulphite as reducing agent generally does not improve the stability and, even more, that with increasing concentration of the antioxidant the stability is decreased. Since the stability test in D5 is based upon the time required for noting the change in the colour of the bath and such change of colour is effected by the conversion of the dye from its water-soluble form into its water-insoluble form (precipitation of the dye), a skilled person would not deduce from this document that precipitation and, consequently, clogging on nozzles could be avoided by adding an antioxidant. Thus this document leads away from the invention.

11. Consequently, the Board holds that Claim 1 meets the requirements of the EPC. The same considerations apply to independent Claim 8, which relates to an ink-jet recording process using the ink according to Claim 1 because this subject-matter define the same invention as Claim 1 in a different patent category. The claims depending on Claims 1 and 8 relate to specific embodiments and are likewise allowable.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent in the following version:

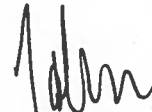
Description: Pages 1 to 3 and 6 to 30 as originally filed,
pages 4 and 5 filed with letter of
20 Spetember 1990,
page 31 filed with letter of 8 June 1994.

Claims: Nos. 1 to 13 filed with the letter of 8
June 1994.

The Registrar:


E. Gorgmaler

The Chairman:


A. Jahn