BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File Number: T 319/90 - 3.2.2

Application No.: 83 306 924.8

Publication No.: 0 109 295

Title of invention: Dye transfer sheets for heat-sensitive recording

Classification: B41M 5/26

D E C I S I O N
of 24 October 1991

Proprietor of the patent: MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

Opponent: Eastman Kodak Company

Headword:

EPC Article 56

Keyword: "Inventive step - denied" -
"One document contains separate state of the art"

Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 319/90 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 24 October 1991

Appellant : (Opponent)
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Decision under appeal :
Decision of Opposition Division 2.3.04.086 of the European Patent Office of 18 December 1989, dispatched on 20 February 1990 rejecting the opposition filed against European patent No. 0 109 295 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : W.D. Weiss
Members : M.G. Noel
J.H. van Moer

Summary of Facts and Submissions

I. European patent No. 0 109 295 was granted on 20 January 1988 on the basis of European patent application No. 83 306 924.8, filed on 11 November 1983.

II. An opposition was filed against this patent on the grounds of lack of novelty and inventive step in the light of two documents of which

US-A-4 123 580 (Franer)

is of a particular relevance.

III. At the end of an oral proceedings on 18 December 1989 the Opposition Division decided to reject the opposition. The written grounds of this decision were posted on 20 February 1990.

IV. On 12 April 1990 the Appellant (Opponent) filed an appeal against this decision and paid the appeal fee simultaneously. The Statement of Grounds was filed on 19 June 1990 by a letter dated 18 June 1990.

The Appellant, relying on newly filed experimental evidence (Exhibit E) in addition to the one already filed during the opposition stage with a letter dated 4 October 1988 (Appendix), inter alia, insisted on his assertion that the patented subject-matter was not novel with respect to the Franer document, because an "alleged distinction over Franer was meaningless since it had nothing to do with the claims". Moreover, he denied that the claimed ranges of parameters constituted any optimisation. Therefore, in the event that any difference were to be found between the disclosure of the Franer

document and the patent in suit, such difference would not involve an inventive step.

With a letter dated 28 May 1991 the Appellant (submitted) EP-A-0 124 616 (Sony) as a further document, claiming this to be a state of the art according to Article 54(3) EPC also affecting the novelty of the subject-matter of the patent in suit. With letter of 24 September 1991 he filed the results of new comparative tests (Exhibits I to J) performed with respect to this document.

V. In the oral proceedings held on 24 October 1991 the Respondent submitted a first set of Claims 1 to 6 as a main request and a second set of Claims 1 to 5 as an auxiliary request.

Claim 1 according to the main request reads as follows:

"1. A dye transfer sheet (S) for heat-sensitive recording comprising a substrate (1) and a thin layer (2) of at least one dye which sublimes at below 100°C formed on one side of the substrate (1) and containing non-sublimable particles (3) uniformly distributed there through and optionally a binder, characterised in that said non-sublimable particles (3) have an average size of 1 to 100 μm and a mechanical strength such that they are not broken under pressure exerted thereon upon intimate contact of the dye transfer sheet with an image-receiving sheet during recording, are used in an amount of 10^{-2} to 10^{4} parts by volume per 100 parts by volume of said at least one dye and are distributed in such a way that adjacent particles are not more than 20 μm apart as measured between cross-sections thereof at the surface level of said thin layer (2) and form irregularities on the surface thereof which have a height (h) from the

surface level of the layer (2) of from 1 to 100 μm, the substrate when no binder is present being formed of or having thereon a prime coating of a soluble resin of melting point higher than 100°C and the binder when present having a high melting or softening point such that it does not melt or transfer to an image-receiving sheet by application of heat upon recording."

Claim 1 according to the auxiliary request reads as follows:

"1. Use of a dye transfer sheet (S) in the preparation of a visible image on an image-receiving sheet (4) by heat-sensitive recording wherein the dye-transfer sheet (S) comprises a substrate (1) and a thin layer (2) of at least one dye which sublimes at below 100°C formed on one side of the substrate (1) and containing non-sublimable particles (3) uniformly distributed there through and optionally a binder, characterised in that said non-sublimable particles (3) have an average size of 1 to 100 μm and a mechanical strength such that they are not broken under pressure exerted thereon upon intimate contact of the dye transfer sheet with an image-receiving sheet during recording, are used in an amount of 10^{-2} to 10^{4} parts by volume per 100 parts by volume of said at least one dye and are distributed in such a way that adjacent particles are not more than 20 μm apart as measured between cross-sections thereof at the surface level of said thin layer (2) and form irregularities on the surface thereof which have a height (h) from the surface level of the layer (2) of from 1 to 100 μm, the substrate when no binder is present being formed of or having thereon a prime coating of a soluble resin of melting point higher than 100°C and the binder when present having a high melting or softening point such that it does not melt nor transfer to an image-receiving sheet

by application of heat upon recording, the non-sublimable particles (3) serving as a spacer between the dye-transfer sheet (S) and the image-receiving sheet (4)."

VI. The Appellant maintained his objections with respect to lack of novelty and inventive step on the basis of the Franer document against both Claims 1 according to the main and the auxiliary requests.

Referring to the results of the comparative tests presented with his Grounds of Appeal, he argued that, by executing the recipes and manufacturing rules given in Franer, products were obtained which perfectly complied with the features of Claim 1 according to the main request or the auxiliary request, respectively. In particular, the characterisation of the binder as "having a high melting and softening point such that it does not melt or transfer to an image-receiving sheet by application of heat upon recording" did not make a difference to the examples described in the Franer document, because the rubber binder disclosed therein had also met this feature. However, if this feature were to be considered as a distinguishing one, the subject-matter of the independent claims would appear to be obvious when considering the actual teaching of this document in the light of the prior art acknowledged in the same document.

VII. The Respondent drew attention to the fact that the features referring to the distance of adjacent particles and to the height from the surface level of the layer (2), respectively, were not explicitly disclosed in the Franer document. Moreover, he contested that the comparative tests submitted by letter of 18 June 1990 (Exhibit E) had been performed strictly following the rules given in the Franer document, because Franer did not describe the use of a additional solvent when applying the dye layer

composition. Moreover, in some examples (i.e. 11.5% Min-U-Sil) the rubber content of 69.1% did not fall into the range of 20 to 50% mentioned in the table at the end of column 3 of Franer. He contended that the use of a solvent and its subsequent evaporation might influence the settling and agglomeration of the particles in the layer during the phase of its shrinkage to the final thickness.

From the statement in the description of the patent in suit that the transfer sheet was to be used in high speed recording, it had to be concluded that it was never intended to cool the sheets down before the transfer sheet was stripped from the receptor sheet. Therefore the binder must neither melt nor be transferred to the image receiving sheet at recording temperatures.

VIII. The Respondent finally submitted the following requests:

- The appeal should be dismissed.

- The patent should be maintained as amended on the basis of Claims 1 to 6 (main request) or on the basis of Claims 1 to 5 (supplementary request), both submitted at the oral proceedings on 24 October 1991.

- Should the Board intend to consider the originally filed documents of the European patent application No. 0 124 616 as a relevant state of the art with respect to the patent in suit, the case should be remitted to the first instance for further prosecution and 50% of the costs incurred since 28 May 1991 should be awarded to the Respondent.

IX. The Appellant maintained his request that the decision under appeal be set aside and that the European patent be revoked.

Reasons for the Decision

1. The appeal is admissible.

2. Admissibility under Article 123 EPC

The Appellant has not objected to the amended claims according to the main request and to the supplementary request under Article 123(2) and (3) EPC. The Board recognises admissibility in these respects.

3. Closest State of the Art under Article 54(2) EPC

3.1 US-A-4 123 580 (Franer) has been acknowledged in the description of the patent in suit as the closest state of the art. The parties have agreed that none of the other documents cited during the appeal and opposition proceedings (as state of the art according to Article 54(2) EPC) is closer to the subject-matter of the patent in suit than this document, and the Board takes the same position.

The Franer document contains two parts, the description of the "Background of the Invention" (column 1, lines 4 to 30) and the contribution of Franer itself to the prior art which is described thereafter. These two parts of this document have to be considered as if they were separate state of the art.

3.2 The second of these two parts is the one which the Board considers to stand closest to the subject-matter of either Claims 1 (main or auxiliary request, respectively).

In this part, the Franer document undisputedly discloses a dye transfer sheet for heat sensitive recording comprising a substrate and a thin layer of at least one dye which sublimes at below 100°C (see in particular column 2, last paragraph) formed on one side of the substrate and containing non-sublimable particles uniformly distributed there through, and a binder.

The non-sublimable particles may be "quartz particles having an average size no greater than about 35 microns (preferably less than 10 microns)" (column 2, lines 54 to 59). Consequently, these non-sublimable particles meet the condition for an average size of 1 to 100 μm and for a mechanical strength such that they are not broken under pressure exerted on them, upon intimate contact of the dye transfer sheet with an image receiving sheet during recording.

According to the same document (the Table bridging columns 3 and 4) the dye coating contains dye in a percentage per weight which is at the same level as that of the particulate filler particles. Since the density of quartz does not differ from the densities of the dyes which are used in Franer as well as by the patent in suit by several orders of magnitude, the known filler content would lie well within the very broad range of "10^{-2} to 10^{4} parts per volume per 100 parts per volume of the at least one dye" specified in either Claims 1 in the requests.

The known transfer sheet is used in the preparation of a visible image on an image-receiving sheet (column 1, lines 31 to 40).

3.3 The Franer document does not explicitly mention values for the parameters referring to the distance of adjacent particles and to the height from the surface level of the layer of the irregularities formed by the particulate filler particles. The Appellant, however, has asserted that products which are produced strictly following the teaching given in Franer will automatically provide these features and has submitted the results of comparative tests (grounds of opposition, Exhibit E) in support for this assertion.

There is no doubt that at least the micrographs of the said Exhibit E which refer to "Franer: Min-U-Sil Examples", i.e. 10 μm - 60% particles and 5 μm - 60% particles, display particles which are distributed in such a way that adjacent particles are not more than 20 μm apart, as measured between cross-sections thereof, and which form irregularities which have a height of 1 to 100 μm from the surface level of the layer.

The Respondent did not dispute the result of these two examples. He objected, however, that the coating composition had been further diluted in these tests before the execution of the coating step to obtain a coatable viscosity (Exhibit E, page 2, second paragraph) such additional measure might have influenced the distribution and settling of the particles in the final layer.

The Board cannot follow this objection. Franer leaves, as usual, the choice of the particular coating method to the discretion of the practitioner who wants to make use of his disclosure. It is only prescribed that the final coating after drying should form a uniform layer with a coating weight after drying of 2.95 lbs per ream (column 3, lines 29 to 32). The viscosity always depends on the particular coating apparatus which is used and is therefore understood by a skilled person to be open to

an adaptation in this respect. The population density of the filler particles is so high in the examples cited that the choice of another coating method could not possibly have led to another uniform layer which would not meet the requirements about the features relating to the height and the distance of irregularities mentioned above.

The analysis of the micrographs in Exhibit E, however, reveals that the parameters "distance of adjacent particles (dpi)" and "height of the irregularities (h)" are not exactly defined, because the dye layer does not form a straight surface between adjacent particles, as is suggested by the figures annexed to the patent in suit. Since a well defined level of reference and therefore a clear rule for their measurement is missing, the exact values of these parameters, when evaluating comparative tests is open to discretion to a certain extent.

The Board, therefore, is convinced that the teaching of Franer, when using quartz as a filler material in quantities of more than 35% up to 60%, results in transfer sheets which meet the features referring to (h) and (dpi) stated in the Claims 1 under consideration.

3.4 Both said Claims 1 claim protection for two equivalent alternative options. According to the first of these two options, no binder is present in the dye layer, but the substrate is formed or has thereon a prime coating of a soluble resin of a melting point higher than 100°C. According to the second option, a binder is present in the dye layer which binder has a high melting or softening point such that it does not melt or transfer to an image-receiving sheet by application of heat upon recording.

3.5 The second (main) part of the Franer document which forms the closest prior art exclusively refers to dye transfer

sheets, the dye containing layer, which in turn contains an obligatory binder. This binder is rubber-based and, in spite of an inherent tackiness of this binder at image-receiving temperatures, the transfer sheet is easily separable from the image-receiving sheet after cooling to room temperature (column 1, lines 44 to 65).

3.6 Claim 1 according to the auxiliary request of the patent in suit states the feature "the non-sublimable particles serving as spacer between the dye-transfer sheet and the image-receiving sheet". Interpreted in the light of Figure 3 and page 3, lines 3 to 6, of the patent, this feature does not mean that the non-sublimable particles prevent any contact between the image-receiving sheet and the dye-containing layer of the transfer sheet. Their recognisable function is that the part of the layer substance which covers the non-sublimable particles can avoid the pressure exerted on the sheets during recording and flow into the valleys between the particles where it remains unaffected by the pressure.

If interpreted in this way, the quartz particles in the Franer document exert the same function.

4. Novelty

Following the above analysis the subject-matter of Claim 1 according to either request differs from the closest state of the art by the features that the substrate

A. when no binder is present, is formed of a prime coating of a soluble resin having a melting point higher than 100°C, or has it thereupon,
or

B. **when binder is present**, has a high melting or softening point such that it does not melt nor transfer to an image-receiving sheet by application of heat upon recording.

The Respondent has always consistently pointed to the fact that the dye transfer sheet according to the patent in suit is to be used in **high speed recording** (EP-B-0 109 295, page 1, lines 4 and 21 to 22). This use implies that there is no time to cool the dye transfer and the image-receiving sheets down from recording temperature before they are separated from each other, but separation is done at still high temperatures.

The above stated alternative feature referring to the option of "when a binder is present", therefore, has to be interpreted that the binder does not melt nor transfer to the image-receiving sheet at temperatures in the order of the recording temperature.

Consequently, the subject-matter of Claim 1 (according two both requests) is novel.

This consideration disregards, for reasons explained hereinafter, the EP-A-0 124 616 which was cited as a state of the art according to Article 54(3) EPC.

5. Problem and solution

The dye transfer sheet which is disclosed in the Franer document cannot be used for high speed recording, because the sheets have to be cooled down to room temperature before stripping due to the tackiness of the rubber containing binder at recording temperatures.

The technical problem to be solved by the subject-matter of the patent in suit vis-à-vis the closest prior art consists in creating a dye transfer sheet which can be used for high speed recording.

Starting from the closest state of the art, this problem is solved by the differentiating features stated under point 4 above.

6. Inventive step

6.1 The main subject-matter of the Franer document which forms the closest state of the art with respect to the subject-matter of the patent in suit has to be seen in the light of the historical development from which it originated. This development is described in the first part of the Franer document with the title "Background of the invention" (point 3.1. above).

6.2 According to this background, binders are incorporated into the dye containing layer to improve the uniformity of the dye transfer and to avoid its removal by casual contact. However, in the presence of the binders, the temperature necessary to cause effective transfer of the dye is higher than desired, requiring operating at undesirable high temperatures. At these temperatures, many of the binder formulations are found to adhere unduly to the receptor sheets when heated in contact therewith. To avoid this sticking, inert particulate fillers with hard resin materials are incorporated into the dye containing layer. This particular filler inevitably acts as spacer between the dye containing layer and the receptor sheet. This space, however, brings about that lateral diffusion

of the dye is now possible at the interface with resultant blurring of the image outline.

6.3 The main subject-matter in the second part of the Franer document avoids this blurring by a combination of two measures:

- The rubber binder used softens and swells at recording temperatures thus closing the interspace between the dye containing layer of the transfer sheet and the receptor sheet, but it reduces its volume and looses its tackiness at low temperatures thus allowing separation of the sheets, when cooled to room temperature.

- Dyes are used which are heat-volatilisable at the relatively low temperature of about 70 to 100°C.

6.4 It is evident that this Franer solution may have delivered images of high quality as long as the low speed of conventional thermographic copiers allowed for the time required to cool the sheets to room temperature before their separation. This was, however, no longer acceptable as soon as modern high speed copying machines called for a separation at temperatures close to the recording temperatures.

The need for a higher copying speed necessarily also involves a desire to replace in the Franer solution the rubber binder by a binder which has "a high melting or softening point such that it does not melt or transfer to an image-receiving sheet at recording temperatures". Because Franer uses dyes which sublimate at temperatures lower than the dyes used there before, this condition is fulfilled by well known binder materials like polystyrene

and cellulose acetate. These had, however, proved to become tacky, when higher recording temperatures had to be used in connection with dyes which sublimated at temperatures higher than those used by Franer (EP-B-0 109 295, lines 12 to 16, and Franer, column 1, lines 15 to 18). Because the tendency of becoming tacky at the lower recording temperature is reduced, the space between the dye transfer sheet and the image-receiving sheet also can be diminished which automatically brings about a reduction of blurring.

6.5 The subject-matter of the binder containing option of Claims 1 according to both requests therefore, is the inevitable result of an obvious adaptation of the dye transfer sheet disclosed in Franer to the requirements of high speed recording.

6.6 The subject-matter of Claim 1 according to the main request as well as of Claim 1 of the auxiliary request is therefore lacking inventive step.

7. In view of the above conclusion, the result of an examination to the relevancy of the late cited document EP-A-0 124 616 would have no influence on the issue of this case. The Board made therefore use of its discretion to disregard this document (Article 114(2) EPC).

Consequently, the basic conditions for the requests concerning the remittal of the case to the first instance and the award of costs are not satisfied.

Order

For these reasons, it is decided that:

1. The decision of the Opposition Division is set aside.

2. The patent is revoked.

The Registrar: The Chairman

S. Fabiani W. D. Weiß