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D E C I S I O N
of 23 January 2002

Case Number: T 0070/00 - 3.2.5

Application Number: 96203125.8

Publication Number: 0775592

IPC: B41M 5/38

Language of the proceedings: EN

Title of invention:
Thermal image-forming process

Applicant:
AGFA-GEVAERT N.V.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 84

Keyword:
"Clarity (yes)"
"Novelty; main request, first auxiliary request (yes)"
"Inventive step; main request (no) - first auxiliary request (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0070/00 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 23 January 2002

Appellant: AGFA-GEVAERT N.V.
Septestraat 27
B-2640 Mortsel (BE)

Representative: -

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 28 October 1999 refusing European patent application No. 96 203 125.8 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: W. Moser
Members: W. R. Zellhuber
P. E. Michel

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal against the decision of the Examining Division refusing application No. 96 203 125.8.

II. The Examining Division referred, *inter alia,* to the following documents:

D1: WO-A 94/11198 and

D2: WO-A 94/14618.

With regard to the subject-matter of the claims on which the decision under appeal was based, the Examining Division held that the subject-matter of claim 1 was not novel having regard to the prior art as disclosed in document D2, and that the subject-matter of claims 1 to 11 did not involve an inventive step having regard to the prior art as disclosed in documents D1 and D2.

The Examining Division further raised an objection of lack of clarity with respect to the term "outermost layer" used in claims 1 and 4 on which the decision under appeal was based.

In the course of the examination procedure, the Examining Division raised the objection that the definition of the concept of dynamic frictional coefficient ($\mu = (F-R)/L$) given in the application in suit as published, on page 3, lines 9 to 15, was unclear, because the component R, called "rotation resistance of the transporting drum", was not defined.

In communications dated 15 November 2000, 5 November 2001 and 8 January 2002 reflecting the provisional opinion of the Board, the Board referred to this issue of clarity.

III. In the course of the appeal procedure, the appellant referred to the following documents:

D3: ISO 8295, second edition, 1995-10-01, "Plastics - Film and sheeting - Determination of the coefficients of friction";

D4: ASTM D 1894-93, "Standard Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting", published December 1993;

D5: ASTM D 1894-95, "Standard Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting", published December 1995;

D6: ASTM G 143-96, "Standard Test Method for Measurement of Web/Roller Friction Characteristics", published December 1996;

D7: Excerpts from a 1995 maintenance manual for a DRYSTAR™ DS2000 apparatus;

D8: Declaration by Mr Geert Defieuw, "Dynamic frictional coefficient measurements carried out as disclosed in EP 96203125.8/0775592 during direct thermal printing according to the method of WO-A 94/14618"; 18 January 2002.

IV. Oral proceedings were held before the Board of Appeal on 23 January 2002.

The appellant requested that the decision under appeal be set aside and that a patent be granted, on the basis of the following documents:

(a) claims 1 to 11 filed as main request on 7 January 2000; or

(b) claims 1 to 10 filed as first auxiliary request on 7 January 2000; or

(c) claims 1 to 10 and pages 3 and 4 to be substituted for instant pages 3 and 4, filed as second auxiliary request on 7 January 2000; or

(d) claims 1 to 10 and pages 2 to 6 to be substituted for instant pages 2 to 6, filed as third auxiliary request on 17 December 2001.

V. Claim 1 of the main request reads as follows:

"1. A thermal image forming process comprising the steps of: (i) bringing an outermost layer of a recording material into contact with a heat source, said recording material comprising at least one thermosensitive element on a support and said thermosensitive element comprising a substantially light-insensitive silver salt and a reducing agent therefor in thermal working relationship therewith; (ii) applying heat from said heat source imagewise to said recording material while maintaining mutual contact to but with relative movement between said recording material and said heat source; and (iii) separating said recording material from said heat source, characterized in that the dynamic frictional coefficient during said contact between said outermost

layer of said recording material and said heat source has a maximum value of less than 0.3."

Claims 1 and 3 of the first auxiliary request read as follows:

"1. A thermal image forming process comprising the steps of: (i) bringing an outermost layer of a recording material comprising at least one thermosensitive element on a support into contact with a heat source, said thermosensitive element comprising a substantially light-insensitive silver salt and a reducing agent therefor in thermal working relationship therewith; (ii) applying heat from said heat source imagewise to said recording material while maintaining mutual contact to but with relative movement between said recording material and said heat source; and (iii) separating said recording material from said heat source, characterized in that the dynamic frictional coefficient during said contact between said outermost layer of said recording material and said heat source has a maximum value of less than 0.3 and the ratio of the maximum value of said dynamic frictional coefficient to the minimum value of said dynamic frictional coefficient is less than 1.9."

"3. Thermal image forming process according to any of the preceding claims, wherein said outermost layer is the outermost layer of said thermosensitive element."

VI. In the written and oral procedure, the appellant argued essentially as follows:

VI.1 The subject-matter of the claims according to the main request was clear. The dynamic frictional coefficient,

as well as methods and devices for measuring it, were subjects of International Standards such as ISO and ASTM.

In the description of the application in suit, the formula used for defining the dynamic frictional coefficient included a component "R", called rotation resistance of the transporting drum. It was clear that, in connection with the method of measuring the dynamic frictional coefficient as described on page 11 of the application in suit as published, the term "rotation resistance" was erroneous.

However, a person skilled in the art would consider that the component "R" indicated some sort of a calibration correction factor and, if necessary, he would take such a correction factor into consideration when determining the dynamic frictional coefficient. He would do that in the way as shown in the formula on page 3 of the application in suit as published. This formula could thus be regarded as a practical version of the generally known formula defining the dynamic frictional coefficient ($\mu=F/L$).

Therefore, the subject-matter of the claims according to main request was clear and supported by the description.

VI.2 Furthermore, the subject-matter of claim 1 according to the main request was novel with regard to the cited prior art.

Document D1 related to a thermal image forming process comprising the steps cited in the preamble of claim 1 according to the main request. Furthermore, it

disclosed adding a lubricant to the protective layer. However, it did not refer to any dynamic frictional coefficient and thus did not disclose a process wherein the dynamic frictional coefficient between the outermost layer of the recording material and the outermost layer of the heat source has a maximum value of less than 0.3.

Document D2 concerned a thermal image forming process wherein, according to claim 1 of document D2, a recording material was used containing a heat-sensitive layer on a support, and, optionally, an outermost anti-friction or protective layer. The step of imagewise heating the heat-sensitive layer was carried out through a contacting, but removable protection element.

The whole disclosure of document D2 was ambiguous, because a plurality of different terms, such as anti-friction layer, protective layer, protection element, protective element, protective resin element, protective resin sheet, were used in the description and the claims of that document without clearly indicating the relationship between these objects.

According to a third embodiment, described on pages 9 and 11 (example 2) of document D2, a protective resin sheet was applied to the recording layer by lamination, but did not adhere so strongly that it could not be peeled off anymore. The third embodiment thus apparently concerned a sandwich construction comprising the protective resin sheet and, according to claim 1 of document D2, a protection element. Furthermore, document D2 did not refer to the coefficient of friction between the print head and the surface contacting the print head.

Dynamic frictional coefficient measurements carried out by the appellant and submitted as document D8, showed that the maximum value of the coefficient of a recording material and a polyethylene terephtalate-web according to document D2 was 0.60 and the ratio of maximum to minimum 5.5.

Document D2 thus did not disclose a process wherein the dynamic frictional coefficient between the outermost layer of a recording material and the heat source has a maximum value of less than 0.3.

The subject-matter of claim 1 according to the main request was therefore novel within the meaning of Article 54 EPC.

VI.3 The subject-matter of claim 1 of the main request also involved an inventive step.

Neither document D1 nor document D2 suggested a process wherein the dynamic frictional coefficient between the outermost layer of a recording material and the heat source had a maximum value of less than 0.3. Furthermore, neither of these documents made a link between, on the one hand, the friction between the outermost layer of a recording material and the heat source, and, on the other, the occurrence of image defects.

Thus, neither of these documents suggested solving the problem of avoiding image defects by adjusting the surfaces of the recording material and the heat source in such a way that the dynamic frictional coefficient between these surfaces had a maximum value of less than 0.3.

Moreover, a combination of the teachings of documents D1 and D2 did not result in a process according to claim 1 of the main request. Since a contacting but removable protection element was an essential feature of document D2, a person skilled in the art would not contemplate carrying out the process without using such a contacting, but removable element. Claim 1 according to the main request, however, did not concern a process wherein such a removable protection element was used.

The subject-matter of claim 1 according to the main request thus involved an inventive step within the meaning of Article 56 EPC.

VI.4 Claim 1 according to the first auxiliary request further specified that the ratio of the maximum value of said dynamic frictional coefficient to the minimum value of said dynamic frictional coefficient was less than 1.9.

The cited prior art was silent about such a maximum/minimum ratio. Accordingly, the prior art did not suggest improving the quality of the printed image by adjusting the outermost layer of the recording material and the heat source in such a way that the dynamic frictional coefficient and the maximum/minimum ratio of the dynamic frictional coefficient were within the limits as defined in claim 1 of the first auxiliary request.

In Table 3 on page 11 of the application in suit as published, examples of the invention together with their respective maximum and minimum values of the dynamic frictional coefficient were listed. These examples showed that there was no correlation between,

on the one hand, the respective maximum values of the dynamic frictional coefficient and, on the other, the maximum/minimum ratio. Decreasing the maximum value of the dynamic frictional coefficient thus did not involve a decrease of the maximum/minimum ratio.

Therefore, the process according to claim 1 of the first auxiliary request was not obvious with regard to the cited prior art.

Reasons for the Decision

1. *Main request*

1.1 Admissibility of the amendments (claim 1)

Apart from some editorial amendments, claim 1 of the main request corresponds to claim 1 of the application in suit as filed. The amendments comply with the requirements of Article 123(2) EPC.

1.2 Clarity

Claim 1 specifies that the dynamic frictional coefficient between the outermost layer of the recording material and the heat source has a maximum value of less than 0.3.

According to the description of the application in suit as published, cf. page 3, lines 9 to 15, "the dynamic frictional coefficient, μ, is defined as follows: $\mu = (F - R) / L$ where F is the lateral strain applied to a strain gauge connected to the heat source as the recording material is transported past the heat source

at a particular speed, R is the rotation resistance of the transporting drum and L is the load applied to the heat source perpendicular to the transport direction of the recording material."

Irrespective of the question of whether the component rotation resistance "R" is clearly defined or not, a person skilled in the art would take into consideration that, whenever the force F indicated by the strain gauge does not only represent the frictional force but includes other components, the value of that force F has to be corrected accordingly. In principle, a correction may be carried out in the way as shown on page 3, lines 9 to 15 of the description of the application in suit as published. A person skilled in the art would thus construe the passage in question as meaning that a rotation resistance R, or any other force having a conceivable impact on the determination of the dynamic frictional coefficient, has to be considered only if necessary, and that, otherwise, it may be set to zero.

The definition of the dynamic frictional coefficient in the description of the application in suit, therefore, does not render unclear the subject-matter of claim 1.

Therefore, the subject-matter of claim 1 of the main request meets the requirements of Article 84 EPC.

1.3 Novelty

1.3.1 Document D1 discloses a thermal image forming process, wherein a silver-salt direct thermal imaging material is brought into contact with, and moved relative to, a thermal head. In order to solve transportation problems

and to avoid image deformations, document D1 suggests using a protective layer incorporating a lubricant in, or with a lubricant on top of, the protective layer, cf. page 6, first paragraph and claim 3.

Document D1 does not disclose any particular value of the dynamic frictional coefficient between the outermost layer of the recording material and the thermal head.

1.3.2 Document D2 discloses a thermal image forming process wherein heating of the heat-sensitive layer of the direct thermal imaging material is carried out through a contacting, but removable protection element. According to the third embodiment disclosed in document D2 on page 9, last paragraph and further illustrated in Example 2 (cf. page 11), a protective sheet is applied by lamination to the recording layer. That protective sheet is in contact with a print head, and it can be peeled off by hand after the thermal recording.

Document D2 further discloses that during "thermal recording the protective element has to be sufficiently dimensionally stable and to possess a low coefficient of friction, preferably lower than 30", cf. page 4, lines 24 to 29.

The indicated value of "30" cannot be construed as meaning that the friction force was thirty times higher than the load. Such an interpretation goes beyond any reasonable considerations. Rather, it may be construed as meaning 30%. However, it is not directly and unambiguously derivable from the disclosure of document D2 that this is the only possible interpretation.

1.3.3 Accordingly, neither document D1 nor document D2 discloses a process wherein the maximum value of the dynamic friction coefficient between the outermost layer of the recording material and thermal head is less than 0.3.

Therefore, the subject-matter of claim 1 according to the main request is novel within the meaning of Article 54 EPC with regard to the cited prior art.

1.4 Inventive step

1.4.1 Either of documents D1 and D2 may be considered to represent the closest prior art.

Starting from document D1, the problem to be solved by the application in suit may be seen in further improving the image quality by eliminating image faults under most printing conditions, cf. page 2, lines 43 to 44 of the application in suit as published.

According to claim 1, the problem is solved by adjusting the contacting surfaces of the thermal head and the outermost layer of the recording material such that the maximum value of the dynamic frictional coefficient between these surfaces is less than 0.3.

1.4.2 Document D1 does not suggest a particular value of the dynamic frictional coefficient between the outermost layer of the recording material and the thermal head. However, document D1 makes mention of the fact that the protective layer includes a lubricant in order to avoid transportation problems and image deformations, cf. page 6, lines 2 to 13. It is generally known that a lubricant has the function of reducing the friction

between contacting surfaces (cf. document D2, page 5, lines 6 to 10).

Thus, a person skilled in the art would conclude from the disclosure on page 6, lines 2 to 13 of document D1, that the dynamic frictional coefficient between the outermost layer of the recording material and that of the thermal head should be low in order to avoid transportation problems and image deformations.

Since an improvement of the image quality could thus be expected, a skilled person would consider adjusting the surfaces of the outermost layer of the recording material and that of the thermal head in such a way that the dynamic frictional coefficient is as low as possible. By so doing, he or she would also consider dynamic frictional coefficients below 0.3.

Suggesting an upper limit for a parameter for which it is known that it should have a low value belongs to the common practice of a person skilled in the art. Such considerations do not require an inventive step.

Consequently, the subject-matter of claim 1 according to the main request does not involve an inventive step within the meaning of Article 56 EPC. Therefore, the main request is not allowable.

2. *First auxiliary request*

2.1 Admissibility of the amendments

Claim 1 according to the first auxiliary request represents a combination of the features of claims 1 and 2 of the application in suit as filed. Dependent

claims 2 to 10 correspond to claims 3 to 11 of the application in suit as filed; their numbering and references have been amended accordingly. The amendments thus comply with the requirements of Article 123(2) EPC. The same applies to the amendments in the description of the application in suit.

2.2 Clarity

As regards the requirements of Article 84 EPC, the reasons given in paragraph 1.2 above are also valid with respect to claim 1 of the first auxiliary request.

Dependent claim 3 corresponds to claim 4 of the main request, which has been objected to by the Examining Division because of lack of clarity with regard to the term "outermost layer".

According to claim 1, the heat source is brought into contact with an outermost layer of a recording material comprising a thermosensitive element on a support.

Claim 3 specifies that the outermost layer, referred to in claim 1, is the outermost layer of the thermosensitive element. Claim 3 thus further defines the step of bringing an outermost layer into contact with a heat source, in that that layer is defined as being a layer of the thermosensitive element, in particular, the outermost layer of that element.

The Board thus concludes that the subject-matter of claims 1 and 3 is clear. There was further no reason to raise any objection of lack of clarity with respect to the subject-matter of claims 2 and 4 to 10. Claims 1 to 10 thus comply with the requirements of Article 84 EPC.

2.3 Novelty

Claim 1 according to the first auxiliary request comprises, apart from the features of claim 1 of the main request, the feature according to which the ratio of the maximum value of the dynamic frictional coefficient to the minimum value of the dynamic frictional coefficient is less than 1.9.

The subject-matter of claim 1 is thus novel with regard to the cited prior art, among others, for the reasons given in paragraph 1.3 above. Consequently, the subject-matter of claims 2 to 10, which are appendant to claim 1, is also novel.

2.4 Inventive step

The cited prior art is silent about any ratio of the maximum value of the dynamic frictional coefficient to the minimum value of the dynamic frictional coefficient, and, consequently, does not disclose any a maximum value of that ratio.

Furthermore, there is no suggestion in the cited prior art that, in order to provide a thermal image forming process wherein image faults are eliminated under most printing conditions, the ratio of the maximum value of the dynamic frictional coefficient to the minimum value of the dynamic frictional coefficient has to be taken into consideration, and that that ratio should be selected as being less than 1.9.

A thermal image forming process wherein the dynamic frictional coefficient during the contact between the outermost layer of the recording material and the heat

source has a maximum value of less than 0.3, **and** wherein the ratio of the maximum value of the dynamic frictional coefficient to the minimum value of the dynamic frictional coefficient is less than 1.9, was thus not obvious to a person skilled in the art.

Table 3 on page 13 of the application in suit as published shows that, in a thermal image forming process wherein the above-mentioned criteria are met in combination, a good, a very good, and, in particular cases, even an excellent image quality can be obtained.

Therefore, the subject-matter of claim 1 according to the first auxiliary request involves an inventive step within the meaning of Article 56 EPC.

The subject-matter of claims 2 to 10, which are appendant to claim 1, similarly involves an inventive step.

Consequently, the first auxiliary request is allowable.

3. It is, accordingly, not necessary to consider the remaining auxiliary requests.

4. The documents submitted as documents D3 to D8 by the appellant in the course of the appeal procedure, had been taken into consideration, but had not been found to have an impact on the outcome of the procedure. In particular, the measurements according to document D8 were carried out using a web material mentioned as such in an example of document D2. However, that web material does not comprise a lubricating material as suggested in document D2, page 5, lines 6 to 10 for obtaining a low coefficient of friction.

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 European patent on the basis of the following documents:

   (a) claims 1 to 10 filed as first auxiliary request on 7 January 2000; and

   (b) description: pages 2, 3, 15 and 16 submitted during oral proceedings, and pages 1, 4 to 14 and 17 to 21 as filed; and

   (c) drawing, Figure 1, as filed.

The Registrar: The Chairman:

M. Dainese W. Moser