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Bezeichnung der Erfindung: An optical storage medium

Title of invention:

Titre de l'invention :

Klassifikation / Classification / Classement : G11B 7/24, B41M 5/26

ENTSCHEIDUNG / DECISION

vom / of / du 16 September 1988

Anmelder / Applicant / Demandeur : International Business Machines Corp.

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ/EPC/CBE Article 56

Schlagwort / Keyword / Mot clé : Inventive step (no)

Leitsatz / Headnote / Sommaire

Europäisches
Patentamt

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European Patent
Office

Boards of Appeal

Office européen
des brevets

Chambres de recours



Case Number : T 388/86 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 5.3.1
of 16 September 1988

Appellant : International Business Machines Corporation
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Decision under appeal : Decision of Examining Division 067
of the European Patent Office
dated 12 June 1986 refusing European
patent application No. 82 109 187.3
pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : P.K.J. Van den Berg
Members : Y.J.F. Van Henden
O.P. Bossung

Summary of Facts and Submissions

- I. The European patent application No. 82 109 187.3, filed on 5 October 1982, claiming the priority of the earlier application US-336 525 of 31 December 1981 and published on 13 July 1983 under No. 83 396, was refused by Decision of the Examining Division 2.2.01.067 dated 12 June 1986. That decision was based on Claims 1-5 filed with letter of 13 February 1986 and Claims 6-10 filed with letter of 29 July 1985.
- II. The reason given was that, having regard to the state of the art disclosed in the patent specification US-A-4 252 890, the subject-matter of Claim 1 could not be credited with an inventive step within the meaning of Article 56 EPC. With Claim 1 fell the remaining Claims 2-10, which all were appended to it. Moreover, the Claims 2, 3, 6, 7, 9 and 10 were considered as adding nothing inventive.
- III. The Appellant lodged an appeal against this decision and paid the appeal fee on 8 August 1986. The statement of grounds was filed on 9 October 1986, together with an alternative set of claims numbered 1-3. These claims were to be considered if none of those on which the refusal was based were found to be allowable.
- IV. In a communication on behalf of the Board of Appeal, the Rapporteur furthermore drew the Appellant's attention to the following publications:

"CRC Handbook of Chemistry and Physics", CRC Press Inc., 1979, West Palm Beach, Florida USA;

"Kunststoff-Handbuch", vol. VIII, "Polyester", Carl Hanser Verlag, 1973, Munich, W.G.

Following said communication, the Appellant submitted with a letter dated 6 July 1988 a new set of claims numbered 1 to 4 together with amended pages of description, Claims 1 and 2 being independent ones. He declared in said letter to withdraw the set of claims submitted with a letter of 13 February 1988, as well as the alternative set received with the statement of grounds. No letter dated 13 February 1988 and dealing with the present application having been received, the Board concludes that a mistake was made and that the letter of 13 February 1986 is actually meant. From the latter, the Board furthermore infers that the submission of 13 February 1986 also includes the Claims 6-10 received with the correspondence of 29 July 1985.

- V. In his letter of 6 July 1988, the Appellant essentially argued that the US-A-4 252 890 fails to teach unexpected advantageous properties resulting from the use of a noble metal of the group comprising gold, platinum, palladium and rhodium, especially gold, for making the discontinuous layer of the claimed storage medium, which properties would be indicated in the application-in-suit. The claims being now restricted to the use of such metals, the comments in the communication sent on behalf of the Board of Appeal should, therefore, no longer apply.
- VI. In his letter of 6 July 1988, last sentence, the Appellant requests a European patent to be granted on the basis of the claims and description enclosed thereto as an annex. Said annex comprises the Claims 1-4 already mentioned and pages of description numbered 2a, 3, 4, 6 to 9, 15 and 21. The Board assumes that the request also pertains to the pages 1, 2, 5, 10 to 14, 16 to 20, 22 and 23 of the

description as originally filed, and to the sheets of drawings 1/12 to 12/12 as originally filed.

VII. The independent Claims 1 and 2 submitted with the letter of 6 July 1988 read as follows:

1. An optical storage medium, for storing binary data by forming coding spots in the medium by a focused laser light beam, comprising a substrate (10) having thereon a discontinuous film layer (11) composed of particles of noble metal ranging in thickness from about 0.001 to 0.01 micrometers whereby the focused beam can be directed to heat individual ones of the metal particles to cause change in the reflectivity of the medium to record information at the sites where heating has occurred and wherein the physical characteristics of the substrate (10) in contact with the film layer (11) are such that the substrate adjacent to the heated particles melts or undergoes glass transition and allows the heated particles to move relative to the surface of the substrate (10) and coalesce without migrating into the substrate (10), wherein the noble metal is selected from gold, platinum, palladium and rhodium.

2. An optical storage medium, for storing binary data by forming coding spots in the medium by a focused laser light beam, comprising a substrate (10) having thereon a discontinuous film layer (11) composed of particles of gold ranging in thickness from about 0.001 to 0.01 micrometers whereby the focused beam can be directed to heat individual ones of the metal particles to cause change in the reflectivity of the medium to record information at the sites where heating has occurred and wherein the physical characteristics of the substrate

(10) in contact with the film layer (11) are such that the substrate adjacent to the heated particles melts or undergoes glass transition and allows the heated particles to move relative to the surface of the substrate (10) and coalesce without migrating into the substrate (10).

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and, therefore, is admissible.
2. Although the new independent claims no longer refer to a storage medium having a substrate made of a material with a low melting point, no objection under Article 123(2) EPC will be raised. Indeed, the deleted feature was unclear and, moreover, the description discloses the use of fused quartz for making the substrate in a particular embodiment of the claimed invention. Finally, the amendment does not result in excluding from the scope of claimed protection the subject-matter that was taken into consideration in the communication sent to the Appellant on behalf of the Board of Appeal. So, the objections raised there still exist.
3. With respect to the previous submissions, the scope of the new independent Claims 1 and 2 is limited to the use of a laser light beam for exposing the storage medium. The application does indeed not disclose or suggest the use of other high intensity light sources. No unexpected advantageous effect owing to exposition by a laser beam, neither alone nor in combination with features of the claimed medium, was put forward in Appellant's letter of 6 July 1988.

4. The US-A-4 252 890 reveals an imaging member (21) comprising a microscopically discontinuous layer of agglomerable material (22) deposited on a substrate (23) - see the Figure 6 and column 8, lines 56 to 58. The layer (22) is made of a material which typically has a high absorption coefficient in the visible and infrared ranges to produce visible images by the process of agglomeration and fusion. The document mentions silver as an example of such a material - see column 9, lines 4 to 9.

The Board of Appeal infers therefrom that the member (21) is "an optical storage medium" within the meaning of the application. An image being produced as a consequence of agglomeration and fusion, whereby the occurrence of the latter obviously presupposes a rise in temperature, the Board also concludes that there too, as stated in the current Claims 1 and 2, "a focused beam can be directed to heat individual ones of the metal particles" and that "information is recorded at the sites where heating has occurred". Said image being visible, the Board further concludes that a change in the reflectivity of the storage medium is achieved. It also concludes that the focused beam is a light beam, since absorption in the visible and infrared ranges is desired. As a matter of fact, the production of said beam by means of a laser is envisaged in the cited US patent - see column 8, lines 48 to 50. Lastly, no reason can be perceived, why the storage medium known from the US-A-4 252 890 should not be suitable for storing binary data by forming coding spots.

According to the US-A-4 252 890, the substrate (23) is made of a material such as Mylar or a polyethylene terephthalate resin, whereas the particles of the layer (22) may be made of selenium, arsenic, silver, cadmium, zinc or tellurium, for instance - see from column 8, line 65 to column 9, line 15.

From "CRC Handbook of Chemistry and Physics", it is known that selenium, silver, cadmium, zinc and tellurium melt down at 217°C, 961.9°C, 419.58°C and 449.5°C, respectively, and that arsenic sublimates at 613°C. From "Kunststoff-Handbuch", volume VIII, "Polyester", it is known that polyethylene terephthalate has a crystalline melt temperature range of 255°C to 258°C. Finally, it is known that "Mylar" is a trade name for polyethylene terephthalate.

When considering these values, it is readily perceived that, except, maybe, the case where selenium is selected, the absorption of light energy by the particles of the layer (22) cannot make them melt down without bringing the neighbouring polyethylene terephthalate to fusion. This conclusion is implicitly confirmed by the reference made in the US-A-4 252 890 to substrate materials having nearly the same viscosity as Mylar - see, in that document, the sentence bridging the columns 8 and 9.

Finally, according to the same document, no migration in depth is observed when the particles of the layer (22) fuse and agglomerate, i.e. coalesce - see column 9, lines 28 to 36.

The subject-matter of Claim 2 distinguishes over the storage medium known from the US-A-4 252 890 in that the particles of noble metal forming the layer (11) range in

thickness from about 1nm to 10nm and in that they are made of gold - Article 54.1 EPC. The subject-matter of Claim 1 includes that of Claim 2, as well as storage media differing therefrom in that gold is replaced by platinum, palladium or rhodium, all other features remaining unchanged.

5. The task which the invention sets out to meet consists apparently in providing a cheap storage medium requiring a low writing energy and exhibiting a long-lifetime - see page 1 of the EP-A-83 396, lines 5 to 7 of the second paragraph. No inventive step, however, can be perceived therein, for it is the normal task of the skilled man to improve existing products - Article 56 EPC. The Appellant never contended that such should not be the case.

6. When directing a light pulse towards particles of an energy absorbing material, their temperature rises. If said particles are deposited on a substrate which does not absorb energy, i.e. a transparent one, the heat is initially concentrated in their bulk. Then, through thermal conduction, it flows towards the neighbouring parts of the substrate. During this process, the temperature rise is the highest in those parts of the substrate that are adjacent to the energy absorbing material, whereas it remains limited in substrate regions located at some distance therefrom. Said rise in temperature is also the higher as the thermal conductivity of the substrate is lower.

It thus appears possible, by directing towards the particles a light pulse of suitable intensity and duration, to raise their temperature such that the adjacent substrate material, exclusively, will melt down. Said material being also adjacent to the substrate surface, no migration of the particles into the substrate would consequently occur and,

under the action of capillarity, they would agglomerate, i.e. coalesce. The success of the method actually depends on an adequate matching of the various physical parameters that play a part while carrying out the writing process, to wit: the size and energy absorption characteristics of the particles, the specific heats and thermal conductivities of both the particles and substrate material, the light intensity and the exposure time. In particular, it is relevant to notice that the thinner the particles are, the higher their temperature is liable to rise. The reason therefore is that the ratio of outer surface area to volume increases when at least one dimension decreases, so that the ratio of absorbed energy to particle mass becomes higher. When all dimensions decrease, as proposed in Claim 3, this effect is, of course, still enhanced.

As a matter of fact, from the quotations on page 15 of the description, second paragraph, on page 18, last paragraph and on page 19, the Board concludes that this knowledge was available to the skilled man before the priority date of the application-in-suit. Therefore, no inventive step can hitherto be perceived in the subject-matter of Claim 2 and Claim 3 as appended to Claim 2 - Article 56 EPC.

7. The board does not deny that noble metals can be advantageous for making the particles of the layer (11). Nonetheless, their resistance to corrosion as well as the high reflective power and stability resulting therefrom are widely known. Therefore, the skilled man attempting to improve storage media of the kind referred to in the present application is not deterred from contemplating their eventual use, and actually the less as one of them, namely silver, has already been proposed in the US-A-4 252 890.

In the particular case of gold, the application does not reveal any information leading the reader to conclude that, although obviously preferred, it should systematically be more advantageous and provide improved, if not surprising, effects. For instance, the statement of low costs in the last paragraph of page 6 is followed by the mention of silver as an economical substitute for gold - see the lines 2 to 5 of page 7. The arguments brought up in the second and third paragraphs of page 17 are not liable either to carry weight with the Board. The comparison of results obtained with continuous layers of different materials is not indicative of what would happen with discontinuous layers, for instance of a noble metal, the reason being that the conditions of thermal conduction are not the same. On the other hand, the application reveals the results of theoretical studies on the coalescence of gold particles having a diameter of 5nm, i.e. a value falling within the intervals covered by the current Claims 1 to 3, results which were published before its priority date - see the second paragraph on page 15, as well as the paragraph bridging pages 18 and 19. Said results clearly show the interest of providing such a layer of gold particles in any optical storage medium of the kind referred to in the US-A-4 252 890.

8. Coalescence of particles as a consequence of glass transition is mentioned in the description. Nevertheless, the latter does not reveal any embodiment of the invention where this physical change could be the cause of coalescence. No reason to credit such an embodiment can, therefore, be perceived and, actually, it was never contended that such should be the case.
9. In consideration of the arguments put forward in the preceding sections 5-8 of the present decision, the Board

concludes that none of the current Claims 1 to 3 does cover subject-matter involving an inventive step within the meaning of Article 56 EPC. Said claims, therefore, are not allowable - article 52.1 EPC.

The dependent Claim 4 is not allowable either, the reason being that the use of a polymer substrate in contact with a discontinuous layer of a noble metal, to wit, silver, is also disclosed in the US-A-4 252 890. Said claim, therefore, does not involve an inventive step.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

S. Fabiani

P.K.J. Van den Berg