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 155/89 - 3.5.1

Application No.: 82 303 354.3

Publication No.: 0 068 860

Title of invention: Optical reader

Classification: H04N 1

D E C I S I O N
of 4 July 1990

Proprietor of the patent: FUJITSU LIMITED

Opponent: CANON Inc.

Headword:

EPC Articles 52(1), 56

Keyword: Inventive step (denied)

Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 155/89 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal
of 4 July 1990

Appellant : (Proprietor of the patent)
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Decision under appeal : **Decision of the Opposition Division of the European Patent Office dated 9 January 1989 revoking European patent No. 0 068 860 pursuant to Article 102(1) EPC.**

Composition of the Board :

Chairman : P. van den Berg

Members : C. Biggio

J. Stephens-Ofner

Summary of Facts and Submissions

I. European patent EP-B1-68 860 was granted on European patent application No. 82 303 354.3, which claims its rights of priority from the patent applications No. 98 362/81, 140 854/81 and 141 646/81 filed in Japan on 26 June, 9 and 10 September 1981 respectively, has been filed at the EPO on 25 June 1982 and published on 5 January 1983.

The notice of grant was published on 12 February 1986.

II. On 12 November 1986 an opposition was filed, requesting the European patent to be revoked in its entirety.

III. By its decision dated 9 January 1989, the Opposition Division revoked the patent.

The decision was based on the patent in an amended form, made up of Description pages 1, 2 and 2a (filed by hand during the Oral Proceedings before the Opposition Division on 24 November 1988, and replacing column 1 (line 1) to column 2 (line 22) of the granted patent); Description column 2 (line 23) to column 9 (line 65) of the granted patent; Claims 1 to 5 (filed during said Oral Proceedings on 24 November 1988); and Drawings Sheets 1 to 14 of the granted patent.

The ground given for the decision was that the subject-matter of the independent Claim 1 lacked inventive step pursuant to Article 56 EPC.

In its decision, the Opposition Division referred to the following citations:

D1: Japanese publication "Institute of Electronics and Communication Engineers of Japan Technical Report", I.E. 80-63 to 72, Vol. 80, No. 163, 29, October 1980, Editor: Institute of Electronics and Communication Engineers of Japan, Pages 73 to 82,

D2: US-A-4 288 701,

D3: Japanese publication "Electronic Parts and Materials 2 1980", Vol. 19, Pages 73 to 77,

D4: JP-A-12 229/79, published on 29 January 1979; Application No. 65 081/77, filed on 1 June 1977, and

D5: JP-U-60 718/79, published on 23 May 1978; Application No. 143 920/76, filed on: 25 October 1976.

IV. On 7 March 1989, the Patentee lodged an appeal against said decision and paid the appropriate fee on the day before.

On 5 May 1989 the Appellant filed his Statement of Grounds requesting that the appealed decision be reversed and that the patent be maintained in the amended form (Version A) as submitted to the Opposition Division on 24 November 1988.

Subsidiarily he requested to be heard at Oral Proceedings and that the patent be maintained in a further amended form (Version B), filed with said Grounds for Appeal.

Said further amended form (Version B), as filed on 5 May 1989, is made up of Description pages 1 and 2 (replacing column 1 (line 1) to column 2 (line 22) of the granted patent); Description column 2 (line 23) to column 9 (line 65) of the granted patent; Claims 1 to 5; and Drawings Sheets 1 to 14 of the granted patent.

V. In his Grounds for Appeal, the Appellant accepted that contact-type optical readers, especially for use in facsimile machines, were generally known using LED's as their light source.

He also accepted that LED's of various colours, including yellow, were commercially available before the priority date of his application and that their characteristics were generally known.

He stated, however, that the entire conventional teaching from the citations on file, as regards the most efficient colour of a light source to be used to obtain the best detection of marks of a particular colour, was always to use a light source of a colour complementary to that of the particular mark, i.e., in the case of red and blue marks, a green-coloured light source, which, being substantially complementary to both red and blue, will thus provide for the optimum contrast over the widest range of different colours.

He therefore concluded that such an unanimous teaching amounted to a prejudice against using yellow light.

He also submitted that none of the citations on file provided any pointer towards the use of a yellow-coloured light source only, and pointed out that citation D4 taught expressly to use a green or blue light, i.e. light having a wavelength around 555 or 560 nm, for detecting red

marks, while citation D5, which showed the use of yellow LED's in an optical reader, did so only in combination with red LED's and only for detecting blue marks, but did not teach the use of said yellow LED's either alone or in combination with green LED's, and anyway not for detecting red and blue marks simultaneously.

Finally he pointed out that the use of yellow, green or blue filters, as mentioned in Claim 1 (Version B), could not be considered obvious, since the use of filters reduces the intensity of the light produced by any light source, thereby reducing its efficiency and resulting in one of the drawbacks the invention according to the patent at issue is aimed to overcome.

VI. On 27 November 1989, the Respondent filed his observations on the Appellant's Grounds for Appeal.

In respect of Claim 1 (both Versions A and B), he pointed out that the known phenomena, involved in the absorption and reflection of light having a given colour by coloured marks, are ruled by the natural laws governing the mixing of colours and that, consequently the Appellant was wrong in alleging that the entire conventional teaching to use a light source of complementary colour to the particular mark, i.e. a green coloured light source, should be regarded as amounting to a prejudice against the choice of other different colours.

He also argued that the various citations on file taught, in cases - like the present one - where marks of more than one colour had to be detected with enough contrast, to use light having a colour which may never be the effective

complementary of that of the marks, but will at any time result from a reasoned compromise, accepting even slight disadvantages and making use of the possible and available colours only.

Lastly he stated that:

(a) citation D1, representing the undisputed closest state of the art on file, indicated that the array of LED's used by it as a monochromatic light source was made up of GaP-LED's emitting a green light which had its central wavelength at 555 nm and a spectral composition extending approximately from 525 nm to 575 nm;

(b) citation D3 showed that, before the priority date of the patent at issue, GaP-LED's emitting yellow, or at least, yellowish green light having a spectral composition extending from 560 nm to 580 nm, which coincides with that expressly mentioned in Claim 2 of the patent at issue, were freely available on the market and stated further that said GaP-LED's were doped with nitrogen, providing for the effect of increasing the intensity of the emitted light, while shifting the wavelength thereof from the 555 nm of a "pure" green light to the somewhat longer wavelength (560-580 nm) of a green-yellow light containing a large amount of yellow; and

(c) citation D5 showed that, before the priority date of the patent at issue, yellow LED's arrays had already been considered as suitable for and indeed used in the realisation of optical readers, thereby clearly indicating that the prejudice the Appellant has alleged is indeed a false one.

The Respondent, therefore, concluded that the subject-matter of Claim 1, according to both Versions A and B thereof, was obvious.

Specifically in respect of Version B of Claim 1, the Respondent raised a preliminary objection pursuant to Article 123(2) EPC, stating that the feature: "... the light source (4) comprises an array of yellow LED's only covered by a ... blue filter (29, 29') ...", mentioned in said claim, was not supported by the patent application as originally filed, since the latter does not disclose that the yellow LED's might be "covered" by a blue filter; this possibility being disclosed only insofar as the yellow or green "domes" and/or "continuous cover" are concerned.

He pointed also out that the use of coloured filters in optical readers was known from citation D4 and that the use of "... a yellow, green or blue filter ...", as set out in Version B of Claim 1, should not endow the subject-matter thereof with an inventive step, since the function of said filters has to be construed as being well known to any person skilled in the art.

VII. Oral Proceedings were held on 4 July 1990, during which the Parties made the following submissions and requests:

1. The Appellant submitted essentially the same arguments as were mentioned in his Grounds for Appeal (see: V above), and requested, primarily, that the appealed decision be reversed and that the patent be maintained in the amended form (Version A) submitted to the Opposition Division on 24 November 1988, subsidiarily, that the patent be maintained in the further amended form (Version B), as filed on 5 May 1989.

He stated, nevertheless, that he was ready to submit Version B of Claim 1 to the amendments that the Board might have to consider as useful and necessary to overcome the objection pursuant to Article 123(2) EPC raised in respect of said claim.

2. The Respondent submitted substantially the same arguments already submitted in writing (see: VI above), and stressed that the teachings from citations D1 and D3 have to be considered as strongly linked together, since both said citations deal with GaP-LED's emitting yellow, or at least, yellowish green light having a spectral composition which extends from 560 nm to 580 nm and which fully coincides with that expressly mentioned in Claim 2 of the patent at issue.

He maintained his objection under Article 123(2) EPC against Version B of Claim 1.

He requested that the Appeal be dismissed.

VIII. Version A of Claim 1 reads:

"An optical reader comprising at least one array of LED's (light-emitting diodes) (4) as a monochromatic light source for illuminating original material (2) to be read; optical guide means (5) for guiding light reflected from the original material; and an image sensor (6) to which the reflected light is guided by the optical guide means and which converts the reflected light to electrical signals; the electrical signals being binary signals for discriminating the marks or letters of various colours on the original material as black and for discriminating the background of the original material as white in accordance with whether or not the contrast between the

reflected light from the marks or letter and the reflected light from the background is above a critical level; characterised in that the light source (4) comprises an array of yellow LED's only or a combination of yellow LED's arrays and green LED's arrays only".

Version B Claim 1 reads:

"An optical reader comprising at least one array of LED's (light-emitting diodes) (4) as a monochromatic light source for illuminating original material (2) to be read; optical guide means (5) for guiding light reflected from the original material; and an image sensor (6) to which the reflected light is guided by the optical guide means and which converts the reflected light to electrical signals; the electrical signals being binary signals for discriminating the marks or letters of various colours on the original material as black and for discriminating the background of the original material as white in accordance with whether or not the contrast between the reflected light from the marks or letter and the reflected light from the background is above a critical level; characterised in that the light source (4) comprises an array of yellow LED's only covered by a yellow, green or blue filter (9, 10, 29, 29') or a combination of yellow LED's arrays and green LED's arrays only".

Claim 2, according to both Versions A and B reads:

"An optical reader according to Claim 1, characterised in that LED'S having a 560-580 nm centre wavelength are used as the yellow LED's (4)".

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.

2. The Prior Art.

2.1 Citation D1, with reference to its Figure 20 on page 80, discloses an optical reader comprising at least one array of LED's (light-emitting diodes) as a monochromatic light source for illuminating original material to be read; optical guide means for guiding the light reflected from the original material; and an image sensor to which the reflected light is guided by the optical guide means and which converts the reflected light to electrical signals; the electrical signals being binary signals for discriminating the marks or letters of various colours on the original material as black and for discriminating the background of the original material as white in accordance with whether or not the contrast between the reflected light from the marks or letter and the reflected light from the background is above a critical level.

Citation D1 discloses, thus, an optical reader as defined by the precharacterising clause of Claim 1, according to either Version A or B thereof, and has hence to be considered as the closest prior art document on file.

Citation D1 indicates further that said array of LED's used as a monochromatic light source is made up with GaP-LED's (see: page 7, first paragraph) emitting a green light (see: page 1, last sentence) which has its central wavelength at 555 nm (see: Table 1 on page 3) and a spectral composition extending approximately from 525 nm to 575 nm (see: Figure 3 on page 4).

Neither the Appellant nor the Respondent have disputed these facts.

2.2 The optical reader defined by Version A of Claim 1 differs from said optical reader disclosed by citation D1 in that:

"... the light source (4) comprises an array of yellow LED's only or a combination of yellow LED's arrays and green LED's arrays only".

2.3 Citation D3 shows that, prior to the priority date of the patent at issue, GaP-LED's emitting yellow, or at least, yellowish green light having a spectral composition extending from 560 nm to 580 nm (which coincides exactly with that expressly mentioned in Claim 2 of the patent at issue) were freely available on the market.

Citation D3 states further that said GaP-LED's are doped with nitrogen and that said doping provides for the effect of increasing - in a ratio of 5/1 with reference to previously known GaAlAs-LED's -the intensity of the emitted light, while shifting the wavelength thereof from the 555 nm of a "pure" green light to the somewhat longer wavelength (560-580 nm) of a green-yellow light containing a large amount of yellow.

2.4 Citation D5 discloses an optical reader in which the light source comprises either a combination of red LED's arrays and yellow LED's arrays or a combination of red LED's arrays and green LED's arrays, thereby indicating that, before the priority date of the patent at issue, yellow LED's arrays have already been considered suitable for, and indeed used, in the implementation of optical readers.

2.5 Thus, none of the considered prior art citations D1 to D5 discloses an optical reader showing all the features mentioned in Version A of Claim 1.

3. Inventive step.

The Technical Problem to be solved by the invention.

3.1 From the patent specification in its present form, the Board concludes that an objective consideration of the technical problem to be solved by the patent at issue reveals that the said problem can be subdivided into two distinct, but intimately related subproblems, i.e.:

3.1a First Subproblem:
taking into account the various and different absorption and reflection capabilities - as a function of the spectral composition of an impinging beam of light from a light source - of a white background and, respectively, of black, blue and red marks on said background, to find out the most suitable spectral composition for said impinging beam of light, in order to obtain the highest possible absorption, or, conversely, the lowest possible reflection by said black, blue and red marks; both said highest absorption and lowest reflection corresponding to the highest possible contrast of said black, blue and red marks, respectively, against said white background, and

3.1b Second Subproblem:
taking into account the fact that the element used as photosensor shows the better signal to noise ratio (S/N) the lower its operating temperature is, to find out the

most suitable kind of light source susceptible to meet simultaneously the following requirements:

(a) to show the smallest possible geometrical dimensions, so as to allow the realisation of a very small and compact optical reader;

(b) to produce a beam of light having the said most suitable spectral composition, as defined by the considerations mentioned in previous point 3. 1a;

(c) to produce said beam of light with the highest possible luminous intensity, while requiring the lowest possible current intensity to be supplied to said light source, so as to reduce the overall amount of power required by the optical reader and to ensure the lowest possible level of power dissipation on said light source, and hence;

(d) to produce the lowest possible quantity of heat inside the optical reader and transmitted to said element used as photosensor, so as to allow said photosensor to operate at the lowest possible operating temperature, thereby ensuring that said photosensor operates at its best possible signal to noise ratio (S/N).

3.2 In respect of the first subproblem, the Board observes that this problem is not new, since it is dealt with in detail by both citations D4 and D5.

3.3 In respect of the second subproblem, the Board observes that also that problem is not new, since it is dealt with by citation D1, which states that the higher the operating temperature of the photosensor is, the lower its output will be, when light is falling upon it.

3.4 The Board, therefore, finds that no inventive contribution may be derived from the mere statement of either the first or the second subproblem.

3.5 The Board further finds:

That the features mentioned in the characterising clause of Claim 1 (Version A or B) have to be construed as being expressely intended to solve said first subproblem only, and that none of the features mentioned in the characterising clause of Claim 1 (Version A or B) may be construed as intended to solve said second subproblem.

4. The solution according to the invention.

4.1 The Board observes that, in order to solve the first subproblem, a person skilled in the art did not need any specific indication or suggestion from the prior art dealing specifically with optical readers, since he would have found the solution of said first subproblem, by merely using his basic knowledge of the well known physical phenomena governed by the laws of additive and subtractive colour mixing, which were also, not only well known to any person skilled in the art of optical readers, but also to a large number of other persons, like e.g. amateur photographers, who are not necessarily technically oriented.

4.2 The scientific laws governing additive and subtractive colour mixing provide that, if white is the colour of the background and black is the colour of a first kind of

marks on said background, said white background and said black marks thereon will reflect, respectively, absorb nearly 100% of the intensity of the light illuminating them, irrespective of the spectral composition thereof, thereby providing for a very large contrast in respect to each other.

4.3 The above scientific laws also state that, in order to prevent a coloured mark from reflecting the total intensity or, at least, an extremely large percentage of the light impinging on it, the spectral composition of said impinging light shall not contain spectral components having a colour which is the same as, or even is too similar to, that of said coloured mark.

In the present case, since the colours of the other coloured marks, which are intended to be simultaneously present on the same white background, are respectively red and blue, any person skilled in the art, by merely applying the above rule, would have recognized at once that the spectral composition of light which will be very poorly reflected by both said red and blue marks shall not contain:

(a) any red and/or orange light, i.e. any light having a wavelength comprised between ≃700 nm and ≃600 nm,

(b) any cyan, indigo, blue and/or violet light, i.e. any light having a wavelength comprised between ≃500 nm and ≃400 nm, and even

(c) any magenta light, since magenta light is resulting from the additive mixing of two already excluded colours, namely, red and blue-violet.

4.4 The above scientific laws also provide that, in order to obtain that a coloured mark absorbs the total intensity of

the light impinging thereon, said light shall have a colour which is effectively complementary to the colour of said coloured mark, and that, if at least a very large percentage of absorption is desired, then said impinging light shall have a colour approaching as nearly as possible that one which is the effective complementary to the colour of said coloured mark.

In the present case, very large portions of the visible spectrum - namely from ≈700 nm to ≈600 nm and from ≈500 nm to ≈400 nm - have to be excluded for the reasons and considerations mentioned under previous point 4.3. Since the largest possible percentage of absorption and, conversely, the lowest possible percentage of reflection is desired, the above scientific laws require consequently that only light having either a yellow or a yellow-green colour, i.e. having a wavelength falling within the non-excluded range, may and shall be used in order to provide for said blue and red marks having the largest possible absorption and, conversely, the lowest possible reflection i.e. the largest possible contrast in respect to the white background.

4.5 The Board, therefore, finds that the characterising clause of Claim 1 (Version A), merely setting out that the light source (4) shall comprise either an array of yellow LED's only, or a combination of yellow LED's arrays and green LED's arrays only, sets out nothing more than the use of light having either a yellow or a yellow-green colour, i.e. nothing else than features which any person skilled in the art would have arrived at directly, even without needing any specific indication or suggestion thereto from the prior art dealing specifically with optical readers.

4.6 The Board observes, moreover, that the combination of yellow LED's arrays and green LED's arrays, which is mentioned as an alternative in Claim 1 (Version A), and which is intended to compensate for the relatively poor contrast of the red marks, when illuminated only by the yellow light from the yellow LED's arrays alone, by adding to said yellow light some green light from the green LED's arrays, represents nothing more than the direct application of that scientific law governing the additive colour mixing, which provides that, by additively mixing two neighbouring colours (e.g. yellow and green), the intermediate (yellow-green) resulting colour is obtained, having its central wavelength displaced towards higher values in respect to those of the yellow light, which makes said yellow-green light resulting from said combination of yellow LED's arrays and green LED's arrays more suitable for providing for a higher contrast of said red marks.

4.7 Accordingly, the subject matter of Claim 1 (Version A) does not involve an inventive step pursuant to Article 56 EPC and is hence not patentable pursuant to Article 52(1) EPC.

4.8 The optical reader defined by Version B of Claim 1 differs from the optical reader disclosed by citation D1 in that:

"... the light source (4) comprises an array of yellow LED's only covered by a yellow, green or blue filter (9, 10, 29, 29') or a combination of yellow LED's arrays and green LED's arrays only".

4.9 The Board finds that the characterising clause of Claim 1 (Version B), merely setting out that the light source (4) shall comprise an array of yellow LED's only covered by a yellow, green or blue filter (9, 10, 29, 29'), sets out

nothing more than the mere application of that scientific law governing the subtractive colour mixture, which is complementary of the scientific law governing the additive colour mixture referred to in previous point 4. 6, and which produces the same effects which are summing up to the displacement of the central wavelength of the resulting light towards higher values, in respect to those of the yellow light.

4.10 The subject-matter of Claim 1 (Version B) has hence to be considered as not involving an inventive step pursuant to Article 56 EPC and hence as not patentable pursuant to Article 52(1) EPC.

5. Thus, the Board concludes that:

5.1 The subject-matter of Claim 1, according to either Version A or Version B thereof, does not meet the requirements for patentability laid down by Article 52(1) EPC, in conjunction with Article 56, because of lack of an inventive step.

5.2 Consequently, both the Appellant's primary and auxiliary request have to be refused.

5.3 Under these circumstances, the objection pursuant to Article 123(2) EPC, raised by the Respondent in respect of Version B of Claim 1, need not be considered any further.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: **The Chairman:**

M. Kiehl P.K.J. van den Berg