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**Datasheet for the decision
of 22 October 2013**

Case Number: T 0661/09 - 3.4.02

Application Number: 97902876.8

Publication Number: 916103

IPC: G02B5/30

Language of the proceedings: EN

Title of invention:

REFLECTIVE POLARIZERS HAVING EXTENDED RED BAND EDGE FOR
CONTROLLED OFF AXIS COLOR

Patent Proprietor:

MINNESOTA MINING AND MANUFACTURING COMPANY

Opponent:

Bismanns H.

Headword:

Relevant legal provisions:

Keyword:

Inventive step - (no) - obvious desiderata

Decisions cited:

Catchword:

The only features distinguishing the claimed device from the closest prior art express no more than a set of desiderata, without any indication of a causal link between the desired properties and the constitution of the claimed device.

Insofar as the claim does not define any concrete measures on how to ensure that the claimed properties are effectively obtained, the claimed properties remain at an abstract or conceptual level.

Accordingly, the issue of inventive step boils down to the question of whether or not the skilled person, in view of the available prior art and his/her common general knowledge, would in an obvious way have envisaged the claimed set of desiderata.

See decision, point 2.1 (and point 2.7.2).



**Beschwerdekammern
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Chambres de recours**

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Case Number: T 0661/09 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 22 October 2013

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
9 January 2009 concerning maintenance of the
European Patent No. 916103 in amended form.**

Composition of the Board:

Chairman: A. Klein
Members: A. Hornung
B. Müller

Summary of Facts and Submissions

- I. Both the opponent (appellant I) and the patentee (appellant II) appealed against the interlocutory decision of the opposition division maintaining European patent No. 0916103 in amended form.

Opposition was filed against the patent as a whole and based on the grounds of Article 100(a), together with Articles 54(1) and 56 EPC, and on Article 100(b) EPC.

The opposition division held that the grounds on which the opposition was based did not prejudice maintenance of the patent as amended according to the second auxiliary request.

- II. Oral proceedings before the board were held on 22 October 2013.

- III. Together with the grounds of appeal, the patentee requested that the decision of the opposition division be set aside and that the patent be maintained as granted (main request) or, as an auxiliary measure, that the patent be maintained on the basis of the sets of claims according to auxiliary requests 1 and 2 enclosed to the statement of grounds. The set of claims according to auxiliary request 2 was identical to that found allowable by the opposition division.

During the oral proceedings, the patentee withdrew its main request and auxiliary request 1, so that auxiliary request 2 became the new main request. Additionally, the patentee filed a new auxiliary request 1.

The opponent requested that the decision of the opposition division be set aside and that the patent be revoked.

IV. Independent claims 1 and 3 according to the patentee's main request on file at the time of the present decision read as follows:

Claim 1

"A reflective polarizer which transmits light of one polarization and reflects light of another polarization,

the reflective polarizer having an OAC red band edge of at least 620 nm for light having a 60 degree angle of incidence,

and having an average transmission from 400 - 800 nm of less than about 12% for light polarized parallel to the extinction axis at normal incidence,

wherein the OAC red band edge is defined as a wavelength at which reflectance for the transmission axis at off normal incidence for p-polarized light increases from a baseline value to 10 percent of an OAC spectrum's peak reflection value,

wherein the reflective polarizer is a multilayer reflective polarizer."

[Note: The term "OAC" stands for "off axis colour" in the patent.]

Claim 3

"A liquid crystal display system comprising the reflective polarizer of claim 1 or 2."

Remaining claims 2 and 4 to 6 are dependent on independent claims 1 and 3, respectively.

Independent claim 1 according to the patentee's auxiliary request 1 on file at the time of the present decision reads as follows:

Claim 1

"A liquid crystal display system comprising

a reflective polarizer which transmits light of one polarization and reflects light of another polarization,

the reflective polarizer having an OAC red band edge of at least 630 nm for light having a 60 degree angle of incidence,

and having an average transmission from 400 - 800 nm of less than about 12% for light polarized parallel to the extinction axis at normal incidence,

wherein the OAC red band edge is defined as a wavelength at which reflectance for the transmission axis at off normal incidence for p-polarized light increases from a baseline value to 10 percent of an OAC spectrum's peak reflection value,

wherein the reflective polarizer is a multilayer reflective polarizer."

Remaining claims 2 to 5 are dependent on the above independent claim 1.

V. The following documents relied on in the opposition proceedings will be referred to in the present decision:

D6: WO 95/27919

D11: WO 96/19347

D15: annotated version of figure 7B of document D6 as filed by the opponent.

Reasons for the Decision

1. Admissibility of the patentee's appeal

During the oral proceedings held before the board, the patentee amended the requests submitted with the statement of grounds, thereby limiting the defence of the patent to the version considered to be allowable by the opposition division (main request) or to a more restricted version (auxiliary request 1). As a result of these amendments, the patentee can no longer be considered to be adversely affected by the decision of the opposition division, as required by Article 107, first sentence, EPC 1973 (see also point 1.2 of decision T332/06, taken by the present board in a different composition).

As a consequence, the patentee's appeal became inadmissible upon the filing of the amended requests and must be rejected pursuant to Rule 101(1) EPC.

2. Main request

The subject-matter of claim 1 of the main request is undisputedly novel (Article 54(1) and (2) EPC 1973) in view of the available prior art.

In view of the present claim language, the assessment of inventive step (Article 56 EPC 1973) requires, as a preliminary step, the determination of how to construe the technical features of claim 1.

2.1 Construction of claim 1

The only technical feature defining the claimed reflective polarizer in terms of structural limitations is that the polarizer is a "multilayer reflective polarizer", meaning that the reflective polarizer comprises multiple layers. Rather than specifying the concrete nature of the multiple layers by indicating, for instance, their total number, individual thicknesses, composition or sequence in a stack of layers, the remaining features of claim 1 only give numerical values for particular spectral reflection properties which the polarizer exhibits when subjected to specific illumination and observation conditions. These properties of the polarizer are the result of functional interactions between individual layers, each layer requiring specific layer characteristics. However, the claim does not define any concrete measures on how to ensure that the claimed properties are effectively obtained. The claimed properties insofar remain at an abstract or conceptual level.

Therefore, these remaining features of claim 1 express no more than a set of desiderata, without any indication of a causal link between the desired properties and the constitution of the claimed device. Accordingly, the issue of inventive step in the board's view boils down to the question of whether or not the skilled person, in view of the available prior art and his/her common general knowledge, would in an obvious way have envisaged the claimed set of desiderata.

In the board's view, this question must be answered in the affirmative for the reasons set out below.

2.2 Closest prior art

The board agrees with the opposition division and the opponent that the reflective polarizer of D6, described on page 8, lines 19 to 25 and in figure 7B, represents the closest prior art. The reasons are as follows:

(a) D6 belongs to the same technical field as the claimed subject-matter, i.e. multilayer reflective polarizers made of polymeric thin layers (see e.g. D6, page 8, lines 19-20 and the present patent application, page 14, lines 6-11).

(b) The embodiment corresponding to figure 7B has most features in common with the claimed polarizer:

- a multilayer reflective polarizer (D6, page 8, lines 19-20)
- the reflective polarizer has an "OAC red band edge for light having a 60° angle of incidence" (see curve (b) in figure 7B)
- the reflective polarizer has an average transmission from 400-800nm for light polarized parallel to the extinction axis at normal incidence (see curve (c) in figure 7B).

Precise numerical values of the claimed parameters "OAC red band edge" and "average transmission" can be deduced neither from figure 7B of D6 nor from the corresponding description. However, the board agrees with the opposition division and the opponent that the following approximate numerical values, which are not sufficiently reliable for clearly anticipating the claimed values, can be deduced from figure 7B of D6 (see also document D15): the OAC red band edge is approximately 610 nm and its average transmission is approximately 12.6%.

(c) The present patent deals with the problem of providing a more colour-balanced reflective polarizer system (see patent application, page 2, lines 9-10). D6 relates to a similar problem in that it recognizes "poor angular

response and poor spectral transmission for non-designed wavelengths" in the reflective polarizers of the prior art (D6, page 1, lines 27-29 and lines 34-37).

2.3 Distinguishing features

The claimed subject-matter differs from the closest prior art disclosed in D6, figure 7B, only in that it comprises the following features (i) and (ii):

(i) the OAC red band edge is at least 620 nm for p-polarized light having a 60° angle of incidence [instead of approximately 610 nm in D6],

(ii) the average transmission from 400-800 nm is less than about 12% for light polarized parallel to the extinction axis at normal incidence [instead of approximately 12.6% in D6].

2.4 Objective technical problem

2.4.1 Distinguishing feature (i)

The technical effect of feature (i) is to affect the relative transmission of red versus green and blue light and, hence, the hue of obliquely transmitted light (see patent application, page 5, lines 4-8).

In agreement with the original disclosure on page 5, lines 2-30 the objective technical problem solved by feature (i) is to reduce the reddish hue of the reflective polarizer under obliquely incident light.

2.4.2 Distinguishing feature (ii)

The technical effect of feature (ii) is to limit the transmission of light polarized parallel to the extinction axis.

The extinction axis is defined by the property that light polarized parallel to it is reflected (see original application page 3, lines 1-2). It follows that the objective technical problem solved by feature (ii) is to optimize the polarizing properties of the reflective polarizer.

2.5 Solution to the objective technical problems

Distinguishing features (i) and (ii) define distinct optical properties which the claimed polarizer is expected to exhibit under different illumination or observation conditions. Although in practice any technical measures to be taken to achieve one property might well have an influence on the other property, these properties are defined in the claim independently of each other and without reference to the constitution of the polarizer. Their respective contribution to inventive step must therefore be assessed separately.

2.5.1 Distinguishing feature (i)

In using the prior art reflective polarizer corresponding to figure 7B of D6 under 60° off-axis illumination, the light will be transmitted according to transmission curve "b" of figure 7B. It can be seen from figure 7B that the transmission coefficient of curve "b" for red light is larger than that for green and blue light, which means that comparatively more red light will be transmitted through the reflective polarizer. The skilled person will, therefore, observe a red hue in the transmitted light.

Since the reflective polarizer of D6 is used in illumination devices for LCDs (see D6, page 2, lines 19-20), where

uniformly white background light is generally desired, the skilled person will doubtlessly consider the reddish hue of the light transmitted by the polarizer as a drawback and strive for an improvement.

Since the skilled person knows that a reddish hue is due to a comparatively large transmission of red light, it is self-evident that this reddish hue will be reduced by lowering the transmission coefficient of the polarizer for red light with respect to the transmission coefficient for green and blue light, thereby flattening the transmission curve in the visible spectrum. Looking at transmission curve (b) in figure 7B, with the OAC red band edge at about 610 nm, the skilled person would immediately realize that it is the position of the red band edge at too low a wavelength which causes excessive transmission in the red, and that it would be desirable that said OAC red band edge be located at a position shifted towards a wavelength longer than 610 nm. The exact value of this desirable wavelength depends on aspects such as the actual transmission spectrum of the polarizer, the actual spectrum of the illuminating light source, or the specific light uniformity desired. Since none of these aspects is defined in present claim 1, no inventive step can be seen merely in the selection of a precise value of the OAC red band edge within a wavelength range starting at 610 nm. The claimed minimum value of 620 nm for the OAC red band edge wavelength is thus an obvious possibility for solving the above technical problem.

Incidentally, the skilled person would not, in the board's view, doubt that providing a multilayer reflective polarizer with an OAC red band located so as to lower the transmission coefficient for red light is a technically realistic proposal since, as exemplified in the available prior art documents (see e.g. figures 7A-7C of D6 or figures 21-35C of D11), it is common general knowledge that the transmission spectrum of

a polymeric multilayer reflective polarizer can be readily modified by adjusting the number, the thicknesses and the material composition of the layers.

2.5.2 Distinguishing feature (ii)

The aim of a reflective polarizer is to transmit light of a desired polarization (P1) and to reflect light of the other polarization (P2). Evidently, the ideal reflective polarizer reflects 100% of light polarized P2 and transmits 0% of light polarized P1, and does so over the widest possible spectral bandwidth and the widest possible range of angle of incidence.

In the device of D6, a highly efficient reflective polarizer is required (see D6, page 5, lines 3-20). Therefore, the skilled person is motivated to provide a solution to the above technical problem by looking for a reflective polarizer as close as possible to the ideal, i.e. the transmission of light polarized parallel to the extinction axis has a value as low as possible over a spectral bandwidth as large as possible. The exact value retained by the skilled person will obviously depend, amongst other things, on the technical feasibility and the requirements specification. In the present case in which the skilled person starts from a polarizer having an average transmission of approximately 12.6% in the range of 400-800 nm in the closest prior art embodiment, the claimed value of less than about 12% in the range of 400-800 nm is an obvious proposal for solving the above technical problem.

2.6 It follows from the above that a finding of inventive step of the subject-matter of claim 1 cannot be based on distinguishing features (i) and (ii).

2.7 The patentee provided the following arguments in favour of inventive step of the claimed subject-matter.

2.7.1 The patentee argued that the closest prior art document is not D6 but D11. Moreover, there is no reason why the skilled person would start from figure 7B of D6 instead of, for instance, figure 7A of D6.

In its view, D11 deals with the problem of controlling the degree of off-axis colour in a reflective polarizer. For applications where a low colour polarizer is desirable, the % RMS colour should be reduced as much as possible. Thus, similar to the present patent, the solution taught by D11 provides some smoothing out of the spectrum. In contrast to D11, the invention of D6 focuses on the light randomizing element in a polarized light source. The reflective polarizer is not essential for the invention of D6. Therefore, in real life, the skilled person would start from D11 and not D6.

The board, however, for the reasons set out above (see point 2.2) considers D6, figure 7B, to constitute the most suitable starting point for the consideration of inventive step, being the "most promising springboard" to the invention.

2.7.2 At the oral proceedings, the patentee argued that the claimed subject-matter did not lack an inventive step in view of the fact that the prior art documents did not teach how to achieve the claimed features. In particular, D11, page 21, lines 11-20, or page 22, lines 3-14, merely taught how the ideal polarizer acted, but this information could not be considered as being an "enabling disclosure" for the invention as claimed in the patent. Also, the disclosure in D6 did not enable the skilled person to shift the OAC red band edge, which D6 did not even mention. It was only as the result of complicated testing and development work that the

patentee had provided a practical and non-obvious way of implementing the invention.

As discussed during the oral proceedings, this argumentation, in the board's view, misses the point in so far as claim 1 does not define any tangible feature in terms of structure or manufacturing method which is effectively at the origin of the claimed properties and could constitute an inventive contribution. The claim boils down to the statement of desiderata for the optical response of a reflective polarizer. The board, therefore, has to assess the inventive activity on the abstract level at which claim 1 is actually formulated, and, for the reasons set out above, the definition of such desiderata was obvious to the skilled person in view of the shortcomings of the closest prior art disclosed in D6.

The skilled person would also not have considered the possibility of achieving the claimed desiderata to be so improbable as to reject the idea as a whole. As explained above, D6 discloses reflective polarizers with features close to those of the claimed polarizer. It has never been questioned that the devices of document D6 can actually be manufactured with the properties disclosed therein. Hence document D6 is a reasonable starting point not only for the expression of the concept underlying claim 1 but also for the concrete development of devices having the potentially improved properties of claim 1.

- 2.7.3 According to the patentee, the invention is about providing "a more color balanced system" (page 2, lines 9-11). The critical issue of the invention is the recognition that the hue of the transmitted light at off-normal incidence is greatly affected by the position of the OAC red band edge (page 5, lines 2-8). In particular, as compared to the prior art devices, the invention recognized that the OAC red band

edge had to be shifted towards wavelengths beyond 620 nm. Therefore, the invention was fully and concisely defined in claim 1 by specifying numerical values for the two parameters "OAC red band edge at a single wavelength" and "average transmission from 400-800 nm" which amounted to functional features of the polarizer. Beyond the fact that it was not possible without unduly restricting the scope of the invention, there was no need to add further structural features for defining the invention.

The board notes that the question at issue is not whether an invention may be defined *inter alia* by parameters or functional features, which, in appropriate cases, might indeed be allowable, but whether present claim 1 comprises any inventive features. In the board's view, the claim does not comprise any information about how the numerical values of the parameters representing technical functional features of the reflective polarizer are effectively put into practice, which the patentee itself considers to be a major contribution of the invention. The features actually claimed, distinguishing the claimed polarizer from the prior art, merely express desiderata at an abstract level which for the reasons set out above are considered obvious.

- 2.7.4 The patentee contended that there was no disclosure in prior art documents D6 and D11 relating to the expression "OAC red band edge", let alone to the feasibility and usefulness of shifting it beyond 620 nm. This meant that the patent described and claimed a completely new approach. Adding the fact that D6 did not discuss the hue issue at all, there could be no incentive, starting from D6, to design a reflective polarizer with the OAC red band edge shifted beyond 620 nm. Actually, picking up figure 7B of D6 and calculating the numerical values of the OAC red band edge and the average transmission, as the opponent did, could only be based on hindsight.

This argument is not found to be convincing. The OAC red band edge is defined in the claim as "a wavelength at which reflectance for the transmission axis at off normal incidence for p-polarized light increases from a baseline value to 10 percent of an OAC spectrum's peak reflection value". This is undisputedly an unusual definition and the absence of a similar definition in a prior art document is not a reason for excluding that document from being a "candidate" as closest prior art. In fact, D6, page 10, lines 2-4, does actually mention the shift of a "red band edge", albeit in connection with the further embodiment of figure 7C. Once figure 7B of D6 has been selected as closest prior art (see above point 2.2), calculating the numerical values of the claimed parameters is not based on hindsight but rather corresponds to the required step of establishing the difference between the claimed subject-matter and the closest prior art.

- 2.7.5 The patentee argued that the only teaching in the prior art for solving the hue issue was about flattening the spectrum by reducing the % RMS colour [see e.g. D11, page 23, lines 9-13]. This approach was not only different from the approach in the patent but, most importantly, flattening the spectrum might solve the hue issue without necessarily leading to an OAC red band edge larger than 620 nm as claimed. This meant that the skilled person, even if he/she started from D6 and applied the solution taught by D11, would not obviously arrive at the claimed polarizer.

The board is not convinced by this reasoning because the existence of a second approach for solving the hue issue (reducing the % RMS colour), albeit based on the explicit teaching in other prior art documents, does not automatically invalidate the board's approach based on merely applying common general knowledge regarding the relationship between

the perceived colour of light and its spectrum. Since the obvious solution to the hue problem results from such basic considerations, looking for different teachings in other prior art documents does not constitute a more compelling approach than using common general knowledge, even if D11 is explicitly referred to in D6 (e.g. page 8, lines 7-9).

- 2.7.6 The patentee further denies that precise numerical values for the OAC red band edge and the average transmission can be deduced from figure 7B of D6.

The board concurs with the patentee's opinion in relation to the information content of document D6. However, the fact that the values retrieved from figure 7B of D6 are not precise has no effect on the decision of the board because its reasoning leading to lack of inventive step uses the notion of approximate values only.

- 2.8 In view of the above considerations, the board comes to the conclusion that the subject-matter of claim 1 according to the main request on file lacks an inventive step within the meaning of Article 56 EPC 1973.

3. Auxiliary request 1

The subject-matter of claim 1 of auxiliary request 1 lacks an inventive step over the disclosure of D6 within the meaning of Article 56 EPC for the reasons that follow.

Claim 1 of auxiliary request 1 relates to a liquid crystal display system comprising all the features of claim 1 of the main request, except that the wavelength of the OAC red band edge equals 630 nm instead of 620 nm. The feature of the liquid crystal display (LCD) is not new in view of the

disclosure of D6, page 2, lines 19-20, stating that the polarizer of D6 is typically used to illuminate a LCD.

Therefore, the claimed subject-matter differs from the LCD of D6 by the same features (i) and (ii) as mentioned above in point 2.3, except for the wavelength of 630 nm replacing the wavelength of 620 nm.

Despite this replacement of the wavelength value, the reasons for denying inventive step of the subject-matter of claim 1 of the main request apply in substance also to claim 1 of auxiliary request 1. Indeed, the exact value of the wavelength of the OAC red band edge of the modified polarizer envisaged by the skilled person depends on aspects not defined in the claim. As long as these aspects, such as the spectrum of the input light source, the exact profile of the transmission spectrum of the polarizer or the desired light colour uniformity, are left undefined in the claim, the precise amount of the shifting of the OAC red band edge toward longer wavelengths in claim 1 is of an arbitrary nature on which no finding of inventive step can be based.

4. For the above reasons the board comes to the conclusion that the patent must be revoked.

Order

For these reasons it is decided that:

1. The appeal filed by the patentee is rejected as inadmissible.
2. The decision under appeal is set aside.
3. The patent is revoked.

The Registrar:

The Chairman:



M. Kiehl

A. Klein

Decision electronically authenticated