

A		B		C	X
---	--	---	--	---	---

File Number: T 319/91 - 3.4.2
Application No.: 83 303 373.1
Publication No.: 0 098 070
Title of invention: Liquid crystal devices

Classification: G02F 1/137, G02F 1/33

D E C I S I O N
of 8 December 1992

Applicant: The Secretary of State for Defence in Her Britannic Majesty's Government of the United Kingdom of Great Britain and Northern Ireland

Opponents: Asea Brown Boveri AG
N.V. Philips' Gloeilampenfabrieken

EPC Article 123(2) and (3), Rule 67

Keyword: - "Main and first to sixth auxiliary requests: additional subject-matter (yes)"
- "Seventh auxiliary request: additional subject-matter, extension of protection (no), remitted to Opposition Division"
- "Refund of appeal fee (no)"



Case Number : T 319/91 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 8 December 1992

Appellant :
(Proprietor of the patent)

The Secretary of State for Defence in Her
Britannic Majesty's Government of the
United Kingdom of Great Britain and
Northern Ireland
Whitehall
London SW1A 2HB (GB)

(Representative)

Beckham, Robert William
Defence Research Agency
Intellectual Property Department
DRA Farnborough
Farnborough, Hants GU14 6TD (GB)

Respondents:

(Opponent 01)

Asea Brown Boveri AG
Haslerstr. 16
CH-5401 Baden (CH)

(Representative)

Dr. G. Lück

(Opponent 02)

N.V. Philips' Gloeilampenfabrieken
Groenewoudseweg 1
NL-5621 BA Eindhoven (NL)

(Representative)

Raap, Adriaan Yde
International Octrooibureau B.V.
Prof. Holstlaan 6
NL-5656 AA Eindhoven (NL)

Decision under appeal :

Decision of the Opposition Division of the
European Patent Office dated 12 March 1991
revoking European patent No. 0 098 070 pursuant
to Article 102(1) EPC.

Composition of the Board :

Chairman : E. Turrini
Members : M. Chomentowski
M.V.E. Lewenton

Summary of facts and submissions

- I. The Appellant is proprietor of European patent No. 0 098 070, which was granted on the basis of European patent application No. 83 303 373.1.
- II. The Respondents I and II (Opponents 01 and 02) filed an opposition against the grant of the patent in particular on the grounds that the patent contained subject-matter extending beyond the content of the application as filed because a liquid crystal device without pleochroic dye and with a layer thickness less than 12 μm , as covered by the opposed Claim 1 as granted, had not been disclosed originally.

The opposition was also based on the grounds that the subject-matter of the patent was not novel or did not involve an inventive step and that the patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

- III. The patent was revoked. The Opposition Division considered that, in accordance with the decision T 260/85, OJ EPO 1989, 105, the relevant priority document could not be taken into account for providing a basis for a submitted amended main claim mentioning that means are provided for selectively absorbing transmitted light depending upon the molecular orientation of the liquid crystal material but omitting the feature that the liquid crystal device incorporates an amount of pleochroic dye; moreover, a liquid crystal device without pleochroic dye and with a layer thickness less than 12 μm , covered by the amended Claim 1 auxiliarily submitted by the Proprietor, had not been disclosed in the application as filed.

- IV. The Appellant lodged an appeal against this decision. He requested that the decision under appeal be set aside and that the patent be maintained on the basis of submitted texts of claims. Auxiliarily, he requested oral proceedings.
- V. The Respondents requested that the appeal be dismissed and that the patent be revoked. Moreover, they requested oral proceedings auxiliarily.
- VI. During the oral proceedings, the Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of a main request or of one of seven auxiliary requests. Moreover, he requested the reimbursement of the appeal fees because the Opposition Division had not issued any communication or any invitation for oral proceedings and thus deprived him of an opportunity to present his comments on the grounds against the maintenance of the patent before its negative decision.

The Respondents again requested that the appeal be dismissed.

- VII. In this paragraph is only reported the wording of those independent claims which are referred to in the present decision.

Claim 1 of Appellant's main request reads as follows:

"1. A highly multiplexed liquid crystal device. (read ",") comprising:

- (1) a liquid crystal cell (1), comprising
 - (1.1) a layer (2) of a long pitch cholesteric liquid crystal material, wherein

- the thickness (d) of the layer (2) is less than $20 \mu\text{m}$,
- the ratio (d/p) of the layer thickness (d) divided by the pitch (p) of the liquid crystal material is between 0.5 and 1.0, and
- the liquid crystal material has a positive dielectric anisotropy ($\Delta\epsilon > 0$). (read ",") and

(1.2) two cell walls (3, 4),

- containing the layer (2) of the liquid crystal material,
- bearing electrode structures (6, 7) which are arranged as a first series of m separate electrodes (6; 6_1 to 6_m) on one wall (3) and a second series of n separate electrodes (7; 7_1 to 7_n), forming an m x n matrix of separate addressable elements, and
- being surface treated to align the liquid crystal molecules (23) at the cell wall surface along an alignment direction (R) and with a tilt to the surface in a tilted homogeneous structure,
- the surface alignment and the natural pitch (p) of the liquid crystal material being matched to provide a progressive molecular twist of greater than π and less than 2π radians across the layer (2), with a uniform tilt direction,

whereby the device may be switched directly between a light transmissive ON state and a light-absorbing non transmissive OFF state with a sharp transmission/voltage characteristic with substantially zero hysteresis,

(2) driver circuits (8, 9) for repetitively applying voltages from a voltage source (11) to the electrodes (6, 7) to RMS multiplex address each addressable element, and

- (3) a logic circuit (10) controlling the driver circuits (8, 9) (Figs. 1 to 6)."

Claim 1 of Appellant's first auxiliary request reads as follows:

"1. A highly multiplexed liquid crystal device. (read ",") comprising:

- (1) a liquid crystal cell (1), comprising
- (1.1) a layer (2) of a long pitch cholesteric liquid crystal material, wherein
- the thickness (d) of the layer (2) is less than 20 μm ,
 - the ratio (d/p) of the layer thickness (d) divided by the pitch (p) of the liquid crystal material is between 0.5 and 1.0, and
 - the liquid crystal material has a positive dielectric anisotropy ($\Delta\epsilon > 0$). (read ",") and
- (1.2) two cell walls (3, 4),
- containing the layer (2) of the liquid crystal material,
 - bearing electrode structures (6, 7) which are arranged as a first series of m separate electrodes (6; 6₁ to 6_m) on one wall (3) and a second series of n separate electrodes (7; 7₁ to 7_n), forming an m x n matrix of separate addressable elements, and
 - being surface treated to align the liquid crystal molecules (23) at the cell wall surface along an alignment direction (R) and with a tilt to the surface in a tilted homogeneous structure,

- the surface alignment and the natural pitch (p) of the liquid crystal material being arranged to provide a progressive molecular twist of greater than π and less than 2π radians across the layer (2), with a uniform tilt direction,

the elastic and dielectric constants of the material together with the surface alignment and natural pitch of the material being arranged to provide a sharp transmission/voltage characteristic with substantially zero hysteresis, whereby the device may be switched directly between a light transmissive ON state and a light-absorbing non transmissive OFF state,

- (2) driver circuits (8, 9) for repetitively applying voltages from a voltage source (11) to the electrodes (6, 7) to RMS multiplex address each addressable element, and
- (3) a logic circuit (10) controlling (read "controlling") the driver circuits (8, 9) (Figs. 1 to 6)."

Claim 1 of Appellant's second auxiliary request reads as follows:

"1. A highly multiplexed liquid crystal device comprising: a layer (2) of long pitch cholesteric liquid crystal material of positive dielectric anisotropy ($\Delta\epsilon > 0$); contained between two cell walls (3, 4) bearing electrode structures (6, 7) and being surface treated to align liquid crystal molecules in a tilted homogeneous structure;

comprising an amount of pleochroic dye in the liquid crystal material, or two polarizers in combination with a high birefringence material, characterised in that the surface alignment (R) and natural pitch p of the cholesteric material are arranged to provide a progressive molecular twist of greater than π and less than 2π radians across the layer (2) with a uniform tilt direction, the ratio of layer (2) thickness d divided by pitch p lying between 0.5 and 1.0 with a value of d less than $20 \mu\text{m}$;

the electrode structure on one cell wall (3) is arranged in a first series of m separate electrodes ($6; 6_1$ to 6_m) and the electrode structure on the other cell wall (4) is arranged in a second series of n separate electrodes ($7; 7_1$ to 7_n) to form an m x n matrix of separate addressable elements, and

two sets of driver circuits (8, 9) are connected to the first and second series of electrodes ($6; 6_1$ to 6_m) ($7; 7_1$ to 7_n) and controlled by a logic circuit (10) for repetitively applying voltages from a voltage source to the electrodes in a multiplexed sequence,

the elastic and dielectric constants of the material together with the surface alignment and natural pitch of the material being arranged to provide a sharp transmission/voltage characteristics with substantially zero hysteresis, whereby the device may be multiplex addressed to switch directly between a light transmissive ON state and a light absorbing non transmissive OFF state."

Independent Claim 2 of Appellant's third auxiliary request reads as follows:

"2. A highly multiplexed liquid crystal device, comprising:

- (1) a liquid crystal cell (1), comprising
- (1.1) a layer (2) of a long pitch cholesteric liquid crystal material, wherein
- the thickness (d) of the layer (2) is less than 20 μm ,
 - the ratio (d/p) of the layer thickness (d) divided by the pitch (p) of the liquid crystal material is between 0.5 and 1.0, and
 - the liquid crystal material has a positive dielectric anisotropy ($\Delta\epsilon > 0$), and the liquid crystal material has a high birefringence ($\Delta n_p > 0.15$), and
- (1.2) two cell walls (3, 4),
- containing the layer (2) of the liquid crystal material,
 - bearing electrode structures (6, 7) which are arranged as a first series of m separate electrodes (6; 6₁ to 6_m) on one wall (3) and a second series of n separate electrodes (7; 7₁ to 7_n), forming an m x n matrix of separate addressable elements, and
 - being surface treated to align the liquid crystal molecules (23) at the cell wall surface along an alignment direction (R) and with a tilt to the surface in a tilted homogeneous structure,
 - the surface alignment and the natural pitch (p) of the liquid crystal material being matched to provide a progressive molecular twist of greater than π and less than 2π radians across the layer (2), with a uniform tilt direction,
- whereby the device may be switched directly between a light transmissive ON state and a light-absorbing non transmissive OFF state with a sharp

transmission/voltage characteristic with substantially zero hysteresis,

- (2) driver circuits (8, 9) for repetitively applying voltages from a voltage source (11) to the electrodes (6, 7) to RMS multiplex address each addressable element, and
- (3) a logic circuit (10) controlling the driver circuits (8, 9) (Figs. 1 to 6)."

Independent Claim 2 of Appellant's fourth auxiliary request reads as follows:

"2. A highly multiplexed liquid crystal device, comprising:

- (1) a liquid crystal cell (1), comprising
 - (1.1) a layer (2) of a long pitch cholesteric liquid crystal material, wherein
 - the thickness (d) of the layer (2) is less than 20 μm and equal to or greater than 12 μm ,
 - the ratio (d/p) of the layer thickness (d) divided by the pitch (p) of the liquid crystal material is between 0.5 and 1.0, and
 - the liquid crystal material has a positive dielectric anisotropy ($\Delta\epsilon > 0$), and the liquid crystal material has a high birefringence ($\Delta n > 0.15$), and
 - (1.2) two cell walls (3, 4),
 - containing the layer (2) of the liquid crystal material,
 - bearing electrode structures (6, 7) which are arranged as a first series of m separate

electrodes (6; 6₁ to 6_m) on one wall (3) and a second series of n separate electrodes (7; 7₁ to 7_n), forming an m x n matrix of separate addressable elements, and

- being surface treated to align the liquid crystal molecules (23) at the cell wall surface along an alignment direction (R) and with a tilt to the surface in a tilted homogeneous structure,
- the surface alignment and the natural pitch (p) of the liquid crystal material being matched to provide a progressive molecular twist of greater than π and less than 2π radians across the layer (2), with a uniform tilt direction,

whereby the device may be switched directly between a light transmissive ON state and a light-absorbing non transmissive OFF state with a sharp transmission/voltage characteristic with substantially zero hysteresis,

- (2) driver circuits (8, 9) for repetitively applying voltages from a voltage source (11) to the electrodes (6, 7) to RMS multiplex address each addressable element, and
- (3) a logic circuit (10) controlling the driver circuits (8, 9) (Figs. 1 to 6)."

Independent Claim 2 of Appellant's fifth auxiliary request reads as follows:

"2. A highly multiplexed liquid crystal device, comprising:

- (1) a liquid crystal cell (1), comprising

- (1.1) a layer (2) of a long pitch cholesteric liquid crystal material, wherein
- (i) having a small or zero temperature-dependence of pitch (p), or
 - (ii) comprising a liquid crystal material whose pitch decreases with increasing temperature to partially or wholly compensate for variations in threshold voltage with temperature,
- the thickness (d) of the layer (2) is less than 20 μm and equal to or greater than 12 μm ,
 - the ratio (d/p) of the layer thickness (d) divided by the pitch (p) of the liquid crystal material is between 0.5 and 1.0, and
 - the liquid crystal material has a positive dielectric anisotropy ($\Delta\epsilon > 0$), and the liquid crystal material has a high birefringence ($\Delta n_p \geq 0.15$), and
- (1.2) two cell walls (3, 4),
- containing the layer (2) of the liquid crystal material,
 - bearing electrode structures (6, 7) which are arranged as a first series of m separate electrodes (6; 6₁ to 6_m) on one wall (3) and a second series of n separate electrodes (7; 7₁ to 7_n), forming an m x n matrix of separate addressable elements, and
 - being surface treated to align the liquid crystal molecules (23) at the cell wall surface along an alignment direction (R) and with a tilt to the surface in a tilted homogeneous structure,
 - the surface alignment and the natural pitch (p) of the liquid crystal material being matched to provide a progressive molecular twist of greater than π and less than 2π radians across the layer (2), with a uniform tilt direction,

whereby the device may be switched directly between a light transmissive ON state and a light-absorbing non transmissive OFF state with a sharp transmission/voltage characteristic with substantially zero hysteresis,

- (2) driver circuits (8, 9) for repetitively applying voltages from a voltage source (11) to the electrodes (6, 7) to RMS multiplex address each addressable element, and
- (3) a logic circuit (10) controlling the driver circuits (8, 9) (Figs. 1 to 6)."

Independent Claim 2 of Appellant's sixth auxiliary request reads as follows:

"2. A highly multiplexed liquid crystal device, comprising:

- (1) a liquid crystal cell (1), comprising
 - (1.1) a layer (2) of a long pitch cholesteric liquid crystal material, wherein
 - (i) having a small or zero temperature dependence of pitch (p), or
 - (ii) comprising a liquid crystal material whose pitch decreases with increasing temperature to partially or wholly compensate for variations in threshold voltage with temperature,
 - the thickness (d) of the layer (2) is 6 μm ,
 - the ratio (d/p) of the layer thickness (d) divided by the pitch (p) of the liquid crystal material is between 0.5 and 1.0, and
 - the liquid crystal material has a positive dielectric anisotropy ($\Delta\epsilon > 0$), and the liquid

crystal material has a high birefringence ($\Delta n > 0.15$), and

- (1.2) two cell walls (3, 4),
 - containing the layer (2) of the liquid crystal material,
 - bearing electrode structures (6, 7) which are arranged as a first series of m separate electrodes (6; 6_1 to 6_m) on one wall (3) and a second series of n separate electrodes (7; 7_1 to 7_n), forming an $m \times n$ matrix of separate addressable elements, and
 - being surface treated to align the liquid crystal molecules (23) at the cell wall surface along an alignment direction (R) and with a tilt to the surface in a tilted homogeneous structure,
 - the surface alignment and the natural pitch (p) of the liquid crystal material being matched to provide a progressive molecular twist of greater than π and less than 2π radians across the layer (2), with a uniform tilt direction,whereby the device may be switched directly between a light transmissive ON state and a light-absorbing non transmissive OFF state with a sharp transmission/voltage characteristic with substantially zero hysteresis,
- (2) driver circuits (8, 9) for repetitively applying voltages from a voltage source (11) to the electrodes (6, 7) to RMS multiplex address each addressable element, and
- (3) a logic circuit (10) controlling the driver circuits (8, 9) (Figs. 1 to 6)."

Claim 1 of Appellant's seventh auxiliary request reads as follows:

"1. A highly multiplexed liquid crystal device. (read ",") comprising:

- (1) a liquid crystal cell (1), comprising
 - (1.1) a layer (2) of a long pitch cholesteric liquid crystal material,
 - (i) having a small or zero temperature dependence of pitch (p), or
 - (ii) comprising a liquid crystal material whose pitch decreases with increasing temperature to partially or wholly compensate for variations in threshold voltage with temperature, wherein
 - the thickness (d) of the layer (2) is less than 20 μm ,
 - the ratio (d/p) of the layer thickness (d) divided by the pitch (p) of the liquid crystal material is between 0.5 and 1.0, and
 - the liquid crystal material has a positive dielectric anisotropy ($\Delta\epsilon > 0$), and the liquid crystal material comprises an amount of a pleochroic dye, and
 - (1.2) two cell walls (3, 4),
 - containing the layer (2) of the liquid crystal material,
 - bearing electrode structures (6, 7) which are arranged as a first series of m separate electrodes (6; 6₁ to 6_m) on one wall (3) and a second series of n separate electrodes (7; 7₁ to 7_n), forming an m x n matrix of separate addressable elements, and
 - being surface treated to align the liquid crystal molecules (23) at the cell wall surface along an

- alignment direction (R) and with a tilt to the surface in a tilted homogeneous structure,
- the surface alignment and the natural pitch (p) of the liquid crystal material being arranged to provide a progressive molecular twist of greater than π and less than 2π radians across the layer (2), with a uniform tilt direction,
- the elastic and dielectric constants of the material together with the surface alignment and natural pitch of the material being arranged to provide a sharp transmission/voltage characteristic with substantially zero hysteresis, whereby the device may be switched directly between a light transmissive ON state and a light-absorbing non transmissive OFF state,
- (2) driver circuits (8, 9) for repetitively applying voltages from a voltage source (11) to the electrodes (6, 7) to RMS multiplex address each addressable element, and
 - (3) a logic circuit (10) controlling the driver circuits (8, 9) (Figs. 1 to 6)."

Claims 2 to 7 of Appellant's seventh auxiliary request are dependent claims.

VIII. In support of his requests, the Appellant submitted essentially the following arguments:

The invention in suit provides a display with sharp transmission/voltage characteristics, substantially zero hysteresis and direct switching between light transmissive and light absorbing states. This requires special characteristics of the liquid crystal device. In this respect, it should be noted that dyes are merely one way

of absorbing light and that the orientation of the dye molecules is controlled by rotation of the host material. Unless the liquid crystal material has the necessary characteristics, i.e. the liquid crystal molecules can switch with sharp transmission/voltage characteristics, substantially zero hysteresis and directly between light transmissive and light absorbing states, the inclusion of a dye will not give the desired display multiplexing ability. When the necessary characteristics have been achieved, it is then possible to consider whether to use polarisers with or without dye material to give the visual changes between two states.

In particular, a skilled person reading the original disclosure understands that there was a limit in multiplexing displays, this limit being particularly severe in dyed displays. The problem was overcome by the invention characterized at page 3, lines 28 to 36 of the application as filed. It was then verified that the invention worked with multiplexing levels in excess of 40, and it was confirmed that the invention worked for undyed displays. Expert evidence (see the filed statutory declarations) confirms that it is clear to the skilled person that the multiplexibility in Examples 1 to 10 of the patent would be equally valid for undyed displays such as the one disclosed by Example 4, and he would understand dye not to be essential to the invention. Regarding Example 4, the missing cholesteric additive is an obvious error, capable of correction under Rule 88 EPC. The invention is generally applicable to all devices, whether dyed or undyed.

Therefore, with particular reference to the decisions T 260/85 (OJ EPO 1989, 105), T 331/87 (OJ EPO 1991, 22) and T 66/85 (OJ EPO 1989, 167), the patent according to the main request, or to any of the first to sixth

auxiliary requests stating alternative or generalized forms of the originally disclosed displays, does not contain additional subject-matter. The wording of the seventh auxiliary request corresponds to the original disclosure.

IX. The Respondent I submitted essentially the following arguments in support of his request:

Liquid crystal devices according to following variants are part of the original disclosure:

- a first variant with dye as guest component, high birefringence of the host component and a single polariser having a polarisation direction parallel to the orientation direction of the adjacent cell wall (so-called Heilmeyer-effect); the devices of Examples 1 to 3 and 5 to 10, with a thickness of the liquid crystal material of 6 or 8 μm , are based on this variant (see in particular Fig. 1 to 6 for the construction of the cell, and Fig. 7 to 10, for its characteristics);
- a second variant with dye as guest component, low birefringence of the host component and no polariser, using the so-called White-Taylor-effect (see page 10, lines 19 to 22 and page 11, lines 3 and 4);
- a third variant without dye, with high birefringence of the liquid crystal material, a thickness of the liquid crystal layer of more than 12 μm and two polarisers having a polarisation direction parallel or orthogonal to the orientation directions of the adjacent cell walls, using the so-called Schadt-Helfrich-effect (see page 11, lines 6 to 8).

However, a further variant, without dye, with low birefringence of the LC material, a thickness of the LC layer of less than $12 \mu\text{m}$, two polarisers having a polarisation direction parallel or orthogonal to the orientation directions of the adjacent cell walls and having two given values of the product $d \cdot \Delta n$, is not disclosed originally. A person skilled in the art understands that the original disclosure primarily refers to a guest-host liquid crystal device functioning according to the Heilmeyer-effect. Embodiments according to the White-Taylor-effect and the Schadt-Helfrich-effect are, indeed, mentioned in addition to the main embodiment according to the Heilmeyer-effect, but not described in detail. In Example 4, it has been forgotten to mention not only the dye, but also the cholesteric component of the LC material.

All independent claims according to the various requests which do not mention the presence of a dye and wherein the thickness of the layer is less than $12 \mu\text{m}$ therefore comprise additional subject-matter.

- X. The Respondent II submitted essentially the following arguments in support of his request:

The application as originally filed stresses that it has now been found that "certain cholesteric liquid crystal cells incorporating a pleochroic dye and having about a $3\pi/2$ twist exhibit a sharp transmission/voltage characteristic" and that the invention concerns "a liquid crystal device ... incorporating an amount of a pleochroic dye" (see page 3, lines 17 to 25). Furthermore, the characteristic transmission/voltage of a low tilt, $6 \mu\text{m}$, $3\pi/2$ twist cell incorporating a dye and using a single

polariser is discussed (see in particular page 10, lines 1 to 3 and Fig. 7). A cell without dye is mentioned on page 11, lines 6 to 8, without however referring to the invention or to any further advantages, so that this paragraph seems to be a statement per se, and not a specific embodiment of the invention. In this respect, no evidence is given about cell parameters in relation with the possibility of obtaining a sharp transmission/voltage characteristic without substantial hysteresis. Moreover, Example 4, not mentioning the dye, does not give any support to the said statement because no cholesteric material is used and the cell thickness is less than 12 μm . Therefore, the use of a pleochroic dye is presented originally as being an essential feature of the invention. As to the decisions T 260/85, T 331/87 and T 66/85 referred to by the Appellant for justifying the proposed amendments, they are not relevant because, in the present case, specific requirements mentioned in said decisions are not satisfied.

Therefore, all independent claims of the requests failing to disclose the presence of the dye and a thickness of the layer of 12 μm or more contain additional subject-matter.

Reasons for the decision

1. The appeal is admissible.
2. Main request
 - 2.1 Contrary to the only main claim of the application as filed, Claim 1 in dispute does not include the feature that the claimed liquid crystal device incorporates an amount of a pleochroic dye. This particular feature is

also mentioned in the part of the original description (see page 3, lines 23 to 36) presenting the invention.

- 2.2 Indeed, according to the application as filed (see page 11, lines 6 to 8), for high birefringence materials and layers of 12 μm or more a polarisation switch effect (c.f. the $\pi/2$ twisted nematic) is obtainable without a dye by using the cell between two polarisers. However, this statement, which is not consistent with the text of the original only main claim specifying that dyes are incorporated in the liquid crystal material of the claimed device, also indicates that the layer of said material is of a thickness of 12 μm or more. The liquid crystal device of Claim 1 in dispute has a layer which has a thickness less than 20 μm , i.e. within a range including values less than 12 μm .

However, there is no basis in the application as filed for a device according to Claim 1 in dispute with in particular a layer of liquid crystal material without dyes and of a thickness less than 12 μm .

- 2.3 In this respect, the Appellant has argued that the dyes are merely one means for absorbing light, the orientation of the dye molecules being controlled by rotation of the liquid crystal material, but that, unless the liquid crystal material has the necessary controlled rotation characteristics, the inclusion of the dye will not give the desired multiplexing capability, which is the aim of the invention; in particular, there is no statement in the original application specifying that dyes are necessary; e.g., the application as filed (see page 7, lines 14 to 15) stresses that present displays using the twisted nematic or Shadt Helfrich effect without dyes can be multiplexed about 32 ways, whereas dyed displays have previously been limited to around three ways, and that

displays of the present invention provide sharp on/off transmission characteristics and hence a high number of ways.

Indeed, it may be that dyes are merely a means for increasing the contrast of the resulting display device and that persons skilled in the art may have been aware of it; however, it is to be noted that the original description (see page 3, lines 1 to 15; lines 17 to 21 and 23 to 36) first mentions drawbacks of liquid crystal devices including pleochroic dyes, i.e., a significant hysteresis irrespective of the rate of increase of voltage, then states that it has now been found that certain cholesteric liquid crystal cells incorporating a pleochroic dye and having about $3\pi/2$ twist exhibit a sharp transmission/voltage characteristic for rapidly increasing voltages, without hysteresis, whereby a slow increase in voltage may still produce some hysteresis, and last, discloses the device according to the invention with the liquid crystal including pleochroic dyes, respectively. Therefore, the Board is of the opinion that, since consecutive text locations of the application as filed acknowledge dyed displays, mention problems related to their use and disclose the solution to these problems found for certain cells incorporating dyes and then a detailed statement of the liquid crystal devices with dyes according to the invention, this is an indication that, except for statements specifically mentioning displays wherein dyes are omitted, the other originally disclosed displays included dyes in accordance with the original main claim.

Moreover, although the original description (see page 5, lines 22 to 36) of the liquid crystal device illustrated by Figures 1 to 3 discloses a device having a thickness of $6 \mu\text{m}$, i.e less than $12 \mu\text{m}$, and does not mention the

inclusion of dye molecules in the liquid crystal material, however, this text location does not contain either any statement that dye molecules are intentionally omitted. Therefore, the Board is of the opinion that, for the skilled person reading the application as filed and taking into account its only main claim stating that the liquid crystal material of the claimed device incorporates dyes, this cannot result in the conclusion that dye molecules can be intentionally omitted, but that it is a feature not directly apparent in Figures 1 to 3.

The Board is also of the opinion that, since in one of the only two statements of the application as filed (see page 7, lines 14 to 15; page 11, lines 6 to 8) relating to displays working according to the twisted nematic effect and wherein dyes are intentionally omitted, in particular a further condition that the thickness of the layer of the liquid crystal material is 12 μm or more is added, the teaching of these statements read together is distinguished from Claim 1 in dispute which does not include said further condition.

- 2.4 The Appellant has also argued that, since Example 4 of the application as filed (see page 13, lines 19 to 24) discloses a cell which does not include molecule dyes, this is an indication that the use of a dye was not considered originally as indispensable. However, it is to be noted that said Example 4 does not include any indication that a cholesteric additive is contained in said material and that the Appellant has requested that said particular error be corrected. Indeed, without correction of said error, Example 4 is not consistent with the only original main claim. However, since Example 4 does not mention either the incorporation of dye material and is thus further not consistent with the only original main claim, it cannot be excluded that this lack of

information concerning the dye in Example 4 was a further error which the skilled reader would also have immediately corrected. Thus, the Board is of the opinion that this argument of the Appellant cannot be accepted.

2.5 The Appellant has further submitted the argument that the priority document for the European patent in dispute clearly describes a device operating both with and without a dye and that, thus, this is an indication that devices without dyes were also disclosed in the application as filed. However, the Board is of the opinion that, in accordance with the conclusion mentioned in the decision T 260/85 (OJ EPO 1989, 105; see point 3), for the purpose of Article 123(2) EPC, the content of the application as filed does not include any priority documents, even if they were filed on the same day as the European patent application. Moreover, although several decisions, for instance J 19/80 (OJ EPO 1981, 65) and J 4/85 (OJ EPO 1986, 205), have admitted that the contents of priority documents may be taken into consideration for the purpose of establishing whether amendments offered as corrections of errors under Rule 88 EPC are allowable, however, said corrections have to meet the requirement that it should be evident that nothing else would have been intended than what was offered as the corrections; however, the comparison of the texts does not allow to conclude that the repetitive stressing that the liquid crystal device of the invention incorporates dyes in the patent application as originally filed was the result of any evident error as compared with the content of the priority document.

2.6 The Appellant has also submitted that, in accordance with the decision T 331/87 (OJ EPO 1991, 22; see point 6), the replacement or removal of a feature from a claim may not violate Article 123(2) EPC provided the skilled person would directly and unambiguously recognise that, in

particular, the feature was not explained as essential in the disclosure. However, since in relation with displays without dyes the application as filed (see page 11, lines 6 to 8) states that, for high birefringence materials and layers of 12 μm or more a polarisation switch effect (c.f. the $\pi/2$ twisted nematic) is obtainable without a dye by using the cell between two polarisers, this indicates that devices in dispute with liquid crystal layers of a thickness less than 12 μm would not satisfy said requirement. Therefore, this argument cannot be accepted.

2.7 The Appellant has further argued that, according to the decision T 66/85 (OJ EPO 1989, 167; see point 2), if a technical feature is deleted from a claim in the course of prosecution of a European patent application in order to exclude from protection certain embodiments of the invention, the broadening of the claim does not contravene Article 123(2) EPC as long as there is a basis for a claim lacking this feature in the application as filed. However, there is no basis in the application as filed for a claim having the features of Claim 1 in dispute with in particular a layer of liquid crystal material of a thickness less than 12 μm and which does not include dyes.

2.8 For these reasons, Claim 1 in dispute has been amended in such a way that it comprises subject-matter extending beyond the content of the original application and, therefore, the main request cannot be allowed (Art. 123(2) EPC).

3. First auxiliary request

3.1 The Appellant has mentioned that Claim 1 in dispute specifies in particular that the elastic and dielectric constants of the material together with the surface

alignment and natural pitch of the material are arranged to provide a sharp/transmission voltage characteristic with substantially zero hysteresis; thus, although this corresponds to a generalization as compared with the device of Claim 1 of the original application which states that pleochroic dyes are incorporated in the liquid crystal material, however, this corresponds to the teaching of the main claim with the description of the application as filed. However, in the opinion of the Board, as mentioned here above, the application as filed specifically provides indications about devices wherein, contrary to the device of the original main claim, dyes are intentionally omitted, but does not disclose a device according to Claim 1 in dispute comprising a layer of liquid crystal material which does not include dyes and with a thickness which can be less than 12 μm and, therefore, the request is not allowable (Art. 123(2) EPC).

4. Second auxiliary request

- 4.1 Claim 1 in dispute specifies that the liquid crystal device in particular comprises an amount of pleochroic dye, or two polarisers in combination with a high birefringence material. However, a device having the features of Claim 1 in dispute with in particular two polarisers but wherein the layer of liquid crystal of high birefringence material does not include dyes and is of a thickness less than 12 μm is not disclosed in the application as filed. Therefore, since one of the alternatives of Claim 1 in dispute is not disclosed originally, the request is not allowable (Art. 123(2) EPC).

5. Third auxiliary request

5.1 Independent Claim 2 specifies that the liquid crystal device comprises a layer of liquid crystal material with a high birefringence ($\Delta n > 0.15$) and does not mention that the layer incorporates dyes, but, contrary to the application as filed (see page 11, lines 6 to 8), does not indicate that the layer is of 12 μm or more, and that the polarisation switch effect is obtainable by using the cell between two polarisers. Therefore, since there is no basis in the description as filed for a device including all the features of independent Claim 2 in dispute, the request is not allowable (Art. 123(2) EPC).

6. Fourth and fifth auxiliary requests

6.1 Independent Claim 2 specifies that the liquid crystal device comprises a layer of liquid crystal material with a high birefringence ($\Delta n > 0.15$), that the layer is of a thickness less than 20 μm and equal to or greater than 12 μm , and does not mention that the layer incorporates dyes, but, contrary to the application as filed (see page 11, lines 6 to 8), does not indicate that the polarisation switch effect is obtainable by using the cell between two polarisers. Therefore, since there is no basis in the description as filed for a device including all the features of independent Claim 2 in dispute, the requests are not allowable (Art. 123(2) EPC).

7. Sixth auxiliary request

7.1 Independent Claim 2 specifies that the liquid crystal device comprises a layer of liquid crystal material with a high birefringence ($\Delta n > 0.15$), that the thickness of the layer is 6 μm , and does not mention that the layer incorporates dyes; thus, contrary to the application as

filed (see page 11, lines 6 to 8), in particular, the thickness is not 12 μm or more. Therefore, since there is no basis in the description as filed for a device including all the features of independent Claim 2 in dispute, the request is not allowable (Art. 123(2) EPC).

8. Seventh auxiliary request

- 8.1 The Board is satisfied that, since Claim 1 in dispute results from a combination of the features of Claim 1 and dependent Claim 2 both as granted, with further features from the description as granted, it thus discloses a particular form of the device of Claim 1 as granted and, thus, the claims of said request have not been amended in such a way as to extend the protection conferred (Art. 123(3) EPC).

Moreover, in relation with the amendments, it is to be noted that, even if the features concerning the elastic and dielectric constants of the liquid crystal material together with the surface alignment and natural pitch of the material in connection with the sharp transmission/voltage characteristic are not explicitly disclosed in the originally filed application, however the listed properties of liquid crystal materials at page 16 of the original description clearly related to the elastic and dielectric constants, the content of original Claim 1 concerning the surface alignment and natural pitch of the material and the last paragraph at page 9 of the original description concerning the relationship between alignment and transmission/voltage characteristic render said features unequivocally deducible from the original disclosure. Therefore, the Board is satisfied that, since the device of Claim 1 in dispute comprises features, and in particular the dye molecules incorporated in the liquid crystal material, which together are derivable as being

part of devices disclosed in the application as filed, thus, the amendments of said request are such that they do not contain subject-matter which extends beyond the content of the application as filed (Art. 123(2) EPC).

9. Request for refund of the appeal fee

- 9.1 The Appellant sees a substantial violation of his rights under Article 113(1) EPC during the proceedings in the first instance. In his opinion, the Opposition Division ought not have reached a decision which was clearly contrary to his views without an indication of the Opposition Division's standpoint and giving him the opportunity to be heard; he had not had a chance to consider the Opposition Division's opinion and request oral proceedings if he wished.

This argument is not accepted for the following reasons:

The Opponents (Respondents) have based their oppositions against the whole patent on grounds of Article 100(a), (b) and (c) EPC. This was known to the Appellant, who made comments and filed an amended text of the patent. The Appellant's argument under Article 113(1) EPC is essentially raised in respect of the fact that following the observations filed by the Opponents, the Opposition Division revoked the patent without any warning in form of a communication or summons to oral proceedings.

Pursuant to Article 101(2) EPC, in the examination of the opposition the Opposition Division shall invite the parties, as often as necessary, to file observations on communications from another party or issued by itself. In the present case, the Opponents' observations received after the filing of the amended text of the patent did not in fact bring forward new arguments since they

substantially repeated their objections, in particular under Article 100(c) EPC. Thus, there was not a need to further invite the Appellant to file observations.

Moreover, the Opposition Division essentially based its decision on the ground of Article 100(c) EPC and on evidence and arguments known to the parties in this respect. The arguments under Article 100(a) EPC mentioned in the decision for sake of completeness need not be considered.

Furthermore, pursuant to Article 116(1) EPC, oral considering this to be expedient, or at the request of any party to the proceedings. In the present case, the Appellant had the opportunity during the whole opposition procedure to request oral proceedings, but did not use it. The Respondents requested oral proceedings, but only auxiliarily. In such a case, if in the Opposition Division's judgment no further clarification of the position and observations of the parties is needed and the patent can be revoked on the grounds and evidence already brought forward in writing, it lies within the discretion of the Opposition Division to decide without summoning to oral proceedings.

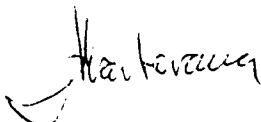
Summarising, the proceedings in the first instance do not suffer from a substantial procedural violation, so that there is no basis for reimbursement of the appeal fee pursuant to Rule 67 EPC.

Order

For these reasons it is decided that:

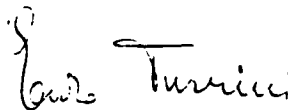
1. The decision under appeal is set aside.
2. The Appellant's main and first to sixth auxiliary requests are rejected.
3. The request that the appeal fee be refunded is rejected.
4. The case is remitted to the Opposition Division with the order to continue the opposition procedure on the basis of the Claims 1 to 7 according to the Appellant's seventh auxiliary request filed during the oral proceedings.

The Registrar:



P. Martorana

The Chairman:



E. Turrini

MCA