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**D E C I S I O N**  
of 1 July 2003

**Case Number:** T 0778/02 - 3.4.2

**Application Number:** 94305406.4

**Publication Number:** 0635749

**IPC:** G02F 1/1339

**Language of the proceedings:** EN

**Title of invention:**

Method of manufacturing a liquid crystal panel assembly

**Applicant:**

TOPPAN PRINTING CO. LTD.

**Opponent:**

-

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Interpretation of claim wording for question of novelty"

"Novelty - yes"

"Inventive step - yes"

**Decisions cited:**

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**Catchword:**

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Case Number: T 0778/02 - 3.4.2

**D E C I S I O N**  
of the Technical Board of Appeal 3.4.2  
of 1 July 2003

**Appellant:** TOPPAN PRINTING CO. LTD.  
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**Representative:** Calderbank, Thomas Roger  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 9 March 2001  
refusing European patent application  
No. 94305406.4 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** E. Turrini  
**Members:** A. G. M. Maaswinkel  
B. J. Schachenmann

## Summary of Facts and Submissions

I. The appellant lodged an appeal, received on 16 May 2001, against the decision of the examining division, dispatched on 9 March 2001, refusing the European patent application 94 305 406.4. The fee for the appeal was paid on 16 May 2001 and the statement setting out the grounds of appeal was received on 16 July 2001.

The examining division objected that the application did not meet the requirements of Article 52(1) EPC because the subject-matter of claims 1 and 2 was not novel in the sense of Article 54 EPC having regard to the teachings of either of the documents D1 or D2:

(D1) FR-A-2 569 280

(D2) FR-A-2 561 005.

Furthermore in the opinion of the division the method of filling a cell as known from either D1 or D2 defined in claims 15 to 18 was rendered obvious (Article 56 EPC) by the further teaching of document

(D3) Patent Abstracts of Japan vol.11, No. 121

(page 568) (2568) 16 April 1987 & JP-A-61 267 028.

II. The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents which correspond to the documents on which the decision had been based with one clerical correction:

- Claims:** 1 to 20 (claims pages 88 to 91, 91A, 92 and 93) as received with letter of 4 June 2003;
- Description:** page 1 as received with letter of 4 June 2003;  
pages 2 to 15, 19 to 23, 25, 29 to 87 as originally filed; with cancellation of page 28 as originally filed;  
pages 16, 17, 17a, 17b, 17c, 18, 24, 26 and 27 filed with letter of 13 June 2000;
- Drawings:** sheets 1/21 to 21/21 as originally filed.

III. The wording of independent claim 1 reads as follows:

"Liquid crystal panel frame comprising:  
a pair of substrates at least one of which is transparent;  
a pair of electrodes each formed on said substrates so as to oppose each other;  
a plurality of rectilinear barrier members which are provided between both substrates and which are arrayed in parallel to each other at predetermined intervals;  
and  
an orientation film formed on at least one of said substrates and to which an uniaxial alignment treatment is applied;  
each barrier member extending substantially in parallel to the direction in which the uniaxial alignment treatment is carried out; and

each barrier member being adhered to both substrates so that portions other than an aperture formed at end portion thereof through which the liquid crystal passes form a rectilinear space sealed against liquid."

The wording of independent claim 2 reads as follows:

"Liquid crystal panel assembly comprising:  
a pair of substrates at least one of which is transparent;  
a pair of electrodes each formed on said substrates so as to oppose each other;  
a plurality of rectilinear barrier members which are provided between both substrates and which are arrayed in parallel to each other at predetermined intervals;  
and  
an orientation film formed on at least one of said substrates and to which the uniaxial alignment treatment is applied;  
each barrier member extending in substantially in parallel to the direction in which the uniaxial alignment treatment is carried out;  
each barrier member being adhered to both opposed substrates so that portions other than an aperture formed at end portion thereof through which the liquid passes form a rectilinear space sealed against liquid;  
and  
ferroelectric liquid crystal or anti-ferroelectric liquid crystal being encapsulated in each rectilinear space."

The wording of independent claim 14 reads as follows:

"Use of a liquid crystal display, the liquid crystal display comprising a liquid crystal panel assembly as claimed in claim 2, and attachments thereto, the use being such that said liquid crystal panel assembly is orientated so that the barrier members extend horizontally."

The wording of independent claim 15 reads as follows:

"Method of manufacturing a liquid crystal panel assembly, comprising the steps of:

- (1) forming an orientation film on at least one of a pair of substrates opposed to each other;
- (2) applying an uniaxial alignment treatment to at least one of said orientation films ;
- (3) providing a plurality of rectilinear barrier members which are adhered to both substrates, thus forming a plurality of rectilinear spaces being continuously in parallel with each other between said substrates so as to extend substantially in parallel to the direction of said uniaxial alignment treatment, said rectilinear spaces each having an aperture at at least one end thereof, portions other than said aperture being sealed against liquid;
- (4) encapsulating ferroelectric liquid crystal or anti-ferroelectric liquid crystal in said rectilinear spaces;
- (5) retaining the encapsulated liquid crystal to the temperature corresponding to the high temperature phase; and
- (6) sequentially cooling the encapsulated liquid crystal from one end of said rectilinear spaces to the

other end, from the temperature corresponding to the high temperature phase to the temperature corresponding to the low temperature phase, under the condition in which the temperature gradient is kept appearing along the direction of said uniaxial alignment treatment."

Claims 3 to 13 and claims 16 to 20 are dependent claims.

IV. The appellant's arguments may be summarised as follows:

The patent application relates to a liquid crystal panel frame in which a plurality of rectilinear barrier members are provided between a pair of substrates. Electrodes are formed on the substrates and in addition on at least one of these an orientation film with uniaxial alignment. The barrier members extend substantially parallel to the direction of the alignment treatment. In addition, each barrier is adhered to **both** substrates so that rectilinear spaces are formed which are sealed against liquid. With respect to the prior art documents D1 and D2 which, in the opinion of the examining division, anticipate the subject matter of claims 1 and 2, document D1 discloses a liquid crystal panel frame comprising substrates, electrodes and an orientation film subjected to an alignment treatment. At page 6, lines 8 to 14 it is disclosed that "spacer members" are formed on **one** substrate either by applying a polyimide as a coating and then photo-etching that coating, or by etching the substrate itself. On page 7, lines 3 to 11, D1 discloses that the other substrate is secured to the resulting structure with an epoxy type adhesive. Furthermore addressing the embodiment in Figure 4b, on

page 13, lines 24 to 30 it is disclosed that the substrates are joined by a sealing agent 110 such as an epoxy adhesive. According to the examining division, in this panel frame the spacer members are in contact with the substrates, and in its opinion the term "adhere" used in claims 1 and 2 could not distinguish the claimed subject-matter from such contact. However, as demonstrated by the appellant by reference to English-language dictionaries, a fundamental part of the definition of "adhere" is the property "sticky", therefore this property "sticky" is inherent to the term "adhere" and the use of the term "adhere" in the claims necessarily incorporates such a feature. Since there is nothing in document D1 which suggests that both substrates are adhered to the spacer members, the subject-matter of claims 1 and 2 is novel over the disclosure in D1 by virtue of this feature "adhere". Furthermore it is pointed out that D1 does also not disclose that the spacer members are orientated parallel to the direction of alignment treatment as required in claim 1 for the barrier members of the invention.

Document D2 discloses a liquid crystal display panel frame similar to D1 with the additional teaching that the spacer members are parallel to the direction of the alignment treatment of the orientation film. With respect to the question whether the spacer members are adhered to both substrates it is pointed out that according to D2, page 16, lines 21 to 26, the spacer members are formed by printing methods. Since it is not possible to print on two different substrates simultaneously and still have a single structure, it is concluded that the spacer members are formed on one



substrate only. Furthermore the passage on page 18, lines 24 to 35 discloses that the second substrate is mounted on the top of the spacer members and that afterwards the substrates are fixed together by an adhesive as in document D1. Thus the spacer members are **not** adhered to both substrates for the same reason as discussed in the context of document D1. Addressing examples 9 and 10 of document D2 the examining division had argued that in these embodiments the liquid crystal material is introduced while in the isotropic phase which occurs at temperatures of 171°C (material 3) or 170.6°C (material 4). The introduction of the liquid crystal material at these temperatures would heat up the material of the spacer members in a way which would result in at least a partial adhesion of the members to both substrates by the same mechanism as in the present patent application because the temperatures were comparable. However, as discussed in example 2 of document D2, the material used for the spacer members is polyimide, which is known for its thermal stability and has a high melting point, for example 300°C or more. Therefore introduction of the liquid crystal material at temperatures around 170°C would not cause any thermal effect on the polyimide spacer members and therefore not lead to any adhesion. It should be noted that the resist material used in the patent application for forming the barrier members is not polyimide but either MP-S 1400 or OMR-83, which -unlike polyimide- will cause adhesion of the barrier members when treated at 180°C. In this respect, the applicants have not been able to find any prior art documents which disclose that the resist material used in the patent application will adhere at 180°C, which also illustrates the novelty

of this concept. Finally, in the embodiment of the present invention polyimide resin is used for the orientation film. Should this polyimide resin be significantly softened at the temperature of 180°C this would destroy the film's orientation properties from the rubbing operation, which in fact is not the case. Therefore the reasoning of the examining division is based on a misconception, and the subject-matter of the independent claims 1 and 2, and for similar reasons that of claims 14 and 15 is novel over the prior art, because none of the documents discloses a liquid crystal panel frame in which barrier members are adhered to both substrates. Furthermore, in none of the prior art documents there is a suggestion to this feature, and, as discussed before, documents D1 and D2 disclose the use of polyimide resin to form the spacer members. Because of the very high melting temperature of this material in the order of 300°C the establishment of an adhesion of the barrier members to both substrates would imply a processing of the device at very high temperatures which would be detrimental to the liquid crystal panel frame, because the other components (e.g. colour filter, including dyes or pigments) would degrade, and moreover the alignment film would lose its orientation properties. Therefore the present invention also involves an inventive step.

## Reasons for the Decision

1. The appeal is admissible.

2. *Formal requirements*

In the decision under appeal no objections were raised under Article 84 EPC or Article 123(2) EPC. The board has no reason to arrive at a different conclusion.

3. *Patentability*

3.1 Novelty

3.1.1 Document D1

Document D1 discloses liquid crystal cells or panel frames. For instance, in the embodiment shown in Figure 4B the cell 100 comprises a pair of substrates 101 and 102, of which at least substrate 101 is transparent (page 11, lines 9 to 10); a pair of electrodes (103, 104) each formed on the substrates so as to oppose each other; a plurality of rectilinear barrier members 111 provided between the substrates which may be arrayed in parallel to each other at predetermined intervals (see Figure 4B, see also page 11, lines 31 and 32); and an orientation film formed on substrate 101 and to which an uniaxial alignment treatment is applied (page 12, lines 28 to 35).

Claim 1 defines two further features:

- (i) each barrier member extends substantially in parallel to the direction in which the uniaxial alignment treatment is carried out; and
- (ii) each barrier member is adhered to both substrates so that portions other than an aperture formed at end portion thereof through which the liquid crystal passes form a rectilinear space sealed against liquid.

With respect to feature (i), in the decision under appeal, point 1.1 of the Reasons for the Decision, reference was made to "*passages already cited*" in the prior analysis of the features of documents D1 and D2. However on consulting the cited passages in document D1 the board was unable to find an anticipation of feature (i) in this document. Rather, it appears that the passages relating to the orientation treatment (page 6, lines 14 to 17 in the context of the embodiment in Figure 1; page 12, lines 28 to 35 for the embodiment of Figure 4) do not touch upon this issue, and it is also observed that according to page 11, lines 31 to 33, apart from stripes the barrier members may be shaped as a lattice or even dots, in which cases the alignment with respect to the uniaxial treatment layer would not be uniquely "parallel". Therefore the board concurs with the appellant that this feature from claim 1 is not disclosed in document D1.

As to feature (ii) defined in claim 1, with respect to document D1 the examining division had referred to page 7, lines 22 and 23, which disclosed that the opposite substrate (not shown in Figure 1) closely contacts (*porte étroitement*) the spacer members 13. Furthermore, in its opinion, the term "adhere" did not imply the use of any adhesive and thus could not distinguish the subject-matter of claim 1 from the device according to D1 (or D2). To support its position during the examination phase the appellant had made reference to several English-language dictionaries. For instance, the "Concise Oxford Dictionary of Current English", eighth edition (Clarendon Press Oxford) gives the following definition: "**adhere** (*usu. foll. by to*) (*of a substance*) *stick fast to a surface, another substance, etc.*". The same feature ("*to stick fast*") is found in the Collins English Dictionary and in Webster's Third New International Dictionary, where it reads "**adhere** *...to hold fast or stick by or as if by gluing, suction, grasping or fusing*". Therefore undoubtedly the accepted meaning of the term "adhere" is synonymous to the property "stick fast". In this context, concerning the interpretation of claims, reference is made to the passage in the Guidelines for Examination, Part C, Chapter III. "4. Clarity and interpretation of claims", 4.2, which reads: "*Each claim should be read giving the words the meaning and scope which they normally have in the relevant art, unless in particular cases the description gives the words a special meaning, by explicit definition or otherwise*". Since throughout the description (*see, for instance, the passage on page 52, lines 17 to 22; and page 61, lines 1 to 10*) the word "adhere" is used in its normal meaning and scope, it follows that

feature (ii) of claim 1 indeed requires a *fast* or *firm fixation* of the barrier members to both substrates. For this feature document D1 does not offer a disclosure, neither explicit nor implicit.

Rather, it appears that in order to attain the desired object (a cell adapted for providing a thin and uniform, in particular a ferro-electric, liquid crystal layer for a large area device, see page 1, lines 1 to 12) document D1 offers a rather different solution, in that the second substrate is a flexible polyester film (page 7, lines 3 to 6) which film rests on the barrier members. In order to guarantee the close contact between this flexible substrate and the barrier members the cell is evacuated and a reduced pressure is retained in space 16 (page 7, lines 18 to 26).

### 3.1.2 Document D2

This document, for instance Figures 3A to 3C, also discloses a liquid crystal panel frame comprising a pair of substrates (101, 110), a pair of electrodes (102, 111), a plurality of rectilinear barrier members (éléments structuraux 104) and an orientation film (112 with face 113) onto which face an uniaxial alignment treatment is carried out. According to page 8, lines 27 to 33, this treatment may be made substantially in parallel to the extension direction of the barrier members. Therefore the above defined feature (i) of claim 1 is disclosed in document D2.

With respect to feature (ii), the examining division had argued that, because the barrier members are in contact to both substrates this "contacting" includes

"adhering", at least to a certain extent. For the same reasons as discussed in relation to document D1 for the definition of "adhere" the board cannot concur with this position.

In the particular context of Examples 9 and 10 of document D2 the examining division had reasoned that because the barrier members as well as the opposing film layer in the liquid crystal panel frame were made of polyimide material, its exposure to temperatures around 170°C by the introduction of the liquid crystal material in the cell at this temperature should bring along the same adhering effect as in the patent application, because in the embodiment of the patent application the barrier members and the opposing polyimide orientation layer are brought into contact and adhered at the similar temperature of 180°C. The appellant has objected that, differing from the disclosure in D2, the barrier members in the embodiment of the patent application are not of polyimide material; and that subjecting polyimide at temperatures around 170°C would not cause any adherence effect because of the high temperature melting point of this material. The board finds the appellant's arguments credible. Since at temperatures below the glass transition temperature polyimides behave like glassy materials it appears an unproven fact that polyimides would exhibit any adhering properties within the normal meaning and scope of the word at 170°C. Therefore it must be concluded that document D2 does not offer a disclosure for feature (ii).

In any case it is noted, that according to document D2, page 19, lines 14 to 19, the barrier members 104 need not function as spacer members contacting both base plates as far as they have side walls having the necessary wall effect for acting on the liquid crystal. Therefore it appears that document D2 does not recognise any advantages in fixation of the barrier members to both substrates.

### 3.1.3 The further documents

The remaining documents, in particular document D3 had not been cited against the subject-matter of claim 1. Therefore, since none of the available documents discloses the feature (ii) of claim 1, its subject-matter is novel within the meaning of Article 54(1) EPC.

3.1.4 Independent claim 2 defines a liquid crystal panel assembly including barrier members equally being adhered to both opposed substrates. Claim 14 defines the use of a liquid crystal display comprising an assembly as defined in claim 2. Finally, independent method claim 15 defines a method of manufacturing a liquid crystal display assembly comprising the step of providing a plurality of rectilinear barrier members which are adhered to both substrates. Since this feature is not known from the prior art documents, the subject-matter of the independent claims 2, 14 and 15 is novel for the same reasons as discussed in relation to claim 1.



### 3.2 Inventive step

3.2.1 The subject-matter of claim 1, and similarly that of the further independent claims, differs from the closest prior art at least in feature (ii). This feature solves in combination with the further features of claim 1 the problem of assuring a rigid fixation of the substrates while feature (i) certifies that the liquid crystal material is located between the barrier members in a correct orientation which ensures a display free of defects. As discussed above, neither document D1 nor D2 provides a hint to this solution. In the device disclosed in D1 the (thin film-like) upper substrate is kept against the top of the barrier members by keeping a reduced pressure in the cell. Furthermore feature (i) is also not disclosed or suggested in D1. According to document D2, the barrier members in the liquid crystal panel frame do not need to contact the upper substrate, therefore the skilled person learns from this document that a fixation of the members to both substrates is not advantageous. Finally, as pointed out by the appellant, a fixation of the barrier members to the orientation film, both of which are made of polyimide material, by subjecting the liquid crystal panel to the required high temperatures would not be considered by the skilled person as a routine measure because of the very high processing temperature for polyimide and possible detrimental effects to the panel. Therefore the subject-matter of claim 1 is considered as involving an inventive step within the meaning of Article 56 EPC.

3.2.2 The subject-matter of claims 2, 14 and 15 is considered as involving an inventive step for the same reasons.

3.2.3 The further claims 3 to 13, 16 to 20 are dependent of the independent claims and are therefore equally allowable.

4. For the above reasons, the Board finds that the appellant's request meets the requirements of the EPC and that a patent can be granted on the basis thereof.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to grant a patent on the basis of the following documents:

**Claims:** 1 to 20 (claims pages 88 to 91, 91A, 92 and 93) as received with letter of 4 June 2003;

**Description:** page 1 as received with letter of 4 June 2003;  
pages 2 to 15, 19 to 23, 25, 29 to 87 as originally filed; with cancellation of page 28 as originally filed;  
pages 16, 17, 17a, 17b, 17c, 18, 24, 26 and 27 filed with letter of 13 June 2000;

**Drawings:** sheets 1/21 to 21/21 as originally filed.

The Registrar:

The Chairman:

P. Martorana

E. Turrini