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Datasheet for the decision of 14 December 2006

Case Number: T 1251/04 - 3.4.02

Application Number: 95918206.4

Publication Number: 0708931

IPC: G02F 1/1333

Language of the proceedings: EN

Title of invention:
Thin seal liquid crystal display and method of making same

Patentee:
SAMSUNG ELECTRONICS CO., LTD.

Opponent:
Asulab S.A.

Headword:
-

Relevant legal provisions:
EPC Art. 56, 100, 114

Keyword:
"Main and auxiliary requests I to III: inventive step: no"
"Auxiliary request IV: not admitted (withdrawn before the opposition division and submitted too late)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1251/04 - 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 14 December 2006

Appellant: (Opponent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 23 August 2004 concerning maintenance of the European patent No. 0708931 in amended form.

Composition of the Board:

Chairman: A. Klein
Members: M. Stock
C. Rennie-Smith

Summary of Facts and Submissions

I. Both the patent proprietor and the opponent lodged appeals against the decision of the opposition division maintaining European patent number 0 798 931 (application number 95 918 206.4) in amended form.

II. Opposition had been filed against the patent as a whole and based on the ground under Article 100(a) EPC that the subject-matter of the patent was not new and did not involve an inventive step; see Article 52(1) EPC in connection with Articles 54(1) and 56 EPC, respectively.

The opposition division reasoned that the subject-matter of claim 1 as granted (main request) was not new. The subject-matter of claim 1 according to the auxiliary request I, however, was found to be new and to involve an inventive step.

Reference was made to the following documents:

D1: JP 55-064212
D2: FR 2410859
D3: JP 62-052534
D4: JP 56-107214
D5: JP 05-313198
D6: JP 61-284727
D7: FR 2 159 590
D8: JP 63-005325
D9: JP 05-323332
D10: JP 06-082737
Dl1: JP 61-086729
D12: FR 2 415 852
D13: FR 2 243 485

D14: JP 03-110518
D14a:English translation of D14

III. The opponent requested that the patent be entirely revoked. Its arguments can be summarised as follows:

In its decision the opposition division stated that according to claim 1 of the auxiliary request the thin seal display was formed by "precisely reducing the edges of the sealed substrate assembly (200)", whereas the actual claim wording does not use "the" in front of "edges". Therefore the extent of claim 1 is wider than assumed by the opposition division and the basis of its decision is thus erroneous. However, independently of the formulation used in claim 1, its subject-matter is rendered obvious by the teachings of D4 and D14 and the routine expertise of the person skilled in the art.

Methods according to the patent were also made accessible to the public through prior use by the German company AEG MIS GmbH as shown by a document D15. This document shows a first type of LCD having an upper edge cut under an angle of 45°. In order to fulfil tolerances the edge was precisely reduced, the reduction being performed parallel to an outer edge of the seal and reducing a width of the seal to form a thin seal. This type of LCD was sold by AEG to the Italian company Logic S.P.A. as proved by a "Certificate of Compliance" forming part of D15.

D15 also shows a second type of LCD manufactured and sold by AEG. This LCD is of an octagonal shape and has precisely reduced edges. From a view by microscope of the edge from above it is derivable that perfect

alignment of the edges of the substrate and the outer edge of the seal frame is obtained by simultaneous cutting of the assembly of the sealed substrate and the seal frame. This corresponds to the teaching of claim 1 of the contested patent.

The opponent filed a sworn statement by an employee of AEG GmbH and a document D16, to show that the LCD of octagonal shape mentioned in document D15 was manufactured by AEG and sold to the German company Beta GmbH.

As far as inventive step is concerned, according to the opponent, Document D14 represents the closest prior art and addresses the same problem as the contested patent, namely that, in conventional displays, adjacent LCD's cannot be brought into intimate contact with one another when a plurality of LCD's are arranged to constitute a large display, because of the presence of the area of the terminal electrodes which go beyond the seal frame and let spaces appear between the LCD's.

D14 discloses all features indicated in claim 1 of the contested patent with the exception that the patent does not perform the reduction parallel to one single outer edge, but "parallel to the respective outer edges of the seal". Relying upon the teaching of D14 the skilled person had no difficulty in cutting the three other edges of the assembly of sealed substrates in order to provide access to the electrodes in the same way as the first edge was cut. This amounted to a simple operation of duplication which lacks an inventive step.

The feature of cutting "parallel", apart from being disclosed in D14, is trivial. Moreover, the opening for filling arranged in the middle of one of the edges, as shown in Figure 1A of D14, does not prevent the skilled person from cutting through this edge since in reality the material used for sealing this opening penetrates this opening by simple capillarity and ensures the continuation of the seal frame in this opening as was also apparent from documents US 3,799,649, US 5,148,239, JP 57-096317 and JP 60-067927.

IV. The proprietor requested as a main request that the interlocutory decision of the opposition division be set aside and the opposition be rejected. It further requested maintenance of the patent in amended form on the basis of claims according to auxiliary requests I to IV.

The proprietor argued that the term "thin seal" as it is understood by the skilled person has a specific meaning. In document D14 it is clearly the intention to cut along the outer edge and not to reduce the width of the sealing. Therefore D14 does not disclose a thin seal in the sense of the patent. The claimed subject-matter is also novel with respect to D1 because this document does not disclose the use of oversized substrates and a step of reducing edges of the sealed substrate assembly. For the assessment of inventive step D14 is considered to represent the closest prior art from which the subject-matter of the patent differed by the step of reducing the sealed (oversized) substrate assembly to the final outline dimension of the display, wherein the width of the seal is reduced

to form a thin seal. This step is not obvious from D1 or D2 none of which disclose such reduction.

The proprietor requested that documents D15 and D16 be disregarded irrespective of their relevance because no good reason was given for their late filing. It emphasised further that D15 and D16 are not of such a high relevance that they have to be admitted into the proceedings.

V. In preparation for the oral proceedings requested by the parties, the Board made the following preliminary non-binding comments:

It should be discussed in the oral proceedings, whether "thin seal" or "thin seal display" have a well recognised meaning in the art. If not, then "thin" would be a relative term which would generally be unclear and would have to be interpreted according to the description.

The general purpose of the appeal proceedings was to give a judicial decision upon the correctness of the earlier decision taken by the first-instance department, see Case Law of the Boards of Appeal, 4th edition, 2001, page 504, 3rd paragraph. Therefore, in the present case, the decision of the Board would primarily be based on prior art cited before, and requests dealt with by, the opposition division. This would mean that consideration would mainly be limited to those documents cited in the proceedings before the opposition division, i.e. Documents D1, D2, D4, D14 and D14a. Only if the Board came to the conclusion that the claimed subject-matter was patentable with respect to this prior art, would it then consider whether the late-filed evidence of prior

use (documents D15 and D16) was both admissible per se and *prima facie* so highly relevant that it must be admitted into the proceedings, with the consequence that the case would probably have to be remitted to the opposition division.

Oral proceedings took place on 14 December 2006

VI. The main request is directed to claim 1 as granted. Auxiliary requests I to III were submitted one month before the oral proceedings. Auxiliary request IV was only submitted at the oral proceedings. Versions of claim 1 according to the different requests are as follows:

Main Request:

"1. A method for making a thin seal display (1) comprising the steps of:
disposing a seal material (140, 240) in a substantially precise manner on a first oversized substrate (10) on a substantial portion of an outline dimension (110) of the thin seal liquid crystal display (1) to create a fill gap opening (150);
forming a substrate assembly (200) by arranging the first substrate (20) on top of a second oversized substrate (20) so as to create a cavity in an area bounded by the first and second substrates (20, 30) and the seal material (140, 240);
transforming the seal material (140, 240) into a seal which joins the substrates (20, 30);
filling the cavity of the sealed substrate assembly (200) with a material (230) through the fill gap opening (150) to form a display area;

sealing the fill gap opening (150); and
forming the thin seal display (1) by precisely reducing edges of the sealed substrate assembly (200) to the outline dimension (110) of the thin seal display (1), wherein the precision reduction is performed parallel to the respective outer edges of the seal and reduces a width of the seal (140, 240) to form the thin seal (25)."

Auxiliary Request I:

"1. A method for making a thin seal display (1) comprising the steps of:
disposing a seal material (140, 240) in a substantially precise manner on a first oversized substrate (10) on a substantial portion of an outline dimension (110) of the thin seal liquid crystal display (1) to create a fill gap opening (150);
forming a substrate assembly (200) by arranging the first substrate (20) on top of a second oversized substrate (20) so as to create a cavity in an area bounded by the first and second substrates (20, 30) and the seal material (140, 240);
transforming the seal material (140, 240) into a seal which joins the substrates (20, 30);
filling the cavity of the sealed substrate assembly (200) with a material (230) through the fill gap opening (150) to form a display area;
sealing the fill gap opening (150); and
forming the thin seal display (1) by precisely reducing edges of the sealed substrate assembly (200) to the outline dimension (110) of the thin seal display (1), wherein the precision reduction is performed parallel

to the respective outer edges of the seal and reduces a width of the seal (140, 240) to form the thin seal (25)."

Auxiliary Request II:

"1. A method for making a thin seal display (1) comprising the steps of:
disposing a seal material (140, 240) in a substantially precise manner on a first oversized substrate (10) an a substantial portion of an outline dimension (110) of the thin seal liquid crystal display (1) to create a fill gap opening (150);
forming a substrate assembly (200) by arranging the first substrate (20) an top of a second oversized substrate (20) so as to create a cavity in an area bounded by the first and second substrates (20, 30) and the seal material (140, 240);
transforming the seal material (140, 240) into a seal which joins the substrates (20, 30);
filling the cavity of the sealed substrate assembly (200) with a material (230) through the fill gap opening (150) to form a display area;
sealing the fill gap opening (150); and
forming the thin seal display (1) by precisely reducing edges of the sealed substrate assembly (200) to the outline dimension (110) of the thin seal display (1), wherein the precision reduction reduces a width of the seal (140, 240) to form the thin seal (25), and wherein the precision reduction consists of precisely cutting the substrate assembly (200) to a size substantially near the outline dimension (110) of the thin seal display (1), and precisely grinding the cut substrate

assembly (200) to the final outline dimension (110) of the thin seal display (1)."

Auxiliary Request III:

"1. A method for making a thin seal display (1) comprising the steps of:
disposing a seal material (140, 240) in a substantially precise manner on a first oversized substrate (10) on a substantial portion of an outline dimension (110) of the thin seal liquid crystal display (1) to create a fill gap opening (150);
forming a substrate assembly (200) by arranging the first substrate (20) on top of a second oversized substrate (20) so as to create a cavity in an area bounded by the first and second substrates (20, 30) and the seal material (140, 240);
transforming the seal material (140, 240) into a seal which joins the substrates (20, 30);
filling the cavity of the sealed substrate assembly (200) with a material (230) through the fill gap opening (150) to form a display area;
sealing the fill gap opening (150); and
forming the thin seal display (1) by precisely reducing the circumferential edges of the sealed substrate assembly (200) to the outline dimension (110) of the thin seal display (1), wherein the precision reduction reduces a width of the seal (140, 240) along the circumference to form the thin seal (25)."

Auxiliary Request IV:

"1. A method for making a thin seal display (1) comprising the steps of:

disposing electrically conductive strips (120) on a major surface (125) of first and second oversized substrates (10, 20, 105) to form first and second metalized substrates (100, 210, 220), wherein at least one end of each of the electrically conductive strips (120) extends over an outline dimension (110) of the thin seal liquid crystal display (1),
disposing a seal material (140, 240) in a substantially precise manner on the first substrate (10) on a substantial portion of the outline dimension (110) of the thin seal liquid crystal display (1) to create a fill gap opening (150);
forming a substrate assembly (200) by arranging the first substrate (20) on top of the second substrate (20) so as to create a cavity in an area bounded by the first and second substrates (20, 30) and the seal material (140, 240);
transforming the seal material (140, 240) into a seal which joins the substrates (20, 30);
filling the cavity of the sealed substrate assembly (200) with a material (230) through the fill gap opening (150) to form a display area;
sealing the fill gap opening (150);
forming the thin seal display (1) by precisely reducing edges of the sealed substrate assembly (200) to the outline dimension (110) of the thin seal display (1), wherein the precision reduction reduces a width of the seal (140, 240) to form the thin seal (25) and exposes edges of the electrically conductive strips (120); and
forming electrical edge contacts (40) by depositing an electrically conductive material on the edges (12, 22) of the reduced substrate assembly in the areas of the exposed edges of the electrically conductive strips (120)."

Reasons for the Decision

1. *Main Request*

1.1 Using the terminology employed in claim 1 according to the main request, in document D14, see Figure 1 with the associated description, there is described a method for making a liquid crystal display comprising the steps of disposing a seal material in a substantially precise manner on a first oversized substrate on a substantial portion of an outline dimension of the liquid crystal display to create a fill gap opening, forming a substrate assembly by arranging the first substrate on top of a second oversized substrate so as to create a cavity in an area bounded by the first and second substrates and the seal material, transforming the seal material into a seal which joins the substrates, filling the cavity of the sealed substrate assembly with a material through the fill gap opening to form a display area, sealing the fill gap opening, and forming the display by precisely reducing an edge of the sealed substrate assembly to the outline dimension of the display, wherein the precision reduction is performed parallel to the respective outer edges of the seal and reduces a width of the seal. The display obtained by this method can evidently be designated as a "thin seal display".

1.2 Therefore the subject-matter of present claim 1 differs from this prior art in that instead of one edge, "edges" of the sealed substrate assembly are reduced. This measure solves the problem of positioning of a

liquid crystal display (LCD) in close proximity to similar LCD's to facilitate the construction of large area tiled display systems having a substantially seamless appearance, see patent specification, column 2, lines 25 to 47.

1.3 A similar problem is mentioned in D14, see D14a, page 4, lines 4 to 26. Since D14 generally concentrates on edges (see D14a, page 6, lines 6 to 10, and Figure 1) to which the electrode patterns 13b extend to constitute terminal electrodes 13c, it was, if not clear teaching, in any case obvious to the skilled person to reduce any edge to which electrodes extend. This would for the majority of liquid crystal displays mean that "edges" were reduced in accordance with the wording of present claim 1. But, even if the interpretation of the proprietor were accepted that "edges" in claim 1 referred to all edges in view of the further definition "to the outline dimension" (see last paragraph of claim 1), it would be obvious for the skilled person to reduce all edges for removing inactive spaces between adjacent elements in liquid crystal display systems. In D14 (see D14a, sentence bridging pages 6 and 7) the cut is performed "along the outer edge of the sealing agent 14, or along a line that is slightly inwardly deviated from the outer edge". It was obvious for the skilled person to select the latter alternative, which corresponds to the last feature of present claim 1, since this provides for further reduction.

1.4 The arguments of the proprietor relating to the difference in the number of edges claimed and

considered in D14 have been dealt with implicitly by the above reasoning of the Board.

1.5 A further argument, that D14 did not clearly disclose a reduction of the seal, because cutting "slightly inwardly deviated from the outer edge" was only found at one location in D14, can also not be accepted in view of Figure 1 of D14 showing a line A-A in the centre of the seal 14, along which the cut is performed, see D14a, page 6, sentence bridging pages 6 and 7. The proprietor's opinion, that it was not the intention in D14 to reduce the seal in accordance with an alternative, is therefore not convincing.

1.6 Moreover, the proprietor has argued that reduction of the width of the seal would not be possible in D14 at the edge carrying a plug on the liquid crystal injection hole. This hole would be opened during cutting through the seal. In contrast to that, in the present patent there is described a fill gap opening which is suitable for the cutting step. The Board is, however, convinced that the skilled person was able to find a solution for sealing the injection hole, which is compatible with a reduction of the seal. In contrast to the edge at which the terminal electrodes are arranged, the plug is drawn rather schematically in Figure 1 of D14 and not described in detail. A more realistic plug would extend into the hole deep enough to allow reduction of the sealed substrates without causing a leak.

1.7 Therefore, while taking due account of the essential arguments of the proprietor, it follows that the subject-matter of claim 1 according to the main request

does not involve an inventive step within the meaning of Article 56 EPC.

2. *Auxiliary Request I*

2.1 Claim 1 according to this request recites in addition the feature that the reduction is performed parallel to the respective outer edge of the seal. The proprietor has argued in support of this request that the corresponding outer edge in D14, Figure 1, is not a straight line due to the projecting conducting elements 16.

2.2 However, the Board agrees with the opponent that the feature is trivial since it is the general direction of the outer edge of the seal to which the reduction is related. Such a general direction of the outer edge of the seal 14 can be identified in D14, Figure 1, by the skilled person in an obvious manner.

2.3 Therefore the subject-matter of claim 1 according to the auxiliary request I does not involve an inventive step.

3. *Auxiliary Request II*

3.1 Claim 1 according to this request defines in addition to cutting a step of grinding the cut substrate assembly to the final outline dimension. The proprietor submitted in support of this request that only an ex-post-facto analysis of D14 leads to the claimed subject-matter, since D14 is directed to the connection of the electrodes of a liquid crystal display with a flexible printed circuit board. No precision grinding

is needed in D14, whereas the present patent is concerned with further reduction of the seal.

3.2 The Board, however, agrees with the opinion of the opponent that it was common technique in the field of liquid crystal displays to grind coarsely cut display elements to the final dimension, e.g. in order to fit them in a frame. The subject-matter of claim 1 according to this request was thus obvious to the skilled person.

3.3 Therefore the subject-matter of claim 1 according to the auxiliary request II does not involve an inventive step.

4. *Auxiliary Request III*

4.1 Claim 1 of this request specifies in addition to the main request that the edges are circumferential and that the reduction is performed along a circumferential line. The proprietor has argued that these features serve the purpose of distinguishing the claimed subject-matter more clearly from D14 being concerned only with the reduction of inactive zones due to terminal electrodes. This argument is not accepted by the Board which is satisfied that it was obvious to the skilled person to perform reduction of all edges.

4.2 Therefore the subject-matter of claim 1 according to the auxiliary request III does not involve an inventive step.

5. *Auxiliary Request IV*

Claim 1 of auxiliary request IV comprises additional features directed to the forming of additional contacts on the edge of the reduced substrate assembly. This aspect had not been discussed earlier in the appeal procedure. Auxiliary request IV had indeed been filed for consideration by the opposition division, but it was withdrawn at the beginning of the oral proceedings before the opposition division, and submitted again only during the oral proceedings before the Board. Since there had not been the slightest indication at any earlier stage in the proceedings that a request abandoned before the first instance would be reintroduced at the very end of the appeal procedure, the Board's view is that this late request can not be considered admissible.

6. *Conclusion*

The Board concludes that a ground for opposition under Article 100 EPC prejudices the maintenance of the patent according the main and auxiliary requests I to III. The auxiliary request IV is not admitted into the proceedings in accordance with Article 114(2) EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

E. Görgmaier A. G. Klein