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D E C I S I O N
of 23 March 2004

Case Number: T 0893/99 - 3.4.2

Application Number: 93300716.3

Publication Number: 0554130

IPC: G02F 1/1335

Language of the proceedings: EN

Title of invention:
Liquid crystal display device

Applicant:
SHARP KABUSHIKI KAISHA

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56
EPC R. 29(6), 86(4)

Keyword:
"Inventive step - yes (after amendment)"
"Admissibility of a claim comprising a reference to a figure (yes)"

Decisions cited:
T 0442/95

Catchword:
-

Case Number: T 0893/99 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 23 March 2004

Appellant: SHARP KABUSHIKI KAISHA
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Decision under appeal: Decision of the Examining Division of the European Patent Office posted 29 June 1999 refusing European application No. 93300716.3 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: A. G. Klein
Members: M. A. Rayner
M. J. Vogel

Summary of Facts and Submissions

I. The patent applicant has appealed against the decision of the examining division refusing European patent application number 93300716.3 with a priority date of 30 January 1992 and concerning liquid crystal display devices using optical compensation plates.

II. The decision under appeal made reference to a number of documents including the following:

D1 WO-A-90/11546

D2 EP-A-424 951

D3 EP-A-478 383 (priority date 28 September 1990, published on 1 April 1992)

D4 EP-A-412 844

In the decision, of the issues addressed and having regard to the amendments made during the appeal proceedings, the following are pertinent to the present appeal decision.

(a) *Rule 86(4)*

An objection arose against a claim containing coefficients (K1,K2 substantially zero) not specifically claimed but deriving from the description, the division arguing the search examiner would not have included this in the search. The claim concerned was thus inadmissible in the light of Rule 86(4), parts of the claim concerned common to originally filed claims

not being suitable to establish a general inventive concept. The division saw a correspondence with appeal decision T 442/95.

(b) *Substantive Patentability*

In its assessment of novelty, the division acknowledged that none of documents D1 to D4 remove novelty from the in its view admissibly claimed subject matter.

In the view of the examining division, documents D1 and D2 disclose the same components of liquid crystal display stacked in the same order as claimed in the patent application, the former teaching selection of films according to three dimensional refractive index.

Document D4 discloses that when aiming to compensate the birefringence of a supertwisted liquid crystal cell via compensator plates and stretched films, the 3-D distribution of retardation of birefringent LC material has to be taken into account and that using a description of the birefringent films based on 3-D description of the refractive index of the film can be used to obtain optimum compensation. Document D4 discloses embodiments having several films piled up and twisted with regard to each other, but it also discloses in Figure 20 at least one embodiment having one film and not a pile of films. Thus the gist of document D4 is apparently the solution of the well known compensation problem. The ranges claimed in the application are the result of a straightforward compensation of the viewing angle, which optimisation is also the problem addressed by the teachings of document D1 and D4.

III. In the written appeal proceedings, the appellant requested oral proceedings on an auxiliary basis and such proceedings were appointed consequent thereto by the board. The case of the appellant can be summarised as follows.

(a) *Requests*

The appellant requests grant of a patent based on claims 1-4 filed during the oral proceedings.

The independent claims upon which the request of the appellant are based are worded as follows:

1. A liquid crystal display device (12) consisting of a first polariser plate (8), a first optical compensation plate (9) formed of a first uniaxially stretched polymer film, a second optical compensation plate (10) formed of a second uniaxially stretched polymer film, a supertwisted nematic type liquid crystal display panel (1, 2, 3, 4, 5, 6, 7) and a second polariser plate (11) which are stacked in the foregoing order such that the slow axis of the first optical compensation plate (9) is at 60° clockwise to the absorption axis of the first polariser plate (8); such that the slow axis of the second optical compensation plate (10) is at 25° clockwise to he absorption axis of the first polariser plate (8); such that the rubbing axis of the first substrate (1) is at 60° anticlockwise to the absorption axis of the first polariser plate (8); such that the rubbing axis of the second substrate (7) is at 60° clockwise to the absorption axis absorption axis of the first polariser

plate (8); and such that the absorption axis of the second polariser plate (11)is at 105° clockwise to the absorption axis of the first polariser plate, wherein the on-axis retardation of the first and second optical compensation plates are selected to cancel the on axis retardation of the liquid crystal display panel;
wherein the uniaxially stretched polymer films exhibit anisotropic optical properties defined by mutually orthogonal refractive indices denoted X and Y in directions parallel to the film plane and Z in a direction normal to the film plane; and
wherein coefficients K1 and K2 of the uniaxially stretched polymer films forming the first and second optical compensation plates, respectively, are set in the area defined in Figure 10 by the lines K=0, K2=1, K1=-1 and by the line L3, whereby the coefficients of the first and second optical compensation plates are selected to be adapted to the change in retardation with elevation of the liquid crystal display panel;
wherein the coefficient K1, denoting the rate of retardation change of light viewed through the first polymer film as the inclination of the viewing direction changes, is determined by
(a) $K1=1-(Z-Y)/(X-Z)$ when $(X+Y)/2>Z$ and $X\neq Z$
(b) $K1=(X-Z)/(Z-Y)-1$ when $(X+Y)/2<Z$ and $Z\neq Y$
(c) $K1=0$ when $(X+Y)/2=Z$;
where X, Y and Z are the refractive indices of the first polymer film;
and wherein the coefficient K2, denoting the rate of retardation change of light viewed through the second polymer film as the inclination of the viewing direction changes, is determined by
(a) $K2=1-(Z-Y)/(X-Z)$ when $(X+Y)/2>Z$ and $X\neq Z$
(b) $K2=0$ when $(X+Y)/2=Z$;

where X, Y and Z are the refractive indices of the second polymer film.

2. A liquid crystal display device consisting of a first polariser plate (8), a first optical compensation plate (9) formed of a uniaxially stretched polymer film, a second optical compensation plate (10) formed of a uniaxially stretched polymer film, a supertwisted nematic type liquid crystal display panel (1, 2, 3, 4, 5, 6,) and a second polariser plate (11) which are stacked in the foregoing order such that the slow axis of the first optical compensation plate (9) is at 60° clockwise to the absorption axis of the first polariser plate (8); such that the slow axis of the second optical compensation plate (10) is at 25° clockwise to he absorption axis of the first polariser plate (8); such that the rubbing axis of the first substrate (1) is at 60° anticlockwise to the absorption axis of the first polariser plate (8); such that the rubbing axis of the second substrate (7) is at 60° clockwise to the absorption axis absorption axis of the first polariser plate (8); and such that the absorption axis of the second polariser plate (11)is at 105° clockwise to the absorption axis of the first polariser plate, wherein the on-axis retardation of the first and second optical compensation plates are selected to cancel the on axis retardation of the liquid crystal display panel;
the uniaxially stretched polymer films exhibit anisotropic optical properties defined by mutually orthogonal refractive indices denoted X and Y in directions parallel to the film plane and Z in a direction normal to the film plane;
wherein coefficients K1 and K2 of the uniaxially stretched polymer films forming the first and second

optical compensation plates are in the area defined in Figure 10 by the lines K2=-1, K2=0, K1=-1 and by the line L3 whereby the coefficients of the first and second optical compensation plates are selected to be adapted to the change in retardation with elevation of the liquid display panel;
wherein the coefficient K1, denoting the rate of retardation change of light viewed through the first polymer film as the inclination of the viewing direction changes, is determined by
$K1=(X-Z)/(Z-Y)-1$ when $(X+Y)/2<Z$ and $Z\neq Y$
where X, Y and Z are the refractive indices of the first polymer film;
and wherein the coefficient K2, denoting the rate of retardation change of light viewed through the second polymer film as the inclination of the viewing direction changes, is determined by
(a) $K2=(X-Z)/(Z-Y)-1$ when $(X+Y)/2<Z$ and $Z\neq Y$
(b) $K2=0$ when $(X+Y)/2=Z$;
where X, Y and Z are the refractive indices of the second polymer film.

3. A liquid crystal display device consisting of a first polariser plate (8), a first optical compensation plate (9) formed of a uniaxially stretched polymer film, a second optical compensation plate (10) formed of a uniaxially stretched polymer film, a supertwisted nematic type liquid crystal display panel (1, 2, 3, 4, 5, 6,) and a second polariser plate (11) which are stacked in the foregoing order such that the slow axis of the first optical compensation plate (9) is at 55° clockwise to the absorption axis of the first polariser plate (8); such that the slow axis of the second optical compensation plate (10) is at 25° clockwise to

he absorption axis of the first polariser plate (8); such that the rubbing axis of the first substrate (1) is at 55° anticlockwise to the absorption axis of the first polariser plate; such that the rubbing axis of the second substrate (7) is at 65° clockwise to the absorption axis of the first polariser plate; and such that the absorption axis of the second polariser plate (11) is at 110° clockwise to the absorption axis of the first polariser plate (8), wherein the on-axis retardation of the first and second optical compensation plates are selected to cancel the on axis retardation of the liquid crystal display panel;
the uniaxially stretched polymer films exhibit anisotropic optical properties defined by mutually orthogonal refractive indices denoted X and Y in directions parallel to the film plane and Z in a direction normal to the film plane;
wherein coefficients K1 and K2 of the uniaxially stretched polymer films forming the first and second optical compensation plates are in the area defined in Figure 10 by the lines K2=-1, K2=0, K1=-1 and by the line L3 whereby the coefficients of the first and second optical compensation plates are selected to be adapted to the change in retardation with elevation of the liquid display panel;
wherein the coefficient K1, denoting the rate of retardation change of light viewed through the first polymer film as the inclination of the viewing direction changes, is determined by
$K1=(X-Z)/(Z-Y)-1$ when $(X+Y)/2<Z$ and $Z\neq Y$
where X,Y and Z are the refractive indices of the fist polymer film;
and wherein the coefficient K2, denoting the rate of retardation change of light viewed through the second

polymer film as the inclination of the viewing direction changes, is determined by
(a) $K2=(X-Z)/(Z-Y)-1$ when $(X+Y)/2<Z$ and $Z\neq Y$
(b) $K2=0$ when $(X+Y)/2=Z$;
where X, Y and Z are the refractive indices of the second polymer film.

4. A liquid crystal display device (13) consisting of a first polariser plate (8), a first optical compensation plate (9) formed of a uniaxially stretched polymer film, a supertwisted nematic type liquid crystal display panel (1, 2, 3, 4, 5, 6, 7), a second optical compensation plate (10) formed of a uniaxially stretched polymer film and a second polariser plate (11) which are stacked in the foregoing order such that the slow axis of the first optical compensation plate (9) is at 35° clockwise to the absorption axis of the first polariser plate (8); such that the rubbing axis of the first substrate (1) is at 40° anticlockwise to the absorption axis of the first polariser plate (8); such that the rubbing axis of the second substrate (7) is at 80° clockwise to the absorption axis of the first polariser plate (8); such that the slow axis of the second optical compensation plate is at 10° clockwise to he absorption axis of the first polariser plate (8); and such that the absorption axis of the second polariser plate (11) is at 50° anticlockwise to the absorption axis of the first polariser plate (8), wherein the on-axis retardation of the first and second optical compensation plates are selected to cancel the on axis retardation of the liquid crystal display panel; the uniaxially stretched polymer films exhibit anisotropic optical properties defined by mutually orthogonal refractive indices denoted X and Y in

directions parallel to the film plane and Z in a direction normal to the film plane;
wherein coefficients K1 and K2 of the uniaxially stretched polymer films forming the first and second optical compensation plates are both zero whereby the coefficients of the first and second optical compensation plates are selected to be adapted to the change in retardation with elevation of the liquid display panel;
wherein the coefficient K1, denoting the rate of retardation, change of light viewed through the first polymer film as the inclination of the viewing direction changes, is determined by

K1=0 when (X+Y)/2=Z;

where X, Y and Z are the refractive indices of the first polymer film;
and wherein the coefficient K2, denoting the rate of retardation change of light viewed through the second polymer film as the inclination of the viewing direction changes, is determined by

K2=0 when (X+Y)/2=Z;

where X, Y and Z are the refractive indices of the second polymer film.

(b) *Arguments*

Admissibility

In the amended claims, the structure of the LCD is in accordance with the original claims, orientations being as shown in Figure 2, 13 or 17, the K-definitions being derived from column 7 of the published patent, on-axis retardation from column 6, line 54 to column 7, line 4

and coefficient selection from column 9, lines 3 to 4, Figure 10 and column 12 line 52.

Rule 86(4)

The examining division provided no real justification for its statement that the subject matter of claim 3 was not searched, should internal documents have been used, the applicant was given no opportunity to comment. The feature K1, K2 is equal to zero is consistent with the invention and simply a restriction of the originally claimed range.

(c) *Substantive Patentability*

Examples 14 to 26 of document D1 cited by the examining division in relation to inventive step all have one birefringent plate with K=2, which is excluded by the claims. The teaching cannot therefore lead to the invention.

Document D2 contains absolutely no reference at all to three dimensional refractive indices and thus provides no teaching that would have led the skilled person to the invention.

Document D3 which is citable only in the context of Article 54(3) EPC discloses compensator plates on both sides of the LC and so cannot anticipate any of claims 1 to 3, where the LCD device has two plates on one side of the LC. For the embodiment disclosed in Figure 6, there is no disclosure of K=0, so that claim 4 cannot be anticipated.

Document D4 initially addresses the problem of suppressing colouring effects in an LC device, and again initially considers (in its acknowledgement of the prior art starting at page 3, line 20) the use of a single polymer film to compensate for colouring effects. Document D4 then goes on to state that the retardation of a phase plate varies with the viewing angle and, furthermore, varies in a different manner along the stretch direction (of a stretched polymer film) than in a direction perpendicular to the stretch direction (see page 3, lines 23 to 39 and Figure 1) - this is the meaning of the reference in document D4 that "three-dimensional refractive indices should be taken into consideration", which is the only reference to three dimensional refractive indices in document D4. Document D4 then discloses that if a single phase plate is used with an LC panel, the resultant device will have a narrow viewing angle - see page 2, lines 50 to 54. This is exactly the same as the problem described in the present application. However, although document D4 and the present application identify the same problem, they present entirely different solutions to this problem. Document D4 primarily proposes devices where an LCD should have a "stack" of many optical compensation plates, as shown in Figure 6 of document D4. Document D4 gives no teaching about the three dimensional refractive indices of the plates in this stack. Thus, the statement in document D4 that "three-dimensional refractive indexes should be taken into consideration when the viewing angle characteristics of a phase difference plate is to be reviewed" is not teaching a skilled person to choose the phase plates on the basis of their three-dimensional refractive indices. Instead, Document D4 is simply stating that the three

dimensional refractive indexes of the phase plates will, if only one polymer film is provided, lead to a display device that has a small viewing angle, and document D4 then teaches away from the invention by proposing the use of stacks of many phase difference plates.

With respect to Figure 20 of document D4, there is shown a device having two phase difference plates 53 and 55, one disposed on either side of an LC panel 54. The description of this embodiment does not mention the coefficients K1, K2 of the phase difference plates 53 and 55, nor does it even give any information by which they can be determined. The discussion of the embodiment of Figure 20 of document D4 is in fact clearly directed to improving the viewing angle by arranging the axes of the various components in specific ways. In examples 5a to 5e at pages 18 and 19 of document D4, quantities that are varied are the angles between the axes of the components. Furthermore, claim 12 of document D4 indicates that this embodiment is directed to the angles between the various components of the device.

Thus, document D4 provides two solutions to the problem addressed by the present application, namely (1) to use a stack of many phase difference plates or (2) to use two phase difference plates oriented in specific orientations relative to one another and relative to the liquid crystal panel. The invention, however, adopts a completely different solution, which is to use two optical compensation plates and select the coefficients K1, K2 of the plates to provide a wide viewing angle. This solution is not suggested in document D4 - the description of the preferred

embodiments of document D4 does not refer anywhere to the coefficients K1, K2 of the plates. There is no suggestion in document D4 that the viewing angle range can be further improved by choosing the coefficients of the phase difference plates in the manner taught in the present invention.

Therefore, it must be concluded that the examining division did not shown how a skilled person would go from the vague statement in document D4 to the claimed subject matter except with the use of hindsight.

In view of the foregoing, and having regard to advantages of the configurations claimed in relation to a lightweight device and obtaining a clear achromatic display with sufficient contrast in a wide range of a viewing angle, the subject matter of the independent claims is both novel and can be considered to involve an inventive step.

IV. Oral proceedings were held on 23 March 2004 at the end of which the board gave its decision.

Reasons for the Decision

1. The appeal complies with the provisions mentioned in Rule 65(1) EPC and is therefore admissible.

2. *Admissibility of amendments*

2.1 The position of the appellant in relation to support for amendments made in the documents as filed is

correct in the view of the board. Consequential amendments to the description have been made in an admissible way. Thus Article 123(2) EPC can be considered satisfied.

3. *Clarity of claims*

3.1 Each of the independent claims describes specific configurations of liquid crystal display devices of the commonly used supertwisted nematic type. Although claims 1 to 3 make reference to Figure 10, this feature can exceptionally be considered admissible because the area specified with reference to the line L3 cannot be defined in any other way (see Rule 29(6) EPC, first sentence).

4. *Rule 86(4)*

Since claim 4 amounts to a limitation of a range in an originally searched claim and derives from a specific value disclosed for a specific embodiment, the board can see no reason why the search examiner would not have searched the field concerned for the subject matter. Nor can the board see any reason to speculate about the possibility of material in this connection in the file not being public. At all events, the board does not see a parallel to T 442/95 as in that case the board concerned considered the subject matter of the amended claim different (one entity as opposed to two). On the other hand, in the present case K values of two compensation plates are involved in the claims, which does not point to a lack of unity.

The board does not therefore consider that any bar to consideration of claim 4 involving K1,K2 equal to zero is provided by Rule 86(4).

5. *Prior art documents*

5.1 Document D1

This document discloses a nematic liquid crystal having positive dielectric anisotropy interposed between a pair of substrates with transparent electrodes each having an aligning layer which are arranged substantially in parallel to provide a twist angle of 160°-300°, a driving means to apply a voltage across the electrodes attached to the substrates which interpose the liquid crystal layer, a pair of polarizing plates arranged outside the liquid crystal layer, and at least one birefringent plate provided between the liquid crystal layer and the polarizing plate on at least one side of the liquid crystal layer. While the document has some 87 pages of description, thirty examples and ten comparative examples, only comparative examples 8 and 9 and examples 14, 15, 17 to 19 have a configuration with two uniaxial plates on the same side of the LC (see also Figure 14). Here, because X=Y the plate designated F2 always has, as is derivable from the Tables on pages 83 and 84, one K value of magnitude 2. Relative angular configuration of LC to polarisers and plates are given as 45°, 95° and 135°, and 30° is mentioned for polariser crossing in Figure 14 as is 90°. Where a plate is on either side of the LC as in comparative example 5 and examples 6 to 8 (see also Figure 13), it can be seen from the Tables on pages 81 and 82 that (X+Y)/2 is never zero. Parallel

and perpendicular polariser crossing is mentioned for Figure 13.

5.2 Document D2

This document discloses a liquid crystal display comprising a liquid crystal element (10), at least two birefringent films (7, 8) and a pair of polarizing sheets (1, 9). The liquid crystal element (10) comprises a cell of two sheets of substrates (2, 6) and a twisted nematic liquid crystal (4), each substrate being provided with an electrode (3, 5) on one surface thereof. The substrates are arranged so that the electrodes are opposed to each other and the twisted nematic liquid crystal is between the electrodes. The birefringent films are composed of at least one uniaxially stretched film of a polymer having a positive intrinsic birefringence and light transmission properties and at least one uniaxially stretched film of a polymer having a negative intrinsic birefringence and light transmission properties. The relative angle between the horizontal axis 20 and the polarization axis 21 of the first polarizing sheet is 90° and the relative angle between the horizontal axis and the polarization axis 22 of the second polarizing sheet is 40°. The relative angle between the polarization axis 21 of the first polarizing sheet and the rubbing direction 23 of the transparent electrode 3 substrate is 45° (see Figures 1 and 2).

5.3 Document D3

This document discloses a liquid crystal display apparatus which includes a supertwist type liquid

crystal panel (1) including a liquid crystal layer (8) provided between first and second transparent substrates (2, 3). A first phase plate group (11; 13, 14) including at least one uniaxially stretched polymer film is arranged on the outer surface of the first substrate (2) and a first polarizing plate (9) is arranged on the first phase plate group (11; 13, 14). A second phase plate group (12; 15, 16) including at least one uniaxially stretched polymer film is arranged on the outer surface of the second substrate (3) and a second polarizing plate (10) is arranged on the second phase plate group (12; 15, 16). At least one of the uniaxially stretched polymer films (11, 12; 13, 14, 15, 16) has positive optical anisotropy and the others have negative optical anisotropy. Specific K values are not present in document D3, but refractive index values given in the section bridging columns 4 and 5 do not satisfy (X+Y)/2=0 and the description of Figure 6, concerning a single upper and lower phase plate, indicates that these are negative and positive.

5.4 Document D4

This document includes a discussion of colour compensation utilising the property of the high polymer film in which there is a difference in refractive index between the direction along which it is extended and the direction perpendicular to the extension. Three-dimensional refractive indexes should be taken into consideration when the viewing angle characteristic of a phase difference plate is to be reviewed. The underlying idea in document D4 is to provide on both sides of the LC a plurality of phase difference plates piled on each other in such a way that their

retardations are added, the cross angle between the slow axis of a phase difference plate at the first layer and the slow axis of a phase difference plate at the nth layer being 20° or more, the slow axes of phase difference plates at the second layer to the (n-1)th layer falling within the cross angle. In Figure 20, there is also an arrangement with just one phase difference plate (53 or 55) on either side of the LC. It can be seen from Figure 21 that the slow axis of the lower plate is anticlockwise of the upper polariser. Moreover, the polarising axis of the second polariser is well over 50° anticlockwise of the first polariser.

6. *Novelty*

None of the prior art documents disclose coefficients of configurations of the first and second optical compensation plates meeting the requirements specified in the claims for K values which are selected to be adapted to the change in retardation with elevation of the liquid display panel. Accordingly, even without going into the details of the angular component configurations, at least for this reason the subject matter of all the independent claims is novel.

7. *Inventive step*

7.1 The problem solved by the selection of K values claimed is to improve viewing performance of particular configurations of supertwist type liquid crystal display. The board of appeal has no information at its disposal which could give it a reason not to accept the submissions of the appellant in relation to advantages of the configurations claimed in relation to a

lightweight device and obtaining a clear achromatic display with sufficient contrast in a wide range of a viewing angle.

7.2 Earlier European patent application document D3 cannot be taken into account in assessment of inventive step as it was published after the priority date of the application under appeal and is thus relevant only under Article 54(3) EPC in the context of novelty.

7.3 The board therefore considers document D1 to represent the closest prior art because it deals specifically with three dimensional refractive indices. While it is true that the skilled person tries to optimise viewing characteristics, the board does not consider the suggestion in document D4 would have motivated the skilled person towards the invention as it does not add anything to the teaching of document D1, three dimensional refractive index considerations already being included without the suggestion. Thus the teaching of document D1 would have been followed directly. Document D2 does not contain any information which could be considered to move any combination of the teachings towards the invention. The subject matter of the claims was therefore not obvious to the skilled person.

7.4 Starting from document D4, the board considers it enough to comment that it finds the approach of the appellant to inventive step persuasive (see section III(c) above). In the case of present claim 4, it can be added that some aspects of the angular configuration are similar to Figure 20 of document D4. Although one might therefore wonder whether K1=K2=0,

such speculation is hindsight driven as is also the case with speculation about results of optimisation in connection with the other claims, there simply being no information available calling into question the approach of the appellant in relation to inventive step. Furthermore, if the skilled person added teaching from document D1 to that of document D4, then the result would again be no closer to the claimed subject matter than document D1. Thus, this approach again does not render obvious the subject matter of the claims to the skilled person.

7.5 Accordingly, the board reached the view that the subject matter of claims 1 to 4 can be considered to involve an inventive step within the meaning of Article 56 EPC.

8. *Article 111(1) EPC*

Having regard to the amendments made during the appeal proceedings, the board was therefore satisfied that the application documents meet the requirements of the Convention. The board therefore considered exercising power within the competence of the department which was responsible for the decision under appeal to be appropriate.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a patent on the basis of the following documents:
claims, 1 to 4 filed during the oral proceedings;
description, pages 3 to 5, 9, 10, 18, 23, 24, 26, 27, 29, 30 filed during the oral proceedings;
description, pages 1, 2, 6 to 8, 11 to 17, 19 to 22, 25, 28 as originally filed
drawings, sheet 10/22 filed during the oral proceedings;
drawings, sheets 1/22 to 9/22, 11/22 to 22/22, as originally filed.

The Registrar: The Chairman:

P. Martorana A. G. Klein