

PATENTS ACT 1977

IN THE MATTER OF

Patent Application No GB9714832.4

in the name of LG Electronics Inc.

DECISION

Introduction

1. Patent Application GB9714832.4 was filed on 14 July 1997 claiming the priority date of 29 July 1996 from Korean Application No KR96030940. The application was published as GB2315875A.

2. Combined search and examination were requested and in the first report issued under sections 17 and 18 of the Patents Act 1977 on 23 October 1997 the examiner objected, *inter alia*, that the invention of one of the claims, claim 20, was not clearly and sufficiently disclosed in the description and was not supported by the description. In a response dated 29 July 1998 LG Electronics Inc's agents, Edward Evans & Co, refuted these objections. Further correspondence between the examiner and agents failed to resolve the matter which came before me at a hearing on 17 August 1999. The applicant was represented by Mr M Foster, assisted by Miss R Peacock and Mr G Pitchman attended as examiner.

The application

3. The application is entitled "A method for manufacturing a multi-domain liquid crystal cell" and relates to methods of forming an alignment layer for a liquid crystal device by irradiation of a photosensitive layer in which different parts of the layer are subjected to different doses of radiation to cause the alignment direction to vary over the area of the layer.

The opening paragraph reads:-

"The present invention relates to a method for manufacturing a multi-domain liquid crystal cell, and more particularly to a method for manufacturing a multi-domain liquid

crystal cell in which the liquid crystal director is aligned by irradiating an alignment layer with light."

The description goes on to explain that liquid crystal displays generally include two transparent substrates with liquid crystal material injected into the space between them. Alignment of the LC molecules is achieved by providing an alignment layer, typically a specially treated polymer, on the substrate and if a plurality of binary domains are provided on the surface of the layer a uniform viewing angle is obtained. Alignment has been achieved by a rubbing process to form mechanically microgrooves in the polymer layer, intermolecular interaction between the polymer and the liquid crystal molecules resulting in the alignment of the latter. However defects in the microgrooves can result in light scattering and phase distortion and dust and electrostatic discharges are produced in the alignment layer. As an alternative LC alignment has been effected by irradiation of the polymer with polarized light. In the present invention a photoalignment process is used to create an array of domains where the easy orientation axes of the liquid crystal molecules lie in two orthogonal directions.

4. Two objects of the invention are given :-

- (1) to provide a simple method for producing binary multi-domain directional alignment in an LC cell, which does not possess the drawbacks of known methods, and
- (2) to create binary multi-domain directors in an alignment layer without any rearrangement of the optical scheme.

5. The next paragraph reads :-

"It has been discovered that the initial easy axis of the polymer caused in photoalignment techniques change (sic) sharply by 90° when the intensity or dose of incident light exceeds a particular threshold."

6. The following statements of invention are then listed:-

"Thus, in accordance with the present invention a method for controlling the alignment direction is provided, comprising the steps of coating a substrate with an alignment layer of a photosensitive material; irradiating the alignment layer with a first energy dose of light to impart a first alignment direction; irradiating the alignment layer

with a second energy dose of light to impart a second alignment direction, the second alignment direction being perpendicular to the first alignment direction.

In addition, the method of fabricating a multi-domain LC cell using the substrate made from the above method comprises the step of providing a first substrate and a second substrate, the first substrate is covered with a first alignment layer and the second substrate is covered with a second alignment layer; irradiating the first and second alignment layers with light to impart different alignment directions depending upon the light energy dose absorbed in each domain; assembling a cell from two substrates where the alignment layers face one another; and injecting LC material between the first and second substrates. Control of the energy dose absorbed in each domain can be achieved by varying the radiation intensity or duration.

According to another aspect of the present invention, the photosensitive material for the alignment layer comprises polymers illustrated in FIGs. 1-4."

7. The description has eight accompanying drawings. Figures 1-4 show the chemical structures of four suitable photoalignment materials adopted in the invention, Figures 5 and 6 show the device for controlling alignment in accordance with the invention, Figure 7 illustrates the two domain twisted nematic structure of the invention and Figure 8 shows a graph of photo-energy against alignment directions.

8. The particular description describes the irradiation of polysiloxane cinnamates by polarised nonfiltered light in which an easy axis is created parallel to the direction of polarisation of the light and either the intensity of the light or the exposure time may be increased to create an easy axis in the perpendicular direction. This is followed by the following paragraph:-

"In accordance with the present invention, these materials, and other such compounds, can thus be used to control the easy axes direction on an alignment surface by changing the irradiation dose of light to produce a binary multi-domain direction orientation in an LC cell. Further, multi-domain LCDs can be readily created with wide viewing angle characteristics while reducing the number of photomasks used in the process, and without rearranging the optical scheme or exposure apparatus during domain fabrication. Moreover, the present invention can be used to manufacture high density

optical information storage cell where information is encoded in accordance with the binary direction of the easy axis."

9. In one embodiment the different axes are achieved using the apparatus shown in figures 5 and 6 where a photomask having regions with two different transmissivities is used to adjust the radiation dose applied to the photosensitive layer to produce first portions which impart in an adjacent LC material an easy axis parallel to the direction of polarisation of the incident light and second portions which impart an easy axis perpendicular to this. In a second embodiment the exposure time is controlled to produce the orthogonal easy axes.

10. Following the description of these embodiments it is stated that :-

"The method according to the present invention can be used for information storage in an LC cell where optical information is recorded as a binary code by producing pixels with LC molecules oriented orthogonal directions.

In accordance with the present invention, a binary domain LCD with wide viewing angle characteristics can be obtained"

11. The preferred embodiment of the invention is then described with reference to six examples which all relate to the manufacture of liquid crystal cells.

12. The final two paragraphs of the description read :-

"It will be apparent to those skilled in the art that various modifications and variations can be made in the method for manufacturing a liquid display of the present invention without departing from the scope or spirit of the invention.

Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims."

13. The original application had 4 independent claims, claim 1, claim 9, claim 20 and claim 24. These read as follows:-

claim 1 A method for controlling an alignment direction in an LC cell,

comprising the steps of:

providing a substrate coated with a photosensitive alignment layer;

subjecting a first portion of the said photosensitive alignment layer to a first energy dose to impart a first alignment direction in said first portion of said photosensitive alignment layer; and

subjecting a second portion of said alignment layer to a second energy dose to impart a second alignment direction in said second portion of said photosensitive alignment layer.

claim 9 A method of fabricating a multi-domain LC cell, comprising the steps of:
providing a first substrate coated with a first alignment layer;
subjecting a first region of said first alignment layer to a first energy dose of light to impart a first alignment direction;
subjecting a second region of said first alignment layer to a second energy dose of light to impart a second alignment direction;
providing a second substrate with a second alignment layer;
positioning said first substrate adjacent said second substrate such that said first and second layers face one another; and
injecting LC material between said first and second substrates.

claim 20 A method for storing information in a photosensitive layer comprising the steps of:
exposing a first portion of said photosensitive layer to a first dose of radiation corresponding to a first information; and
exposing a second portion of said photosensitive layer to a second dose of radiation different from said first dose and corresponding to a second information.

claim 24 A method for controlling an alignment direction in an LC cell,
comprising the steps of:
providing a substrate coated with a photosensitive alignment layer;
subjecting said photosensitive alignment layer to a first energy dose to impart a first alignment direction; and
subjecting said photosensitive alignment layer to a second dose to shift the first alignment direction to a second alignment direction.

During the examination process claim 20 (the claim against which objection was raised) was amended and renumbered as claim 18. It now reads:-

claim 18 A method for storing information in a photosensitive layer, the method comprising the steps of:-
exposing a first region of a photosensitive layer to a first energy dose of radiation corresponding to a first information, wherein said first energy dose of radiation imparts a first orientation in said first region of said photosensitive layer; and
exposing a second region of a photosensitive layer to a second dose of radiation different from said first energy dose of radiation and corresponding to a second information, wherein said second energy dose of radiation imparts a second orientation in said second region of said photosensitive layer.

The law

14. The relevant parts of section 14 read:-

14(3) The specification of an application shall disclose the invention in a manner which is clear enough and complete enough for the invention to be performed by a person skilled in the art.

14(5) The claim or claims shall -

.....

(b) be clear and concise;

(c) be supported by the description;

15. The meaning of "invention" is defined in section 125(1), viz :-

"For the purposes of this Act an invention for a patent for which an application has been granted shall, unless the context otherwise requires, be taken to be that specified in a claim of the specification of the application or patent, as the case may be, as interpreted by the description and any drawings contained in that specification, and the extent of the protection conferred by a patent or application for a patent shall be determined accordingly."

General principles and authorities

16. The concept of an enabling disclosure is central to the objections raised against claim 18. It was established by Lord Hoffman in *Biogen v Medeva* [1997] RPC 1, (applying the reasoning of Lord Oliver of Aylmerton in *Asahi Kasei Kogyo KK's Application* [1991] RPC 485) that:-

"a description would not "support" the claims for the purposes of subsection (5)(c) unless it contained sufficient material to enable the specification to constitute the enabling disclosure which subsection (3) required".

Consequently when there is dispute as to whether a claim is unduly broad and speculative having regard to what has been disclosed it may be difficult to decide whether the objection should be that the disclosure is incomplete or that the claim is not supported by the description. It was agreed at the hearing that, in respect of support, the correct approach was that stated by Aldous J, as he then was, in *Schering Biotech Corp's Application* [1993] RPC 249, namely:-

"Under section 125(1) the invention is that specified in the claims. Thus to decide whether the claims are supported by the description it is necessary to ascertain what is the invention which is specified in the claims and then compare that with the invention which has been described in the specification. I do not believe that the mere mention in the specification of features appearing in the claim will necessarily be sufficient support. The word "support" means more than that and requires the description to be the base which can fairly entitle the patentee to a monopoly of the width claimed"

In the present application the examiner has raised objections of both incompleteness and support and although these objections may be two sides of the same coin I consider that there are two issues to address. The first, which is directed more to compliance with section 14(3), is "Is there a clear and complete enough disclosure in the description of the method of storing information *in a photosensitive layer*?" The second, which is directed more to compliance with section 14(5)(c), is "Does the description support a claim of the width of claim 18?" I shall consider the two issues separately.

Section 14(3)

17. In support of his objection under section 14(3) the examiner argued that whilst the claim requires that the photosensitive layer acquire certain "orientations" as a result of irradiation, the specification contains no disclosure of re-orientation of the layer, and there is no evidence that the

photosensitive layer itself is caused to acquire first and second orientations as a result of irradiation. He maintained that, as yet, the effect of the irradiation on the layer is not understood by the person skilled in the art and, in these circumstances, the use of the word "orientation" to define what is happening to the layer is unclear. The description mentions "orientation" many times but always in the context of the liquid crystal. What is disclosed is a method in which the molecules of liquid crystal material adjacent a photosensitive layer treated with first and second doses of radiation acquire different orientations.

18. Mr Foster argued that the applicants had discovered the principle elucidated at page 5 line 21 - page 6 line 2 and quoted in paragraph 5 above. He accepted that a principle *per se* could not be patented but considered that the applicants were entitled to patent a way of using the principle. He maintained that there was an enabling disclosure of the method of claim 18 - the claim was directed to a method for storing information in a photosensitive layer and the description described one method for effecting this. The liquid crystal layer *per se* was entirely conventional and the alignment layer contained the stored information, whether or not the liquid crystal material was present. He agreed that the effect of the irradiation on the polymer layer was not as yet fully understood but considered that the term "orientation" was a fair description. He accepted that there was a problem with the claim but considered that it was as clear as it could be, given that what was happening in the layer was not known.

19. Whilst I accept that there is disclosure of irradiating a photosensitive layer with a first and second dose of irradiation I find it difficult to accept Mr Foster's argument that this amounts to an enabling disclosure of using the layer for storing information and in particular for storing information by imparting different "orientations" to different regions of the layer. I can understand Mr Foster's view that the word "orientation" is a convenient one to use in the circumstances. However it was agreed at the hearing that the effect of irradiation on the photosensitive layer is not generally understood. My understanding is that whilst the requisite orientation is imparted into the molecules of the liquid crystal material when the material is positioned adjacent a photosensitive layer which has been appropriately treated with light there is as yet no clear understanding of why this happens. Articles such as those referenced in the description describe the process of applying irradiation to a polymer alignment layer to produce

alignment in liquid crystal materials but, whilst there is speculation as to what might be happening in the alignment layer, the authors of these articles do not appear to have a clear idea of why alignment occurs. One definition in Chambers Science Technology Dictionary of the word "orientation" is "the ordering of molecules, particles, or crystals so that they point in a definite direction". In approaching the construction of claims it is clear from section 125(1) that one is entitled to read the specification to obtain the necessary background, and if necessary, the meaning of words. However, in the present circumstances no assistance is provided by the specification since, as the examiner stated, the word "orientation" is only used in the context of the liquid crystal material and its meaning in this context is clear. Therefore I consider that the use of this word in the context of the photosensitive layer is unclear since it may be construed as implying that the effect on this layer is known to be orientation of the molecules whereas, as stated above, the effect on the polymer is not known.

20. I find it difficult to comprehend the precise meaning of the passage quoted in paragraph 5 above and to which Mr Foster particularly drew my attention since it is only in the context of liquid crystal material that the term "easy axis" is clearly understood. However if this passage is in fact defining a principle then it is only defining it in respect of photoalignment techniques and, read in the context of the whole description, of alignment techniques in liquid crystal cells. The claim in dispute is much more general than this, referring as it does to storing information in any photosensitive layer by exposing the layer to first and second doses of irradiation. It does not even require that the photosensitive layer is one which would effect the alignment of liquid crystal material.

21. For completeness of disclosure at least one embodiment of the invention or at least one method of performing the invention must be described. The invention of claim 18 is directed to storing information in a photosensitive layer. However whilst there is some disclosure in the specification of how information may be stored in the liquid crystal layer by the interaction of the alignment layer and the crystal material, in my opinion, there is no clear teaching of how information may be stored in a photosensitive layer *per se*. Furthermore, the description itself does not indicate what is meant by "orientation" of the photosensitive layer, how such "orientation" may be achieved or even that it is achieved. Without such information I consider

that there are inadequate directions as to how, at the date of filing, the person skilled in the art of either information storage or liquid crystal materials may store information in the photosensitive layer. Accordingly I find that the specification does not sufficiently disclose the invention of claim 18 in a manner which is clear enough and complete enough for the invention to be performed by a person skilled in the art, contrary to section 14(3).

Section 14(5)(c)

22. The examiner argued that, whilst the applicant did not have to restrict his claims to the specific embodiment described, the width of the claim must be properly supported by the description of the invention in the specification. He pointed out that, whilst the claim was directed to a method of storing information by irradiating a photosensitive layer in a two-stage process the description was wholly concerned with the alignment of liquid crystals. In the only references to storing information it was clear that liquid crystals were involved as an essential part of the storage mechanism. He maintained that, in the present application, the technical contribution disclosed was a method of producing an alignment layer for a liquid crystal by a double exposure method, there being nothing in the description to suggest a contribution to the information storage art other than as a side effect of the method of producing an alignment layer.

23. Mr Foster pointed out that a claim corresponding to claim 18 was in the specification as originally filed and the applicants should not be prejudiced by the fact that the bulk of the description relates to liquid crystals. Rather I should consider the technical contribution made by the applicant. The applicants had disclosed a way of using the alignment layer to store information and described one way of reading it out, i.e. using the liquid crystal material. However there may be other ways of reading out the stored information, e.g. with an electron microscope. He likened the claim to a method for storing information on a magnetic tape, maintaining that in such a storage method there would be no requirement to include in the claim any read out means, the tape, playback head and tape player being completely separate items. He pointed out that, in the present application, the alignment material and liquid crystal material could be bought separately, the alignment layer being a self-contained entity.

24. The applicant's agents indicated their willingness, in their letter dated 29 July 1998, to

include wording corresponding to claim 18 into the body of the description but, following the decision in *Schering*, this alone would not necessarily provide sufficient support for the claim. Applying the approach used in *Schering* I need first to look at the invention specified in claim 18. It relates to a method for storing information in a photosensitive layer by using a first dose of radiation to impart a first orientation in a first region of the layer and a second different dose of radiation to impart a second orientation to a second region of the layer. Leaving aside the difficulties with the word "orientation" referred to above this claim is clearly directed to using the photosensitive layer itself for storage of information.

25. Comparing this invention with what is described in the specification I note that the title and opening paragraph of the description indicate that the invention relates to a method for manufacturing a multi-domain liquid crystal cell by aligning the liquid crystal director by irradiating an alignment layer. The first object is to produce multi-domain directional alignment in a liquid crystal cell and the second is to create binary multi-domain directors in an alignment layer without any rearrangement of the optical scheme. Since the word "director" is a term of the art in liquid crystal technology it seems to me that both these objects relate quite clearly to LC devices. The whole tenure of the description which follows is that the photosensitive layer exists to provide alignment in an LC cell, that it is one of the elements necessary to manufacture a multi-domain liquid crystal cell. Mr Foster conceded that the bulk of the description related to liquid crystal devices and in fact I can find no disclosure of the photosensitive layer being used for any other purpose than as an alignment layer for such devices.

26. The only two references to information storage are quoted in paragraphs 8 and 10 above. The first refers to the manufacture of a high density optical information storage cell and the second relates to storing binary data in an LC cell by orthogonally orientated molecules. In my opinion both these references are directed to storing data in LC cells. The idea that storage may be effected in the photosensitive layer is not even hinted at and there is certainly no suggestion that the liquid crystal material was merely the read out mechanism. Mr Foster also suggested that read out could be effected using an electron microscope but, given that the effect of the radiation on the photosensitive layer is not understood, the suggestion that stored information could be read out in this way appears to be pure speculation. Any analogy with magnetic tape technology does

not, in my opinion, stand up to scrutiny firstly because, in that instance, the storage process is clearly understood and, secondly and more importantly, because the question of support is one to be decided in each instance by careful comparison of the invention claimed with the invention described.

27. Mr Foster was concerned that the applicants should not be prejudiced by the repeated references in the description to liquid crystals and cautioned me about reading the specification in the way a patent examiner would, i.e. from a legal point of view. However I consider that the reason why the man skilled in the art reading the specification would find such emphasis on liquid crystal technology is because it is in this field that the applicants have made their technical contribution. Mr Foster maintained that the alignment layer was a self-contained piece of equipment with information stored on it. However I do not consider that this teaching emerges from a careful reading of the specification. The alignment layer may well be a separate entity but there is no indication in the description that it is a separate storage device. The polymer is only described in the context of an alignment layer for a liquid crystal cell. As indicated above the only method for storing information envisaged by the specification is one utilising as the storage medium liquid crystal cells. Therefore, in my opinion, there is no disclosure in the specification coterminous with the monopoly indicated in claim 18 and consequently I find that there is no support in the description for this claim contrary to section 14(5)(c).

Summary

28. I have found firstly that the specification does not disclose the invention of claim 18 in a manner which is clear enough and complete enough for the invention to be performed by a person skilled in the art, contrary to section 14(3), and secondly that the invention of claim 18 is not supported by the description, contrary to section 14(5)(c). I allow a period of two months from the date of this decision for the submission of amendments to the Office to overcome the objections to this claim. Consequential amendment will be necessary to claims appendant to claim 18. If no satisfactory amendments are proposed within that period the application will be refused.

Appeal

29. As this decision relates to a substantive matter, under the Rules of the Supreme Court any

appeal must be lodged within six weeks of the date of this decision.

Dated this 6th day of September 1999

Mrs J A Wilson

Deputy Director, acting for the Comptroller