EUROPEAN QUALIFYING EXAMINATION 1991

PAPER C

This paper comprises:

- Instructions to Candidates — 91/C/e/1-2
- Letter from client to professional representative — 91/C/e/3-4
- Annex 1 (EP-B-0 192 444) — 91/C/e/5-13
- Annex 2 (Nr. 84 18 300 Priority Document) — 91/C/e/14-18
- Annex 3 (FR-A-2 385 128) — 91/C/d,e,f/19-23
- Annex 4 (Laboratory Record) — 91/C/d,e,f/24
- Annex 5 (Summary of Lecture) — 91/C/d,e,f/25
- Annex 6 (Brochure of Fair) — 91/C/d,e,f/26
- Annex 7 (GB-A-2 122 460) — 91/C/d,e,f/27-31
- Annex 8 (DE-A-31 40 400) — 91/C/d,e,f/32-37
- Glossary for Annexes 1 to 8 — 91/C/d,e,f/38-39

INSTRUCTIONS TO CANDIDATES

1. Attached you will find a letter from a client to a professional representative with annexed documents.

2. Your task is to put yourself in the position of the representative and, using only the information provided by the client, to prepare a notice of opposition, which when typed would be ready for filing.

3. If in the notice of opposition

   - you have not taken account of a particular piece of prior art,
   - there is a claim which you have not attacked,
   - you have made no use of a possible line of attack on a claim, or
   - you have attacked a given claim in circumstances where there is real doubt as to whether the attack would be successful,

   you should justify this briefly on a separate sheet of paper.

4. The documents should be referred to by their annex number.

5. If not needed for the sake of argumentation, avoid word for word reproduction of the claims in your work. In particular, a mere listing of the features of the claims of Annex 1 should not be given by way of an introduction to the arguments presented.

6. You are not called upon to prepare documents which might be necessary for supporting the opposition, e.g. evidence from experts, authorisations, receipts or statements by witnesses.

7. The date of the client's letter has been chosen only to indicate to the candidate that there is not time to confer with the client. Explanations regarding the manner of filing the opposition to meet the deadline are therefore not required.

8. You should be aware that Annex 1 is fictitious and is not necessarily in a form that would have lead to a patent granted by the European Patent Office.

9. In addition the following points from "Instructions to candidates for preparing their answers" (Official Journal EPO 1-2/1991) should be taken into account:

I. APPLICABLE TO PAPERS A, B, C AND D

1. Candidates are to accept the facts given in the paper and to base their answers upon such facts. Whether and to what extent these facts are used is the responsibility of the candidate.

2. Candidates are not to use any special knowledge they may have of the subject-matter of the invention, but are to assume that the prior art given is in fact exhaustive.

IV. APPLICABLE TO PAPER C

- **DURATION: 5 HOURS; THIRD DAY, MORNING**

8. The paper will be presented in the form of a letter from a client to a professional representative. The candidate is expected to draw up a notice of opposition which satisfies the requirements regarding filing, other than those relating to typing and the keeping of certain margins.

   The notice of opposition prepared by the candidate should comply with Article 100 and Rule 55, bearing in mind the relevant recommendations in the Guidelines for examination in the EPO, Part D. However, in order to maintain the candidate's anonymity he is not to use his real name in the papers but, instead, the candidate should use the name of the representative to whom the client's letter is addressed. The grounds of Article 100(b) will not be used.

   The candidate must also briefly set out on a separate sheet reasons why he adopted or did not adopt the suggestions of the client. In addition any questions the client may have posed should be answered.

   Detailed analysis of documents done in rough on separate sheets is not regarded as part of the answer and should not be included or attached; nor should the test paper itself or any rough notes. Candidates should therefore concentrate more on the contested patent claims and less on analysis of the documents of the prior art.

9. The notice of opposition should contain all (and only those) grounds - as far as possible against all the claims - which the candidate in that particular case considers prejudicial to the maintenance of the patent.

   Omission of a good ground for opposition will lead to a loss of marks, commensurate with the importance of the ground in the particular case.

11. The European patent to be opposed will be furnished in all three official languages. The candidate must indicate which of the three versions he chose to oppose.

PAPER C/1991

Kfz-zubehör Bremen AG
Rudolf Diesel Str. 2-4
2800 Bremen

Bremen, 17.04.91

Dipl.-Ing. Karlpeter Gründlich
Europaplatz 104
8000 München 80

Dear Sir,

We request that you file an opposition in our name against European Patent 0 192 444 (Annex 1).

We have already inspected the file. The content of the first priority document filed on 19.01.84 has been marked in Annex 1 by vertical lines in the margin. We attach the second priority document (Annex 2) filed on 24.04.84 and having the number 8418300.

Furthermore we would like to make the following observations:

The Patent was granted as filed without any objections having been raised. Will the opposition division automatically consider the document (Annex 3) referred to in the patent description as being in the opposition proceedings? We are reluctant to cite it again as this may be considered a criticism of the EPO.

The grant of the patent was decided on the basis of claims 1 to 9. However, claim 9 does not appear in the printed Patent specification. A reference to this mistake appeared in the Patent Bulletin 90/50. The correction in the file reads:

"Claim 9: Apparatus according to claim 1, modified in that the glass plates are replaced by plates of another transparent material."

This seems to constitute added subject matter. Please attack on this ground. Does this later publication extend the time for opposition against the whole patent or only against claim 9?

We request an award of all our costs arising from opposition as the firm Racing-car has no right at all the Patent because its subject-matter was developed by us as shown below. Although we are not interested in having this patent we consider it totally unacceptable that we should now have to pay to contest something which was stolen from us. Will these circumstances help our case?

Mr. Michael Goldminor, the inventor, moved at the end of June, 1983 from us to Racing-car. We can prove that he was entrusted by us with the development of automobile fittings now patented by Racing-car. Dr. Müller, the then head of our LCD laboratory and now head of Development, and I can testify to that. In addition we enclose a record of experiments carried out in our laboratory (Annex 4).

Furthermore, Mr. Goldminor gave a lecture on this topic at the Tradefair "auto und sport 1984". The organisers of the fair sent a summary of all lectures to all participants a month in advance (Annex 5).

We also took part in the fair and exhibited our previously undisclosed, heatable car window, model V 84; see the enclosed brochure (Annex 6) which was first available on the opening day of the fair. This brochure was on our stand amongst our other brochures but we have to admit that no-one visited our stand as we had such an unfavourable location and there was so much free drink elsewhere. Should you require these facts to be confirmed, Mrs Deveraux, who was also on the stand, is offered as a witness.

Finally we refer to a GB Patent application (Annex 7) and to a DE Patent application (Annex 8).

We hope that you can formulate the opposition in such a way that nothing remains of the Patent.

Sincerely Yours

HJ Sauer

Dr. Hans-Jürgen Sauer

encls.: Annexes 1 to 8

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 192 444**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: 25.07.90

(51) Int. Cl. 5: G02F 1/133

(21) Application number: 85 300 111.4

(22) Date of filing: 18.01.85

(54) # Liquid crystal cell display with heating device

(30) Priority: 19.01.84 GB 84 01 600
24.04.84 GB 84 18 300

(43) Date of publication of application: 18.07.85
Bulletin 85/29

(45) Publication of the grant of the patent: 25.07.90
Bulletin 90/29

(84) Designated Contracting States:
DE FR GB IT SE

(56) References cited:
FR-A- 2 385 128

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EP 0 192 444 B1

Courier Press, Leamington Spa, England.

The invention relates to a liquid crystal display devi of the transmission type for indicating alpha-numeric signs and symbols in automobiles and which is provided with a heating device.

In the development of electronic display systems liquid crystal cells play an important part. Liquid crystal cells (called LCC from hereon) have a number of advantageous properties, e.g. ease of reading, low current input and long life, which make them particularly suitable as indicators in automobiles. In the case of racing cars their high vibratory fatigue limit is a particular advantage. However, a disadvantage exists in that below a certain temperature the liquid crystal can no longer be controlled by an applied electrical field.

It is already known to overcome this disadvantage by providing the LCC with a heating device which prevents the temperature of the liquid crystal from falling too much; see for example FR-A-2 385 128.

In conventional LCC the liquid crystal is enclosed between two plates of organic or inorganic glass or other transparent material. Each inner surface of the plates is coated with a set of transparent electrodes the electrodes of one set being perpendicular to the electrodes of the other set. Each electrode is connected to a voltage source to control the transparency of the picture elements of the LCC. A polarizer is arranged on both sides of the liquid crystal.

There exist two types of LCC displays, a transmissi type wherein the illumination source is on one side of the LCC and the observer on the other side, and a reflection type wherein the illumination source and the observer are on the same side of the LCC, in which case a reflector is arranged on the rear side (in the viewing direction) of the LCC.

The known heating devices, which may be meshed or wave-shaped, are either arranged outside the two glass plates, in which case either a large amount of heat or a long heating time is required, or they may be arranged in the space between the plates, in which case electrical isolation from the transparent electrodes is a problem.

The present invention therefore sets out to solve the problem of providing a liquid crystal display device of the transmission type with a heating device in such a way that even with comparatively low heating power a rapid warming of the liquid crystal is possible without isolation problems.

This problem is solved by a device as claimed in claim 1.

By embedding the resistance heating means between two glass layers the problem of isolation is solved. The heat transfer to the liquid crystal is improved as the heat need not be conducted through the entire thickness of a glass plate but only through the glass layer adjacent the liquid crystal. The heat loss to the outside is especially low if the glass layer closer to the liquid crystal is thinner than the more remote glass layer.

In the embodiment according to claim 3, even though heat need only be conducted through a very thin glass layer, the conventionally available LCC must be modified accordingly.

In contrast, in the embodiment according to claim 4 using a conventionally available LCC the resistance heating means is located in the outer of two superposed glass plates. Admittedly, in this embodiment the heating means is a larger distance away from the liquid crystal but it has the advantage that the two glass layers with the heating means form a composite structure which provides, in the case of an accident, as much safety as the laminated glass otherwise used in automobile production.

The resistance heating means can be a meshed or a wave-shaped heating conductor. Naturally it must be so thin not to significantly affect the transparency of the cell.

In order to avoid detrimental structural influences, the resistance heating means can be formed from a transparent film which is substantially coextensive with the glass layers. In this way a very even heating is also achieved.

As a film which provides highly uniform transparency over the cell, oxides of metals have shown to be a suitable resistance material. Such a film can be applied pyrolytically from solutions of indium, gallium and tin salts.

When a LCC is heated the maximum permitted temperatu of the liquid crystal must not be exceeded. This could be ensured with the use of a control circuit having a temperature sensor and a regulating unit.

A simpler control is achieved if the material of the resistance heating means has an electrical resistance which increases strongly with increasing temperature (a kind of a cold conductor) and if a constant voltage source is used for the supply the current to the heating device. In this way when the LCC temperature is low, a large current flows which decreases during the heating in such a way that the heat being lost at any one moment is compensated.

The invention is explained with the help of the Figures in which:

Figure 1 shows a device according to the invention;
Figure 2 shows a device according to the invention with two superposed glass plates on one side of the liquid crystal;
Figure 3 shows a wave-shaped heating conductor; and
Figure 4 shows a heating means formed from a transparent film which is substantially coextensive with the adjacent glass layers.

Figure 1 shows a liquid crystal 3 enclosed between two glass plates 1,2. The inner surfaces of the plates are provided with two sets of transparent electrodes 4,5 to control the transparency of the picture elements of the LCC through application of a control voltage. Polarizers are indicated by reference numerals 7 and 8. The glass plate 2 is a composite structure in which a resistance heating means 10 is arranged between two glass layers 2a,2b. The glass layer 2a closer to the liquid crystal

is thinner than the other glass layer 2b. The arrows designate the direction of the illuminating light and the arrow 6b is directed to the car driver.

In the arrangement of Figure 2, two superposed glass plates 2,9 are arranged on one side of the liquid crystal 3 the outer glass plate 9 being the composite structure 9a, 10, 9b wherein the resistance heating means 10 is arranged.

In Figure 3, the resistance heating means is shown as a wave-shaped heating conductor 11. Connections to the voltage source are depicted with 12 and 13.

In Figure 4, the resistance heating means is shown as a transparent film 14 which is substantially coextensive with the adjacent glass layers.

Claims

1. A liquid crystal display device of the transmission type for indicating alpha-numeric signs and symbols in automobiles and which is provided with a heating device, in which display device at least one glass plate (1,2;9) is arranged on both sides of the liquid crystal (3), characterised in that one of the glass plates (2,9) is a composite structure in which a resistance heating means (10) is arranged between two glass layers (2a,2b;9a,9b).

2. Device according to claim 1, characterised in that the glass layer (2a,9a) closer to the liquid crystal (3) is thinner than the more remote glass layer (2b,9b).

3. Device according to claim 1 or claim 2, characterised in that the composite structure (2a,10,2b) is located adjacent the liquid crystal (3).

4. Device according to claim 1 or claim 2, characterised in that on one side of the liquid crystal (3) two superposed glass plates (2,9) are arranged the outer glass plate being the composite structure (9a,10,9b).

5. Device according to any of claims 1 to 4, characterised in that the resistance heating means (10) is a meshed or a wave-shaped heating conductor (11).

6. Device according to claim 4, characterised in that the resistance heating means (10) is formed from a transparent film (14) which is substantially co-extensive with the adjacent glass layers.

7. Device in particular according to claim 6, characterised in that it comprises a constant voltage source for the supply of current to a heating device provided with a heating means made of resistance material whose electrical resistance increases strongly with increasing temperature.

8. Device according to claim 7, characterised in that the resistance material consists of metal oxides of indium, gallium and tin.

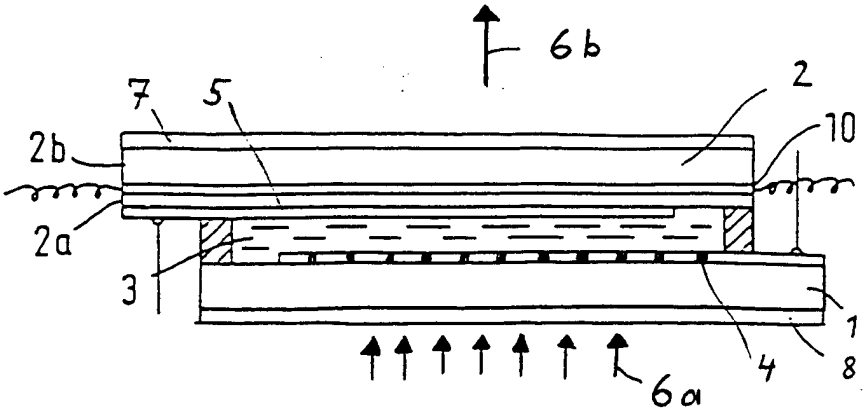


FIG. 1

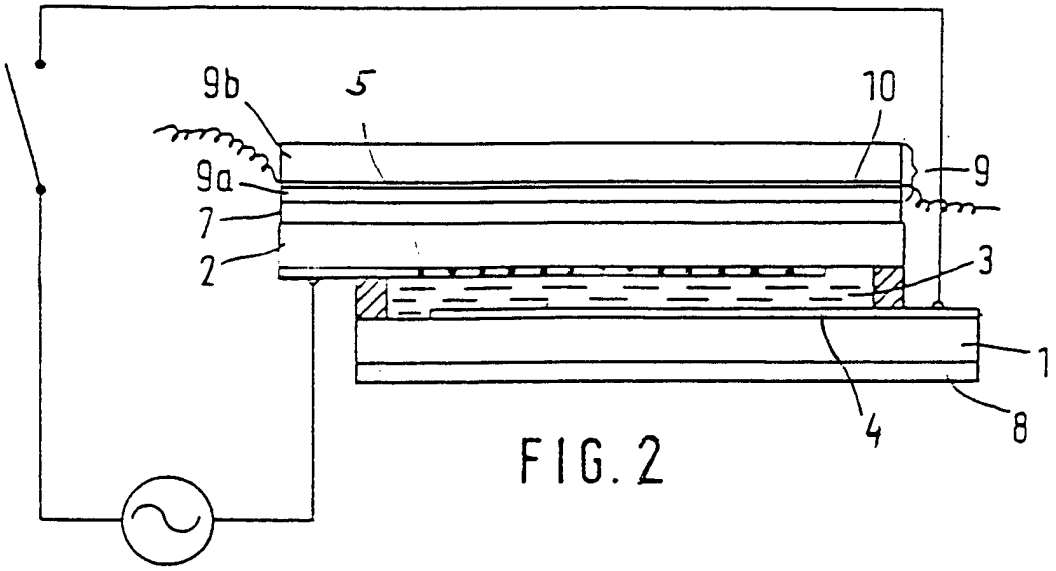


FIG. 2

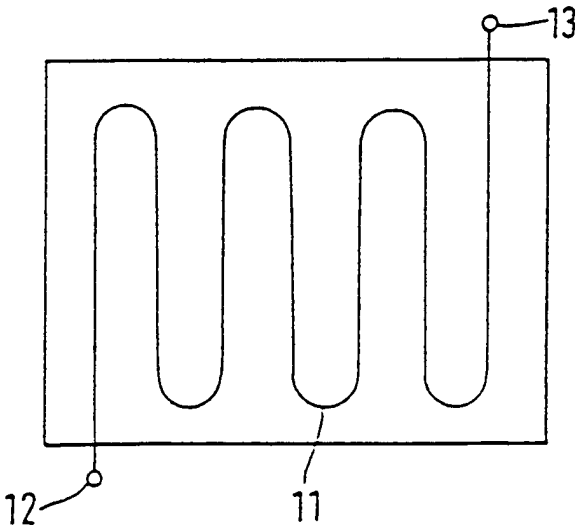


FIG. 3

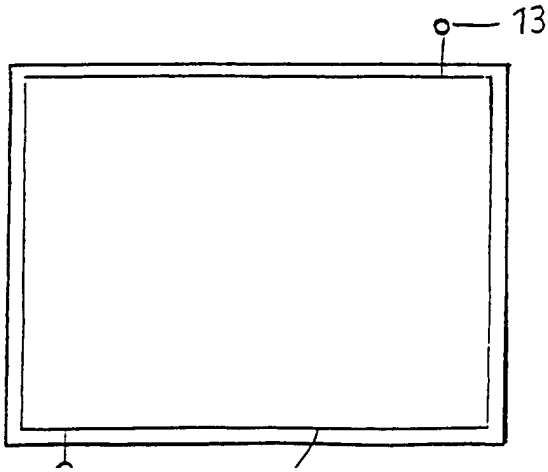


FIG. 4

Nr 84 18 300 priority document filed on 24.04

The invention relates to a liquid crystal display device of the transmission type for indicating alpha-numeric signs and symbols in automobiles and which is provided with a heating device.

In the development of electronic display systems liquid crystal cells play an important part. Liquid crystal cells (called LCC from hereon) have a number of advantageous properties, e.g. ease of reading, low current input and long life, which make them particularly suitable as indicators in automobiles. In the case of racing cars their high vibratory fatigue limit is a particular advantage. However, a disadvantage exists in that below a certain temperature the liquid crystal can no longer be controlled by an applied electrical field.

It is already known to overcome this disadvantage by providing the LCC with a heating device which prevents the temperature of the liquid crystal from falling too much.

The present invention sets out to solve the problem of providing a liquid crystal display device of the transmission type with a heating device in such a way that even with comparatively low heating power a rapid and very even warming of the liquid crystal is possible without isolation problems and without structural influences onto the display.

This problem is solved by a device as claimed in cla 1.

As a film which provides highly uniform transparency over the cell, oxides of metals have shown to be a suitable resistance material. It can also achieve a simple temperature control, when used in combination with a constant voltage source to supply the current, as it exhibits an electrical resistance which increases strongly with increasing temperature.

The invention is explained with the help of the Figures in which:

Figure 1 shows a device according to the invention;
Figure 2 shows a device according to the invention, with two superposed glass plates on one side of the liquid crystal; and
Figure 3 shows a heating means formed from a transparent film which is substantially coextensive with the adjacent glass layers.

Figure 1 shows a liquid crystal 3 enclosed between two glass plates 1,2. The inner surfaces of the plates are provided with two sets of transparent electrodes 4,5 to control the transparency of the picture elements of the LCC through application of a control voltage. Polarizers are indicated by reference numerals 7 and 8. The glass plate 2 is a composite structure in which a resistance heating means 10 is arranged between two glass layers 2a,2b. The glass layer 2a closer to the liquid crystal is thinner than the other glass layer 2b. The arrows 6a designate the direction of the illuminating light and the arrow 6b is directed to the car driver.

In the arrangement of Figure 2, two superposed gl plates 2,9 are arranged on one side of the liquid crystal 3 the outer glass plate 9 being the composite structure 9a, 10, 9b wherein the resistance heating means 10 is arranged.

In Figure 3, the resistance heating means is shown as a transparent film 14, the connections to the voltage source are depicted with 12 and 13.

Claims

1. A liquid crystal display device of the transmission type for indicating alpha-numeric signs and symbols in automobiles and which is provided with a heating device, in which display device at least one glass plate (1,2;9) is arranged on both sides of the liquid crystal (3), characterised in that one of the glass plates (2,9) is a composite structure in which a resistance heating means (10) is arranged between two glass layers (2a,2b;9a,9b), which means is formed from a transparent film (14) which is substantially coextensive with the adjacent glass layers.

2. Device in particular according to claim 1, characterised in that it comprises a constant voltage source for the supply of current to a heating device provided with a heating means of resistance material, e.g. metal oxides, whose electrical resistance increases strongly with increasing temperature.

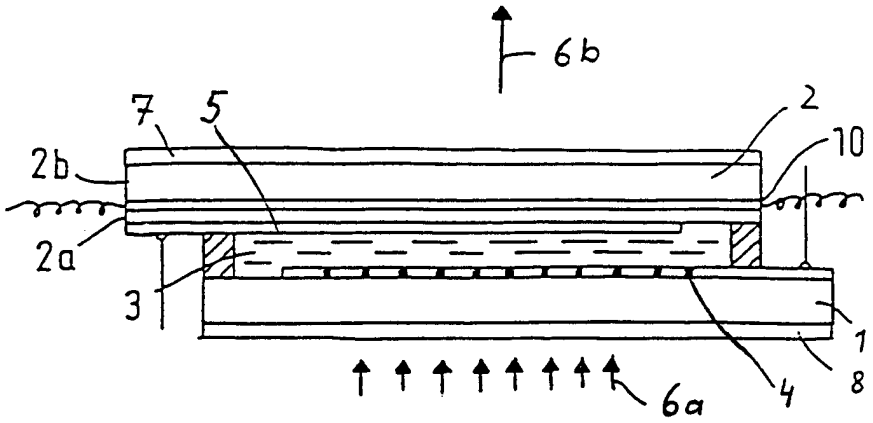


FIG. 1

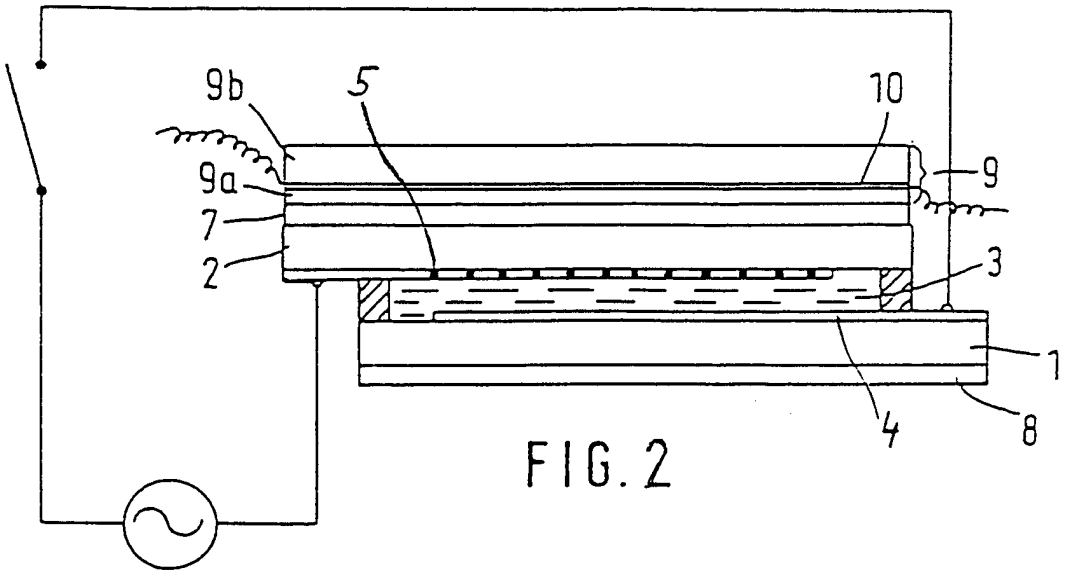


FIG. 2

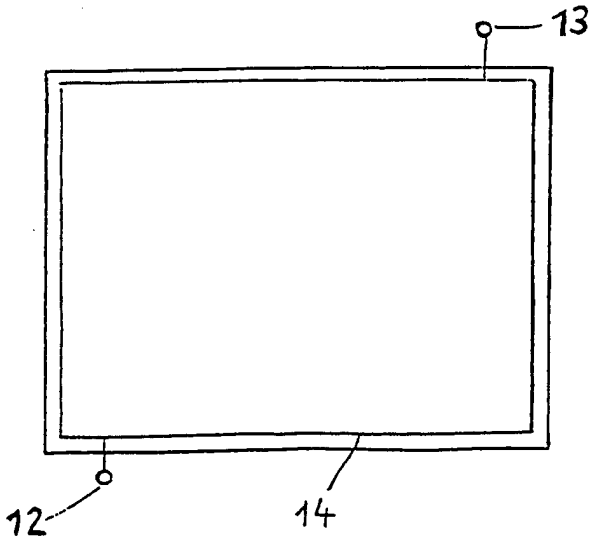


FIG. 3

RÉPUBLIQUE FRANÇAISE

INSTITUT NATIONAL
DE LA PROPRIÉTÉ INDUSTRIELLE

PARIS

(11) N° de publication 2 38
(A n'utiliser que pour les commandes de reproduction).

A1

DEMANDE DE BREVET D'INVENTION

(21) N° 78 08576

(54) Ecran d'affichage à cristaux liquides

(51) Classification internationale (Int. Cl.³). G02F 1/33

(22) Date de dépôt ..... 23 mars 1978, à 16 h 3 mn.

(33) (32) (31) Priorité revendiquée : *Demande de brevet déposée au Japon le 26 mars 1977, n. 33.452/1977 au nom de la demanderesse.*

(41) Date de la mise à la disposition du public de la demande ..... B.O.P.I. — «Listes» n. 42 du 20-10-1978.

(71) Déposant : Société dite : Sherp K.K., Tokyo 545 (Japan)
22-Nagaike-cho Abeno-ku

(72) Invention de : Movino, Masuaki
Kikuchi Dai-1, Mansion 4-12, Tokumaru
Itabashi-ku Tokyo (JP)

(73) Titulaire : *Idem* (71)

(74) Mandataire : Bruxelles J. avenue Percier, 75008 Paris.

La présente invention a pour objet un écran d'affichage à cristaux liquides, utilisé pour des panneaux publicitaires extérieurs, avec un domaine d'application élargi.

La technique des cellules à cristaux liquides est devenue relativement bien maîtrisée ces dernières années, aussi, de telles cellules sont utilisées de plus en plus comme dispositif d'affichage. Cependant, le problème suivant se présente: ces écrans d'affichage ne peuvent pas être utilisés pour des températures inférieures à 20° C, cette limite étant évidemment fonction du matériau qui constitue le cristal liquide utilisé.

La présente demande a pour but d'élargir les conditions d'utilisation des écrans d'affichage à cristaux liquides.

Ce but est atteint par des moyens de chauffage électrique.

De manière avantageuse, des moyens de réglage du courant de chauffage sont prévus.

Le chauffage peut être réalisé par une couche mince, transparente ou réfléchissante, et électriquement conductrice.

Figure 1 est une vue schématique d'une cellule à cristaux liquides connue dans l'état de la technique;

Figures 2 et 3 illustrent schématiquement deux cellules à cristaux liquides selon l'invention.

Sur la Figure 1, on a représenté schématiquement la structure d'une cellule à cristaux liquides. Le cristal liquide 4 est compris entre deux plaques transparentes

1, par exemple de verre, et fermé hermétiquement sur l[illegible] côtés par des moyens 3. Deux séries d'électrodes minces (indiquées par 2, 2') qui sont mutuellement orthogonales permettent, lorsqu'on applique une tension à des électrodes sélectionnées, un changement de transparence des cristaux liquides au point de croisement; l'ensemble des points de croisement sélectionnés donne un affichage lisible. Des composants additionnels, comme des couches d'alignement au bord du cristal liquide ou des polariseurs sur les deux côtés des plaques de verre, sont omis pour raison de clarté.

Généralement, on distingue entre les écrans en transmission pour lesquels la source d'illumination et l'observateur sont de part et d'autre de la cellule à cristaux liquides, et les écrans en réflexion pour lesquels la source d'illumination et l'observateur sont du même côté de la cellule, un miroir étant de l'autre côté.

Les Figures 2 et 3 illustrent deux modes de disposition de la couche électriquement conductrice 5.

Celle-ci peut être transparente et est disposée sur la surface intérieure d'une des plaques de verre (Figure 2). Une source de courant est notée 6 et un élément de réglage du courant de chauffage est noté 7.

La couche électriquement conductrice peut être également disposée sur la surface extérieure d'une des plaques de verre (Figure 3). Dans l'exemple montré la couche électriquement conductrice 5' est à la fois réfléchissante, formant ainsi un écran en réflexion, et elle est protégée par une plaque mince 8 contre les contacts mécaniques ou l'endommagement, par exemple une plaque de verre.

Revendications

1. Ecran d'affichage à cristaux liquides, utilisé pour des panneaux publicitaires extérieurs, et muni de moyens de chauffage électrique.

2. Ecran d'affichage selon la revendication 1, muni de moyens (7) de réglage pour le courant de chauffage.

3. Ecran d'affichage selon la revendication 1 ou 2, dans lequel le chauffage est formé par une couche (5) mince, transparente et électriquement conductrice.

4. Ecran d'affichage selon la revendication 1 ou 2, dans lequel le chauffage est formé par une couche (5') mince, réfléchissante et électriquement conductrice.

Fig. 1

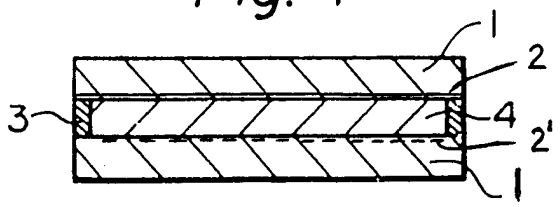


Fig. 2

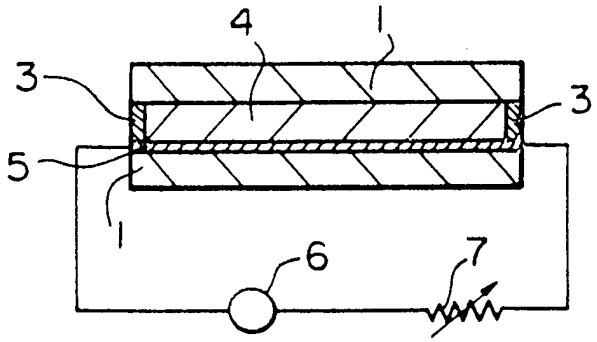
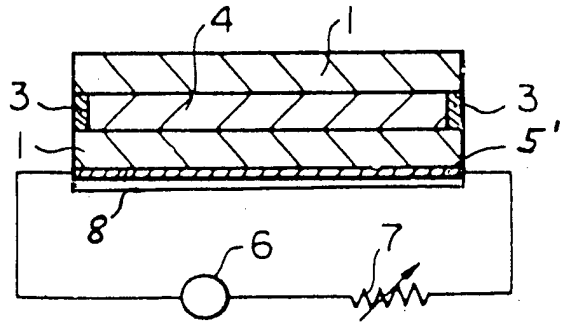


Fig. 3



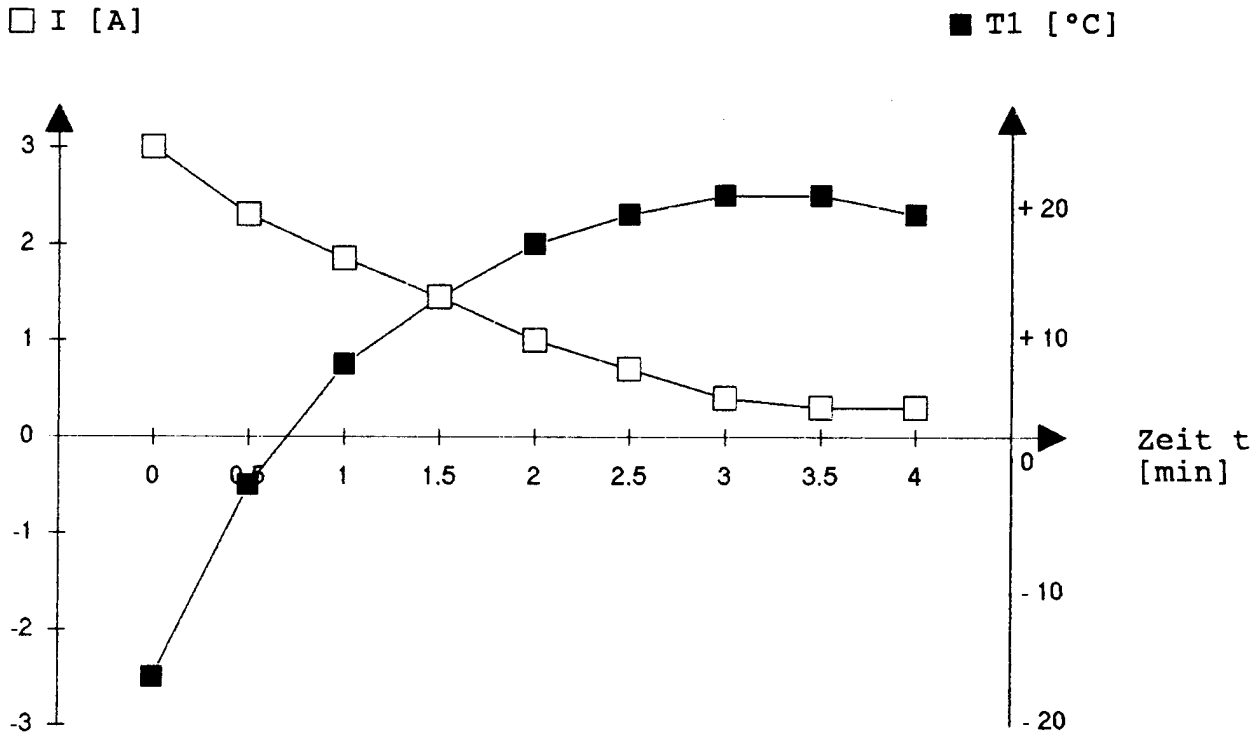
Kfz-zubehör Bremen AG
Rudolf Diesel Str. 2-4
2800 Bremen

LABOR LCD - 1983

Kennlinie einer Flüssigkristallzelle Typ F
in Verbindung mit einem Heizgitter Typ B
d.h. einer Mischung aus Oxiden von Indium, Gallium und Zinn

gemessen wird der Heizstrom I sowie die Temperatur T1
des Flüssigkristalls über die Zeit t

Die Außentemperatur beträgt -20°C



Projekt 1223 Sachbearbeiter: M. Goldminor	Datum: 16.05.83 Laborleiter: Dr. Müller

auto und sport 1984

die Messe für Autobauer und Autoliebhaber

vom 24. April 1984 bis 29. April 1984

Vortrag Nr. 12 (englisch)

Zeit: 24.04.84, 14 00 Uhr

Ort: Saal B

Referent: Michael Goldminor, Liverpool

Neuentwickelte, bei niedrigen Außentemperaturen verwendbare, verbrauchsarme Autoarmaturen in Form von heizbaren Flüssigkristallanzeigen werden an Hand von Kenndaten vorgestellt. Zur Verwendung kommen z.B. als Gitter ausgebildete Heizschichten, die aus einem Kaltleitermaterial bestehen und an eine Konstantspannungsquelle angeschlossen werden. Die Gitter sind zwischen zwei Glasschichten eingebettet und bilden dadurch ein bruchfestes Verbundglas, das auf einer handelsüblichen Flüssigkristallzelle aufgebracht ist.

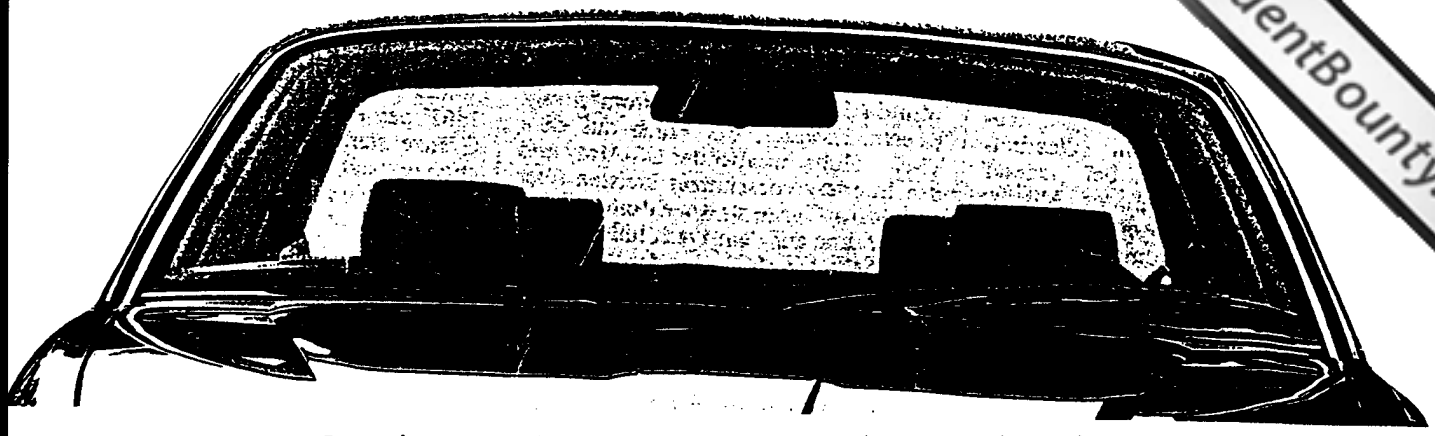
Vortrag Nr. 13 (französisch)

Zeit: 24.04.84, 15 00 Uhr

Ort: Saal B

Referent: Béatrice Mélot, Paris

Eine neue Klasse von Autolacken auf der Basis von .....



Informieren Sie sich! Informieren Sie sich!
Halle 4, Stand 11

Unser neues Verbundglas V 84 für die Fenster beliebiger Autotypen

Besonderer Vorteil:
Die im Innern der Scheibe liegende, selbstregelnde Heizschicht aus Metalloxiden, bspw. Indium, Gallium und Zinnoxiden ist absolut unsichtbar.

Störende Heizdraht-Muster im Blickfeld des Fahrers sind Vergangenheit!

Kristallklare Scheibe
sichere Sicht!

Vertrieb durch Kfz-zubehör Bremen AG
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AS/4.84

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Heatable vehicle windscreen

(57)

A bridge circuit controls current supplied to a transparent heating coating of a vehicle windscreen using a temperature sensor made of a material having an electrical resistance which increases strongly with increasing temperature

GB 2 122 460 A

The invention relates to an improvement of an electrically heatable vehicle windscreen and in particular to a temperature control to protect the windscreen against overheating.

It has been known to pass electric current through a transparent conductive coating in order to raise its temperature. Generally the windscreen comprises a pair of parallel bus bars on opposite sides of the windscreen to distribute the current through the coating. The bus bars have low resistance compared to the coating. Overheating which may result from a discontinuity in the conductive coating or from a defective bus bar can damage the plastics interlayer commonly provided in laminated or composite-structure screens, or, in severe cases, can locally damage the windscreen.

In order to prevent overheating there has already been disclosed in US-A-3 789 191, published on 29. January 1974, a wave-shaped variable resistance heating wire for windscreens. The material suggested is a nickel-iron composition with an electrical resistance relationship of, for example, 1 : 4 for the cold and hot state whereby the current supplied by the battery via a voltage stabilizing circuit is reduced in the hot state. However, such heating elements can not be used in form of large area coatings invisible to the driver as their transparency is low. Commonly used coatings which are invisible consist for example of 0.01 mm thick silver films between films of zinc stannate, each of which films can easily be applied by magnetron sputtering. The silver acts as a conductive layer and the zinc stannate films serve to mask the reflectance of the silver.

The present invention is explained with reference to Figures 1 and 2.

In Figure 1 the composite structure of the windscreen consists of an inner glass sheet, a plastics interlayer which may be made from polyvinylbutyral, and an outer glass sheet. A top bus bar is designated 2, a bottom bus bar is designated 3. A wire loop 4 is provided at an area of the windscreen 1 outside the driver's viewing area. The wire loop may consist of iron-nickel having a specific resistance that increases at a rate of 0.04 ohms/m degree C. Preferably the wire loop is positioned along the surface of the plastics interlayer.

Line 5 indicates the edge of the heating coating 6 leaving an uncoated margin along three sides. The uncoated areas permit electrical connections to be made to the wire loop 4, and to the top bus bar 2 from the terminals 7 by a pair of conductive strips 8 and 9, without passing through the heating coating 6. The bus bars and the conductive strips 8 and 9 may be made of silver containing ceramic frit material fused to the inner glass sheet and may be silk screened. A circuit 11 monitors the temperature of the windscreen 1 based on the resistance of the wire loop 4. When the temperature of the wire loop 4 reaches a set value, circuit 11 will interrupt the current flowing to the heating coating 6 in the windscreen.

With reference to Figure 2, the car battery 12 powers a constant voltage circuit 13 connected to a bridge circuit 14. The voltage drop in wire loop 4 which increases with increasing temperature is fed to a comparator 15. If the voltage drop in wire loop 4 exceeds a predetermined value (selectable by bridge adjustment), relay 16 opens switches 10 to interrupt the current to the bus bars. Optionally a warning lamp 17 may be provided. The current cut-off may be set on a timer so that after a set time period the windscreen is reenergized, or may be set so as to require manual reenergization by the car driver.

Claims

1. Electrically heatable vehicle windscreen having an electrically conductive, highly transparent heating coating (6) over essentially the entire screen and first and second bus bars (2,3) to supply current to said coating, characterised in that a temperature sensor (4) electrically insulated from the coating (6) is provided in the screen and forms one branch of a bridge circuit (14), the bridge circuit delivering a signal to cut off the current to said coating (6) if a predetermined temperature is reached at said sensor (4).

2. Windscreen according to claim 1, characterised in that the temperature sensor (4) is made of an iron-nickel composition having an electrical resistance strongly increasing with increasing temperature.

3. Windscreen according to claim 1 or 2, characterised in that the bridge circuit (14) is connected to a constant voltage circuit (13).

4. Windscreen according to any of claims 1 to 3, characterised in that the windscreen is a break-resistant composite structure wherein a plastics interlayer is embedded between two glass layers.

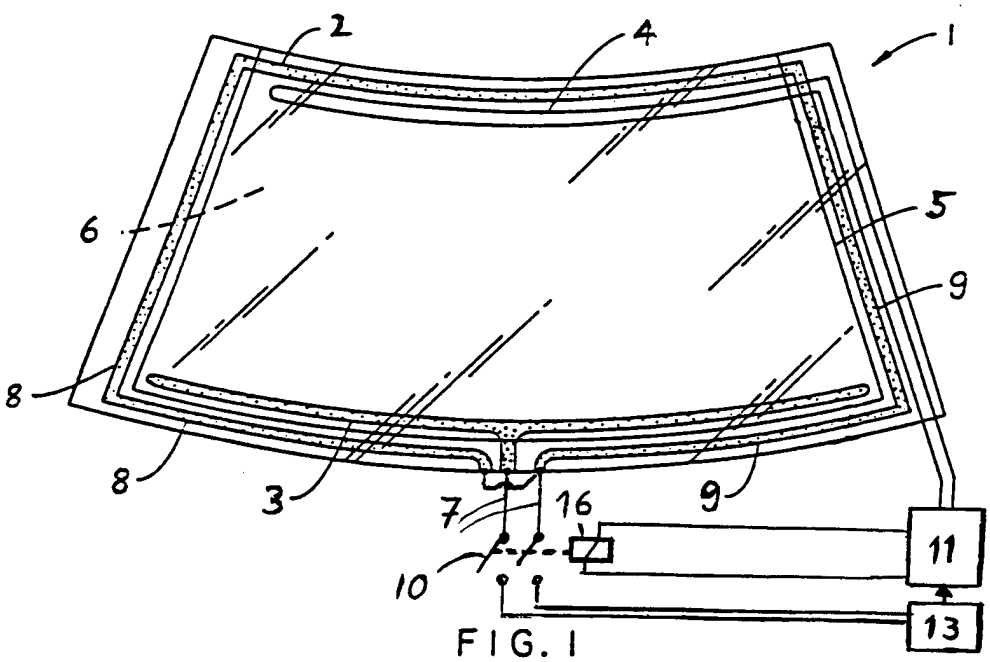

FIG. 1

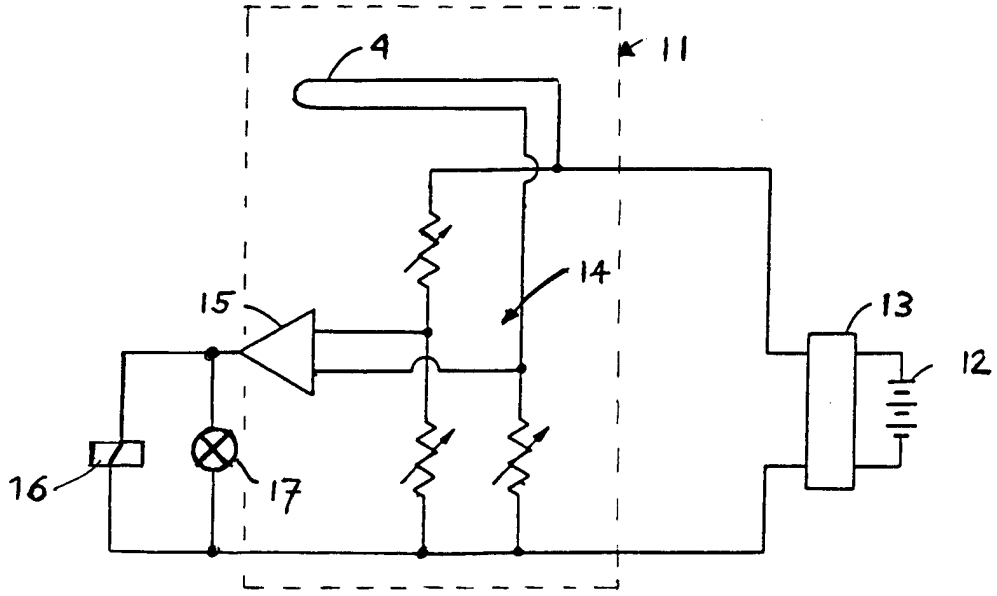

FIG. 2

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(54) Bezeichnung: Flüssigkristall-Anzeigevorrichtung vom Reflexionstyp

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Die vorliegende Erfindung bezieht sich auf e Flüssigkristall-Anzeigevorrichtung vom Reflexionstyp, die eine Schicht Flüssigkristall mit zwei stabilen Zuständen benutzt, nämlich einem transparenten Zustand nach Anlegen eines elektrischen Feldes, und einem nichttransparenten Zustand bei erhöhter Temperatur.

Beim Stand der Technik wird beim Abkühlen des Flüssigkristalls nach Abschalten des Heizstroms sowie nach Abschalten des Feldes automatisch die Anzeige gelöscht, die bekannten Vorrichtungen haben kein "Gedächtnis". Man muß daher ständig Energie zuführen, um die Anzeigen länger aufrechtzuhalten. Es bestand daher ein Bedürfnis für eine energiesparende Anzeigevorrichtung mit "Gedächtnis".

Es gibt auch cholesterische Substanzen, die bei Anlegen eines elektrischen Feldes transparent werden und diesen Zustand nach Abschalten des elektrischen Feldes beibehalten. Beim Erwärmen bis zu einer Temperatur oberhalb des sogenannten Klarpunkts werden sie nichttransparent, wobei dieser Zustand auch nach Abkühlen erhalten bleibt. Der nichttransparente Zustand bleibt solange erhalten, bis der Flüssigkristall durch Anlegen eines elektrischen Feldes erneut in den transparenten Zustand geschaltet wird.

Außer den beiden Elektroden zum Anlegen eines homogenen elektrischen Feldes wird eine Vielzahl von winzigen Heizelementen vorgesehen. Ein geeigneter Flüssigkristall mit Klarpunkt 75°C hat bspw. folgende Zusammensetzung:

70% Cholesterol-nonanoat, 25% Cholesterol-chlorid,
5% Cholesterol-cinnamat.

Es werden Feldelektroden vorgesehen, die sich über da ganze Anzeigefeld erstrecken, sowie eine Vielzahl von winzigen Heizelementen. Wenn an den Flüssigkristall ein elektrisches Feld angelegt wird, wird der gesamte Flüssigkristall transparent. Auffallendes Licht geht hindurch und wird von einer Schicht absorbiert; der Beobachter sieht ein homogen dunkles Anzeigefeld. Eine Anzeige entsteht, wenn ausgewählte Heizelemente eingeschaltet werden. Die Temperatur der zugehörigen (benachbarten) Flüssigkristall-Bereiche wird hierbei über den Klarpunkt angehoben, diese Bereiche werden nichttransparent und können Licht zum Beobachter reflektieren. Diese Bereiche bleiben auch nach Abkühlen im wesentlichen nichttransparent und erscheinen hell und die den nicht ausgewählten Heizelementen zugehörigen Flüssigkristall-Bereiche bleiben transparent und erscheinen dunkel.

Figur 1 zeigt eine Draufsicht auf eine Vorrichtung gemäß der Erfindung; und
Figur 2 den Schnitt längs der Linie 2-2 in Figur 1.

Figur 1 zeigt die Vorrichtung 10, wie sie der Beobachter sieht. Eine Vielzahl winziger Heizelemente 17a, 17b, 17c ... sind auf elektrisch nichtleitendem Substrat 18 wie Glas angeordnet, im gezeigten Beispiel in Matrix-Anordnung. Die Heizelemente sind, vgl. Figur 2, durch eine Glas-Isolierschicht 19 elektrisch gegeneinander isoliert, die möglichst dünn gehalten ist, um ein rasches Aufheizen der Flüssigkristallbereiche 21 c,j,o zu ermöglichen. Jedes Heizelement ist einzeln mit einer (nicht gezeigten) Stromquelle verbunden. Über der Schicht 19 ist eine leitende Tantalschicht 20 aufgebracht, die als erste Feldelektrode dient. Die von der Glasschicht 19 abgewandte Oberfläche 20a der Tantalschicht ist oxidiert, so daß sie durch den Flüssigkristall hindurchgehendes Licht absorbiert. Über einer Flüssigkristallschicht 21 der oben angegebenen Zusammen-

setzung wird eine abdeckende Glasplatte 22, auf der e leitende, transparente Schicht 23 als zweite Feldelek trode aufgebracht ist, angeordnet. Mit Pfeilen 6a ist die Beleuchtung und mit 6b die Richtung zum Beobachter angedeutet.

Das Substrat 18 wird auf einer konstanten Temperatur gehalten, um die Heizleistung, die erforderlich ist, um einen Flüssigkristallbereich (21 c,j,o) über den Klarpunkt zu erhitzen, klein und konstant zu halten. In der Praxis hat sich eine Thermostateinheit 11 bewährt, die aus einer relativ dicken Metallplatte 14, einer homogenen Heizschicht 13 und einer Glasplatte 12 besteht und von Schrauben 15 zusammengehalten wird. Der Temperaturfühler 16 ist mit einer Schaltung zur Aufrechterhaltung einer konstanten Temperatur verbunden.

Anspruch

Flüssigkristall-Anzeigevorrichtung vom Reflexionstyp, enthaltend

- eine Flüssigkristallschicht (21) mit folgenden Eigenschaften:

  - transparenter Zustand bei Anlegen eines elektrischen Feldes, der nach Abschalten des Feldes erhalten bleibt,

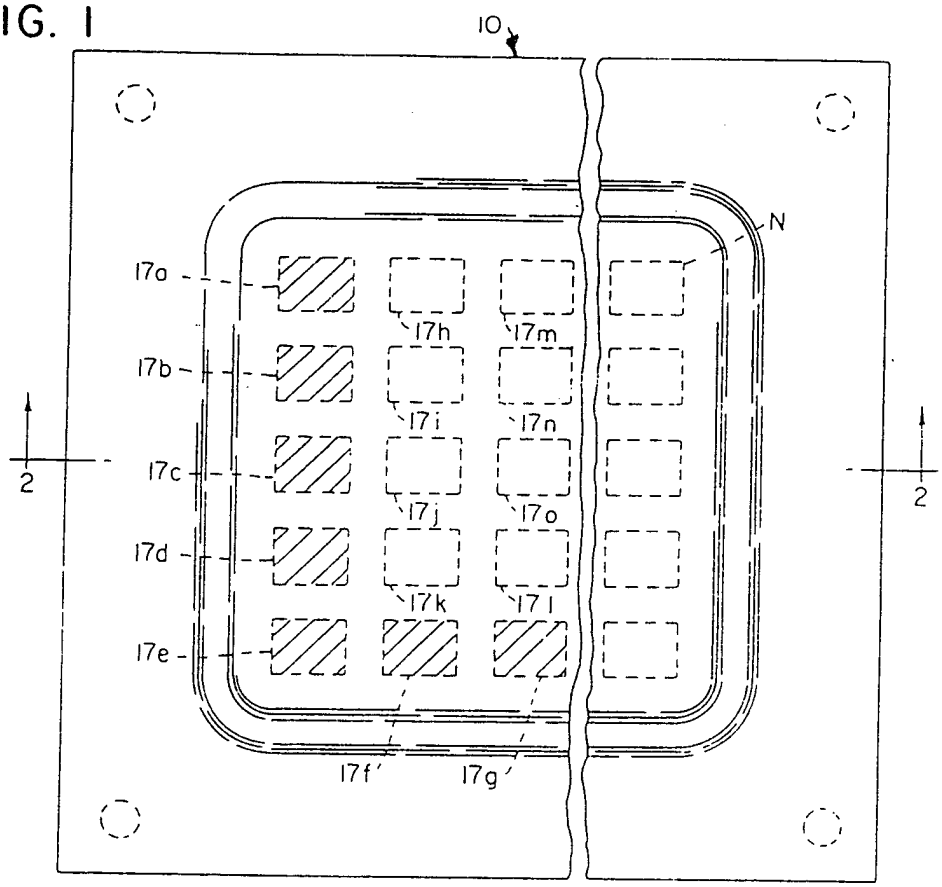
  - bei Erhitzen über den Klarpunkt Übergang in den nichttransparenten Zustand, der beim Abkühlen erhalten bleibt;

- erste und zweite Feldelektroden (20,23) auf beiden Seiten der Flüssigkristallschicht sowie Mittel zum Anlegen eines elektrischen Feldes;

- eine Anordnung winziger Heizelemente (17) und Mittel zum Anlegen eines Stroms an ausgewählte Heizelemente, um die Temperatur der zugehörigen Flüssigkristall-Bereiche über den Klarpunkt anzuheben, wobei sich die Lichtreflexions-Eigenschaft der Flüssigkristall-Elemente ändert; und

- eine Thermostateinheit (11) mit einer Metallplatte, um die Flüssigkristallschicht (21) auf einer im wesentlichen konstanten Temperatur zu halten.

FIG. 1



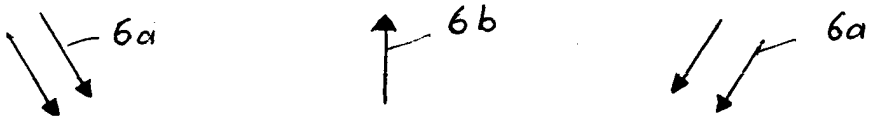
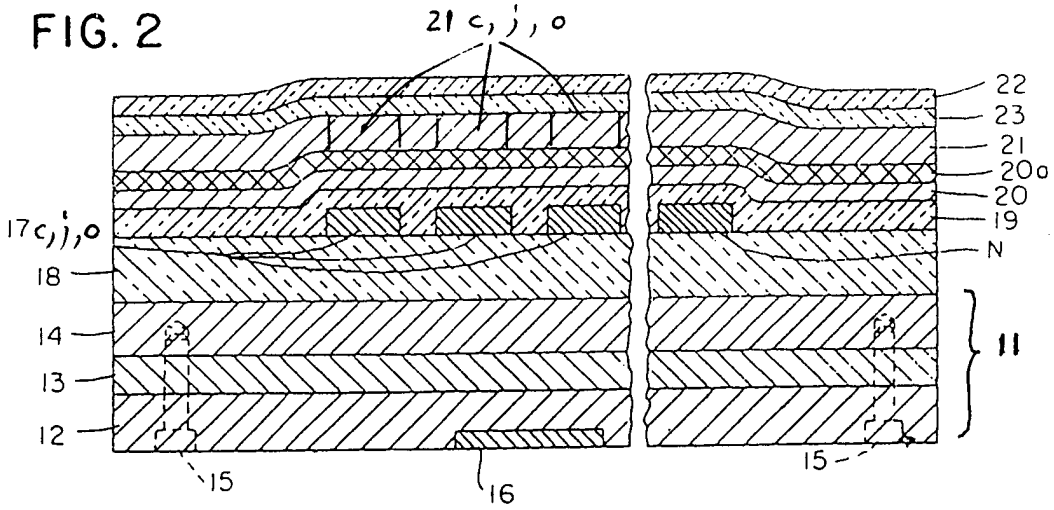


FIG. 2



Übersetzungshilfe / Glossary / Glossaire

ANLAGE 1 / ANNEX 1 / ANNEXE 1

Dansk	Deutsch	English	Français	Italiano	Nederlands	Svenska
flydende krystal celle	Flüssigkristallzellen	liquid crystal cells	cellules à cristaux liquides	cellule a cristalli liquidi	liquid crystal cells	flytande kristall celler
vibrations traetheds graense	Schwingungsfestigkeit	high vibratory fatigue limit	limite élevée à la fatigue due aux vibrations	alto limite di fatica da vibrazioni	trillingsvemoeidheids-grens	utmattningsgräns för höga vibrationer
billedelement	Bildelemente	picture elements	éléments d'image	elementi d'immagine	pixels	bildelement
komposit /sammensat struktur	Verbundkörper	composite structure	structure composite	struttura composita	compositie structuur	kompositstruktur
lamineret glas	Verbundglas	laminated glass structure	verre feuilleté	vetro laminato	compositie glas	laminerad glasstruktur struktur

ANLAGE 2 / ANNEX 2 / ANNEXE 2

Dansk	Deutsch	English	Français	Italiano	Nederlands	Svenska
gitterformet	gitterförmig	meshed	grillagée	reticolare	tralievormig	nät formad
bølgeformet	wellenlinienförmig	wave-shaped	ondulée	ondulato	golfijnvormig	vågformad
lavtemperaturleder	Kaltleiter	cold conductor	conducteur froid	conduttore freddo	koud weerstand	kall ledare
forstyrrende	störende	detrimental	nuisibles	disturbante	storend/schadelijk	skadliga

ANNEXE 3

Français	English	Deutsch	Nederlands	Italiano	Svenska	Dansk
écran d'affichage	display screen	Anzeigeschirm	display scherm	schermo per l'immagine	bildskärm	billedskaerm
maîtrisée	controlled	beherrscht	beheerst	ben nota	förstådd	kendt teknik
mince	thin	dünn	dun	sottile	tunn	tynd

ANLAGE 4

Deutsch	English	Français	Nederlands	Italiano	Svenska	Dansk
Kennlinien	characteristic curves	courbes caractéristiques	karakteristieke kromme	curve caratteristiche	karakteristiska kurvor	karakteris
Heizgitter	heating mesh	grille de chauffage	verwarmingstralie	griglia di riscaldamento	värmegaller	varm

ANLAGE 5

Deutsch	English	Français	Nederlands	Italiano	Svenska	Dansk
verbrauchsarm	low consumption	à basse consommation	zuinig	a basso consumo	energisnål	lavt energiforbrug
an Hand von	with the aid of	à l'aide de	aan de hand van	per mezzo di	med hjälp av	ved hjaelp af
Kenndaten	characteristic data	caractéristiques techniques	typische gegevens	dati caratteristici	tekniska data	karakteristiske data
eingebettet	embedded	inclu. enrobé	versonken	compreso fra	inbäddat	indstøbt

ANLAGE 6

Deutsch	English	Français	Nederlands	Italiano	Svenska	Dansk
Zinnoxide	tin oxides	oxide d'étain	tin oxide	ossidi di stagno	tennoxider	tinoxid
Heizdraht	heating wire	résistance chauffante	verwarmingsdraad	resistenza di riscaldamento	värmetråd	varmeleder

ANNEX 7

English	Deutsch	Français	Nederlands	Italiano	Svenska	Dansk
busbar	Verbindungsleitung	bus linéaire	contact rail	connettore elettrico	samlingsskena	samleskinne
loop	Schleife	boucle	lus	spira	slinga	sløjfe/loop
frit material	Frittenmaterial	matériau de fritte	frit materiaal	materiale per fritta	frittmaterial	frit materiale
silk screened	mit Siebdruck hergestellt	fait par sérigraphie	vervaardigd met seefdruk	fatto per serigrafia	duktryckt	serigrafi
bridge circuit	Brückenschaltung	circuit en pont	brugschakeling	collegamento a ponte	bryggkoppling	broforbindelse

ANLAGE 8

Deutsch	English	Français	Nederlands	Italiano	Svenska	Dansk
Anzeige	display	affichage	beeld	display	meddelandet	vise på skaerm
gelöscht	dispelled	annulée	uitgewist	cancellato	borttaget	slettet
Klarpunkt	clear point	point de transparence	punt van transparentie	punto di trasparenza	klarpunkt	tydeligste p