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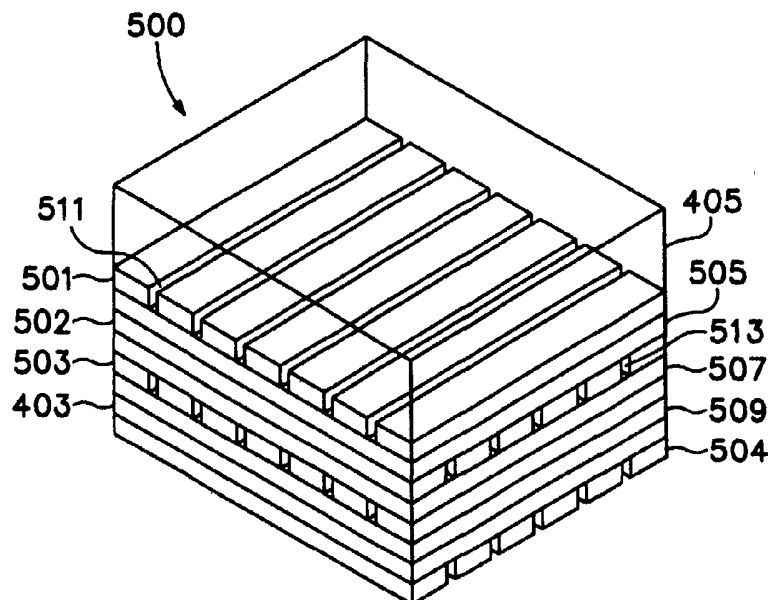
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[Continued on next page]

(54) Title: HIGH RESOLUTION DISPLAY



(57) Abstract: Method and apparatus for document content publishing, distribution, and display, including a method of doing business. An electronic display includes at least one reusable imaging stratum forming a pixel array of a bi-modal molecular colorant. Preferably, the molecules have bistable orientations. The imaging stratum having a viewing surface and a back surface. Adjacent said back surface is a background stratum. An addressing device is mounted for selectively switching colorant molecules of the imaging stratum between a transparent orientation and a color-exhibiting orientation. The present invention is adaptable to reflective light, black lit, and projection implementations.

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 02/33078

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 G02F1/15

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G02F G06F G11C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

BIOSIS, COMPENDEX, EPO-Internal, INSPEC, PAJ, IBM-TDB, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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X	US 5 781 330 A (ROUSSEAU DENIS LAWRENCE ET AL) 14 July 1998 (1998-07-14)	1-6, 10-13, 15-26, 29,30, 32-36, 39, 41-44, 50-55
Y	the whole document	7-9,14, 31,40, 59-61
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

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Y	abstract; figures 1,2,5,6,10	4-6,10, 15,20, 21,31, 33,34, 40,42, 43,52-55
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International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	TAMULIS A ET AL: "AB INITIO QUANTUM CHEMICAL DESIGN OF SUPERMOLECULE LOGICAL DEVICES" PROCEEDINGS OF THE SPIE, SPIE, BELLINGHAM, VA, US, vol. 4290, 24 January 2001 (2001-01-24), pages 82-93, XP008004659 page 88	15,16
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Y	--- WO 99 47019 A (HARRISON SHELTON E JR ;ORANG OTANG COMPUTERS INC (US); PEDERSEN SC) 23 September 1999 (1999-09-23) page 7, line 28 - line 31; figure 13	31,40
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## INTERNATIONAL SEARCH REPORT

 International Application No  
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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 6 040 811 A (MALHI SATWINDER D S) 21 March 2000 (2000-03-21)  column 8, line 36 - line 46; figures 3-11 ---	1,26-28, 36-38, 50,62,63
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Y		59-61
X	US 5 956 034 A (SACHS JAMES ET AL) 21 September 1999 (1999-09-21) abstract; figures 1-6 -----	56-58
Y		59-61

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 02/33078

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: **48**  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
**Claim 48 does not contain any subject-matter and, thus, no meaningful search is possible.**
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.



## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-22,24,26,32-36,41-44,50-55

An electronic device and method of fabrication, the device comprising an addressable bi-modal molecular colorant stratum.

1.1. Claims: 1,5,6(1),7,8,55(1)

The colorant molecules exhibit an electric field induced band gap change by molecular conformation change or an isomerization wherein the colorant molecules have at least one stator portion and at least one rotor portion which rotates from a first state (having extended conjugation and, thus, a relatively smaller band gap) to a second state (having no extended conjugation and, thus, a relatively larger band gap) with an applied electric field.

1.2. Claims: 1,5,6(1),7,9,55(1)

The colorant molecules exhibit an electric field induced band gap change by a molecular conformation change or an isomerization wherein, dependent upon the direction of the electric field applied, in a first state the colorant molecules are in a more conjugate state having a relatively smaller band gap, and in a second state the colorant molecules are in a less conjugated state having a relatively larger band gap.

1.3. Claims: 1,5,6(2),10-12,55(2)

The colorant molecules exhibit an electric field induced band gap change by a change of extended conjugation via chemical bonding change wherein a change from a first state to a second state occurs with an applied electric field, the change involves charge separation from the first state to the second state with less p-(band)-delocalisation and relatively larger band gap, and recombination of charge from the second state to the first state with greater p-(band)-delocalisation and a relatively smaller band gap.

1.4. Claims: 1,5,6(2),13,14,55(2)

The colorant molecules exhibit an electric field induced band gap change by change of extended conjugation via chemical bonding change wherein a change from a first state having extended conjugation (i.e. relatively larger band gap) to a second state having no extended conjugation (i.e. relatively

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

smaller band gap) occurs with an applied electric field, the change involves the creation of separated positive and negative charges together with p-bond breaking; furthermore recombination and p-bond formation is also possible.

## 1.5. Claims: 1,5,6(3),15,16,55(3)

The colorant molecules exhibit an electric field induced band gap change by molecular folding or stretching wherein the colorant molecules have three portions, a first portion and a third portion bonded to a second, central portion wherein a change from a first state to a second state occurs with an applied electric field, said change involving a folding or stretching about or of said second portion wherein the first state has an extended conjugation (i.e. a relatively smaller band gap) and the second state has no extended conjugation (i.e. a relatively larger band gap).

## 1.6. Claims: 1,21,22(1),34,35(1),43,44(1)

The molecules have more than two states and are switchable such that the optical properties are tuned continuously by application of a decreasing or increasing electric field to form a volatile switch.

## 1.7. Claims: 1,20,22(2),33,35(2),42,44(2)

The molecules have more than two states and are switchable such that the color of selected composition regions is changed abruptly by application of voltage pulses to switch with at least one molecular activation barrier.

## 2. Claims: 1,23-26,29-31,36,39,40

A display device comprising an addressable bi-modal molecular colorant stratum and an addressing device for selectively switching colorant molecules of the stratum, wherein the display device e.g. forms part of a variety of different electronic appliances or is e.g. a retractable geometry positionable screen.

## 3. Claims: 26-28,36-38,45,62,63

A display device comprising an addressable bi-modal molecular colorant stratum forming a pixel array and an addressing device for selectively switching colorant molecules of the stratum, wherein the display device e.g. has a background stratum which provides a high contrast or has a plurality of addressable bi-modal molecular colorant

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

strata (forming a plurality of pixel arrays) which have separate addressing devices or has a transparent/translucent substrate such that the display e.g. forms part of a projection apparatus or has means for backlighting.

a) Claims 26-28,36-38: The display device has a background stratum which provides a high contrast or the two states of the molecules provide a high contrast to each other.

b) Claims 36,45: The display device has a plurality of addressable bi-modal molecular colorant strata (forming a plurality of pixel arrays) which have separate addressing devices.

c) Claims 62,63: The display device has a transparent/translucent substrate such that the display e.g. forms part of a projection apparatus or has means for backlighting.

4. Claims: 36,46,47

A display device and a method of its fabrication comprising an addressable bi-modal molecular colorant stratum forming a pixel array and an addressing device for selectively switching colorant molecules of the stratum, wherein the display device has a mosaic pattern of colorant molecules arranged in addressable picture element groups.

5. Claims: 36,49

A display device comprising an addressable bi-modal molecular colorant stratum forming a pixel array and an addressing device for selectively switching colorant molecules of the stratum, wherein the addressing device has a molecular crossbar wiring.

6. Claims: 56-61

A communication appliance having corresponding methods, the appliance comprising a pixel array of a bi-modal molecular colorant, wherein the device provides methods of retrieving, ordering and downloading documents from internet sites, e.g. by a wireless interface.

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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