US006225971B1

(12) **United States Patent**
Gordon, II et al.

(10) **Patent No.: US 6,225,971 B1**
(45) **Date of Patent: May 1, 2001**

(54) **REFLECTIVE ELECTROPHORETIC DISPLAY WITH LATERALLY ADJACENT COLOR CELLS USING AN ABSORBING PANEL**

(75) Inventors: **Joseph Grover Gordon, II**; **Mark Whitney Hart**; **Sally Ann Swanson**, all of San Jose, CA (US)

(73) Assignee: **International Business Machines Corporation**, Armonk, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/154,114**

(22) Filed: **Sep. 16, 1998**

(51) **Int. Cl.**[7] **G09G 3/34**; G02B 26/00

(52) **U.S. Cl.** **345/107**; 359/296

(58) **Field of Search** 345/107; 359/296; 204/450, 600

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,612,758	10/1971	Evans et al.	178/5.4 R
4,062,009	12/1977	Raverdy et al.	340/324
4,071,430	1/1978	Liebert	204/299
4,218,302	8/1980	Dalisa et al.	204/299 R
4,272,596	6/1981	Harbour et al.	430/37
4,620,916	11/1986	Zwemer et al.	204/299 R
4,648,956	3/1987	Marshall et al.	204/299
4,650,288	3/1987	White	350/362
4,833,464	5/1989	Di Santo et al.	340/793
5,293,528	3/1994	Di Santo et al.	345/107
5,298,833	3/1994	Hou	313/483
5,745,094	4/1998	Gordon, II et al.	345/107
5,872,552 *	2/1999	Gordon, II et al.	359/296

FOREIGN PATENT DOCUMENTS

51-130241	11/1976	(JP)	G02F/1/17
55-071782	5/1980	(JP)	C09K/9/02
55-105227	8/1980	(JP)	G02F/1/19
59-165028	9/1984	(JP)	G02F/1/19
60-087317	5/1985	(JP)	G02F/1/19
60-189731	9/1985	(JP)	G02F/1/19
2-189525	7/1990	(JP)	G02F/1/167
2-223932	9/1990	(JP)	G02F/1/167
2-223933	9/1990	(JP)	G02F/1/167
2-284123	11/1990	(JP)	G02F/1/167
2-284128	11/1990	(JP)	G02F/1/167
3-266818	11/1991	(JP)	G02F/1/167
3-284729	12/1991	(JP)	G02F/1/167
4-127190	4/1992	(JP)	G09F/9/37
4-166917	6/1992	(JP)	G02F/1/167
4-166918	6/1992	(JP)	G02F/1/167

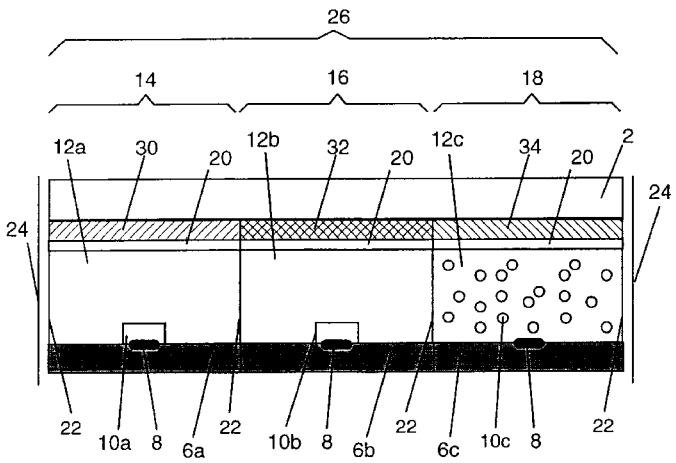
OTHER PUBLICATIONS

Beilin et al., "2000–Character Electrophoretic Display", SID 86 Digest, pp. 136–140.
Chiang, "Conduction Mechanism of Charge Control Agents Used in Electrophoretic Display Devices", Proceeding of the S.I.D., vol. 18, 3rd/4th Quarters 1977, pp. 275–282.
Chiang, "Electrophoretic Displays: The State of the Art", IEEE, 1980, pp. 10–12.

(List continued on next page.)

Primary Examiner—Richard A. Hjerpe
Assistant Examiner—Benjamin D. Bowers
(74) *Attorney, Agent, or Firm*—Thomas R. Berthold

(57) **ABSTRACT**

An ambient light reflective color electrophoretic display is comprised of a plurality of color pixels; each comprised of at least two electrophoretic cells. Each cell is comprised of a suspension of charged, white or colored light-scattering pigment particles in a light-transmissive fluid. Each cell is also comprised of a light-transmissive front window, at least one non-obstructing counter electrode, at least one non-obstructing collecting electrode, a light-absorbing panel, and a color filter medium. The cells of different colors are in a laterally adjacent relationship to each other and the charged pigment particles are responsive to the electrodes. The filter medium in each cell can be a light-transmissive color filter element. Alternatively, the pigment suspension fluid itself or the pigment particles themselves can be colored and serve as the filter medium.

13 Claims, 5 Drawing Sheets