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[54] **DEGRADATION RETARDANTS FOR ELECTROPHORETIC DISPLAY DEVICES**

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[58] **Field of Search** ..... 350/362; 340/787; 204/299 EC, 299 R, 299 PE

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,668,106	6/1972	Ota	204/299 R
3,892,568	7/1975	Ota	96/1.3
4,039,255	8/1977	Yamashita	204/299 PE
4,041,481	8/1977	Sato	340/324 M
4,093,534	6/1978	Carter et al.	350/355
4,203,106	5/1980	Dalisa et al.	340/787
4,285,801	8/1981	Chiang	204/299 R
4,418,346	11/1983	Batchelder	340/787

OTHER PUBLICATIONS

Lim et al., *J. Electrochemical Soc.,* vol. 123, No. 6, Jun. 1976, pp. 837–838.

Lim et al., *Appl. Phys. Lett.,* vol. 28, No. 9, May 1, 1976, pp. 478–480.

Lim et al., *J. Electrochemical Soc.,* vol. 124, No. 9, Sep. 1977, pp. 1389–1394.

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[57] **ABSTRACT**

Degradation retardants reduce electrochemical degradations and provide significantly increased operation lifetimes for the colloidal suspensions of electrophoretic display devices. Suitable degradation retardants include redox agents capable of being repeatedly, reversibly oxidized and reduced in the colloidal suspensions.

24 Claims, No Drawings