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(21) International Application Number: PCT/GB97/01019 (22) International Filing Date: 14 April 1997 (14.04.97) (30) Priority Data: 9607854.8 16 April 1996 (16.04.96) GB (71) Applicant (for all designated States except US): THE SECRETARY OF STATE FOR DEFENCE IN HER BRITANNIC MAJESTY'S GOVERNMENT OF THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND [GB/GB]; Defence Evaluation & Research Agency, Ively Road, Farnborough, Hampshire GU14 0LX (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): BRYAN-BROWN, Guy, Peter [GB/GB]; Defence Research Agency, St. Andrews Road, Malvern, Worcs. WR14 3PS (GB). BROWN, Carl, Vernon [GB/GB]; Defence Research Agency, St. Andrews Road, Malvern, Worcs. WR14 3PS (GB). SAGE, Ian, Charles [GB/GB]; Defence Research Agency, St. Andrews Road, Malvern, Worcs. WR14 3PS (GB). (74) Agent: SKELTON, Stephen, Richard; D/IPR (DERA) Formalities, Poplar 2a, MOD (PE) Abbey Wood #19, P.O. Box 702, Bristol BS12 7DU (GB).	(81) Designated States: CA, CN, GB, JP, KR, <u>SG</u> /US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report.	

(54) Title: LIQUID CRYSTAL DEVICE

(57) Abstract

A liquid crystal device comprises a layer of nematic or long pitch cholesteric liquid crystal material contained between two cell walls. One wall (A) carries a surface treatment giving a first azimuthal alignment direction with or without a surface pretilt to liquid crystal molecules. The other wall (B) carries a surface treatment (17) capable of separately providing both a preferred, substantially homeotropic alignment of the adjacent liquid crystal, and a defined azimuthal second alignment direction to the adjacent liquid crystal dependent upon liquid crystal molecular arrangement. The first and second alignment directions are approximately orthogonal. The device is formed into an array of separately addressable pixels, e.g. an x, y matrix array. Each pixel may be addressed via an active matrix e.g. thin film transistors, or in an rms. multiplex manner via row and column electrodes. Polariser may be arranged on either side of the cell walls with their polarisation axes parallel or perpendicular to the two azimuthal directions. Alternatively an amount of dichroic dye may be incorporated in the liquid crystal material, and the device operated with one or two polarisers. The device operates between two different voltage levels, one level providing a non twisted liquid crystal molecular arrangement, the other and higher voltage providing a twisted molecular arrangement. The two polarisers, or dye plus polarisers, distinguishes between the two molecular arrangements in a manner similar to that of prior art twisted nematic devices.

