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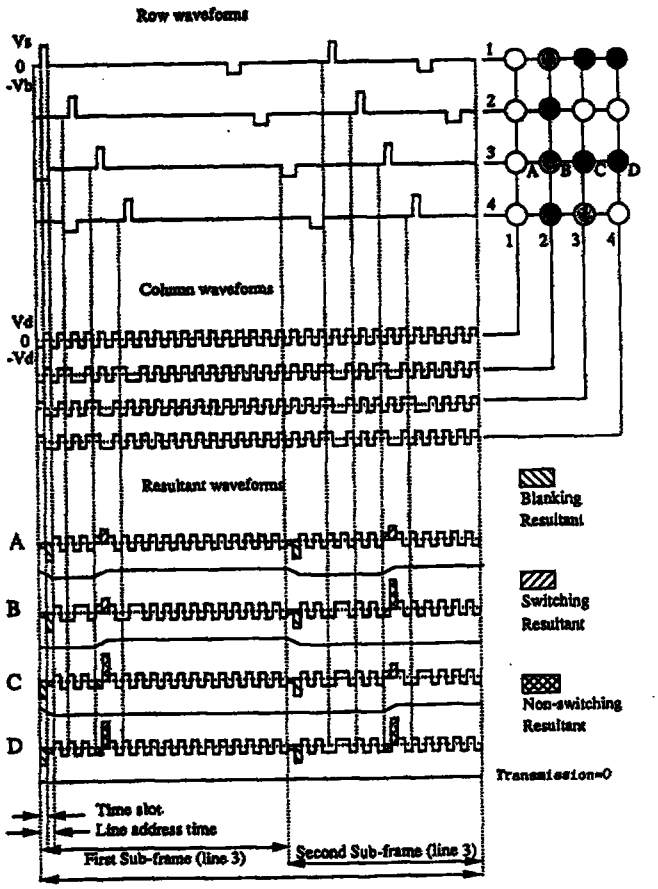
(54) Title: FERROELECTRIC LIQUID CRYSTAL DISPLAYS WITH GREYSCALE

(57) Abstract

The invention provides a ferroelectric liquid crystal display with uniformly spaced greyscale levels. The invention uses a bistable ferroelectric liquid crystal display formed by a layer of chiral smectic liquid crystal material between two cell walls. The walls carry e.g. line and column electrodes to give an x,y matrix of addressable pixels, and are surface treated to provide bistable operation. Each pixel may be divided into subpixels thereby giving spatial weighting for greyscale. Temporal weighting of greyscale is obtained by switching a pixel to a dark state for time T1 and a light state for time T2. When T1 and T2 are not equal, four different greyscales are obtainable; i.e. dark, dark grey, light grey, and light. The present invention provides a required uniform spacing of greyscale levels by addressing each pixel two or more times in one frame time. Each pixel is blanked then strobed, two or more times in each frame time; the relative times between blanking and strobing, at least four different time periods, are varied to give the desired greyscale levels. The temporal and spatial weighting may be combined to increase the number of obtainable greyscales. Further, the relative intensity between adjacent subpixels may be adjusted to vary the apparent size of the smallest subpixel; this is useful when subpixel size is near to manufacturing limits.



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