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# United States Patent [19]

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Scheffer et al.

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- [54] **SPLIT INTERVAL GRAY LEVEL ADDRESSING FOR LCDS**
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- [73] Assignee: **In Focus Systems, Inc.**, Wilsonville, Oreg.
- [\*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,459,495.

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- [21] Appl. No.: **484,165**
- [22] Filed: **Jun. 7, 1995**

### Related U.S. Application Data

- [60] Division of Ser. No. 883,002, May 14, 1992, Pat. No. 5,459,495, and a continuation-in-part of Ser. No. 678,736, Apr. 1, 1991, Pat. No. 5,485,173.
- [51] Int. Cl.<sup>6</sup> ..... **G09G 3/36**
- [52] U.S. Cl. .... **345/147; 345/89**
- [58] Field of Search ..... **345/89, 87, 147, 345/100**

### [57] ABSTRACT

Method and apparatus are disclosed for providing gray level addressing for passive matrix liquid crystal display (LCD) panels having pixels defined by overlapping row and column electrodes. The pixels have optical states determined by the rms voltage appearing across the pixels during a frame period. The frame period is divided into characteristic time intervals, which are further divided into sub-intervals. The amplitude of the column signals during each of the sub-intervals is determined from the desired gray level of the pixel or pixels defined by the corresponding column electrode and selected one or ones of the row electrodes.

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**37 Claims, 14 Drawing Sheets**

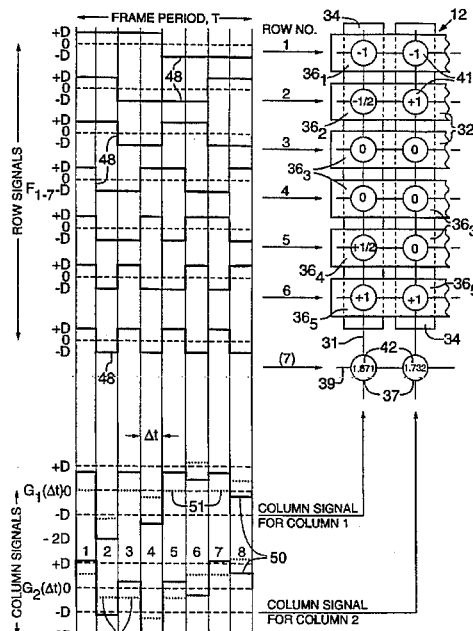


FIG. 1

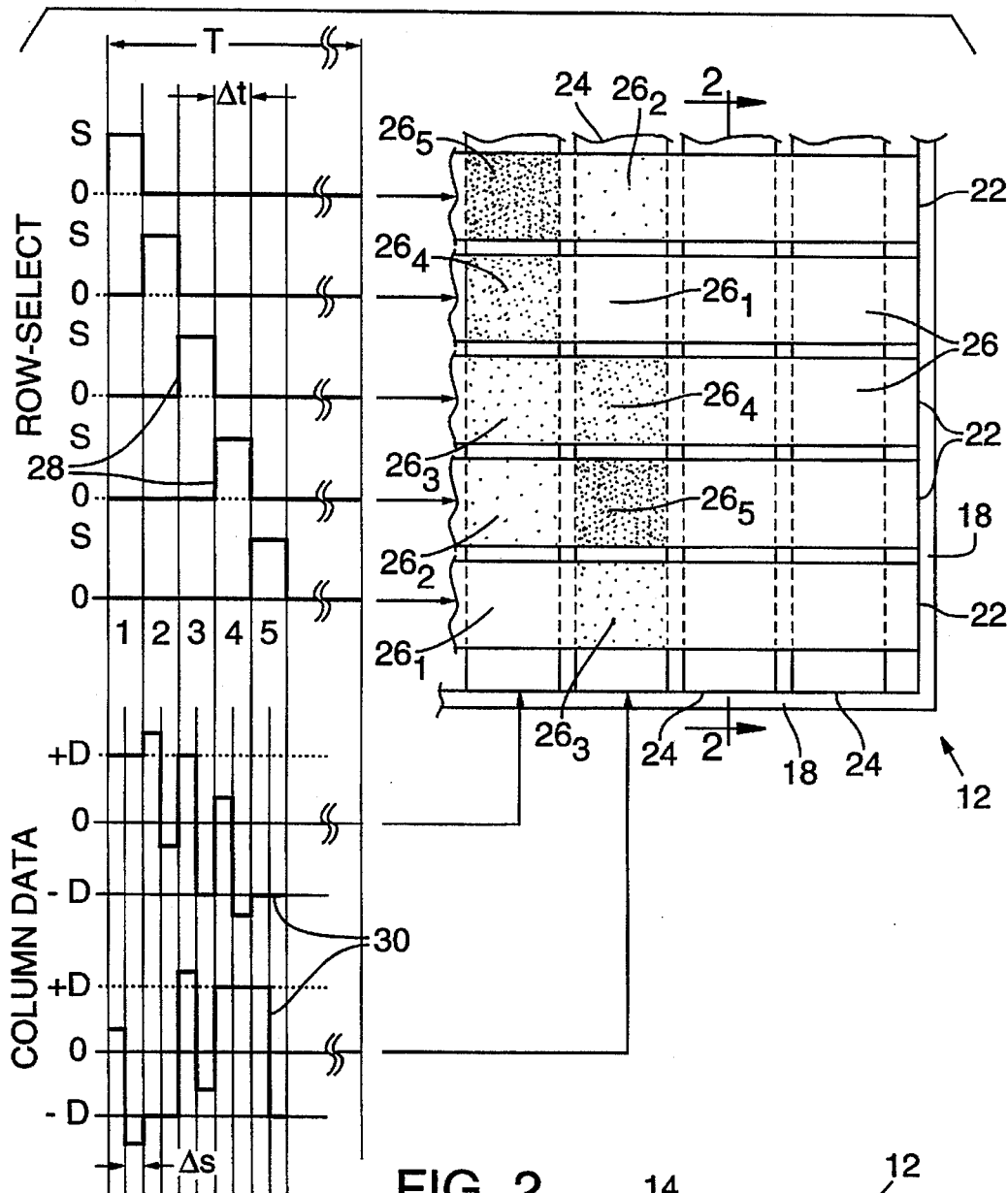


FIG. 2

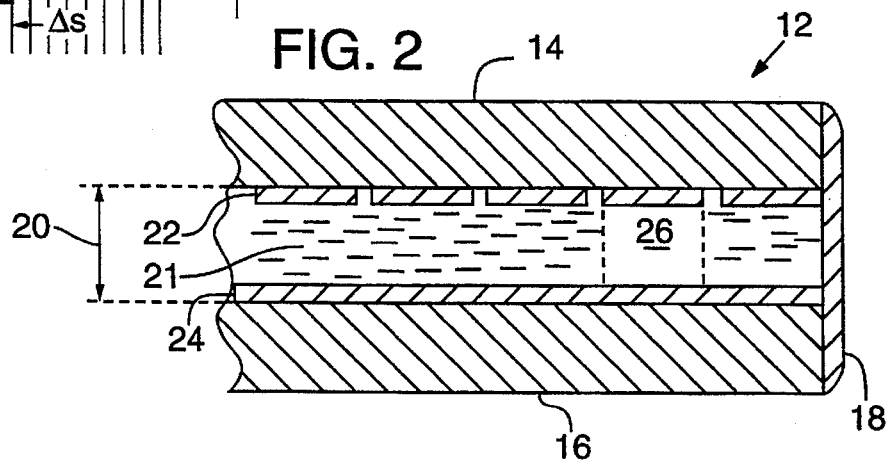


FIG. 3A (Prior Art)

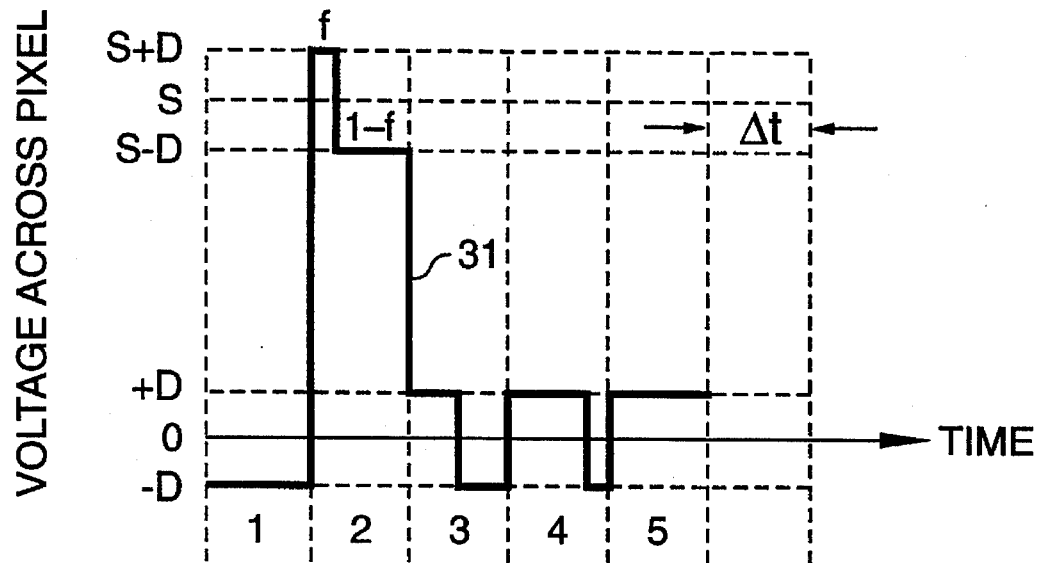


FIG. 3B This Invention

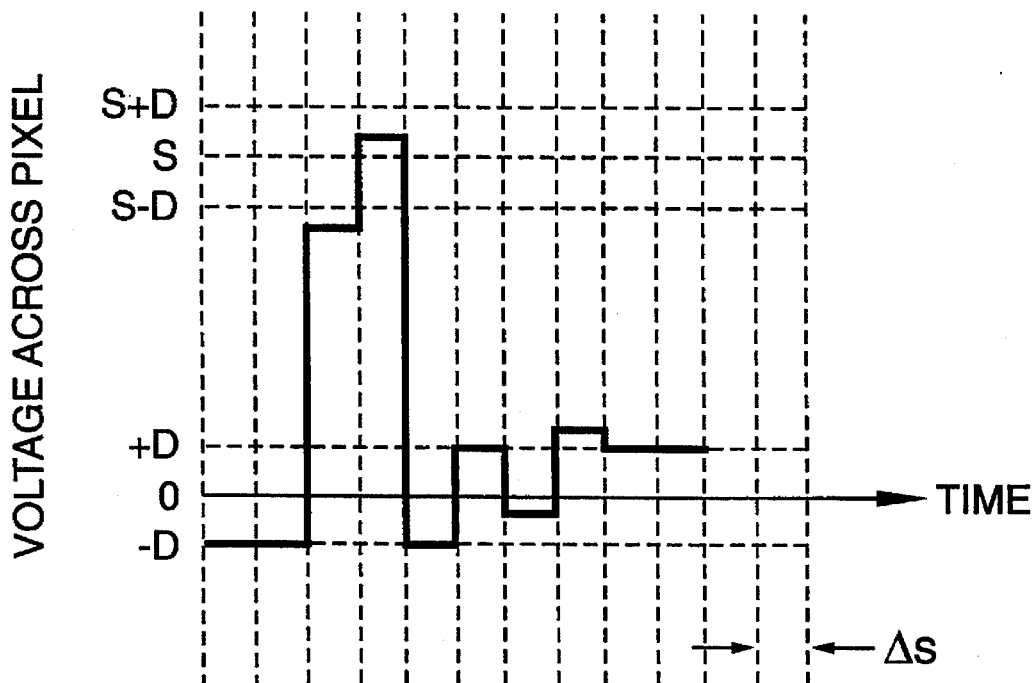


FIG. 4

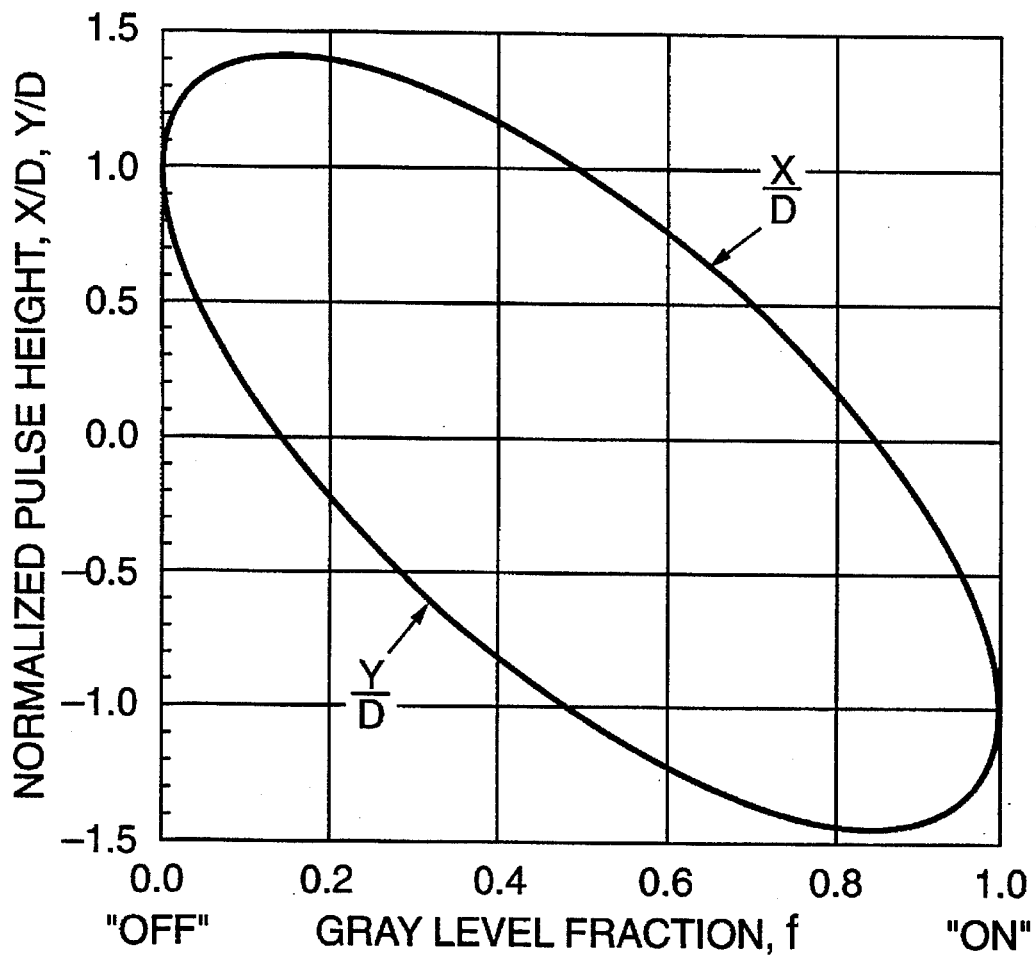


FIG. 5A (Prior Art)

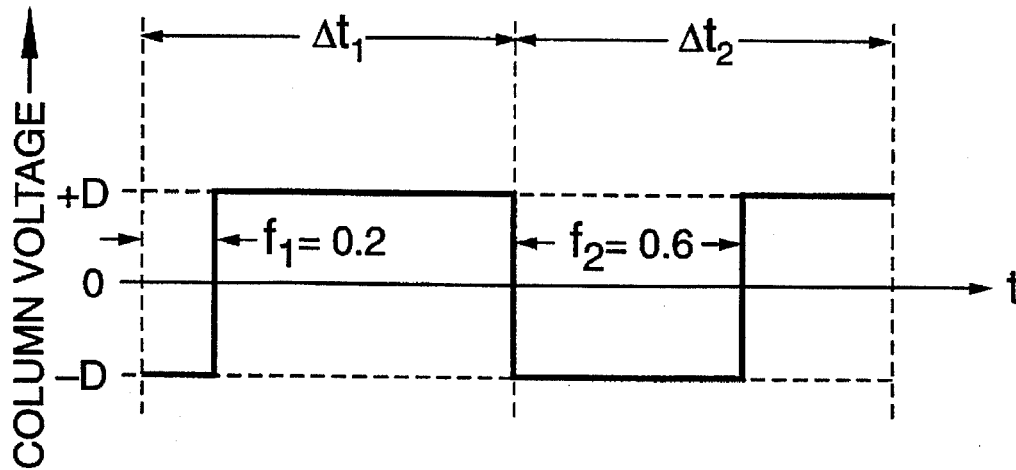
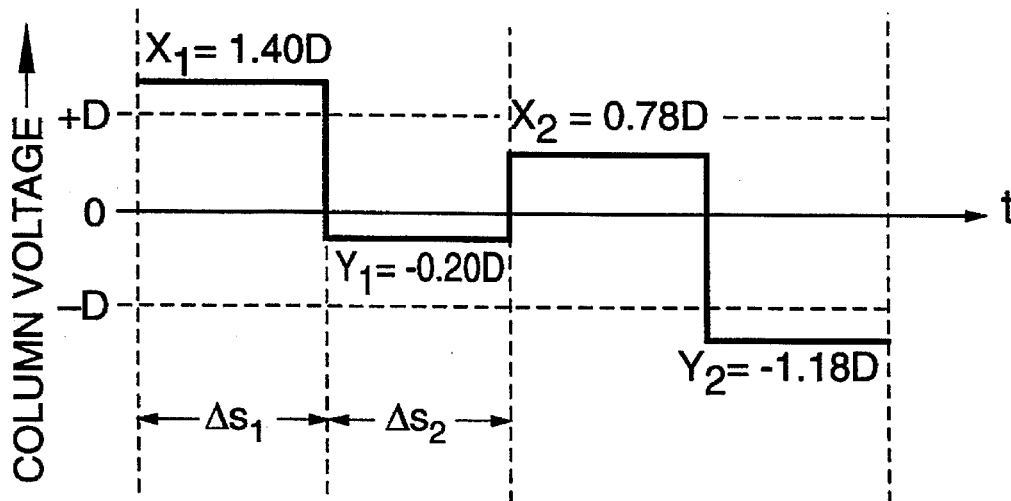


FIG. 5B This Invention



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