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# United States Patent [19] Hagerman

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[54] **BIAS DRIVE AND NOISE REDUCTION IN IMAGE PROJECTORS**

294416 12/1986 Japan ..... 359/85  
443778 2/1992 Japan .  
4043778 2/1992 Japan ..... H04N 5/74

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### [57] ABSTRACT

Improved bias drive and noise reduction techniques for use with an image projector, such as a liquid crystal light valve image projector. A bias drive circuit produces a square wave-like signal to drive the liquid crystal light valve, for example, with a square wave signal. The square wave-like signal is phase-locked to the vertical refresh (vertical sync) signal of the projector. A frequency synthesizer is used to drive the bias drive circuit wherein the noise is interlaced by using every other field as the sync reference input to the bias drive circuit. The bias drive circuit is unique in how it reduces unwanted visual noise effects in a displayed image by waveshaping the drive signal and interlacing and phase-locking it to the vertical refresh signal of the projector. These aspects of the present invention combine to virtually eliminate visual noise in the projected image. An optional variable gain circuit may be provided that provides the ability to set the amplitude of the bias provided by the bias drive circuit to the cut-in operating point of the liquid crystal light valve.

13 Claims, 4 Drawing Sheets

