

[54] **LIQUID CRYSTAL DEVICES AND SYSTEMS FOR ULTRASONIC IMAGING**

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[56] **References Cited**

UNITED STATES PATENTS

3,597,043 8/1971 Dryer350/150

Primary Examiner—Ronald L. Wibert

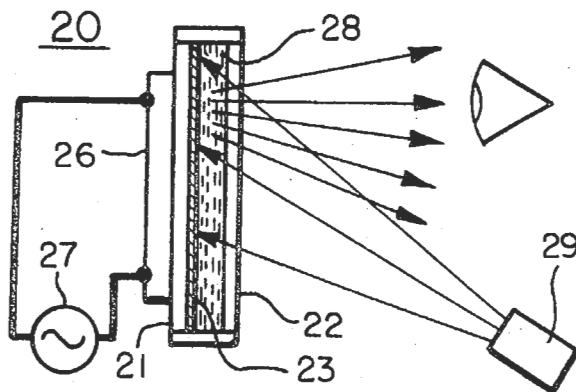
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[57] **ABSTRACT**

A device is disclosed which includes a layer comprising a nematic liquid crystal toward which ultrasonic wavefronts are directed. A marked change over any particular area of the layer occurs from a clear state to a light-scattering state when the intensity of the ultrasound applied to that area exceeds a threshold value. The degree of light scattering obtainable is found to be functionally related to the intensity of the applied ultrasound above the threshold. A matrixed array of such devices is arranged in a system with suitable ultrasonic addressing means and scanning means to provide a real-time image display system having a gray-scale. A system for visualizing ultrasonic image information either conventionally or holographically is also provided by causing a sound beam carrying image information as well as a reference beam to impinge on a common area of such a device. The resulting pattern of ultrasonic intensity variations over the area causes light to be variably scattered from different points in the area in accordance with the ultrasonic intensity pattern, thereby rendering visible the analogue optical hologram of the image.

9 Claims, 6 Drawing Figures



Absorptive Mode