

(12) United States Patent Kubota et al.

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(54)	DISPLAY DEVICE		Koyama
(75)	Inventors: Yasushi Kubota, Nara; Kenichi Katoh, Hiroshima; Jun Koyama, Kanagawa, all of (JP)	5,818,068 * 10/1998 5,841,317 * 11/1998	Kubota et al. 345/100 Sasaki 257/59 Ohmori et al. 327/563 Yamasaki et al. 257/57
(72)	Assistant Comicanductor Francy Laboratory		

Assignees: Semiconductor Energy Laboratory Co., Ltd., Kanagawa-ken; Sharp Kabushiki Kaisha, Osaka, both of (JP)

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U.S. Cl. 345/92; 345/98; 345/100;

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(21) Appl. No.: 08/932,246

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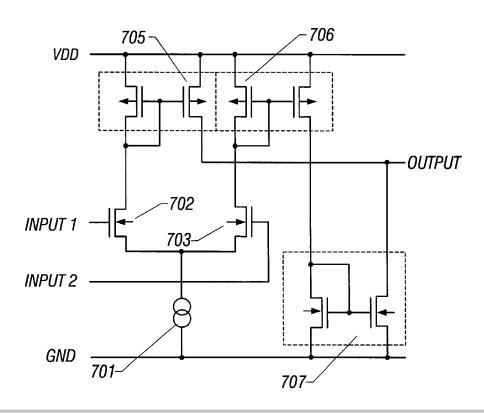
Primary Examiner—Steven Saras Assistant Examiner—Fritz Alphonse

(74) Attorney, Agent, or Firm—Fish & Richardson P.C.

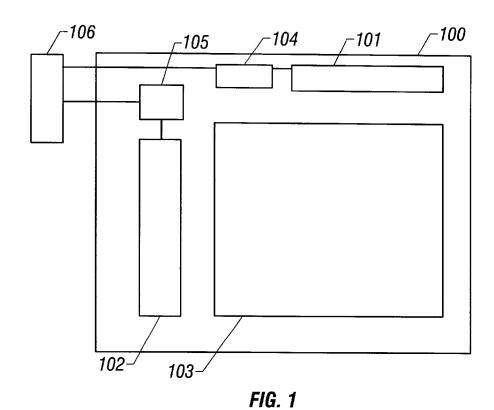
ABSTRACT

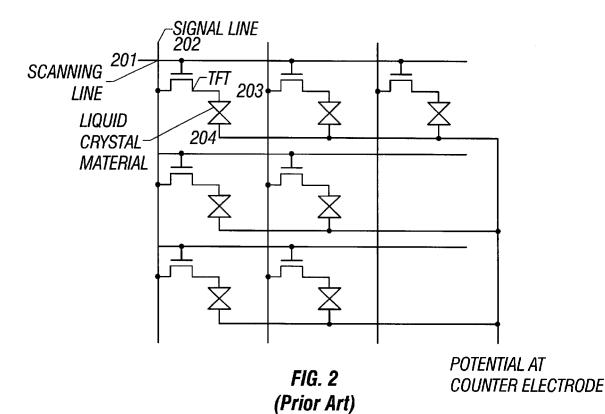
There is disclosed an active matrix liquid crystal display that receives input signals having small amplitudes and needs no externally attached level-shifting circuit. The active matrix liquid crystal display has a level-shifting circuit for amplifying various input signals, such as control signals, a clock signal, and a start pulse signal, and supplying the amplified signals to peripheral driver circuits. These peripheral driver circuits drive an active matrix circuit. The level-shifting circuit is made of a differential amplifier consisting of polysilicon TFTs. This amplifier is an analog amplifier. This level-shifting circuit is fabricated on the same substrate as the active matrix circuit and the peripheral driver circuits. If the amplitudes of the input signals are small, level-shifting operations can be performed well. Since any externally attached level-shifting circuit is dispensed with, the cost can be curtailed.

22 Claims, 7 Drawing Sheets



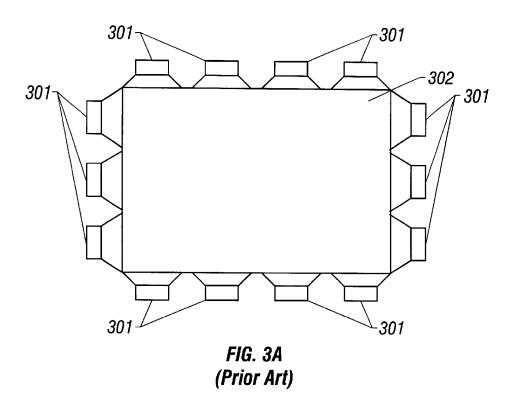








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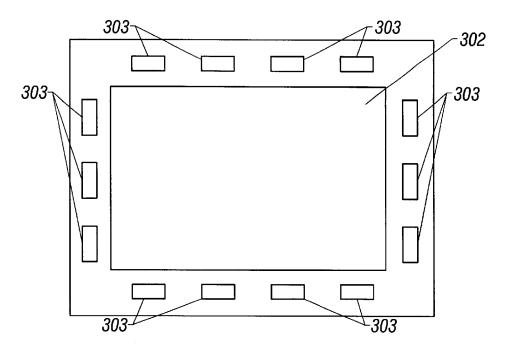


FIG. 3B (Prior Art)



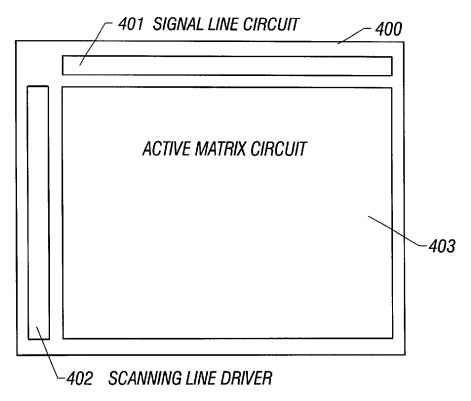


FIG. 4 (Prior Art)

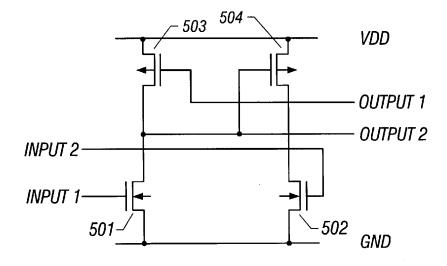
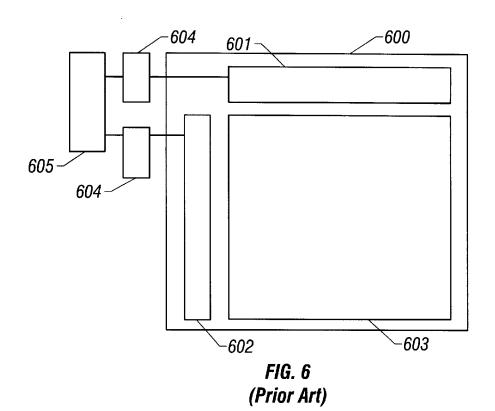
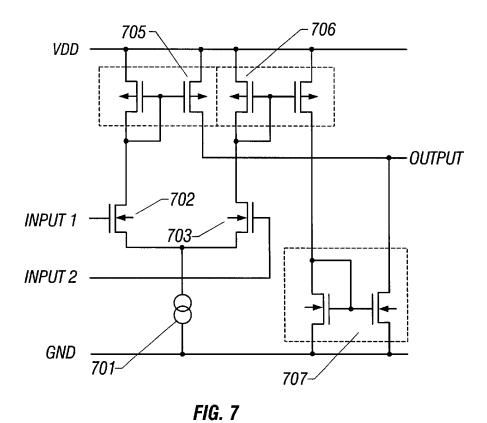


FIG. 5 (Prior Art)





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