



United States Patent [19]

[11] **Patent Number:** **5,543,588**

Bisset et al.

[45] **Date of Patent:** **Aug. 6, 1996**

[54] **TOUCH PAD DRIVEN HANDHELD COMPUTING DEVICE**

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[73] Assignee: **Synaptics, Incorporated**, San Jose, Calif.

[21] Appl. No.: **161,671**

[22] Filed: **Dec. 3, 1993**
(Under 37 CFR 1.47)

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 895,934, Jun. 8, 1992, and a continuation-in-part of Ser. No. 115,743, Aug. 31, 1993, Pat. No. 5,374,787.

[51] **Int. Cl.⁶** **G08C 21/00; G09G 5/00**

[52] **U.S. Cl.** **178/18; 345/173**

[58] **Field of Search** **178/18, 19; 341/33, 341/34; 345/173, 174**

[56] **References Cited**

U.S. PATENT DOCUMENTS

5,327,163 7/1994 Hashimoto et al. 178/18 X

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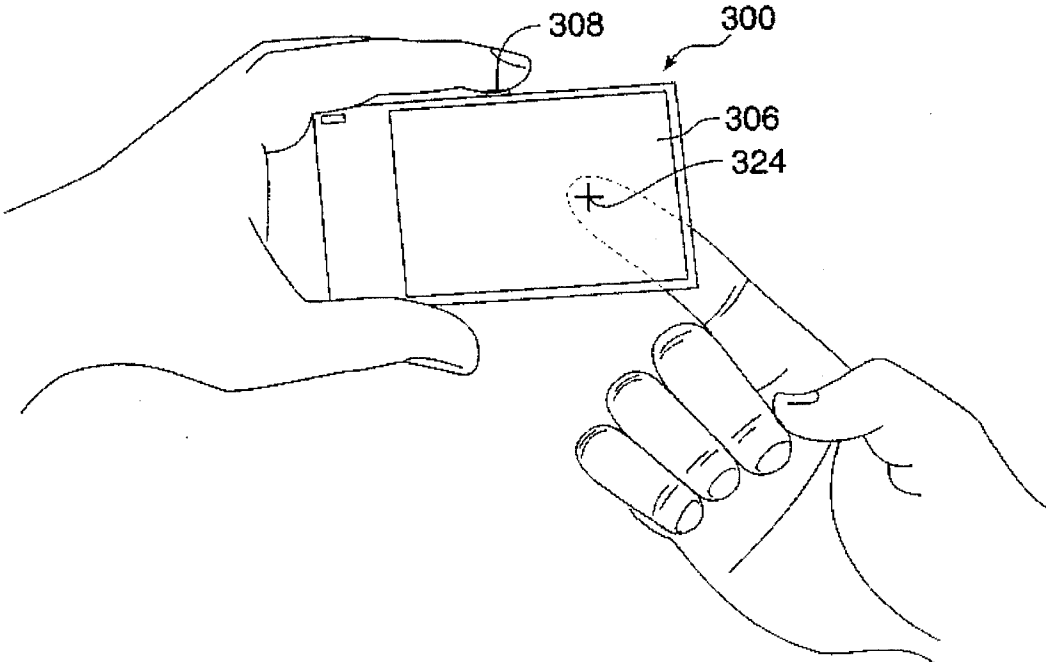
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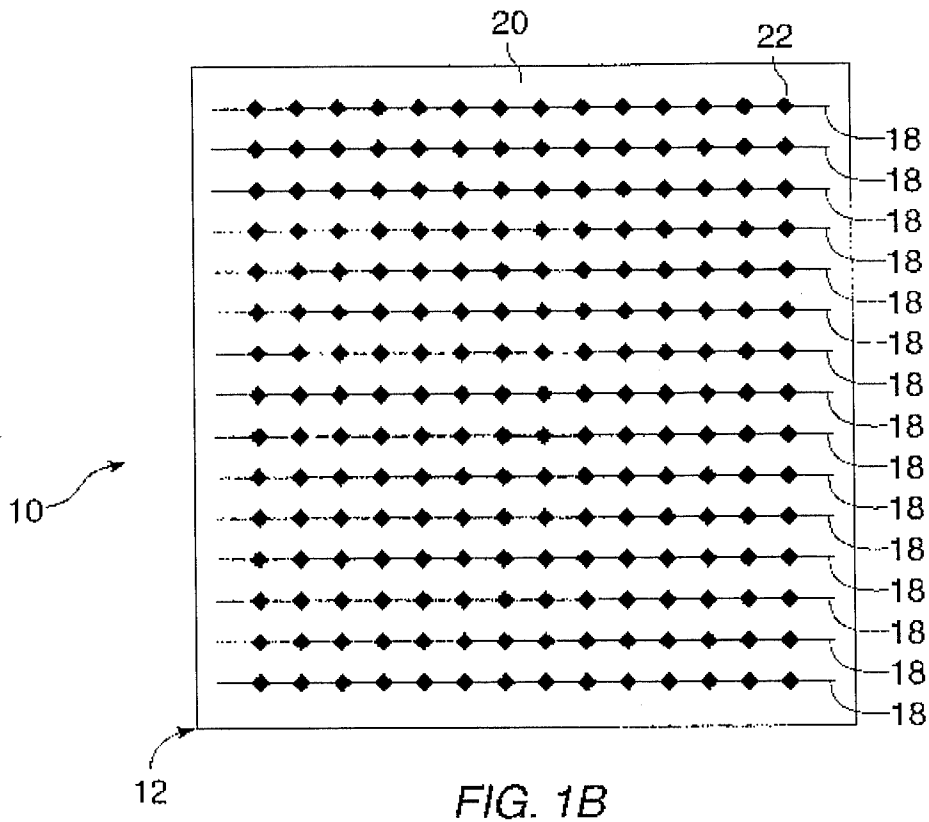
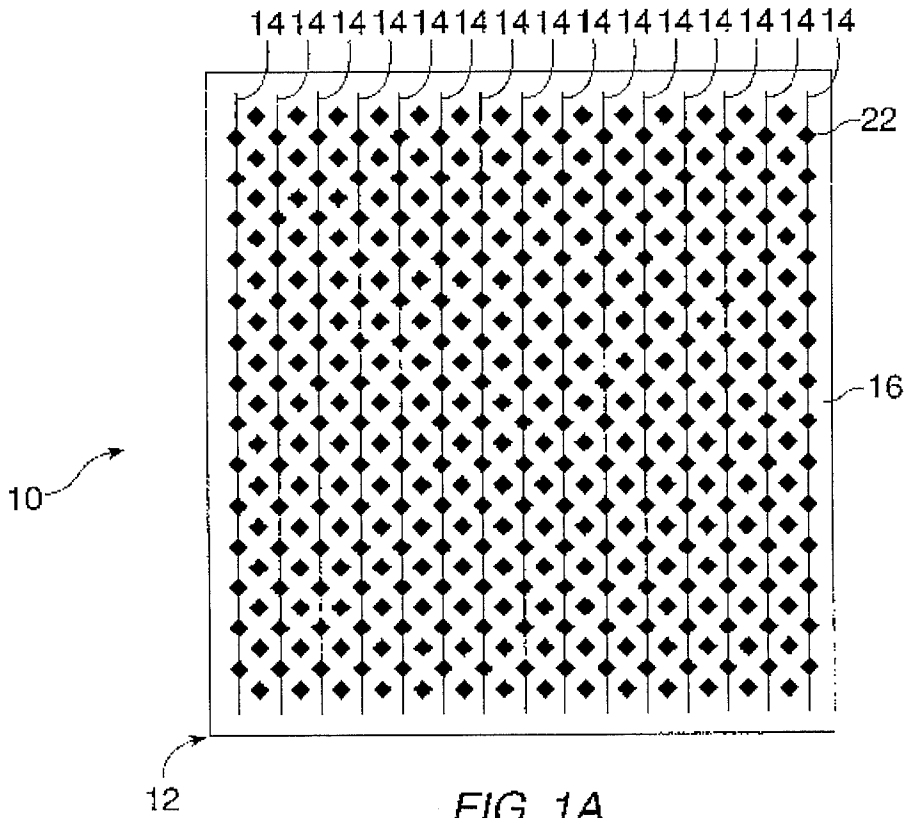
Primary Examiner—Stephen Chin
Assistant Examiner—Kevin Kim
Attorney, Agent, or Firm—D'Alessandro & Ritchie

[57] **ABSTRACT**

A handheld computing device comprises a thin enclosure having two opposing major faces. A display screen is disposed on a first one of the major opposing faces of the enclosure and a touch-sensitive object position detector input device is disposed on a second one of the major opposing faces of the enclosure. Computing device circuitry, circuitry for interfacing the touch-sensitive object position detector to the computing device circuitry, and circuitry for driving the display screen are all disposed within the enclosure.

4 Claims, 15 Drawing Sheets





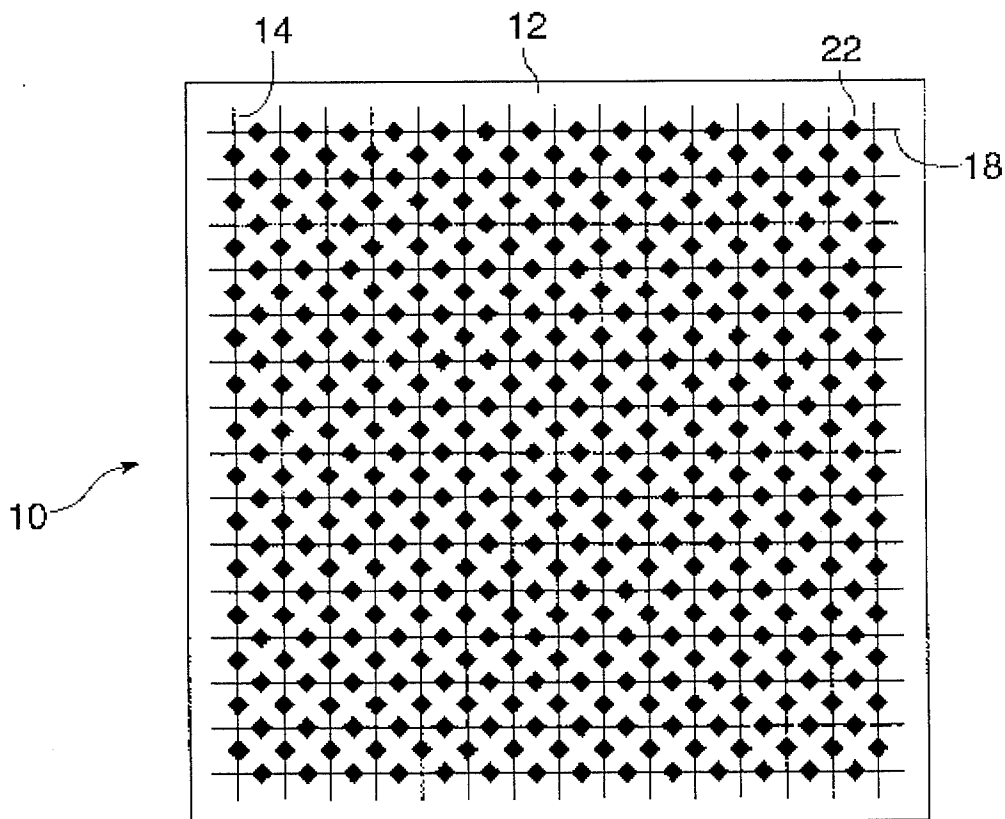


FIG. 1C

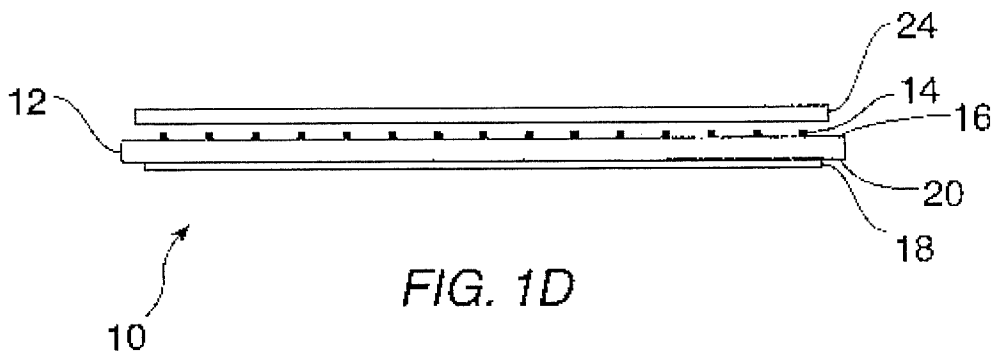


FIG. 1D

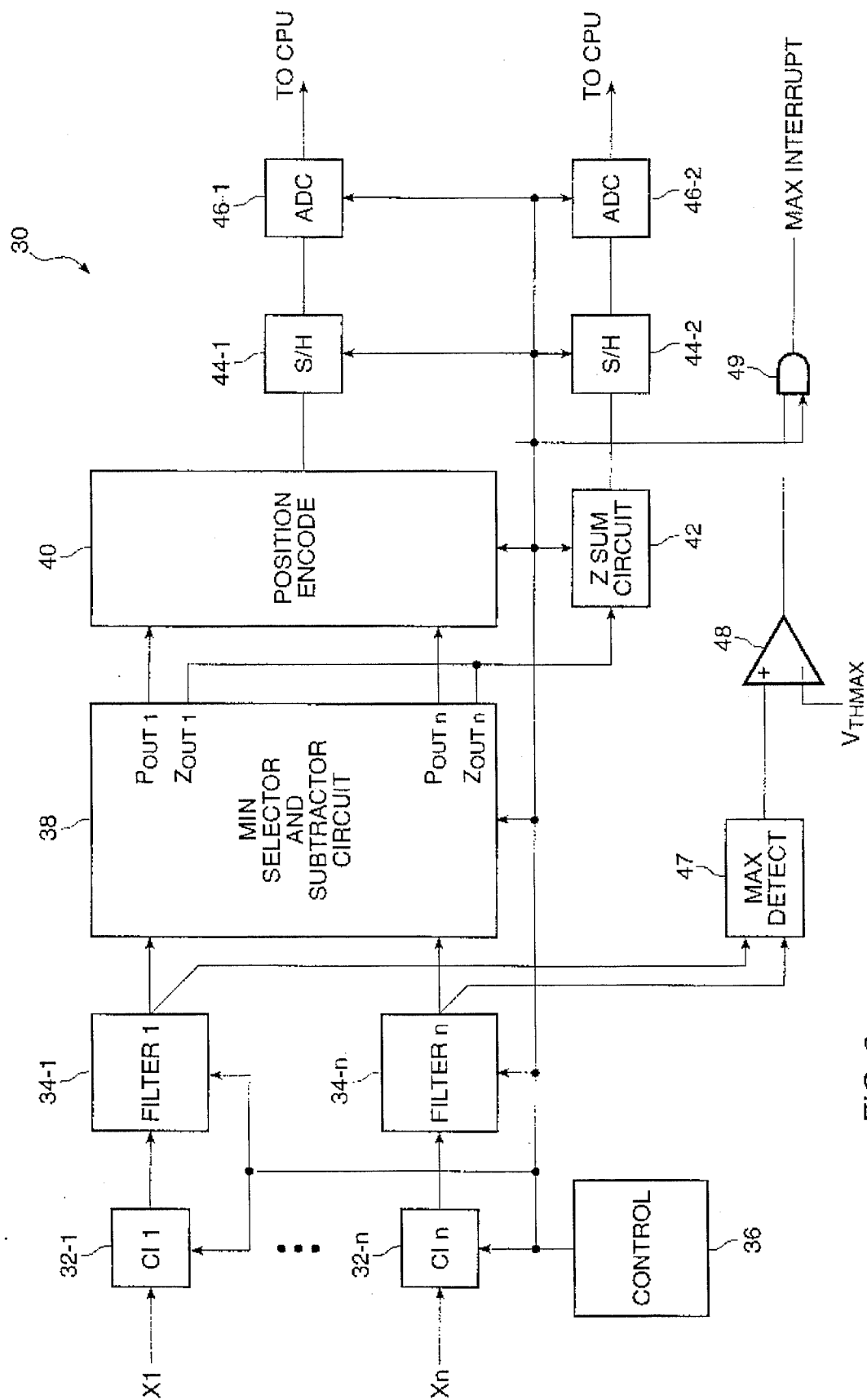


FIG. 2

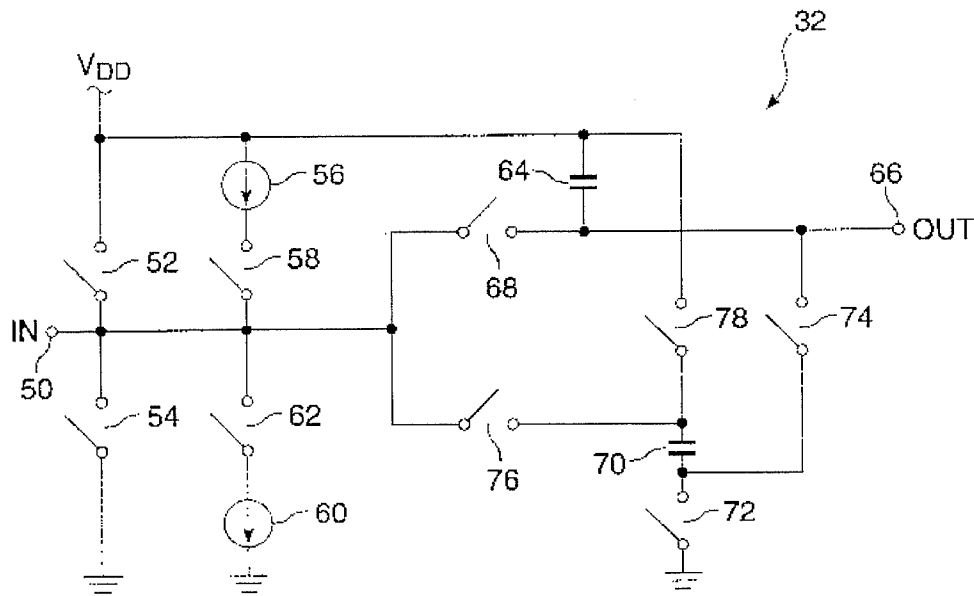


FIG. 3A

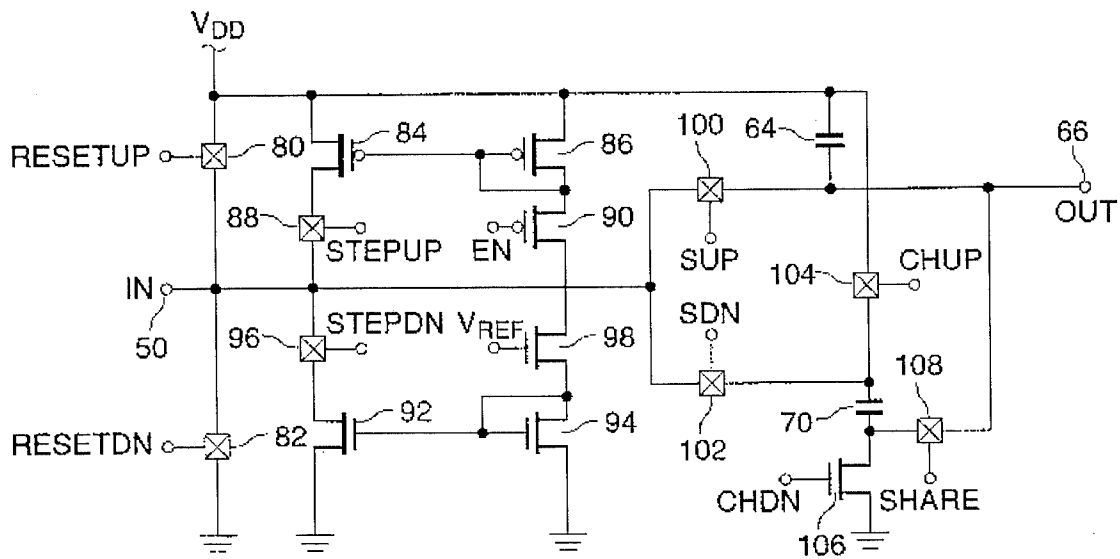


FIG. 3B

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