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United States Patent [19]

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Bisset et al.

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

- [54] **TOUCH PAD DRIVEN HANDHELD COMPUTING DEVICE**
- [75] **Inventors:** Stephen Bisset, Palo Alto; Robert J. Miller, Fremont; Timothy P. Allen, Los Gatos; Günter Steinbach, Palo Alto, all of Calif.
- [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

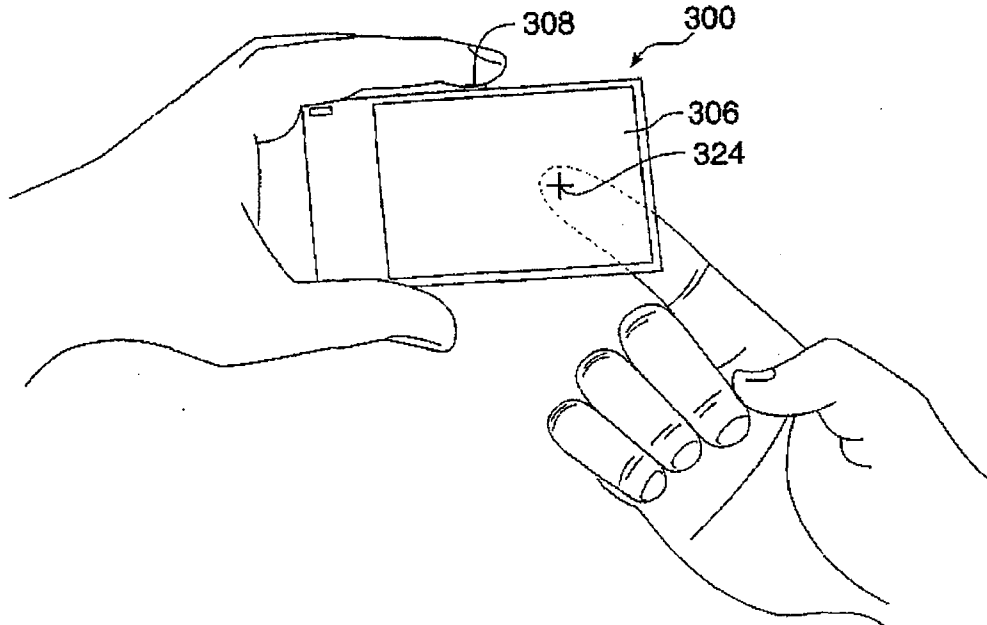
- [56] **References Cited**
- U.S. PATENT DOCUMENTS
- 5,327,163 7/1994 Hashimoto et al. 178/18 X
- FOREIGN PATENT DOCUMENTS
- 2662528 11/1991 European Pat. Off. .

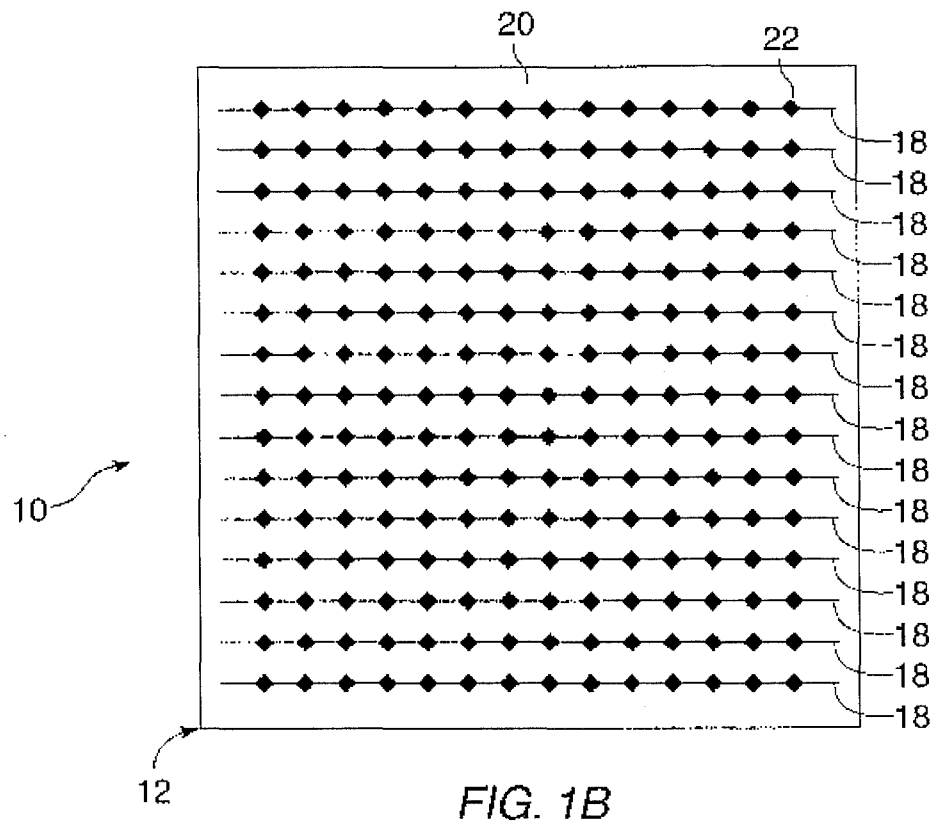
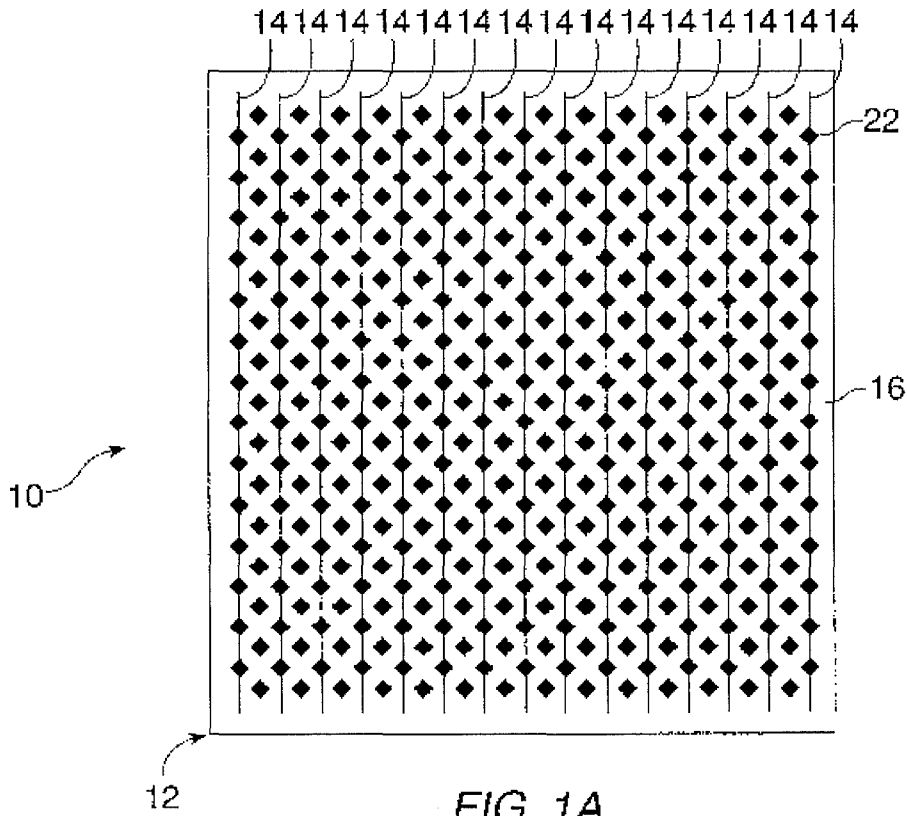
Primary Examiner—Stephen Chin
Assistant Examiner—Kevin Kim
Attorney, Agent, or Firm—D'Alessandro & Ritchie

[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





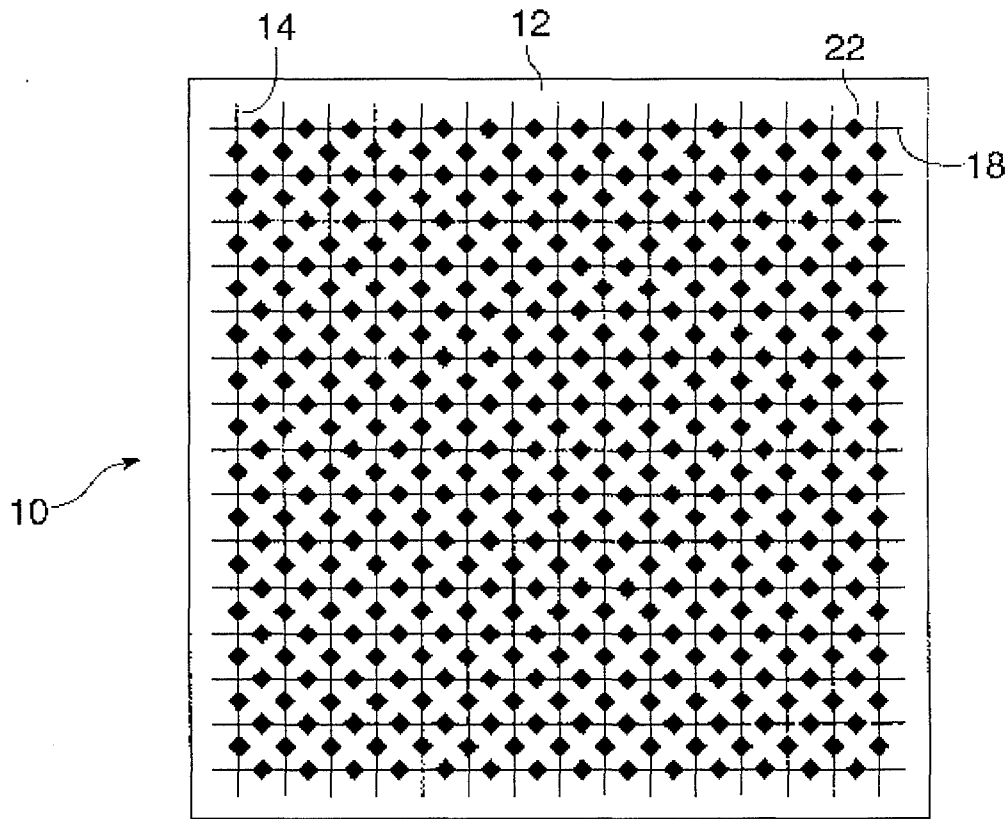


FIG. 1C

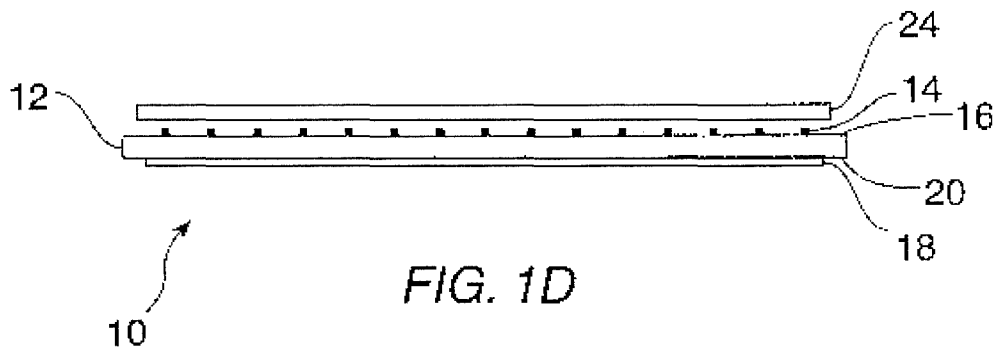


FIG. 1D

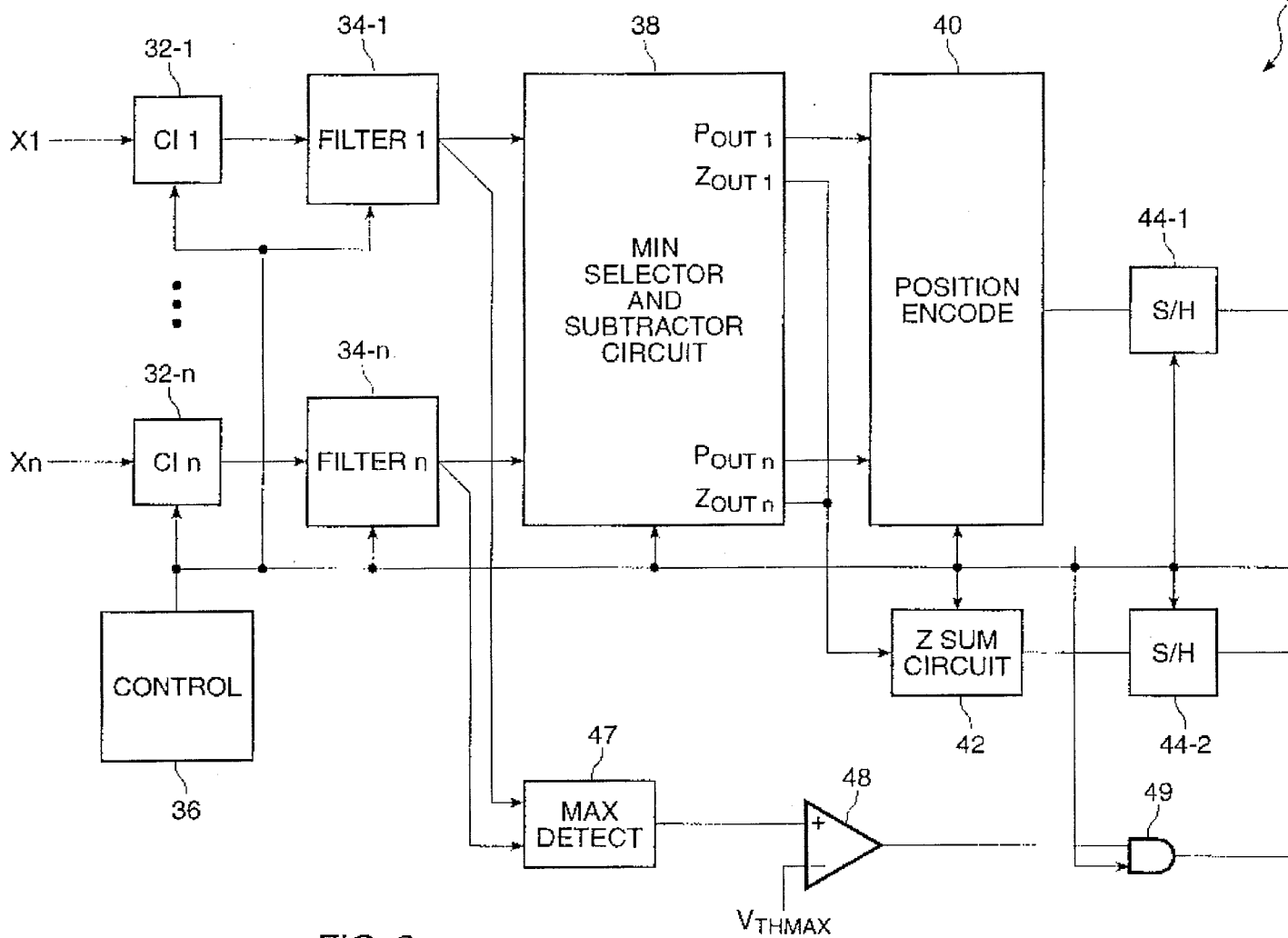


FIG. 2

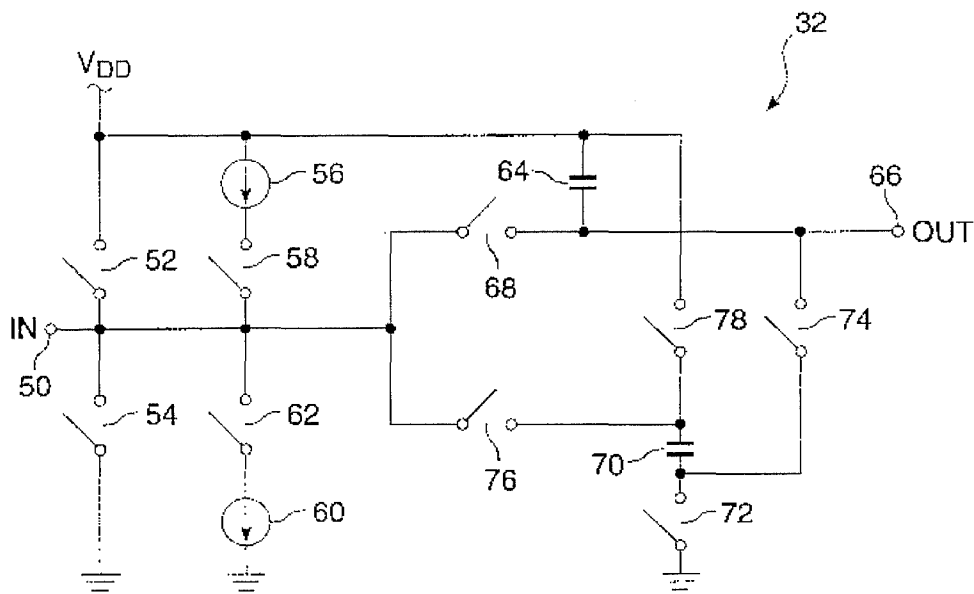


FIG. 3A

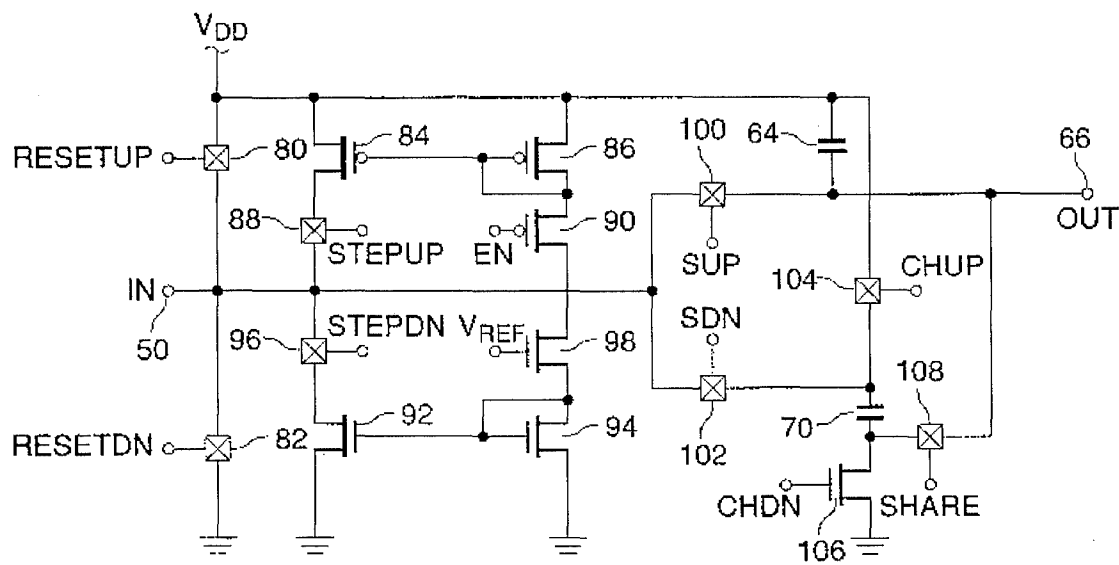


FIG. 3B

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