United States Patent [19]

Numazaki et al.

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[45] **Date of Patent:** **Nov. 7, 2000**

[54] **METHOD AND APPARATUS FOR GENERATING INFORMATION INPUT USING REFLECTED LIGHT IMAGE OF TARGET OBJECT**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.^{7}** **G09G 5/08**
[52] **U.S. Cl.** **345/156**; 345/157; 345/158
[58] **Field of Search** .... 345/158, 157, 345/156, 419, 425; 463/31, 32, 33, 36, 37; 250/200, 206.1, 208.1, 214 R

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[57] **ABSTRACT**

A method and an apparatus for generating information input which are capable of realizing a direct command type information input scheme by which the gesture or the motion can be inputted easily. The apparatus has a timing signal generation unit for generating a timing signal; a lighting unit for emitting a light whose intensity vary in time, according to the timing signal generated by the timing signal generation unit; and a reflected light extraction unit having a sensor array for detecting a reflected light from a target object resulting from the light emitted by the lighting unit, in synchronization with the timing signal generated by the timing signal generation unit, so as to obtain a spatial intensity distribution of the reflected light in a form of a reflected light image indicative of an information input related to the target object, in separation from an external light that is illuminating the target object.

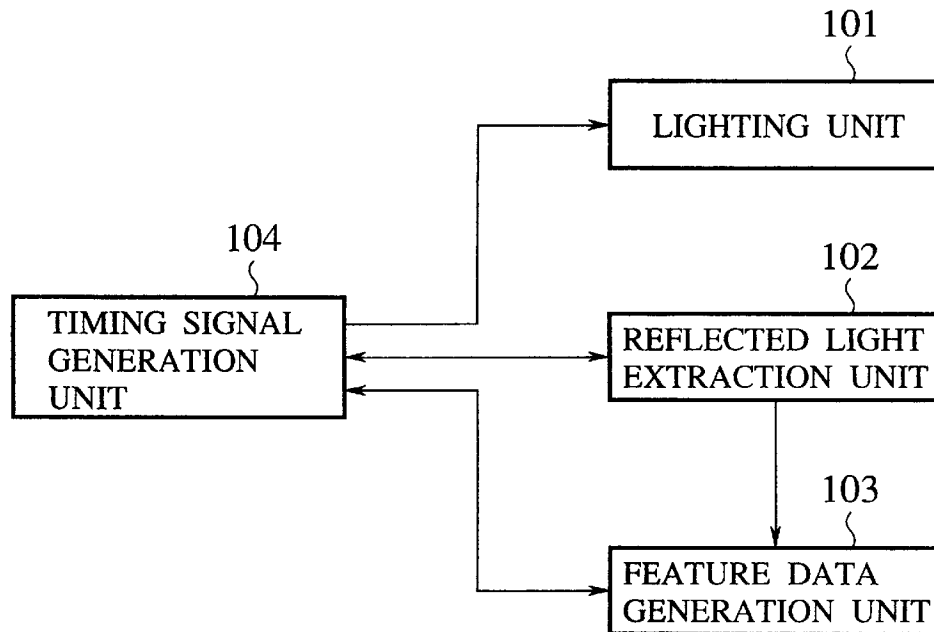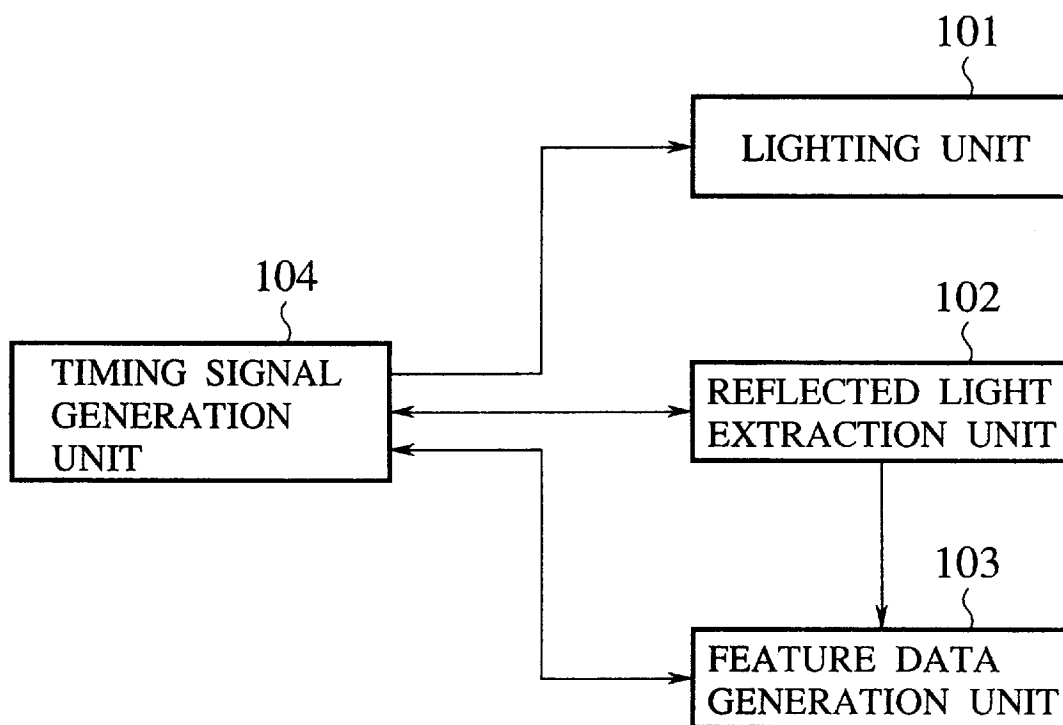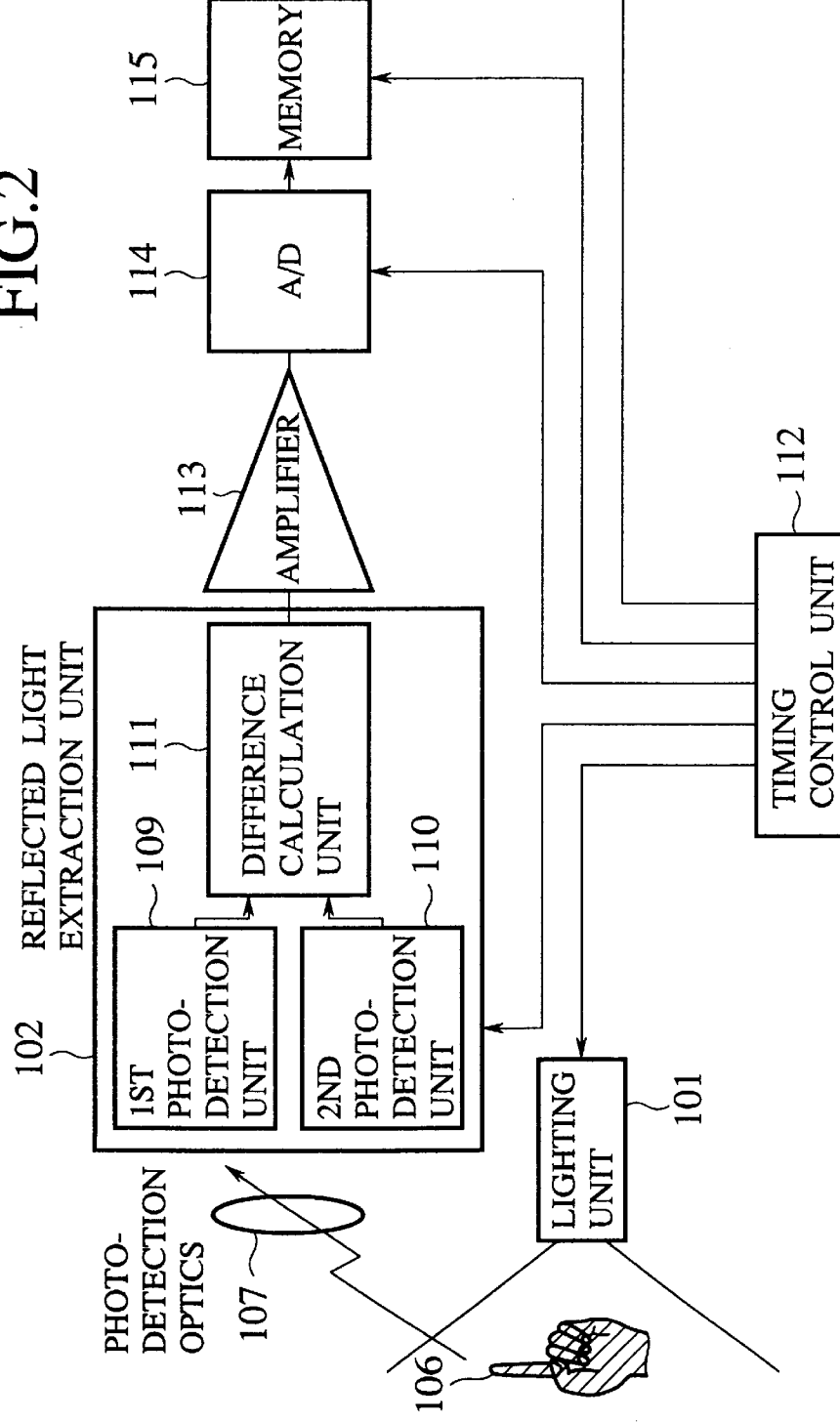**96 Claims, 101 Drawing Sheets**

FIG.1

101

LIGHTING UNIT

104

TIMING SIGNAL
GENERATION
UNIT

102

REFLECTED LIGHT
EXTRACTION UNIT

103

FEATURE DATA
GENERATION UNIT

FIG.2

F...

IMAG...
REGI...
(2×2...)

TIMING GENERATOR ~134

~117

PD

PD

V_{CC5}
V_{CC4}
V_{CC3}
V_{CC2}
V_{CC1}
V_{SS}

PD

PD

DIFFERENCE CIRCUIT ~133

HORIZONTAL SHIFT REGISTERS ~136

VERTICAL SELECTORS

135

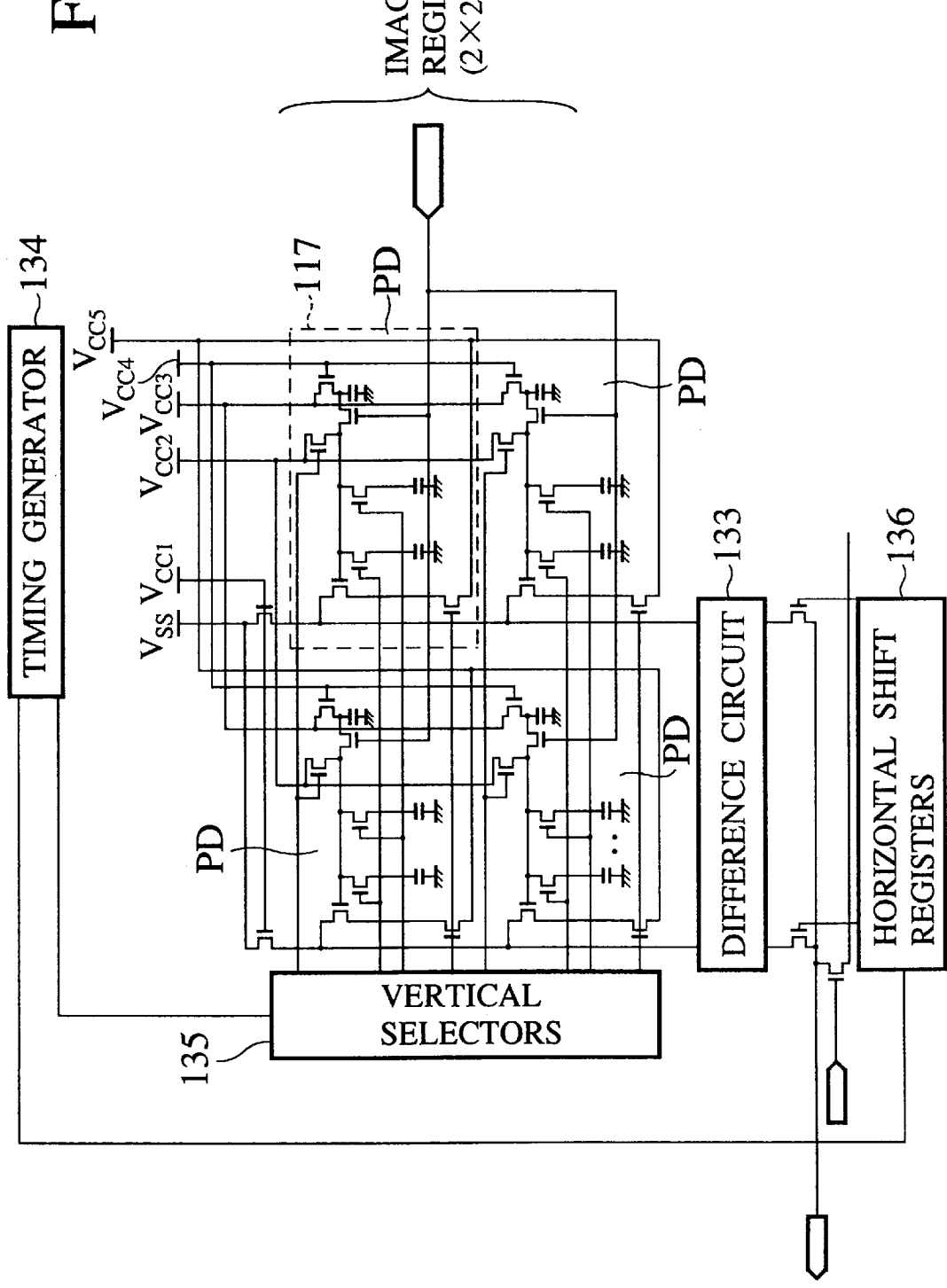FIG.4

VERTICAL
SIGNAL LINE
126

ADDRESS LINE 127

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