

United States Patent [19]

Hara et al.

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[54] **OPTICALLY READABLE TWO-DIMENSIONAL CODE AND METHOD AND APPARATUS USING THE SAME**

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[51] **Int. Cl.⁶** G06K 19/06; G06K 7/10

[52] **U.S. Cl.** 235/294; 235/462

[58] **Field of Search** 235/456, 454, 235/494, 460, 470, 465; 250/566; 382/56

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[57] **ABSTRACT**

A two-dimensional code 1 consists of three positioning symbols 2, a data region 3, timing cells 4 and an apex detecting cell 5. The shape of the whole code 1 is a square having the same number of vertical and lateral cells. A scanning line passing through the center of each positioning symbol 2 always gives a constant frequency component ratio—dark:light:dark:light:dark=1:1:3:1:1, irrespective of the scanning direction. For this reason, even if a rotational angle of the two-dimensional code is not certain, the specific frequency component ratio of each positioning symbol 2 can be easily detected by executing only one scanning operation in a predetermined direction. Hence, the coordinates of the center of each positioning symbols 2 can be easily found. Thus, the position of the two-dimensional code 1 is quickly identified.

61 Claims, 13 Drawing Sheets

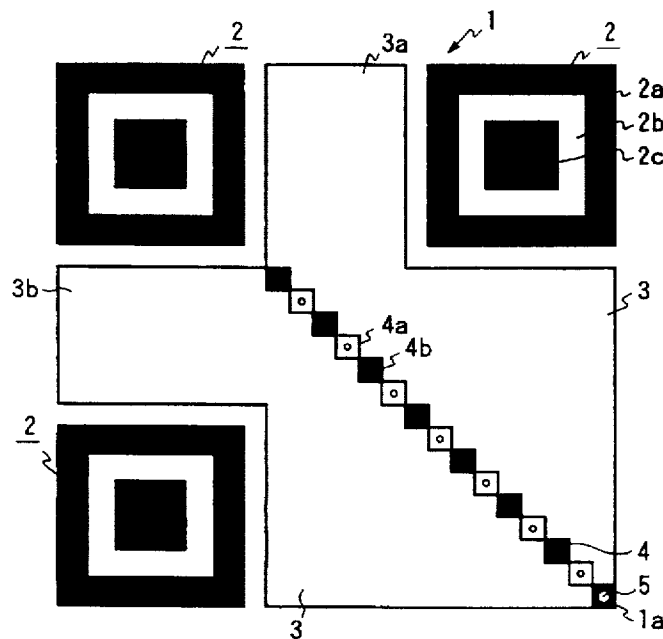


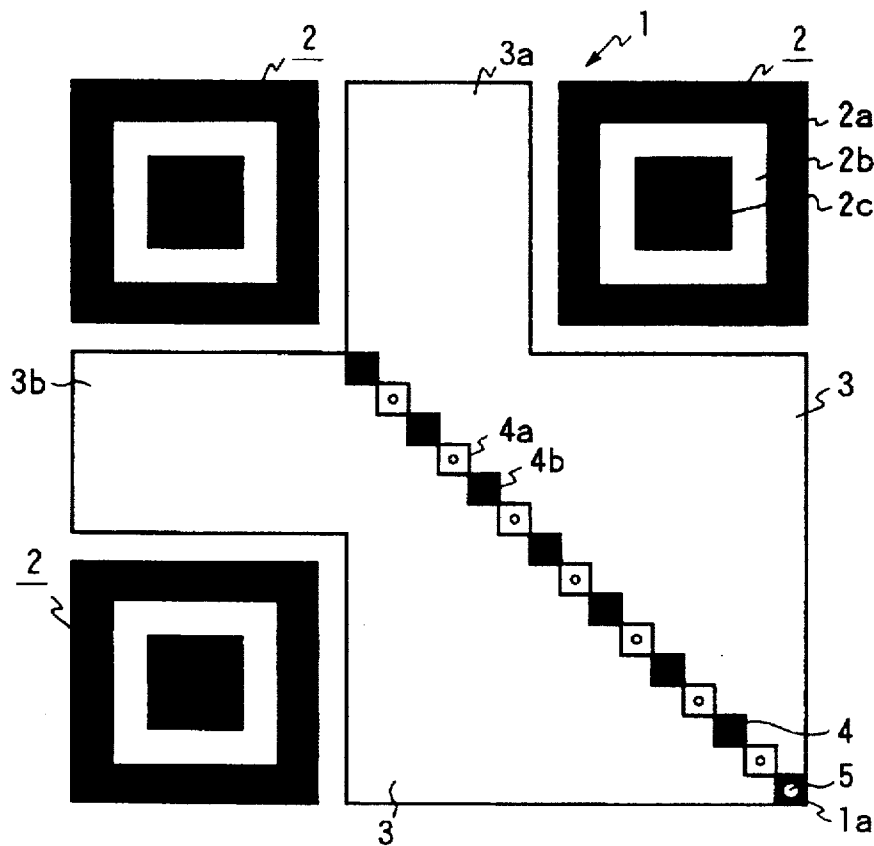
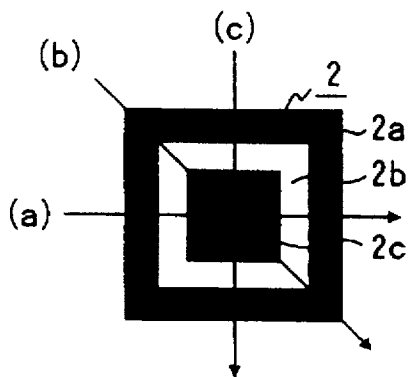
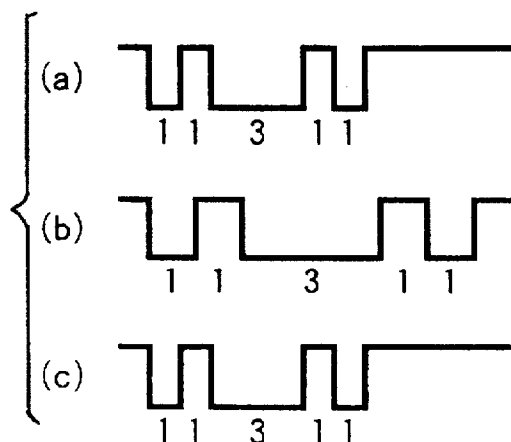
FIG. 1*FIG. 2A**FIG. 2B*

FIG. 3A

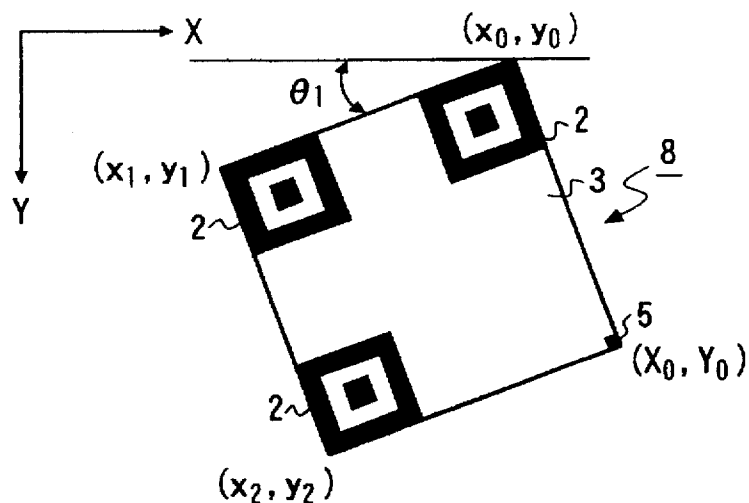


FIG. 3B

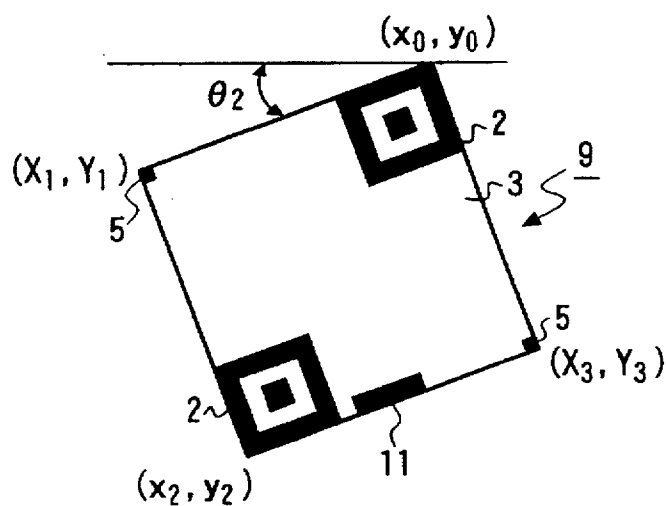


FIG. 3C

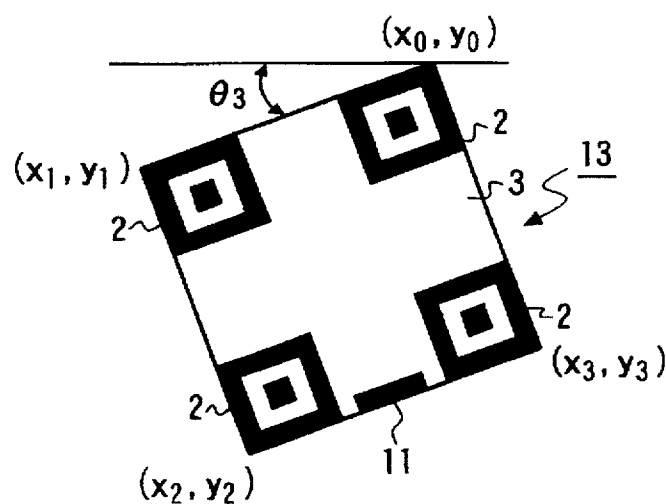


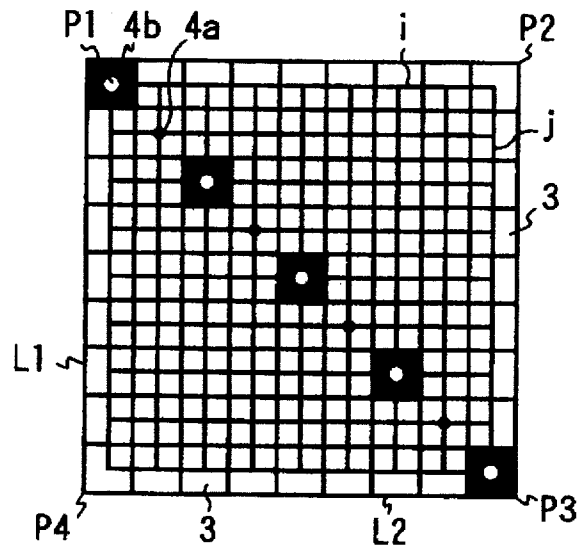
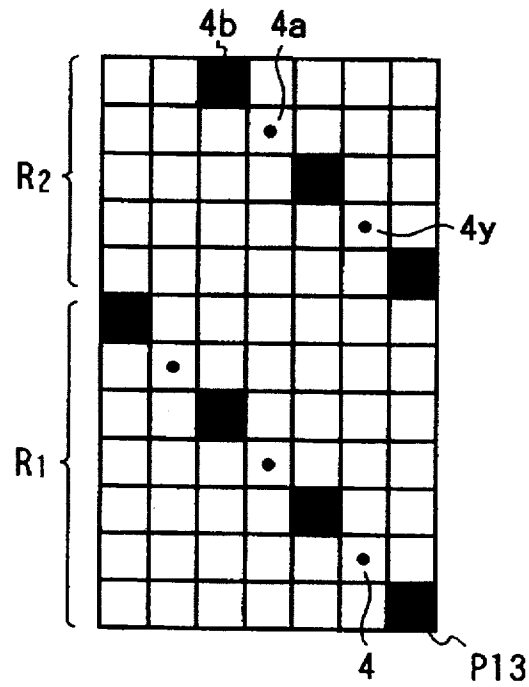
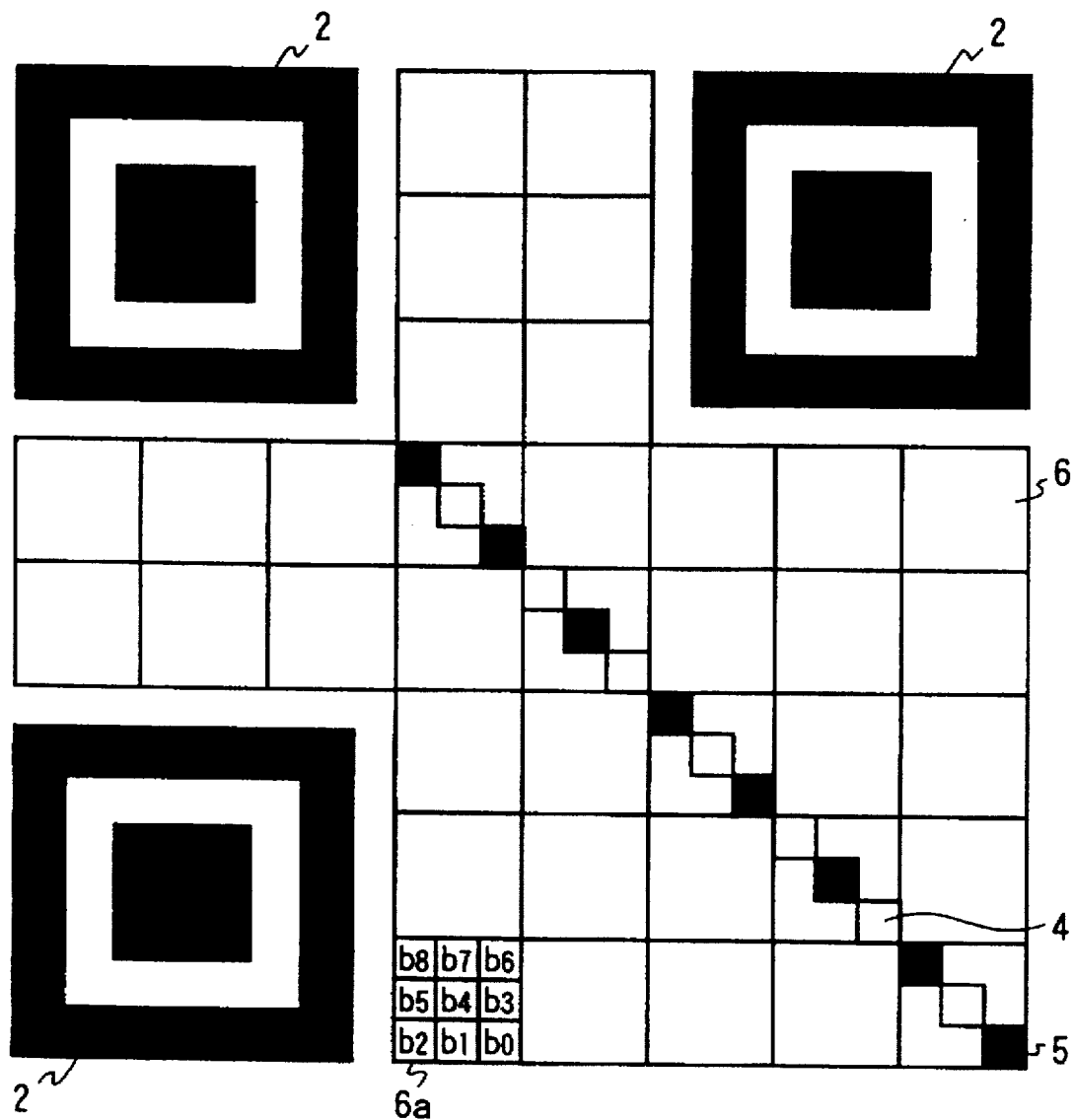
FIG. 4A*FIG. 4B*

FIG. 5

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