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United States Patent [19]

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Asayama

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[54] **DISTANCE DETECTING APPARATUS FOR A VEHICLE**

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[73] Assignee: **Mitsubishi Denki Kabushiki Kaisha, Tokyo, Japan**

[21] Appl. No.: **782,110**

[22] Filed: **Oct. 24, 1991**

[30] **Foreign Application Priority Data**

| | | |
|--------------------|-------|----------|
| Oct. 25, 1990 [JP] | Japan | 2-290469 |
| Nov. 28, 1990 [JP] | Japan | 2-335430 |

[51] Int. Cl.⁵ **B60Q 1/00; G08G 1/16**

[52] U.S. Cl. **340/435; 340/436; 340/901; 340/903; 340/939; 340/555; 340/942; 358/105; 358/125; 180/169; 180/167; 342/55; 342/66; 342/69**

[58] **Field of Search** 340/435, 903, 937, 901, 340/436, 555, 556, 937, 961; 358/107-113, 125; 180/167-169, 271; 342/47, 55, 66, 126, 118, 69, 450, 451

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Primary Examiner—Donnie L. Crosland
Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak and Seas

[57] ABSTRACT

A distance detecting apparatus enables the driver of a vehicle to readily and concurrently recognize the location and direction of each of a plurality of objects present in the driver's field of view, in daylight or darkness, and at the same time determine whether each of the objects is an obstacle to the vehicle travel. The objects sensed by a pair of first and second image sensors 3, 4 are displayed on a screen 11 in a plurality of windows 15-19. Deviations between the images of the objects within the respective windows are electrically detected so that the distance to an object within each window is individually calculated based on the deviations. Obstacles to the travel of the vehicle can be discriminated on the basis of the positions of the windows on the screen and the distances to the objects in the respective windows as detected. Infrared light can be projected onto objects present within the fields of view of the image sensors when natural visible light is insufficient for the image sensors which, in this case, are sensitive to infrared light.

8 Claims, 6 Drawing Sheets

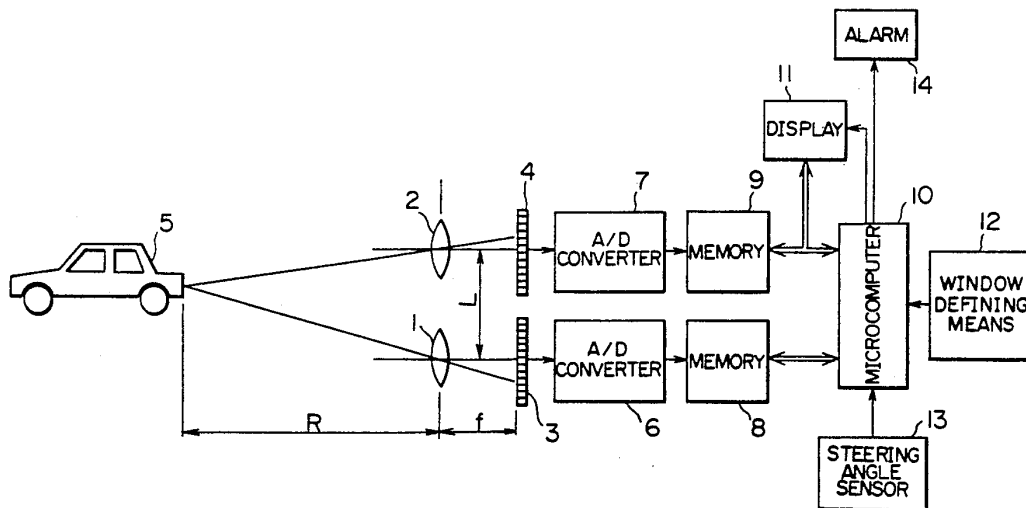


FIG. 1

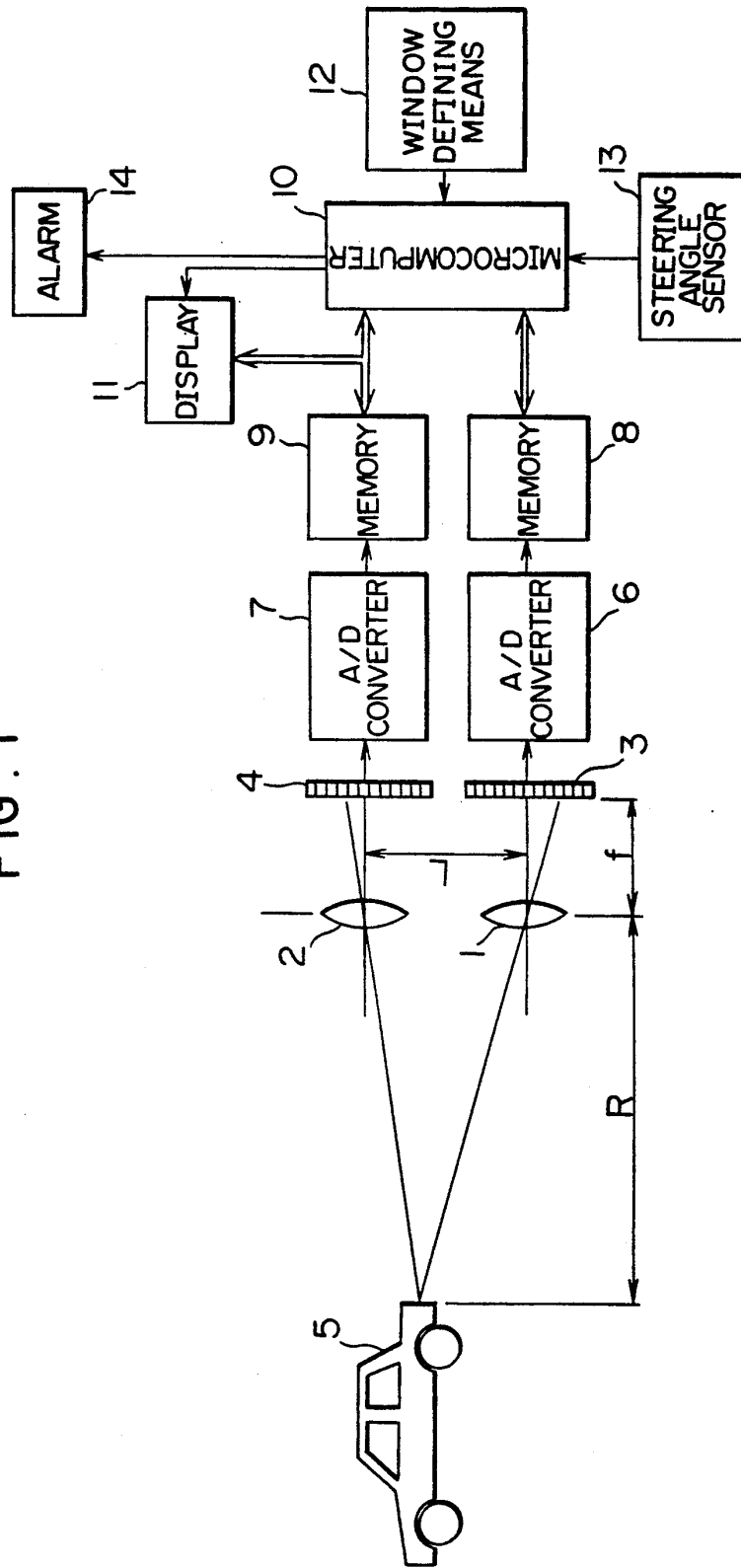


FIG. 2

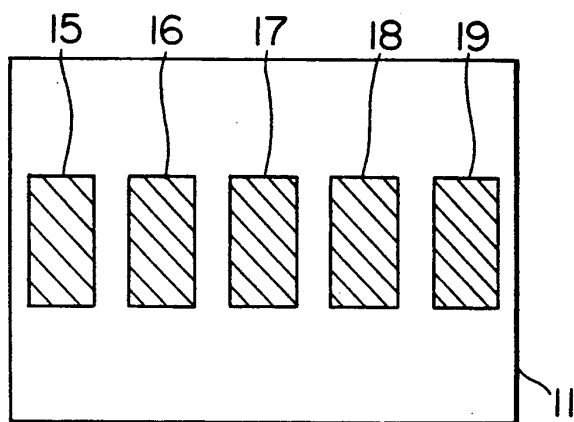


FIG. 3

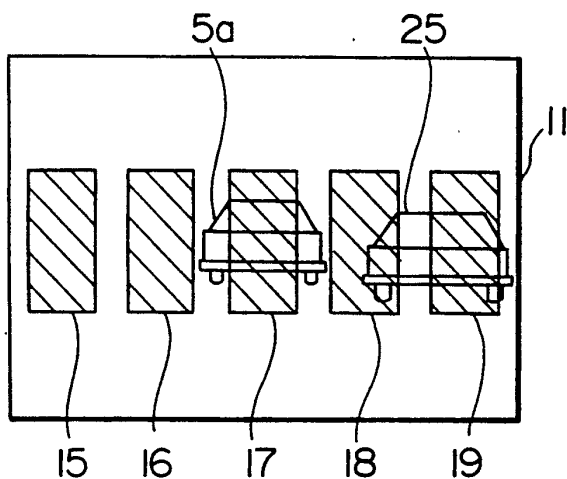


FIG. 4(a)

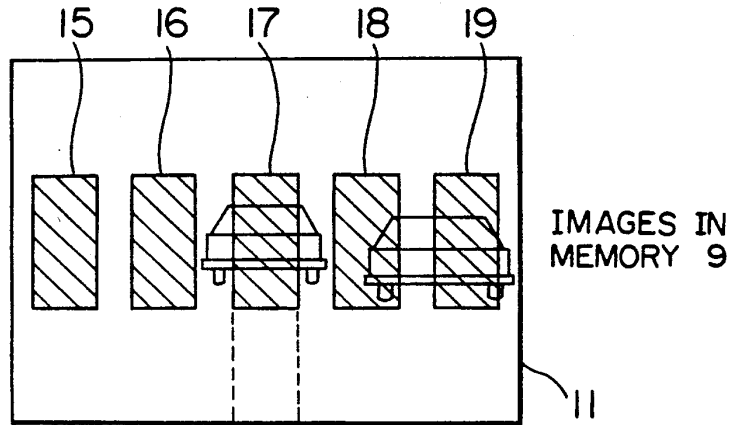


FIG. 4(b)

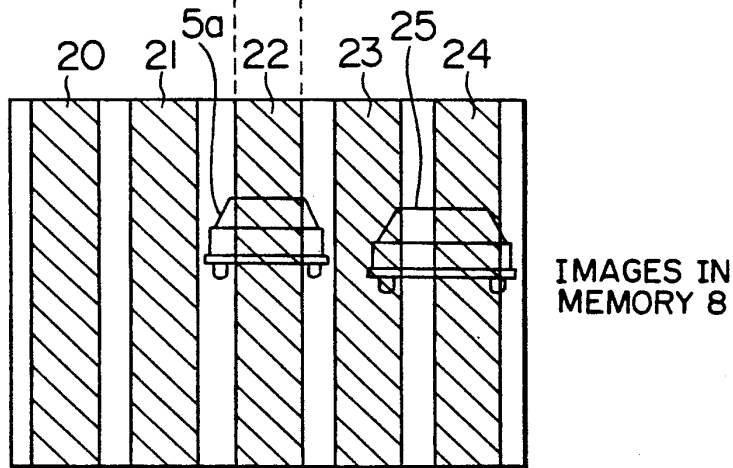


FIG. 5

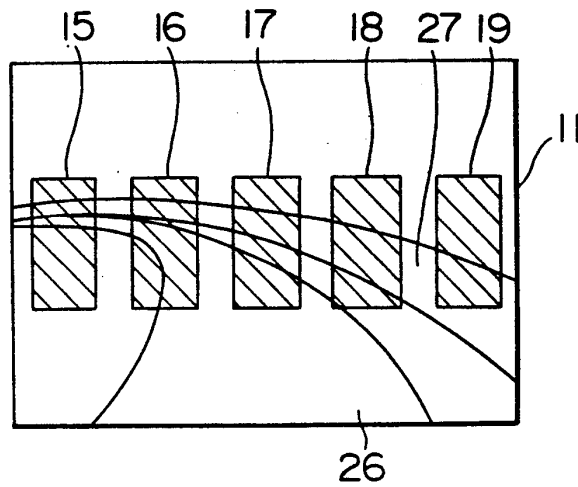
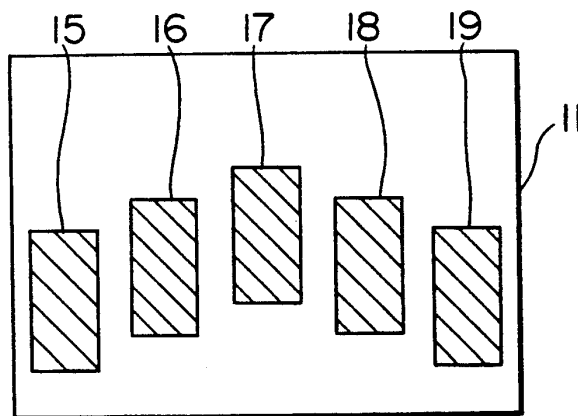


FIG. 6



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