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Takeda et al.

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- [54] **POWER WINDOW APPARATUS WITH SAFETY DEVICE**
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- [73] Assignee: **Koito Manufacturing Co., Ltd.**, Tokyo, Japan
- [21] Appl. No.: **78,643**
- [22] Filed: **Jun. 21, 1993**
- [30] **Foreign Application Priority Data**

- 3329717 5/1984 Germany .
- 3829405 8/1990 Germany .
- 3303590 9/1994 Germany .
- 1384974 2/1973 United Kingdom .

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German Office Action dated 20 Jul. 1994 (with translation).

Primary Examiner—Philip C. Kannan
Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak & Seas

- [30] **Foreign Application Priority Data**
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- Oct. 8, 1992 [JP] Japan 4-293973
- [51] **Int. Cl.⁶** **E05F 15/16**
- [52] **U.S. Cl.** **49/28; 49/349; 49/352; 318/266; 318/282; 318/468; 318/470**
- [58] **Field of Search** **49/28, 26, 349, 352; 318/256, 264, 265, 266, 282, 467, 468, 469, 470**

[57] ABSTRACT

A power window apparatus for carrying out a safety control operation when an object is caught in the window, which apparatus is capable of setting a safety control mode disabling region to within the required distance exactly. The power window apparatus includes a motor rotation sensor for sensing a state of rotation of the motor, and a window movement sensor for sensing the amount of movement of the window. The object-caught state is detected on the basis of the rotational rate of the motor, and the absolute position of the window is detected on the basis of the detected amount of movement of the window. The safety control mode is disabled in response to the detected absolute position of the window. A reference value for detecting the object-caught state may be varied as the window approaches its fully closed position.

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14 Claims, 12 Drawing Sheets

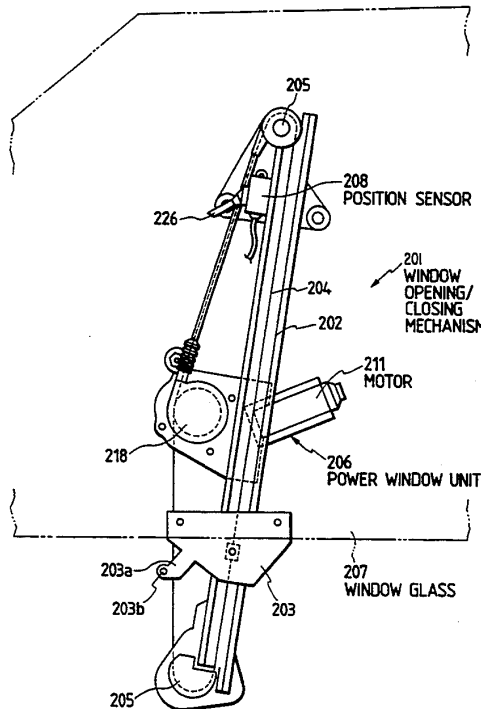


FIG. 1

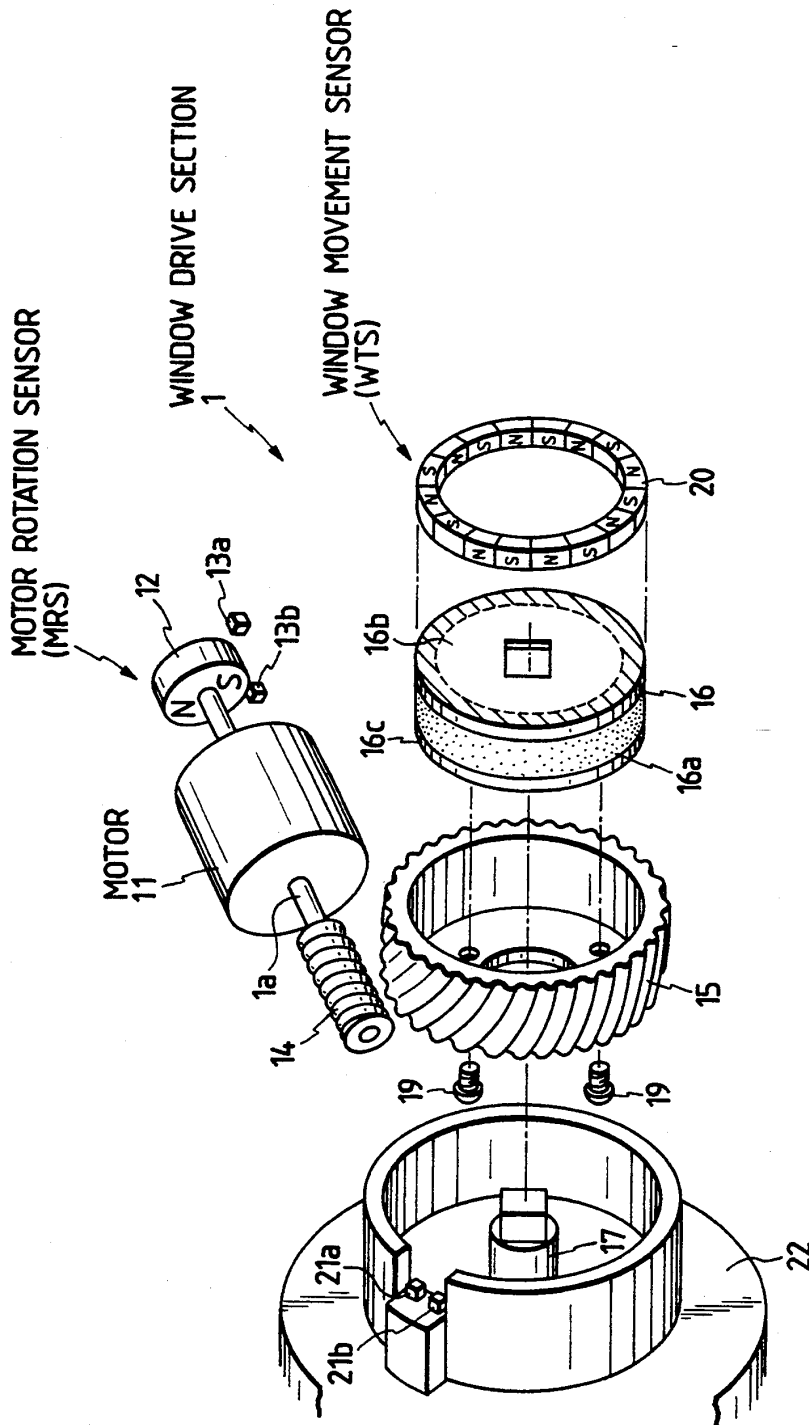


FIG. 2

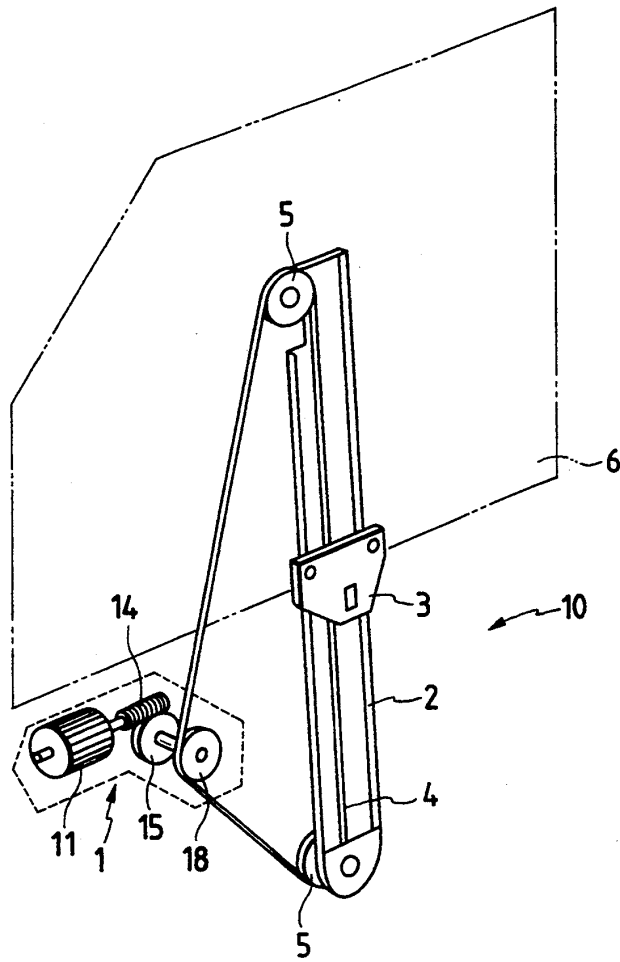
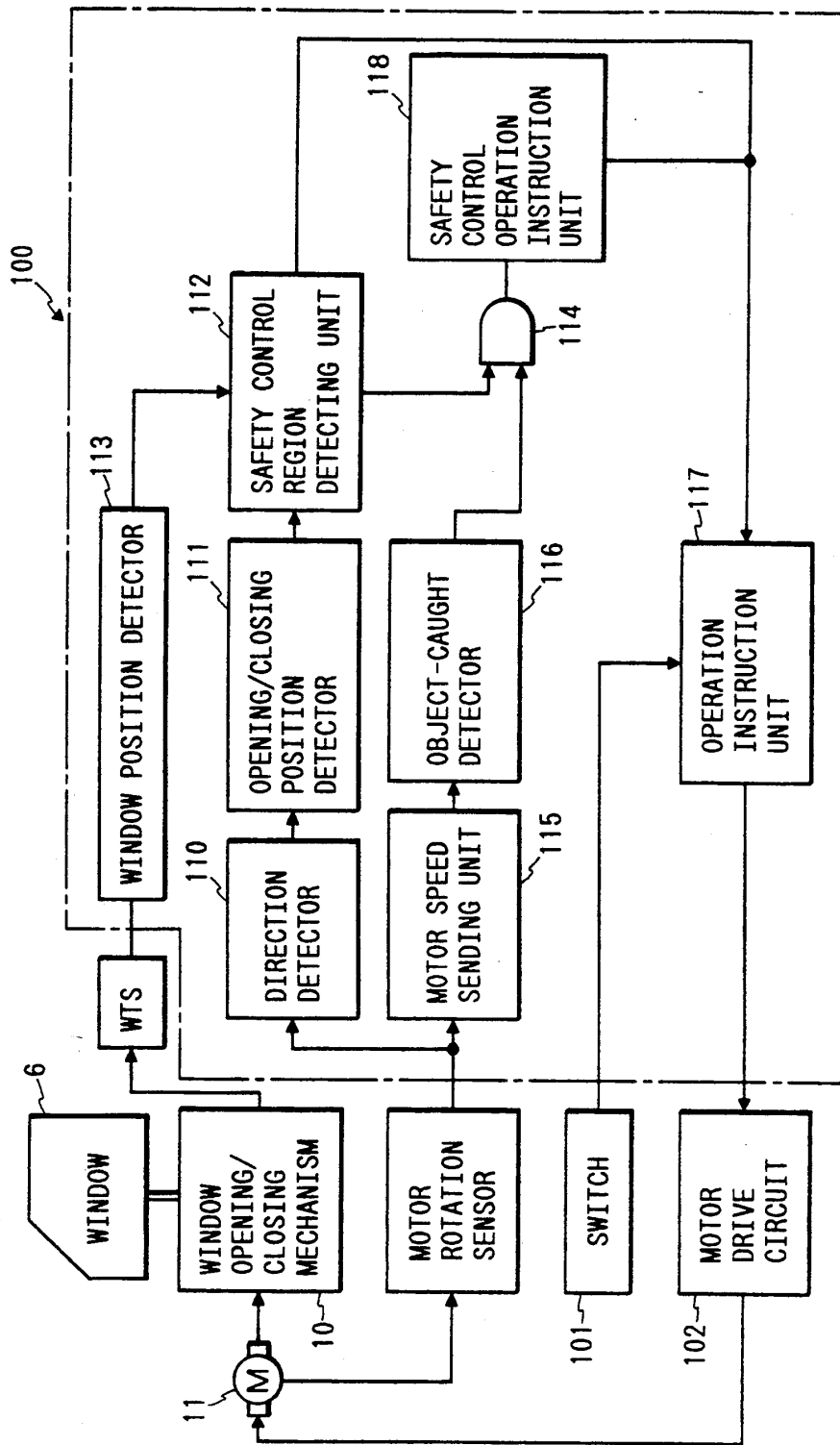
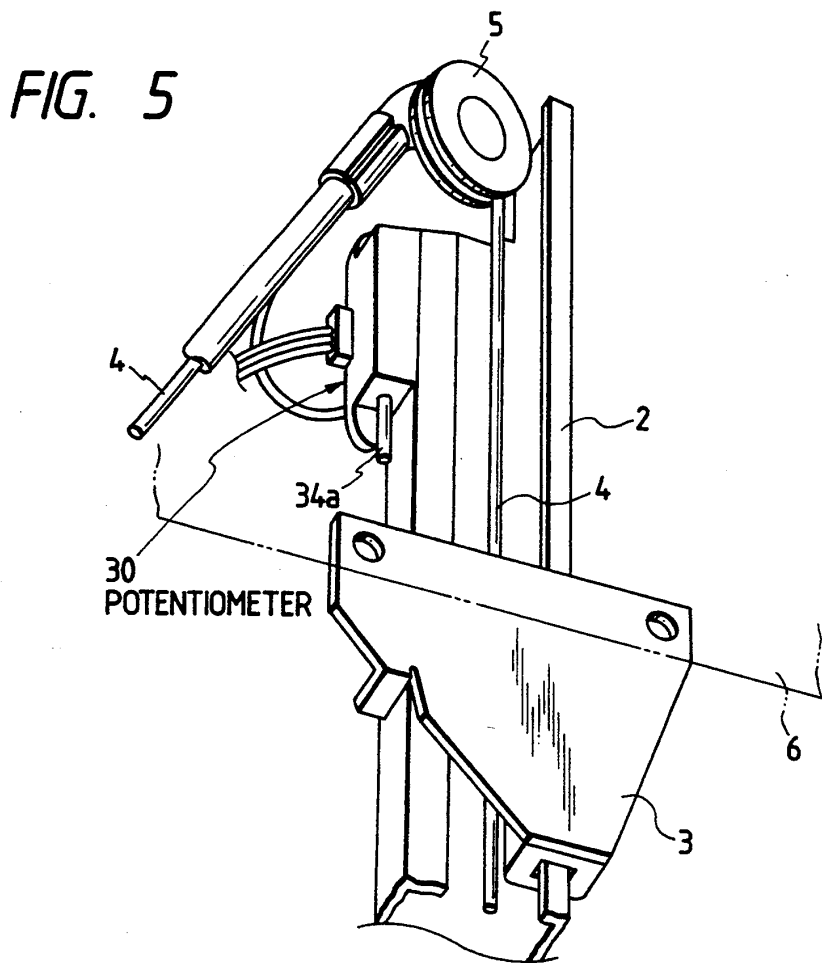
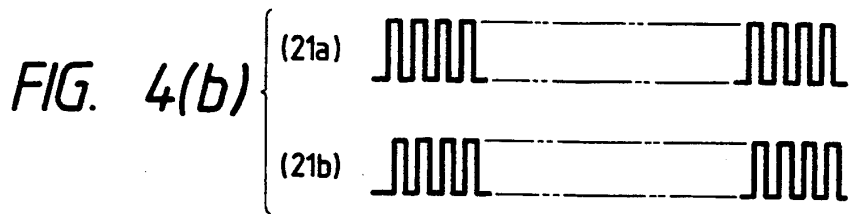
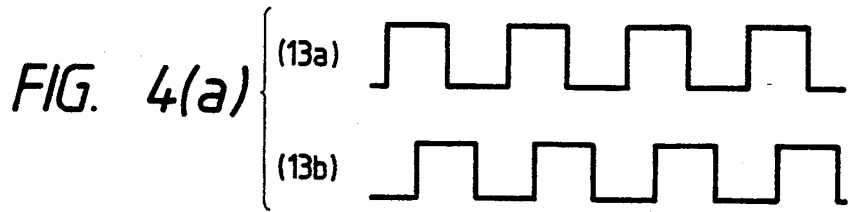


FIG. 3





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