



- [54] **AUTOMATIC DOOR OPERATOR INCLUDING ELECTRONIC TRAVEL DETECTION**
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- [73] Assignee: **Stanley Home Automation, Novi, Mich.**
- [21] Appl. No.: **496,796**
- [22] Filed: **Mar. 22, 1990**
- [51] Int. Cl.⁵ **H02K 27/30**
- [52] U.S. Cl. **318/603; 318/434; 318/468; 318/466; 318/470**
- [58] Field of Search **318/268-293, 318/560-640, 430-434, 16, 267, 266, 480, 469; 49/25, 360, 280, 167, 194, 199, 357, 358, 59**

4,673,848	6/1987	Hagiwara et al.	318/266
4,701,684	1/1987	Seidel et al.	318/282
4,794,309	12/1988	Saito et al.	318/466 X
4,831,509	5/1989	Jones et al.	364/167.01
4,887,205	12/1989	Chou	364/400
4,922,168	5/1990	Waggamon et al.	318/286

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 Attorney, Agent, or Firm—Krass & Young

[57] **ABSTRACT**

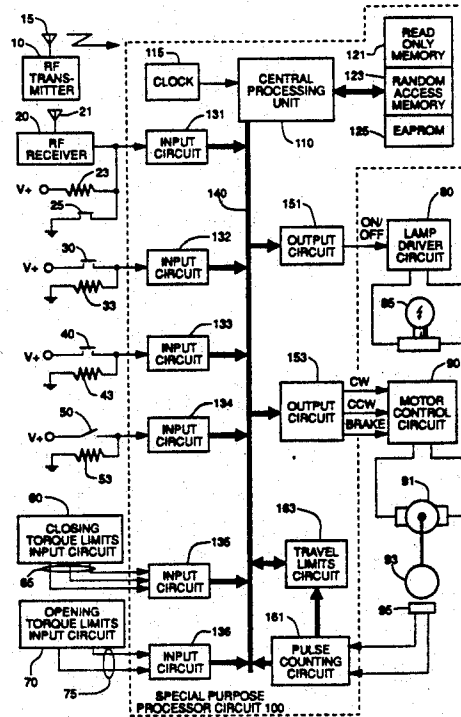
The present invention is an automatic door operator which includes an obstruction detector for at least stopping the motor when the detected motor speed indicates a motor torque greater than the selected closing torque limit while closing the door, and for at least stopping the motor when the detected motor speed indicates a motor torque greater than the selected opening torque limit while opening the door. The motor speed is detected based upon a predetermined count of electrical pulses corresponding to motor shaft rotation in order smooth noise. Selection of the number of pulses per rotation enables the same controller to control motors operating on either 60 Hz or 50 Hz power. A travel count of rotation pulses permits identification of a plurality of regions in the opening and closing travel of the door and corresponding adaptive torque limits. The travel counter may also be employed for detection of the fully opened and fully closed limits. The controller can be used to control either a four-pole motor or a six-pole motor via a manual motor type selection switch, which selects a torque limit table.

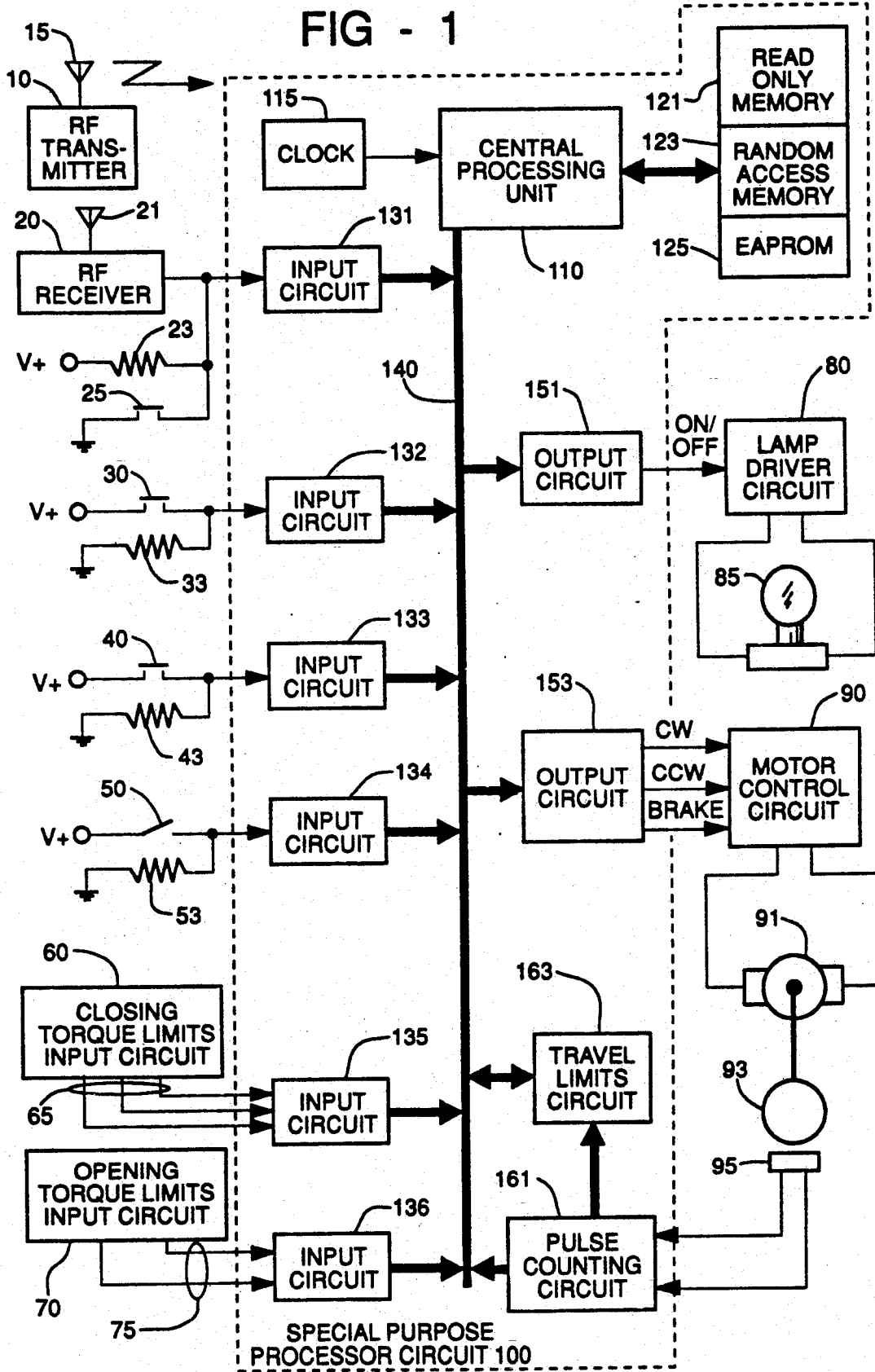
[56] **References Cited**

U.S. PATENT DOCUMENTS

4,234,833	11/1980	Barrett	318/282
4,328,540	5/1982	Matsuoka et al.	364/167
4,338,553	7/1982	Scott, Jr.	318/266
4,364,111	12/1982	Jocz	318/466 X
4,365,250	12/1982	Matsuoka et al.	318/266 X
4,383,206	5/1983	Matsuoka et al.	318/445
4,394,607	7/1983	Lemirande	318/469 X
4,408,146	10/1983	Beckerman	318/466
4,429,264	4/1984	Richmond	318/466
4,445,075	4/1984	Fry	318/283 X
4,468,596	8/1984	Kinzl et al.	318/287
4,475,069	10/1984	Tadokoro et al.	318/265
4,563,625	1/1986	Kornbrekke et al.	318/603
4,585,981	4/1986	Zintler	318/615
4,625,291	11/1986	Hormann	318/265
4,638,433	1/1987	Schindler	364/400

53 Claims, 11 Drawing Sheets





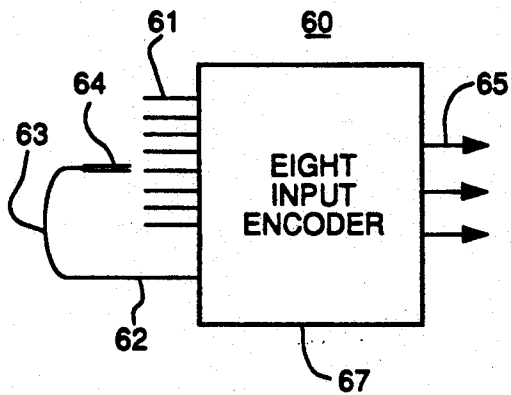


FIG - 2A

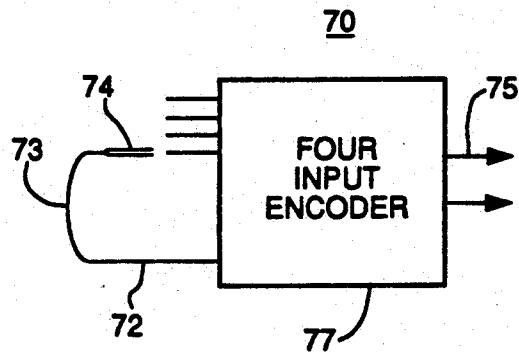


FIG - 2B

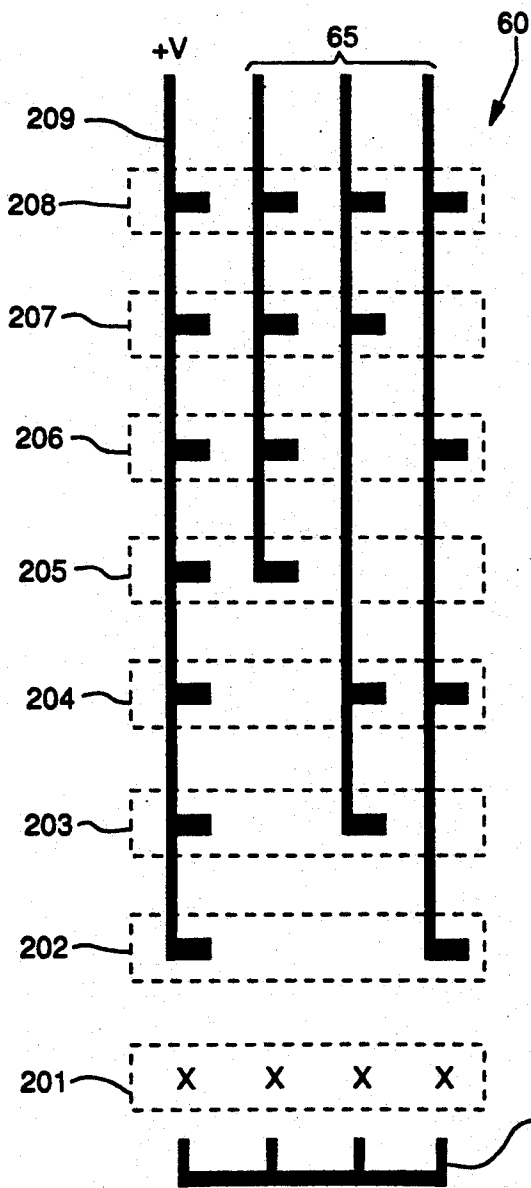


FIG - 3A

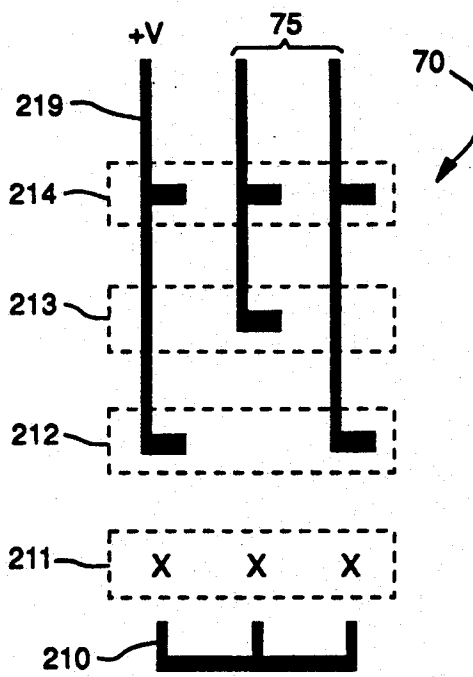


FIG - 3B

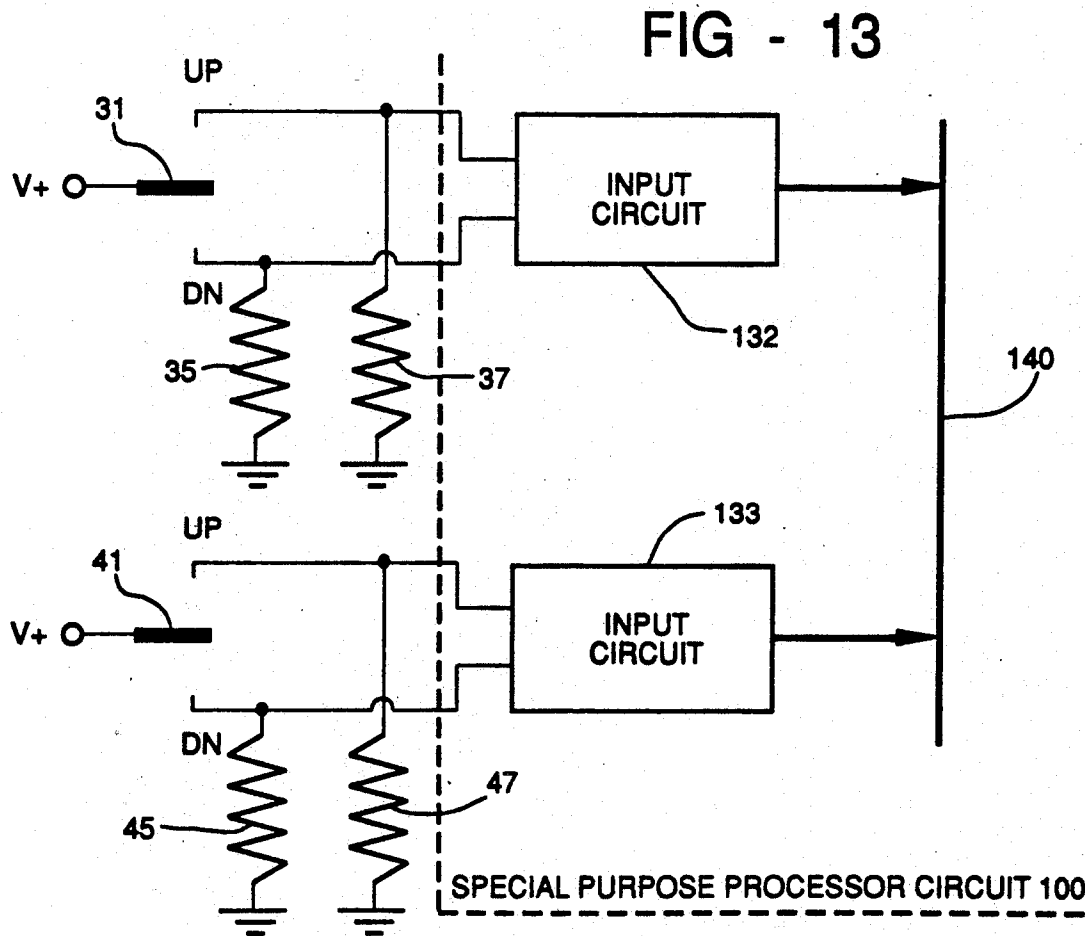
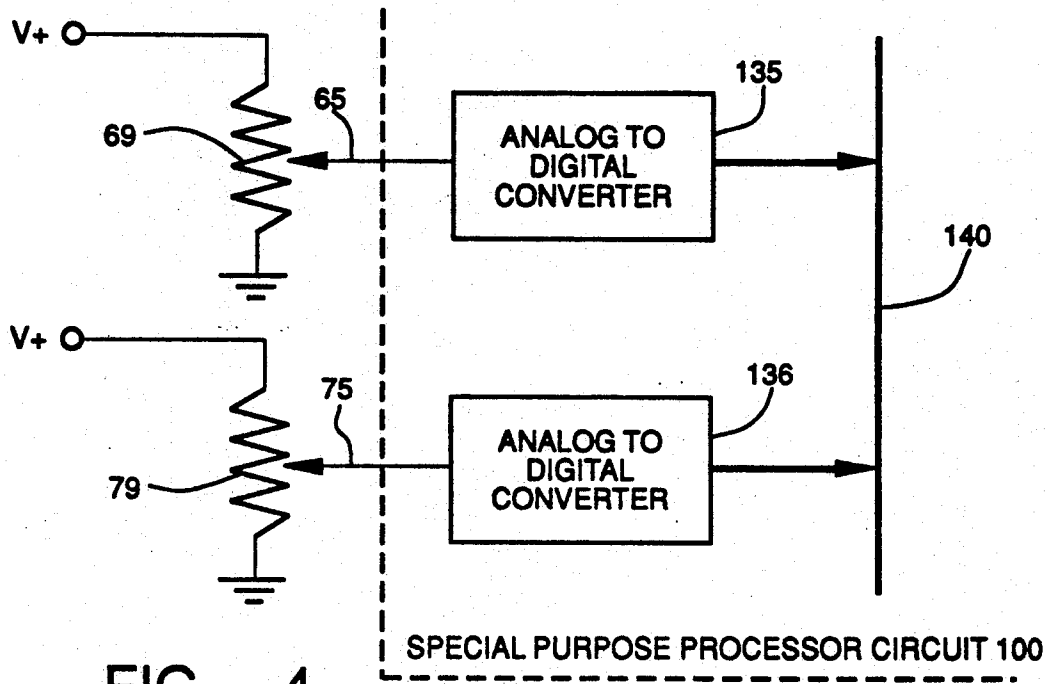


FIG - 5

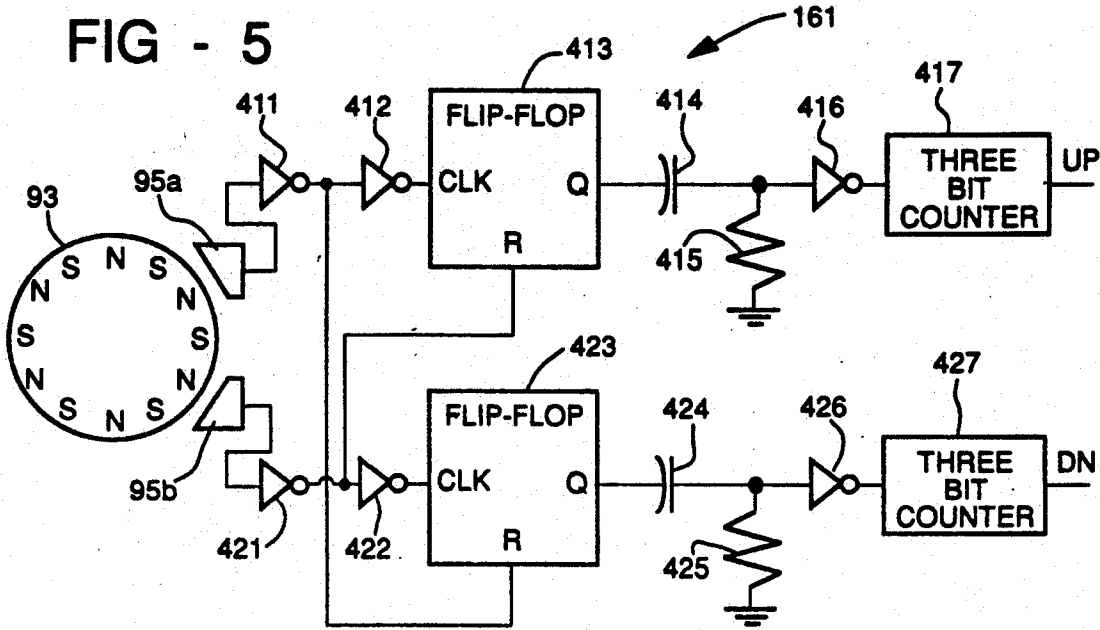
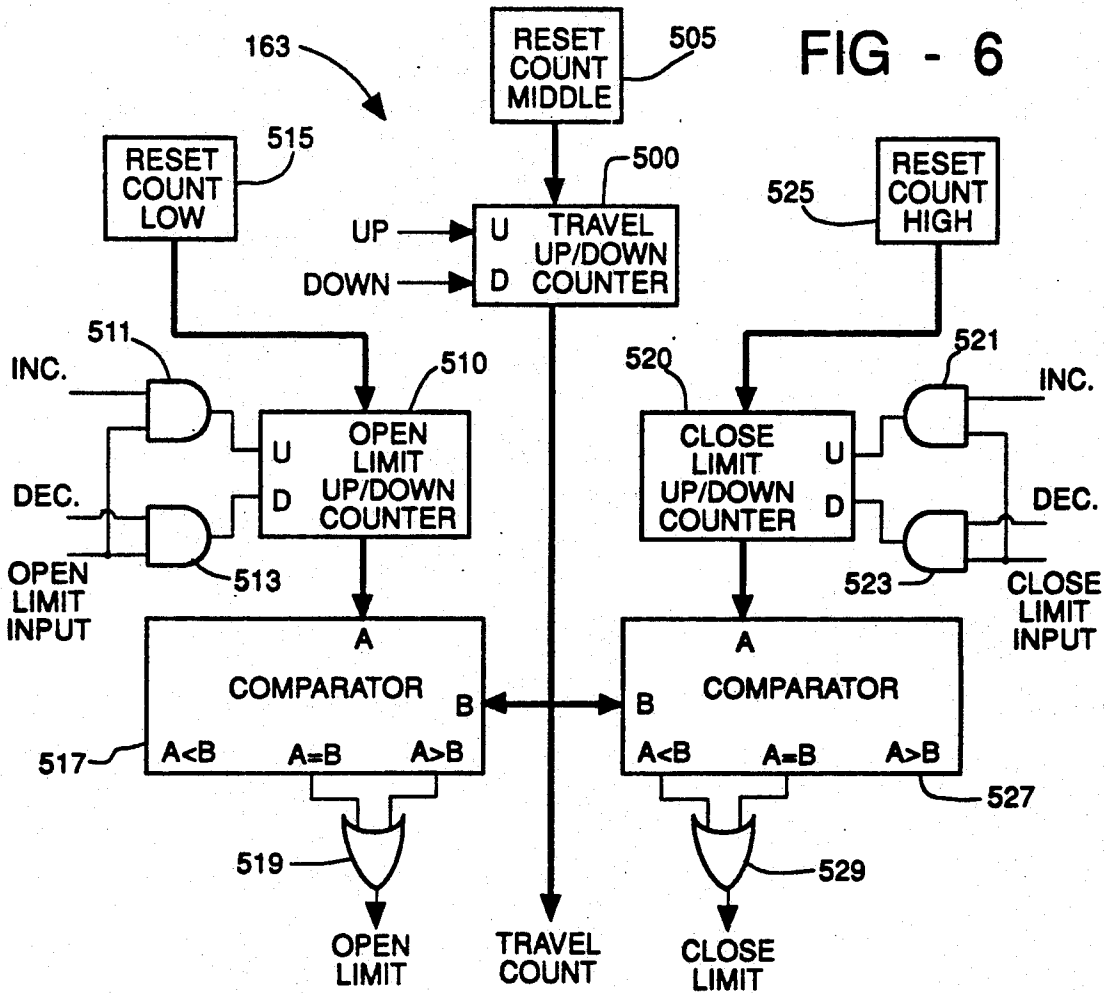


FIG - 6



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