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United States Patent [19]

[11] Patent Number: **6,064,165**

Boisvert et al.

[45] Date of Patent: **May 16, 2000**

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[73] Assignee: **Nartron Corporation**, Reed City, Mich.

[21] Appl. No.: **08/736,786**

[22] Filed: **Oct. 25, 1996**

Related U.S. Application Data

[63] Continuation of application No. 08/275,107, Jul. 14, 1994, which is a continuation-in-part of application No. 07/872,190, Apr. 22, 1992, abandoned.

[51] **Int. Cl.⁷** **G05B 5/00**

[52] **U.S. Cl.** **318/465; 318/466; 318/476; 388/815; 388/833; 388/903**

[58] **Field of Search** 318/264-266, 318/280-286, 460-470, 565, 626, 434, 139, 474-477; 388/815, 833, 903; 701/36, 49

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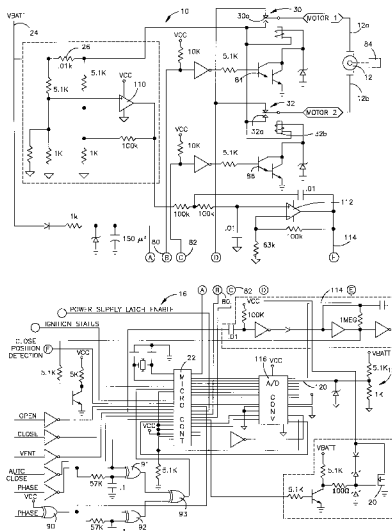
NHTSA notice published Apr. 16, 1991 in the Federal Register Issuing a final rule Amending Standard No. 118.

Primary Examiner—Brian Sircus
Attorney, Agent, or Firm—Watts, Hoffmann, Fisher & Heinke, Co., L.P.A.

[57] ABSTRACT

A controller for energizing a power-operable element, such as a sunroof, window, door, vehicle seat, a component of a major appliance or of a machine or of a conveyor system. The disclosed controller senses both hard and soft obstructions and de-activates or otherwise alters operation of a motor that drives the element when an obstruction is detected. The controller can also be used to actuate a brake. The controller senses obstructions during start-up of the motor and regulates the speed of the power-operable element by pulse width modulating motor energization signals.

32 Claims, 15 Drawing Sheets



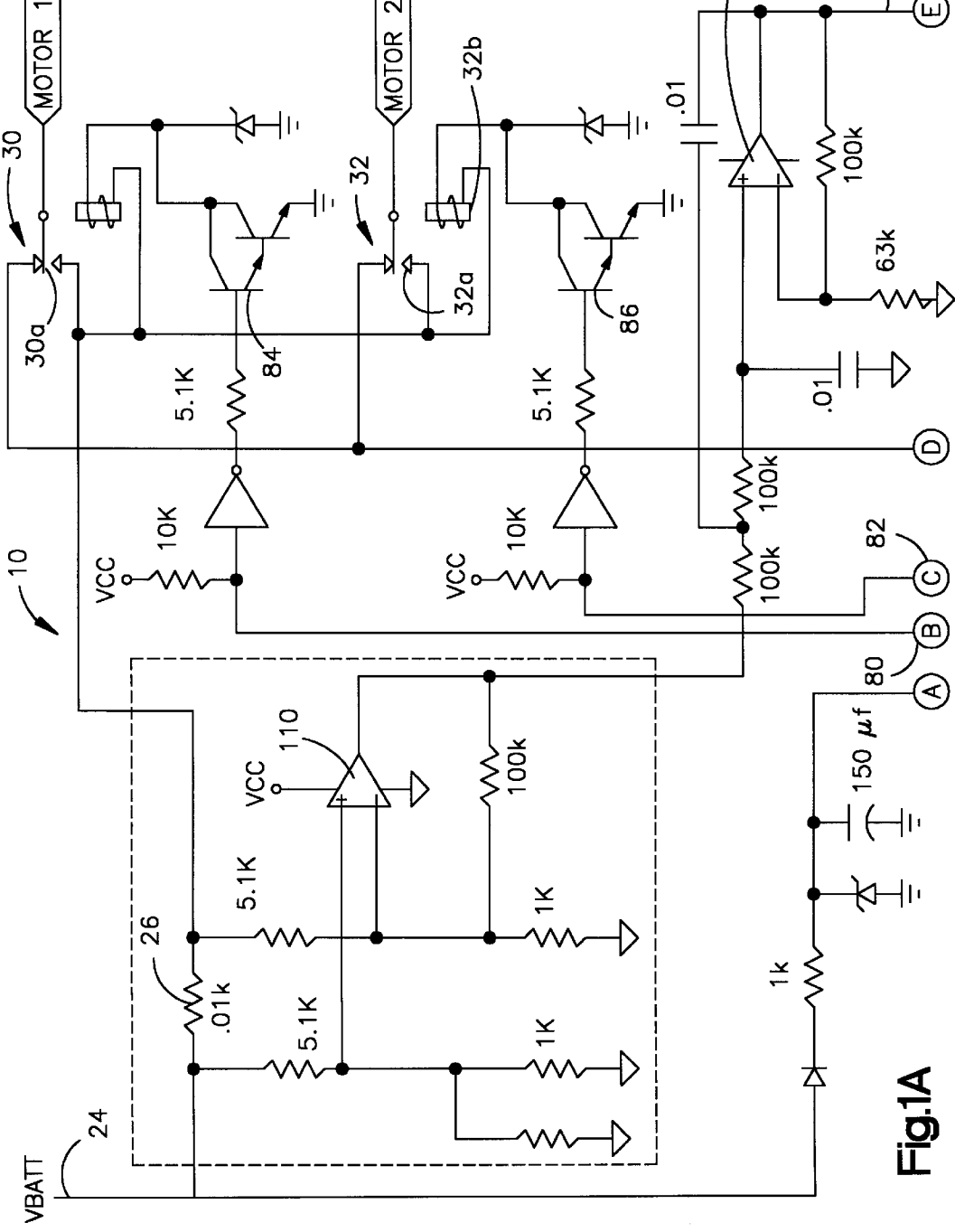


Fig.1A

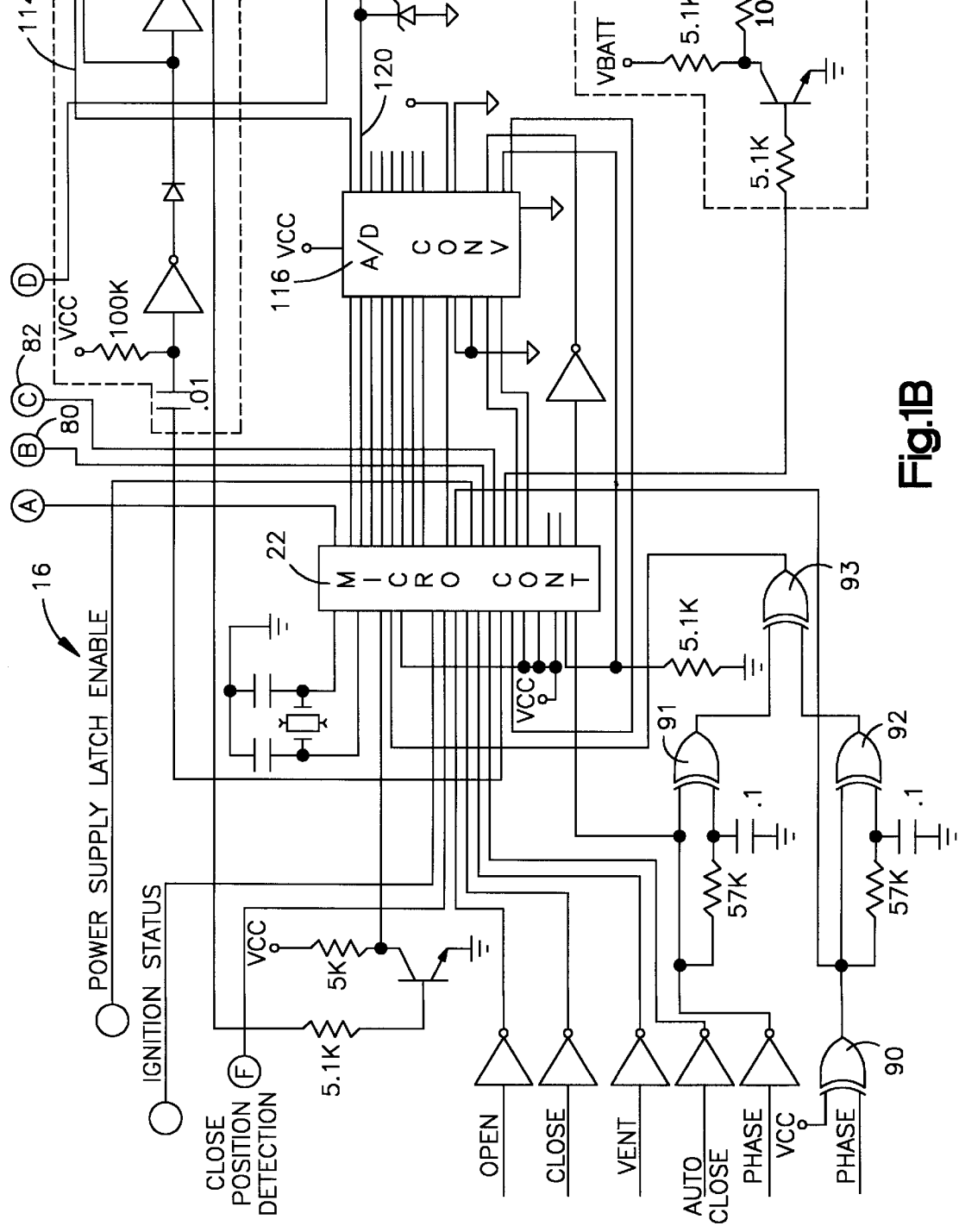


Fig.1B

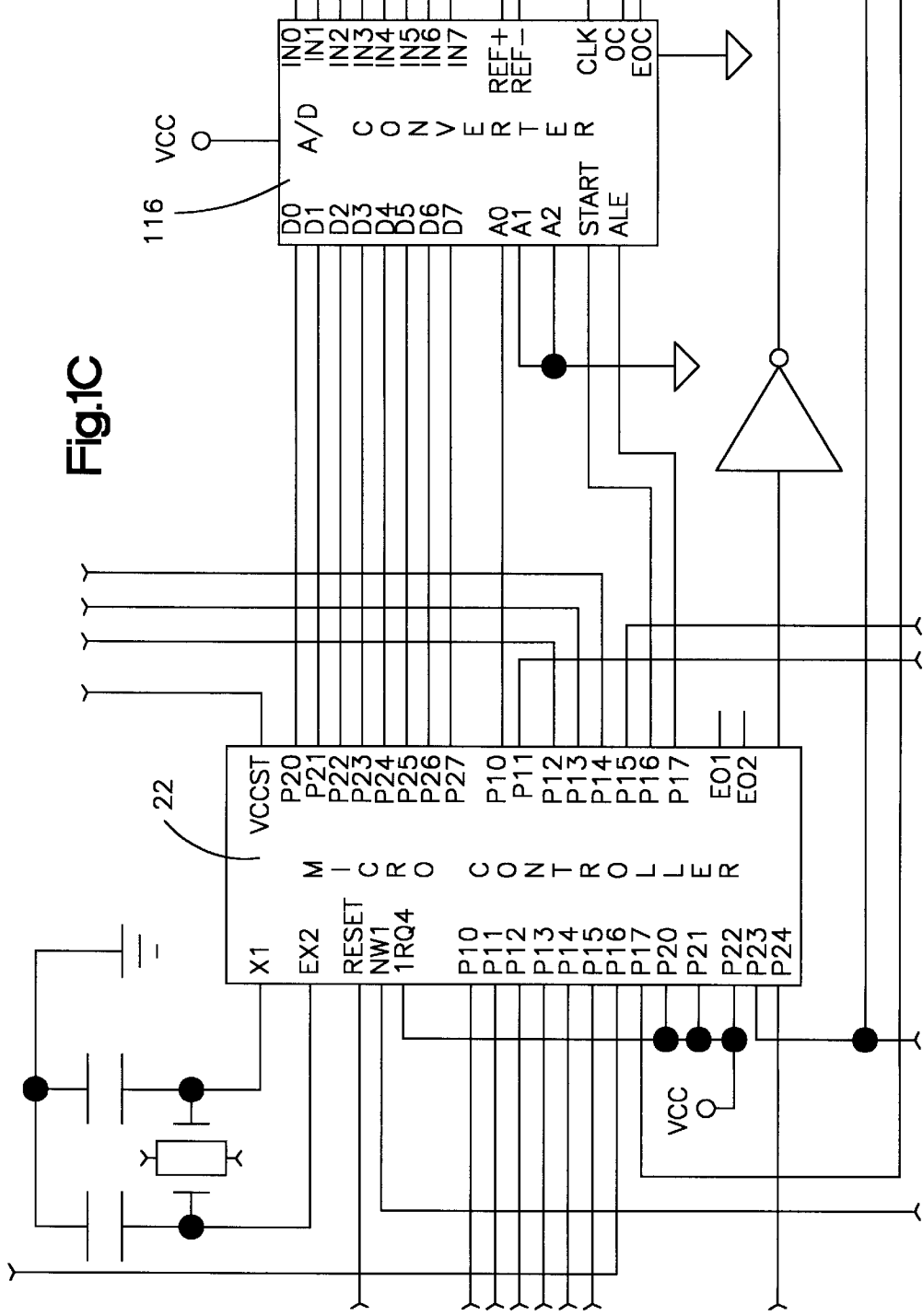
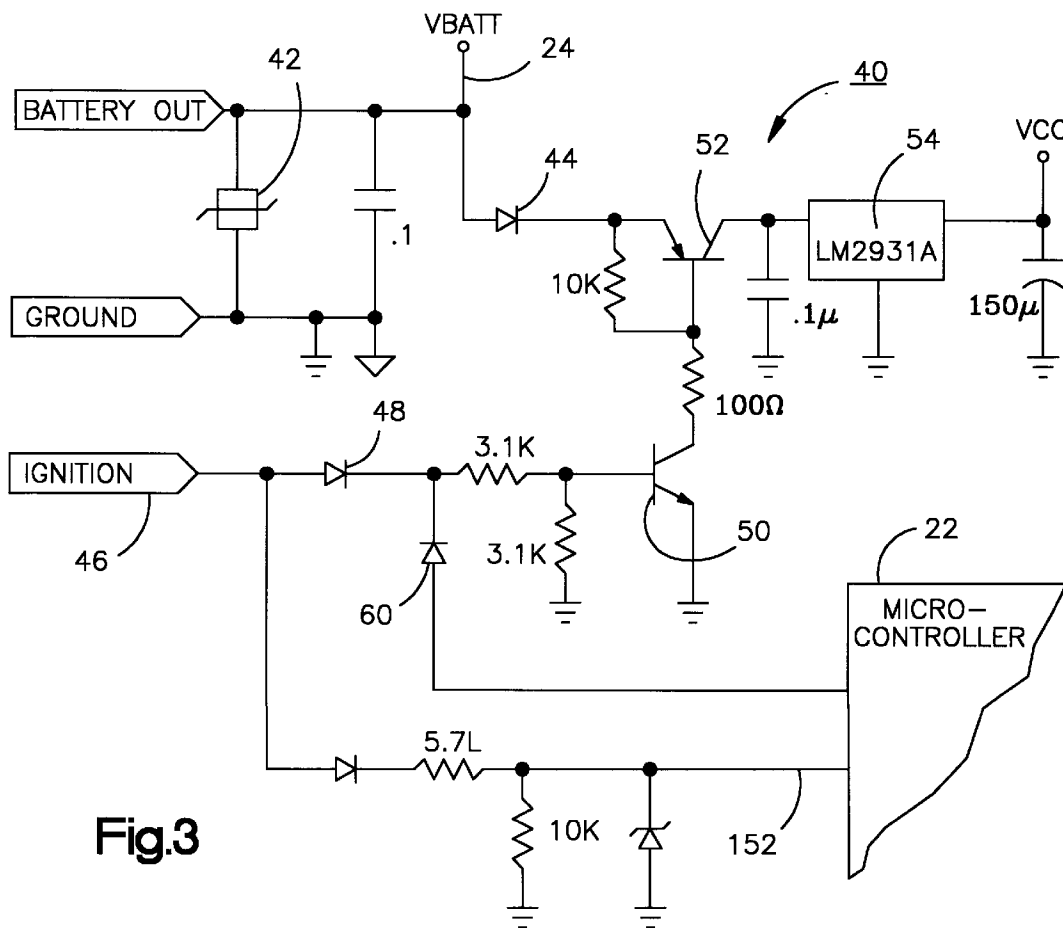
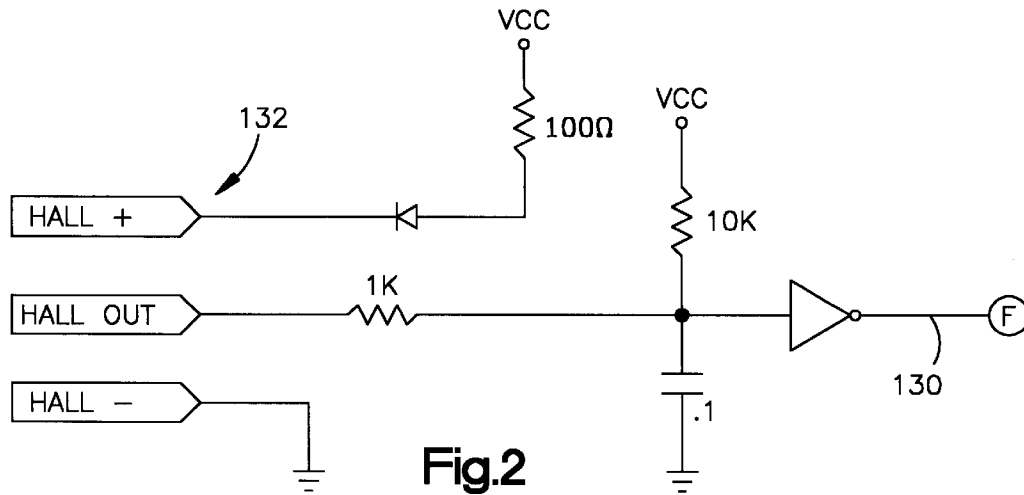


Fig.1C



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