United States Patent [19]

Klimo

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[45] **Date of Patent: Jan. 6, 1987**

[54] **ELECTRIC WHEELCHAIR WITH IMPROVED CONTROL CIRCUIT**

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[73] Assignee: **Invacare Corporation**, Elyria, Ohio

[21] Appl. No.: **721,572**

[22] Filed: **Apr. 10, 1985**

Related U.S. Application Data

[60] Division of Ser. No. 351,990, Feb. 24, 1982, Pat. No. 4,511,825, which is a continuation-in-part of Ser. No. 254,443, Apr. 15, 1981, Pat. No. 4,387,325.

[51] **Int. Cl.**[4] **G05D 1/00**

[52] **U.S. Cl.** **318/139**; 318/587; 320/2; 180/6.5; 180/907

[58] **Field of Search** 318/587, 139; 320/2; 180/6.5, 907

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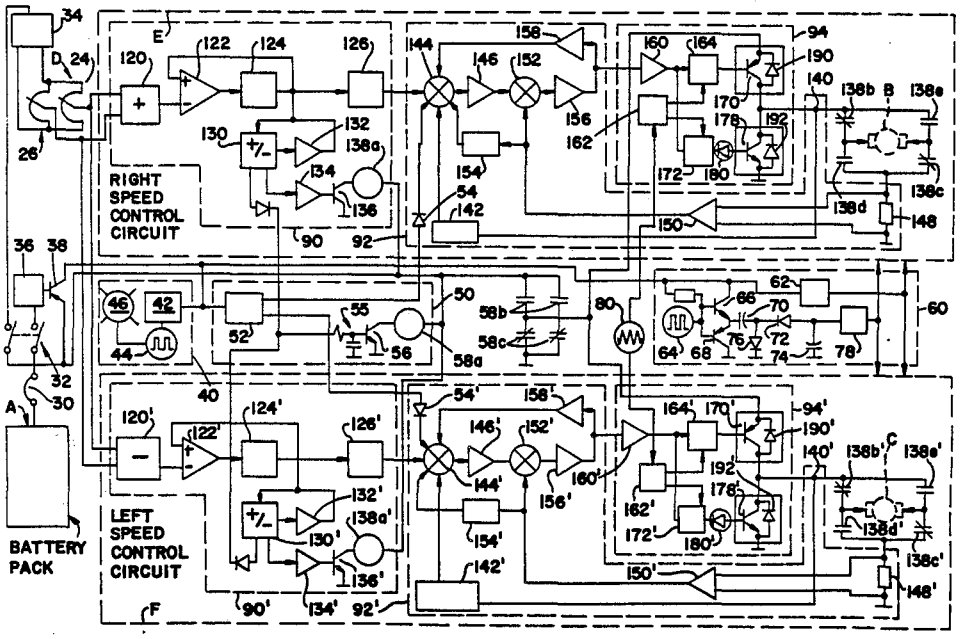
[57] **ABSTRACT**

The electric wheelchair includes a battery pack (A), a right drive motor (B), a left drive motor (C), and a control circuit for controlling the amount of power supplied from the battery to the left and right control motors. A speed potentiometer (**24**) and a direction potentiometer (**26**) are connected with a joystick (**22**) for producing a selected vehicle speed signal and a selected vehicle direction signal, respectively. A right speed control circuit (E) and a left speed control circuit (F) receive the selected vehicle speed and direction signals and control the right and left motors in accordance with them. Each speed control circuit includes a reference signal circuit (**90**) which receives the selected vehicle speed and direction signals and produces a reference signal whose magnitude varies with the speed selected for its motor. The voltage and current across the armature of the motor are detected as measures of the motors actual speed. A comparing circuit (**92**) compares the actual speed as determined by the armature voltage and current with the selected speed as denoted by their reference signal. Specifically, it subtractively combines the armature voltage and the reference signal to produce a first difference signal. Further, it subtractively combines the first difference signal with the armature current signal to produce a speed error reference signal. The speed error reference signal controls a variable power regulator (**94**) which varies the amount of power supplied to the motor in a manner which tends to cause the actual and selected speeds to match.

17 Claims, 11 Drawing Figures



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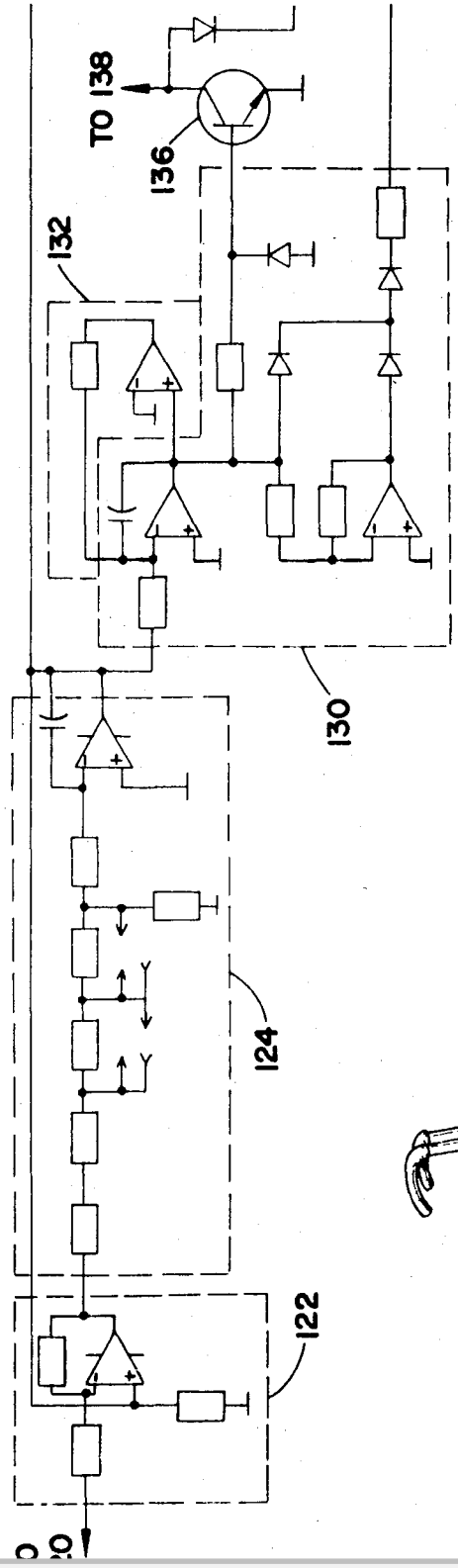

FIG. 4A

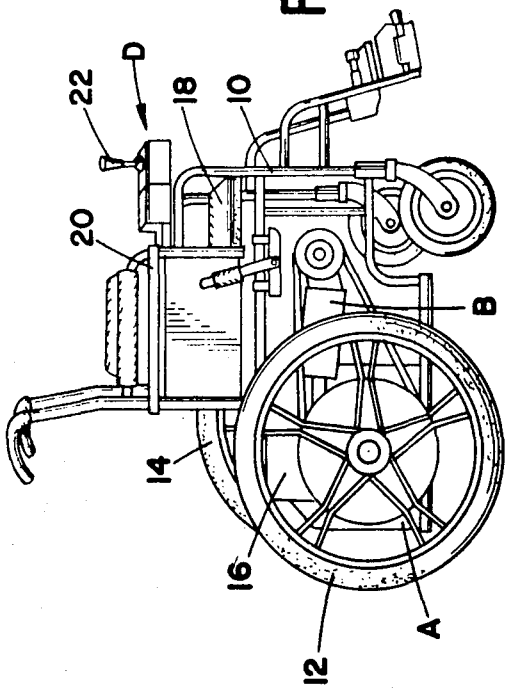

FIG. 1

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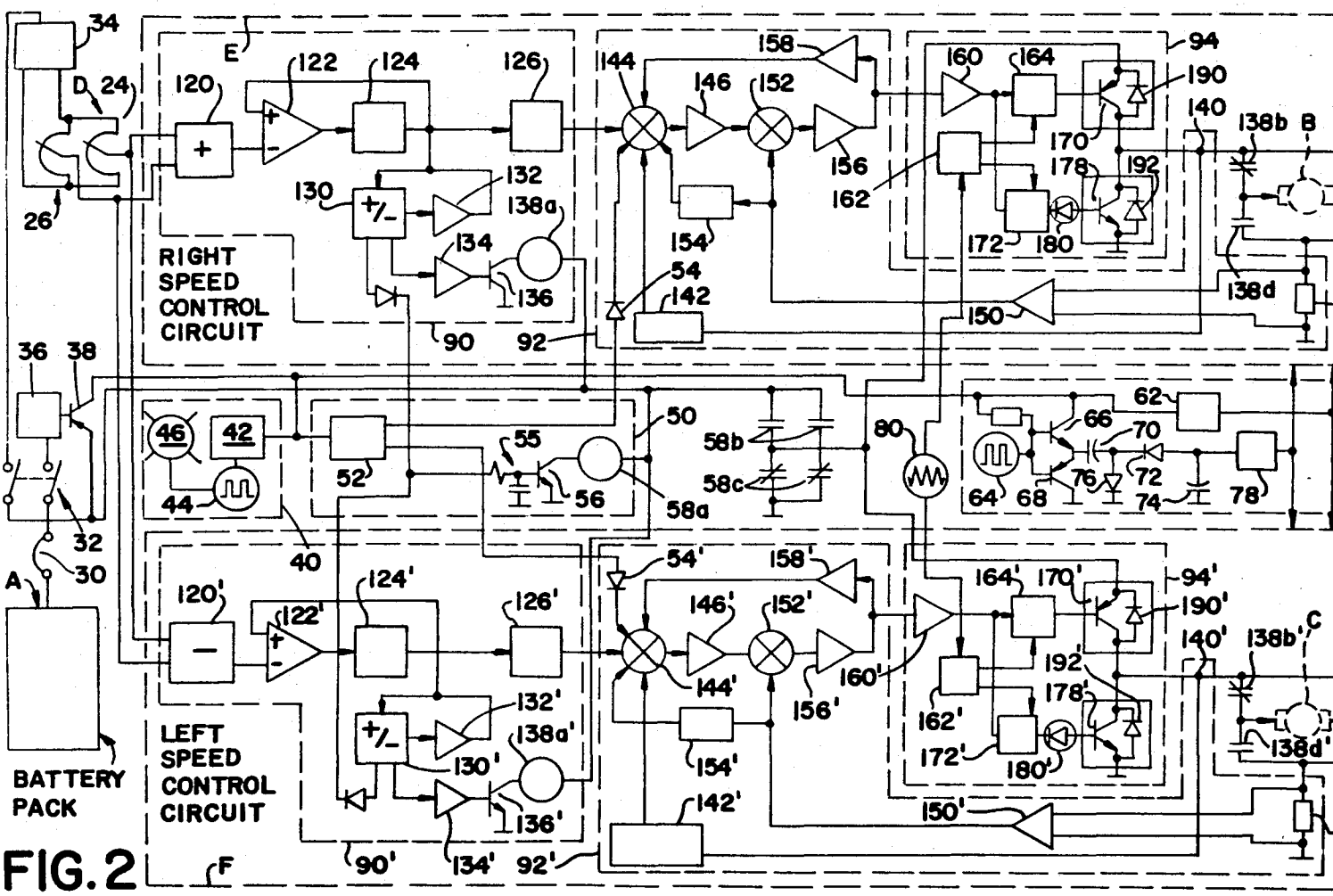

FIG. 2

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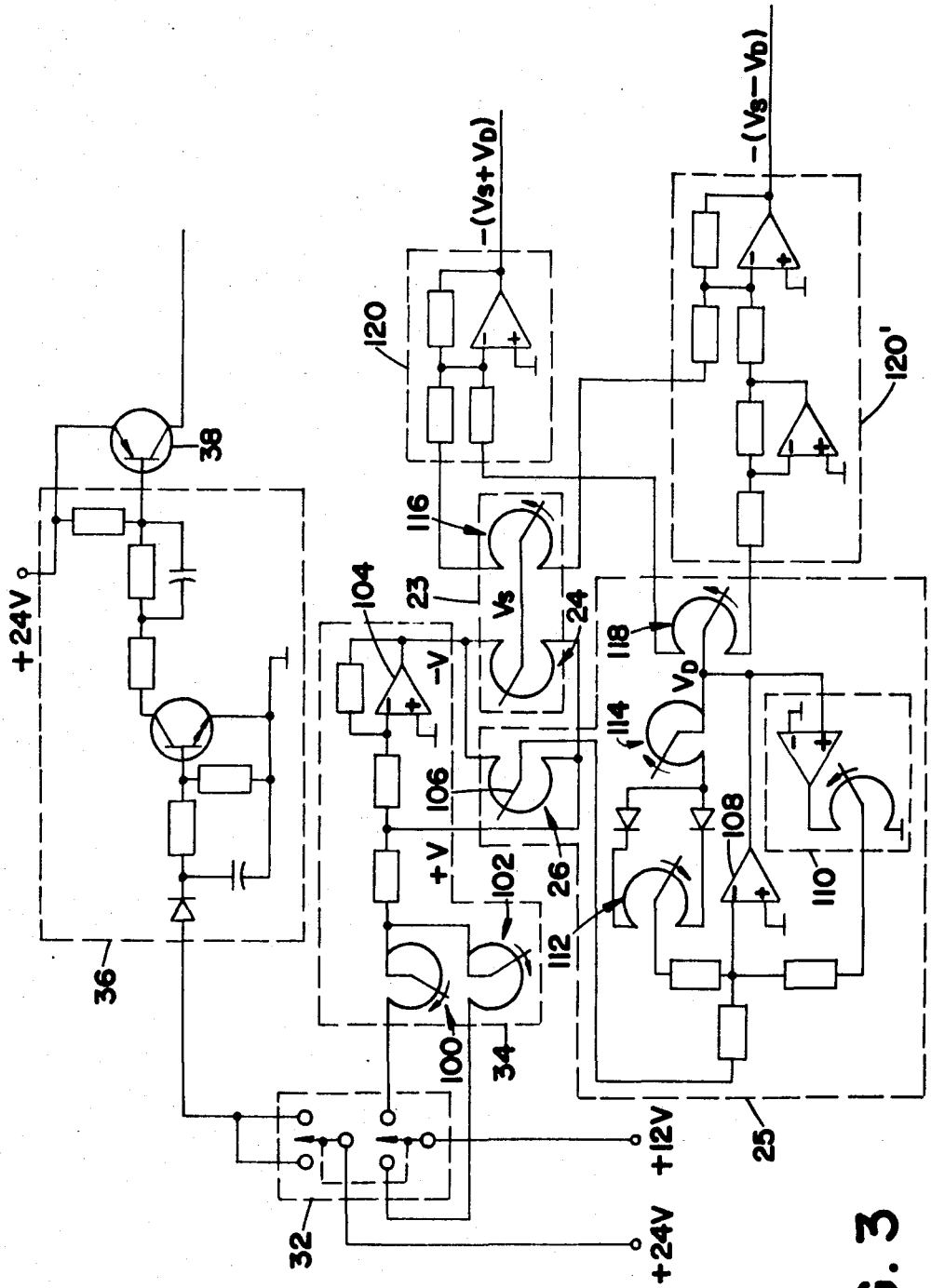

FIG. 3

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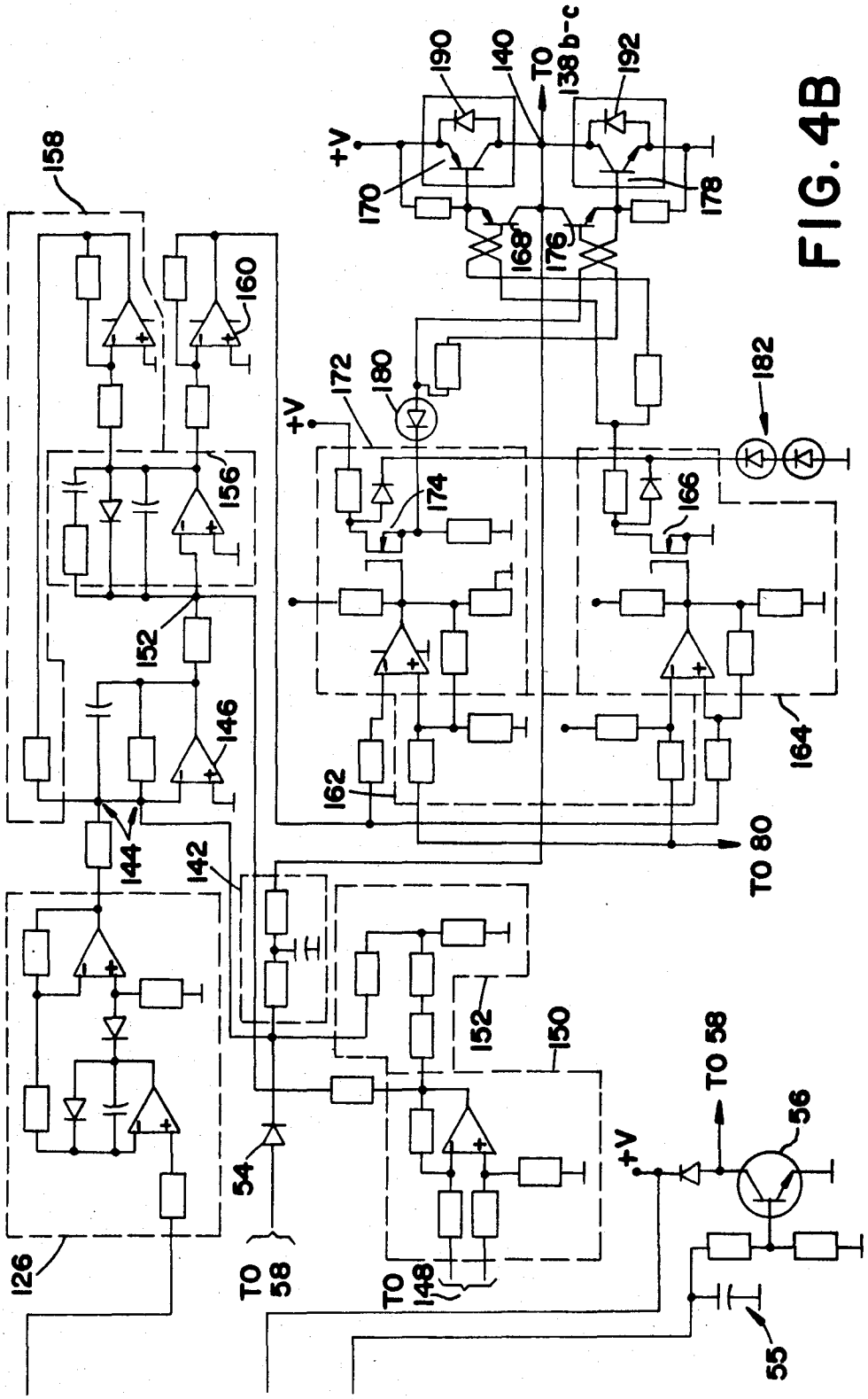

FIG. 4B

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