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(12) **United States Patent**  
**Hirst**

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(54) **MULTIPLE FREQUENCY SWITCHING  
POWER SUPPLY AND METHODS TO  
OPERATE A SWITCHING POWER SUPPLY**

5,969,515 \* 10/1999 Oglesbee ..... 232/283  
6,127,816 \* 10/2000 Hirst ..... 323/284

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\* cited by examiner

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Primary Examiner—Shawn Riley

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

(57) **ABSTRACT**

This patent is subject to a terminal dis-  
claimer.

A multiple frequency switching power supply including a pulse width modulation circuit having an output, having an input and having a clock signal input. The power supply also includes a switching transistor having first and second current-carrying electrodes and a control electrode. The first current-carrying electrode is coupled to a voltage source, the control electrode is coupled to the output of the pulse width modulation circuit and the second current-carrying electrode is coupled to a power supply output configured to provide a regulated output voltage. The power supply additionally includes a voltage sensing circuit coupled to the power supply output and having an output coupled to the pulse width modulation circuit input and a switch coupled to the clock input of the pulse width modulation circuit. The switch supplies a first clock signal having a first frequency when the power supply is in a normal mode of operation and supplies a second clock signal having a second frequency more than order of magnitude lower than the first frequency when the power supply is in a standby mode of operation.

(21) Appl. No.: **09/656,669**

(22) Filed: **Sep. 7, 2000**

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 09/368,401, filed on  
Aug. 4, 1999, now Pat. No. 6,127,816.

(51) Int. Cl.<sup>7</sup> ..... **G05F 1/40**

(52) U.S. Cl. .... **323/283; 323/284**

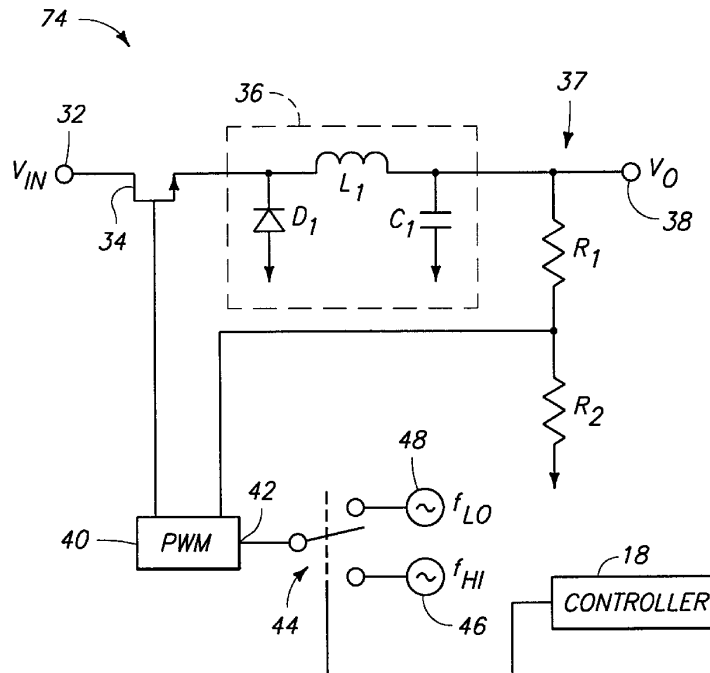
(58) Field of Search ..... 323/283, 285,  
323/284, 282

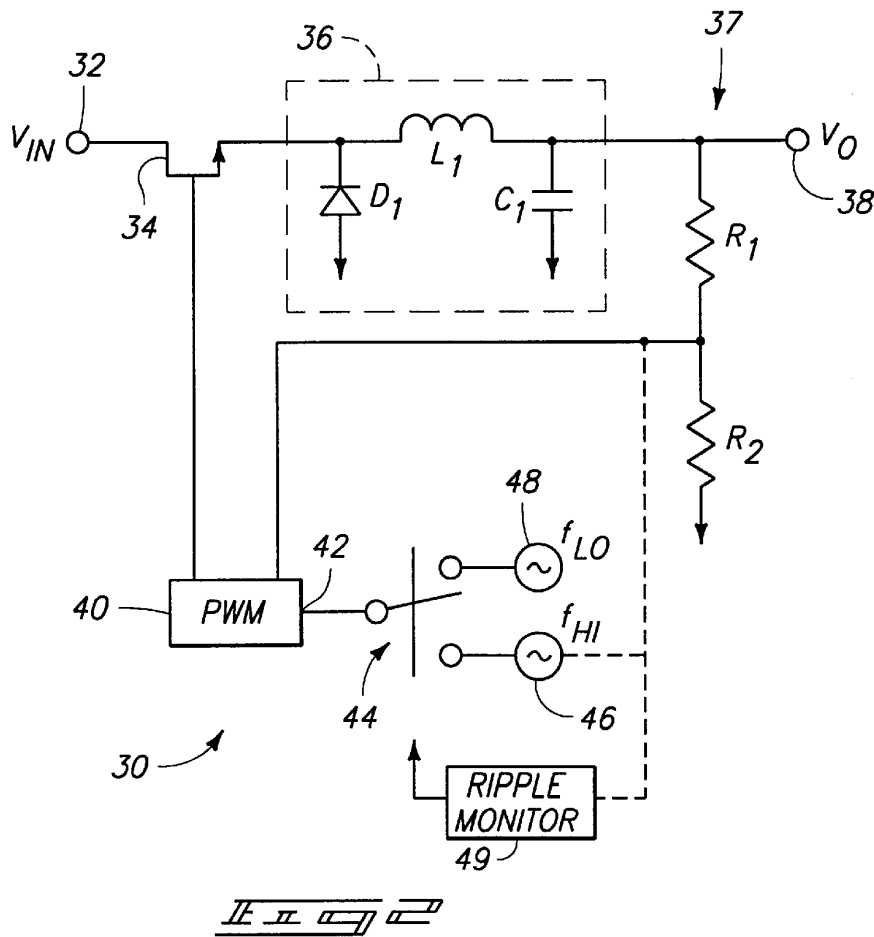
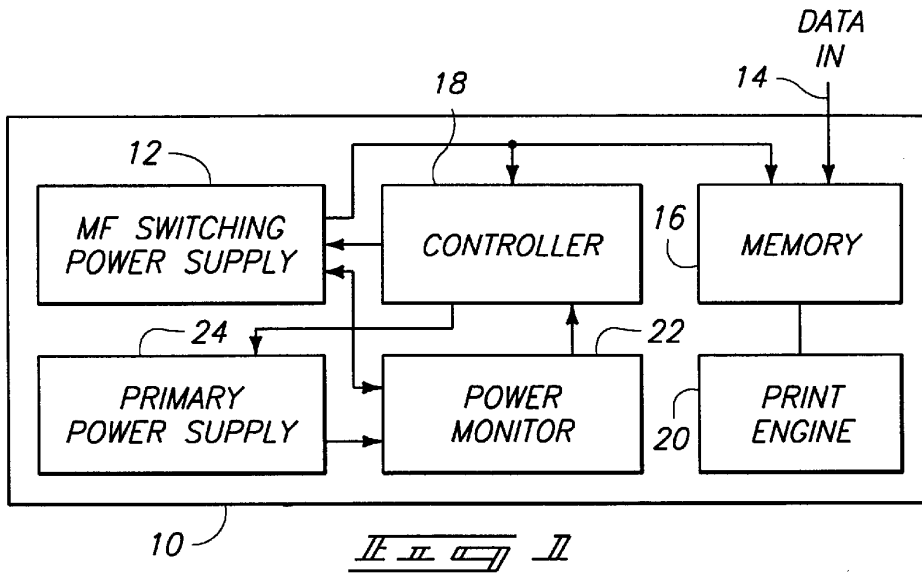
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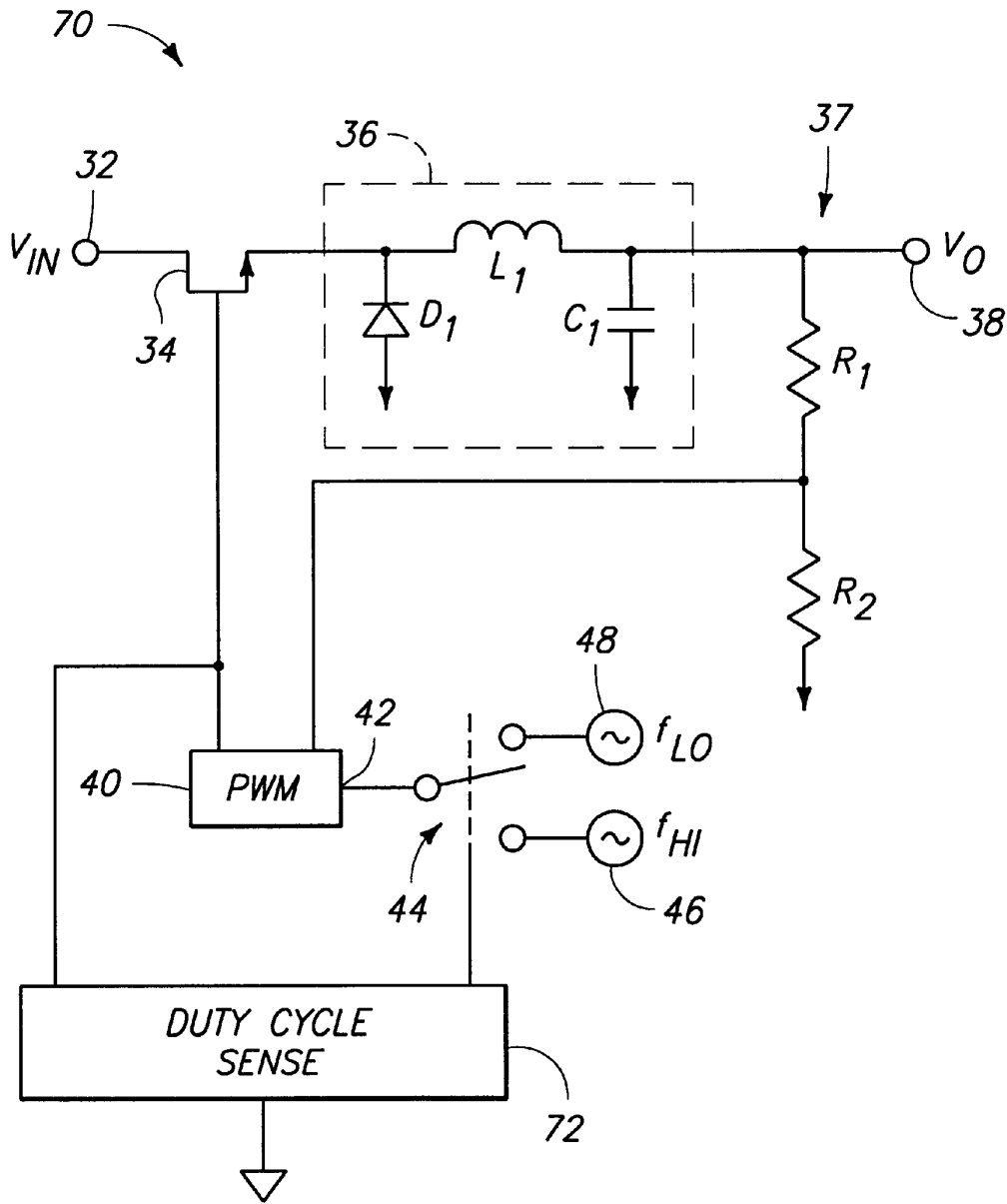
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**14 Claims, 5 Drawing Sheets**

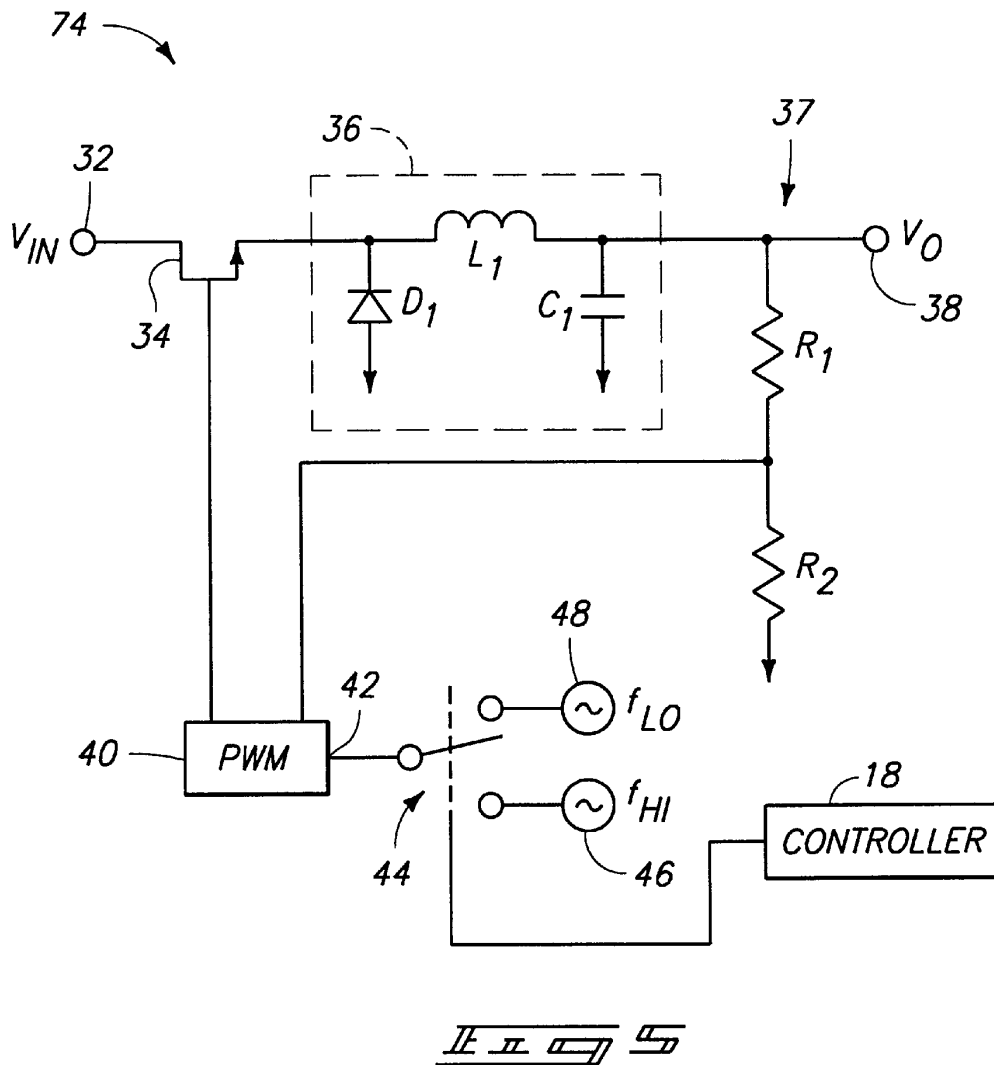








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