



US006294904B1

(12) **United States Patent**
Hirst

(10) **Patent No.:** **US 6,294,904 B1**
(45) **Date of Patent:** ***Sep. 25, 2001**

(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

* cited by examiner

(75) Inventor: **B. Mark Hirst**, Boise, ID (US)

(73) Assignee: **Hewlett-Packard Company**, Palo Alto,
CA (US)

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

This patent is subject to a terminal dis-
claimer.

(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.⁷ **G05F 1/40**

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

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

(56) **References Cited**

U.S. PATENT DOCUMENTS

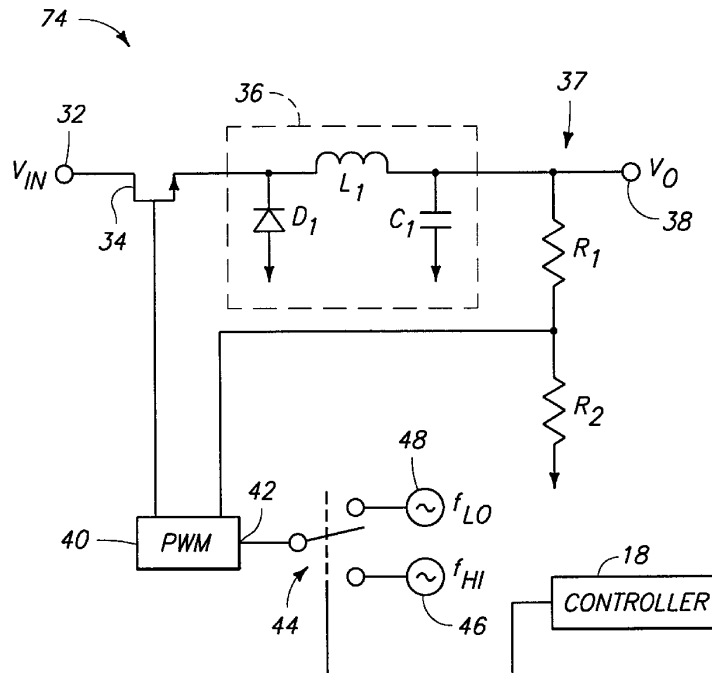
4,030,015 * 6/1977 Herko et al. 323/266

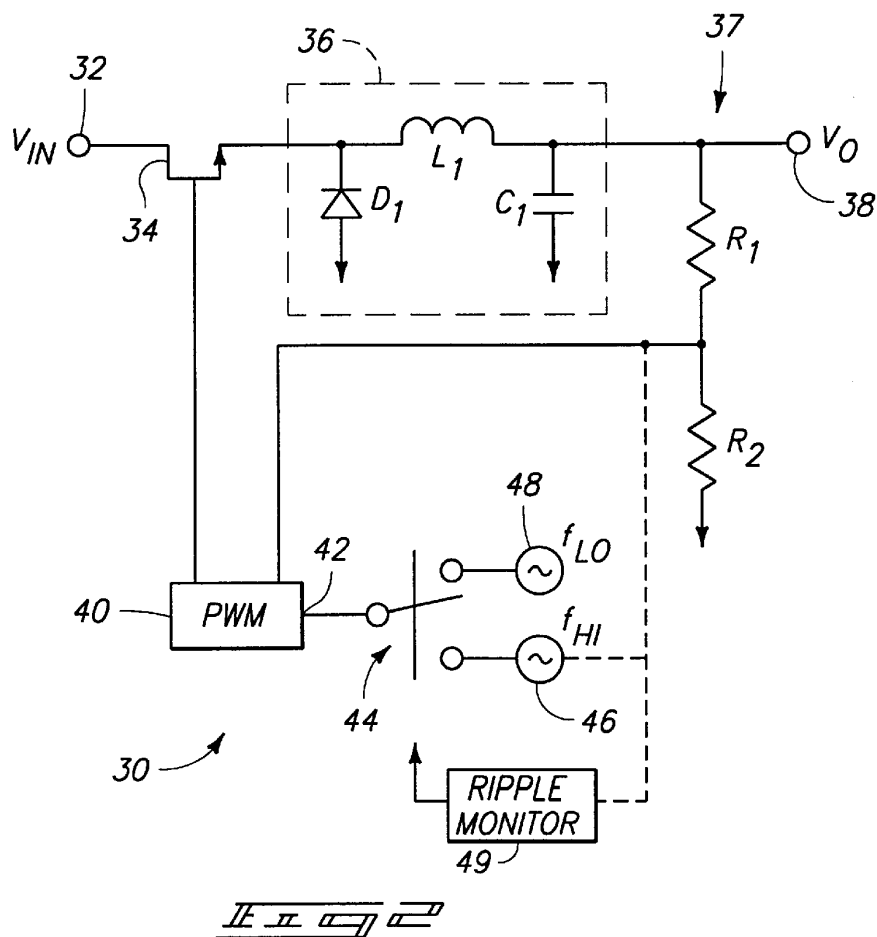
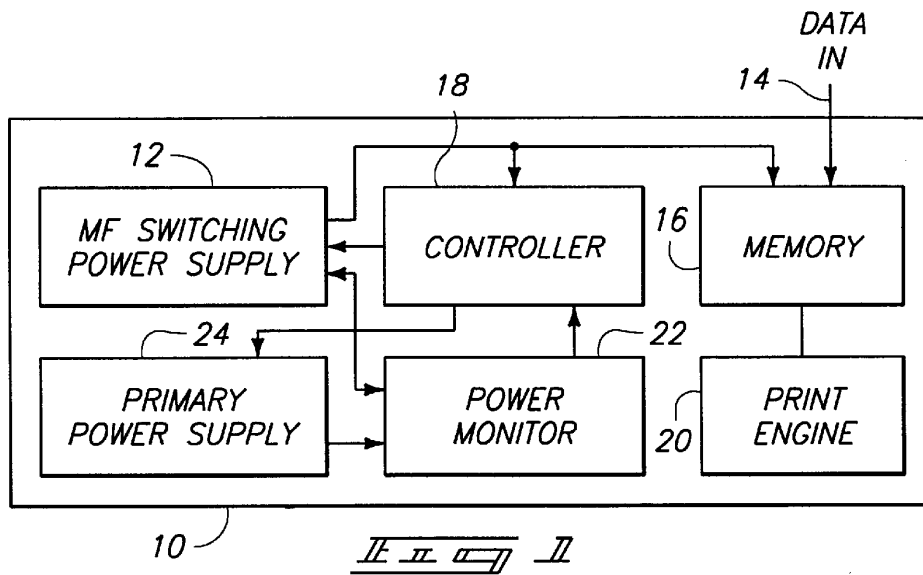
Primary Examiner—Shawn Riley

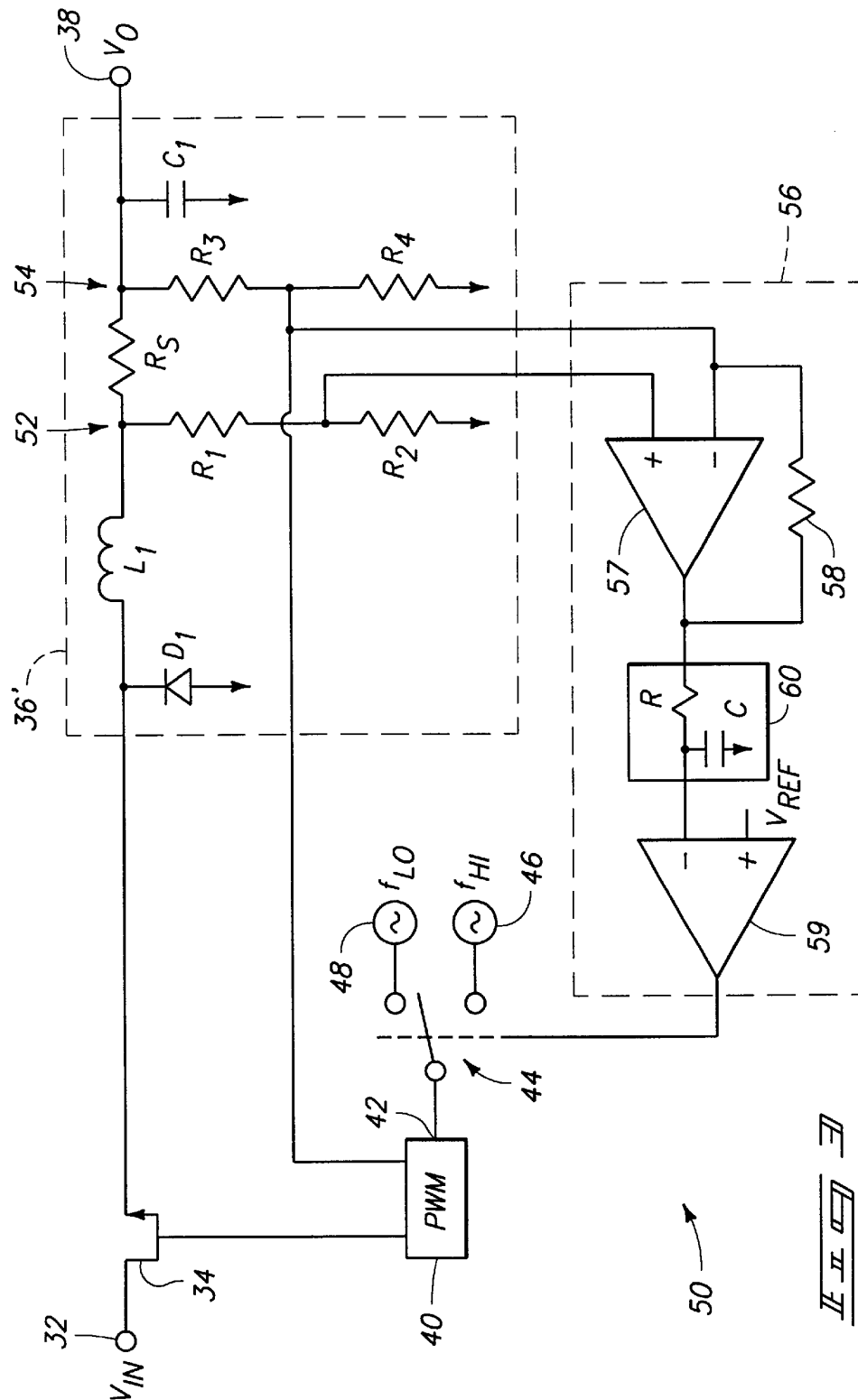
(57) **ABSTRACT**

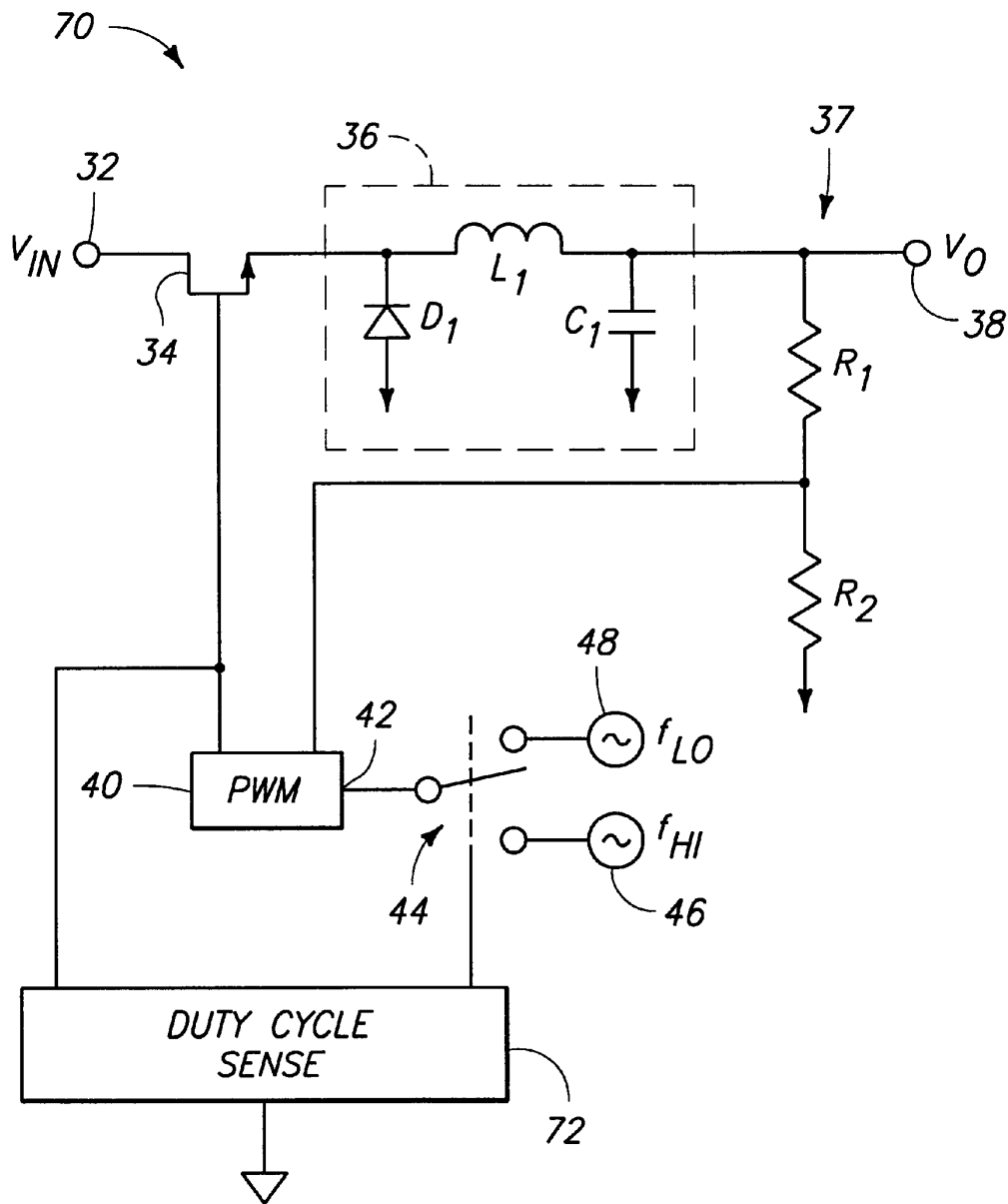
A multiple frequency switching power supply including a pulse width modulation circuit having an output, having an input and having a clock signal input. The power supply also includes a switching transistor having first and second current-carrying electrodes and a control electrode. The first current-carrying 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.

14 Claims, 5 Drawing Sheets

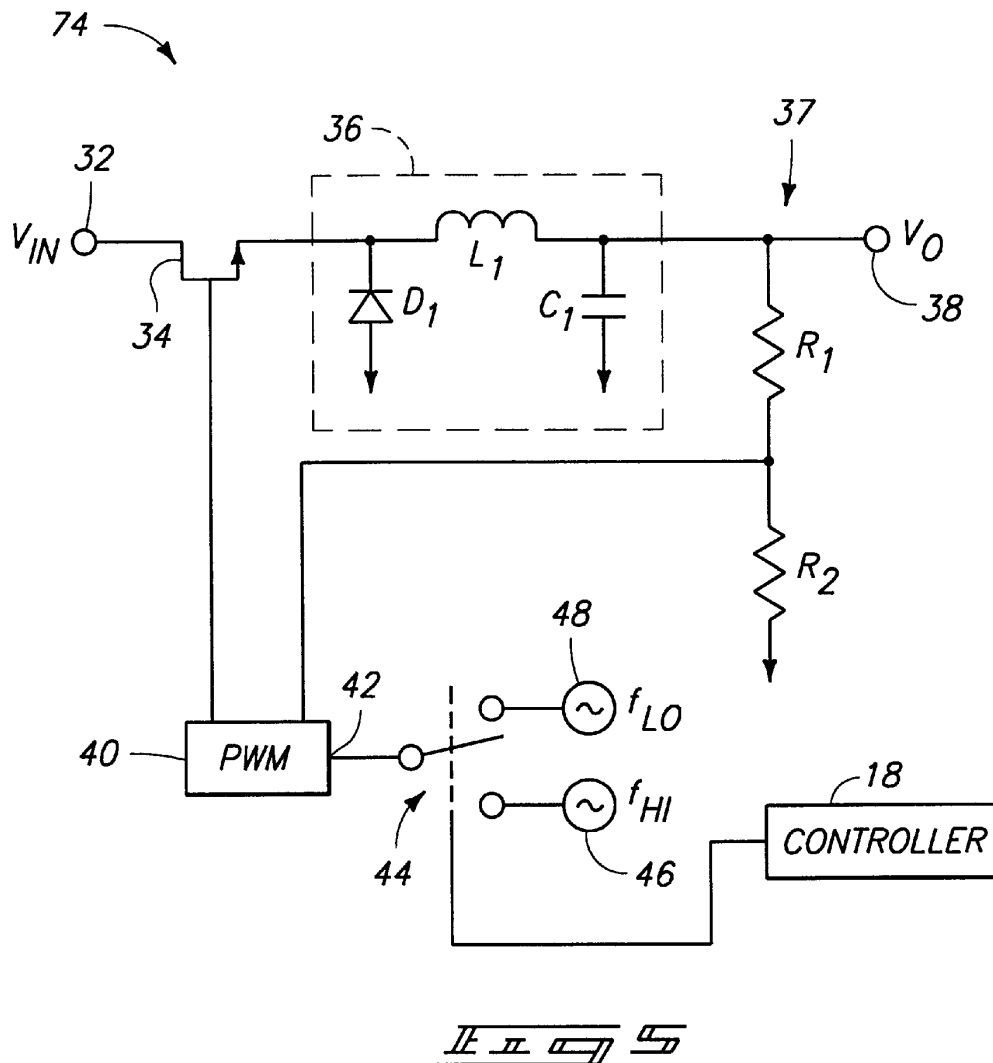








II II II II





Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.