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United States Patent [19]
Hwang

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- [54] SYNCHRONOUS SWITCHING CASCADE CONNECTED OFFLINE PFC-PWM COMBINATION POWER CONVERTER CONTROLLER
- [76] Inventor: Jeffrey H. Hwang, 20576 Manor Dr., Saratoga, Calif. 95070
- [21] Appl. No.: 300,475
- [22] Filed: Sep. 2, 1994
- [51] Int. Cl.⁶ G05F 1/656
- [52] U.S. Cl. 323/222; 323/282
- [58] Field of Search 323/222, 223, 323/224, 282, 284, 288; 363/21, 23, 25

[57] ABSTRACT

A synchronous switching cascade connected power converter includes a first power factor correction converter stage and a second DC to DC converter stage for generating an output voltage in response to an input voltage and current. The output voltage is controlled by a circuit which measures a level of current within the circuit, compares that level to a predetermined desired level, and develops a response elsewhere in the circuit. Leading edge modulation for the first stage and trailing edge modulation for the second stage is implemented to realize synchronous switching between the two power stages. A single reference clock signal is used to control both the power stages. The duty cycle of the first stage is varied according to the input voltage. The duty cycle of the second stage is ideally held constant at fifty percent but will vary as the input voltage to this stage varies. A dc comparator is coupled to the first stage for comparing an output voltage to a threshold value and preventing the second stage from turning on if the output voltage of the first stage is below the threshold value. A transconductance amplifier is used to control the input current and the output voltage of the power stages. A circuit for capturing a portion of the voltage lost due to the parasitic capacitances of the switches is also included. This capturing stage is coupled to the switch to capture voltage discharged by the parasitic capacitance and use it to then charge the output capacitor of the converter stage.

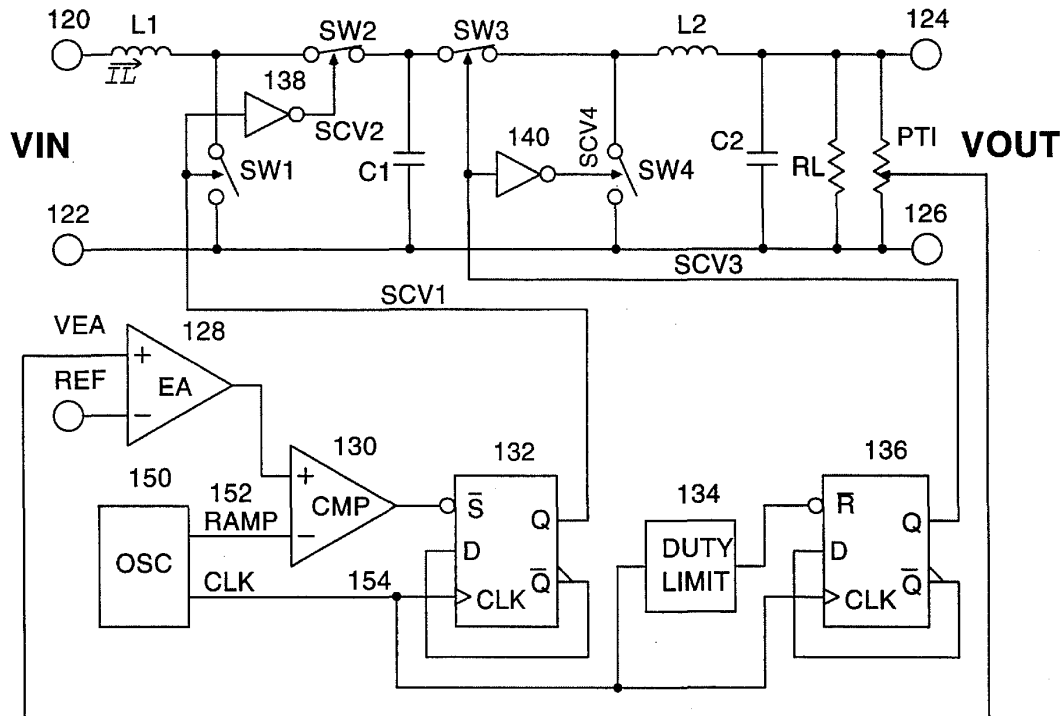
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Primary Examiner—Matthew V. Nguyen
Attorney, Agent, or Firm—Haverstock & Associates

23 Claims, 12 Drawing Sheets



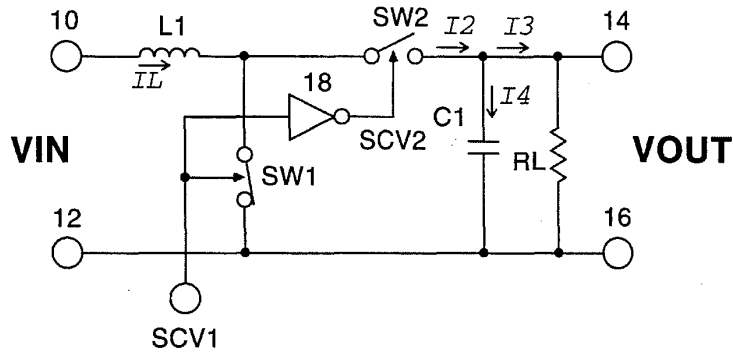


FIGURE 1 (Prior Art)

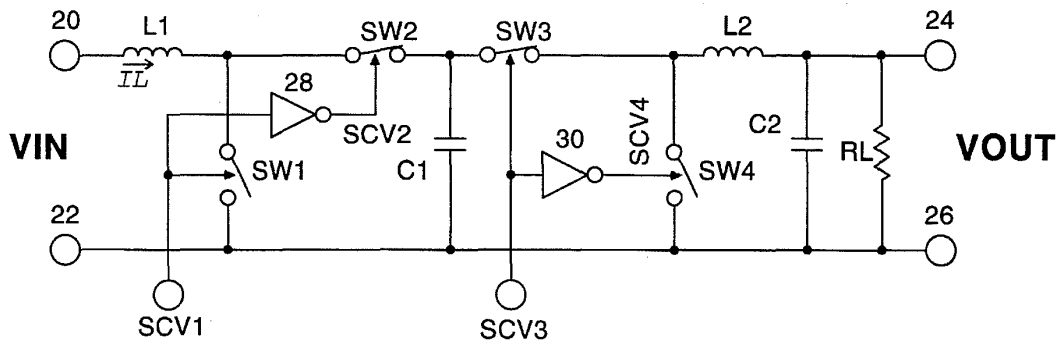


FIGURE 2 (Prior Art)

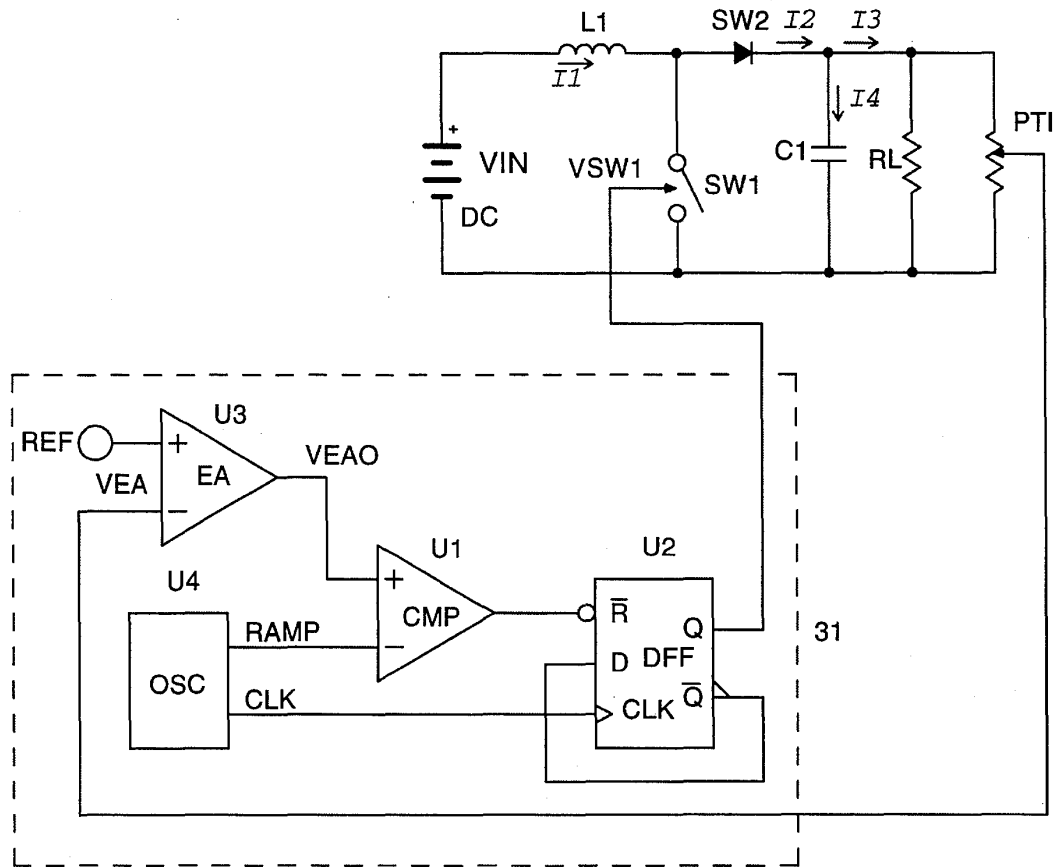


FIGURE 3 (Prior Art)

FIGURE 4
(Prior Art)

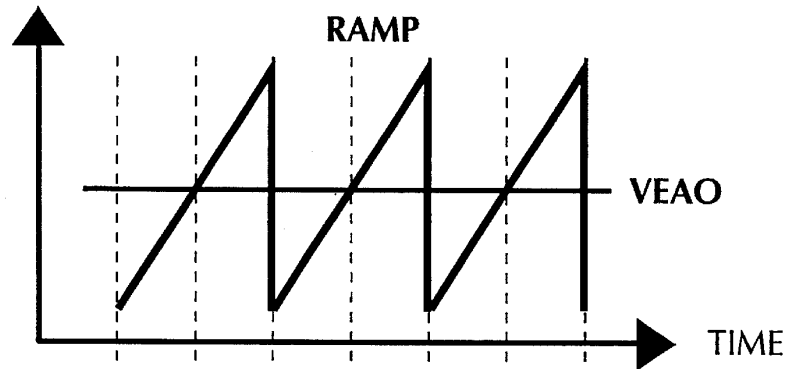


FIGURE 5
(Prior Art)

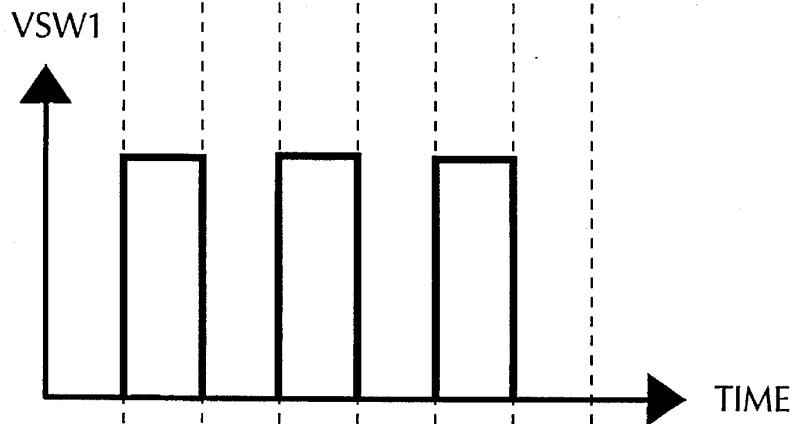
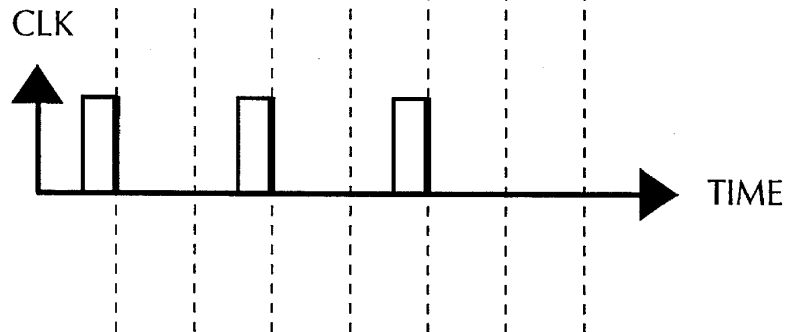


FIGURE 6
(Prior Art)



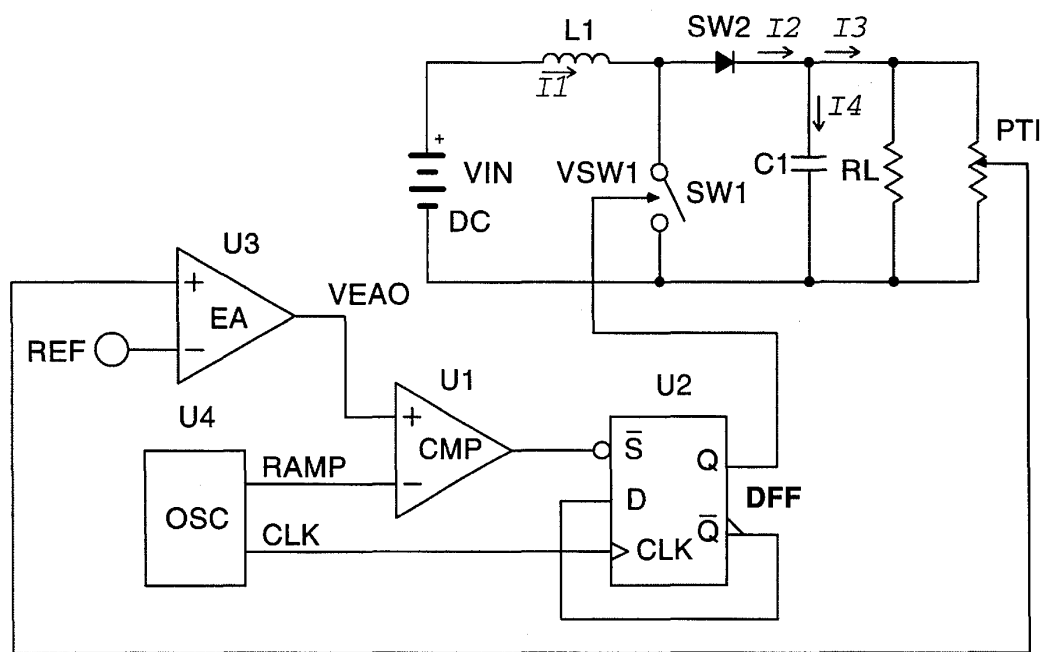


FIGURE 7 (Prior Art)

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