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(71) Applicant: PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).			
(71) Applicants (for SE only): PHILIPS NORDEN AB [SE/SE]; Kottbygatan 5, Kista, S-164 85 Stockholm (SE). HEWLETT-PACKARD COMPANY [US/US]; 11413 Chinden Boulevard, Mail Stop 314, Boise, ID 83714 (US).			
(72) Inventors: SHELTON, Boyd, N.; 10736 Bridgtower Drive, Boise, ID 83709 (US). BUTHKER, Henricus, C., J.; Langenakker 72, NL-5731 JT Mierlo (NL).			
(74) Agent: CUPPENS, Hubertus, M., M.; Internationaal Octrooibureau B.V., P.O. Box 220, NL-5600 AE Eindhoven (NL).			

(54) Title: SOFT SWITCHING, PWM CONTROLLER AND METHOD FOR REDUCING TORQUE RIPPLE IN MULTIPHASE DC MOTOR

(57) Abstract

A PWM controlled multiphase DC motor apparatus has a multiphase DC motor, a current sensor, and a PWM controller. The DC motor has multiple windings which turn on and off during commutation at a commutation frequency. The current sensor is coupled to sense power supply current flowing in all windings of the DC motor. The PWM controller is coupled to control the DC motor using a PWM signal at selected PWM frequency with variable duty cycle. Using the feedback from the current sensor, the PWM controller maintains approximately constant torque in the DC motor by adjusting the duty cycle of the PWM signal. The PWM controller includes a soft switching circuit which manipulates a voltage used to generate the controlling PWM signal in a manner which causes

linear slewing of currents in the windings during commutation. The linear current slewing occurs at a slow rate that is slow relative to the PWM frequency to thereby reduce torque ripple during commutation. The combined features of continuous PWM duty cycle control and linear current slewing during commutation significantly reduces torque ripple at the fundamental commutation frequency, as well as at the first few harmonics. A method for PWM control of a multiphase DC motor is also described.

