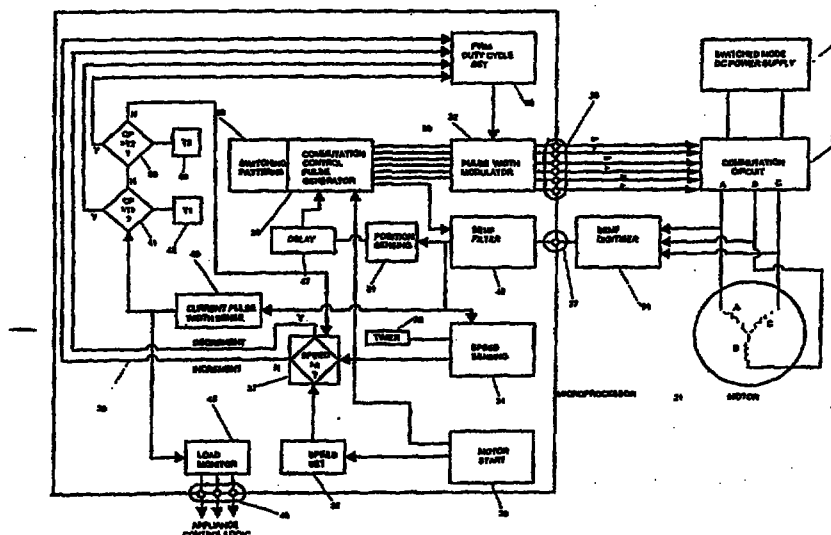




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶: H02K 29/00, H02P 6/08, 6/18	A1	(11) International Publication Number: WO 98/35428 (43) International Publication Date: 13 August 1998 (13.08.98)
(21) International Application Number: ✓ PCT/NZ98/00012 (22) International Filing Date: ✓ 5 February 1998 (05.02.98) (30) Priority Data: 314195 ✓ 5 February 1997 (05.02.97) ✓ NZ (71) Applicant (for all designated States except US): FISHER & PAYKEL LIMITED [NZ/NZ]; 78 Springs Road, East Tamaki, Auckland (NZ). (72) Inventors; and (75) Inventors/Applicants (for US only): BOYD, John, H. [US/US]; 57 Forest Hills Drive, Holland, MI 49424 (US). DUNCAN, Gerald [NZ/NZ]; 42 Henley Road, Mt Eden, Auckland (NZ). PERRY, Michael, Thomas, George [NZ/NZ]; 6 Seri Place, Manukau, Auckland (NZ). (74) Agents: CALHOUN, Douglas, C. et al.; A. J. Park & Son, Huddart Parker Building, 6th floor, Post Office Square, P.O. Box 949, Wellington 6015 (NZ).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, <u>SG</u> , SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report.

(54) Title: BRUSHLESS DC MOTOR CONTROL ✓



(57) Abstract

An electronically commutated brushless DC motor primarily for fractional horsepower applications of the type where at any instant one motor winding is unpowered and used to detect back EMF zero-crossings which information is used to initiate winding commutations. The duration of the pulse produced in this winding due to dissipation of stored energy by free-wheel diodes in parallel with the commutation devices after supply of current has been removed from this winding is used to provide a measure of motor current. This allows for simplified commutation device current limiting circuits and is available for control purposes which are a function of motor torque. There is also disclosed a method for maximising useful power output by reducing the phase angle between the motor current and the back EMF. This is accomplished by introducing a delay in commutating the motor windings beyond the occurrence of each back EMF zero-crossing, with the delay being a function of the time between commutations.