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(71) Applicant: **THE BOARD OF TRUSTEES OF THE UNIVERSITY OF ILLINOIS** [US/US]; 1737 West Polk Street, Chicago, IL 60612-7227 (US).

(72) Inventors: **NEBRIGIC, Dragan, Danilo**; 4155 Mill Crest Drive, Indian Springs, OH 45011 (US). **JEVTITCH, Milan, Marcel**; 3001 Springer Avenue, Cincinnati, OH 45208 (US). **GARTSTEIN, Vladimir**; 11187 Huntwick Place, Cincinnati, OH 45241 (US). **MILAM, William, Thomas**; 8311 Chadwick Drive, Knoxville, TN 37909 (US). **SHERRILL, James, Vig**; P.O. Box 214, Norris, TN 37828 (US). **BUSKO, Nicholas**; 1508 Secretariat Blvd., Knoxville, TN 37931 (US). **HANSEN, Peter**; 329 McFee Road, Knoxville, TN 37922 (US).

(74) Agent: **GAMSON, Edward**; Welsh & Katz, Ltd., 120 South Riverside Plaza, 22nd Floor, Chicago, IL 60612-7227 (US).

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- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations*

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(54) Title: MULTIPLE OUTPUT DYNAMICALLY REGULATED CHARGE PUMP POWER CONVERTER

(57) Abstract: A charge pump power converter efficiently provides electrical power by dynamically controlling a switch matrix of the charge pump. Instead of open-loop oscillator-based control, a dynamic controller provides power upon demand by sensing the output voltage and changing the operating frequency of the charge pump in response. Moreover, this closed-loop dynamic control intrinsically voltage regulates the output voltage of the charge pump power converter without the inefficient addition of a step-down voltage regulator, downstream of the power converter. Additional efficiencies are achieved through maintaining the voltage ripple across the fly capacitor and/or the load capacitor. Also, a three-state control scheme is used to charge the fly capacitor, wait for the output voltage to drop to a predetermined level, and discharge the fly capacitor. Furthermore, a multiple-output charge pump power converter provides multiple voltage levels for devices such as portable communication electronic devices.