



PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

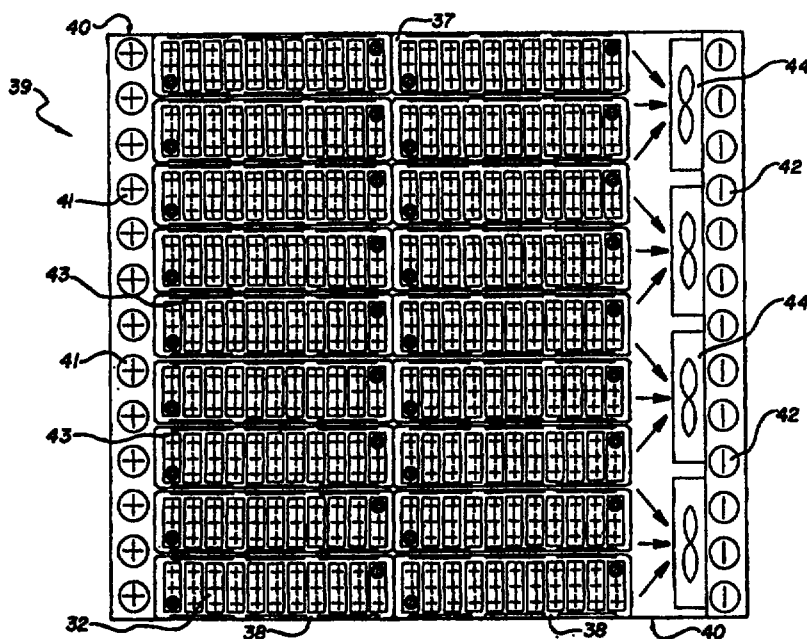
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H01M 2/10, 10/50, 10/52	A1	(11) International Publication Number: WO 98/31059 (43) International Publication Date: 16 July 1998 (16.07.98)
(21) International Application Number: PCT/US97/00805 (22) International Filing Date: 13 January 1997 (13.01.97) (71) Applicant: OVONIC BATTERY COMPANY, INC. [US/US]; 1707 Northwood, Troy, MI 48084 (US). (72) Inventors: OVSHINSKY, Stanford, R.; 2700 Squirrel Road, Bloomfield Hills, MI 48012 (US). CORRIGAN, Dennis, A.; 3793 Burkoff, Troy, MI 48084 (US). VENKATESAN, Srinivasan; 30115 Woodgate Drive, Southfield, MI 48076 (US). DHAR, Subhash, K.; 1978 Long Lake Shores, Bloomfield Hills, MI 48302 (US). HOLLAND, Arthur; 679 Brockmoore Lane, Bloomfield Hills, MI 48304 (US). FILLMORE, Donn; 4440 Island Park Drive, Waterford, MI 48239 (US). HIGLEY, Lin; 4791 Foxcroft, Troy, MI 48098 (US). GOW, Philippe; 382 Moy Avenue, Windsor, Ontario N9A 2N2 (CA). HIMMLER, Ronald; 5127 Kebbe, Sterling Heights, MI 48310 (US). KARDITSAS, Nick; 1450 Ford Boulevard, Lincoln Park, MI 48146 (US). LAMING, Kenneth; 1905 Hessen Road, Columbus, MI 48063 (US). OSGOOD, Anthony; Apartment 302, 530 Kimberly, Lake Orion, MI 48362 (US). (74) Agents: LUDDY, Marc et al.; Energy Conversion Devices, Inc., 1675 West Maple Road, Troy, MI 48084 (US).		(81) Designated States: AU, BR, CA, FI, JP, KR, MX, NO, RU, SG, UA, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: MECHANICAL AND THERMAL IMPROVEMENTS IN METAL HYDRIDE BATTERIES, BATTERY MODULES AND BATTERY PACKS

(57) Abstract

Mechanically and thermally improved rechargeable batteries, modules and fluid-cooled battery systems are disclosed herein. The battery is prismatic in shape with an optimized thickness to width to height aspect ratio which provides the battery with balanced optimal properties when compared to prismatic batteries lacking this optimized aspect ratio. The optimized thickness, width and height allow for maximum capacity and power output, while eliminating deleterious side effects. The battery case allows for unidirectional expansion which is readily compensated for by applying external mechanical compression counter to that direction. In the module (32), the batteries are bound within a bundling/compression means under external mechanical compression which is optimized to balance outward pressure due to expansion and provide additional inward compression to reduce the distance between the positive and negative electrodes, thereby increasing overall battery power. The fluid-cooled battery pack (39) includes a battery-pack case (40) having coolant inlets (41) and outlets (42); battery modules within



the case such that they are spaced from the case walls and from each other to form coolant flow channels (43) along at least one surface of the bundled batteries; and at least one coolant transport means (44). The width of the coolant flow channels allows for maximum heat transfer. Finally, the batteries, modules and packs can also include means for providing variable thermal insulation to at least that portion of the rechargeable battery system which is most directly exposed to ambient thermal conditions, so as to maintain the temperature of the system within the desired operating range thereof under variable ambient conditions.