

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
16 September 2004 (16.09.2004)

PCT

(10) International Publication Number
WO 2004/079792 A3

(51) International Patent Classification⁷: **B21D 53/02**,
B23K 31/02, F28F 7/00

(74) Agents: **PATTERSON, James, H.** et al.; Patterson,
Thuente, Skaar & Christensen, P.A., 4800 IDS Center, 80
South Eighth Street, Minneapolis, MN 55402-2100 (US).

(21) International Application Number:
PCT/US2004/006489

(81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, 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, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

(22) International Filing Date: 3 March 2004 (03.03.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/382,286 4 March 2003 (04.03.2003) US

(71) Applicant (*for all designated States except US*): **UNITED
DEFENSE, L.P.** [US/US]; 1525 Wilson Boulevard, Suite
700, Arlington, VA 22209 (US).

(84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Euro-
pean (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,
GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

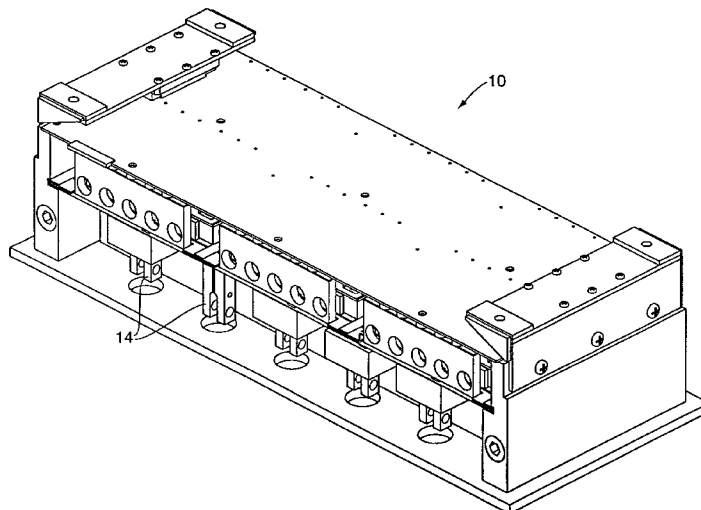
(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **JOSEPH, Craig**
[US/US]; 2830 De La Cruz Boulevard, Santa Clara, CA
95050 (US). **ARNOLD, Kelly, W.** [US/US]; 2830 de La
Cruz Boulevard, Santa Clara, CA 95050 (US). **DORSCH,
James, T.** [US/US]; 27663 Havenhill Lane, Los Gatos,
CA 95033 (US). **EVANS, Anthony, C.** [US/US]; 193
Windmill Drive, Hollister, CA 95023 (US).

Published:
— with international search report

[Continued on next page]

(54) Title: ELECTRICAL BUS WITH ASSOCIATED POROUS METAL HEAT SINK AND METHOD OF MANUFACTURING
SAME



(57) Abstract: A module (18,16) is formed in which semiconductor components are soldered to an electrically conductive heat sink(16).The electrically conductive heat sink(16) is formed so that it will serve as an electrical bus(22) in an electronic device. The chips of the semiconductor coomponenets are metallurgically bonded to the surface of the heat sink (16).The heat sink(16) uses a heat transfer fluid that flows through an interior of the heat containing an internal element(24).In the preferred embodiment, the internal element is a plurality of silver plated copper balls(24). The copper balls (24) are brazed to each other and to the walls of the heat sinks in an assembly process. The heat sink housing will typically be made from copper, with one surface made from molybdenum so that the expansion and contraction of the heat sink housing (161) molybdenum surface will be similar to that of the silicon substrate of the chips, thereby avoiding the problem of the chip substrate cracking and breaking due to thermal flexing.

WO 2004/079792 A3



(88) Date of publication of the international search report:

23 June 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.