

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
28 February 2008 (28.02.2008)

PCT

(10) International Publication Number
WO 2008/024247 A3

(51) International Patent Classification:

B23P 11/00 (2006.01) **A44B 1/00** (2006.01)
B23P 13/00 (2006.01) **H01H 3/12** (2006.01)
B23P 25/00 (2006.01)

(21) International Application Number:

PCT/US2007/018054

(22) International Filing Date: 16 August 2007 (16.08.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/838,698 18 August 2006 (18.08.2006) US
60/931,467 23 May 2007 (23.05.2007) US
11/893,357 15 August 2007 (15.08.2007) US

(71) Applicant (for all designated States except US): **DELPHI TECHNOLOGIES, INC.** [US/US]; Legal Staff M/C: 480-410-202, P.O. Box 5052, Troy, MI 48007-5052 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SNIDER, Chris, R.**

[US/US]; 2981 Waterstone Place, Kokomo, IN 46902-5086 (US). **GUPTA, Vineet** [US/US]; 5801 Poole Place, Noblesville, IN 46060 (US). **HUNTZINGER, Joseph, K.** [US/US]; 4403 Mckibben Drive, Kokomo, IN 46902 (US). **COADY, Michael, G.** [US/US]; 1211 West Cadillac Drive, Kokomo, IN 46902 (US). **STAPERT, Curtis, A.** [US/US]; 812 Jeff Drive, Kokomo, IN 46901 (US). **MEYER, Kevin, E.** [US/US]; 7127 Abbey Lane, Swartz Creek, MI 48473 (US). **GARNER, Timothy, D.** [US/US]; 3710 South Albright Road, Kokomo, IN 46902 (US). **STAHL, Gary, L.** [US/US]; 1723 Willow Court, Kokomo, IN 46902 (US). **HASSLER, Edgar, G.** [US/US]; 104 Tanglewood Drive, Sharpsville, IN 46068 (US). **UGLUM, Paul, A.** [US/US]; 926 Queensbury Drive, Noblesville, IN 46060 (US). **FYE, Michael, E.** [US/US]; 2339 East 100 North, Kokomo, IN 46901 (US).

(74) Agent: **LEWIS, J., Gordon**; Delphi Technologies, Inc., Legal Staff M/C: 480-410-202, P.O. Box 5052, Troy, MI 48007-5052 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH,

[Continued on next page]

(54) Title: LIGHTWEIGHT AUDIO SYSTEM FOR AUTOMOTIVE APPLICATIONS AND METHOD

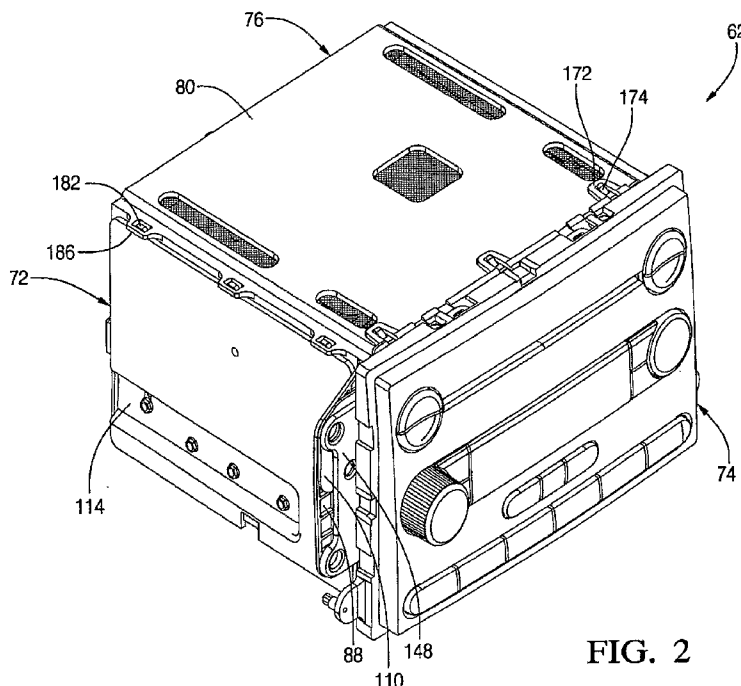


FIG. 2

(57) Abstract: A lightweight radio/CD player (62) for vehicular application is visually fastenerless includes a case and frontal interface formed of polymer based material that is molded to provide details to accept audio devices such as playback mechanisms and radio receivers, as well as the circuit boards required for electrical control and display. The case (68) and frontal interface are of composite structure, including an insert molded electrically conductive wire mesh screen that has been pre-formed to contour with the molding operation. The wire mesh provides EMC, RFI, BCI and ESD shielding and grounding of the circuit boards via exposed wire mesh pads and adjacent ground clips. The PCB architecture is bifurcated into a first board carrying common circuit components in a surface mount configuration suitable for high volume production, and a second board carrying application specific circuit components in a wave soldered stick

mount configuration. The major components and subassemblies are self-fixturing during the final assembly process, eliminating the need for dedicated tools, fixtures and assembly equipment. The major components and subassemblies self-interconnect by integral guide and connection features effecting slide lock and snap lock self-interconnection. The radio architecture includes improved push buttons employing 4-bar living hinge linkage and front loaded decorative trim buttons.



CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,

ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, 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).

Published:

— *with international search report*

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

21 August 2008

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/18054

A. CLASSIFICATION OF SUBJECT MATTER

IPC: **B23P 11/00**(2006.01);**13/00**(2006.01);**25/00**(2006.01);**A44B 1/00**(2006.01);**H01H 3/12**(2006.01)

USPC: 29/428,458,527.1,527.2,557,558,559;264/239;24/114.4;200/341,345

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 29/428,458,527.1,527.2,557,558,559; 264/239; 24/114.4; 200/341, 345

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,413,598 B1 (MOTOKI et al.) 02 JULY 2002 (02.07.2002). See figures 1-4.	1-11
A	US 6,187,514 B1 (KIYOSAWA et al.) 13 FEBRUARY 2001 (13.02.2001). See figures 3A-3E.	1-11
A	US 6,621,027 B1 (SHIMIZU et al.) 16 SEPTEMBER 2003 (16.09.2003). See figures 4a-4f.	1-11
A	US 5,362,932 (INAGAKI et al.) 08 NOVEMBER 1994 (08.11.1994). See figure 27.	1-11



Further documents are listed in the continuation of Box C.



See patent family annex.

Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

29 April 2008 (29.04.2008)

Date of mailing of the international search report

19 MAY 2008

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Facsimile No. (571) 273-3201

Authorized officer

Jermie E. Cozart

Telephone No. 571-272-4528

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/18054

Continuation of B. FIELDS SEARCHED Item 3:

EAST

search terms: buttons, mould, molding, moulding, injection, fixture, work holder