(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 March 2002 (28.03.2002)

PCT

(10) International Publication Number
WO 02/025702 A3

(51) International Patent Classification[7]: H01L 23/495, 23/48, 23/52, 29/40

(21) International Application Number: PCT/US01/27723

(22) International Filing Date:
20 September 2001 (20.09.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/665,898 20 September 2000 (20.09.2000) US

(71) Applicants and
(72) Inventors: **KIM, Stephen, M.** [US/KR]; 493-3 Sungsung-Dong, Cheonan-Si, Choongnam (KR). **HONG, Soon, Sung** [KR/KR]; 493-3 Sungsung-Dong, Cheonan-Si, Choongnam (KR). **LEE, Ji, Yong** [KR/KR]; 493-3 Sungsung-Dong, Cheonan-Si, Choongnam (KR). **PARK, Byung, Jun** [KR/KR]; 493-3 Sungsung-Dong, Cheonan-Si, Choongnam (KR). **KWON, Hyok, Won** [KR/KR]; 2nd Floor, Gunyang Building, 224-4 Poy-dong, Kangnam-ku, Seoul 135-964 (KR).

(74) Agent: **MOON, Soo, Lee**; eFirm, Ltd., 6208A Old Franconia Road, Alexandria, VA 22310 (US).

(81) Designated States *(national)*: 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, US, UZ, VN, YU, ZA, ZW.

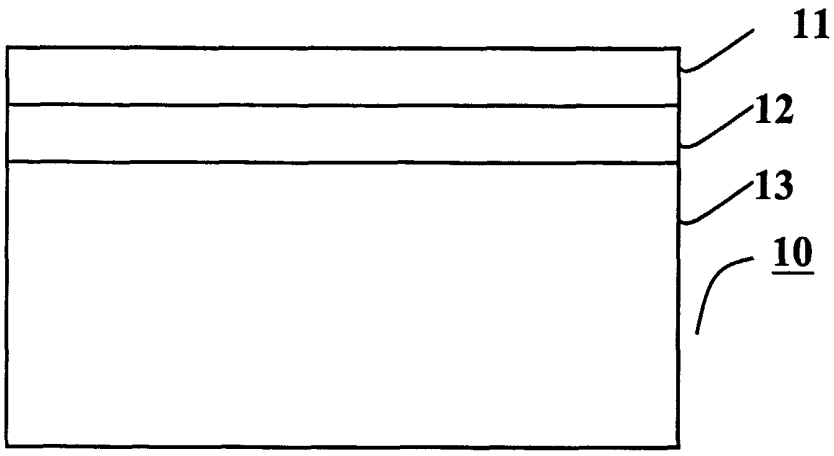
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(88) Date of publication of the international search report:
1 August 2002

[Continued on next page]

(54) Title: SEMICONDUCTOR PRODUCT WITH A SILVER AND GOLD ALLOY



(57) Abstract: A semiconductor product (10) comprises a silver and gold alloy layer (11), wherein the silver and gold alloy forms an outside layer of the product (11). In some embodiments, a nickellayer (12) underlies the silver and gold alloy layer (11). In further embodiments, a copper layer (13) underlies the nickel layer (12). Moreover, the present invention pertains to a semiconductor substrate comprising a silver and gold alloy layer, wherein the silver and gold alloy forms an outside layer of the semiconductor substrate. The present invention has a particular application in having a silver and gold alloy form the outside layer of various items, including a lead frame, a board grid array, a header, a printed circuit board, a Reed switch, and a connector.

WO 02/025702 A3

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.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/27723

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H01L 23/495, 23/48, 23/52, 29/40

US CL : 257/677, 737, 762, 779, 781; 174/257; 335/151; 439/524

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. : 257/677, 737, 762, 779, 781; 174/257; 335/151; 439/524

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

METALS HANDBOOK DESK EDITION 2ND EDITION

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

Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,081,310 A (Katsuya et al.) 27 June 2000, col 10, line 49, to col 11, line 13; col 12, lines 27-36.	1-30 --- 136-165

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier document published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"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 01 APRIL 2002	Date of mailing of the international search report 23 APR 2002
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer ERIK KIELIN Telephone No. (703) 308-5980

Form PCT/ISA/210 (second sheet) (July 1998)★

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/27723

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	JP 11-008341 A (Mori et al.) 12 January 1999 (12.01.99), Fig. 1(c), Table 2	1, 3, 4, 7-11, 16, 18, 19, 22-26, 31, 33, 34, 37-41, 121, 123, 124, 127-131 --- 2, 5, 6, 12-15, 17, 20, 21, 27-30, 32, 35, 36, 42-45, 122, 125, 126, 132-135, 136-180, 256-270
X --- Y	JP 05-117898 A (Morikawa et al.) 14 May 1993 (14.05.93), Abstract, Figs. 1-2, paragraphs, [0014], [0019], [0024]-[0026], [0034], [0035].	1, 3, 4, 7-11, 16, 18, 19, 22-26, 31, 33, 34, 37-41, 121, 123, 124, 127-131 --- 2, 5, 6, 12-15, 17, 20, 21, 27-30, 32, 35, 36, 42-45, 122, 125, 126, 132-135, 136-180, 256-270
Y	US 5,035,656 A (Patel) 30 July 1991 (30.07.91) Figures; col 5, lines 57-63; col 6, lines 15-32.	1, 61-75, 106-120, 196-210, 241-255
Y	US 3,342,568 A (Capillon) 19 September 1967 (19.09.67), cols 1-2).	1, 61-75, 106-120, 196-210, 241-255
Y	US 5,981,090 A (Ott) 9 November 1999 (09.11.99), cols. 1-2.	1, 61-75, 106-120, 196-210, 241-255
Y	US 6,054,761 A (McCormack et al.) 25 April 2000 (25.04.00), Figs 1(a)-1(f); col 9, lines 4-37.	1-15, 46-60, 76-90, 181-195, 211-225
X	US 3,668,355 A (Campbell et al.) 6 June 1972 (06.06.72), Abstract, Fig. col 2, lines 52-73; claims 3, 6.	91-105, 226-240
X --- Y	US 3,251,121 A (Prival) 17 May 1966 (17.05.66), Figs. 1-2; col 3, lines 5-34; col 4, lines 12-51.	91, 93, 94, 97 --- 92, 95, 96, 98-105, 226-240
X --- Y	US 3,568,096 A (Kordos et al.) 2 March 1971 (02.03.71) Abstract; col 1, line 69 to col 2, line 2; col 3, lines 37-57.	91, 93, 94 --- 92, 95-105, 226-240

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/27728

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 3,634,048 A (Koons et al.) 11 January 1972 (11.01.72), Abstract, col 2, lines 54-61; col 3, lines 27-40, 52-57.	106-120, 241-255 --- 1-105, 121-240, 256-270
Y	US 3,600,794 A (Shibata et al.) 24 August 1971 (24.08.71), Abstract; col 4, lines 24-25.	1-270

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/27723

B. FIELDS SEARCHED
Electronic data bases consulted (Name of data base and where practicable terms used):

EAST: ALL DATABASES; DIALOG
search terms: gold, Au, silver, Ag, alloy, nickel, Ni, leadframe, header, ball (or bump) grid array, BGA, printed wiring (or circuit) board (or substrate), PWB, PCB, PWS, PCS, contact, bond, bonding, pad, connector, reed switch, percent, %, wt%, at%, mol%, ratio