



US00D840404S

(12) **United States Design Patent** (10) **Patent No.:** **US D840,404 S**
Beals et al. (45) **Date of Patent:** **** Feb. 12, 2019**

(54) **SMART CARD INTERFACE**
(71) Applicant: **NagraStar LLC**, Englewood, CO (US)
(72) Inventors: **William Michael Beals**, Englewood, CO (US); **Hervé Goupil**, Villars sous Yens (CH)
(73) Assignee: **NAGRASTAR, LLC**, Englewood, CO (US)
(**) Term: **15 Years**
(21) Appl. No.: **29/567,144**
(22) Filed: **Jun. 6, 2016**

Related U.S. Application Data

(62) Division of application No. 29/448,761, filed on Mar. 13, 2013, now Pat. No. Des. 758,372.
(51) **LOC (11) Cl.** **14-02**
(52) **U.S. Cl.**
USPC **D14/436; D14/437**
(58) **Field of Classification Search**
USPC D14/435-437, 478-480, 485-495, 474, D14/217; D13/182; 369/275.1-275.5, 369/44.26, 100, 52.1, 272, 273, 280-288; 283/81; 720/718; 435/6, 287.2; 604/891.1; 216/2; D11/80; 235/492, 235/488, 493, 487, 375, 379, 439, 440, 235/441, 451, 486; 361/737, 748-752; D19/9, 10; D9/457; 705/51; 257/707, 257/686; 340/5.52, 5.25, 5.74
CPC G06K 9/00973-9/00986; G06K 19/063-19/0701; G06K 19/0708-19/0712; G06K 19/0715-19/07771; G06K 19/083-19/18; G06K 2207/00-2207/1018; G06K 21/00-21/06; G06F 3/08; G06F 3/12; G06F 7/40; G06F 17/5068; G06F 21/00; G06F 21/30; G06F 21/31; G06F 21/34; G06F 21/45; G06F 21/77-21/80; Y10T

(Continued)

(56) **References Cited**
U.S. PATENT DOCUMENTS

216,075 A 6/1879 Wiselogel
D54,610 S 3/1920 Evans et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2318936 4/2004
CN 101005563 7/2007
(Continued)

OTHER PUBLICATIONS

European Search Report in Application 13878216.4, dated Jan. 13, 2017, 16 pages.

(Continued)

Primary Examiner — Susan Moon Lee

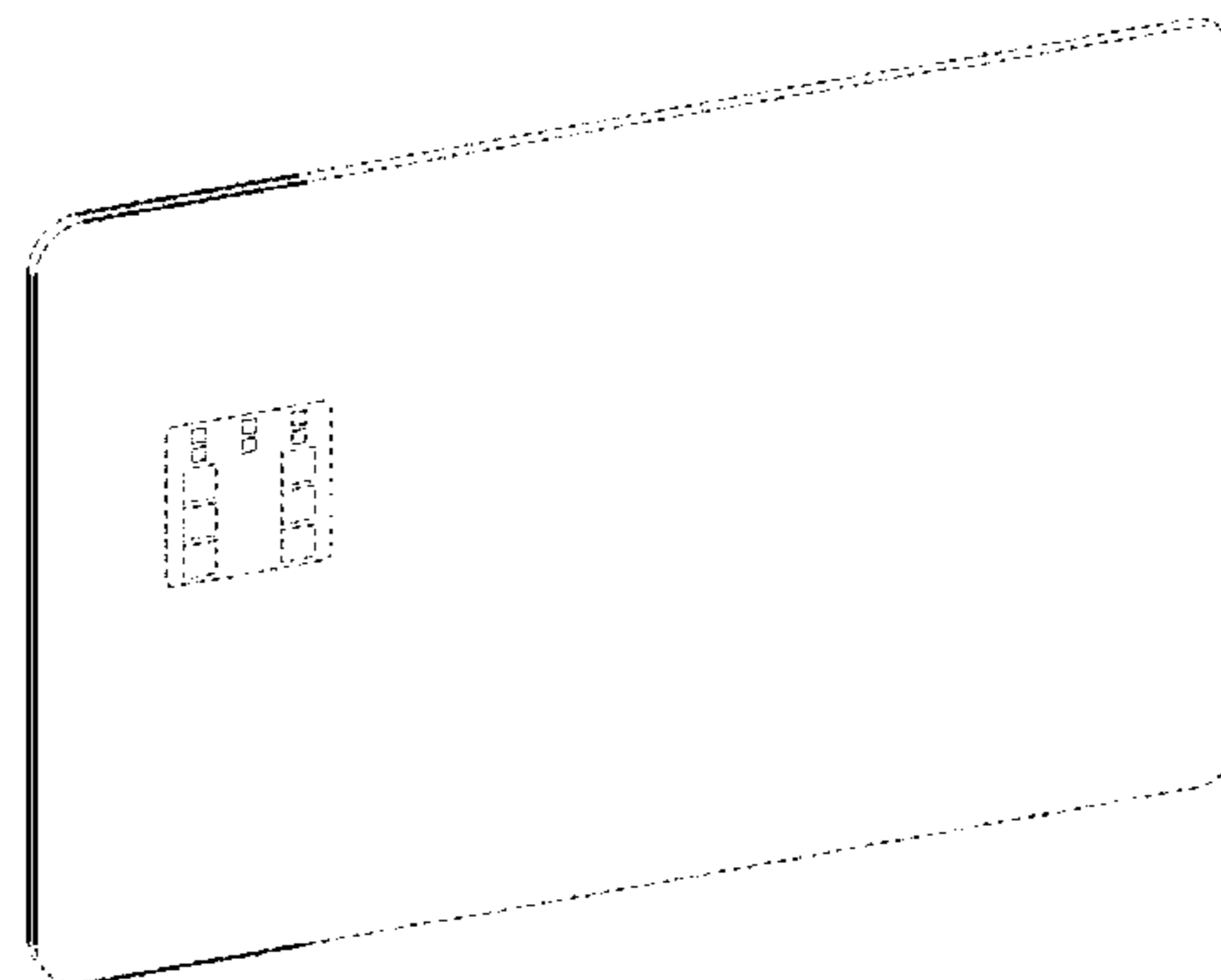
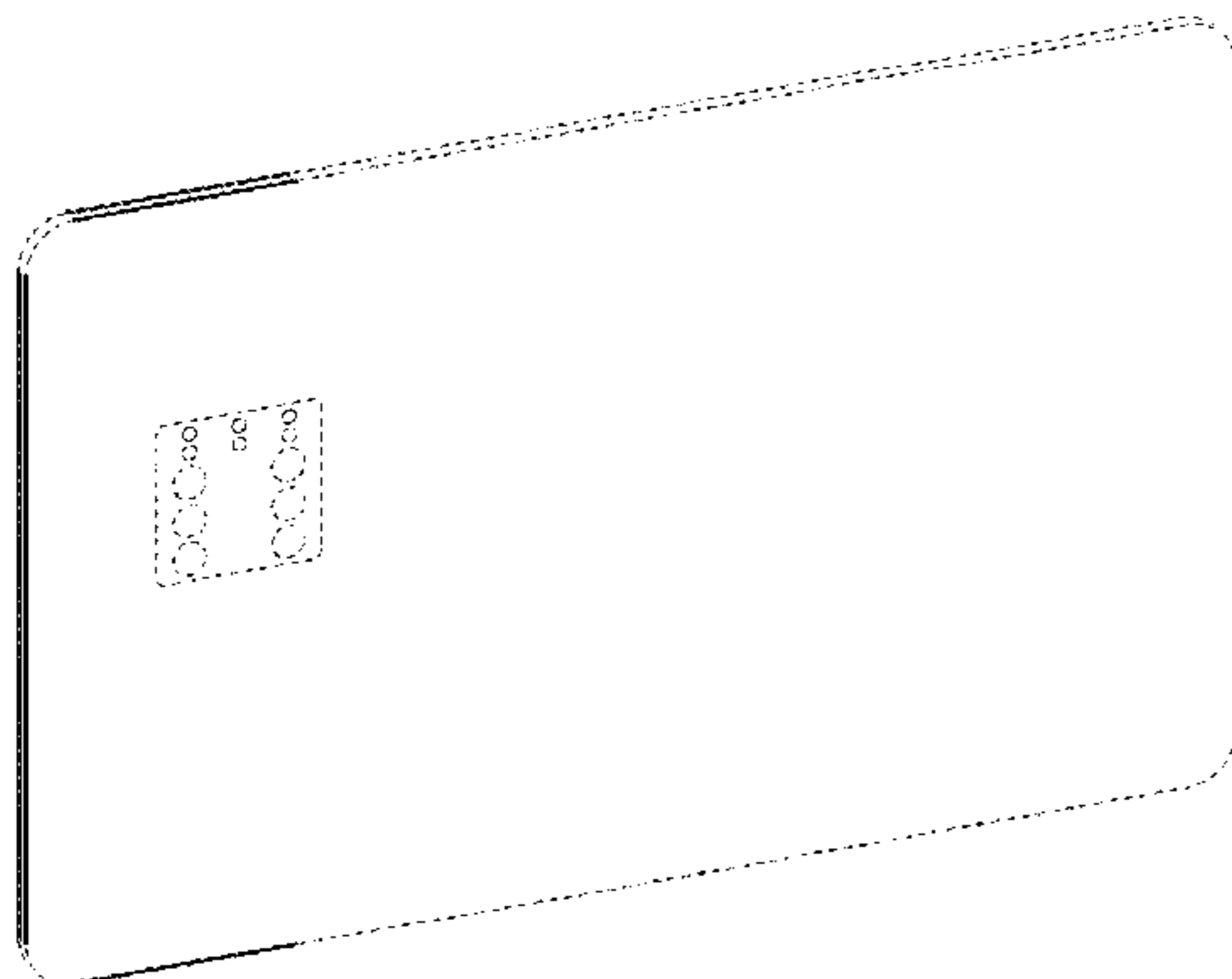
(57) **CLAIM**

The ornamental design for a smart card interface, as shown and described.

DESCRIPTION

FIG. 1 is a front perspective view of a smart card interface according to a first embodiment;
FIG. 2 is a front elevation view thereof;
FIG. 3 is an enlarged view of the contacts portion of the smart card interface of FIG. 1;
FIG. 4 is a front perspective view of the smart card interface according to a second embodiment;
FIG. 5 is a front elevation view thereof; and,
FIG. 6 is an enlarged view of the contacts portion of the smart card interface of FIG. 4.
Singular broken lines and portions contained within broken lines are not claimed.

1 Claim, 4 Drawing Sheets



(58) **Field of Classification Search**

CPC 29/49018; Y10T 29/49124-29/4913; Y10T
 29/49117; H01L 23/13; H01L 23/31;
 H01L 23/3128; H01L 23/48; H01L
 23/49541; H01L 23/498; H01L 23/49811;
 H01L 23/49816; H01L 23/49833; H01L
 23/49838; H01L 23/49844; H01L
 23/4985; H01L 23/49855; H01L
 23/49888; H01L 23/50; H01L 23/522;
 H01L 23/528; H01L 23/5283; H01L
 23/538; H01L 23/5386; H01L 23/5388;
 H01L 23/5389; H01L 25/00; H01L
 25/0655; H01L 27/0203; H01L 27/0207;
 H01L 27/12; H01L 27/1218; H01L
 27/1222; H01L 27/127; H01L
 24/00-24/17; H01L 24/94-24/98; H01L
 2224/01; H01L 2224/0501; H01L
 24/0501; H01L 2224/05013-2224/05017;
 H01L 2224/0555-2224/05557; H01L
 2224/0612-2224/06189; H01L
 2224/07-2224/09181

See application file for complete search history.

D284,215 S * 6/1986 Sherwin D24/225
 4,600,257 A 7/1986 Fushimoto
 4,603,249 A 7/1986 Hoppe et al.
 4,614,861 A 9/1986 Pavlov et al.
 4,628,407 A 12/1986 August et al.
 4,639,585 A 1/1987 Haghiri-Tehrani et al.
 4,677,529 A 6/1987 Watanabe et al.
 4,689,103 A 8/1987 Elarde
 4,696,034 A 9/1987 Wiedemer
 4,794,243 A 1/1988 Hamada
 4,727,246 A 2/1988 Hara et al.
 4,739,448 A 4/1988 Rowe et al.
 4,754,319 A * 6/1988 Saito B32B 37/185
 235/492
 4,774,633 A 9/1988 Dehaine et al.
 4,783,823 A * 11/1988 Tasaki G06K 9/00
 235/380
 4,789,214 A * 12/1988 Vilhelmsson G02B 6/262
 216/24
 4,792,843 A 12/1988 Haghiri-Tehrani et al.
 4,795,895 A 1/1989 Hara et al.
 4,797,542 A 1/1989 Hara
 4,803,154 A * 2/1989 Uo G01N 33/535
 422/424
 4,803,542 A 2/1989 Haghiri-Tehrani et al.
 4,814,943 A 3/1989 Okuaki
 4,817,183 A * 3/1989 Sparrow G06K 9/00067
 382/125

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,474,365 A * 6/1949 Munn A63F 3/00694
 273/239
 2,640,647 A * 6/1953 Rand, Jr. B42F 19/00
 235/493
 3,311,084 A * 3/1967 Edenbaum A61L 2/28
 116/207
 3,465,361 A 9/1969 Lode
 3,502,437 A * 3/1970 Morris G01N 33/80
 283/900
 3,702,025 A 11/1972 Archer
 3,832,134 A * 8/1974 Sohn G01N 30/95
 210/658
 3,853,468 A * 12/1974 Haymond G01N 33/53
 436/506
 3,898,172 A * 8/1975 Reif C09B 67/0097
 116/206
 3,924,239 A 12/1975 Fletcher
 3,990,850 A * 11/1976 Friedman G01N 33/54386
 422/401
 4,029,945 A * 6/1977 Yamada G06K 7/085
 235/439
 4,099,886 A * 7/1978 Oliveira G01B 15/025
 356/244
 4,104,785 A 8/1978 Shiba et al.
 4,125,841 A 11/1978 Munk
 D254,687 S * 4/1980 Fadler D13/182
 4,205,043 A * 5/1980 Esch G01N 31/224
 116/206
 D258,281 S * 2/1981 Murphy D13/182
 4,249,302 A * 2/1981 Crepeau H05K 3/368
 216/18
 4,264,917 A 4/1981 Ugon
 4,305,721 A * 12/1981 Bernstein G01N 33/54313
 422/565
 D267,094 S 11/1982 Doi
 4,380,699 A * 4/1983 Monnier G06K 19/07745
 235/443
 4,387,972 A * 6/1983 Valencia G02B 21/34
 356/244
 4,394,654 A 7/1983 Hofmann-Cerfontaine
 4,417,413 A 11/1983 Hoppe et al.
 4,532,419 A 7/1985 Takeda
 4,535,385 A 8/1985 August
 4,549,200 A 10/1985 Ecker et al.
 4,549,247 A 10/1985 Hoppe et al.
 4,575,621 A 3/1986 Dreifus

4,822,989 A 4/1989 Miyamoto et al.
 4,825,283 A 4/1989 Shino
 4,835,846 A 6/1989 Juan et al.
 D302,294 S * 7/1989 Hillman D24/223
 4,844,866 A * 7/1989 Wallace G01N 33/523
 422/420
 4,849,944 A 7/1989 Matsushita
 4,868,376 A 9/1989 Lessin et al.
 D304,826 S 11/1989 Sutoh
 D305,023 S 12/1989 Suto
 4,887,234 A * 12/1989 Iijima G06Q 20/341
 235/380
 4,889,980 A 12/1989 Hara et al.
 4,896,028 A 1/1990 Kushima
 4,897,534 A 1/1990 Haghiri-Tehrani
 4,943,464 A 7/1990 Gloton et al.
 4,980,802 A 12/1990 Champagne et al.
 4,984,358 A * 1/1991 Nelson H01L 21/78
 257/E21.509
 4,985,920 A 1/1991 Seki
 4,990,759 A 2/1991 Gloton et al.
 5,023,751 A 6/1991 Stampfli
 5,027,190 A 6/1991 Haghiri-Tehrani et al.
 5,031,026 A 7/1991 Ueda
 5,049,718 A 9/1991 Spletter et al.
 5,049,728 A * 9/1991 Rovin G06K 19/072
 235/487
 5,055,913 A 10/1991 Haghiri-Tehrani
 5,097,117 A 3/1992 Champagne et al.
 5,122,860 A 6/1992 Kikuchi et al.
 5,126,548 A 6/1992 Sekiguchi
 D327,883 S 7/1992 Gloton
 D328,599 S 8/1992 Gloton
 5,134,773 A 8/1992 LeMaire et al.
 5,155,068 A 10/1992 Tada
 5,187,461 A 2/1993 Brommer
 5,203,078 A 4/1993 Nakanishi et al.
 5,208,450 A 5/1993 Uenishi et al.
 5,216,278 A 6/1993 Lin
 5,220,598 A 6/1993 Böck
 D340,289 S * 10/1993 Gerber D24/223
 5,250,341 A 10/1993 Kobayashi et al.
 5,255,430 A 10/1993 Tallaksen
 5,264,722 A 11/1993 Tonucci
 D342,728 S 12/1993 Gloton
 5,276,311 A 1/1994 Hennige
 5,276,317 A 1/1994 Ozouf et al.
 D344,502 S 2/1994 Gloton
 5,285,352 A 2/1994 Pastore et al.
 5,304,513 A 4/1994 Haghiri-Tehrani et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

5,312,297 A	5/1994	Dieckert et al.	5,754,410 A	5/1998	Bradsley
5,332,681 A	7/1994	Tonucci	5,764,522 A	6/1998	Shalev
5,361,062 A	11/1994	Weiss et al.	5,767,999 A	6/1998	Kayner
5,362,955 A	11/1994	Haghiri-Tehrani	5,773,812 A *	6/1998	Kreft G06K 19/07743 235/380
5,363,279 A	11/1994	Cha	5,776,797 A *	7/1998	Nicewarner, Jr. ... H01L 23/5387 257/E23.177
D353,135 S	12/1994	Gloton	5,780,098 A *	7/1998	Battles A61L 2/28 422/1
D353,136 S	12/1994	Gloton	5,780,836 A	7/1998	Iguchi et al.
5,375,037 A	12/1994	Le Roux	5,780,837 A	7/1998	Garcia
5,386,215 A	1/1995	Brown	5,784,400 A	7/1998	Joannopoulos
5,386,340 A	1/1995	Kurz	5,786,988 A	7/1998	Harari et al.
D357,909 S	5/1995	Gloton	5,787,399 A *	7/1998	Lee G11C 7/16 704/201
D358,142 S	5/1995	Gloton	5,789,733 A	8/1998	Jachimowicz et al.
5,438,481 A	8/1995	Murphy et al.	5,802,236 A	9/1998	DiGiovanni
5,444,301 A	8/1995	Song et al.	5,807,762 A	9/1998	Akram et al.
5,448,511 A	9/1995	Paurus et al.	5,818,309 A	10/1998	De Los Santos
5,457,590 A *	10/1995	Barrett G06F 21/80 235/492	5,822,190 A	10/1998	Iwasaki
5,463,210 A	10/1995	Imura	5,834,747 A	11/1998	Cooper
5,467,251 A	11/1995	Katchmar	5,837,984 A	11/1998	Bleier et al.
D365,092 S	12/1995	Mundigi	5,852,290 A	12/1998	Chaney
5,486,687 A	1/1996	Le Roux	5,856,662 A	1/1999	Kohama et al.
5,502,278 A	3/1996	Mabboux et al.	5,865,470 A *	2/1999	Thompson B42D 15/00 283/51
5,512,490 A *	4/1996	Walt G01N 21/6428 250/459.1	5,866,950 A	2/1999	Iwasaki et al.
5,517,752 A	5/1996	Sakata et al.	5,869,791 A *	2/1999	Young G06F 3/0414 178/18.01
5,521,366 A *	5/1996	Wang G06K 7/10564 235/454	D407,392 S	3/1999	Kleineidam
5,526,233 A	6/1996	Hayakawa	5,877,488 A	3/1999	Klatt et al.
5,526,449 A	6/1996	Meade	5,877,975 A	3/1999	Jigour et al.
5,534,720 A	7/1996	Song et al.	5,900,655 A	5/1999	Shim
5,543,585 A	8/1996	Booth et al.	5,912,502 A	6/1999	Kano
5,544,014 A	8/1996	Atsumi	5,923,225 A	7/1999	De Los Santos
5,552,632 A	9/1996	Iwasaki	5,932,866 A	8/1999	Terada et al.
5,563,400 A	10/1996	Le Roux	5,933,328 A	8/1999	Wallace et al.
5,569,941 A	10/1996	Takahashi	5,942,761 A *	8/1999	Tuli G06K 7/10722 250/556
D375,303 S	11/1996	Gaumet	5,948,673 A *	9/1999	Cottingham B01L 3/5025 422/50
5,572,779 A	11/1996	Adelman et al.	5,955,961 A	9/1999	Wallerstein
5,579,207 A	11/1996	Hayden et al.	5,991,400 A	11/1999	Kamperman
5,581,065 A	12/1996	Nishikawa et al.	5,993,261 A	11/1999	Klatt et al.
5,584,043 A *	12/1996	Burkart G06K 7/0013 710/2	5,998,220 A *	12/1999	Chandler B01L 3/5023 422/408
5,590,596 A	1/1997	Tani	5,999,308 A	12/1999	Nelson
5,594,275 A *	1/1997	Kwon H01L 23/3128 257/685	6,002,605 A	12/1999	Iwasaki
5,689,275 A	1/1997	Moore	D420,452 S *	2/2000	Cardy D24/224
5,604,330 A	2/1997	Hasan et al.	D420,745 S *	2/2000	Cardy D24/224
5,615,085 A	3/1997	Wakabayashi et al.	6,019,639 A	2/2000	Brunker et al.
5,616,520 A *	4/1997	Nishiuma H01L 23/10 228/180.22	6,019,663 A	2/2000	Angell
5,623,552 A	4/1997	Lane	6,024,920 A *	2/2000	Cunanan G01N 21/253 356/432
5,637,858 A	6/1997	Hoppe et al.	6,025,997 A	2/2000	Huber et al.
5,652,428 A	7/1997	Nishioka	6,027,028 A	2/2000	Pieterse et al.
D382,647 S *	8/1997	Staples D24/216	6,035,037 A	3/2000	Chaney
5,655,917 A	8/1997	Kaneshige et al.	6,035,216 A	3/2000	Cheng
5,677,524 A	10/1997	Haghiri-Tehrani	6,036,099 A	3/2000	Leighton
D387,746 S	12/1997	Ishihara	6,048,734 A *	4/2000	Burns B01F 5/0085 366/DIG. 4
D387,747 S	12/1997	Ishihara	6,054,774 A	4/2000	Ohmori et al.
D388,066 S	12/1997	Ishihara	D425,519 S	5/2000	Merlin et al.
D389,130 S	1/1998	Ishihara	6,060,332 A *	5/2000	Martin G06K 19/0728 257/679
5,721,781 A *	2/1998	Deo G06Q 20/341 705/67	6,062,887 A	5/2000	Schuster et al.
5,827,084 A	2/1998	Biernath	6,064,506 A	5/2000	Koops
5,724,545 A	3/1998	Skorski	6,065,681 A	5/2000	Trueggelmann
5,727,153 A *	3/1998	Powell G06Q 20/20 235/375	6,075,915 A	6/2000	Koops
5,729,000 A	3/1998	Sugimoto	6,085,155 A	7/2000	Hayase et al.
5,736,969 A	4/1998	Kuga	6,086,740 A *	7/2000	Kennedy B01L 3/502715 204/601
5,739,515 A	4/1998	Takemura	6,089,451 A	7/2000	Krause
5,742,680 A	4/1998	Wilson	6,097,605 A	8/2000	Klatt et al.
5,745,988 A	5/1998	Hohmann et al.	6,101,300 A	8/2000	Fan
5,747,274 A *	5/1998	Jackowski C07K 16/4283 422/430	6,102,517 A	8/2000	Kobayashi
5,748,057 A	5/1998	De Los Santos	6,102,743 A	8/2000	Haffenden et al.
5,752,857 A	5/1998	Knights	6,118,114 A	9/2000	Fujimoto

(56)

References Cited

U.S. PATENT DOCUMENTS

6,130,969 A	10/2000	Villeneuve	6,466,709 B1	10/2002	Scherer
6,134,043 A	10/2000	Johnson	D466,093 S *	11/2002	Ebihara D13/182
6,134,369 A	10/2000	Kurosawa	6,474,776 B1	11/2002	Murray
6,141,210 A	10/2000	Iwasaki	6,483,640 B1	11/2002	Tonucci
D434,396 S	11/2000	Iwasaki	6,492,182 B1 *	12/2002	Bright G01N 33/542 422/534
D434,418 S	11/2000	Shinada	6,492,718 B2	12/2002	Ohmori
6,149,058 A	11/2000	Albaret	6,512,580 B1 *	1/2003	Behringer G01N 21/643 356/244
6,151,511 A	11/2000	Cruciani	6,513,718 B1 *	2/2003	Bouchez G06K 19/07728 235/492
6,170,116 B1	1/2001	Mizuta	6,514,328 B1	2/2003	Katoh
6,175,671 B1	1/2001	Roberts	6,542,682 B2	4/2003	Cotteverte
6,188,580 B1	2/2001	Huber et al.	6,548,888 B1	4/2003	Fidalgo et al.
6,191,951 B1	2/2001	Houdeau et al.	6,552,910 B1 *	4/2003	Moon H01L 23/5387 257/698
6,195,183 B1	2/2001	Fujimoto et al.	6,560,006 B2	5/2003	Sigalas
6,198,860 B1	3/2001	Johnson	6,561,432 B1	5/2003	Vedder et al.
6,205,028 B1	3/2001	Matsumura et al.	6,568,600 B1	5/2003	Carpier et al.
6,209,790 B1	4/2001	Houdeau et al.	6,570,768 B2	5/2003	Medina
6,213,403 B1	4/2001	Bates, III	6,576,992 B1 *	6/2003	Cady H01L 23/3114 174/254
6,222,737 B1 *	4/2001	Ross H01L 23/5385 174/541	6,580,547 B2	6/2003	Liu
6,232,937 B1	5/2001	Jacobsen	6,581,840 B2	6/2003	Takeda et al.
6,241,557 B1	6/2001	Reichardt	6,592,031 B1	7/2003	Klatt
6,255,038 B1 *	7/2001	Hobbs G03F 7/001 430/311	6,592,044 B1	7/2003	Wong et al.
6,257,486 B1	7/2001	Teicher et al.	6,594,361 B1	7/2003	Chaney et al.
6,274,926 B1 *	8/2001	Iwasaki G06K 19/07743 257/679	6,597,721 B1	7/2003	Hutchinson
6,278,105 B1	8/2001	Mattia	6,600,222 B1 *	7/2003	Levarado H01L 23/5387 257/685
6,281,450 B1	8/2001	Urasaki et al.	6,613,610 B2 *	9/2003	Iwafuchi H01L 21/2007 438/128
6,281,577 B1 *	8/2001	Oppermann H01L 25/0652 257/690	6,617,693 B2	9/2003	Hikita et al.
6,285,559 B1	9/2001	Fukiharu	6,618,258 B2	9/2003	Goris
6,292,490 B1	9/2001	Gratacap et al.	6,636,668 B1	10/2003	Al-Hermyari
6,296,552 B1	10/2001	Boutaghou et al.	6,640,034 B1	10/2003	Charlton
6,297,548 B1	10/2001	Moden	6,641,049 B2	11/2003	Luu
6,304,683 B1	10/2001	Kiyohara	6,646,957 B2	11/2003	Martin et al.
6,310,991 B1	10/2001	Koops	6,657,523 B2 *	12/2003	Tarui H01L 23/66 333/160
6,312,304 B1 *	11/2001	Duthaler B41J 3/4076 313/506	6,663,831 B2 *	12/2003	Konecke A61B 10/0045 422/417
6,315,205 B1	11/2001	Bates, III	6,673,630 B2 *	1/2004	Albarella G01N 33/521 422/424
6,317,554 B1	11/2001	Kosaka	6,681,616 B2 *	1/2004	Spaid B01L 3/5027 73/54.07
6,326,243 B1	12/2001	Suzuya et al.	6,687,447 B2	2/2004	Flory
6,328,217 B1	12/2001	Everett	6,693,315 B2	2/2004	Kuroda et al.
6,329,228 B1	12/2001	Terashima	D487,747 S	3/2004	Yu et al.
6,330,164 B1 *	12/2001	Khandros B23K 20/004 257/724	6,698,378 B1 *	3/2004	Dick G01N 31/222 116/206
6,333,989 B1 *	12/2001	Borza G06K 9/0002 250/556	6,705,520 B1	3/2004	Pitroda et al.
D452,864 S	1/2002	Wallace et al.	6,710,912 B1	3/2004	Filkins
6,338,967 B1 *	1/2002	Bickar G01N 33/6839 436/15	6,719,206 B1	4/2004	Bashan et al.
6,344,162 B1	2/2002	Miyajima	6,728,457 B2	4/2004	Sigalas
D456,414 S	4/2002	Turin	6,731,846 B2	5/2004	Hosomi
6,368,558 B1 *	4/2002	Suslick G01N 21/272 422/404	6,735,368 B2	5/2004	Parker
6,369,795 B1	4/2002	Lester et al.	D491,276 S *	6/2004	Langille D24/225
6,372,541 B1	4/2002	Bouchez et al.	D491,951 S	6/2004	Yu et al.
6,378,774 B1	4/2002	Emori et al.	D492,688 S	7/2004	Wallace et al.
D456,910 S *	5/2002	Clark D20/22	6,760,514 B2	7/2004	Wilson
6,398,114 B1	6/2002	Nishikawa et al.	6,762,537 B1 *	7/2004	Kikushima H03H 9/0547 310/313 R
6,402,301 B1	6/2002	Powers et al.	6,764,005 B2	7/2004	Cooper
6,407,933 B1	6/2002	Bologna et al.	D493,798 S	8/2004	Yu et al.
6,409,089 B1	6/2002	Eskicioglu	6,778,722 B1	8/2004	Klocek
6,411,752 B1	6/2002	Little	6,779,115 B1	8/2004	Naim
6,420,887 B1	7/2002	Kister et al.	6,782,169 B2	8/2004	Shi
D461,251 S *	8/2002	Pham D24/225	6,787,469 B2	9/2004	Houston
D461,561 S *	8/2002	Pham D24/225	6,788,863 B2	9/2004	Parker
D461,906 S *	8/2002	Pham D24/225	6,791,732 B2	9/2004	Simon
D462,125 S *	8/2002	Pham D24/225	6,804,446 B1	10/2004	Nordin
6,433,919 B1	8/2002	Chowdhury	6,809,932 B2	10/2004	Wu
6,443,361 B1	9/2002	Klatt et al.	6,811,082 B2	11/2004	Wong
6,452,713 B1	9/2002	White	6,822,784 B2	11/2004	Fukushima
6,460,772 B1	10/2002	Stahl	6,825,741 B2	11/2004	Chappell
6,462,273 B1 *	10/2002	Corisis G06K 19/077 174/521	6,826,185 B1	11/2004	Montanaro et al.
			6,832,029 B2	12/2004	Roberson

(56)

References Cited

U.S. PATENT DOCUMENTS

6,833,323 B2	12/2004	Yui et al.		7,292,740 B1	11/2007	Barker	
6,836,138 B1 *	12/2004	Park	G01R 1/0483	7,293,716 B1 *	11/2007	Miks	H01L 21/561 235/451
			324/756.05	7,294,918 B2	11/2007	Wada et al.	
6,847,265 B2	1/2005	Tanaka et al.		7,295,744 B2	11/2007	Benisty	
6,848,617 B1	2/2005	Fries et al.		7,296,750 B2	11/2007	Wood et al.	
6,853,087 B2 *	2/2005	Neuhaus	H01L 24/95	7,305,535 B2	12/2007	Harari et al.	
			257/700	7,307,719 B2	12/2007	Wang	
6,859,304 B2	2/2005	Miller		7,317,248 B2	1/2008	Poechmueller	
6,870,430 B2	3/2005	Nakamura		7,343,059 B2	3/2008	Beausoleil	
6,873,777 B2	3/2005	Bourelle		7,346,239 B2	3/2008	Romagnoli	
6,879,432 B1	4/2005	Chen		7,350,714 B2	4/2008	Wallace et al.	
6,879,766 B2	4/2005	Tomaru		7,352,588 B2	4/2008	Nishizawa et al.	
6,882,537 B2	4/2005	Barclay		7,360,688 B1	4/2008	Harris	
6,882,541 B2	4/2005	Maruyama et al.		7,384,294 B2	6/2008	Washino et al.	
6,884,642 B2 *	4/2005	Farnworth	G01R 31/2856	7,385,169 B2	6/2008	Saitou	
			438/14	D571,810 S	7/2008	Ikeda	
6,896,189 B2	5/2005	Guion et al.		7,416,132 B2	8/2008	Takiar et al.	
6,903,935 B1 *	6/2005	Chen	G06K 19/077	7,417,310 B2 *	8/2008	Szewerenko	H01L 23/3128 257/696
			235/492	7,424,136 B2 *	9/2008	Setlak	G06K 9/00053 257/414
6,913,198 B2	7/2005	Ruat		7,428,352 B2	9/2008	Noda	
6,916,207 B2 *	7/2005	Fielding	H01R 29/00	7,442,050 B1 *	10/2008	Bhakta	H05K 1/147 439/71
			386/E5.002	7,446,352 B2	11/2008	Becker et al.	
6,922,780 B1	7/2005	Siegel		7,466,407 B2	12/2008	Spillane	
6,934,441 B2	8/2005	Toney		7,469,420 B2	12/2008	Duffield et al.	
6,936,854 B2	8/2005	Iwasaki		7,485,501 B2	2/2009	Takiar et al.	
6,937,191 B2	8/2005	Baliarda et al.		7,492,979 B2	2/2009	Wang	
6,937,206 B2 *	8/2005	Puente Baliarda	H01Q 1/246	D588,133 S	3/2009	Nakamura	
			343/700 MS	D588,134 S	3/2009	Nakamura	
6,940,637 B2	9/2005	Toney		7,503,899 B2 *	3/2009	Caillouette	A61B 5/14507 600/573
6,945,712 B1	9/2005	Conn		7,508,942 B2	3/2009	Candelore	
6,950,128 B1 *	9/2005	Sawada	H04N 1/00241	7,520,052 B2	4/2009	Takahashi et al.	
			348/207.1	7,530,495 B2	5/2009	Cooper	
6,959,127 B2	10/2005	Zoorob		7,552,876 B2	6/2009	Nishizawa et al.	
6,961,501 B2	11/2005	Matsuura		7,554,139 B2	6/2009	Inoue	
6,974,343 B2	12/2005	Zheng et al.		7,559,469 B2	7/2009	Noda et al.	
7,001,800 B2	2/2006	Cappelletti		7,577,846 B2	8/2009	Kudelski et al.	
7,005,955 B2	2/2006	Schumacher		7,605,453 B2	10/2009	Stampka et al.	
7,009,233 B2	3/2006	Uchiyama		7,615,858 B2 *	11/2009	Eun	H01L 23/24 257/686
7,012,946 B2	3/2006	Kim		7,616,015 B2 *	11/2009	Lee	G01R 1/07307 324/756.03
7,019,981 B2	3/2006	Heinemann et al.		7,618,849 B2	11/2009	Khan et al.	
7,023,706 B2 *	4/2006	Negishi	H01L 23/36	D605,304 S *	12/2009	Aoki	D24/169
			257/E23.101	7,630,203 B1	12/2009	Chen	
7,045,052 B2	5/2006	Kochergin		7,636,070 B2	12/2009	De Lustrac	
7,051,128 B2	5/2006	Bando		7,647,641 B2	1/2010	Dubroeuq et al.	
7,051,929 B2	5/2006	Li		7,657,188 B2	2/2010	Covey	
7,054,524 B2	5/2006	Miller		7,659,606 B2	2/2010	Klatt	
7,061,263 B1	6/2006	Ong		7,673,805 B2	3/2010	Onishi et al.	
7,062,584 B1	6/2006	Worrell et al.		D615,506 S	5/2010	Eide et al.	
7,063,267 B2	6/2006	Tsuchimoto		7,728,422 B2	6/2010	Kim	
7,064,423 B2	6/2006	Okita		7,733,198 B1	6/2010	Olsson	
7,064,431 B2	6/2006	Singh et al.		7,745,943 B2	6/2010	Haba et al.	
7,065,272 B2	6/2006	Taillaert		7,750,464 B2	7/2010	Yoshikawa et al.	
7,078,697 B2	7/2006	Barker		7,753,266 B2 *	7/2010	Harris	G06K 7/0021 235/380
7,082,034 B2	7/2006	Tiwari et al.		7,772,686 B2	8/2010	Ye	
7,088,902 B2	8/2006	Katoh		7,784,693 B2	8/2010	Liao et al.	
7,101,660 B2 *	9/2006	Cunningham	B01L 3/5085	7,793,848 B2	9/2010	Abe et al.	
			422/82.11	7,799,416 B1	9/2010	Chan	
7,110,630 B2	9/2006	Suzuki		7,808,788 B2	10/2010	Gertiser	
D530,021 S *	10/2006	Muraca	D24/226	7,810,718 B2	10/2010	Bonneau et al.	
7,136,514 B1	11/2006	Wong		7,828,207 B2	11/2010	Cooper	
7,140,550 B2	11/2006	Ramachandran		7,854,505 B2	12/2010	Cunningham	
7,184,093 B2	2/2007	Manning		7,861,029 B2 *	12/2010	Djordjevic	G11C 5/025 365/63
D537,824 S	3/2007	Day		7,864,540 B2	1/2011	Takiar	
7,194,174 B2	3/2007	Dridi		7,866,996 B2 *	1/2011	Achsaf	H05K 5/0278 439/159
7,207,662 B2	4/2007	Shin et al.		7,871,007 B2	1/2011	Amiot et al.	
7,215,861 B2	5/2007	Sakai		7,871,011 B2	1/2011	Reignoux et al.	
7,225,537 B2	6/2007	Reed		7,872,979 B1	1/2011	Liu	
7,233,729 B2	6/2007	Romagnoli		7,880,286 B2	2/2011	Lee et al.	
7,245,891 B2	7/2007	Huginin					
7,252,242 B2	8/2007	Ho					
7,253,363 B2 *	8/2007	Iwasaki	H01L 23/49838				
			174/254				
7,272,290 B2	9/2007	Sugita					
7,273,234 B1	9/2007	Collins et al.					

(56)

References Cited

U.S. PATENT DOCUMENTS

7,903,422 B2	3/2011	Watanabe	8,550,362 B2	10/2013	Cowcher
7,913,916 B2	3/2011	Musial et al.	8,582,308 B2	11/2013	Sugimoto et al.
7,922,097 B2	4/2011	Yoshikawa et al.	8,588,561 B2	11/2013	Zbinden
7,925,016 B2	4/2011	Candelore	D695,636 S	12/2013	Mullen et al.
D638,810 S	5/2011	Morikawa et al.	8,608,082 B2	12/2013	Le Garrec et al.
7,940,249 B2 *	5/2011	Perreault G06K 9/00053 178/18.06	8,618,669 B2	12/2013	Furuta
7,944,058 B2	5/2011	Ishihara et al.	D699,201 S	2/2014	Petsch
7,954,705 B2	6/2011	Mullen et al.	8,647,110 B2	2/2014	Choi et al.
7,967,214 B2 *	6/2011	Landau G06K 19/077 235/487	8,649,820 B2	2/2014	Schwandt et al.
D643,040 S	8/2011	Sedio et al.	8,654,535 B2	2/2014	Lin et al.
7,991,289 B2	8/2011	Hill	8,658,542 B2	2/2014	Smayling et al.
7,999,353 B1	8/2011	Odom	8,679,729 B2	3/2014	Lee
8,009,432 B2	8/2011	Su et al.	D701,864 S	4/2014	Lepp et al.
8,022,526 B2	9/2011	Chall et al.	D702,240 S	4/2014	Lepp et al.
8,026,496 B2	9/2011	Barker	D702,241 S	4/2014	Lepp et al.
8,030,746 B2	10/2011	Tan	D703,208 S	4/2014	Lepp et al.
8,054,145 B2	11/2011	Mohammadi	8,684,267 B2	4/2014	Foo
8,061,625 B2	11/2011	Yu	8,690,283 B2	4/2014	Pomerantz et al.
8,064,205 B2	11/2011	Farhan et al.	8,699,836 B2	4/2014	Doerr
8,072,764 B2 *	12/2011	Yeates H05K 1/117 361/748	8,700,833 B2	4/2014	Cedar et al.
8,079,528 B2	12/2011	Song	8,707,237 B2	4/2014	Chen
8,082,844 B1	12/2011	Barker	8,710,591 B2 *	4/2014	Hwang H01L 21/76898 257/368
8,083,150 B2 *	12/2011	Sakurai G06K 19/07749 235/375	8,730,009 B2	5/2014	Barry
8,093,502 B2 *	1/2012	Mikado H05K 1/0281 174/254	D707,682 S	6/2014	Florek et al.
8,097,939 B2 *	1/2012	Okada H05K 1/181 257/679	8,746,579 B1	6/2014	Cloutier et al.
8,111,566 B1 *	2/2012	Wang G06F 13/4234 365/191	8,794,520 B2	8/2014	Wang et al.
8,141,780 B2 *	3/2012	Lawson G06K 7/083 235/454	8,814,053 B2	8/2014	Narendra et al.
8,143,720 B2 *	3/2012	Lambrecht G11C 5/025 257/723	8,819,918 B2 *	9/2014	Ayala G06K 19/07745 235/492
8,181,879 B2	5/2012	Landau	8,826,086 B2	9/2014	Hook et al.
D667,442 S	9/2012	Phelan	D715,854 S *	10/2014	Sippola D19/10
D667,495 S	9/2012	Bender	8,854,624 B2	10/2014	Pervez
8,256,667 B2	9/2012	Poznansky et al.	8,936,199 B2	1/2015	Lepp et al.
8,261,557 B2	9/2012	Barker	8,947,883 B2	2/2015	Upadhyayula et al.
D669,478 S	10/2012	Lepp et al.	D724,660 S *	3/2015	Sippola D19/10
D669,479 S	10/2012	Lepp et al.	D725,187 S *	3/2015	Sippola D19/10
D669,594 S *	10/2012	Cao D24/216	D727,861 S	4/2015	Tang
8,317,103 B1	11/2012	Foo et al.	9,009,633 B2	4/2015	Wu
8,349,709 B2	1/2013	Inoue et al.	D729,808 S	5/2015	Beals et al.
8,350,158 B2	1/2013	Chung et al.	D730,304 S	5/2015	Matsumoto et al.
8,353,728 B2	1/2013	Wang et al.	9,047,547 B2	6/2015	Okada
8,384,211 B2	2/2013	Soeno et al.	9,049,811 B2	6/2015	Subat
8,395,465 B2 *	3/2013	Lauder H01F 7/04 206/320	9,054,094 B2	6/2015	Anthony et al.
8,422,263 B2 *	4/2013	Saito G11C 5/04 365/189.03	9,058,897 B2 *	6/2015	Yu G11C 11/4063
D681,640 S	5/2013	Aoki et al.	9,064,195 B2	6/2015	Hartwick et al.
8,448,102 B2	5/2013	Kornachuk	9,093,277 B2 *	7/2015	Yamaguchi H01L 23/3121
8,448,867 B2 *	5/2013	Liu G06K 7/10732 235/435	9,101,048 B2	8/2015	Nakanishi et al.
8,449,783 B2	5/2013	Watanabe	9,136,212 B2	9/2015	Kato
8,451,122 B2	5/2013	Narendra et al.	9,139,972 B2	9/2015	Mo
8,453,094 B2	5/2013	Kornachuk et al.	9,170,482 B2	10/2015	Landis
8,456,850 B2	6/2013	Kang et al.	9,197,218 B2	11/2015	Kondo
8,456,852 B2	6/2013	Xiao et al.	9,258,897 B2	2/2016	Ishihara et al.
8,469,271 B2	6/2013	DePaula et al.	9,265,148 B2	2/2016	Lassmann et al.
D685,375 S	7/2013	Steinberger	9,291,889 B2	3/2016	Yoshioka
D686,214 S	7/2013	Maus et al.	D754,083 S	4/2016	Vinciarelli et al.
8,480,002 B2	7/2013	Poidomani et al.	D755,741 S *	5/2016	Prajuckamol D13/182
8,490,127 B2	7/2013	Vantalou et al.	D757,015 S *	5/2016	Amit D14/435
8,500,019 B2	8/2013	Poidomani et al.	9,330,992 B2	5/2016	Nakagawa
8,502,735 B1 *	8/2013	Moosbrugger H01Q 3/30 343/700 MS	D758,372 S	6/2016	Beals et al.
8,505,064 B2	8/2013	Hildebrand et al.	D759,022 S	6/2016	Beals et al.
8,523,071 B2	9/2013	DePaula et al.	D764,424 S *	8/2016	Matsumoto D13/182
D691,101 S	10/2013	Ishizawa et al.	9,435,959 B2	9/2016	Doerr
			9,455,517 B2	9/2016	Babu
			D775,093 S *	12/2016	Vinciarelli D13/182
			D778,850 S *	2/2017	Matsumoto D13/182
			D778,851 S *	2/2017	Matsumoto D13/182
			D778,852 S *	2/2017	Matsumoto D13/182
			D780,184 S	2/2017	Beals et al.
			D792,410 S	7/2017	Beals et al.
			D792,411 S	7/2017	Beals et al.
			9,702,813 B2	7/2017	Lavchiev
			9,806,017 B2 *	10/2017	Haba H01L 25/16
			9,815,057 B2 *	11/2017	Handique B01L 3/502738
			9,880,137 B2 *	1/2018	Lim G01N 31/22
			9,881,564 B2 *	1/2018	Wilcox G09G 3/344
			9,895,692 B2 *	2/2018	Battrell B01L 3/50273
			9,956,562 B2 *	5/2018	Huang B03C 1/30
			2001/0043075 A1	5/2001	Suzuki

US D840,404 S

Page 7

(56)

References Cited

U.S. PATENT DOCUMENTS

2001/0011944	A1	8/2001	Garrido-Gadea et al.	2004/0185763	A1*	9/2004	Ishizaki	B24B 53/12
2001/0011962	A1*	8/2001	Fletout G06K 19/07745	2004/0189311	A1*	9/2004	Glezer	B01L 3/5027
			343/767					324/444
2001/0012366	A1	8/2001	Van Rijnsoever et al.	2004/0238210	A1	12/2004	Droz	
2001/0018984	A1	9/2001	Takeda et al.	2004/0256150	A1	12/2004	Barchmann et al.	
2001/0026659	A1	10/2001	Sekine	2004/0258762	A1*	12/2004	Boppart	A61K 9/1694
2001/0050846	A1	12/2001	Cho					424/491
2002/0003168	A1	1/2002	Takabayashi	2004/0260823	A1	12/2004	Tiwari et al.	
2002/0009277	A1	1/2002	Noda	2005/0002605	A1	1/2005	Sakai	
2002/0014535	A1*	2/2002	Okada G06K 7/0013	2005/0005287	A1	1/2005	Claussen	
			235/492	2005/0011671	A1	1/2005	Takiar et al.	
2002/0021878	A1	2/2002	Allan	2005/0017336	A1*	1/2005	Kung	H01L 25/0652
2002/0045106	A1	4/2002	Baselmans et al.					257/685
2002/0105000	A1	8/2002	Abe	2005/0023361	A1	2/2005	Ikefuji et al.	
2002/0115224	A1*	8/2002	Rudel B01J 19/0046	2005/0033688	A1	2/2005	Peart et al.	
			436/164	2005/0048695	A1	3/2005	Chia et al.	
2002/0137502	A1	9/2002	Cronin et al.	2005/0058574	A1*	3/2005	Bysouth	G01N 15/0227
2002/0145049	A1	10/2002	Lasch et al.					422/63
2002/0152048	A1*	10/2002	Hayes G01D 5/2405	2005/0061884	A1	3/2005	Stewart	
			702/127	2005/0111280	A1	3/2005	Takiar	
2002/0186542	A1*	12/2002	Choi H01L 23/36	2005/0076321	A1	4/2005	Smith	
			361/719	2005/0191787	A1	4/2005	Bolken	
2002/0191905	A1	12/2002	Prather	2005/0148121	A1	7/2005	Yamazaki et al.	
2003/0002577	A1	1/2003	Pinder	2005/0152656	A1	7/2005	Talneau	
2003/0030870	A1	2/2003	Joannopoulos	2005/0158781	A1*	7/2005	Woudenberg	B01L 3/5027
2003/0169575	A1	2/2003	Ikuta					435/6.11
2003/0057537	A1	3/2003	Iwasaki et al.	2005/0197169	A1	9/2005	Son	
2003/0058311	A1	3/2003	Chen et al.	2005/0212657	A1	9/2005	Simon	
2003/0059047	A1	3/2003	Iwamura	2005/0212690	A1	9/2005	Nishikawa	
2003/0068152	A1	4/2003	Gunn	2005/0230853	A1	10/2005	Yoshikawa et al.	
2003/0085287	A1	5/2003	Gray	2005/0231921	A1	10/2005	Noda et al.	
2003/0091160	A1	5/2003	Enbom et al.	2005/0232471	A1*	10/2005	Baer	G06K 9/00006
2003/0099118	A1	5/2003	Saitoh et al.					382/115
2003/0123827	A1	7/2003	Salerno	2005/0247784	A1	11/2005	Klatt	
2003/0129085	A1*	7/2003	Suslick G01N 21/272	2005/0252978	A1	11/2005	Nishizawa et al.	
			422/400	2005/0265660	A1	12/2005	Miller	
2003/0132284	A1	7/2003	Reynolds et al.	2005/0281524	A1	12/2005	Mouli	
2003/0153356	A1	8/2003	Liu	2006/0018594	A1	1/2006	Sugitatsu	
2003/0163508	A1	8/2003	Goodman	2006/0026295	A1	2/2006	Iwamura	
2003/0179910	A1	9/2003	Wong	2006/0029522	A1*	2/2006	Theil	G01N 21/253
2003/0194091	A1	10/2003	Wajs					422/82.05
2003/0213849	A1	11/2003	Luu	2006/0040189	A1	2/2006	Yang	
2003/0221066	A1*	11/2003	Kaneko G06F 12/1466	2006/0043202	A1	3/2006	Kim et al.	
			711/115	2006/0053345	A1*	3/2006	Goodwin	H05K 1/189
2003/0223720	A1	12/2003	Li					714/42
2003/0224553	A1*	12/2003	Manansala G06K 9/00053	2006/0057039	A1*	3/2006	Morse	B01J 19/0093
			438/106					422/198
2003/0231822	A1	12/2003	Li	2006/0058065	A1	3/2006	Shen et al.	
2004/0001591	A1	1/2004	Mani et al.	2006/0059391	A1	3/2006	Park et al.	
2004/0009409	A1*	1/2004	Hwang G03F 1/36	2006/0072293	A1	4/2006	Peele	
			430/5	2006/0093296	A1	5/2006	Jin	
2004/0016804	A1	1/2004	Namaky et al.	2006/0097059	A1*	5/2006	Miyazaki	G06K 19/0718
2004/0229135	A1	2/2004	Wang et al.					235/492
2004/0053290	A1*	3/2004	Terbruggen B01F 11/0071	2006/0112197	A1	5/2006	Yao	
			435/6.11	2006/0125067	A1*	6/2006	Wehrly, Jr.	H05K 1/189
2004/0062505	A1	4/2004	Sugitatsu					257/679
2004/0066693	A1	4/2004	Osako et al.	2006/0131396	A1	6/2006	Blossom	
2004/0109644	A1	6/2004	Assefa	2006/0133051	A1	6/2006	Calvas et al.	
2004/0245891	A1	6/2004	Kawachi et al.	2006/0155913	A1	7/2006	Nishikawa et al.	
2004/0124246	A1	7/2004	Allen et al.	2006/0198238	A1*	9/2006	Partridge	H05K 1/189
2004/0129785	A1	7/2004	Luu					365/233.5
2004/0133787	A1	7/2004	Doughty et al.	2006/0202125	A1	9/2006	Suhami	
2004/0135645	A1*	7/2004	Koyama H03H 9/0547	2006/0208077	A1	9/2006	Hirata	
			331/158	2006/0228256	A1*	10/2006	McDevitt	B01J 19/0046
2004/0139412	A1	7/2004	Ito et al.					422/82.05
2004/0143716	A1	7/2004	Hong	2006/0261454	A1*	11/2006	Takiar	G06K 19/07732
2004/0152392	A1	8/2004	Nakamura					257/678
2004/0155715	A1	8/2004	Nakamura et al.	2006/0283946	A1	12/2006	Riester et al.	
2004/0166140	A1*	8/2004	Santini, Jr. A61K 9/0009	2006/0286847	A1	12/2006	Zuo et al.	
			424/424	2007/0009219	A1	1/2007	Hatsuda	
2004/0171192	A1	9/2004	Morimura et al.	2007/0009386	A1*	1/2007	Padmanabhan ...	B01L 3/502776
2004/0175174	A1	9/2004	Suhami					422/68.1
2004/0181800	A1	9/2004	Rakib et al.	2007/0018313	A1	1/2007	Gomyo et al.	
				2007/0020764	A1*	1/2007	Miller	G01N 35/0092
								436/45
				2007/0028260	A1	2/2007	Williams et al.	

(56)		References Cited	
U.S. PATENT DOCUMENTS			
2007/0033490	A1*	2/2007	Moosrainer G06F 11/1044 714/763
2007/0033606	A1	2/2007	Yamada et al.
2007/0035002	A1	2/2007	Moto et al.
2007/0035031	A1	2/2007	Jessen et al.
2007/0042613	A1	2/2007	Yoda
2007/0060198	A1	3/2007	Kuo
2007/0067820	A1	3/2007	Cha
2007/0228536	A1	3/2007	Aoki et al.
2007/0081165	A1	4/2007	Kilic
2007/0085187	A1	4/2007	Sun et al.
2007/0090534	A1	4/2007	Iwasaki et al.
2007/0117550	A1	5/2007	Boris et al.
2007/0121008	A1	5/2007	Kanoh
2007/0125855	A1	6/2007	Jiang et al.
2007/0127185	A1	6/2007	Watanabe
2007/0138301	A1	6/2007	Cinkler
2007/0145133	A1	6/2007	Jolivet
2007/0146542	A1	6/2007	Strasser
2007/0153487	A1	7/2007	Frallicciardi et al.
2007/0165295	A1	7/2007	Kim
2007/0172388	A1*	7/2007	Padmanabhan ... B01L 3/502715 422/400
2007/0176622	A1	8/2007	Yamazaki
2007/0235545	A1	10/2007	Martinez et al.
2007/0237243	A1	10/2007	Fagan
2007/0243661	A1	10/2007	Jackson et al.
2007/0246536	A1	10/2007	Tuin
2007/0250872	A1	10/2007	Dua
2007/0262156	A1	11/2007	Chen et al.
2007/0266182	A1	11/2007	Lanning
2007/0269176	A1	11/2007	Mitomi
2007/0269178	A1	11/2007	Sarukura
2008/0012860	A1	1/2008	Klevenz et al.
2008/0020800	A1	1/2008	Xu
2008/0228973	A1	1/2008	Lee
2008/0031449	A1	2/2008	Osen
2008/0041952	A1	2/2008	Kang
2008/0056948	A1*	3/2008	Dale B01F 5/0647 422/68.1
2008/0062066	A1	3/2008	Arai
2008/0079565	A1	4/2008	Koyama
2008/0083831	A1	4/2008	Lafuente et al.
2008/0094788	A1	4/2008	Choe
2008/0096317	A1	4/2008	Middlekauff et al.
2008/0099559	A1	5/2008	Lo et al.
2008/0107565	A1*	5/2008	Vivienne B01L 3/502715 422/63
2008/0111254	A1	5/2008	Park et al.
2008/0122894	A1	5/2008	Lee et al.
2008/0135626	A1	6/2008	Reignoux et al.
2008/0137278	A1*	6/2008	Chih G11C 5/06 361/679.31
2008/0164893	A1*	7/2008	Lee G01R 1/07342 324/754.07
2008/0165962	A1	7/2008	Kawano et al.
2008/0174408	A1	7/2008	Takahashi
2008/0186337	A1*	8/2008	Hammond B41J 2/1753 347/6
2008/0211074	A1	9/2008	Osako et al.
2008/0211302	A1	9/2008	Hirota et al.
2008/0223937	A1	9/2008	Preta et al.
2008/0257967	A1	10/2008	Nishizawa et al.
2008/0257968	A1	10/2008	Nishizawa et al.
2008/0262213	A1*	10/2008	Wu B01F 5/0646 536/25.4
2008/0314983	A1	10/2008	Capurso et al.
2008/0279379	A1	11/2008	Muijen
2009/0011538	A1	1/2009	Masumoto et al.
2009/0032593	A1	2/2009	Ljungcrantz
2009/0040695	A1	2/2009	Fidalgo et al.
2009/0057417	A1	3/2009	Shinohara et al.
2009/0061450	A1*	3/2009	Hunter B01L 3/502715 435/6.11
2009/0066350	A1	3/2009	Lee
2009/0228853	A1	3/2009	Hong et al.
2009/0101933	A1	4/2009	Takao
2009/0108993	A1	4/2009	Forster
2009/0116029	A1	5/2009	Ohtera
2009/0131028	A1	5/2009	Horodezky et al.
2009/0140415	A1	6/2009	Furuta
2009/0144456	A1	6/2009	Gelf et al.
2009/0153163	A1*	6/2009	Han H01L 23/538 324/763.01
2009/0153622	A1	6/2009	Guan
2009/0155953	A1*	6/2009	Saeki H01L 24/75 438/106
2009/0156254	A1	6/2009	Montes
2009/0166894	A1	7/2009	Azumai
2009/0168322	A1	7/2009	Okada
2009/0181314	A1	7/2009	Shyu et al.
2009/0199283	A1	8/2009	Jain
2009/0232384	A1	9/2009	Tu et al.
2009/0244858	A1	10/2009	Di Sirio et al.
2009/0273100	A1	11/2009	Aton et al.
2009/0275170	A1	11/2009	Chen
2009/0279243	A1*	11/2009	Amidi G11C 5/04 361/679.31
2009/0303624	A1	12/2009	Fujii
2009/0309952	A1*	12/2009	Akatsu B41J 2/473 347/224
2010/0006322	A1	1/2010	Cheng
2010/0013887	A1*	1/2010	Suh B41J 2/1408 347/18
2010/0019038	A1	1/2010	Puente Baliarda et al.
2010/0025480	A1	2/2010	Nishizawa et al.
2010/0072284	A1	3/2010	Nishizawa et al.
2010/0085338	A1	4/2010	Miguchi
2010/0097080	A1*	4/2010	Kobayashi G06K 9/00053 324/692
2010/0109141	A1	5/2010	Nishiyama et al.
2010/0117800	A1	5/2010	Li et al.
2010/0124344	A1	5/2010	Mizutani et al.
2010/0136816	A1	6/2010	Ahn
2010/0138857	A1	6/2010	Gondkar
2010/0165581	A1	7/2010	Ziglioli et al.
2010/0165589	A1	7/2010	Zhou
2010/0169940	A1	7/2010	Howarter et al.
2010/0172112	A1	7/2010	Okada
2010/0176207	A1	7/2010	Yoshikawa et al.
2010/0191976	A1	7/2010	Chu
2010/0205439	A1	8/2010	Chu
2010/0244166	A1*	9/2010	Shibuta H01L 27/14618 257/432
2010/0272257	A1	10/2010	Beals
2010/0302516	A1*	12/2010	Rehn G02B 17/0615 353/99
2010/0303687	A1*	12/2010	Blaga B01L 3/50273 422/504
2010/0318627	A1	12/2010	Edwards et al.
2010/0327467	A1	12/2010	Hirabayashi
2011/0003303	A1*	1/2011	Pagano B01L 3/502761 435/6.19
2011/0003493	A1	1/2011	Mo
2011/0010734	A1	1/2011	Newell
2011/0012960	A1*	1/2011	Sakuma B41J 2/1404 347/44
2011/0028184	A1	2/2011	Cooper
2011/0042125	A1*	2/2011	Lee C23C 18/08 174/250
2011/0205412	A1	2/2011	Miyazaki et al.
2011/0063066	A1	3/2011	Choi et al.
2011/0076867	A1	3/2011	Achsaf et al.
2011/0221014	A1	3/2011	Nakatani
2011/0080331	A1*	4/2011	Kato H01Q 1/2216 343/803
2011/0114856	A1	5/2011	Cooke
2011/0138088	A1	6/2011	Sirio et al.
2011/0161583	A1	6/2011	Youn
2011/0170750	A1*	7/2011	Kropp A61B 5/02444 382/124
2011/0182040	A1	7/2011	Ellul

(56)

References Cited

U.S. PATENT DOCUMENTS

2011/0221385 A1* 9/2011 Partovi H01F 5/003
320/101

2011/0259966 A1 10/2011 Phillips

2011/0315779 A1 12/2011 Bidin et al.

2012/0007096 A1 1/2012 Yamazaki

2012/0018522 A1 1/2012 Le Garrec et al.

2012/0028342 A1* 2/2012 Ismagilov B01L 3/502738
435/283.1

2012/0048948 A1 3/2012 Bertin et al.

2012/0079692 A1 4/2012 Sinha et al.

2012/0105081 A1* 5/2012 Shaikh G06K 9/0002
324/686

2012/0138690 A1 6/2012 Bosquet et al.

2012/0140420 A1 6/2012 Soyano et al.

2012/0168517 A1 7/2012 Lee

2012/0177543 A1* 7/2012 Battrell B01F 11/0071
422/187

2012/0193435 A1 8/2012 Hanaoka et al.

2012/0200366 A1* 8/2012 Nishiyama H03H 9/10
331/158

2012/0299444 A1 8/2012 Yokoyama et al.

2012/0231650 A1 9/2012 Tian et al.

2012/0241615 A1 9/2012 Tomioka

2012/0248201 A1 10/2012 Sutera

2012/0261575 A1 10/2012 Averitt

2012/0267438 A1 10/2012 Kato et al.

2012/0287587 A1* 11/2012 Los H05K 1/147
361/749

2012/0289196 A1 11/2012 Tan et al.

2012/0292395 A1 11/2012 Huang et al.

2013/0008968 A1 1/2013 Launay et al.

2013/0015441 A1 1/2013 Takayama et al.

2013/0193534 A1 2/2013 Nakatani

2013/0222484 A1 2/2013 Yokoyama

2013/0254445 A1 3/2013 Burns et al.

2013/0099118 A1 4/2013 Tomioka

2013/0112757 A1 5/2013 Lee

2013/0130262 A1* 5/2013 Battrell B01L 3/50273
435/6.12

2013/0134227 A1 5/2013 De Maquille et al.

2013/0161390 A1 6/2013 Rodriguez

2013/0175346 A1 7/2013 Jenni

2013/0185566 A1 7/2013 Pang

2013/0193591 A1* 8/2013 Groening H01L 23/36
257/786

2013/0194071 A1* 8/2013 Slogedal G06K 9/0002
340/5.82

2013/0207781 A1 8/2013 Pagani et al.

2013/0219097 A1 8/2013 Wang

2013/0277434 A1 10/2013 Lin

2013/0286603 A1* 10/2013 Okada H05K 7/02
361/746

2013/0287267 A1 10/2013 Varone

2013/0320088 A1 12/2013 Lin et al.

2013/0334320 A1 12/2013 Thill et al.

2013/0337686 A1* 12/2013 Wang G06F 1/182
439/607.31

2014/0021264 A1 1/2014 Pueschner et al.

2014/0328023 A1 1/2014 Choi

2014/0042230 A1 2/2014 Pueschner et al.

2014/0264029 A1 2/2014 Tomioka

2014/0061316 A1 3/2014 Narayanaswami et al.

2014/0253767 A1 3/2014 Kato

2014/0256069 A1 3/2014 Kishimoto et al.

2014/0292941 A1 3/2014 Kobayashi et al.

2014/0313261 A1 3/2014 Nagai

2014/0138449 A1* 5/2014 Goldman G06K 19/06206
235/492

2014/0158340 A1* 6/2014 Dixler F28F 27/00
165/287

2014/0166759 A1 6/2014 Liu

2014/0299667 A1 6/2014 Baek

2014/0193988 A1* 7/2014 Ma H01R 12/7082
439/83

2014/0282685 A1 9/2014 Beals et al.

2014/0304445 A1 10/2014 Gervasi

2014/0347818 A1* 11/2014 Uhlemann H01L 23/473
361/699

2015/0016607 A1 1/2015 Beals et al.

2015/0049142 A1 2/2015 Hager et al.

2015/0178584 A1 3/2015 Aller et al.

2015/0092357 A1 4/2015 Yoshikawa et al.

2015/0113585 A1 4/2015 Beals et al.

2015/0143105 A1 5/2015 Beals et al.

2015/0147914 A1* 5/2015 Gao H01R 12/716
439/638

2015/0154998 A1* 6/2015 Gallo G06K 7/10722
720/626

2015/0366061 A1 6/2015 Noda

2015/0320506 A1 11/2015 Sayles

2015/0321193 A1* 11/2015 Sprague F04B 19/006
422/505

2015/0352549 A1* 12/2015 Kolb F16K 99/0015
422/505

2016/0022570 A1* 1/2016 Adams A61K 9/0024
424/425

2016/0117714 A1* 4/2016 Salihu G06Q 30/0232
705/14.31

2016/0132761 A1 5/2016 Hanmer

2016/0140433 A1 5/2016 Alcaide

2016/0157346 A1 6/2016 Wu

2016/0165731 A1 6/2016 Hurwitz

2016/0217087 A1* 7/2016 Lim G06F 13/1684

2016/0250393 A1* 9/2016 Jeong A61L 27/54
424/425

2016/0365140 A1* 12/2016 Azuma G11C 13/004

2017/0010639 A1* 1/2017 Matsumoto G06F 1/183

2018/0027288 A1 1/2018 Beals et al.

FOREIGN PATENT DOCUMENTS

CN 101267532 9/2008

CN 102164320 8/2011

CN 102164329 8/2011

EP 740478 10/1996

EP 1463322 9/2004

EP 1662361 5/2006

EP 1765013 3/2007

EP 2204997 7/2010

EP 2407916 1/2012

EP 2541959 1/2013

KR 3004415620000 2/2007

KR 3006175300000 10/2011

KR 3006364910000 3/2012

KR 3006364910001 3/2012

WO 2007072211 6/2007

WO 2011120901 10/2011

OTHER PUBLICATIONS

U.S. Appl. No. 14/499,956, Amendment and Response filed Mar. 8, 2017, 12 pages.

U.S. Appl. No. 14/500,037, Amendment and Response filed Mar. 10, 2017, 11 pages.

U.S. Appl. No. 29/567,139, Notice of Allowance dated Mar. 10, 2017, 28 pages.

U.S. Appl. No. 29/567,135, Notice of Allowance dated Mar. 10, 2017, 30 pages.

U.S. Appl. No. 29/525,632, Office Action dated Mar. 2, 2017, 17 pages.

U.S. Appl. No. 13/799,891, Amendment and Response filed Mar. 30, 2017, 15 pages.

U.S. Appl. No. 14/500,113, Office Action dated Apr. 6, 2017, 10 pages.

U.S. Appl. No. 14/608,900, Notice of Allowance dated Apr. 12, 2017, 2 pages.

U.S. Appl. No. 29/567,139, Notice of Allowance dated Apr. 3, 2017, 2 pages.

(56)

References Cited

OTHER PUBLICATIONS

Taiwanese Notice of Allowance in Application 104306112, dated Feb. 10, 2017, 5 pages.

U.S. Appl. No. 14/500,037, Notice of Allowance dated May 26, 2017, 8 pages.

U.S. Appl. No. 14/500,037, Notice of Allowance dated Jun. 15, 2017, 2 pages.

U.S. Appl. No. 13/799,891, Office Action dated May 10, 2017, 13 pages.

U.S. Appl. No. 14/499,956, Notice of Allowance dated May 9, 2017, 7 pages.

U.S. Appl. No. 14/499,956, Notice of Allowance dated Jun. 5, 2017 4 pages.

U.S. Appl. No. 29/567,139, Notice of Allowance dated May 16, 2017, 2 pages.

Taiwanese Notice of Allowance in Application 105307889, dated May 17, 2017, 5 pages.

Taiwanese Notice of Allowance in Application 105307888, dated May 17, 2017, 5 pages.

Taiwanese Notice of Allowance in Application 105307887, dated May 17, 2017, 5 pages.

U.S. Appl. No. 14/500,113, Amendment and Response filed Jul. 6, 2017, 11 pages.

Taiwanese Notice of Allowance in Application 105307890, dated Jul. 13, 2017, 5 pages.

U.S. Appl. No. 13/799,891, Amendment and Response filed Aug. 10, 2017, 16 pages.

U.S. Appl. No. 13/799,891, Notice of Allowance dated Sep. 22, 2017, 7 pages.

U.S. Appl. No. 14/499,956, Notice of Allowance dated Aug. 24, 2017, 2 pages.

U.S. Appl. No. 14/500,113, Office Action dated Sep. 15, 2017, 11 pages.

U.S. Appl. No. 29/525,632, Amendment and Response filed Sep. 1, 2017, 5 pages.

Taiwanese Office Action in Application 102144270, dated Dec. 14, 2017, 4 pages.

U.S. Appl. No. 29/525,632, Office Action dated Dec. 21, 2017, 4 pages.

European Office Action in Application 13878216.4, dated Jan. 18, 2018, 8 pages.

U.S. Appl. No. 14/500,113, Amendment and Response filed Feb. 15, 2018, 11 pages.

Chinese Office Action in Application 201380074371.8, dated Feb. 23, 2018, 8 pages.

ISO/IEC 7816-3 Identification cards—Integrated circuit(s) cards with contacts—Part 3: Cards with contacts—Electrical Interface and transmission protocols Nov. 1, 2006, 58 pages, <http://read.pudn.com/downloads132/doc/comm/563504/ISO-IEC7816/ISO+IEC7816-3-2006.pdf>.

U.S. Appl. No. 13/799,891, Amendment and Response filed Nov. 18, 2016, 17 pages.

U.S. Appl. No. 14/499,956, Office Action dated Nov. 8, 2016, 10 pages.

U.S. Appl. No. 14/500,037, Office Action dated Nov. 10, 2016, 9 pages.

U.S. Appl. No. 14/500,113, Office Action dated Nov. 28, 2016, 10 pages.

U.S. Appl. No. 14/608,900, Amendment and Response filed Dec. 5, 2016, 17 pages.

European Communication in 13878216.4, dated Sep. 21, 2016, 7 pages.

U.S. Appl. No. 14/499,956, Amendment and Response filed Sep. 23, 2016, 12 pages.

U.S. Appl. No. 14/500,037, Amendment and Response filed Sep. 26, 2016, 11 pages.

U.S. Appl. No. 14/500,113, Amendment and Response filed Sep. 28, 2016, 12 pages.

U.S. Appl. No. 29/521,234, Notice of Allowance dated Oct. 14, 2016, 5 pages.

U.S. Appl. No. 29/521,236, Notice of Allowance dated Oct. 17, 2016, 5 pages.

Chinese Patent Application No. 201330395635.2, Notice of Allowance, dated Dec. 2, 2013.

Chinese Patent Application No. 201330395780.0, Notice of Allowance dated Jan. 10, 2014.

Chinese Patent Application No. 201330395895.X, Notice of Allowance dated Nov. 19, 2013.

European Patent Application No. 15184485.9, EESR dated Mar. 3, 2016, 9 pages.

International Standard (1999) “Information technology—Identification cards—Integrated circuit(s) cards with contacts—Part 2: Dimensions and location of the contacts” Reference No. ISO/IEC 7816-2: 1999E, 11 pages.

PCT International Search Report and Written Opinion for PCT/US2013/039803, dated Jan. 23, 2014, 13 pages.

Smart Card Module Poster compiled by Endre Nagy of Hungary 1 page poster, edition Mar. 2004, www.wrinkl.de/Uthings/Training.html.

TW Patent Application No. 102304015, Office Action dated Mar. 24, 2014, 3 pages. (English Translation).

TW Patent Application No. 102304016, Office Action dated Mar. 24, 2014, 3 pages. (English Translation).

TW Patent Application No. 102304017, Office Action dated Mar. 24, 2014, 3 pages. (English Translation).

U.S. Appl. No. 13/799,891, Amendment and Response filed Dec. 1, 2014, 8 pages.

U.S. Appl. No. 13/799,891, Amendment and Response filed Dec. 10, 2015, 14 pages.

U.S. Appl. No. 13/799,891, Amendment and Response filed Jul. 6, 2015, 13 pages.

U.S. Appl. No. 13/799,891, Amendment and Response filed Jun. 14, 2016, 16 pages.

U.S. Appl. No. 13/799,891, Office Action dated Aug. 10, 2015, 14 pages.

U.S. Appl. No. 13/799,891, Office Action dated Feb. 3, 2015, 22 pages.

U.S. Appl. No. 13/799,891, Office Action dated Jan. 14, 2016, 10 pages.

U.S. Appl. No. 13/799,891, Office Action dated Jul. 18, 2016, 12 pages.

U.S. Appl. No. 14/499,956, Amendment and Response filed May 31, 2016, 11 pages.

U.S. Appl. No. 14/499,956, Amendment and Response filed Nov. 30, 2015, 7 pages.

U.S. Appl. No. 14/499,956, Office Action dated Jan. 29, 2016, 8 pages.

U.S. Appl. No. 14/499,956, Office Action dated Jul. 30, 2015, 23 pages.

U.S. Appl. No. 14/499,956, Office Action dated Jun. 17, 2016, 10 pages.

U.S. Appl. No. 14/500,037, Amendment and Response filed Dec. 10, 2015, 8 pages.

U.S. Appl. No. 14/500,037, Amendment and Response filed Jun. 16, 2016, 12 pages.

U.S. Appl. No. 14/500,037, Office Action dated Aug. 10, 2015, 20 pages.

U.S. Appl. No. 14/500,037, Office Action dated Feb. 16, 2016, 9 pages.

U.S. Appl. No. 14/500,037, Office Action dated Jun. 24, 2016, 10 pages.

U.S. Appl. No. 14/500,113, Amendment and Response filed Dec. 14, 2015, 8 pages.

U.S. Appl. No. 14/500,113, Amendment and Response filed Jun. 17, 2016, 12 pages.

U.S. Appl. No. 14/500,113, Office Action dated Aug. 12, 2015, 21 pages.

U.S. Appl. No. 14/500,113, Office Action dated Feb. 17, 2016, 8 pages.

U.S. Appl. No. 14/500,113, Office Action dated Jun. 28, 2016, 10 pages.

U.S. Appl. No. 14/608,900, Amendment and Response filed Jun. 21, 2016, 17 pages.

(56)

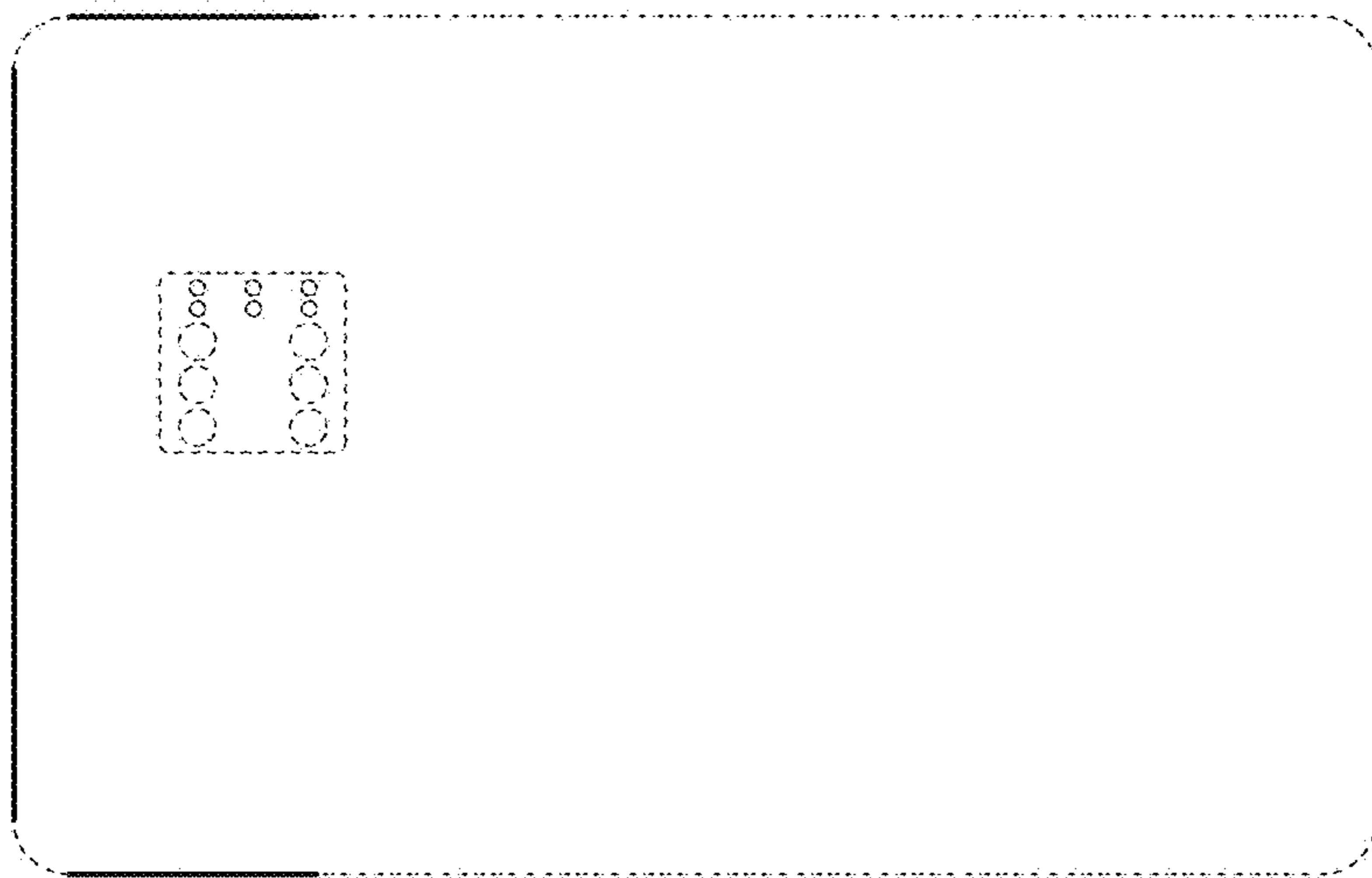
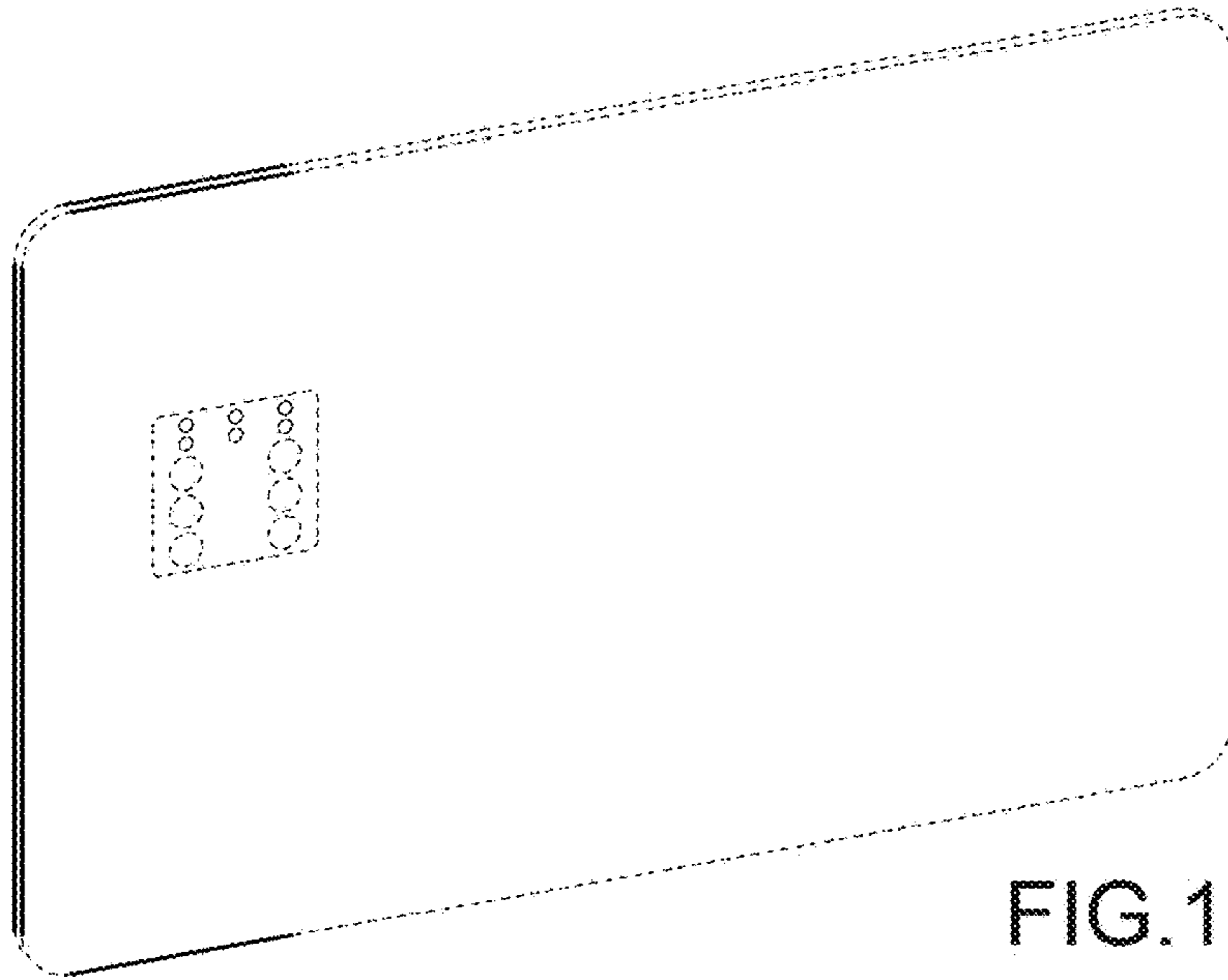
References Cited

OTHER PUBLICATIONS

U.S. Appl. No. 14/608,900, Office Action dated Aug. 5, 2016, 14 pages.
U.S. Appl. No. 14/608,900, Office Action dated Mar. 21, 2016, 12 pages.
U.S. Appl. No. 29/448,754, Amendment and Response filed Apr. 15, 2015, 10 pages.
U.S. Appl. No. 29/448,754, Amendment and Response filed Dec. 10, 2014, 5 pages.
U.S. Appl. No. 29/448,754, Amendment and Response filed Dec. 30, 2015, 7 pages.
U.S. Appl. No. 29/448,754, Notice of Allowance dated Jan. 29, 2016, 6 pages.
U.S. Appl. No. 29/448,754, Office Action dated Apr. 1, 2015, 11 pages.
U.S. Appl. No. 29/448,754, Office Action dated Jul. 31, 2015, 8 pages.
U.S. Appl. No. 29/448,754, Office Action dated Sep. 10, 2014, 26 pages.
U.S. Appl. No. 29/448,761, Amendment and Response filed Apr. 20, 2015, 9 pages.
U.S. Appl. No. 29/448,761, Amendment and Response filed Dec. 10, 2014, 6 pages.
U.S. Appl. No. 29/448,761, Amendment and Response filed Dec. 30, 2015, 8 pages.
U.S. Appl. No. 29/448,761, Notice of Allowance dated Jan. 22, 2016, 6 pages.
U.S. Appl. No. 29/448,761, Office Action dated Aug. 14, 2015, 7 pages.
U.S. Appl. No. 29/448,761, Office Action dated Mar. 26, 2015, 12 pages.

U.S. Appl. No. 29/448,761, Office Action dated Sep. 10, 2014, 26 pages.
U.S. Appl. No. 29/448,766, Notice of Allowance dated Apr. 22, 2015, 5 pages.
U.S. Appl. No. 29/448,766, Notice of Allowance dated Jan. 12, 2015, 36 pages.
U.S. Appl. No. 29/448,766, Notice of Allowance dated Sep. 18, 2014, 28 pages.
U.S. Appl. No. 29/521,234, Notice of Allowance dated Sep. 8, 2016, 26 pages.
U.S. Appl. No. 29/521,236, Notice of Allowance dated Sep. 12, 2016, 26 pages.
Chinese Notice of Allowance in 201530425865.8 dated Jun. 7, 2016, 4 pages.
Taiwanese Office Action in 104306112 dated Jun. 23, 2016, 9 pages.
U.S. Appl. No. 13/799,891, Office Action dated Dec. 30, 2016, 12 pages.
U.S. Appl. No. 14/608,900, Notice of Allowance dated Jan. 3, 2017, 8 pages.
U.S. Appl. No. 14/500,113, Notice of Allowance dated Apr. 6, 2018, 8 pages.
U.S. Appl. No. 15/710,340, Office Action dated Apr. 17, 2018 13 pages.
U.S. Appl. No. 29/525,632, Amendment and Response filed Mar. 20, 2018, 5 pages.
U.S. Appl. No. 29/525,632, Office Action dated Aug. 13, 2018, 6 pages.
U.S. Appl. No. 14/500,113, Notice of Allowance dated Aug. 1, 2018, 3 pages.
U.S. Appl. No. 15/710,340, Amendment and Response filed Sep. 17, 2018, 11 pages.
U.S. Appl. No. 29/567,145, Office Action dated Jul. 31, 2018, 16 pages.

* cited by examiner



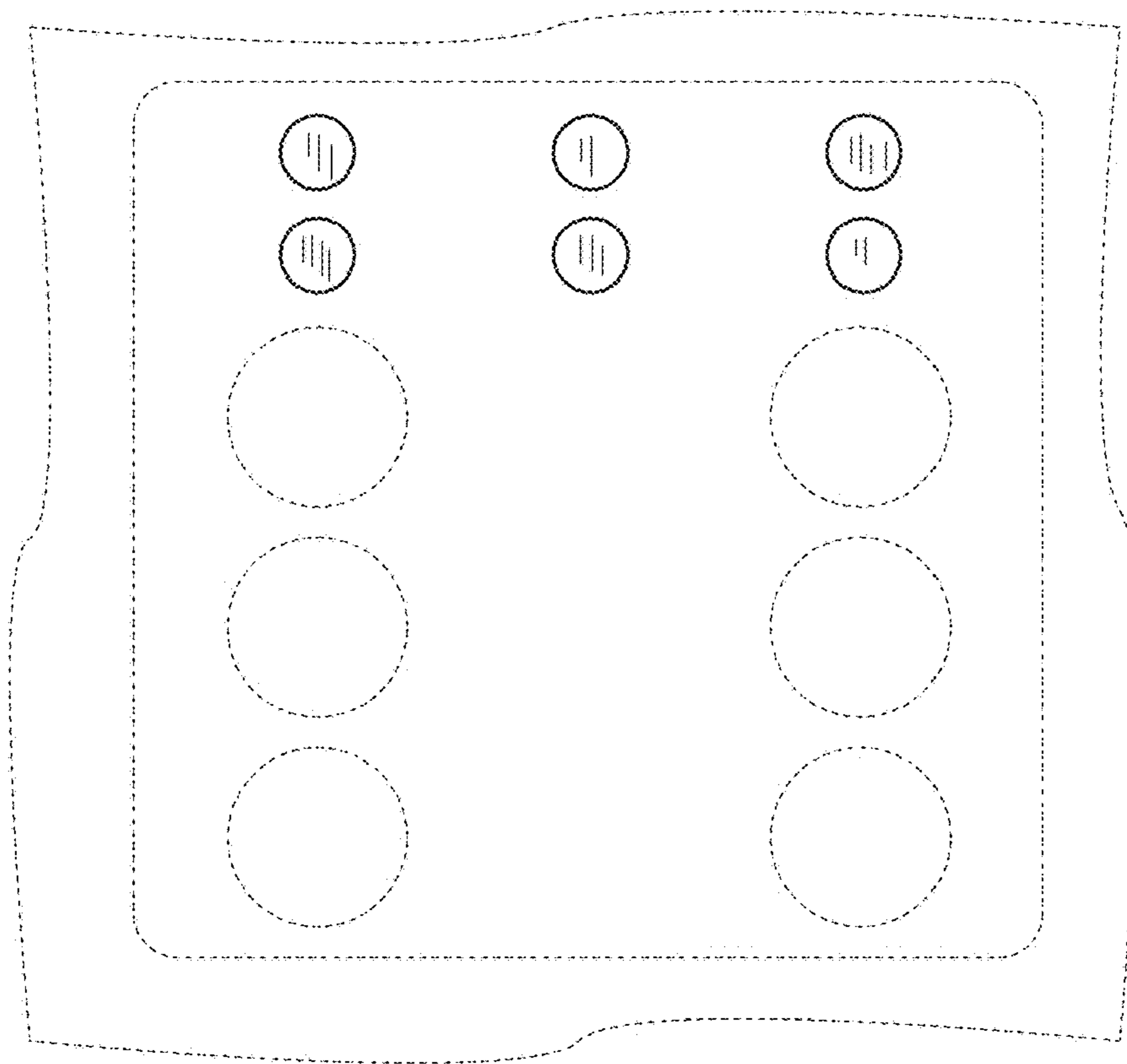


FIG. 3

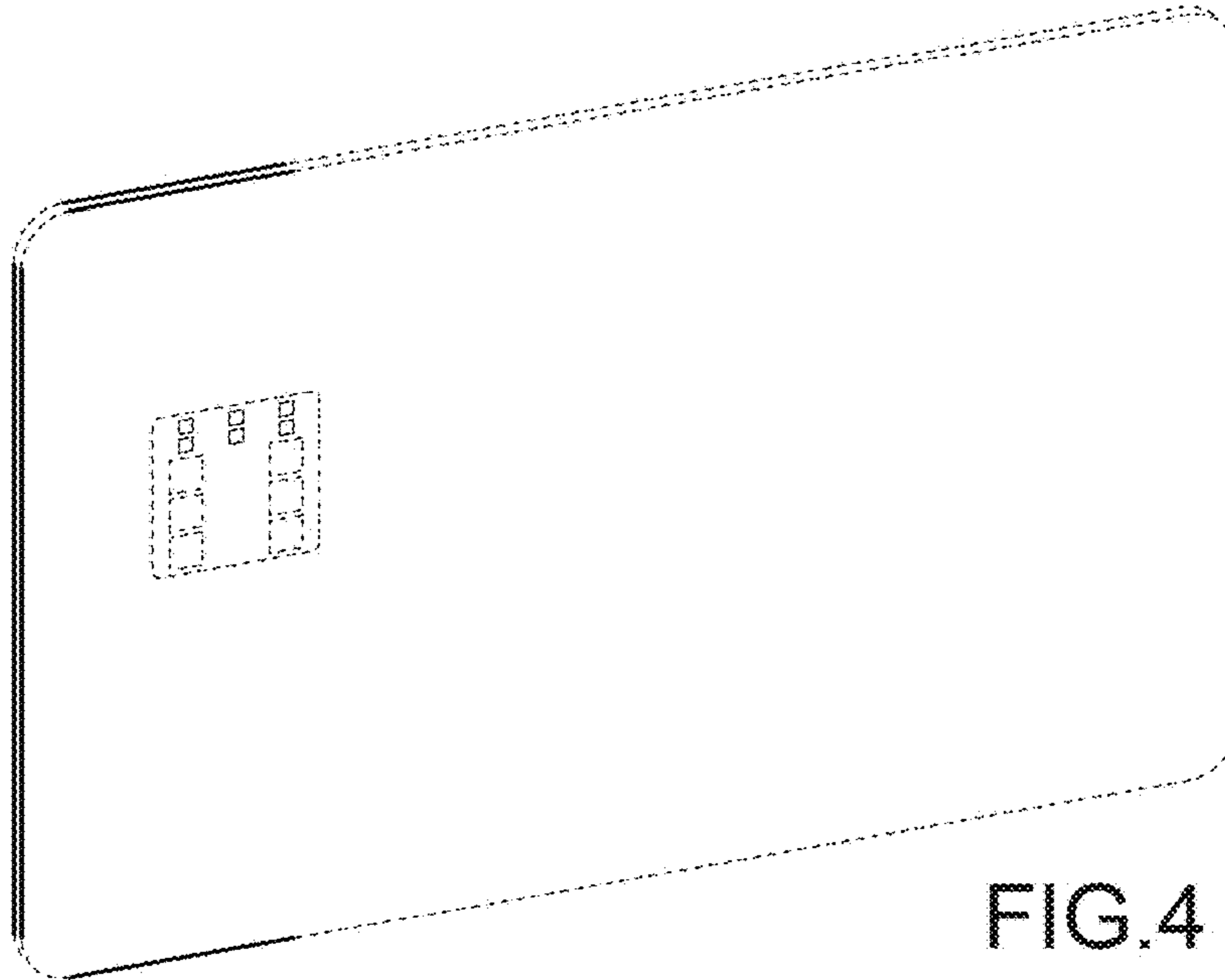


FIG. 4

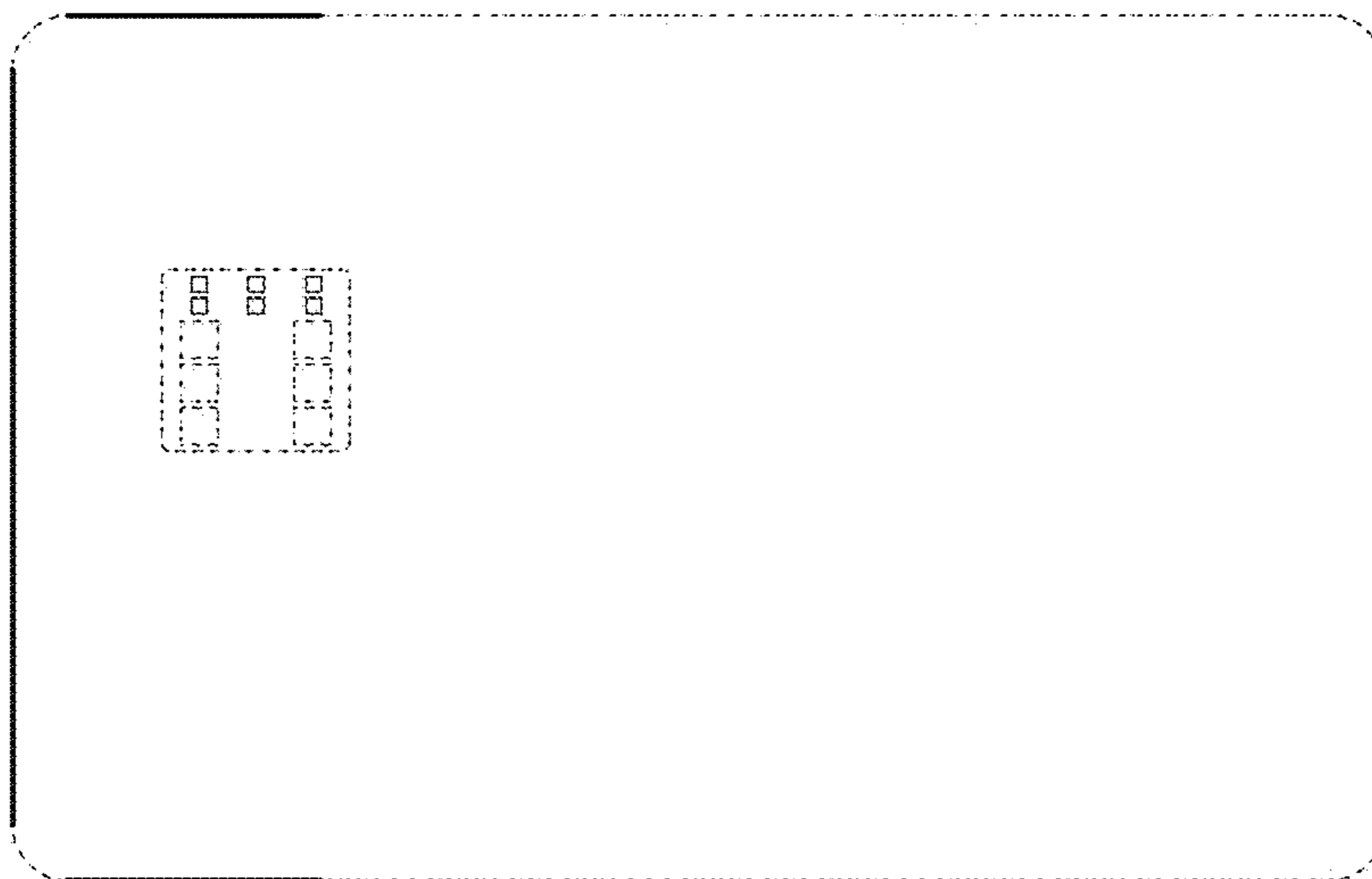


FIG. 5

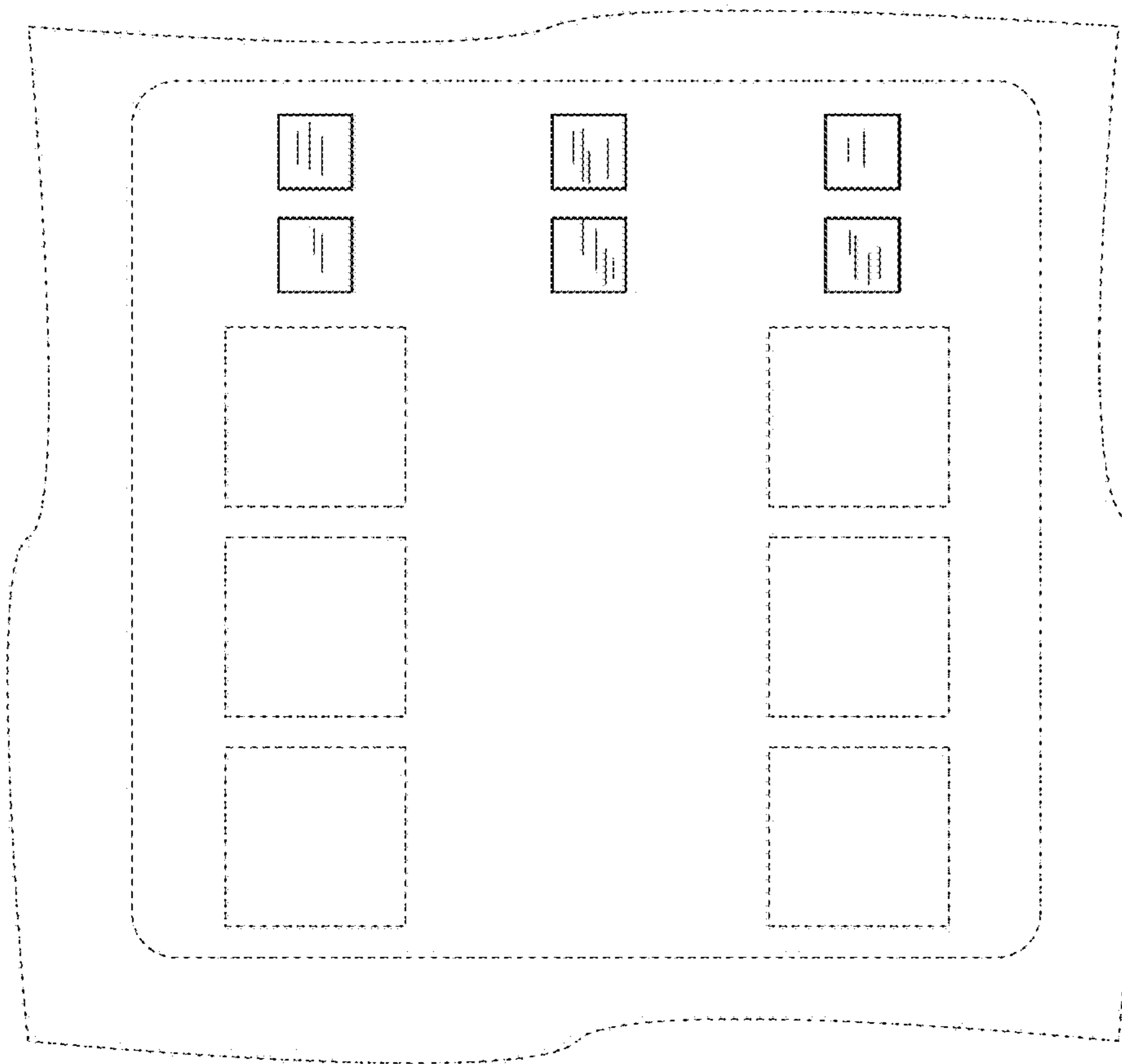


FIG. 6