



[54] **ENHANCED SECURITY FINGERPRINT SENSOR PACKAGE AND RELATED METHODS**

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[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

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[22] Filed: **Jan. 26, 1996**

[51] **Int. Cl.⁶** **G06K 9/00**

[52] **U.S. Cl.** **382/124; 340/825.34**

[58] **Field of Search** 382/124-127; 340/825.34; 356/71; 283/68-70, 74, 78; 380/9, 21, 23

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,781,855	12/1973	Killen	340/146.3 E
3,859,633	1/1975	Ho et al.	340/146.3 E
3,959,884	6/1976	Jordan et al.	33/1 BB
4,140,272	2/1979	Atalla	235/380
4,151,512	4/1979	Riganati et al.	340/146.3 E
4,156,230	5/1979	Riganati et al.	340/146.3 E
4,185,270	1/1980	Fischer, II et al.	340/146.3 E
4,210,899	7/1980	Swonger et al.	340/146.3 E
4,336,998	6/1982	Ruell	356/71

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

0 040 838	12/1981	European Pat. Off. .
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0 041 693	12/1981	European Pat. Off. .
0 044 489 A1	1/1982	European Pat. Off. .
0 459 808	12/1991	European Pat. Off. .
0 513 612 A2	11/1992	European Pat. Off. .
WO 94/25938	10/1994	European Pat. Off. .
2674051-A1	9/1992	France .
4026-167-A	5/1991	Germany .
403036791	1/1991	Japan .
404190470	7/1992	Japan .
2 219 870	12/1989	United Kingdom .

OTHER PUBLICATIONS

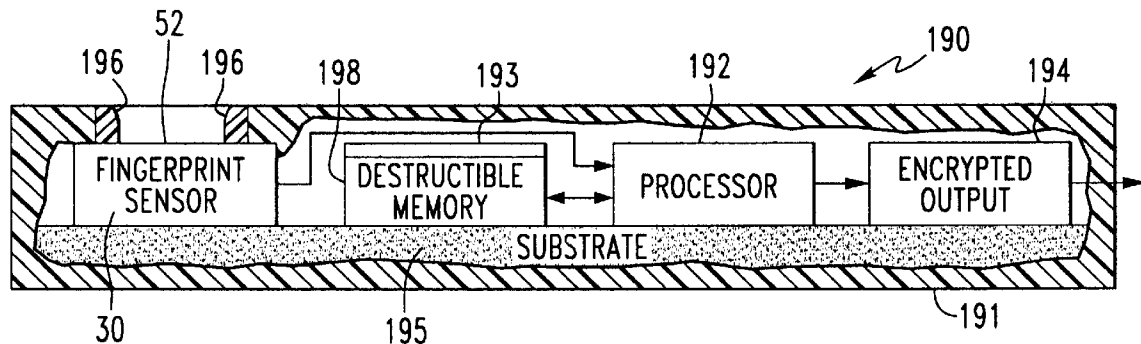
R.P. James, *IBM Technical Disclosure Bulletin*, vol. 14, No. 11, (Apr. 1972), "Finger-Print Sensor", p. 3361.
Masahiro Takeda, Satoshi Uchida, Kenichi Hiramatsu & Tokumi Matsunami, "Finger Image Identification Method for Personal Verification," IEEE, pp. 761-766 (1990).

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[57] **ABSTRACT**

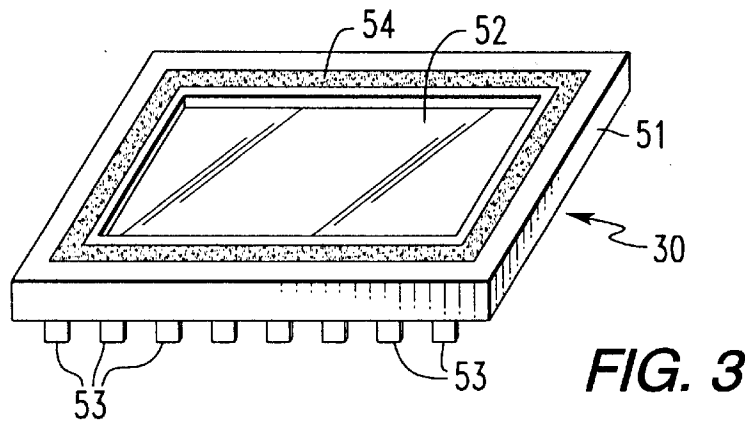
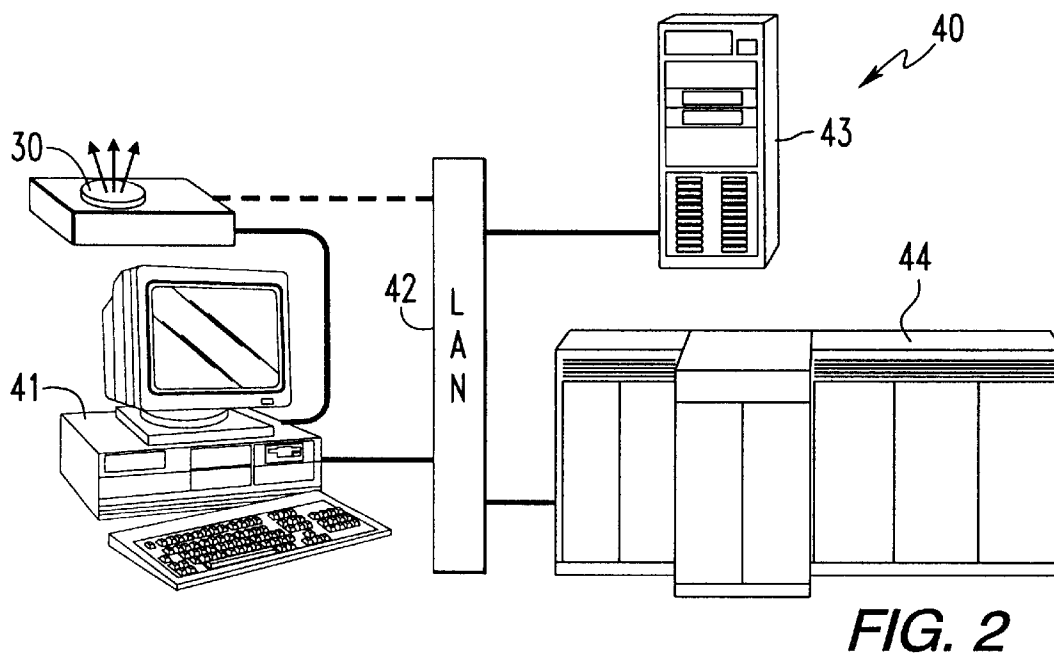
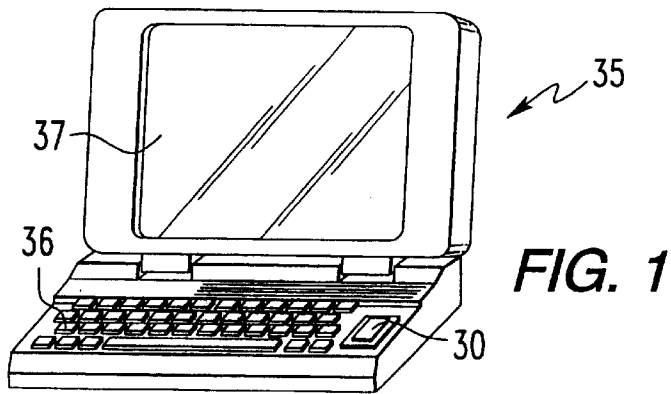
A fingerprint sensor package includes a tamper-resistant housing, a fingerprint sensor mounted in the housing, and an encryption output circuit mounted within the housing and operatively connected to the fingerprint sensor for generating an encrypted output signal related to a sensed fingerprint. The fingerprint sensor package may include a processor operatively connected between the fingerprint sensor and the encryption circuit. In addition, the package may also include a reference fingerprint memory for storing reference fingerprint information. Accordingly, the processor may have the capability to determine if a sensed fingerprint matches a stored reference fingerprint. To further enhance security of the stored reference fingerprint information, the sensor package also preferably includes a removing circuit or device for removing reference fingerprint information from the reference fingerprint storage means responsive to tampering. In one embodiment of the invention, the fingerprint sensor preferably includes an electric field integrated circuit fingerprint sensor. Method aspects of the invention are also disclosed.

36 Claims, 10 Drawing Sheets



U.S. PATENT DOCUMENTS

4,353,056	10/1982	Tsikos	340/146.3	5,134,773	8/1992	LeMaire et al.	29/827
4,394,773	7/1983	Ruell	382/4	5,140,642	8/1992	Hsu et al.	382/5
4,429,413	1/1984	Edwards	382/4	5,239,590	8/1993	Yamamoto	382/4
4,525,859	7/1985	Bowles et al.	382/5	5,325,442	6/1994	Knapp	382/4
4,526,043	7/1985	Boie et al.	73/862.04	5,337,357	8/1994	Chou et al.	380/4
4,577,345	3/1986	Abramov	382/4	5,351,304	9/1994	Yamamoto	382/5
4,581,760	4/1986	Schüller et al.	382/4	5,363,453	11/1994	Gagne et al.	382/5
4,582,985	4/1986	Löfberg	235/380	5,373,181	12/1994	Scheiter et al.	257/415
4,747,147	5/1988	Sparrow	382/4	5,400,662	3/1995	Tamori	73/862.046
4,805,223	2/1989	Denyer	382/127	5,420,936	5/1995	Fitzpatrick et al.	382/124
4,845,610	7/1989	Parvin	364/200	5,429,006	7/1995	Tamori	73/862.046
4,932,776	6/1990	Dowling, Jr. et al.	357/71	5,436,972	7/1995	Fischer	380/25
4,947,443	8/1990	Costello	382/5	5,465,303	11/1995	Levison et al.	382/124
4,993,068	2/1991	Piosenka et al.	380/23	5,488,719	1/1996	Kaplan et al.	395/600
5,010,772	4/1991	Bourland et al.	73/862.04	5,497,429	3/1996	Shibuya	382/125
5,040,223	8/1991	Kamiya et al.	382/4	5,503,029	4/1996	Tamori	73/862.046
5,040,224	8/1991	Hara	382/4	5,526,701	6/1996	Tamori	73/862.046
5,050,220	9/1991	Marsh et al.	382/4	5,559,504	9/1996	Itsumi et al.	340/825.3
				5,613,012	3/1997	Hoffman et al.	382/115



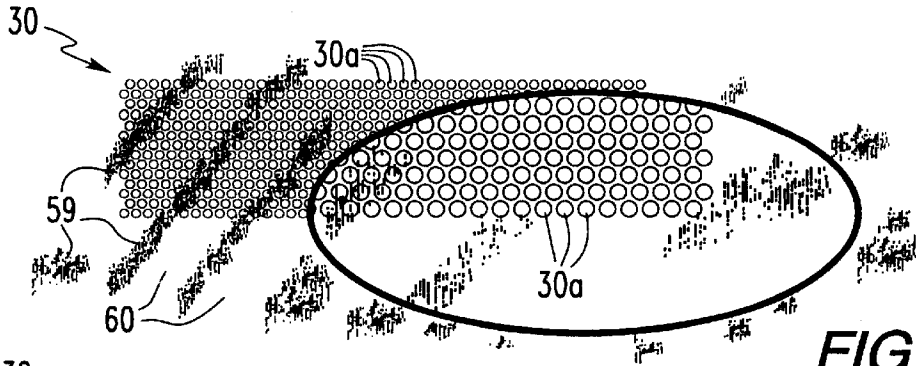


FIG. 4

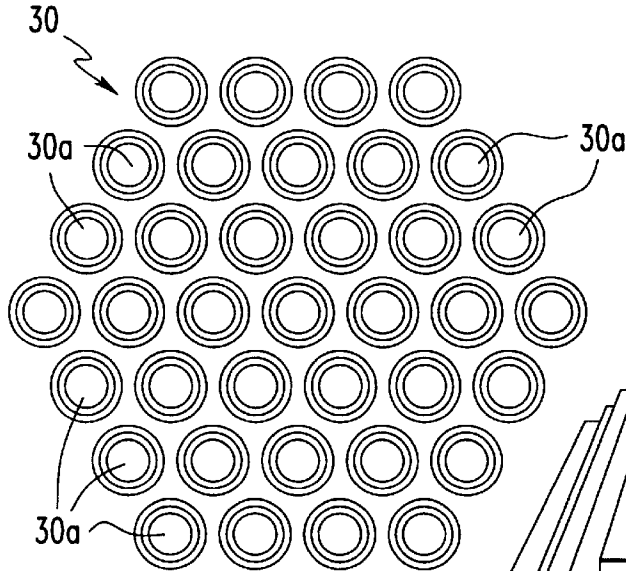


FIG. 5

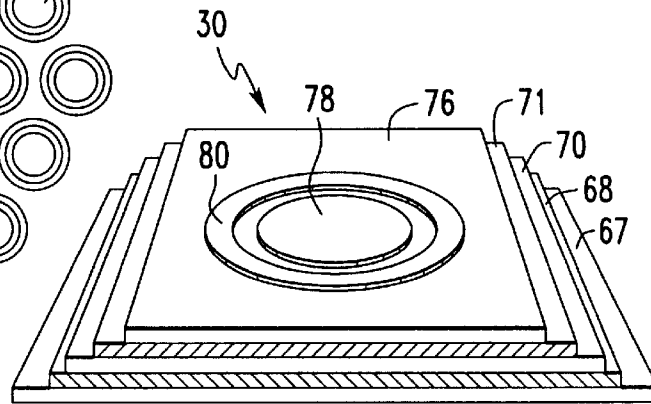


FIG. 6

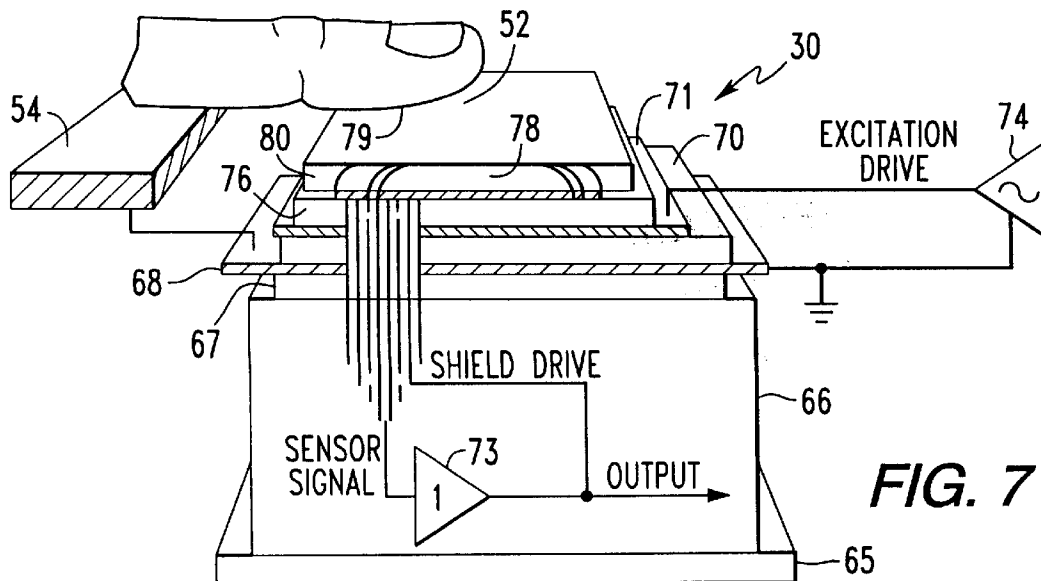


FIG. 7

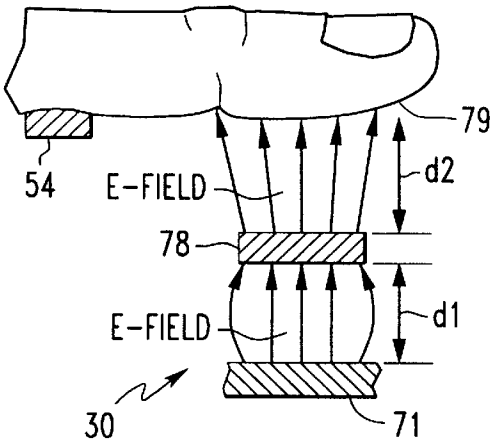


FIG. 8

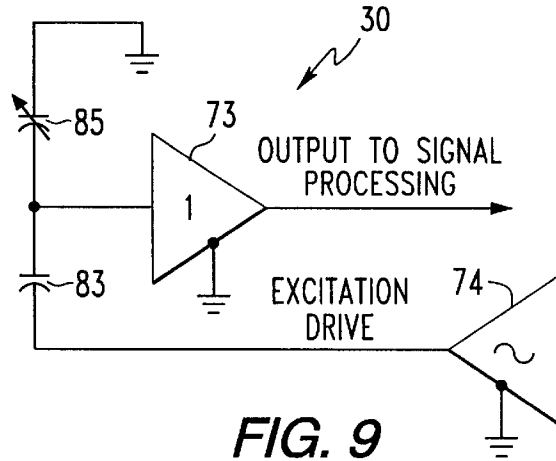


FIG. 9

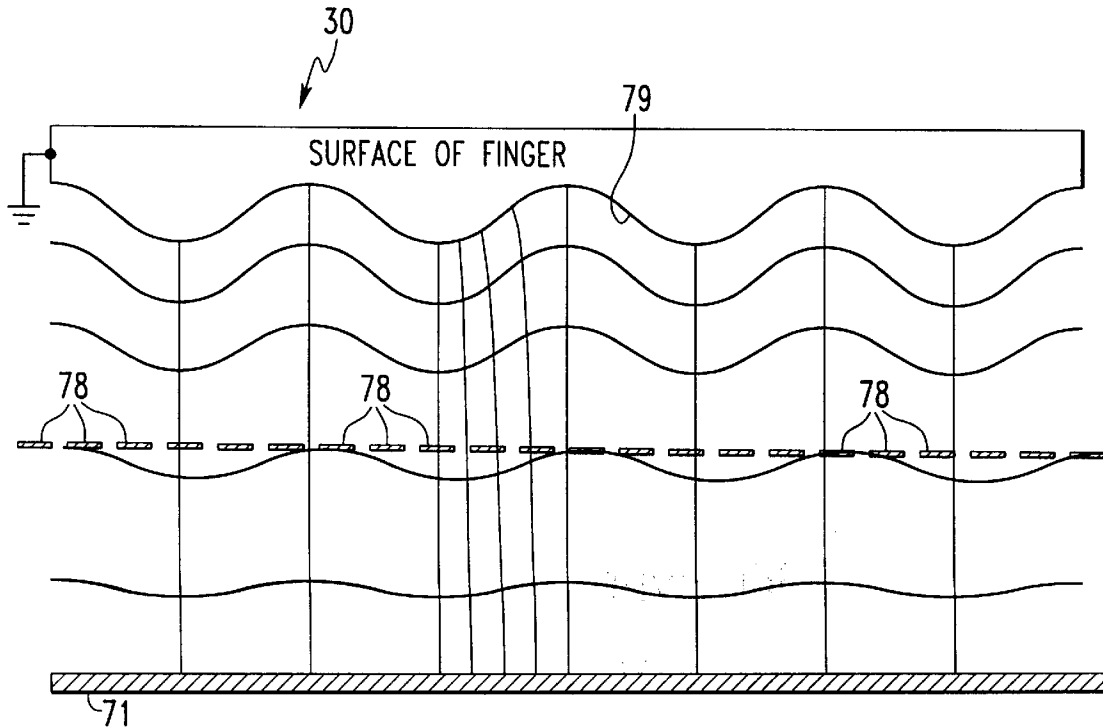


FIG. 10

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