US005798907A

United States Patent [19]

Janik

[11] Patent Number: 5,798,907

[45] Date of Patent: *Aug. 25, 1998

[54] **WEARABLE COMPUTING DEVICE WITH MODULE PROTRUSION PASSING INTO FLEXIBLE CIRCUITRY**

[75] Inventor: **Craig M. Janik**, Palo Alto, Calif.

[73] Assignee: **ViA, Inc.**, Northfield, Minn.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. Nos. 5,285,398 and 5,581,492.

[21] Appl. No.: **759,846**

[22] Filed: **Dec. 2, 1996**

Related U.S. Application Data

[63] Continuation of Ser. No. 600,669, Feb. 13, 1996, Pat. No. 5,581,492, which is a continuation of Ser. No. 192,636, Feb. 7, 1994, Pat. No. 5,285,398, which is a continuation of Ser. No. 884,117, May 15, 1992, Pat. No. 4,491,651.

[51] **Int. Cl.**[6] **G06F 1/16**; H05K 1/02

[52] **U.S. Cl.** **361/683**; 361/686; 361/733; 361/749

[58] **Field of Search** ..... 364/708.1; 439/67, 439/77; 174/254, 268, 72 A, 117 F, 117 FF; 361/680–686, 733, 749, 827

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,156,504	5/1939	Liss .	
3,588,359	6/1971	Cribb .	
3,744,025	7/1973	Bilgutay .	
3,876,863	4/1975	Boone .	
3,956,740	5/1976	Jones et al. .	
4,087,864	5/1978	LaBove et al. .	
4,096,577	6/1978	Ferber et al. .	
4,104,728	8/1978	Kasubuchi .	
4,364,112	12/1982	Onodera et al. .	
4,533,188	8/1985	Miniet	439/77
4,545,023	10/1985	Mizzi .	
4,607,156	8/1986	Koppenaal et al. .	
4,633,881	1/1987	Moore et al. .	
4,690,653	9/1987	Goldberg .	
4,719,462	1/1988	Hawkins .	
4,756,940	7/1988	Payne et al. .	
4,768,971	9/1988	Simpson	439/67 X
4,825,471	5/1989	Jennings .	
4,827,534	5/1989	Haugen .	

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

0 251 643 A2	1/1988	European Pat. Off. .	
0 264 956 A2	4/1988	European Pat. Off. .	
0 531 645 A2	3/1993	European Pat. Off. .	
56-74765	6/1981	Japan .	
60-204056	10/1985	Japan .	
2-177395	7/1990	Japan .	
2-108164 U	8/1990	Japan .	
6-302930	10/1994	Japan	439/67
1887091	3/1975	United Kingdom .	
WO 88/07659	10/1988	WIPO .	
WO 93/23801	11/1993	WIPO .	

OTHER PUBLICATIONS

"Wearable Interconnection for Portable Computers"; IBM Technical Disclosure Bulletin; vol. 34, No. 10B, Mar. 1992, p. 30.

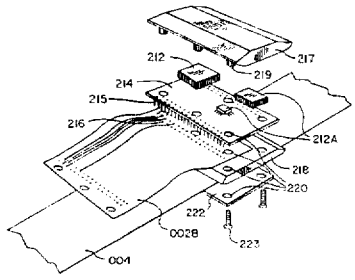
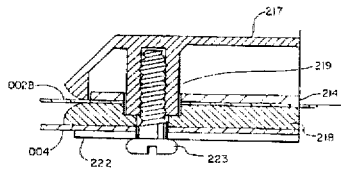
Helm, Leslie; Japan Turns Fanciful in the Evolution of Computers; Los Angeles Times; Oct. 14, 1991; Business Section; p. 1, Part D, col. 2.

"Die Hände werden frei"; Nachrichten Elektronik und Telematrik; vol. 44, No. 4, Apr. 1990, Heidelberg DE, p. 154.

Primary Examiner—Michael W. Phillips

Attorney, Agent, or Firm—Patterson & Keough, P.A.

[57] **ABSTRACT**

A wearable computing device includes at least one computing-device component module and flexible circuitry operably connected to the module. The module includes a top module portion, a bottom module portion, and at least one protrusion for holding the top module portion in substantially fixed relationship with the bottom module portion. The protrusion passes into and/or through the flexible circuitry. A plurality of such modules are also contemplated.

19 Claims, 14 Drawing Sheets