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Emmert

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(54) **HIGH DENSITY FLEXIBLE CIRCUIT ELEMENT AND COMMUNICATION DEVICE USING SAME**

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Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(52) **U.S. Cl.** **439/65**; 439/165
(58) **Field of Search** 439/65, 59, 60, 439/61, 62, 64, 66, 67, 162, 165

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,999,826 A		12/1976	Yurtin	
4,255,640 A		3/1981	Bressler	
4,471,493 A		9/1984	Schober	
4,802,605 A		2/1989	Salmon et al.	
4,825,395 A		4/1989	Kinser, Jr. et al.	
4,842,531 A		6/1989	Takemura	
4,845,772 A		7/1989	Metroka et al.	
4,864,523 A		9/1989	Sasaki	
4,897,873 A		1/1990	Beutler et al.	
4,959,887 A		10/1990	Gruenberg et al.	
4,961,126 A		10/1990	Suzuki	
5,001,659 A		3/1991	Watabe	
5,014,346 A		5/1991	Phillips et al.	
5,027,394 A		6/1991	Ono et al.	
5,141,446 A		8/1992	Ozouf et al.	
5,170,173 A		12/1992	Krenz et al.	
5,259,019 A		11/1993	Stilley	
5,260,998 A		11/1993	Takagi	
5,335,273 A		8/1994	Takagi et al.	
5,394,297 A		2/1995	Toedter	
5,737,053 A	*	4/1998	Yomogihara et al.	349/149
5,760,997 A	*	6/1998	Koyanagi et al.	360/97
5,832,080 A		11/1998	Beutler et al.	
5,844,783 A	*	12/1998	Kojima	361/777
5,897,382 A	*	4/1999	Takahashi	439/31
6,011,699 A		1/2000	Murray et al.	

FOREIGN PATENT DOCUMENTS

GB	2 300 670	11/1996
JP	59-135959	8/1984
JP	59-135960	8/1984
WO	WO 92/17974	10/1992
WO	WO 92/20181	11/1992
WO	WO 93/18592	9/1993

OTHER PUBLICATIONS

Qualcomm Press Release, "Qualcomm Unveils the "Q" Phone: An Extraordinary New Palm–Sized CDMA Digital PCS Phone", Mar. 3, 1997, 4 pages.
Qualcomm Brochure, "the power of digital in the palm of your hand", 2/97, 2 pages.
Pictures of the Qualcomm Q Phone, 6 pages, (No Date).

* cited by examiner

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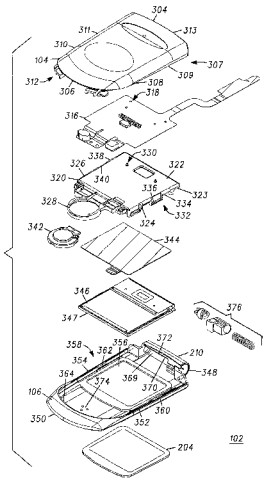
(57) **ABSTRACT**

Apparatus for routing a flexible circuit element **(216)** between a top housing **(102)** and a bottom housing **(108)** in an electronic device such as a radiotelephone **(100)**. The flexible circuit element includes a termination at a tab **(2712)** off the edge of the flex strip, oriented at an angle from the direction of trace routing. This provides the minimum possible flex width so that the flex may be routed through minimally sized openings, in turn minimizing the size of the electronic device.

11 Claims, 11 Drawing Sheets