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Sage et al.

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[54] FREQUENCY AGILE TRANSCEIVER WITH MULTIPLE FREQUENCY SYNTHESIZERS PER TRANSCEIVER

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[51] Int. Cl.⁶ **H04K 1/04; H04L 27/26; H04B 1/38**

[52] U.S. Cl. **375/202; 375/222; 375/376; 340/825.74; 379/59; 370/330; 380/34; 455/422**

[58] Field of Search **375/202, 200, 375/344, 356, 375, 219, 376; 455/33.1, 49.1, 33.4, 50.1, 51.1, 53.1, 54.1, 57.1, 87, 422; 380/33, 21, 48, 49; 395/200.19; 364/232.2, 232.9; 379/58, 59, 62; 340/825.14, 825.2, 825.5, 825.73, 825.74; 370/297, 330**

[56] References Cited

U.S. PATENT DOCUMENTS

4,144,409	3/1979	Utano et al.	379/60
4,777,633	10/1988	Fletcher	370/50
4,785,450	11/1988	Bolgiano et al.	374/95.1
4,825,448	4/1989	Critchlow et al.	375/222
5,224,121	6/1993	Schorman	375/1
5,263,047	11/1993	Kotzin et al.	375/202
5,287,384	2/1994	Avery et al.	375/202
5,303,234	4/1994	Kou	370/85.2
5,448,569	9/1995	Huang et al.	370/95.1
5,483,557	1/1996	Webb	375/349
5,541,954	7/1996	Emi	375/202

FOREIGN PATENT DOCUMENTS

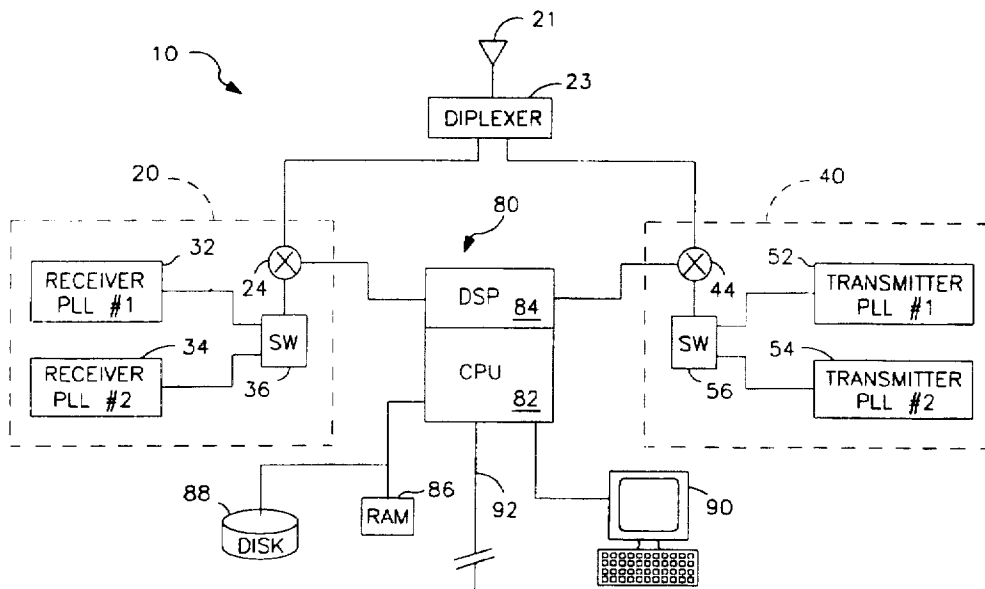
0182762A1	5/1986	European Pat. Off.
0565127A2	10/1993	European Pat. Off.
2612028	9/1988	France
2699769	6/1994	France
2169477	7/1986	United Kingdom
WO 93/20625	10/1993	WIPO

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[57] ABSTRACT

A base station communicates with a plurality of mobile stations over a cellular network. In one embodiment, the base station includes a receiver having a receiver synthesizer input, where the receiver is configured to receive inbound information from the mobile station on a first predetermined frequency. The receiver further has two programmable frequency sources that are configured to alternately supply a receiver synthesizer input signal to the receiver. The base station also includes a transmitter having a transmitter synthesizer input, where the transmitter is configured to transmit outbound information to the mobile station on a second predetermined frequency. The transmitter further has two programmable frequency sources that are configured to alternately supply a transmitter synthesizer input signal to the transmitter. A processor is connected to the receiver and the transmitter and is configured to decode the inbound information and to encode the outbound information to communicate with the mobile station. This two-way communication continues by programming and then alternately selecting the receive synthesizers to receive on the correct frequency, and by programming and then alternately selecting the transmit synthesizers to transmit on the correct frequency. A preferred protocol is Global Systems for Mobile Communication (GSM).

26 Claims, 10 Drawing Sheets



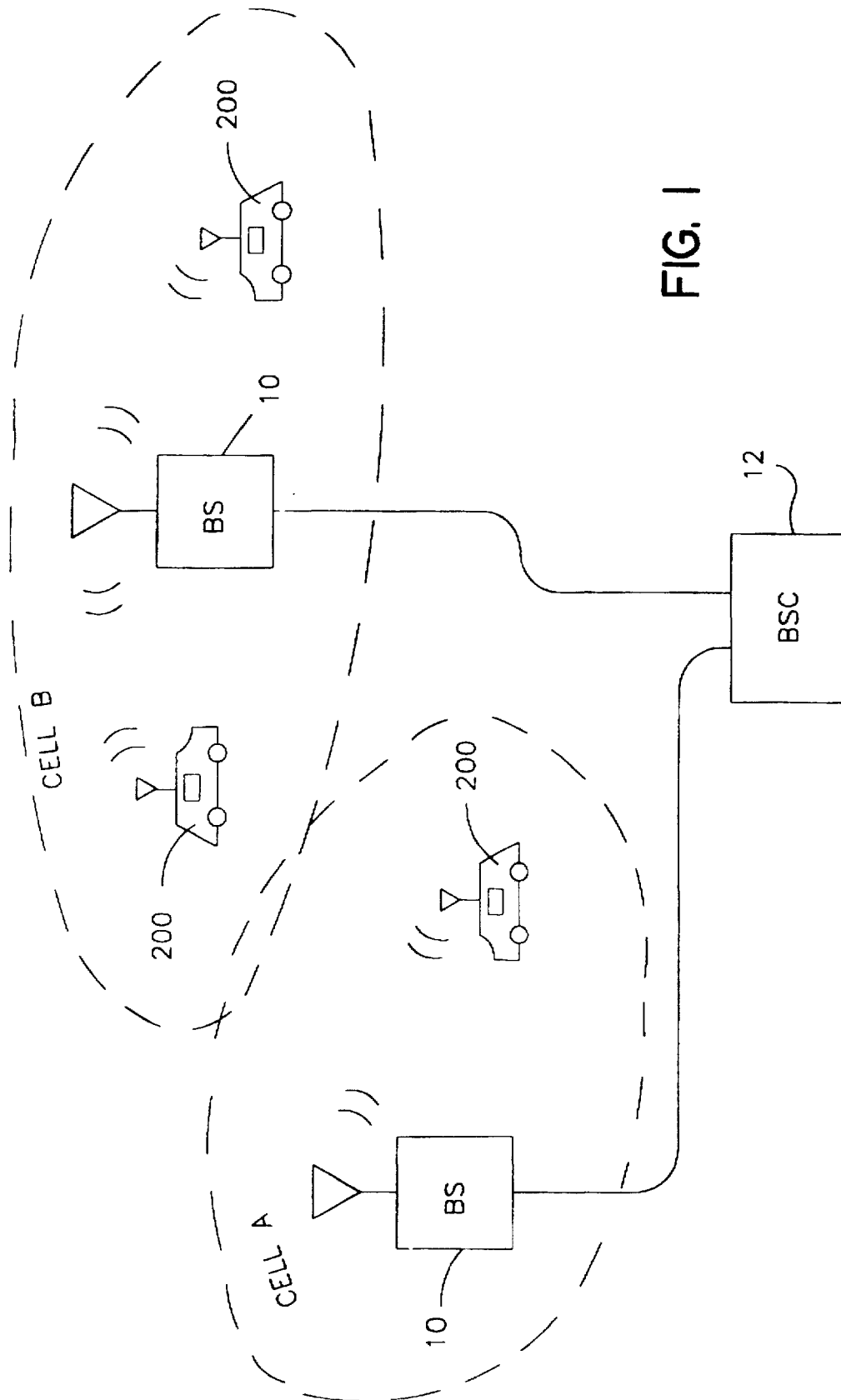


FIG. 1

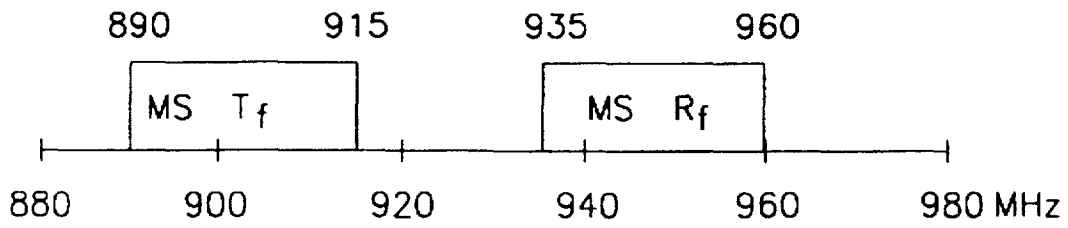


FIG. 2A

#	MS TRANSMIT	MS RECEIVE
0	m0	m0+45MHz
1	m1	m1+45MHz
2	m2	m2+45MHz
3	m3	m3+45MHz
⋮	⋮	⋮
N-1	mN-1	mN-1+45MHz

FIG. 2B

FN FRAME NUMBER
 HSN HOPPING SEQUENCE NUMBER - 0...63
 MA MOBILE ALLOCATION - SET OF N FREQUENCIES
 AVAILABLE FOR USE $m_0...m_{N-1}$
 MAIO MOBILE ALLOCATION INDEX - OFFSET IN MA TABLE
 N NUMBER OF FREQUENCIES IN MA
 RFCHN RAIDO FREQUENCY CHANNEL NUMBER

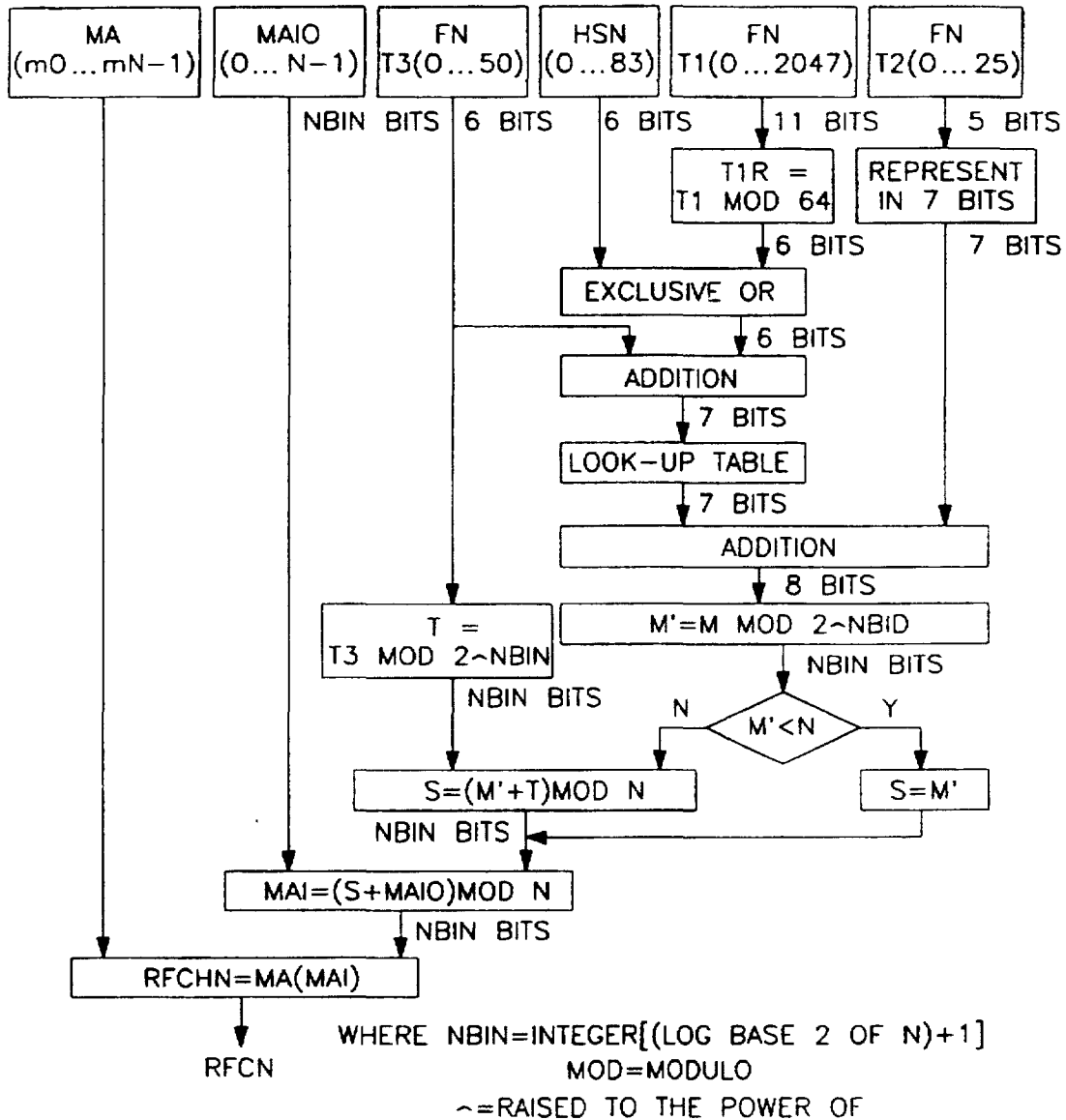


FIG. 2C

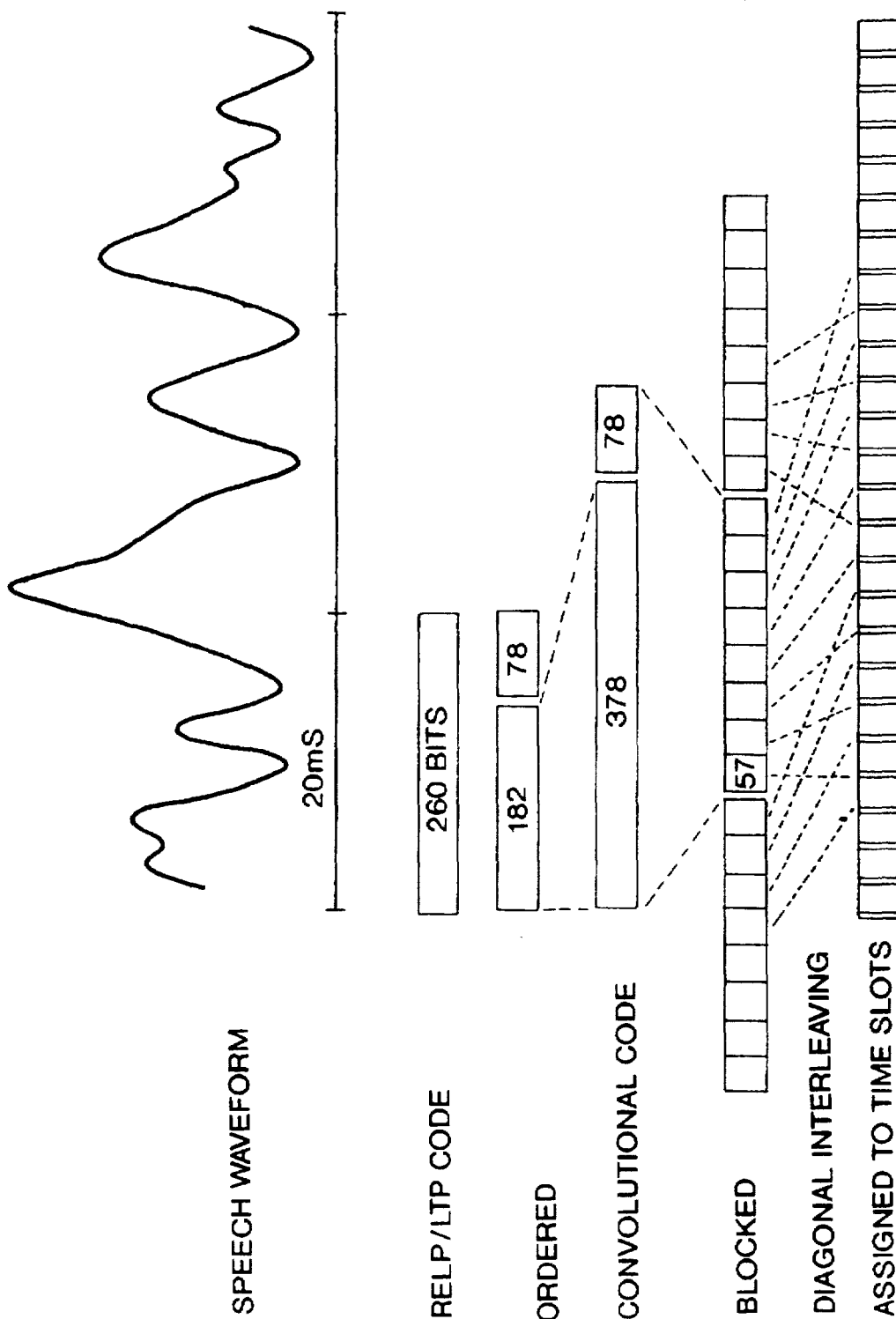


FIG. 3

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