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# United States Patent [19]

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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.<sup>6</sup> ..... **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**

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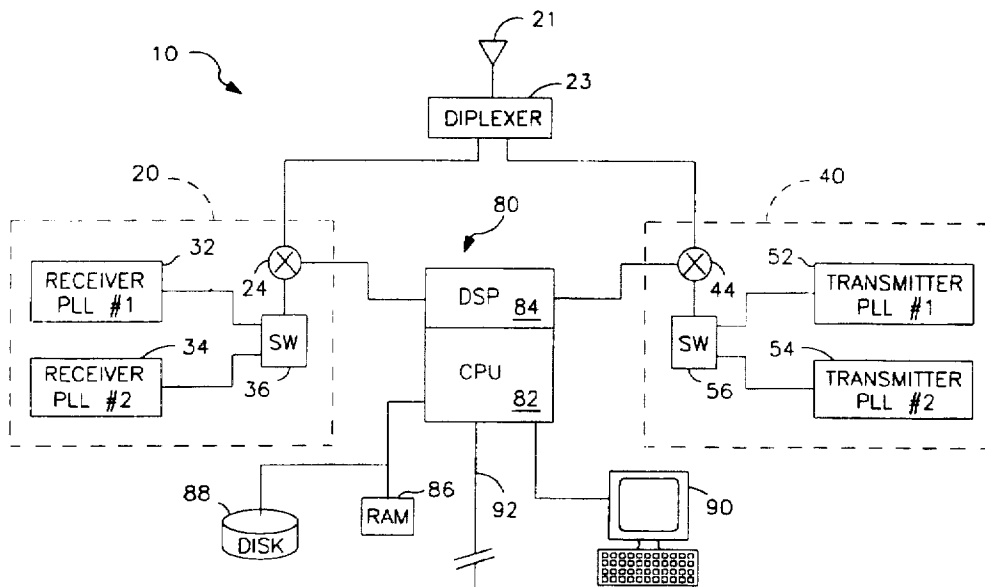
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## [57] ABSTRACT

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**



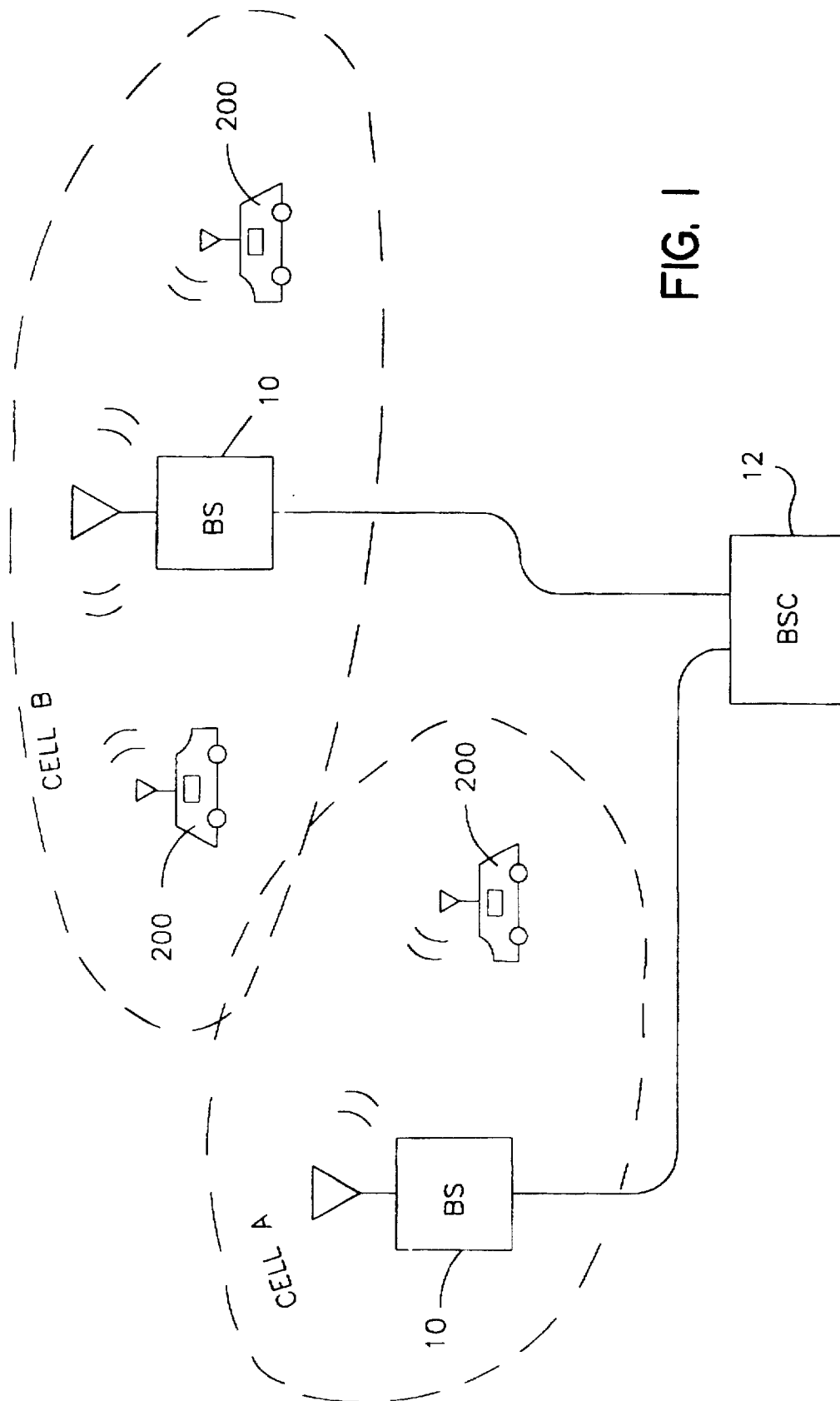


FIG. 1

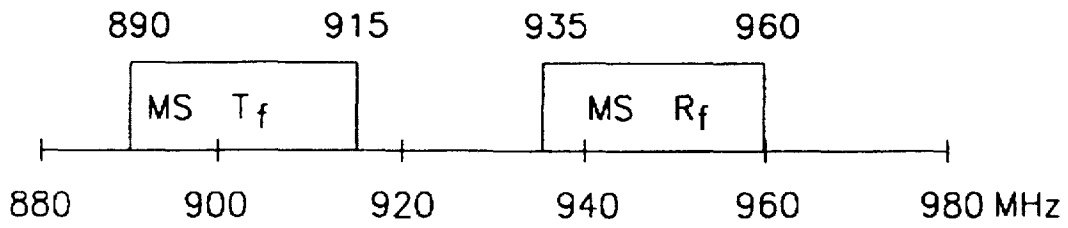


FIG. 2A

#	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

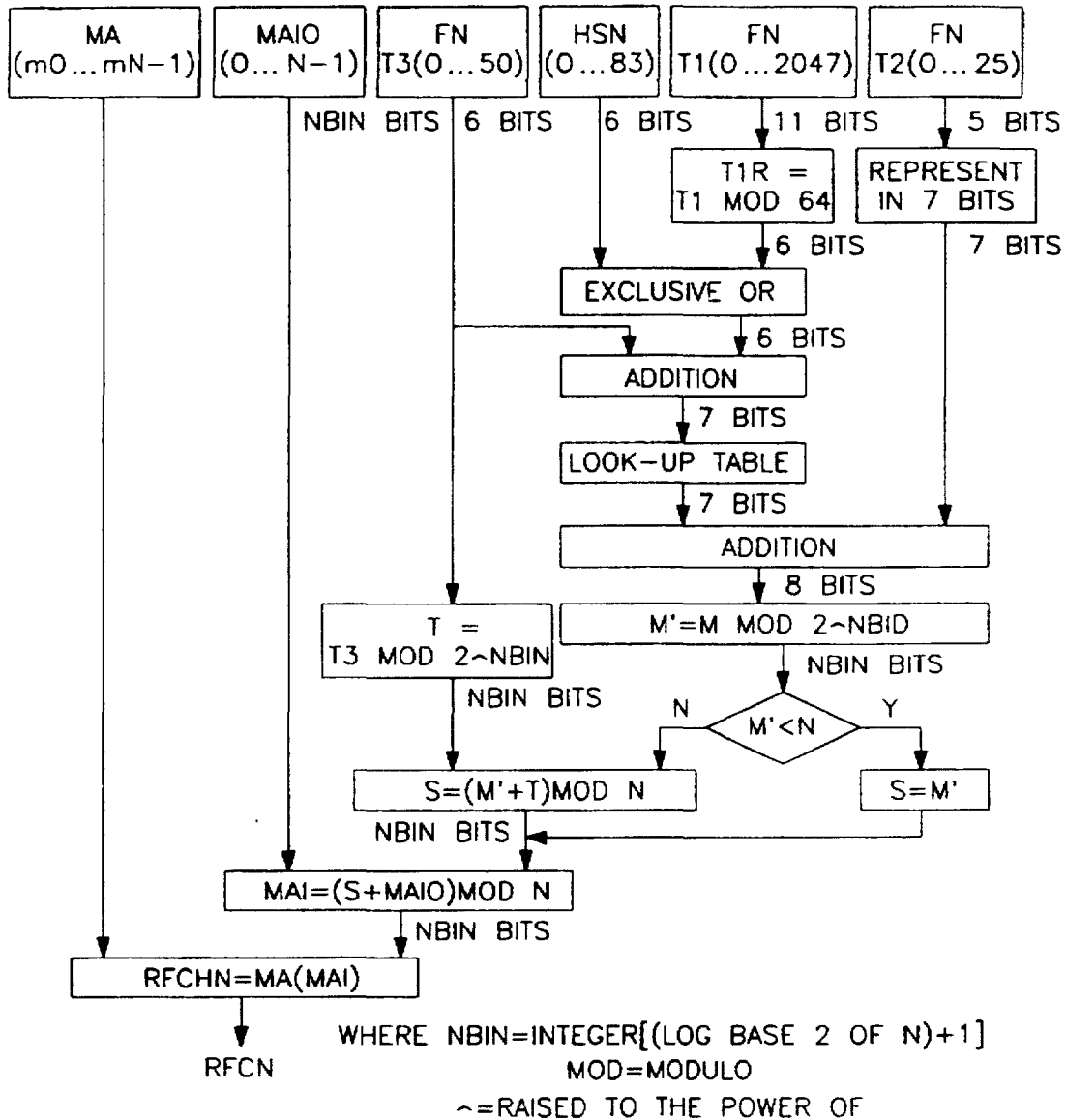


FIG. 2C

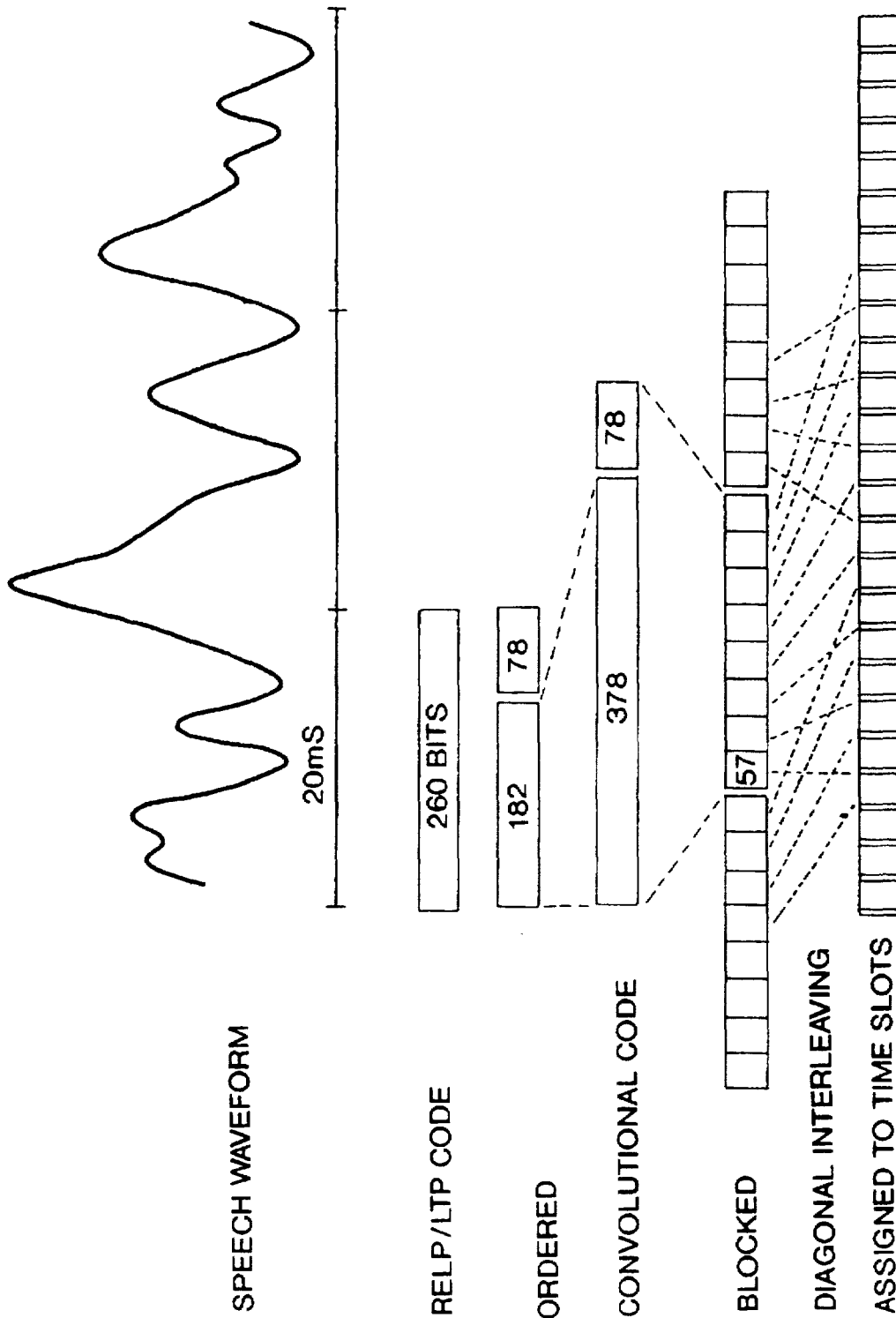


FIG. 3

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