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Saalfrank

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[54] **PROCEDURE FOR THE IDENTIFICATION OF TRANSMITTER OR REGION IN COMMON-WAVE BROADCASTING NETWORKS**

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[51] **Int. Cl.**[6] **H04L 27/28**

[52] **U.S. Cl.** **375/260**; 370/69.1

[58] **Field of Search** 375/38; 370/21, 370/110.1, 69.1, 74, 76; 455/44, 59, 60, 103, 104

[56] **References Cited**

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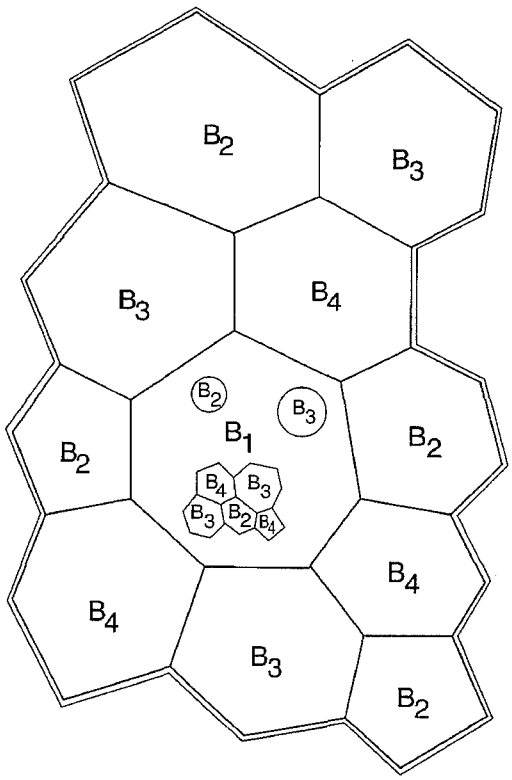
Attorney, Agent, or Firm—Kane, Dalsimer, Sullivan, Kurucz, Levy, Eisele & Richard

[57] **ABSTRACT**

The method pertains to wireless transmission in the common-wave operation. For the operation of common-wave networks, it is required that the modulation contents of the transmission frequencies (**1** . . . m) transmitted by the individual transmitting stations are identical. However, in order to enable a station or regional identification, one or more regionally differing additional carrier frequencies (n-**3** . . . n) are transmitted, whose reception permits the selection of specific regionally related news or messages in the receiver. The demand of additional carrier frequencies may be reduced to four individual frequencies or frequency groups, if these additional carriers are modulated.

6 Claims, 3 Drawing Sheets



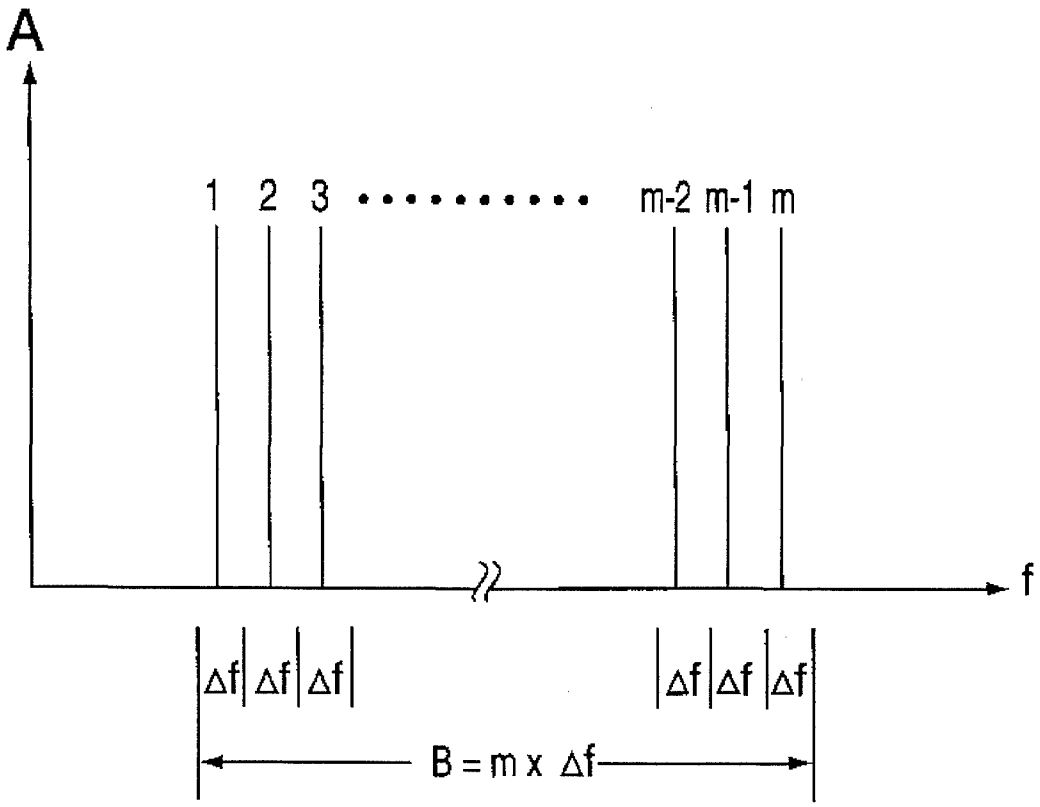


FIG. 1a

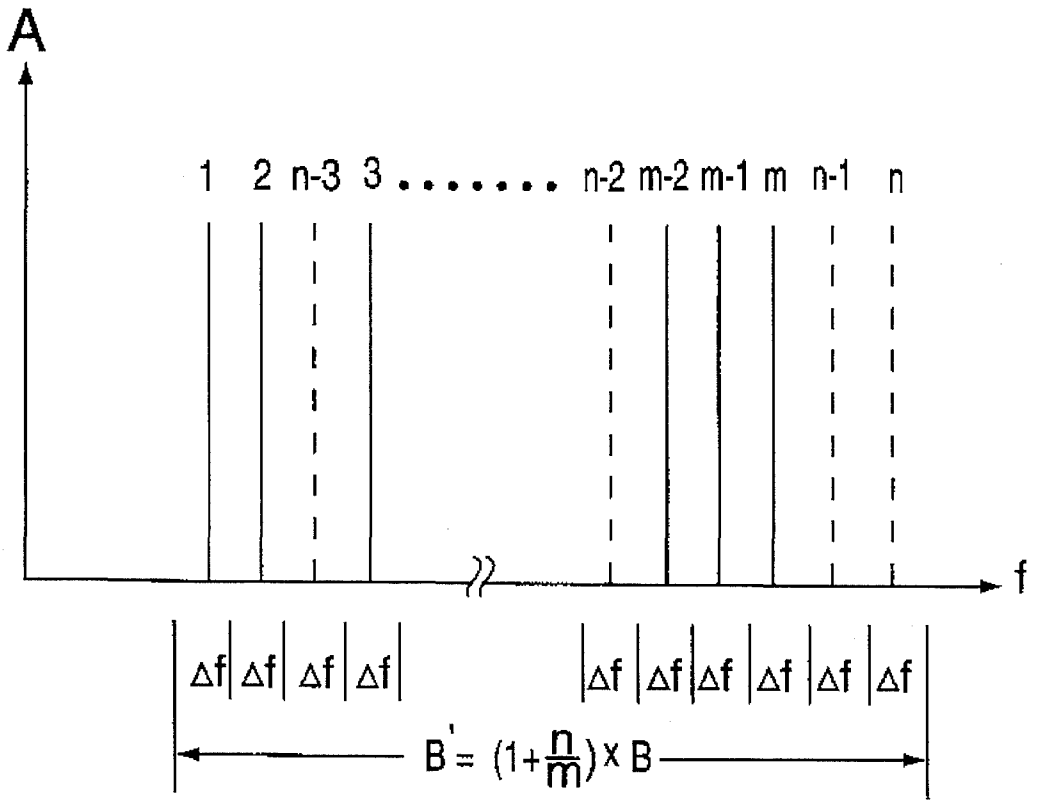


FIG. 1b

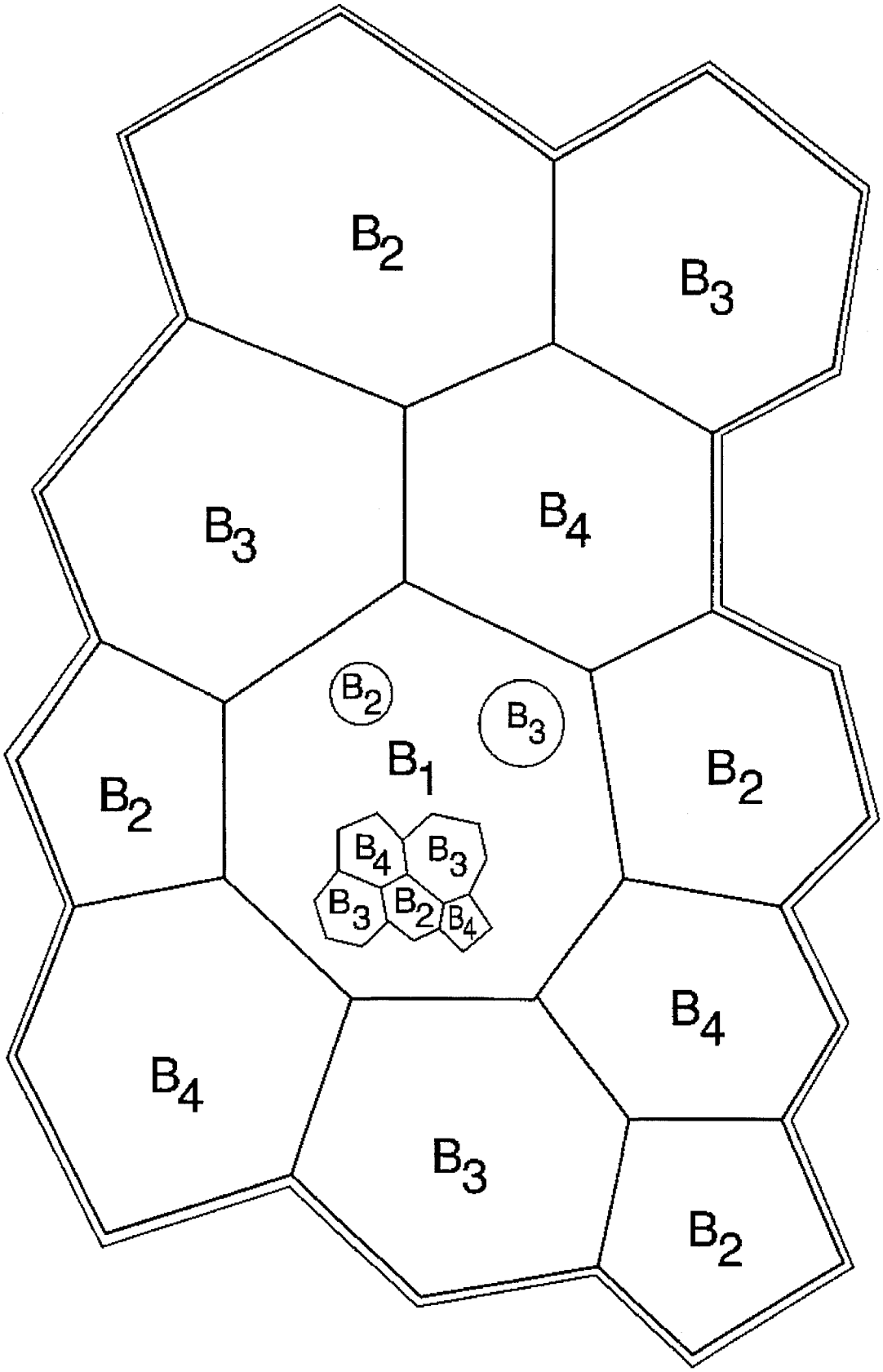


FIG. 2

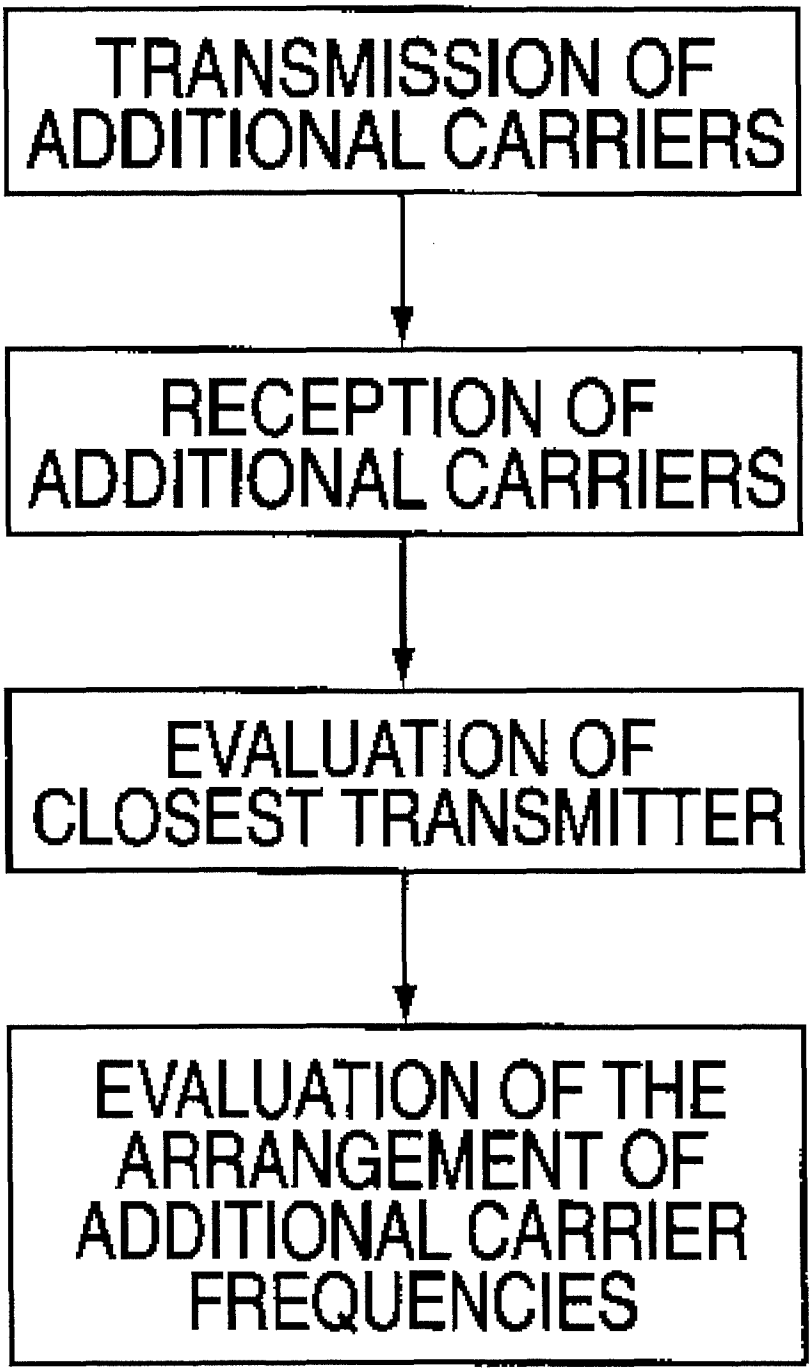


FIG. 3

PROCEDURE FOR THE IDENTIFICATION OF TRANSMITTER OR REGION IN COMMON-WAVE BROADCASTING NETWORKS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to a common-wave broadcasting network wherein additional carrier frequencies which differ from each other from region to region are emitted in order to make transmitter or regional identification possible. Reception of these additionally carrier frequencies make it possible to select at the receiver specialized regional news.

2. Description of the Prior Art

Analog VHF radio transmission is not able to match the quality standard offered by digital recording media (such as compact discs or Digital Audio Tape 'DAT'). Further, mobile reception in a motor vehicle or with portable devices results in further degradation of the reception. Field intensity fluctuations and multipath reception result in signal distortions, whose effects can be reduced only partially by alternating strategies to alternative reception frequencies (for example, in conjunction with the radio data systems).

Digital radio transmission for mobile reception with the aid of satellites is not presently feasible as it is necessary to use receiver antennas with distinct directional effects in view of the relatively low transmission efficiency. Therefore, work has been in progress for a few years to develop a standard for a new terrestrial digital transmission system known as DAB (Digital Audio Broadcasting), see "Funkschau-Spezial", "Digitaler Ton-Von HGrfunk bis Mobiltelefon", 1990, pages 9–18).

One of the specifics of the planned transmission network is the common wave operation of the transmitting station within a country-wide program offering. This means that in a defined region all transmitting stations simultaneously broadcast with the same modulation on the same transmission frequency or the same carrier frequency.

The COFDM (coded orthogonal frequency division multiplex) transmission procedure is provided wherein within a region, for example the transmission area of a European country, a broadcasting station simultaneously transmits about five or six stereo programs by using a carrier frequency bandwidth of, for example, 1.5 megahertz (in addition to the program related and program independent data). Within the available channel bandwidth, a plurality of individual carriers (for example, 448 carrier frequencies equidistant on the frequency axis) are generated with a 4-DPSK (differential phase shift keying) modulation. By scrambling the digital program data in the time sequence and in the allocation to the individual carrier frequencies, transmission errors due to field intensity fluctuation do not extend over longer time connected signal segments and can therefore be more easily corrected.

A detailed explanation of the principal transmission and coding procedure can be found in the article "Digital Sound Broadcasting to Mobile Receivers" in the "IEEE Transactions on Consumer Electronics", Vol. 35, No. 3, August 1989, pages 493–503).

To establish an overlapping transmission network for an area the size of a European country (or equivalently, a U.S. state), it is necessary to provide a minimum of four different transmission channels of a defined bandwidth B, so that the different programs of the different transmission regions do not interfere with each other. With the aid of four different transmission channels, it is possible to plan the frequency distribution to the individual transmission regions in the form of a four cluster, so that an overlapping region or international transmission network has no adjacent joining zones with a different program, but the same transmission frequency. For the common-wave configuration of the DAB-audio broadcasting, a frequency band with a bandwidth of a total of 4×B is required. Naturally, within a transmission region, also a network of locally limited stations may be established with the aid of the remaining three-cluster-frequencies, so that in addition to the 5 . . . 6 (European) country-wide programs, 6 to 18 local programs may be transmitted.

As previously mentioned, the common-wave operation of a (European) country-wide transmission network, for example, requires 100 percent conformity of the modulation content of the frequency proportion transmitted simultaneously by the individual broadcasting stations, in order to enable interference-free decoding of the program data. However, since the future of DAB-network may soon supersede the current VHF radio traffic, the (European) country-wide transmission of the same traffic news, for example, may contradict the goal of direct region or local traffic broadcasts. Furthermore, a driver who drives from one broadcasting region to another should be provided with rough positional information, so that the driver's receiver can be automatically or manually set to the receiving channel of the neighboring region.

OBJECTS AND SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a method and procedure for the identification of a transmitter or region which does not interfere with the common-wave broadcasting operation of the network.

It is therefore a further object of the present invention that the procedure should be able to transmit not regionally related further transmisssion data.

These and other objects are achieved by providing a method and procedure for wireless transmission of digital signals through a broadcasting network operating in the common-wave frequency which simultaneously transmits a plurality of different individual carrier frequencies for all the transmitting stations in the network, which are equidistantly arranged in the frequency axis of a defined transmission frequency band and which are only modulated with portions of the bit sequence representing the digital signals, whereby the modulation contents of the individual carrier frequencies are identical for all transmitting stations of the transmitting region, characterized in that for identifying at least one transmitting station in a local transmitting region, at least one transmission specific or regionally differing unmodulated individual carrier frequencies are simultaneously transmitted from this and, if necessary, other transmitting stations, whose configuration in the frequency domain are evaluated for station identification and which do not interfere with the transmission of these signals in the common-wave operation within overlapping transmission areas of individual transmitting stations, due to the reception of these signals separately from the information and control signal modulation.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

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