

CHANNEL IDENTIFICATION BY A MULTICHANNEL SELECTIVE CALL RECEIVER

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Field of the Invention

This invention relates to selective call receivers, such as pagers, operating in a communication environment. In particular, this invention relates to, but is not necessarily limited by, channel identification by a multichannel selective call receiver operating in a communication environment.

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Background of the Invention

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Selective call receivers, such as pagers, receive information that is typically formatted according to messaging protocols defined for selective calling in a communication environment. For example, in Motorola's FLEX™ messaging protocol, information is grouped into blocks or frames to form cycles for transmitting on a carrier frequency or channel. A FLEX™ cycle has one hundred and twenty eight frames of which some are mandatory frames having information specifying channel parameters that must be received by selective call receivers. Channel parameters in the FLEX™ messaging protocol include Simulcast System Identifier (SSID) and a frame offset value. Part of the SSID is recognized by every selective call receivers supported by a FLEX™ selective call system and the frame offset value provides an indication of assigned frames within FLEX™ cycles from which the selective call receiver receives information when operating in the FLEX™ selective call system. Frames are assigned based on the frame offset value for each FLEX™ selective call system so as to prevent frame collisions when a selective call receiver operates in, for example, overlapping areas between different FLEX™ selective call systems.

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Selective call receivers in the FLEX™ communication environment can also be supported by different FLEX™ selective call systems. Such selective call receivers typically receive information on more than one channel and are termed multichannel selective call receivers. In different

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FLEX™ selective call systems, a channel can be valid or invalid for a multichannel selective call receiver to receive information. A valid channel provides information specifically addressed to the multichannel selective call receiver.

5 Multichannel selective call receivers in the FLEX™ communication environment need to synchronize to FLEX™ cycles transmitted synchronously in different FLEX™ selective call systems at predetermined times. The FLEX™ cycles are transmitted synchronously by referencing to external time signals provided by, for example, a Global Positioning
10 System. Every frame in a FLEX™ cycle has a synchronization codeword to which the multichannel selective call receivers synchronize. One benefit of synchronization to the FLEX™ cycles is that the multichannel selective call receivers can save on battery power as such receivers need to receive mandatory frames and, thereafter, determine and receive only on assigned
15 frames. Some circuitry of the selective call receivers can be turned off or minimally operated to conserve their battery power during non-assigned frames.

 Multichannel selective call receivers need to synchronize to a channel before determining whether the channel is valid or invalid. This
20 can be a problem when the multichannel selective call receivers are receiving information from more than one channel such as, for example, in overlapping areas between different FLEX™ selective call systems. Slow or ineffective channel identification causes a multichannel selective call receiver to receive information unreliably or even miss the information.

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Summary of the Invention

 It is an object of this invention to overcome or at least alleviate at least
30 one of the limitations associated with channel identification by a multichannel selective call receiver operating in a communication environment.

 According to one aspect of the invention, there is provided a selective
35 call receiver comprising:

 a receiver for receiving information on at least one channel;

and

processing means coupled to said receiver,

wherein said processing means is adapted to process said information when synchronized to said channel to determine
5 whether said channel is of a messaging protocol usable by said selective call receiver and, if usable, maintaining synchronization to said channel irrespective of said channel being valid or invalid.

10 Preferably, said processing means can be further adapted to search for at least one valid channel while maintaining synchronization to said channel.

Suitably, said information can be grouped into frames to form a cycle, said cycle being transmitted on said channel at predetermined times,
15 wherein said processing means is further adapted to search for said valid channel while maintaining synchronization to mandatory frames of said cycle.

20 Preferably, said processing means can comprise a memory for storing one or more channel parameters for processing said information, said channel parameters including an identifier.

Suitably, said processing means can further comprise a controller adapted to match said information with part of said identifier.
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Preferably, said controller is further adapted to match said information with said identifier.

30 According to another aspect of the invention, there is provided a method for channel identification by a multichannel selective call receiver, said method comprising the steps of:

35 processing information when synchronized to at least one channel to determine whether said channel is of a messaging protocol usable by said selective call receiver; and
maintaining synchronization to said channel irrespective of said channel being valid or invalid when said messaging protocol is

usable.

Preferably, said method may further comprise the step of searching for at least one valid channel while maintaining synchronization to said
5 channel.

Suitably, said step of processing can comprise the step of matching said information with part of an identifier stored in said selective call receiver.
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Preferably, said step of processing can comprise the step of matching said information with an identifier stored in said selective call receiver.

Suitably, said step of maintaining synchronization can comprise the step of periodically synchronizing to one or more portions of said information.
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Preferably, said step of maintaining synchronization can comprise the step of periodically synchronizing to one or more mandatory portions of said information.
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Brief Description of the Drawings

25 In order to describe the invention and to put it into practical effect, reference will now be made to a preferred embodiment as illustrated with reference to the accompanying drawings in which:

FIG. 1 shows structure of a FLEX™ cycle in accordance with a preferred embodiment of the invention;
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FIG. 2 shows a block diagram of a selective call receiver for receiving the FLEX™ cycle of FIG. 1; and

35 FIG. 3 is a flow diagram showing a method of operating the selective call receiver of FIG. 2.

Detailed Description of the Invention

FIG. 1 shows structure of a FLEX™ cycle 1. A frame 2 is indicated with a synchronization codeword 3 having three fields: a "Sync 1" field 4, a "Frame Information" field 5 and a "Sync 2" field 6. Frame 2 also has a plurality of blocks of which two blocks 8,9 are indicated. A bit in "Frame Information" field 5 indicates that FLEX™ cycle 1 is transmitted on a channel which supports multichannel selective call receivers. Such a channel is termed a roaming channel. Mandatory frames in FLEX™ cycle 1 has an SSID that is two 32 bit codewords. The two 32 bit codewords are termed in the FLEX™ messaging protocol as Block Information Word "000" and Block Information Word "111". Block Information Word "000" is contained in every other frame in FLEX™ cycle 1 and, in this specification, is termed as a partial SSID. The partial SSID is recognized by every multichannel selective call receivers of a FLEX™ selective call system.

FIG. 2 shows a block diagram of a selective call receiver 10 for receiving FLEX™ cycle 1. Selective call receiver 10 comprises a receiver 11 and processing means 12. Receiver 11 couples to an antenna 15 for receiving information modulated on at least one channel. A channel 16 of the at least one channel is shown by way of example in FIG. 2. Processing means 12 couples to receiver 11 and includes a controller 13 and a memory 14. Controller 13 couples to control receiver 11 and memory 14. Memory 14 stores one or more channel parameters for controller 13 to process information received on channel 16. The channel parameters include an identifier termed as a Simulcast System Identifier (SSID), a frame offset value determinator, an assigned frames designator and a channel list. The channel list is indicative of the at least one channel on which information can be received by selective call receiver 10. These channels may be valid or invalid channels depending on whether they provide information specifically addressed to selective call receiver 10.

Processing means 12 is adapted to process information when synchronized to channel 16 to determine whether channel 16 is of a messaging protocol usable by selective call receiver 10. In this preferred embodiment, the messaging protocol is Motorola's FLEX™ messaging protocol as shown in FIG. 1. If usable in that channel 16 is a roaming

channel with the FLEX™ messaging protocol, then controller 13 controls receiver 11 to maintain synchronization to channel 16 irrespective of channel 16 being valid or invalid.

5 Maintaining synchronization to channel 16 even when invalid enables processing means 12 to search for at least one valid channel based on the channel list stored in memory 14. Selective call receiver 10 can maintain synchronization to channel 16 by, for example, periodically synchronizing to one or more portions of the information. Thus, the invention
10 advantageously identifies valid channels quicker so that mandatory frames can be more reliably detected to receive information on assigned frames. Furthermore, selective call receiver 10 need only scan the mandatory frames of FLEX™ cycle 1 in such valid channels and, therefore, saves battery power.

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FIG. 3 is a flow diagram showing a method of operating selective call receiver 10. Starting at step 21, controller 13 determines whether receiver 11 is synchronized to a channel at decision step 22. If decision step 22 is a "Yes", method 20 proceeds to decision step 23 in which controller 13
20 determines whether the channel has part of the identifier or a partial SSID matched to that of selective call receiver 10 stored in memory 14. If decision step 22 is a "No", controller 13 continues to monitor receiver 11 by periodically repeating decision step 22.

25 For a "No" at decision step 23, method 20 proceeds to step 28 in which controller 13 controls receiver 11 in maintaining synchronization to the channel. This channel may be an invalid channel with respect to selective call receiver 10. However, such an invalid channel can still be a roaming channel that supports multichannel selective call receivers albeit
30 of a different FLEX™ selective call system. As such, whether valid or invalid, the channel can have a FLEX™ messaging protocol that is usable by selective call receiver 10 to maintain synchronization by, for example, periodically synchronizing to one or more portions of the information. While maintaining synchronization with the channel at step 28, method 20
35 proceeds to step 29 in which controller 13 controls receiver 11 in searching for another channel according to the channel list stored in memory 14. At decision step 30, controller 13 determines whether another channel is

found following the searching of step 29. If decision step 30 is a "Yes", method 20 is repeated from decision step 23 to determine whether the another channel has a partial SSID matching that of selective call receiver 10. If decision step 30 is a "No", method 20 proceeds to decision step 31 to
 5 determine whether the channel synchronized earlier at step 22 is within range. From a "Yes" at decision step 31 method 20 is repeated from step 28 at which controller 13 controls receiver 11 by maintaining synchronization to the channel synchronized earlier at decision step 22. Otherwise, from a "No" at decision step 31, method 20 proceeds to
 10 decision step 22 for selective call receiver 10 to synchronized to a channel.

For a "Yes" at decision step 23, method 20 proceeds to step 24 where controller 13 controls receiver 11 in receiving information at every frame to detect mandatory frames of a FLEX™ cycle. Detecting the mandatory
 15 frames provides controller 13 with channel parameters of the FLEX™ cycle such as an SSID and a frame offset value. Proceeding to step 25, the SSID of the channel is compared with that of selective call receiver 10 stored in memory 14.

If the SSID is not matched with that of selective call receiver 10,
 20 method 20 proceeds to step 28 at which controller 13 controls receiver 11 in maintaining synchronization to the channel by, for example, periodically synchronizing to one or more mandatory portions of the information. Such mandatory portions are of the mandatory frames. Subsequently, method 20 continues as described above with a "No" from decision step 23.

25 If the SSID matches that of selective call receiver 10, controller 13 will then control receiver 11 in receiving information only at assigned frames at step 26. Such assigned frames, including a first assigned frame, are determined in accordance with the FLEX™ messaging protocol. For example, controller 13 can determine the assigned frames by processing
 30 the frame offset value detected in the mandatory frames at step 24 using the frame offset determinator and the assigned frames designator stored within memory 14.

In addition, method 20 also provides decision step 27 in which
 35 controller 13 controls receiver 11 to determine whether the channel is within range for receiving information. If decision step 27 is a "Yes", then controller 13 continues maintaining synchronization to the channel so as to

receive information transmitted subsequently. Otherwise, for a "No" from decision step 27, method 20 proceeds to decision step 22 for selective call receiver 10 to synchronized to a channel.

- 5 By maintaining synchronization to a channel irrespective of the channel being valid or invalid and sampling all frames after partial SSID matching but before mandatory frames, the invention advantageously enables quicker channel identification to more reliably receive the information. Even though synchronized to an invalid channel, the invention
- 10 searches for at least one valid channel. Furthermore, when synchronized to mandatory frames of FLEX™ cycles, battery savings is enhanced even when selective call receiver 10 has to receive information on more than one channel in, for example, different FLEX™ selective call systems or in overlapping areas between the different FLEX™ selective call systems.
- 15 Hence, the invention overcomes or at least alleviate at least one of the limitations associated with channel identification by a multichannel or roaming selective call receiver operating in a communication environment.

20 We claim:



Claims

1. A selective call receiver comprising:
5 a receiver for receiving information on at least one channel;
 and
 processing means coupled to said receiver,
 wherein said processing means is adapted to process said
10 information when synchronized to said channel to determine
 whether said channel is of a messaging protocol usable by said
 selective call receiver and, if usable, maintaining synchronization to
 said channel irrespective of said channel being valid or invalid.
- 15 2. The selective call receiver as claimed in Claim 1, wherein said
 processing means is further adapted to search for at least one valid
 channel while maintaining synchronization to said channel.
- 20 3. The selective call receiver as claimed in Claim 1, wherein said
 information is grouped into frames to form a cycle, said cycle being
 transmitted on said channel at predetermined times, wherein said
 processing means is further adapted to search for said valid channel while
 maintaining synchronization to mandatory frames of said cycle.
- 25 4. The selective call receiver as claimed in Claim 1, wherein said
 processing means comprises a memory for storing one or more channel
 parameters for processing said information, said channel parameters
 including an identifier.
- 30 5. The selective call receiver as claimed in Claim 4, wherein said
 processing means further comprises a controller adapted to match said
 information with part of said identifier.
- 35 6. The selective call receiver as claimed in Claim 4, wherein said
 processing means further comprises a controller adapted to match said
 information with said identifier.



7. A method for channel identification by a multichannel selective call receiver, said method comprising the steps of:

5 processing information when synchronized to at least one
channel to determine whether said channel is of a messaging
protocol usable by said selective call receiver; and
 maintaining synchronization to said channel irrespective of said
channel being valid or invalid when said messaging protocol is
usable.

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8. The method as claimed in Claim 7 wherein said method further
comprises the step of searching for at least one valid channel while
maintaining synchronization to said channel.

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9. The method as claimed in Claim 7 wherein said step of
processing comprises the step of matching said information with part of an
identifier stored in said selective call receiver.

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10. The method as claimed in Claim 7 wherein said step of
processing comprises the step of matching said information with an
identifier stored in said selective call receiver.

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11. The method as claimed in Claim 7 wherein said step of
maintaining synchronization comprises the step of periodically
synchronizing to one or more portions of said information.

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12. The method as claimed in Claim 7 wherein said step of
maintaining synchronization comprises the step of periodically
synchronizing to one or more mandatory portions of said information.

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13. A selective call receiver comprising a receiver and processing
means substantially as described herein with reference to and as
illustrated by the accompanying drawings.

14. A method for channel identification by a multichannel selective
call receiver substantially as described herein with reference to and as
illustrated by the accompanying drawings.