

Description

The present invention relates to a mobile communications system.

In a prior art mobile communications system, a base station (connecting unit) is connected to a switched telephone network and radio speech channels are established between it and portable telephones. A control channel is used during channel acquisition and release to transmit control signals including a control signal. The base station constantly monitors the status of calls and the request of a call from mobile units by sequentially scanning the speech channels and control channel. The control signal of the system includes a preamble which is a 12-bit sequence of alternating 1's and 0's for clock timing recovery, a frame sync field containing a 16-bit sequence of "1100010011010110", and a 37-bit calling sequence which is a 25-bit user's identification code encoded with 12 error correcting bits. The base station recovers clock timing from the preamble of a control signal received on the control channel and proceeds to detect a frame sync code from the subsequent frame sync field of the control signal. Upon detection of a frame sync, the base station stores the following calling sequence into a buffer by counting the recovered clock pulses. However, the error correction encoding can result in a bit sequence identical to the 16-bit frame sync code. For example, encoding of an identification code "806240" results in a 37-bit code "0000011000100110101100000000001011011" which contains a sequence having the same bit pattern as the 16-bit frame sync code as identified by an underline. To prevent the stored calling sequence from being disrupted by a false sync code, the base station is "locked" into a state in which it is insensitive to the subsequent frame sync until whole bits of a calling sequence are stored into the buffer.

One shortcoming of this approach is that, due to the constant scanning operation, the base station may switch from one speech channel to the control channel at the instant a calling sequence is being received. If this calling sequence contains a false sync code, and if clock timing is shortly recovered, such false sync code will be detected and the buffer will be supplied with information other than the intended calling sequence. The result is a decision by a decoder that a mismatch has occurred between the received user's identification code and a stored version of the code. Since the base station remains locked in response to frame sync until the buffer is completely supplied with a 37-bit sequence, the true sync code of the next control signal can occur in this locked state, and the base station will be locked again following the next false sync code, and a mismatch decision is repeated. This process continues indefinitely.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a mobile communications system which is insensitive to false sync codes which might be falsely embedded in a control signal.

A mobile communications system of this invention include a base station and one or more mobile stations, the base station being connected to a switched telecommunication network. The base station comprises a transceiver for establishing speech channels with the mobile stations for carrying information signals between the mobile stations and the switched telecommunication network and a control channel for carrying a control signal between the base station and the mobile stations. The transceiver sequentially scans the speech channels and the control channel for monitoring status of calls and detecting a control signal transmitted from an originating mobile station. The control signal contains a sync field containing a sync code of a unique format, and an identification field containing the originating mobile station's identification code which follows the sync field and may undesirably contain a code identical to the unique format.

According to a first aspect of this invention, the base station comprises a sync detector for detecting a code identical to the unique format and deriving therefrom an output signal. First and second buffers are provided for storing a successive bit sequence of the control signal. A decoder is coupled to the first and second buffers for decoding contents of each of the buffers and detecting a match between the decoded contents of each buffer and a stored version of the mobile station's identification code. A buffer controller is responsive to an earlier one of two successive output signals from the sync detector for counting bits stored in the first buffer from the instant the earlier output signal is generated, and responsive to a later one of the successive output signals for counting bits stored in the second buffer from the instant the later output signal is generated. The buffer controller causes the bit sequence stored into the first buffer to be loaded into the decoder when the bit count thereof reaches a predetermined value and causes the bit sequence stored into the second buffer to be loaded into the decoder when the bit count thereof reaches the predetermined value. When a match is detected by the decoder, a control signal indicative of the match is transmitted through the control channel to the originating mobile station.

According to a second aspect of this invention, the base station comprises a sync detector for detecting a code identical to the unique format and deriving therefrom an output signal. First and second buffers are provided for storing a successive bit sequence of the control signal. A decoder is coupled to the first and second buffers for decoding contents of each of the

buffers and detecting a match between the decoded contents of each buffer and a stored version of the mobile station's identification code. A single buffer is provided for storing a successive bit sequence of the control signal. A buffer controller responds to each of two successive output signals from the sync detector if the output signals are spaced apart from each other a first interval or exclusively responsive to an earlier one of the two successive output signals if they are spaced apart from each other a second interval smaller than the first interval by counting bits stored into the single buffer and causing the stored bit sequence of the buffer means to be supplied to the decoder when the count value reaches a predetermined value.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described in further detail with reference to the accompanying drawings, in which:

Fig. 1 is a block diagram of a mobile communications system according to an embodiment of the present invention;

Figs. 2A and 2B are timing diagrams associated with the embodiment of Fig. 1;

Fig. 3 is a block diagram of a mobile communications system according to a modified embodiment of this invention; and

Figs. 4A and 4B are timing diagrams associated with the embodiment of Fig. 3.

DETAILED DESCRIPTION

Referring now to Fig. 1, there is shown a mobile communications system of the present invention. The system comprises a base station 1 and a plurality of mobile stations 6 such as "cordless" telephones. Base station 1 includes a line interface 2 by which it is connected through an exchange line 4 to a switched telecommunication network 5 and a multi-channel transceiver 3 through which the base station establishes speech channels with the mobile stations using a special channel, known as control channel according to a well known channel assignment algorithm. Transceiver 3 successively scans all channels under control of a base-station controller 17 to monitor the status of calls carried on speech channels and to receive control signals from mobile stations 6 on the control channel. The control channel is provided by a subcarrier frequency on which the control signal is modulated according to MSK (minimum phase shift keying) format. When received from any mobile station, transceiver 3 converts the MSK subcarrier signal to a nonreturn-to-zero (NRZ) format. Station controller 17 is connected to line interface 2 to detect calls from the switched network 5 and sends an off-hook signal thereto in response to a call request signal from the mobile stations.

When a call is originated from a mobile station, it sends a call request signal containing a 12-bit sequence of alternating 0 and 1 symbols as a preamble, a 16-bit sequence of frame sync code and a 37-bit sequence of calling information. The NRZ signal is then applied to a clock recovery circuit 7 which utilizes the 12-bit clock timing recovery field of the incoming signal to establish the reference clock timing for the base station.

The output of clock recovery circuit 7 is coupled to a bit synchronizer 8 to allow it to clearly sample the incoming data stream at significant instants to recover a replica of the original pulse stream. The output of synchronizer 8 is applied to a frame sync detector 9 which checks each successive sequence of incoming bits with a predetermined frame sequence and generates an output to trigger a T flip-flop 10 into one of binary states upon detection of a frame sequence which occurs in the 16-bit frame sync field of the call request signal. The frame sequence may also occur in the 37-bit calling sequence depending on the subscriber identification code. The output of synchronizer 8 is also applied to buffers 13 and 14 whose contents are loaded into a decoder 16 in response to a load command signal applied thereto.

The binary states at the Q and $\bar{Q}$ outputs of flip-flop 10 alternate in response to each occurrence of the output of frame sync detector 9 so that the Q output changes to significant level when the sync detector first generates its output and the $\bar{Q}$ output changes to the significant level when a frame sync is subsequently detected again. The Q and $\bar{Q}$ outputs of flip-flop 10 are coupled respectively to the reset inputs of 37-bit counters 11 and 12 to which the output of clock recovery circuit 7 is also applied. Counters 11 and 12 each generate an output when it is clocked to a count equal to the bits contained in the calling sequence, i.e., 37 bits. The outputs of counters 11 and 12 are supplied as a load command signal to buffers 13 and 14, respectively, and by way of an OR gate 15 to decoder 16. In response to the respective load command inputs, the contents of each buffer are transferred to decoder 16 in which they are checked for error detection and correction and then the contents of a memory, not shown, are searched for one-to-one coincidence with a subscriber's identification code. If they match, decoder 16 communicates this fact to station controller 17 to allow it to communicate this fact to the calling station through transceiver 3. On receiving this signal, the calling station ceases transmission of the control signal.

The operation of the mobile communications system of this invention will be best understood by reference to Figs. 2A and 2B in which it is assumed that the switching instant from a speech channel to the control channel occurs at time T_0 . In Fig. 2A, the mobile station sends a control signal signaling the origination of a call, including a preamble, a frame sync

and an encoded calling sequence identifying that station. If the ID code of this mobile station is such that, when encoded with redundant bits according to a particular error detection and correction algorithm, it produces a false frame sync in the 37-bit calling sequence. If the channel switching instant T_0 occurs in the calling sequence of first occurrence as indicated, and if clock timing has been established shortly following time T_0 , a false frame sync will be detected by frame sync detector 9, resulting in a frame-sync output signal of first occurrence at time T_1 . At the same time, the same bit sequence as that supplied from synchronizer 8 to sync detector 9 is continuously stored into buffers 13 and 14.

The output of sync detector 9 triggers flip-flop 10 into a first binary condition in which it supplies a reset signal to counter 11. Counter 11 thus begins counting clock pulses from clock recovery circuit 7, and at the count of 37 bits it applies a load command signal to buffer 13 and via OR gate 15 to decoder 16 at time T_2 . As the contents of buffer 13 are totally different from the calling sequence, decoder 16 produces an output indicating a mismatch. Base-station controller 17 ignores this mismatch signal and continues to monitor the output of decoder 16.

At time T_3 , a true frame sync is detected by sync detector 9 and therefore a second frame-sync output is applied to flip-flop 10, switching it into a second binary condition in which it supplies a reset pulse to counter 12. Counter 12 begins counting clock pulses and at the count of 37 bits a load command signal is applied to buffer 14 and decoder 16 at time T_4 . Thus, at time T_4 , buffer 14 is filled with the calling sequence of second occurrence in the incoming data stream, and decoder 16 produces a signal indicating a match. Base-station controller 17 now recognizes that the calling station is one that is authorized for access to the base station and sends a signal through transceiver 3 to the originating station to cause it to cease the transmission of a subsequent control signal.

Assume that the channel switching instant T_0 occurs prior to a preamble as shown in Fig. 2B and the same mobile station as in the example of Fig. 2A has placed a call request. Frame sync detector 9 will produce a first output at time t_1 in response to a true frame sync in the incoming data stream, then a second output at time T_2 in response to a false frame sync embedded in a calling sequence of the data stream. Counters 11 and 12 are respectively triggered at times T_1 and T_2 to supply a first load command from counter 11 to buffer 13 and decoder 16 upon the count of 37 bits at time T_3 . This results in the generation of a signal by decoder 16 indicating a match, and the calling mobile station is informed of this fact to cease transmission of a subsequent control signal. Thus, at the count of 37 bits by counter 12, a mismatch signal is generated at time T_4 which is ignored by base-station controller 17.

A modified embodiment of this invention is shown in Fig. 3. This embodiment is suitable for applications in which the true and false sync sequences are not equally spaced apart from each other. In this modification, a single buffer is used instead of the two-buffer scheme of Fig. 1 by inhibiting the output of frame sync detector 9 of second occurrence. As illustrated, the output of frame sync detector 9 is coupled to an inhibit pulse generator 20 which generates a pulse of duration sufficient to cover the instants at which the false frame sync is likely to occur following a true frame sync. The output of sync detector 9 is further applied to an inhibit gate 21 to which the inhibit pulse is applied to prevent the passage of a false sync detector output to the reset input of a 37-bit counter 22. A single buffer 23 constantly stores bit sequences from synchronizer 8 and responds to the output of counter 22 by loading its contents to decoder 16 at the count of 37 bits.

The operation of Fig. 3 will be understood by reference to Figs. 4A and 4B. If the channel switching instant T_0 occurs in the calling sequence of a first control signal as shown in Fig. 4A, a sync detector output pulse $a1$ of first occurrence is generated in response to the false sync embedded in that calling sequence and is passed through the inhibit gate 21 to allow it to reset counter 22, causing it to start counting 37 bits of incoming data at time T_1 . An inhibit pulse $b1$ is generated in response to the sync detector pulse $a1$, but it produces no effect on the buffer load timing, and a "mismatch" decision is taken by decoder 16 at time T_2 . A sync detector output $a2$ is then generated at time T_3 in response to the true frame sync contained in the next control signal and is passed through inhibit gate 21 to counter 22, resetting it to start counting the next 37 bit sequence which exactly corresponds to the calling sequence of the second control signal. A sync detector output $a3$ of third occurrence is generated in response to the false sync embedded in the calling sequence. However, the sync output $a3$ is masked by an inhibit pulse $b2$ generated in response to the second sync output pulse $a2$. Therefore, a "match" decision is taken by decoder 16 at time T_4 .

If the channel switching instant T_0 occurs prior to a preamble as shown in Fig. 4B, first and second sync detector outputs $c1$ and $c2$ are successively generated at times T_1 and T_2 in response to true and false frame sync patterns of the first control signal, as indicated. An inhibit pulse $d1$ is generated in response to sync detector pulse $c1$ to inhibit the next sync detector pulse $c2$, thus exclusively allowing the first pulse $c1$ to reset counter 22 to start counting 37 bits of incoming control data stream. Thus, a "match" decision is taken at time T_3 . An inhibit pulse $d2$ will be generated in response to the second sync output $c2$, but it produces no effect.

If the calling sequence has been corrupted during transmission and a "mismatch" decision is taken at

time T_3 , the originating mobile station will send a second control signal as indicated by dotted lines and the above process is repeated, so that third and fourth sync detector outputs c_3 and c_4 are generated at times T_4 and T_5 , respectively, in response to the true and false frame sync patterns of the second call control signal. An inhibit pulse d_3 is generated in response to the third sync detector pulse c_3 to mask the subsequent false sync output c_4 to prevent it from disturbing the bit sequence stored in buffer 23.

The foregoing description shows only preferred embodiments of the present invention. Various modifications are apparent to those skilled in the art without departing from the scope of the present invention which is only limited by the appended claims. Therefore, the embodiments shown and described are only illustrative, not restrictive.

Claims

1. A mobile communications system including a base station (1) and one or more mobile stations (6), said base station being connected to a switched telecommunication network, said base station comprising:

transceiver means (3) for establishing speech channels with said mobile stations (6) for carrying information signals between said mobile stations and said switched telecommunication network and a control channel for carrying a control signal between said base station and said mobile stations, said transceiver means sequentially scanning said speech channels and said control channel for monitoring status of calls and detecting a control signal transmitted from said mobile stations, said control signal containing a sync field containing a sync code of a unique format, and an identification field containing an encoded mobile station's identification code which follows said sync field and may undesirably contain a code identical to said unique format;

sync detector means (7,8,9) for detecting a code identical to said unique format and deriving therefrom an output signal;

first buffer means (13) for storing a successive bit sequence of the detected control signal;

second buffer means (14) for storing a successive bit sequence of the detected control signal;

decoder means (16) coupled to said first and second buffer means for decoding the stored bit sequence of each of said buffer means and detecting a match between the decoded bit sequence of each of the buffer means and a stored version of the mobile station's identification code;

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buffer control means (10-12) responsive to an earlier one of two successive output signals from said sync detector means (7-9) for counting bits stored into said first buffer means from the instant said earlier output signal is generated and responsive to a later one of said successive output signals for counting bits stored into said second buffer means from the instant said later output signal is generated and causing the stored bit sequence of said first buffer means (13) to be supplied to said decoder means (16) when the bit count value of said first buffer means reaches a predetermined value and causing the stored bit sequence of said second buffer means (14) to be supplied to said decoder means (16) when the bit count of said second buffer means (14) reaches said predetermined value; and

means (17) responsive to the detection of a match by said decoder means (16) for sending a signal indicative of the match to said mobile stations (6) through said transceiver means (3).

2. A mobile communications system as claimed in claim 1, wherein said sync detector means includes clock recovery means (7) for recovering clock pulses from the clock recovery field of the detected control signal, and wherein said buffer control means (10-12) comprises:

first and second counter means (11, 12) respectively responsive to a first and second reset signal applied thereto for counting said clock pulses to respectively increment first and second count values respectively representative of the bit counts of said first and second buffer means (13, 14), said first and second counter means respectively causing said first and second buffer means (13, 14) to supply their stored bit sequences to said decoder means (16) when said first and second count values reach said predetermined value; and

means (10) for alternately supplying the output signal of said sync detector means (7,8,9) to said first and second counter means (11, 12) as said first and second reset signals.

3. A mobile communications system including a base station (1) and one or more mobile stations (6), said base station being connected to a switched telecommunication network, said base station comprising:

transceiver means (3) for establishing speech channels with said mobile stations (6) for carrying information signals between said mobile stations and said switched telecommunication network and a control channel for carrying a control signal between said base station and said mobile stations, said transceiver means sequentially scanning said speech channels and said



time T_3 , the originating mobile station will send a second control signal as indicated by dotted lines and the above process is repeated, so that third and fourth sync detector outputs $c3$ and $c4$ are generated at times T_4 and T_5 , respectively, in response to the true and false frame sync patterns of the second call control signal. An inhibit pulse $d3$ is generated in response to the third sync detector pulse $c3$ to mask the subsequent false sync output $c4$ to prevent it from disturbing the bit sequence stored in buffer 23.

The foregoing description shows only preferred embodiments of the present invention. Various modifications are apparent to those skilled in the art without departing from the scope of the present invention which is only limited by the appended claims. Therefore, the embodiments shown and described are only illustrative, not restrictive.

Claims

1. A mobile communications system including a base station (1) and one or more mobile stations (6), said base station being connected to a switched telecommunication network, said base station comprising:

transceiver means (3) for establishing speech channels with said mobile stations (6) for carrying information signals between said mobile stations and said switched telecommunication network and a control channel for carrying a control signal between said base station and said mobile stations, said transceiver means sequentially scanning said speech channels and said control channel for monitoring status of calls and detecting a control signal transmitted from said mobile stations, said control signal containing a sync field containing a sync code of a unique format, and an identification field containing an encoded mobile station's identification code which follows said sync field and may undesirably contain a code identical to said unique format;

sync detector means (7,8,9) for detecting a code identical to said unique format and deriving therefrom an output signal;

first buffer means (13) for storing a successive bit sequence of the detected control signal;

second buffer means (14) for storing a successive bit sequence of the detected control signal;

decoder means (16) coupled to said first and second buffer means for decoding the stored bit sequence of each of said buffer means and detecting a match between the decoded bit sequence of each of the buffer means and a stored version of the mobile station's identification code;

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buffer control means (10-12) responsive to an earlier one of two successive output signals from said sync detector means (7-9) for counting bits stored into said first buffer means from the instant said earlier output signal is generated and responsive to a later one of said successive output signals for counting bits stored into said second buffer means from the instant said later output signal is generated and causing the stored bit sequence of said first buffer means (13) to be supplied to said decoder means (16) when the bit count value of said first buffer means reaches a predetermined value and causing the stored bit sequence of said second buffer means (14) to be supplied to said decoder means (16) when the bit count of said second buffer means (14) reaches said predetermined value; and

means (17) responsive to the detection of a match by said decoder means (16) for sending a signal indicative of the match to said mobile stations (6) through said transceiver means (3).

2. A mobile communications system as claimed in claim 1, wherein said sync detector means includes clock recovery means (7) for recovering clock pulses from the clock recovery field of the detected control signal, and wherein said buffer control means (10-12) comprises:

first and second counter means (11, 12) respectively responsive to a first and second reset signal applied thereto for counting said clock pulses to respectively increment first and second count values respectively representative of the bit counts of said first and second buffer means (13, 14), said first and second counter means respectively causing said first and second buffer means (13, 14) to supply their stored bit sequences to said decoder means (16) when said first and second count values reach said predetermined value; and

means (10) for alternately supplying the output signal of said sync detector means (7,8,9) to said first and second counter means (11, 12) as said first and second reset signals.

3. A mobile communications system including a base station (1) and one or more mobile stations (6), said base station being connected to a switched telecommunication network, said base station comprising:

transceiver means (3) for establishing speech channels with said mobile stations (6) for carrying information signals between said mobile stations and said switched telecommunication network and a control channel for carrying a control signal between said base station and said mobile stations, said transceiver means sequentially scanning said speech channels and said



control channel for monitoring status of calls and detecting a control signal transmitted from said mobile stations as said control signal, said control signal containing a sync field containing a sync code of a unique format, and an identification field containing an encoded mobile station's identification code which follows said sync field and may undesirably contain a code identical to said unique format;

sync detector means (7,8,9) for detecting a code identical to said unique format and deriving therefrom an output signal;

buffer means (23) for storing a successive bit sequence of the detected control signal;

decoder means (16) coupled to said buffer means for decoding a stored bit sequence of said buffer means and detecting a match between the decoded bit sequence and a stored version of the mobile station's identification code;

buffer control means (20-22), responsive to each of two successive output signals from said sync detector means if said output signals are spaced apart from each other a first interval or exclusively responsive to an earlier one of said two successive output signals if said output signals are spaced apart from each other a second interval smaller than said first interval, for counting bits stored into said buffer means, and causing the stored bit sequence of said buffer means to be supplied to said decoder means when the bit count of said buffer means reaches a predetermined value; and

means (17) responsive to the detection of a match by said decoder means for sending a signal indicative of the match to said mobile stations through said transceiver means.

4. A mobile communications system as claimed in claim 3, wherein said sync detector means comprises clock recovery means (7) for recovering clock pulses from the clock recovery field of the control signal, and wherein said buffer control means (20-22) comprises:

inhibit pulse generator means (20) for generating an inhibit pulse in response to an output signal from said sync detector means (7, 8, 9);

counter means (22) responsive to a reset signal applied thereto for counting said clock pulses to increment a count value representative of said bit count of said buffer means from the instant a reset signal is applied thereto; and

inhibit gate means (21) for supplying the output signal of said sync detector means (7,8,9) as said reset signal in the absence of said inhibit pulse.

5. A communication method for a mobile communications system including a base station connect-

ed to a switched telecommunication network and mobile stations, wherein a speech channel is established between said base station (1) and said mobile stations (6) for carrying information signals between said mobile stations and said switched telecommunication network and a control channel for carrying said control signal from said mobile stations to said base station, said control signal containing a sync field containing a sync code of a unique format, and an identification field containing an encoded mobile station's identification code which follows said sync field and may undesirably contain a code identical to said unique format, and wherein said speech channels and said control channel are sequentially scanned to detect said control signal from the control channel, comprising the steps of:

a) detecting a code identical to said unique format from the detected control signal and deriving therefrom an output signal;

b) storing a successive bit sequence of the detected control signal in first and second buffers (13, 14);

c) counting bits stored into said first buffer (13) in response to an earlier one of two successive output signals detected by the step (a) and counting bits stored into said second buffer (14) in response to a later one of said successive output signals detected by the step (a);

d) decoding a sequence of the bits stored into said first buffer (13) when the bit count thereof reaches a predetermined value or decoding a sequence of bits stored into said second buffer (14) when the bit count thereof reaches said predetermined value and detecting a match between each of the decoded bit sequences and a stored version of a mobile station's identification code; and

e) transmitting a signal indicative of the match from said base station to the mobile station from which said control signal is transmitted to said base station.

6. A communication method for a mobile communications system including a base station connected to a switched telecommunication network and mobile stations, wherein a speech channel is established between said base station (1) and said mobile stations (6) for carrying information signals between said mobile stations and said switched telecommunication network and a control channel for carrying said control signal from said mobile stations to said base station, said control signal containing a sync field containing a sync code of a unique format, and an identification field containing an encoded mobile station's identification code which follows said sync



field and may undesirably contain a code identical to said unique format, and wherein said speech channels and said control channel are sequentially scanned to detect said control signal from the control channel, comprising the steps of:

- a) detecting a code identical to said unique format from the detected control signal and deriving therefrom an output signal;
- b) storing a successive bit sequence of said control signal in a buffer (23);
- c) counting bits stored into said buffer (23) in response to either of two successive output signals detected by the step (a) if said output signals are spaced apart from each other a first interval, or counting bits stored into said buffer (23) in response to an earlier one of said two successive output signals if said output signals are spaced apart from each other a second interval smaller than said first interval;
- d) decoding a sequence of bits stored into said buffer (23) when the bit count thereof reaches a preselected value and detecting a match between the decoded bit sequence and a stored version of a mobile station's identification code; and
- e) transmitting a signal indicative of the match from said base station to the mobile station from which said control signal is received.

Patentansprüche

1. Mobiles Kommunikationssystem mit einer Basisstation (1) und einer oder mehreren mobilen Stationen (6), wobei die Basisstation mit einem Telekommunikationswählnetz verbunden ist, wobei die Basisstation aufweist:

eine Senderempfängereinrichtung (3) zum Herstellen von Sprachkanälen mit den mobilen Stationen (6) zum Übertragen von Informationssignalen zwischen den mobilen Stationen und dem Telekommunikationswählnetz und eines Steuerkanals zum Übertragen eines Steuersignals zwischen der Basisstation und den mobilen Stationen, wobei die Senderempfängereinrichtung die Sprachkanäle und den Steuerkanal sequentiell abtastet zur Überwachung des Status der Rufe und zur Detektierung eines Steuersignals, das von den mobilen Stationen übertragen wird, wobei das Steuersignal ein Synchronisationsfeld mit einem Synchronisationscode mit einem eindeutigen Format und ein Identifikationsfeld mit einem codierten Identifikationscode der mobilen Station aufweist, das auf das Synchronisationsfeld folgt und unerwünschterweise einen Code enthalten kann, der identisch ist mit dem eindeutigen Format;

eine Synchronisationsdetektoreinrichtung (7, 8, 9) zum Detektieren eines Codes, der identisch ist mit dem eindeutigen Format, und zum Ableiten eines Ausgangssignals daraus;

eine erste Puffereinrichtung (13) zum Speichern einer aufeinanderfolgenden Bitsequenz des detektierten Steuersignals;

eine zweite Puffereinrichtung (14) zum Speichern einer aufeinanderfolgenden Bitsequenz des detektierten Steuersignals;

eine Decodiereinrichtung (16), die mit der ersten und der zweiten Puffereinrichtung verbunden ist, zum Decodieren der gespeicherten Bitsequenz jedes der Puffereinrichtungen und zum Ermitteln einer Übereinstimmung zwischen der decodierten Bitsequenz jeder der Puffereinrichtungen und einer gespeicherten Version des Identifikationscodes der mobilen Station;

eine Puffersteuereinrichtung (10 - 12), die anspricht auf ein erstes von zwei aufeinanderfolgenden Ausgangssignalen von der Synchronisationsdetektoreinrichtung (7 - 9) zum Zählen von in der ersten Puffereinrichtung gespeicherten Bits von dem Zeitpunkt an, wo das erste Ausgangssignal erzeugt wird, und die anspricht auf ein späteres der aufeinanderfolgenden Ausgangssignale zum Zählen von in der zweiten Puffereinrichtung gespeicherten Bits von dem Zeitpunkt an, wo das spätere Ausgangssignal erzeugt wird, und mit dem Bewirken, daß die gespeicherte Bit-Sequenz der ersten Puffereinrichtung (13) an die Decodiereinrichtungen (16) übergeben wird, wenn der Bit-Zählwert der ersten Puffereinrichtung einen vorbestimmten Wert erreicht, und mit dem Bewirken, daß die gespeicherte Bit-Sequenz der zweiten Puffereinrichtung (14) an die Decodiereinrichtung (16) übergeben wird, wenn der Bit-Zählwert der zweiten Puffereinrichtung (14) den vorbestimmten Wert erreicht; und

eine Einrichtung (17), die anspricht auf die Ermittlung einer Übereinstimmung durch die Decodiereinrichtung (16), zum Senden eines Signals, das die Übereinstimmung anzeigt, an die mobilen Stationen (6) über die Senderempfängereinrichtung (3).

2. Mobiles Kommunikationssystem nach Anspruch 1, bei dem die Synchronisationsdetektoreinrichtung eine Taktwiedergewinnungseinrichtung (7) aufweist zum Wiedergewinnen von Taktimpulsen aus dem Taktwiedergewinnungsfeld des detektierten Steuersignals und bei dem die Puffersteuereinrichtung (10 - 12) aufweist:

eine erste und zweite Zählereinrichtung (11, 12), die jeweils anspricht auf ein erstes und ein zweites Rücksetzsignal, die an sie angelegt werden, zum Zählen der Taktimpulse, um einen



ersten bzw. einen zweiten Zählwert, die den Bit-Zählwerten der ersten bzw. der zweiten Puffereinrichtung (13, 14) entsprechen, jeweils zu inkrementieren, wobei die erste und die zweite Zählereinrichtung jeweils bewirken, daß die erste und die zweite Puffereinrichtung (13, 14) ihre gespeicherten Bit-Sequenzen an die Decodierereinrichtung (16) übergeben, wenn der erste und der zweite Zählwert den vorbestimmten Wert erreichen; und

eine Einrichtung (10) zum abwechselnden Übergeben des Ausgangssignals der Synchronisationsdetektoreinrichtung (7, 8, 9) an die erste und die zweite Zählereinrichtung (11, 12) als das erste und das zweite Rücksetzsignal.

3. Mobiles Kommunikationssystem mit einer Basisstation (1) und einer oder mehreren mobilen Stationen (6), wobei die Basisstation mit einem Telekommunikationswählnetz verbunden ist, wobei die Basisstation aufweist:

eine Senderempfängereinrichtung (3) zum Herstellen von Sprachkanälen mit den mobilen Stationen (6) zum Übertragen von Informationssignalen zwischen den mobilen Stationen und dem Telekommunikationswählnetz und eines Steuerkanals zum Übertragen eines Steuersignals zwischen der Basisstation und den mobilen Stationen, wobei die Senderempfängereinrichtung die Sprachkanäle und den Steuerkanal sequentiell abtastet zum Überwachen des Status von Rufen und zum Detektieren eines Steuersignals, das von den mobilen Stationen als das Steuersignal übertragen wird, wobei das Steuersignal ein Synchronisationsfeld mit einem Synchronisationscode mit einem eindeutigen Format und ein Identifikationsfeld mit einem codierten Identifikationscode der mobilen Station, das dem Synchronisationsfeld folgt, aufweist und unerwünschterweise einen Code enthalten kann, der mit dem eindeutigen Format identisch ist;

eine Synchronisationsdetektoreinrichtung (7, 8, 9) zum Detektieren eines Codes, der mit dem eindeutigen Format identisch ist, und zum Ableiten eines Ausgangssignals daraus;

eine Puffereinrichtung (23) zum Speichern einer aufeinanderfolgenden Bit-Sequenz des detektierten Steuersignals;

eine Decodierereinrichtung (16), die mit der Puffereinrichtung verbunden ist, zum Decodieren einer gespeicherten Bit-Sequenz der Puffereinrichtung und zum Ermitteln einer Übereinstimmung zwischen der decodierten Bit-Sequenz und einer gespeicherten Version des Identifikationscodes der mobilen Station;

eine Puffersteuereinrichtung (20 - 22), die anspricht auf jedes der beiden aufeinanderfolgenden Ausgangssignale von der Synchronisationsdetektoreinrichtung, wenn die Ausgangssignale durch ein erstes Intervall voneinander beabstandet sind, oder die ausschließlich anspricht auf ein ersteres der beiden aufeinanderfolgenden Ausgangssignale, wenn die Ausgangssignale durch ein zweites Intervall voneinander beabstandet sind, das kleiner ist als das erste Intervall, zum Zählen von Bits, die in der Puffereinrichtung gespeichert sind, und mit dem Bewirken, daß die gespeicherte Bit-Sequenz der Puffereinrichtung an die Decodierereinrichtung übergeben wird, wenn der Bit-Zählerstand der Puffereinrichtung einen vorbestimmten Wert erreicht; und

eine Einrichtung (17), die anspricht auf die Ermittlung einer Übereinstimmung durch die Decodierereinrichtung, zum Aussenden eines Signals, das die Übereinstimmung anzeigt, an die mobilen Stationen über die Senderempfängereinrichtung.

4. Mobiles Kommunikationssystem nach Anspruch 3, bei dem die Synchronisationsdetektoreinrichtung eine Taktwiedergewinnungseinrichtung (7) aufweist zum Wiedergewinnen von Taktimpulsen aus dem Taktwiedergewinnungsfeld des Steuersignals und bei dem die Puffersteuereinrichtung (20 - 22) aufweist:

eine Sperrimpulsgeneratoreinrichtung (20) zum Erzeugen eines Sperrimpulses als Antwort auf ein Ausgangssignal von der Synchronisationsdetektoreinrichtung (7, 8, 9);

eine Zählereinrichtung (22), die anspricht auf ein Rücksetzsignal, das an sie angelegt wird, zum Zählen der Taktimpulse, um einen Zählwert, der dem Bit-Zählerstand der Puffereinrichtung entspricht, von dem Zeitpunkt an zu inkrementieren, wo ein Rücksetzsignal an sie angelegt wird;

eine Sperrgliedereinrichtung (21) zum Übergeben des Ausgangssignals der Synchronisationsdetektoreinrichtung (7, 8, 9) als das Rücksetzsignal bei Nichtvorhandensein des Sperrimpulses.

5. Kommunikationsverfahren für ein mobiles Kommunikationssystem mit einer Basisstation, die mit einem Telekommunikationswählnetz verbunden ist, und mobilen Stationen, wobei ein Sprachkanal zwischen der Basisstation (1) und den mobilen Stationen (6) zum Übertragen von Informationssignalen zwischen den mobilen Stationen und dem Telekommunikationswählnetz und ein Steuerkanal zum Übertragen des Steuersignals von den mobilen Stationen zu der Basisstation hergestellt werden, wobei das Steuersignal ein Synchronisationsfeld mit einem Synchronisationscode mit einem eindeutigen Format und ein Identifikationsfeld mit einem codierten Identifikationscode der mobilen Station aufweist, das



dem Synchronisationsfeld folgt und unerwünschterweise einen Code enthalten kann, der mit dem eindeutigen Format identisch ist, und wobei die Sprachkanäle und der Steuerkanal sequentiell abgetastet werden, um das Steuersignal aus dem Steuerkanal zu detektieren, mit den Schritten:

- a) Detektieren eines Codes, der identisch ist mit dem eindeutigen Format, aus dem detektierten Steuersignal und Ableiten eines Ausgangssignals daraus;
- b) Speichern einer aufeinanderfolgenden Bit-Sequenz des detektierten Steuersignals in einem ersten und einem zweiten Puffer (13, 14);
- c) Zählen von in dem ersten Puffer (13) gespeicherten Bits als Antwort auf ein erstes von zwei aufeinanderfolgenden Ausgangssignalen, die im Schritt (a) detektiert worden sind, und Zählen von in dem zweiten Puffer (14) gespeicherten Bits als Antwort auf ein späteres der aufeinanderfolgenden Ausgangssignale, das im Schritt (a) detektiert worden ist;
- d) Decodieren einer Sequenz der in dem ersten Puffer (13) gespeicherten Bits, wenn dessen Bit-Zählerstand einen vorbestimmten Wert erreicht, oder Decodieren einer Sequenz von in dem zweiten Puffer (14) gespeicherten Bits, wenn dessen Bit-Zählerstand den vorbestimmten Wert erreicht, und Ermitteln einer Übereinstimmung zwischen jeder der decodierten Bit-Sequenzen und einer gespeicherten Version eines Identifikationscodes einer mobilen Station; und
- e) Übertragen eines Signals, das die Übereinstimmung anzeigt, von der Basisstation an die mobile Station, von der das Steuersignal an die Basisstation übertragen worden ist.

6. Kommunikationsverfahren für ein mobiles Kommunikationssystem mit einer Basisstation, die mit einem Telekommunikationswählnetz verbunden ist, und mobilen Stationen, wobei ein Sprachkanal zwischen der Basisstation (1) und den mobilen Stationen (6) zum Übertragen von Informationssignalen zwischen den mobilen Stationen und dem Telekommunikationswählnetz und ein Steuerkanal zum Übertragen des Steuersignals von den mobilen Stationen zu der Basisstation hergestellt werden, wobei das Steuersignal ein Synchronisationsfeld mit einem Synchronisationscode mit einem eindeutigen Format und ein Identifikationsfeld mit einem kodierten Identifikationscode der mobilen Station aufweist, das dem Synchronisationsfeld folgt und unerwünschterweise einen Code enthalten kann, der mit dem eindeutigen Format identisch ist, und wobei die Sprachkanäle und der Steuerkanal sequentiell

abgetastet werden, um das Steuersignal aus dem Steuerkanal zu detektieren, mit den Schritten:

- a) Detektieren eines Codes, der identisch ist mit dem eindeutigen Format, aus dem detektierten Steuersignal und Ableiten eines Ausgangssignals daraus;
- b) Speichern einer aufeinanderfolgenden Bit-Sequenz des Steuersignals in einem Puffer (23);
- c) Zählen von in dem Puffer (23) gespeicherten Bits als Antwort auf eines von zwei aufeinanderfolgenden Ausgangssignalen, die im Schritt (a) detektiert worden sind, wenn die Ausgangssignale durch ein erstes Intervall voneinander beabstandet sind, oder Zählen von in dem Puffer (23) gespeicherten Bits als Antwort auf ein erstes der beiden aufeinanderfolgenden Ausgangssignale, wenn die Ausgangssignale durch ein zweites Intervall voneinander beabstandet sind, das kleiner ist als das erste Intervall;
- d) Decodieren einer Sequenz von in dem Puffer (23) gespeicherten Bits, wenn dessen Bit-Zählerstand einen vorgewählten Wert erreicht, und Ermitteln einer Übereinstimmung zwischen der decodierten Bit-Sequenz und der gespeicherten Version eines Identifikationscodes der mobilen Station; und
- e) Übertragen eines Signals, das die Übereinstimmung anzeigt, von der Basisstation an die mobile Station, von der das Steuersignal empfangen worden ist.

Revendications

1. Système de communication mobile comportant une station de base (1) et une ou plusieurs stations mobiles (6), ladite station de base étant connectée à un réseau de télécommunication commuté, ladite station de base comprenant :
un moyen d'émetteur/récepteur (3) pour établir des canaux vocaux avec lesdites stations mobiles (6) pour véhiculer des signaux d'information entre lesdites stations mobiles et ledit réseau de communication commuté et un canal de commande pour véhiculer un signal de commande entre ladite station de base et lesdites stations mobiles, ledit moyen d'émetteur/récepteur balayant séquentiellement lesdits canaux vocaux et ledit canal de commande pour surveiller l'état des appels et détecter un signal de commande émis à partir desdites stations mobiles, ledit signal de commande contenant une zone de synchronisation contenant un code de synchronisation d'un format particulier et une zone d'identification contenant un code d'identification de station mobile codé qui suit ladite zone de synchro-



nisation et peut contenir de manière non souhaitable un code identique audit format particulier,
un moyen de détecteur de synchronisation (7, 8, 9) pour détecter un code identique audit format particulier et obtenir à partir de celui-ci un signal de sortie,

un premier moyen de mémoire tampon (13) pour mémoriser une séquence de bits successifs du signal de commande détecté,

un second moyen de mémoire tampon (14) pour mémoriser une séquence de bits successifs du signal de commande détecté,

un moyen de décodeur (16) couplé auxdits premier et second moyens de mémoire tampon pour décoder la séquence de bits mémorisée de chacun desdits moyens de mémoire tampon et détecter une concordance entre la séquence de bits décodée de chacun des moyens de mémoire tampon et une version mémorisée du code d'identification de station mobile,

un moyen de contrôleur de mémoire tampon (10 à 12) répondant au premier signal de sortie des deux signaux de sortie successifs provenant dudit moyen de détecteur de synchronisation (7 à 9) pour compter les bits mémorisés dans ledit premier moyen de mémoire tampon à partir de l'instant où ledit premier signal de sortie est produit et répondant au dernier signal de sortie desdits signaux de sortie successifs pour compter les bits mémorisés dans ledit second moyen de mémoire tampon à partir de l'instant où ledit dernier signal de sortie est produit et pour amener la séquence de bits mémorisée dudit premier moyen de mémoire tampon (13) à être délivrée audit moyen de décodeur (16) lorsque la valeur du compte de bits dudit premier moyen de mémoire tampon atteint une valeur prédéterminée et pour amener la séquence de bits mémorisée dudit second moyen de mémoire tampon (14) à être délivrée audit moyen de décodeur (16) lorsque le compte de bits dudit second moyen de mémoire tampon (14) atteint ladite valeur prédéterminée, et

un moyen (17) répondant à la détection d'une concordance par ledit moyen de décodeur (16) pour envoyer un signal représentatif de la concordance auxdites stations mobiles (6) par l'intermédiaire dudit moyen d'émetteur/récepteur (3).

2. Système de communication mobile selon la revendication 1, dans lequel ledit moyen de détecteur de synchronisation comporte un moyen de reconstitution d'horloge (7) pour reconstituer les impulsions d'horloge à partir de la zone de reconstitution d'horloge du signal de commande détecté et dans lequel ledit moyen de contrôleur de mémoire tampon (10 à 12) comprend :

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des premier et second moyens de compteur (11, 12) répondant respectivement à des premier et second signaux de remise à zéro appliqués à ceux-ci pour compter lesdites impulsions d'horloge pour incrémenter respectivement des première et seconde valeurs de compte, respectivement représentatives des comptes de bits desdits premier et second moyens de mémoire tampon (13, 14), lesdits premier et second moyens de compteur amenant respectivement lesdits premier et second moyens de mémoire tampon (13, 14) à délivrer leurs séquences de bits mémorisées audit moyen de décodeur (16) lorsque lesdites première et seconde valeurs de compte atteignent ladite valeur prédéterminée, et

un moyen (10) pour délivrer en alternance le signal de sortie dudit moyen de détecteur de synchronisation (7, 8, 9) auxdits premier et second moyens de compteur (11, 12) comme lesdits premier et second signaux de remise à zéro.

3. Système de communication mobile comportant une station de base (1) et une ou plusieurs stations mobiles (6), ladite station de base étant connectée à un réseau de télécommunication commuté, ladite station de base comprenant :

un moyen d'émetteur/récepteur (3) pour établir des canaux vocaux avec lesdites stations mobiles (6) pour véhiculer des signaux d'information entre lesdites stations mobiles et ledit réseau de télécommunication commuté et un canal de commande pour véhiculer un signal de commande entre ladite station de base et lesdites stations mobiles, ledit moyen d'émetteur/récepteur balayant séquentiellement lesdits canaux vocaux et ledit canal de commande pour surveiller l'état des appels et pour détecter un signal de commande émis à partir desdites stations mobiles comme ledit signal de commande, ledit signal de commande contenant une zone de synchronisation contenant un code de synchronisation d'un format particulier et une zone d'identification contenant un code d'identification de station mobile codé qui suit ladite zone de synchronisation et peut contenir de manière non souhaitable un code identique audit format particulier,

un moyen de détecteur de synchronisation (7, 8, 9) pour détecter un code identique audit format particulier et obtenir à partir de celui-ci un signal de sortie,

un moyen de mémoire tampon (23) pour mémoriser une séquence de bits successifs du signal de commande détecté, un moyen de décodeur (16) couplé audit moyen de mémoire tampon pour décoder la séquence de bits mémorisée dudit moyen de mémoire tampon et détecter une concordance entre la séquence de bits décodée et une version mémorisée du code d'identification



tion de la station mobile,

un moyen de contrôleur de mémoire tampon (20 à 22) répondant à chacun des deux signaux de sortie successifs provenant dudit moyen de détecteur de synchronisation, si lesdits signaux de sortie sont espacés l'un de l'autre d'un premier intervalle ou répondant exclusivement au premier signal de sortie desdits deux signaux de sortie successifs si lesdits signaux de sortie sont espacés l'un de l'autre d'un second intervalle plus petit que ledit premier intervalle, pour compter les bits mémorisés dans ledit moyen de mémoire tampon et pour amener la séquence de bits mémorisée dudit moyen de mémoire tampon à être délivrée audit moyen de décodeur lorsque le compte de bits dudit moyen de mémoire tampon atteint une valeur prédéterminée, et

un moyen (17) répondant à la détection d'une concordance par ledit moyen de décodeur pour envoyer un signal représentatif de la concordance auxdites stations mobiles par l'intermédiaire dudit moyen d'émetteur/récepteur.

4. Système de communication mobile selon la revendication 3, dans lequel ledit moyen de détecteur de synchronisation comprend un moyen de reconstitution d'horloge (7) pour reconstituer les impulsions d'horloge à partir de la zone de reconstitution d'horloge du signal de commande et dans lequel ledit moyen de contrôleur de mémoire tampon (20 à 22) comprend :

un moyen de générateur d'impulsion d'interdiction (20) pour produire une impulsion d'interdiction en réponse à un signal de sortie provenant dudit moyen de détecteur de synchronisation (7, 8, 9),

un moyen de compteur (22) répondant à un signal de remise à zéro appliqué à celui-ci pour compter lesdites impulsions d'horloge afin d'incrémenter une valeur de compte représentative dudit compte de bits dudit moyen de mémoire tampon à partir du moment où le signal de remise à zéro lui est appliqué, et

un moyen de porte d'interdiction (21) pour délivrer le signal de sortie dudit moyen de détecteur de synchronisation (7, 8, 9) comme ledit signal de remise à zéro en l'absence de ladite impulsion d'interdiction.

5. Procédé de communication pour un système de communication mobile comportant une station de base connectée à un réseau de télécommunication commuté et des stations mobiles, dans lequel un canal vocal est établi entre ladite station de base (1) et lesdites stations mobiles (6) pour véhiculer des signaux d'information entre lesdites stations mobiles et ledit réseau de télécom-

munication commuté et un canal de commande pour véhiculer ledit signal de commande à partir desdites stations mobiles vers ladite station de base, ledit signal de commande contenant une zone de synchronisation contenant un code de synchronisation d'un format particulier et une zone d'identification contenant un code d'identification de station mobile codé qui suit ladite zone de synchronisation et peut contenir de manière non souhaitable un code identique audit format particulier et dans lequel lesdits canaux vocaux et ledit canal de commande sont séquentiellement balayés afin de détecter ledit signal de commande provenant du canal de commande, comprenant les étapes consistant à :

a) détecter un code identique audit format particulier à partir du signal de commande détecté et obtenir à partir de celui-ci un signal de sortie,

b) mémoriser une séquence de bits successifs du signal de commande détecté dans des première et seconde mémoires tampon (13, 14),

c) compter les bits mémorisés dans ladite première mémoire tampon (13) en réponse à un premier signal de sortie parmi deux signaux de sortie successifs détectés par l'étape a) et compter les bits mémorisés dans ladite seconde mémoire tampon (14) en réponse au dernier signal de sortie desdits signaux de sortie successifs détectés par l'étape a),

d) décoder une séquence de bits mémorisée dans ladite première mémoire tampon (13) lorsque son compte de bits atteint une valeur prédéterminée ou décoder une séquence de bits mémorisée dans ladite seconde mémoire tampon (14) lorsque son compte de bits atteint ladite valeur prédéterminée et détecter une concordance entre chacune des séquences de bits décodées et une version mémorisée d'un code d'identification de station mobile, et

e) émettre un signal représentatif de la concordance à partir de ladite station de base vers la station mobile à partir de laquelle ledit signal de commande est émis vers ladite station de base.

6. Procédé de communication pour un système de communication mobile comportant une station de base connectée à un réseau de télécommunication commuté et des stations mobiles, dans lequel un canal vocal est établi entre ladite station de base (1) et lesdites stations mobiles (6) pour véhiculer des signaux d'information entre lesdites stations mobiles et ledit réseau de télécommunication commuté et un canal de commande pour véhiculer ledit signal de commande à partir



des stations mobiles à ladite station de base, ledit signal de commande contenant une zone de synchronisation contenant un code de synchronisation d'un format particulier et une zone d'identification contenant un code d'identification de station mobile codé qui suit ladite zone de synchronisation et peut contenir de manière non souhaitable un code identique audit format particulier et dans lequel lesdits canaux vocaux et ledit canal de commande sont séquentiellement balayés afin de détecter ledit signal de commande provenant du canal de commande comprenant les étapes consistant à :

a) détecter un code identique audit format particulier provenant du signal de commande détecté et obtenir à partir de celui-ci un signal de sortie,

b) mémoriser une séquence de bits successifs dudit signal de commande dans une mémoire tampon (23),

c) compter les bits mémorisés dans ladite mémoire tampon (23) en réponse à l'un ou l'autre des deux signaux de sortie successifs détectés par l'étape (a) si lesdits signaux de sortie sont espacés l'un de l'autre d'un premier intervalle ou compter les bits mémorisés dans ladite mémoire tampon (23) en réponse au premier signal de sortie desdits deux signaux de sortie successifs si lesdits signaux de sortie sont espacés l'un de l'autre d'un second intervalle plus petit que ledit premier intervalle,

d) décoder une séquence de bits mémorisée dans ladite mémoire tampon (23) lorsque son compte de bits atteint une valeur présélectionnée et détecter une concordance entre la séquence de bits décodée et une version mémorisée du code d'identification d'une station mobile, et

e) émettre un signal représentatif de la concordance à partir de ladite station de base vers la station mobile à partir de laquelle ledit signal de commande est reçu.

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