



Transmission system comprising at least two subscriber devices exchanging information signals in the simplex or half-duplex mode.

The present invention relates to a transmission system comprising at least a remote and a near subscriber device exchanging information signals in the simplex mode by means of time-division multiplex signals in which control time intervals are provided.

5 The invention likewise relates to a subscriber device suitable for such a system.

A system of this type finds important applications, more specifically, when the connections are realised by radio channel.

A known system of this type is described in French Patent Application
10 No. 2 667 747 filed 9 October 1990 in the name of the Applicants. When these systems are used as private systems (as against public systems), the radio resources (reduced pass-band frequency channels) are spread parsimoniously. Therefore, the communications between two subscribers are effected in the alternate mode: that is to say, when one subscriber speaks, the other listens (e.g. with a push to talk switch).

15 The problem then posed is caused by the simultaneous request from two subscribers or more to speak. A risk of communication getting lost then arises.

In order to resolve this problem a system of the type mentioned in the opening paragraph is characterized, in that for a communication between a remote subscriber and a near subscriber a control time interval is allocated to the transmission
20 of a request to speak made by one of the subscribers, and in that this request to speak received by the other subscriber is used for preventing him from transmitting.

The following description made with reference to the annexed drawings, all this given by way of non-limiting example, will make it better understood how the
25 invention may be realised, in which:

Fig. 1 shows a diagram of the transmission system;

Fig. 2 shows the spreading of the control time intervals within a time-division multiplex;





Fig. 3 shows the diagram of a subscriber coupling station; and
Fig. 4 shows the protocol of the simplex control.

Fig. 1 shows a system according to the invention. This system is formed
5 by a set of transceiver stations STB, STM1 and STM2. Self-evidently, the number of
stations may be arbitrary. STB is a transceiver base station, STM1 and STM2 are sub-
stations, that is to say, managed by the base station. In practice the base station is a
fixed station, whereas the stations STM1 and STM2 are portable stations or stations
installed in vehicles. A subscriber device A1 is connected to the mobile station STM1
10 and a subscriber device B1 is connected to the mobile station STM2. The stations
communicate among themselves by radio links which utilize two frequency channels
 F_{BM} and F_{MB} .

In general, the channel F_{BM} is used for the communications leading from
the base station STB to the mobile stations STM1 and STM2 and the channel F_{MB} for
15 the communications leading from the mobile stations to the base station. The
communications established over these frequency channels are organized in a time-
division multiplex mode of the TDMA type.

Fig. 2 shows in a very schematic manner the organization of this
multiplex. A series of time intervals IT numbered 0, 1, 2, ..., 37, 38, ... has been
20 shown. These time intervals are used for transmitting, for example, speech information.
Other time intervals XCCH are inserted before the interval "0", between the intervals
18 and 19, ..., between the intervals 37 and 38, ..., etc. These time intervals may be
allocated to different tasks for the organization of the multiplex. The intervals XCCH
are used by the mobile stations, either for transmitting information signals during which
25 period of time the frequency channel centred on the carrier F_{MB} is used, or for
receiving information signals during which period of time the frequency channel is then
centred on F_{BM} .

Fig. 3 shows the diagram of the mobile stations STM1 and STM2 having
identical structures.

30 Each station is constituted by a set of transceivers 10 controlled by a pair
of reference oscillators 12 oscillating, respectively, at the frequencies F_{MB} and F_{BM} .
This set is adapted to a TDMA frame by means of a frame management circuit 17. A
duplex switch 22 controlled by the control circuit 17 makes it possible *via* one and the



same antenna 24 both to transmit at a frequency F_{MB} and receive at a frequency F_{BM} either or not different from F_{MB} . A transmit amplifier 25 and a receive amplifier 26 are connected to this switch 22.

The set 10 is formed by a transmit section 40 cooperating with a filter 41, centred at an intermediate frequency FI , and a modulator 42. The modulator 42 centres at the carrier frequency F_{MB} the information signals produced by the section 40. The section 40 arranges the information signals to be transmitted in accordance with the commands given by the management circuit 17, phase-modulates, frequency-modulates or amplitude-modulates the information signals on an intermediate frequency FI . This management circuit 17 makes it also possible to recover the different information signals contained in the TDMA frame received by a receive set 44. The input of this set is connected to the output of a filter 46 centred at the frequency FI , connected to the output of a demodulator 48. This demodulator 48 receives from the amplifier 26 the signals supplied at the frequency F_{BM} . Reference numeral 60 denotes the subscriber's microphone and reference numeral 62 is his loudspeaker. The speech information, previously digitized, is transmitted in one of the time intervals of the frame transmitted by the carrier F_{MB} , this time interval being allocated by the management circuit 17. The speech information signals coming from the remote subscriber, transmitted in one of the time intervals of the frame transmitted at F_{BM} are recovered at the loudspeaker after decoding. The management circuit 17 further operates so that all these XCCHs can be received.

According to the invention such a system comprises means for transmitting in a time interval XCCH a request to speak signal for a remote subscriber, means for detecting this request to speak signal for the remote subscriber and means for denying the remote subscriber access to transmission.

The means for transmitting the request to speak may be realised by a simplex button 70 connected to the section 40, in a time interval XCCH allocated to the connection of the near subscriber to the remote subscriber.

The means for detecting this request to speak for the remote subscriber are constituted by the reception of the interval XCCH allocated to the communication, with the aid of a request-to-speak receiver 72 which influences the management circuit 17.

The means for denying access to transmission may be constituted by a



luminous signal signalling to the remote subscriber that he cannot transmit speech because the management circuit 17 prevents this command, or also by the remote subscriber's device automatically changing to the receive mode.

Fig. 4 shows the procedure which permits the simplex communications in
5 a satisfactory manner.

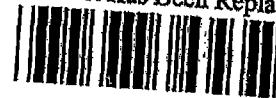
To begin with, an XCCH is assumed to be allocated by the station STB for the connection of subscriber A1 to subscriber B1.

- At instant t_1 , by depressing the button 70, the subscriber A1 makes known to the station STB his request to transmit to the subscriber B1 in the interval
10 XCCH.
- At instant t_2 the station STB, once it has verified that it is possible while avoiding conflicts of simultaneity, authorizes subscriber A1 to transmit. STM1 is put in position T (transmission as regards speech).
- At instant t_3 (which may be merged with instant t_2) STB transmits this request
15 to the station STM2.
- At instant t_4 the station STM2 has received this signal, which brings the station into the receive position R.
- At instant t_5 the subscriber A1 releases his simplex button, station STB is then transmitted to.
- 20 - At instant t_6 the station STB acknowledges reception of this release to station STM1.
- At instant t_7 (which may be merged with instant t_6) the station STB removes any obstacles for the station STM2.

This procedure may be further simplified as required, for example, by
25 cancelling the instant t_2 , t_5 , t_6 , t_7 . In that case one the transmission priority is given to the last transmitter (t_1 , t_3 , t_4).

**CLAIMS:**

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1. Transmission system comprising at least a remote and a near subscriber device exchanging information signals in the simplex mode by means of time-division multiplex signals in which control time intervals are provided, characterized in that for a communication between a remote subscriber and a near subscriber a control interval is
5 allocated to the transmission of a request to speak made by one of the subscribers, and in that this request to speak received by the other subscriber is used for preventing him from transmitting.
2. Transmission system as claimed in Claim 1, in which a base station is provided by which the information signals between the remote and near subscribers are
10 transmitted, characterized in that a control time interval is allocated to said communication for the connection between one of the subscribers and the base station and a time interval is allocated for the connection between the other subscriber and the base station.
3. Subscriber device suitable for a transmission system as claimed in Claim 1
15 or 2, characterized in that it comprises means for generating control time intervals containing a request-to-speak signal when a request to speak is made by the near subscriber coupled to this device, and in that it comprises means for detecting control time intervals and means for initiating transmission when the control time interval contains a request to speak coming from another subscriber coupled to another device.

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Transmission system comprising at least two subscriber devices exchanging information signals in the simplex mode.

ABSTRACT:

This transmission system comprises at least a remote and a near subscriber device (A1, B1) exchanging information signals in the simplex mode by means of a multiplex of the time-division type in which a control time interval is provided. For a communication between a remote subscriber and a near subscriber, a
5 control time interval (XCCH) is allocated for the transmission of a request to speak made by one of the subscribers. The request to speak received by the other subscriber is used for preventing him from transmitting.

Application: Mobile radio networks.

10 Reference: Fig. 1.

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**Claims:**

1. An information transmission system, comprising at least one base station and at least one satellite station, which stations exchange their information by way of a plurality of time multiplex signals which are transported by means of a plurality of carriers, characterized in that for the transmission of useful information between stations
5 there are provided replica means for forming a plurality of replicas of the useful information, frequency dispersion means for transmitting the plurality of replicas in the plurality of multiplex signals, receiving means for receiving the plurality of replicas thus transmitted, and combinatory means for restoring the information on the basis of the plurality of replicas received.
- 10 2. A transmission system as claimed in Claim 1, characterized in that each replica represents a part of the useful information.
3. A transmission system as claimed in any one of the Claims 1 or 2, characterized in that the multiplexing is of the type TDMA.
4. A transmission system as claimed in any one of the Claims 1 to 3,
15 characterized in that the frequency dispersion means are formed on the basis of a fast inverse Fourier transform whereas the combinatory means are formed on the basis of a direct fast Fourier transform.
5. A satellite station suitable for an information transmission system as claimed in any one of the Claims 1 to 4, characterized in that for the transmission of
20 useful information between the stations there are provided replica means for forming a plurality of replicas of the useful information, frequency dispersion means for transmitting the plurality of replicas in the plurality of multiplex signals, receiving means for receiving the plurality of replicas thus transmitted, and combinatory means for restoring the information on the basis of the plurality of replicas received.
- 25 6. A base station suitable for an information transmission system as claimed in any one of the Claims 1 to 4, characterized in that for the transmission of useful information between the stations there are provided replica means for forming a plurality of replicas of the useful information, frequency dispersion means for transmitting the plurality of replicas in the plurality of multiplex signals, receiving
30 means for receiving the plurality of replicas thus transmitted, and combinatory means for restoring the information on the basis of the plurality of replicas received.

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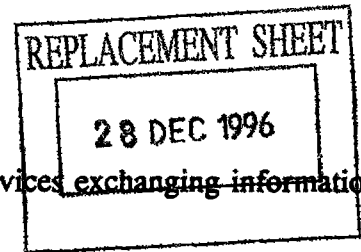
"Information transmission system comprising at least one base station and at least one satellite station".

Abstract:

This system is formed by a base station STB1 and two mobile stations STM1 and STM2. The information exchange between these stations is performed by means of two time multiplex signals which are transported via frequency channels with carriers F1 and F2. In accordance with the invention, the information systematically
5 uses the two frequency channels. The resistance against fading is notably improved.

Application: private mobile radio.

Reference: Fig. 1.



Transmission system comprising at least two subscriber devices exchanging information signals in the simplex mode.

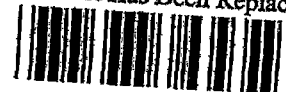
ABSTRACT:

This transmission system comprises at least a remote and a near subscriber device (A1, B1) exchanging information signals in the simplex mode by means of a multiplex of the time-division type in which a control time interval is provided. For a communication between a remote subscriber and a near subscriber, a
5 control time interval (XCCH) is allocated for the transmission of a request to speak made by one of the subscribers. The request to speak received by the other subscriber is used for preventing him from transmitting.

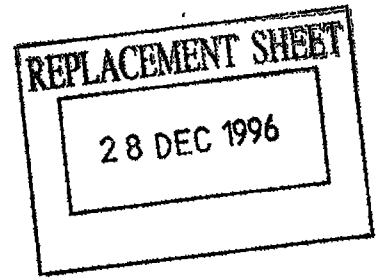
Application: Mobile radio networks.

10 Reference: Fig. 1.

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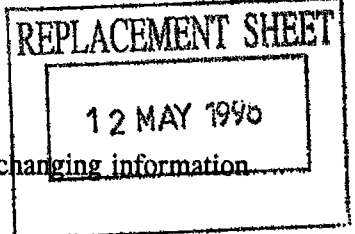
CLAIMS:

1. Transmission system comprising at least a remote and a near subscriber device exchanging information signals in the simplex mode by means of time-division multiplex signals in which control time intervals are provided, characterized in that for a communication between a remote subscriber and a near subscriber a control interval is
5 allocated to the transmission of a request to speak made by one of the subscribers, and in that this request to speak received by the other subscriber is used for preventing him from transmitting.
2. Transmission system as claimed in Claim 1, in which a base station is provided by which the information signals between the remote and near subscribers are
10 transmitted, characterized in that a control time interval is allocated to said communication for the connection between one of the subscribers and the base station and a time interval is allocated for the connection between the other subscriber and the base station.
3. Subscriber device suitable for a transmission system as claimed in Claim 1
15 or 2, characterized in that it comprises means for generating control time intervals containing a request-to-speak signal when a request to speak is made by the near subscriber coupled to this device, and in that it comprises means for detecting control time intervals and means for initiating transmission when the control time interval contains a request to speak coming from another subscriber coupled to another device.

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Transmission System Comprising at least two subscriber devices exchanging information signals in the simple or half-duplex mode.

ABSTRACT:

This transmission system comprises at least a remote and a near subscriber device (A1, B1) exchanging information signals in the simplex mode by means of a multiplex of the time-division type in which a control time interval is provided. For a communication between a remote subscriber and a near subscriber, a control time interval (XCCH) is allocated for the transmission of a request to speak made by one of the subscribers. The request to speak received by the other subscriber is used for preventing him from transmitting.

Application: Mobile radio networks.

Reference: Fig. 1.

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**TRANSMISSION SYSTEM COMPRISING AT
LEAST TWO SUBSCRIBER DEVICES
EXCHANGING INFORMATION SIGNALS IN
THE SIMPLEX OR HALF-DUPLEX MODE****BACKGROUND OF THE INVENTION**

The present invention relates to a transmission system comprising at least a remote and a near subscriber device exchanging information signals in the simplex mode by means of time-division multiplex signals in which control time intervals are provided.

The invention likewise relates to a subscriber device suitable for such a system.

A system of this type finds important applications, more specifically, when the connections are realised by radio channel.

A known system of this type is described in French Patent Application No. 2 667 747 filed Oct. 9, 1990 in the name of the Applicants. When these systems are used as private systems (as against public systems), the radio resources (reduced pass-band frequency channels) are spread parsimoniously. Therefore, the communications between two subscribers are effected in the alternate mode: that is to say, when one subscriber speaks, the other listens (e.g. with a push to talk switch).

The problem then posed is caused by the simultaneous request from two subscribers or more to speak. A risk of communication getting lost then arises.

SUMMARY OF THE INVENTION

In order to resolve this problem a system of the type mentioned in the opening paragraph is characterized, in that for a communication between a remote subscriber and a near subscriber a control time interval is allocated to the transmission of a request to transmit or speak made by one of the subscribers, and in that this request to transmit or speak received by the other subscriber is used for preventing him from transmitting.

The following description made with reference to the annexed drawings, all this given by way of non-limiting example, will make it better understood how the invention may be realised.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows a diagram of the transmission system;

FIG. 2 shows the spreading of the control time intervals within a time-division multiplex;

FIG. 3 shows the diagram of a subscriber coupling station; and

FIG. 4 shows the protocol of the simplex control.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a system according to the invention. This system is formed by a set of transceiver stations **STB**, **STM1** and **STM2**. Self-evidently, the number of stations may be arbitrary. **STB** is a transceiver base station, **STM1** and **STM2** are sub-stations, that is to say, managed by the base station. In practice the base station is a fixed station, whereas the stations **STM1** and **STM2** are portable stations or stations installed in vehicles. A subscriber device **A1** is connected to the mobile station **STM1** and a subscriber device **B1** is connected to the mobile station **STM2**. The stations communicate among themselves by radio links which utilize two frequency channels F_{BM} and F_{MB} .

In general, the channel F_{BM} is used for the communications leading from the base station **STB** to the mobile stations **STM1** and **STM2** and the channel F_{MB} for the communications leading from the mobile stations to the base station. The communications established over these frequency channels are organized in a time-division multiplex mode of the TDMA type.

FIG. 2 shows in a very schematic manner the organization of this multiplex. A series of time intervals **IT** numbered 0, 1, 2, . . . , 37, 38, . . . has been shown. These time intervals form common channels and are used for transmitting, for example, speech information. Other time intervals **XCCH** are inserted before the interval "0", between the intervals 18 and 19, . . . , between the intervals 37 and 38; . . . , etc. These time intervals may be allocated to different tasks for the organization of the multiplex. The intervals **XCCH** are used by the mobile stations, either for transmitting information signals during which period of time the frequency channel centred on the carrier F_{MB} is used, or for receiving information signals during which period of time the frequency channel is then centred on F_{BM} .

FIG. 3 shows the diagram of the mobile stations STM1 and STM2 having identical structures.

Each station is constituted by a transceiver 10 controlled by a pair of reference oscillators 12 oscillating, respectively, at the frequencies F_{MB} and F_{BM} . This set is adapted to a TDMA frame by means of a frame management circuit 17. A duplex switch 22 controlled by the control circuit 17 makes it possible via one and the same antenna 24 both to transmit at a frequency F_{MB} and receive at a frequency F_{BM} either or not different from F_{MB} . A transmit amplifier 25 and a receive amplifier 26 are connected to this switch 22.

The set 10 is formed by a transmit section 40 cooperating with a filter 41, centred at an intermediate frequency F_I , and a modulator 42. The modulator 42 centres at the carrier frequency F_{MB} the information signals produced by the section 40. The section 40 arranges the information signals to be transmitted in accordance with the commands given by the management circuit 17, phase-modulates, frequency-modulates or amplitude-modulates the information signals on an intermediate frequency F_I . This management circuit 17 makes it also possible to recover the different information signals contained in the TDMA frame received by a receive set 44. The input of this set is connected to the output of a filter 46 centred at the frequency F_I , connected to the output of a demodulator 48. This demodulator 48 receives from the amplifier 26 the signals supplied at the frequency F_{BM} . Reference numeral 60 denotes the subscriber's microphone and reference numeral 62 is his loudspeaker. The speech information, previously digitized, is transmitted in one of the time intervals of the frame transmitted by the carrier F_{MB} , this time interval being allocated by the management circuit 17. The speech information signals coming from the remote subscriber, transmitted in one of the time intervals of the frame transmitted at F_{BM} , are recovered at the loudspeaker after decoding. The management circuit 17 further operates so that all these XCCHs can be received.

According to the invention such a system comprises means for transmitting in a time interval XCCH a request to transmit or speak signal for a remote subscriber, means for detecting this request to transmit at the remote subscriber,

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and means for denying the remote subscriber access to transmission.

The means for transmitting the request to transmit may be realised by a simplex or "push-to-talk" button 70 connected to the section 40, in a time interval XCCH allocated to the connection of the near subscriber to the remote subscriber.

The means for detecting this request to transmit, at the remote subscriber, are constituted by the reception of the interval XCCH allocated to the communication, with the aid of a request-to-speak receiver 72 which influences the management circuit 17.

The means for denying access to transmission may be constituted by a luminous signal signalling to the remote subscriber that he cannot transmit speech because the management circuit 17 prevents this command, or also by the remote subscriber's device automatic change to the receive mode.

FIG. 4 shows the procedure which permits the simplex communications in a satisfactory manner.

To begin with, an XCCH is assumed to be allocated by the station STB for the connection of subscriber A1 to subscriber B1.

At instant t1, by depressing the button 70, the subscriber A1 makes known to the station STB his request to transmit to the subscriber B1 in the interval XCCH.

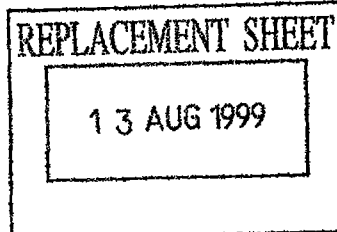
At instant t2 the station STB, once it has verified that it is possible while avoiding conflicts of simultaneity, grants transmission priority to subscriber A1 by authorizing subscriber A1 to transmit. STM1 is put in position T (transmission as regards spcch).

At instant t3 (which may overlap instant t2) STB transmits this request to the station STM2, thereby denying STM2 access to transmission.

At instant t4 the station STM2 has received this signal, which brings the station the receive position R.

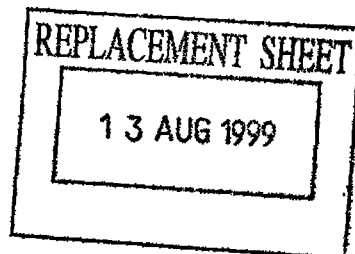
At instant t5 the subscriber A1 releases his simplex button, thereby causing transmission of a release signal to station STB.

At instant t6 the station STB acknowledges reception of this release signal to station STM1.



At instant t_7 (which may overlap instant t_6) the station STB transmits a cancellation of transmission denial to station STM2, and thereby removes any obstacles for the station STM2.

This procedure may be further simplified as required, for example, by cancelling the instant t_2 , t_5 , t_6 , t_7 . In that case one the transmission priority is given to the last transmitter (t_1 , t_3 , t_4).



CLAIMS

1. A first subscriber device for communicating over a transmission system comprising a base station and at least a second subscriber device and another subscriber device, wherein said first and second subscriber devices exchange information signals in a simplex mode using time division multiplex signals, said time division multiplex signals including spaced control time intervals, and one of said control time intervals being allocated for a request to transmit by said first subscriber device, characterized in that said first subscriber device comprises

means for detecting said one of said control time intervals,

means for enabling a subscriber using said first subscriber device to obtain transmission priority for transmitting information to said another subscriber device, said means for enabling including means for generating a first request to transmit signal; means, responsive to said means for detecting, for transmitting said first

request to transmit signal during said one of said control time intervals; and means, responsive to receipt of a first control signal from said base station, for enabling transmission of said information to said another subscriber device, and

means, responsive to completion of transmission of said information, for transmitting a release signal.

2. A first subscriber device as claimed in claim 1, comprising means responsive to receipt, during one of said control time intervals, of a second control signal from said base station relating to a request to transmit signal from said second subscriber device seeking to communicate information to said first subscriber device, for preventing transmission by said first subscriber device prior to receipt of a release signal from said second subscriber device.

3. A device as claimed in claim 1, characterized in that said first subscriber device is a speech signal transceiver having a push-to-talk switch,

said means for generating is responsive to actuation of said push-to-talk switch, and

said means for transmitting a release signal is responsive to release of said push-to-talk switch.



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4. A method of operating a transmission system comprising a base station and at least a first subscriber device and a second subscriber device, wherein said devices exchange information signals in a simplex mode over a common channel of a time division multiplex system, wherein said time division multiplex system further includes spaced control time intervals, and wherein said method comprises allocating one of said control time intervals by said base station for managing said common channel,

characterized in that said method further comprises:

permitting transmission of a request to transmit from said first subscriber device to said base station during said one of said control time intervals,

responsive to completion of a transmission of said information signals from said first subscriber device over said common channel, transmitting a release signal from said first subscriber device during another of said control time intervals, and

responsive to receipt by said base station of said request to transmit, transmitting from said base station at least one control signal for permitting said first subscriber device to transmit and for preventing said second subscriber device from transmitting until receipt by said second subscriber device of a signal indicative of the release by said first subscriber device.

5. A method as claimed in claim 4, wherein said first subscriber device is a speech communication device having a push-to-talk switch, characterized in that said release signal is transmitted responsive to release of said push-to-talk switch.

6. A method as claimed in claim 5, characterized in that said request to transmit is transmitted responsive to actuation of said push-to-talk switch.

7. A method as claimed in claim 4, characterized in that said one of said control time intervals is allocated to said first subscriber device by said base station.

8. A method as claimed in claim 4, characterized in that, responsive to receipt of said request to transmit, said base station transmits to said first subscriber device a first signal authorizing said first subscriber device to transmit, and transmits to said second subscriber device a signal corresponding to said request to transmit; and

responsive to receipt of said release signal, said base station transmits to said second subscriber device a signal corresponding to said release signal.

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**TRANSMISSION SYSTEM COMPRISING AT
LEAST TWO SUBSCRIBER DEVICES
EXCHANGING INFORMATION SIGNALS IN
THE SIMPLEX OF HALF-DUPLEX MODE**

ABSTRACT

Transmission system comprising at least two subscriber devices exchanging information signals in the simplex mode. This transmission system comprises at least a remote and a near subscriber device (A1, B1) exchanging information signals in the simplex mode by means of a multiplex of the time-division type in which a control time interval is provided. For a communication between a remote subscriber and a near subscriber, a control time interval (XCCH) is allocated for the transmission of a request to speak made by one of the subscribers. The request to speak received by the other subscriber is used for preventing him from transmitting.

FIGURE 1

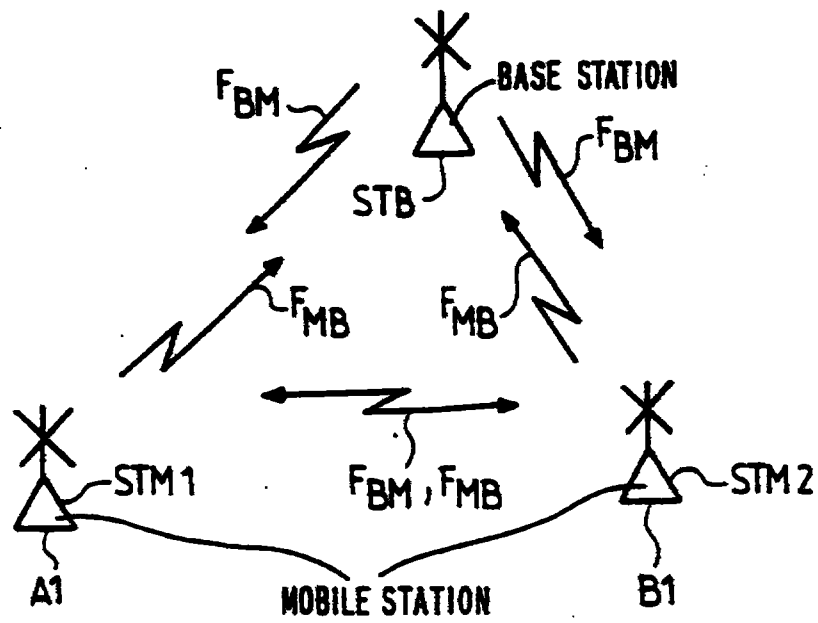


FIG. 1

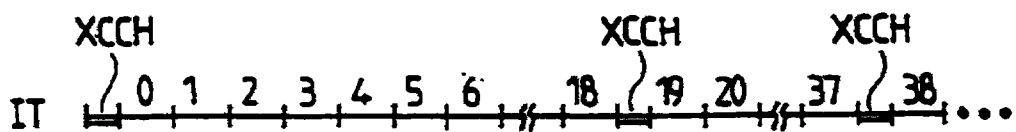


FIG. 2

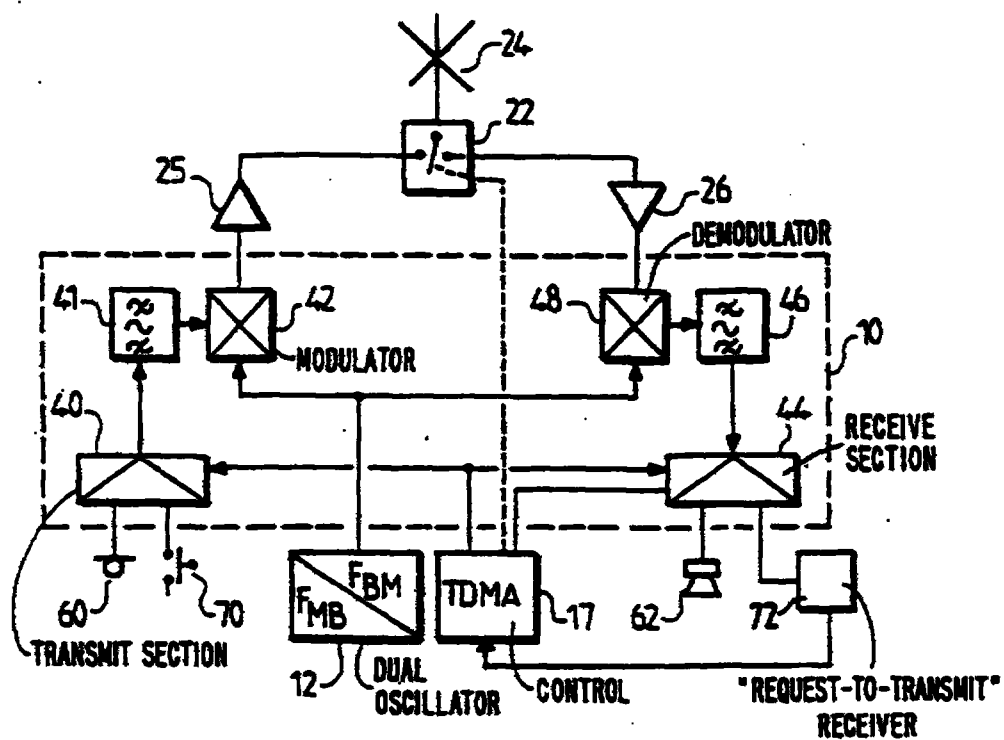


FIG. 3

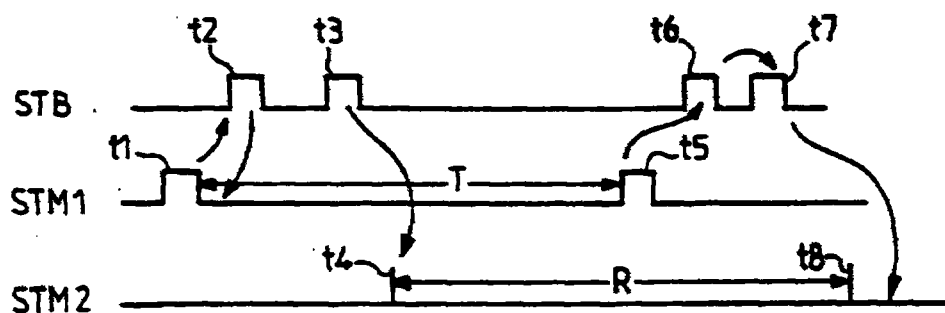


FIG. 4