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Description

BACKGROUND OF THE INVENTION

The present invention relates to a receiver mounted on an automobile telephone or similar mobile station included in a cellular mobile radio communication system. More particularly, the present invention is concerned with a receiver capable of enhancing the reception sensitivity characteristic in locations where the reception field strength is low or the intermodulation distortion characteristic in locations where the field sensitivity is high and intermodulation distortions occur.

A cellular mobile radio communication system divides a service area into minute cells and locates a base station in each of the cells. This kind of communication system allows the base stations to communicate with mobile stations such as automobile telephones while promoting effective use of frequencies. A conventional receiver for such an application (see e.g. United Kingdom Patent Application GB-A-2 204 215) has an antenna duplexer for passing, among received input waves coming in through an antenna, only a desired wave. A high frequency amplifier amplifies the received wave while a high frequency filter attenuates the frequencies of the received wave lying outside of a particular frequency band. A first frequency converter has a first mixer and a first local oscillator and converts the received wave passed the high frequency filter to a first intermediate frequency (IF). The first IF is applied to an IF filter. A second frequency converter has a second mixer and a second local oscillator and converts the first IF passed the filter to a second IF. The second IF is fed to an IF amplifier and then to a demodulator. The demodulated signal from the demodulator is amplified by a low frequency amplifier and then outputted via a loudspeaker as voice. A field strength detector monitors the reception field strength by converting the field strength of the received input wave from the antenna to a voltage. A SAT (Supervisory Audible Tone) signal detector is responsive to a SAT signal being fed from a base station for determining whether or not the mobile station is in communication with the base station.

The above-described receiver has an excellent reception sensitivity characteristic since the high frequency amplifier amplifies the received wave and since the first mixer converts it to the first IF with a high gain. However, when the desired received wave is accompanied by interference waves, the intermodulation distortion is aggravated to degrade the intermodulation characteristic.

Some different efforts have heretofore been made to reduce the intermodulation distortions and thereby improve the intermodulation characteristic. For example, the high frequency amplifier may be omitted to lower the level of the interference waves entering the first mixer, or the gain of the first mixer may be reduced. However, the problem with these implementations is that the high frequency gain of the receiver is reduced, which degrades the receive sensitivity due to the omission of the high frequency amplifier or the lowered gain of the first mixer.

It is also known from U.S. Patent US-A-4 227 256, in the context of the RF amplifier stage of an AM broadcast radio tuner, selectively to amplify the received signal by a high gain RF amplifier, or by a low gain RF amplifier, or by a combination of the two.

According to the present invention there is provided a receiver mounted on a mobile station which is included in a cellular mobile radio communication system for communicating with a base station, comprising, a high frequency signal path for amplifying a received input wave and converting it to an intermediate frequency, field strength detecting means for detecting the field strength of a received input wave, and SAT (Supervisory Audible Tone) signal detecting means for detecting a SAT signal fed from said base station and thereby determining whether or not the mobile station is in communication with the base station, characterised by control means having inputs coupled to the outputs of the field strength detecting means and the SAT signal detecting means and an output coupled to the high frequency signal path, for changing the gain through the high frequency signal path in response both to the level of the field strength of a received input wave as detected by the field strength detecting means, and to the result of the detection performed by the SAT signal detecting means.

In a first embodiment the high frequency signal path includes a high frequency amplifier, and the control means includes means for selectively enabling or disabling the high frequency amplifier.

Alternatively, the high frequency signal path may include amplifier means providing selectively one of a plurality of possible gain values in response to the output of the control means.

In a third embodiment, the high frequency signal path comprises mixer means for converting the received input wave to an intermediate frequency, and wherein the control means controls the mixer means to effect a change in the gain of the mixer means.

In all such embodiments, a receiver for a cellular mobile radio communication system can be made which improves both the radiation sensitivity characteristic and the intermodulation characteristic at the same time.

The invention will now be described in more detail, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a block diagram schematically showing a conventional receiver for a cellular mobile radio communication system;
FIG. 2 shows a relation between the inputs and the outputs of a mixer included in the convention-
al receiver;
FIG. 3 is a graph showing a relation between the input signal power and the output signal power of desired signal output and tertiary intermodulation distortion;
FIG. 4 is a block diagram schematically showing a first embodiment of the receiver in accordance with the present invention;
FIG. 5 is a diagram showing a specific construction of a switching circuit included in the embodiment;
FIG. 6 is a block diagram schematically showing a second embodiment of the present invention;
FIG. 7 is a diagram showing a specific construction of a high frequency amplifier and a switching circuit included in the second embodiment; and
FIG. 8 is a block diagram showing a third embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

To better understand the present invention, a brief reference will be made to a conventional receiver for a cellular mobile communication system, shown in FIG. 1. As shown, electromagnetic waves coming in through an antenna 1 are applied to an antenna duplexer 2. Only the received wave included in the electromagnetic waves is passed through the duplexer 2, amplified by a high frequency amplifier 3, and then fed to a high frequency filter 4 to attenuate the frequency components outside of the reception frequency band. The received wave passed through the filter 4 is converted to a first intermediate frequency (IF) by a first mixer 5 and a first local oscillator 6 which constitute a first frequency converter in combination. The first IF is filtered by an IF filter 7 and then converted to a second IF by a second mixer 8 and a second local oscillator 9 which constitute a second frequency converter. The second IF has the gain thereof increased by an IF amplifier 10 to an operating level particular to a demodulator 11. The demodulator 11 demodulates the received IF. The demodulated signal is amplified by a low frequency amplifier 12 and then outputted via a loudspeaker as voice. A field strength detector 14 monitors the reception field strength by converting the field strength of received input waves to voltages. A SAT (Supervisory Audible Tone) signal detector 15 is responsive to a SAT signal being sent from a base station for thereby determining whether or not the associated mobile station is in communication with the base station. For details of the SAT signal detector 15, a reference may be made to U.S. Patent No. 4, 025, 853 by way of example, which is incorporated herein. The antenna 1 is connected to a transmitter, not shown, as well as to the receiver.

The above-described conventional receiver receives incoming waves with high sensitivity since the high frequency amplifier 3 amplifies the received waves and since the mixer 5 of the first frequency converter converts them to the first IF with a high gain. However, the problem is that when interference waves are received together with a desired wave, intermodulation distortions are aggravated to degrade the intermodulation characteristic. This problem will be described with reference to FIGS. 2 and 3 more specifically.

As shown in FIG. 2, when input signals f1 and f2 each having a particular frequency and a local signal fL for frequency conversion are applied to the input of the first mixer 5, the mixer 5 produce output signals f1', f2' and fL as desired signals. In addition, tertiary intermodulation distortions d1 and d2 appear on the output of the mixer 5 due to the nonlinearity of a transistor that constitutes the mixer 5. As a result, the output signal of the mixer 5, i.e., the first frequency converter includes not only the desired frequencies but also the interference frequencies, degrading the reception characteristic of the receiver. FIG. 3 shows a relation between the input signal voltage to the mixer 5 (abscissa) and the output signal power of desired signal output and tertiary intermodulation distortion (ordinate). As shown, while the desired signal output F of the mixer 5 has a gradient 1, the tertiary intermodulation distortion D has a gradient 3. Hence, when the input signal power is increased by 1 dB, the tertiary intermodulation distortion D increases by 3 dB although the desired signal output F also increases by 1 dB. Conversely, on the decrease of the input signal power by 1 dB, the tertiary intermodulation distortion D decreases by 3 dB while the desired signal output F decreases by only 1 dB. It follows that reducing the input signal power to the mixer 5 is successful in improving the intermodulation characteristic in a ratio of 1:3 so long as the received input signal has a sufficient level, i.e., the input power of the desired signal can be safely lowered.

For the above reason, it has been customary to omit the high frequency amplifier 3 to thereby reduce the input signal power to the first mixer 5 or the gain of the mixer 5. This suppresses the intermodulation distortions and thereby improves the intermodulation characteristic. However, such an implementation lowers the high frequency gain and, therefore, the reception sensitivity characteristic, as mentioned earlier.

Hereinafter will be described preferred embodiments of the present invention which improve not only the reception sensitivity characteristic but also the intermodulation characteristic.

First Embodiment

Referring to FIG. 4, a first embodiment of the present invention selectively connects and disconnects a high frequency amplifier depending on the level of a reception field strength, thereby reducing the intermodulation distortions without degrading the
reception sensitivity characteristic. In FIG. 4, the same or similar components as those of the conventional receiver, FIG. 1, are designated by the same reference numerals, and redundant description will be avoided for simplicity. In FIG. 4, the receiver has a switching circuit 16, a NAND gate 17, and a NOT gate 18 in addition to the various components of the prior art receiver shown in FIG. 1. The output of the SAT signal detector 15 is applied to the NOT gate 18 whose output is in turn fed to one input terminal of the NAND gate 17. The output of the field strength detector 14 is delivered to the other input terminal of the NAND gate 17 the output of which is in turn fed to the switching circuit 16. The output of the field strength detector 14 goes high or "H" when the detector 14 detects a reception field strength higher than a predetermined level. The output of the SAT signal detector 15 goes high when the detector 15 detects a SAT signal. When the output of the NAND gate 17 goes high, the switching circuit 16 connects the high frequency amplifier 3 to the duplexer 2 and high frequency filter 4 to allow the amplifier 3 to amplify the received signal. Conversely, when the output of the NAND gate 17 goes low or "L", the switching circuit 16 disconnects the amplifier 3 from the duplexer 2 to deliver the received signal from the duplexer 2 directly to the high frequency filter 4.

In operation, when the reception field strength is low, i.e., when the field strength of the input waves being received is determined to be low, the output of the field strength detector 14 remains in a low level or "L". The NAND gate 17, therefore, produces a high level output or "H" with no regard to the output of the SAT signal detector 15. In response, the switching circuit 16 connects the high frequency amplifier 3 to the duplexer 2 and high frequency filter 4 with the result that the received signal from the antenna 1 is applied to and amplified by the amplifier 3. In this condition, reception with high sensitivity is insured. On the other hand, assume that the waveform of the SAT signal has been disturbed by interference waves and has not been detected by the SAT signal detector 15, despite that the reception field strength is high. Such a condition means that an intermodulation distortion has occurred. Then, the outputs of the field strength detector 14 and SAT signal detector 15 are in a high level and a low level, respectively. The output of the SAT signal detector 15 is inverted by the NOT gate 18, and the resulted high level is applied to the NAND gate 17. As a result, the output of the NAND gate 17 goes low. The switching circuit 16, therefore, disconnects the high frequency amplifier 3 from the duplexer 2 and passes the received signal directly to the high frequency filter 4. In this manner, when interference waves come in through the antenna 1, the high frequency amplifier 3 is excluded to lower the level of the interference waves applied to the first mixer 5 by an amount corresponding to the gain of the amplifier 3. Consequently, the intermodulation distortion in the first mixer 5 is reduced to improve the intermodulation characteristic of the receiver.

FIG. 5 shows a specific construction of the switching circuit 16. As shown, the switching circuit 16 has PIN diodes D1-D5 each lowering the high frequency resistance thereof in response to a current, resistors R1-R4, capacitors C1-C4, an analog switch SW1, and a power source BT1. In operation, when the high level output of the NAND gate 17 is applied to the analog switch SW1, the switch SW1 connects the power source 1 to the resistor R1. Then, a current flows through the PIN diodes D1 and D2 and resistor R4. As a result, the output of the high frequency amplifier 3 is routed through the AC shut-off capacitor C1, PIN diodes D1 and D3 and DC shut-off capacitor C4 to the high frequency filter 4. At this instant, since no current flows through the PIN diodes D4 and D5, these diodes D4 and D5 maintain high resistance and, therefore, the multiplexer 2 and the high frequency filter 4 are isolated from each other with respect to high frequency. On the other hand, when the output of the NAND gate 17 goes low, the analog switch SW1 connects the power source BT1 to the resistor R2. Then, a current flows through the PIN diodes D5 and D4 and resistor R4 to lower their high frequency resistance. A current also flows through the PIN diode D2 since the voltage from the power source BT1 is also applied to the resistor R3, lowering the resistance of the diode D2. In this condition, a high frequency signal cannot pass the PIN diodes D1 and D3. The PIN diodes D1 and D3, therefore, remain in a high resistance state. As a result, the output of the high frequency amplifier 3 is prevented from reaching the high frequency filter 4 via the PIN diodes D1 and D3.

Second Embodiment

Referring to FIG. 6, an alternative embodiment of the present invention is shown which selectively changes the gain of the high frequency amplifier 3 for reducing intermodulation distortions. As shown, this embodiment is essentially similar to the embodiment of FIG. 4 except for the constructions of the high frequency amplifier 3 and switching circuit 16. Specifically, as shown in FIG. 7, a high frequency amplifier 3A is made up of a transistor TR1 serving as an amplifying element, capacitors C11 and C12 and a coil L11 constituting an input impedance adjusting circuit in combination, resistors R11 and R12 constituting a base bias voltage adjusting circuit associated with the transistor TR1, a resistor R13 for interrupting the oscillation of the amplifier 3, a coil L12 and capacitors C13 and C14 constituting an output impedance adjusting circuit, capacitors C15, C16, C17 and C18 for passing high frequencies, a power source BT2, and resistors R14 and R15 for feeding power to the transistor TR1. The resistors R14 and R15 each has a
particular resistance. On the other hand, a switching circuit 16A is implemented by an analog switch SW2 inserted between the resistors R14 and R15 and the power source BT2. The gain of the transistor TR1 depends on the collector current which in turn depends on the resistance of the resistor R14 or R15. In the illustrative embodiment, the resistance of the resistor R15 is maintained higher than the resistance of the resistor R14, and the analog switch SW2 is driven by the output of the NAND gate 17 to connect the power source BT2 to either one of the resistors R14 and R15. Specifically, when the output of the NAND gate 17 coupled to the analog switch SW2 goes high, the switch SW2 connects the power source BT2 to the resistor R14 to thereby increase the gain of the transistor TR1, i.e., the gain of the amplifier 3A. On the other hand, as the output of the NAND gate 17 goes low, the analog switch SW2 connects the power source BT2 to the resistor R15. However, since the resistance of the resistor R15 is lower than that of the resistor R14, the gain of the transistor TR1, i.e., the gain of the amplifier 3 is reduced.

As stated above, this embodiment selects either one of the lower resistance resistor R14 and the higher resistance resistor and, therefore, one of the higher and lower gains of the high frequency amplifier 3A. This reduces the intermodulation distortions and thereby improves the intermodulation characteristic. The embodiment may be modified to change the gain of the amplifier 3A in thee or more steps, if desired.

Third Embodiment

Referring to FIG. 8, another alternative embodiment of the present invention will be described. Briefly, this embodiment achieves the same objectives as the foregoing embodiments by implementing the first mixer 5 as two split mixers each having a particular conversion gain and selecting either one of them by the switching circuit 16.

As shown in FIG. 8, the receiver has a first mixer 5A, a second mixer 5B, and a switching circuit 16B for selecting either one of the mixers 5A and 5B. The first mixer 5A is constituted by a transistor mixer having a high conversion gain, while the second mixer 5B is constituted by a double balanced mixer having a desirable intermodulation characteristic although the conversion gain is low. The switching circuit 16B selectively connects either one of the mixers 5A and 5B to the high frequency filter 4 and IF filter 7 in response to the output of the NAND gate 17. In operation, when the output of the NAND gate 17 goes high, the switching circuit 16B selects the mixer 5A having a high gain. When the output of the NAND gate 17 goes low, the switching circuit 16B selects the other mixer 5B whose gain is low. Therefore, when the reception field strength is lower than a predetermined value, the mixer 5A having a high gain is used to prevent the sensitivity characteristic, rather than the intermodulation characteristic, from being lowered. On the other hand, when the field strength is higher than the predetermined value and, at the same time, an intermodulation distortion has occurred, the mixer 5B having a desirable intermodulation characteristic is used to improve the intermodulation characteristic.

This embodiment may be modified such that the switching circuit 16B selects either one of the mixers 5A and 5B on the basis of the output of the field strength detector 14 only, i.e., without referencing the output of the SAT signal detector 15.

In summary, it will be seen that the present invention provides a receiver for a cellular mobile radio communication system which enhances the sensitivity characteristic in locations where the reception field strength is low or the intermodulation characteristic in locations where the field intensity is high and intermodulation distortion occurs. The receiver, therefore, achieves an unprecedented reception characteristic.

Claims

1. A receiver mounted on a mobile station which is included in a cellular mobile radio communication system for communicating with a base station, comprising:
   - a high frequency signal path (3-5) for amplifying a received input wave and converting it to an intermediate frequency;
   - field strength detecting means (14) for detecting the field strength of a received input wave; and
   - SAT (Supervisory Audible Tone) signal detecting means (15) for detecting a SAT signal fed from said base station and thereby determining whether or not the mobile station is in communication with the base station; characterised by control means (16-18) having inputs coupled to the outputs of the field strength detecting means (14) and the SAT signal detecting means (15) and an output coupled to the high frequency signal path (3-5, 16), for changing the gain through the high frequency signal path (3-5, 16) in response both to the level of the field strength of a received input wave as detected by the field strength detecting means, and to the result of the detection performed by the SAT signal detecting means.

2. A receiver as claimed in claim 1, wherein the high frequency signal path includes a high frequency amplifier (3), and the control means includes means (16) for selectively enabling or disabling the high frequency amplifier.
3. A receiver as claimed in claim 2, wherein the control means (16-18) enables the high frequency amplifier (3) when the field strength of the received input wave is lower than a predetermined level and disables the high frequency amplifier when the field intensity is higher than the predetermined level and the SAT signal is not detected.

4. A receiver as claimed in claim 2 or 3, wherein the control means comprises switching means (16) for selectively causing the received input wave to reach the high frequency amplifier (3) or to reach the next stage bypassing the high frequency amplifier.

5. A receiver as claimed in claim 1, wherein the high frequency signal path includes amplifier means (3A) providing selectively one of a plurality of possible gain values, in response to the output of the control means (16A, 17, 18).

6. A receiver as claimed in claim 5, wherein the control means (16A, 17, 18) increases the gain of the amplifier means (3A) when the field strength of the received input wave is lower than a predetermined level and reduces the gain when the field strength is higher than the predetermined level and the SAT signal is not detected.

7. A receiver according to claim 1, wherein the high frequency signal path comprises mixer means (5A, 5B) for converting the received input wave to an intermediate frequency, and wherein the control means (16B, 17, 18) controls the mixer means to effect a change in the gain of the mixer means.

8. A receiver as claimed in claim 7, wherein the control means (16B, 17, 18) increases the gain of the mixer means (5A, 5B) when the field strength of the received input wave is lower than a predetermined level and reduces the gain when the field strength is higher than the predetermined level.

9. A receiver as claimed in claim 8, wherein the mixer means comprises a first mixer (5A) having a relatively high gain and a second mixer (5B) having a relatively low gain.

10. A receiver as claimed in claim 9, wherein the control means comprises switching means (16B) for selecting the first mixer (5A) when the field strength of the received input wave is lower than the predetermined level or the second mixer when the field strength is higher than the predetermined level.

11. A receiver as claimed in claim 9 or 10, wherein the first mixer (5A) and the second mixer (5B) comprise a transistor mixer and a double balanced mixer, respectively.

12. A receiver as claimed in any of claims 7 to 11, wherein the control means (16B, 17, 18) increases the gain of the mixer means (5A, 5B) when the field strength of the received input wave is lower than a predetermined level, and reduces the gain when the field strength is higher than the predetermined level and the SAT signal is not detected.

13. A receiver as claimed in claim 12, wherein the control means comprises switching means (16B) which selects the first mixer when the field intensity of the received input wave is lower than the predetermined level, or the second mixer when the field intensity is higher than the predetermined level and the SAT signal is not detected.

14. A receiver as claimed in any preceding claim, wherein the control means comprises logical means (17, 18) for receiving the output of the field strength detecting means at one input terminal thereof and the output of the SAT signal detecting means at the other input terminal thereof.

Patentansprüche

1. Empfänger, der an einer mobilen Station angeordnet und in ein zelluläres Mobilfunkübertragungssystem einbegriffen ist, zur Verbindung mit einer Basisstation, mit:
   einen Hochfrequenzsignalweg (3-5) zum Verstärken einer empfangenen Eingangswelle und zum Umsetzen derselben in eine Zwischenfrequenz;
   einer Feldstärkeermittlungseinrichtung (14) zum Ermitteln der Feldstärke einer empfangenen Eingangswelle; und
einer SAT-(Überwachungshörton-)Signalermittlungseinrichtung (15) zum Ermitteln eines SAT-Signals, das von der Basisstation zugeführt wird, und somit zum Bestimmen, ob die mobile Station sich in Verbindung mit der Basisstation befindet oder nicht, gekennzeichnet durch
   eine Steuereinrichtung (16-18) mit Eingängen, die mit den Ausgängen der Feldstärkeermittlungseinrichtung (14) und der SAT-Signalermittlungseinrichtung (15) verbunden sind, und einem Ausgang, der mit dem Hochfrequenzsignalweg verbunden ist, zum Ändern der Verstärkung über den Hochfrequenzsignalweg (3-5, 16) als Antwort sowohl auf den Pegel der Feldstärke einer empfangenen Eingangswelle, wie sie von der Feldstärkeermittlungseinrichtung ermittelt wird, als auch auf das Ergebnis der Ermittlung,
die von der SAT-Signalermittlungseinrichtung durchgeführt wird.

2. Empfänger nach Anspruch 1, bei dem der Hochfrequenzsignalweg einen Hochfrequenzverstärker (3) aufweist und die Steuereinrichtung eine Einrichtung (16) aufweist zum selektiven Aktivieren oder Sperren des Hochfrequenzverstärkers.

3. Empfänger nach Anspruch 2, bei dem die Steuereinrichtung (16-18) den Hochfrequenzverstärker (3) aktiviert, wenn die Feldstärke der empfangenen Eingangswelle geringer ist als ein vorbestimmter Pegel, und den Hochfrequenzverstärker deaktiviert, wenn die Feldstärke höher ist als ein vorbestimmter Pegel und das SAT-Signal nicht ermittelt worden ist.

4. Empfänger nach Anspruch 2 oder 3, bei dem die Steuereinrichtung eine Umschalteinrichtung (16) aufweist zum Bewirken, daß die empfangene Eingangswelle selektiv den Hochfrequenzverstärker (3) oder unter Umgehung des Hochfrequenzverstärkers die nächste Stufe erreicht.

5. Empfänger nach Anspruch 1, bei dem der Hochfrequenzsignalweg eine Verstärkereinrichtung (3A) aufweist, die selektiv einen von mehreren möglichen Verstärkungswerten als Antwort auf das Ausgangssignal der Steuereinrichtung (16A, 17, 18) bereitstellt.

6. Empfänger nach Anspruch 5, bei dem die Steuereinrichtung (16A, 17, 18) die Verstärkung der Verstärkereinrichtung (3A) erhöht, wenn die Feldstärke der empfangenen Eingangswelle geringer ist als ein vorbestimmter Pegel, und die Verstärkung verringert, wenn die Feldstärke höher ist als der vorbestimmte Pegel und das SAT-Signal nicht ermittelt worden ist.

7. Empfänger nach Anspruch 1, bei dem der Hochfrequenzsignalweg eine Mischereinrichtung (5A, 5B) aufweist zum Umsetzen der empfangenen Eingangswelle in eine Zwischenfrequenz, wobei die Steuereinrichtung (16B, 17, 18) die Mischereinrichtung steuert, um eine Änderung der Verstärkung der Mischereinrichtung zu bewirken.

8. Empfänger nach Anspruch 7, bei dem die Steuereinrichtung (16B, 17, 18) die Verstärkung der Mischereinrichtung (5A, 5B) erhöht, wenn die Feldstärke der empfangenen Eingangswelle geringer ist als ein vorbestimmter Pegel, und die Verstärkung verringert, wenn die Feldstärke höher ist als der vorbestimmte Pegel.

9. Empfänger nach Anspruch 8, bei dem die Mi-

schereinrichtung einen ersten Mischer (5A) mit einer relativ hohen Verstärkung und einen zweiten Mischer (5B) mit einer relativ geringen Verstärkung aufweist.

10. Empfänger nach Anspruch 9, bei dem die Steuereinrichtung eine Umschalteinrichtung (16B) aufweist zum Wählen des ersten Mischers (5A), wenn die Feldstärke der empfangenen Eingangswelle geringer ist als der vorbestimmte Pegel, oder des zweiten Mischers, wenn die Feldstärke höher ist als der vorbestimmte Pegel.

11. Empfänger nach Anspruch 9 oder 10, bei dem der erste Mischer (5A) und der zweite Mischer (5B) einen Transistormischer bzw. einen Ringmischer aufweisen.

12. Empfänger nach einem der Ansprüche 7 bis 11, bei dem die Steuereinrichtung (16B, 17, 18) die Verstärkung der Mischereinrichtung (5A, 5B) erhöht, wenn die Feldstärke der empfangenen Eingangswelle geringer ist als ein vorbestimmter Pegel, und die Verstärkung verringert, wenn die Feldstärke höher ist als der vorbestimmte Pegel und das SAT-Signal nicht ermittelt worden ist.

13. Empfänger nach Anspruch 12, bei dem die Steuereinrichtung eine Umschalteinrichtung (16B) aufweist, die, wenn die Feldstärke der empfangenen Eingangswelle geringer ist als der vorbestimmter Pegel, den ersten Mischer oder, wenn die Feldstärke höher ist als der vorbestimmte Pegel und das SAT-Signal nicht ermittelt worden ist, den zweiten Mischer wählt.

14. Empfänger nach einem der vorangegangenen Ansprüche, bei dem die Steuereinrichtung eine Logikeinrichtung (17, 18) aufweist zum Empfang des Ausgangssignals der Feldstärkeermittlungseinrichtung an ihrem einen Eingangsanschluß und des Ausgangssignals der SAT-Signalermittlungseinrichtung an ihrem anderen Eingangsanschluß.

Reivendications

1. Récepteur monté sur une station mobile qui est inclus dans un système de communication radio cellulaire mobile pour communiquer avec une station de base, comprenant:
   un chemin de signal haute fréquence (3-5) pour amplifier une onde d'entrée reçue et la convertir en une fréquence intermédiaire;
   un moyen de détection d'intensité de champ (14) pour détecter l'intensité de champ d'une onde d'entrée reçue; et
un moyen de détection de signal SAT (tonalité sonore de surveillance) (15) pour détecter un signal SAT provenant de ladite station de base et déterminant par là si oui ou non la station mobile est en communication avec la station de base; caractérisé par
un moyen de commande (16-18) ayant des entrées couplées aux sorties du moyen de détection d'intensité de champ (14) et du moyen de détection de signal SAT (15) et une sortie couplée au chemin de signal haute fréquence (3-5, 16), pour changer le gain par le chemin de signal haute fréquence (3-5,16) en réponse à la fois au niveau de l'intensité de champ d'une onde d'entrée reçue telle que détectée par le moyen de détection d'intensité de champ, et au résultat de la détection effectuée par le moyen de détection de signal SAT.

2. Récepteur selon la revendication 1, caractérisé en ce que le chemin de signal haute fréquence comporte un amplificateur haute fréquence (3), et le moyen de commande comporte un moyen (16) pour valider ou inhiber sélectivement l'amplificateur haute fréquence.

3. Récepteur selon la revendication 2, caractérisé en ce que le moyen de commande (16-18) valide l'amplificateur haute fréquence (3) quand l'intensité de champ de l'onde d'entrée reçue est inférieure à un niveau prédéterminé et inhibe l'amplificateur haute fréquence quand l'intensité de champ est supérieure au niveau prédéterminé et le signal SAT n'est pas détecté.

4. Récepteur selon la revendication 2 ou 3, caractérisé en ce que le moyen de commande comprend un moyen de commutation (16) pour forcer sélectivement l'onde d'entrée reçue à atteindre l'amplificateur haute fréquence (3) ou à atteindre l'étage suivant en contournant l'amplificateur haute fréquence.

5. Récepteur selon la revendication 1, caractérisé en ce que le chemin de signal haute fréquence comporte un moyen amplificateur (3A) fournissant sélectivement l'une d'une pluralité de valeurs de gain possibles, en réponse à la sortie du moyen de commande (16A, 17, 18).

6. Récepteur selon la revendication 5, caractérisé en ce que le moyen de commande (16A, 17, 18) augmente le gain du moyen amplificateur (3A) quand l'intensité de champ de l'onde d'entrée reçue est inférieure à un niveau prédéterminé et réduit le gain quand l'intensité de champ est supérieure au niveau prédéterminé et le signal SAT n'est pas détecté.

7. Récepteur selon la revendication 1, caractérisé en ce que le chemin de signal haute fréquence comporte un moyen mélangeur (5A, 5B) pour convertir l'onde d'entrée reçue en une fréquence intermédiaire, et en ce que le moyen de commande (16B, 17, 18) commande le moyen mélangeur pour effectuer un changement du gain du moyen mélangeur.

8. Récepteur selon la revendication 7, caractérisé en ce que le moyen de commande (16A, 17, 18) augmente le gain du moyen mélangeur (5A, 5B) quand l'intensité de champ de l'onde d'entrée reçue est inférieure à un niveau prédéterminé et réduit le gain quand l'intensité de champ est supérieure au niveau prédéterminé.

9. Récepteur selon la revendication 8, caractérisé en ce que le moyen mélangeur comprend un premier mélangeur (5A) ayant un gain relativement haut et un second mélangeur (5B) ayant un gain relativement bas.

10. Récepteur selon la revendication 9, caractérisé en ce que le moyen de commande comprend un moyen de commutation (16B) pour sélectionner le premier mélangeur (5A) quand l'intensité de champ de l'onde d'entrée reçue est inférieure à un niveau prédéterminé ou le second mélangeur quand l'intensité de champ est supérieure au niveau prédéterminé.

11. Récepteur selon la revendication 9 ou 10, caractérisé en ce que le premier mélangeur (5A) et le second mélangeur (5B) comprennent un mélangeur à transistor et un mélangeur équilibré dou- ble, respectivement.

12. Récepteur selon l'une quelconque des revendications 7 à 11, caractérisé en ce que le moyen de commande (16B, 17, 18) augmente le gain du moyen mélangeur (5A, 5B) quand l'intensité de champ de l'onde d'entrée reçue est inférieure à un niveau prédéterminé, et réduit le gain quand l'intensité de champ est supérieure au niveau prédéterminé et le signal SAT n'est pas détecté.

13. Récepteur selon la revendication 12, caractérisé en ce que le moyen de commande comprend un moyen de commutation (18B) qui sélectionne le premier mélangeur (5A) quand l'intensité de champ de l'onde d'entrée reçue est inférieure au niveau prédéterminé, ou le second mélangeur quand l'intensité de champ est supérieure au niveau prédéterminé et le signal SAT n'est pas détecté.

14. Récepteur selon l'une quelconque des revendi-
cations précédentes, caractérisé en ce que le moyen de commande comprend un moyen logique (17, 18) pour recevoir la sortie du moyen de détection d'intensité de champ à l'une de ses bornes d'entrée et la sortie du moyen de détection de signal SAT à son autre borne d'entrée.
FIG. 2