

Description

BACKGROUND OF THE INVENTION

The present invention relates to a paging receiver having a capability of receiving message data.

The recent development in the electronics art has accelerated the trend toward a miniature and high performance paging receiver. Indeed, a paging receiver which is furnished not only with a simple paging function but also with a message data receiving function is presently on the market and extensively used in the data services industry. Popularization of data services, however, brings about a problem of the supply of valuable information even to those receivers which are delinquent in payment. In the light of this, there has been proposed a paging communication system in U. S. Patent Application Serial No. 697,334, U.K. Patent Application GB 2 154 347A, and Canadian Patent Application Serial No. 473,573 which are based on Japanese Patent Application No. 59-24337/1984 as filed by NEC Corporation. The paging communication system proposed is configured so that a plurality of receivers are called in group in response to a paging signal transmitted from a base station. The base station transmits to an individual receiver a control signal adapted to inhibit the receipt of message data or cancel the inhibition. The control is added to a paging number particular to the receiver while the message data in question is transmitted after a calling number (common address number) that is meant for many and unspecified receivers.

However, such a system has a drawback that once a battery or like power source installed in the receiver is removed, the inhibition of the receipt of the message data is cancelled allowing even a receiver in delinquency to receive message data again. Further, the prior art system is susceptible to noise because a detection pulse adapted for the inhibition of the receipt of message data and the cancellation of the inhibition is implemented with only a single bit, i.e., logical ONE or ZERO.

It is therefore an object of the present invention to provide a paging receiver with a capability of receiving message data which makes it possible for a base station to exclude a delinquent receiver from a data service and to restore it into the data service, each over a radio link.

It is another object of the present invention to provide a generally improved paging receiver with a capability of receiving message data.

A paging receiver having a capability of receiving message data on reception of a first calling number which is assigned to the receiver and a second calling number which is adapted for a data service for many and unspecified paging receivers

of an embodiment to be described comprises detecting means for detecting a predetermined pattern which is contained in message data that is added to the first calling number, and control means responsive to a control signal from the detecting means for controlling at least a data service which corresponds to the second calling number the control means comprising at least a first power source which is different from a main power source of the receiver and which powers a hold circuit for inverting and holding an output logic of the hold circuit in response to the control signal. The control means is also responsive to a signal which is representative of the presence/absence of said first power source

In another embodiment to be described there is provided a message receiver for receiving messages following a first identification number which is assigned to the paging receiver and a second identification number which is assigned to a plurality of paging receivers inclusive of the paging receiver, a detector for detecting a predetermined pattern which is contained in a message following the first identification number to produce a control signal, and a controller responsive to the control signal for controlling the reception of a message which follows the second identification number. The controller is energized by a first power source which is separate from a main power source of the paging receiver.

A method of controlling the reception of a message following a common call number which is assigned to a plurality of paging receivers inclusive of a paging receiver to be described includes the steps of receiving messages following the common call number and an individual call number which is assigned to the given paging receiver, detecting a predetermined pattern which is contained in a message following the individual call number to produce a control signal, holding the control signal irrespective of the removal of a main power source of the given paging receiver, and responsive to the held control signal, controlling the reception of a message following the common call number.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Fig. 1 is a block diagram showing a paging receiver embodying the present invention;

Fig. 2 is a diagram showing a specific construction of a data set and hold circuit which is included in the receiver of Fig. 1;

Figs. 3A to 3D are diagrams showing the formats of signals which are applicable to the paging receiver of the present invention;

Figs. 4A to 4N are timing charts representative of exemplary waveforms which appear in various portions of Figs. 1 and 2; and

Fig. 5 is a flowchart demonstrating a basic routine which is executed by a central processing unit as shown in Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Fig. 1 of the drawings, a paging receiver with a capability of receiving message data embodying the present invention is shown. As shown, a radio signal coming in through an antenna 10 is amplified, detected and demodulated by a radio section 20 and, then, converted by a waveform shaper 30 into a digital signal. A decoder 100 compares the digital signal with a plurality of own calling numbers which are stored in an erasable read only memory (PROM) 50, as will be described later, informing a central processing unit (CPU) 70 of the receipt of a call via a level shifter 60. A liquid crystal display (LCD) driver 70a is built in the CPU 70 in order to drive an LCD 80.

While a switch 40 of the receiver is ON, voltage from a battery 150 is applied to the radio section 20, waveform shaper 30 and decoder 100 and, at the same time, to the level shifter 60 and CPU 70 via a DC/DC converter 90.

The decoder 100 comprises a read circuit 101 for reading data out of the PROM 50, an Exclusive-NOR (EX-NOR) gate 102, an Exclusive-OR (EX-OR) gate 103, a NOR gate 104, counters 105 and 106, an SR flip-flop 107, an OR gate 108, an alert controller 109, a synchronizing signal detector 110, an inverter 111, and a data set and hold circuit 200 which constitutes a characteristic feature of the present invention.

When the alert controller 109 is enabled, an alarm horn 140 is driven via a buffer amplifier 130. A battery 120 is connected to the data set and hold circuit 200.

In this particular embodiment, two calling numbers are stored in the PROM 50 as the previously mentioned receiver calling numbers, one of them being referred to as a call A and the other as call B hereinafter. While the call A is representative of a paging number which is assigned to an individual receiver, the call B is representative of a common number which is commonly assigned to respective receivers.

Referring to Fig. 2, a specific construction of the data set and hold circuit 200 of Fig. 1 is shown. In this example, the circuit 200 is shown as comprising a D type flip-flop 210, an AND gate 220, a D type flip-flop 230, an OR gate 240, a shift register 250, inverters 260 and 270, and an AND gate 280.

Figs. 3A to 3D show signal formats which are applicable to this particular embodiment. Specifically, Fig. 3B shows the format of a transmit signal

which is made up of a synchronizing signal SC, identification signals ID1, ID2, ..., IDN, and message signals M1, M2, ... As shown in Fig. 3C, the synchronizing signal SC may have a pattern of "0111110011010010000101011101100." Fig. 3D shows a word which is applicable to both of the identification signals and the message signals. An identification signal and a message signal are discriminated from each other based on an identification bit, or most significant bit (MSB); when the MSB is (logical) ZERO, it indicates that the signal which follows it is an identification signal ID1, ID2, ... and, when it is ONE, it indicates that the following signal is a message signal M1, M2, ... The word has a format of BCH (Bose-Chaudhuri Hocquenghem) (31, 21) which is comprised of twenty one data bits (bits 1 to 21), and ten check bits (bits 22 to 31).

Waveforms of signals which appear in various portions of Figs. 1 and 2 are shown in a timing chart in Figs. 4A to 4N. The basic routine to be executed by the CPU 70 is shown in a flowchart in Fig. 5.

In operation, a demodulated wave outputted by the radio section 20 is shaped by the waveform shaper 30 as shown in Fig. 3B and, then, fed to the decoder 100. Assume that, as shown in Fig. 4A, the calls A and B are transmitted as a signal *m* with message data MA and MB respectively added thereto. As soon as the synchronizing signal detector 110 detects a synchronizing signal, the read circuit 101 and the counters 105 and 106 are preset to prepare for the subsequent detection of an identification signal. The calls A and B which are stored in the PROM 50 are read out by the read circuit 101 and applied to, respectively, the EX-NOR gate 102 and the EX-OR gate 103 serially on a bit-by-bit basis together with patterns which correspond to the calls A and B, whereby the data read out are compared with the received data bit by bit.

When the detection of the call A is confirmed by the above procedure as represented by a signal *a* in Fig. 4B, the SR flip-flop 107 is set with the signal *a* fed to the OR gate 108. As a result, a calling signal detect signal *b*, Fig. 4C, and a received call identify signal *c*, Fig. 4D, are delivered to the CPU 70 via the level shifter 60. When detected a level shifted signal *b'*, the CPU 70 decides that a calling signal has been detected (Yes, step 200 of Fig. 5) and, then, determines the logical level of a level shifted signal *c'* (step 201). As represented by a signal *c* in Fig. 4D, when the CPU 70 identifies a (logical) high level, or "H", it determines that a call A has been detected (CALL A, step 201) and, in response to a clock *e*, Fig. 4F, which is fed thereto from the decoder 100 and synchronized with received data *d*, Fig. 4E, de-

codes the subsequent message data out of the received data *d* (step 202).

Subsequently, the CPU 70 checks the output *f*, Fig. 4G, of the data set and hold circuit 200 (step 203). When determined that the signal *f* is low level, or "L" (L, step 203), meaning that the receiver is qualified to receive the service based on the common number, the CPU 70 examines the first digit of the received data (steps 204 and 205). If the first digit is "1100" (Yes, step 205) which is representative of a space, as shown in table 1 below, the CPU 70 restores the receiver to an ordinary standby condition and then, returns to the step 200.

Table 1

BCD CODE	CHARACTER DISPLAYED
0 0 0 0	0
0 0 0 1	1
0 0 1 0	2
0 0 1 1	3
0 1 0 0	4
0 1 0 1	5
0 1 1 0	6
0 1 1 1	7
1 0 0 0	8
1 0 0 1	9
1 0 1 0	E
1 0 1 1	U
1 1 0 0	(SPACE)
1 1 0 1	-
1 1 1 0	}
1 1 1 1	(

If the first digit is "1101" (Yes, step 204) representative of a hyphen, as shown in Table 1, the CPU 70 sets an alert designate signal *j*, Fig. 4K, to the logic of call A (i.e. high level) (step 206) while producing an alert control signal *i*, Fig. 4J, (Step 207). In response to the signals *i* and *j*, the alert controller 109 delivers an output *h* thereof to the buffer amplifier 130 so as to drive the alarm horn 140. Further, the CPU 70 produces a signal *g*, Fig. 4H, (step 208). Then the CPU 70 increments *N* (step 209) and determines if the resultant *N* is odd (step 210). Because the initial value of *N* is zero, the resultant *N* mentioned above is odd (Yes, step 210) so that the CPU 70 produces on the LCD 80 a message which notifies the user of the end of the information service available, "OUT SERVICE" in this particular embodiment (step 211).

In the data set and hold circuit 200, the output of the D type flip-flop 210 is inverted by the signal *g*. As shown in Fig. 2, the signal *g* consists of a component *g*₁ which is representative of a pattern of "1010", and a component *g*₂ representative of four-bits of clock corresponding to the component *g*₁. In the above condition, the call B signal with the

message data MB, *m* in Fig. 4A, is applied to the EX-OR gate 103 to be compared bit by bit with the call B data which is stored in the PROM 50. However, because the output of the EX-OR gate 103 has been inhibited by the control signal *f* which has been applied to the NOR gate 104, the call B is not received (Figs. 4C and 4D).

Next, upon detection of the receipt of a call A, because the signal *f* is high level of "H", the CPU 70 sets the alert designate signal *j* to the logic of call A (step 214) if the first digit of the message data is neither a space nor a hyphen (No, step 212 and No, step 213), as seen from Fig. 5. At the same time, the CPU 70 delivers the alert control signal *i* (step 215) to enable the alert controller 109. Consequently, the alarm horn 140 is driven via the buffer amplifier 130, and received data is produced on the LCD 80 (step 216). If the first digit is a hyphen (Yes, step 213), the receiver is restored to the standby condition making no response, the program returning to the step 200. Further, if the initial digit is a space (Yes, step 212), the CPU 70 sets the alert designate signal *j* to the logic of call A (step 206), delivers the alert control signal *i* (step 207) to sound the receiver, and produces the signal *g* (step 208) to invert the logic of the D type flip-flop 210 which is built in the data set and hold circuit 200. Thereupon, the CPU 70 increments *N* by one (step 209) and, because the resultant *N* is even (No, step 210), it displays a message "IN SERVICE" on the LCD 80 to show the user that the receiver is qualified for the service (step 217).

Under the above condition, as a message associated with a call B is detected (CALL B, step 201), the CPU 70 decodes the subsequent message data out of the received data (step 218), sets the alert designate signal *j* to the logic of call B (step 219), produces the alert control signal *i* (step 220) to sound the receiver, and produces the received message data on the LCD 80 (step 221).

In this particular embodiment, when the user of the receiver intentionally removes the battery 120 which is to power the data set and hold circuit 200, a power signal *n* is fed via the inverter 111 to the NOR gate 104. In this construction, on the removal of the battery 120, the signal *n* becomes low level, or "L", to disable the NOR gate 104 and, thereby, prevents the receiver from sensing a call B.

As described above, a paging receiver in accordance with the present invention is provided with a data set and hold circuit which is responsive to the detection of a predetermined control signal and driven by a different power source from a one adapted to drive the receiver, the operation of the receiver being controlled by an output of the data set and hold circuit. This allows a radio base station to end and resume over a radio link data services for those receivers which are in delin-

quency, contributing a great deal to the efficient management of data supply services.

Although the invention has been described, by way of example, with reference to particular embodiments, it will be understood that variations and modifications may be made within the scope of the appended claims.

Claims

1. A paging receiver which is capable of receiving message data upon receipt of a first calling number (A) which is assigned to the receiver and of receiving a second calling number (B) for a data service which serves a plurality of paging receivers, the paging receiver including detecting means (70) for detecting a predetermined pattern which is contained in message data (MA) that is added to the first calling number, and control means (100) responsive to a control signal (g) from the detecting means (70) for controlling at least a data service which corresponds to the second calling number (B), characterised in that the control means (100) includes a data set and hold circuit (200) for inverting or holding a logic output (f) of said hold circuit in response to said control signal (g) in order to receive or inhibit the data services based on the second calling number (B) and includes a first power source (120) which is different from the main power source (150) and which powers the data set and hold circuit (200) and in that the control means (100) also uses as a control signal at least a signal (n) which is representative of the presence/absence of the first power source (120).
2. A method of controlling the reception of a message following a common call number which is assigned to a plurality of paging receivers inclusive of a given paging receiver comprising the steps of:-
 - receiving messages following said common call number and an individual call number which is assigned to said given paging receiver;
 - detecting a predetermined pattern which is contained in a message following said individual call number to produce a control signal;
 - holding said control signal irrespective of the removal of a main power source of said given paging receiver; and
 - responsive to the held control signal, controlling the reception of a message following said common call number.

Patentansprüche

1. Funkrufempfänger, der Datennachrichten bei dem Empfang einer ersten dem Empfänger zugeordneten Rufnummer (A) und eine zweite Rufnummer (B) für einen Datenservice empfangen kann, der mehreren Funkrufempfängern zur Verfügung steht, wobei der Funkrufempfänger eine Detektionseinrichtung (70) zur Detektion eines vorgegebenen Musters, welches in Datennachrichten (MA) enthalten ist, die an die erste Rufnummer angefügt sind, und eine Steuereinrichtung (100) aufweist, die auf ein Steuersignal (g) von der Detektionseinrichtung (70) reagiert, um mindestens einen Datendienst zu steuern, welcher der zweiten Funkrufnummer (B) entspricht, dadurch gekennzeichnet, daß die Steuereinrichtung (100) eine Datensetz- und Halteschaltung (200) zum Invertieren oder Halten eines logischen Ausgangssignals (f) der Halteschaltung als Antwort auf das Steuersignal (g) enthält, um die auf der zweiten Rufnummer (B) basierenden Datendienste zu empfangen oder zu sperren, und daß sie eine erste Energieversorgungsquelle (120) enthält, welche sich von der Hauptenergieversorgungsquelle (150) unterscheidet und welche die Datensetz- und Halteschaltung (200) mit Energie versorgt; und daß die Steuereinrichtung (100) auch als Steuersignal mindestens ein Signal (n) verwendet, das repräsentativ für das Vorhandensein/Nichtvorhandensein der ersten Energieversorgungsquelle (120) ist.
2. Verfahren zur Steuerung des Empfangs einer Nachricht, die einer gemeinsamen Rufnummer folgt, die mehreren Funkrufempfängern einschließlich einem gegebenem Funkrufempfänger zugeordnet ist, das die Schritte aufweist:
 - Empfang von Nachrichten, die der allgemeinen Rufnummer und einer individuellen Rufnummer folgen, welche dem gegebenem Funkrufempfänger zugeordnet ist;
 - Detektieren eines vorgegebenen Musters, welches in einer der individuellen Rufnummer folgenden Nachricht enthalten ist, um ein Steuersignal zu erzeugen;
 - Halten des Steuersignals unabhängig von der Entnahme einer Hauptenergieversorgungsquelle des gegebenen Funkrufempfängers, und
 - Steuerung des Empfangs einer der allgemeinen Rufnummer folgenden Nachricht als Antwort auf das gehaltene Steuersignal.

quency, contributing a great deal to the efficient management of data supply services.

Although the invention has been described, by way of example, with reference to particular embodiments, it will be understood that variations and modifications may be made within the scope of the appended claims.

Claims

1. A paging receiver which is capable of receiving message data upon receipt of a first calling number (A) which is assigned to the receiver and of receiving a second calling number (B) for a data service which serves a plurality of paging receivers, the paging receiver including detecting means (70) for detecting a predetermined pattern which is contained in message data (MA) that is added to the first calling number, and control means (100) responsive to a control signal (g) from the detecting means (70) for controlling at least a data service which corresponds to the second calling number (B), characterised in that the control means (100) includes a data set and hold circuit (200) for inverting or holding a logic output (f) of said hold circuit in response to said control signal (g) in order to receive or inhibit the data services based on the second calling number (B) and includes a first power source (120) which is different from the main power source (150) and which powers the data set and hold circuit (200) and in that the control means (100) also uses as a control signal at least a signal (n) which is representative of the presence/absence of the first power source (120).
2. A method of controlling the reception of a message following a common call number which is assigned to a plurality of paging receivers inclusive of a given paging receiver comprising the steps of:-
 - receiving messages following said common call number and an individual call number which is assigned to said given paging receiver;
 - detecting a predetermined pattern which is contained in a message following said individual call number to produce a control signal;
 - holding said control signal irrespective of the removal of a main power source of said given paging receiver; and
 - responsive to the held control signal, controlling the reception of a message following said common call number.

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1. Funkrufempfänger, der Datennachrichten bei dem Empfang einer ersten dem Empfänger zugeordneten Rufnummer (A) und eine zweite Rufnummer (B) für einen Datenservice empfangen kann, der mehreren Funkrufempfängern zur Verfügung steht, wobei der Funkrufempfänger eine Detektionseinrichtung (70) zur Detektion eines vorgegebenen Musters, welches in Datennachrichten (MA) enthalten ist, die an die erste Rufnummer angefügt sind, und eine Steuereinrichtung (100) aufweist, die auf ein Steuersignal (g) von der Detektionseinrichtung (70) reagiert, um mindestens einen Datendienst zu steuern, welcher der zweiten Funkrufnummer (B) entspricht, dadurch gekennzeichnet, daß die Steuereinrichtung (100) eine Datensetz- und Halteschaltung (200) zum Invertieren oder Halten eines logischen Ausgangssignals (f) der Halteschaltung als Antwort auf das Steuersignal (g) enthält, um die auf der zweiten Rufnummer (B) basierenden Datendienste zu empfangen oder zu sperren, und daß sie eine erste Energieversorgungsquelle (120) enthält, welche sich von der Hauptenergieversorgungsquelle (150) unterscheidet und welche die Datensetz- und Halteschaltung (200) mit Energie versorgt; und daß die Steuereinrichtung (100) auch als Steuersignal mindestens ein Signal (n) verwendet, das repräsentativ für das Vorhandensein/Nichtvorhandensein der ersten Energieversorgungsquelle (120) ist.
2. Verfahren zur Steuerung des Empfangs einer Nachricht, die einer gemeinsamen Rufnummer folgt, die mehreren Funkrufempfängern einschließlich einem gegebenen Funkrufempfänger zugeordnet ist, das die Schritte aufweist: Empfang von Nachrichten, die der allgemeinen Rufnummer und einer individuellen Rufnummer folgen, welche dem gegebenen Funkrufempfänger zugeordnet ist; Detektieren eines vorgegebenen Musters, welches in einer der individuellen Rufnummer folgenden Nachricht enthalten ist, um ein Steuersignal zu erzeugen; Halten des Steuersignals unabhängig von der Entnahme einer Hauptenergieversorgungsquelle des gegebenen Funkrufempfängers, und Steuerung des Empfangs einer der allgemeinen Rufnummer folgenden Nachricht als Antwort auf das gehaltene Steuersignal.



Revendications

1. Récepteur d'appel qui peut recevoir des messages de données sur réception d'un premier numéro d'appel (A) qui est affecté au récepteur et qui peut recevoir un second numéro d'appel (B) pour un service de données qui sert une multitude de récepteurs d'appel, le récepteur d'appel comportant un moyen de détection (70) pour détecter une configuration prédéterminée qui est contenue dans un message de données (MA) qui est ajouté au premier numéro d'appel, et un moyen de commande (100) répondant au signal de commande (g) provenant du moyen de détection (70) pour commander au moins un service de données qui correspond au second numéro d'appel (B),
- caractérisé en ce que
- le moyen de commande (100) comporte un circuit d'établissement et de mémorisation de données (200) pour inverser ou mémoriser une sortie logique (f) dudit circuit de mémorisation en réponse au signal de commande (g) afin de recevoir ou d'interdire les services de données basés sur le second numéro d'appel (B)
- et comporte une première source d'alimentation (120) qui est différente de la source d'alimentation principale (150) et qui alimente le circuit d'établissement et de mémorisation de données (200).
- et en ce que le moyen de commande (100) utilise également comme signal de commande au moins un signal (n) qui est représentatif de la présence/absence de la première source d'alimentation (120).
- Procédé pour commander la réception d'un message suivant un numéro d'appel commun qui est affecté à une multitude de récepteurs d'appel comprenant le récepteur d'appel donné comprenant les étapes consistant à :
- recevoir les messages suivant le numéro d'appel commun et un numéro d'appel individuel qui est affecté au récepteur d'appel donné ;
- détecter une configuration prédéterminée qui est contenue dans un message suivant le numéro d'appel individuel pour produire un signal de commande ;
- mémoriser le signal de commande sans tenir compte de l'enlèvement de la source d'alimentation principale du récepteur d'appel donné, et
- répondant au signal de commande mémorisé, commander la réception d'un message suivant le numéro d'appel commun.

