

Description

The present invention relates to a mobile communications apparatus comprising a load circuit to which a DC voltage is supplied from a DC power source; reset voltage detector means for generating a reset signal for turning off said load circuit when said DC voltage falls below a predetermined level and a reset release signal for turning on said load circuit when said DC voltage returns to or above said predetermined level; and means for detecting whether or not a change in said DC voltage is a sustained drop.

Mobile communications apparatuses when battery-powered have a transmitter reset function because, when the battery output falls below a prescribed level, the transmitter is susceptible to such abnormalities as output interruption and radiation of radio waves at unlicensed frequencies. This reset function monitors the output level of the battery, and turns off the transmitter when the output falls below the prescribed level.

As the battery deteriorates, its output level transiently falls off steeply when the transmitter is turned on, and the reset function is actuated to turn off the transmitter. As soon as the transmitter is turned off, the output level of the battery is restored relatively quickly. This restoration releases the reset function, and an instantaneous drop detector circuit in the apparatus judges the transient fall of the battery's output level to be an instantaneous drop. Consequently the transmitter is turned on again in response to the release of the reset function and the action of the instantaneous drop detector circuit. The reactivation of the transmitter causes a steep fall in the battery's output level again, and the aforementioned process is repeated. Thus the transmitter is turned on and off repeatedly, making normal communication impossible.

US-A-4509201 describes a mobile wireless telephone apparatus comprising a load circuit to which a DC voltage is supplied from a DC power source, and reset voltage detector means for generating a reset signal for turning off the load circuit when the DC voltage falls below a first predetermined level and a reset release signal for turning on the load circuit when the DC voltage returns to or above the predetermined level. The apparatus also has means for detecting a fall sustained to below a lower second level and for turning off further load circuitry if such a fall is detected. The further load circuitry is turned on again if the DC voltage subsequently moves above the second predetermined level.

GB-A-1424550 describes means for detecting a sustained voltage drop in a power supply circuit by comparing the duration of a voltage drop below a threshold with predetermined time periods.

US-A-4471492 describes a radio transceiver with means for limiting the transmission time when the power supply voltage is below a threshold.

An object of the present invention, therefore, is to provide a battery-powered mobile communications apparatus having a reset function such that its transmitter can correctly operate when its battery has deteriorated.

Another object of the invention is to provide a DC-powered mobile communications apparatus free from the undesirable repetition of the transmitter's turning on and off when the DC power source has deteriorated.

Still another object of the invention is to provide a DC-powered mobile communications apparatus capable of distinguishing between an instantaneous voltage drop occurring from the deterioration of the DC power source while the transmitter is on and any other instantaneous voltage drop, and thereby preventing faulty functioning when the DC power source has deteriorated.

According to the invention, a mobile communications apparatus of the kind defined hereinbefore at the beginning is characterised by means for measuring the lapse of time from the actuation of said load circuit till the generation of said reset signal; and means for comparing, when said reset voltage detector means and said sustained drop detecting means indicate the occurrence of an instantaneous drop, the measured lapse of time with a predetermined length of time, and restoring the actuated state of said load circuit if the measured time is longer than said predetermined time, and keeping said load circuit turned off if the former is shorter than the latter.

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

FIG. 1 is a block diagram of a mobile communications apparatus according to the invention;

FIG. 2 is a block diagram of the essential part of the logic circuit illustrated in FIG. 1;

FIGS. 3A to 3G and 4A to 4G are time charts for explaining the operation of the circuit shown in FIG. 2;

FIG. 5 is a schematic circuit diagram illustrating a reset voltage detector circuit shown in FIG. 2;

FIG. 6 is a schematic circuit diagram illustrating a sustained drop detector circuit shown in FIG. 2;

FIG. 7 is a block diagram illustrating another preferred embodiment of the mobile communications apparatus according to the invention; and

FIG. 8 is a flow chart for explaining the operation of the apparatus shown in FIG. 7.

DETAILED DESCRIPTION OF THE PREFERRED

EMBODIMENTS

Referring to FIG. 1, a mobile communications apparatus includes a transmitter 16 and a receiver 14. A synthesizer 15 supplies a local oscillation signal to the transmitter 16 and receiver 14, which are coupled to an antenna 12 through an antenna duplexer 13. The control of turning on and off the transmitter 16 and receiver 14, and that of the oscillation frequency of the synthesizer 15 are achieved by a control circuit 17. A dry battery 18 supplies DC voltage to the logic circuit 17, transmitter 16, receiver 14 and synthesizer 15.

The control circuit 17, monitoring the DC output of the battery 18, has a reset function to turn off the transmitter 16 when the DC output falls below a prescribed level. It also has a function to detect an instantaneous drop in the DC output level. The control circuit 17 further has a function to distinguish an instantaneous voltage drop caused by the deterioration of the battery from any other instantaneous voltage drop. This last mentioned function eliminates the undesirable repeated interruption of transmitted radio waves that may otherwise be caused by the battery deterioration.

Referring now to FIG. 2, a DC voltage from the battery 18 is supplied to a reset voltage detector circuit 1 and a sustained drop detector circuit 2 as well as to the transmitter 16. Initially, the transmitter 16 is still in a standby state and has not started transmission. When a transmitter "ON" signal a is given, a transmitter ON/OFF controller circuit 3 outputs a control signal g to let the transmitter 16 start transmission unless there is any abnormality in the battery voltage. Meanwhile, if there is any abnormality in the battery voltage, for instance if the battery has deteriorated, the controller circuit 3 disables the transmitter 16 so as to prevent the transmitter 16 starting transmission in response to the control signal g . Determination of the presence or absence of an abnormality in the battery voltage is achieved by the reset voltage detector circuit 1, the sustained drop detector circuit 2 and a reset decision circuit 6.

The reset voltage detector circuit 1, monitoring the battery voltage, outputs a reset signal when the voltage falls below a prescribed level, and a reset release signal when it returns to the prescribed level or above. The sustained drop detector circuit 2, also monitoring the battery voltage, checks the duration for which the voltage lies below the prescribed level. Thus, the circuit 2, normally keeping its output at a high level of "1", which does not vary even if an instantaneous voltage drop occurs, changes its output to a low level of "0" when the voltage remains below the prescribed level for more than a prescribed length of time. The circuits 1 and 2 thereby determine whether or not fluctuation in the battery voltage is an instantaneous drop.

The reset decision circuit 6, comprising a timer circuit 4 and a time decision circuit 5, determines whether or not an instantaneous voltage drop is due to the deterioration of the battery.

The operation of the circuit illustrated in FIG. 2 will now be described in detail with reference to FIGS. 3A to 3G and 4A to 4G. FIGS. 3A to 3G show how the circuit of FIG. 2 operates when the battery has deteriorated. When the transmitter "ON" signal a is supplied at time t_1 in FIG. 3A, the output g of the transmitter ON/OFF controller circuit 3 rises to its high level as shown in FIG. 3G, and the transmitter 16 is turned on. Once the transmitter is turned on, a large amperage is consumed (for instance from 600 to 800 mA), so that, if the battery of 6 or 7.2 volts and 600 mAH capacity has already deteriorated, its voltage b will quickly fall off (see FIG. 3B). When the voltage b falls below a prescribed level V_{TH} at time t_2 , the reset voltage detector circuit 1 changes its output from a high to low level as shown in FIG. 3C. Along with this change, the output g of the controller circuit 3 also changes to its low level to turn off the transmitter 16. The timer circuit 4 starts counting in response to the transmitter ON signal a , and discontinues counting in response to the reset signal c , as shown in FIG. 3E. The count T_{C1} at this time is written as an output e into and stored in the time decision circuit 5.

The battery voltage is quickly restored by the turning-off of the transmitter 16 as shown in FIG. 3B. When this restoration brings the battery voltage to or above the prescribed level V_{TH} at a time t_3 , the reset voltage detector circuit 1 changes its output from a low to high level as shown in FIG. 3C, and supplies the output c as a reset release signal to the time decision circuit 5 and the transmitter ON/OFF controller circuit 3. In response to the reset release signal, the time decision circuit 5 compares the earlier stored count T_{C1} with a prescribed length of time T_0 . Since T_0 is greater than T_{C1} in FIGS. 3A to 3G, the time decision circuit 5 attributes the reset from time t_2 to time t_3 to battery deterioration, and keeps the output at its high level as shown in FIG. 3F. Although the reset release signal commands the controller circuit 3 to reactuate the transmitter 16, since an output f is supplied indicating that the deterioration of the battery has been detected by the time decision circuit 5, the circuit 3 continues to keep the transmitter 16 off, as shown in FIG. 3G.

FIGS. 4A to 4G show how the circuit of FIG. 2 operates when the battery has not deteriorated. When the transmitter "ON" signal a rises to its high level at time t_4 , the transmitter 16 is turned on, as shown in FIG. 4G, and at the same time the timer circuit 4 starts counting, as shown in FIG. 4E.

When the battery has not deteriorated and the transmitter 16 is turned on, there is scarcely any voltage drop. As shown in FIG. 4B, the battery voltage does not fall as far as to the prescribed level V_{TH} . Therefore, the output c of the reset voltage detector circuit 1 (FIG. 4C) does not vary, and the timer circuit 4 continues counting. The output g of the transmitter ON/OFF controller circuit 3 does not vary, and so the transmitter 16 remains ON.

If then the battery voltage drops instantaneously for some reason or other as shown in FIG. 4B at time t_5 , the output g of the controller circuit 3 will temporarily fall to its low level in response to the output c of the reset detector circuit 1. The output c also causes the timer circuit 4 to stop counting and to provide a count T_{C2} . When the output c returns to its high level at time t_6 , the time decision circuit 5 compares the count T_{C2} with the prescribed length of time T_0 . Because T_0 is smaller than T_{C2} , the time decision circuit 5 judges the instantaneous drop between time t_5 and time t_6 to be a simple instantaneous drop, and the output f remains at its low level. Since the output f is at its low level at time t_6 when the reset release signal is supplied, the transmitter ON/OFF controller circuit 3 brings back the output g to its high level, and turns the transmitter 16 on again.

In the manner described above, it is possible to determine whether a given instantaneous voltage drop is a simple one or attributable to the turning-on of the transmitter when the battery is deteriorated.

If the battery voltage remains at a low level for a relatively long period of time as from t_7 to t_8 in FIG. 4B and the sustained drop detector circuit 2 determines that the sustained drop is not an instantaneous drop, by comparison with a time τ to be explained below, the transmitter 16 will be kept turned off even if the voltage returns to its normal level at time t_8 .

FIG. 5 is a circuit diagram illustrating the reset voltage detector circuit 1. A voltage b from the battery 18 is divided by resistors $R1$ and $R2$, and the divided voltage is compared with a reference voltage (e.g., 2.5 V) by a comparator 19, which outputs the reset signal c when the battery voltage falls below 2.5 V.

FIG. 6 illustrates the sustained drop detector circuit 2. When the battery voltage b falls off, a capacitor $C1$ discharges at a time constants τ ($= C1R3$), and as the terminal voltage of the capacitor $C1$ falls below the reference voltage (2.5 V), a comparator 20 senses that the drop is not an instantaneous drop and changes its output d from high to low level, as illustrated at time t_8 in FIG. 4D. If the battery voltage recovery within τ , the output d of the comparator 20 does not change, as

illustrated by FIGS. 3B and 3D.

In the embodiment FIG. 7, a central processing unit (CPU) 26 has the functions of the transmitter ON/OFF controller circuit 32 and the time decision circuit 5 of the first preferred embodiment illustrated in FIG. 2. A counter 21 corresponds to the timer circuit 4 in FIG. 2, and counts clock pulses supplied from a clock generator 23 through an AND gate 25. An input/output (I/O) port 22 serves to connect external circuits to the CPU 26, which controls the turning on and off of the transmitter 16 through a bus line 24 and the I/O port 22. A high level signal to turn on the transmitter 16 is supplied to the AND gate 25 as well as to the transmitter 16 from the I/O port 22.

As shown in FIG. 8, when the CPU 26 generates a transmitter "ON" signal at Step S1, it clears the counter 21 at Step S2. The counter 21 starts counting in response to the transmitter "ON" signal (Step S3). At Step S4, the CPU 26 checks the output c of the reset voltage detector circuit 1 (FIG. 2) and, in the absence of a reset output, stores the count of the counter 21 into a memory within the CPU 26 at Step S5, followed by a return to Step S4. In the presence of a reset output, the process moves ahead to Step S6 to read the output d of the sustained drop detector circuit 2 (FIG. 2), and determines whether or not there is an instantaneous voltage drop at Step S7.

If it is determined at Step S7 that there is a sustained voltage drop, i.e., the voltage drop lasts longer than the period of time τ , the CPU 26 will initialize the whole apparatus. Conversely, if the presence of an instantaneous voltage drop is detected, the count T_C of the counter will be read out of the memory at Step S8, and compared with the prescribed value T_0 at Step S9. If T_C is found greater than T_0 , the battery will be judged normal as at Step S12, and the transmitter will be turned on again (Step S13), as at time t_6 in FIG. 4C. If T_C is smaller than T_0 , as in FIG. 3E the battery will be judged at Step S10 to have deteriorated, and the process will move ahead to Step S11 to keep the transmitter 16 turned off.

Claims

1. A mobile communications apparatus comprising:
 - a load circuit (16) to which a DC voltage (b) is supplied from a DC power source (18);
 - reset voltage detector means (1) for generating a reset signal for turning off said load circuit (16) when said DC voltage (b) falls below a predetermined level (V_{TH}) and
 - a reset release signal for turning on said

When the battery has not deteriorated and the transmitter 16 is turned on, there is scarcely any voltage drop. As shown in FIG. 4B, the battery voltage does not fall as far as to the prescribed level V_{TH} . Therefore, the output c of the reset voltage detector circuit 1 (FIG. 4C) does not vary, and the timer circuit 4 continues counting. The output g of the transmitter ON/OFF controller circuit 3 does not vary, and so the transmitter 16 remains ON.

If then the battery voltage drops instantaneously for some reason or other as shown in FIG. 4B at time t_s , the output g of the controller circuit 3 will temporarily fall to its low level in response to the output c of the reset detector circuit 1. The output c also causes the timer circuit 4 to stop counting and to provide a count T_{C2} . When the output c returns to its high level at time t_e , the time decision circuit 5 compares the count T_{C2} with the prescribed length of time T_0 . Because T_0 is smaller than T_{C2} , the time decision circuit 5 judges the instantaneous drop between time t_s and time t_e to be a simple instantaneous drop, and the output f remains at its low level. Since the output f is at its low level at time t_e when the reset release signal is supplied, the transmitter ON/OFF controller circuit 3 brings back the output g to its high level, and turns the transmitter 16 on again.

In the manner described above, it is possible to determine whether a given instantaneous voltage drop is a simple one or attributable to the turning-on of the transmitter when the battery is deteriorated.

If the battery voltage remains at a low level for a relatively long period of time as from t_7 to t_8 in FIG. 4B and the sustained drop detector circuit 2 determines that the sustained drop is not an instantaneous drop, by comparison with a time τ to be explained below, the transmitter 16 will be kept turned off even if the voltage returns to its normal level at time t_8 .

FIG. 5 is a circuit diagram illustrating the reset voltage detector circuit 1. A voltage b from the battery 18 is divided by resistors R_1 and R_2 , and the divided voltage is compared with a reference voltage (e.g., 2.5 V) by a comparator 19, which outputs the reset signal c when the battery voltage falls below 2.5 V.

FIG. 6 illustrates the sustained drop detector circuit 2. When the battery voltage b falls off, a capacitor C_1 discharges at a time constants τ ($= C_1 R_3$), and as the terminal voltage of the capacitor C_1 falls below the reference voltage (2.5 V), a comparator 20 senses that the drop is not an instantaneous drop and changes its output d from high to low level, as illustrated at time t_a in FIG. 4D. If the battery voltage recovers within τ , the output d of the comparator 20 does not change, as

illustrated by FIGS. 3B and 3D.

In the embodiment FIG. 7, a central processing unit (CPU) 26 has the functions of the transmitter ON/OFF controller circuit 32 and the time decision circuit 5 of the first preferred embodiment illustrated in FIG. 2. A counter 21 corresponds to the timer circuit 4 in FIG. 2, and counts clock pulses supplied from a clock generator 23 through an AND gate 25. An input/output (I/O) port 22 serves to connect external circuits to the CPU 26, which controls the turning on and off of the transmitter 16 through a bus line 24 and the I/O port 22. A high level signal to turn on the transmitter 16 is supplied to the AND gate 25 as well as to the transmitter 16 from the I/O port 22.

As shown in FIG. 8, when the CPU 26 generates a transmitter "ON" signal at Step S1, it clears the counter 21 at Step S2. The counter 21 starts counting in response to the transmitter "ON" signal (Step S3). At Step S4, the CPU 26 checks the output c of the reset voltage detector circuit 1 (FIG. 2) and, in the absence of a reset output, stores the count of the counter 21 into a memory within the CPU 26 at Step S5, followed by a return to Step S4. In the presence of a reset output, the process moves ahead to Step S6 to read the output d of the sustained drop detector circuit 2 (FIG. 2), and determines whether or not there is an instantaneous voltage drop at Step S7.

If it is determined at Step S7 that there is a sustained voltage drop, i.e., the voltage drop lasts longer than the period of time τ , the CPU 26 will initialize the whole apparatus. Conversely, if the presence of an instantaneous voltage drop is detected, the count T_C of the counter will be read out of the memory at Step S8, and compared with the prescribed value T_0 at Step S9. If T_C is found greater than T_0 , the battery will be judged normal as at Step S12, and the transmitter will be turned on again (Step S13), as at time t_e in FIG. 4C. If the T_C is smaller than T_0 , as in FIG. 3E the battery will be judged at Step S10 to have deteriorated, and the process will move ahead to Step S11 to keep the transmitter 16 turned off.

Claims

1. A mobile communications apparatus comprising:
 - a load circuit (16) to which a DC voltage (b) is supplied from a DC power source (18);
 - reset voltage detector means (1) for generating a reset signal for turning off said load circuit (16) when said DC voltage (b) falls below a predetermined level (V_{TH}) and a reset release signal for turning on said



- load circuit (16) when said DC voltage (b) returns to or above said predetermined level (V_{TH}); and means (2) for detecting whether or not a change in said DC voltage is a sustained drop; characterised by means (4) for measuring the lapse of time from the actuation of said load circuit (16) till the generation of said reset signal; and means (5) for comparing, when said reset voltage detector means (1) and said sustained drop detecting means (2) indicate the occurrence of an instantaneous drop, the measured lapse of time (T_C) with a predetermined length of time (T_O) and restoring the actuated state of said load circuit (16) if the measured time (T_C) is longer than said predetermined time (T_O), and keeping said load circuit (16) turned off if the former is shorter than the latter.
2. A mobile communications apparatus according to claim 1, characterised in that the DC power source comprises a dry battery (18).
 3. A mobile communications apparatus according to claim 1, characterised in that the load circuit comprises a transmitter (16).
 4. A mobile communications apparatus according to claim 1, characterised in that the reset voltage detector means (1) comprises resistors (R_1 , R_2) for dividing said DC voltage and a voltage comparator (19) for comparing the divided voltage with a reference voltage and supplying the result of comparison as the output (c) of said reset voltage detector means (1).
 5. A mobile communications apparatus according to claim 1, characterised in that the sustained drop detecting means (2) comprises an integrator circuit (R_3 , C_1) coupled to said DC power source (18) and a voltage comparator (20) for comparing the output of said integrator circuit (R_3 , C_1) with a reference voltage and supplying the result of comparison as the output (d) of the sustained drop detecting means.
 6. A mobile communications apparatus according to claim 5, characterised in that the integrator circuit comprises a resistor (R_3) connected between the DC power source (18) and the voltage comparator (20), and a capacitor (C_1) connected between a common voltage point and the connection point of the said resistor (R_3) and the voltage comparator (20).
 7. A mobile communications apparatus according to claim 1, characterised in that the said measuring means includes a counter which starts counting clock pulses in response to a signal for actuating the load circuit (16), and the said comparing means includes a central processing unit (26) for providing the said actuating signal.
 8. A method of detecting the deterioration of a DC power source, comprising the following steps:
 - supplying a DC voltage (b) from the DC power source (18) to a load circuit (16);
 - comparing (1) the DC voltage (b) with a predetermined level of voltage (V_{TH});
 - providing a reset signal when the DC voltage (b) falls below the predetermined level (V_{TH}) and a reset release signal when the DC voltage (b) returns to or above the predetermined level (V_{TH}); and
 - determining (2) whether or not a change in the DC voltage (b) is a sustained drop; characterised by
 - measuring (4) the lapse of time from the actuation of the load circuit (16) till the generation of said reset signal;
 - comparing (5), when a change in the DC voltage (b) has been determined to be an instantaneous drop, the measured lapse of time (T_C) with a predetermined length of time (T_O);
 - restoring the actuated state of the load circuit (16) if the measured time (T_C) is longer than the predetermined time (T_O); and
 - keeping the load circuit (16) turned off if the measured time (T_C) is shorter than the predetermined time (T_O).

Revendications

1. Dispositif de communications mobile comprenant :
 - un circuit de charge (16) auquel est appliquée une tension à courant continu (b) à partir d'une source d'alimentation en courant continu (18);
 - un moyen (1) de détecteur de tension remise à l'état initial pour produire un signal remis à l'état initial afin de couper le circuit de charge (16) lorsque la tension à courant continu (b) tombe au-dessous d'une valeur prédéterminée (V_{TH}) et un signal de libération remis à l'état initial pour fermer le circuit de charge (16) lorsque la tension à courant continu (b) revient à ou est au-dessus de



- la valeur prédéterminée (V_{TH}); et
- un moyen (2) pour détecter si oui ou non un changement de la tension à courant continu est une chute maintenue; caractérisé par :
 - un moyen (4) pour mesurer le laps de temps entre l'actionnement du circuit de charge (16) et la production du signal remis à l'état initial; et
 - un moyen (5) pour comparer, lorsque le moyen (1) de détecteur de tension remise à l'état initial et le moyen (2) de détection de chute maintenue indiquent l'apparition d'une chute instantanée, le laps de temps mesuré (T_C) à une durée prédéterminée (T_0), et rétablir l'état actionné du circuit de charge (16) si le laps de temps mesuré (T_C) est plus grand que la durée prédéterminée (T_0), et maintenir le circuit de charge (16) à l'état de coupure si le premier temps est plus court que le second.
2. Dispositif de communications mobile selon la revendication 1, caractérisé en ce que l'alimentation en courant continu comprend une pile sèche (18).
3. Dispositif de communications mobile selon la revendication 1, caractérisé en ce que le circuit de charge comprend un émetteur (16).
4. Dispositif de communications mobile selon la revendication 1, caractérisé en ce que le moyen de détecteur de tension remise à l'état initial comprend des résistances (R_1 , R_2) pour diviser la tension à courant continu et un comparateur de tension (19) pour comparer la tension divisée à une tension de référence et fournir le résultat de la comparaison comme sortie (C) du moyen (1) de détecteur de tension remise à l'état initial.
5. Dispositif de communications mobile selon la revendication 1, caractérisé en ce que le moyen (2) de détection de chute maintenue comprend un circuit intégrateur (R_3 C_1) accouplé à l'alimentation en courant continu (18) et un comparateur de tension (20) pour comparer la sortie du circuit intégrateur (R_3 C_1) à une tension de référence et fournir le résultat de la comparaison comme sortie (d) du moyen de détection de chute maintenue.
6. Dispositif de communications mobile selon la revendication 5, caractérisé en ce que le circuit intégrateur comprend une résistance (R_3) montée entre l'alimentation en courant continu (18) et un comparateur de tension (20), et un condensateur (C_1) connecté entre un point commun de tension et le point de connexion de la résistance (R_3) et du comparateur de tension (20).
7. Dispositif de communications mobile selon la revendication 1, caractérisé en ce que le moyen de mesure comprend un compteur qui démarre le comptage des impulsions d'horloge en réponse à un signal pour actionner le circuit de charge (16), et le moyen de comparaison comporte une unité centrale de traitement (26) pour fournir le signal d'actionnement.
8. Procédé de détection de la détérioration d'une alimentation en courant continu, comprenant les étapes consistant à :
- fournir une tension à courant continu (b) à partir de l'alimentation en courant continu (18) à un circuit de charge (16);
 - comparer (1) la tension à courant continu (b) à une valeur prédéterminée de tension (V_{TH});
 - fournir un signal remis à l'état initial lorsque la tension à courant continu (b) tombe au-dessous de la valeur prédéterminée (V_{TH}) et un signal de libération remis à l'état initial lorsque la tension à courant continu (b) revient ou est supérieure à la valeur prédéterminée (V_{TH}); et
 - déterminer (2) si oui ou non un changement de la tension à courant continu (b) est une chute maintenue, caractérisé par les étapes consistant à :
 - mesurer (4) le laps de temps entre l'actionnement du circuit de charge (16) et la production du signal remis à l'état initial;
 - comparer (5), lorsqu'il y a eu détermination du fait qu'un changement de la tension à courant continu (b) est une chute instantanée, le laps de temps mesuré (T_C) à la durée prédéterminée (T_0);
 - rétablir l'état actionné du circuit de charge (16) si le laps de temps mesuré (T_C) est plus long que la durée prédéterminée (T_0); et
 - maintenir le circuit de charge (16) à l'état de coupure si le laps de temps mesuré (T_C) est plus court que la durée prédéterminée (T_0).

Ansprüche

1. Mobile Kommunikationsvorrichtung mit:
einer Lastschaltung (16), an die eine Gleichspannung (b) von einer Gleichspannungs-



- quelle (18) geliefert wird,
 einer Rücksetzspannung-Detektoreinrichtung (1) zum Erzeugen eines Rücksetzsignals zum Abschalten der Lastschaltung (16), wenn die Gleichspannung (b) unter einen bestimmten Pegel (V_{TH}) fällt, und eines Rücksetzfreigabesignals zum Einschalten der Lastschaltung (16), wenn die Gleichspannung (b) auf oder über den bestimmten Pegel (V_{TH}) zurückkehrt, und
 einer Einrichtung (2) zum Detektieren, ob eine Änderung der Gleichspannung einen anhaltenden Abfall darstellt oder nicht, gekennzeichnet durch
 eine Einrichtung (4) zum Messen der Zeitdauer von der Betätigung der Lastschaltung (16) bis zur Erzeugung des Rücksetzsignals, und
 eine Einrichtung (5) zum Vergleichen der gemessenen Zeitdauer (T_C) mit einer bestimmten Zeitlänge (T_O), wenn die Rücksetzspannung-Detektoreinrichtung (1) und die Detektoreinrichtung (2) für den anhaltenden Abfall das Auftreten eines plötzlichen Abfalls anzeigt, und zum Wiederherstellen des Tätigkeitszustands der Lastschaltung (16), wenn die gemessene Zeit (T_C) größer als die bestimmte Zeit (T_O) ist, und zum Beibehalten des abgeschalteten Zustands der Lastschaltung (16), wenn die Erstgenannte kürzer als die Letztgenannte ist.
2. Mobile Kommunikationsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Gleichspannungsquelle eine Trockenbatterie (18) aufweist.
 3. Mobile Kommunikationsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Lastschaltung einen Sender (16) aufweist.
 4. Mobile Kommunikationsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Rücksetzspannung-Detektoreinrichtung (1) Widerstände (R_1 , R_2) zum Teilen der Gleichspannung und einen Spannungsvergleicher (19) aufweist zum vergleichen der geteilten Spannung mit einer Referenzspannung und Liefern dem Vergleichsergebnisses als die Ausgabe (C) der Rücksetzspannung-Detektoreinrichtung (1).
 5. Mobile Kommunikationsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Detektoreinrichtung (2) für den anhaltenden Abfall eine mit der Gleichspannungsquelle (18) verbundene Integratorschaltung (R_3 , C_1) und einen Spannungsvergleicher (20) aufweist zum vergleichen der Ausgabe der Integratorschaltung (R_3 , C_1) mit einer Referenzspannung und Liefern des Vergleichsergebnisses als die Ausgabe (d) der Detektoreinrichtung für den anhaltenden Abfall.
 6. Mobile Verbindungsvorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß die Integratorschaltung einen Widerstand (R_3), der zwischen der Gleichspannungsquelle (18) und dem Spannungsvergleicher (20) angeschlossen ist, und einen Kondensator (C_1) aufweist, der zwischen einem gemeinsamen Spannungspunkt und dem Verbindungspunkt des Widerstands (R_3) und des Spannungsvergleichers (20) angeschlossen ist.
 7. Mobile Kommunikationsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Meßeinrichtung einen Zähler aufweist, der abhängig von einem Signal zum Betätigen der Lastschaltung (16) beginnt, Taktpulse zu zählen, und die genannte Vergleichseinrichtung eine Zentralverarbeitungseinheit (26) zum Bereitstellen des genannten Betätigungssignals aufweist.
 8. Verfahren zum Detektieren der Verschlechterung einer Gleichspannungsquelle, mit den folgenden Schritten:
 Liefern einer Gleichspannung (b) von der Gleichspannungsquelle (18) an eine Lastschaltung (16),
 Vergleichen (1) der Gleichspannung (b) mit einem bestimmten Spannungspegel (V_{TH}),
 Bereitstellen eines Rücksetzsignals, wenn die Gleichspannung (b) unter den bestimmten Pegel (V_{TH}) fällt, und eines Rücksetzfreigabesignals, wenn die Gleichspannung (b) auf oder über den bestimmten Pegel (V_{TH}) zurückkehrt, und
 Bestimmen (2), ob eine Änderung der Gleichspannung (b) ein anhaltender Abfall ist; gekennzeichnet durch Messen (4) der Zeitdauer von der Betätigung der Lastschaltung (16) bis zur Erzeugung des Rücksetzsignals,
 Vergleichen (5) der gemessenen Zeitdauer (T_C) mit einer bestimmten Zeitlänge (T_O), wenn eine Änderung der Gleichspannung (b) als ein plötzlicher Abfall erkannt wird;
 Wiederherstellen des Tätigkeitszustands der Lastschaltung (16), wenn die gemessene Zeit (T_C) länger als die bestimmte Zeit (T_O) ist, und
 Beibehalten des abgeschalteten Zustands der Lastschaltung (16), wenn die gemessene



ne Zeit (T_0) kürzer als die bestimmte Zeit
(T_0) ist.

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