

[54] **SIGNAL PRIVACY WITH SAFETY FEATURE**

2,199,634 5/1940 Koch..... 179/1.5
2,365,672 12/1944 Affel..... 179/1.5

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EXEMPLARY CLAIM

1. In a signal privacy system, a signal current input circuit, a privacy equipment including a source for supplying masking currents thereto, means for combining said masking currents with said signal current for disguising the identity of the signals, a circuit controller having a normal condition and an operated condition, means to impress a portion of said masking currents from said source on said circuit controller, said portion normally having a critical value such as to hold said controller in its normal condition, said circuit controller in its operated condition disabling said signal current input circuit from supplying signal current to said combining means.

[52] U.S. Cl. 179/1.5 M; 179/1.5 R

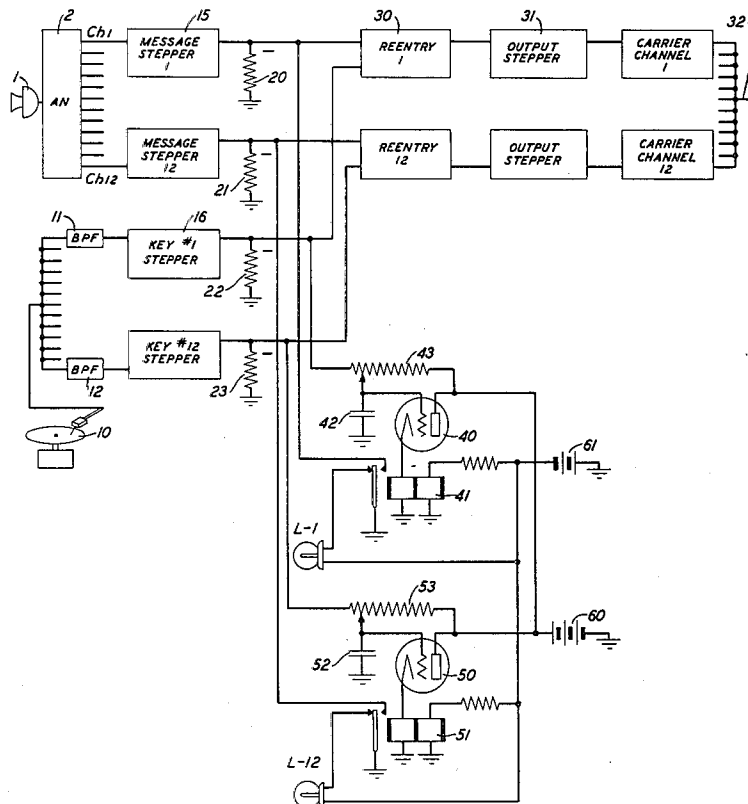
[51] Int. Cl. H04m 1/68; H04k 1/02

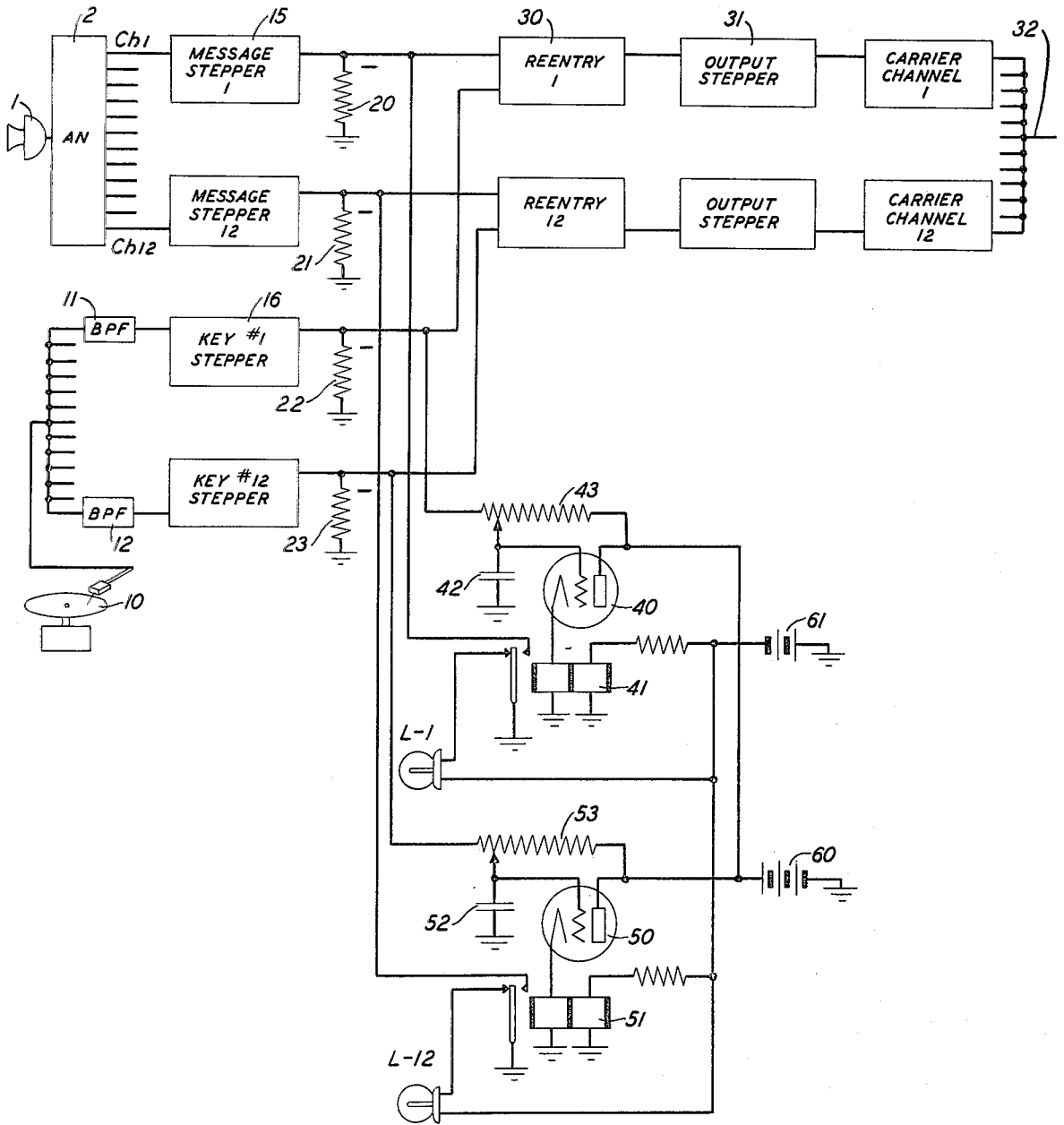
[58] Field of Search 179/1.5, 1.5 M, 1.5 R; 250/6.6, 17.6; 178/22

[56] **References Cited**
UNITED STATES PATENTS

1,460,438	7/1923	Parker	179/1.5
1,719,041	7/1929	Blackwell et al.	332/38
1,753,353	4/1930	Steinberg	179/1.5
1,758,058	5/1930	Potter	332/38
2,083,653	6/1937	Kasemann.....	179/1.5

2 Claims, 1 Drawing Figure





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SIGNAL PRIVACY WITH SAFETY FEATURE

The present invention relates to the transmission of signals with privacy and more particularly to the prevention of transmission of clear signal in case of improper operation of the privacy apparatus.

The general object of the invention is to guard continuously against the transmission of clear signals in case of failure of the privacy equipment to function properly.

The invention will be disclosed herein as embodied in the type of system in which privacy in transmission is accomplished by combining with the message currents before transmission masking waves or impulses for disguising the identity of the message currents and in which the message is recovered at the receiver by properly combining the received currents with duplicate masking currents supplied at the receiver. Such a system is disclosed, for example, in Lundstrom-Schimpf application for U.S. Pat. Ser. No. 456,322, filed Aug. 27, 1942, and reference may be made to that application for a full disclosure of the system.

These masking pulses, which may be referred to as key pulses or key waves, may be in the form of pulses of one polarity having different amplitudes and having an amplitude distribution which is random with time. The secrecy is dependent mainly upon this random distribution of the pulse amplitudes and if the key circuit should fail to supply pulses of this character and should, for example, supply to the privacy equipment either no pulses or pulses of constant or nearly constant amplitude, the privacy would be impaired or might be wholly lost.

The invention provides for allowing normal transmission to continue so long as key pulses of normal type are being supplied but in case the key pulses either cease or become of too low or too high amplitude to permit proper enciphering of the signals, the transmission of the signals is cut off.

The nature and objects of the invention will be more fully understood from the following detailed description of an illustrative embodiment as shown in the accompanying drawing, the single FIGURE of which shows a schematic circuit diagram of the invention as applied to a multichannel privacy system of known type.

The type of system shown is for the transmission of speech waves with secrecy. The speech waves are spoken into the microphone 1 and after being analyzed in the vocoder analyzer 2 into low frequency components in twelve vocoder channels, these components are combined with key waves or pulses derived in any suitable manner but illustrated as coming from a phonograph record 10. The key waves are recorded as modulations of carrier waves and the twelve individual keys are separated by band-pass filters 11, 12 of which there would be twelve filters in practice.

The low frequency vocoder channel currents are applied to the message steppers 15 and the key pulses are applied to the key steppers 16 all of which may be of similar construction. These steppers contain gas-filled tubes which fire in different numbers according to the strength of the input current and they produce across the output resistors 20, 21, 22, 23 current varying in steps in accordance with the strength of the input currents. For example, the total range of current values in one channel may be divided into six steps designated 0,

1, 2, 3, 4, 5, the intermediate values of a message current not being transmitted.

The current from the output of the message stepper of channel 1 is combined with the current from the output of key stepper No. 1 in reentry circuit shown at 30. The output of the reentry circuit is applied to output stepper 31. It is to be understood that there are twelve reentry circuits, one per channel, and that each such reentry circuit has impressed on it current derived from one message stepper and from one key stepper. The outputs of the individual output steppers 31 are applied to twelve individual carrier channels for modulation of carrier waves of different frequencies to enable the currents to be transmitted by multiplex carrier over the common outgoing path 32.

The privacy system as broadly outlined above is the same as that disclosed in the Lundstrom-Schimpf application above referred to, which may be consulted for further details.

Referring now, more particularly, to the circuits provided in accordance with the present invention, each key channel is provided with a pilot discharge tube of which two are shown at respectively 40 and 50. Each of these tubes controls energization of the individual relay 41 or 51 the armature of which when attracted places a short-circuit across the corresponding message channel to disable that channel. For example, when relay 41 attracts its armature a circuit to ground is closed from the ungrounded terminal of output resistor 20. Similarly, when relay 51 attracts its armature, a short-circuit is placed across output resistor 21.

Relays 41 and 51 are held normally deenergized by key pulses occurring in the respective key channels. These key pulses all have such polarity as to make the ungrounded terminal of the output resistor 22 or 23 negative. While the amplitudes of the key pulses vary in random manner with time, the average value of the pulses, when measured over a time of the order of 1 second, remains substantially constant so that the condensers 42 and 52 normally carry a charge of average value, such as to make the grids of tubes 40 and 50 negative toward ground. Plate voltage for the tubes 40 and 50 is supplied from positive battery 60. High resistances 43 and 53 are connected from the plates of tubes 40 and 50 to the output sides of the key steppers and the grids have a sliding biasing contact along these resistances for enabling the space current through these tubes to be accurately adjusted for the average value of key pulses. This adjustment is made such that when the key pulses are of normal type the normal space current through the left-hand winding of the relays 41 and 51 is just sufficient to neutralize the current through the right-hand or biasing windings of the relays derived from biasing battery 61. When this balanced condition obtains the flux in the core of the relays 41 and 51 is reduced to zero and the armatures are in their retracted position causing pilot lamps L-1 and L-12 to be lighted from battery 61.

This condition obtains in a circuit so long as normal level key pulses are being supplied from the steppers 16 to the reentry circuits. In case of failure of one of the key channels to supply pulses of average value, the charge on the condenser 42 or 52 changes in value such as to change the space current flowing through the left-hand winding of the corresponding relay, thus upsetting the balanced condition and causing the relay to attract its armature. When this occurs the corresponding mes-

sage channel is immediately short-circuited and the message currents are stopped from reaching the reentry so that they are not transmitted out over the system.

It will be observed from what has been said that the balanced condition obtaining in the relay circuits is disturbed either when the key currents cease or when they assume an abnormal average value either too high or too low. For example, assuming the average value of the key currents to be that corresponding to step 2.5 (not an actual step but assumed for reference purposes), the pilot relay would become energized if the strength of the key pulses should drop to step 1 value or below or rise to step 4 or higher value. The condenser 42 or 52, together with the associated resistances, may be given a time constant of about 1.5 seconds so that the abnormal condition in the key currents must persist for the order of 1 second before the corresponding message channel is cut off.

It will be understood that the invention is not limited to the details that have been disclosed nor to the specific type of privacy system to which the invention is shown as applied nor to the different values that have been given since these are intended to be illustrative and not limiting. The scope of the invention is defined in the claims which follow.

What is claimed is:

1. In a signal privacy system, a signal current input

circuit, a privacy equipment including a source for supplying masking currents thereto, means for combining said masking currents with said signal current for disguising the identity of the signals, a circuit controller having a normal condition and an operated condition, means to impress a portion of said masking currents from said source on said circuit controller, said portion normally having a critical value such as to hold said controller in its normal condition, said circuit controller in its operated condition disabling said signal current input circuit for supplying signal current to said combining means.

2. In a signal privacy system, a signal channel including a signal coding device, means to supply unidirectional masking pulses thereto for combination with the signals to disguise the same, said masking pulses having a normal mean value when averaged over a time interval, means to cut off signal transmission through said channel, and means operating in response to normal average value of masking pulses from said supply means for maintaining said transmission cut-off means unoperated, said maintaining means operating in response to a radical change in value of the pulses, including a change to zero value, for operating the means to cause transmission through said channel to be cut off.

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