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[54] **ALARM RETRANSMISSION SYSTEM**

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[52] **U.S. Cl.**..... **340/415**, 340/167 A, 340/171 R, 179/15 BA

[51] **Int. Cl.** **G08b 19/00**

[58] **Field of Search**.... 340/415, 171 R, 163, 163 A, 340/156, 164 R, 164 A, 224, 416; 325/54, 325/55, 57, 64; 169/41 A, 15 BA

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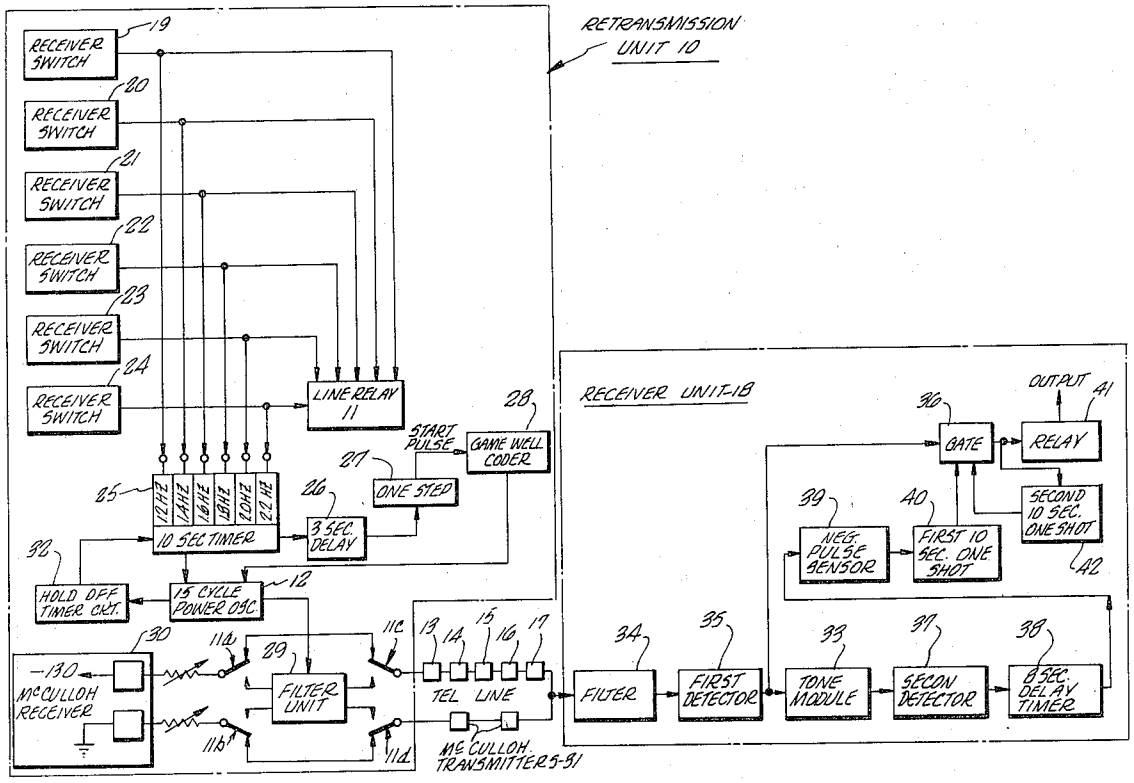
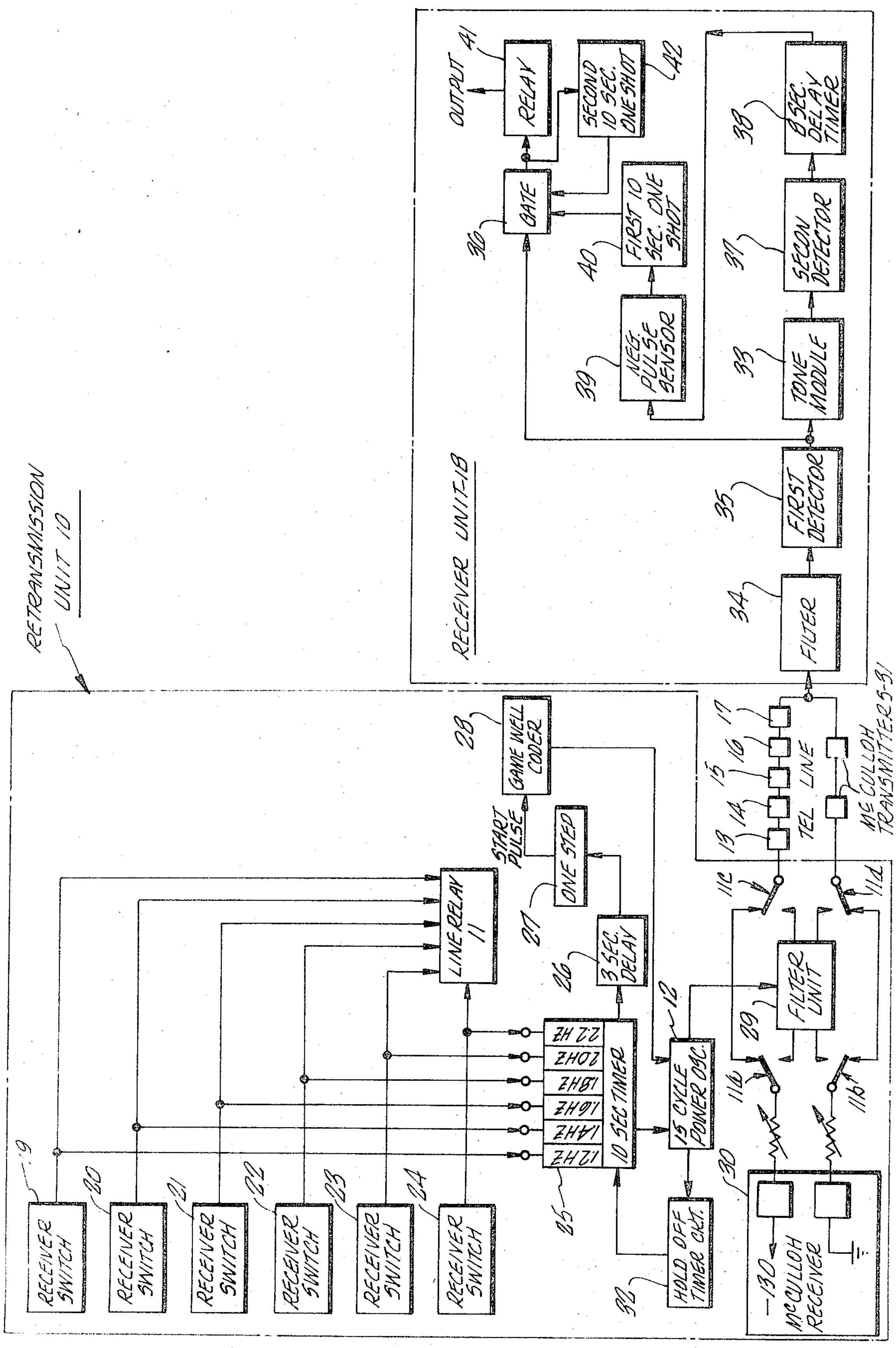
[57] **ABSTRACT**

An AC alarm retranmission system connecting a plurality of receiver units on a single DC circuit such as a McCulloh circuit. When an alarm retransmission is initiated, all of the receiver units will receive a first signal which is a basic signal transmitted at a frequency so chosen to minimize noise interference. The first signal is achieved by switching the basic signal on and off at a frequency which will correspond with that of a tone module connected in the addressed or selected receiver unit. Although each receiver unit is capable of receiving the basic signal, only the selected receiver unit will be capable of receiving a second signal. The second signal is the basic signal transmitted in code by means of a Gamewell Coder in a manner well known in the art, to provide information as to the initial source of the alarm.

11 Claims, 1 Drawing Figure




RETRANSMISSION UNIT 10
RECEIVER UNIT-18
RECEIVER SWITCH
LINE RELAY 11
12 HZ
14 HZ
16 HZ
18 HZ
20 HZ
22 HZ
10 SEC TIMER
15 CYCLE POWER OSC.
HOLD OFF TIMER CKT.
3 SEC. DELAY
ONE STEP
START PULSE
GAME WELL CODER
FILTER UNIT
TEL LINE
McCULLOH TRANSMITTERS 5-31
McCULLOH RECEIVER
FILTER
FIRST DETECTOR
TONE MODULE
SECON DETECTOR
8 SEC. DELAY TIMER
NEG. PULSE SENSOR
FIRST 10 SEC. ONE SHOT
GATE
SECOND 10 SEC. ONE SHOT
RELAY
OUTPUT

ALARM RETRANSMISSION SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to a system for transmitting a signal indicative of an alarm location to a selected receiver. Typically, the receiver unit would be located at a police or fire station proximate to the source of the alarm.

More particularly, this invention relates to an alarm retransmission system capable of employing a plurality of receiver units on a common circuit such as a McCulloh circuit.

Typically, alarm retransmission systems have required each receiver unit to be on a separate circuit. When more than one receiver unit per circuit was desired, relays were sequentially activated until the proper receiver unit was chosen. Utilizing sequentially activated relays resulted in the total system being particularly susceptible to false noise trippings and ultimately an alarm being sent to the wrong receiver unit.

The foregoing problem has been substantially eliminated by providing in a preferred embodiment of this invention, a system which provides for the transmission of a signal indicative of an alarm signal to any one of a plurality of receiver units on the same circuit. This is achieved by switching a carrier or basic signal at a frequency so chosen to match the frequency of a tone module in a receiver unit, i.e., the desired receiver unit. Then, after the basic signal has been coded by a Gamewell Coder to provide source information as to the alarm status, the coded alarm signal is transmitted and received by only the chosen receiver.

This invention is particularly advantageous since it is especially adaptable to be connected in a McCulloh alarm circuit without interfering with the normal alarm signals typically associated with the McCulloh circuit.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an alarm retransmission system which is capable of selecting one of a plurality of receiver units on the same circuit and transmitting alarm location information thereto.

It is another object of this invention to provide an alarm retransmission system which on the same circuit selects the desired receiver unit by sending a basic signal at a preselected frequency which corresponds to the frequency of a tone module in the desired receiver unit.

It is another object of this invention to provide an alarm retransmission system which is capable of sending alarm location information to any one of a plurality of receiver units on the same circuit without sequentially activating mechanical relays or the like.

It is a further object of this invention to provide an alarm retransmission system on a single circuit, which is compatible with a typical McCulloh alarm circuit and which is capable of transmitting a coded alarm signal to a particular receiver unit by first transmitting a basic signal to all receivers at a rate corresponding to the frequency of a tone module, in the desired receiver unit, and then transmitting a second signal (a coded alarm signal) which is received by only the desired receiver unit.

Briefly stated, and according to one aspect of this invention, the foregoing objects are achieved by providing an alarm retransmission system utilizing a retransmission unit located at a central station, and a plurality of receiver units connected therewith on the same DC circuit. The retransmission unit comprises a source producing a basic signal transmitted at a frequency chosen to substantially eliminate noise problems typically associated with transmission systems. This basic signal is switched at a rate which corresponds to a frequency of a tone module associated with the selected receiver unit. Only the selected receiver unit will receive the forthcoming basic signal transmitted in a code indicative of the alarm location, and thus allow an alarm register unit associated therewith to be activated.

BRIEF DESCRIPTION OF THE DRAWING

The invention both as to its organization and principle of operation, together with further objects and advantages thereof, may better be understood by reference to the following detailed description of an embodiment of the invention when taken in conjunction with the accompanying drawing.

The drawing is a system diagram illustrating an exemplary embodiment of the basic concepts of an alarm retransmission system comprising a retransmission unit and a plurality of receiver units on a single DC circuit, in accordance with this invention.

As to the background, a McCulloh alarm circuit typically includes receiving equipment such as a DC voltage source and relays (or a solid state receiver in many modern adaptations) located at a central station. This equipment is connected through telephone lines to various subscriber alarm units. The alarm units may be of the fire and/or burglar type typical in alarm systems. The alarm units or McCulloh transmitters are typically connected in series and include a normally closed switch in series with the line and a normally open switch connected to ground. The switches are activated by means of a code wheel or the like, in a particular sequence usually in response to the operation of an associated alarm sensor.

When an alarm event occurs, the code wheel rotates and operates the switches, thereby providing a coded set of pulses. Each wheel has different teeth removed to realize the coded set of pulses, indicative of the location of the alarm unit. Thus, a different code will result from the activation of each code wheel. Each pulse in the coded set produced by the activated code wheel typically presents information in three pulse intervals. The first pulse interval represents the opening of the normally closed switch, the second pulse interval represents the closing of the normally open switch, and the third pulse interval represents the normal condition. That is, when the normally closed switch is opened, the entire series loop of the McCulloh system is broken; and when the normally open switch is closed, the series loop is grounded. Thus, the McCulloh system generates a coded set of pulses to indicate an alarm condition and the location of the alarm event.

The system of the drawing is illustrated to include on one McCulloh alarm circuit, six receiver units. However, the number of receiver units shown is a matter of choice, as an exemplary embodiment, and the utilization of a single circuit is not to suggest that a separate circuit is required for this alarm retransmission system.

On the contrary, the alarm retransmission system of this invention is particularly applicable to be connected in a typical McCulloh alarm circuit without interfering with the normal alarm transmission associated with a typical McCulloh alarm circuit.

Assuming that the alarm retransmission system is "sharing" a McCulloh circuit, i.e., having a McCulloh receiver **30** and McCulloh transmitters **31,** it is believed evident to one skilled in the art, that the retransmission unit **10** located at a central station, may readily be switched into any one of a plurality of McCulloh alarm circuits by means of line relay unit **11** thereby requiring just one retransmission unit **10.** Switches **19–24** control the line relay **11.** Relay **11** controls contacts **11***a*, **11***b*, **11***c*, and **11***d* which, when activated, connects equipment in the retransmission unit **10** to the telephone line.

The retransmission unit **10** includes a source such as a power oscillator **12** which transmits a basic signal to remotely located receiver units **13** through **18** through a 15 hertz filter unit **29** to the telephone lines. Filter unit **29** allows the 15-cycle signal to propagate down the telephone line towards the receiver units **13–18,** but prevents the 15-cycle signal from feeding back to the retransmission unit **10** and into the McCulloh receiver **30** and causing false signals. The oscillator **12** is chosen to transmit a basic signal of 15 Hz. since 15-hertz is sufficiently remote from 60 Hz. (line frequency) and 20 Hz. (bell frequency) interferences. When an alarm signal (such as that indicating a fire) is received, by any means, at the central station, the appropriate fire station is selected. This selection is achieved manually or automatically, with the criteria including information as to the distance between the fire station and the subscriber who has activated the alarm signal. Of course, the selection may be determined in advance for every contingency.

When accomplished manually, an operator will determine an appropriate receiver switch (e.g., receiver switch units **19–24**) to select the corresponding receiver unit (e.g., receiver units **13–18**) located remotely. The line relay unit **11** connected to output of the receiver switch units **19–24** controls which McCulloh or DC circuit is to be used.

The basic signal from the source **12** is transmitted to the receiver units **13** through **18** at a frequency which corresponds to that of the desired receiver location by means of a command unit **25** thereby forming a first signal. The command unit **25,** including timing circuitry, is electrically connected between the outputs of the receiver switch units **19–24** and the source **12.** The command unit **25** turns the basic signal from the source **12** on and off (or modulates the basic signal) at a frequency which corresponds to that of tone module (to be discussed later), in the desired receiver unit i.e., at the chosen command frequency which is set into the command unit **25** by means of receiver switch units **19–24.** The modulating frequencies of the command unit are chosen for illustrative purposes to be 1.2 Hz., 1.4 Hz., 1.6 Hz., 1.8 Hz., 2.0 Hz. and 2.2 Hz. Each modulating frequency corresponding to a receiver unit (e.g. **13–18**). The retransmission unit **10** acts as a transmitter which provides a basic signal modulated at a command frequency to allow only the desired receiver unit (the one having a tone module at the same command frequency) to receive a second signal containing alarm location information. The basic signal transmitted at the selected command, (the first signal) acts as a low frequency presignaling signal and is transmitted for approximately 10 seconds as provided by the timing circuitry of the command unit **25** to the receiver units **13** through **18.**

The command unit **25** is also electrically connected to the source **12** through a delay unit **26,** which in turn is connected to a one-shot unit **27,** which in turn provides a start pulse once activated, to a Gamewell Coder **28.** The output of the Gamewell Coder **28** is connected as a second input to the source **12.** As is well known in the art, the Gamewell Coder **28** is a unit which is manually programmed to send a sequence of pulse in a code, which code may be indicative of alarm location information.

Delay unit **26** provides a three second delay after the ten second transmitting of the first signal has expired. After the three second delay, the one-shot **27** is activated and produces a pulse which starts the Gamewell Coder **28.** The source **12** is now activated and produces a pulse which starts the Gamewell Coder **28.** The source **12** is now activated, or turned fully on and off, i.e, modulated, at a lower rate (such as less than 1 hertz, which is out of the tone module's bandwith) than any command frequency, by the Gamewell Coder **28** to provide a second signal or a retransmitted signal. The Gamewell Coder **28** modulates the 15 Hz. carrier signal or basic signal of unit **25** to transmit a coded message to the receiver units via the **15** hertz filter unit **29** and the telephone line.

The retransmission unit **10** also includes a hold-off timer circuit **32** connected between the source **12** and the command unit **25** to reset the command unit **25** after a predetermined time such as approximately 18 seconds. This delay is sufficient to allow the receiver units **13–18** to reset to standby after receiving a retransmission signal.

The retransmission unit **10** may also include further delay circuitry (not shown) to prevent different coded signals indicative of a different alarm location from being sent immediately successive. This is to allow the previously used receiver units to time out and thus allow only the newly addressed receiver to receive the retransmission signal.

Turning to the reception end of the system, receiver units **13** through **18** are strategically located with each receiver unit having included therein a tone module such as tone module **33** in receiver unit **18.** For purposes of illustration each tone module is typically a plug-in low frequency active filter with a band-pass centered at a unique predetermined value such as 1.2 Hz., 1.4 Hz., 1.6 Hz., 1.8 Hz., 2.0 Hz., and 2.2 Hz. to correspond with the modulating frequencies of the command unit **25.**

The receiver unit **18** (as well as receiver units **13** through **17**), will receive for ten seconds, the basic signal modulated at the chosen command frequency from source **12** over the McCulloh circuit or the like through an active low frequency filter **34.** Filter **34** is electrically connected to a first detector **35** which converts the **15** hertz signals or first signals to pulsating DC at the modulating frequency of the command unit **25.** Thus, the output signal of the first detector **35** varies at a repetition rate which corresponds to the selected modulated frequency of the command unit **25.**

The output of first detector **35** is electrically connected to a gate **36** and the tone module **33.** The tone

module **33** is tuned to one of the six different frequencies from 1.2 Hz. to 2.2 Hz. The tone module **33** is connected to an input of a second detector **37** and allows the pulsating DC (if the pulsating DC is at the frequency of the particular tone module) to pass to the second detector **37.** The second detector **37** converts the pulsating DC to a steady positive DC voltage.

The output of the second detector **37** is connected to an input of a delay timer unit **38.** After an 8-second delay, the delay timer unit **38** produces at its output a steady DC voltage. Thus, after 10 seconds, the modulated 15-cycle signal or first signal stops the DC voltage output of the second detector **37** and thus the steady DC voltage output of the delay timer unit **38** drops to zero.

The output of the delay time unit **38** is connected to an input of a negative pulse sensor **39.** The pulse sensor **39** senses the negative going pulse at the output of the timer **38** (after **10** seconds of transmission by the source **12** as modulated by the command unit **25**). The pulse sensor **39** is connected at its output to an input of a first 10 second one-shot **40** which in turn is connected to the gate **36.** When the first ten second one-shot **40** is activated by the negative pulse sensor **39,** it produces an output for 10 seconds, which allows the gate **36** to pass signals from the output of the first detector unit **35** through a relay coil **41,** which in turn produces an output to associated recording equipment in a manner well known in the art. Thus, if the Gamewell Coder **28** produces coded pulses before the ten seconds are up, these coded pulses will pass through the gate **36** to the relay coil **41** and thence to the recording equipment.

The output of the gate **36** is also connected at its output to an input of a second 10-second one-shot **42,** which in turn is connected at its output to an input of gate **36.** The gate **36** is kept open by the second 10-second one-shot **42** for ten seconds, each time a coded pulse passes through the gate **36.** At the end of the last coded pulse, the gate **36** finally closes after 10 seconds, and will not pass coded pulses until the proper presignal (i.e., first signal) is received.

As a further modification, this system may include provisions for sending an acknowledgement code, such as by an acknowedgement transmitter located in such receiver unit and an acknowledgement receiver located in retransmission unit **10,** in any conventional manner.

In operation, and assuming that the alarm retransmission system is sharing a typical McCulloh circuit, when an alarm signal is sent over the common McCulloh circuit, the retransmission unit **10** will transmit a first signal to the receiver units **13–18** connected in the same McCulloh circuit. This is accomplished by an operator selecting an appropriate modulating frequency (e.g., 2.2 Hz.) in the command unit **25** which will correspond to that of the tone module in the desired receiver unit (e.g., receiver unit **18**).

The chosen frequency (2.2 Hz. for illustration) will modulate the basic signal from the source **12** to produce a first signal. This signal will be transmitted via the 15 hertz filter unit **29** and the telephone line to all the receiver units on the same McCulloh circuit. Since each receiver unit **13** through **18** has a tone module set at a frequency different from the others, and which frequencies correspond to modulating frequencies of the command unit **25,** only the selected receiver unit will be properly addressed by the first signal.

The addressing or presignaling is accomplished by a tuned tone module, such as module **33** tuned to one of the modulating frequencies (e.g., 2.2 Hz.) of the command unit **25.** Tone module **33** will only allow the 2.2 Hz. signal to pass through to the negative pulse sensor **39** which will activate the gate **36** through the first ten seconds one shot **40** when the first signal stops.

The second signal which is the basic signal modulated in a code by a Gamewell Coder to provide alarm location information is then transmitted to all the receiver units. The selected receiver unit (e.g., unit **18**) has its gate **36** open (because of the first signal) and passes the coded pulse (originating as the second signal) to the relay coil **41** and thence to recording equipment. The retransmission unit **10** and the receiver units **13–18** include circuitry which will reset their respective units after specific time has elapsed as previously explained.

It has been shown that a reliable single circuit alarm transmission system capable of operating in harmony with a McCulloh alarm circuit has been achieved by providing an alarm retransmission system utilizing a retransmission unit and a plurality of receiver units. The retransmission unit transmits a first signal to the plurality of receiver units on the same circuit and preselects the appropriate receiver unit by the use of a tone module tuned to the frequency of modulating of the first signal. The retransmission unit then transmits a second signal in coded pulses directly to the appropriate receiver unit to indicate the subscriber location of the activated alarm.

While an embodiment and application of this invention has been shown and described, it will be apparent to those skilled in the art that many more modifications are possible without departing from the inventive concepts herein described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. An alarm retransmission system for use in a McCulloh circuit for presignaling a selected receiver unit by a first signal and subsequently providing additional data by a second signal to the selected receiver unit comprising:

first means for transmitting a basic signal at a preselected frequency in response to an alarm event;

a command unit electrically connected to said first means capable of modulating the basic signal at a plurality of predetermined frequencies thereby forming a first signal;

a coder unit electrically connected to said first means capable of modulating the basic signal in a code thereby forming a second signal, said code being indicative of the origin of the alarm event;

a plurality of receiver units, each of said receiver units being connected in series in a single circuit, each of said receiver units being adapted to receive the first signal and the second signal;

a tone module electrically connected in each of said receiver units, each of said tone modules having a different frequency range corresponding to a predetermined frequency output of said command unit; and

a gate unit for receiving the additional data, electrically coupled with each of said tone modules in each of said receiver units and activated in re-

sponse to the second signal within a predetermined time after the appropriate first signal has been received by said appropriate receiver unit, said appropriate receiver unit including said tone module of the corresponding frequency range as the preselected frequency of said command unit.

2. An alarm retransmission system as in claim **1** wherein said first means is an oscillator.

3. An alarm retransmission system as in claim **2** wherein said oscillator transmits a basic signal of **15** Hz.

4. An alarm retransmission system as in claim **1** wherein said coder unit is a Gamewell Coder.

5. An alarm retransmission system of claim **1** wherein said coder unit modulates the basic signal at a frequency outside the frequency range of all of said tone modules.

6. An alarm retransmission system for use in a McCulloh circuit for presignaling a selected receiver unit by a first signal and subsequently providing additional data by a second signal to the selected receiver unit comprising:

first means for transmitting a first signal on a circuit in response to an alarm location, said first signal comprising a first carrier signal modulated at a predetermined frequency;

second means for transmitting a second signal on the same circuit, said second signal comprising a second carrier signal modulated in accordance with a code, the code being indicative of the alarm location;

a plurality of receiver units being connected in series in the same circuit, each of said receiver units including a tone module of a preselected frequency range, each of said tone modules having a unique preselected frequency range; and

a gate unit for receiving the additional data, electrically coupled to each of said tone modules in each of said receiver units, said gate unit being activated in response to said second signal only within a predetermined time after transmission of said first signal at the predetermined frequency corresponding to the frequency range of said tone module associated with said gate unit.

7. An alarm retransmission system as in claim **6** wherein said first and second means are oscillators.

8. An alarm retransmission system as in claim **6** wherein each second means modulates the second signal at a frequency outside the range of all of said tone modules.

9. An alarm retransmission system for use in a McCulloh circuit for presignaling a selected receiver unit by a first signal and subsequently providing additional data by a second signal to the selected receiver unit comprising:

first means for transmitting a first basic signal at a preselected frequency in response to an alarm event;

a command unit electrically connected to said first means and capable of modulating the first basic signal at a plurality of predetermined frequencies, thereby forming a first signal, each predetermined frequency of said command unit corresponding to a particular location on the McCulloh circuit;

a Gamewell Coder unit electrically connected to said first means capable of modulating a second basic signal in a code thereby forming a second signal, said code being representative of the location of the origin of the alarm event;

a plurality of receiver units, each of said receiver units connected in series at particular locations in the McCulloh circuit, each of said receiver units adapted to receive the first and second signals;

a tone module having a predetermined frequency range, electrically connected in each of said receiver units, each tone module having a frequency range determined by the location of said receiver unit, and corresponding to a frequency of said command unit; and

a gate unit for receiving the additional data electrically coupled to each of said tone modules and activated by the first signal when modulated at the frequency indicative of the location of the tone module and remaining activated within a predetermined time after the first signal in response to the second signal after being initially activated.

10. An alarm retransmission system as in claim **9** wherein said Gamewell Coder modulates the second signal at a frequency outside the range of all said tone modules.

11. An alarm retransmission system as in claim **9** wherein said first means is an oscillator operating at a frequency of **15** hertz.

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