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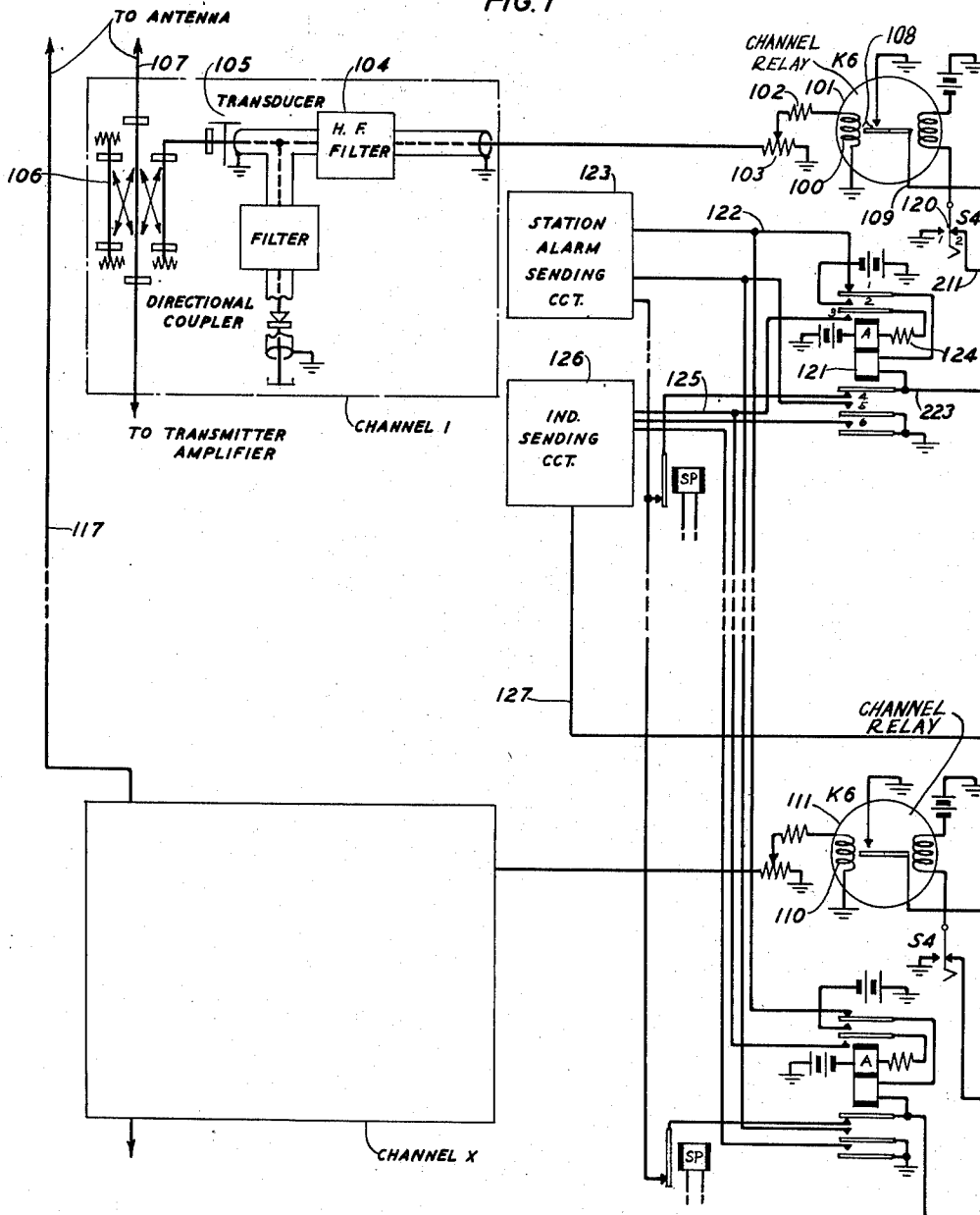
2,630,564

COMMON TIMING CIRCUIT

Filed Sept. 13, 1950

2 SHEETS—SHEET 1

FIG. 1



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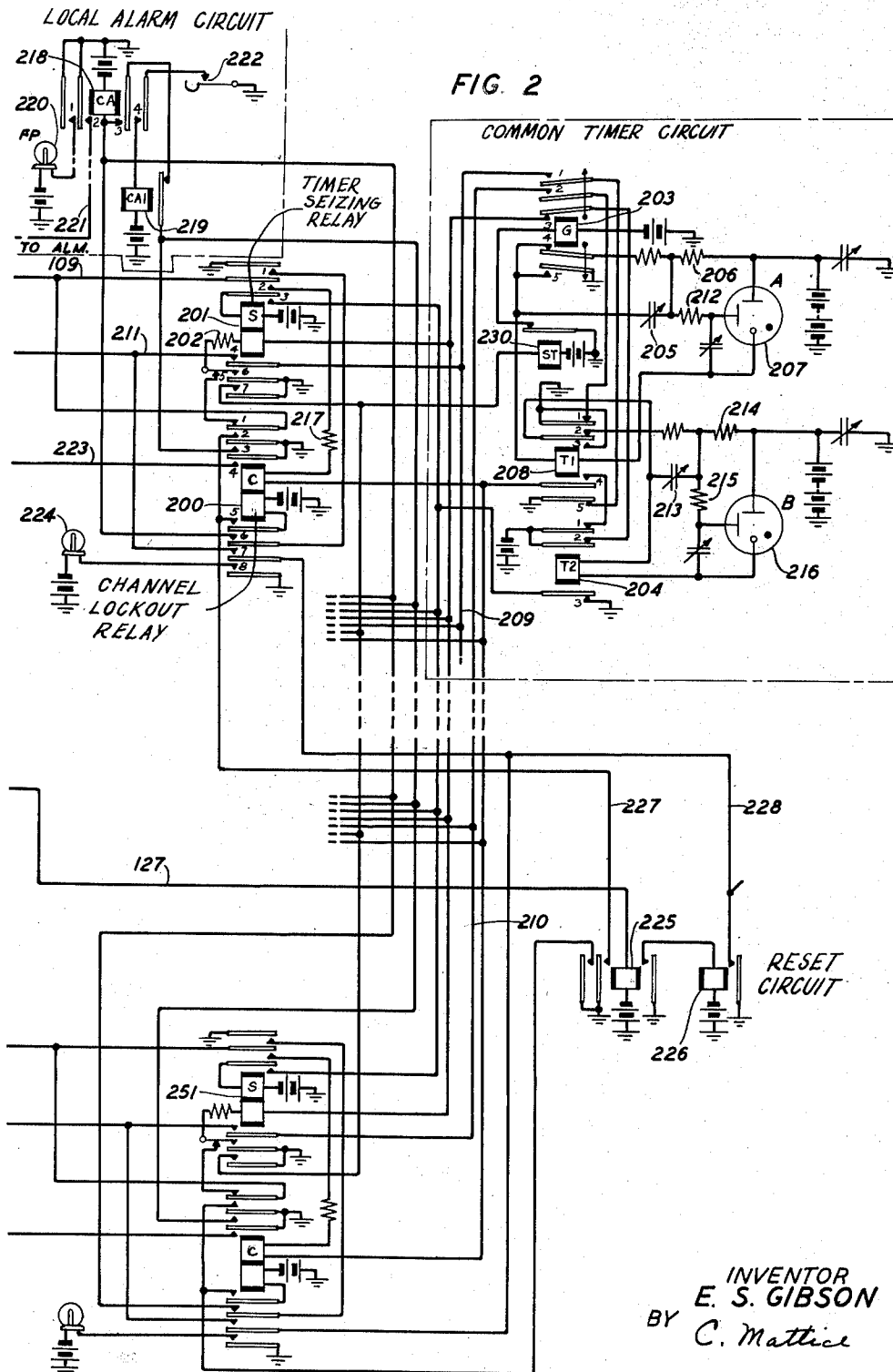
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2 SHEETS—SHEET 2



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COMMON TIMING CIRCUIT

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11 Claims. (Cl. 343—200)

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This invention relates to alarm systems and has for its object the provision of means for distinguishing between temporary and prolonged abnormal conditions.

In communication systems certain abnormal conditions may arise which may correct themselves after a short interval, but which if prolonged may require adjustment.

Where there are a number of pieces of equipment subject to the same abnormal condition, but at different times, the provision of separate timing means for each piece of equipment is costly.

In accordance with the present invention means is provided, responsive to the occurrence of an abnormal condition on any piece of equipment, to connect that equipment with a common timing device and start a timing operation which results in the sounding of an alarm only if the condition persists beyond a pre-determined time interval.

In accordance with a further feature of the invention, means is provided for preventing the connection of the timing device with an additional piece of equipment during the timing operation.

If the abnormal condition is still present at the end of the time interval a registration is made of the identity of the piece of equipment in which the condition arose and reseizure by the identified equipment is prevented, while the timing device is made available to other pieces of equipment.

More specifically the timing and alarm arrangement of the present invention is designed for use in connection with radio channels subject to fading. To detect such fading a sensitrol relay is associated with each channel, which is held operated as long as the radio currents are of sufficient strength. When fading occurs the sensitrol relay releases to seize the timing circuit. Since the current strength may be rising at the end of the measured time interval, auxiliary means is provided to reoperate the sensitrol relay at that time and to then test whether the relay is held operated before registering the fading condition.

These and other features of the invention will be more clearly understood from a consideration of the following description made in connection with the attached drawing in which:

Fig. 1 shows, in a diagrammatic form, two radio channels with their associated sensitrol relays; and

Fig. 2 shows the seizing and lock-out means

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individual to the two channels and the common timing circuit.

This timing and alarm arrangement may conveniently be associated with an alarm signaling system of the type shown in the application of Clutts-Pullis-Schenck-Weber, Serial No. 184,632, filed September 13, 1950, which issued on January 22, 1952, as Patent 2,583,088 and was reissued on November 11, 1952, as reissue patent 23,571.

The operating winding 100 of sensitrol relay 101 is connected through fixed resistance 102 and adjustable resistance 103 by means of high frequency filter 104, tuned to the particular radio channel, transducer 105 and directional coupler 106 to the circuit over which the particular channel, which may be called channel 1, is connected to the radio antenna, indicated by wire 107. By similar means the operating winding 110 of sensitrol relay 111 is connected with the circuit over which another channel, which may be called channel X is connected to the radio antenna.

As long as radio waves of satisfactory strength are passing over wire 107, relay 100 holds its contact 108 open. When the signal strength fades, contact 108 closes and, if the timing circuit is normal, completes a circuit from ground over contact 108, conductor 109, contact 1 of relay 200, contact 5 of relay 201 resistance 202, lower winding of relay 201, contact 3 of normally operated relay 203, contact 2 of relay 204 to battery. Relay 201 operates and locks in a circuit from battery through its upper winding, and over its contact 3 to ground at contact 3 of relay 204. Relay 201 also closes a second locking circuit for itself from ground over its contact 6, through resistance 202 and its lower winding to battery as above traced.

Relay 201 in operating connects ground over its contact 7 to battery through the winding of relay 230 to seize the timing circuit and start its operation. Relay 230 when operated opens the circuit of relay 203 which releases slowly to measure a first time interval. The release time of relay 203 is made sufficiently slow so that, if the cause of fading affects other channels, for example channel X, the associated sensitrol relay 111 may release to operate the corresponding timer seizing relay 251 and have the latter relay lock before relay 203 opens its contacts.

When relay 203 opens its contact 3 no other channel may operate its timer seizing relay. At its contact 4, relay 203 opens the shunt around timing condenser 205, permitting this condenser

to charge in a circuit from +130-volt battery, resistance 206, condenser 205 to ground at contact 5 of relay 203. Condenser 205 is connected through resistance 212 to the control anode of tube 207, +130 volts to the main anode and ground over contact 5 of relay 203 and through the winding of relay 208 to the cathode.

When relay 203 closes its contacts 1 and 2, it connects ground from contacts 5 and 1 of relay 208 to conductors 209 and 210. With timer seizing relay 201 operated, ground on conductor 209 is connected over contact 4 of relay 201, conductor 211, contact 2 of key 120 to battery through the reset winding of sensitrol relay 101 causing that relay to reopen its contact. Similar circuits are closed for the reset windings of any other sensitrol relays which may have released and operated their associated timer seizing relays.

Condenser 205 and resistance 206 are so chosen that it requires approximately six seconds for condenser 205 to charge to the breakdown potential of tube 207. When this charge is reached tube 207 breaks down and relay 208 operates. With relay 208 operated, ground is disconnected from the reset winding of the sensitrol relay 101 and that relay may hold its contact open or closed as determined by the transmission level in the associated channel.

Relay 209, in operating, closes a circuit to test whether the sensitrol relay 101 has again opened its contact, this circuit extending from battery over contact 1 of relay 204, contact 4 of relay 208, upper winding of relay 200, resistance 217, contact 2 of relay 201, conductor 109 to the contact 108 of relay 101. If this contact is closed, relay 200 operates, and lights lamp 224 to indicate the channel on which the fading condition has occurred, closing a locking circuit for itself from battery through its lower winding and over its contacts 5 and 2 to conductor 109 and ground supplied by relay 101. At its contact 1, relay 200 opens the operating circuit of relay 201 so that the timing circuit cannot be resealed by channel 1 until the fading condition has ended.

Relay 200 closes a circuit from ground over contact 1 of relay 201, contact 6 of relay 200, to battery through the winding of common alarm relay 218. Relay 218 operates and locks over its contact 3 and the contact of relay 219 to ground at contact 3 of relay 200. Relay 218 lights lamp 220 and grounds conductor 221 to give an audible alarm when the station is attended. Key 222 may be operated to operate relay 219 and release relay 218 to silence the alarm.

In addition relay 200, at its contact 4, connects ground to conductor 223 closing a circuit through the lower winding of relay 121 and over contact 1 of that relay to battery supplied to conductor 122 by the station alarm sending circuit 123. Relay 121 locks to battery over its contact 2 as long as conductor 223 is grounded and also locks in a circuit from battery through its upper winding, resistance 124, and its contact 3 to ground supplied to conductor 125 by the indication sending circuit 126. Ground on conductor 223 also initiates the operation of the station alarm sending circuit 123 to send an alarm signal to an attended station, while ground supplied over contact 6 of relay 121 to the indication sending circuit 126 is later used to transmit the identity of the channel to the attended station. A suitable station alarm sending circuit and indication sending circuit are disclosed in the above-identified patent to Clutts et al.

Relay 208, when operated as above described, opens the shunt around condenser 213 permitting that condenser to charge in a circuit from +130-volt battery, resistance 214, condenser 213, to ground over contact 3 of relay 208. Condenser 213 is connected through resistance 215 to the control anode of tube 216, +130 volts being connected to the main anode. The cathode of tube 216 is connected through the winding of relay 204 to ground over contact 3 of relay 208. Condenser 213 and resistance 214 are so chosen that it requires approximately 1.3 seconds for the charge on condenser 213 to reach the breakdown potential of tube 216 at which time the tube becomes conducting and relay 204 operates.

Relay 204 at its contact 1 opens the operating circuit of relay 200 and similar relays pertaining to other channels so that any subsequent closure of a sensitrol relay contact must go through a complete timing cycle before it may be registered. At its contact 3, relay 204 opens the holding circuit for relay 201, permitting that relay to release. The release of relay 201 in turn releases relay 230, which recloses the operating circuit for relay 203. Relay 203 operates, opening the operating circuit of relay 208 and reclosing the shunt around condenser 205, to discharge the condenser and quench tube 207.

Relay 208 releases, opening the circuit of relay 204 and reclosing the shunt around condenser 213 to discharge the condenser and quench tube 216. With relay 208 released, the timing circuit is restored to normal.

Relay 200 may be released by operating key 120 to energize the reset winding of relay 101. When the key is released, if the fade persists and contact 108 recloses, it will be treated as a new alarm.

When the station is unattended and the indication sending circuit functions to transmit the trouble indication to an attended station, ground is connected to conductor 127 at a particular point in the transmitting cycle. Ground on conductor 127 operates relay 225, in turn operating relay 226. Relay 225 connects ground to conductor 227 to hold operated relay 200 and the corresponding relays of other channels which may be operated. Relay 226 connects ground to conductor 228 which is extended over contact 7 of relay 200 to conductor 211 to operate the reset winding of relay 101. The reset windings of sensitrol relays associated with other operated channel relays like relay 200 are also operated. When ground is removed from conductor 127, relays 225 and 226 release and, if relay 101 holds its contact 108 open, relay 200 also releases.

What is claimed is:

1. In a signaling system, a plurality of apparatus units subject to temporary abnormal conditions, a common timing circuit operable through a cycle to measure a plurality of time intervals, means under the control of each apparatus unit responsive to an abnormal condition for seizing said common timing circuit and initiating its cycle of operation, and means operated by said timing circuit at the end of a predetermined one of said time intervals to record the identity of the seizing unit and to operate an alarm.

2. In a signaling system, a plurality of apparatus units subject to temporary abnormal conditions, a common timing circuit operable through a cycle to measure a plurality of time

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intervals, means under the control of each apparatus unit responsive to an abnormal condition for seizing said common timing circuit and initiating its cycle of operation, and means operated by said timing circuit at the end of a predetermined one of said time intervals to record the identity of the seizing unit, to operate an alarm, and to prevent said seizing unit from reseizing said timing circuit for the duration of said abnormal condition.

3. In a signaling system, a plurality of apparatus units subject to temporary abnormal conditions, a common timing circuit operable through a cycle to measure a plurality of time intervals, means under the control of each apparatus unit responsive to an abnormal condition for seizing said common timing circuit and initiating its cycle of operation, means operated by said timing circuit at the end of a predetermined one of said time intervals to record the identity of the seizing unit and to operate an alarm, and means operated by said timing circuit at the end of a subsequent one of said time intervals to restore said timing circuit to normal.

4. In a signaling system, a plurality of apparatus units subject to temporary release in response to a trouble condition, a common timing circuit operable through a cycle to measure a plurality of time intervals, means under the control of each apparatus unit responsive to a temporary release for seizing said common timing circuit and initiating its cycle of operation, and means operated by said timing circuit at the end of a predetermined one of said time intervals to record the identity of the seizing unit and to operate an alarm.

5. In a signaling system, a plurality of apparatus units subject to temporary release in response to a trouble condition, a common timing circuit operable through a cycle to measure a plurality of time intervals, means under the control of any one of said apparatus units responsive to a temporary release for seizing said common timing circuit and initiating its operation, auxiliary operating circuits for said apparatus units means operated by said timing circuit at the end of a first one of said time intervals to close the auxiliary operating circuit for said seizing unit for a second one of said time intervals, and means operated by said timing circuit at the end of said second interval, in response to the rerelease of said unit to record the identity of the seizing unit and to operate an alarm.

6. In a signaling system, a plurality of apparatus units subject to temporary release in response to a trouble condition, a common timing circuit operable through a cycle to measure a plurality of time intervals, means under the control of each apparatus unit responsive to a temporary release for seizing said common timing circuit and initiating its cycle of operation, and means operated by said timing circuit at the end of a predetermined one of said time intervals to record the identity of the seizing unit, to operate an alarm, and to prevent said seizing unit from reseizing said timing circuit for the duration of said release.

7. In a signaling system, a plurality of apparatus units subject to temporary abnormal conditions, a common timing circuit operable through a cycle to measure a plurality of time intervals, means under the control of any one of said apparatus units responsive to an abnormal condition for seizing said common timing

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circuit and initiating its operation, auxiliary operating circuits for said apparatus units means under the control of said timing circuit at the end of a first one of said time intervals to close the auxiliary operating circuit for said seizing unit for a second one of said time intervals, means operated by said timing circuit at the end of said second time interval to record the identity of the seizing unit and to operate an alarm, and means operated by said timing circuit at the end of a third one of said time intervals to restore said timing circuit to normal.

8. In a signaling system, a plurality of radio channels subject to fading, a common timing circuit operable through a cycle to measure a plurality of time intervals, means under the control of each channel responsive to a temporary fading for seizing said common timing circuit and initiating its cycle of operation, and means operated by said timing circuit at the end of a predetermined one of said time intervals to record the identity of the seizing channel and to operate an alarm.

9. In a signaling system, a plurality of radio channels subject to fading, a normally operated relay in each channel, said channel relays releasing in response to fading on the associated channel, a common timing circuit operable through a cycle to measure a plurality of time intervals, means responsive to the release of one of said relays for seizing said common timing circuit and initiating the operation thereof, auxiliary operating circuits for said channel relays, means operated by said timing circuit at the end of a first one of said time intervals to close said auxiliary operating circuit for the channel relay for a second time interval, and means under the control of said timing circuit after said second interval, operated if said channel relay has again released, to record the identity of the channel associated with said channel relay.

10. In a signaling system, a plurality of apparatus units subject to temporary release in response to a trouble condition, a common timing circuit operable through a cycle to measure a plurality of time intervals, means under the control of each apparatus unit responsive to a temporary release for operating a seizing relay individual to said apparatus unit, means under the control of one operated seizing relay to cause said common timing circuit to measure a predetermined time interval during which other apparatus units may operate the seizing relay individual thereto, means operated at the end of said predetermined time interval to prevent the operation of any additional seizing relays, auxiliary operating circuits for said apparatus units means under the control of said timing circuit at the end of said predetermined interval to close the auxiliary operating circuits for units whose seizing relays are operated for a further predetermined interval, and means effective at the end of said further predetermined interval, if any of said units have again released, to record the identity of said released seizing units and to operate an alarm.

11. In a signaling system, a plurality of radio channels subject to fading, a normally operated relay in each channel, said channel relays releasing in response to fading on the associated channel, a common timing circuit operable through a cycle to measure a plurality of time intervals, means responsive to the release of any one of said channel relays for operating a seizing relay individual to said channel, means under the

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control of one operated seizing relay to cause said common timing circuit to measure a first predetermined time interval during which other channel relays may operate the seizing relay individual thereto; auxiliary operating circuits for said channel relays means operated at the end of said first time interval to prevent the operation of any additional seizing relays and to close an auxiliary operating circuit for the channel relay associated with each operated seizing relay for a second predetermined interval, and means under the control of said timing circuit after said second interval, effective if any of said channel relays have again released, to record the identity of the channels associated with said released channel relays.

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