

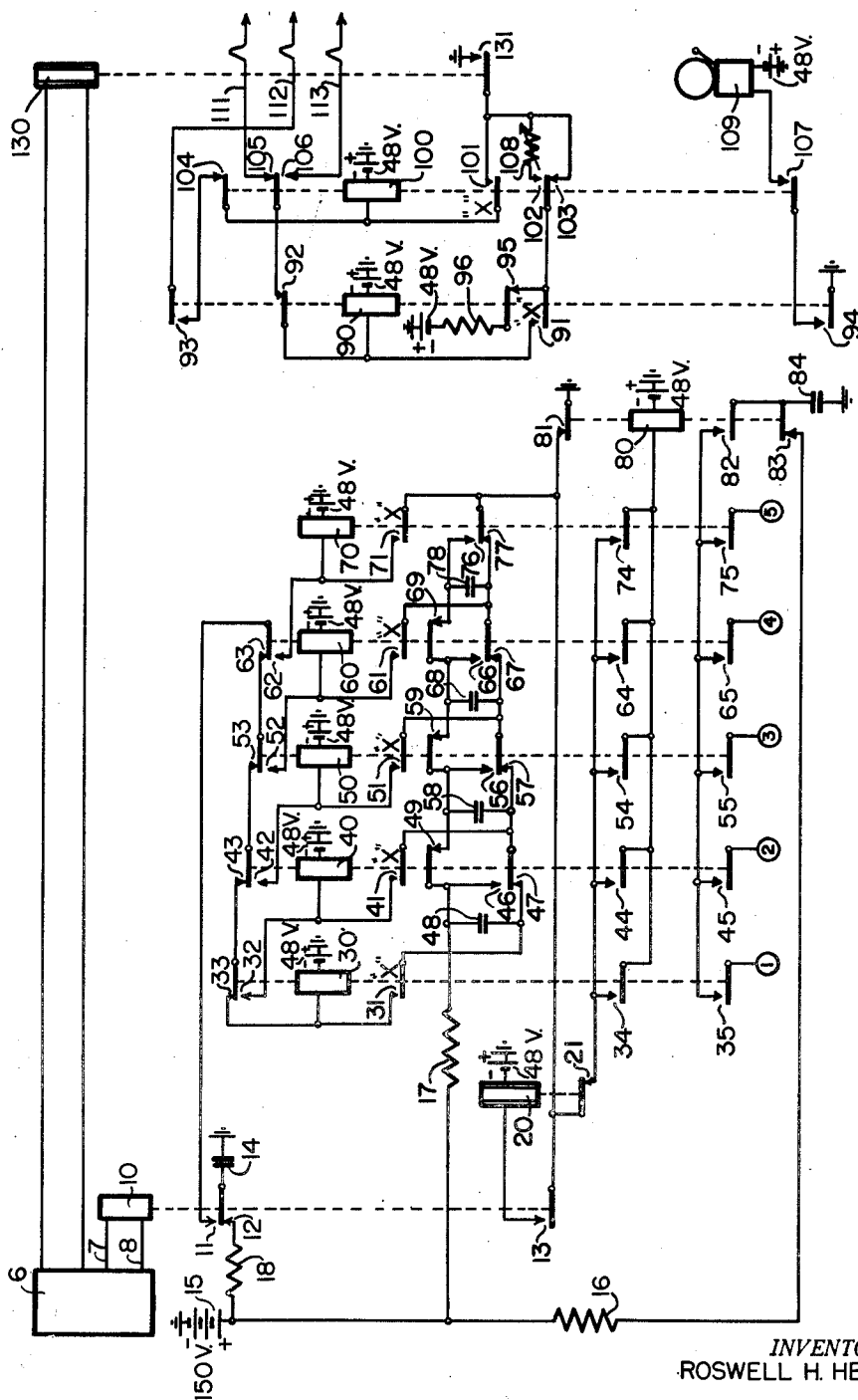
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RELAY REGISTERING SYSTEM

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RELAY REGISTERING SYSTEM

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This invention relates to an all-relay selective calling system of the type wherein one out of a large number of receivers in communication with a single transmitter may be alerted for conversation.

It is an object of this invention to provide an all-relay selective calling system in which a particular series of digital pulses is individual to the operation of each receiving station.

Another object of the invention is to provide a selective calling system wherein two registering relays and a temperature-sensitive resistor provide a response to a three digit system.

Another object of the invention is to provide a selective calling system including a series of counting relays arranged to be energized sequentially in which a series of condensers is arranged to speed the release of each counting relay when its locking circuit is broken.

Other objects of the invention will be apparent from the following specification taken in connection with the accompanying drawing.

Referring generally to the drawing a receiver 6 picks up pulse signals from a transmitter (not shown). These pulses are utilized to energize a pulse relay 10. Operation of the relay 10 energizes a slow-release relay 20 and also a series of five counting relays 30, 40, 50, 60 and 70 in sequence. The operation of each counting relay breaks a locking circuit for the preceding counting relay so that only one counting relay will be operated at a time. Each counting relay has contacts which control one of a series of terminals 1 to 5. The terminals 1 to 5 are accessible for attachment of three registering relay leads 111, 112 and 113. These leads are connected to terminals 1 to 5 in accordance with the call number assigned to the particular unit in question, lead 111 being connected to the terminal representing the first digit, lead 112 the second digit, and lead 113 the third digit.

The release of slow-release relay 20 at the conclusion of the pulse or pulses constituting a particular digit actuates a relay 80 which closes its contacts 82 to complete a condenser discharge circuit through one of the terminals 1 to 5 and lead 111 provided lead 111 is connected to a terminal which has contacts closed in response to the called digit. If the discharge path is the proper one the condenser discharge energizes a registering relay 90, which locks up and prepares a circuit through lead 112 to a registering relay 100 which is operated in response to a particular second digit pulse series.

Relay 100, upon being energized, has contacts

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which complete a locking circuit for itself and break the locking circuit of relay 90. If a third series of digit pulses then completes a circuit through lead 113 relay 90 is reoperated. It is the joint operation of relays 90 and 100 which completes a circuit to an alarm signal 109. A more detailed explanation of the operation of the various circuits in the unit illustrated will be given hereinafter.

While only a single unit is shown on the drawing a receiving system is composed of a number of such units wherein the receivers are in communication with the same transmitter. All of the units are identical in construction the only difference being that leads 111, 112 and 113 are connected to different numbers and sequences of terminals 1 to 5 in order that only one unit may be signaled by a particular series of digital pulses.

The receiver 6 may be of the conventional type of radio receiver. A pair of leads 7 and 8 communicate digit pulses picked up by receivers 6 to the relay 10. The first pulse on relay 10 closes contacts 13 to complete the following circuit for the operation of relay 20; ground, contacts 81, contacts 13, relay 20, and battery to ground. Relay 20 then remains operated, due to its slow to release characteristics, for the series of impulses making up a single digit but releases during the pause between digits.

Reception of the carrier on receiver 6 completes a circuit for the operation of a squelch relay 130. Relay 130 closes its contacts 131 to furnish locking ground for the subsequent operation of relays 90 and 100 in a manner to be explained hereinafter.

Before receipt of a pulse a condenser 14 was charged through contacts 12 by the following circuit: ground, condenser 14, contacts 12, resistor 18, direct current source 15, and ground. Resistor 18 is present in the circuit for protective purposes and may conveniently have a resistance of about 1,000 ohms. The direct current source 15 may conveniently have a potential of about 150 volts.

On each pulse of relay 10 the contacts 12 are opened and the contacts 11 closed to create a condenser discharge path for the operation in sequence on successive pulses of the counting relays 30, 40, 50, 60 and 70. The discharge of condenser 14 on the first pulse operates relay 30 over the following circuit: ground, condenser 14, contacts 11, contacts 63, contacts 53, contacts 43, contacts 33, relay 30, and battery to ground.

Upon receipt of the pulse from condenser 14,

relay 30 locks up through its "X" contacts 31 by the following circuit: ground, battery, relay 30, contacts 31, contacts 47, contacts 57, contacts 67, contacts 77, contacts 81, and ground.

Upon operation, relay 30 opens its contacts 33 and closes its contacts 32 to prepare a circuit for the operation of relay 40. Relay 30 also closes its contacts 34 to prepare a circuit for the operation of relay 80 which will be completed upon the release of relay 20. Relay 30 contacts 35 are closed to prepare a condenser discharge circuit through terminal 1. If no further pulses are received relay 30 remains operated until its locking circuit is interrupted by operation of relay 90. In this event the digit 1 would be recorded on relay 90 at stations which had call numbers beginning with the digit 1.

A second pulse following before the release of relay 20 passes through contacts 32 to operate relay 40. This relay then closes its "X" contacts 41 to complete a locking circuit for itself through contacts 57, 67, 77, 81 and ground. Relay 40 then opens its contacts 47 to break the locking circuit of relay 30 and closes its contacts 45 to enable the discharge of a condenser 48 to speed the release of relay 30.

Condensers 48, 58, 68 and 78 all serve the purpose of speeding the release of one of the counting relays. The operation will be explained with reference to condenser 48. This condenser is initially charged through the following circuit: ground, direct current source 15, resistor 17, condenser 48, contacts 47, 57, 67, 77 and 81 and ground. Resistor 17 is placed in the circuit for protective purposes and may conveniently be of about 10,000 ohms resistance.

When contacts 47 are opened the charging path for condenser 48 is broken and when contacts 45 are closed the condenser plate with the positive charge is grounded and the plate with the negative charge is connected through relay 30 in opposition to the battery current which has a positive ground. The relay battery potential is about 48 volts while the condenser 48 potential is about 150 volts. This high condenser potential in opposition to the battery current quickly releases relay 30.

When relay 40 is operated its contacts 43 are opened and its contacts 42 closed to prepare a circuit for the operation of relay 50. Its contacts 44 and 45 are closed to prepare circuits for the operation of relay 80 and through terminal 2 respectively. Thus if there are only two pulses relay 40 alone of the counting relays will be energized and a circuit through terminal 2 will be prepared in all stations and completed through relay 40 in stations which have the digit 2 as the first digit in their call numbers.

If a third pulse is delivered through relay 10 before relay 20 releases, relay 50 will be energized by the discharge of condenser 14 through contacts 42 and its various contacts will be operated in a manner exactly analogous to that outlined above for relay 40. Similarly a fourth pulse will energize relay 60 through relay 50 contacts 52 and a fifth pulse will energize relay 70 through relay 60 contacts 62. The embodiment illustrated shows five counting relays which allows for a calling system utilizing digits 1 to 5. More counting relays may be added if an expanded digit system is desired.

The registering circuit consists of relays 90 and 100 with their accessory circuits. The first incoming signal passes through lead 111, the second through lead 112 and the third through

lead 113. These leads are connected to terminals 1 to 5 in accordance with the number assigned to the unit. For example, for number 531 lead 111 would be connected to terminal 5, lead 112 to terminal 3, and lead 113 to terminal 1. For number 222, all three leads would be connected to terminal 2.

The registering relays 90 and 100 are initially energized by a condenser discharge circuit responsive to operation of relay 80. When relay 80 is released a registering relay condenser 84 is charged from direct current source 15 through protective resistor 16 and contacts 83.

With conclusion of a pulse or pulses constituting a single digit an operating circuit is prepared for relay 80 through one of contacts 34, 44, 54, 64, or 74. Upon the conclusion of the series of pulses relay 20 releases to complete the circuit for relay 80 through contacts 21.

At its contacts 81 relay 80 breaks the locking circuit for whichever counting relay is operated. At its contacts 83 relay 80 opens the charging circuit of condenser 84 and at its contacts 82 closes a discharge circuit for condenser 84 through whichever of terminals 1 to 5 has its associated counting relay operated.

If, for example, the number of the unit is 534 and this is the unit being called the first series of pulses will leave counting relay 70 operated and contacts 75 will be closed. Relay 90 will then be energized through the following circuit: ground, condenser 84, contacts 82, contacts 75, terminal 5, lead 111, contacts 105, contacts 92, relay 90, and battery to ground.

Relay 90 locks up over its "X" contacts 91 by the following circuit; ground, battery, relay 90, contacts 91, contacts 103, contacts 131 and ground.

At its contacts 93 relay 90 prepares a circuit for the operation of relay 100 by a condenser discharge through conductor 112.

Conductor 112 is connected to terminal 3. When relay 20 releases at the conclusion of the pulses representing digit 3, relay 80 operates and condenser 84 discharges through contacts 82 and 55, terminal 3, conductor 112, contacts 92, contacts 104, relay 100, and battery to ground.

Relay 100 then locks up over its "X" contacts 101 through contacts 131 to ground. At the same time the contacts 103 are opened to break the direct locking circuit of relay 90 and the contacts 102 are closed to complete the following circuit for a temperature-sensitive resistor 108: ground, contacts 131, resistor 108, contacts 102, contacts 95, resistor 96, and battery to ground. Resistor 96, which is in the circuit for protective purposes, may conveniently have a resistance of about 1,000 ohms.

The temperature-sensitive resistor 108 is of the type which offers high resistance when it is cold but very little resistance when it is heated. Consequently, although it is momentarily in the locking ground circuit of relay 90 when its circuit is first prepared it offers such high resistance on account of its cold state that the locking circuit of relay 90 breaks at the "X" contacts 91. The contacts 95 then close and resistor 108 heats up to a point where it offers little resistance to the flow of current.

When the third digit (4 in the assumed example) is counted on relay 60 relay 100 contacts 106 are closed and the following circuit is thereby provided for the reoperation of registering relay 90: ground, condenser 84, contacts 82 and 65,

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terminal 4, conductor 113, contacts 106 and 92, relay 90, and battery to ground.

Relay 90 is now locked up over the following circuit through resistor 108 which is hot and therefore offers little resistance: ground, battery, relay 90, contacts 91, contacts 102, resistor 108, contacts 131, and ground.

Relays 90 and 100 are now both operated and their contacts 94 and 107 are closed to complete a circuit for the operation of alerting signal 109.

The three-digit five-numbered system illustrated will allow for 125 calling stations. If there are this many stations the first digit will operate relay 90 in 25 of the stations, the second will operate relay 100 in five of the 25, and the third will reoperate relay 90 in one of the five to give an alerting signal only at the station called. The stations which had relay 90 or 100 operated but did not complete the call will remain partially operated until the carrier ceases at which time relay 130 will release and open its contacts 131. This will break the locking circuits for whichever of relays 90 and 100 are operated. The operation of relay 80 had previously opened its contacts 81 to release any of the counting relays which may have been locked.

While the preceding description has reference to a single embodiment of the invention this should not be construed to limit the scope of the invention other than as necessitated by the appended claims.

I claim as my invention:

1. A registering system for three condenser discharge circuits comprising a pair of registering relays, a first operating circuit for a first of said relays, a condenser, means for charging said condenser, a first discharge circuit for said condenser which energizes said first relay, a locking circuit for said first relay, said locking circuit passing through contacts of a second of said registering relays, said contacts being closed when said second registering relay is not energized, a second discharge circuit for said condenser which energizes said second relay, a locking circuit for said second relay, a temperature-sensitive resistor which offers high resistance to current flow when cold and low resistance when hot, a ground circuit through said temperature-sensitive resistance, contacts of said second and first relays and the winding of said first relay, said ground circuit being closed when both of said relays are operated, a third discharge circuit for said condenser which passes through contacts of said second relay which are closed when said second relay is energized to reoperate said first relay, and a signal circuit completed by the joint operation of said two relays.

2. A registering system for a three-digit system comprising a first relay, an operating circuit for said first relay, a locking circuit for said first relay, a second relay, an operating circuit for said second relay, said second relay operating circuit being complete only after energization of said first relay, the operation of said second relay breaking the operating circuit of said first relay, a temperature-sensitive resistor which strongly resists current flow when cold and offers little resistance to current flow when hot, said temperature-sensitive resistor being placed in the locking circuit of said first relay by operation of said second relay, contacts on said second relay which complete a holding circuit for said first relay through contacts of said second relay which are closed when said second relay is operated, an additional operating circuit for said first relay

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which passes through contacts of said second relay which are closed when said second relay is energized, and a signal circuit completed by the joint operation of said two relays.

3. In a registering system, three conductors, a condenser, means for charging said condenser three times, means for connecting said charged condenser sequentially to said three conductors, a first relay, a second relay, a first battery circuit including the winding of said first relay, first contacts of said first relay, closed first contacts of said second relay, and one of said conductors, said first contacts closed when said relays are deenergized, said condenser discharging through said first battery circuit to operate said first relay, a locking circuit for said first relay including closed second contacts of said first relay and closed second contacts of said second relay, said second contacts of said first relay closed when said first relay is energized, said second contacts of said second relay closed when said second relay is deenergized, a second battery circuit including the winding of said second relay, closed third contacts of said first relay, closed third contacts of said second relay, and a second one of said conductors, said third contacts of said first relay closed when said first relay is energized, said third contacts of said second relay closed when said second relay is deenergized, said condenser discharging through said second battery circuit to operate said second relay, a locking circuit for said second relay, said locking circuit including open fourth contacts of said second relay, said fourth contacts closed by the energization of said second relay to complete said locking circuit, a temperature sensitive resistor which has a high resistance when cold and a low resistance when hot, an alternate locking circuit for said first relay including said second contacts of said first relay and open fifth contacts of said second relay and said temperature sensitive resistor, said fifth contacts of said second relay closed by the energization of said second relay and said second contacts of said second relay opened by the energization of said second relay thereby opening said locking circuit for said first relay and completing said alternate locking circuit for said first relay, said cold resistor preventing said first relay from remaining locked whereby said first relay is restored, a third battery circuit including closed third contacts of said first relay, said third contacts of said first relay closed when said first relay is deenergized, said third battery circuit connected to said alternate holding circuit whereby said third battery circuit causes said resistor to become hot, a fourth battery circuit including the winding of said first relay, said closed first contacts of said first relay, closed sixth contacts of said second relay, and the third one of said conductors, said sixth contacts of said second relay closed when said second relay is energized, said condenser discharging through said fourth battery circuit to operate said first relay, said second contacts of said first relay closed again to complete said alternate holding circuit, said first relay remaining energized through said alternate holding circuit as said hot resistor has a low resistance, and a signal circuit completed by the joint operation of said two relays.

4. A registering system for three condenser discharge circuits comprising a pair of registering relays, in which there are a series of incoming conductors and means for applying a charged condenser to said conductors sequentially, a normally closed circuit for one of said relays includ-

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ing said relay and one of said conductors over which said one relay is energized when the condenser is connected thereto, an energizing circuit for the other relay, means controlled by the energization of said one relay for closing a locking circuit for itself and connecting said other relay to a second one of said conductors, said other relay energized when said condenser is connected to said second conductor, means controlled by the energization of said second relay for closing a locking circuit for itself and preparing an alternate locking circuit for said first relay including a normally high resistance temperature sensitive element, said first relay deenergized when said alternate circuit is closed, means controlled jointly by the deenergization of said first relay and the energization of said second relay for preparing another circuit for said first relay over a third one of said conductors, and for complet-

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ing a heating circuit for said element, said first relay energized over said third conductor when said charged condenser is connected thereto, and means controlled by the last energization of said first relay for again completing the alternate locking circuit of said first relay through said now heated element to maintain the relay operated.

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