

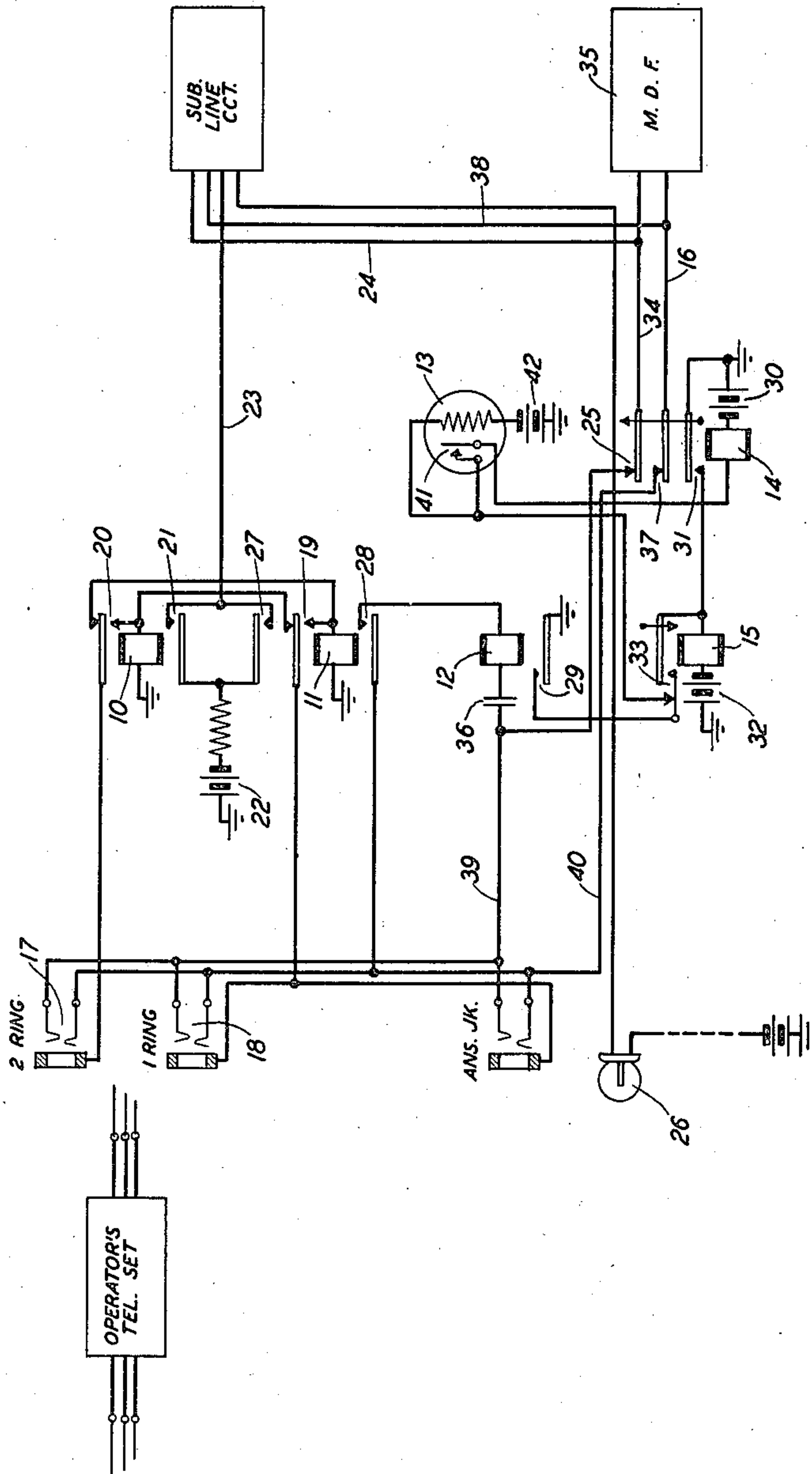
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SUBSCRIBER RINGING CIRCUIT

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SUBSCRIBER RINGING CIRCUIT

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1

This invention relates to a circuit for ringing telephone subscribers and more particularly to a system for rendering eight-party semiselective service in four-party manual full selective offices.

In rural line service, where more than one party is on a line, it is commonly required that the rural operator determine from the originating local or toll operator which of the parties is wanted on the line being called. By means of the subject invention, however, a call will be able to be completed to one party on a line directly from the multiple of the local or toll operator, and, at the same time that the selected party on the line is being called, the bridged jack on the operator's multiple for ringing the other parties on the line will be made busy. Additionally, each party on the same line will be able to distinguish his calls from calls to the other parties on the line by means of a distinctive ringing signal for each party. Thus, circuits in the subject invention include circuit arrangements which will convert a ringing signal which operates continuously for two seconds into a ring-pause-ring signal, with each of the rings being slightly less than one second in duration and the total amount of time required for the complete signal being two seconds.

Accordingly, a feature of the present invention is a circuit for rendering eight-party semiselective service in four-party full selective offices.

Another feature of the invention is a circuit which will prevent a call from being made to a second party on a line while a call is being made to a first party.

A further feature of the invention is a circuit which will convert one ringing signal into a second signal distinctively different from the first signal, so that each party on the line will respond only to those calls that are being made to him.

Other advantages of the invention will be apparent from the following detailed description and from the accompanying drawing, in which a circuit diagram of the electrical features of the invention is shown.

Referring now to the accompanying drawing, a schematic diagram is shown of the circuit for rendering semiselective party line service. This circuit comprises the relays 10 and 11, which serve to render the bridged jack for one party on the line busy when the second party is called; the relay 12 connected between the relay 11 and the subscriber's line; the tube 13 operated on by the relay 12; the relay 14 operated by tube 13 after a predetermined interval to provide an interruption in the ringing signal; and the relay 15, which

2

reestablishes the ringing signal by release of the relay 14. When a call is received on the lines 16 and 34 from the main distributing frame 35, they are introduced to the tip leads of the jack 17 and consequently to the tip leads of the jack 18, since the corresponding tip leads of the jacks 17 and 18 are connected in parallel. The jacks 17 and 18 are located on the switchboard of a local or a toll operator, depending upon the type of call that is being made, and each of these jacks serves as the plug-in position for one of the two ringing parties on a common line. When the operator plugs into the correct jack for the call being made, either the relay 10 or 11 acts to make the bridged jack busy. Suppose, for example, that the operator plugs into the jack 17. A continuous circuit will then be established from the battery on the sleeve of the plug and through jack 17 to the upper contact of the switch 20, which is associated with the relay 10, and then to the energizing winding of the relay 11, the other side of the winding being grounded. Current will therefore flow through the winding of the relay 11 so as to energize the winding and attract the armatures of the switches associated with the relay 11. Thus the armature of the switch 19 associated with the relay 11 will be attracted from the upper contact to the lower contact and a continuous circuit will be established to the sleeve conductor of the jack 18, which is connected to the armature of the switch 19. This jack will then be made busy so that no calls can be made through it. When the energizing winding of the relay 11 is actuated, it also operates a cut-off relay, not shown, to prevent the lighting of lamp 26 when the party called answers.

A similar situation will occur if a call is made to a subscriber whose connection on the operator's multiple is jack 18. When the operator plugs into the jack a continuous circuit will be established from battery through the sleeve of the cord and through the sleeve connection on the jack 18 to the upper contact of the switch 19 and from there to one side of the winding energizing relay 10, the other side of this winding being grounded. The relay 10 will operate and attract the armature of the switch 20 so that the armature touches the lower contact. Since the armature is also connected to the sleeve portion of the jack 17, the sleeve portion of the jack 17 will be connected to the sleeve portion of the jack 18 and consequently the jack 17 will be made busy with respect to any calls at that jack. In addition to attracting the armature of the switch 20, the relay 10 will also attract the armature of the switch

3

21 towards its contact and a continuous circuit will thereby be established from the battery 22 through the switch 21 and lead 23 to a conventional cut-off relay of the subscriber line circuit which connects to ground. This relay then operates in a manner well known in the telephone art and prevents the lighting of lamp 26 when the called party answers. Since the switches 25 and 37 are connected in a normally closed position to the leads 34 and 16 respectively and since the switch 37 is not acted upon when the jack 18 is plugged into, the customary ringing signal of two seconds duration will result.

The circuit which is the heart of my invention, for breaking the normal two-second ringing signal up into two shorter signals with a brief pause between the two signals will now be discussed. This ring-pause-ring signal of two seconds total duration occurs only for calls being made to the jack 17 and is for the purpose of giving the subscribers connected to the jacks 17 and 18 an opportunity to distinguish between their own calls and calls to the other party. As has been previously described, the winding of the relay 11 is energized when the jack 17 is plugged in and the relay 11 then acts upon the switches associated with it. Accordingly, the armature of the switch 27 is attracted towards its contact, which is connected to the battery 22 and thus voltage is applied to operate the cut-off relay of the line circuit. At the same time, however, as the switch 27 is operated upon, the armature of the switch 28 is attracted towards its contact. Since the armature is connected to one of the tip connections on the jack 17 and since the contact of the switch 28 is connected to the relay 12, the relay 12 will be actuated by ringing current which is sent through the leads 39 and 40 from the cord connected to jack 17. The operation of relay 12 causes the grounded armature of the switch 29 to move towards its contact. The capacitance 36 is connected between the relay 12 and the ring connection of the jack 17 and serves to prevent any direct current signal from being introduced to the relay 12. Upon the actuation of the relay contact 29, the ground connection at the armature of the relay will be introduced directly to the heating element of the tube 13, since the heating element is connected to the contact of the switch 29. The tube 13 may be of the thermostat variety, for example, an Amperite tube, such that switch 41 will not close until current has passed through the heating element for a predetermined period after the ground voltage has been established at switch 29. The timing can be accomplished through other means as well as the thermostat tube 13, such, for example, as a condenser timed cold cathode tube circuit, the operation of which is well known to the art. Through the use of the tube 13 or other suitable means the timing interval can be made to be slightly less than one second. At the end of the interval current will flow from the battery 42 through the tube 13 and the switch 29 and back to the ground side of the battery 42 by way of the ground on the armature of the switch 29. Accordingly, switch 41 will be operated and continuity will be established from the battery 30 through the relay 14 connected in series with the battery 30 to the switch 41, the armature of which is connected to the relay 14. Since the contact of the switch 29 is connected to the contact of the switch 41 and since the armature of the switch 29 and the second side of the battery 30 are grounded, current will flow through the relay 14. Thus, the armature of the

4

switches 25 and 37 will be attracted away from their contacts. Since the switches 25 and 37 are connected in the subscriber's lines 34 and 16 and since the ringing signal is transmitted over these lines, the ringing signal will be interrupted. The opening of switches 37 and 25 also insures that the correct signal may be transmitted to the non-called party as well as the called party. At the same time that electrical continuity is disestablished in the switches 25 and 37, it will be established in the switch 31. The armature of this switch is connected to ground while the contact of the switch is connected to one side of the winding energizing the slow-operating relay 15, the other side of this winding being connected to the battery 32. Thus, current will flow through the winding so as to actuate the relay and attract the armature of the switch 33 towards its contact. The armature of the switch 33 is connected to the same side of the energizing winding for the relay 15 as is connected to the contact of the switch 31, while the contact of the switch 33 is connected to the contact of the switch 29. Since the relay 12 will be actuated as long as ringing current is applied by the cord and thus will be actuated for the full two seconds that constitutes a normal ringing period the switch 29 will be closed for the full two-second period. Thus, a continuous circuit will be established from the battery 32 through the energizing winding of the relay 15 and the switch 33 to the switch 29 and then back to the battery 32 by means of the ground on the armature of the switch 29. The relay 15 will, therefore, be locked in by the switch 29 for the rest of the two-second ringing period and consequently the winding for the relay 14 will no longer have to be energized to keep the switch 31 closed. Thus, relay 14 will cease to be actuated and the switches 25 and 37 will again close and allow a ringing signal to be transmitted over the line conductors 16 and 34. At the end of the two-second period the conventional ringing generator associated with the operator's control set and line cord will interrupt the signal in the usual manner and a ring-pause-ring signal having a total duration of two seconds will result.

While certain specific embodiments of the invention have been described, it should be understood that various other embodiments of the invention may be made by those skilled in the art without departing from the spirit of the invention as defined within the scope of the appended claims.

What is claimed is:

1. A circuit for converting a manually rung eight-party semiselective line into an eight-party semiselective line rung by machine ringing, said circuit comprising a separate bridged jack for each set of four parties, relay means for rendering the bridged jack busy when any party is called, means for calling one party, a timing device for interrupting said ringing signal at a predetermined period, and further relay means to reestablish said ringing signal after a brief interruption.

2. A circuit for converting a manually rung eight-party semiselective line into an eight-party semiselective line rung by machine ringing, said circuit comprising a separate bridged jack for each set of four parties, relay means for rendering the bridged jack busy when any party is called, a second relay operable by said relay means, said second relay connected to said called subscriber's line whereby a continuous circuit is established and a ringing signal is transmitted, a timing de-

5

vice for interrupting said ringing signal at a predetermined period, and further relay means for reestablishing said ringing signal after a brief interruption.

3. A circuit for converting a manually rung eight-party semiselective line into an eight-party semiselective line rung by machine ringing, said circuit comprising a separate bridged jack for each set of four parties, relay means for rendering the bridged jack busy when any party is called, a second relay operable by said relay means, said second relay connected to the called subscriber's line whereby a continuous circuit is established and a ringing signal is transmitted, a timing device, a third relay, switches associated with said relay and connected in the line between said second relay and said called subscriber's line, said timing device operating to excite said third relay and open the contact in the called subscriber's line whereby the ringing signal is interrupted, and further relay means to reestablish said ringing signal after a brief interruption.

4. A circuit for converting a manually rung eight-party semiselective line into an eight-party semiselective line rung by machine ringing, said circuit comprising a separate bridged jack for each set of four parties, relay means for rendering the bridged jack for all other parties busy when one party is called, a number of switches associated with said relay means, a second relay connected to one of said switches, said relay means operating on said switch so as to establish a continuous circuit to said second relay, said second relay connected to the called subscriber's line whereby a continuous circuit is established and a ringing signal is transmitted, a timing device, a third relay, switches associated with said relay and connected in the line between said second relay and said called subscriber's line, said timing device operating to excite said third relay and open the switches in the called subscriber's line, whereby the ringing signal is interrupted, a fourth relay connected to said third relay, said third relay operating to energize said fourth relay, switches associated with said fourth relay, said switches connected to said second relay so as to lock said fourth relay in with said second relay and release said third relay after said fourth relay has been actuated, thus allowing a continuous circuit to be reestablished for ringing purposes to the called subscriber's line.

5. A circuit for converting a manually rung eight-party semiselective line into an eight-party semiselective line rung by machine ringing, said circuit comprising a separate bridged jack for each set of four parties, a separate relay means connected to each of said jacks, switches associated with each of said relay means, the switches associated with the relay means for each jack being connected to the other jack, each of said relay means operating on a call to its jack to close its switches and establish continuity to the other jack whereby a call is prevented from being established to that jack, means for calling one party, a timing tube for interrupting said ringing signal at a predetermined period, and further relay means to reestablish said ringing signal after a brief interruption.

6. A circuit for converting a manually rung eight-party semiselective line into an eight-party semiselective line rung by machine ringing, said circuit comprising a separate bridged jack for each set of four parties, a separate relay means connected to each of said jacks, switches associated with each of said relay means, the switches

6

associated with the relay means for each jack being connected to the other jack, each of said relay means operating on a call to its jack to close its switches and establish continuity to the other jack whereby a call is prevented from being established to that jack, a second relay operable by said relay means, said second relay connected to the called subscriber's line whereby a continuous circuit is established and a ringing signal is transmitted, a timing device, a third relay, switches associated with said relay and connected in the line between said second relay and said called subscriber's line, said timing device operating to excite the relay and open the switch in the called subscriber's line whereby the ringing signal is interrupted, a fourth relay operable by said third relay, switches associated with said fourth relay, said switches connected to said second relay so as to lock said fourth relay in with said second relay and release said third relay after said fourth relay has been energized, thus allowing a continuous circuit to be reestablished for ringing purposes to the called subscriber's line.

7. A circuit for converting a manually rung eight-party semiselective line into an eight-party semiselective line rung by machine ringing, said circuit comprising, a separate bridged jack for each set of four parties, relay means for rendering the bridged jack for all other parties busy when any party is called, a second relay connecting into said first relay, said second relay connected to the called subscriber's line whereby a continuous circuit is established and a ringing signal is transmitted, a timing device, a third relay operable after the operation of said timing device, switches associated with said relay connecting into the line between said second relay and the called subscriber's line, said timing device operating to actuate said third relay and open the ringing circuit to said called subscriber's line, and a fourth relay, said relay operating to reestablish the ringing circuit to said called subscriber's line.

8. A circuit for adapting a manually rung semiselective party line for full automatic machine ringing, said circuit comprising a first jack for each two-ring party on said line, a second bridged jack for each one ring party on said line, relay means for applying a busy signal to either of said jacks when the other jack is plugged into, a second relay cooperating with said first relay means to establish circuit continuity to the called subscriber's line, a timing device controlled by said second relay, a third relay operable under the control of said timing device to interrupt the ringing circuit to said called subscriber's line, and a fourth relay operable by said third relay to reestablish the ringing circuit to said called subscriber's line.

9. A circuit for converting a manually rung semiselective party line into a fully automatic machine rung party line, said circuit comprising a separate bridged jack for each one and two-ring party of a common ringing pair, relay means for rendering the bridged jack busy when the common ringing party is called, a second relay operable by said relay means to connect said called subscriber's line for ringing, a timing device for interrupting said connection at a predetermined period, and further relay means for reestablishing said connection after each brief interruption.

10. A circuit for converting a manually rung semiselective party line to full automatic machine ringing, said circuit comprising a separate

jack for each subscriber according to his distinctive call signal, relay means for rendering all other jacks busy whenever any party on said line is called, additional relay means cooperating with said first relay means to establish ringing circuit continuity to the called subscriber's line, a timing device controlled by said second relay means, a third relay means controlled by said timing device to interrupt said ringing circuit to said called subscriber's line at predetermined intervals, and a fourth relay means operable by said third relay means to periodically reestablish said ringing circuit.

11. A circuit for converting a machine rung full selective four-party line system into an eight-party semiselective machine rung system, said circuit comprising a second bridged jack for each additional party bridged on said line, relay means for applying a busy signal to the jack of either of said bridged parties whenever the other party is called, a second relay means cooperating with said first relay means to establish a ringing circuit to the called subscriber, a timing device controlled by said second relay means for interrupting said ringing circuit at a predetermined interval, and additional relay means operable under the control of said timing device for reestablishing said ringing circuit after each interruption.

12. In a full selective machine rung party line

telephone system, means for increasing the number of subscribers' stations on said party line by conversion to a semiselective ringing system, comprising an additional bridged jack for each added subscriber's station bridged on said party line, relay means for applying a busy signal to either of said bridged jacks whenever the other bridged ringing party is called, additional relay means operable by the aforesaid relay means to establish a ringing circuit to the called subscriber's station, a timing device connected by said relay means to said additional bridged jack whereby said ringing circuit to said jack is interrupted at a predetermined rate, and additional relay means controlled by said timing device to reestablish said ringing circuit following each interruption.

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