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STATION SELECTOR SYSTEM

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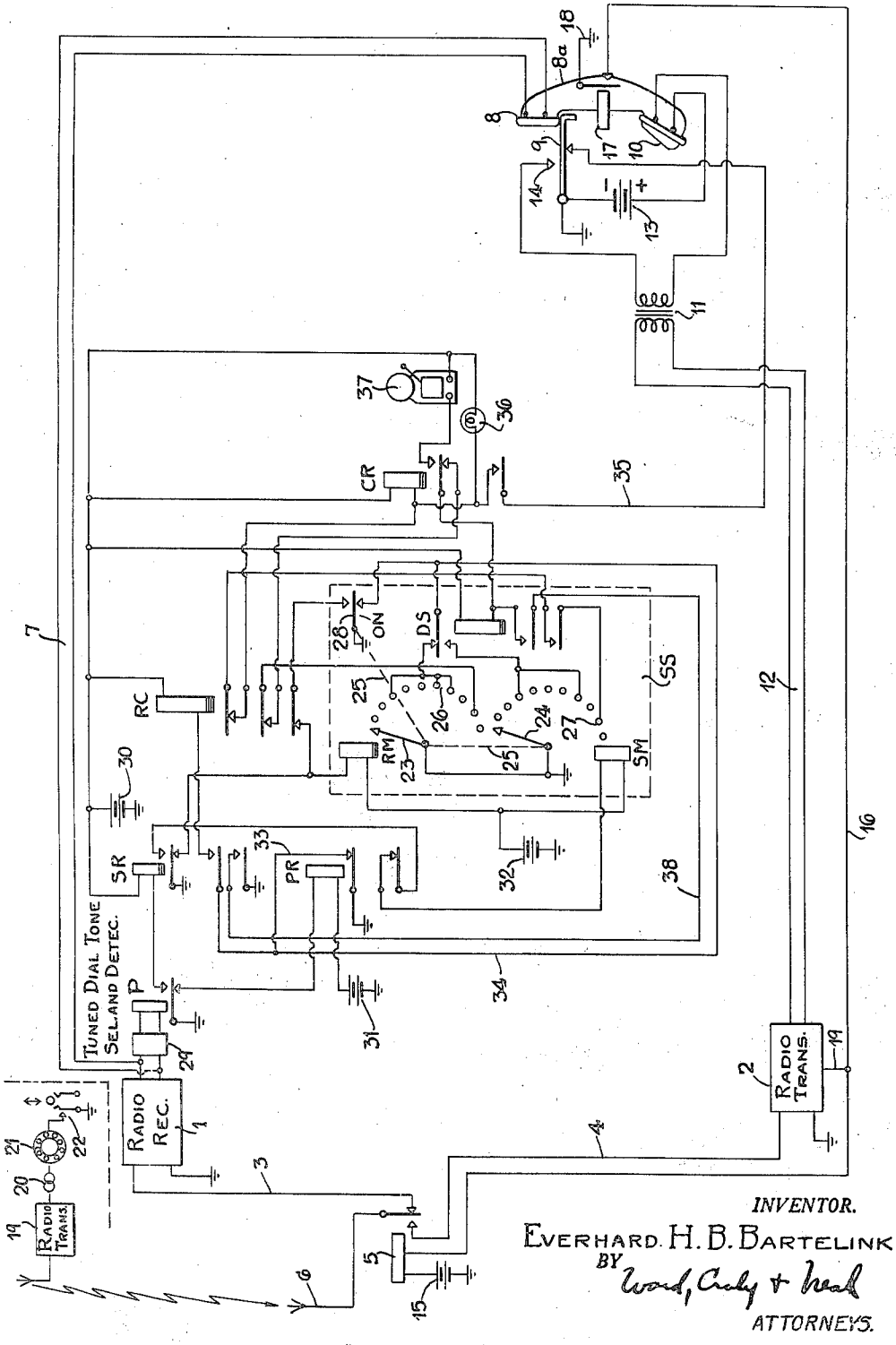

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STATION SELECTOR SYSTEM

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6 Claims. (Cl. 177—353)

1

This invention pertains to station selector circuits selectively responsive to dial telephone pulses, and more particularly to such as are adapted for use at subscriber's stations of radio telephone systems.

An object of the invention is to provide an extremely simple and compact form of selector circuit for use at subscriber's stations reached by radio from a central office, such that dialing impulses radioed from the central office will actuate the selector circuits at the various subscriber's stations in such manner as to select and signal only the particular station desired to be called.

The subscriber's station thus dialed and communicated with by radio may have fixed, land-based locations, as for example in the houses of farmers, remote hotel resorts, etc., or may be mounted on mobile units, such as ships, planes, trains, automobiles, etc., the invention being especially adapted for the latter.

In most station selector circuits heretofore devised, particularly those employed in mobile radio telephone stations, the dialing pulses are transmitted as positive pulses, that is, the number of dial tone pulses equals the number of digits dialed. In accordance with my invention, I have found it advantageous to reverse this procedure, that is, to put dial tone on the radio carrier prior to dialing, and to interrupt this tone according to the numbers comprising the dialing code of the station to be selected. One advantage of this modification as employed in conjunction with the novel selector system of my invention, is that the dialing tone, in addition to serving as the medium for selecting the particular station to be called by pulse interruptions thereof, also serves thereafter as the medium for controlling the duration of ringing at the called station. That is to say, the system is so actuated as to ring the selected subscriber's station, but ceases upon removal of the dial tone. In this way, the duration of ringing of the selected station is under control of the central office.

Other novel features of the selector system of my invention are: The selectors at all stations always release, i. e., are automatically restored to the zero positions of the stepping switches until dialing tone is received. Likewise, the selectors at all stations, including the called station, release after dialing is completed. Before the selector switch at the called station releases, it actuates a calling relay which locks up over a circuit traced through the receiver switch hook of the subscriber's telephone set, and thus releases only when the subscriber answers, and removes the

2

receiver from the hook. The calling relay actuates a lamp signal which remains energized until the calling relay is released as aforesaid. An audible signalling circuit, bell or buzzer, at the subscriber's station is completed through series-connected contacts of the calling relay and a supervising relay, the latter being operated during reception of the dialing tone. Accordingly, ringing will be initiated when the calling relay is energized by the selector switch as aforesaid, and will continue thereafter until the supervising relay releases upon cessation of the dialing tone. The stepping switches preferably comprise eleven position minor switches which, as manufactured, have two banks of rotary switch contacts and a decade switching relay for automatically switching the dialing code from one bank to the other. Also included in such switches are a stepping relay, a release magnet, and an off-normal contact actuated by the rotary switch arm. The calling relays at all stations are energized through contacts of the stepping switches thereat which are the same for all stations, for example, contact number nine of each stepping switch, the dialing codes being so arranged as always to actuate the selector switch to this contact at the station called, irrespective of which station is called.

In my copending application Serial No. 729,828, filed February 20, 1947, I have described station selector circuits constructed, arranged and operating generally as above described. In the present application, I describe improved circuits of this character embodying additional novel features of construction and operation as explained below.

The single figure of the accompanying drawing is a circuit diagram of a radio telephone subscriber's station embodying the improved station selector system of the present invention.

Referring to the drawing, there is shown a radio telephone receiver 1 and a radio telephone transmitter 2, the antenna input terminals of which are connected respectively over conductors 3, 4 to back and front contacts respectively of a relay 5, the armature of which is connected to an antenna 6, whereby, during periods when relay 5 is deenergized, the antenna is connected to the radio telephone receiver input, whereas when relay 5 is energized, the antenna is connected to the radio telephone transmitter output.

The speech output of the radio receiver 1 is applied over conductors 7 to a subscriber's telephone receiver 8, incorporated in the subscriber's handset 8a, which normally rests on a switch hook 9

as shown. The speech output of the subscriber's microphone transmitter 10 is coupled through an isolating transformer 11 over conductors 12 to the input of the radio transmitter 2. Upon removal of the handset 8a from the switch hook 9, the microphone transmitter 10 receives energizing current from battery 13 over an obvious circuit which includes, in series, battery 13, transmitter 10, primary winding of the isolating transformer 11, and the normally-open upper switch hook contact 14. The switch hook is grounded at the negative terminal of battery 13 as shown.

The antenna control relay 5 is energized from a negatively grounded battery 15 over a connection 16 extending to a normally open contact of a push-button switch 17, the opposite contact of which is grounded at 18, whereby, upon depression of the push-button, relay 5 will be energized to switch the antenna 6 from the input to radio receiver to the output of the radio transmitter. Also the actuation of push-button 17 switches on the carrier of the radio transmitter from ground at 18 over connections 16, 19. Thus, while speech-modulated carrier is incoming to the subscriber's station, push-button 17 is released to transmit the speech to the subscriber's receiver 8, but when speech is outgoing, push-button 17 is depressed to connect the antenna to the radio transmitter and concurrently to switch on the transmitter carrier. For dialing purposes, the carrier transmitted from the central office transmitter 19a is modulated with dial tone 20, which is subject to dialing interruptions by actuation of the telephone dialing equipment 21, upon operation of a switch 22.

The dial tone actuated, station selector system shown in the drawing comprises: a pulse relay P, a supervising relay SR, a pulse repeat relay PR, a release control relay RC, a minor or stepping relay selector switch indicated generally at SS, and a calling relay CR. The selector switch SS includes a stepping magnet SM, adapted to step grounded rotary switch arms 23, 24 over successive arcuately spaced fixed contacts 26, 27 respectively. The selector switch also includes a release magnet RM, adapted to return the rotary switch arms 23, 24 to the zero position, from any position to which it may have been stepped by the stepping magnet SM. Also included is a decade switching relay DS for switching the code dialing from the upper switch bank 23, 26 of the drawing, to the lower switch bank 24, 27. In addition, the selector switch is provided with an off-normal switch ON, the grounded switch arm 28 of which rests against its lower contact with the rotary switch arms 23, 24 in the zero position, but is actuated to its upper contact by the rotary switch arm shaft 25, for all other positions of switch arms 23, 24. The selector switch SS is shown herein in diagrammatic form only, inasmuch as switches of this character are well-known in the telephone art.

As shown in the drawing, the pulse relay P is connected to the output of radio receiver 1, through a tuned dial-tone selector circuit and rectifier 29, and hence responds only to the dial-tone received from transmitter 19. The pulse relay P is thus energized so long as dial-tone is being received, and is sufficiently rapid in operation to follow dialing interruptions thereof. Operation of relay P as aforesaid in turn operates the supervising relay SR from negatively grounded battery 30 through the relay winding and the upper front contact and grounded armature of relay P. The supervising relay is of the

slow release type, as indicated, and hence does not follow the dialing interruptions. Accordingly, whereas pulse relay P follows the dialing interruptions, the supervising relay does not, but remains continuously operated during dialing.

The pulse relay P controls the operation of the pulse repeat relay PR over a circuit traced from negatively grounded battery 31 through the relay winding and back contact and grounded armature of the pulse relay P. Thus, the pulse repeat relay PR is normally energized, but is deenergized during reception of dialing tone, owing to operation of the pulse relay P thereby. The pulse repeat relay, however, follows the dialing interruptions but in reverse fashion to that of the pulse relay. That is to say, during each dialing tone interruption, the pulse relay P releases, thereby to operate the pulse repeat relay PR for the duration of such interruption.

The stepping magnet SM of the selector switch SS is energized over a circuit traced from the negatively grounded battery 32, thence through the winding of the SM magnet, and through the lower front contact and armature of the pulse repeat relay PR, to ground through the upper front contact and grounded armature of the supervising relay SR. Accordingly, the stepping magnet will be energized only when the supervising relay SR and the pulse repeat relay PR are concurrently energized. As above stated, the supervising relay remains energized during dialing, because it is of the slow release type, while the pulse repeat relay PR follows the dialing pulses under control of the pulse relay P. Hence, during dialing, the stepping magnet SM will be actuated by the successive dialing pulses to step the rotary switch arms 23, 24 around to successive switch contacts 26, 27, in accordance with the digits dialed, with resulting operation at the called and non-called stations as explained below.

The release magnet RM is energizable over either of two circuits, both originating at negatively grounded battery 32 and extending through the winding of the release magnet RM, one circuit being completed thence through the upper back contact and grounded armature of the supervising relay SR, while the other circuit is completed thence through the lower back contact and armature of the RC relay and in series therewith through the upper or make contact and grounded switch arm 28 of the off-normal switch ON. Accordingly, when no dial tone is being received, the release magnet will be energized through the aforesaid back contact of the SR relay, which is then released, as explained, to maintain the rotary switch arms 23, 24, on their zero position. During reception of dial tone, this operating circuit for RM is open, due to operation of the SR relay, so that operation of the release magnet is then under joint control of the RC relay and the off-normal switch ON. And since, as stated, the grounded switch arm 28 is applied to the upper contact of ON, while the selector switch arms 23, 24 are rotated to any position other than zero, actuation of the release magnet at the end of a series of dialing pulses will be governed by the condition of the RC relay, i. e., whether it is actuated or released, an aspect of the selector circuit operation which will now be discussed.

The RC relay is, in a sense, the key relay of the system, inasmuch as it selectively controls the successive operations of the selector switches at the called and non-called stations, respectively, as will be apparent from the following. The RC relay is normally deenergized inasmuch as its

operating circuit is traced from grounded battery 30, through the winding of RC and thence to the middle upper front contact of the SR relay, which is open except during reception of dialing tone, due to deenergization of the SR relay as explained. When dialing tone is received, the SR relay operates, whereupon the RC relay operates over the circuit above traced, which is now completed to ground through the middle armature of SR and over connection 34 to the lower contact of ON, on which the grounded switch arm 28 thereof normally rests. During the dialing of a digit in the dialing code, this ground is of course removed as soon as the rotary selector switch arms 23, 24 are rotated off the zero setting by SM, but in this interval an intermittent ground, to hold RC operated, is provided over connection 33 through the upper contact and grounded armature of the PR relay, which latter, it will be recalled, follows the dialing pulses in reverse relation to the P relay. The RC relay thus holds up during reception of the dialing pulses corresponding to the digit in question, by virtue of the fact that it is of the slow-release type, as shown, and hence does not drop off during the momentary dialing pulse releases of PR. When, however, the dialing of the digit is completed, this intermittent ground provided by the PR relay is also removed because, as above explained, this relay thereupon promptly releases. Thus, the RC relay must also necessarily release at this time, unless further holding circuits are provided for the RC relay in the intervals elapsing between the dialing of successive digits of the dialing code. The selector switch contacts at the various stations are so wired in accordance with their respective dialing codes, as to provide such holding circuits for the RC relay during such intervals, only at the station called, but not at the other stations.

Since, as above pointed out, an operating circuit for the selector switch release magnet RM is completed through the lower back contact and armature of the RC relay and the upper contact and grounded armature of the off-normal contact ON, the release of the RC relay following the dialing of a digit will actuate the RM relay to restore the selector switches to zero. This is the operation required at all stations other than the station called, and the selector switch contacts are so wired as to effect this result, at least at some point in the dialing sequence, so that the selector switches at all such stations will be restored to their zero settings on completion of the dialing. At the called station, however, it is required that the selector switches be progressively advanced during the dialing of successive digits until the ninth contact is arrived at, whereupon the decade switching relay is actuated to transfer the code dialing from the upper to the lower switch banks. Thereupon, the selector switches must restore to zero and again be advanced progressively as the dialing proceeds, until the ninth contact is again arrived at, this time to operate the call relay CR with results as aforesaid. Accordingly, at the called stations, the selector switch contacts are wired to provide holding circuits for the RC relay during the progressive advancements of the rotary switch arms to the ninth contact as aforesaid.

Thus, referring to the drawing, and assuming a seven-digit dialing code of 3—3—1—2—3—4—2 for the station thereof, contacts 3, 6 and 7 of the upper selector switch bank 23, 26 are wired in multiple to the back contact of the upper armature of the DS relay, while contacts 3 and 7 of the lower switch bank 24, 27 are wired in multiple to the front contact of the DS relay upper armature. The DS relay upper armature is in turn wired to connection 34.

Assuming the above code to be dialed, the first digit dialed, viz., 3, will advance the rotary switch arm 23 to contact number 3 of the upper bank. The RC relay accordingly will not release when dialing of this digit is complete because a holding circuit is now provided traced from battery 30, through the winding of RC and over connection 34 to the DS relay upper armature, thence through its back contact to ground through the grounded selector switch arm 23 now resting on contact number 3 of contacts 26, to which the aforesaid back contact of the DS relay is permenently wired. Thus, the selector switch release magnet is held inoperative, and the next digit ofthe code, viz., 3, thus advances the switch arm 23 to the 6th contact of group 26 to which the aforesaid back contact of the DS relay is also wired. The RC relay is thus again held operated and the release magnet inoperative, so that the next digit 1, of the code advances switch arm 23 to the 7th contact of group 26, whereupon the RC relay again remains operated. Upon dialing the next digit 2, of the code, switch arm 23 is accordingly advanced to the 9th contact of group 26. Since this contact is not wired to the aforesaid back contact of the DS relay, no holding circuit for the RC relay is provided. Relay RC accordingly releases to energize the release magnet RM as explained, which thereupon restores the rotary switch arms 23, 25 to zero. Before the release magnet has had time to operate, however, the DS relay is energized over a circuit traced from battery 30 through the winding of DS, upper armature and back contact of the CR relay, middle back contact and armature of the RC relay to ground through the 9th contact of switch bank 26 and grounded switch arm 23 resting thereon. The DS relay, upon operating, immediately locks up through its middle front contact and armature under control of the SR relay. Operations of the DS relay transfers the code dialing from the upper switch bank 23, 26 to the lower switch bank 24, 27, by actuation of the upper armature from its back to its front contact. The next two digits of the dialing code, viz., 3 and 4, bring the lower switch arm 24 to rest on contacts 3 and 7 respectively of switch bank 27, at each of which positions the RC relay is held operative as aforesaid. The final digit 2, thus advances switch arm 24 to the 9th contact of bank 27, at which no holding circuit for relay RC is provided. Accordingly, relay RC releases to actuate the release magnet RM and thus restore the selector switch to zero. Before this occurs, however, the CR relay operates over a circuit traced from battery 30, through the winding of relay CR, the upper back contact and armature of relay RC, the lower front contact and armature of relay DS, to ground through the 9th contact of switch bank 27 and grounded switch arm 24 resting thereon. The CR relay, upon operating, immediately locks through its lower front contact and armature to ground over connection 35 through the subscriber's switch hook 9. Call lamp 36 connected in parallel with the CR relay winding, is energized over this same circuit. The CR relay and the call lamp thus remain energized until the subscriber answers by removing the handset 8a from switch hook 9. Operation of the CR relay also energizes a bell or buzzer, over a circuit traced from battery 30 through device 37, the inner front contact and armature of

relay CR, the middle front contact and armature of relay DS, and over a connection 38 to ground through the lower front contact and armature of relay SR. The bell or buzzer 37 thus remains energized only so long as the dial tone is received.

With the foregoing description of the various components of the circuits in mind, the complete operation of the entire system will now be briefly reviewed.

When no dial tone is being received, the selector is at rest on zero setting and all relays are released except the pulse-repeat relay PR. Prior to dialing, the central office operator applies a continuous dial tone 20 to the radio transmitter circuit 19 by means of a dial switch 22. With the exception of the calling relay CR, and the decade switching relay DS, all relays change their excitation from the conditions shown in the drawing, i. e., relays P, SR and RC operate, and relay PR releases. The system is now ready to receive dial pulses, which are transmitted by interruptions in the dial tone by actuation of dial 21. It is seen that the supervising relay SR, and the release control relay RC are energized when dial tone is received, and that the operating circuit for the selector stepping magnet SM is prepared through contacts of the PR and SR relays. The latter circuit is only closed when the SR relay is energized and the PR relay is simultaneously energized. As above noted, the SR and RC relays have copper slugs around their windings in order to impart a slow release action. These slugs will, however, also increase their operating times to some extent.

This arrangement by which the stepping magnet can be energized by interruptions in the dial tone only after the latter has been applied for some time, constitutes an excellent safeguard against stepping of the selector by spurious noise pulses occurring during the standby periods. It is again to be noted that the release control RC is deenergized whenever the dial tone is absent. This prepares a circuit for the release magnet RM of the selector. The release magnet will be energized by the off-normal contact ON and the lower back contact on relay RC, whenever the selector leaves the zero position and RC relay is not energized. Operation of the release magnet RM will immediately restore the selector to zero. Thus, the first provision is incorporated to protect the selector against accidental stepping operations, while the second one insures the resetting to zero during all standby periods. As a result, special signals to reset the selector to zero can be completely eliminated in this system. When the tone has been applied for a short period (about 0.25 second), it may be interrupted by the dial pulses. The pulse relays P and PR will follow these pulses, but the SR relay remains operated as long as dial tone is applied. The lower armature and back contact on relay PR provide stepping pulses to the stepping magnet SM through the closed upper front contact and armature of relay SR. When dial tone is applied, operation of the SR relay will also operate the release control relay RC, through the middle front contact and armature of relay SR and the lower off-normal contact ON. After the first step of the rotary switch arms 23, 25, the continuous ground is removed by ON, but the pulsating ground applied by the PR relay contacts over connection 33 keeps relay RC energized during a pulse series and keeps the circuit for the release magnet RM interrupted at the lower back contact of relay RC.

If the end of a digit pulse series leaves the grounded arm of the selector switch on one of the contacts which is "wired in" (according to the particular code of the selector under consideration), a ground is applied to relay RC through the upper back contact and armature of relay DS. Thus, relay RC remains energized, the selector is held in this position and is ready to receive a new series of pulses. If the end of such pulse series leaves the grounded selector switch arm on a contact which is not wired in, relay RC releases after a short period; this energizes the release magnet and returns the selector to zero. Subsequent series of dial pulses are handled in the same manner.

If, at the end of a pulse series, the selector stops on the 9th position, the following occurs. There is no ground applied to relay RC which thus releases. In releasing, it closes a circuit which energizes the decade switching relay DS from the grounded selector switch arm through the middle back contact and armature of the RC relay, and the upper back contact and armature of the CR relay.

If, at the end of the complete pulse series, the selector stops at the 9th position, relay RC will again release and in turn operate the release magnet RM and reset the selector, but before this occurs the CR relay will operate. Relays DS and CR can not be operated when the selector switch arm is swept past the 9th contact in a pulse series, because during this pulse series, relay RC is operated, and hence no circuits to relays DS and CR are provided from the 9th contacts until after the series has been completed. It is to prevent operation of relays DS and CR when the selector switch arm is swept by the 9th contacts that the operating circuits for relays DS and CR are held open by relay RC until a pulse series is completed. Of course, relays DS and CR may be connected to the 8th, 7th or 6th contacts, the important consideration being that there are contacts available on the selector switch banks which are beyond the one to which relays DS and CR are connected.

A simple timing problem is involved in the operation of the DS relay. When relay RC releases, the circuit for relay DS is completed and relay DS must be operated before the release magnet RM has removed the grounded selector switch arm from the 9th contact, i. e., within about 60 milliseconds. Operation of relay DS also closes, through its lower front contact and armature, the circuit for actuating the call relay CR, and thus the time between operation of relay DS and the removal of the grounded selector switch arm must be too short to operate relay CR. This is achieved by making both relays DS and CR slow acting, their operation requiring about 50 milliseconds. The selector switch arm should, therefore, remain on the 9th contact for at least 100 milliseconds before both the relays DS and CR can be operated, while, as mentioned above, it only remains there for 60 milliseconds. Thus, only relay DS operates.

The decade switching relay DS holds itself over its own contacts, in series with make contacts in relay SR, and will thus be released whenever the dial tone is removed.

When relay has operated and the selector has been reset, the latter is ready to receive another series of pulses on the second decade of the selector. This operation is identical with that on the first decade, and if the proper codes have been dialed, the selector arm will come to rest on

the 9th contact and energize relay CR. The call relay CR is energized when relay RC releases over the circuit traced through a back contact of the RC relay and front contact of the DS relay and locks over a circuit through its own front contacts and the hook switch back contact. The call relay thus remains operated until the handset is removed from the hook. The call lamp **36** connected across relay CR remains lit as long as relay CR is energized. The upper make contact of relay CR applies ground to the bell or buzzer **37** through make contacts of the DS and SR relays and thus rings it so long as the dial tone is applied. When it is interrupted, relay DS releases and the bell stops. While relay CR remains operated, it is impossible to operate relay DS and any subsequent applications of dial tone to the system will therefore not ring the subscriber's bell. Lifting of the handset is required to completely reset the selector.

It is entirely feasible to equip relay DS with attitional contacts, and to employ these to change the code wires from one group of contacts to another on the same decade. Such an arrangement may be used if more combinations are desired and extra decade relays may then be added. The present invention results in a minimum of contacts on relay DS while giving an adequate number of combinations.

The total number of combinations that can be obtained is dependent on the total number of digits that one is willing to dial. If six numbers are dialed for every call, a total of 784 different combinations can be obtained. If seven numbers are dialed, this increases to 1,568.

I claim:

1. In a dialing pulse actuated selector system: a pulse relay responsive to dialing current interruptions; a pulse repeat relay responsive to release of said pulse relay; a supervising relay responsive to energization of said pulse relay, but unresponsive to dialing pulses; a rotary selector switch including stepping and release magnets and an off-normal switch; an operating circuit for the stepping magnet including, in series, front contacts of said pulse repeat and supervising relays; an operating circuit for the release magnet including a back contact of the supervising relay; a release control relay; an operating circuit therefore including a front contact of the supervising relay and a back contact of the off-normal switch; and an additional operating circuit for said release magnet including, in series, a back contact of said release control relay and a front contact of said off-normal switch.

2. In a dialing pulse actuated selector system: a pulse relay responsive to dialing current interruptions; a pulse repeat relay responsive to release of said pulse relay; a supervising relay responsive to energization of said pulse relay, but unresponsive to dialing pulses; a rotary selector switch including stepping and release magnets and an off-normal switch; and operating circuit for the stepping magnet including, in series, front contacts of said pulse repeat and supervising relays; an operating circuit for the release magnet including a back contact of the supervising relay; a "slow release," release control relay; an operating circuit therefor including a front contact of said supervising relay and a back contact of said off-normal switch; a holding circuit for said release control relay, during reception of dialing pulses, including a front contact of said pulse repeat relay; additional holding circuits for said release control relay between

dialing pulse sequences, including a plurality of contacts in multiple of said selector switch, preselected in accordance with a dialing code, and an additional energizing circuit for said release magnet including in series a back contact of said release control relay and a make contact of said off-normal switch, whereby said selector switch is progressively advanced only when said code is dialed.

3. In a dialing pulse actuated selector system: a pulse relay responsive to dialing current interruptions; a pulse repeat relay responsive to release of said pulse relay; a supervising relay responsive to energization of said pulse relay, but unresponsive to dialing pulses; a rotary selector switch including stepping and release magnets and an off-normal switch; an operating circuit for the stepping magnet including, in series, front contacts of said pulse repeat and supervising relays; an operating circuit for the release magnet including a front contact of the supervising relay; a "slow release," release control relay; an operating circuit therefor including a front contact of said supervising relay and a back contact of said off-normal switch; a holding circuit for said release control relay, during reception of dialing pulses, including a front contact of said pulse repeat relay; additional holding circuits for said release control relay between dialing pulse sequences, including a plurality of contacts in multiple of said selector switch, preselected in accordance with a dialing code, an additional energizing circuit for said release magnet including, in series, a back contact of said release control relay and a make contact of said off-normal switch, whereby said selector switch is progressively advanced only when said code is dialed a call relay; a circuit including a back contact of said release control relay and responsive to progressive advancement of said selector switch to a preselected contact for energizing said call relay; and signaling means responsive to actuation of said call relay.

4. In a dialing pulse actuated selector system: a pulse relay responsive to dialing current interruptions; a pulse repeat relay responsive to release of said pulse relay; a supervising relay responsive to energization of said pulse relay, but unresponsive to dialing pulses; a rotary selector switch including stepping and release magnets and an off-normal switch; an operating circuit for the stepping magnet including front contacts, in series, of said pulse repeat and supervising relays; an operating circuit for the release magnet including a front contact of the supervising relay; a "slow release," release control relay; an operating circuit therefor including a front contact of said supervising relay and a back contact of said off-normal switch; a holding circuit for said release control relay, during reception of dialing pulses, including a front contact of said pulse repeat relay; additional holding circuits for said release control relay between dialing pulse sequences, including a plurality of contacts in multiple of said selector switch, preselected in accordance with a dialing code, an additional energizing circuit for said release magnet including, in series, a back contact of said release control relay and a make contact of said off-normal switch, whereby said selector switch is progressively advanced only when said code is dialed a call relay; a circuit including a back contact of said release control relay and responsive to progressive advancement of said selector switch to a preselected contact

for energizing said call relay; a locking circuit for said call relay including a manually actuated switch for releasing the same; a visual signaling device energized over said locking circuit; an audible signaling device and an operating circuit therefor including make contacts in series of said call and supervising relays.

5. In a dialing pulse actuated selector system: a pulse relay responsive to dialing current interruptions; a pulse repeat relay responsive to release of the pulse relay; a supervising relay responsive to energization of the pulse relay, but unresponsive to dialing pulses; a selector which including a pair of contact banks and associated rotary switch arms, together with a stepping magnet, a release magnet, an off-normal switch, and a decade switching relay; an operating circuit for the stepping magnet including front contacts, in series, of said pulse repeat and supervising relays; an operating circuit for the release magnet including a front contact of the supervising relay; a "slow release," release control relay; an operating circuit therefor including a front contact of the supervising relay and a back contact of the off-normal switch; an intermittent holding circuit for said release control relay, during reception of dialing pulses, including a front contact of said pulse repeat relay; additional holding circuits for the release control relay between dialing pulse sequences, including contacts of the decade switching relay and a plurality of contacts in multiple of each of said selector switch banks, the latter preselected according to a dialing code; an additional energizing circuit for said release magnet including, in series, a back contact of said release control relay and a front contact of said off-normal switch, whereby said selector switch is progressively advanced only when said code is dialed a call relay; a circuit including back contacts, in series, of said call and release control relays and responsive to progressive advancement of said selector switch to a preselected contact on a first of said selector switch contact banks for energizing said decade switching relay, to transfer the last-mentioned holding circuit for the release control relay, from the first said contact bank of the selector switch to the second contact bank thereof; a circuit including a back contact of said release control relay and responsive to progressive advancement of said selector switch to a preselected contact of said second contact bank for energizing said call relay; and signaling means responsive to actuation of said call relay.

6. In a dialing pulse actuated selector system: a pulse relay responsive to dialing current interruptions; a pulse repeat relay responsive to release of the pulse relay, but unresponsive to

dialing pulses; a selector switch including a pair of contact banks and associated rotary switch arms, together with a stepping magnet, a release magnet, an off-normal switch, and a decade switching relay; an operating circuit for the stepping magnet including front contacts, in series, of said pulse repeat and supervising relays; an operating circuit for the release magnet including a back contact of the supervising relay; a "slow release," release control relay; an operating circuit therefor including a front contact of the supervising relay and a back contact of the off-normal switch; an intermittent holding circuit for said release control relay, during reception of dialing pulses, including a front contact of said pulse repeat relay; additional holding circuits for the release control relay between dialing pulse sequences, including contacts of the decade switching relay and a plurality of contacts in multiple of each of said selector switch banks, the latter preselected according to a dialing code; an additional energizing circuit for said release magnet including, in series, a back contact of said release control relay and a front contact of said off-normal switch, whereby said selector switch is progressively advanced only when said code is dialed a call relay; a circuit including back contacts, in series, of said call and release control relays and responsive to progressive advancement of said selector switch to a preselected contact on a first of said selector switch contact banks for energizing said decade switching relay, to transfer the last-mentioned holding circuit for the release control relay from the first said contact bank of the selector switch to the second contact bank thereof; a circuit including a back contact of said release control relay and responsive to progressive advancement of said selector switch to a preselected contact of said second contact bank for energizing said call relay; a locking circuit for said call relay including a manually actuated switch for releasing the same; a visual signaling device energized over said locking circuit; an audible signaling device; and an operating circuit therefor including make contacts, in series, of said call, decade switching, and supervising relays.

EVERHARD H. B. BARTELINK.

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The following references are of record in the file of this patent:

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Certificate of Correction

Patent No. 2,478,361 August 9, 1949

EVERHARD H. B. BARTELINK

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 8, line 70, after the word "relay" insert *DS*; column 10, lines 21 and 55, for "front" read *back*; column 11, line 13, for "which" read *switch*; line 21, for "front" read *back*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 3rd day of January, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.