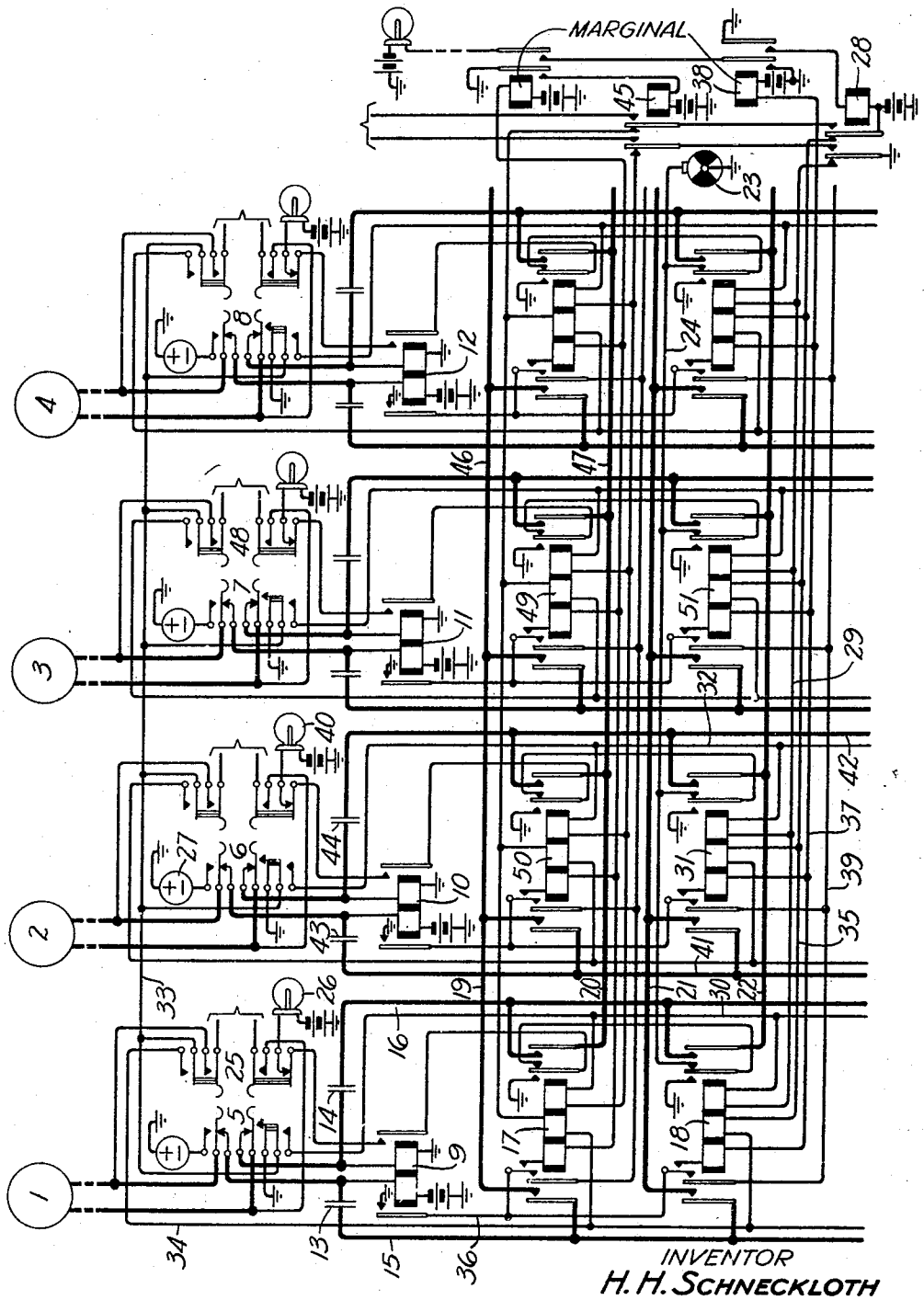
April 28, 1931. H. H. SCHNECKLOTH 1,802,446

TELEPHONE SYSTEM

Filed March 28, 1930



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Patented Apr. 28, 1931 1,802,446

UNITED STATES PATENT OFFICE

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TELEPHONE SYSTEM

Application filed March 28, 1930. Serial No. 439,751.

This invention relates to telephone systems and particularly to private branch exchanges.

The invention resides in a line switching arrangement in which each line appears in a single two-way talking and ringing key and is characterized by means responsive to the operation of the talking key of the calling line and the ringing key of the called line for interconnecting the calling and called lines. The connection thus simply established is maintained under control of the two lines and will remain in this condition until both parties to the connection have hung up regardless of any manipulation of the apparatus by the attendant.

A feature of the invention is the means whereby several parties may be brought in on the same connection either through connecting them all to the same link circuit or through connecting one party to several link circuits each extended to another different party.

The drawings consist of a single sheet of circuit diagrams illustrating the present invention.

Four subscribers' stations 1, 2, 3 and 4 are shown at the top with their lines running to the contacts of individual ringing keys 5, 6, 7 and 8 respectively. Through the contacts of the ringing key each subscriber's line extends to the windings of a relay 9, 10, 11 or 12 respectively. The line of subscriber No. 1 extends through condensers 13 and 14 to conductors 15 and 16 and thence to the contacts of relays such as 17 and 18. Relay 17 is individual to a link circuit comprising conductors 19 and 20 and relay 18 is individual to a link circuit comprising conductors 21 and 22. Similar arrangements are provided for each of the other substations so that the present invention is illustrated by four substations and two link circuits, it being understood that there may be as many substations as desired and as many link circuits as desired.

When the subscriber at substation 1 removes his receiver from its hook relay 9 is operated whereupon a circuit is established from ground, interrupter 23, conductor 24, back contact and inner right-hand armature of relay 18, back contact and inner right-hand armature of relay 17, right-hand armature and front contact of relay 9, lower outer contacts of listening key 25, signal lamp 26 to battery. Signal lamp 26 flashes in this circuit and thereby calls the attendant's attention to the fact that line 1 is calling.

The attendant will operate listening key 25 and thereby connect her set with the line running to substation 1. The subscriber at substation 1 orders a connection to substation 2 whereupon the attendant operates ringing key 6 thereby connecting source of ringing current 27 to line 2.

While key 25 and key 6 are both operated, a circuit is established from ground, outer left-hand armature and back contact of relay 28, conductor 29, right-hand winding of relay 31, conductor 32, lower outer contacts of key 6, conductor 33, upper outer contacts of key 25, conductor 34, middle winding of relay 18, conductor 35, back contact and inner left hand armature of relay 28 to battery. Relays 31 and 18 become energized in this circuit.

A locking circuit is now established from ground, front contact and left-hand armature of relay 9, conductor 36, contacts of the inner left-hand armature of relay 18, left-hand winding of relay 18, conductor 37, winding of relay 38, to battery. Relay 38 is marginal and will not operate on the current flowing through the left-hand winding of relay 18 alone. Relay 18 holds in this connection. The ground on conductor 36 is also extended through the inner left-hand armature of relay 18, conductor 39, inner left-hand armature and front contacts of relay 31, left-hand winding of relay 31, to conductor 37, so that relay 31 also holds in this circuit and now operates relay 38.

As soon as the attendant has rung substation 2 she may restore keys 6 and 25 to normal. The subscriber at substation 1 having his receiver off the hook maintains relay 9 operated and by thus maintaining ground on conductor 36 maintains both relays 18 and 31 operated.

During the operation of relay 18, a circuit is established from ground, front contact and

inner right-hand armature of relay 18, back contact and inner right-hand armature of relay 17, right-hand armature and front contact of relay 9, lower outer contacts of key 25 to signal lamp 26. Signal lamp 26 now operates steadily to indicate that the line of substation 1 is busy. A similar circuit for signal lamp 40 is not closed until the subscriber at substation 2 answers by removing his receiver from its hook and thereby energizing relay 10. When this happens lamp 40 will become illuminated, thereby notifying the attendant that the subscriber at substation 2 has answered.

A talking circuit from substation 1 to substation 2 is now complete through the normal inner contacts of key 5, condensers 13 and 14, conductors 15 and 16, the outer armatures and front contacts of relay 18, conductors 21 and 22, the outer armatures and front contacts of relay 31, conductors 41 and 42, condensers 43 and 44, normal contacts of key 6 to substation 2. Talking battery is supplied to substation 1 through the windings of relay 9 and to substation 2 through the windings of relay 10.

Upon the operation of relay 38, relay 28 becomes operated and removes ground and battery from conductors 29 and 35 respectively, and advances this battery supply through the armatures of relay 45 leading to the next link circuit.

This connection will be maintained as long as either the subscriber at substation 1 or substation 2 has his receiver off the hook, thereby maintaining energized either relay 9 or relay 10.

If during the maintenance of this connection the subscriber at substation 3 removes his receiver from its hook and thereby causes the energizing of relay 11, the next link circuit comprising conductors 46 and 47 will be seized and a connection can be established in a similar manner to substation 4.

It should be noted that if the subscriber at substation 3 wishes to be added to the connection between substations 1 and 2 such a connection can be accomplished by operating the ringing key 5 or 6 while the listening key 48 is operated. Under these conditions relay 49 will become operated together with either relay 17 or 50 and substations 1, 2 and 3 will all be connected together through the use of two link circuits.

If during the maintenance of the original connection between substations 1 and 2 the subscriber at substation 1 flashes the attendant by moving his receiver hook up and down, relay 9 will operate its armatures and flash signal lamp 26. The attendant then operates key 25 and being told to add substation 3 to the connection will, as before, merely operate ringing key 7. Due to the fact that key 25 and key 7 are simultaneously operated a circuit similar to that hereinbefore described will be established for the energization of relays 17 and 49.

It is possible to establish a conference connection including, for instance, substations 1, 2 and 3 by first operating two listening keys such as 25 and 48 and then one ringing key such as 6 whereupon relays 18, 31 and 51 will become operated and connect all three substations to conductors 21 and 22.

What is claimed is:

1. In a telephone system, a plurality of lines, a two-way key individual to each said line, a link circuit for interconnecting said lines, a relay individual to each of said lines for connecting the corresponding line to said link circuit and a circuit for energizing a pair of said relays established through one of said keys actuated in one way and another of said keys actuated in another way.

2. In a telephone system, a plurality of lines, a two-way key individual to each said line, a link circuit for interconnecting said lines, a relay individual to each of said lines for connecting the corresponding line to said link circuit, a circuit for energizing a pair of said relays established through one of said keys actuated in one way and another of said keys actuated in another way, and means for maintaining said relays energized under line control after said keys have been returned to normal.

3. In a telephone system, a plurality of lines, a two-way key individual to each of said lines, a plurality of link circuits common to said lines for interconnecting said lines and means responsive to the simultaneous actuation of one of said keys in one way and another of said keys in another way to exclusively appropriate one of said link circuits to the use of the corresponding lines.

4. In a telephone system, a plurality of lines, a two-way key individual to each of said lines, a plurality of link circuits common to said lines for interconnecting said lines, means responsive to the simultaneous actuation of one of said keys in one way and another of said keys in another way to exclusively appropriate one of said link circuits to the use of the corresponding lines, and means for preselecting another of said link circuits for use in the next connection.

5. In a telephone system, a plurality of lines, a two-way key individual to each of said lines, a signal individual to each of said lines, a link circuit for interconnecting said lines, a relay for connecting each of said lines to said link circuit, means for intermittently operating said signal when one of said lines calls, means for stopping the operation of said signal when the corresponding key is operated in one way to answer said call, means for calling another line by operating the corresponding key in another way, means responsive to the simultaneous operation of said keys for operating the corresponding

said relays, and means under line control responsive to the operation of said relays for operating said signals steadily.

6. In a telephone system, a plurality of lines, a two-way key individual to each said line, a plurality of link circuits common to said lines for interconnecting said lines, means responsive to the simultaneous actuation of one of said keys in one way and another of said keys in another way to exclusively appropriate one of said link circuits to the use of the corresponding lines, and means for setting up a plurality of such connections each including a common one of said lines.

In testimony whereof, I have signed my name to this specification this 27th day of March, 1930.

HARRY H. SCHNECKLOTH.