

April 13, 1926.

E. JACOBSEN

1,580,252

AUTOMATIC TELEPHONE SYSTEM

Filed March 25, 1918

2 Sheets-Sheet 1

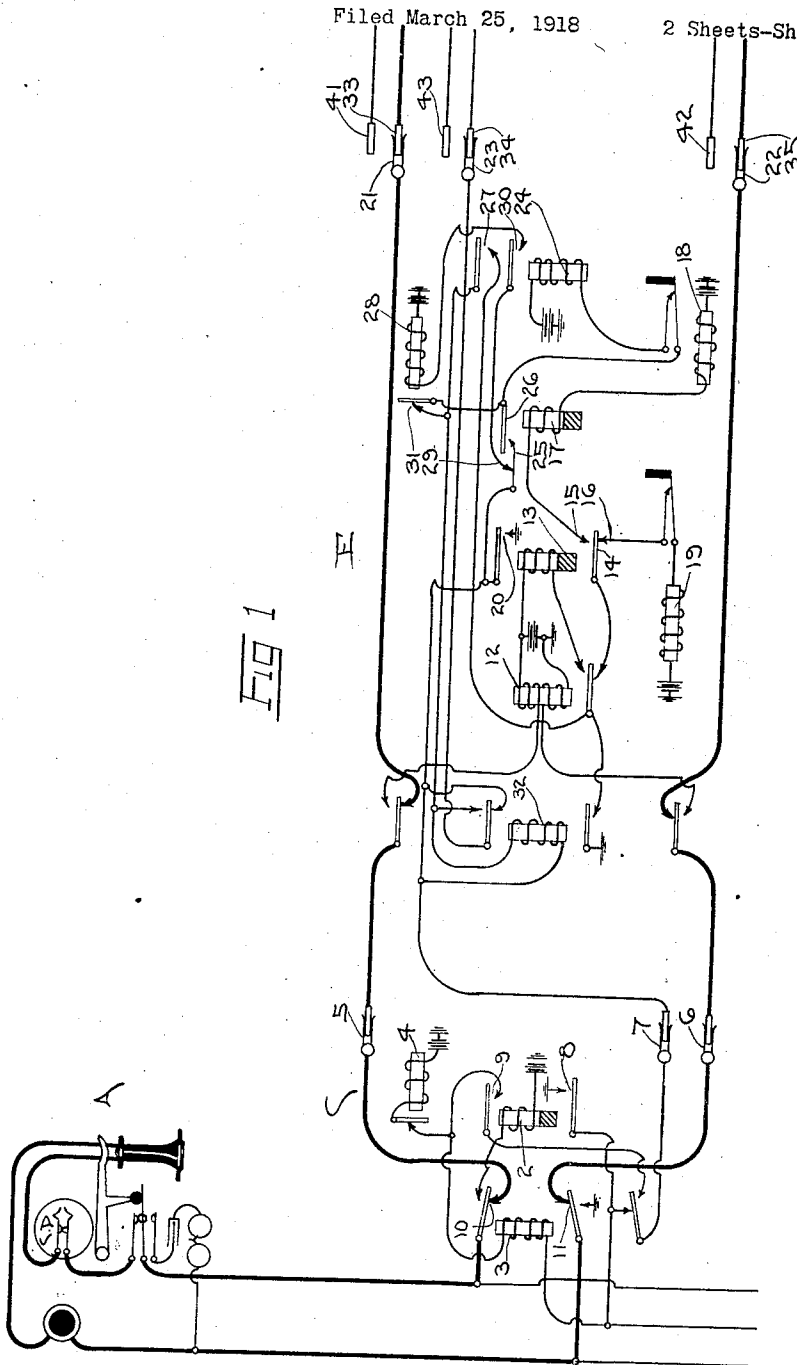


FIG 1

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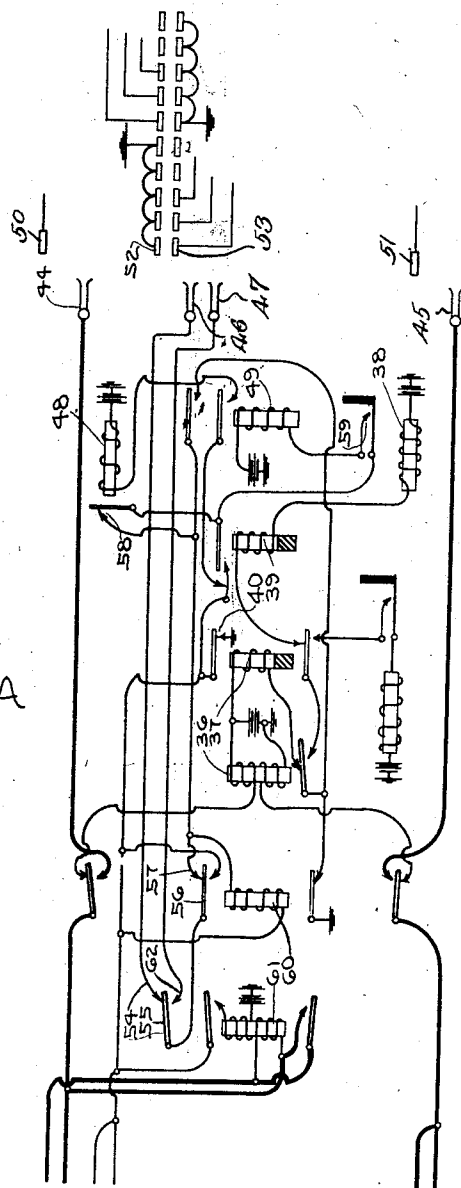
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2 Sheets-Sheet 2

FIG 2

A



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Patented Apr. 13, 1926.

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UNITED STATES PATENT OFFICE.

EMIL JACOBSEN, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC INC., OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

AUTOMATIC TELEPHONE SYSTEM.

Application filed March 25, 1918. Serial No. 224,430.

To all whom it may concern:

Be it known that I, EMIL JACOBSEN, a citizen of the United States of America, and a resident of Chicago, Cook County, and State of Illinois, have invented certain new and useful Improvements in Automatic Telephone Systems, of which the following is a specification.

My invention relates in general to automatic telephone systems and I have applied the same to a system in which automatic selector switches of the Strowger type are used for the purpose of automatically selecting an idle trunk line.

In systems of this character it has been the practice in the past to use a selector switch of the standard type having ten levels of contacts of ten each which may be selected by the selector; that is, when one digit is dialed to select the level or group desired, the switch automatically rotates to pick out one of the ten trunks in that group. It is very often desirable, however, to split up the groups; that is, it might be desired to have four trunks of one level leading to one branch exchange and the other six trunks extending to another exchange. In this case means must be provided to determine which group of trunk lines the switch will be directed to, the first four or the last six.

It is an object of my invention to provide a switch which is arranged to accomplish this result and which at the will of the calling subscriber may be operated to select trunks in either of two groups in one level.

In the drawings comprising Figs. 1 and 2 I have shown a calling substation A (Fig. 1) having access to selector switches E through the medium of the well known rotary type of line switch C. The selector E is of the well known Strowger type similar to that shown in U. S. Letters Patent #815,321, granted March 13, 1906, to Keith, Erickson, and Erickson, except that the side switch has been omitted and the circuit has been rearranged to operate over two sides of a calling line in series.

Accessible to the selectors E are a number of similar selectors such as D, (Fig. 2) the circuit of which has been improved to adapt it to operate in accordance with my invention. This selector D is made accessible to the selector E through two different levels of the bank of said selector E. Each

level of the banks of the selector D may be divided into two groups of any desired number, each group leading to a different branch exchange. If the selector D is seized by the selector E at one level of the bank it will operate to select trunks only in the first group, while if it is seized from the other level it will operate to select trunks only in the last group.

I will now describe the operation of the switches in detail when a call is made by the subscriber A.

When the subscriber at substation A removes his receiver, a circuit is closed at the switch hook springs for the line relay 2 of switch C in series with the line circuit. Relay 2 energizes to close a circuit at springs 8 including the switching relay 3 and rotary magnet 4 in series and at the same time to close a circuit at springs 9 for the magnet 4 to the private wiper 7. Now it will be understood that if the trunk line upon which the switch C is resting is busy and a ground is present on the private contact thereof, this ground will short circuit the high resistance relay 3 and energize the rotary magnet 4 to step the wipers 5, 6 and 7 to the contacts of the next trunk line. If the next trunk line is busy, this operation will continue until an idle trunk is reached, at which time there will be no ground present at the contact which wiper 7 meets. Relay 3 will be no longer short circuited, therefore and will immediately energize over the series circuit above traced, to disconnect the relay 2 and ground from the line circuit and extend said line circuit to the trunk leading to selector E by means of the springs 10 and 11.

As soon as relay 3 energizes a circuit is closed for the line relay 12 of switch E in series with the line circuit and wipers 5 and 6. Relay 12, upon energizing, closes a circuit for slow release relay 13. Relay 13 energizes to prepare a circuit at springs 14 and 15 for the series relay 17 and vertical magnet 18, opens a point in the circuit of the release magnet 19 at springs 14 and 16, and closes a circuit at springs 20 to hold the relay 3 of switch C energized.

As soon as the first digit of the called number is delivered by the calling device CD, the relay 12 operates to open and close the circuit of magnet 18 to thereby step the wipers 21, 22 and 23 to a desired level of

the banks. Relay 17 also energizes in series with magnet 18 and operates to close a circuit for rotary interrupter relay 24 at springs 25 and 26. Relay 24 energizes to
 5 prepare a circuit for the rotary magnet at springs 30 and also closes a locking circuit for itself through springs 27. As soon as relay 17 deenergizes, the circuit of the rotary magnet 28 is closed at springs 25 and
 10 29. Magnet 28 therefore operates to rotate the wipers onto the first contact of the elected level and opens the locking circuit of relay 24 at springs 31. Relay 24 then deenergizes and again opens the circuit of
 15 magnet 28 at springs 30, which magnet deenergizes to prepare a new circuit for relay 24 to the private wiper 23. If the first trunk is busy, the relay 24 will again be energized to cause magnet 28 to step the
 20 wipers to the next trunk. When the first idle trunk is reached, no ground is present at wiper 23 and relay 32, which has heretofore been short circuited, is energized in series with relay 24 from ground at springs
 25 20. Relay 24, being of comparatively low resistance, does not energize at this time. Relay 32, upon energizing, extends the line circuit of substation A to line wipers 21 and 22 and prepares a locking circuit for
 30 itself which will be completed over wiper 23 from the next succeeding switch.

Assuming that the wipers 21, 22, and 23 were raised opposite the first of the two
 35 levels in which is terminated the trunk line leading to selector switch D (Fig. 2), and selected contacts 33, 34, and 35, then as soon as relay 32 energizes, a circuit is closed for the line relay 36 of the selector switch
 40 D in series with the line circuit and wipers 21 and 22. Relay 36 energizes to close a circuit for release relay 37 which in turn energizes to prepare a circuit for the vertical magnet 38 and slow relay 39 and also
 45 connects ground to the release trunk through springs 40. This ground on the release trunk makes the selector D busy at contacts 34 and 43 and their multiples and also supplies a holding ground for relays 3 and
 50 32 of switches C and E, respectively.

The calling device CD is now operated for the second digit of the called number, the impulses of which digit operate relay 36 to in turn operate the vertical magnet
 55 38 to raise the wipers 44, 45, 46, and 47 to a desired level of the bank. I have shown one level of contacts in the bank as divided into two groups, the first five contacts being connected to trunk lines leading
 60 to one exchange and the last five contacts being connected to trunk lines leading to another exchange. The calling subscriber has already determined that he desires to select trunks in the second group (the last
 65 5 contacts) by seizing the selector D from the lower level (contacts 33, 34, and 35.)

Therefore, when the impulses for the second digit cease, the relay 39 will deenergize and close a circuit for rotary magnet 48, which
 70 has been prepared by relay 49, in the same manner as explained in connection with the selector E. Magnet 48 operates to rotate the wipers onto the first set of contacts 50
 75 to 53, inclusive. It will be noted that the upper contact of each pair of contacts associated with the first group of five trunks is grounded, so that when the magnet 48 deenergizes after its first operation, a circuit
 80 will be closed for the relay 49 extending from ground through contact 52, wiper 46, springs 54 and 55, springs 56 and 57, springs
 85 58, springs 59, and relay 49 to battery. Relay 49 therefore energizes again to again close a circuit for the magnet 48, which magnet will rotate the wipers to the second
 90 contact and again open the circuit of relay 49. This alternate operation of relay 49 and magnet 48 causes the wipers to be rotated rapidly to the first set of contacts in
 95 the second group, in this instance, the sixth contact. From this point the upper contacts of the bank are connected in the usual
 100 manner to the release trunks of other selectors or connectors so that the automatic rotation of the selector depends upon the busy or idle condition of said trunks and
 105 when the wipers reach one of said trunks which is idle, the switching relay 60 is energized in the same manner as relay 32 of selector E to switch the extended connection
 110 through to the selected trunk.

Assuming now that the calling subscriber desires to select trunks in the first group, that is, one of the first 5 contacts, the selector E will be operated to select the selector
 115 D, or a similar selector, from another level, one set of contacts in said level being shown at 41, 42, and 43. When these contacts are seized, a circuit will be closed for the line
 120 relay 36 of the selector D in the same manner as when the switch was seized over the first level except that this circuit will include a winding of a special relay 61. Relay 61 will therefore operate in series with
 125 the line relay 36 and lock itself to ground through the springs 40 of release relay 37. Relay 61 also operates to short out the lower winding from the line circuit and to switch
 130 the testing circuit from the private wiper 46 to the private wiper 47. The line relay 36 is operated in the manner hereinbefore described to control the vertical magnet 38 to step the wipers to the desired level, and to
 135 control relay 39 to cause the wipers to be stepped on to the first contact of the group by means of rotary magnet 48. It will be noted that at this time the ground, which is permanently connected to the upper private
 140 contacts of the first group, has no effect on the switch, as the circuit from the upper private wiper is open at springs 54 and 55,

As soon as the rotary magnet falls back after its initial energization, the circuit for operating the relay 49 again will extend from contact 53, through wiper 47, springs 62 and 55, springs 56 and 57, springs 58, springs 59, and said relay to battery. If this contact is busy, relay 49 will operate in the usual manner to step the switch to the second contact of the group and so on until an idle trunk line is reached, at which time relay 60 will be energized to switch the connection through to the seized trunk line. Should all the trunk lines of the first group of contacts be busy, the switch will rotate onto the sixth contact which terminates one of the trunks of the second group and is not accessible for this call. The switch will then be rotated on past the last contact without stopping due to the ground permanently connected to the lower contacts of each set. Assuming that an idle trunk is selected, however, the connection may be extended through other switches to a called subscriber and after conversation is completed, may be released in the manner peculiar to switches of this type.

It will be seen, therefore, that I have provided an improved mechanism and circuits therefor which makes it possible to divide the levels of a selector switch into smaller groups, and which makes it possible for a subscriber to determine in which group he desires to select trunks.

Having fully described and ascertained my invention, what I consider to be new and desire to have protected by Letters Patent will be pointed out in the appended claims.

What I claim as my invention is:

1. In a telephone system, an automatic trunk selecting switch, two groups of trunk lines accessible thereto, means for making certain of said trunks busy when in use, a pair of test wipers for the switch, and means involving the use of one of said wipers for preventing the switch from seizing the trunks of one group even though not in use, and involving the use of the other wiper for enabling the switch to select an idle trunk in said group.

2. In a telephone system, an automatic trunk selecting switch, two groups of trunk lines accessible thereto, a pair of test wipers for the switch, and means involving the use of one of said wipers for preventing the switch from seizing the trunks of one group, and involving the use of the other wiper for enabling the switch to select an idle trunk in said group, said wipers being used in the reverse order for the same purpose when testing trunks in the other group.

3. In a telephone system, an automatic trunk selecting switch, a plurality of groups of trunk lines accessible thereto, a pair of test wipers for the switch, means for making each group of trunks artificially busy to a

different one of said wipers, means involving the use of one of said test wipers for preventing the switch from selecting idle trunk lines in the group which is artificially busy thereto and involving the other test wiper for preventing the switch from selecting idle trunk lines in another of said groups.

4. In a telephone system, an automatic trunk selecting switch, a plurality of groups of trunk lines accessible thereto, a pair of test wipers therefor, means for making certain of said groups artificially busy to certain of said wipers, means involving the use of one of said test wipers for causing the switch to select idle trunks in only the groups which are not artificially busy thereto and involving the other of said test wipers for causing the switch to select idle trunks in only the rest of said groups.

5. In a telephone system, an automatic trunk selecting switch, a plurality of groups of trunk lines accessible thereto, a pair of test wipers for the switch, means involving the use of one of said test wipers for preventing the switch from selecting trunk lines in certain of said groups and involving the other test wiper for preventing the switch from selecting trunk lines in the remainder of said groups, the first mentioned test wiper controlling the selection of an idle trunk in any of the last mentioned groups and the last mentioned test wiper controlling the selection of an idle trunk in any of the first mentioned groups.

6. In a telephone system, an automatic trunk selecting switch, two groups of trunk lines accessible thereto, a pair of test wipers for the switch, means involving the use of one of said wipers for preventing the switch from seizing the trunks of one group, and involving the use of the other wiper for enabling the switch to select an idle trunk in said group, a pair of trunk lines terminating in said switch and over which said switch may be seized and automatic means controlled by the seizure of the switch over one of said last mentioned trunk lines for rendering one of said wipers ineffective and controlled by the seizure of the switch over the other trunk line of the pair to render the other wiper ineffective.

7. In a telephone system, an automatic trunk selecting switch, a plurality of groups of trunk lines accessible thereto, a pair of test wipers for the switch, means involving the use of one of said test wipers for preventing the switch from selecting trunk lines in certain of said groups and involving the other test wiper for preventing the switch from selecting trunk lines in the remainder of said groups, a pair of paths over which said switch may be seized, and automatic means operated when the switch is seized over one path for bringing the switch under the exclusive control of one of said test

wipers and operated when the switch is seized over the other path for bringing the switch under the exclusive control of the other wiper.

8. In a telephone system, an automatic trunk selecting switch, a plurality of groups of trunk lines accessible thereto, a pair of test wipers therefor, means involving the use of one of said test wipers for causing the switch to select trunks in only certain of said groups and involving the other of said test wipers for causing the switch to select trunks in only the rest of said groups, a pair of paths over which said switch may be seized, and automatic means which operates in one manner when the switch is seized over one path to cause only one wiper to control the switch in its trunk selecting movement and in another manner when seized over the other path to cause only the other wiper to control the switch.

9. In a telephone system, an automatic trunk selecting switch, two groups of trunk lines accessible thereto, each of said groups of trunks having a set of test contacts normally busy and another set normally non busy, a pair of test wipers for the switch each having access to the normally busy contacts of one group and the normally non busy contacts of the other group, and automatic means operated when the switch is seized for predetermining the wiper which is to be used to test trunks and therefore the group in which a trunk is to be selected.

10. In a telephone system, an automatic trunk selecting switch, two groups of trunk lines accessible thereto, each of said groups of trunks having a set of test contacts normally busy and another set normally non busy, a pair of test wipers for the switch each having access to the normally busy contacts of one group and the normally non busy contacts of the other group, a pair of trunk lines over which the switch may be seized, and automatic means operated when the switch is seized over one trunk line for causing only one wiper to control the switch and operated when the switch is seized over the other trunk for causing only the other wiper to control the switch.

11. In a telephone system, an automatic trunk selecting switch, two groups of trunk lines accessible thereto, a pair of test wipers for the switch, means involving the use of one of said wipers for preventing the switch from seizing the trunks of one group, and involving the use of the other wiper for enabling the switch to select an idle trunk in said group, testing means associated with said wipers, a relay for switching the testing means from one wiper to the other, said relay operated automatically when the switch is seized in one manner to render the testing means subject to only one wiper, and re-

maining normal when the switch is seized in another manner to render the testing means subject to only the other wiper.

12. In a telephone system, an automatic switch, a pair of wipers therefor, two groups of trunk lines having test contacts accessible to said wipers, means controlled by the manner of seizure of the switch for predetermining one of said wipers for use, the wiper thus predetermined controlling the switch to prevent seizure of idle trunk lines in one group and to permit seizure of an idle trunk line in the other group.

13. In a telephone system, an automatic switch, test wipers therefor, trunk lines accessible to said switch each having a pair of test contacts, means for making one of the contacts in each of said pairs always artificially busy, means for seizing said switch, and means for causing said switch to be controlled over one test wiper and said artificially busy contacts to pass idle trunk lines, or for causing the switch to be controlled over another test wiper and the other test contacts of the trunk lines to select an idle trunk.

14. In a telephone system, an automatic switch, trunk lines accessible thereto, test contacts for said switch normally grounded, test contacts for said switch normally open, means for operating said switch to cause it to rotate over said test contacts, means controlled by said normally grounded contacts for preventing said switch from stopping on any of said test contacts and means for removing said switch from control of said normally grounded contacts and for causing it to stop on one of said contacts.

15. In a telephone system, an automatic switch, trunk lines accessible to said switch, a pair of test contacts for each of said trunk lines, one of each pair being normally grounded, a pair of test wipers for said switch, means for operating said switch to rotate said wipers over said test contacts, automatic means in said switch controlled by said grounded contacts for preventing said switch from stopping on any of said contacts, and automatic means for rendering said second means inoperative to prevent said switch from stopping.

16. In a telephone system, an automatic switch, trunk lines accessible to said switch, a pair of test contacts for each trunk line, one of said contacts being permanently grounded and the other being normally open, a test mechanism for said switch, test wipers for said switch, means for operating said switch to rotate said test wipers over said test contacts, and test mechanism normally controlled by said grounded contacts through one of said wipers to continue the operation of said switch, and automatic means for disconnecting said test mechanism from said

grounded contacts and connecting it with said normally open contacts through said other wiper.

17. In a telephone system, an automatic switch, trunk lines accessible thereto, a pair of test contacts for each trunk line, one contact of each pair being permanently grounded, test mechanism for said switch, means for operating said switch to test said trunk lines by associating said test mechanism with said test contacts, and means whereby said test mechanism is associated with the normally grounded contacts of certain trunk lines and with the other contact of the pair on other trunk lines.

18. In a telephone system, an automatic switch, two groups of trunk lines, a permanently grounded contact for each trunk in each group, a test contact for each trunk in each group, a test wiper for each group having access to the test contacts of its own group and the grounded contacts of the other group, means controlled by the engagement of the wiper of the second group with the grounded contacts of the other group for causing said switch to move said wipers to the second group, and means controlled by the engagement of the wiper of the first group with the grounded contacts of said second group for preventing the switch from seizing a trunk of said second group.

19. In a telephone system, a trunk line having two branches at the incoming end, an automatic switch in which said trunk terminates at the outgoing end, two groups of lines accessible to said switch corresponding, respectively, to said two branches, automatic switching mechanism for extending a call to the trunk via either of said branches, means for then operating said switch to further extend the call by way of an idle one of said lines, and discriminating means for causing said switch to select an idle line in the particular group which corresponds to the incoming branch in use.

20. In a telephone system, a trunk line having two branches at the incoming end, an automatic switch in which said trunk terminates at the outgoing end, two groups of lines accessible to said switch corresponding, respectively, to said two branches, auto-

matic switching mechanism for extending a call to the trunk via either of said branches, means for then operating said switch to further extend the call by way of an idle one of said lines, testing means in said switch, and means associated with said incoming branches for controlling the action of said testing means to cause the said switch to select an idle line in the particular group which corresponds to the incoming branch in use.

21. In a telephone system, a trunk line having two branches at the incoming end, an automatic switch in which said trunk terminates at the outgoing end, two groups of lines accessible to said switch corresponding, respectively, to said two branches, automatic switching mechanism for extending a call to the trunk via either of said branches, means for then operating said switch to further extend the call by way of an idle one of said lines, testing means in said switch normally effective to cause said switch to select an idle line in a particular one of said groups corresponding to a particular incoming branch, and means responsive in case the call is received over the other incoming branch for causing said switch to select an idle line in the other group.

22. In a telephone system, a trunk line having two branches at the incoming end, an automatic switch in which said trunk terminates at the outgoing end, two groups of lines accessible to said switch corresponding, respectively, to said two branches, automatic switching mechanism for extending a call to the trunk via either of said branches, means for then operating said switch to further extend the call by way of an idle one of said lines, testing means in said switch for causing the selection of an idle line in a particular one of said groups, other testing means in said switch for causing the selection of an idle line in the other group, and means for automatically rendering effective only the testing means which is associated with the group corresponding to the incoming branch in use.

Signed by me at Chicago, Cook County, Illinois, this 21st day of March, 1918.

EMIL JACOBSEN.

DISCLAIMER.

1,580,252.—*Emil Jacobsen*, Chicago, Ill. AUTOMATIC TELEPHONE SYSTEM. Patent dated April 13, 1926. Disclaimer filed May 12, 1927, by the assignee, *Automatic Electric Inc.*

Hereby enters this disclaimer to that part of the claims in said specification which is in the following words, to wit:

"19. In a telephone system, a trunk line having two branches at the incoming end, an automatic switch in which said trunk terminates at the outgoing end, two groups of lines accessible to said switch corresponding, respectively, to said two branches, automatic switching mechanism for extending a call to the trunk via either of said branches, means for then operating said switch to further extend the call by way of an idle one of said lines, and discriminating means for causing said switch to select an idle line in the particular group which corresponds to the incoming branch in use.

"20. In a telephone system, a trunk line having two branches at the incoming end, an automatic switch in which said trunk terminates at the outgoing end, two groups of lines accessible to said switch corresponding, respectively, to said two branches, automatic switching mechanism for extending a call to the trunk via either of said branches, means for then operating said switch to further extend the call by way of an idle one of said lines, testing means in said switch, and means associated with said incoming branches for controlling the action of said testing means to cause the said switch to select an idle line in the particular group which corresponds to the incoming branch in use.

"21. In a telephone system, a trunk line having two branches at the incoming end, an automatic switch in which said trunk terminates at the outgoing end, two groups of lines accessible to said switch corresponding, respectively, to said two branches, automatic switching mechanism for extending a call to the trunk via either of said branches, means for then operating said switch to further extend the call by way of an idle one of said lines, testing means in said switch normally effective to cause said switch to select an idle line in a particular one of said groups corresponding to a particular incoming branch, and means responsive in case the call is received over the other incoming branch for causing said switch to select an idle line in the other group.

"22. In a telephone system, a trunk line having two branches at the incoming end, an automatic switch in which said trunk terminates at the outgoing end, two groups of lines, accessible to said switch corresponding, respectively, to said two branches, automatic switching mechanism for extending a call to the trunk via either of said branches, means for then operating said switch to further extend the call by way of an idle one of said lines, testing means in said switch for causing the selection of an idle line in a particular one of said groups, other testing means in said switch for causing the selection of an idle line in the other group, and means for automatically rendering effective only the testing means which is associated with the group corresponding to the incoming branch in use."

[*Official Gazette May 31, 1927.*]