

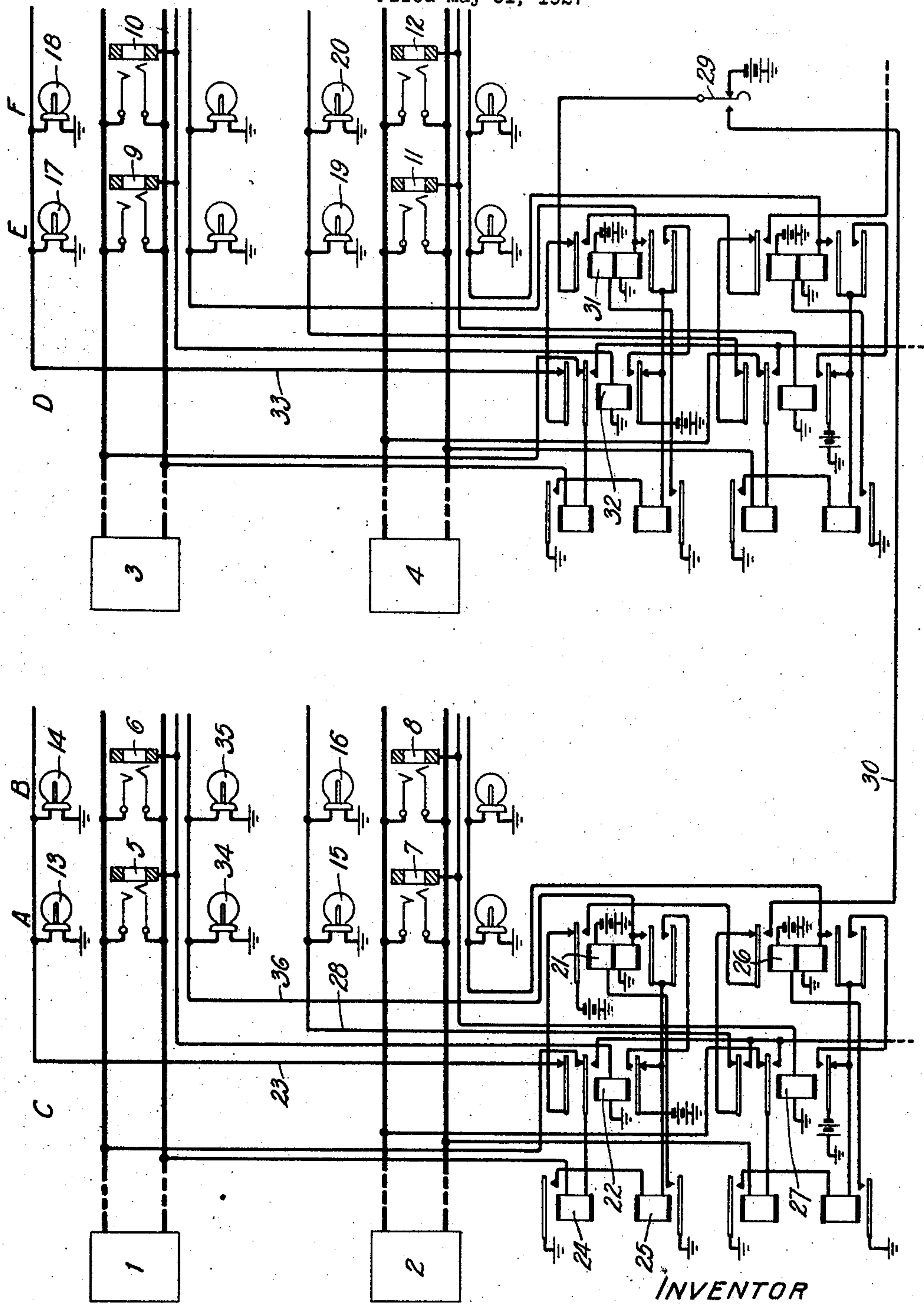
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM.

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This invention relates to telephone systems and more particularly to toll line systems employing means for indicating the idle or busy conditions of toll lines.

5 According to usual practice toll lines are provided with visual busy signals which are operated while the toll line is in use. This practice results in comparatively heavy battery drain in operating the signals on all busy
10 lines.

It is an object of this invention to provide a more economical method for indicating the idle or busy conditions of toll lines.

15 In accordance with one feature of this invention, this object is accomplished by the provision of a circuit arrangement whereby the signal lamps of a single toll line are lighted to indicate the presence of an idle toll line in a group of lines.

20 Another feature of the invention provides means for combining several normally dissociated groups of toll lines to function as a single unit in such a manner that the signal lamps of a single toll line are employed to indicate the presence of an idle toll line in the
25 combined groups of lines.

30 The practicability of such an arrangement as is involved in this second feature will be readily understood when the periods of light and heavy load traffic are considered. In order to expedite the completion of toll line connections during heavy load periods, it is desirable to have a sufficient number of idle toll line signals displayed simultaneously so
35 that several operators may have access to the idle lines at the same time. This is accomplished by providing an improvement over the system disclosed in Patent No. 1,632,826, issued June 21, 1927, to L. L. Eagon, which
40 consists of a circuit arrangement whereby but one signal lamp is lighted in a group of toll lines to indicate an idle line in that group.

45 During "light load" periods when a smaller number of toll lines would be sufficient to efficiently handle the toll traffic, it is desirable to lessen the number of idle lines on which signal lamps are displayed simultaneously. This is accomplished in this invention by the provision of a "light load" key which may
50 be located at a chief operator's desk or any other suitable location in an exchange, the actuation of which combines the several groups of toll lines into a single unit and causes the display of the signal lamps on but
55 one idle line in the combined groups of lines.

Referring to the drawing, there is shown a main group of toll lines consisting of the two sub-groups C and D which comprise, respectively, the toll lines 1 and 2, and 3 and 4. The toll lines 1, 2, 3 and 4 are shown terminating in the multiple jacks 5, 6, 7, 8, 9, 10, 11
60 and 12 at the operators' positions A, B, E and F. A better understanding of the invention will be had from the following detailed description.

65 As shown, the signal lamps 13 and 14 are normally lighted in a circuit extending from battery, upper armature and normal contact of relay 21, uppermost armature and normal contact of relay 22, conductor 23, lamps 13
70 and 14 in parallel to ground. These signal lamps are, as shown, associated with jacks 5 and 6, respectively, of toll line 1 in sub-group C so that, if the operator at either position A or B desires to extend a connection,
75 she will pick the idle jack having its signal normally lighted, that is, the operator at A would pick jack 5 and the operator at B would pick jack 6. If line 1 becomes engaged, it will be noted that lamps 13 and 14 will be extinguished and lamps 15 and 16 associated with
80 the multiple jacks 7 and 8, respectively, of line 2, will be lighted as follows: With the line 1 in use relay 24, which bridges this line, operates in the well-known manner, effecting an obvious circuit for relay 25. Relay
85 25, in operating, causes relay 21 to operate. Relay 21 locks in a circuit including ground, lower winding of relay 21, alternate contact and first lower armature of relay 21 to battery and ground over the normal contact and armature of relay 22. In actuating its uppermost armature, relay 21 transfers the battery source from lamps 13 and 14 of line 1 to lamps
90 15 and 16 of line 2. The circuit for lighting lamps 15 and 16 includes battery, upper armature and alternate contact of relay 21, upper armature and normal contact of relay 26, uppermost armature and normal contact of relay 27, conductor 28 to ground through
95 lamps 15 and 16 in parallel. The illumination of lamps 15 and 16 indicates to an operator that line 2 is the next idle line and may be used in extending a call. In a similar manner, the seizure of line 2 at a distant exchange causes the operation of corresponding
100 relays associated therewith to cause lamps 15 and 16 to be extinguished and the signal lamps of the next succeeding line in the group to be lighted, provided line 1 is still in use.
110

Relay 21, in attracting its lower armature, establishes a circuit for the illumination of line lamps 34 and 35 which extends from battery, lowermost armature and normal contact of relay 22, lower armature and alternate contact of relay 21, conductor 36, through the line lamps 34 and 35 in parallel to ground. The line lamps remain lighted until the incoming call is answered by the operator.

Assuming a call to have come in over the toll line 1, an operator at position A or at any other position at which the toll line 1 terminates in a multiple jack, would proceed to answer the call by inserting the plug of a toll cord circuit into the jack associated with that particular position. This places battery on the sleeve of the jack, causing relay 22 to operate in an obvious sleeve circuit.

Relay 22, in operating, opens the locking circuit for relay 21 which relay thereupon releases, opening the circuit for line lamps 34 and 35, whereupon these lamps are extinguished. It will be noted that relay 21, in releasing its uppermost armature, reconnects battery to the normal circuit for the signal lamps 13 and 14 but relay 22, in operating, opens this circuit at its uppermost armature so that the signal lamps 13 and 14 remain extinguished.

The illumination of signal lamps 17 and 18, and 19 and 20, associated with the toll lines 3 and 4, respectively, of sub-group D, is effected in the same manner as described in connection with the lighting of the signal lamps of the toll lines in sub-group C.

In the condition disclosed, that is, with the "light load" key 29 in normal position, the signal lamps associated with one idle line in each sub-group are lighted so that the number of lamps illuminated simultaneously depends upon the number of sub-groups into which a main group of toll lines may be divided. Therefore, the number of idle signal lamps displayed simultaneously may be predetermined by dividing a main group of toll lines into as many sub-groups as it is desired to have lamps lighted.

During periods of "light load" the chief operator actuates the "light load" key 29, thereby disconnecting the battery source normally supplying the idle signal lamps of sub-group D and placing these lamps under the control of the relays, such as 21 and 26 in sub-group C, so that with key 29 actuated, the toll lines, instead of being divided into sub-groups, are combined into a single main group. In this manner, there will be but one idle signal lamp and its multiples lighted at any one time.

With key 29 actuated, it will be assumed for descriptive purposes that the toll lines 1 and 2 are in use, so that relays 21 and 26 will be operated. Line 3 then becomes the next idle line and the idle signal lamps 17

and 18 will be lighted over a circuit extending from battery, upper armatures and alternate contacts of relays 21 and 26, conductor 30, alternate contact of key 29, upper armature and normal contact of relay 31, uppermost armature and normal contact of relay 32, conductor 33, to ground through lamps 17 and 18 in parallel. The illumination of lamps 17 and 18 indicates that line 3 is the next idle line in the main group. Should line 2 become idle before line 3 is seized, the circuit for lamps 17 and 18 will be opened by the release of relay 26 whereupon lamps 17 and 18 are extinguished and lamps 15 and 16 relighted.

If line 1 should become idle before line 2 is engaged, relay 21 releases and consequently the circuit for lamps 15 and 16 is broken and the circuit for lamps 13 and 14 established so that lamps 15 and 16 would be extinguished and lamps 13 and 14 relighted.

Though but two sub-groups of lines are disclosed, it is quite obvious that the invention is not so limited but may be employed in connection with any number of groups without departing from its spirit or scope.

The drawings disclose groups of two-way toll lines and the specification is specifically directed to the description thereof, but it is easily conceivable that the circuit arrangement shown may be readily applied to a straightforward trunking system wherein groups of trunk lines would be substituted for the sub-groups of toll lines.

What is claimed is:

1. In a telephone system, a plurality of groups of lines normally functioning as individual units, each group having a signal normally actuated, and means for combining said groups to function as a single unit and restoring the signals in all but one of said groups.

2. In a telephone system, a group of telephone lines arranged in a certain series relation, a second group of telephone lines arranged in a certain series relation, a signal for each of said lines, means for normally maintaining the signal of one of said lines in one of said groups actuated in response to the seizure of all the preceding lines in said group, and means for restoring said signal, maintaining the signal of a line in the other of said groups actuated and combining both of said groups of telephone lines in a certain series relation.

3. In a telephone system, a group of telephone lines arranged in series relation, a second group of telephone lines arranged in series relation, a signal for each of said lines, means for normally maintaining the signal of one of said lines in one of said groups actuated in response to the seizure of all the preceding lines in said group, and a manually controlled key for restoring said signal, maintaining the signal of a line in the other of

said groups actuated and combining both of said groups of telephone lines in a certain series relation.

4. In a telephone system, a group of telephone lines, a second group of telephone lines independent of said first group, a signal for each of said lines, means for normally maintaining the signal of one of said lines in one of said groups actuated, and means for restoring said signal and placing the lines of both of said groups in a certain series relation.

5. In a telephone system, a plurality of normally independent groups of telephone lines, signals for each group, means individual to each group of lines for maintaining a signal in each group actuated in response to the seizure of the preceding lines in the groups, and means for combining said normally independent groups of lines and maintaining one of said signals actuated.

6. In a telephone system, a group of lines, a signal therefor normally actuated, a second group of lines normally electrically disassociated from said first group of lines, a signal therefor, and means for associating said first and second groups of lines in a certain series relation, restoring said normally actuated signal, and actuating the signal of said second group of lines.

7. In a telephone system, a group of telephone lines, a second group of telephone lines, the lines in each group arranged in a certain series relation, a signal for each line, means individual to each group of lines for maintaining the signal of one line in each of said groups actuated in response to the seizure of all the preceding lines in each group, and operator controlled means for

placing the lines in one of said groups in a certain series relation with the lines in the other of said groups and maintaining one of said signals actuated.

8. In a telephone system, a plurality of groups of telephone lines, a signal for each of said lines, a signal in each of said groups being normally actuated, a relay for each of said signals, said relays of each group being associated in certain series relations, and means for combining the relays in all of said groups of lines in a certain series relation and restoring the normally actuated signal in all but one of said groups of lines.

9. In a telephone system, a plurality of groups of telephone lines, a signal for each of said lines, a signal in each of said groups being normally actuated, a relay for each of said signals, said relays of each group being associated in certain series relations, and manually controlled means for combining the relays in all of said groups of lines in a certain series relation and restoring all but one of said normally actuated signals.

10. In a telephone system, a plurality of independent groups of telephone lines, a signal for each of said lines, a source of power, a separate power lead for each of said groups of lines associated with said source of power over which the signals of each group of lines are controlled, and means for associating the power leads of all of said groups of lines to form a single lead over which the signals of all of said groups of lines are controlled.

In witness whereof, I hereunto subscribe my name this 26th day of May A. D., 1927.

PAUL B. MURPHY.