

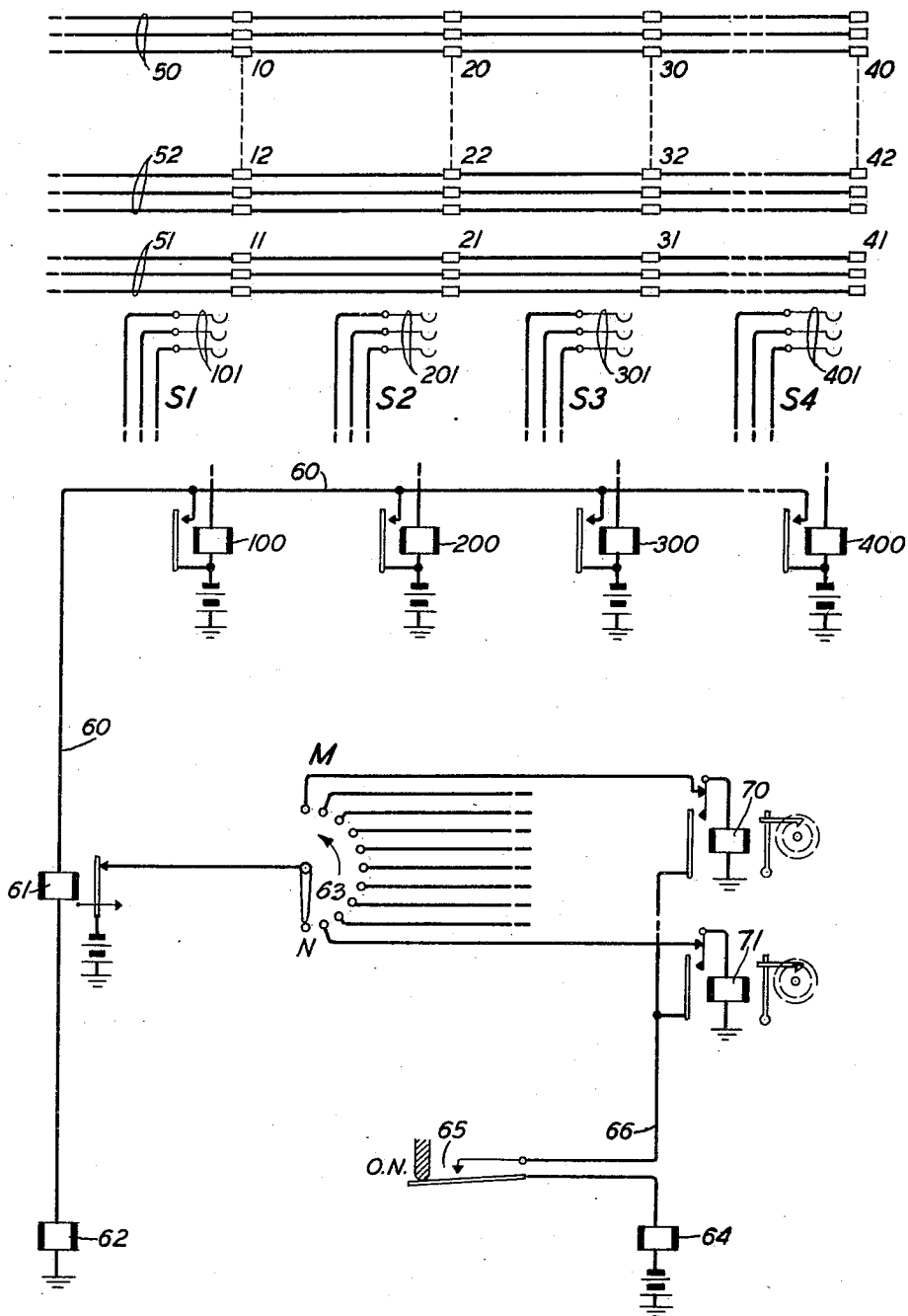
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone systems, and more particularly to systems using automatic switches for establishing connections between subscribers' lines.

6 The object of this invention is to provide an improved arrangement for accurately ascertaining the number of calls routed over each of a plurality of trunk groups in an automatic telephone system.

10 In telephone systems which employ selector switches of the two-motion step-by-step type, it is usual to provide a meter control relay in series with the conductor which connects the release magnet of each of the selectors in a group with the central office battery; the meter control relay operates each time one of these selectors is restored to normal, thereby causing the operation of a meter to record the total number of times the selectors were advanced from their normal positions. This recorded number includes connections which are released before the connection is established and includes other false starts. Furthermore, this arrangement does not indicate the distribution of the calls over the various outgoing trunk groups to which these selectors have access. It is also usual in telephone systems of the aforementioned type to connect the various outgoing groups of trunks to the same level in the banks of all of the selectors, and in such a system applicant's invention provides a simple, reliable and inexpensive arrangement for automatically recording the calls routed over each of the groups of trunks to which the selectors have access.

15 According to this invention, an auxiliary single-motion switch is provided common to a plurality of selectors, all of which have access to the same groups of trunks; and meters are provided, one for each position of the auxiliary switch, for separately recording the traffic over each of these groups of trunks. The arrangement is such that the operation of the vertical magnet of any of the associated selectors causes the operation of the stepping magnet of the auxiliary switch so that the operation of any of these selectors to select a particular group of trunks is also effective to cause the advance

of the auxiliary switch to a position corresponding to the selected group of trunks; when the auxiliary switch reaches this position, a circuit is closed for operating the meter which is individual to the selected group of trunks.

One embodiment of the invention is illustrated diagrammatically in the drawing and the invention will be better understood by considering this arrangement in detail. S1, S2, S3 and S4 represent a group of selector switches which are of the Strowger type. For a complete description of the construction and operation of these switches, reference may be had to pages 53 to 67, inclusive, of the second edition of "Automatic Telephony" by Smith and Campbell. The selector S1 is represented schematically by the vertical-stepping magnet 100, the brushes 101, and by the bank terminals designated 11, 12 and 10; the terminals designated 11 represent one set of terminals in the first level, the terminals designated 12 represent one set of terminals in the second level, and the terminals designated 10 represent one set of terminals in the tenth level of the terminal bank to which the brushes 101 have access. In a similar manner the selectors S2, S3 and S4 are represented schematically by the vertical magnets 200, 300 and 400, and by brushes 201, 301 and 401; the first, second, and tenth levels of the banks of these selectors are represented by the terminals 21, 22 and 20, the terminals 31, 32 and 30, and the terminals 41, 42 and 40.

The groups of trunk lines connected to corresponding levels in the banks of each of these selectors are represented by the trunks 51, 52 and 50, these trunks being connected to the terminals 11, 12 and 10 in the bank of selector S1, to the terminals 21, 22 and 20 in the bank of selector S2, to terminals 31, 32 and 30 in the bank of selector S3, to terminals 41, 42 and 40 in the bank of selector S4, and to corresponding terminals in the banks of each of the other selectors in the same group.

Meters, such as 71 and 70, are provided for recording the calls directed over each of these groups of trunks and a meter control switch M is provided for controlling the op-

eration of these meters. The control switch M is of the rotary step-by-step type having a stepping magnet 62, a brush and terminal bank 63, a release magnet 64, and a set of off-normal contacts 65. The normal position of the brush is designated N and the successive off-normal positions may be referred to as position 1, position 2, etc. The meter 71 is connected to the first off-normal terminal of bank 63 for recording the calls routed over the first level of the selectors; the meter 70 is connected to the tenth off-normal terminal of bank 63 for recording the calls routed over the tenth level of the selectors. In like manner the other meters are connected to off-normal terminals 2 to 9, inclusive, of bank 63 for recording the calls routed over each of levels 2 to 9, inclusive, of the selectors. The stepping magnet 62 of switch M is connected, in series with the winding of a meter control relay 61, over conductor 60 to front contacts of the vertical-stepping magnets of the selectors S1, S2, S3, S4 and to front contacts of the vertical-stepping magnets of the other selectors in the group.

To illustrate the operation of the various meters to record the traffic over a corresponding group of trunks, assume that the line of a calling subscriber has been extended to the selector S1 and that the dialing of a digit of a called number is effective in the usual manner to effect the alternate operation and release of magnet 100 to step the brushes 101 up to a corresponding level of the terminal bank. The operation of magnet 100 closes the circuit through the windings of relay 61 and magnet 62. Relay 61 and magnet 62 operate, the operation of magnet 62 being effective to advance brush 63 from normal into engagement with the first off-normal terminal. When magnet 100 releases, magnet 62 releases. Each additional operation and release of magnet 100 causes the reoperation and release of magnet 62, so that the brush 63 is advanced to a position and off-normal terminal which corresponds to the level to which the brushes 101 are advanced by the operation of magnet 100. Relay 61 is slow to release and remains operated during the alternate operation and release of magnet 62 corresponding to the train of dial impulses received by switch S1. With brush 63 in the proper position, the release of relay 61 closes a circuit for operating the traffic meter which is associated with the group of trunks selected by switch S1. Thus, if the brushes 101 are advanced to the first level, brush 63 is in contact with off-normal terminal 1 and a circuit for operating meter 71 is closed from battery through the back contact of relay 61, brush 63, and through the normally closed contact and winding of meter 71 to ground; or if the brushes 101 are advanced to the tenth level a similar circuit is closed for operating meter 70. The opera-

tion of any other of selectors S2, S3, etc., is likewise effective to advance switch M and cause the operation of that one of the traffic meters which corresponds to the trunk group selected.

When switch M is advanced out of its normal position, the off-normal springs ON are actuated, and when one of the meters is operated a circuit is closed for operating the release magnet 64. Thus, if meter 71 operates, a circuit is closed from battery through the winding of release magnet 64, through the contacts 65 of the off-normal spring ON, over conductor 66, and through the front contact and winding of meter 71 to ground. Magnet 64 operates to cause the return of brush 63 to its normal position and meter 71 is held operated until the switch reaches its normal position. When the normal position is reached, the ON springs are restored to normal thus causing the release of magnet 64 and meter 71. The meters are sufficiently slow in operating so that they are not falsely operated by short closures of their circuits during the return of brush 63 to its normal position. The switch M is now ready to respond to the operation of another of the selectors in the group.

What is claimed is:

1. In a telephone system, selector switches, groups of trunks connected to correspondingly situated groups of terminals in each of the banks of said selector switches, means individual to each selector switch for selecting a desired one of said groups of trunks, meters one for each of said groups of trunks, and means responsive to the selective operation of any one of said selector switches for operating that one of said meters which corresponds to said desired group of trunks.

2. In a telephone system, a selector switch comprising a set of brushes and an associated bank of terminals, the terminals being divided into groups, means for operating said switch to select a desired one of said groups, an auxiliary switch comprising a brush and an associated bank of terminals, meters one for each of said groups, means responsive to the selective operation of said selector switch for operating said auxiliary switch, and means for operating that one of said meters which corresponds to the group to which the brushes of said selector switch are advanced.

3. In a telephone system, selector switches each comprising a stepping magnet, a set of brushes and an associated bank of terminals, the terminals of each of said banks being divided into groups, an auxiliary switch common to said selector switches and comprising a magnet, a brush and an associated bank of terminals, meters one for each of the terminals of said auxiliary switch, means responsive to the operation of any one of the stepping magnets of said selector switches for

operating the magnet of said auxiliary switch, and means for operating a desired one of said meters.

4. In a telephone system, a selector switch
5 comprising a set of brushes and an associated
bank of terminals, the terminals being divid-
ed into groups, means for operating said
switch to select a desired one of said groups,
an auxiliary switch comprising a brush and
10 an associated bank of terminals, meters one
for each of said groups, means responsive to
the selective operation of said selector switch
for operating said auxiliary switch to advance
the brush of said auxiliary switch to a
15 position corresponding to the group to which
the brushes of said selector switch are advanced,
and means for operating that one of said
meters which corresponds to the group to
which the brushes of said selector switch
20 are advanced.

5. In a telephone system, a selector switch
comprising a set of brushes and an associated
bank of terminals, the terminals being divid-
ed into groups, means for operating said
25 switch to select a particular one of said
groups, an auxiliary switch comprising a
brush and an associated bank of terminals,
meters one for each of said groups, means responsive
to the selective operation of said selector
30 switch for simultaneously operating said
auxiliary switch to advance the brush of
said auxiliary switch, and means for operating
that one of said meters which corresponds
to said particular group.

6. In a telephone system, a selector switch
comprising a set of brushes and an associated
bank of terminals, the terminals being divid-
ed into groups means for operating said
40 switch to select a desired one of said groups,
an auxiliary switch comprising a brush and
an associated bank of terminals, meters one
for each of said groups, means responsive to
the selective operation of said selector switch
for advancing the brush of said auxiliary
45 switch to a position corresponding to the desired
group of said selector switch, means for
preventing the operation of any of said
meters during the advance of said brush and
for operating that one of said meters which
50 corresponds to the desired group of said selector
switch.

7. In a telephone system, a selector switch
comprising a set of brushes and an associated
bank of terminals, the terminals being divid-
ed into groups, means for operating said
55 switch to select a particular one of said
groups, an auxiliary switch comprising a
brush and an associated bank of terminals,
meters one for each of said groups, means responsive
to the selective operation of said selector
60 switch for operating said auxiliary switch
to advance the brush of said auxiliary switch,
means for operating that one of said
meters which corresponds to said particular
group, and means rendered effective by the

operation of any one of said meters for restoring said auxiliary switch to normal.

8. In a telephone system, an automatic
switch comprising a set of brushes and
groups of terminals, means for selectively advancing
70 the brushes of said switch, meters one
for each of said groups, and means responsive
to the selective advance of the
brushes of said switch to any one of said
groups for operating the corresponding one
75 of said meters.

9. In a telephone system, a selector switch
comprising a set of brushes and groups of
terminals, means including a magnet for selectively
80 advancing the brushes of said
switch, meters one for each of said groups, a
switch for controlling the operation of said
meters, and means controlled by the operation
of said magnet for advancing said control
switch to effect the operation of the meter
85 corresponding to the group to which the
brushes of said selector switch are advanced.

10. In a telephone system, an automatic
switch, groups of terminals accessible to the
brushes of said switch and connected to corresponding
90 groups of trunks, a magnet for
advancing said brushes to select any one of
said groups, meters one for each of said
groups, a switch for controlling the operation
of said meters, an operating magnet for
95 said control switch responsive to each operation
of the magnet of said automatic switch
for advancing said control switch to a position
corresponding to the selected one of said
groups of trunks, and means effective in said
100 position of said control switch for operating
the meter corresponding to said selected
group of trunks.

In witness whereof, I hereunto subscribe
my name this 21st day of August, 1931.

JAMES G. FERGUSON.

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