

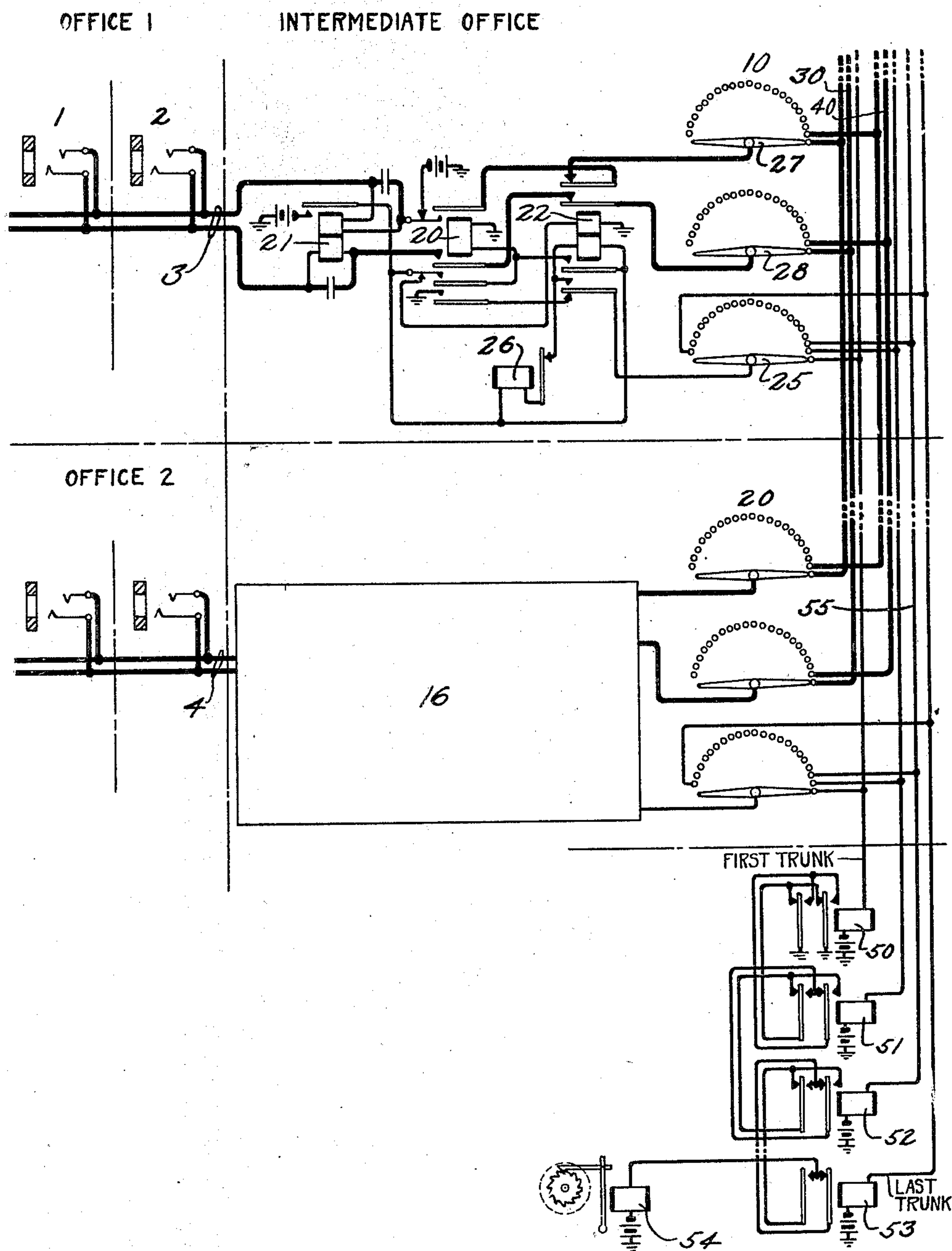
Nov. 29, 1927.

1,650,683

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STRAIGHTFORWARD TRUNKING SYSTEM

Filed Sept. 17, 1925



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UNITED STATES PATENT OFFICE.

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STRAIGHTFORWARD TRUNKING SYSTEM.

Application filed September 17, 1925. Serial No. 56,871.

This invention relates to telephone systems and more particularly to a service measuring arrangement for straight-forward trunking systems.

5 In systems of this type automatically operated switches are often employed at an intermediate office in extending connections between groups of trunk lines incoming to this office from a number of small offices to
10 a common group of trunk lines leading from this intermediate office to a distant office and it is with straight-forward trunking systems of this class that this invention is concerned.

15 An object of this invention is to provide a greatly simplified service measuring or message registering system for use in systems of this class whereby a record is made of the number of times the trunk lines out-
20 going to a distant office are engaged.

To attain this and other objects of the invention as will hereinafter appear, there is provided in accordance with one feature of the invention, a relay for each outgoing
25 trunk which is operated the moment said trunk is engaged through an automatic switch by a trunk incoming to the intermediate office, a common meter of the type that registers on its operation and a contact
30 and armature arrangement on said relays in combination with a circuit arrangement therefor whereby when any one of said relays is operated, a partial registration is effected on the meter regardless of the posi-
35 tion of the meter at the time said relay operated; that is, regardless of whether it is in operated or released position and whereby when any one of said relays is released, the
40 second part of the registrations is effected on the meter regardless of its position at the time the release of the relay takes place. The advantage of this service measuring arrangement is that a minimum amount of apparatus is required and that a positive registration is effected regardless of the order in
45 which the trunks outgoing to a distant office become engaged.

50 This invention has been illustrated in the accompanying drawing in connection with a straight-forward trunking system in which

the operators at different offices such as office 1 and office 2 have access through a plurality of trunks such as 3 from office 1 and such as 4 from office 2 to an intermediate
55 office where these trunks terminate in automatic switches such as switch 10 and switch 20 whereby connections from these incoming trunks may be extended through outgoing trunks, such as 30 or 40, to a distant
60 office; that is, groups of trunks incoming from different smaller offices have access to a common group of trunks outgoing to a distant office, said outgoing trunks being smaller in number than the total number of
65 incoming trunks.

In systems of this class, as in any other system, of similar nature, it is essential to keep accurate record of the number of times the outgoing trunks are engaged, and considering that the outgoing trunks are mul-
70 tiplied to a larger number of switches which are operated in no particular order but as the incoming trunks at the intermediate exchange happen to become engaged by the operators at the various smaller offices the
75 problem of accomplishing this purpose becomes a complicated and difficult one. However, in accordance with this invention this has been done with the least possible amount of apparatus as shown in the accompanying
80 drawing and consists primarily of a series of relays such as relays 50, 51, 52 and 53, the meter or message register 54 and a circuit arrangement controlled by the armatures and contacts of these relays.
85

In describing this invention, as it is applied to a system of this kind, the operation of extending a connection from office 1 through trunk 3, switch 10 and an idle outgoing trunk will be described followed by a
90 description of the registration of a call over an outgoing trunk and the function of the message register itself regardless of the order in which outgoing trunks are engaged.

If it is assumed then that an operator at a
95 position in office 1 inserts the calling plug of a cord circuit into jack 2, for example, it is well known in the art that the tip terminal of jack 2 will be connected to ground and a circuit will therefore be established as fol-
100

lows: battery, upper make-before-break contact of relay 20, upper winding of relay 21, tip conductor of trunk line 3, tip terminal of jack 2, to ground at the operator's cord circuit. This causes the operation of relay 21 which in attracting its armature closes a circuit for relay 22 as follows: battery, armature and front contact of relay 21, lower make-before-break contacts of relay 20, upper winding of relay 22 to ground. This causes the operation of relay 22 which in attracting its upper armatures opens the tip and ring conductors to the switch 10 to prevent interference with a possible other connection over the outgoing trunks terminating at this switch. The operation of relay 22 also closes a circuit for relay 20 as follows: battery, armature and front contact of relay 21, lower inner armature and front contact of relay 22, winding of relay 20 to ground. Relay 20 in operating closes a locking circuit for itself through its lower middle armature and front contact to the battery at the armature and front contact of relay 21 and also connects at its upper armature and front contact and lower inner armature and front contact the tip and ring leads from trunk line 3 to contacts of relay 22. The operation of relay 20 opens the circuit for the upper winding of relay 22 but the circuit for the lower winding of this relay 22 is now extended from the battery at the armature and front contact of relay 21, through this winding, the lower outer armature and front contact of relay 22 to the hunting brush 25 of switch 10. It should be noted that a parallel path is also established to the hunting brush for the stepping magnet 26 from the battery at the armature and front contact of relay 21, through the lower outer armature and front contact of relay 22. If the switch 10 is resting with its brushes on a busy outgoing trunk, ground from the sleeve lead of this trunk through the hunting brush 25 is supplied for the maintenance of relay 22 energized. The same ground causes the stepping magnet 26 to operate and in operating interrupts its own circuit so that it will release and stop the brushes of switch 10 on to the next trunk terminals. In case the next trunk is also busy and consequently has its sleeve lead grounded, the switch operates again and this action is repeated until the brushes finally come to rest on the terminal of an idle trunk. The hunting brush 25 is so constructed as not to open the circuit to the sleeve terminals when stepping from one terminal to another and the circuit for the lower winding of relay 22 is therefore maintained until the idle trunk is reached. When the switch 10 therefore finally comes to rest on an idle outgoing trunk, the sleeve circuit through the lower winding of relay 22 is broken so that this relay in releasing now

completes the connection of the tip and ring conductors from the trunk line 3 through to the tip and ring brushes 27 and 28 of switch 10. It should also be noted that a busy condition is now established on the sleeve terminal of this trunk from ground at the lower outer armature and front contact of relay 20 through the lower outer armature and back contact of relay 22 through brush 25 so that the selected trunk will now test busy to other switches to which its terminals are multiplied. When relay 22 releases, the condition will therefore be such that relay 21 will be maintained energized by having its two windings included in the tip and ring leads of this trunk line 3, and consequently, relay 20 will also be held locked by virtue of the operation of relay 21.

Referring now to the registration of the engagement of the trunks outgoing from the intermediate office, it will be noted that on each engagement of an outgoing trunk a corresponding relay such as 50, 51, 52 or 53 is energized through the sleeve terminals of a correspondingly engaged switch such as 10 or 15 to cause the operation or release of the meter 54 depending on its previous condition. If, for example, relay 50 is energized due to engagement of trunk 30 and the meter 54 is in non-operated condition, that is, if all of the other relays such as 51, 52, 53 are in normal position, a circuit will be closed as follows: battery, winding of the meter 54, inner armatures and back contacts of relays 53, 52 and 51 in series and armatures and front contacts of relay 50 to ground. That is in this case the engagement of trunk 30 is recorded by the operation of meter 54. If, on the other hand, for example, relay 51 is operated due to the engagement of trunk 40 at the time relay 50 operates, it will be seen that the meter 54 has already been operated over the following circuit: battery, winding of meter 54, inner armatures and back contacts of relays 53 and 52, outer armature and front contact of relay 51, armatures and back contacts of relay 50, to ground, and consequently, when relay 50 now operates the meter 54 is released as this latter circuit is broken at the armatures and back contacts of relay 50, so that the engagement of trunk 30 in this case while not strictly speaking is recorded by the release of the meter 54 it will be recorded next time the meter is operated, as will hereinafter be made clear.

Another example of the functioning of this circuit may be mentioned. For example, if relay 52 is operated due to the engagement of the trunk corresponding to the sleeve lead 55 and relays 51 and 53 are in normal position when relay 50 is energized, the meter 54 will then have been operated over the following circuit: battery, winding of meter 54, inner armature and back contact of relay 53, outer armature and front

contact of relay 52, outer armature and back contact of relay 51, armatures and back contacts of relay 50 to ground so that when relay 50 now operates, this circuit will be broken at the armature and back contacts of relay 50 and the meter 54 permitted to release so that the engagement of trunk 30 in this case is similarly identified by a release of the meter. The same operation also will take place if relay 53 only is energized at the time relay 50 becomes operated, and to mention still a further example of this circuit, if all the relays 51, 52 and 53 and any other relays in the group are energized when relay 50 operates, the release or operation of meter 54 will take place.

No matter, therefore what relay in the group would operate, the meter 54 would change from its previous condition to partially record the engagement of a trunk and on the release of a relay the meter would also change from its previous position so as to partly record the engagement of a trunk. That is, the arrangement may be considered as having recorded each single engagement of a trunk by causing two effects on the meter, whether or not these are both releases of both operations of the meter or a release and an operation is immaterial, for in the end when a number of trunks have been engaged and then become idle a number of times, the meter would have operated the corresponding number of times the various trunks had been engaged. It is therefore seen that an ordinary meter making a record each time it is operated may be used in this system.

What is claimed is:

1. In a trunking system, incoming lines, a smaller number of outgoing lines, switching means associated with each incoming line for extending it to an outgoing line, a relay for each outgoing line and a metering means common to said relays, said metering means being responsive to a change in condition of one of said relays to operate and to a subsequent change in condition of one of said relays to release.

2. In a trunking system, incoming lines, a smaller number of outgoing lines, switching means associated with each incoming line for extending it to an outgoing line, a relay for each of said outgoing lines responsive to the engagement of the corresponding outgoing line and a metering means common to said relays, said metering means being responsive to a change in condition of

one of said relays to operate and to a subsequent change in condition of one of said relays to release.

3. In a trunking system, incoming lines, a smaller number of outgoing lines, switching means associated with each incoming line for extending it to an outgoing line, a relay for each of said outgoing lines, a meter adapted to register each time it is actuated and means associated with said relays and the meter for effecting the operation or release of said meter each time a relay is actuated and each time a relay is released.

4. In a trunking system, incoming lines, a smaller number of outgoing lines, a switching means associated with each incoming line for extending it to an outgoing line, relays associated with all of said switching means and one of said relays associated with each outgoing line, means responsive to the operation of any one of said switching means for operating the relay corresponding to the outgoing line selected by said switching means, means responsive to the release of any one of said switching means for releasing the relay corresponding to the outgoing line to which the switching means is extended, a metering device arranged to register only on its operation and a circuit connecting the metering device and said relays so arranged that each time a relay is operated or released the metering device is either operated or released depending on its previous condition so that a registration takes place on the meter for each use of an outgoing line.

5. In a trunking system, incoming lines, a smaller number of outgoing lines, switching means associated with each incoming line for extending it to an outgoing line and means for registering each use of each outgoing line comprising a plurality of relays one individual to each outgoing line, a metering device and a circuit arrangement associated with said relays and said metering device for actuating or releasing said meter, depending upon its previous condition, each time a relay is actuated or released.

In witness whereof, I hereunto subscribe my name this 31st day of August, A. D., 1925.

HENRY M. BASCOM.

In witness whereof, I hereunto subscribe my name this 9th day of September, 1925.

CLARENCE B. FOWLER.