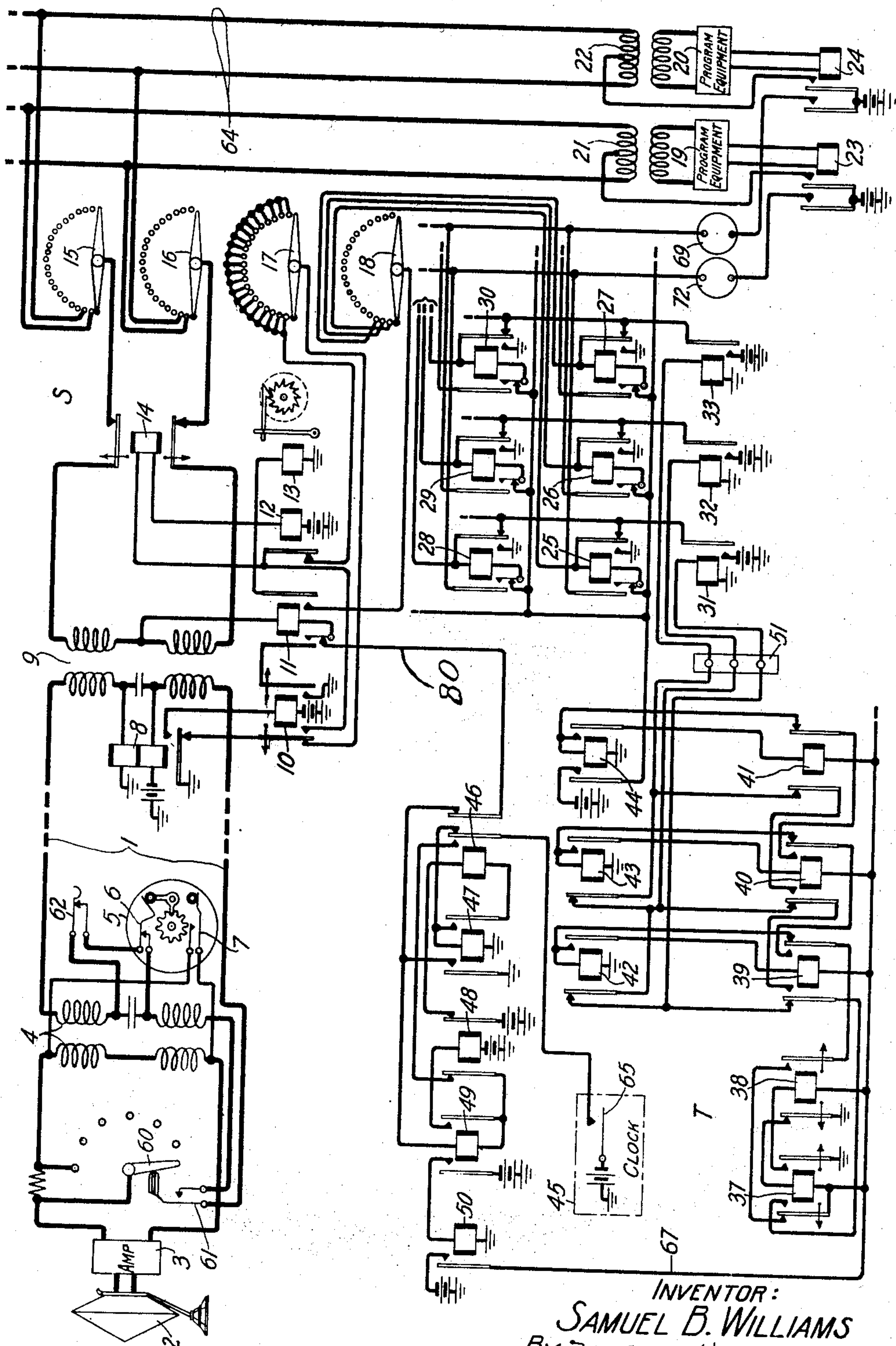


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TRANSMISSION SYSTEM

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TRANSMISSION SYSTEM.

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This invention relates to transmission systems and particularly to the distribution of programs to subscribers over physical lines.

Its object is to secure a more satisfactory basis of charging the subscriber for the service rendered.

Heretofore it has been customary to charge a subscriber either in accordance with the total length of time he receives the program service or on a flat rate basis. By the latter plan his meter is operated each time he listens in on a program.

According to the present invention a service charging device is so arranged that the first time a subscriber selects a program a charge is made against him, the amount varying with the program, whereas subsequent selections of the same program do not affect the charging device.

The drawing illustrates one of a number of subscribers' lines together with a portion of the central office equipment. The subscriber's line 1 is provided with a loud speaking receiver 2, an amplifier 3 and an impulse sender 5 at the substation. The receiver 2 and amplifier 3 and also a volume control switch 60 are shown in diagrammatic manner and may be of any suitable types.

The line 1 terminates in the brushes of a stepping switch S at the central office. The switch S has access to a number of program sending equipments 19, 20, etc. These equipments are illustrated diagrammatically and may be of any well known design.

At the central office each subscriber's line is provided with an individual service register 13. Each line also has a number of relays 25, 26, 27, etc., one for each of the different program equipments. The three relays 25, 26 and 27 belong to the subscriber's line 1. Three other relays, 28, 29 and 30, belong to some other line, not shown. The remainder of the equipment at the central office is common to all subscribers. At the left of the drawing is shown a timing mechanism T the purpose of which is to operate the subscribers' service meters in accordance with the character of the program to which the subscribers are listening. As will be explained in detail hereinafter, the charging circuits are so designed that the service meter is operated when the subscriber first makes connection with the equipment sending a program, the extent of the charge de-

pending upon the program. If, during the sending of the same program, the subscriber disconnects therefrom and subsequently returns to the same program, no further charge is made against him.

A detailed description of the operation will now be given. Assume the subscriber wishes to listen to the program being distributed by the equipment 20. He throws the volume control switch 60, closing the contacts 61 and then manipulates dial 5 to transmit a series of impulses designating the equipment 20. The closure of the contacts 61 completes a circuit from battery, through the lower winding of relay 8, lower left winding of repeating coil 9 over the lower side of the line, contacts 61, lower right winding of repeating coil 4, impulse springs 6, key 62, upper right winding of coil 4, over the upper side of the line 1, through the upper left winding of coil 9 and the upper winding of relay 8 to ground. Relay 8 closes an obvious circuit for slow release relay 10.

During the forward or setting movement of the dial 5 the springs 7 are closed to complete a shunt around the receiving set. This prevents disagreeable noise in the receiving set while impulses are being transmitted.

On the return movement of the dial 5 the impulse springs 6 are opened and closed in turn causing the repeated release and operation of relay 8. For each release of relay 8 a circuit is closed from ground through the back contact thereof, left front contact of relay 10, winding of slow release relay 14, winding of the stepping magnet 12 to battery. Relay 14 remains operated during impulsing. The magnet 12 steps the brushes 15 to 18 inclusive of the switch S from position to position. At the end of the impulse series brushes 15 and 16 are brought to rest upon the terminals in which appears the circuit 64 leading to the program equipment 20. After an interval relay 14 releases. Relay 14 on releasing prepares for the operation of the meter 13 as soon as the timing mechanism T reaches the proper point in its next cycle. The release of relay 14 completes a circuit from battery through the inner front contact of relay 24 to the midpoint of transformer 22, thence over both conductors of circuit 64 to the brushes 15

and 16 respectively, back contacts of relay 14, right windings of repeating coil 9, through the winding of relay 11, contact of said relay to the conductor 80. The relay 24 is operated while the equipment 20 is in service.

When the clock 45 closes the contact 65 a circuit is completed from battery, through the inner back contact of relay 46, winding of relay 47 to ground. Relay 47 operates and prepares a circuit from battery, through the right contact of relay 48, winding of relay 46, contact and winding of relay 47 to ground. While contact 65 remains closed the relay 46 is shunted and does not operate in the circuit last traced. Relay 47 at its left contact completes the circuit previously traced through the winding of relay 11. Relay 11 operates and locks through its left front contact to ground at the right contact of relay 10.

On the next opening of contact 65 relay 46 operates in series with relay 47. On the next closure of the contact 65 a circuit is completed from battery, through said contact, inner front contact of relay 46, left contact of relay 48, winding of relay 49 to ground at the contact of relay 47. Relay 49 operates and prepares a circuit from battery, through the winding of relay 48, contact and winding of relay 49 to ground at the contact of relay 47. Relay 48 is shunted during the closed period of contact 65 and does not operate. This closed period of the contact 65 is sufficiently long to permit the relays 39 to 44 inclusive to go through a complete cycle. Relay 49 in operating closes an obvious circuit for relay 50. Relay 50 places battery potential upon the conductor 67 resulting in the closure of an obvious circuit for the slow release relay 37. Relay 37 operates and closes an obvious operating circuit for relay 38. Relay 38 opens the circuit of relay 37 which releases after an interval. Relay 37 in releasing opens the circuit of relay 38 which also releases after an interval. This operation continues as long as battery potential exists on the conductor 67.

On the first operation of relay 37 a circuit is completed from battery over conductor 67, left front contact of relay 37, left back contact of relay 39, connecting frame 51, winding of relay 31 to ground. Another branch of this same circuit may be traced through the back contact of relay 42, through the winding of relay 32 to ground. Still another circuit extends through the left back contacts of relays 42 and 43 in series and the winding of relay 33 to ground. Thus on the first operation of relay 37 all of the relays 31, 32 and 33 are operated. The relays 31, 32 and 33 apply battery potential through their respective contacts, thence over the back contacts of relays 25,

26 and 27 respectively to corresponding points in the switch S. Since the switch S is standing in its second position corresponding to the distributing equipment 20, only the circuit on relay 32 becomes effective. This circuit may be traced through the brush 18, right contact of relay 11, winding of register 13 to ground. This causes the operation of register 13 to record one count. Should other subscribers' lines be using the program equipments represented by relays 31 and 33 a count will be made at this time on the individual meters of said lines.

As soon as relay 37 releases, following the operation of relay 38, for the first time a circuit is completed from the conductor 67, back contact of relay 37, front contact of relay 38, right back contact of relay 39, winding of relay 42 to ground. Relay 42 operates and prepares a locking circuit for itself in series with relay 39. Relay 39 is shunted, however, and does not operate at this time. When, an instant later, relay 38 releases, the shunt is removed and relay 39 operates.

On the next operation of relay 37 a circuit is closed from battery, over conductor 67, left front contact of relay 37, left front contact of relay 39, left back contact of relay 40 and thence as above traced through the windings of relays 32 and 33. It will be noted that relay 31 is not operated at this time. This means that the program to which the relay 31 is individual is one for which only one unit of charge is made. Relay 32 in operating again completes the above traced circuit to cause a second count to be made on the meter 13. Relay 33 likewise registers a second count against all subscribers' lines using the corresponding program. On the next release of relay 37, while relay 38 still remains operated, the circuit above traced is extended through the right front contact of relay 39, right back contact of relay 40 to the winding of relay 43. Relay 43 operates and prepares a circuit for relay 40. Later when relay 38 releases relay 40 operates.

On the next operation of relay 37 the conductor 67 is extended through the left front contact of relay 37, left front contacts of relays 39 and 40, back contact of relay 41 to the winding of relay 33. It will be noted that the relay 33 is the only relay to be operated at this time. This indicates that the program which corresponds to the relay 33 is one of a higher quality and requires three units of charge for its use. In a manner now well understood relay 44 is presently operated.

When relay 44 is operated a circuit is completed from battery, through its left contact, left normal contact and winding of relay 26, thence through the brush 18, contact of relay 11, register 13 to ground. Relay

26 operates but due to its resistance the meter 13 is not actuated. Relay 26 in operating locks in a circuit from battery, through the outer front contact of relay 24, indicating meter 69, left front contact and winding and right front contact of relay 26 to ground. The relay 26 in operating opens at its left back contact the metering circuit and this prevents any further operation of the meter 13 until relay 26 is again released.

Returning now to the operation of the timing mechanism T, the relay 41 soon operates following the operation of relay 44. This completes the operation of the charging relays under the control of the clock 45. When the contact 65 is again opened, the relay 48 operates and opens the circuits of relays 46 and 47. These relays release in turn opening the circuits of relays 48 and 49 causing the release of relay 50.

The subscriber listens to the program being sent from the equipment 20. The transmission circuit extends from the transformer 22 over the circuit 64 through the brushes 15 and 16, back contacts of relay 14 to the right windings of the repeating coil 9, the other section of the repeating coil 9 being connected to the subscriber's line 1. So long as this particular program is being sent from the equipment 20 the relay 24 remains energized. This holds the relay 26 locked independently of the subscriber's line 1 so that further cycles of the timing mechanism T have no effect on meter 13.

If the subscriber wishes to turn to some other program, he may do so by releasing the connection and setting up a new connection. To release, it is merely necessary for him to open the key 62 or to open the contact 61. Either of these operations opens the circuit of relay 8, resulting in the subsequent release of relay 10. A circuit is now completed from ground through the back contacts of relays 8 and 10, brush 17, thence through the contact of magnet 12, winding of relay 14, winding of magnet 12 to battery. Magnet 12 interrupts its own circuit and steps the switch S to its normal position. The release of relay 10 also opens the holding circuit of relay 11 which in turn opens the circuit of meter 13.

The subscriber now closes the line 1 and manipulates his dial 5 to set the switch S to select the next program to which he desires to listen. In the manner already described the subscriber's meter 13 will be operated the proper amount to charge him for listening to the new program.

Should the subscriber eventually return to the first program equipment 20 to which he previously listened and for which he was charged, no further charge will be made. This is true as above explained since the relay 26 remains energized under the control of relay 24. When the program being sent

from the equipment 20 terminates or when a change is made in the program the relay 24 is released to release the relay 26 and any corresponding relays for other subscribers' lines which may be operated. If subsequently a subscriber makes connection with the equipment 20, a charge will be made.

The instruments 69 and 72 are for indicating the number of subscribers listening to the corresponding programs at the same time. Each time a subscriber listens in on a program, a separate branch is closed to ground through the instrument. This causes the needle to move to a point on the scale indicating the number of subscribers listening.

What is claimed is:

1. In combination, a central office having a plurality of circuits therein, a subscriber's line leading to said office, means for connecting the subscriber's line to any one of said circuits, a service meter operable in response to such connection, and means to prevent further operation of the meter in response to a subsequent connection of the subscriber's line to the circuit.

2. In combination, a central office having a plurality of circuits therein, a subscriber's line leading to said office, means operable at will to connect the subscriber's line to and disconnect it from a desired one of said circuits, a service meter actuated in response to the first connection to such circuit, and means to prevent the meter from actuating in response to any subsequent connection of the line to such circuit.

3. In combination, a central office having a plurality of circuits therein, a subscriber's line leading to said office, means for selecting any one of said circuits and connecting the subscriber's line thereto, a variable operable service meter actuated in response to such connection, the extent of operation of the meter depending on the circuit selected, and means to prevent further operation of the meter in response to a subsequent connection of the subscriber's line to the circuit.

4. In combination, a central office having a plurality of circuits therein, a subscriber's line, an automatic switch controlled by the subscriber to select any desired one of said circuits, a service meter operable in response to such selection, and means to prevent further operation of a meter in response to a subsequent connection of the line to the circuit.

5. In combination, a central office having a plurality of program transmission equipments, a subscriber's line, an automatic switch controlled by the subscriber for selecting any one of said equipments, a variably operable service meter actuated in response to the selection of a program equipment, the amount of operation varying with the program selected, and means to prevent

reoperation of the meter if the subscriber re-selects the same program.

6. In combination, a central office having a plurality of program transmission equipments, a subscriber's line, an automatic switch controlled by the subscriber for selecting any one of said equipments, a service meter, an operating circuit for the meter, a counting relay mechanism for closing said

circuit a variable number of times according to the program selected, and means for disabling the meter circuit to prevent its closure in response to a reselection of the same program.

In witness whereof, I hereunto subscribe my name this 18th day of August, A. D. 1927.

SAMUEL B. WILLIAMS.