Rainier

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Equipment Enginerring Branch - Hawthorne.

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METHOD OF OPERATION
SELECTOR CIRCUIT

Inter-Office Incoming From Full Mechanical - 4 Party Semi-Selective Ringing - Power Driven Machine Switching System.

DEVELOPMENT

1. PURPOSE OF CIRCUIT

This circuit is for use in establishing connections between full mechanical power driven exchanges in which the circuits are of the Kansas City type and provided for only 4 party ringing.

2. WORKING LIMITS

This circuit has an external circuit loop range for selection of zero to 1300 ohms. For trunk supervision the maximum external loop is 1920 ohms.

OPERATION

3. PRINCIPAL FUNCTIONS

This circuit is used in establishing calls between the district or office selector in a distant full mechanical or semi-mechanical office and a final selector. Its principal functions are as follows:

3.1 Selection of proper idle final selector and dismissing of sender at end of selection.

3.2 Signalling the called subscriber.

3.3 Establishing the talking selection.

3.4 Returning to normal.

4. CONNECTION CIRCUITS

This incoming selector will function with any sender, district, office, and final selectors of the Kansas City type or similar type.

DESCRIPTION OF OPERATION

5. SEIZURE

When a district or office selector seizes this trunk, ground is connected to the "S" terminal, thus holding this selector busy to all district or office selectors. Also a circuit is closed to operate the (L) relay over the tip side of the fundamental circuit, through the associated district and sender circuits (not shown) and back over the ring to ground through the inner contacts of cam "J". The (L) relay operated, locks through its inner winding and make contact to the same ground on cam "J" over the fundamental circuit and closes a circuit from ground on its armature, to advance the sequence switch to position 2. With the switch in position 2, the (UP) magnet operates, moving the selector upward for brush selection.

6. BRUSH SELECTION.

As the selector moves upward in position 2 carrying the commutator brushes over the commutator segments, the "A" segment and brush intermittently connect ground to the tip side of the fundamental circuit, holding the (L) relay operated, but successively short circuiting the stepping relay in the associated sender circuit, thus releasing and permitting its reoperation, until the proper brush has been selected. When sufficient impulses have been sent back to satisfy the sender, the fundamental circuit is opened, releasing the (L) relay. The (L) relay, released, opens the circuit through the (UP) magnet, stopping the upward movement of the selector, and closes a circuit through the (R) magnet, advancing the switch to position 3. In position 3 the Trip Magnet (TM) operates. The (L) relay again operates and locks over the fundamental circuit as previously described, advancing the switch to position 4.

7. GROUP SELECTION.

In position 4, the (UP) magnet is again operated, moving the selector upward for group selection. The trip magnet being operated, causes the previously selected set of brushes to trip as the selector starts upward. As the selector moves upward for group selection, carrying the commutator brushes over the commutator segments, the "B" segment and brush intermittently connect ground to the tip side of the fundamental circuit, holding the (L) relay operated, but successively short circuiting the stepping relay in the associated sender circuit, thus releasing and permitting its reoperation, until the proper group has been selected. When sufficient impulses have been sent back to satisfy the sender, the fundamental circuit is opened, releasing the (L) relay. The release of the (L) relay opens the circuit through the (UP) magnet, and advances the switch to position 5 over the circuit previously described. With the switch in position 5, a circuit is closed through the outer winding of the (L) relay which operates, advancing the switch to position 6 for trunk hunting.

8. TRUNK HUNTING.

Should the first trunk of the group in which the selector is hunting be busy, the (L) relay is held operated from battery through its inner winding and make contact to ground on the sleeve terminal of the busy trunk. With the (L) relay held operated, due to this busy condition, the circuit through the (UP) magnet is maintained and the selector travels upward until an idle trunk is found. When an idle trunk is found, the holding circuit through the inner winding of the (L) relay is opened, but the relay will not release immediately due to a circuit being closed from ground through the "C" commutator brush and segment, upper contacts of cam "D", to battery through the outer winding of the (L) relay. When the brushes are centered on the trunk terminals, the circuit through the "C" commutator segment is opened, and the (L) relay releases, opening the circuit through the (UP) magnet, which stops the selector brush on the terminals of the selector trunk. The release of the (L) relay also advances the switch to position 7.

8. (a) "C" COMMUTATOR.

The adjustment of the "C" commutator brush, with relation to the tripped sleeve multiple brush, is such, that it does not break contact with the "C" commutator segment until slightly after the holding circuit through the inner winding of the (L) relay is opened, by the sleeve brush leaving the busy terminal and making contact with the sleeve terminal of the idle trunk. The (UP) magnet, therefore, remains operated and the selector continues to travel upward until the brushes are carried slightly above the center of the trunk terminals, allowing the locking pawl to enter the notch on the rack attached to the brush support rod. At this time the holding circuit through the outer winding of the (L) relay is opened at the "C" commutator, releasing the relay. The (L) relay released, disconnects ground from the commutator feed bar (G), and releases the (UP) magnet. The selector then drops into place thus centering the brushes on the trunk terminals. During trunk hunting, in position 6 only, the commutator feed ground is supplied through cam "C", from ground on the armature of and under control of the (L) relay. This is to prevent the reoperation of the (L) relay by the closing of a circuit between the "C" commutator brush and segment, on the overthrow of the selector, or as it drops into place.

9. SELECTION BEYOND.

Should the first trunk in the group be idle, the (L) relay releases when the switch advances from position 5-1/4. In position 5-1/2, the release of the (L) relay connects ground through cam "M" temporarily to the "S" terminal of the trunk, thus holding the selected final circuit busy until the switch advances to position 6-3/4. When the switch enters position 6-3/4, the selected final trunk is held busy to all other incoming selectors, by ground being connected to the "S" terminal of the trunk through the upper contacts of cam "L". With the switch in position 7, the (L) relay operates over the ~~sleeve~~ Ring to ground in the final selector circuit. The (L) relay operated, advances the switch ~~to position 8~~ OUT OF POS. 7 and locks to ground on cam "L" through its make contact, until the switch advances from position 7-1/2. As the switch enters position 7-3/4, the (L) relay locks through cam "K" to the same ground on the ring side of the final circuit. In position 8, the tip side of the fundamental circuit is established for selection beyond, and the ring side is closed through the (R) compensating resistance to ground on cam "J".

10. INCOMING ADVANCE.

After selection beyond has been completed the final functions, removing ground from the "R" brush, thus releasing the (L) relay, which advances the switch to position 9. The (L) relay reoperates in position 9 over the fundamental circuit to ground through the upper outer contact of cam "I". The direction of the current over the tip and ring sides of the fundamental circuit being reversed causes the associated sender and district selector circuits to function. The (L) relay operated, advances the switch to position 10. As the switch advances from position 9, the circuit through the (L) relay is opened, releasing the relay.

11. TRUNK CLOSURE:

In position 10, the windings of the (A) relay are connected in series aiding over the tip and ring of the fundamental circuit, operating the (A) relay, and in turn the (L) relay. The (L) relay locks through its inner winding and make contact to ground until the switch advances from position 10-1/2, and operates the (R-2) relay. The (R-2) relay operated, connects ground on its armature, to battery through the (R) magnet advancing the switch to position 11, the "A" cam advancing it to position 13. The (R-2) relay operated also locks through its make contact to ground on the armature of the (L) relay. When the switch reaches position 10-3/4, the locking circuit for the (L) relay is transferred through the lower outer and upper inner contacts of cam "K", to ground on the armature of the (A) relay.

FOUR PARTY SEMI-SELECTIVE RINGING.

12. With the switch in position 13, "one ring" ringing current is connected to the ring side of the called line and to ground through the bells of the subscriber's set connected to that particular side of the line. "Two ring" ringing current is applied to the ring side of the line with the switch in position 15. In this case, the (R-2) relay is short circuited and released by ground on the "P" commutator brush and segment through the upper contacts of cam "O", as the switch passes through position 11-3/4 to 12-1/4. As the switch enters position 13, ground through the "P" commutator brush and segment advances the switch to position 14. With the switch in position 14, a circuit is closed from ground through the pick-up interrupter and lamp reoperating the (R-2) relay. The (R-2) relay operated, advances the switch to position 15 from ground on its armature. "Two ring" ringing current is connected to the line through the lower contacts of cam

"N", to ground through the bell of the subscriber's set connected to that side of the line.

13. The (R-1) relay is not necessarily slow acting, but is designed to be less responsive to alternating than to direct current, thus insuring its operation only when the receiver is removed from the switch~~board~~ -hook during either the silent or ringing interval.

14. During the ringing period, a small amount of ringing current is shunted through the .02 m.f. condenser and one winding of the repeating coil to ground, thus transmitting a tone to the calling party as an audible indication that ringing current is connected to the called line.

15. "P" COMMUTATOR.

The switch has two ringing positions, namely 13 and 15. Stations which are rung with the "one ring" ringing current are assigned numbers which are reached through final trunks originating in either #0 or #2 group on the incoming frame. Stations which are rung with "two ring" ringing current, are assigned numbers which are reached through final trunks originating in either #1 or #3 groups on the incoming frame. The ringing of stations on the tip side of the line is cared for by a cross-connecting and reversing scheme at the distributing frames. The switch stops in position 13, when the selector is on a final trunk so located that the circuit through the "P" commutator brush and segment is open, but it advances to position 15, when the selector is on a trunk so located that the circuit through the "P" commutator is closed.

16. CALLED PARTY ANSWERS.

When the receiver is removed from the switchhook at the called station, with the switch in position 13 or 15, the (R-1) relay operates. The operation of the (R-1) relay opens the circuit through the winding of the (R-2) relay, which releases. The release of the (R-2) relay opens the ringing circuit and closes the talking circuit, thus allowing the (CS) relay to operate over the line loop, in turn operating the (CS-1) relay. The operation of the (CS-1) relay reverses the direction of the current over the tip and ring of the incoming trunk which operates a polarized relay in the district selector circuit, thus causing the district selector to function.

17. DISCONNECTION.

When the receiver is replaced on the switchhook at the called station, the (CS) relay releases, in turn releasing the (CS-1) relay. The (CS-1) relay released, causes the battery and ground to be reversed over the tip and ring of the trunk, allowing the district selector circuit to function, which in turn releases the (A) relay. The release of the (A) relay opens the holding circuit through the (L) relay which releases, in turn advancing the switch to position 18. In position 18, the (DOWN) magnet operates restoring the selector to normal, the "Y" commutator advancing the switch to normal.

18. OVERFLOW.

Should all the trunks of the group be busy, the selector while trunk hunting in position 6 travels to the top of the bank and rests on the overflow terminals. As the sleeve of the overflow terminal is open, the holding circuit through the inner winding of the (L) relay is opened, releasing the relay. The (L) relay released, advances the switch to position 7. With the switch in position 7 a circuit is closed from ground through the "Z" commutator brush and segment to battery through the (R) magnet, advancing the switch to position 9. In position 9, the (L) relay operates over the fundamental circuit from ground on cam "I", as previously described, advancing the switch to position 10. In position 10 the (A) relay operates over the tip and ring of the trunk, in turn operating the (L) relay. The (L) relay operated, in turn operates the (R-2) relay, which advances the switch to position 11, the "A" cam advancing it to position 13. After the sender and district have functioned, the (A) relay releases, in turn releasing the (L) relay. The release of the (L) relay advances the switch to position 18. In position 18, the (DOWN) magnet is operated, as previously described, restoring the selector to normal. When the selector reaches normal, ground on the "Y" commutator brush and segment advances the switch to position 1, or normal.

19. TELL TALE.

Should the selector travel to tell tale during selection, the switch is advanced to the next position over a circuit from ground on the "X" commutator brush and segment, to battery through the (R) magnet. If in position 3, the (L) relay is operated over the fundamental circuit from ground on cam "J", advancing the switch to position 4, as previously described. In position 4, ground on the "X" commutator brush and segment advances the switch to position 5. The (L) relay operates in position 5 through its outer winding, to ground on cam "D", advancing the switch to position 6. When the switch leaves position 5-1/4, the holding circuit through the (L) relay is opened, releasing the relay. In position 6, ground on the "X" commutator brush and segment advances the switch to position 7, where it remains until it is restored to normal manually.

20. SELECTOR GROUP REGISTERS.

Each selector is connected to a Selector Group Register for peg count purposes. This register is operated from ground through cam "E" as the switch passes through position 13-3/4.

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3/3/23

Chk'd--JI

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