

CIRCUIT EXPLANATION  
OF  
TOLL TRANSMISSION SELECTOR CIRCUIT 18781-A  
SIDE SWITCHLESS

- c00 -

GENERAL

The functions of this switch are as follows:

1. Make itself busy to the selectors.
2. Hold the switches in back of it in their operated positions.
3. Execute the vertical movement of the shaft under the control of the dial.
4. Rotate automatically without regard to the dial.
5. Keep the wipers disconnected during rotation so as not to interfere with the trunks over which they rotate.
6. Test each trunk for busy until a free trunk is found.
7. Stop the rotary motion on the first free trunk.
8. Notify the toll operator if all the trunks are busy.
9. Protect the seized trunk from intrusion.
10. Extend the line circuit thru to the next switch without attachments.
11. Relay impulses to the next switch.
12. Allow other switches to release.
13. Release itself without interfering with other trunks.
14. Operate an alarm signal if the circuit to the release magnet remains closed.

LINE  
RELAY A

FIGURES  
#1 AND 2

When this switch is selected, A\* is energized thru its negative winding from direct ground or ground thru 400 ohms resistance (see figures #1 and 2 on circuit 18781-A) thru the cam springs, over lead #16, the circuit of the relay and repeating coil equipment associated with this switch, the toll operator's loop circuit, over lead #1, and the back contact of F. A operates and closes the circuit to B. The battery to the winding of B may be taken thru a relay, associated with the shelf, to cause a lamp

\* NOTE: A, B, etc. refer to relays A, B, etc.



12-18-23  
CO-71705-E  
Revised  
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RELEASE  
RELAY B

to glow to give supervision, if desired.

B, on operating, grounds the release trunk from ground on the private ground lead, to hold the switches in back of this switch in their operated positions and to make this switch busy to the selectors and grounds lead #5 thru the back contact of D, thus preparing the locking circuit to a relay in the relay and repeating coil equipment associated with this switch.

IMPULSING

At each interruption of the circuit at the dial, A restores; opens the circuit to B; and closes the circuit to the vertical magnet, in series with C, thru the make contact of B and the back contact of D. B, due to its slow release action, remains in its operated position while its circuit is interrupted during impulsing. The vertical magnet operates and raises the shaft and wipers to the called level.

VERTICAL  
MAGNET

VERTICAL  
SPARK  
COND.

A  $\frac{1}{2}$  M.F. condenser in series with a 10 ohm resistance to ground, connected to one side of the winding of C, prevents excessive sparking at the impulse springs of A.

OFF  
NORMAL  
SPRINGS

The off normal springs operate on the first vertical step of the shaft and ground lead #15, thus preparing the circuit to the reverse battery relay in the relay and repeating coil equipment.

RELAY C

C operates in series with the vertical magnet; closes the circuit to E from ground at B thru the off normal springs; short circuits the winding of D thru the rotary magnet springs and the cam springs; and grounds lead #17 from ground at B, thus closing the circuit to a relay in the relay and repeating coil equipment.

RELAY E

E operates; locks itself from ground thru the back contact of F, the rotary magnet springs and the off normal springs; and places a guarding ground to one side of the winding of D, thereby closing a guarding short circuit to the winding of D, to prevent D from

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ROTARY  
MAGNET

SELECTING  
IDLE  
TRUNKS

ROTARY  
SPARK  
COND.

operating before the wipers are stepped in onto the bank contacts.

After the last impulse of this series, C restores (not having restored while its circuit is interrupted during impulsing on account of its slow release action); removes the ground from lead #17, thus opening the starting circuit to a relay in the relay and repeating coil equipment; opens the starting circuit to E; removes a guarding short circuit from the winding of D; and closes the circuit to the rotary magnet from ground at B thru the make contact of E. The rotary magnet operates; steps the wipers in onto the bank contacts associated with the first trunk on the called level; and opens the circuit to E. E restores and opens the circuit to the rotary magnet.

If the first trunk is busy (the private bank contact P-2 associated with a trunk is grounded when the trunk is busy), E, on restoring, does not remove the short circuit from the winding of D as a short circuit is now completed from ground on the private wiper P.W. thru the back contacts of F and D. As soon as the rotary magnet restores, the circuit to E is closed from ground on the private wiper P.W. thru the back contacts of F and D, the rotary magnet springs and the off normal springs. E operates; locks itself from ground at F as previously explained; and closes the circuit to the rotary magnet from ground at B thru the back contact of C. The rotary magnet operates; steps the wipers to the bank contacts associated with the next trunk; and opens the circuit to E. If this trunk is also busy, the same cycle of operations is repeated until a free trunk is found or the wipers pass off the bank contacts associated with the tenth trunk.

A  $\frac{1}{2}$  M.F. condenser in series with a 10 ohm resistance to ground, connected to one side of the winding of the rotary magnet, prevents excessive sparking at the contacts of E thru which the circuit to the



ROTARY  
SPARK  
COIL

rotary magnet is taken.

The 1300 ohm non-inductive resistance, wound on top of and in multiple with the winding of E, prevents excessive sparking at the rotary magnet springs.

RELAY  
D

If a free trunk is found, the circuit to B is closed (since its winding is no longer short circuited by ground on the private wiper P.W.), as soon as the rotary magnet restores, from ground at B thru the cam springs, the rotary magnet springs, the off normal springs and the winding of E to battery. E, however, on account of its stiff spring adjustment, does not operate in series with D. D operates in series with E; opens a part of the incomplete impulsing circuit to the vertical magnet; grounds the private wiper P.W. from ground at B thru the back contact of F, to protect the seized trunk from intrusion and to hold the selected connector in its operated position after it cuts thru onto the called line; closes the loop circuit to the switch ahead thru the make contact of A and the circuit of the relay and repeating coil equipment; and switches the ground on lead #5 from ground at B to ground over the private wiper P-1.

## IMPULSING

At each interruption of the circuit at the dial as the next series of impulses comes in, A, on restoring, opens the loop circuit to the switch ahead and opens the circuit to B.

REPEATING  
IMPULSES

As A operates, in response to the impulses from the dial, it opens and closes the loop circuit to the switch ahead, thus causing the switch ahead to complete the desired connection.

After the toll operator completes the dialing of the called party's number, the relay and repeating coil equipment associated with this switch, switches the circuit to A so that both its windings are energized in series over leads #1 and #2.



2-18-23

O-71705-E

Revised

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## RELEASING

When the toll operator releases the connection, the circuit to A is opened. A restores and opens the circuit to B. B, on restoring, opens the circuit to D, thus allowing D to restore; removes the ground from the private wiper P.W., to allow the selected connector to release; removes the ground from the release trunk, to allow the switches in back of this switch to release and to make this switch available to the selectors; closes the circuit to F from ground at A thru the off normal springs; and closes the circuit to the release magnet from ground at A thru the off normal springs to battery over the release signal lead. F operates; disconnects E from the private wiper P.W., to prevent unnecessary operation of E as the private wiper P.W. passes over grounded bank contacts; places a 5000 ohm resistance coil in the circuit to the negative winding of A, to prevent the discharge of a condenser in the relay and repeating coil equipment from operating A; locks itself from ground at its make contact thru the off normal springs; and closes the guarding circuit to the release magnet thru the off normal springs. The release magnet operates (when its circuit is closed at B) and releases the switch. As soon as the shaft returns to normal, the off normal springs are returned to normal. The off normal springs remove ground from lead #15 and open the circuits to F and the release magnet.

RELAY  
FRELEASE  
SPARK  
COIL

A 500 ohm non-inductive resistance, wound on top of and in multiple with the winding of the release magnet, prevents excessive sparking at the off normal release springs.

RELEASE  
SIGNAL  
RELAY

The battery to the release magnet is taken thru a relay, associated with the shelf, so that if for any reason the circuit to the release magnet remains closed, an alarm will be given. This release signal relay is slow acting so that in case the number of calls is to



12-18-23  
CO-71705-E  
Revised  
Issue #7

ALL  
TRUNKS  
BUSY

CAM  
SPRINGS

BUSY  
TONE

RELEASING

be registered, a meter can be operated.

If a free trunk is not found, the shaft on the eleventh rotary step operates the cam springs. The cam springs open a part of the incomplete circuit to D, to prevent D from operating when ground is removed from the private wiper P.W. and replace the direct ground or ground thru 400 ohms resistance to the negative winding of A, as the case maybe, with a ground upon which is superimposed the busy tone, to inform the toll operator that all the trunks are busy. When the toll operator releases the connection, the circuit to A is opened. A restores and opens the circuit to B. B, on restoring, removes the ground from lead #5, thus opening the locking circuit to a relay in the relay and repeating coil equipment; removes the ground from the release trunk, to allow the switches in back of this switch to release and to make this switch available to the selectors; and closes the circuits to F and the release magnet as previously explained. F operates and performs the functions previously explained. The release magnet operates and releases the switch. As soon as the shaft returns to normal, the off normal springs are restored to normal. The off normal springs remove ground from lead #15 and open the circuits to F and the release magnet.

FLASHING  
BUSY  
SIGNAL

When flashing busy signal is used in the place of audible busy signal, omit connection to overflow busy. When all the trunks on the called level of this switch are busy and flashing busy signal is used, the shaft of this switch restores to normal. The restoring of the shaft of this switch to normal is caused by the opening of the circuit to A at the cam springs, which allows A to restore and open the circuit to B. B restores; removes the ground from the release trunk to allow the switches in back of this switch to release and to make



this switch available to the selectors; and releases this switch in the regular manner. The flashing busy signal received by the toll operator when all the trunks on the called level of this switch are busy is caused by certain trunk equipment in the toll board. The functioning of the trunk equipment in the toll board is caused by the momentary removal of battery from the toll trunk.

FIGURE  
#3

When this switch is used with relay and repeating coil equipment which provides a ringing control feature by means of which the ring cut-off feature is not under the control of the toll operator (as in circuit 28472-X), connect release trunk to jack #9 of relay and repeating coil equipment and omit conductor #18.

NOT FOR PUBLICATION

KWG:RD - Revised by JHV

APPROVED	SHOP _____	CIRCUIT EXPLANATION OF TOLL TRANSMISSION SELECTOR CIRCUIT 18781-A      ISSUE #24	
	ENG. DEPT. _____		
	DRAFT DEPT. _____		
AUTOMATIC ELECTRIC CO. CHICAGO, ILL.		PAGE 7 FINIS	E-18781-A