METHOD OF OPERATION
CORD CIRCUIT

Sender Monitoring Position - With Coin Collect Feature - Arranged to Provide
Talking Battery to Subscribers When Required - Trouble Leak - Full Mechanical
Power Driven System.

GENERAL DESCRIPTION

1. This circuit is used in a mechanical exchange at the sender monitoring
position with time measure and monitoring alarm circuits whose sleeves are
grounded through a maximum resistance of 1050 ohms, and with plugging up line
circuits whose sleeves are connected directly to ground and to ground through
1050 ohms. The circuit is arranged to provide talking battery to subscribers,
when required; to give supervision at the sender monitor's position on all
connections; to trip machine ringing without operating the message register
of the calling subscriber; to flash on manual connections, and for coin collect
and refund. The circuit is arranged so that in the event the operator flashes
through error on a call originating at a mechanical office, the subscriber will
not be charged.

DETAILED DESCRIPTION

SENDER TEST

2. When the plug of the cord is inserted in the test jack of a sender in
answer to a lighted sender lamp, the MG relay does not operate due to the high
resistance of the sender jack sleeve circuit, but the SV relay operates and
lights the supervisory lamp. If a subscriber's station is connected to the line,
or ring-side of the line is grounded, or the line is short-circuited, a cir-
cuit is closed from battery through the 60 ohm winding of the S relay, break
contact of the MG-1 relay, winding of the repeating coil, over the ring side
of the line, through the direct current bridge, to ground and in the forms:
case back over the tip side of the line, through the repeating coil, and the
break contact of the MG-1 relay to ground, operating the S relay, extinguishing
the supervisory lamp. When the plug of the cord is withdrawn from the test
jack, the SV relay releases restoring the circuit to normal.

INCOMING FROM LONG DISTANCE

3. If the cord is used in connection with long distance trunks, the
plug of the cord is inserted in the switchboard jack of a plugging up line
operating the SL and MG relays in series. The operation of the SLV relay
lights the cord supervisory lamp. The operation of the MG-1 relay closes a
circuit from ground on its armature, through its make contact, to battery
through the winding of the MG-1 relay, which operates and closes a circuit from
battery through the 850 ohm winding of the S relay, make contact of the MG-1
relay, winding of the repeating coil, over the tip side of the cord and trunk,
to ground in the long distance trunk circuit operating the S relay. The oper-
vation of the S relay extinguishes the supervisory lamp. When ground is dis-
connected from the tip side of the long distance trunk, the S relay re-
leases in turn lighting the supervisory lamp as a disconnect signal. When the
plug of the cord is withdrawn from the trunk jack, the SL and MG relays re-
lease, in turn releasing the MG-1 relay and restoring the circuit to normal.

INCOMING FROM LOCAL:

4. When the plug of the cord is inserted in the switchboard jack of
a ringing up line in answer to an incoming call, the EL and MG relay
operate. The EL relay operated, closes a circuit to light the supervisory
lamp from battery through the lamp, make contact of the EL relay, to ground
on the break contact of the S relay. The MG relay operated, close-
circuit through the winding of the MG-1 relay which operates, and also re-
moves the short circuit from the 18-AF resistance.

5. The talking key should be adjusted so that the make contact springs
"A" should make before contact B. When the talking key is operated, a cir-
cuit is closed from battery through the operating winding of the TP relay,
break contact of the CO relay, make contacts (B) of the listening key, to ground
on the make contact of the S relay, causing the TP relay to relay to operate,
The operation of the TP relay closes a circuit for the TP-1 relay to operate
under control of the interrupter. This circuit is traced from battery through
the winding of the TP-1 relay, break contact of the TP-2 relay, make contact
of the TP relay make contact of the interrupter to ground on the break contact of
(F) relay. The TP-1 relay operated, short circuits the TP-2 relay from ground on
the armature of the TP relay, through its make contact, make contact of the TP-1
relay, to one side of the winding of the TP-2 relay, the other side of the
winding being connected to ground on the make contact of the interrupter. When
the contacts on the interrupter open, ground is removed from one side of the
winding of the TP-2 relay, causing it to operate in series with the TP-1 relay.

The operation of the TP-2 relay closes a circuit from ground on the interrupter
through its armature and make contact, break contact of the CO relay, make con-
tact of the SLV relay, to battery through the winding of the CN relay which oper-
ates at the next "make" of the contacts of the interrupter. The operation
of the CN relay connects the 500 ohm 18-AF resistance across the tip and ring
of the cord, tripping the machine ringing current in the selector circuit.

The operation of the CN relay also closes a circuit from ground on the armature
and make contact of the TP-2 relay, make contact of the CN relay to battery through
the winding of the TF relay which operates. When the contact of the interrupter
breaks, the CN relay releases, but the TF relay does not release, being held
operated in a circuit traced from battery through the winding and make con-
tact of the TF relay, break contact and winding of the CO relay, to ground
on the make contact of the SLV relay, causing the CO relay to operate. The
CO relay operated looks to battery on its armature through its make contact.

It also closes a holding circuit for the TF relay which is traced from ground on
the make spring of the talking key, through 500 ohm 18-AF resistance,
make contact of the CO relay, to battery through the winding of the TF relay.
The operation of the CO relay opens the holding circuit through the TP relay,
which releases in turn releasing the TP-1 and TP-2 relays, and transfers the
ground on the armature and make contact of the F relay, to the sleeve lead
of the operator's telephone circuit.

6. If it is desired to flash over a trunk to a manual office, the
flashing key is operated and released in the usual manner. With the first
operation of the flashing key, ground is connected through the make contacts
of the key, to battery through the winding of the F relay which operates. The
F relay is made slow to release in order to give a uniform flash on the super-
visory lamps in the manual office. The operation of the F relay closes a
circuit from ground on the make contact and armature of the F relay; through
the make contact of the TF relay to battery through the winding of the CN re-
lay which operates. The operation of the CN relay disconnects the tip and ring
of the cord from the repeating coil and connects them to the 300 ohm 13-AF
resistance. As the key is operated and released, the bridge across the tip
and ring of the cord is made and broken, causing the supervisory relay at the
distant end of the connection to flash the supervisory lamp. If the flashing
key is normal, the CN relay is held operated due to the slow release of the F
relay. When the flashing key is in the operated position, the tip and ring
of the cord is connected through the make contacts of the CN relay, the make
contacts of the flashing key, to the TF and TP leads of the operator's tele-
phone circuit, thereby allowing the operator to hear the distant operator's
challenge.

7. The maximum period during which the 13-AF resistance can remain
across the line is equal to the time required to release the F relay. This
period is not sufficient to make a charge on a call originating in a mechanical
office in case the operator, through error, should flash on a mechanical conne-
tion.

COIN COLLECT AND COIN REFUND

8. To collect a coin, the CC key is operated closing a circuit from
ground through the contact of the key, to battery through the winding of the
CN relay which operates. The operation of the CN relay, the coin collect key
being operated, connects 110 volts positive battery to the tip and ring of the
cord and line operating the coin collect magnet in the subscriber's set. The
coin is returned, by operating the coin refund key, operating the CN relay as
before, but connecting 110 volt negative battery to the tip and ring of the
cord. This circuit is traced from 110 volts battery through the contacts of
the coin refund key, the make contact of the CN relay and over the tip side
of the cord, the circuit on the ring side of the cord being closed through
the make contact of the flashing key, the 118-AF resistance, make contact of the
CN relay to the ring side of the line. The CN relay is made slow in releasing
so that when the coin collect or coin return circuit is opened, the arcing will
take place at the key contacts rather than at the relay contacts. The 19-BF
resistance and 2 M.F. condenser are provided to absorb the spark when the cir-
cuit is opened at the relay contacts in the subscribers set upon the collection
or return of the coin.
9. When the talking key is restored to normal, and the plug of the cord withdrawn from the jack of the trunk, all operated relays are released and the circuit is restored to normal.
### Circuit Requirements

<table>
<thead>
<tr>
<th>Component</th>
<th>Operate</th>
<th>Non-Operate</th>
<th>Heafpage</th>
</tr>
</thead>
<tbody>
<tr>
<td>B164 (s)</td>
<td>After a soak of approximately .100 amp.</td>
<td>Test .021 amp.</td>
<td>Readj. .014 amp.</td>
</tr>
</tbody>
</table>

**NOTE:** Adjust straight outside spring of the make-break combination to give at least 20 grams pressure against its back contact spring.
**CIRCUIT REQUIREMENTS**

<table>
<thead>
<tr>
<th>OPERATE</th>
<th>NON-OPERATE</th>
<th>RELEASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>E663</td>
<td>Test .040 amp.</td>
<td>Test .020 amp.</td>
</tr>
<tr>
<td>CK</td>
<td>Readj. .038 amp.</td>
<td>Readj. .022 amp.</td>
</tr>
<tr>
<td>E691</td>
<td>Test .050 amp.</td>
<td>Test .0015 amp.</td>
</tr>
<tr>
<td>(TP)</td>
<td>Readj. .024 amp.</td>
<td>Readj. .005 amp.</td>
</tr>
<tr>
<td>(Inner 500 ohms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Outer 500 ohms)</td>
<td>Test .040 amp.</td>
<td></td>
</tr>
<tr>
<td>149-P (F)</td>
<td>Shall operate and hold when the current through the relay winding is interrupted on 1/3 second make and 1/3 second break time intervals.</td>
<td>Shall operate and release (follow the pulses) when current through the relay winding is interrupted on 1/2 second make and 1/2 second break time intervals.</td>
</tr>
<tr>
<td>Test .019 amp.</td>
<td>Test .018 amp.</td>
<td></td>
</tr>
<tr>
<td>Readj. .019 amp.</td>
<td>Readj. .018 amp.</td>
<td></td>
</tr>
</tbody>
</table>

The above circuit interruptions may be obtained by using Relay Test Circuit T-438798.

**ENG.--JIS-JO.**

**CHK'D.--WCD-CWP.**

**APPROVED -- C.I. SLUYTER, G.M.L.**

8/7/32.