

SERVICE INSTRUCTIONS

FOR THE

ELECTRONIC SECRETARY

MODEL DCR - 1

Manufactured exclusively in the United States of America by
ELECTRONIC SECRETARY INDUSTRIES
805 SOUTH 5TH STREET - MILWAUKEE 4 , WISCONSIN

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Engineering Service Manual For The Electronic Secretary Model DCR-1

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ENGINEERING SERVICE MANUAL

CHAPTER 1

EXPLANATION OF GENERAL OPERATING PRINCIPLES. INCLUDING 10 DIAGRAMS

WHAT IT IS

THE ELECTRONIC SECRETARY IS AN AUTOMATIC TELEPHONE ANSWERING MACHINE, CONSISTING OF SEVERAL ELECTRONIC AMPLIFIERS WHOSE OPERATING PERIODS ARE GOVERNED BY SIMPLE ELECTRICAL-MECHANICAL SEQUENCE SWITCHING. THE HARMONIOUS CO-FUNCTIONING OF THESE BASICALLY DIFFERENT SYSTEMS PROVIDE A SIMPLE, YET COMPLETELY SATISFACTORY METHOD OF TELEPHONE ANSWERING, REQUIRING A MINIMUM AMOUNT OF ADJUSTMENT FROM ONE OPERATING CONDITION TO ANOTHER.

BASIC TIMING

BASICALLY THE TIMING DEVICE USED IN ELECTRONIC SECRETARIES TO CONTROL THE ACTIVITY SEQUENCE OF THE VARIOUS AMPLIFIERS IS THE OUTGOING MESSAGE DISC OR RECORD; AND THE RECORD PLAYER ASSOCIATED WITH IT PROVIDES THE MECHANICAL POWER FOR THE BASIC SWITCHING ACTIONS.

START AND STOP MU SWITCHES ON RECORD PLAYER

THE RECORD PLAYER HAS ATTACHED TO ITS REPEATER MECHANISM A PAIR OF VERY LOW OPERATING PRESSURE SWITCHES, WHICH CLOSE AS THE TONE ARM LOWERS ITSELF TO THE RECORD TO BEGIN A CYCLE AND OPENS AS THE TONE ARM TRAVELS THROUGH THE THROW-OUT GROOVES AND RESETS ITSELF, TO END A CYCLE. WE SEE THEREFORE THAT THE BASIC TIME-SWITCHING OPERATION OF STARTING AND STOPPING THE MACHINE IS PERFORMED BY TWO SIMPLE SWITCHES ATTACHED TO THE RECORD PLAYER, SO THE DURATION OF THE OPERATING CYCLE IS DETERMINED BY THE LENGTH OF TIME TO WHICH THE RECORD IS CUT.

WHAT IS RE- QUIRED TO START A CYCLE OF AUTOMATIC OPERATION

FROM THE ABOVE OBSERVATION WE LEARN THAT ALL THAT IS REQUIRED TO PLACE THE MACHINE INTO OPERATION WOULD BE TO APPLY CURRENT, WHEN THE TELEPHONE RINGS, TO THE RECORD PLAYER MOTOR, FOR A PERIOD LONG ENOUGH FOR IT TO CLOSE ITS OWN SWITCHES, WHICH AS WE LEARNED IN THE PRECEDING PARAGRAPH, CLOSE WHEN THE TONE ARM SETS DOWN UPON THE RECORD. THIS CURRENT OF COURSE WILL BE CUT OFF WHEN THE TONE ARM RESETS TO END THE OPERATING CYCLE.

HOW THE TELE- PHONE RING STARTS THE RE- CORD PLAYER MOTOR - TRIG- GER ACTION.

TO COMPREHEND FULLY HOW THE TELEPHONE RING AUTOMATICALLY STARTS THE RECORD PLAYER, WE CAN REFER TO SCHEMATIC DIAGRAMS S AND S₁. YOU WILL NOTE THAT DIAGRAM S₁ IS MERELY A PART OF DIAGRAM S, WHICH HAS BEEN LITERALLY LIFTED OUT OF THE COMPLETE SCHEMATIC TO SHOW AND ISOLATE THE TRIGGERING ACTION. LOOKING AT S₁ CLOSELY, WE SEE THAT ONE SIDE OF THE TELEPHONE TERMINAL BLOCK IS CONNECTED THROUGH A 2 MICROFARAD CONDENSER TO A SELENIUM BRIDGE RECTIFIER, AND THE OTHER SIDE OF THE TELEPHONE LINE IS CONNECTED THROUGH THE NORMALLY CLOSED CONTACTS 3a, THROUGH A 100 OHM FUSING RESISTOR TO THE OTHER INPUT POINT OF THE SELENIUM BRIDGE. THE OUTPUT OF THE BRIDGE RECTIFIER FEEDS A 2500 OHM D.C. RELAY THROUGH A METERING JACK. IT IS THIS RELAY, R₁ WHOSE CONTACTS APPLY CURRENT TO THE RECORD PLAYER MOTOR WHENEVER THE RELAY IS ENERGIZED BY THE RECTIFIED RINGING CURRENT OF THE TELEPHONE.

SEE DIA. S AND S₁

RELAY CONTACTS INVOLVED: 3a

RELAY CON-
TACT OF RELAY
1 SWITCHES
115 V.A.C.
TO RECORD
PLAYER MOTOR

IF WE NOW REFER MOMENTARILY TO DIAGRAM S₆ WE CAN SEE HOW CURRENT FROM THE HOT SIDE OF THE POWER LINE, TRAVELS THROUGH THE 3 AMPERE FUSE, POWER SWITCH CONNECTED TO THE VOLUME CONTROL SHAFT, SAFETY TIMER SWITCH, NORMALLY CLOSED CONTACT OF RELAY CONTACT 7a, THROUGH THE CONTACTS OF RELAY 1 WHEN CLOSED TO PIN 3 OF THE 4 PIN JONES PHONO MOTOR SOCKET. PIN 3 THROUGH THE PLUG THAT FITS THIS SOCKET LEADS TO THE HOT SIDE OF THE RECORD PLAYER MOTOR. THIS ACTION OF CONTACT OF RELAY 1 CLOSING IS CALLED 'TRIGGERING' AND RELAY 1 IS CALLED THE TRIGGERING RELAY.

ELECTRICAL
ACTION OF THE
MU-SWITCHES
ON THE RECORD
PLAYER.

WE HAVE NOW SEEN THE ELECTRICAL EFFECT OF RELAY 1 IN STARTING THE RECORD PLAYER AND THE ACTION OF THE LOW PRESSURE MU-SWITCHES IN CLOSING, THUS STARTING A CYCLE. THE EFFECT OF CLOSING THESE TWO SWITCHES IS TO SHORT PINS 1 TO 3 AND 3 TO 4 ON THE 4 PIN PHONO MOTOR SOCKET (REFER TO DIAGRAM S₆). THIS ACTION IN EFFECT ADVANCES CURRENT FROM THE HOT SIDE OF THE LINE ACROSS THE CONTACTS OF RELAY 1 TO HOLD THE RECORD PLAYER MOTOR IN CONTINUOUSLY, AND THE SHORTING OF PINS 3 TO 4 OF THE SECOND RECORD PLAYER MU SWITCH ADVANCES CURRENT TO THE COILS OF RELAY 3 AND RELAY 6. YOU WILL NOTE FROM DIAGRAM S OR S₆ THAT THE COILS OF THESE TWO RELAYS GET THEIR NEUTRAL FEED THROUGH THE NORMALLY CLOSED CONTACTS OF RELAY 8a. IN THE PLAY-BACK POSITION OF THE MASTER CONTROL SWITCH. CURRENT WILL OF COURSE BE BROUGHT TO THE COIL OF RELAY 8 AND THE PATH TO RELAYS 3 AND 6 WILL BE BROKEN.

HOW THE MA-
CHINE ANSWERS
THE PHONE

FUNCTION OF
RELAY 3

WE SEE HOWEVER THAT IN THE AUTOMATIC POSITION CLOSING OF THE CONTACTS OF RELAYS 3 AND 6 WILL IN EFFECT ANSWER THE PHONE IN THE FOLLOWING MANNER: REFERRING TO DIAGRAM S, WE SEE THAT IN THE STAND-BY AUTOMATIC POSITION, CONTACT 3a OF RELAY 3 IS CONNECTING ONE SIDE OF THE TELEPHONE LINE TO THE SELENIUM RECTIFIER BRIDGE, WHILE RELAY CONTACT 3b IS CONNECTING THE OUTPUT OF THE AUDIO OUTPUT TRANSFORMER TO THE LOUDSPEAKER VOICE COIL. WHEN RELAY 3 IS ENERGIZED HOWEVER, THESE NORMALLY OPEN CONTACTS CLOSE AND THE EFFECT ON CONTACT 3a IS TO LEAD FROM ONE SIDE OF THE INPUT LINE TRANSFORMER TO ONE SIDE OF THE TELEPHONE LINE, WHILE AT THE SAME TIME CONTACT 3b WILL SWITCH ONE SIDE OF THE AUDIO OUTPUT TRANSFORMER, AND THE LINE INPUT TRANSFORMER WITH THEIR SECONDARIES IN SERIES WILL BE THROWN ACROSS THE TELEPHONE LINE. THE EFFECT OF THIS LOADING WILL BE THE SAME AS ANSWERING THE PHONE IN THE CONVENTIONAL MANNER.

FUNCTION OF
RELAY 6

THE FUNCTION OF RELAY 6 IN THIS OPERATION IS TWOFOLD. CONTACT 6a OPENS AT THIS TIME TO REMOVE AN .01 BY-PASS CONDENSOR FROM THE PLATE OF THE 6AQ5 TUBE, AS THIS CONDENSOR WHILE DESIRABLE IN THE PLAYBACK OPERATION OF THE AMPLIFIER TENDS TO MUFFLE THE SPEECH DURING THE OUTGOING MESSAGE PHASE OF AUTOMATIC OPERATION. RELAY CONTACT 6b CLOSES ALSO AT THIS TIME TO SUPPLY D.C. VOLTAGE TO RELAY 2 AND THE 6AU6 TUBE ASSOCIATED WITH ITS OPERATION.

AT THIS POINT WE ARE NOW IN CYCLE AND TRANSMITTING AN OUTGOING MESSAGE. THE OUTGOING MESSAGE PATH CAN BE SEEN CLEARLY IN DIAGRAM S₂, OUTGOING MESSAGE AND CR ACTION. TO FULLY UNDERSTAND THIS ACTION WE CAN TAKE A PENCIL AND FOLLOW A SIGNAL FROM THE PHONOGRAPH RECORD AS IT ENTERS THE AMPLIFIER AT A POINT

HOW THE REC-
ORD PLAYER
TRANSMITS
THE OUTGOING
MESSAGE OVER
THE TELEPHONE

MARKED PHONO TIP JACK ON DIAGRAM S₂. THE SIGNAL IS CARRIED THRU THE NORMALLY CLOSED CONTACT OF RELAY 5b TO THE GRID OF THE 12AX7 (SECOND SECTION) THROUGH ONE SECTION OF THE 12AU7 FROM WHERE IT TRAVELS THROUGH THE OUTGOING MESSAGE VOLUME CONTROL POTENTIOMETER AND THE NORMALLY CLOSED SECTION OF RELAY CONTACT 8d TO THE OUTPUT TUBE 6AQ5. FROM THE OUTPUT OF THIS TUBE IT TRAVELS THROUGH THE TWO SECONDARIES OF THE OUTPUT AND INPUT TRANSFORMER IN SERIES AND IS IMPRESSED ON THE TELEPHONE LINE THROUGH THE CONTACTS OF RELAY 3 NOW CLOSED.

THE CR ACTION
HOW IT WORKS

WE ARE NOW SENDING OUT AN OUTGOING MESSAGE IN WHICH THE ANSWERING MACHINE FIRST IDENTIFIES ITSELF TO THE CALLING PARTY, EVENTUALLY DIRECTING HIM TO LEAVE HIS MESSAGE IN SOME SUCH MANNER AS, "AT THE END OF THE TONE SIGNAL, PLEASE BEGIN SPEAKING." NOW LET US REFER TO DIAGRAM S₂ TO STUDY WHAT HAPPENS AS THIS DIRECTIVE IS GIVEN, BOTH ELECTRONICALLY AND ELECTRICALLY. FIRST OF ALL, RETRACING THE AUDIO PATH THROUGH THE NORMALLY CLOSED CONTACTS OF RELAY 5b TO THE GRID OF THE SECOND SECTION OF VOLTAGE AMPLIFIER TUBE 12ax7 TO AND THROUGH THE SECOND VOLTAGE AMPLIFIER TUBE 12AU7. THE OUTPUT PLATE OF THE 12AU7 FEEDS UP TO A JUNCTION POINT, WHERE IT GOES IN ONE DIRECTION THROUGH AN .01 CONDENSOR TO THE AUDIO OUTPUT STAGE 6AQ5 AND THROUGH AN .001 CONDENSOR TO THE RELAY TUBE 6AU6. IT IS THE FUNCTION OF THIS LATTER TUBE IN WHICH WE ARE NOW INTERESTED, IN ORDER TO OBTAIN "CR ACTION" WHICH IN ORDINARY ENGLISH MEANS:

WHAT IT DOES

- A. STARTING AND STOPPING THE WIRE RECORDER MECHANISM AT THE PROPER TIME.
- B. MUTING THE OUTGOING MESSAGE AT THE PROPER TIME SO THAT THERE WILL BE NO BACKGROUND NOISE FROM THE OUTGOING MESSAGE AMPLIFIER IN THE RECORDINGS.
- C. SWITCHING PLATE VOLTAGE TO THE RECORD PRE-AMPLIFIER TUBE (12AU7) AND THE OSCILLATOR TUBE (6AQ5). REFER TO DIAGRAM S₃.

ELECTRONIC
AND ELECTRICAL
OPERATION
OF CR.

NOW THESE FUNCTIONS OF THE CR ACTION ARE ACCOMPLISHED AS FOLLOWS. ALL AUDIO IMPULSES LEAVING THE RECORD DISC WILL SHOW UP AT BOTH THE INPUT OF THE 6AQ5 AUDIO OUTPUT STAGE AND AT THE INPUT OF THE 6AU6 RELAY TUBE STAGE. HOWEVER THE EFFECT ON THE RELAY TUBE STAGE WILL BE TO ENERGIZE THE RELAY R₂ FOR RELATIVELY SHORT INTERVALS. THIS ACTION WILL ALLOW THE CONTACTS OF R₂ TO CLOSE MOMENTARILY AND PLACE 115 V.A.C. ON THE CR MOTOR SHOWN IN DIAGRAM S₆. WE SEE FROM THIS DIAGRAM THAT THIS POWER IS OBTAINED FROM PIN 4 OF THE PHONO MOTOR SOCKET, WHICH NOW HAS POWER, SINCE THE MACHINE IS IN CYCLE. HOWEVER SINCE THE SMALL MOTOR SHAFT IS SPRING LOADED, IT CANNOT ADVANCE FAR BEFORE THE POWER IS AGAIN REMOVED. HOWEVER, WHEN THE STEADY TONE IS EMITTED FROM THE RECORD, THE RELAY R₂ WILL HOLD IN STEADILY FOR THE DURATION OF THE TONE, WHICH IS THE ALLOTTED RECORDING PERIOD. THIS ADVANCES THE MOTOR AND CAM UNTIL IT STALLS AGAINST THE MU SWITCH WHICH IS ATTACHED TO THE MOTOR AND CAM ASSEMBLY. THE MU SWITCH BRINGS 115 V.A.C. TO THE WIRE RECORDER MOTOR AND ALSO TO THE COILS OF RELAY 4 AND RELAY 9 THROUGH THE CLOSED CONTACTS OF RELAY 7b. THE ENERGIZING OF RELAYS 4 AND 9 DOES THE FOLLOWING. REFERRING BACK TO DIAGRAM S₃ AND THE GENERAL SCHEMATIC DIAGRAM S, WE CAN FOLLOW

ELECTRICAL
OPERATION
OF CR.

THE SPECIFIC ACTION OF THESE TWO RELAYS, AND THEIR RESULTANT COMPLETION OF THE CR ACTION.

RELAY 4 AND 9

THEIR FUNCTION IN THE CR ACTION.

HOW MACHINE RESETS TO END A CYCLE OF AUTOMATIC OPERATION

THE MACHINE DROPS OUT OF THE AUTOMATIC CYCLE.

THE PLAYBACK ACTION

ACTION OF RELAY CONTACT 5b.

AS RELAY 4a IS ENERGIZED ITS CONTACTS, SWITCH THE WIRE RECORDER HEAD LEAD (PIN 4 ON AMPHENOL CONNECTOR) FROM THE GRID OF THE PLAYBACK AMPLIFIER 12AX7 TO THE OUTPUT OF THE RECORDING PREAMPLIFIER 12AU7. THIS CIRCUIT IS MADE THROUGH AN EQUALIZING NETWORK, WHICH CONSISTS OF A 56,000 OHM RESISTOR SHUNTED BY A .001 CONDENSOR, THE EQUALIZING NETWORK IN SERIES WITH A .1 COUPLING CONDENSOR COMPLETES THE PATH BETWEEN THE HEAD AND THE PLATE OF THE 12AU7. AT THE SAME TIME RELAY CONTACT 4b IS COMPLETING A B PLUS CIRCUIT TO THE PLATE RETURN OF THE 12AU7 RECORDING PREAMP TUBE AND THE 6AQ5 OSCILLATOR TUBE TO SUPPLY PLATE CURRENT TO BOTH OF THEM. SIMULTANEOUSLY WITH THIS ACTION RELAY CONTACT 9b IS CLOSING A CIRCUIT FROM ONE SIDE OF THE OSCILLATOR COIL SECONDARY TO THE OSCILLATOR SECTION OF THE RECORD HEAD (PIN 3 OF RECORDING HEAD CONNECTOR). THE STAGE IS NOW SET FOR RECORDING INCOMING MESSAGES AND THIS PHASE OF THE AUTOMATIC CYCLE WILL BE TERMINATED, WHEN THE TONE SIGNAL CEASES ON THE RECORD. WHEN THIS OCCURS, RELAY 2 DROPS OUT ALLOWING THE CR MOTOR AND CAM TO RETURN; THUS OPENING THE CR MU SWITCH. (SEE DIAGRAM S₆). THIS STOPS THE WIRE RECORDER MOTOR, DE-ENERGIZES RELAYS 4 AND 9, THUS RESTORING THE ACTIVITY OF THE OUTGOING MESSAGE AMPLIFIER AND TERMINATING THE RECORD AND ERASE CONDITIONS. THE CLOSING MESSAGE NOW COMES OFF THE RECORD DISC AND THE TONE ARM FINALLY TRAVERSES THE THROW-OUT GROOVES OF THE RECORD AND THE RECORD PLAYER RESETS ITSELF. THIS RESET ACTION OF COURSE, DROPS OUT THE TWO MU SWITCHES ATTACHED TO THE RECORD PLAYER (SEE S₆) AND THE CONTINUITY OF POWER FLOW FROM PIN 1 TO 3 TO 4 ON THE PHONO MOTOR SOCKET IS BROKEN. THIS, OF COURSE, DE-ENERGIZES RELAYS 3 AND 6. RELAY CONTACTS 3a AND 3b OF COURSE, REMOVE THE LOAD OF THE INPUT AND OUTPUT LINE TRANSFORMER FROM THE LINE AND RESTORE THE TRIGGER CIRCUIT TO THE CONDITION OF STANDBY. RELAY CONTACT 6a WHICH WHEN ENERGIZED, COMPLETES A NEGATIVE RETURN TO THE PLATE POWER SUPPLY. NOW UPON DE-ENERGIZATION, WILL RECONNECT A PLATE BYPASS CONDENSOR TO GROUND THROUGH A 250 PHM DROPPING BIAS RESISTOR. THIS BYPASS FOR ALL PRACTICAL PURPOSES IS SATISFACTORILY CLOSE TO GROUND. WE HAVE REMOVED THE SOURCE OF PLATE CURRENT BY BREAKING THE NEGATIVE RETURN TO THE POWER SUPPLY FOR STANDBY CONDITIONS. RELAY CONTACT 6b CLOSED DURING THE AUTOMATIC OPERATION CYCLE, OPENS AGAIN TO REMOVE THE SOURCE OF DIRECT CURRENT FROM CR RELAY R₂ AND THE CR TUBE 6AU6. WE HAVE NOW COMPLETED AN AUTOMATIC CYCLE AND ARE AWAITING ANOTHER CALL.

TO COMPREHEND FULLY THE CONDITIONS OF PLAYBACK, WE CAN REFER ADVANTAGEOUSLY TO DIAGRAMS S₄ AND S₆. ELECTRONICALLY, WE SEE THAT SMALL VOLTAGES GENERATED BY PASSING MAGNETICALLY TREATED WIRE THRU THE SLOT IN THE RECORDING HEAD, WILL BE FED THROUGH AN .01 CONDENSOR INTO THE FIRST PLAYBACK PRE-AMPLIFIER WHICH IS A SECTION OF A 12AX7 TUBE. LEAVING THE OUTPUT OF THIS VOLTAGE AMPLIFIER TUBE, THE SIGNAL REACHES THE HIGH SIDE OF A 500,000 OHM VOLUME CONTROL, WHOSE MOVABLE ARM IS NOW SWITCHED INTO THE GRID CIRCUIT OF THE SUCCEEDING TUBE BY THE ACTION OF RELAY CONTACT 5b, WHICH IS ONE OF THE RELAY CONTACTS AFFECTED BY PLACING THE MAIN CONTROL SWITCH INTO EITHER THE REWIND OR PLAYBACK POSITIONS. THE ACTION OF 5b HAS NOW MADE THE VOLUME CONTROL AVAILABLE AS A PLAYBACK VOLUME CONTROL

AND IT IS LOCATED FOR CONVENIENCE ON THE FRONT PANEL OF THE MACHINE. THE SIGNAL CONTINUES ON THROUGH THE SECOND SECTION OF THE 12AX7 AND THE 12AU7 AND ON TO THE JUNCTION POINT, WHERE THE 6AQ5 AND 6AU6 ARE FED. WE NOTE, HOWEVER, THAT UNDER CONDITIONS OF PLAYBACK (SEE S) RELAY CONTACT 8b WILL BE OPEN, SO THE CR RELAY AND TUBE WILL BE INOPERATIVE. NORMALLY CLOSED RELAY CONTACT 8a WILL, HOWEVER, BE CLOSED. THUS SUPPLYING PLATE VOLTAGE FOR OUTPUT TUBE 6AQ5. THE PLAYBACK SIGNAL WILL THEN PROCEED THROUGH THE NOW CLOSED CONTACT 8b, WHOSE SWITCHING ACTION TAKES THE FULL VOLTAGE FROM THE TOP CONNECTION OF THE VOLUME CONTROL POTENTIOMETER RATHER THAN THE PARTIAL DROP FROM THE ARM OF THE CONTROL. THE SIGNAL WILL THEN GO ON THROUGH THE 6AQ5 WHERE IT WILL ATTAIN A VERY HIGH LEVEL OF VOLTAGE AND POWER AND WILL TRANSFER THIS ENERGY THROUGH ITS OUTPUT TRANSFORMER, WHOSE SECONDARY WILL NOW BE CONNECTED TO THE VOICE COIL OF THE SPEAKER THROUGH THE NORMALLY CLOSED CONTACT

RELAY CONTACT
8b

RELAY CONTACT
8a

RELAY CONTACT
8b

RELAY CONTACT

3b

RELAY 3b

ELECTRICAL
OPERATION
DURING PLAY-
BACK.

TO GET THE COMPLETE PICTURE ELECTRICALLY OF PLAYBACK ACTION, WE CAN REFER TO DIAGRAMS S₅ AND S₆, WE HAVE THUS FAR ACCOUNTED FOR THE ACTION OF RELAY CONTACT 5b. AND 8b. IN THE PLAYBACK CYCLE. WE SEE FROM THE ELECTRICAL PORTION OF THE SCHEMATIC, S₆, THAT RELAYS 5, 7, AND 8 ARE INVOLVED IN THE PLAYBACK ACTION. THIS LEAVES CONTACTS 5a, 7a, 7b, AND 8a UNEXPLAINED.

FUNCTION OF
RELAYS 7, 8,
AND 8

STUDYING A DIAGRAM OF THE POWER SUPPLY S₅, WE SEE THAT CONTACT 5a PROVIDES A CLOSING OF THE NEGATIVE RETURN OF THE POWER SUPPLY ON PLAYBACK, JUST AS 6a DOES DURING THE AUTOMATIC CYCLE. CONTACT 7a IN ITS NORMALLY CLOSED POSITION, PROVIDES A PATH TO THE TRIGGER RELAY CONTACT R₁ AND THE AUTOMATIC PORTION OF THE CIRCUIT WHEN IN THE AUTOMATIC POSITION, BUT WHEN RELAY 7 IS ENERGIZED IN PLAYBACK IT BREAKS THIS PATH AND FORMS ONE TO PIN 2 OF THE RECORDER MOTOR SOCKET, WHICH IS THE WIRE RECORDER MOTOR "HOT SIDE". RELAY CONTACT 7b BREAKS THE PATH TO RELAY COILS 4 AND 9 WHEN RELAY 7 IS ENERGIZED THUS ALLOWING THE WIRE RECORDER MOTOR TO RUN WITHOUT RELAYS 4 AND 9 BEING ENERGIZED. RELAY CONTACT 8a BREAKS THE NEUTRAL TO RELAYS 3 AND 6 WHEN RELAY 8 IS ENERGIZED.

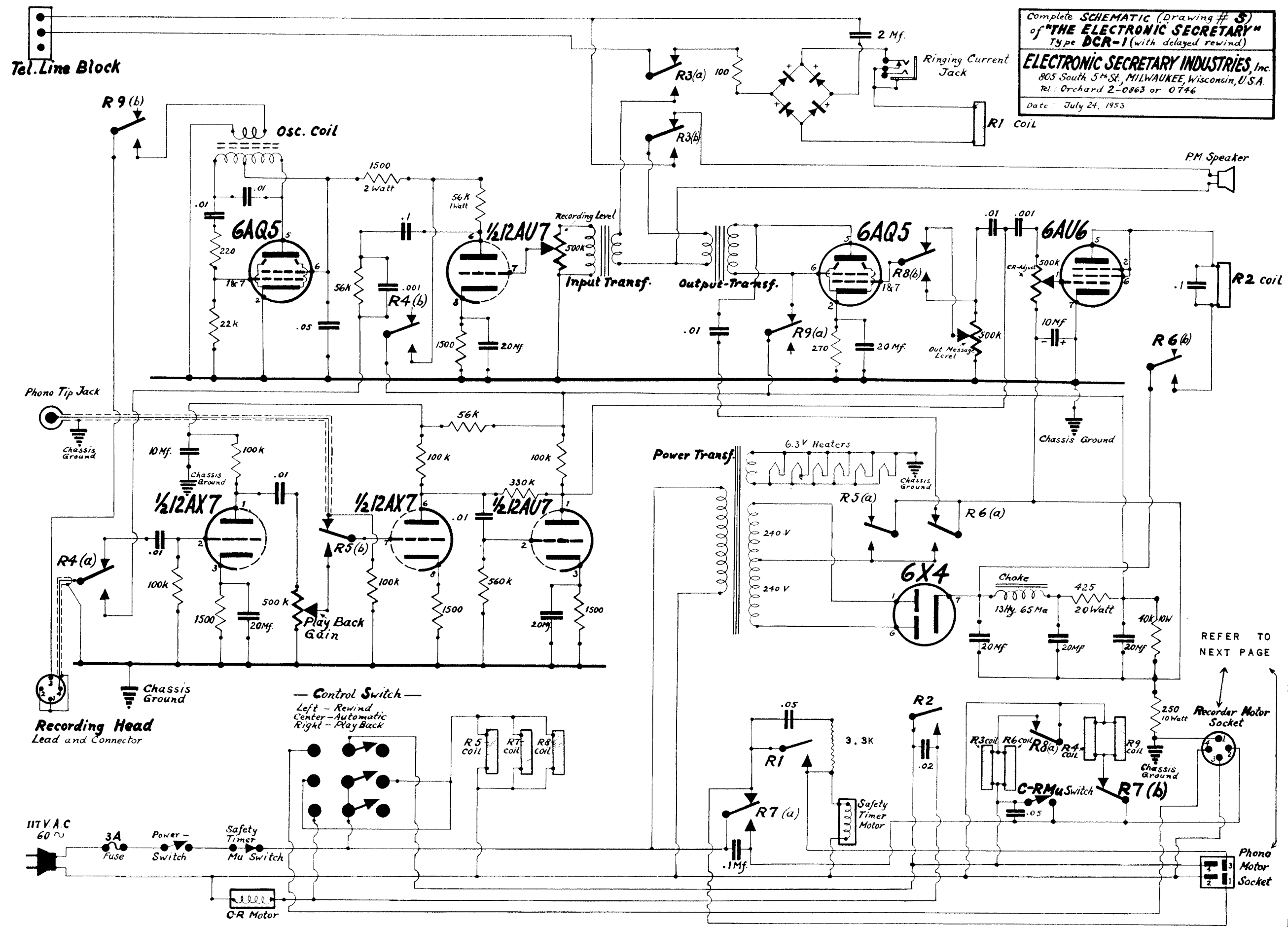
DELAYED AC-
TION OF WIRE
RECORDER
REWIND.

TO COMPLETE OUR ELECTRICAL STUDY WE MUST LEARN HOW THE CR MOTOR DEVICE IS USED IN THE REWIND CYCLE TO INTRODUCE A DELAY BEFORE THE WIRE RECORDER REVERSES ITSELF. THE PURPOSE OF THIS DELAY IS TO ALLOW THE HIGH SPEED REVERSAL TO BE INITIATED UNDER MOTOR CONDITIONS OF FULL TORQUE AND SPEED. TO FULLY COMPREHEND THIS, WE MUST BE COGNIZANT OF THE FUNDAMENTAL OPERATING PRINCIPLES OF THE WIRE RECORDER MECHANISM. THE WIRE RECORDER MOTOR OPERATES IN ONLY ONE SPEED AND IN ONE DIRECTION, BUT ITS SHAFT IS CONNECTED FRICTIONALLY TO A SYSTEM OF IDLERS TO GIVE A UNIFORM SPEED IN WHAT WE WOULD CALL THE FORWARD DIRECTION OF THE WIRE RECORDER MECHANISM. HOWEVER FOR THE PURPOSE OF REWINDING THE WIRE TO THE ORIGINAL SPOOL, THE SYSTEM OF IDLERS IS MECHANICALLY DISENGAGED AND ANOTHER SYSTEM OF HIGHER SPEED REVERSING IDLERS IS ENGAGED THROUGH THE SIMPLE LATERAL OR PULLING MOTION OF AN ELECTRICAL SOLENOID. WE SEE HOWEVER THAT WITH THE HIGHER RESULTANT SPEED OF THE REVERSING ACTION, A GREATER POWER TRANSFER FROM THE MOTOR IS NECESSARY. THEREFORE IN ORDER TO OBTAIN THE GREATER STARTING POWER REQUIRED BEFORE ENGAGING THE REVERSING IDLERS THE MOTOR IS ALLOWED TO DEVELOP ITS APPROXIMATE FULL SPEED BEFORE THE REVERSING SOLENOID IS ENERGIZED. THE ELECTRICAL PROCEDURE OF THIS IS AS FOLLOWS FROM DIAGRAM 6:

WHEN THE MAIN CONTROL SWITCH IS THROWN TO THE LEFT OR REWIND POSITION, THE CR MOTOR SHOWN AT THE LEFT OF THE DIAGRAM WILL BE ENERGIZED BY DIRECT ACTION FROM THE POWER LINE THROUGH THE MAIN CONTROL SWITCH. THIS ACTION WILL AFTER A SECOND OF DELAY, CLOSE THE CR MU SWITCH SHOWN AT THE RIGHT HAND SIDE OF THE DRAWING. THE CR MU SWITCH WILL TAKE CURRENT FROM PIN 2 OF THE RECORDER MOTOR SOCKET, NOW MADE LIVE BY THE ACTION OF 7a AND FEED IT TO THE ARM ON THE DECK OF THE MASTER CONTROL SWITCH.

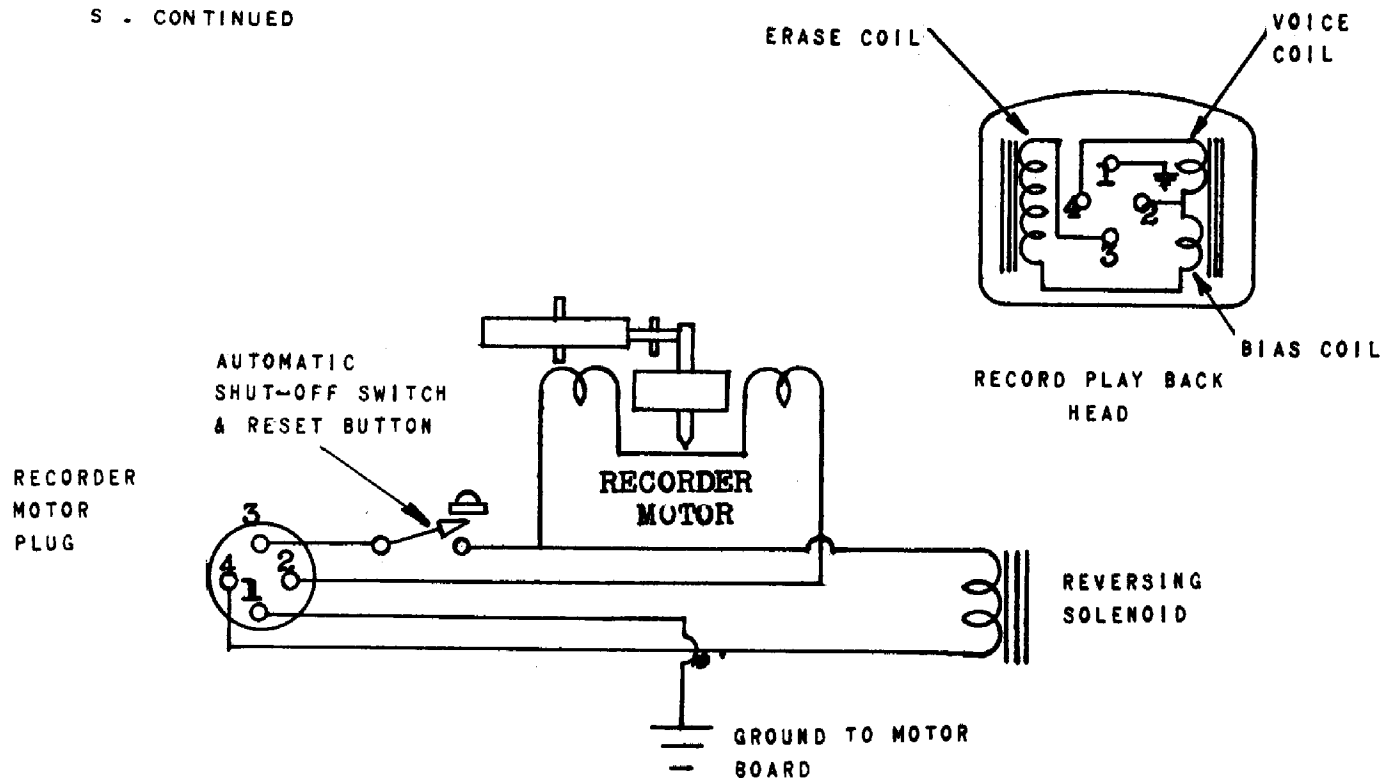
DELAYED ACTION
ON WIRE
RECORDER
REWIND.

BUT SINCE THIS SWITCH IS NOW TURNED TOWARD THE LEFT OR REWIND POSITION THE CURRENT WILL BE CARRIED BACK TO PIN 4 OF THE RECORDER MOTOR SOCKET, WHICH LEADS TO THE REVERSAL SOLENOID. THUS IN APPROXIMATELY ONE SECOND AFTER THE REWIND POSITION IS ENGAGED, THE WIRE RECORDER MECHANISM WILL REWIND.

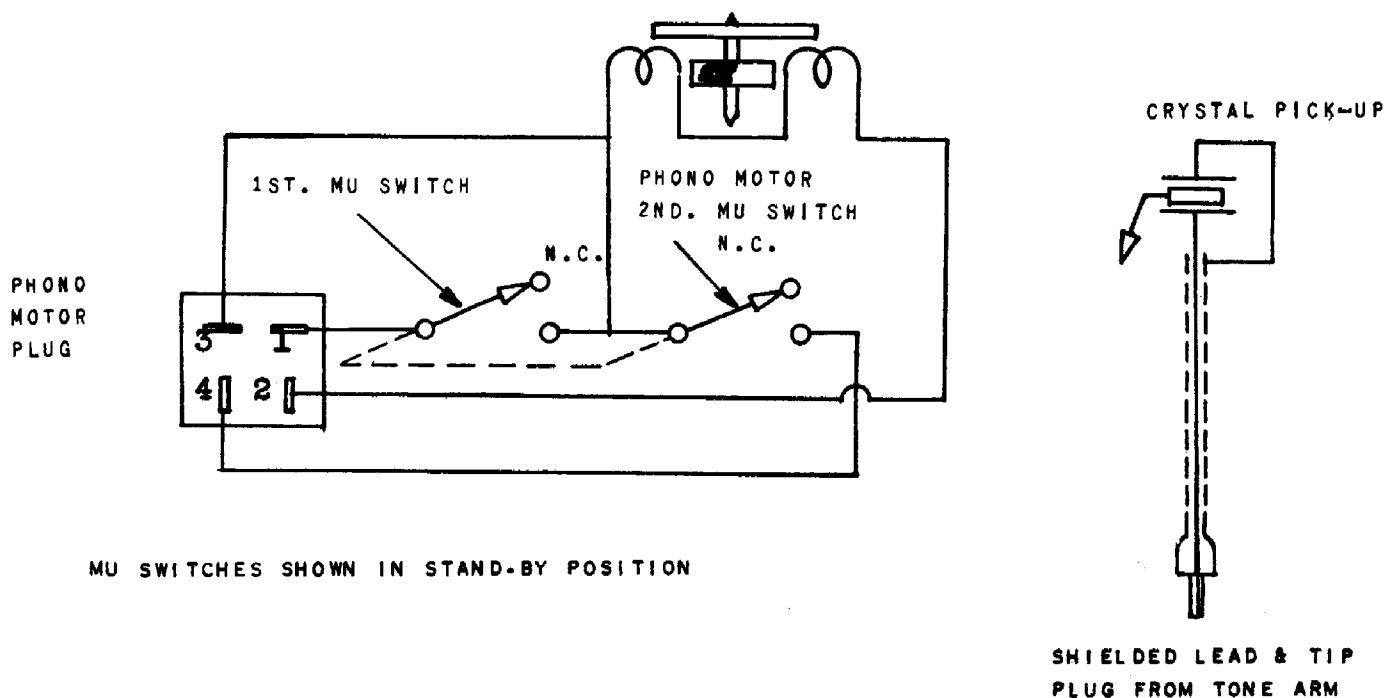


Complete SCHEMATIC (Drawing # 3)
of "THE ELECTRONIC SECRETARY"
Type DCR-1 (with delayed rewind)
ELECTRONIC SECRETARY INDUSTRIES, Inc.
805 South 5th St., MILWAUKEE, Wisconsin, U.S.A.
Tel.: Orchard 2-0863 or 0746
Date: July 24, 1953

REFER TO
NEXT PAGE



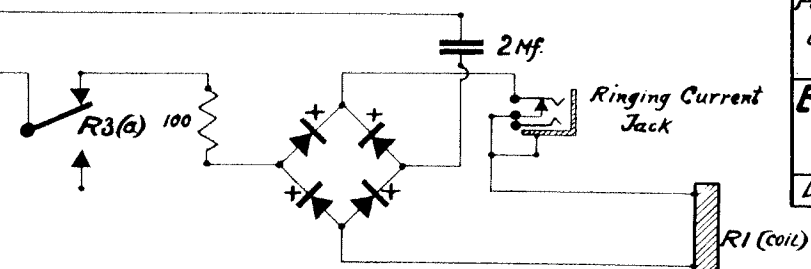
ELECTRICAL CIRCUIT OF WIRE RECORDER MECHANISM



MU SWITCHES SHOWN IN STAND-BY POSITION

ELECTRICAL CIRCUIT OF RECORD CHANGER

Tel.
Line
Block



Partial Drawing S#1 - Triggering Action
of "THE ELECTRONIC SECRETARY"
Type DCR-1 (with delayed rewind)
ELECTRONIC SECRETARY INDUSTRIES, Inc.
805 South 5th St., MILWAUKEE, Wisconsin, U.S.A.
Tel. Orchard 2-0863 or 0746
Date: July 24, 1953 E.O. ROLLE

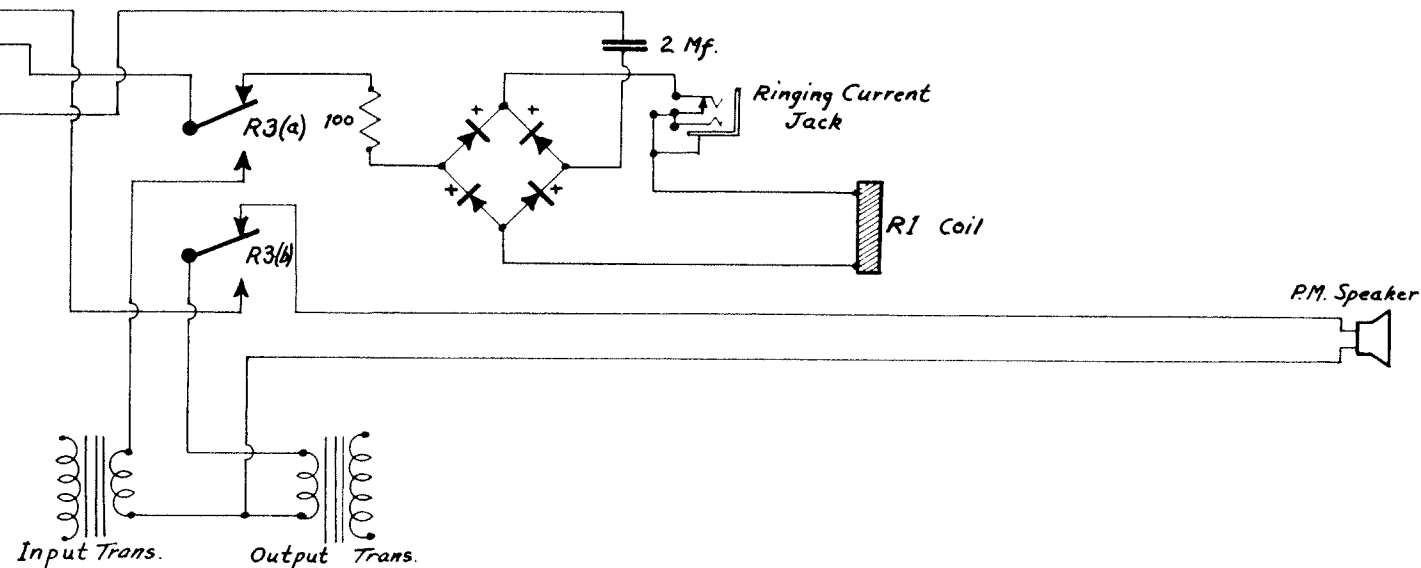
Trigger Circuit for across line ringing installation. (Note: 2 Mf. capacitor connected to one line)

Changes: ✓ Remove G.P. wire from 2 Mf. cond. & connect to other end of jumper wire between Cond. & Relay 3 B - Normally open

✓ Remove jumper wire between 2 Mf. cond. & Relay 3 D - Normally open

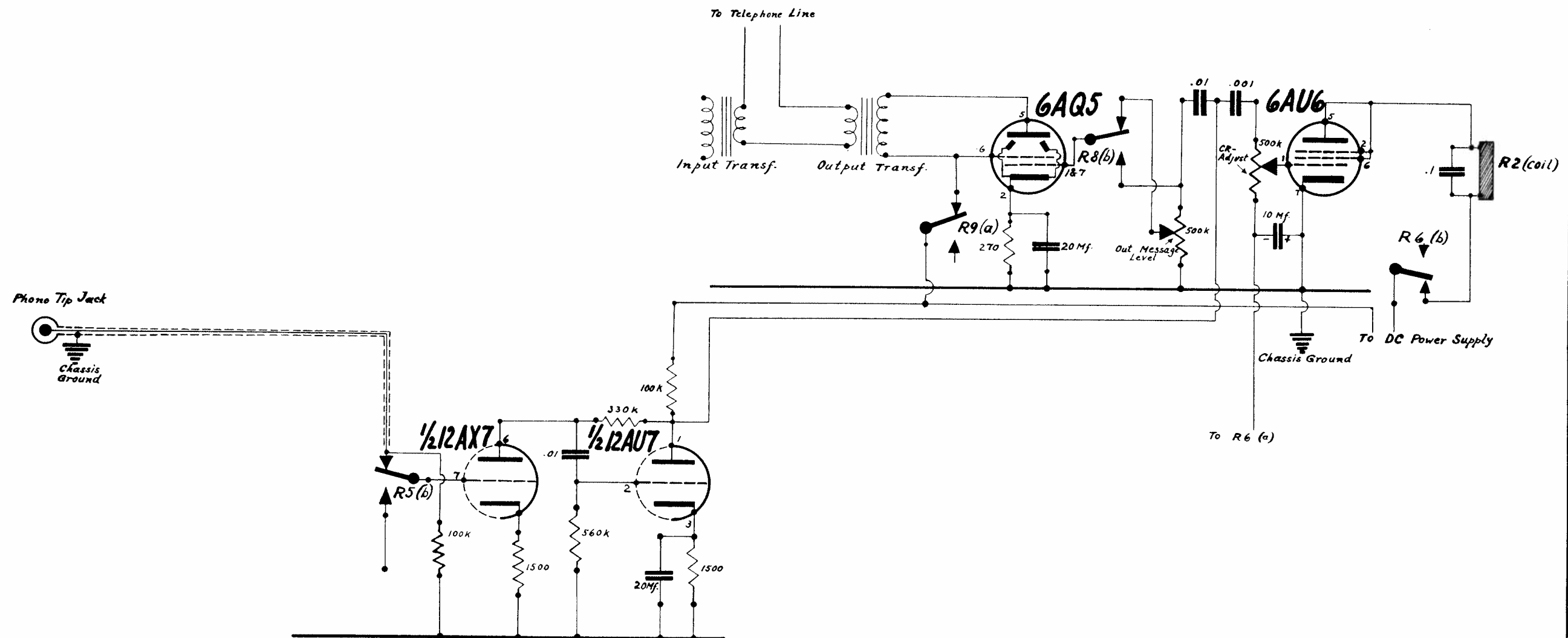
✓ Run a wire from 2 Mf. cond. l.a.c. To Ground on Term. blk.

Tel.
Line
Block

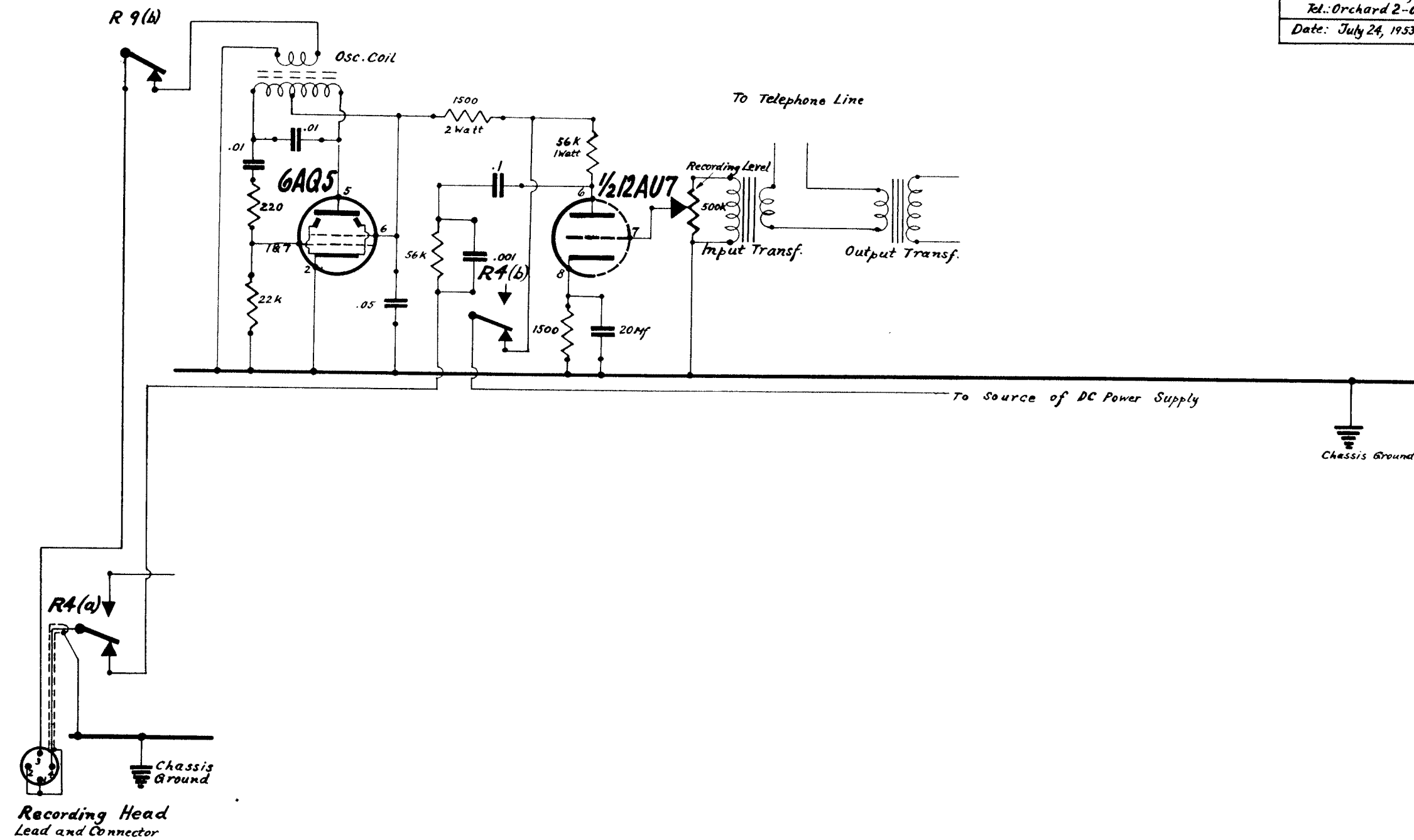


Trigger Circuit for Divided Ringing installation. (Note: 2 Mf. capacitor connected to Tel. Line Block term. G)

Partial Drawing S#2 • Outgoing Message & CR-Action
 of "THE ELECTRONIC SECRETARY"
 Type DCR-1 (with delayed rewind)
ELECTRONIC SECRETARY INDUSTRIES, Inc.
 805 South 5th St., MILWAUKEE, Wisconsin, U. S. A.
 Tel.: Orchard 2-0863 or 0746
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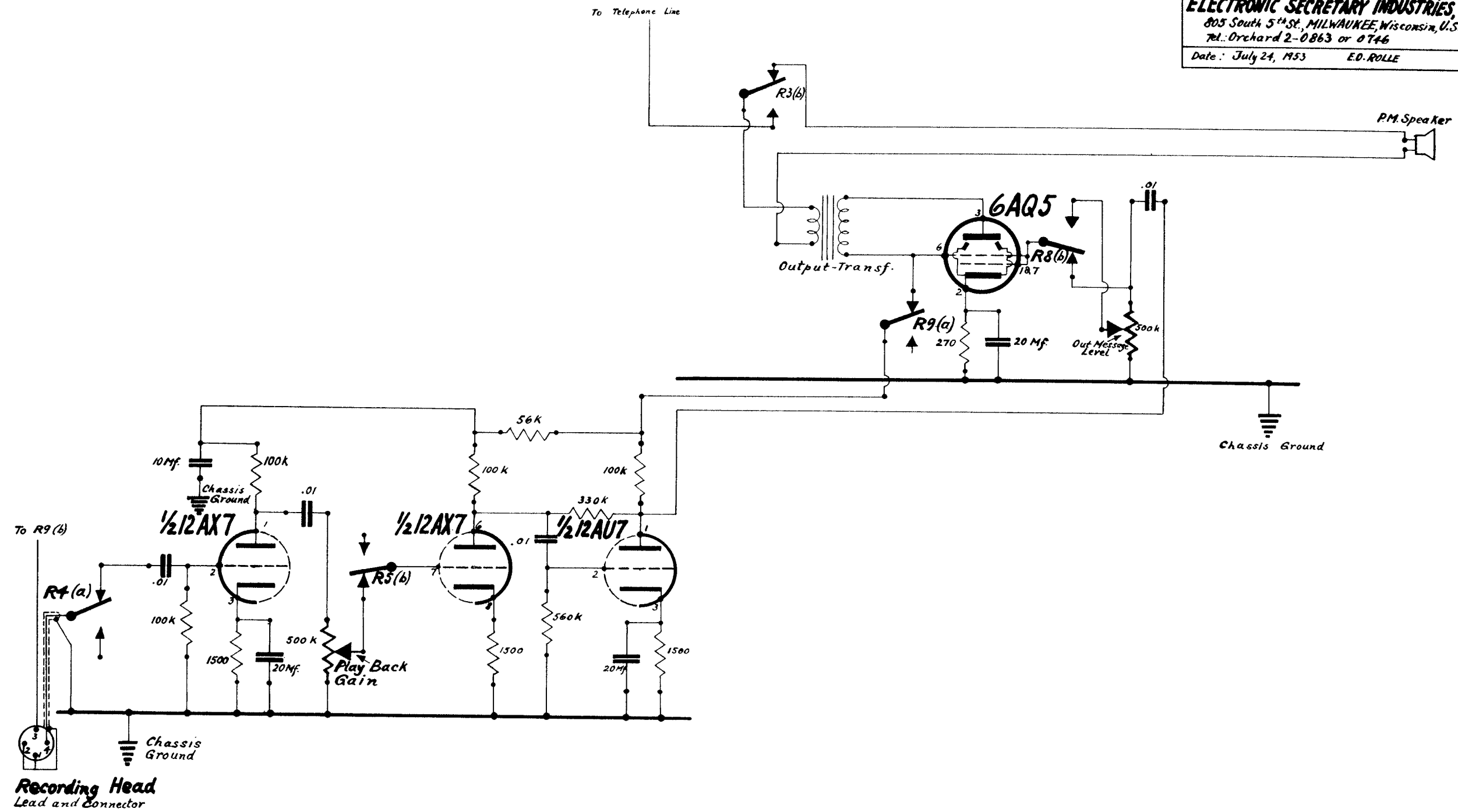


Partial Drawing S#3 • Record & Erase Action
 of "THE ELECTRONIC SECRETARY"
 Type DCR-1 (with delayed rewind)
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 Tel.: Orchard 2-0863 or 0746
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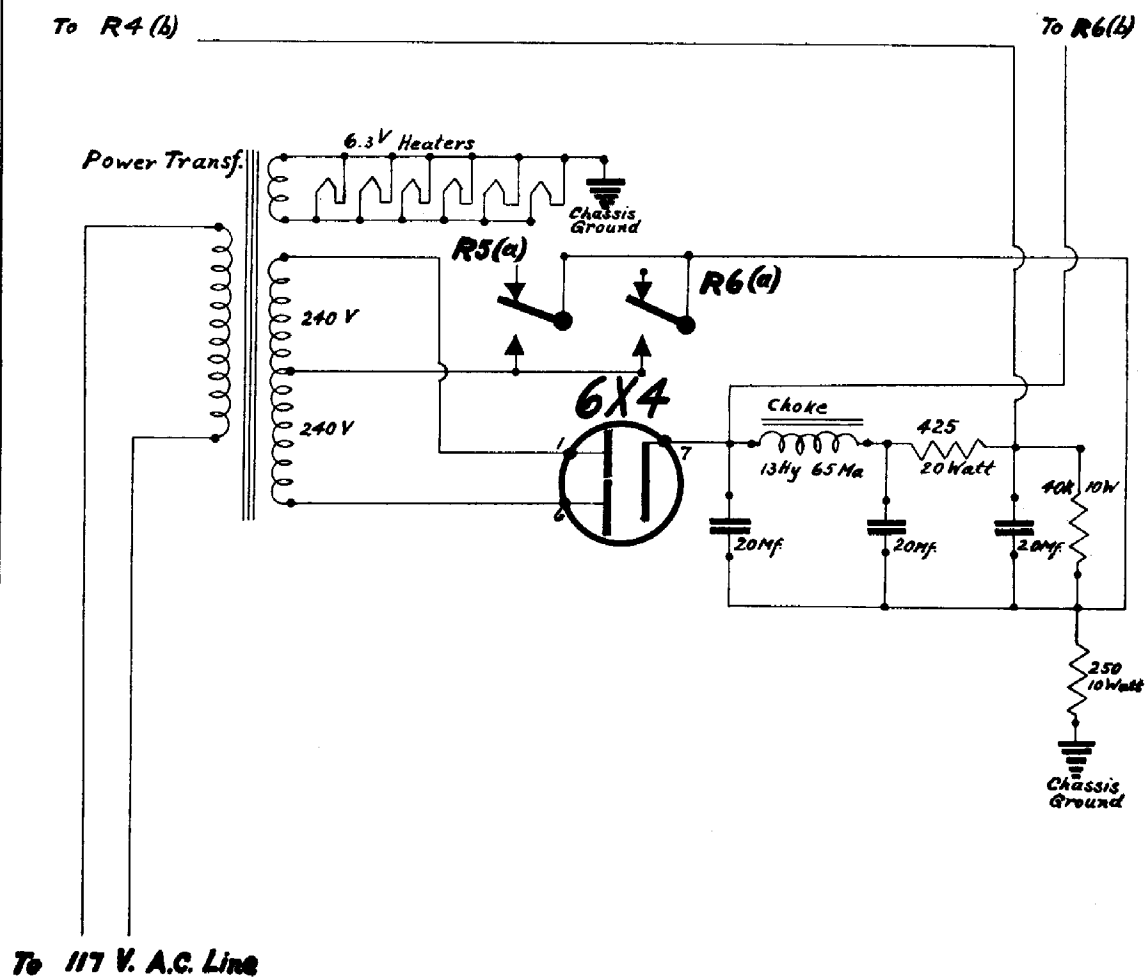
Date: July 24, 1953 E.D.ROLLE



Partial Drawing **S#5** - Power Supply
of **"THE ELECTRONIC SECRETARY"**
Type **DCR-1** (with delayed rewind)

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Tel.: Orchard 2-0863 or 0746

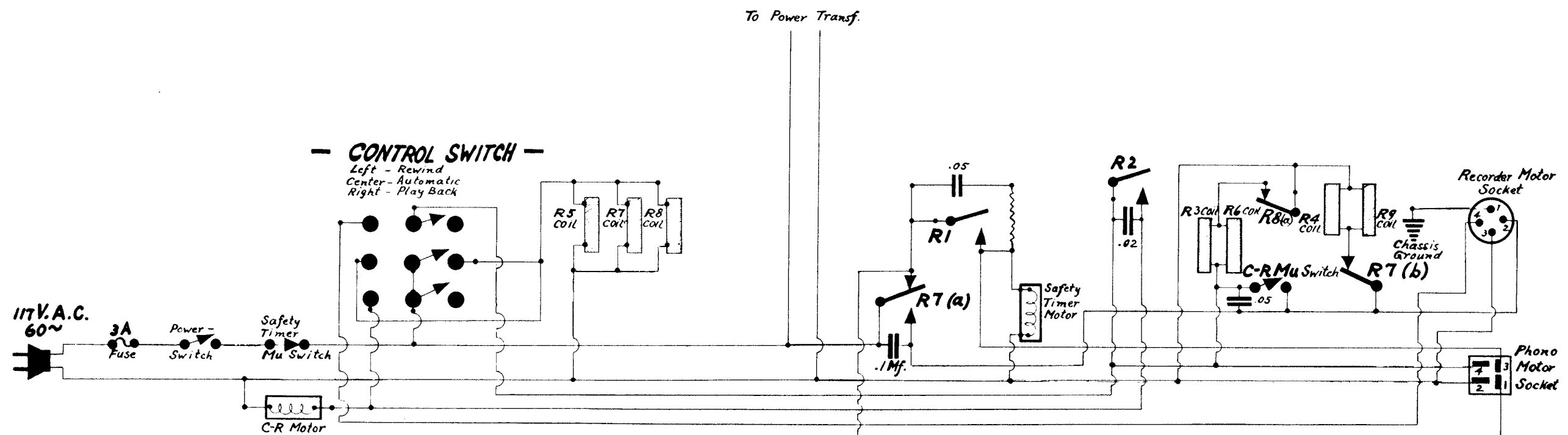
Date: July 24, 1953 E.O. ROLLE

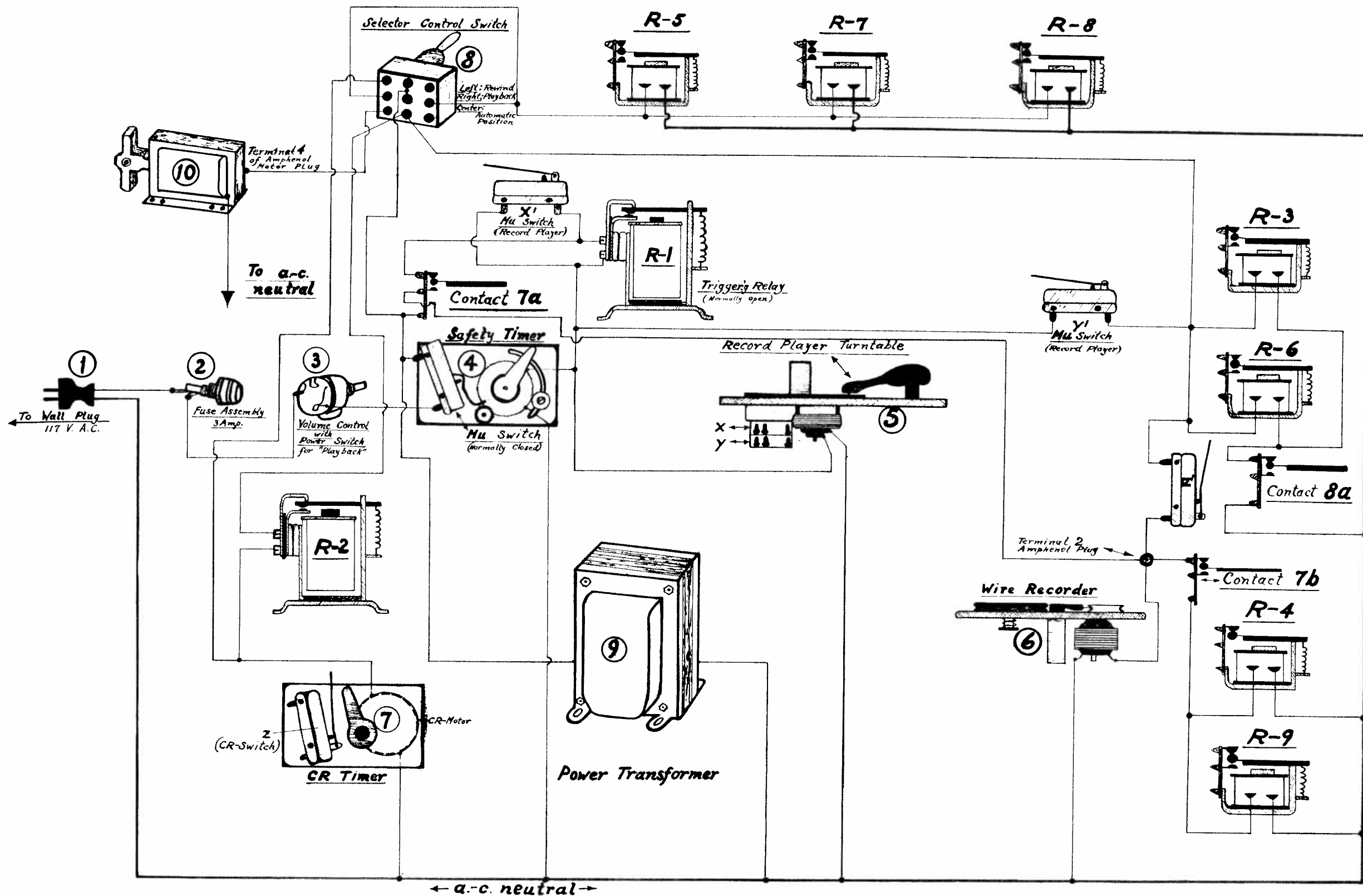


Partial Drawing **S#6** • Electrical Functions
of **"THE ELECTRONIC SECRETARY"**
Type **DCR-1** (with delayed rewind)

ELECTRONIC SECRETARY INDUSTRIES, Inc.
805 South 5th St., MILWAUKEE, Wisconsin, U.S.A.
Tel. Orchard 2-0863 or 0746

Date: July 24, 1953 E.O.ROLLE





**ELECTRICAL SEQUENCE DRAWING #S7,
Pictorial Electrical Diagram
of THE "ELECTRONIC SECRETARY DCR-1"**

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CHAPTER II

DESCRIPTION OF BASIC COMPONENTS

BASIC COMPONENT. 1. THE RECORD PLAYER OR PRIMARY TIMER

THE RECORD PLAYER ON THE ELECTRONIC SECRETARY IS THE BASIC TIMER AND ITS TIMING FUNCTIONS ARE REGULATED BY THE MANNER IN WHICH THE RECORD IS CUT. THIS ARRANGEMENT AFFORDS AN INFINITE AMOUNT OF FLEXIBILITY AND IS ENTIRELY SELF SYNCHRONIZING, THEREFORE NO ADJUSTMENT NEED BE MADE FOR DIFFERENT OUTGOING OR DIFFERENT TIMING CYCLES. THIS IS ACCOMPLISHED IN THE FOLLOWING MANNER:

THE RECORD DISC STARTS OUT WITH THE CONVENTIONAL LEAD-IN SPIRAL AND THEN GOES INTO THE ANSWERING OR OPENING PORTION OF THE OUTGOING MESSAGE. BEFORE THIS PART OF THE MESSAGE IS COMPLETED, THE VOICE DIRECTS THE CALLING PARTY IN THIS MANNER. "AT THE END OF THE TONE SIGNAL, PLEASE BEGIN YOUR MESSAGE." A 1000 CYCLE TONE SIGNAL IS THEN RECORDED ONTO THE DISC FOR THE DURATION OF TIME DESIRED FOR RECORDING OF THE INCOMING MESSAGE. AT THE END OF THIS INTERVAL THE TONE SIGNAL STOPS AND THE FAREWELL OR CLOSING MESSAGE IS RECORDED ON THE DISC. A LEAD-OUT SPIRAL IS THEN CUT ONTO THE DISC TO COMPLETE ONE TIMING CYCLE. THE RECORD PLAYER, THEREFORE BY A SERIES OF SIMPLE ELECTRICAL-MECHANICAL OPERATIONS, TIMED THROUGH THE GUIDANCE OF INDIVIDUAL RECORD DISCS, CONTROLS THE OVERALL AUTOMATIC OPERATION OF THE MACHINE IN THE FOLLOWING MANNER:

WHEN THE TELEPHONE RINGS THE RECTIFIED RINGING VOLTAGE OF THE TELEPHONE ENERGIZES RELAY 1, WHICH PLACES CURRENT ON THE RECORD PLAYER MOTOR AND THE SAFETY TIMER MOTOR. IF THE DURATION OF RING IS SUFFICIENTLY LONG, THE RECORD PLAYER WILL SPIN UNTIL THE TONE ARM POSITIONS ITSELF ONTO THE LEAD-IN GROOVE OF THE RECORD. ABOUT THIS TIME TWO SMALL MU SWITCHES ARE MECHANICALLY CLOSED STARTING AN OPERATING CYCLE. THE FIRST OF THESE TWO SWITCHES FORM A HOLDING CIRCUIT AROUND THE CONTACTS OF RELAY 1, WHICH HAVE REOPENED AGAIN WHEN THE PHONE STOPS RINGING. THE SECOND MU SWITCH FORMS A PATH TO RELAYS 3 AND 6, ONE OF WHOSE FUNCTIONS IS TO THROW THE TRANSMITTING AND RECORDING TRANSFORMERS ACROSS THE TELEPHONE LINE, THUS IN EFFECT ANSWERING THE TELEPHONE. THE OTHER FUNCTIONS OF THESE RELAYS WILL BE EXPLAINED IN DETAIL UNDER RELAYS 3 AND 6.

THE TONE ARM NOW STARTS TO TRAVERSE THE SOUND GROOVES OF THE RECORD AND THE OUTGOING MESSAGE IS AMPLIFIED AND IMPRESSED ONTO THE TELEPHONE LINE. AT THE END OF THE OUTGOING MESSAGE A TONE OPERATED SWITCH, CALLED THE CR SWITCH, STARTS THE WIRE RECORDER MOTOR AND PLACES CURRENT ON RELAYS 4 AND 9, THROUGH THE NORMALLY CLOSED CONTACTS OF RELAY 7 (b). THIS ACTION MUTES THE TONE AS FAR AS THE TELEPHONE LINE IS CONCERNED AND SWITCHES THE WIRE RECORDER AMPLIFIER TO THE RECORD POSITION. THE ACTION OF THE CR SYSTEM WILL BE EXPLAINED IN DETAIL UNDER CR-MECHANISM. AT THE END OF THE TONE SIGNAL OF COURSE, THIS ACTION IS REVERSED AND THE BALANCE OF THE OUTGOING MESSAGE IS TRANSMITTED. AT THIS POINT THE TONE ARM MOVES INTO THE THROW-OUT GROOVE AND MECHANICALLY RESETS THE RECORD PLAYER. THIS CAUSES THE TWO MU SWITCHES TO OPEN UP AND RE-ESTABLISH THE ELECTRICAL CONDITIONS OF STAND-BY.

WE HAVE NOW GONE THROUGH A COMPLETE NORMAL CYCLE OF AUTOMATIC OPERATION AND HAVE SEEN HOW THE RECORD PLAYER HAS PERFORMED ITS FUNCTION OF BASIC TIMING OF THE AUTOMATIC CYCLE.

BASIC COMPONENT 2. THE CR MECHANISM OR AUXILIARY TIMER.

THE CR MECHANISM IS A COMBINATION OF ELECTRICAL, MECHANICAL AND ELECTRONIC COM.

PONENTS CO-FUNCTIONING TO FORM A RELAY SYSTEM THAT WILL DISCRIMINATE BETWEEN A SERIES OF SHORT PULSE-LIKE SOUNDS AND STEADY TONES OF UNVARYING AMPLITUDE,

THE OUTPUT OF THE SOUND CARTRIDGE IS FED INTO THE CR-VOLTAGE AMPLIFIER JUST AS IT IS INTO THE AUDIO OUTPUT AMPLIFIER, AND THE VOICE PEAKS ON THE RECORD TEND TO PULL IN A SENSITIVE TYPE RELAY MARKED RELAY 2. WHENEVER THIS RELAY PULLS IN IT PLACES A.C. LINE VOLTAGE ON A SMALL SYNCHRONOUS MOTOR TO WHOSE SHAFT IS ATTACHED A SPRING LOADED CAM. WHENEVER THE RELAY PULLS IN THE CAM TENDS TO ADVANCE, BUT SINCE THE APPLICATION OF VOLTAGE IS SPORADIC THE SPRING LOADING RETURNS IT TO THE STARTING POINT. HOWEVER, WHEN A STEADY TONE COMES THROUGH THE AMPLIFIER, THE CAM ADVANCES FAR ENOUGH TO CLOSE A MU SWITCH, WHOSE SWITCHING ACTION MAKES POSSIBLE THE AUXILIARY TIMING OR CR ACTION, REQUIRED TO START THE RECORDER MOTOR. IN ADDITION TO THIS THE AMPLIFIERS ARE SWITCHED FROM THE TRANSMIT TO THE RECORD PHASE AND THE TONE SIGNAL AND OUTGOING AMPLIFIER IS MUTED THRU AUXILIARY RELAY ACTION.

BASIC COMPONENT 3. THE SAFETY TIMER

THE SAFETY TIMER IS A SECONDARY TIMING DEVICE BUILT INTO THE ELECTRONIC SECRETARY TO INSURE THE CONTINUITY OF TELEPHONE SERVICE IN THE EVENT OF MECHANICAL OR ELECTRICAL FAILURE ON THE PART OF THE ELECTRONIC SECRETARY. THIS DEVICE LIKE THE CR MECHANISM CONSISTS OF A SPRING LOADED CAM ACTUATED BY A SYNCHRONOUS MOTOR. AFTER A PERIOD OF TRAVEL EXCEEDING THE REGULAR TIME INTERVAL OF A CYCLE OF OPERATION BY ABOUT 50% THE CAM WILL OPERATE A RESET TYPE OF MU SWITCH, WHICH OPENS UP THE MAIN POWER CIRCUIT, JUST AHEAD OF THE POWER SWITCH; THUS DISABLING THE ELECTRONIC SECRETARY, BUT OPENING ALL RELAYS SO THAT THE TELEPHONE CIRCUIT WILL BE OPENED, AND A REGULAR TELEPHONE SERVICE WILL NOT BE INTERRUPTED.

BASIC COMPONENT 4. THE SELECTOR SWITCH

THE SELECTOR SWITCH IS ACTUALLY ONLY IN CIRCUIT DURING THE PLAYBACK AND REWIND PHASES OF OPERATION. IN THE PLAYBACK POSITION IT SERVES TO BY-PASS THE AUTOMATIC SWITCHING IN ORDER TO GET CURRENT TO THE WIRE RECORDER MOTOR. IN BOTH THE PLAYBACK AND REWIND POSITIONS, IT CLOSSES CIRCUITS TO RELAYS 5, 7 AND 8 WHOSE PARTICULAR SWITCHING DUTIES WILL BE DETAILED IN THE SECTION ON RELAYS. IN REWIND POSITION ALONE, THE WIRE RECORDER REVERSING SOLENOID IS ENERGIZED, THUS MECHANICALLY REWINDING THE WIRE RECORDER. THE CENTER OR AUTOMATIC POSITION LEAVES ALL RELAYS DE-ENERGIZED UNTIL THE TELEPHONE RINGS.

BASIC COMPONENT 5. RELAYS

RELAY 1

THIS IS A DIRECT CURRENT RELAY OF THE SENSITIVE TYPE WITH A RESISTANCE OF 2500 OHMS. ITS NORMAL PULL-IN POINT IS BETWEEN 6 AND 8 MILLIAMPERES AND THIS POINT CAN BE VARIED BY INCREASING OR DECREASING THE SPRING TENSION ADJUSTMENT. IT IS ENERGIZED BY THE RECTIFIED RINGING CURRENT OF THE TELEPHONE. THE 2MFD. P.A. PER CONDENSER SHOWN IN SERIES WITH ONE SIDE OF THE TELEPHONE LINE IS USED TO BLOCK THE DIRECT CURRENT PRESENT IN THE TELEPHONE CIRCUIT FROM THE ELECTRONIC SECRETARY.

RELAY 2

THIS RELAY IS PHYSICALLY THE SAME AS 1. FUNCTIONALLY IT IS USED IN THE PLATE CIRCUIT OF THE CR AMPLIFIER TO START AND STOP THE SYNCHRONOUS CR MOTOR IN RESPONSE TO AUDIO PULSES.

RELAY 3

THIS IS A DOUBLE POLE DOUBLE THROW RELAY WITH AN A.C. COIL. THIS RELAY IS ENERGIZED BY THE ACTION OF THE MU SWITCH AT THE BEGINNING OF A CYCLE AND SERVES TO SWITCH THE TELEPHONE CIRCUITS TO AN ANSWERING POSITION. THE SWITCHING IS DONE AS FOLLOWS:

IN THE STANDBY POSITION OF THE MACHINE RELAY CONTACT 3 (a) CONNECTS ONE SIDE OF THE TELEPHONE LINE TO A SELENIUM BRIDGE, WHILE CONTACT 3 (b) CONNECTS THE VOICE COIL WINDING OF THE OUTGOING MESSAGE AMPLIFIER TO THE VOICE COIL OF THE LOUD-SPEAKER. HOWEVER, WHEN THE MU SWITCH ON THE RECORD PLAYER CLOSES THE RELAY IS ENERGIZED AND CONTACT 3 (a) SWITCHES THE TELEPHONE LINE ACROSS THE SECONDARY OF A 10:1 RECORDING TRANSFORMER, WHICH IS IN SERIES WITH THE VOICE COIL WINDING OF THE OUT-GOING MESSAGE LOUD-SPEAKER TRANSFORMERS AND, CONTACT 3 (b) THROWS THE OTHER END OF THIS VOICE COIL WINDING ACROSS THE TELEPHONE LINE.

THUS IN EFFECT THE TWO CONTACTS HAVE PLACED THE TWO TRANSFORMER WITH THEIR SECONDARIES IN SERIES ACROSS THE TELEPHONE LINE.

RELAY 4

THIS IS AN ALTERNATING CURRENT RELAY. ITS 4 (a) CONTACTS CONNECT THE VOICE COIL OF THE RECORDING HEAD TO THE INPUT OF THE PLAYBACK AMPLIFIER IN THE NORMAL POSITION AND IN THE ENERGIZED POSITION THEY CONNECT THE VOICE COIL OF THE HEAD TO THE OUTPUT OF THE RECORD AMPLIFIER TUBE. CONTACTS 4 (b) CONNECT THE PLATE VOLTAGE SUPPLY TO THE OSCILLATOR, AND TO THE RECORD AMPLIFIER WHEN THEY ARE IN THE ENERGIZED POSITION. THIS RELAY IS ENERGIZED BY THE CR MECHANISM WHICH ALLOWS IT TO OPERATE ONLY DURING THE RECORD PORTION OF THE ANSWERING CYCLE.

RELAY 5

THIS IS AN ALTERNATING CURRENT RELAY. ITS FUNCTIONS ARE AS FOLLOWS: CONTACT 5 (a) CLOSES A CIRCUIT IN THE NEGATIVE RETURN AND OPERATES ONLY ON PLAYBACK TO ESTABLISH A SOURCE OF PLATE VOLTAGE DURING THE PLAYBACK PERIOD OF OPERATION. THIS CONTACT IS NECESSARY BECAUSE A SIMILARLY OPERATING RELAY CONTACT 6 (a) PROVIDES THIS PLATE VOLTAGE ONLY DURING THE AUTOMATIC PORTION OF OPERATION. THE CONTACT 5 (a) THEREFORE IS NECESSARY IN ORDER TO SHUNT 6 (a) SO THAT PLATE CURRENT WILL FLOW DURING MANUAL OR PLAYBACK OPERATIONS OF THE SET. CONTACT 5 (b) SWITCHES IN THE PLAYBACK VOLUME CONTROL DURING THE PLAYBACK PERIOD OF OPERATION AND ALSO IN SO DOING LINKS UP THE FIRST SECTION OF THE 12AX7 PRE-AMPLIFIER TUBE WHICH IS NOT USED DURING THE OUTGOING MESSAGE PORTION OF THE AUTOMATIC CYCLE. RELAY 5 IS ENERGIZED BY THE ACTION OF THE SELECTOR SWITCH GOING INTO THE PLAYBACK OR REWIND POSITION.

RELAY 6

THIS IS AN ALTERNATING CURRENT RELAY. RELAY 6 IS OPERATED BY THE MU SWITCH ON THE RECORD PLAYER AND BECOMES ENERGIZED AT THE BEGINNING OF AN AUTOMATIC CYCLE. CONTACTS 6 (a) CLOSE THE NEGATIVE RETURN AND PROVIDE PLATE VOLTAGE AT THE BEGINNING OF AN AUTOMATIC CYCLE. CONTACTS 6 (b) PROVIDE PLATE VOLTAGE FOR THE CR RELAY ON AUTOMATIC OPERATION WHEN THE MACHINE GOES INTO CYCLE.

RELAY 7

THIS IS AN ALTERNATING CURRENT RELAY. RELAY 7 IS OPERATED BY THE SELECTOR SWITCH IN THE PLAYBACK AND REWIND POSITIONS AND SERVES THROUGH CONTACT 7 (a) TO CUT OFF THE AUTOMATIC SWITCHING SECTION DURING MANUAL OPERATION AND ALSO TO

BREAK THE PATH TO RELAY 4 AND 9 WHICH OTHERWISE WOULD BE ENERGIZED IN PLAYBACK OR REWIND.

RELAY 8

THIS IS AN ALTERNATING CURRENT RELAY. IT IS OPERATED IN PLAYBACK AND REWIND POSITIONS BY THE SELECTOR SWITCH. CONTACTS 8a BREAK THE NEUTRAL FROM RELAYS 3 AND 6 ON PLAYBACK. CONTACTS 8b SERVE TO REMOVE THE ARM OF THE VOLUME CONTROL FROM THE CIRCUIT ON PLAYBACK.

RELAY 9

THIS IS AN ALTERNATING CURRENT RELAY. IT IS OPERATED BY THE CR MECHANISM AND IS ENERGIZED DURING THE RECORD PORTION OF THE AUTOMATIC CYCLE. CONTACTS 9 (a) WHEN CLOSED PLACE VOLTAGE ON THE OUTGOING MESSAGE OUTPUT TUBE, BUT ARE OPENED UP WHEN THE RELAY IS ENERGIZED, SO THAT THEY TEND TO MUTE THE OUTGOING MESSAGE. CONTACT 9 (b) CONNECTS THE OSCILLATOR SECTION OF THE RECORD HEAD TO THE OSCILLATOR TRANSFORMER, WHEN THE RELAY IS ENERGIZED TO PLACE THE MACHINE IN THE RECORD POSITION.

RELAY SUMMARY

- D. C. RELAYS 1 AND 2 . USED IN ANSWERING AND CR CIRCUITS.
- A. C. RELAYS 3 AND 6 . OPERATED BY MU SWITCH ON RECORD PLAYER.
- A. C. RELAYS 5, 7, AND 8 . OPERATED BY SELECTOR SWITCH.
- A. C. RELAYS 4 AND 9 . OPERATED BY CR MECHANISM.

CHAPTER III

GENERAL MAINTENANCE PROCEDURE

TO PERFORM ANY SERVICE OPERATION ON AN ELECTRONIC SECRETARY OTHER THAN WHAT WOULD NORMALLY BE CONNECTED WITH THE TOP SIDE OF THE WIRE RECORDER OR RECORD PLAYER, IT WILL BE NECESSARY TO REMOVE THE COVER AND LID ASSEMBLY AS SHOWN IN FIGURES a, b, AND c. (SEE NEXT PAGE).

WE FIRST REMOVE THE LATCHING SCREW FROM BOTH ENDS OF THE CHASSIS AS INDICATED BY THE ARROW IN FIGURE a. NOW, GRASPING THE SIDE OF THE COVER LID ASSEMBLY AS SHOWN IN FIGURE b WE LIFT IT THROUGH A 90° ARC. WHEN WE HAVE REACHED THIS POSITION WE CAN REMOVE THE COVER COMPLETELY BY DISENGAGING THE LOOSE PIN HINGES, WHICH HOLD THE TWO ASSEMBLIES TOGETHER. THE SEPARATE PIECES ARE SHOWN IN FIGURE c.

WE NOTE FROM THIS LAST ILLUSTRATION THAT ALL THE TUBES, THE RECORDER HEAD, AND THE VARIOUS PLUGS ARE READILY ACCESSIBLE. TO WORK ON THE UNDER SIDE OF THE CHASSIS, WE NEED ONLY REMOVE THE RECORD PLAYER AND THE WIRE AND DRUM FROM THE WIRE RECORDER MECHANISM, AND WE TURN THE ENTIRE CHASSIS UP-SIDE-DOWN. IN THIS POSITION WE CAN TAKE OUT THE THREE MACHINE SCREWS AND REMOVE THE BASE PANEL. STANDARD ELECTRICAL AND ELECTRONIC PROCEDURE IS THEN FOLLOWED AS INDICATED OTHER PLACES IN THIS MANUAL.

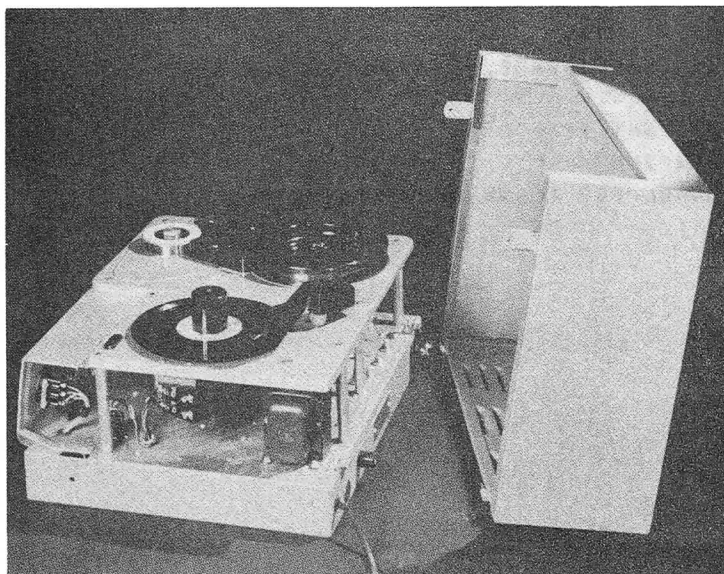
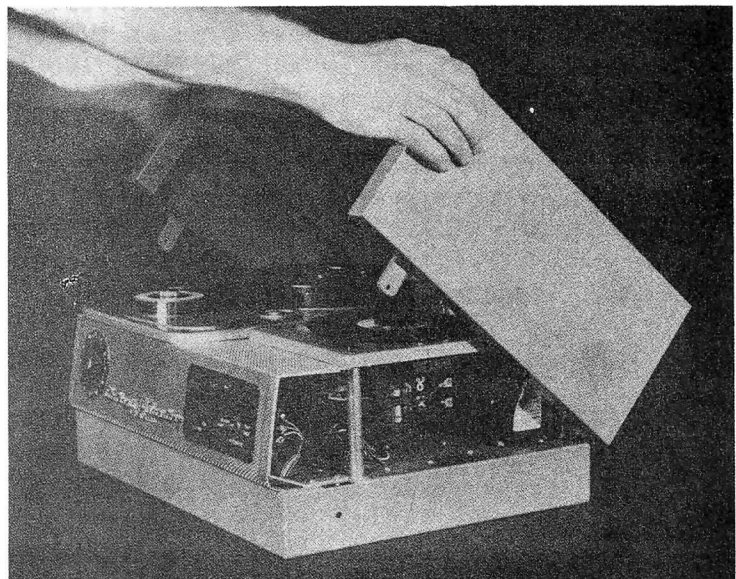
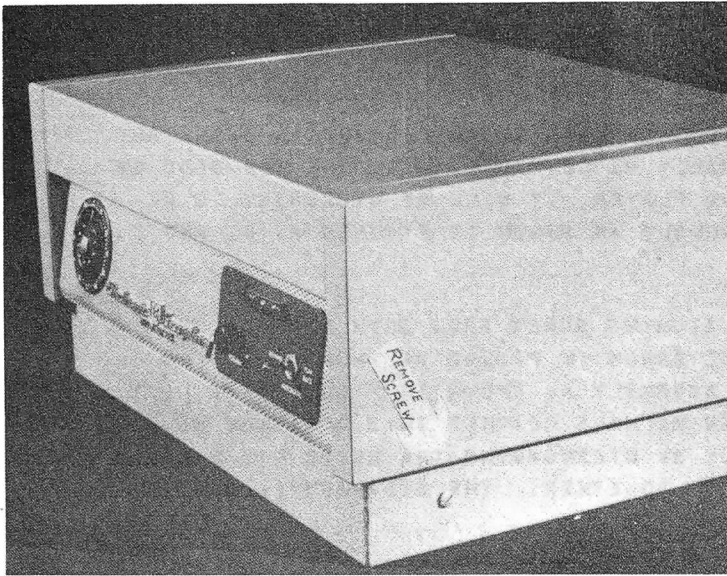
ITEMS TO BE CARRIED IN STOCK FOR POSSIBLE REPLACEMENT ARE SUGGESTED, AS FOLLOWS:

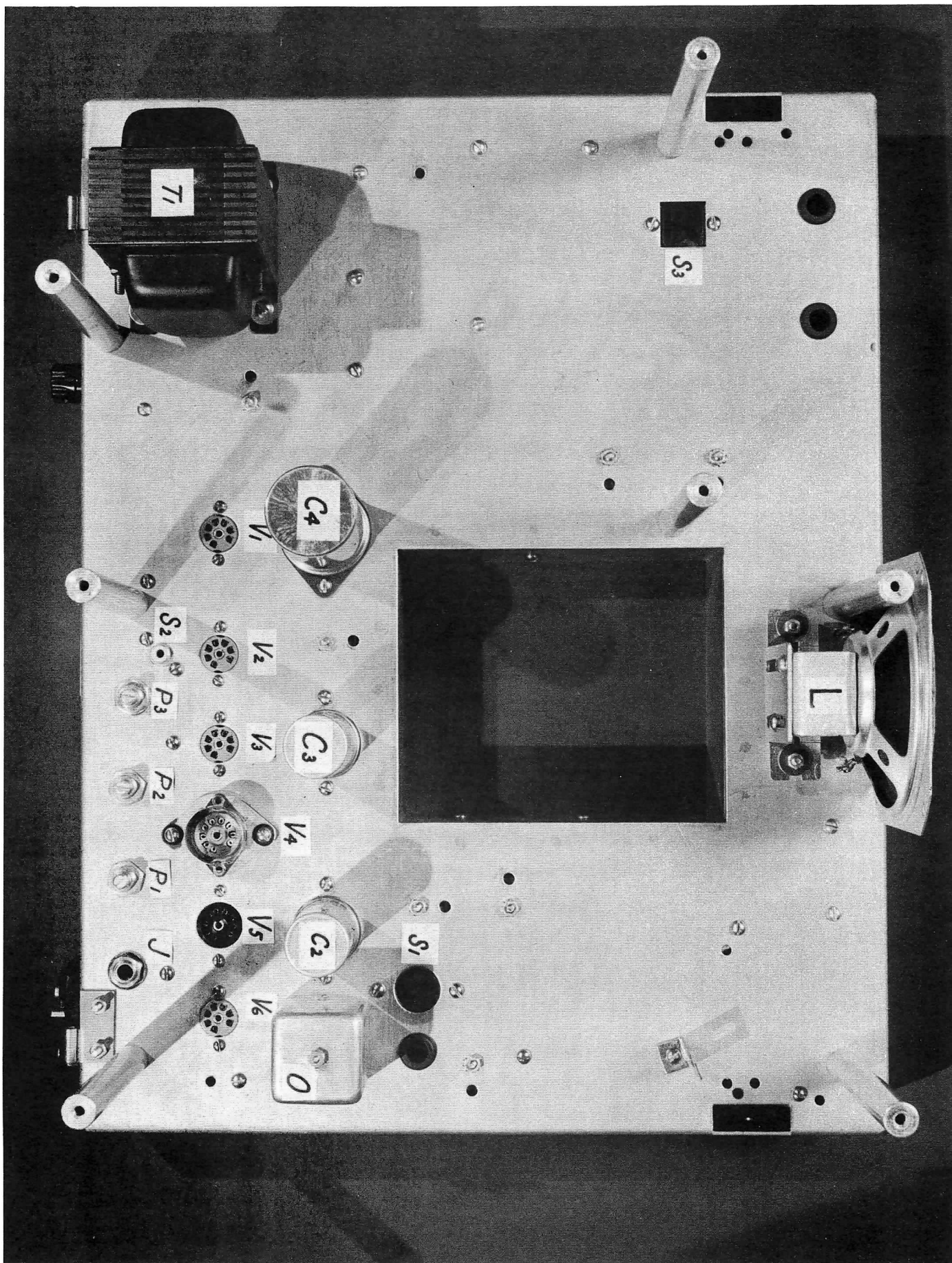
1. ONE, OR MORE, COMPLETE SETS OF TUBES.
2. ONE PHONO CARTRIDGE REPLACEMENT.
3. ONE RECORD HEAD FOR WIRE RECORDER.

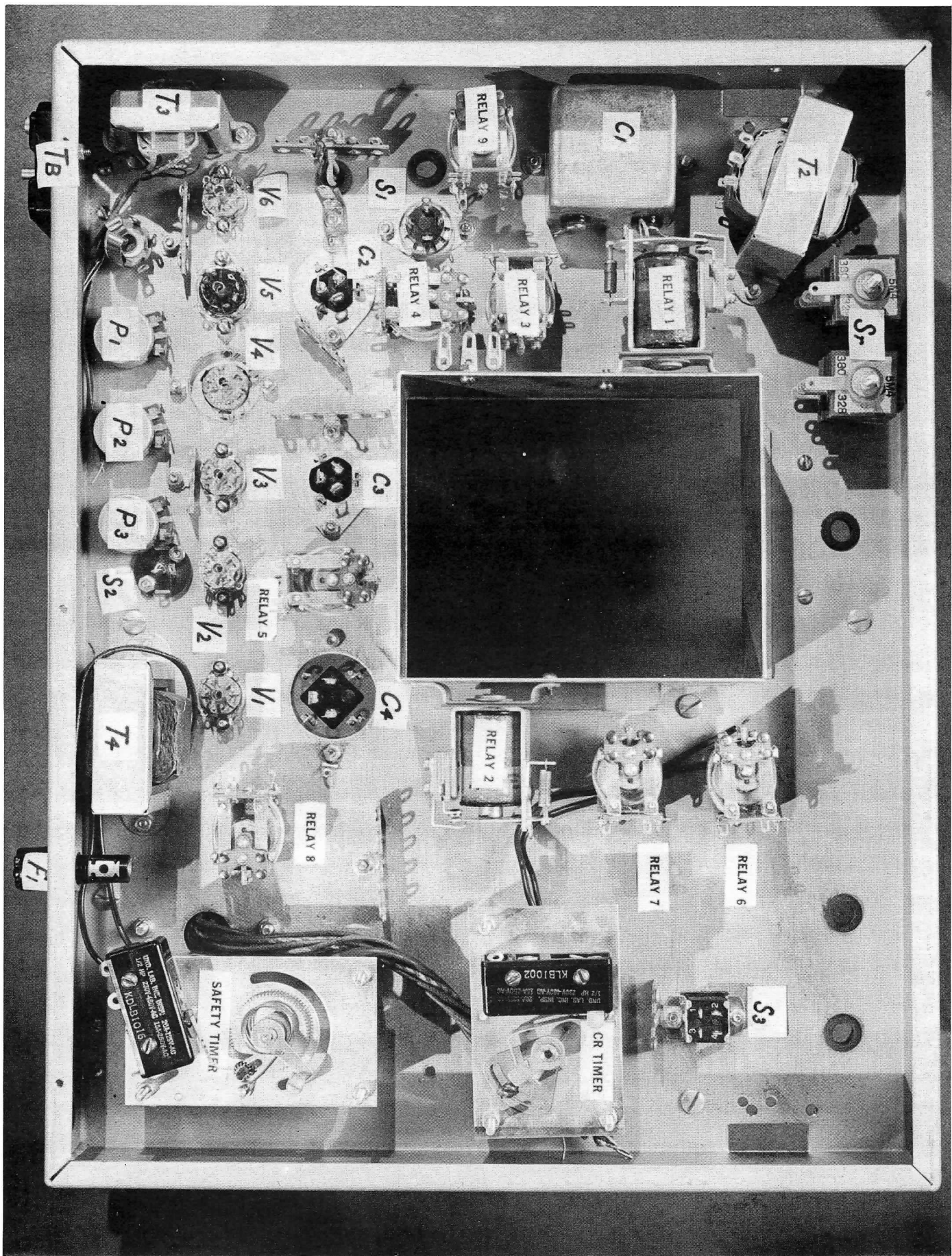
BASIC TOOLS AND INSTRUMENTS SUGGESTED FOR SERVICING:

1. NORMAL STOCK OF ELECTRICAL TOOLS, DIAGONAL PLIERS, SCREW DRIVERS, ETC.
2. SMALL ALLEN WRENCH SET.
3. BURNISHING TOOLS FOR RELAYS.
4. A MULTI-METER. INCLUDING VOLTAGE, MILLIAMPERE AND OHMS SCALES.
5. A SET OF SMALL SPIN-TIGHT WRENCHES.
6. SOLDERING IRON AND OR GUN.
7. SMALL BOTTLE OF ALCOHOL FOR CLEANING OF DRIVE PULLEYS.

THE ELECTRONIC SECRETARY
Photos A, B and C, showing General Maintenance Procedure







CHAPTER IV

IDENTIFICATION OF PRINCIPAL PARTS AS SHOWN IN TWO PHOTOGRAPHIC VIEWS OF AMPLIFIER CHASSIS

T₁ MAIN POWER TRANSFORMER
T₂ INPUT LINE TRANSFORMER
T₃ OUTPUT TRANSFORMER
T₄ POWER SUPPLY CHOKE
P₁ RECORD GAIN CONTROL
P₂ OUTGOING MESSAGE GAIN CONTROL
P₃ CR GAIN CONTROL
V₁ SOCKET FOR 6X4 RECTIFIER
V₂ SOCKET FOR 6AU6 CR RELAY TUBE
V₃ SOCKET FOR 6AQ5 AUDIO OUTPUT
V₄ SOCKET FOR 12AX7 VOLTAGE AMPLIFIER (OUTGOING MESSAGE AND PLAYBACK)
V₅ SOCKET FOR 12AU7 (RECORD PRE-AMP, OUTGOING MESSAGE DRIVER, AND PLAY-
BACK DRIVER TUBE).
V₆ SOCKET FOR 6AQ5 ERASE OSCILLATOR
S_r SELENIUM RECTIFIER STACKS
RELAYS 1 & 2 D.C. RELAYS
RELAYS 3 TO 9 A.C. RELAYS
C₁ 2 MFD. BLOCKING CONDENSER IN TELEPHONE LINE.
C₂ ELECTROLYTIC CONDENSER - 10 • 450. 10 • 450v., AND 20 • 25v.
C₃ ELECTROLYTIC CONDENSER 20 - 20 - 20 • 25 VOLTS.
C₄ ELECTROLYTIC CONDENSER 20 - 20 - 20 • 450 VOLTS.
CR TIMER - SYNCHRONOUS MOTOR TIME DELAY ASSEMBLY.
SAFETY TIMER- RESET TYPE SYNCHRONOUS MOTOR TIME DELAY ASSEMBLY.
S₁ WIRE RECORDER MOTOR SOCKET
S₂ PHONO TIP SOCKET
S₃ 4 PIN PHONO MOTOR SOCKET
TB TELEPHONE LINE TERMINAL BLOCK
F₁ FUSE RECEPTACLE
L LOUD SPEAKER
O OSCILLATOR COIL
J METERING JACK TO MEASURE RECTIFIED RINGING CURRENT OF TELEPHONE.

CHAPTER V

TABLE OF POSSIBLE MAINTENANCE TROUBLES AND THEIR REMEDIES

TROUBLE	CAUSE IN ORDER OF PROBABILITY	REMEDY
MACHINE DOES NOT ANSWER	POOR CONNECTION AT TERMINAL BLOCK FROM TELEPHONE LINE. NO POWER TO MACHINE. NO CONTINUITY TO RELAY 1.	CHECK BY INSPECTION. CHECK FOR BREAK IN POWER, FUSE, POOR WALL SOCKET CONNECTION, ETC. CHECK CONTINUITY THROUGH ALL POINTS TO SELENIUM RECTIFIER. CHECK CURRENT THROUGH R ₁ WITH MILLIAMETER AND PHONE PLUG.
SET DOES NOT SHUT OFF AT END OF CYCLE. RECYCLING.	R ₁ IS STICKING	IF THE D.C. RELAY IS NOT RELEASING, IT MAY BE BECAUSE OF INSUFFICIENT SPRING TENSION OR TOO SMALL A GAP BETWEEN THE ARMATURE AND THE POLEFACE WHEN THE RELAY IS PULLED IN. IF THIS CAN NOT BE REMEDIED IN THE FIELD, THE RELAY SHOULD BE REPLACED.
RECYCLING	MU-SWITCHES ON RECORD PLAYER DO NOT RELEASE.	THIS IS CAUSED BY TOO SMALL AN ALLOWANCE FOR OVERTRAVEL IN SETTING THE SWITCHES. THE ADJUSTMENT CAN BE MADE BY SLIGHTLY BENDING THE ACTUATING LEVERS OF THE SWITCHES, SO THAT THEY WILL EASILY RELEASE.
OUTGOING MESSAGE WEAK.	WEAK TUBE WEAK CARTRIDGE	CHECK AND REPLACE 12AX7, 12AU7 OR 6AQ5 OUTPUT. REPLACE CARTRIDGE.
OUTGOING MESSAGE DISTORTED.	DEFECTIVE TUBES DEFECTIVE CARTRIDGE OR NEEDLE	CHECK OR REPLACE 12AX7, 12AU7 OR 6AQ5 OUTPUT. CHECK AND REPLACE CARTRIDGE IF NECESSARY.
CR DIFFICULTIES TONE SIGNAL DOES NOT STOP	RELAY 2 DOES NOT PULL IN BECAUSE OF LOW GAIN IN AMPLIFIER A. DEFECTIVE TUBE B. DEFECTIVE CARTRIDGE C. CR MOTOR JAMMED	REPLACE FAULTY TUBE 12AX7, 12AU7, OR 6AU6. REPLACE DEFECTIVE CARTRIDGE REPLACE CR MOTOR.
WIRE RECORDER DOES NOT STOP	RELAY 2 STICKING. CR MOTOR JAMMED IN CLOSED POSITION.	ADJUST RELAY. REPLACE CR MOTOR.
RECORDING-WEAK	WEAK TUBE IN RECORD AMPLIFIER OR DEFECTIVE RECORD HEAD.	CHECK 12AU7 REPLACE HEAD
RECORDING DISTORTED	ERASE OSCILLATOR NOT WORKING. DEFECTIVE HEAD	CHECK 6AQ5 REPLACE HEAD.

TROUBLE	CAUSE IN ORDER OF PROBABILITY	REMEDY
INSUFFICIENT PLAYBACK VOLUME.	WEAK TUBE, VERY LIKELY 12AX7 IF MACHINE HAS GOOD AUDIO OTHERWISE.	CHECK 12AX7 AND REPLACE.
	BROKEN OR POOR ELECTRICAL OR ELECTRONIC CONTINUITY.	CHECK WITH EITHER OHM METER, OR SIGNAL GENERATOR AND VACUUM TUBE VOLTMETER AS REQUIRED.

CHAPTER VI

TYPICAL VOLTAGE READINGS ON DCR-1 A

ALL D.C. READINGS MEASURED WITH
SIMPSON #260 METER. ALL VOLTAGES WITH
RESPECT TO CHASSIS EXCEPT WHERE INDICATED

D.C. MEASUREMENTS

SET IN AUTOMATIC OPERATION	TRIGGERED	RECORDING
POWER SUPPLY		
6X4 CATHODE (PIN 7)	260	260
SECOND FILTER	235	235
THIRD FILTER	215	215
NEGATIVE RETURN	-10	-11
CR AMPLIFIER		
6AU6 TRIODE PLATE & SCREEN. (PINS 5 & 6)	260	235
GRID (PIN 1)	-6.5	-6.8
1/2 12AU7 (DRIVER) PLATE (PIN 1)	62	62
CATHODE (PIN 3)	2.2	2.2
1/2 12AX7 (2ND PRE-AMP) PLATE (PIN 1)	80	80
CATHODE - PIN 3	.75	.75
1/2 12AU7 (RECORD AMP.) PLATE (PIN 6) (IN RECORD POSITION)	105	85
CATHODE (PIN 8)	3.8	4.5
6AQ5 OSCILLATOR SCREEN (PIN 6)		160
PLATE (PIN 5)		160
GRID (PIN 1, 7)		-23

SET IN PLAYBACK OPERATION	VOLTAGES
PLAYBACK AMPLIFIER	
1/2 12AX7 FIRST AMP. PLATE (PIN 1)	80
CATHODE (PIN 3)	.75
1/2 12AX7 (SECOND AMP.) PLATE (PIN 6)	85
CATHODE (PIN 8)	.65
1/2 12AU7 (DRIVER) PLATE PIN 1	60
CATHODE (PIN 3)	2.3
6AQ5 (OUTPUT PLATE PIN 5)	210
SCREEN GRID (PIN 6)	215
CATHODE (PIN 2)	11

AC SIGNAL MEASUREMENTS

RECORD AMPLIFIER (RECORD GAIN CONTROL FULL- 400 CYCLE SIGNAL FROM 600 OHM GENERATOR. OUTPUT LOADED WITH HEAD.)	
INPUT TO TERMINAL BLOCK (DO NOT GROUND ONE SIDE) (OSCILLATOR TUBE OUT)	.034
1/2 12AU7 RECORD AMPLIFIER GRID (PIN 7)	.42
1/2 12AU7 " " PLATE (PIN 6)	5.8
THROUGH COUPLING CAPACITOR	5.6

AC SIGNAL MEASUREMENTS (CONTINUED)

AT RECORD HEAD

.094

RECORD AMP HAS OVERALL GAIN OF 2.6 TO 3.
READING AT HEAD MAY BE .08 TO .1 VOLT.

PLAY BACK AMPLIFIER

(PLAYBACK GAIN CONTROL -- FULL -- 1000 CYCLE SIGNAL
INPUT LOADED WITH HEAD)

INPUT AT HEAD TERMINALS			.001	V.A.C.
1/2 12AX7	FIRST AMPLIFIER PLATE	(PIN 1)	.045	V.A.C.
1/2 12AX7	SECOND AMPLIFIER GRID	(PIN 7)	.044	V.A.C.
1/2 12AX7	SECOND AMPLIFIER PLATE	(PIN 6)	.32	V.A.C.
1/2 12AU7	DRIVER AMPLIFIER GRID	(PIN 2)	.32	V.A.C.
1/2 12AU7	DRIVER AMPLIFIER PLATE	(PIN 1)	4.8	V.A.C.
6AQ5	POWER OUTPUT GRID	(PIN 1,7)	4.6	V.A.C.
6AQ5	POWER OUTPUT PLATE TO B+	(PIN 5)	82.0	V.A.C.

OVERALL VOLTAGE GAIN OF PLAYBACK AMPLIFIER MAY VARY FROM
60,000 TO 100,000, THEREFORE A READING AT 6AQ5 PLATE CAN
BE BETWEEN 60 AND 100 VOLTS.

ADJUSTMENTS OF RECORD PLAYER MECHANISM

SECTION A

BRIEF DESCRIPTION OF OPERATING PRINCIPLES.

THE DEVICE USED IS ESSENTIALLY THE REPEATER PORTION OF A STANDARD, HIGHLY DEVELOPED, RECORD CHANGER MECHANISM. TO ADAPT THIS MECHANISM TO THE REQUIREMENTS OF TELEPHONE ANSWERING, SEVERAL MODIFICATIONS WERE MADE TO FULLY UTILIZE THE TORQUE OF THE PRIME MOVER AND TO INCREASE THE INDEXING LATITUDE OF THE REPEATER MECHANISM.

CURRENT APPLIED TO THE WINDING OF THE DRIVER MOTOR WILL TRANSFER POWER TO ITS SHAFT AND THEN ON TO A DRIVE PULLEY. CO-AXIALLY AFFIXED TO THIS FIRST DRIVE IS A SMALLER DRIVING SURFACE, WHICH ENGAGES THE INSIDE RIM OF THE TURNTABLE ITSELF AND IN SO DOING EFFECTS A SPEED REDUCTION, RESULTING IN AN OUTPUT DRIVE OF 45 RPM.

ATTACHED TO THE UNDERSIDE OF THE TURNTABLE SHAFT IS A KNURLED COUPLING, WHOSE FRICTIONAL SURFACE ENGAGES AN ECCENTRIC DRIVE WHEEL, WHOSE HUB IS ATTACHED TO THE MOVABLE SLIDE PLATE. MOVEMENT OF THE ECCENTRIC CAUSES THE PLATE TO TRAVEL IN A LATERAL COURSE BETWEEN GUIDE BARS.

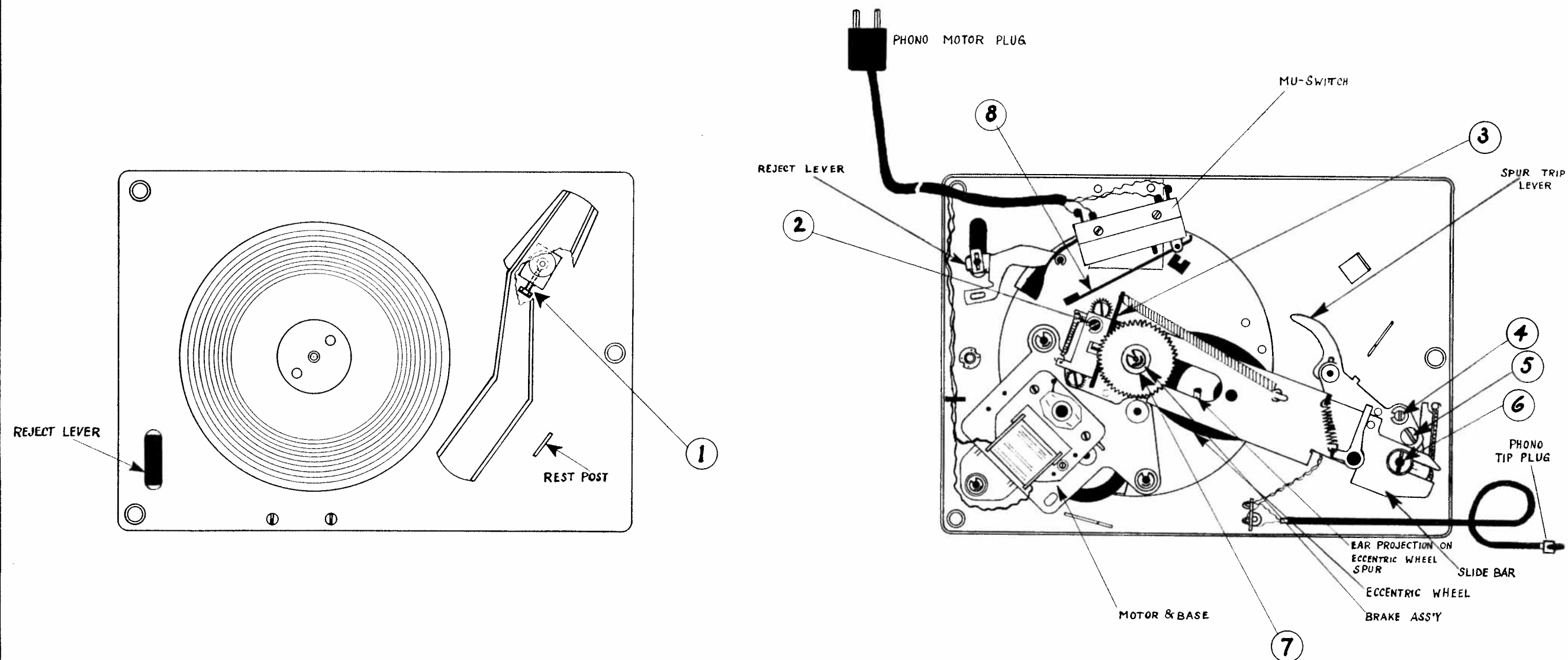
FOR PURPOSES OF MECHANICAL ANALYSIS THE POSITIONS OF THE GUIDE BAR CAN BE SUBDIVIDED:

- A. THE FORWARD OR STATIONARY POSITION; THAT IS WHEN THE BAR HAS MOVED TO ITS FURTHERMOST POSITION TOWARD THE TURNTABLE SHAFT. IN THIS POSITION THE TONE ARM HAS BEEN LOWERED AND IS FREE TO FOLLOW THE GROOVING OF THE RECORD.
- B. THE BACKWARD AND IN-BETWEEN POSITIONS. WHERE THE ECCENTRIC WHEEL AND ITS ASSOCIATED SLIDE PLATE ARE IN MOTION; THE TONE ARM IS NOT FREE, BUT IS BEING GUIDED THROUGH A PATH DETERMINED BY THE MECHANICAL CAMMING AND LEVERING ACTIONS OF THE SLIDE BAR ASSEMBLY.

CONSIDERING FIRST OF ALL THE CONDITION OF SECTION A., WE SEE THAT WHEN THE SLIDE BAR IS WAY FORWARD, THE ECCENTRIC DRIVE HAS POSITIONED ITSELF SO THAT ITS "ROUND" OR "BAY" IS HARBORING THE KNURLED COUPLING OF THE TURNTABLE SHAFT. IN THIS POSITION, A DEFINITE CLEARANCE EXISTS BETWEEN THE KNURLED SURFACE OF THE COUPLING AND THE HOLLOWED SECTION ON THE PERIPHERY OF THE ECCENTRIC DRIVE WHEEL. THIS CONDITION OF NO FRICTION WILL REMAIN UNTIL SOME POSITIVE FORCE IS APPLIED TO THE ECCENTRIC TO NUDGE IT INTO ENGAGEMENT WITH THE REVOLVING KNURLED COUPLING.

THIS FORCE IS APPLIED AS FOLLOWS: AS THE TONE ARM TRAVERSES THE GROOVING OF THE RECORD, A FOLLOWER MECHANISM BELOW IT AND ON THE UNDERSIDE OF THE RECORD MOVES IN A PARALLEL PATH. AT THE TIP OF THIS FOLLOWER IS A SPUR TRIP LEVER, WHICH EVENTUALLY AS IT MOVES IN A TANGENTIAL PATH ACROSS THE ECCENTRIC WHEEL, PUSHES THE SMALL EAR PROJECTING FROM THE TOP SIDE OF THE ECCENTRIC AND CAUSES THE OUTER SURFACE TO RE-ENGAGE THE KNURLED COUPLING. THIS CAUSES THE SLIDE BAR TO MOVE AWAY FROM THE CENTER OF THE TURNTABLE.

WE ARE NOW ENTERING THE PHASE OF MECHANICAL OPERATION DESIGNATED UNDER (B.). THE MOTION OF THE SLIDE BAR EFFECTS A 3 WAY MECHANICAL ACTION OF LIFTING THE TONE ARM, RETURNING IT TO A STARTING POSITION AND OPERATING A LATCH TO MAKE POSSIBLE A STEADY INDEXING POSITION. THE LIFTING OF THE TONE ARM IS ACCOMPLISHED BY A RAISED PORTION OF THE SLIDE, BEARING UPWARD ON A PIN, TO LIFT THE TONE ARM UP AT A POINT AHEAD OF ITS SWIVEL POSITION. THE RETURN OF THE ARM IS EFFECTED BY THE ACTION OF A LEVER IN THE SLIDE MECHANISM STRIKING A PROJECTING PIN FROM A LEVER AFFIXED TO THE UNDERSIDE OF THE TONE ARM SWIVEL. ON THE FORWARD STROKE OF THE SLIDE, AGAIN THE TONE ARM WILL SWING BACK TOWARD ITS INDEXING POSITION; THE RAISING STEP ON THE SLIDE BAR WILL SLIP OUT FROM UNDER THE TONE ARM ELEVATING PIN, ALLOWING IT TO DROP TO THE RECORD. THE LATCH WILL RELEASE, THUS FREEING THE ARM TO FOLLOW THE RECORD GROOVING.



- ① COARSE TONE ARM INDEXING ADJUSTMENT - Keep screw fairly tight to prevent slippage ; adjust arm, then lock with screw .
- ② BRAKE ADJUSTMENT - Usually set for full engage time of brake knife , screw also actuates MU Switch Lever Arm .
- ③ SLIDE BAR STOP ADJUSTMENT - Adjust for necessary clearance (approx. $\frac{1}{16}$ ") in hollow spot on excentric wheel in running position of turntable .
- ④ SPUR LEVER TRIP ADJUSTMENT - Adjust for maximum trip action .
- ⑤ FINE INDEXING ADJUSTMENT - Adjust for lead-in groove on record, after making adjustment ① .
- ⑥ TONE ARM LIFT ADJUSTMENT - Adjust so that tone arm lifts and clears rest post on top side .
- ⑦ BRAKE SPRING - If too much brake action. Shorten spring , if further reduction is needed .
- ⑧ MU SWITCH LEVER ARM - Adjust by bending so that Mu Switches click in as tone arm drops on record .

**Adjustments
of Record Player Mechanism**
- THE "ELECTRONIC SECRETARY DCR-1" -
ELECTRONIC SECRETARY INDUSTRIES, Inc.
805 South Fifth Street, MILWAUKEE, Wisconsin, U.S.A.
Tel.: Orchard 2-0863 or 0746

August 24, 1953 E.O. ROLLE.

CHAPTER VIII

ADJUSTMENTS OF THE WIRE RECORDER MECHANISM

SECTION A

FORWARD ADJUSTMENTS: THIS CATEGORY OF ADJUSTMENTS HAS REFERENCE TO CORRECTIVE MEASURES TAKEN TO REMEDY FAULTY OPERATION IN THE RUN OR FORWARD OPERATION OF THE WIRE RECORDER MECHANISM. WE SHALL LIST THE TROUBLES RESULTING FROM THESE MALADJUSTMENTS, THE CAUSE AND THE REMEDY OR CORRECT ADJUSTMENT:

APPARENT TROUBLE: SLIPPING IN THE RUN POSITION.

CAUSE 1. OIL ON MOTOR SHAFT, INTERMEDIATE DRIVE PULLEY, OR TAKE-UP DRUM TURNTABLE. (SEE FIGURE 2)

ADJUSTMENT: CLEAN WITH ALCOHOL ONLY.

CAUSE 2. MOTOR SHAFT NOT CENTERED IN ACCESS WELL ON TOPSIDE OF MOTOR BOARD.

ADJUSTMENT: REMOVE PLUG FROM TOPSIDE OF MOTOR BOARD AS SHOWN IN FIGURE 4. THIS PERMITS VISIBLE ACCESS TO TOP END OF MOTOR SHAFT. NOW LOOSEN MACHINE SCREWS HOLDING MOTOR FRAME ASSEMBLY TO BRACKET ATTACHED TO MOTOR BOARD. POSITION MOTOR SO THAT SHAFT IS CENTERED IN WELL AND TIGHTEN SCREWS.

CAUSE 3. STICKING OF THE ROCKER ARM ASSEMBLY CAUSED BY FRICTION DEVELOPED BETWEEN STABILIZING BAR (REFER TO FIGURE 3) AND ALUMINUM IDLER WHEEL OR ITS SUPPORTING ARM.

REMEDY: SPRING BAR UP OR DOWN TO GET UNIFORM CLEARANCE ON BOTH SIDES OF STABILIZING BAR. THIS WILL PERMIT ROCKER ASSEMBLY TO MOVE WITHOUT UNBUE FRICTION.

CAUSE 4. IMPROPER ADJUSTMENT OF TURNTABLE TORQUE.

PROPER ADJUSTMENT OF THE TURNTABLE TORQUE IS VERY IMPORTANT. INSUFFICIENT TORQUE WILL RESULT IN INCONSISTENT TURNTABLE SPEED, CAUSING "WOW". TOO MUCH TORQUE WILL RESULT IN WIRE BREAKAGE WHEN SWITCHING FROM "REWIND" TO "PLAY".

1. WITH THE POWER CONNECTED, PLACE THE UNIT IN "PLAY" POSITION.

2. LOOSEN THE LOCKNUT ON THE ADJUSTMENT SCREW IN THE MOTOR MOUNTING BRACKET.

3. IF THE TURNTABLE DOES NOT ROTATE, TURN THE ADJUSTMENT SCREW COUNTERCLOCKWISE UNTIL THE IDLER DRIVE PULLEY BARELY MAKES CONTACT WITH THE TURNTABLE, BUT ENOUGH TO ALLOW THE TURNTABLE TO ROTATE.

4. IF THE TURNTABLE IS ROTATING, TURN THE SCREW CLOCKWISE UNTIL THE TURNTABLE STOPS ROTATING, THEN BACK THE SCREW OUT UNTIL THE IDLER DRIVE PULLEY BARELY MAKES CONTACT WITH THE TURNTABLE, BUT ENOUGH TO ALLOW THE TURNTABLE TO ROTATE.

5. AFTER THIS ADJUSTMENT IS MADE, TURN THE ADJUSTMENT SCREW COUNTERCLOCKWISE 3/4 TURN.

6. TIGHTEN THE LOCKNUT, BEING CAREFUL NOT TO TURN THE ADJUSTMENT SCREW.

APPARENT TROUBLE: STALLING IN THE RUN POSITION.

CAUSE 1. INSUFFICIENT END PLAY IN TURNTABLE DRUM SHAFT ASSEMBLY. SEE FIGURE 5 AS DSA.

ADJUSTMENT: LOOSEN ALLEN SET SCREWS ON SPRING SUPPORT HUB AND SET FOR CLEARANCE OF .006''.

CAUSE 2. INSUFFICIENT END PLAY IN REWIND PULLEY SHAFT ASSEMBLY SHOWN IN FIGURE 5 AS RPSA.

ADJUSTMENT: LOOSEN ALLEN SET SCREW ON WORM GEAR COUPLING AND SET FOR .006'' PLAY.

CAUSE 3. TOO MUCH FRICTON OR TOO DEEP MESH BETWEEN THE WORM GEAR AND FIBER GEAR TRAIN.

ADJUSTMENT: REMOVE BAKELITE SWITCH COVER HOUSING ON TOP OF MOTOR BOARD BY TAKING OUT THREE PHILLIPS HEAD SCREWS. THIS MAKES AVAILABLE THREE HEX HEAD SCREWS WHICH HOLD THE ENTIRE LEVEL WIND ASSEMBLY WITH THE FIBER GEAR TRAIN TO THE UNDERSIDE OF THE MOTOR BOARD. SLIGHT LOOSENING OF THESE SCREWS PERMITS THE ASSEMBLY TO BE SHIFTED SO THAT A SHALLOWER OR DEEPER MESH CAN BE SECURED AS REQUIRED. SET THE MESH FOR 3/4 TOOTH DEPTH AND SECURE BY TIGHTENING THE HEX SCREWS.

CAUSE 4. NOT ENOUGH END PLAY IN THE HORIZONTAL SHAFT EXTENDING FROM THE TAKE-OFF FIBER GEAR TO THE HEART SHAPED LEVEL WIND CAM ON THE REWIND ASSEMBLY.

ADJUSTMENT: LOOSEN ALLEN SET SCREWS ON CAM AND RESET FOR 10/1000THS CLEARANCE.

CAUSE 5. INSUFFICIENT END PLAY IN SHAFT EXTENDING FROM SECONDARY FIBER GEAR TO FLEXIBLE SHAFT COUPLING ON REWIND ASSEMBLY.

ADJUSTMENT: LOOSEN ALLEN SET SCREWS ON COUPLING AND ADJUST FOR .003''.

SECTION B.

REWIND ADJUSTMENTS: THIS SECTION DEALS PRINCIPALLY WITH ADJUSTMENTS THAT EFFECT THE REWIND OPERATION OF THE MECHANISM. THESE MANIFESTATIONS WOULD IN MOST CASES BE A SLOW REWIND, AND LESS FREQUENTLY NO REWIND.

CAUSE 1. OIL ON IDLER WHEEL TRAIN. SEE FIGURE 3 FOR WHEELS THAT WOULD BE AFFECTED.

ADJUSTMENT: CLEAN WITH ALCOHOL ONLY.

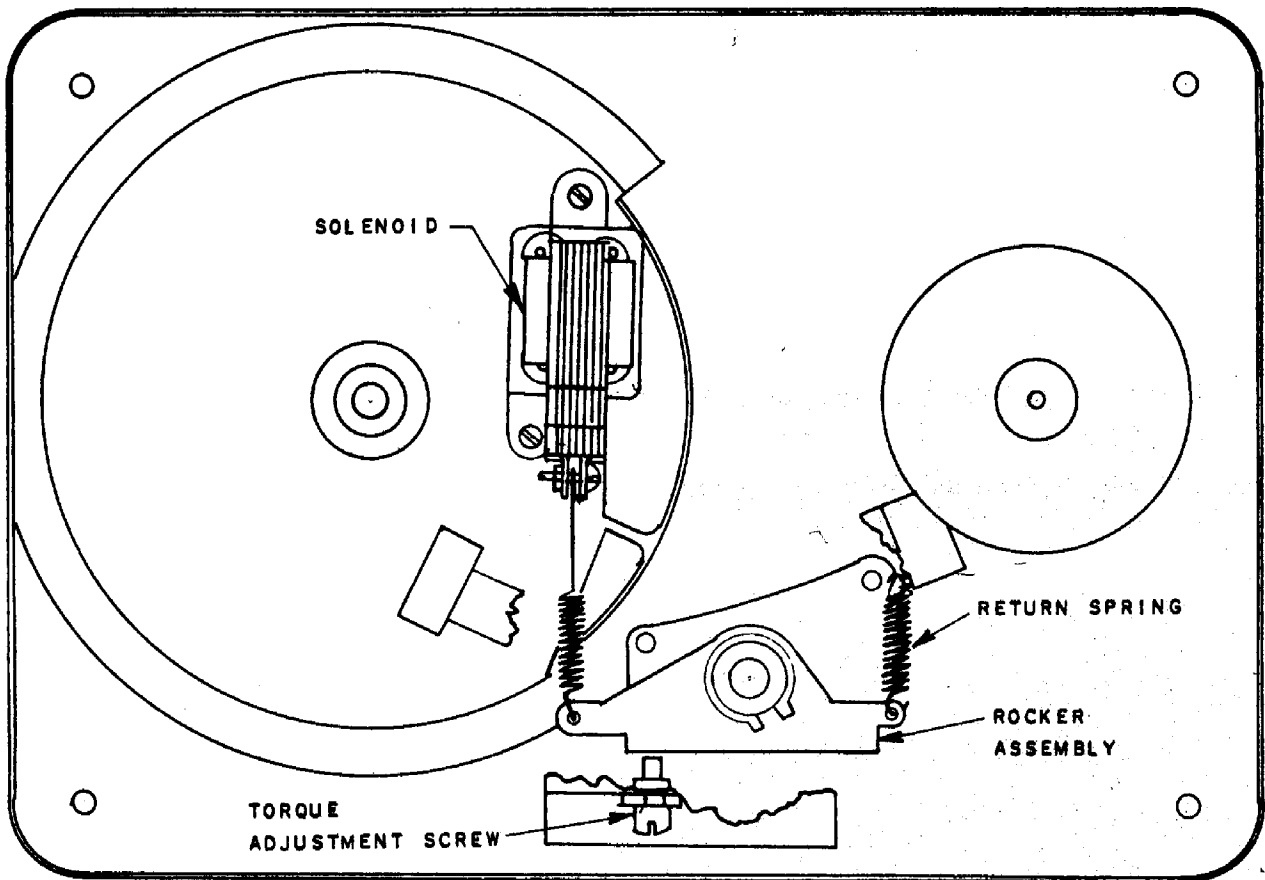


FIGURE # 1 ACTION OF ROCKER ASSEMBLY

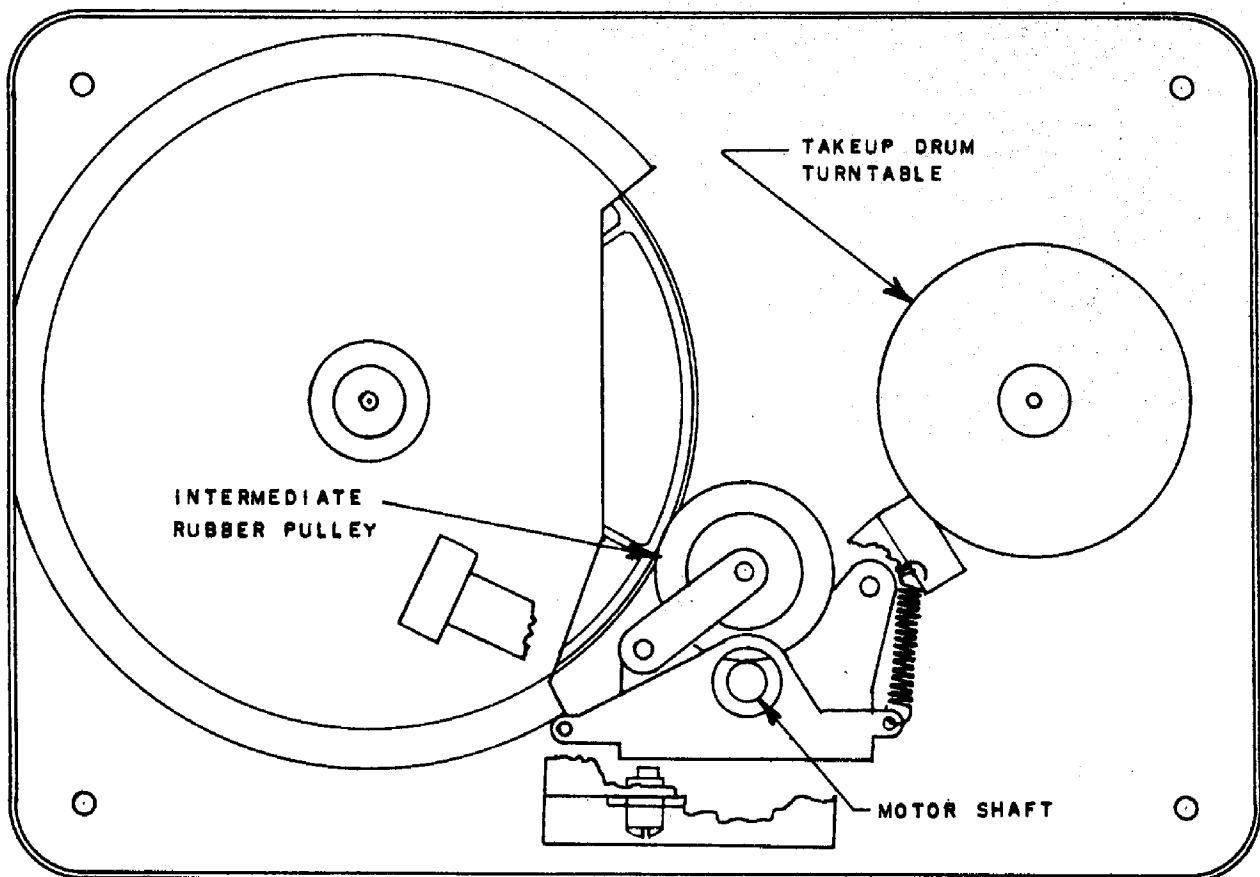


FIGURE # 2 OPERATION OF RUN

CAUSE 2. MISALIGNMENT OF IDLER WHEELS, ESPECIALLY 2 RIM RUBBER DRIVE PULLEY.

ADJUSTMENT: SPRING SUPPORTING ARM UP OR DOWN UNTIL PULLEY IS IN PROPER PLANE WITH RESPECT TO OTHER PULLEYS.

CAUSE 3. MALADJUSTMENT OF STABILIZING BAR.

ADJUSTMENT: WITH THE MACHINE IN OFF POSITION, LOOSEN SET SCREW ON STABILIZING BAR AND ADJUST TO OBTAIN $1/16''$ CLEARANCE BETWEEN ALUMINUM DRIVE PULLEY AND RUBBER DRIVE PULLEY, ATTACHED TO MOTOR SHAFT.

CAUSE 4. INSUFFICIENT EXERTION OF FORCE ON ROCKER ASSEMBLY BY SOLENOID.

ADJUSTMENT: LOOSEN MOUNTING SCREWS ON SOLENOID BRACKET AND MOVE SOLENOID ASSEMBLY AS NECESSARY TO OBTAIN INCREASED PRESSURE.

CAUSE 5. SOLENOID JAMMING IN OUT POSITION, THUS NOT PERMITTING REWIND ACTION.

ADJUSTMENT: LOOSEN SCREWS ON BUMPER BRACKET WHICH LIMITS TRAVEL OF SOLENOID, AND RESET SO THAT SOLENOID IS $1/32''$ FROM EXTENDED POSITION.

CAUSE 6. REFER TO SECTION A UNDER SLOW RUN. SOME OF THESE CAUSES COULD AFFECT REWIND ACTION ALSO.

SECTION C.

LEVEL WIND ADJUSTMENTS:

1. ROTATE THE REWIND HUB UNTIL THE RECORDING HEAD IS IN ITS EXTREME DOWNWARD POSITION. IN THIS POSITION, THE WIRE SLOT IN THE RECORDING HEAD SHOULD BE APPROXIMATELY $.20''$ ABOVE THE MOTOR BOARD. IF THE WIRE IS TOO HIGH OR TOO LOW, WITH RESPECT TO THE MOTOR BOARD, IT MAY BE ADJUSTED BY SLIGHT BENDING OF THE LEVEL WIND SLIDE.
2. THE RESET SWITCH ARM, WHICH IS FASTENED TO THE TOP OF THE SWITCH HOUSING, SHOULD BE $15/32''$ FROM RAISED SECTION ON THE MOTOR BOARD UNDER SWITCH LEVER FINGER. THIS MAY BE ADJUSTED BY BENDING THE ARM.
3. THREAD ON A SPOOL OF WIRE AND LET IT WIND ON THE TURNTABLE FOR 15 OR 20 MINUTES. OBSERVE HOW THE WIRE LIES IN THE CHANNEL OF THE TURNTABLE. WITH THE PROPER ADJUSTMENT, THE WIRE SHOULD BE EVEN ALL THE WAY ACROSS THE CHANNEL. IF THE WIRE PILES UP IN THE TOP OF THE CHANNEL OF THE TURNTABLE, REMOVE THE TURNTABLE AND ADD WASHERS UNTIL THE CONDITION IS CORRECTED. IF THE WIRE PILES UP IN THE BOTTOM OF THE CHANNEL, WASHERS SHOULD BE REMOVED.
4. REWIND THE WIRE ON THE STORAGE SPOOL AND OBSERVE HOW THE WIRE LIES ON THE SPOOL. IF THE WIRE PILES UP ON THE TOP OF THE SPOOL, REMOVE THE HUB ASSEMBLY AND ADD WASHERS UNTIL THIS CONDITION IS CORRECTED. IF THE WIRE PILES UP ON THE BOTTOM OF THE SPOOL, WASHERS SHOULD BE REMOVED.

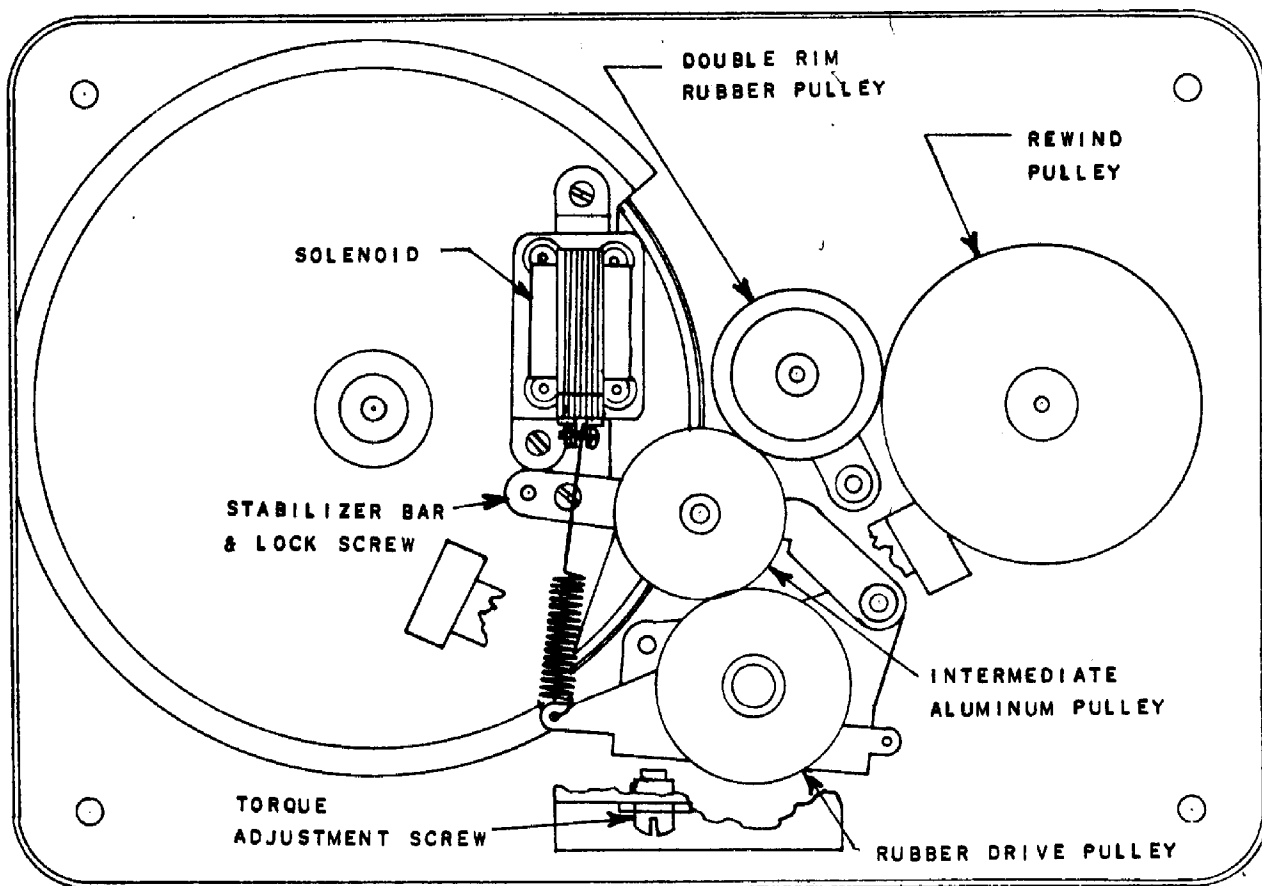


FIGURE # 3. OPERATION OF REWIND

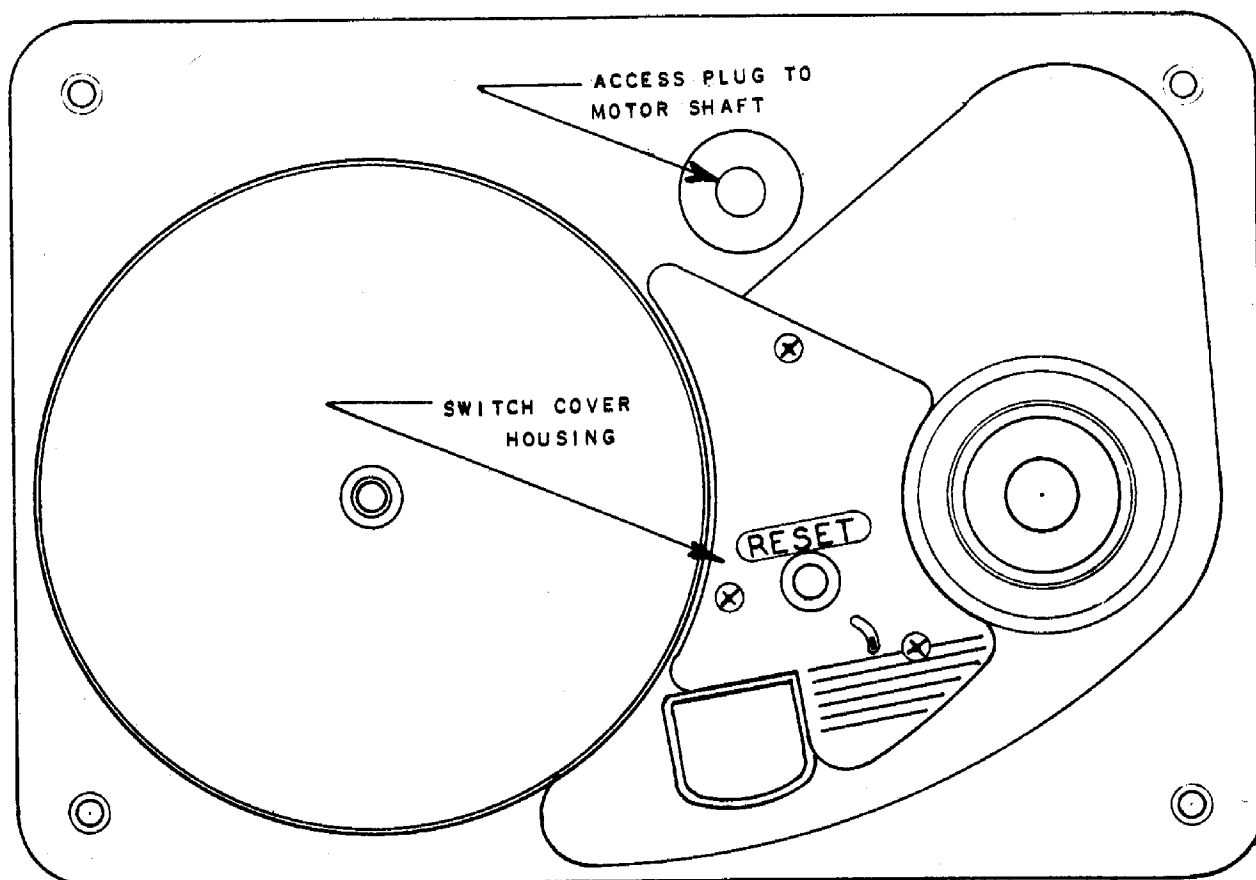


FIGURE # 4 TOP VIEW WIRE RECORDER

SECTION D.

LUBRICATION: FACTORY LUBRICATION SHOULD BE SUFFICIENT FOR A LONG PERIOD OF SERVICE; HOWEVER, SHOULD IT BECOME NECESSARY TO LUBRICATE THE RECORDER, DO SO AS FOLLOWS: USE STA-PUT NO. 512 GREASE ON THE FOLLOWING:

1. PINS OF THE BRACKET AND POST ASSEMBLY.
2. WASHERS.
3. THE WORM GEAR OF THE REWIND PULLEY ASSEMBLY.
4. THE SHAFT OF THE LEVEL WIND SHAFT AND GEAR ASSEMBLY, ALSO BEARING FACES.
5. LEVEL WIND GUIDES OF THE FRAME AND HOUSING ASSEMBLY.
6. FOLLOWER ASSEMBLY.

USE STA-PUT NO. 320 OIL ON THE FOLLOWING:

1. REVERSING GEAR ASSEMBLY.
2. THE CAM SURFACE OF THE LEVEL WIND CAM.

CAUTION: ALL PRESSED OILITE BEARINGS DO NOT REQUIRE OIL.

DO NOT, UNDER ANY CIRCUMSTANCES, PERMIT OIL OR GREASE TO COME IN CONTACT WITH THE RUBBER TIRES OF THE IDLER PULLEYS AND DRIVE PULLEY, THE TURNTABLE RIM, PULLEY, AND THE REWIND PULLEY. IF GREASE AND OIL ARE ON THE RUBBER TIRES, REPLACE THEM WITH NEW ONES AND CLEAN THE OTHER SURFACES WITH CARBON TETRACHLORIDE.

AVOID OVERLUBRICATION.

SECTION E.

CLEANING OF THE RECORDING HEAD: WEAK REPRODUCTION WHEN NOT ACCOMPANIED BY HIGH DISTORTION. IS PROBABLY DUE TO DIRT OR FOREIGN MATTER IN THE RECORDING GAP. CLEAN THE GAP WITH A STIFF-BRISTLE BRUSH, USING CARBON TETRACHLORIDE.

CAUTION: DO NOT USE ANY METALLIC OBJECT FOR THIS PURPOSE.

SECTION F.

AUTOMATIC SWITCH ASSEMBLY:

THIS ASSEMBLY IS LOCATED ON THE TOP SIDE OF THE MOTOR BOARD UNDER THE BAKELITE SWITCH HOUSING, AND ITS ACTUATING DEVICE FOR RESETTING PURPOSES IS A SMALL PUSHBUTTON. THE DEVICE NORMALLY IS MADE TO TRIP WHEN THE PLASTIC LEADER AT EITHER END OF THE SPOOL OF WIRE PASSES BY IT. THE ACTUATING DEVICE FOR OPENING OR TRIGGERING THE SWITCH IS A SMALL METTALIC PEG, WHICH EXTENDS ACROSS AND JUST ABOVE THE NORMAL PATH OF THE WIRE AS IT TRAVELS FROM ONE SPOOL TO THE OTHER. ATTACHED TO THIS TRIPPING PEG IS A SMALL RECTANGULAR PLATE, WHICH IS FREE TO TRAVEL AROUND A MOUNTING POST, BUT ASSUMES A CENTERED POSITION BECAUSE OF THE EQUALIZING FORCE OF A TINY HAIR PIN SPRING. PROJECTING FROM ONE END OF THIS PLATE IS A SHORT TRIPPING PAWL, WHICH IN ITS CENTERED POSITION TENDS TO HOLD THE MOVING LEAF OF A SNAP-ACTION SWITCH IN THE CLOSED POSITION. A SLIGHT DISTURBANCE OF THE SMALL METTALIC PEG, SUCH AS MIGHT OCCUR WHEN THE PLAS-

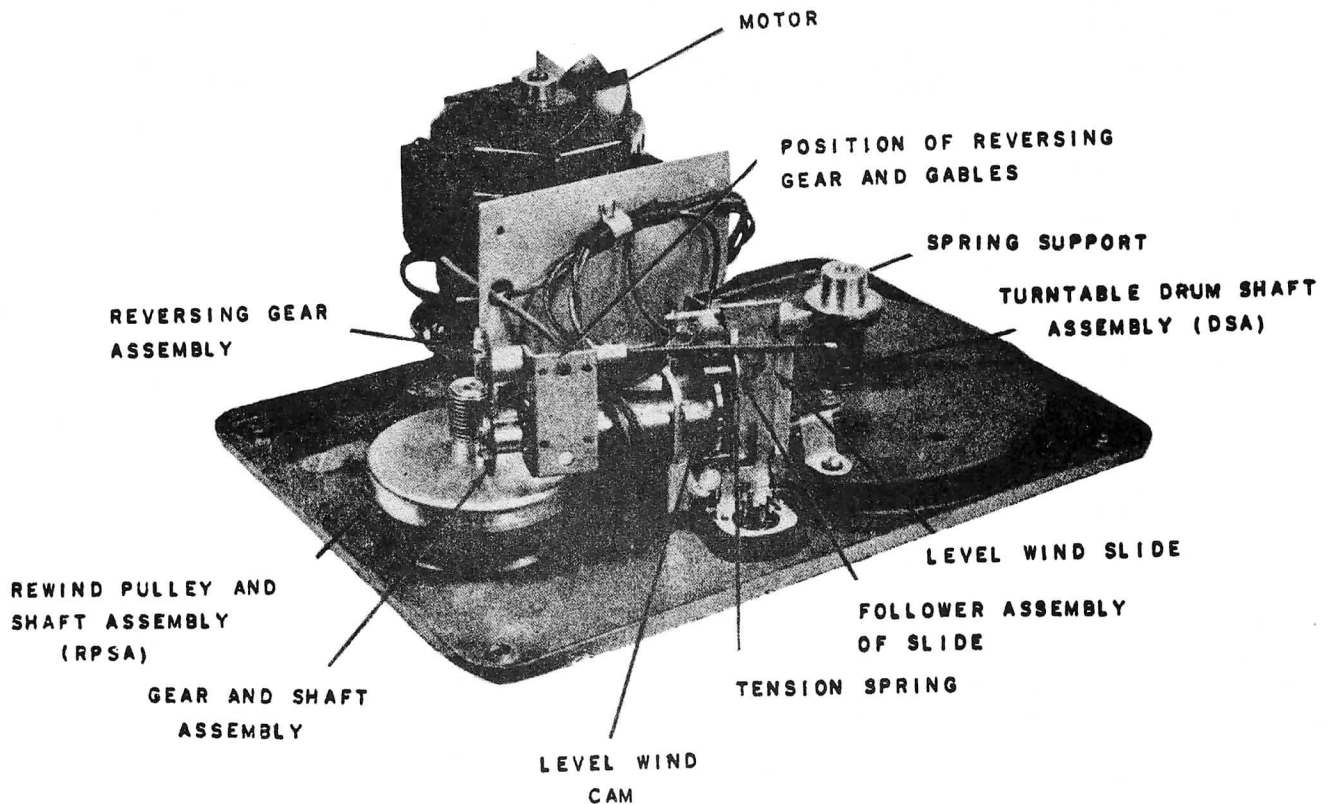


FIGURE # 5 UNDERSIDE WIRE RECORDER ASSEMBLY

TIC LEADER RUBS AGAINST IT, WILL PRODUCE A SWIVELING MOTION IN THE PLATE AND A LATERAL MOVEMENT OF THE TRIPPING PAWL FROM UNDER THE SWITCH LEAF, ALLOWING IT TO SNAP OPEN AND INTERRUPT THE FLOW OF CURRENT TO THE WIRE RECORDER MOTOR.

FALSE TRIPPING DUE TO VIBRATION OR OTHER EXTRANEIOUS CAUSES CAN BE CORRECTED BY SETTING THE BENT ENDS OF THE HAIR PIN SPRING SO THAT THE SWIVELING PLATE WILL ASSUME A POSITION OF CORRECT CENTER. IN THIS POSITION THE PAWL WILL PUSH UP SQUARELY AGAINST THE CENTER OF THE LEAF SPRING.

COUNTER NOT TURNING.

IN MOST CASES THIS IS CAUSED BY ONE OF THE SMALL ALLEN SET SCREWS, HOLDING THE CABLE WHICH LINKS THE REWIND ASSEMBLY TO THE COUNTER ASSEMBLY, BEING LOOSE.

ADJUSTMENT: TIGHTEN THE LOOSE SET SCREW WITH A SMALL ALLEN WRENCH.

Parts Price List For DCR Electronic Secretary

		LIST PRICE
DCR	PUNCHED CHASSIS WITH BOTTOM PLATE	\$24.00
4-1/16"	MOUNTING PILLARS	.28
4-1/8"	MOUNTING PILLARS	.28
10/32-1/2"	OVAL HEAD MOUNTING SCREWS	.04
V ₅	NOVAL TUBE SOCKET - 9 PIN BASE	.20
V ₄	NOVAL TUBE SOCKET WITH SHIELD	.60
	1-15/16" SHIELD FOR ABOVE ITEM	.32
V ₁	MINIATURE TUBE SOCKET	.16
V ₂	MINIATURE TUBE SOCKET	.16
V ₃	MINIATURE TUBE SOCKET	.16
V ₆	MINIATURE TUBE SOCKET	.16
4/36 x 3/8"	CADMIUM PLATED BOLTS	.04
4/36"	LOCK WASHERS	.04
4/36"	NUTS	.04
6/32 x 1/2"	MACHINE SCREWS	.04
6/32	LOCK WASHER	.04
6/32	NUTS	.04
1/8"	GROMMETS	.04
C ₃	20-20-20-25 CONDENSER-ELECTROLYTIC	1.24
C ₄	20-20-20 450 CONDENSER-ELECTROLYTIC	2.00
C ₂	10-10 450 20 25 CONDENSER-ELECTROLYTIC	1.24
6/32 x 3/8"	BOLT	.04
1-3/8"	CONDENSER MOUNTING PLATE	.04
1"	CONDENSER MOUNTING PLATE	.04
S ₁	AMPHENOL CHASSIS SOCKET	.60
6/32 x 1/4"	BOLT	.04
S ₃	JONES CHASSIS SOCKET	.60
	3 LUG TY STRIP	.04
	2 LUG TY STRIP	.04
	5 LUG TY STRIP	.04
	SOLDERING LUG	.04
S ₂	PHONE SOCKET	.04
M-93	PHONE TIP	.04
P ₁	.5 MEG VOLUME CONTROL	.96
P ₂	.5 MEG VOLUME CONTROL	.96
P ₃	.5 MEG VOLUME CONTROL	.96

	NUTS FOR VOLUME CONTROL	.04
	WASHERS FOR VOLUME CONTROL	.04
J	3 CIRCUIT JACK	.96
	INSULATING WASHER FOR ABOVE ITEM	.04
	INSULATING WASHER FOR ABOVE ITEM	.04
O	OSCILLATOR COIL	4.20
C ₁	400 V CONDENSOR 2 MF	3.60
L	LOUD SPEAKER AND BRACKET	4.20
6/32 x 1"	BOLT	.04
1/2"	BRASS SPACERS	.04
T ₁	POWER TRANSFORMER	6.80
T ₃	OUTPUT TRANSFORMER	1.80
T ₂	INPUT TRANSFORMER	5.20
T ₄	CHOKE	2.80
1/2 x 5/8"	GROMMETS	.04
F ₁	FUSE EXTRACTOR POST	.44
	3 A FUSE	.04
1714 M	SNAP BUTTON TIMER PLUG	.04
SR	SELENIUM RECTIFIER 75 MA	.96
	CR TIMER	24.00
	SAFETY TIMER	28.00
6/32 x 2"	BOLT	.04
1 1/4"	BRASS PILLARS	.12
	425 OHM 20W RESISTOR	.80
	1/2 W 100 OHM CARBON RESISTOR	.12
	1/2 W 220 OHM CARBON RESISTOR	.12
	1/2 W 500 OHM CARBON RESISTOR	.12
	1/2 W 22K CARBON RESISTOR	.12
	1/2 W 56K CARBON RESISTOR	.12
	1/2 W 100K CARBON RESISTOR	.12
	1/2 W 330K CARBON RESISTOR	.12
	1/2 W 560K CARBON RESISTOR	.12
	1 W 270 OHM CARBON RESISTOR	.16
	1 W 56K CARBON RESISTOR	.16
	2 W 1500 OHM CARBON RESISTOR	.24
	10 W 250 OHM CARBON RESISTOR WITH LEADS	.80
	10 W 40K OHM CARBON RESISTOR WITH LEADS.	1.60
	.001 MFD 600V CONDENSOR	.08
	.01 MFD 600V CONDENSOR	.08
	.02 MFD 600V CONDENSOR	.16
	.05 MFD 600V CONDENSOR	.12
	.1 MFD 600V CONDENSOR	.16

	10 50V CONDENSOR TUBULAR	.40
7613	3 PDT CONTROL SWITCH	2.80
91 M	AMPHENOL CABLE CONNECTOR	.28
	1 FT. LENGTH TENSOLITE HEAD CABLE	.20
	8 FT. POWER CORD - .2 WIRE	.80
861	SPRING ACTION AC PLUG	.36
P4	.5 MEG. VOLUME CONTROL WITH SWITCH	1.20
1114	VOLUME CONTROL KNOB	.16
R1	2500 OHM SPST RELAY	2.80
R2	2500 OHM SPST RELAY	2.80
R3	AC RELAY	2.96
R4	AC RELAY	2.96
R5	AC RELAY	2.96
R6	AC RELAY	2.96
R7	AC RELAY	2.96
R8	AC RELAY	2.96
R9	AC RELAY	2.96
	FRONT CONTROL PLATE	1.00
RP 190	RECORD PLAYER ONLY	24.00
RP 190	RECORD PLAYER COMPLETE WITH MU SWITCHES, BRACKET AND JONES PLUG CABLE	36.00
KLB1002	MU SWITCHES	1.60
	BRACKET FOR MU SWITCHES	.60
P-304	JONES PLUG	.96
	CABLE ASSEMBLY - .4 WIRE	.96
6-3/4"	LG. TIMER SPEEDOMETER CABLE	.18
	BRACKET SUPPORT FOR SPEEDOMETER CABLE	.04
	RECORDER MECHANISM	60.00
	COMPLETE TIMER COUNTER ASSEMBLY	8.00
	ONE HOUR SPOOL WIRE	4.40
	STANDARD RECORD	1.60
	RECORD - CUT TO SPECIFICATION	2.20
	TINY GLOW PILOT LIGHT	.80
6 x 4	TUBE	1.60
12AU7	TUBE	2.40
12AX7	TUBE	2.40
6AU6	TUBE	2.00
6AU5	TUBE	2.00
	NAME PLATE - "ELECTRONIC SECRETARY"	1.60
	COMPLETE CABINET - PAINTED	28.00

TAKE-UP DRUM	\$ 4.00
CARTRIDGE	7.50
RECORD HEAD	12.00
TEST LEADS	6.00

INDUSTRIAL TUBES

6202	4.40
5814.A	4.50
5751	4.50
6136	3.10
6005	5.00

OPTIONAL FEATURES

HEADPHONE JACK	3.73
ERASE FEATURE	6.68
AUTOMATIC STOP	10.00

EXTENSION LEADS FOR TEST PURPOSES

PER SET	8.20
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OPTIONAL FEATURES

- A. PROVISION FOR HEADPHONE JACK
- B. OPTIONAL ERASE FEATURE
- C. AUTOMATIC STOP FOR WIRE RECORDER MECHANISM
- D. HARMONIC RINGING ADAPTOR

PROVISION FOR HEADPHONE JACK. IF IT IS DESIRABLE TO TRANSCRIBE MESSAGES FROM THE ELECTRONIC SECRETARY WITH HEADPHONES, THIS FEATURE CAN BE HAD ON THE ELECTRONIC SECRETARY BY SO REQUESTING WHEN PLACING AN ORDER. THE LOCATION OF THE HEADPHONE IS SHOWN AS PH ON ILLUSTRATION O-1. TO USE THE HEADPHONES WITH THE ELECTRONIC SECRETARY SIMPLY CONNECT THE HEADPHONE LEADS TO A 2-CIRCUIT TELEPHONE PLUG AND INSERT IN THE JACK AT POINT PH. THE INSERTION OF THE HEADPHONE JACK IN THE CIRCUIT IS SHOWN IN ILLUSTRATION O-2.

OPTIONAL ERASE FEATURE. AT THE CENTER OF THE CONTROL PANEL JUST BELOW THE PILOT LIGHT IS A SMALL, PUSH-BUTTON TYPE SWITCH. AFTER THE MACHINE IS PLACED IN THE REWIND POSITION, BY TURNING THE TOGGLE SWITCH TO REWIND, THE WIRE WILL NORMALLY BE UNAFFECTED. HOWEVER IF WHILE THE WIRE IS BEING REWOUND THE PUSH BOTTON IS DEPRESSED, MESSAGES RECORDED ON THE WIRE WILL BE ERASED BY A HIGH FREQUENCY ERASE SIGNAL. CARE SHOULD BE TAKEN TO INSTRUCT THE SUBSCRIBER THAT THIS BUTTON SHOULD BE USED ONLY WHEN HE WISHES TO CLEAR THE WIRE OF EXISTING MESSAGES. A DIAGRAM SHOWING WHERE THIS SWITCH IS PLACED IN THE ELECTRONIC SECRETARY CIRCUIT IS SHOWN BELOW AS ILLUSTRATION O-3. THE PHYSICAL LOCATION OF THE OPTIONAL ERASE BUTTON IS DESIGNATED AS LETTERS OE ON ILLUSTRATION O-1.

AUTOMATIC STOP FOR WIRE RECORDER MECHANISM. THE AUTOMATIC STOP FEATURE FOR THE WIRE RECORDER MECHANISM IS A LIMIT SWITCH WHOSE OPERATION IS DETERMINED BY THE POSITION OF THE ELAPSED TIME INDICATOR. THIS SWITCH IS SECURED TO THE FRAME OF THE ELAPSED TIME INDICATOR AND IS MADE SO THAT IT WILL OPEN ITS NORMALLY CLOSED CIRCUIT EITHER WHEN THE ELAPSED TIME INDICATOR IS DRIVEN IN REWIND OPERATION PAST 0 POSITION, OR IN FORWARD OPERATION PAST THE 59 MINUTE POSITION. THIS LIMIT OPERATION FACILITATES COMPLETELY AUTOMATIC OR UNATTENDED REWIND OPERATION. THE SUBSCRIBER HAS MERELY TO PLACE HIS MAIN CONTROL SWITCH INTO REWIND AND THE AUTOMATIC LIMIT SWITCH WILL TAKE OVER AND OPEN THE ELECTRICAL CIRCUIT BEFORE THE WIRE AND LEADER WILL COME OFF OF THE TAKE-UP DRUM. TO RESET THIS SWITCH AND RE-ESTABLISH NORMAL OPERATION, THE SUBSCRIBER SHOULD, IF THE MACHINE IS IN REWIND, PLACE IT IN PLAY POSITION AND PRESS THE RESET BUTTON DESIGNATED AS ASR ON THE EXTREME LEFTHAND SIDE OF THE FRONT SCREEN, UNTIL THE PILOT LIGHT REMAINS ON. THIS WILL NORMALLY TAKE 3 TO 5 SECONDS.

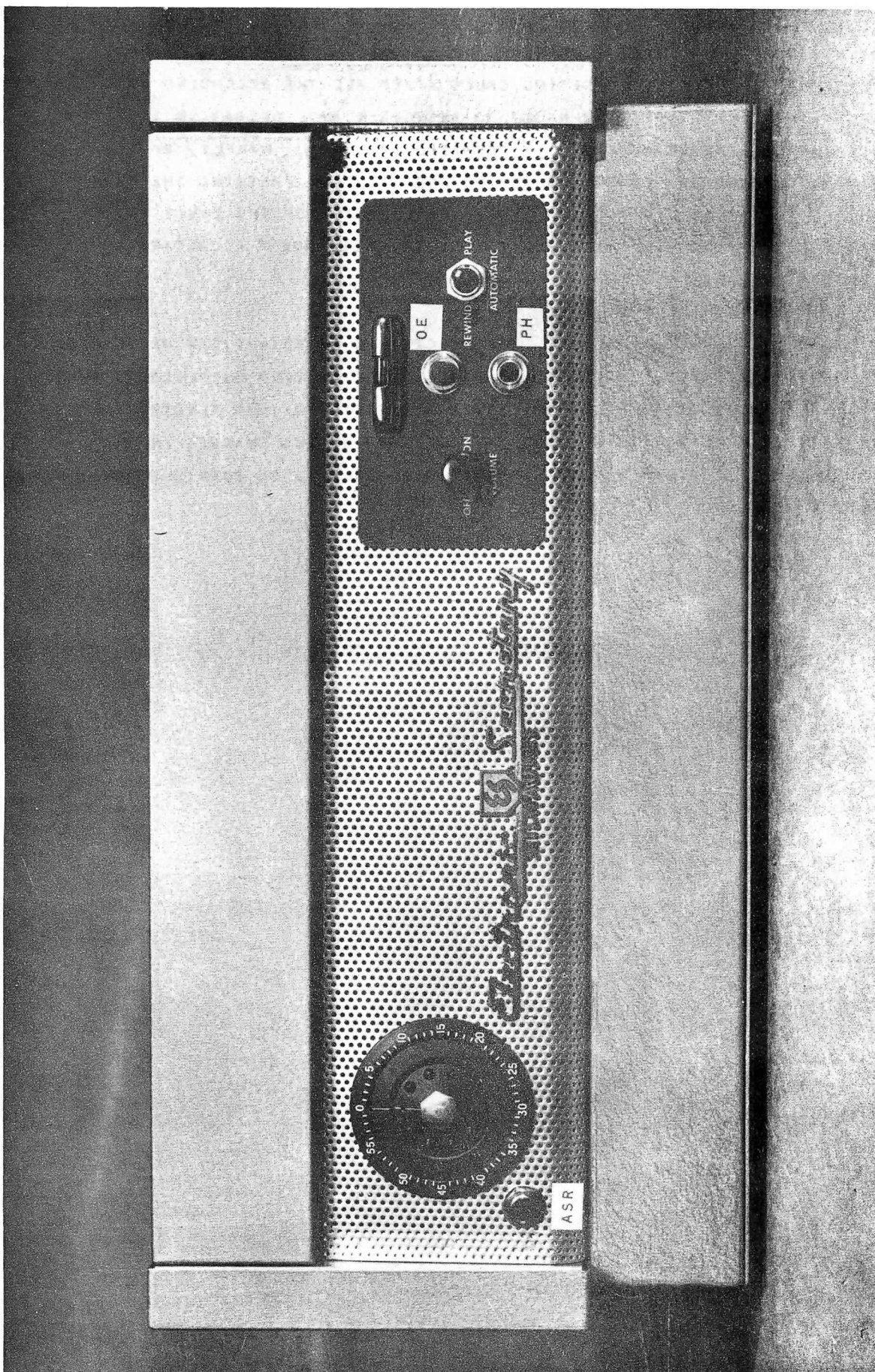
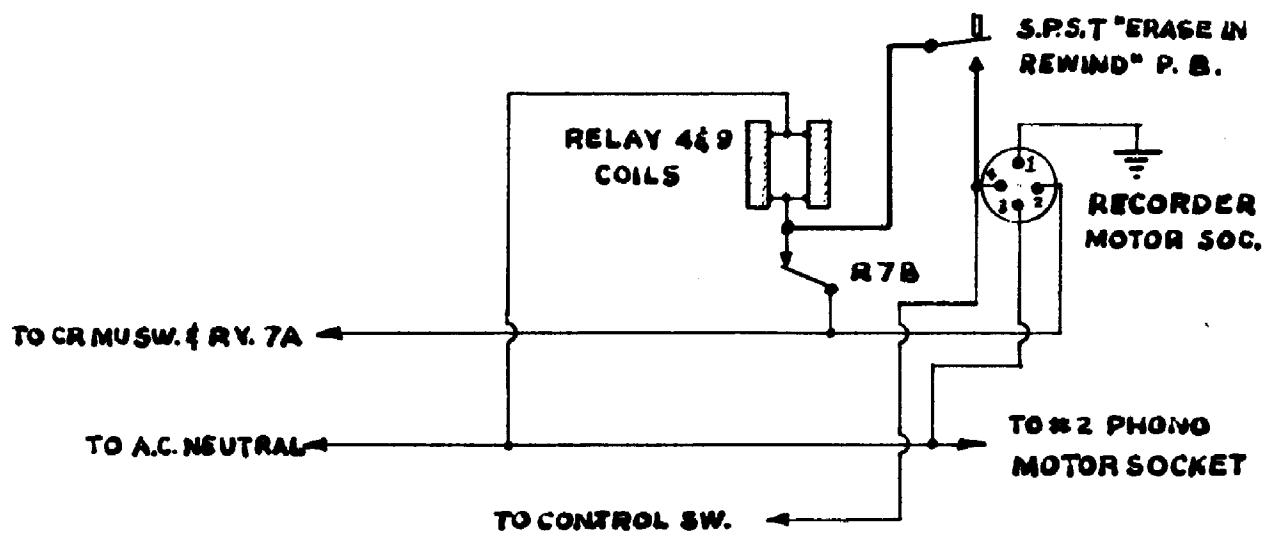
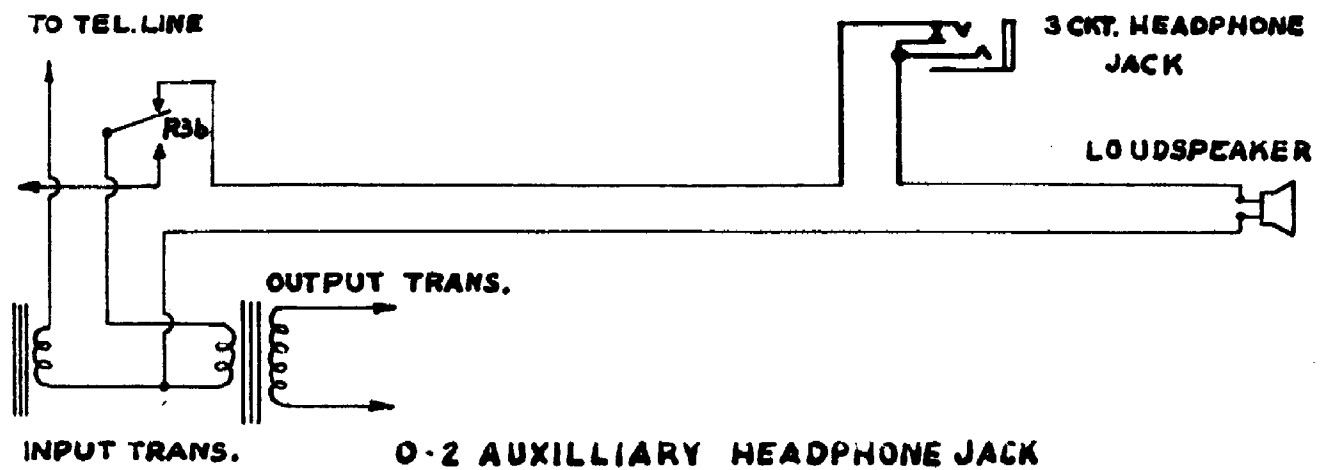


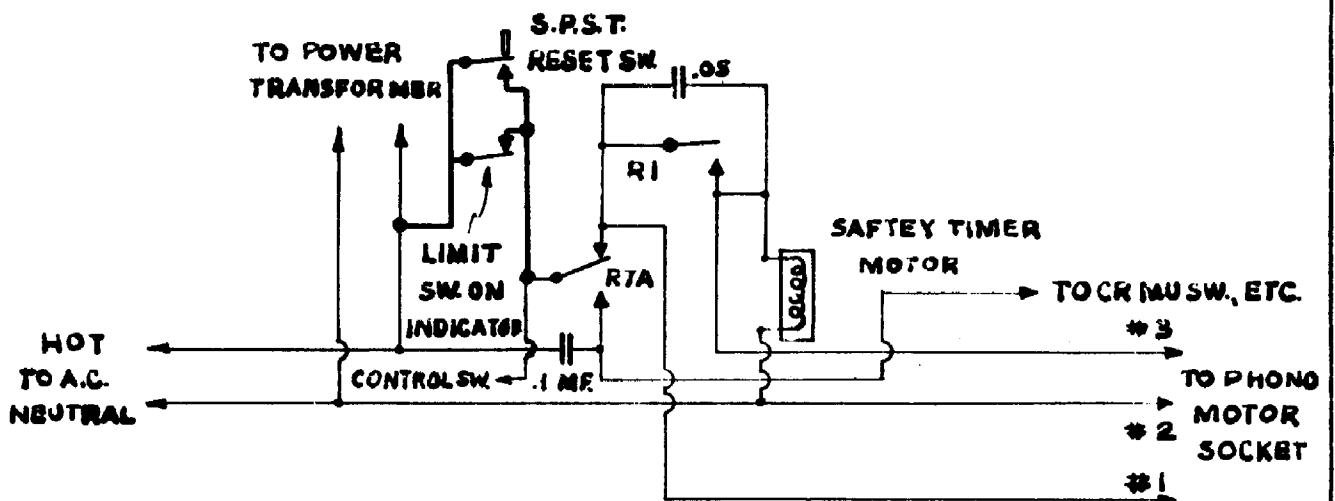
Illustration O-1

THIS SAME LIMIT SWITCH WILL ALSO TERMINATE OPERATION OF THE MACHINE BEFORE ALL THE WIRE HAS BEEN EXHAUSTED FROM THE SUPPLY SPOOL. THIS WILL ELIMINATE THE POSSIBILITY OF THE MACHINE ACCEPTING CALLS AFTER ALL THE RECORDING WIRE HAS BEEN USED. THE LIMIT SWITCH IS RESET TO RESTORE NORMAL OPERATION IN THIS INSTANCE THE SAME AS IT WAS WHEN IT OPERATED IN REWIND, NAMELY, BY REVERSING THE MAIN CONTROL SWITCH TO THE REWIND POSITION AND PRESSING THE PUSH BUTTON ASR UNTIL THE PILOT LIGHT STAYS LIT. THE LOCATION OF THE LIMIT SWITCH, AS WELL AS THE RESET SWITCH IN THE CIRCUITRY OF THE ELECTRONIC SECRETARY IS SHOWN IN ILLUSTRATION 0-4.

HARMONIC RINGING ADAPTOR. THE ELECTRONIC SECRETARY CAN BE ADAPTED FOR HARMONIC RINGING SYSTEMS. PROVISION HAS BEEN MADE BY YOUR SUPPLIER TO FURNISH A PARTY LINE ADAPTOR WHICH WILL FACILITATE CONVERSION OF THE ELECTRONIC SECRETARY TO PARTY LINE CIRCUITS WITHOUT ANY INTERNAL WIRING CHANGES IN THE ELECTRONIC SECRETARY. FURTHER DETAILS ON THIS ADAPTOR WILL BE FURNISHED BY YOUR SUPPLIER ON REQUEST.



O-3 OPTIONAL "ERASE IN REWIND" FEATURE



O-4 OPTIONAL AUTOMATIC LIMIT FEATURE