

S E R V I C E M A N U A L

Mohawk
midgetape



MODEL BR-1

- OPERATION
- ADJUSTMENT
- MAINTENANCE
- REPAIR



MOHAWK BUSINESS MACHINES CORP.
944 HALSEY STREET • BROOKLYN, NEW YORK

FOREWORD

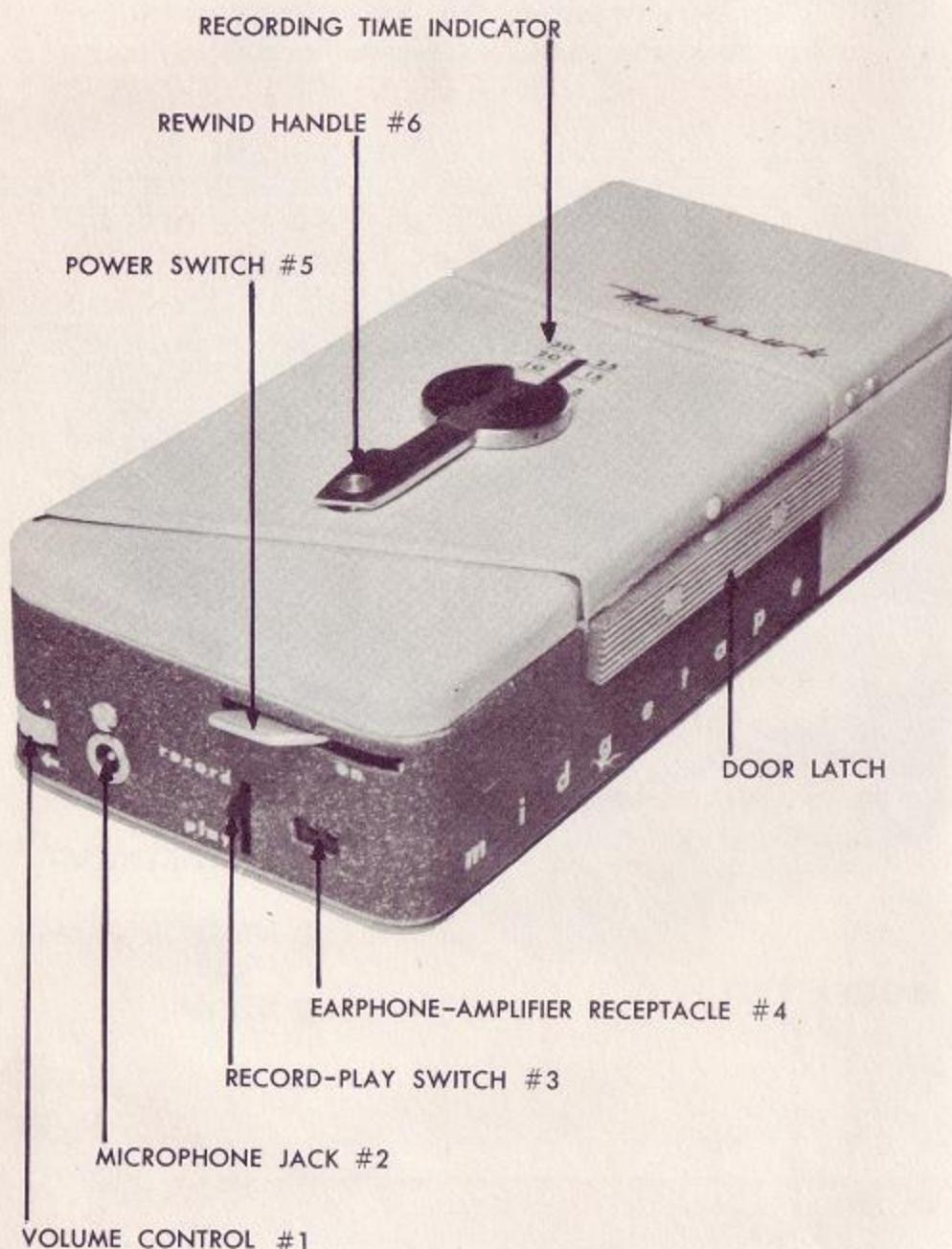


FIGURE I

This service manual has been specially prepared to aid servicemen and field representatives in making minor adjustments and repairs on Midgetape Model #BR-1.

Although the "Mohawk Midgetape" has been engineered and designed to require a minimum amount of adjustment or repair, it still is a precision machine, and like any other precision instrument is susceptible to damage from careless handling or abuse.

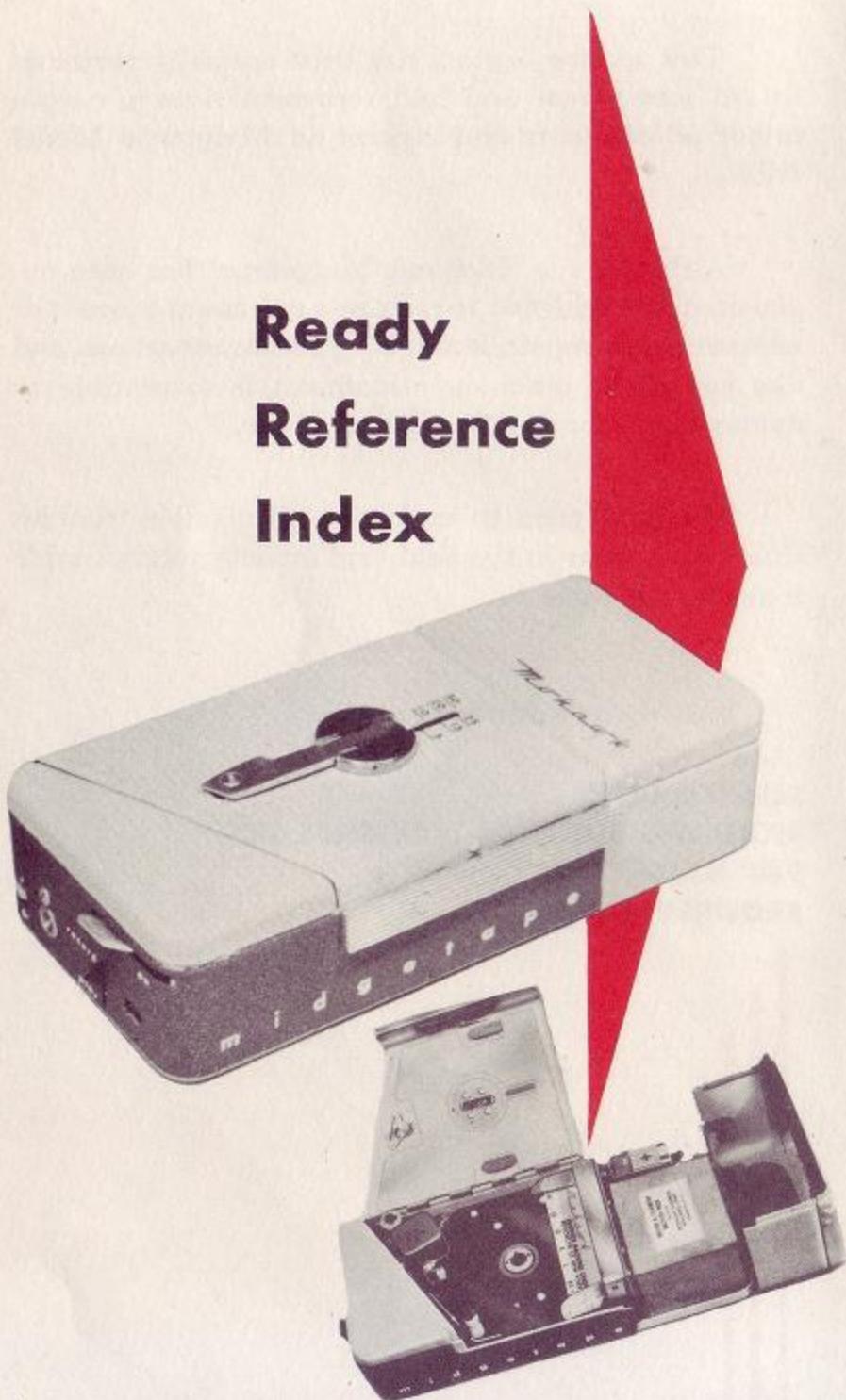
We have tried to anticipate all possible troubles that may appear in the field, and are suggesting simple remedies for same.

Kindly address all servicing inquiries to:

**SERVICE DEPT.
MOHAWK BUSINESS MACHINES CORP.
944 HALSEY ST.
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DISMANTLING THE MIDGETAPE

The Midgetape, Model #BR-1, can be removed from its case in its entirety simply by following the instructions listed below.

1. Place ON-OFF switch #5 Fig. I to "OFF" position.
2. Place PLAY RECORD switch #3 Fig. I to "RECORD" position.
3. Remove all connecting cables (earphone, microphone, etc.)
4. Remove Cartridge.
5. Remove batteries (place protective tape over battery contacts so they will not be accidentally shorted).
6. Remove screw from front of machine (located above microphone socket). Refer to Fig. IA #1 front view.
7. Remove 2 screws from bottom of case. #2 Fig. IA.
8. Place entire machine on a table edge, so that the battery compartment shell when opened will swing down and out of the way. Refer to Fig. #IB.
9. Grip back end of machine (refer to Fig. #IB) and lift machine carefully back and out of case.
10. Both batteries can be replaced and the entire machine can be operated in any position.

CAUTION NOTES

- (a) Do not handle machine in any other way than that indicated in Fig. #IB.
- (b) Never place machine on switch end.
- (c) Do not jam running mechanism.
- (d) Do not override the "play-record" switch. This switch will position itself, and the only movement necessary is to move the lever past the center position. (The case acts as a lever stop and prevents the lever from being moved past the "play" or "record" position).
- (e) Do not disturb any of the electrical components or wiring.
- (f) Keep machine clear of all foreign matter. (Perform all work on a clean bench).

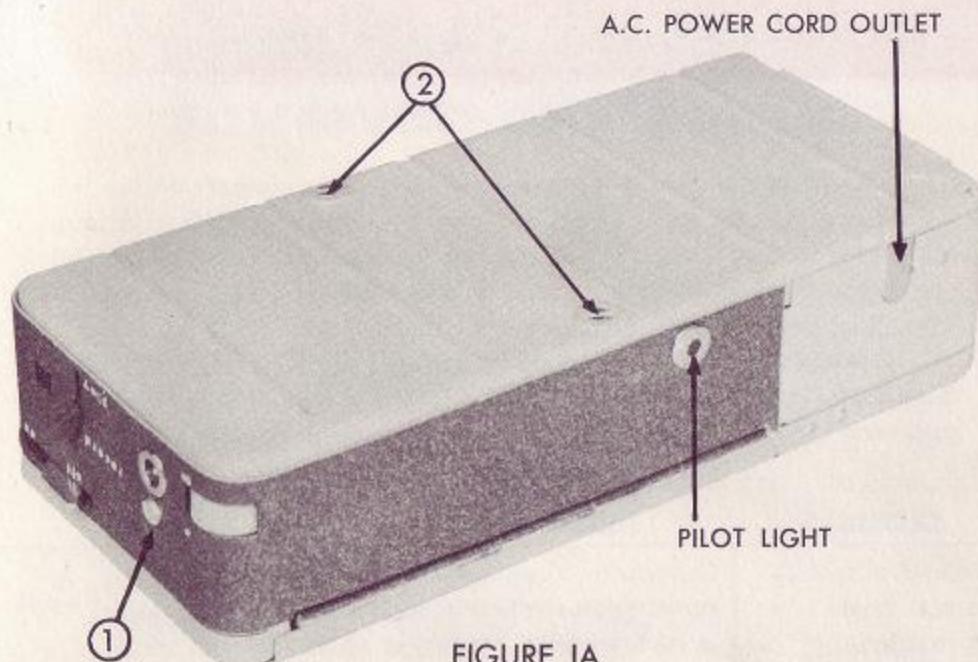


FIGURE IA

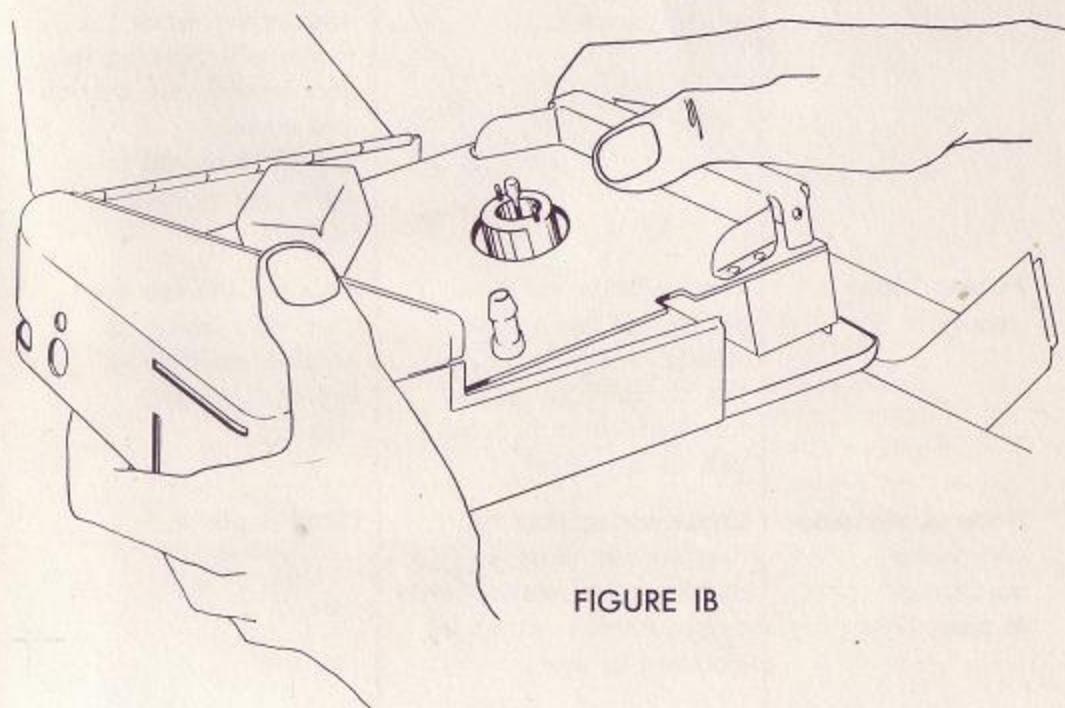


FIGURE IB

DRIVE MECHANISM— MOTOR AND GOVERNOR

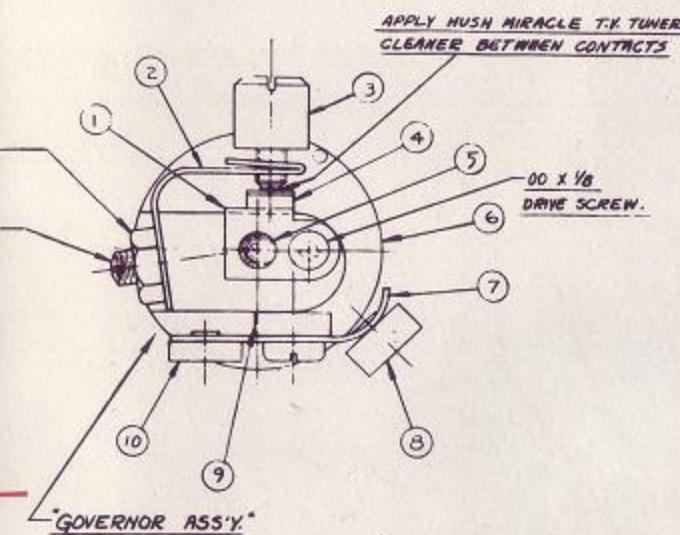
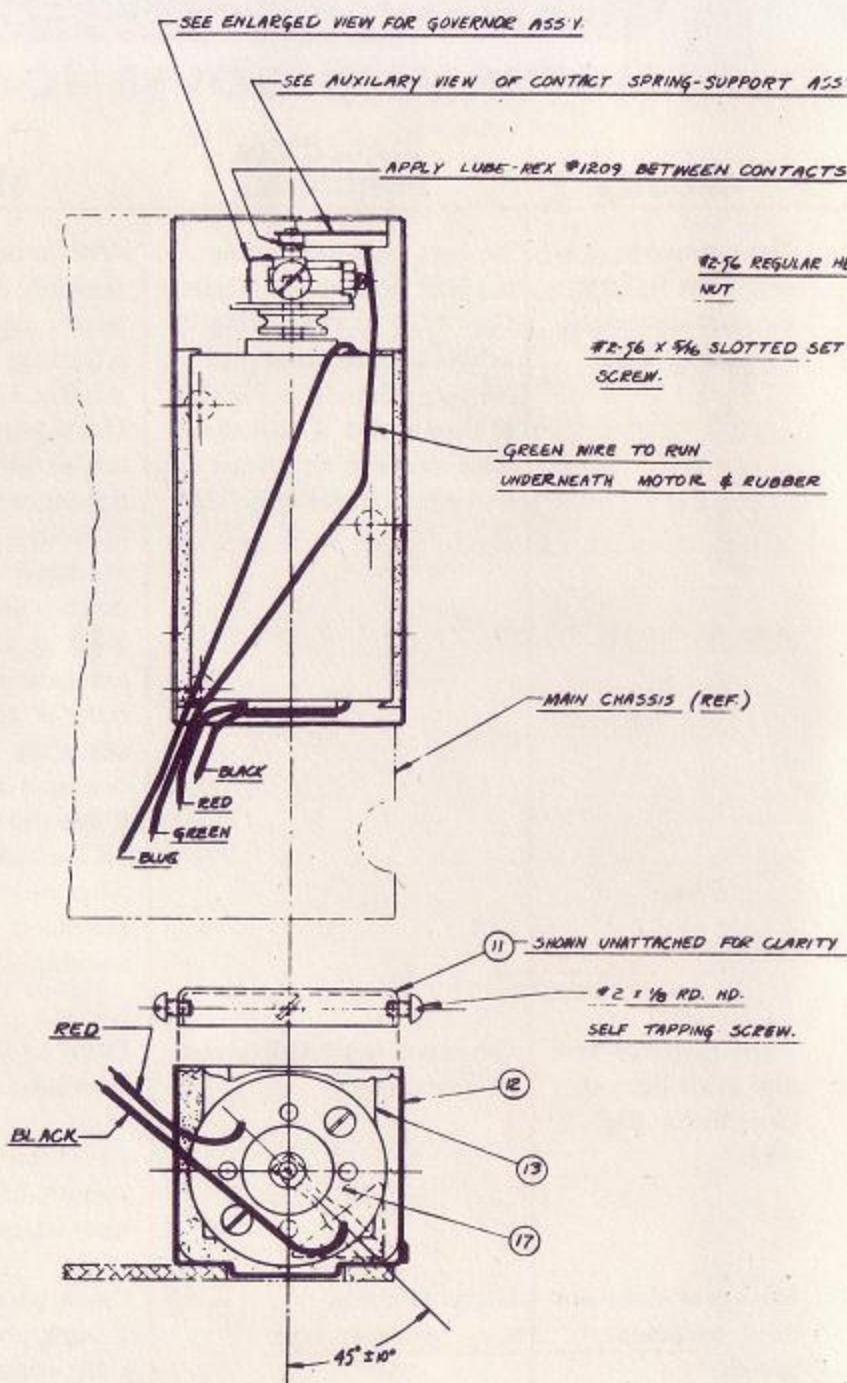
The Midgetape drive system (Ref. Fig. III) consists of the following: one motor (#26) one idler cone (#29), one Flywheel assembly (refer to Sec. "C-C" Fig. #III), one spring drive belt (#19), and one electromechanical Governor (Fig. #II). Motor Rotation is clockwise (looking at Motor from Governor end).

Governor is of the weighted centrifugal spring type, and maintains a constant motor speed of 3200 RPM. Ref. Fig. #II. Tape speed past recording head is a constant $1\frac{1}{8}$ " per second at all times.

TROUBLE	DIAGNOSIS PROCEDURE	REMEDY
Excessive mechanical noise in machine. (Operate Machine without cartridge)	Determine Frequency of noise (pulse rate) if noise is of high freq. (constant high speed grinding) type, than the noise is probably due to idler cone being out of Adjustment.	Refer Fig. #IIIA Adjust idler cone (#29) as follows: Loosen one screw holding idler cone and spring assembly (#3) and adjust while machine is running to obtain minimum friction and noise. Belt #20 should meet fly wheel perfectly parallel.
Pulsing noise steady.	If noise is the same as above, but has a slow steady thumping sound, trouble may be due to interference with drive belt or Flywheel.	This trouble can be checked visually by holding machine at eyelevel, while it is running.
Noise is obvious only when machine is in case.	Loose wiring may be dangerously close to moving parts causing parts to rub when machine is installed in case.	Ditto as above.
Noise is obvious only when Cartridge is in use.	Cartridge is noisy.	See Cartridge section.

DRIVE MECHANISM— MOTOR AND GOVERNOR

TROUBLE	DIAGNOSIS PROCEDURE	REMEDY
Tape speed is slow and pilot light is excessively bright. (Ref. Fig. #IA)	Be sure "contact spring support assembly" (Refer Fig. #II) is contacting properly with Governor contact (item # 5 Fig. II). If tape speed is still slow, then proceed to adjust Governor. Refer Fig. #IIA.	With machine in "Off" position, turn flywheel gently until Governor adjusting screw (item #3 Fig. II) is accessible. Use a jewelers screwdriver and slightly tighten screw (about $1/16$ of a turn). Invert machine and mark pinch roller tire (item #4 Fig. III), turn machine on, and clock RPS of tire. Continue adjusting Governor until tire speed reaches 9 revolutions, per 15 seconds. Also refer to electrical section if trouble still persists.
Tape speed is fast and pilot light is dim. Refer Fig. #IA.	Governor is probably out of adjustment.	Ditto as above except loosen screw $1/16$ of a turn. Also refer to electrical section for additional instructions.
Governor does not hold constant speed.	Dirty contacts.	Clean contacts with fine French polishing cloth refer items #3, #4 #5, Fig. #II, and to electronic section.



CONTACT SPRING-SUPPORT ASS'Y.

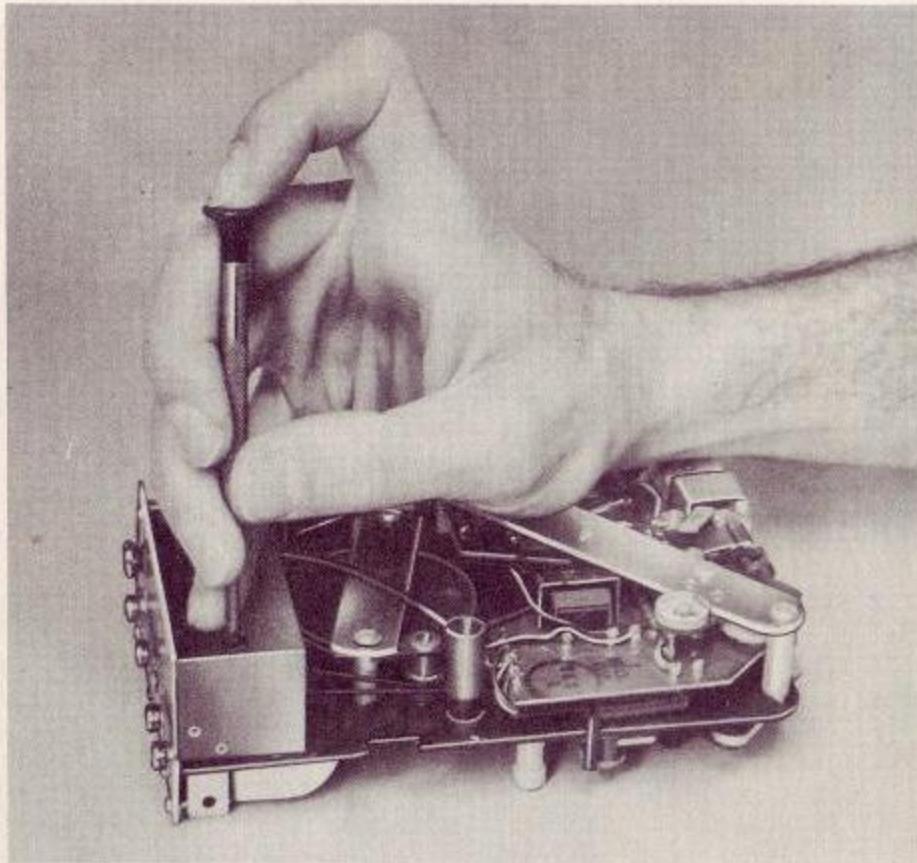
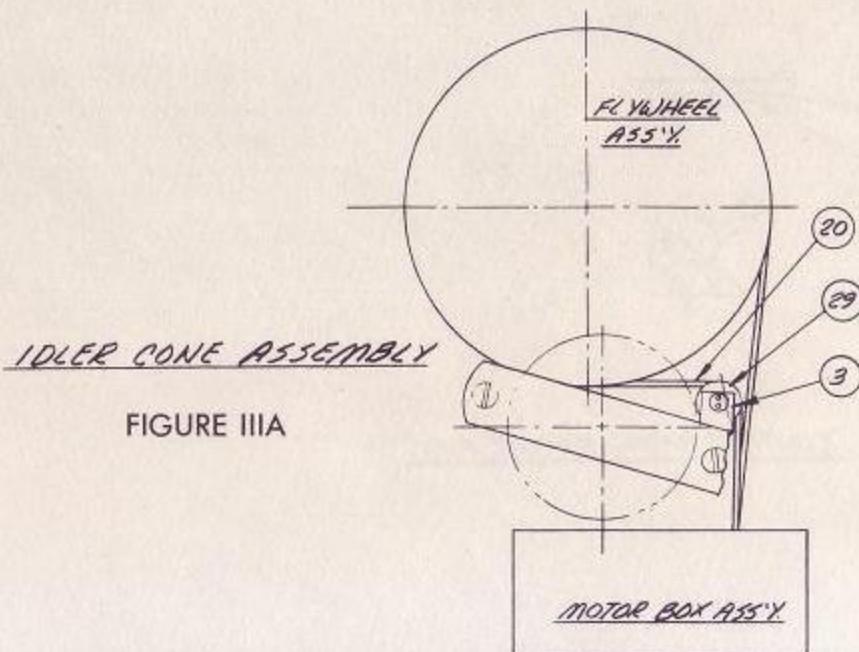


FIGURE IIA



IDLER CONE ASSEMBLY

FIGURE IIIA

PINCH ROLLER MECHANISM

The Midegtape Pinch Roller Mechanism consists of the following:

One pinch roller rubber tire (molded on an oilite bearing and precision ground to obtain maximum concentricity), refer to item #4 section "B-B" Figure #III.

A latching cam (#30) link (#34) and an "On-off" lever (#5) (Refer Fig. #III).

The "On-Off" lever item #5 Figure III activates the cam item #30 for the "on" position only, in the following manner:

The latching cam (#30) is spring loaded in the latched position, locking the pinch roller bracket item #7 in the "off" position. When the "on-off" lever is thrown to the "on" position, it pushes the Tab side of the latching cam (#30) out of its spring loaded locked position, causing the pinch roller bracket item #7 (which is spring loaded in the engaged position) to spring to the engage position (on).

On turning the machine off, the "on-off" lever (#5) does not touch the latching cam (#30) in any way. The cam portion of the pinch roller bracket (#7) moves the latching cam (#30) until it locks itself in place.

TROUBLE	DIAGNOSIS PROCEDURE	REMEDY
"On-Off" Mechanism binds. (Does not operate smoothly)	Latching cam tab (#30) may be bent out of adjustment, causing it to rub on the "On-Off" lever (#5) during actuation to the "Off" position.	Bend latching cam tab #30 slightly towards direction of Pinch roller (#4).
Faltering Recordings (Tape Slippage at capstan item #16 Figure III).	Oily or dirty pinch roller tire or capstan.	Cleanse Pinch Roller tire (#4) and capstan (#16) thoroughly with carbon tetrachloride.

TROUBLE

**DIAGNOSIS
PROCEDURE**

REMEDY

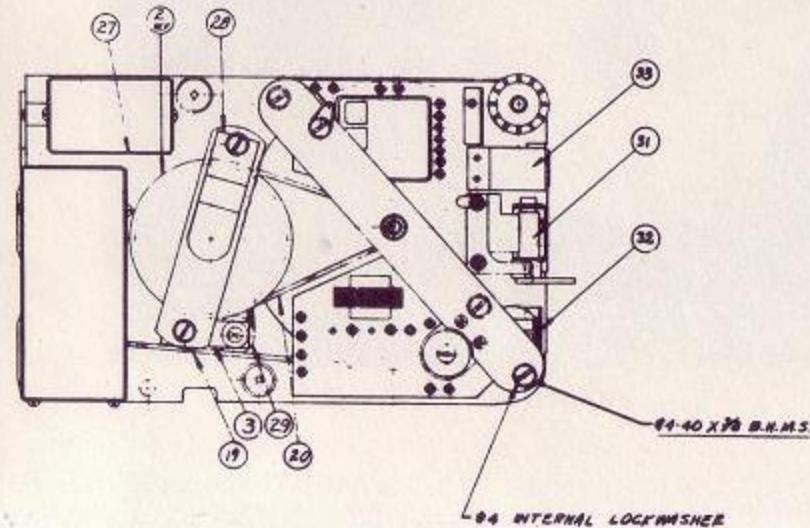
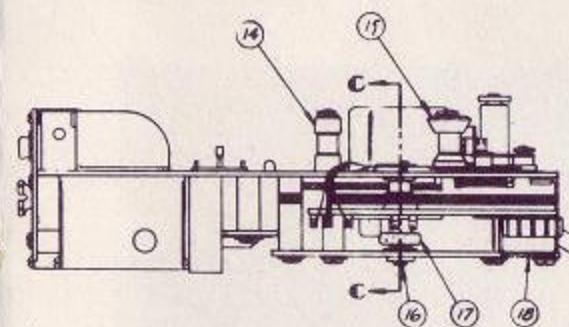
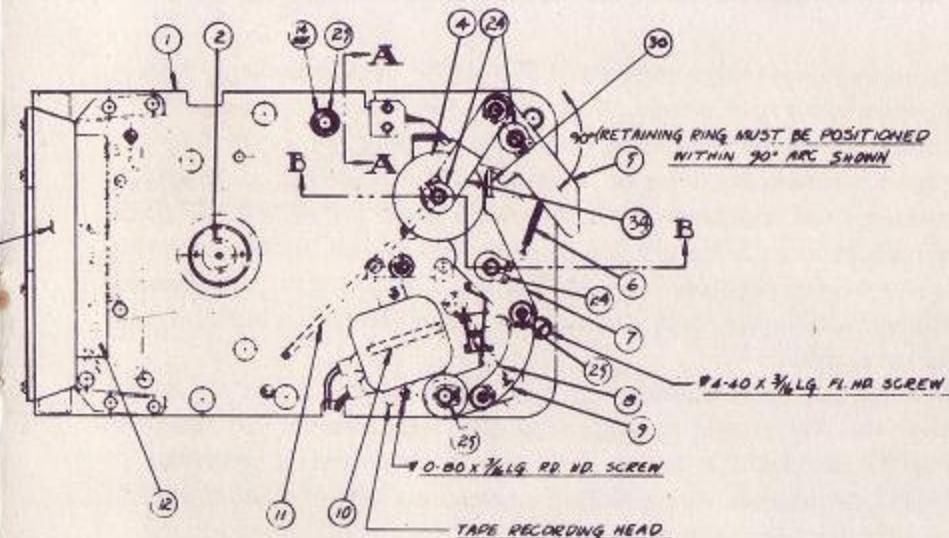
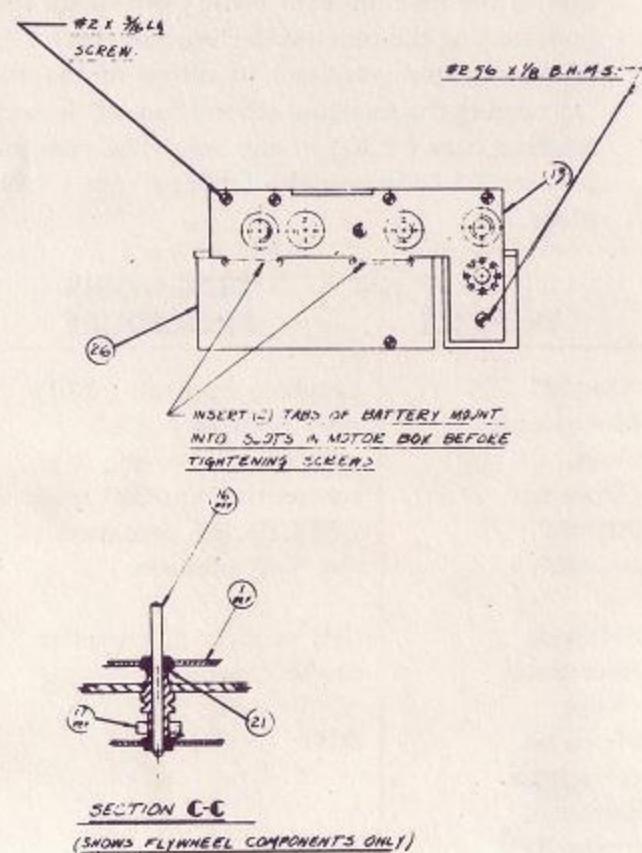
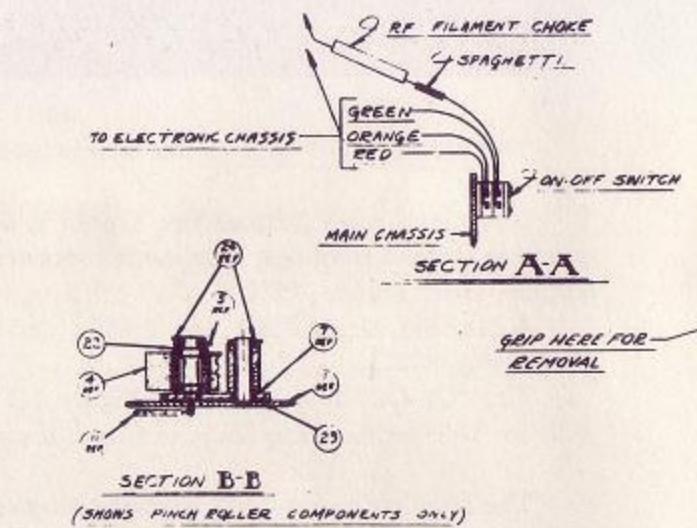


FIGURE III

CARTRIDGE MECHANISM

Midgetape cartridge consists of 300' of $\frac{1}{4}$ " magnetic tape, 2 reels, and a center shaft mechanism. There should be absolutely, no scraping or rubbing between revolving discs and housing of cartridge, and no drag or tension on tape as it is slowly pulled out of cartridge. The center shaft mechanism consists of a float pin which is spring loaded centrally and should be free enough at all times to spring back to its center position, refer to Fig. IV. This freedom is necessary for efficient disengage and rewind operation. Refer to Rewind and Disengage section.

We do not recommend that any attempts be made to adjust or repair the Midgetape cartridge by field servicemen. All interests will best be served if a faulty cartridge is immediately returned to Mohawks laboratories, where skilled technicians with the aid of special tools will make necessary repairs.



FIGURE IVA

CARTRIDGE MECHANISM

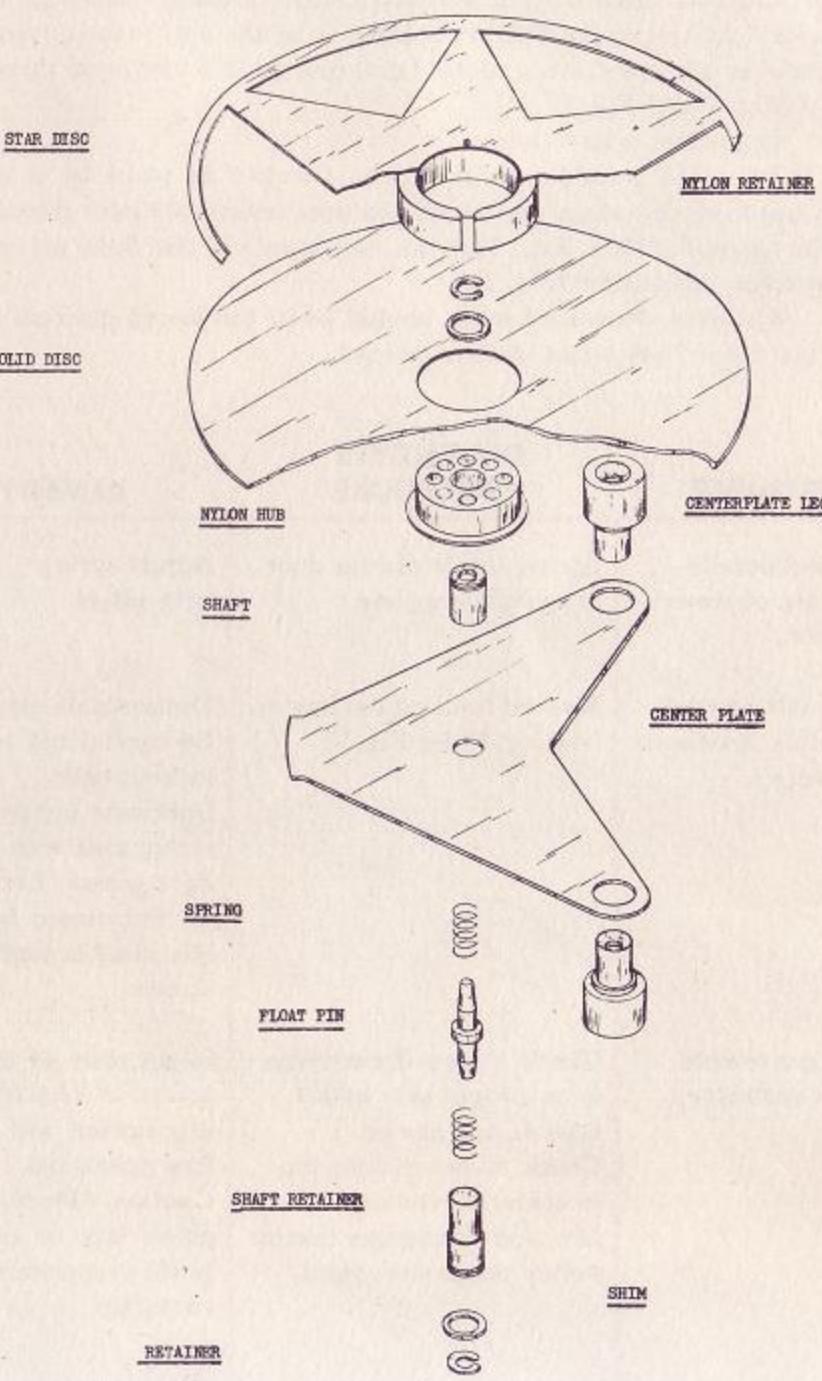


FIGURE IV

REWIND DISENGAGE MECHANISM

Consists essentially of a knob, handle, housing, disengage actuator, and locking balls. This mechanism is of the anti reverse type, and should at all times turn smoothly and quietly in a clockwise direction. Ref. Fig. V and Fig. I.

Operation is as follows:

In stored position, rewind knob is locked in place by a spring on inside of case door. In rewind position, rewind actuator disengages take up pulley (Ref. Fig. VI) from cartridge, via the float pin in the cartridge mechanism (Fig. IV).

Caution—Rewind handle, should be in the stored position at all times other than when used to rewind.

TROUBLE	DIAGNOSIS PROCEDURE	REMEDY
Rewind handle slips out of stored position.	Spring inside of case door is probably sprung.	Adjust spring with pliers.
Does not rewind smoothly (without cartridge).	Rewind housing binding on bearing. Refer Fig. V.	Disassemble carefully. Be careful not to lose locking balls. Lubricate lightly on riding area with any light grease "Lube Rex" or "Petroleum Jelly." Reassemble and tighten screws.
Will not rewind (with cartridge).	Check to see if cartridge is on proper side and if tape is not at end. Check to see if float pin in center mechanism is free, and disengages takeup pulley when depressed.	Slight drop of oil in center of cartridge mechanism will help free operation. <i>Caution</i> —Do not get oil on tape or any other parts of machine or cartridge.

REWIND & DISENGAGE MECHANISM

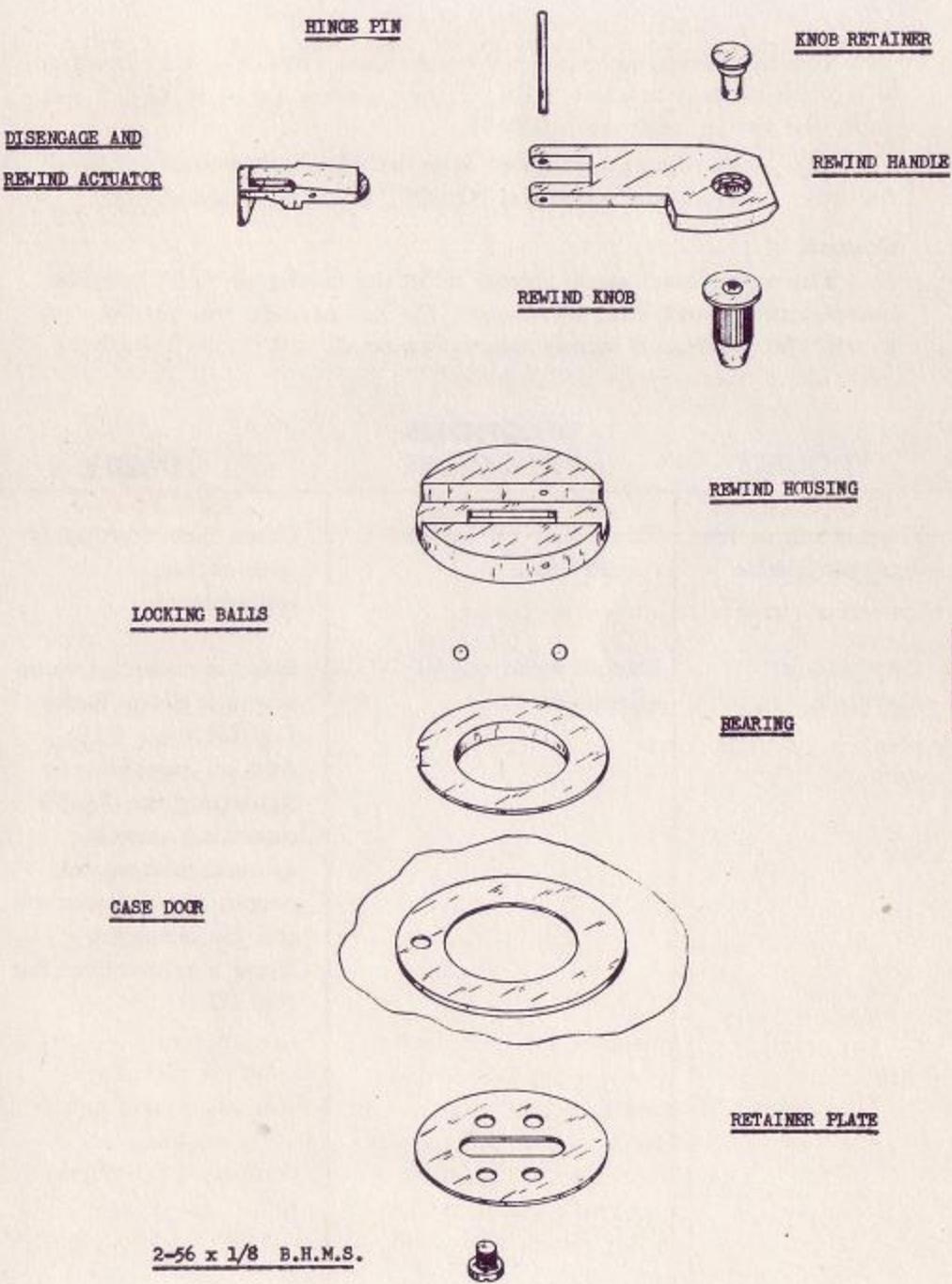


FIGURE V

PRESSURE PAD MECHANISM

The Midgetape pressure pad mechanism (Ref. Fig. III) consists of a pressure pad bracket (#8), 2 tape guides (#14 & 15), 2 felt pads, one spring, and one link (#9).

The pressure pad mechanism is actuated simultaneously with all the other mechanisms when the "On-Off" lever is actuated.

Caution

The entire mechanism should be in the disengage (off) position, before, during, and after all repairs. *Do not actuate this mechanism to the "On" position if record head is removed.*

TROUBLE	DIAGNOSIS PROCEDURE	REMEDY
Fluctuating or low level play back.	Tape dust on face of record head.	Clean face thoroughly with carbon tetrachloride.
Cross talk at playback.	Record head out of alignment.	Head is mounted on an azimuth Shim. Refer Fig. III item #10. And by loosening or tightening the #0-80 mounting screws, azimuth setting for proper head alignment can be obtained. Refer machine drawing Fig. III.

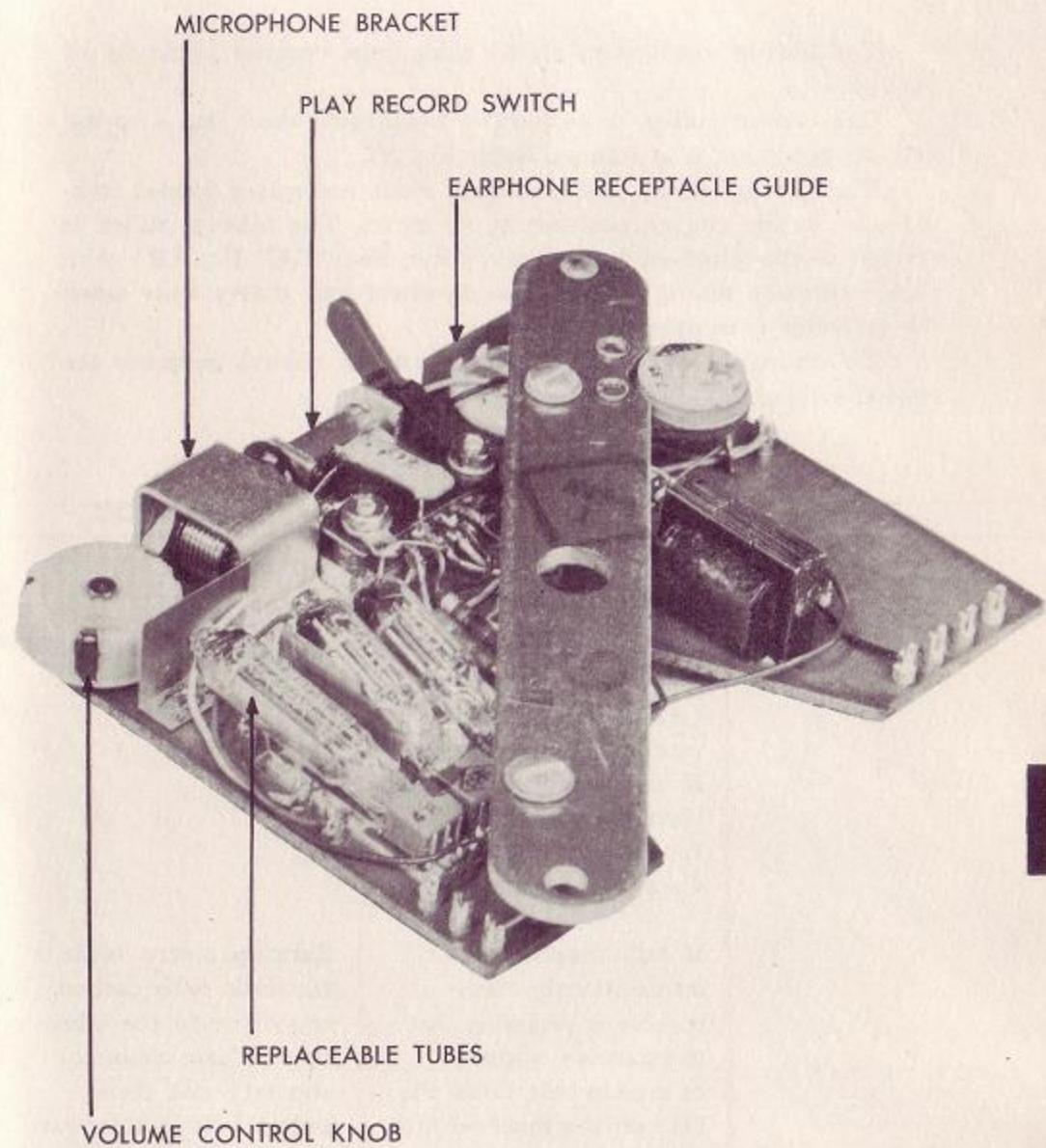


FIGURE VII

TAKEUP MECHANISM

The takeup mechanism of the Midgetape consists primarily of the following:

One takeup pulley, drive pins, a disengaging shaft and a spring belt. Its operation is as follows. Refer Fig. VI.

The takeup pulley and disengage shaft are spring loaded individually in the engage position at all times. The takeup pulley is driven off the flywheel hub pulley, (Ref. Sec. "C-C" Fig. III) with clutch slippage taking place at the flywheel hub pulley, only when the cartridge is in operation.

To disengage the takeup mechanism for rewind purposes see rewind section.

TROUBLE	DIAGNOSIS PROCEDURE	REMEDY
Tape fails to spool into cartridge or spools too slowly.	Remove cartridge from machine. Observe smoothness of revolving takeup pulley hub, (#2 Fig. III) while machine is operating. If hub revolves smoothly, then trouble is due to faulty Cartridge—See Cartridge section.	
If hub revolves intermittently, then trouble is probably due to excessive slippage of takeup belt, (#20 Fig. III) on the flywheel hub pulley, caused by the accumulation of oil or grit on belt and pulley grooves.	Saturate cotton swab or facsimile with carbon tetrachloride (or other non oil base cleaning solvent) and clean pulley belt and grooves thoroughly.	

TAKEUP & DISENGAGE MECHANISM

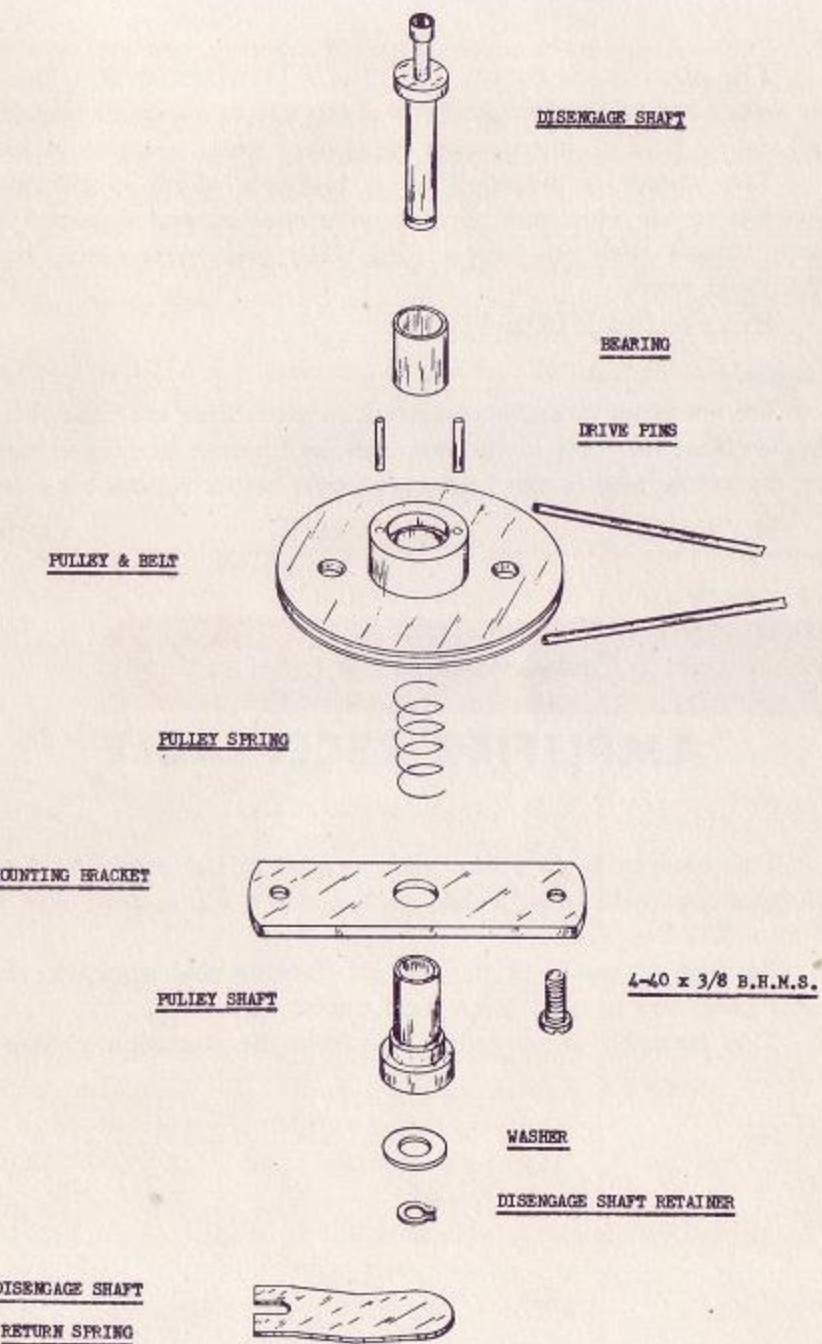


FIGURE VI

MICROPHONE SOCKET

The microphone socket (#2 Fig. #1) which is also located at the switch end of the Midgetape, is of the spring locking bayonet type, and should hold all microphone plugs rigid when snapped in place.

The socket is mounted on a bracket, which is permanently fastened to the electronic chassis with eyelets, and fastened to the main chassis with one screw (Fig. III) and to the case with an additional screw.

Refer to Fig. I, IA & VII.

Caution

Do not cross thread screw when reassembling machine into case. Be sure that the hole in the microphone bracket is aligned with the corresponding hole in the Midgetape case before tightening screw.

EARPHONE AND AMPLIFIER RECEPTACLE

This receptacle (#4 Fig. #1) located at the switch end of the Midgetape, consists of a "Telex" socket, and a red nylon guide. Refer to item #32 Fig. III.

Purpose of guide is to prevent cocking and shorting of earphone plug, and to hold same rigid during operation.

This assembly is not removable from the electronic chassis.

PLAY RECORD SWITCH

This switch is exclusively manufactured by the Mohawk Business Machines Corp. and is the smallest known 5 pole, double throw, switch in existence today. Refer to item #31 Figure III, and item #3 Fig. #I.

The contacts are of extremely low resistance coin silver, molded in nylon and shielded against electrostatic radiation.

Caution

Do not override switch in any position, when machine is outside of case. Refer to Chapter "Dismantling The Midgetape."

VOLUME CONTROL

Specifications for the "Midgetape" Volume control are as follows:

1. Resistance range—500 OHMS to 10 MEGOHMS.
2. Wattage Rating—1/10 Watt.
3. Knob with blue and red markings (see Recording techniques, Refer to instruction Manual).
4. Resistor element—is made of special resistance material bonded to a high quality phenolic base, and tested for 25000 cycles.
5. Effective electrical rotation of 260 degrees. Refer to Figure #I item #1, and Fig. VII.

"ON-OFF" SWITCH

Is a single throw, double pole, coin silver contact switch, molded in nylon, normally loaded in the "On" position and actuated simultaneously with the pinch roller mechanism. Refer to section "A-A" Fig. III.

TROUBLE	DIAGNOSIS PROCEDURE	REMEDY
Machine will not shut off.	Switch contacts bent out of adjustment.	Remove batteries immediately. Proceed to adjust contacts.
Machine will not start.	Check battery life. Check to see whether batteries are properly contacting.	Switch "On-Off" lever (#5 Fig. III) to "On" position. Be sure pinch roller tire (#4 Fig. III) is against capstan (#16 Fig. III). Then proceed to adjust silver contacts.
<i>Caution</i> Do not make any contact adjustments with batteries in place.	If machine still fails to start, remove batteries and check "On-Off" switch contacts.	

BATTERIES

Battery pack BR26 x 15A is a specially prepared battery, containing 8 mercury cells, packaged and tested by the Mohawk Business Machines Corp. to guarantee peak efficiency during a continuous operating life of 45 hours.

30 Volt "B" battery is a standard hearing aid type battery and has a life expectancy of over 100 hrs. of continuous usage.

The "B" battery adaptor which is supplied with the Midgetape should not be discarded when "B" battery is replaced.

TROUBLE	DIAGNOSIS PROCEDURE	REMEDY
Batteries are difficult to mount.	Female contacts are sprung closed.	Contacts on battery may be pried open. <i>Caution</i> Do not short across contacts.
Batteries do not hold on contacts.	Battery contacts are sprung open.	Ditto as above except close contacts.

MOTOR AND GOVERNOR ELECTRICAL

The motor is a precision built permanent magnet motor. The speed of the motor is kept constant over the fluctuating strength of the battery by an electro centrifugal governor which inserts resistance into the armature circuit when the motor runs too fast.

The current from the motor battery positive terminal (average voltage 8V) goes through an R.F. Filter (C10, C11, C12 and Choke) to the motor, via the negative side. The motor voltage is controlled by the governor. When the governor contacts are closed, battery negative is applied directly to motor armature. The speed of the armature increases until the centrifugal contact of governor opens (when centrifugal force overcomes spring tension). At that time resistor R14 and pilot light #48 are switched in to series with the armature. And pilot light #48 lights up, causing voltage to armature to be lowered due to the resistance of R14 and #48 bulb. The motor then slows down until Governor contacts again close causing motor to speed up again. This cycle is repeated 60 times per second. This process will keep the motor speed constant over the battery voltage range of 9.2V to 6.8V.

When the battery life drops down to its minimum operating voltage, the governor contacts will close and remain so, causing the pilot bulb to cutout.

Visual indication of the pilot light being out is utilized as a warning that the motor battery life is down to a residual life of about 3 to 5 hours.

Refer to instruction manual and to chapter on batteries in this manual.

ADJUSTMENT

The current drain on motor battery with tape running should not exceed 100 M.A. If current is high, motor should be tapped lightly, with screwdriver handle to allow motor bearings to align themselves. If this does not lower current drain then motor or other part of mechanism is defective. In replacing motor be sure the motor is put in with red and black lead in the position indicated in Fig. II. Also end contact pressure should not be excessive.

The linear speed of the tape can best be adjusted by counting the revolutions in 15 seconds. To increase or decrease motor speed centrifugal weight must be adjusted. Turn flywheel until centrifugal weight screw is under hole in motor box cover and turn centrifugal

weight screw clockwise to increase and counterclockwise to decrease speed. See Fig. II and Fig. II A. Use small screw driver for this adjustment. If governor adjustment will not change speed of motor either contacts are dirty, (and must be cleaned with 3M Emery polishing cloth, #4/0) or end contact is not touching, or there is short in control circuit. If motor operation causes severe noise (electrical) on play back, pilot light may be open or motor is not in proper position. See Fig. II.

ELECTRICAL GENERAL

AMPLIFIER

The Amplifier is a 3 stage conventional amplifier — see Fig. VII and VIII in Play position of selector switch. In the Record position of Selector switch the output acts both as an amplifier and oscillator modulator.

PLAY BACK

In the Play position, signal input is thru the coil P and R of PLAY RECORD HEAD which gets its signal from recorded tape. Refer Fig. VIII.

This signal is APPLIED through Section 4 and 1 of selector switch to grid of V1. R10 is an R. F. hash suppression resistor. Output of V2 is fed to input of power amplifier V3. V3 is biased by R7. Output of V3 goes to output transformer and Sect. 5 of Selector Switch to earphone socket. Output impedance is 2000 ohms. Sect. 3 of selector switch disconnects —1.35 volts from R12 and coil E. Erase.

Section 2 of Selector Switch is grounded to provide isolation between section 1 and 3.

Gain measurement must be made with A.C. vacuum tube voltmeter.

Output of head coil should be 0.5 mV at 3000 cps with normal 2 DB below saturation recording.

Point 8 top of volume control to ground 13 mV with volume control set to maximum.

Point 4 input of V3 voltage should be 0.4V.

Output at Point 3 V3 plate should be 4.4V.

Output at earphone socket with 2200 ohm resistor load across output should be 1V.

ELECTRICAL GENERAL

RECORD

Input to the Amplifier is either a crystal mike or other high impedance or low impedance source but input voltage may not exceed 40 mV or be less than .1 mV.

The input voltage is applied to Sect. 1 of Selector switch through coupling condenser C9 and then to the grid of V1 from the plate of V1 it is fed to the volume control and then the Grid of V2 and from the plate of V2 to the grid of V3, and then the output transformer primary. The output transformer secondary is disconnected from the earphone socket and through Sect. 5 and Section 4 of Selector Switch to play and record coil.

At the same time C13 variable condenser forms a feed back loop between sec. of output transformer and Grid of V3 which causes V3 to oscillate at 11000 cps for purposes of bias. The frequency and amplitude of this is controlled by osc trimmer C13. The audio signal to be recorded is also amplified by V3 and at the plate of V3 the audio signal is superimposed on the bias signal that is developed by the oscillator and then the combined voltages are fed to the Play-Record coil. *If bias is not adjusted properly recordings will be distorted and low in volume.*

Erase is accomplished by Sect. 3 of Selector Switch. 1.35 volts D.C. is applied to erase coil through R12. The erase current is 20MA and is taken from the filament battery.

To adjust the bias voltage. Bias must be adjusted *everytime* V3 (output tube) is changed.

To adjust disconnect the red lead of the play record head and connect a precision 100 ohms resistor between lead and terminal. Turn volume control to minimum. Turn recorder on with selector switch in record position. Connect a reliable AC V.T.V.M. across resistor and turn trimmer C13 clockwise until highest reading is obtained on meter (approximately 50 mV). Then turn trimmer counterclockwise until reading drops down 1 D.B. This should be the correct bias. Disconnect resistor and reconnect red lead.

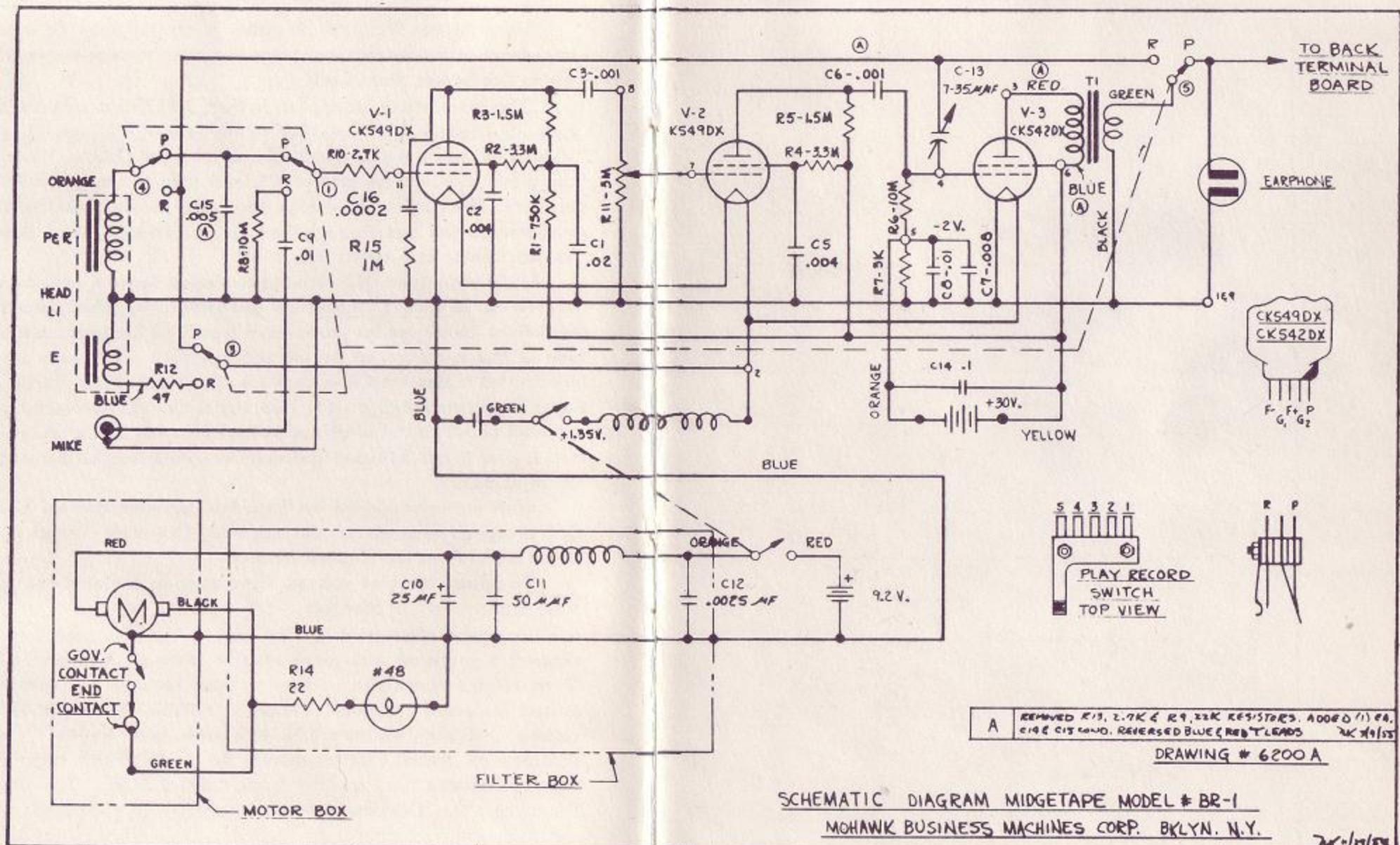


FIGURE VIII