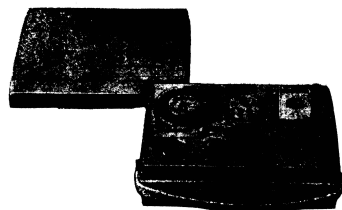


# NATIONAL TAPE RECORDER SERVICE NOTE



## MODEL RQ-100

### SPECIFICATIONS

<b>Power source:</b>	Dry cells UM-1 9V (6 pcs.)
<b>Rated output:</b>	500 mW (700 mW maximum)
<b>Transistors:</b>	2SB-173(1) 2SB-175(2) 2SB-178(2) 2SB-172(1)
<b>Thermistor:</b>	TD6A 050
<b>Recording system:</b>	AC bias
<b>Erasing system:</b>	DC erasure
<b>Tape speeds:</b>	3-3/4 ips. (9.5 cm/sec) 1-7/8 ips. (4.75 cm/sec)
<b>Record/playback time:</b>	30 min. at 3-3/4 ips., 60 min. at 1-7/8 ips., with 3" (300) ft tape
<b>Frequency response:</b>	100-7000 c/s at 3-3/4 ips., 100-4000 c/s at 1-7/8 ips.
<b>Recording level indicator:</b>	Neon lamp
<b>Input impedance:</b>	30 KΩ
<b>Output impedance:</b>	8 Ω
<b>Dry cells life:</b>	About 10 hours in continuous use
<b>Speaker:</b>	3-1/2" (8 cm) Permanent dynamic
<b>Dimensions:</b>	9-4/5" x 8" x 3-1/5"
<b>Weight:</b>	4.8 lbs.

**MATSUSHITA ELECTRIC**

### FUNCTIONAL PARTS

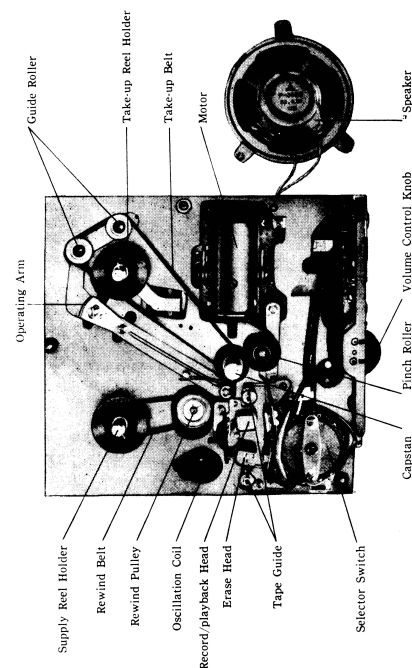


Fig. 2

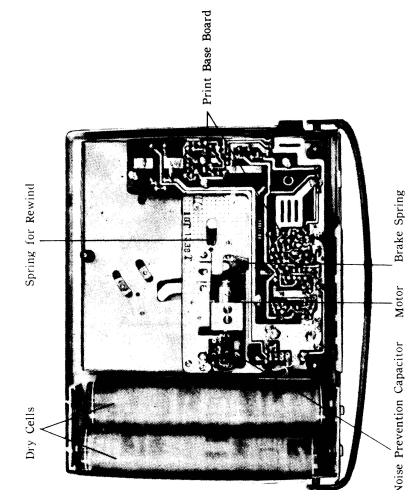


Fig. 3

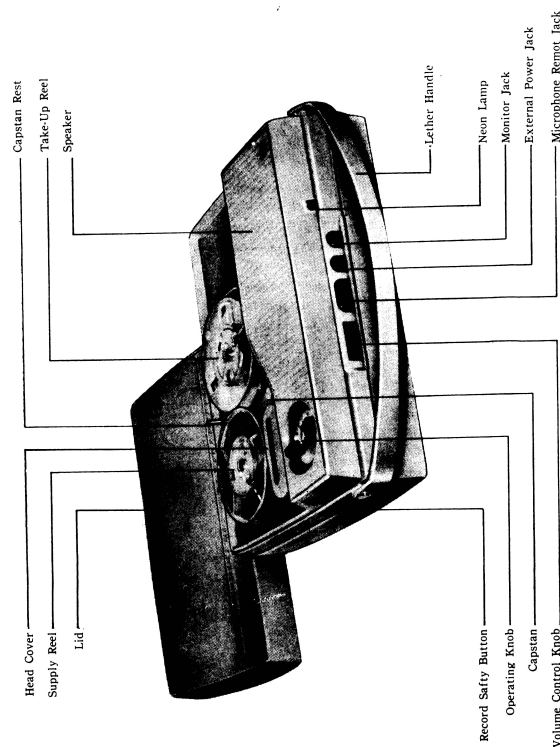


Fig. 1

## TRANSMISSION

### 1. Recording and Playback

Turn Operating Knob to **PLAYBACK**

Operating arm moves toward take-up reel holder, and motor-pulley is pressed against main pulley by which movement is transmitted to take-up reel holder. Main pulley rotates and capstan also rotates, pinch-roller presses against capstan and tape is advanced. Rewind-pulley comes off main pulley, and brake also comes off take-up reel holder.

The above three movements take place almost simultaneously and back-tension in playback mode is produced by the tension of belt hung between supply reel holder and Rewind-pulley.

Turn operating lever to **RECORD** after pressing record safety button.

Electric circuit is set for recording, while the movement of mechanism remains same as playback mode.

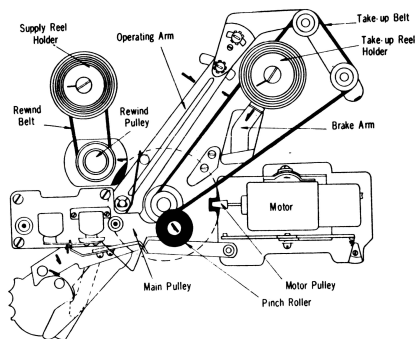


Fig. 7

### 2. Selection of Tape Speeds

Tape speed can be readily changed to 1-7/8 ips. (4r75 cm/secr) by removing capstan sleeve.

By attaching sleeve, a speed, 3-3/4 ips. (9.5 cm/sec.) can be obtained.

### 3. Rewind

Turn Operating Knob to **REWIND**

By the action of cam-plate, clutch lever is freed and motor presses against main pulley by the force of spring, and rotation is transmitted to main pulley.

Rewind-pulley presses against main pulley, and the rotation of main pulley is transmitted to supply reel holder through rewind-pulley and supply reel holder. Thus tape is rewound fast. Brake is freed.

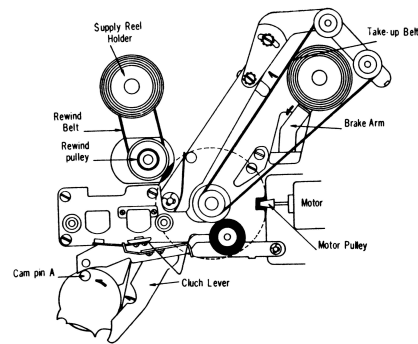


Fig. 8

### 4. Stop

Set Operating Knob at **STOP**

Motor-pulley is freed from main pulley.

Pinch-roller is freed from capstan, and pads also come off Erase and Record Heads. Brake is pressed against supply reel holder.

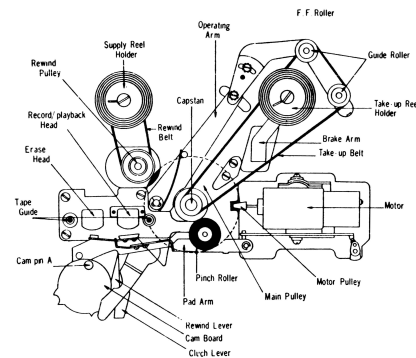


Fig. 9

## HINTS FOR ADJUSTMENT

### Adjustment of Functional Parts

As the adjustment of functional details according to numerical values is practically not easy, determine it by watching actual performances of each part. Balance of capstan and pressure of pads affect the performances of tape recorder and tape, and shall be carefully conditioned.

### Balance of Capstan and Pinch Roller

When balance is lost, it will result in irregular traveling of or even stretching of one edge of tape.

Adjust as shown so that capstan and pinch roller are maintained in a close and parallel contact.

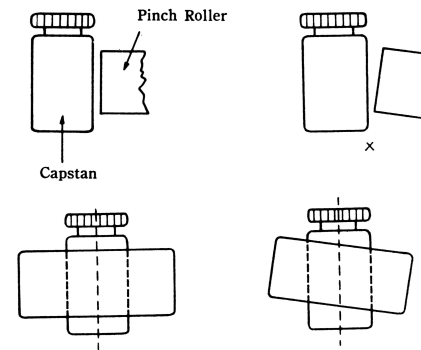


Fig. 10

### Winding Torque for Playback

Measurement

- 1) Form a loop at the end of No. 3 Tape by sticking tape end with adhesive tape and place the reel on take-up reel holder as shown Fig. 11.
- 2) Hook tension Gauge, 50g on the loop at the end of tape.
- 3) Set the unit in playback or record mode.
- 4) Let take-up reel pull tension gauge.
- 5) Read the gauge where it ceases to swing. (Repeat several times)
- 6) Normal torque shall be 6-14g for No. 3 Tape, fully wound up.

Adjustment

(Adjust with Friction Spring as shown Fig. 12)

If tension is insufficient, bend strongly the Friction Spring, and if too strong, stretch the Spring in the whole length.

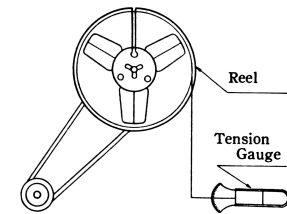


Fig. 11

### Winding Torque for Rewind

Measurement

Measure in manner similar to playback, but the unit in rewind mode.

Normal torque shall be over 20g for No. 3 Tape, fully wound up.

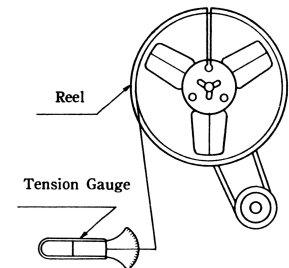


Fig. 12

### Pressure of Tape Pads

Measurement

- 1) Set the unit playback mode.
- 2) Read the gauge where tape pads are released.
- 3) Normal pressure shall be 8-18g.

### Positions of Heads

Record/playback head and Erase head function as a set. When the relative position of these two are not true, such troubles as imperfect erasure or cross-talk may occur. Recondition as shown below.

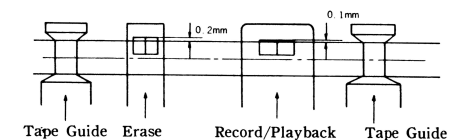


Fig. 13

## DISASSEMBLING OF MAIN PARTS

### Mechanism and Case

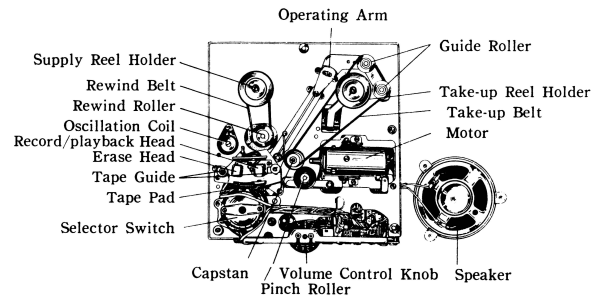


Fig. 17

### Arrangement of Main Parts

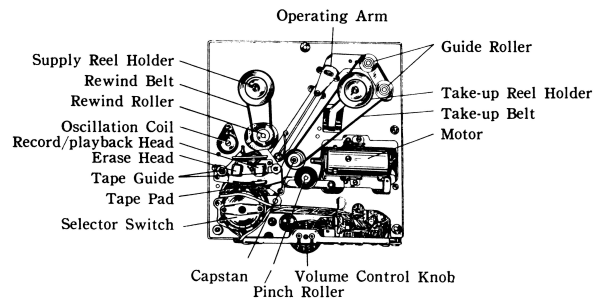


Fig. 18

### Pinch-roller

- 1) Take off Pinch-roller Spring and Pull out Pinch roller.

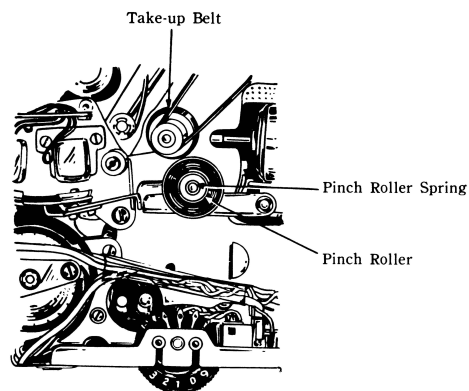


Fig. 19

## NATIONAL MODEL RQ-100

N1-4

### Supply Reel Holder

1. Remove screw on reel holder taking care not to damage the screw, also remove reel holder spring.
2. Remove rubber belt, connecting with rewind pulley.
3. Pull out reel holder.

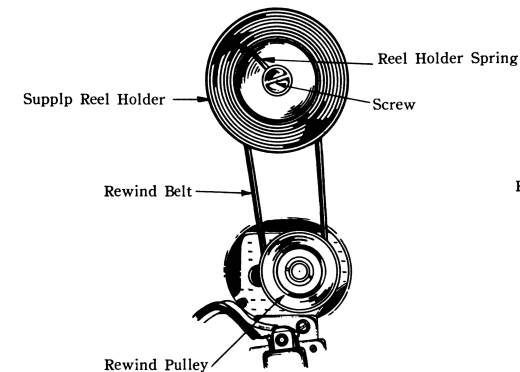


Fig. 20

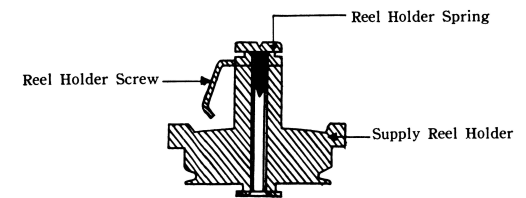


Fig. 21

### Take-up Reel Holder (Same as the case of Supply Reel Holder above)

Take apart the take-up reel holder as bellow condition.

1. When adjusting the pressure of reel pressing spring.
2. When friction washer is oiled or soiled it has to be removed for cleaning.
  - I. Remove holding ring.
  - II. Remove friction spring.
  - III. Remove reel pulley.
  - IV. Remove friction washer.

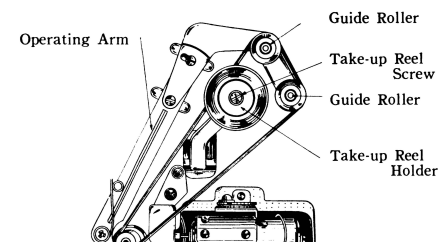


Fig. 22

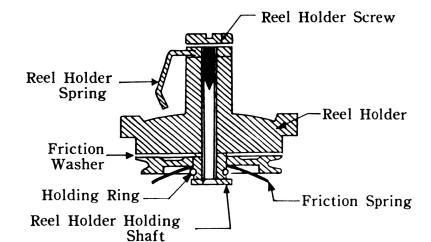
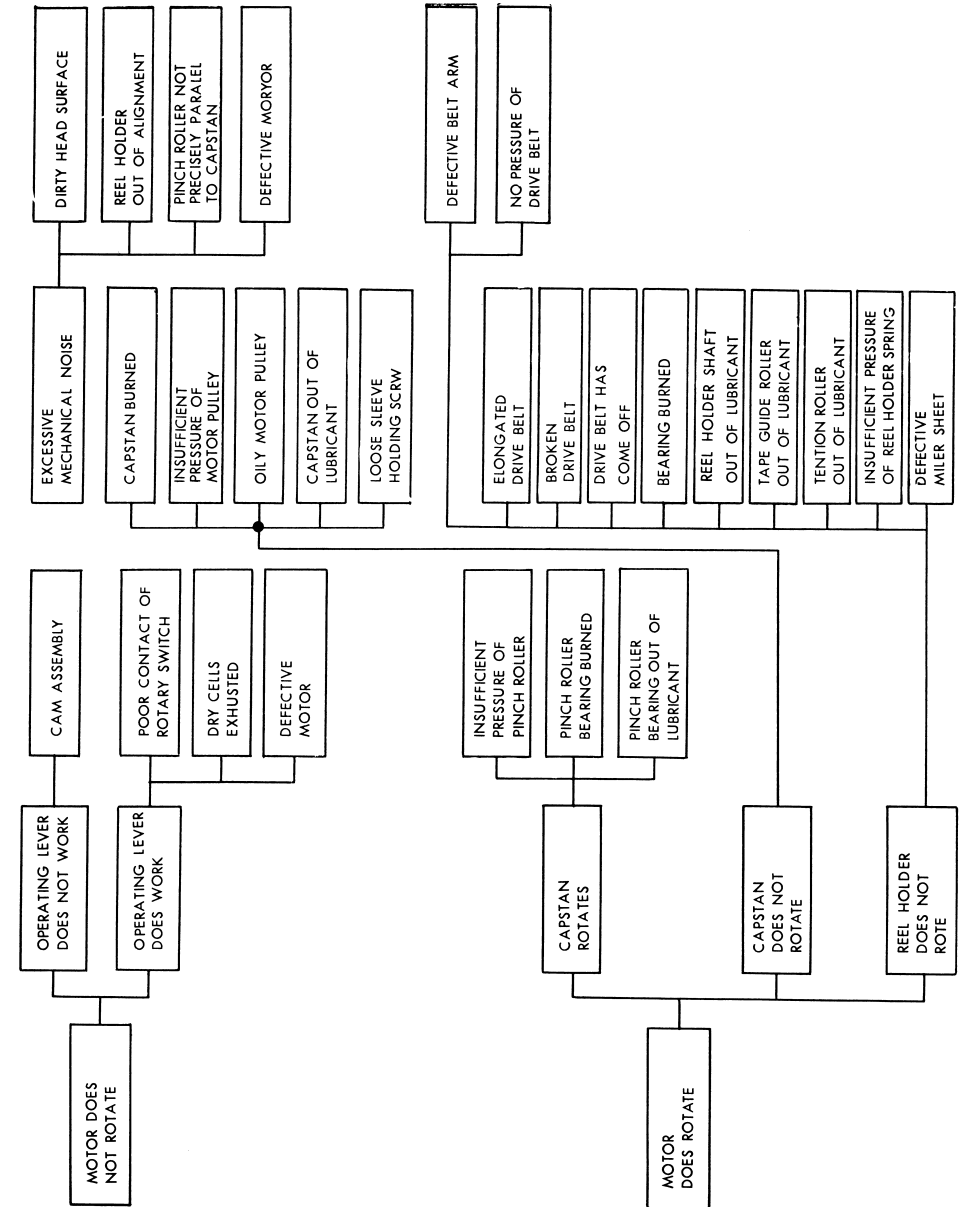
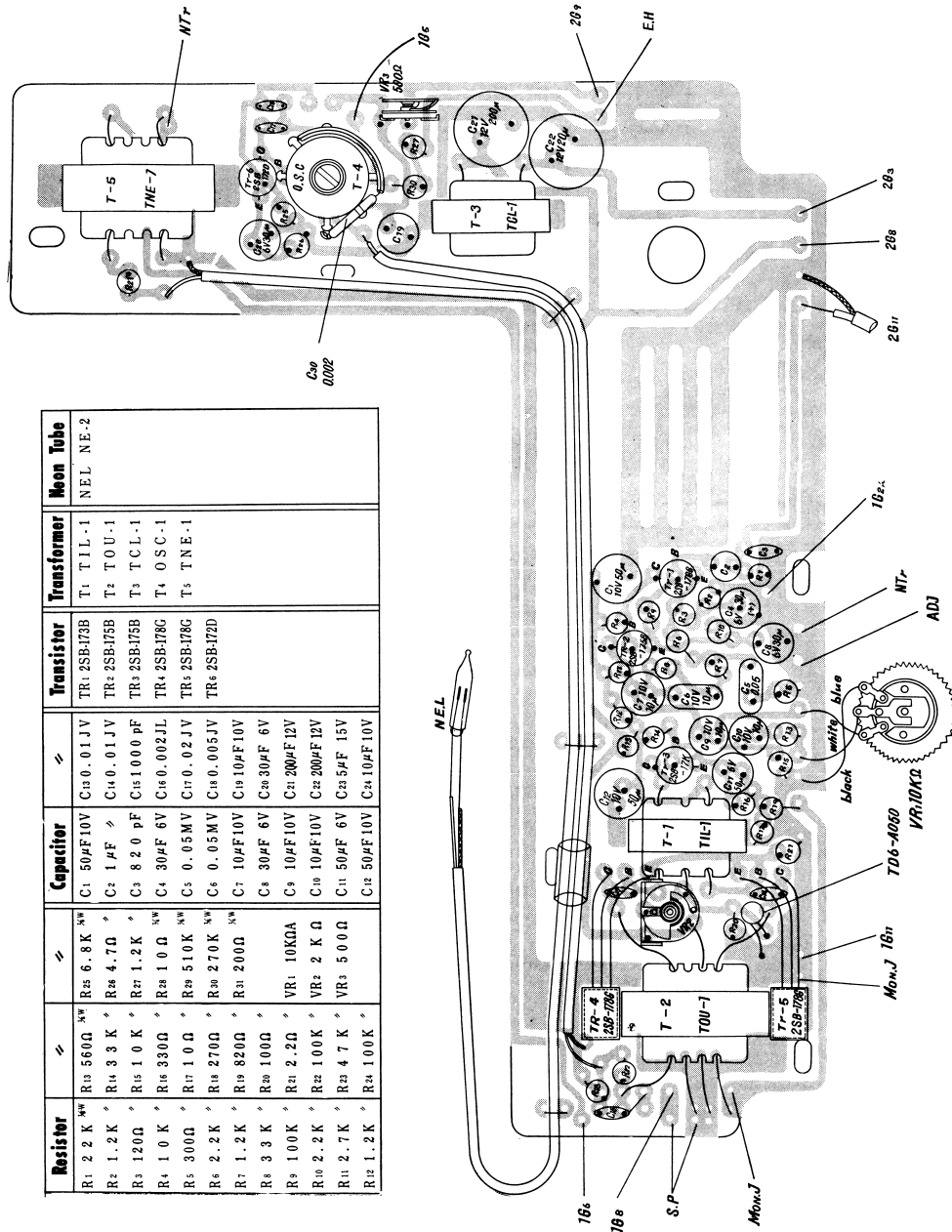
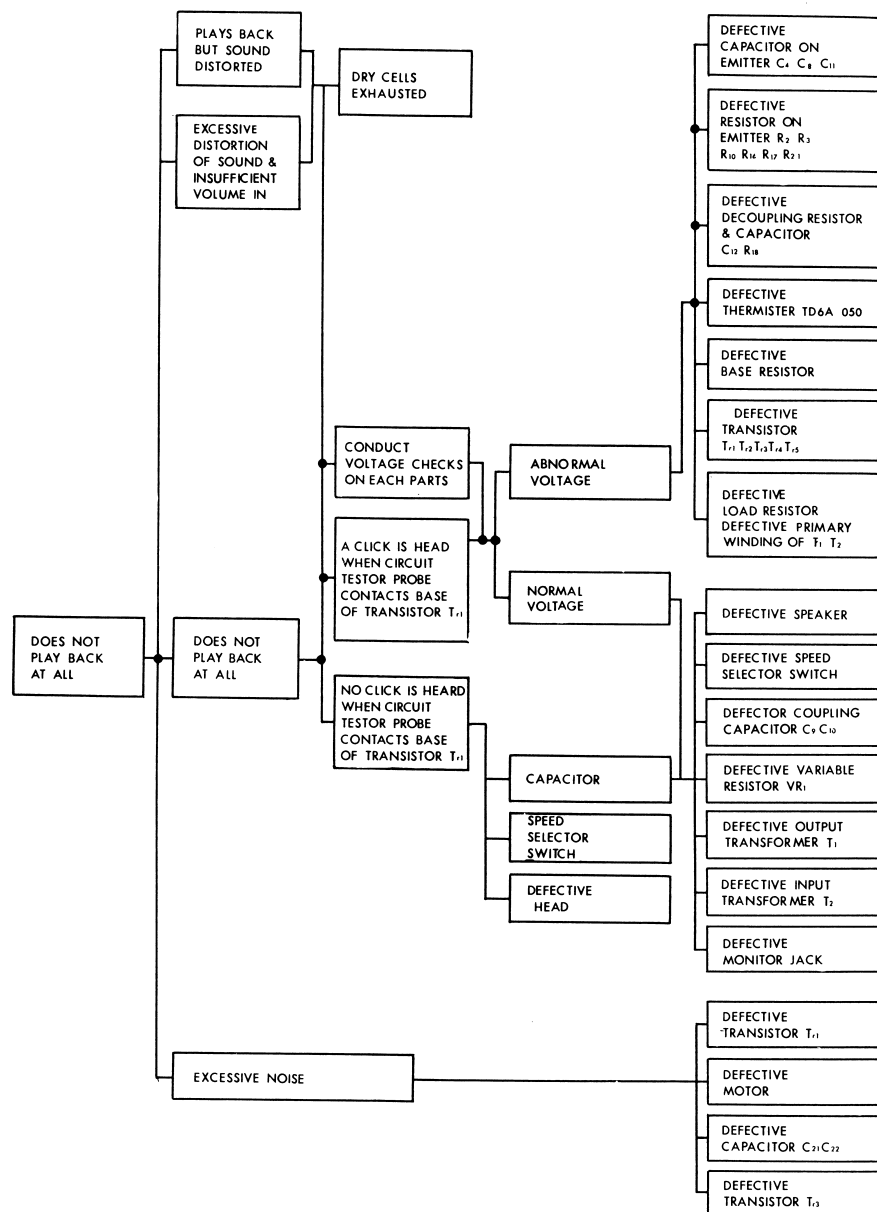


Fig. 23

## TROUBLE SHOOTING GUIDE (1)



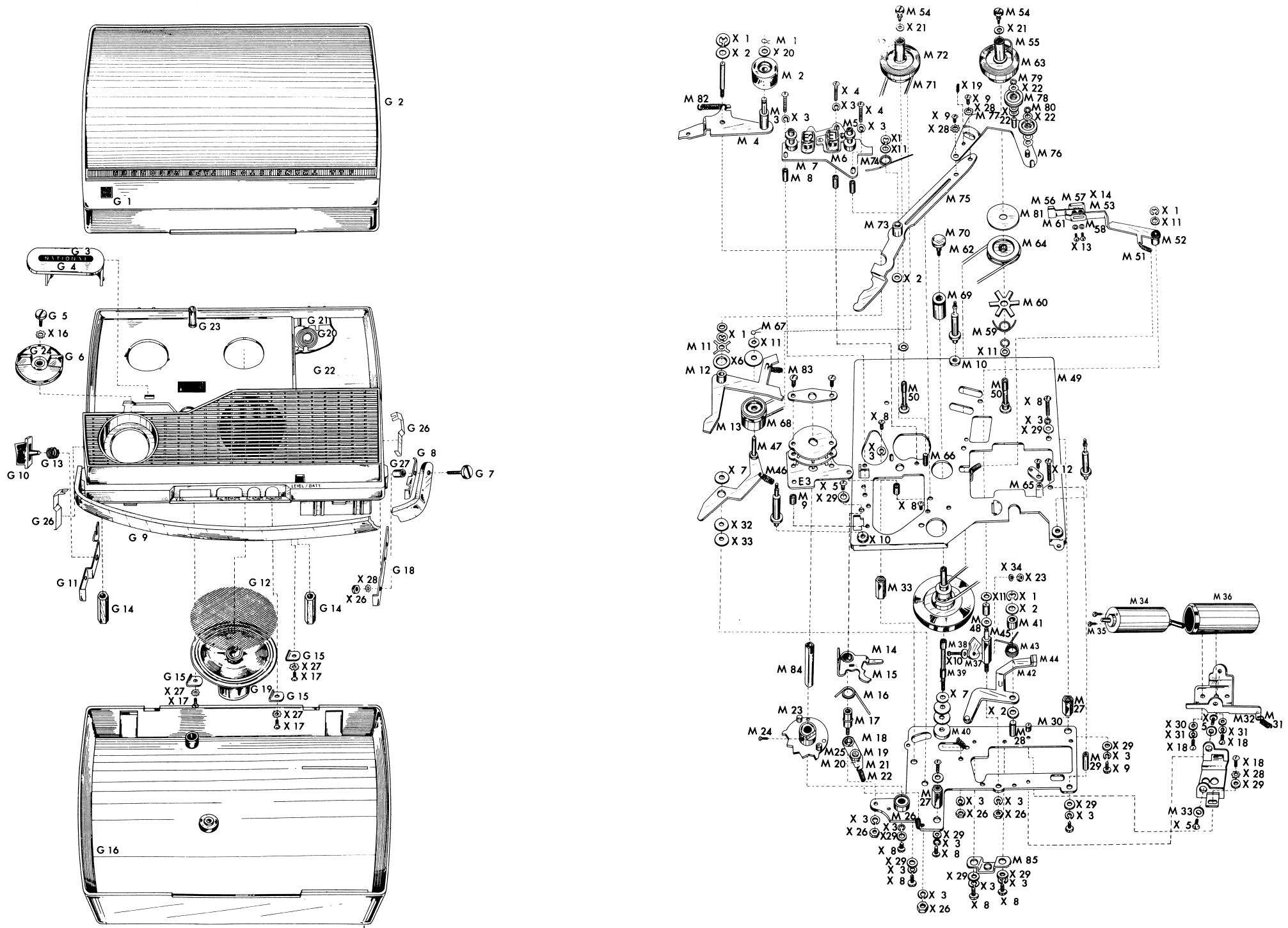


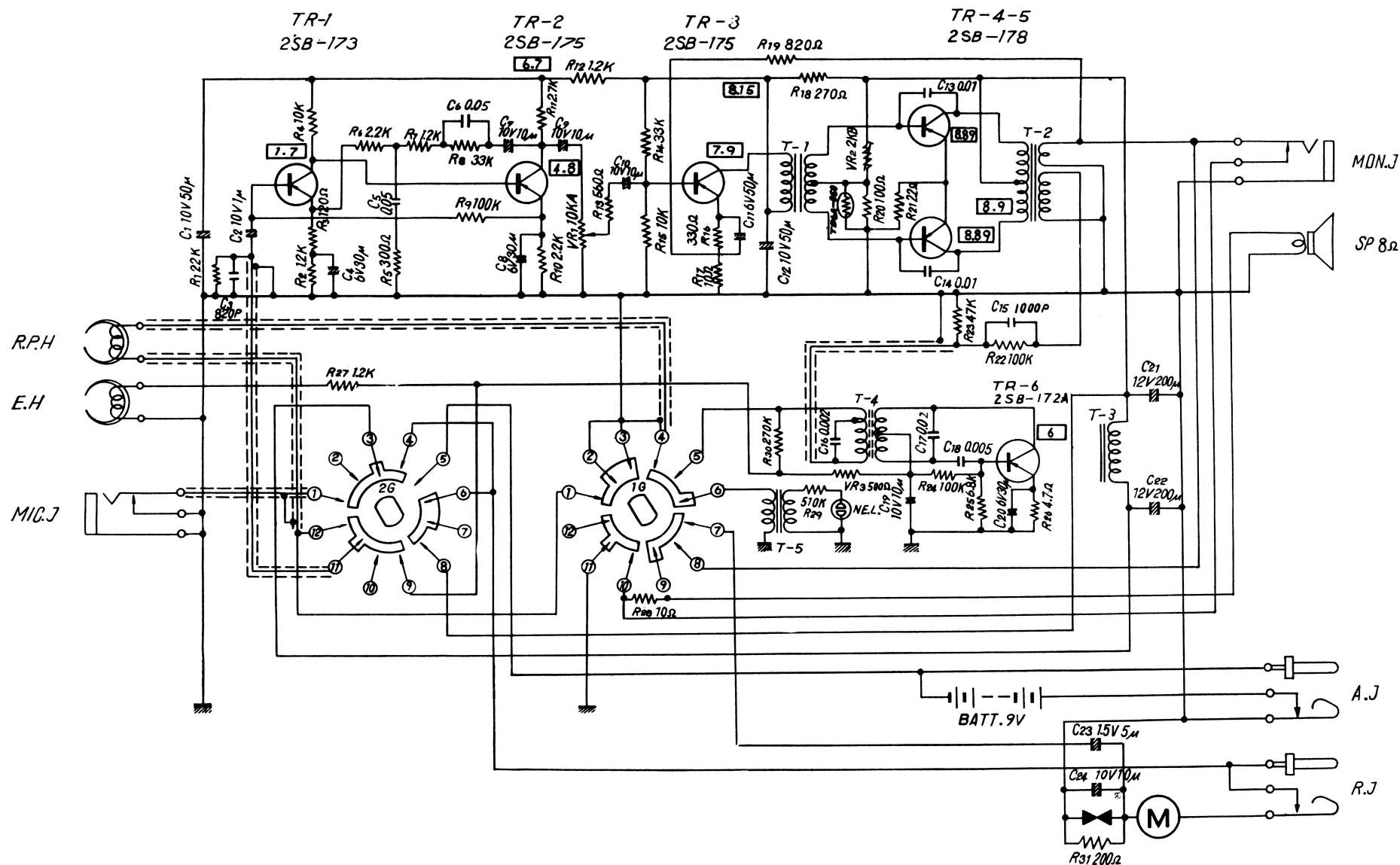


## REPLACEMENT PARTS

C 1	Electrolytic Tubular Capacitor	NCA 50 $\mu$ F 10V
C 2	Electrolytic Tubular Capacitor	" 1 $\mu$ F "
C 3	Electrolytic Tubular Capacitor	" 820PF
C 4	Electrolytic Tubular Capacitor	NCA 30 $\mu$ F 6V
C 5	Electrolytic Tubular Capacitor	" 0.05MV
C 6	Electrolytic Tubular Capacitor	" "
C 7	Electrolytic Tubular Capacitor	NCA 10 $\mu$ F 10V
C 8	Electrolytic Tubular Capacitor	" 30 $\mu$ F 6V
C 9	Electrolytic Tubular Capacitor	" 10 $\mu$ F 10V
C 10	Electrolytic Tubular Capacitor	" "
C 11	Electrolytic Tubular Capacitor	" 50 $\mu$ F 6V
C 12	Electrolytic Tubular Capacitor	" 50 $\mu$ F 10V
C 13	Myler Capacitor	" 0.01JV
C 14	Myler Capacitor	" "
C 15	Myler Capacitor	" 1000PF
C 16	Myler Capacitor	" 0.002JL
C 17	Myler Capacitor	" 0.02JV
C 18	Myler Capacitor	" 0.005JV
C 19	Myler Capacitor	NCA 10 $\mu$ F 1V
C 20	Oil Tubular Capacitor	30 $\mu$ F 6V
C 21	Oil Tubular Capacitor	PB 200 $\mu$ F 12V
C 22	Oil Tubular Capacitor	" "
C 23	Oil Tubular Capacitor	NCA 5 $\mu$ F 15V
C 24	Oil Tubular Capacitor	" 10 $\mu$ F 10V
E 1	Recording/Playback Head	
E 2	Erasing Head	
E 3	Rotary Switch	
G 1	Brand Name plate	
G 2	Case Cover	
G 3	Head Cover Name Plate	
G 4	Head Cover	
G 5	Screw For Lever Knob	
G 7	Screw For Hand Belt Holder	
G 8	Tait Metal For Hand Belt	
G 9	Hand Belt	
G 10	Recording Lock Button	
G 11	Metal Holder For Abore	
G 12	Speaker Net	
G 13	Spring For Recording Lock	
G 14	Chassis Pool	
G 15	Setting Metal For Speaker	
G 16	Bottom Case Cover	
G 17	Mechanism Amp (Assembly)	
G 18	Metal Holder (Right)	
G 19	Speaker	
G 20	Spring For Batteries	
G 21	Batteries Teminal	
G 22	Main Case	
G 23	Capstan Rest	
G 24	Lever Knob	
G 25	Volume Control Knob	
G 26	Case Spring	
G 27	Belt Holding Spacer	

G 28	Jack Holding Board
G 29	Beak Board For Jack Portion
M 1	Pinch Roller Spring
M 2	Pinch Roller
M 3	Pinch Roller Shaft
M 4	Pinch Roller Lever
M 5	Tape Guide
M 6	Recording Head Ajust Plate
M 7	Head Plate
M 8	Head Plate Spacer
M 9	Switch Plate Spacer
M 10	Rubber Bushing
M 11	Cluch Lever Spacer Spring
M 12	Cluch Lever Bushing
M 13	Cluch Lever
M 14	Recording Lock Lever Bushing
M 15	Recording Lock
M 16	Recording Lock Spring
M 17	Catch Lever Shafr
M 18	Catch Lever Bushing
M 19	Catch Pulley Shaft
M 20	Catch Pulley
M 21	Catch Lever
M 22	Spring For Clatch Lever
M 23	Operator Plate Stat
M 24	Set Screw For Operator Plate
M 25	Operator Plate
M 26	Switch Shaft Bushing
M 27	Chassis Spacer
M 28	Brake Arm Shaft
M 29	Chassis Spacer Tube
M 30	Low Chassis
M 31	Motor Spring
M 32	Motor Clutch Arm
M 33	Motor Pipot
M 34	Motor
M 35	Motor Pulley
M 36	Motor Shield Cover
M 37	Motor Lift
M 38	Motor Lift Bushing
M 39	Main Pulley Shaft
M 40	Main Pulley Spacer
M 41	Bushing For Brake Arm
M 42	Brake
M 43	Spring For Brake
M 44	Felt For Brake Arm
M 45	Pad Arm Shaft
M 46	Spring For Rewind Lever
M 47	Rewind Pulley Shaft
M 48	Main Pulley
M 49	Upper Chassis
M 50	Reel Holder Shaft
M 51	Spring For Pad Arm
M 52	Pad Arm Bushing
M 53	Pad Arm
M 54	Reel Holder Screw



**Note:**

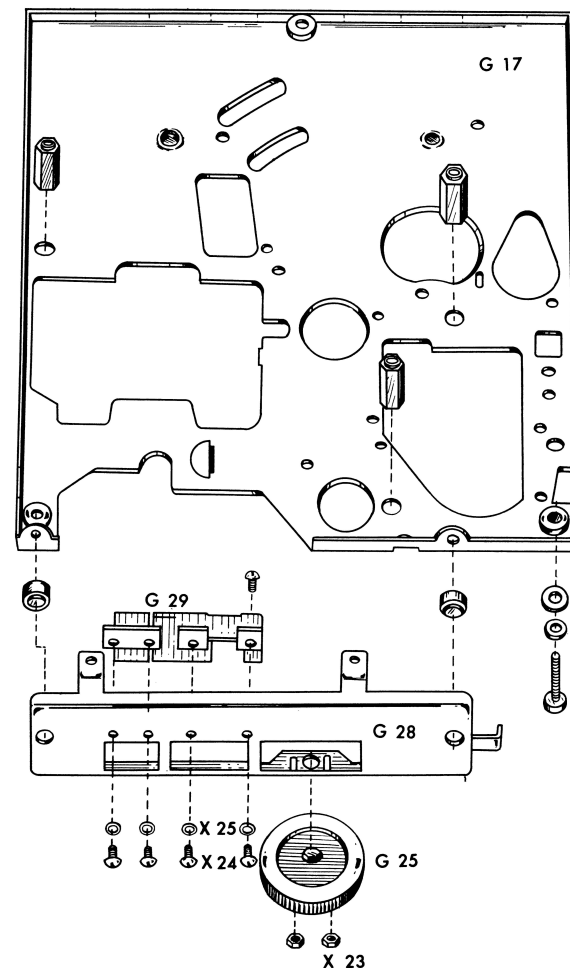
Position of Switch ..... STOP (illustrated in STOP mode).

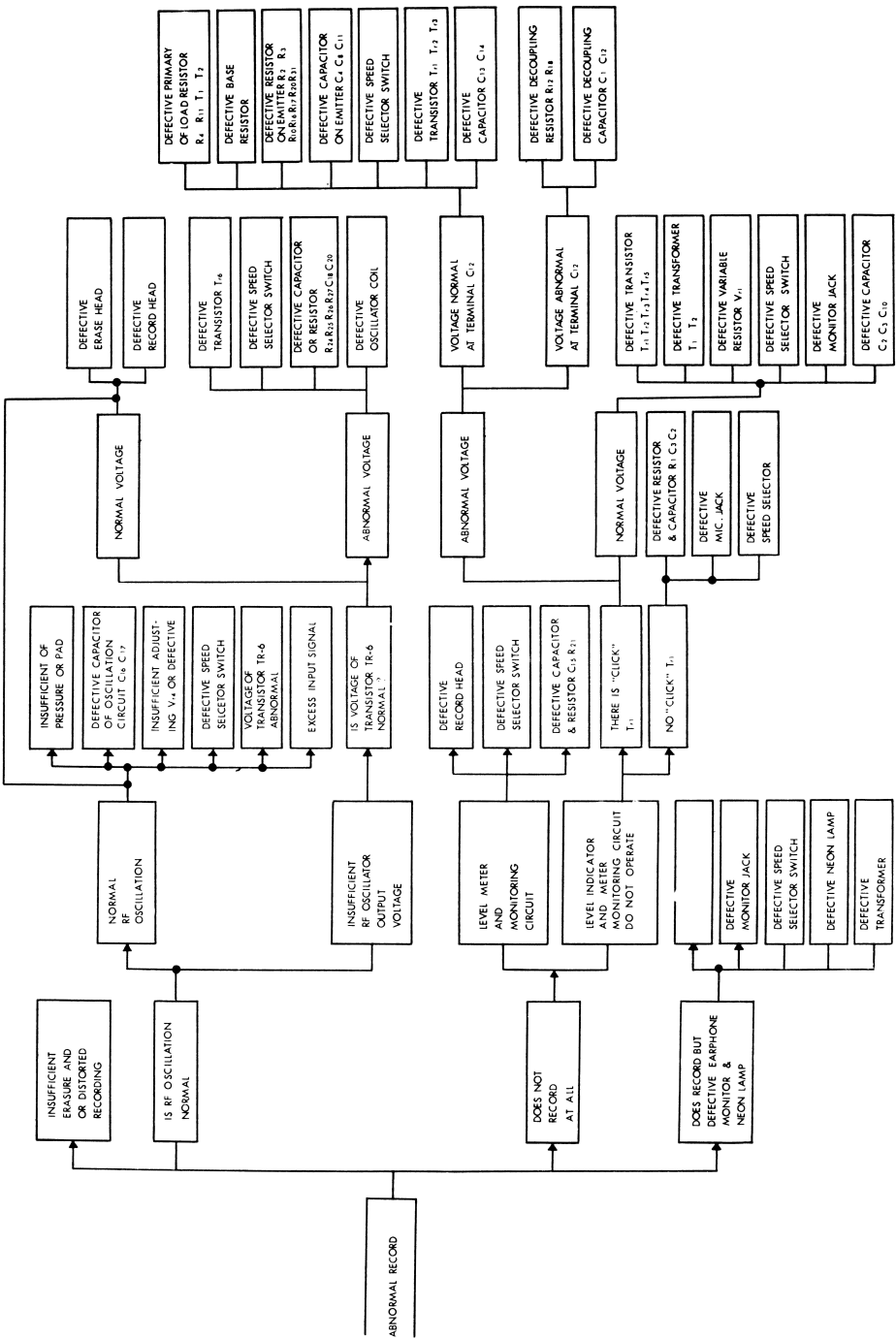
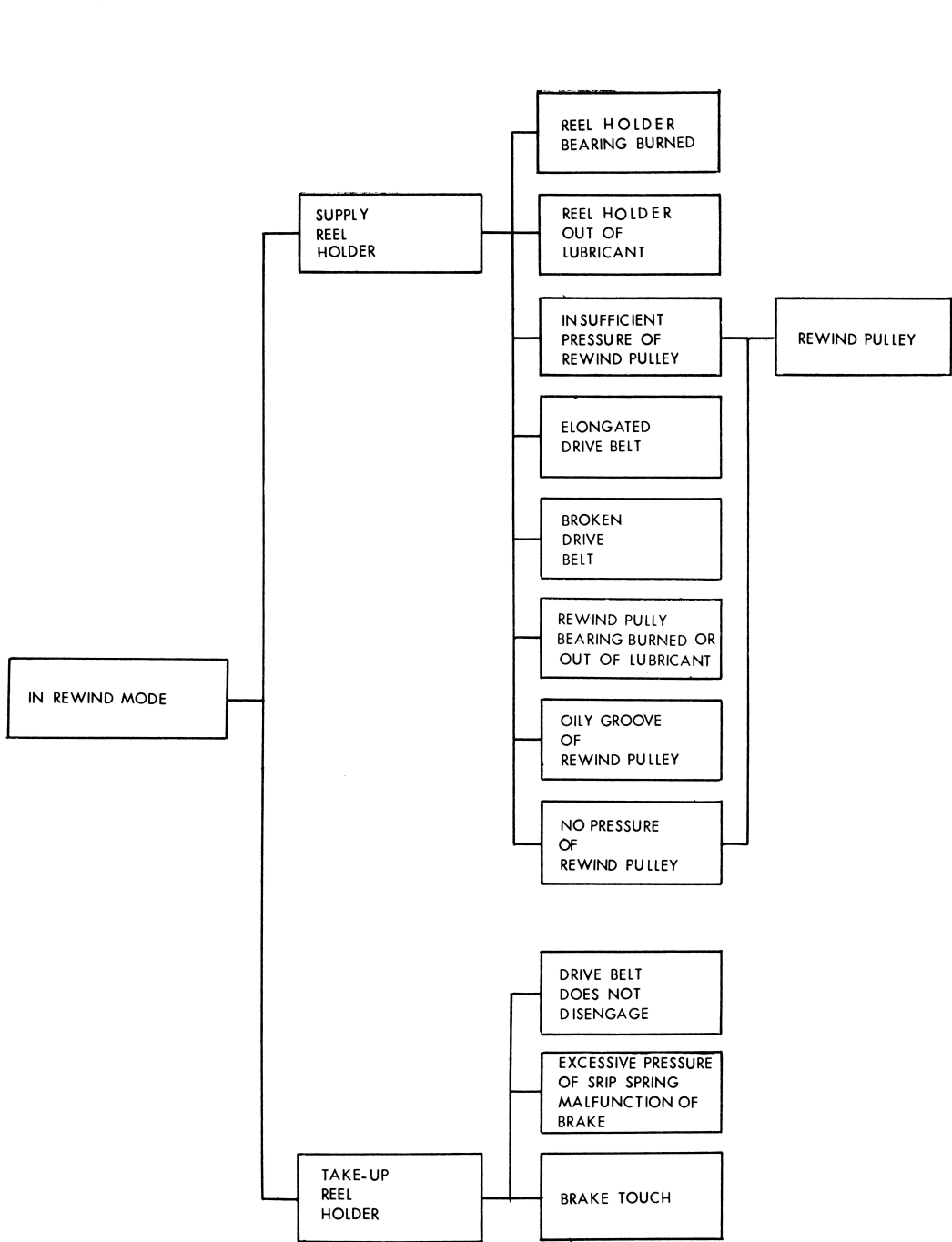
- |                          |    |
|--------------------------|----|
| PLAYBACK Clockwise       | 1. |
| RECORD                   | 2. |
| REWIND Counter-clockwise | 1. |

Values indicated in    are D.C. currents between the chassis.

M55	Reel Holder Spring
M56	Pad Felt (Left)
M57	Head Shield Cover
M58	Pad Metal
M59	Spring For Friction Pulley
M60	Friction Spring
M61	Pad
M63	Take-up Belt
M63	Take-up Reel Pan
M64	Friction Pulley
M65	Hook For Motor Spring
M66	Take-up Guide Lever Shaft
M67	Rewind Pulley Spring
M68	Rewind Pulley
M69	Capstan
M70	Capstan Screw
M71	Rewind Belt
M72	Rewind Reel Pan
M73	Take-up Lever Bushing
M74	Take-up Lever Spring
M75	Take-up Guide Lever
M76	Roller Shaft For Take-up Guide pulley F.F.
M77	Take-up Guide arm
M78	Take-up Guide Pulley
M79	Fast Forward Spring
M80	Guide Pulley Spring
M81	Friction Washer
M82	Spring For Pinch Roller Lever
M83	Spring for Catch Lever
M84	Switch Shaft
M85	Holding Metal For Bottom Case
R 1	Carbon Film Resistor RD 1/6 RNZK 22K 10%
R 2	Carbon Film Resistor " 1.2K "
R 3	Carbon Film Resistor " 120Ω "
R 4	Carbon Film Resistor " 10K "
R 5	Carbon Film Resistor " 300Ω "
R 6	Carbon Film Resistor " 2.2K "
R 7	Carbon Film Resistor " 1.2K "
R 8	Carbon Film Resistor " 3.3K "
R 9	Carbon Film Resistor " 100K "
R10	Carbon Film Resistor " 22K "
R11	Carbon Film Resistor " 2.7K "
R12	Carbon Film Resistor " 1.2K "
R13	Carbon Film Resistor " 560Ω "
R14	Carbon Film Resistor " 33K "
R15	Carbon Film Resistor " 10K "
R16	Carbon Film Resistor " 330Ω "
R17	Carbon Film Resistor " 10Ω "
R18	Carbon Film Resistor " 270Ω "
R19	Carbon Film Resistor " 820Ω "
R20	Carbon Film Resistor " 100Ω "
R21	Carbon Film Resistor " 2.2Ω "
R22	Carbon Film Resistor " 100K "
R23	Carbon Film Resistor " 47K "
R24	Carbon Film Resistor " 100K "

R25	Carbon Film Resistor	"	6.8K	"
R26	Carbon Film Resistor	"	4.7Ω	"
R27	Carbon Film Resistor	"	1.2K	"
R28	Carbon Film Resistor	RD1/4 LZK	10Ω	"
R29	Carbon Film Resistor	RD 1/6 RNZK	510K	"
R30	Carbon Film Resistor	"	270K	"
R31	Carbon Film Resistor	RD1/4 LZK	200Ω	"
X 1	E3 Stop Ring			
X 2	Fiber Washer	4.2φ, 8φ.	0r5	
X 3	Spring Washer	3φ		
X 4	Screw, Round Head	3×15		
X 5	Screw, Round Head	3×6		
X 6	Washer	4.1φ. 12φ	0.3	
X 7	Tetron Washer	4.1φ. 12φ.	0.15	
X 8	Screw, Round Head	3×5		
X 9	Screw, Round Head	3×4		
X10	Nut, Round Head	2×12		
X11	Tetron Washer	4.2φ 8φ	0.25	
X12	Screw, Round Head	3×18		
X13	Screw, Round Head	2×3		
X14	Rivet	2×3		
X15	Washer			
X16	Washer	3.5φ		
X17	Screw	2.6×4		
X18	Screw, Round Head	2.6×4		
X19	Screw,	2.6×3		
X20	Tetron Washer	4.2φ 7φ	0.15	
X21	Tetron Washer	3.7φ 7φ	0.15	
X22	Fiber Washer	3.7φ.7φ	0.25 Nut 2φ	
X24	Screw, Round Head	2×3.5		
X25	Washer 2φ	26 Nut 3φ		
X27	Washer	2.6φ		
X28	Washer	3φ		
X29	Washer	3φ		
X30	Washer	2.6φ		
X31	Spring Washer	2.6φ		
X32	Washer	6.2φ		
X33	Tetron Washer			
X34	Spring Washer	2φ		
VR 1	Variable Resistor	NV16AT12	10 KΩA	
VR 2	Semi-Fixed Variable Resistor		2 KΩ	
VR 3	Semi-Fixed Variable Resistor		500 Ω	
TR 1	Transistor		2SB-173B	
TR 2	Transistor		2SB-175B	
TR 3	Transistor		"	
TR 4	Transistor		2SB-178G	
TR 5	Transistor		"	
TR 6	Transistor		2SB-172D	
T 1	Input Transformer		TIL-1	
T 2	Output Transformer		TOU-1	
T 3	Chorck Coil		TCL-1	
T 4	Oscillator Coil		OSC-1	
T 5	Neon Transformer		TNE-1	
NE-2	Neon Lamp			
TD6A-050	Thermistor			





# N1-5 NATIONAL MODEL RQ-100

## Rotary Switch

1. Remove 2 switch holding screws.
2. Pull out rotary switch from shaft.

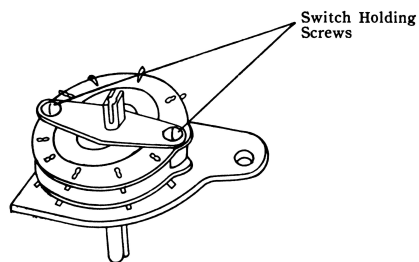


Fig. 24

## Motor

1. Remove motor lead wires from terminals.
2. Remove motor holder holding screw.
3. Remove motor spring holding screw.
4. Remove motor set screw.
5. Remove motor.

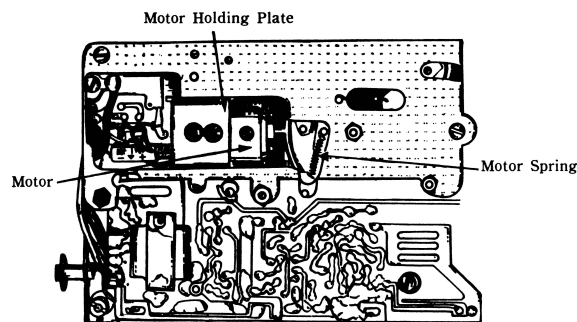
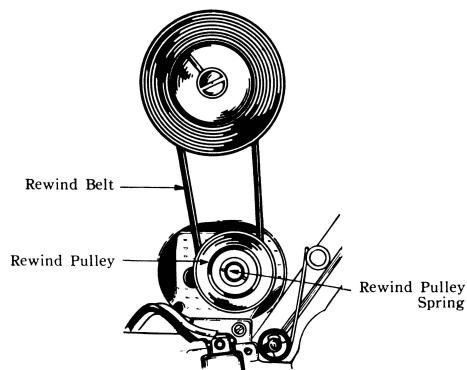


Fig. 25

## Rewind Pulley

1. Remove spring washer.
2. Pull out rewind pulley upward.



## Volume Control

1. Remove 2 nuts ( $2\phi$ ), holding volume control.
2. Remove wires on terminals.

## Print Base-board

1. Remove 5 screws ( $2.6\phi$ ), holding print base board.
2. Remove brass supports with care.
3. Lift base board lightly from chassis.

## Speaker

1. Remove 4 holding screws.

## Record/Playback Head

1. Remove 2 holding (adjusting) screws. White lacquer lock shall be removed with thinner.
2. Remove lead wires on terminals.

## Erase Head

1. Remove 3 screws, holding head base.
2. Remove 2 screws holding head at head base.
3. Remove lead wires on terminals.

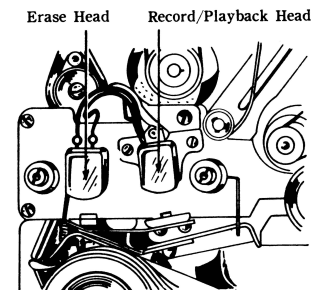


Fig. 27

## Installation and Adjustment of Heads

1. Fix new head with holding (adjusting) screws.
2. Screw on right side is fitted with spring.
3. Temporarily screw (with spring) so that the height of spring is pressed to 3-4 mm. Screw in left screw loosely.
4. Set standard tape (with signal, 3,500 c/s at 3-3/4 ips. (9.5 cm/sec) recorded) in playback mode, and adjust left screw so that the maximum signal output is obtained at 300 c/s.
5. After properly adjusting head position, lacquer lock the 2 screws.

### Angle of Heads

If the gap line in brusing surface of record head does not keep true vertical to tape, transformer response may deteriorate in high-tone range. To correct this, head shall be repositioned in the following manner: Obtain a standard tape fortensing angle (3,000 c/s signal is recorded in accurate angle). Playback this tape and find out the angle, by turning screw 2, at which the maximum output is obtain. After conditioning, the screw shall best be paint-locked to prevet accidental divergency.

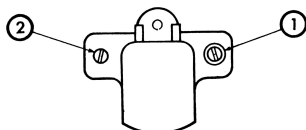


Fig. 14

### Record Bias

A.C. bias system is employed for this tape recorder, so that when replacing heads, oscillation transformer or transistors on oscillation circuit, etc., readjustment of bias must be made. Adjust it according to the illustration below:

Bias Current	0.7 mA
Bias Frequency	20~30 kc (25 kc desirable)

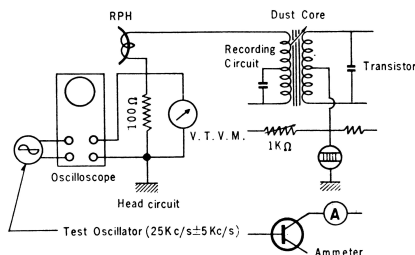


Fig. 15

### Adjust Frequency

1. Connect an oscilloscope (pre-adjusted to sync at approximately 25 kc) across a 100 ohm 5% resistor, placed in series with the record head.
2. Adjust core of oscillator coil to approximately 25 kc as indicated on oscilloscope.

### Head Current

1. Connect a VTVM across a 100 ohm 5% resistor placed in series with the record head.

2. Adjust the 1k ohm variable resistor, so that the VTVM reads within the range of 40-70 millivolts. (Current 0.4-0.7 mA.)

### Oscillator Transistor Current

Connect a milli-ammeter in series with the collector. Current must not exceed 0.9 mA. Adjust 1k ohm variable resistor for 0.9 mA reading on the milliammeter. The circuit is so designed that 0.9 mA collector current will produce a bias current of 0.7 mA.

### Erase Current

Normally, 4-6 mA DC will flow through the erase head (Fig. 17). When replacing the erase head, observe polarity.

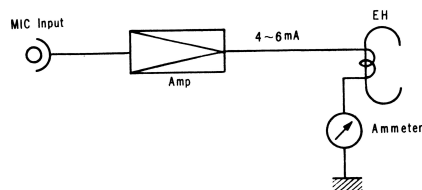


Fig. 16

## MAINTENANCE

### Cleaning Lubrication

This tape recoder dose not, as a rule, require oiling, but it is preferable to oil once in a year or when parts are repaired, as following;

Capstan bearing	1-2 drops
Pinch roller bearing	1-2 drops
Rewind Pulley bearing	1-2 drops
Motor bearing	1 drop
Reel spindles	1-2 drops

### Record/Playback & Erase Head

Good performance of the recorder depends largely on the maintenance of heads. Accumulation of dust on head cores should not be overlooked. Dust must be cleaned off with carbon tetrachloride. Heads might lose their characteristic if used too long since they always have the friction with the tape. Replace with new ones after about 1,000 hours of use.

### Motor

The motor rarely goes wrong, but occasional oiling is necessary. Oil it after each 500 hours of performance. Use spindle oil or machine oil.

### Mechanical Parts

#### 1) Idler

Clean the surface of the idler in contact with the motor-pulley with carbon tetrachloride. Also, clean the surfaces of the motor-pulley and main pulley in contact with the idler. Oil 1-2 drops on bearing after every 200 hours of performance.

#### 2) Pinch Roller

Clean the surface of the pinch roller in contact with the capstan. Oil 2-3 drops on bearings after every 200 hours of performance.

#### 3) Capstan

Clean the capstan with benzene. Oil 1-2 drops on bearing after every 200 hours. Keep free of oil the surface of the capstan in contact with the pinch roller. Otherwise, the tape may slip and the pinch roller rubber may be damaged.

#### 4) Each parts roller

Oil bearings once every 200 hours. Clean the surface in contact with the belt with benzene. Be sure to wipe off any amount of oil on the rubber surface in order to prevent slipping.

## 2. ELECTRICAL CIRCUITS

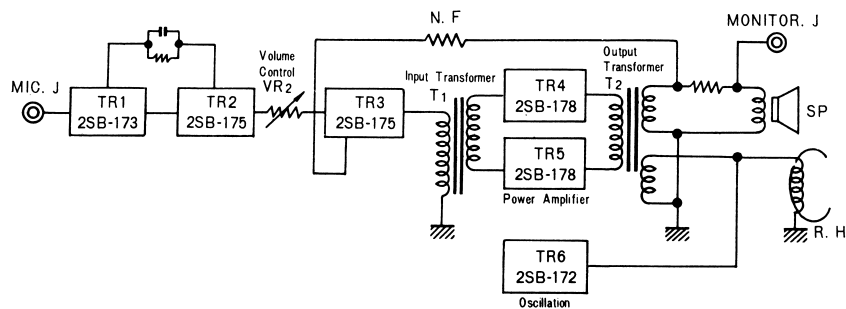


Fig. 4

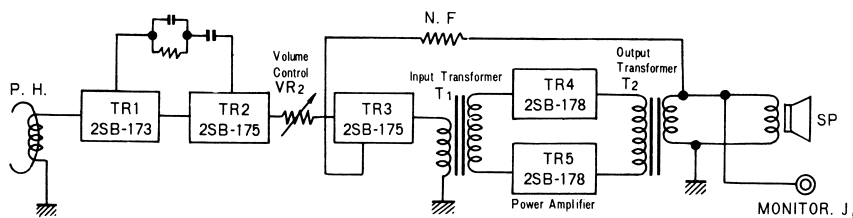


Fig. 5

## MECHANISM

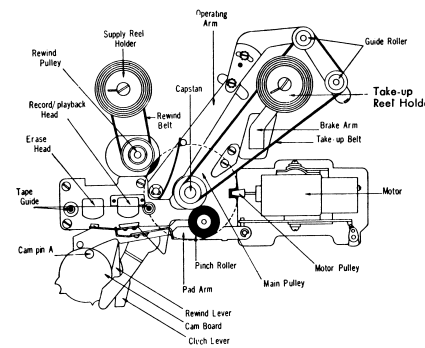


Fig. 6

### Single-Knob Control

This tape-recorder operates by single-knob-control. All movements connected with tape is exclusively controlled by operating-knob, which switches electric power ON and OFF at the same time.

- 1) Turn Operating-knob clockwise to PLAY-BACK to set up mechanism for play-back, and to turn ON power switches for amplifier and motor simultaneously.
- 2) Turn operating-knob counter-clockwise to REWIND to set up mechanism for rewinding and to switch OFF amplifier.
- 3) Press Recording Safety button and turn operating-knob to RECORD. Amplifier now works for recording. Recording Safety button is a locking device to prevent accidental erasure.
- 4) Volume-control knob is used to adjust recording. Level and volume of reproduced sound but has no direct connection to power switch. Neon lamp indicates recording level.

### Change of Speeds

Two tape speeds are available by changing capstan diameters. Capstan equipped with outer sleeve works at the speed of 3-3/4 ips. (9.5 cm/sec) and without sleeve, at 1-7/8 ips. (4.75 cm/sec)

### Record (Playback) Mechanism

Performance of mechanism is exactly same for recording and for playback that in the former case, operating-knob shall be turned to RECORD after Recording Safety button is pressed.

Electrical connection within amplifier is shifted to and from recording and playback by means of rotary switch which is controlled by movement of operating knob.

When operation knob is set at RECORD or PLAYBACK, camplate turns and cam-pin is freed operating arm, pinch-roller arm and brake move in the direction of arrow respectively whereby, pinch roller presses against capstan and transmits rotary motion to tape.

Take-up belt touches pulley at the bottom of take-up reel holder and imparts rotary motion to holder. At the same time, brake comes loose in the direction of arrow and allows holder start winding up tape without slack.

Motor starts rotation by means of rotary switch which is synchronized to the movement of cam-plate. Motor-pulley touches rubber tire of main pulley.

All these actions occur almost simultaneously and are transmitted from motor through main pulley, capstan, and by the belt to reel-holder. By the rotation of each parts, tape travels.

### Rewind Mechanism

Operating knob at REWIND, cam-pin comes free and rewind arm moves in the direction of arrow, rewind-pulley touches rubber tire of main pulley, and supply reel holder rotates by means of rubber belt.

Rotary motion is transmitted from motor-pulley to main pulley as in the case of playback. As for take-up reel holder are clearly and brake comes off. Reel holder thus rotates freely as pulled by tape.

### Stop Mechanism

Operating knob at STOP, knob is freed and motor stops, and tape also stops instantly without any over-run.

This is due to back-tension of rewind-belt, when stopped from record or play-back position, and by brake, when stopped from rewind position.