

MECHANICAL PARTS LIST - Con't.

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
17	106125-501G	Pressure Wheel Assembly	37		Lifter Cam - Take-up Reel
18	106127K	Pressure Wheel Shaft	38		Lifter Cam - Supply Reel
19	104307-2	Truarc Retaining Ring	39	114008	Micro Switch Mounting Bracket
20	106128A	Pressure Wheel Spring	40	110027B	Leaf Spring
21		Pressure Wheel Bracket	41	112791	Switch, Micro-S. P. D. T.
21A	106129B	Pressure Pad for Record Head	42	110016H	Erase Switch Actuating Pin
22	110078D	Pressure Wheel Bracket Spring	42A	101643E	Erase Pin Sleeve
23	110056-501	Erase Head Pressure Arm & Pad Assembly	43	112822-501	Control Arm Assembly
24	110076A	Pressure Arm Spring	44	104307-2	Truarc Retaining Ring
25	110327-PL1	Mechanical Panel Assembly	45	110028B	Control Mounting Clamp
26	106364-501M	Spindle Bearing Assembly	46	209823-501A	Capstan Drive Assy.; Includes Spindle Bearing, Spindle, Fly-wheel, Pulley, Lower Bearing and Mounting Bracket
27	114173-17	Tinnerman Nut			Capstan Shaft Assy. with Plates
28	212046-501J	Erase Head Assembly	48	209800-501	Clutch Lifter Bracket-Supply Reel
29	215198-501	Record Head Assembly	49	210180-501	Clutch Lifter Bracket-Take-up Reel
	216559-501	Complete Head Assembly, Erase & Record (Consists of Items 28 and 29)	50	106407-501C	Ball Bearing
30	106262E	Tape Guide Post-Left Hand	51	104636-1	Bottom Bearing Bracket Assy.
31	115514A	Tape Guide Post-Right Hand	52	106394-501C	Drive Motor
32	115513B	Tape Guide Post - Center	53	317438	Fan Blade
33		Flywheel Mounting Bracket	54	111783	
34	110111	Toggle Switch			
35		Cam Link			
36		Clutch Lever			

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
V1	7075	6J7, 1st. AF Amp.	R9	5-115557-225	Resistor, 2.2 Meg., 1/2 Watt
V2	105205	6SN7, 2nd. AF Amp.	R10	5-115557-474	Resistor, 470K Ω , 1/2 Watt
V3	103185	6SN7, 3rd. AF Amp.	R11	5-115557-104	Resistor, 100K Ω , 1/2 Watt
V4	105206	6E5, Record Level Indicator	R12	5-115557-222	Resistor, 2200 Ω , 1/2 Watt
V5	103185	6SN7, Bias Oscillator	R13	5-115557-224	Resistor, 220K Ω , 1/2 Watt
V6	102709	6V6, Audio Output	R14	5-115557-222	Resistor, 2200 Ω , 1/2 Watt
V7	102705	5Y3GT, Rectifier	R15	5-115558-473	Resistor, 47K Ω , 1 Watt
C1A	102711	Elect. Cap., 20mfd. @ 450V.	R16	5-115557-223	Resistor, 22K Ω , 1/2 Watt
C1B		Elect. Cap., 20mfd. @ 450V.	R17	5-115557-223	Resistor, 22K Ω , 1/2 Watt
C2A	103253	Elect. Cap., 20mfd. @ 450V.	R18	5-115557-681	Resistor, 680 Ω , 1/2 Watt
C2B		Elect. Cap., 20mfd. @ 25V.	R19	5-115558-473	Resistor, 47K Ω , 1 Watt
C2C		Elect. Cap., 20mfd. @ 450V.	R20	5-115557-224	Resistor, 220K Ω , 1/2 Watt
C3	20-112034-473	.047mfd. @ 600V.	R21	5-115557-224	Resistor, 220K Ω , 1/2 Watt
C4	1-109354-3	100mmf., Mica	R22	5-115557-222	Resistor, 2200 Ω , 1/2 Watt
C5	20-113115-223	.022mfd. @ 600V.	R23	5-115557-224	Resistor, 220K Ω , 1/2 Watt
C6	20-112034-473	.047mfd. @ 600V.	R24	5-115557-224	Resistor, 220K Ω , 1/2 Watt
C7	1-109354-3	100mmf., Mica	R25	5-115557-474	Resistor, 470K Ω , 1/2 Watt
C8	20-113115-222	.0022mfd. @ 600V.	R26	5-115558-391	Resistor, 390 Ω , 1 Watt
C9	20-113115-222	.0022mfd. @ 600V.	R27	5-115558-222	Resistor, 2200 Ω , 1 Watt
C10	20-112034-473	.047mfd. @ 600V.	R28	5-115557-224	Resistor, 220K Ω , 1/2 Watt
C11	20-112034-104	.1mfd. @ 600V.	R29	5-115557-224	Resistor, 220K Ω , 1/2 Watt
C12	20-113115-223	.022mfd. @ 600V.	R30	5-115557-472	Resistor, 4.7K Ω , 1/2 Watt
C13	20-113115-223	.022mfd. @ 600V.	R31	3-106771-3	Resistor, 1 Meg., 1/2 Watt
C14	20-113115-222	.0022mfd. @ 600V.	R32	5-115557-224	Resistor, 220K Ω , 1/2 Watt
C15	20-113115-102	1000mmf.	R33	5-115557-225	Resistor, 2.2 Meg., 1/2 Watt
C16	1-109354-3	100mmf., Mica	R34	5-115557-224	Resistor, 220K Ω , 1/2 Watt
C17	1-109354-3	100mmf., Mica	R35	5-115557-223	Resistor, 22K Ω , 1/2 Watt
C18	1-109354-3	100mmf., Mica	T1		Power Transformer
C19	20-112034-472	.0047mfd. @ 600V.	T2	208913	Output Transformer
C20	20-112034-473	.047mfd. @ 600V.	SP1		Speaker
R1	103469	Volume Control, 1 Meg.	L1	200925	Filter Choke
R2	106762-1	Tone Cont., On-Off Sw. 100K Ω	M1	105710-1	Pilot Lamp, Type #44
R3	103469-2	Monitor Cont., 25K Ω	M2	102625-9	Fuse, 5 Amp.
R4	5-115557-105	Resistor, 1Meg., 1/2 Watt	M3	106746-3	Selector Switch
R5	5-115557-223	Resistor, 22K Ω , 1/2 Watt	M4	21421-3	Radio Input Jack
R6	5-115557-223	Resistor, 22K Ω , 1/2 Watt	M5	21421-3	Mic. Input Jack
R7	5-115557-106	Resistor, 10 Meg., 1/2 Watt	M6	21421-3	Output Jack
R8	5-115555-4R7	Resistor, 4.7 Ω , 1 Watt			

PHOTOFACT* Folder



BRUSH
MODEL BK-455P

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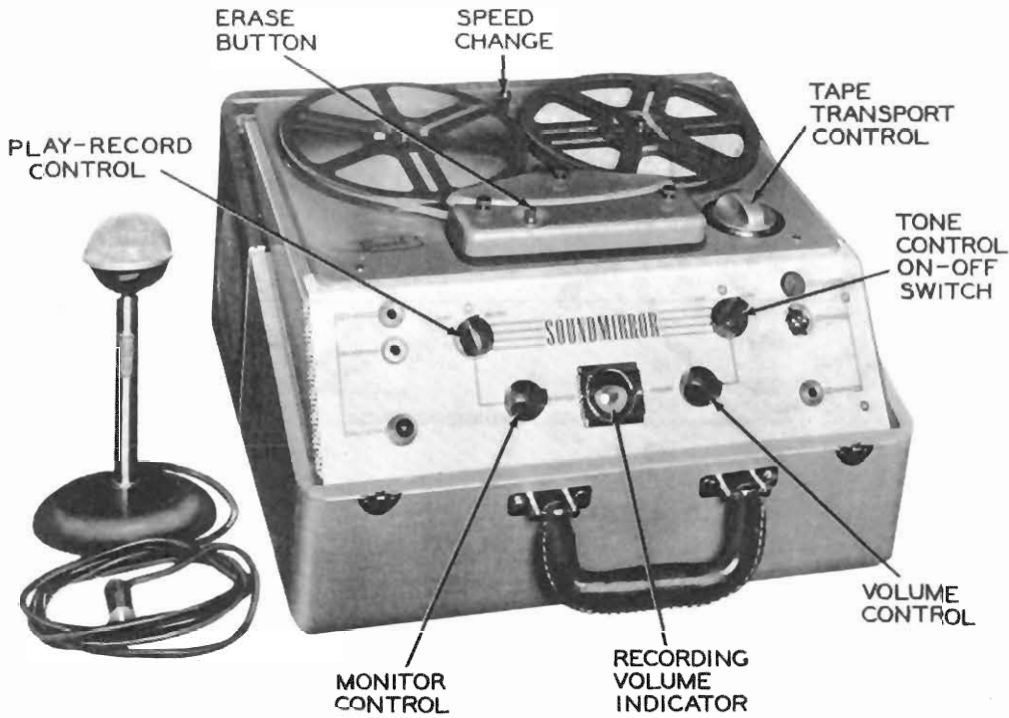


Figure 1

GENERAL INFORMATION

The Brush "Soundmirror" Model BK-455P features a single control knob for Off, Fast Forward, Fast Reverse, and Play or Record operations. This recorder is designed to record and play back two tracks of material on standard width recording tape, which doubles the playing time of a standard 5" or 7" reel with no loss of frequency response or quality. Recordings can be made from a radio, television receiver or phonograph, in addition to those made directly from the microphone. Recordings can be played back through the self-contained speaker or an external speaker through use of the "Output" jack.

This "Soundmirror" has two tape speeds, 7 1/2" and 3 3/4" per second. Using both channels of the tape the recording time is as follows:

Size	Speed 3 3/4"	Speed 7 1/2"
5" reel	1 hour	1/2 hour
7" reel	2 hours	1 hour

This recorder is designed to operate on 60 cycle, 110 volt, AC supply only.

CAUTION: Severe Damage May Result If Connection Is Made To A Direct Current (DC) Line.

Manufactured by:

Brush Electronics Company
3405 Perkins Avenue
Cleveland 14, Ohio

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DATE 7-54

SET 245

FOLDER 2

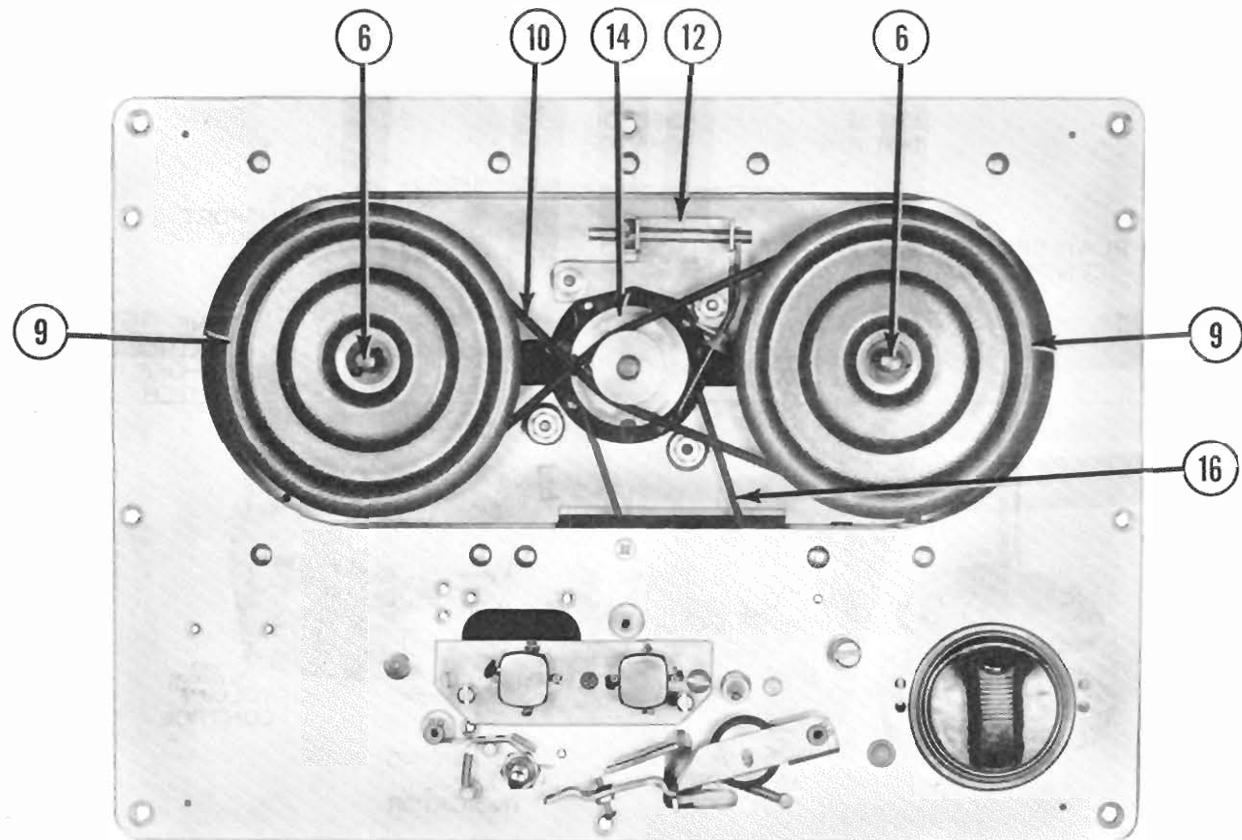


Figure 2

OPERATING CONTROLS

Tape Transport Control (5)-

The positions of this control are described as follows:

Off: Control centered and pointing toward numeral ①. While control (5) is in this position, the tape will not move in either direction.

Fast Forward: Control in upward position and turned fully clockwise pointing toward numeral ③.

Fast Reverse: Control in upward position and turned full counterclockwise toward numeral ②.

Play or Record: Control fully depressed when in the "Off" position ① and then turned fully clockwise pointing toward numeral ③ using a positive motion. If a positive motion is not used, tape breaking may result.

NOTE: When recording depress erase button (42) in addition to moving control (5) to Record Position.

Amplifier Controls - (Refer to Figure 1)-

Volume Control-

When playing a recording this controls the loudspeaker volume. When making a recording this regulates the voltage applied to the recording head, thus determining the level at which a recording will be made.

Play-Record Selector Switch-

This switch has two self-explanatory positions: Play and Record.

Monitor Control-

This control is effective only when the Play-Record Selector is in Record position. It then regulates the volume of the loudspeaker in its monitor function up to the level set by the Volume Control.

Off-On Tone Control-

As this switch is turned clockwise it first turns on power to the Soundmirror and then regulates tonal quality from bass to treble. The Tone Control function is effective on the speaker, but not on the reading circuit.

Recording Volume Indicator-

This indicates the intensity of the signal being fed to the record head, and serves as an index for adjusting the Volume Control during recording. The Volume Indicator will light and function only when the other related controls are in proper position for making a recording and its winking is a sure indication that recording is taking place.

OPERATING INSTRUCTIONS

Threading The Tape-

1. Place a full reel of tape on the supply reel turntable (lefthand) so that the reel will turn counterclockwise when tape is pulled from the reel.

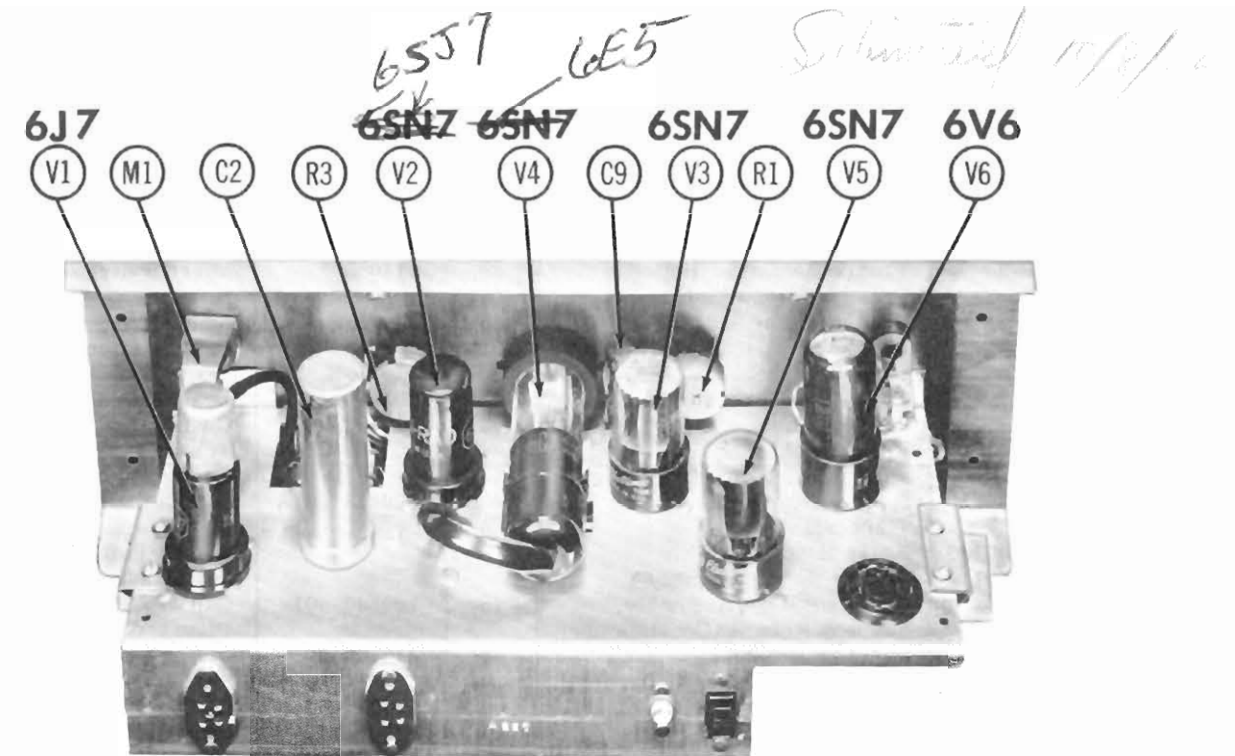


Figure 8

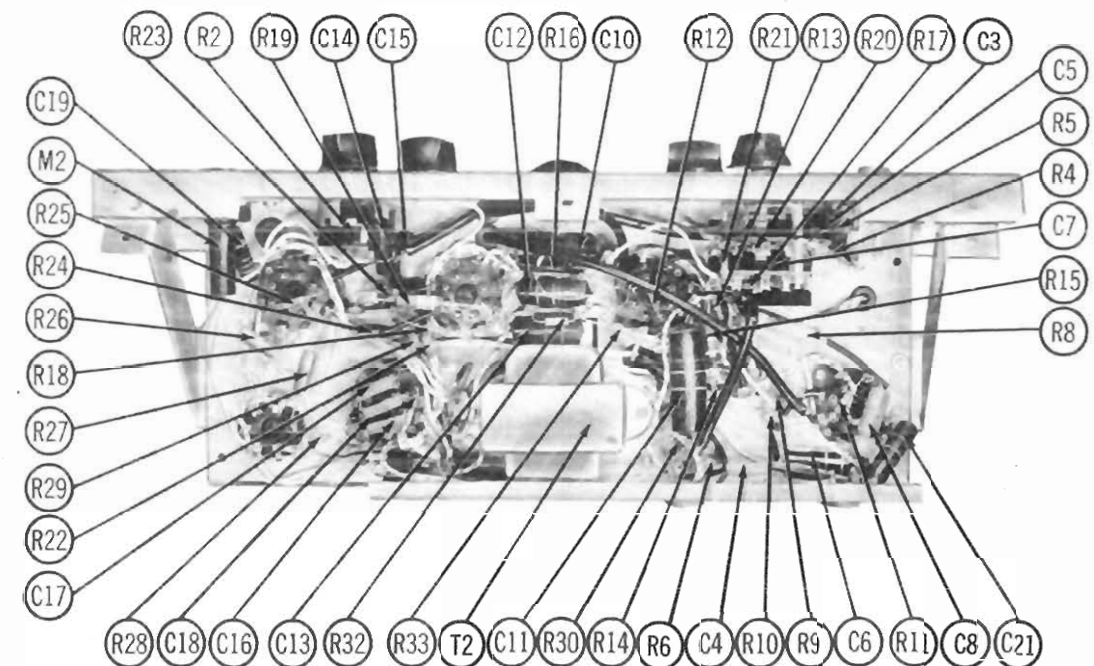


Figure 9

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	110326-PL1	Head Cover Assembly	9		Reel Drive Cup
2	310313-501	Pressure Wheel Cover Assy.	10	106340	Clutch Drive Belt
3	116637	Speed Shift Knob	11		Clutch Cup Pulley
4	310208-501	Cover Panel Assembly	12	216356-501A	Speed Bracket Assembly
5	110312-501	Control Knob Assembly	13	116313	Nylon Roller
6	114102	Reel Clamping Knob	14	216401B	Motor Drive Pulley
7	116754	Reel Key	15	114101	Clutch Lifter Pin
8	10-32x3/4"	Allen Head Set Screw	16	106339	Capstan Drive Belt



A recording is now being made and any sound entering the microphone will be recorded on the tape.

5. Start with the Monitor Control completely to the left and gradually turn to the right, being careful not to set the level so high that acoustic "feed back"

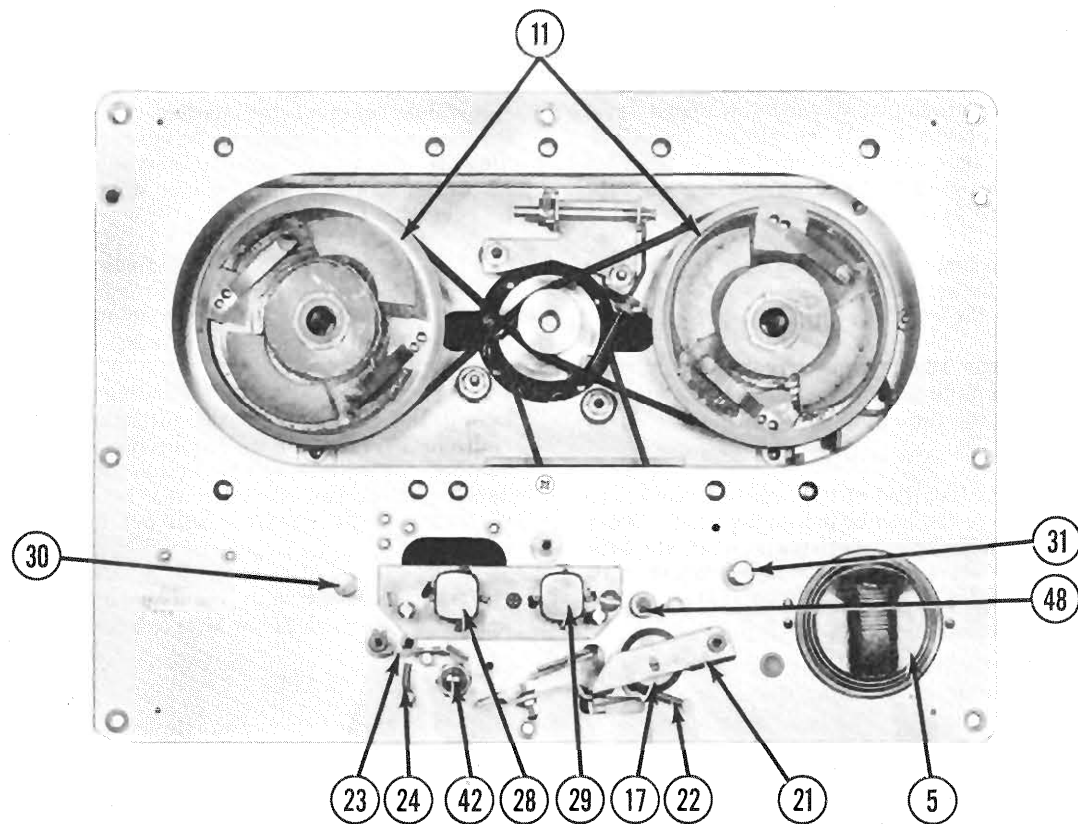


Figure 3

sets in. Remember that the Volume Control limits the top volume obtainable from the Monitor Control.

To Edit and Splice Tape-

NOTE: Since it is impossible to edit and splice one track without affecting the other, recordings which are to be edited should be limited to one track only.

1. The tape may be edited by cutting out unwanted portions, or by joining selections into another sequence. Announcements may be inserted between selections, etc. Unused sections of tape can be spliced together for re-use.

2. For best results, cut tape at a slight diagonal, join ends together with splicing tape on the glossy side and trim off any excessive width.

Erasing Recorded Material-

Erasing of recorded material takes place automatically when new material is recorded; therefore, no special step is necessary to erase old recordings before new recordings are made.

MECHANICAL FUNCTIONS

Drive Mechanism-

The drive mechanism includes the following:

1. A single motor (53) drives both the capstan and pulley assembly (47) and the reeling mechanism. A fan is attached to the drive motor shaft to cool the motor.

2. Rubber belts (10 and 16) couple the motor drive pulley (14), which is mounted on the motor shaft, to the capstan assembly and reeling mechanism. The smaller belt (16) drives the capstan while the large belt (10) drives the reels.

3. The capstan is attached to a balanced fly-wheel and pulley and provides a constant drive speed for the tape. The capstan revolves in two "Oilite" bearings and require no additional lubrication. The bottom bearing is of the self-aligning type.

4. The pressure wheel (17) and pressure pad (21A) are assembled on the pressure wheel bracket (21). When control knob (5) is depressed and turned to numeral ③, the pressure wheel bracket is actuated causing the pressure wheel (17) and pressure pad (21A) to press the tape against the capstan and play-record head. Also, as the pressure wheel bracket (21) moves inward it engages the erase head pressure arm and pad assembly (23) and moves it in to hold the tape against the erase head (28).

Reeling Mechanism-

Cemented to the top surface of the clutch cup pulleys (11) are felt pads which are capable of engaging the lower surface of the reel drive cups (9) with the action of a light friction clutch. The direction of rotation of the pulleys (11) is such that each reel drive cup (9), when resting on its pulley, tends to reel in tape. A pair of cams (37 and 38) are provided, one under each reel shaft, to lift the reel drive cups (9) free of the pulleys. Two small felt pads which are mounted on springs on the clutch cup pulleys (11) re-

Tape Fails To Wind On Reel-

1. Clutch out of adjustment.
(a) See "Adjustment Of Clutches".
2. Clutch belt (10) slipping.
(a) Clean motor drive pulley.
3. Reel key (7) broken allowing reel to slip on turntable.
(a) Replace reel key (7).

Poor Frequency Response-

1. Too much or too little bias. This can be caused by the frequency varying from the desired 40 KC.
(a) Replace faulty component.
2. Defective component in compensating network.
(a) Replace.
3. Accumulation of dirt on tape, residue on play-record head.
(a) See "Cleaning".

No Erase And "Magic Eye" Does Not Function-

1. Erase button (42) not depressed.
2. Check erase switch (41) to see if it is operating properly. Adjust if necessary.

3. Defective play-record switch. Replace.

4. Erase actuator leaf spring (40) bent.
(a) Adjust by bending or replace.

Tape Breaks At Capstan Spindle-

1. Too little pressure on head pads.
(a) Adjust pressure pads.
2. Dirty capstan spindle.
(a) Clean.
3. Worn capstan spindle.
(a) Replace.
4. Pressure wheel worn.
(a) Replace.

CLEANING

The play-record head, erase head, capstan, and pressure roller are subject to an accumulation of tape coating residue, which is worn off the tape as it passes these parts. Use a soft cloth and alcohol to clean these surfaces.

NOTE: Do not use a brush or metallic object when cleaning the heads as this could possibly mar the head surfaces.

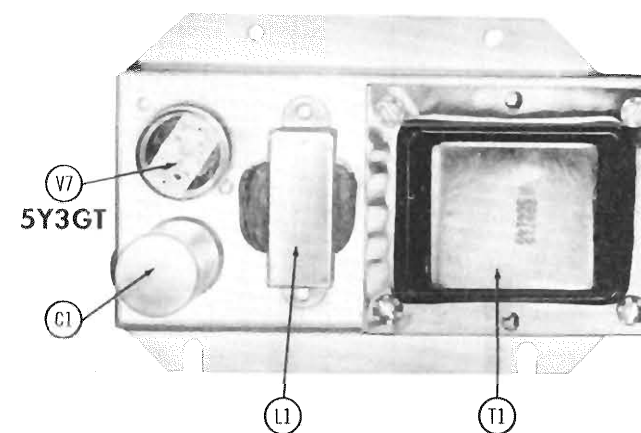


Figure 6

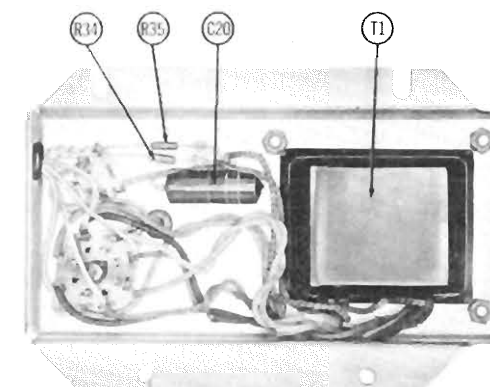


Figure 7

Replacement of Pressure Wheel Bracket Assembly (21)-

The pressure wheel assembly consists of the bracket (21), shaft (18), pressure wheel (17), spring (20), and the pressure pad which is attached to the bracket. Replace the complete assembly as follows:

1. Remove the "Truarc" retaining ring (19).
2. Lift the assembly off its mounting post after disconnecting spring (22).
3. Slide new assembly onto mounting post and connect spring (22).

Adjustment of Pressure Roller (17)-

The amount of pressure of the pressure wheel (17) against the tape and capstan is adjusted at the factory. It is not recommended that any adjustment be attempted, but that the defective part be replaced.

If the tape tends to crawl up or down on the capstan, check to see if spring (20) is seated properly in the groove of shaft (18). If this is not the cause, then spring (20) may be bent in a manner causing more pressure from one arm than the other. Since this is a critical adjustment it is recommended that spring (20) be replaced rather than adjusted.

Replacement of Pressure Pads-

When it becomes necessary to replace the pressure pads (which have been worn down by the friction set up between the pads and tape), remove the old pads and all foreign material from where the old pads were cemented. Use a quick drying cement and position the pads in their respective location. Care should be taken to prevent any cement from getting on the felt which contacts the tape. After the pads have been replaced, adjust the tape tension as described under "Adjustment of Tape Tension".

Adjustment Of Tape Tension-

The tape tension is measured by attaching a spring scale to the end of a piece of tape drawn only past the erase head (28); then past the record head (29). The tension required to move the tape past the heads should be from 1 to 1 1/2 oz.

The pressure of the tape against the erase head (28) can be adjusted by bending the copper colored leaf spring located on pressure arm (23).

The pressure of the tape against the record head (29) can be adjusted by loosening the hex nut and turning the slotted head screw which is located on the pressure wheel bracket (21).

Play-Record Head Adjustment-

1. Remove head cover (1).
2. Properly thread an alignment tape or a good recorded tape on the machine.
3. Set the controls as described under "To Play A Recording".
4. By turning the Allen Head set screws, located on either side of the play-record head (29), rock

the head from side to side slightly until the maximum high frequencies are obtained. After the adjustment has been made place a drop of cement on each set screw to hold the adjustment.

Adjustment of Clutches-

The clutches are adjusted by the clutch adjusting screws (8). Check clutches for proper adjustment as follows:

1. Turn off power to the Soundmirror.
2. Place a loaded reel of tape on the left hand turntable, then turn control knob (5) to position numeral ③. As this is done the turntable and reel should rise very slightly, not over 1/32 of an inch. If the turntable does not rise this amount or exceeds this dimension, loosen the tapped turntable washer and adjust screw (8) until this condition is corrected.

Make the same adjustment for the right hand turntable with the exception of control knob (5) which is turned to numeral ②.

LUBRICATION

The motor should be oiled every three months with #20 SAE oil.

All moving or sliding parts should be cleaned to remove all foreign matter before lubricating. After cleaning, apply a light coat of oil.

NOTE: Avoid over lubrication. Wipe off all excessive oil. Do not allow lubricant to come in contact with any drive surfaces or rubber belts.

The following are oilite type bearings and need very little lubrication:

1. Clutch pulley bearing.
2. Capstan spindle bearing.
3. Pressure wheel bearing.

TROUBLES AND REMEDIES

Wow And Flutter-

1. Motor pulley (14) loose on motor shaft. Tighten.
2. Pressure pads applying too much pressure against tape.
(a) See "Adjustment of Tape Tension".
3. Bent capstan shaft (48).
(a) Replace capstan drive assembly.
4. Damaged or oily capstan drive belt (16).
(a) Clean belt with alcohol; if worn, replace.
5. Binding motor shaft.
(a) Repair or replace motor.
6. Binding reel post bearing.
(a) Clean or replace bearing or reel post.

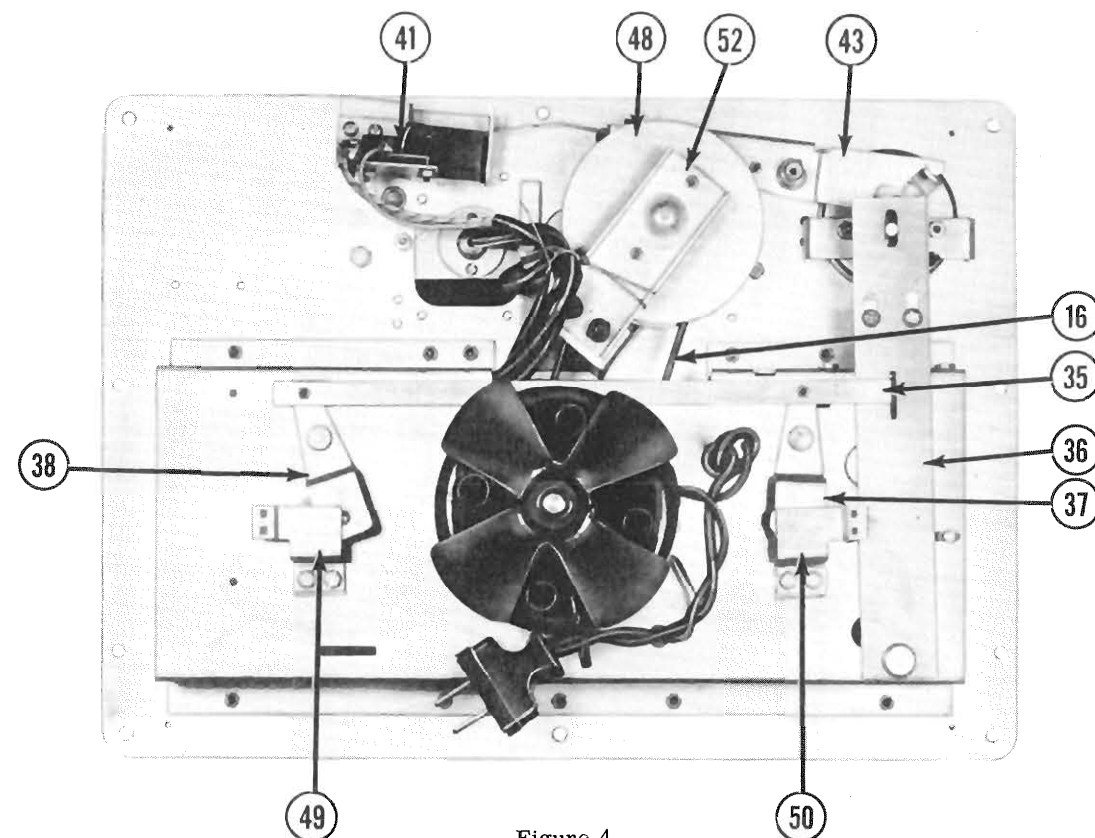


Figure 4

main in contact with the reel drive cups (9) when they are elevated, and in turn offer a slight amount of reverse drive torque when the tape is being pulled from a reel. This action provides back tension to the tape and insures that the tape is wound tightly in fast forward and fast reverse.

Speed Change Mechanism-

The speed bracket assembly (12) consists of a wire rod bent in such a manner so as to loop around the capstan drive belt (16). The drive belt (16) rides in one of two pulley surfaces on the motor drive pulley (14), the lowermost or largest diameter pulley being for 7 1/2" per second and the smaller diameter pulley located directly above the lowermost pulley for 3 3/4" per second. When speed shift knob (3) is moved either back or forward, the formed wire rod on the speed bracket (12) lifts or lowers the capstan drive belt (16) from one pulley surface to the other.

Control Mechanism-

When control knob assembly (5) is turned to either position ② or ③ the following action takes place.

1. The clutch lever (36) is pivoted to the left or right, depending on the direction control knob (5) has been turned, causing the switch actuator bracket (46) to actuate toggle switch (34) thus supplying power to the motor. Simultaneously, the cam link (35), actuated by clutch lever (36), pivots the lifter cams (37 and 38). One cam is moved from under the lifter pin (15) allowing the reel drive cup (9) to engage with the felt pads while the other lifter cam raises

the lifter pin and reel drive cup to allow the reel drive cup to turn freely while tape is being wound on the opposite reel.

2. When control knob (5) is turned to position numeral ①, the clutch lever (36) is centered, opening motor switch (34) and allowing both reel drive cups (9) to engage their clutches. This acts as a brake to halt the tape.

3. When control knob (5) is depressed and turned to Play-Record position numeral ③, it rotates control arm assembly (43) and locks it in position. The spring extending from control arm (43) applies pressure against erase pin (42) providing a jam proof arrangement for depressing the erase pin either before or after control arm (43) is actuated. The pressure wheel bracket (21) is also actuated by control arm (43) and causes the pressure wheel (17) to press the tape against the capstan, thus causing the tape to be driven at a constant speed.

DISASSEMBLY INSTRUCTIONS

1. Remove the head cover assembly (1) and the pressure wheel cover assembly (2).
2. Remove four screws holding cover panel (4). Remove panel (4).
3. Remove three screws located at rear of mechanical panel (25).
4. Remove two screws holding handle to carrying case.
5. Lift unit out of case, removing power supply and speaker plug before removing unit completely.

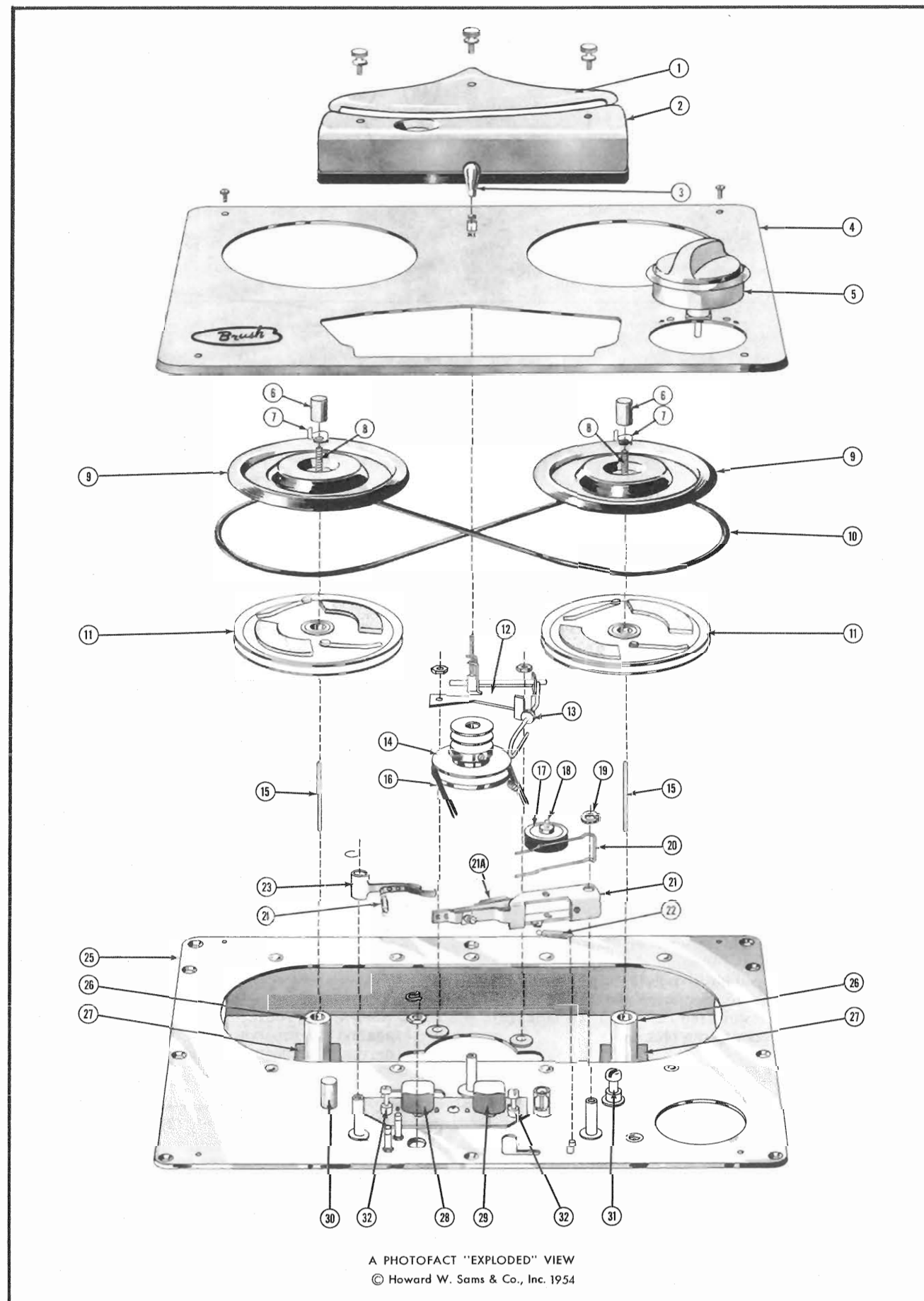


Figure 5A. Exploded View Of Parts Above Baseplate.

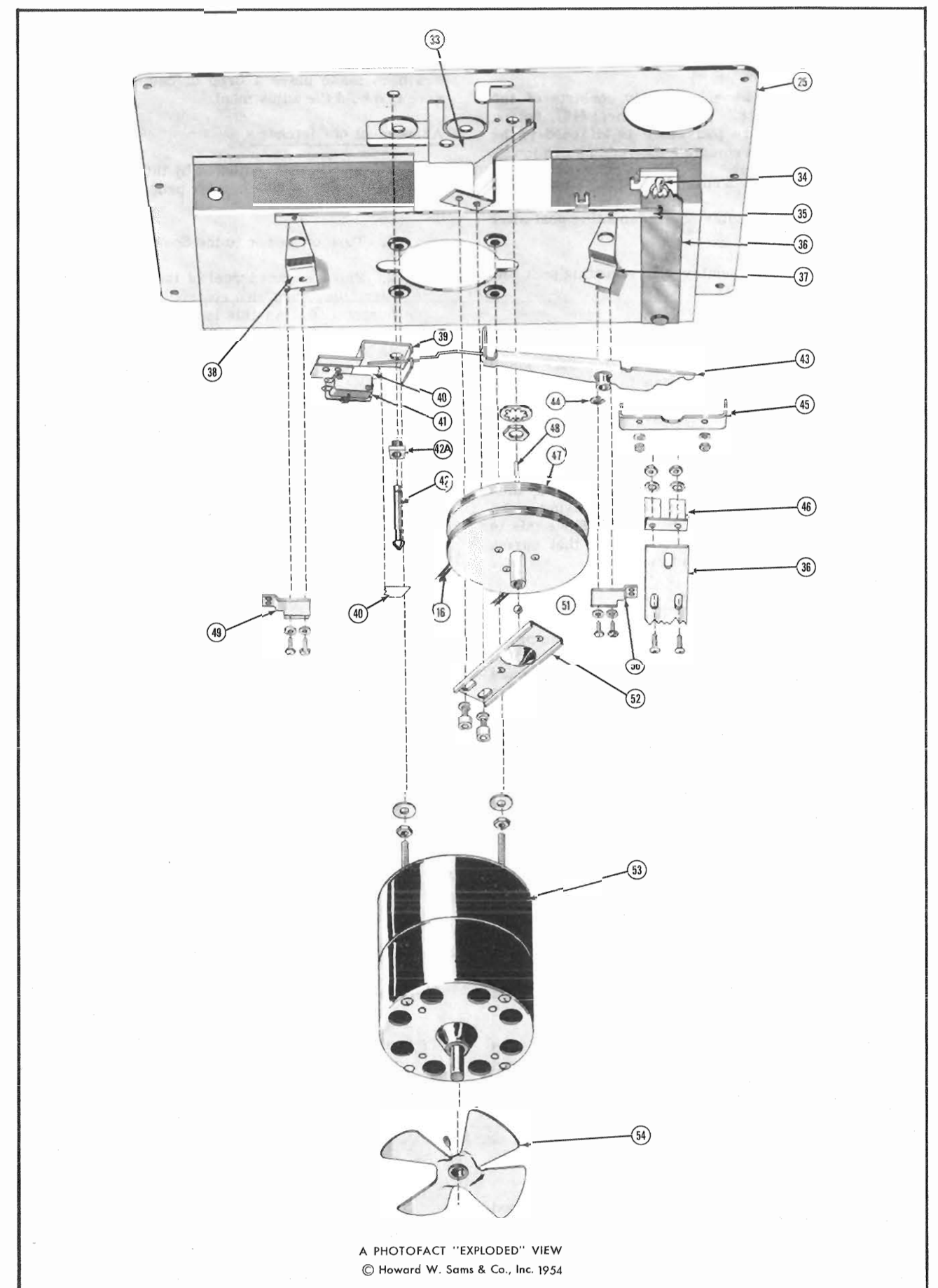


Figure 5B. Exploded View Of Parts Below Baseplate.