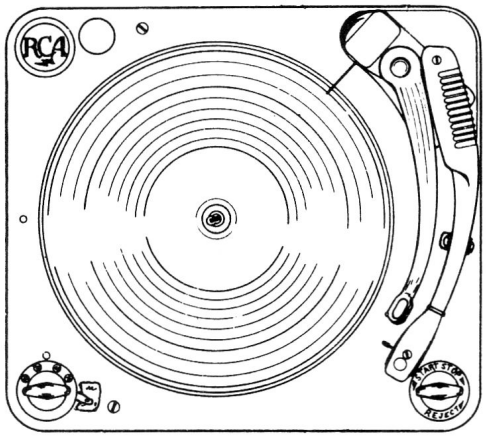


COLLARO
RC-456

RCA VICTOR

HI-FIDELITY RECORD CHANGER

Model Collaro RC-456
SERVICE DATA

— 1956 No. 23 —

ISSUED BY
GENERAL SERVICE DEPARTMENT
RCA VICTOR COMPANY, LTD.
MONTREAL, CANADA

GENERAL DESCRIPTION

The Model RC 456 record changer is a four speed record changer designed to play in automatic sequence a total of ten of either 7 inch, 10 inch and 12 inch records intermixed, providing they are of the same speed and same type of groove, and to shut off automatically after the last record.

The record changer is provided with two control dials the Motor Speed control is located on the left hand corner of the turntable board and the Start-Stop-Reject control on the Right hand corner.

Turning the Start control gently to the left, will cause the turntable to start rotating, at this time the control may be released.

The Motor Speed control makes possible the selection of the four speeds, 16-2/3, 33-1/3, 45 and 78 R.P.M. by rotating the knob to the desired position.

To increase the versatility of this record changer, an Auto-Manual Lever has been added, thus allowing the mechanism to be operated either automatically or manually.

Connect this changer to an outlet supplying 100-125 volts, 60 cycle A.C. only, unless otherwise specified.

OPERATING INSTRUCTIONS

RECORD LOADING. — Hold Record Balancing Arm near wide end, lift clear of 78 R.P.M. Spindle and swing out over Pick-Up arm. Place records on spindle and lower to offset step. Replace Record Balancing Arm on 78 R.P.M. Spindle.

NOTE. — 7 inch, 10 inch and 12 inch records can be intermixed on this changer, but be certain that they are of the same playing speed and same type of groove.

TURNTABLE START. — After setting the stylus and speed control to their proper position, turn the Start-Stop-Reject control knob (35) to the left and release when turntable is in motion. The Changer will operate automatically until the last record has been played, at which time, the Pick-Up Arm is returned to its Rest Post (33) and the Motor is switched off.

RECORD REJECT. — A record may be rejected at any time by turning the Start-Stop-Reject control (35) fully to the left and releasing it. The Pick-Up arm will immediately lift from the record and the next record will drop and begin to play.

STOPPING. — The changer may be stopped at anytime by turning the Start-Stop-Reject control (35) fully to the right and releasing. The Pick-Up Arm will immediately lift from the record and return to the Rest Post (33), as the supply to the Motor will be automatically switched off.

RECORD UNLOADING. — Lift the Record Balancing Arm and swing out over Pick-Up Arm. Using both hands, with fingers under the edge of bottom record, lift records straight up off Spindle.

SPECIAL FEATURES

MUTING EFFECT. — The Pick-Up Cartridge is muted during the change cycle, thus avoiding the reproduction of undesirable noises during the interval between records, and also avoiding the unpleasant "running down" effect due to slowing of turntable when a record is rejected or when the "Stop" control is actuated.

RETRACTING DRIVES. — Rubber tired Drive Wheels (40 & 47) are automatically retracted when the unit is switched off. The development of flats on the Drive Wheels due to constant contact under pressure during periods of disuse, consequently noisy running and uneven turntable speed are prevented.

STYLUS PRESSURE. — .....Tolerance 8-10 grams

MAINTENANCE INSTRUCTIONS

GENERAL INFORMATION.— Apart from faults arising directly from the Pickup, the satisfactory reproduction of records is basically dependent upon the maintenance of correct and uniform speed. In order to achieve this, it is obviously necessary to maintain correct and uniform speed of the Turntable itself, but it is important to remember that uneven speed of the record track as it passes the stylus may arise from other causes such as:—

1. Enlarged centre holes in records resulting in eccentric rotation, causing excessive sideways swing of the Pickup Head.
2. Warping of records causing excessive up and down movement of the Pickup Head.
3. High Spots on records or distortion, resulting in failure of the records to drive each other when used more than one at a time on Record Changers.

Before proceeding to investigate any faults on the basis of the information which follows, it is essential to eliminate the above three possible sources. For this purpose the Service man is recommended to select and carefully preserve a set of test records in which he knows these defects to be wholly absent.

It is also important to make sure that the drive to the Turntable is not slipping, due to the presence of grease or oil on the driving surfaces of the Pulleys or the inside rim of the Turntable (See instructions for cleaning in Section I).

It will be of great assistance to the Service Engineer when tracing the source of "Wow" to remember that defects in the Turntable itself will, in general, cause "Wow" to occur regularly at Turntable speed, whilst defects in the Idler Wheel will generally cause it to occur at approximately four times Turntable speed. These are not invariable rules; for example, the Turntable bearing may have tight spots in two diametrically opposite positions, thus causing "Wow" at twice Turntable speed.

CONDITIONS ESSENTIAL FOR SATISFACTORY OPERATION OF MOTOR UNIT.— The information given in the following pages is based on the tolerances and precautions actually observed in manufacture and assembly. While the Service man may not always have means at his disposal for checking all the tolerances quoted, the information will, nevertheless, give a useful indication of the degree of accuracy considered necessary to ensure satisfactory reproduction of records, and so help him in the diagnosis of any faults encountered.

SWITCHING ON.— Normally the "START" control should be turned gently to the LEFT until the turntable starts to rotate, when it may be released. Stalling of the machine is unlikely to occur unless the main supply is interrupted or disconnected at certain critical points in the change cycle. In all cases normal working may be restored by operating the "START" control to the extreme of its movement, and holding there for a few moments before gently releasing.

Failure to start may be caused by bent or damaged switch contacts. These may be inspected under working conditions by removal of the switch cover, taking care to avoid touching the contacts unless main supply has first been disconnected.

TO ADJUST OR CHECK ADJUSTMENT

1. Remove all records and disconnect Main Supply.
2. Loosen set bolts (A, Fig. 4) two or three turns.
3. Operate start control.
4. Turn large Gear Wheel (85) in direction indicated by arrow in Fig. 4 until Record Dropping Lever (82) is moved to its extreme position. The Roller (84) will then be behind and covered by the Operating Bar (122).
5. Tighten set bolt (A, Fig. 4) securely.
6. Reconnect Main supply and test with full load of 12"records.

RECORD DROPPING.— Adjustment of the mechanism should not normally be necessary unless the machine has been partially dismantled to make replacements.

I. GENERAL INSTRUCTIONS FOR MAINTENANCE OF MOTOR AND TURNTABLE DRIVE.— No lubrication of motor is normally required as it is fitted with self-oiling bearings. The only maintenance necessary consists in occasional removal of the turntable to clean its inner rim and the driving surfaces of the Motor Pulley (164) and Idler Wheel (47), by wiping a clean-petrol-moistened rag. The thrust washers and ball race fitted underneath the turntable bearing should also be examined, and if necessary, washed clean with petrol and relubricated with a small amount of soft grease. When carrying out these operations, carefully observe all instructions given in Section IX concerning removal and replacement of the Turntable.

Dismantling of the main motor assembly, beyond the stage depicted by Item 135, Fig. 4, is not recommended as it is difficult to reassemble the Motor satisfactorily without special equipment, and noisy running and uneven speed may result.

II. ADJUSTMENTS NECESSARY IN THE EVENT OF CHANGES IN VOLTAGE AND/OR PERIODICITY OF SUPPLY.— Each Motor carries an engraved plate giving details of the periodicity and voltage of the supply which it may be used.

AUTOMATIC TRIP.— This is of the "Velocity Trip" variety and is designed to be extremely light and sensitive in operation. No adjustment is provided, and the only likely cause of failure is if the curved end of the Feed Lever (93) has been accidentally bent upwards or downwards so that the end of the Striker Arm (92) cannot work freely in the aperture in the side of the Diecast Housing carrying the turntable bearing, etc. Both the Feed Lever (93) and the Striker Arm (92) must be absolutely free on their respective pivots, and note that the long Pin (23) must always lie within the forked end of the Feed Lever (93) as shown in Fig. 3 and 4.

III. STOP CONTROL.— This movement should be operated firmly to its full extent to the Right and released gently. Letting the knob fly back out of the fingers may in extreme cases cause failure of the machine to switch off, and another record may be played as if the "REJECT" control has been used.

IV. AUTOMATIC STOP.— Any failure of the Automatic Stop (i.e. the automatic switching off of the machine after playing the last record) will be best diagnosed from the following description of the various functions performed by the mechanism.

The Automatic Stop is brought into operation after the last record has been played by reason of the Record Balancing Arm (1) having dropped to its fullest extent. This depresses the Auto Stop Lever (125) which in turn allows the Auto Stop Catch Plate (127) to fall and retain the Pick-up Return Lever (119) in the position shown in Fig. 4. The Pick-up Arm is thus not returned inwards over the records, but subsides on to its rest at the end of the change cycle. At the same time the Pick-up Return Lever (119) through the medium of the Switch-off Plate (123) restrains the Switch-off Link (89) in the position shown in Fig. 4. against the pull of the Spring (91). The turned up end of the Switch-off Link is thus held in the path of the Peg (89) and at the end of the cycle, the notch in the Switch Pawl (68) is disengaged from the Peg (B), and the Spring (69) holds the motor switch open and simultaneously retarcts the Rubber Idler Wheel (47) through the medium of the Lever (66) and the Link (49).

The Record Spindle, Dropping Mechanism, and Turntable Spigot Bearing Housing are built as a pre-adjusted unit. UNDER NO CIRCUMSTANCES SHOULD THE NUT (63) OR THE STOP (79) BE DISTURBED FROM THEIR ORIGINAL SETTING. If damage has occurred or the adjustment has been disturbed, it is recommended that this unit should be replaced as a whole.

INSTRUCTIONS

TO REMOVE SPINDLE UNIT FROM MACHINE:

1. Remove Circlip and Auto-trip Striker Arm (92).
2. Withdraw Split Pin (80).
3. Disengage Motor Switch Lead from Tal.
4. Remove Turntable (See Section IX).
5. Remove 3 screws.
6. Disengage slot in Record Dropping Slide (62) peg in Record Dropping Lever (122), after which spindle unit may be withdrawn.

TO ASSEMBLE REPLACEMENT UNIT TO MACHINE.— Reserve above procedure taking care that the various parts are arranged exactly as shown in Fig. 4. When replacing Auto-trip Striker Arm (92) note that the rubber roller must face upwards towards the underside of the unit plate. After assembly is complete, adjust Record Dropping Roller (84) as indicated at beginning of this Section.

NOTE.— If records fail to drop. Worn or chipped centre holes can be the cause, and the use of records damaged in this way should be avoided. If failure occurs when using undamaged records, check adjustment of record dropping mechanism as indicated at the beginning of this Section.

If more than one record drops at a time. Worn or chipped centre holes may also be the cause. Also make sure that the small sliding member housed in the top of the spindle drops perfectly freely under its own weight. If it does not do so, it is probable that some foreign matter has become lodged between the slide and side of the grove in which it works, and this may best be dislodged by means of a thin razor blade. Grease or oil on the slide may also be the cause to its failure to drop freely, and consequently great care should be exercised if the turntable is removed to avoid depositing on the slide any grease or oil from the turntable bearing. Carbon tetrachloride or other solvent applied with a small brush should be used to clean the parts if this cause of failure is suspected.

On switching on again, the Control Lever (98) disengages the turned-up end of the Switch-off Link (89) from the Peg thus allowing the notch in the Switch Pawl (68) to engage with the Peg (B) so holding the motor switch closed and at the same time holding the Rubber Idler Wheel (47) in contact between the Motor Pulley and the Turntable Rim. If, at the same time, one or more records have been leaded on to the machine, the Auto-Stop Lever (125) will lift under the influence of its spring (39) as soon as the Pick-up Return Lever (119) is moved momentarily out of the nitch in the Auto-Stop Catch Plate (127) during the change cycle. This removes all restraints on the various parts of the mechanism, and the cycle. This removes all restraints on the various parts of the mechanism, and the cycle is completed in the normal way. If, however, no records have been loaded on to the machine and the Record Balancing Arm (1) remains dropped to its fullest extent, the Pick-up Return Lever (119) will not be released, and the Pick-up Arm will again subside on to its rest and the machine will Switch-off at the completion of the cycle.

The purpose of the small Pawl attached to the Auto-Stop Catch Plate (127) is to prevent the Pick-up Return Lever (119) being restrained as the last record falls, which would cause the machine to switch off without playing the last record. This Pawl thus delays the restraint of the Pick-up Return Lever until the next cycle, i.e., after the playing of the last record is completed.

For satisfactory working it is essential that all the parts mentioned above should work absolutely freely, and that the Spring (39), should positively actuate the Auto-Stop Lever (125) lifting the Auto-Stop Catch Plate (127) with it. At the same time the Spring (39) must not be so strong as to prevent the weight of the Record Balancing Arm fully depressing the Auto Stop Lever (125).

V. CONTINUOUS OPERATION ON CHANGE CYCLE.— If the change mechanism operates continuously without allowing each record to play to the end the cause can be:

1. Weakening or displacement of Spring (74).
2. Drive Withdrawal Pawl (75) being stiff on its pivot (42).
3. Auto-Trip Lever (38) being stiff on its pivot.

All the above causes may have the effect of preventing the Drive Withdrawal Pawl being properly picked up by the Pin on the underside of the Operating Gear (85).

VI. PICK-UP SETTING DOWN POSITION.— If positions are erratic, check first of all that the nut shown at D (Fig. 1) is securely tightened.

The position at which the stylus alights on the record may be adjusted, if necessary, by means of the two screws A and B (Fig. 1). To bring position further in, loosen screw A and tighten Screw B the same amount. To bring position further out, loosen screw B and tighten screw A the same amount.

NOTE.— This adjustment is very sensitive; turn the screws only a small fraction of a turn at a time until the desired adjustment is obtained, and finally check that position is correct after both screws have been firmly tightened. AVOID EXCESSIVE FORCE when tightening these screws.

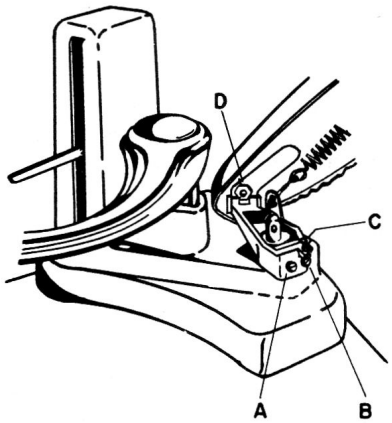
The machine gives automatic positioning for 7", 10" and 12" records and the above adjustment affects all positions equally. The design of the mechanism ensures that when the 7" setting down position is correctly adjusted the 10" and 12" positions will be correct also in accordance with the following table based on the standards laid down by the principal record manufacturers:

STANDARD SETTING-DOWN POSITIONS	Measured from turntable centre	Measured from side of record spindle
for 7" Records - - - - -	3.11/32"	3.13/64"
for 10" Records - - - - -	4.13/16"	4.43/64"
for 12" Records - - - - -	5.13/16"	5.43/64"

All machines are adjusted in accordance with the above at the factory.

VII. PICK-UP HEIGHT ADJUSTMENT.— The height to which the pick-up arm lifted during the change cycle is controlled by a simple self-locking adjustment shown at C (Fig. 1). To make adjustment, if necessary, switch off the main supply during the change cycle at the point where the pick-up arm has just swung outwards over its rest. The screw C may then be screwed up or down as required. Correct adjustment is when the pick-up arm clears the top of its rest by 1/8" approximately. Finally switch on main supply again.

If machine does not start up and complete the change cycle when mains supply is re-connected, turn the control knob fully to the "start" position and hold there for a few moments before gently releasing.



VIEW OF PICK-UP HOUSING WITH PICK-UP ARM RAISED TO REVEAL ADJUSMENTS FOR PICK-UP POSITIONS AND HEIGHT.

FIG. 1

VIII DIAGNOSIS OF FAULTS AND SUGGESTED REMEDIES

Condition	Defect Produced by Non-compliance with Condition	Probable Causes of Defect
MOTOR		
1. Motor must spin freely.	Slow running. Uneven Speed. Noisy running. Background Rumble.	Bearings out of alignment. (Tap Motor lightly on all sides whilst running to line up bearings). Rotor not central in tunnel of Stator. (To centralize (I) loosen 6 Clamp Bolts (heads on underside of Motor Frame); (II) insert 2 shims 1" wide x .010" thick between Stator and Rotor; (III) tighten 6 Clamp Bolts; (IV) withdraw shims).
2. Motor must run quietly.		
TURNTABLE		
3. Inside of rim must run concentric within .006", and be free from all irregularities.	Wow.	(I) Distorted Turntable. (II) Foreign matter adhering to inside of rim.
4. Face (near rim) must run true within .010". (Test with truly flat disc 10" dia. on Turntable).	Wow.	(I) Distorted Turntable. (II) Displacement of Rubber Mat.
5. Turntable bearing, with Circlip in place, must have small amount of end play. (.015" max.).	Slow running. Noisy running. Wow. Background Rumble.	Extra steel or neoprene washers, or incorrect washers, fitted under turntable bearing, (If from this cause, fault will disappear if wire circlip is removed from centre of Turntable).
6. Turntable must spin freely without any trace of a tight spot (a tight spot is indicated by a tendency to come to rest predominantly in on position – to test mark edge of Turntable with chalk gummed paper).	Wow. Slow running.	(I) Dirty or dry bearing. (II) damaged steel Thrust washer. (III) Damaged ball in Thrust face. (IV) Ball binding in Thrust cage. (V) Damaged ball cage contracting Thrust washer or binding on spigot. (VI) No end play in bearing (See Condition 5).
7. Bearing must run silently and smoothly.	Noisy. Running. Rumble.	(I) Dirty or dry bearing. (II) Damaged steel Thrust washer. (III) Damaged ball in thrust race. (IV) Ball binding in Thrust cage. (V) Omission of neoprene cushion washer. (VI) Damaged ball cage, contracting Thrust washer or binding on spigot. (VII) No end play in bearing (See condition 5).
MOTOR PULLEY		
8. Driving surfaces must run concentric within .002" and be free from flats or other irregulations.	Flutter. Cross Modulation.	(I) Bent motor spindle (II) Enlarged bore in pulley. (III) Burr on motor spindle.
9. Must be close sliding fit on Motor Spindle without perceptible play.	Noisy running. (Probably in form of intermittent light rattling).	(I) Enlarge bore in pulley (II) Undersize Motor Spindle.
10. Must be set at correct working level, (Level is controlled by position of Fan on Motor Spindle – See SECTION XIV).	Wow. Slow running.	(I) Idler Wheel overlapping flange of Motor Pulley at 78 r.p.m. (II) Face of Idler Wheel contracting flange of Motor Pulley on either 33-1/3 r.p.m., 45 r.p.m. or 16-2/3 r.p.m.
IDLER WHEEL		
11. Rim must run concentric within .002" and be free from flats or other irregularities.	Wow. Noisy running (Probably in form of regular low thumping).	(I) Distorted Idler Wheel (II) Rubber damaged at rim. (III) Boss loosened in Idler Wheel. (IV) Foreign matter adhering to rim.
12. Face (near rim) must run true within .010".	Wow. (caused by rim overriding 78 r.p.m. flange of Motor Pulley or intermittently touching face of 78 r.p.m. flange when operating on 33-1/3, 45 r.p.m. or 16-2/3	(I) Distorted Idler Wheel. (II) Boss loosened in Idler Wheel.
13. Wheel must spin freely without trace of tight spots (with retaining washer and screw in place).	Wow. Slow running.	
14. Bearing must have end play (.005" max.) (with retaining washer and screw in place).	Wow. Slow running.	(I) Washer omitted (above or below bearing) causing excessive end play, permitting rim of wheel to override flange of Motor Pulley. (See Condition 10). (II) Extra washer or incorrect washer fitted causing lack of end play and possibly tightness.

Diagnosis of Faults and Suggested Remedies (Cont'd)

15. Plane of Wheel must be square to Motor Spindle.	Slow running (Accompanied by scurfing of the rubber rim).	Distorted Idler Swivel Arm (159).
16. Wheel must be set at correct working level (i.e., centrally disposed relative to largest flange of Motor Pulley when operating on 78 r.p.m.).	Slow running. Wow. Failure of drive to engage on 45 r.p.m.	(I) Rim of Idler Wheel overriding 78 r.p.m. flange of Motor Pulley. (II) Face of Idler Wheel touching face of 78 r.p.m. flange of Motor Pulley when operating on 33-1/3, 16-2/3 or 45 r.p.m. (III) Idler Swivel Arm (159) fouling Motor Frame. Correct above faults by adjusting Nut (153) after first checking that Motor Pulley is at correct level. (See notes at end of SECTION XIII).
17. Wheel must clear top of Spindle when operating on 45 r.p.m.	No drive or uneven speed on 45 r p.m.	(I) Incorrect setting of Spindle (142). (See SECTION XVI) (II) Incorrect adjustment of Nut (153). (See 16 above).
IDLER SLIDE ARM 18. Must pivot absolutely freely on Idler Slide Arm (162). (End play should not exceed .005").	Low or uneven Turntable does not rotate (due to Idler Wheel failing to engage).	(I) Holes in Idler Slide Arm (162) through which Spindle (161) passes out of line (due to distortion of Idler Slide Arm). (II) Spindle (161) bent. (III) Forks of Idler Slide Arm (162) bent or twisted and pinching boxs or Idler Swivel Arm (159). (IV) Grubscrew insecure, allowing Spindle (161) to drop out of engagement with top fork of Idler Slide Arm (162). NOTE.– Spindle (161) is made fast to Idler Swivel Arm (159) by the Grubscrew and must be able to turn absolutely freely in the forks of Idler Slide Arm (162). See SECTION XV for instruction on setting.
IDLER SLIDE ARM 19. Must pivot and slide absolutely freely on Spindle (142) when machine is switched on. 20. Spindle (142) must be set at correct level in Motor Frame. (See SECTION XVI).	Low or uneven Turntable speed. Turntable does not rotate (due to Idler Wheel failing to engage). Uneven speed on 45 r.p.m. setting. Turntable does not rotate when on 45 r.p.m. setting.	(I) Holes in Idler Slide Arm (162) through which Spindle (142) passes out of line (due to distortion of Idler Slide Arm) (II) Spindle (142) bent. Contact between top of Spindle (142) and Idler Wheel (29) when on 45 r.p.m. setting. Check operating level of both these components (See SECTION XVI and SECTION VIII (11)-(17) inclusive).

STYLUS PRESSURE ADJUSTMENT.– To obtain the correct Stylus Pressure, a Stylus Pressure Gauge must be used. The adjustment for obtaining the correct Stylus Pressure is located in the Tone Arm, and identified as the Weight Compensating Control Bracket (18). When moved toward the Tone Arm's narrow end, it will increase the Stylus Pressure. Where a decrease in pressure is required, the bracket is moved toward the wide end of the Tone Arm; in this case it may be necessary to shorten the length of the Weight Compensating Link (16) in order to maintain the proper tension in the Weight Compensating Spring. (17).

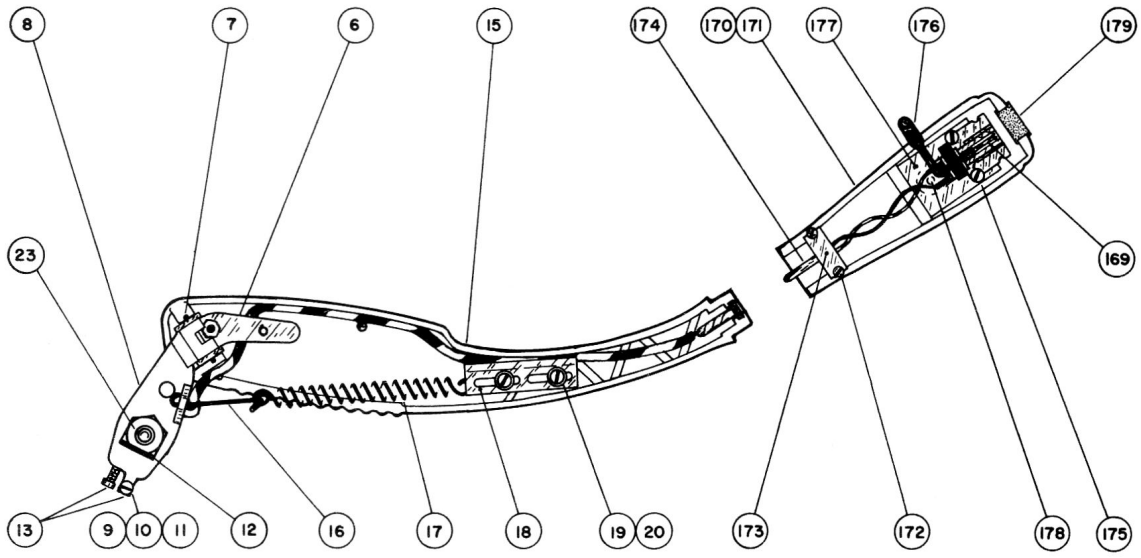


FIG. 2

INSTRUCTIONS FOR DISMANTLING, RE-ASSEMBLING AND SERVICING 4-SPEED MOTOR UNITS

REMOVAL

REPLACEMENT

IX. TURNTABLE.— Remove wire circlip from centre of Turntable. Turntable should then be lifted right off spindle with a small to and fro rotary movement.

1. Check that Ball Thrust Cage and Washers are free from foreign matter and lubricated with a small quantity of light grease. Ball Race Cage must be replaced open side downwards with steel thrust washer immediately below and another immediately above it. Resilient washers of neoprene are fitted below and above the steel thrust washers, the upper neoprene washer having a larger centre hole and locating in the recessed end of the turntable boss to which it should be fitted before replacing Turntable.
2. Check that the Fan (139) and Motor Pulley (164) are correctly located on the Motor Spindle in accordance with instructions given in Section XIII and XIV.
3. Check that the Idler Wheel (47) also the rubber wheel which drives the Change mechanisms are in their retracted positions clear of the turntable rim.
4. Replace Turntable on spigot, fit the retaining wire circlip and check that Turntable spins quite freely.

IMPORTANT NOTE.— Take great care to avoid depositing grease or oil on the Motor Pulley (164), the Idler Wheel (47), or the inside rim of the turntable, as even a minute trace will cause the drive to slip. As a precaution against this, it is advisable to wipe these parts with a clean petrol-moistened rag immediately prior to re-assembly. In case of record changers, also avoid depositing grease or oil on the sliding member in the top of the record spindle, as this may prevent it falling freely under its own weight, causing records to drop more than one at a time.

X. IDLER WHEEL

1. Remove Screw (48).
2. Withdraw Idler Wheel (47) upwards from its spindle.

1. Reverse procedure given opposite, taking care that all washers are correctly in place.
2. Check that Idler Wheel spins freely and runs true within the limits specified in the tabulated information given in SECTION VIII (11)-(17) inclusive.

IMPORTANT NOTE.— Most machines have one or two Fibre Washers (158) fitted under the Idler Wheel (47), but some have no washers in this position. When fitted, these Washers generally adhere to the boss of the Idler Wheel when it is withdrawn. Be sure to replace Washers exactly as found when dismantling.

XI.— MOTOR UNIT (as a whole)

1. Disconnect main lead supplying motor.
2. Remove Turntable. (See Section IX).
3. Remove Switch Cover and slide the two spring contacts off the lugs which locate them in the Switch base, taking care not to distort the contacts.
4. Uncouple the Speed Control Link (148) by removing the Circlip (149).
5. Remove Idler Wheel (See Section X).
6. Detach Idler Slide Arm (162), lift Idler Withdrawal Link (49) from post and swing clear.
7. Remove three screws (136) which secure the motor frame to the base plate. NOTE — A shakeproof washer is used under the head of the screw nearest the turntable centre, and must be replaced in that position.

Reverse procedure given opposite, taking all precautions given in Sections X and IX when replacing Idler Wheel and Turntable respectively. Check also that the Fan (139) and Motor Pulley (164) are correctly located on the Motor Spindle, in accordance with instructions in Sections XII and XIII.

XII. MOTOR PULLEY

1. Hold Cooling Fan (139) stationary by inserting finger tip between the blades.
2. Grip the Motor Pulley (164) with thumb and finger of the other hand, and turn it in an anti-clockwise direction, at the same time pulling it gently upwards. The coupling spring (138), usually comes away with the Pulley, but in any case should be removed from the Fan Boss for pusposes of re-assembly.

1. Press Motor Pulley (164) into coupling Spring (138) with a left hand twisting movement until the end coil of the Spring sits firmly against the shoulder of the Pulley.

NOTE.— The end of the Spring without the projecting tail should be next to the Pulley.

Hold Cooling Fan (139) stationary by inserting finger tip between the blades.

3. Slide Pulley (with Spring attached) on to the Motor Spindle so that the open end of the Spring engages with the neck of the Fan Boss. Grip Pulley with thumb and finger, turn it in an anti-clockwise direction, at the same time pressing it gently downwards. When properly located the bottom of the Pulley should butt firmly against the top of the Fan Boss.

REMOVAL

XIII. MOTOR PULLEY (Cont'd)

REPLACEMENT

4. Check that Motor spins freely and that Motor Pulley runs true within limits specified in the tabulated information given in SECTION VIII (8), (9) and (10).

IMPORTANT NOTES.–

1. Take care not to distort Fan Blades (see Section XIV).
2. Cooling Fan (139) is a drive fit on Motor Spindle, and is set so that the Motor Pulley (164) will be at correct level when butting against it. Do not push Motor Pulley forcibly downwards when replacing, as this may disturb location of the Fan on the Spindle. (Refer to Section XIV for instructions on checking and setting level of Cooling Fan).
3. As a ready means of checking correct working level of the Motor Pulley (164) the Service men should equip hemself with a straight strip of metal 3-1/2" long, 11/32" wide. This should be used by laying edgewise on top of the Unit Plate, so as to bridge the aperature through which the Motor Pulley protrudes. The upper edge should just pass under the largest flange of the Motor Pulley.

XIV. COOLING FAN

First remove Idler Wheel (47) and Motor Pulley (164) as described in Sections X and XIII respectively. The Cooling Fan (139) may then be pried off the Motor Spindle, taking great care to avoid bending the Motor Spindle. For this purpose a pair of suitable bent levers should be used simultaneously on opposite sides, taking care to pry directly on the underside of the Fan Boss to avoid distorting the blades.

If necessary, pinch the split neck of the Fan Boss to make it a tight drive fit on the Motor Spindle. Do not close in too much as undue force may then be necessary to push it on to the Motor Spindle. If over-tight, a length of 3/16" diameter rod with a tapered end, should be driven through the Boss before attempting to push it on to the Motor Spindle.

To push the Fan into position on the Motor Spindle, it is convenient to use a short length of tube 9/32" diameter bore. This should be gently tapped down until the top of the split neck of the Fan Boss is 7/16" above the flat face of the motor frame. If set too low, rise upwards as described opposite.

Finally, check that all six fan blades have adequate clearance, setting any blades that are out of line. The lower edge of each blade should be parallel to the face of the motor frame with a gap of 1/16".

XV. IDLER SWIVEL ARM

1. Remove Idler Wheel (47) as described in Section X.
2. Loosen Set Scre w (160) two or three turns.
3. Withdraw Spindle (161) upwards, thus enabling the Idler Swivel Arm (159) to be withdrawn sideways from between the forks of the Idler Slide Arm (162).

Reverse procedure given opposite. Take care to replace Spindle (161) so that the recessed portion engages with the Set Screw (160). The Spindle (161) should be set so that each of its ends is slightly proud of the outside faces of the forks of the Idler Slide Arm (162). Tighten Set Screw (160) securely and check that the Swivel Arm (159) swings quite freely on the Slide Arm (162).

NOTE.– The lug "X" of the Swivel Arm (159) must be assembled so as to engage with the recess "X" of the Slide Arm (162).

XVI. IDLER SLIDE ARM

NOTE.– Idler Swivel Arm (159) may be left attached to the Slide Arm (162) during this operation, or alternatively it may be separately removed, as described in Section XV.

1. Remove Idler Wheel (47). See Section X.
2. Detach Idler Slide Arm (162), lift Idler Withdrawal Link (49) from post and swing clear.
3. Loosen Set Screw (141) two or three turns.
4. Withdraw Spindle (142) upwards, thus enabling the Slide Arm (162) to be detached.

NOTE.– Withdrawal of the Spindle (142) also releases Thrust Collar (144).

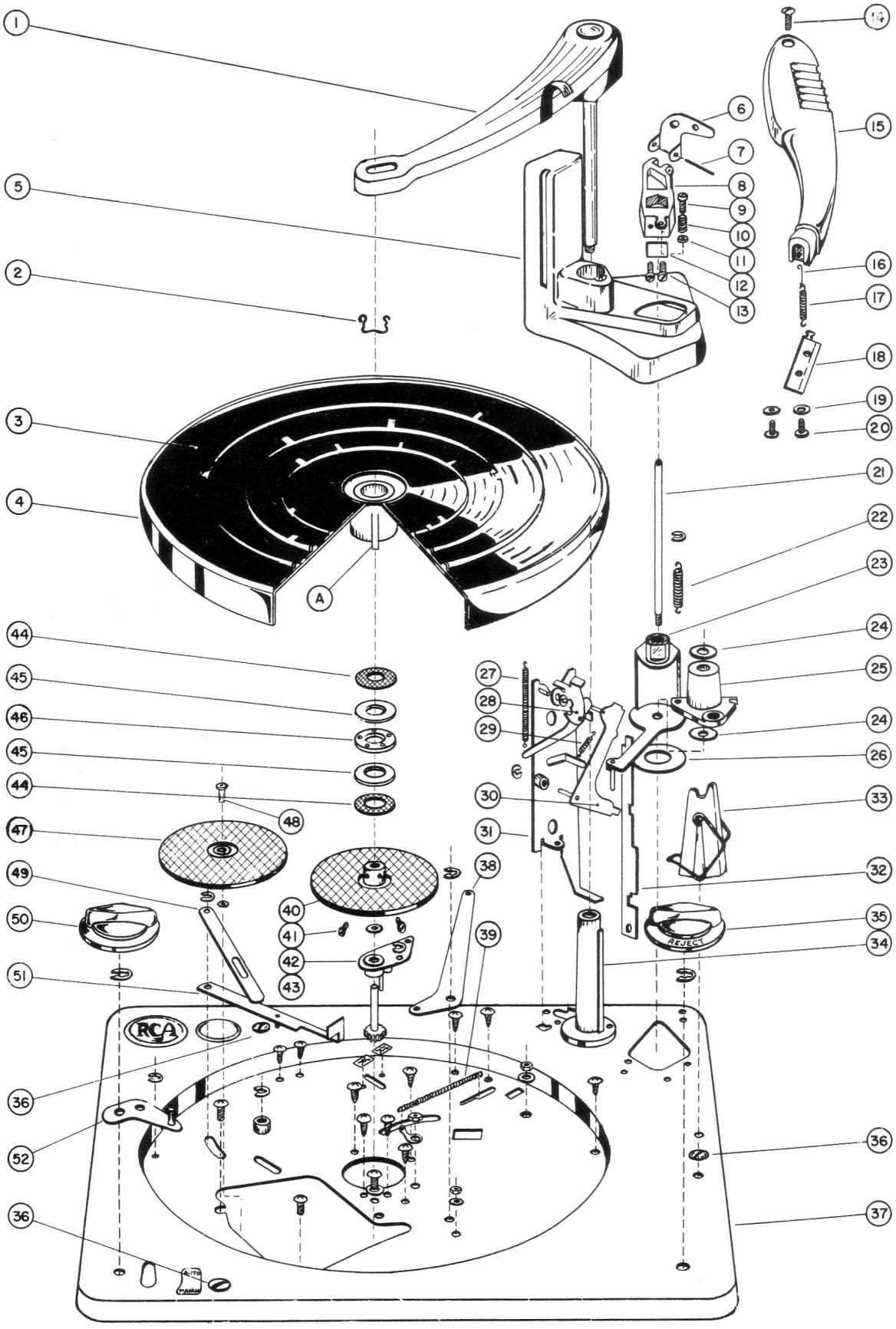
Reverse procedure given opposite. Take care to replace Spindle (142) so that the recessed portion is engaged by the Set Screw (141).

Thread the Thrust Collar (144) on to the lower end of the Spindle (142), with its bevelled end downwards in contact with the upper face of the 4-speed Control Cam (150). The Spindle (142) should then be set so that its upper end projects 21/32" above the flat face of the motor frame, and the Set Screw (141) tightened securely.

XVII. SPEED CONTROL CAM
IDLER WITHDRAWAL LEVER ETC.

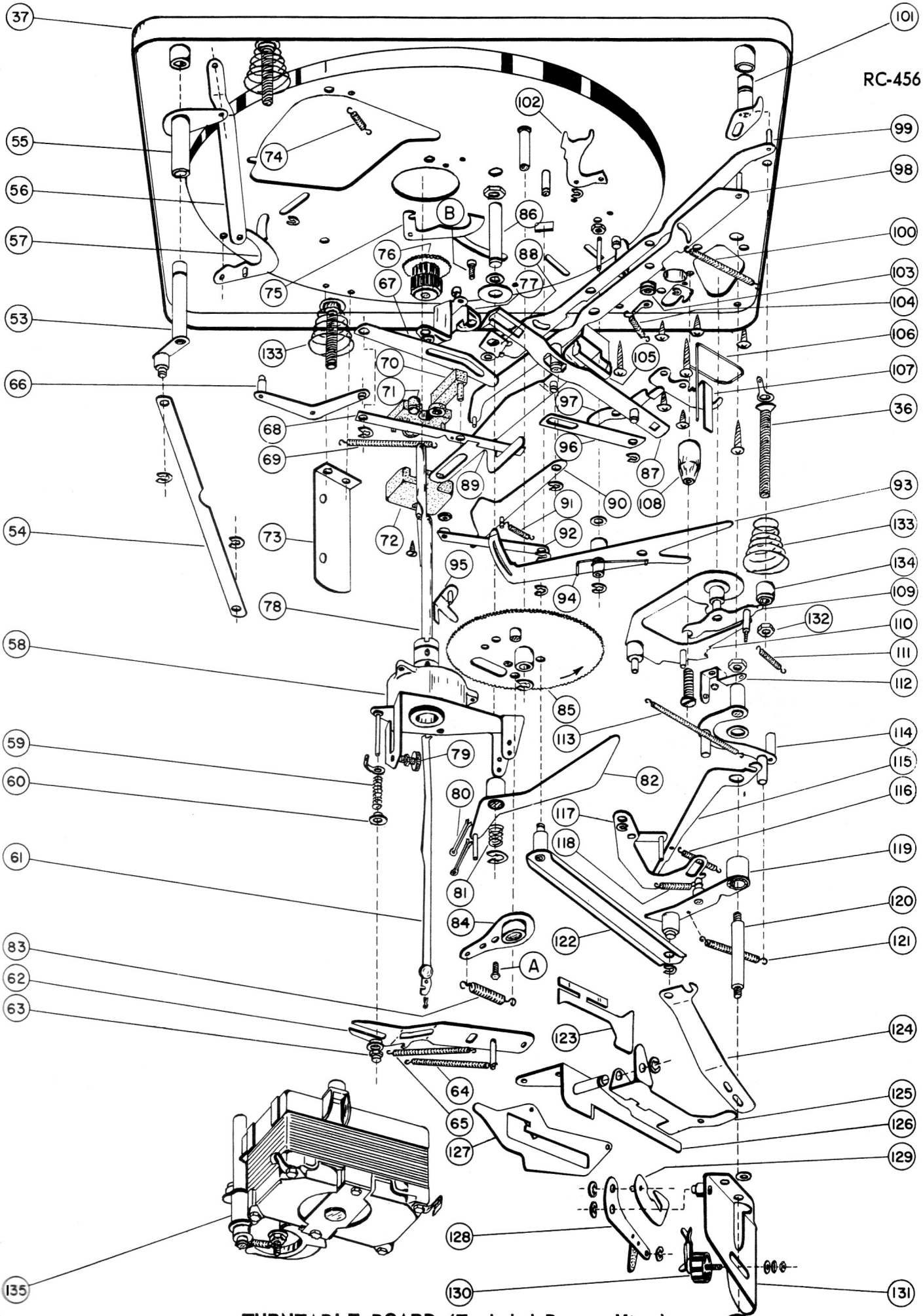
1. Remove Circlip (149) and swing Control Link clear.
2. Detach Spring (154).
3. Remove Self Locking Nut (154). All items numbered 144 to 157 inclusively can then be detached.

1. Assemble items 155, 156, 157 together, and assemble to Motor Frame, taking care to locate the limb "A" of the Idler Withdrawal Leverl (155) behind the peg "A" projecting from the bottom member of the Idler Slide Arm (162).
2. Slide Thrust Collar (144) on to lower end of Spindle (142) with its bevelled end downwards.
3. Slide Spring (145) on to the plain portion of the Spindle with the threaded end projecting downwards from the motor frame.
4. Assemble items 146, 147, 148, 150, 151 together and slide on to the spindle with the threaded end, followed by the Washer (152), Self Locking Nut (153) and Spring (154). Make sure that the Flange of the Roller (156) over-rides the top face of the 4-speed Control Cam (150).
5. Adjust working level of 4-speed Control Cam (150) by means of the Self Locking Nut (153).



TURNTABLE BOARD (Exploded Top View)

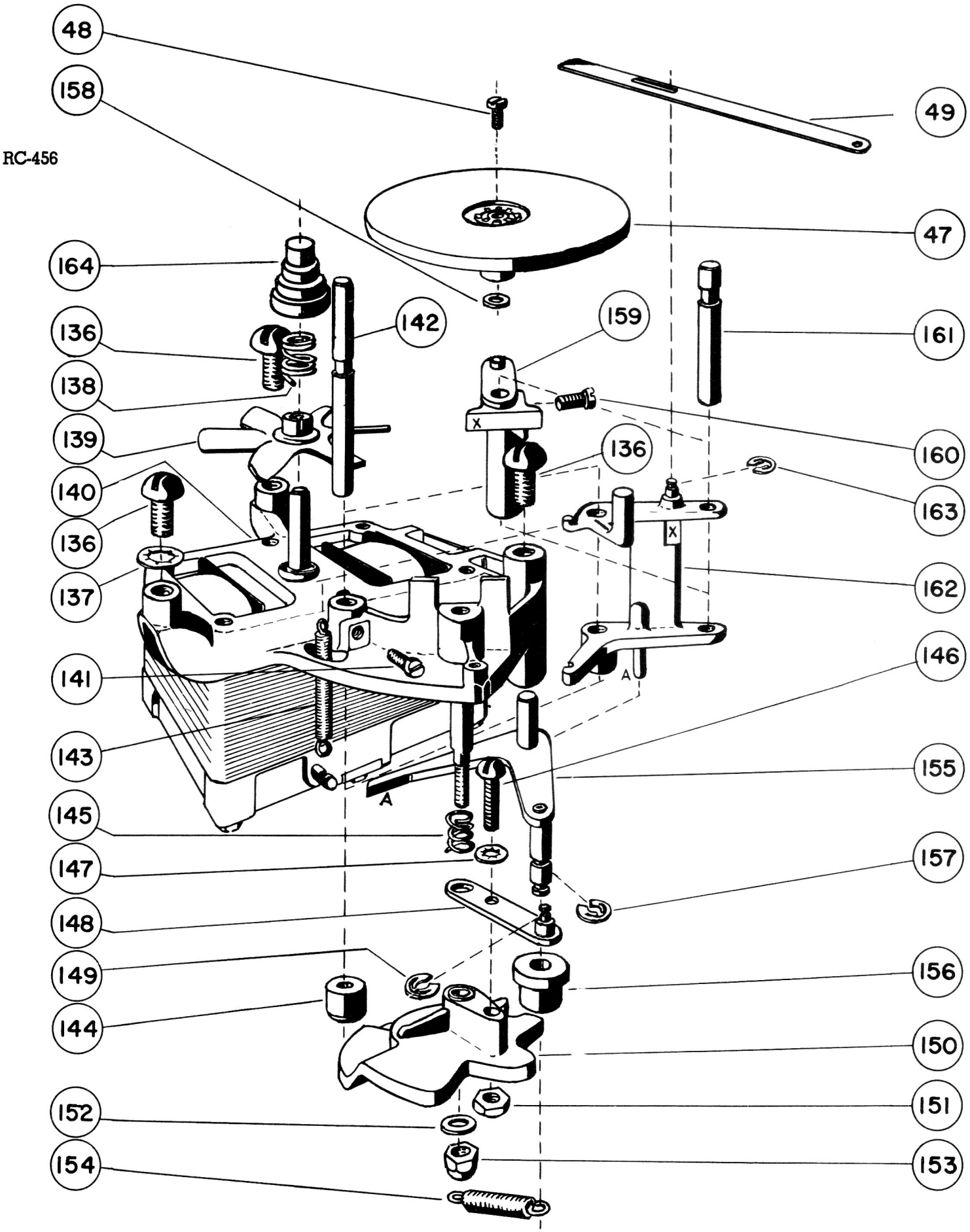
Fig. 3



TURNTABLE BOARD (Exploded Bottom View)

Fig. 4

RC-456



DRIVE MECHANISM (Exploded View)

Fig. 5

Ref. No.	Part No.	DESCRIPTION
1	*S-21556	Record Balancing Arm
2	S-21175	Turntable Retainer
3	S-21187	Turntable Rubber Mat
4	S-20825	Turntable and Turntable Hub Assembly
5	S-21162	Pick-up Base and Set Down Selector Housing
6	*S-21557	Pick-up Arm Mounting Bracket
7	*S-21558	Hinge Pin
8	S-21176	Pick-up Arm Hinge
9		Set Screw
10	*S-21559	Spring
11		Washer
12	*S-21560	Set Down Positioning Shim
13		Serews Shim Retainer
14	*S-21561	Pick-up Arm Mounting Screw
15	*S-21562	Pick-up Arm Shell
16	S-21163	Weight Compensating Link
17	*S-21563	Weight Compensating Spring
18	*S-21564	Weight Compensating Control
19	*S-21565	Flat Washer (Steel)
20	*S-21566	Weight Compensating Control Adjust. Screws
21	*S-21567	Pick-up Arm Lift Pin
22	*S-21568	Lift Pin Lift Spring
23	*S-21569	Pick-up Tripping Arm
24		Flat Washer (Steel)
25		Pick-up Arm Mounting Base
26		Clutch Washer (Felt)
27	*S-21570	Record Gate Finger Lift Spring
28	S-21165	Record Gate Cam and Finger
29	*S-21571	Record Gate Lever Actuating Spring
30	*S-21572	Record Gate Lever
31	*S-21573	Record Gate Assembly Mounting Bracket
32	S-21166	Set Down Positioning Lever
33	*S-21574	Rest Post and Lock Assembly
34		Balancing Arm Column
35	S-21168	Start – Stop Reject Knob
36		Turntable Mounting Screw
37		Baseplate
38	*S-21576	Automatic Trip Lever
39	*S-21575	Automatic Stop Lever Spring
40	*S-21578	Cycle Drive Wheel
41		Drive Wheel Mounting Screws
42	*S-21577	Drive Wheel Swing Bracket
43	S-21172	Drive Wheel Mounting Shaft and Gear
44	*S-21579	Neoprene Washers
45	*S-21580	Turntable Bearing Washers (Steel)
46	S-21164	Bearing (Ball Race)
47	S-20778	Motor Idler Wheel
48	*S-21581	Idler Wheel Retaining Pin
49		Idler Wheel Retracting Link
50	*S-21582	Speed Control Knob
51	*S-21583	Cycle Delay Lever
52	*S-21584	Auto – Manual Selector
53	*S-21585	Speed Control Crank and Speed Selector
54		Speed Control Lever
55		Auto-Manual Crank
56	*S-21587	Auto-Manual Link
57	*S-21588	Auto-Manual Lever
58		Turntable Axle
59	*S-21594	Compression Spring
60	*S-21595	Shoulder Washer
61	*S-21596	Record Selector Pawl
62	*S-21598	Spindle Slide Plate
63	*S-21597	Locknut
64	S-21177	Selector Pawl Return Spring
65	S-21174	Spindle Slide Plate Return Spring
66		Idler Wheel Actuating Lever
67		Idler Wheel Actuating Link
68		Switch Pawl
69	S-21173	Switch and Idler Wheel Actuating Spring
70	S-21190	Switch Actuating Cam
71	S-21191	On-Off Switch
72	S-21192	Switch Cover
73		Name Plate Bracket
74	S-21173	Cycle Drive Wheel Actuating Spring
75		Main Gear Release Lever
76	*S-21589	Intermediate Cycling Gear
77		Intermediate Cycling Gear Mtg. Bracket
78	S-20832	Spindle Shaft (78 R.P.M.)
79		Record Dropping Adjustment Screw
80		Cotter Key
81	S-21178	Compression Spring
82		Record Dropping Lever
83		Main Drive Gear Adj. Spring
84		Main Drive Gear Roller
85	S-20789	Main Drive Gear
86		Record Dropping Lever Mounting Stud
87		Spindle Dactivating Lever
88		Spindle Deactivating Lever Holder
89		Switch-Off Link
90		Secondary Switch-Off Link
91	S-20807	Switch-Off Link Spring
92	S-21699	Striker Arm
93	*S-21592	Trip Feed Lever
94	*S-21593	Trip Feed Wire Mover
95		Striker Arm Stopper
96		Spindle Deactivating Link
97		Manual Stop Actuating Lever
98		Stop Lever
99		Reject Lever
100	S-21174	Reject Lever Return Spring
101	*S-21590	Start-Stop-Reject Shaft and Cam
102		Switch-Off Link Holder
103		Switch-Off Link Spacer
104	*S-21628	Switch-Off Link Holder Return Spring
105		Switch-Off Link Pivot Bracket
106	*S-21591	Set-Down Selector Wire
107		Selector Wire Mounting Bracket
108		Plate Guide Spacer
109	*S-21600	Positioning Plate Guide
110	*S-21590	Pick-up Arm Positioning Plate
111	*S-21601	Positioning Plate Guide Holding Spring
112	*S-21602	Lift Pin Mounting Bracket
113	S-21180	Pick-up Arm Return Lever Spring
114	*S-21603	Pick-up Arm Lateral Lever
115		Pick-up Arm Return Lever
116	S-21181	Positioning Plate Spring
117		Record Gate Reset Lever

REPLACEMENT PARTS (Cont'd)

Ref. No.	Part No.	DESCRIPTION
118	*S-21604	Record Gate Reset Lever Return Spring
119		Pick-up Arm Actuating Lever
120		Mounting Stud
121	*S-21606	Pick-up Arm Actuating Lever Return Spring
122		Operating Bar
123	*S-21605	Switch-off Plate
124		Strengthener
125	*S-21608	Auto-Stop Lever
126	*S-21607	Auto-Stop Lever Mounting Bracket
127	*S-21609	Auto-Stop Catch Plate
128	*S-21612	Lift Pin and Muting Switch Actuating Lever Assy.
129	*S-21611	Lift Pin and Muting Switch Actuating Link
130	S-21193	Muting Switch Assembly
131	*S-21610	Muting Switch Mounting Bracket
132		Turntable Mounting Hex. Nut
133	*S-21586	Turntable Suspension Spring
134		Suspension Spring Shoulder Spacer
135	*S-21613	Motor Assembly (60 cyc.)
136		Motor Mounting Screw
137		Motor Mounting Lock Washer
138	S-21183	Coupling Spring
139	*S-21616	Motor Cooling Fan
140	*S-21677	Motor Only (60 cyc.)
"	*S-21678	Motor Only (50 cyc.)
"	*S-21679	Motor Only (25 cyc.)
141		Idler Slide Arm Set Screw
142	*S-21663	Idler Slide Arm Spindle
143	S-21185	Slide Arm Return Spring
144		Thrust Collar
145	S-21186	Compression Spring
146		Control Link Mounting Screw
147		Control Link Mounting Screw Lock Washer
148		Speed Control Link
149		Circlip
150	*S-21664	Speed Control Cam
151		Hex Nut
152		Flat Washer
153		Locknut
154	S-21194	Index Spring
155	*S-21617	Cam Lever
156		Cam Index Roller
157		Circlip
158		Flat Washer
159	*S-21618	Idler Swivel Arm
160		Swivel Arm Set Screw
161		Slide Arm Moving Spindle
162	*S-21619	Idler Slide Arm Ass'y.
163		Circlip
164	*S-21665	Motor Pulley (60 cyc.) Red
"	*S-21666	Motor Pulley (60 cyc.) Blue
"	*S-21667	Motor Pulley (60 cyc.) Green
"	*S-21668	Motor Pulley (60 cyc.) Yellow
165	*S-21669	Motor Pulley (50 cyc.) Red
"	*S-21670	Motor Pulley (50 cyc.) Blue
"	*S-21671	Motor Pulley (50 cyc.) Green
"	*S-21672	Motor Pulley (50 cyc.) Yellow
166	*S-21673	Motor Pulley (25 cyc.) Red
"	*S-21674	Motor Pulley (25 cyc.) Blue
"	*S-21675	Motor Pulley (25 cyc.) Green
"	*S-21676	Motor Pulley (25 cyc.) Yellow
167	*S-21626	Motor Ass'y.– 50 cyc.
168	*S-21681	Motor Ass'y. – 25 cyc.
169	78827	Turnover Stylus
170	*S-21620	Pick-up Head Ass'y.
171	*S-21621	Pick-up Head Shell Only
172		Connection Bracket Screw
173		Connection Holder Bracket
174	*S-21622	Pick-up Head Connection Ass'y.
175		Cartridge Set Screw
176	100653	Cartridge
177	*S-21624	Cartridge Mounting Bracket
178		Mounting Bracket Screw
179	*S-21625	Rubber Stopper
180	S-20833	Spindle (45 R.P.M.)
181	*S-21680	RC-456 Changer Complete

NOTE: Parts designated with an asterisk indicate new stock items.
Only items listed under stock numbers are available as Replacement Parts.
All parts subject to change or withdrawal without notice.