hallicrafters 3-SPEED AUTOMATIC RECORD CHANGER

SERVICE INSTRUCTIONS

115A147
(Garrard RC-80)

the hallicrafters co.
MANUFACTURERS OF RADIO, TELEVISION AND ELECTRONIC EQUIPMENT, CHICAGO 24, U. S. A.

92X2192

DESCRIPTION

The Hallicrafters 115A147 Automatic Record Changer (Garrard Model RC-80) will play up to ten 7", 10" or 12" records (not mixed) at all three speeds - 78, 45 and 33-1/3 r.p.m. It is designed to operate on 100-130 volt, 60 cycle AC current.

It is equipped with two record spindles, one for the large 45 r.p.m. records and a stepped sloping spindle for all other types of records.

A super-sensitive auto trip mechanism is built in and the changer will automatically switch off after the last record has played.

An important feature is the pickup protection. Should the changer be switched on without a record on the record spindle, the pickup will not leave its rest thus preventing damage to the pickup, stylus, or turntable covering. A pickup muting switch is also built in to prevent extraneous noises from being heard while the changer mechanism is operating.

The pickup arm contains a variable reluctance magnetic cartridge with a replaceable dual-tipped sapphire stylus. This cartridge is noted for outstanding fidelity, wide range response (30-15,000 cycles), and virtual elimination of surface noise and needle talk.

PREPARING FOR OPERATION

TRANSIT SCREWS

During transit, the changer is secured to the motor board by means of two screws. (See Figure 6.) Before placing the changer in operation, these screws should be removed to permit the changer to "float" on its spring mountings.

TO REMOVE THE TURNTABLE

The turntable may be removed by applying equal pressure under opposite sides of the rim with the fingers and lifting up with a slightly twisting motion.

TO REPLACE THE TURNTABLE

Turn the Speed knob to "33". (See Figure 2.) Then move the Control knob to "Start" and back to "Stop". Place the turntable on the main spindle and while moving the Control knob to "Start", slowly rotate the turntable clockwise until it drops into position.

LEVELING THE CHANGER

It is essential to have the record changer absolutely level. To check the level of the changer, place a spirit level on the record turntable. If the changer is not level, it may be adjusted by removing the lock nuts and fixing nuts located under the suspension springs (see Figure 1) and then lifting the changer and adjusting the nuts inside the springs.

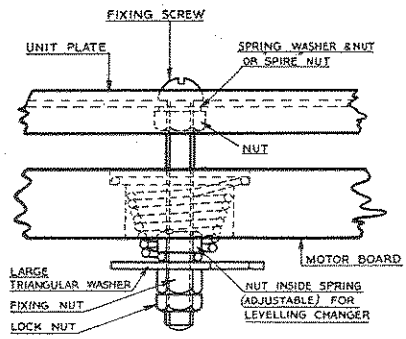


Fig. 1. Suspension Spring Mounting

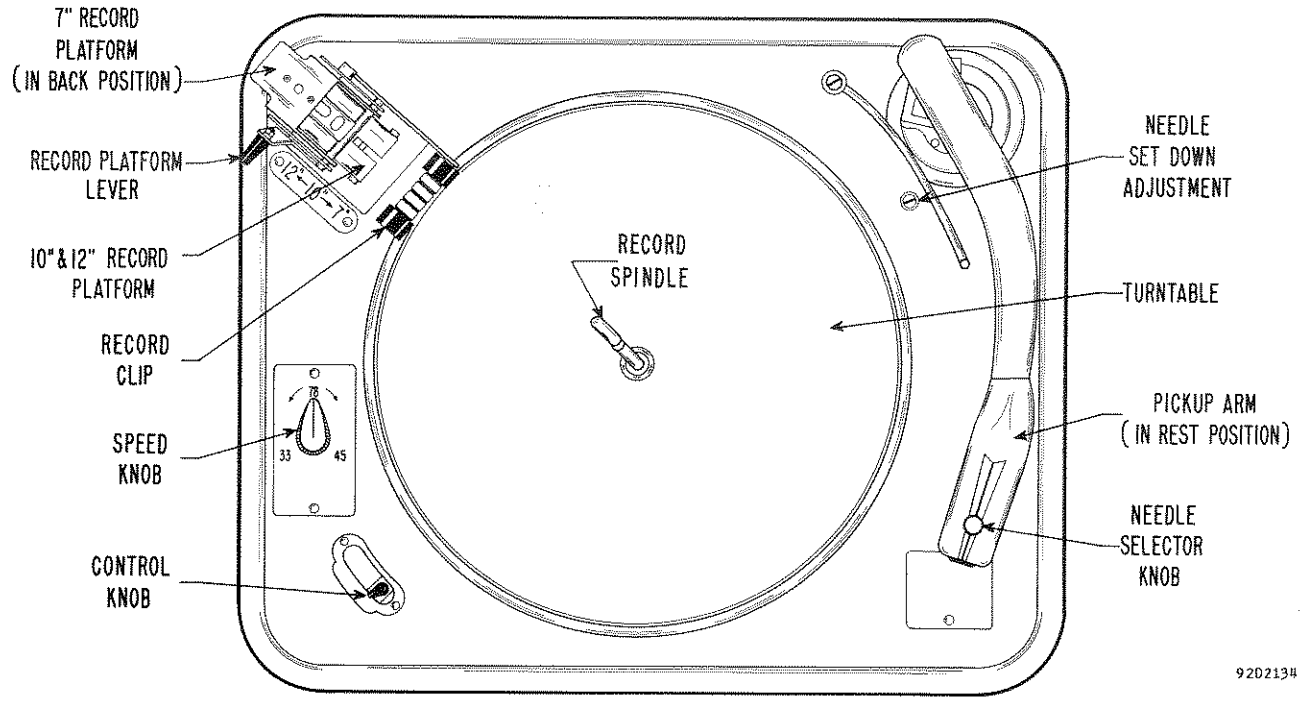


Fig. 2. Changer Operating Controls

OPERATING INSTRUCTIONS

The changer will play any number of records up to 10, of any of the following types (not mixed):

78 r.p.m.	-	10" or 12"
33-1/3 r.p.m.	-	7", 10" or 12"
45 r.p.m.	-	7"

To operate the changer, proceed in the following order:

1. See that the correct needle is in position in the Pickup Arm for the type of record to be played.

   The variable reluctance cartridge supplied with the changer has two sapphire tipped needles, one for playing standard 78 r.p.m. records and the other for 33-1/3 and 45 r.p.m. records. To change from one needle to the other, press and turn the knob at the front of the Pickup Arm. This knob is set correctly when the knob marking facing the front end of the arm corresponds to the type of record to be played, i.e., "STD" for standard 78 r.p.m. records or "MG" for 33-1/3 and 45 r.p.m. microgroove records.

2. Place the correct Record Spindle in position, i.e., the sloping spindle for 78 or 33-1/3 r.p.m. records, or the large spindle for 45 r.p.m. records.

3. Set the Record Platform Lever to size of record it is desired to play - 7", 10" or 12". Also turn 7" Record Platform to the forward position if it is desired to play 7" records with small hole, making sure that hole in rear of platform locates over Key. (See Fig. 3.)

4. Turn the Speed Knob to proper speed for type of record to be played - 78, 45 or 33-1/3 r.p.m.

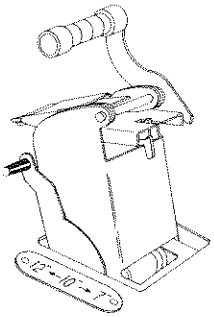
5. Place any number of records up to 10 (not mixed) on the Record Spindle. Lower the Record Clip and then start the changer by moving the Control Knob to "Start". The changer will play the entire stack of records and shut off automatically after the last record is played. To reject a record at any time, simply move the Control Knob to "Reject".

   NOTE: The Record Clip is not used when playing 7" records.

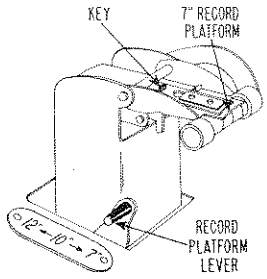
6. To stop the changer before all records on the spindle have been played, first remove the remaining records on the spindle and then move the Control Knob to "Stop". This will return the Pickup Arm to its rest position and automatically stop the changer.

   CAUTION: Do not attempt to return the Pickup Arm to its rest position manually. Instead, proceed just as outlined above to stop the changer.

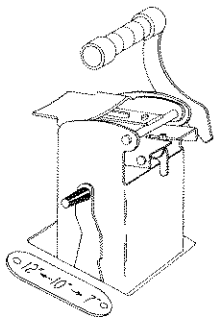
   The Pickup Arm will not move from its rest position unless one or more records are placed on the Record Spindle. This is a safety device designed to prevent damage to needle or cartridge should the changer be started without being loaded with records.



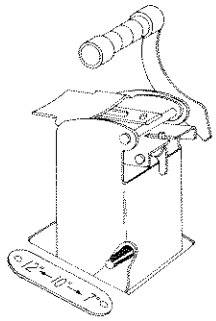
Setting for
12" Records 9282137



Setting for
7" Records
(Except 45 RPM) 9282138



Setting for
10" Records
9282139



Setting for
7" - 45 RPM Records
9282140

Fig. 3. Record Platform Settings for 7", 10" and 12" Records

MAINTENANCE

The motor and intermediate wheel bearings, being of the oil retaining type, rarely need lubricating. When the need for oil is apparent, remove both the belts and while holding the intermediate wheel out of the way, lubricate the pulley and motor bearings. Carefully remove every trace of surplus oil before replacing the belts.

The rubber rim on the intermediate wheel and the two belts must be kept free from oil. All oiling points are shown on the lubrication chart (Figure 4.) A fine grade of light machine oil such as sewing machine oil should be used.

Occasionally, especially if the changer mechanism becomes rather noisy, put a smear of grease such as vaseline on all cam faces, and lightly lubricate all lever pivots.

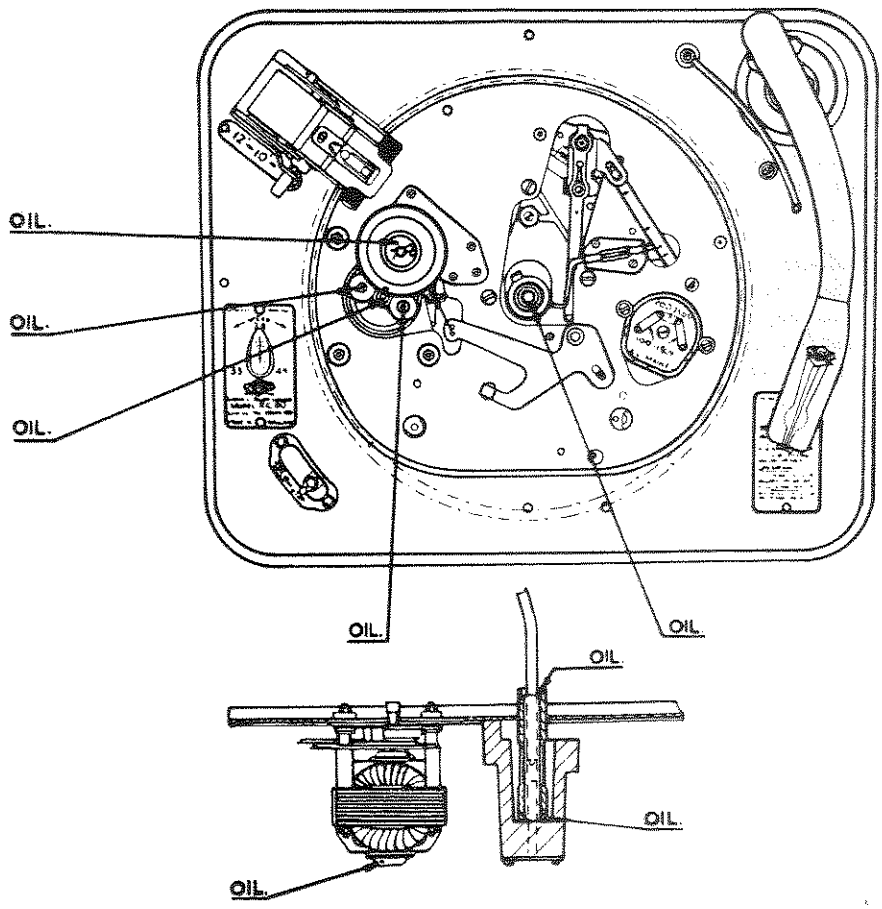


Fig. 4. Lubrication Chart

SERVICE INSTRUCTIONS

REMOVING CHANGER FROM CABINET

To remove the changer for service, it will be necessary to first remove the changer drawer from the cabinet. This is accomplished by removing the two triangular spring clips accessible through the openings on the underside of the record changer compartment, near the front. Using long nose pliers, compress the clips and pull downward to remove. Unplug the changer power and audio cables attached to the AM-FM tuner chassis and then slide the changer drawer out of the cabinet. A firm pull outward will be necessary to disengage the drawer from the ball-bearing slides. To separate the changer from the drawer, first remove the lock nuts and fixing nuts located under the suspension springs (Figure 1). Then lift the changer off the suspension springs and remove it from the drawer.

NEEDLE REPLACEMENT

The dual needle assembly is replaceable as a unit, and is easily removable from the pickup cartridge. When making replacement, use Hallicrafters Part No. 121A104. Figure 5 shows the needle assembly installed in the cartridge.

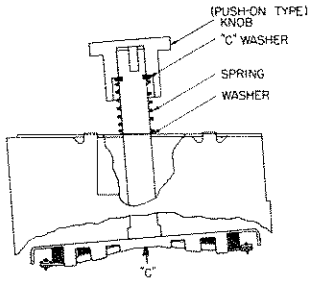


Fig. 5. Side View of Pickup Cartridge

Removal - Pull off the knob and remove the two mounting screws and cartridge from the pickup arm. Compress the spring slightly, remove the "C" washer, pick off the spring and flat washer, and remove the needle assembly from the cartridge.

Installation - Insert needle assembly into cartridge with a rotating motion. Place flat washer, then spring, over the needle assembly shaft. Compress spring slightly and insert "C" washer into groove on shaft to hold spring in place. Mount the cartridge into pickup arm and install knob. Note that the knob key and needle assembly shaft are both off-center so that the knob can fit on in only one position. Do not force the knob on. Press knob firmly on shaft making certain first that the alignment is correct. Apply pressure only at point "C" to prevent damage to the needle assembly.

AUTOMATIC TRIP DESCRIPTION

The automatic trip fitted to the changer operates on the velocity principle which means that it is brought into operation by the acceleration of the pick-up as the stylus enters the run off or eccentric groove on the record and not by the return movement of the pick-up in the eccentric groove. Referring to Figure 7, the operating lever is moved towards the main spindle by the movement of the pick-up arm. It should commence to move when the stylus point has reached a 2-7/8" radius from the main spindle center.

When the pick-up reaches the record run off groove, its movement is accelerated. This increases the movement of the operating lever which is caught by the striker and lifted on its cam face. This, via the trip rod, moves the trip lever thus releasing the impulse lever which in turn gives the main gear a push and causes it to engage with the pinion on the main spindle, so completing one cycle of the changer mechanism.

AUTOMATIC TRIP ADJUSTMENT

Should the auto trip commence to operate too early or too late (in the latter case it would fail to operate) check the radius at which it commences. Set the changer in the playing position, remove the turntable and, holding the pick-up in the hand, slowly move it towards the main spindle as if playing a record. When the needle point is nearly 2-7/8" from the main spindle center the friction plate should commence to move carrying with it the operating lever. At 2-7/8" radius the striker should commence to touch the felt pad in the end of the operating lever. A quick inward movement of the pick-up should then cause the trip to operate if the main spindle is turned by hand.

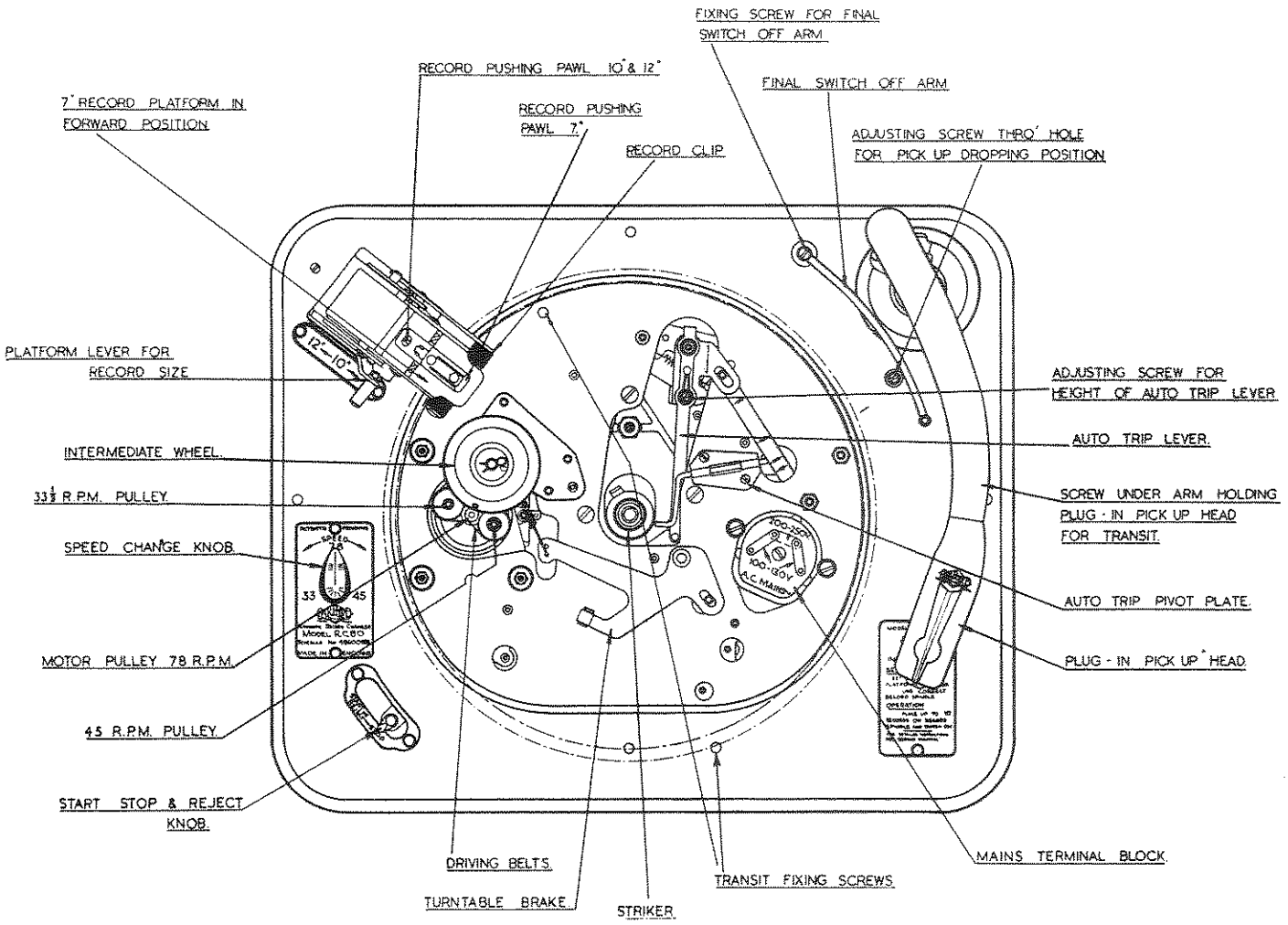


Fig. 6.

If this dimension is not correct, loosen the screw holding the setting lever Figure 11, (later models have 2 screws) and move the setting lever in the required direction. If the screws are left partially tight, the setting lever can be tried for position as described above, re-adjusted and the screws finally tightened.

When complaints are received that the auto trip does not operate, first see that the records used have a run off groove of at least 3/16". There are a few old records still in existance with run off grooves under this dimension, and some without any run off groove. Record changers will not operate with these non-standard records. Check the position of the operating lever in relation to the cam face on the striker. The relative positions should be as shown on Figure 7, and the correct position can be obtained by turning the "Adjusting Screw for height of operating lever," (Figure 7). Also see that the face of the felt pad in the end of the operating lever is projecting a small amount from the lever face, 3/64" maximum, and that its surface is clean and free from ragged edges.

Make certain that the trip rod, held in position by the "Pivot Plate" is in its correct position. The end nearest the main spindle must be in a position which enables it to be lifted by the operating lever when it rises on the striker cam. The other end which is below the unit plate should engage in a hole in the trip lever as shown on Figure 7. Make certain that this engagement actually does take place as sometimes a severe blow received in transit may cause the trip rod to come out of the hole. The position of the trip rod can be adjusted by loosening the screws holding the pivot plate and moving it until the rod position is correct. The screws can then be tightened again.

Check that the operating lever is perfectly free on its pivot by lifting it off the friction plate. Also see that the friction plate is clean. The use of oil at this point is not advisable as it may produce a sticky surface on the friction plate and make the action of the auto trip heavy. Should a bump be heard every revolution of the turntable when the auto trip is operating, the cause will in most cases be dirt or

gummed oil on the friction plate. To cure this trouble, the adjusting screw should be removed and the felt pad in the end scraped or replaced. The friction plate should also be cleaned.

TURNTABLE BRAKE ADJUSTMENT

The turntable brake, which was not fitted to earlier models, is combined with the lever to remove the tension from the intermediate wheel when the changer is switched off. The purpose of the brake is to stop the turntable revolving an excessive number of times after the intermediate wheel tension has been released. Should the turntable continue revolving after the changer has been switched off, examine the felt pad which operates on the turntable drum. It may have become worn or have been pushed back in the curled part of the lever holding it. In either case, push it through the lever until the end pointing to the main spindle projects a maximum of 3/32", and if it is loose squeeze the curl with a pair of pliers until it grips the felt pad firmly. When the felt pad becomes too short to make the above adjustment, it should be replaced. The turntable brake is shown on Figure 6.

MOTOR SPEED

If the speed of the first record played is correct but it becomes erratic on the records which follow, the trouble is almost certain to be caused by record slip.

Record slip may be due to warped records or incorrect pick-up weight. If the pick-up is too heavy, especially on L.P. records, they will slip. Slip can be reduced by sticking a transparent stamp hinge on each label. This is usually sufficient to provide enough key to drive the records. The motor is the induction type and while it is not synchronous, the frequency of the supply is the principle controlling factor in maintaining the correct motor speed. However, as the motor is not synchronous, the load applied to the motor also affects the speed and should the turntable run slow first see that the motor shaft intermediate wheel, pulleys and main spindle are free.

When testing the speed of the turntable, check the speed when the pick-up is playing a record. It will be noticed that the motor speeds up slightly when the pick-up is removed.

Sometimes after use the turntable may run one or two r.p.m. fast due to the various bearings freeing up. In this case hook the interwheel tension spring in the hole toward the front of the changer in the spring tension lever. This usually increases the load sufficiently to reduce the speed slightly. Should the spring already be in the front hole or when hooked there the speed is still fast, then a new pulley should be obtained from our Service Department. When ordering, the model number of the changer and the exact speed at which the turntable runs should be stated. Alternatively, the pulley diameters can be turned in a lathe, approximately .005" reduction in size will slow the turntable 1 r.p.m. Both diameters of the motor pulley should be reduced.

Great care must be taken to see that the rubber belts and intermediate wheel rim are kept free of oil. If the unit runs slow first make sure that oil on these items is not causing the trouble due to excessive slip.

Also see that the belts are running in the center of their respective pulleys. If they run up or down the edges will rub causing noise and unsteady running. To rectify this condition, try turning the belts over. If this is not effective, fit new belts. If this trouble still persists, check that the pulleys are square with the base plate. Sometimes a pulley spindle may be bent and the pulley running at a slight angle will cause the belt to run out of position. If a pulley is out of square, carefully straighten the pulley spindle by wrapping a piece of rag around the pulley and gripping with a pair of pliers. Before replacing the belt make sure that the pulley runs freely.

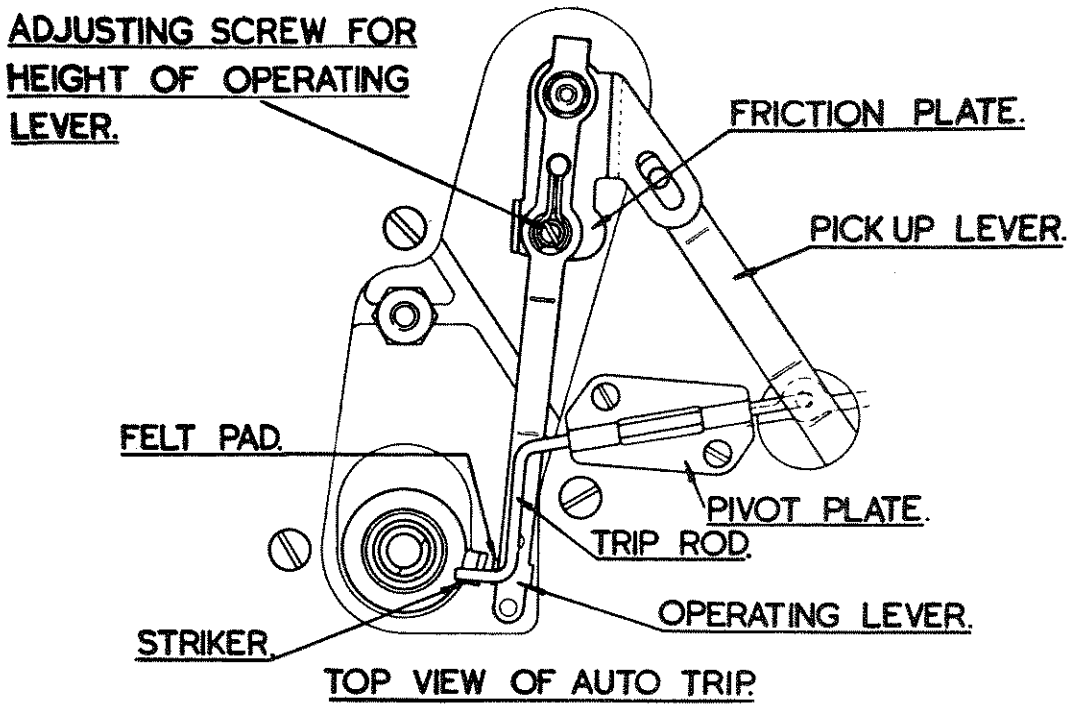
Also see that the motor pulley is clear of the top motor bearing. Sometimes it works down and causes the motor to slow up. See that the 45 and 33-1/3 r.p.m. pulleys have a little end play.

If the changer tends to run slow, check that the main spindle has a small amount of end play by first removing the turntable, then gripping the main spindle and lifting it up and down. A slight end play movement should be felt but if there is none, loosen the two screws holding the record spindle location (Figure 8) lift the main spindle about 1/64", and tighten the screws. After making this adjustment the position of the record spindle should be checked as described on page 12.

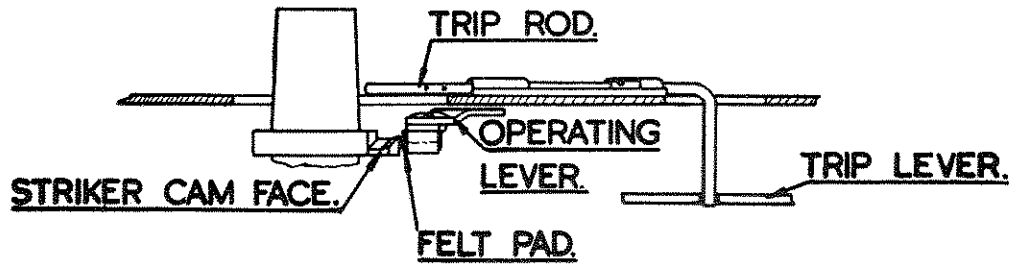
If after switching to 33-1/3 r.p.m. the motor will not drive, this is due to the fact that on turning the speed change knob to 33-1/3 r.p.m. the intermediate wheel mounting plate is pushed back its maximum amount and fails to return due to stiffness between the intermediate wheel plate and the unit plate. To correct this, insert the blade of a screwdriver between the plates and gently pry upwards. This

should be sufficient to free the plate and cure the trouble. Should the trouble still persist, examine the underside of the changer unit plate immediately under the intermediate wheel plate which is fixed to the unit plate by a rivet and large washer moving in an elongated hole. The trouble may be caused by the head of this rivet catching up on the head of another rivet joining the platform and selector levers together. This condition may occur when the platform is in the 10" position. To correct, pry the platform and selector levers a little further away from the underside of the unit plate.

If the turntable slows up or stops between each record, as the knock off arm moves inward, the cause is probably due to slip between the intermediate wheel and the pulley in contact with it. First check that the slip is not due to oil on the pulley and wheel, if clean, increase the tension of spring No. 22 Figure 18. If the spring is anchored in the hole nearest the intermediate wheel on lever 20 it should be moved to the other hole, if it is already anchored in this hole, remove the spring and shorten the tail by about 1/8". Should slip still occur the driving pulleys may have become polished on their driving surfaces, if so new pulleys should be fitted.



TOP VIEW OF AUTO TRIP



FRONT VIEW OF AUTO TRIP

Fig. 7. Top View

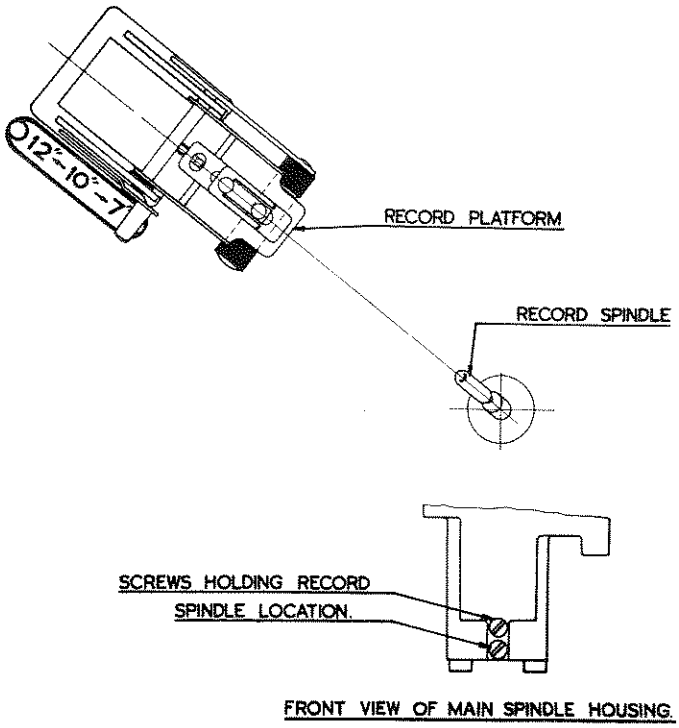


Fig. 8.

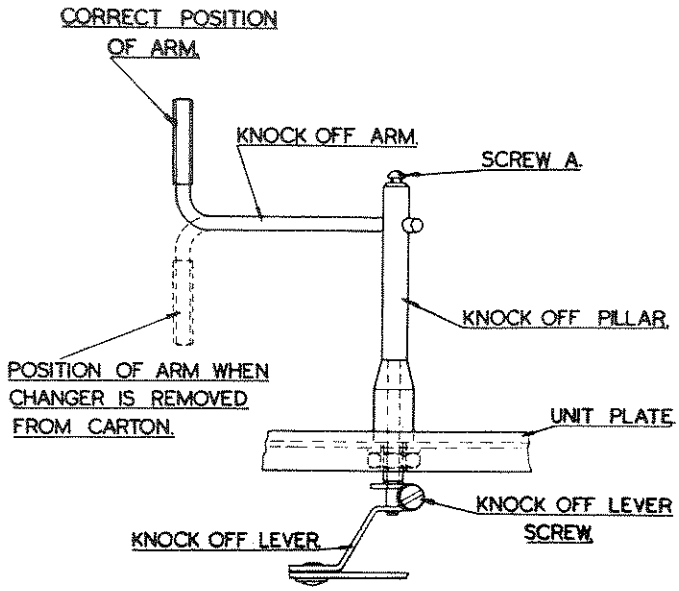


Fig. 9.

NOISE

Should the changer become noisy when running, first see that the cheese headed screw holding the pulley to the motor shaft is not touching the intermediate wheel as it revolves. If it is, raise the pulley by loosening the screw holding it to the shaft. On later models the pulley screw has been replaced by a grub screw so this condition cannot occur.

Another cause of noise is dry bearings and all points indicated on lubrication chart (Figure 4) should be lubricated with a fine machine oil. The belts should be removed and a drop of oil placed on the pulley bearings. All surplus oil must be carefully wiped off before replacing the belts.

Flats on the rubber tire of the intermediate wheel will cause a bumping noise when the unit is running, and to cure this trouble, the intermediate wheel should be replaced. The flats can be caused by holding the turntable stationary with the motor switched on, and this should be avoided.

A tapping noise is sometimes caused by the two pulley wheels vibrating up and down due to the action of the belts. To cure this, the end play must be reduced and this can be done by either inserting another fibre washer under the metal washer on top of the pulley, or by removing and bending the metal washer to take up the end play. On removing the split pin to make the above adjustment it is advisable to replace it with a new pin.

Occasionally a tapping noise can be caused by excessive end play on the intermediate wheel. This may occur through the bearing becoming dry, in which case lubricate. If this is not effective, a fibre washer should be used to reduce the end play.

A grating noise from the motor may be due to foreign matter in the air gap between the motor and stator or if the motor has received a severe shaking, perhaps in transit, the rotor may actually touch the stator. To correct this, first remove the belts then the motor pulley, unscrew the two nuts holding the bottom rotor bearing bracket, remove the bracket and withdraw the rotor. Clean the rotor and the tunnel in the stator and carefully examine for small metal chips. A metal chip causing a grating noise may not be too easy to see as it sometimes rests against the laminations and only projects when the current is switched on. Clean the bearings and before replacing the rotor, put a spot of fine machine oil on the bearing surfaces of the shaft. Should the trouble be due to the rotor fouling the stator, careful re-assembly should correct this.

Should an intermittent squeak be heard when the changing cycle is taking place, observe which lever is moving at the time the noise is heard and lubricate its pivot. If it is engaging with another lever, put a drop of oil on the point of engagement.

See that the cam faces are not dry - they should have a smear of light grease such as vaseline on the bearing faces.

If, when using the large record spindle for playing 45 r.p.m. records, a squeak is heard every revolution of the turntable, this may be due to the bearing of the lower revolving portion of the record spindle becoming dry. Remove the spring clip on the underside of the spindle, lift off the revolving part, clean and lubricate.

EXTRANEOUS NOISES IN THE REPRODUCER

After switching off at the supply switch, remove the cover of the main terminal block underneath the turntable. Examine the two main terminals and make sure that the nuts are tight and hold the wire firmly. Also see that the nuts holding the voltage change over links are tight. Examine the switch contacts by removing the bakelite cover on the underside of the mains connection block. It is held in position by two nuts. Examine the make and break of the contacts by operating the switch knob and carefully bend the contacts so that they move outwards about 1/32", when the moving roller contact moves between them. The moving roller contact should revolve freely. All the contacts should be thoroughly cleaned and a very light trace of vaseline put on the contact surfaces of the two switch blades.

Should the "plop" in the reproducer when the unit switches off, prove objectionable, a 0.01 mfd. condenser can be connected across the switch contacts to eliminate this noise. The condenser must have a high working voltage, at least 1,000 volts, and the most convenient point to which to connect it is two of the terminals in the mains connection block as shown in Figure 10.

Bad contact in the pick-up circuit may also be the cause of crackle in the reproducer and the plug connections, soldered joints etc. should be checked. The lead should also be tested. Sometimes the wire insulation chafes away with the movement of the lead, and the conductor then touches the earthed screening

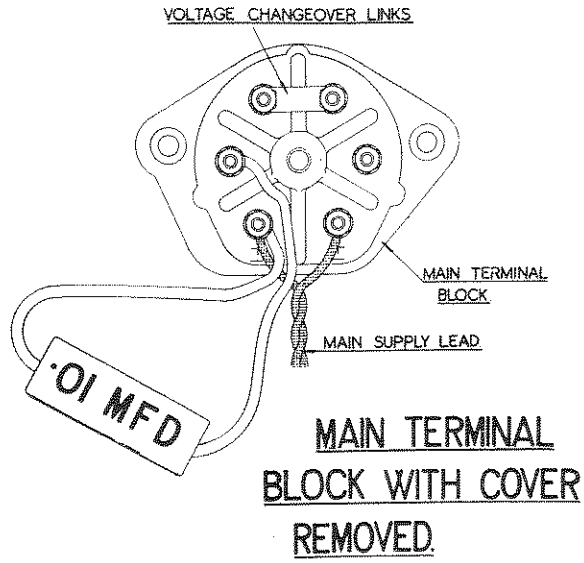


Fig. 10.

HUM DURING RECORD REPRODUCTION

Hum in the reproducer when the changer is switched off, may be due to insufficient screening of the pick-up lead. To check this, remove the pick-up sockets from the amplifier chassis. If the hum is still heard, then the trouble is in the amplifier, if it ceases, the pick-up connections on the muting switch terminals should be checked. They should be connected as shown on Figure 12.

On the earlier models, single core screened pick-up lead was used from the pick-up to the muting switch, the center core being connected to contact spring "A" and the screening to the other contact spring which was also attached to the earth connection. If the pick-up connections or the plugs in the amplifier chassis become reversed, hum may be heard, or in some cases there will be no reproduction. On later models, twin core screened lead is used, and where the colors of the two cores are red and black, the red lead should be connected to contact spring "A", or if the cores are colored green and white, then the green lead should be connected to that spring. Make sure that the lead from the muting switch blade "A", is attached to the grid or live pick-up terminal of the amplifier. Also see that the screening of the pick-up lead is connected to the earth connection of the muting switch, thus effectively bonding it to the screening of the changer pick-up lead.

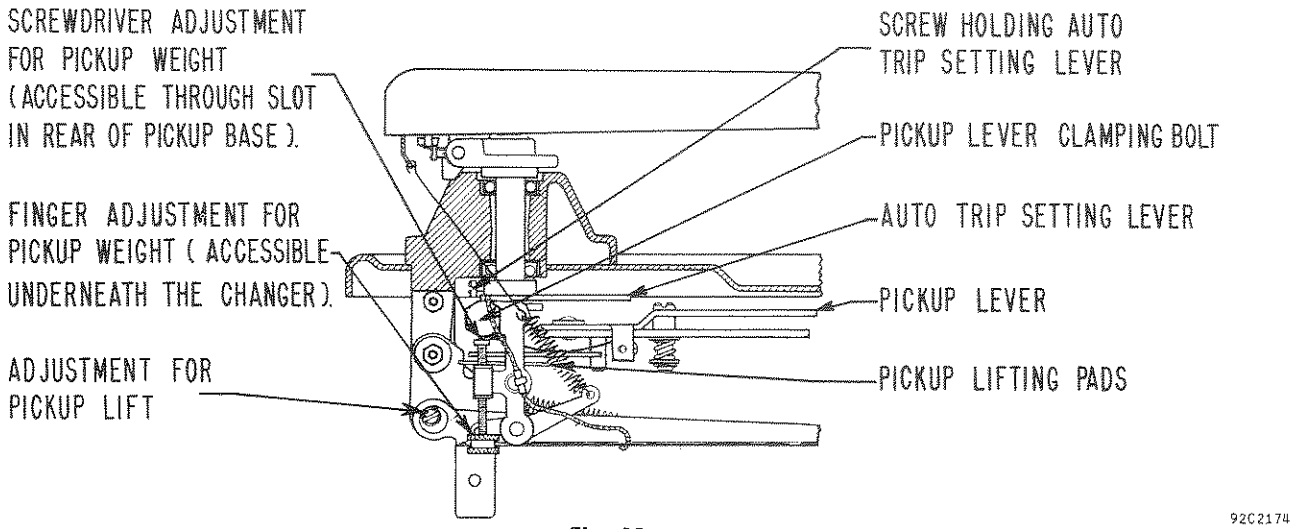


Fig. 11

RUMBLE

If there is a background rumble while playing a record, the main spindle thrust bearing may need lubricating (Figure 4).

The main spindle thrust bearing consists of two 1/16" thick bevel-edged hardened steel washers between which run five 3/32" dia. steel balls held in position by a bakelite cage. When assembling this thrust bearing, the beveled side of the washer should be in contact with the balls. A thin plastic washer is located under the lower steel washer. If lubrication is not effective, the trouble may be caused by dirt or a rough washer, in which case the main spindle must be dismantled. Remove the turntable and set the changer in playing position. Loosen the two screws holding the record spindle location (Figure 8) and then carefully withdraw the main spindle. Carefully note the position of the steel washers, bakelite cage, and plastic washer so they can be replaced correctly. Thoroughly clean the 5 balls, washers, and bakelite cage. Then examine the bearing faces of the steel washers. They should be smooth, flat, and free from blemishes. On reassembling, put a little thin grease in the bakelite cage with the balls.

A background rumble may also occur if the motor bearings become dry and when this occurs, the motor should be lubricated as shown in the lubrication chart (Figure 4).

It is important to see that the motor suspension is free. Should the motor leads be strained or the motor touching some component, this will cause hum and low frequency vibration to reach the pick-up. If in the course of time the rubber motor mountings harden due to aging, they should be replaced.

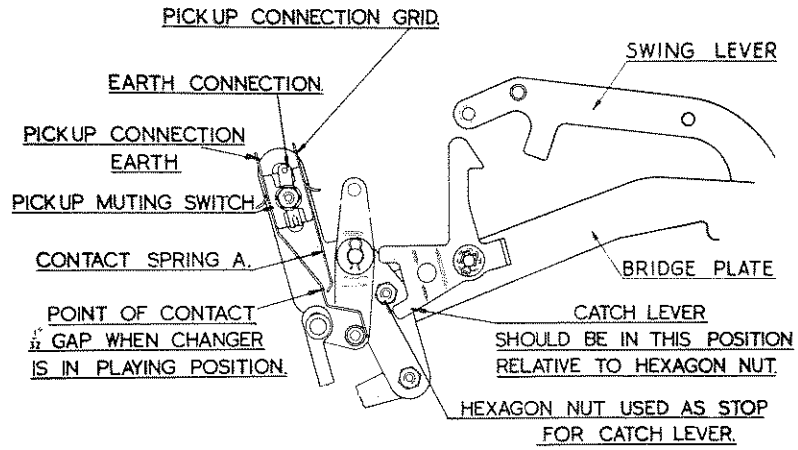


Fig. 12.

RECORD DROPPING

If the changer fails to drop records other than the 45 r.p.m. type, first make sure that the records are not badly warped. If they are reasonably flat, check the record spindle by laying in on the template (Figure 14) and checking that the shape and record gap are correct. If the spindle shape does not conform to the template, carefully bend it until it does. Set the changer to play 10" records and place a 10"

record in position on the record spindle with its edge resting on the record platform. The edge of the record should overlap the record platform by 3/16" and there should be a gap of 1/16" to 3/16" between the front edge of the record pushing pawl and the edge of the record. If the platform setting is incorrect, adjust by means of the "Eccentric Adjusting Pin for Platform" (Figure 13). A slot will be found at one end of this pin and a screwdriver should be inserted, the screw in the bush holding the pin loosened, and the pin turned until the platform position is correct. Before finally tightening the screw, see that a small clearance, about 1/64", is left between the eccentric shoulder and side of the platform support. To adjust the record pushing pawl position, loosen the nut of the "Eccentric Adjustment for platform pawl" (Figure 13) and turn the eccentric pin until the pawl position is correct then tighten the nut.

7" 45 R.P.M. records do not drop

The radial location of the 45 r.p.m spindle on earlier models is rather critical. On later models a spring lever has been incorporated which avoids the necessity for precise adjustment. Should the 7", 45 r.p.m. records fail to drop or seem to hesitate and then fall at an angle, remove the large record spindle and place the sloping stepped record spindle (Figure 14) in position. This spindle should lean and point to the center of the record platform as shown on Figure 8, and it will probably be noticed that it is slightly out of this position. To correct this, loosen the two screws (Figure 8) which hold the spindle location in position, turn the record spindle until it is in line with the record platform and re-tighten the screws. This will correct the position of the large record spindle which should now operate correctly.

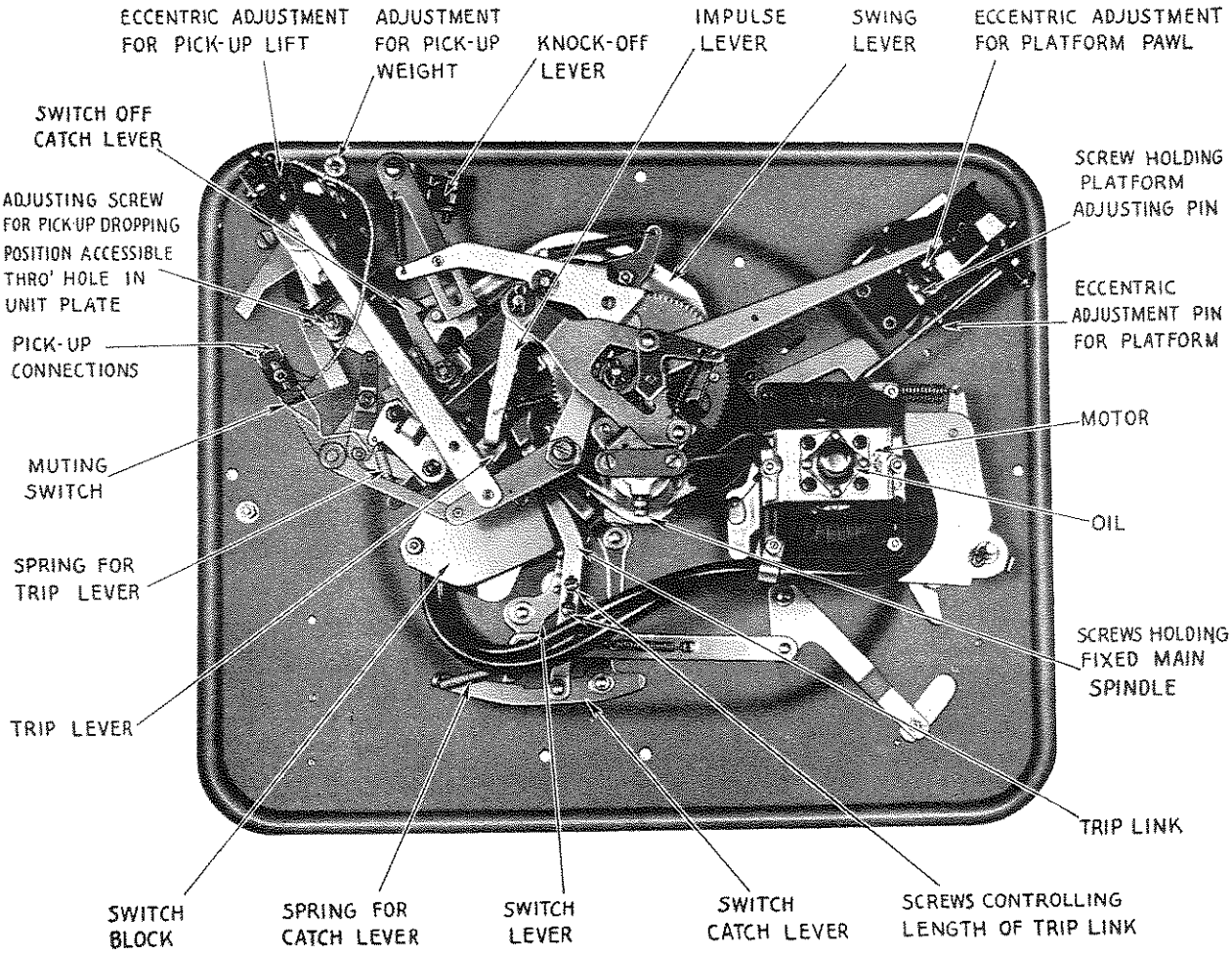


Fig. 13. Bottom View

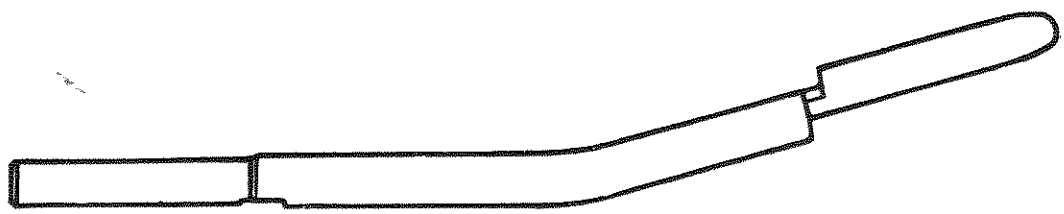


Fig. 14.

AUTO SWITCH (FINAL KNOCK-OFF)

Fails to switch off after last record has played.

First see that the knock off arm moves freely. Gently push it about 1" to the rear and it should easily return to its original position when released. If found to be tight, the cause is probably due to the vertical pillar having become bent, thus, tightening it up through the bush in the unit plate. To correct, observe which way the spindle is bent and gently bend it straight. If this is not successful, remove the spindle by unscrewing the knock off lever screw (Figure 9), in the lever under the unit plate and true it up in a lathe. After replacing, set as described in paragraph, "7-inch records drop but pick-up arm does not leave rest to play them" which follows.

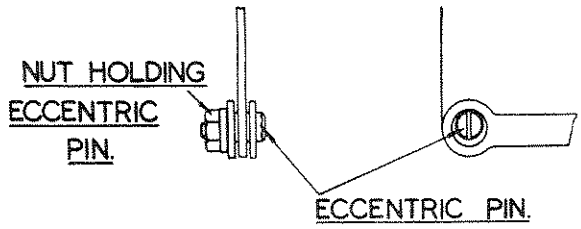


Fig. 15.

Another cause of failure to switch off is the switch catch lever and its associated levers (Figure 13) which may be sticky in operation. If this is the case, gently pry them away from the unit plate until they move freely.

Check that the position of the catch lever is correct. Sometimes on receiving a severe blow in transit the lever will jump out of position and the unit will not switch off. The correct position is shown on Figure 12. If out of position, lift the catch lever against the friction spring over the hexagon nut which, in addition to holding the bridge plate, acts as a stop for the catch lever.

7" records drop but pick-up does not leave rest to play them.

This condition is due to incorrect setting of the knock off arm. To correct this fault the changer must be operated and allowed to switch itself off. The pick-up arm should now be on its rest. Measure the distance from the center of the turntable to the bent up part of the switch off arm - this should be 6-1/4". (Figure 16). If this dimension is found to be incorrect, loosen the knock off lever screw, (Figure 9) hold the knock off pillar, and whilst holding the knock off lever under the plate, turn the knock off arm to its correct position and re-tighten the screw.

PICK-UP OPERATION

MUTING SWITCH

A pick-up muting switch is connected across the pick-up to short circuit the pick-up except when the changer is in the playing position. It is important to note that no sound will be obtained from the pick-up by flicking the needle when the pick-up is on its rest. The muting switch contacts should be closed except when the changer is in its playing position.

Should no sound be heard in the amplifier when the pick-up is traversing a record, first examine the muting switch contacts which should be set as shown on Figure 12.

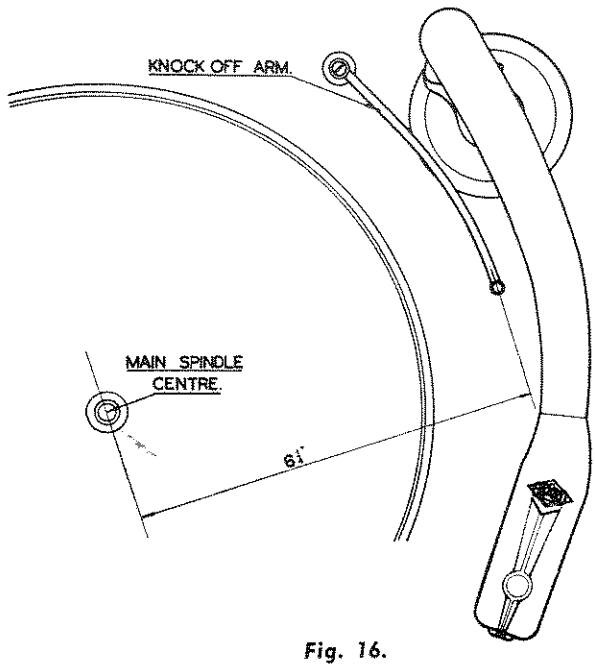


Fig. 16.

The contacts are shown open with the changer in the playing position. The gap should be 1/32" and the contacts should close soon after the changing cycle commences and remain closed until after the pick-up has landed on the next record. Contact Spring "A" on Figure 12, should be bent to obtain the correct gap setting.

Should noise be heard through the reproducer while the changing cycle is taking place, this indicates that the muting switch is not operating. Examine the contacts and set as described in previous paragraph and Figure 12. Clean the springs at their point of contact being careful not to bend them out of position.

PICK-UP WEIGHT ADJUSTMENT

When playing LP records, the weight of the pick-up is very important and should be between 6 and 8 grams. It is advisable after making any adjustment to the changer, to check the pick-up weight with a stylus pressure gauge when the changer is again set up to operate and make the adjustment if required. The pick-up weight adjustment screw is shown in Figure 11. Adjustment can be made by turning the knurled knob if the underside of the changer is accessible. Alternately, adjustment can be made from above the changer by inserting a screwdriver through the slot at the rear of the pick-up arm base, locating it in the screw slot at the top end of the adjusting screw.

PICK-UP DOES NOT TRACK

Should trouble be experienced with the pick-up failing to track correctly, i.e. it jumps out of, or has a tendency to rise in the record groove (the latter condition would cause a "bubbling" type of distortion), first see that the pick-up weight is correct with the L.P. pick-up in position. The weight should not be less than 6, nor more than 8 grammes. See that the pick-up arm pivots are free and that the pick-up lead is not strained or caught up where it leaves the pick-up arm. The changer must be floating freely on its suspension springs otherwise the slightest vibration such as walking across a room, can cause the pick-up to jump and skid across an L.P. record. In the case of persistent jumping the stylus point should be suspected and a new one tried.

If the pick-up jumps out of record groove when nearing center of record although the first part of the record has played correctly, remove the turntable and examine the clearance between the pick-up lever, friction plate and unit plate. (Figure 7). Pry the levers upwards to ensure adequate clearance and also see that the top of the roller on the other end of the pick-up lever underneath the unit plate, is not rubbing on the unit plate.

PICK-UP REMAINS ON REST

This is due to the rivet head of the roller pin on the swing lever catching up under the bridge plate, (Figure 12). This can be cured by prying the swing lever so that it cannot catch up.

PICK-UP DROPPING POSITION

The pick-up dropping position is factory set for optimum accuracy. Should any minor adjustment be required, rotate the pick-up dropping adjusting screw accessible through a hole in the unit plate as shown on Figure 6. Adjustment must be made only when the pick-up arm is on its rest. If the pick-up arm has been strained beyond the scope of the previous adjustment, first set this adjustment in its center position, then loosen the pick-up lever clamping bolt, (Figure 11). While holding the pick-up lever move the pick-up arm the required amount then tighten the bolt and make the final adjustment with the pick-up arm adjusting screw.

NOTE: The nut on the end of the hexagon bolt referred to is keyed on the clamp and cannot be turned.

Should the pick-up tend to wander while lowering onto a record, first check the pick-up lead and make sure that it is not biasing the movement of the pick-up arm, also examine the pick-up lifting pads, (Figure 11). The lower pad is felt and pushes against the top one which is leatheroid. The friction between these two pads holds the pick-up arm steady while being raised or lowered. These pads must be left dry and on no account lubricated. Should one of the pads become unstuck from its plate, refix with glue or if the friction does not seem sufficient to hold the pick-up arm steady, set the changer in the playing position and insert a thin rough file between the pads and rough up the face of the leatheroid pad.

PICK-UP LIFT

The amount the pick-up lifts can be adjusted by loosening the nut securing the Eccentric Adjustment for Pick-up Lift, Figure 13, and adjusting the eccentric pivot with a screwdriver in the slot, finally re-tighten the nut. This eccentric adjustment is shown in detail on Figure 15.

Should insufficient adjustment be obtained by means of the Eccentric Adjustment, a further adjustment may be made with the eccentric hexagon nut which is the pivot of lever 71 on Figure 19. To make this adjustment, hold the hexagon nut with a wrench and loosen the screw holding it. Turn the nut in the required direction to raise or lower the pick-up and tighten the screw. Final adjustment can be made as described in the preceding paragraph.

MOTOR

Should the motor be suspect, check the stator coil resistance. Each coil should be 230 ohms, giving a total reading of 460 ohms, if connected for 200/250 volts, or 115 ohms, if connected for 100/130 volts. The total resistance can be checked at the main terminals with the changer switched on, make sure that the main supply is disconnected. Should the coils be at fault, they should be replaced. To do this first remove the two screws holding the main terminal block in position then, after removing the driving belts, undo the three nuts holding the motor and the motor can be withdrawn complete with the terminal block. Now undo the two nuts holding the top and bottom bearings together then remove them and the rotor. To remove the coils, carefully tap out the 4 small brass pins which hold the poles of the stator in position. When these pins are removed the pole pieces can be pushed out complete with coil which can then be replaced. When disconnecting the faulty coil, note the connections in the terminal block so that the new coil can be replaced in the same way.

SERVICE PARTS LIST
Fig. 17

Number on Fig. 17	Cross Reference	Description	Hallicrafters Part Number
1	A 40218	Screw fixing pawl unit.	121-517
	A 42527	Spring washer.	121-588
2	A 48501	Separator.	121-676
3	A 48502	Retaining plate.	121-677
4	A 41604	Spring.	121-569
5	A 48480	Record spindle complete.	121-665
6	A 40130	Screw fixing spindle top.	121-511
7	A 48481	Support, with spindles and operating collars.	121-666
	A 48487	Support only.	121-667
8	A 48488	Support spindle, with operating spindle and collars.	121-668
	A 48489	Support spindle only.	121-669
9	A 48490	Operating spindle.	121-670
10	A 48491	Operating collar.	121-671
11	A 48492	Pin fixing operating collar.	121-672
12	A 45087	Spring clip.	121-599
13	A 48494	Record center.	121-673
14	A 48491	Operating collar.	121-671
15	A 48492	Pin fixing operating collar.	121-672
16	A 48506	Spindle top.	121-679
17	A 48496	Pawl, with spring pins.	121-674
18	A 48500	Pawl bushing.	121-675
19	A 48503	Crank, with pins	121-678

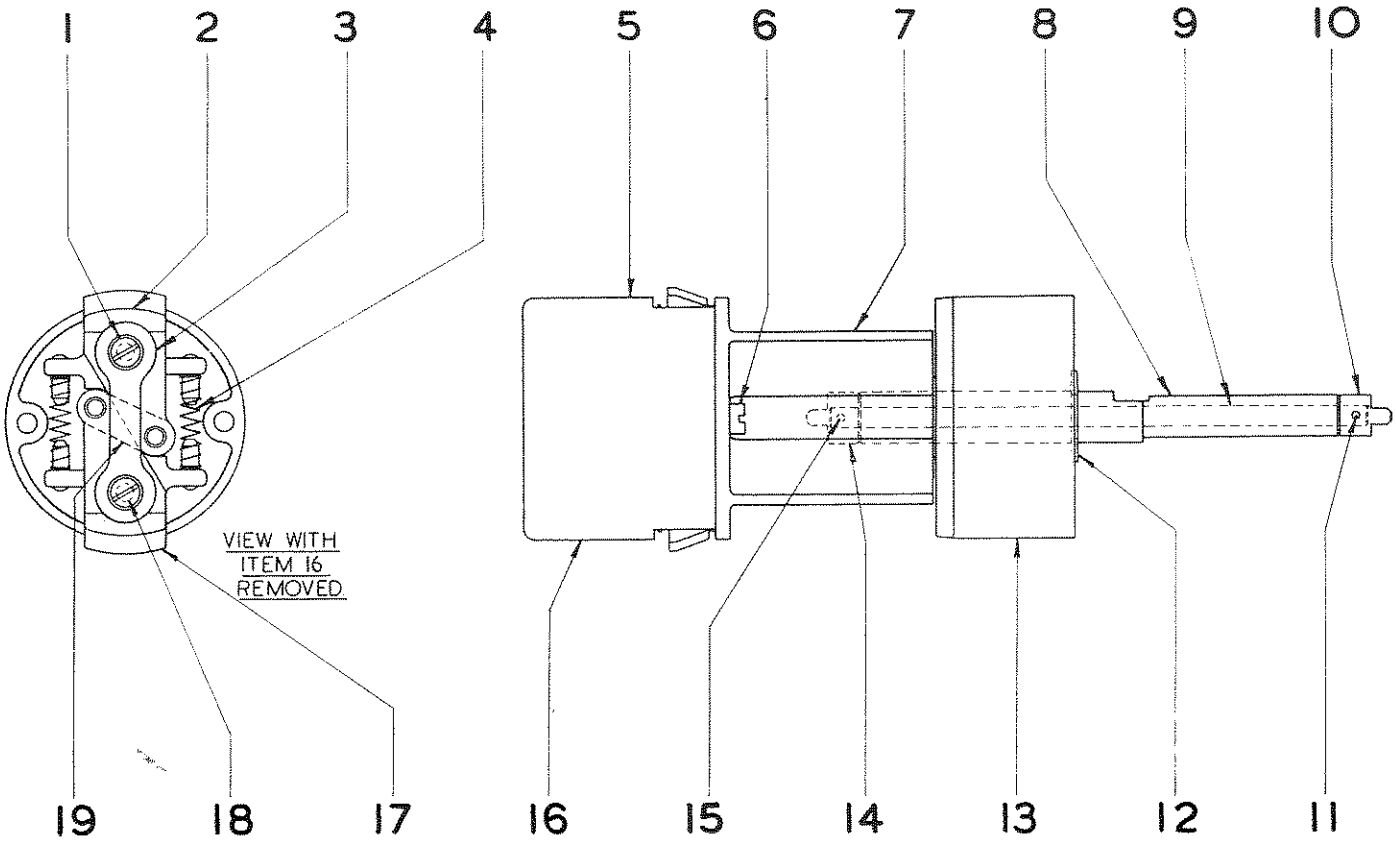
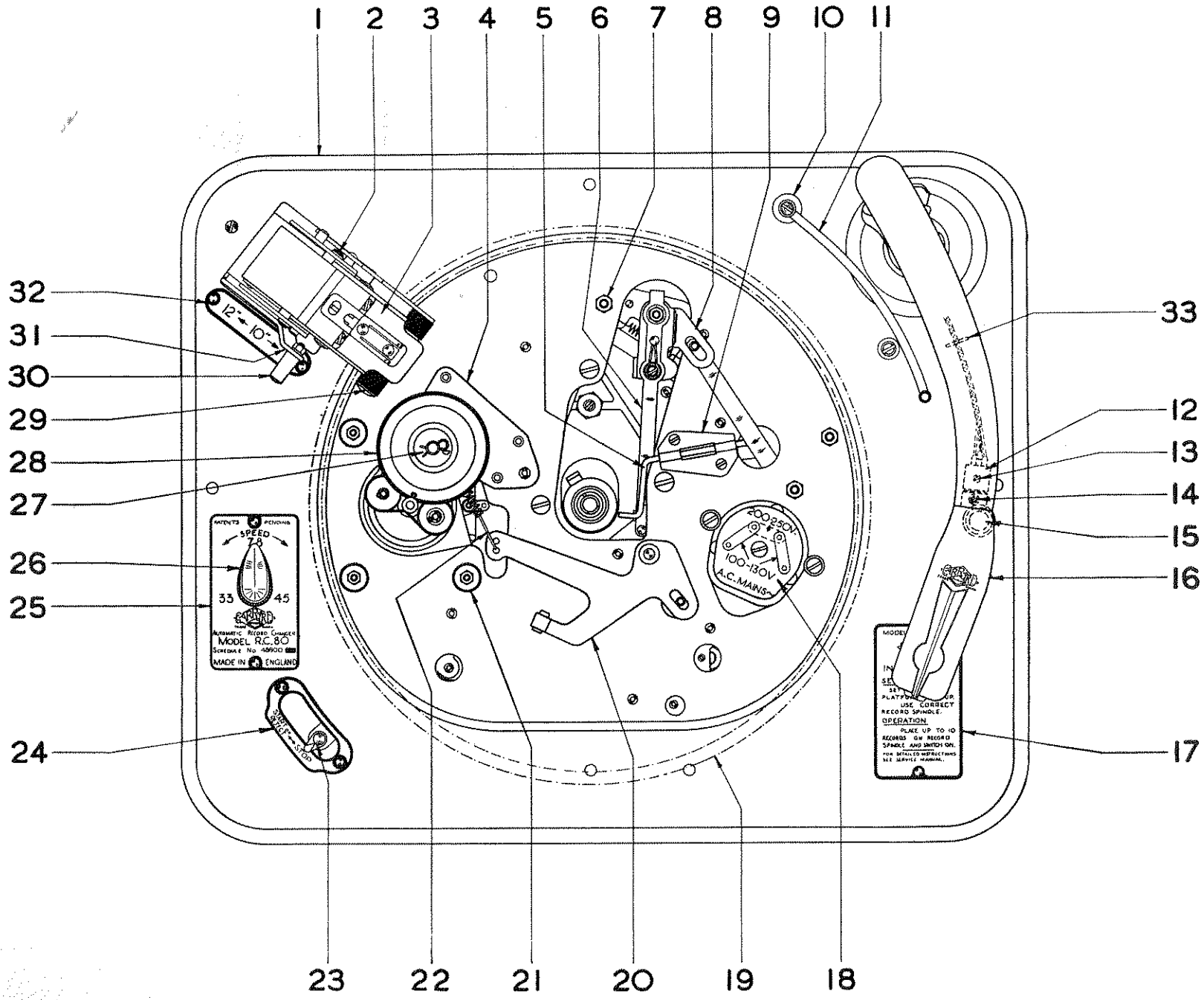


Fig. 17

SERVICE PARTS LIST
Fig. 18

Number on Fig. 18	Cross Reference	Description	Hallicrafters Part Number
1	C 48601	Unit plate assembly.	121-684
	C 48603	Unit plate only.	121-685
2	A 48666	Platform collar.	121-708
	A 42013	Rivet for platform collar.	121-580
3	A 48683	7" Platform, with pawl & friction plate.	121-718
	A 48684	7" Platform only.	121-719
	A 48685	7" Pawl.	121-720
	A 48934	Friction plate.	121-787
	A 42009	Rivet.	121-579
	A 45180	Collar.	121-602
4	A 48614	Support plate, with pivot pin.	121-695
	A 45161	Collar.	121-601
	A 40643	Washer.	121-543
	A 42005	Rivet.	121-577
5	A 48672	Trip rod.	121-712
6	A 48721	Operating lever, with spring clip & Felt pad.	121-742
	A 41625	Spring clip.	121-574
	A 42002	Rivet.	121-576
	A 48724	Pad clip.	121-743
	A 48834	Felt pad.	121-765
	A 48835	Friction pad screw with friction pad.	121-766
7	A 47153	Pillar.	121-629
	A 42501	Spring washer.	121-586
	A 41012	Nut.	121-555
8	A 48717	Friction lever, with bushing.	121-739
	A 48719	Collar (bottom).	121-740
	A 48720	Collar (top).	121-741
	A 47153	Pillar.	121-629
	A 42501	Spring washer.	121-586
	A 41012	Nut.	121-555
9	A 48673	Pivot plate.	121-713
	A 48833	Locking plate.	121-764
	A 40014	Screw.	121-502
10	A 48645	Knock-off bushing.	121-701
	A 41042	Nut.	121-559
11	A 48931	Knock-off arm.	121-785
	A 48932	Pillar.	121-786
	A 40309	Screw.	121-522
	A 48736	Rubber sleeve.	121-749
12	A 48991	Connector assembly, with pick-up lead (single).	121-792
	A 49315	Connector assembly, with pick-up lead (twin).	121-802
13	A 40267	Screw fixing connector.	121-519
14	A 40038	Screw fixing pick-up head.	121-507
15	A 47676	Pick-up rest.	121-642
	A 40515	Washer.	121-533
	A 42501	Spring washer	121-586
	A 41012	Nut.	121-555
16	A 49024	Pick-up head, plug in type (less cartridge)	121-794
	-------	Pickup cartridge (less dual needle assembly)	121A103
	-------	Dual needle assembly	121A104
17	A 48899	Instruction plate.	121-777
	A 42035	Rivet.	121-583
18	B 45473	Top cover for change-over block	121-607
	A 40045	Screw.	121-509
19	A 48743	Turntable, complete	121-754
	A 47060	Velvet disc, with eyelet	121-627
20	A 49256	Spring tension lever, with felt pad	121-798
	A 45064	Felt pad	121-598
	A 42006	Rivet.	121-578
	A 45210	Collar.	121-603
	A 40514	Washer.	121-532
21	A 46653	Rubber collar.	121-618
	A 46652	Rubber bushing.	121-617
	A 40560	Washer.	121-537
	A 41012	Nut.	121-555
22	A 41614	Spring.	121-570
23	A 47438	Knob.	121-638
	A 42527	Spring washer.	121-588
	A 41008	Nut.	121-554
24	A 48898	Control plate.	121-776
	A 42035	Rivet.	121-583
25	B 48703	Speed plate.	121-732
	A 42035	Rivet.	121-583
26	B 48762	Knob.	121-763
	A 40307	Screw.	121-521
	A 41004	Nut.	121-552
27	A 41560	Spring clip.	121-564
	A 40611	Felt washer.	121-540
	A 40614	Steel washer.	121-542
	A 40597	Presspahn washer.	121-538
28	A 46524	Inter wheel, with rubber ring.	121-611
29	A 48686	Record Arm, with weight and spindle.	121-721
	A 48689	Rubber sleeve.	121-722
	A 40504	Washer.	121-529
	A 41621	Spring clip	121-572
30	A 46909	Knob.	121-624
	A 42527	Spring washer.	121-588
	A 41008	Nut.	121-554
31	A 48657	Change-over lever, with bushing & roller.	121-705
	A 45271	Roller pin	121-604
	A 47981	Roller.	121-651
	A 40511	Washer.	121-530
32	A 48613	Instruction plate.	121-694
	A 42035	Rivet.	121-583
33	A 48264	Clip, retaining pick-up lead.	121-656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AUTOMATIC RECORD CHANGER
MODEL R.C.80
MADE IN ENGLAND
200-250V
100-130V
A.C. MAINS
USE CORRECT
RECORD SPINDLE.
OPERATION
PLACE UP TO 10
RECORDS ON RECORD
SPINDLE AND SWITCH ON.

Fig. 18

SERVICE PARTS LIST

Fig. 19

Number on Fig. 19	Cross Reference	Description	Hallicrafters Part Number
34	A 48709	Catch lever.	121-734
35	A 41508	Knock-off spring.	121-563
36	A 48734	Knock-off link.	121-747
	A 45161	Collar.	121-601
	A 40514	Washer.	121-532
	A 42005	Rivet.	121-577
37	A 48731	Knock-off lever, with knock-off cam lever & link.	121-745
	A 48735	Knock-off lever only.	121-748
	A 40018	Screw.	121-503
	A 40504	Washer.	121-529
	A 41006	Nut.	121-523
	A 47277	Impulse lever, with bushing.	121-634
39	B 48607	Selector lever, with link, inter selector lever & platform selector lever.	121-689
	A 48608	Selector lever, with pin only.	121-690
	A 45210	Collar.	121-603
	A 40514	Washer.	121-532
	A 42006	Rivet.	121-578
40	A 48732	Knock-off cam lever, with bush.	121-746
41	A 48610	Selector link.	121-691
42	A 48712	Swing lever, with bushing, pin & roller.	121-736
	A 47981	Roller.	121-651
	A 45271	Roller pin.	121-604
	A 40511	Washer.	121-530
43	A 41506	Spring for impulse lever	121-562
44	A 41600	Cam spring.	121-567
	A 42014	Rivet.	121-581
45	A 46549	Cam stud, with washer.	121-615
	A 41029	Nut.	121-556
	A 40612	Washer.	121-541
46	A 41508	Spring for swing lever.	121-563
47	A 48705	Bridge, with pivot pins.	121-733
48	A 41560	Spring clip.	121-564
	A 40514	Washer.	121-532
49	A 41576	Segment spring.	121-565
	A 46543	Stud.	121-614
	A 47285	Tension pin.	121-637
50	A 48611	Inter. selector lever.	121-692
51	A 40023	Screw.	121-504
	A 40515	Washer.	121-533
	A 47594	Collar.	121-639
	A 42501	Spring washer.	121-586
	A 41012	Nut.	121-555
52	A 41560	Spring clip.	121-564
	A 40504	Washer.	121-529
53	A 48643	Platform selector lever.	121-699
	A 45210	Collar.	121-603
	A 40514	Washer.	121-532
	A 42006	Rivet.	121-578
54	A 46539	Segment, with pin.	121-612
	A 46542	Segment stud.	121-613
55	B 48647	Cam unit complete, with gear assembly.	121-702
56	C 48751	Motor model D18.	121-756
57	B 48605	Control lever, with switch link & switch lever.	121-687
	A 48606	Control lever only.	121-688
	A 45180	Collar.	121-602
	A 40516	Washer.	121-816
	A 42009	Rivet.	121-579
58	A 48737	Center cam lever, with center lever, link & center spindle unit.	121-750
	A 48738	Center cam lever, with bushing only.	121-751
	A 45210	Collar.	121-603
	A 40514	Washer.	121-532
	A 42006	Rivet.	121-578
59	A 48740	Center link.	121-752
60	A 48748	Center lever, with spindle.	121-755
61	A 40155	Screw fixing fixed spindle (long).	121-513
	A 40317	Screw fixing fixed spindle (short).	121-524
62	A 48612	Reject lever.	121-693
63	A 47158	Switch link.	121-630
64	A 41602	Spring for switch link.	121-568
65	A 47261	Catch lever, with trip link extension.	121-632
	A 46972	Catch lever only.	121-625
	A 47683	Collar.	121-643
	A 40516	Washer.	121-816
	A 42009	Rivet.	121-579
66	A 47282	Trip link extension.	121-635
67	A 41503	Spring for catch lever.	121-561
68	A 49254	Switch lever, with insulator & contact.	121-797
	A 45180	Collar.	121-602
	A 40516	Washer.	121-816
	A 42009	Rivet.	121-579
69	A 45476	Insulating plate for change-over block.	121-609
70	A 47264	Trip link.	121-633
	A 40031	Screws.	121-506
	A 47283	Collar (large).	121-636
	A 45210	Collar (pivot).	121-603
	A 40514	Washer.	121-532
	A 42048	Rivet.	121-584
71	B 48701	Lifting lever, with lifting link, connecting link & muting switch lever.	121-730
	A 48702	Lifting lever, with pin only.	121-731
	A 45161	Collar.	121-601
	A 40514	Washer.	121-532
	A 42006	Rivet.	121-578
	A 40027	Screw.	121-505
	A 42520	Spring washer.	121-587
	A 40512	Washer.	121-531
	A 45283	Collar.	121-605
72	A 49028	Cam stop lever.	121-795
	A 42016	Rivet.	121-582
	A 49211	Collar.	121-796
	A 40697	Washer.	121-549
73	A 40215	Screw fixing change-over block.	121-516
	A 41012	Nut.	121-555
	A 42501	Spring washer.	121-586
	A 40501	Washer.	121-528
	A 41004	Lock Nut.	121-552
74	A 48910	Connecting link.	121-781
	A 45180	Collar.	121-602
	A 40516	Washer.	121-816
	A 42009	Rivet.	121-579
75	A 41506	Spring for cam stop lever.	121-562
76	A 48710	Trip lever, with bushing.	121-735
77	A 41602	Spring for trip lever.	121-568
78	A 48715	Inter lever, with bushing and roller.	121-738
	A 48714	Roller pin.	121-737
	A 47800	Roller.	121-645
	A 40511	Washer.	121-530
79	A 43311	Split pin for catch lever.	121-596
	A 40515	Washer.	121-533
	A 40504	Washer.	121-529
	A 41624	Spring.	121-573
80	A 48907	Switch plate, with pin.	121-779
81	A 48911	Muting switch lever, with pin & roller.	121-782
	A 48345	Roller pin.	121-663
	A 47939	Roller.	121-650
	A 40663	Washer.	121-545
	A 40504	Washer.	121-529
	A 41560	Spring clip.	121-564
82	A 40005	Screw fixing switch unit.	121-501
	A 41012	Nut.	121-555
	A 40501	Washer.	121-528
	A 42501	Spring washer.	121-586
	A 43000	Tag (upper).	121-589
	A 43021	Tag (lower).	121-590
83	A 48909	Switch block, with blades.	121-780
84	A 41506	Spring for pick-up lever.	121-562
85	A 48725	Setting lever, with bushing.	121-744
	A 40040	Screw fixing setting lever.	121-508
86	A 40183	Screw fixing pick-up base.	121-514

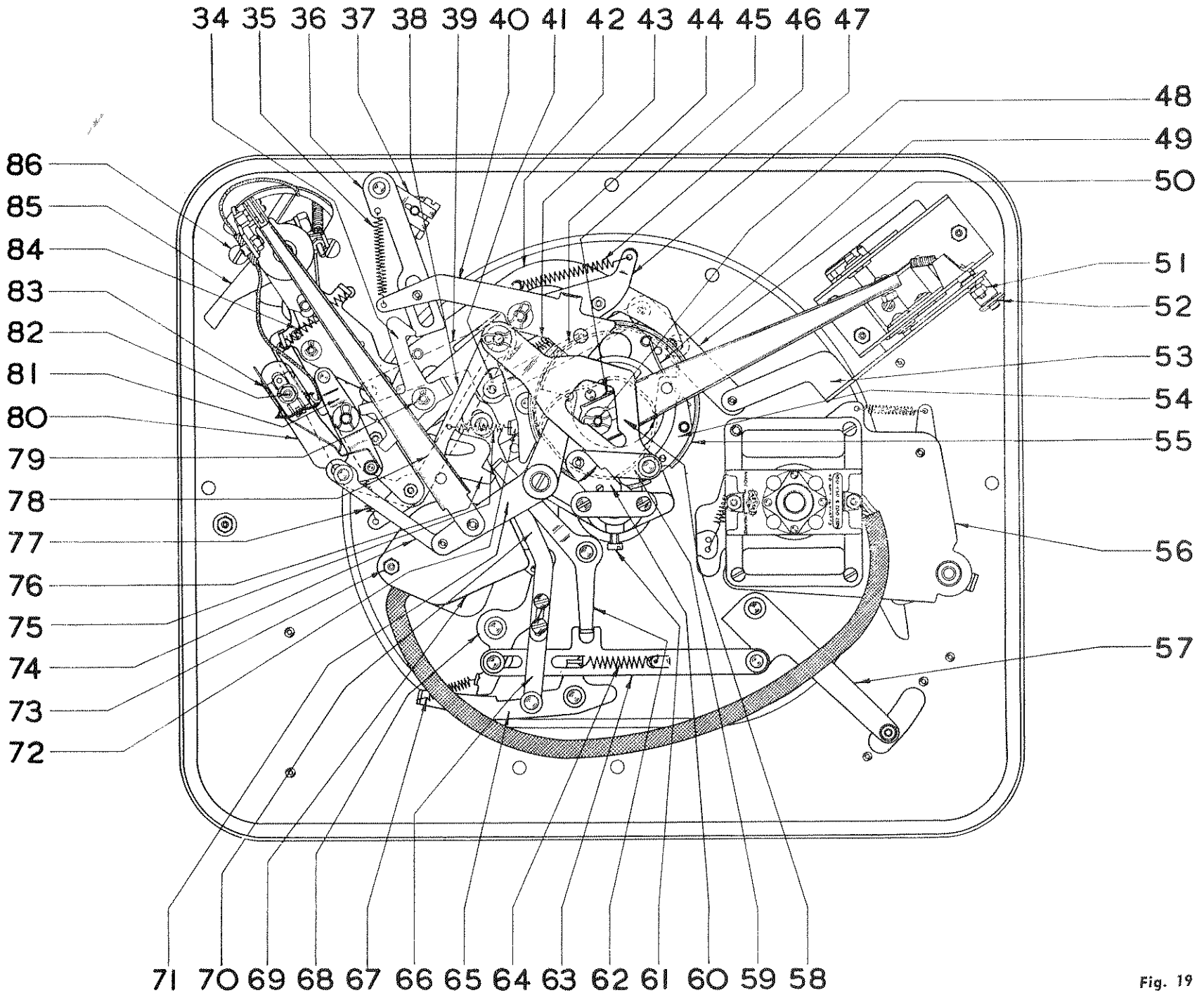
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Fig. 19

SERVICE PARTS LIST

Fig. 20

Number on Fig. 20	Cross Reference	Description	Hallicrafters Part Number
87	A 40333	Screw fixing pick-up arm bracket (long).	121-525
	A 42527	Spring washer.	121-588
	A 41008	Nut.	121-554
88	A 40253	Screw fixing pick-up arm bracket (short).	121-518
	A 40519	Washer.	121-534
89	A 48901	Bush.	121-778
90	A 48941	Pick-up arm bracket.	121-791
91	A 48694	Pick-up spindle, with pivot bracket.	121-725
92	A 46522	Thrust race.	121-610
	A 40558	Thrust washer.	121-536
	A 43200	Ball.	121-592
93	B 48691	Pick-up arm assembly, with pick-up base and pick-up levers.	121-723
	B 48940	Pick-up arm, with pick-up arm bracket, bushings and screws.	121-790
	C 48693	Pick-up arm only.	121-724
94	A 46706	Pick-up base.	121-620
96	A 48644	Striker.	121-700
97	B 48741	Record spindle.	121-753
98	A 40027	Screw fixing main spindle housing.	121-505
99	A 40000	Screw fixing platform assembly.	121-500
	A 42501	Spring washer.	121-586
	A 41012	Nut.	121-555
100	B 48662	Platform assembly, with 7" platform, pawls & operating lever.	121-706
	A 48663	Platform, with studs only.	121-707
101	A 48678	Pawl, with pin.	121-716
	A 48681	Stud, fixing pawl.	121-717
102	B 48654	Platform bracket and lever assembly.	121-703
	A 48668	Platform lever with stop pin.	121-710
103	A 41503	Spring for pawl.	121-561
104	A 48667	Platform link.	121-709
	A 45210	Collar.	121-603
	A 40514	Washer.	121-532
	A 42006	Rivet.	121-578
105	A 48674	Operating lever, with pawl and spring.	121-714
	A 48675	Operating lever only.	121-715
	A 40000	Screw fixing operating lever	121-500
106	A 48939	Pivot spindle.	121-789
107	A 48655	Platform bracket, with pivot stud.	121-704
108	A 41506	Spring for locating lever.	121-562
109	A 48671	Locating lever.	121-711
110	A 46733	Eccentric pin.	121-622
	A 42501	Spring washer.	121-586
	A 41012	Nut.	121-555
111	A 46735	Coupling link.	121-623
112	A 48640	Main spindle, with bearings.	121-698
113	A 40713	Bevel-edged steel washer	121-550
	A 49606	Bakelite cage for balls	121-817
	A 43201	3/32" dia. steel ball.	121-593
	A 40721	Plastic washer	121-551
114	A 48923	Center plate.	121-784
115	A 40023	Screw fixing center plate	121-504
116	A 48652	Fixed spindle with retaining coil.	121-818
	A 45372	Retaining coil.	121-819
117	B 48637	Main spindle housing assembly, with main spindle and cam unit.	121-696
	B 48639	Main spindle housing only.	121-697
118	A 48700	Pick-up selector lever.	121-729
	A 45210	Collar.	121-603
	A 40514	Washer.	121-532
	A 42005	Rivet.	121-577
119	A 48697	Pick-up lever, with pick-up selector lever.	121-728
	A 48698	Pick-up lever only.	121-727
120	A 46989	Eccentric pin.	121-619
	A 41582	Spring.	121-566
	A 40515	Washer.	121-533
	A 43311	Split pin.	121-596
121	A 46728	Lifting link.	121-621
122	A 41618	Lifting spring.	121-571
123	A 41506	Spring for lifting crank.	121-562
124	A 47609	Lead plate.	121-640
	A 40146	Screw fixing lead plate.	121-512
	A 42501	Spring washer.	121-586
	A 40515	Washer.	121-533
	A 47594	Collar.	121-639
	A 41012	Nut.	121-555
125	A 49598	Pickup weight adjusting unit complete with bracket, lever, screw, nut, knob, and tag.	121-804
	A 49599	Adjusting bracket only	121-820
	A 49601	Adjusting lever only, with pin	121-805
	A 42009	Rivet.	121-579
	A 45180	Collar.	121-602
	A 40516	Washer.	121-816
	A 40367	Screw.	121-527
	A 41045	Square nut.	121-560
	A 49602	Knob.	121-806
	A 49603	Pin for fixing knob	121-807
	A 43022	Tag for lead	121-591
	A 48913	Sleeve for lead.	121-783
126	A 49605	Link for spring.	121-809
127	A 48992	Pickup lead (Single).	121-793
	A 49282	Pick-up lead (Twin).	121-800
128	A 46733	Eccentric pin.	121-622
	A 42501	Spring washer.	121-586
	A 41012	Nut.	121-555
129	A 49263	Lifting crank, with disc & bracket.	121-799
	A 40609	Felt washer.	121-539
130	A 46597	Lifting spindle, with lifting plate & leatheroid washer.	121-616
131	A 40185	Screw.	121-515
	A 40612	Washer.	121-541
	A 41030	Nut.	121-557
132	A 41508	Counterbalance spring.	121-563
133	A 48696	Pivot spindle.	121-726
134	A 40038	Screw fixing pivot spindle.	121-507
135	A 49604	Anchor plate.	121-808
		SPRING MOUNTING PARTS	
136	------	Screw.	121-810
137	------	Spring washer.	121-811
138	------	Nut.	121-812
139	------	Suspension spring.	121-813
140	------	Triangular washer	121-814
141	------	Nut.	121-815

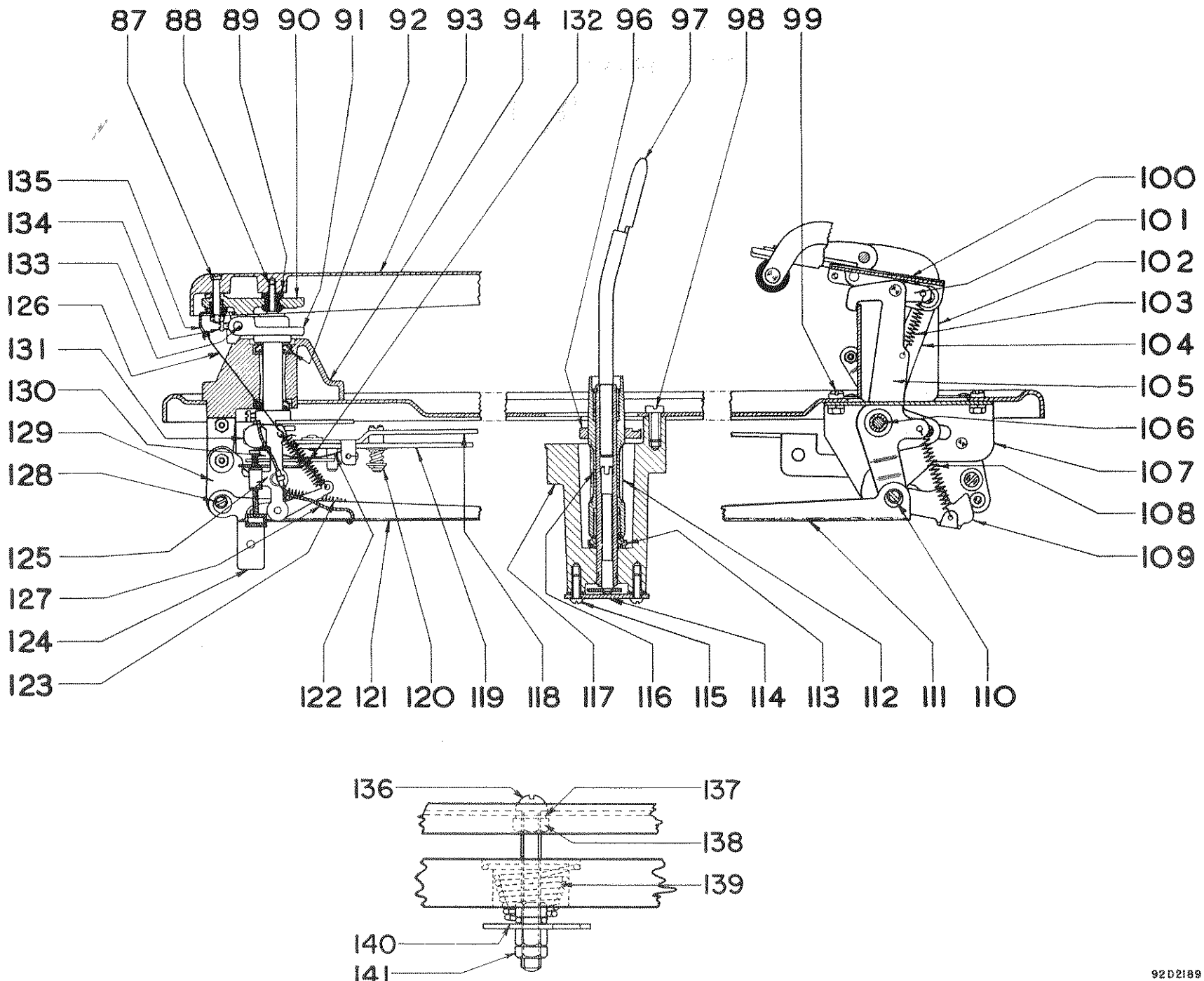

Fig. 20

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SERVICE PARTS LIST

Fig. 21

Number on Fig. 21	Cross Reference	Description	Hallicrafters Part Number
1	A 47770	Coil, with leads	121-644
2	A 48346	Stator complete with coils.	121-664
	A 45359	Dowels.	121-606
	A 48312/3	Pole Pieces (pair).	121-659
	A 48310	Starting Bands.	121-658
	A 47667	Coil shields.	121-641
	A 48317	Stator pack, with starting bands only.	121-660
3	A 47667	Coil shield.	121-641
4	A 49297	Earthing lead with tags	121-801
	A 45141	Rubber Sleeves.	121-600
5	A 48756	Pulley plate complete with pulley spindles, link and control spindle assembly.	121-760
	A 48757	Pulley plate, with pulley spindles only.	121-761
6	A 47829	Plastic tubing.	121-646
7	A 48243	Change-over block assembly.	121-655
7a	B 47128	Change-over block moulding only.	121-628
7b	B 45473	Top cover.	121-607
7c	A 40045	Screw fixing top cover.	121-509
7d	A 45475	Bar connector.	121-608
7e	A 40644	Cup washer.	121-544
7f	A 45476	Insulating plate	121-609
7g	A 47874/6	Brackets with contact springs (pair)	121-648
8	A 43308	Split pin	121-595
9	A 40683	Steel washer for 45 r.p.m. pulley	121-547
10	A 40689	Presspahn washer for 45 r.p.m. pulley	121-548
11	A 48858	Pulley, with bearings - 45 r.p.m.	121-773
12	A 48852	Bushing for pulley plate.	121-772
13	B 48321	Motor cover (bottom), complete with bearing, spring plate, felt washer, thrust plate and rivets	121-661
	A 48096	Motor cover - casting only	121-652
14	A 40541	Felt washer	121-535
15	A 48129A	Spring plate.	121-653
16	A 47015	Rotor bearing.	121-626
17	A 43207	Thrust ball.	121-594
18	A 48232	Thrust plate.	121-654
19	A 42073	Rivet.	121-585
20	A 47837	Fan, with bushing.	121-647
	A 40113	Screw, fixing fan.	121-510
21	A 47209	Stud fixing motor covers.	121-631
22	A 41012	Nut.	121-555
23	A 42501	Spring washer.	121-586
24	A 41560	Spring clip.	121-564
25	A 48604	Bushing for mounting plate.	121-686
26	A 48886	Distance piece.	121-775
27	B 48322	Motor cover (top), complete with bearing, spring plate, felt washer, top bearing cover and rivets.	121-662
	A 48096	Motor cover - casting only	121-652
28	A 48290	Top bearing cover.	121-657
29	A 47894	Clip, retaining lead.	121-649
30	A 49329	Motor pulley - 40 cycles.	121-803
	A 48595	Motor pulley - 50 cycles.	121-683
	A 48594	Motor pulley - 60 cycles.	121-682
31	A 48592	Rotor complete, with spindle.	121-681
32	A 40339	Screw fixing pulley.	121-526
33	A 40688	Presspahn washer for 33-1/3 r.p.m. pulley.	121-546
34	A 40511	Steel washer for 33-1/3 r.p.m. pulley.	121-530
35	A 48861	Pulley with bearings - 33-1/3 r.p.m.	121-774
36	A 40306	Stud fixing motor.	121-520
37	A 41041	Nut.	121-558
38	A 48849	Stud fixing link to control lever.	121-769
39	A 48851	Index lever.	121-771
40	A 48846	Control lever, with bushing.	121-767
41	A 48761	Control spindle, with control lever, bushing and pin.	121-762
42	A 43312	Pin, fixing control lever.	121-597
43	A 48581	Rubber belt.	121-680
44	A 48850	Stud, fixing link to pulley plate.	121-770
45	A 48848	Link.	121-768
46	B 48752	Mounting plate assembly complete, with levers, pulleys and bushing.	121-757
	B 48753	Mounting plate, with levers and bushing only.	121-758
	A 48754	Mounting plate, with bushing only.	121-759
47	A 41627	Spring.	121-575
48	A 42006	Rivet.	121-578
	A 45210	Collar.	121-603
	A 40514	Washer.	121-532

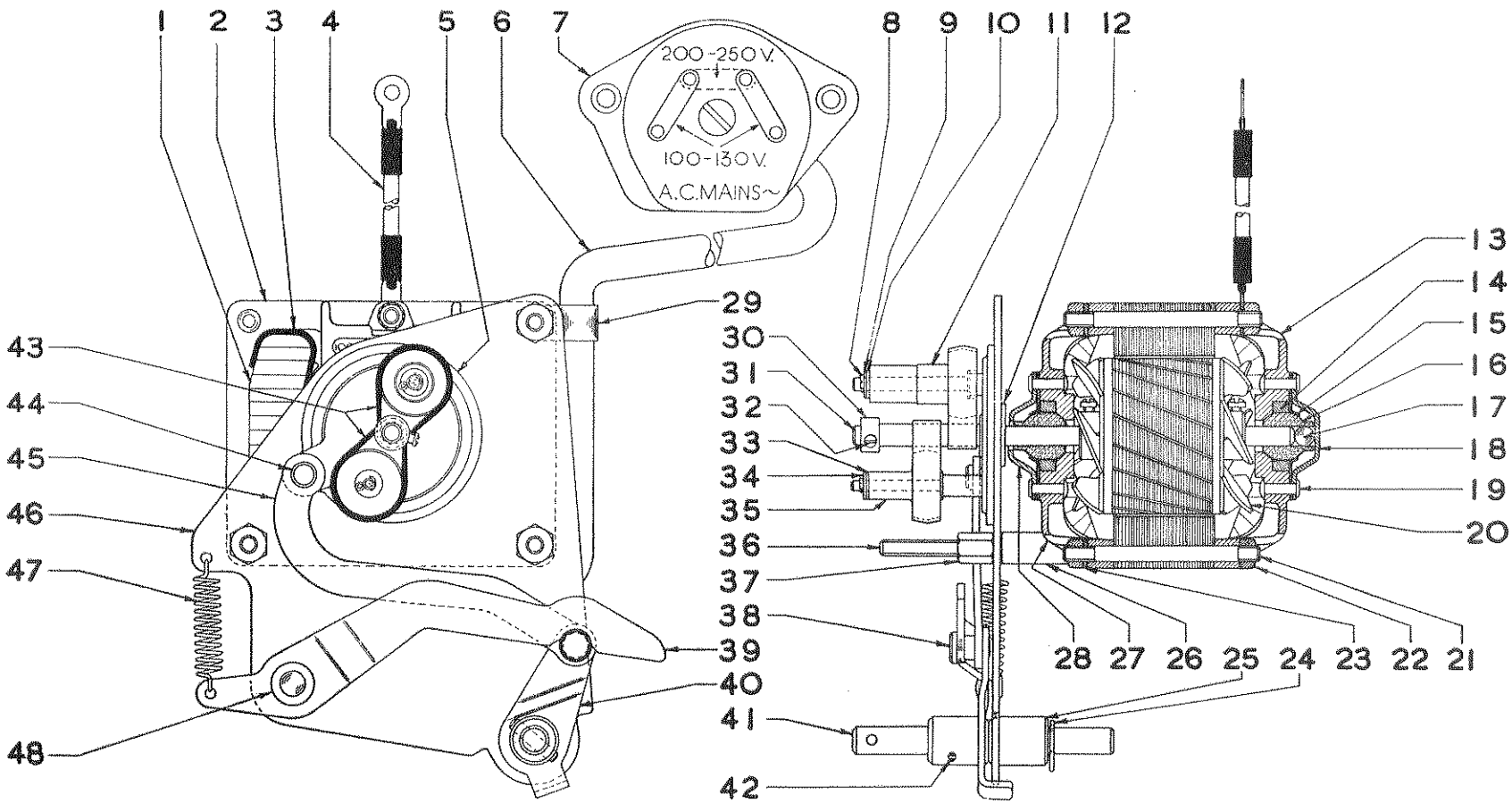
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Fig. 21

hallicrafters

MANUFACTURERS OF RADIO, TELEVISION, AND ELECTRONIC EQUIPMENT

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