COLLARO MODEL RC 49
AUTOMATIC RECORD CHANGER

FOREWORD

Before proceeding to give detailed instructions for adjustment and maintenance, it is proposed to give a brief description of the method of working of the machine, with the object of giving the service engineer, or the more mechanically interested user, a complete understanding of the function performed by each and every working part. Where it is found in this preliminary description that little or no detail is given of the function performed by a particular part or group of parts, full details will be found under the appropriate section of the subsequent instructions.

An attempt has been made to make all the matter contained in this booklet easily understandable by the non-technical reader, and wherever possible each point has been clarified by reference to the illustrations. The numerical references are arranged in sequence in a clockwise direction around each illustration, and the illustrations are grouped together so that the reader will have no difficulty in following closely the references encountered in the text.

Owing to a variation in thickness between British and Australian records, it has been found that a small modification to the slide fitted to the upper part of the record spindle, for the purpose of retaining the upper records while the lowermost record is pushed off the step in the spindle on to the turntable, is necessary to enable both English and Australian recordings of widely varying thickness to be played without failure or damage to the record.

The nature of the modification is indicated in drawing number 8, page 17. Modified parts from the Collaro factory are now available from Electronic Industries Imports Pty. Ltd., 670 Chapel Street, South Yarra, Melbourne, S.E.1. It should, however, as an emergency measure, be well within the scope of most service men to modify this part of the machine by filing approximately to the shape indicated in the drawing.

To remove the slide, remove the small screw in the top of the spindle and withdraw the ferrule. A small spring and pad will be found in the centre bore of the upper part of the spindle, and in the majority of cases it will be found that these do not spring upwards out of the spindle when the ferrule is removed, owing to the pad catching in the threads cut by the screw. The slide, however, may be removed quite easily leaving the spring and pad "in situ" by lifting the pad about ⅛" and then withdrawing it sideways and downwards. When replacing the slide it will probably be necessary to lift the bottom of the spring slightly with a pin or piece of wire so as to ensure that it is properly located without damage within the forked end of the slide. Replace the ferrule and make certain that the slide works up and down in its slot absolutely freely. This is vitally important, as if the slide tends to stick this may result in as many as 4 records dropping at once. Stickiness of the slide may be due to the forked end having been accidentally splayed open, to a damaged or improperly located spring, to foreign matter in the slot or ferrule, or to burrs or other accidental damage to the slide arising during the modification by filing. When replacing the securing screws in the top of the spindle, turn it lightly backwards until it is felt to pick up the original thread cut in the spindle, and then tighten up firmly but carefully, avoiding over-tightening which may strip the thread.

Attempts to use the changer in its existing form with the thicker Australian records may have resulted in the record dropping mechanism having become strained out of adjustment, so that it will no longer work satisfactorily even with English records. In this connection it must be remembered that an unduly enlarged or otherwise damaged centre hole in a record may be the cause of that record failing to drop or dropping out of turn, and this possible cause should always be investigated before any other. Badly warped records are unlikely to cause failure in this respect, but their use should be avoided as the drive of the turntable will not be satisfactorily transmitted to them and slip will inevitably occur, with resultant "wow."

METHOD OF WORKING

The change mechanism is driven by a rubber-tyred pulley (112) which engages with the rim of the Turntable. This pulley is carried on a spindle running in an "Oilite" bearing, with a small spur gear (40) cut on its lower end, the whole assembly being mounted on the Drive Pulley Mounting Plate (26) by means of the Retaining Clip (39). The Drive Pulley Mounting Plate (26) is pivoted about the Intermediate Gear Post (41) and the Drive Pulley is pulled into engagement with the Turntable Rim by the Spring (19), which is tensioned when the machine is switched on. The Drive Pulley is pushed out of engagement with the Turntable Rim by the Release Link (16) when the machine automatically switches off. A similar link and spring (109) and (110) are used in conjunction with the Idler Pulley (111) which transmits the rotation of the Motor to the Turntable. The purpose in both cases is to avoid the development of flats on the rubber tyres if the machine were left unused for long periods with the tyres pressed against the Turntable Rim or Motor Spindle Pulley. In the case of the Drive Pulley, the hold-off effected by the Link (16) is also employed to prevent the change mechanism being started unless there is at least one record on the step of the record spindle. The possibility of starting the machine without records and of the pickup needle being lowered, with consequent damage, on to the bare turntable, is thus avoided.

The spur gear (40) drives a train of gears clearly visible in Fig. 3, the final drive carrying the Auto-Trip Cam (25) and the Operating Cam (75) which rotates in the direction indicated by the arrow. When the Operating Cam has made one complete rotation, the Drive Pulley (112) is disengaged from the Turntable Rim by the niche in the Auto-Trip Cam (25) engaging with the Auto-Trip Pawl (24). The Operating Cam (75) is set in such a position on its spindle that when the change mechanism comes to rest in the above manner the Roller (74) attached to the Operating Quadrant (78) lies in the niche "A" in the Operating Cam, as shown in Fig. 4.

The change mechanism thus remains at rest, and the playing of the record proceeds until the mechanism is again set in motion by the Auto-Trip Pawl (24) being tripped out of engagement with the Auto-Trip Cam (25), thus allowing the Drive Pulley (112) to re-engage with the Turntable Rim. This can be brought about in any one of three ways:—(i) By the Automatic Trip operated by the quick run-in at the end of each record. (ii) By operation of the "Reject" control. (iii) By operation of the "Stop" control.

The Roller (74) attached to the Operating Quadrant (78) is made to bear against the edge of the Operating Cam (75) by the spring (79), of which only one end is visible in Fig. 4. The Quadrant floats vertically on its pivot, its outer edge being supported by a roller mounted on the inside of the Bracket (77).

The rotation of the Operating Cam (75) causes the Operating Quadrant (78) first of all to rotate in the same direction as the Operating Cam, then to remain stationary while traversing the radial section of the Cam, and finally to return to its original position under the action of the spring (79). During the outward motion of the Quadrant (78) the Roller (60) rides up a ramp pressed in the Quadrant, resulting first of all in the Cantilever Weight (57) being lifted until stopped by contact of the screw (3) with a rubber pad on the under side of the Unit Plate, following which the pick-up head is lifted clear of the record by engagement of the forked end of the Pick-up Lift Lever (61) with the flange on the Pick-up Lift Tube (63). This tube carries the screened lead from the Pick-up Head to the Pick-up Terminal Tags mounted on the outer side of the Cover Plate. The Pick-up having been lifted off the record, the further outward movement of the Quadrant brings the Roller (81) to bear against the Pick-up Control Arm Finger (89), which is pivoted and spring loaded to the Pick-up Control Arm (88). This Arm pivots about the same centre line as the Pick-up itself, being carried on a hollow spigot mounted on the Cover Plate. The Pick-up Screened Lead passes through and clears the centre of this hollow spigot. The Pick-up Control Arm (88) is thus swung outwards, and carries the Pick-up with it by contact with the Pick-up Control Pillar (80). The Pick-up is moved clear of the records to a fixed outward stop, the purpose of the spring loaded finger (89) being to ensure that the Pick-up is moved fully to this stop without the necessity of fine adjustment.

During this sequence of operations the Operating Cam Peg (76) has engaged with the Positioning Cam Setting Lever (99) which in turn has moved the Positioning Cam Setting Slide (101) horizontally across the machine, re-setting the Positioning Cam (35) to the 10" position if a 12" record has just been played. The Positioning Cam will also have been lifted by the action of the Lever (7) engaging with a pin in the Pick-up Control Arm (88). It is retained in this lifted position by the Bias Trip Lever (32) and subsequently acts as a stop to the inward travel of the Pick-up. Further inward movement of the Pick-up is not permitted until the needle has been positioned on the outer edge of the record. The lifting of the Positioning Cam as the Pick-up is moved outwards also serves to close the Pick-up Muting Contacts (9), so that the Pick-up remains "dead" until after the needle has been positioned on the outer edge of the next record to be played.

The machine has now reached the stage for dropping the next record on to the Turntable, during which operation the Operating Quadrant (78) will remain stationary, since the radial section of the Operating Cam (75) will be traversing the Roller (74). The rising contour of the Operating Cam is now engaging the Roller (90) on one end of the Record Release Rocker (102), the peg in the other end of which transmits a horizontal movement to the Record Release Slide (42). The translation of this motion into the dropping of the next record is fully explained under Section VII "Record Dropping" in the subsequent instructions. In falling, the record, if 12" diameter, will contact the Record Gates (106) and the motion thus imparted to the right-hand gate is transmitted through the Link (38) to the Pawl (37), which is thus tripped out of engagement with the Positioning Cam (35) which rotates under the action of a spring to a setting suitable for 12" records. A 10" record does not contact the Record Gates (106) in falling, and the Positioning Cam remains set at the

10" position to which it was returned by the motion of the Positioning Cam Setting Slide (101) at the commencement of the change cycle.

The next record having dropped, the Operating Quadrant (78) is now permitted to rotate back towards its original position under the action of the Spring (79), as the Roller (74) is now traversing the falling contour of the Operating Cam (75). This first of all permits the Pick-up Control Arm (88) to be swung inwards under the action of the Spring (84), this in turn releasing the Lever (7) and leaving the Positioning Cam (35) free to fall clear of the path of the Pick-up Positioning Arm (33) as soon as the Bias Trip Lever (32) is released from engagement with the groove in the Positioning Cam Spindle (36). This takes place immediately after the needle has been positioned on the outer edge of the record. The inward movement of the Pick-up Control Arm (88) swings the Pick-up inwards under the action of the Friction Finger (86) until the Pick-up Positioning Arm (33) contacts the Positioning Cam (35). The strength of the friction is controlled by the Adjusting Nut (87), for the correct setting of which see Section V, "Biasing." The further inward movement of the Operating Quadrant results in the gradual lowering of the needle on to the outer edge of the record. As soon as the needle contacts the record, the Cantilever Weight (57) commences to fall, thus immediately dropping the Positioning Cam (35) from the path of the Pick-up Positioning Arm (33). This leaves the Pick-up free to move inwards, and should the record be of the older type which is not provided with a run-in groove on its outer edge, the drag of the record on the needle will be sufficient to bring the needle into the first playing groove, provided the machine is mounted reasonably level. At the same time the Pick-up Muting Contacts are opened. The playing of the record now proceeds until the cycle of operations is again set in motion, either automatically at the end of the record or by the operation of the "Reject" or "Stop" controls, which, together with the method by which a record is repeated, are fully described under their respective headings in the subsequent instructions.

SERVICE ADJUSTMENTS

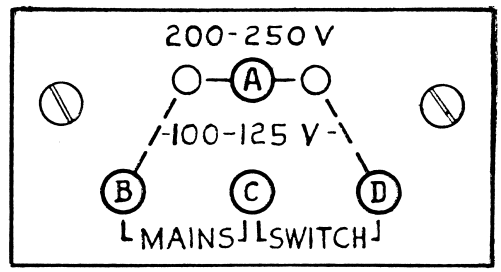
I. SPEED

The motor is of the constant speed induction type, and no governor or speed adjustment is provided. It is suitable for **A.C. Mains Supply Only** of from 100/130 and 200/250 volts at a frequency of 50 cycles per second. Separate pulleys for the motor spindles are available for 40 and 60 cycle supplies.

It is most important that the driving surface of the brass pulley on the motor spindle, the rubber tyre on the idler pulley, and the driven flange of the turntable, should be kept absolutely free from grease or oil. These surfaces should not be handled, and if slip is suspected, should be cleaned by wiping with a rag moistened with petrol or other suitable grease solvent.

II. MOTOR

Care must be taken to see that the motor is connected to suit the voltage of the supply mains (see illustration below). The motor should require no attention for a considerable period. When oiling is necessary (after about 3 years) the bearing bridges should be removed and soaked in light oil (three in one oil) for ten minutes. This will impregnate the felt washers and the oilite bearings. In the case of mis-placement of bearings due to accidental dropping, etc., the bearing bridges should be loosened and the rotor centralised. The gap between rotor and stator should be .010" to .014" all round and 2 feeler gauges .010" thick and about 1" wide should be inserted between rotor and stator while the bearing bridges are again locked up. It is MOST IMPORTANT that the bearing bridges should be locked up dead tight by means of the two bolts and nuts provided.



III. PICK-UP HEIGHT

The height to which the pick-up lifts is controlled by means of a stop screw and lock-nut (3 and 4). This stop screw bears against a small rubber pad attached to the under side of the unit plate.

To adjust correctly, stop the machine by hand and disconnect the Mains Supply at the point where the Pick-up has lifted completely and just commenced to swing outwards. After loosening the locknut (4) adjust screw (3) until the pick-up clears the underside of the next record by not more than $\frac{1}{8}$". Finally lock in position with locknut (4), reconnect mains supply and allow machine to switch off automatically.

IV. PICK-UP DROPPING POSITION

Two adjustments are provided; one (64) affecting both 10" and 12" positions and (82 & 83) affecting only 12" position.

Procedure for adjustment is as follows:—

Place 10" record on machine, start machine, and using hand as a brake on the Turntable, stop the machine at the point where the pick-up has reached the end of its inward travel, but has not commenced

eccentric head of the screw (30) having been lifted out of contact with the other end of the lever (32), and is held in engagement by the spring (34).

The screw (30) remains lifted until the pick-up needle contacts the record, when it commences to fall. In falling it again depresses lever (32) and disengages it from the groove in the positioning cam spindle (36), allowing the cam (35) to fall clear of the path of the pick-up positioning arm (33), and allowing the Pick-up Arm to move inwards.

Adjustment of this system is effected as follows:—

1. Set machine in switched-off position.

2. Adjust screw (8) and lock with nut so that the groove in positioning cam spindle (36) is lifted sufficiently to engage with the flattened end of lever (32). The lift imparted by the lever (7) to the spindle (36) should be only just sufficient for this purpose, and it should be possible to feel a little more upward movement of the spindle (36) by pushing with the finger.

3. Slacken locknut (6) and rotate screw (5) so that its eccentric head (30) is just clear (about .015" max.) of lever (32) and lock in position.

4. Place records on machine and start. If pick-up swings right into centre of record, then positioning cam is not being retained in lifted position by lever (32) and **either** adjustments 2 or 3 above, or both, are in error, **or** the bias trip lever (32) is not pivoted freely, and in consequence is not being pulled into engagement with the groove in spindle (36) by the spring (34). If pick-up positions on record correctly, but is not released on contact with the record, then adjustment 3 is probably in error. Recheck and if not at fault look for possible causes preventing positioning cam spindle (36) from dropping freely when released from engagement with lever (32). In this connection, see also remarks at end of penultimate paragraph of Section V. Another possible cause of the Positioning Cam (35) failing to drop clear of the Pick-up Positioning Arm (33) is wrong adjustment or accidental bending of the Muting Contacts (9). (See Section XVIII for correct adjustment.)

VII. RECORD DROPPING

An unduly enlarged, or otherwise damaged centre hole in a record may be the cause of that record dropping out of turn or failing to drop, and this possible cause should always be investigated before any other. Badly warped records are unlikely to cause failure in this respect, but their use should be avoided as the drive of the Turntable will not be satisfactorily transmitted to them and slip will inevitably occur, with resultant "wow."

If more than one record falls at a time, and the fault cannot be attributed to the foregoing, check that the Record Retaining Slide (91) is working freely up and down in the spindle. By unscrewing the screw in the top of the spindle, the ferrule may be removed and the slide (91) and its spring and spring-pad removed for examination. Clean in petrol, wipe out the slot in the top of the spindle and replace, lubricating with one drop of thin machine oil. Make certain there are no burrs or that the spring has not been damaged, thus preventing free movement of the slide.

If the machine fails to drop records, especially the lower ones of a full load, and the fault is not attributable to the records themselves, the record Release Push-rod Pad (93) may require adjustment. Proceed as follows:—

Unload the machine, and when returning the control knob to the centre position, place a small object (such as a match stick) across the top of one column so as to prevent the balancing arm falling completely. Remove the pick-up needle, or if a permanent needle is fitted, turn the Pick-up head over or fit the guard supplied with each High Fidelity Pick-up, since a permanent needle should never be disturbed until it is discarded. The machine may now be started without any records being on the spindle. Using the hand as a brake on the Turntable, stop the machine at the exact point where the Record Selector Pawl (92) reaches the extreme of its sideways movement. Disconnect the mains supply with the machine held in this position. The left-hand top corner of the Selector Pawl (92) should now be projecting just beyond the edge of the step in the record spindle, and it should not be possible to push the Selector Pawl (92) downwards into the spindle other than by exerting considerable pressure (about 10 lbs.). If the Pawl is easily pushed downwards, the machine will probably fail to drop the bottom records of a full load, particularly if the records are new. To effect adjustment, first return machine to switched-off position by re-connecting mains supply and operating "Stop" control; then unscrew the record spindle from the machine (see Section XV) and unscrew the brass pad (93) on the bottom of the push rod a small amount (say ½ turn) after first loosening the small locking nut. Re-tighten locknut and screw spindle home, not omitting to replace the Turntable retaining washer (107) under the shoulder in the spindle, as its omission would affect the adjustment. Repeat until a satisfactory adjustment is obtained. Do not overdo this adjustment or it may result in the mechanism locking up solid, in overstraining certain parts of the machine, or in the Selector Pawl (92) failing to return fully after dropping a record.

The need for making this adjustment when records are failing to drop is probably the best determined by the following procedure:—Unload the machine, disconnect mains supply, load with eight 12" records, move control knob as if to start machine, then push Record Release Slide (42) firmly by hand towards the centre of the machine. If it is possible by this means to drop the records one after another, then it is probable that the above adjustment will cure the defect. After carrying out this operation, it will be necessary to reconnect the mains supply and allow the machine to switch off automatically before the Control Knob can be moved to the "Unload" position.

When properly adjusted, then after dropping the bottom record of a full load, the remaining stack of records will be left supported on the Selector Pawl (92), and then lowered gently on to the step in the Spindle.

Another possible cause of records failing to drop is that the Record Release Slide Pawl (45) is not engaging with the peg (44) in Record Release Lever No. 2 (54). This may be due to weakness or displacement of the Spring (43), or to the Pawl (45) being stiff on its pivot. Alternatively the Record Release Slide (42) may not be returning fully under the action of its spring. This cause of failure will be characterised by the Selector Pawl (92) failing to move, and is likely to occur most frequently after using the "Repeat" movement. (See last paragraph of Section XIII in this connection.)

If the adjustment cannot be effected, and records cannot be dropped by hand in the manner described above, it is probable that part of the spindle has become damaged and it should be returned to the manufacturers for examination.

VIII. 12" POSITION TRIP

If the pick-up drops in 10" position when playing a 12" record, set machine to repeat the 12" record, and hold the gate (106) in the column adjacent to the pick-up fully depressed during the change cycle. If pick-up now positions correctly, the fault can probably be remedied by adjusting the Link (38) by setting its bent end so as to ensure that the smallest diameter 12" record encountered, trips the selector cam by releasing it from the pawl (37) which retains it in the 10" position. At the same time, it must be made certain that the positioning cam spindle (36) is rotated into engagement with the pawl (37) by the movement of the positioning cam setting slide (101). The positioning cam setting slide adjuster (104) should be set laterally by means of its two fixing screws so that the edge of the wide portion of the slide (101) just clears the positioning cam spindle (36) without interfering with its free movement. This adjustment is best made with the machine in its switched-off position, with a piece of paper interposed between the slide (101) and the spindle (36).

If the pick-up drops in 12" position when playing a 10" record, the cause may be either:

(1) The pawl (37) is not moving freely or its spring is damaged or displaced, and in consequence it is not springing into engagement with the positioning cam spindle (36), or

(2) The adjustment of the positioning cam setting slide adjuster (104) has not been correctly made as explained in the preceding paragraph.

IX. BALANCING ARM LIFT ADJUSTMENT

The height to which the balancing arms are lifted when the control knob is moved to the "LOAD" or "UNLOAD" position is adjustable by means of the screw (12) which is locked by a hexagon nut on its upper end. Adjustment should be made so that when the control knob is pressed firmly to its extreme left hand position, the balancing arms lift and then rotate freely through 90° in an anti-clockwise direction. ONLY JUST SUFFICIENT LIFT TO ACCOMPLISH THIS SHOULD BE GIVEN.

If either, or both of the balancing arms fail to rotate of their own accord, after making suitable adjustments to the screw (12) or if their rotation is hesitant, then examine the pivot points in the shoes on the ends of the balancing arm lifting levers (13) and make sure that the torsion springs which effect the rotation are in order. Dust or gummy oil may restrain their rotation, and it may be necessary to clean the parts with a little petrol or other solvent applied with a soft brush, and then lubricate with a minimum of thin machine oil. The same remarks apply to the bearing points at the top and bottom of each column, in which the balancing arm spindles must slide and rotate with complete freedom.

If, when the Control Knob is moved from the "LOAD" position to the central position, the Balancing Arms (108) turn back into line but fail to drop, the probable cause is either the Spring (68) has become displaced, or else the bent-down ends of the Gate Control Links (46) are not engaging sufficiently with the Balancing Arm Return Pegs (105). Adjustment of this engagement is effected by setting the lateral position of the Gate Adjuster Brackets (58). This is done by loosening the two fixing screws (115) holding each Bracket, which should be set laterally so that the edge of the turned-down ends of the Gate Control Links (46) can just pass the Balancing Arm Spindles (48) without interference. (See also last paragraph Section XIV if making this adjustment.)

X. AUTOMATIC STOP

When the last record falls from the step in the record spindle to the turntable, the Balancing Arms (108) fall to their lowest position and the head of the balancing arm lift lever Coupling Pin (65) lifts the Switch Trip Link (72) so that the peg of the Switch Trip Link Adjuster (73) engages with a peg in the Positioning Cam Setting Slide (101) when the latter is moved horizontally during the change cycle by the Positioning Cam Setting Lever (99). This results in the switch trip lever (71) being disengaged from a niche in the Control Bar (70), which is then pulled back by the Spring (10), opening the Motor Switch (11) and releasing the driving surfaces of the Idler Pulley (111) and Drive Pulley (112) from contact with the turntable rim through the action of two elbow levers and two release links. The idler pulley is also released from contact with the brass driving pulley on the motor spindle. One elbow lever (15) and one release link (16) actuating the Drive Pulley are visible in Fig. 2. The elbow lever actuating the Idler Pulley is concealed by the Motor, but the link is shown at (109) in Fig. 7.

It is important that the switch-off should occur at the point where the niche in the Locking Lever (94) has just engaged with the Peg (76) in the Operating Cam (75). (See Fig. 4.) If, when the machine switches off, the Pick-up swings inwards and drops on to the record, the switch-off is occurring too early, i.e., before

the Locking Lever (94) has engaged with the Peg (76), and the whole change mechanism is reversing under the tension of the Spring (79). If the machine switches off too late, i.e., after the Peg (76) has passed the niche in the Locking Lever (94), the record release mechanism may have commenced to function and it may then be difficult, or impossible, to lift the played records off the spindle. If this occurs, the records may be removed by partly unscrewing the spindle from the machine. (See Section XV.)

Adjustment of the switch-off position is effected by the Switch Trip Link Adjuster (73). Loosen the locking nut, adjust by means of the adjusting screw, and re-tighten the locking nut. **Clockwise** rotation of the adjusting screw gives **later** switching off, and vice versa. Adjust one full turn at a time until the correct setting is obtained. This is clearly indicated by noticing that the niche in the Locking Lever (94) just drops on to the Peg (76) at the moment of switching off.

If the machine fails to switch off automatically after playing the last record, the fault is probably due to the Balancing Arms (108) failing to fall sufficiently to ensure engagement between the Switch Trip Link Adjuster (73) and the tapered peg in the Positioning Cam Setting Slide (101). The fall of the balancing arms (108) is assisted by the spring (68).

It should therefore, first of all be ascertained that this spring has not become displaced, or weakened by over-stretching. If the spring is found to be in order, next ascertain that the Switch Trip Link (72) is working quite freely and has not become bent or distorted in such a way as to restrict its movement; or, that the Spring (66) has not been inadvertently replaced by a spring which is too strong to permit the Link being lifted by the head of the Pin (65) when the Balancing Arms are released by the falling of the last record.

If the fault cannot be attributed to any of the above causes, it is almost certainly due to some part of the balancing arm system not working freely. To locate the offending part, remove the Coupling Pin (65) and the Spring (68). If each Balancing Arm and its associated levers is now found to fall freely under its own weight, the stiffness must be due to the coupling pin not working freely in the slots through which it passes. This would most likely be caused by either, or both, of the Balancing Arm Lifting Levers (13) having been accidentally bent or twisted. When replacing the Pin (65) be sure that the inner ends of the Levers (13) overlap in the correct manner, as shown in Fig. 8.

If it is found that either, or both of the Balancing Arms do not fall freely after the Coupling Pin (65) and the Spring (68) have been removed, next uncouple the lower end of the Balancing Arm Spindle (48) from the Balancing Arm Lifting Lever (13) by removing the circlip, washer, and torsion spring on the lower end of the spindle, followed by removal of the two small Pegs (49) which engage with the slots in the outer ends of the Balancing Arm Lifting Lever (13). It can now be ascertained whether the Balancing Arm Spindle (48) is sliding freely in its bearings in the column, and whether the Balancing Arm Lifting Lever (13) is moving freely on its pivot pin. If the left hand lever (13) is found to be stiff, this may be due to the Balancing Arm Lift Slide (1) not working freely. This will be easily discernible, as there is a small amount of free movement between the Slide and its associated Lever (13). Also make sure that the Balancing Arm Spindle Shoe (50) works quite freely in the end of the Lever (13) when the Pegs (49) are replaced.

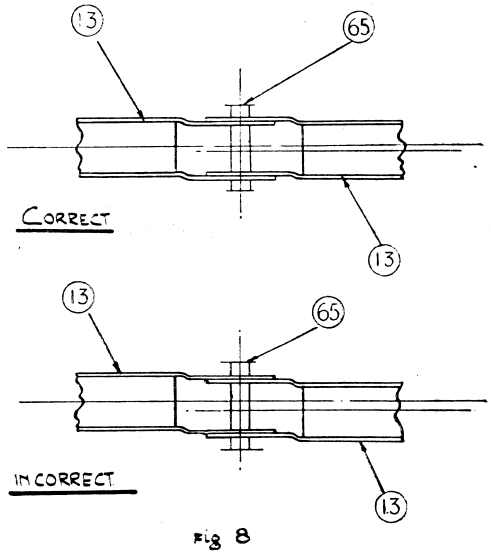


Fig 8

If either, or both of the Balancing Arm Spindles (48) after uncoupling in the foregoing manner, does not slide freely up and down in the column, make sure that the spindle has not been accidentally bent. Restriction of this movement could also be caused by the Stop Pin (117) binding against the rib cast inside the column, due to roughness of the working edge of the rib, or through the Back Stop Pin (116) having become bent and forcing the Pin (117) back against the rib. (See Fig. 9.)

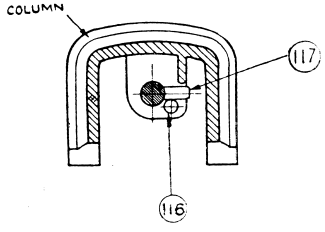


FIG. 9

When reassembling after carrying out the above routine, it will be necessary to remove the Balancing Arm Return Pegs (105), the Back Stop Pins (116) and the Stop Pins (117) in that order, so as to facilitate the winding up of the torsion springs fitted to the lower ends of the Balancing Arm Spindles (48). These springs should be wound up 1½ turns from their free position before replacing the Stop Pins (117). Couple up the whole system and test for free working before replacing the Pegs (105) and Pins (116). If too much torsion is exerted on the Spindles (48) by winding up the springs more than the recommended amount, there may be excessive friction between the Stop Pins (117) and the ribs in the columns with which they engage, thus preventing free falling of the Balancing Arms. Finally, the Pegs (105) and Pins (116) should be replaced, taking care that the Pegs (105) project on the same side of the Spindle as the Balancing Arms (108).

Another possible cause of failure to switch off, is that the Control Bar (70) is not working freely and is not being pulled back fully by its Spring (10). This may cause the motor to continue to run although the changer ceases to function. Another possible cause of this occurring is that the switch pull-off spring may have become displaced or weakened, or the lever and link operating the Switch are not moving freely.

XI. INDEPENDENT STOP

When the control knob is moved to the "STOP" position, the Repeat/Stop Slide (95) is moved away from the centre of the machine, carrying the Trip Plate (20) with it. The movement of the Repeat/Stop Slide in this direction pivots the Repeat/Stop Lever (96) in such a direction as to lift the Switch Trip Link (72), so that the peg of the Switch Trip Link Adjuster (73) will engage with the tapered peg in the Positioning Cam Setting Slide (101), when the latter moves horizontally during the change cycle. The Switch Trip Link (72) is retained in this lifted position by engaging with the niche in the Switch Trip Pawl (69). The movement of the Trip Plate (20) disengages the Auto-Trip Pawl (24) from the niche in the Auto-Trip Cam (25), thus allowing the Drive Pulley (112) to be pulled back into engagement with the Turntable rim by the Spring (19), thus starting the change cycle and switching off the machine, as at the end of the last record. (See Section X.) Engagement of the Drive Pulley with the Turntable Rim is not, however, permitted until the Control Knob is allowed to return to its central position under the action of the Spring (17), by reason of the Peg (21) in the end of the Drive Pulley Mounting Plate (26) being restrained by the edge of the Trip Plate (20).

If operation of the "STOP" movement results only in the rejection of the record being played, the machine not switching off, but continuing to play the next record, the fault will probably be that the Repeat/Stop Lever (96) is not lifting the Switch Trip Link (72) sufficiently to engage with the Switch Trip Pawl (69). Alternatively, the Switch Trip Pawl (69) may not be working freely so that it can engage with the Switch Trip Link (72). Another possible source of trouble is that through accidental bending of the Switch Trip Link (72), the Peg (73) and the tapered peg in the Positioning Cam Setting Slide (101) are not held in sufficient engagement by the Switch Trip Pawl (69), and it may be found necessary to set the tongue, on the end of the Switch Trip Link (72) which engages with the Switch Trip Pawl (69), a little upwards. When engaged by the Switch Trip Pawl (69), the Switch Trip Link (72) should be lifted very nearly to a horizontal position.

If operation of the "STOP" movement produces no immediate results, but the machine switches off at the end of the record being played, this indicates that although the Switch Trip Link (72) is being set properly, the movement of the Trip Plate (20) is not resulting in the Auto-Trip Pawl (24) being disengaged from the niche in the Auto-Trip Cam (25). Possible causes of this failure are, that the lug on the Trip Plate (20) which engages with a peg in the Auto Trip Pawl (24), has been accidentally bent, or that the peg has itself been bent or loosened. Check also that the Drive Pulley Mounting Plate (26) is pivoting freely under the action of the spring (19).

If no results, delayed or otherwise, are produced by operation of the "STOP" movement, then both the tripping of the Switch Trip Link (72) and of the Auto-Trip Pawl (24) must be out of adjustment.

XII. REJECTION

The rejection of a record is achieved by the same movement as to "START" the machine, this movement resulting in drawing the Trip Plate (20) away from the centre of the machine, thus tripping the Auto-Trip Pawl (24) out of engagement with Auto-Trip Cam (25) and starting the change cycle when the Control Knob is allowed to return to its central position. The functioning of the machine in this respect is identical with that described under Section XI "Independent Stop" with the exception that when rejecting, the Switch Trip Link (72) is not set so as to switch off the machine. The appropriate part of the instructions given under Section XI apply also to the "REJECT" movement.

XIII. REPEAT

To repeat a record it is necessary:—

1. To throw the record dropping mechanism out of gear.

2. To avoid re-setting the Pick-Up Positioning Cam.

3. To avoid switching off, if it is desired to repeat the last record.

The movement of the Control Knob to the "Repeat" position results in the Repeat/Stop Slide (95) moving towards the centre of the machine. It is retained in this position by reason of a peg in the end of the Repeat/Stop Lever (96) being pulled firmly into a niche in the Repeat/Stop Slide (95) by the spring (98). The resultant movement of the Repeat/Stop Lever (96) causes the Record Release Slide Pawl (45) to be depressed out of engagement with the Peg (44) in the Record Release Lever No. 2 (54), so that the motion of the Record Release Slide (42) during the change cycle is not transmitted to the record release mechanism in the Record Spindle. The forward position of the Repeat/Stop Slide (95) results in the Positioning Cam Setting Slide (101) being lifted so that the Plate (100) attached to the Slide does not engage with the Positioning Cam Setting Lever (99). The motion of the latter is therefore not transmitted to the Positioning Cam Setting Slide (101), and in consequence the Positioning Cam remains at its existing setting during the cycle, and the machine is not switched off, even if the last record has fallen (since the switching off is achieved from the motion of the Slide (101)).

The motion of the Record Release Slide (42) during the cycle, however, depresses the peg in the end of the Repeat/Stop Lever (96), out of engagement with the niche in the edge of the Repeat/Stop Slide (95), which returns to its central position under the action of the spring (56) moving the Control Knob back to its central position at the same time. The Record Release Slide Pawl (45) also re-engages with the Peg (44) during the change cycle. The machine thus repeats a record once only on each setting. It will be seen from this description that the machine may be made to repeat a record indefinitely by removing the Spring (56), when repetition will continue until the Control Knob is returned by hand to its central position. Alternatively, the Control Knob may be wedged in the "Repeat" position with the same results.

If the Control Knob will not remain in the "Repeat" position, but springs back to central as soon as the hand is removed, it is probable that the Spring (98) has become dislodged, or weakened by straining of the end loops. Alternatively, the Spring (56) may be too strong, and may be judiciously weakened by stretching slightly. **Great care is necessary** in doing this not to weaken it beyond the point where it will positively return the Control Knob to the central position.

If the Control Knob does not return to the central position during the change cycle when repeating a record, or does not fully return, the possible faults are (i) the spring (56) is too weak; (ii) the Repeat/Stop Slide (95) is not working freely; (iii) the Control Lever Slide (23) is not working freely; or, (iv) the peg in the end of the Repeat/Stop Lever (96)is not being fully disengaged from the niche in the Repeat/Stop Slide (95) by the motion of the Record Release Slide (42).

If the Control Knob returns to the central position, but the machine continues to repeat (the pick-up under these conditions will almost invariably be positioned for a 10" record, even if a 12" record is being played) the cause of the fault will be that the Record Release Slide Pawl (45) is not re-engaging with the peg (44) in Record Release Lever No. 2 (54). This may be due to the Pawl (45) not pivoting freely, or to either of the two springs attached to the Pawl (45) having become dislodged or weakened. Also check that the end of the Switch Trip Link (72) has not become bent sideways, thus restricting free movement of the Pawl (45).

XIV. CONTROLS

The Control nob is returned to its central position from the "START" or "REJECT" position, and from the "STOP" position by the Spring (17) acting through the Trip Plate (20) and the Control Lever Slide (23). If it does not return freely from the "STOP" position check that the Trip Plate (20), the Repeat/Stop Slide (95) and the Control Lever Slide (23), are moving freely and that the Spring (17) is in position and not weakened. Make sure that the Nut (97) is not tightened so as to prevent free movement. It is, however, more likely to encounter failure of the Control Knob to return from the "Start" or "Reject" position to the central position, and the fault may then lie in any one of the following parts which are actuated by this motion: Control Lever (55), Control Lever Link (51), Control Spider (52), Gate Control Links (46), and Trip Plate (20). Check that all pivot points and sliding movements are quite free, and that movement is not restricted by any of the links or levers having become twisted. Another possible cause of trouble is that the escutcheon plate in which the Control Knob works has been accidentally distorted so as to foul the washer under the Control Knob.

If the Record Gates (106) fail to spring up to their horizontal locked position when the Control Knob is moved to the "LOAD" or "UNLOAD" position, check that the Gate Lever Springs (67) are not dislodged and that the Gate Lever Links (47) are being released from the inner niche in the Gate Adjusters (58) by the ramp in the Gate Control Links (46).

If the Record Gates (106) fail to retract to the playing position (i.e., approximately 45° inclination) when the machine is started, check that the Pegs (59) in the Gate Control Links (46) have not become loose or bent. If these are in order, either or both the Gate Adjusters (58) may require re-setting so as to ensure that the Peg (59) pulls the Gate Lever Link (47) back far enough to drop into the inner niche. This adjustment is effected by loosening the two fixing screws (115) to be found under the Turntable. When making this adjustment, be sure that the lateral position of the Gate Adjusters (58) permits the ends of the Gate Control Links (46) just to pass the Balancing Arm Spindles (48) without interference. If too much clearance is left, the Gate Control Links (46) may fail to engage sufficiently with the Balancing Arm Return Pegs (105) to ensure the Balancing Arms returning into line and dropping when the Control Knob is moved from the "LOAD" position.

XV. TO REMOVE THE SPINDLE AND TURNTABLE

Unscrew the record spindle by gripping firmly near its base with pliers, protecting the spindle from damage with rubber or cloth. **Under no circumstances** should the spindle be removed or tightened by inserting any form of lever through the slotted part of the spindle. It may then be withdrawn upwards out of the Turntable Spigot. The turntable may then be removed by inserting two suitable thin articles under two diametrically opposite points of the rim and lifting upwards.

When replacing, be sure that the ball thrust race and washer, together with any shim washers found under the ball race, are in position under the turntable, and that the Turntable Retaining Washer (107) is replaced under the shoulder of the Record Spindle before this is screwed home. The Turntable Spigot is set during manufacture, so that when the Record Spindle is screwed home with the Turntable Retaining Washer (107) in position, the step of the spindle faces directly towards the Left Hand Column of the machine. This setting will be disturbed unless the Turntable Retaining Washer is replaced. If the Record Spindle is at any time replaced by another one, it will almost certainly be necessary to reset the Turntable Spigot by

loosening the large hexagon Locknut (53) and re-tightening after rotating the spigot to set the Record Spindle in the correct position, i.e., with the step facing directly towards the Left Hand Column of the machine.

XVI. AUTOMATIC TRIP

The change mechanism is set in operation at the end of each record by a "velocity trip" mechanism, which is actuated if the inward motion of the pick-up exceeds ⅛" in one revolution of the Turntable. The inward motion of the pick-up is transmitted from the Pick-up Positioning Arm (33) via the Auto-Trip Feed Link (31), the Auto-Trip Feed Lever (28) and the Auto-Trip Friction Link (27), to the Auto-Trip Striker Arm (114), which is counterbalanced by a weight (113) to ensure a free pivoting motion and to prevent the tapered end sagging into contact with the Unit Plate. There is a certain amount of lost motion given by the curved slot in one end of the Feed Link (31) so that the inward motion of the Pick-up is not transmitted to the Striker Arm (114) until the Pick-up needle reaches a radius of approximately 3½" from the centre of the Turntable. The motion of the Lever (28) is transmitted frictionally to the Friction Link (27), the friction being provided by a light spring and washer under the head of the Screw Peg (29). As the Pick-up moves slowly inwards during the playing of a record, the tapered end of the Striker Arm (114) is moved a small amount with each revolution of the Turntable towards the centre of the Turntable, but is each time wiped back to its original position by a rubber roller, attached to the underside of the Turntable Boss, rotating past the edge of the Striker Arm (114). This wiping back results in the Screw Peg (29) moving progressively along the slot in the Auto-Trip Friction Link (27). When, at the end of the record, the Pick-up runs inwards quickly, the Striker Arm (114) is moved in sufficiently for another rubber roller, shallower than the one previously mentioned, and positioned 40° in advance of it, to strike against the step in the Striker Arm (114) which, being pivoted in a boss attached to the Auto-Trip Pawl (24), disengages the latter from the niche in the Auto-Trip Cam (25), permitting the Drive Pulley (112) to engage with the Turntable Rim and thus set the change cycle in motion.

For satisfactory operation, the whole system of links and levers used in this system must work perfectly freely. Any stiffness will cause side pressure between the needle and playing groove of the record with consequent record wear, while excessive stiffness may cause the needle to jump the groove. Excessive friction at the Screw Peg (29) will make itself apparent by a knocking in the Loud Speaker as the striker arm is wiped back by each revolution of the Turntable. In particular, the Striker Arm (114) must be completely free in its pivot, otherwise the Automatic Trip may fail to operate at the end of each record. In this connection, the small nut (22) which retains the Striker Arm (114) in the boss attached to the Auto-Trip Pawl (24) must not be taken up further than will permit complete freedom of movement with a minimum of play. The tapered end of the Striker Arm (114) should, in its natural position, lie level with the Unit Plate with a clearance of 1/32" to 1/16".

XVII. SAFETY TRIP

As explained under Section X "Automatic Stop," the switching off of the machine is effected by the engagement between the Peg (73) and another tapered peg in the Positioning Cam Setting Slide (101), resulting in the Switch Trip Lever (71) being disengaged from a niche in the Control Bar (70). When the Control Knob is moved to the "Start" position the Control Bar (70) is drawn back against the tension of the Spring (10), closing the Motor Switch (11) and tensioning the Springs (110) and (19) which pull the Idler Pulley (111) and Drive Pulley (112) into engagement with the Turntable, which will thus commence to rotate. The Drive Pulley (112) is, however, prevented from engaging with the Turntable by the engagement of the Peg (21) with the edge of the Trip Plate (20), so that the change mechanism cannot commence to operate until the Control Knob is released to its central position. If the Control Bar (70) also returns under the action of its Spring (10) then both the Idler Pulley (111) and Drive Pulley (112) are disengaged from the Turntable by the Release Links (109) and (16) respectively, the Spring (18) ensuring that the Drive Pulley (112) does not even momentarily contact the rotating turntable. The motor switch (11) will also be opened, and the machine will come to rest.

It will thus be seen that it is impossible to set the change mechanism in motion unless the Control Bar (70) is retained in the "ON" position while the Control Knob is returned to the central position. This can only be effected by the Switch Trip Lever (71) being released into engagement with the niche in the Control Bar (70), this in turn being brought about by the Peg (14) disengaging the Switch Trip Pawl (69) from the Switch Trip Link (72), allowing the Peg (73) to drop out of engagement with the tapered peg in the Positioning Cam Setting Slide (101). If, however, no records are on the step of the record spindle, the balancing arms (108) will be in their lowest position, and the head of the Pin (65) will prevent the Peg (73) from dropping. Thus the automatic change mechanism cannot be set in motion unless there is at least one record on the step of the record spindle.

If the machine cannot be easily started when loaded, check that the Peg (14) is fully disengaging the Switch Trip Pawl (69) from the Switch Trip Link (72), and that the latter is then dropping freely under the action of the Spring (66). Check also that the Switch Trip Lever (71) is moving perfectly freely, and that the Peg (2) in the Control Lever (55) is imparting sufficient sliding movement to the Control Bar (70) to allow engagement of the niche in its side with the Switch Trip-Lever (71).

XVIII. PICK-UP MUTING

The Pick-up Muting Contacts (9) are held open during the playing of a record by a washer retained under the locknut of the Positioning Cam Lift Adjusting Screw (8). When the Positioning Cam (35) is

lifted by the Lever (7) the contacts are allowed to spring together, thus muting the Pick-up until they are again opened by the Positioning Cam (35) dropping when the needle contacts the edge of the next record.

For correct setting, the longer contact should be straight and parallel to the Cover Plate on which it is mounted, and the shorter contact should be set so as to ensure firm contact when the machine is in the switched-off position.

If the longer contact is set upwards too strongly, it may prevent the contacts opening so that the pick-up always remains muted, or may even be sufficient to prevent the Positioning Cam (35) falling fully, thus preventing the Pick-up from travelling inwards from the edge of the record.

Unpleasant noises in the loudspeaker caused by tapping the changer or by microphonic action may be attributable to too light a pressure between the Muting Contacts in the switched-off position, or by incomplete opening of the Contacts in the playing position in which a gap of about 1/32" should be discernible between them. Dirt on the contacting surfaces may have a similar effect.

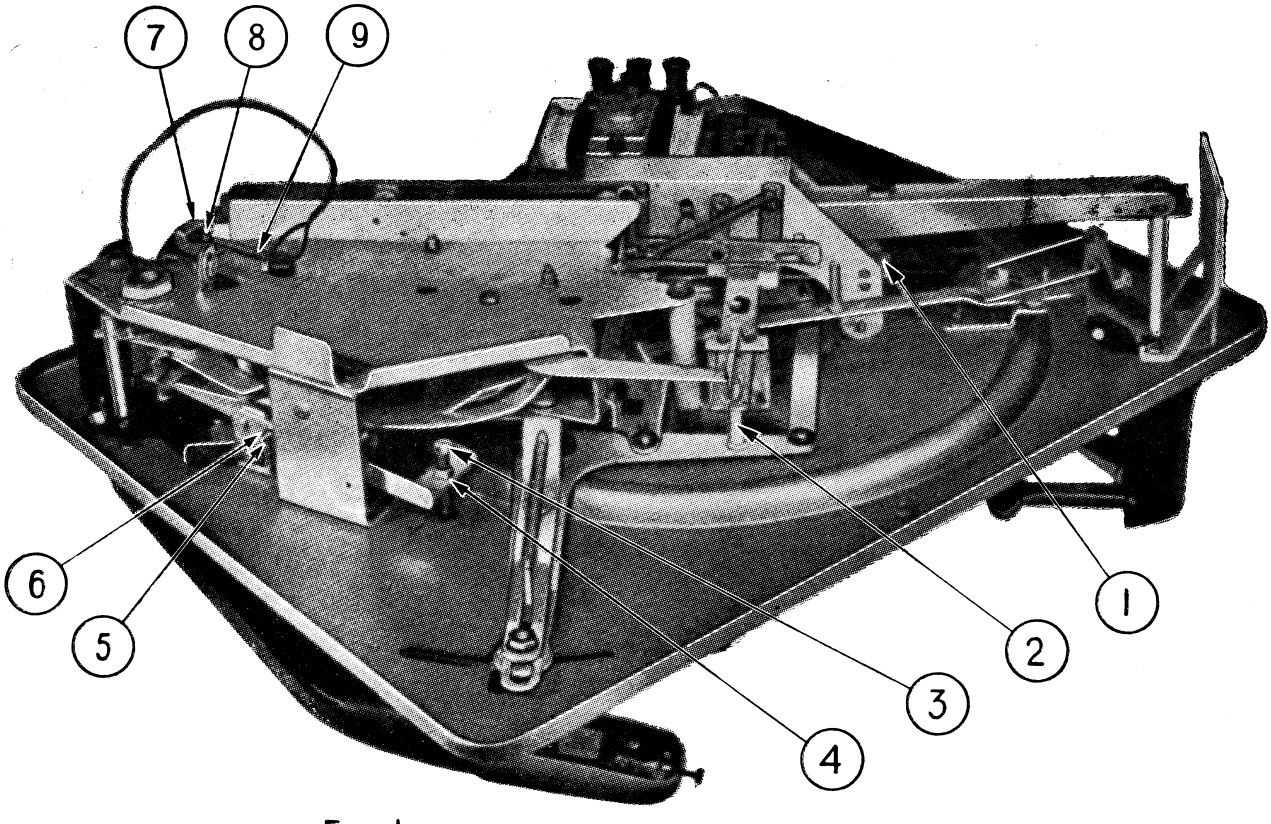


FIG. 1.

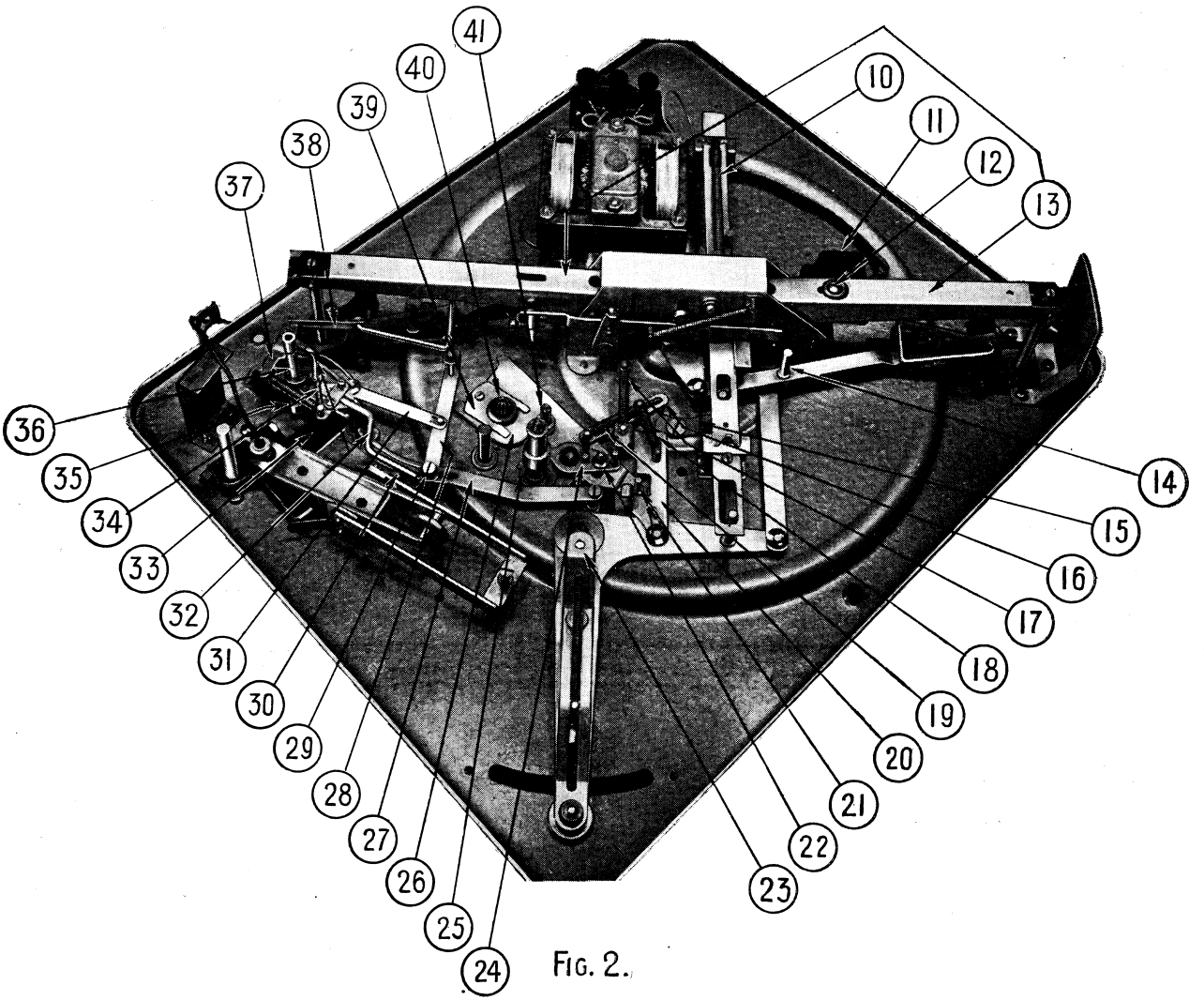

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FIG. 2.

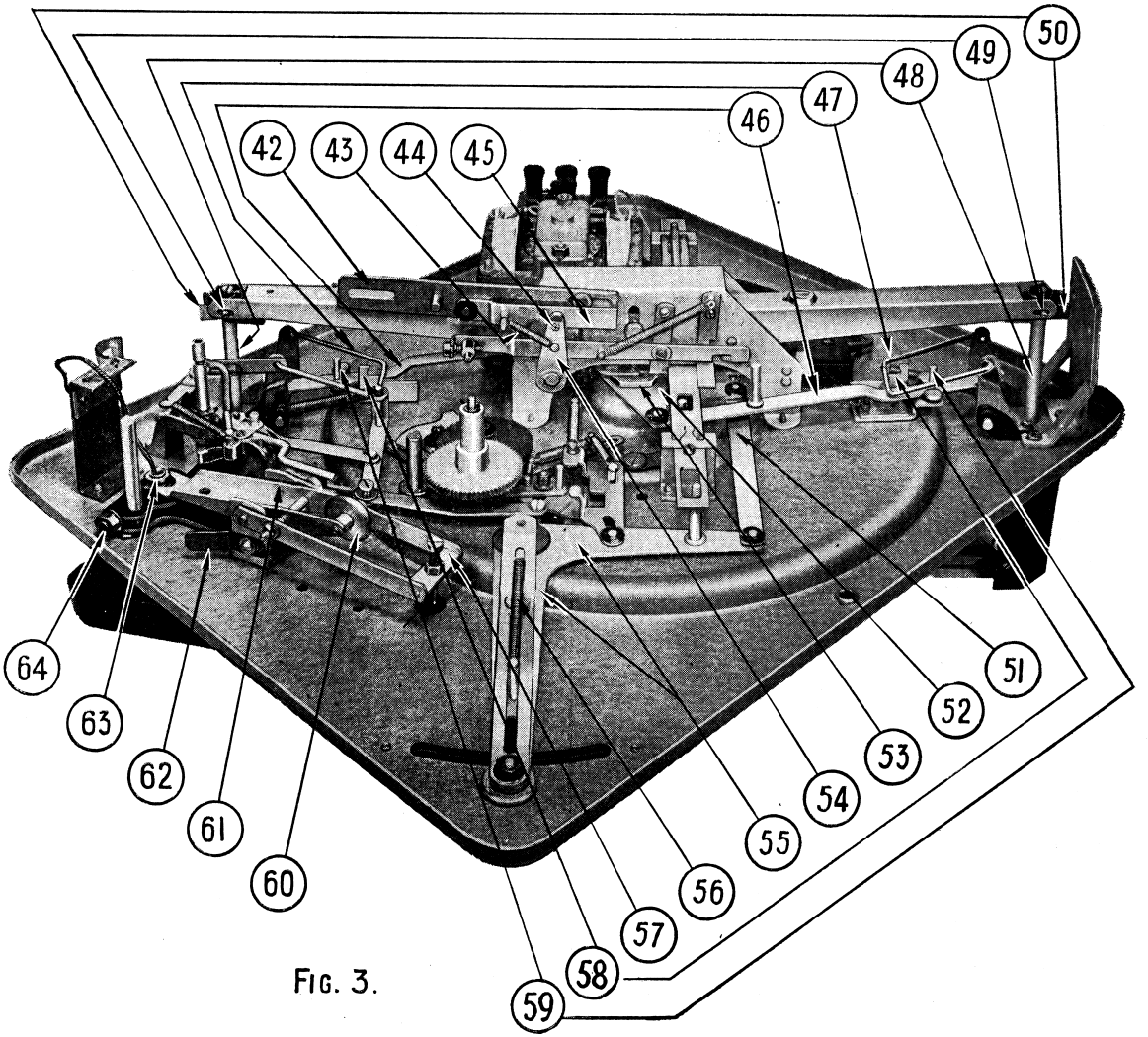

FIG. 3.

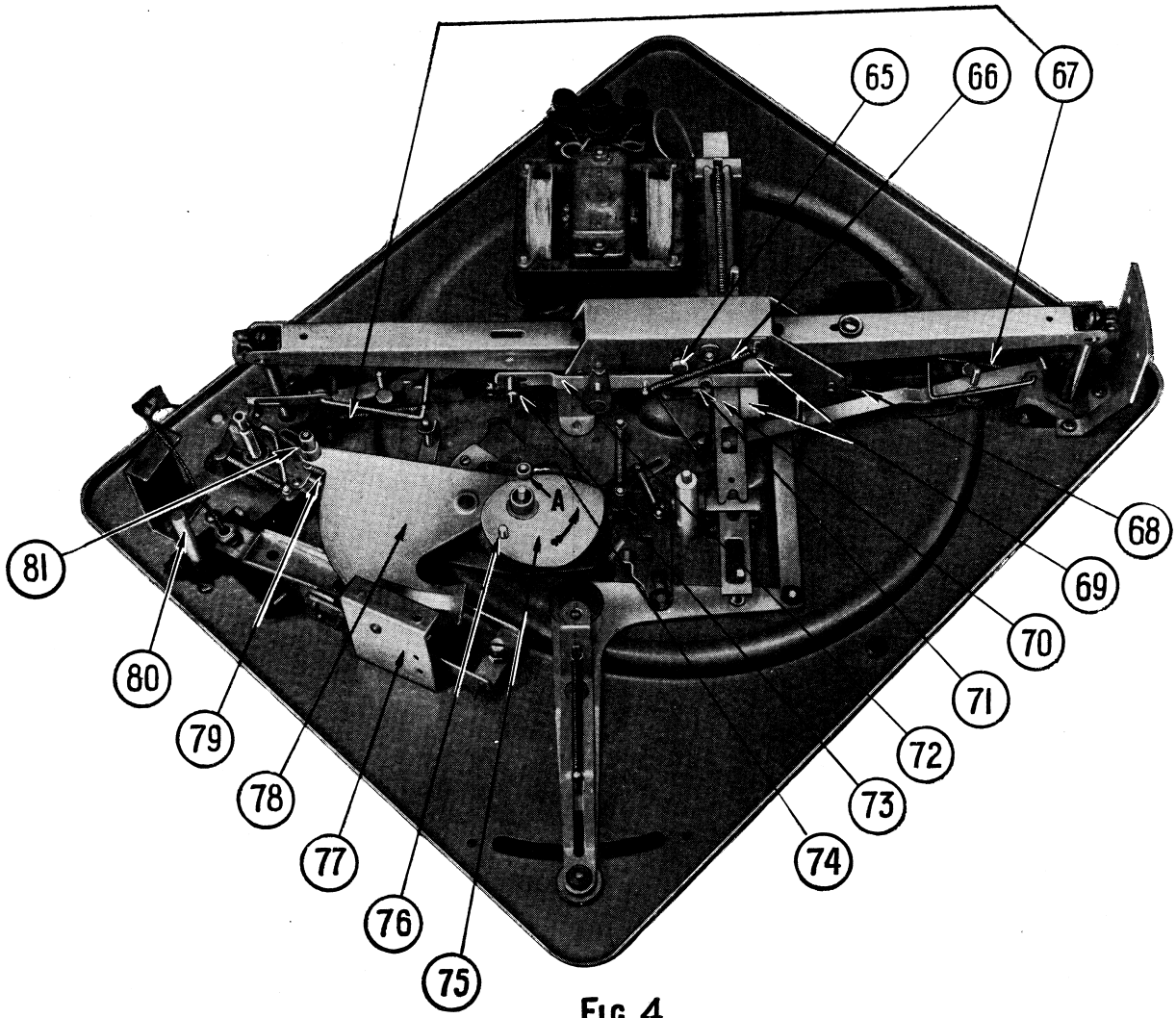

FIG. 4.

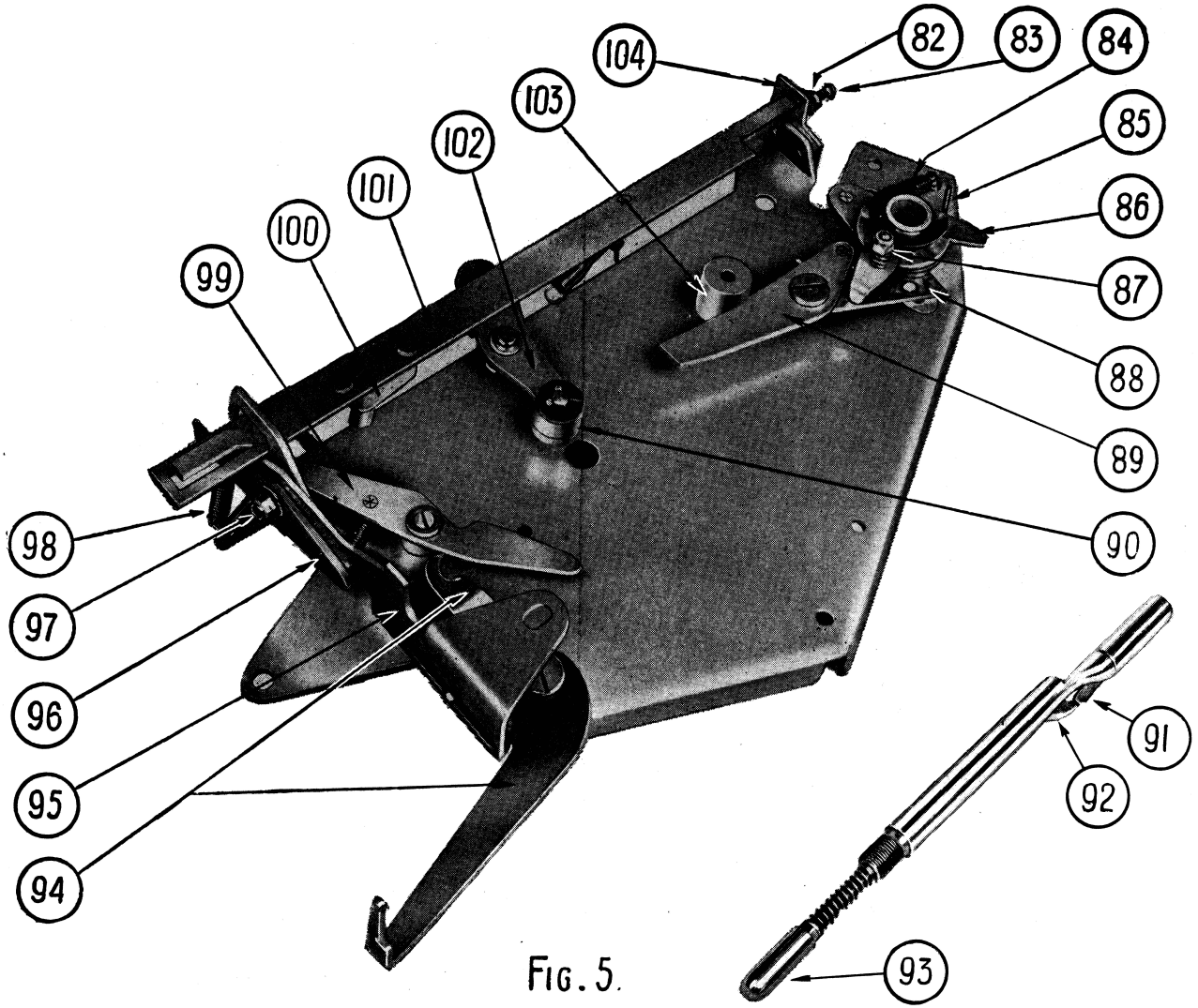
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FIG. 5.

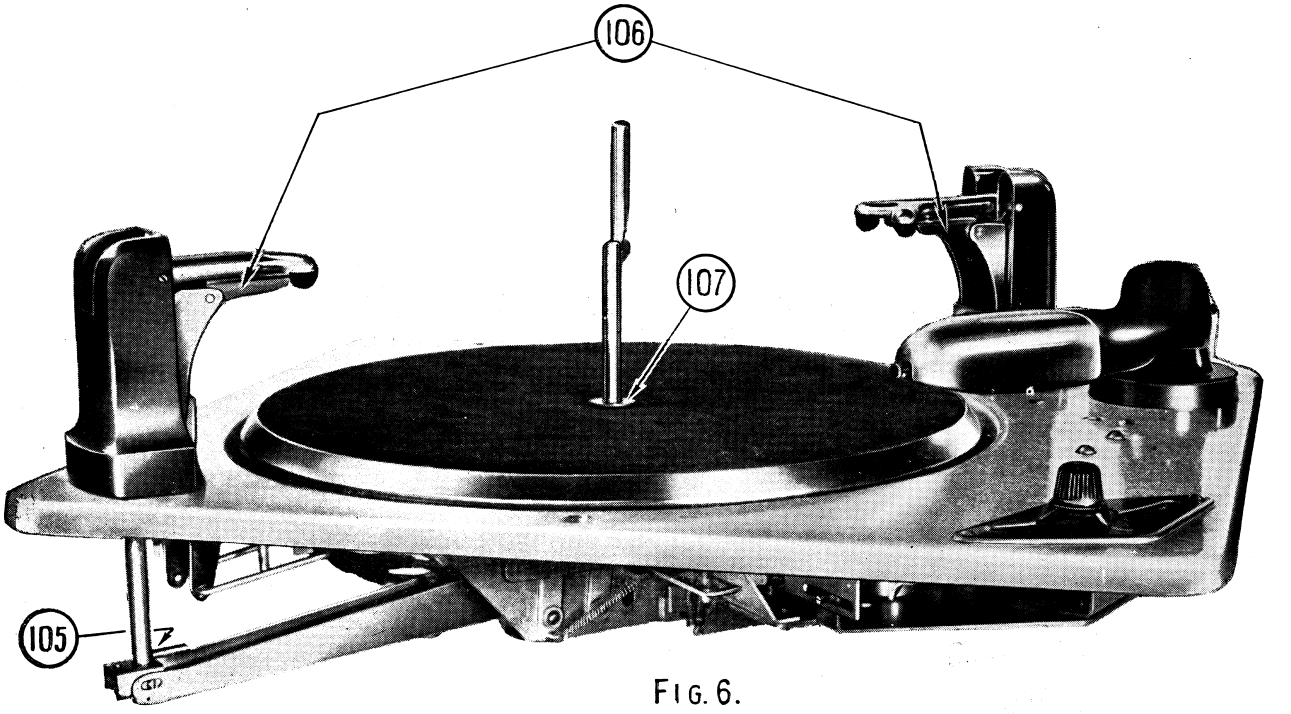

FIG. 6.

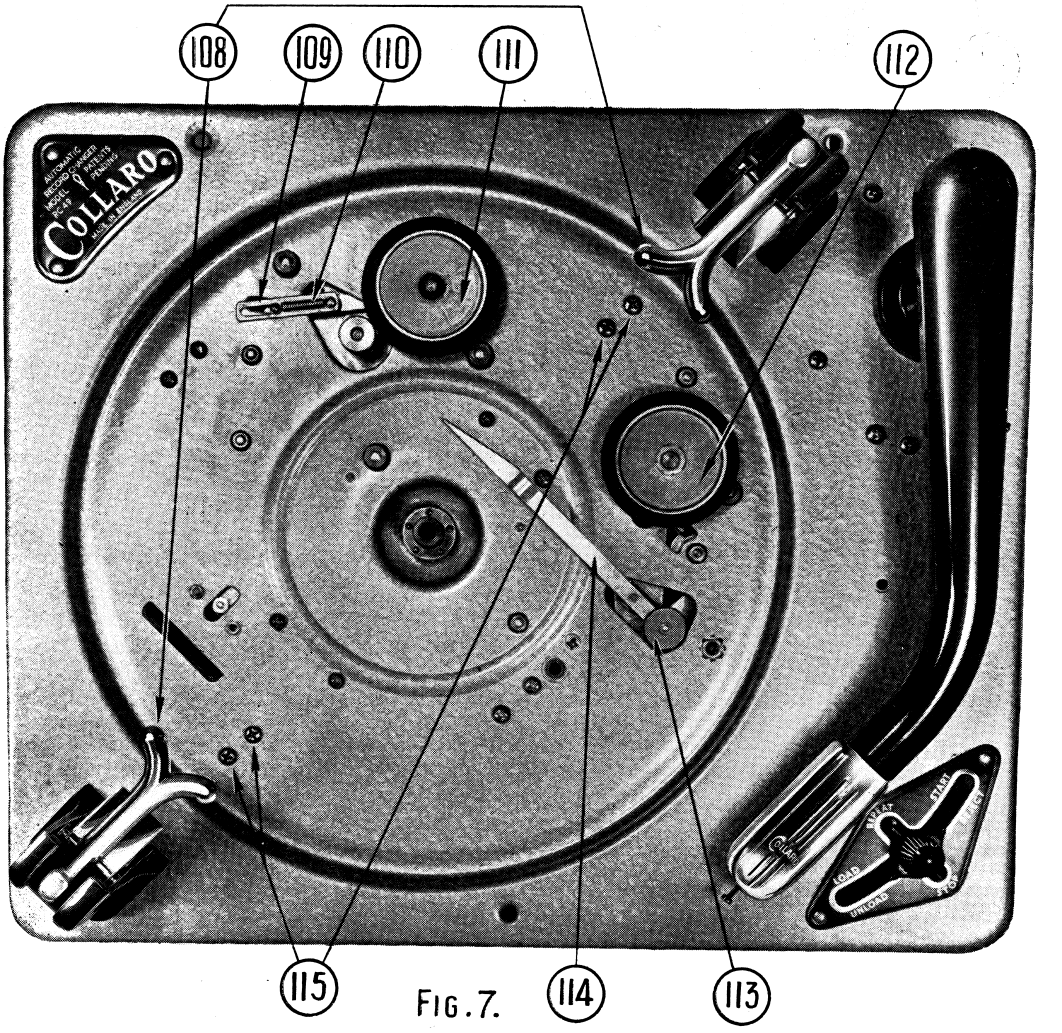

FIG. 7.