

Dual

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# Service Manual Dual 1009 F



First Edition E 9 F

## Technical Data:

<b>Current:</b>	Alternating, 50 or 60 cycle, with appropriate motor pulleys
<b>Line voltage:</b>	selector for 110 or 220 volts
<b>Drive:</b>	four-pole, single-phase, induction motor
<b>Power consumption:</b>	6.5 watts approximately
<b>Current requirements:</b>	50 ma maximum at 220 V, 50 cycle; 90 ma maximum at 117 V, 60 cycle
<b>Turntable speeds:</b>	78, 45 and 33 $\frac{1}{3}$ r.p.m.
<b>Speed adjustment:</b>	adjustment range of 6 % at all three turntable speeds
<b>Turntable:</b>	non-magnetic, 4 lb., Hi-Fi turntable
<b>Wow and flutter:</b>	Less than $\pm 0.12$ %
<b>Rumble:</b>	less than 38 dB below signal level *
<b>Signal-to-noise ratio:</b>	less than 56 dB below signal level *
<b>Tonearm:</b>	balanced on all three axes, extremely low mass, and precision, friction-free suspension (vertical and horizontal friction bearing friction less than 0.04 gm)
<b>Pickup cartridge:</b>	tonearm will accept all cartridges with $\frac{1}{2}$ " mounting and weighing from 1—13 gms.
<b>Weight:</b>	11 lbs. without packing
<b>Dimensions and mounting cutouts:</b>	see installation instructions

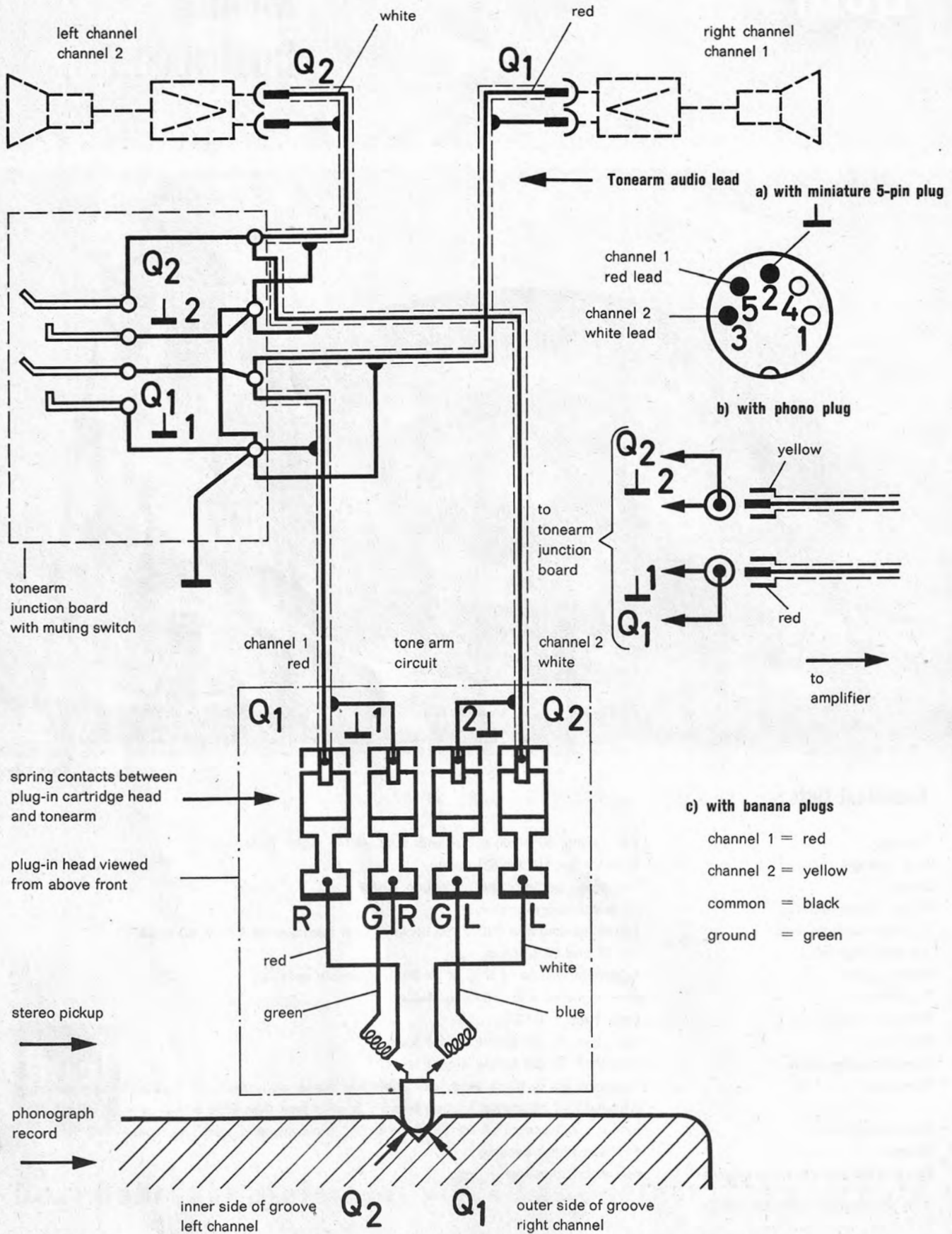
\* In accordance with DIN 45500

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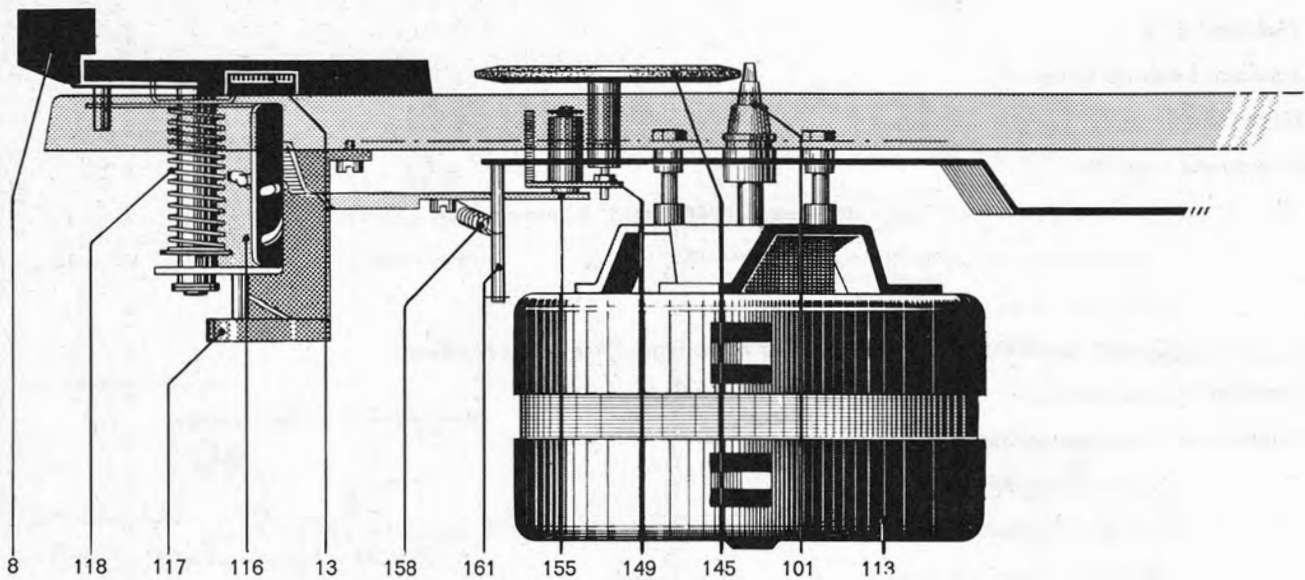
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Fig. 1 Tonearm hook-up schematic



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Fig. 2 Motor suspension and turntable drive



### Motor and drive

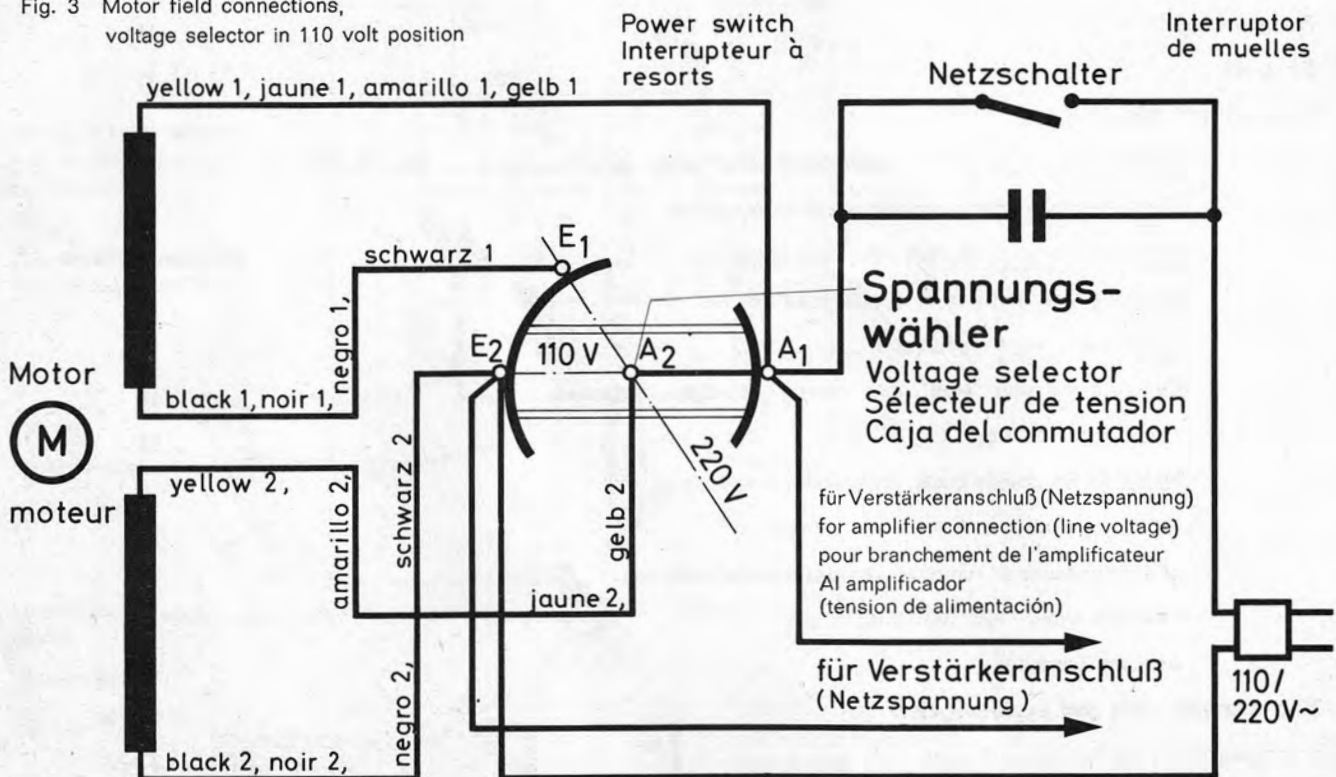
The turntable and change cycle are driven by a four-pole induction motor (113) with an extremely low magnetic field and vibration-free drive.

Motor speed is constant for line variations of  $\pm 10\%$ . Motor speed is dependent on, and proportional to line frequency. Adapting for operation at line frequencies of 50 or 60 cycle is accomplished by the use of replaceable motor pulleys (101).

- 1009 F Motor pulley, 50 cycle Part No. 12 X - U 14
- Motor pulley, 60 cycle Part No. 12 X - U 20

The motor pulley is secured to the motor shaft by means of a set screw. When changing pulleys, care must be taken that it is set at the correct height.

Fig. 3 Motor field connections, voltage selector in 110 volt position



The turntable is driven by means of the drive wheel (145) which, to prevent damage to its friction surfaces, automatically disengages in the "Off" position.

Setting the turntable speed to  $33\frac{1}{3}$ , 45 and 78 r.p.m. is accomplished by raising or lowering the drive wheel to the corresponding step of the motor pulley.

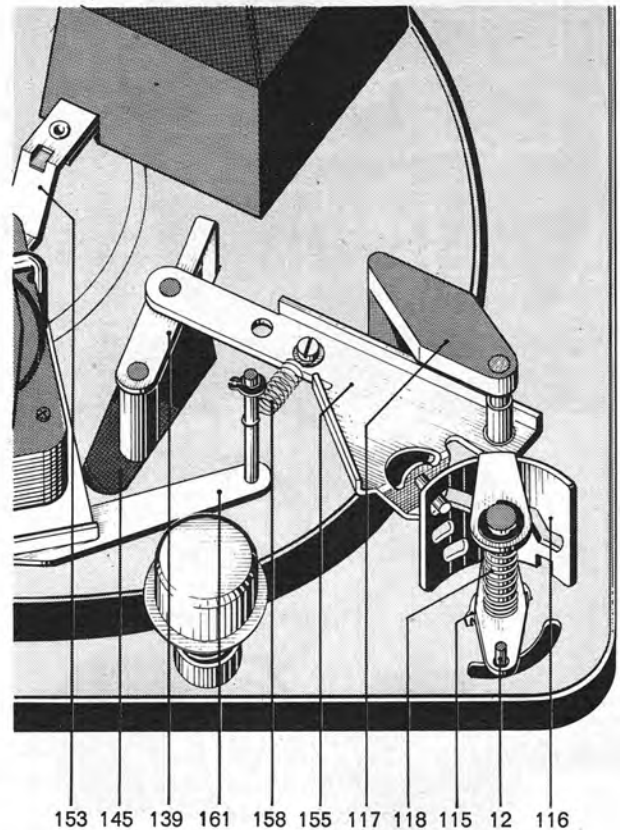
Similarly, moving the speed change knob (8) causes the switch segment (116) to rotate. The grooves in the switch segment guide the rocker assembly (155) on which the drive wheel is mounted. The drive wheel is thus lifted vertically from the motor pulley and placed in the desired position.

### Fine-speed regulation

A fine speed adjustment for all three record speeds —  $33\frac{1}{3}$ , 45 and 78 r.p.m. — permits a variation in turntable speed of 6 %.

Turning the adjusting wheel causes the switch segment (116) and with it the rocker assembly (155) to move up and down. This vertical motion changes the position of the idler wheel on the selected step of the motor pulley. The tapered shape of the motor pulley gives an adjustment range of  $\pm 3\%$  from the nominal speed.

Fig. 4 Turntable speeds and drive wheel shift mechanism



### Trouble shooting:

Symptom	Cause	Remedy
Turntable does not run when unit plugged in and "start" button operated	a) Current path to motor interrupted	a) Check connection at switch plate and voltage selector
	b) Drive wheel (145) not in contact with turntable	b) Check rocker assembly (155)
	c) Motor pulley (101) loose	c) Tighten motor pulley (101)
Turntable does not come up to speed	a) Motor pulley does not correspond to local line frequency	a) Change motor pulley
	b) Slippage between motor pulley (101), drive wheel (145) and turntable	b) Clean friction surface of drive wheel (145) and motor pulley. Change drive wheel, if necessary
	c) Motor bearing friction	c) Clean motor bearings and re-lubricate from lubrication chart
Noise during change cycle, arm set-down and lift-off	Worn drive wheel	Replace drive wheel (145). Clean friction surfaces of turntable and motor pulley thoroughly with a grease-free cloth. After cleaning, take care not to touch the inner rim or motor pulley.
Correct speed obtained only by extreme adjustment of fine-speed regulator	Idler wheel does not contact motor pulley correctly	Correct idler wheel position. Loosen lock nut (149) and rotate idler wheel shaft (147).
		The correct position of the idler wheel is in the center of the selector motor pulley step (dial pointer in mid-position) Re-secure lock nut after adjusting

Fig. 5 Tonearm suspension

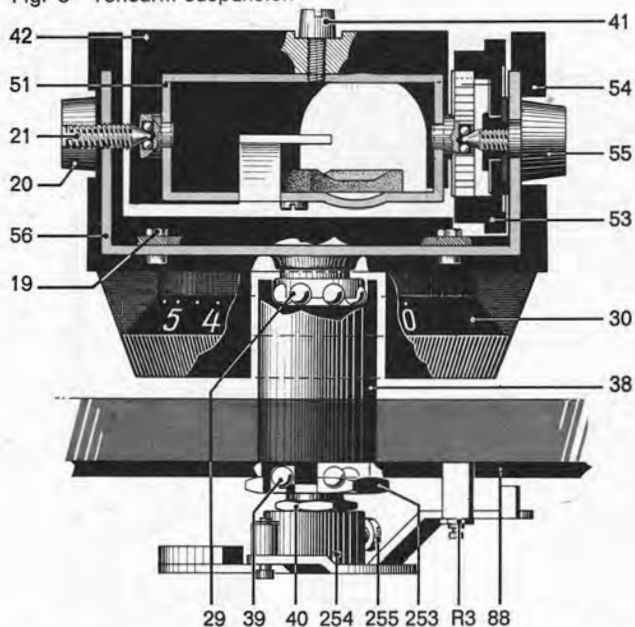


Fig. 6 Tonearm suspension with anti-skating compensation

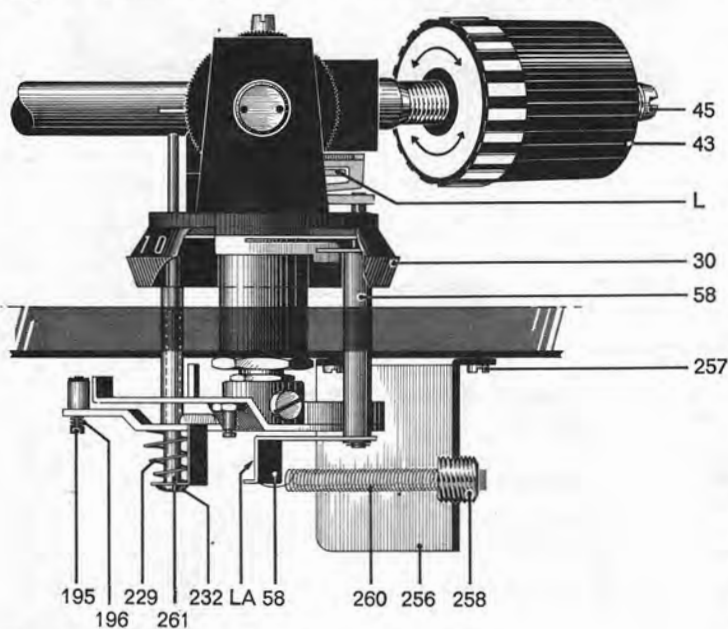
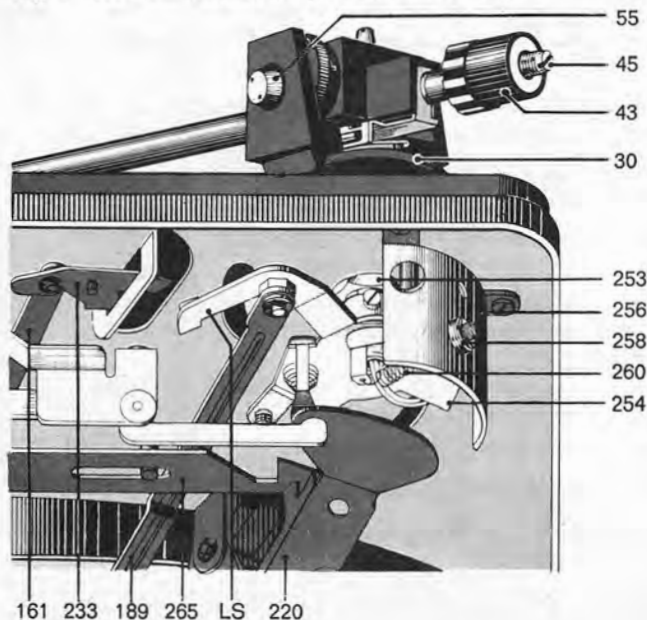


Fig. 7 Tonearm suspension (viewed from below)



## Tonearm and its suspension

The Hi-Fi tonearm of the Dual 1009 F employs precision ball bearings for both horizontal and vertical movements.

Vertical bearing friction is less than 0.04 gms.

Horizontal bearing friction is less than 0.04 gms.

Especially favorable conditions for pickup are thus provided.

Before setting the tracking pressure corresponding to the cartridge used, set the scale to zero and balance the arm.

The counterbalance weight is such that cartridges weighing from 1 to 13 gms. can be balanced by rotating the counter balance weight (43) on its spindle. Two spindles are available — Part No. 12 L - U 117 for cartridges weighing between 1 and 8 gms. and Part No. 12 L - U 118 for cartridges weighing up to 13 gms.

In order to absorb shocks (sharp blows), the counterbalance weight is mounted on the threaded spindle (45) by means of an elastic coupling. This also prevents the counterbalance from turning during ordinary handling.

The cartridge head will accept all cartridges with the international  $\frac{1}{2}$ " standard mount. Tracking force is set by turning the spring housing (53) with its scale divisions and thus tightening or loosening the internal spiral spring. Scale markings are for an adjustment range of 0—5 gms. with **exact settings from 0.5 gms. by  $\frac{1}{2}$  gm. steps.**

To replace the tonearm assembly and suspension, the following procedure is recommended:

1. Set tracking force scale to "0".
2. Unsolder the tonearm lead.
3. Remove main lever (220) and connecting lever (242).
4. Remove "C" ring and washer of the shut-off slide (189) from the arm segment.
5. Unhook tension spring (260) and loosen screws (252, 255).
6. Place adjusting ring (30) of the "Anti-Skating" mechanism in the "5.5" position.
7. Lift off arm segment (254) and remove lift screw (261).

To loosen the nut (253), hold the bearing housing (38), between the base plate (88) and adjusting ring (30), with a suitable tool (such as flat pliers). Carefully take out the tonearm, taking care not to bend the spring lever (58).

To re-install the tonearm, the reverse procedure is followed. Before tightening screws (252, 255), check the tonearm position over the arm rest, so that tonearm lowers onto the rest without binding.

When installed, moving the tonearm in and out, when the adjustment ring (30) is in its "0" position, should not cause the tension spring (260) to move. If necessary, the setting can be corrected by means of the tabs (LS) of the spring lever (58).

Similarly, after re-installing the retaining spring for the tonearm leads, care must be taken the arm segment (254) is not impeded by the tonearm leads.

To remove the tonearm from the bearing frame, unsolder tonearm leads, place spring housing in its zero position, loosen lock-nut (20) and remove set screw (21). Then carefully take tonearm out of the bearing frame.

When re-installing tonearm, make certain that the angle formed in the end of the spiral spring engages the slot in the tonearm bearing housing. Then screw in set screw (21) and tighten lock nut. Check that bearing play, after tightening, is barely noticeable.

## Tonearm anti-skating mechanism

The tendency of a tonearm to slide across the record is caused by the tonearm geometry. In the Dual 1009 F, this is virtually eliminated by a precision anti-skating mechanism.

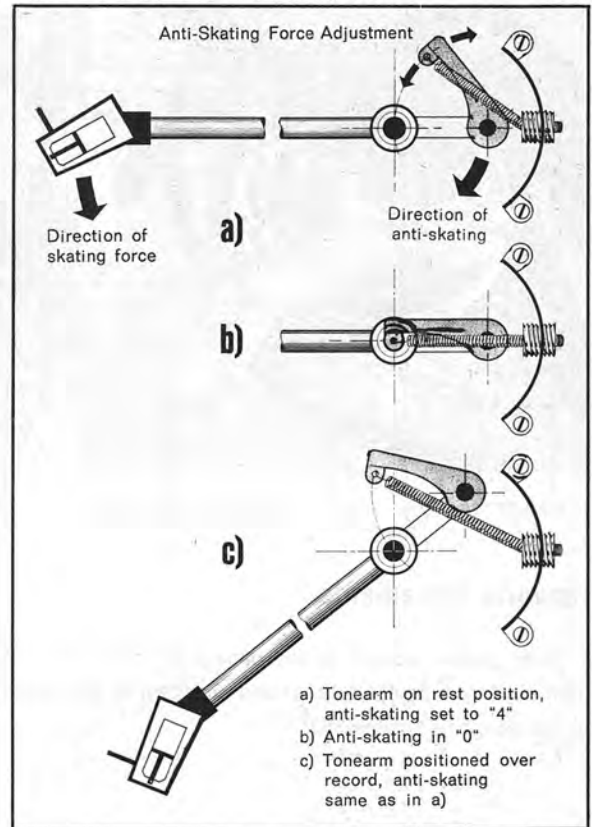
Skating force is caused by friction between record and stylus, and to a less extent by the geometry of the tonearm and the physical properties of the material from which the record is made. Skating force increases with increasing tracking pressure and with decreasing stylus radius.

The resulting skating effect pulls the tonearm towards the center of the record. This occurs not only on the eccentric shut-off grooves but also causes unequal contact with the groove sides. The anti-skating mechanism tends to minimize these effects when playing valuable Hi-Fi records.

Rotating the adjustment ring of the anti-skating mechanism moves the spring lever (58) by means of the curved track inside the adjustment ring, and the tension spring (260) transmits the counter-moment to the tonearm.

The optimum adjustment of the anti-skating mechanism is obtained with a needle curvature of  $0.7 \pm 0.1$  mil. The adjusting screw (threaded bushing) is sealed with glyptol after setting. A special Dual-Skate-O-Meter and standard record L 096 are required for re-adjustment, which should only be performed by an authorized service station.

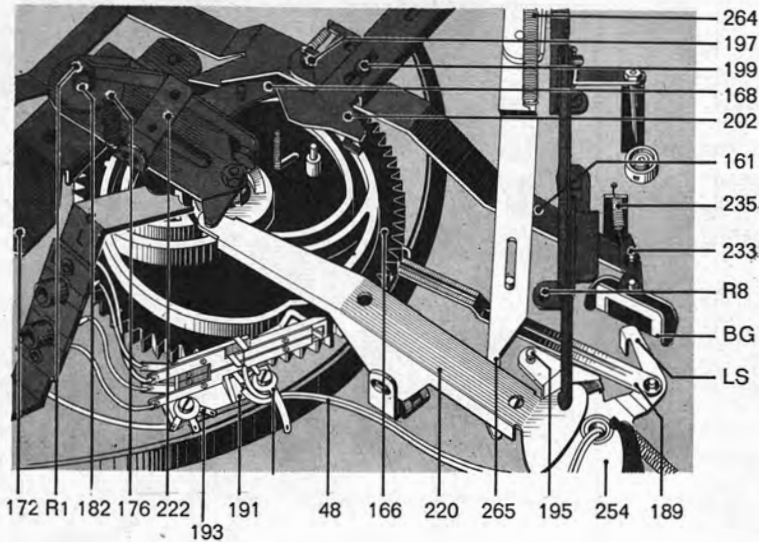
Fig. 8 Skating and anti-skating force



## Trouble shooting:

Symptom	Cause	Remedy
<b>Tonearm suspension</b>		
Both bearings require a small, barely noticeable, amount of play. Only the left bearing screw is adjustable for the horizontal bearings. The vertical bearing adjustment is made by means of the stop nut (40).		
Needle slides out of record groove	<ul style="list-style-type: none"> <li>a) Tonearm not balanced</li> <li>b) Tonearm tracking force too light</li> <li>c) Needle defective</li> <li>d) Tonearm bearing friction too high</li> <li>e) Ball missing from shut-off rail (189)</li> </ul>	<ul style="list-style-type: none"> <li>a) See operating instructions</li> <li>b) Adjust with spring housing (barrel spring 53) to correct pressure for particular cartridge</li> <li>c) Replace needle</li> <li>d) Check tonearm bearing</li> <li>e) Install ball (33 or 209)</li> </ul>
Tonearm lands beside tonearm rest (68)	<ul style="list-style-type: none"> <li>a) Arm segment assembly (254) out of position</li> <li>b) The latch (233) presses against the tabs (LS) of the arm segment during the change cycle</li> </ul>	<ul style="list-style-type: none"> <li>a) Loosen the machine screws (252, 255) and rotate the arm segment assembly (254). Then tighten screw (255) and re-check adjustment. Adjustment is correct when tonearm lowers onto arm rest (68) without binding. Finally, tighten screw.</li> <li>b) Loosen screw (197). Turn the short arm on the long switch arm piece to correct switch arm position. Turn the main cam by hand, and adjust so that when the tonearm lowers onto the arm rest, clearance of about <math>\frac{1}{64}</math>" is obtained between latch and segment tabs (LS).</li> </ul>
Horizontal bearing friction too high	Tonearm is set too high on the arm lift. Main lever jams against the guide pin of the lift screw assembly	Pickup needle should not be farther from the record than $\frac{1}{4}$ ". Adjust by turning screw (R 8, fig. 11).
Vertical movement of tonearm is impeded during set down cycle	<ul style="list-style-type: none"> <li>a) Bearing friction too high</li> <li>b) Lift screw (261) jams in guide sleeve of the arm segment (254)</li> </ul>	<ul style="list-style-type: none"> <li>a) Check bearing set screw (21) and arm balance</li> <li>b) Remove and clean lift screw</li> </ul>

Fig. 9 Tonearm guide mechanism



Tonearm raising and lowering, as well as horizontal movements, are controlled by main lever (220) and lift screw (261).

Setting the unit for playback of 7", 10" and 12" records is accomplished by means of the switch button (73, fig. 12). The set-down point of the tonearm is determined by the eccentric of the arm positioning slide (265) contacting the record size selector lever (262, fig. 13).

Horizontal movement of the tonearm is limited by the arm segment (254) striking the arm positioning slide (265). During the change cycle, the main lever (220) raises the arm positioning slide bringing it within reach of the spring stud (195). On completion of the change cycle (i. e., set-down of the tonearm on the record), the arm positioning slide is again released and returns to its normal position. It thus moves out of reach of the spring stud (195) permitting the tonearm to move horizontally without hindrance, while playing a record.

### Tonearm movements

A guide groove located on the underside of the main cam (166) controls automatic lift-off and set-down of the tonearm as the main cam rotates 360°.

### Tonearm lift

The tonearm lift permits the tonearm to be safely set down at any desired position of the record (except in the shut-off area).

Pushing the lift handle towards the front, turns the drive washer (245). This, in turn, moves the connecting lever (242), main lever (220), and lift screw (261) to raise the tonearm.

After swinging the tonearm to the desired spot of the record,

the lift handle is lightly tapped towards the rear, to release. Thus freed, connecting lever and the leaf spring (206) of the main lever (220) resume their normal positions and the tonearm lowers. The lowering of the tonearm is delayed by silicone grease on the drive washer.

The set screw (R 8) permits needle height to be varied from 0 to 1/2" above the record. Turning to the right increases, to the left decreases, this distance.

Fig. 10 Tonearm lift (tonearm raised)

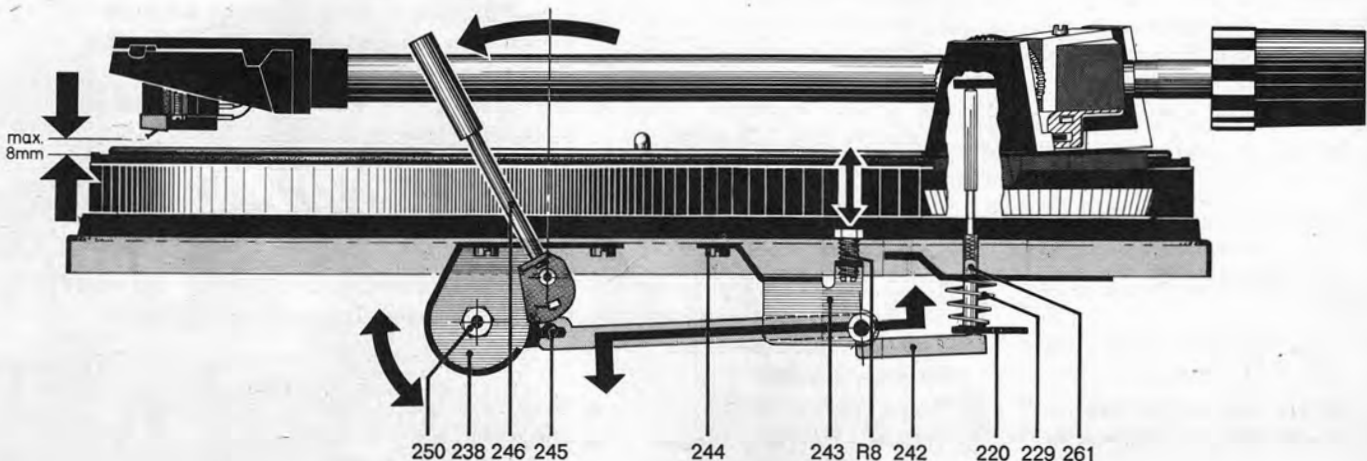
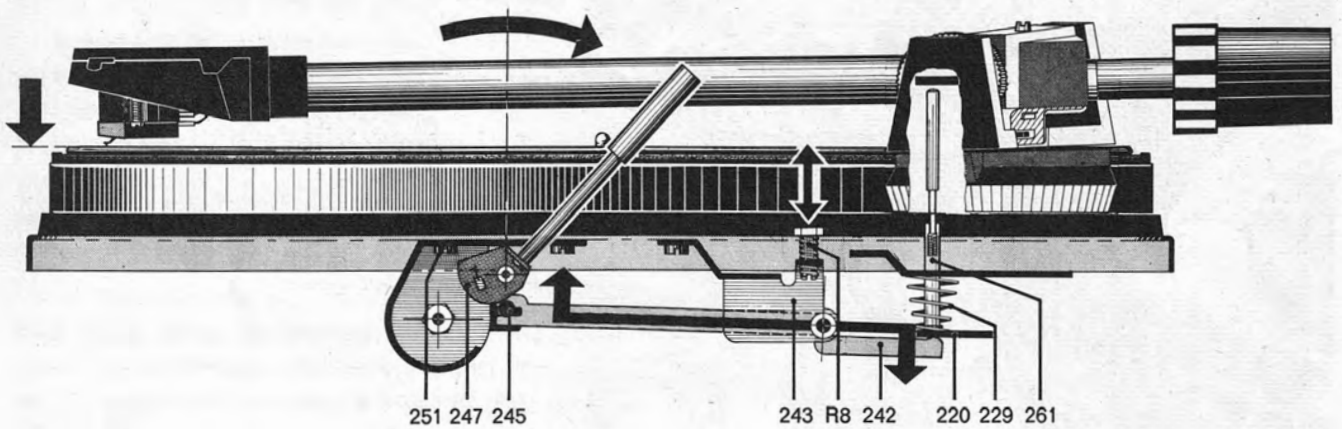




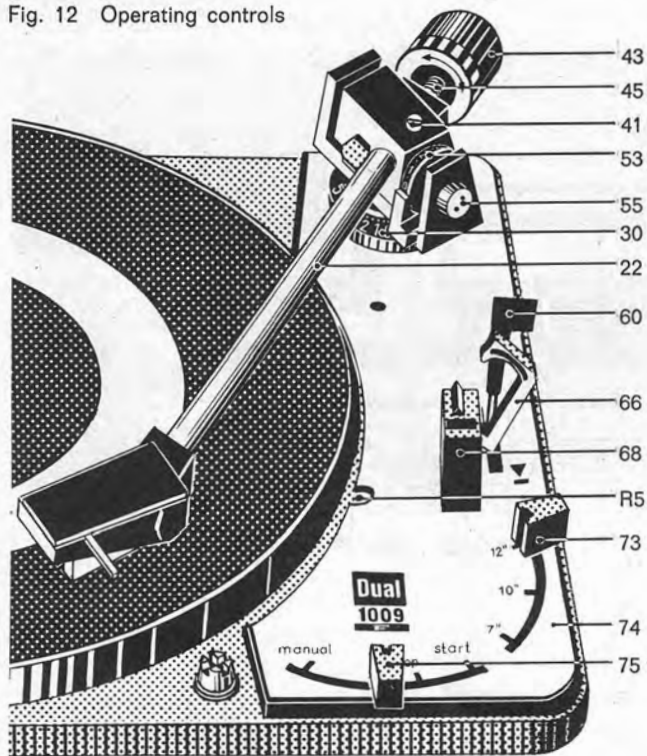
Fig. 11 Tonearm lift in rest position



### Trouble shooting:

Symptom	Cause	Remedy
Tonearm does not move onto record when drop cycle actuated	Damping too great Drive washer dirty	Loosen nut (250). Remove cover washer (249) and drive washer (245). Clean thoroughly. Smear silicone oil AK 300 000 evenly on both sides of the drive washer. Reassemble and wipe off excess oil.
Tonearm lowers too quickly onto record when drop cycle is actuated	Too little damping	Loosen nut (250). Remove cover washer (249) and drive washer (245). Clean thoroughly. Smear silicone oil AK 300 000 evenly on both sides of the drive washer. Reassemble and wipe off excess oil.
Tonearm misses edge of record	a) Wrong record size selected b) Set-down incorrectly adjusted c) Record not of standard size d) Tonearm clutch surfaces contaminated	a) Select correct record size with record size button b) Adjust for 7" record by turning eccentric screw R 5, so that tonearm sets down about $\frac{1}{16}$ " from edge of record. (Adjustment is made only for 7" records; 10" and 12" adjustment being then automatically correct.) c) Use standard records d) Clean clutch surfaces
Tonearm strikes record during change cycle	Tonearm height incorrectly set	Bend tab (L) towards or away from bearing plate (51). When correctly adjusted, the pickup needle is $\frac{1}{64}$ " above the dress-up plate (74) when removed from the arm rest.

Fig. 12 Operating controls



## Start cycle

Operating the start button (75, fig. 12) moves the switch lever (269) towards the main cam, initiating the following sequences:

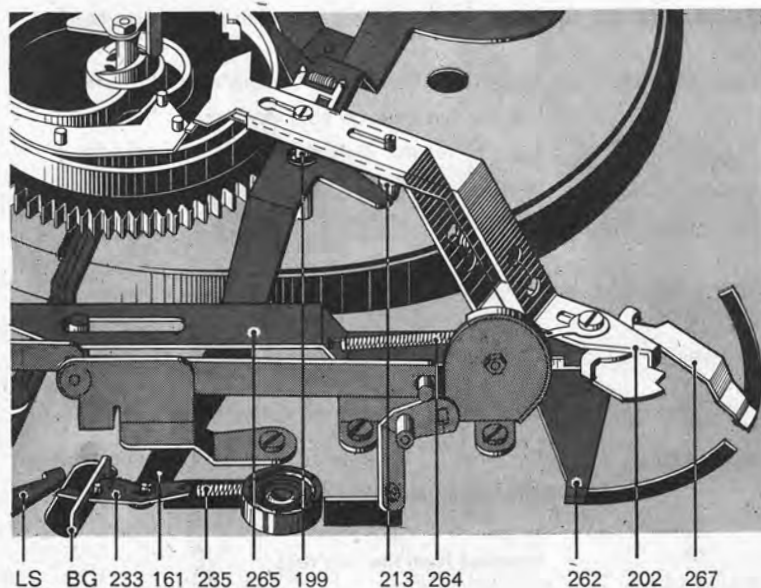
- a) The set screw (213) of the switch lever assembly turns the switch arm (161) mounted on the grooved shaft (199). The rocker assembly (155) moves the drive wheel (145, fig. 2) into contact with the motor pulley and turntable, by means of a tension spring. At the same time, the switch slide (153, fig. 15) actuates the line switch through the switch arm, and the turntable begins to turn.
- b) The switch angle (UW) mounted on the switch lever assembly (269) is brought within range of the cam follower lever (168) so that it is pushed into the change position after the rotation of the main cam (fig. 14).

Operating the start button also releases the start lever (202) pulling it towards the main cam by means of the tension spring (268). This causes the coiled spring (201, fig. 15) to bring the shut-off lever (163, fig. 18) within range of the main cam dog. Thus the shut-off lever drives the main cam.

To prevent mis-operation, the start button is locked during the start cycle (i. e. when the main cam is turning). Just before the main cam reaches its zero position (at the end of the change cycle), the start lever is pushed clear of the main cam by means of the start pin (SB) of the main cam. This, in turn, restores the switch lever and start button to their original positions.

After installing and also after moving the record changer, the unit should be operated with the tonearm locked. This will automatically re-adjust the shut-off lever which may have shifted out of position.

Fig. 13 Start position



## Manual operation

Placing the switch button in "manual" position initiates the start cycle. The switch lever assembly (269) is pushed towards the main cam and the following sequence is set up:

- a) Set screw (213) mounted on the switch lever (269) rotates the switch arm (161) which is mounted on the grooved shaft (199).
- b) The rocker assembly (155) then moves the drive wheel (145) into contact with the motor pulley and turntable by means of a tension spring.

- c) At the same time, the switch slide (153, fig. 15) actuates the line switch and the turntable begins to rotate.
- d) The switch arm latch (233) rests in the support (BG, fig. 14) in the base plate, locking the switch arm in position to keep the drive wheel in contact with the turntable.

On reaching the shut-off groove, the tonearm automatically returns to its rest position and the unit shuts off (see shut-off mechanism). However, should the tonearm be lifted off manually and returned to the tonearm rest, the tabs of the arm segment (254) release the latch (233). The tension spring (235) then returns the switch arm (161) to its initial position, opening the line switch and disengaging the drive wheel.

Fig. 14 Stop position

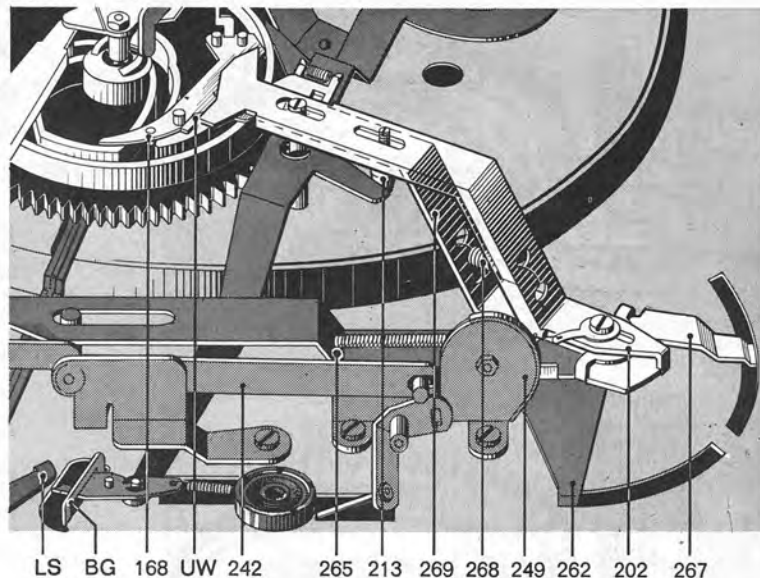
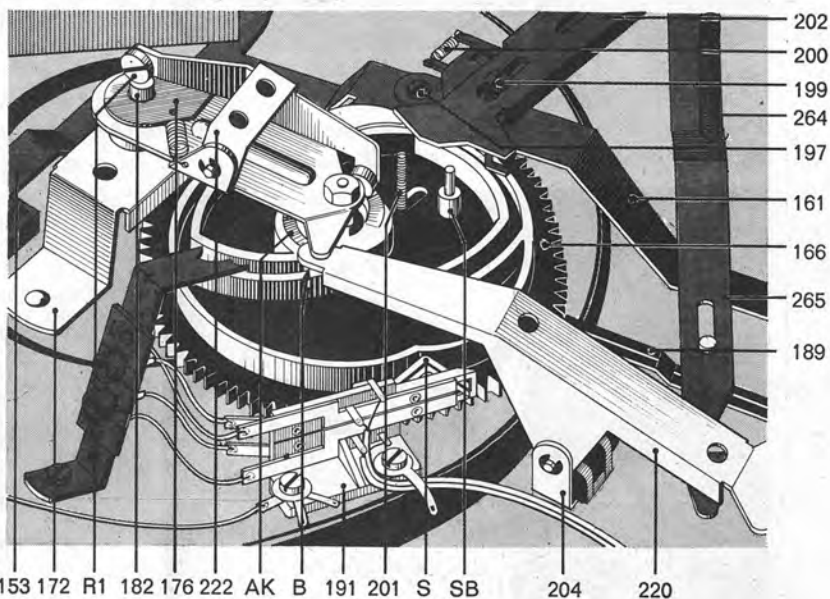


Fig. 15 Record drop



## Stop switching

Placing the switch button in "stop" position moves the switch lever (269) and switch angle (UW) towards the main cam, as in the start cycle, but only half as far. This causes the main cam to push the cam follower lever (168) to the side, into its "stop" position.

## Record drop

Records to be placed are stacked on the appropriate record spindle — AW 2 for standard records, AS 9 for 45 r.p.m. records. Records are dropped by the rotation of the main cam (166) whose cam (AK) guides the cam rocker (222), pushing the change actuator stud (182) and releasing a record by means of the automatic spindle.

The design of the main cam is such that a record can only

drop when the tonearm is above the tonearm rest — where it cannot interfere with the largest possible record (12" dia.).

A muting switch (191) is provided to prevent change cycle noises from being picked up by the tonearm cartridge. The switch springs (S) for both channels are actuated by the main cam (166). In the rest position, the muting switch opens.

Fig. 16 Change cycle

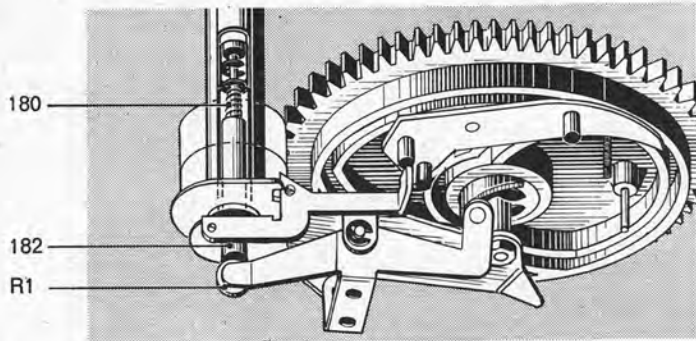


Fig. 17 Shut-off position

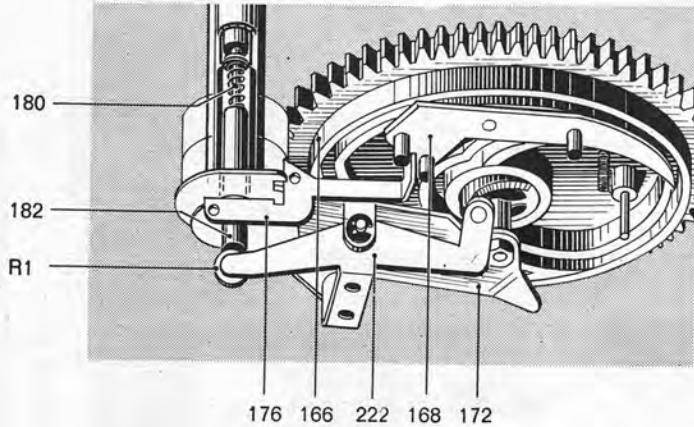
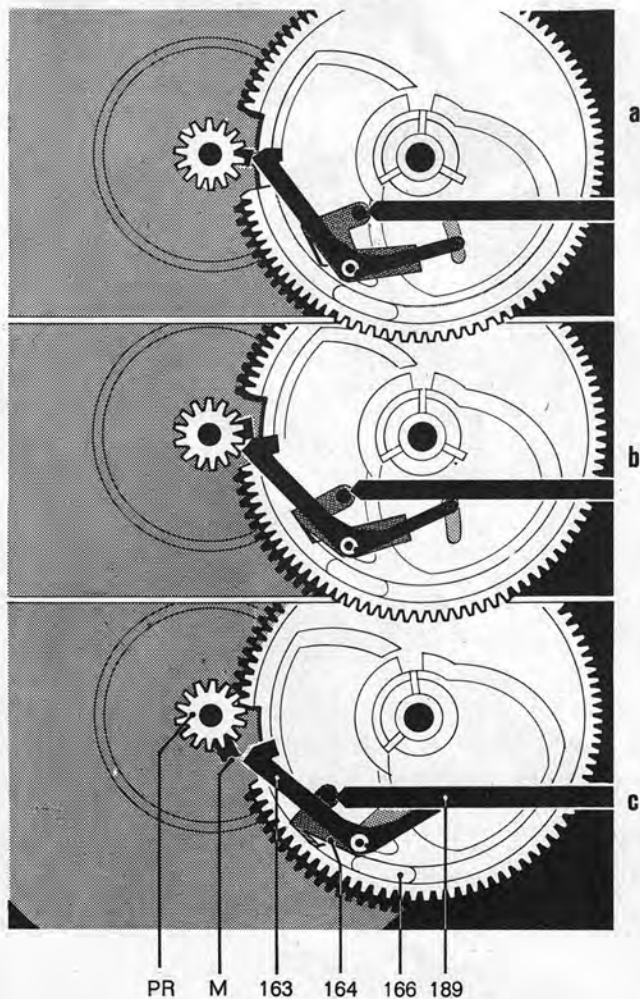


Fig. 18 Actuating "change" or "shut-off"



## Shut-off

Shut-off and change functions are determined by the position of the cam follower lever (168, fig. 17). After the last record of the stack drops, the change lever (176) guides the cam follower lever.

To initiate shut-off, the cam follower lever is brought into position (longer end towards the center of the main cam) by the change lever. After the tonearm has swung over the tonearm rest, the guide post (B, fig. 15) of the main lever (220) contacts the outside of the main cam (166) whose vertical profile causes the tonearm to lower onto its support. The traversing of the tonearm releases the latch (233) from its support (BG). However, the main cam keeps the switch arm (161) in its "play" position until the end of the change cycle. When the main cam returns to its zero position, the switch arm drops into the cut-out in the main cam, the line switch is operated and the drive wheel is disengaged.

## Shut-off and change cycle

The dog (M) on the turntable gear (PR) and the shut-off lever (163) actuate both the change cycle at the end of the record as well as the shut-off after the last record of a stack.

As a record is played, the tonearm moves towards the center of the record, dependent on the pitch of the record groove. This motion carries the shut-off lever towards the dog by means of the shut-off slide (189). The eccentric dog pushes the shut-off lever back at each revolution, as long as the tonearm advance is only one record groove (fig. 18a). The shut-off groove with its greater pitch brings the shut-off lever against the dog with greater force (fig. 18b). The shut-off lever then engages and causes the main cam (166) to be driven by the turntable gear out of its zero position (fig. 18c).

## Trouble shooting:

Symptom	Cause	Remedy
Tonearm returns to arm rest immediately, after being manually placed on record	Shut-off mechanism shifted out of position during shipping	Whenever unit is moved, before using, push selector button to "start" position
Turntable stops after automatic set-down of the tonearm	Switch arm (161) fails to engage latch (233)	Loosen screw (197) and turn the short arm piece on the long switch-arm piece. Turn the main cam to its zero position and adjust for about $\frac{1}{64}$ " play between the tabs (L) and the arm segment, when the tonearm drops onto the arm rest
Tonearm returns to its rest position after each record	Engagement between change lever (176) and cam follower lever (168) is too great	Re-adjust change lever (176) so that with record on, and spindle locked, there is about $\frac{1}{64}$ " clearance between change lever and the guide post of the cam follower lever (168). With no record loaded, engagement should be about $\frac{1}{32}$ ", to obtain shut-off
Turntable stops in manual position	Switch lever assembly out of adjustment	Re-adjust with set screw (213) so that in manual position, the latch (233) overtravels the support (BG) about $\frac{1}{64}$ ". Secure adjustment with locknut
Last record keeps repeating	Too little engagement between change lever (176) and cam follower lever (168)	Re-adjust change lever (176) so that with record on and spindle locked, there is about $\frac{1}{64}$ " clearance between change lever and guide pin of the cam follower lever (168). With no record loaded, engagement should be about $\frac{1}{32}$ ", to obtain shut-off
Record drops after stop, then start buttons are depressed	Normal operation	
Records do not drop	<p>a) Travel of cam rocker (222) too short</p> <p>b) Automatic spindle not locked in position</p> <p>c) Spindle is defective</p>	<p>a) Re-adjust eccentric R 1 so that when the 3 supports of the automatic spindle are completely retracted, further rotation of the main cam causes over-travel of about <math>\frac{1}{64}</math>" between the cam and the follower of the cam-rocker</p> <p>b) After inserting spindle, rotate to its stop</p> <p>c) Replace spindle</p>
Noise during change cycle, arm set-down and lift-off	Muting switch mis-adjusted. Clearance between switch spring (S) and switch leaf is too great	Bend switch spring (S) so that with main cam (166) in zero position, there is about $\frac{1}{64}$ " clearance between the switch spring (S) and the contact leaves of the muting switch. Spray contacts (e. g. contact 47) with contact cleaner and check muting switch adjustment
No sound. Muting switch remains closed	Too little clearance between switch spring (S) and contact leaves of muting switch	Bend switch spring (S) so that with main cam (166) in zero position, there is about $\frac{1}{64}$ " clearance between the switch spring (S) and the contact leaves of the muting switch

## Trouble shooting:

Symptom	Cause	Remedy
Motor continues to run after tonearm returns to its rest	Capacitor (154), 10,000 pF, 700 V. shorted	Replace RF interference capacitor with new 10,000 pF, 700 V. (see also fig. 3)
Turntable slows down as record drops	Travel of cam rocker (222) too long	Re-adjust eccentric R 1 so that when the three supports of the automatic spindle are completely retracted, further rotation of the main cam causes over-travel of about $1/64$ " between cam and roller of the cam rocker
Acoustic feedback	a) Parts of the chassis (e. g. junction board) touching the mounting board	a) Correct cut-out according to installation instructions
	b) Connecting leads pulled too tight	b) Loosen or lengthen leads

## Replacement parts

Ref. No.	Part No.	Description	Number per unit
1	202 357	45 automatic spindle (accessory)	1
2	200 469	Automatic spindle AW 2, 12 C - U 208	1
3	201 215	Turntable washer 12 K - 196	1
4	200 543	Retaining ring 12 E - 214	1
5	201 452	Facing ring for turntable mat 12 M - 22	1
6	207 481	Turntable mat assembly 12 M - U 36	1
7	207 480	Turntable and mat assembly 12 M - U 34	1
8	212 128	Speed change knob 12 V - 30	1
9	212 118	Switch plate assembly 12 V - U 52	1
10	210 362	Hex nut M 3/7a	6
11	212 126	Cam wheel 12 V - 18	1
12	212 114	Speed change lever 12 V - U 4	1
13	212 127	Adjusting wheel 12 V - 20	1
14	201 103	Shipping screw assembly 12 K - U 341	1
16	207 420	Tonearm assembly with bearings 12 J - U 103	1
17	201 095	Centering disc for 45 records 12 K - U 327	1
18	201 101	Manual spindle 12 K - U 337	1
19	210 362	Hex nut M 3/7a	6
20	200 829	Stop nut 12 J - 46	1
21	200 828	Set screw 12 J - 44	1
22	207 420	Tonearm assembly 12 J - U 103	1
23	201 132	Tonearm lift 12 K - 36	1
24	210 182	Tonearm handle 4680/4,2/8d	1
25	210 630	Washer 4,2/8/0,5 St	1
26	210 197	Grip ring 4693/4	1
27	201 077	Retainer 12 K - U 270	1
28	207 454	Shield 12 K - 314	1
29	200 567	Ball bearing race 12 F - U 60	2
30	207 431	Adjusting ring with guide ring assembly 12 J - U 121	1
31	210 816	Hex-head screw 6 K 4/4	2
32	210 816	Hex-head screw 6 K 4/4	2

Ref. No.	Part No.	Description	Number per unit
33	209 358	Steel ball 4000/400	1
34	210 366	Hex nut M 4/2	10
35	210 362	Hex nut M 3/7a	6
36	210 187	Bowed lockwasher 4680/5,2/10a	2
37	201 159	Positioning screw 12 K - 90	1
38	201 148	Bearing housing 12 K - 69	1
39	200 567	Ball bearing race 12 F - U 60	2
40	200 149	Lock nut 12 K - 71	1
41	200 820	Screw 12 J - 26	1
42	200 819	Dress-up cover 12 J - 24	1
43	201 090	Counterweight assembly 12 K - U 320	1
44	207 495	Counterweight assembly with spindle (short) 12 L - U 105	1
	207 460	Counterweight assembly with spindle (long) 12 L - U 106	1
45	207 467	Spindle, short 12 L - U 117	1
	207 468	Spindle, long 12 L - U 118	1
46	200 827	Washer 12 J - 42	1
47	201 414	Threaded stud 12 L - 38	1
48	201 099	Contact block assembly with tonearm leads 12 K - U 333	1
50	200 817	Spacing block 12 J - 18	1
51	200 806	Bearing plate assembly 12 J - U 16	1
52	201 413	Hex-head screw 12 L - 36	1
53	201 085	Spring barrel 12 K - U 311	1
54	200 824	Dress-up cover 12 J - 32	1
55	201 404	Bearing screw assembly, long 12 L - U 14	1
56	201 403	Bearing post 12 L - U 12	1
57	207 463	Bearing frame assembly 12 L - U 109	1
58	201 026	Spring lever 12 K - U 46	1
59	210 145	"C" ring 4650/2,3	10
60	201 782	Arm lift lever 12 P - U 54	1
61	210 353	Hex nut M 2/4	1
66	201 625	Arm latch assembly 12 N - 32	1
67	201 626	Shaft 12 N - 34	1
68	202 212	Tonearm rest assembly with arm latch 12 S - U 50	1
69	202 211	Plate complete with threaded bushing 12 S - U 4	1
70	210 362	Hex nut M 3/7a	6
71	200 703	Special screw (pierced)	2
	200 708	Special screw (threaded)	2
72	201 162	Damping block 12 K - 95	1
73	201 835	Switch button 12 P - 68	2
74	212 147	Dress-up plate, metric markings 12 X - U 50	1
	212 148	Dress-up plate, inch markings 12 X - U 52	1
75	201 835	Switch button 12 P - 68	2
76	200 444	Spring washer 12 A - 92	2
77	210 474	Machine screw Z 3/4,5a	2
78	210 187	Bowed lockwasher 4680/5,2/10a	2
79	210 658	Washer 5,1/10/1 St	1
80	210 147	"C" ring 4650/4	3
81	210 366	Hex nut M 4/2	10
82	200 579	Suspension spring (3 pcs to a set) 12 F - U 136	1
83	200 723	Rubber sleeve 12 F - 303	3
84	200 722	Cup 12 F - 300	3
85	200 724	Compression spring 12 F - 314	3
86	200 721	Threaded disc 12 F - 298	3
87	212 149	Name plate, 110/220 V, 50 cycle 12 X - 25	1
	212 150	Name plate, 110/125 V, 60 cycle 12 X - 26	1
	212 151	Name plate, CSA	1
88	212 113	Baseplate assembly 12 V - U 2	1
89	200 713	Washer 12 F - 255	2
	201 632	Rubber washer 12 N - 88	2
90	200 712	Spring cup 12 F - 254	2
	210 366	Hex nut M 4/2	10
91	200 711	"C" ring 12 F - 249	2
92	200 718	Compression spring 12 F - 291	2
93	210 624	Washer 4,2/7/0,3 St	4
94	210 147	"C" washer 4650/4	3
*	200 811	Assortement of spares, screws, and nuts 12 J - U 119	1
*	201 102	Mounting cone 12 K - U 339	1
*	201 223	Gauge for mounting the cartridge 12 K - 206	1
*	201 244	Compensating key in 15° system	1
*	211 473	Stroboscopic disc 10 - 30	1
*	210 099	Plastic shell 4170/23	1
*	210 503	Machine screw Z 3/4,2a	1
*	201 877	Mounting template 12 P - D 1	1
*	201 792	Shipping carton assembly 12 P - U 98	1
*	212 509	Operating instructions 12 X - D 2	1
*	212 511	Operating instructions 12 X - D 4	1
*	212 512	Operating instructions 12 X - D 6	1

Fig. 19 Exploded view, parts above base plate

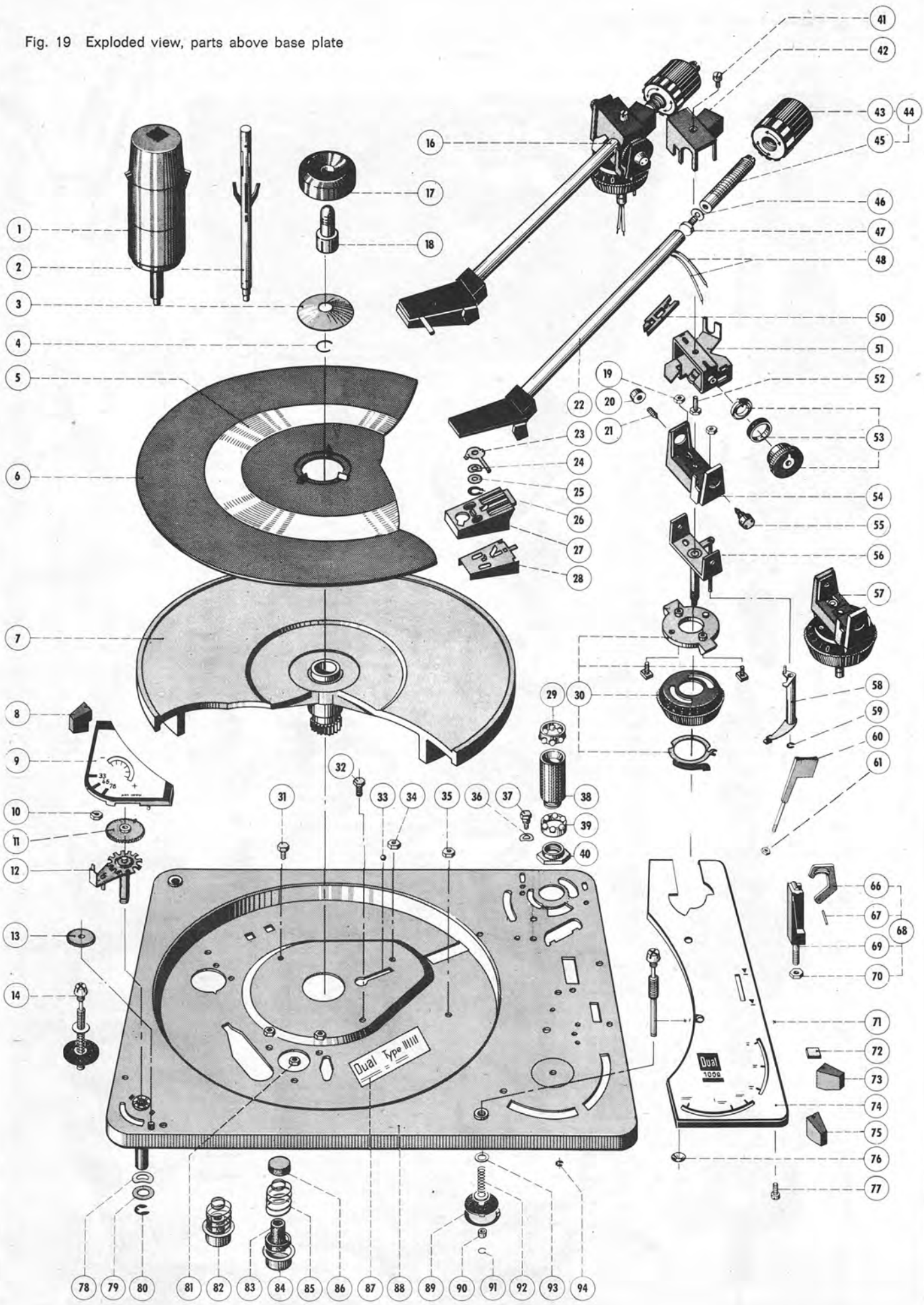
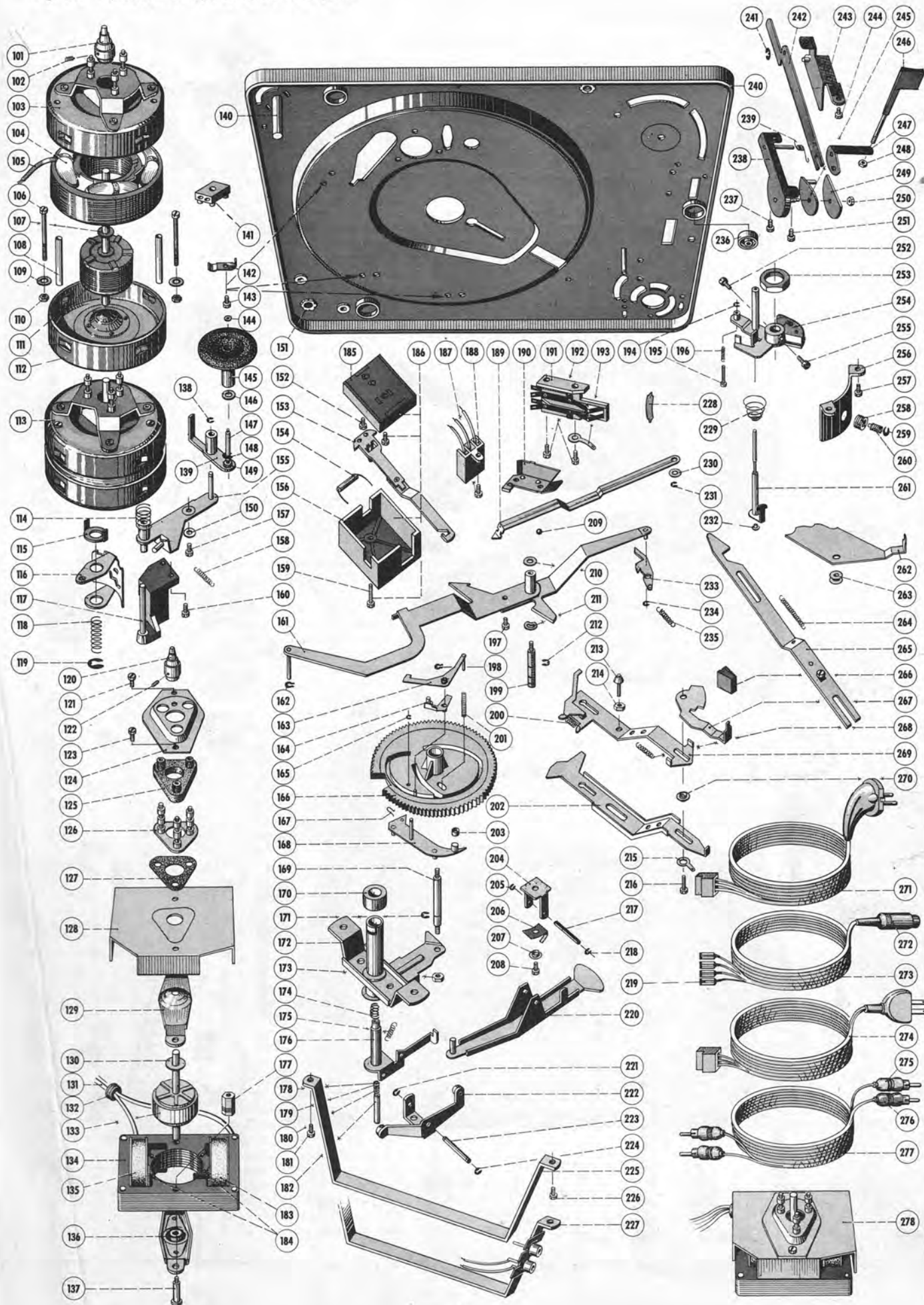




Fig. 20 Exploded view, parts below base plate



Ref. No.	Part No.	Description	Number per unit
101	212 145	Motor pulley, 50 cycle 12 X - U 14	1
	212 146	Motor pulley, 60 cycle 12 X - U 20	1
102	210 220	Set screw G 2,6/35	1
103	211 488	Upper end-bell assembly 31 N - U 72	1
104	204 487	Stator assembly 31 N - U 1	1
105	210 731	Insulating sleeve J 07 nf / 150	1
106	211 553	Machine screw Z 4/48	2
107	210 670	Washer 5,3/10/2 F	1
108	213 510	Insulating sleeve J 158 ge / 42	2
109	210 161	Tooth lock washer 4661 / 4,3	2
110	210 366	Hex nut M 4/2	10
111	204 499	Rotor assembly 31 N - U 15	1
112	211 487	Lower end-bell assembly 31 N - U 70	1
113	204 495	Motor assembly, less motor pulley 31 N - U 10	1
114	200 622	Compression spring 12 F - 24	1
115	212 123	Speed regulator detent 12 V - 9	1
116	212 124	Switch segment 12 V - 12	1
117	200 548	Support assembly 12 F - U 8	1
118	200 621	Compression spring 12 F - 18	1
119	210 151	"C" ring 4650/7	1
120	212 115	Motor pulley, 50 cycle 12 V - U 16	1
	212 116	Motor pulley, 60 cycle 12 V - U 22	1
121	210 509	Machine screw Z 3,5 / 8a	2
122	210 220	Set screw G 2,6 / 3,5	1
123	210 509	Machine screw Z 3,5 / 8a	2
124	204 669	Dress-up cover 31 R - 44	1
125	204 668	Rubber top 31 R - 40	1
126	204 632	Insert plate assembly 31 R - U 34	1
127	204 666	Rubber bottom 31 R - 36	1
128	204 663	Hum shield 31 R - 34	1
129	204 686	Upper end-bell assembly 31 U - U 16	1
130	204 689	Washer 31 U - 4	1
131	210 762	Insulating sleeving J 60 tr / 95	2
132	209 939	Grommet 4040/46	1
133	204 687	Rotor assembly 31 U - U 20	1
134	204 617	Stator assembly 31 R - U 3	1
135	204 622	Motor field coil 110/220 V 31 R - U 15	2
	204 662	Leaf spring for field coil 31 R - 22	4
136	204 685	Lower end-bell assembly 31 U - U 10	1
137	204 468	Mounting screw 12 F - 59	2
138	210 146	"C" ring 4650/3,2	1
139	212 121	Lever and stud assembly 12 V - U 58	1
140	212 122	Bearing tube 12 V - 4	1
141	209 381	Clamp (for power cord) 4010/2	1
142	200 447	Cable clamp 12 A - 325	3
143	210 472	Machine screw Z 3/4d	7
144	200 633	Lockwasher 12 F - 45	1
145	212 117	Idler wheel 12 V - U 50	1
146	200 110	Washer 11 C - 138	1
147	212 125	Idler wheel shaft 12 V - 16	1
148	210 145	"C" ring 4650 / 2,3	10
149	210 361	Hex nut M 3/4b	1
150	210 584	Washer 3,2/6/0,5 St	1
151	200 613	Threaded bushing 12 F - 8	2
152	210 486	Machine screw Z 3/8a	2
153	207 289	Switch slide 12 F - U 57	1
154	209 506	Capacitor, 10,000 pF, 700 V, 4020/83	1
155	200 547	Rocker assembly 12 F - U 7	1
156	200 684	Power switch cover 12 F - 152	1
157	210 469	Machine screw Z 3/3c	5
158	200 664	Drive wheel spring 12 F - 112	1
159	210 499	Machine screw Z 3/30a	1
160	210 475	Machine screw Z 3/5a	2
161	207 285	Switch arm 12 F - U 43	1
162	210 196	Grip ring 4693/3	1
163	200 558	Shut-off lever 12 F - U 42	1
164	200 557	Friction plate assembly 12 F - U 40	1
165	210 145	"C" ring 4650/2,3	10
166	201 081	Main cam 12 K - U 303	1
167	200 522	Snap ring 12 D - 57	1
168	200 795	Cam follower lever 12 H - U 11	1
169	200 519	Main cam bearing post 12 D - 36	1
170	200 554	Ball bearing assembly 12 F - U 28	1
171	210 149	"C" washer 4650/6	2
172	200 753	Bearing housing assembly 12 G - U 10	1
173	210 366	Hex nut M 4/2	10
174	200 638	Compression spring 12 F - 64	1
175	200 523	Change lever tension spring 12 D - 96	1

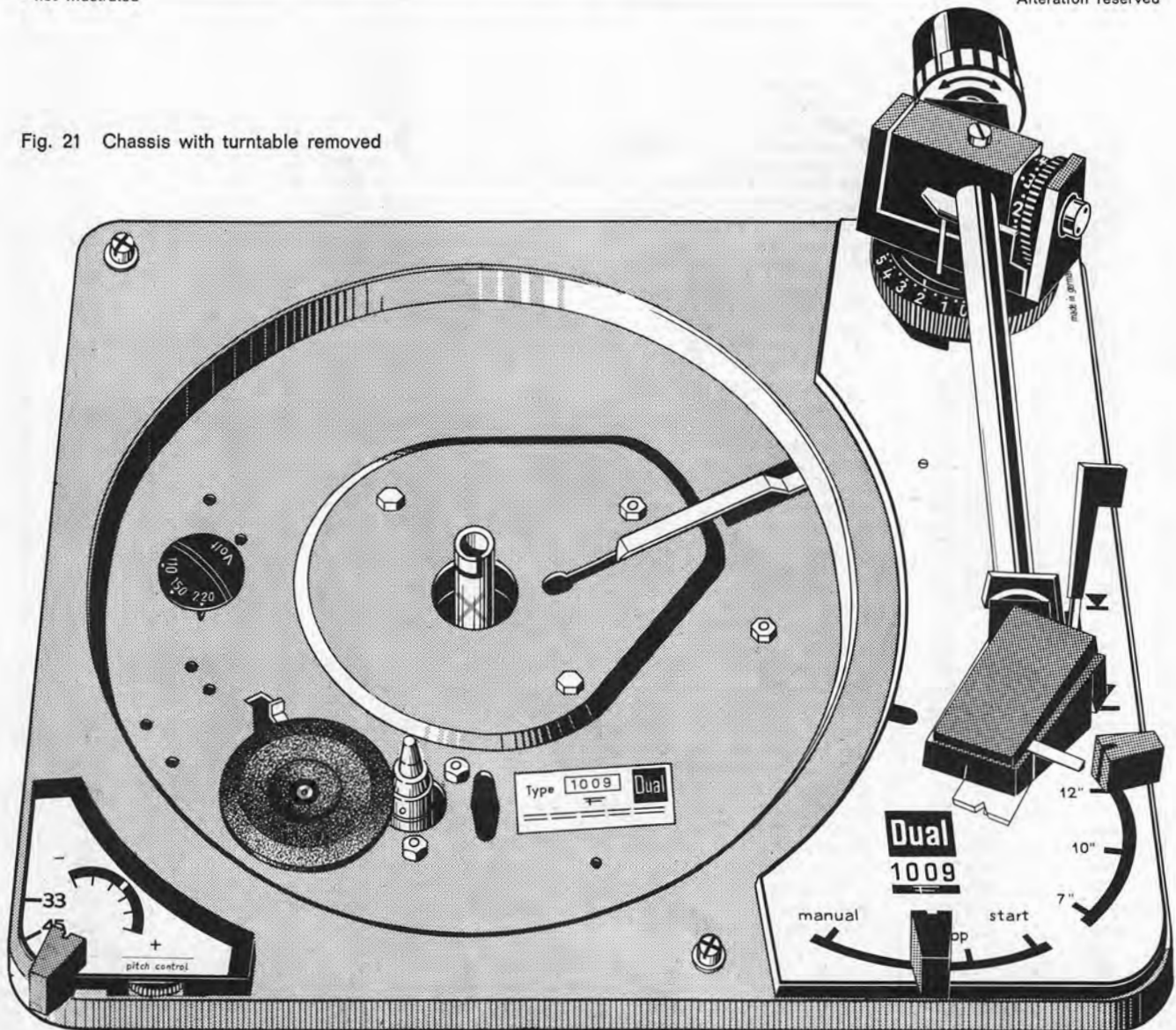
Ref. No.	Part No.	Description	Number per unit
176	200 754	Change lever 12 G - U 12	1
177	200 167	Bearing post 11 K - 100	2
178	210 143	"C" washer 4650/1,5	2
179	210 549	Washer 2,1 / 5 / 0,5 St	1
180	200 641	Compression spring 12 F - 68	1
181	210 472	Machine screw Z 3/4d	7
182	200 755	Change actuator stud assembly 12 G - U 14	1
184	210 140	Connector 4281/10	4
185	200 756	Switch plate with voltage selector 12 G - U 26	1
	200 563	Switch plate less voltage selector 12 F - U 54	1
186	207 361	Power switch with voltage selector 12 G - U 77	1
	207 287	Power switch with slide and cover 12 F - U 52	1
187	210 480	Machine screw Z 3/6a	3
188	200 587	4-pin connector w/breakaway power cord 12 F - U 163	1
189	200 688	Shut-off slide 12 F - 174	1
190	201 240	Hum shield 12 K - 250	1
191	207 447	Muting switch 12 K - U 345	1
192	210 472	Machine screw Z 3/4d	7
193	211 614	Solder lug 4103/29	1
194	210 143	"C" washer 4650/1,5	2
195	200 686	Spring stud 12 F - 168	1
196	201 174	Compression spring 12 K - 120	1
197	210 472	Machine screw Z 3/4d	7
198	210 194	Grip ring 4693/2	1
199	200 658	Grooved shaft 12 F - 100	1
200	200 676	Tension spring 12 F - 137	1
201	200 657	Coiled spring 12 F - 98	1
202	200 674	Start lever 12 F - 135	1
203	200 650	Rubber bumper 12 F - 84	1
204	201 185	Main lever bearing support 12 K - 140	1
205	210 145	"C" washer 4650/2,3	10
206	201 186	Leaf spring 12 K - 142	1
207	200 458	Spacer 12 B - 50	1
208	210 481	Machine screw Z 3/6b	1
209	209 358	Steel ball 4000/400	1
210	210 586	Washer 3,2/7/0,5 St	2
211	210 184	Bowed lockwasher 4680/5,2/8	1
212	210 147	"C" washer 4650/4	3
213	207 286	Set screw 12 F - U 51	1
214	210 360	Hex nut M 3/4b	1
215	209 974	Solder lug 4103/32	1
216	210 491	Machine screw Z 3/14a	1
217	200 528	Main lever shaft 12 D - 212	1
218	210 145	"C" washer 4650/2,3	10
219	209 436	Blade connector 4012/40	4
220	201 094	Main lever 12 K - U 325	1
221	210 145	"C" washer 4650/2,3	10
222	200 513	Cam rocker 12 D - U 60	1
223	200 525	Cam rocker shaft 12 D - 102	1
224	210 145	"C" washer 4650/2,3	10
225	201 204	Stand 12 K - 180	1
	202 082	Stand 12 R - 16	1
226	210 479	Machine screw Z 3/5,5	2
227	211 434	Stand with phono jacks 12 K - U 102	1
228	200 687	Audio cable, spring retainer 12 F - 172	1
229	201 179	Helical spring 12 K - 128	1
230	201 187	Washer 12 K - 144	1
231	210 145	"C" washer 4650/2,3	10
232	200 527	Guide pin 12 D - 209	1
233	201 014	Latch 12 K - U 18	1
234	210 145	"C" washer 4 650/2,3	10
235	200 103	Tension spring 11 A - 10	2
236	200 721	Threaded bushing 12 F - 298	3
237	210 469	Machine screw Z 3/3c	5
238	201 037	Support bracket with drive washer 12 K - U 70	1
239	201 196	Torsion spring 12 K - 162	1
240	212 113	Base plate assembly 12 V - U 2	1
241	210 145	"C" washer 4650/2,3	10
242	201 203	Connecting lever 12 K - 176	1
243	201 042	Bearing support, connecting lever 12 K - U 80	1
244	210 479	Machine screw Z 3/5,5	2
245	201 039	Drive washer 12 K - U 74	1
246	201 782	Arm lift rod 12 P - U 54	1
247	201 040	Drive cam assembly 12 K - U 76	1
248	210 353	Hex nut M 2/4	1
249	201 195	Cover washer 12 K - 160	1

Ref. No.	Part No.	Description	Number per unit
250	210 366	Hex nut M 4/2	10
251	210 469	Machine screw Z 3/3c	5
252	210 482	Machine screw Z 3/6c	1
253	200 685	Hex nut 12 F - 156	1
254	207 462	Arm segment assembly 12 L - U 108	1
255	210 480	Machine screw Z 3/6	3
256	201 181	Spring post 12 K - 131	1
257	210 469	Machine screw Z 3/3 c	5
258	201 182	Threaded bushing 12 K - 132	1
259	201 184	Positioning washer 12 K - 136	1
260	201 183	Tension spring 12 K - 134	1
261	201 033	Lift screw 12 K - U 60	1
262	201 815	Record size selector lever 12 P - 16	1
263	200 666	Spacer, short 12 F - 120	1
264	200 453	Tension spring 12 A - 452	1
265	201 035	Arm positioning slide 12 K - U 64	1
266	201 835	Switch button 12 P - 68	2
267	201 816	Manual / automatic selector 12 P - 18	1
268	200 103	Tension spring 11 A - 10	2
269	207 284	Switch lever assembly 12 F - U 41	1
270	200 672	Spacer, long 12 F - 132	1
271	207 312	Power cord, european 12 F - U 184	1
272	209 424	Miniature 5-pin plug 4012/21	1
273	207 303	Plug-in output cable 12 F - U 133	1
274	207 311	Power cord, american 12 F - U 175	1
275	209 425	Phono plug (yellow) for output cable 4012/22	2
276	209 426	Phono plug (red) for output cable 4012/23	2
277	207 299	Output cable, phono connector 12 F - U 127	1

\* not illustrated

Alteration reserved

Fig. 21 Chassis with turntable removed



## Lubrication

All bearings and sliding points have been properly lubricated during assembly. Re-lubrication is normally not necessary for about two years since all important bearings are provided with oil retainers and sintered bearings.

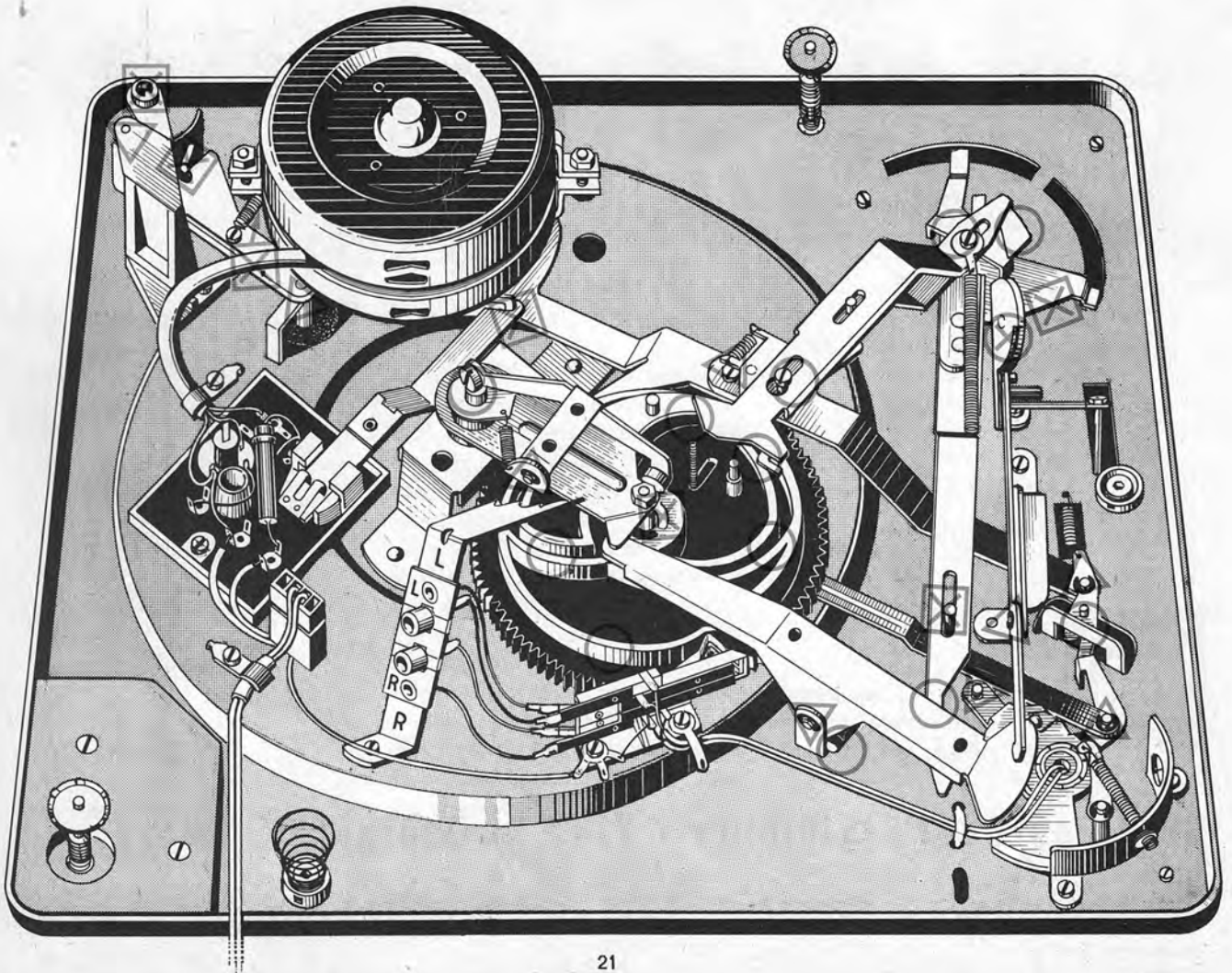
Lubrication should be applied sparingly. It is of primary

importance that no oil or grease should get onto the friction surfaces of the drive wheel, motor pulley or turntable, to avoid slippage. For the same reason, avoid touching these parts.

Use the following lubricants:

- Fine bearing oil, Shell Clavus 17, for motor bearings and sintered bearings.
- × Adhesive oil, Renotac, for turntable and drive wheel.
- Molycote paste G, where greater pressure or friction occur.
- ⊕ Silicon oil AK 300 000, for the drive washer of the tonearm lift.
- ⊗ Silicone grease.
- △ Thicker, non-gumming oil, Calypsol WIK 700, for other sliding and bearing points.

Fig. 22 Chassis, viewed from below



**Dual**

**Dual Gebrüder Steidinger · 7742 St. Georgen/Schwarzwald**