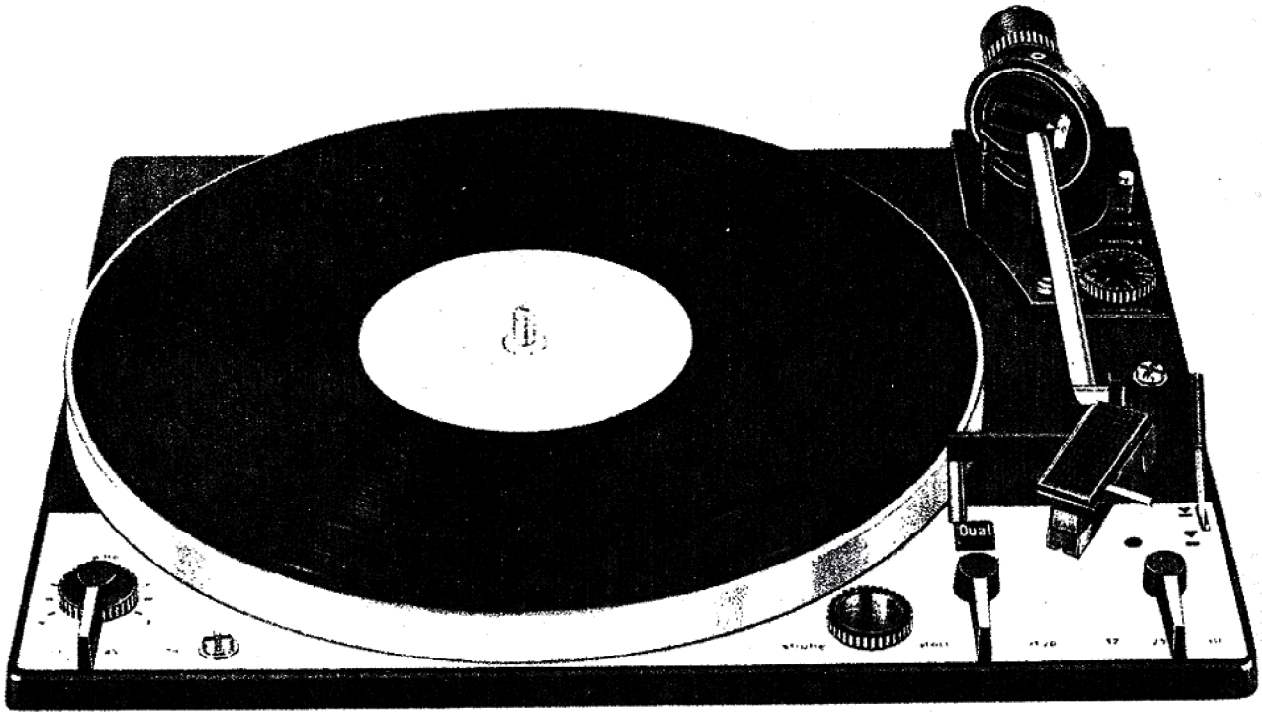
Dual

Dual 1229
Service manual

Edition May 1972



1229

Technical specifications

Power source:	50 or 60 Hz alternating current, selected by exchanging motor pulley and resetting stroboscope.
Line (mains) voltage:	110 – 130 volts or 220 – 240 volts, switchable
Drive:	Dual synchronous/continuous-pole motor, with radial elastic suspension (type M 1219 S)
Power consumption:	approx. 10 W
Current consumption:	at 220 volts, 50 Hz approx. 62 mA at 117 volts, 60 Hz approx. 115 mA
Turntable platter:	nonmagnetic, dynamically balanced, weight 3.1 kg, diam. 305 mm.
Turntable speeds:	33 1/3, 45 and 78 rpm
Pitch control:	Range of variation, one semitone (6 %), on all three speeds.
Stroboscope:	For 33 1/3 and 45 rpm speeds. Illuminated by special neon glow lamp.
Speed variation:	< ± 0,06 % according to DIN 45 507
Noise:	Rumble 42 dB below standard signal Weighted audible rumble 63 dB below standard signal } measured according to DIN 45 500
Tonearm:	Torsionally rigid, extra-long all-metal tonearm in four-point gimbal type bearing, with skeletal tonearm head.
Maximum tracking error:	0.16°/cm
Tonearm bearing friction: (referred to stylus tip)	vertical 0.007 gram horizontal 0.015 gram
Tonearm head (cartridge holder):	Removable, accepts all cartridges weighing 1 to 12 grams and having standard 1/2" mounting centers.
Weight:	7.2 kg unpacked
Mounting dimensions and mounting-board cut-out:	see installation instructions.

Dual Gebrüder Steidinger · 7742 St. Georgen/Schwarzwald

Fig. 1 Tonearm hook-up schematic

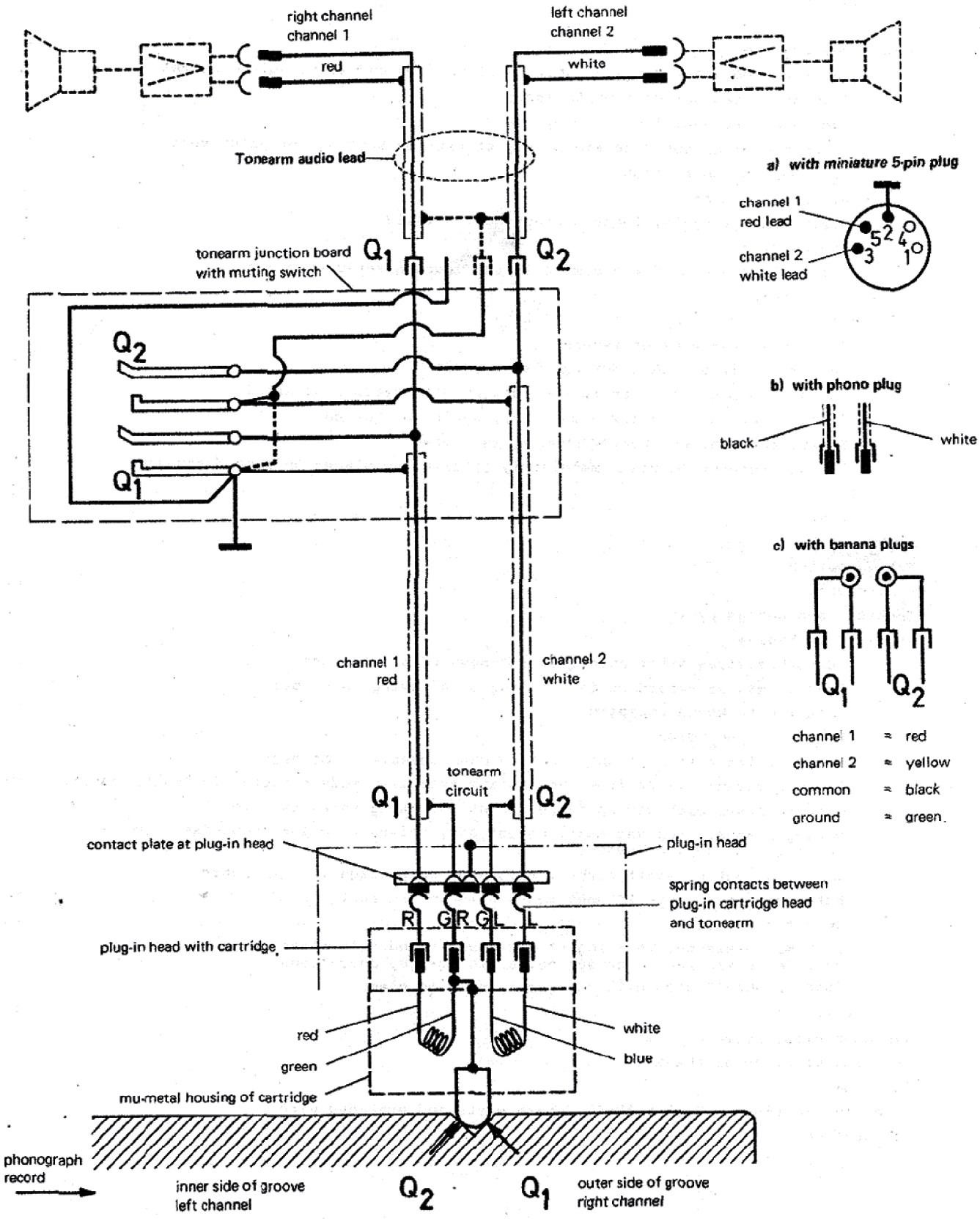


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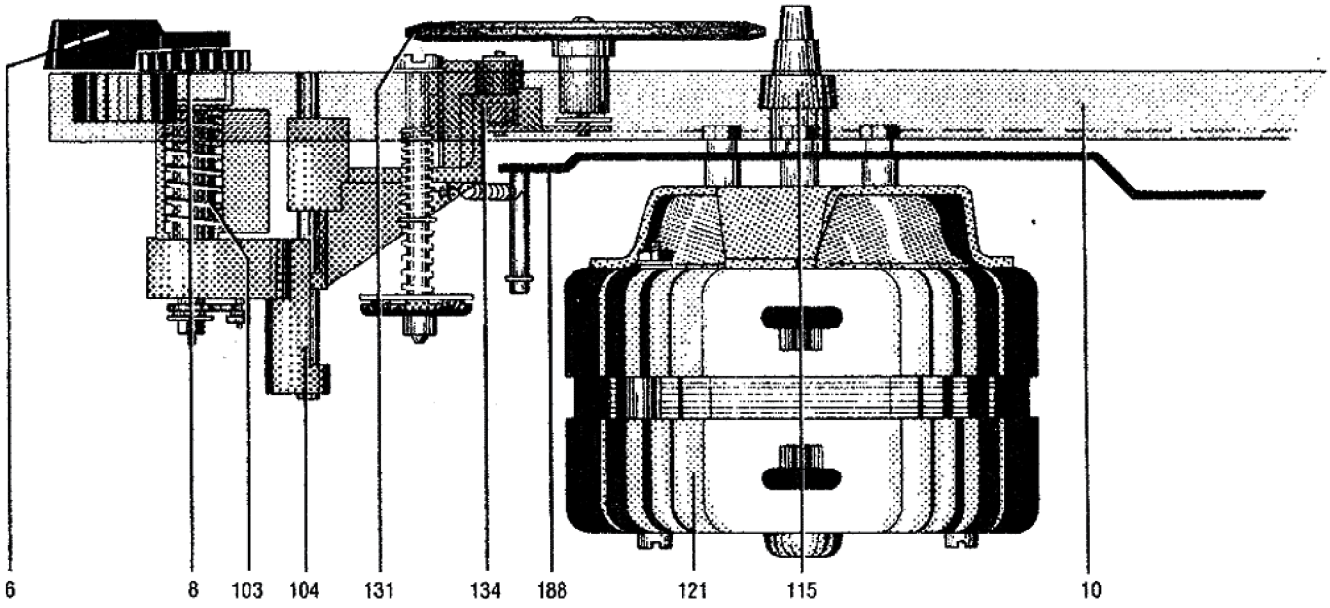
Fig. 2 Motor suspension and turntable platter drive



Motor and drive

Power for the turntable platter and the changing mechanism is supplied by a four-pole, split-pole synchronous motor suspended by radially located elastic mounts and having a very small stray magnetic field as well as little vibration.

The speed of the motor is independent of line-voltage, temperature or load variations. Speed is dependent on, and proportional to power-line frequency. The motor is adapted to 50 or 60 cycle (Hz) power-line frequencies by the correct choice of the motor pulley.

Motor pulley for 50 Hz operation:	part no. 218 275
Motor pulley for 60 Hz operation:	part no. 218 276

The motor pulley is fastened to the motor shaft by a setscrew. When you change pulleys, be sure that the new pulley is set at the correct height (see page 6). The turntable platter is driven by the idler wheel (131), which, to prevent damage to its friction surfaces, is automatically disengaged when the unit is shut off. Setting the turntable speed to 33 1/3, 45 or 78 rpm is done by raising or lowering the idler to bear against the proper step of the motor pulley.
Upon actuation of the switch (6), the switch segment (102) rotates. This causes the lever (134) fitted into a slot on the segment to move vertically. The drive wheel (131) carried on the swinging arm (133) is then lifted off the motor pulley and moved and replaced on the motor pulley step corresponding to the selected speed.

Fig. 3 Motor field connections (without voltage selector)

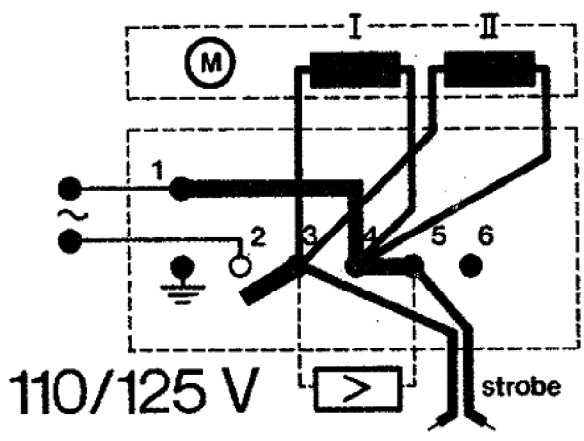
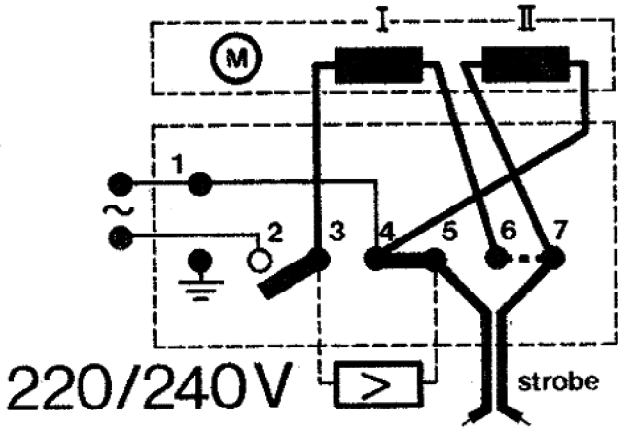


Fig. 4 Motor field connections (with voltage selector)



Strobe

The exact adjustment for the 33 1/3 and 45 r.p.m. can be done and control with the help of the strobe.

The ring of lines on the strobe will appear to stand still when the corresponding chosen speed (33 1/3 or 45 r.p.m.) rotates at the correct speed.

If the ring of lines move in the same direction as the turntable platter, the speed of the platter is too fast; when the lines move in the opposite direction of the platter, then the platter is rotating slower than the chosen speed.

The adjustment is made with the Var.Pitch knob (8). The view angle of the strobe can be rotated by turning the strobe ring. To change the cylinder-head screws of the strobe, loosen then, strobe housing (85) on "50" or "60", push it and tight the screws again.

The neon lamp can changed after removing the top part of the housing (84). When replacing the neon lamp, be sure that the red point (P) (Anode) is located on the right contact-spring (front view of unit).

Symptom

The strobe's neon lamp does not light up when the unit is turned on.

Cause

a) Defective neon lamp
b) Current path is interrupted

Remedy

a) Replace the neon lamp (87). Make sure that the the red point (Anode) of the neon lamp is located on the right contact spring (front view of unit)
b) Check the connection on the power supply switch and structure parts

Fig. 6 Strobe

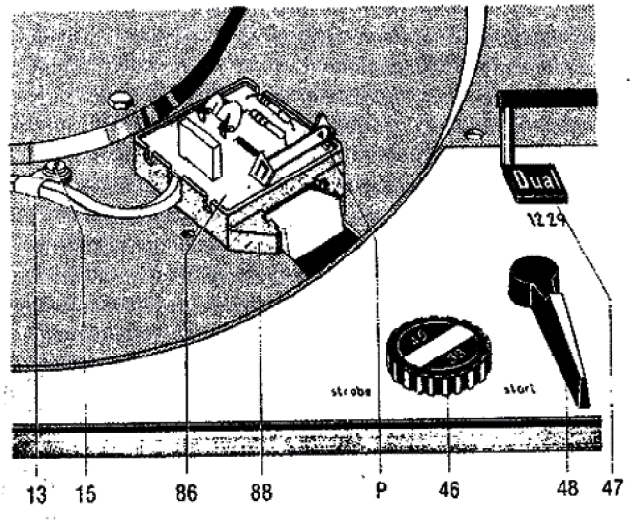


Fig. 7 Wiring diagram

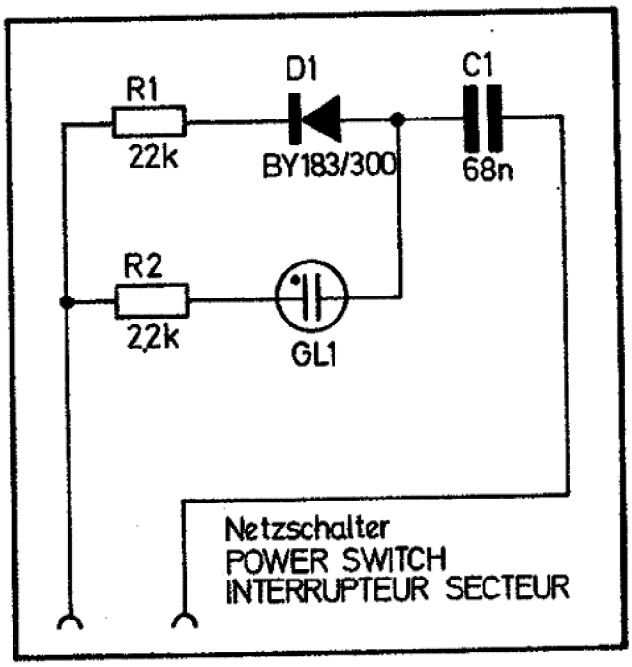


Fig. 5 Motor field connections (without voltage selector)

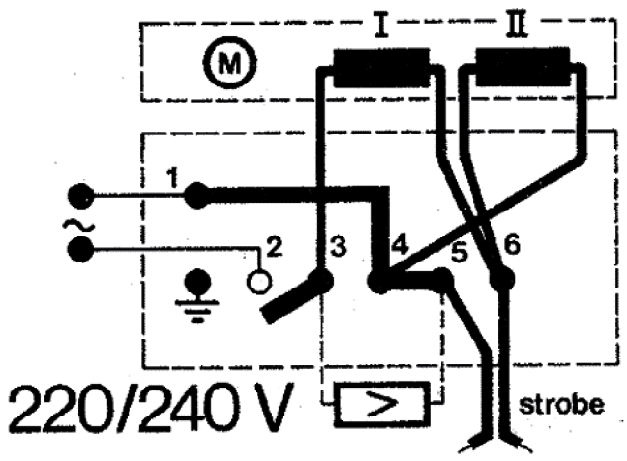


Fig. 8 Circuit board (output stages)

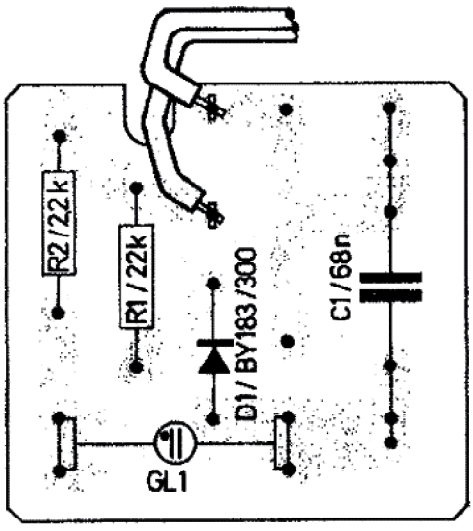
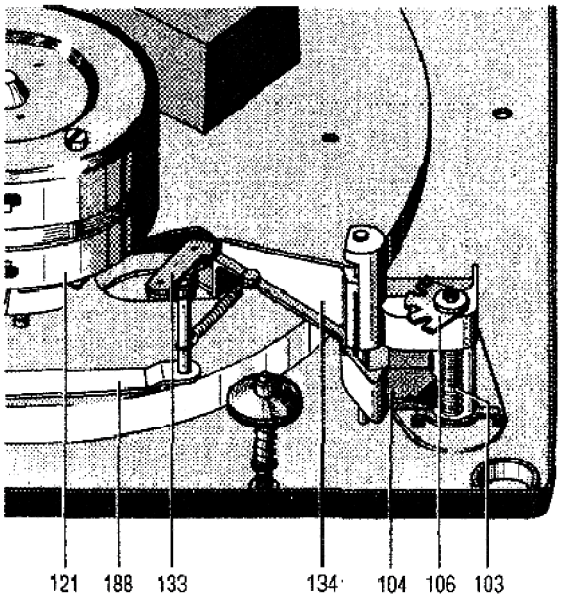


Fig. 9 Drive-wheel shift mechanism and turntable speeds



Fine-speed adjustment

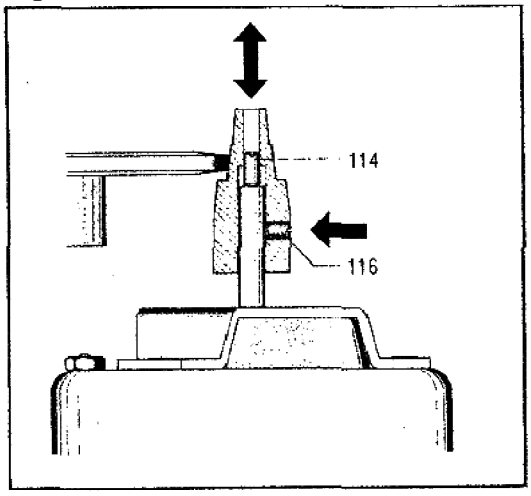
A fine-speed adjustment for all three speeds permits a platterspeed variation of 6 % (about 1 semitone), independent of supply voltage. Turning the pitch-control knob (8) causes the selector segment (102) to rotate. The switch lever assembly (134) moves up and down, changing the position of the idler wheel on whatever motor pulley step it has been placed on. The tapered shape of the motor pulley gives an adjustment range of ± 3 % from the nominal speed.

The motor pulley (115) should be adjusted in such a way that by setting it on 33 1/3 r.p.m. (controlled with the strobe)., the markings an the adjusting disc (8) should be between the two middle lines.

Due to the tolerance on the 45 r.p.m. speed, the rated speed differs from the 33 1/3 r.p.m. in that it can tolerate two dial markings on either side.

Symptom	Cause	Remedy
Turntable does not run when unit is plugged in and start switch operated	a) Current path to motor interrupted	a) Check connection at switch plate and voltage selector
	b) Idler wheel (131) not in contact with platter	b) Check switch lever assembly (134)
	c) Motor pulley loose	c) Tighten motor pulley
Turntable does not come up to speed	a) Motor pulley is not correct for local line frequency	a) Change motor pulley
	b) Slippage between idler wheel (131) and motor pulley or platter	b) Clean friction surfaces of idler wheel, motor pulley and turntable platter. If necessary, replace drive wheel. Once the drive surface of the platter has been cleaned, do not touch it with your fingers.
	c) Excessive friction in motor, drive wheel or platter bearings	c) Clean and oil bearings
Rumble in reproduction	Worn idler wheel	Replace idler wheel (131) and clean platter drive surface and motor pulley with greaseless solvent. Once surfaces are cleaned, do not touch them with your fingers.

Fig. 10



Symptom

Correct nominal speed obtained only at extreme settings of pitch control

Cause

Idler wheel does not contact motor pulley correctly

Remedy

Adjust the motor pulley vertically after loosening its setscrew (116) by turning screw (114). The correct position for the idler is in the center of each motor pulley step, when the pitch control is centered in its range (Fig. 10). Retighten setscrew after adjustments.

The tonearm and its suspension

The all-metal extra long "studio" tonearm of the Dual 1229 pivots both horizontally and vertically on needle bearings and precision ball bearings in hardened and polished races. It is suspended in a gimbal arrangement. This keeps friction to a minimum.

Vertical pivot friction = 0.007 gram
Horizontal pivot friction = 0.015 gram
referred to stylus tip

The arm is thus able to track extremely well. The tonearm head is removeable. Before setting the tracking force for the cartridge being used, set the tracking-force scale to zero and balance the tonearm.

You can balance it by sliding the counterweight (74). You can balance cartridges with a weight of 1 to 12 grams. To reduce the effects of small shock impulses to the arm, the counterbalance weight is elastically mounted on a threaded spindle, and friction-braket to prevent undesired rotation.

The cartridge holder will accept all cartridges with standard mounting centers of 1/2 inch. Stylus force is set by turning a calibrated dial (77), which stresses or releases a spiral spring contained inside.

The scale adjustment is calibrated from 0 - 3 p which is calibrated from 0 - 1,5 p in 1/10 p and from 1,5 - 3 p it is calibrated in 1/4 p.

Tracking force of more than 3 p can be adjusted with the help of the counter-weight on the tonearm by turning left (counter-clockwise) increasing the tracking force by 1/2 p.

To replace the tonearm and bearing assembly, follow these steps:

1. Set stylus force dial to zero and mode selector to "single".
2. Fasten unit in repair jig and turn up side down.
3. Unsolder tonearm leads.
4. Remove main lever (184) and linking lever (270).
5. Unhook springs (237, 241, 265) and unscrew protective plate (233).
6. Remove washer (266) and skating lever (267).
7. After removing washers (272) and (271), remove shut-off slide (253) from segment (201).
8. Loosen hex nut (236). Lift up guide (198), also the "C" ring.
9. Turn the unit back in its normal position.
10. Set mode selector on "multi", then rotate the outer bearing ring (60) counter-clockwise until it cannot turn any more. The tonearm can then be lifted out.

To replace the tonearm bearing assembly hold it fast with a suitable tool (such as a pair of flat-nose pliers) and loosen hex nut (71) with an open-end wrench. Be sure to secure the bearing socket with a 5 mm rod to prevent its being pinched together.

Fig. 11 Tonearm bearing assembly

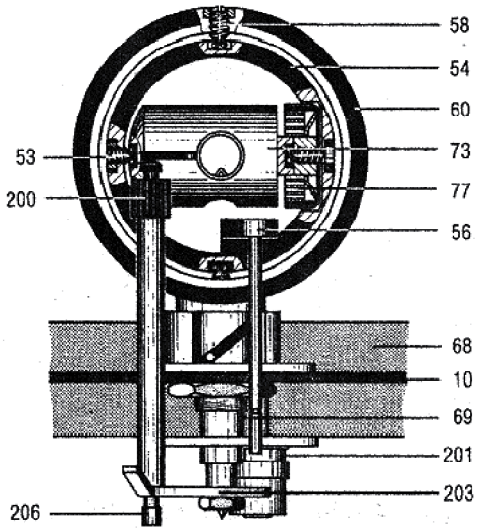


Fig. 12 Tonearm assembly

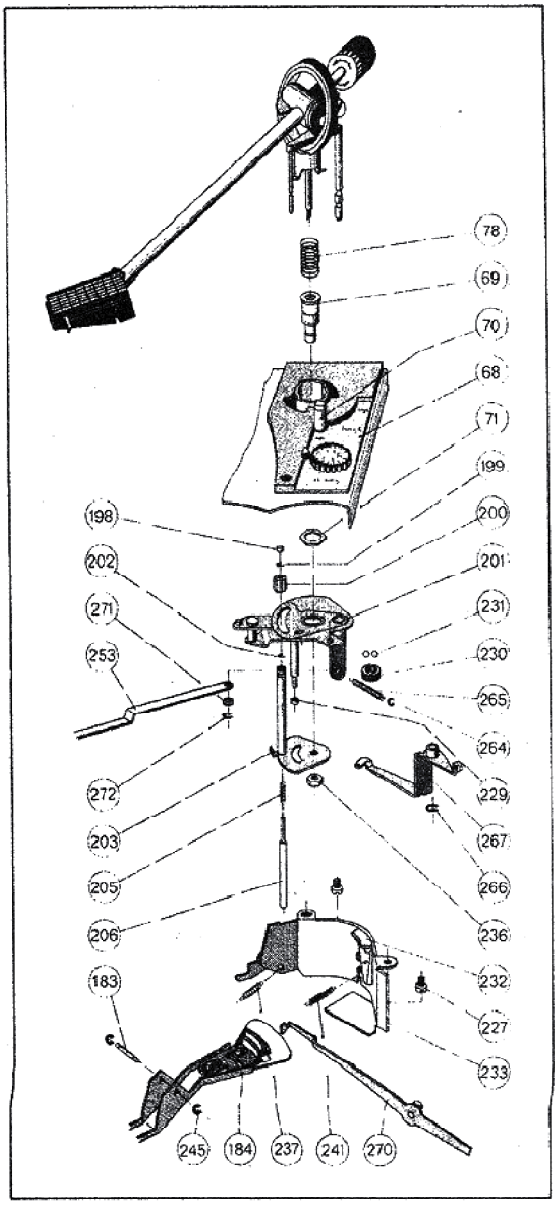


Fig. 13 Tonearm bearing assembly viewed from underneath

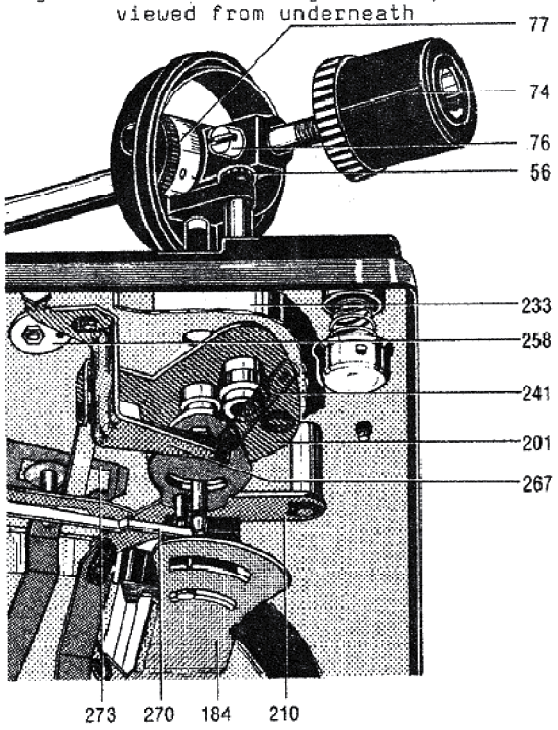
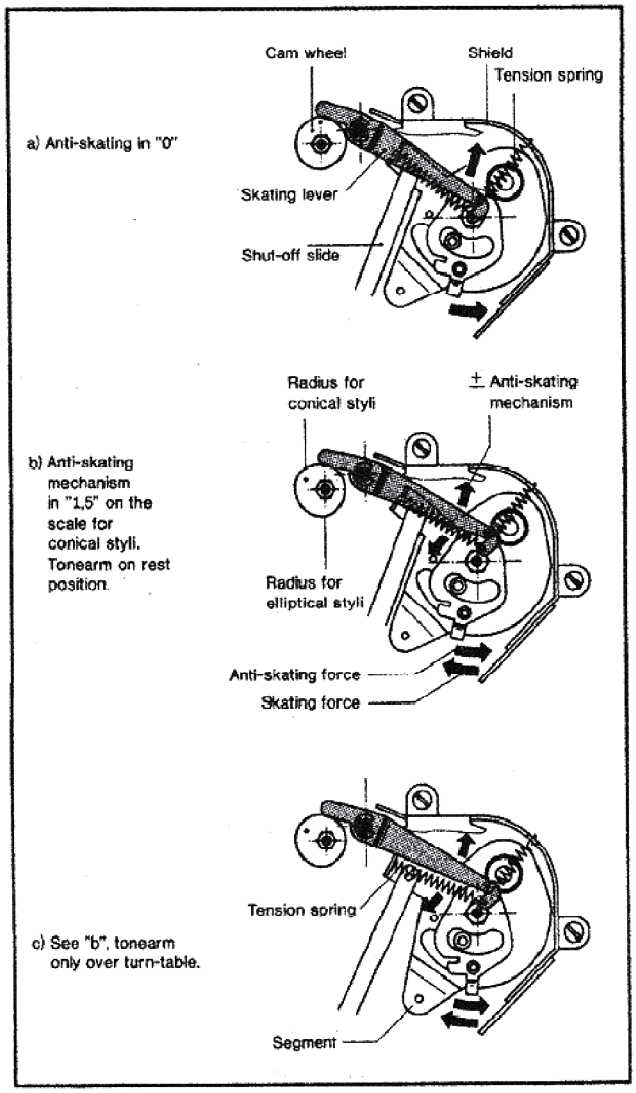


Fig. 14 Anti-skating force



Reverse the procedure to reassemble the tonearm and bearing. The unit must be right-side up. Do not omit spring (78)! After assembly, immediately place the mode selector at "single". This prevents the tonearm from falling out when the unit is turned upside down again.

Install segment (201) and lift plate (203). Tight the positioning sleeve (200) onto the lift bolt and mount the guide (198) again. Put "C" ring into the pierce of lift bolt.

Before tightening hex nut (236), rotate outer bearing ring (60) counter-clockwise until you feel slight resistance. This puts the forward edge of the outer bearing ring at the center line of the inner tonearm bearing screw.

After reinstalling the protective plate be sure that the segment (201) moves freely and without rubbing in its guide (232) and is not hindered in its movement by the tonearm wires. Adjust tonearm height with positioning sleeve (200) and locating screw (56) on "multi" position on the mode selector.

(Measured at tonearm head. See Fig. 15).

Anti-skating adjustment

The tendency of a tonearm with an offset (angled) head to "skate" inward across the record is eliminated in the dual 1229 by a precision anti-skating mechanism. Skating force depends on tonearm geometry, stylus force and the tip radius of the stylus. The inward pull on the tonearm caused by the skating effect gives rise not only to an undesireable jumping of the tonearm when it is set down on the record, but also to unequal forces on the two opposite groove walls, with corresponding ill effects. This can be corrected with proper anti-skating adjustment.

By turning the anti-skating adjustment knob (79) on the chassis, an asymmetrical curved washer (258) is turned. This washer has two different curved surfaces corresponding, respectively, to the red and white scales on the anti-skating dial. The red scale is for conical (spherical tip) styli, the white for elliptical (bi-radial) styli. When the knob is turned, the curved surfaces push the anti-skating lever (267) away from its rest position so that it applies a suitable counter-force via a spring (265).

Skating compensation is set at the factory for conical styli with a tip radius of 0.6 to 0.7 mil. (.0006-.0007 inch), and for elliptical styli with measurements of 0.20 to 0.23 mil. by 0.79 to 0.87 mil. The adjusting hex nut (259) is tightened and sealed. Readjustments should be attempted only with the help of the Dual Skate-o-meter and test record L 096. This work is best done by an authorized Dual service agency.

Symptom

During change cycle, tonearm binds horizontally

Cause

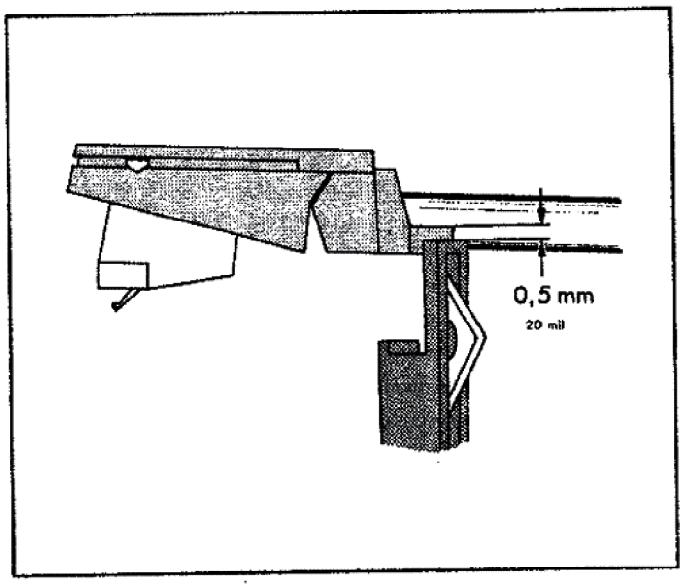
Positioning sleeve or locating screw misadjusted

Remedy

With main lever (184) pressed, adjust bushing nut so that, with the tonearm unlocked and hanging over the rest, the above edge of the tonearm rest piece and the above edge of the tonearm rest are at an equal height. Now adjust a play of 0.1 - 0.2 mm between guide (198) and the tonearm's bearing surface by means of the locating screw (56).

(Measured 0.5 mm at tonearm head. see Fig. 15)

Fig.15



Symptom	Cause	Remedy
Stylus skips	a) Tonearm not balanced	a) Balance tonearm
	b) Stylus force too low	b) Set stylus force to cartridge manufacturer's recommended value
	c) Anti-skating wrongly adjusted	c) Correct anti-skating setting
	d) Stylus worn or chipped	d) Replace stylus
	e) Excessive friction in tonearm bearing	e) Check tonearm pivot. Should have barely noticeable play. Adjust vertical bearing only with the left bearing screw (53) and the horizontal bearing with nut (58). Horizontal bearing is correctly adjusted when the tonearm, with anti-skating set at 0.5 gram, swings freely from center to rest.
	f) Ball (254) missing from shut-off rail	f) Replace ball (254)
	g) Segment (201) rubs in its guide (232)	g) Adjust guide (232). Adjustment is correct when the tonearm moves freely in the horizontal plane at both settings of the mode selector
Vertical movement of tonearm is impeded during set-down cycle	a) Bearing friction too high	a) Check bearing screw (53) and arm balance
	b) Lift screw (206) jams in guide sleeve of arm segment (203)	b) Remove and clean lift screw. Clean guide sleeve and fill lift tube with "Wacker Silicon Oil AK 300 000"

Fig. 16 Tonearm guide mechanism

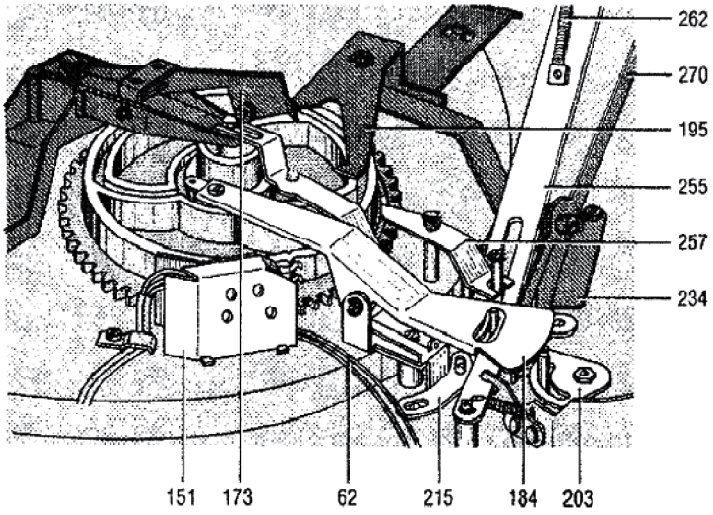
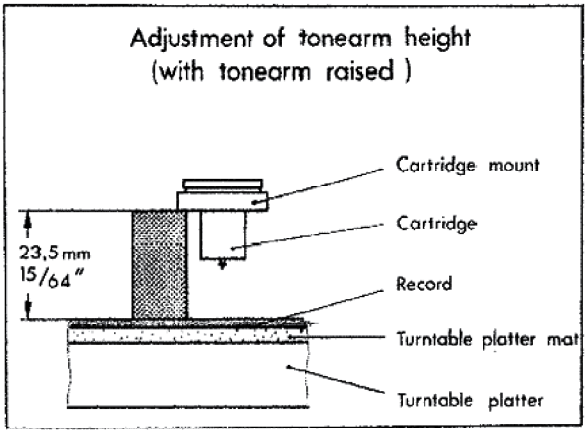


Fig. 17



Tonearm lift

The tonearm lift permits the tonearm to be set down on the record safely at any desired point except the shut-off area (near the record label).

Pulling the tonearm lift towards the front turns the drive washer (220). This moves the connecting lever (270), and lift screw (206) to raise the tonearm.

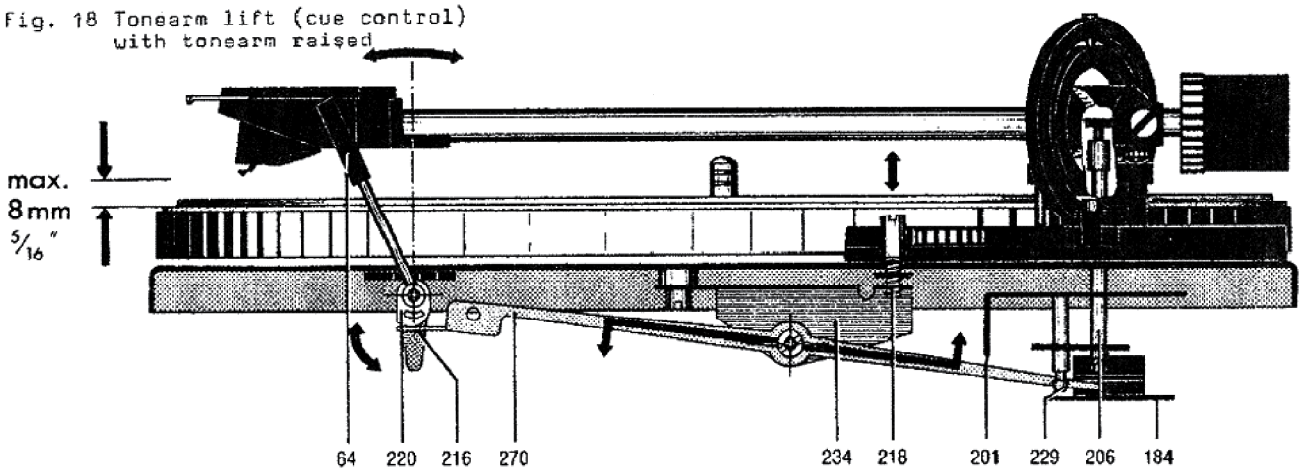
Tonearm movements

A guide groove located on the underside of the main cam (165) controls the automatic lift and set-down of the tonearm as the cam rotates through 360°. Tonearm lift and lowering are controlled by the main lever (184) and the lift screw (206). Horizontal movements are controlled by the main lever (184) and the segment (201). Setting the changer for playback of 7", 10" or 12" discs is done with the indexing lever (49). Set-down points are determined by the eccentric portion of the arm positioning slide (255) and the indexing lever (276).

Horizontal movement of the tonearm is limited by the arm segment striking the arm positioning slide (255). During the change cycle, the main lever (184) raises the arm positioning slide, bringing it within reach of the spring stud. On completion of the change cycle (set-down of the tonearm on the record), the arm positioning slide (255) is again released and returns to its normal position. It thus moves out of reach of the spring stud, permitting the tonearm to move horizontally without hindrace, while playing the record.

After the tonearm is moved (by hand) to the desired spot on the record, the tonearm lift handle is lightly tapped towards the rear to release the mechanism. The connecting lever (270) and the leaf spring (205) of the lift screw (206) are freed, allowing the tonearm to fall. The rate of fall is controlled by silicone oil lift tube. The height of the stylus above the record can be varied by adjusting setscrew (218). Turning it to the right increases the height, turning it to the left decreases the height. In any case, units leaving the factory are adjusted so that the tonearm lifted off the fifth record on the platter.

Fig. 18 Tonearm lift (cue control) with tonearm raised



Symptom	Cause	Remedy
Tonearm misses edge of record	a) Record size incorrectly set	a) Set record size selector
	b) Set-down incorrectly adjusted	b) Adjust set-down with a 12" record so that stylus touches record approximately 1/16" inside edge of record. Adjustment will be correct for other sizes.
	c) Record not standard size	c) Use standard records
	d) Friction surfaces of tonearm clutch dirty	d) Clean clutch surfaces
Tonearm strikes record during change cycle	Tonearm height incorrectly set	Adjust it by turning rear adjustment screw (56). Adjustment is correct when in "multi" position, with tonearm unlocked and on its rest, the upper edge of the tonearm support is about 0.5 mm (.02 in.) above the upper edge of the tonearm bracket. (See fig. 15)
Tonearm does not move on to record when drop cycle is started	Damping too great, dirty oil in lift tube	Remove lift plate according to instructions in the section "The tonearm and its suspension". Clean lift tube and bolt and fill tube with "Wacker Silicon Oil AK 300 000".
Tonearm lowers too quickly when drop cycle is started	Too little damping	Follow instructions above for too great damping
Sleeve (64) movement not damped when it is tapped	Too little or the wrong lubricant is used when damping the tonearm lift	Remove lift plate (221). Clean and smear it with Wacker Silicon Oil AK 500 000. After setting it back again, clean any lubricant that has overflown
Tonearm returns to rest immediately after being placed on record manually	Shut-off mechanism has shifted out of position during shipping	Before using changer after moving, run it through start cycle with tonearm locked on rest.

Start cycle

Moving the start switch (48) moves the switch lever (195) clockwise, initiating the following sequence.

a) The set screw of the switch lever assembly (195) turns the switch arm (188) mounted on the grooved shaft (192). Via a tension spring, this actuates the rocker assembly (134) and engages the idler (131) between the platter (4) and the motor pulley (115). At the same time, the power switch (129) is actuated by the switch slide (167) through the switch arm, and the turntable begins to rotate.

b) The switch lever (195) is brought within reach of the cam follower lever (207), so that it is pushed into the change position after the rotation of the main cam.

Moving the operating switch also releases the start lever (248), pulling it towards the main cam by means of the tension spring (251). This causes coil spring to bring the shut-off lever (162) within range of the main cam dog. Thus the shut-off lever drives the main cam (165).

Fig. 19 Start position

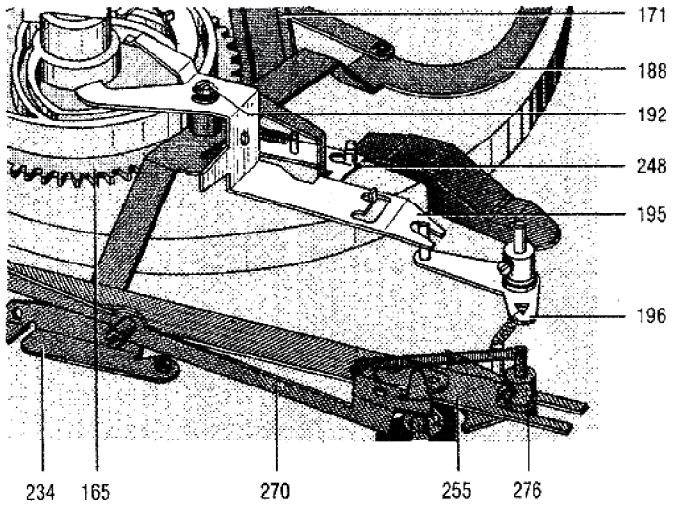


Fig. 20 Stop position

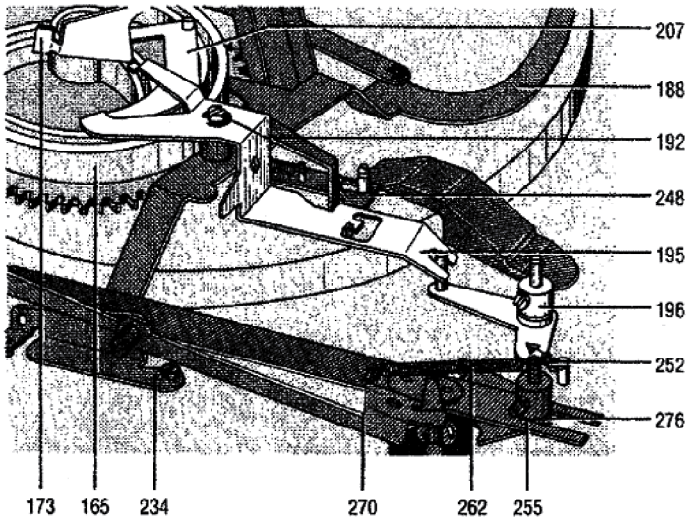
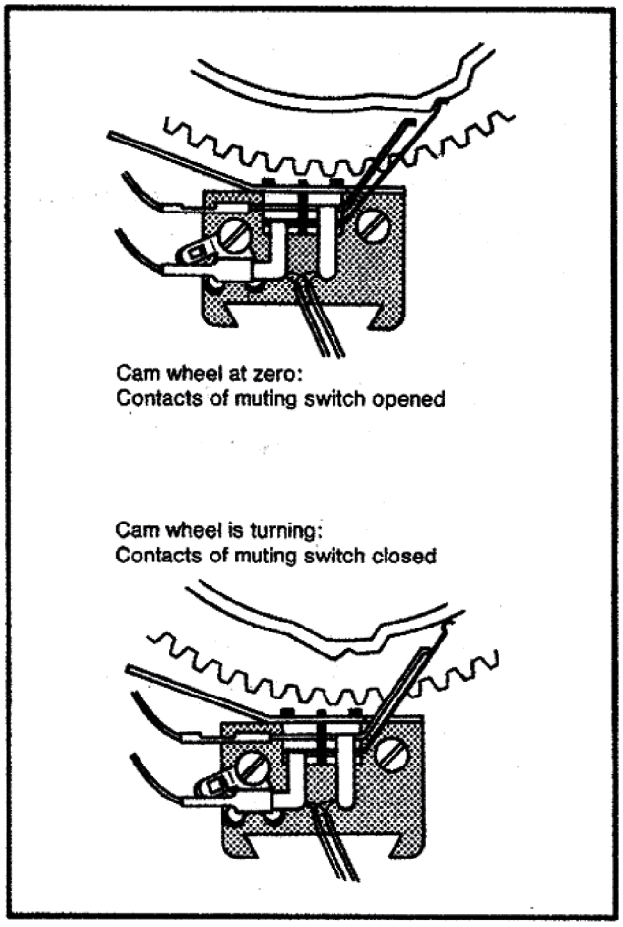


Fig. 21 Muting switch



To prevent malfunctioning, the operating switch is locked during the start cycle (that is, while the main cam is turning). Just before the main cam reaches its neutral position (at the end of the change cycle), the start lever (248) is pushed clear of the main cam by the angular part of the main cam. This restores the switch lever and operating switch to their original positions.

After installation and also after moving the changer, the unit should be started with the tonearm locked on the rest. This will automatically readjust the shut-off lever, which may have shifted out of position.

Manual start

When the tonearm is swung inward by hand, the pawl (273) on the switch arm (188) drops into a square bolt on the base plate, holding the switch arm in this position and the idler wheel (131) in contact with the platter. The slide (157) linked with the switch arm actuates the power switch and sets the turntable platter rotating.

On reaching the run-out groove, the tonearm automatically returns to its rest position and the unit shuts itself off. However, if the tonearm is lifted off the record manually and returned to the rest, the tabs of the arm segment (201) release the pawl (273). The torsion spring (187) then returns the switch arm to its initial position, opening the power switch and disengaging the idler wheel.

Stop switching

When the operating lever is moved to "stop", the starting lever is pushed forward. As a result the shut-off linkage comes into contact with the main cam. The swinging lever remains in its stop position.

When the tonearm is on its rest and the operating lever is pushed to "stop", the operating lever must not jam.

Muting switch

To prevent the noises of the change cycle from being sent through the audio system, the apparatus is fitted with a short-circuiting (muting) switch. The switch springs for both channels are actuated by the main cam. In the tonearm rest position, the muting switch is opened.

Record drop

Insert the appropriate spindle - AW 3 for standard records (7 mm or 1/4" center hole) or AS 12 for 45 rpm records (38 mm or 1 1/2" center hole).

To prevent faulty operation, automatic record-changing operation is possible only when the mode selector is in the "multi" position.

Record-drop is initiated by the rotation of cam (165), whose cam surface (AK) guides the cam rocker (173), pushing the change actator stud (206) and releasing a record by means of the automatic spindle. The main cam is designed so that a record can drop only when the tonearm is above the tonearm rest and thus out of the reach of the largest possible record (12" diameter).

Fig. 22 Record drop

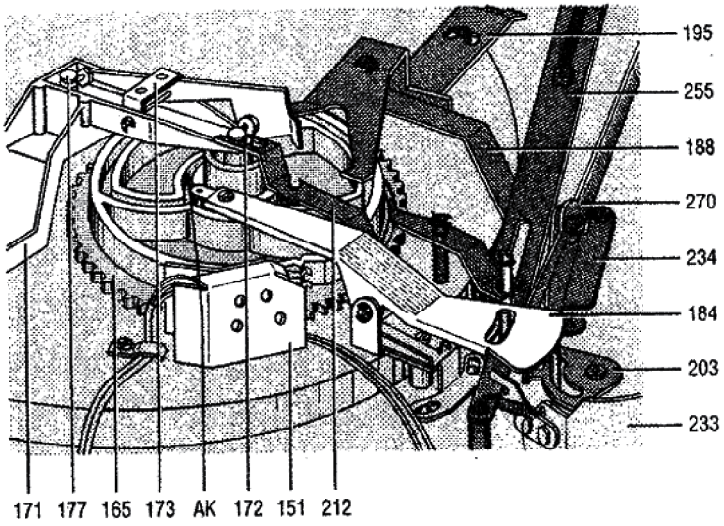
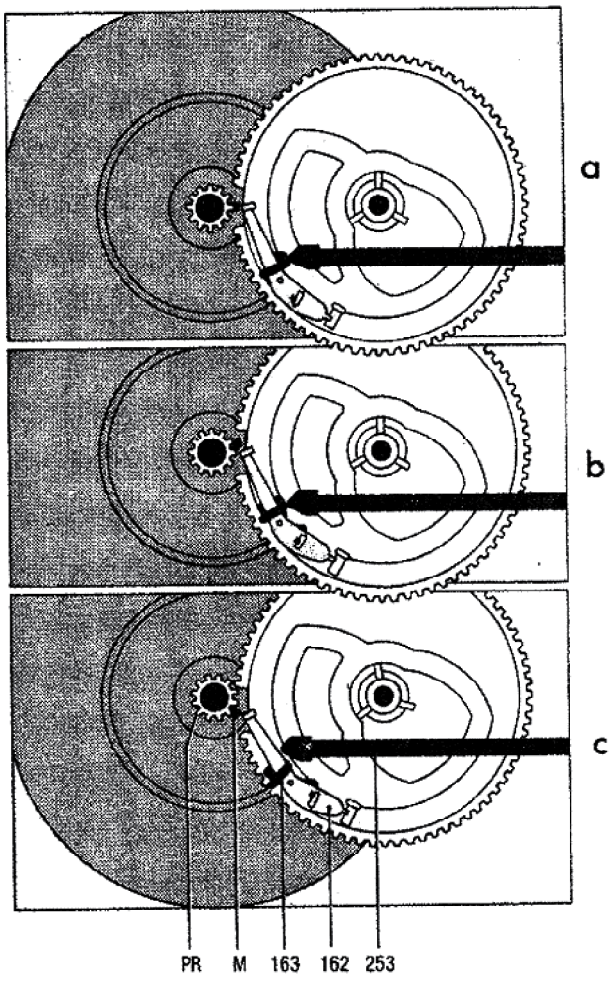


Fig. 23 Actuating change or shut-off operations



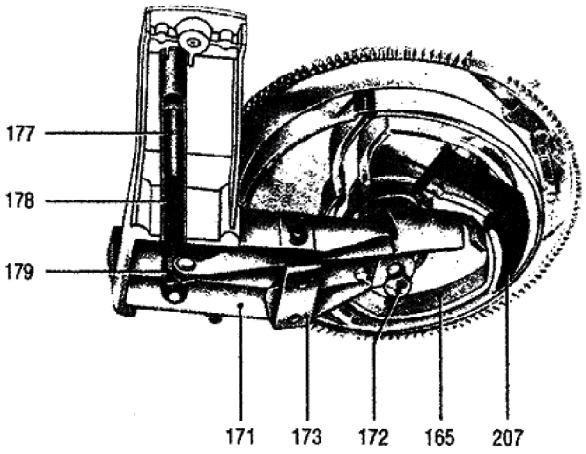
Shut-off and change cycle

The dog (M) on the turntable platter gear (PR) and the shut-off lever (162) actuate both the change cycle at the end of the record as well as the shut-off after the last record in a stack is played.

At the end of a record, the tonearm moves towards the center at an accelerated rate due to the increased pitch of the grooves. This motion carries the shut-off lever (162) towards the dog by means of the shut-off slide (253). The eccentric dog pushes the shut-off lever (162) back at each revolution as long as the tonearm advance is only one normal record groove.

The run-out groove with its steeper pitch moves the shut-off lever against the dog with greater force, engaging the shut-off lever (162) and causing the main cam (165) to be driven out of its neutral position by the turntable platter gear.

Fig. 24 Change cycle



Shut-off mechanism

Shut-off and change functions are determined by the position of the cam follower lever (207). After every start or record-drop, the cam follower lever is brought to its stop position by the main lever (184) (longer end towards the center of the main cam). As the record is dropped the cam follower lever (207) is turned to its start position by the cam rocker (173), so that the tonearm can swing in toward the record and be lowered on to it. If there are no more records on the spindle, and the cam rocker cannot turn the cam follower lever, the lever remains in its stop position and allows the tonearm to swing to its rest position.

When the main cam (165) returns to its neutral position, the switch arm (188) drops into a cut-out in the main cam, opening the power switch (129) and disengaging the drive idler (131).

Fig.25

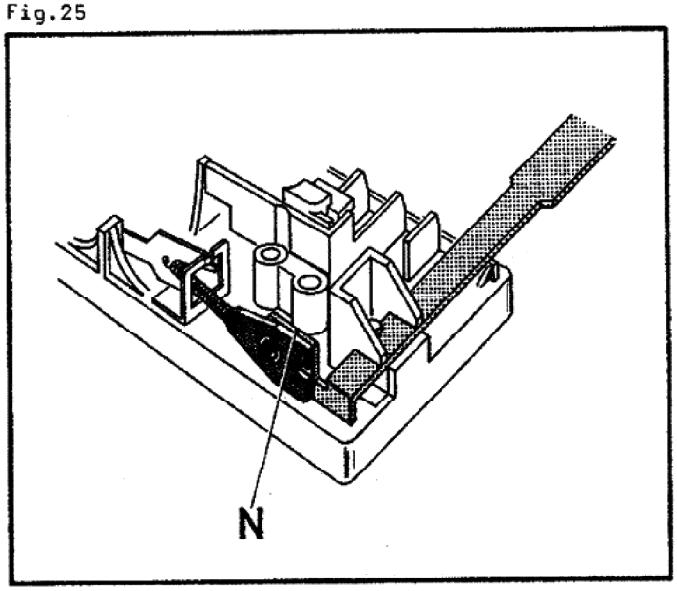
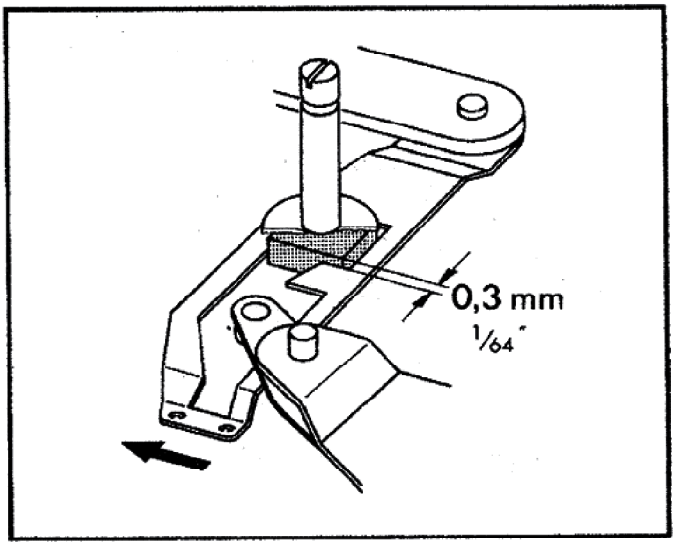


Fig.26



Symptom

Turntable stops after automatic set-down of the tonearm.

Cause

a) Switch arm (188) is not latched by paul (273). Bolt of segment slips over paul instead of engaging it.

b) Power switch opens.

c) Square bar not properly screwed. Paul disconnected.

Remedy

a) Adjust segment (201) so that bolt catches paul in both positions of mode selector.

b) As the tonearm moves in, switch slide (167) must overtravel by about 0.3 - 0.5 mm. If necessary: adjust part (N) or switch slide (167) on power switch.

c) Loosen screw (256). Press paul against square bar (274), see fig. 26, and fasten screw.

Symptom

Tonearm misses record during cycling when moving in or out.

Cause

Switch arm misadjusted. Paul touches square bar.

Remedy

After loosening screw (189), twist short part of the switch arm on the long part. Adjustment is correct, when the distance between paul and square bolt is 0.3 mm (274, mounted on chassis plate) after the tonearm has moved in and the main cam was turned manually.

Symptom

Last record keeps repeating

Cause

Defective spindle

Remedy

Replace spindle

Symptom

Records do not drop

Cause

Cam rocker has too little force (travel)

Remedy

Readjust eccentric so that when the three supports in the automatic spindle are held in and the main cam is at neutral, pressing the change screw moves the support about 0.2 mm (1/64").

Symptom

Switch latches into "stop" position when tonearm is at rest

Cause

Too much clearance between tab on switch arm (188) and start lever (248).

Remedy

Adjust tab on switch arm so that it clears start lever by 0.1-0.2 mm or 1/64 " when main cam in neutral position.

Symptom

Tonearm doesn't raise from the tonearm rest with mode selector in "multi" position.

Cause

Equalizing arm (210) misadjusted. Balance plate (243) at the main lever (184) doesn't contact with the lifting bolt.

Remedy

Adjust equalizing arm on the eccentric piece of the protecting plate so that with the main lever pushed down, the balance plate sits a minimum of 0.6 - 0.8 mm on the lift bolt. When setting on "single" position, the lift bolt must slide along the balance plate without hindrance.

Fig.27

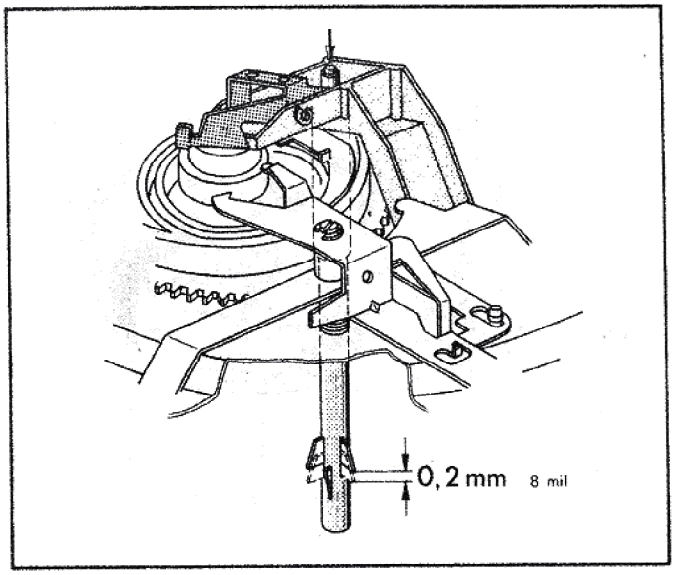


Fig.28

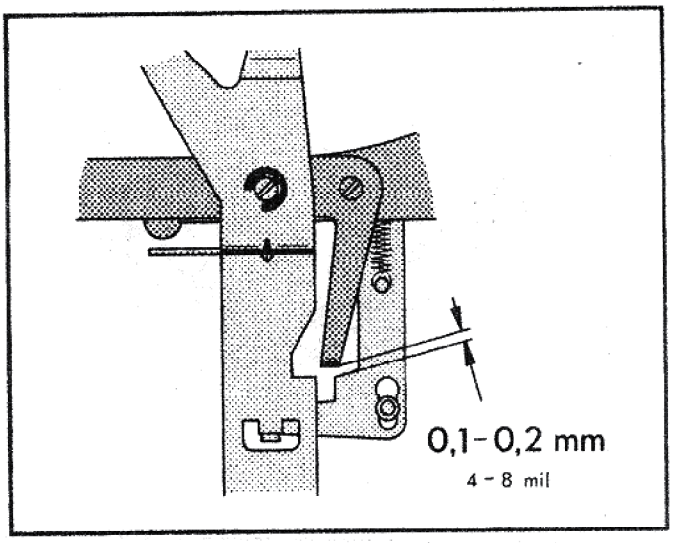
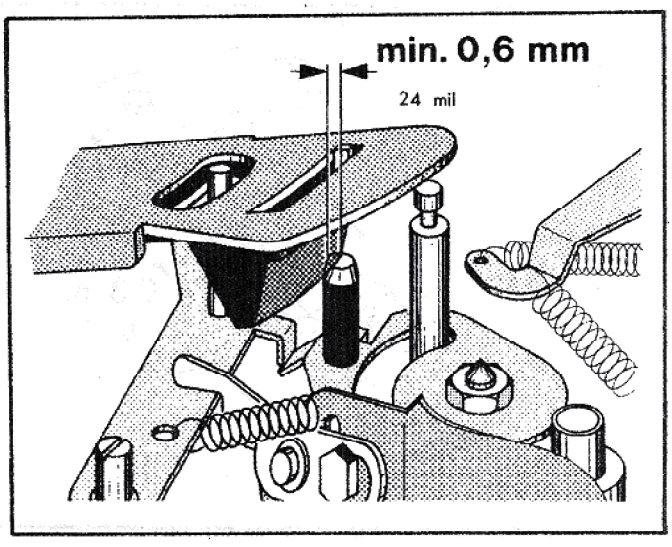


Fig.29



Symptom	Cause	Remedy
Tonearm moves with stylus force and anti-skating force at zero:		
a) outward	a) Anti-skating out of adjustment	a) Adjust skating lever so that skating spring applies force exactly at tonearm pivot
b) inward	b) Too taut tonearm leads produce a twisting force	b) Allow some slack in tonearm leads
During change, stop and start operations, noises from the mechanism can be heard in the speaker system	Muting switch misadjusted. Distance between contact springs and shorting contact is too great	Bend contacts so that, in the neutral position of the main cam the spacing between contacts is about 0.5 mm or 0.02 inch. Clean contacts.
No sound; muting short circuit across pick-up leads is not opened	Muting switch contact spacing too small	Bend contacts so that, in the neutral position of the main cam the spacing between contacts is about 0.5 mm or 0.02 inch.
Motor will not shut-off when tonearm is on arm rest	Capacitor across power switch is shorted	Replace capacitor (.01 µF, 700 V)
Acoustic feedback	a) Chassis parts (for example leads) are touching base cut-out	a) Correct cut-out according to instructions supplied with unit. Move cables.
	b) Connecting cables are too taut	b) Allow more slack in cables
With mode selector in "single" and short spindle in place, tonearm does not move in toward record on automatic single-play operations	Switch spring on locking slide (212) is misadjusted	With the unit in normal upright position, adjust spring so that when the main cam is rotated the raised tab on the switch lever is just cleared.
Records do not drop with changer spindle in place	Mode selector is set to "single"	This is normal

Spare parts

Ref.No.	Part.No.	Description	Quantity	
1	215 470	Automatic spindle AS 12	1	
2	213 895	Automatic spindle AW 3	1	
3	227 001	Turntable mat complete with washer	1	
4	227 003	Turntable complete with mat and stroboscope ring	1	
5	225 222	Stroboscope ring	1	
6	224 805	Speed change lever left complete	1	
7	216 740	"C" washer H 7 x 0,0	1	
8	225 209	Control washer complete	1	
9	218 480	Bowed lockwasher	1	
10	227 006	Chassis complete	1	
11	214 047	Special screw, pierced	3	
	214 211	Special screw, threaded	3	
12	214 210	Shipping screw assembly	3	
13	220 152	Plastic clamp	3	
14	210 586	Washer 3.2/7.0/0.5 St	3	
15	210 472	Machine screw AM 3 x 4	3	
16	213 512	Hex nut M 4 x 8	2	
17	210 366	Hex nut BM 4	7	
18	210 362	Hex nut BM 3	5	
19	210 362	Hex nut BM 3	5	
20	227 009	Blind (cm)	1	
	227 008	Blind (inch)	1	
21	213 512	Hex nut M 4 x 8	2	

Ref.No.	Part.No.	Description	Quantity	
22	210 624	Washer 4.2/7.0/0.3	6	
23	210 624	Washer 4.2/7.0/0.3	6	
24	200 713	Washer	3	
25	200 711	Lockwasher	3	
26	209 934	Sleeving	1	
27	200 718	Compression spring	3	
28	201 632	Rubber washer	3	
29	200 712	Spring cup	3	
30	210 366	Hex nut BM 4	7	
31	224 947	Rest ring	1	
32	200 721	Threaded piece	4	
33	200 728	Compression spring	4	
34	200 723	Rubber damping block	4	
35	200 722	Steel cup	4	
36	220 163	Spring mounted footing complete (1 set = 4 pieces)	4	
37	220 213	Centering disc	1	
38	201 101	Centering pin	1	
39	225 108	Washer	1	
40	200 543	Retaining ring	1	
41	219 065	Tonearm head complete	1	
42	201 132	Lift	1	
43	210 182	Bowed lockwasher	1	
44	210 630	Washer 4.2/8/0.5 St	1	
45	210 197	Ring G 4 x 0.8	1	
46	227 007	Ring complete	1	
47	225 096	Dual emblem	1	
48	225 197	Switch lever right complete	2	
49	225 197	Switch lever right complete	2	
50	217 504	Stud	1	
51	210 362	Hex nut BM 3	5	
52	217 439	Crosspiece	1	
53	211 486	Threaded rod, long	1	
54	218 335	Bearing ring complete	1	
55	218 894	Bowed lockwasher	1	
56	217 600	Locating screw	1	
57	216 829	Bearing screw	1	
58	216 830	Threaded rod	1	
59	216 834	Locknut high	1	
60	218 518	Ring complete	1	
61	216 831	Threaded rod	1	
62	218 296	Contact plate complete	1	
63	215 430	Cartridge mount TK 14	1	
64	216 881	Lever complete	1	
65	210 353	Hex nut BM 2	1	
66	227 000	Rest complete	1	
67	210 362	Hex nut BM 3	5	
68	227 004	Dress plate complete	1	
69	216 810	Bearing for tonearm	1	
70	217 601	Locating lever	1	
71	218 321	Hex nut	1	
72	210 469	Machine screw AM 3 x 3	8	
73	218 238	Tonearm complete	1	
74	227 005	Weight	1	
75	225 145	Stud	1	
76	225 136	Clamp bolt	1	
77	227 002	Spring housing complete	1	
78	218 827	Spring	1	
79	225 177	Knob complete	1	
80	217 386	Tension spring	1	
81	217 381	Rest lever complete	1	
82	217 385	Roller	1	
83	213 260	Pin 2 x 6	4	
84	227 014	Case, upper part	1	
85	227 012	Case complete	1	
86	227 013	Wiring board	1	
R1	225 916	Carbon resistor 22 kOhm/0.25 W/10 %	1	
R2	225 915	Carbon resistor 2.2 kOhm/1.8 W/ 5 %	1	
C1	225 322	Foil capacitor 68 nF/400 V/10 %	1	
D1	225 247	Silicon capacitor	1	
87	225 247	Glim lamp	1	
88	227 015	Case, lower part with prism	1	

Fig. 30 Exploded view, above chassis

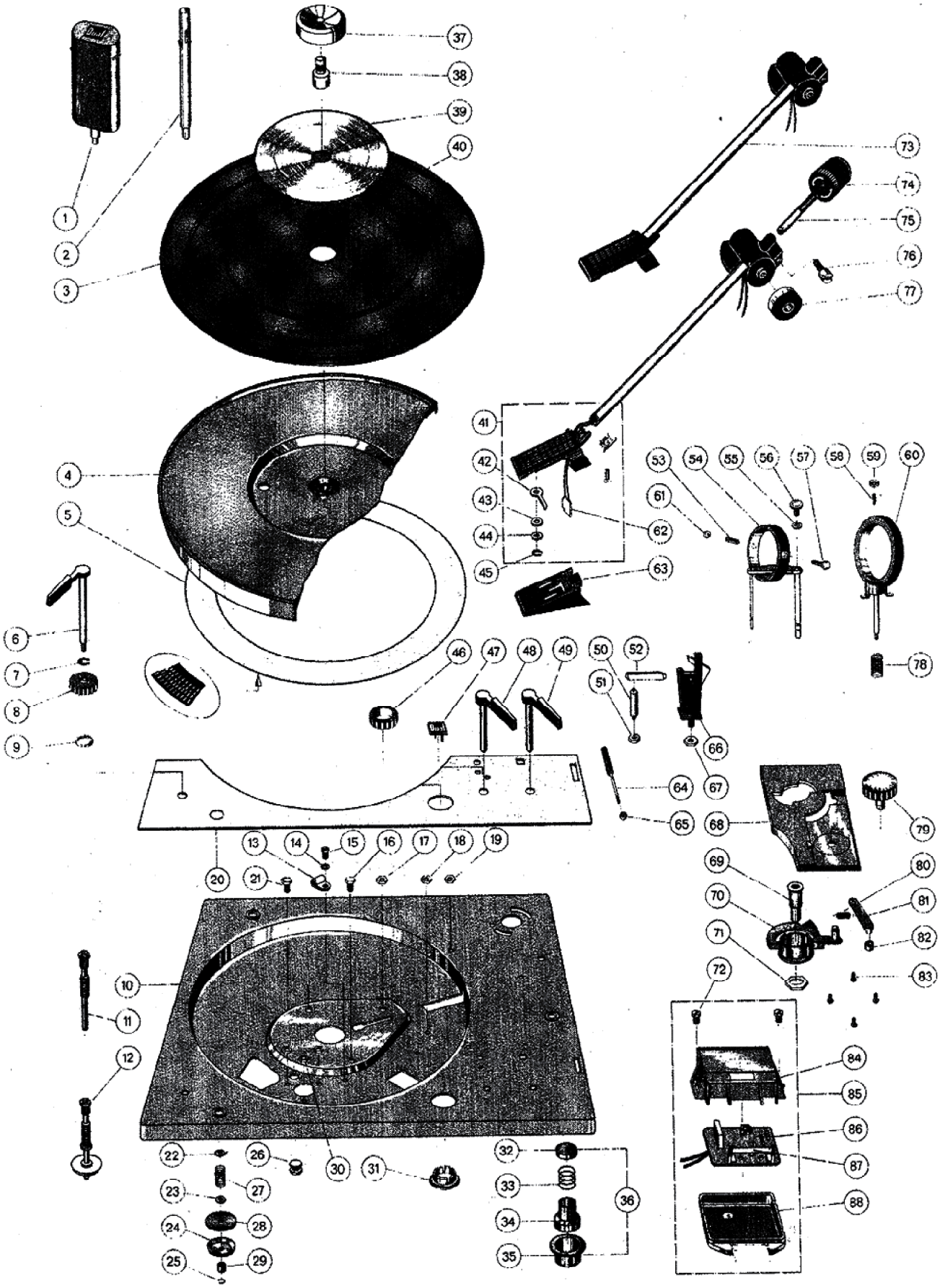
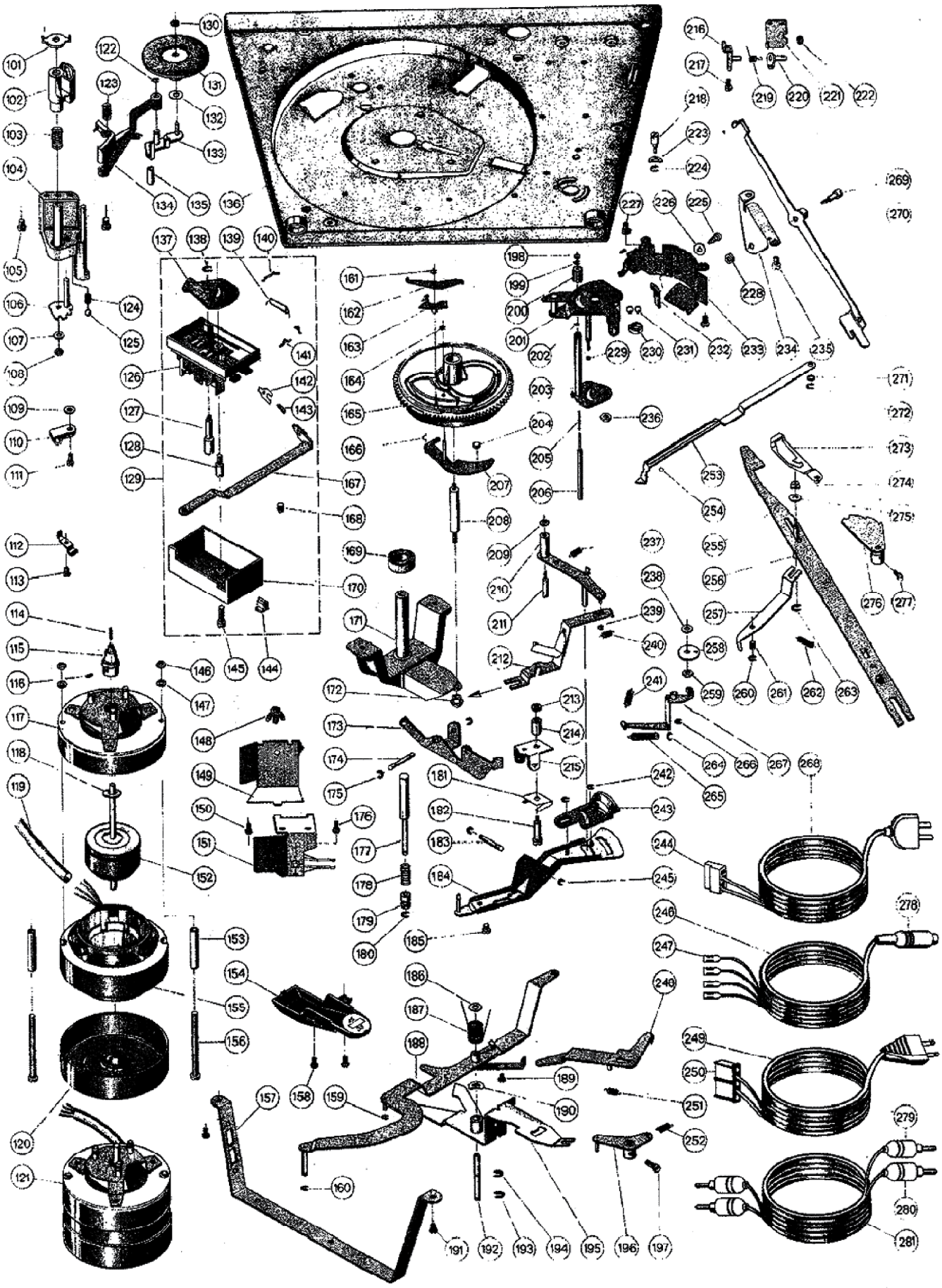


Fig. 31 Exploded view, below chassis



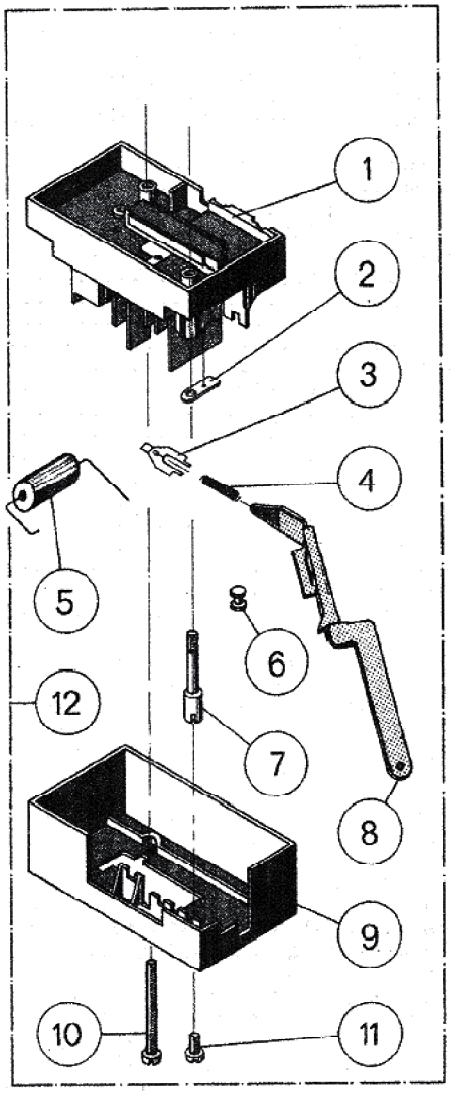
Ref.No.	Part.No.	Description	Quantity	
101	216 738	Speed regulator detent	1	
102	216 735	Switching segment	1	
103	216 736	Compression spring	1	
104	225 193	Support complete	1	
105	210 475	Machine screw AM 3 x 5	7	
106	216 746	Groove detent complete	1	
107	210 642	Washer 4.2/10.0/1.5 St	1	
108	210 361	Hex nut M 3	2	
109	210 586	Washer 3.2/7.0/0.5 St	3	
110	220 152	Plastic clamp	3	
111	210 475	Machine screw AM 3 x 5	7	
112	200 447	Cable clamp	1	
113	210 475	Machine screw AM 3 x 5	7	
114	217 751	Threaded pin M 2.6 x 8	1	
115	218 275	Motor pulley complete 50 Hz	1	
	218 276	Motor pulley complete 60 Hz	1	
116	210 220	Threaded pin M 2.6 x 3.5	1	
117	216 278	Upper housing complete	1	
118	220 806	Washer 4.1/12/0.7 F	1	
119	216 303	Silicon tube	1	
120	216 276	Lower housing complete	1	
121	218 326	Motor complete	1	
122	210 146	"C" washer 3.2	3	
123	216 737	Compression spring	1	
124	218 629	Compression spring	1	
125	209 358	Ball 4 mm Ø	2	
126	217 060	Wiring board complete with voltage selector	1	
	214 206	Wiring board complete without voltage selector	1	
	223 006	Wiring board complete with SEMKO-capacitor and voltage selector	1	
127	214 173	Switch shaft	1	
128	214 181	Screw bolt	1	
129	214 327	Power switch complete with voltage selector	1	
	225 685	Power switch complete without voltage selector	1	
	225 686	Power switch complete with voltage selector and SEMKO-capacitor	1	
130	200 633	Bowed lockwasher	1	
131	218 237	Friction washer	1	
133	218 700	Swing lever complete	1	
134	217 596	Switch lever complete	1	
135	218 702	Silicon tube	1	
136	227 006	Installation plate complete	1	
137	214 174	Contact block	1	
138	210 196	"C" clip G 3	1	
139	203 725	Capacitor 10 000 pF/700 V	1	
	221 186	SEMKO-capacitor	1	
140	214 176	Detent spring	1	
141	214 175	Contact spring	2	
142	213 966	Toggle spring	1	
143	213 968	Tension spring	1	
144	213 978	Locking device, small	1	
	213 979	Locking device, large	1	
145	210 492	Machine screw AM 3 x 15	1	
146	210 366	Hex nut BM 4	7	
147	210 161	Toothed washer, 4.3	2	
148	211 614	Solder lug	1	
149	216 901	Shield	1	
150	210 475	Machine screw AM 3 x 5	7	
151	218 242	Muting switch complete	1	
152	218 322	Rotor complete	1	
153	213 510	Insulating tubing	2	
154	227 010	Cover with deviating priom	1	
155	218 323	Stator complete	1	
156	211 553	Machine screw AM 4 x 48	2	
157	217 530	Stand	1	
	217 801	Stand complete with phono jacks	1	
158	210 469	Machine screw AM 3 x 3	8	
159	210 145	"C" washer 2.3	14	
160	210 145	"C" washer 2.3	14	
161	210 142	"C" washer 1.2	1	
162	218 787	Shut-off lever	1	
163	216 765	Friction plate	1	
164	210 145	"C" washer 2.3	14	
165	218 295	Cam wheel complete	1	
166	200 522	Snap spring	1	
167	217 502	Switch slide complete	1	
168	218 986	Roller for switch slide	1	

Ref.No.	Part.No.	Description	Quantity	
169	200 554	Ball bearing complete	1	
170	217 062	Cover for power switch with voltage selector	1	
	214 207	Cover for power switch without voltage selector	1	
	223 007	Cover for power switch with SEMKO-capacitor and voltage selector	1	
171	219 096	Bearing support complete	1	
172	218 150	Joining nut	1	
173	216 758	Cam rocker complete	1	
174	217 813	Spindle	1	
175	210 145	"C" washer 2.3	14	
176	210 475	Machine screw AM 3 x 5	7	
177	216 756	Change bolt, complete	1	
178	213 920	Compression spring	1	
179	213 921	Bushing	1	
180	210 145	"C" washer 2.3	14	
181	216 858	Leaf spring	1	
182	219 074	Joining screw	1	
183	216 864	Shaft	1	
184	220 933	Main lever	1	
185	210 469	Machine screw AM 3 x 3	8	
186	210 586	Washer 3.2/7.0/0.5 St	3	
187	216 787	Prong spring	1	
188	218 308	Switch arm complete	1	
189	210 475	Machine screw AM 3 x 5	7	
190	210 184	Bowed lockwasher	1	
191	210 472	Machine screw AM 3 x 4	3	
192	216 778	Grooved shaft	1	
193	210 147	"C" washer 4	3	
194	210 147	"C" washer 4	3	
195	216 788	Switch lever complete	1	
196	216 773	Start lever complete	1	
197	218 583	Machine screw AM 3 x 4 with ring edge	2	
198	216 844	Guide	1	
199	210 143	"C" washer 1.5	2	
200	218 318	Positioning sleeve	1	
201	210 240	Segment complete	1	
202	210 143	"C" washer 1.5	2	
203	220 934	Lift plate complete with lifting bolt	1	
204	200 650	Rubber sleeve	1	
205	216 853	Compression spring	1	
206	220 902	Lifting bolt complete	1	
207	214 203	Cam follower lever complete with rubber sleeve	1	
208	216 761	Bearing pillar	1	
209	210 609	Washer 3.2/10.0/1.0	1	
210	219 077	Equalizing arm complete	1	
211	219 073	Shaft	1	
212	218 151	Locking slide complete	1	
213	210 586	Washer 3.2/7.0/0.5 St	1	
214	221 463	Bushing	1	
215	221 462	Connecting lever bracket	1	
216	216 875	Connecting lever bracket complete	1	
217	210 469	Machine screw AM 3 x 3	8	
218	220 935	Adjusting screw	1	
219	220 900	Torsion spring	1	
220	220 790	Lift cam	1	
221	225 214	Damping plate	1	
222	200 650	Rubber sleeve	1	
223	210 187	Bowed lockwasher	1	
224	210 147	"C" washer 4	3	
225	210 286	Sheet-metal screw B 2.9 x 9.5	1	
226	210 607	Washer 3.2/10/0.5 St	1	
227	210 469	Machine screw AM 3 x 3	8	
228	210 362	Hex nut BM 3	5	
229	223 777	Guide	1	
230	216 845	Rubber washer	1	
231	211 718	Ball 3 mm Ø	2	
232	218 485	Guide piece	1	
233	225 924	Protecting plate complete	1	
	225 210	Compression piece	1	
234	216 886	Bearing bracket for linking lever	1	
235	210 511	Machine screw AM 4 x 4	1	
236	210 366	Hex nut BM 4	7	
237	216 777	Tension spring	2	
238	216 867	Bowed lockwasher	1	
239	210 145	"C" washer 2.3	14	
240	218 145	Tension spring	1	
241	216 796	Tension spring	2	

Ref.No.	Part.No.	Description	Quantity	
242	210 145	"C" washer 2.3	14	
243	220 789	Equalizing plate	1	
244	209 457	Inner housing for AMP-plug	1	
245	210 145	"C" washer 2.3	14	
246	207 303	Audio cable complete with miniature plugs and socket for flat prong	1	
247	209 436	Socket for flat prong	4	
248	216 793	Start bracket complete	1	
249	220 142	Power cord complete	1	
	207 317	Power cord complete	1	
250	213 980	Socket housing	1	
	213 982	AMP plug contacts, round	2	
251	216 796	Tension spring	2	
252	216 777	Tension spring	1	
253	217 216	Shut-off slide	1	
254	209 358	Ball 4 mm Ø	2	
255	216 803	Locating slide complete	1	
256	219 050	Threaded bolt	1	
257	217 547	Rocker	1	
258	225 176	Curve washer	1	
259	210 361	Hex nut M 3	1	
260	210 145	"C" washer 2.3	14	
261	218 834	Compression spring	1	
262	200 453	Tension spring	1	
263	210 146	"C" washer 3.2	2	
264	201 184	Adjusting washer	1	
265	201 183	Tension spring for antiskating	1	
266	210 146	"C" washer 3.2	2	
267	222 692	Skating lever complete	1	
268	207 311	Power cord complete with ground wire, AMP and US flat-prong plugs	1	
	213 984	Power cord with Dual and US flat-prong plugs	1	
269	217 227	Joining screw	1	
270	225 212	Linking lever complete	1	
271	201 187	Slip washer	1	
272	210 145	"C" washer 2.3	14	
273	216 791	Pawl complete	1	
274	219 049	Square piece	1	
275	219 083	Washer 3.2/13/0.5 St	1	
276	216 800	Positioning lever complete	1	
277	218 583	Machine screw AM 3 x 4 with set screw	2	
278	209 424	Miniature 5-prong audio plug	1	
279	209 425	RCA-type plug white	2	
280	209 426	RCA-type plug black	2	
281	207 299	Audio cable complete with RCA-type plugs	1	
**	214 120	Hardware for cartridge mounting	1	
**	201 245	Cone for retaining ring (Pos.No. 40) mounting	1	
**	218 320	Packing carton complete	1	
**	225 223	Mounting instructions		
**	225 428	Operating instructions english		
**	225 458	Operating instructions UAP		
**	225 224	Operating instructions 4 languages		

** Not illustrated
Alterations reserved

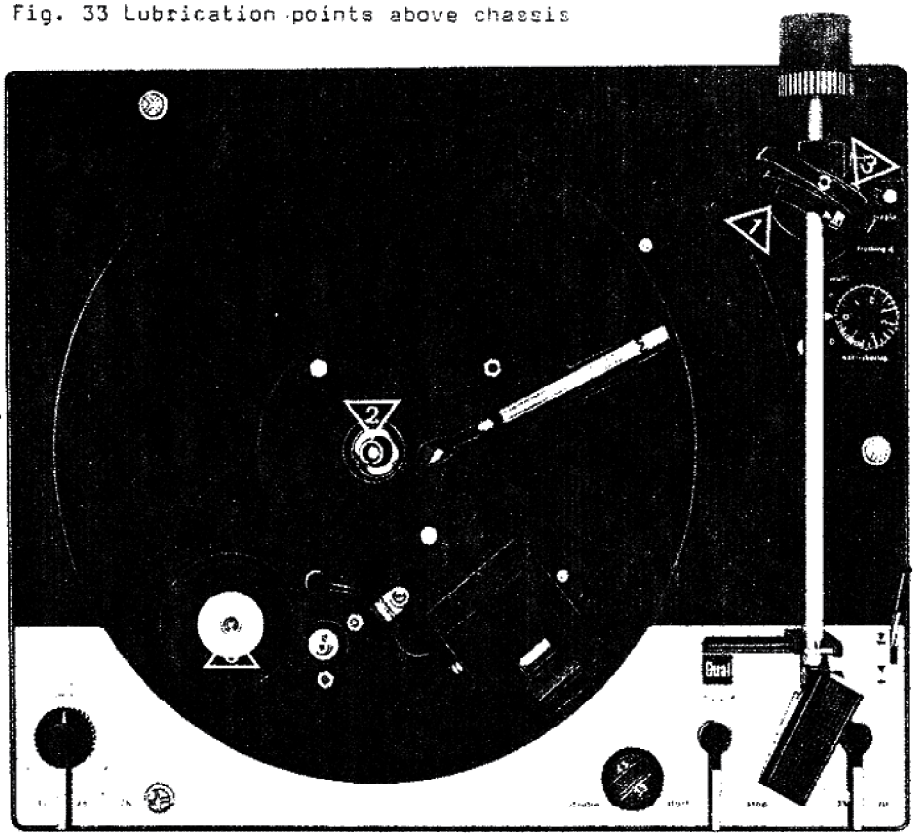
Fig. 32 Power switch (66,5 x 38,5 x 30,5)



Spare parts

Ref.No.	Part.No.	Description	Quantity	
1	227 215	Switch plate with voltage selector, complete ...	1	
	227 214	Switch plate without voltage selector, complete	1	
	227 216	Switch plate with voltage selector, complete and SEMKO capacitor	1	
2	223 617	Holding-down clamp	1	
3	219 200	Toggle spring	1	
4	227 209	Tension spring	1	
5	223 603	Capacitor 10 nF/1000 V	1	
	223 633	SEMKO-capacitor	1	
6	223 621	Roller	1	
7	224 183	Screw	1	
8	224 014	Switch slide, complete	1	
9	227 217	Cover for power switch with voltage selector ...	1	
	227 218	Cover for power switch without voltage selector	1	
10	210 501	Special screw AM 3 x 35	1	
11	210 480	Special screw AM 3 x 6	1	
12	227 222	Power switch complete with voltage selector	1	
	227 220	Power switch complete without voltage selector .	1	
	227 224	Power switch complete with voltage selector and SEMKO capacitor	1	

Fig. 33 Lubrication points above chassis



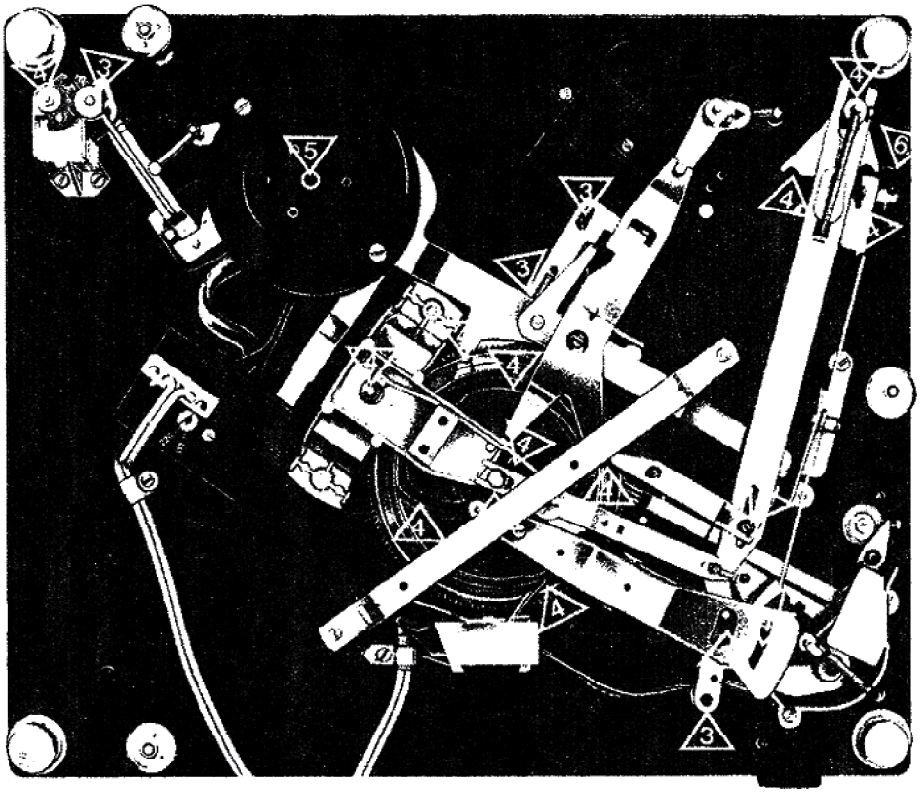
Lubrication

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:

Fig. 34 Lubrication points below chassis



1	Wacker siliconoil AK 300 000
2	Adhesive oil Renotac No. 342
3	BP oil Super Viscostatic 10 W/30
4	Shell Alvania No. 2
5	Isoflex PDP 40
6	Wacker siliconoil AK 500 000