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Dual 1224 Dual 1225 Service Manual

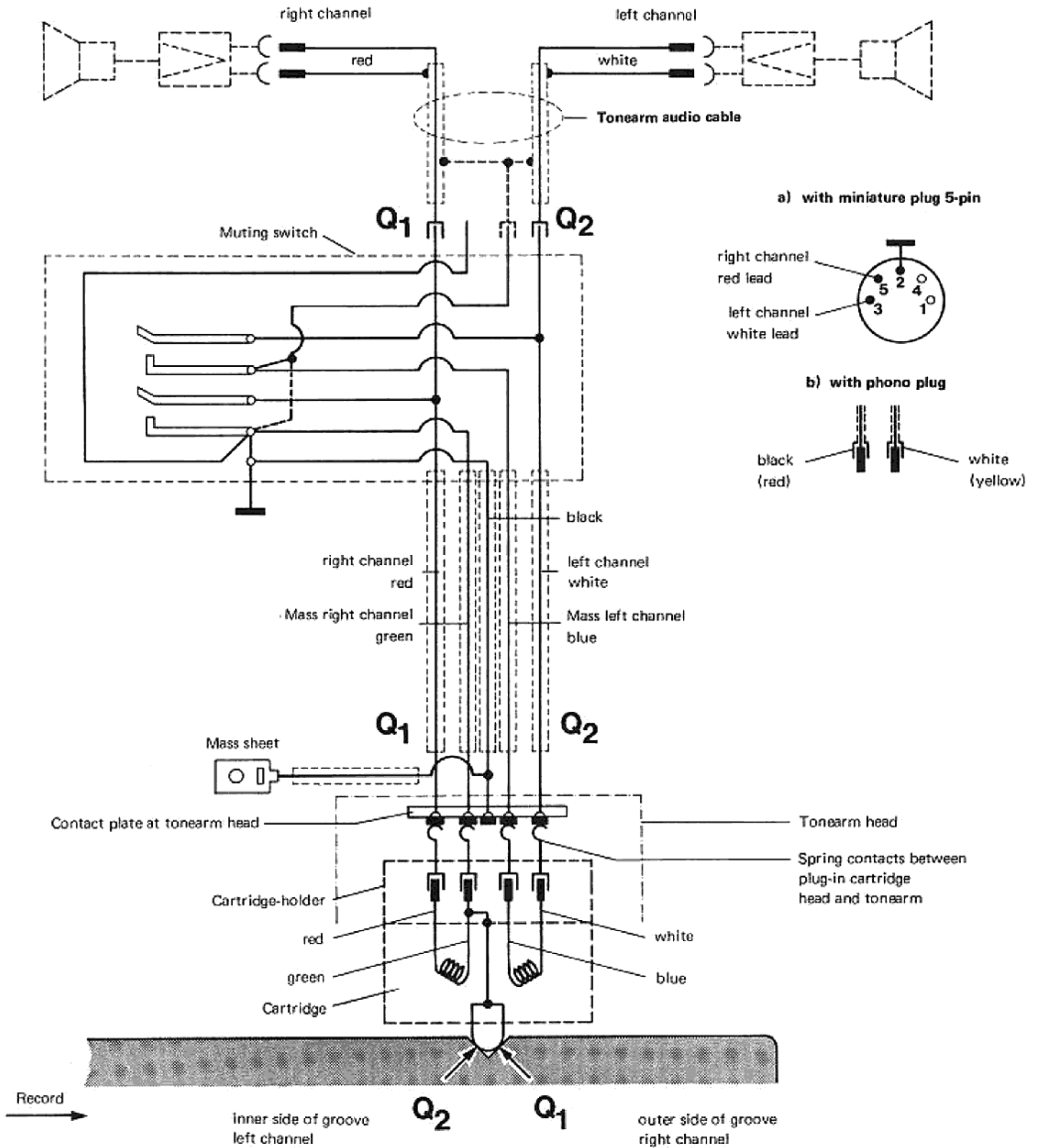


Technical data

| | | |
|--|---|-------------------------------|
| Current type | AC 50 or 60 cycle, with appropriate motor pulleys | |
| Line voltage | 110/130 V and 220/240 V selector | |
| Drive Dual 1224 | Two-pole Dual single-phase asynchronous motor | |
| Drive Dual 1225 | Four-pole asynchronous motor | |
| Power consumption | < 10 Watt | |
| Current requirements Dual 1224 | approx. 60 mA at 220 V 50 cycle, approx. 115 mA at 110 V 60 cycle | |
| Current requirements Dual 1225 | approx. 64 mA at 220 V 50 cycle, approx. 115 mA at 110 V 60 cycle | |
| Platter | 1.45 kg, 270 mm ϕ | |
| Platter speeds | 33 1/3 and 45 rpm, automatic tonearm setdown coupled to speed selector | |
| Pitch control | Adjustment of approx. 1 semi-tone (6 %) at both platter speeds | |
| Wow and flutter | < \pm 0.15 % rated in accordance with DIN 45 507 | |
| Signal-to-noise ratio Dual 1224 | Rumble signal-to-noise ratio > 55 dB | in accordance with DIN 45 500 |
| | Rumble unweighted signal-to-noise ratio > 35 dB | |
| Signal-to-noise ratio Dual 1225 | Rumble signal-to-noise ratio > 56 dB | in accordance with DIN 45 500 |
| | Rumble unweighted signal-to-noise ratio > 37 dB | |
| Tonearm | Torsionally-rigid tubular aluminium arm with vertical pivot mounting, horizontal self-adjusting pivot mounting | |
| Pick-up head (cartridge holder) | Removable, suitable for acceptance of all (Dual 1224 all piezo electric) cartridges having 1/2" mounting and a deadweight of 2 – 10 grams (including mounting fixtures) | |
| Stylus pressure | Continuously-adjustable from 0 – 8 p, reliable as from 1 p stylus pressure | |
| Pick-up cartridge | See separate data sheet | |
| Dimensions | 329 x 274 mm (+ 2 mm tonearm overhang) | |
| Weight Dual 1224 | 3.9 kg | |
| Weight Dual 1225 | 4 kg | |

Dual Gebrüder Steidinger · 7742 St. Georgen/Schwarzwald

Fig. 1 Pick-up Connection Diagram



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Fig. 2 Motor suspension and platter drive Dual 1224

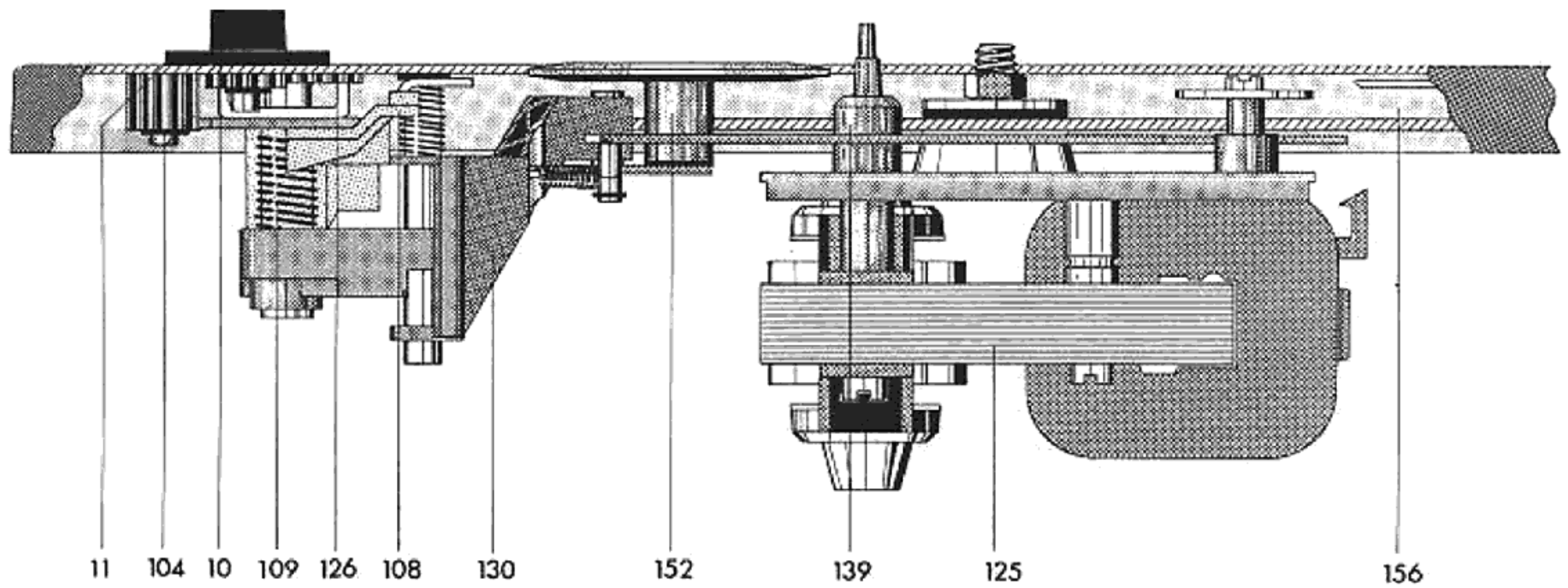
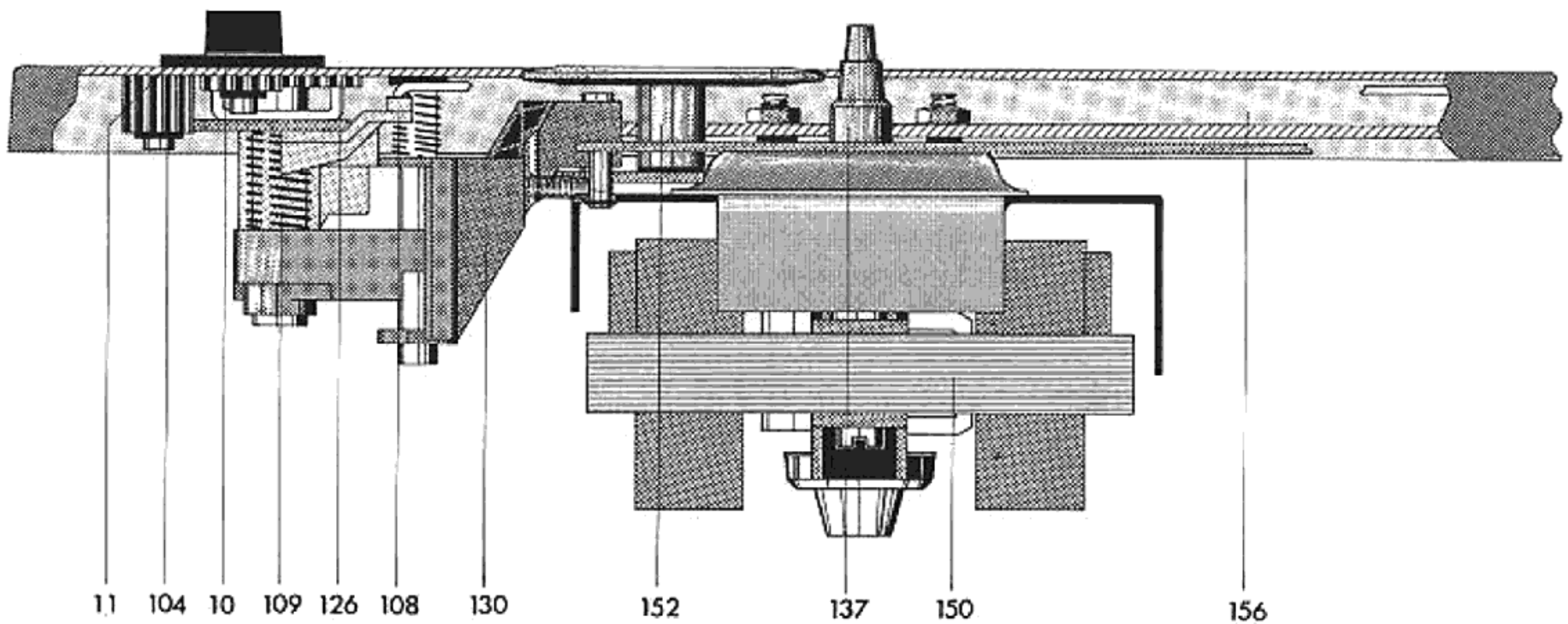


Fig. 3 Motor suspension and platter drive Dual 1225



Motor and Drive

The platter and associated mechanism are driven on the Dual 1224 by a two-pole asynchronous motor (125) and on the Dual 1225 by a four-pole asynchronous motor (150). Both motors have a rotor balanced at two levels, polished bearing surfaces and ensure vibrationfree running. In addition, the four-pole motor is distinguished by an extremely small stray magnetic field. The speed of the motors is constant over a supply voltage range of $\pm 10\%$. Deviations in speed depend on, and are proportional to, the line frequency. Adaptation of the motor to 50 or 60 Hz power is accomplished by changing the motor pulley (137/139).

Two-pole motor (Dual 1224):
 Pulley for 50 Hz Art. No. 232 896
 Pulley for 60 Hz Art. No. 232 897

Four-pole motor (Dual 1225):
 Pulley for 50 Hz Art. No. 232 898
 Pulley for 60 Hz Art. No. 232 899

The motor pulley is secured to the motor shaft by a setscrew. When a pulley is replaced or exchanged it must be set at the correct height (see Fig. 4).

The platter is driven by the idler wheel (152) which is automatically disengaged from the motor pulley when the unit is shut off in order to protect its driving surface.

Platter speeds of $33 \frac{1}{3}$ and 45 rpm are selected by raising or lowering the idler wheel (152) to the appropriate step on the motor pulley.

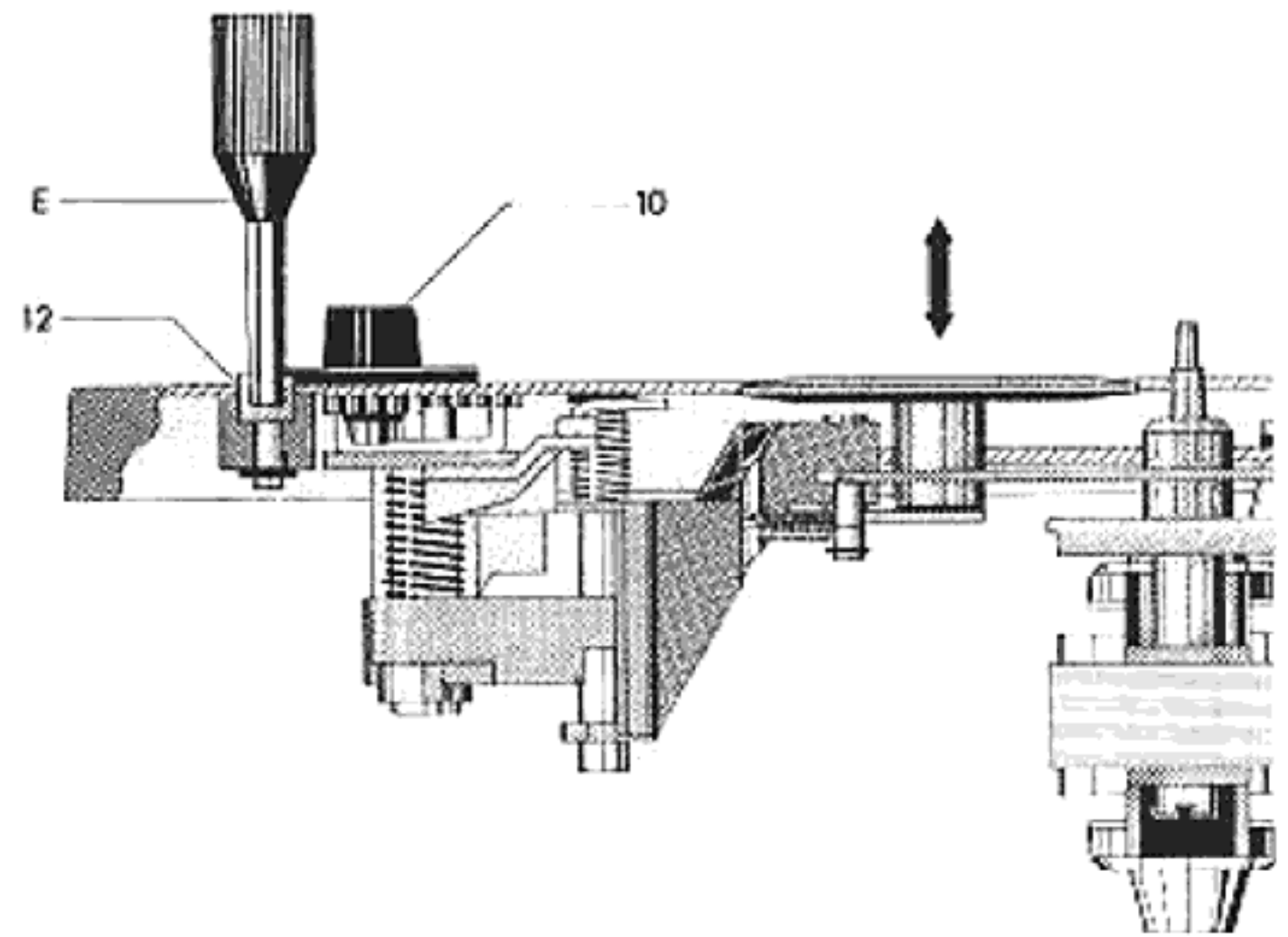
When the selector lever (33) is moved, the selector segment (108) rotates. This causes the lever (130) fitted in the slot of the selector segment to move in a vertical direction. The idler wheel (152) mounted on the swinging arm (155) is lifted off the motor pulley and set down again on the motor pulley step for the appropriate speed.

Pitch Control

For platter speeds of 33 1/3 and 45 rpm the unit incorporates a power-independent pitch control which permits a platter speed variation of up to 6% (approximately one semi-tone).

When the pitch control knob (10) is turned, the switch segment (100) and the switch lever (130) attached to it are moved up or down. This vertical displacement changes the position of the idler wheel on whatever step of the motor pulley it has been placed, by the speed selector, and due to the tapered shape of the pulley effects approximately $\pm 3\%$ variation in speed.

Fig. 4 Position of idler wheel



| Trouble | Cause |
|--|---|
| Platter does not run when unit is plugged in and start switch operated | a) Current path to motor interrupted b) Idler wheel (152) not in contact with platter c) Motor pulley loose |
| Platter does not reach required speed | a) Motor pulley is not correct for local line frequency b) Slip between idler wheel (152) and motor pulley or platter c) Excessive friction in motor, idler wheel or platter bearings |
| Rumble in reproduction | Worn idler wheel |
| Correct nominal speed obtained only at extreme settings of pitch control | Idler wheel does not contact motor pulley correctly |

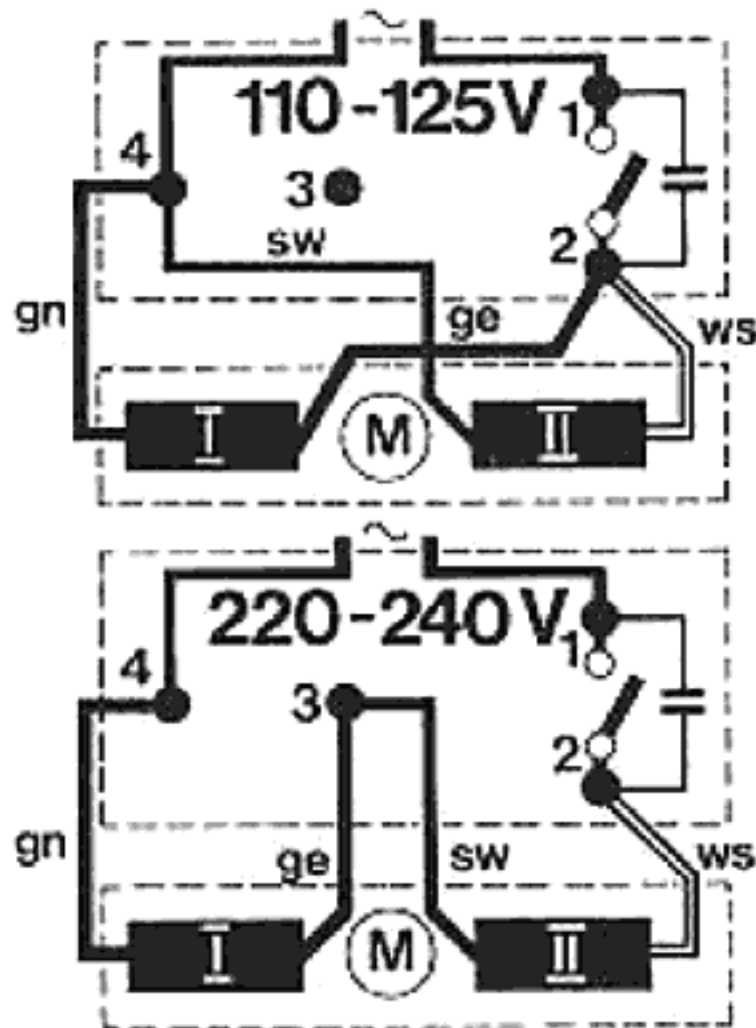
Remedy

- Check connection at switch plate and voltage selector
- Check switch lever assembly (130)
- Tighten motor pulley
- Change motor pulley
- Clean friction surfaces of idler wheel, motor pulley and turntable platter. If necessary, replace idler wheel. Once the drive surface of the platter has been cleaned do not touch it with your fingers
- Clean and oil bearings

Replace idler wheel (152), clean platter drive surface and motor pulley with greaseless solvent. (Once surfaces are cleaned do not touch them with your fingers).

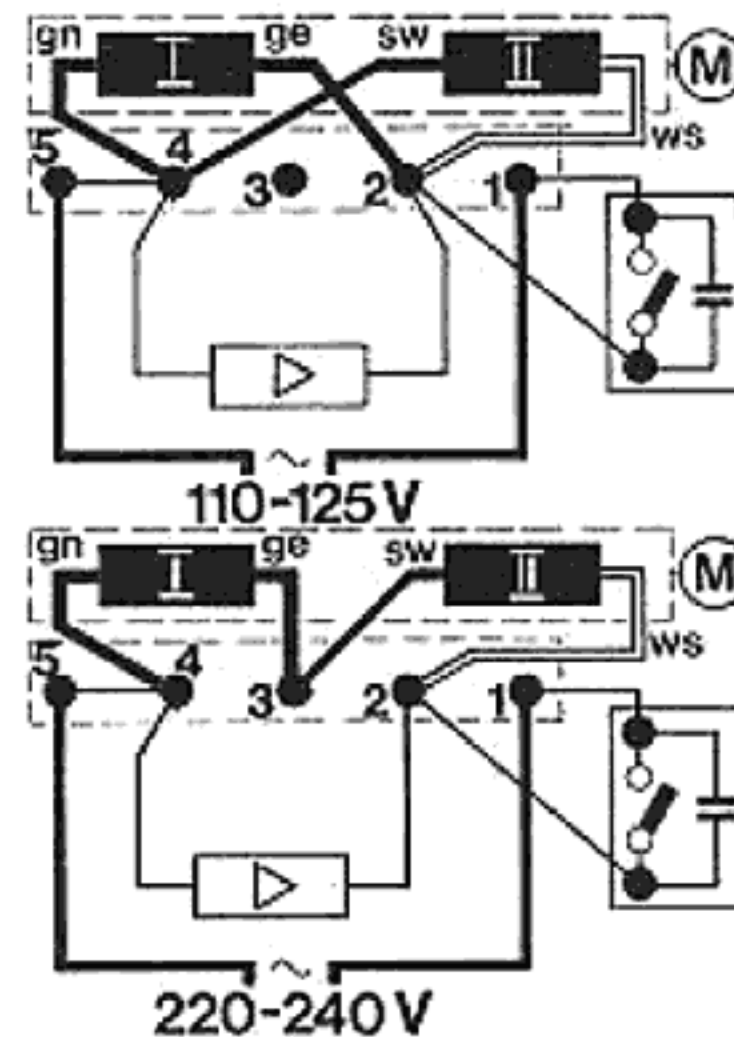
Adjust position of idler wheel by turning adjustment screw (12) so that the fine speed adjustment knob (10) is in the center position by correct nominal (Fig. 4).

Fig. 5 Motor field connections (less voltage selector)



Coil II not in 2-pole motor which, according to model, can only be used for 220 V or 110 V or 150 V

Fig. 6 Motor field connections (with voltage selector)



Tonearm and Tonearm Suspension

The tonearm of the Dual 1224 and 1225 is counter balanced and pivot mounted vertically and horizontally. This provides extremely favourable tracking characteristics. The tonearm head is removable. To aid in replacing or adjusting the tonearm head a hole is provided in the chassis to facilitate adjustment of the tonearm head without first removing the tonearm. Before setting the correct stylus force for the cartridge which has been installed the tonearm should be balanced with the stylus force setting at zero. It is recommended that balancing should be carried out in the direct vicinity of the tonearm rest. This is carried out by rotating the counterweight.

The counterweight is designed so that it can balance cartridges weighing 1 - 10 g.

For shock absorption (absorption of brief shocks) the counterweight is flexibly mounted on the tonearm and secured to prevent unintentional rotation. The tonearm head is designed to accept all cartridges with internationally standard 1/2" mounting centers and weighing not more than 10 g. Stylus force is set by rotating the graduated spring housing (56) and thus tensioning or slackening the coil spring contained therein. The scale is calibrated for an adjustment range of 0 - 5 p, permitting accurate setting within that range in 0.5 p steps.

Fig. 7 Tonearm bearing assembly

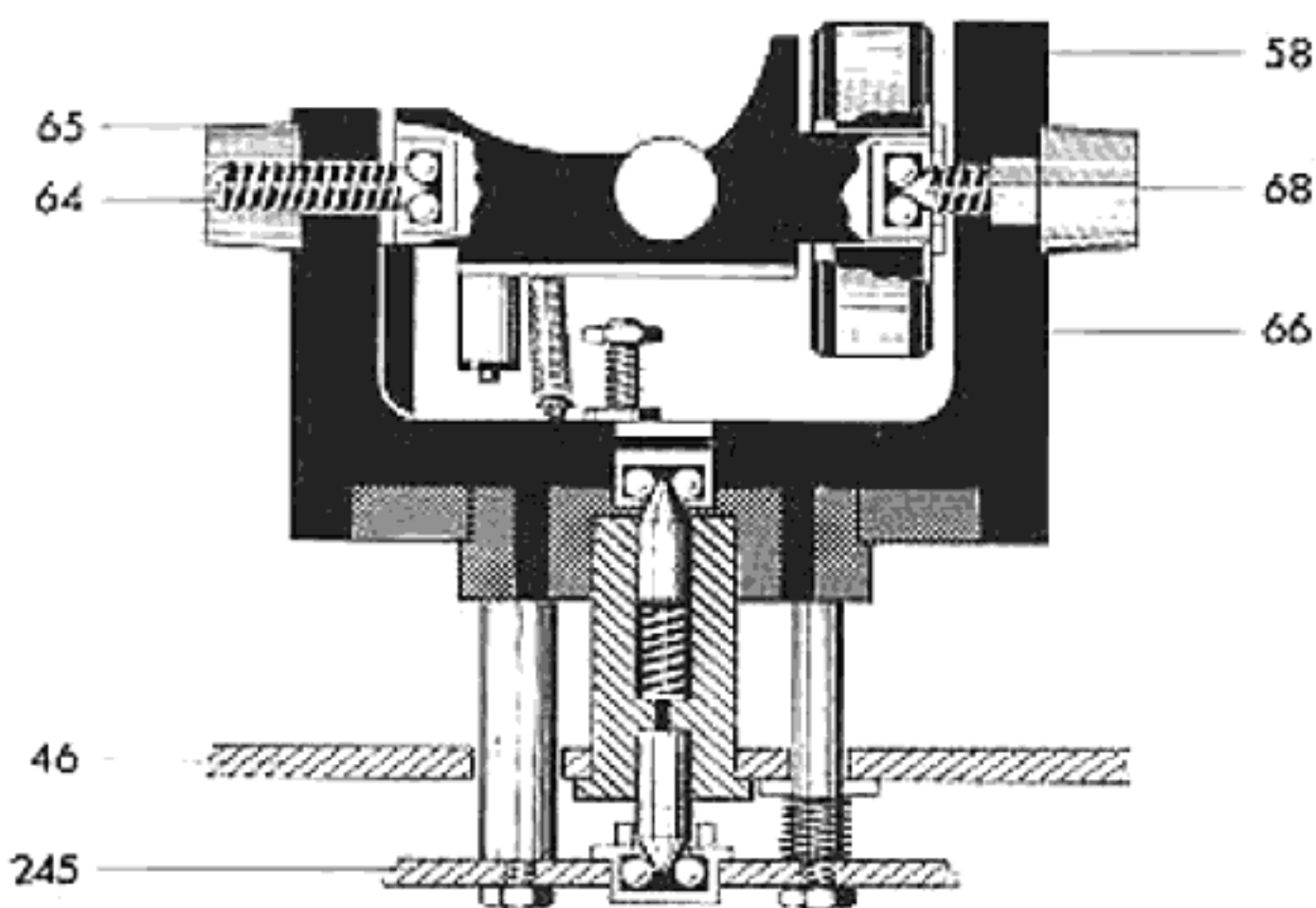
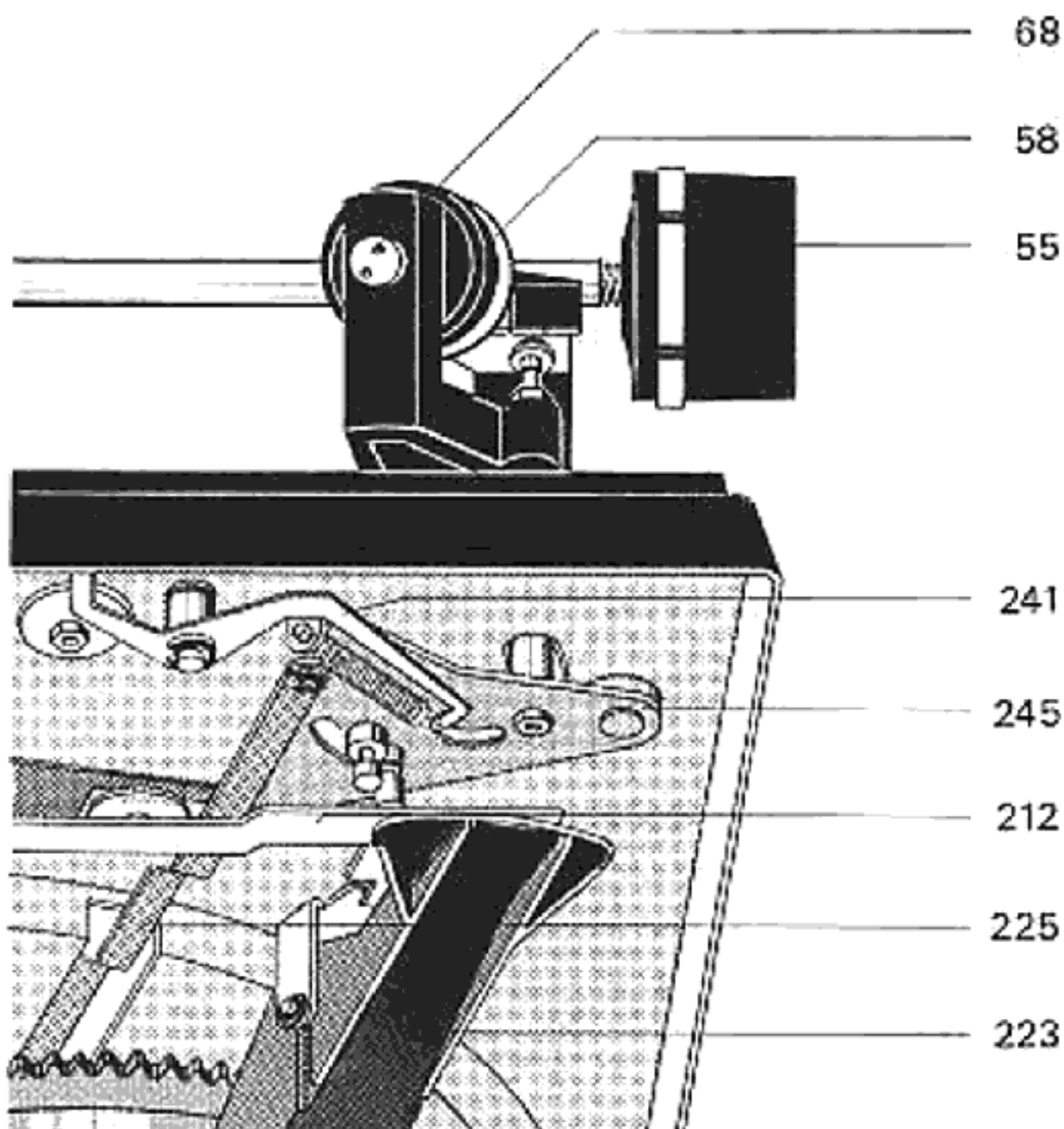


Fig. 8 Tonearm bearing assembly (view from underneath)



Replacing the Complete Tonearm and Bearing Assembly

To replace the complete tonearm and bearing assembly we recommend proceeding as follows:

1. Tighten unit in repair jig, set stylus force scale to zero and lock the tonearm in position
2. Turn unit upside down, remove retainer spring (188) and unsolder tonearm leads
3. Remove main lever (223), disengage spring (256)
4. Remove lock washer (227) and skating disc (226), remove shut-off slide (225) from eccentric pin on segment, ensure ball (224) does not drop out
5. Slacken hexagon nuts (244), remove segment (245), then remove tonearm, ensuring that bearing pivot (39) and compression spring (40) do not drop out.

Tonearm complete with bearing frame assembly should be refitted in reverse order. The unit is in normal position. Insert tonearm complete with bearing frame assembly and lock in rest. With tonearm held in place turn unit upside down. Place segment (245) in position and fit hexagon nuts.

Replacement of Tonearm

To remove the tonearm from the bearing frame unsolder the tonearm leads and set the tonearm tracking force scale to zero. Unscrew locknut (65) with setscrew (64) and bearing screw (68) (left-hand thread). Carefully remove tonearm from bearing frame.

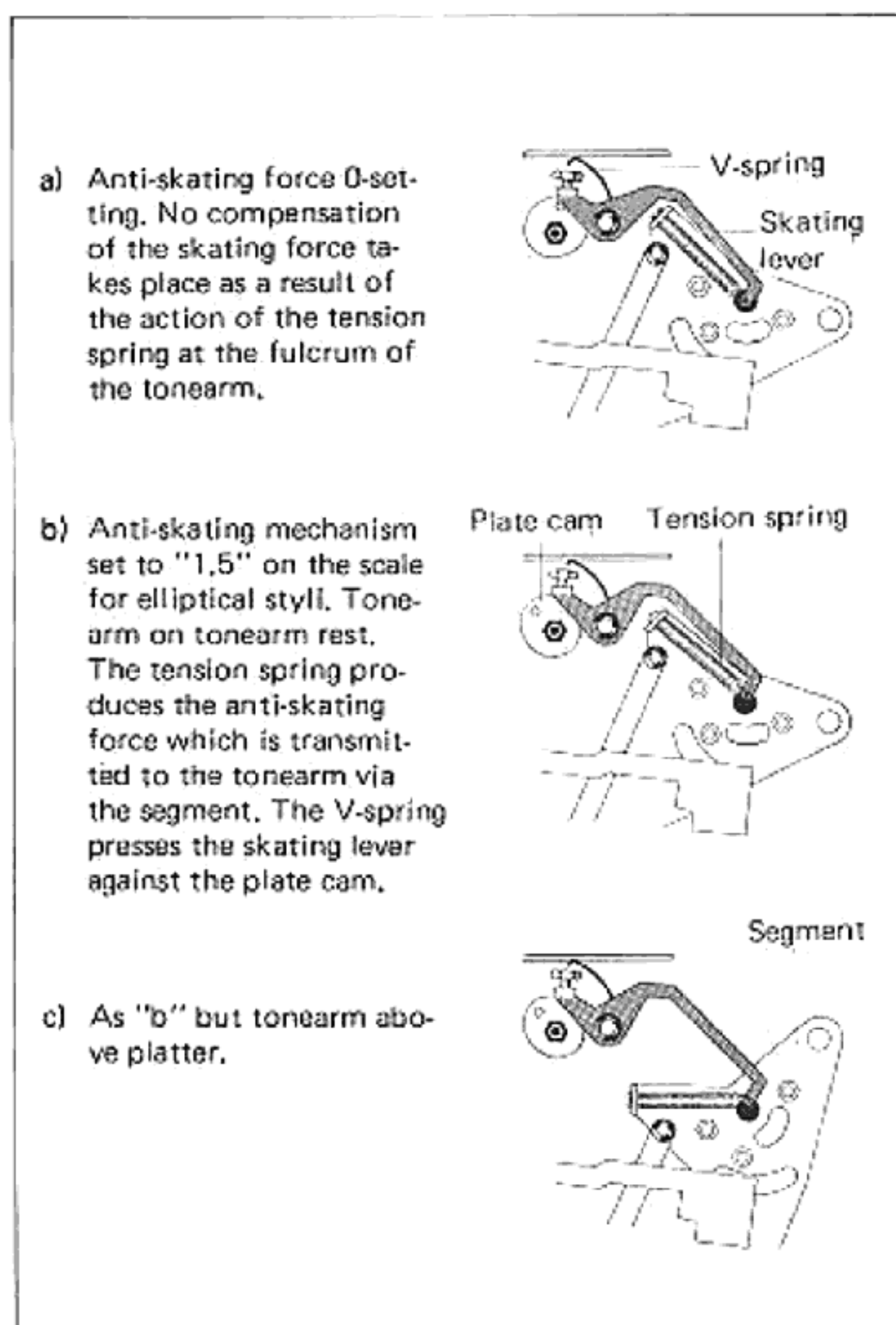
Tonearm Anti-skating Device

The geometrically caused skating force acting on any tonearm is eliminated to a large extent in the case of the Dual 1224 and 1225 by means of a precision antiskating device.

The skating force is dependent on the tonearm geometry, on the stylus force and the tip radius of the cartridge stylus. The inward pull of the tonearm caused by the skating effect leads not only to undesirable jumping of the tonearm when set down on the record but also unequal forces on the two opposite groove walls with resultant unfavourable effects. These can be corrected with the aid of a suitable anti-skating device. By turning the knob (69) of the anti-skating device located on the cover the asymmetrical plate cam (238) is moved. This plate cam has two different curvatures which, according to the different scales used, for spherical and elliptical tip styli and for CD 4 pick-up cartridges, move the skating lever (241) out of its position of rest and transmit the counter force to the tonearm by means of the tension spring (256).

Skating adjustment is set at the works for conical styli with a tip radius of $15 \pm 2 \mu\text{m}$ and for elliptical styli with measurements of $5/6$ and $18/22 \mu\text{m}$ and also for CD 4 cartridges. The hexagon nut (239) is firmly tightened and locked with paint. Readjustment should only be attempted with the aid of the Dual Skate-0-Meter and the L 096 test record. This is best done by an authorised Dual service station.

Fig. 9 Anti-skating force



Trouble

Tonearm head not located parallel to platter

Cause

Shocks incurred during transport have altered the location of the tonearm head on the tonearm tube

Remedy

Remove platter, slacken the screw on the tonearm head with the aid of a screwdriver inserted through the hole in the chassis provided for this purpose. Retighten screw after aligning the tonearm head (Fig. 10).

Fig. 10

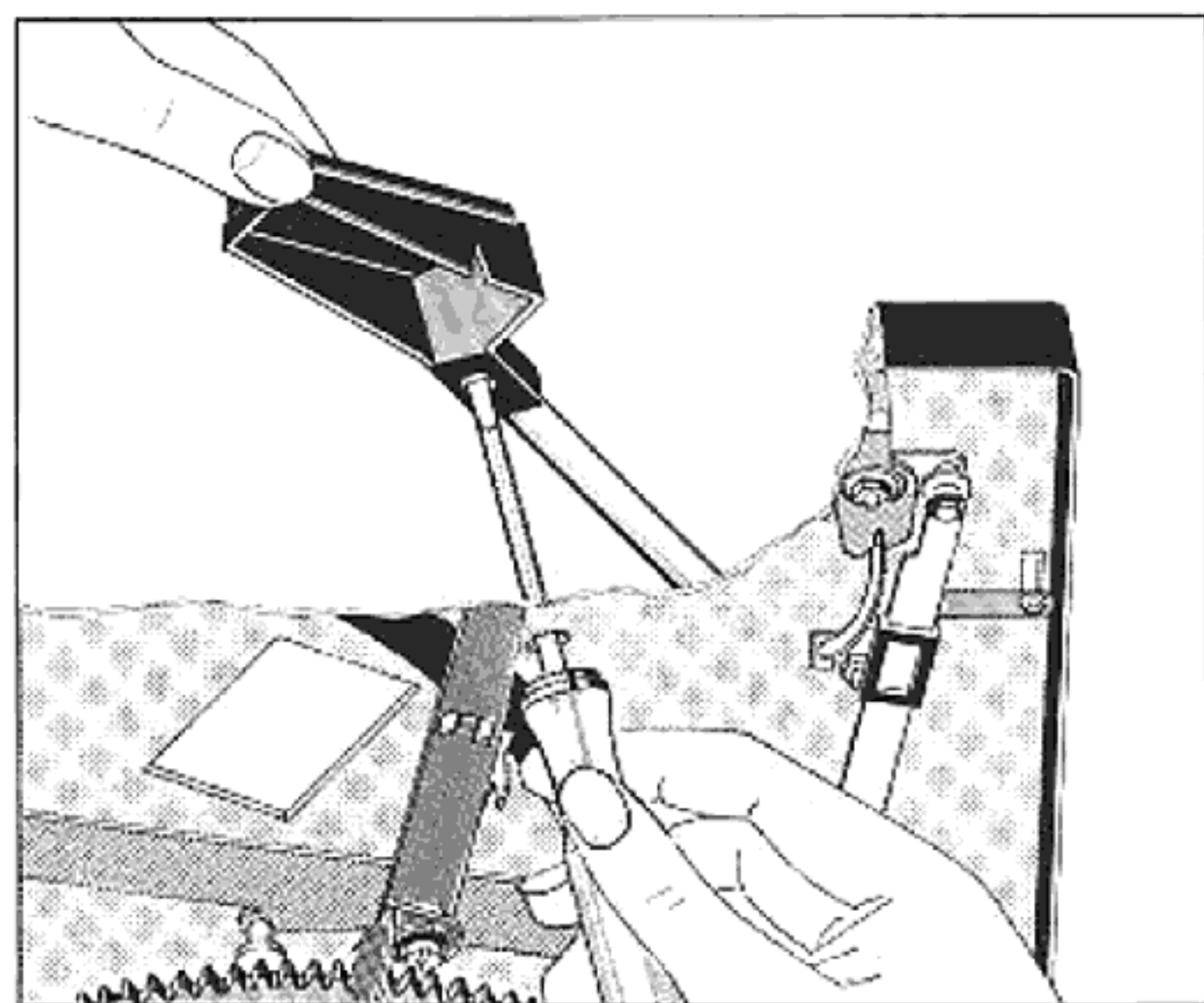
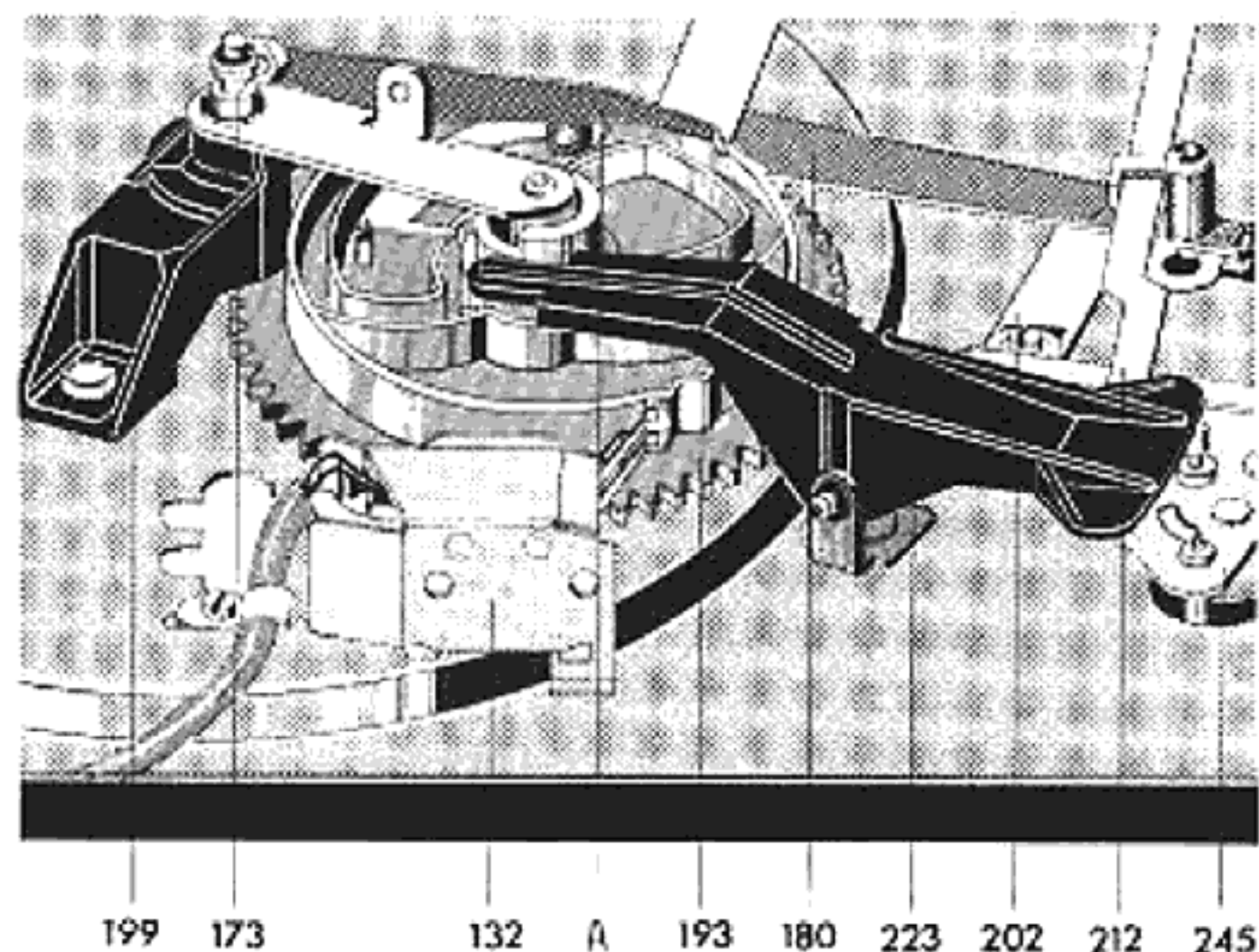


Fig. 11 Tonearm guide mechanism



Tonearm Guide Mechanism

A guide groove located on the underside of the main cam (193) controls the automatic lift and set-down of the tonearm as the cam rotates through 360°. Tonearm lift and lowering are controlled by main lever (223) and lift screw (249). Horizontal movements are controlled by the main lever (223) and the segment (240). Automatic tonearm set-down is designed for 12" and 7" records and is coupled to the platter speed selector. Set-down points are determined by the spring pin of segment (240) contacting the positioning slide (212) which is only raised by the main lever (223) during the change cycle and thus moves within reach of the spring pin fitted on the segment. On completion of set-down or change cycle (tonearm sets down on the record) the positioning slide (212) is released again and returns to its normal position. It thus moves out of reach of the spring pin permitting the tonearm to move horizontally without hindrance while playing the record.

Tonearm Lift (Cue Control)

The tonearm lift permits the tonearm to be set down on the record safely at any desired point outside the shut-off area.

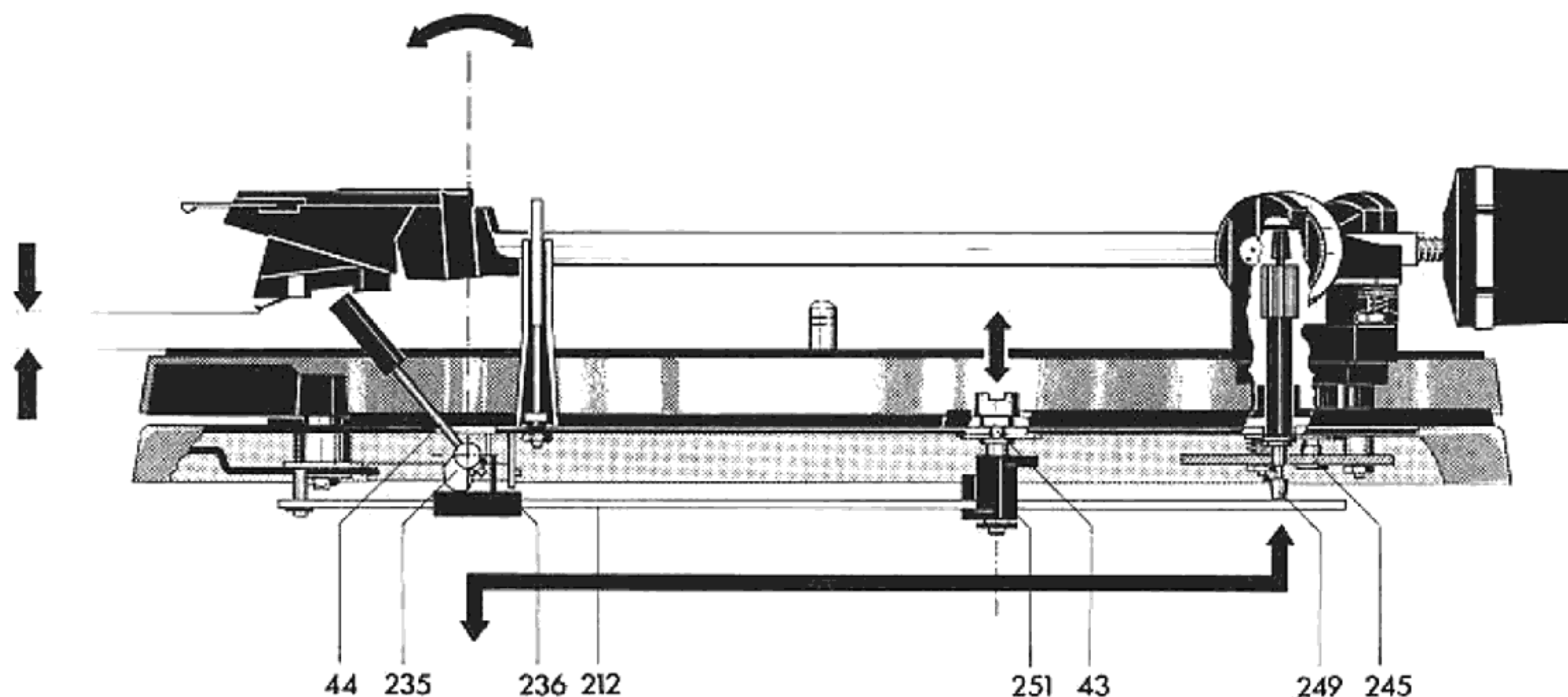
Moving the tonearm lift handle (44) forward causes lift cam (235) to rotate. This movement is transmitted via positioning slide (212) to the lift pin which then raises the tonearm.

After moving the tonearm (by hand) to the desired spot on the record the tonearm lift handle is tapped lightly (to the rear) to release the mechanism.

The positioning slide (212) is thus released and the tonearm descends slowly, controlled by the viscosity damped lift pin.

The height of the stylus above the record can be varied from zero to 6 mm by turning adjuster screw (43). Turning to the right increases the height, turning to the left reduces the height.

Fig. 12 Tonearm lift (tonearm raised)



| Trouble | Cause | Remedy |
|---|--|---|
| Tonearm misses edge of record | a) Record setting incorrect b) Set-down point incorrectly adjusted c) Record not standard size d) Friction surfaces of tonearm clutch dirty | a) Carry out necessary adjustment by means of right-hand selector lever (33). b) Set right-hand selector lever to "45". With a screwdriver inserted through the hole exposed turn eccentric pin until the tonearm sets down approximately 1.5 mm from the edge of the record. (Adjustment is only carried out for 7" records and is then automatically correct for 12" records.) c) Use standard record d) Clean clutch surfaces |
| Tonearm strikes record during change cycle | Tonearm height adjustment incorrectly set | Adjust arm height with adjuster sleeve (36). Height is correct when stylus tip is 2 - 3 mm above selector lever (33) when arm is removed from rest. |
| Tonearm does not move onto record when drop cycle is started | Excessive damping caused by dirt in silicone oil in lift tube | Remove tonearm complete with bearing assembly (described on page 6). Remove lock washer (37), detach adjuster sleeve and remove second lock washer (37). Remove lock washer (253) on adjuster lever (214). Detach positioning slide from pin on adjuster lever, turn slightly until lift pin (249) is released. Remove lift pin. Clean lift tube and lift pin. Smear lift pin evenly with "Wacker silicone oil AK 500 000". Smear lift pin evenly with "Wacker silicone oil AK 500 000". Reassemble components. |
| Tonearm lowers too quickly when drop cycle is started | Insufficient damping caused by improper addition of lubricant to damping compound | Remove tonearm complete with bearing assembly (described on page 6). Remove lock washer (37), detach adjuster sleeve and remove second lock washer (37). Remove lock washer (253) on adjuster lever (214). Detach positioning slide from pin on adjuster lever, turn slightly until lift pin (249) is released. Remove lift pin. Clean lift tube and lift pin. Smear lift pin evenly with "Wacker silicone oil AK 500 000". Reassemble components. |
| 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 (selector moved to "start") |

Start Cycle

Moving the start switch (33) causes change lever (209) to rotate outwards. This initiates the following functions:

- A lug rotates shift arm (180). The latter in turn by means of a tension spring moves the change lever (130) and thus the idler wheel (152) into engagement with motor pulley (137/139) and platter (9). At the same time the power switch (167) is actuated by the switch slide (177) coupled to the shift arm and the platter starts to rotate.
- Change lever (209) is brought within reach of the cam follower lever (195) so that the latter is pushed into the change position after subsequent rotation of the main cam.

Fig. 13 Start position

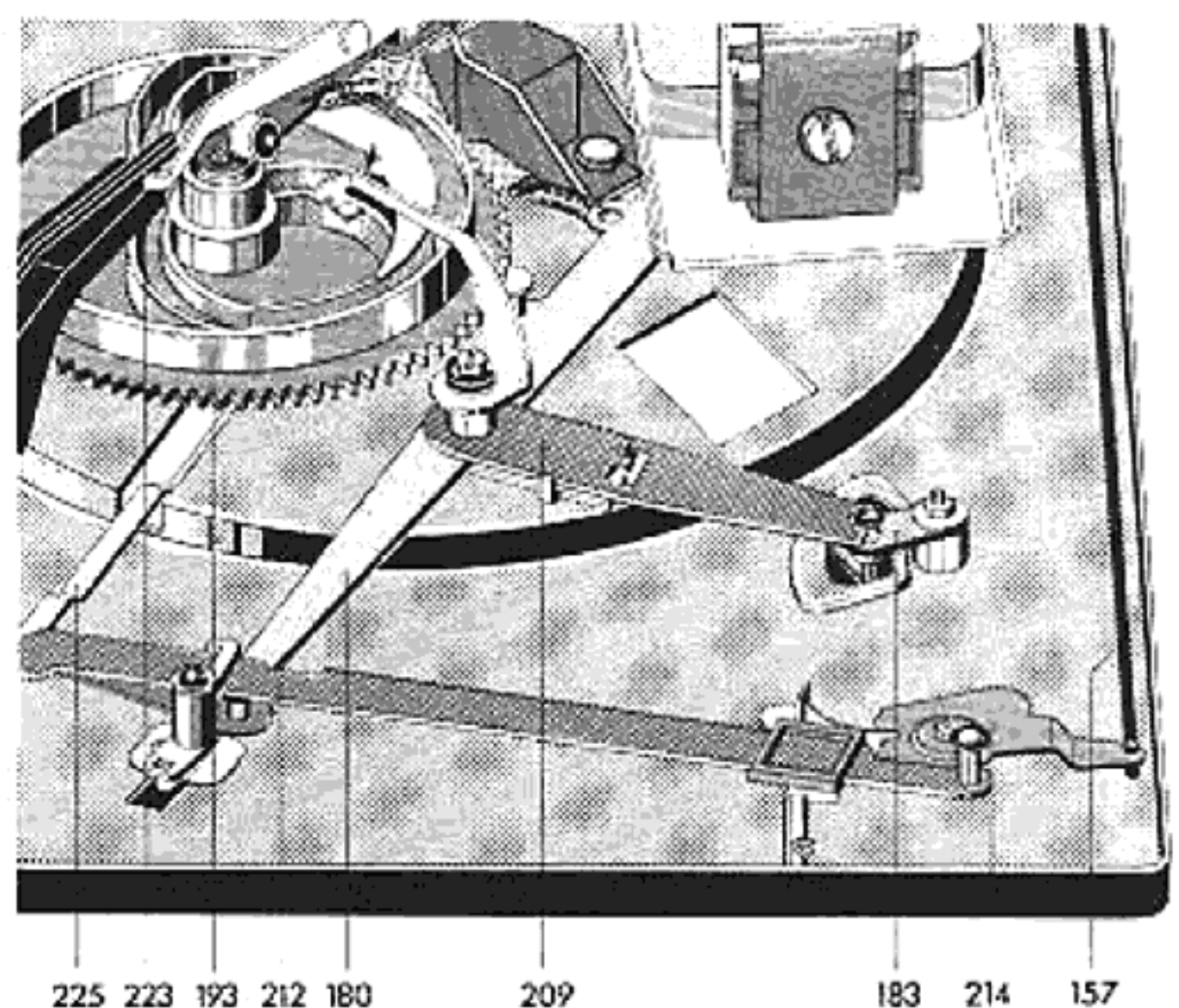
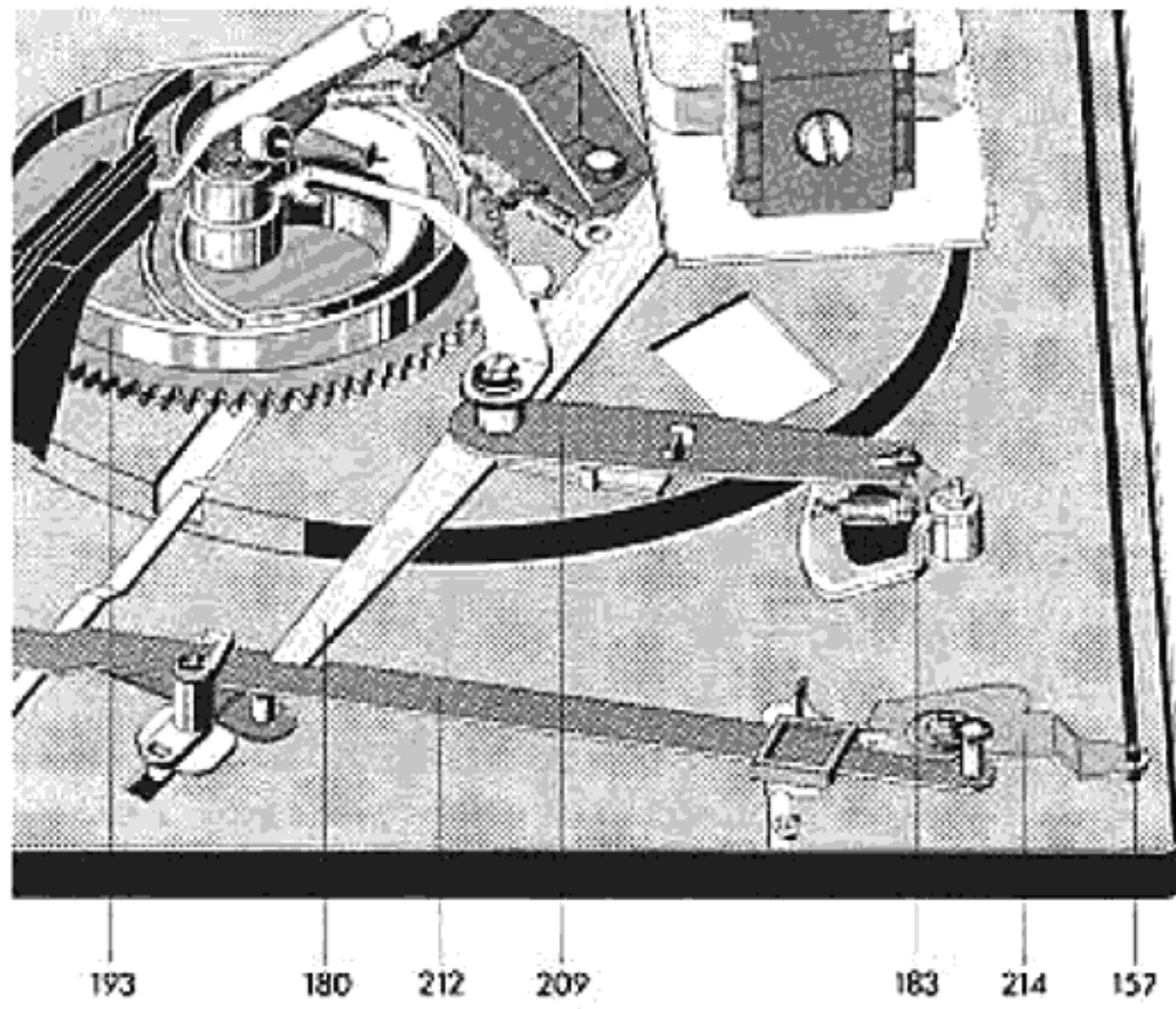


Fig. 14 Stop position

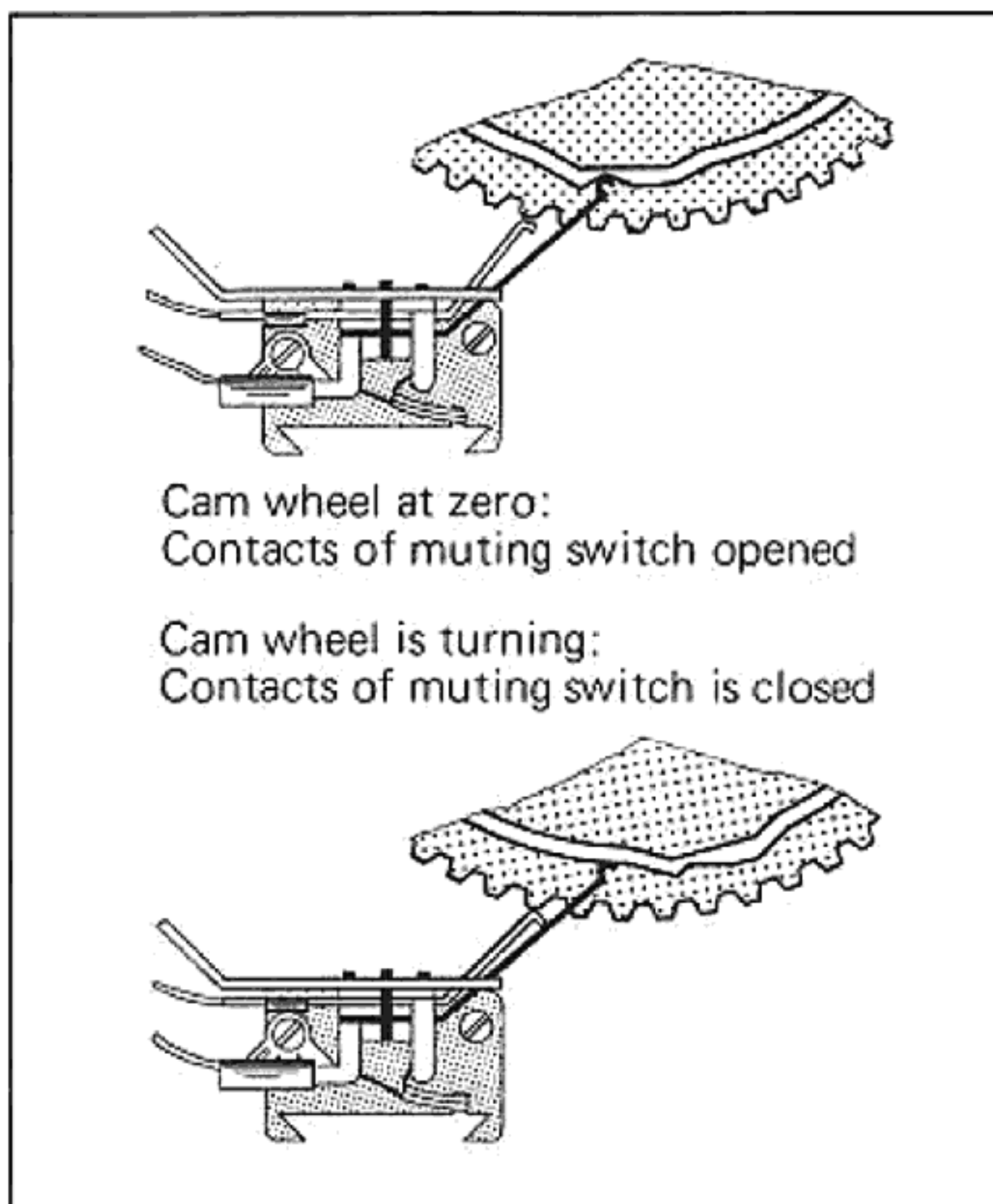


Moving the operating switch (33) also releases the start level (208) which is pulled towards the main cam by means of tension spring (207). By this means the shut-off lever (190) is moved within the range of the dog on the platter pinion thus driving the main cam. The change lever (209) is also locked. To prevent malfunctions the operating switch is locked in position during the start cycle (rotation of the main cam). Just before the main cam reaches neutral position (at the end of the change cycle) the start lever is pushed clear by the main cam and thus the operating switch and change lever are returned to their original positions. After installation and 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 inwards by hand the pawl (202) on the shift arm (180) engages on a square end pin fitted in the chassis, retaining the shift arm in this position and thus the idler wheel (152) in engagement with the platter. The slide (177) linked to the shift arm actuates the power switch and sets the platter in motion. On reaching the run-out groove the tonearm automatically returns to its rest position and the unit shuts itself off. If, however, the tonearm is lifted off the record before completion of play and returned to the rest, the pin of segment (245) releases the pawl (202). The tension spring then returns the shift arm to its initial position, opening the power switch and disengaging the idler wheel.

Fig. 15 Muting Switch



Stop Switching

When the operating lever is moved to "stop" only the starting lever (208) is drawn forward. As a result, the shut-off linkage engages with the main cam. The cam follower lever remains in stop position. When the tonearm is on its rest and the operating lever is pushed to "stop", the change lever must not jam.

Muting Switch

To prevent disturbing noise during the change cycle and during automatic operation of the tonearm the unit is fitted with a muting switch. Control of the switch springs for both channels is effected by the main cam. With the unit in position of rest the muting switch is opened.

Record Drop

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

Record drop is initiated by rotation of the main cam (193) whose cam surface guides the cam rocker (A) and the change actuator stud (173). The resultant downward movement initiates record drop via the changing spindle or automatic spindle.

The record drop cam is located on the main cam so that record drop can only take place when the tonearm is over the tonearm rest, that is to say, out of reach of the largest possible records (12" diameter).

Shut-off and Change Cycle

The dog (M) of platter pinion (PR) and shut-off lever (190) actuate both the change cycle at the end of the record and 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 shut-off lever (190) towards the dog by means of shut-off slide (225). The eccentric dog pushes the shut-off lever (190) back at each revolution as long as the tonearm advance is only one normal record groove. (Fig. 17 a)

The run-out groove with its steeper pitch moves the shut-off lever (190) against the dog with greater force so that the shut-off lever is picked up and moves with it. (Fig. 17 b)

The main cam (193) is thus moved out of its neutral position into engagement with the pinion of the platter. (Fig. 17 c)

Fig. 16 Record Drop

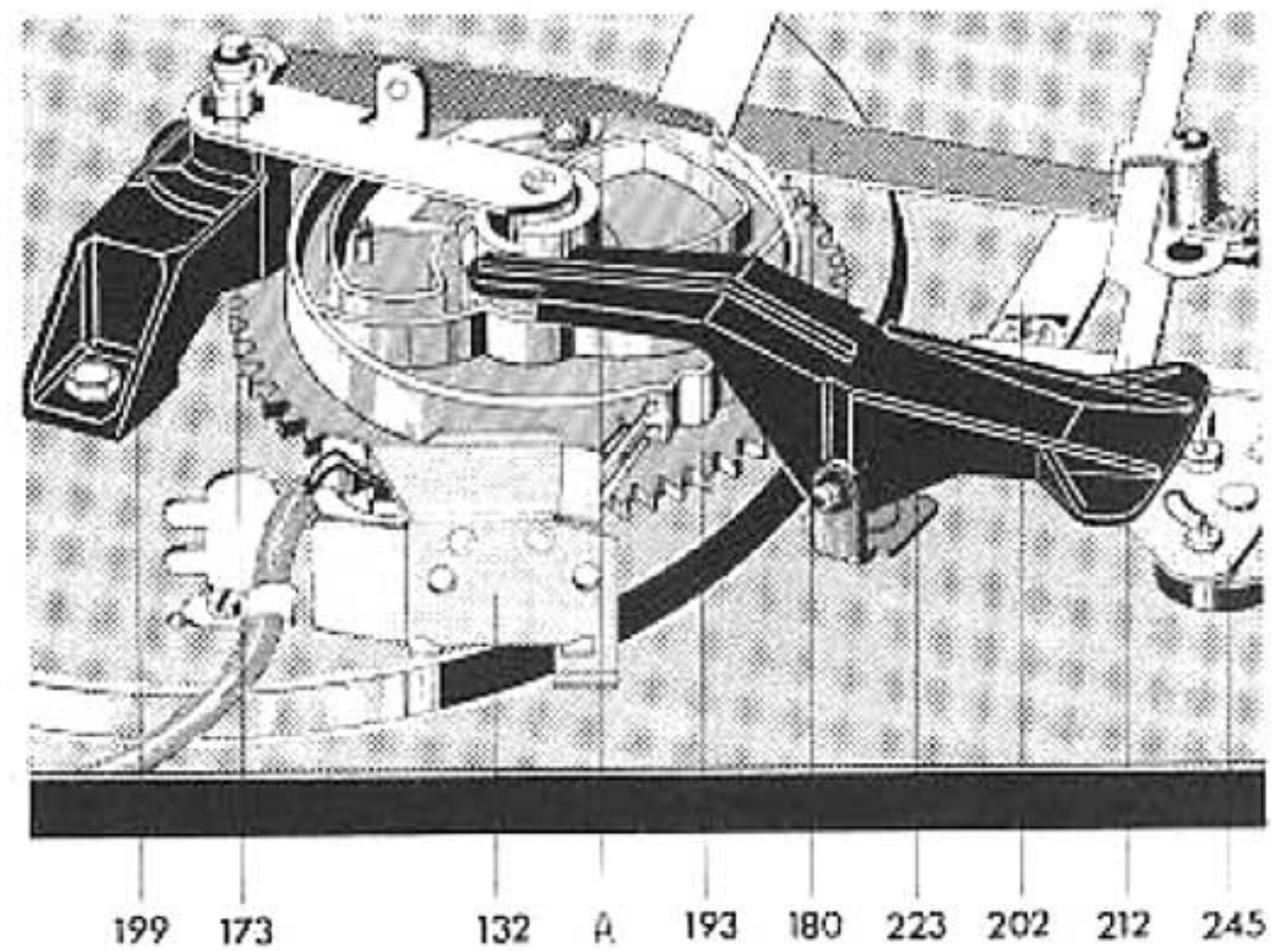


Fig. 17 Actuating "change" or "shut-off"

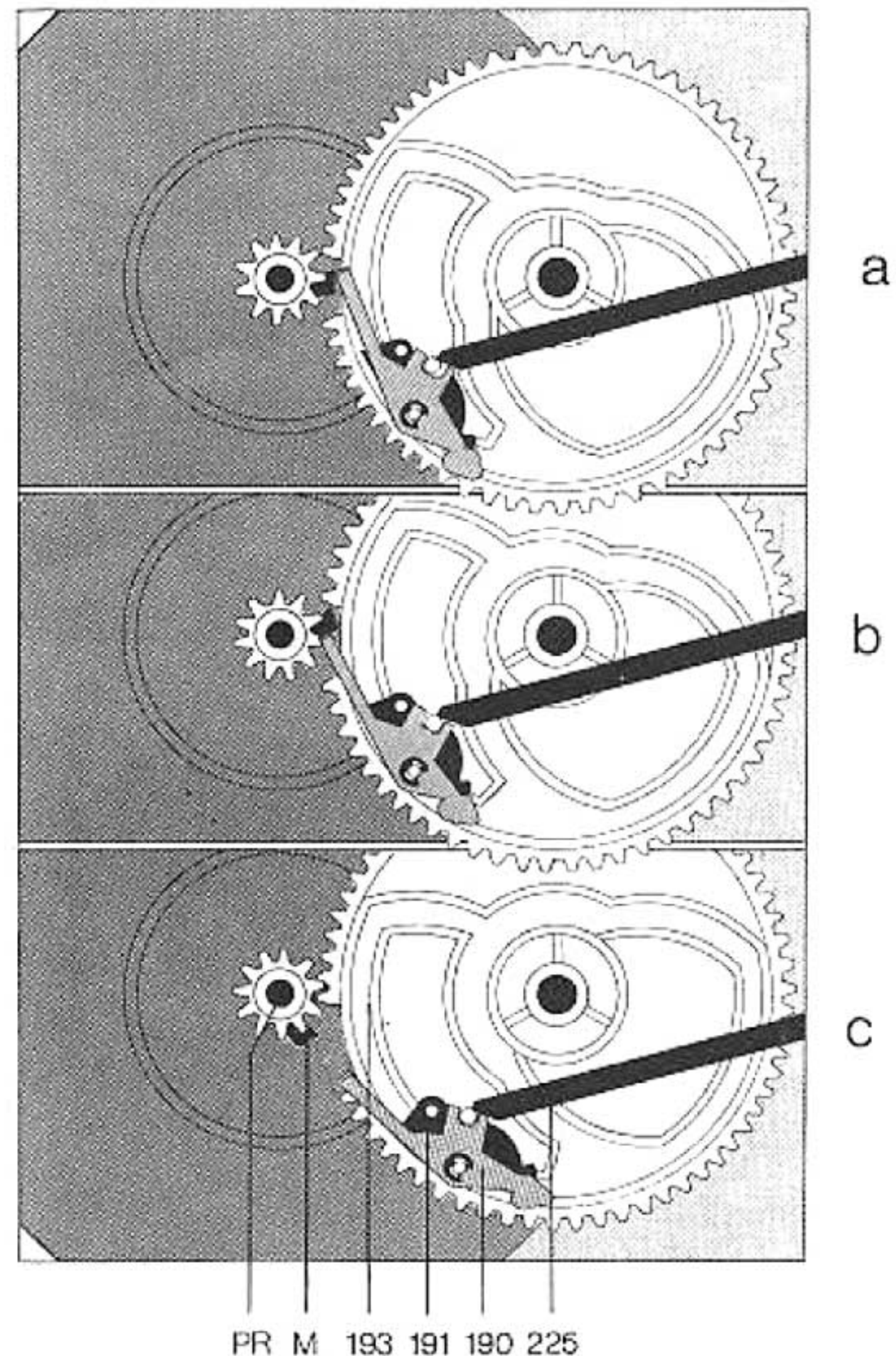
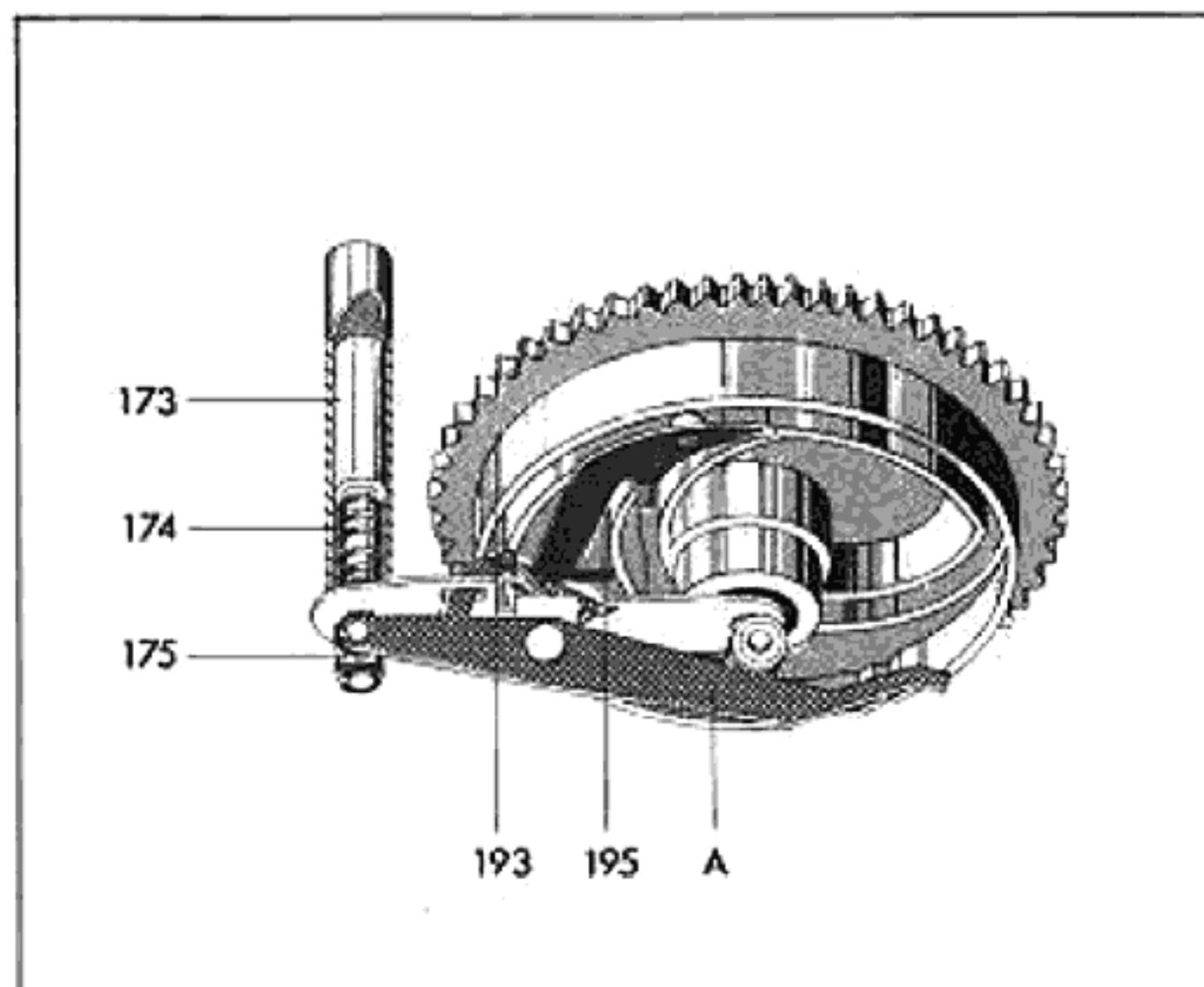


Fig. 18 Change Cycle

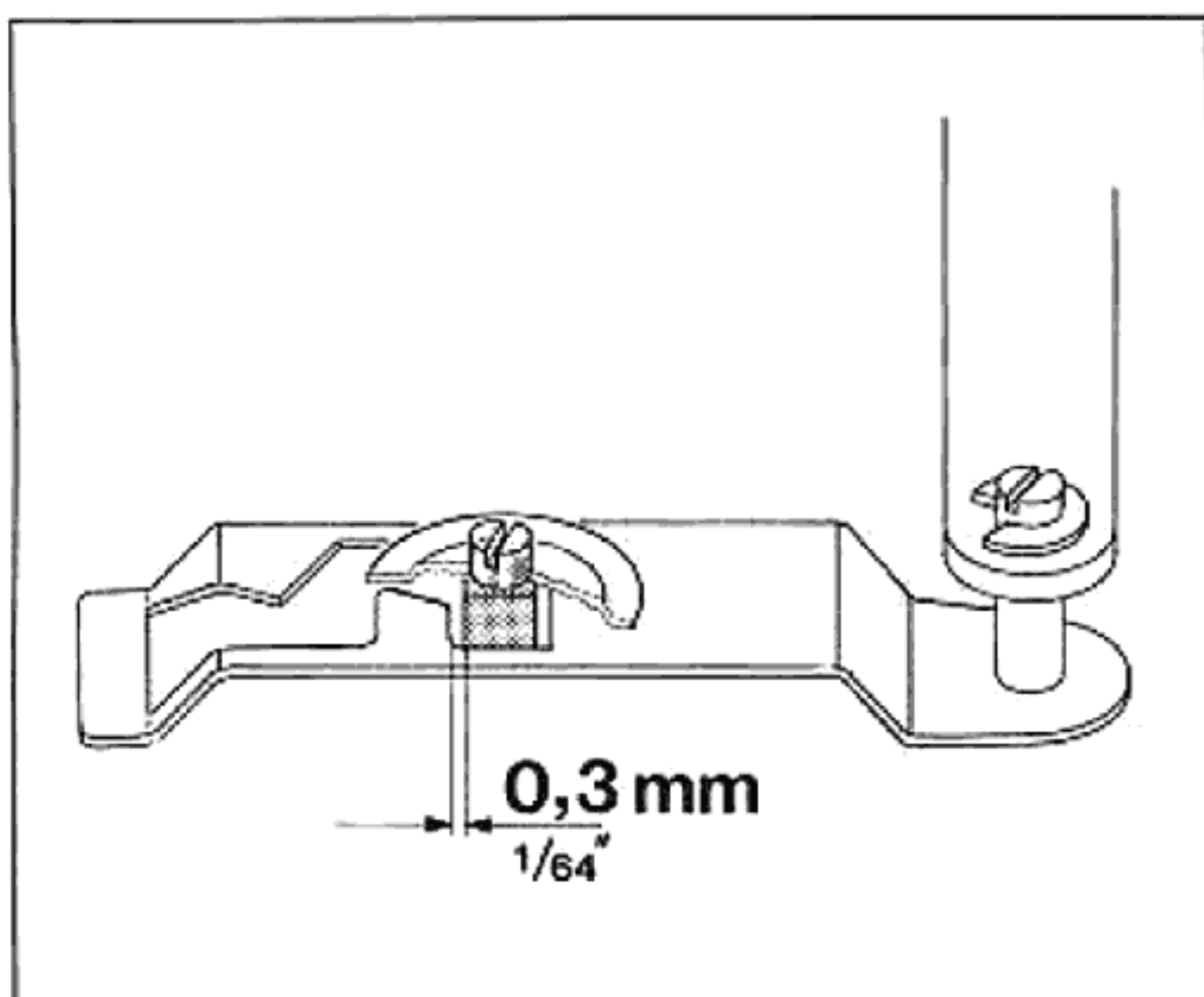


Shut-off Mechanism

The shut-off and change functions are determined by the position of the cam follower lever (195). After every start or record drop the cam follower lever (195) is moved to stop position by main lever (223) (longer end of the cam follower lever towards the center of the main cam).

As the record is dropped the cam follower lever (195) is turned to start position by cam rocker (A) so that the tonearm can swing in after record drop and be lowered onto it. If there are no more records on the spindle its downward movement is locked and the cam rocker cannot turn the cam follower lever, the lever remains in stop position and causes the tonearm to lower onto its rest. When main cam (193) returns to neutral position the lug of shift arm (180) is able to move into the recess provided in the main cam, actuate power switch (167) and disengage idler wheel (152).

Fig. 19



Trouble

Platter stops after automatic set-down of tonearm

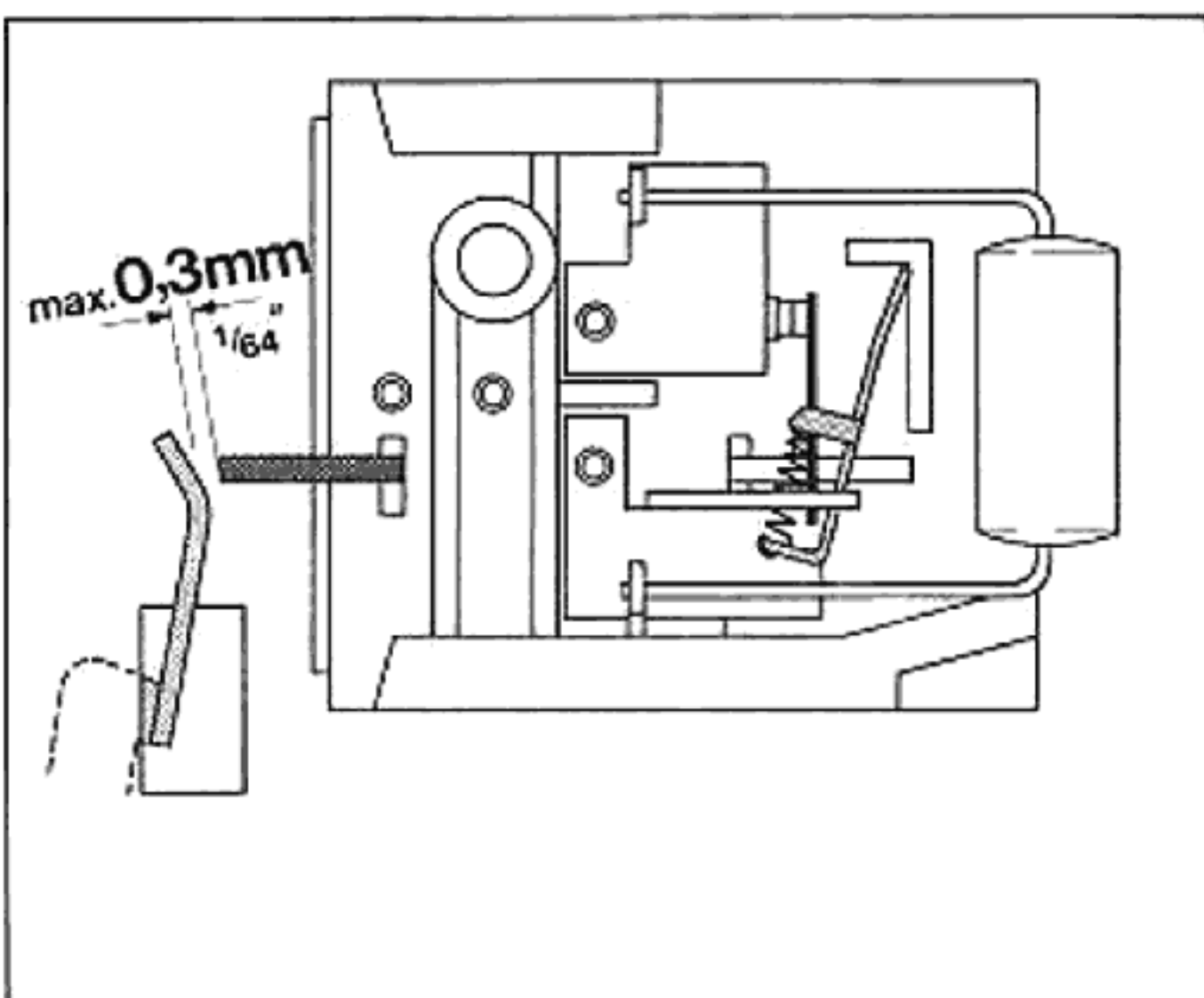
Cause

- a) Shift arm (180) not locked by paul (202).
- b) Power switch has interrupted power supply (has switched off)

Remedy

- a) By turning the eccentric pin on the paul
- b) By adjusting switch slide (177) maximum play between switch slide and shift arm (0.3 mm).

Fig. 20



Trouble

The last record of a stack keeps repeating

Cause

Defective spindle

Remedy

Replace spindle

Trouble

After adjustment of the tonearm set-down point for 7" records the set-down point for 12" records is incorrect

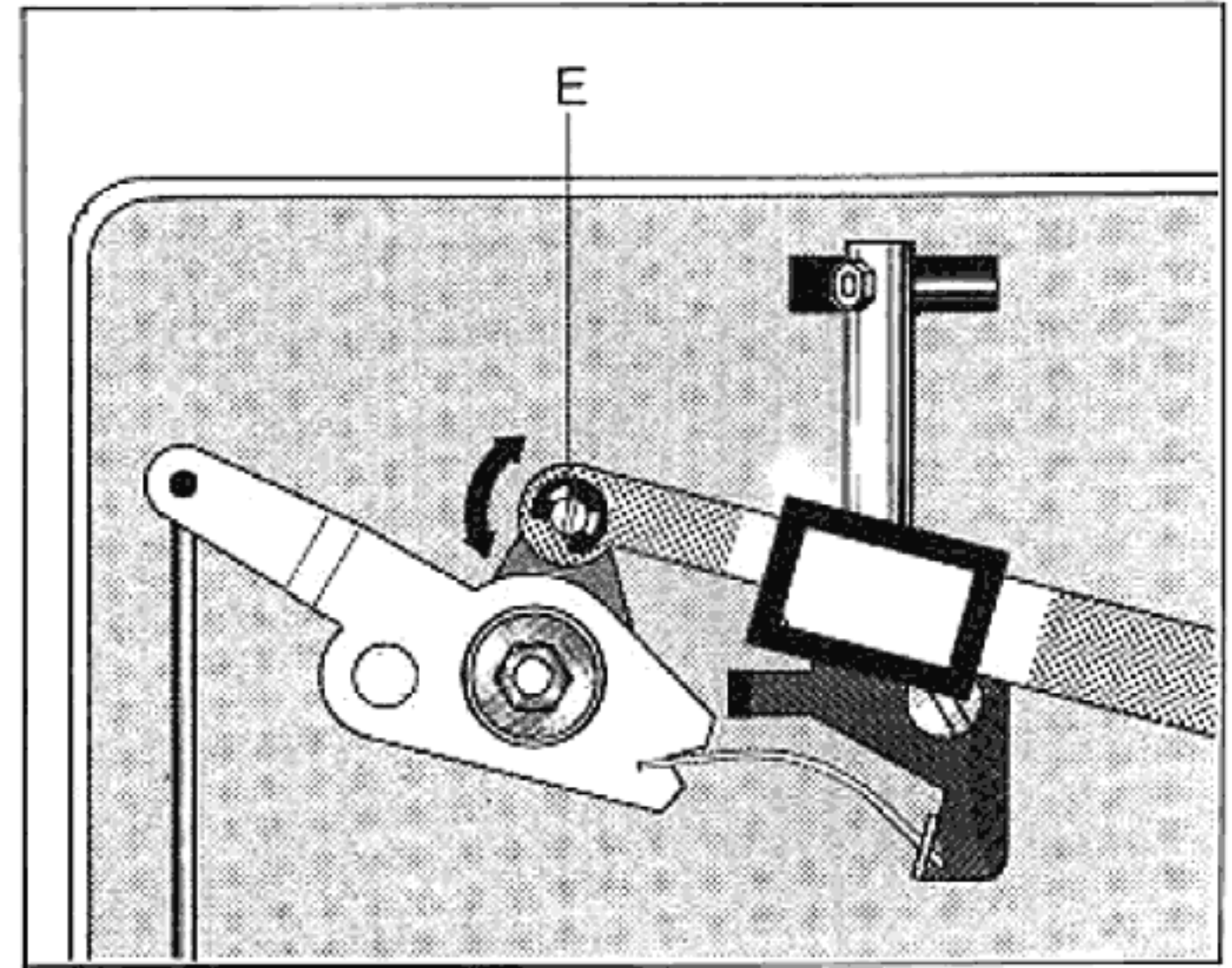
Cause

Eccentric pin (E) of adjuster lever (214) out of adjustment

Remedy

Adjust tonearm set-down by turning eccentric pin (E)

Fig. 21



Trouble

Record drops when unit is switched to "stop"

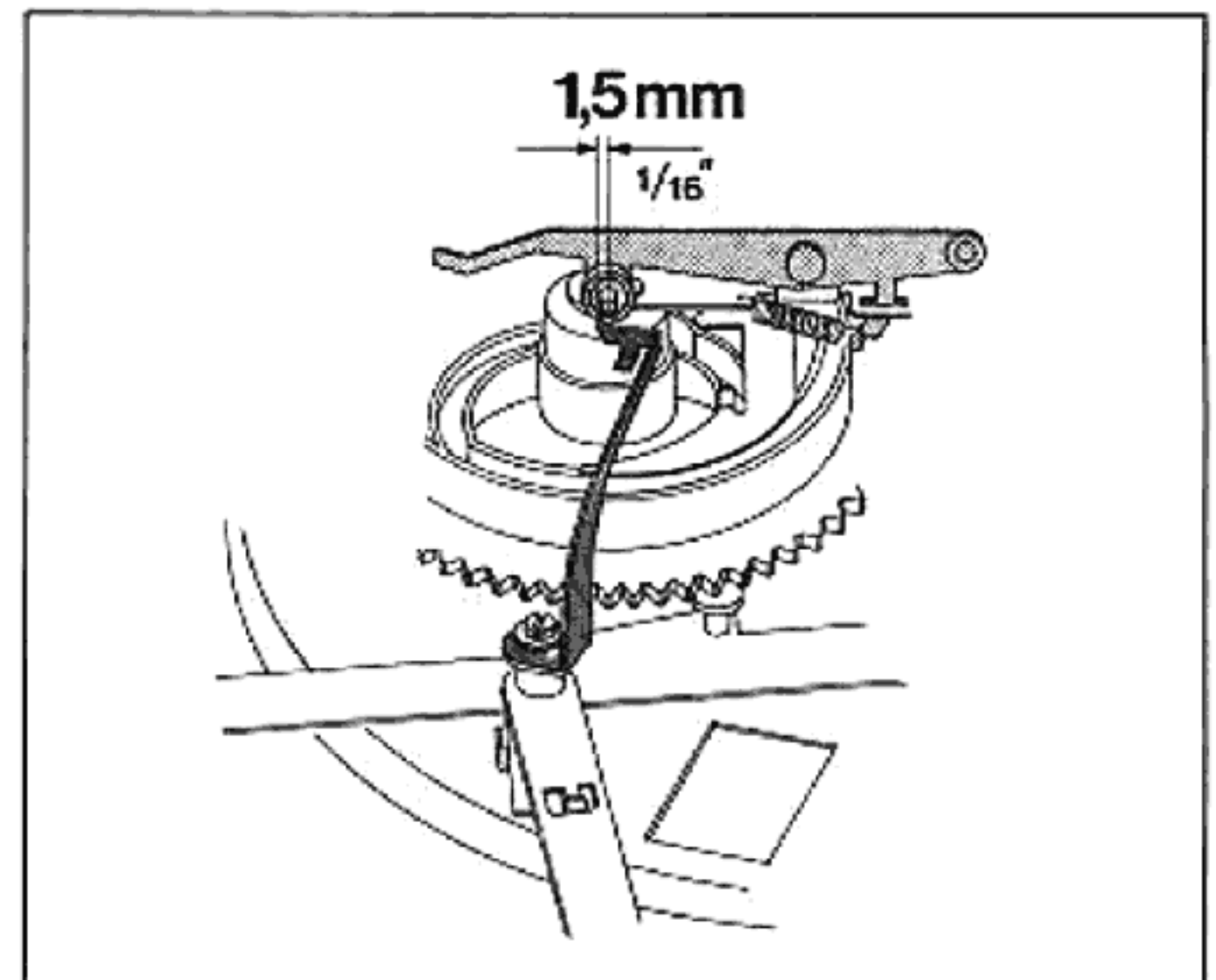
Cause

Cam rocker (A) not locked by change lever

Remedy

Adjust change lever so that it passes approximately 1.5 mm underneath the cam rocker when "stop" function is initiated

Fig. 22



Trouble

Records do not drop

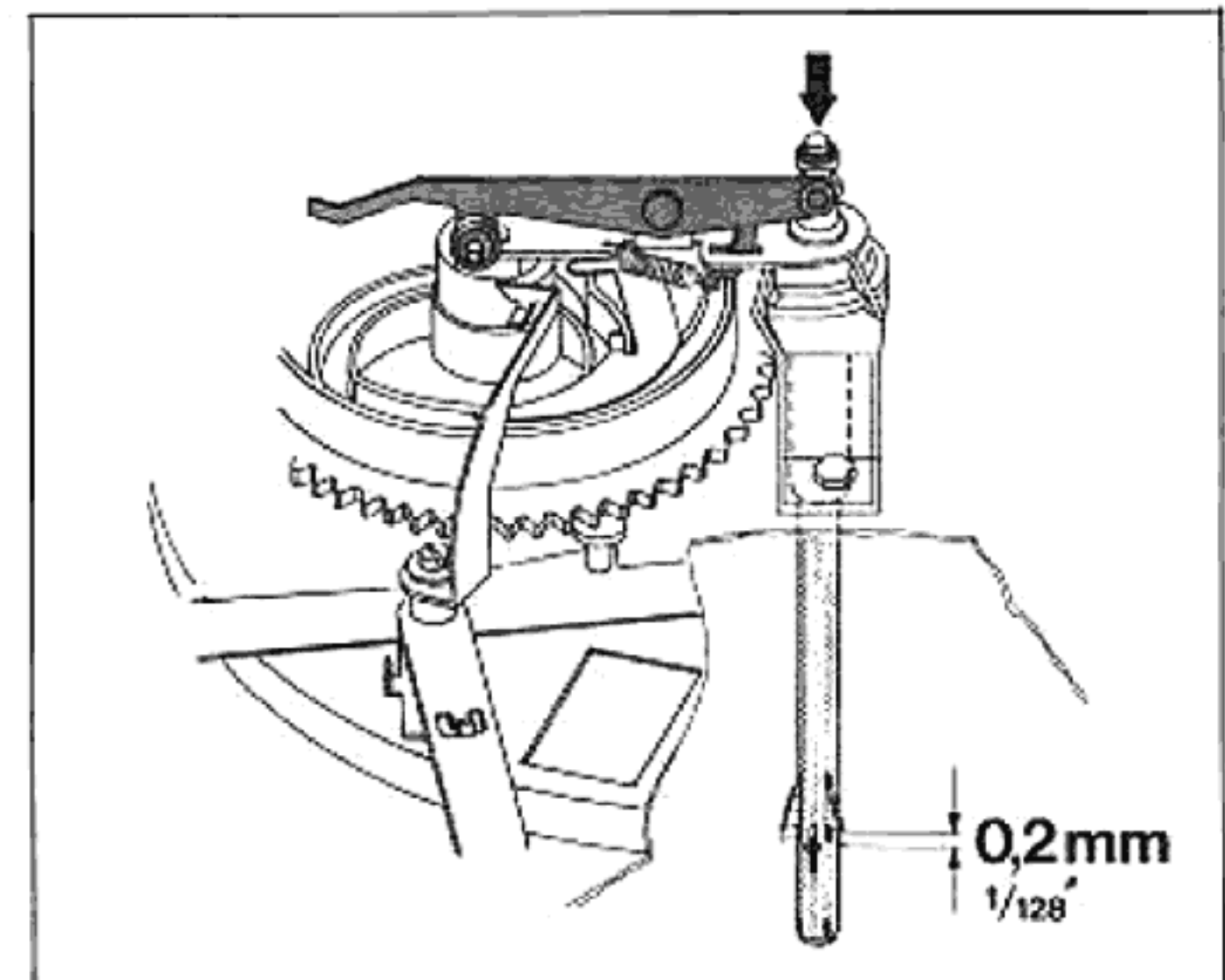
Cause

Cam rocker has insufficient travel

Remedy

Adjust travel with eccentric screw on cam rocker. Adjustment is correct when, with the main cam in neutral position and the changing spindle locked, the three supports of the changing spindle describe longitudinal movement of 0.2 mm when the change actuator stud is pushed up

Fig. 23



| Trouble | Cause | Remedy |
|---|---|--|
| Stylus slips out of playing groove | <ul style="list-style-type: none"> a) Tonearm not balanced b) Tonearm contact pressure insufficient c) Stylus point worn or splintered d) Excessive bearing friction in tonearm bearing e) Steel ball (224) of shut-off slide missing f) Antiskating adjustment incorrect | <ul style="list-style-type: none"> a) Balance tonearm b) Check tonearm balance, set contact pressure to value stated by cartridge manufacturer c) Renew stylus d) Check tonearm bearing e) Renew steel ball (224) f) Correct anti-skating adjustment |
| Vertical tonearm movement restricted during set-down cycle | <ul style="list-style-type: none"> a) Excessive bearing friction b) Lift pin sticks in lift tube | <ul style="list-style-type: none"> a) Eliminate friction by adjustment of bearing screw (setscrew 64) and check balance b) Remove lift pin and clean (described on page 9) |
| Tonearm moves with stylus pressure and anti-skating scale in zero position a) outwards, b) inwards | <ul style="list-style-type: none"> a) Anti-skating device out of adjustment b) Excessively taut tonearm leads producing torque | <ul style="list-style-type: none"> a) Adjust skating lever so that skating spring acts correctly at tonearm pivot b) Slacken tonearm leads |
| During change, start and stop operations, noise from the mechanism can be heard in speaker system | Muting switch maladjusted. Clearance between contact strips on muting switch excessive | By bending contact strips. Adjustment is correct when, with the main cam in neutral position, the gap between the wipers and the contact strips on the muting switch is approximately 0.5 mm. Spray contact springs with preservative (e.g. Kontakt 61) and check adjustment of contact strips |
| No sound. The short circuit of the pick-up leads is no longer broken | Clearance between wipers and contact strips absent or insufficient | By adjusting contact strips. Adjustment is correct when, with the main cam in neutral position, the gap between the wipers and the contact strips on the muting switch is approximately 0.5 mm |
| Motor will not shut off when tonearm is on arm rest | Suppression capacitor (in power switch) is defective (short circuit) | Renew suppression capacitor in power switch |
| Acoustic feedback | <ul style="list-style-type: none"> a) Chassis parts (e.g. connection leads) are touching base cutout. b) Connecting leads are too taut | <ul style="list-style-type: none"> a) Correct cutout according to instructions supplied with unit. Move leads b) Slacken or extend leads |

Replacement parts

| Pos. | Part-No. | Description | Quantity |
|------|----------|---|----------|
| 1 | 215 470 | Automatic spindle AS 12 | 1 |
| 2 | 213 895 | Automatic spindle AW 3 | 1 |
| 3 | 220 213 | Centring piece | 1 |
| 4 | 200 709 | Plate pin | 1 |
| 5 | 214 054 | Washer | 1 |
| 6 | 200 543 | Retaining ring | 1 |
| 7 | 229 732 | Ring | 1 |
| 8 | 232 970 | Turntable mat compl. with ring and washer | 1 |
| 9 | 232 971 | Turntable compl. with mat | 1 |
| 10 | 229 743 | Knob | 1 |
| 11 | 229 733 | Scale ring | 1 |
| 12 | 228 111 | Adjusting screw | 1 |
| 13 | 230 529 | Threaded piece | 1 |
| 14 | 230 521 | Compression spring blue (1224) | 3 |
| | 230 523 | Compression spring (1225) | 1 |
| 15 | 200 723 | Rubber damping block | 3 |
| 16 | 200 722 | Steel cup | 3 |
| 17 | 232 972 | Spring mounted footing compl. (1224) | 3 |
| | 232 975 | Spring mounted footing compl. (1225) | 3 |
| 18 | 232 976 | Tonearm head compl. | 1 |
| 19 | 231 992 | Contact plate compl. with mass sheet | 1 |
| 20 | 201 132 | Lift | 1 |
| 21 | 210 182 | Bowed lockwasher 4.2/8 | 1 |
| 22 | 210 630 | Washer 4.2/8/0.5 St | 1 |
| 23 | 210 197 | Ring 4/0.8 | 1 |
| 24 | 215 430 | Cartridge mount TK 14 compl. | 1 |
| 25 | 232 978 | Tonearm rest compl. | 1 |
| 26 | 210 361 | Hex nut BM 3 | 3 |
| 27 | 200 718 | Compression spring | 2 |
| 28 | 210 624 | Washer 4.2/7/0.3 St | 4 |
| 29 | 201 632 | Rubber washer | 2 |
| 30 | 200 713 | Washer | 2 |
| 31 | 200 712 | Spring cup | 2 |
| 32 | 200 711 | Lockwasher | 2 |
| 33 | 229 767 | Switch lever compl. | 2 |
| 34 | 225 096 | Dual emblem | 1 |
| 35 | 232 999 | Blind 1224 compl. | 1 |
| | 232 998 | Blind 1225 compl. | 1 |
| 36 | 216 844 | Guide | 1 |
| 37 | 210 143 | Bowed lockwasher 1.5 | 2 |
| 38 | 218 318 | Positioning sleeve | 1 |
| 39 | 229 655 | Bearing peak | 1 |
| 40 | 229 685 | Compression spring | 1 |
| 41 | 210 469 | Machine screw M 3 x 4 | 3 |
| 42 | 233 004 | Dress plate compl. with lifting bolt | 1 |
| 43 | 229 631 | Adjusting screw | 1 |
| 44 | 229 745 | Lever compl. | 1 |
| 45 | 210 353 | Hex nut BM 2 | 1 |
| 46 | 232 997 | Mounting plate compl. | 1 |
| 47 | 213 260 | Pin | 4 |
| 48 | 214 047 | Special screw | 2 |
| 49 | 214 210 | Shipping screw compl. | 2 |
| 54 | 233 000 | Tonearm compl. | 1 |
| 55 | 233 001 | Weight compl. | 1 |
| 56 | 229 788 | Stud | 1 |
| 57 | 233 003 | Bearing compl. | 1 |
| 58 | 232 985 | Spring housing compl. | 1 |
| 59 | 229 725 | Plate | 1 |
| 60 | 203 475 | Sunk screw M 3 x 8 | 1 |
| 61 | 229 723 | Locating screw | 1 |
| 62 | 232 068 | Compression spring | 1 |
| 63 | 218 043 | Washer 3.2/7/0.5 St | 2 |
| 64 | 217 438 | Threaded rod | 1 |
| 65 | 229 721 | Locknut | 1 |
| 66 | 232 986 | Connecting lever bracket compl. | 1 |
| 67 | 229 720 | Needle | 1 |
| 68 | 229 738 | Bearing screw compl. | 1 |
| 69 | 229 794 | Antiskating knob compl. | 1 |

Fig. 24 Exploded view, above chassis

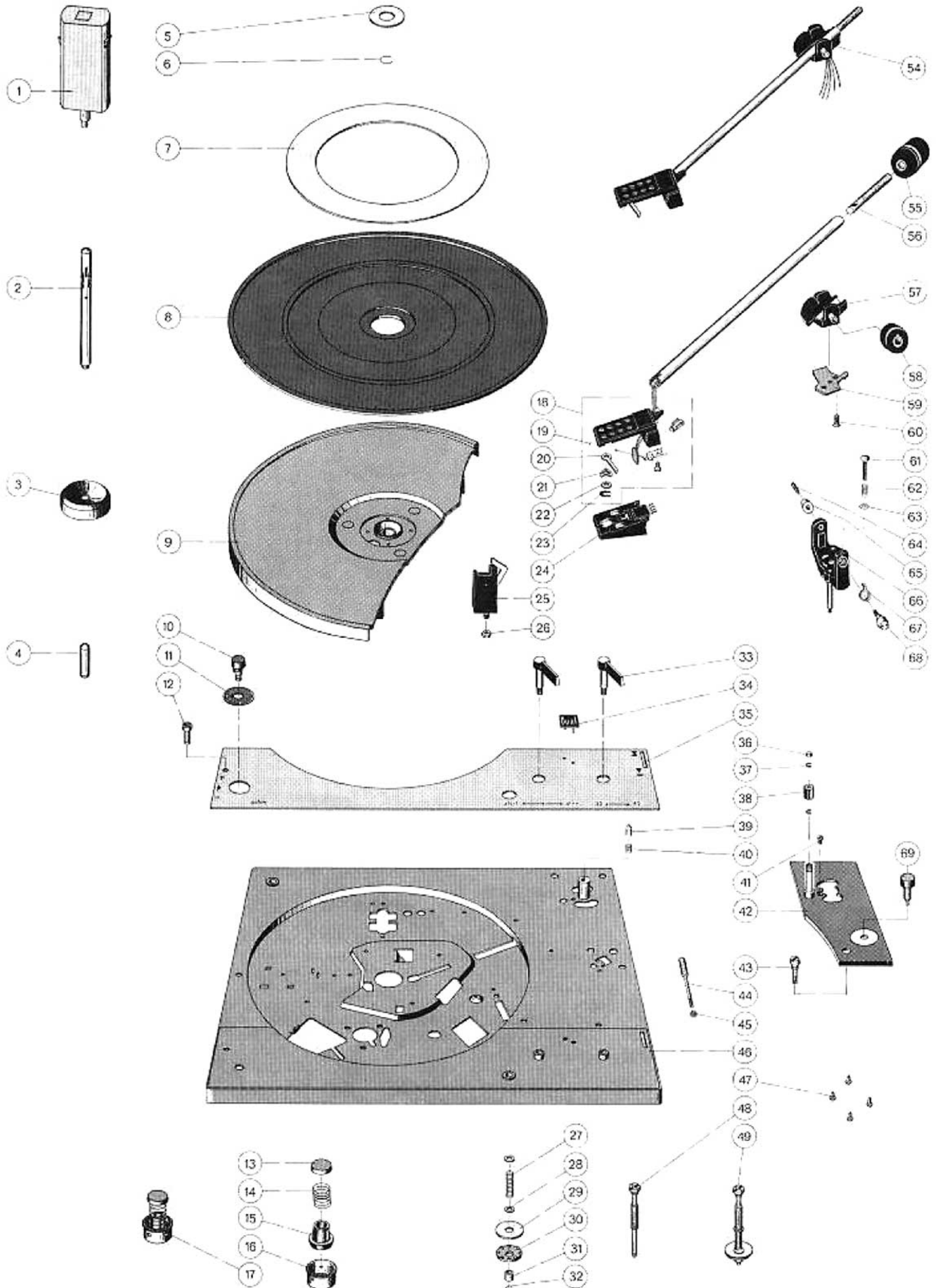
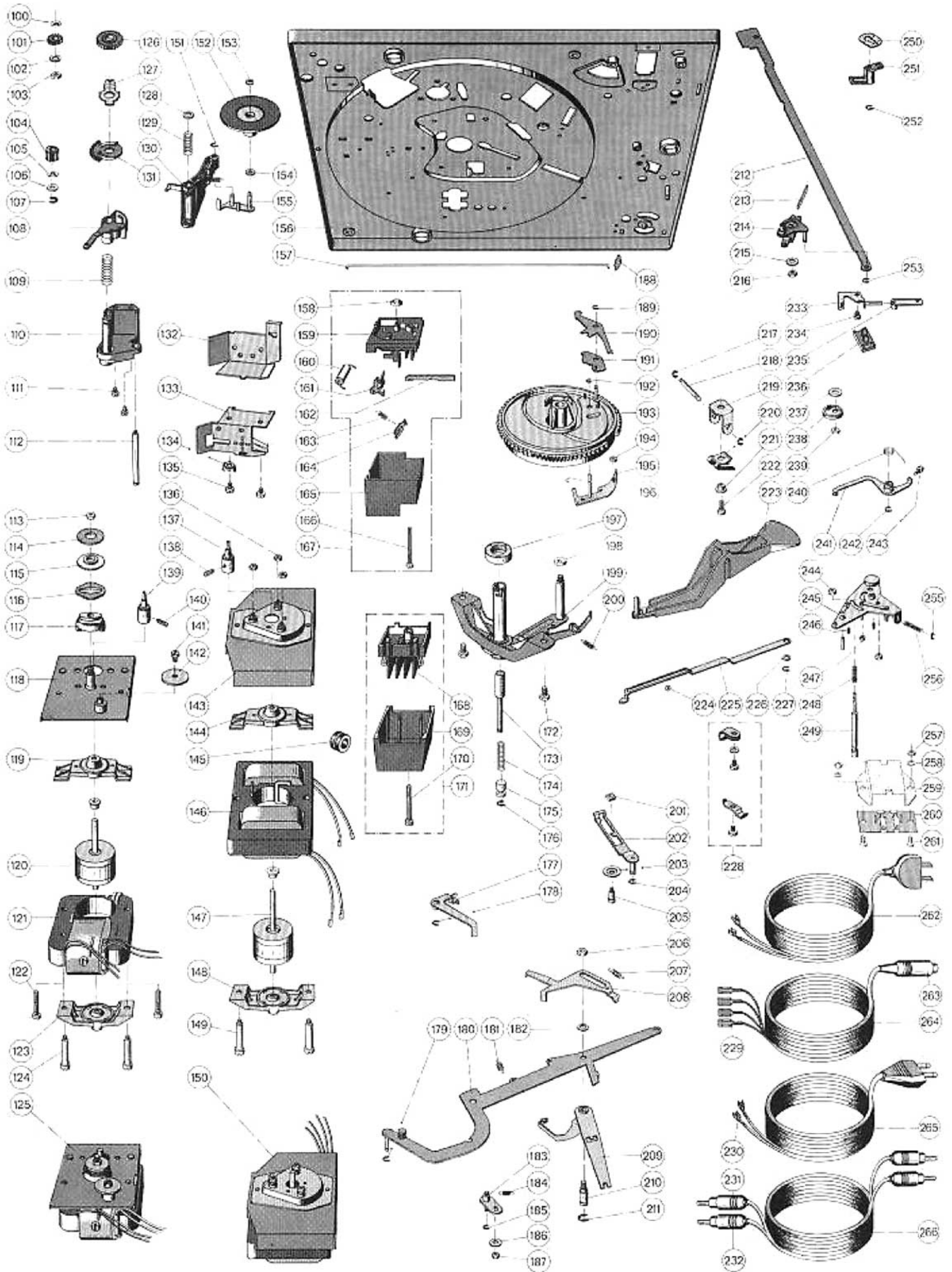


Fig. 25 Exploded view, below chassis



| Pos. | Part. No. | Description | Quantity |
|------|-----------|--|----------|
| 100 | 232 439 | Spring washer 6.4/11/0.15 | 1 |
| 101 | 229 373 | Adjuster wheel | 1 |
| 102 | 210 586 | Washer 3.2/7/0.5 ST | 1 |
| 103 | 210 362 | Hexagon nut BM 3 | 5 |
| 104 | 228 112 | Adjusting wheel | 1 |
| 105 | 210 182 | Lock washer, thr. | 1 |
| 106 | 228 113 | Washer 4.2/8/1.0 ST | 1 |
| 107 | 210 146 | Lock washer 3.2 | 2 |
| 108 | 229 370 | Selector segment | 1 |
| 109 | 229 714 | Compression spring | 1 |
| 110 | 229 663 | Bracket complete | 1 |
| 111 | 210 472 | Fillister head cap screw AM 3 x 4 | 2 |
| 112 | 229 715 | Bearing spindle | 1 |
| 113 | 210 369 | Hexagon nut M 5 | 1 |
| 114 | 204 608 | Washer | 1 |
| 115 | 204 606 | Rubber washer | 1 |
| 116 | 204 607 | Spacing washer | 1 |
| 117 | 230 470 | Pad 50/60 Hz (1224) | 1 |
| 118 | 228 471 | Screen plate complete | 1 |
| 119 | 233 038 | Top bearing bracket complete | 1 |
| 120 | 233 023 | Rotor complete | 1 |
| 121 | 233 027 | Stator 110/220 V complete (2-pole-motor) | 1 |
| | 233 025 | Stator 150 V complete (2-pole motor) | 1 |
| 122 | 210 522 | Fillister head cap screw AM 4 x 18..... | 2 |
| 123 | 233 039 | Bottom bearing bracket complete | 1 |
| 124 | 228 472 | Centering screw | 2 |
| 125 | 233 021 | 2-pole motor AM 203 110/220 V complete | 1 |
| | 233 022 | 2-pole motor AM 203 150 V complete | 1 |
| 126 | 229 374 | Regulator wheel | 1 |
| 127 | 229 695 | Regulator plate | 1 |
| 128 | 210 600 | Washer 3.2/8/1 ST | 1 |
| 129 | 229 716 | Compression spring | 1 |
| 130 | 229 672 | Change lever | 1 |
| 131 | 229 372 | Adjustment washer | 1 |
| 132 | 229 748 | Screen plate | 1 |
| 133 | 232 987 | Muting switch complete | 1 |
| 134 | 211 614 | Soldering lug | 1 |
| 135 | 210 469 | Fillister head cap screw AM 3 x 3 | 2 |
| 136 | 210 366 | Hexagon nut BM 4 | 3 |
| 137 | 232 898 | Motor pulley 50 Hz complete (1225) | 1 |
| | 232 899 | Motor pulley 60 Hz complete (1225) | 1 |
| 138 | 230 559 | Set screw M 2.5 x 3.5 | 1 |
| 139 | 232 896 | Motor pulley 50 Hz complete (1224) | 1 |
| | 232 897 | Motor pulley 60 Hz complete (1224) | 1 |
| 140 | 230 559 | Set screw M 2.5 x 3.5 | 1 |
| 141 | 210 472 | Fillister head cap screw M 3 x 4 | 1 |
| 142 | 210 615 | Washer 3.2/20/1.5 | 1 |
| 143 | 228 932 | Screen plate .. | 1 |
| 144 | 233 038 | Top bearing bracket complete | 1 |
| 145 | 209 939 | Cable grommet | 1 |
| 146 | 233 020 | Stator 110/220 V complete (4-pole-motor) | 1 |
| | 233 018 | Stator 150 V complete (4-pole motor) | 1 |
| 147 | 233 016 | Rotor complete | 1 |
| 148 | 233 039 | Bottom bearing bracket complete | 1 |
| 149 | 228 472 | Centering screw | 1 |
| 150 | 233 014 | 4-pole motor AM 400 110 - 220 V kpl. | 1 |
| | 233 015 | 4-pole motor AM 400 150 V kpl. | 1 |
| 151 | 210 146 | Lock washer 3.2 | 2 |
| 152 | 217 888 | Idler wheel complete | 1 |
| 153 | 200 633 | Lock washer | 1 |
| 154 | 229 719 | Slip plate | 1 |
| 155 | 229 747 | Swinging arm complete | 1 |
| 156 | 232 997 | Fitting plate complete | 1 |
| 157 | 229 660 | Control rod | 1 |
| 158 | 223 625 | Lock washer 3 | 1 |
| 159 | 233 012 | Switch plate complete | 1 |
| | 233 013 | Switch plate UL with special capacitor complete | 1 |
| 160 | 209 505 | Capacitor 10 nF/1000 V/10 % | 1 |
| | 230 355 | Capacitor 68 nF/ 250 V/20 % | 1 |
| 161 | 230 148 | Switch slide | 1 |
| 162 | 230 151 | Slide | 1 |
| 163 | 230 296 | Tension spring | 1 |
| 164 | 219 200 | Snap spring | 1 |
| 165 | 233 010 | Power switch cover complete | 1 |
| | 233 011 | Cover UL complete (for KS 4 with connection plate) | 1 |
| 166 | 210 498 | Fillister head cap screw M 3 x 28 | 1 |

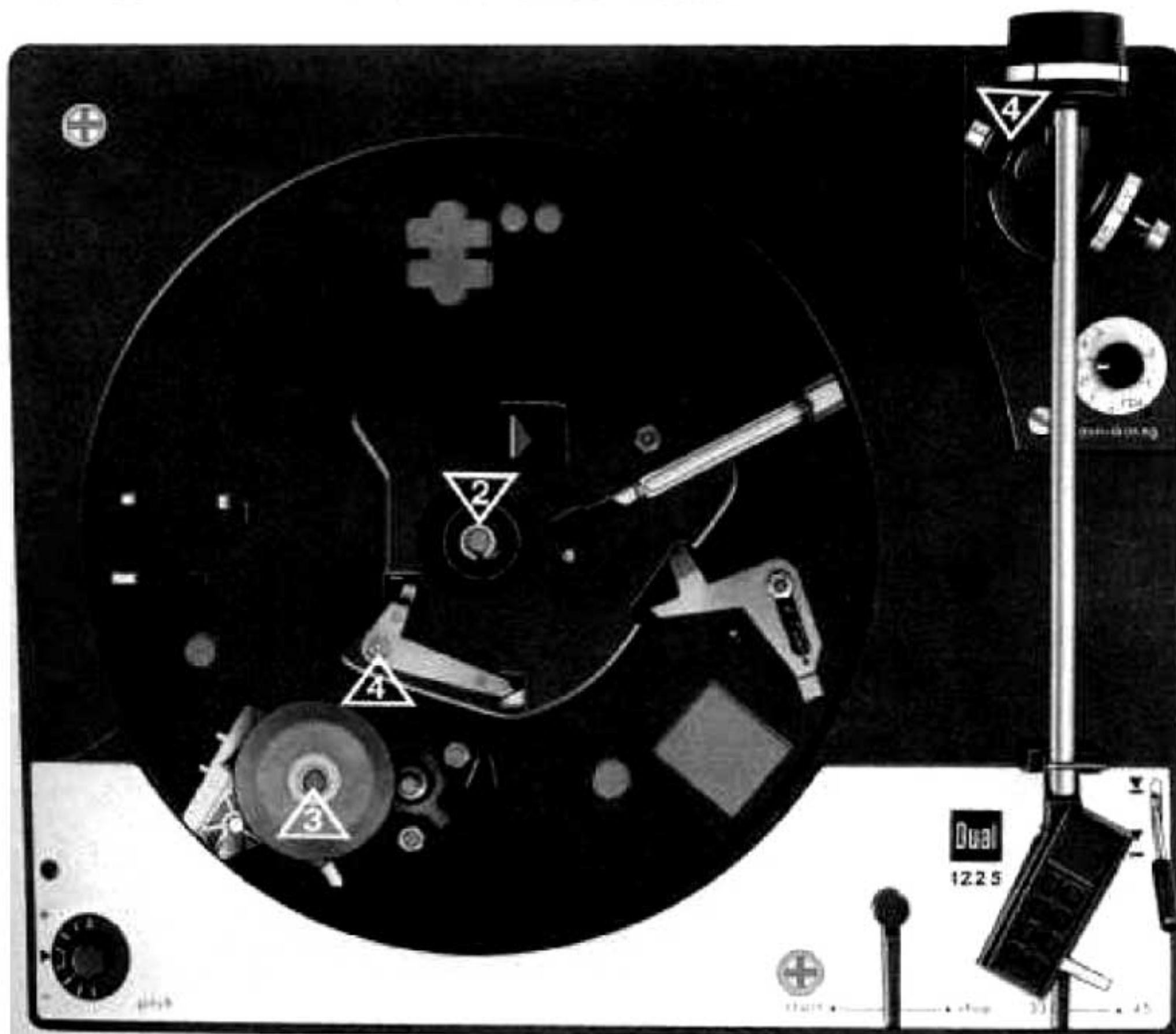
| Pos. | Part. No. | Description | Quantity |
|------|-----------|--|----------|
| 167 | 233 009 | Power switch complete | 1 |
| | 233 008 | Power switch UL with special capacitor complete | 1 |
| 168 | 233 007 | Connection plate complete | 1 |
| 169 | 233 006 | Connection plate cover complete | 1 |
| 170 | 210 501 | Fillister head cap screw M 3 x 35 | 1 |
| 171 | 233 005 | Connection plate complete with cover | 1 |
| 172 | 216 155 | Hexagon screw M 4 x 6 | 2 |
| 173 | 229 753 | Change actuator stud complete | 1 |
| 174 | 213 920 | Compression spring | 1 |
| 175 | 213 921 | Bush | 1 |
| 176 | 210 145 | Lock washer 2.3 | 7 |
| 177 | 229 700 | Switch slide | 1 |
| 178 | 210 145 | Lock washer 2.3 | 7 |
| 179 | 210 145 | Lock washer 2.3 | 7 |
| 180 | 229 674 | Shift arm | 1 |
| 181 | 229 698 | Tension spring | 1 |
| 182 | 210 586 | Washer 3.2/7/0.5 ST | 7 |
| 183 | 229 690 | Start lever complete | 1 |
| 184 | 231 017 | Tension spring | 1 |
| 185 | 210 145 | Lock washer 2.3 | 7 |
| 186 | 210 641 | Washer 4.2/10/1 ST | 2 |
| 187 | 210 361 | Hexagon nut M 3 | 3 |
| 188 | 200 687 | Retainer spring | 1 |
| 189 | 210 144 | Lock washer 1.9 | 2 |
| 190 | 229 635 | Shut-off lever | 1 |
| 191 | 229 756 | Friction plate | 1 |
| 192 | 210 145 | Lock washer 2.3 | 7 |
| 193 | 232 988 | Main cam complete | 1 |
| 194 | 200 650 | Rubber bush | 1 |
| 195 | 229 755 | Cam follower lever | 1 |
| 196 | 200 522 | Snap spring | 1 |
| 197 | 229 754 | Ball bearing | 1 |
| 198 | 210 366 | Hexagon nut BM 4 | 1 |
| 199 | 232 990 | Bearing bridge complete | 1 |
| 200 | 227 045 | Tension spring | 1 |
| 201 | 219 049 | Square section | 1 |
| 202 | 229 758 | Paul complete | 1 |
| 203 | 229 704 | Washer 3.2/13/0.5 ST | 1 |
| 204 | 210 145 | Lock washer 2.3 | 7 |
| 205 | 227 060 | Bolt | 1 |
| 206 | 229 650 | Shoulder nut | 1 |
| 207 | 229 686 | Tension spring | 1 |
| 208 | 229 634 | Start lever | 1 |
| 209 | 229 757 | Change lever complete | 1 |
| 210 | 229 654 | Grooved pin | 1 |
| 211 | 210 147 | Lock washer 4 | 1 |
| 212 | 229 629 | Positioning slide | 1 |
| 213 | 229 649 | Leaf spring | 1 |
| 214 | 229 759 | Adjuster lever | 1 |
| 215 | 210 641 | Washer 4.1/10/1 ST | 2 |
| 216 | 210 361 | Hexagon nut M 3 | 3 |
| 217 | 210 145 | Lock washer 2.3 | 7 |
| 218 | 200 528 | Spindle | 1 |
| 219 | 229 648 | Bearing support | 1 |
| 220 | 229 642 | Leaf spring | 1 |
| 221 | 200 458 | Spacer bush | 1 |
| 222 | 210 480 | Fillister head cap screw AM 3 x 6 | 1 |
| 223 | 232 993 | Main lever complete | 1 |
| 224 | 209 358 | Ball 4.0 | 1 |
| 225 | 229 633 | Shut-off slide | 1 |
| 226 | 201 187 | Skating disc | 1 |
| 227 | 210 145 | Lock washer 2.3 | 7 |
| 228 | 231 079 | Cable clips complete | 1 |
| 229 | 209 436 | Flat connector | 4 |
| 230 | 214 602 | AMP connector | 4 |
| 231 | 209 425 | Cynch plug, white | 2 |
| 232 | 209 426 | Cynch plug, black | 2 |
| 233 | 229 761 | Bearing bracket | 1 |
| 234 | 232 373 | Fillister head cap screw AM 3 x 3 | 1 |
| 235 | 229 679 | Lift cam | 1 |
| 236 | 229 680 | Brake section | 1 |
| 237 | 216 867 | Bowed lockwasher | 1 |
| 238 | 220 899 | Curve washer | 1 |
| 239 | 210 361 | Hex nut BM 3 | 3 |
| 240 | 229 688 | Torsion spring | 1 |
| 241 | 229 796 | Skating lever compl. with adjusting screw and torsion spring | 1 |

| Pos. | Part.-No. | Description | Quantity |
|------|-----------|---|----------|
| 242 | 210 146 | Bowed lockwasher 3.2 | 2 |
| 243 | 221 260 | Adjusting screw | 1 |
| 244 | 210 362 | Hex nut M 3 | 5 |
| 245 | 233 002 | Segment compl. | 2 |
| 246 | 229 772 | Threaded pin | 1 |
| 247 | 223 777 | Guide | 1 |
| 248 | 216 853 | Compression spring | 1 |
| 249 | 229 769 | Lifting bolt | 1 |
| 250 | 223 146 | Securing spring | 1 |
| 251 | 229 362 | Guide bearing | 1 |
| 252 | 210 145 | Bowed lockwasher 2.3 | 7 |
| 253 | 210 145 | Bowed lockwasher 2.3 | 7 |
| 255 | 201 184 | Adjusting washer | 1 |
| 256 | 218 591 | Tension spring | 1 |
| 257 | 210 362 | Hex nut BM 3 | 5 |
| 258 | 210 155 | Toothed washer A 3.2 | 2 |
| 259 | 233 089 | Shield compl. with insulating plate | 1 |
| 260 | 227 254 | RCA-type socket plate | 1 |
| 261 | 210 480 | Machine screw AM 3 x 6 | 2 |
| 262 | 232 995 | Power cable America compl. | 1 |
| 263 | 209 424 | Miniature plug for audio cable | 1 |
| 264 | 207 303 | Audio cable compl. with miniature plug and socket for plat prong | 1 |
| 265 | 232 996 | Power cable Europa compl. | 1 |
| 266 | 226 817 | Audio cable compl. with RCA-type plugs | 1 |
| ** | 214 120 | Hardware for cartridge mounting | 1 |
| ** | 230 747 | Shipping carton compl. | 1 |
| ** | 229 987 | Mounting instructions | |
| ** | 211 473 | Stroboscope washer 50/60 Hz | |
| ** | 230 582 | Operating instructions 1224, 4 languages | |
| ** | 230 637 | Operating instructions 1225, 4 languages | |
| ** | 231 307 | Operating instructions 1225 UAP | |
| ** | 228 114 | Adjusting lever | 1 |

** Not illustrated

Alterations reserved

Fig. 26 Lubrication points above chassis



Lubrication

All bearings and friction surfaces have been adequately lubricated at the works. Replenishment of oil and grease is only necessary after about 2 years with normal use as the most important bearing points (motor bearings) are fitted with sintered metal bushes.

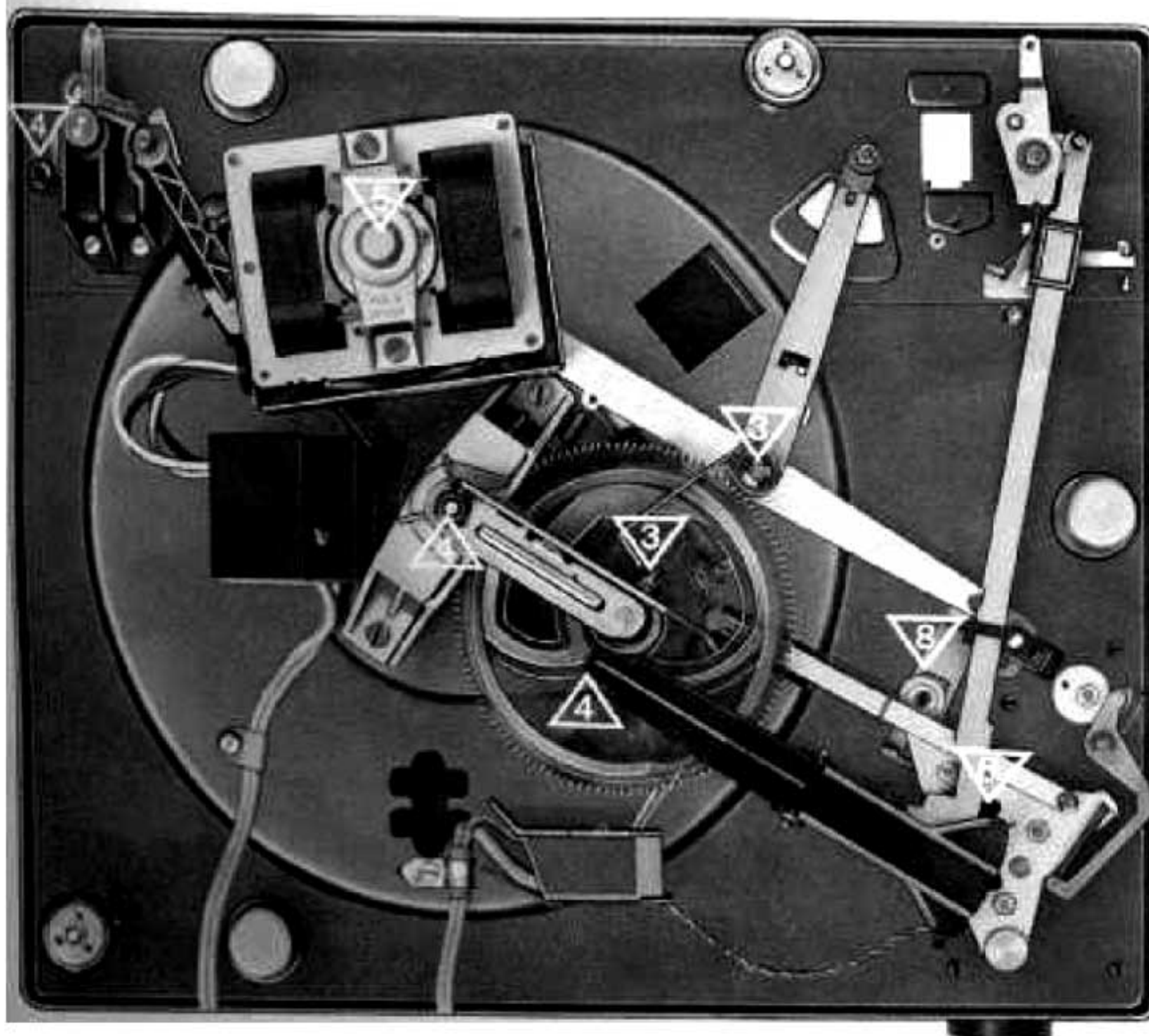
Lubricants should be applied sparingly to bearing points and friction surfaces. It is important that no oil or grease should come in contact with the friction faces of the idler wheel, motor pulley and platter as otherwise slip will occur. Avoid touching these parts for the same reason.

When lubricants of different types are mixed, chemical decomposition frequently occurs.

To avoid complications with lubricants we recommend using the original lubricants listed below.

The following lubricants should be used:

Fig. 27 Lubrication points below chassis



- ② Renotac No. 342 adhesive oil
- ③ 8P Super Viscostatic 10 W/30
- ④ Shell Alvania No. 2
- ⑤ Isoflex PDF 40
- ⑥ Silicone oil AK 500 000
- ⑧ Molykote



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