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Dual 1219

Professional Automatic Turntable



Dual

Owner's Manual

Introduction

If you are typical of most new owners, you probably want to connect your Dual with the least possible delay, and then hear it play. We understand.

But any new turntable or changer needs to be unpacked and installed on its base. Then the cartridge must be mounted, the tonearm balanced, and the entire unit connected to the rest of the system.

On pages 12 and 13 you will find instructions and illustrations for these steps which we hope you will find easy to follow. If you open this flap, as you do so, you will find a photograph of the 1219 with each feature identified.

Beginning on page 6 you will find detailed descriptions of the various engineering and operating features of the 1219.

We have included these descriptions because we have learned from previous Dual owners that they like to learn even more about their Dual after they've bought it than they did before.

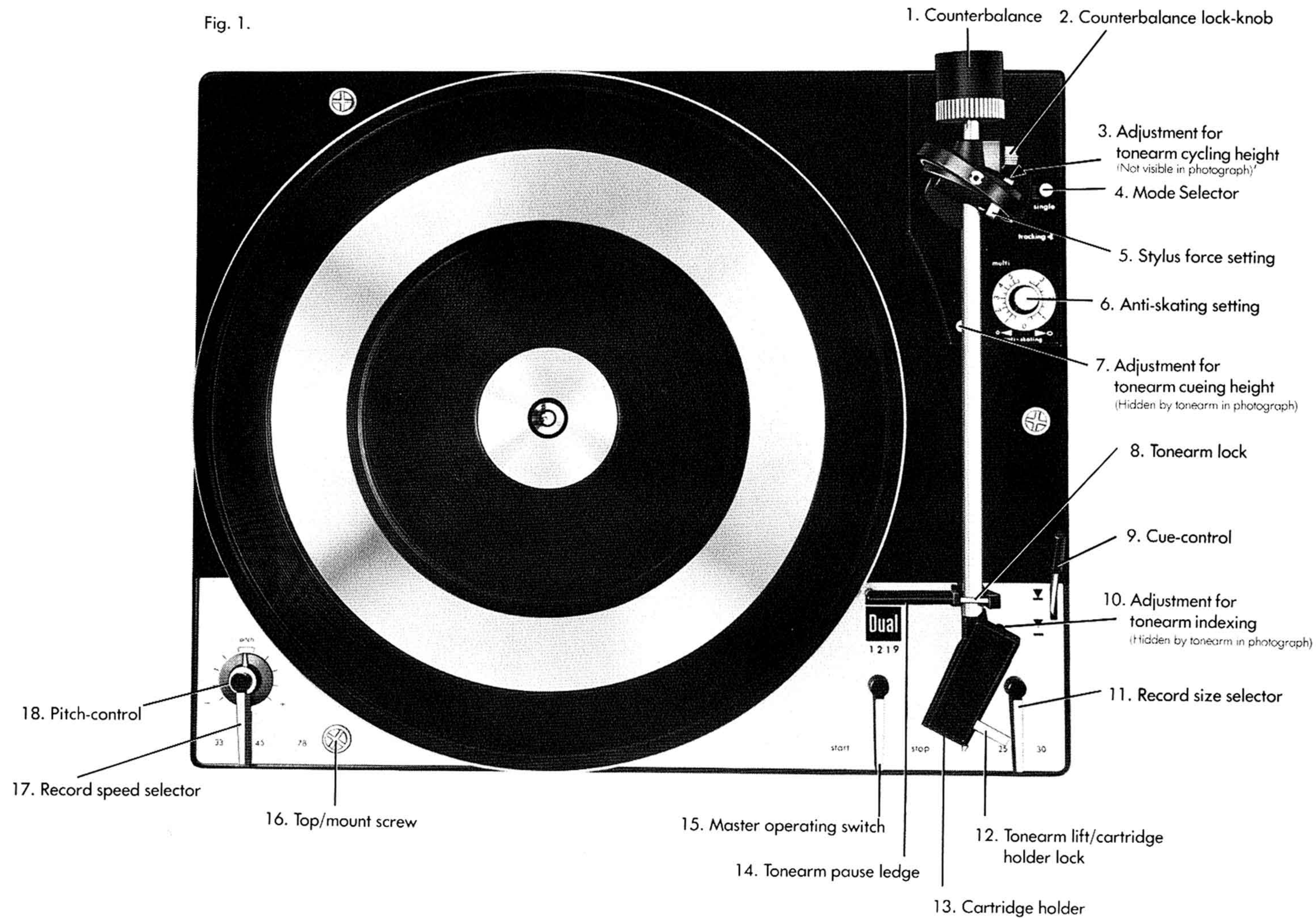
Good listening.

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Open flap for features.

Fig. 1.



Features of the 1219

1. Counterbalance

Rotates on fine threads for fine balance.

2. Counterbalance lock-knob

Locks counterbalance shaft on tonearm after coarse balance.

3. Adjustment for tonearm cycling height

4. Mode Selector

Lowers tonearm base for single-play mode; lifts tonearm base for multiple-play mode.

5. Stylus force setting

Direct-reading numerical scale from 0 to 5.5 grams.

6. Anti-skating setting

Separate numerical scales for conical and elliptical styli.

7. Adjustment for tonearm cueing height

Allows stylus-to-record distance to be varied up to $\frac{1}{4}$ ".

8. Tonearm lock

Secures tonearm to rest post.

9. Cue-control

Lowers and raises tonearm anywhere on record. Silicone-damped in both directions.

10. Adjustment for tonearm indexing

11. Record size selector

For 7", 10" and 12" records

12. Tonearm lift/cartridge holder lock

Short turn to rear releases cartridge holder.

13. Cartridge holder

14. Tonearm pause ledge

For convenience in flipping records. Platter continues to rotate.

15. Master operating switch

For automatic start and stop in both single-play and multiple-play modes.

16. Top/mount screw

Allows mounting and securing of chassis to base or mounting board from above. (One of three)

17. Record speed selector

For $33\frac{1}{3}$, 45 and 78 rpm

18. Pitch-control

Allows each speed to be varied over 6% range (semitone).

Operating instructions

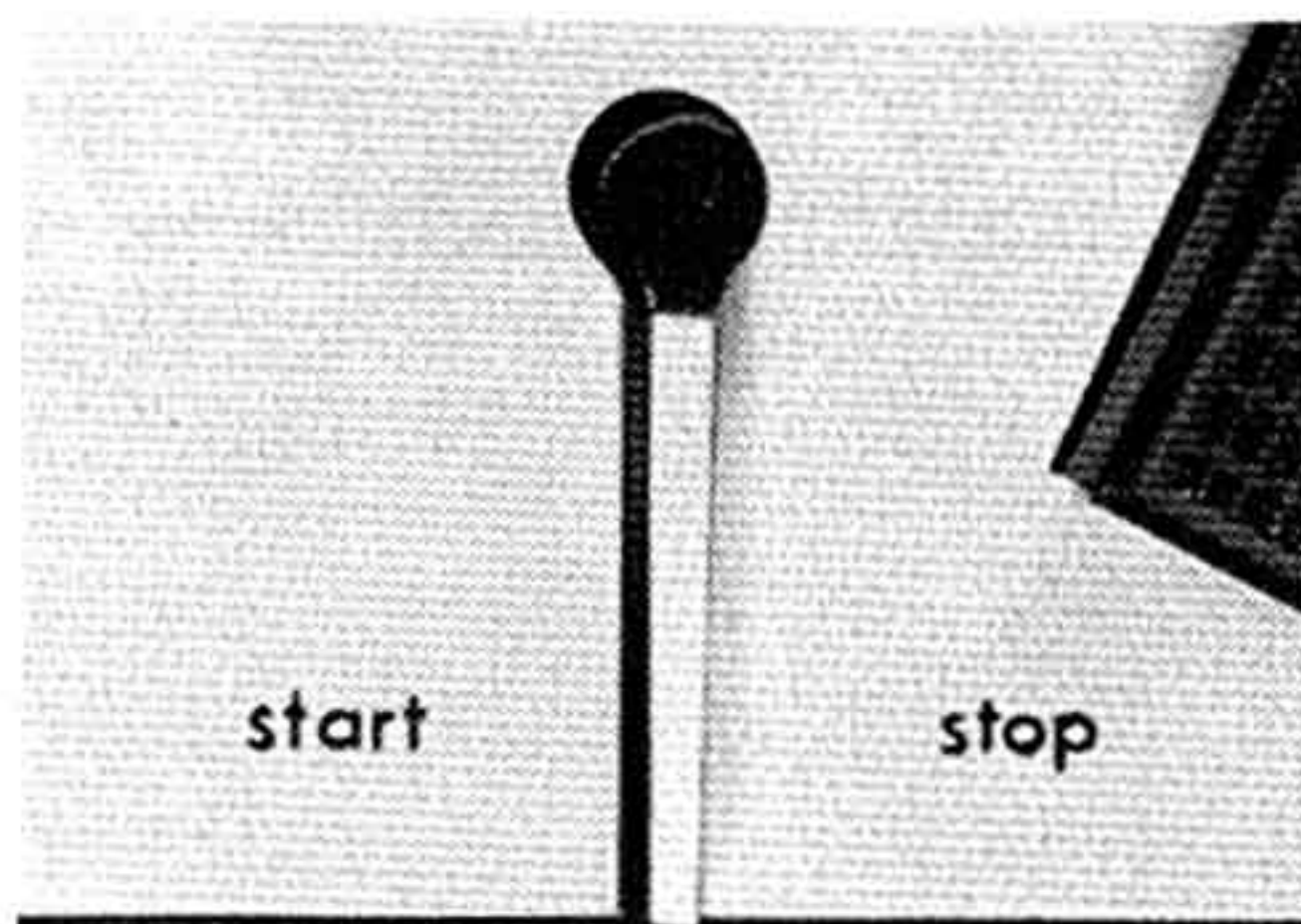


Fig. 2. Master operating switch for all start and stop functions in either single-play or multiple-play mode.

Foolproof design

Despite its versatility and precision, the Dual 1219 is quite easy to operate in either its single-play or multiple-play mode. It is also quite difficult to damage.

If you happen to move the operating switch to "start" when the tonearm is locked on the resting post, just wait till the switch returns to "neutral," unlock the tonearm and start again.

If the speed is set at 45 rpm when you have a 33 rpm record on the platter, just change the speed accordingly, even if the tonearm is already cycling. You can also do the same with the record size indicator.

As for the variety of ways the Dual 1219 can be operated, they take longer to describe than to perform, so don't let the number of words that follow disturb you.



Fig. 3. Single-play spindle fits snugly into platter, rotates with record.

Single-play mode

Set the Mode Selector for single play and insert the short spindle. Set the motor speed and record index switch for the record to be played.

Automatic start: Move the operating switch to "start." (The motor will start, the tonearm will rise, move over to the record and descend to play.)

Manual start: Lift the tonearm off its resting post and place it anywhere on the record. (The movement of the tonearm toward the record will start the platter rotating.)

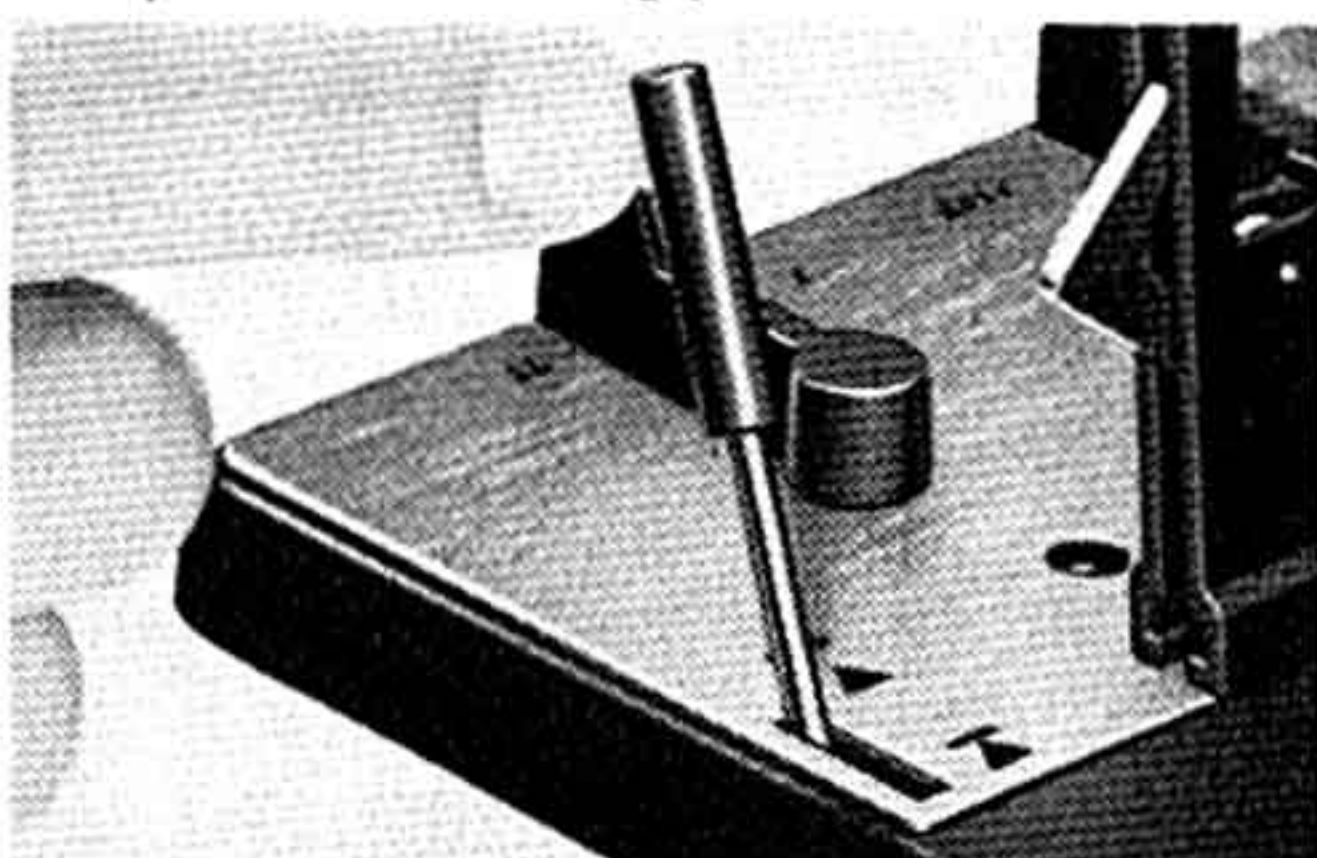


Fig. 4. Cue-control in "up" position allows tonearm to be placed anywhere over the record, or to be lifted from record without shutting motor off. A light touch of the lever shifts it to the "down" position, letting tonearm float down to the record.

Cue-control

Cue-control start: Move the cue-control lever to the forward position, then place the tonearm wherever you like over the record. Move the cue-control lever to the rear position (a light touch will do) and the tonearm will float down to the record.

To interrupt play when you intend to resume at the same place: Move the cue-control forward. This will lift the tonearm from the record without shutting the motor off.

The ledge extending inward from the resting post is for your convenience when flipping a record over. You can place the tonearm on the ledge out of the way of the record, without activating the automatic cycle.



Fig. 5. Multiple-play spindle holds up to six records.

Multiple-play mode

Set the Mode Selector for multiple play. Insert the multiple play spindle by placing the key at its base into the slot of the shaft. Then turn the spindle clockwise until it stops. The spindle can handle up to six records of the same size and speed.

All the functions as described above for single play are exactly the same in multiple play, plus these additions:

To reject a record during play and change to the next record on the spindle: turn switch to "start."

To replay any record on the platter: With no other record on the spindle platform above, just start normally, as in single play.

With another record on the platter, you can start automatically by lifting the record you wish to replay up to the platform. Or you can leave it on the platter and start it manually.

To replay a record indefinitely: Place the 45 rpm disc (supplied with your Dual) on the spindle platform after the record is on the platter. You may find it necessary to add the weight of 2 or 3 records on top of the disc.

Stopping play, either mode

To stop play: either turn the switch to "stop" or lift the tonearm from the record, either by hand or with the cue-control, and place it on the resting post. The motor will then shut off. At the end of play, the tonearm will return to its resting post automatically and the motor will shut off. No matter what the mode of play, or how you started, you can stop at any time by any of the above means. (Don't be concerned about the continuing rotation of the platter. Its near-frictionless bearings let it go on and on.)

Design features of the 1219 tonearm

Mode Selector for single play and multiple play

The Mode Selector makes the 1219 the first automatic turntable to provide zero vertical tracking error in single play, previously possible only with manual turntables. To appreciate why this is so, you have to understand a bit about the "vertical tracking angle."

This is the angle between a line perpendicular to the record surface and the line described by the vertical motion of the stylus. It has been standardized at 15° (Fig. 7.) This is the angle at which records are cut, and thus the angle at which records should be played.

All automatic units except the 1219 have been designed to provide the correct tracking angle of the stylus on the third or fourth record on the platter. This necessarily compromises performance in single play.

The Mode Selector feature of the 1219 eliminates this compromise. It does so by moving the base of the tonearm vertically so that in single play, the entire tonearm is at the correct angle over the record. (Fig. 8.)

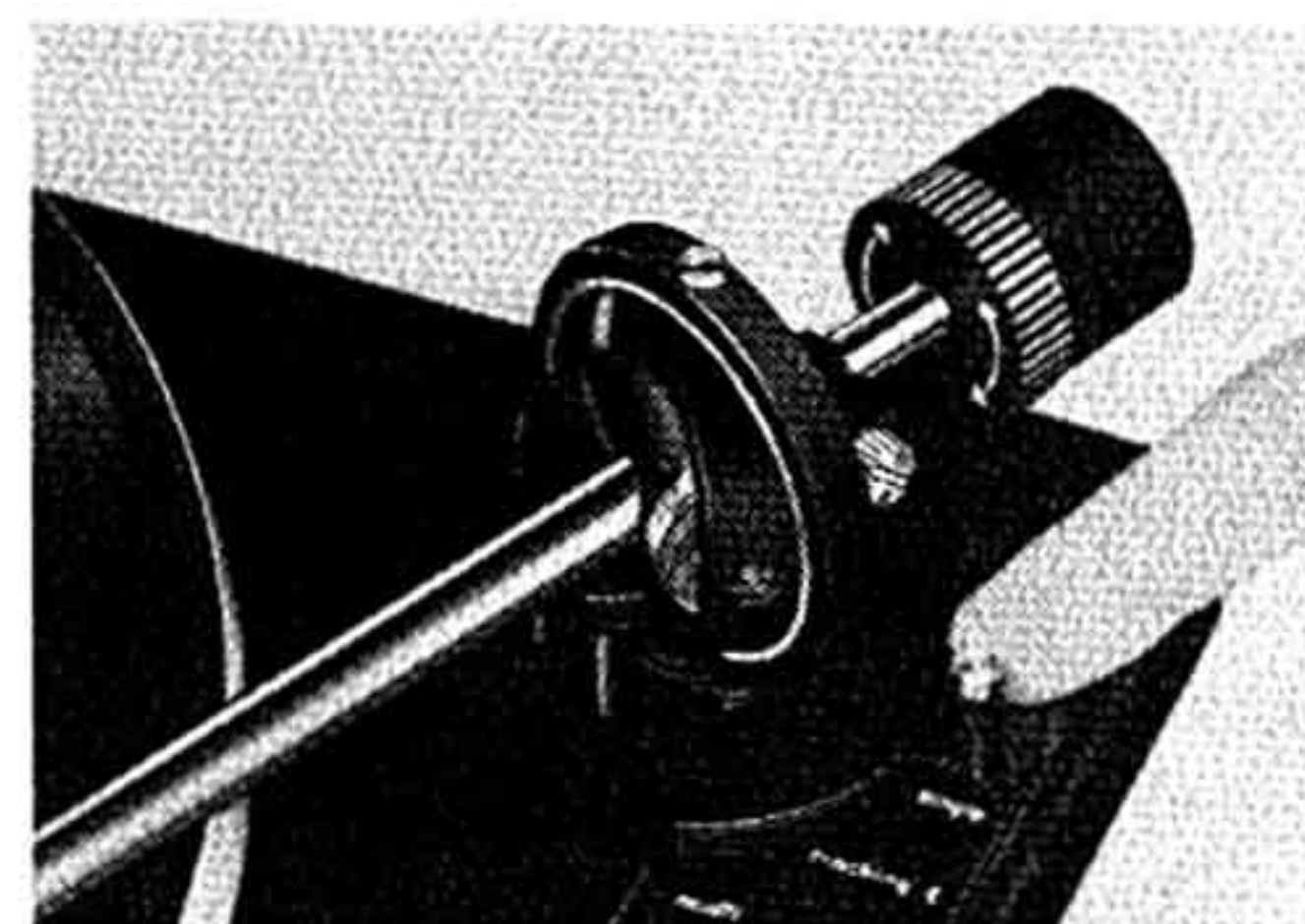


Fig. 6. Mode Selector in "single" position for single-play mode. Moving Mode Selector to "multi" position raises tonearm base for multiple-play mode.

When set for multiple play, the tonearm base moves up to provide zero vertical tracking error at the center of a six record stack. (Fig. 9.)

The maximum vertical tracking error in multiple play is still only one and a half degrees. (This occurs on either the first or sixth record on the platter, and is well within the plus-or-minus five degree tolerance allowed cartridge manufacturers by industry standards.)

Note: Be sure to match the setting of the Mode Selector to the spindle in the platter, or the machine will not function normally.

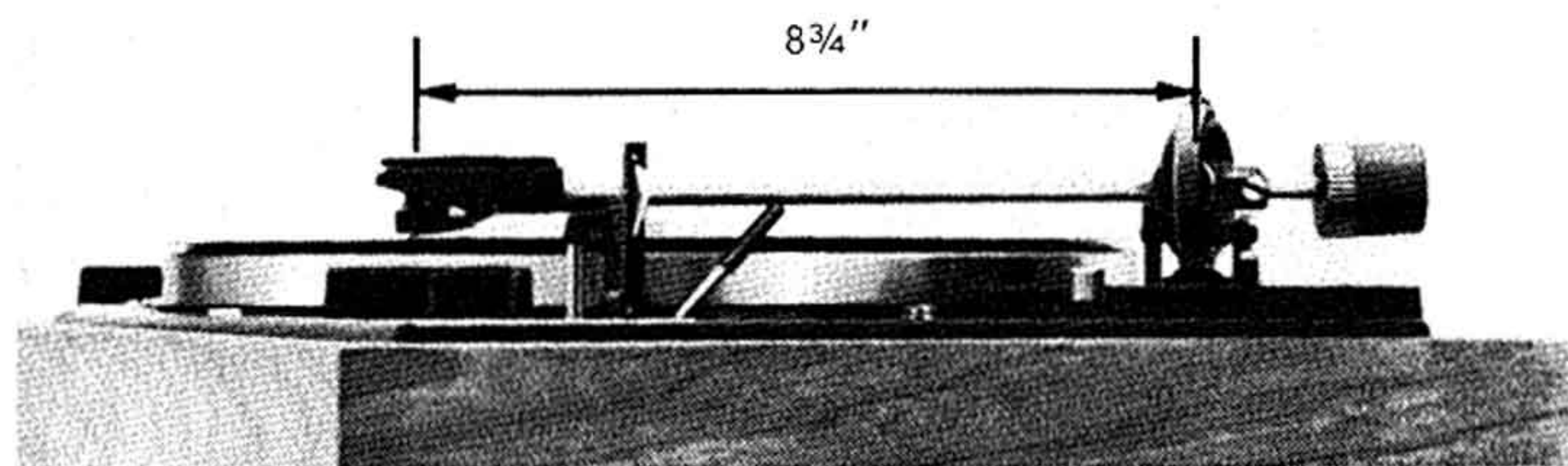


Fig. 8. Tonearm set at correct angle for single-play mode as set by Mode Selector. Also note the $8\frac{3}{4}"$ effective length of the tonearm. The advantages of this length are explained on page 7.

For example, if the Mode Selector is set for "single" when the multiple-play spindle is in the platter, the motor will start, but no record will drop, and the tonearm will not leave the resting post. (If this happens, simply wait for the end of the cycle—about 13 seconds—shift the Mode Selector to "multi" and start again.)

On the other hand, if the Mode Selector is set for "multi" when the single-play spindle is in the platter, the machine will start automatically, but the stylus will not be tracking at the optimum angle. (In this case, wait for a convenient moment to interrupt the record, then shift the Mode Selector to "single" and resume play.)

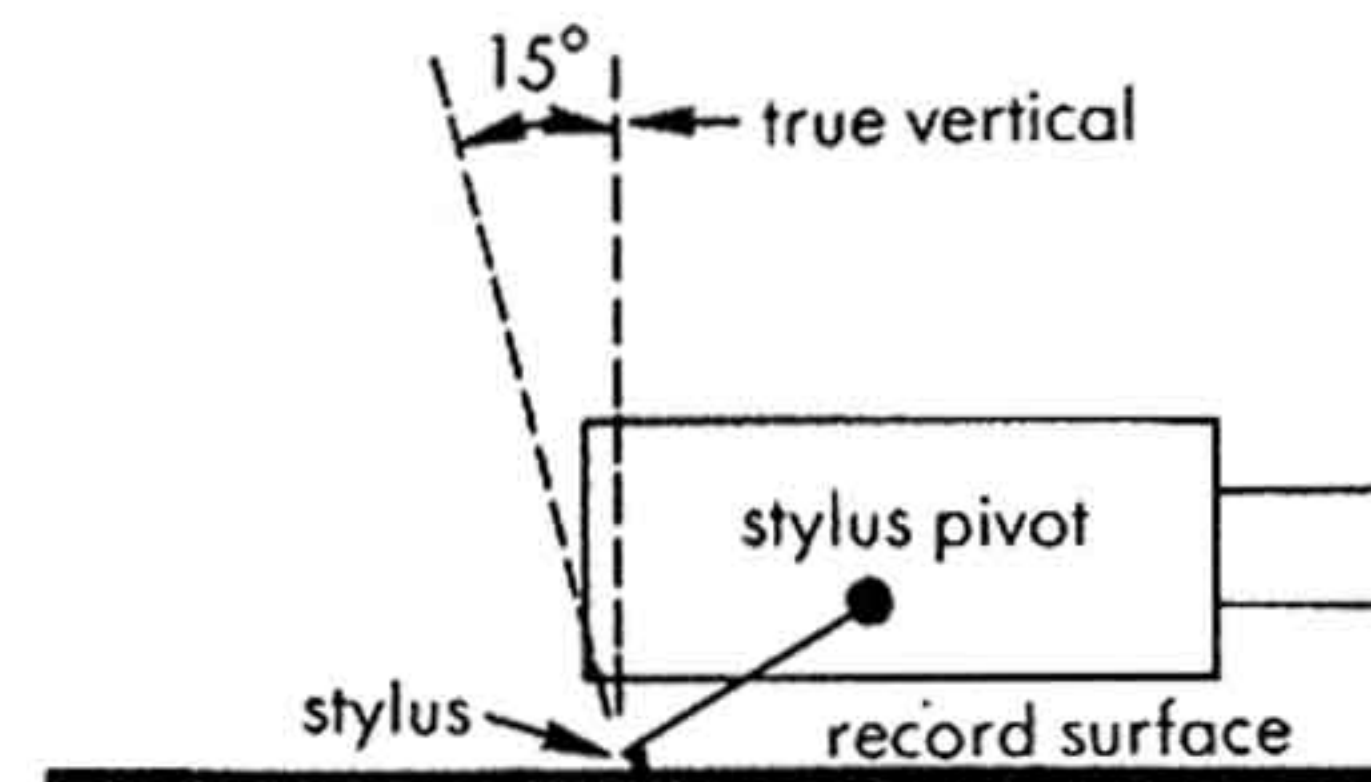


Fig. 7. 15° vertical tracking angle of stylus is standardized at 15° forward of true vertical.

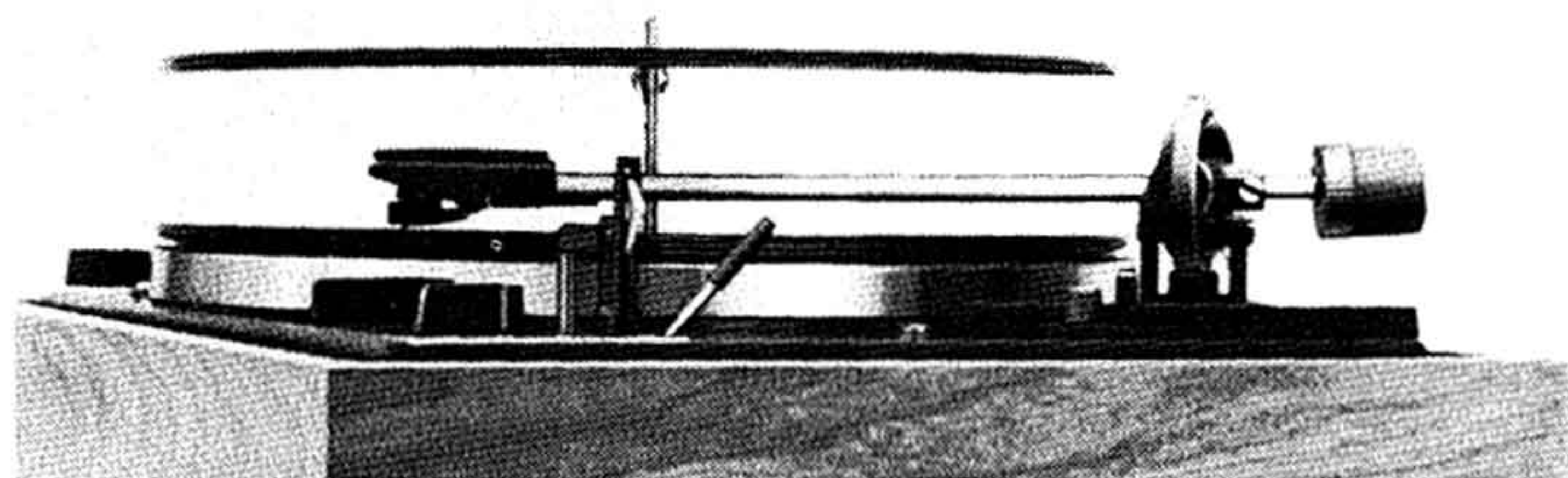


Fig. 9. Tonearm set by Mode Selector at correct angle for multiple-play mode. Zero vertical tracking error is provided at mid-point of six-record stack.

Four-point gyroscopic gimbal suspension

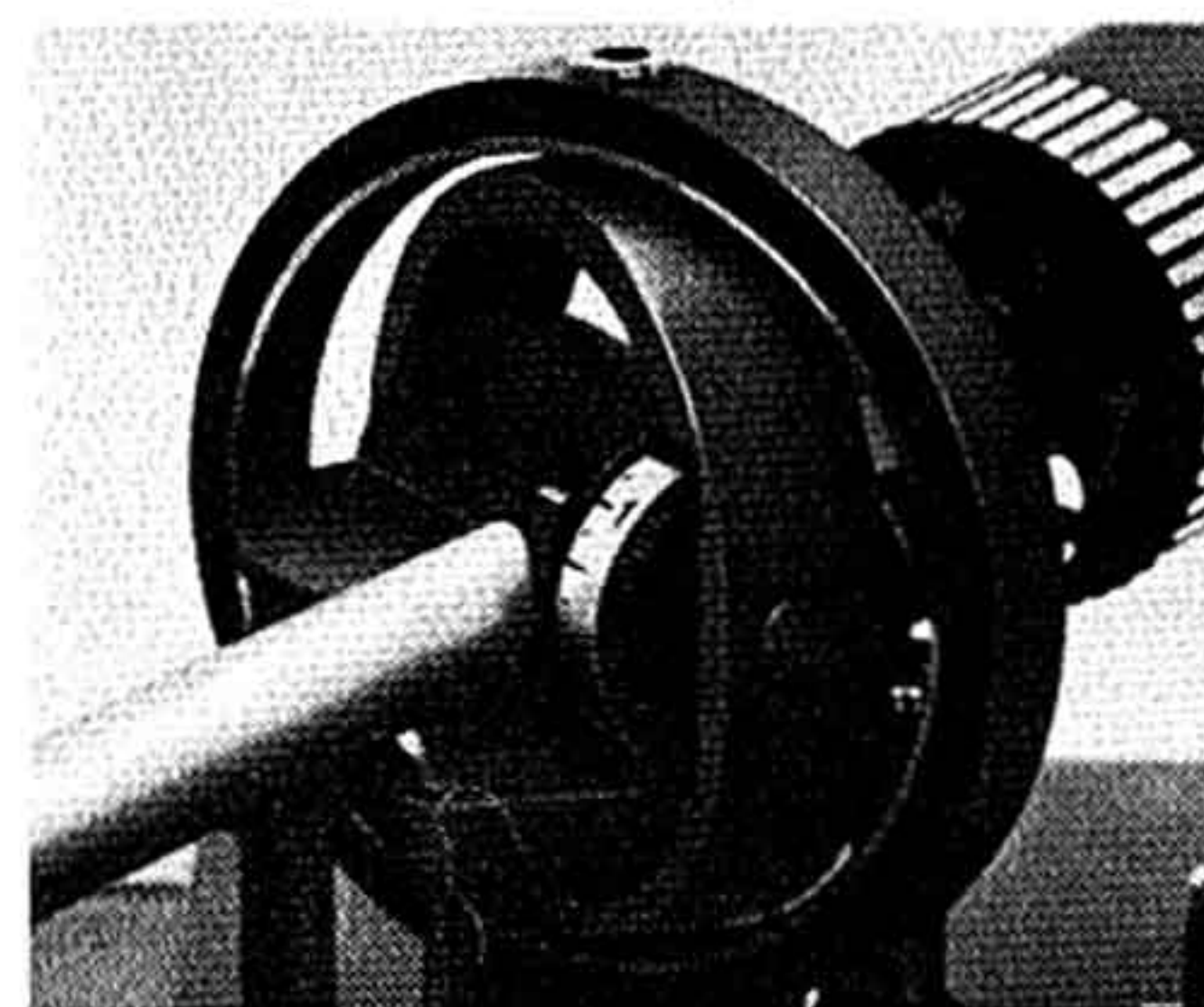


Fig. 10. Four-point gimbal suspension of the 1219 tonearm. Note that the tonearm pivots vertically from inner ring and pivots horizontally together with the inner ring from the outer ring. All four pivot bearings are identical.

This is another distinctive "first" for an automatic tonearm. The 1219's tonearm is suspended from an inner concentric ring that itself is suspended within an outer concentric ring. The tonearm pivots vertically from the inner ring. The tonearm and the inner ring together pivot horizontally from the outer ring, which remains stationary.

This ring-within-ring suspension is simply the definition of a gimbal, the suspension used for precision gyroscopes and other scientific instruments that require equal freedom of motion in all planes. The tonearm of the 1219 is centered and dynamically balanced within four suspension points, each designed with identical low-friction pivot bearings.

These bearings have such low friction that conventional instruments have difficulty in measuring them with any degree of accuracy. Measuring devices designed by Dual, and meticulous quality control checks, assure that the vertical bearing friction in every 1219 will be no more than 0.007 gram, and that horizontal bearing friction will be no more than 0.015 gram.

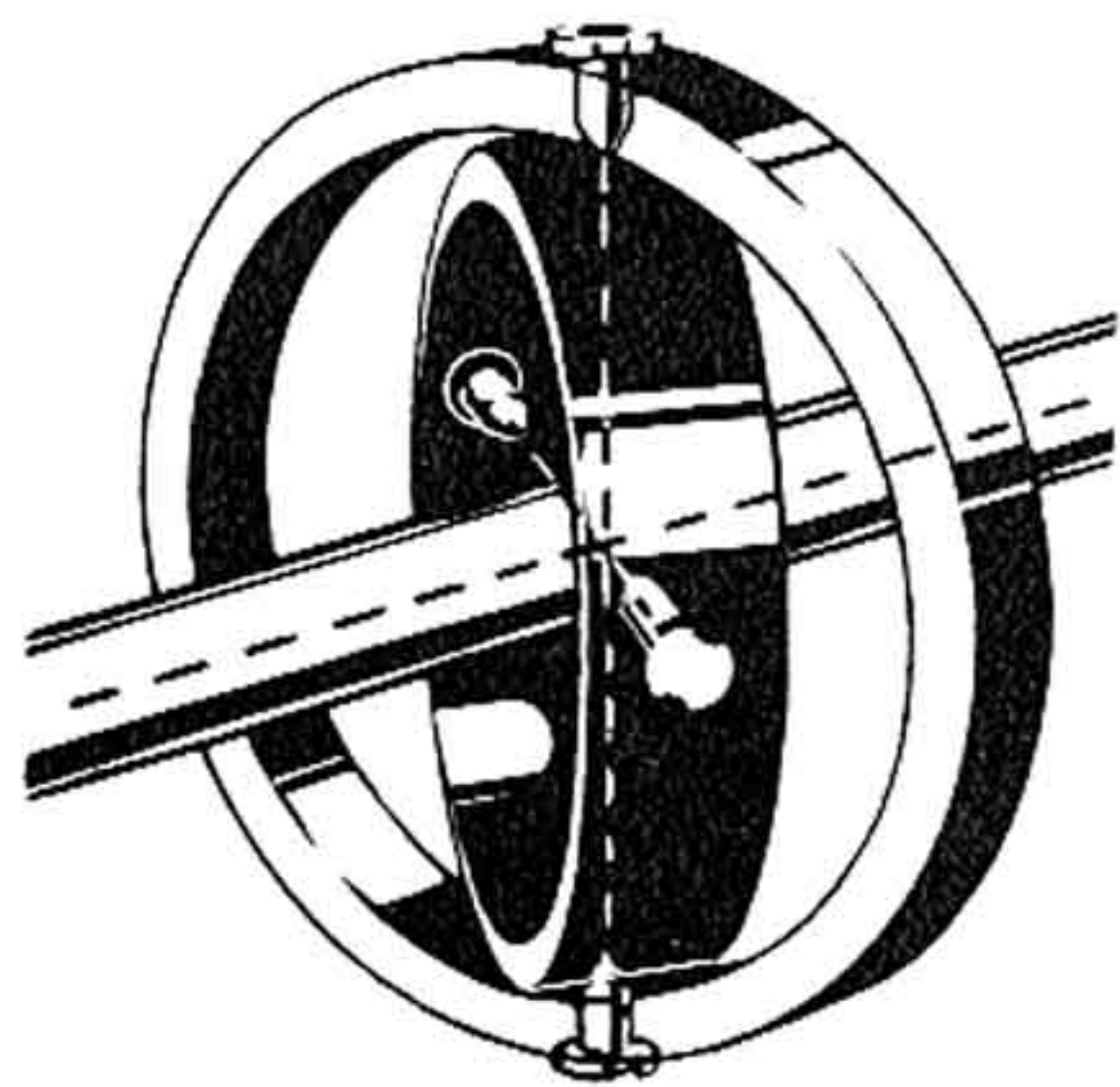


Fig. 11. Pivot bearings of the 1219.

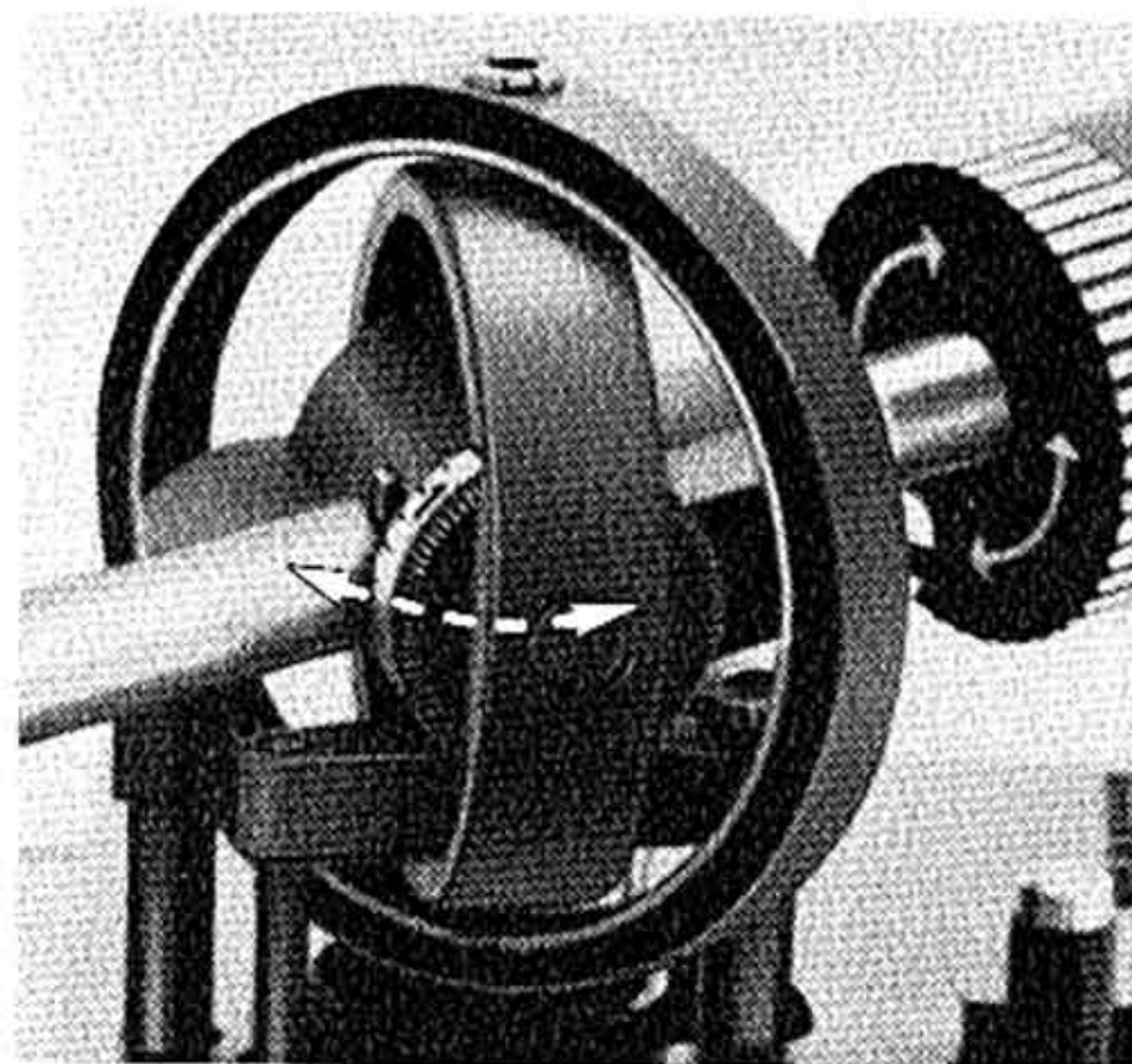


Fig. 12. Tonearm pivots horizontally within outer concentric ring of gimbal.

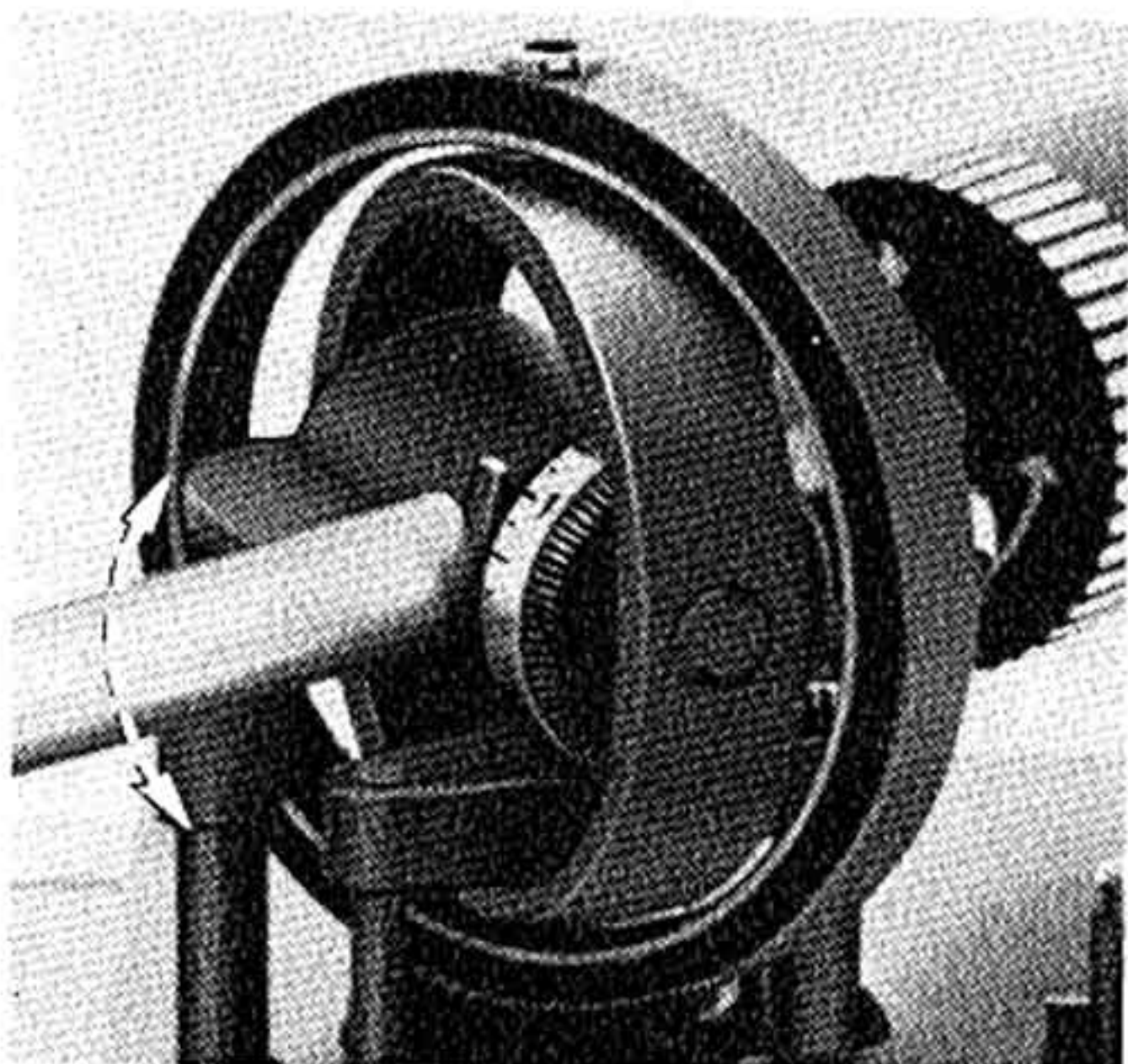


Fig. 13. Tonearm pivots vertically from inner concentric ring of gimbal.

8 $\frac{3}{4}$ " effective length, pivot to stylus

The effective length of the 1219 tonearm is 8 $\frac{3}{4}$ " from the pivot to the stylus tip. (Fig. 8.) This is longer than any other automatic tonearm. Effective length and the geometry of tracking determine horizontal tracking error.

This error, which exists to some extent in all tonearms with angled heads, is the difference between a tangent and the angle described by the stylus as it swings across the record in play. (Fig. 14.) The horizontal tracking error of the 1219 tonearm is no more than one and a half degrees, lowest of all automatic tonearms.

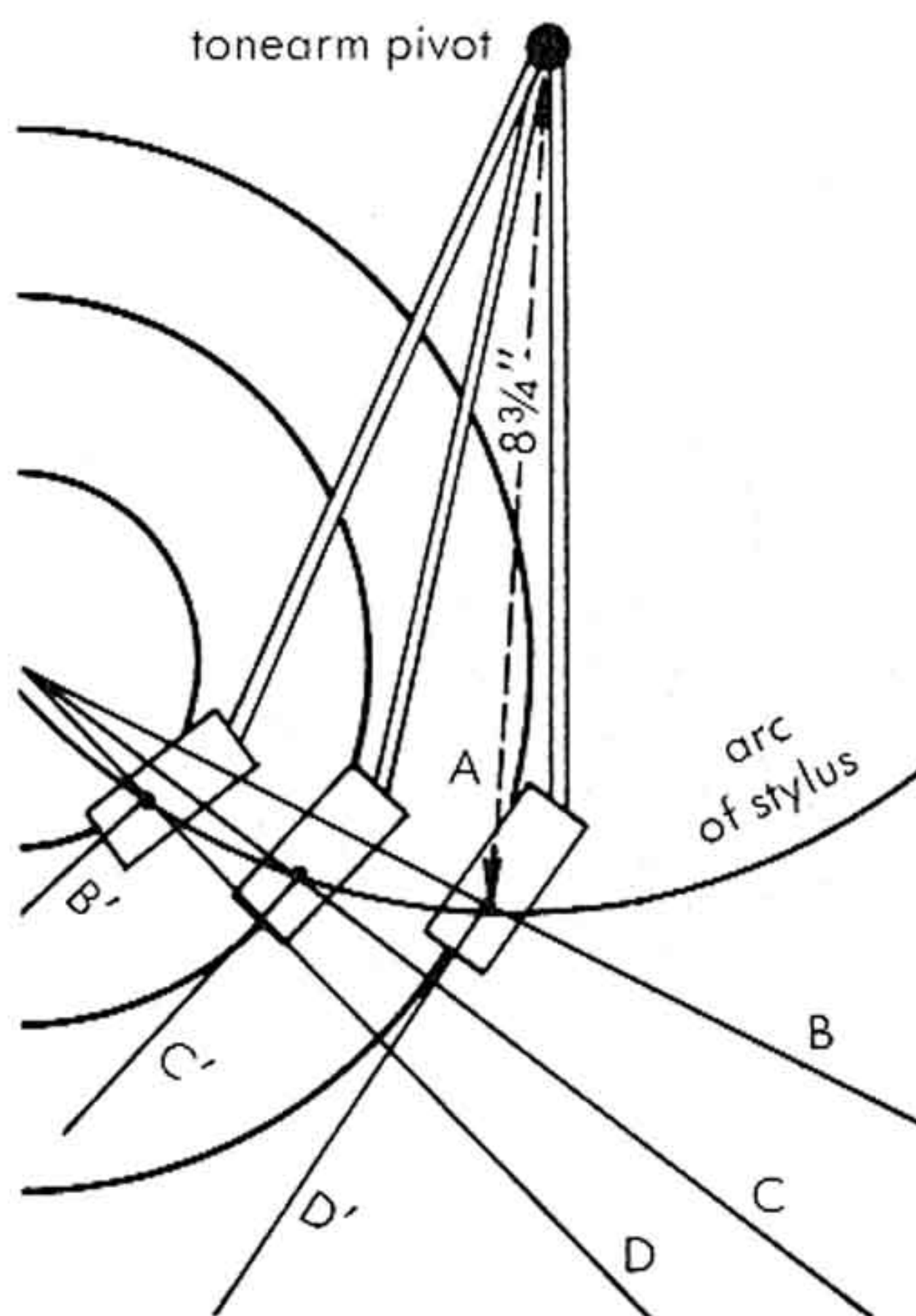


Fig. 14. Relationship of stylus and tangents as the stylus describes an arc across the record. A is effective tonearm length as measured from pivot to stylus. B, C and D are the radii at three different points on the record. B', C' and D' are the tangents of the groove at those same points. Horizontal tracking error at any point on the record is the difference between the stylus angle and the tangent. Tracking error of the 1219 tonearm is never more than 0.3° per inch.

Quick-release cartridge holder

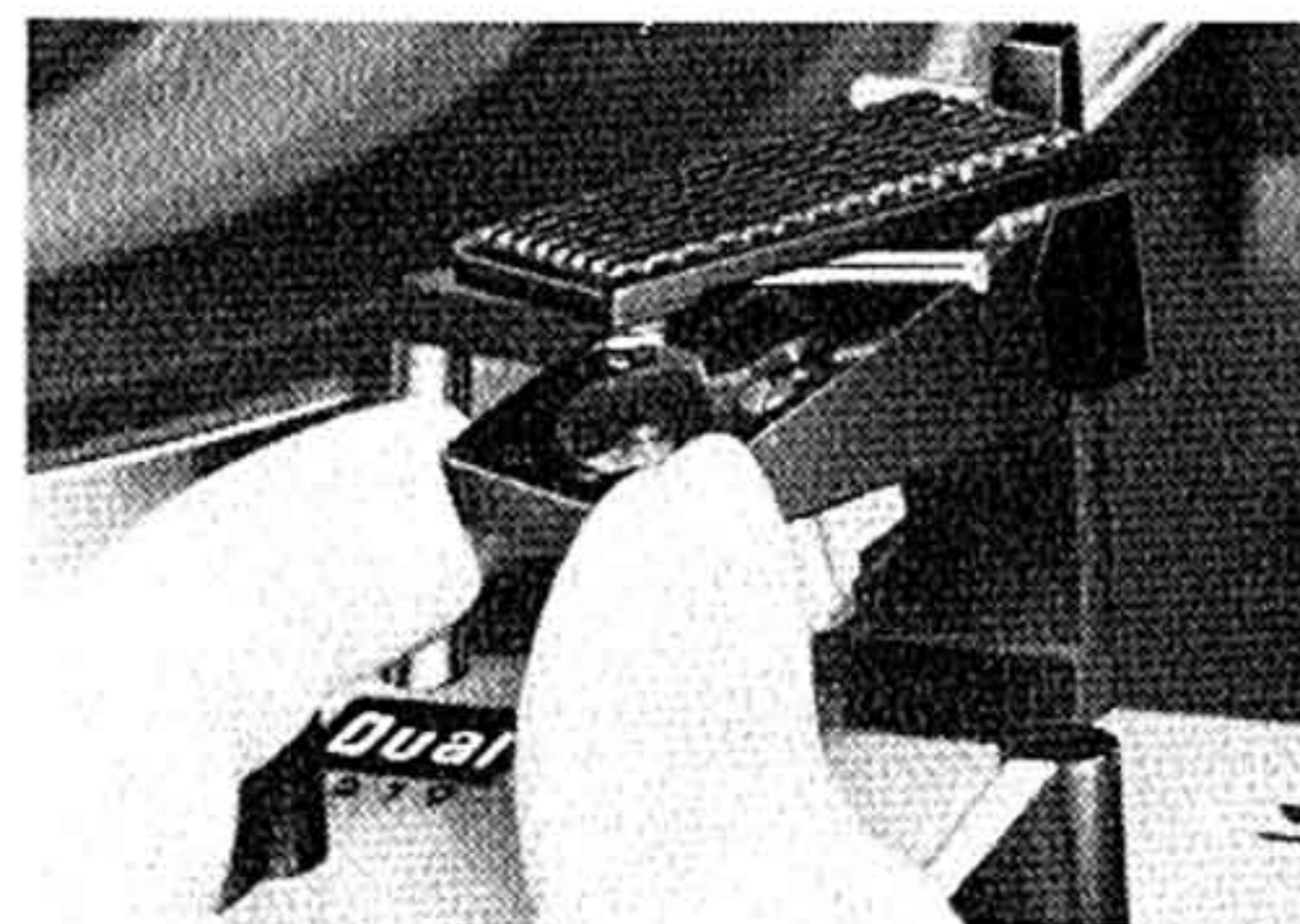


Fig. 15. Cartridge holder locks into tonearm with tonearm/lift lever.

The cartridge holder is easily removable for easy access to cartridge mounting and connections. It accepts any cartridge with mounting holes on $\frac{1}{2}$ " centers and weighing from 1 to 12 grams.

The mounting holes are elliptical, to permit the cartridge to be adjusted forward or back during mounting. This allows for optimum stylus overhang (which affects horizontal tracking error.) A mounting gauge comes with your 1219 to help you set this overhang correctly.

The magnesium tonearm head which accepts the cartridge holder has a waffle-type of construction. This provides the strength and rigidity of a solid, but saves substantial weight.

Precision tonearm settings

Elastically damped counterbalance

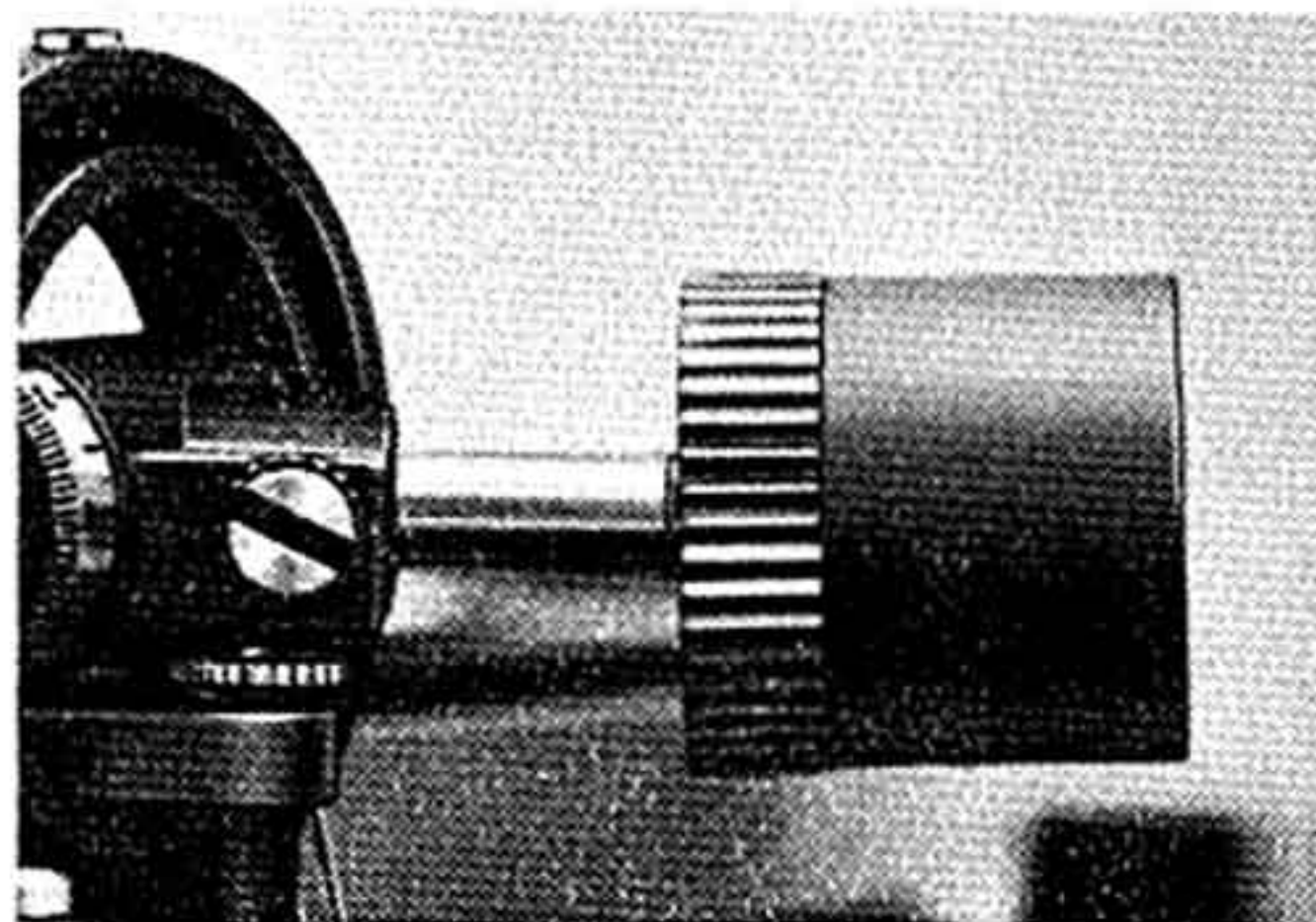


Fig. 16

The counterbalance (together with its shaft) which compensates for the weight of the cartridge, is shifted behind the pivot for approximate balance. It is then locked in place, and the weighted section rotated for fine balance.

As you turn the counterbalance, you will hear a succession of clicks. This special feature will come in handy for those owning more than one cartridge. If the weight difference between cartridges is within a reasonable number of click stops, balancing the tonearm from one to the other will be relatively simple.

The counterbalance is elastically damped from the shaft so as to effectively uncouple it from the tonearm.

Stylus force dialed directly to desired pressure

With the tonearm balanced for the particular cartridge in use, stylus force is applied by dialing to the amount desired.

When you turn the stylus force dial on the 1219, the force itself is applied to the tonearm by a long spiral spring which acts directly around the pivot of the tonearm. The tonearm remains balanced, and even major deviations from perfect levelling of the chassis won't affect tracking.

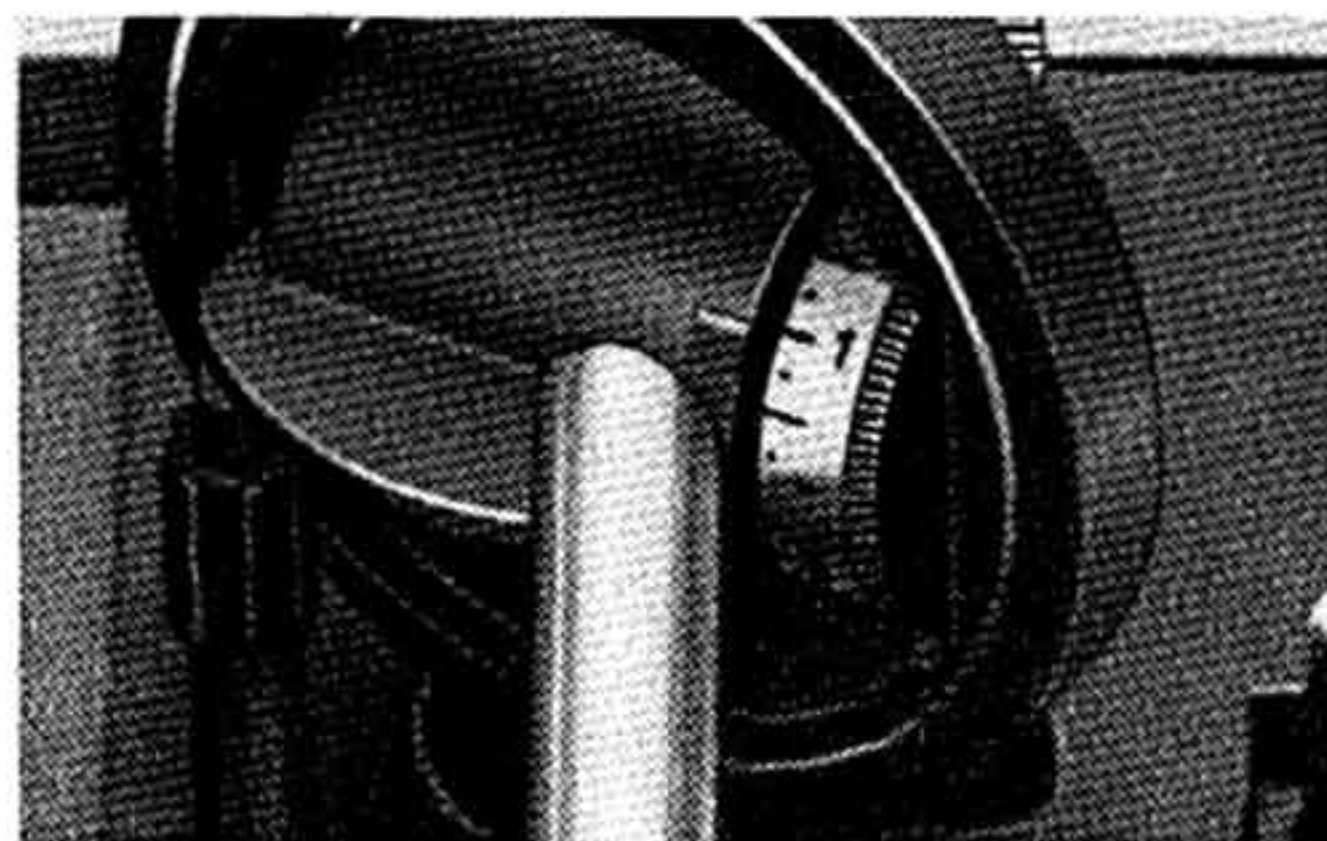


Fig. 17

Note: although the 1219 tonearm can track at a force as low as 0.25 gram, you should not actually attempt to track at so low a pressure. In all cases, the tracking ability of the cartridge you select will determine what is the best stylus force to use.

It is usually wise to set stylus force toward the higher end of the range suggested by the manufacturer of your cartridge. If loud passages with a good record sound clean, you can reduce the force slightly, but listen for the harshness or fuzziness that occurs with insufficient tracking force. Too light a tracking force produces distortion, and also produces groove skipping and excessive record wear. Too heavy a tracking force restricts the ability of the stylus to follow the contours of the groove and can also cause excessive record wear.

Separate anti-skating scales for conical and elliptical styli



Fig. 18. Left scale is calibrated for 0.7 mil conical styli; right scale for 0.2 x 0.9 (or 0.7) mil styli. For all practical purposes, these are sufficient. But for purists, Fig. 21 provides settings for different conical styli.

Skating refers to the tendency of the tonearm to move toward the center of the record faster than the decreasing spiral of the groove would normally move it.

This "skating force" is caused by the friction between the rotating record groove and the stylus. (Fig. 19.) Skating potentially occurs in all angled (or "offset") tonearm heads. The offset design is necessary to bring the stylus as close as possible to the tangent at every point as it describes an arc from the outside to the inside of the record.

Skating is actually not a serious problem with ordinary tonearms, as their bearing friction in the pivot is generally high enough to cancel out or to minimize the relatively small skating force. (Such tonearms also can't track well enough for the more sensitive cartridges.)

But with tonearms with low bearing friction, skating does become significant. Distortion can result, as well as increased wear on the inner groove and on the stylus itself.

The objective of "anti-skating" is to apply an equal, precise, and opposite counterforce to the skating force. Among the factors to be considered in the design of an anti-skating device are the friction in the pivot bearings (a constant), the amount of tracking force (a variable) and the size of the stylus tip (also a variable.)

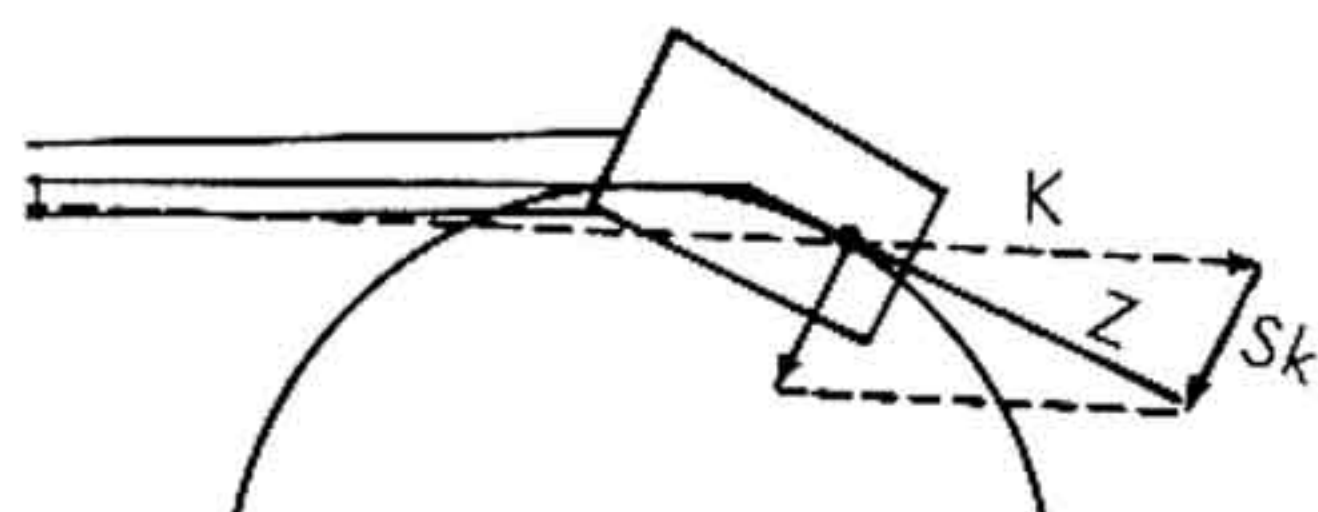


Fig. 19. Geometry of skating force originating in angled tonearm head. K is the theoretical direction of force against tone-arm bearing if head were not angled. Z is the actual direction of force against tonearm because of angled head. S_k is the resulting skating force.

Bearing friction must not only be constant in principle, but must meet the same specifications in every unit if the anti-skating settings are to be accurate. Dual quality control sees to it that bearing friction in every 1219 is no higher than 0.007 gram in the horizontal plane and no higher than 0.015 gram in the vertical plane. And the anti-skating system is calibrated for these carefully checked constants.

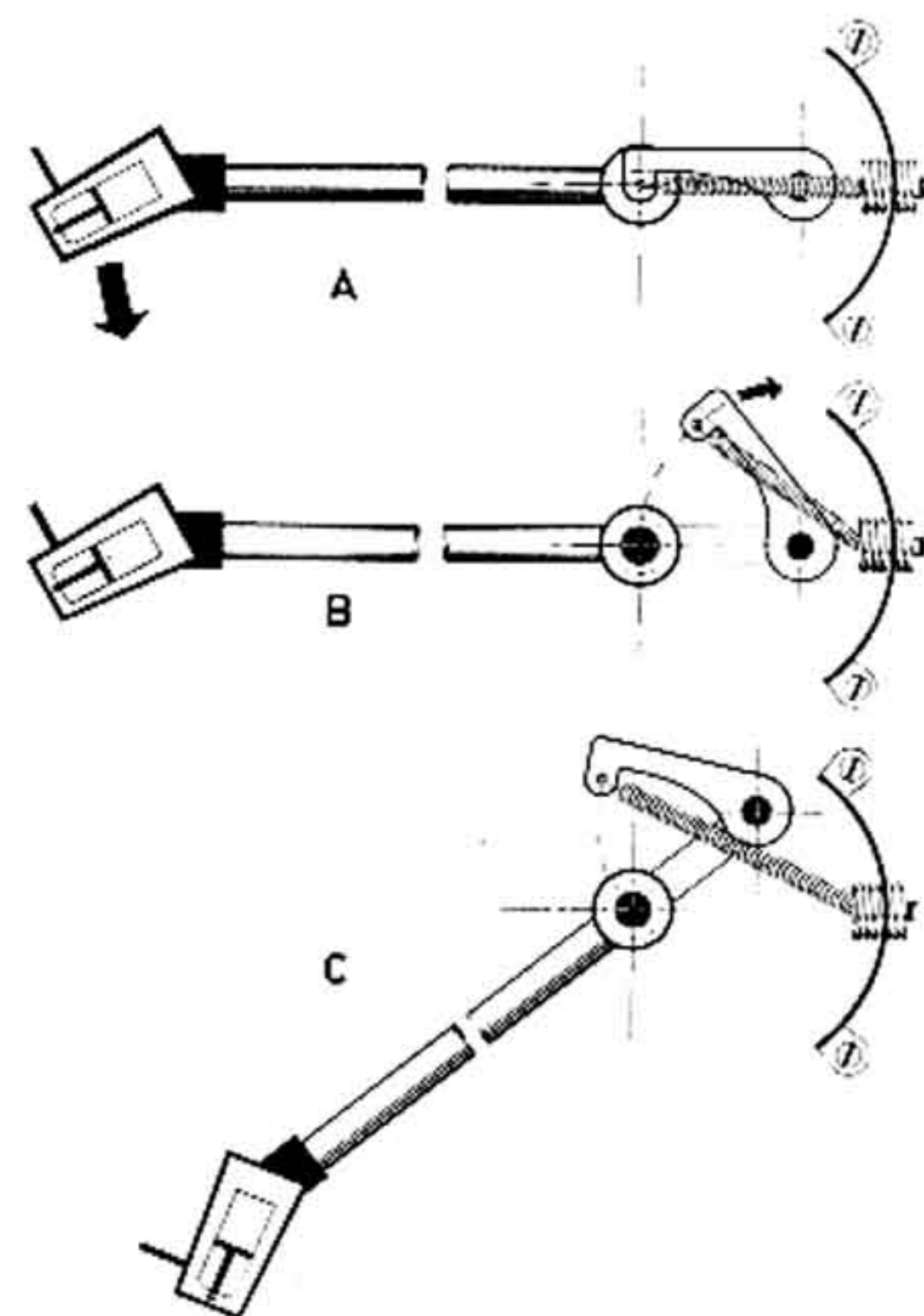


Fig. 20. Principle of Dual anti-skating system. Compensation is applied around tonearm pivot, and remains constant through entire area of tonearm travel. A. No anti-skating applied. B. Anti-skating applied; tonearm at rest. C. Anti-skating applied; tonearm on record. Though spring is extended, compensating angle of lever reduces pull as tonearm moves across record.

To set anti-skating in 1219, you need only dial to the same number as previously set for tracking force. This applies the correct amount of anti-skating force around the tonearm pivot, in the same plane as the skating force but in the opposite direction. (Fig. 20.)

The smaller the stylus radius, the more it will tend to skate, because it will press more deeply into the inner wall of the groove and thus cause more friction. This is another very fine point, but a measurable one, and the 1219's anti-skating system takes it into account.

Stylus force	Stylus radius in mils					
	0.4	0.5	0.6	0.7*	0.8	0.9
0.5	0.70	0.60	0.55	0.5	0.45	0.4
1.0	1.15	1.10	1.05	1.0	0.95	0.9
1.5	1.75	1.65	1.55	1.5	1.45	1.40
2.0	2.30	2.15	2.05	2.0	1.95	1.90
2.5	2.90	2.65	2.55	2.5	2.45	2.4
3.0	3.45	3.20	3.05	3.0	2.95	2.9
3.5	4.10	3.75	3.55	3.5	3.45	3.35
4.0	4.80	4.30	4.10	4.0	3.95	3.85
4.5	5.5	4.90	4.60	4.5	4.40	4.30
5.0	—	5.50	5.15	5.0	4.90	4.80

Fig. 21. Special anti-skating settings for conical styli with radii other than 0.7 mil. *Red scale is calibrated for 0.7 mil conical styli.

Thus, there are two scales, red for conical styli, and black for elliptical styli whose smaller radii contact the walls of the groove.

Each scale is calibrated for the most commonly used stylus radii. For all practical purposes, these are quite sufficient. But since there are conical styli made with different tracking radii, and since some Dual owners are complete purists, we include a chart for even further precision in applying anti-skating (Fig. 21.)

Motor and drive system

Incorrect speed affects musical pitch and tempo. Varying speed causes music to sound sour (wow) or warbly (flutter). Vibration from the motor or drive system, if transmitted through the record into the cartridge, produces rumble, a continuous low-pitched sound that robs music of clarity and transparency.

A great deal of engineering effort has gone into your Dual to prevent mechanical troubles like these from spoiling your enjoyment of your records.

Synchronous/continuous-pole motor

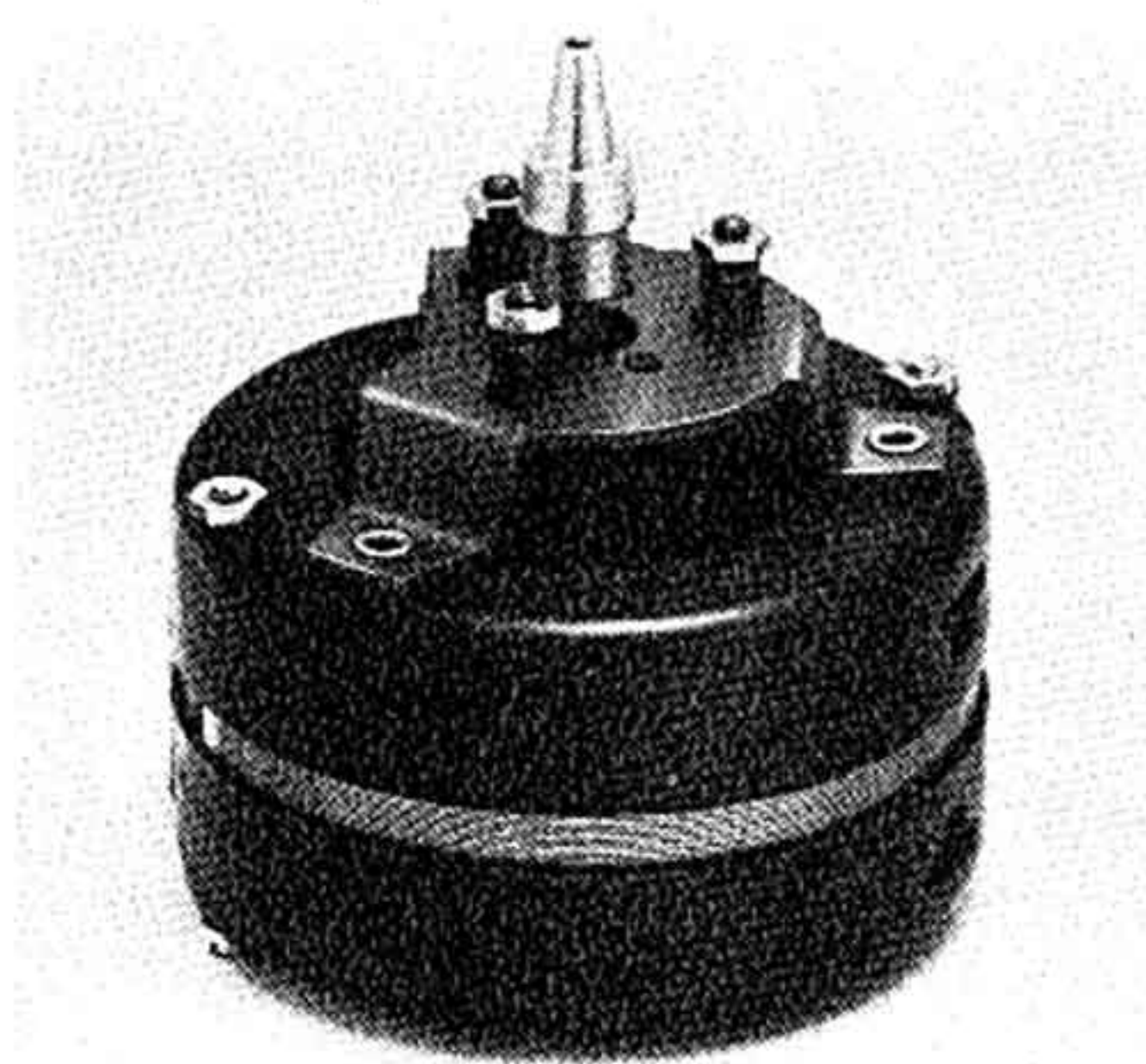


Fig. 22. Dual's synchronous/continuous-pole motor.

The synchronous/continuous-pole motor is a newly developed type, designed and made by Dual. The high starting torque from the continuous-pole element brings the platter up to full, stable speed in less than half a revolution, and the synchronous element maintains absolutely constant speed which is locked into the electric line frequency.

But constant and accurate motor speed still requires a precise drive system if the records are to rotate at the intended speed. The 1219's motor has a drive shaft with a precisely machined three-step pulley, one step for each speed: $33\frac{1}{3}$, 45 and 78 rpm.

Idler wheel drive system

An idler wheel engages the selected step and simultaneously engages a flange on the underside of the platter. (Fig. 23.) This sequence "reduces" the high rotary speed of the motor (1800 rpm) to one of the three standard record speeds, and filters out what little vibration the motor itself produces. (The motor is suspended from the chassis by a radially-elastic mounting.)

When the 1219 is shut off, the idler wheel disengages automatically from the motor shaft and the platter, thus preventing flat spots from forming on the rim of the idler wheel. Such flat spots would otherwise cause audible speed fluctuations.

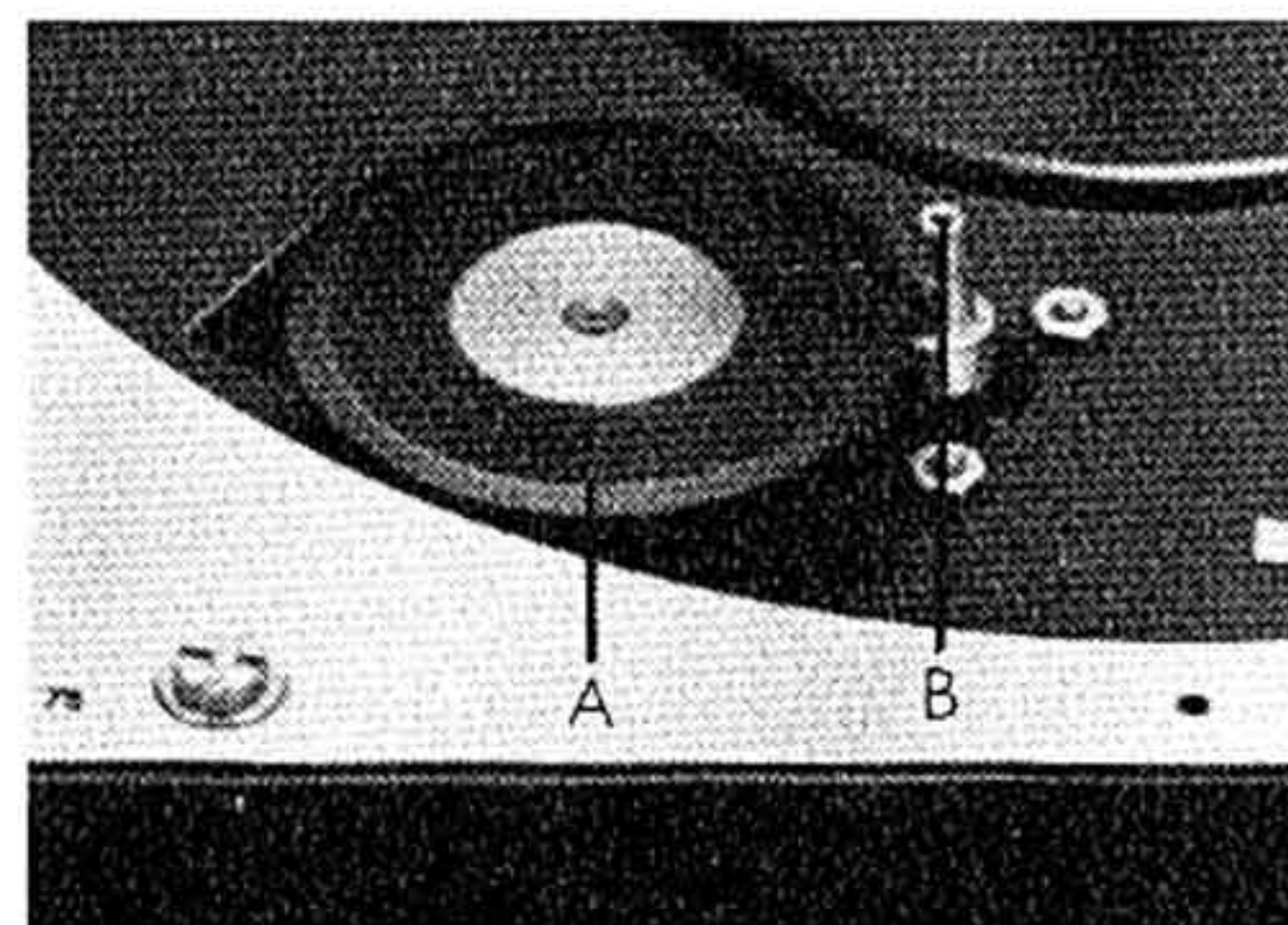


Fig. 23. Idler wheel (A) and motor pulley (B). In play, idler wheel engages flange on underside of platter and one of the steps of the motor pulley.

Pitch-control for "tuning" records

In addition to dead-accurate standard speeds, the 1219 allows each of these speeds to be varied within a 6% range for special purposes. This "tuning range" is equivalent to a musical semitone.

With the pitch-control, you can match the pitch of recorded music to live musical instruments or compensate for off-pitch records. You can also "stretch" or "shrink" a recorded selection slightly to fit a length of motion picture film as another example.

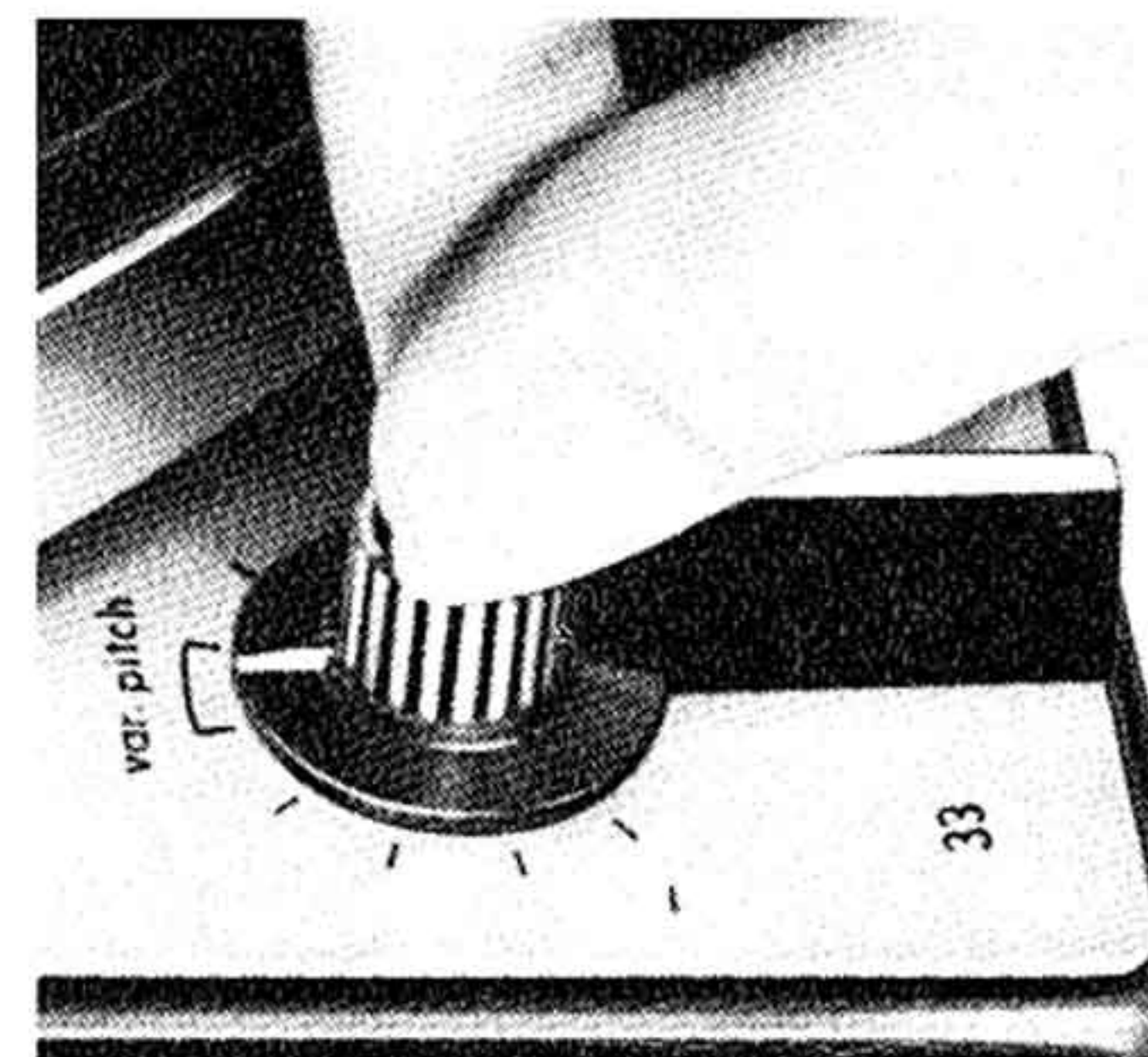


Fig. 24. Speed selector and pitch-control.

These deliberate speed variations are accomplished by the idler wheel (Fig. 23A) moving vertically along the tapered surface of each step of the motor pulley. (Fig. 23B.) There is no effect whatever on the speed or power of the motor.

Operating features

Twelve-inch dynamically balanced platter

The platter itself is dynamically balanced, which means it has been balanced while rotating. During this process, special holes on the underside are partially filled with metal weights as required to compensate for any final irregularities which are detected.

The platter is a full 12 inches in diameter, and weighs 7 pounds. This weight, combined with the platter's centrifugal design, contributes substantially to the extremely low wow, flutter and rumble of the 1219.

It is cast from a single piece of non-magnetic alloy, which prevents certain types of magnetic cartridges from being drawn toward the platter while in play. The anti-static mat on the upper surface of the platter has special ribs to support each size record at its outer diameter.

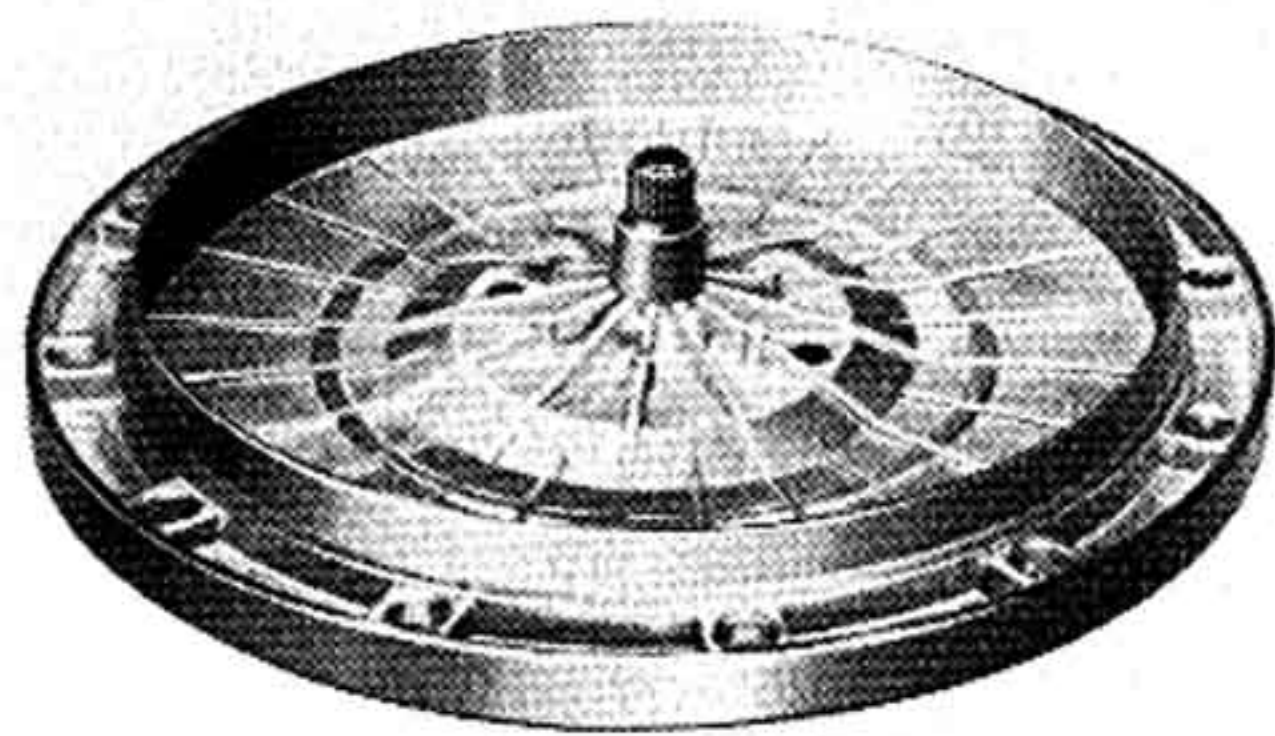


Fig. 25. Underside of platter. Holes around outer surface are for metal plugs when needed for final balancing.

Two-way damped cue-control

The 1219's cue-control is extremely precise and versatile. The vertical movement of the tonearm is silicone-damped in both directions. This provides a slow, gentle descent, and also a controlled ascent that prevents bounce. Try working the lever hard and note how the tonearm responds.

With the use of the cue-control, you can not only safely and gently begin play wherever you like, but interrupt play at any point and then resume where you left off. (The latter function comes in particularly handy when the phone rings.)

The height of the tonearm over the record when raised by the cue-control is adjustable from 0 to $\frac{1}{4}$ inch.

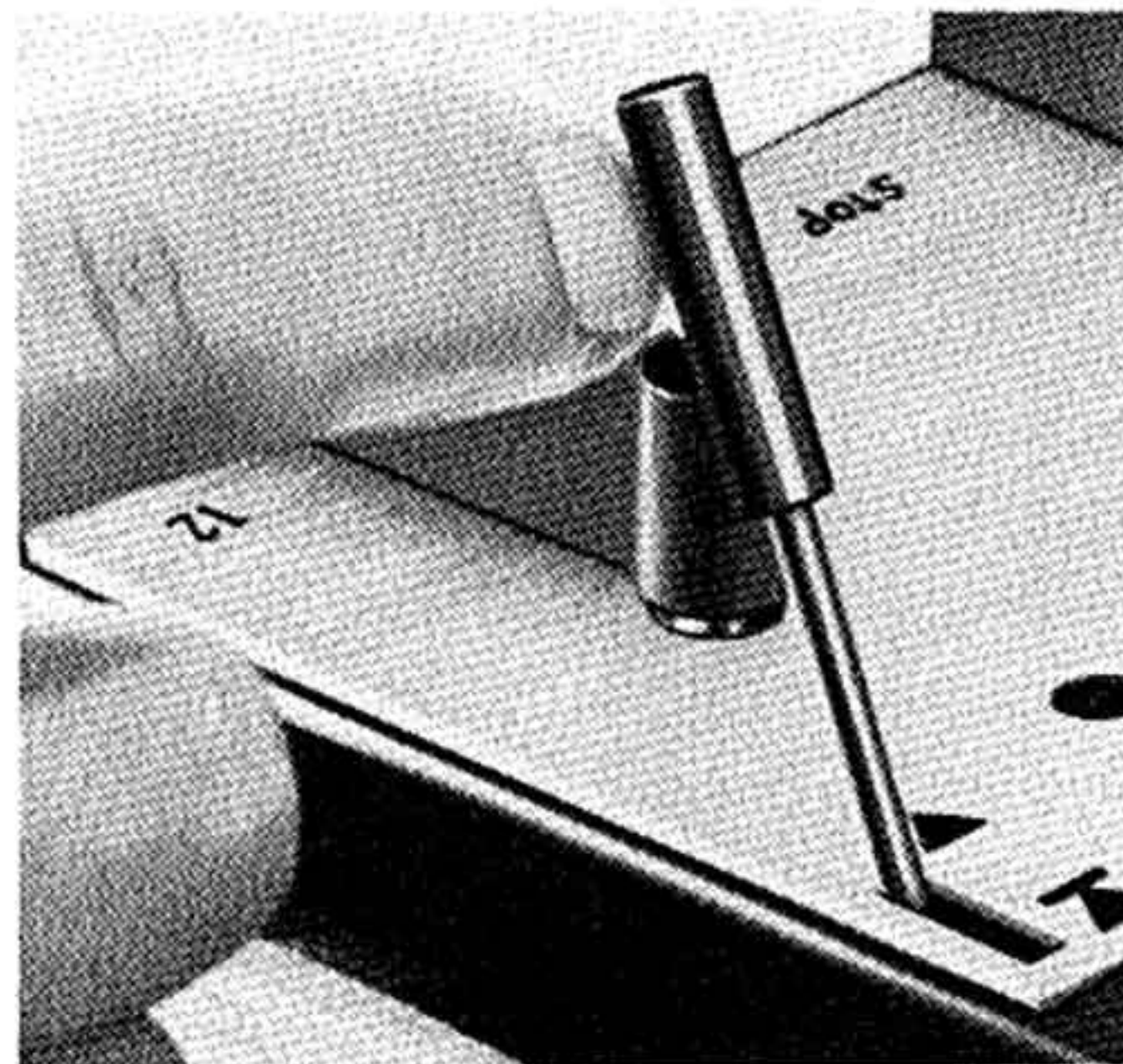


Fig. 26

Single-play spindle rotates with record

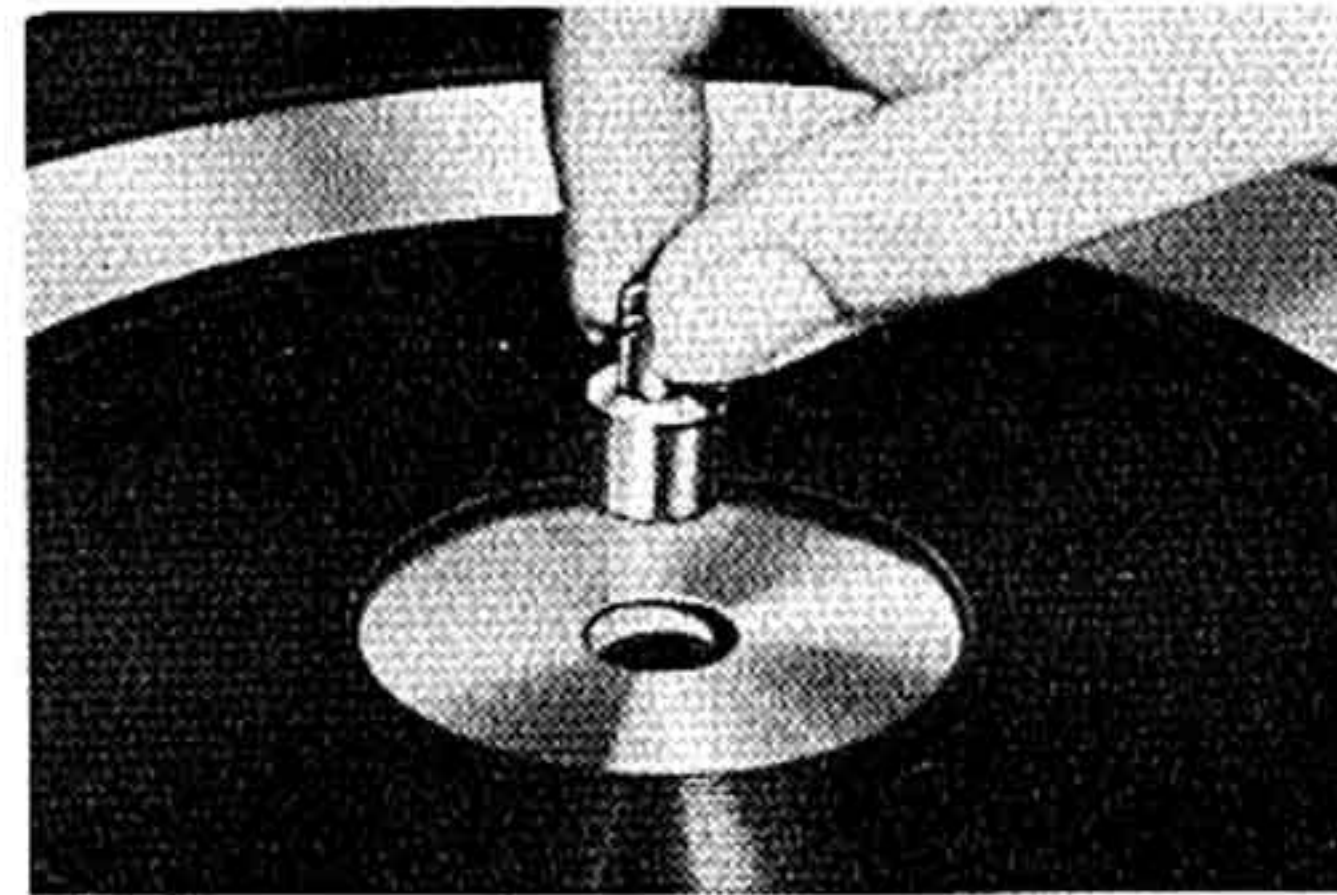


Fig. 27

The single-play spindle of the 1219 fits snugly into the platter and rotates with it, exactly as is done on manual turntables. By rotating with the record, instead of sitting loosely in the platter shaft, this spindle eliminates all possibility of binding or eccentric record hole wear.

Multiple-play spindle with "elevator-action"



Fig. 28

The multiple-play spindle, which holds up to six records, offers a number of unique features that provide unusually careful handling of your records as well as much convenience and flexibility.

If you look at the bottom record on the stack when you start the automatic cycle, you will note that it is first lowered from the other records on the stack above. This action removes all weight from the bottom record before it is released to the platter. Each step of the "elevator-action" is described in Fig. 29.

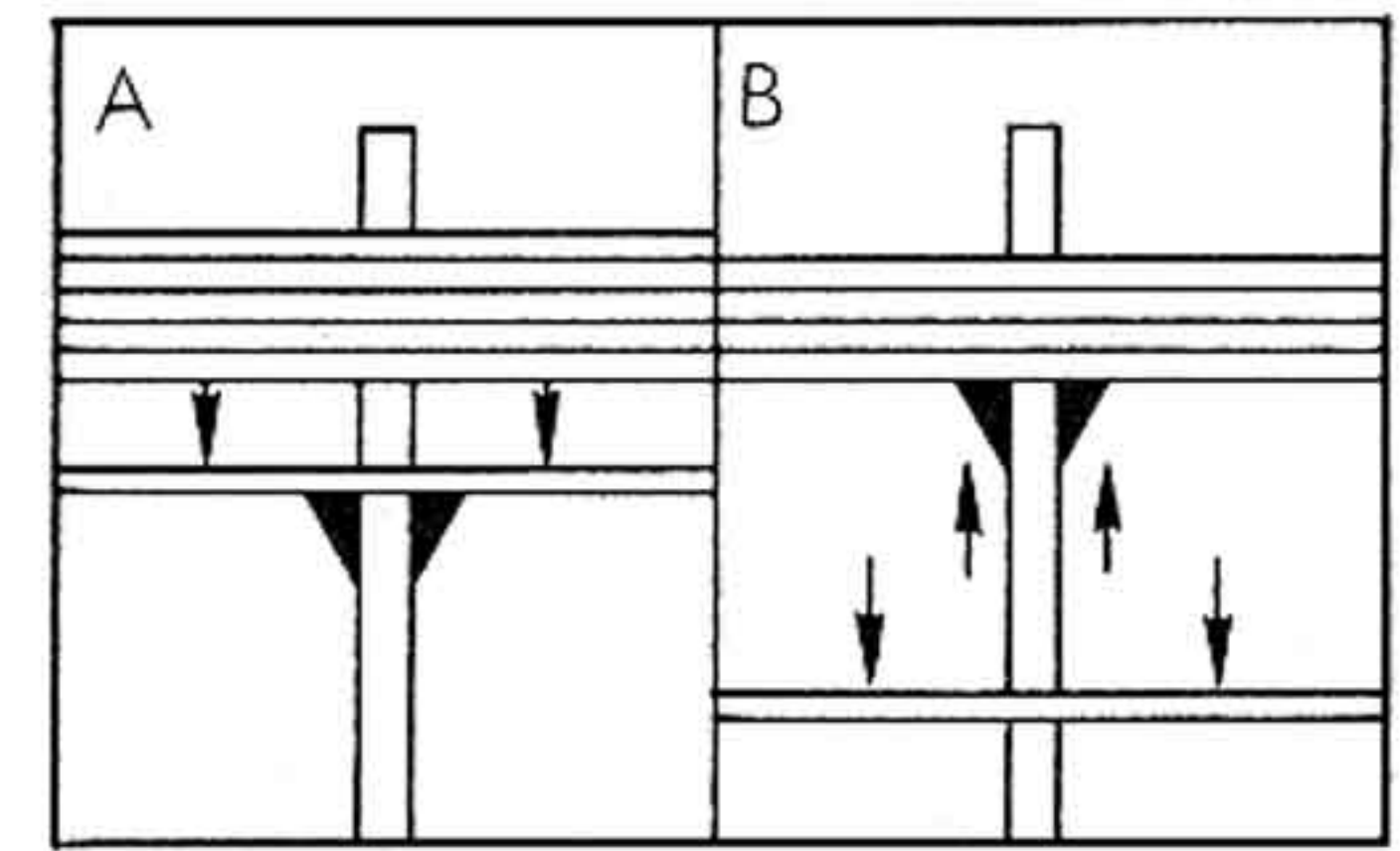


Fig. 29. How the "elevator-action" works. (a) Six records on stack. When operating switch is moved to "start," platform lowers with bottom record. Records above are held by grippers. (b) After bottom record is released to platter, platform opens and rises to support stack until next cycle begins.

Continuous repeat

To repeat one record indefinitely, use the multiple-play spindle and lower the record to the platter as in the normal change cycle. Then place the 45-rpm disc (supplied with your Dual) on the spindle just as you would normally place a stack of records. (It may also be necessary to place a record or two on top of the disc for added weight.) At the end of each play, the tonearm will continue to recycle and replay the record.

Installation instructions

Dimensions required

The required cut-out is shown on the template supplied, this cut-out is also provided in bases designed for your Dual, and available from any authorized Dual dealer. External dimensions of the chassis are 12" x 14 $\frac{3}{4}$ ". Allow 1" additional at the rear for the tonearm overhang (2 $\frac{3}{4}$ " clearance below the chassis is required) and approximately 5" above for inserting the multiple play spindle.

Mounting on base

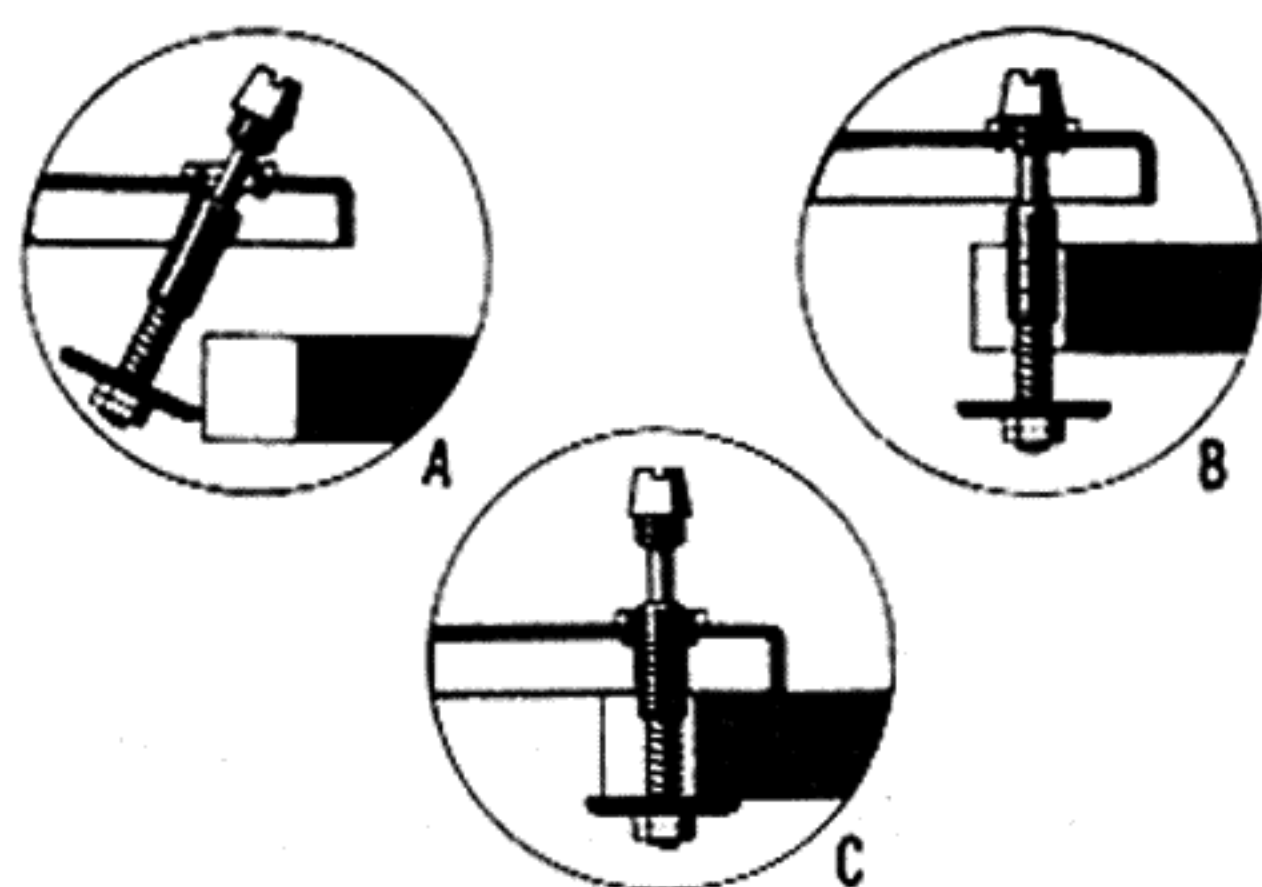


Fig. 30. 3-position mounting screws.

The 1219 has three mounting screws, each with three positions, that allow you to install and remove your Dual from the top. (Fig. 30.)

1. With the screws in their loose position, hold the chassis over the base so the four spring-mounted footings will be over their cut-outs. Tilt the mounting screws to let them slip past the notches as you lower the chassis. (Fig. 30A.)

2. Turn each screw clockwise until it is seated in the top of the chassis. (Fig. 30B.)

3. To remove the Dual, reverse the above procedure.

4. To secure the Dual to the base for transport, loosen the mounting screws, depress the chassis against the base, then continue to turn the screws counterclockwise until they tighten the chassis to the base. (Fig. 30C.)

Note: When carrying the Dual for any distance, it is important to either remove the platter or to insert the plastic wedges (supplied in the accessory bag) between the platter and chassis. This is to prevent possible damage by the platter bouncing against the shaft and bearings.

Mounting the platter

With the chassis on its base, slowly and gently lower the platter onto the shaft. (An oiled felt plug in the center hole of the platter will lubricate the shaft as it is forced out. The plug may then be discarded.) If desired, the platter can be secured to the shaft with the spring-clip supplied in the accessory bag. A special cone is also supplied to facilitate inserting and removing the spring-clip. (Fig. 31.)

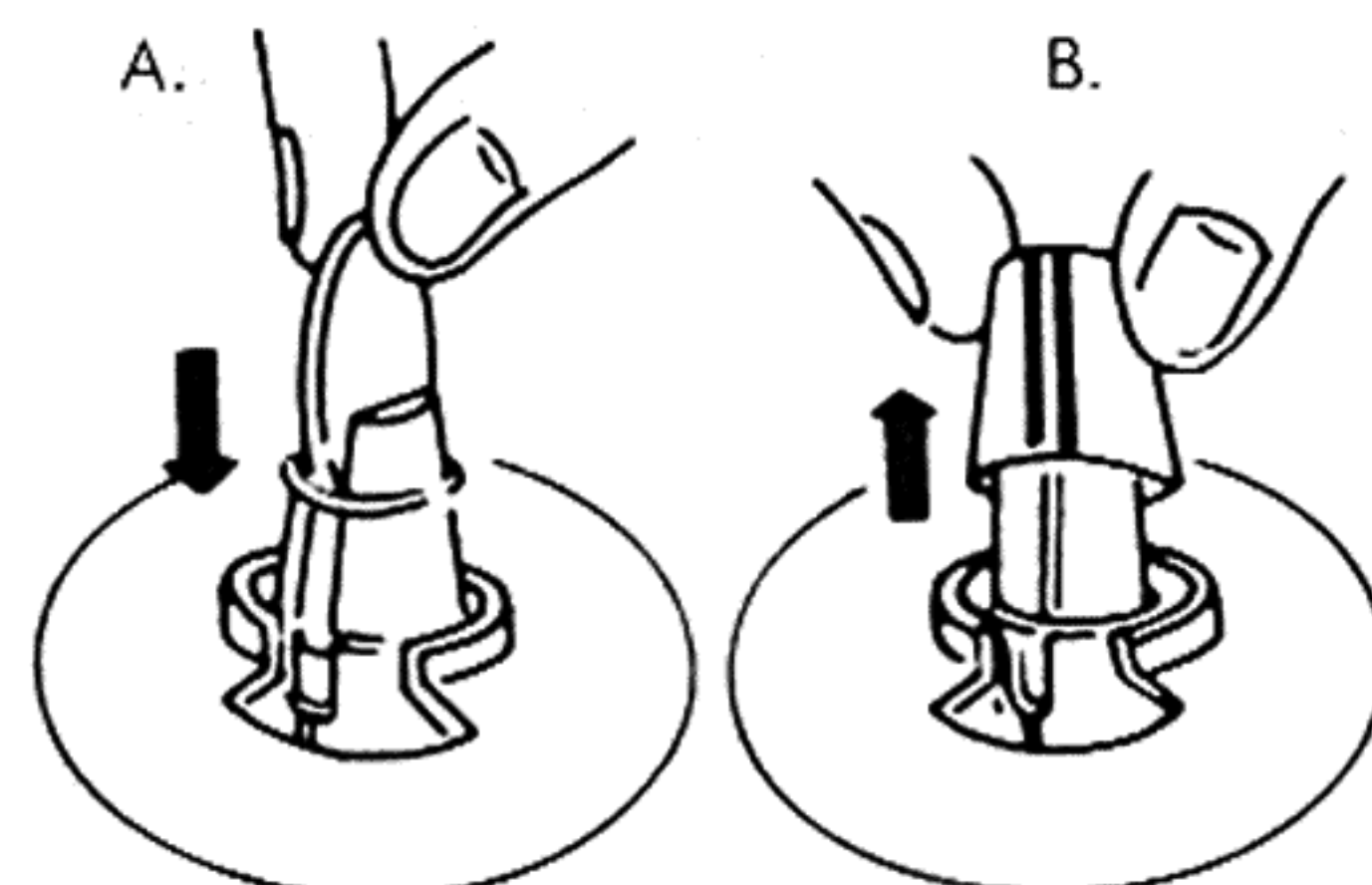


Fig. 31. Cone for inserting and removing spring-clip for securing platter to chassis.

Mounting the cartridge

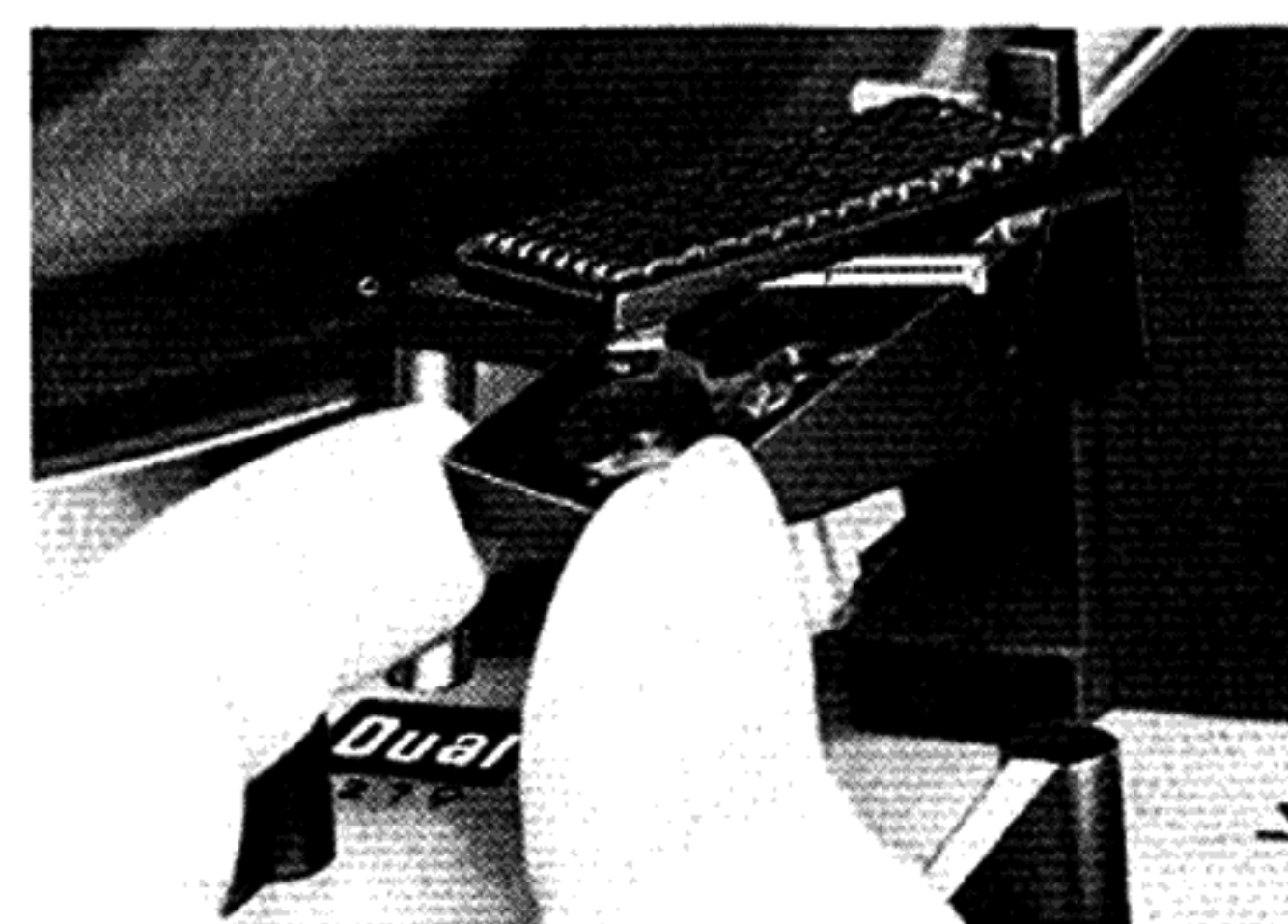


Fig. 32. Cartridge holder with mounted cartridge. When inserting, place upper rear edge along tonearm head first, then lift up before locking by pressing tonearm/lift forward.

1. Release the cartridge holder from the tonearm head by pressing the tone-arm lift a short turn to the rear. Be ready to catch the holder, as it will drop right into your hand. (Fig. 32.)

2. From the hardware supplied with either your Dual or with your cartridge, select a pair of spacers and screws that will place the stylus tip at the correct depth from the top of the

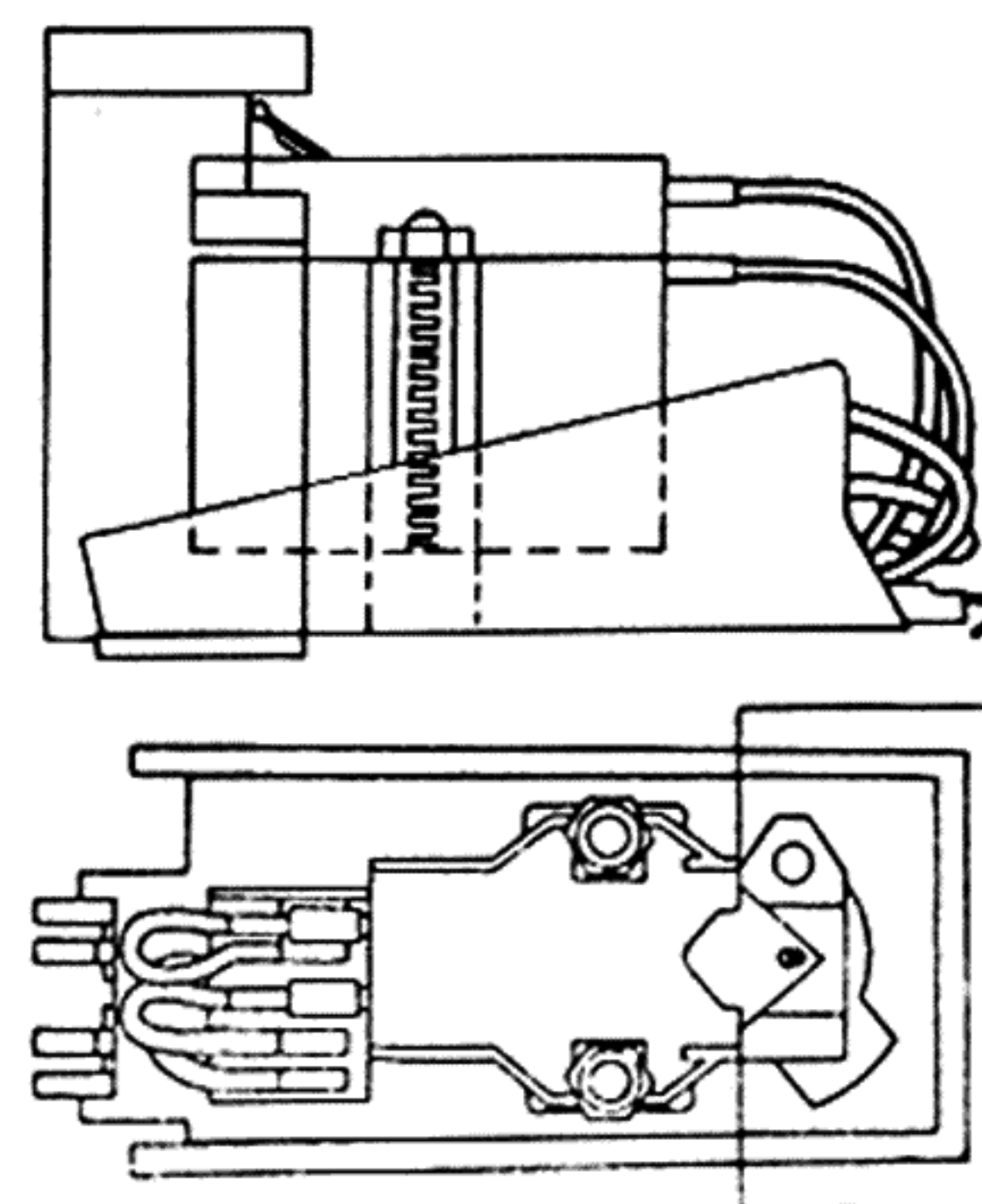


Fig. 33. Gauge for checking correct depth of cartridge and overhang of stylus.

holder. The special gauge supplied with your Dual, when snapped onto the holder as shown in Fig. 33, will give you this proper depth for the correct vertical tracking angle, plus the correct stylus overhang position for minimum horizontal tracking error. When the stylus is at the correct depth and position, it will be centered in the notch of the gauge.

3. Before tightening the cartridge, also be sure that it is positioned at a right angle to the front edge of the holder.

4. Connect each lead on the cartridge holder to its corresponding pin on the cartridge. Each lead is color-coded as shown in Fig. 34.

5. Attach the cartridge holder by placing it against the tonearm head as shown in Fig. 32, lift it up flush against the bottom of the tonearm head, then lock it by pressing the tonearm lift forward.

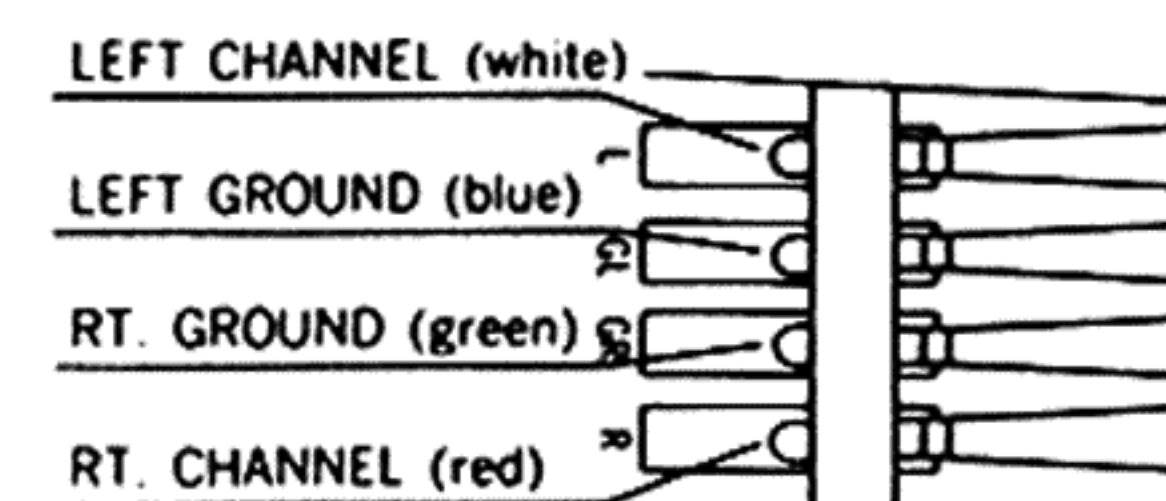


Fig. 34. Cartridge lead connections.

Balancing the tonearm

1. With the tonearm locked and the stylus force and anti-skating dials set at 0, slip the shaft of the counterbalance onto the rear of the tonearm, guiding it on by the V-shaped track. Do not tighten the set-screw.

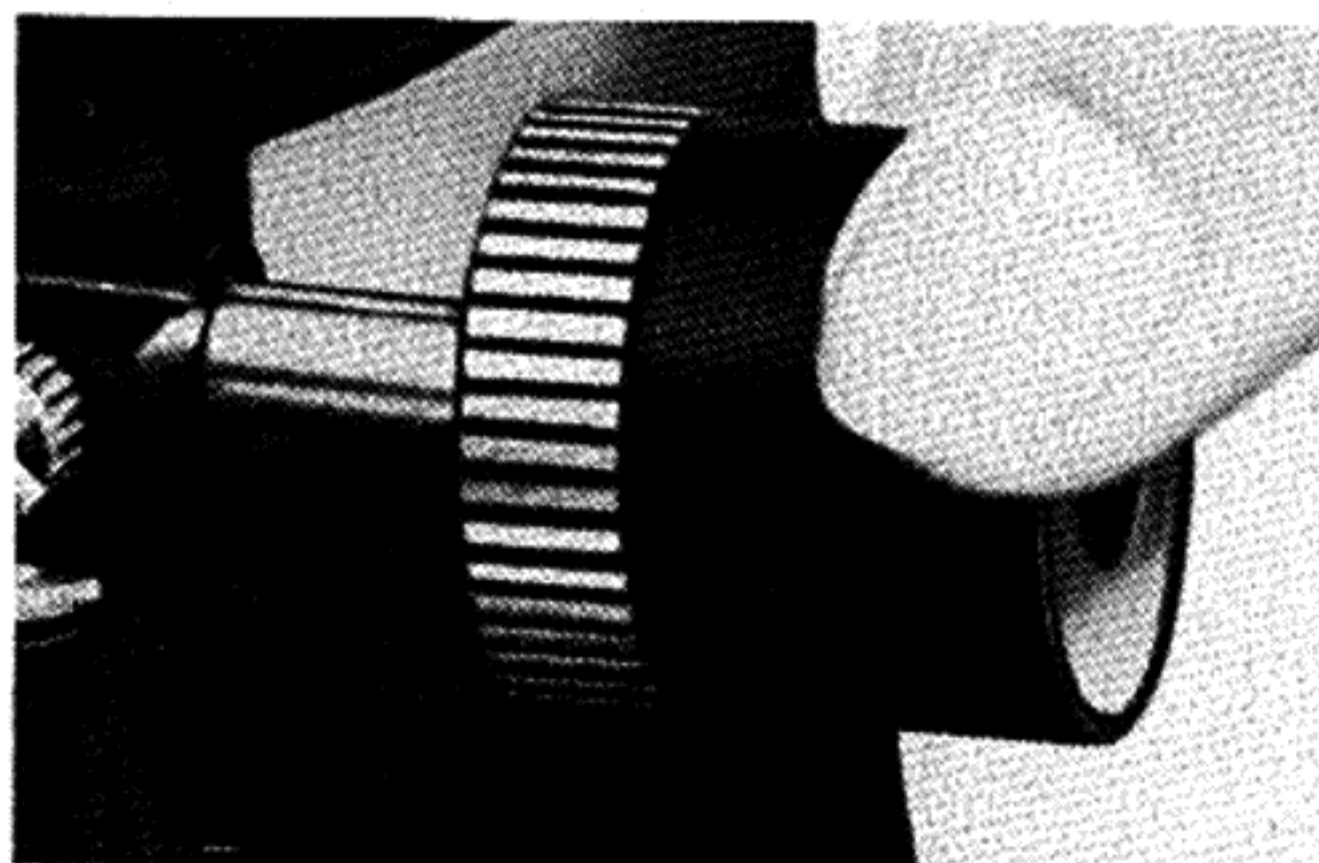


Fig. 35

2. To make sure the operating switch is in "neutral," move the operating switch to "start," then rotate the platter by hand two or three times.

3. Unlock the tonearm, move it slightly in from the rest post and slide the counterbalance back and forth until the tonearm is approximately balanced for the weight of the cartridge. Then tighten the set-screw.

4. For fine balance, turn the counterbalance until the tonearm floats freely. (The counterbalance has been pre-set at a mid-position on its threads. If you ever find it too close to either end of its shaft, simply turn it in the opposite direction a few times.)

Applying stylus force

The numbers on the dial correspond to stylus force. Just turn to the number recommended for your cartridge. (See page 8 for some suggestions on applying stylus force for your particular cartridge.)

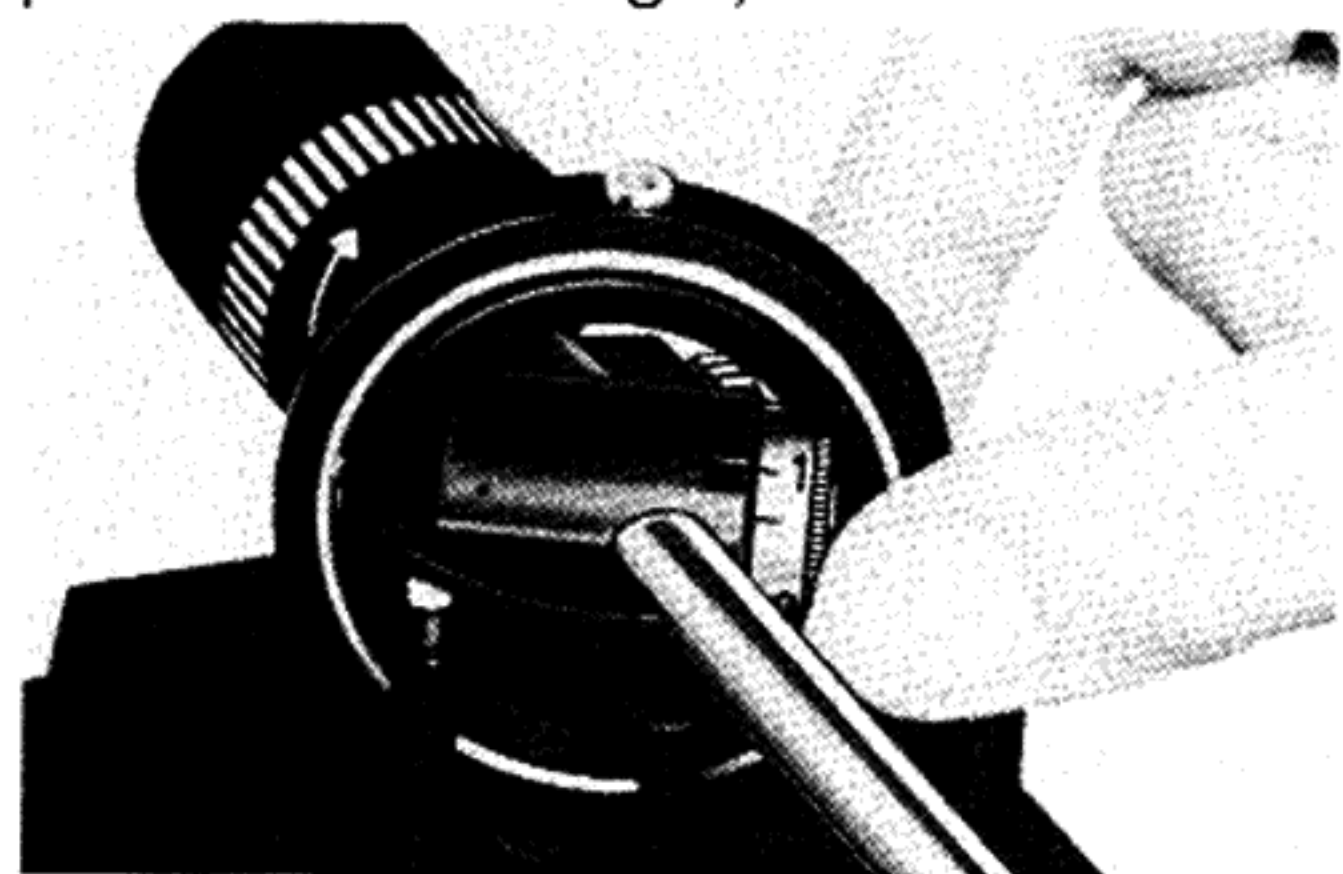


Fig. 36

Applying anti-skating

Use the left scale for conical styli; the right scale for elliptical styli. Turn the knob to the same number that you previously set for stylus force. (See page 8 for explanation of anti-skating.)

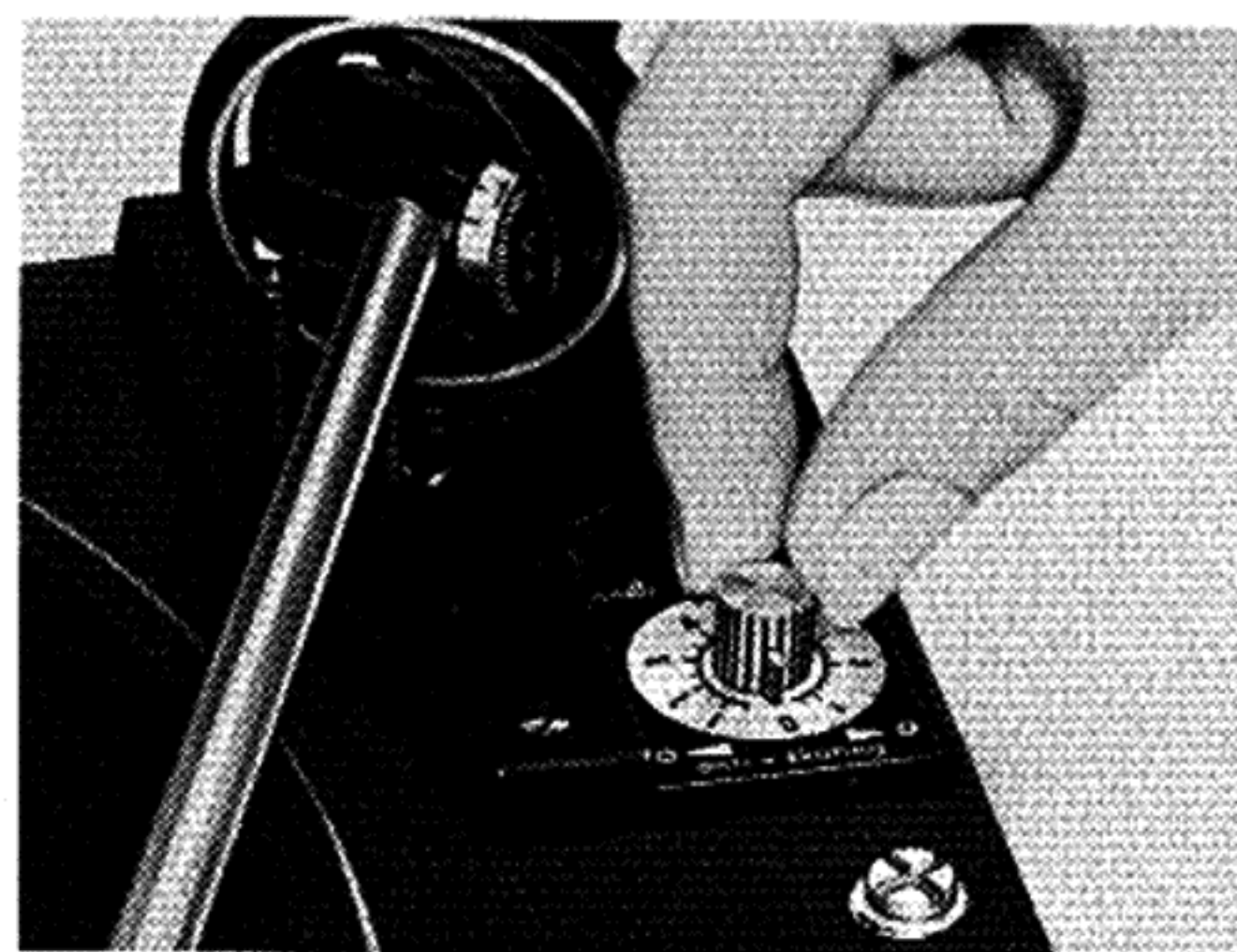


Fig. 37

Connections to amplifier

1. The red phono cable is for the right channel, the yellow cable for the left channel.

2. Check for hum when your system is completely set up and working correctly. Turn amplifier volume up until you hear a hum (steady low-pitched tone.) Now touch the ground wire of your Dual to some of the chassis screws at the rear of the amplifier, which may have a special screw for this purpose. Listen for any difference in the loudness of the hum, and use whichever connection seems to give the least hum.

Connections to power supply

You can plug the line voltage cord of your Dual either into the convenience outlet on the back of your amplifier or directly into a house outlet. If the amplifier outlet is switched, this will allow the power to the Dual to be controlled by the amplifier's on/off switch. If you do this, don't shut the amplifier off until the Dual itself has shut off at the end of play, or the idler wheel may not disengage from the motor pulley and platter.

Note: Your Dual is equipped with a unique provision for controlling the power to the amplifier so that the entire system can be switched off automatically by the turntable after the last record has been played.

If you wish to use this feature in your own system, write to United Audio for instructions. (See address on back cover.)

Adjustment for lead-in groove

If it is ever necessary to adjust the set-down position of the tonearm, this adjustment can be made with the indexing adjustment screw. This screw is accessible through the hole in the chassis (near the rest post) when the record size selector is set for 12" records. Turning this screw clockwise will move the set-down position of the tonearm toward the center of the record, and vice versa. The adjustment for the 12" record simultaneously applies for 7" and 10" records.

Adjustment for cueing height

The tonearm has been set at the factory to lift the stylus 1/4" from a single record when raised by the cue-control.

This stylus-to-record height can be increased (to clear more records) or decreased by the adjustment screw located on the chassis next to the anti-skating scale.

Turn this screw counter clockwise to raise the tonearm, turn clockwise to lower it. (A coin can be used to turn the screw.)

Adjustment for cycling height

This adjustment could be necessary only if the top of the tonearm head touched the bottom record of the stack during multiple-play. To lower the tonearm head, turn the cycling height adjustment screw clockwise. This screw is located on the inner side of the tonearm pivot.

Servicing

If your Dual ever requires servicing, write to United Audio for the address of the nearest Authorized Service Station.

Always ship your Dual in the original packaging, dismantled as when first received. If necessary, ask for special shipping instructions when you write.

Note: In order to maintain your Dual's performance at its optimum, we recommend that it be cleaned and lubricated every two years. Your authorized Dual dealer can provide this service.



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Dual

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