

Thales **Tonarm**

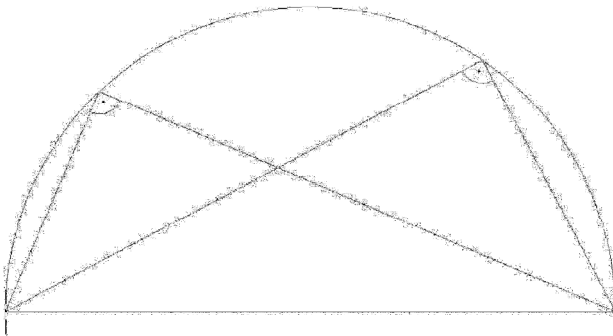
Tangential Pivoted Tonearm



Basics

Thales of Miletus belonged to the group of the Seven Sages of Greece. After later lore of the Hellenistic epoch we learn that he went in for many long journeys among to Egypt. There he should have measured the height of the pyramids by means of the length of the shades. It seems that he also brought more knowledge from Egypt as the discovery that the circumferential angle in the half circle is rectangular. According to this the half circle above of the hypotenuse is called Thales' Circle.

The only certain date of his life seems to be May 28th 585 B.C.; this is the date for which Thales predicted a solar eclipse. This occurrence was certified by astronomer retrospectively.





① horizontale Trägheit

② vertikale Trägheit

③ $I_{\text{ges}} = I_{\text{ges}}$
 im Optimalfall kreisförmiges Trägheitsmoment
 $I = \sum m_i \cdot r_i^2 \rightarrow I = \sum (y_i^2 + z_i^2)$
 gerader Arm kann weggeklipst werden! klein
 $I_0 = \frac{1}{12} m_1 L^2$
 $I = \frac{1}{2} m_2 \cdot l_2^2 + \frac{1}{3} m_3 \cdot l_1^2 + m_3 \cdot l_1^2$

Frage:
 \Rightarrow m_1 = Masse horizontaler Arm [g]
 m_2 = Masse vertikaler Arm [g]
 m_3 = Masse Gegengewicht [g]
 l_1 = Länge horizontaler Arm [mm]
 l_2 = Trägheitsradius vertikaler Arm um Z-Achse [mm]
 l_3 = Trägheitsradius Gegengewicht um Z-Achse [mm]
 l_0 = Länge vertikaler Arm [mm]
 l_1 = Abstand Drehpunkt - Gegengewicht [mm]

$\frac{1}{243} m_1 \cdot L^2 = \frac{1}{2} m_2 \cdot l_2^2 + \frac{1}{3} m_3 \cdot l_1^2 + \frac{1}{3} m_3 \cdot l_1^2 + m_3 \cdot l_1^2$
 - horizontaler Arm nicht zu leicht
 - kleiner Gegengewicht
 - kleine Radien
 Sündige Bedingungen: $(l_3 \cdot m_3) = \left(\frac{l_2}{2} \cdot m_2\right) \cdot 2 \rightarrow$ vereinfacht!
 im Gleichgewicht: $(l_3 \cdot m_3) = \frac{l_2}{2} \cdot m_2 + \frac{l_1}{2} \cdot \frac{m_1}{2}$
 Karten um horizontale Achse tragen einbauen!

Philosophy

It all began when Micha Huber sought for a way to combine the advantages of a conventional tonearm and those of a linear tangential pick-up arm. The solution method is based on the well-known elementary school aid to construct a tangent: the Thales' Circle.

After much thought, endless sketches and calculations, a three-dimensional mechanical solution emerged that satisfies all the requirements placed on a modern pick-up system – provided the mechanics functions as precisely and reliably as a Swiss watch.

The long-cherished dream of geometrically correct sensing with low friction pivot bearings became reality. A new patent was added to the dozens of existing patents that testify to this dream: CH694567 – Tangential Pivoted Tonearm, announced in May 2004.

Micha Huber was trained both as a mechanical engineer and a professional musician. After working five years in the field of developing finest Swiss watches he launched his own company: HiFiction AG. Within this company his dream of combining music and mechanics, culture and precision, became reality.



Inspiration

Music

evokes a moving emotional response. Technology in its proximity to art is able to touch, and even to inspire – especially if it is put in the service of music. Thales combines both music and technology in a unique way.

Innovation

is known by new and progressive solutions for specific problems – even for problems considered as unsolvable. Thales is the only tangential pivoted tonearm.

Precision

ensures the closest approach of a technical device to the perfect intellectual idea. The high precision of the construction of the pivoted tonearm Thales makes the ideal of the tangential tracking on the Thales' Circle become reality.



Benefit

The Thales tonearm creates a bond between music and technology in a very unique manner. It combines an elegant theoretical solution with uncompromising technical realization. The manufacturing of its more than 100 parts is done with the most modern process engineering in Switzerland. Our watchmakers fabricate and assemble the micromechanical parts. Twelve jewel bearings reduce the friction to the utmost. The materials used are carefully selected and tested. The benefit in detail:

- no tracking error and no consequential resulting distortions
- minimal friction because of pivot bearings; no linear bearings; no active tracking
- short tonearm with little resonance
- symmetric inertia at the tracking point in all axes
- damping and compensation of the skating force through weights

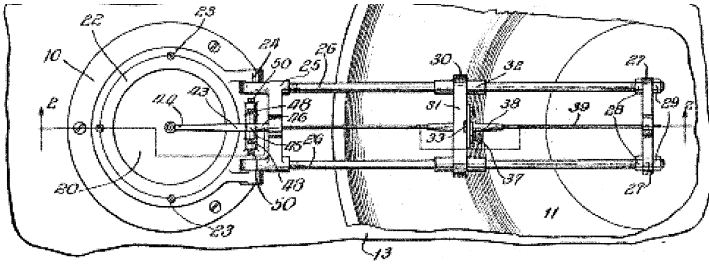
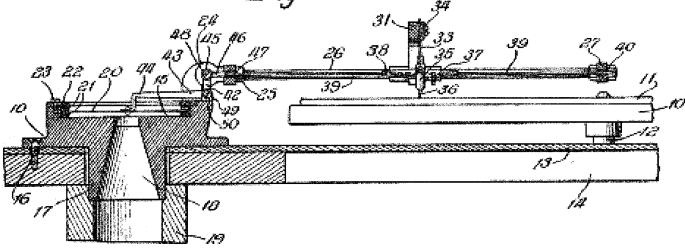
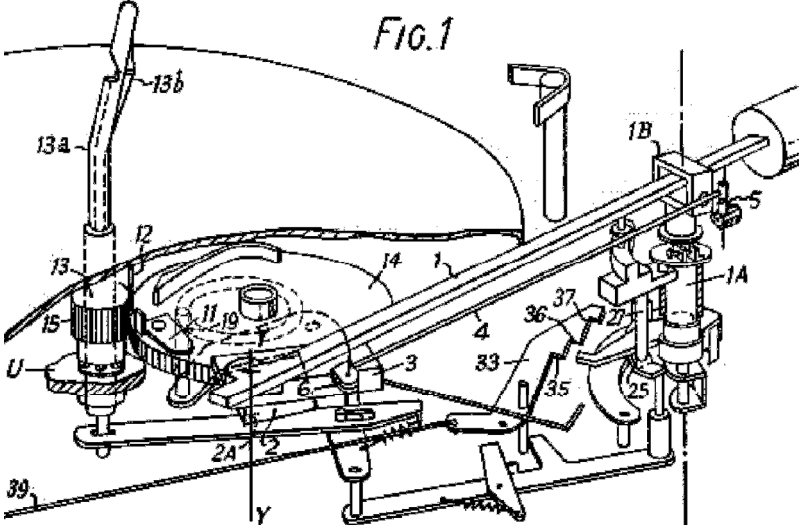


Fig. 2



Inventor:
 Joseph H. Blair
 By: *W. H. Blair*
 Att.

FIG. 1

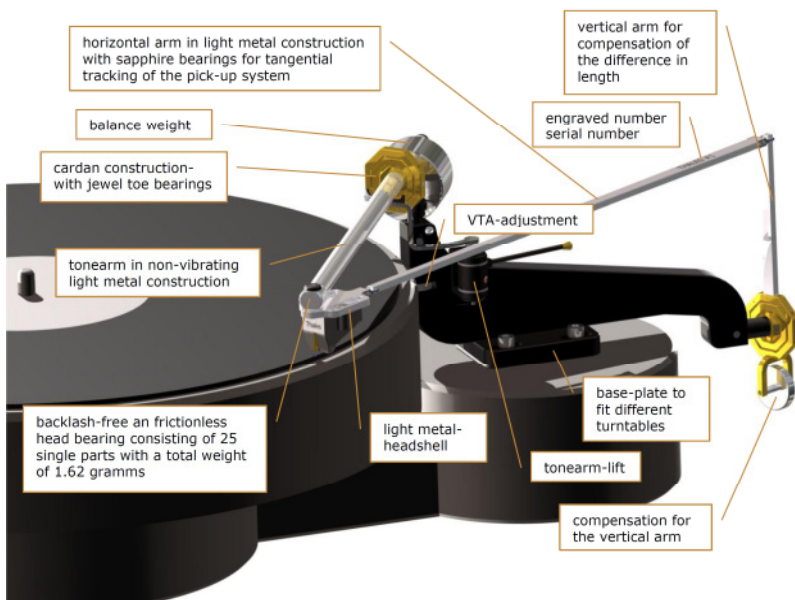
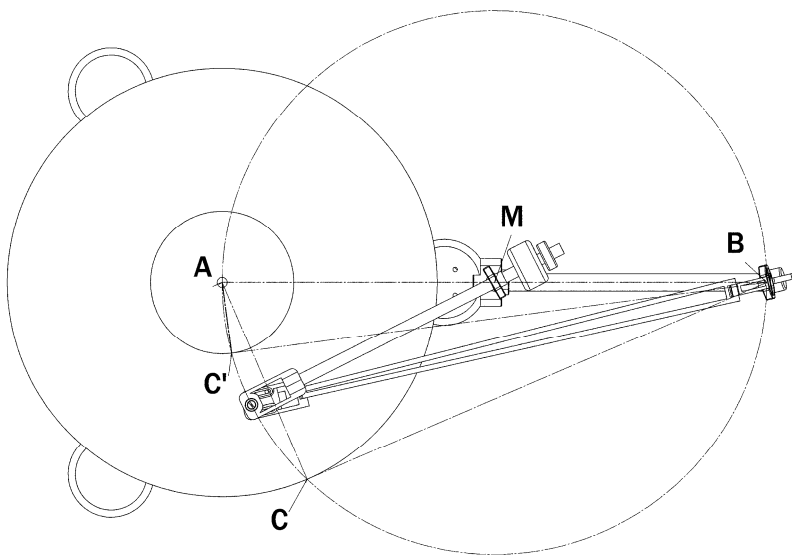


Solutions out of a Century

To reduce or minimize the falsification of the scanning, a lot of different solutions have been chosen since the invention of the phonograph in 1887. The first patent of a tangential installation in 1923 shows still the most spread method of resolution. The pick-up is linearly guided, exactly as the cutting of the masters. You can find active (driven by a motor) or passive (smoothly running) systems.

The drawbacks of the linear principle can be considered the extraordinary technical charges to minimise the friction or the continuous correction of the carriage, because of the angular deviation. Often this asks for many different units and sensitive constructions.

The only non-linear solution that was produced in series is the famous Garrard Zero-100. A parallelogram construction with its pivot bearing, which is changing the crank angle of the Headshell constantly and reduces the tracking error to 0.43° . We find resembling methods of resolution at Burne-Jones and others, mostly two armed constructions. By regarding from the mathematical and geometrical perspective we realise that the tracking error has been minimised but not kept back completely. In this way we can't speak from a tangential scanning but rather from an improvement of the tonearm geometry in consequence of the ingenious correction of the crank angle.



Technology

As the name presents, the Thales tonearm is based upon the tangential scanning from the movement and the adjustment on the Thales circle: All the triangles ABC on the Thales circle around M are standing right-angled. Like this BC is always rectangular to AC and so in every position tangential to the record channel with actual radius AC. By setting up the pick-up exactly under the position C and in the alignment of straight BC results – at variable length of BC- a tangential scanning. This construction is patented since March 31st 2005 under the number CH694567.

Although the scanning of the Thales' Circle seems at first glance obviously and simple, it demands the attention of different details. All the measures are located in the milligram range so that the arm won't produce lateral forces and that the seating remains constantly. The cardan bearings are constructed vibration-less and compact. Precise sapphire bearing make sure that there is also low friction next to the pivot of the adjustment-arm. The pivot bearing above the head is made out of 25 individual parts. The whole construction is manufactured with highest precision what guarantees a smooth-running and free of play between the Headshell and the tonearm.



Thales original

This is the original. The Thales combines traditional craftsmanship with the most up-to-date technology. The cardanic bearings are gold-plated while the pure magnesium arms show their natural colour. The head-shell and the cardanic bearings are treated with a unique handmade scratch-finish – a secret method of our goldsmith. All edges are carefully polished to show the relationship to finest Swiss watches. Each tonearm is engraved by hand.

Features:

- finest sapphire bearing, twelve jewels
- gold-plated cardanic bearings, handmade finish "scratched"
- magnesium arms, handmade finish
- magnesium headshell, handmade finish "scratched"
- effective length: 6/11 inches
- effective tonearm mass: 12g

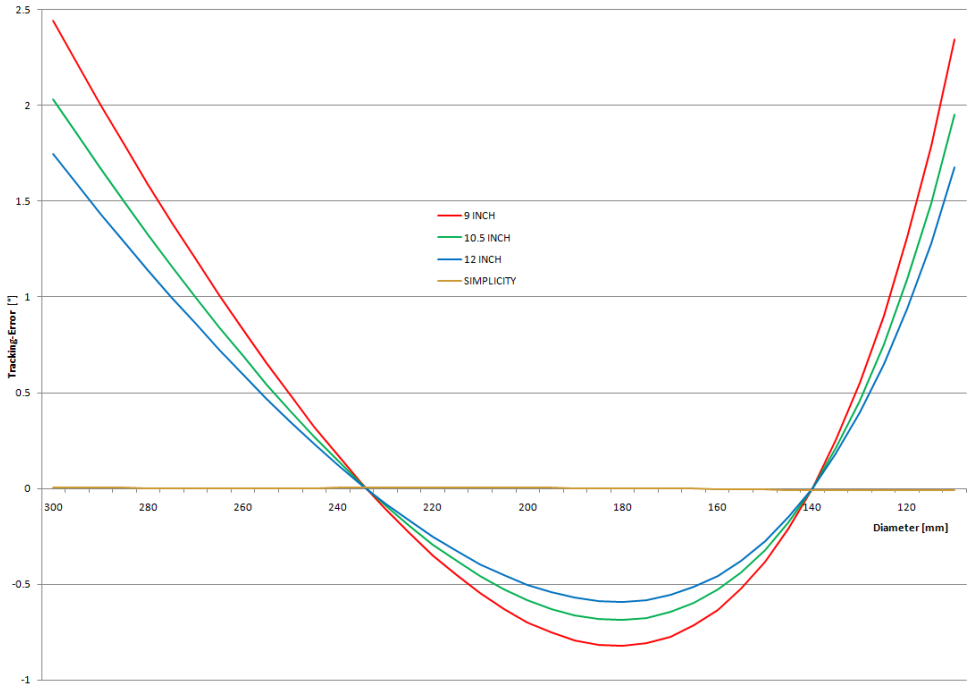


Thales AV

This tonearm shows Swiss precision. Thales AV stands for Aluminium Version because the arms are made of a special aluminium alloy. The bronze anodized finish of these arms guarantees a unique look and provides high corrosion-resistance. The cardanic bearings are hard chrome-plated to point out the impression of a high-precision-instrument.

Features:

- finest sapphire bearing, twelve jewels
- hard-chrome plated cardanic bearings
- aluminium arms, bronze anodized finish
- aluminium headshell, bronze anodized finish
- effective length: 6/11 inches
- effective tonearm mass: 16g



Simplicity

The Simplicity is the little fellow of the Thales tonearm. Its geometry is based on a newly created tetragon solution which reduces the tracking error to a maximum of 0.008° . It uses the same bearing technology as the Thales tonearm. Six jewels and four subminiature ball bearings make sure that the friction and clearance are within our state-of-the-art tolerances. The intrinsic frequencies of the two tonearm tubes are carefully tuned up in inharmonic proportions to even top the damping properties of any single-arm design.

The Simplicity comes with a special tool to make sure the installation is as precise as the manufacturing. The headshell can be taken apart easily for exact placing of the cartridge. The surfaces of the tubes are bronze anodized, using 0.1g of a specific salt per litre electrolyte. All side forces are balanced by two little magnets.

Features:

- finest ruby bearing, six jewels
- hard-chrome plated cardanic bearings
- aluminium arms, bronze anodized finish
- aluminium headshell, bronze anodized
- effective length: 9 inches
- effective tonearm mass: 19g

Contact

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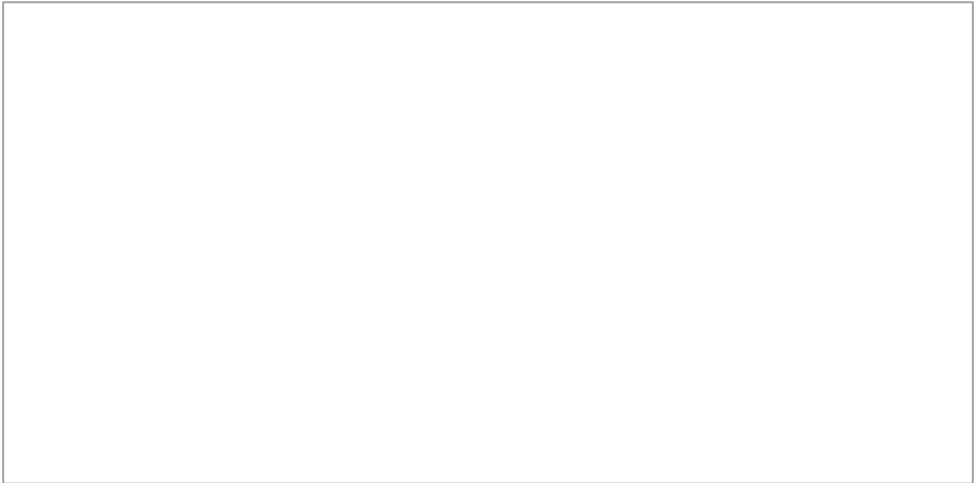
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