

Making a Geigenwerk

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Outline

- **Keyboard Instruments**
- **Geigenwerk**
- **How it works?**
- **History**
- **Difficulties with wing shaped Geigenwerk**
- **Detailed discussions on the new instrument**
- **Demonstrations**
- **Conclusions**

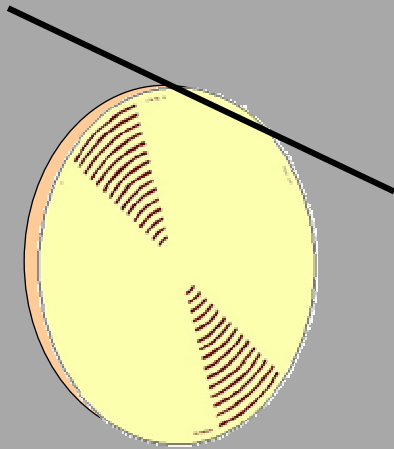
Keyboard instruments

- **No musical expressions implemented after the first break for a single tone.**
- **Discreet pitch with given temperament.**
- **Different timbre selectable and/or mixable.**
- **Complex music played by a single player.**

Geigenwerk

- **Musical expressions with dynamics and pitch modulations implemented after the first break.**
- **Modulated pitch allows no-fixed temperament.**
- **Different timbre controlled with bow speed and pressure between bows and strings.**
- **Complex music played by a single player, like other keyboard instruments.**

How it works?



- **Friction wheels rotate to imitate bows of string instruments.**
- **Selected strings come to contact against the friction wheel.**

History

- Origin can be traced back to Leonardo da Vinci.



First implementations



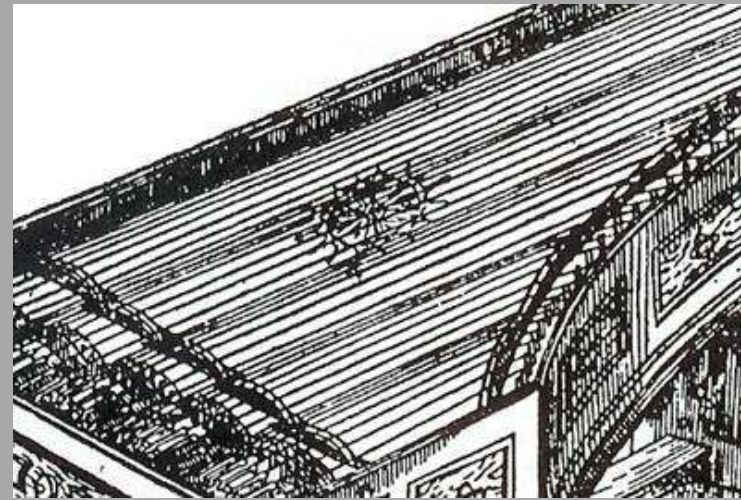
Hans Haiden 1600



Raymundo Truchado 1625

Wing shaped bodies

- Most (all?) of the historically made Geigenwerks are wing shaped.
- In these examples the friction wheels rub strings at the position more or less similar to the plucking point/striking point of harpsichord/pianoforte.



Courtesy of Carolyn W. Simons



Difficulties with wing shaped configuration

Author's experience

- Nasal sound quality
- Slow build-up of sound
- Only slow passages can be played at lower tones
- Often missing sounds in fast passages even in higher notes
- Noticeable difference in loudness at higher and lower portions of the convex bridge



Imitating the violin configuration

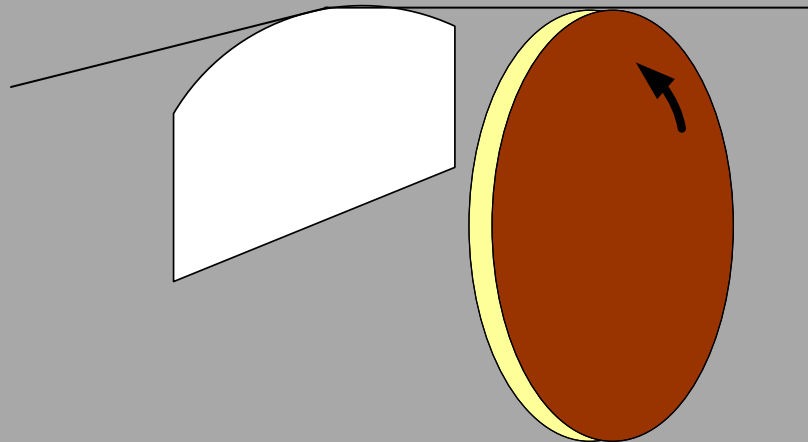
Match to the exact measurements of the violin.

- ① Tail piece
- ② Bridge
- ③ Friction point
- ④ String length

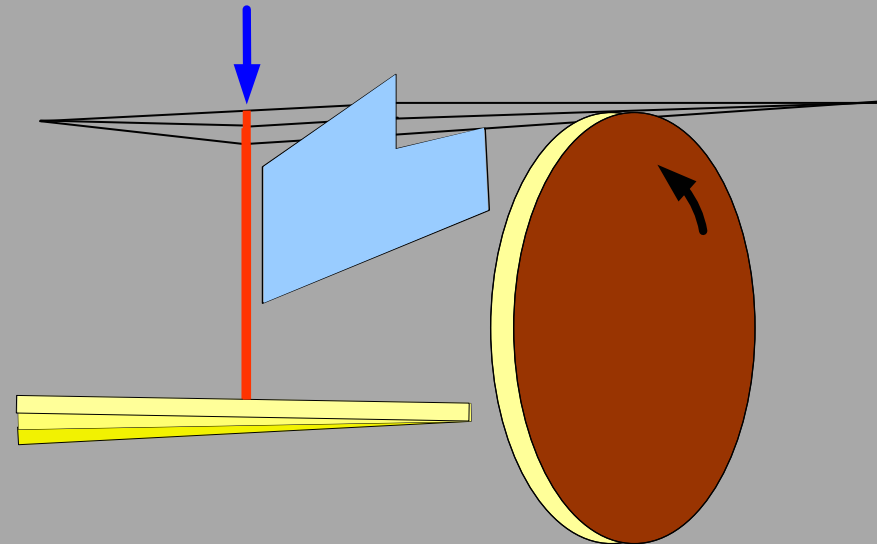


Strings vertically slide on the bridges

- With the violin like configurations string cannot move up and down

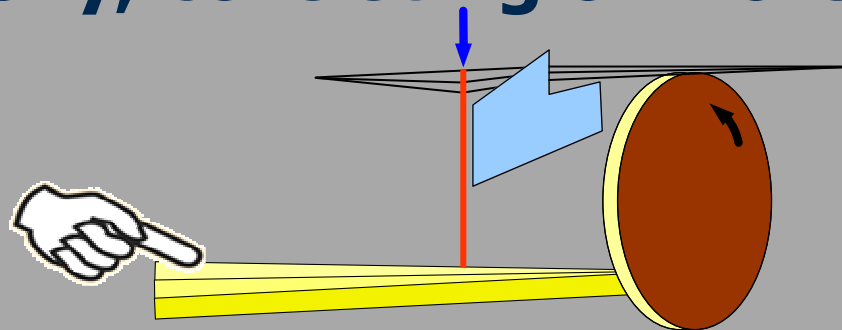


- Strings slide on the vertical edge of the bridge



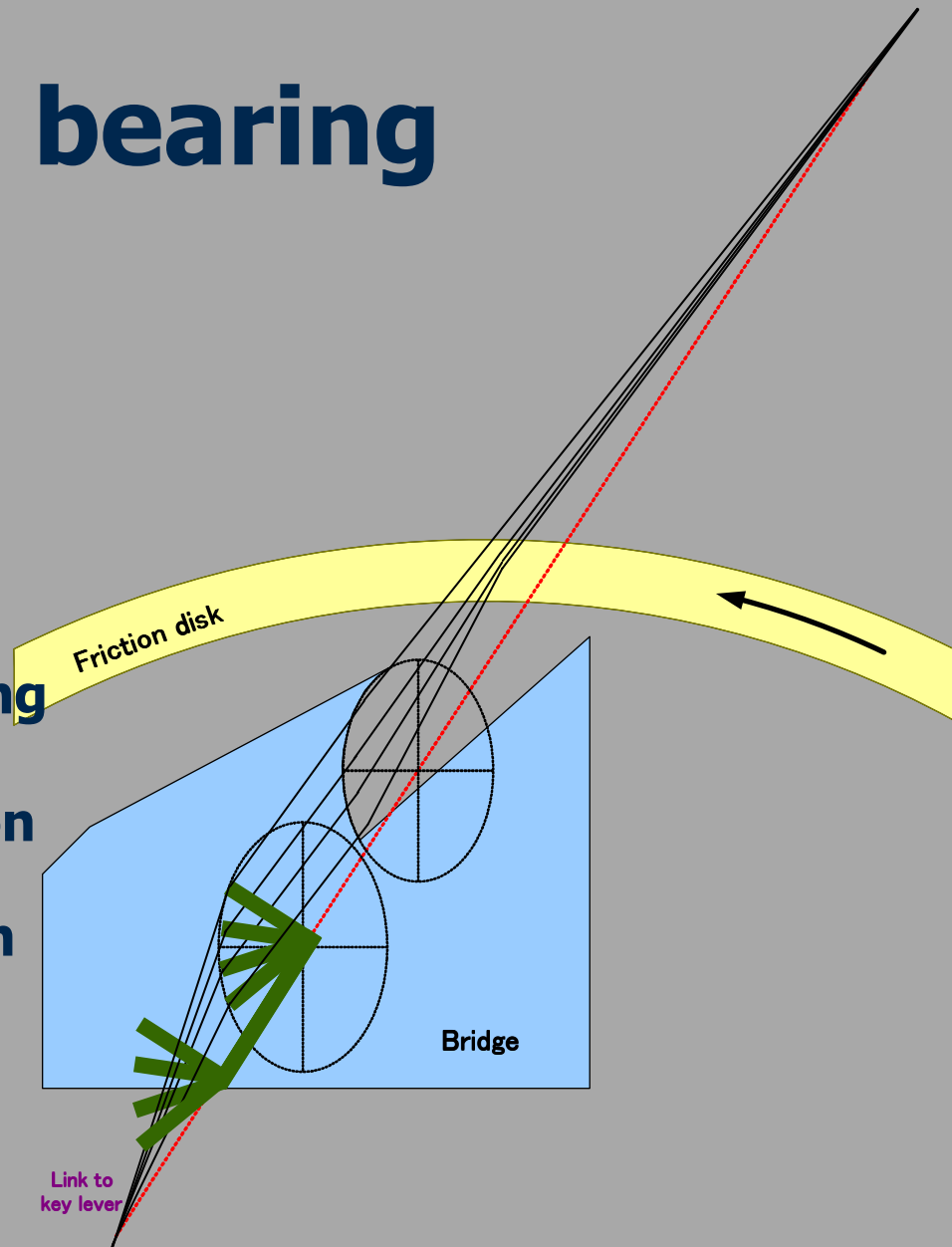
Pitch modulation

- When a string is vertically pushed down, string tension changes proportionally to the key depth.
- This causes pitch change.
- Pitch modulation is one of the unique features of Geigenwerk and cannot be available with other keyboard instruments.
- However, it is not very practical for a player to instantaneously adjust pitch of each note in a complex harmony, consisting of more than 3 or 4 notes.



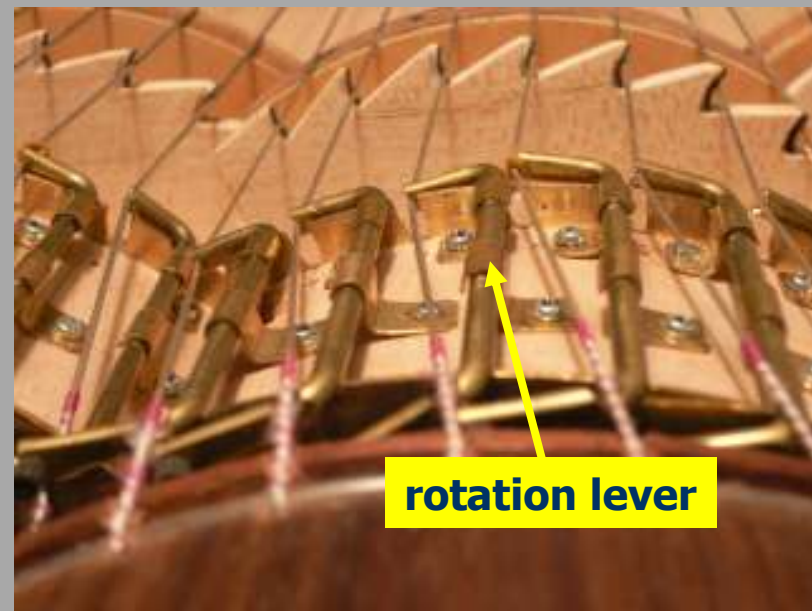
Radial bearing

- String tension does not change with key depth, thus pitch does not change.
- Dynamics can be modulated with finger pressure, independently from pitch modulation.
- Pitch changes when the string is further pressed down.
- As long as the string slides on the concave edge of the bridge, there is neither down bearing nor side bearing but radial bearing between the bridge and the strings.



Key lever linkage to string movements

- A key lever and a rotation lever are connected with a tracker.



Demonstrations

Modulation with rotation speed



Vibrato



Crescendo



Mozart KV. 3



Schafertanz



Amazing Grace



Conclusions

- **A Geigenwerk, imitating violin configuration was constructed.**
- **Dynamics modulations capability, independent from pitch modulation, is demonstrated.**
- **Radial bearing configuration is shown to be effective to maintain constant string tension, while string/bow pressure changed.**
- **Other musical expressions, such as vibrato are also available.**
- **Author would expect players to develop new expressions with unique vocabularies available with this type of instruments.**