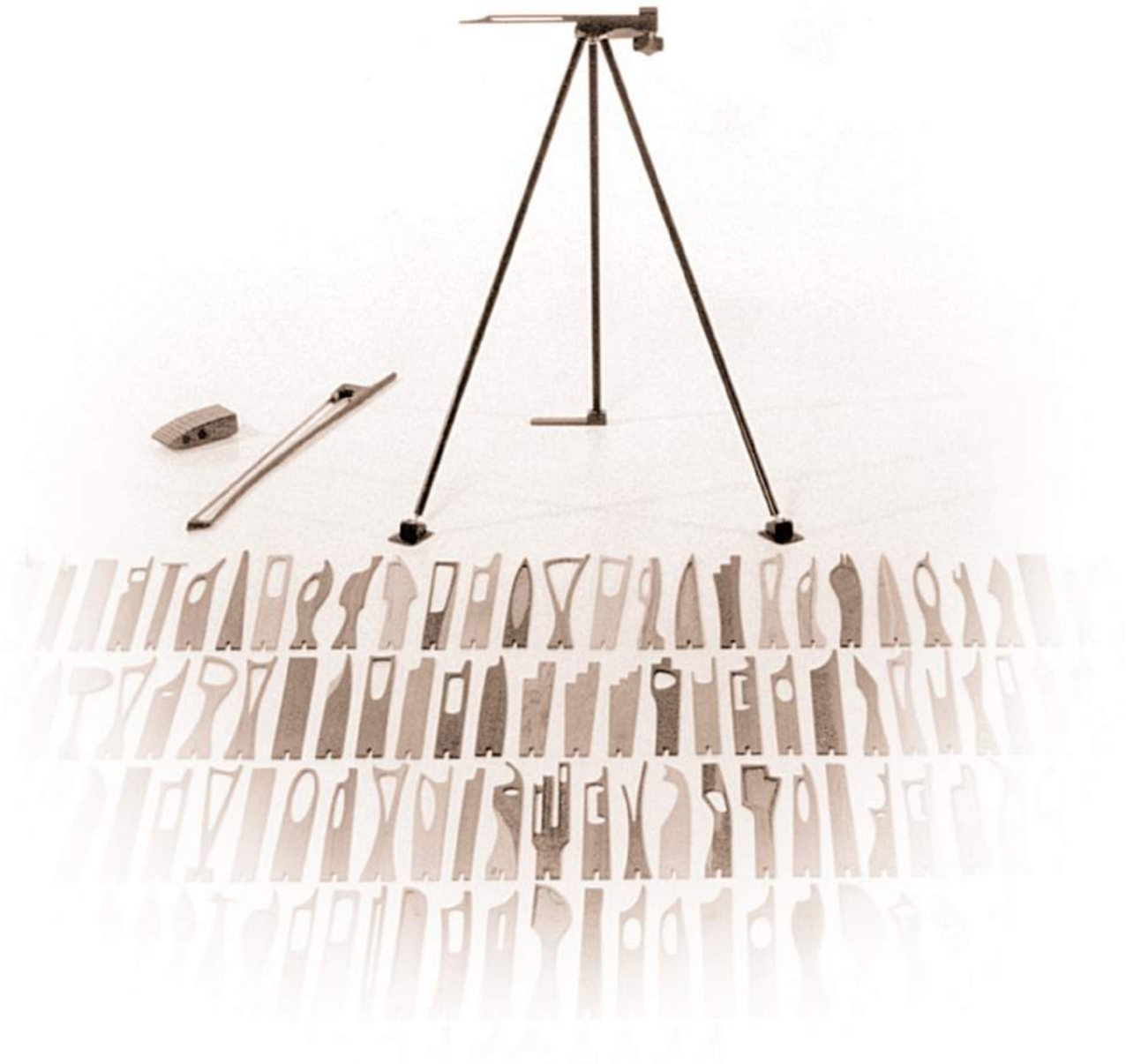
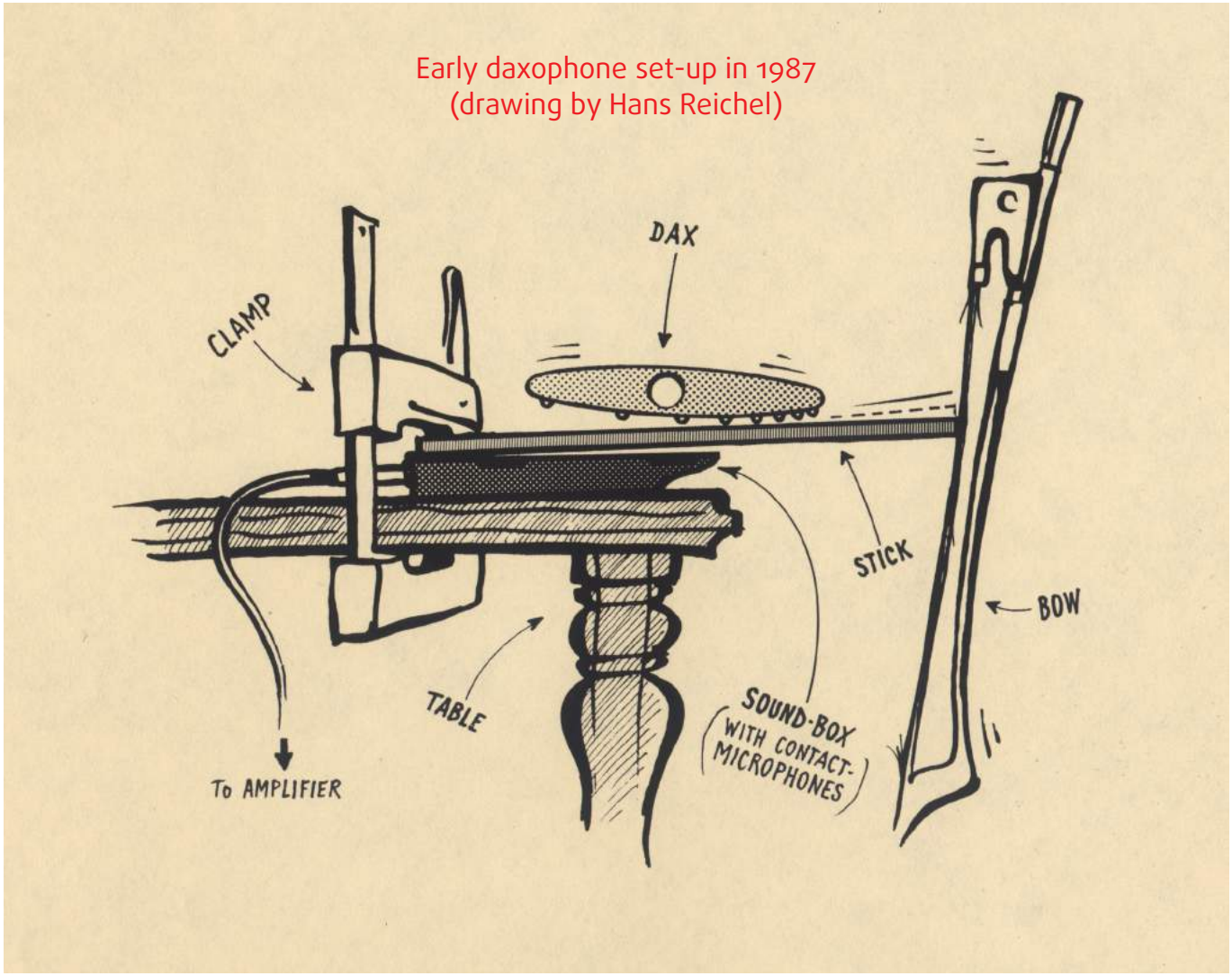


Some information on the daxophone

by Hans Reichel

Early daxophone set-up in 1987
(drawing by Hans Reichel)

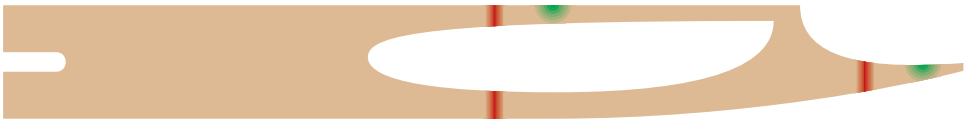


The daxophone belongs to the family of idiophones, i.e. all instruments which produce their own sound without using any other medium (such as strings, membrane, air shaft). It is essentially made up of four parts, two of which are joined together mechanically and two of which are not. A bow (whether this is a violin-bow, cello-bow, double-bass-bow or something else, is purely a matter of taste). With its stroke this bow causes the sound producing piece to vibrate. In my case this is a small wooden board averaging 330 mm in length, 30 mm in width, 5 mm in depth. This strip of wood is fixed by a clamp at what you might call its „foot-end" to the soundbox. This contains one or more contact-microphones which electrically conduct the acoustic/sensory waves. The other end of the strip is in free suspension, like a tongue. Its vibration, i.e. pitch and tonal colour, created by the stroke of the bow, is manipulated by a hand-held wedge of wood, which for the sake of simplicity I call the „dax". This is slightly curved on both sides and is rocked lightly backwards and forwards on the afore-mentioned strip of wood, like a rocking chair. This rocking-dax is integral to the whole thing, because it works to a large extent without mechanical friction. You can create a similar effect by using any other hard object (for instance the handle of a knife), but then the scraping or tapping to and fro creates so much interfering noise that you get fed up with it after a short time. The dax has guitar-frets on one side which get closer together towards one end, like on the finger-board of a guitar. (The frets were placed according to a randomly chosen logarithmic succession). When using this side a scale of distinct notes is created, as opposed to the slide notes on the other (non-fretted) side.
As I am just a right-handed person with two hands, it seemed obvious to hold the bow in the right hand and the dax in the left. As a result the wooden tongue with its attached soundbox has to be fixed and installed so that they cannot wobble. The edge of a table was always good

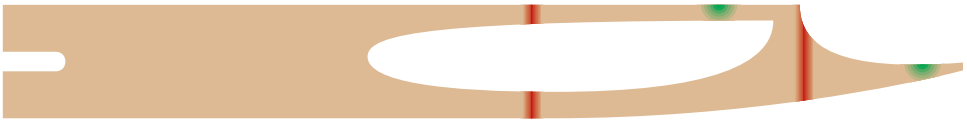
enough for this purpose, but once I was given a table which was almost as big as the stage. As a result, and after several years of thought, I made myself a tripod which can be fixed on the floor and be dismantled and taken away in a carrier bag.

... as it looks today

It's not so easy to describe the different ways in which you can manipulate the pitch of the wooden tongue. What is fairly obvious is that the nearer you rock towards the „foot-end" the lower the tone becomes and vice versa. However, this also alters the tonal colour, adding a kind of „vocal" effect. It makes a big difference which part of the tongue you stroke with the bow in relation to the point of pressure of the dax. In the examples below the red bars indicate the position where the dax touches the strip, while the green dots mark the position of the bow.



very high notes



medium high notes

medium low notes

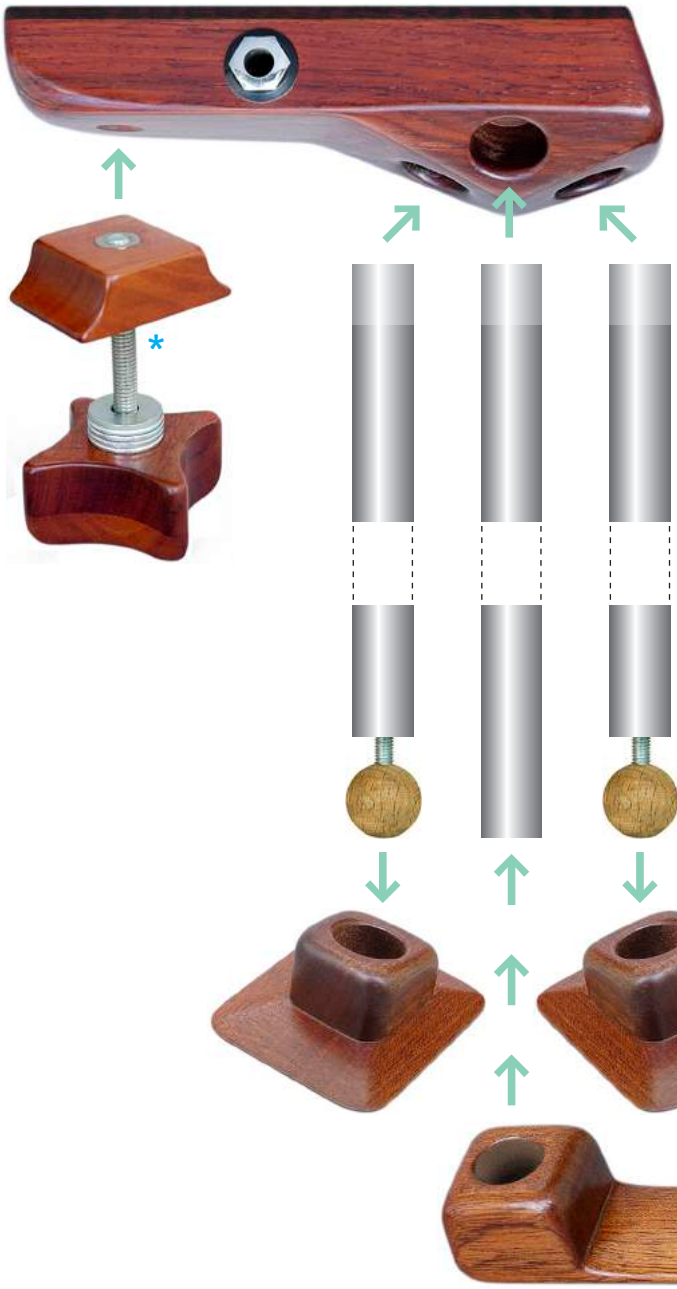
bass notes

However, there is no reliable scale as you would get with a stringed instrument. Somewhere the tone toggles (something like when your voice breaks), and you find yourself in a higher or lower range. So it can happen that playing a certain melody, the strip refuses to intonate the lowest or the highest note of the melody, which sometimes is quite annoying. In this case you have to try out another tongue. It also makes a difference whether you press the dax flat on the strip or just on its side-edge. The sound and pitch alter once more, enabling you to produce the very engaging yodel-effect.
Incidentally, you can, of course, make a daxophone out of any rigid material such as metal, acrylic glass etc. — but, unlike wood, these materials do not produce that versatility of sound. As for the species of wood, I assume there is at least one vague rule: light, not so dense woods with long fibres (like spruce, pine, cedar, ash wood...) are normally loud, bright and crisp, and tend to shriek. Heavy and dense woods (many of the exotics, like rosewood, ebony, but also oak, maple) comparably sound more mellow, and the tones can be controlled more easily.
Last but not least, the shape of the strips matters a lot. As soon as you drill a largish hole somewhere, cut off a corner or sharpen an edge, the thing sounds different yet again. The tone quality as well as the basic pitches can also be altered by changing the depth of the strips. Making them thinner will lower the pitch and make them respond to the stroke of the bow more easily, but at the same time the tone will get weaker. Apart from using a bow it's quite adventurous to treat the thing with a lot of other devices, like pencils with rubber tops, combs, some kitchen utensils, hand-held battery-driven fans and the like.
Since the daxophone in its current shape doesn't come with a real resonator, it requires amplification, especially for low pitches. Depending on the bowing technique, the dynamic range can be extremely wide, and differs from strip to strip — so a volume pedal is absolutely recommended. It should be connected to the insert loop of the amplifier to avoid an audible loss of brightness. The amp should be a clean sounding one, such as a keyboard amp. But that's just a matter of taste — if you're into distortion, go ahead.

photo by **Roberto Masotti**

This Dax is made of Guayak wood (Lignum vitae), one of the heaviest woods on earth. I've found that increase of weight improves the intonation. The plain side is covered with a sheet of cardboard (just fixed with Scotch tape) to mellow the sound and preserve the lacquered surface. Once in a while it should be replaced.

Sound body made of Amaranth (Purple wood). The sound board (of Letterwood) on top is permanently glued on the body. Contains two contact microphones (small piezo-style plates — see next page) and a mono jack outlet for amplification, plus holes for the clamp and the 3 „legs". To prevent humming the interior is electrically shielded with conductive graphite lacquer.

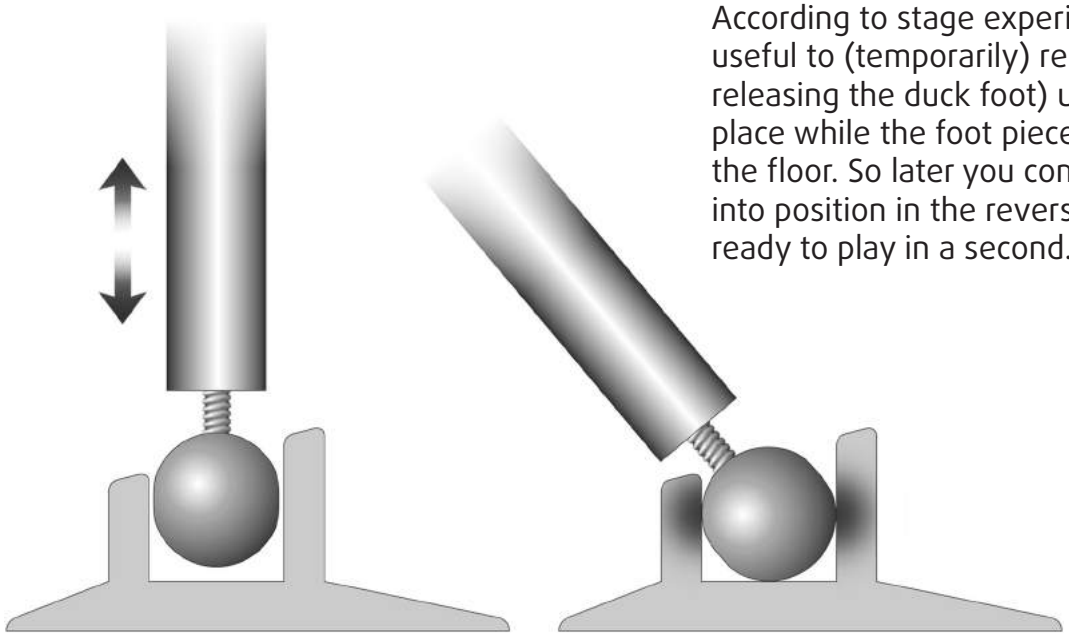


The legs are tubes of aluminum, ∅ 16 mm — 2 long ones (let's say: front legs) with ball ends to be lowered in the respective holes of the foot pieces — and a shorter one to be fixed to the „duck foot" (at the bottom).
On one of the following pages I'll describe how to make the clamp* (on the left).
The washers provide a certain distance between the parts and should not be removed from the screw. In order to hold the tongue in position, the clamp can be turned quite tight, since the respective part of the soundbox is solid. However, applying excessive force will destroy the thread in the long run.

This sound box was made by Minek Mori (Tokyo).

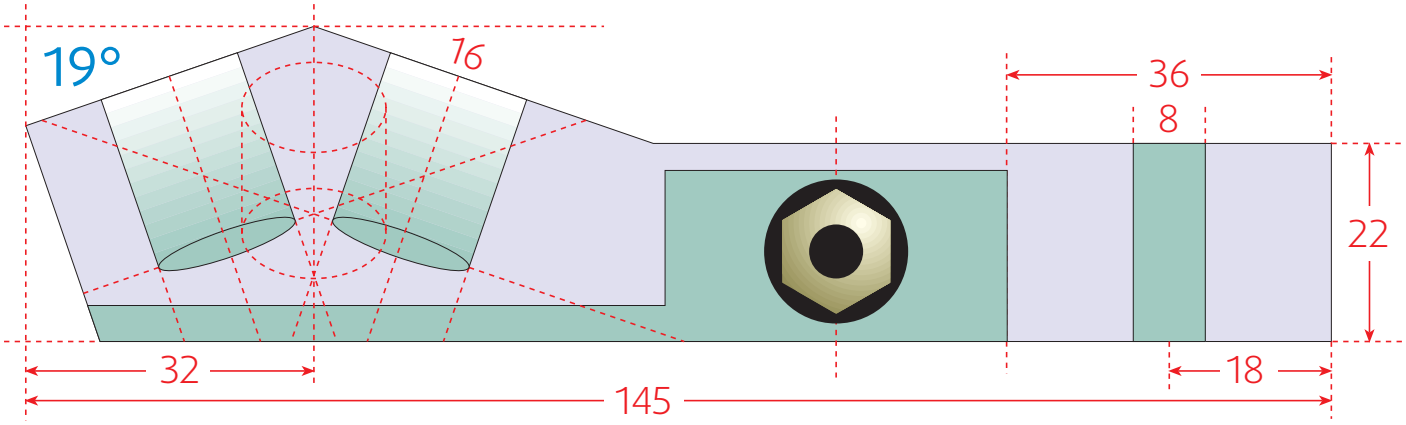
Because people ask frequently: this is the kind of piezo I use — its size as well as its price is a little less than 1 Euro. The one on the left is new, the other one about 15 years old (and it still sounds okay).

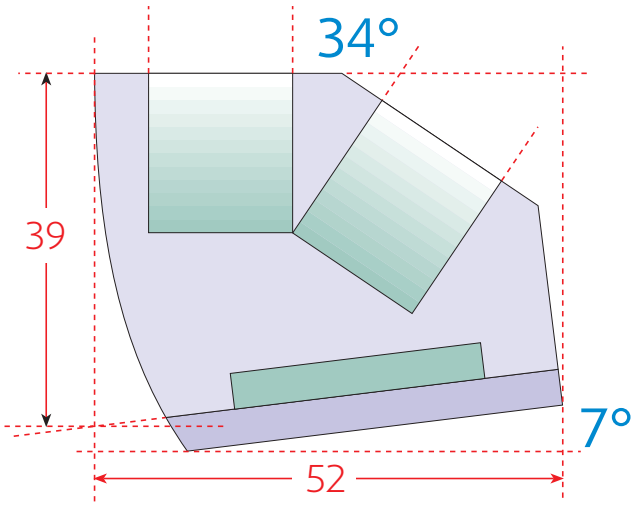
Although it looks quite basic and not really elegant: using adhesive tape to fix the foot pieces on the stage floor has proved to be most practical over the years. I've tried quite a few other solutions, but this one is still the best, at least in most of the cases.
I usually place one of my feet on the afore-mentioned duck foot. In this way the set-up is absolutely stable.

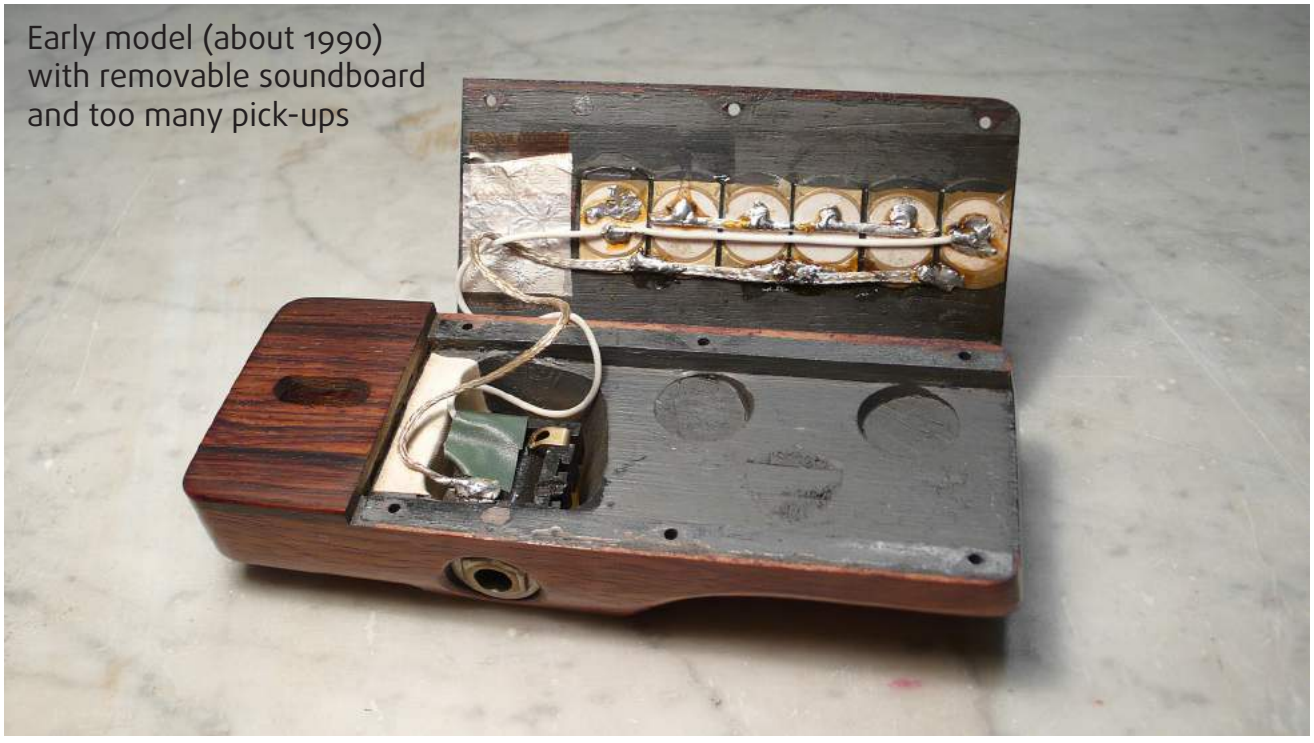


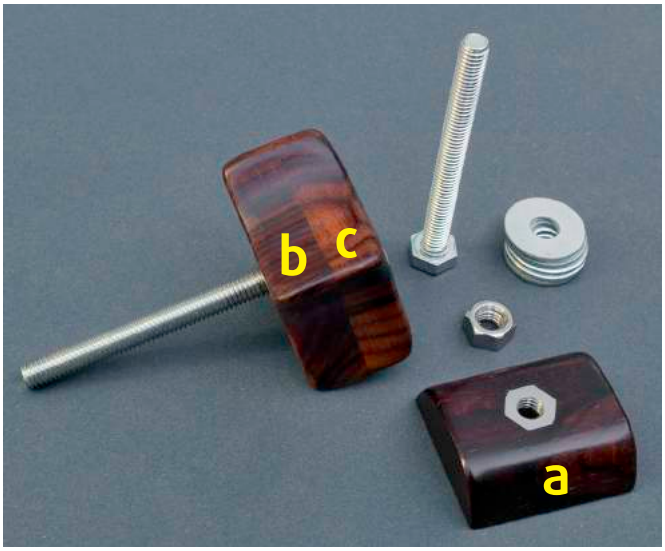
The wooden balls at the foot-end of the legs are not perfectly round, but slightly flattened at their equator. When the legs descend vertically (see bottom left) the balls will slip into and out of the foot pieces easily. In the playing position (right) they will not slip out. According to stage experience it is very useful to (temporarily) remove the tripod (by releasing the duck foot) und bring it to a safe place while the foot pieces remain fixed on the floor. So later you come back and put it into position in the reverse way, and you are ready to play in a second.

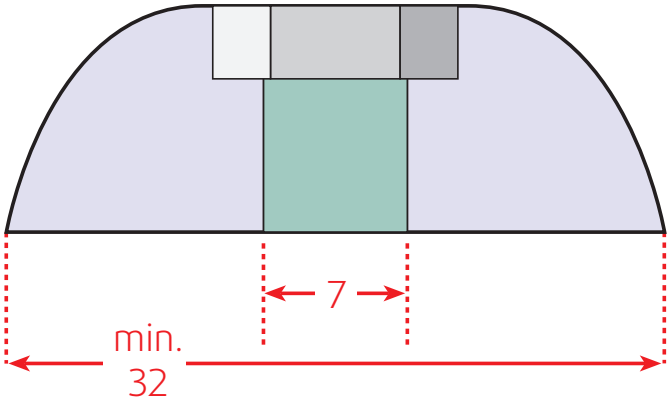
Two virtual x-rays of the soundbox
— all measures in mm







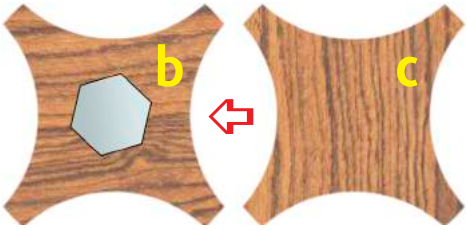




You can, of course, clamp the daxophone tongues on the soundbox with whatever you like.

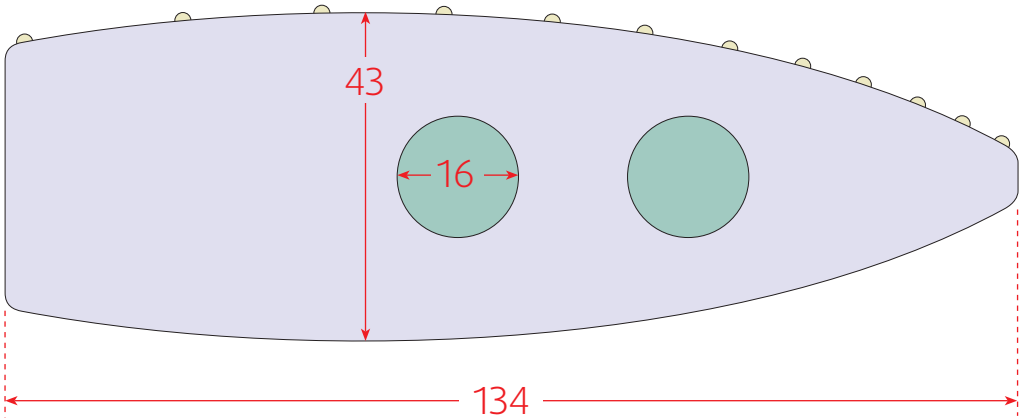
In my case the clamp basically consists of a hexagon-shaped nut (**2**) and a suitable screw, also with a hexagon head (**1**). Thickness of the screw is 6 mm. Furthermore, you need three small pieces of hard wood, the hardest you can get. To make the top of the clamp (**a**), first drill the „through-hole" Ø 7 mm, then the hole for the nut on one side — this hole should be a bit less wide than the nut (so that the nut won't fit in) and a bit less deep than the depth of the nut. Then take the screw and slowly pull the nut into the hole by turning the screw — this will only be possible to a certain extent, because the hole is still too narrow. Then loosen the screw again, and you will find that the six corners of the nut have left their „prints" at the edge of the hole which will help you cutting out the final shape of the nut with a small carving knife. The shape doesn't have to be perfect — the second time you pull the nut down into the hole it will get stuck tightly. After sanding the whole thing (fix some abrasive paper on a plain hard surface) the nut will look as if it had been „melted" into the wood.

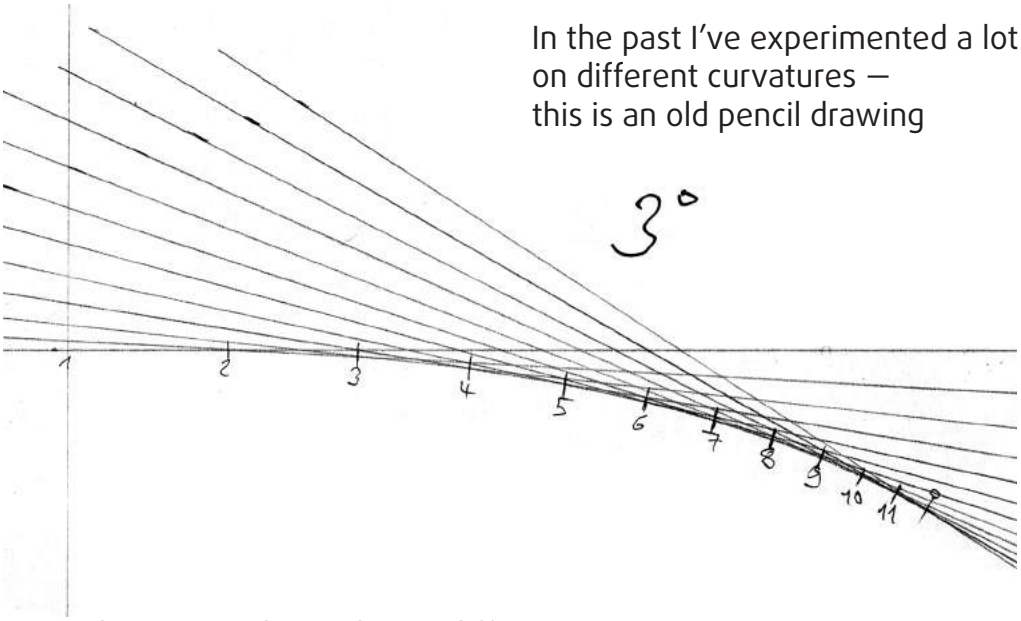
To make the bottom part of the clamp (**b** and **c**) first insert the head of the screw into **b** — it's the same procedure as described before. When everything is tight and plain, glue piece **c** to **b** and make sure that the wood grain of **c** is turned about 90° to the one of **b**, for maximum stability — see the diagram below. In this way the head of the screw is permanently locked inside the wooden knob (which will probably require some final shaping).



Instead of hexagonal screws and nuts you can also use square-shaped or other ones for the same procedure. And make sure you take screws and nuts made of the hardest steel available.

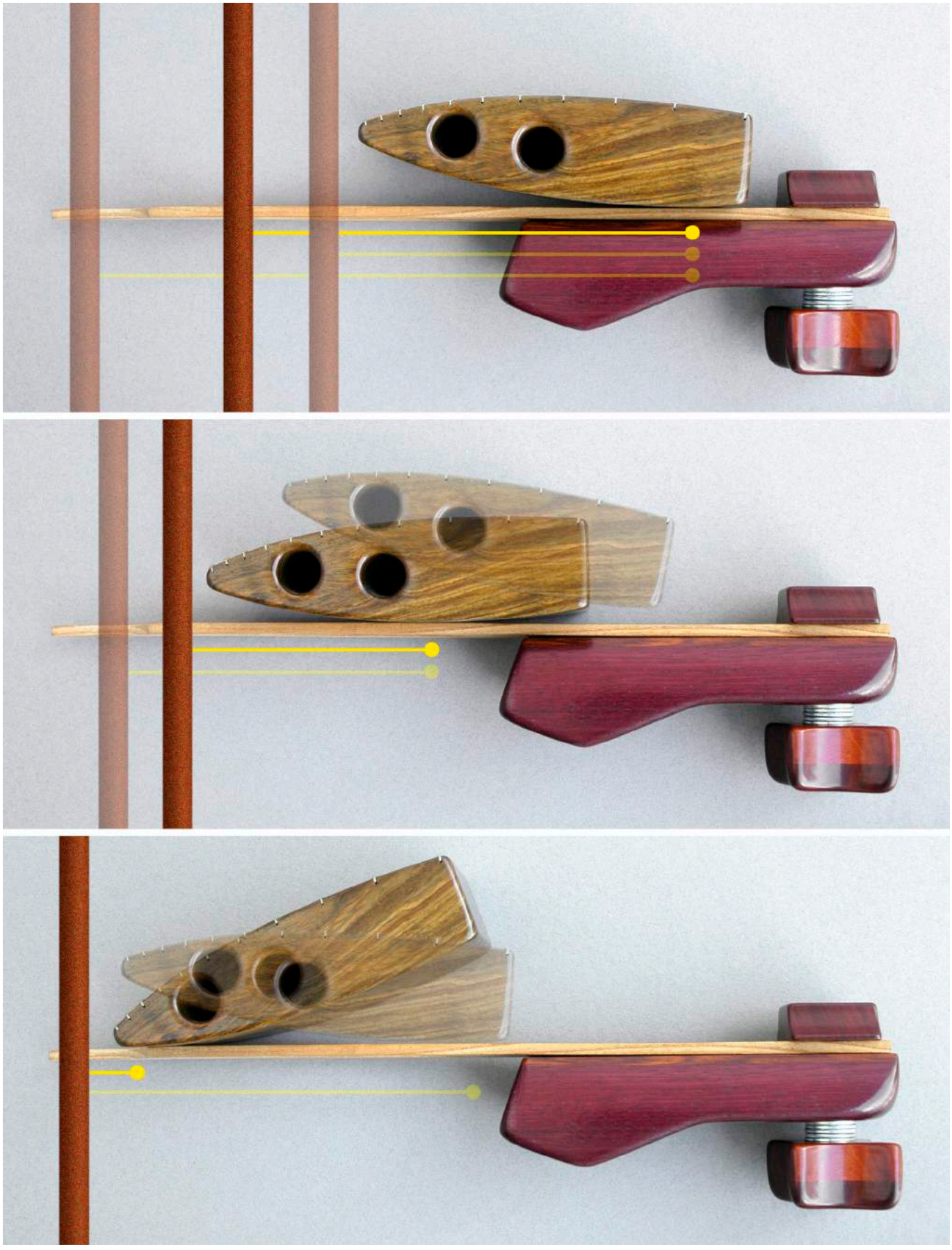
My current dax is a rather massive one, weighing 300 grams.
The diagram below is on a scale of 1:1





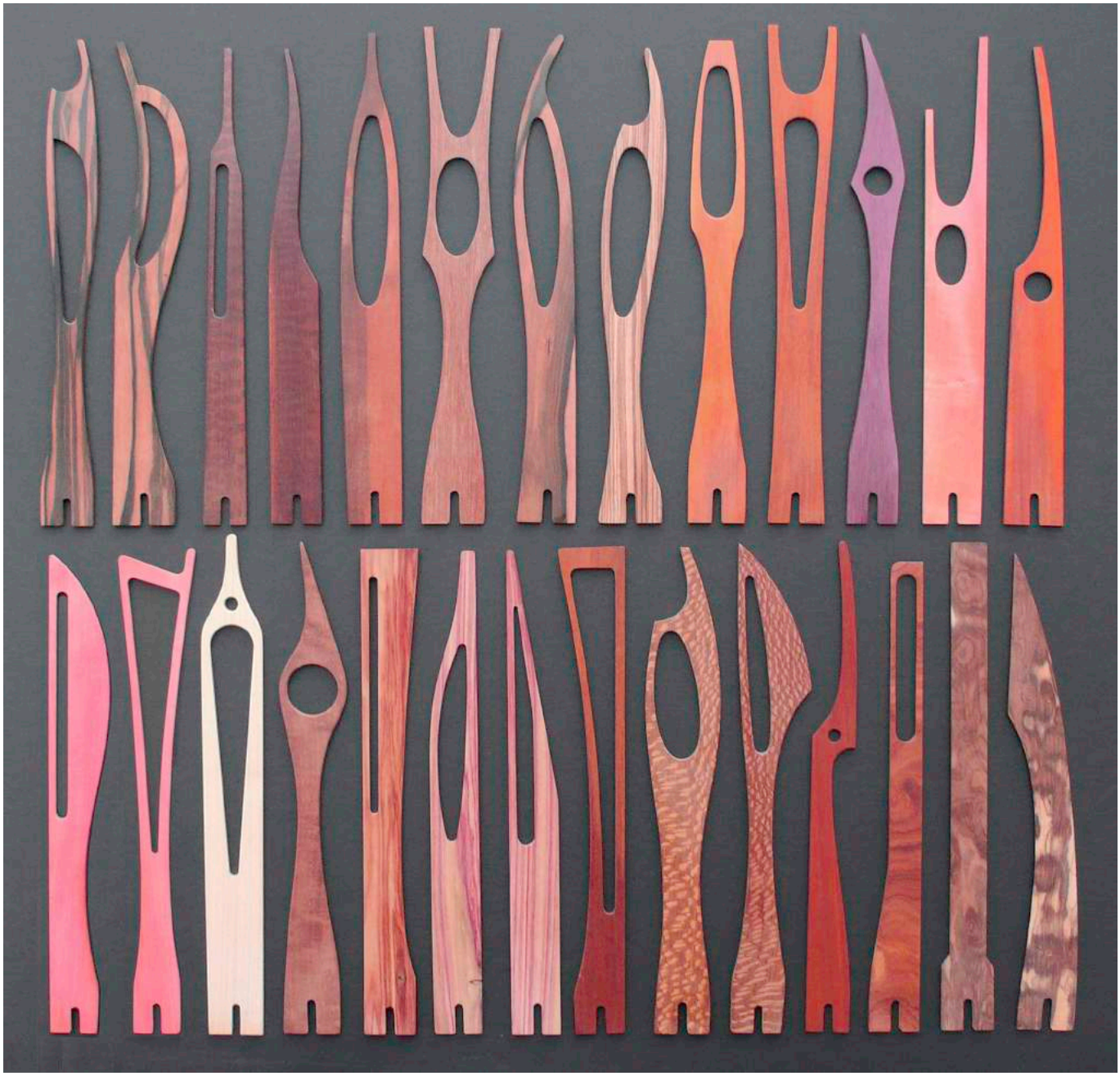
In the past I've experimented a lot on different curvatures — this is an old pencil drawing

An early nineties dax with two different curvatures

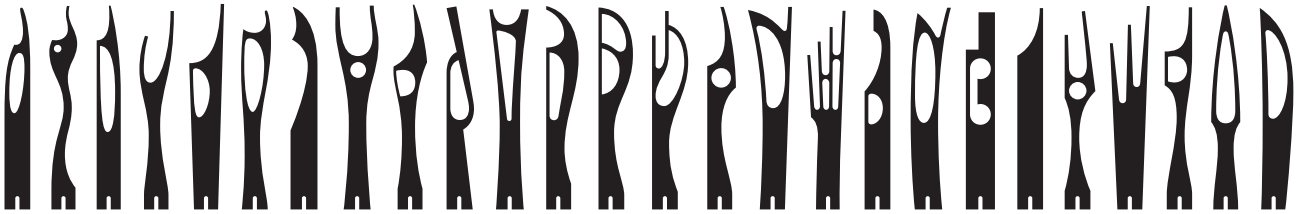


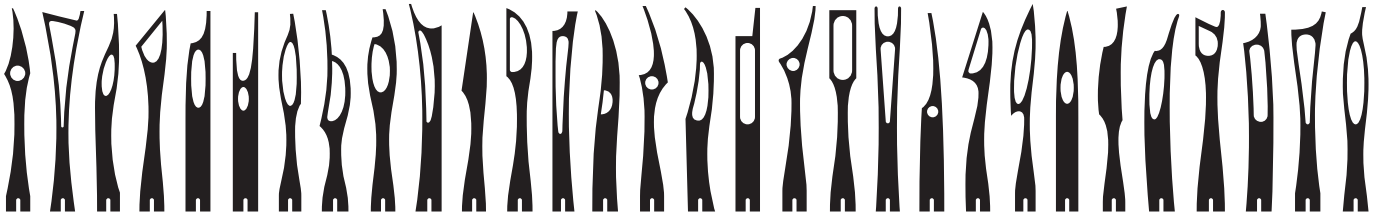
The brown bars indicate some different positions of the bow, and the yellow lines the resulting lengths of the longitudinal (main) vibration. However, one can easily imagine that this matter is much more complex. In any case relatively small alterations of the position of either the bow or the dax produce enormous changes in the pitch and the tone — not to mention the amount of pressure, speed and attack of the stroke of the bow.

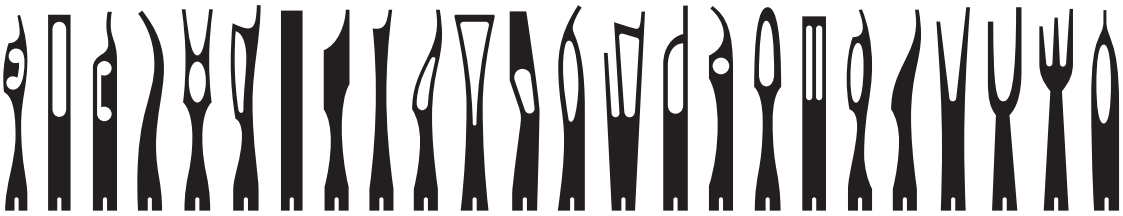
a snapshot
of 2005



In some cases it's hard to believe: all the strips appear in their natural colours of the wood — they are not painted, not oiled, not lacquered . . . just polished with fine steel wool, to emphasize the texture.

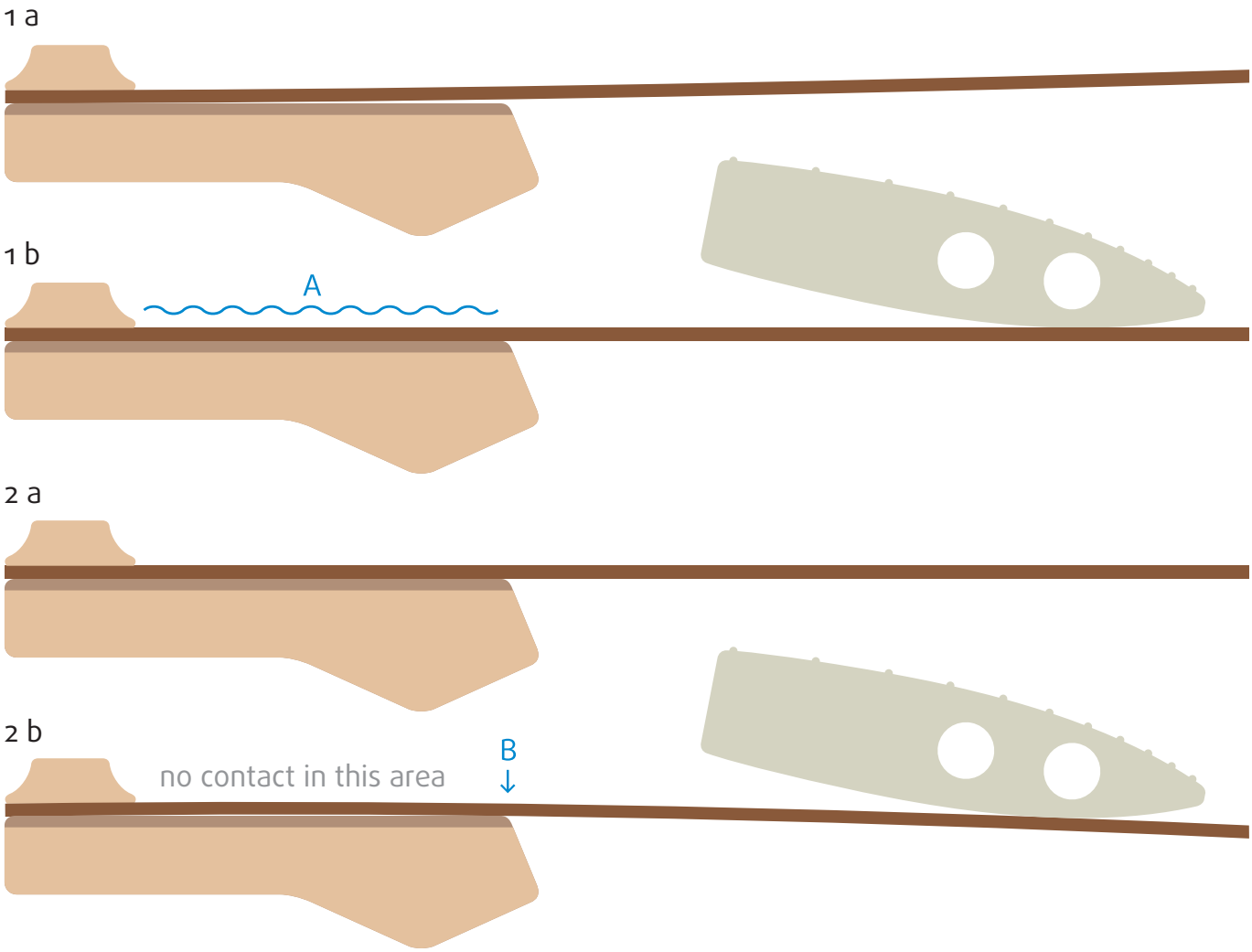






This is a picture font of mine, named „Daxoph“. When you've installed it on your computer, you can type the strips on your keyboard like regular text — the respective characters are located underneath here (in red). You can eventually print out the outlines enlarged to „real“ size (length approx. 33⅓ cm) and use them as tracing templates to make some strips yourself. This font is free — you can download it on my web site www.daxo.de, page 11 (The formats are PostScript Type 1 for Mac, TrueType for PC).

Depending on its flexibility a strip should not be 100% plain, but slightly curved upwards, as seen from the side (Fig. 1 a). When the dax presses it down at the top (Fig. 1 b), the vibration of the wood more or less reaches the entire sound board (A).
If the strip is absolutely plain (Fig. 2 a), the bending of the wood (caused by the dax) will create an almost invisible narrow gap between the soundboard and the strip (Fig. 2 b). In this case there is only one contact point at the front edge of the soundbox (B), resulting in a considerable loss of sound volume.



Admittedly this drawing is a bit simplified and exaggerated. The gap in 2 b may measure less than a hundredth of a millimeter, but still it has the negative effect mentioned above. Apart from that, the flexibility of the strip is related to its depth, as well as to the species of wood. That's why it eventually needs a lot of patience and sandpaper to get closer to the best possible curvature.

By the end I'd say the phenomenon daxophone cannot be readily defined — one could even say it knows no bounds. The present construction and set-up (as described here) is just one of countless possibilities, leaving a lot of room for variation or even completely different solutions. I encourage all people who are interested in this matter to experiment by themselves. After all the basic principle of this instrument can't be more simple: it's a tongue, as well as a ruler at the edge of a table.

Again: made by Minek Mori

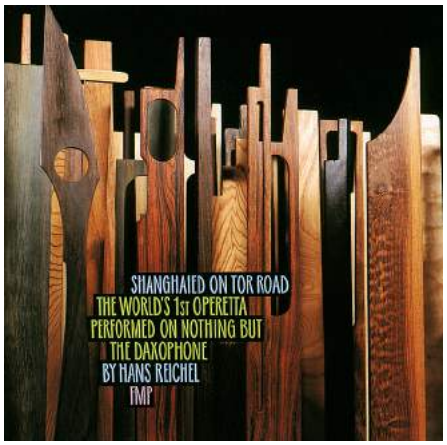
Voices
with a double bass bow

Percussion
with a rubber-topped pencil

Fun
with a mini fan

photos by Jörg Lange

Some CDs featuring the daxophone



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A Guitar and Daxophone Operetta

Rastascan Records 1994
San Leandro, California
www.rastascan.com/catalog/brd016.html

King Pawns

Uchihashi Kazuhisa – guitar & Roland GR500 guitar synthesizer
Hans Reichel – daxophone & guitar
Duets recorded at Big Apple, Kobe, Japan

Zenbei Records 1998
email: bonbon@ro.bekkoame.ne.jp
or: innocentrecords@mac.com
or: uchi@r4.dion.ne.jp

Yuxo

A New Daxophone Operetta

Multitrack recording 2002
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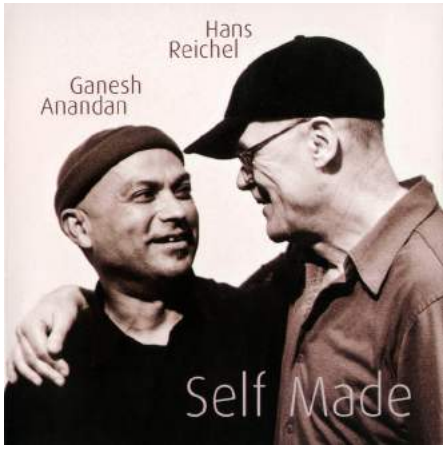

Self Made

Hans Reichel – daxophone
Ganesh Anandan – Shruti stick, métallophone

Duets recorded in Wuppertal, Germany, 2008
1 solo piece by G. Anandan (recorded somewhere else)

Ambiances Magnétiques, Canada
AM 192 CD
www.ambiancesmagnetiques.com/doc.e/index.html