The Construction of a Harp - Erik van den Dool

After more than 40 years of building classical guitars, I decided to build a harp. The only question was: How do you get a design?

In the past I did inquire at the library of the Bouwbrief, but a good harp design turned out to be difficult to trace. I also thought of composing a design myself, but I quickly gave up because I had no knowledge of how to build a harp. And so I went to the Internet to see whether designs could be found there.

After some searching I found a website in Hamburg, the "Folk Friends", who had a number of construction designs for a harp. I decided to find a simple design and that became the "Shepherd harp", a harp with 22 strings and not too big. An American design, because after I had the design in house it turned out that this building design was imported from the USA via www.harpkit.com.

The required set that was sent consisted of a construction drawing, strings, tuning pins, guide pins and some drills with mounting material, quite complete, but of course I had to provide the wood myself, although it is also possible to put all the material in the kit as a kit. USA to order. According to the construction design, for the soundboard actually Finnish aircraft construction birch plywood with a thickness of 3.2 millimeters and with six layers (!) Should be used, but I decided to use Makoré and solid Sitka Spruce for the soundboard for the cabinet.

The construction of this small harp did not prove to be too difficult if one has experience in woodworking and because of its simplicity it did not take too much time to build this harp. See photos 1 to 3.

This harp was such a success that I was asked to build another harp, but a bigger one. Because I already knew the website www.harpkit.com in the USA, I immediately started looking here and the choice was quickly made, it became the Regency Harp. (See the website).

First I received the two construction drawings with description by e-mail after payment as a PDF, after which I had the drawings printed at a copy shop in A0 format on the scale of 1: 1. Then I ordered the necessary set (strings, tuning pins, guide pins and some drills with mounting material), and this was neatly delivered a week and a half later.

I do have to mention that for orders from the USA import duties have to be paid on delivery, but despite these import duties, it makes little difference whether the set was bought in Germany or the USA. Incidentally, it is interesting to take a look at this website to see what instruments such as building kits are offered there.

As the construction of the large harp is very similar to the small harp, I will suffice with just a construction description of the large harp.

The Wood

Also in this design for the soundboard Finnish aircraft construction birch plywood with a thickness of 3.2 millimeters is prescribed and because various sources mention that a harp with this type of wood as a sounding board sounds very good, I have used this plywood with this harp. Although the choice of wood for the sound box is not binding, as stated in the building design, I used cherry wood.

Finnish aircraft construction birch plywood with a thickness of 3.2 millimeters is available from AFH Arnhem. I bought the cherry wood at Kasteel ter Horst in Loenen, where two boards of good quality have been selected from a large quantity of cherry wood planks, see photo 4. This timber merchant supplies the wood as large boards of 40 cm wide and 3 meters long with various thicknesses. Although the wood has been well dried and has been covered for a long time, it is advisable to let the wood dry a little extra.

After drying, a lot of work was needed to plan the large planks to thickness and cut them into shape. Because I do not have a thickness bench with sufficient width, I had the planks planed to thickness.

photo 4

Sound Box and Sounding Board

The sound box has a simple construction and is reinforced on the inside with three transverse partitions. Contrary to the design, I do not have the bulkheads by means of a notch in the sides, but placed on top and reinforced with a side strip. I attached the slats to the side with two screws per slat. My thought was that a notch could potentially weaken the sides and reduce the resonance effect and strength.
See photos 5 and 6.

photos 5 and 6:

I also applied the sounding board somewhat differently than prescribed. According to the building design, the sides are partly milled out and the soundboard and the back are glued into this. Because it is difficult to glue such a large plate exactly into these milled edges, I finished the sides at right angles, then smoothed the cabinet well on the top and bottom, and glued the soundboard on top, leaving the soundboard 5 mm free from the edge is glued.

Gluing in this way is easier because with the help of a straight plywood board and enough screw clamps the baffle can be pressed down sufficiently. See photo 9.

It has been indicated that it is absolutely necessary, because of the high tensile force on the top, to attach the baffle to the sides with nails or screws, in addition to gluing. I myself have used screws with an internal hexagon, which are easier to work and dose than Phillips screws. The distances of the screws are kept equal to the string distances at the location of the baffle.

And of course also pre-drilled and countersunk, so that the heads of the screws do not protrude above the soundboard. See photo 7 and 8.

Then the side edges of the soundboard are filled with edges of 5 x 3.2 mm, and on top of this edge and partly on the baffle, a wider edge is glued over the heads of the screws, so that the screws are not visible (see photo 9).

The back, made of mahogany plywood of 5 mm thick and equipped with the sound holes, which also serve to secure the strings, is mounted in the same way as the top, but less screws are needed than with the top.

The frame of the cabinet is already provided with a top block and bottom shelf. It is recommended to make the small top block in a number of layers of cherry wood, with the wire direction always at right angles to each other, as with plywood. The reason for this is that this top block must be strong to be able to absorb the string force, 300 kg on one side and 300 kg on the other.

On top of the top block there will be a decorative shelf and on top of this another shelf, provided with a rounding with a radius of 170 mm, on which the neck of the harp is attached. Make sure that the neck is not glued to this curve, as it remains a loose connection so that no bending moment is transferred to the case.

My advice is to attach the rounding board later, because it is important that the neck is attached exactly at right angles to the soundboard, which can be made more fitting when all parts are ready. This means that the pillar is mounted slightly at an angle because the pillar is in the middle of the footboard at the bottom.

The Neck

The neck is made in two parts according to the design and each part is milled on the inside in which hardwood reinforcements are glued. It is important to do this because the bending moment in the middle of the neck is very large.

For the hardwood reinforcements I chose Bolletrie (horse meat), which has a high tensile strength.

Although it is not indicated in the design, I have provided the underside of the neck with a cherry wood strip, which covers the reinforcements.

There are two options for attaching the neck to the pillar: using a bolt connection or using a pin connection. I myself chose the latter connection because it is unlikely that the harp will have to be transported in separate parts in the future.
Once the neck is finished as a part, the holes for the tuning pins and the guide pins can be drilled with the supplied drills, which are already precisely sized. The tuning pin holes are drilled all the way through, but the guide pin holes are only drilled on one side with a specified drilling depth.

The Pillar

Sawing out the pillar did not cause any problems. The pillar is cut from a plank as one piece and it is important to ensure that the quality of the wood is good along the full length of the pillar, because this part is most visible. And it is also important to round off the pillar well with the prescribed radius.

The Base Plate

The thread direction of the wood from which the base plate is made must be perpendicular to the baffle. This posed the problem that the planks were not wide enough (40 cm) to make the plank width. And so I glued two planks next to each other, provided with reinforcement strips that were glued into milled grooves, which I thought necessary because of the great forces on the base plate.

The edges are milled with a nice groove in accordance with the design, and then the legs are attached. I had the legs turned because I don't have a lathe myself (see photo 12).

Assembly and Finishing

The assembly of the different parts must be carried out carefully as this determines the quality of the instrument.

First, the base plate must be attached to the cabinet with the supplied bolts and screws.

Second, I glued the connection of the pillar to the neck. But in such a way that during gluing, all parts are first held in exactly the right position with the aid of auxiliary material. This position is that the neck is placed exactly at right angles to the soundboard and that the center of the wide part at the back of the neck is also exactly in the middle of the sound box.

The pillar must be attached to the base plate with two screws, and make sure that when it is correctly positioned, there is no cracking between the pillar and the base plate.

The neck is pressed onto the top of the case using a screw clamp, with a rounding radius of 170 mm on the neck side and on the case side. In the middle there is a dowel that prevents both parts from sliding sideways. Incidentally, it is important that the curves on both parts fit together exactly without play.

To ensure that the two roundings fit together well, I smeared the bottom of the rounding with cherry wood dust mixed with wood glue while gluing, placed a thin sheet of plastic on top and pressed both roundings together well. See photo 11. The result is that after gluing the curves fit together exactly. If all parts are temporarily attached to each other in this way, the connection of the pillar can be glued to the neck, whereby this connection has been made correctly beforehand (see photo 10). I myself have given this pin connection some space, so that it can be adjusted better.

And while gluing, I filled this joint with glue mixed with cherry wood dust, which after drying gives a very hard and tight bond. Then the harp can be put together.

Regarding the finish of the wood: I had already carried out the sanding of the parts before the parts were put together, so that only a little sanding needs to be done.

Modification

After the harp had been in use for several months, it turned out that the upper part of the neck, that is the part that is attached to the pillar, rotated slightly under the influence of the torsion moment, which is created by the eccentric attachment of the strings, causing the distance of the guide pins had to be adjusted. The reason is probably that the design fixing pin, with a length of 114 mm, half of which is fixed in the post and the other half in the neck, is too short in length. Because it was clearly visible that the part of the neck t.p.v. the fixing pin remained straight, while the part above it drifted sideways. However, this was not permissible at one point, so I decided to fix it.

The repair was carried out in the manner as applied to the small harp: 2 strips glued on both sides of the joint harp-neck. I chose the size of the cherry wood strips: 240x50x12 mm, sawn in a purely elliptical shape. Prior to gluing, I had to use both parts of the neck and pillar. return a straight beam and clamps to their original situation.
T
he result works excellently, no more distortions and everything was exactly in the right place again.
See also photo 17D.

Guide and Tuning Pins

The tuning pins and guide pins can then be placed.

To keep the wood surface in the drilled holes as intact as possible, the tuning and guide pins should be screwed in with the appropriate keys. I myself did not use a drill for this reason. See photos 13 and 14.

Strings

Now the strings can be put on and read carefully in the description how this should be done. Small wooden sticks are supplied with the package, which are attached to the strings with a special knot and placed at the back of the soundboard. That works with the thinner strings, but poses a problem with the thicker strings, and so I have to tie two flat knots in the thick strings that establish the attachment, which also works great. The seven steel bass strings already have a counter holder.

I made the mistake of initially tuning the harp one octave too low. But upon inquiry, it turned out that the tuning needed to be raised an octave. And to indicate this clearly: the indicated string A4 has a tuning of 440 Hz, and if this is correct, the rest will follow automatically.

Levers

The harp is a lever harp. I.e. that the strings by means of a parenthesis for each string a semitone can be raised by flipping the hook upwards.

Placing these brackets is quite a job, because the elevation has to be very precise. It is therefore recommended to buy a tuner for this purpose.

Sometimes it may be necessary to adjust the guide pins, especially with the high strings for regulating the lever. Because, by turning the guide pins in or out a little further, the elevation can also be changed, albeit to a lesser extent.

The levers are the most expensive parts, at least if you want to apply all 34 lever, which is not immediately necessary. Ten lever will suffice for a fs and cs tuning, but if you want to provide all 34 strings with levers, this costs 13.50 Euro per lever, which is quite an amount in total.

See photo 17, which shows that part of the levers have already been placed.
In photo 17A the levers are visible in a lowered position.
In photo 17B, one lever is down and the other is up.
Photo 17C shows what the lever look like when they are not mounted.
On photo 17D a number of levers have already been placed and the modification of the neck-pillar connection can be seen.

For any advice on placing the hooks, you can also inquire at Harpcentrum Wehl.

Regarding the tuning of the harp: If the harp is tuned in the C scale, you can the parentheses raise the strings to F sharp, C sharp, G sharp, D flat, etc. The problem is that the lowering to B flat, E flat and A flat is only possible by setting all parentheses up and the b, e and a parenthesis down case of the ES scale. And so it is not possible to play along with other instruments because the harp is then tuned a semitone too high. This is overcome by raising the b, e and a levers while tuning, and then simply tune the harp in C. This ensures that both lowered and raised scales can be played without changing the tuning.

Overview of costs:
Aircraft construction plywood 3.2 mm, 6 layers, 155 x155 cm: 119.79 Euro.
(Only half of this plate is needed, but a smaller sample is not possible).
Back 5 mm mahogany plywood: 20 Euro
Cherry wood: 1 piece 290x40x2.7 cm and 1 piece 360x35x5.2 cm: 159 Euro
Building plan: $ 49
Strings, Pins, Drills, Hardware, Key: $ 400.21
Import duties: 85.89 Euro
The costs for this harp, with 10 hooks, therefore amount to about 930 Euro. That is considerably cheaper than a purchased harp, while the quality is certainly not inferior.

The construction process: some tips

Building this harp is no more difficult than building a guitar, only the different parts are a bit bigger. It is recommended that all important inch sizes on the US drawings be converted to

millimeters in advance, where one inch is known to be 25.4 millimeters. The usual tools will suffice, but a good jigsaw is certainly recommended.

For years I have been using self-made tools for finishing and smoothing the wood, which are used as scraping steel. And I do change an ordinary triangular paint scraper, which is for sale for a few euros, into a modified scraper. Normally the paint scrapers are delivered with a sharp angle. But on a wet stone I sharpen this sharp angle with a much smaller angle, approximately between 15 and 20 degrees.

Due to the pulling movement and the possibility of applying pressure on the scraper with the other hand, one can exert greater force. The result is such that, especially with hardwood, there is hardly any need for finishing after flattening. Although I have many other tools, this simple tool is the one most used for finishing and I highly recommend giving this tool a try.

The result

Two modifications have been made, see photos 5 and 6, and the use of two strips of cherry wood 240x50x12 mm in a purely elliptical shape, see photo 17D. Especially the latter reinforcement is recommended.

But the result is really beyond expectations: The harp gives a beautiful and full sound.
It takes a while before the strings stay tuned. According to the manual, only after 50 votes.
Once the harp is tuned, it only needs to be tuned once a week.

The end result can be seen in pictures 15 and 16.

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References

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