

A Janko keyboard adapter

A hardware isomorphic keyboard converter that can be mounted over your conventional musical keyboard in the wink of an eye!



Fig. 1: Wow, is it a S.F. movie prop or is it a real keyboard?!

By Marc Brassé

1 Impulses!

It can often be difficult to remember what actually started of a project. Where the first idea came from. Well in this case the sparkle came from one very definitive source.

Late 2015 I stumbled over a nice little YouTube video in which somebody called Steven Moseson showed of his conversion of a standard piano type keyboard controller into a very different layout (see the literature overview in paragraph 14 for the link).

That little video triggered a lot of questions. What was the sense behind such an effort? What was this mysterious Janko layout that was mentioned?

2 Keyboards!

First things first though, and this time we are talking about a much older impulse.

Question: Do you sometimes play keyboards?

Second question: Have you ever had a moment when you thought: What an awkward thing this is? My fingers constantly seem to want to do other stuff then I want them to do? In other words: Why is it so darn difficult to learn to play a piano keyboard effectively?

Well I surely had such a moment, although I could not tell you exactly when it was and thus how far back. What I can tell you is that it started a long love and hate relationship with what we all recognize as the classical musical keyboard.

Now, I will not go on to decimate that existing design. Millions of people have used it quite effectively and I can look in wonder at the best of them, those who have been trained so thoroughly in using it that nothing they play seems to require any effort. At the same time I do know that I will never be able to join them. Of course there is the old cliché that you have to start very early to get really good at it but just like most mortals I can be glad to more or less cope at all. And no, my fingers are not too thick or shaped strangely. It's just that my hands are not very good in translating my often elaborate musical ideas into exact muscle movements. Nothing more, nothing less. Man, I already have trouble with typing stuff like this at the speed I come up with it. My first drafts are always total gobbledygook. But let's not go there anyway.

In fact the standard keyboard is a damn fine compromise. It takes the ergonomic demands of the human hand into consideration, combines that with our western 12 tone system and still is able to drive an elaborate mechanical system.

Of course today's typical electronic keyboard does no longer trigger a complete set of levers to hammer or twang a real string or mallet. Still modern keyboards have the same ergonomics. Those who teach it have learned their trade on it themselves and are thus rightfully proud of their accomplishments. Add the inherent conservative nature of man and the reasons why it has lasted so long are clear enough.

3 Never change a winning team?

So why change anything at all then? Good question. If everybody seems to have agreed on a certain standard why indeed change it all?

Well, without diving into the complete history of keyboard design one must be aware that there have always been people who had a similar relation with the musical keyboard as I have. Nothing new there either. So if you believe everything can sooner or later be changed for the better this is actually a quite unavoidable question.

In this second decennium of the 21st century the question is as relevant as ever. New technology enables us to construct soft and flexible control surfaces that are sensitive to multiple instances of pressure and movement. Suddenly we have to ask ourselves if we really still need a mechanical keyboard at all.

This project does not go that far. It stays closer to the standard, but it still concerns itself with the frustrations I and many others have with the existing layout.

What this general development at least reminds us of is that many more solutions are possible. One can for example argue that more than enough life is left in the concept of the mechanical keyboard. It can still offer many advantages.

Who has ever done some typing on an old-fashioned mechanical typewriter, these strange contraptions with their keys rising up like the rows of seats in a stadium? Such keyboards have almost completely been surpassed by many a flat contraption, including the one I am typing this on. Still that old typewriter-keyboard, the one which actually gave as the QWERTY standard, is still the more ergonomic solution. It is much more natural for our hands and fingers to type on such an offset keyboard auditorium. Which is an aspect that most modern controller designers seem to forget. That's much too expensive to build, man!

As such the idea to use such a more ergonomic layout is not new at all. Ever heard of Paul von Janko? Neither did I. He was one of those people who think things can always be done better. In the 19th century he already came up with an alternative for the conventional keyboard, bet his whole fortune on it and died a poor man. What he did leave behind however was a design that is so convincing that it has still not been fully forgotten after all this time. Again and again it has popped up and, like those other esoteric modern control surfaces, seems to go through a sort of renaissance because the few people who use it can now share their experiences on the Internet.

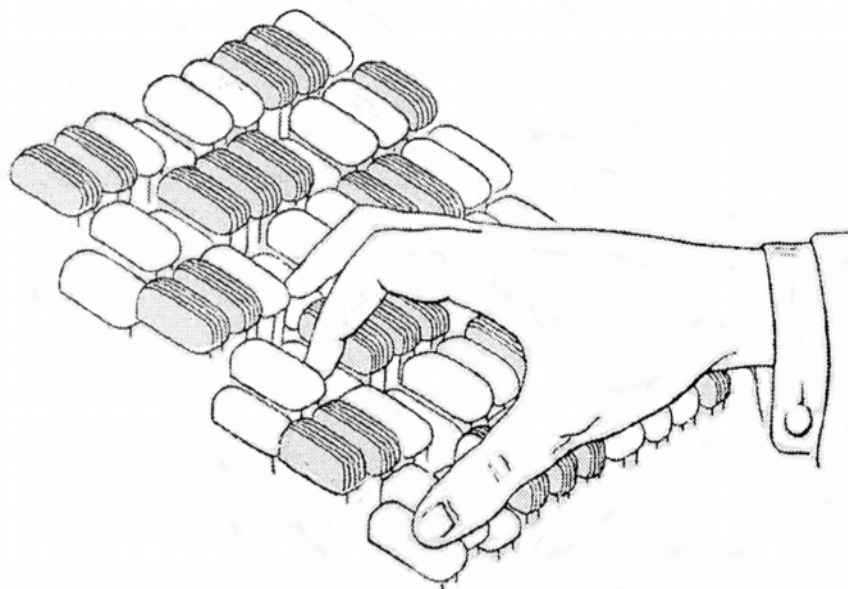


Fig. 12.

Fig. 2: More then words can say. The Janko Keyboard layout
(This is a slightly edited version of fig. 12 out of Paul von Janko's book. See literature list)

4 The Janko layout advantages

Again: One could discuss the conventional keyboard's advantages and disadvantages for ever. Exactly because it started of as a compromise between ergonomic needs and mechanical limitations it also has a few distinct disadvantages. So not only my unwieldy fingers are to blame!

The Janko layout goes far in removing these disadvantages.

The shortest descriptive terms are to call the Janko an **uniform** or **isomorphic** keyboard. These words indicate that the keyboard offers the same size keys for every note and also ensures that all movements or grips one needs to perform music on it are the same in every scale. The Janko is not the only isomorphic design in existence but it surely is a very logical and practical one.

I will not fully describe the Janko layout here. For this document it is more important to see what adapting Janko's idea's can bring us today. Those who want to delve deeper into the subject can do an Internet search. The literature list in paragraph 14 gives a few good leads.

These however are the biggest advantages of a the Janko keyboard layout when compared to the traditional one:

1. All keys are equal size. To me this one of the most important aspects.
 - As already remarked I am not very dexterous by nature and thus not very good good at hitting those narrow black keys with any real consistency.
 - All pitches in our 12 tone system also become equally accessible in a wider sense. Therefore it take away the old ergonomically induced "white supremacy". That might at first sight sound a bit like a repetition of the previous point but think about it: Even skilled fingers will be less inclined to fall into ergonomically preprogrammed harmonic choices on a keyboard that provides an equal surface for every note. So this layout also provides more harmonic freedom to those who are already "handy".
2. An official Janko keyboard is actually less wide then a conventional keyboard. Distances between

keys are therefore shorter and grips bigger the one octave much easier.

3. As already remarked the height difference between the rows actually feels very natural, like an old school mechanical typewriters keyboard, thus being more ergonomically shaped then a modern flat computer keyboard.
4. On every horizontal row the distance between adjacent pitches is always 1 whole step. Very logical!
5. Vertically seen the rows are offset to each other by a half step. Again: very logical!
6. So to play all steps in the 12 tone system you simply play all notes on 2 rows. Like playing A,W,S,E,D,R,F,T,G,Y,H,U,J,I,K,O,L,P, etc. on on a QWERTY keyboard.
7. The other pairs of rows simply repeat the above system. So you always have more then one key to play the same note. On a 6 row version 3 keys per note, on a 4 row version 2 keys per note. That makes it extra easy to avoid awkward finger movements, like having to reposition the thumb under the rest of the fingers to play full scales.
8. There is only one way to play a scale on the Janko. If you wan to play in another key you simply begin on a different note. So only one movement pattern has to be learned to play full scales. On a conventional keyboard every scale has another pattern.
9. On a conventional keyboard you constantly have to realign your fingers to play chords, even for the chords within one scale. On a Janko you basically only need to learn one grip per chord type (1 for major, 1 for minor, etc.) The extra key rows of course again provide alternatives for that but you only have to use those if it is more convenient (see point 7).

What does that all mean in practice? Well, If you look at somebody playing a Janko keyboard and compare it to conventional playing you will see that the hands of the Janko player do not have to dance around on the keyboard as much. Everything simply seems to go much easier. Actually playing one yourself confirms this. One might at first not find all pitches where on expects them but when one concentrates on the purely ergonomic aspects it all feels peculiarly natural.

So in other words: Much more logical. Much more ergonomic. I did not know about it before but as soon as I saw the principles it went PING! in my head. This should no be a "novelty" but the standard.

5 The Steven Moseson layout

So that is where a single YouTube video took me. On a voyage of discovery that made it clear to me that this might be the very thing I had instinctively been looking for all these years.



Fig.3: The direct inspiration: Steven Moseson's permanent conversion

Not that Steven's version is an "official" Janko:

- When one wants to convert a conventional keyboard the average width of the conventional keys, say the total width of one octave becomes leading and thus the keys must also become wider than on the original Janko layout. On such a version the advantage of easier gripping beyond 1 octave (see point 2 in the original list) therefore does not survive.
- This is however partly compensated by the fact that the keys are extra wide when compared with Janko's "official" layout.
- Furthermore keys are on average still where one expects them when one is used to a conventional keyboard. Gripping a full octave is for instance the same as it ever was.
- For similar practical reasons Steven has reduced the number of rows to 4 instead of the 6 on the original Janko. So instead of 3 keys per pitch there are only 2.

When one is aware of how much survives the losses are however quite marginal.

6 The final ingredient

By now I was totally sold on the idea. The next question was: How difficult would it be to build my own version? Should I strictly follow Steven's interpretation or was there even more to gain?

Would it for instance be possible to build a sort of adapter? One that would not convert the chosen keyboard for ever but could also be removed on demand? Then I would not have to buy yet another keyboard instrument to convert.

Wait a minute! What about a version that could be transported from one keyboard to the other? An adapter that I could use on almost any conventional keyboard I have at my disposition?

Eureka!

For many reasons the most certain road to success was to come up with a rather basic concept. It would already be difficult enough to combine a long row of individual keys into one single contraption without having to build some overly complex and weighty mammoth.

In my mind I almost immediately saw a central rib to which levers with incorporated touch surfaces could be attached. That rib itself could then be attached to the housing of the keyboard it was to be used on, assuming that the weight of the adapter itself would not already keep it in place firmly enough (which of course still had to be proven at that time).

The last logical step was to decide to make adapters that would at least have the correct measurements and lengths for my Starship One setup, which already contains many of my favorite enhancements. So even if I would not end up with a totally universal solution I would at least have one that fits my most important instrument.

7 Easier said than done

First there is the inspiration, then there is the idea and then the real trouble starts.

I did a bit of research about the original Janko design. I also found some proof of other constructions along similar lines of thought (also see the literature list in paragraph 14).

But would it be possible to actually build a real adapter? Something that was practical enough to work, could be built with standard tools and out of standard materials. Of course one could imagine a very advanced contraption, constructed out of specially molded high spec material parts, up to a perfection that those wobbly fingers of mine would never be able to match. This thing I however had to build myself. Gulp!

For that reason I decided on a much more practical approach. I intentionally did not begin with an elaborate 3D CAM design that would probably never be built (the world seems to be full of such designs nowadays). Another reason to go down this path was that there probably is no market for a real production version, at best interest from a small circle of other enthusiasts. Therefore I decided to go the more artisanal route that I had already applied to my other musical instrument projects.

8 Time to do some measuring

The first practical step was to work out what the measurements of the main rib would have to be. An adapter can after all only be universal if it fits on every imaginable instrument.

Did I already mention that I own quite a big pile of keyboard instruments? So I had enough sample material in my possession. To not bury myself in endless lists of measurements and statistics I put together a shortlist:

- Technics WSA1 (as is already incorporated into the Starship One)
- GEM S3 turbo (ditto)
- GEM Promega 3 (an excellent digital piano with a very good, grand piano like, weighted keyboard)
- Rhodes Chroma (a early 80ties synthesizer classic with an above average keyboard)
- Yamaha E70 (the basis of my Son Of GX conversions)
- Yamaha SK50D (an underrated multi-keyboard instrument)

I will not bore the reader by describing all the results but in short the conclusions where the following:

1. There is NO definite standard for musical keyboard design. Although there seems to be a general consensus about the average dimensions nobody seems to do exactly the same.
2. Many keyboards Yamaha used for their Electone organs and early 80s SK and CS-series instruments are not even close to the rest. Their keys are decidedly less wide then normal. So much even that it might actually explain why some of these instruments where not very popular at the time. Their keyboards just feel kind of awkward and now I had the statistics to prove why. I therefore decided to cut them from the shortlist. Otherwise they would distort the averages too much.
3. The good news however was that the other keyboards where close enough to each other to extract a sort of "should more or less fit every standard keyboard"-norm". Again: I will not bother the reader with all details but one can imagine that by comparing the average measurements but also by looking very definitely at what the allowable minimal and maximal measurement should be, I could come up with a "standard" that would at least fit the main workforce of my "fleet".

I then incorporated my conclusions into a rib prototype. To this the other parts would have to be attached. You will find a drawing of it in figure 4.

The next step was to design a set of levers that would replace the wooden blocks that Steven glued directly to his keyboard. These would then be individually connected to the main rib, thus resulting in one complete contraption that was not dependent on the existing keyboard to stay in one piece.

That did however mean a complication presented itself. Attaching these levers directly to the rib would lead to new hinge points that are not on the same axle of rotation as the keys of the original keyboard. I was however quite sure that I could negate most complications by simply allowing each lever to slide over the existing key it overlaid.



Fig. 4: The rough prototypes

To keep an even longer story short: I then began sketching, sawing, hacking, grinding, swearing, etc. until I had a set of basic shapes that should provide the needed functionality, not get into each others way and still provide tolerances that are high enough for the basic tools and dexterity I have at my disposition. In figure 4 you see a picture of these prototypes. Nothing much to look at. Not very advanced in their design. But they worked.

9 The complete concept

Figure 5 shows the full **design concept** in the form of a standalone model

Please be aware that the backside of the lever is not attached directly to the rib. In that case the rib would have to be so flexible that it could bend enough to give each individual lever its own room to move. The angle the lever has to go through is not that big but the levers are as close together as the average key on a conventional keyboard. So in that case the rib would have to be made out of a very flexible rubber!

In reality both the lever and the rib are only attached to each other by a **connecting strip** that runs under the whole length of the lever and then further under the rib at the right side of the picture. This strip is also the piece of material that should enable the lever to **slide** over the key of the conventional keyboard underneath.

You can see the seam between the actual lever and the connecting strip quite clearly in figure 5. Another indication for the existence of this connecting sheet spring is that the rib segment actually seems to hover a bit above the table.

Figure 6 shows the attachment principle from another angle, this time as part of a complete assembly. Here you see the whole adapter from below, so from the side that normally comes to sit on the keys of your conventional keyboard. The main rib now is at the top of the picture.

The gray strips individually connect each lever to the main rib. These **individual connecting strips / sheet springs** allow each lever to move independently from the rest of the construction.

Also note the small wooden **distance blocks** that make sure that all levers sit at the right distance from each other. Obviously they are only glued to the levers at one side. Otherwise the levers would still not be able to move fully independently. So when you press a key / lever the block moves with the lever to which it is attached and slides over the adjacent lever.

Why not make the levers themselves wider? Firstly the surface on which they touch would increase and thus the friction between them. More important even: The spacing between the levers are actually necessary to compensate for the already mentioned differences in the conventional keyboard designs out there. So wider levers might actually not be able to move freely between the black keys.

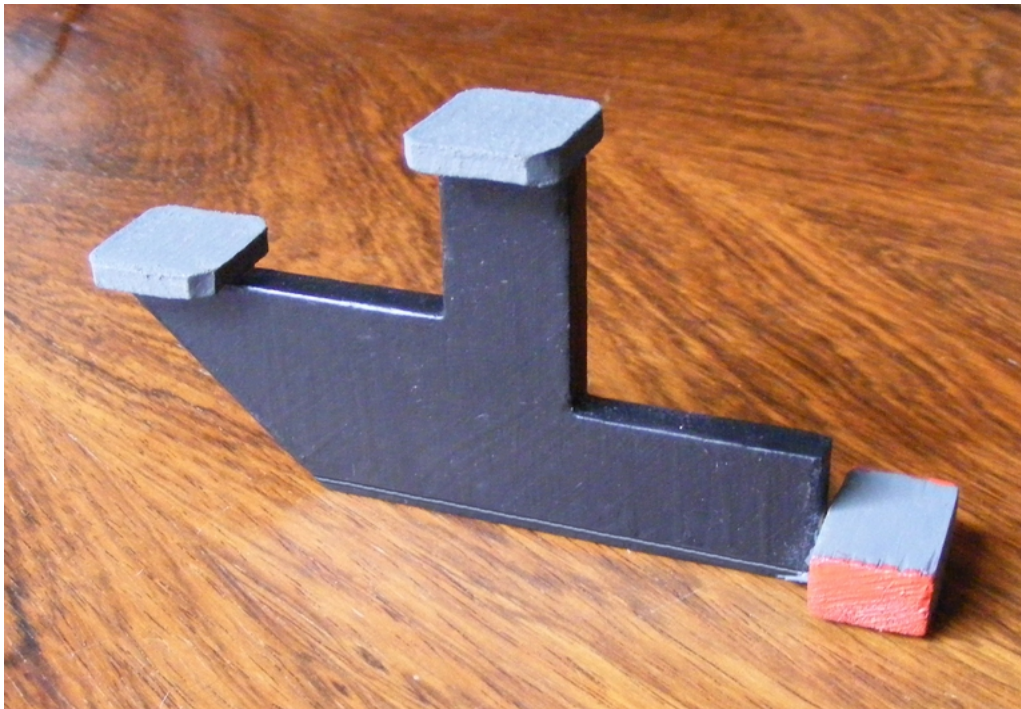


Fig. 5: The principle is simple enough. The small block to the right represents a short section of the main rib.

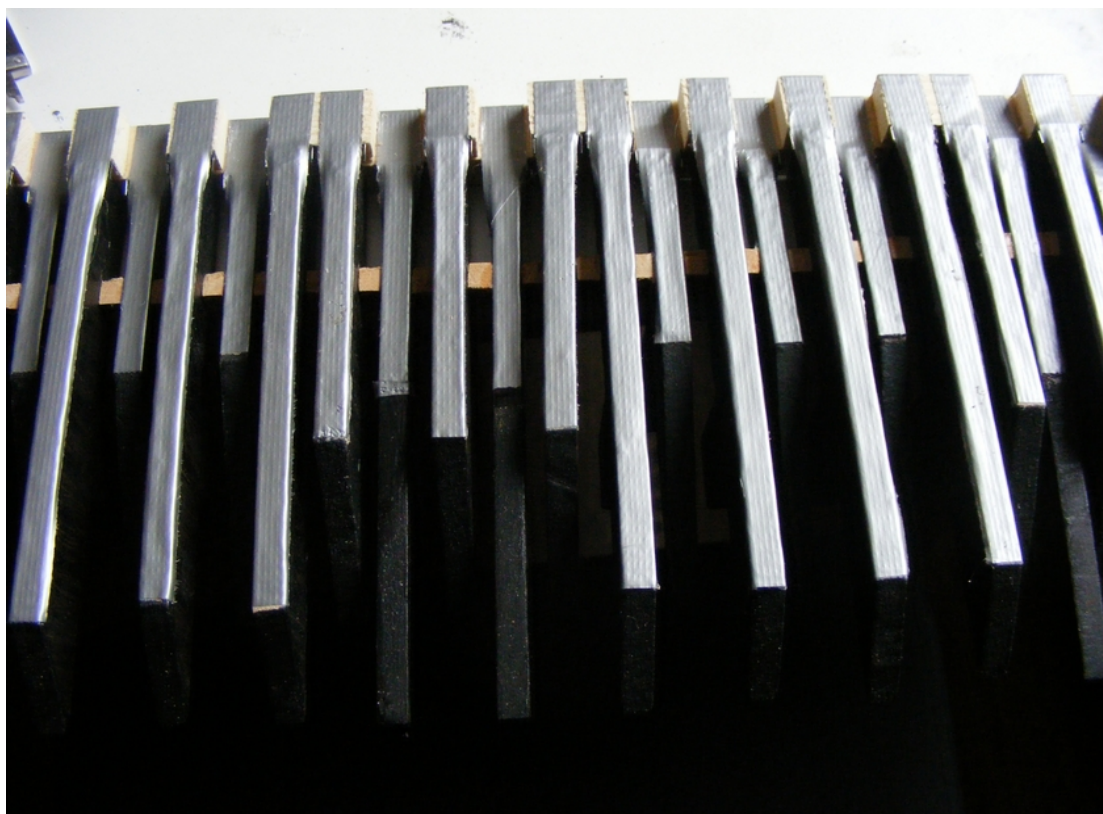


Fig. 6: The main rib and levers are not directly attached to each other but via a connecting strip / sheet spring. In this picture these are gray.

10 Freezing the Design

It was now high time to freeze the prototype parts into a set of drawings. You'll find these in figure 7 to 9. All parts are basically 2 dimensional in their layout and so are the drawings. Overall thicknesses are mentioned on the drawings and in the text below.

Figure 7 shows the final rib design. The **rib thickness** is 18 mm.

Figure 8 and 9 show the lever designs. As you can see there 4 different types of levers are needed. The drawings mentions on which notes and thus above which keys from the existing keyboard a particular type of lever is used.

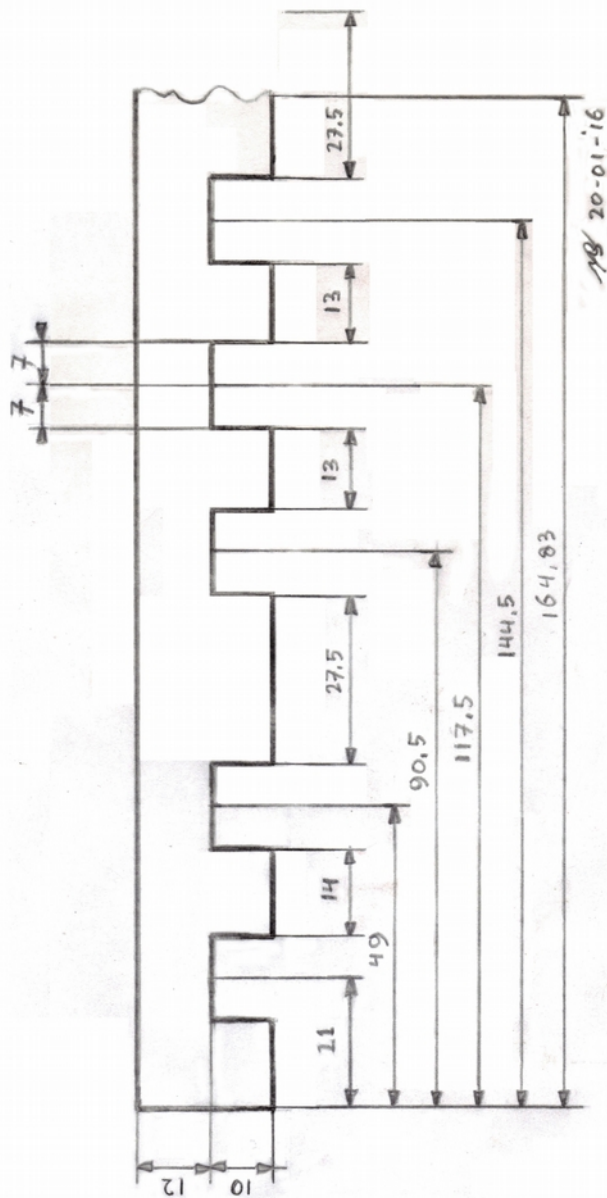
About the **lever thickness**: I choose a material with a thickness of 7,5 mm. If I had to do it all again I would probably decide on a slightly thinner material, so 7,0 mm is actually recommended on the drawings (also see the building tips in paragraph 13).

For the actual **playing surfaces** I cut 25 x 25 mm squares from 6 mm thick material and slightly cut the corners under 45 degrees. Theoretically they could have been a few mm bigger still and one could of course also decide on different shapes but I did not want to get into too much trouble with all the different measurement deviations that could develop throughout the whole build.

Speaking of which: In an official industrially produced design exact tolerances need to be established for every critical measurement. Since I would be building my adapters on a one of basis I refrained from establishing these.

11 (Hardly) Getting on with it (at all)

I will refrain from describing the next weeks in too many details. The accompanying pictures are however rather indicative. Imagine having to build parts for 2 keyboards, one 5 octaves long, the other 6 octaves. That's 137 levers. Every lever existing of 2 parts (see the dotted dividing lines in figures 8 and 9), plus the actual playing surface, so 3 basic parts per lever. That meant sawing $137 \times 3 = 411$ parts from sheet material. I actually built almost 500 parts, just to have enough reserve when parts fell out of tolerance but also to have some spare parts in the future.



JANKO KEYBOARD
ADAPTER

MAIN RIB PER OCTAVE

THICKNESS 18 MM

BASIC PROFILES
18 x 12 (x 2100 x 2)
44 x 7 (x 2100 x 1)

GEM S3 KEYBOARD LENGTH 1065 MM

WSA-1 KEYBOARD LENGTH 856 MM

Fig. 7: The main rib design

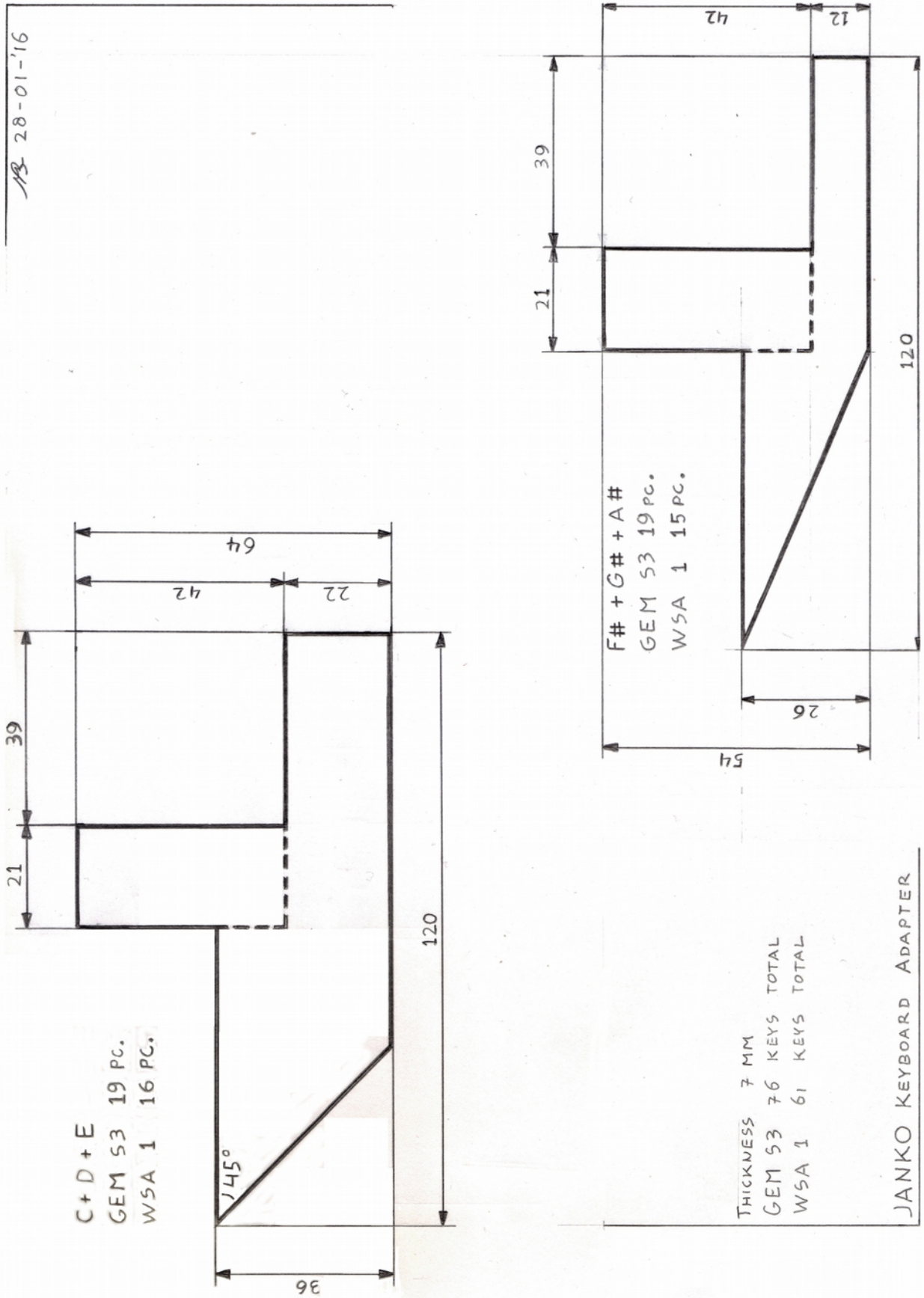


Fig. 8: Lever designs 1 and 2

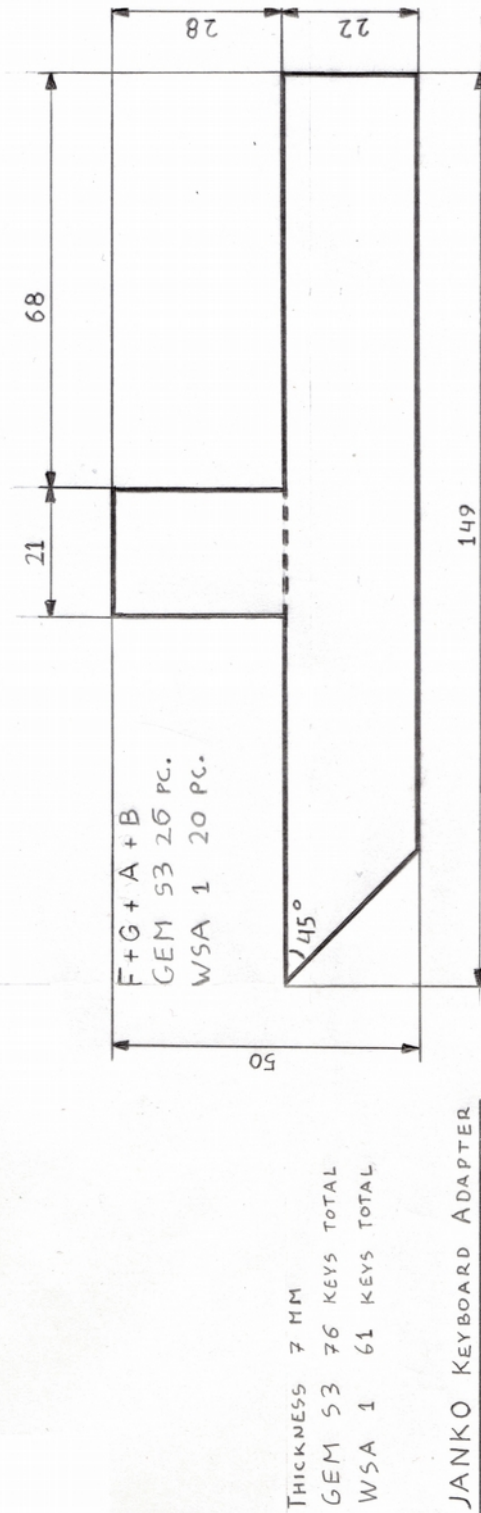
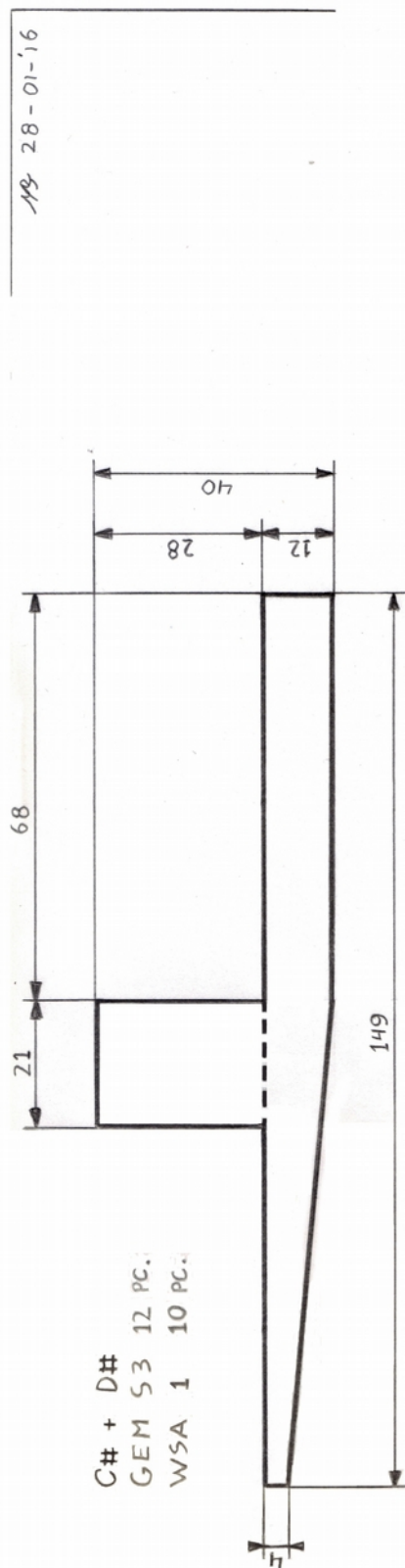


Fig. 9 : Lever designs 3 and 4

Then came endless sessions of gluing, filling, sanding, painting.
Enough said. I persevered and my working surface started to look like a miniature submarine building yard (see figure 10 and 11). In the end I even became so bored out of my skull / zany that I took the submarine association a bit too far and filmed a special little video (which you can find here: <https://www.youtube.com/watch?v=CvDELSBknQE>).
You know what they say about creative people sometimes coming dangerously close to madness....

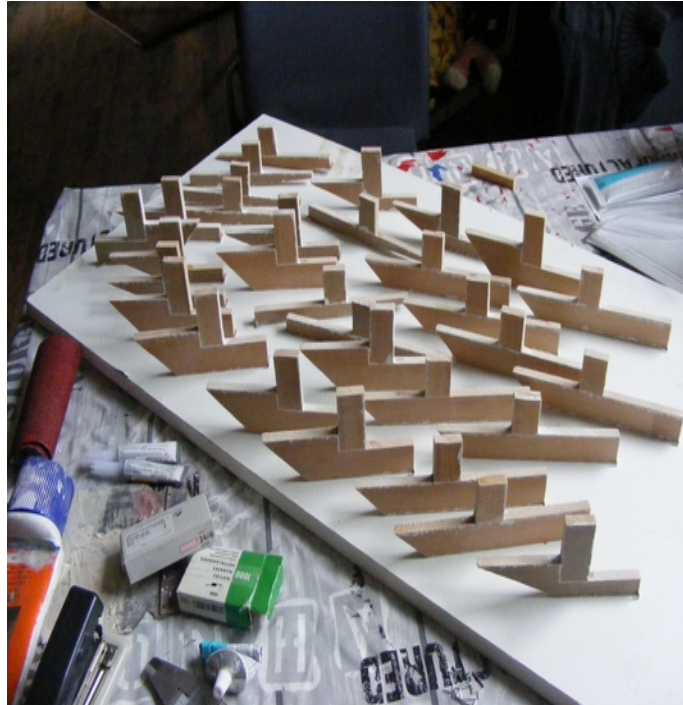


Fig. 10: Building levers 'till you drop. And this is only a small batch!

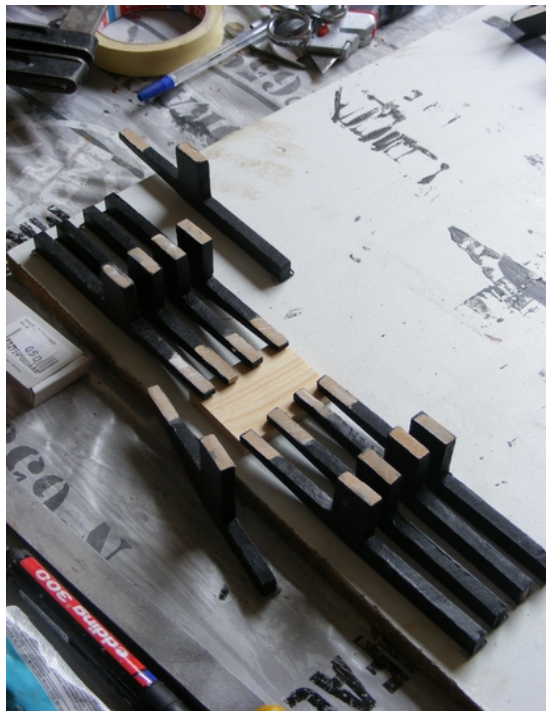


Fig. 11: Submarines everywhere! It's the Cold War all over again!

12 It fits but it don't sit(s)!

Bad English and bad riming that is. It talks about yet another aspect of which I will spare the reader most details.

In this case I am talking about actually connecting all the levers to the main rib.

I tried a few solutions, even built the first adapter with "hinges" only consisting of duct-tape which would thus easily bend at the right spot and provide adequate sliding surfaces between the levers and the original keys. Figure 6 provides a picture of this version.

Up to a certain point this actually worked quite well. There however were some distinct drawbacks.

Placing removing and handling the complete adapter became a rather awkward operation. As long as everything was in place on the keyboard it worked but as soon as the adapter was handled individually levers had a tendency to fall out of order. Only "expert" handling could avoid such complications.

I could have lived with this disadvantage but another one turned out to be even more limiting: Of course every lever has its own weight. So what would happen with all these weights pressing extra on the existing keyboard springs? I actually underestimated the problem, my expectation being that there would only be a single, rather low additional weight per key and that the whole contraption would therefore not become too heavy. Well, I was right about the total weight but not about the individual weights per lever. Not every keyboard out there has the same return spring stiffness. The less weighted piano type and the more organ-type a keyboard is the lower the force one has to apply to press a key. And thus it turned out that the keyboard of the Technics WSA is a rather lightly sprung one and that some keys thus started to sag even before a finger was stretched in their direction.

Back to the drawing board. The conclusion was that each lever actually needed to carry its own semi-rigid hinge. One that was not so stiff that it would increase the playing force too much but just strong enough to carry the weight of the lever itself.

I tried out a lot of materials, even contemplated having special metal sheet springs manufactured but in the end decided on a specific plastic I found in a DIY market. Alas I could not get strips at the exact width I needed (in fact the stuff was U-shaped!) so back I went to the factory. Cutting, sawing, grinding, swearing, etc.. In the end I used 2 layers per key on the WSA keyboard and 1 per key of the S3 keyboard. You do the math this time!

Furthermore: All strips had to be attached, ergo the whole Janko adapters assembled with super-glue.

Wearing an adequate breathing mask became necessary. I've said it before and I'll say it again here: The things we do for art!

Having to do a major reconstruction effort in the middle of the build did not make matters easier anyway. Try ripping apart a whole adapter after initial assembly and with all the playing surface already in place to find that they are then suddenly crookedly placed after the rebuild. Tolerances, tolerances, tolerances indeed! Oops, I'll probably have another nightmare about it tonight.

13 The result

But having said all that. The final results are what ultimately counts.

AND IT WORKS!

My Starship One setup now sports 2 specially built Janko adapters that I can detach and put on any of my other keyboards at will (except the Yamaha keyboards mentioned in paragraph 8).

And it also plays as expected. I can of course not claim that going from the conventional keyboard to a Janko layout is without its complications. Even my below average keyboard skills have been hammered into my fingers over many a year. Having to change over however is not as difficult as one might think. Soon all pitches seem to sit on a much more logical place since pitch is now almost perfectly linear to the position on the keyboard. (No, just as on a conventional keyboard, it isn't, since frequency actually doubles per octave but let's not mince words here).

Is this the ultimate keyboard? Well, one can even imagine more advanced versions. One with curved playing surfaces instead of flat ones. Or even one with a single XYZ sensitive pad per lever? My present Starship One setup "only" provides polyphonic pressure.

Of course things can always be improved. Isn't that the question we actually started with? Overall my conclusion is however that the Janko / Moseson layout totally works for me and combining it with my own adapter concept is exactly the epiphany I was hoping for.

So unite keyboard players of the world! The Janko interpretation of the isomorphic keyboard idea really is the better alternative.

The only remaining question therefore is: How can so many people have been blind for so long?

So thanks Paul von Janko, wherever your spirit might still reside. And thank you Steven!

14 Practical tips (for those brave enough to also want to try)

- As always with this sort of project (also see my Yamaha E70 conversions): Be aware you are in there for the long run. You'll need to build many individual parts and that will take a lot of time. Instead of doing everything by hand you could of course decide to spend out some of the work, for instance by having all the levers and the touch surfaces laser-cut. I personally decided against that for costs grounds but the relative 2-dimensional simplicity of the designs ensures that it can be done. But even then: In the end you will have to assemble a lot of parts into a single construction anyway. Even on the best of days (er, weeks? months?) that is not something for the fainthearted.
- Concerning the **construction materials**. I simply choose wood as my main material because it is relatively cheap and easy to work on. I actually made most of my adapters out of scrap material, cheap b(eep) that I am. The levers where made of spare floor boarding that had been lying around for years. The sky is the limit though. Want to use some high tech carbon fiber? Want to print it? Be my guest. A more high tech material and more precise tools will give you better control over tolerances anyway. I am sure your costs will then however be decidedly higher then the few tenners I spent on the whole project.
- The biggest practical problem indeed was to keep the **tolerances** in check. Nowadays factory built parts can have tolerances within hundreds of a millimeter I could however be lucky if I was able to keep mine within a few tenths of a millimeter. When building many copies of the same parts it therefore becomes rather important to be very conscious of how one actually manufactures his parts. A simple trick for instance is to saw every functionally equal measurement (say what?) of a series of parts with the same tool setting. By not resetting the tool at all and producing all similar measurements in one single session (for instance the height of one single type of lever) one can avoid such complementary measurements differing from part to part. So better saw the height of all the pieces you need of a certain type in one go. For instance: First saw strips with this equal height at the maximum length of the sheet material you start with and only divide them into separate levers later. Even if an actual measurement then deviates a bit from the theoretical number at least all parts will be equally "defective".
- Another example: The exact measurements of the **distancing blocks** between the levers particularly depends on the width of the material used to manufacture the levers.

2 simple formulas which together calculate the theoretical width are:

$$\frac{\text{the total length of the keyboard}}{\text{(the total number of keys x the width of each lever)}} = \text{total length available to the distancing blocks}$$

$$\frac{\text{Total length available to the blocks}}{\text{total number of levers} - 1} = \text{the width of each block}$$

The width you put in for the each lever should however be including eventual layers of paint. I used black paint on all the levers. 2 layers of paint times the total number of levers can still mean a difference of a few millimeters overall. So the calculated width could still be a bit of a theoretical entity only.

Furthermore: How precise you will actually be able to cut the width of the blocks again depends very much on the material you use and the precision of your tools. A practical way to check your calculations is to build a first octave (the theoretical length stemming from my calculations being 164,83 mm, see figure 7) and make sure everything stays within the needed tolerances. With a bit of hit and mis you should then be able to saw a block width that also works in practice. As soon as you have established the tool setting for this width you can, in one single session, saw the total batch of distancing blocks you need.

Lastly you can even get away with including the odd block that is wider or less wide then the established norm to make small corrections when already underway.

See, a bit of arithmetic, a lot of practical savvy. That is how the ancient folks did it all the time.

- Always build more than enough parts. Some of the copies you made will fall out of the acceptable tolerances. Furthermore you might need some spare parts in the future anyway. It of course all depends on the precision of your tools / manufacturing process but on average I recommend to make at least 10 % more levers and touch surfaces than you actually need.
- So you want to build a 61 / note **5 octave version**? Have a look at the figure 8 and 9 and count the numbers of the 4 different types that I needed for the WSA-1. Want a 76 note / **6 octave version**? Look at the numbers mentioned for the GEM S3.
- I recommend to make the **levers** out of a material with a thickness of not more than 7 mm. I actually made mine out of a 7,5 mm thick material but on keyboards that have slightly offset black key positions, like the Technics WSA1 keyboard, this width can already lead to rather tight clearances.
- Concerning the sheet material for the individual connecting strips / sheet springs: I do not have the means to actually analyze the plastic sheet material I used in the end but I would say that it most likely is a blend between Polyethylene and Polypropylene, almost giving the resulting material ABS type properties but overall being a bit more elastic / "springy" before deforming. Counting on plastics will increase the possibility of the material aging chemically over time and thus become more brittle. In that respect a metal solution might be preferable but will probably be much more expensive. One does not simply press /cut a penny part from high tension steel for such an individual build. So a truly optimal and still economic solution will have to wait until the "when hell freezes over", industrial production version becomes reality.
- Concerning attachment solutions: My upper rod type should work in most situations but since no keyboard housing is the same individual adaptations might vary. The best general rule is to work out some sort of clamping system since you probably do not want to diminish the value of your existing instrument by drilling holes into it.
- If you still decide to drill and screw. Detach the parts you have to drill into from the rest of your keyboard. A single "oops!" from a drill going in too far can damage its electronics beyond repair and even if you are relatively lucky it might lead to a lot of unnecessary extra hassle.



Fig. 12: Mounting solutions might vary. Mine is comparable to a glue clamp. So no holes needed.

- For reasons described earlier I cannot fully guarantee that my version will fit on every keyboard out there. So if you want to build one yourself at least check out if it fits the keyboard that you actually intend it for / use most, be it your favorite acoustic piano, your main MIDI keyboard controller or whatever.
- Here is a tip if your adapter still does not fully fit the keyboard you intend it for, thus further expanding the adaptability of the concept: Be aware that the longer the keyboard adapter the more chance there is that the exact distance between keys and octaves becomes a problem.
An example: If I put my adapters on the keyboards of my SGX V2 super-synth which is based on the Yamaha Electone E70. Here my standard design will work OK over 4 octaves but then the notes of the 5th octave will begin to stick, the conclusion obviously being that the E70's keyboards are slightly too narrow.
What to do?
Well there is a "crude" solution that might still help you. If you divide the total converter into more parts by splitting the main rib you can then position these separate sections individually. The mere width of the material removed by a single saw cut might already be enough to just place the sections close enough again to remove the problem. If you need a higher tolerance you can actually sand or file away a bit of extra material from the ends of the remaining rib sections.
OK, you now have separate sections but these can then eventually be fixed relative to each other with the attachment solution you apply. Why for instance not create a 3.5 octave version for you solo synth and use the remaining length as an expander if you want to upgrade or move to a full 5 octave keyboard. Then your adapter solution even becomes modular!
- On choosing note markings: Adding a layout that enables you to visually navigate the keyboard is easy. Just give some of the playing surfaces a contrasting color. You can choose the official Janko layout which still has the good old black and white divisions but you can also find examples of different layouts on the Internet.
I decided to only mark the C and F keys. If you want to play a C major scale on my layout you start on a red key on the 2nd or 4th row from below and switch over to the row above or below when you come across the next red key. As on any Janko playing all other scales goes exactly the same. You just start on another first key (also see paragraph 4).

15 Inspirations / for further reading

- You probably downloaded this guide from my website but just in case you forgot:
www.brassee.com
Also have a look at the rest. Lots of other crazy stuff there.
- I even have already made some music specifically with this setup. It is called Chamber Music For Starships. You can download it here:
<http://www.brassee.cm/music/ChamberMusic1>
- This is the link to Steven Moseson's original YouTube video:
<https://www.youtube.com/watch?v=djZmS6202QE>
- A series of pictures of Stevens build:
<https://get.google.com/albumarchive/106146409780363181514/album/AF1QipPrTS0fA9MsWujs--lASSn2QQW40VYOWultowvv?source=pwa>
- You'll find a few of my videos here (including that very weird one about submarines):
<https://www.youtube.com/channel/UCbaggkIAITcppQB4SzJm4cCw>

- This is a link to download the book called "Eine neue Claviatur. Theorie und Beispiele zur Einführung in die Praxis" that Paul von Janko published in 1886.

<http://vlp.mpiwg-berlin.mpg.de/references?id=lit38215>

Dude! This is actually a link to the Max von Planck Institute in Berlin, Germany. So we do not get our kicks from sex and drugs and rock and roll but from the MPI. How sad!)

- A few other nice sites about the Janko keyboard are:

<http://squeezehead.com/uniform-keyboard/>

and

<http://improvise.free.fr/janko.htm>

- We call it the Janko layout but did he really come up with it all by himself? Nope!

<http://www.le-nouveau-clavier.fr/english/>

If so, couldn't I therefore just as well call this the Brassé Isomorphic Keyboard Adapter (BIKA)? Now THAT has a nice ring to it!

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M.W.E.M. Brassé
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