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Subject: Building a full size Trumpet: multi-part modeling question  
Posted by [Passagemedia](#) on Wed, 09 Jan 2013 22:25:51 GMT  
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I have repaired and played brass musical instruments and am considering building a prototype for a trumpet using Shapeways metals materials. I have a couple questions on best practices and process.

1) Is it best to not have nested parts, such as the valve pistons, which could be part of the model or could be separated out as 3 individual parts?  
(Value Springs, too)

2) How best to handle threaded items, such as screw caps or items that thread onto a second part? Can they be done as part of the same model or should these threaded parts be unique pieces?

3) With my model, at least one tube part needs to be inserted and slide freely inside of a second tube for the tuning mechanism. This is how tuning is done on a trumpet or trombone. Are there any tricks with the process to make this happen best? Should the tuning slide tube part be a separate piece from the body of the horn?

I have always thought casting would be an interesting way to make a horn, but the weight was the killer. The DMLS process is very promising for new trumpet models. New options for shaping the horn seem very possible.

#### File Attachments

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1) [Horn\\_parts.jpg](#), downloaded 77 times

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [Youknowwho4eva](#) on Fri, 11 Jan 2013 13:58:42 GMT  
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I'm guessing the goal is to print in stainless?

1. In stainless you can't nest parts, or have multiple parts in a file.
2. Because of stainless prints resolution and potential for warping, it's best to thread yourself.
3. Any moving parts, you'd have to have in separate files, and if you want them to slide like a tuning slide, you're going to have a lot of polishing to do.

A couple additional notes:

1. The max bounding box for stainless is 1000x450x250mm (not a very big trumpet) so you'd probably have to do separate pieces, and weld them together
2. Cleanability. You have to make sure the operator can clean out unused steel so it doesn't fuse closed any pipes
3. Price, Stainless is \$8 per cubic cm plus \$6 handling fee and shipping. Your trumpet would not be cheap.

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Subject: Re: Building a full size Trumpet: multi-part modeling question

Posted by [Passagemedia](#) on Fri, 11 Jan 2013 15:53:49 GMT

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Thanks for the info. One follow-up questions then...

With regard to the tuning slide "is the need for polishing because the stainless steel material is a rough or pitted finish?

As a working process the tuning slide(s) will be separate parts. The exposed end that is inserted into the other piping could easily be buffed on a grinding wheel to get it polished up.

Just a side note, on cost: not that we will make a Monette horn, but the Dave Monette products run from about \$9500 upwards to \$16K! More than a decade ago I played a \$4500 horn while on tour. Maybe we can make something close and make some money or monette.

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Subject: Re: Building a full size Trumpet: multi-part modeling question

Posted by [Youknowwho4eva](#) on Fri, 11 Jan 2013 16:06:29 GMT

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You are correct about the finish of the stainless. It will certainly be harder to polish the inside of the tuner.

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Subject: Re: Building a full size Trumpet: multi-part modeling question

Posted by [stonysmith](#) on Fri, 11 Jan 2013 16:59:21 GMT

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The other problem is that since Stainless requiring a 3mm wall thickness, the item is going to be fairly "dead" to vibrations. I am not a musician, but I would think that it would not make a good

musical instrument. A portion of the quality of a horn is its response to vibrations, a wooden alpenhorn has an entirely different sound than the classical brass trumpet.

Also.. the Shapeways process is not DMLS. They use an 'organic binder' to adhere the steel particles, and then the particles are fused together in a kiln. DMLS uses a laser or electron beam to fuse the particles.

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [Passagemedia](#) on Fri, 11 Jan 2013 21:16:16 GMT  
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Hey thanks, Stonysmith.

You are dead on. Wall thickness in the bell section should be 1.2mm max. Traditionally a bead roll on the outer bell rim has been for integrity, adding some thickness. There are sections where walls are thicker, and maintaining a specific tube bore is critical to functional tuning once it's built.

Maybe exploring the DMLS process a bit further is the thing to do, as that process can go thinner with metals.

This is a cool area that is exploding. The potential to design differently "because we can" will make things very exciting!

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [stannum](#) on Sat, 12 Jan 2013 00:34:52 GMT  
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And it has lots of bronze (30-40%), not pure SS. That's what is fused and holds the steel particles.

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [Passagemedia](#) on Sat, 12 Jan 2013 17:35:23 GMT  
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You know "bronze would be fine, but I need the thinner wall - 1- 1.5mm.  
Does it really need 3mm? that seems really thick for things like jewelry.

Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [stonysmith](#) on Sat, 12 Jan 2013 17:43:48 GMT  
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That's just it.. for small stuff, you're allowed thinner walls, but for something as large as a functional trumpet, it's 3mm, and possibly even thicker depending upon how well the structure can support itself.

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [stannum](#) on Sun, 13 Jan 2013 00:53:36 GMT  
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People have reported skin problems with rings and pendants, related to the bronze. This steel-bronze composite, when left outside, generates a nice orange skin. Instrument parts could have less contact with sweat, skin oils, spit or just air humidity than those other uses, but never be trully free of them.

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [Passagemedia](#) on Mon, 14 Jan 2013 22:01:53 GMT  
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Hey, so one more final question (ok so there are always more questions, but hey...)

Does anyone know enough about investment casting to know if tubing, such as found in a trumpet, can be handled with this method?

Seems like hollow and deep would be a problem, but I don't know enough to know what I don't know. ;>)

But, I could make my model and sub-parts from some of the plastics on Shapeways, and use it (them) for an investment casting, provided this process would work.

Any thoughts to viability given the shape of my model?

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [AmLachDesigns](#) on Tue, 15 Jan 2013 11:10:58 GMT  
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Hi,

a thought from left-field perhaps, but how about using silver for some or all of the parts? If you are willing to spend 16,000 USD ... lol

I don't know about the tonality etc but it would certainly be a talking point!

Good luck, sounds like a very interesting project

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [JLopatin](#) on Tue, 10 Dec 2013 15:01:19 GMT  
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How thin can the silver be on something like a tube? My husband currently makes world-class flutes from scratch (in the \$7-14K range for sterling), and we're looking into the feasibility for a whole range of flutes, from a sturdy plastic for a student model all the way up through a professional-level sterling (although I wonder how Shapeways can legally call it "sterling" when what they use contains less than 92.5% pure silver content, which is the definition of "sterling").

#### File Attachments

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1) [DSCF1529.JPG](#), downloaded 105 times

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [AmLachDesigns](#) on Tue, 10 Dec 2013 15:35:31 GMT  
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Well, the design guidelines are here.

Why do you believe that SW silver is not sterling? The Material Data Sheet suggests (well, states actually) otherwise. It's true that they do not mark it in any way nor certificate it, which I always think is a shame.

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [Passagemedia](#) on Tue, 10 Dec 2013 15:40:02 GMT  
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Hello JLopatin,

After several months of work on this for our trumpet models, here is what I have learned: Sterling silver can have wall thicknesses down to .8mm, which is right in the sweet spot for typical flute construction. However, the sections of the flute will need to be under 100mm in length (3.94"-ish). For a typical length flute you will be around 80-85 cubic centimeters of material for the tube section alone (an educated guess). At \$35per cc<sup>3</sup> you will be over \$3K for the materials (easily).

With the stainless steel product, the wall thickness we have been able to produce for the trumpet body are at 1.5mm minimum. Almost too thick to be useable for a horn, but it still works for the body, valves, and valve pulls. We are buying an OEM bell from Bach/Conn.

If you go the route of stainless, you will need to add outer thickness to the tube walls to accommodate the inner bore of the flute. It will be heavy, but there are theories about conservation of energy and the standing wave form, which make this heavier instrument make sense. This is why the trumpet we are building is like a Monster truck or armored tank, where all the energy going into the horn comes out the bell, without tiring the player as quickly and giving a big sound. Looks like a tank, too. But trumpet players are all greedy for volume, so we're hoping it fits into the line up for stage playing.

That said, if you go stainless for some of your items, you will want to plate it after assembly/getting it back to your site. Shapeways/ProMetals does electroless plating, which means that both the inside and outside of the tube will be plated. This will affect your fittings.

You might look at the alumide or plating on some of the stronger resin plastics.

Right now, our trumpet parts are coming in around \$1700 (with the commercial bell, too) and we have threading done at a local machine shop for the valves and top/bottom caps.

I am including a little photo to show some of our first model, done with the electroless coating in matte gold. I had to dremel off the excess material on the fittings.

Hope that helps.

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### File Attachments

1) [photo.JPG](#), downloaded 99 times

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Subject: Re: Building a full size Trumpet: multi-part modeling question

Posted by [JLopatin](#) on Tue, 10 Dec 2013 15:49:49 GMT

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Ah, my apologies for doubting Shapeways. An earlier post referred to "SS" which I took to represent sterling silver. It's apparently the stainless steel which has a fairly high percentage of non-steel material.

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [JLopatin](#) on Tue, 10 Dec 2013 16:12:33 GMT  
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Beautiful work, PassageMedia!

Thank you for this thoughtful and thought-filled reply. My husband and I are just at the beginning of this investigation into the many possibilities inherent in 3D printing. Even if all we end up having printed at this time are the cups and ribs with posts already attached, that will save us a HUGE amount of time, energy and money, too. Right now, there is no "good" way to make square cups from scratch that doesn't include having to solder two of the sides on and having to grind off the excess. If we can make cups with (unshaped) arms attached, even better. If we can make our open-holed cups with unshaped arms attached, that would be amazing. If we can print the individual (dedicated) cups ready to be soldered or pinned onto mechanism tubing, we'd be in heaven. Anything more than that (the whole body with all the soldered-on parts in place and the entire shaped keywork) would be gravy and put us into pig heaven. We'll settle for what we can get right now and keep testing the boundaries of what's practical and feasible. --Jackie

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Subject: Re: Building a full size Trumpet: multi-part modeling question  
Posted by [stonysmith](#) on Tue, 10 Dec 2013 18:12:06 GMT  
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For a related discussion of Sterling Silver, please review this thread:  
[https://www.shapeways.com/forum/index.php?t=rview&th=657\\_3&goto=35608#msg\\_35608](https://www.shapeways.com/forum/index.php?t=rview&th=657_3&goto=35608#msg_35608)

Short version.. to properly be allowed to call it "Sterling" Silver, each object must be tested and hallmarked.

To hallmark (any) item, you must get the government (of the receiving party) involved.

Fees and Regulations.. that's why it's not called "Sterling" <grin>

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