String Termination Points

Curtis Spiel

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An ideal string termination produces a freely moving string. The string termination point needs not to leak/link energy beyond the point. It must both stop the vibration, but also let the string go. On old termination points, such as a V-bar or a bridge, the string cuts into the bridge and cuts off the vibration. Although else termination points are already set up and there is not much to do about it, it is important to know what to do about problems with termination points. Often the condition of the termination points determines the fate of the piano and whether or not it is worth putting work into the piano.

It is hard to tune a bad bridge. It's hard to hear and difficult to tune. One common problem is false beats. Another problem is simply a lack of focus, with no harmonic series and vague beat rates. Re-notching and recapping a bridge is thousands of dollars. This might be worth it for a Steinway grand, but probably not for an Aeolian console. For the cost of doing this kind of rebuilding work, it might be more worth buying a new piano.

William Braid White wrote years ago that after 25 years of constant playing, throw the piano away. Back then there were hundreds of American piano factories. By 1906 there were 1100 piano manufacturers. The question is when is it appropriate to buy a new piano? Some pianos are simply not worth fixing.

V-Bars

There are three basic shapes for termination points: V-bars, circular bars, and "whatever" bars. Walter pianos use a circular bar. Glutner uses a bronze insert on the tip of the bar to make the string glide easier when being tuned. Basically it is essential that the V-bar be softer than the piano wire. If the bar were harder, the wire would break more easily, whereas a softer surface will preserve the life of the string. By inserting bronze, the bronze is easier to shape, plus the height can be set easier for down-bearing. The majority of grand pianos use circular points.

The "whatever" shape is a problem termination point. This creates hissing sounds and is difficult to tune because the sound can change. To fix this, take the dampers out, take the strings off, and reshape the bar with a hand file. This procedure could take from four to eight or more hours. Make this shape even the whole length of the capo bar. The end of the bar should be about a millimeter wide. Put the piano back together, tune it, then come back a couple weeks later and tune it again. During this job, clean the soundboard and fix any bridge splits, etc.

On uprights, lower the tension of the strings, remove the pressure bar, and work on it. However, this is so time-consuming that at this point it is time to assess whether the job is worth it or if the customer should buy another piano.

Agraffes

Agraffes will wear. When there is a groove in the agraffe, the vibration will leak through. It is difficult to uncoil and pull the wire through an agraffe and then to fish it back through again. Another choice would be to simply cut the wire, fix the agraffe, and then to splice a piece on the end for the pin. It is best to replace the entire string. Buying new agraffes can also have problems. Sometimes they come with burrs or irregular holes. Use a hand tool to re-shape the holes. Bicyle brake cable (free at any bike shop) is the perfect size for cleaning and sanding out burrs from agraffe holes; the string needs to be removed first. Large burrs can be removed with a razor knife without removing the string.

Bridges

There are a couple theories as to where to place the bridge pins. One theory is to place the bridge pin in the middle of the notch. Another is to place the bridge pin one third onto the flat of the bridge surface, with the rest down on the notch. This is Richard Blutner's concept. However, because bridge pins are so small, this is a highly skilled procedure with tiny tolerances. Factories have either machines to do this or else highly skilled workers who have spent a lot of time perfecting their movements. You can't make a mistake with a bridge. The bridge pin holes are already drilled before notching, so if a notch is misplaced, the holes need to be plugged and re-drilled.

Assuming that the bridge is perfectly notched and pinned, take a look at an older piano where the bridge wood itself has deteriorated. Because the string is pulling down on the bridge, there will be deepened string cuts into the wood. Notice that these grooves are deeper around the pin. Over time, the string cuts are no longer straight, but curved. They are higher at the center and lower at the speaking length. The ideal repair is new bridge caps. There are lesser repairs that can be done.

Match the repairs with the value of the piano. Sometimes an older piano still has music in it, but it needs attention to the strings and termination points. When a piano needs to be restrung, recondition the bridge. Plane or sand the bridge top flat – remove the worn curve which has become waste material. When new the downbearing was at each pin, with the bridge in the middle becoming lower. By sanding the curve down, the original downbearing is restored.

Make sure the bridge pins are tight in the hole. In the case of uprights, most bridge pins are ¾" long, so they will go only so far into the hole. Swab out the hole with epoxy and let the holes set. Then drill the bridge holes deeper so that the pins can go deeper into fresh wood. If you set the pins in as the epoxy is setting, clean up the excess glue with lacquer thinner so that the glue does not interfere with contact points. Curtis prefers to let the epoxy set and then re-drill. He uses a pin that is smaller than the hole as a visual guide, and uses an upright let-off button as a stop on the drill to maintain a consistent drill depth. It is important to match up the same pin angle as the original. Remove the screws that run into the bridge from the ribs might brake off your drill bits. Sometimes you have to drill a hole through a back post to remove a screw from a rib.

Another problem with bridges is cracks. The dog-leg of the string disappears and the strings start going in a straight line. Simply filling big pin holes with epoxy does not last because there is nothing for the epoxy to grab. Usually the bass bridge split frequently in uprights. The other most common place is the top treble because there are more strings per linear inch than in the lower sections. The best way to fix this is to unstring the piano, remove the plate, recap the bridges, etc. and often this job is not worth it.

One cause of false beats is loose bridge pins. Sometimes the top of the pin hole looks fine, but the bottom of the hole might have been enlarged. In this case an epoxy repair is appropriate. Get the strings out of the way, remove the bridge pin, mix up a fast-setting epoxy, push the epoxy into the hole with a piece of music wire, dip the tip of the bridge pin into the glue collar and insert it into the hole, then clean up the excess epoxy with lacquer thinner right away. In about twenty minutes this epoxy should be hard enough to be able to replace the string. Curtis uses a short brass rod with a dimple on the end of it to test if a bridge pin is the cause of the false beat. He pushes on the top of the pin and then moves it at different angles while playing the note to hear if there are any changes.

Super glue seems to fail. It breaks easily, and it also tends to fail over time. Another problem is that it sets so quickly that there is no tolerance for correcting errors. CA glue is not resilient, so it will eventually work itself loose when in contact with wood which is in constant flux.

Damaging Termination Points

There are ways to damage string termination points. Tapping the strings down into the bridge with a brass tool will create grooves into the wood of the bridge. Instead, use a rubbing tool a bit sideways and you will hear a tick when the string moves into the bridge pin. Even the act of tuning the piano over time is machining grooves into the termination points. Eventually all pianos wear down. How long is a piano worth? Braid White says 25 years, some pianos last twice as long.

Roger puts epoxy on the coil side of the V-bar to cancel extra harmonics. Instead of muting the sound, which is what felt does, the glue stores the energy. It is difficult to get the glue in the exact spot and to know where the spot should be. Metal couplers work well, are less messy, are quicker, and can be moved to the best location. The string is going to leak some vibration between the capo bar and the plate bar. Estonia, Fazioni and even Baldwin have made adjustable bars that test on the plate.

Before tuning any piano, Curtis looks over the piano first. He looks for divits in the finish, he looks at the bridges, at the dirt, and at the general condition of the action. When you know there are bridge problems, you can adjust your tuning standards. Let the customer know about what you have noticed.