

# Bushing Pivot Sockets

Chip Owen

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Over-sized pivot sockets in the ends of keys create problems that need to be solved. Although there are a number of ways to solve the problem there are situations where conventional approaches don't succeed. This article presents a method of replacing the end of the key, providing a completely new pivot socket for the key. This technique is also useful for lengthening excessively short keys.

## Problems caused by oversize pivot sockets

Ideally, the only movement of any key should be radially around the axis of the key's hinge. Any other movement results in key noise and in bad key action.

A common action problem resulting from over-sized pivot sockets is double action. In this situation a key will be moved laterally before the radial action occurs. The lateral movement lasts until the pivot contacts the far side of the pivot socket. This combination of lateral and radial action presents a clumsy and inaccurate feel to the player's fingers.

Player's tend to become so familiar with the poor action over time that they are more likely to complain about noisy keys before they are aware of the action.

Lateral movement at the ends of keys results in more noise than does longitudinal movement. The irony is that longitudinal movement results in lateral movement at the pivots. Getting the lateral free play out of pivot sockets inevitably eliminates longitudinal movement

## Normal Procedures

Any procedure for tightening pivots and sockets must be taken either by increasing the effective diameter of the pivot screw or by reducing the size of the pivot socket.

The normal method of increasing the effective diameter of a pivots screw is to either file or counter-sink the post where the head of the pivot screw seats so that the point of the pivot screw protrudes further into the end of the key. When the problem is small this method is usually effective.

There are times when altering the post will not work. The most obvious is when the amount of alteration would be excessive. When properly done the post should look normal. When badly done the post can appear as though the ball has been nearly removed.

Another time when post alterations are not successful is when the design of the pivot screw won't allow it. If the taper of the pivot stops abruptly at threads which are suddenly larger the post alterations

can result in the threads binding on the end of the key before the taper fills the pivot socket. With this type of pivot screw preference should be given to the pivot socket rather than altering the post.

Alterations to the key to reduce the size of the pivot socket can often be the best fix. When sufficient hinge rod is left beyond the key casting closest to the end of the rod it is often possible to simply swedge the key to reduce the pivot socket. When the final key casting on a hinge is soldered in place at the very end of the key there is not way to swedge the key.

## The solution

One of the most permanent ways to fix this problem is to silver solder bushings into the end of the hinge rod. The method I use requires one special tool in addition to the specific pivot reamer required by the instrument and other normal bench tools including a bench motor or lathe.

The technique is based on reaming a tapered socket in the end of the key's hinge, silver soldering a piece of rod into that socket and reaming a new pivot socket into a pre-drilled hole in the new end of the key.

## Tools and materials

In order to replace the end of an existing key's hinge rod it will be necessary to have some rod stock of the same material and of approximately the same diameter. Although the diameter doesn't have to be precisely the same they should be close.

Silver solder and flux will be necessary. Don't consider soft soldering as the weaker joint can someday cause failure of the key.

A tapered reamer will be required to ream out the end of the key. Make a reamer out of steel rod of a diameter somewhat larger than the diameter of the key's hinge rod. Cut a taper such that the length of the taper is approximately three to four times the diameter of the rod. Whether this is done in a lathe or with a file in a bench motor is of little importance as long as the taper is straight and smooth. Harden and temper the tapered end and grind away half of the diameter to create a cutting edge. Take care not to overheat the temper of the steel.

It will also be necessary to drill down the center of the stock hinge rod material. You will need to find the center of the stock and drill on the axis for about 1/2".

## BUSHING PIVOT SOCKETS

### Procedure

Begin by reaming out the end of the key. It is possible to do this free hand with the reamer turning in the bench motor. If it is possible to chuck the key in a lathe it can be easier to do a better job. (A bassoon's long whisper key can often be chucked in a lathe.) Ream the pivot socket out until the outer end of the reamed hole is nearly as large as the diameter of the hinge rod. The closer you can get to that diameter the less noticeable will be the final result.

Next drill a hole in the end of the new hinge rod stock for a depth of about 1/2". The hole should be no more than .039" (#61 drill or 1mm) or less than about .031" (#68 drill or .8mm). This hole will become very important after the rod is soldered into the end of the key.

Now the new stock must be fitted to the reamed end of the key. Turn or file a taper on the drilled end of the hinge stock. The taper needs to match and fit snugly into the reamed end of the key. You will be able to feel when the tapers match each other.

Do not cut the tapered tip off of the end of the rod stock. The extra length will be a convenient handle while soldering the insert into the key.

It is possible to silver solder the insert into the end of the key without burning the plating. This does take a bit of care and it also depends on the quality and condition of the existing plating.

Cut off a small bit of silver solder. How much will depend on the size of the hole and the diameter of the solder wire. You'll just have to take a good guess at how much to use.

Place the solder and some flux into the reamed socket. Hold the solder in place in place with the tapered end of the new rod.

Heat up the joint. Begin by heating the entire joint area. As the temperature rises move the heat onto the new rod and off the plated key. When the temperature is sufficient you will feel and see the parts move together. You should also feel the parts align with each other. Take the parts out of the heat and cool them.

The plating will probably have darkened but hopefully will clean up nicely.

You now have a very long key. If the joint looks a bit ragged some judicious use of swedging pliers may improve it.

Cut off the excess length slightly longer than the distance between the posts. When you cut off the rod you should find the open hole that you drilled in the end of the rod stock. Because the hole was blind drilled it did not fill up with solder. This will become your guide for reaming a new pivot socket into the end of the key.

Carefully ream out the pivot socket and trim back the end of the key until you have a key that fits the way you want it to fit.

If all went well you should now have a key that fits properly with little or no visible evidence of the procedure.

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