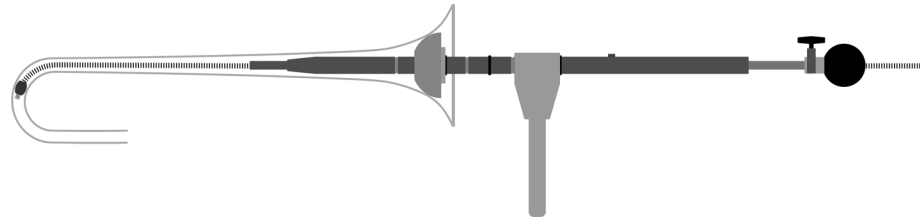


#2040 Spring Loaded Dent Ball Driver Instructions and Tips on Dent Removal



VOTAW TOOL COMPANY

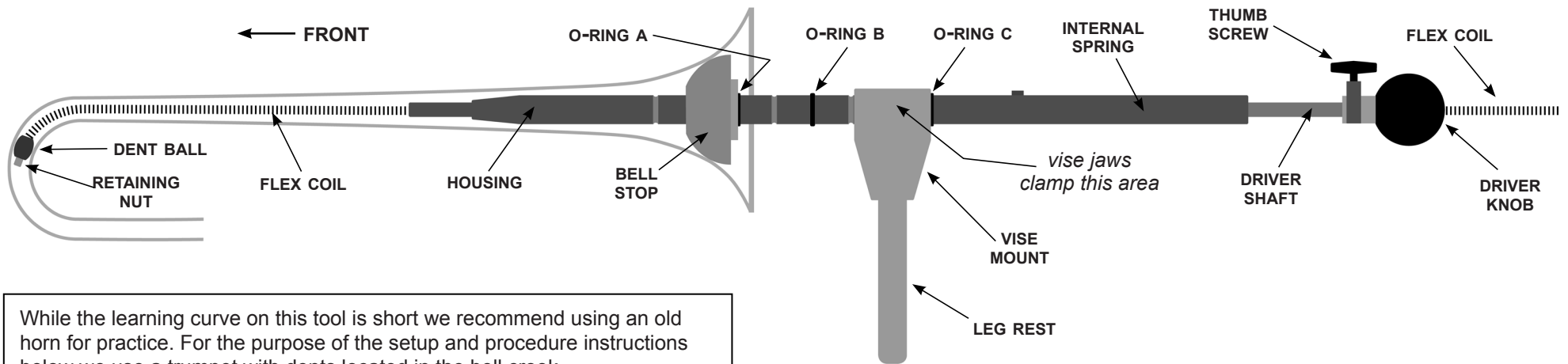
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FOR MUSICAL INSTRUMENT REPAIR SINCE 1978

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While the learning curve on this tool is short we recommend using an old horn for practice. For the purpose of the setup and procedure instructions below we use a trumpet with dents located in the bell crook.

SETUP

STEP 1 VISE MOUNT

The driver can be used either by clamping it in a vise or using the leg rest. To begin, we will start by using a vise. Move rubber O-ring C so that it is in the last housing groove towards back of driver and then slide the vise mount all the way back until it meets O-ring C.

Position the upper area of the vise mount between the vise jaws so that jaws will squeeze the vise mount's slotted area to securely grip driver's housing. Before clamping rotate housing so that thumb screw is pointing up, and angle the driver so that the front end is raised slightly higher than the back end (angle can be later adjusted to better suit technician's needs, but this is a good starting position).



STEP 2 BELL STOP

The positioning of the bell stop is very important as it prevents the tool housing from coming into contact and damaging the bell pipe. Move O-ring A into the 2nd groove from the front of the driver and slide the bell stop back until it meets the O-ring A. Pull back hard on the bell stop to ensure that the O-ring is engaged and does not slip along the housing. (Note that O-ring B is not used when the driver is set up for vise mounted operation.) The front side of the bell stop should now be located 8" to 9" (20-23cm) from the front end of the housing - this is a good position for most trumpets.

Carefully slide the bell pipe over the housing. If you feel any resistance before the bell flare meets the bell stop, then the driver housing is contacting the bell pipe and the bell stop is not positioned correctly for this horn. Remove the bell and move O-ring A and the bell stop forward to the 1st groove in the housing and try again. The bell stop is properly positioned when, with the bell flare snug against the bell stop, there is a small amount of sideways play between the tool housing and the inside wall of the bell. This will insure that no matter how much force you are applying to push a dent up the housing will not cause damage to the bell pipe. This procedure should always be followed when mounting a horn on the driver for the first time.

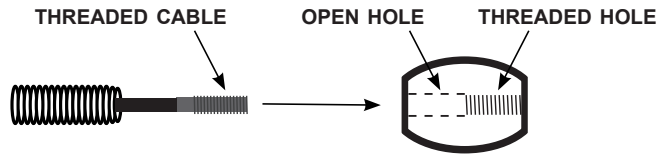
STEP 3 FLEX COIL AND SPRING ADJUSTMENT

Unscrew the retaining nut from the end of the flex coil and insert the threaded end of the coil into the rear of the housing through the driver knob. Loosen the 'T' knob thumb screw to allow the cable to pass through, and run cable all the way through the housing until it comes out the front end. Reattach the retaining nut. Do *not* tighten thumb screw.

The amount of flex coil that extends out the front of the housing plays an important role in the function of the driver's internal spring. Hold the horn up along the *outside* of the housing in the approximate position it will be when mounted against the bell stop, and then slide enough flex coil out to where it reaches 1" to 2" (25-50mm) beyond where the dent is located. Tighten the thumb screw down snug to lock the flex coil in place. The tool is now ready for use.

DRIVER OPERATION

Unscrew the retaining nut and attach the proper size dent ball. As mentioned in GENERAL TIPS ON DENT REMOVAL it is best to first find the size ball that will just slide past the dent so as to determine a good starting point, and then gradually increase ball size to start raising the dent. If using one of Votaw Tool Company's old style threaded dent balls you do not need to use the retaining nut to hold the ball in place, just screw the ball onto the threaded end of the cable. NOTE: the ball's threads run only about 1/2 the length of the ball and it is important to insert the threaded cable into the non-threaded side of the ball first.



Dent balls that do not have threads can just slide over the threaded end of the cable, and then screw the retaining nut back in place to secure the dent ball. If balls do not have a large enough hole they will need to be drilled out to a minimum hole size of 0.175" (4.4mm).

With the dent ball attached to the cable, feed the cable down into the bell pipe and slide the horn onto the tool housing. If the flex coil length was properly set in *Step 3*, the dent ball will reach the dent before the bell reaches the bell stop, and as you continue to push the horn onto the driver you will feel the internal spring engage. As the spring engages one of the following will occur:

1. Depending on the size of the dent ball in relation to the dent, the spring pressure may be sufficient to force the dent up and the dent ball will slide on past the dent. If this happens remove the horn from the driver, change to a larger size dent ball, and repeat.
2. If the spring pressure is not sufficient to raise the dent, you will continue to push the horn onto the driver until the bell flare reaches the bell stop. With the horn against the bell stop you will notice that the driver knob has moved away from the back end of the driver. Holding the horn securely against the bell stop with one hand, use the other hand to grasp and push the driver knob forward to force the dent up (take care to keep fingers away from driver shaft to avoid pinching between driver knob and housing). As the dent is raised the dent ball will slip past the dent, and the internal spring will return to its neutral position with the driver knob returning to rest against the back end of the housing. Remove the horn from driver and proceed to next size dent ball.

As explained in GENERAL TIPS ON DENT REMOVAL once the dent has been roughed up, a dent hammer is used to complete the job and the driver's internal spring again plays an important role. With the bell flare held against the bell stop the spring maintains a constant forward pressure on the dent ball as the hammer works the pipe. The amount of spring pressure is easily modified by adjusting the length of flex coil extending out the front of the housing. More length for greater pressure or less length for minimal pressure when performing final finish hammering.

LEG REST

A technician's physical size in relation to the height position of the shop's bench or floor mounted vise does not always lend itself well to hammering out dents, and can result in awkward bending and twisting to maintain access to the dent area. When a repair job calls for a lot of work with the dent hammer the leg rest feature can be a very helpful alternative by providing easy positioning of the horn for comfortable visual inspection and controlled access with the dent hammer.

1. Follow procedures in Steps 2 and 3 above to set the position of the bell stop and to set the length of flex coil from front of driver. Remove driver from vise.
2. Move O-ring B into the housing groove that is closest to the bell stop and slide vise mount forwards firmly up against ring. Next, move O-ring C forward to groove closest to the vise mount. The vise mount should now be positioned between O-rings B and C with a slight amount of play between rings.
3. Insert the leg rest into hole located in bottom of the vise mount. Attach desired size dent ball and driver is now ready to use.
4. Feed the cable down into the bell pipe and mount the horn onto the driver. With the driver pointing in an upwards position (see picture), set the leg rest against the thigh and bring the horn all the way onto the driver until the bell flare is against the bell stop. While one hand holds the horn against the bell stop, the other hand works the dent hammer, and the horn can be easily moved around for optimum access. Note that the position of the leg rest in relation to the housing can be easily adjusted to better adapt the driver to one's own body build, height, etc. Simply



move O-rings B and C along the housing to reposition the vise mount / leg rest to a more suitable position. If a shop stool is available, you may find it convenient to use the leg rest in a sitting position. Just clear a work area for a place to set dent balls, driver, horn, etc., pull up a stool, and jobs that call for extensive dent work will go faster and easier.

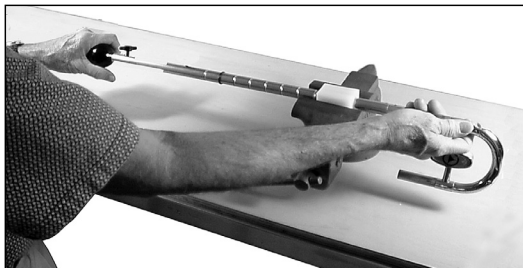
TUNING SLIDE CROOKS

For removing dents in tuning slide crooks the driver is best used mounted in a vise. The following instructions will use a trombone tuning slide as an example.

Remove the bell stop from the driver housing and set aside. Reposition O-rings A and B to the two housing grooves closest to front of the driver and slide the vise mount forward up against O-ring B. Clamp driver in vise as done in *Step 1 VISE MOUNT*.

Bring the larger tuning slide pipe up over the front end of the housing until the end of the slide pipe meets the area of the housing that is tapered. This tapered area has the same function as the bell stop. Make note of the approximate position on the housing where the pipe meets the taper, and as done in *Step 3 FLEX COIL AND SPRING ADJUSTMENT* hold the tuning slide up along the *outside* of the housing in the approximate position it will be when mounted against housing's taper. Loosen the thumb screw and slide enough flex coil out to where it reaches 1" to 2" (25-50mm) beyond where the dent is located. Tighten thumb screw down snug to lock the flex coil in place and the tool is now ready to use.

Proceed as described in DRIVER OPERATION; the only difference is that the housing's tapered area is used to anchor the tuning slide instead of the bell stop. One hand holds the slide pipe against the housing while the other hand is used to either push on the driver knob or to work the dent hammer.



GENERAL TIPS ON DENT REMOVAL

CLEANING & LUBRICANT

Always thoroughly clean the inside of the instrument to remove dirt and build up of mineral deposits. A lubricant should be applied to the dent ball to reduce friction and greatly aid overall operation.

ROUGHING OUT DENTS

For pipes with fairly deep dents a common procedure is to first push the dent up by forcing a dent ball against the dent until it is raised enough to allow the ball to slide past. Find the smallest ball that will just go past the dent and then move up two or three sizes larger and use that ball to raise the dent. Avoid graduating the ball size too quickly or using excessive force to drive balls as swelling of the pipe in the area opposite the dent may occur. A good technique on severe dents is to set the spring pressure fairly high (see *Step 3 FLEX COIL AND SPRING ADJUSTMENT*) and use a small rawhide mallet to lightly tap on the side creases / high points of the dent. The steady force of the spring on the dent ball will work to raise the dent while the mallet works the high spots down and helps to bring the pipe back into round.

It is important to note that these 'roughing out' procedures can only be used to partially raise the dent. Trying for complete removal will usually result in unwanted swelling of the pipe. Experience will help in learning how far you can proceed with these techniques before switching over to a dent hammer to finish the job off.

USING A DENT HAMMER

After roughing out dents as described above, determine the dent ball that is just one size larger than the ball that will slip past the dent. Attach dent ball and adjust flex coil length for light to medium spring pressure.

When hammering out dents it is important to know the exact location of the dent ball in relation to the dent. While a magnet can be handy for finding the approximate position of the ball, listening to the sound of the hammer against the pipe will tell the technician the exact area that the ball is in contact with the pipe. Lightly strike with the dent hammer around the dent area and when the hammer contacts the pipe in the exact spot where the pipe contacts the dent ball a dead, metallic sound will be heard. When the hammer strikes an area of the pipe that is not in contact with the ball a more hollow sound will be heard. With a little experimenting the difference in sound will become apparent.

Once the exact ball location is determined lightly strike the raised area on

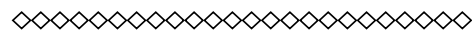
either side of where the ball is making contact with the pipe. This combined with the steady forward spring pressure against the dent ball will work to raise the dent while knocking down the outside high areas. When the dent ball slides past proceed to the next larger size ball and repeat. At some point in the procedure you may likely find that one ball slides past the area of pipe you are needing to work on and the next ball size up is too large. This will be especially true if your set of dent balls has broad incremental graduations. When this occurs you may need to back off completely on any spring pressure so as to help keep ball in desired position. Another option that can help is wrapping a layer of masking or electrical tape around the ball to build up thickness. Given the infinite range of diameter sizes of a tapered pipe, the finer the incremental graduations of the dent ball set the better the finished job, and the faster it can be done.

Another important consideration in dent removal is the fact that when a pipe is dented the metal around the dent is stretched resulting in slightly thinner wall thickness. As the dent is raised this stretched metal will have to go somewhere and will usually bulge and ripple the pipe around the edges of the dent. To help compensate for this many technicians will strike the pipe with a glancing motion where the path of the hammer swing is more sideways than straight down, allowing the hammer to force and 'move' the metal so as to redistribute and even out the wall thickness.

While the above technique will help towards reshaping the pipe to its original conformation and integrity some cutting of the metal such as with ribbon sand paper followed by buffing is generally necessary to completely remove any visible signs that the pipe was dented. While making the pipe look like new is the overall goal, a good technician works towards this end with the least amount of cutting and buffing. Furthermore, a compromise will often be made between how much cutting will be done versus appearance as some horn owners may prefer to leave some blemishes and hammer marks rather than lose metal.

REPLACEMENT PARTS:

FLEX COIL WITH RETAINING NUT CAT. #2321
RETAINING NUT..... CAT. #2323
RUBBER 'O' RINGCAT. #2040B



***Votaw Tool Company offers an excellent selection of
Barrel Dent Balls and Dent Hammers.***

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