TUBE BEADING TOOL

BY CARLOS R. DIAZ

During an engine change on my 1952 Cessna 195, I came up against an unexpected obstacle, one which I suspect has hindered more than one homebuilder. Since the 195 has a radial engine with an external oil tank, there are several oil, vacuum and vent hoses connected to aluminum tubes. These tubes are beaded at the ends in order to keep the hose clamps from slipping off. Because several of these tubes were original equipment (now over 40 years old), and were showing signs of significant wear, I decided to change them all. Obtaining suitable tubing was no problem, but nobody sold beaded tubing, and worse yet, nobody had even heard of a "tube beader." I did finally find a supplier who "thought" he could order one, but for about $200! After dozens of phone calls and many days of frustration, a friend of mine described a tool Lycoming used to form beads on push rod shroud tubes. I decided to build one myself and, surprise! It turned out to be easy, and the device works perfectly. If you have access to a metal working lathe/mill (or better yet, a friend who has one), you can build one of these in a couple of hours, for a buck's worth of scrap metal and a six-pack of Moulson's Ice for your friend.

CONSTRUCTION

The tool must fit snugly into the tube to be beaded, so each tool is specific for a particular diameter tube. Remember, metal tubes, as opposed to hoses, are measured by outside diameter, so the inside diameter depends on the wall thickness. You may have, in other words, different inside diameters for two 3/4" tubes, for example. In my case, I had to make two of these tools, one each for 1/2" tubes and 3/4" tubes. I have not shown any dimensions for the tool for this reason. The only critical dimension is the one labeled X in

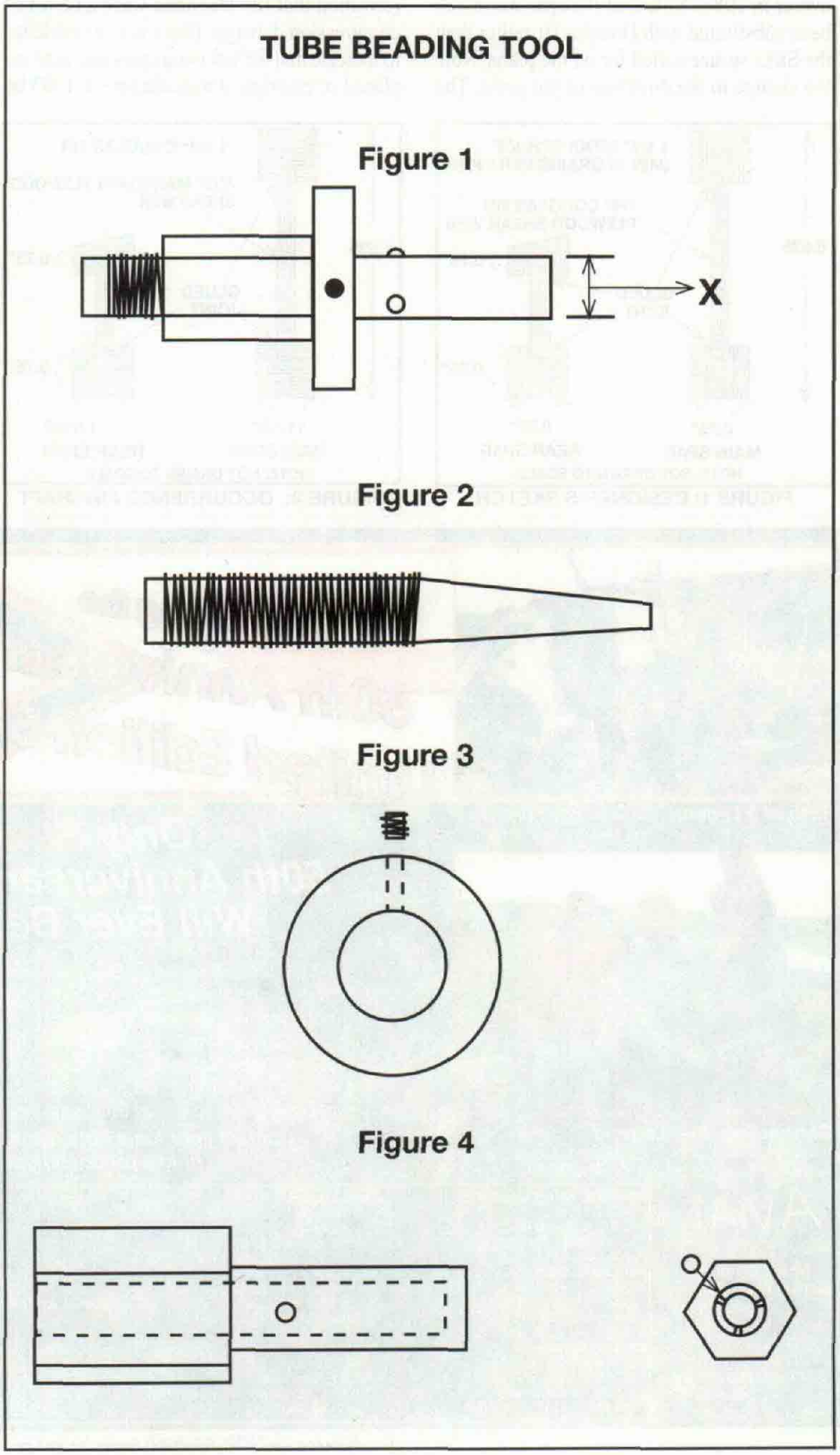

Figure 1. This is the part of the tool that goes into the tube. You need to use your calipers and measure the inside diameter of the tube you are going to bead, then, using the lathe, turn the body of the tool to that dimension.

The body of the tool (Figure 4) is made from brass, since this material is easier to machine, and this part of the tool does not require great strength. I used some scrap hexagonal brass stock for the smaller tool, and for the 3/4" tool I started with round brass stock. The round stock was milled into hexagonal shape with the aid of a dividing head. If you don't have one of those, a rotary table may do, or even careful measuring, marking, then clamping and milling each surface in turn. No great precision is needed here, you are just looking for flat surfaces that you can get a crescent wrench on. The length of the hexagonal part is therefore arbitrary, as long as it is wide enough to grip with a wrench. The rest of the stock is then turned to the inside diameter of the tube to be beaded. Some precision is necessary here, since you want a snug fit without binding.

The body of the tool is then bored with a drill, as shown by the phantom lines in Figure 4. Ball bearings are then selected for use in the tool. The size of the ball bearings determine the width of the bead. Using calipers, measure the size of the ball bearing, then drill the appropriate holes as shown in Figure 4. Although theoretically only one bearing is necessary to form the bead, drilling three holes 120 degrees apart provides a self-centering tool. Once again, a dividing head is useful for this, although not absolutely necessary. next, select a steel rod to use as the tapered pin. The degree of taper is not critical, basically the shallower the taper, the slower the bearings come out to form the bead. I used a rather steep taper, since it allowed the turning of the taper with the lathe cross-slide, therefore avoiding having to mess with moving the tailstock about. I used a regular Sears tap and die set to tap the threads inside the body of the tool and to form the threads on the tapered pin. After this is done, grind two flat surfaces on the end of the threaded portion of the tapered pin, so that you can screw in the pin with a wrench (see Figure 2).

Figure 3 shows the aluminum sleeve. This is used to adjust how far in from the end of the tube the bead will form. Simply turn a piece of round aluminum stock to any arbitrary diameter larger than the tool body, then drill and tap it to accept a set screw.

Insert some heavy grease into the body of the tool, then slip the taper pin in and screw it in part of the way. Insert the bearings into the holes, then unscrew the taper out slowly until you can slip the bearings in flush with the surface of the tool. Take a

small pin punch and "stake" the borders of the holes. This will prevent the ball bearings from slipping out of the tool. Slip the aluminum collar over the tool, tighten the set screw and it's ready to go!

USE

Unscrew the taper pin until the bearings slip in flush with the surface of the tool. Slip it into the end of the tube. Adjust the collar until you have the appropriate position for the bead to form. Hold the body of the tool with a wrench, and turn the tapered pin with another wrench until you feel resistance. Remove the wrench from the tapered pin and rotate the entire tool with the wrench holding the hexagonal body of the tool. This will rotate the bearings around and begin forming the bead. Continue in like manner, alternately tightening the tapered pin inwards (thereby expanding the bearings outward) and rotating the tool around, until the bead reaches the desired size. Then unscrew the tapered pin and remove the tool.

(This homebuilder's tip was submitted by Carlos R. Diaz, EAA 454358, 11590 Dueling Oaks Dr., Pensacola, FL 32514-9731.)

AIRCRAFT SPRUCE & SPECIALTY Since 1965

AMERICAN SAW & MFG. COMPANY LENOX ISO 9002 CERTIFIED

FLUKE®

Readers are invited to submit entries to EAA's Hints For Homebuilders, Att: Golda Cox, P.O. Box 3086, Oshkosh, WI 54903-3086. Entries will be reviewed by a panel of EAA judges. Readers whose hints are published in ***SPORT AVIATION*** will be awarded a $25 gift certificate plus a current catalog from Aircraft Spruce & Specialty, and a Lenox 4012 Hacksaw Frame from American Saw & Mfg. Co. Members are also invited to submit hints of an electrical nature. Any hint used will receive a Fluke Model 23-2 Multimeter with Holster from the John Fluke Mfg. Co., Inc. The contest will run from August through July of each year with a Grand Prize being presented by Aircraft Spruce & Specialty ($250 gift certificate) and American Saw & Mfg. Co. (Lenox VBKMA-6 Vari-Bit Kit). A Grand Prize will also be awarded by the John Fluke Mfg. Co. These awards will be presented during the EAA Convention. Our thanks go to our sponsors for these awards.