

## ROTORWAY

### MAIN DRIVE TRAIN

#### INSTALLATION

##### PREFACE:

The major components involved in assembling the main drive train consist of: the engine, main rotor shaft, secondary drive unit and chain, oil bath, fan drive countershaft, alternator and water pump.

Before beginning any work, read through this entire procedure once or twice to familiarize yourself with each of the steps. By doing so you will gain a greater understanding of what is involved, saving yourself considerable time and effort.

The 10 steps consist of:

1. Preliminary main shaft installation.
2. Final installation, shimming and alignment of secondary drive unit with main shaft. (Assuming that the airframe has been completely finished and painted - see note on next page.)
3. Installation and any required shimming of the engine.
4. Installation of idler pulley assembly, clutch assembly and torque link.
5. Main drive belt installation with fan drive countershaft, water pump, alternator and voltage regulator.
6. Removal of chain and raising of main shaft in order to fit the oil bath.
7. Completion of lower oil bath cover and final installation in the airframe.
8. Final installation of the main shaft, along with the main drive train.
9. Check: chain tension, master link and master link insertion plate, safety wire secondary retainer plate bolts and sprocket hub to shaft bolts.
10. Completion of top oil bath cover and sealing to lower cover.

NOTE: Make sure before starting the engine that oil has been added to the chain oil bath. The correct amount is 1 quart of engine oil and 1 can of STP oil treatment - mix the two oils before pouring them into the chain oil bath.

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NOTE: If your airframe has not been final painted prior to installation of the drive train components, all the components will have to be removed for the painting process. If this is the case, do not glue the rear oil seal in place until you install the secondary drive unit for the final time. The secondary drive unit must be final bolted in place, along with the lower oil bath cover. Only then can the seal be glued in place and all bearings Loctited.

### IMPORTANT:

- A. The main shaft must be installed 90 degrees to the drive mount tubes in the fore and aft and lateral planes.
- B. The secondary drive shaft must be installed parallel to the main drive shaft in the fore and aft plane.
- C. The small sprocket must be installed 1/32" to 1/16" higher than the plane of the large main drive sprocket. This allows for correct alignment of the chain during flight, since the airframe and the hood bracket will flex slightly under load.
- D. It is very important to achieve the correct initial chain tension, and re-tension the chain whenever necessary.
- E. Take your time with the main drive installation and you will be well rewarded with achieving maximum lifetimes on the drive train components.
- F. Be sure to loctite the lower main shaft and secondary shaft lower bearings during final assembly, using the Loctite provided.

**SECTION/OPERATION**

**11**

**DRIVE TRAIN**

<u>COMPONENT</u>	<u>PROCEDURE</u>	<u>PRINT #</u>	<u>TEMPLATE</u>
SECONDARY DRIVE (E23-2000)	Secondary pulley assembly Drive belts Fan drive pulley Fan Secondary sprocket	23-2000	E23-1
MAIN ROTOR SHAFT (E49-2000) (see Section 8)	Main sprocket Main rotor shaft Drive chain Main shaft safety spacer	E49-2000 E49-2001 E49-2002	

**NOTES**

BEARING

LOCK RINGS:

In our application the bearing lock ring must be set in the direction of rotation. This is done by using a drift punch (sized for the hole in the lock ring) and a hammer approximately 10-14 oz. in weight. Strike the punch in the direction the bearing is turning. No more than 2 or 3 strikes are necessary to set the ring in position. Then tighten the set screw firmly. If the bearing requires Loctite, wait until the Loctite is dry before setting the lock ring. Keep in mind the larger the bearing and lock ring, the more force it will take to set.

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### TOOLS REQUIRED FOR OPERATION 11:

Allen wrench	
Band saw	
Drift punch	
Drill bits of the following sizes:	1/16"
	5/16"
	Letter "D"
Drill press	
Hammer	
Hand drill (air or electric)	
Level	
Pliers	
Ratchet with sockets of the following sizes:	7/16"
	1/2"
	9/16"
Ruler	
Screwdriver	
Side cutters	
Snap ring pliers	
Spring scale	
Straight edge	
Tape Measure	
Torque wrench	
Wrenches of the following sizes:	1/2"
	7/16"
	9/16"



Photo #1

Use print E23-2000 and template E23-1 to construct this assembly. Parts as received from RotorWay International for the secondary drive.

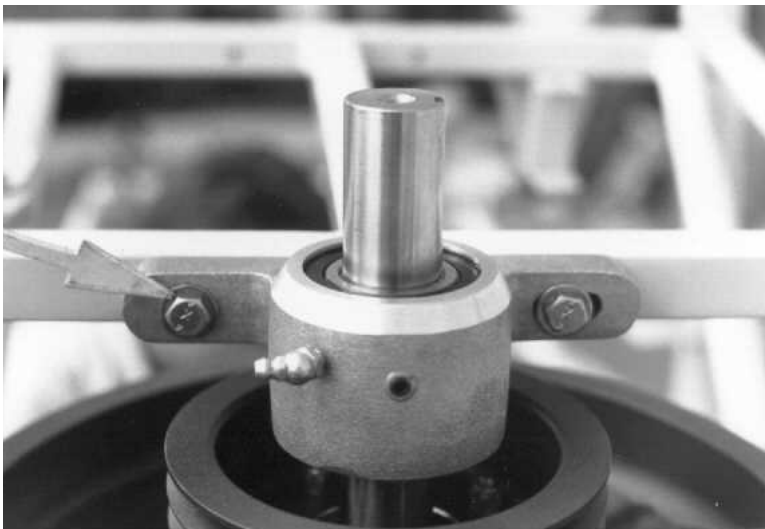


Photo #2

Install the secondary pulley assembly into the airframe. (The tail rotor drive pulley and the steel secondary sprocket must be removed from the secondary shaft before installation into the airframe.) Note: The main drive belts, upper fan drive and water pump belt must be installed at this time. Also, center the lower secondary shaft in the airframe.

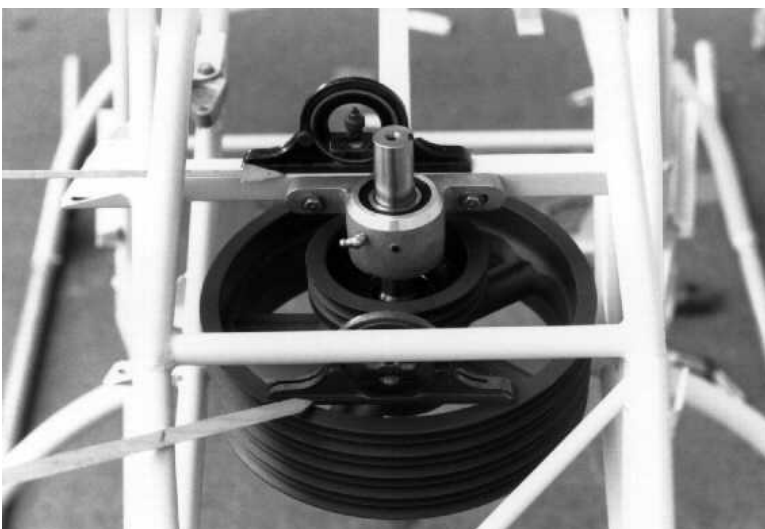


Photo #3

Place a level on the rear square drive tube and level the airframe by shimming under the skids if necessary. Level the secondary pulley by pivoting on the locating bolt (in the above photo). When level, tighten the bolts.



Photo #4

Place a level on the fore and aft square drive tubes and shim under the skids to level the airframe. Place a level on the secondary pulley.

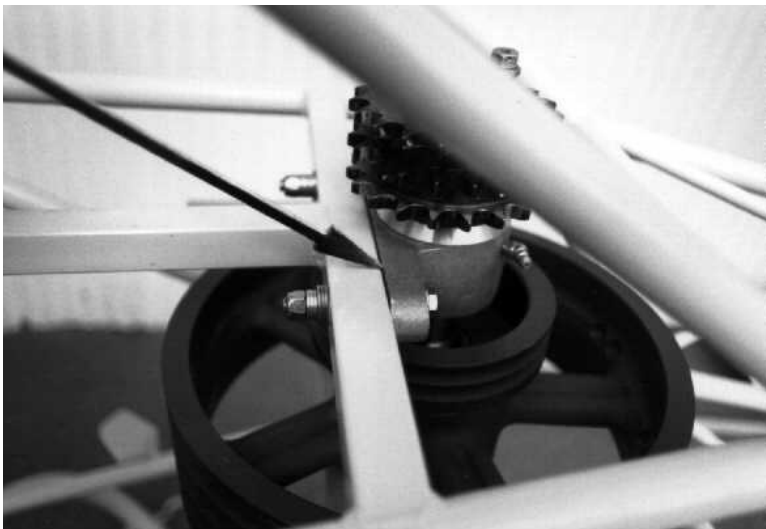


Photo #5

Level the secondary pulley fore and aft by placing shim where indicated by the arrow in Photo 5 or Photo 6. Place the shim on either the top or the bottom as required to make the pulley level.



Photo #6

Another view of where to place shims if necessary.



Photo #7

Refer to print E23-2000 for the up and down positioning of the bearing assembly. On final assembly, loctite the lower bearing to the shaft. Set the lock ring and tighten the set screw. (See notes on section 11 title page regarding the setting of the bearing lock ring.)



Photo #8

Place the fan pulley assembly on the fan and mark the outside diameter of the pulley with a felt marker.



Photo #9

Lay out the hole pattern to be drilled to bolt the fan to the pulley.

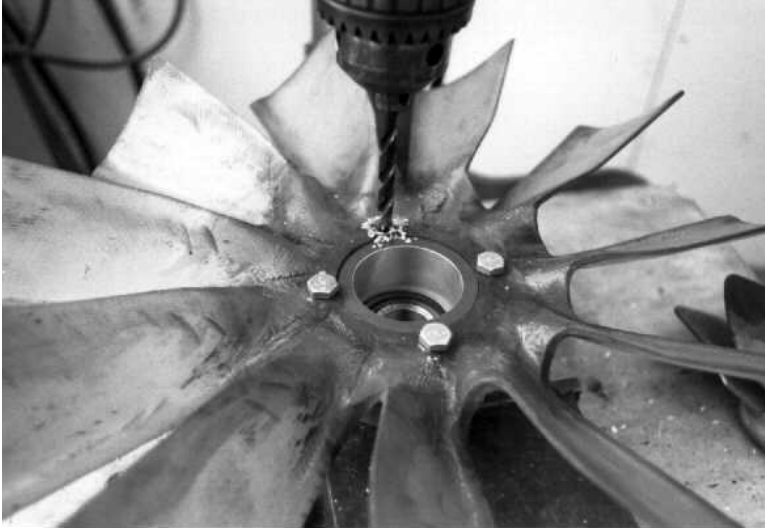


Photo #10

Place the fan drive pulley and the fan on a drill press and drill one 5/16" hole. Install a bolt then drill another hole and install another bolt. Repeat this procedure until all holes are drilled and all bolts are installed.



Photo #11

Install the tail rotor drive pulley and the fan and pulley on the lower secondary shaft. On final assembly, loctite the bearing to the shaft.

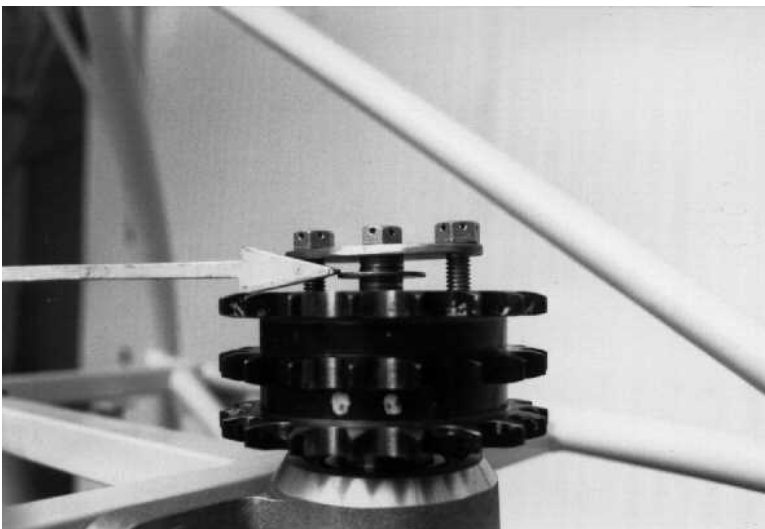


Photo #12

Install the secondary sprocket. Cut out and drill the holes in the retainer plate using template E23-1. When aligning the sprockets, it may be necessary to install a fender washer between the top of the shaft and the retainer plate.



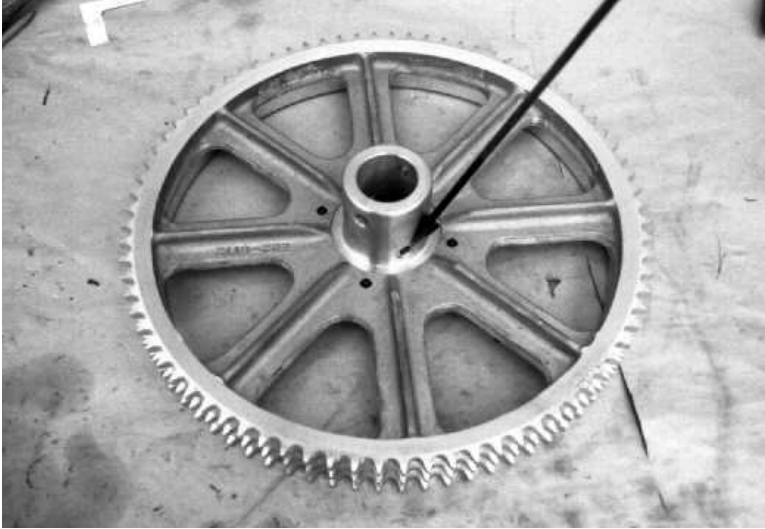


Photo #13

Place the large drive sprocket on the sprocket hub so that the bottom hole in the hub is centered between the spokes without a hole.



Photo #14

PROPER DRILLING OF THE HOLES FOR THE BOLTS THAT HOLD THE SPROCKET TO THE HUB IS EXTREMELY IMPORTANT. **USE A LETTER "D" DRILL** to drill the four holes in the sprocket and hub. Use a drill press, ensuring that the holes are drilled perpendicular (90 degrees) to the face of the sprocket. The bolts should fit snug enough that it will be necessary to lightly tap them in place with a plastic hammer. (A letter "D" drill can be ordered from RotorWay, part number E08-3100.)



Photo #15

On the bottom of the sprocket hub is an index mark.



Photo #16

The index mark on the sprocket hub matches one on the bottom of the main shaft.

Photo #17



Transfer the index marks to the top. This will allow you to align them when installing the three bolts that hold the hub to the main shaft. Install each of the four sprocket bolts from the bottom with the head flush to the hub flange (no washer), and a combination of one or more washers on the nut end of the bolt to locate the nut properly. (After final torque, the nut must be located on the bolt so that safety wire can pass through the hole in the shank, yet the nut must not bottom out on the threads of the bolt.) Torque the four bolts to 7 ft.lbs., then safety wire the bolts as shown on the print. It will be necessary to drill small holes through the sprocket (no larger than 1/16" diameter) so that each bolt head may be individually safety wired to the sprocket. The shanks of the four bolts should then be wired together.

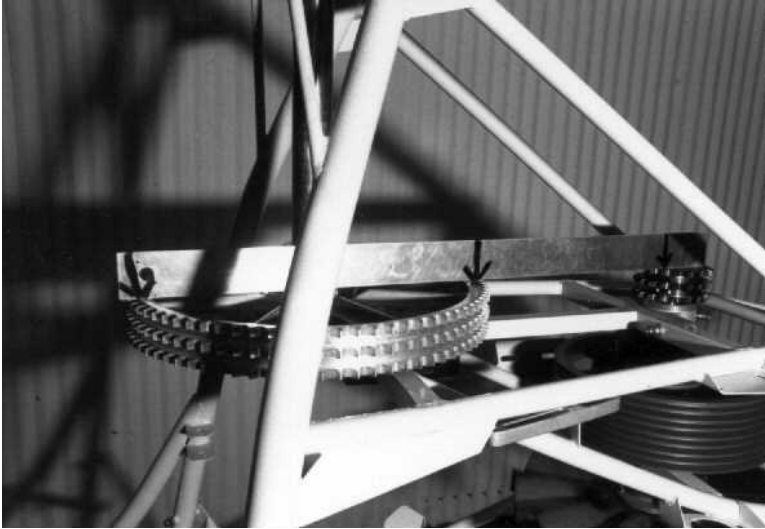


Photo #18

Check the alignment and sprocket heights with a straight edge. The straight edge should make contact with the sprockets at the three points indicated by the arrows.

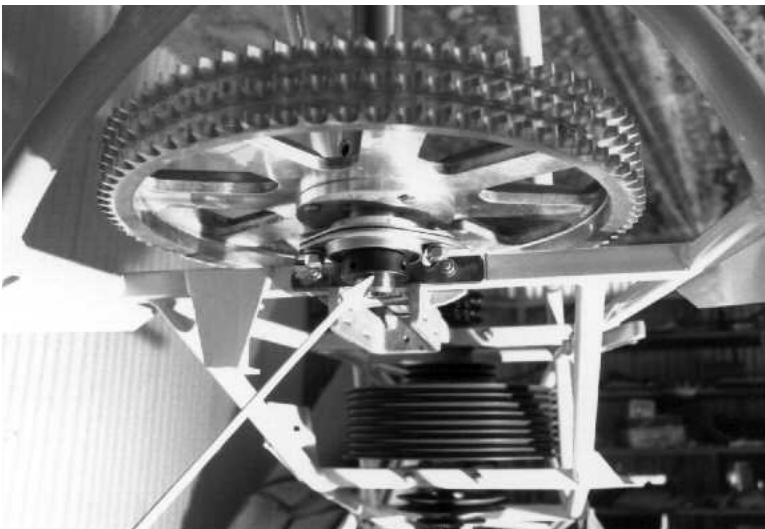


Photo #19

On final assembly, the lower main shaft bearing should be Loctited to the shaft, the lock ring set and the allen screw tightened. Note: This procedure is to be done after the lower oil bath has been installed.

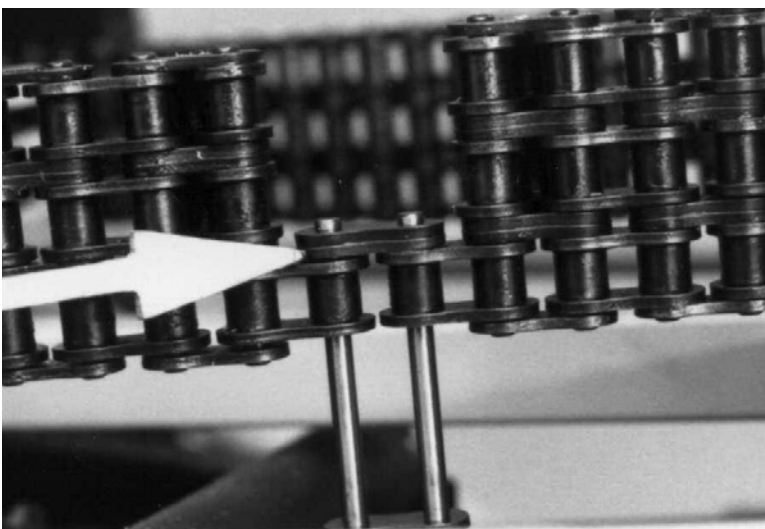


Photo #20

Preliminary installation of the drive chain. Do not forget the two link plates that go between each row of rollers when installing the master link.

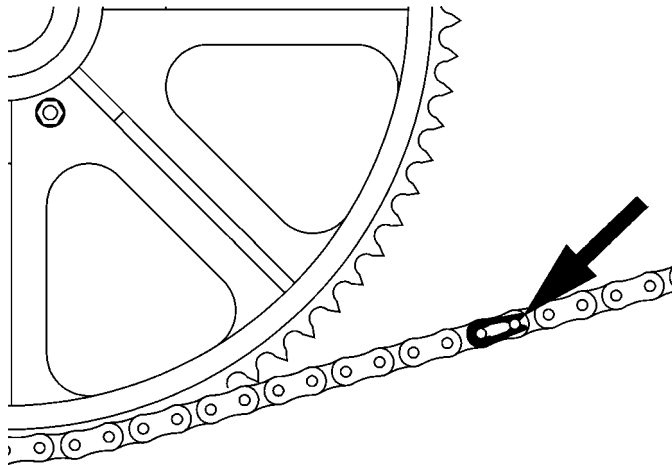


Photo #21

The master link clip should be placed so that the split end is in the trailing position as shown by the arrow. (The main shaft will turn clockwise viewed from above.) The master link is a pre-flight check item, which is the reason for the plexiglass inspection windows in the oil bath cover.

Note: The chain will be removed later for the oil bath to be fitted. Do not install the clip until final assembly.

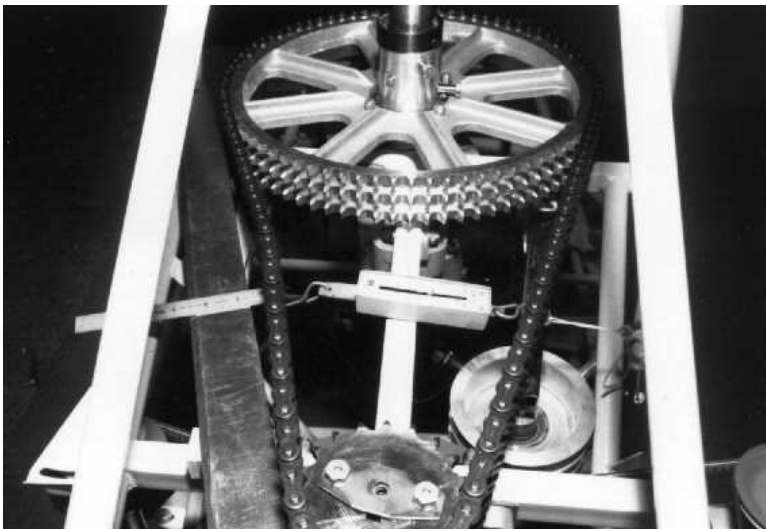


Photo #22

Check the tension of the chain using a straight edge. Pull ten pounds with a spring scale midway between the sprockets. The chain should move 1/2". To tighten the chain, install shims equally between the top and the bottom bearings and square drive tubes on the secondary drive unit.



Photo #23

Place the safety spacer next to the main shaft and mark where it will be cut for a snug fit. Note: Make sure the concentric part of the lock ring on the main shaft bearing is seated against the bearing before the aluminum safety spacer is measured. Failure to do this will cause an excessive gap between the main shaft lock ring and the sprocket hub. This must be a snug fit. Upon final assembly, set the lock ring with a punch and hammer and tighten the set screw.



Photo #24

Check the fit of the safety spacer. It must fit snug between the lock ring and the sprocket hub.

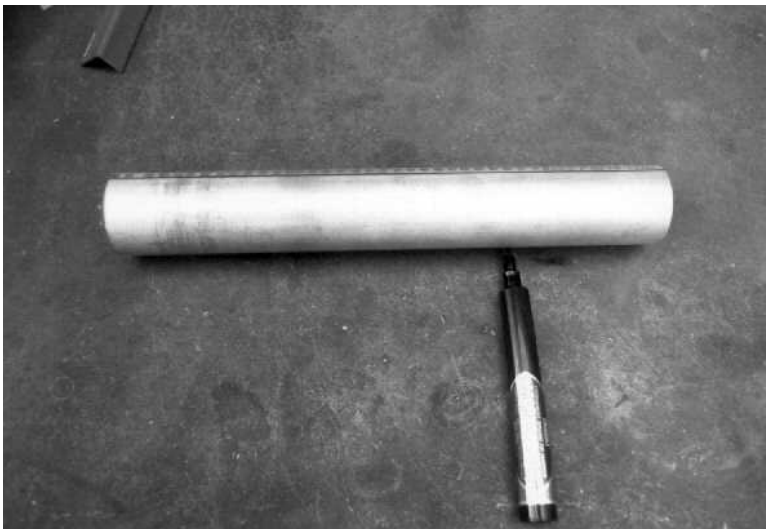


Photo #25

To make a straight line along the length of a tube, lay it on a flat surface. Lay a marker on the surface and slide it from one end of the tube to the other.

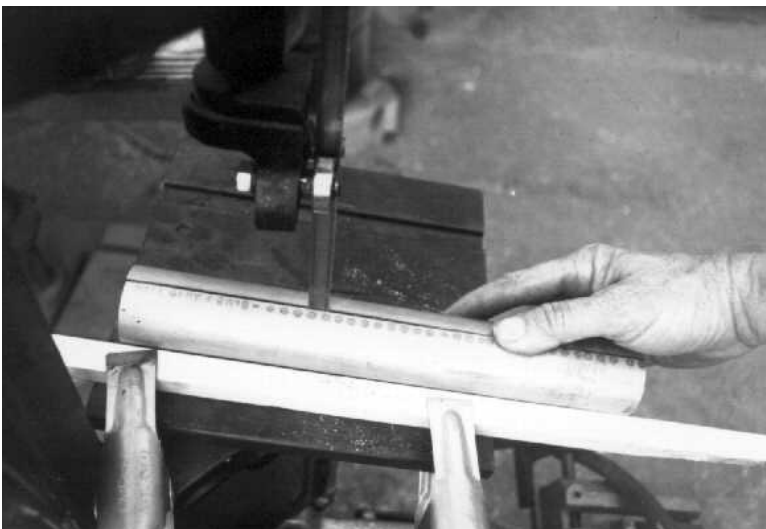


Photo #26

Clamp a board on the band saw table so that when the tube is against the board, the saw blade is centered on the tube. Turn on the saw and slide the tube along the board. The saw blade should stay on the line, effectively cutting the tube in half.



Photo #27

Deburr the edges of the safety spacer and install it on the shaft with hose clamps. Upon final assembly apply a coating of grease to the main shaft to prevent surface rust.



Photo #28

Safety spacer installed.