

Repacking the Spindle Bearings on a 1990 Enco RF-30 Mill/Drill, Version 1.3

By **R. G. Sparber**

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Warning: The spindle nuts are LEFT HANDED.

Sorry about the rambling title, but it was necessary. I looked at a few videos related to the task at hand and was surprised how little my machine had in common with them. So if your RF-30 doesn't look like mine, not to worry. Just go to YouTube and search for other versions.

Disclaimer

Although my results seem to be great, this is the first time I repacked my spindle bearings, so I am far from an expert.

Scope

This article will take you through the steps necessary to extract, degrease, and repack my spindle bearings.

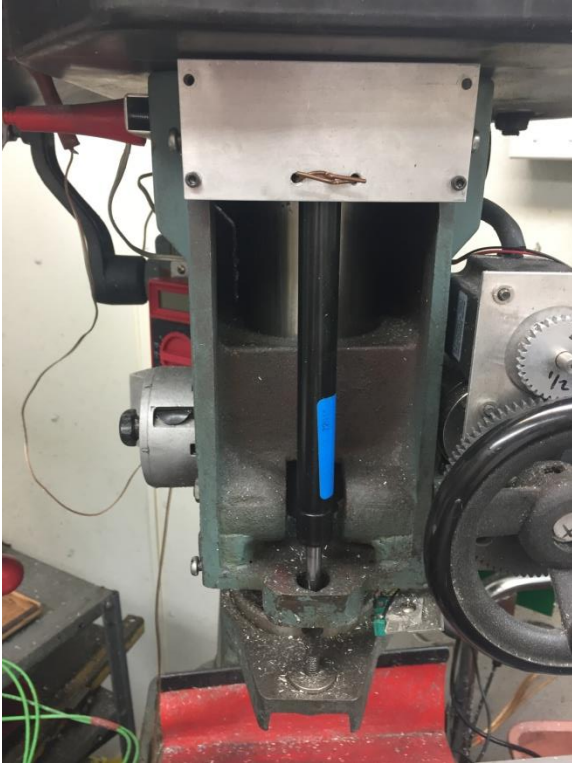
At the suggestion of Gregg Kricorissian, I bought a can of Mobil1 Synthetic bearing lube (<https://mobiloil.com/en/synthetic-grease/mobil-1-synthetic-grease>). Very nice product and cost less than \$10 for a can which should last me many decades.

Why Repack the Bearings?

I was measuring the electrical resistance between the spindle and the head and noticed I could hand turn the spindle and get above 0.5 ohms. By gently tapping the side of the head, this resistance would steadily drop until it reached about 0.001 ohms. I then realized that the bearings have been slowly noisier over the past many years. Gregg asked me when I last repacked these bearings, and I was forced to admit... never.

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Extracting the Quill



The black cylinder is a gas piston that removes backlash from my Z-axis. By lowering the quill and loosening a screw supporting the bottom of the piston, I was able to release the pressure.

You might have the depth stop mechanism here. It can be left in place if the mechanism does not prevent the quill from being removed from the bottom of the head.



~~Raise the head up to the top of the column. This makes room for the quill to come out the bottom.~~

Corey Renner suggested a better approach. Lower the head down as far as it would go. Then lower the quill down on a block of wood. I will continue his suggestion as we proceed.



Loosen the bolt on the back of the lower spindle bearing clamp. You may need to pry the gap open a little, but then the clamp should slide off the bottom.



Lower the quill down as far as it will go and rest the end on blocks of wood.

Continuing Corey's suggestion, since the head is all the way down, the bottom of the quill will be close to the table.



This large silver cylinder contains the take-up spring. That knob in the center secures it. Take care as you turn the knob counterclockwise to remove the cylinder. The cylinder can release from the head, and the spring suddenly release.



During installation, you loosely tighten the knob, wind up the spring by turning the cylinder (clockwise?), and lock it in position by engaging fingers in the head and cylinder base. Then finish tightening the knob.



Lift off the spring assembly to expose the horizontal shaft. The other end of this shaft has the clutch.



With the quill supported by the blocks of wood, pull the horizontal shaft out.



Below and to the right of the spring cylinder is the anti-rotation stop. Insert a screwdriver into the slot and turn the nut counterclockwise to release. Then back out the threaded rod.



The nub on the end of the threaded rod engages a small block. This block rides in the quill's anti-rotation slot.

As you lower the quill, keep an eye out for this tiny block.



Here you see the block fitted to the end of the threaded rod. The curved end points down in the slot.



The block is a close sliding fit in the quill's slot.



~~Lift up on the quill, remove the blocks of wood, and carefully lower the quill/spindle assembly down.~~

Here Corey suggests raising the head, which will expose the quill without having to manually lower it.

At some point, you will be able to guide the bottom forward a little, and it will be free.



Here is the quill with the spindle inside.

I am holding the quill in a bench vise using a split piece of PVC pipe to protect the spline.



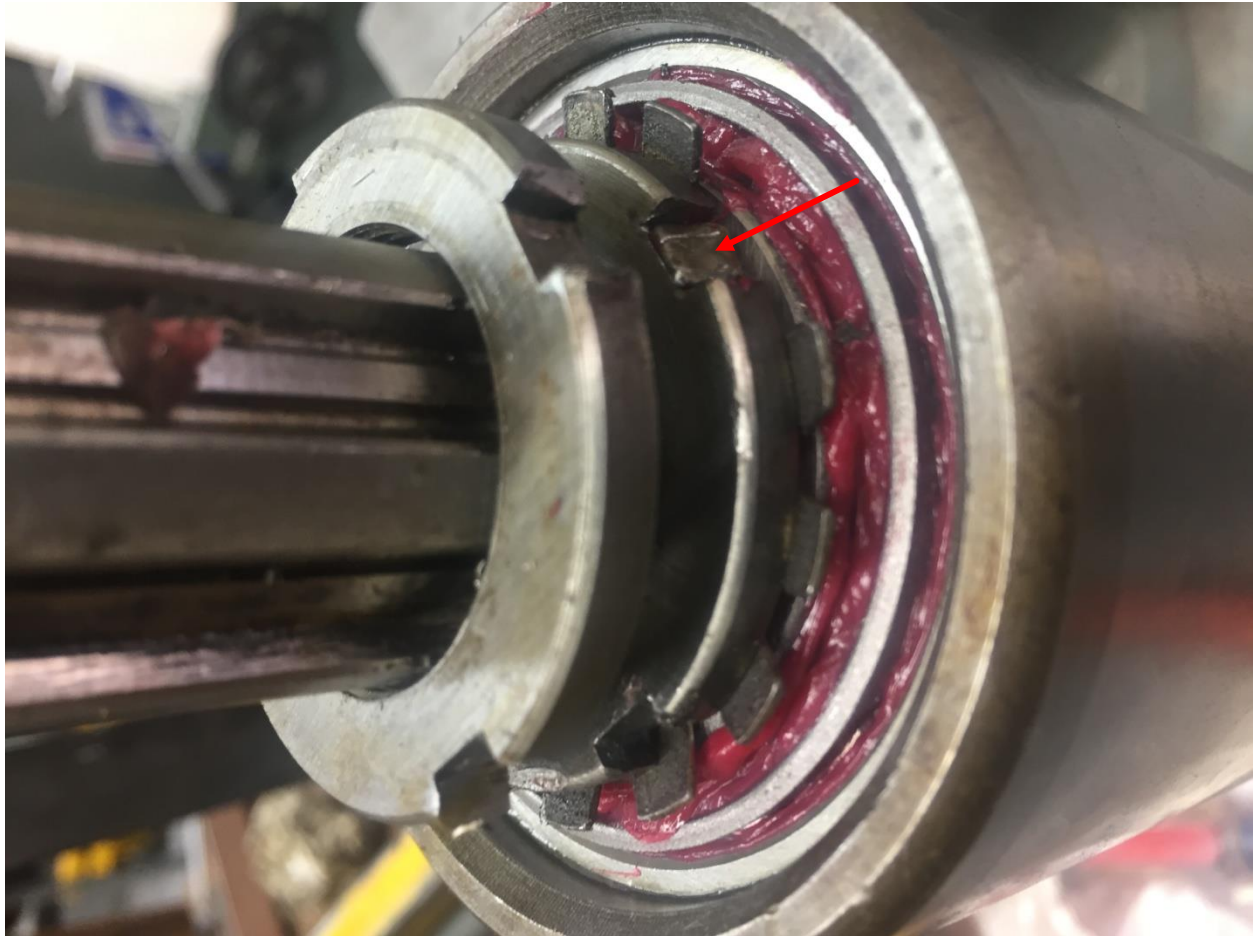
The bottom end of the spindle has a threaded grease cap. Using a drift and a small hammer, you can get this ring to turn. It is a right-hand thread.



Here is the inside of the grease cup after being degreased.



Two nuts hold the spindle inside the quill. **These are left-handed threads.** Using a screwdriver and dead blow hammer, I gently unscrewed the outer nut.

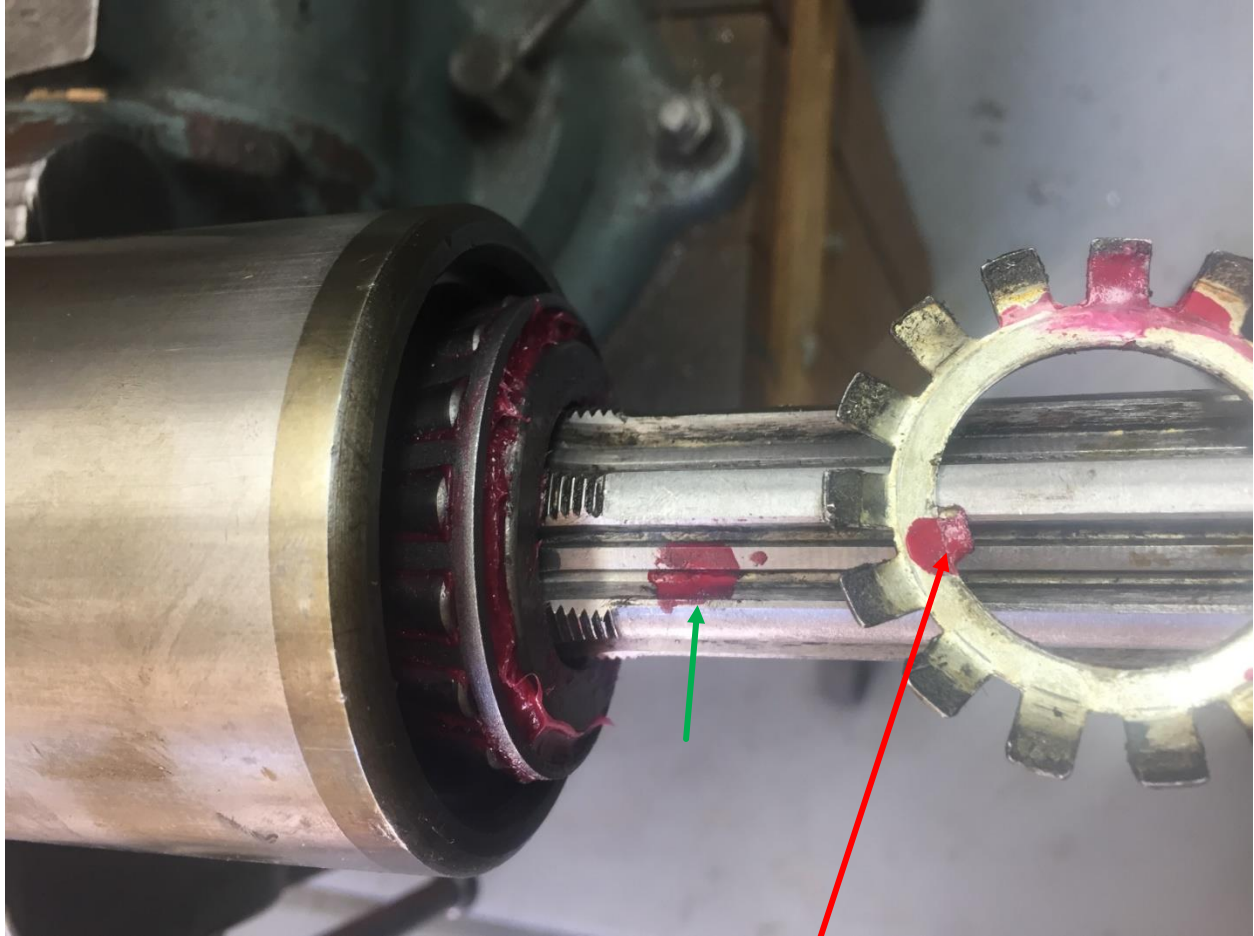


The inner nut is held in place with a tab washer. There are 3 notches in the nut, and there are many tabs on this washer. One of these tabs will align with one of the notches to prevent rotation.

I degreased the bent finger (red arrow) and put a dab of red fingernail polish on it. Then I bent the finger out of the notch. The notch was then degreased and marked with a dot of fingernail polish.

Only then did I spin the **left-handed nut** off.

Notice that both nuts have their smooth faces pointing outward.



Before sliding off the tab washer, I degreased the inner tab and the spline it engaged (green arrow).

All of these dots of fingernail polish will let me reassemble the nuts with the same preload as they had when I started. Adjustments can be made later, but it is good to start out close to right.

This picture was taken after I repacked the upper bearing.



With both nuts removed, a light tap with the dead blow hammer was enough to move the upper bearing. Notice that the bottom of the quill was supported on wood blocks to permit the lower bearing and spindle to drop down.



With the upper bearing removed, the quill slid out to expose the lower bearing. I degreased this bearing in place. It was placed down in a can of degreaser for 15 minutes. Then I soaked it in "Simply Green" to remove a few stubborn bits of grease plus remove the degreaser.

Compressed air was used to move debris out of the bearing. ***Do not use the air to spin the dry bearing as this can damage it.***

After a clean water rinse, I left the bearing in the Arizona sun to quickly dry.

The upper bearing went through the same process.



Here is the upper bearing degreased and ready to be repacked.

Using my fingers, I pushed in grease from one side and watched the progress on the other side. It didn't take long to fill up the bearing. The same process was used on the lower bearing.

I got a tip from my friend Ed. He said to put the degreased bearing in a heavy freezer type plastic bag along with the new grease. Then zip the bag closed and work

the grease in. When done, remove the bearing, invert the bag, and wipe the remaining grease back into the can.

After installing the spindle back into the quill, the upper bearing was gently tapped back in place using a piece of PVC pipe pressing on the inner race. It would have been nice to have a press, but mine wasn't big enough. Then the tab washer goes on as marked with nail polish. Next is the inner left-handed nut with the slightly tapered face towards the bearing. Match nail polish marks and bend the tab into place. Then spin on the outer left-handed nut and tap with screwdriver and dead blow hammer until tight.



Before installing back into the head, I greased up the rack, pinion gear, and drive gear.



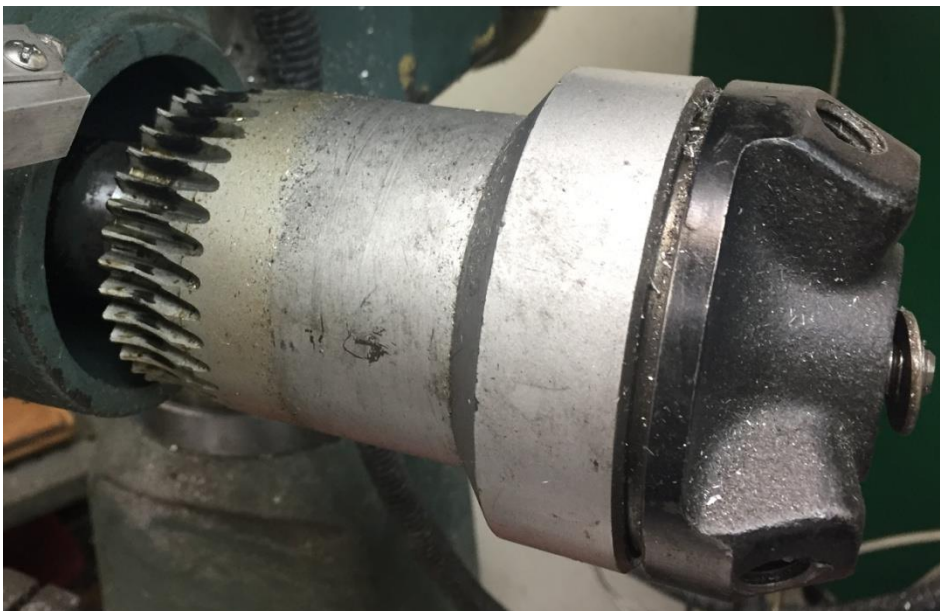
Pack the lower grease cup and screw it into the bottom of the quill. Tap with a drift and small hammer until snug.



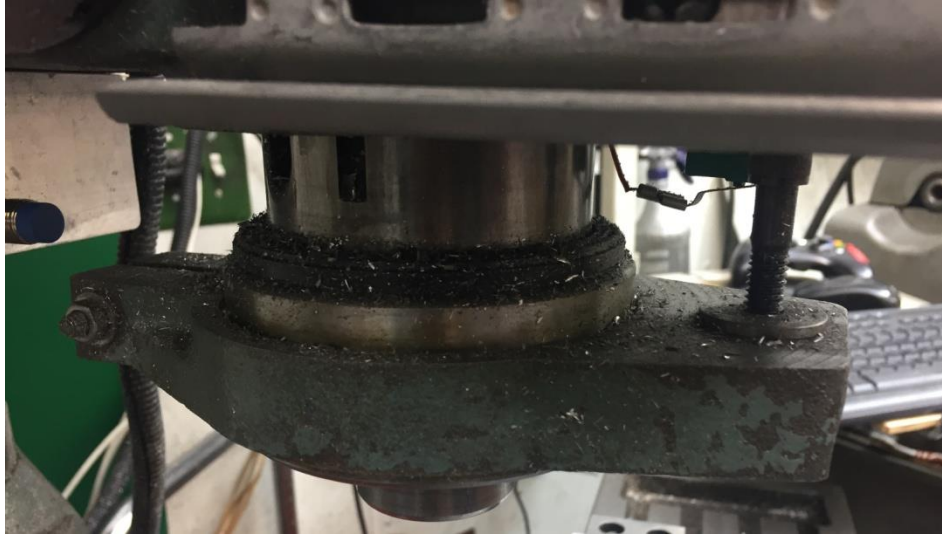
I put some grease in the holes that support the pinion gear assembly.



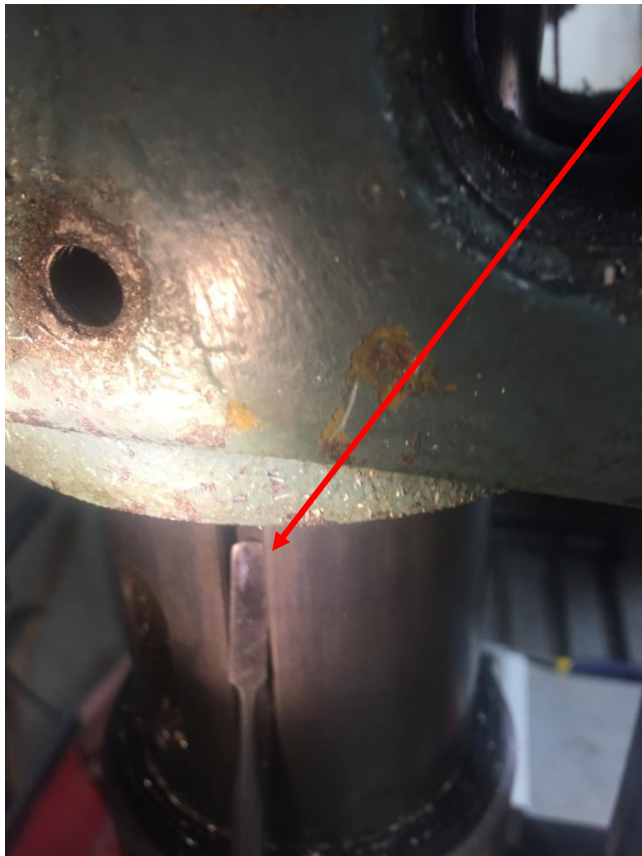
Slide the quill up into the head engaging the spline, and then



slide the pinion gear assembly into place.



Reinstall the yoke.



Slide in the anti-rotation block with the curved end pointing down. Sight through the threaded hole and position the block, so the hole in its face is aligned.



Then thread in the rod. Be careful not to bottom out, or the quill will bind.

Install the locking nut.



Install the spring assembly.

Before declaring success, look around and verify that all parts have been reinstalled. I might have missed a step.

The final step is to verify the bearings have the correct preload. The first test is to run the spindle at a slow speed for about 15 minutes to ensure the grease is fully distributed. Then I ran them at full speed while watching their temperature with a non-contact thermometer until it stabilized. I saw a rise of only 10°F. That is a big improvement. All of this tells me the preload is not too much.

The second test will be done later. It involves measuring spindle run out. If less than a few tenths, it tells me the preload is not too little.

The preload nuts can be accessed from the front of the head, but maybe it would be easier to remove the quill and make the adjustment in the bench vise.

John Herrmann reported on his experience replacing the bearings.

I've been working on replacing the spindle bearings on my vintage Grizzly D1007 (RF-30 clone) mill. Pulled everything but the motor off the head, cleaned things up, etc. Ordered new (genuine, as far as I can tell) Nachi roller and ball bearings. Installed them in the spindle today. Then the question comes up - how tight to make the retaining nuts??? And how to make sure that things are "run in" - bearing races fully seated, lube level OK, etc. I have nearly zero experience with mill spindles or tapered rollers. So I fell back on a general practice I've read about here and elsewhere ... tighten thing up to where they feel good, then run the spindle and check for overheating.

Adjusting (and readjusting) the tightness while the spindle is in the mill is a bit difficult, so I figured out this solution. Installed the drawbar and a collet, tightened up a piece of 1" shaft, clamped the spindle housing in a handy vise, and used a drill motor to spin the spindle at its top speed (~1800 RPM). The first result: I could feel a bit of warmth with my hand after a minute or two. So I backed off the jam nut about 1/2 turn and got out my handy dandy HF IR thermometer. Second test was to run the spindle for 5 minutes. Almost no temperature rise, even though the spindle offered a slight but noticeable resistance to turning by hand. Unless I'm way off base, this seems like an OK place to be.



Acknowledgments

Thanks to Gregg Kricorissian for both his encouragement and advice. Thanks to Corey Renner for his suggestion on how to more safely remove the quill. Thanks to Ed for his method of infusing a bearing with grease in a well-controlled manner. Thanks to John Herrmann for sharing his experience.

I welcome your comments and questions.

If you wish to be contacted each time I publish an article, email me with just "Article Alias" in the subject line.

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