

## **FINALLY a CURE for the always leaking 4 speed tranny, not a Band-Aid, a REAL SOLUTION**

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Hi Everyone

I am starting this new articles concerning the famous 4 speed transmission made by Harley from the early Knucklehead to the end of the Shovelhead era, those types of transmissions are almost indestructible but have a problem they often leak to the ground. I have been doing this modification for the last 15 years with a lot of satisfied customers, and I feel it might interest many of you....

I will start this article with...

Main leaks occur on the drive side, from either the end seal of the fourth gear, or between the spacer and the gear itself. And sometimes in both places, caused by different things, the main seal that runs over the spacer almost never leaks unless the outside of the spacer shows some wear but if you use a good seal it is normally leak free.

I have made many modifications on them over the years and finally came up with a nice solution for anyone tired of having spots of oil on the garage floor or elsewhere.

This modification to me is not a band aid solution, it is a real solution. It takes time to do articles like this, but I hope you find this article worth it. I hope you will enjoy it...

First...you can see an OEM spacer push on the fourth gear, there is a big seal running over it, that seal should not be the problem if properly lubricated.



The first problem I have found is that the bushing is often too loose on the main shaft. So the first thing to do is press out the old bushing.



When the old bushing is out, I start by making a new one out of continuous cast bronze 660. Why making a new one? Often new bushings that came from different companies do not have enough material to clear everything, most of them, not to say all, are set at the factory to have minimal material to remove with a reamer, and often end up with many spots of material not removed.

If you look at the inside of your bushing after pressing it and the reaming is done, you will notice that it is not machined all around. So there is not enough material, meaning the bushing is not supporting on the shaft properly.... So it will likely wear unevenly. So what I do is make my own custom bushing with plenty of material left inside. Remember to clean, prime and put green Loctite inside the gear and on the outside of bushing before pressing.

After the bushing is pressed in ... note the difference between both an old one and the newly press one I just made.

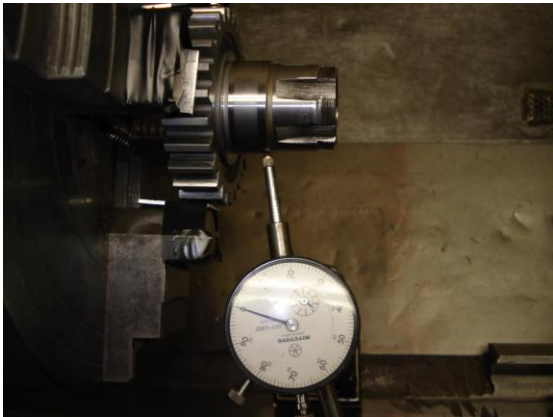
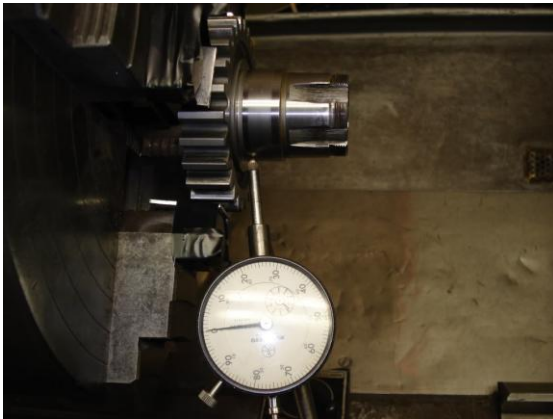


You will have to slightly polish the main shaft to get rid of small imperfection, or use a new shaft if it is too bad..., and then measure carefully so you could machine the bushing to achieve minimum clearance, in this case shaft measurement is .999 inch.

So I machined the bushing to .9997 inch, less than .001 inch of clearance (I am normally looking to have between .0007 to .0012 inch tolerances). You can only do it with a boring bar set up on the lathe; special reamer will only be able to machine one size, that's all.



When everything is properly done, I set up the gear in the four jaws chuck and carefully dialing it to achieve a perfect run out, you have to be sure that where the bearing runs on, run perfect with a dial indicator.



After you take care of accurately dialing the gear on the lathe, and you have the gear in perfect alignment, you could start the machining with a boring bar



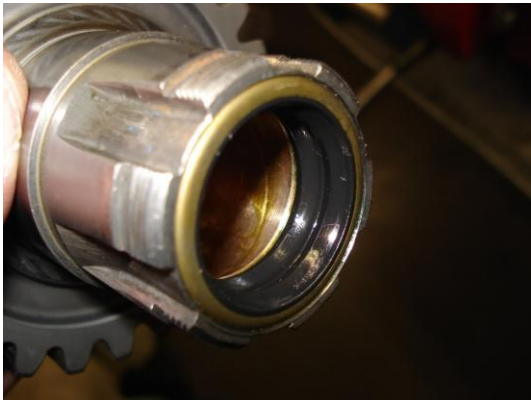
After the inside of the bushing is machined, I still continue modifying the end of the gear, here what I do, machining the recess a little bit deeper so I can put 2 seals in the end of the fourth gear instead of only one as OEM, the machining is done with either carbide or ceramic insert (much easier with a ceramic insert), the total depth required is  $7/16$  inch, instead of the  $3/16$  OEM, you can see the small oil groove inside the bushing not too deep but just enough to lubricate.



Ready to install the 2 new seals inside the end of the fourth gear: remember always clean /prime and put green Loctite on both the 2 small seals.



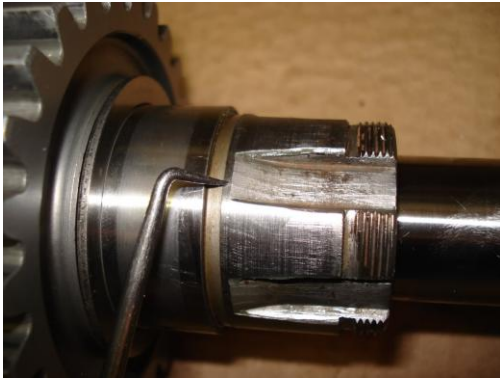
Since the outside seal will not receive too much oil, I simply put some Castrol synthetics grease between both seals, to make sure the seal outside get lubricate and cannot dry out.



. When you are done with the gear, it is time to take care of the spacer, since the other main problem occur when some of the oil escape between the spacer and the shoulder of the gear, I always make a new type of spacer out of C1144 steel, with o ring groove inside so there is no way oil could escape.



Picture show you where the o ring in the spacer is located on the gear.



And the picture of the new spacer to accommodate the old gear.



You could see the spacer with the o ring inside ready to be slip on the OEM gear, just put very small amount of grease around the o-ring to avoid scraping it.



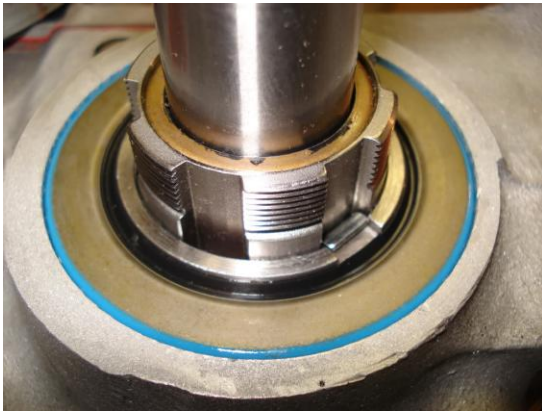
When everything is reassemble you will notice that there is now two seals at the end of the fourth gears including machining from all around the bushing with close tolerance and a 100% mating between both parts,100% mating between both parts means it will now take more time to wear out ,if properly lubricate ,... you will also end up with an O ring in the spacer ....so no more silicone from the outside around the spline.

I feel that sealing the gear from where it normally start to leak, is easier than sealing it from the outside.

See gear mounted vertically with nothing more than friction of the 2 seals and close tolerance getting the gear quite tight on the shaft, but still turn freely on the shaft no problems.



Here is the finished job with everything installed and ready to put the sprocket on. You could not see anything different from the outside, but this will definitely solve your leaking problem.



Note: I had tried a tranny with oil inside without the sprocket at the end, and there was no leak after at least 2 months on the floor, hard to believe but proves this modification is working.

Here is a photo of a brand new Andrews gear that I also modified to accept both 2 end seals and new spacer with an O rings.



Note: that Andrews gear(late model) is now using an O ring seal on the shoulder of their gear, plus my spacer and includes one O ring on that run not far from their O ring, between end of spline and their O ring.

I forgot to mention that there is at least 5 type of spacers needed to do that kind of modifications, depending of the year of you transmission, there is two that is not shown in the picture, so 5 different types of spacers in all, but they all have the same inside diameter.



Hope this article would help those of you who had problems with their leaking 4 speed, from early Knucklehead, Panhead to the Shovelhead era.

Ray