

Fast Frank's Transmission 101

by: Fast Frank

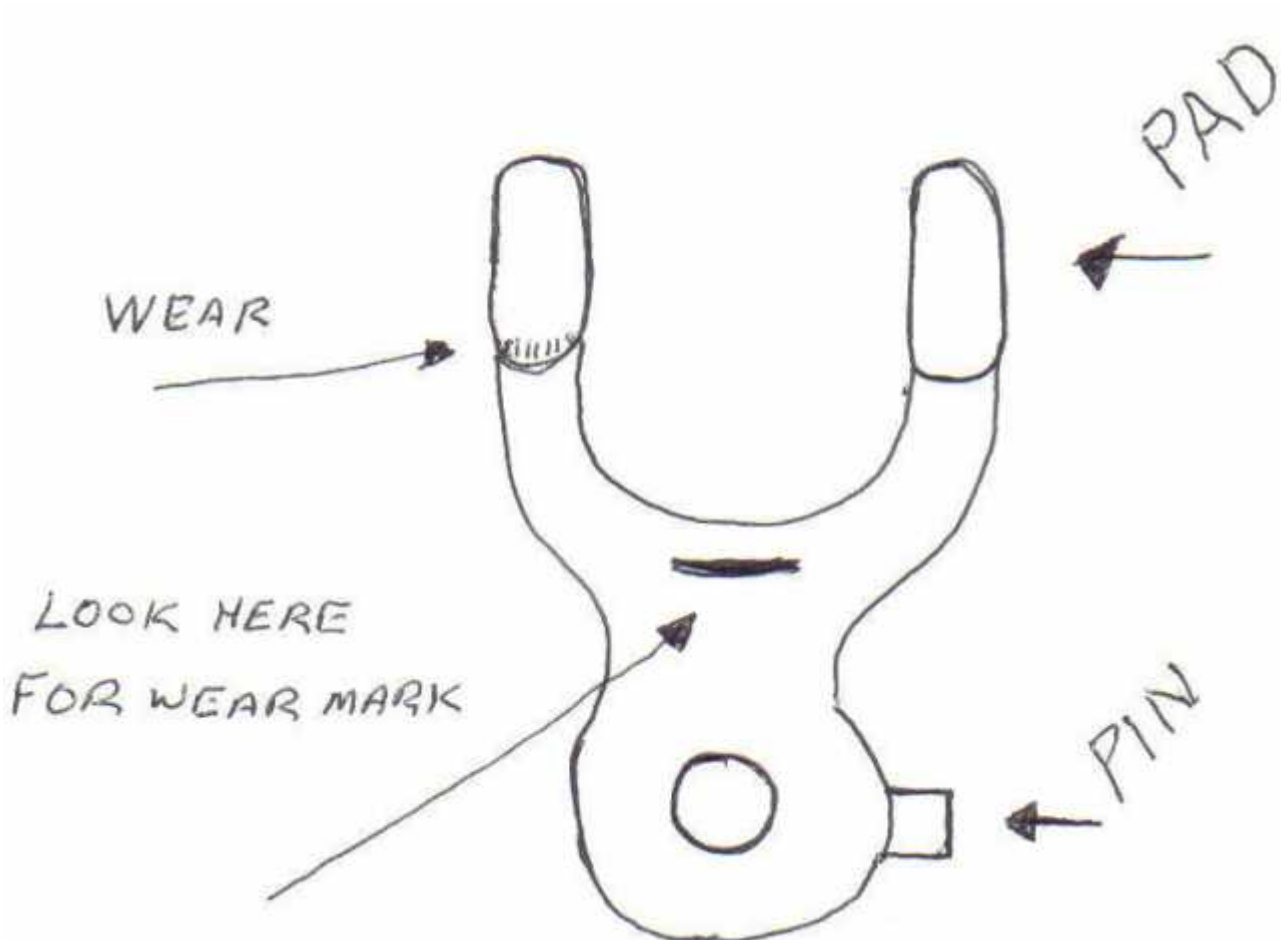
First, the motor has to come out, and the bottom has to come off.

You will have to pull some things off the sides, like the case covers, clutch, stator, and bearing retainers to get the cases apart.

When the cases come open, there's the tranny.

The first thing you will want to look at are the shift forks.

Here's a cheesy drawing to help clarify.



It's normal to find a little wear on the pads, but if it looks more than just a sign that it has been rubbing the slot, replace it.

If the pads show any galling or have turned blue, replace.

If there is a mark on the throat of the fork, as shown, it's bent.

Normally a bent fork is not visible. you cannot see the bend.

The throat of the fork is not supposed to touch the gear. If it has in any way, it's bent. PERIOD.

Yes, I know that you're looking at a tiny little scuff where it might have touched one time. It's bent.

Look at the pin that rides in the shift cam.

If it has a flat spot where it rubs on the cam, then it will not move quite as far as it's supposed to. If there is any significant wear at all, replace it.

If any or all of your forks show these problems, replace them.

Don't be cheap. when in doubt as to whether or not you are looking a perfect part, replace it.

Next, look at the shafts that the forks slide on.

If the tranny crashes hard enough, they can bend.

Roll those babies on a clean flat surface. If you can see any bend at all, or the shaft is worn enough to make the fork loose, replace them.

Now for the shift cam.

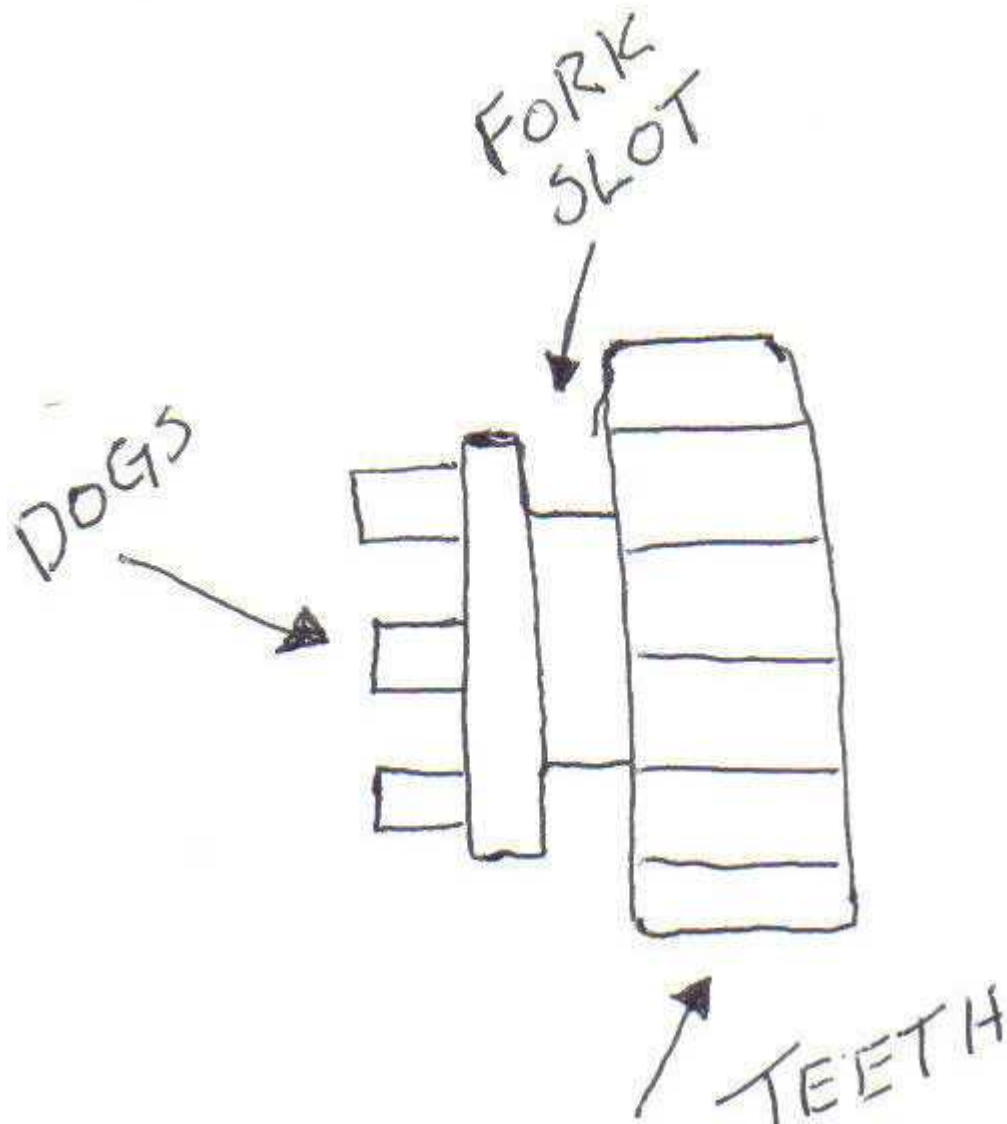
It's a round drum with crooked slots. Those slots move the forks.

Look at those slots. On the sides of the slots, where the fork rubs. You will notice that there is a mark where the fork sits when the tranny is in each gear. If that mark is a dent, then it will not push the fork as far as it is supposed to go. Look at both sides of all the slots. If you can find even one dent in that cam, or a place where it is worn, replace it.

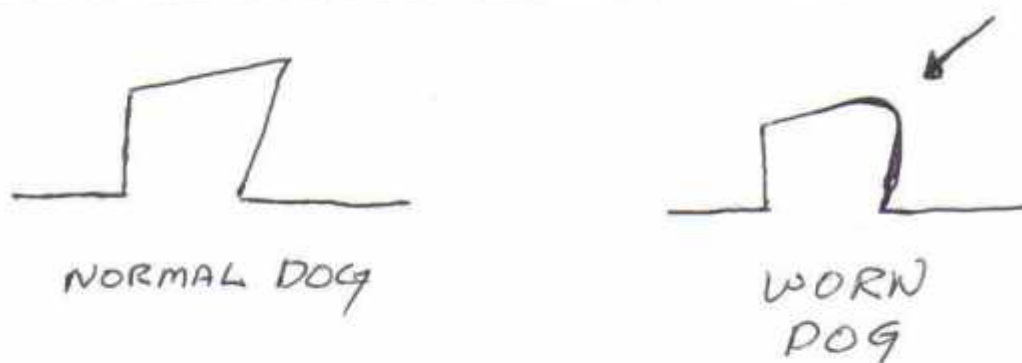
Take a look at the pawls and the stopper plate that make the ratchet work. Don't forget the detent wheel and spring.

If anything is loose or worn, replace.

Now for the gears. Cheesy drawing#2



And cheesy drawing#3



You can inspect the gears with them still on the shaft. There are two varieties- Wheel gears and pinion gears.

The difference is simple. Wheel gears have a bearing, and freewheel on the shaft. These gears are fixed in place and cannot slide around on their shaft.

Pinion gears have splines. they are free to move from side to side, but are not able to turn without turning the shaft with the gear.

And this is how the tranny works. Each pair of gears (1st thru 6th) has one wheel gear and one pinion gear. These pairs of gears are alternated on the shafts so that each wheel gear has a pinion gear next to it.

Each gear has "dogs" sticking out of the side. These dogs are setup so that the fixed pinion gear can lock to the freewheeling wheel gear next to it.

When both gears of any one pair are locked to the shaft, power can be transmitted through that pair of gears. All of the other pairs will freewheel. The teeth on all the gears are engaged to each other all the time.

Simple, huh?

The teeth on the gears are usually not the problem. Sometimes they break off, but you should be able to see that right away.

Give the teeth a good look over. there should not be any that are a whole bunch different than all the rest. When they machine those teeth, they don't apply much effort to the finish at all. It's normal to see machining marks that look like lines going across the teeth from side to side. Ignore those.

If you look at cheesy drawing #2, you can see the dogs.

I didn't draw it, but some gears will have the dogs on the inside of the gear, not sticking out like in the pic.

Inspect those internal dogs the same way.

You will note that the dog in cheesy drawing #3 is crooked.

This is done so that applying pressure on the dogs will force the gears closer together, and prevent them from jumping out of engagement.

They call this an "undercut" gear. Back in the day, this was a badass trick the racers did. The fizzy comes this way stock.

Not all the gears are undercut. just the first three or so.

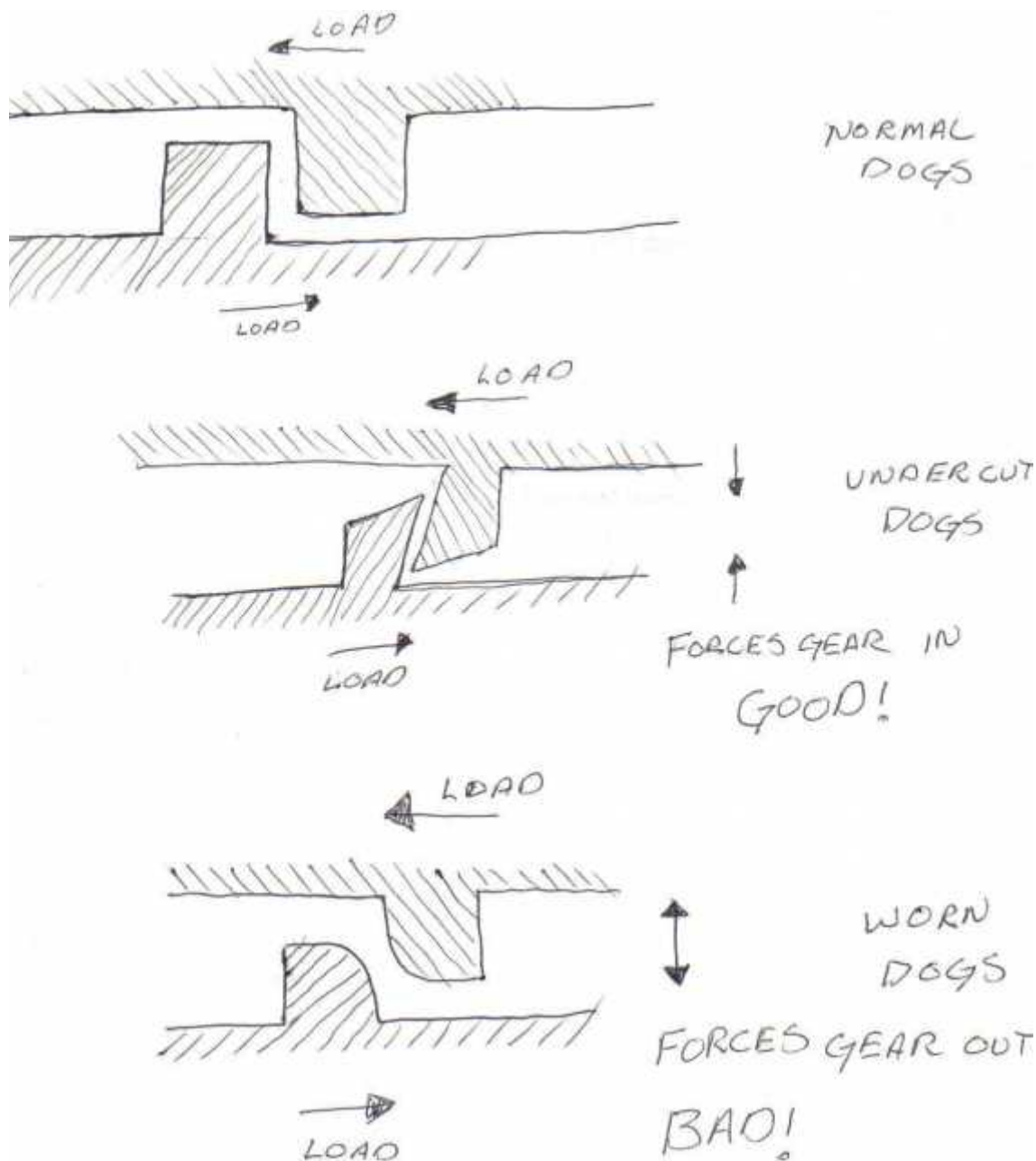
When you inspect the dogs, you are looking for wear and/or rounding of the edges of the dogs.

When you miss a gear, the crunching and crashing you hear is those edges of the dogs smashing into each other.

You can tell if the dogs are worn pretty easily. the worn part may be shiny and smooth, or be jagged and gouged. Good gears are neither.

The dog is probably wider than the contact patch where the other set of dogs touch it. If so, this will make it easy to see the original shape of the dog so you can determine if it is worn or not.

Here is cheesy drawing #4



You can use the forks as a clue as to what set of dogs are going to be trashed, but don't go by that completely. It is possible to round the dogs without bending the fork. Any gear with rounded dogs must be replaced.

Take a look at the fork slot in the gear. If it is worn, or galled, reject the gear.

After you have inspected the parts, stop, wash your hands, and get a pencil and piece of paper. You need a list of parts for the counter guy.

Now, start over. Inspect it all again, and write down the list of bad parts.

Naming the gears is easy, and you can use two names just to make sure. It really sux to get the wrong parts, so make sure you have it right.

First, you need to know what gear you are talking about.

For this discussion, let's call the shaft that the clutch rides on the "input shaft".

We'll call the shaft with the sprocket on it the "output shaft"

When you look at the input shaft, the smallest gear is first gear.

The largest gear on the input shaft is sixth gear.

The output shaft is the opposite.

All the other gears can be found this way. The second smallest gear on the input shaft is second gear.

So, we can call a gear "second gear, input side". Or we could say "third gear, pinion", if we want the one with the splines.

I prefer to use both kinds of description if I'm not pulling the part numbers myself, to avoid mistakes.

When you get parts, replace every snap ring you will have to remove. Don't re-use them.

If you are replacing a gear with dogs on both sides, replace both of the gears those dogs mate with! Don't try to mate new dogs with an old gear, even if it looks perfect.

Some of the wheel gears will have a separate part number for the bearing it rides on. be sure to order that too!

You will also want all the gaskets and "o" rings, and seals.

Again, DONT TRY TO BE CHEAP! When in doubt, order it!

It really, REALLY sux to rebuild a tranny, and have it fail again because one part was not replaced to save a few bux!

If you don't have a service manual, get one! There are little details like the right way to install a snap ring (Yes, there is a wrong way!) in there that you will need.

After you get your parts, then it's time to pull the gears off the shafts.

As you dis-assemble, lay the parts down in order of removal, with the outermost side of the parts facing up. This way, there will be no confusion about how it goes back.

When the parts are laid out, put the new parts next to the old parts, oriented the same way.

At this time, you can verify that the new parts are the same as the old ones. Handle them one at a time to avoid losing track of the proper orientation!

Put in the new parts. When installing the bearing in a wheel gear that has splines in the bearing, be sure to line up the oil holes!

Re-assemble the motor.

Test the tranny by hand as soon as the cases are back together.

Remember that it has to be turning to shift, and work it through all six gears.

If it works, put the motor back together and go riding!

I hope that this little tutorial will help somebody.

If you feel like taking your motor apart is within the limits of your abilities, then this should help by pointing out the things to look for.

If you're not sure of your abilities, maybe it will help decide if doing it yourself is a good idea.

Either way, there it is!



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