Care and Feeding

of the Borg Warner overdrive

by Tom Endy

A cottage industry:

Borg Warner overdrives modified for use in a Model A Ford are all a product of a cottage industry. Some were built very well and some were not. Bert Hiller of Washington State built the really good ones. Bert was very skilled, understood the need for precise alignment, and used only the short housings salvaged from the likes of Nash and Studebaker. Bert sold his business a number of years ago to **Bill Swigart of Redding, California (530-221-1628)**, who continues with the same expertise. As far as I know Bill is the only person still building Borg Warner overdrives for Model A Fords. Bill also provides repair service for existing Borg Warner overdrives.

The rear oil seal:

The most detrimental aspect of a Borg Warner modified for a Model A is the integrity of the real oil seal. There have been numerous oil seal designs used. Some use the A-4245 grease seal as used on the Model A drive shaft and axle shafts, others use a grease seal that rides on the spline coupler, and some don't have a seal at all, but rely on a sealed rear bearing to hold the oil in check. Regardless of what type of seal is employed, if it starts to leak the owner will not be aware of it as the oil will not drip on the garage floor, it will drain through the pinion bearings of the differential and end up in the banjo. As the oil fills the banjo it will migrate into the axle housings toward the rear brakes. The loss of oil in the overdrive will also lead to its failure due to oil starvation. A prudent owner should check the oil level in the banjo and the overdrive frequently. If it is discovered that the banjo is manufacturing oil, it does not mean the owner will become wealthy, it means the overdrive is going to fail.

Overdrive failure:

If a Borg Warner fails to operate properly, there are only three things that can be checked and corrected while the overdrive is still installed in the car.

1. Check that the oil in the overdrive is at the proper level. It should be even with the bottom of the fill port.

2. Check that the pull cable that operates the shifting lever is moving it to each stop completely. It is possible the setscrew holding the cable has slipped and is not allowing full travel of the shift lever.

3. Check that the solenoid is operating when powered. You should be able to hear it "click" when power is applied. If the solenoid has recently been removed, check that it is correctly installed. Remove the two mounting bolts and pull straight back on the solenoid. If it is installed correctly it will not come out, it will extend on its spring.

If none of the three checks correct the problem, the overdrive will have to be removed from the car and disassembled to determine the fault.

What type of oil to use:

Motor manuals published in the 1950's and 1960's offer a wide range of oil type recommendation. They suggest that any of the following lubricants are equally acceptable.

SAE 80 gear lubricant
SAE 20W-20-engine oil
SAE 10W-30-engine oil
Automatic transmission fluid type A, AQ-ATF

From this recommendation it appears that just about any kind of oil is acceptable. I used 30W motor oil for a number of years with good results. Recently I have gone to 60W motor oil with the thought it will be held by the rear seal better. The operation of the overdrive appears to be the same with either weight.

Overdrive repair:

The technology of the operation of a Borg Warner is somewhat complex, however, they are fairly simple to take apart and put together. Everything inside a Borg Warner is held together with snap rings. There are only two bearings, a front and a rear, and in some models they are both the same part number. They are inexpensive and can be

obtained in a sealed version. Almost all internal Borg Warner parts are identical regardless of what make of vehicle they were originally made for. Therefore parts are still readily available and are interchangeable. Beside the rear seal previously described, there is a front seal, which is a Model A A-4245 drive shaft seal, a seal at the shift lever boss (**Federal Mogul U12 343 105**), a seal at the solenoid boss, and one in the solenoid itself. Both solenoid seals are the same part number (**TCM 03061 TEB**). It is prudent to replace all the seals when the unit is disassembled.

Failure modes:

The majority of Borg Warner failures are as a result of oil starvation and the end results are destroyed planetary and sun gears. Another common failure is a broken sun gear hub, which is a result of attempting to back up with the overdrive engaged. A Borg Warner is designed to operate in only the forward mode.

The myth of the rubber band:

There is a myth in the Model A hobby that in order to install the 12 rollers in the over-run clutch it is necessary to place a rubber band around the rollers and leave it inside the housing after the assembly is complete. I have taken numerous Borg Warner overdrives apart and found bits and pieces of a rubber band inside the housing that had been placed around the rollers the last time it was assembled. Leaving a rubber band inside the housing is not the prudent thing to do. There are a number of small oil holes drilled in many of the moving parts for lubrication purposes and they could easily become plugged with pieces of the rubber band.

It is possible the myth got started by the statements found in the early motors manuals that suggested a rubber band could be used to hold the rollers in place “until” installed in the housing. I interpret the word “until” to mean don’t leave the rubber band in the housing. Photo figures in the motors manuals show the roller cam assembly being held in a horizontal position with a rubber band around the rollers. Holding it in this position without a rubber band will allow the bottom three rollers to fall off. A better assembly technique is to place the roller assembly in a vertical position on top of a large coffee can and pack the rollers with wheel bearing grease. The rollers will remain in that position indefinitely. The roller sleeve has a chamfer machined into the leading edge. As it is lowered down over the rollers it will capture them in place until the input shaft is rotated to allow the roller assembly to slide completely into place.

The solenoid:

Borg Warner solenoids can be found in both 6-volt and 12-volt versions. They are physically identical and operate exactly the same. The solenoid plunger actuates a pawl inside the overdrive that locks the sun gear hub in place when overdrive is selected. There are two sets of contacts inside the solenoid. The large contacts are normally-closed until the solenoid is powered. When power is applied current passes through the closed contacts to power a large solenoid coil. It takes about 30-amps (6-volt solenoid) to move the plunger and pawl. Once the plunger has moved the large contacts open, discontinuing the 30-amps, and a second set of small contacts close powering a small holding coil. The holding coil draws about 1½-amps, and continues to draw this amount of current as long as power is applied to the solenoid. Should the large contacts fail to open the solenoid cannot withstand continuous operation at 30-amps, and will burn itself up. This phenomenon occurs when the solenoid is improperly installed. In order to properly engage the solenoid plunger in the pawl, the plunger must be inserted in the mounting boss 90 degrees from the normal mounting position, and then rotated into position. This will engage the plunger in the pawl. If the plunger is not properly engaged in the pawl the plunger cannot actuate to its full travel when powered and the large contacts cannot open.

Borg Warner status:

Today the Borg Warner overdrive has become over-shadowed by the factory built Mitchell overdrive, and the more easily operated Volvo overdrive. However, there are still many converted Model A Borg Warner overdrives around. Many are sitting around in a damaged condition and can easily be repaired. They offer a low cost option to the more expensive overdrives being marketed today. ☺