New Technology – The New Venture Gear 247 Transfer Case

By Mike Weinberg
Contributing Editor

The greatest area of growth in the standard end of the transmission business has been in transfer cases. About 20% of the U.S. market is composed of manually shifted vehicles. With automatics making up 80% of the market, some would say that growth in the stick market is slow.

Transfer cases are used with both automatic and manual transmissions, and the growth of the SUV and truck market has continued, making many new designs of transfer cases available for us to repair. As these 4WD vehicles have come to be the rage of the soccer moms, the manufacturers have designed more-complex systems that require little input from the driver. Many transfer cases have been developed to operate as full-time units, using clutch packs or viscous couplings to provide four-wheel torque on demand. Viscous couplings are very sensitive to differences in wheel speeds created by worn, mismatched or improperly inflated tires.

The NV 247 (Figure 1) does not use a viscous coupling. Found in the 1999 Jeep Grand Cherokee, the 247 is a full-time transfer case with on-demand torque capabilities. There are two operating ranges – 4WD High and 4WD Low – and a neutral position. The unit is manually shifted by a lever mounted

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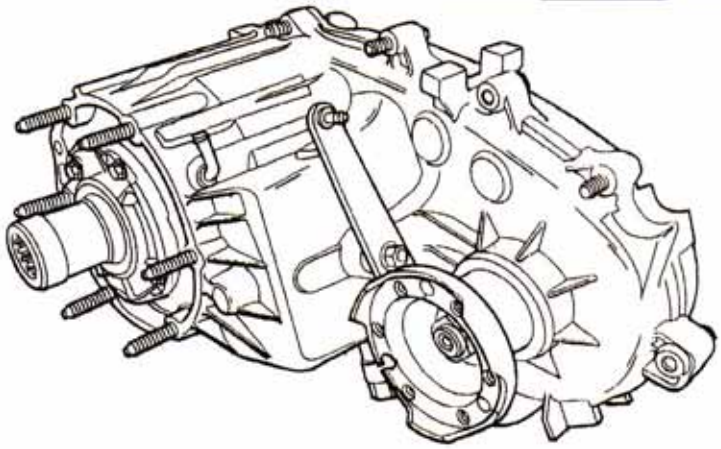
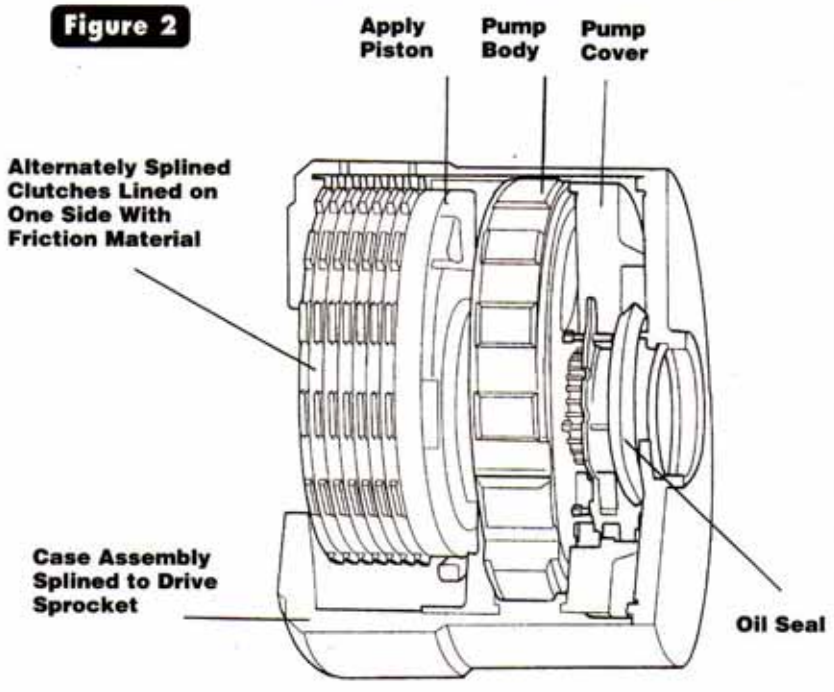
Figure 1



New Venture 247 Transfer Case

Figure 2



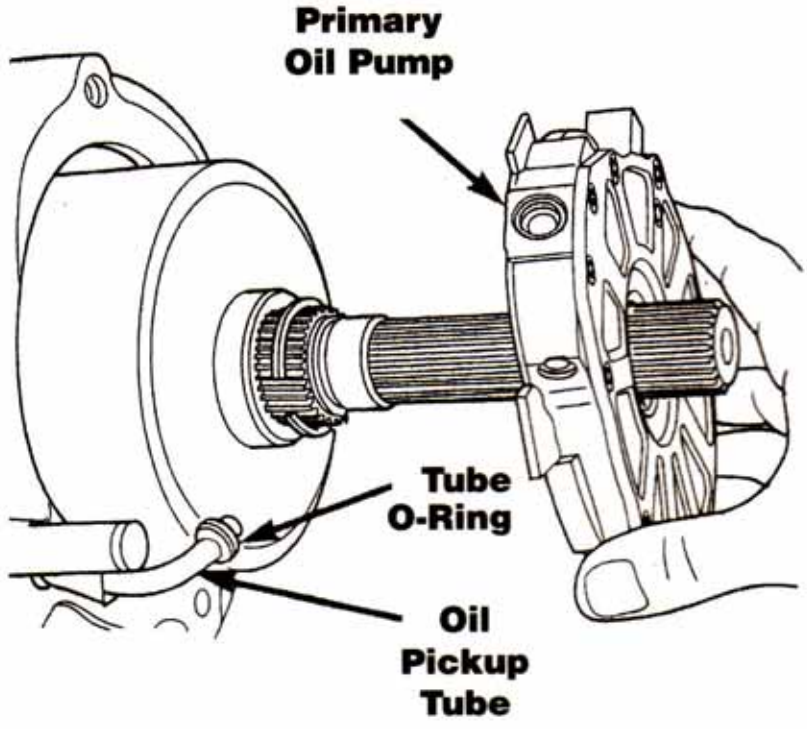
Cutaway View of Progressive Coupling

next to the transmission shifter. Under normal operating conditions, the torque is transferred to the rear wheels. If one set of wheels slips, torque is transferred to the axle with the better traction. This is accomplished without a viscous coupling through a clutch pack contained in a "progressive coupling" on the output shaft of the transfer case. The progressive coupling is a new design that is a sealed, welded unit (Figure 2) and is serviceable only as an assembly. In order to understand how to diagnose the unit, one must understand how this coupling works.

This transfer case has *two* gerotor-type pumps. One is mounted on the rear of the output shaft and picks up oil from the sump of the transfer case in the usual design you are used to seeing (Figure 3). You will notice that the pump is much thicker than a typical lubrication-type pump. This pump provides pressurized lubricant for the transfer case and acts as a "lift pump" to supply oil under pressure to the second pump, which is in the progressive coupling, attached to the mainshaft and the mainshaft drive sprocket for the chain.

You will not see the inside of this coupling unless you wish to destroy one. We have opened up a bad coupling, and it is an engineering marvel. Contained in the coupling is a clutch pack with alternately splined paper-lined clutches. One end of the cover acts as a pressure plate, and a molded piston applies the clutch. The piston gets its motion from another gerotor pump inside the coupling. This pump is very large and is capable of quickly increasing the volume and pressure of the oil fed to it through the lift or primary pump. The pump inside the coupling body has a very complex set of reed valves (similar to Honda transmission pistons) and a set of

Figure 3



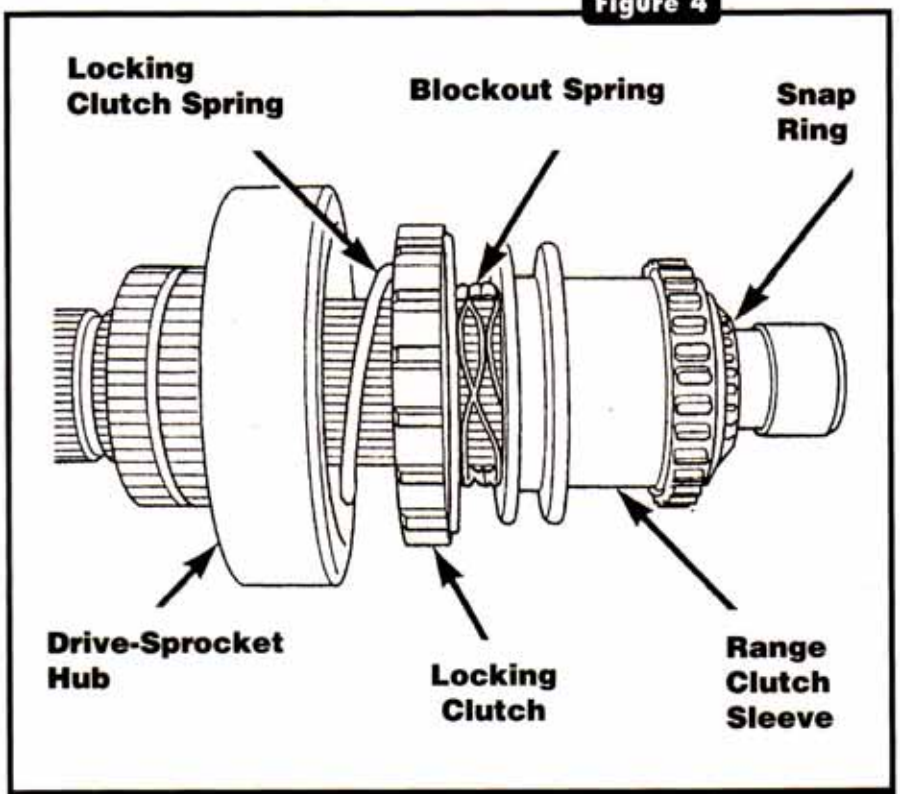
shuttle and drainback valves, and it is capable of making very small adjustments in pressure quickly. This is necessary so the clutch pack can lock the sprocket to the mainshaft when power is needed at the front wheels and yet vary the pressure enough to eliminate wheel hop and tire scrub during turns.

There is also an unusual spring setup on the mainshaft to lock the sprocket and release it when 4WD no longer is necessary (Figure 4). The low range is accomplished through a typical planetary gearset and low-range fork and locking sleeve. The 4LOW position is designed for only off-road use and increases gear reduction for added off-road pulling power.

This is a relatively simple transfer case with a sophisticated design. The one thing this unit will not tolerate is low or no lubricant. If you run one of these out of oil, it will become very expensive. The proper lubricant for this unit is Mopar Transfer Case Lubricant, and the required fill is 3.4 pints.

I will be doing more in-depth technical seminars on this and other late-model transfer cases and manual transmissions at upcoming transmission trade shows and will present more-detailed material next month on these pages. TD

Figure 4



Mainshaft Components and Springs

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