



Modern Automotive Technology Chapter 55

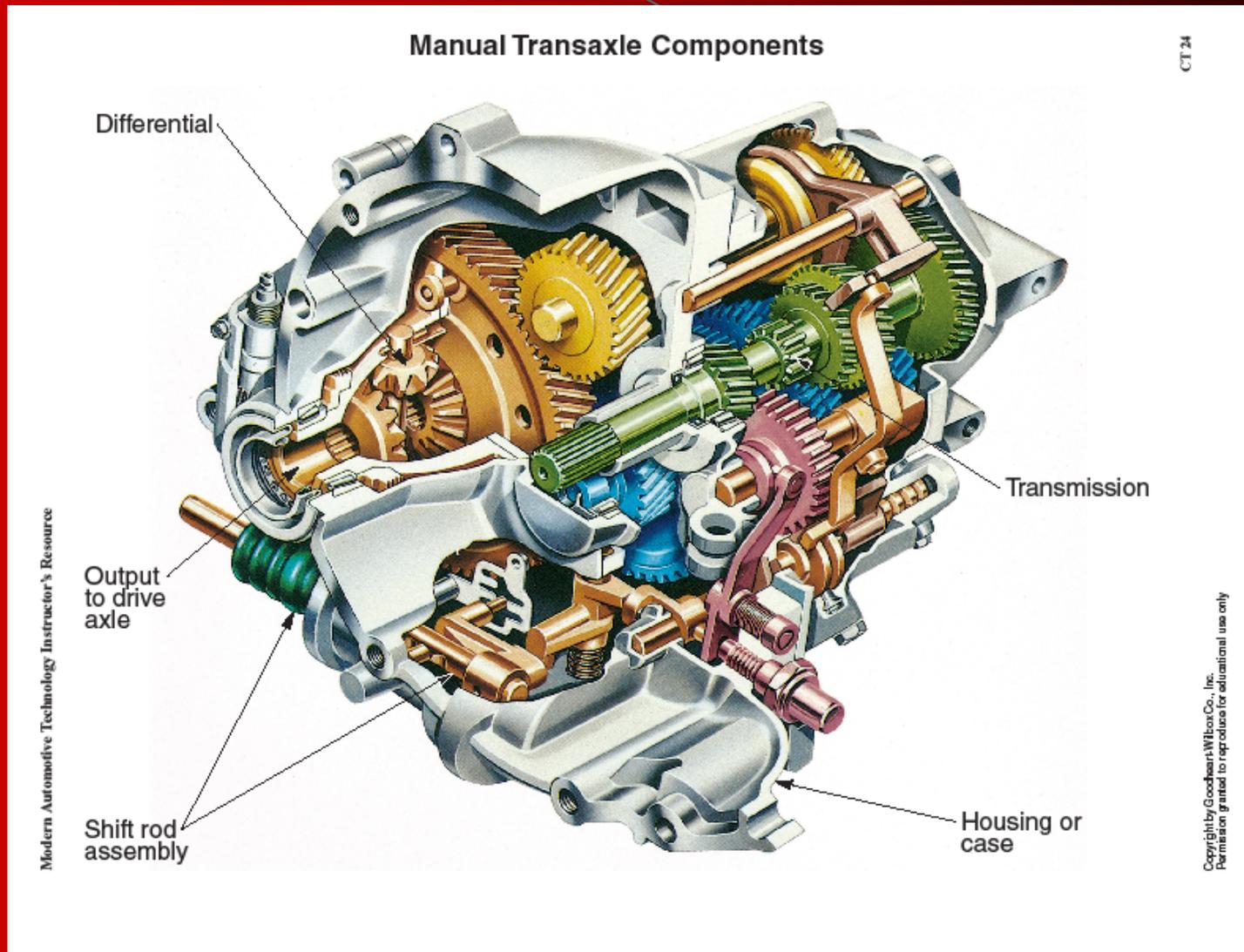
Manual Transmission Fundamentals

*North Montco
Technical Career Center*

Learning Objectives

- Describe gear operating principles.
- Identify & define all the major parts of a transmission.
- Explain the fundamental operation of a manual transmission.
- Trace the power flow through transmission gears.
- Compare the construction of different types of manual transmissions.
- Explain the purpose and operation of a transmission overdrive ratio.
- Acquire knowledge of manual transmission operating principles.

Parts of a Manual Transmission

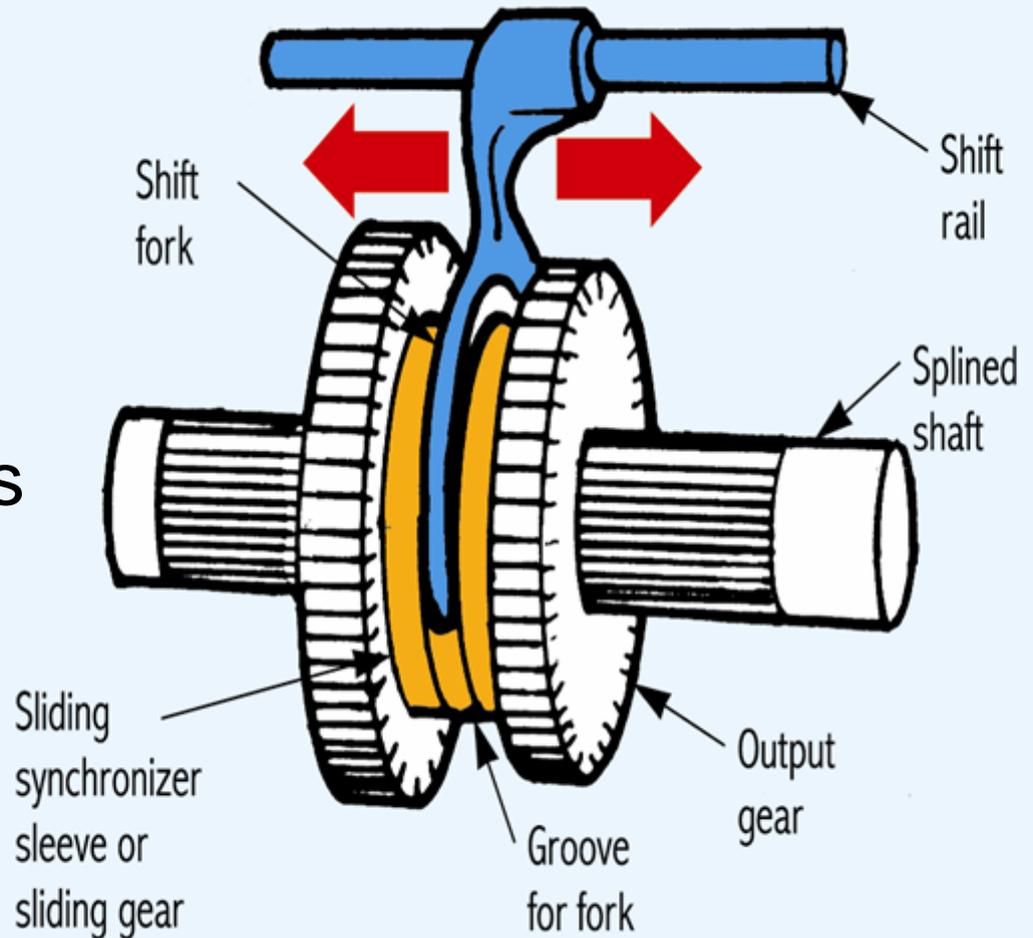


Manual Transmission Fundamentals

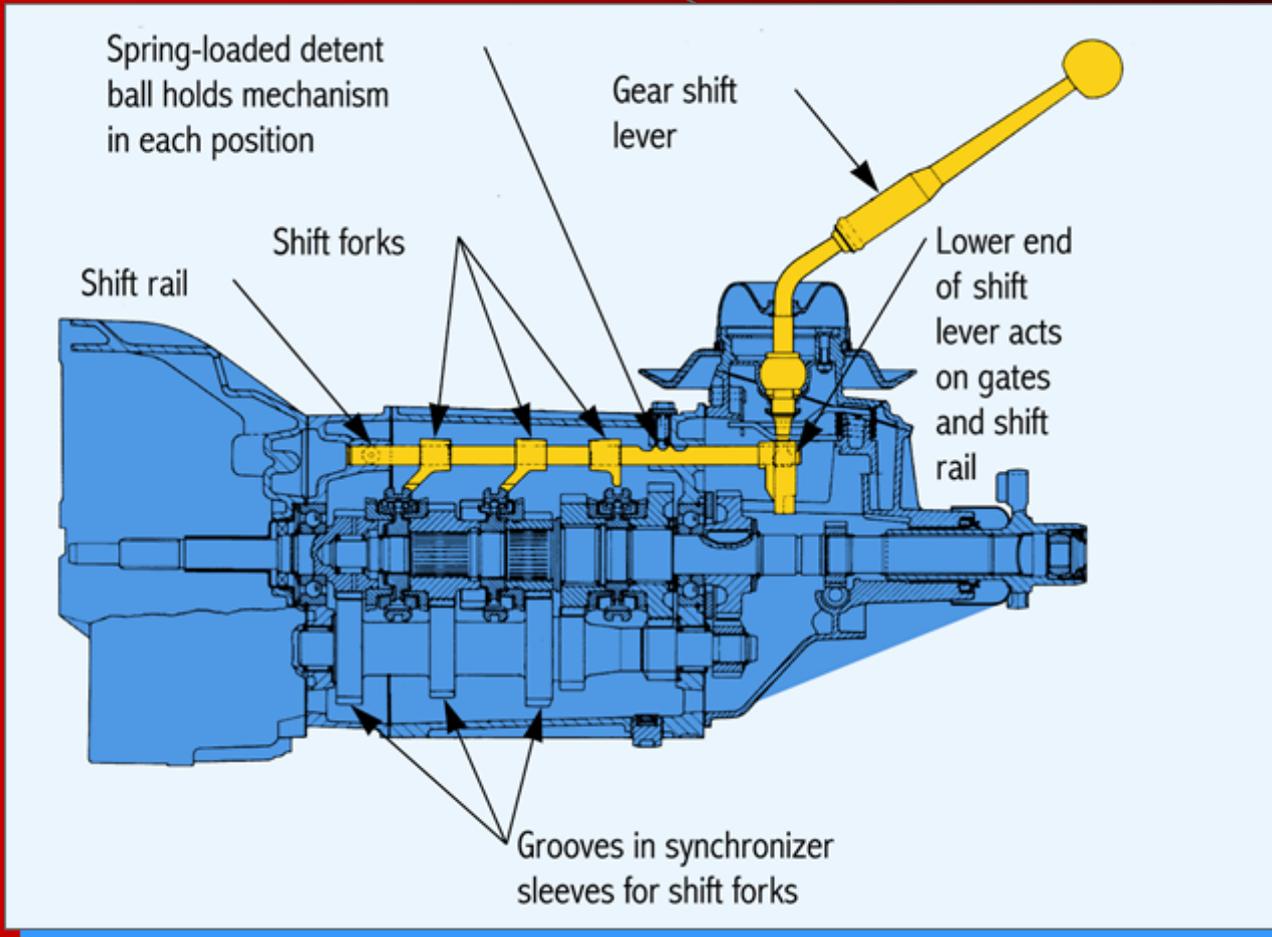
1. Shift Forks are pronged units for moving gears or synchronizers on the shaft rail for gear engagement
2. The Gear Shift Level control allows the driver to change transmission gears.

Shift Forks

Transfer movement from the gear shift linkage to the sleeves



Shift Linkage

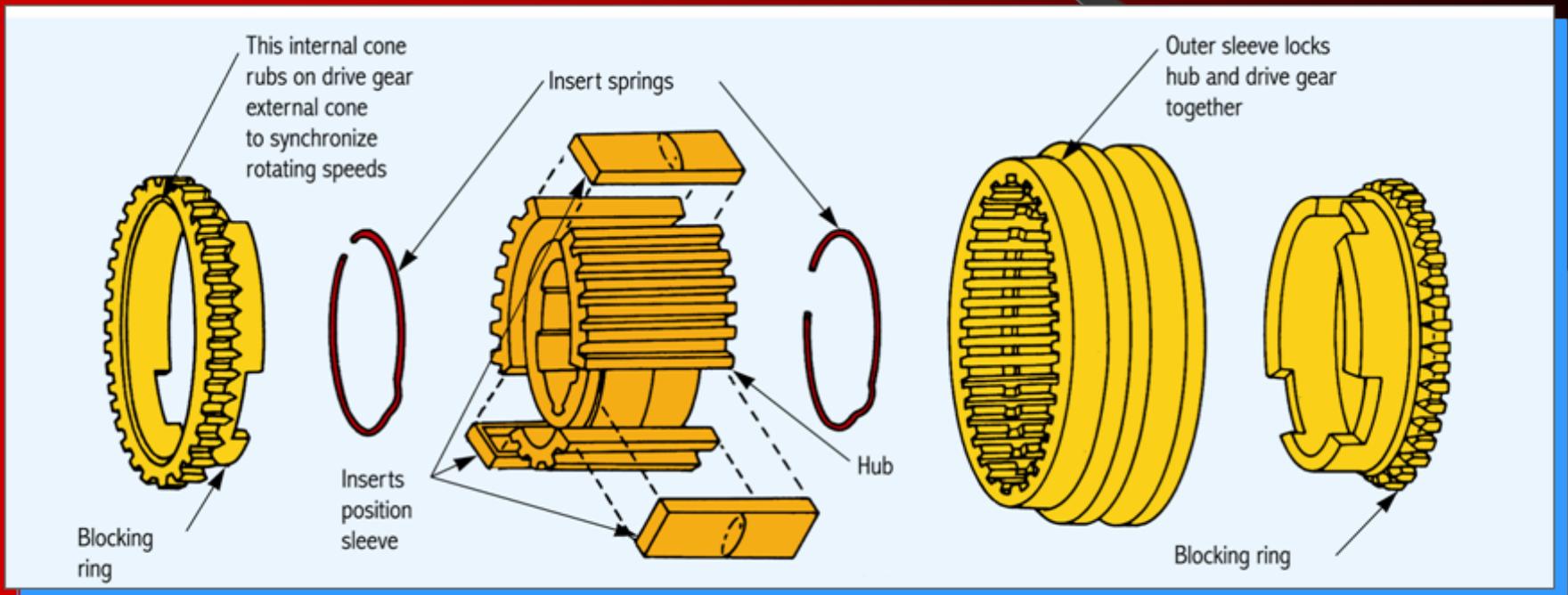


Movement of shift linkage moves the shift fork

Manual Transmission Fundamentals

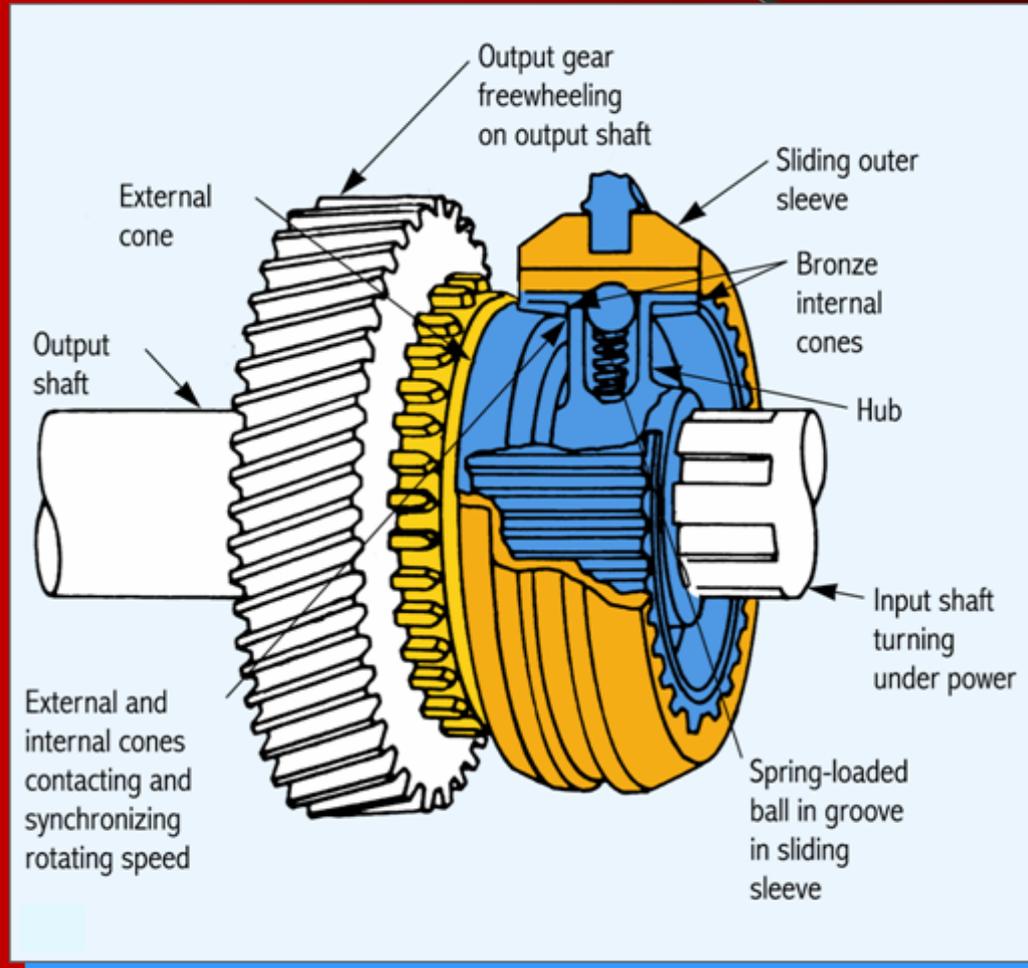
3. Synchronizers are devices used to mesh (lock) gears into engagement.
4. The Transmission Case houses the transmission shafts, gears, and lubricating oil.

Synchronizer Construction

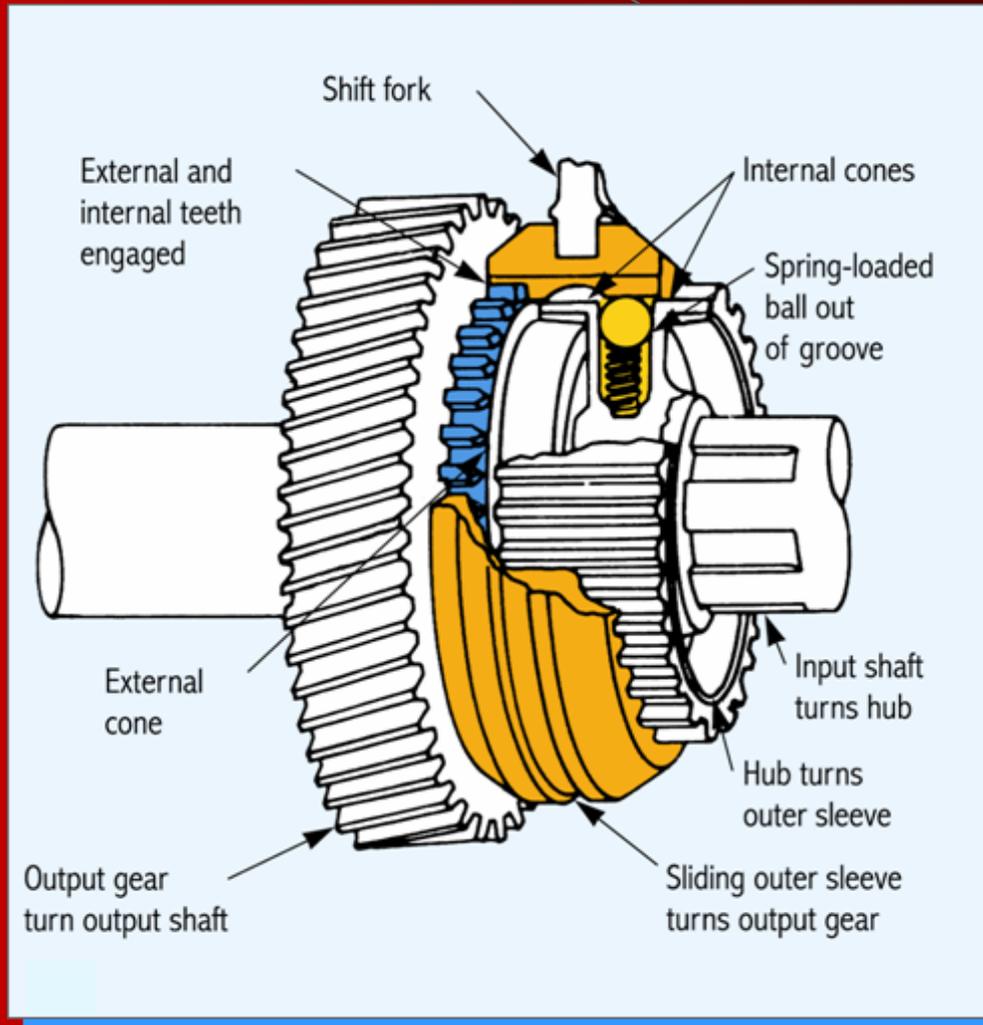


Hub is splined to the output shaft

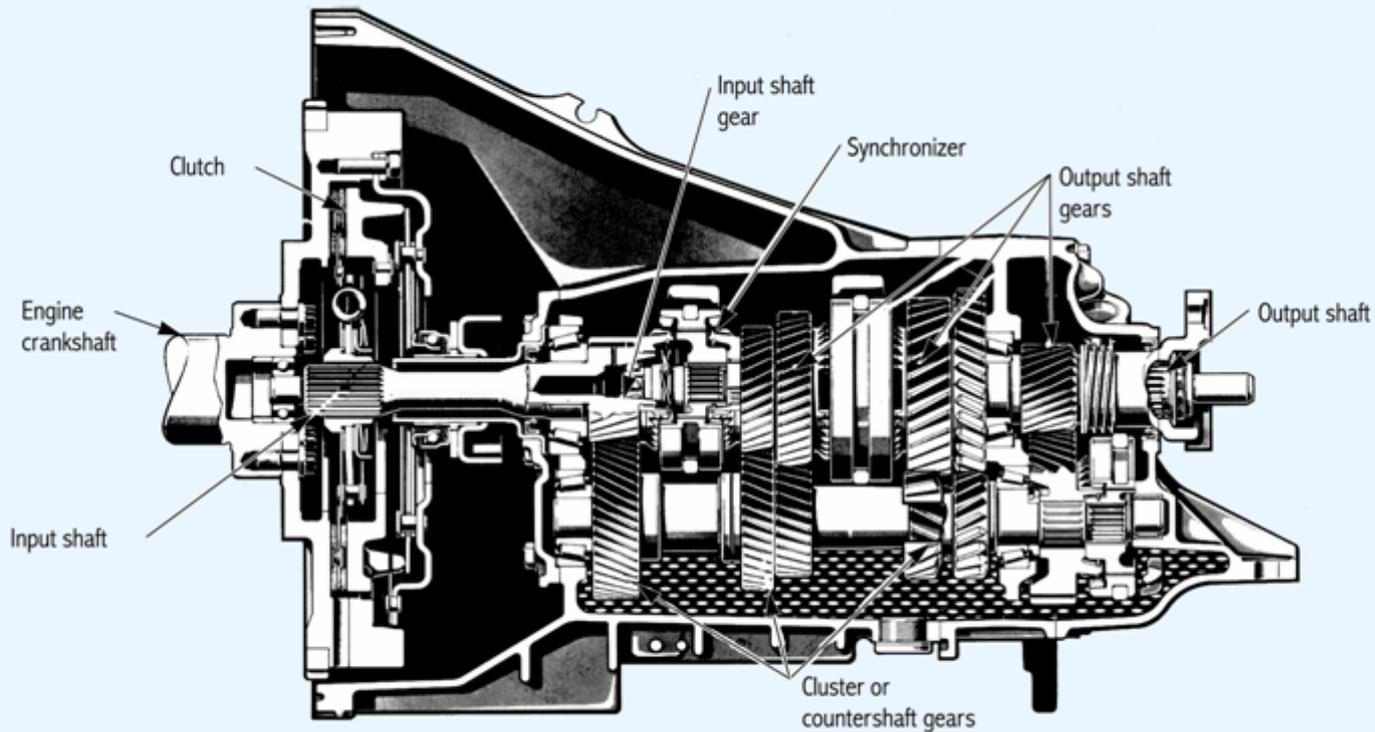
Synchronizer Operation



Synchronizer Operation



Transmission Case

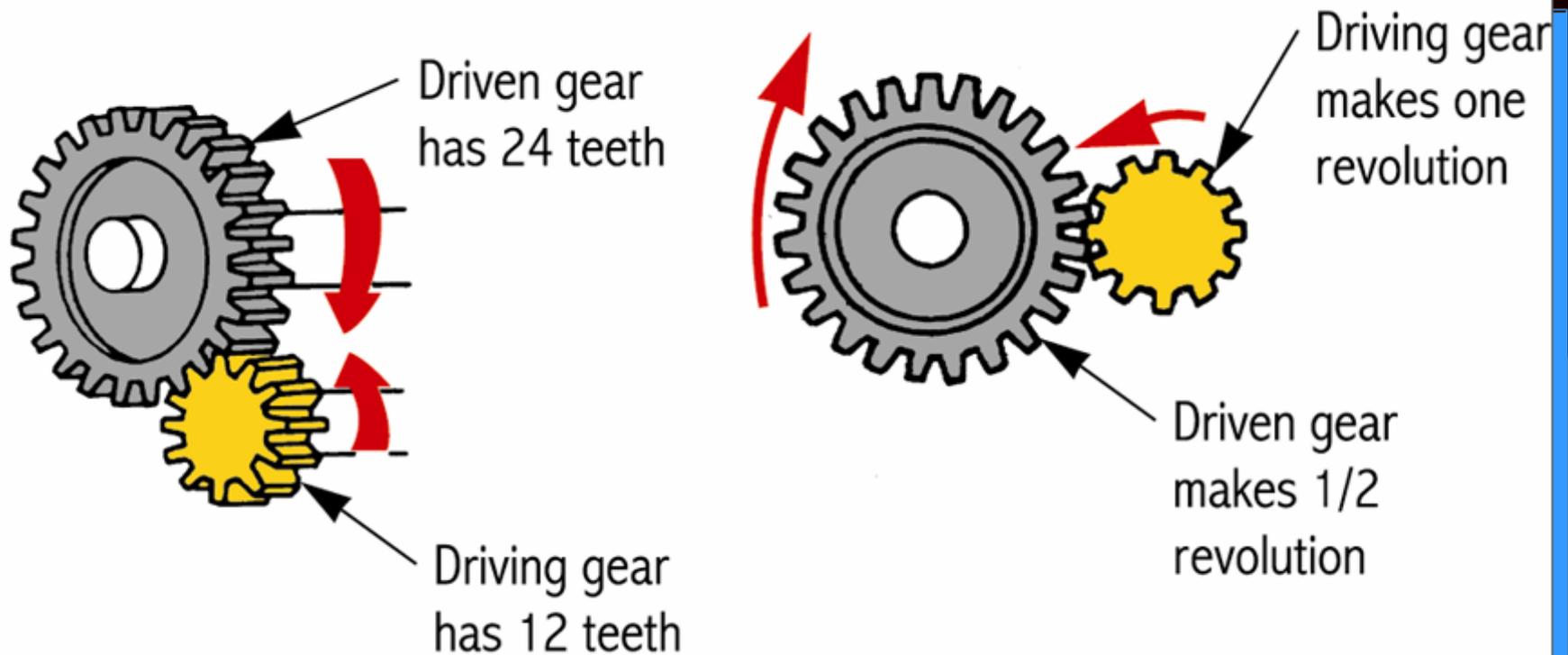


Input shaft gear turns countershaft gears. Countershaft gears turn output shaft gears

Manual Transmission Fundamentals

5. Overdrive is when a larger gear drives a smaller gear.
6. Overdrive Ratio provides a way of changing output torque and output shaft speed.

Gear Ratio

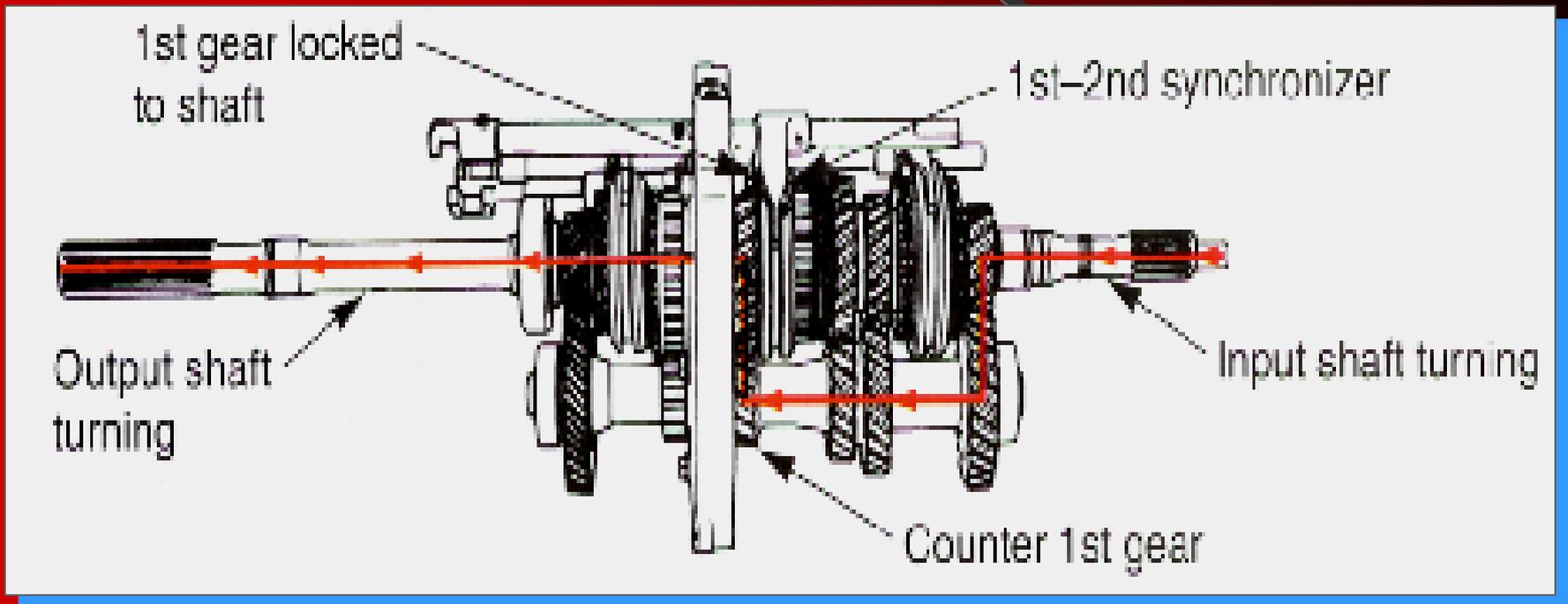


Gear Ratio

If the drive gear has 12 teeth and the driven gear has 24 teeth, the gear ratio is *two-to-one*

$$\begin{aligned}\text{Gear Ratio} &= \frac{\text{\# of driven gear teeth}}{\text{\# of drive gear teeth}} \\ &= \frac{24}{12} \\ &= 2 \text{ or written } 2:1\end{aligned}$$

Five-Speed, Overdrive Transmission

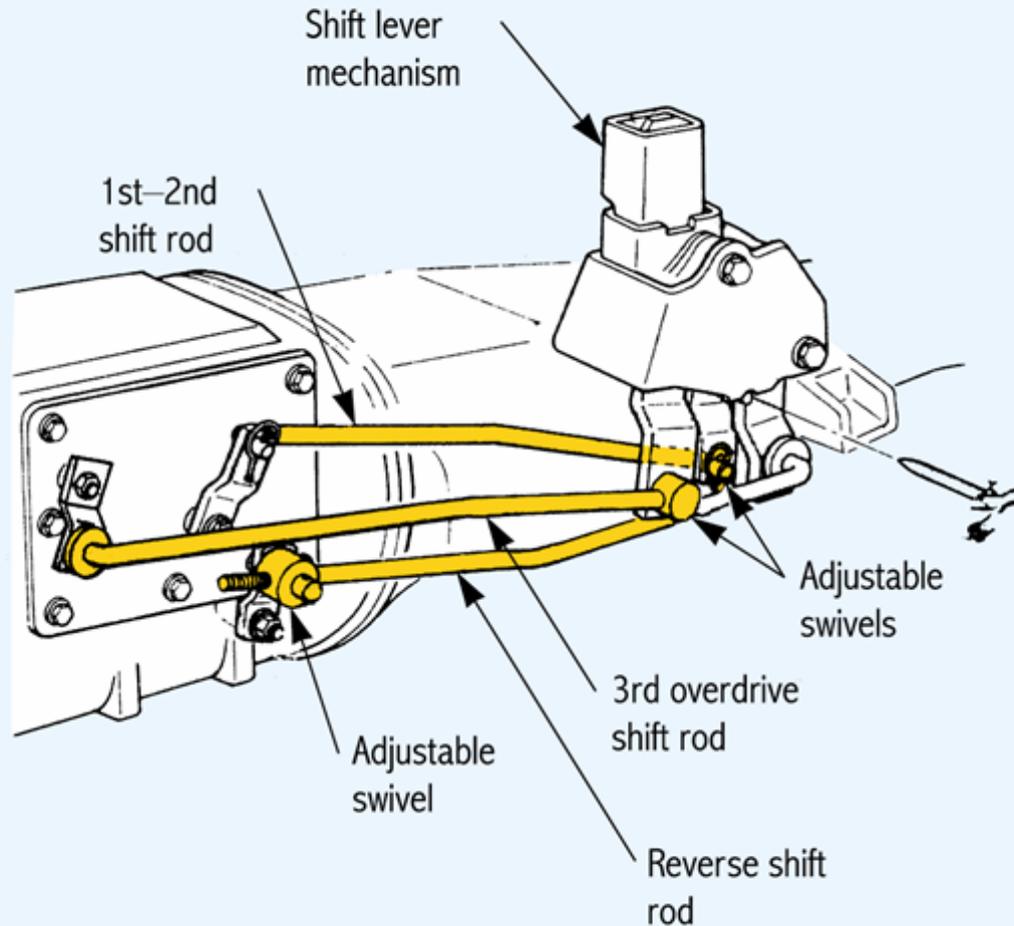


1st Gear Ratio = 4.36:1

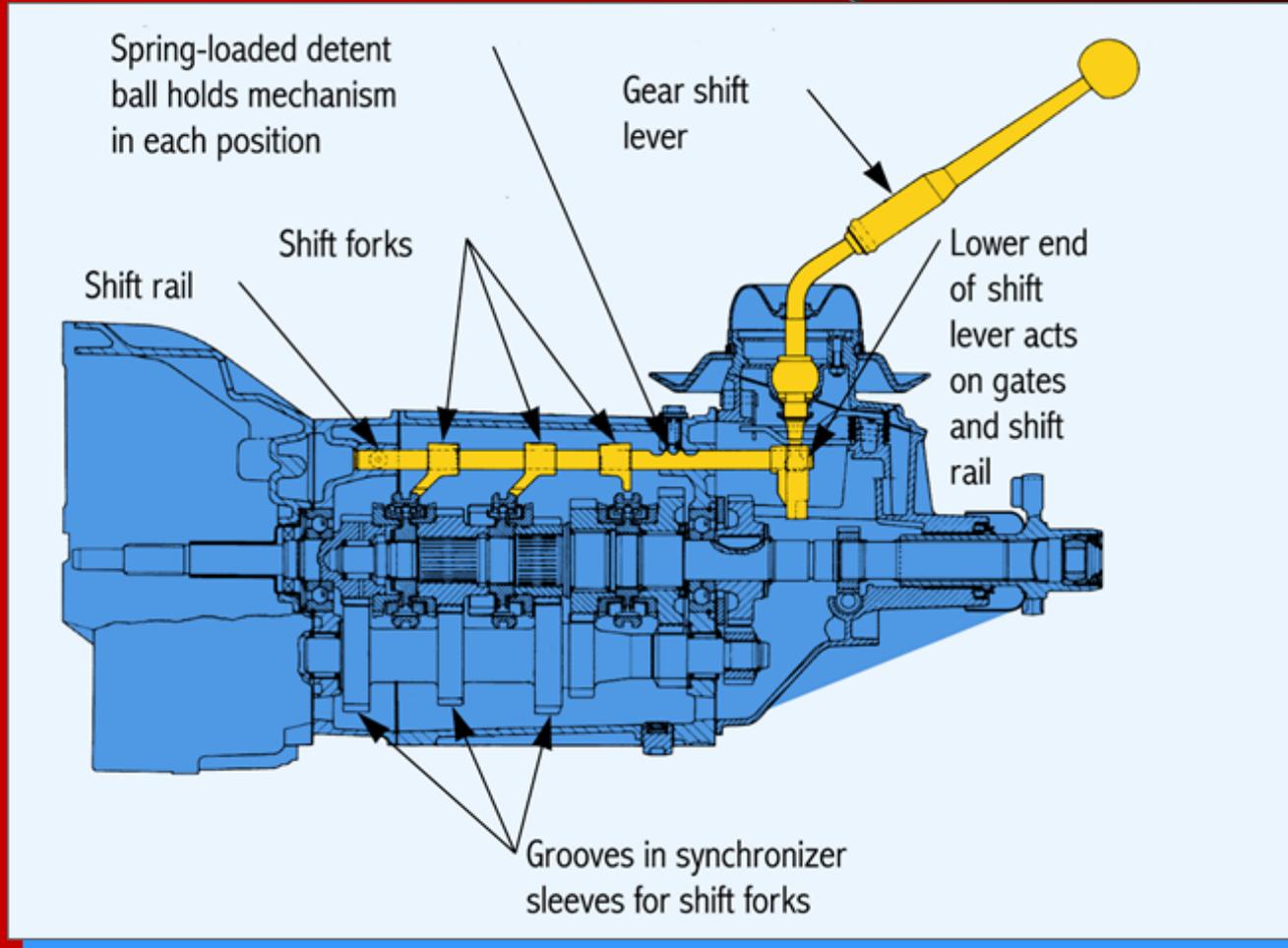
Manual Transmission Fundamentals

7. Shift Linkage are arms or rods that connect the driver's shift control to shift the forks.
8. Gear Reduction occurs when a small gear drives a larger gear to increase turning force.

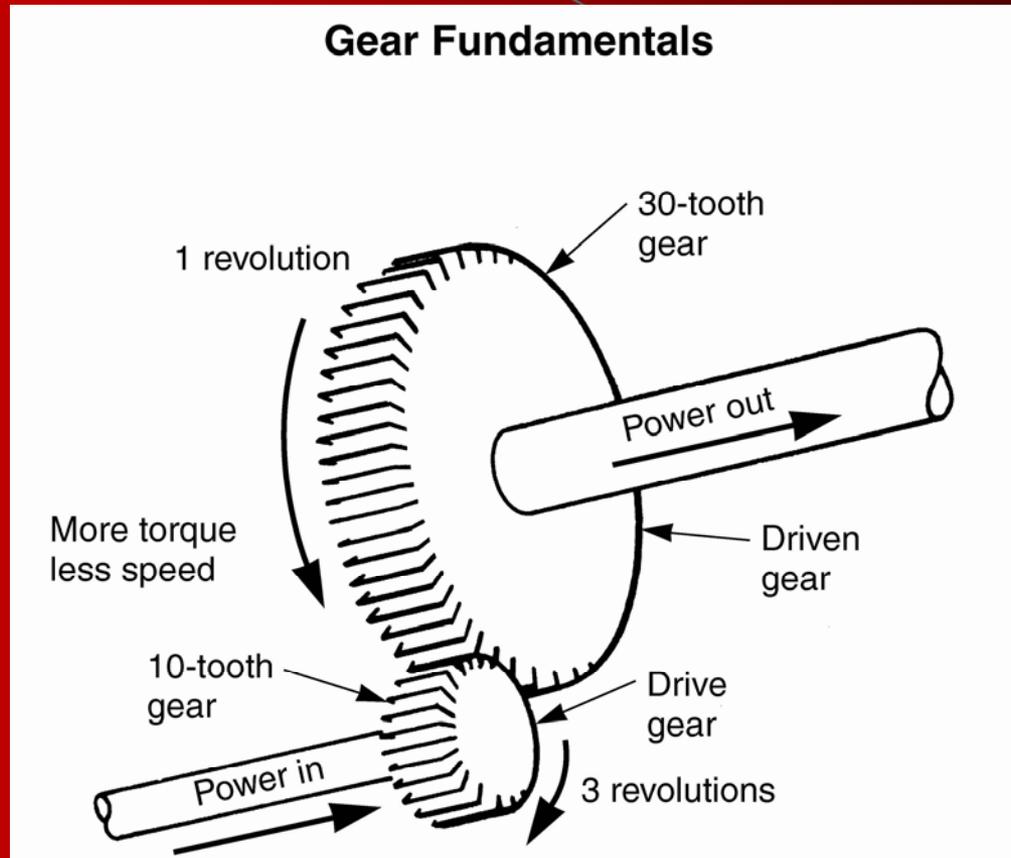
External Shift Rod Linkage



Internal Shift Rail Linkage



Gear Reduction

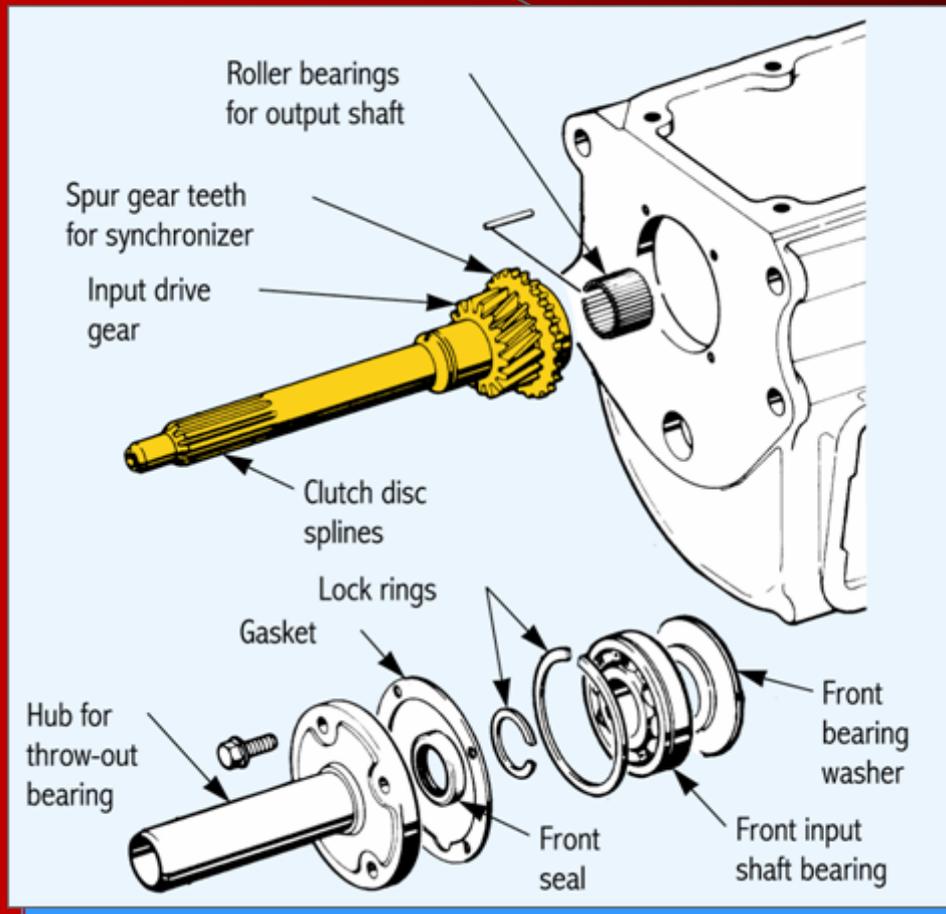


Small gear driving a larger gear

Manual Transmission Fundamentals

9. Operated by a clutch, the Transmission Input Shaft turns gears inside transmission.
10. The Output Shaft transfers rotating power out of the transmission.

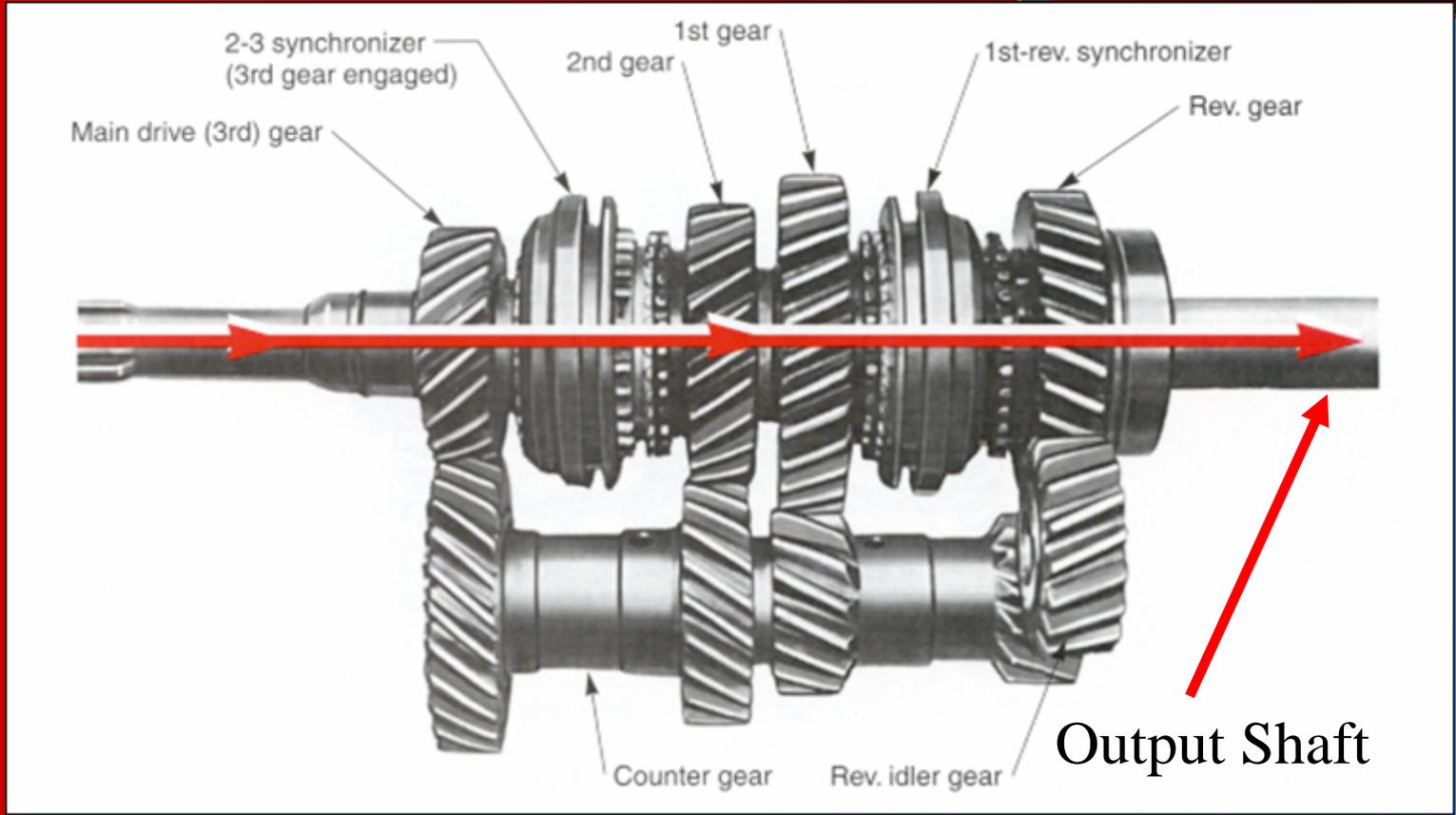
Input Gear



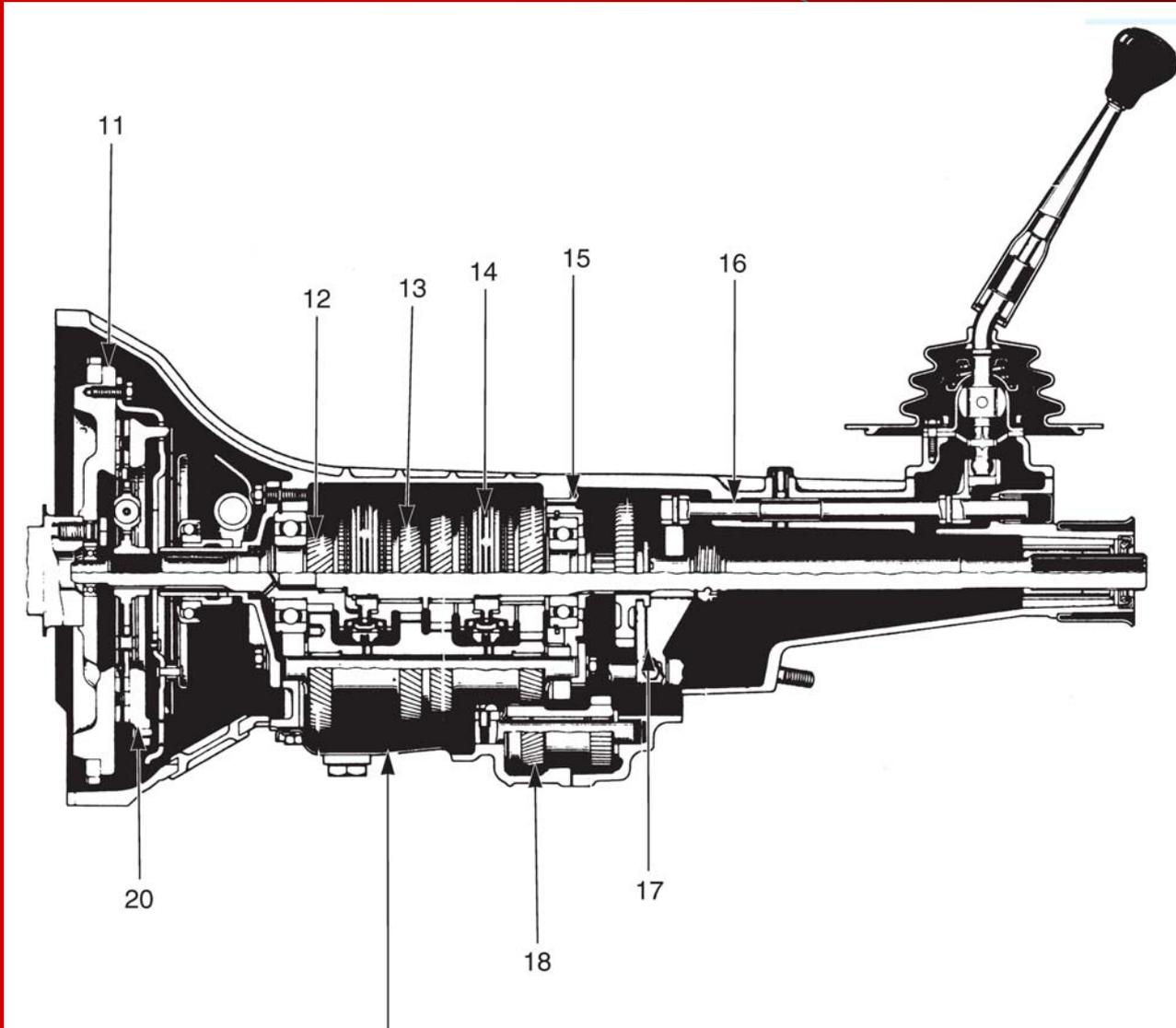
Machined part of the steel input shaft

Output Shaft

(3rd Gear - 3 Speed Manual Transmission)



Transmission Parts



11. Flywheel

12. Input gear

13. Third gear

14. Synchronizer sleeve

15. Bearing retainer

16. Control shaft

17. Shift fork

18. Reverse idler gear

19. Inspection plate

20. Pressure Plate

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