



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.

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DEPARTMENT OF AUTOMOBILE ENGINEERING

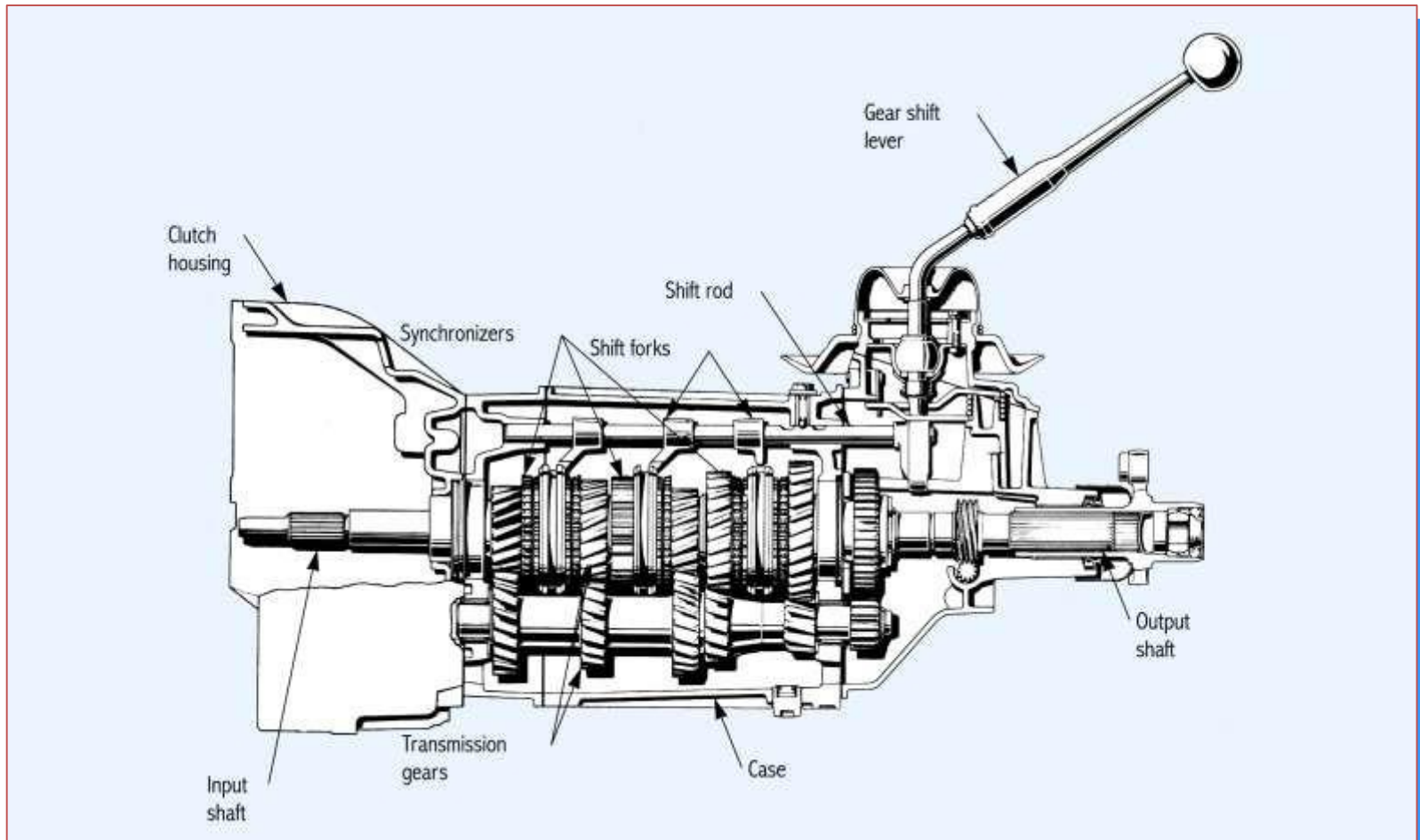
COURSE NAME : 23AUT101 – ELEMENTS OF AUTOMOTIVE SYSTEM

I YEAR /II SEMESTER

Unit 3- Transmission System

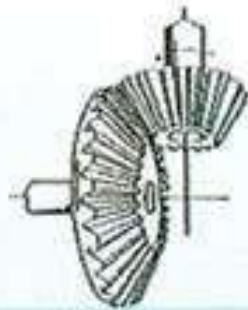
Topic : Gear Box

GEAR BOX





Spur Gears
Transmissions



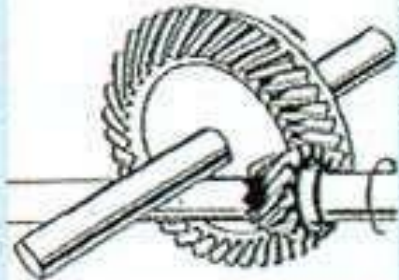
Straight Bevel Gears
Industrial Equipment
Some Differentials



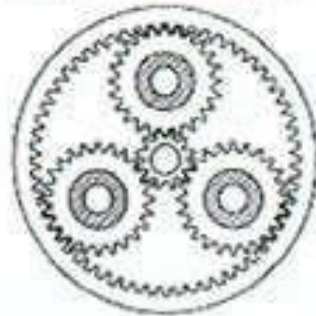
Spiral Bevel Gears
Industrial Equipment
Some Differentials



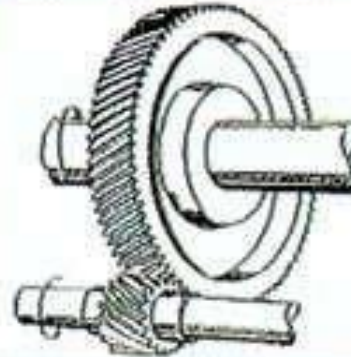
Worm Gear Set
Gear Reduction Boxes



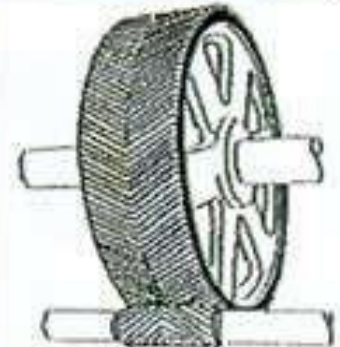
Hypoid Gears
Differentials



Planetary Gear Set
Transmissions



Helical Gears
Transmissions



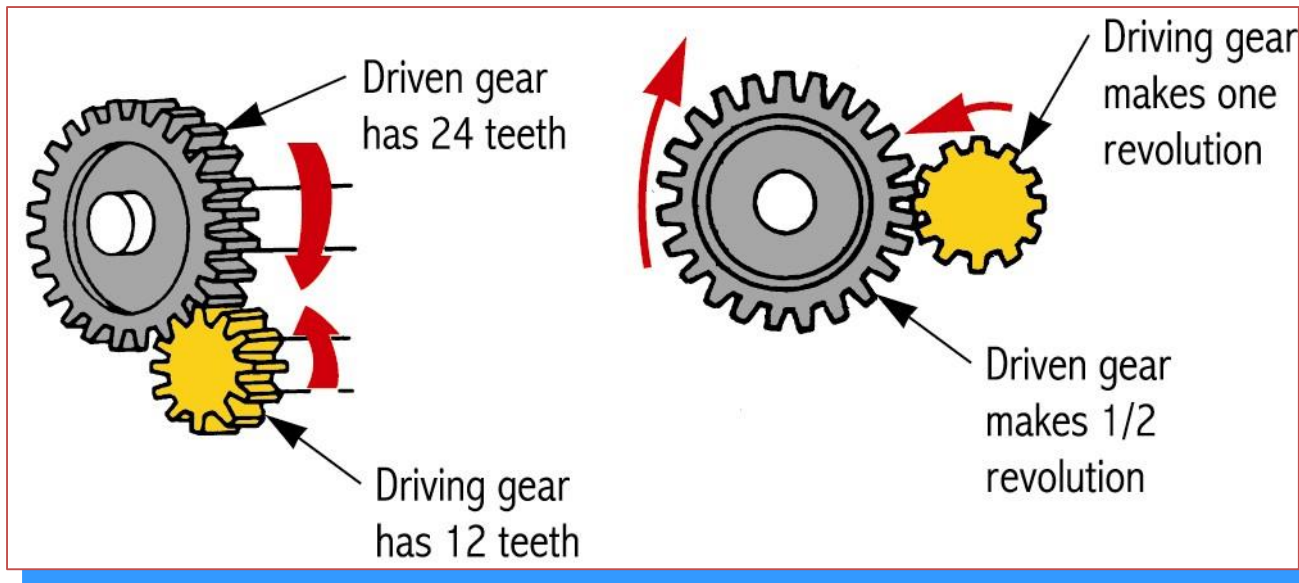
Herringbone Gears
Transmissions

Function of Gear Box

- Provide a means to vary torque ratio between the engine and the road wheels as required.
- Provides a neutral position.
- A means to back the car by reversing the direction of rotation of the drive is also provided by the transmission.

Gear Ratio-Geometrical Series

$$\text{Gear Ratio} = \frac{\text{No. of driven gear teeth}}{\text{No. of drive gear teeth}}$$



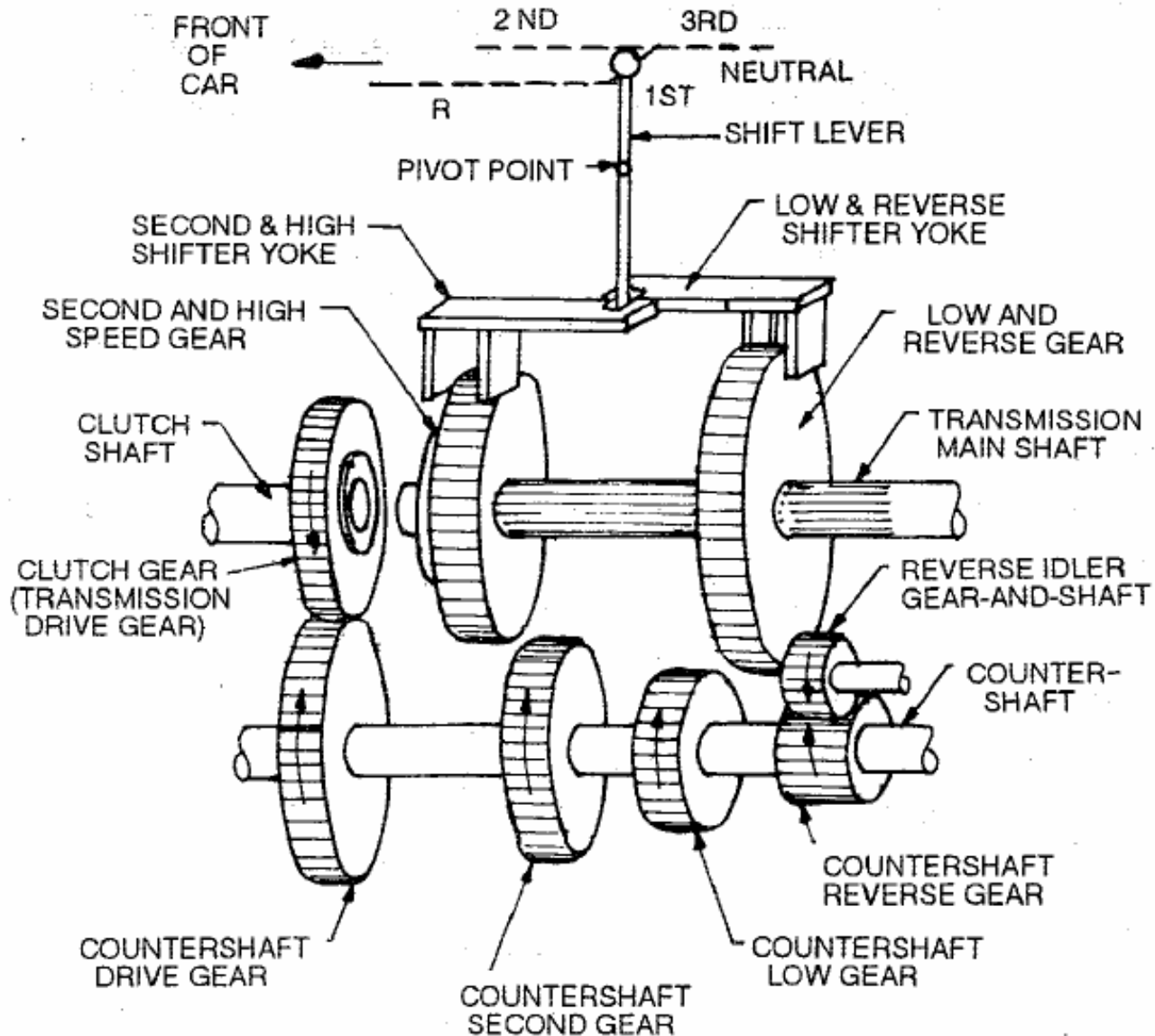
Types of Gearbox

- Sliding mesh gearbox
- Constant mesh gearbox
- Synchromesh gearbox
- Epicyclic Gearbox

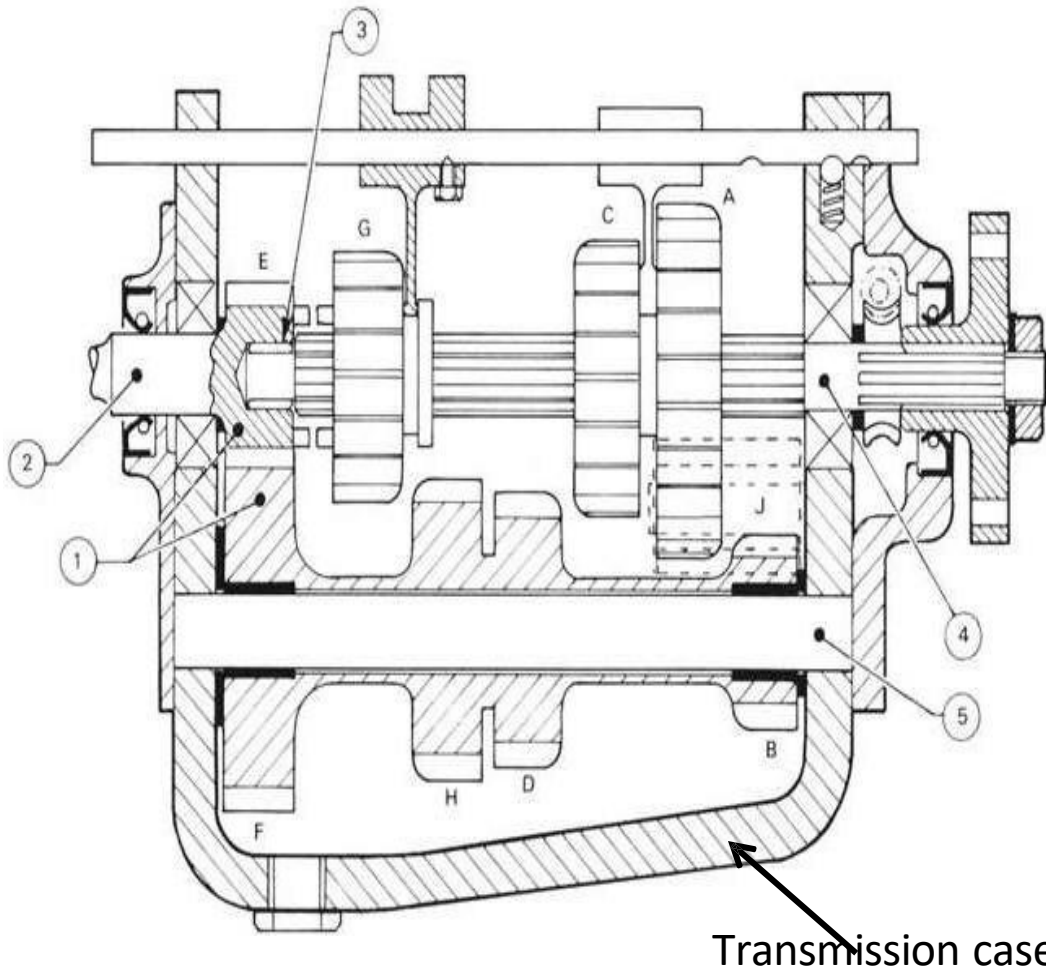
Transmission Shafts

- At least four shafts are commonly used:
 - input shaft
 - countershaft
 - reverse idler shaft
 - output shaft
- Bearings
- Transmission case

Sliding mesh type gearbox



Sliding mesh type gearbox

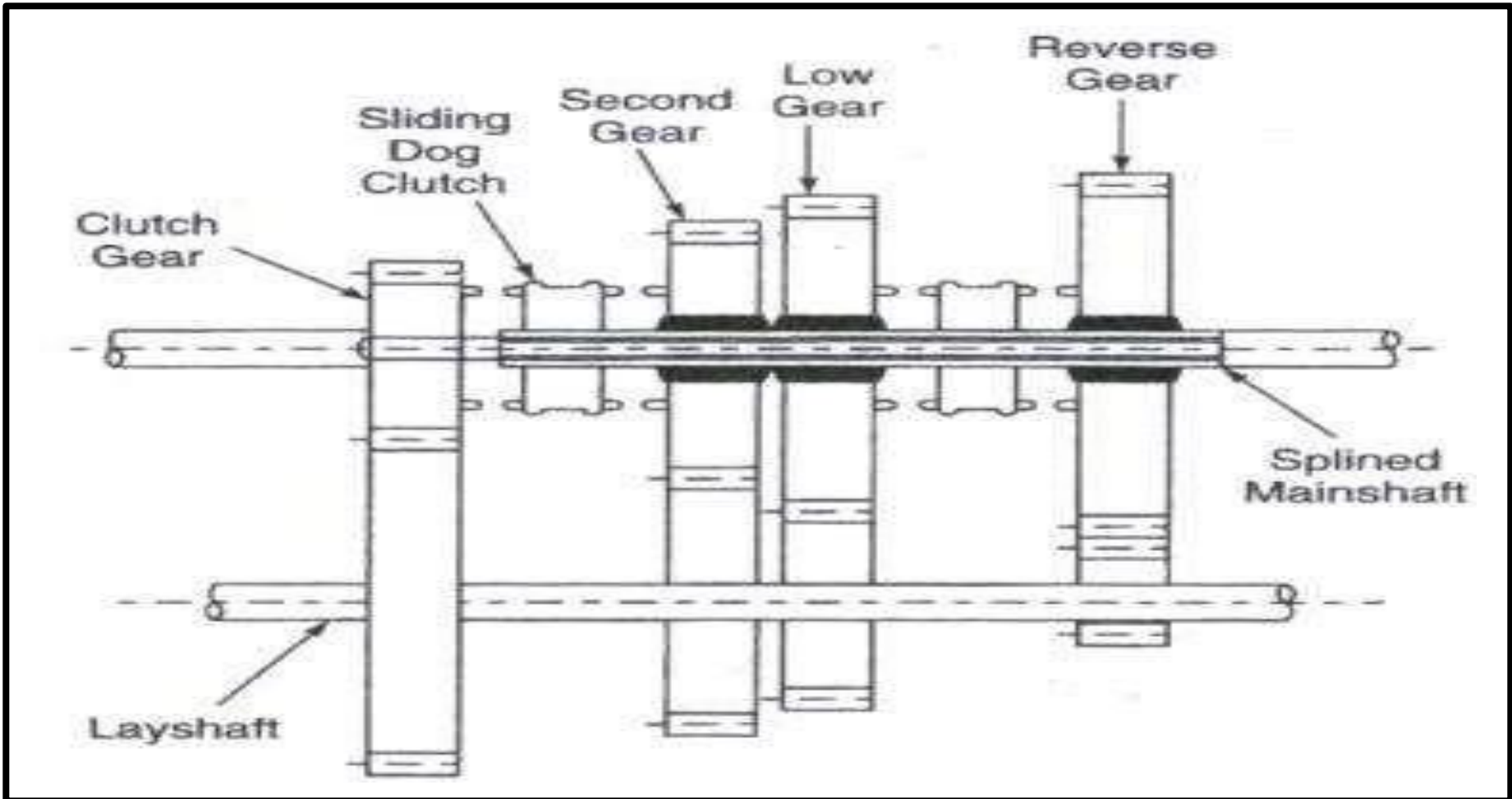


1. Constant mesh gears.
2. Primary shaft (Clutch shaft)
3. Bearing.
4. Main shaft.
5. Lay shaft (counter shaft)

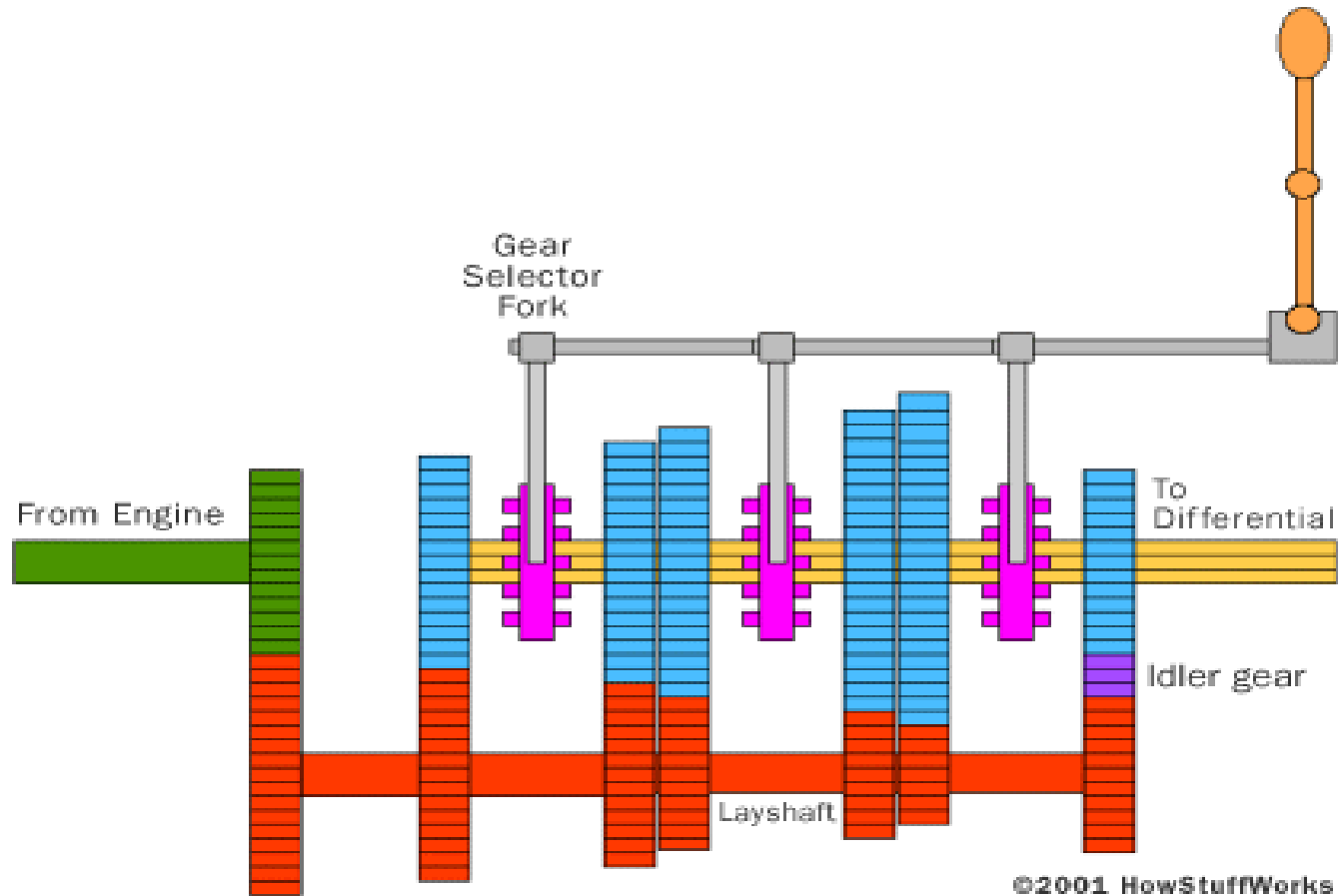
Disadvantage of Sliding mesh Gearbox

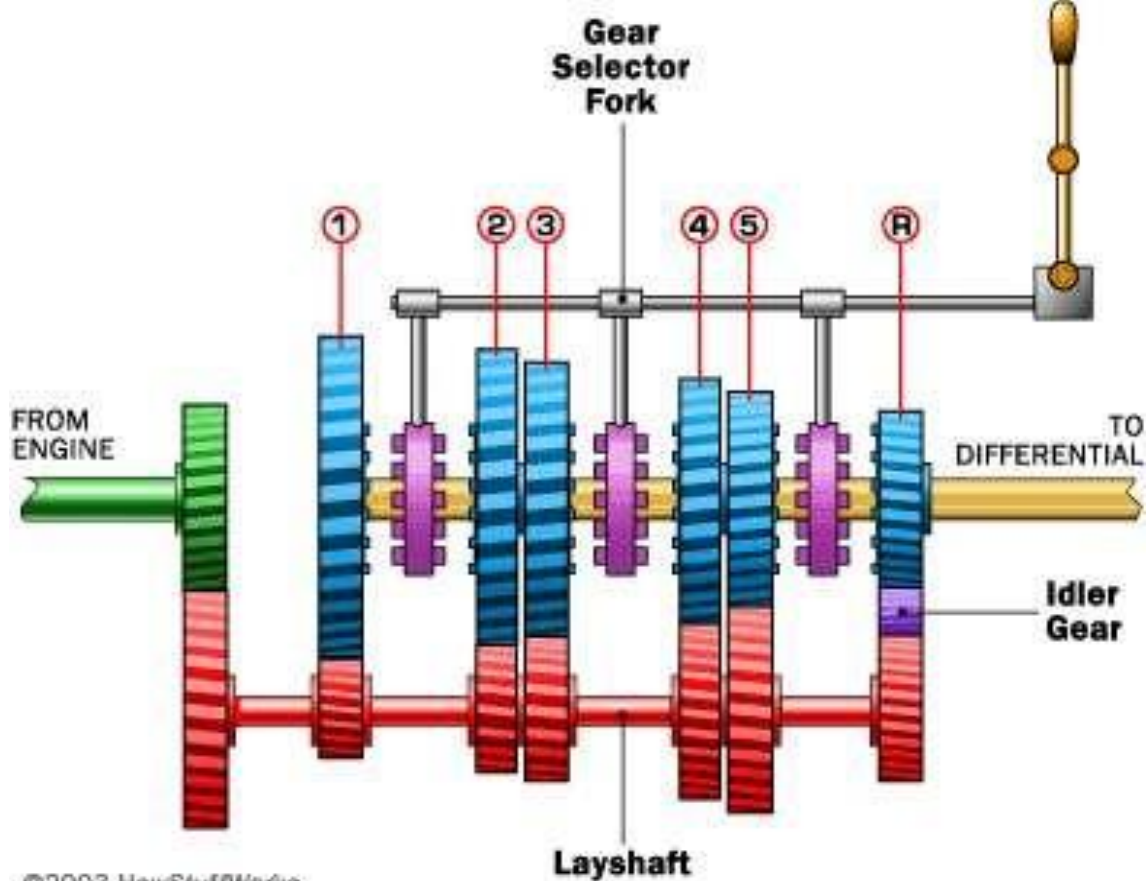
- Gear noise due to the type of gear.
- The difficulty of obtaining a smooth, quiet and quick change of gear without the great skill and judgment.

Constant mesh gearbox

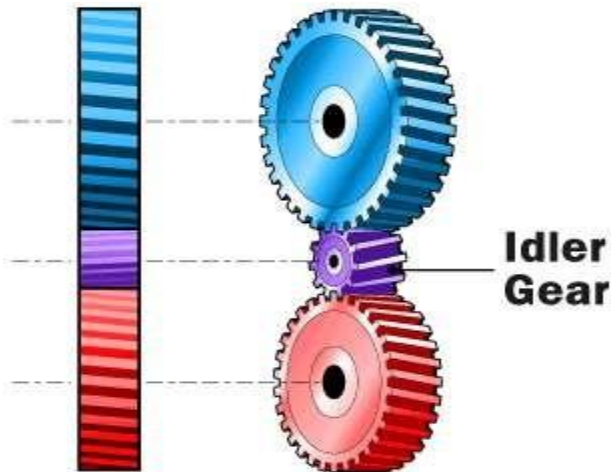


Constant mesh gear box





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Gear Ratio

- 1st 2.315:1
- 2nd 1.568:1
- 3rd 1.195:1
- 4th 1.000:1
- 5th 0.915:1

Advantage of Constant mesh Gearbox compared to Sliding mesh Gearbox

- As the gear remain always in mesh, it is no longer necessary to use straight spur gear. Instead helical gear is used which are quieter running.
- Wear of dog teeth on engaging and disengaging is reduced because here all the teeth of the dog clutches are involved compared to only two or three teeth in the case of sliding gears.

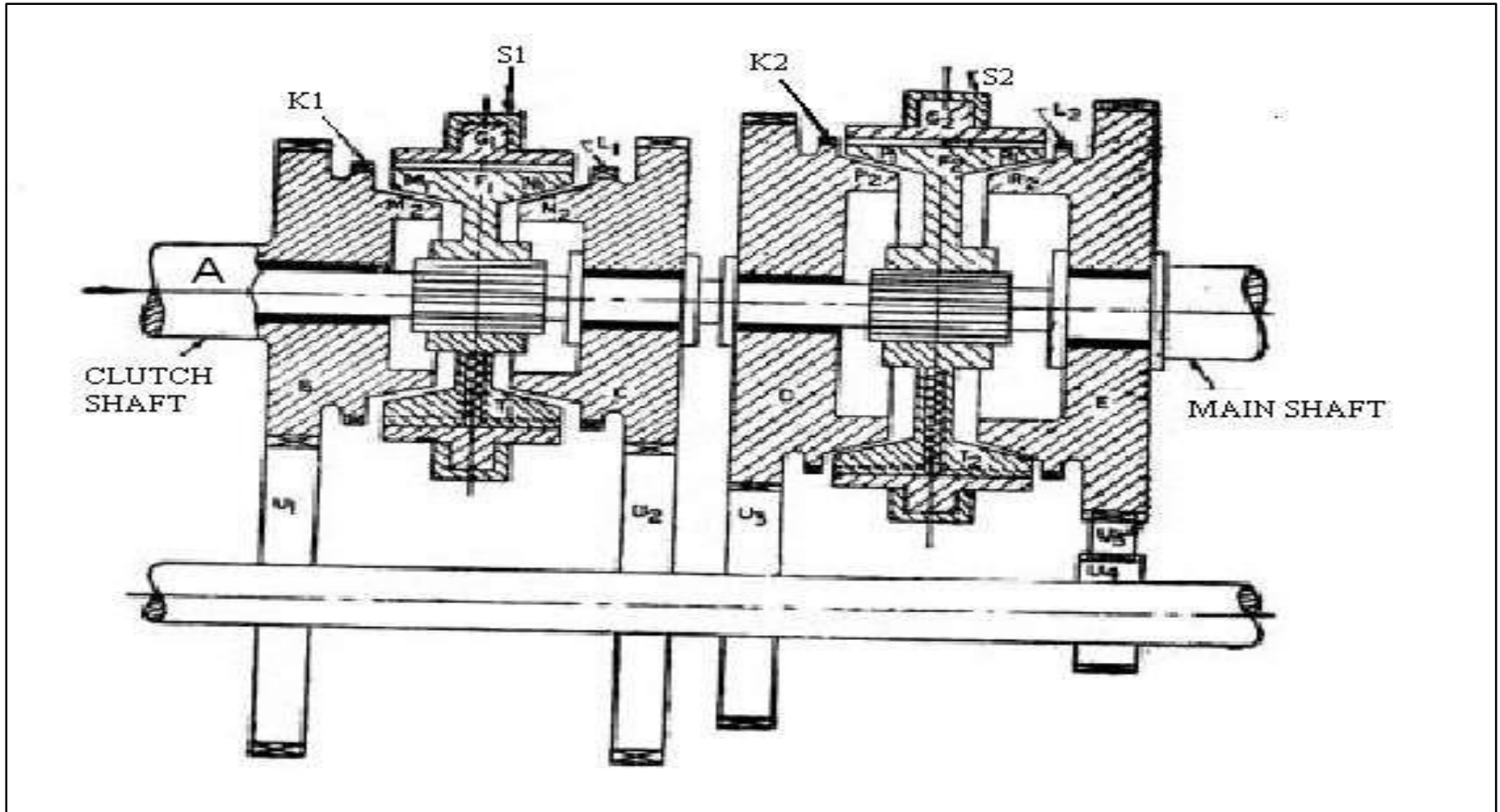
Double Declutching with Constant mesh Gearbox

- For the smooth engagement of the dog clutches it is necessary that the speed of the clutch shaft, layshaft and main shaft gear must be equal.
- The clutch is disengaged and the gear is brought to neutral.
- Then the clutch is engaged and accelerator pedal pressed to increased the speed of the main shaft gears.
- After this the clutch is again disengaged and the gear moved to required lower gear and the clutch is again engaged.
- As the clutch is disengaged twice in this process, it is called double declutching

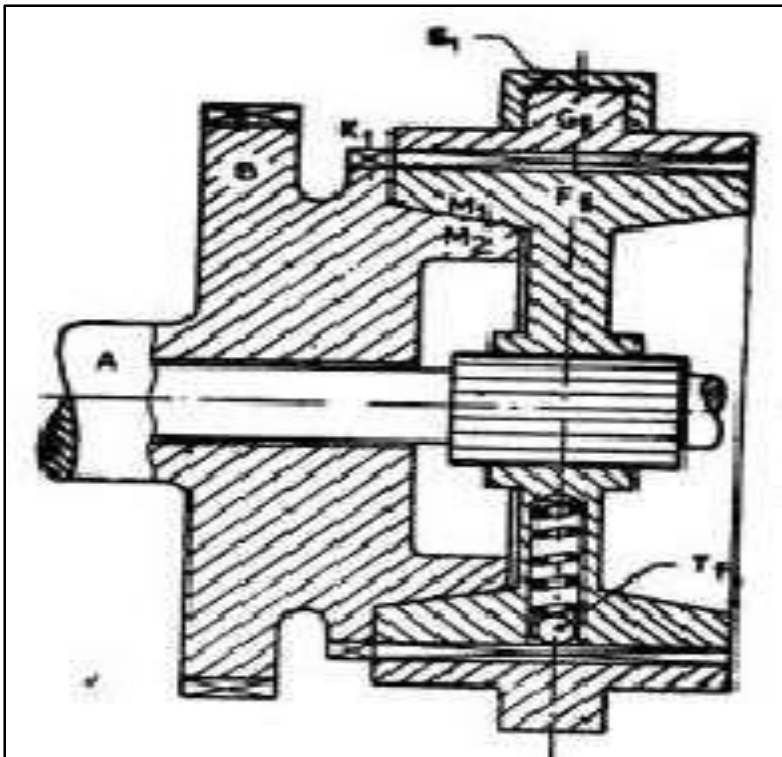
Synchromesh Gearbox

- Similar to constant mesh type, because all the gears on the main shaft are in constant mesh with corresponding gears on the layshaft.
- Avoids the necessity of double declutching.
- The parts which ultimately are to be engaged are first brought into frictional contact which equalizes their speed, after which these may be engaged smoothly.

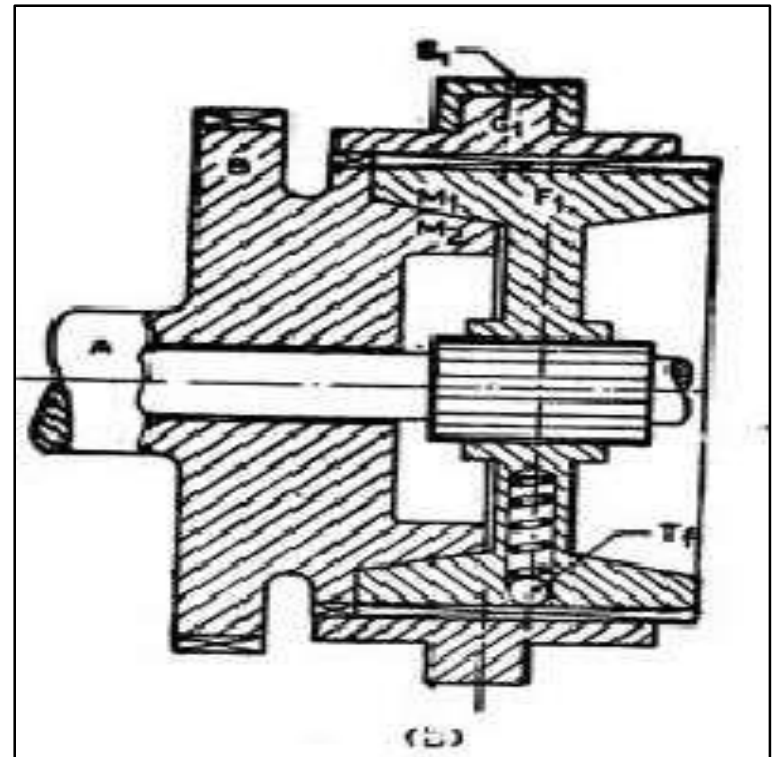
Synchromesh Gearbox



Engagement of direct gear in Synchronmesh Gearbox

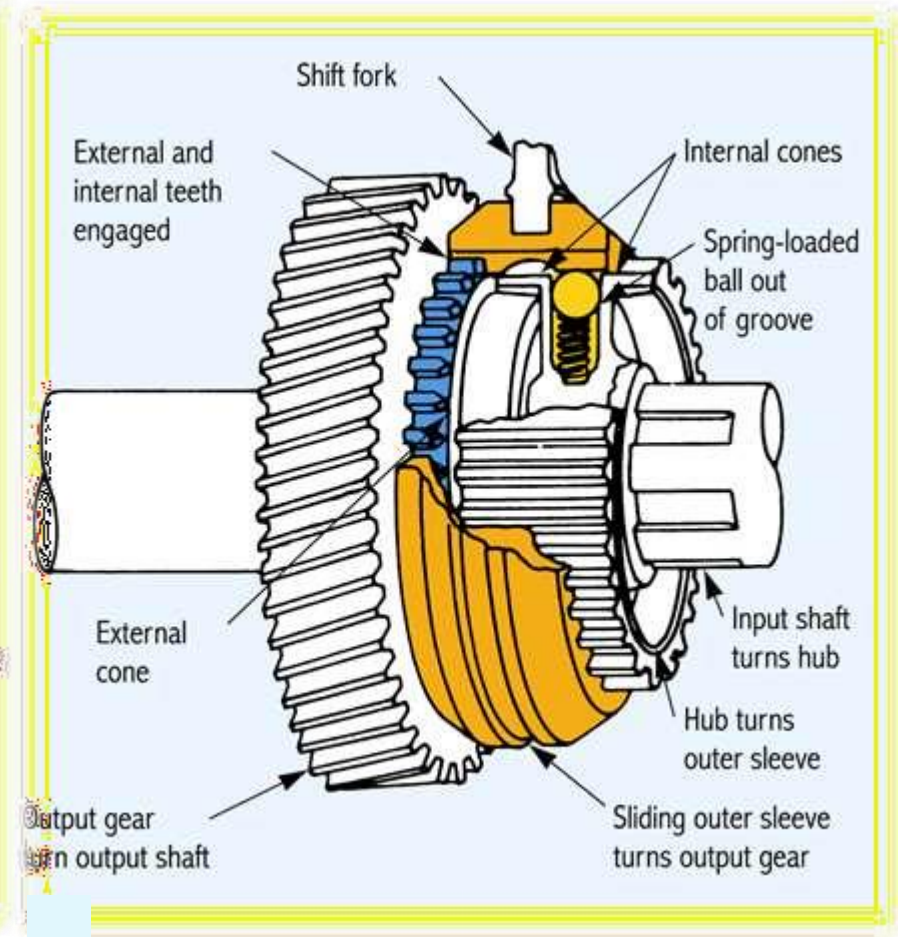
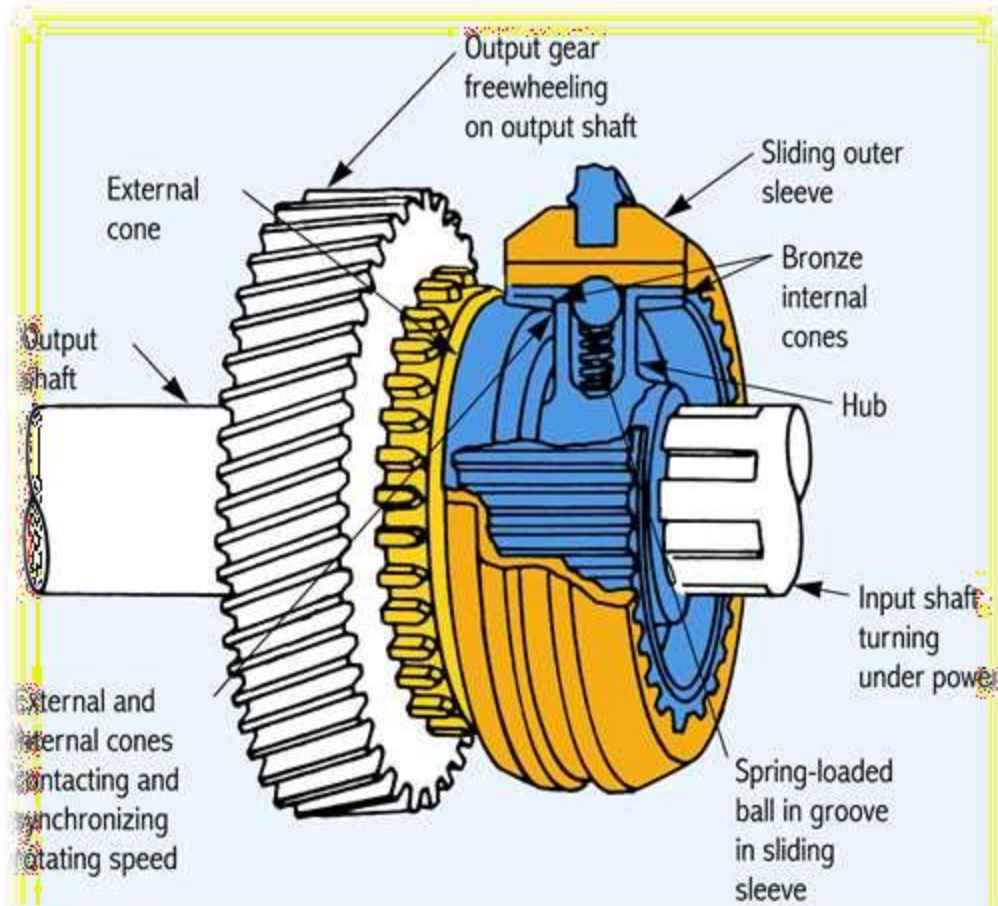


Cones M_1 and M_2 mate to equalize speeds.

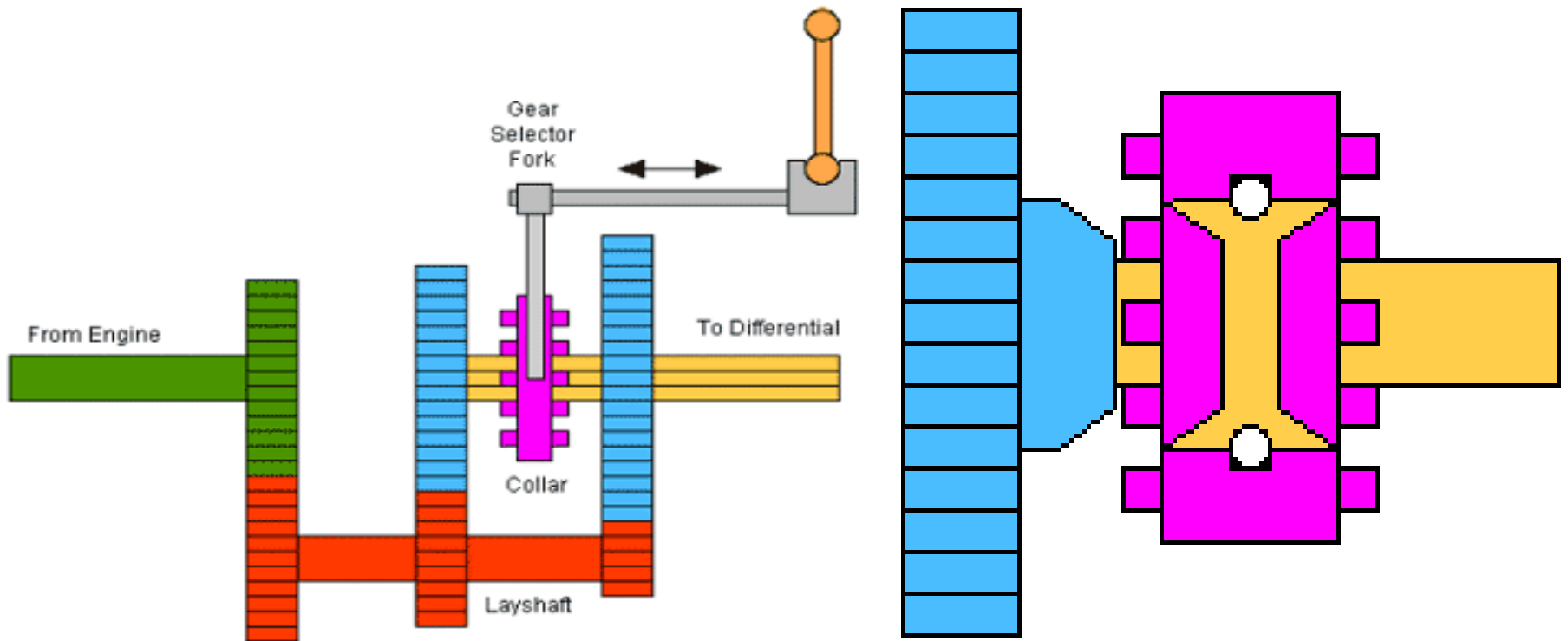


Member G_1 pushed further to engage with dog k_1

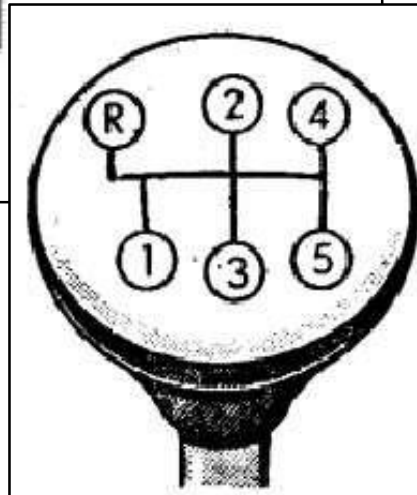
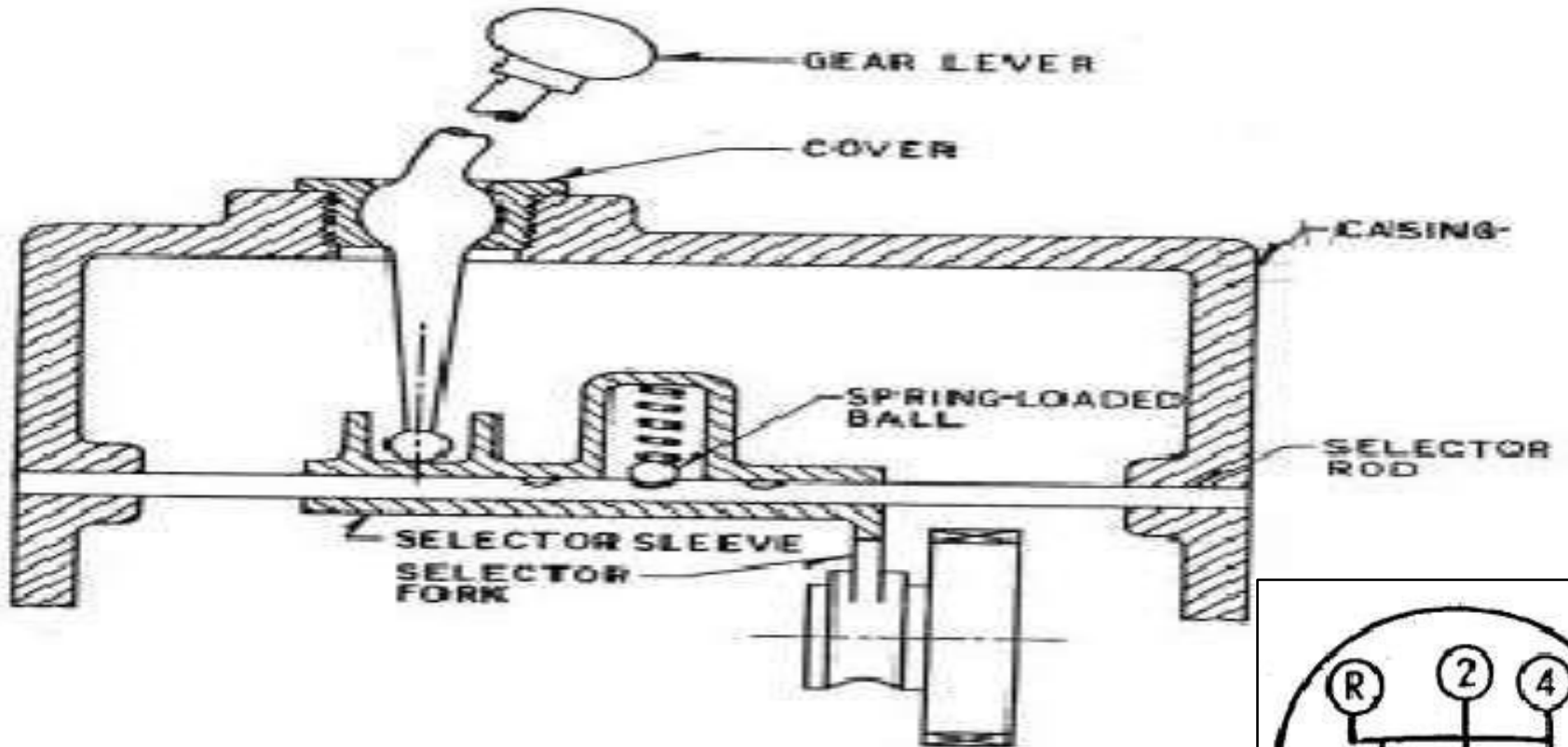
Synchronizer Operation



It's too simple to Understand



Selector Mechanism with gear lever on top of the transmission



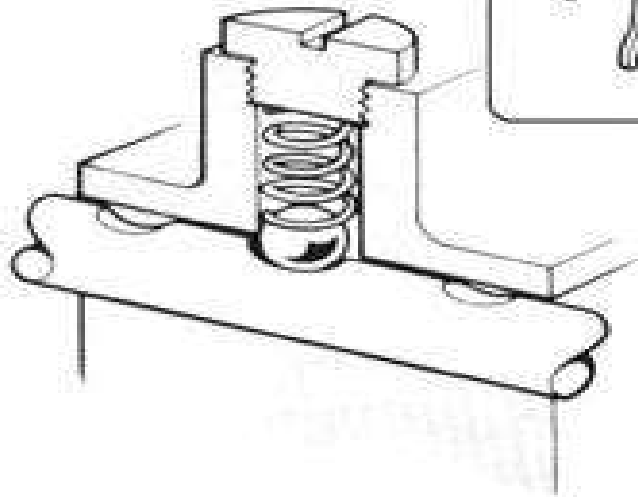
Selector Mechanism with gear lever on top of the transmission

- **There are forks mounted on the sleeves on three separate selector rods which are supported in the gearbox casing.**
- **Each selector sleeve can slide on its rod.**
- **There are slots on the selector rods and the sleeves are provided with spring loaded balls to avoid unwanted engagement of the gears.**

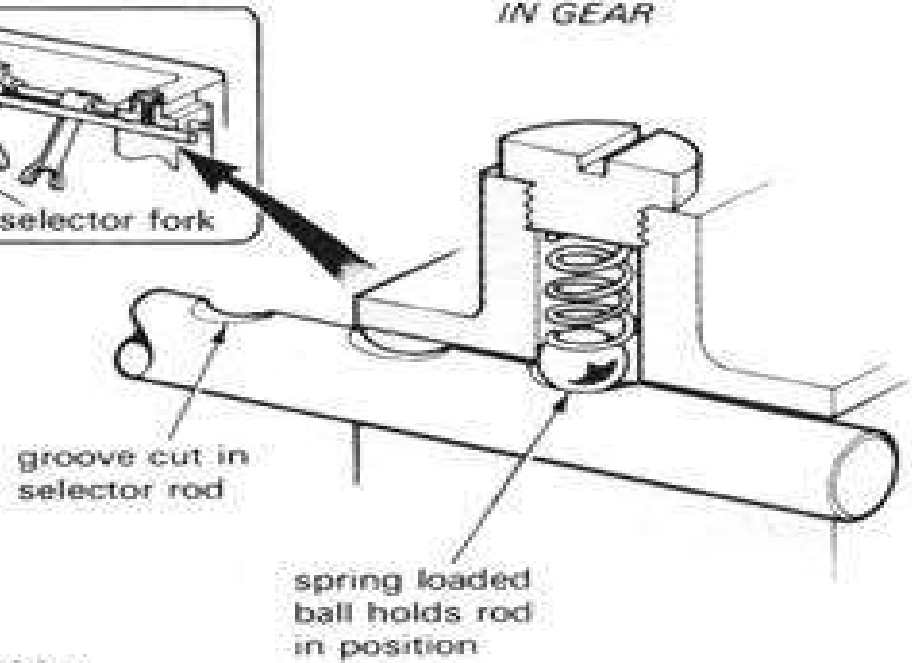
Selector Mechanism with gear lever on
top of the transmission

- **These balls resist the movement of the forks until some force is applied to the gear lever to overcome their resistance.**
- **Grooves are provided on the gear bosses where the selector forks can fit in.**
- **Transverse motion of the gear lever selects the forks which is to be engaged and the longitudinal movement then slides the forks and its gear to engage the selected gear.**

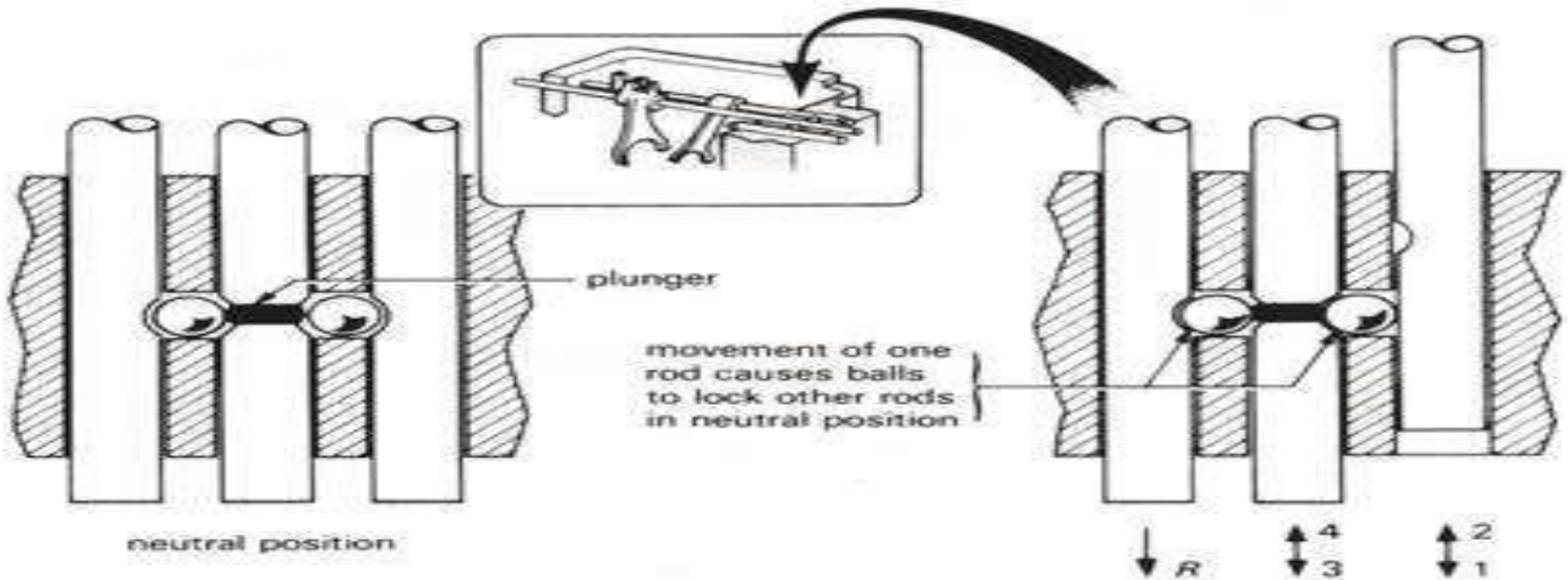
NEUTRAL POSITION



IN GEAR

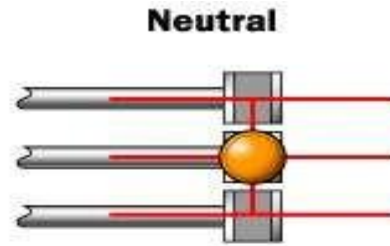
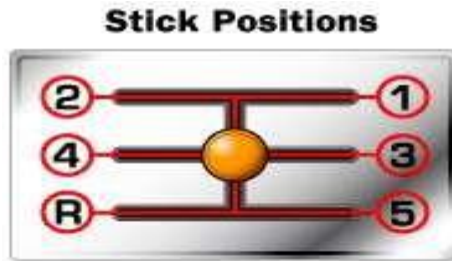


(a) Device to hold selector rod in position

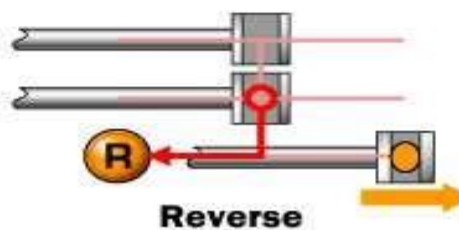
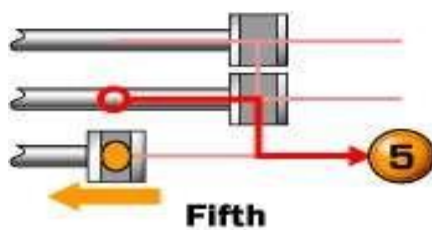
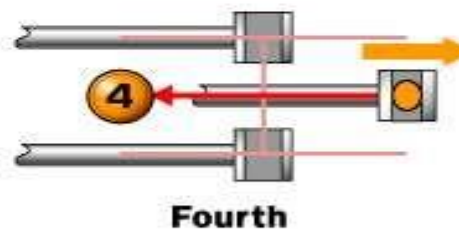
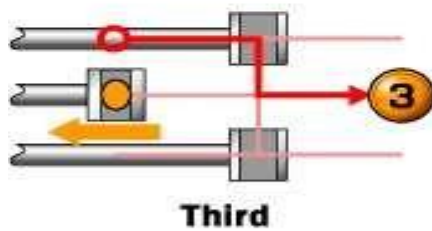
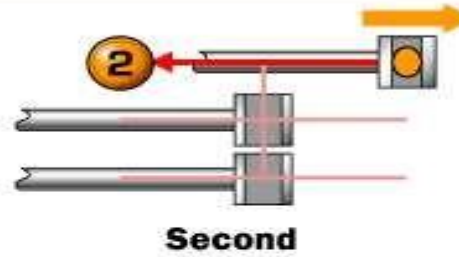
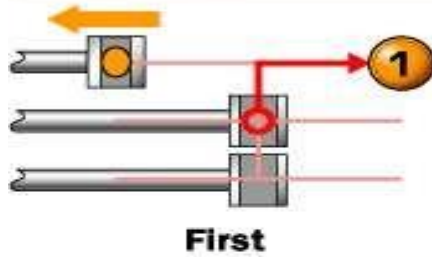


(b) Ball and plunger type of interlocking mechanism prevents two gears engaging at the same time

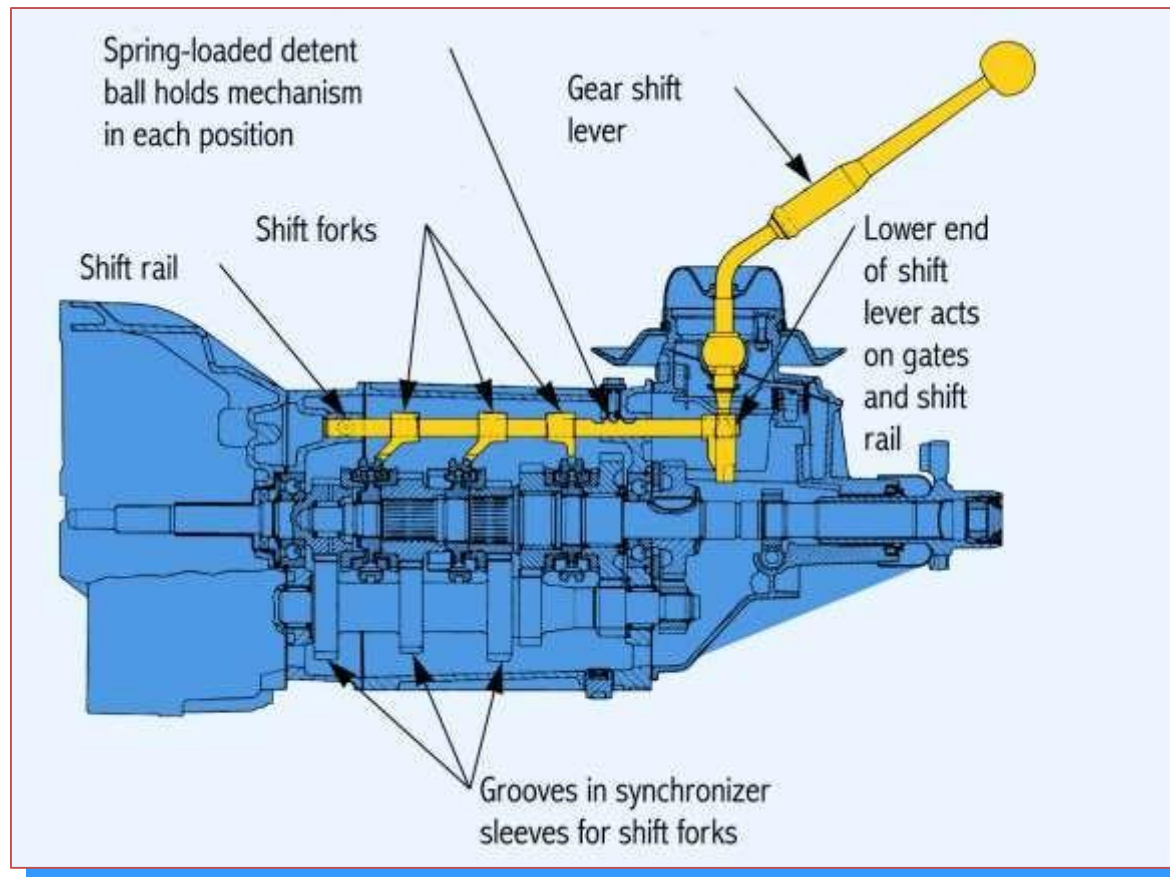
Gear Shift Mechanism



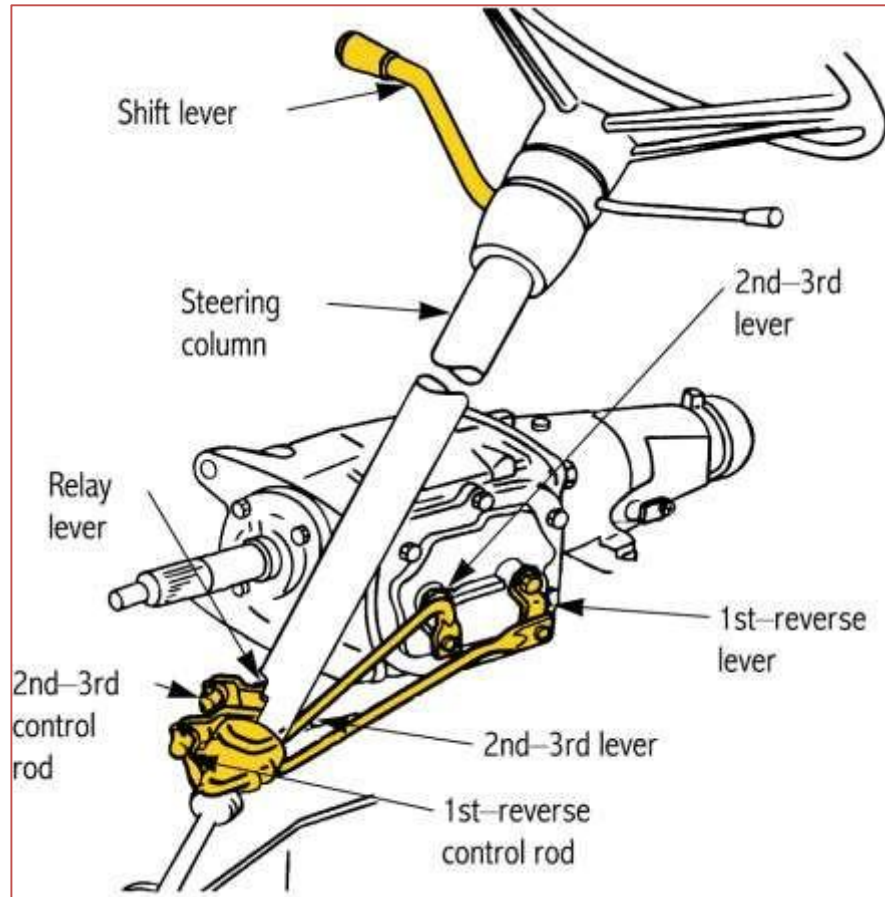
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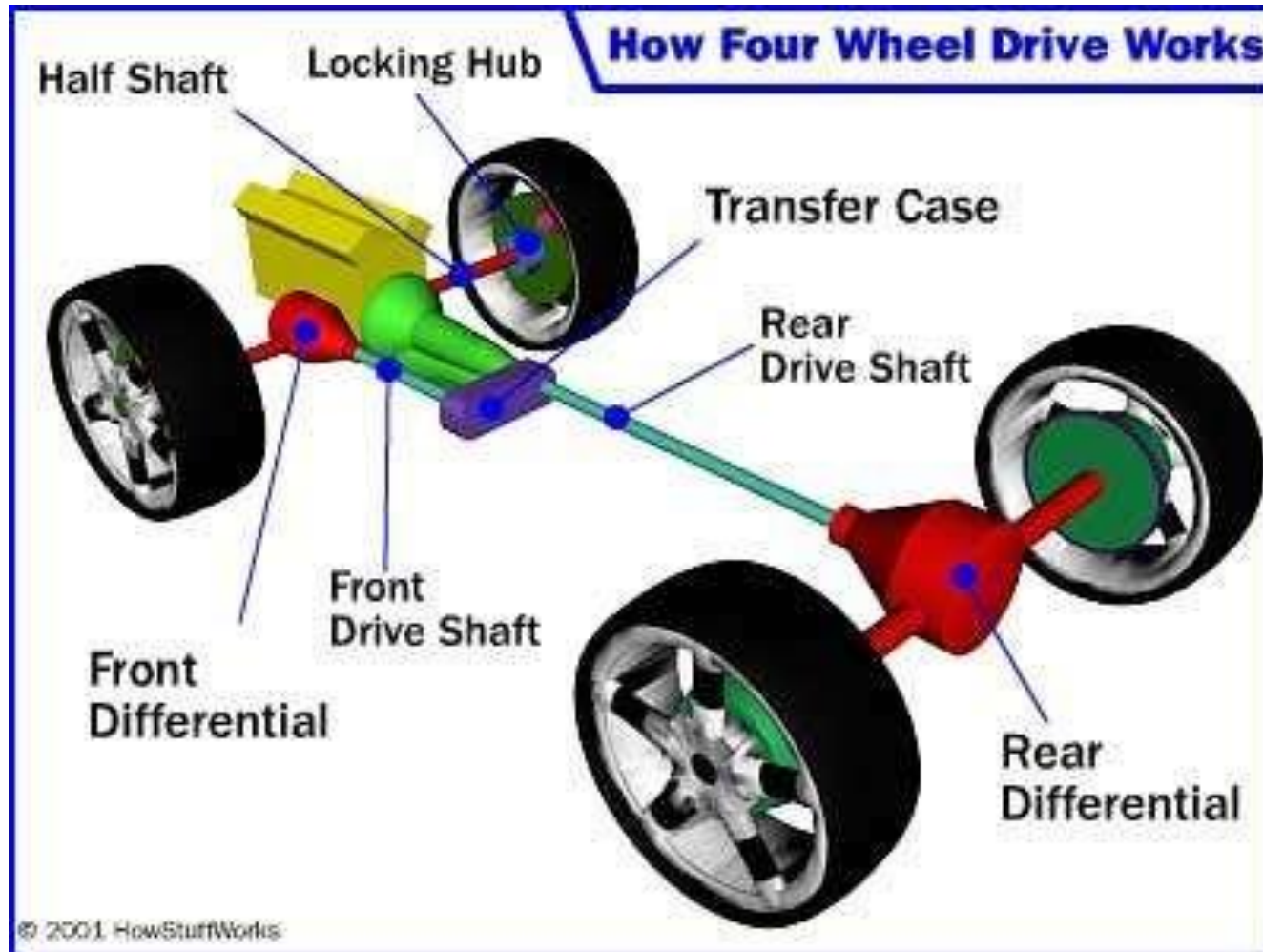
Internal Shift Rail Linkage



Column Shift Mechanism



Transfer case Gear Box



This is the device that splits the power between the front and rear axles on a four-wheel-drive car

Function

- Split and maintain constant power to both the front and rear axles
- Provide different gear ratio according to driving condition (muddy, Plain, off road)

Transfer Cases

– Drive

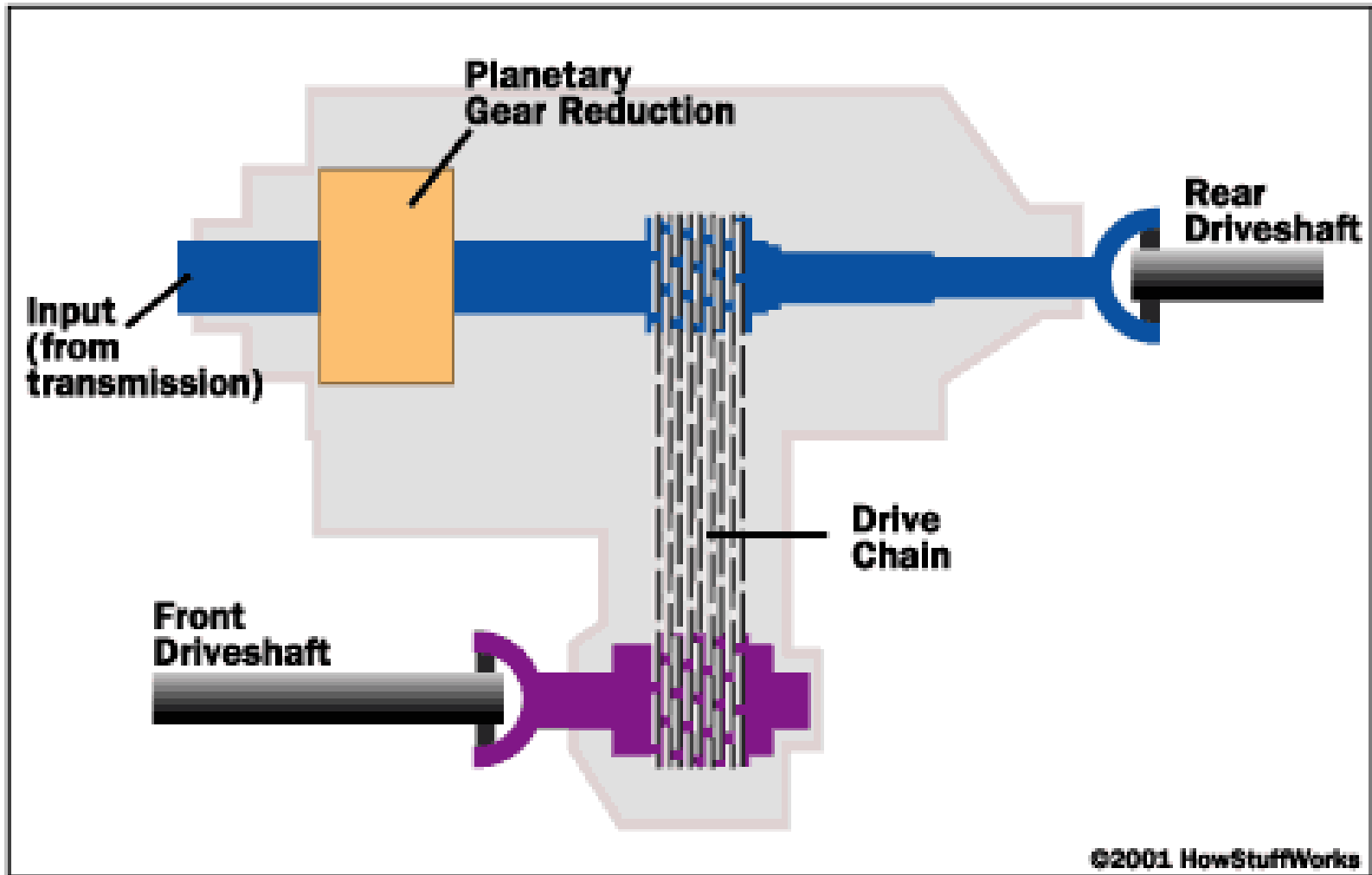
- Chain

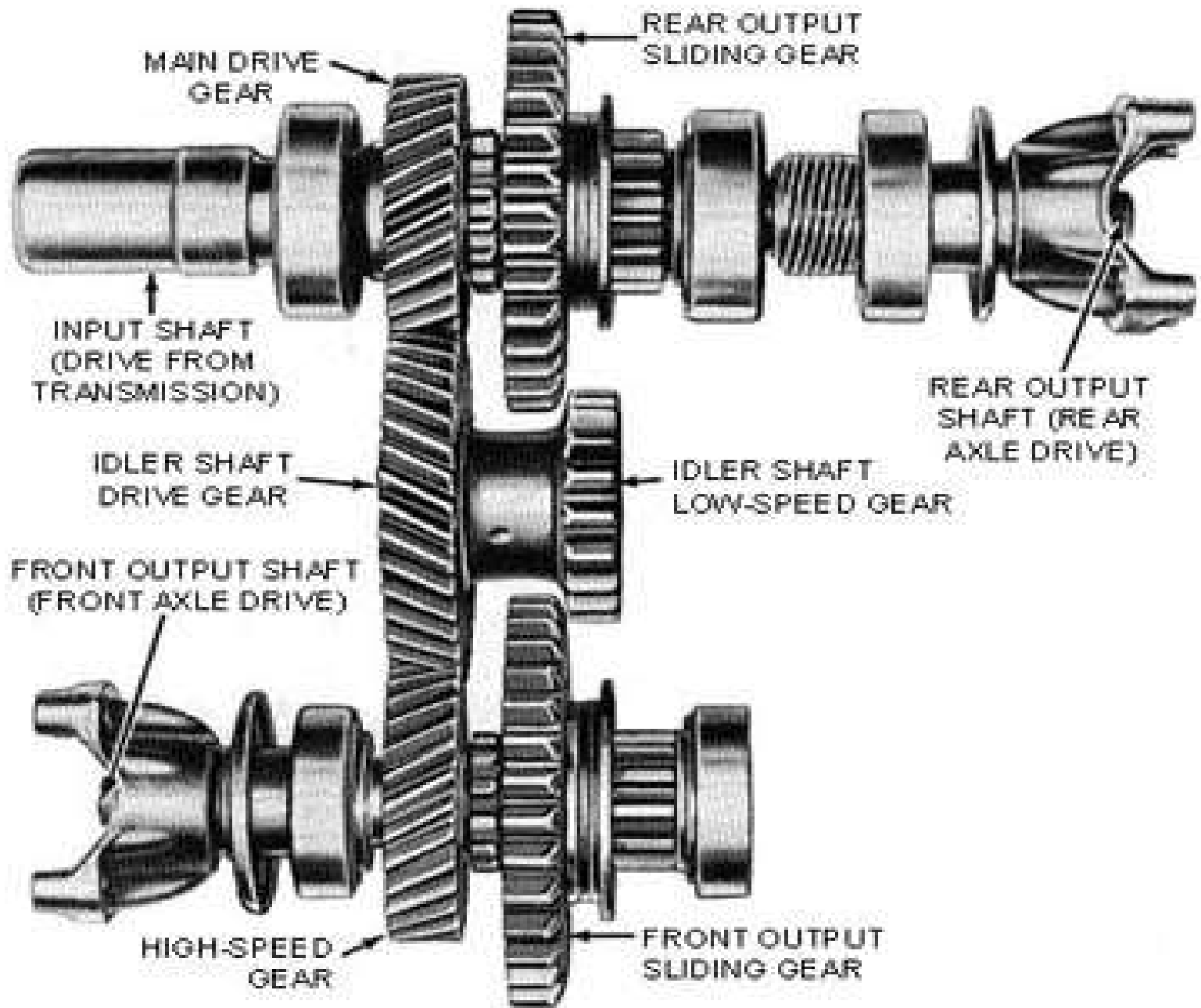
- Uses a link type chain (similar to a timing chain)
- If used with a dual range case, gear reduction takes place before the chain drive sprocket
- Usually will use a planetary gearset for gear reduction

- Gear

- Uses a cluster gear between the transmission and the transfer case output shaft

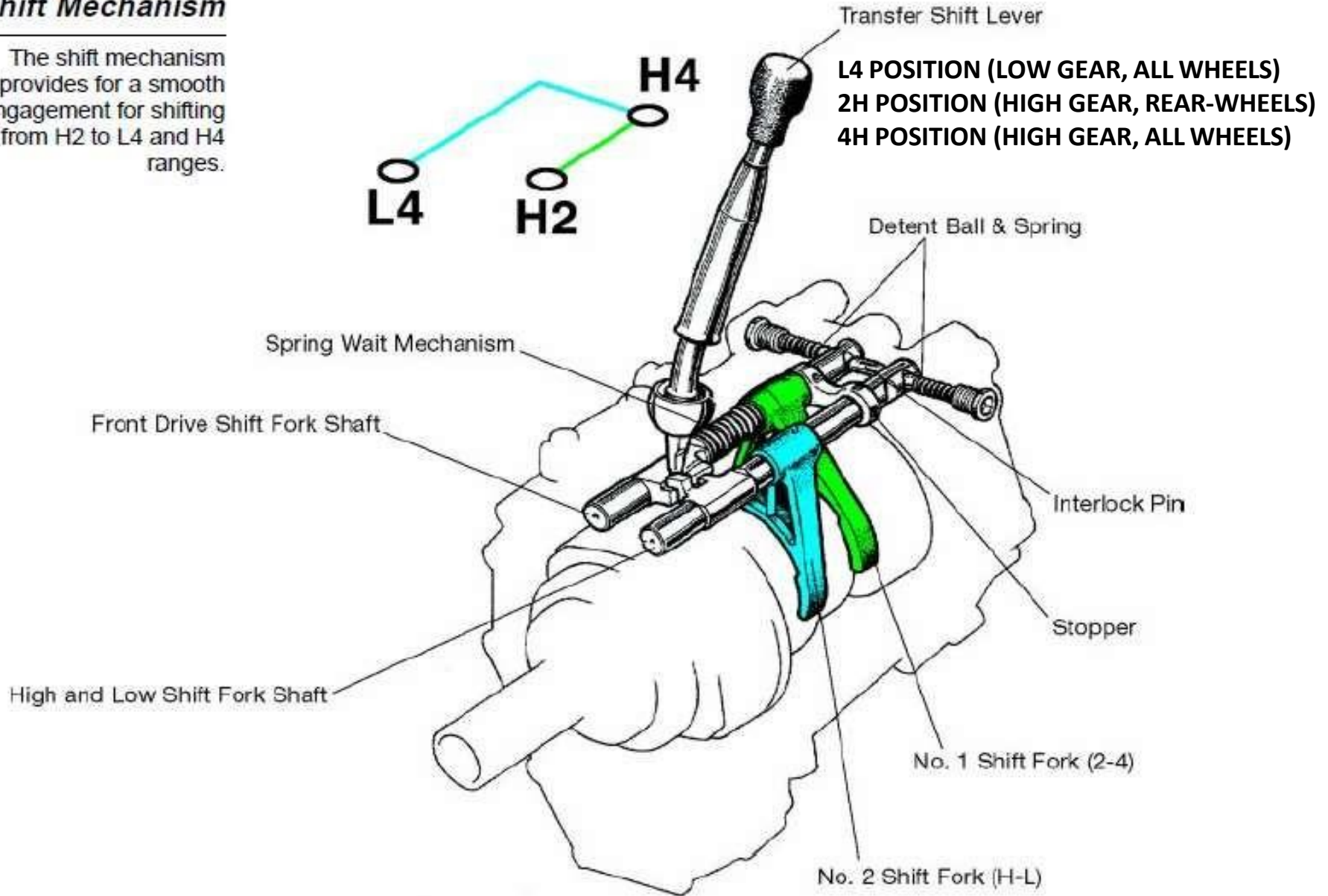
Components





Shift Mechanism

The shift mechanism provides for a smooth engagement for shifting from H2 to L4 and H4 ranges.



- 4WD – Four Wheel Drive
- 2WD – Two Wheel Drive
- AWD- All Wheel Drive