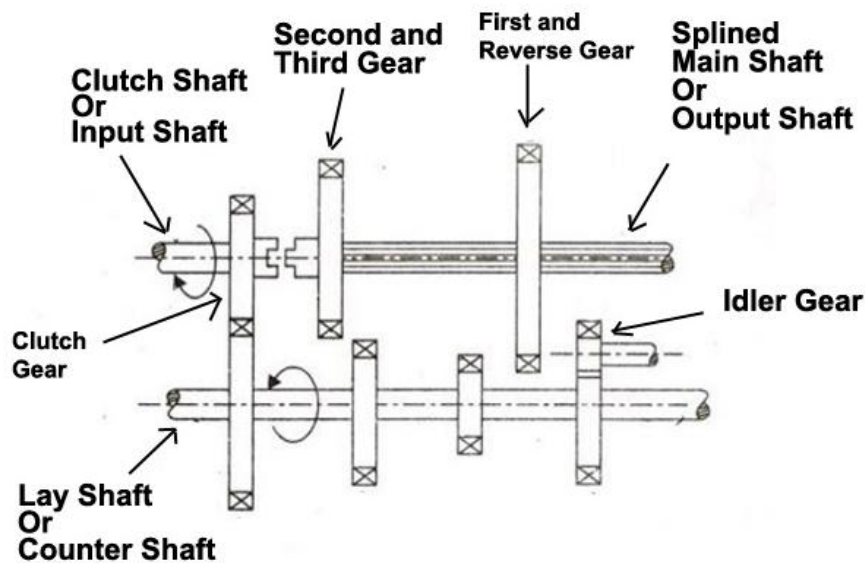




LAYOUT OF SLIDING MESH GEARBOX

INTRODUCTION

Sliding Mesh Gearbox was the first gearbox or transmission system invented for an automobile. The first transmission system was given by French Inventors Louis-Rene and Emile Levassor who invented the world's largest ever transmission system with 3-speed sliding mesh transmission in 1894. Gear ratio is achieved by sliding the required gears to bring it with appropriate mating gears. Sliding mesh gear box is the gearbox in which the required gear ratio is achieved by sliding the required gears to bring into mesh with the appropriate mating gear. Since the gears are to be slide axially and brought into contact the gears have to be necessarily be spur gears.



MAIN PARTS

(i) **Shafts:** There are 3 shafts present in Sliding Mesh Gearbox:

a) **Clutch Shaft:** It is input shaft in the sliding mesh gear box. The clutch shaft carries the engine output to the gearbox with the help of engaging and disengaging clutch which is mounted at the engine end. A gear is mounted over this shaft known as clutch gear which is used to transmit rotational motion to lay shaft.

b) **Lay Shaft or Counter Shaft:** After the input shaft comes the Lay Shaft. Lay shaft is an intermediate shaft between the Clutch Shaft and Main Shaft. In the lay shaft, the gears are rigidly fixed and rotates with the lay shaft. One of the gear of this shaft is always in contact with the gear of the clutch shaft. So when the clutch shaft rotates, the lay shaft also rotates. Lay shaft rotates in a direction counter to the engine rotation. So, it is also known as **Counter Shaft**. Other gears of lay shaft meshes with different gears of main shaft to



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obtain different gear ratios. Also, lay shaft has reverse gear which has idler gear attached to it.

c) Main Shaft: This shaft is used as an output shaft in sliding mesh gearbox. In this shaft the gears are not rigidly fixed. The gears of this shaft have internally splined grooves and the outer surface of this shaft is made splined so that the gears can easily slide over the shaft. The gears of main shaft slides over the shaft to mesh with appropriate gears of lay shaft so that required gear ratio is obtained.

ii) Gears:

Usually two types of gears were used in sliding mesh gearbox. They are:-

- a) **Spur gear:** Spur gears have straight teeth that are produced parallel to the axis of gear. These gears are most economical types of gear but tend to vibrate and become noisy at high speed.

- b) **Helical gear:** The teeth of helical gears are not parallel to gear axis. The teeth of this gear type are at angle to the gear axis. These gears are less noisy and have a smoother operation than spur gear. Also these gears have higher tooth strength and a higher load carrying capacity.

iii) Gear Lever:

It is used slide the gears in the main shaft to obtain appropriate gear ratio. It is operated by the driver.

CONSTRUCTION

- ✚ The clutch shaft is connected to the engine output and rotates when the engine rotates. A gear is mounted on the clutch shaft which is connected with a gear of lay shaft.
- ✚ The lay shaft has several gears, one of which is connected to gear of clutch shaft and others gears connect with different gear of main shaft to obtain different gear ratio. Also, one gear in lay shaft is reverse gear and has and idler gear which is placed between the lay shaft gear and main shaft gear when operated.
- ✚ The main shaft has several gears and these gears can slide over the main shaft to mesh with different gears of main shaft.



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WORKING

- ✚ At first, the clutch shaft is driven by engine. It carries the engine output and rotates in the same direction as that of engine. The gear connected to the clutch shaft also rotates.
- ✚ As gear of clutch shaft rotates, the lay shaft gear which is connected to the clutch shaft gear also rotates but in opposite direction.
- ✚ So the lay shaft rotates due to rotation of lay shaft gear that is rigidly fixed in the lay shaft. Due to rotation of lay shaft other gears of lay shaft also rotates as all the gears in lay shaft are rigidly fixed including the reverse gear.
- ✚ The gears of main shaft are internally splined and the main shaft is also splined, so the gears of main shaft can slide over it. The gear of main shaft are shifted and meshed with different gears of lay shaft to obtain different gear ratios required to face different road problems.
- ✚ First Gear is used at the time when vehicle starts its movement in forward direction. First Gear provide maximum torque and minimum speed and this gear is obtained when the smallest gear on the lay shaft meshes with the biggest gear in the main shaft.
- ✚ Second Gear is obtained when second largest gear of second smallest gear of lay shaft meshes with middle size gear of main shaft. Second Gear provides lower torque and higher speed than First Gear.
- ✚ Third gear is last gear or top gear of Sliding Mesh Gearbox. This gear is obtained when biggest gear of lay shaft meshes with smallest gear of main shaft. This gear provides maximum speed and minimum power.
- ✚ Reverse Gear is used when the vehicle needs to move in the opposite direction. In this gear the rotation of the output shaft or main shaft is reversed by placing an idler gear between the lay shaft gear and the main shaft gear which changes the direction of rotation of output shaft.

ADVANTAGES

- ✚ Since only one gear is in mess in sliding mesh gearbox so less fluctuating loads on shafts causing less vibration and noise.
- ✚ Its efficiency is more than constant gearbox as only one gear is in mess unlike the constant mesh gearbox in which all gears are in constant mesh.
- ✚ Its manufacturing is easy as compared to constant mesh gearbox.
- ✚ Its mechanism is simple.



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DISADVANTAGES

- ✚ More effort is required to engage the gear as the gear has to be slide in sliding mesh gearbox.
- ✚ Less life of gear as more wear and tear of gear is caused in sliding mesh gearbox due to friction.
- ✚ It takes more time and money to replace the gears if the gearbox fails.