GEAR BOX

Working principles of gear box:

Any combination of gear wheels by means of which motion is transmitted from one shaft to another shaft is called gear train. There are two sets of gears in a conventional gearbox- the input and the output. The input gears are fixed on the countershaft, making them single units. It drives the individual gears on the main shaft, which rotate freely on the bearings. Thus, the gearbox passes the drive to the wheels depending upon the gear which engages on the main shaft. Furthermore, when you push the shifter sleeve towards the desired gear that gear lock onto the main shaft and rotates it. Thus, the main shaft rotates at the engaged gear's speed and provides the output according to the engaged gear's ratio.

Types of gearbox:

There are two types of gearbox in tractors:

1. Manual operated selective
2. Planetary

1. Selective type transmission:

In this forward speed may be selected from the neutral position. This natural position has to be obtained before selecting any forward or reverse speed. This gear box consists of two units:

a) Top cover with selective mechanism.
b) Transmission housing having gear trains, bearings and shafts etc.

The gear box housing contains the following shafts:

a) Primary shaft
b) Main shaft or input shaft
c) Lay or counter shaft
d) Idle shaft

Primary and main shafts are in one line and the lay shaft runs parallel below them. The idler shaft is fitted on one side of the lay shaft, which contains idler gear to obtain reverse speed. The selective mechanism is housed in the top cover of the gear box and is operated by means of gear shaft lever. It has lever, fork with shafts and locking devices etc. Every speed is obtained from the neutral

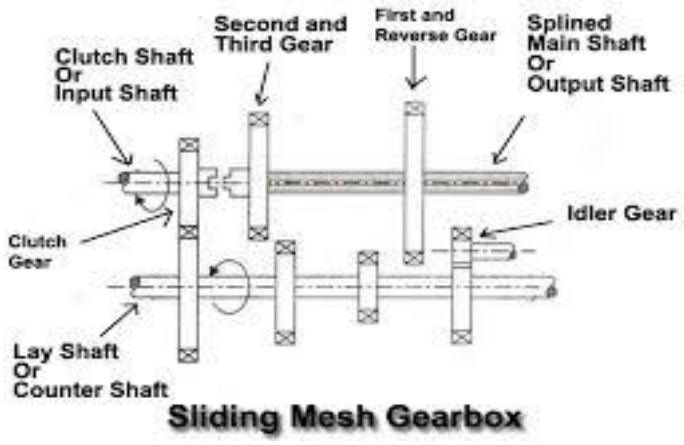
position when input shaft is disconnecting from the main shaft. At this time power will flow onward. To get different road speed, the gear shaft lever is moved from neutral to any desired speed.

2. Planetary type transmission:

Sometimes it is also called as Epicyclical Transmission or Sun and Planet gear box. A planetary gear set consist of a ring gear, sun gear and plant gears with carrier. To obtain different speeds, any one of these three units can be held from rotation by means of lever. Planetary gear system is used in tractor drive trains to change gear ratio and carry heavy load. Its gear systems are much more compact than simple gear reductions. The simple planetary gears are used as a final drive on most tractors. It also helps to provide a continuous flow of power during the shift.

Types of selective gear box:

Sliding mesh gear box:



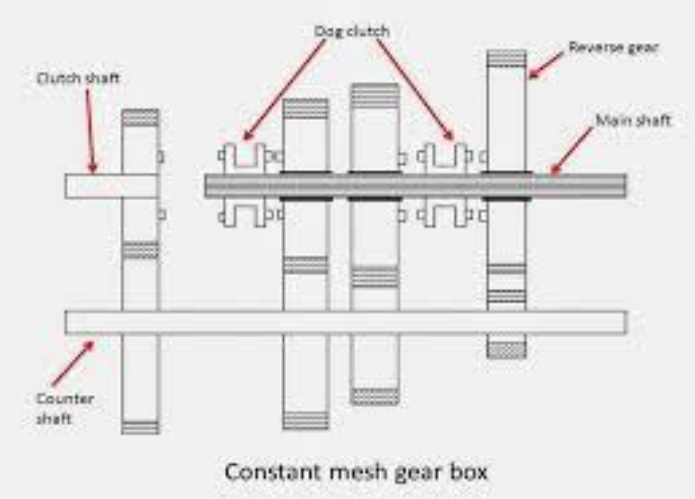
Sliding Mesh Gearbox

Most of the indigenous tractors are fitted with sliding mesh or sliding-cum-constant mesh type gear box. The housing is made of cast iron. It is rigid in construction and serve the purpose of the tractor frame. Usually, the main and counter shafts are parallel to the clutch shaft, but there are certain cases where the shaft is transverse. In addition to the shafts, a third shaft carries a reverse gear. The upper shaft is known as the main shaft and the lower one is known as the counter shaft or lay shaft. The gears on the lay shaft are fixed, whereas those on the main shaft slide to mesh with a suitable gear on the countershaft. Gearshift rails and forks are used to shift gears from one position to another. The shaft rails are kept in position with the help of spring loaded detent balls or by another device. This allows one pair of gears to engage at one time, otherwise the

transmission system will not function and damage may occur to some of the components. The shafts are mounted in the transmission housing on bearing.

Constant gear box:

The constant mesh transmission has parallel shafts one over the other with gears in constant mesh. The gears on the main shaft is mounted on bushings and are free to rotate along with the counter shaft gear without affecting the main shaft when in neutral. When the gear lever is engaged, the coupling devices which have internal splines are mounted on the internal splines of the main shaft move from one side to another to lock a free gear on the main shaft. Thus the main shaft gets drive gear and coupling unit.

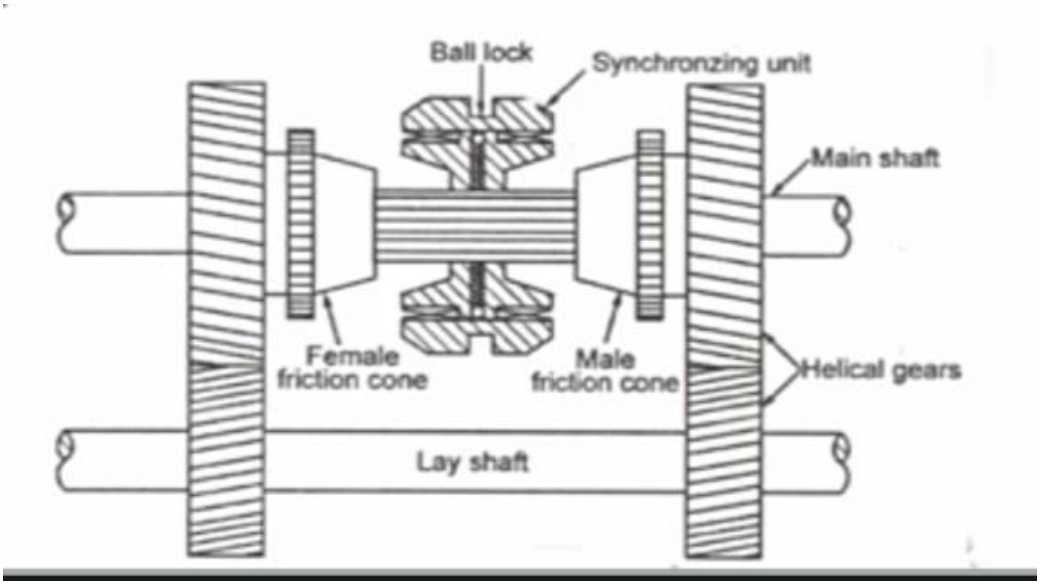


Constant mesh gear box

With the exception of the helical- gear drive to PTO and main counter shaft, the gears are of the spur type, all the gears being in constant mesh and gear- train connections being made by sliding coupling and connectors. The system incorporates a transmission type PTO. The main counter shaft is splined internally to accept the external splines of the short PTO counter shaft.

Synchro Mesh Gear Drive:

The synchro mesh transmission is basically a constant mesh transmission with an extra device called a synchronizer to equalize the speed of the mating parts before they engage. This system is very common on automobiles and is very rarely used on tractor transmission.



The hub is splined to the shaft and the synchronizer sleeve is mounted on the hub. Two lock rings holds the shifter plates out against the sleeve. Each bronze- blocking rings have three slots into which the ends of the shifter plates fit. The inner surface of the blocking rings are cone-shaped and match the conical shape of the drive gear shoulders which they contact. These cone shaped surfaces provides the frictional force to synchronize the speed of the main shaft and gear.

During synchronization the sleeve is moved towards the selected gear, pushing the blocking ring to the right. The ring contacts the shoulder of the driven gear and begins to synchronize the speed of the two parts. To complete the shift, the sleeve tooth passes through the block ring teeth because, both are now rotating at the same speed and mesh with the clutch teeth on the driven gear.