TRANSMISSION SYSTEM

Transmission is a speed reducing mechanism, equipped with several gears. It may be called a sequence of gears and shafts, through which the engine power is transmitted to the tractor wheels. The system consists of various device that cause forward and backward movement of tractor to suit different field condition. The complete path of power from the engine to the wheels is called power train.

Functions of power transmission system:

1. To transmit power from the engine to the rear wheels of the tractor.
2. To make reduced speed available, to rear wheels of the tractor.
3. To alter the ratio of wheel speed and engine speed in order to suit the field condition.
4. To transmit power through right angle drive, because the crankshaft and rear axle are normally at right angles to each other.

The power transmission system consists of:

a) Clutch
b) Transmission gears
c) Differential
d) Final drive
e) Rear axle
f) Rear wheel

Combination of all these components is responsible for transmission of power.

Clutch:

Principle of operation:

The clutch works on the principle of friction in which when one stationary surface is brought into contact with a rotating surface, the stationary surface also starts rotating.

In actual practice one of the driving plates is the flywheel and the other is known as the pressure plate. The driven plate is a clutch plate made of frictional material and directly mounted on the splined end of the clutch shaft. In normal running condition the pressure springs keep the pressure plate in contact with the clutch plate. When the foot pedal is depressed, the pressure plate moves away

against the pressure of springs lowing the clutch plate and thus the clutch shaft to become stationary.

Components of clutch:

Clutch Plate:

Two types of clutch plates are found on tractors: (i) solid-hub type and (ii) flexible-hub type. In the solid-hub design the hub and plate are fastened together securely and there is no movement in the unit whereas the flexible hub-type has torsion springs and friction disc between the plate and the hub. This design permits the facing and plate to rotate with respect to the hub to the limit of the compression spring. The action of springs serves to reduce torsional vibrations and shocks between the engine and the transmission during the clutch operation. These flexible clutch plates are slightly "dished" when manufactured. This dishing allows smooth engagement of the clutch facing with the flywheel. Sometimes, instead of dishing the plates, cushion springs are utilized. These cushion springs decreases in thickness by 1.2 to 1.4 mm when the clutch is engaged and thus serves the same purpose as that required by dishing.

Facings of friction material, such as woven asbestos fibre or molded asbestos fibre, are riveted on both sides of the disc. A woven clutch facing is made by weaving threads of brass or copper wire covered with long fibers of asbestos and cotton. The woven sheets are treated with bonding solution, and then baked and rolled. Molded facings are made from a matrix of asbestos fibre and starch. A very recent development in the manufacture of friction lacings is ceramic material, a clay and metal substance which is oven-baked. The clutch-plate hub is internally splined and mounts on the splined part of the clutch shaft whose front end rests on the pilot bearing placed in the flywheel.

Pressure Plate Assembly:

This assembly consists of a steel cover and a pressure plate loaded with a number of thrust springs. The pressure plate carries three release levers which pivot on floating pins retained by eye bolts. Adjusting nuts are screwed to the eye bolts which pass through the clutch cover and are secured by staking. Struts are interposed between lugs on the pressure plate and the outer ends of release levers. Anti-rattle springs are fitted between release levers and the cover. A release lever plate is fixed to release levers with retainer springs.

Clutch Shaft:

The front end of the shaft is smaller in dimension and is supported on the pilot bearing in the engine crankshaft flange. On the splined part of the shaft, the clutch disc moves.

Pilot Bearing:

It is provided at flywheel. This may be a self-lubricated sealed ball bearing (Ford 3600) or a needle bearing (HMT 2511).

Release Bearing:

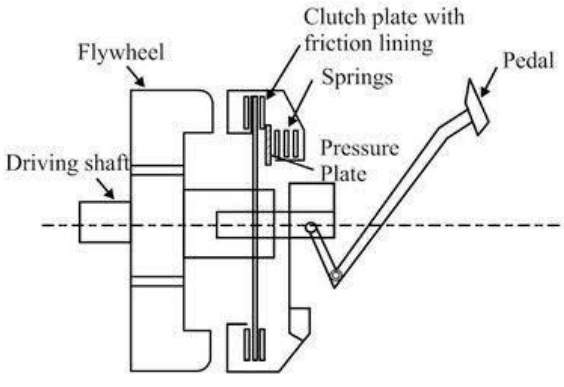
Sometimes it is called as thrust bearing also. Clearance is provided between the release levers and release bearing to ensure complete engagement. On disengage position of clutch if sound comes from clutch, means release bearing is defective. It has to be replaced.

Types of clutch systems

Though the clutch system can be a mechanical or hydraulic system, all indigenous wheeled tractors fitted with a mechanical clutch system.

The mechanical system can further be divided into dry system and the wet system which operates in the all bath. Though in old times wet type of clutches were also available on tractors, the present trend is towards the dry-disc type. Depending upon the design, it may have a single disc or two discs, one for the main mission and the other for power take off (PTO).

Working of single-plate clutch system



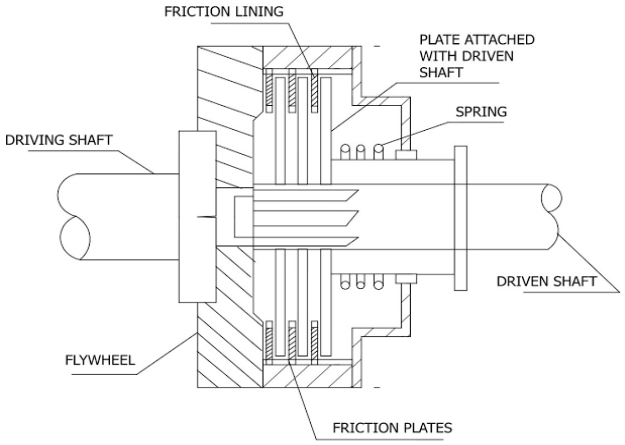
Single plate clutch

The main components are; (i) the clutch plate, (ii) pressure plate, (ii) the clutch cover, (iv) pressure springs, (v) release fingers, (vi) release bearings, (vii)

the clutch shaft and (viii) the linkage. The clutch cover is bolted to the flywheel, and the clutch plate is mounted on the splined part of the clutch shaft, the front end of which is freely supported on the pilot bearing fitted in the flywheel and other end passes through the release bearing. In between the pressure plate and the clutch cover, pressure springs are placed all around the circumference. Three fingers, also known as release levers, are centrally fulcrum to the clutch cover with their outer ends connected to the pressure plate. A release bearing slightly away from the free ends of the fingers moves to and fro on the clutch shaft with the help of fork which is connected to the clutch pedal through the linkage. As soon as the pedal is depressed, the lease bearing moves towards the flywheel and presses the fingers. As the fingers are fulcrum at a point in their length to the clutch cover and the other end is connected to the pressure plate, as soon as the free ends are pressed inside by the release bearing, the outer ends tends to bring the pressure plate away from the clutch plate against pressure springs, making the clutch plate and hence the clutch shaft to disengage, but the pressure plate and cover remain rotating along with the flywheel. Thus the condition of disengagement remains till the front pedal remains depressed. The moment the pedal returns to the engage position, the pressure plate moves ahead to press the clutch plate due to the pressure springs.

Working of dual clutch plate system

In this, PTO can be disconnected without stopping the tractor. It is useful for combine harvester, reaper operation etc.



Some of the tractors are provided with two clutch plates (HMT) one for the main transmission and the other for PTO drive. In between the two clutch plates,

an intermediate plate is provided. Normally three release levers serve the purpose of disengaging the clutch plate. However, some of the tractors (HM 2511) have six release levers, three each for the main drive and PTO drive.