AI 3401 TRACTORS AND ENGINE SYSTEMS

UNIT III NOTES

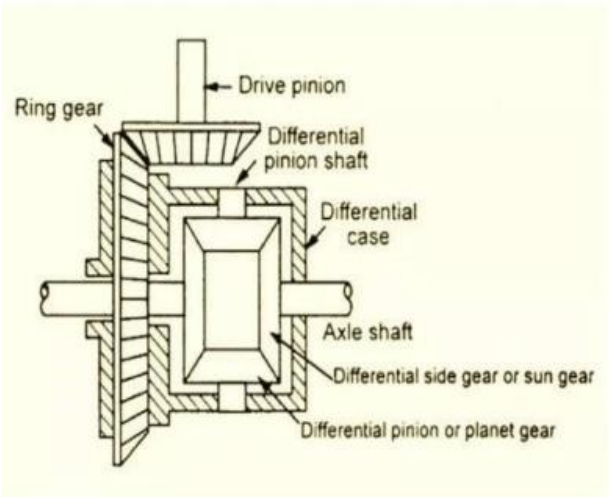
Differential:

Differential unit is a special arrangement of gears to permit one of the rear wheels of the tractor to rotate slower or faster than the other. While turning the tractor on a curved path, the inner wheel has to travel lesser distance than the outer wheel. The inner wheel requires lesser power than the outer wheel, this conditions is fulfilled by differential unit, which permits one of the rear wheels of the tractor to move faster than the other at the turning point. The output shaft coming from the gear box is provided with a bevel pinion at the end of the shaft. The bevel pinion is in mesh with a large bevel wheel known as crown wheel.

The main functions of crown wheel assembly are: i. to transmit power through right angle drive to suit the tractor wheels ii. to reduce the speed of rotation

The differential unit consists of,

i.Differential casing ii. Differential pin iii. Crown wheel iv. Half shaft v. Bevel gear



Each differential pinion can move in two planes simultaneously. When it is carried round by the casing, it drives the half shaft in the same direction but when it is rotated on its own shaft, it drives them in opposite direction i.e. rotation of differential pinion adds motion to one shaft and subtracts motion from the other shaft.

Differential Lock:

Differential lock is a device to join both half axles of the tractor so that even if one wheel is under less resistance, the tractor comes out from the mud, etc. as both wheels move with the same speed and apply equal traction.

Final Drive:

Final drive is a gear reduction unit in the power trains between the differential and the drive wheels. Final drive transmits the power finally to the rear axle and the wheels. The tractor rear wheels are not directly attached to the half shafts but the drive is taken through a pair of spur gears. Each half shaft terminates in a small gear which meshes with a large gear called bull gear. The bull gear is mounted on the shaft, carrying the tractor gear wheel. The device for final speed reduction, suitable for tractor rear wheels is known as final drive mechanism.

What is the importance and purpose of a final drive?

- Torque is a measure of the amount of rotational force of an object and in large machinery it's all (or at least mostly all) about torque. If you've ever used any kind of system of gears — even an old 10-speed bike — you already know that gears can quickly convert your power into speed or torque, and vice versa. That's because the relationship between torque and speed is inversely proportional — one goes up and the other goes down.
- A final drive uses a set of planetary gears (or a bull-and-pinion gear system) to convert force into torque one last time and, in doing so, allows the shafts, bearings, and gears to deliver power without being under the constant strain of a high-torque system.

- Because of the high torque loads they routinely handle and their close connection to tires, tracks, or sprockets, final drives have to be designed to perform under intense circumstances and absorb feedback while they work.
- When you see a bulldozer clearing a small mountain down to flat land, you can thank the final drive for it's important part in the process.

parts in final drives with planetary gears

Final Drive Housing

The housing on a final drive is the container that will enclose the final drive components, keep them in a lubricated environment, and connect to the machine. Because of the immense forces happening inside the final drive, the housing must be constructed to stand up to both internal and external forces. In heavy construction equipment, the final drive housing can be incredibly large and heavy. Overhead cranes, forklifts, and other equipment are often needed to work on a final drive.

Planetary Gears

In final drives with planetary gears, there are often two sets of planetary gears — an inner planetary and an outer planetary — each composed of a set of three planet gears and held together by a carrier.

Sun Gear

At the center of planet gears is the sun gear. The sun gear is the component bringing force into the final drive to be transformed into high-torque output.

The Ring Gear

The ring gear sits around the planet gears. The planet gears, taking power from the sun gear, turn inside the ring gear as they transform the power into increased torque.

Ball Bearings

Ball bearings are a common component to machines of all types, purposes, and designs. Bearings are designed to allow specific movement while greatly reducing friction. In a ball bearing, balls are contained inside of bearing races. To ensure proper functionality bearings must be designed and crafted to meet exact specifications and standards. Bearings in a final drive must be well-oiled at all times to reduce fiction.

O-Rings and Seals

O-rings and seals are another common component in any mechanical system. In a final drive, the O-rings and seals are designed to keep all lubricant inside of the housing and to prevent outside elements from entering the housing. Both the loss of lubricant and the introduction of foreign matter into a final drive will lead to fast and detrimental degradation of the internal components.