- TORQUE CONVERTER GEARBOX
- The constructional features of a torque converter are similar to a fluid flywheel.
- The only difference is that it has an additional stationary member called "stator or reaction member". All members have blades or vanes of specific shape. But the operation is not similar.
- In the case of fluid flywheel, the same torque s transmitted as given by the engine shaft. But, the torque converter increases the torque in the ratio of about 2:1 to 3: 1.
- So, the torque converter does the same purpose similar to a gearbox that too in a better way. Only finite number of steps in torque variation can be obtained in gearbox.
- But, the output torque variation is continuously obtained.
- Hence, the efficiency of a torque converter is high only within narrow
- limits of speed.
- A single stage torque converter is shown in Figure 3.39.
- It consists of three main parts.
- 1. Impeller or driving member:
- This driving member is connected to the engine.

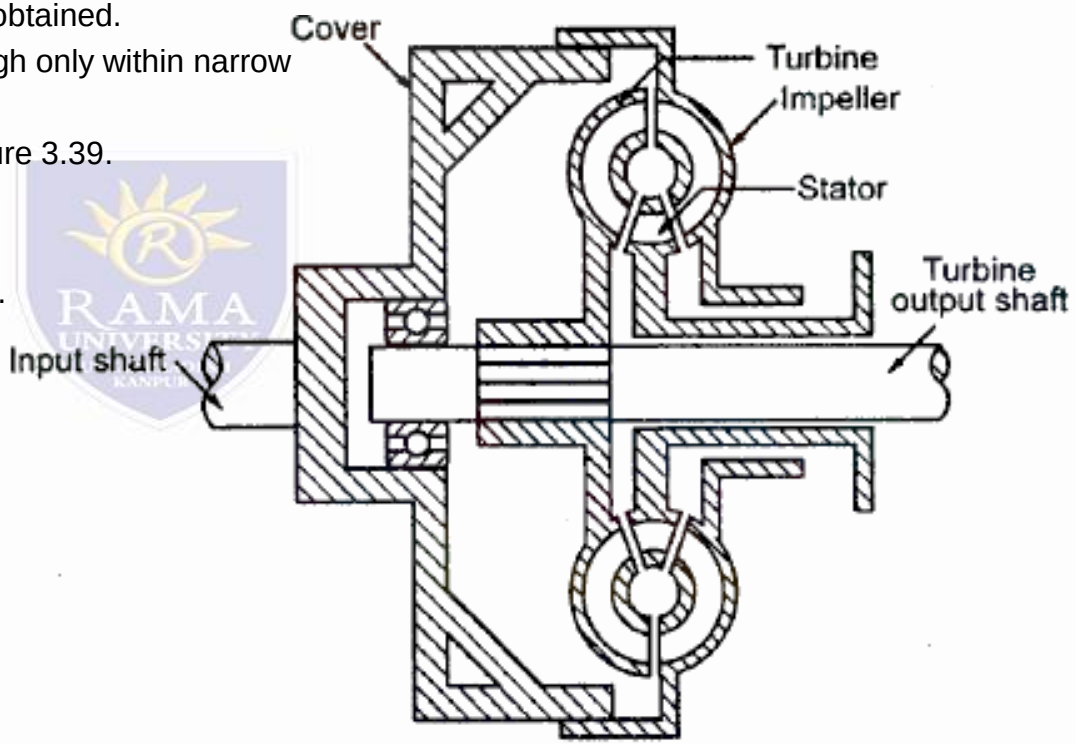

Figure 3.39 Torque converter

- 2. Turbine or driven member:
- This driven member is connected to the road wheels through the transmission gears and the drive line, and
- 3. Stator: It is connected to the frame through a free wheel.
- Apart from this, a transmission oil pump keeps the converter with full of oil under pressure.
- This oil pressure is necessary to keep the converter rotating. Due to rotation, the oil is pushed in the outward direction by the centrifugal force. It tends to form air pockets near the centre of the converter.
- The phenomenon of forming air ockets due to low pressure is called cavitation. It can be avoided by keeping the converter pressure between 200 to 1200kPa. The impeller is started to rotate when the engine starts.
- First, the oil from the impeller is pushed into the turbine due to high centrifugal force at the impeller.
- At that time, the turbine is held stationary.
- Due to this, the oil gets high kinetic energy from the engine through the impeller which hits the outer edge of the turbine. The flow of the high-energy oil creates enough force that tends to rotate the turbine.
- This force increases with increase in engine speed. When it is great enough, the turbine starts rotating. Thus, the vehicle moves. The turbine blade angle changes the direction of the oil flow to come out of the turbine at the centre.
- Now, its direction is entirely backward. If there is no stator, it will enter the impeller directly and push the impeller in the opposite direction.
- Thus, it will cause a loss of power.
- The fluid from the turbine is just made to strike a stationary member to avoid this dragging action on the impeller.
- It means, a stator changes its direction suitably to leave the oil from the stator striking the impeller in the same direction of impeller turning as shown in Figure 3.40.

- The stator is also called reactor because it takes reaction while working. Then the oil is thrown back by the impeller into the turbine at the outer edge continuously.
- The repeated pushing of turbine blades makes the torque on the turbine to increase which is called phenomenon of torque multiplication. Deflecting the fluid in the favorable direction on the stator and subsequent torque multiplication occur
- if the turbine speed (i.e. vehicle speed) is less than the impeller speed (i.e. engine speed). Hence, the maximum torque multiplication possible when the turbine is stationary and impeller is running fast with the engine speed called stall.
- The maximum torque multiplication at stall is about 2.1 to 2.6. When the vehicle starts to move, the turbine speed will start to increase.
- But the torque multiplication will gradually reduce due to decrease of the difference in both impeller and turbine speeds.
- When the turbine speed becomes equal to the impeller speed, the torque multiplication will become unity.

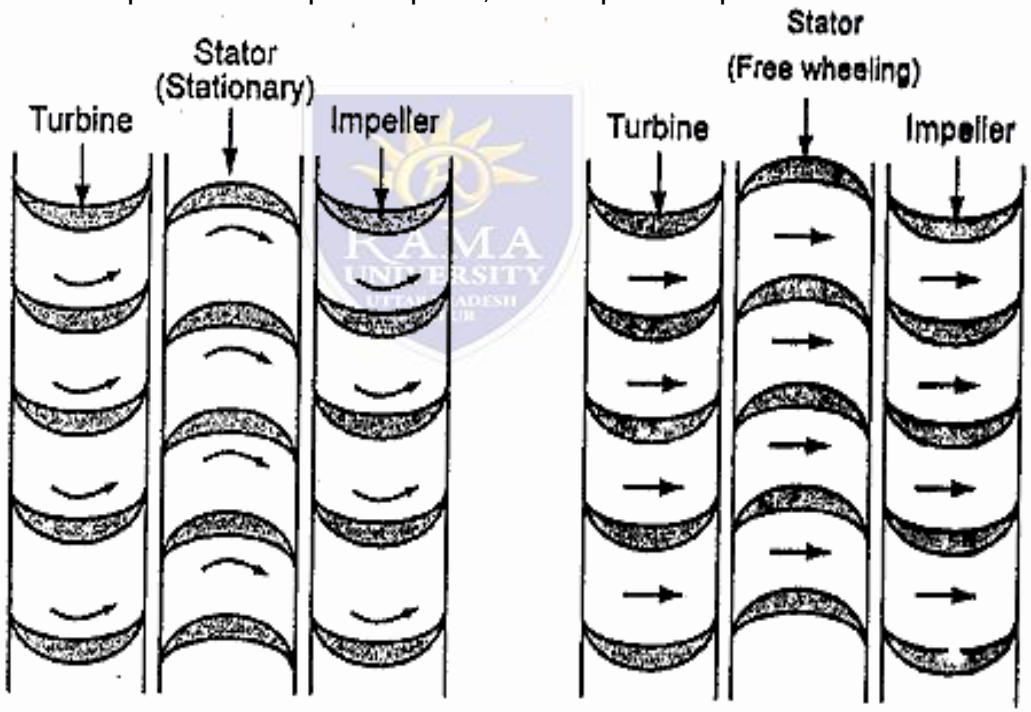

Figure 3.40

- **Centrifugal Clutch with torque converter:**

- The centrifugal clutch used along with the conventional three-member torque converter is shown in Figure 3.41.
- The centrifugal clutch consists of a number of sliding friction shoes or friction pads which are arranged around the circumference of the damper assembly.
- The damper assembly consists of damper springs and a free wheel.
- The friction shoes slide outward due to centrifugal force with increase in turbine speed till it contacts with the cover.
- The power from the converter cover flows directly through the damper assembly to the turbine shaft.
- The centrifugal clutch is designed in such a way that there is some slip at high loads.
- A spilt occurs between direct mechanical drive and hydraulic drive through the torque converter when the vehicle is under load.

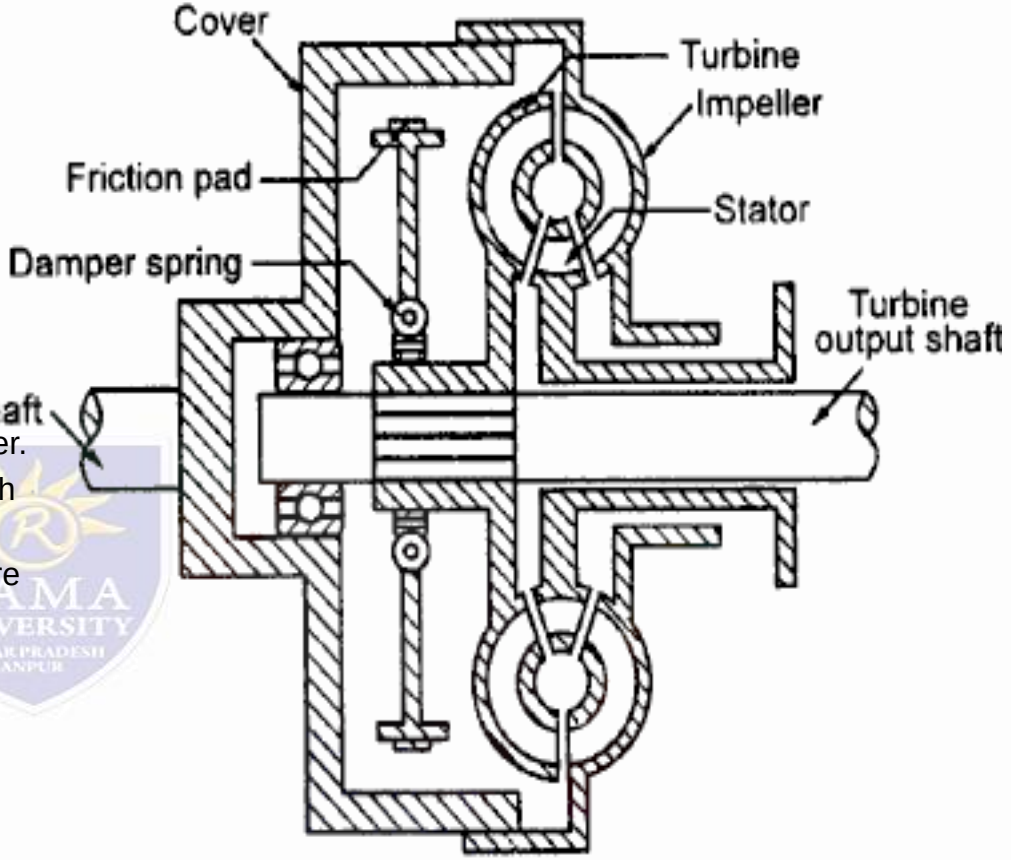

Figure 3.41 Centrifugal clutch with torque converter

- OVERDRIVES
- In transmissions, the high gear position produces a 1:1 ratio between clutch gear and transmission output shaft.
- There is neither gear reduction nor gear increase through the transmission.
- It is the direct drive. At intermediate and higher car speeds, it is sometimes desirable to have the transmission output shaft turned faster than the clutch gear and engine crankshaft.
- Therefore, some transmission systems are designed with gears to provide an over drive ratio.
- A transmission is in overdrive when the transmission output shaft is turning faster than the transmission input shaft or clutch gear.
- Overdrive is a device which is used to step up the gear ratio in the car.
- It is mounted in between transmission and propeller shaft.
- It provides a high cruising speed with a comparatively low engine speed (up to about 20-25% less) on long journeys.
- Due to this, less wear of the engine parts, vibration and noise are produced.
- Though the friction losses at lower speeds are less, there will be a possibility in saving fuel with the overdrive.

- Overdrive is generally fixed at the top gear only.
- Overdrives are fixed on gears other than the top gear for increasing the torque ratios available in some sport cars. For examples, by connecting overdrive at the top, third and second gear, seven forward speeds or torque ratios can be obtained. Usually, overdrives are operated either manually or automatically at a predetermined speed.
- A method of obtaining a fourth forward speed especially in modern passenger cars is through "overdrive" only.
- It provides a speed ratio "over or high" with the direct or high speed ratio.
- Only 70% of the propeller-shaft speed is permissible to operate the engine by this overdrive when the car is operating at higher speed range.
- The overdrives reduce engine wear, vibration and save gasoline even the car is operated in high gear.
- Overdrives are used as supplement to conventional transmissions.
- Slightly higher rear-axle gear ratio is used with an overdrive.