

Lecture

Automobile engineering

- The clutch plate is assembled on a splined shaft that carries the rotary motion to the transmission.
- This shaft is called the clutch shaft, or transmission input shaft.
- It is also known as driving shaft of a gearbox.
- One end of the clutch shaft is attached to the crankshaft or flywheel and the other end is, connected to the gearbox or forms a part of the gear box.

- Working:
 - Due to friction between flywheel, clutch plate and pressure plate surfaces, the clutch plate revolves with the flywheel. As the clutch plate revolves, the clutch shaft will also revolve. The clutch shaft is connected to the gearbox. Normally, the clutch plate is always kept in between flywheel and pressure plate by the number of pressure springs. When the clutch pedal is pressed, the pressure plate moves out against the pressure springs and the gap between pressure plate and flywheel increases. Now, the clutch plate is free to rotate. Thus, power is not transmitted. This position is called clutch release or declutching. As soon as the pedal is released, the pressure spring forces the pressure plate towards the flywheel. The clutch plate is gripped between flywheel and pressure plate. It is called clutch engaging. At this position, the power is transmitted to the gearbox.

- Advantages:
 - 1. It makes easy to change gears than a cone type.
 - 2. It is reliable than a cone clutch.
- Disadvantages:
 - 1. It requires more force to release.
 - 2. Space required to accommodate the clutch is more as compared to multi-plate clutch.



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- Multi-Plate Clutch
- Multi-plate clutches are used in heavy vehicles with racing cars and motorcycles for transmitting high torque. As compared to single plate clutch, these are smooth and easy to operate due to their assembly of friction surface's contact. It may be used where the space is very limited. As the number of clutch plates is increased, the friction surfaces will be also increased. The increase in friction surface obviously increases the capacity of the clutch to transmit more torque for the same size. The multi-plate clutch of small size transmits approximately the same torque as a single plate clutch of twice the diameter. These clutches may be wet or dry type. When the clutch of this type is operated in a bath of oil, it is called wet clutch. But, this oil immersed wet clutches are generally used in conjunction with a part of the automatic transmission. The multi-plate clutch consists of number of clutch plates. Its construction is similar to a single plate clutch except that the number of clutch plates.

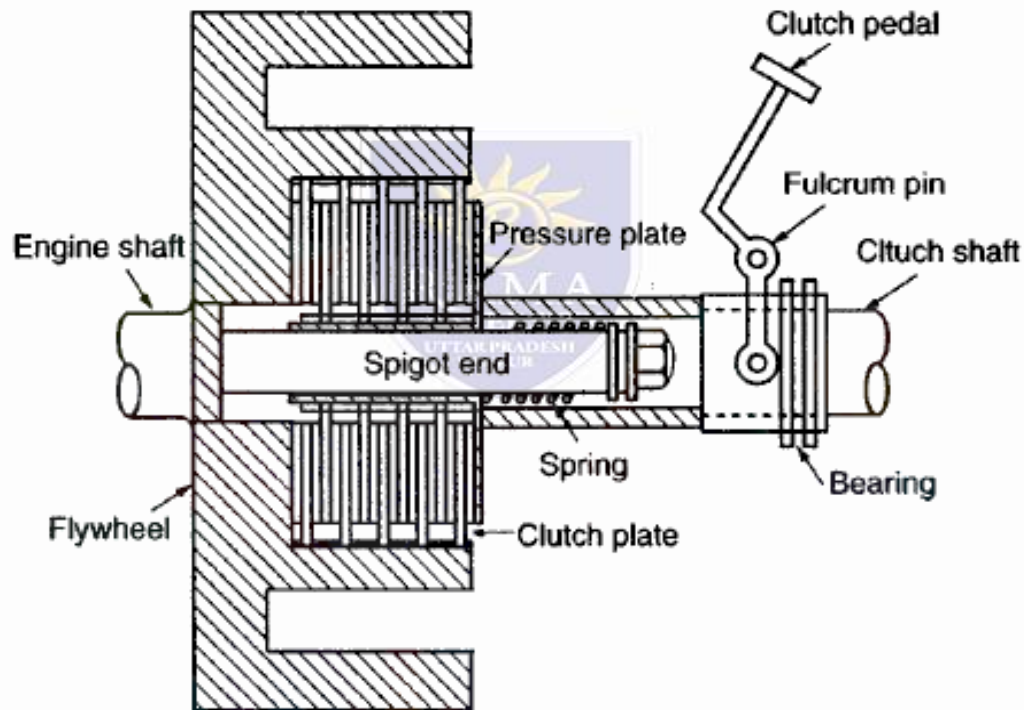


Figure 3.6 Multi-plate clutch

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- The total number of clutch plates is divided into two sets in which one from each set is alternatively arranged as shown in Figure 3.6.
- One set of plate slides in grooves on the flywheel and other one slides on splines on the pressure plate hub.
- These plates are firmly pressed by a strong coil spring and assembled in a drum.
- Multiplate clutch works in the same way as the single plate clutch by operating the clutch pedal.

- Advantages:
 1. Increased torque transmission capacity could be obtained.
 2. The diameter is reduced as it has more friction surface which reduces the size of the clutch assembly.
 3. It is highly reliable.
 4. It is suitable for heavy vehicles.



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- Cone Clutch
- Since the contact surfaces of this type of clutch are in the form of cone, it is called cone clutch.
- It consists of two cones having leather facings. These cones are known as male and female cones.
- One cone is fixed with the driving shaft i.e., flywheel whereas the male member is splined on the driven, shaft i.e., gear box shaft. Figure 3.7 shows the construction details. between plates is increased as the speed of rotation of the clutch increases in proportion to the pressure requirements.
- It is accomplished by means of weights linked to the pressure plate as shown in Figure 3.9. As the weight is linked to the pressure plate, the outward radial pull of centrifugal force is translated into pressure on the plate.
- This pressure increases as the weight increases.

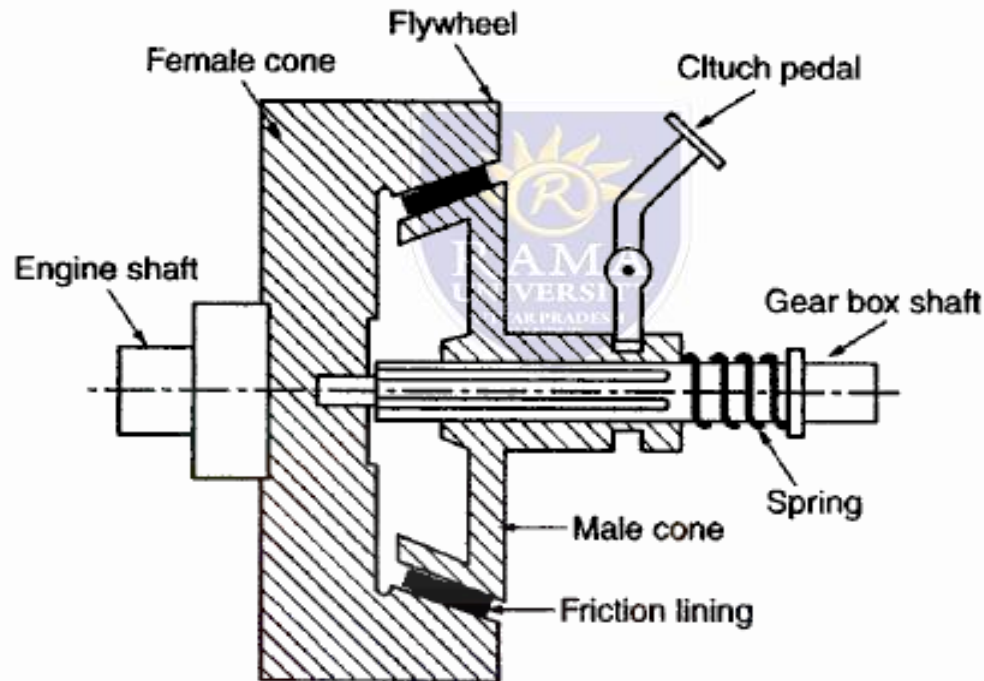


Figure 3.7 Cone clutch

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- When the clutch is in engaged position, the male cone is fully inside the female cone in such a manner that the friction surfaces are in perfect contact
- . It is done by the pressure springs which keep the male cone pressed all time. Now, the torque is transmitted from the engine via the flywheel and the male cone to the gearbox.
- When the clutch pedal is pressed, the male cone slides against the spring force and the clutch is disengaged. Hence, no power is transmitted.

- Advantage:
- Normal force acting on the contact surface is larger than the axial force which reduces the effort required to operate the clutch.

- Disadvantages:
- 1. If the angle of cone is smaller than 20° , the male cone tends to bind or joint in tJ female cone.
- It requires heavy force to disengage the clutch.
- 2. A small amount of wear on cone surface results a considerable axial movement of the male cone for which it will be difficult to allow.

