



CLUTCH

Understanding the Clutch

The purpose of the clutch is to engage and disengage engine power from the transmission. A vehicle at rest requires a lot of engine torque to get all that weight moving. An internal combustion engine does not develop a high starting torque (unlike steam engines), so it must be allowed to operate without any load until it builds up enough torque to move the vehicle. To an extent, torque increases with engine rpm. The clutch allows the engine to build up torque by physically disconnecting the engine from the transmission, relieving the engine of any load or resistance. The transfer of engine power to the transmission (the load) must be smooth and gradual; if it weren't, drive line components would wear out or break quickly. This power transfer is made possible by gradually releasing the clutch pedal. The clutch disc and pressure plate are the connecting link between the engine and transmission. When the clutch pedal is released, the disc and plate contact each other (clutch engagement), physically joining the engine and transmission. When the pedal is pushed in, the disc and plate separate (the clutch is disengaged), disconnecting the engine from the transmission.

The clutch assembly consists of the flywheel, the clutch disc, the clutch pressure plate, the throw-out bearing and fork, the actuating linkage and the pedal. The flywheel and clutch pressure plate (driving members) are connected to the engine crankshaft and rotate with it. The clutch disc is located between the flywheel and pressure plate; it is splined to the transmission shaft. A driving member is one that is attached to the engine and transfers engine power to a driven member (clutch disc) on the transmission shaft. A driving member (pressure plate) rotates (drives) a driven member (clutch disc) on contact and, in so doing, turns the transmission shaft. There is a circular diaphragm spring within the pressure plate cover (transmission side). In a relaxed state (when the clutch pedal is fully released), this spring is convex; that is, it is dished outward toward the transmission. Pushing in the clutch pedal actuates attached linkage. Connected to the other end of this rod is the throw-out bearing fork. The throw-out bearing is attached to the fork. When the clutch pedal is depressed, the clutch linkage pushes the fork and bearing forward to contact the diaphragm spring of the pressure plate. The outer edges of the spring are secured to the pressure plate and are pivoted on rings so that when the center of the spring is compressed by the throw-out bearing, the outer edges bow outward and, by so doing, pull the pressure plate in the same direction away from the clutch disc. This action separates the disc from the plate, disengaging the clutch and allowing the transmission to be shifted into another gear. A coil type clutch return spring attached to the clutch pedal arm permits full release of the pedal. Releasing the pedal pulls the throw-out bearing away from the diaphragm spring resulting in a reversal of spring position. As bearing pressure is gradually released from the spring center, the outer edges of the spring bow outward, pushing the pressure plate into closer contact with the clutch disc. As the disc and plate move closer together, friction between the two increases and slippage is reduced until, when full spring pressure is applied (by fully releasing the pedal), the speed of the disc and plate are the same. This stops all slipping, creating a direct connection between the plate and disc which results in the transfer of power from the engine to the transmission. The clutch disc is now rotating with the pressure plate at engine speed and, because it is splined to the transmission shaft, the shaft now turns at the same engine speed. Understanding clutch operation can be rather difficult at first; if you're still confused after reading this, consider the following analogy. The action of the diaphragm spring can be compared to that of an oil can bottom. The bottom of an oil can is shaped very much like the clutch diaphragm spring and pushing in on the can bottom and then releasing it produces a similar effect. As mentioned earlier, the clutch pedal return spring permits the full release of the pedal and reduces linkage slack due to wear. As the linkage wears, clutch free-pedal travel will increase and free-travel will decrease as the clutch wears. Free-travel is actually throw-out bearing lash.

The transmission varies the gear ratio between the engine and rear wheels. It can be shifted to change engine speed as driving conditions and loads change. The transmission allows disengaging and reversing power from the engine to the wheels.

