SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.

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DEPARTMENT OF AUTOMOBILE ENGINEERING

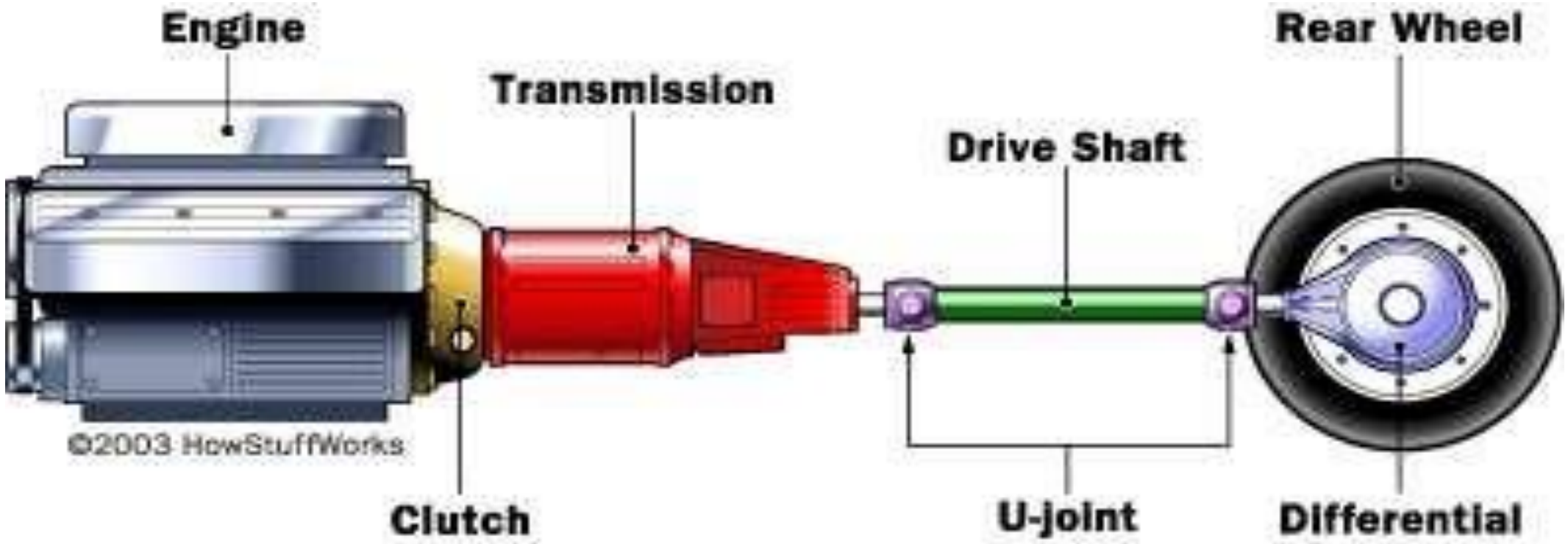
COURSE NAME : 23AUT101 – ELEMENTS OF AUTOMOTIVE SYSTEM

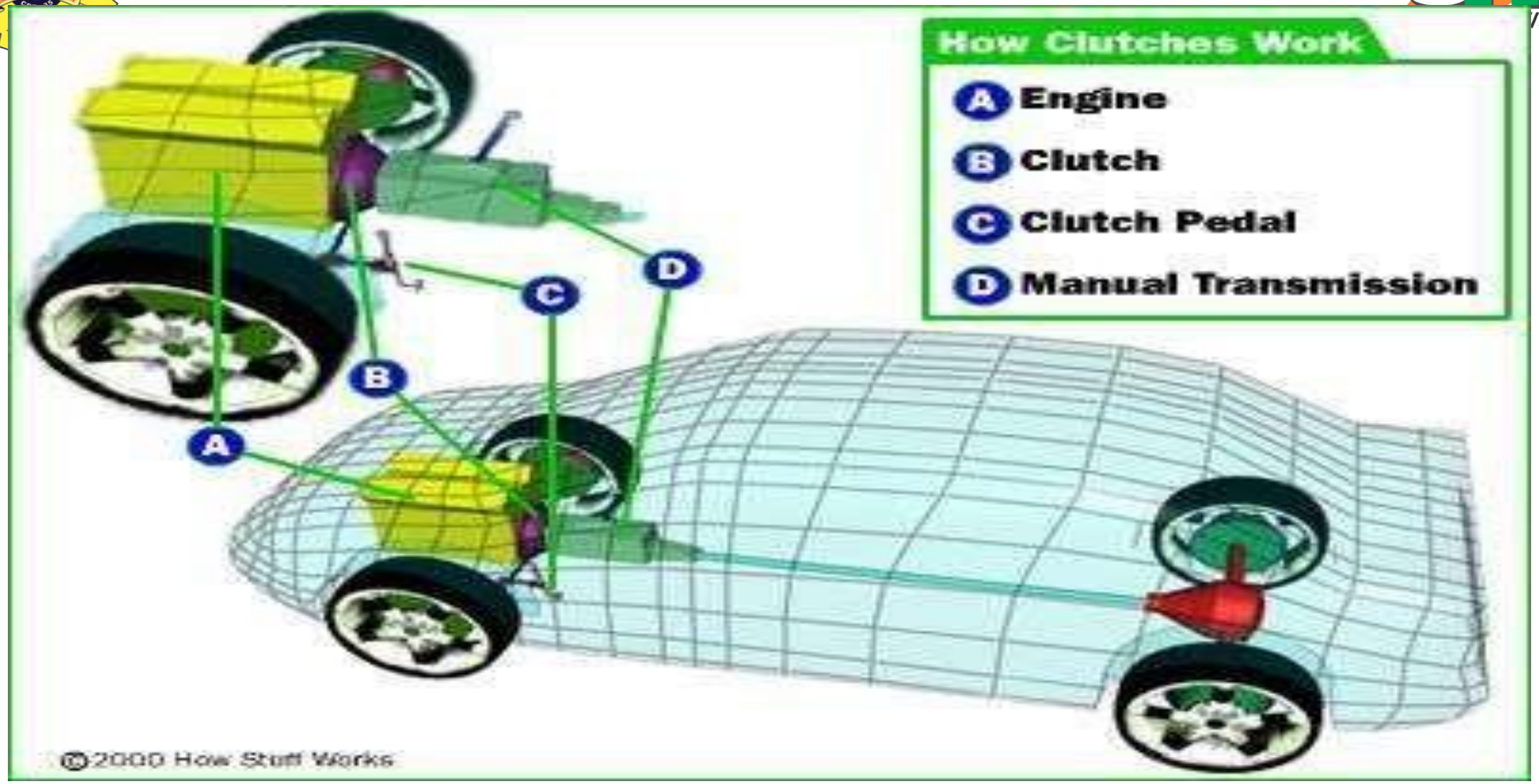
I YEAR /II SEMESTER

Unit 3- Transmission System

Topic : Clutch

Transmission System



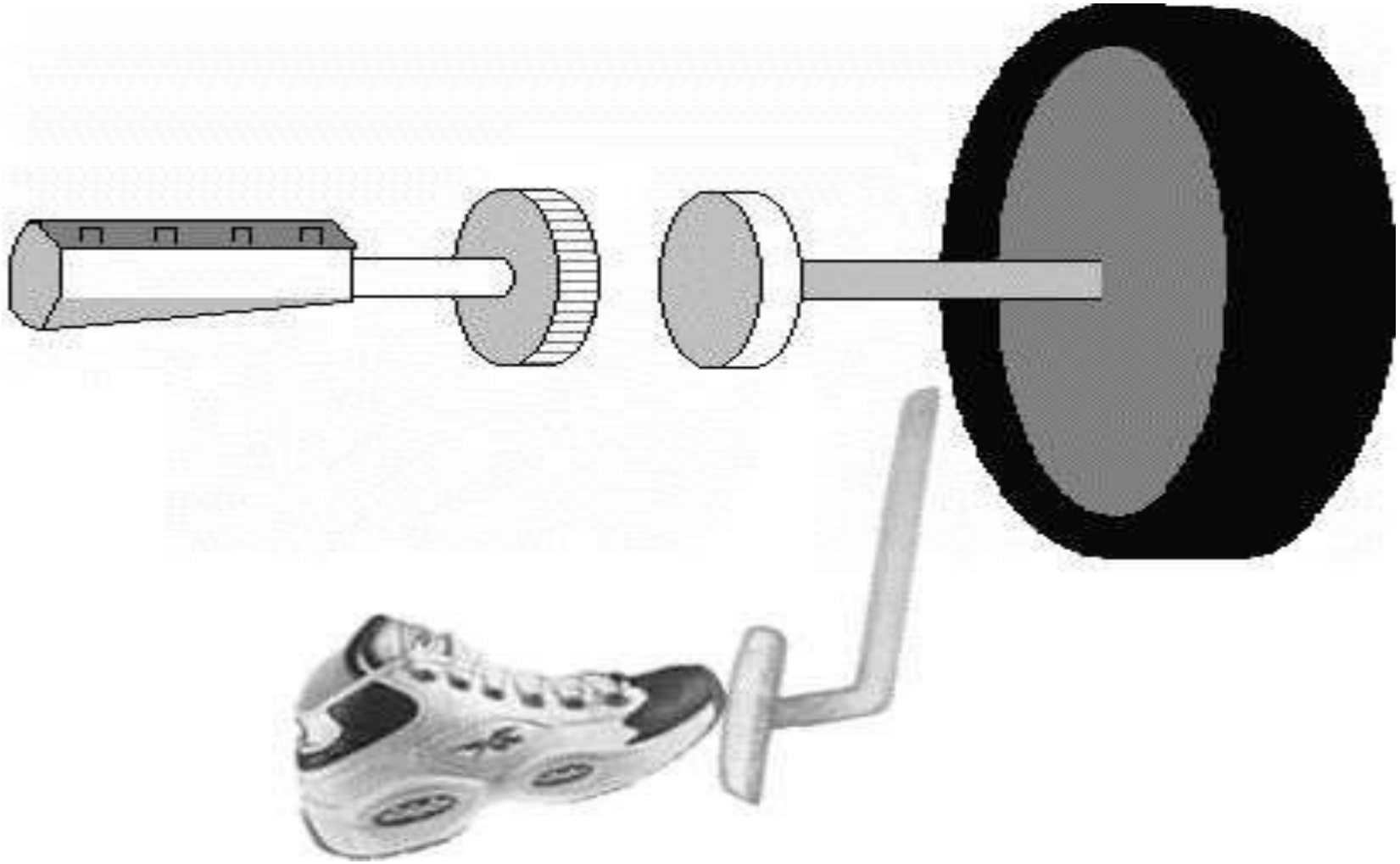

How Clutches Work
A Engine
B Clutch
C Clutch Pedal
D Manual Transmission
©2000 How Stuff Works

Function

- Clutch
  - Found on vehicles with manually shifted transmissions
  - Disengages engine from transmission
  - Releases engine from transmission during gear shifts
  - Driver controls clutch application from inside the vehicle with a clutch pedal
    - Engine does not make sufficient torque at lower rpm to be able to move the car
    - Clutch must gradually couple rear wheels to engine

Principle of Working

- When two surfaces are brought in contact and are held against each other due to friction between them, they can be used to transmit power.
- If one is rotated, then other also rotates.
- One surface is connected to engine and other to the transmission system of automobile.
- Clutch is nothing but a combination of two friction surfaces.



a) Gradual engagement clutch

1) Cone Clutch
2) Single plate Clutch
    a) Diaphragm spring
    b) Coil spring
3) Multi plate clutch (Wet)
4) Centrifugal clutch.
5) Semi-centrifugal clutch.

Friction Clutch

Dry clutch

b) Positive clutch

c) Hydraulic clutch

d) Vacuum clutch.

e) Electromagnetic clutch.

Clutch Parts and Operation

- Clutch parts
  - Flywheel
  - Pressure plate
  - Friction disc
  - Release mechanism
  - Bearing
- Clutch disc pushed against flywheel with enough force
  - Disc will rotate with flywheel

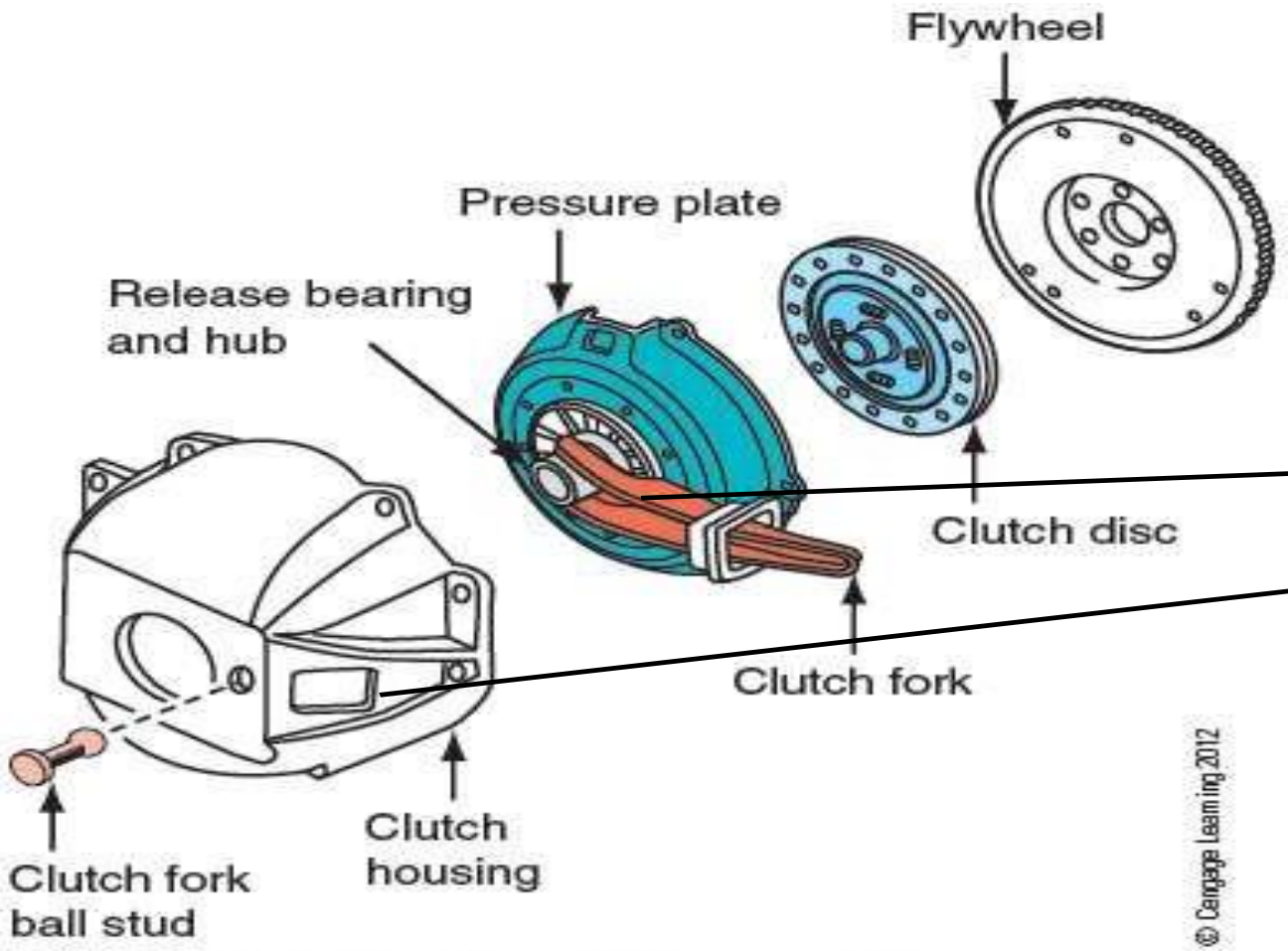
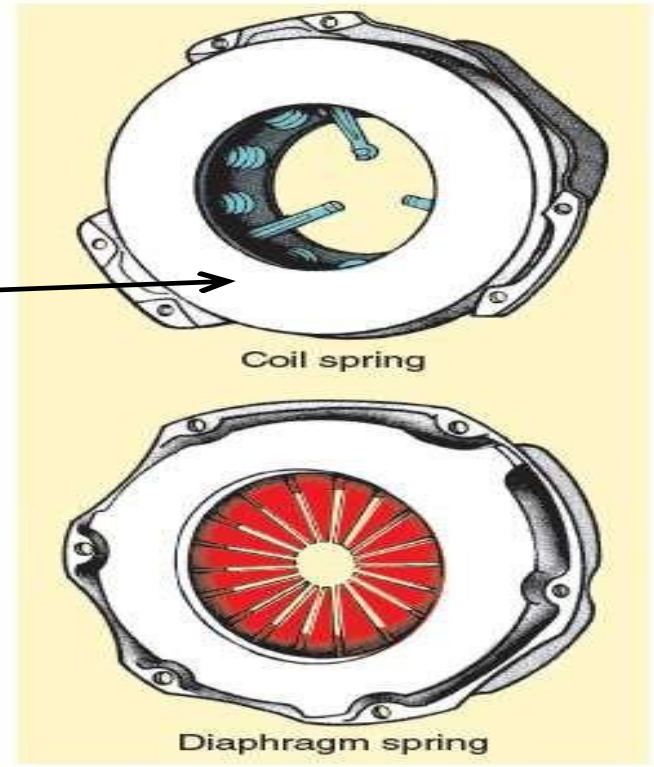


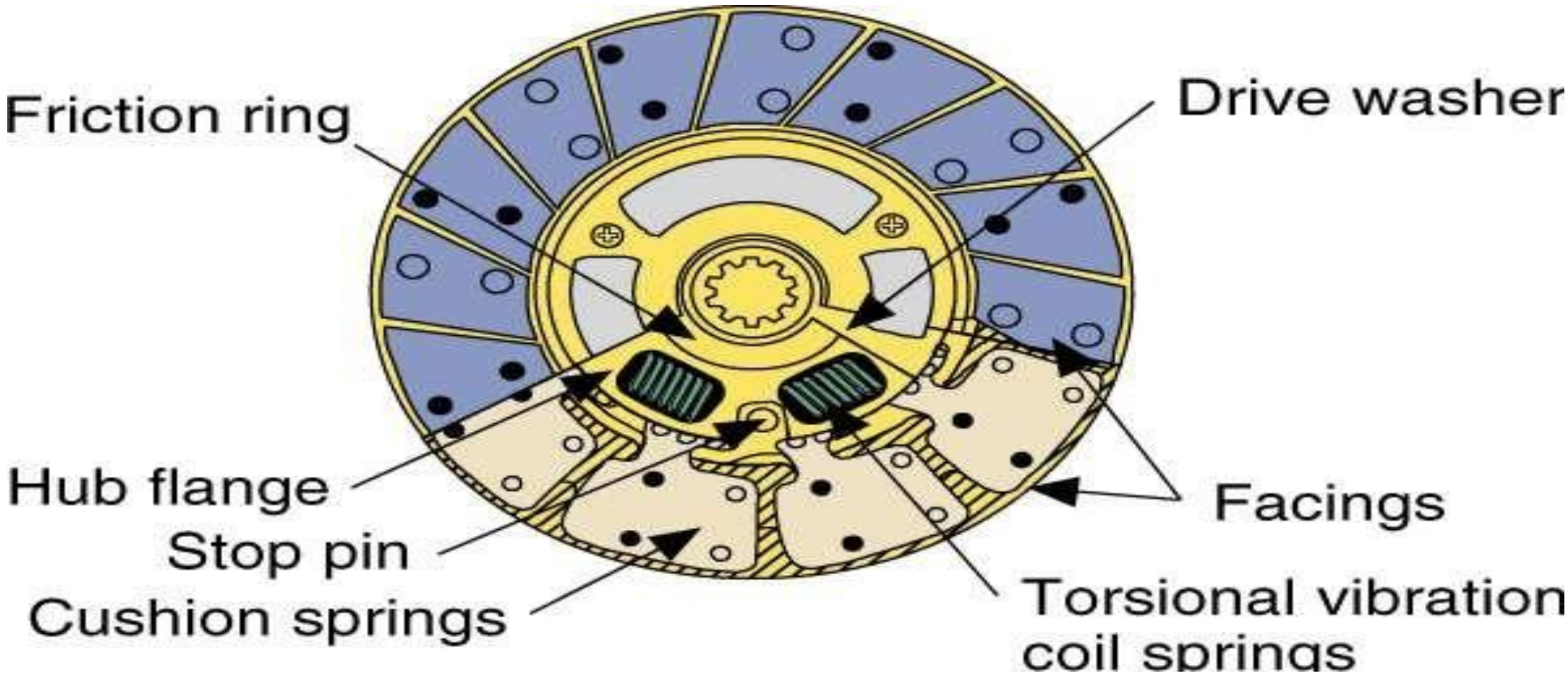
Figure 69.2 Parts of the clutch assembly.



.8 Coil and diaphragm spring clutch

Clutch Disc

- Characteristics
  - Clutch hub: inner part of disc and has splines
  - Torsional dampers: absorb shock
  - Clutch disc has facings made of friction material
    - Contain molded or woven asbestos
  - Facings riveted to both sides of cushion plate
    - Cushion plate is riveted to disc plate
  - Clutch is engaged: air is trapped in grooves
    - Clutch is released: trapped air pushes disc away from pressure plate and flywheel


Friction ring
Drive washer
Hub flange
Stop pin
Cushion springs
Facings
Torsional vibration coil springs

Pressure Plate

- Pressure plate is cast iron plate
  - Part of cover assembly
- Cover assembly is bolted to the flywheel
  - Clutch disc is wedged between pressure plate and flywheel
  - Space between pressure plate and flywheel is less than thickness of clutch disc
  - Engine and transmission are physically connected when clutch pedal released

- Throw out Bearing
  - Exerts force on the pressure plate to compress the springs and release the clutch disc
  - May be mechanically or hydraulically operate

- Clutch Fork
- Release bearing hub has provision to attach it to the clutch fork
- Clutch fork fits between release bearing and clutch cable or linkage

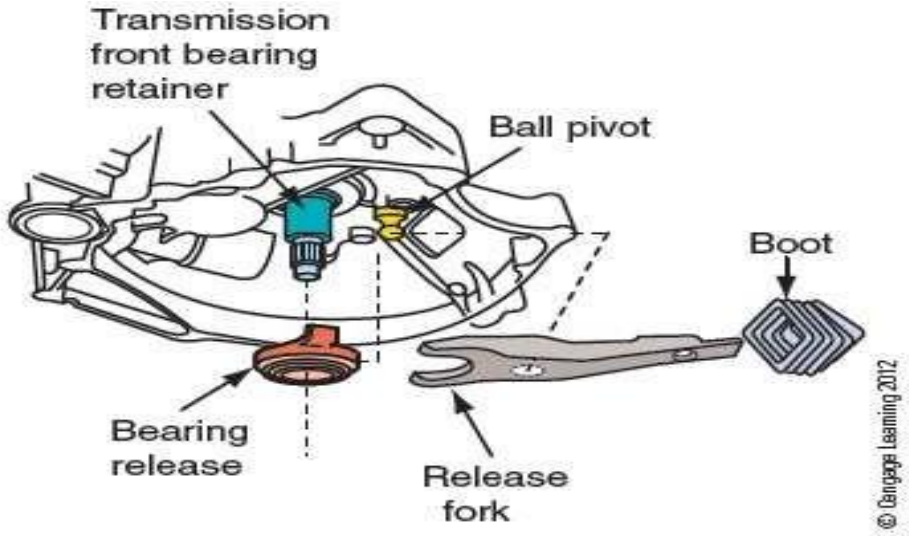
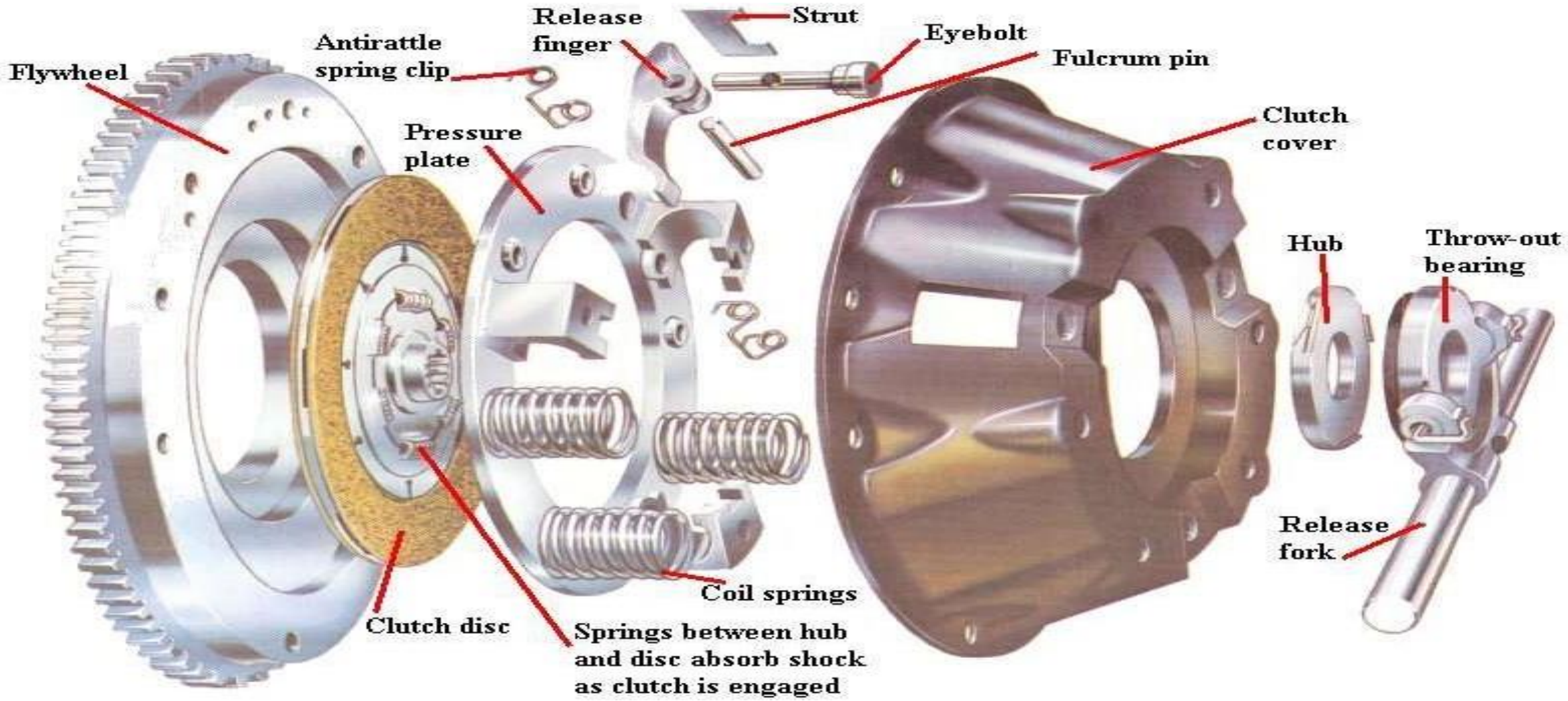


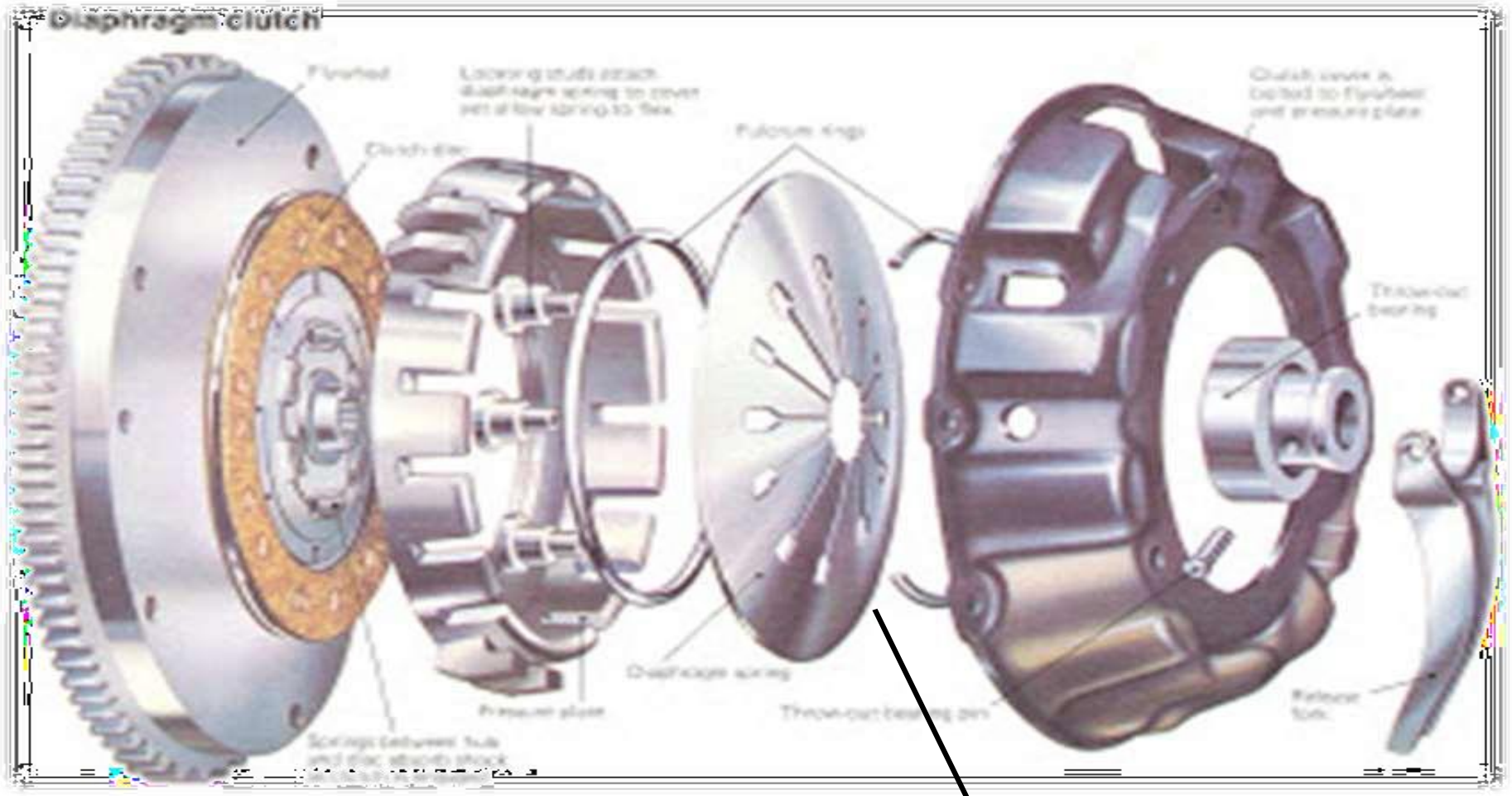
Figure 69.18 The clutch fork fits between the release bearing and the clutch linkage.

a) Coil Spring



- Advantages of coil springs
  - More coil springs can be installed
  - Centrifugal force applies clutch more tightly
    - Disadvantages of coil springs
      - More pedal pressure required
  - Clutch applied less heavily as disc wears
  - Must be precisely balanced after assembly

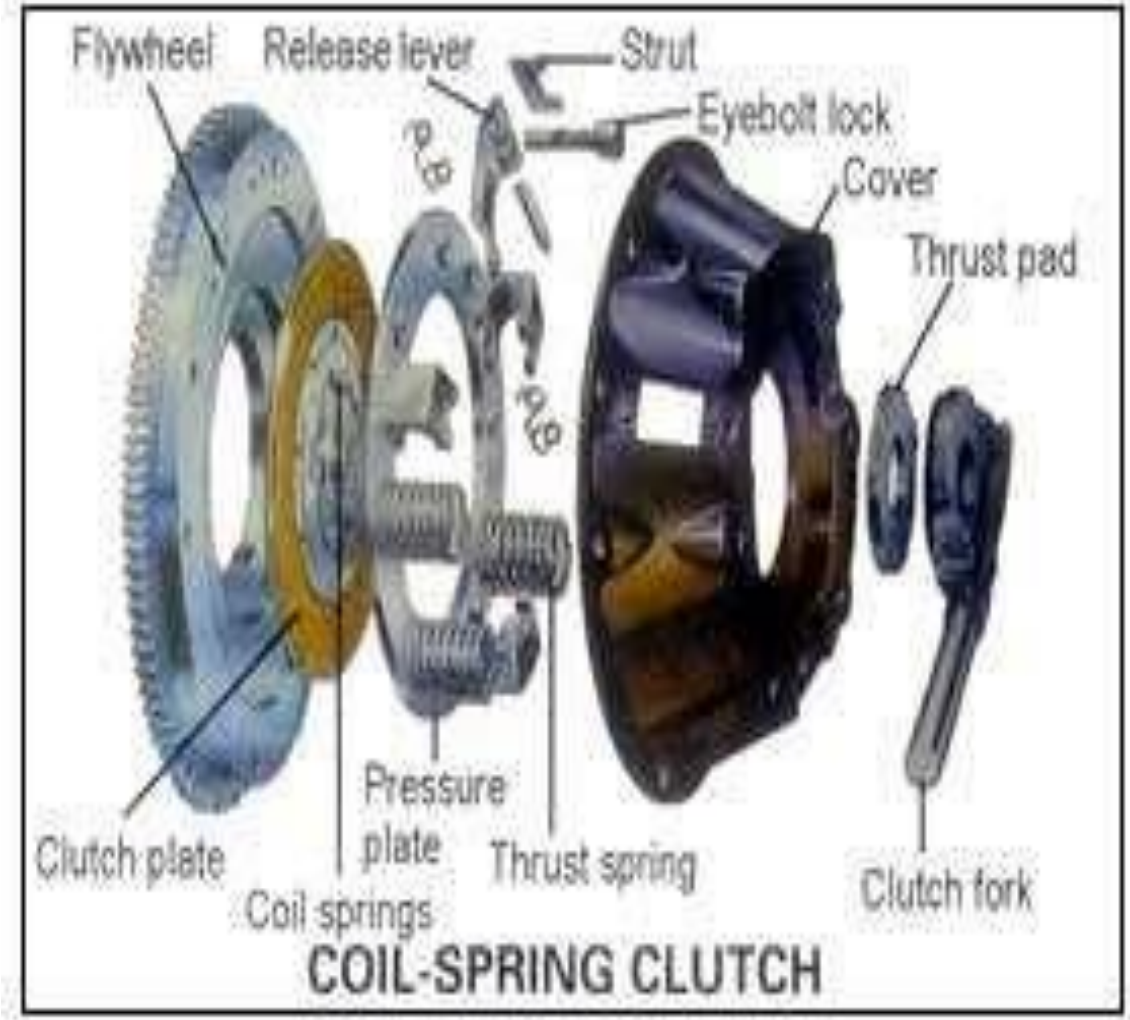
b) Diaphragm Spring

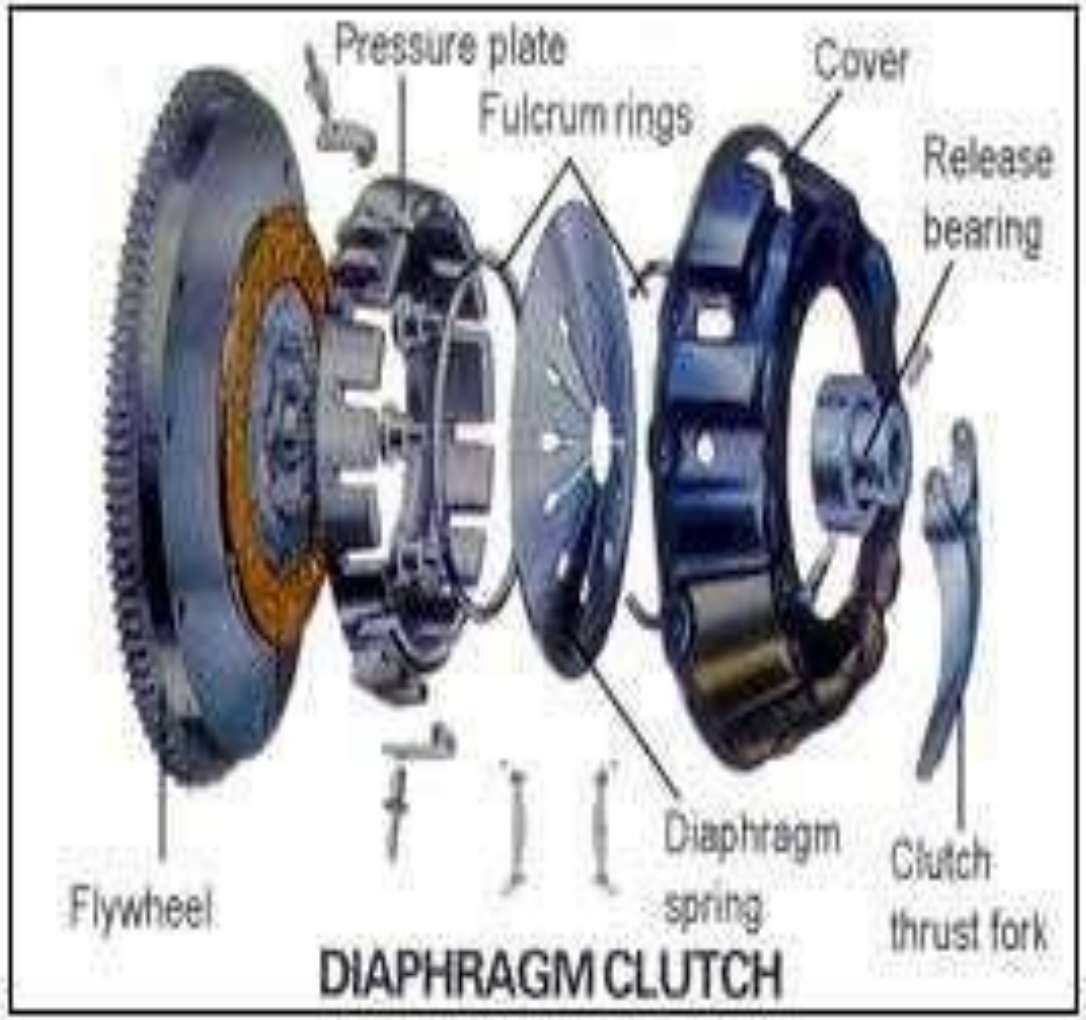


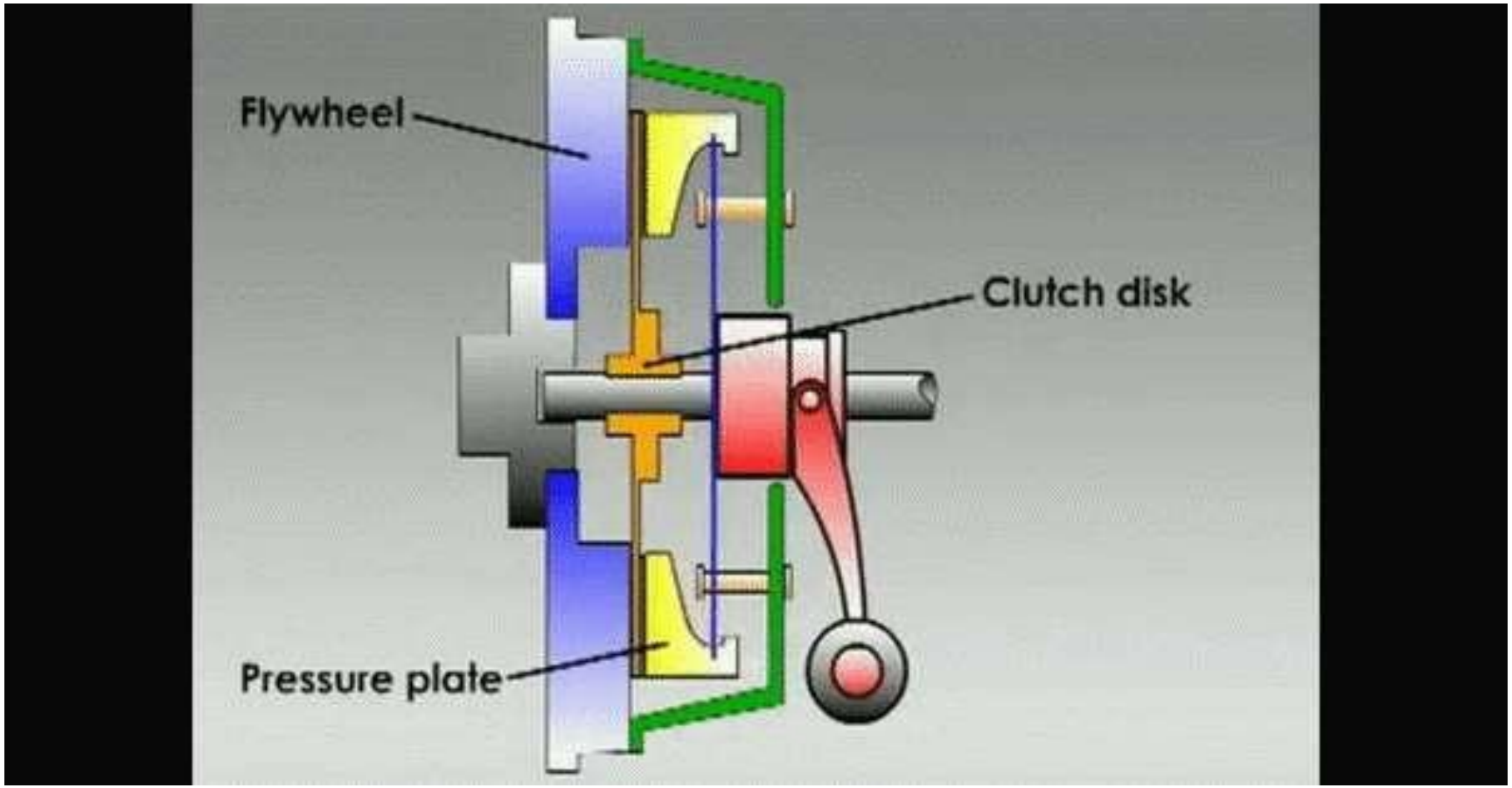
Diaphragm spring

Diaphragm Clutch

- Diaphragm spring replaces release levers and coil springs
  - Diaphragm pivots off pivot rings when clutch pedal is depressed
- Advantages
  - Requires less effort and takes up less space
  - Spring pressure becomes greater as disc wears
  - Well balanced


Flywheel
Release lever
Strut
Eyebolt lock
Cover
Thrust pad
Clutch plate
Coil springs
Pressure plate
Thrust spring
Clutch fork
COIL-SPRING CLUTCH

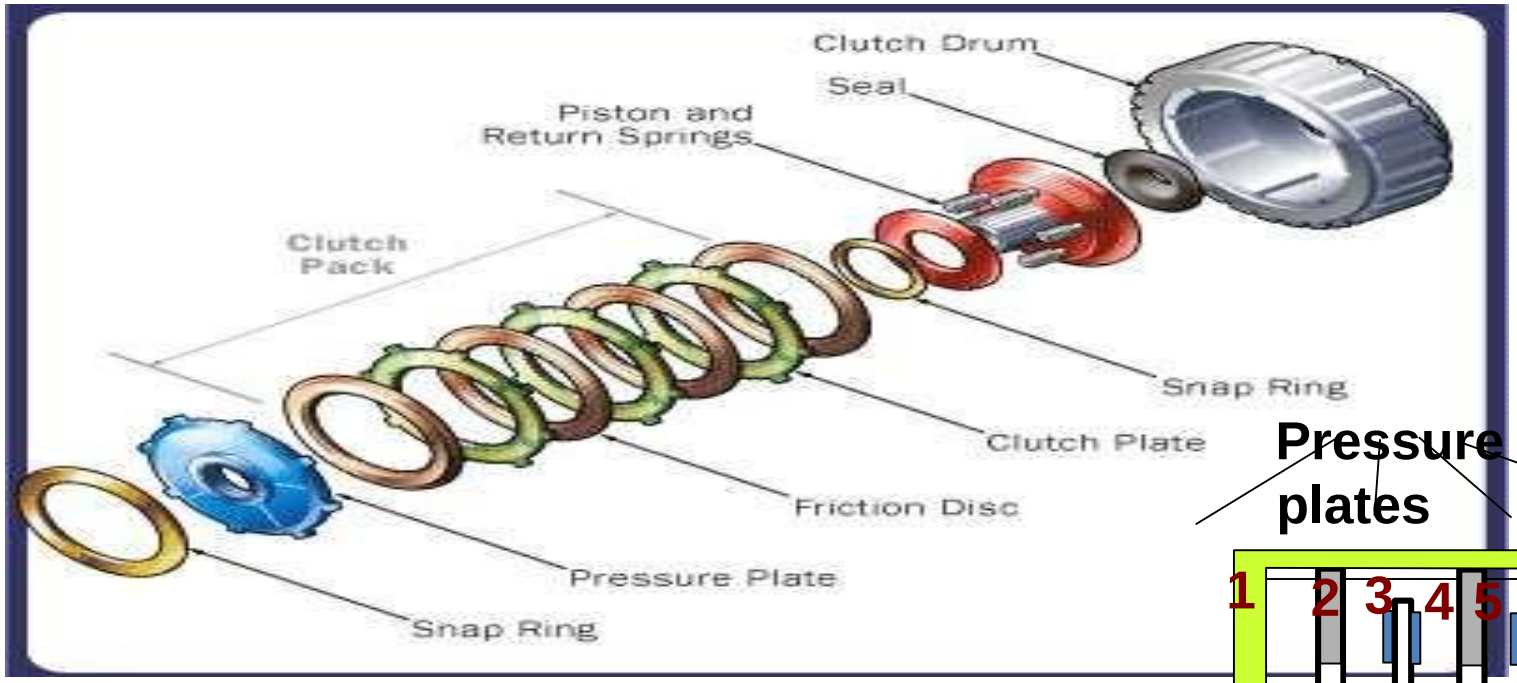

Pressure plate
Fulcrum rings
Cover
Release bearing
Flywheel
Diaphragm spring
Clutch thrust fork
DIAPHRAGM CLUTCH

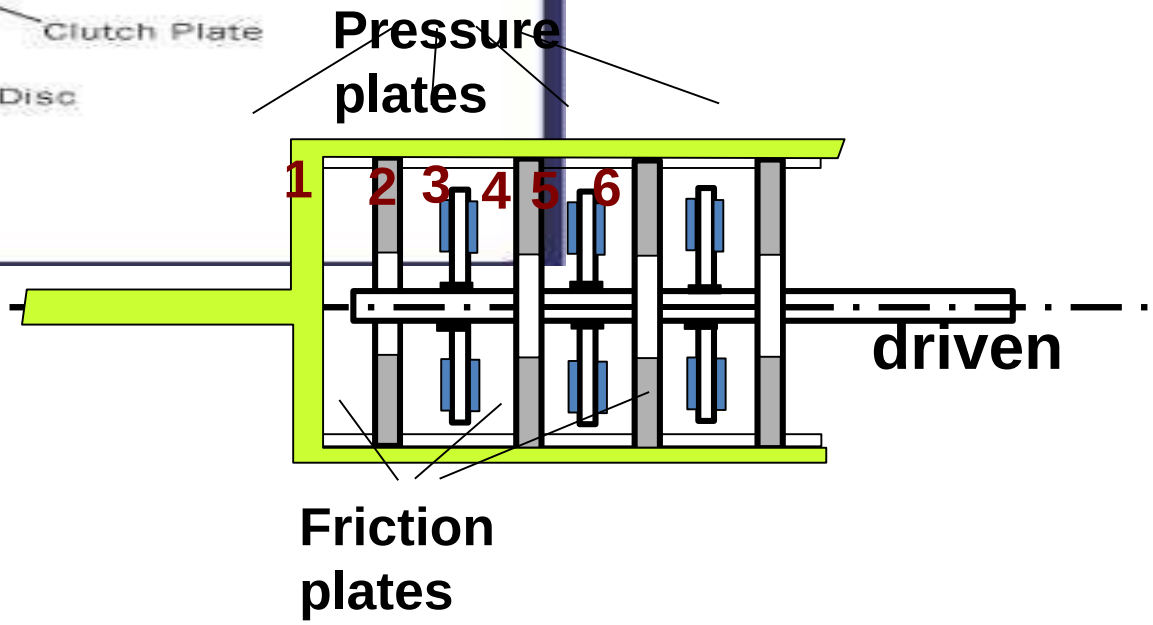

Flywheel
Clutch disk
Pressure plate

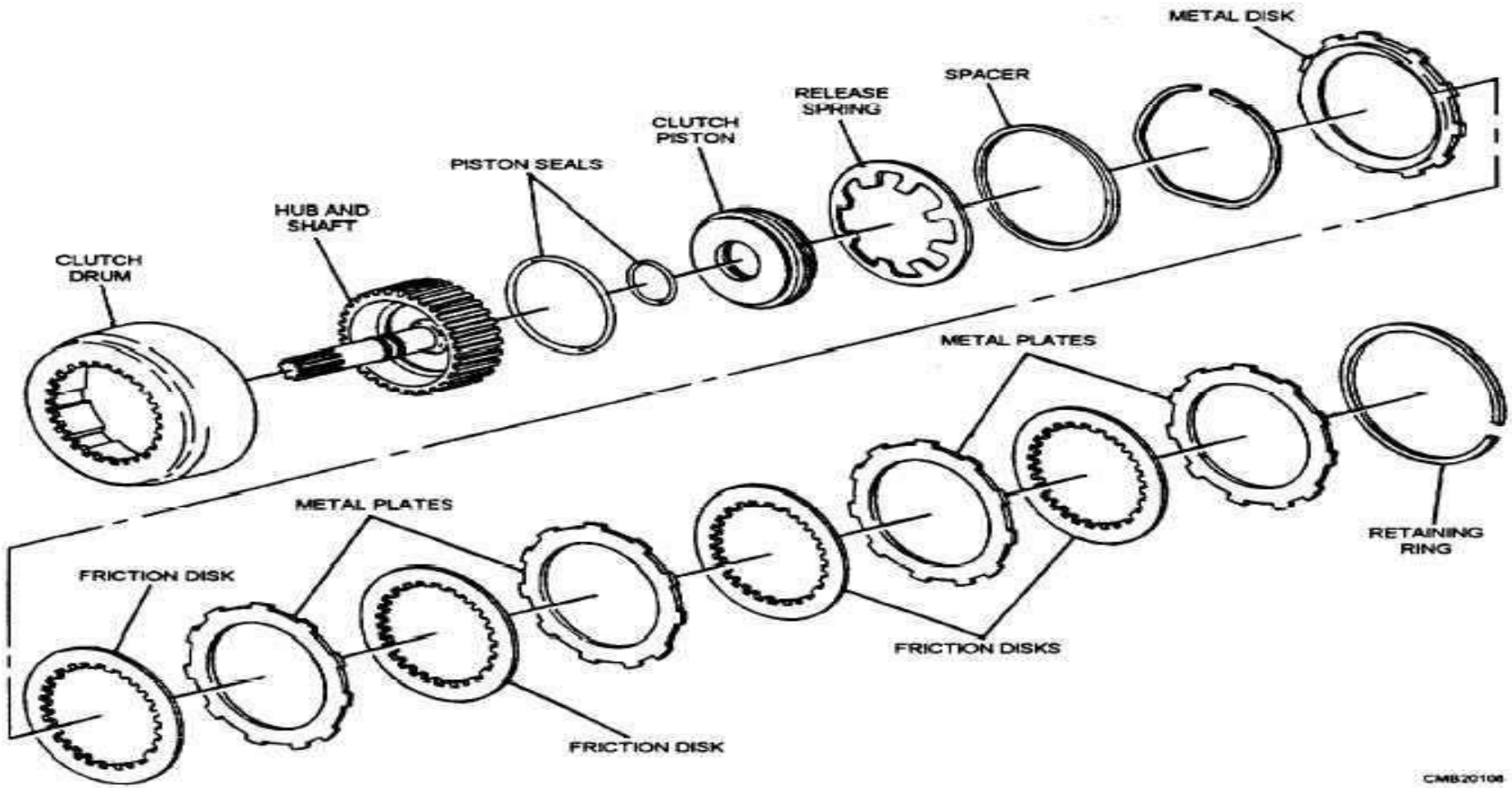
Multi-plate clutch

- Multi-plate clutch consists of more than one clutch plates contrary to single plate clutch which consists of only one plate.
- Friction surfaces are made in case of multi- plate clutch.
- Due to increased number of friction surfaces, a multi-plate clutch can transmit large torque.
- Therefore, it is used in racing cars and heavy motor vehicles witch have high engine power

Multi Plate Clutch

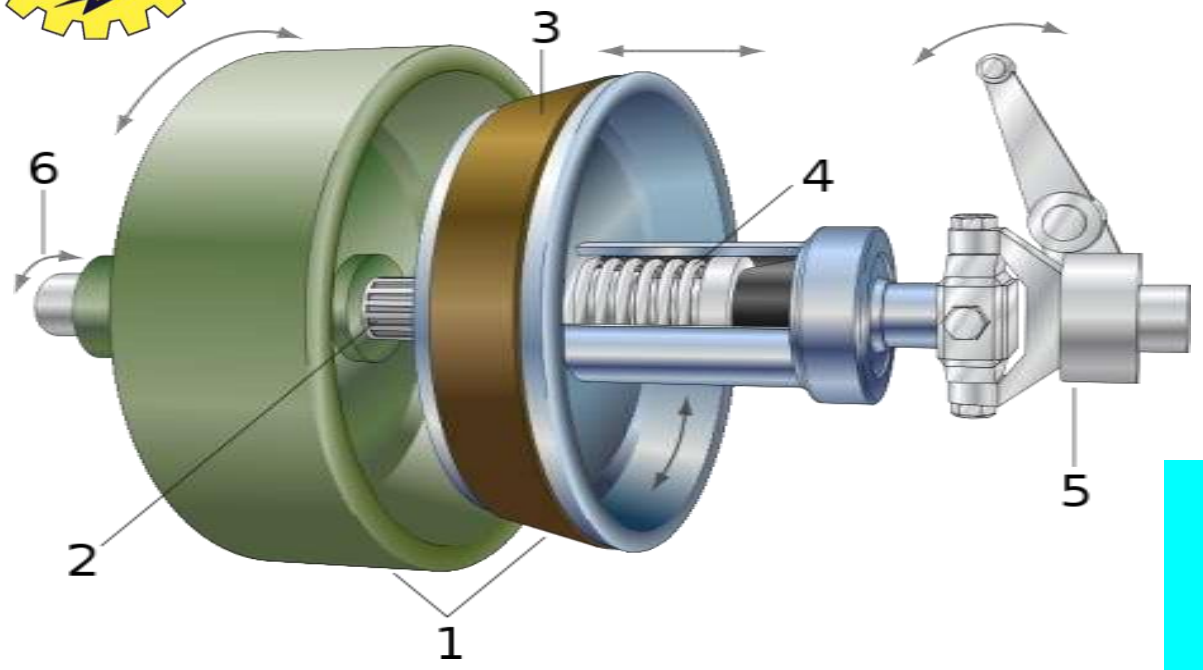




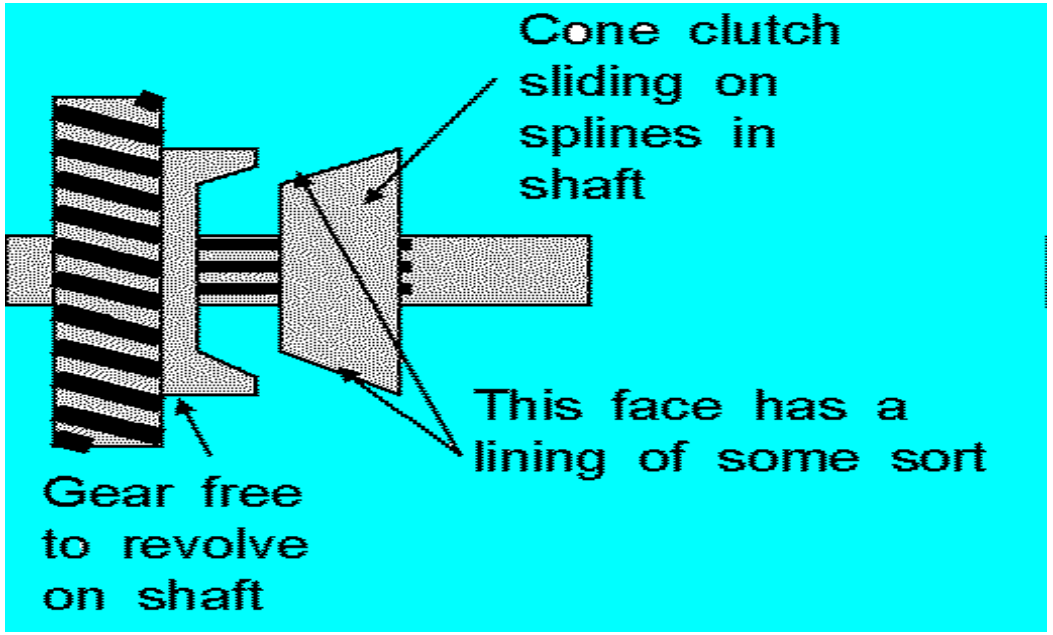

METAL DISK
SPACER
RELEASE SPRING
CLUTCH PISTON
PISTON SEALS
HUB AND SHAFT
CLUTCH DRUM
METAL PLATES
RETAINING RING
METAL PLATES
FRICTION DISK
FRICTION DISKS
FRICTION DISK
CMB20106


CONE CLUTCH

Cone Clutch



The cone clutches are still used in **sports/race cars, some extreme off - roads, and some low speed applications**.
This is maybe because it is really very fast as far as engagement and disengagement is concerned and hence suitable for these applications.



Advantages:

- Less wear and tear compare to positive displacement clutch.
- It is silent in operation.
- The normal force acting on the contact surface is larger than the axial force generated by the springs.
- Comparatively higher torque can be transmitted than same size of plate clutch.

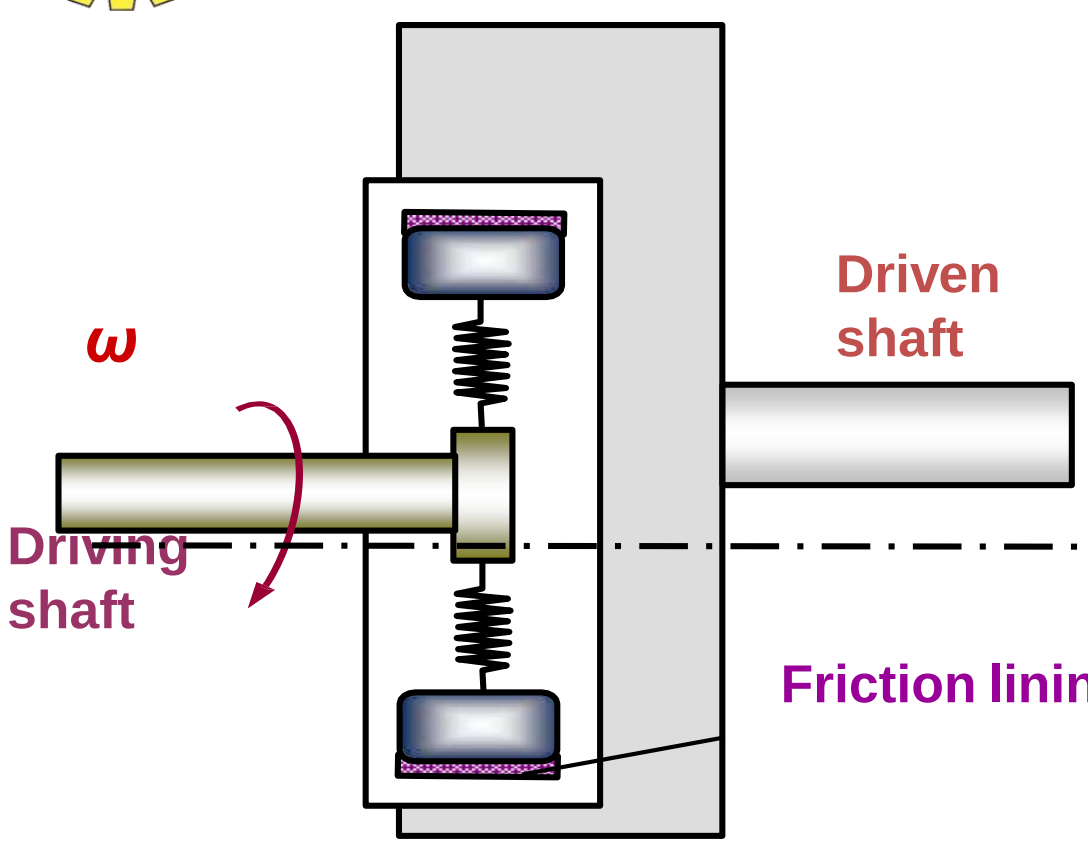
Disadvantages:

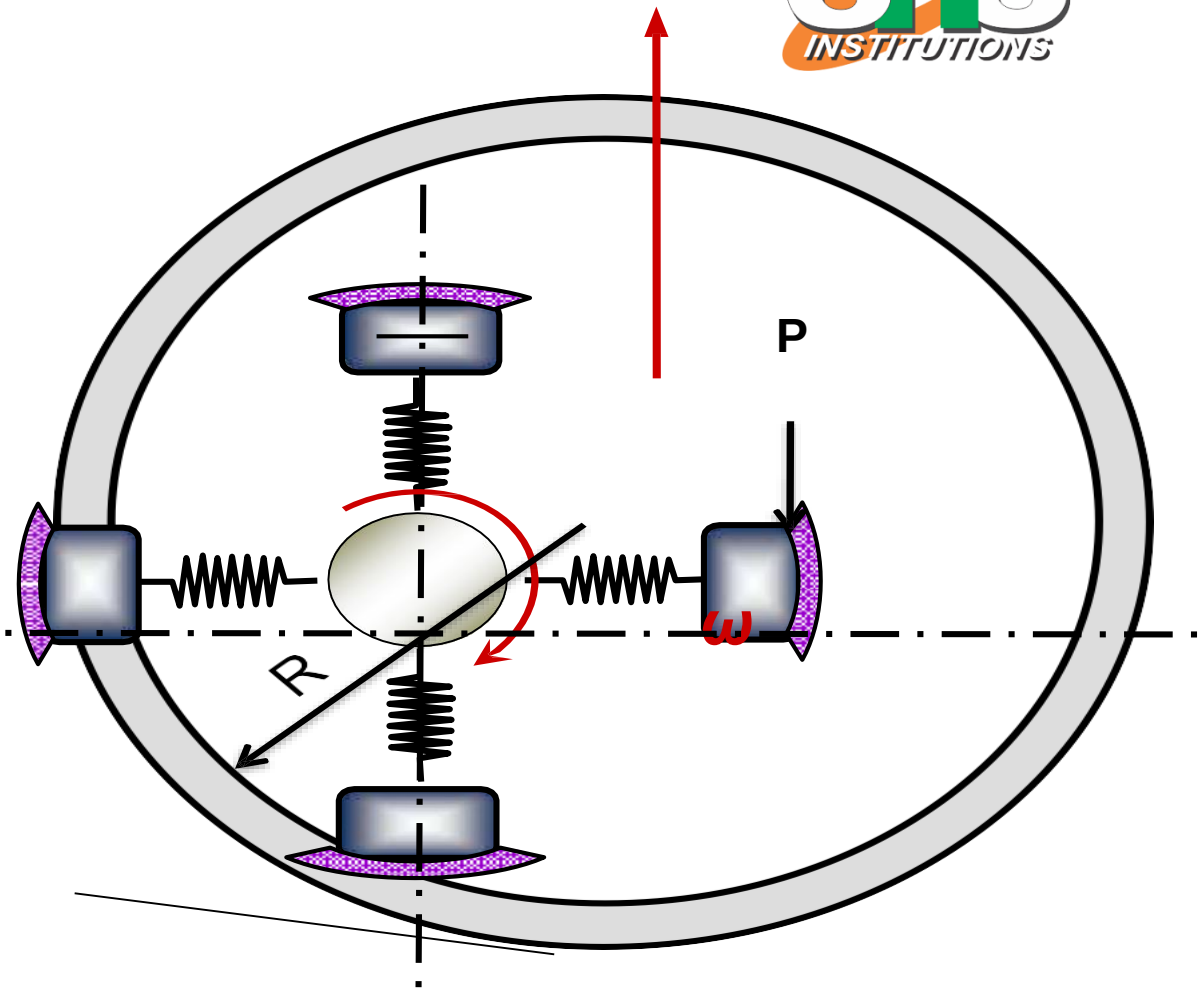
- Operation of the clutch is highly depended on the cone angle. If the cone angle is smaller than 20 degree, it becomes difficult to disengage the clutch.
- Frequent maintenance required because the small amount of wear on the cone surface results in a considerable amount of the axial movement of the inner cone.

A **dragging clutch** is one that fails to disengage the clutch disk from the flywheel when the driver pushes in the clutch pedal. When the driver attempts to shift gears, he or she can't because the still-engaged clutch is still spinning along with the engine.

Centrifugal clutch

$F=mr\omega^2$





Total friction torque , $T = n\mu R(F-P)$

CLUTCH OPERATING MECHANISM

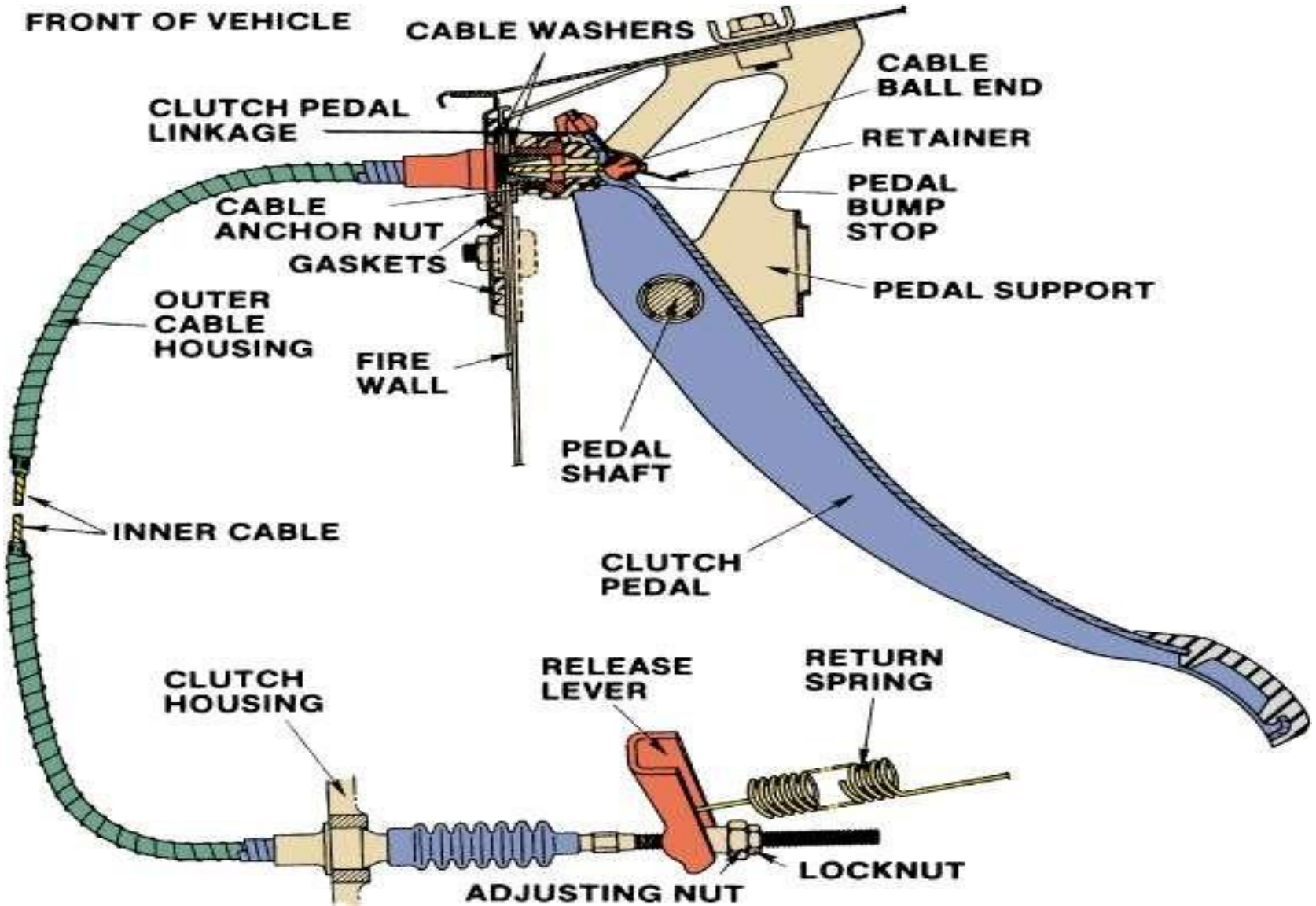
HAND OPERATING MECHANISM

FOOT OPERATING MECHANISM

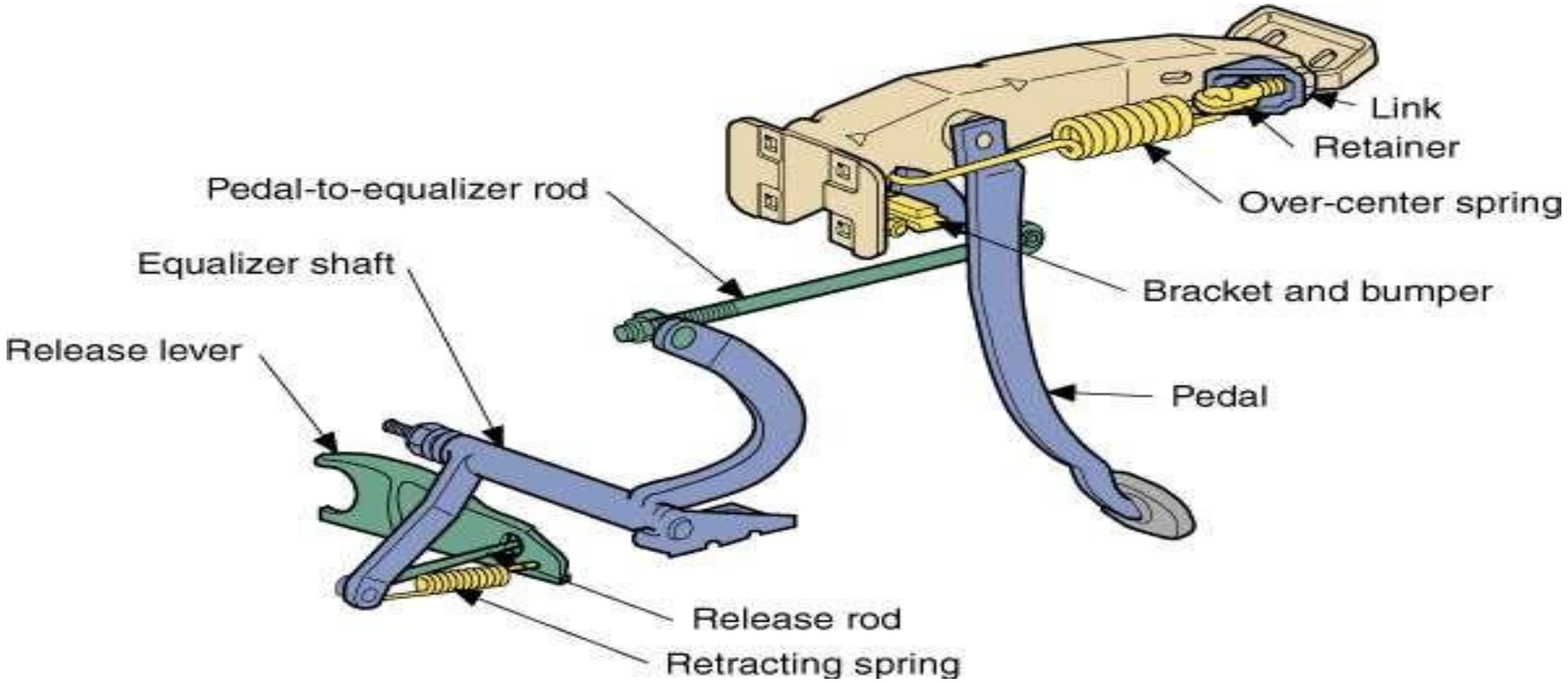
MECHANICALY OPERATED

MECANICALY OR HYDRAULIC ASSISTED

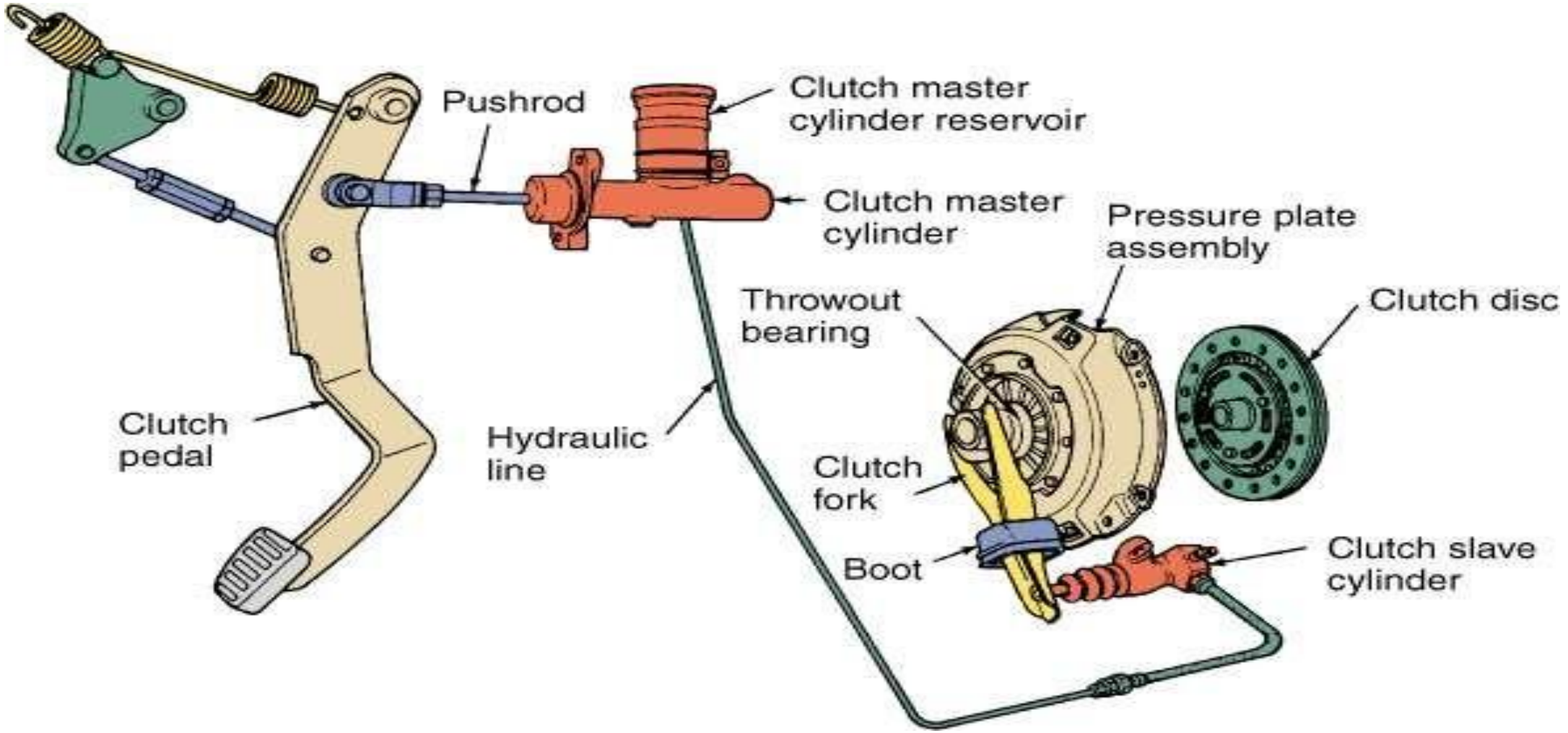
Cable Release



Mechanical Release



Mechanical-Hydraulic Release



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