COUPLINGS, CLUTCHES AND BRAKES.

When there is two shafts do not to be rotate and we need to disengage of the two shaft, at that time we need to connect two shaft by the **couple** device.

When there is two shafts are in even in rotating condition and we need to engage or disengage of the two shaft, at that time we need to connect two shaft by the **clutch** device.

When there is a controlling the speed of the machine member or stop the machine, we need to used **brake** device.

Clutch can not be use for the transmission of very much heavy load as they basically remain engage due to the friction.

COUPLINGS

Couplings and clutches are power transmission elements.

It is used to transmit power from one shaft to other.

A coupling is a device used to couple two shafts.

Shaft couplings are used for following purposes

1. **To connect shafts of motor and generator**
2. **To reduce the transmission of shock loads**
3. **To allow misalignment of shafts**

Coupling connects shafts of the machine members that are manufacturing separately such as motor and the generator

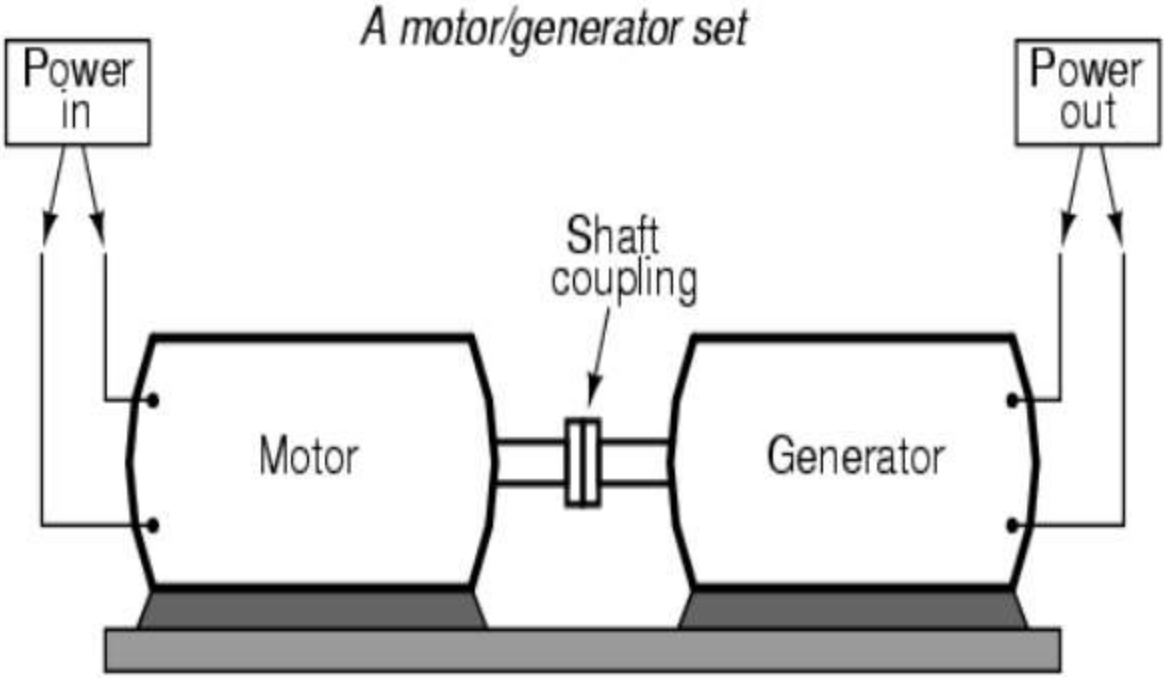
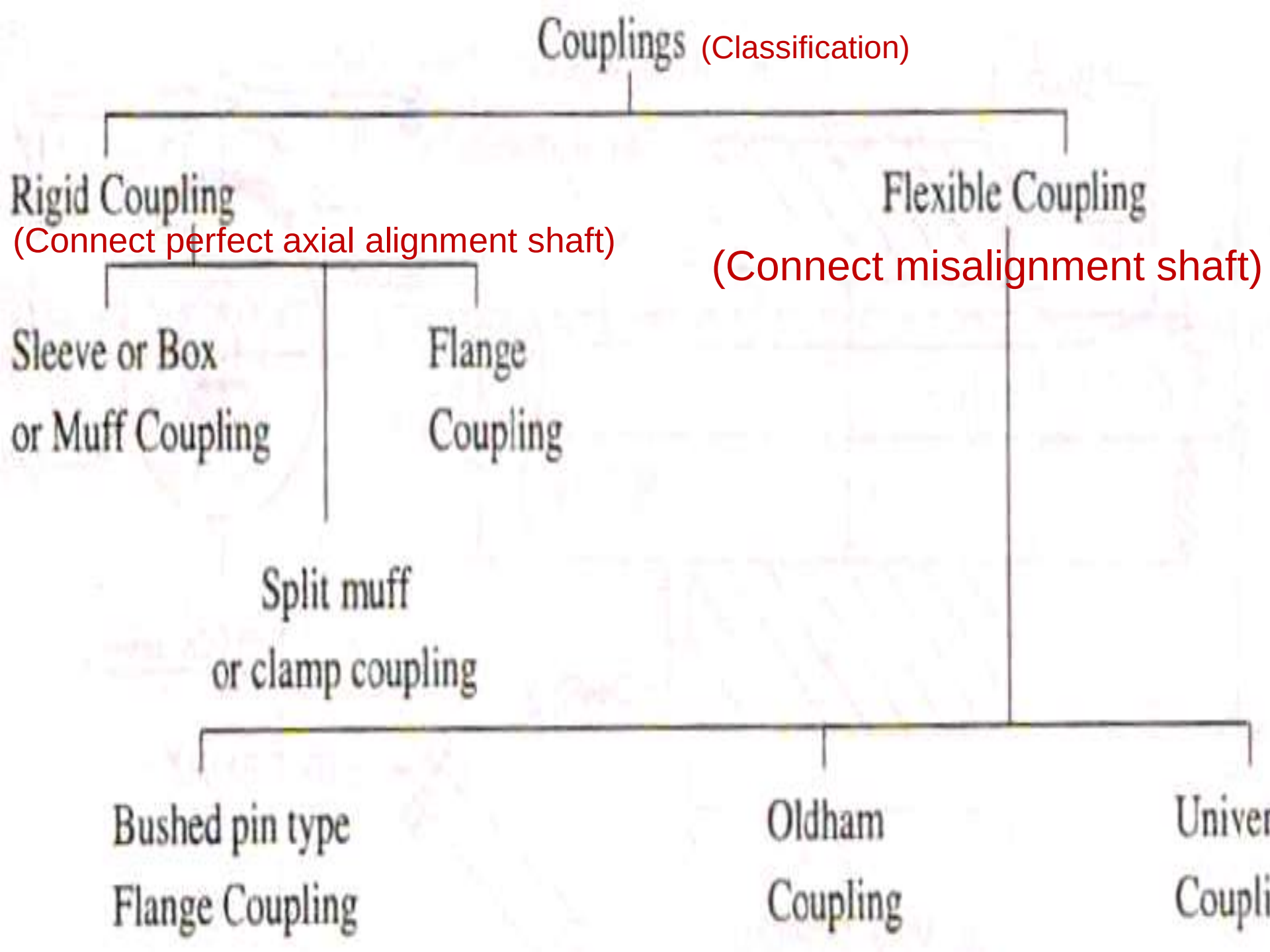


Fig. Power Transmission

Long line shaft is making by numbers of the small shaft pieces put together end to end by coupling mechanism.


Couplings (Classification)
Rigid Coupling
(Connect perfect axial alignment shaft)
Flexible Coupling
(Connect misalignment shaft)
Sleeve or Box
or Muff Coupling
Flange
Coupling
Split muff
or clamp coupling
Bushed pin type
Flange Coupling
Oldham
Coupling
Univer
Coupli

Couplings can be classified in to two category:

(1) Rigid Coupling:-

This type of couplings have no flexibility.

Shaft to be coupled should be in a good alignment.

Muff coupling, Split muff coupling, Flange coupling.

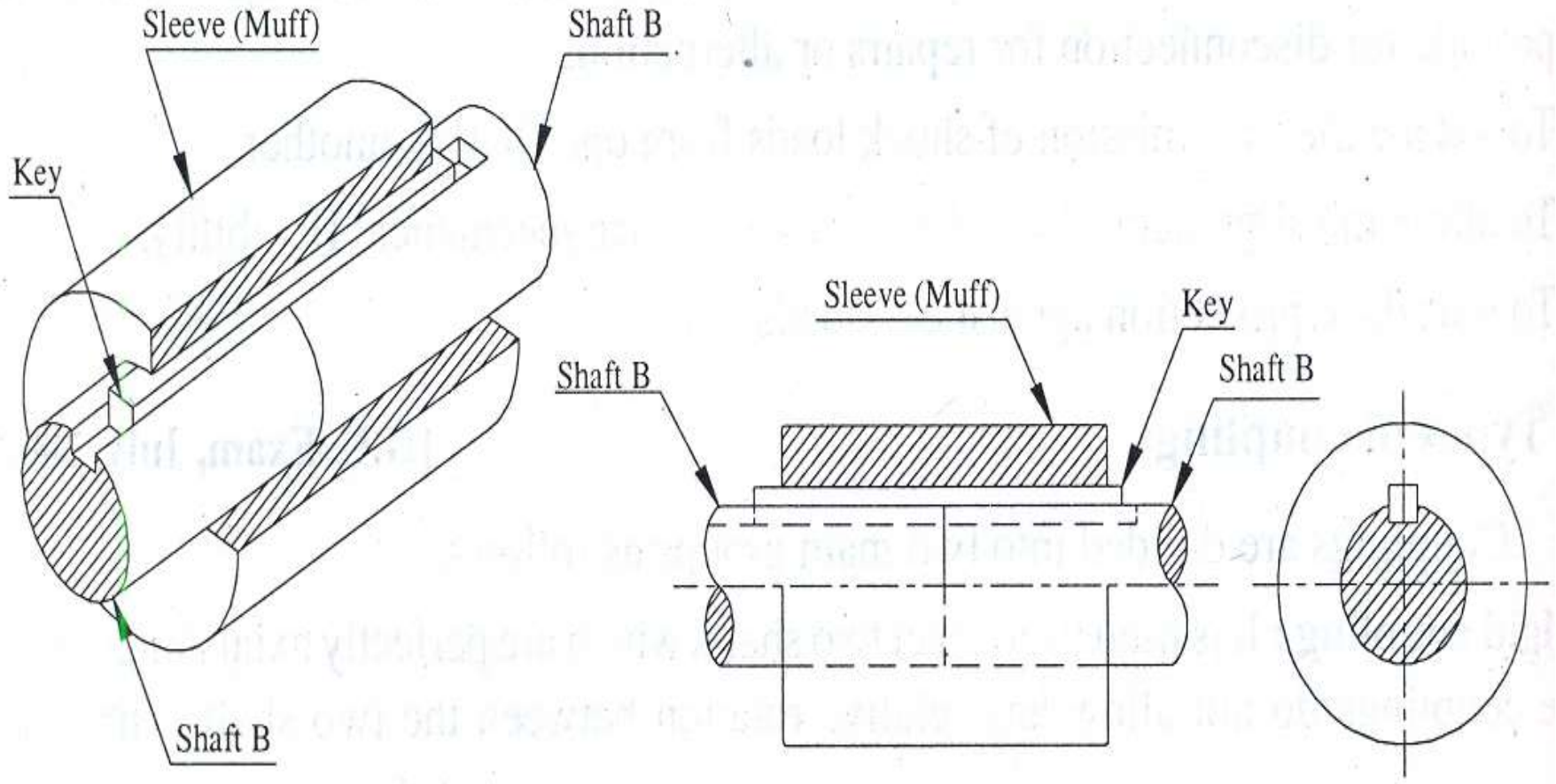
(2) Flexible Coupling:-

This type of coupling allows for the imperfect alignment of two joining shafts such as bush pin type flange coupling, two parallel shaft with small offset such as Oldham coupling, or two intersecting shaft such as universal coupling.

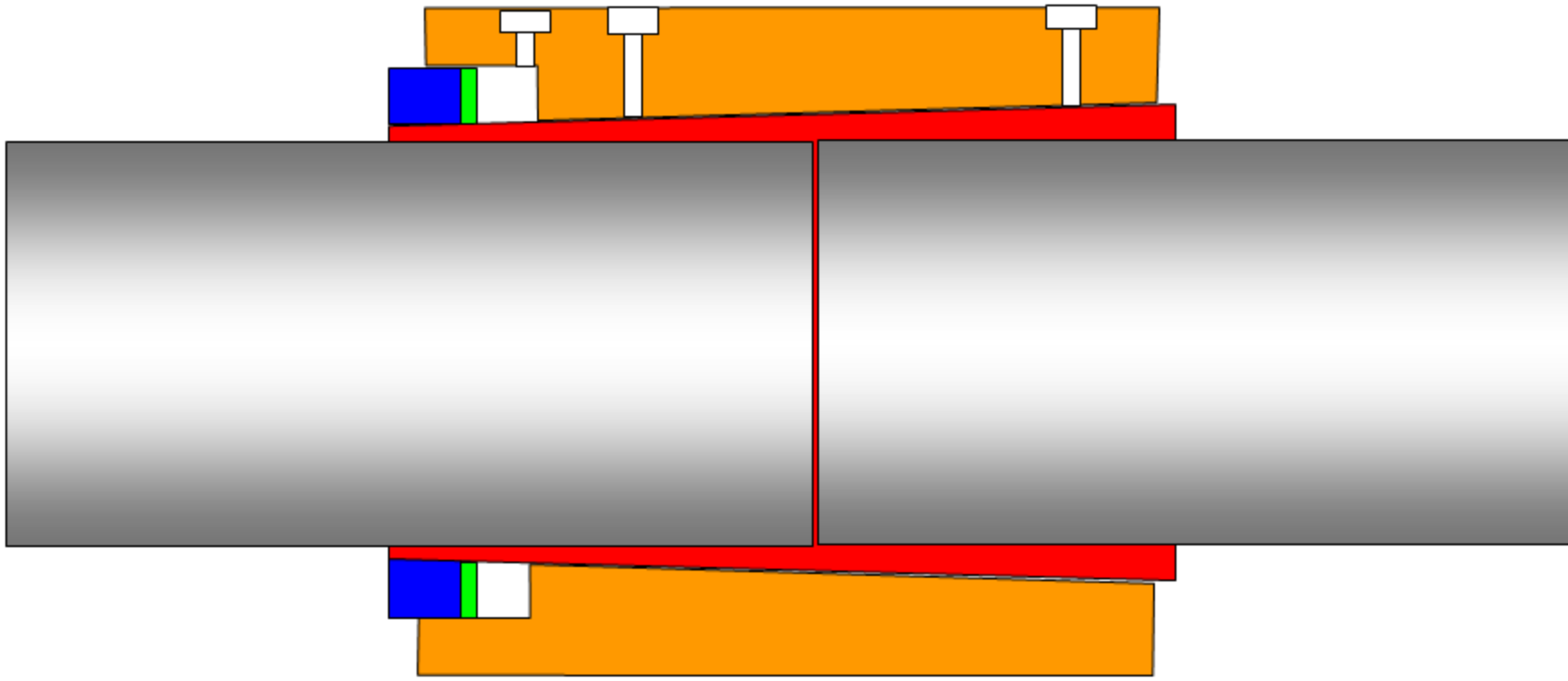
Sleeve (Box or Muff) Coupling

- It Consists of hollow cylindrical sleeve made of generally C.I.

Sleeve (Box or Muff) Coupling

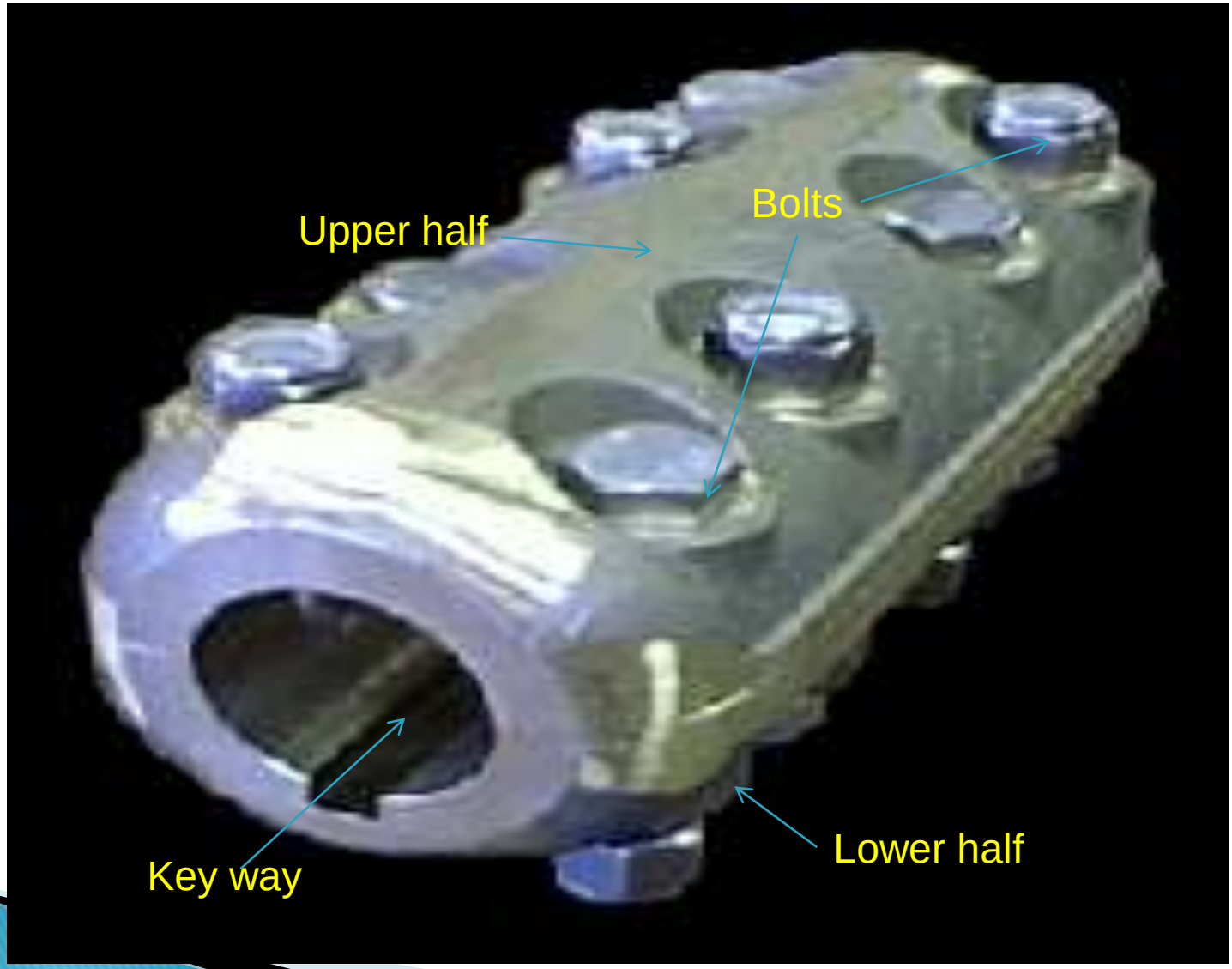


‘Muff’ Coupling



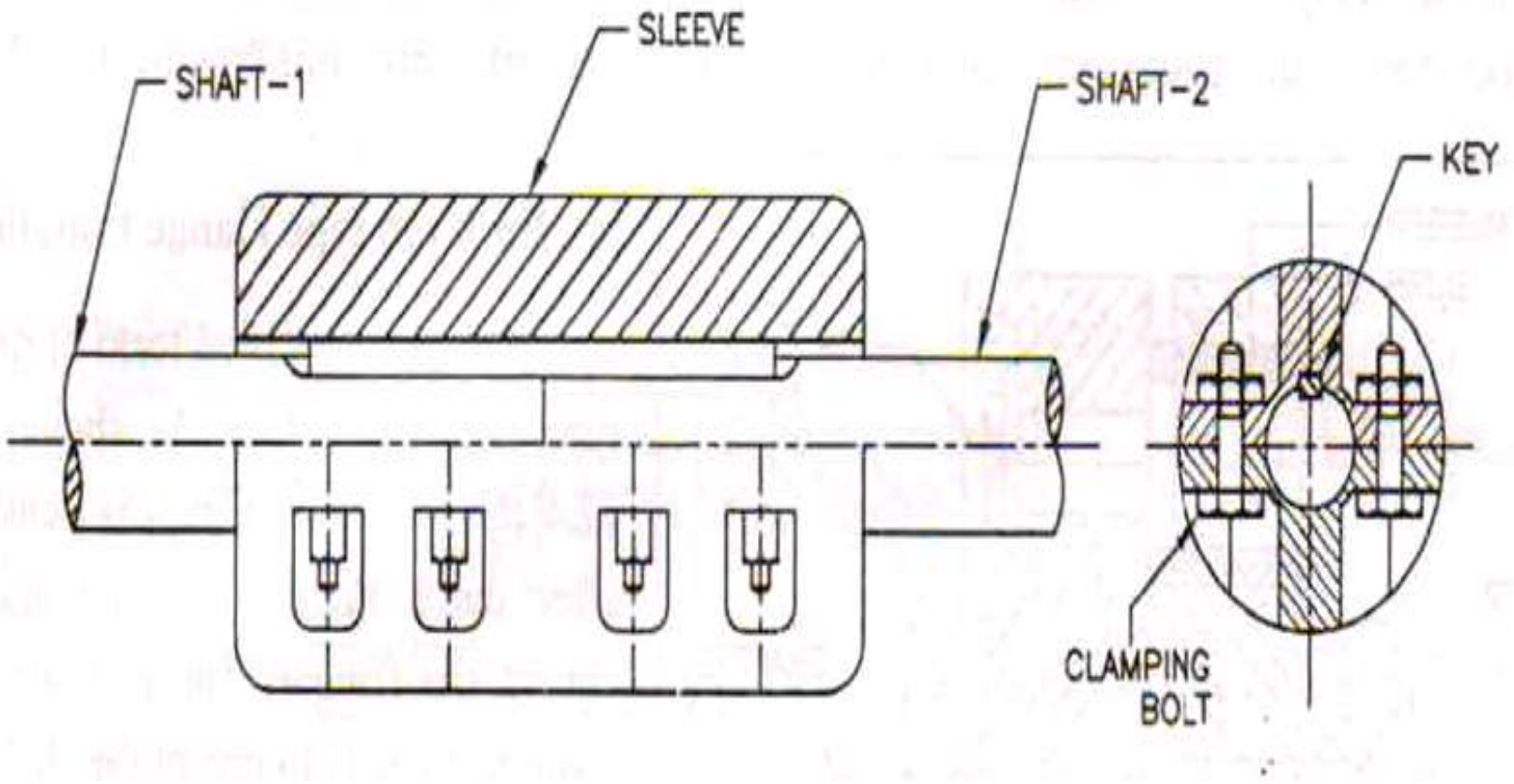
Split Sleeve (Box or Muff) Coupling

Split Sleeve (Box or Muff) Coupling



Split Muff Coupling

This is used for transmission of heavy power at moderate speed



https://youtu.be/Uddhk4e3BPU

This type of coupling is simple in the construction with the hollow cast iron cylinder

Muff which is fit over the ends of two shafts to be connect with each other.

Long sunk taper key is driven through both the shafts and the muff.

The motion of one shaft is communicate to the sleeve and then to the other shaft.

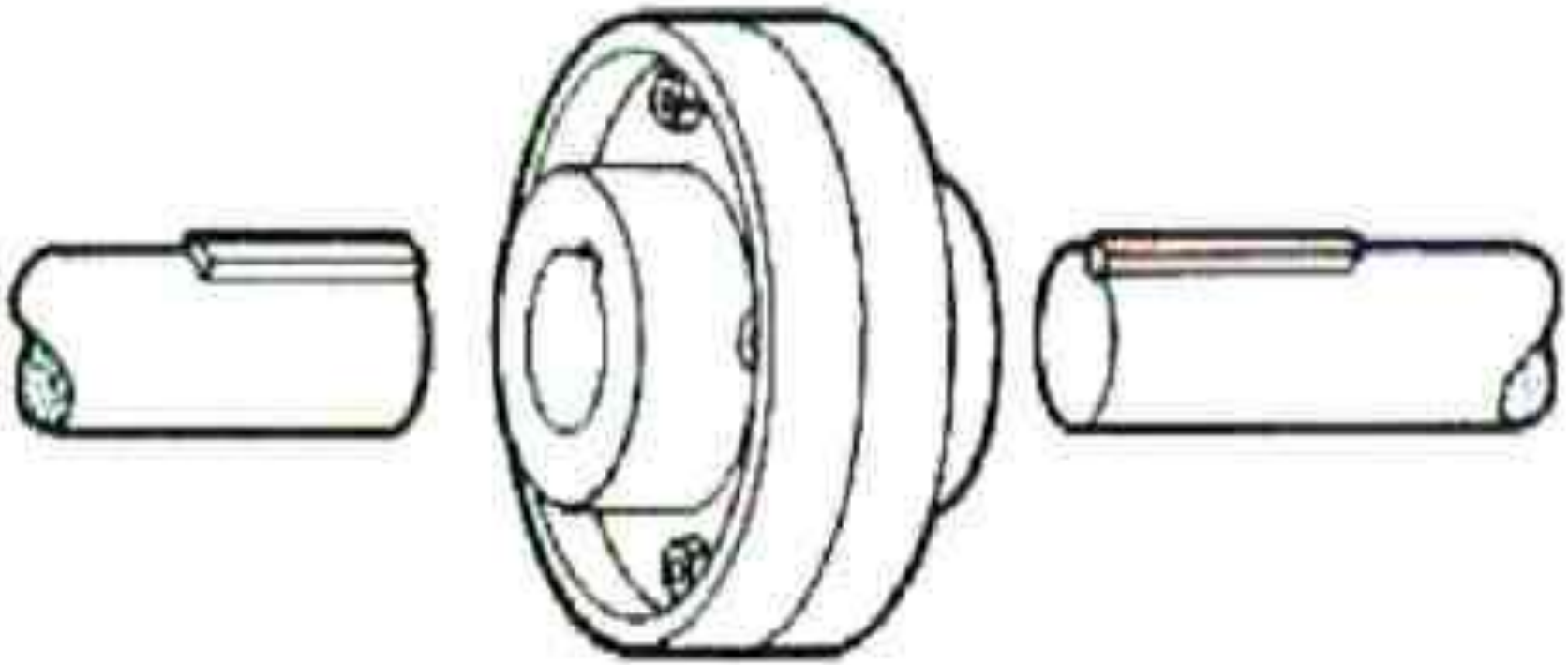
This type of coupling is simple in the design and manufacturing.

It has no projecting parts as it is evidence by its smooth perfect exterior.

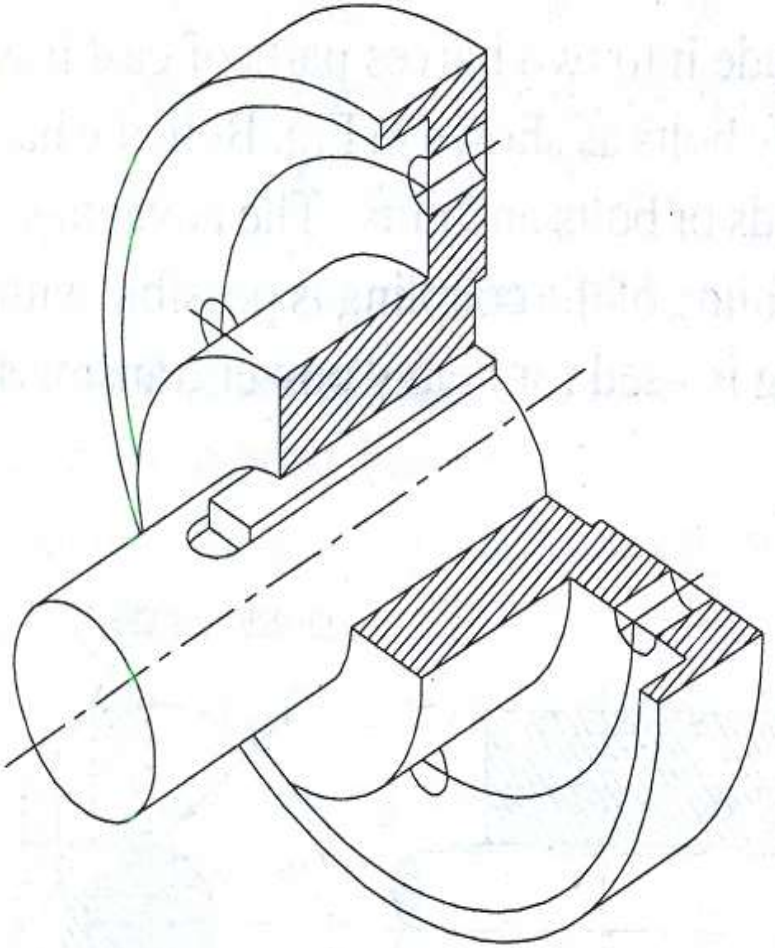
Difficult to disassemble and there is a need of perfect alignment between shaft.

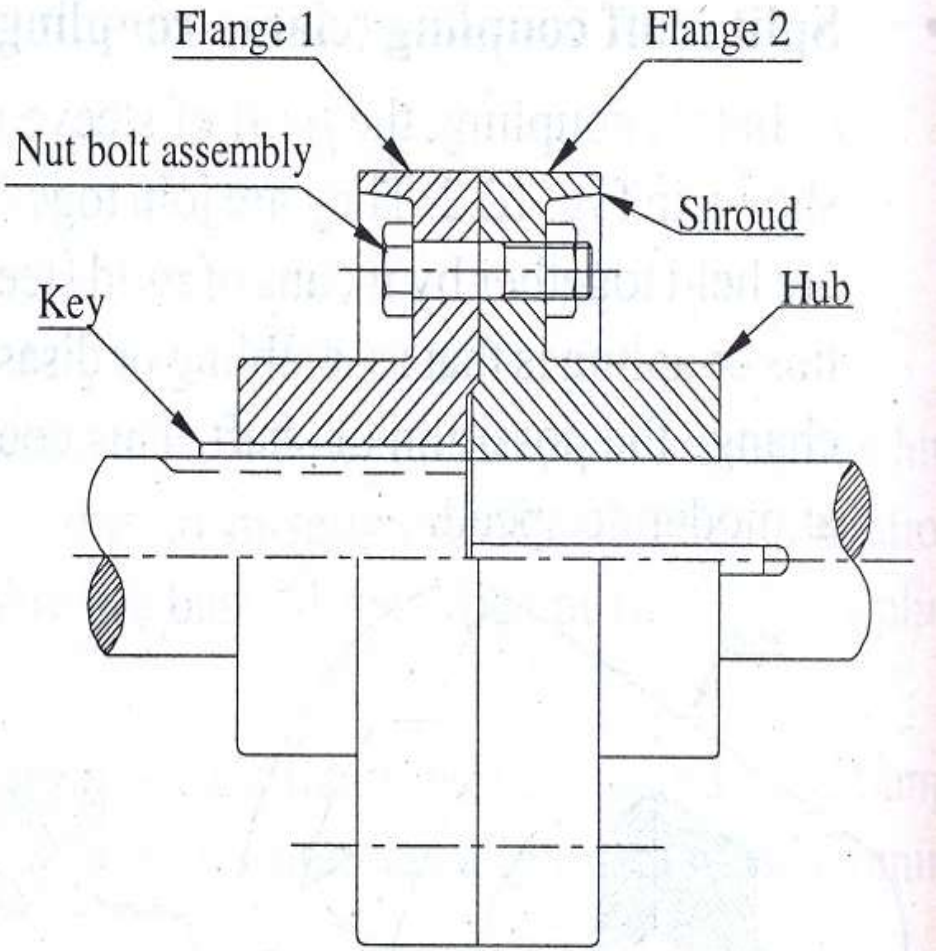
Flange Coupling – Protected Type

Flange Coupling – Protected Type
https://youtu.be/RS723HAXRPE



Flange Coupling – Protected Type



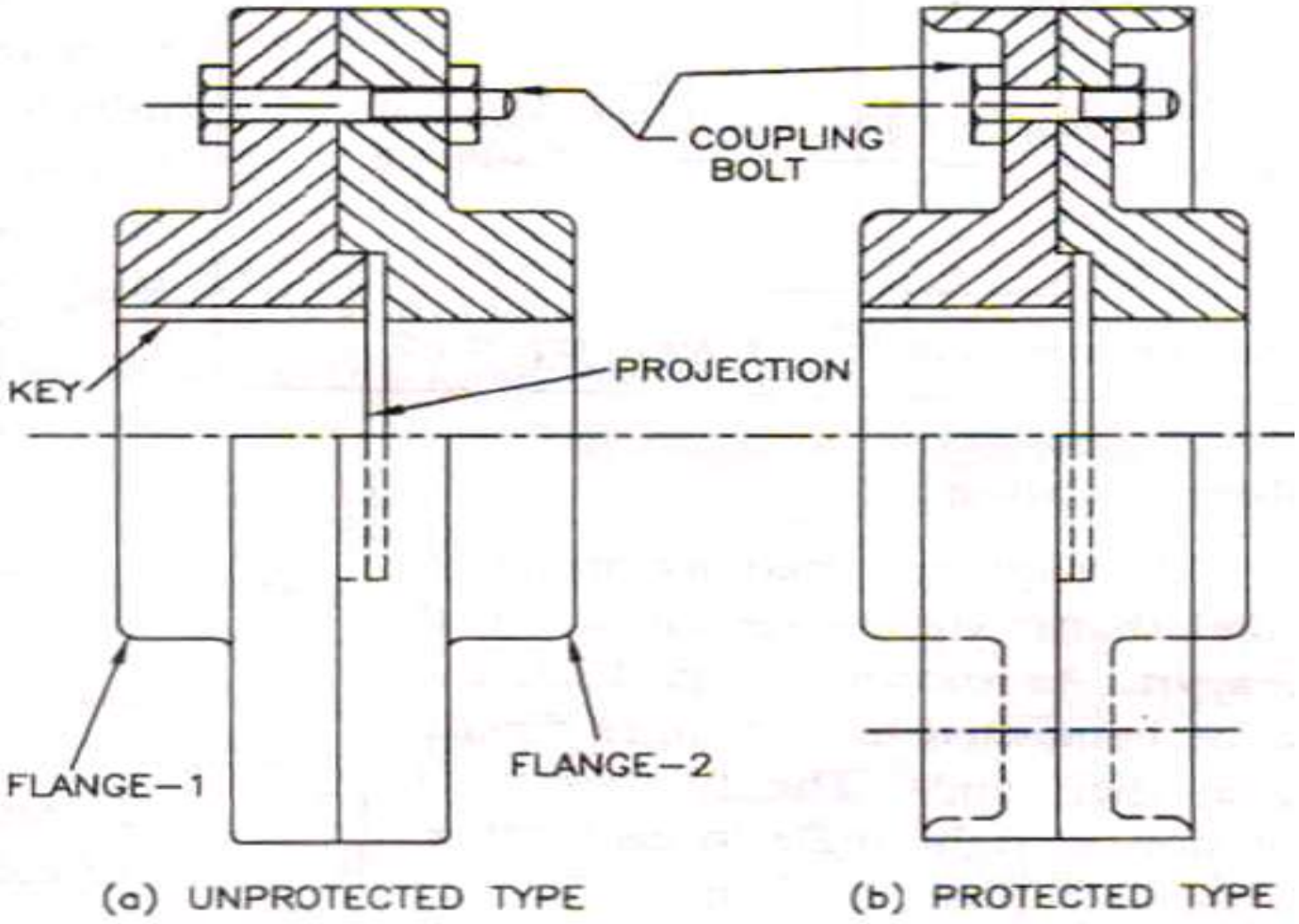


https://youtu.be/O8QtEMeF5gQ
Flange coupling is very extensive useful.
Flange coupling consists of two cast-iron flanges, key to the ends of two shafts.
The faces of the flanges are brought and held together by a series of the bolts arrange concentric about the shaft.
The circular projection of one flange fits in to corresponding recess of the other flange.
This thing ensures the proper alignment of the shaft.

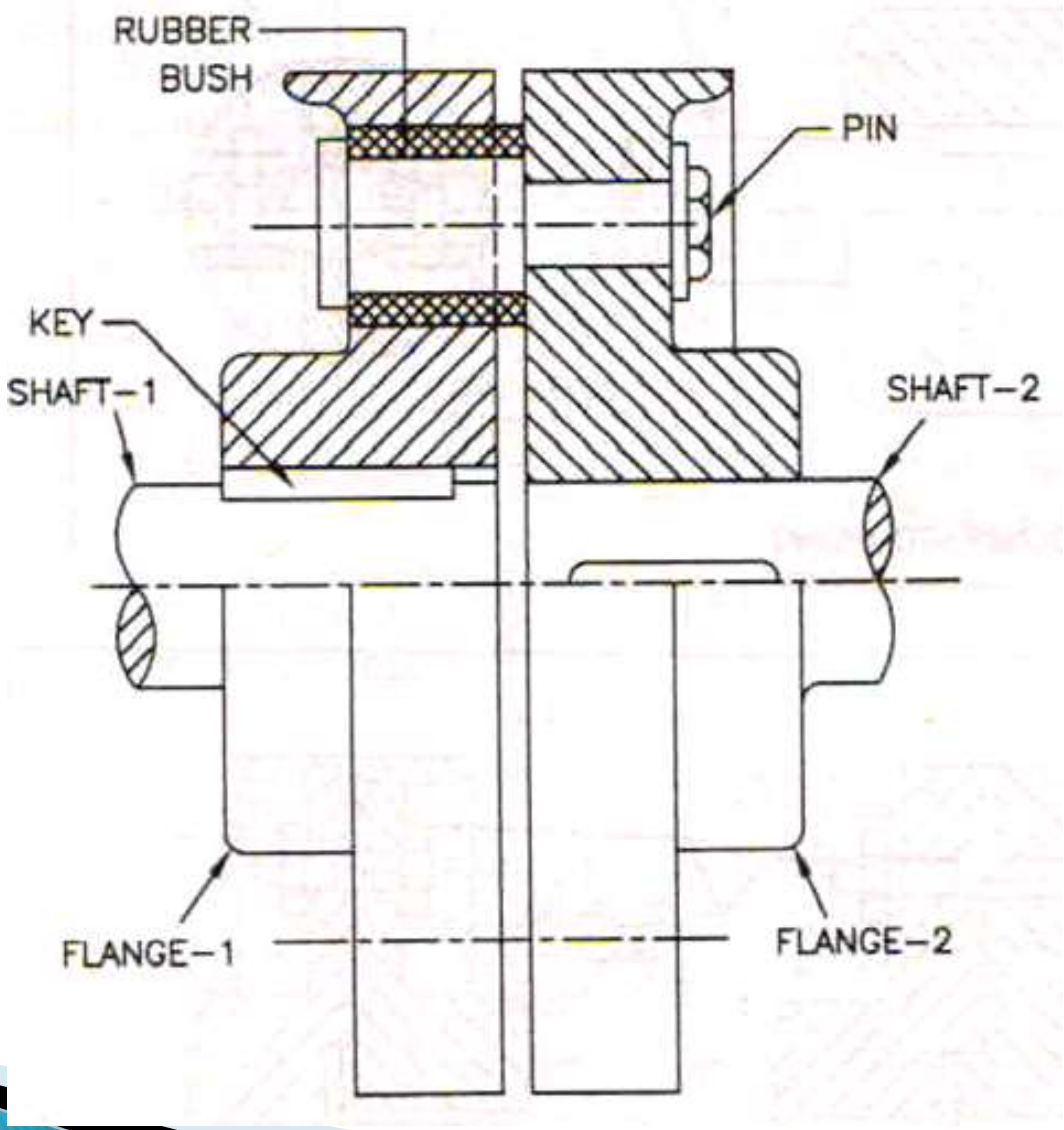
Flange is provide with a shroud which shelter the bolt heads and the nuts.
This thing prevents workman catching cloths.
Such kind of coupling is called as protected type of flange coupling.
Flange coupling ensuring the most accurate rigid coupling and the strong connection of the shafts.
Protected type of flange coupling is adopted to heavy loads.

Flange Coupling

Protected type flange coupling has shroud to shelter the bolt head.



Flexible Coupling



Flexible Coupling – Pin Bush Coupling

Flexible Coupling

This type of the coupling has one flange each mount on to the shaft.

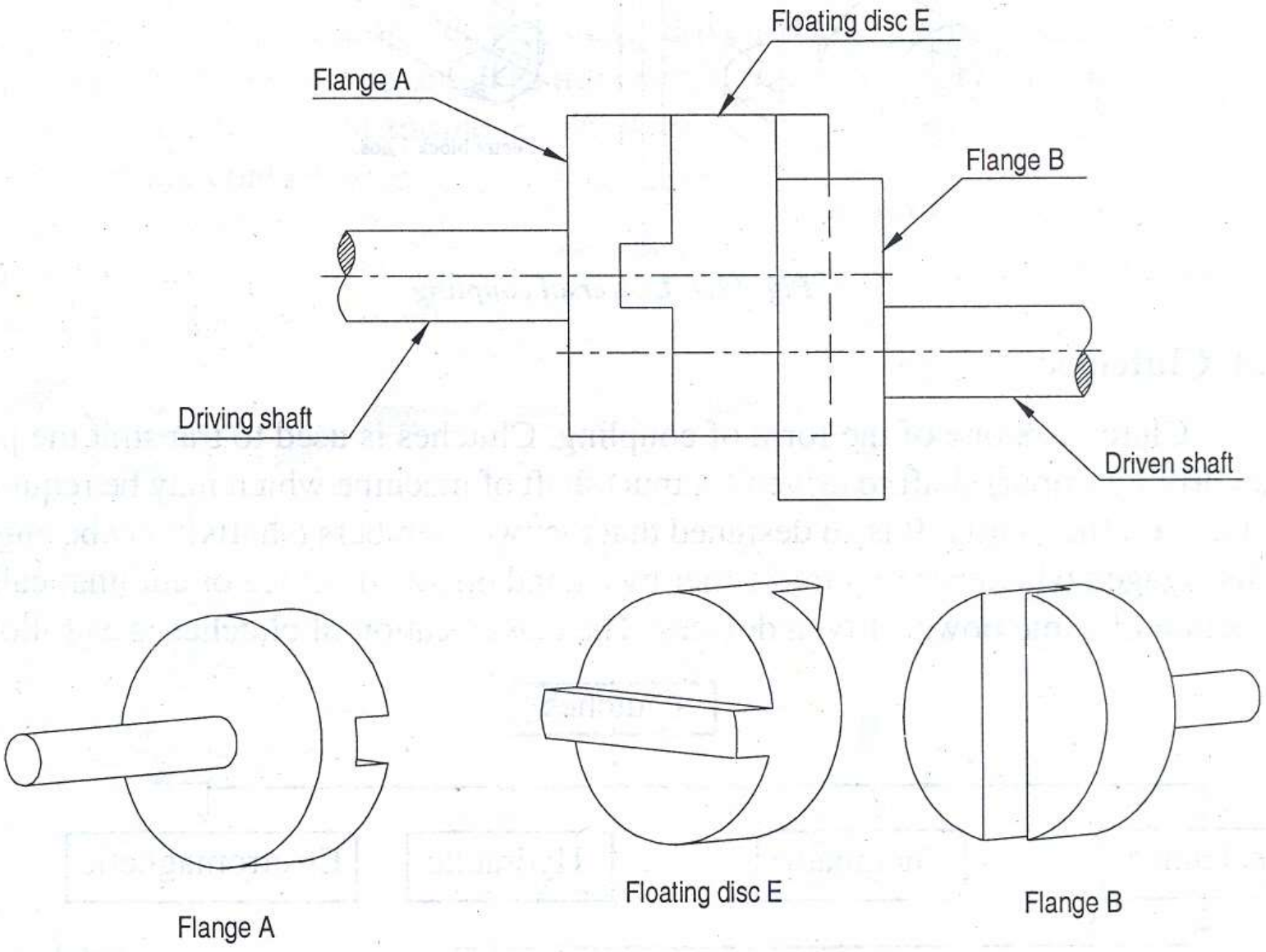
Pins are rigidly fastern by the nuts to one of the flanges while they are cover with the leather or rubber washers bushes and keep loose in the other flange.

This coupling makes up for the small parallel misalignment, angular misalignment and axial displacement.

It can be also absorb the shocks and the vibration during the operation.

This type of coupling is common use for the direct connecting an electric motor to a machine.

Oldham Coupling

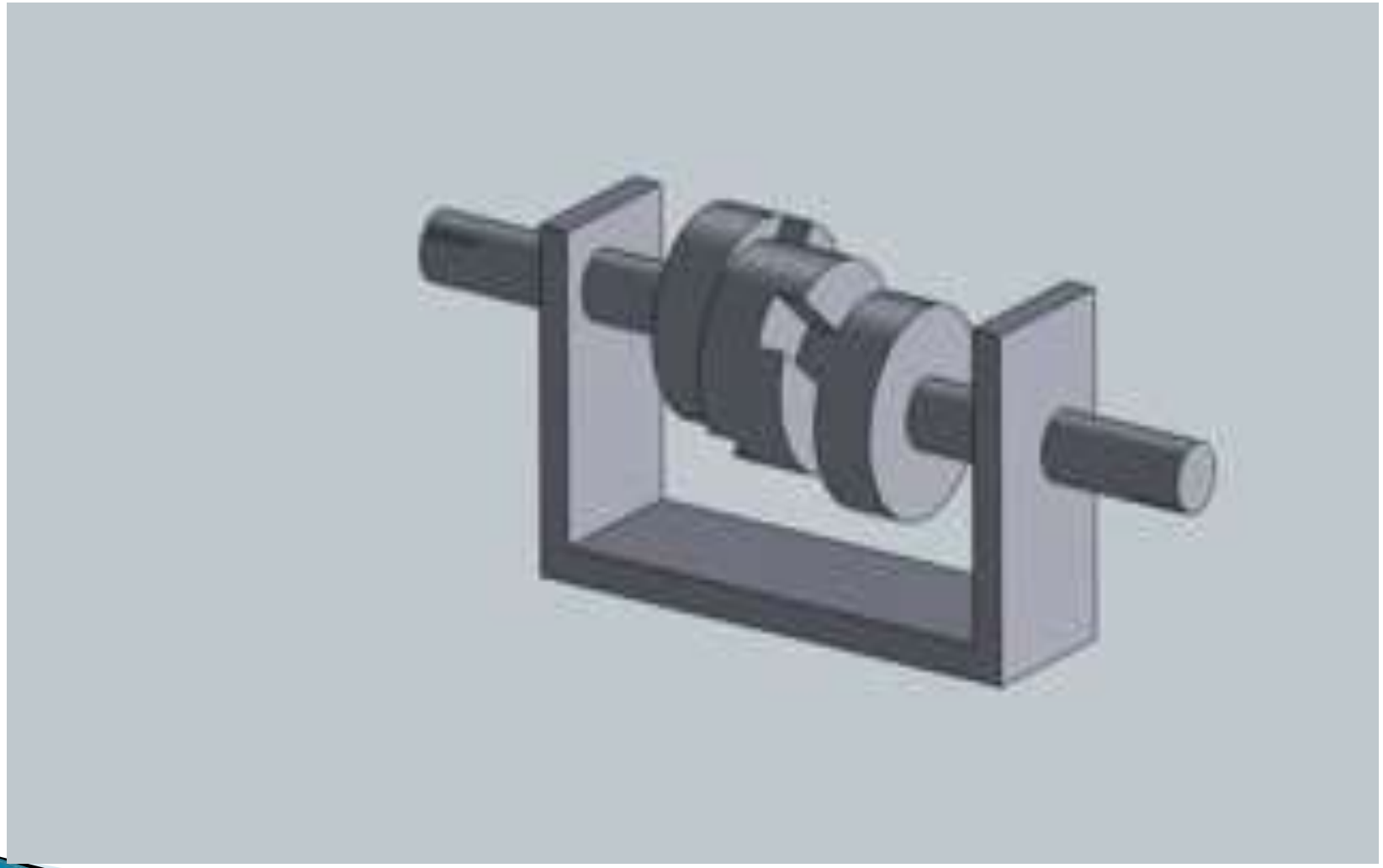


When the axis of the shaft are parallel but not in alignment, Oldham coupling can be use to couple them.
Two flanges in which each is having a rectangular recess and each flange is join by keyway by each one shaft.
The intermediate circular disc has the rectangular projections on both the side of face of the circular disc at the right angle to each other.
These projections fit in to the corresponding recess in to the flanges.
The power is transmitting from the driving shaft to wards driven shaft through the intermediate piece which will be rotates as well as slides in to the slots.

Oldham Coupling

Oldham Coupling

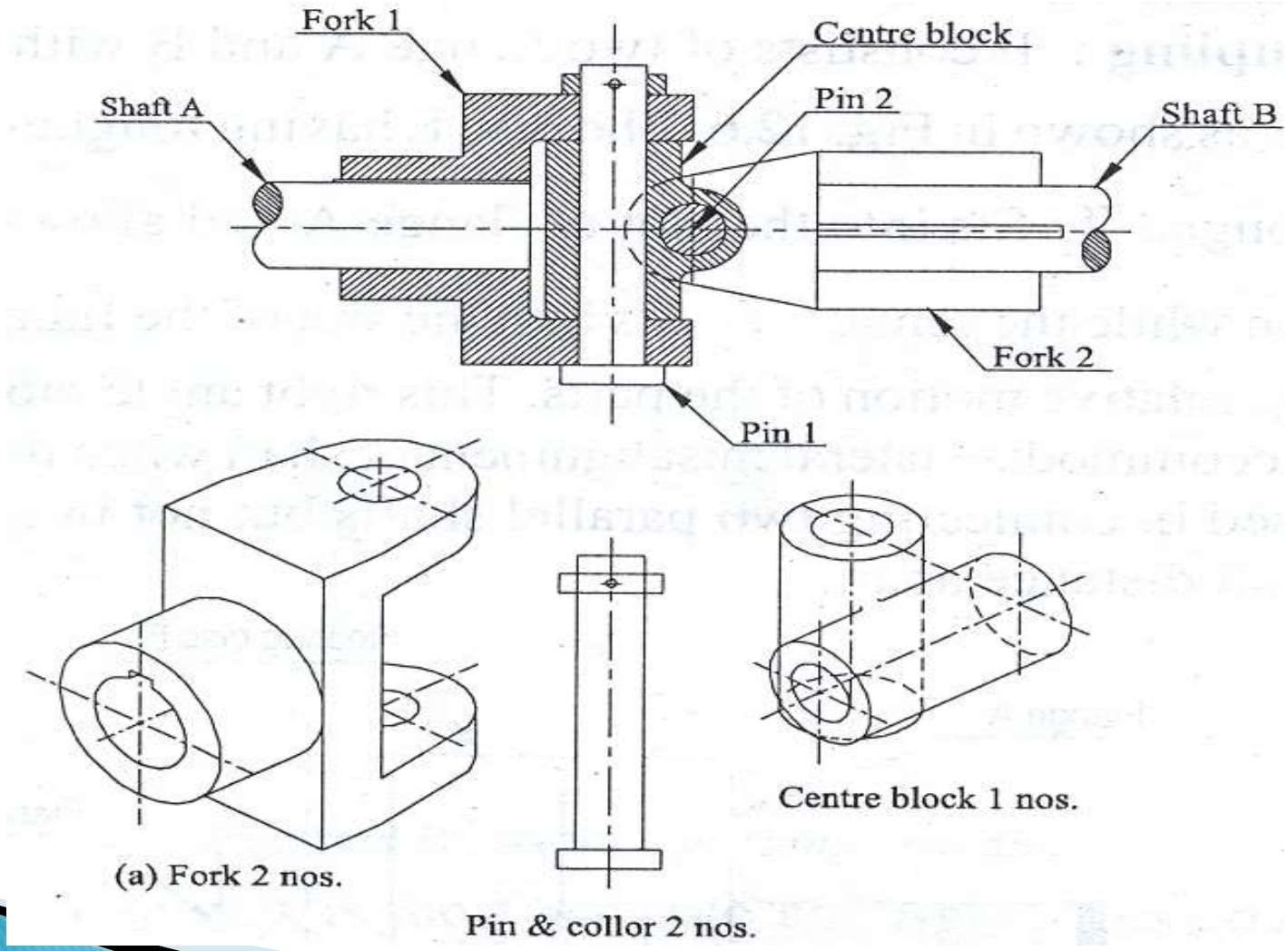
https://youtu.be/91BerJAOvXQ



Universal Coupling

Universal Coupling

This is widely used in automobiles. This is used to connect two shafts Whose axis intersect.



Universal Coupling https://youtu.be/CZIlFiRCmBg

Universal coupling can be applied where there is angular or offset misalignment of the shaft is more.

Universal coupling does not allow for the parallel misalignment and shaft must be intersect with each other.

Two similar forks are key on to the ends of the two shafts.

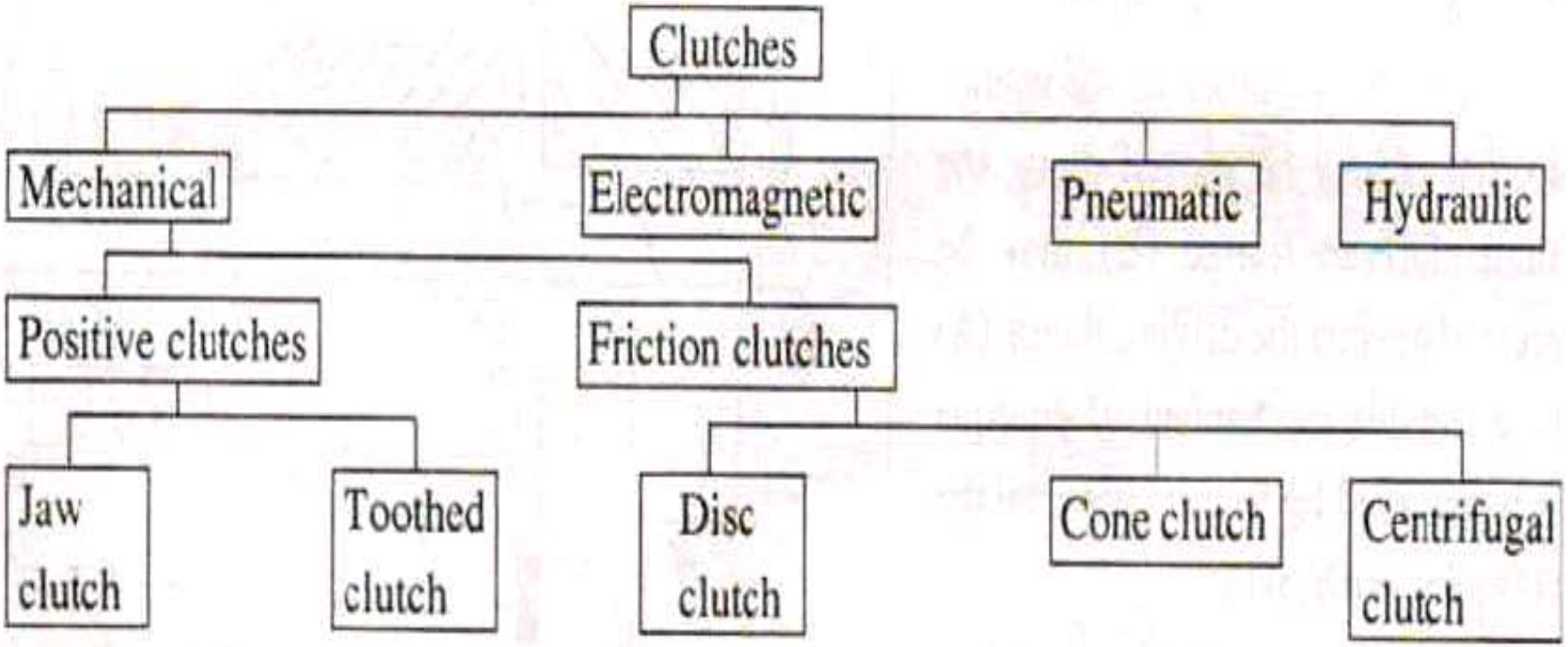
The holes in each of the fork coincide with the hole in the center piece.

Two perpendicular pins and collars fasten the forks with each other by the centre piece.

CLUTCHES

Clutches are one form of coupling.

It is useful to transmit power from driving shaft to driven shaft of machine which may be require to start or stop frequently.



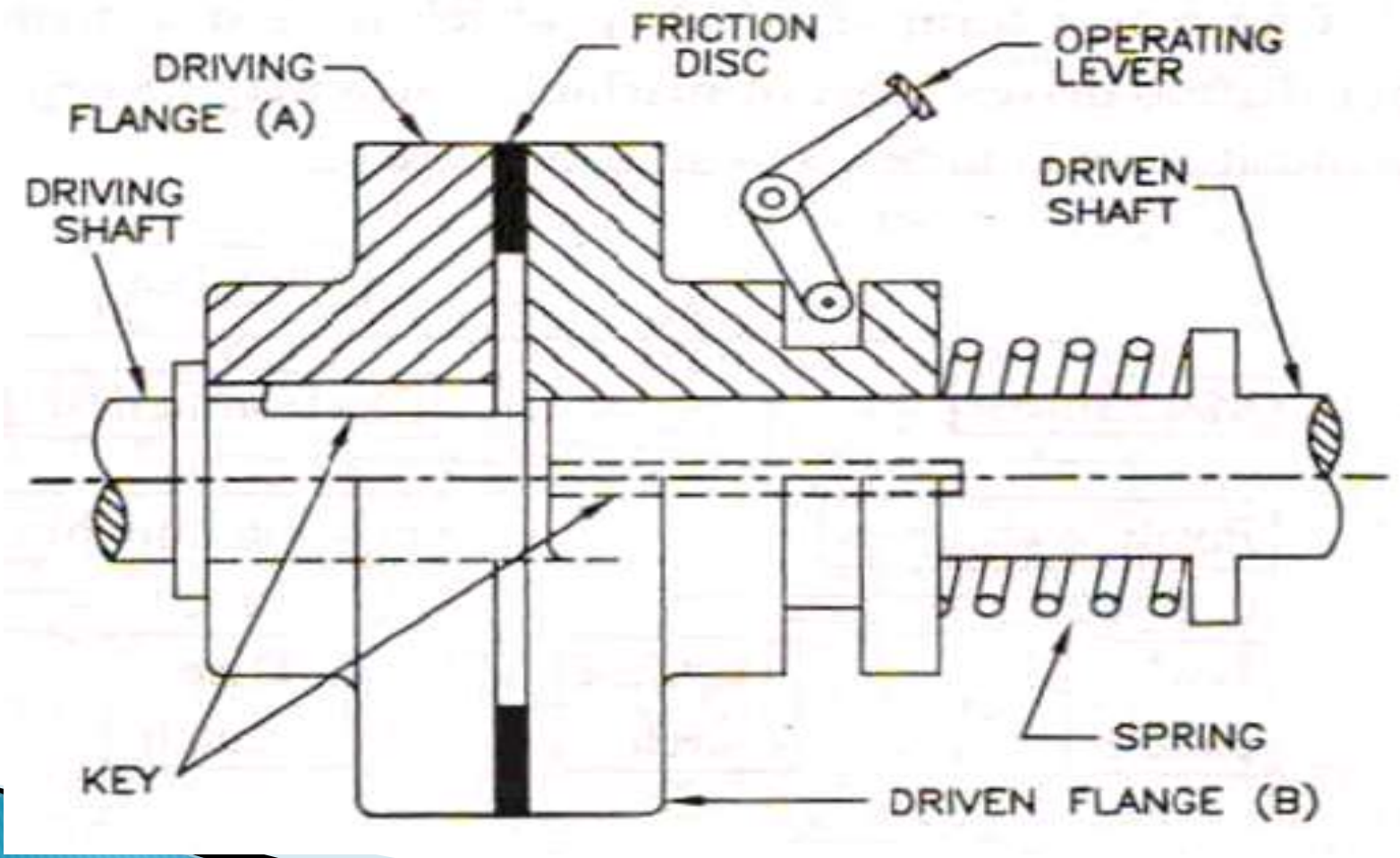
Friction Clutch

Operation of the friction clutch is mainly base on the friction force develop between surfaces of the two clutch members.

When engage the clutch members tend to rotate as a single unit but can be slip under certain conditions.

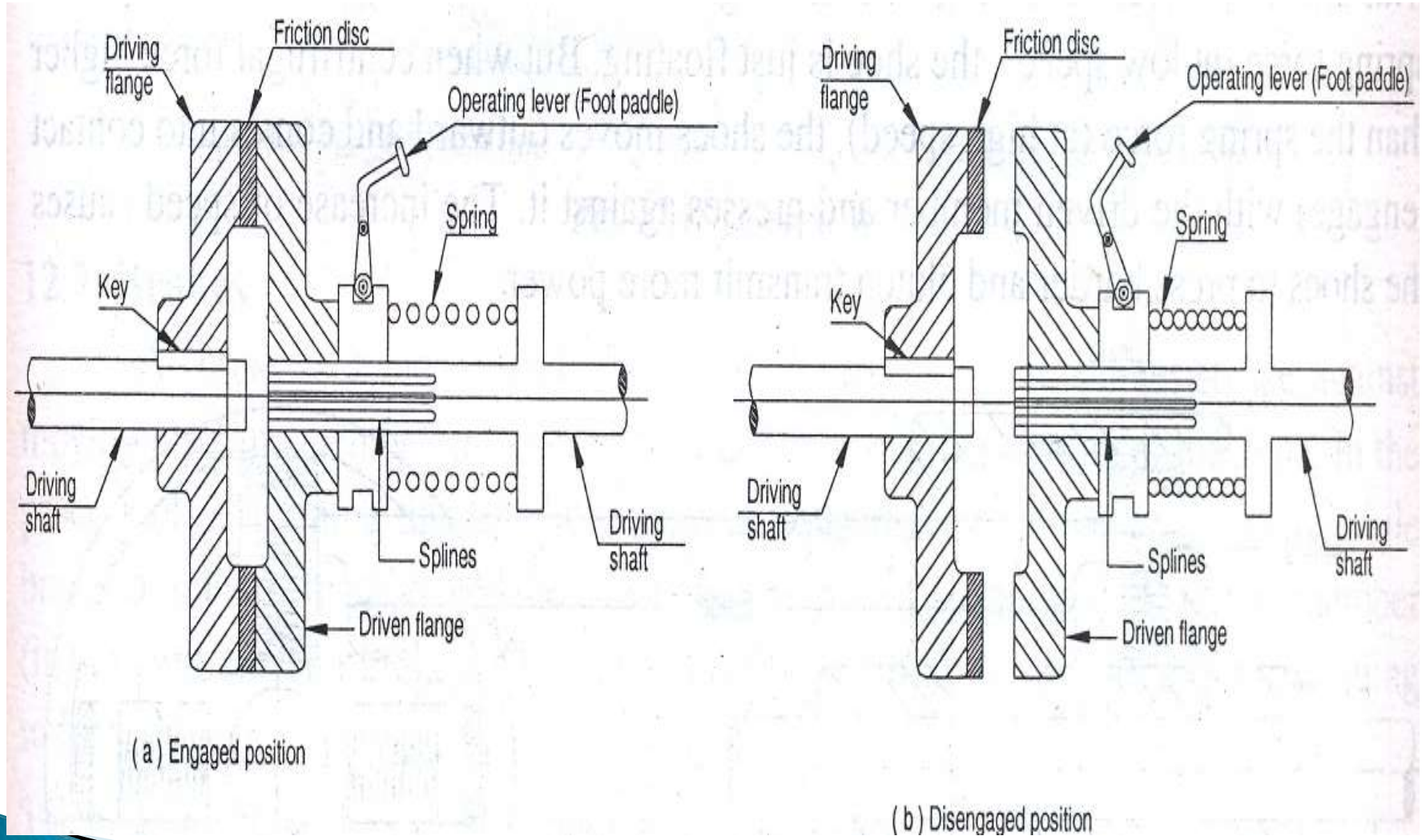
This type of clutch can be engage at the high speed with minimum shock.

Friction Clutch



Disc Clutch

https://youtu.be/6DL0j0eKD8Y



Disc type of clutch has two flanges, one flange is on driving shaft and other flange is on driven shaft.
One of the flange is line with the material having a high co-efficient of friction.
Other flange is providing the support with the first flange.

The flange on the driving shaft is providing keyway rigidly while the flange on the driven shaft can move along the axis of the shaft by use of the some suitable mechanism.

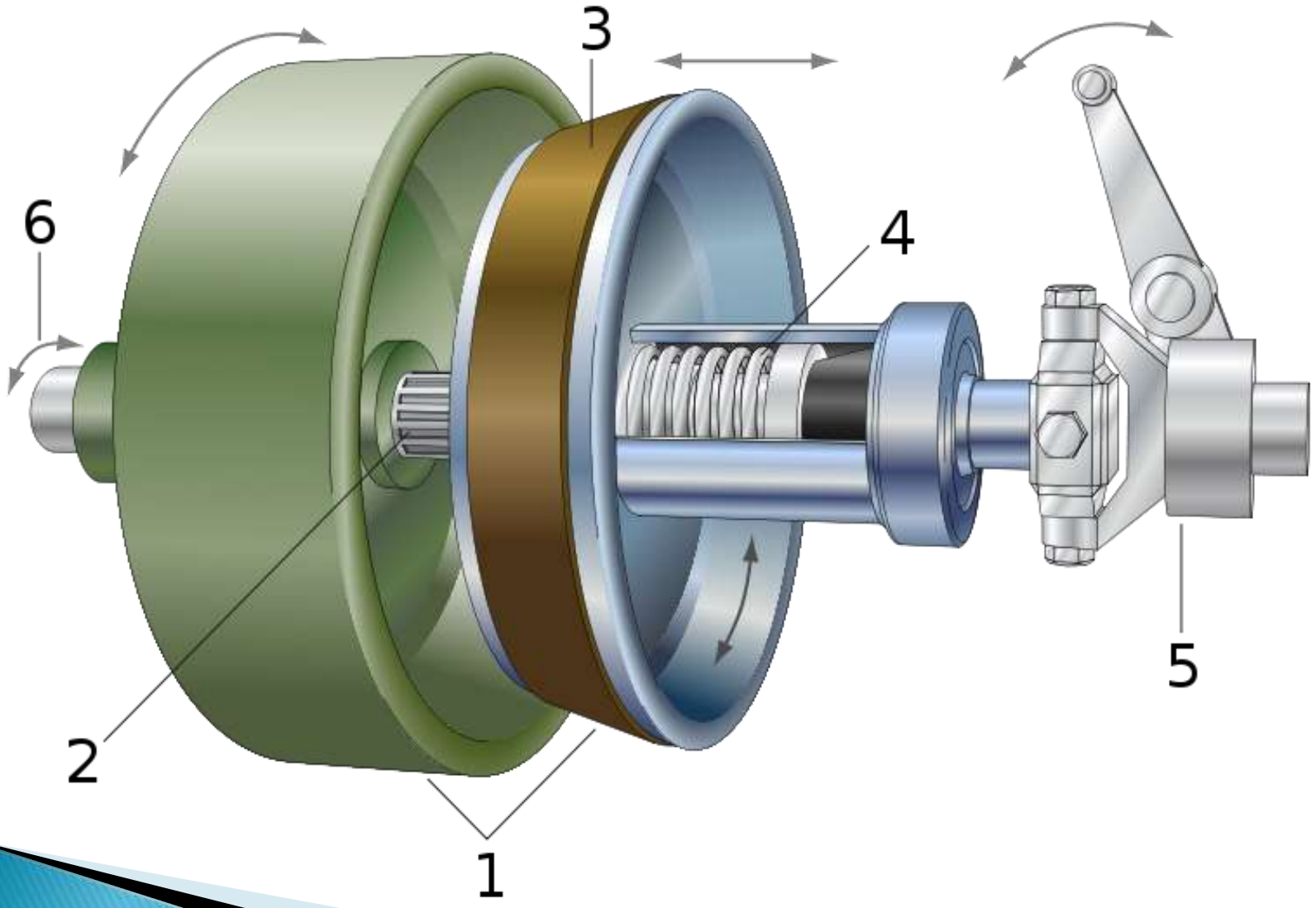
The torque can be transmit from the driving flange towards the driven flange through friction lining material when both the flange press upon to each other.

Single disc clutch are useful in the automobiles sector.

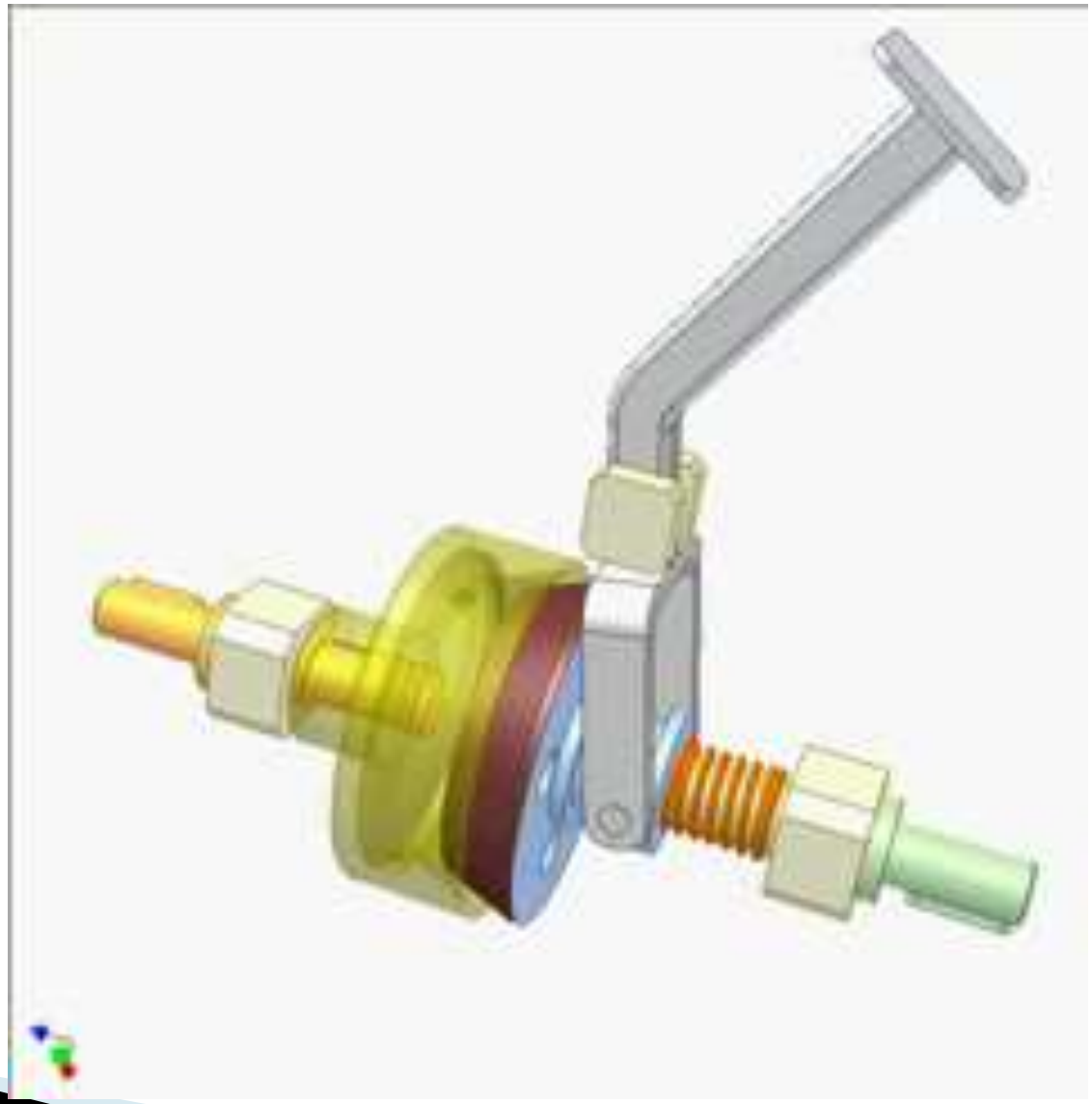
When there is a larger amount of torque is to be transmission require, multiple disc clutches are useful. They have more then one driving and driven plates and more contact surfaces.

Cone Clutch

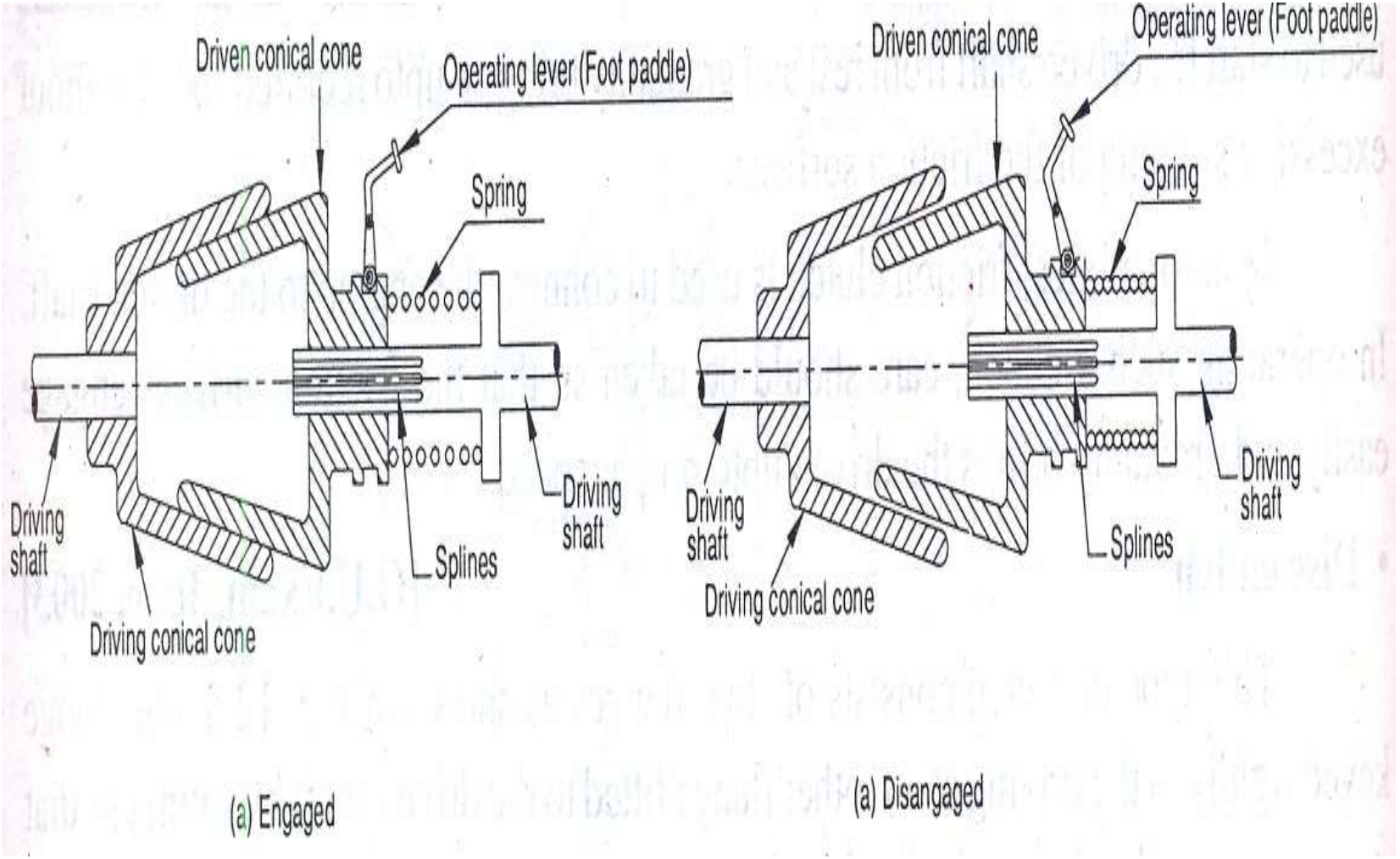
https://youtu.be/IUYZ4BmHR1Y



Cone Clutch



Cone Clutch


Driven conical cone
Operating lever (Foot paddle)
Spring
Driving shaft
Splines
Driving shaft
Driving conical cone
(a) Engaged
Driven conical cone
Operating lever (Foot paddle)
Spring
Driving shaft
Splines
Driving shaft
Driving conical cone
(a) Disangaged

Cone clutch is one type of clutch in which torque is transmit by using friction material between internal surfaces.

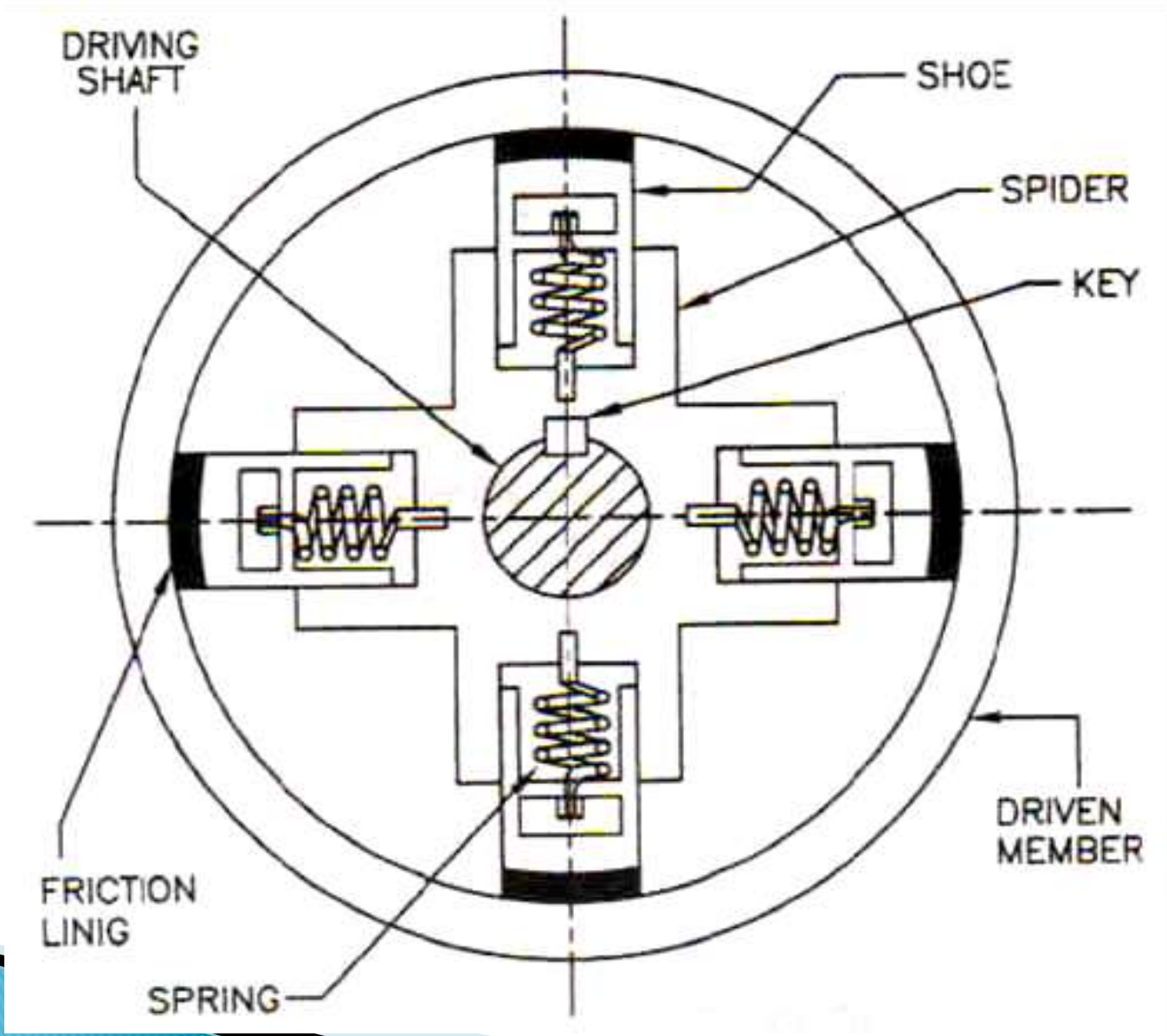
Cones of one face mount on driving shaft and external surface of another face mount on driven shaft.

The cone on the driven shaft can move to be axially by the suitable mechanism.

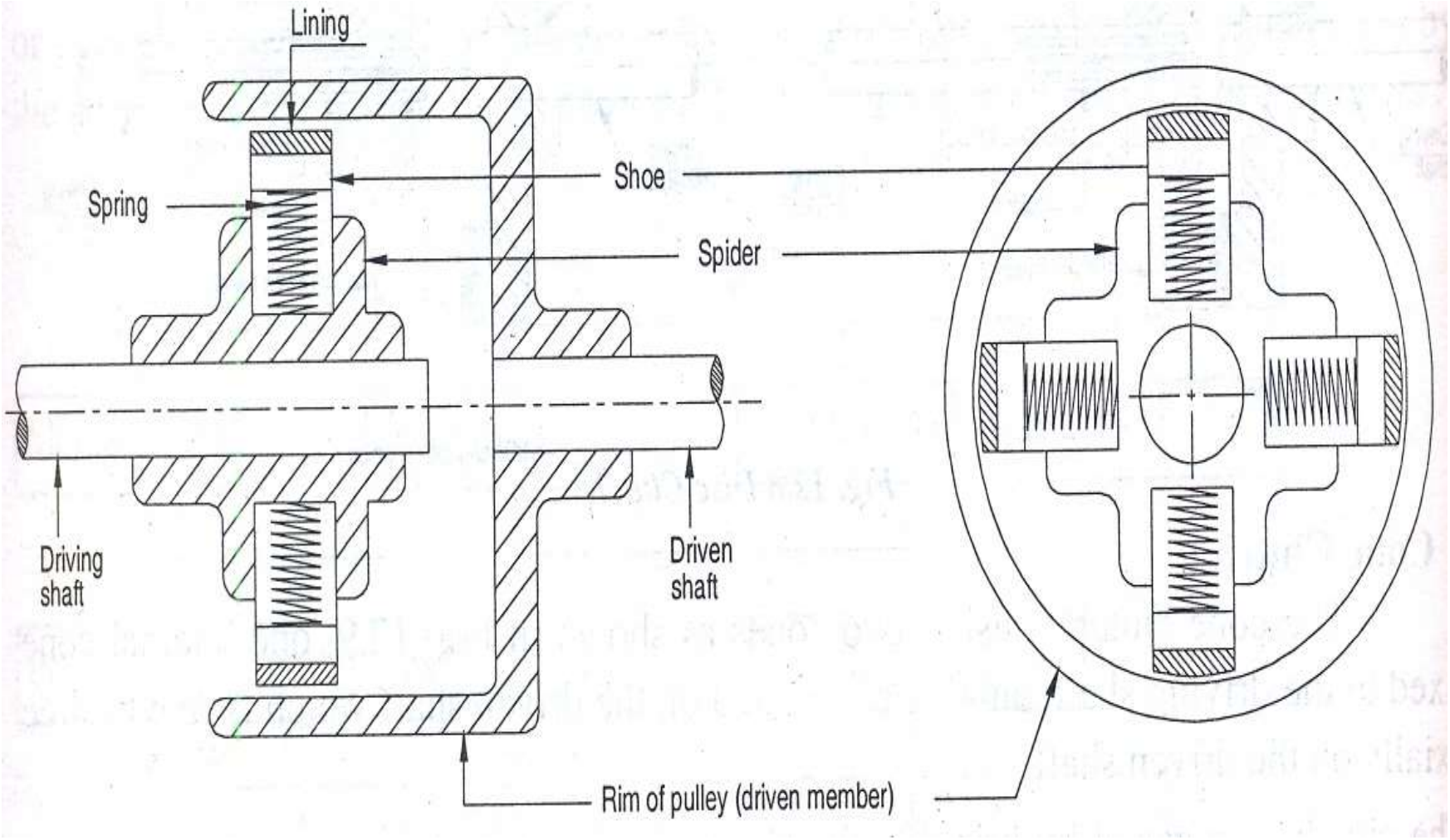
Cone clutch can be couple two shafts without excessive axial pressure but it is difficult to be disengage the two shafts.

Centrifugal Clutch

https://youtu.be/KL_P1mNMx_k



Centrifugal Clutch



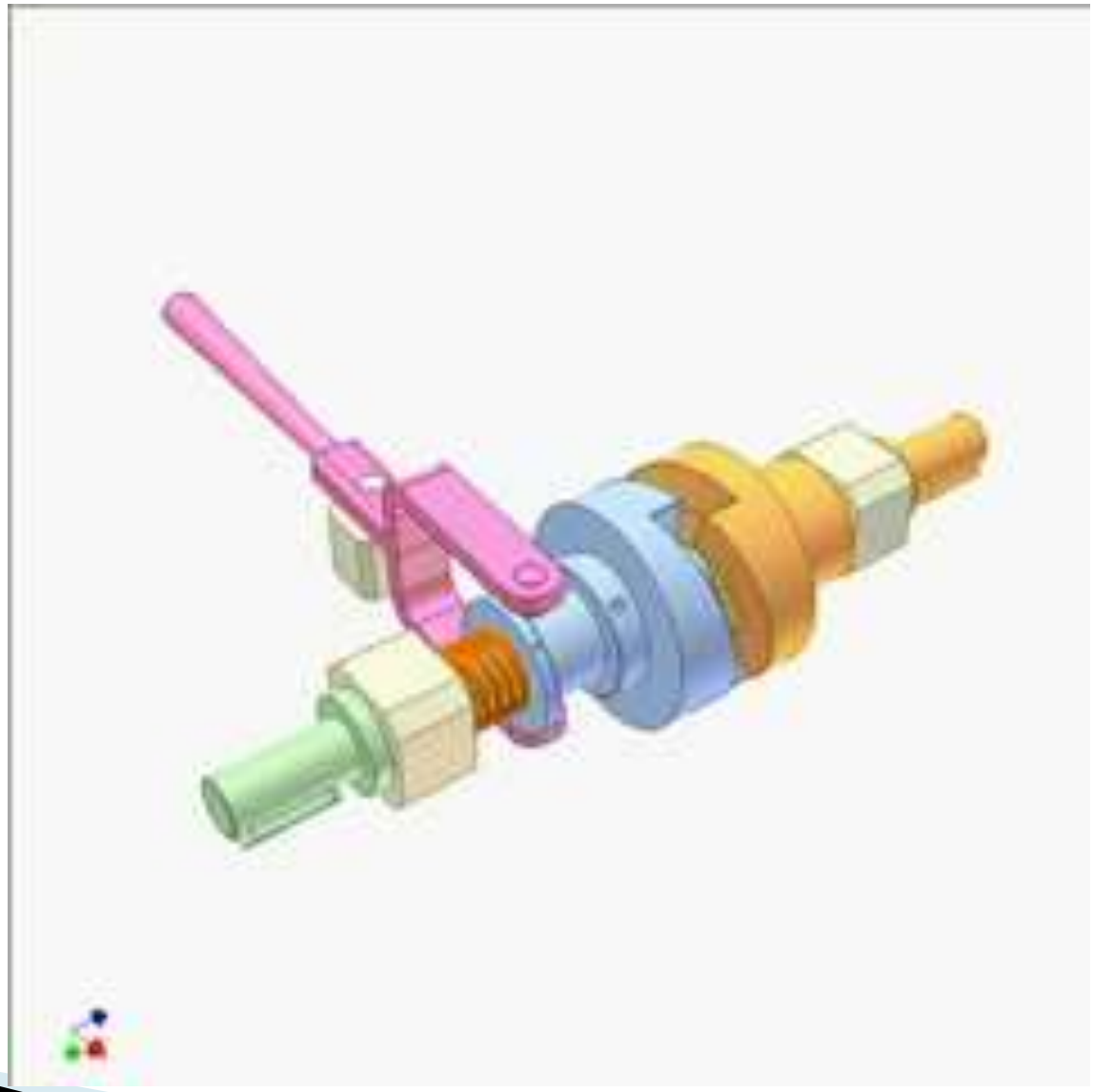
Centrifugal clutch is useful to connect two parts of a transmission after the driving part has attain a definite speed of the rotation.

The shoes are pull towards inward side by the spring members and the shoes are creating force outward side by the centrifugal force generate by the rotation of the driving shaft.

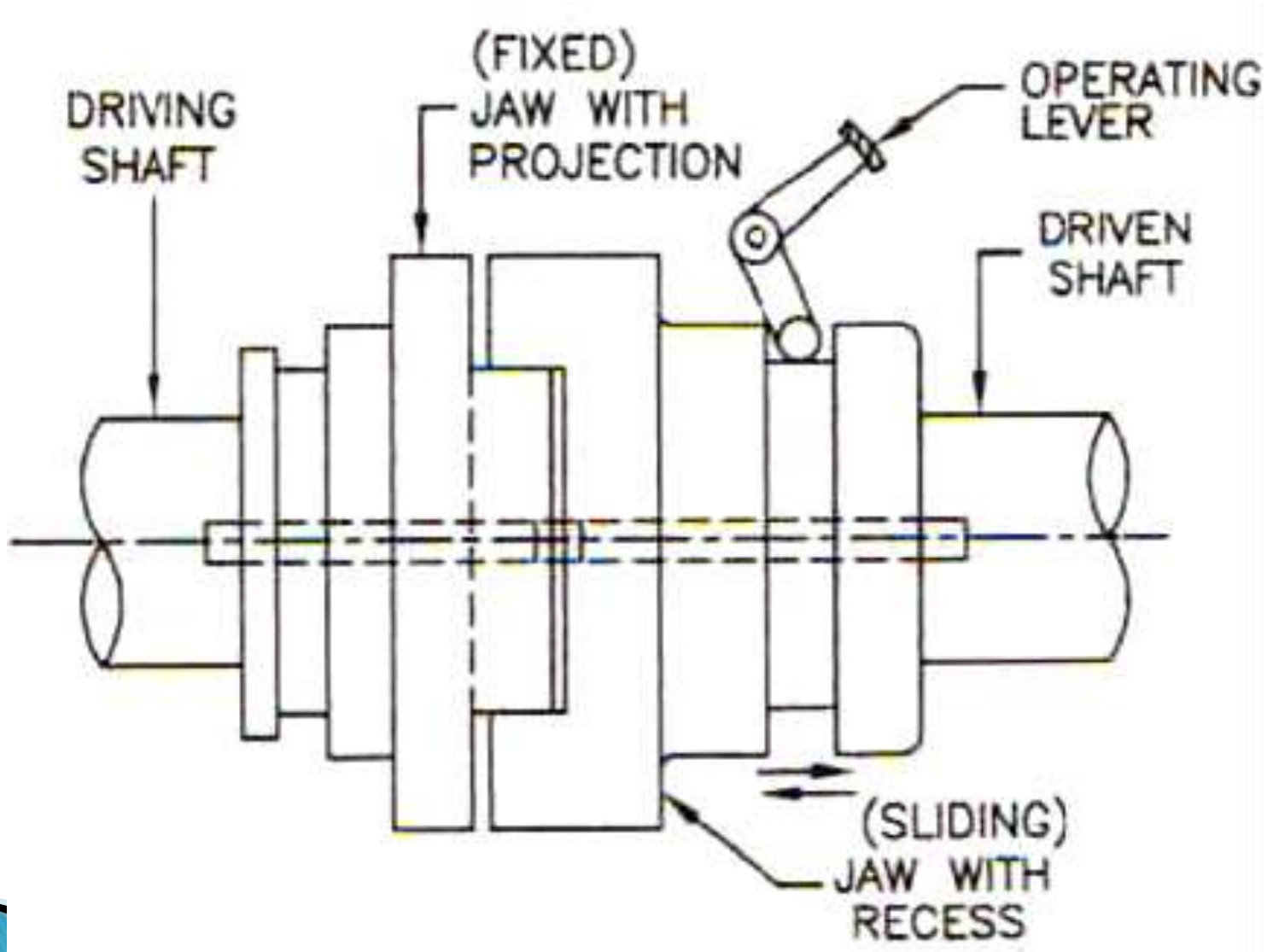
When the driving shaft attain certain speed, the centrifugal force on the shoes increase than the spring force exert by the spring members on to the shoes.

The shoes are engage with the inner surface of the cylindrical drum which is the driven member.

Jaw Clutch



Jaw Clutch


DRIVING SHAFT
(FIXED) JAW WITH PROJECTION
OPERATING LEVER
DRIVEN SHAFT
(SLIDING) JAW WITH RECESS

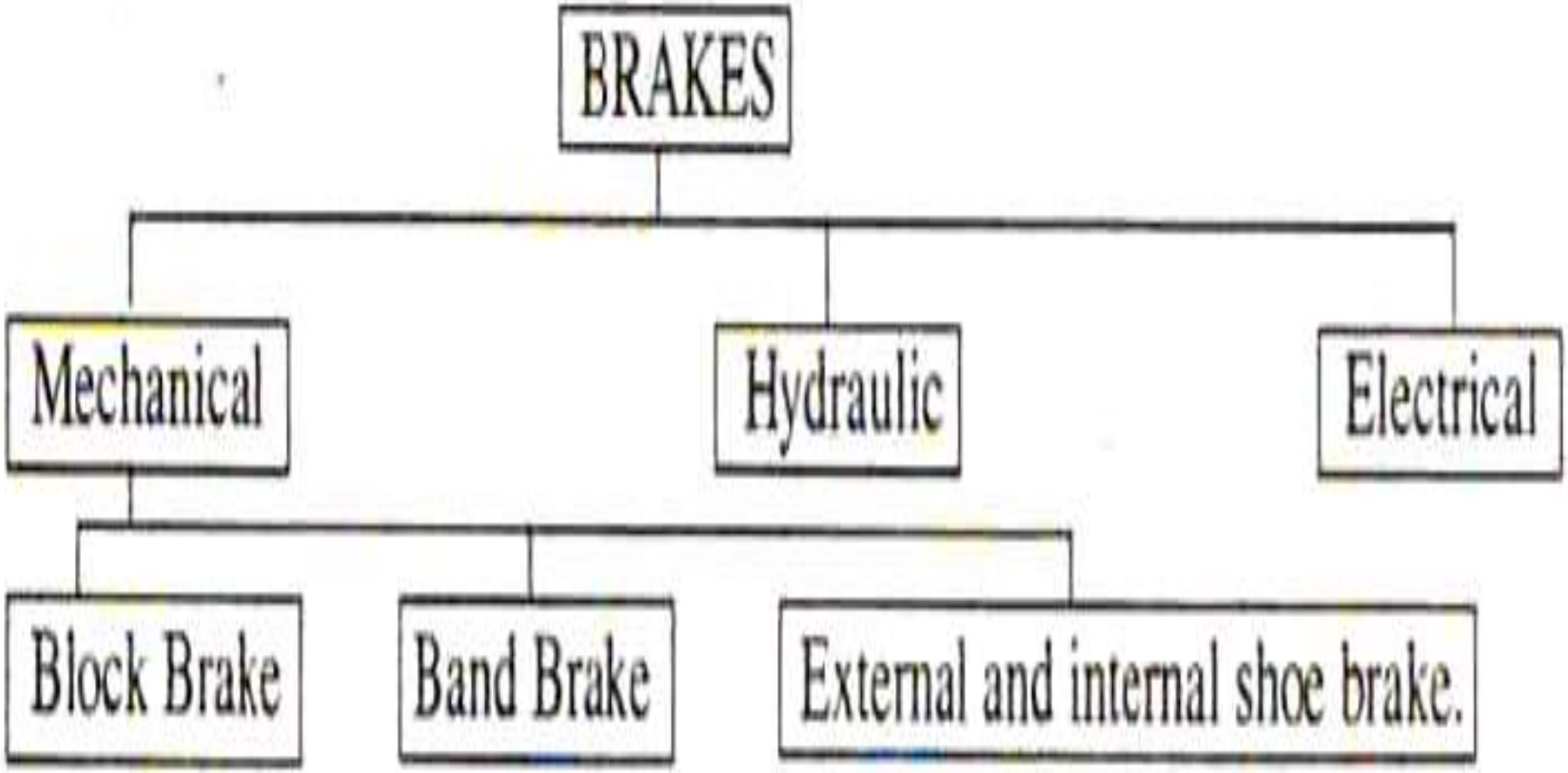
Toothed Clutch

Brake is a frictional device whose primary function is to control the motion of the machine member.

Brake is called as to bring the body in to the rest condition, a body which is in the motion or to slow it to down or to hold it in to state of the rest condition.

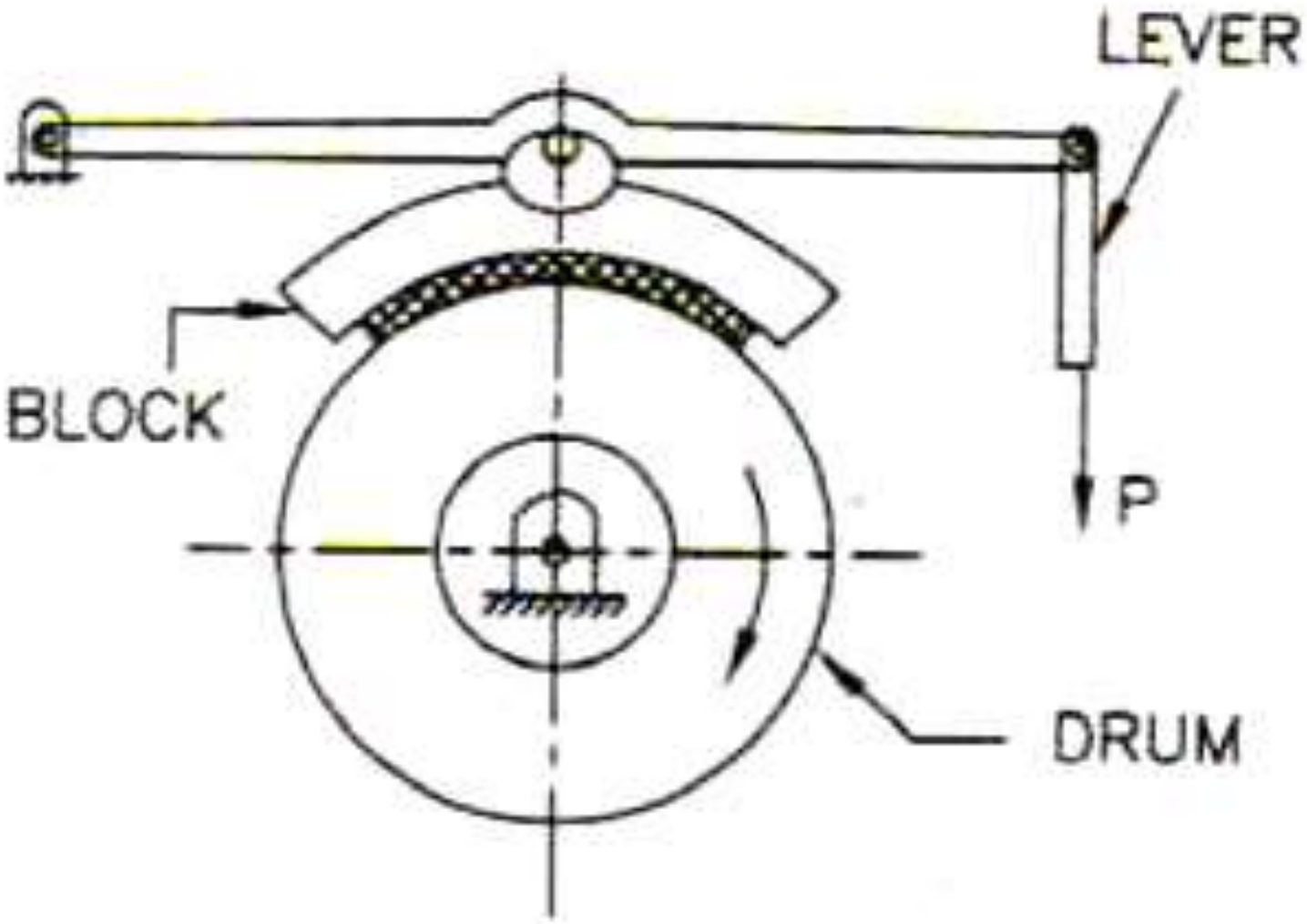
It is essential to absorb the kinetic energy of the moving body or the part or the potential energy of the object to be lower down by with the help of the hoist, elevators etc.

BRAKES

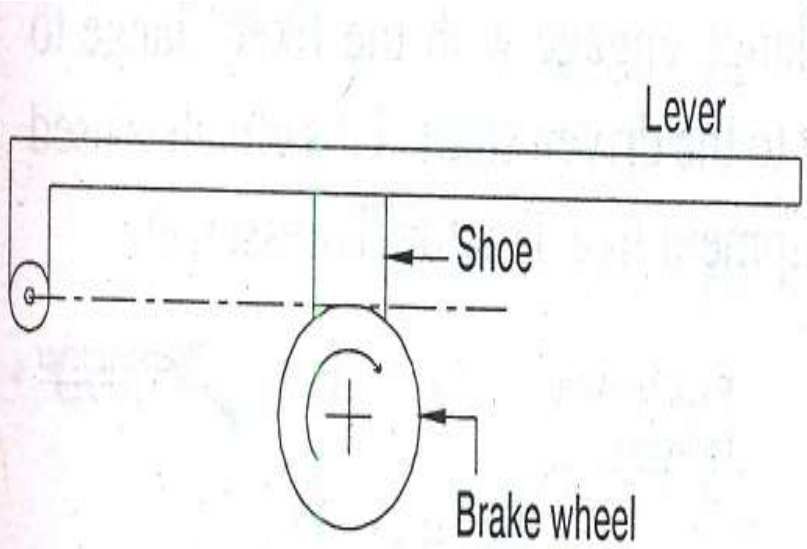

BRAKES
Mechanical
Hydraulic
Electrical
Block Brake
Band Brake
External and internal shoe brake.

Block Brake

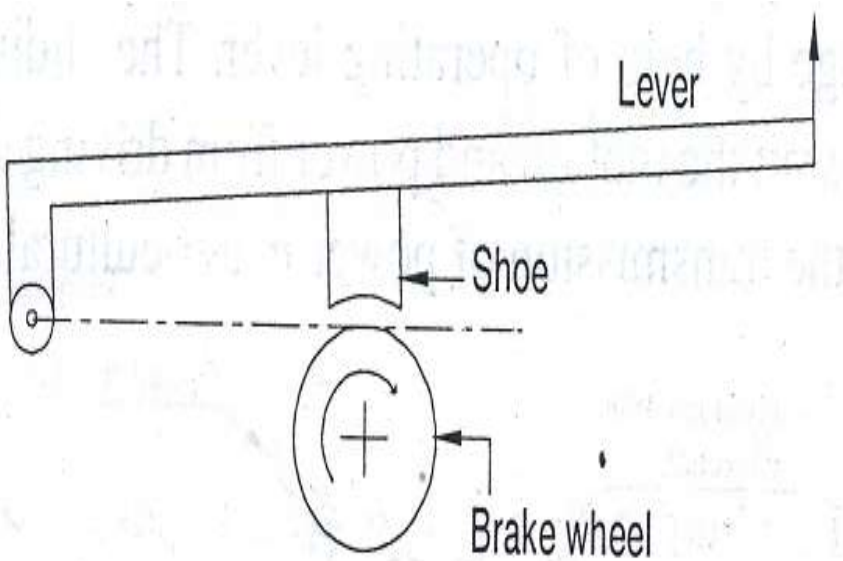
https://youtu.be/tLXRicfvQs8



Block Brake

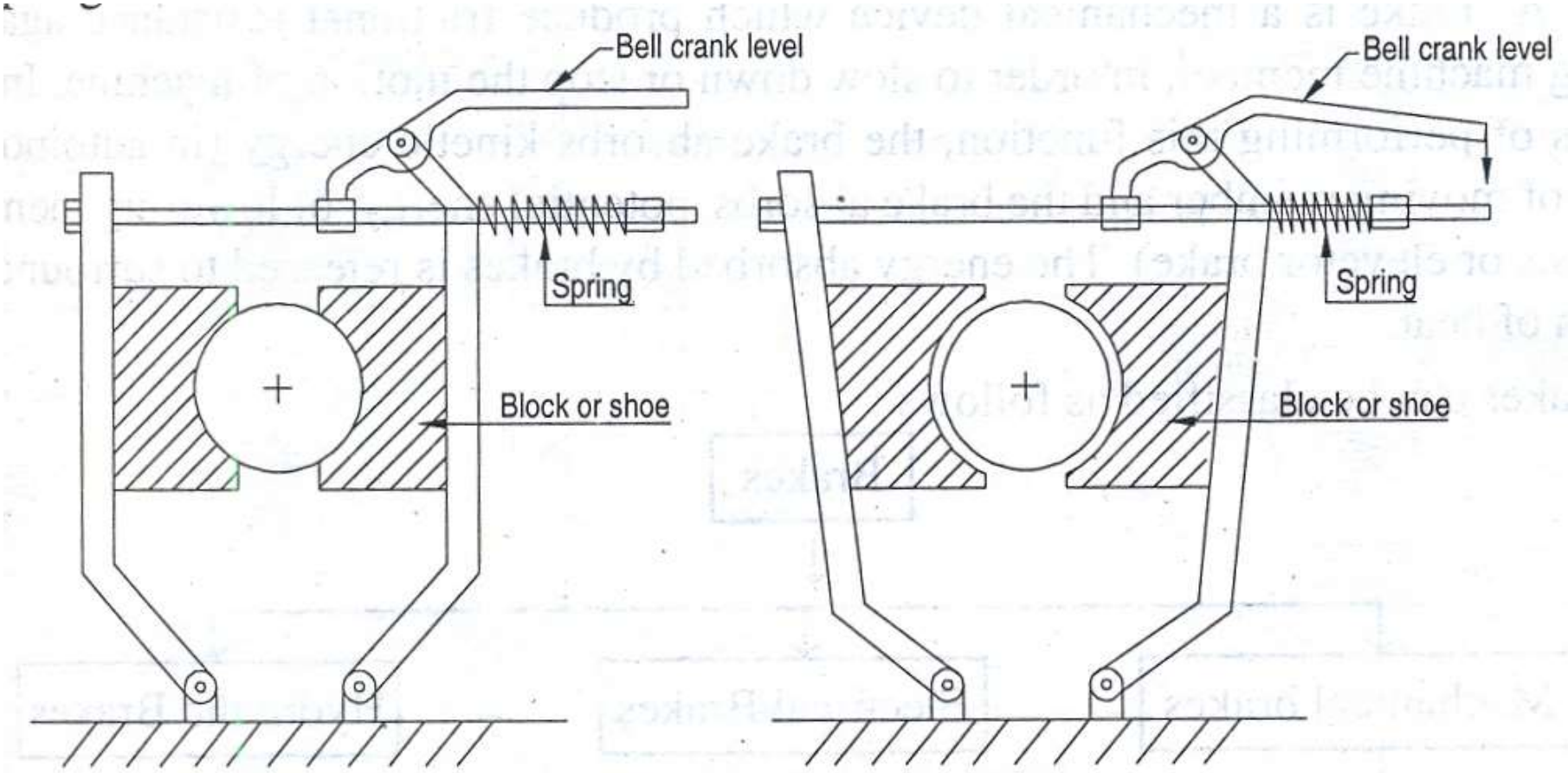


(a) brake in action



(b) brake not in action

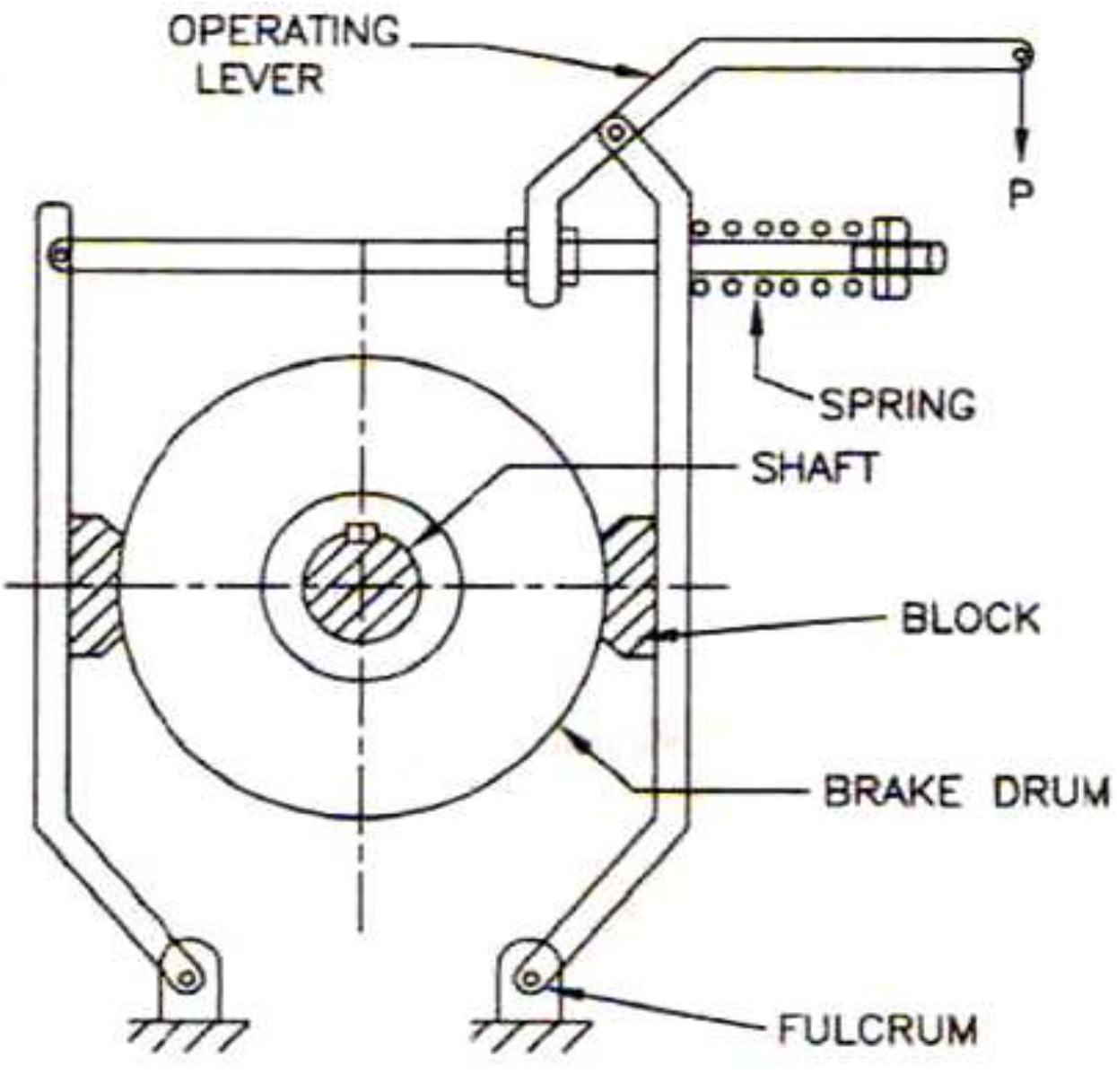
Block Brake



(a) Brake in engaged position

(b) Brake in disengaged position

Fig. 12.13 double shoe or block brake


OPERATING
LEVER
P
SPRING
SHAFT
BLOCK
BRAKE DRUM
FULCRUM

Block brake is one in which blocks are press against outside surface of the brake drum.

The brake drum is joining by keyway with the shaft member.

The double shoe brake is to be shown in the figure.

The spring pushes the upper ends of the brake arms together, and thus the braking action is applied in this way.

The force “P” is applying at the end of the operating lever by using a solenoid or by the mechanical force then breaking action is stop can be shown from diagram.

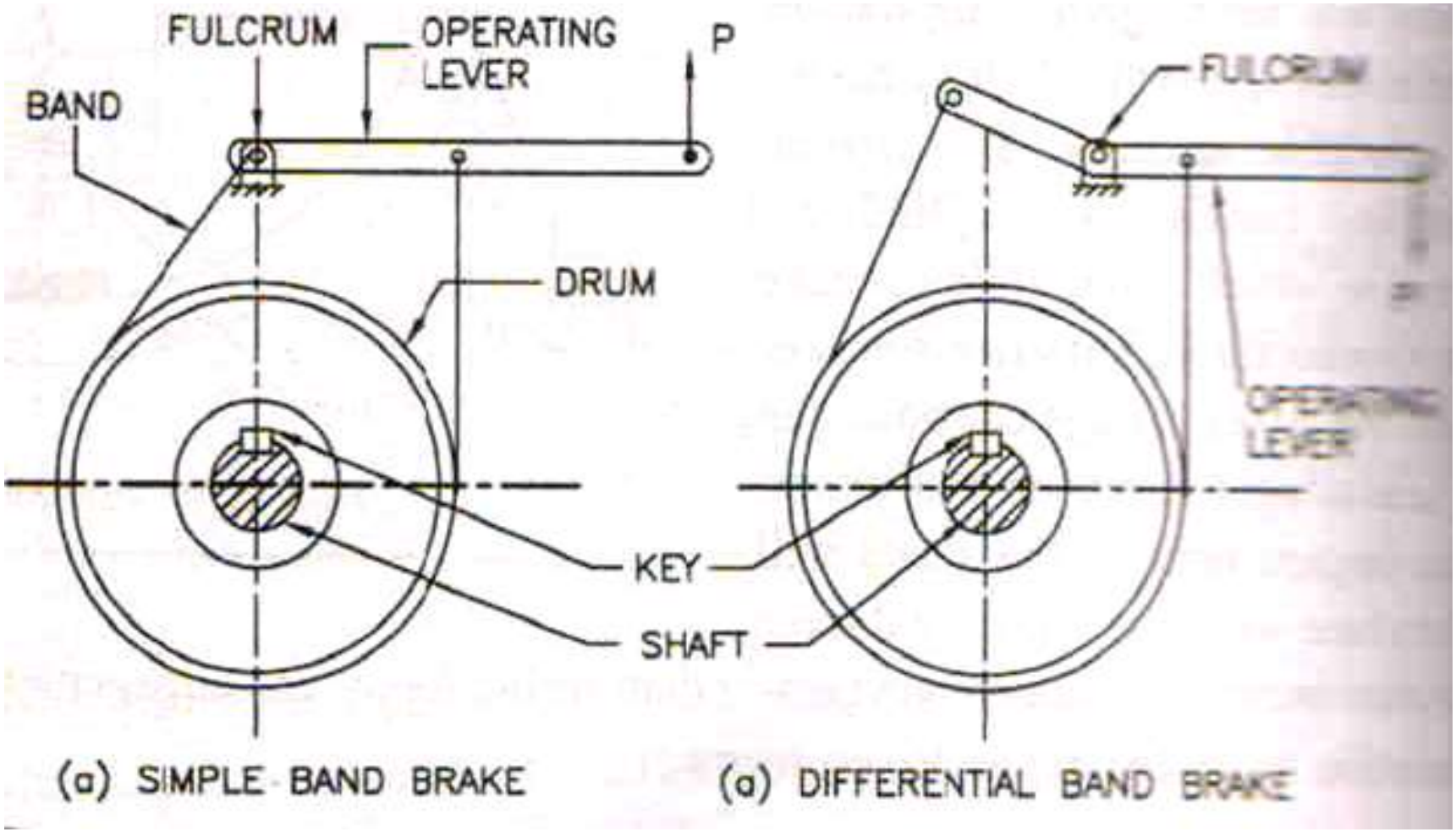
Due to this action or increasing the force at the end of operating lever the spring force reducing and drum will start to rotating, means blocks are move outside from break drum.

When the force P becomes to be zero, the brakes will get engage due to the spring force and braking action is apply.

Such kind of brake is frequently useful in hoisting machinery.

Band Brake

https://youtu.be/HIKRl-22rzE



Band brake is one type of break in which flexible steel Band line with the friction material embraces on to a portion of the circumference of the brake drum.

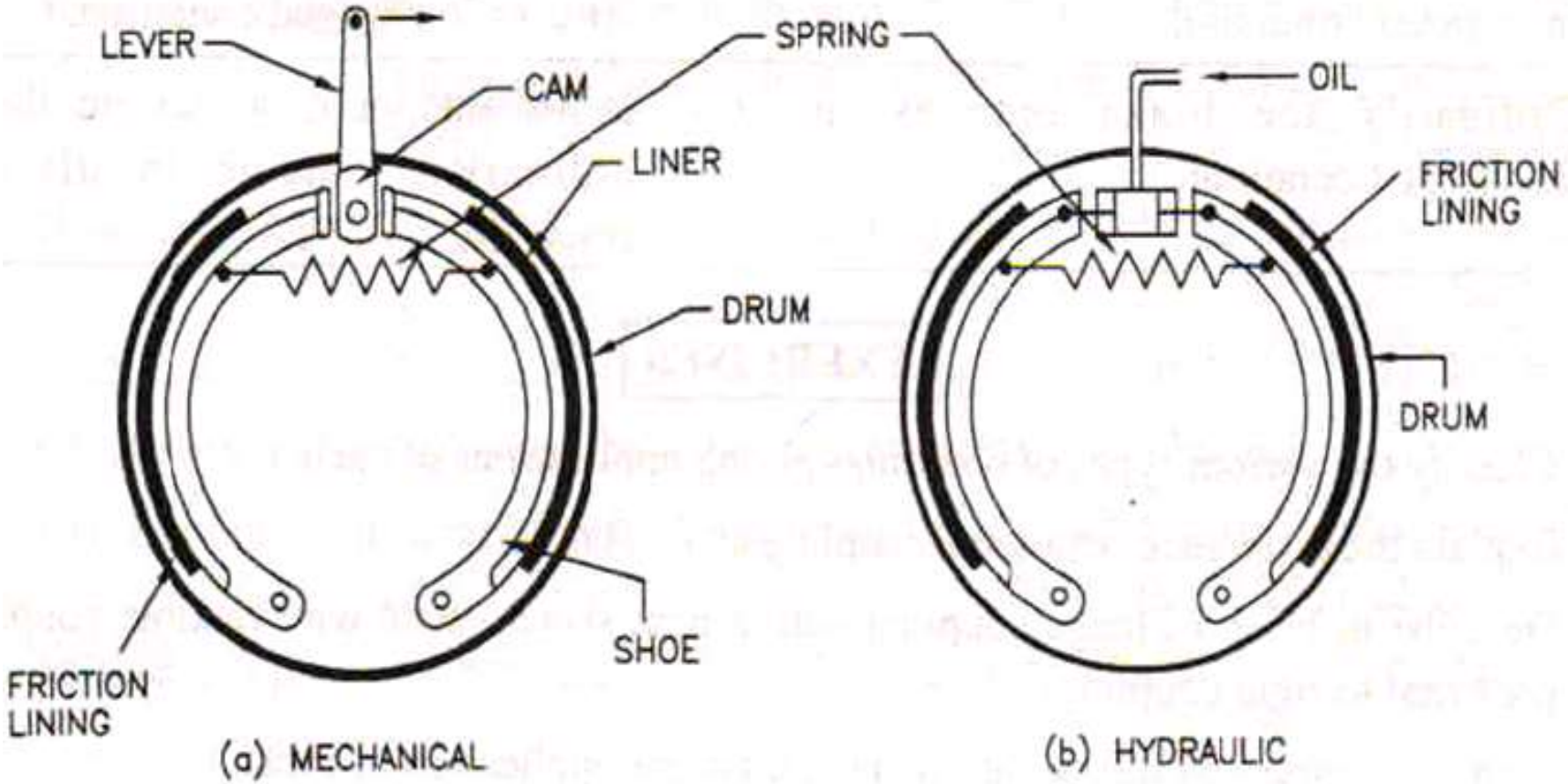
An actuating force of P is apply on to the operating lever, so that due to that steel band tight around the brake drum.

So that due to that action frictional force attach on to the steel band stop the motion of the rotating drum.

This type of brake is most widely useful in to the construction equipment as well as in the automobiles sectors as a hand brake.

Internal Expanding Shoe Brake

https://youtu.be/EIW1w4BH6SA



Internal expanding shoe brake is to be shown in the figure.

Both shoe is pivot at both side of the end about fix fulcrum.

Both shoe other end connect towards nearest to the face of a cam.

The outer surface of both the shoe are line with the friction lining material.

Cam is to be operate by some external force action.

Due to that cam mechanism action expanding the shoes and the braking action is applying in this way.

By due to this action by the cam mechanism expanding the shoes, this will be press both the shoes, on outer or external side against the inner rim of the brake drum, to brake the torsional moment of the drum.

When the cam is not to operate, the shoes come to its original off position by the spring force.

Shoe brake is compact type and its working elements are enclosing and protect from the dirt by the drum.

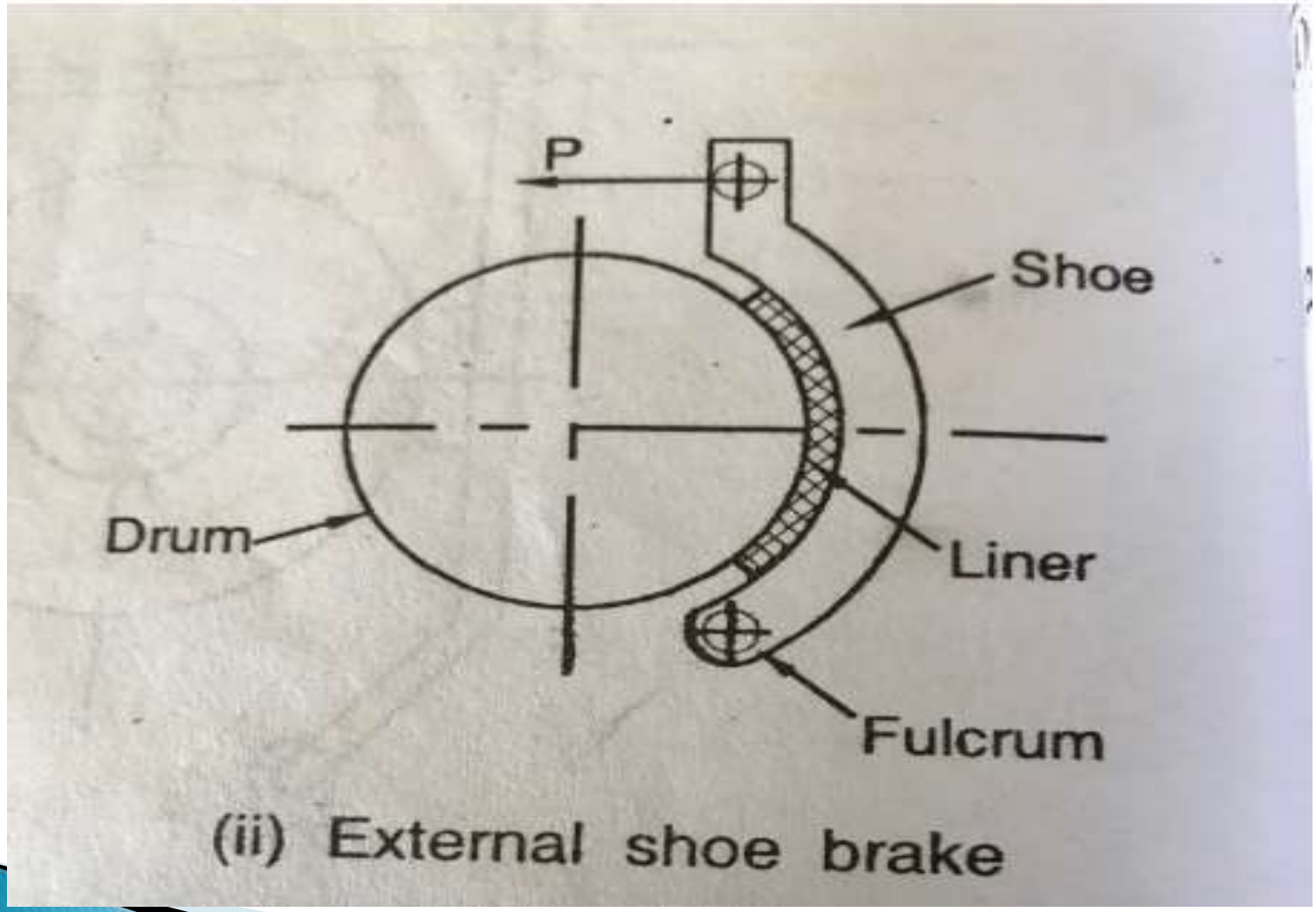
Shoe brake is universally adopt for the automobiles sector.

Internal shoe brake is shown in the figure which work on inside surface of the break drum.

When the force P is apply with some external jerk on cam, which is apply on both the shoes, the liner presses upon the drum and brakes the wheels due to the friction material place in the break liner.

When the force P = 0 is apply on both the shoes, a spring bring back the shoes member to its original position.

External Expanding Shoe Brake



(ii) External shoe brake

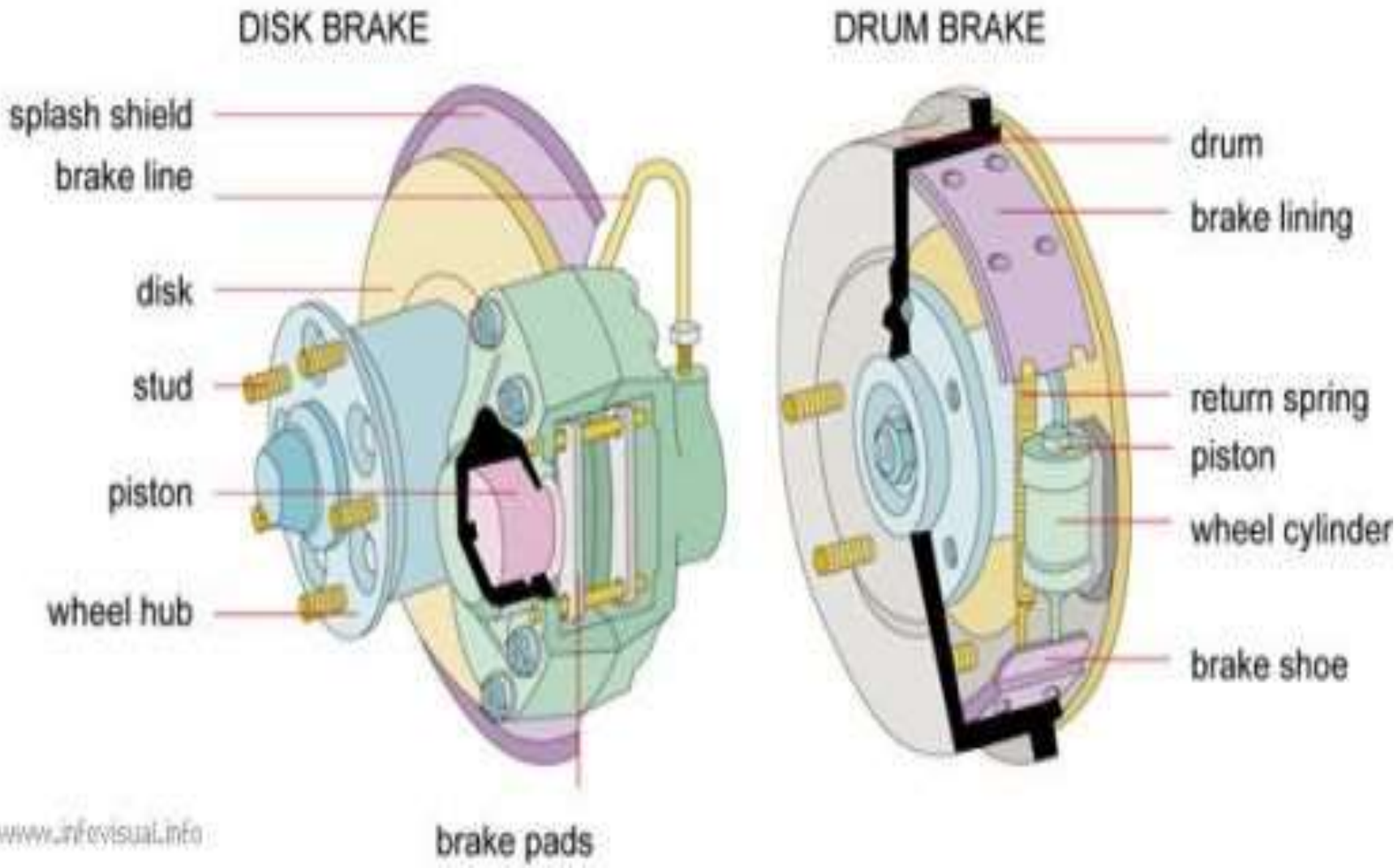
External shoe brake is shown in the figure which work on outside surface of the wheel drum.

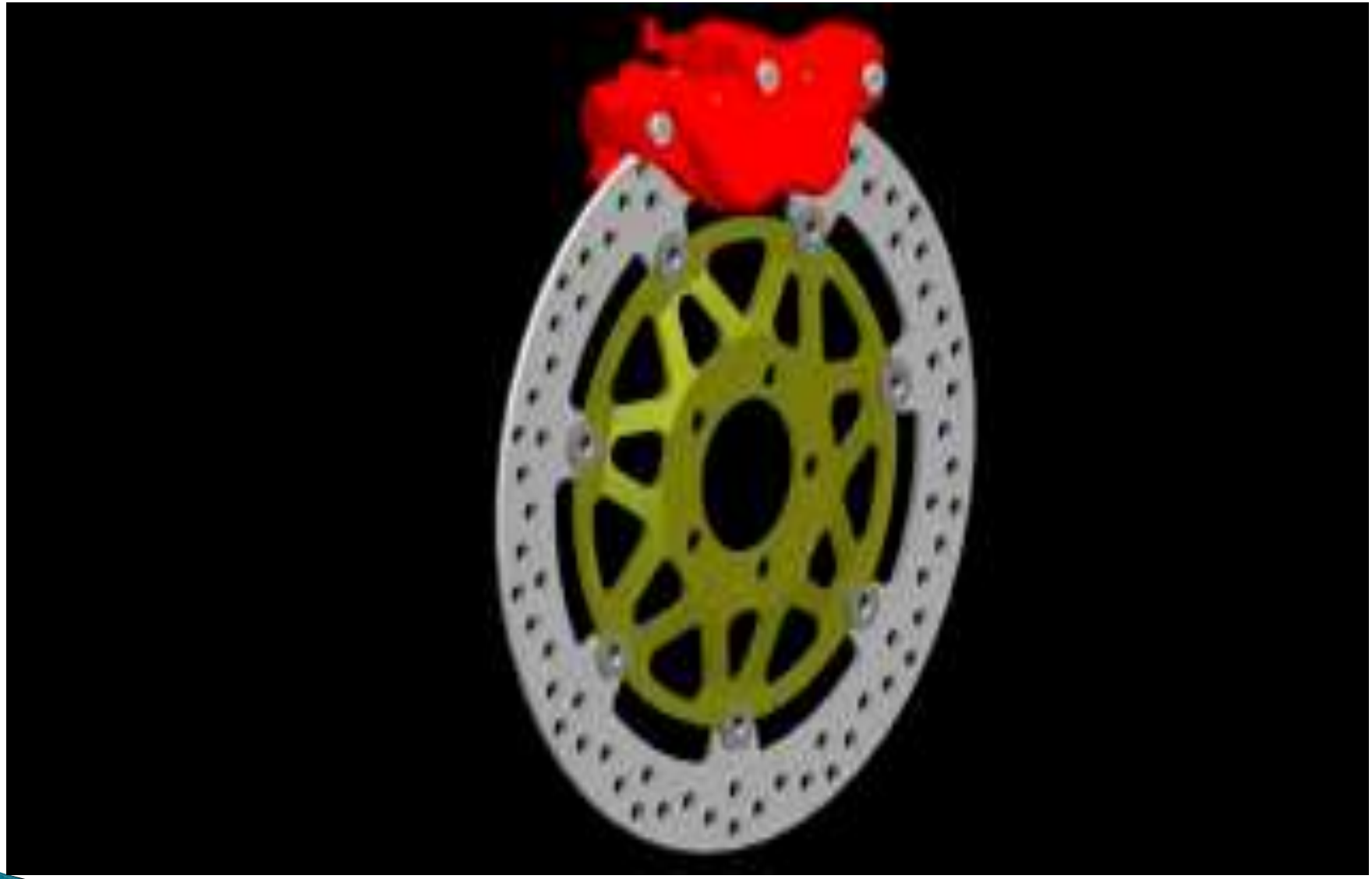
The shoe is pull away by the spring force.

Force of P presses liner on to the drum.

Due to the friction force creating between liner and the drum, the speed of the drum is reducing.

TYPES OF BRAKES





Difference Between Brake and Clutch

Brake	Clutch
(1) Used to slow down or stop the motion of a moving body.	(1) Used to transmit the motion of moving body to another body which may be moving or stationary.
(2) During braking, the energy of the moving members is lost in friction.	(2) During working of clutches, the energy is not lost in friction except in case of slipping of clutch.
(3) In a hoists, the brake normally remains in engaged condition,	(3) In an automobile, the clutch normally remains in engaged condition.
(4) Ordinarily the brake remains in disengaged condition.	(4) In machine tools, presses etc. the clutch ordinarily remains in disengaged condition.