Mechanical Transmission of power

- Belt
- Rope
- Chain
- Toothed gearing
- Shaft couplings and clutches
- Hydraulic pressure

MECHANICAL TRANSMISSION OF POWER

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- Couplings
- Clutches
- Hydraulic coupling

Shaft Coupling and clutches

Shaft may be a prime mover or directly connected to the driver shaft or pulley by belt, rope, chain etc.

Shaft couplings are used to join two in-line rotating shafts, allowing torque to be transmitted from one shaft to the other.

Shaft couplings may be flexible or rigid, torque limiting or spacer type.

Clutches allow shafts to be connected and disconnected easily.

Clutch Couplings Used for intermittent transmission of torque from one fully supported shaft to another. Torque is linear in response to air pressure applied and the shafts are disconnected when air is exhausted

Torque Limiter Couplings Used to continuously transmit torque from one fully supported shaft to another. Slip when the input torque is exceeded to provide overload protection

Rigid Clutch Couplings and Torque Limiter Couplings
Connects two shafts that are in precise angular and parallel alignment

Flexible Clutch Couplings and Torque Limiter Couplings
Connects two shafts that have a slight amount of angular misalignment and/or parallel offset

A coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. Couplings do not normally allow disconnection of shafts during operation, however there are torque limiting couplings which can slip or disconnect when some torque limit is exceeded.

The primary purpose of couplings is to join two pieces of rotating equipment while permitting some degree of misalignment or end movement or both. By careful selection, installation and maintenance of couplings, substantial savings can be made in reduced maintenance costs and downtime.

A rigid coupling is a unit of hardware used to join two shafts within a motor or mechanical system.

It may be used to connect two separate systems, such as a motor and a generator, or to repair a connection within a single system.

A rigid coupling may also be added between shafts to reduce shock and wear at the point where the shafts meet.

Flexible couplings are used to transmit torque from one shaft to another when the two shafts are slightly misaligned.

It can also be used for vibration damping or noise reduction.

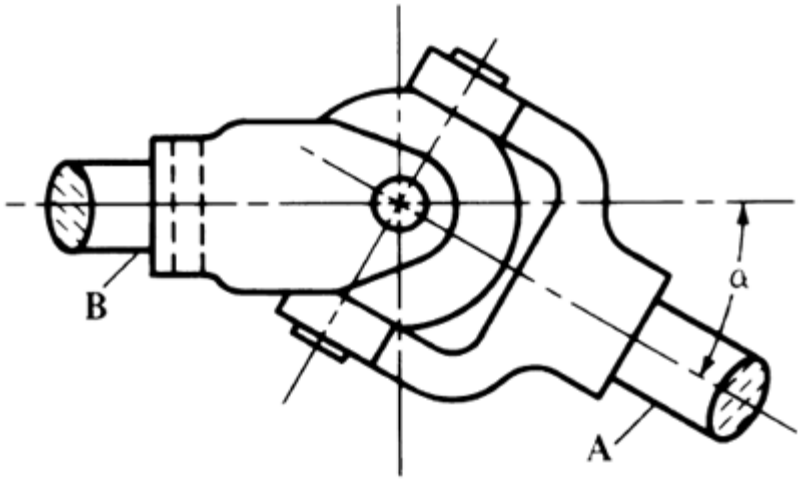
Flexible couplings are designed to transmit torque while permitting some radial, axial, and angular misalignment.

Flexible couplings can accommodate angular misalignment up to a few degrees and some parallel misalignment.

Flexible Couplings.—Shafts that are out of alignment (*misalignment*) laterally or angularly can be connected by any of several designs of *flexible couplings*. Such couplings also permit some degree of axial movement in one or both shafts. Some couplings use disks or diaphragms to transmit the torque. Another simple form of flexible coupling consists of two flanges connected by links or endless belts made of leather or other strong, pliable material. Alternatively, the flanges may have projections that engage spacers of molded rubber or other flexible materials that accommodate uneven motion between the shafts. More highly developed flexible couplings use toothed flanges engaged by correspondingly toothed elements, permitting relative movement.

These *flexible couplings* require lubrication unless one or more of the elements is made of a self-lubricating material. Other couplings use diaphragms or bellows that can flex to accommodate relative movement between the shafts. The Universal Joint.—This form of coupling, originally known as a *Cardan or Hooke's coupling*, is used for connecting two shafts the axes of which are not in line with each other, but which merely intersect at a point. There are many different designs of universal joints or couplings, which are based on the principle embodied in the original design.

Torque Limiter Coupling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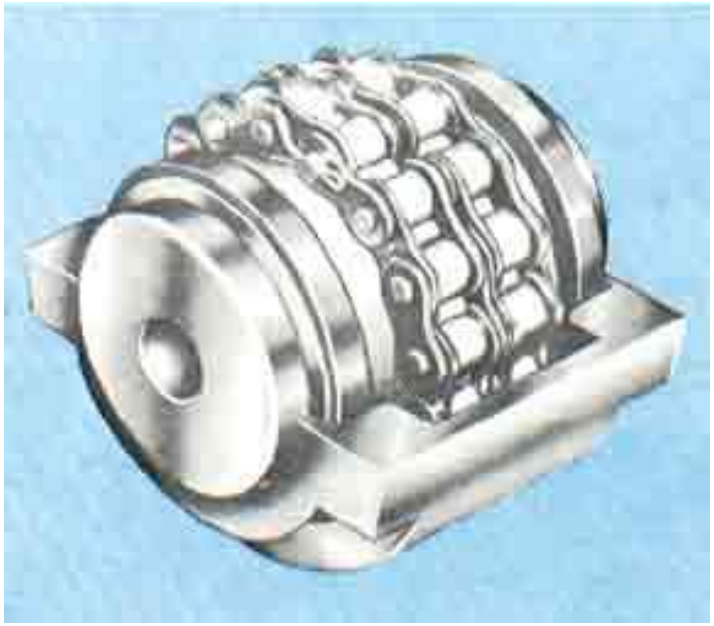
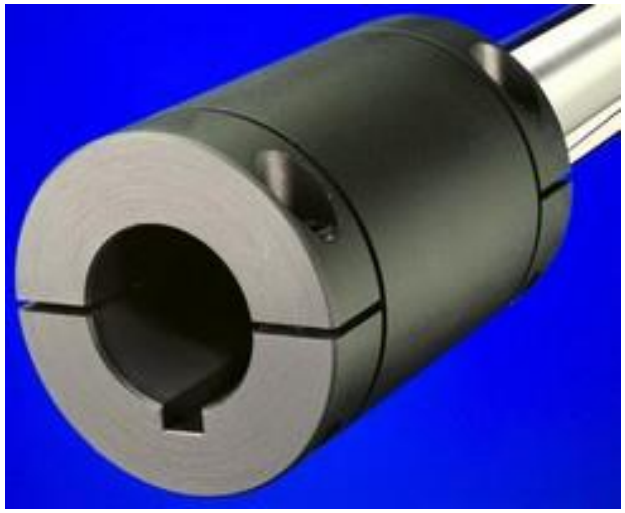


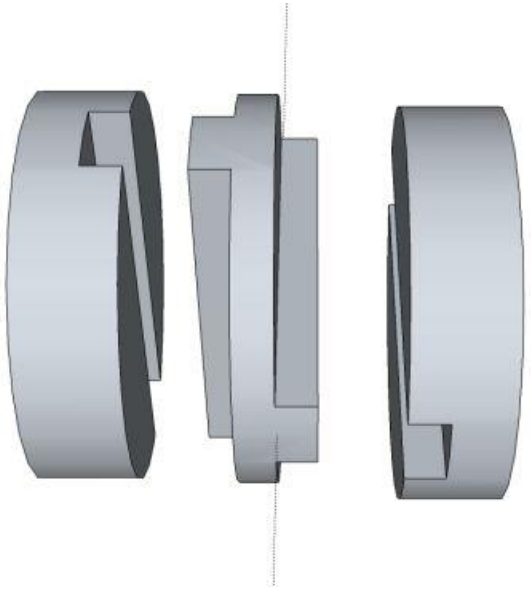


Sleeve Coupling

Clamp Coupling

Flange Coupling

Oldham Coupling



Universal Joints Coupling

N-FLEX

Coupling with graded cast iron hubs and a set of H-shaped highly resilient blocks witch allows for parallel, angular and axial misalignment and absorbs torsional vibrations. Reduces vibration and noise from severe torque fluctuations.
N-Flex spacer couplings are very suitable for *Back Pullout Pumps*, because the impeller can be disassembled without disturbing motor and pump from the base frame.

JAW-FLEX

Unique wrap around Nitrile rubber connecting element, the Snap Wrap coupling eliminates the need for dismantling the connected equipment, and hence reduces downtime for maintenance. Combined with a range of pre-bored hubs, a modular hub design and optionally spacer elements, the Snap Wrap coupling is unsurpassed for quality, flexibility and quick installation and easy maintenance.

Hydraulic coupling

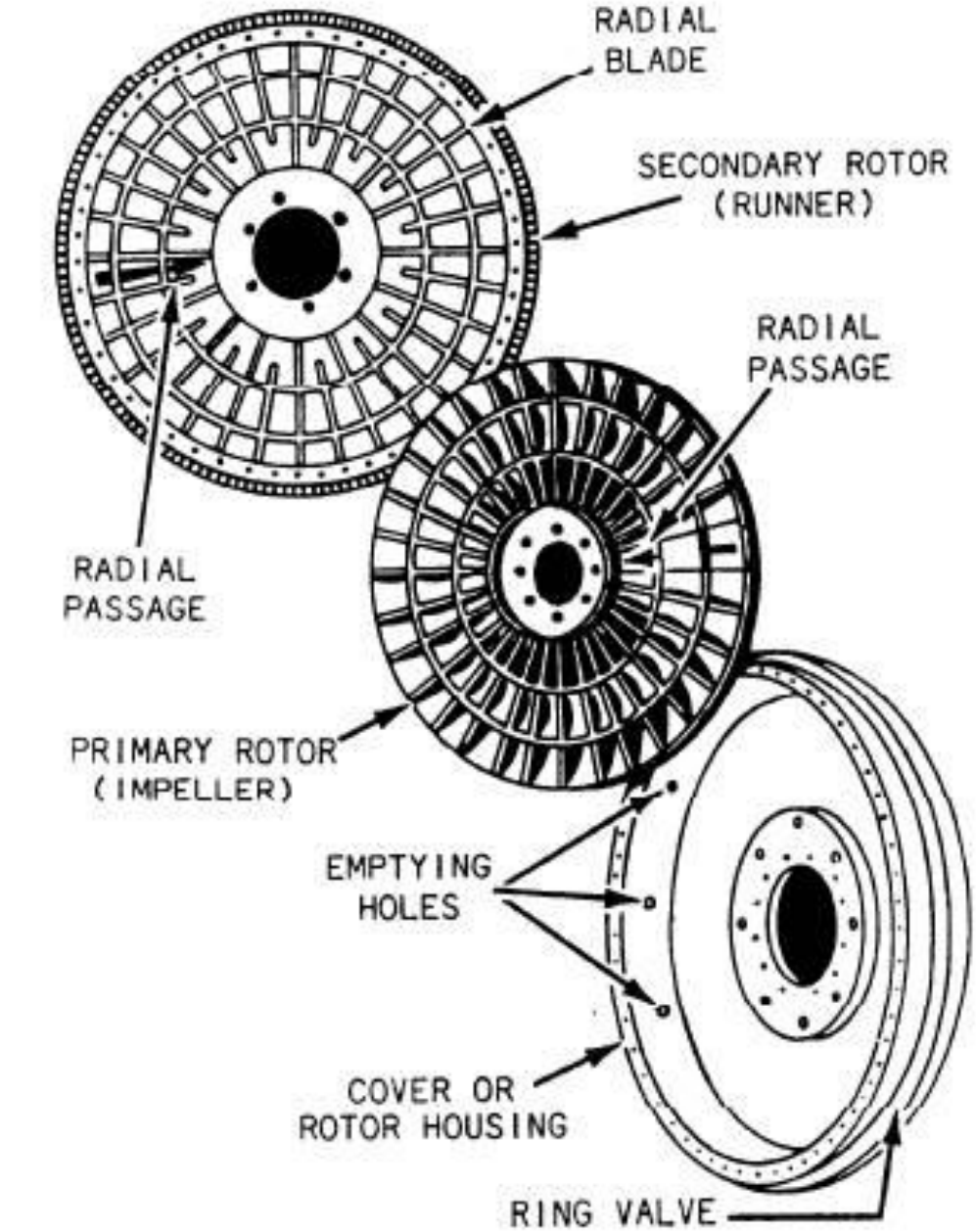
Fluid coupling is known as hydraulic coupling and the drive arrangement with the help of a fluid coupling is known as fluid drive. It uses the fluid to transmit the power to the machinery.

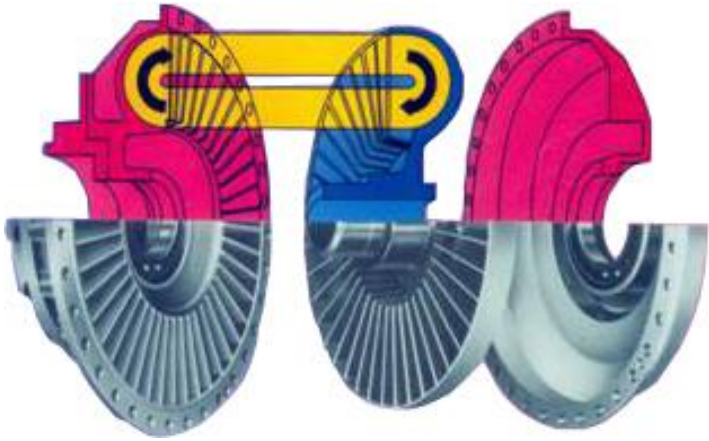
Used in mechanical industries
Mining (belt conveyor and locomotive drives)

A fluid coupling is a hydrodynamic device used to transmit rotating mechanical power. It has been used in automobile transmissions as an alternative to a mechanical clutch. It also has widespread application in marine and industrial machine drives, where variable speed operation and/or controlled start-up without shock loading of the power transmission system is essential

It consists mainly two components

- An impeller (a disc fitted with radial vanes) which is fitted to and rotated by the driving shaft
- A runner of similar construction which is secured to the driven shaft of the gear box forming part of the driven machine. It is also called turbine.


RADIAL
BLADE
SECONDARY ROTOR
(RUNNER)
RADIAL
PASSAGE
RADIAL
PASSAGE
PRIMARY ROTOR
(IMPELLER)
EMPTYING
HOLES
COVER OR
ROTOR HOUSING
RING VALVE



Stall speed

An important characteristic of a fluid coupling is its stall speed. The stall speed is defined as the highest speed at which the pump can turn when the output turbine is locked and maximum input power is applied. Under stall conditions all of the engine's power would be dissipated in the fluid coupling as heat, possibly leading to damage.

Slip

A fluid coupling cannot develop output torque when the input and output angular velocities are identical. Hence a fluid coupling cannot achieve 100 percent power transmission efficiency. Due to slippage that will occur in any fluid coupling under load, some power will always be lost in fluid friction and turbulence, and dissipated as heat.

Advantage of hydraulic couplings

- It gives perfect smooth and progressive drive
- Slip occurs in case of overloaded and there is no danger of over heating.
- No shock is imparted to the gear box
- Wear-free power transmission because of absence of mechanical connection between the input and output elements.
- No-load start-up of motor irrespective of machine load. Motor peak torque utilized for machine acceleration.
- Automatic unloading of prime mover in case of any sustained overload, by blowing-off of fusible plug on coupling, thus draining out oil.
- Easy start-up with gradual acceleration of the driven component
- The drive motor is protected against overloads
- rotational vibrations are dampened

Clutches

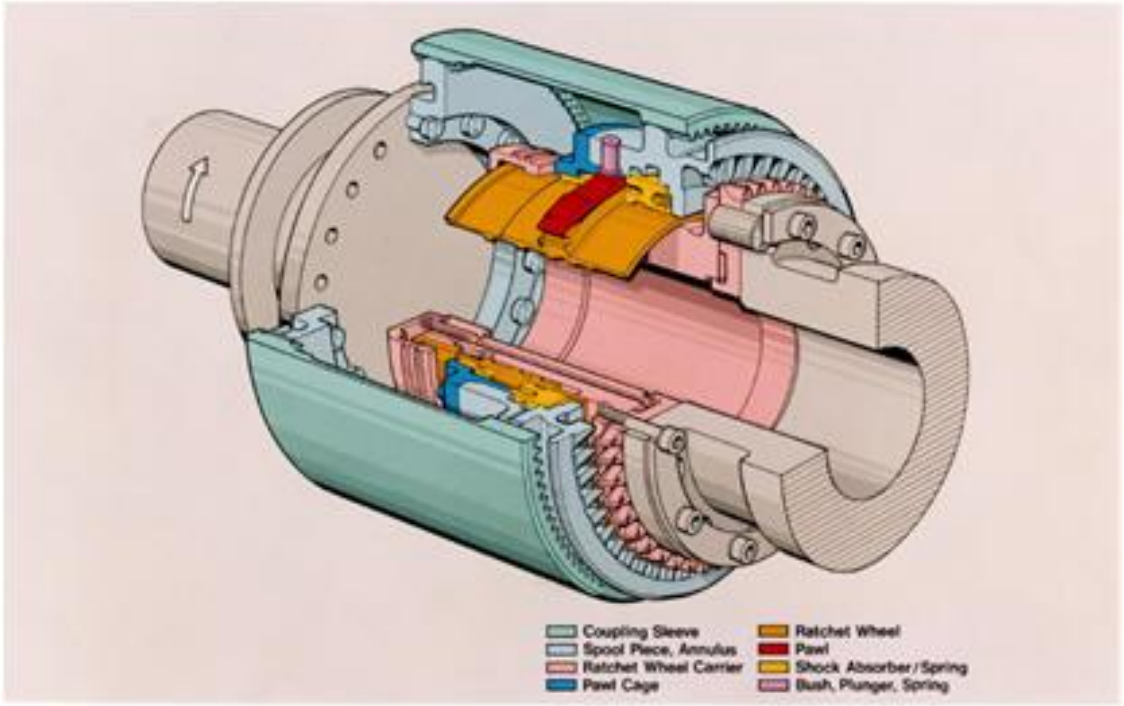
It is a device by which two shafts turning on the same axis, can be connected and disconnected.

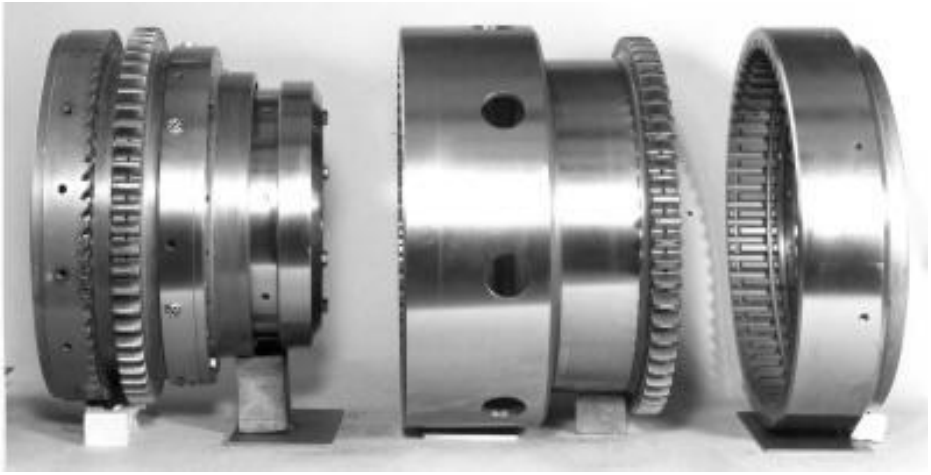
- A direct rope haulage
- Main and tail rope haulage
- Endless rope haulage
- Coal cutting machine

A clutch is a mechanical device which provides for the transmission of power (and therefore usually motion) from one component (the driving member) to another (the driven member)

Clutches are used
Transmission of power or motion needs to be controlled either in amount or over time (e.g. electric screwdrivers limit how much torque is transmitted through use of a clutch; clutches control whether automobiles transmit engine power to the wheels)

In the simplest application clutches are employed in devices which have two rotating shafts. In these devices one shaft is typically attached to a motor or other power unit (the driving member) while the other shaft (the driven member) provides output power for work to be done. In a drill for instance, one shaft is driven by a motor and the other drives a drill chuck. The clutch connects the two shafts so that they may be locked together and spin at the same speed (engaged), locked together but spinning at different speeds (slipping), or unlocked and spinning at different speeds (disengaged)


Coupling Sleeve
Spool Piece, Annulus
Ratchet Wheel Carrier
Pawl Cage
Ratchet Wheel
Pawl
Shock Absorber/Spring
Bush, Plunger, Spring



Design of clutch

Whether of not it is to be engaged while running and whether or not slipping can be permitted

- friction clutches
- Claw clutches (dog clutch or jaw clutch)