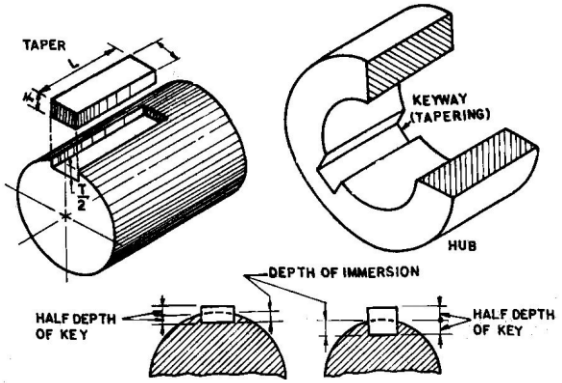
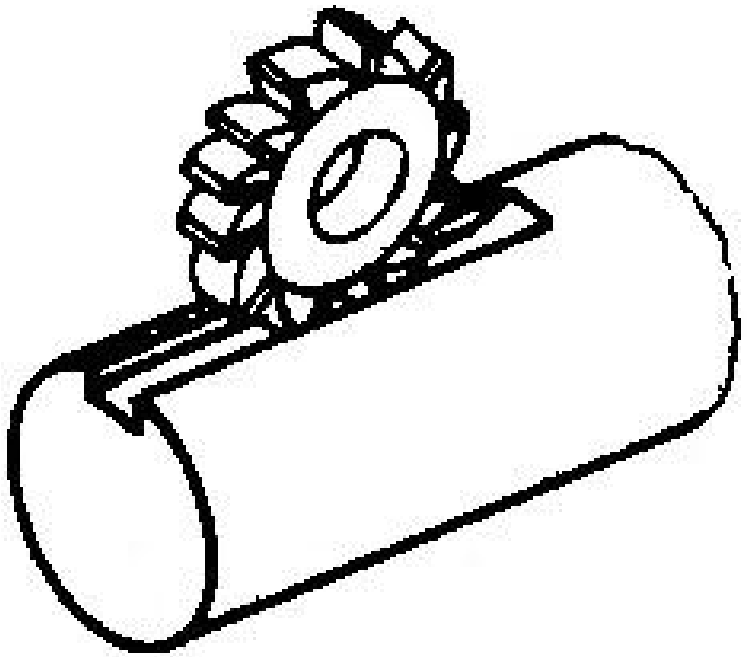
Keys



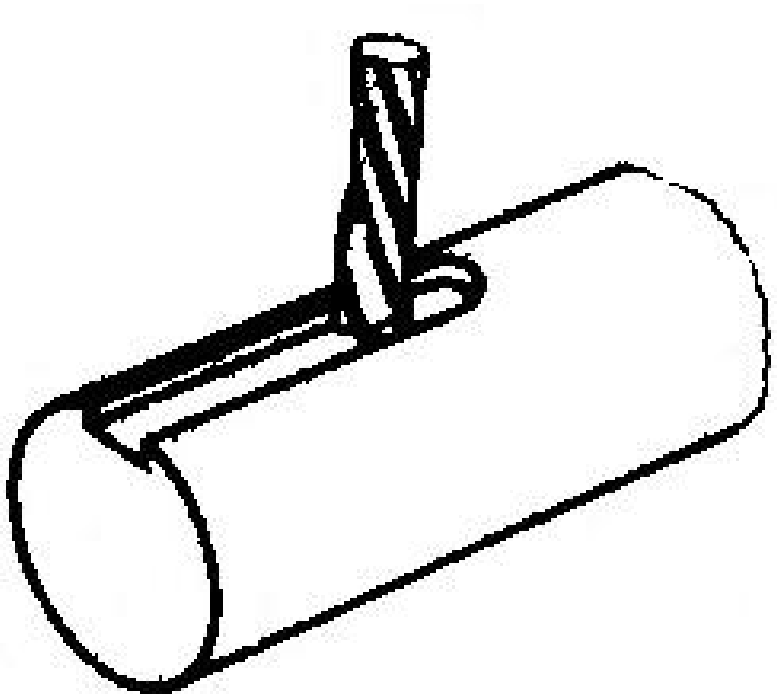
- A key is the piece inserted in an axial direction between a shaft and hub of the mounted machine element such as pulley or gear etc.,
- to prevent relative rotation….

  may allow sliding movement along the shaft if required.
- Keys are temporary fastening and are always made of mild steel because they are subjected to shearing and compressive stresses caused by the torque they transmit.
- a keyway is the groove cut in the shaft or hub to accommodate a key. Key ways can be milled horizontally or vertically .

Keyways milled



horizontally



vertically

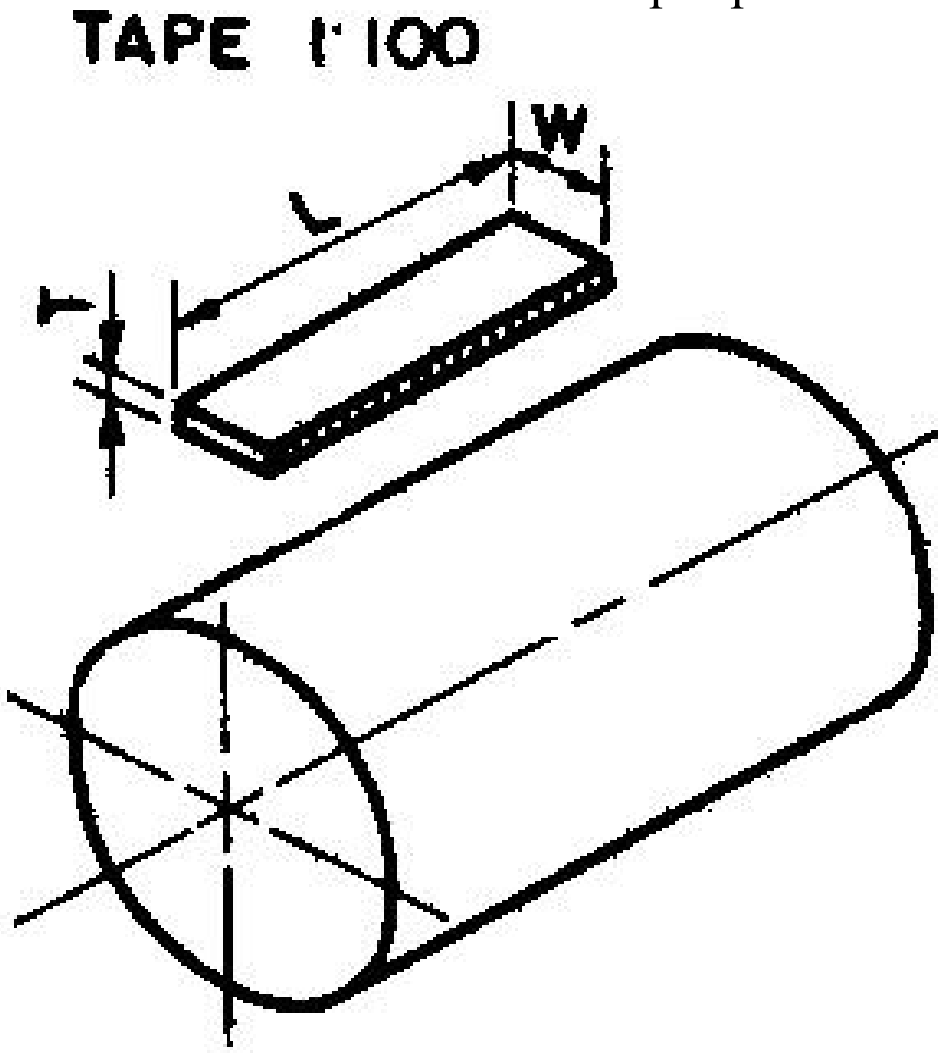
Classification of keys

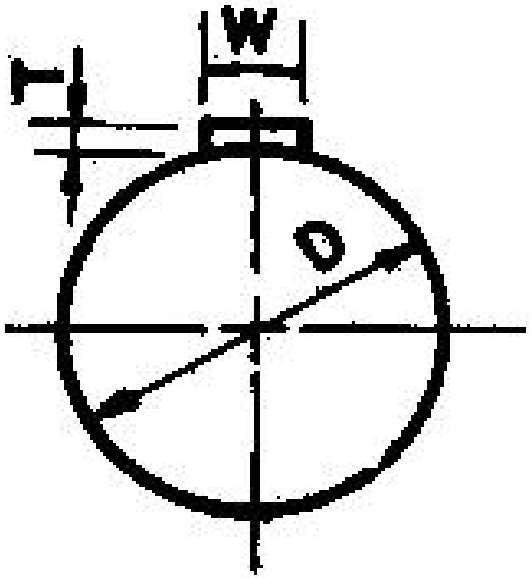
- Saddle keys
  - » Hollow saddle key
  - » Flat saddle key
- Sunk keys
  - » Taper sunk keys
  - » Parallel sunk keys
  - » Feather keys
  - – Woodruff key (adjustable key)
- Round keys
  - » Parallel pin
  - » Taper pin

Hollow saddle key

–this key has curved underside so that it can be placed on the curved surface of the shaft. The keyway is cut in the mating piece (hub) only.

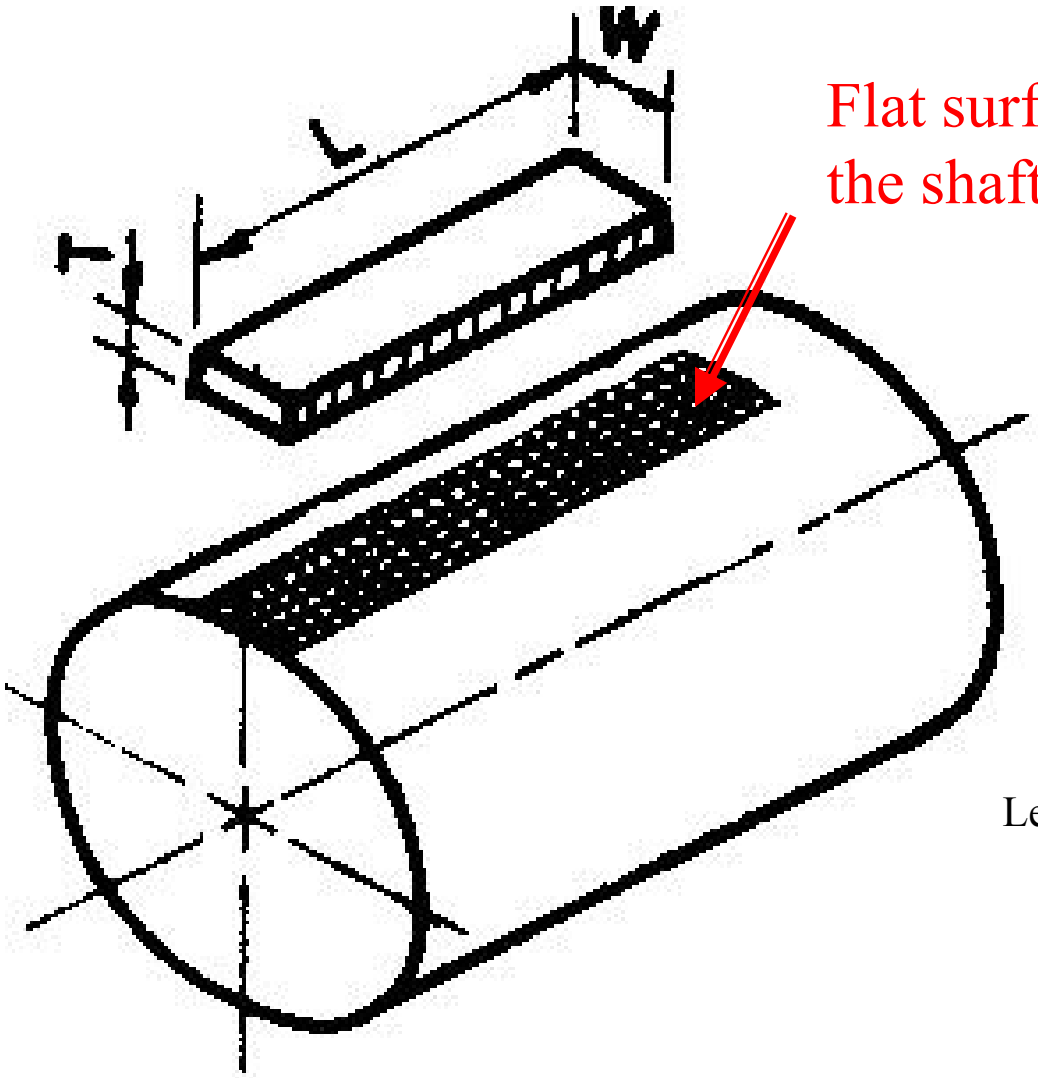
Saddle key are taper keys and are sunk into the hub only
Taper prevents axial movement along the shaft



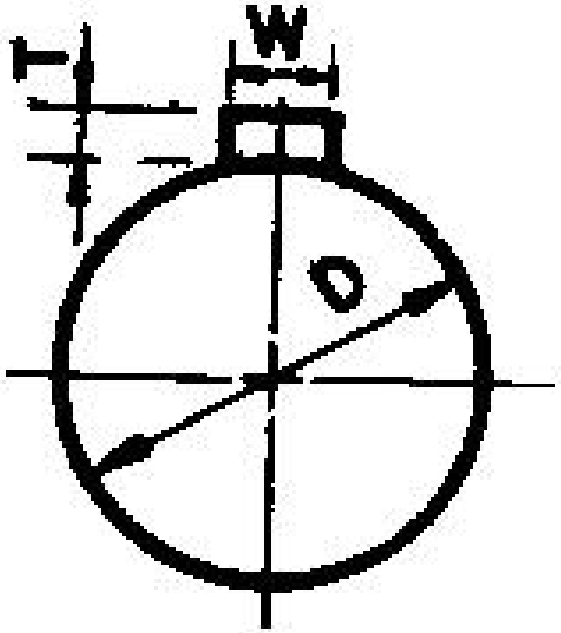


Saddle key is suitable for light duty, since they rely on a friction drive alone and are liable to slip on the shaft under load

Flat saddle key



Flat surface on the shaft



Let D = diameter of the shaft

Width of the key, W = D/4

Nominal thickness at large end , T = W/3 = D/12

Length of the key , L = D to 1.5D

Taper on the top surface = 1:100

holding force is comparative large than the hollow saddle key

Sunk keys

- Sunk keys are sunk in the shaft and the hub. These keys are suitable for heavy duty since they rely on positive drive.
  - Taper sunk keys:
    - This is the standard form of the key and may be either of rectangular or square cross-section. The key is sunk in the shaft to a depth of half its nominal thickness when measured at the side.
      - » Rectangular cross-section

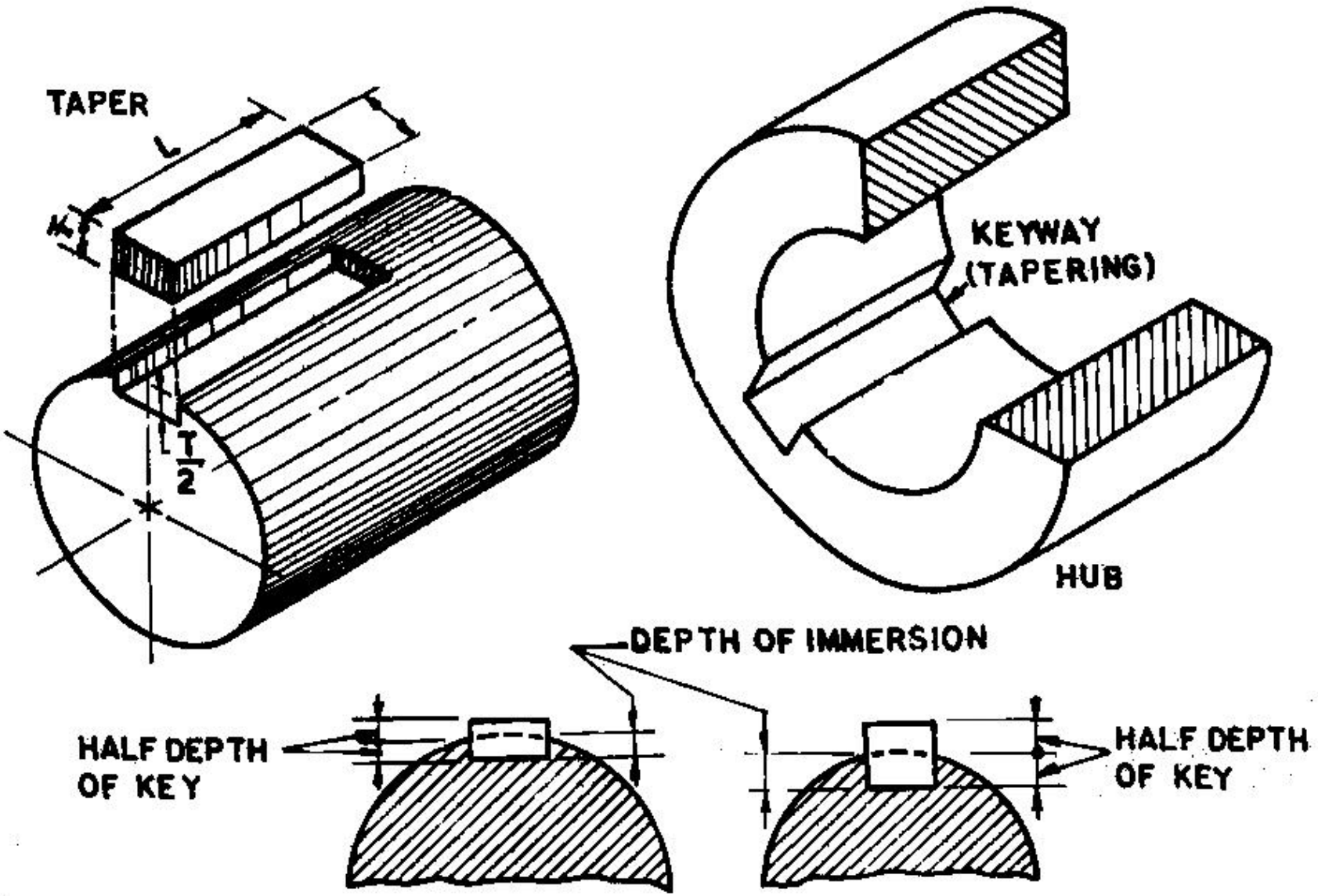
        let D = diameter of the shaft

        width of the key W = D/4

        nominal thickness T = (2/3)W = (1/6)D
      - » Square cross-section:

        T = W

Sunk taper key

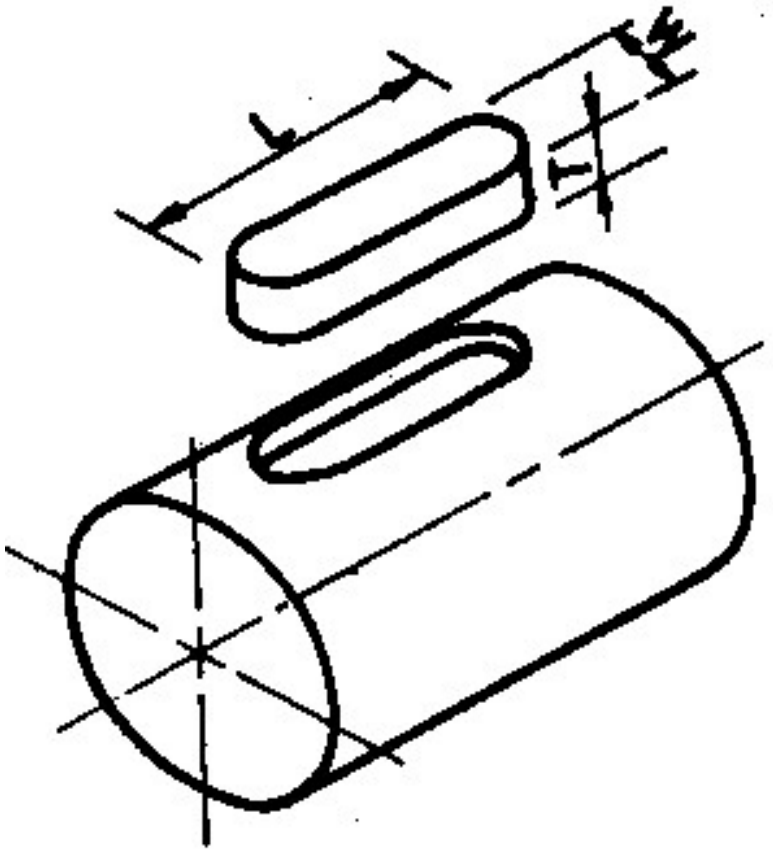


Parallel sunk key

It is uniform in width and thickness throughout.

It is thus taper less and is used where the pulley or other mating piece is required to slide along the shaft.

It may be rectangular or square cross-section and their ends may be squared or rounded.

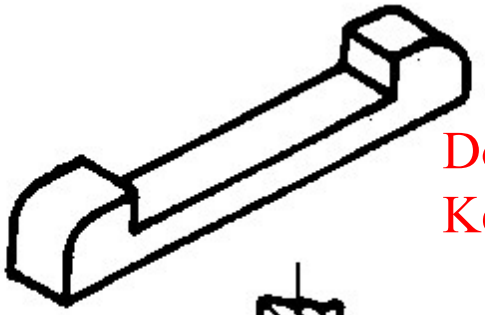


Feather keys

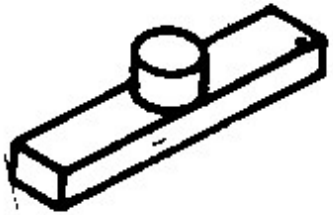
It is a key attached to one member of a pair

It is a particular kind of parallel key that permits axial moment

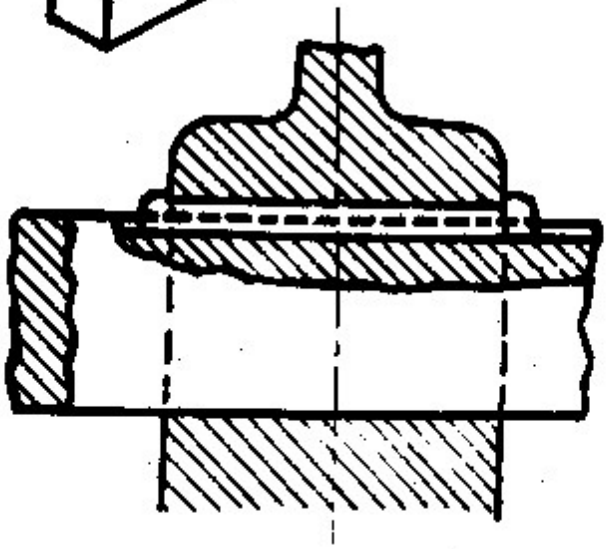
A feather key is secured either to the shaft or to the hub, the key being a sliding fit in the keyway of the machine element on which it moves.

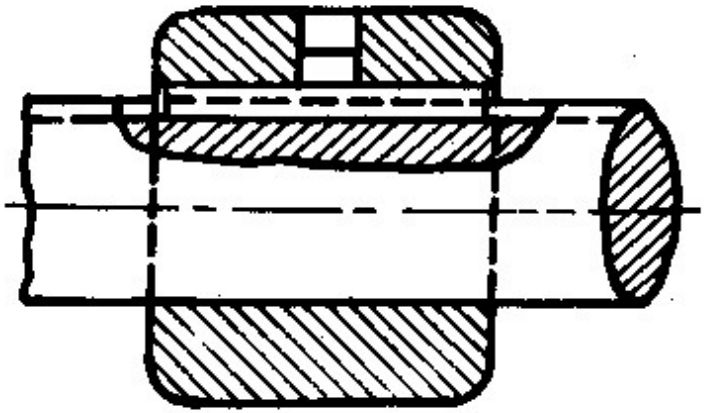


Double Headed Key



Peg Key





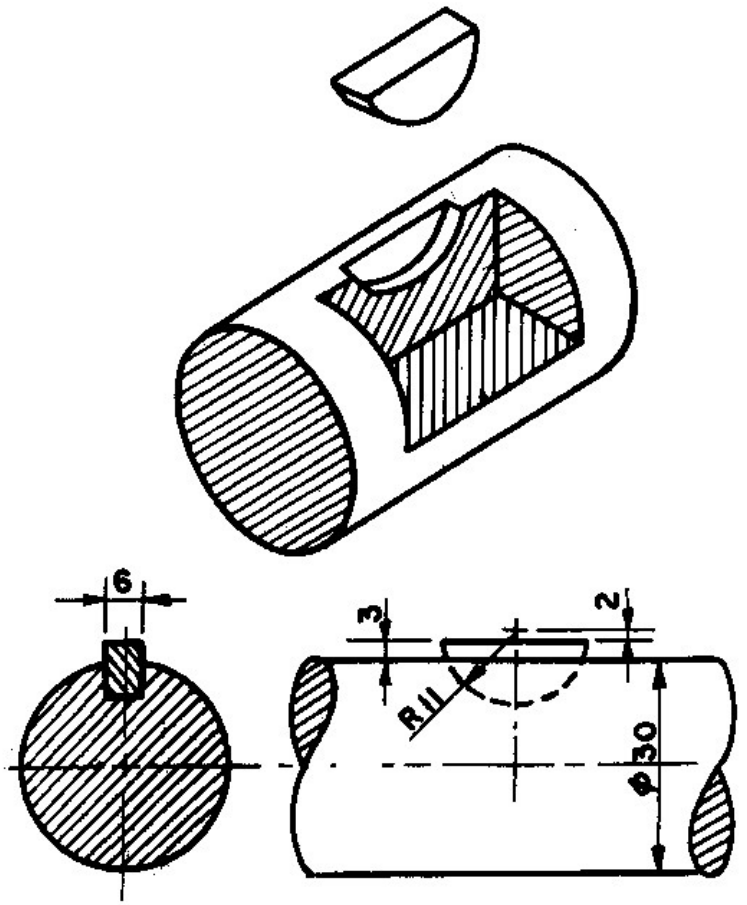
Woodruff keys

It is an adjustable sunk key in the form of a semi-circular disc of uniform thickness.

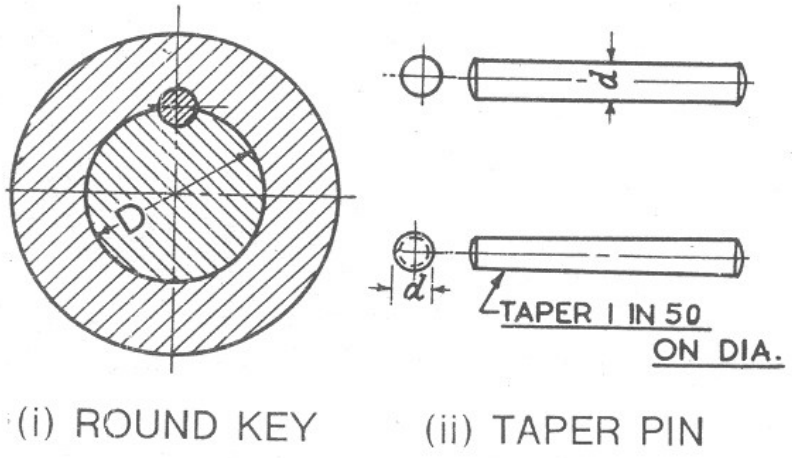
The key fits into a semi-circular keyway in the shaft and the top of the key fits into a plain rectangular key way in the hub of the wheel.

Since the key and the key seat bear the same radius , it has the advantage of adjusting itself to any taper of the slot of the hub or boss of wheel

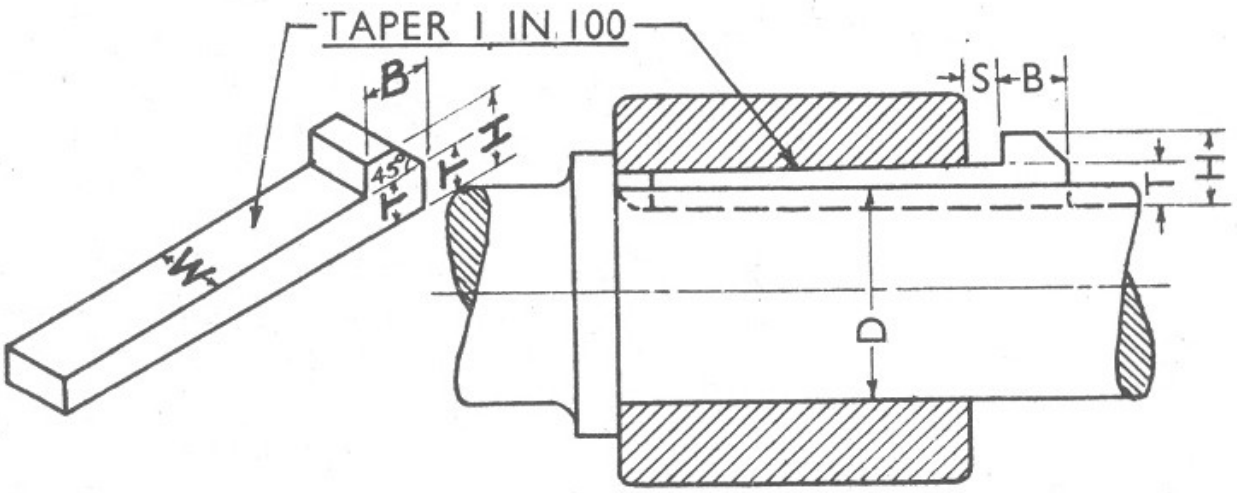
Used in feed gear box of lathe, other machine tools and in automobiles



Round key or Pin Key:



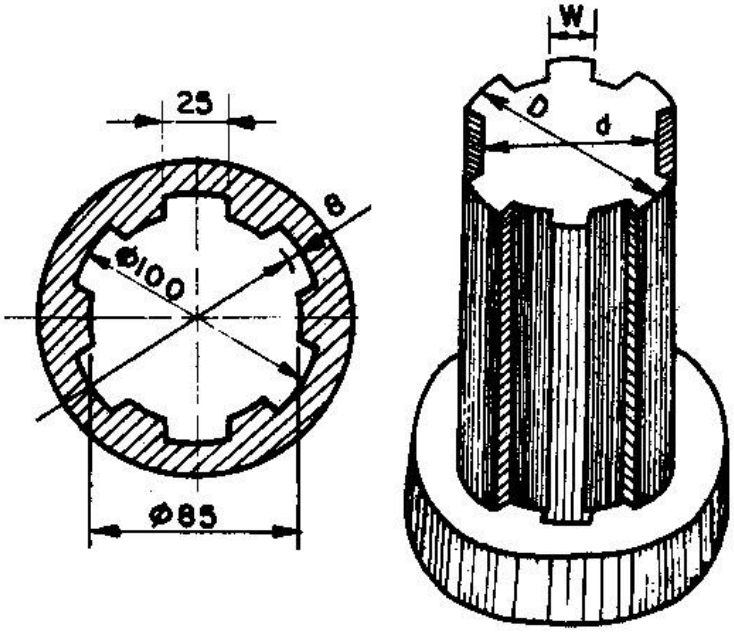
(i) ROUND KEY (ii) TAPER PIN



Key with gib-head

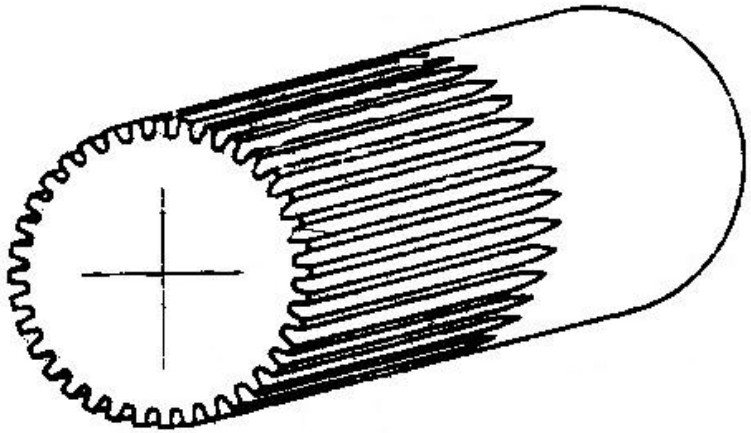
Spline shaft and hub

- A spline shaft is used when the hub is required to slide along the shaft. These shafts are used mostly for sliding gear application as in automotive gear box and propeller shaft of aircraft.
- A spline shaft in which are cut equiangular longitudinal groove, the metal between these groove forming splines or feathers of uniform depth.
- By this means the power transmitted is equally divided amongst the number of keys giving great strength and security against total failure than by using a single key.

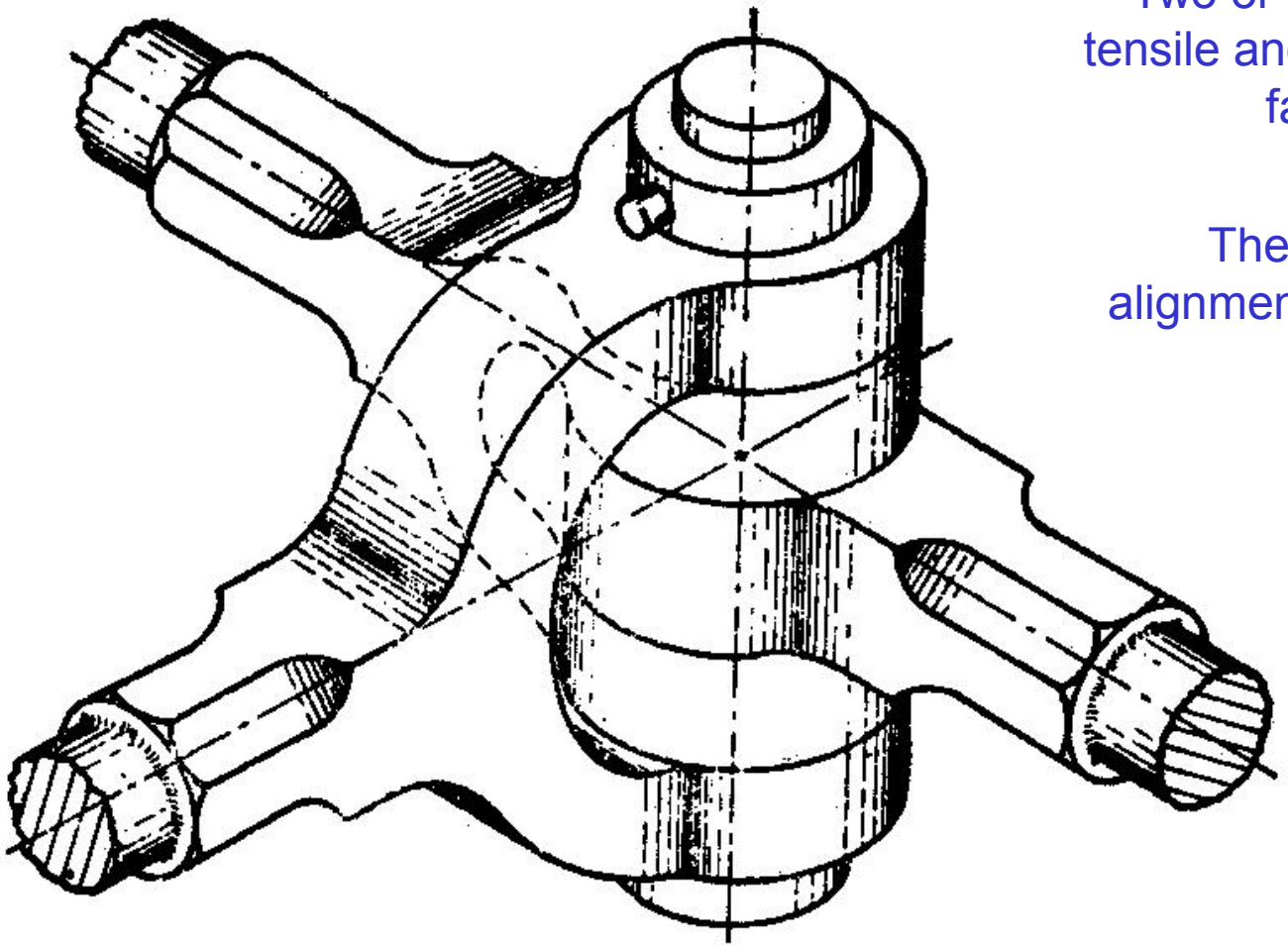


Serrated shafts

- A spine shaft - disadvantage of reduced strength
- A serrated shaft gives maximum strength for a given weight of material.
- number of corresponding grooves are cut in the shaft and mating piece, the two being tightly pressed, one over the other
- the bottom of the serrations and the crests of the teeth are flat.
- these are used in aircraft assemblies



Joints::: Knuckle joint



Two or more rods subjected to tensile and compressive forces are fastened together

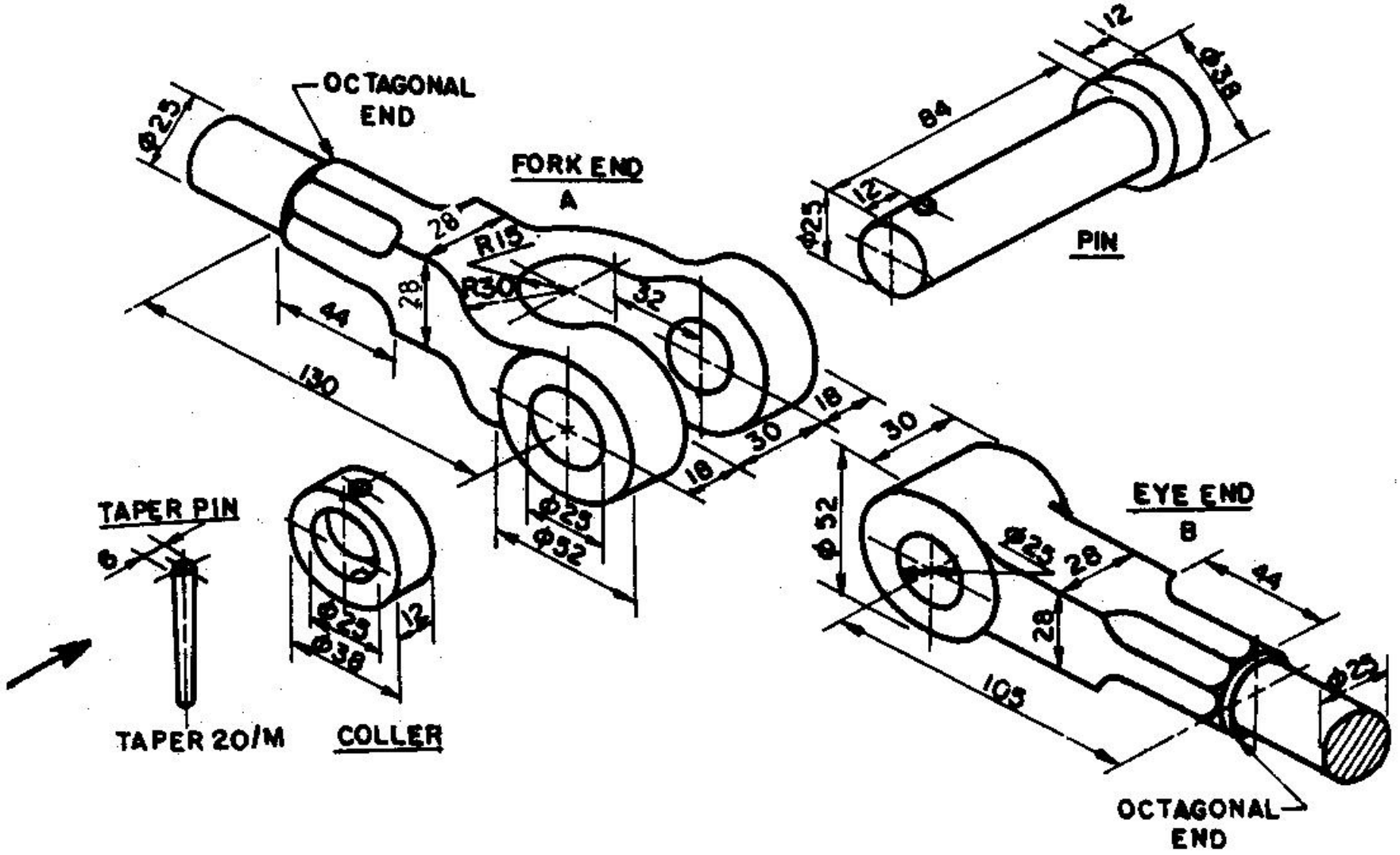
Their axes are not in alignments but meet in a point

The joint allows a small angular moment of one rod relative to another

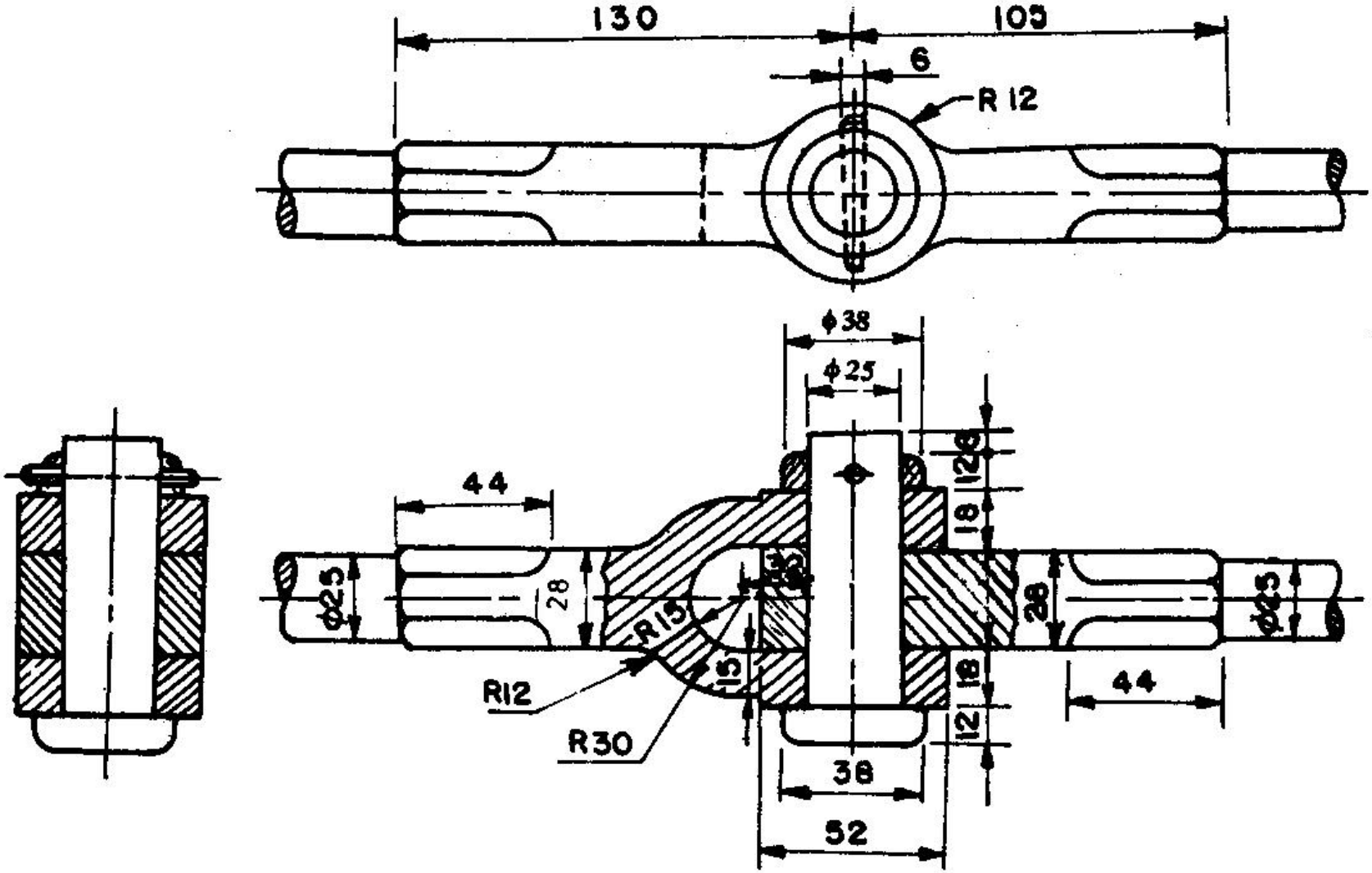
It can be easily connected and disconnected

Applications: Elevator chains, valve rods, etc

Knuckle joint



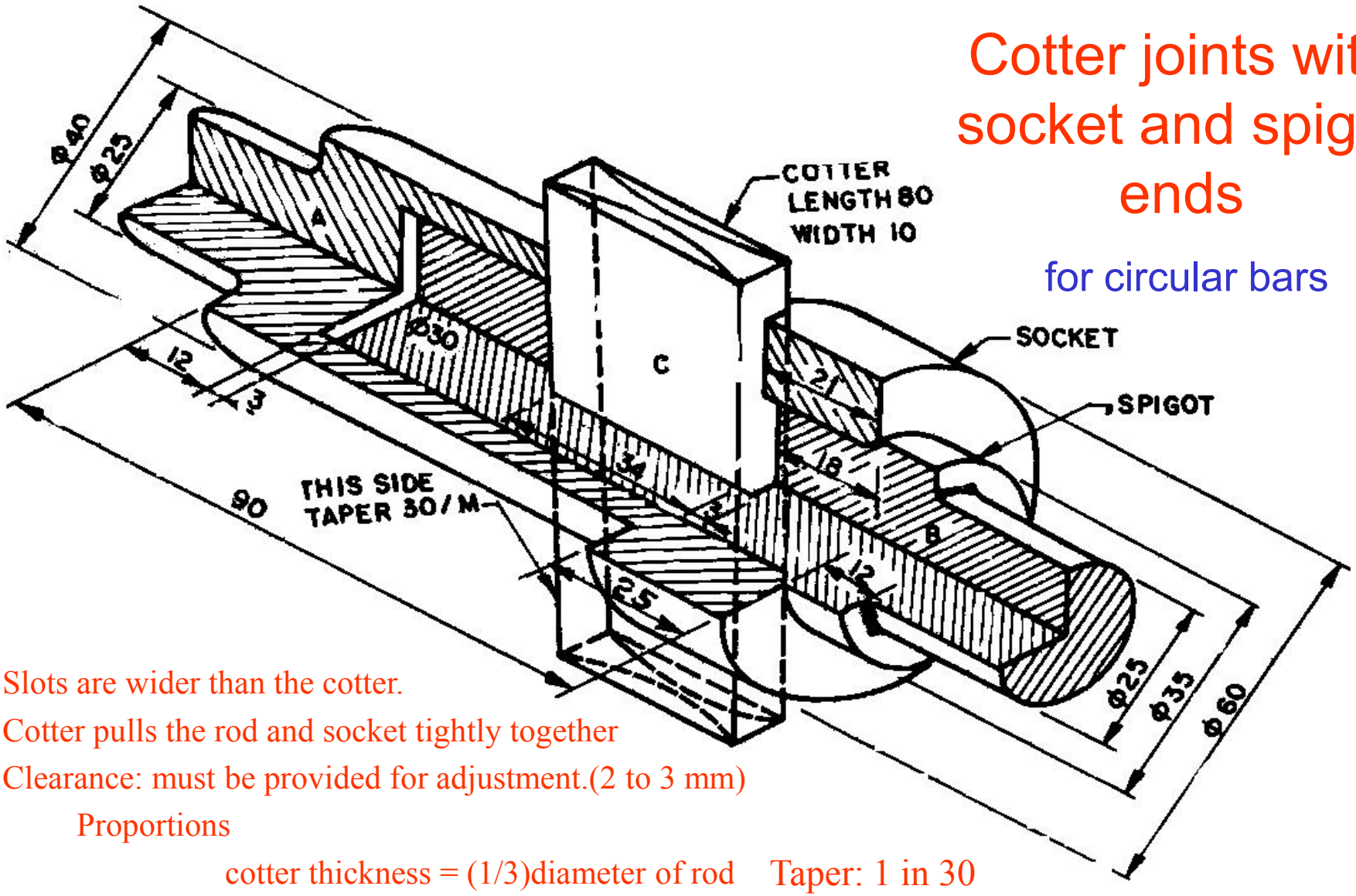
Knuckle joint



Cotter joint

Cotter joints with socket and spigot ends

for circular bars



Slots are wider than the cotter.

Cotter pulls the rod and socket tightly together

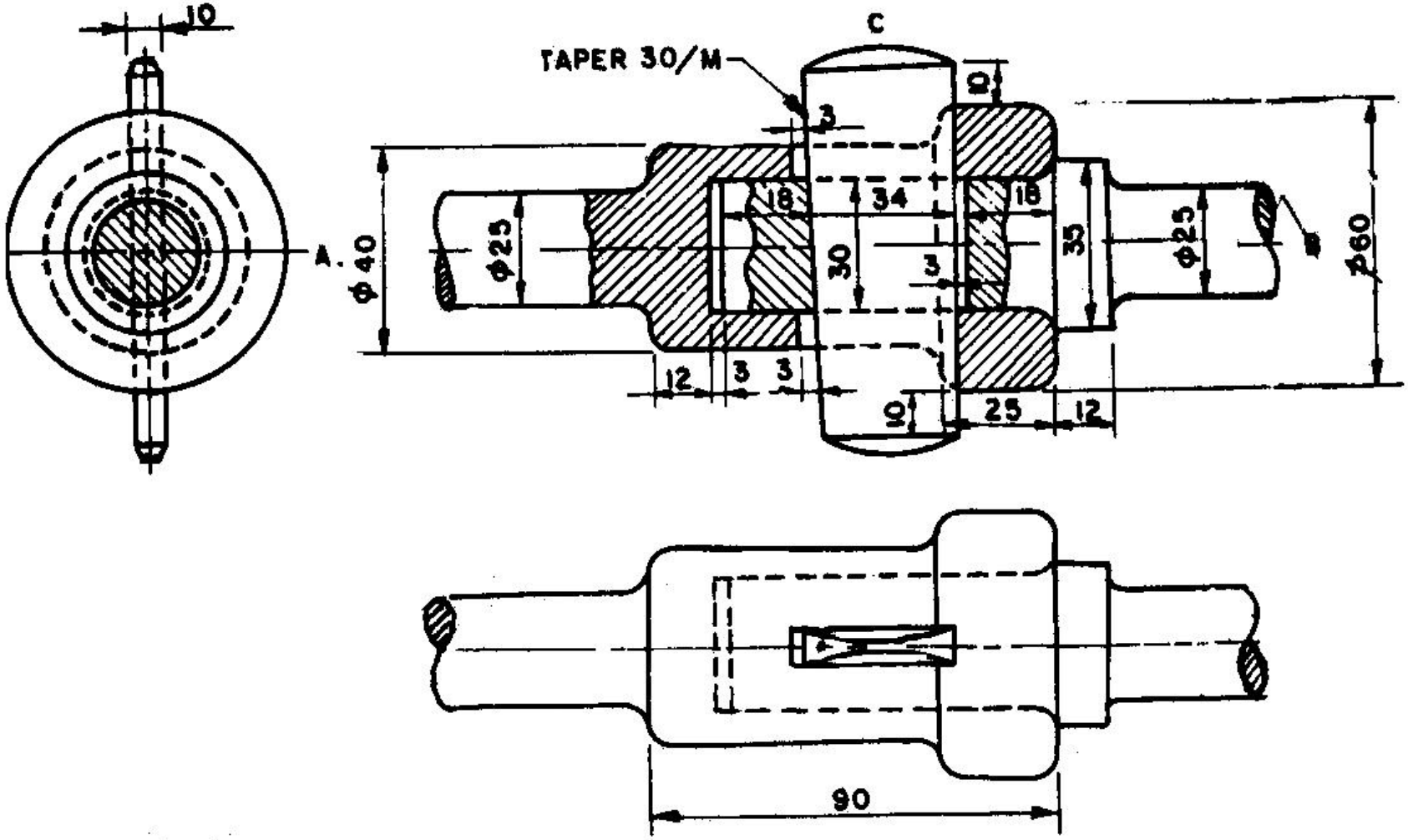
Clearance: must be provided for adjustment.(2 to 3 mm)

Proportions

cotter thickness = (1/3)diameter of rod Taper: 1 in 30

cotter width = rod diameter

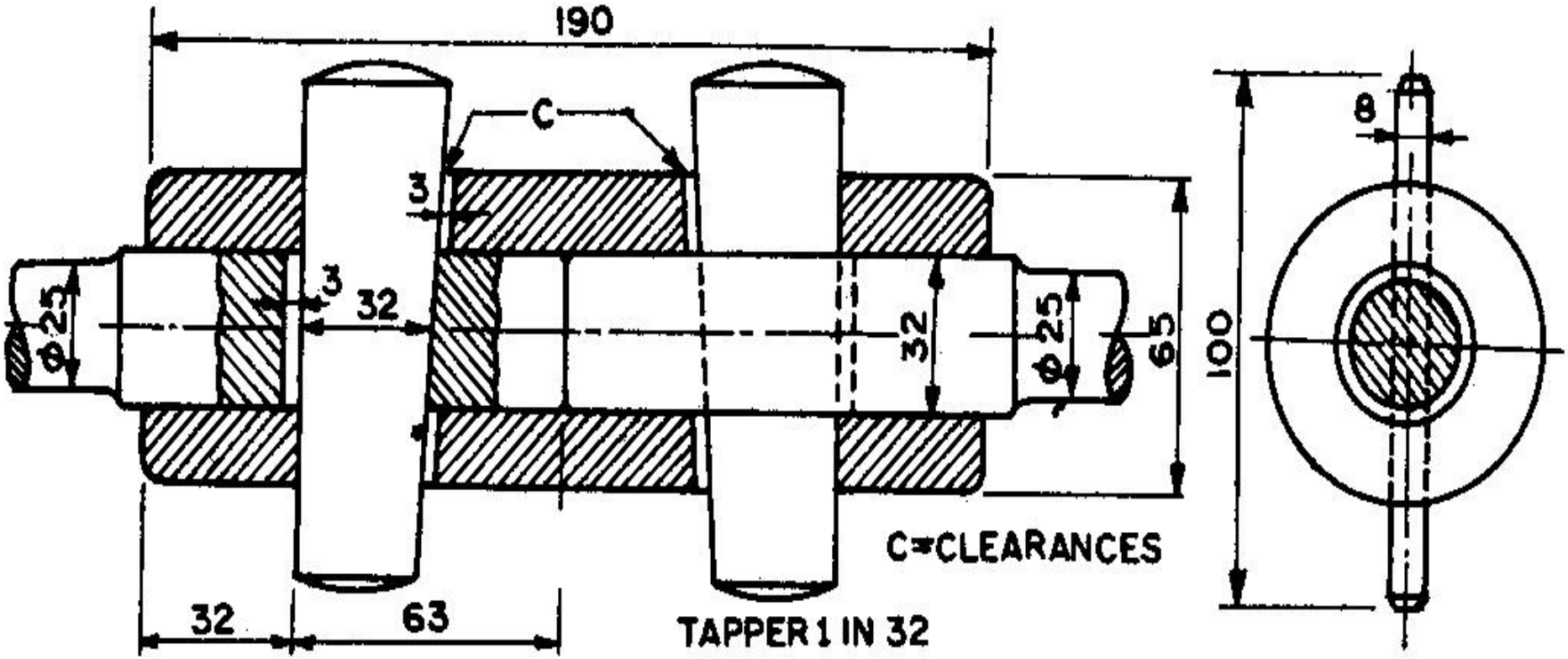
Cotter joint



How do they differ from keyed joints ??

Sleeve and cotter joint

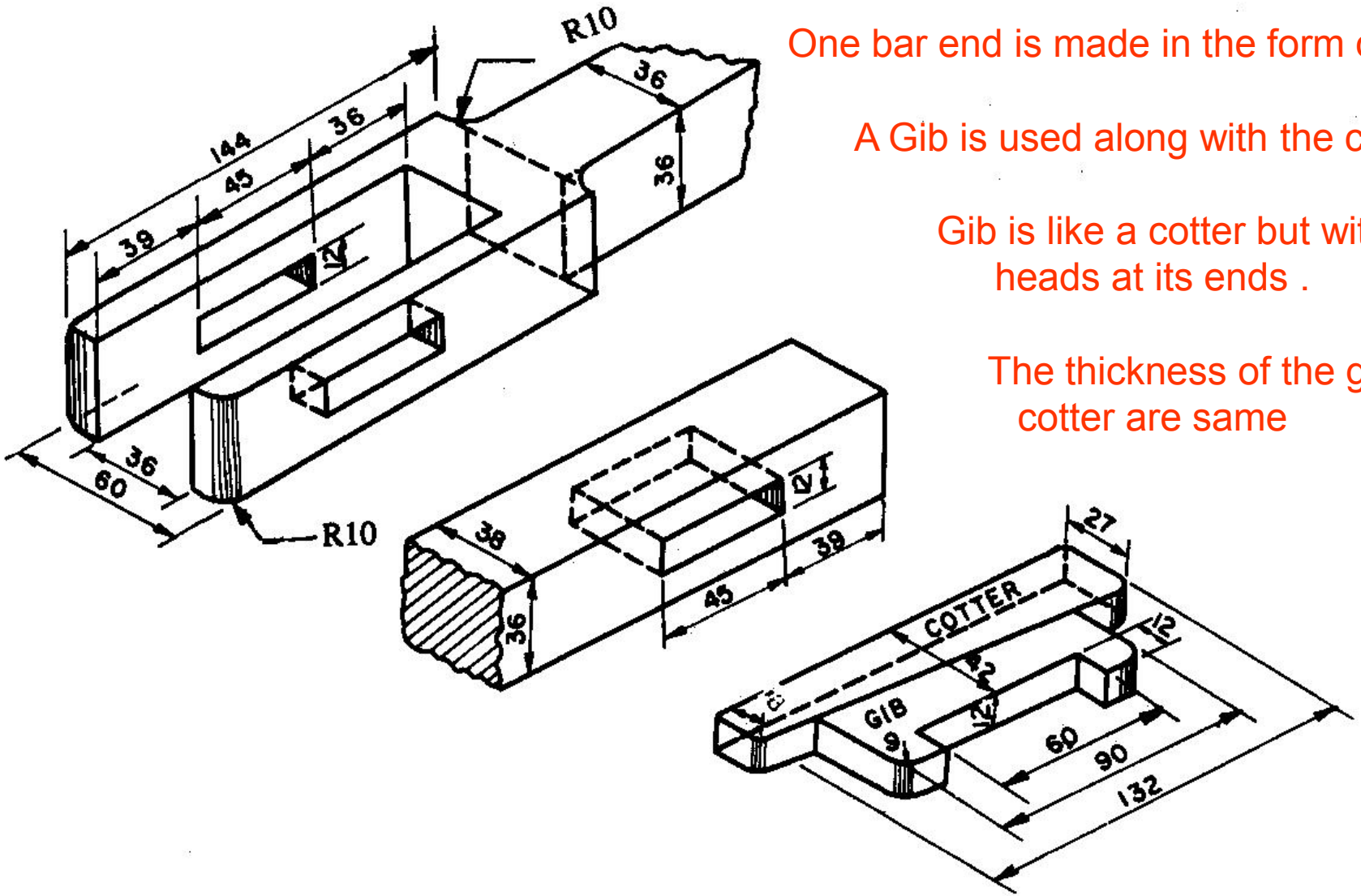
For circular rods



The enlarged ends of the rods butt against each other with a common sleeve over them

- The rod ends are enlarged to take care of the weakening effect caused by slots

Gib and cotter joint for rectangular rods



One bar end is made in the form of a strap

A Gib is used along with the cotter.

Gib is like a cotter but with two gib heads at its ends .

The thickness of the gib and cotter are same

Gib and cotter joint or rectangular rods