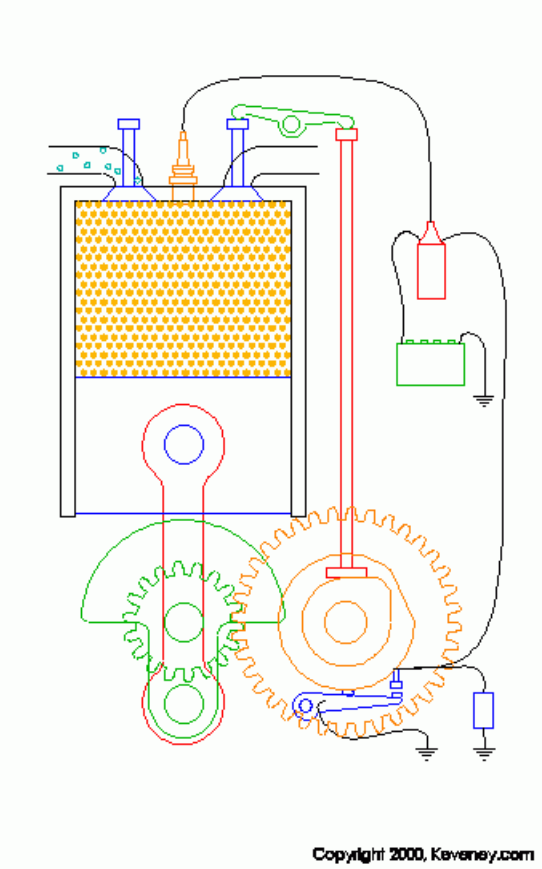
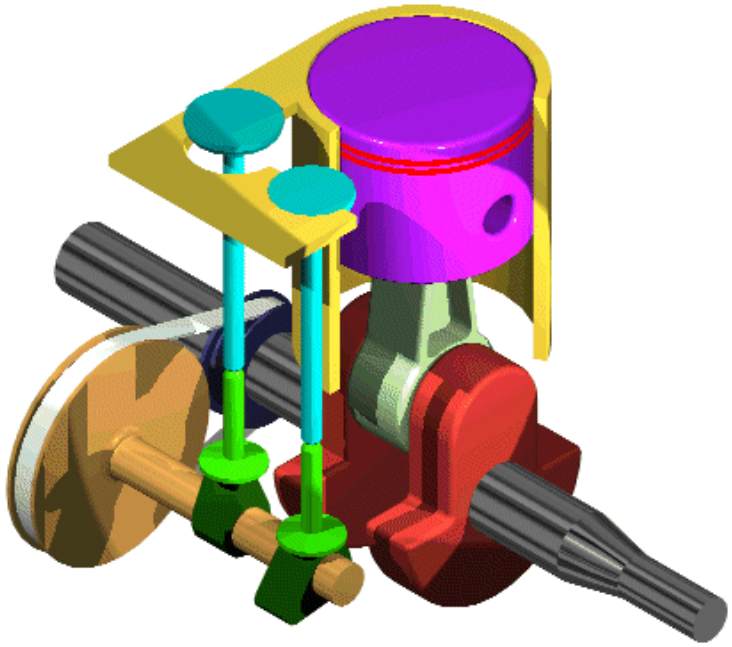
CAM

1.1 CAM - Definition

- Cams are used to convert rotary motion into reciprocating motion

Examples for cam





- In IC engines to operate the inlet and exhaust valves

1.2 Classification of CAM Mechanism

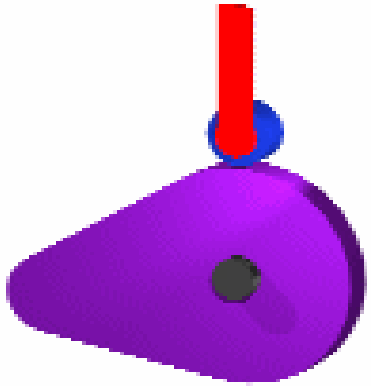
Based on modes of Input / Output motion

1.2.1 Rotating cam – Translating follower

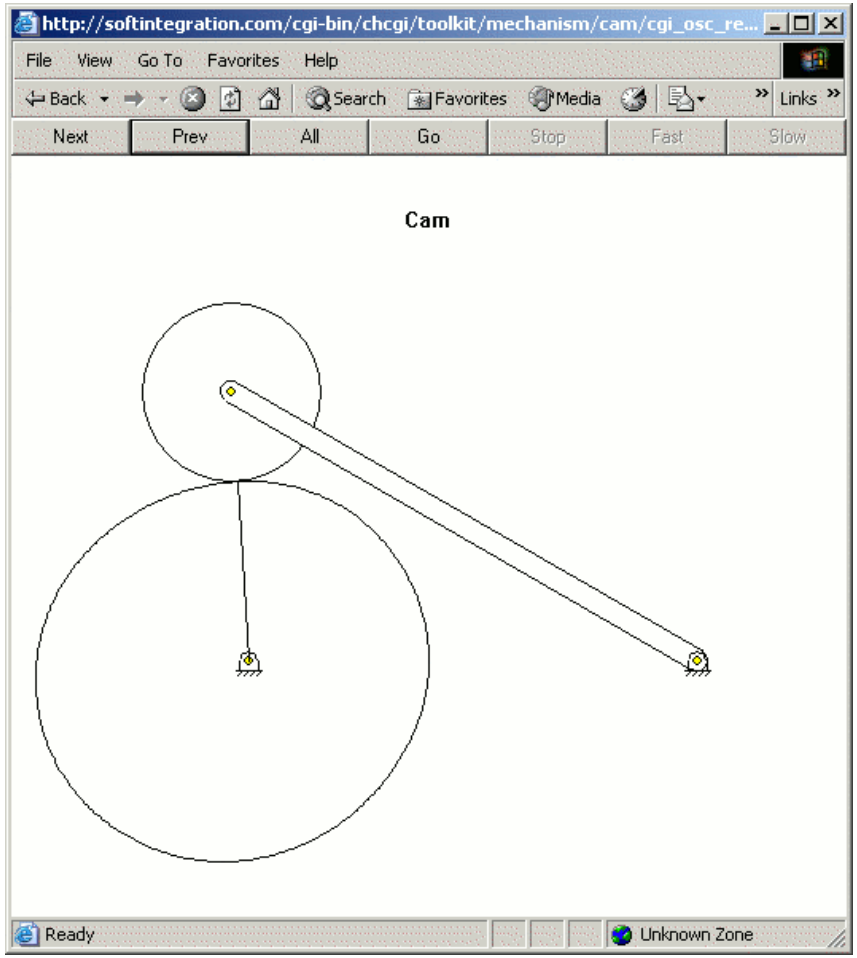
1.2.2 Rotating cam – Oscillating follower

1.2.3 Translating cam – Translating follower

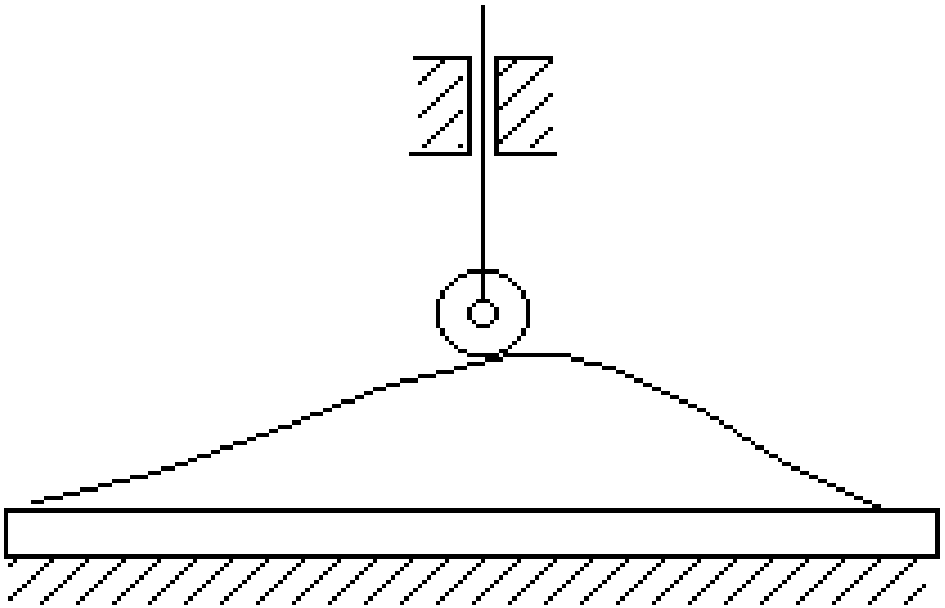
1.2.1 Rotating cam – Translating follower



1.2.2 Rotating cam – oscillating follower



1.2.3 Translating cam – Translating follower

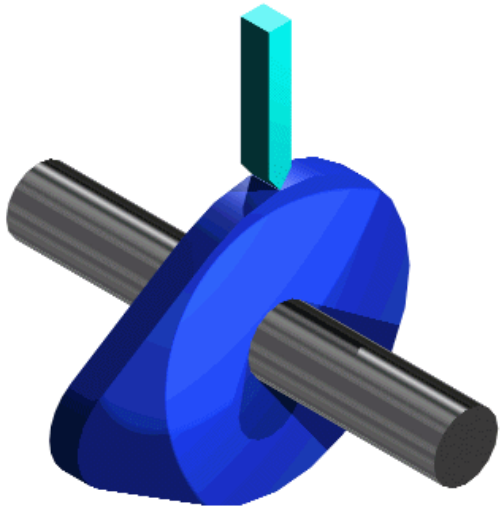


1.3 Classification of followers

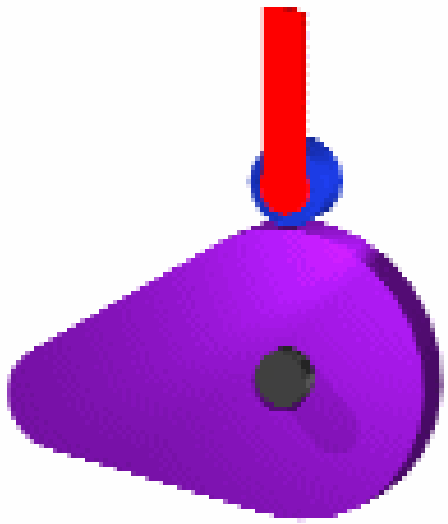
1.3.1 According to the shape of follower

- Knife edge follower
- Roller follower
- Flat faced follower
- Spherical faced follower

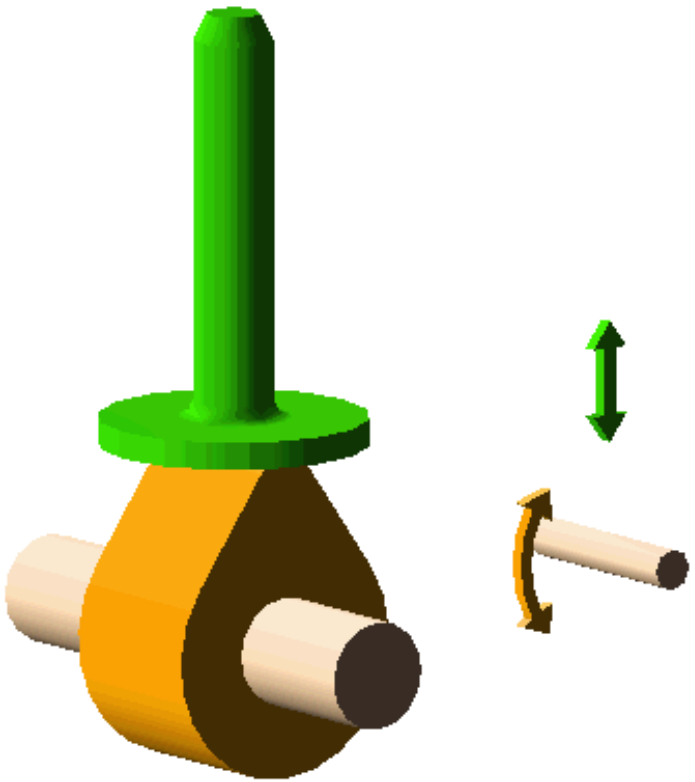
a) Knife edge follower

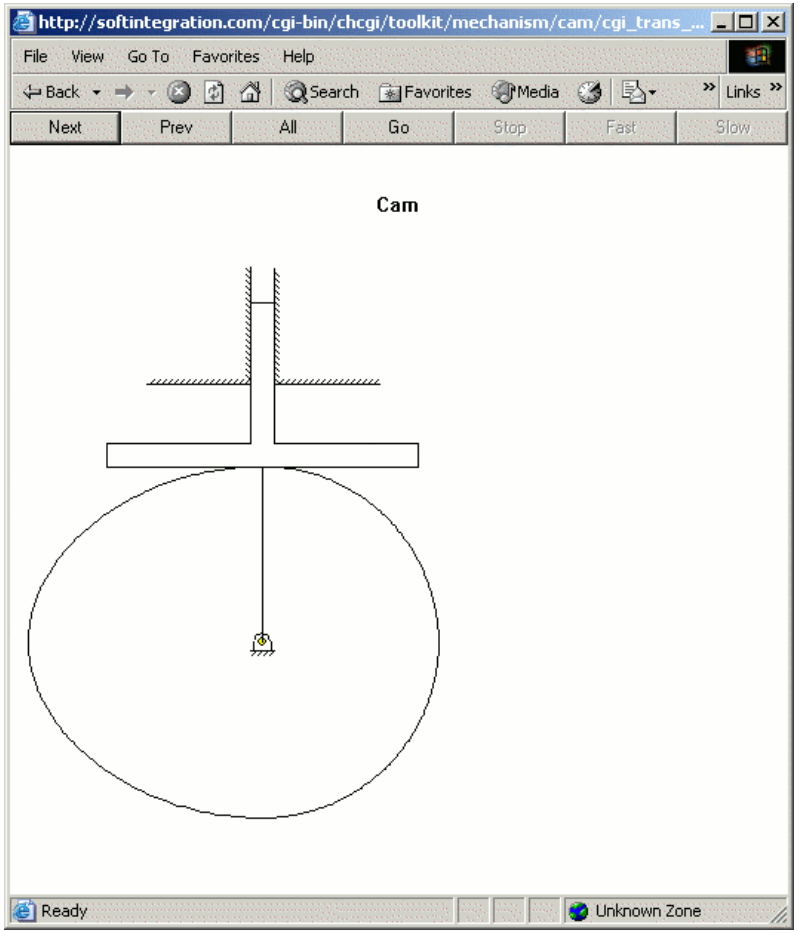


b) Roller follower

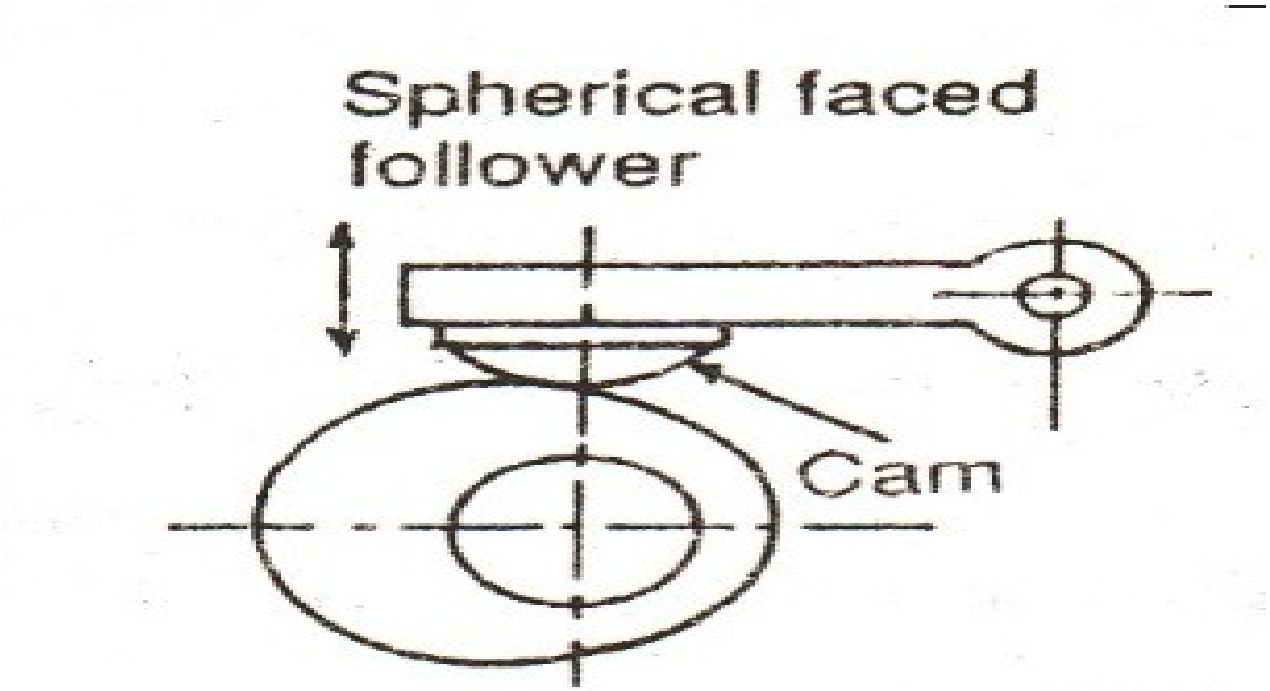


c) Flat faced follower





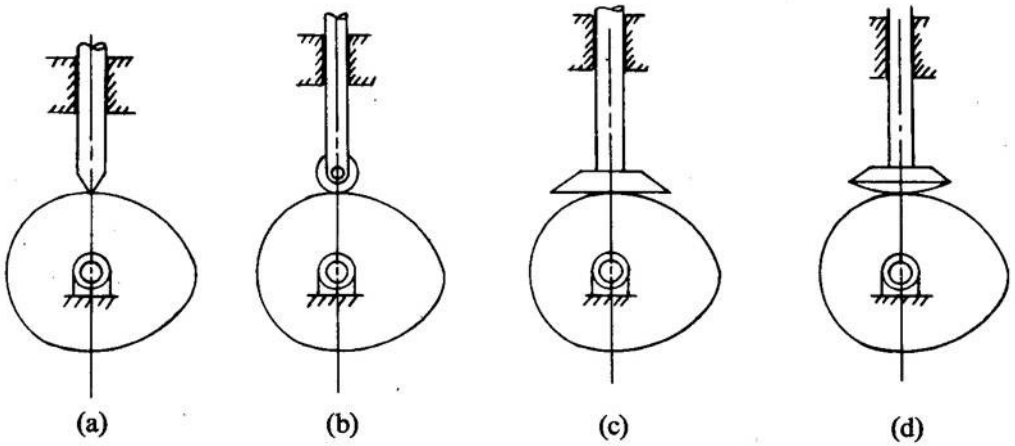
d) Spherical faced follower



1.3.2 According to the path of motion of follower

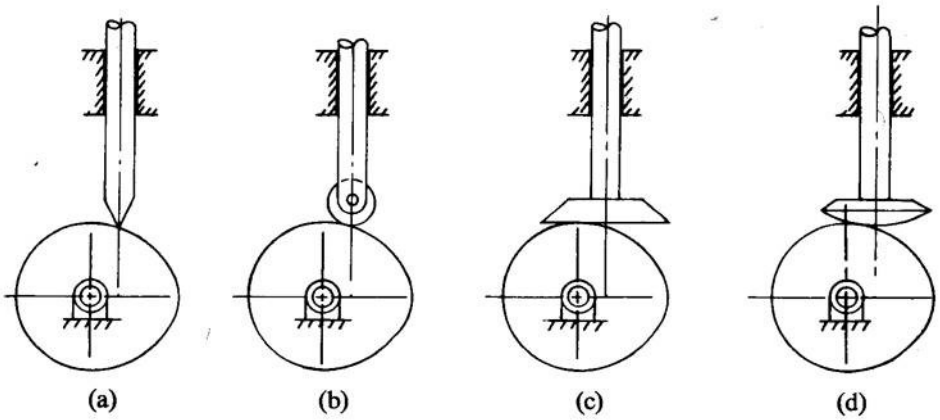
a) Radial follower
b) Offset follower

a) Radial follower



- When the motion of the follower is along an axis passing through the centre of the cam, it is known as radial followers. Above figures are examples of this type.

b) Offset follower



When the motion of the follower is along an axis away from the axis of the cam centre, it is called off-set follower. Above figures are examples of this type.

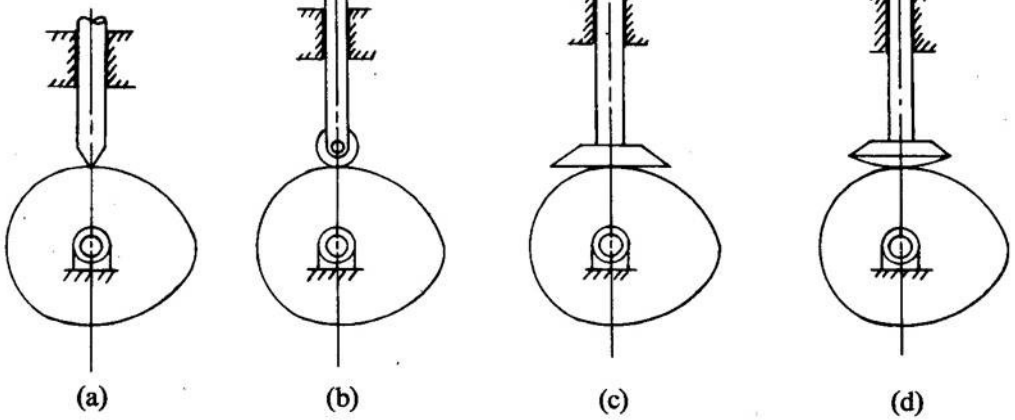
1.4 Classification of cams

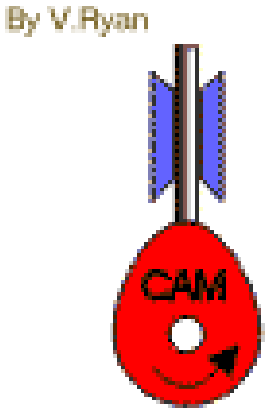
a) Radial or disc cam

b) Cylindrical cam

c) End cam

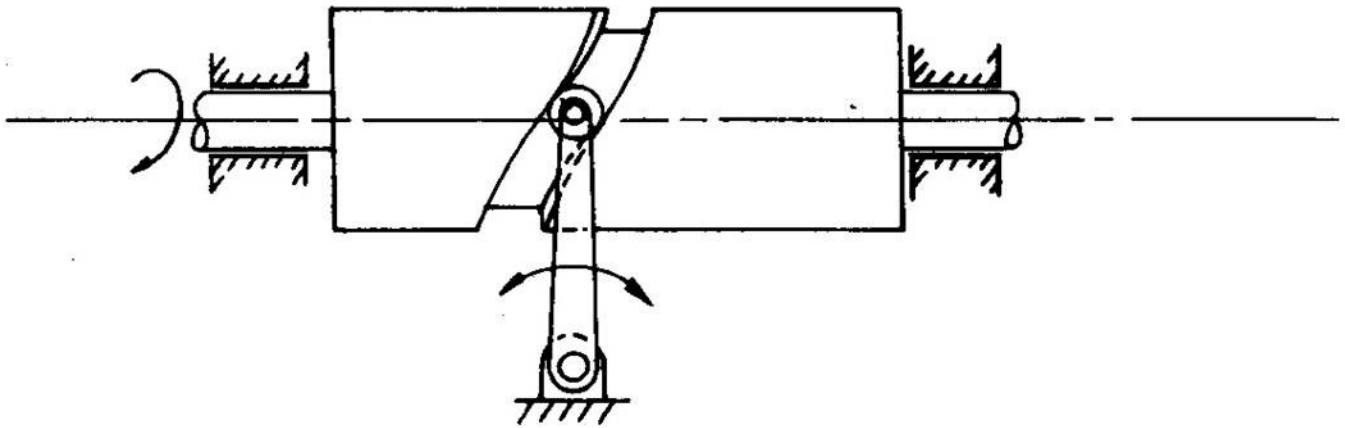
a) Radial or Disc cam





In radial cams, the follower reciprocates or oscillates in a direction perpendicular to the cam axis.

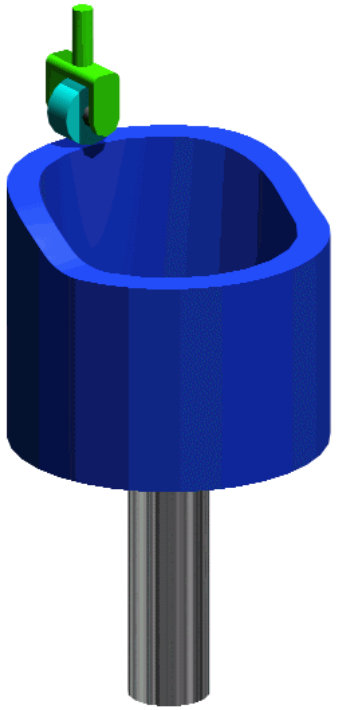
b) Cylindrical cams



In cylindrical cams, the follower reciprocates or oscillates in a direction parallel to the cams axis.

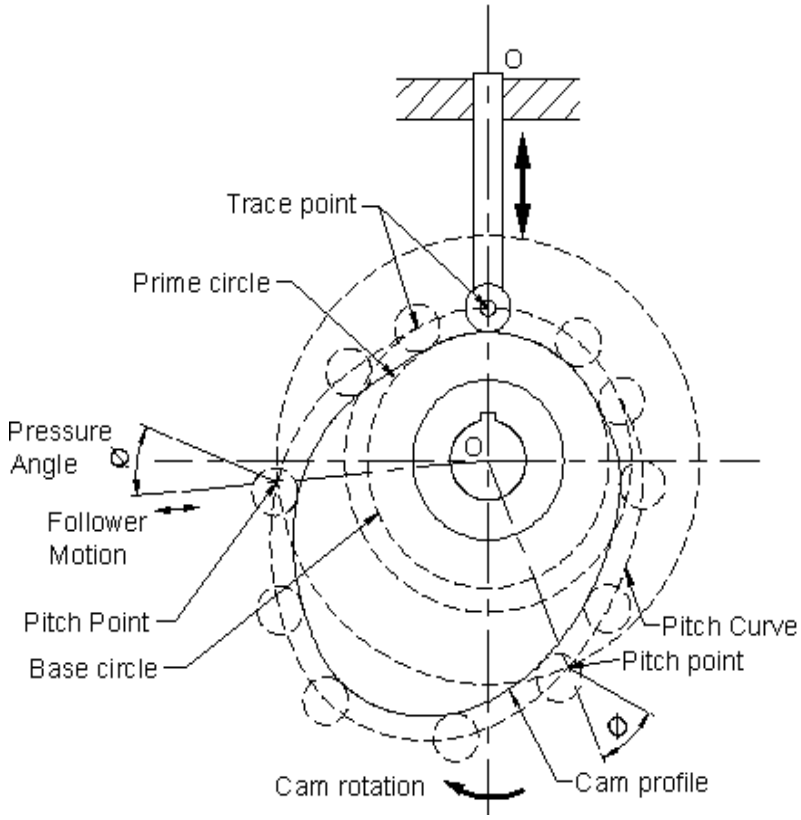
c) End cams

It is also similar to cylindrical cams, but the follower makes contact at periphery of the cam as shown in fig



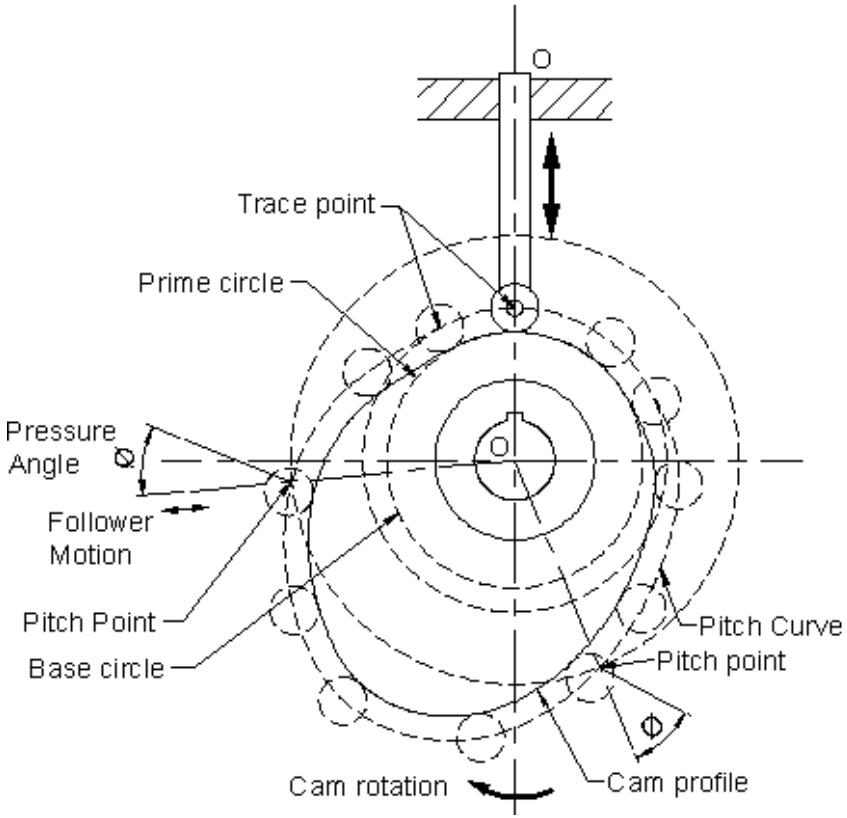
2. CAM Nomenclature

- **Cam profile:** The outer surface of the disc cam.
- **Base circle :** The circle with the shortest radius from the cam center to any part of the cam profile.
- **Trace point:** It is a point on the follower, and its motion describes the movement of the follower. It is used to generate the pitch curve.



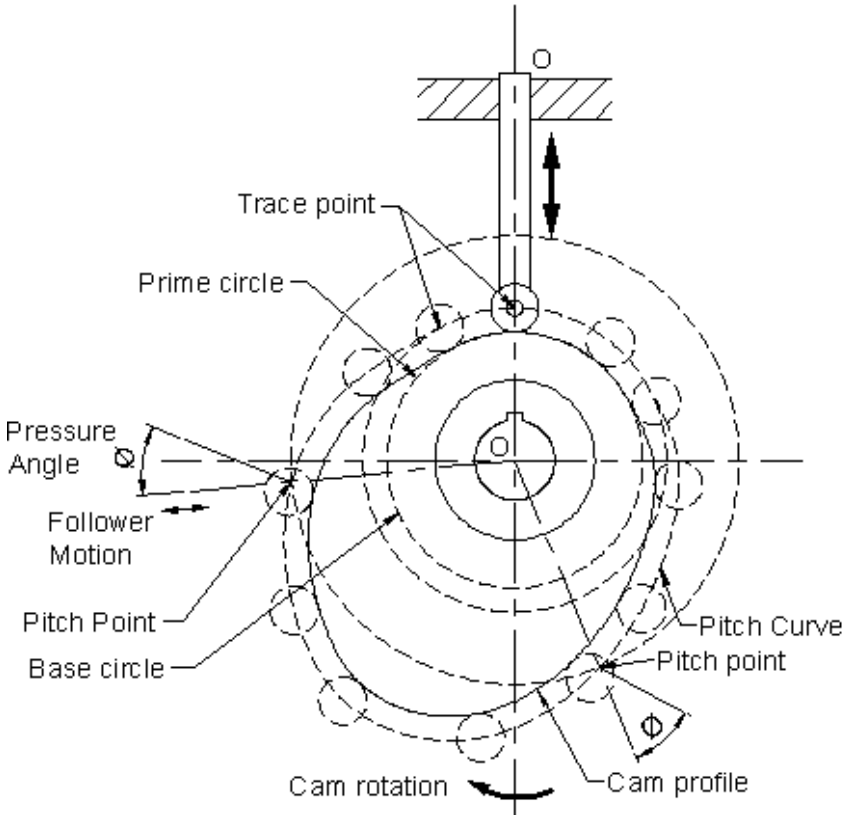
2. CAM Nomenclature

- **Pitch curve :** The path generated by the trace point as the follower is rotated about a stationery cam.
- **Prime circle:** The smallest circle from the cam center through the pitch curve



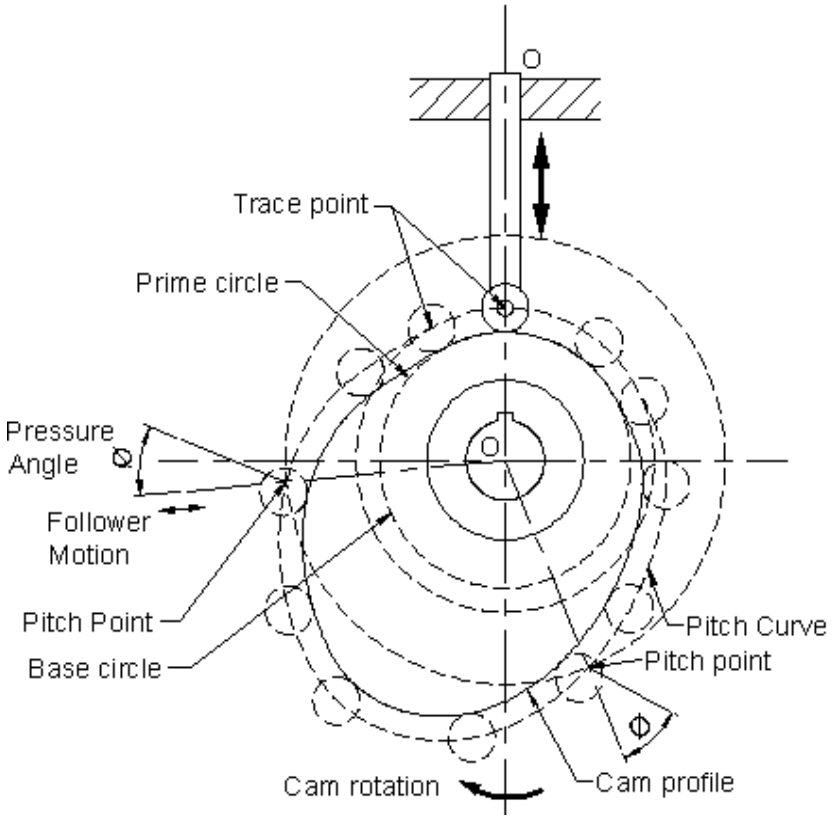
2. CAM Nomenclature

- **Pressure angle:** The angle between the direction of the follower movement and the normal to the pitch curve.
- **Pitch point:** Pitch point corresponds to the point of maximum pressure angle.



2. CAM Nomenclature

- **Pitch circle:** A circle drawn from the cam center and passes through the pitch point is called Pitch circle
- **Stroke:** The greatest distance or angle through which the follower moves or rotates



3. Motion of the follower

As the cam rotates the follower moves upward and downward.

- The upward movement of follower is called rise (Outstroke)
- The downward movement is called fall (Returnstroke).
- When the follower is not moving upward and downward even when the cam rotates, it is called dwell.

3.1 Types of follower motion

1. Uniform motion (constant velocity)
2. Simple harmonic motion
3. Uniform acceleration and retardation motion
4. Cycloidal motion

a) Uniform motion (constant velocity)

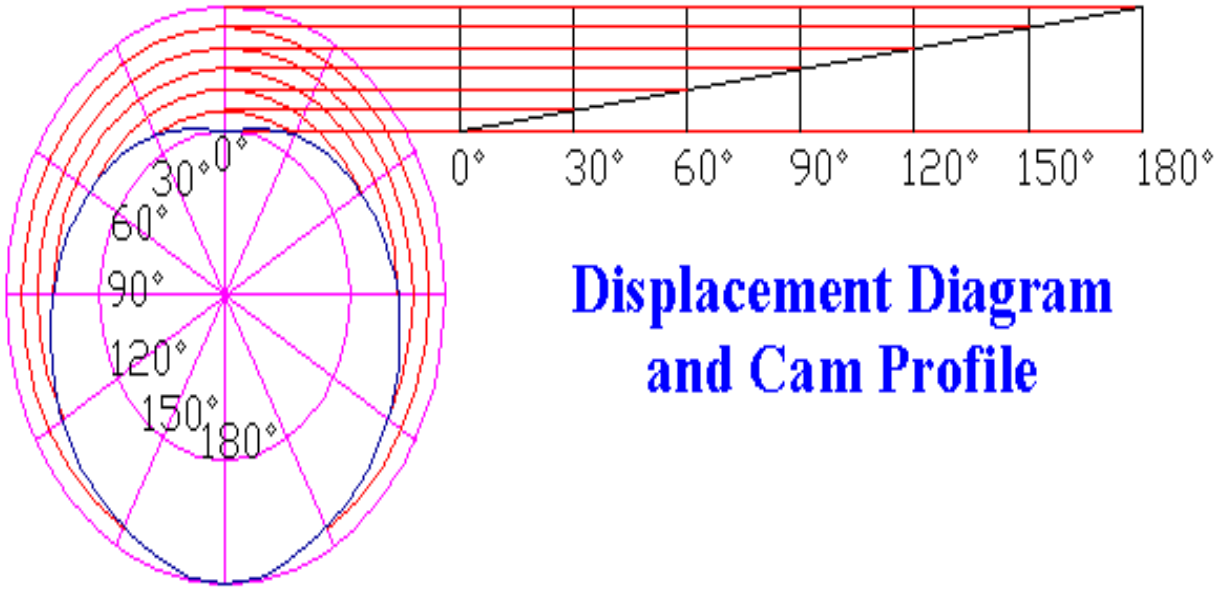
- Displacement diagram: **Displacement is the distance that a follower moves during one complete revolution (or cycle) of the cam while the follower is in contact with the cam.**
- **It is the plot of linear displacement (s) of follower V/S angular displacement (θ) of the cam for one full rotation of the cam.**
- **A period is a part of the cam cycle and it includes the following:**

Rise (Outstroke) – the upward motion of the follower caused by cam motion.

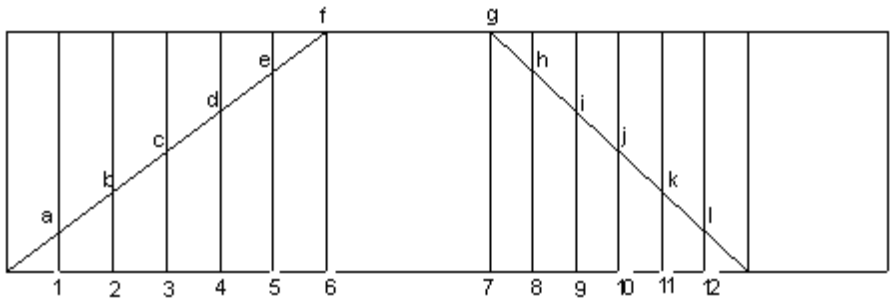
Fall (Return stroke) – the downward motion of the follower caused by cam motion.

Dwell – the stationary position of the follower caused by cam motion.

a) Uniform motion (constant velocity)



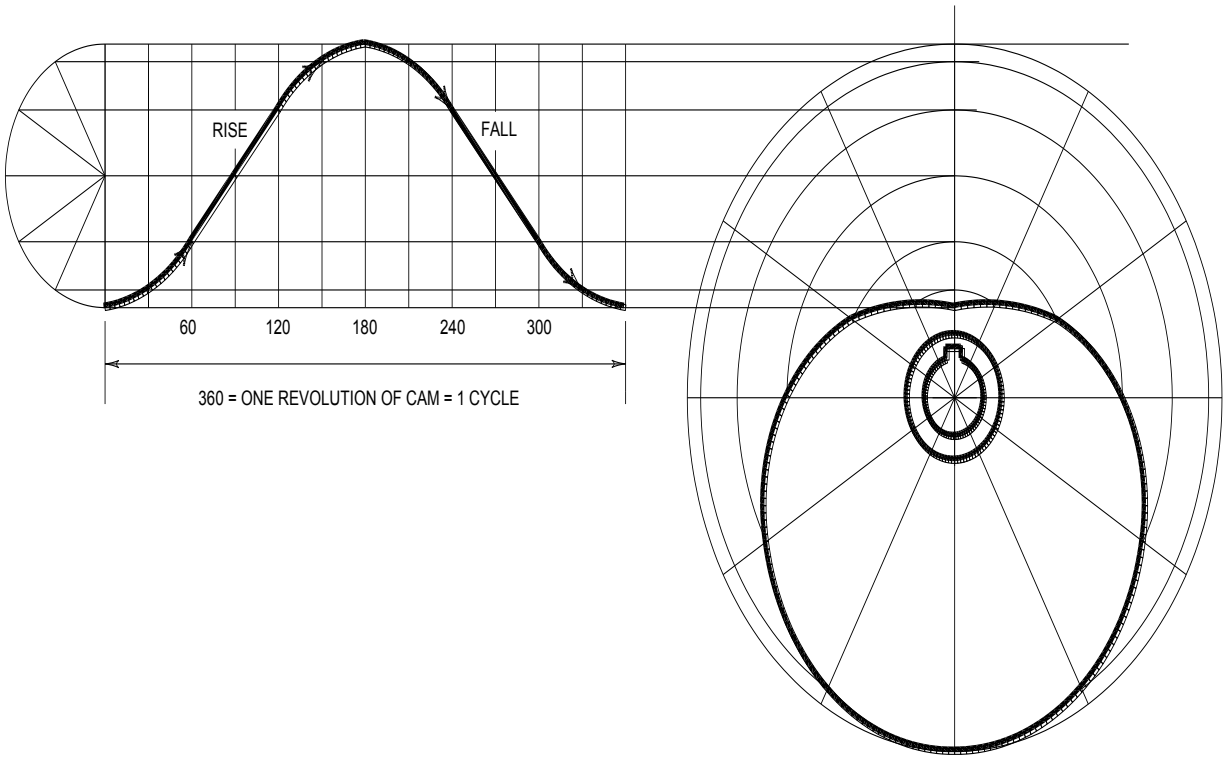
a) Uniform motion (constant velocity)



Displacement diagram

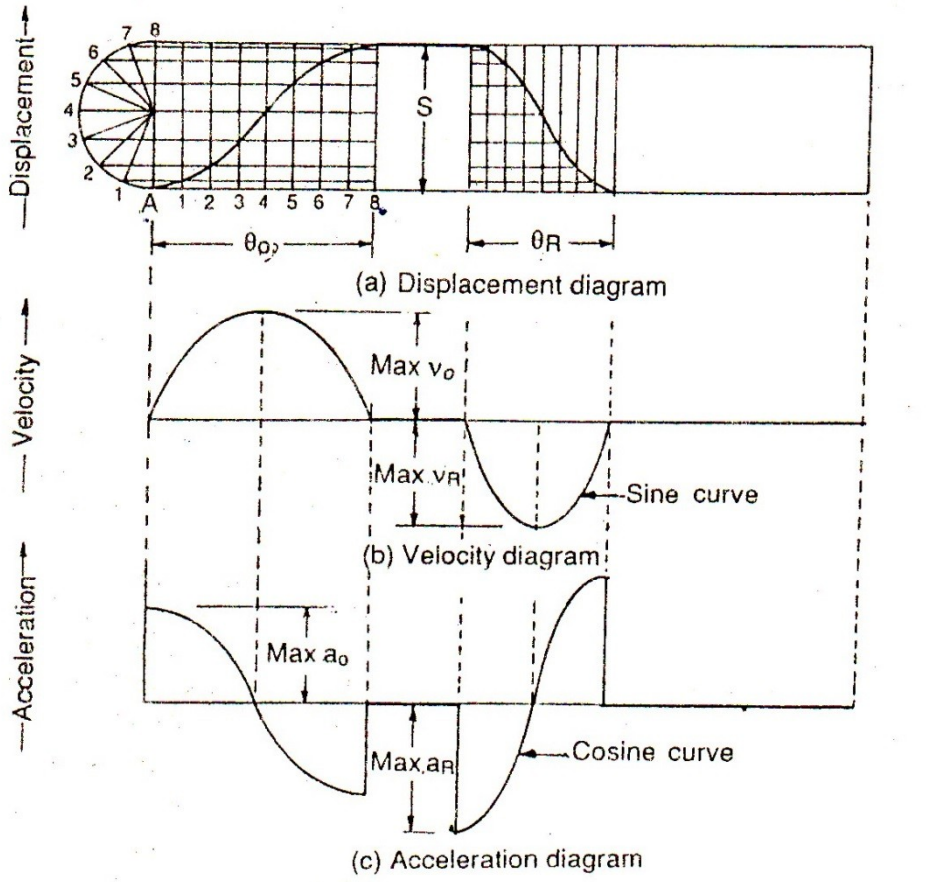
Since the follower moves with uniform velocity during its rise and fall, the slope of the displacement curve must be constant as shown in fig

b) Simple Harmonic motion



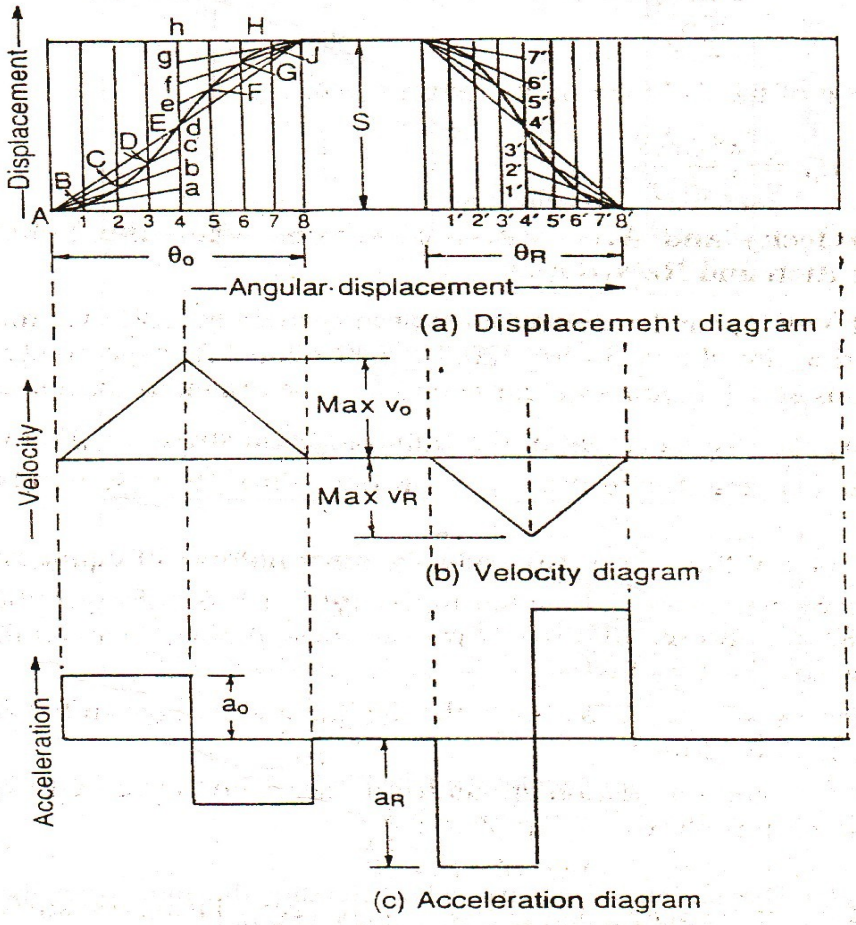
b) Simple harmonic motion

- Since the follower moves with a simple harmonic motion, therefore velocity diagram consists of a sine curve and the acceleration diagram consists of a cosine curve.

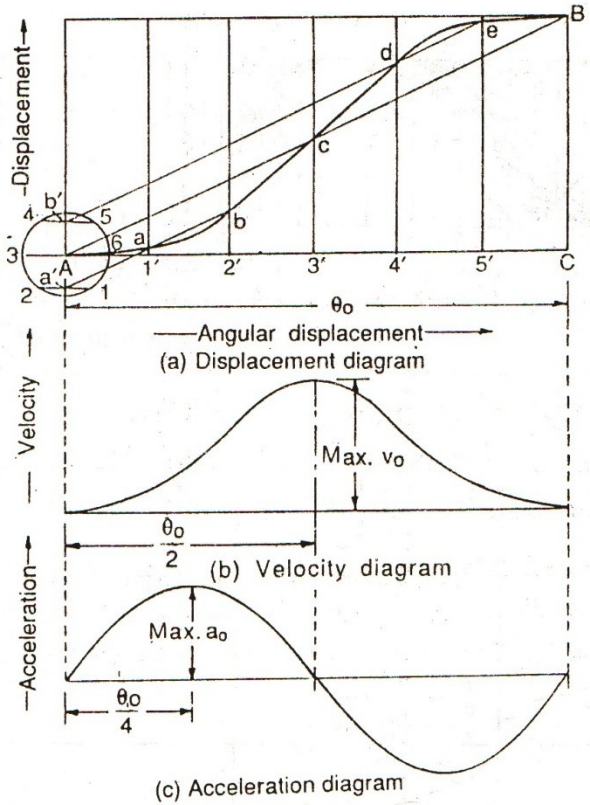


c) Uniform acceleration and retardation

- Since the acceleration and retardation are uniform, therefore the velocity varies directly with time.



d) Cycloidal motion



CAM Profile