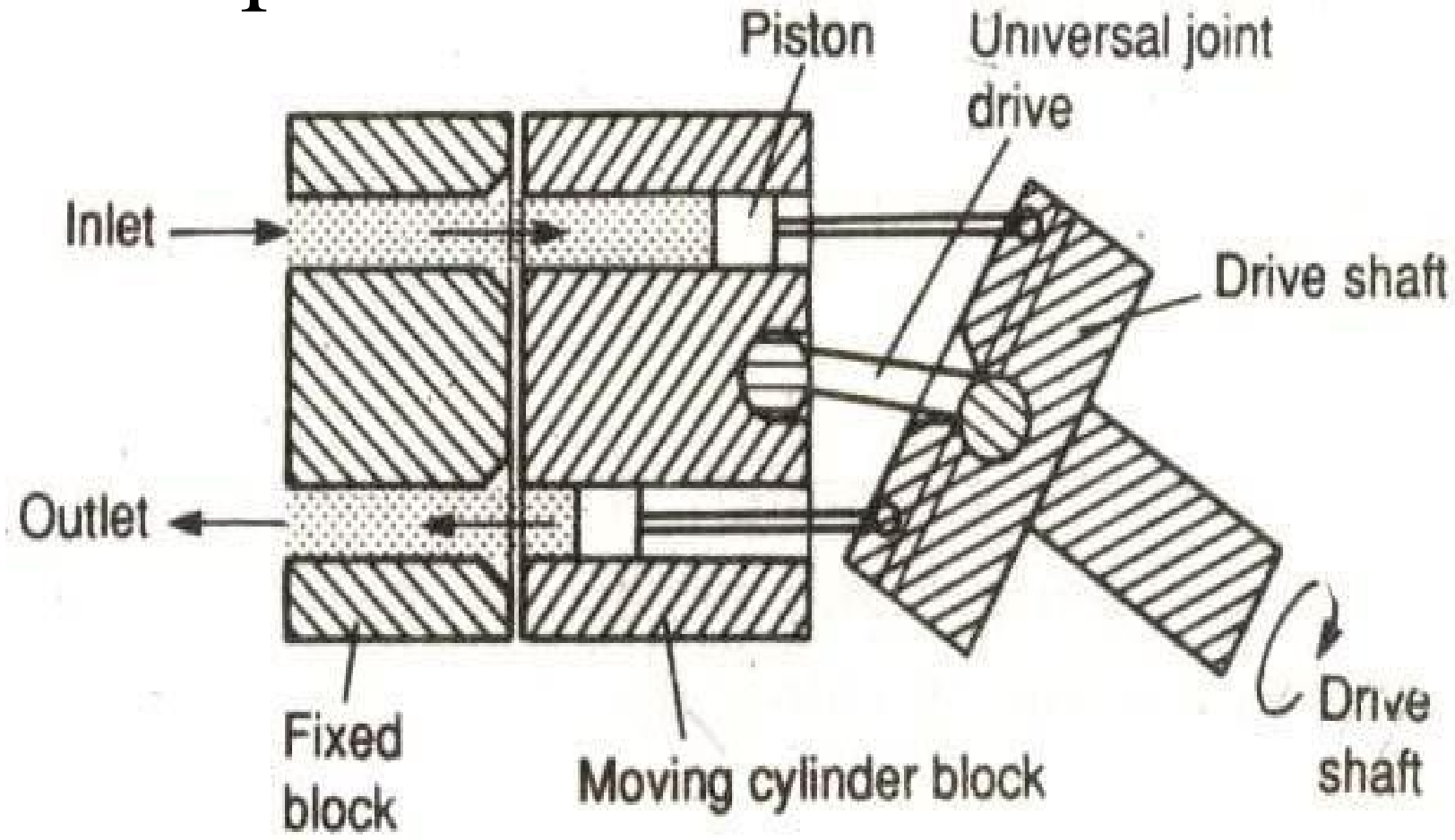
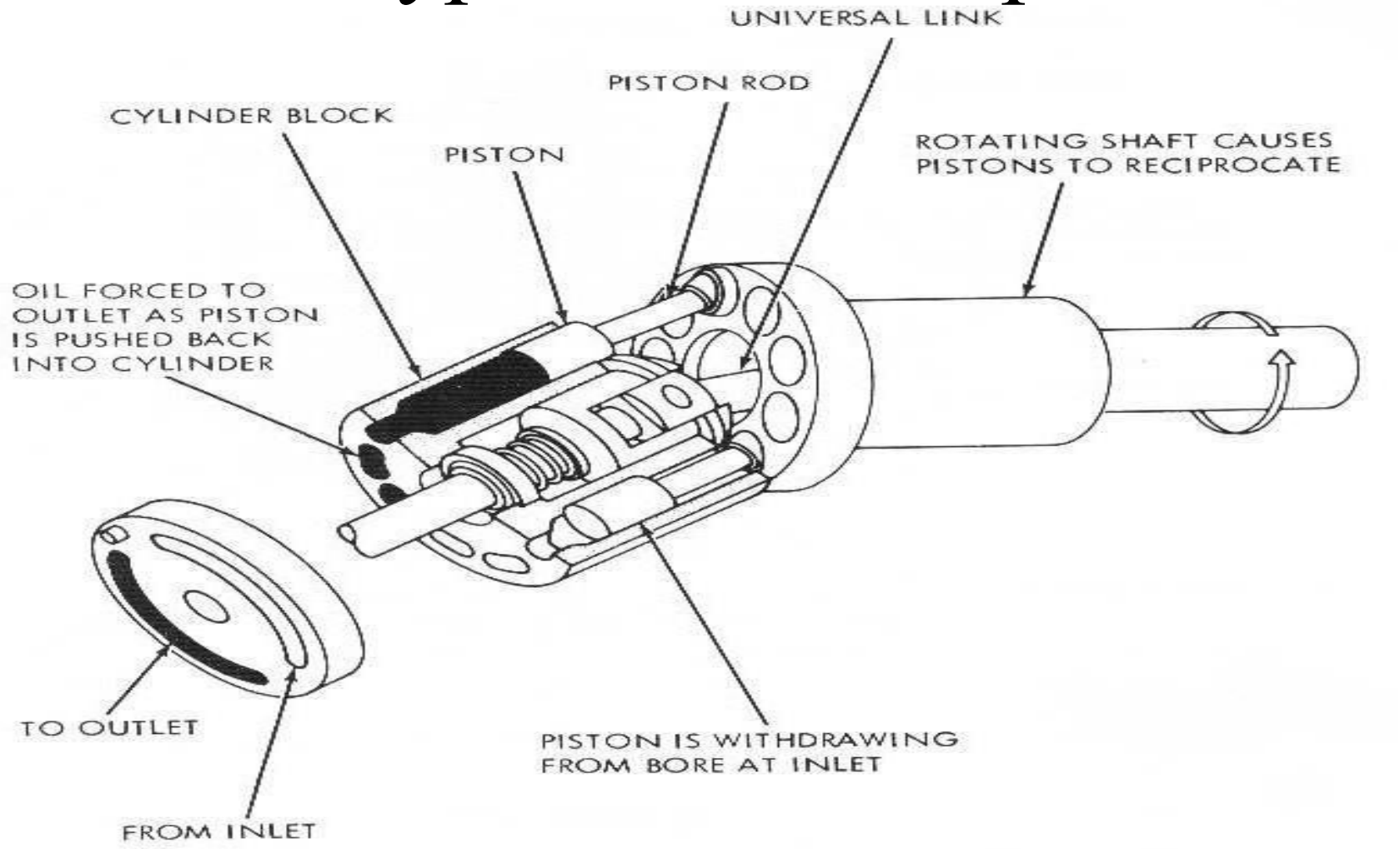
UNIT I- FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS

PISTON PUMPS

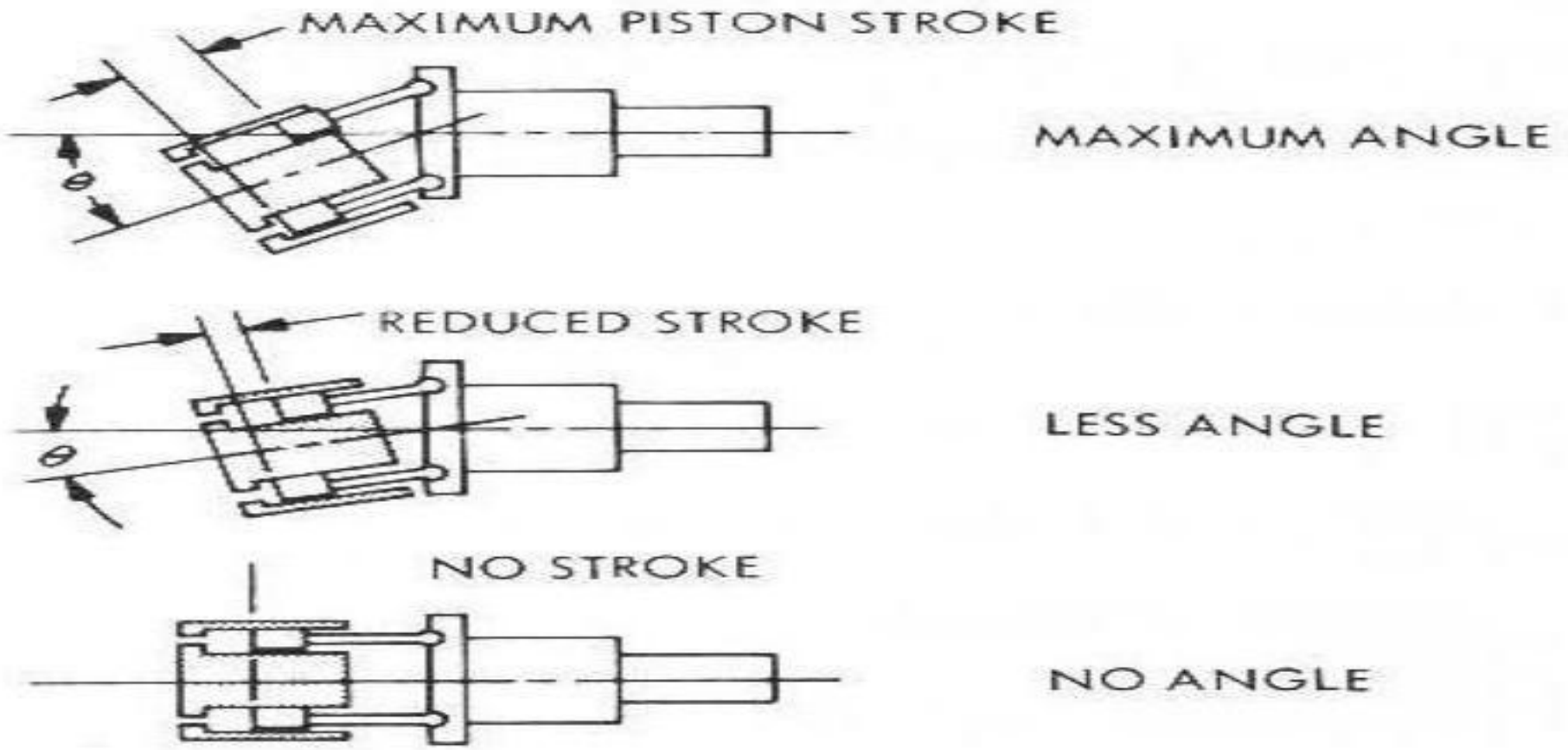
Axial Piston Pump



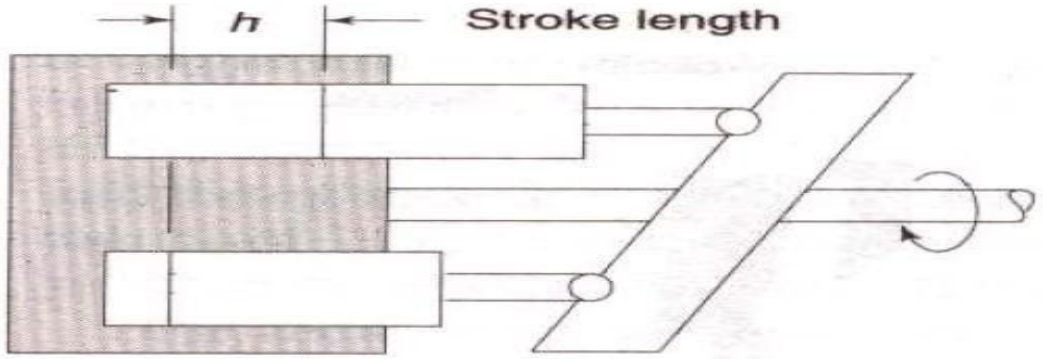
Bent Axis Type Piston Pump



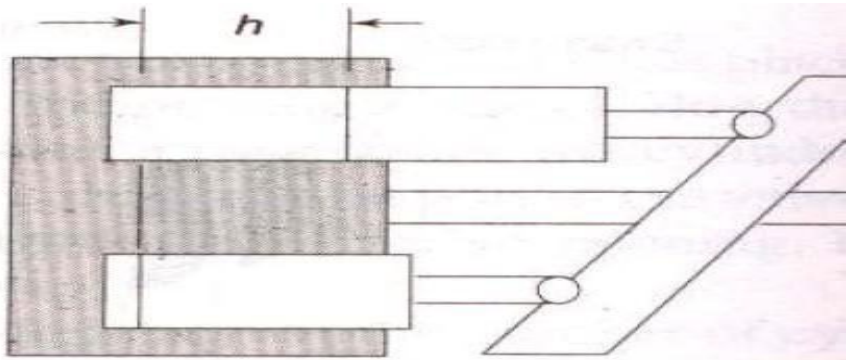
Bent Axis Type Piston Pump



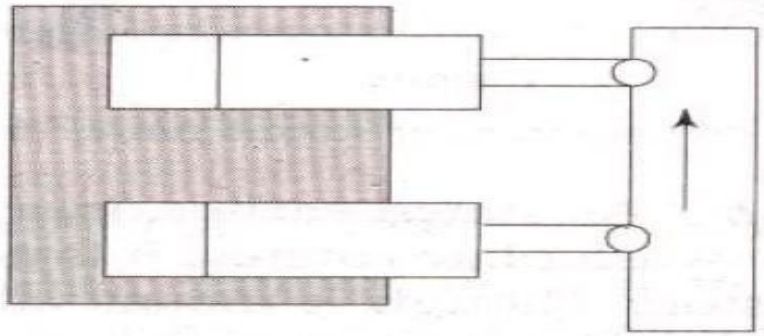
Swash Plate Type Piston Pump



(a) Maximum swash plate angle Q_{max}



(b) Decreased swash plate



(c) Zero swash plate angle (no displacement)

- Swash plate rotates with drive shaft while the cylinder block is kept fixed
- Swash plate in such pumps are called as wobble plate
- Shoe plate is prevented from rotation
- Swash plate rotating on surface of the shoe plate produces to & fro motion of piston
- The angle of the swash plate is controlled by the displacement piston.
- The swash plate is at its maximum angle which corresponds to maximum displacement and maximum flow.

Advantages of Piston Pumps

- high pressure, high speed, large power-driven pump
- Efficiency, volumetric efficiency is 95% of the total efficiency of about 90%
- Long life

Dis- Advantages

The mechanical parts are prone to wear, so the maintenance costs can be high.

Summary

- **GEAR PUMPS**
  - ✓ Least expensive
  - ✓ Lowest level of performance
  - ✓ Efficiency is rapidly reduced by wear
  - ✓ High maintenance cost
  - ✓ Simple in design
  - ✓ Widely used in fluid power industry
- **VANE PUMPS**
  - ✓ Efficiency & cost fall between Gear and Piston pumps
  - ✓ Have good efficiencies
  - ✓ Last for longer time
  - ✓ Leakage losses across the faces of rotor & between the bronze wear plates and pressure ring

Summary

- **PISTON PUMPS**
  - Most expensive
  - Provides highest level of overall performance
  - Can be driven at high speeds (up to 5000 rpm)
  - Produces non pulsating flow
  - Operates at the highest pressure levels
  - Highest efficiency
  - Longer pump life
  - Normally can not be repaired in the field because of their complex design