Unit II

LINEAR ACTUATORS

Cylinders

- Single acting
- Double acting

PUMP Vs ACTUATOR

- PUMP which convert **mechanical input** into **fluid power output**.

- The actuator which converts fluid power into mechanical power output.

ACTUATORS

- Hydraulic systems are used to control & transmit power.
- A pump driven by prime mover (electric motor) creates **flow of fluid**.
- An actuator is used to convert the energy of the fluid back into mechanical power.
- Amount of output power developed depends upon the flow rate, pressure drop across the actuator & its overall efficiency

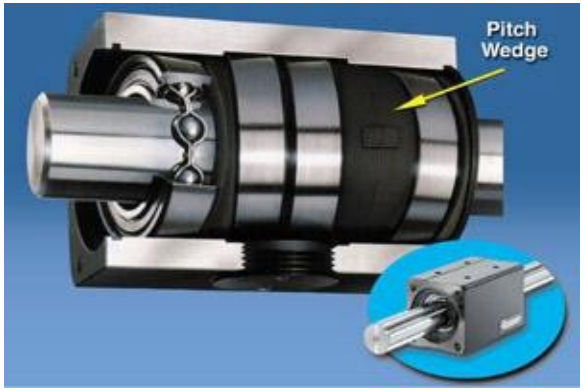
What Is a Linear Actuator?

A mechanical device that converts various types of energy into linear kinetic energy to perform mechanical work.

LINEAR ACTUATOR

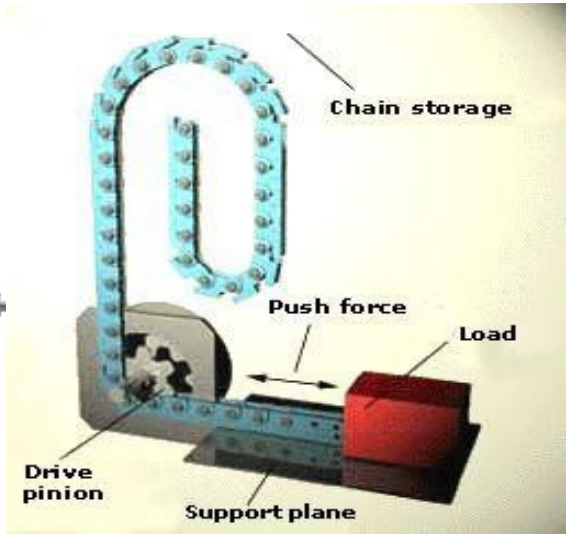
- A **linear actuator** is an actuator that creates **motion in a straight line**.
- Linear actuators are used in **machine tools and industrial machinery, Valves**
- Hydraulic or pneumatic cylinders inherently produce linear motion.
- Many other mechanisms are used to generate **linear motion from a rotating motor**.

How do they work?



Components:

- Motor
- Gearing
- Linear Mechanism (belt, screw, etc.)
- Controller
- Air Muscles
- Rolling Ring
- Rigid Chain



TYPES OF ACTUATORS

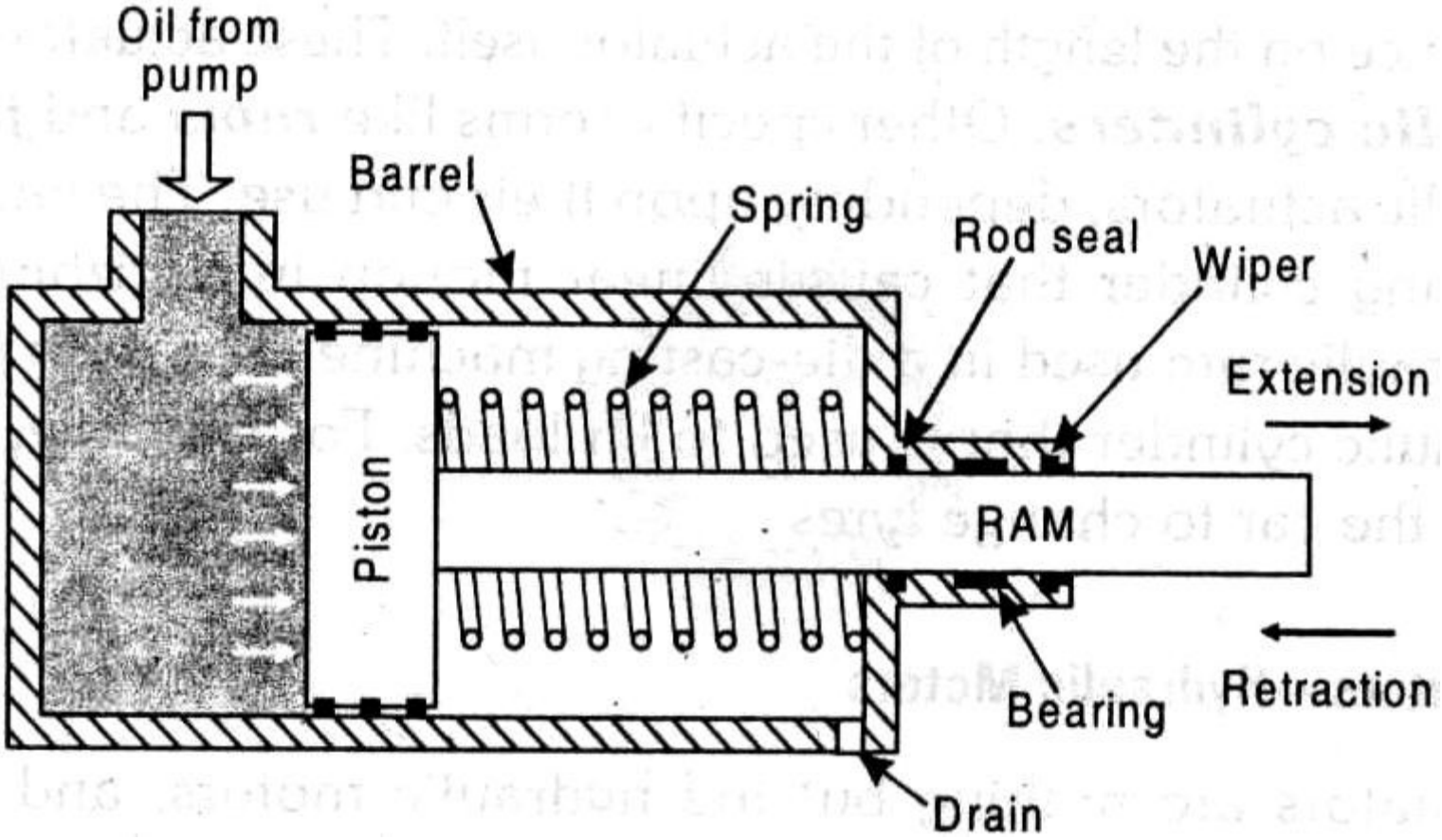
- **Linear actuator**

  (single acting cylinders) or jacks (cylinder used for lifting)

- **Common Types**
  - Single acting cylinder, Double acting cylinder
- **Special Types**

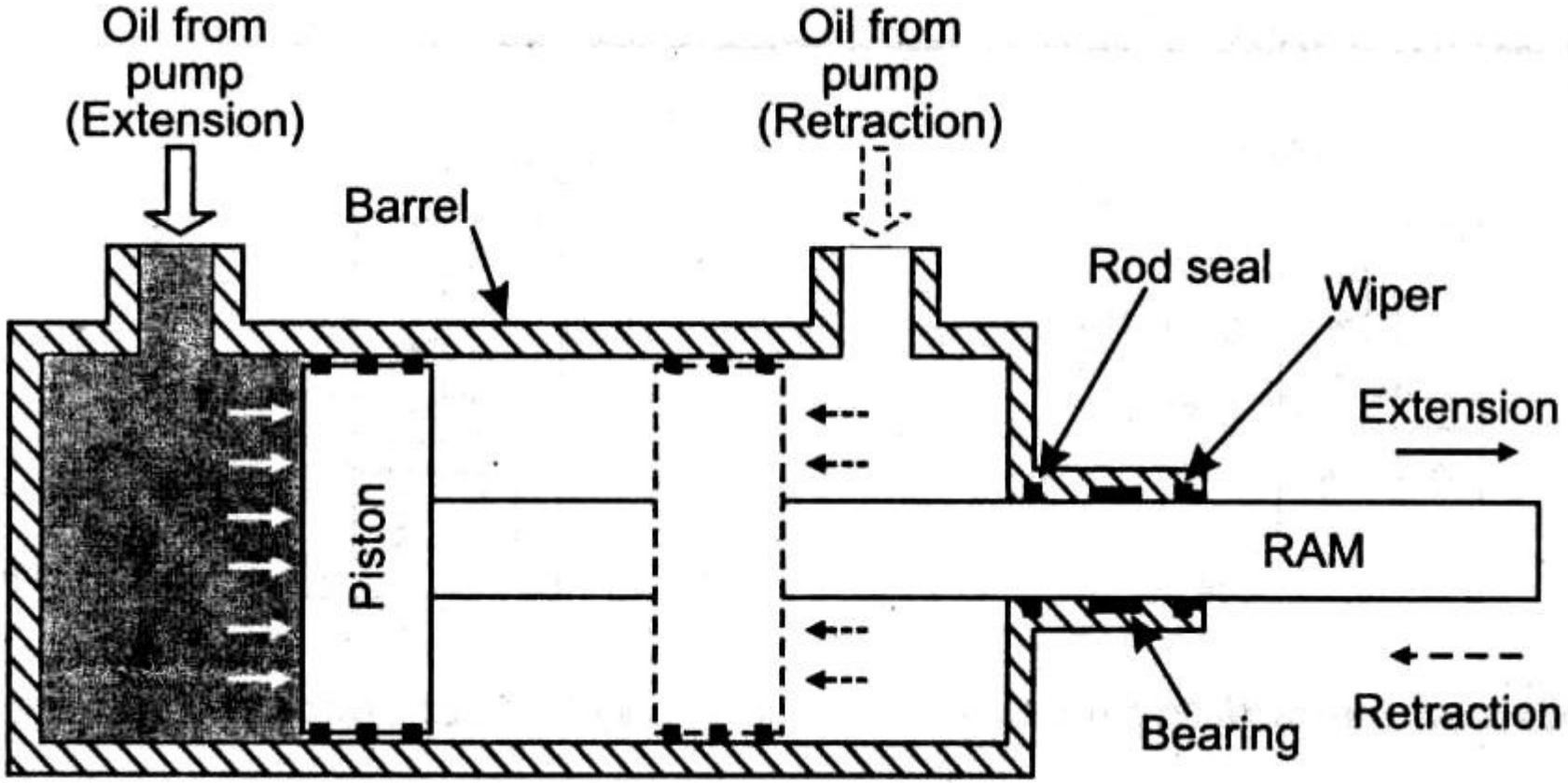
  Plunger or ram, Telescoping, Cable, Diaphragm, Bellow, Tandem, Duplex,

SINGLE ACTING CYLINDER



Produces linear motion in one direction

- Consists of cylinder (barrel), piston, piston-rod (ram) & inlet port at piston end or blank end (other end is known as rod end)
- Cylinder is machined to high surface finish (honing)
- Fluid enters through inlet port into piston end or blank end –pressure build up-force generation on piston-movement of piston –EXTENSION or FORWARD STROKE
- RETRACTION or RETURN by compression spring or under the influence of gravity (only in case of vertical mounting)


Oil from pump (Extension)
Oil from pump (Retraction)
Barrel
Rod seal
Wiper
Extension
Piston
RAM
Bearing
Retraction

Produces linear motion in two directions

- May be single rod ended or double rod ended
- Piston is connected to smaller diameter piston rod
- Fluid pressure acts on either side of piston alternatively
- Both sides of piston has oil ports
- **Fluid enters through left port causing extension stroke** while when it enters through right port causes retraction stroke, for present case
- For a given pressure double acting cylinder (single rod type) exerts **greater force** when extending than **when retracting**