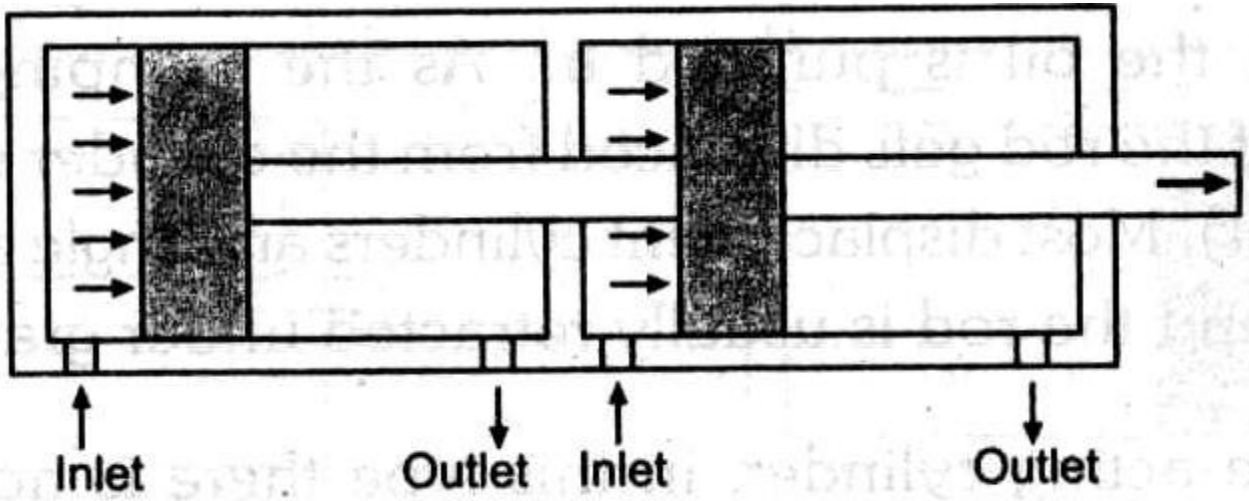
Unit II

- **Tandem cylinder**
- **Rod less cylinder**
- **Telescopic cylinder**

TANDEM CYLINDER

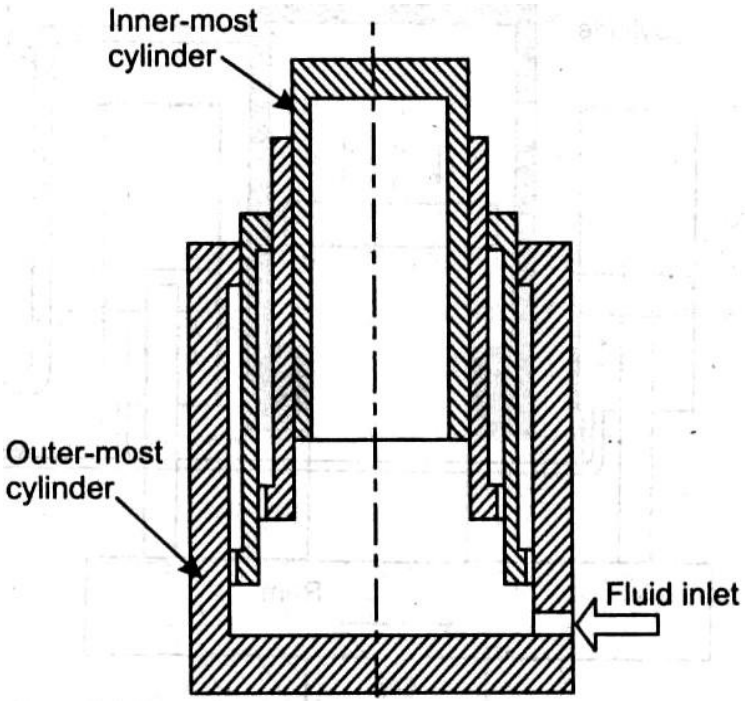


(a) Extesnion

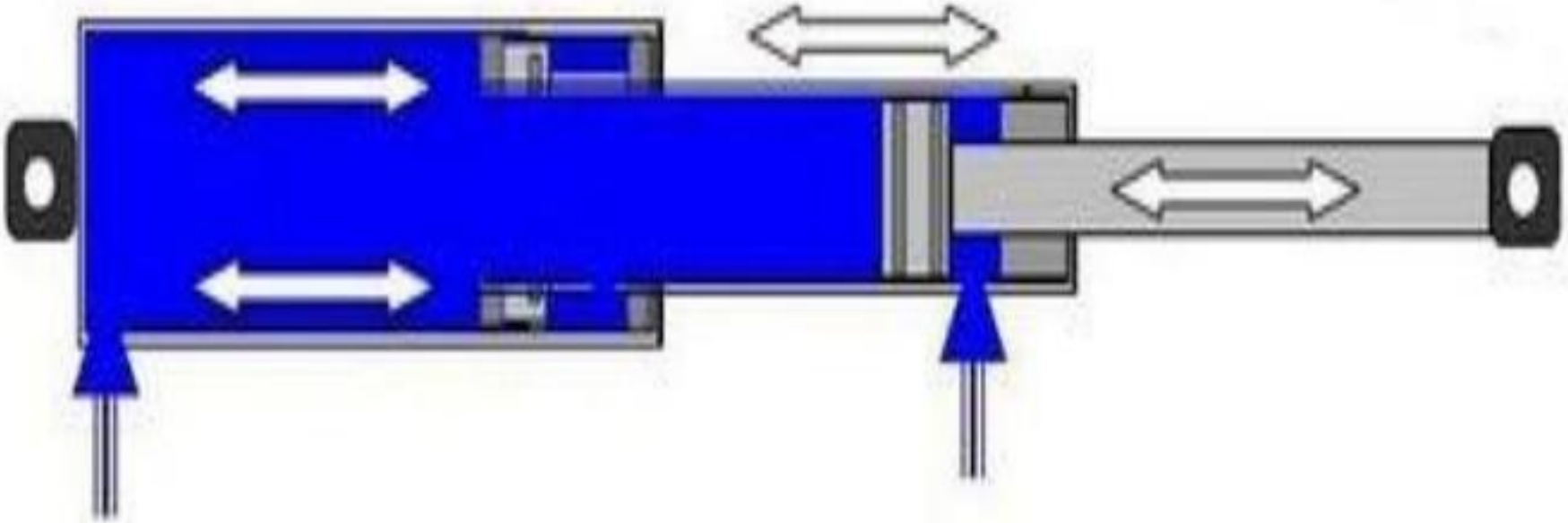
- Also known as combination cylinder
- Two separate pistons are mounted on same rod
- Two double acting cylinders are connected in series
- Suitable for higher force (2 cylinders –twice force) generation with smaller cylinders
- High volume of oil is required to drive the cylinders

TELESCOPIC CYLINDER

- Multiple cylinders mounted concentrically within one another
- Suitable for longer strokes with shorter retraction
- Operates on displacement principle
- Stop rings limit the movement of each section
- When the cylinder extends, all the sections move together until the outer section is prevented from further extension by its stop ring
- Remaining sections continue out-stroking until the second outermost section reaches the limit of its stroke and so on until all sections are extended, the innermost one being last of all
- For a given input flow rate, the speed of operation will increase in steps as each successive section reaches the end of its stroke
- For a specific pressure the load lifting capacity reduces for each successive section

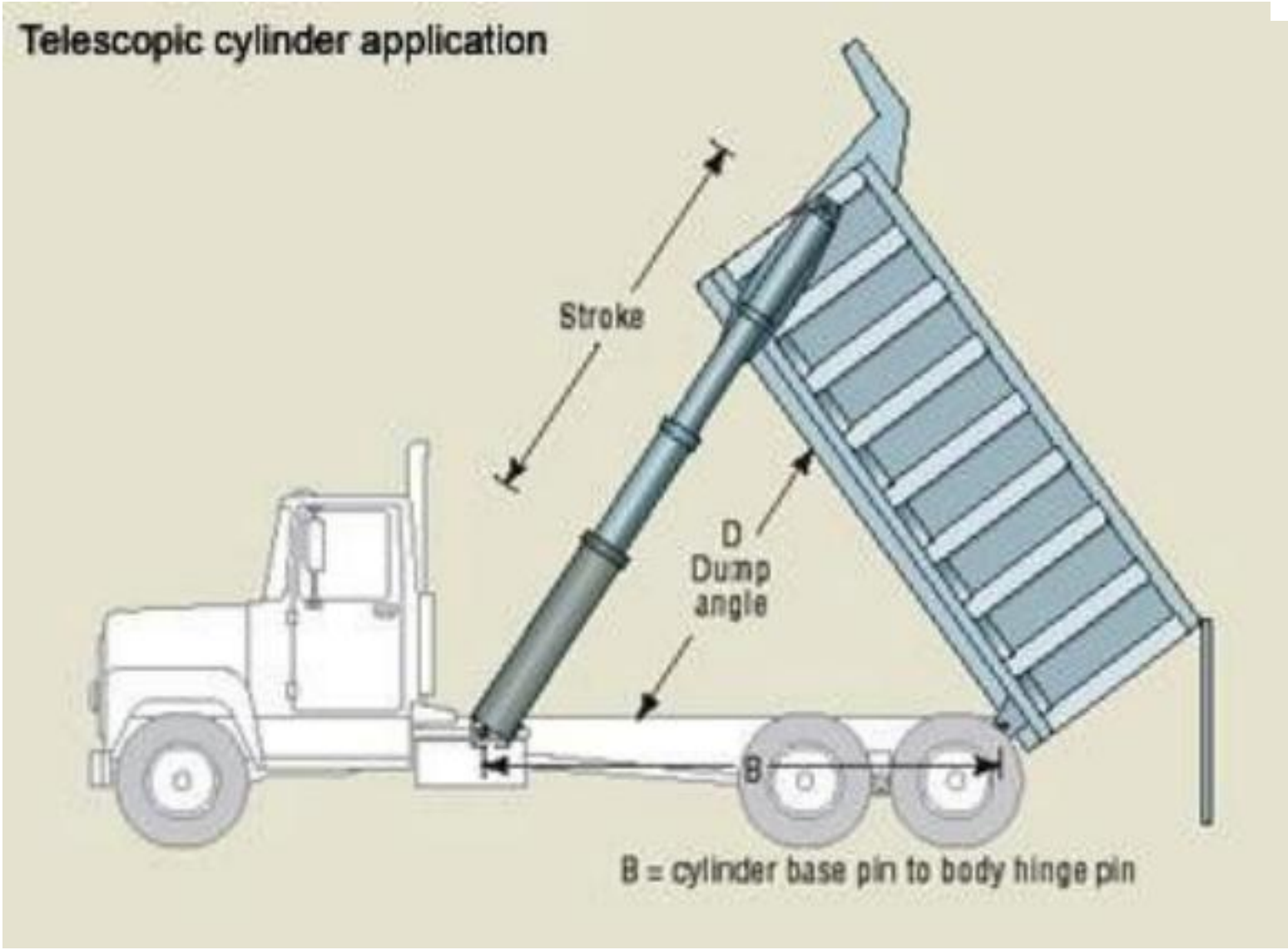


Telescoping Hydraulic Cylinder is actually two or three cylinders in one to extend stroke



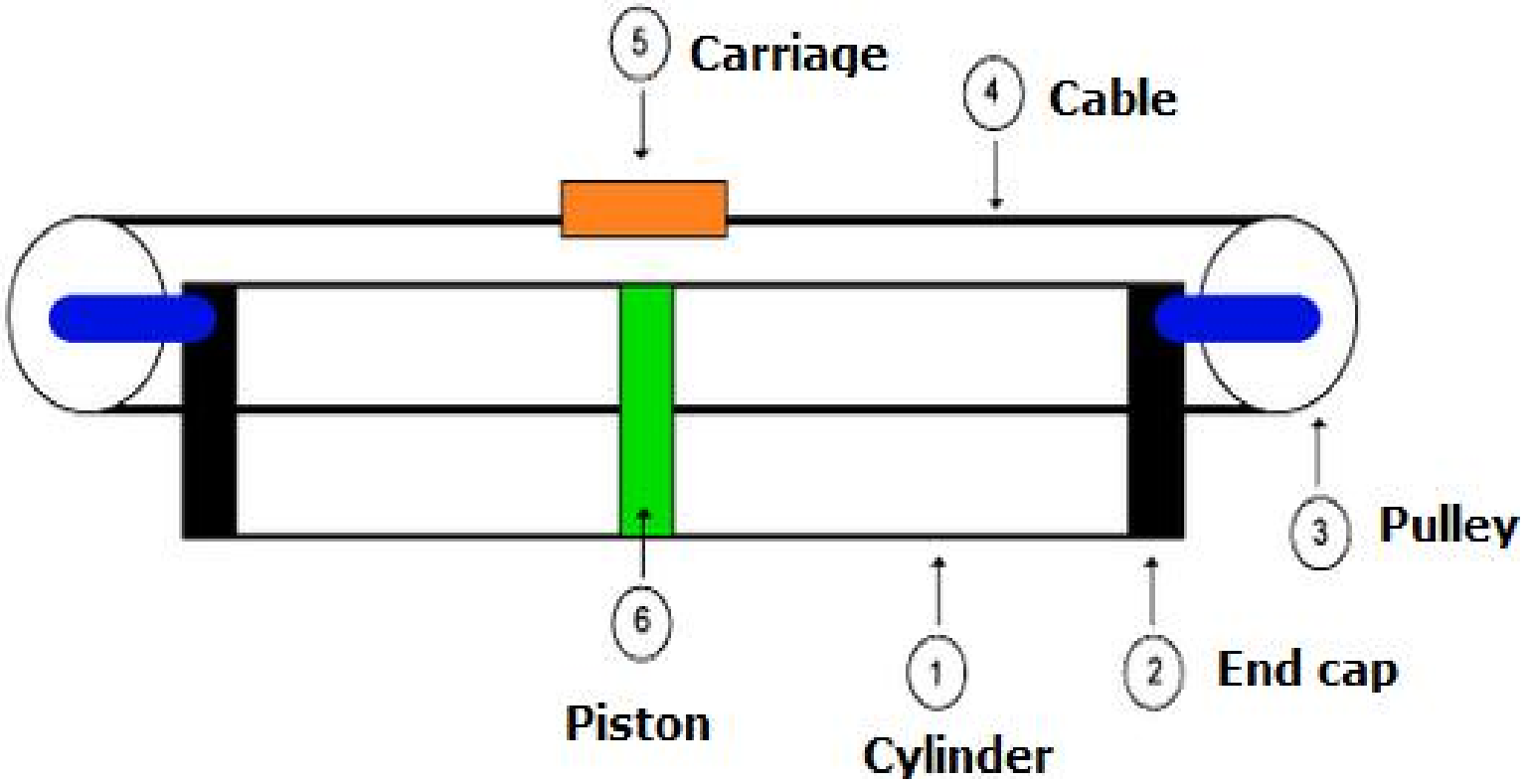
Variable Air pressure signal applied at top of cylinder

Fixed Air Pressure Air Pressure Cushion OR Mechanical Coil ReturnSpring pressure applied at


Telescopic cylinder application
Stroke
D
Dump
angle
B
B = cylinder base pin to body hinge pin

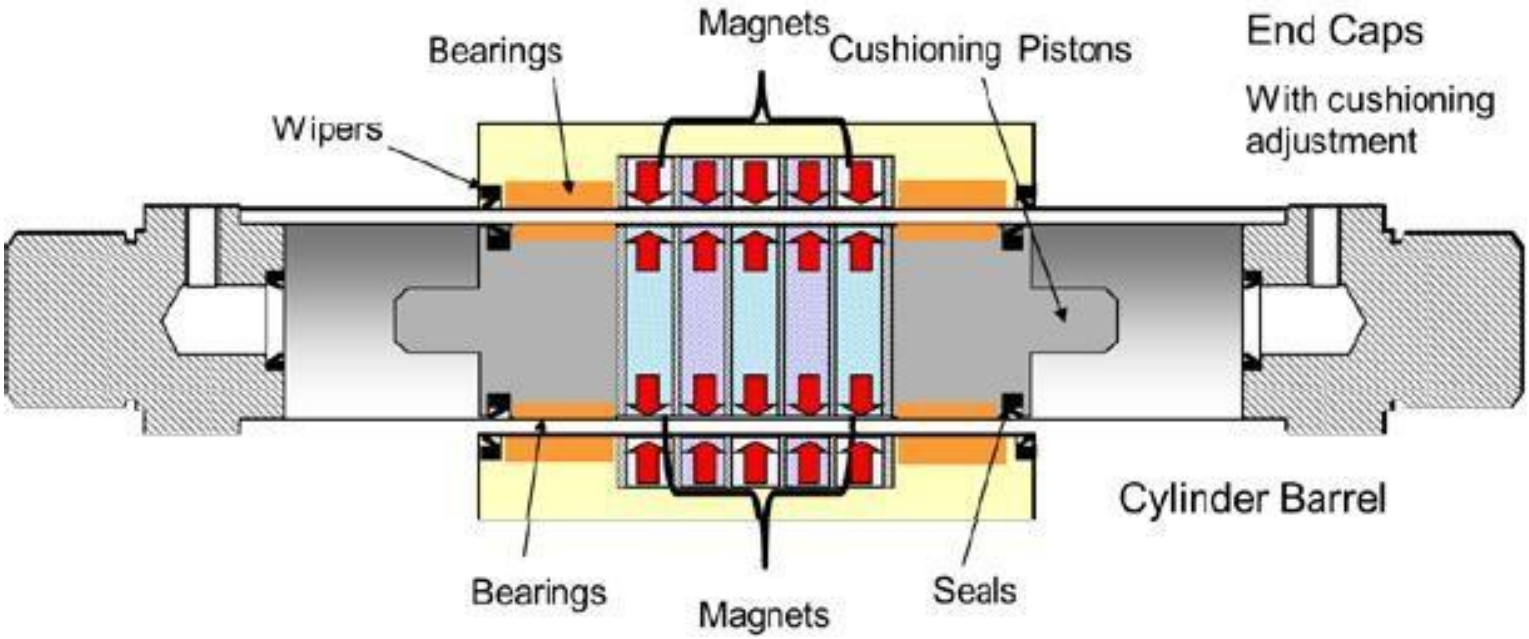
Rodless cylinders

- Conventional double acting cylinders require space to house the cylinder and space to carry out the work.
- Three different operational principles are used for the construction of rodless cylinders:
  - sealing band cylinder with slotted cylinder barrel
  - cylinder with magnetically coupled slide
  - band or cable cylinder


5
Carriage
4
Cable
3
Pulley
6
Piston
1
Cylinder
2
End cap

Cylinder with magnetic coupling

- This double-acting pneumatic linear actuator (rodless cylinder) consists of a cylindrical barrel, a piston and 2 slides. The piston in the cylinder is freely movable according to pneumatic actuation, but there is no positive external connection.
- The piston and the slide are fitted with a set of annular permanent magnets. Thus, a magnetic coupling is produced between slide and piston.
- As soon as the piston is moved by compressed air the slide moves synchronously with it. The cylinder barrel is hermetically sealed from the outer slide since there is no mechanical connection. There are no leakage losses.


Magnets
Bearings
Cushioning Pistons
End Caps
With cushioning adjustment
Wipers
Cylinder Barrel
Bearings
Magnets
Seals