Note :- Vaccum :- The atmospheric air around us is said to be contain nearly 2.5×10^9 molecules for every cubic centimeter shape any given space having molecular density less than this is said to be under "vaccum" condition. This technology dealing with the production of such reduced pressure environment using different scientific concept is known as "vaccum technology".

Vaccum technology is fundamental to a range of scientific explorations and the technological process's extending from analysing atomically clean surfaces at extremely low pressure of the order of 10^{-11} Torr (1 torr = 1mm hg) to freeze-drying of foodstuffs at relatively high pressures in the range of 10^{-1} Torr. Vaccum condition b/w these extremes are required for TV trebe production vaccum furnance, vaccum coating, semiconductor processing, particle accelerators space simulation etc.

It is interesting to know that we human beings continuously create vaccum during respiration and suction. Another natural phenomenon is the decrease in atmospheric pressure with an increase in altitude (by a factor of 10 for every 15km) from 760 Torr at sea level to a pressure of 10^{-3} Torr at an altitude of 90km.

unit of vaccum :- 1 Torr = 1mmHg = $\frac{1}{760}$ atm

1mbar = 100 pascal = $\frac{1}{1013}$ atm

Atmospheric pressure = 760 mm Hg.

Classification of Vaccum Range :-

1. Low Vaccum :- (Rough Vaccum) :- 760 atm - 10^{-2} Torr
2. High Vaccum :- 10^{-3} - 10^{-7} torr
3. Ultra High vaccum :- 10^{-7} Torr - 10^{-16} Torr].

Production of Vaccum :-

1. Rotary Van Pump :- The rotary vane pump, know also as rotary pump is a simple and most popular positive displacement pump. Fig 1 & 2 show the cross-section & exploded view of a typical rotary van pump. It has a cylinderical steel rotor located eccentrically in a cylinderical stator housing, almost touching the stator surface at the top. The rotor is slotted at its diameter to take two sping loaded vanes which bear tightly against the Inner surface of the stator. The stator is a steel cylinderical the ends of which are closed by suitables plates, which hold the shaft of the rotor. The stator is pierced by the inlet and exhaust port which are

positioned respectively a few degrees on either side of the vertical. The inlet port with a dust filter is connected to the vacuum system and the exhaust port is provided with a valve, which may be a metal flap moving vertically between arrester plates, or a sheet of Neoprene which constrained to hinge between the stator and a metal backing plate.

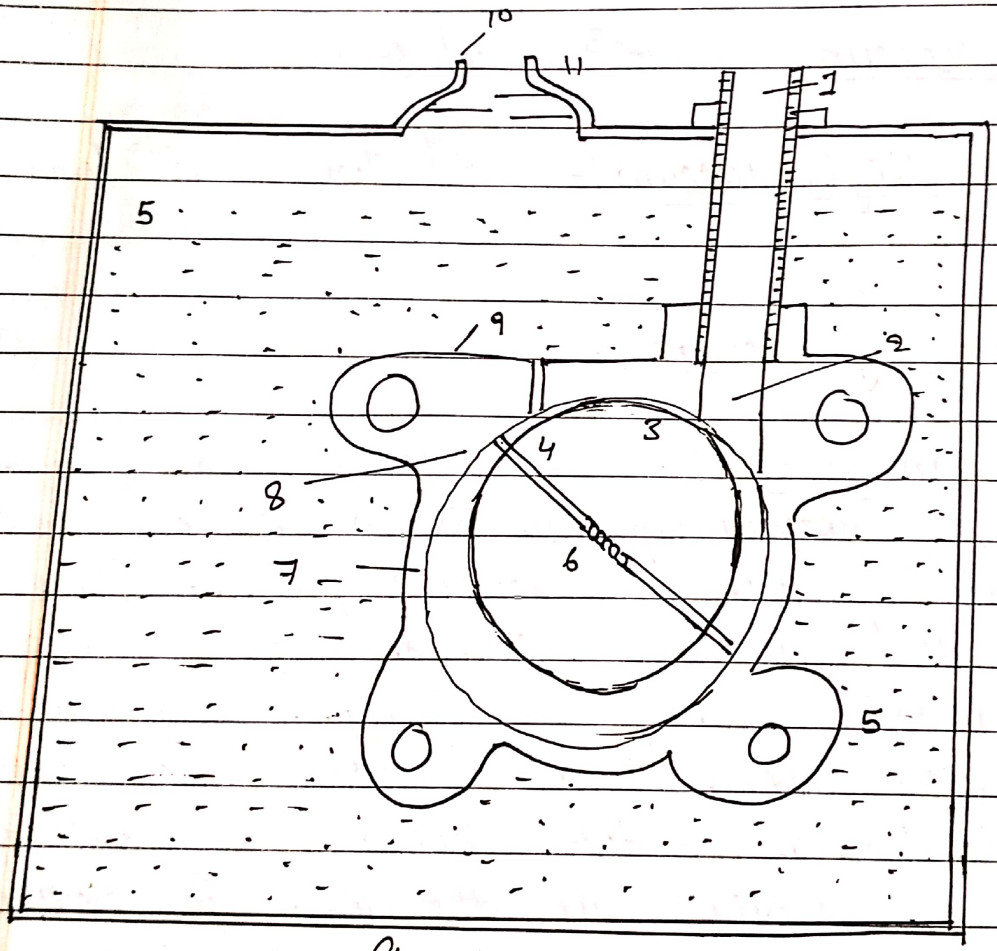
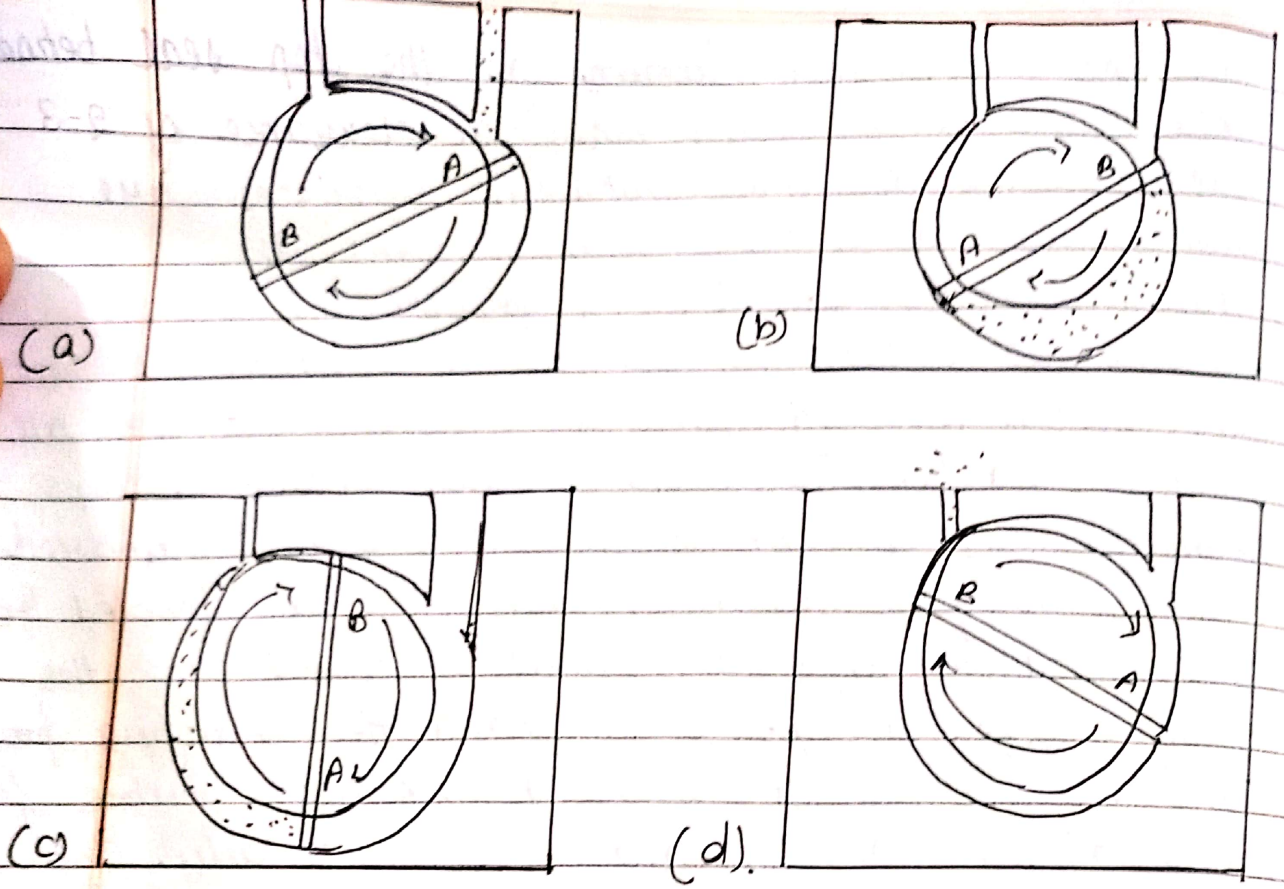


fig 1 :- cross-section of rotary pump

1	Inlet tube	7	stator
2	Inlet Port	8	exhaust port
3	Top seal	9	exhaust flap valve with backing plate
4	Vanes	10	exhaust outlet
5	Oil	11	oil splash baffles.
6	Rotar		

The line of contact known as the top seal between rotar and stator must have a clearance of 2-3 microns. All of the contacting surfaces are ground to a high precision and the whole stator-rotor assembly is submerged in a suitable oil which serves as a sealant, coolant and lubricant. A film of oil is used on all moving parts. The rotary oil-sealed pumps normally operate at speeds of several hundred revolution per minutes. They are air cooled in the smaller sizes and water cooled in the larger size. Pumps with capacities ranging from a few tenths to over a thousand cubic feet per minute are available commercially. The action of pump is shown in figure 2. As van a passes the inlet port, the vaccum system is connected to the space limited by the stator, the top seal, the rotor & vane A. The volume of this space increases as the van sweeps round thus producing a pressure decrease in the system. This continues until van B passes the inlet port, when the volu of the gas evacuated is isolated b/w the 2 vanes. Further rotation sweeps the isolated gas around the stator until vane A passes the top seal. The gas is now held between vane B and the top seal, and by furth rotation it is compressed until the pressure is sufficient to open the exhaust valve, an the gas bubbles out through the oil to the atmosphere.



Action of the Rotating Vane Pump.

2. Diffusion Pump:- Diffusion pumps are vapour jet pumps or vapour ejector pumps designed for pumping rarefied gases in the high-vaccum rang ($< 10^{-2}$ Torr). of pressure. These are called "diffusion" pumps because of the fact that the molecules of the pumped gas penetrate the vapour jet in a manner resembling diffusion of one gas into another.

High vaccum pumping systems based on diffusion pumps include at least one diffusion pump and one mechanical pump connected in series. Mechanical pumps remove about 99.99 % of the air from the vaccum chamber. The remaining air and water vapour, down to any pressure from