Medical Suction Apparatus

Medical Suction Apparatus: Is a medical device used for suction of fluid, mucous, blood and soft tissue during operation or outpatient clinic.
Medical Suction Apparatus requires a vacuum to function effectively. It uses negative pressure (vacuum) to remove fluids, secretions, or debris from a patient's body during medical procedures or treatments. The vacuum created by the apparatus helps to draw out unwanted substances from areas such as the respiratory tract, surgical wounds, or other body cavities, aiding in maintaining clear airways and preventing complications.
Note: the physical action of negative pressure involves the movement of fluids or gases from areas of higher pressure to areas of lower pressure.

BASIC VACUUM

- The term vacuum can be defined in two ways: as a space empty of matter or a space in which the pressure is significantly lower than atmospheric pressure.
- It is the lower pressure term that has clinical relevance. In fact, for clinical use, vacuum can be more simply defined as negative pressure. Suction is defined as the application of negative pressure to create movement of air, liquids or solids.

The essential parts of the suction apparatus are:

1. Source of vacuum.
2. The reservoir.
3. The delivery tubing (which may include a nozzle and catheter)
4. Bacterial filter
5. Vacume guage

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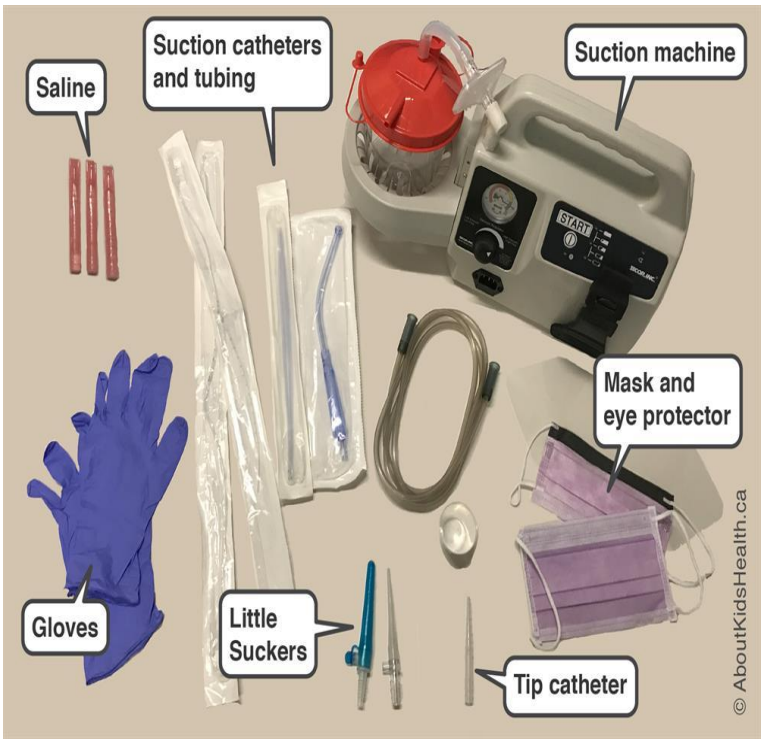
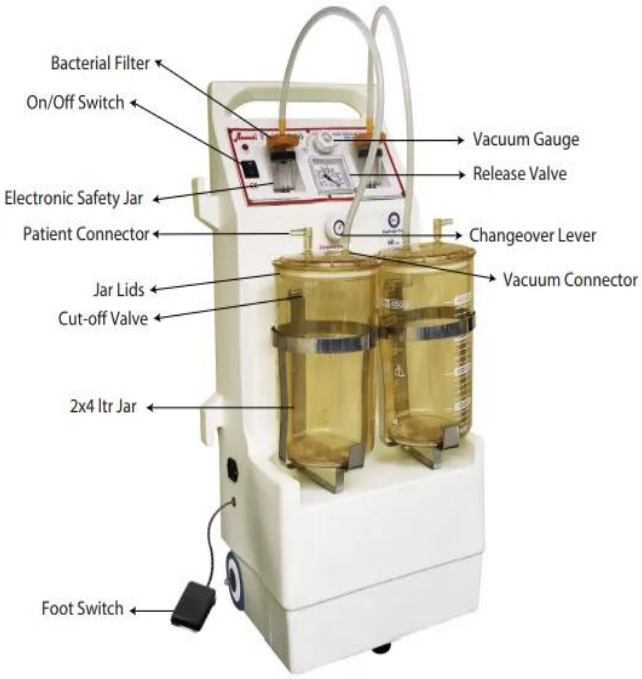
The efficiency of suction apparatus depends on:

1. The displacement (the volume of air sucked at unit of time, measured at atmospheric pressure, usually expressed in liters/min. when the pump is working).
2. The degree of negative (sub-atmospheric) pressure which can be produced by pump with regard to the time taken to achieve it.
3. The length and diameter of delivery tube.



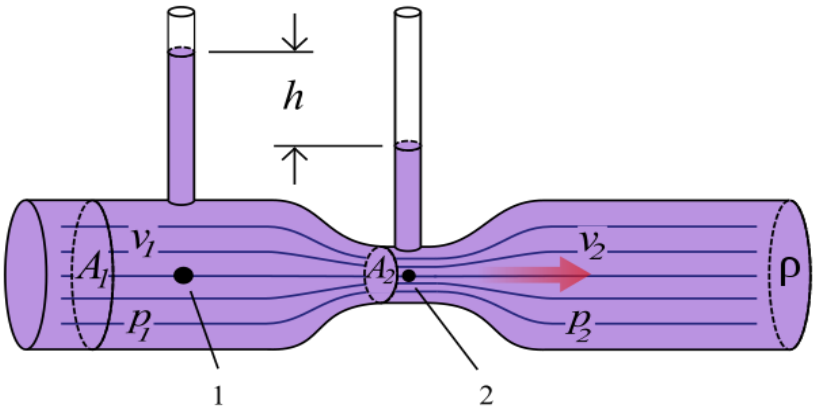


Eight means or mechanisms of providing negative pressure or vacuum

1- Venturi tube

a short tube with a tapering constriction in the middle that causes an increase in the velocity of flow of a fluid and a corresponding decrease in fluid pressure and that is used especially in measuring fluid flow or for creating a suction ,

- Commonly used for
- 1- Saliva suction on dental unit
- 2- In dry mode on steam sterilizer



2.Thermotic This thermotic pump is engineered to provide suction by alternating the expansion and contraction of air within a cylinder at regular intervals (refers to the use of temperature-related changes to create suction or vacuum).
This unit is designed for such specialized uses as gastric lavage, abdominal decompression, and is:

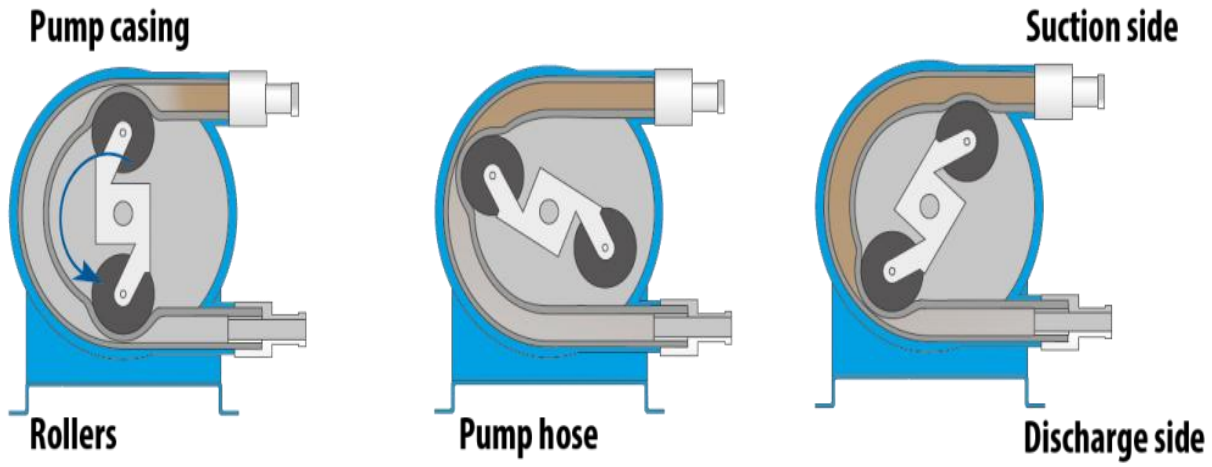
- Sealed chamber with heating element
- Heating element is De-energized
- Check valve allows air to come into the heating chamber (attached to suction bottle
- Usually very low pressure vacuum, check at chamber for suction
- Fragile heating element especially filaments .Controlled by a bimetallic strip thermostat

- **Discuss this (Thermotic mechanism can be used to generate negative pressure (vacuum) through temperature manipulation).**

When the chamber is heated, the air inside it expands, creating a lower pressure compared to the surrounding environment. Conversely, cooling the chamber causes the air inside to contract, again resulting in higher pressure. This pressure difference is utilized to generate suction, allowing the unit to remove fluids or gases from a specific area or source.

- **3-Peristaltic pump** is a type of displacement pump used for moving bodily fluids from the body and back into the body within sterile tubing to reduce contamination , is mad from Tubing along rollers (series of rollers – fingers) Fingers (vanes) operated by stepping motor or electromagnet.

- It operates by using a mechanism that involves squeezing and releasing a flexible tube or hose to create a pumping action. This design allows for precise control of the flow rate and the ability to handle a wide range of fluids.



4-Piston pump:

- It is a high vacuum pump, it required hydraulic oil. The level of oil should be checked at periodic time. that works by using a reciprocating piston to move fluid. The piston moves back and forth inside a cylinder, creating pressure variations that draw in and push out the fluid.

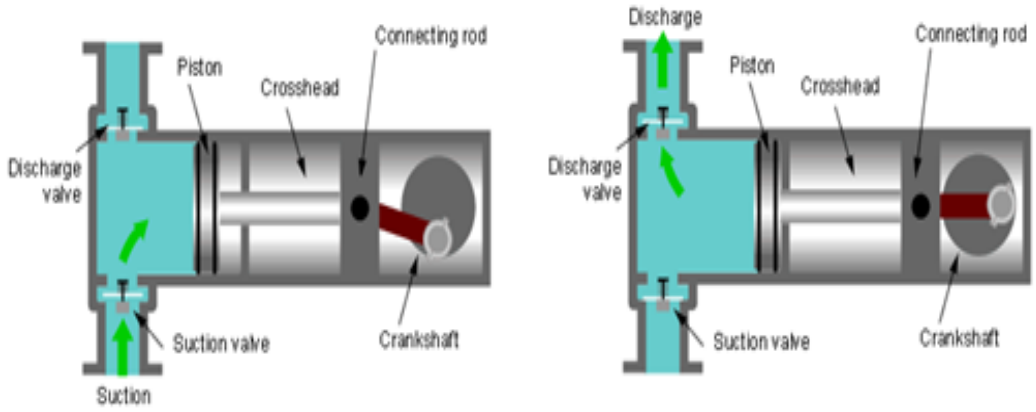


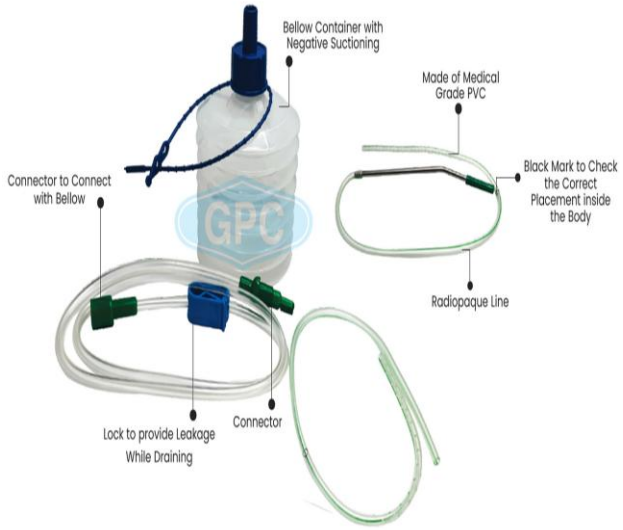
Figure: Reciprocating Piston Pumps: They consist of a hydraulic chamber were a reciprocating piston is placed. This way, solvent gets in the pump when the piston moves back and is pushed into the column when the piston moves forward.

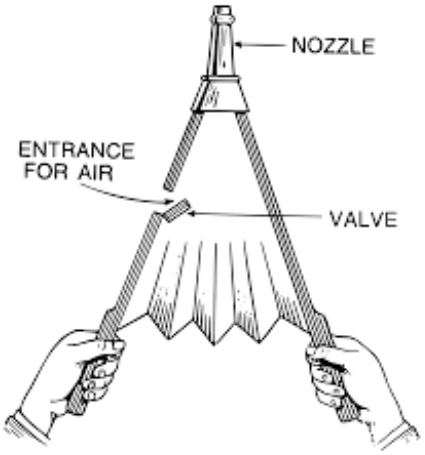
- Note: the physical principle of a piston pump relies on the reciprocating motion of a piston to alternately increase and decrease the volume within a cylinder, resulting in suction and compression strokes that enable the pump to draw in and expel fluids at a controlled rate and pressure.

5. Bellows:

A bellows is a flexible, expandable, and contractible component typically made of airtight material. It is often used to create a sealed chamber that can expand, and contract as needed.

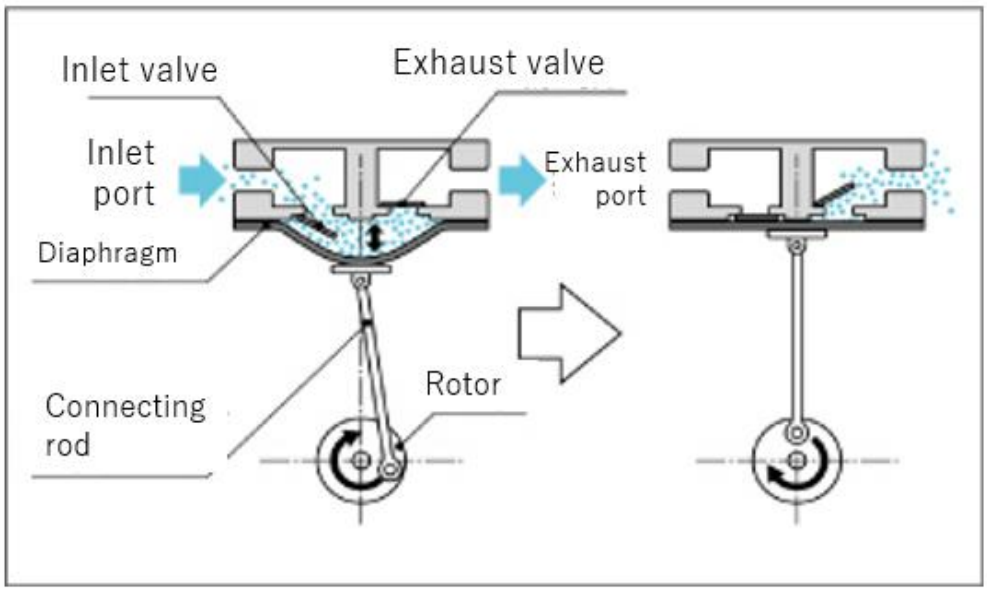
- Used to draw air from one direction and expel it in another





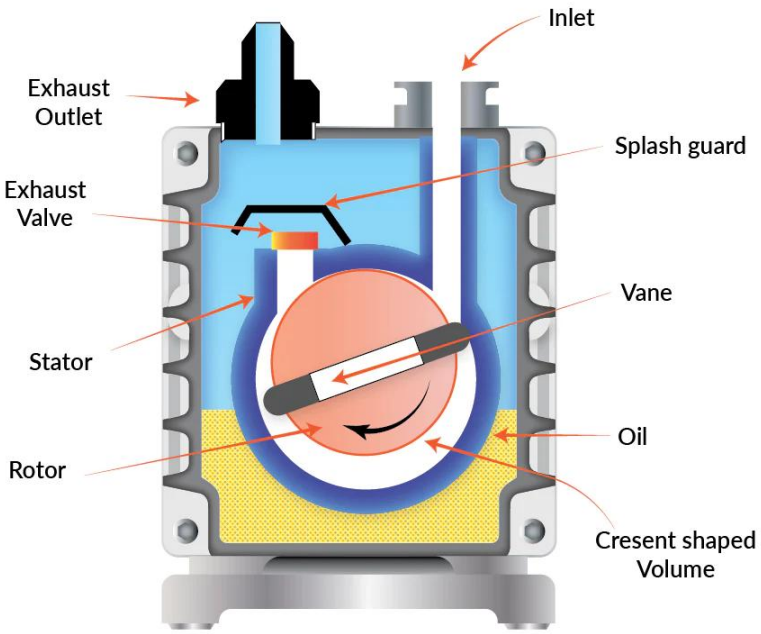
6-Diaphragm:

- Use rubber diaphragm within well closed chamber to make negative pressure with the help of two valves, one for suck air and other for push it out.



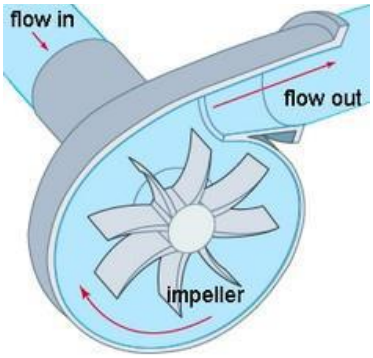
7- Rotary van:

- Make use of rotating vanes to take the fluid from one side and push it to other side.



8. Centrifugal pump

- Motor spins a turbine wheel at high speed (found in common vacuum cleaners). Large volume of air moves through the pump creating a negative pressure Air movement carries particles with it Commonly found in high-speed dental suction unit.



Impellers play a crucial role in the operation of centrifugal pumps and other fluid-handling equipment by imparting kinetic energy to the fluid, which results in the movement and pressurization of the fluid.