Practice lecture of anaethetic equipements

ANAESTHETIC MACHINE

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Anasthtic machine

The anaesthetic machine receives medical gases

(oxygen, nitrous oxide, air) under pressure and accurately controls the flow of each gas individually. A gas mixture of the desired composition at a defined flow rate is created before a known concentration of an inhalational agent vapour is added. Gas and vapour mixtures are continuously delivered to the common gas outlet of the machine, as fresh gas flow (FGF), and to the breathing system and patient.

The anaesthetic machine consist of:

1.gas supplies

2. pressure gauges

3. pressure regulators (reducing valves)

4. flowmeters

5. vaporizers

6. common gas outlet

7. a variety of other features, e.g. high-flow oxygen flush, pressure relief valve and oxygen supply failure alarm and suction apparatus

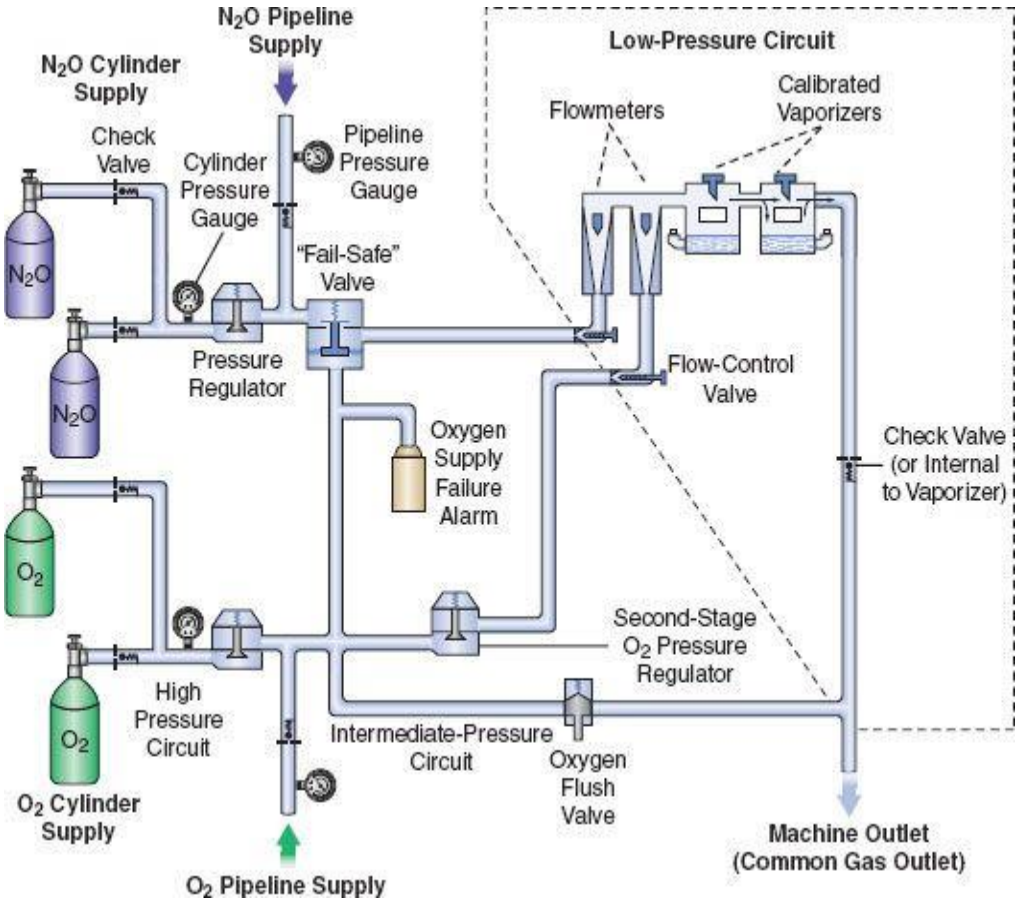
8. most modern anaesthetic machines or stations incorporate a circle breathing system and a bag-in-bottle type ventilator

Anatomy of the anesthetic machine:

-high pressure section

-intermediate pressure section

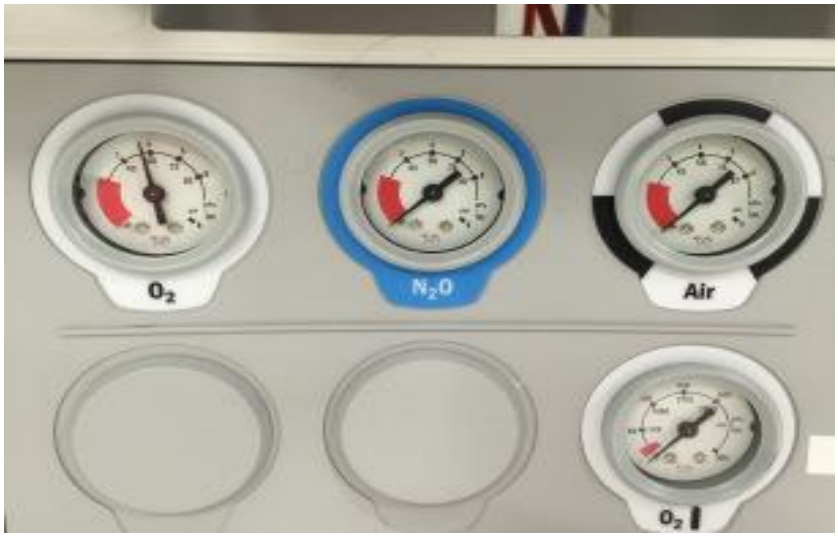
-low pressure section



Pressure gauge

This measures the pressure in the cylinder or pipeline. The pressure gauges for oxygen, nitrous oxide and medical air are mounted in a front-facing panel on the anasthetic machine.

Some modern anasthetic machine designs have a digital display of the gas supply pressures.



Components of the pressure gauges:

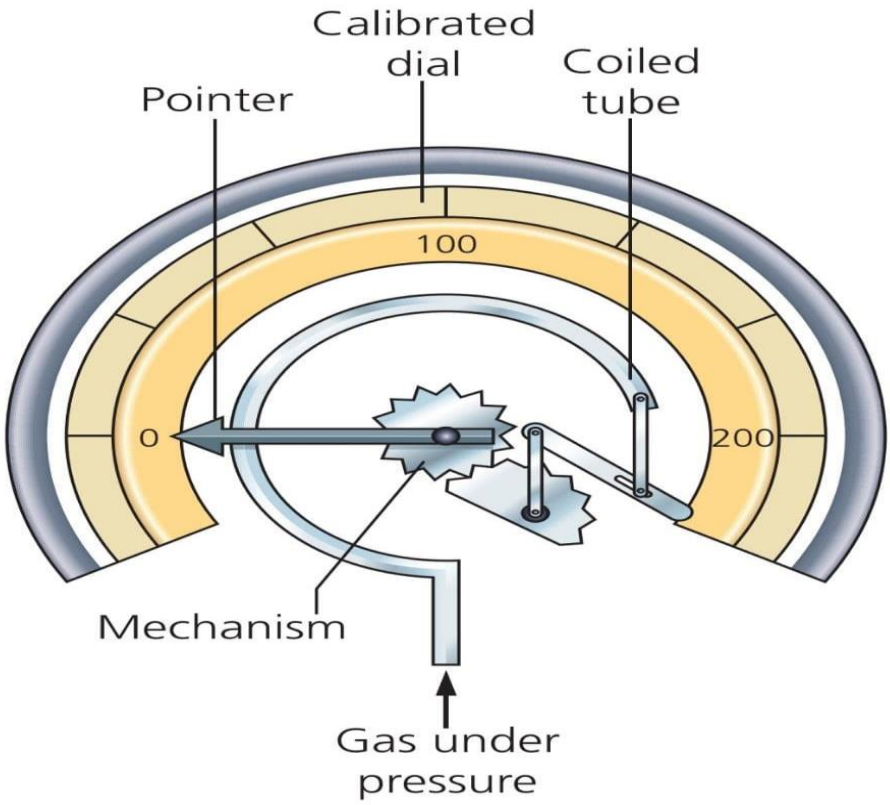
1- flexible and coiled tube which is oval in cross section. It should be able to withstand the sudden high pressure when the cylinder is switched on.

2- The tube is sealed at its inner end and connected to a needle pointer which moves over a dial.

3. The other end of the tube is exposed to the gas supply.

Mechanism of action:

1-The high-pressure gas causes the tube to uncoil (Bourdon gauge).



2-The movement of the tube causes the needle pointer to move on the calibrated dial indicating the pressure.

Problems in practice and safety features:

1-Each pressure gauge is colour coded and calibrated for a particular gas or vapour.

2-A pressure gauge designed for pipelines should not be used to measure cylinder pressure and vice versa. This leads to inaccuracies and/or damage to the pressure gauge.

3-Should the coiled tube rupture, the gas vents from the back of the pressure gauge casing. The face of the pressure gauge is made of heavy glass as an additional safety feature.

Pressure regulator (reducing valve)

Pressure-reducing valves (pressure regulators) are used on anesthesia machines or central pipeline systems to convert the high variable pressure of gas from cylinders (entering into the pressure regulators) to a low constant working pressure (4 bar, 60psi) of the gas (emerging out from the pressure regulators) so as to prevent damage to the structures of flowmeters, of wall outlets or anesthesia machines, especially the flow control needles. valve

Components:

1-An inlet, with a filter, leading to a high-pressure chamber with a valve.

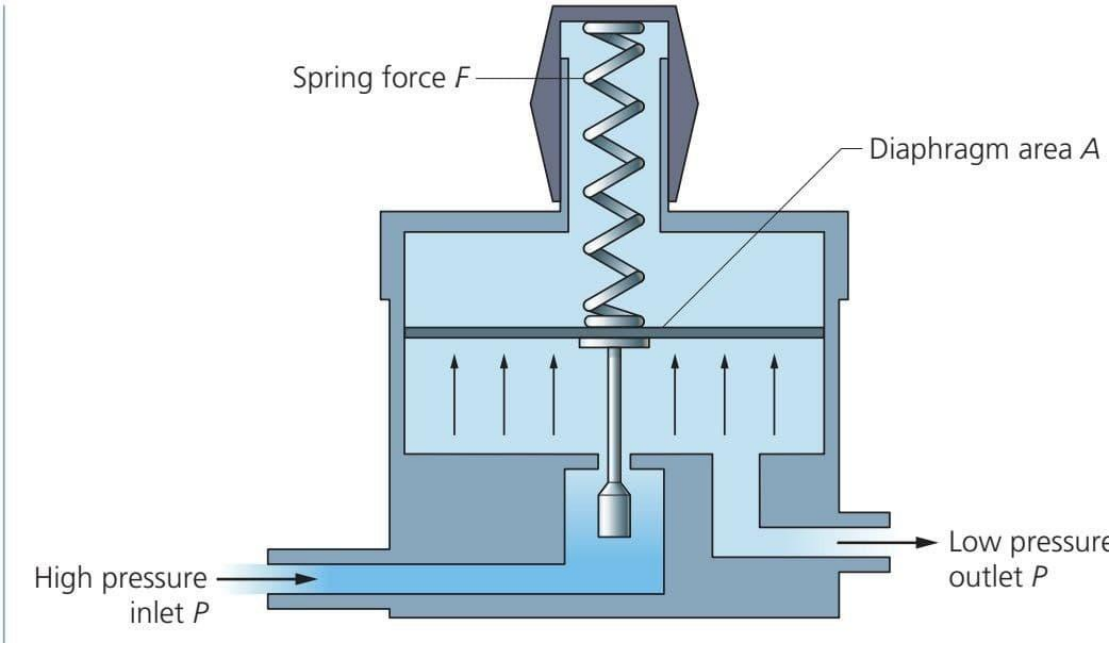
2. This valve leads to a low pressure chamber and outlet.

3. A diaphragm attached to a spring is situated in the low pressure chamber.

Mechanism of action:

1-Gas enters the high-pressure chamber and passes into the low-pressure chamber via the valve.

2. The force exerted by the high-pressure gas tries to close the valve. The opposing force of the diaphragm and spring tries to open the valve. A balance is reached between the two opposing forces. This maintains a gas flow under a constant pressure of about 400 kPa



Problems in practice and safety features:

1-Formation of ice inside the regulator can occur. If the cylinder contains water vapour, this may condense and freeze as a result of the heat lost when gas expands on entry into the low-pressure chamber.

2-The diaphragm can rupture.

3. Relief valves (usually set at700 kPa) are fitted down stream of the regulators and allow the escape of gas should the regulators fail.

4. A one-way valve is positioned within the cylinder supply line. This prevents backflow and loss of gas from the pipeline supplies should a cylinder not be connected.

Best wishes