ANAESTHETIC BREATHING SYSTEMS
L1

BY

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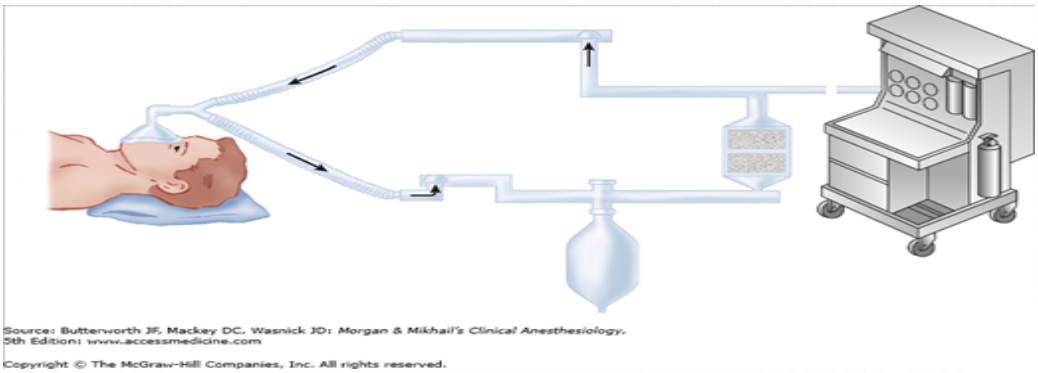
breathing systems/circuits

- A breathing system a device that conducts gases such as oxygen and anesthetic agents to the patient and conducts waste gases such as CO2 away.



Essential requirements of a breathing circuit

- Deliver the gases from machine to alveoli in the same concentration as set &in the shortest possible time.
- Removal of carbon dioxide from the patient
- Minimal resistance
- Economy of gases

PROPERTIES OF THE IDEAL BREATHING SYSTEM

1. Simple and safe to use.
2. Delivers the intended inspired gas mixture.
3. Permits spontaneous, manual and controlled ventilation in all age groups.
4. Efficient, requiring low FGF rates.
5. Protects the patient from barotrauma.
6. Sturdy, compact, portable and lightweight in design.
7. Permits the easy removal of waste exhaled gases.
8. Ability to conserve heat and moisture.
9. Easy to maintain with minimal running costs.

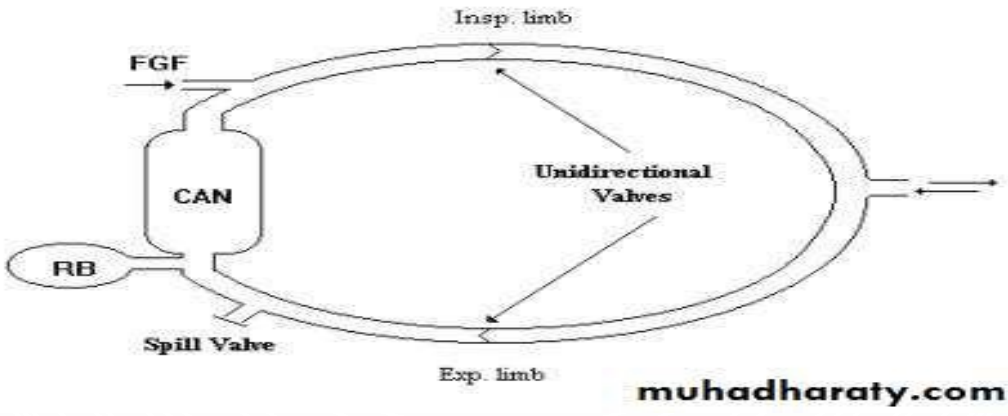
Simple Classification

- Unidirectional flow – Circle system:

Two phase system: Gas passes through two separate (Insp &exp.) tubes with unidirectional valve to one-way flow of gases.

- Bidirectional flow – To and fro system:

Single- phase system: gas passes through CO2 absorber during both inspiration and expiration.



Other Classification of breathing circuits

1.Open circuit

2. Semi-open circuit

3. Semi-closed circuit

4. Closed circuit

1. Open circuit:

- Used in ancient times
- fully opened mask, through that open mask the inhalational agents are directly poured

2. Semi-open circuit:

- Same as the open circuit but it is covered with a towel
- It is not fully opened

3. Semi-closed circuit:

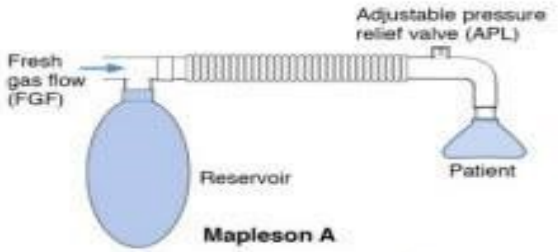
- These semi-closed circuits are more commonly used, classified into,
- Mapleson A,B,C,D,E and F
- A, B, C and D are adult circuits
- E and F are used for pediatrics

Mapleson classification

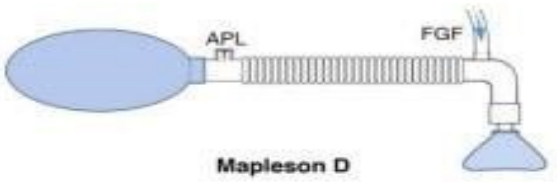
- Introduced in 1954 by professor W W Mapleson
- It does not include systems with carbon dioxide absorption

Components Of Mapleson Systems

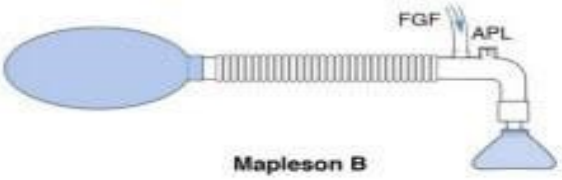
- Reservoir bag
- Fresh gas flow entry
- Expiratory valve
- Corrugator tubing



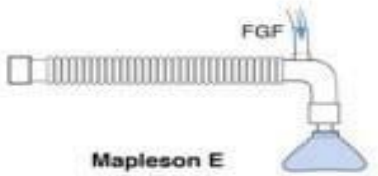
Mapleson A



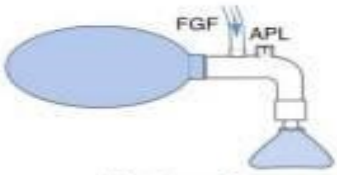
Mapleson D



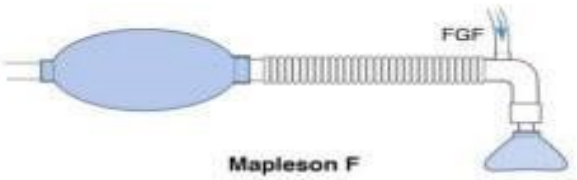
Mapleson B



Mapleson E



Mapleson C



Mapleson F

Functions Of A Reservoir Bag

- Acts as a reservoir for the peak inspiratory flow
- Visual and tactile assessment of respiration and depth of anesthesia
- Control of ventilation
- Prevents barotrauma
- Nebulization of drugs

Selecting The Size Of A Reservoir Bag

- Based on the inspiratory capacity
- 30-35 ml/kg
- Half, 1,2 & 3 liter bags

Why breathing tubes are corrugated?

1. Increased flexibility
2. Prevents kinking
3. Produces turbulent flow → better mixing

Material

- Rubber
- Plastic
- Silicone

Advantages Of Plastic Tubes

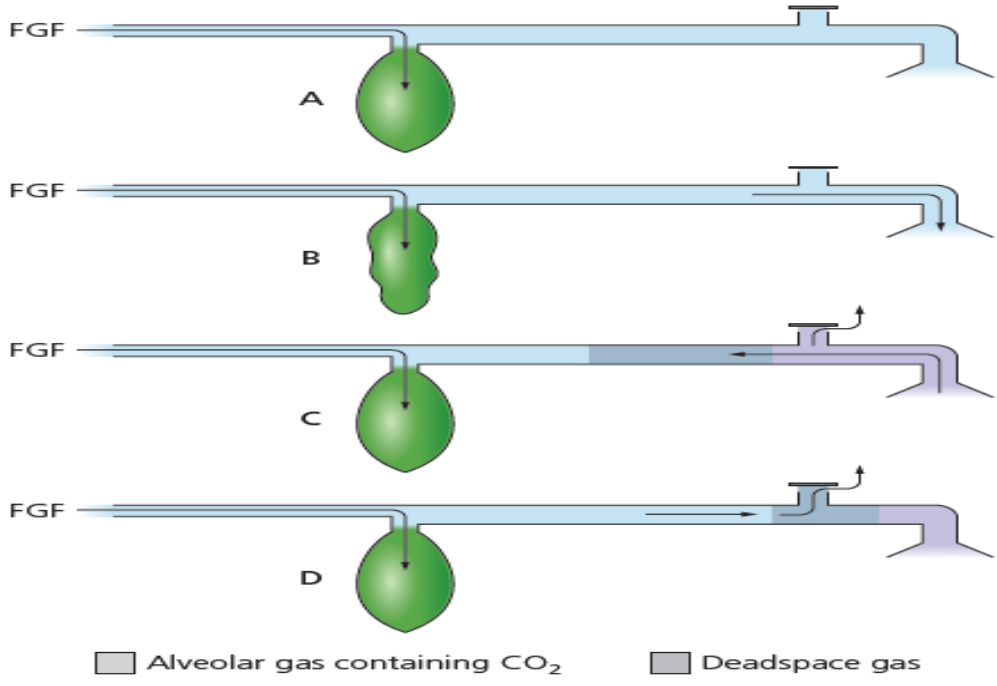
- Transparent - better visualization of interior
- Light weight
- Cause less drag on endotracheal tube
- Absorb less halogenated agents
- Decreased compressible
- Lower compliance volume

The Mapleson A (Magill) System

- It was designed by Sir Ivan Magill in the 1930's
- In spontaneous ventilation, a fresh gas flow (FGF) equal to the patient's alveolar minute ventilation
- It excellent system for spontaneous ventilation.
- In controlled ventilation A FGF of two and a half times the patient's minute volume is required
- During controlled ventilation the Magill circuit becomes wasteful and inefficient, requiring high fresh gas flows to prevent rebreathing.
- The Magill system is not suitable for use with children of less than 25–30 kg body weight.

Mechanism of action

1. During the first inspiration, all the gases are fresh and consist of oxygen and anaesthetic gases from the anaesthetic machine.
2. As the patient exhales (Fig. C), the gases coming from the anatomical dead space (i.e. they have not undergone gas exchange so contain no CO2) are exhaled first and enter the tubing and are channelled back towards the reservoir bag which is being filled continuously with FGF**.**
3. During the expiratory pause, pressure build-up within the system allows the FGF to expel the alveolar gases first out through the APL valve (Fig. D).
4. By that time the patient inspires again (Fig. B), getting a mixture of FGF and the rebreathed anatomical dead space gases.
5. It is a very efficient system for spontaneous breathing. Because there is no gas exchange in the anatomical dead space, the FGF requirements to prevent rebreathing of alveolar gases are theoretically equal to the patient's alveolar minute volume (about 70 mL/kg/min).
6. The Magill system is not an efficient system for controlled ventilation. An FGF rate of three times the alveolar minute volume is required to prevent rebreathing.



Good luck today! I know you'll do great

Thank you

"A sad soul can be just as lethal as a germ."