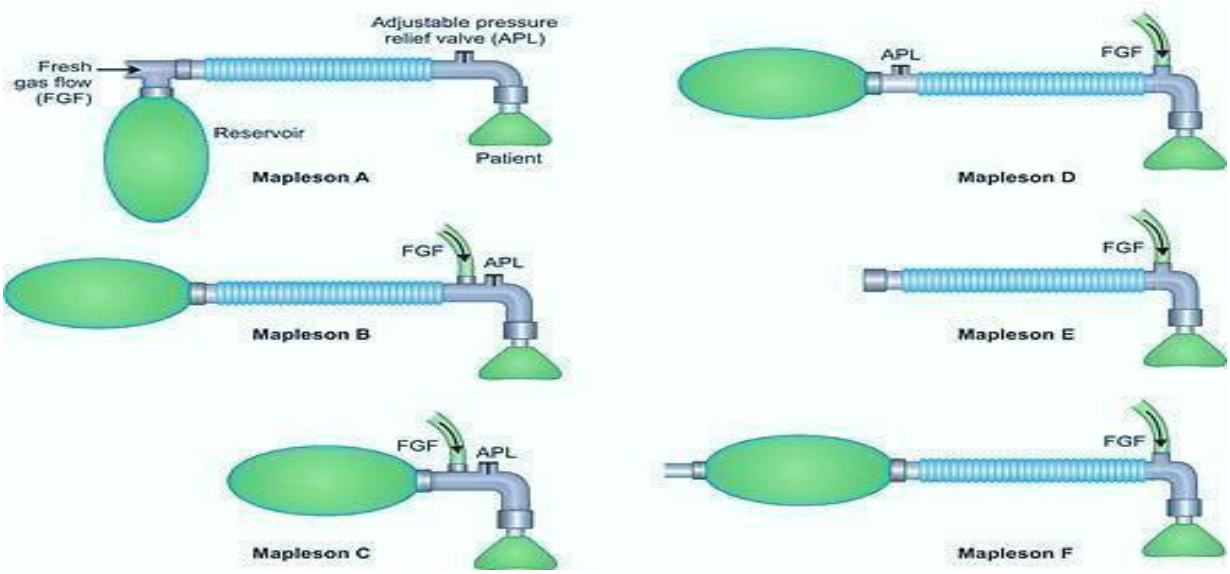
Mapleson classification (Semiclosed Partial rebreathing)

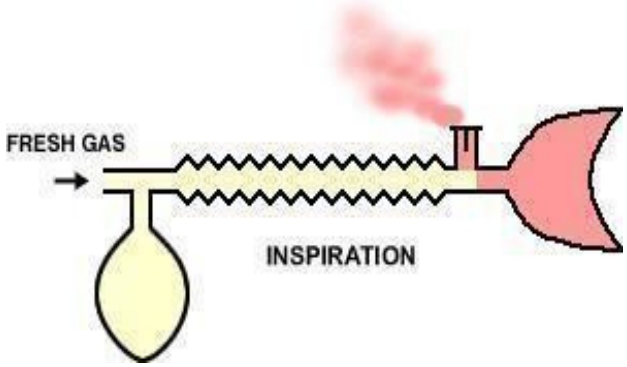
In 1954, Mapleson classified the breathing systems into five configurations (A to E) and a sixth (F) was added later. The classification is according to the relative positions of the APL valve, reservoir bag and FGF. Mapleson systems need significantly higher FGF to prevent rebreathing compared to the circle breathing system and therefore the expensive use of volatile agents. Their use in modern anesthesia is very limited with the wide spread of the circle breathing system.



Magill system (Mapleson A)

Components

1. Corrugated rubber or plastic ***tubing*** (usually 110–180 cm in length) and an internal volume of at least 550 mL.
2. A ***reservoir bag***, mounted at the ***machine end***.
3. ***APL valve*** situated at the ***patient end***.



Uses of magill system 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).
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.

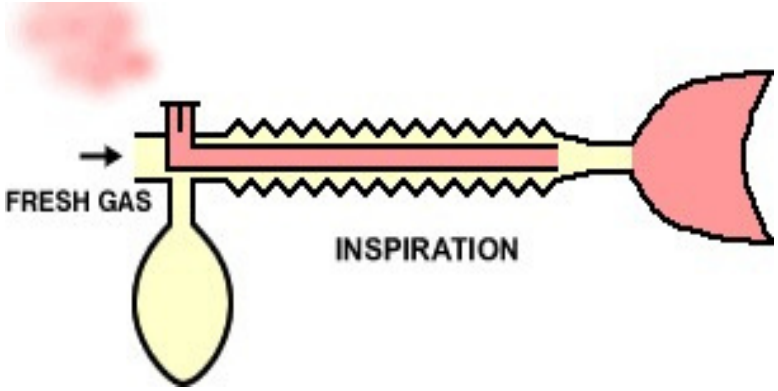
Problems in practice and safety features

1- The Magill system is ***not suitable for use with children of less than 25–30 kg*** body weight. This is because of the increased dead space caused by the system's geometry at the patient end. Dead space is further increased by the angle piece and face mask.

2- One of its disadvantages is the ***heaviness of the APL valve*** at the patient's end (***Not suitable for paediatric practice***). especially if connected to a scavenging system.

Lack system (Mapleson A)

This is a ***coaxial*** modification of the ***Magill Mapleson A system***.



Components

1. 1.8-m length coaxial tubing (tube inside a tube). The FGF is through the outside tube, and the exhaled gases flow through the inside tube.

2. The reservoir bag and APL valve is mounted at the machine end.

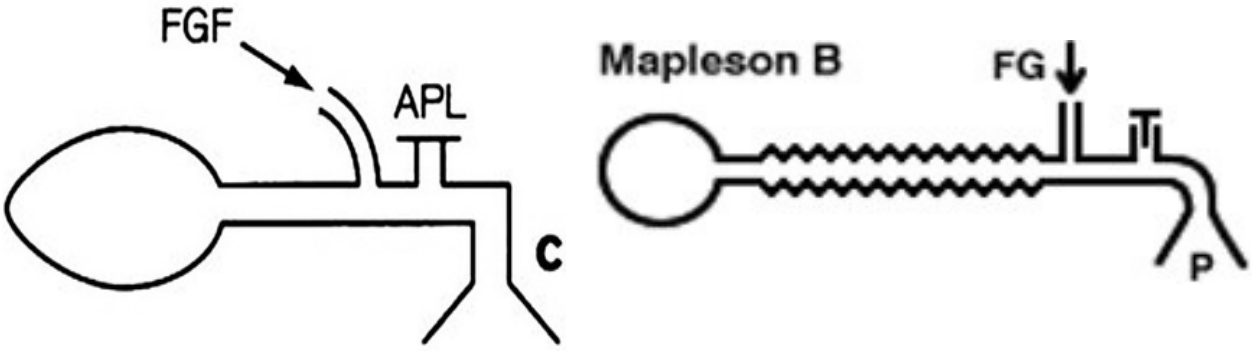
Uses A FGF rate of about 70 mL/kg/min is required in order to prevent rebreathing.

This
makes it an ***efficient breathing system for spontaneous ventilation.***
Since it is based on the Magill system, it is ***not suitable for controlled ventilation***.
Instead of the coaxial design, a ***parallel*** tubing version of the system exists This has separate inspiratory and expiratory tubing, and retains the same flow characteristics as the coaxial version.

Mapleson B and C systems

Components

1. A reservoir bag. In the B system, corrugated tubing is attached to the bag and both act as a reservoir.
2. An APL valve at the patient's end.
3. FGF is added just proximal to the APL.

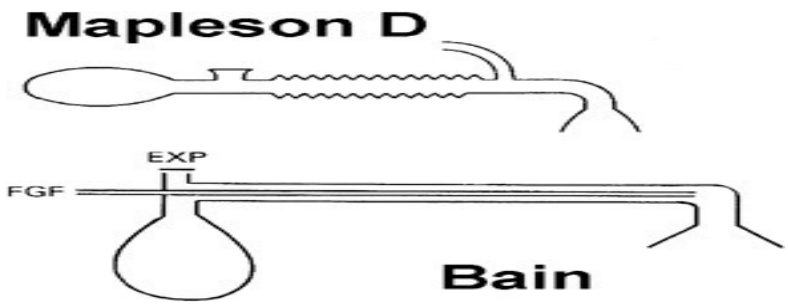


Mapleson D System

1- It consists of fresh gas inlet near the patient end

2-a corrugated rubber tubing one end which is connected with expiratory valve and then reservoir bag.

3. It is mainly used for assisted or controlled ventilation.



Bain system (Mapleson D) 1- Bain system is a coaxial version (tube inside a tube) of the Mapleson D system. 2- It is lightweight and compact at the patient end.

Components

The usual length of coaxial tubing is 180 cm, but it can be supplied at 270 cm , (for dental or ophthalmic surgery) and 540 cm (for [MRI] scans where the anaesthetic machine needs to be kept outside the scanner's magnetic field).

Problems in practice and safety features

1. The ***internal tube can kink***, preventing fresh gas being delivered to the patient.
2. The internal tube can become ***disconnected*** at the machine end, causing a large increase in the dead space and resulting in ***hypoxaemia*** and ***hypercapnia***.

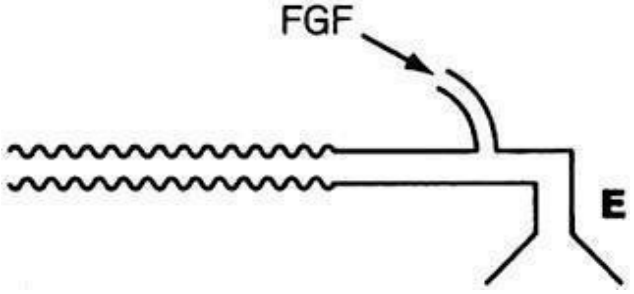
Mapelson E sys (Ayre's T-Piece)

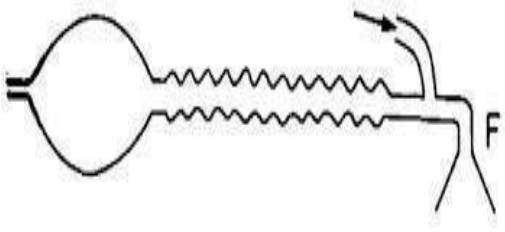
Components

1. A T-shaped tubing with three open ports
2. The first port to Fresh gas from the ***anesthetic machine*** is delivered via a tube
3. The second port leads to the ***patient*** .
4. The third port leads to ***reservoir tubing***.

A recent modification exists where an APL valve is included before a closed ended 500 mL reservoir bag. A pressure relief safety mechanism in the APL valve is actuated at a pressure of 30 cm H2O.
*No bag, no valve, used in children (low resistance to breathing and minimal dead space) .

Not:To prevent respiration of room air, the reservoir limb should exceed the VT & to prevent rebreathing, FGF (2-3 MV) .





Mapelson F sys (Jackson Rees modification of the Ayer s T piece)

A small bag (0.5L) with an open end is attached to the outlet of the reservoir limb. The bag is visual monitor FGF (2-3 MV) in both spontaneous and controlled.