



اسم المادة: الاجهزة الطبية ٣
اسم التدريسي : م.م.لبنان حمدي
المرحلة: الرابعة
السنة الدراسية : ٢٠٢٣-٢٠٢٤
عنوان المحاضرة:

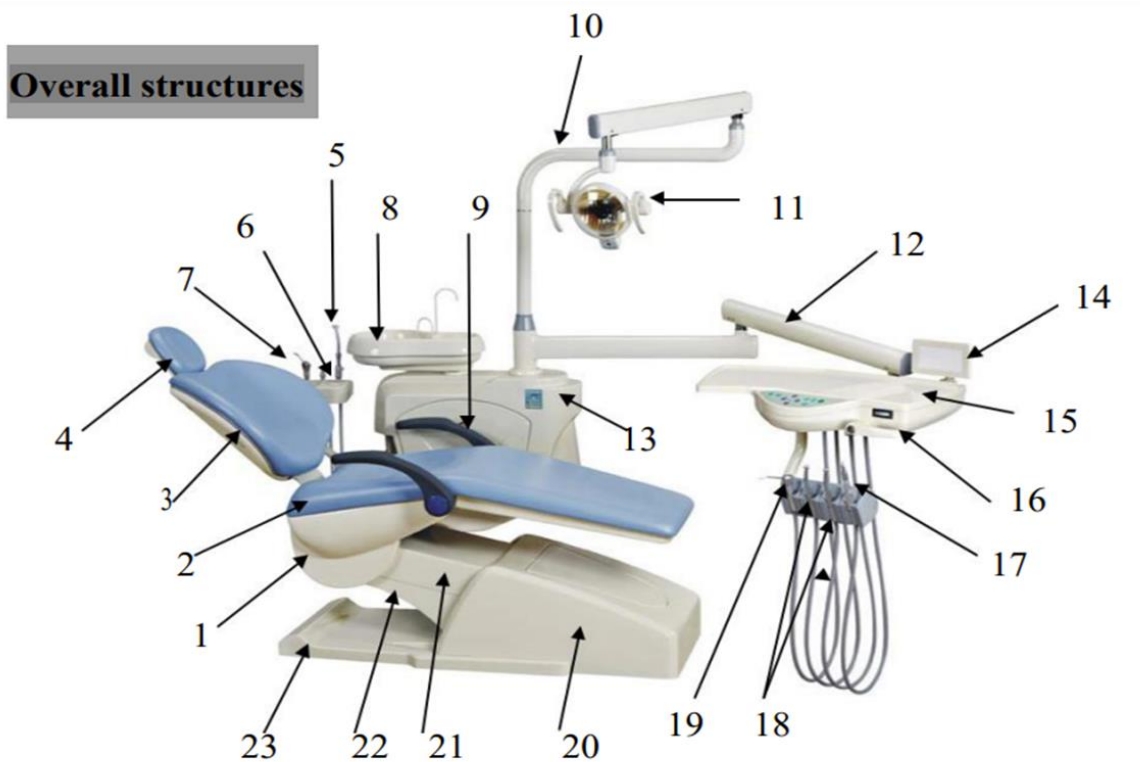


Dental Unit

Dental Unit

Dental unit:

Provides the necessary electrical and air-operated mechanics to the hoses, attachments, and working parts of the unit.



- | | | | | |
|-------------------------------|----------------------------------|---------------------------|------------------------------------|-------------------|
| 1、 Shell | 2、 Seat | 3、 Backrest | 4、 Headrest | 5、 Strong suction |
| 6、 Weak suction | 7、 Three way syringe (hot water) | 8、 Cuspidor | 9、 Arms | 10、 Light arm |
| 11、 Dental light | 12、 Balance arm | 13、 Box | 14、 X-ray viewer | 15、 Main tray |
| 16、 Hand piece pressure gauge | 17、 Low speed hand piece | 18、 High speed hand piece | 19、 Three way syringe (cold water) | 20、 Junction box |
| 21、 Up balance shell | 22、 Down balance shell | 23、 Bottom shell | | |



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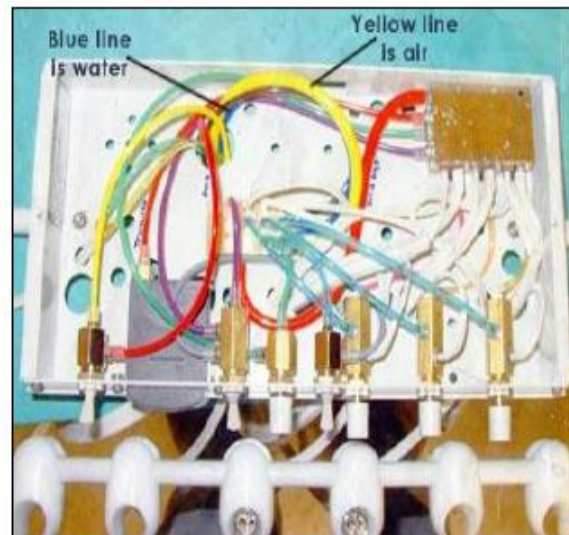
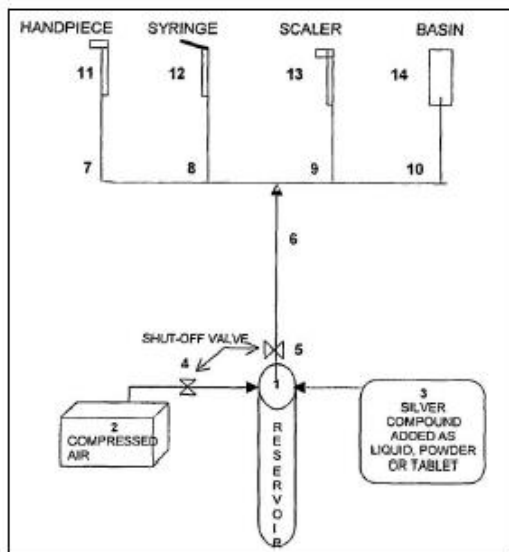
Dental unit delivery systems

- Front delivery: Positioned over the patient's lap.
- Side delivery: Positioned at either side of the patient's chair.
- Rear delivery: Positioned behind the dental chair.

Rheostat: A foot-controlled device placed on the floor near the operator to control the function of the dental handpieces.



Dental unit waterlines: supplies water through hoses or water lines into dental handpiece.





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Air-water syringe: is an instrument that is attached to the dental unit.

□ Functions

- Deliver a stream of water.
- Deliver a stream of air.
- Deliver a combined spray of air and water.



Operating light is used to illuminate the oral cavity during a procedure.





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□ **Oral evacuation system** is a means for removing water, saliva, blood, and other fragments during a dental procedure.

□ **Types:**

- Saliva ejector
- High volume evacuator (HVE)



□ **Disposable traps:** Filtering mechanisms for the saliva ejector and high volume evacuator.

The curing light is used to “harden” or light-cure dental materials. The light used falls under the visible blue light spectrum. *The two main dental curing lights are halogen and LED.* The wavelength of the halogen curing system is (410-480) nm and for the LED curing system is (420-490) nm. The light intensity is ranged from 600 to 1220 mW/cm². The intensity of the curing light is strongly affected by *the angles and distance.*





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An amalgamator is used to triturate dental materials by vigorously shaking the ingredients. The speed is up to 4,800 rpm.

- Central vacuum compressor provides the suction needed for the oral evacuation systems.
- Central air compressor provides compressed air for the air-water syringe and air-driven hand pieces.
- **Note:** triturate (mean crush or grind) the mixing or grinding of a powder such as the mixing of silver alloy and mercury to form amalgam.

OPERATION PICTURE



(1)



(2)



(3)



(4)



(5)



(6)



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Dental Unit

Dental Systems Components:

1. Projector: LED light with intensity (15000-30000) lux Projector
2. Chair
3. Basin
4. Cup
5. Saliva ejector
6. Foot switch
7. Fast turbine
8. Micro-motor: A. air motor (17-20KR\m) B. Micro motor (500KR\m)
9. Triple syringe (Water, Air, Spray)
10. Dental X-ray

Three cycle of Dental system:

Electrical cycle		Air cycle		Water cycle	
1.	Chair	1.	Triple syringe	1.	Saliva ejector
2.	Projector	2.	Fast turbine	2.	Basin
3.	Basin	3.	Slow turbine	3.	Cup
4.	Cup			4.	Triple syringe
5.	Saliva ejector				
6.	Foot switch				
7.	Triple syringe				
8.	Fast turbine				
9.	Slow turbine				



Dental Unit

Block Diagram of Air Cycle

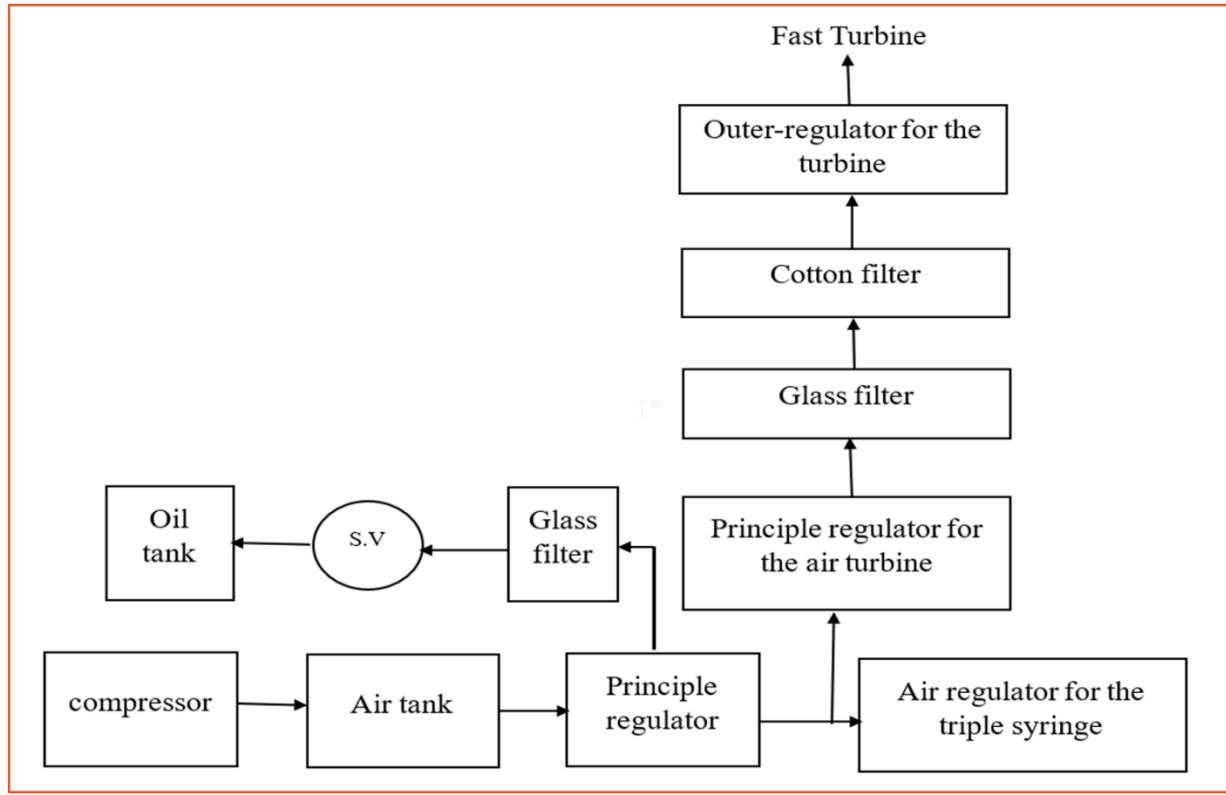


Figure: Block diagram of Air cycle

Air Cycle

Air in this device should pass through two filter first is glass filter which contain fiber glass with wide pore the second is the cotton filter with fine pore which serve for air purification the air is used by the following devices.

1-slow speed turbine (rotate with speed 17-20 KR/min)



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2-high speed turbine (rotate with speed 150-500 KR/min)



3-Triples syringe which mixed air with water to discharge it as spray.



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Block Diagram of Water Cycles

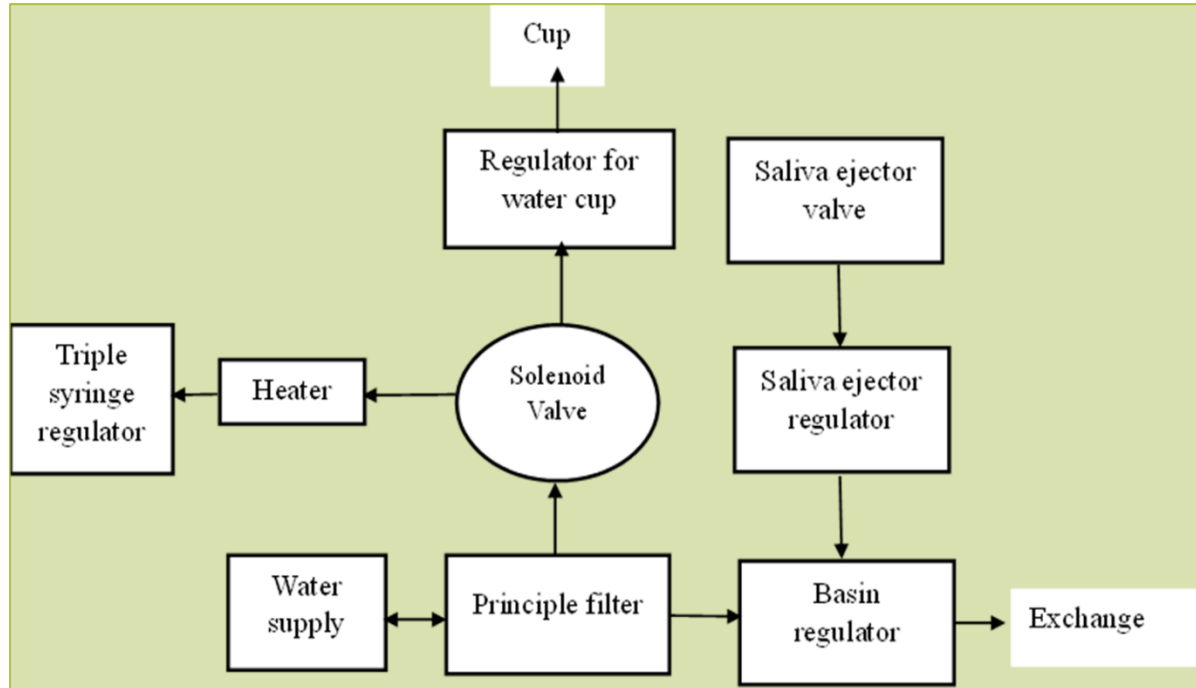


Figure: Block diagram of Water cycle

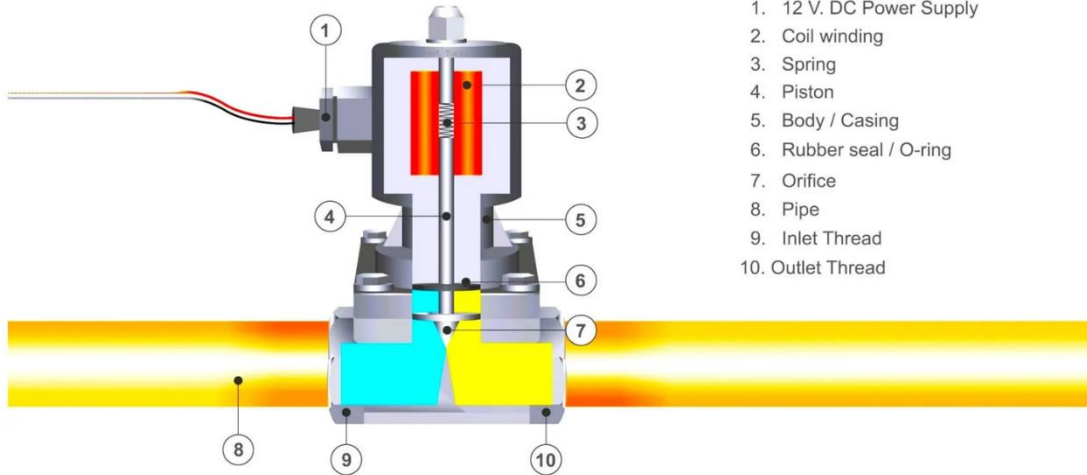
Water Cycle

Water come from the source and then enter filter for its purification, then through the valve and the heater at last go through triple syringe either by automatic or mechanic manner. Also from the valve the water go through the regulator to the cup. The waste water and the saliva go through the Basin for discharge out.

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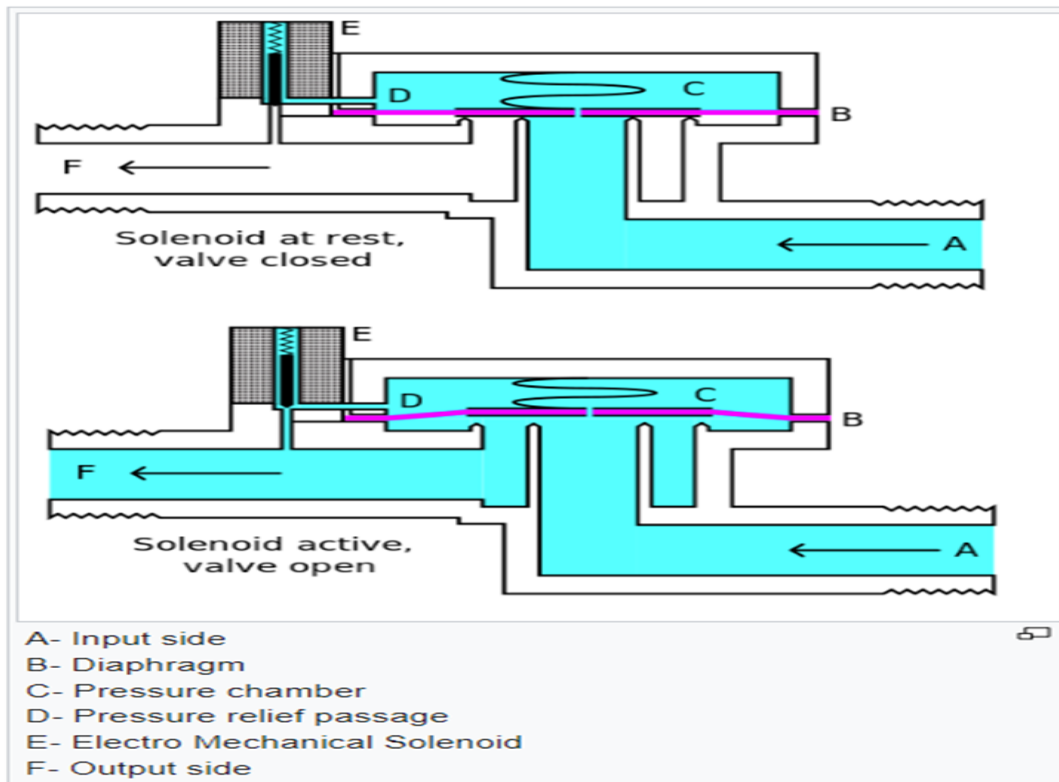
Solenoid Valve

InstrumentationTools.com



Parts of Solenoid Valve

1. 12 V. DC Power Supply
2. Coil winding
3. Spring
4. Piston
5. Body / Casing
6. Rubber seal / O-ring
7. Orifice
8. Pipe
9. Inlet Thread
10. Outlet Thread



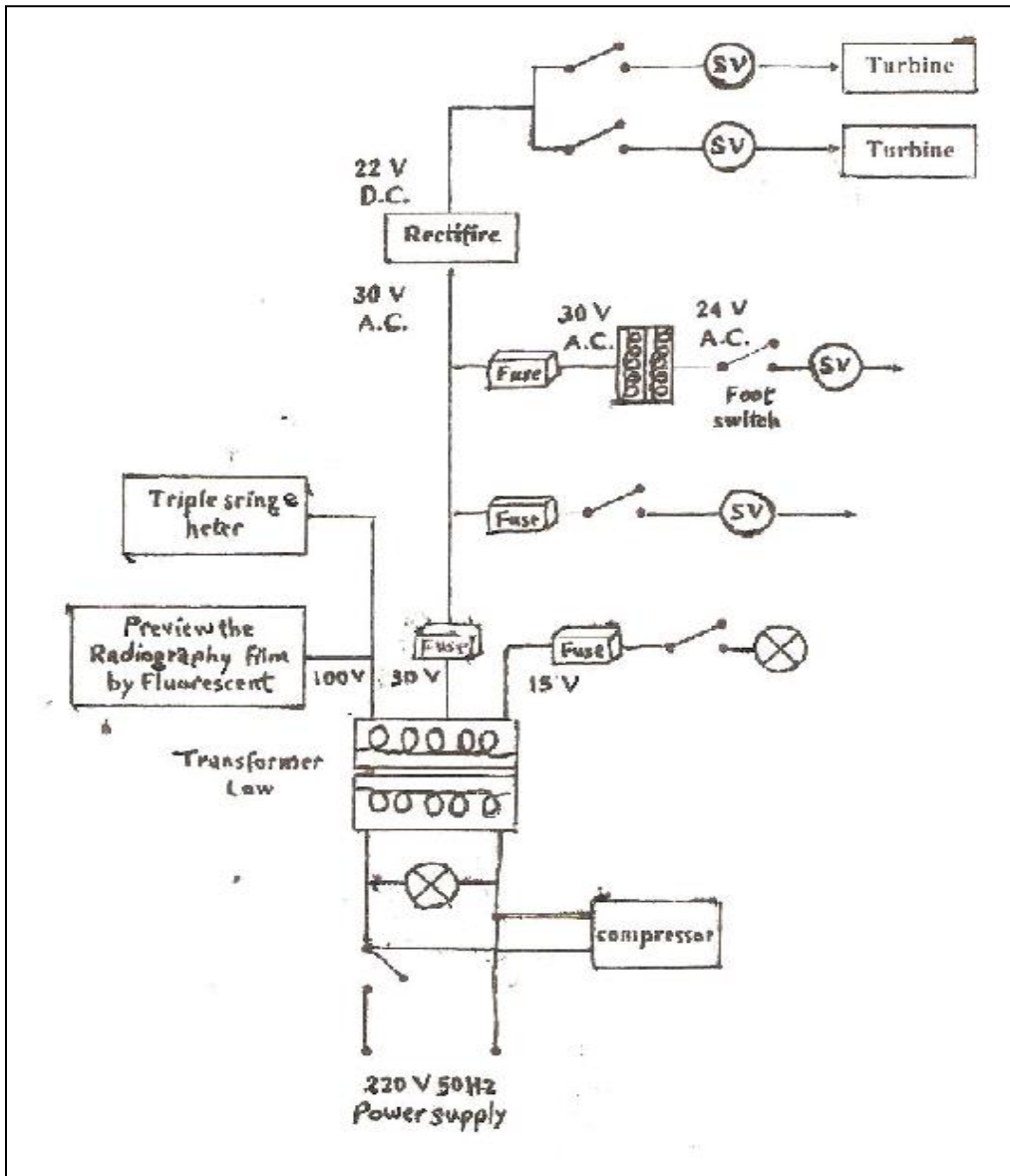


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Block Diagram for electrical circuit for Dental device





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The air flow for compressor and tank:

Compressor-consists from electric motor and pump which connect directly or through a belt. It draw atmospheric air from the filter and directed it by the one direction check valve to the reservoir until filling of reservoir. The air pressure in the reservoir is controlled by pressure meter, and the air compressor is controlled automatically by pressure switch which tied respectively with motor. The range of work pressure it between 5-7 bar. The air in air tank should be empty at the end of the day or week .because of water drops may accumulate in the tank which may lead to the following problems:

- 1-Break the inner surface of the reservoir.
- 2-Reduce the size of compressed air.

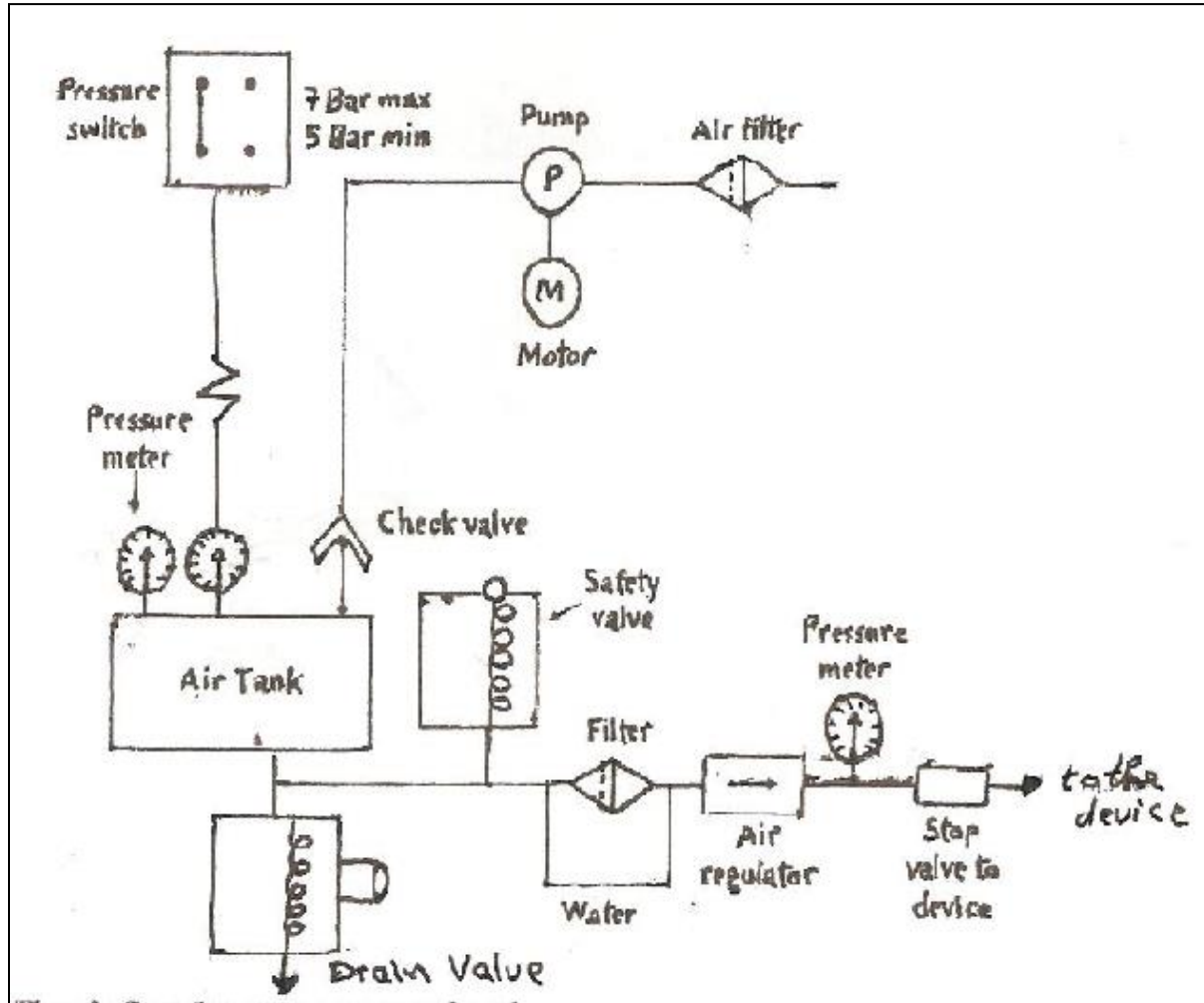


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Dental Unit

The block diagram air flow for compressor and tank:



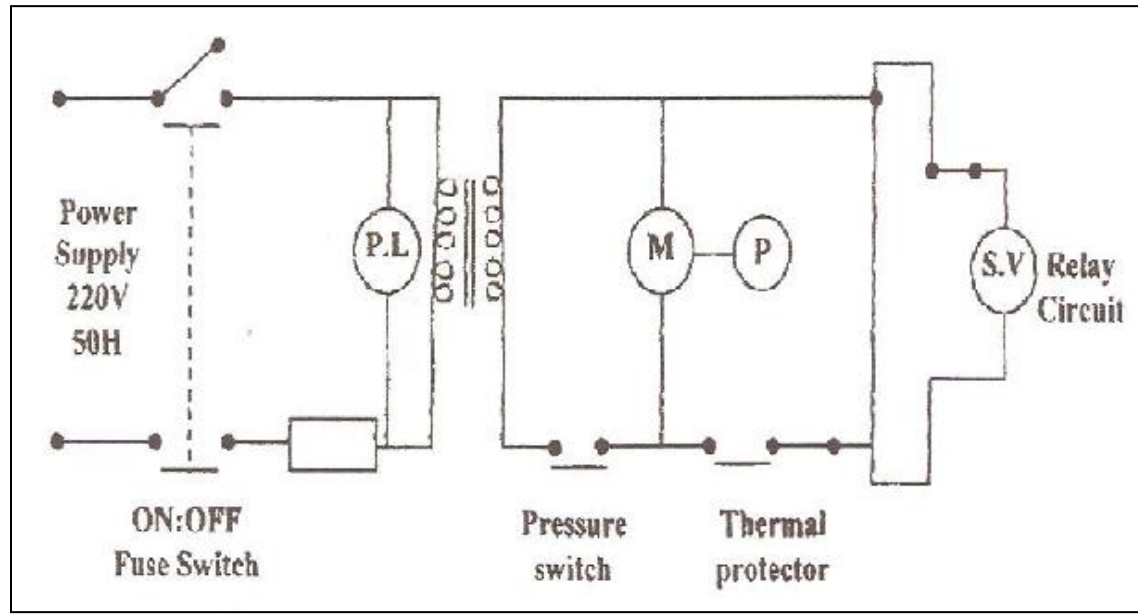


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Electric circuit of the compressor



Preventive maintenance of compressor:

1. Weekly Maintenance

A. Check the oil level through the lens of the oil level control, must be level between the lines (mm, max) must use quality oil for compressor.

B. Empty air tank using vacuum valve.

2. Monthly maintenance

A. Check the compressor and air lines of diversions



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B. Inspection and cleaning or replacement candidate entering the air.C. examination and cleaning of the pressurize pipeline connectivity KP the compressor & remove dust.

Slow Turbine

It is a part of dental chair device depends on air by its work and has the following advantages: -

- 1-high speed 17-20 Krpm.
- 2-small size
- 3-Move by air force
- 4-few fault

It consists of the following parts:-

1. The clutch part with hand piece.
2. Spring and cylindrical holders.
3. Set of ball bearing enable for rotation.
4. The spinner part is the heart of *the* device contain of metal *sheet* of mica
5. Container containing entry and exit holes air
6. Lever change the direction of rotation
7. Digging machine.

Mode of operation "operation principle"

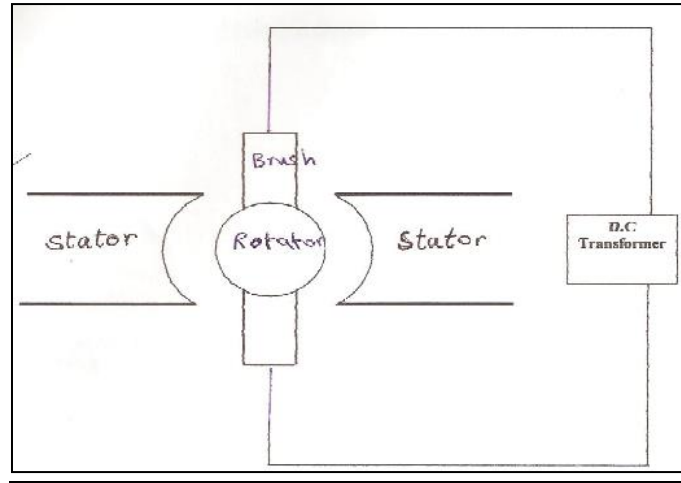
The movement of turbine depend on air force .The compressed air with pressure ranging from 5-7 bar enters through the entrance hole and push the plate of mica forward to rotate in high speed the iron core of the turbine with the help of ball bearing.



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The micro motor circuit

Micro Motor

It is a very small electric motor which replaced the turbine machine and has the following

Advantage:-

- 1-Small in size, occupies a major place in die device,
- 2-working on a few constant voltage 22-24 volts.
- 3-motor speed can be controlled by potentiometer.
- 4-Rapid turnover motor brushes.

One of the most important faults of this device is the erosion of the brushes due to friction.



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Principle of work

- 1-low voltage transformer to convert input voltage from 220 V to 30 V.
- 2-Rectifier circuit to convert 30 V -AC to 22-24 V DC.
- 3-The Dc voltage inter the rotator by brushes connection which produce magnetic field which intersect with the magnetic field of the permanent magnet of the motor which lead to its rotation

Chair Action:

1. Chair rise up: by clicking on the key to rise the chair electric motor as well as the hydraulic pump will work and push the hydraulic fluid from the reservoir and valve that starts to open so the hydraulic fluid inter the cylinder and push the piston to rise the chair.
2. Chair go down: this action depend on the weight of the patient and the chair itself. By opening the valve which control the return of the hydraulic fluid to the tank.
3. Forward and backward movement:
By clicking on forward key, the sensor as well as the motor will push the hydraulic fluid through the opened valve and push the chair piston forward and vice versa moving backward.



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