Electric Lamp:
An electric lamp is a source which converts electric energy into heat energy and then lighting energy.

Mainly there are two types of lamps:

1. **Incandescent Lamp**
   (a) Carbon filament lamp
   (b) Metal filament lamp

      (i) Gas filled type (ii) Vacuum type

2. **Luminescent or Gas Discharge Lamp**
   (a) Sodium vapour lamp
   (b) Mercury vapour lamp
   (c) Fluorescent tube

Fluorescent Tube:

Its shape is like a tube, and fluorescent powder is coated inside the tube, so it is called a fluorescent tube. It is also called a low-pressure mercury vapour lamp.

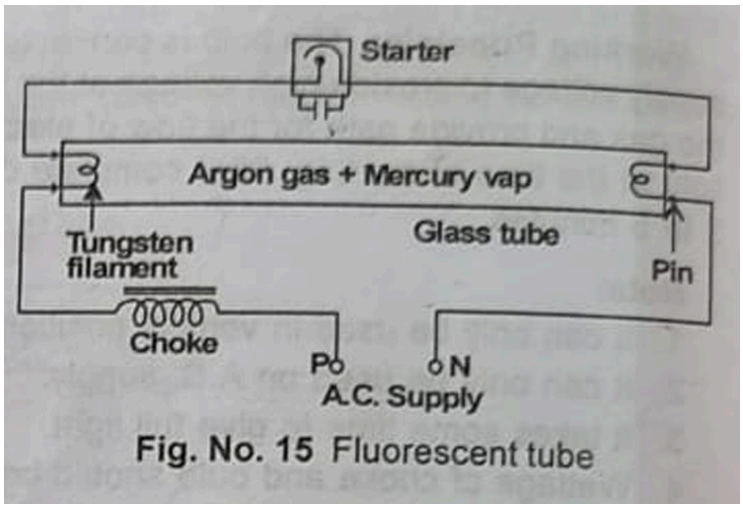


Fig. No. 15 Fluorescent tube

Construction:

The tube is made of glass with fluorescent powder coating on its inner surface. Tungsten filaments coated with barium oxide are placed at each side of the tube. The mercury vapour with a small quantity of argon gas at low pressure is filled up in the tube. Bi-pin caps are provided at both ends for fixing the tube in the holder and connection with supply.

Working Principle:

When the fluorescent tube is connected to the supply through a choke and tube starter, about four times the supply voltage (approximately 1000 volts) is induced. Due to this, the filament discharges the gas on heating and provides a path for the flow of electrons, as gas after discharge acts as a conductor. Mercury vapours are evaporized and give full light.

The function of the fluorescent powder coating is to change ultraviolet rays into light rays. It is available in different lengths and wattages, and some common sizes are 20 W (2 ft.), 40 W (4 ft.), and 55 W (5 ft.) in different ranges like day light, cool white, etc. The efficiency of the tube is about 30 lumens per watt.

Choke:

It is designed by providing a number of turns of winding wire on a laminated core. Its function is to induce surge voltage about four times the voltage with respect to the supply voltage and drop the supply voltage about to half when the tube or lamp is in working position, i.e., to control the voltage and current.

Tube Starter:

Its function is like an ON-OFF switch to complete the circuit. There are two types of tube starters:

1. Glow type starter
2. Thermal type starter

Nowadays, mostly glow-type starters are used. It consists of two bimetallic strips with a small quantity of helium gas at low pressure in a very small glass tube. A very small condenser is connected in parallel to its terminals for reducing the sparking effect.

At the start, the bimetallic strips remain open. Due to voltage at its terminals, an electrical stress develops which discharges through the helium gas. Due to the heat produced by this, the bimetallic strips are short-circuited, and the flow of current stops through helium gas. In the meantime, the gas is cooled, and the bimetallic strips open again. Thus, a position of ON and OFF is achieved, which glows the tube. Once the tube is ON, the starter has no function.

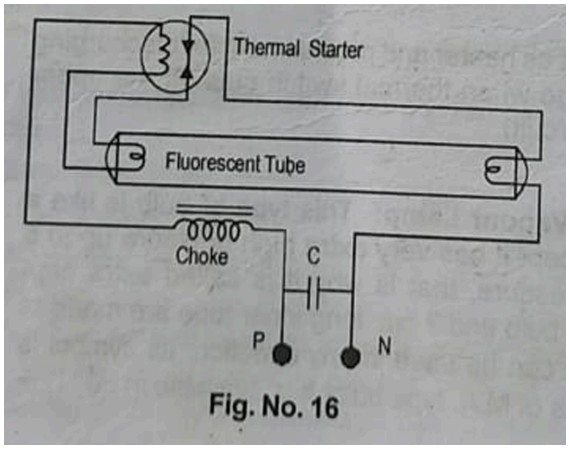


Fig. No. 16

3. It can be used on both A.C./D.C. supply by doing some modification.
4. Its life is of about 4000 hours.
5. It can be used in any position.
6. It consumes 50% less energy than the incandescent lamp of the same wattage.
7. It gives full light in short duration as compared to the other discharge lamps.
8. It is cheaper than other discharge lamps.

Electronic Choke:

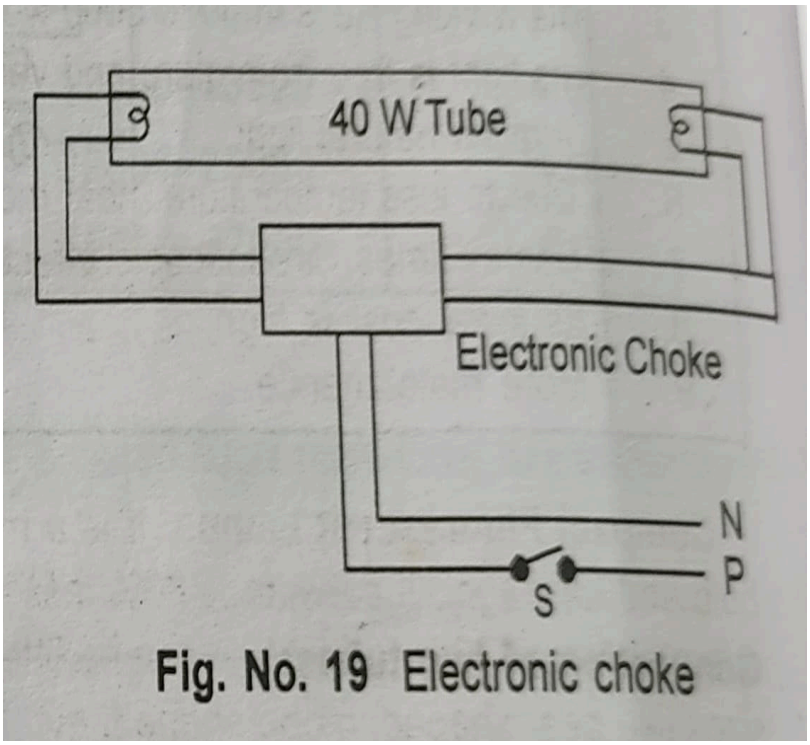
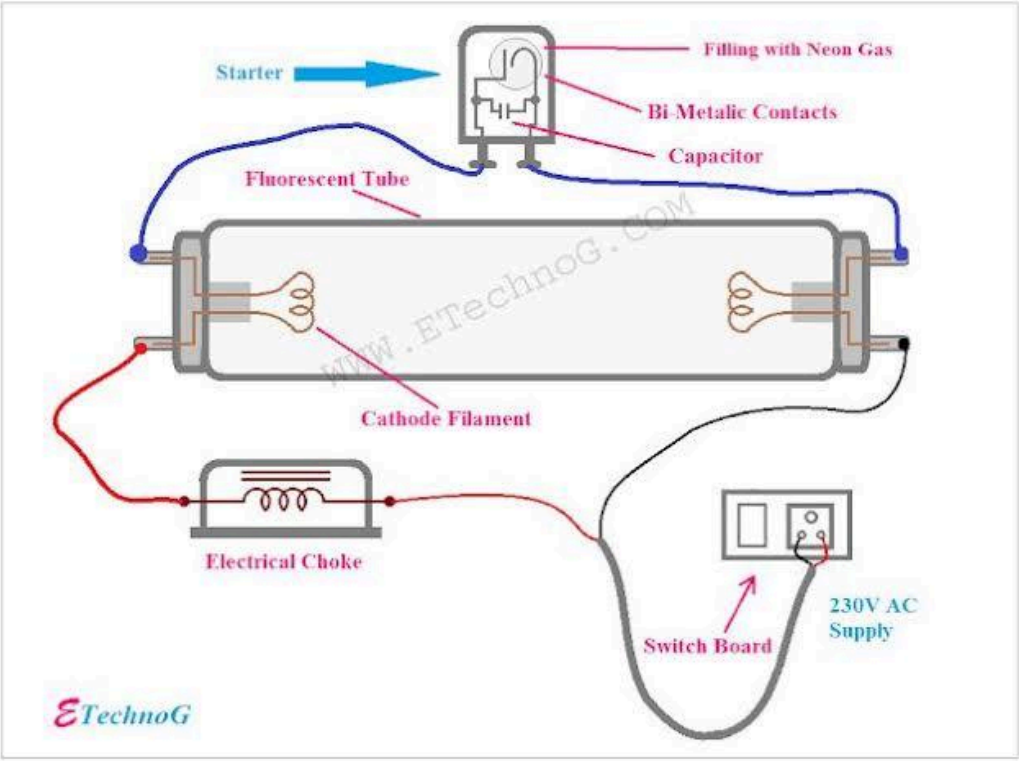


Fig. No. 19 Electronic choke

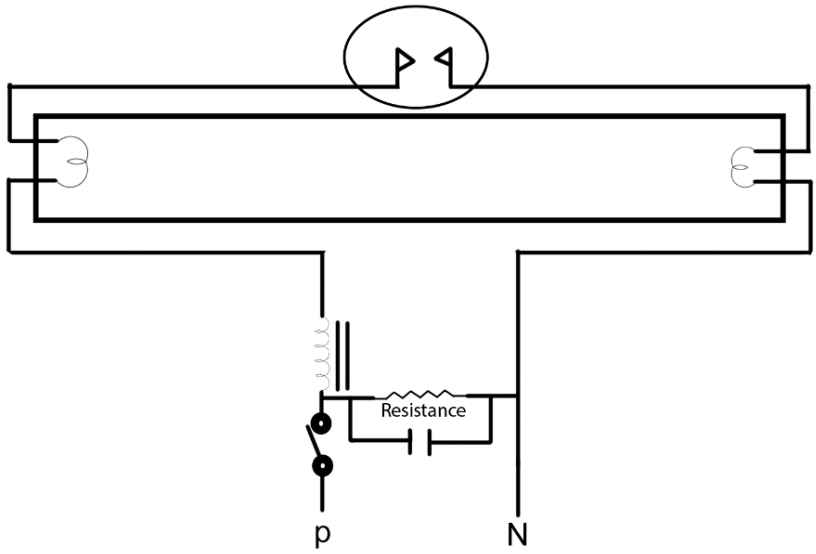
Today, electronic chokes are also used in place of ordinary chokes. This choke has six terminals, two for main A.C. single-phase supply, and two each for tube terminal holders. The main advantages of these chokes are that the tubes can be worked on low voltage supply, saving electricity power, and tubes start very quickly as it does not require any type of starter. But due to high cost factor, these are not very much popular.

Stroboscopic Effect:

In case of discharge lamps, the discharge takes place twice per cycle, which creates a stroboscopic effect and normally appears in the set of two tubes. This effect can be eliminated either by using a condenser in series with the choke or by connecting each tube with a separate phase.



STREET LIGHT



Double Tube Light Connection