Lighting System

Introduction: The lighting system of an automobile consists of fog lamps, flashing lamps, parking lamps, warning lamps, brake lamps, panel lamps and interior illumination lamps. Sometimes a reversing lamp is also fitted. The modern lighting system consists of switches, lamps, wiring harness, fuses or circuit breakers. The primary purpose of the headlight design is to produce illumination ahead of the vehicle for a sufficient distance.

Light Sources: There are two kinds of light sources - one that emits light and the other that reflects light. In the case of the headlamp used in automobiles, both the things are combined in it. The filament of the electric lamp is the primary source, while the reflector is referred to as the secondary source. The intensity, colour and distribution are the important characteristic of any light source.

Headlights: The headlights are composed of three elements:

1. The light filament that gives off light when a current flows through it.
2. The parabolic reflector that reflects the light in front
3. The lens that refracts or distorts the light beam into an illuminating pattern.

The present day headlights are outcomes of lot of research and development. Initially a single electric bulb of the carbon filament type was used. The bulb was placed at the focus of a parabolic silvered reflector in order to give a parallel beam of light. The earlier headlights were provided with certain means of adjusting the bulb holder with respect to the reflector along the bulb axis in order to focus it. The lens is made up of a number of glass prisms moulded together and they bend the beam of light into an oval pattern which is aimed ahead of the vehicle and somewhat in downward direction.

The first major advancement in headlight design took place with the introduction of pre-focussed bulbs. It has two filaments, one for normal driving and the other for city driving or for overtaking.

Sealed Beam Headlights: The sealed beam headlights were first introduced in 1940 in US. In this headlight, the filament and the reflector along with the lens are sealed in an airtight unit. The front face of the sealed beam unit is a lens which is fused to the reflector after the two filament units have been inserted through the centre of the reflector and sealed in position. The complete unit is then evacuated and filled with an inert gas. The following are the advantages of sealed beam headlight:

1. The glass unit is self contained with accurately focussed filaments.
2. Dust, moisture etc. are prevented from entering from the back of the lens and the reflector.
3. A greater amount of light is provided in the beam because of the absence of a filament bulb
4. The beam of light obtained is greatly improved due to the pre focussed filament and permanently bright reflector.

Control of Headlight Beam: The circular beam can be spread horizontally to any desired extent with the help of prisms moulded in the inside of the headlight cover glass. The horizontal light intensity can be controlled in any desired way by a suitable design of headlight.

Headlight Dazzle: The problem of headlight dazzle is linked with many factors of which the human eye is most important. It is essential to consider the causes leading to dazzle before considering the methods and ways for its elimination.

The various factors which govern it are - brightness, contrast, angle subtended by the bright area on the eye. The following are the ways with which effect of dazzle can be prevented to a greater extent:

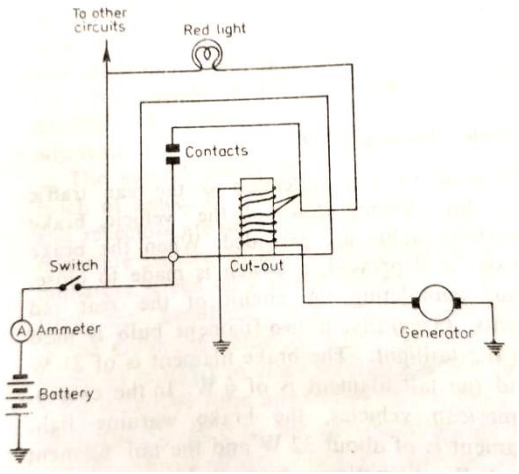
1. Reducing the brightness of the headlights of the vehicle
2. Stopping high intensity light from entering the eyes of on coming drivers or road users
3. Reducing the contrast between the surrounding area and the headlights of the vehicle.

In earlier days a dipping reflector was used as one of the popular anti-dazzle devices. The bifocal bulb is extensively used anti-dazzle device in the US and UK. This type of bulb has two filaments one being either in front or above the other filament.

Two Filament Modern Headlight: This type of headlight uses a two filament bulb with a fixed reflector. In this case, one filament is meant for dipping beam and the other main beam filament is below it and located at the focus of reflector.

Bulb Wattages: The pre-focussed bulbs generally employ 45-50 W for the main beam filaments and 30-40 W for the dipped beam filaments. Recently the wattages of filaments have been increased by about 15-20%.

Ignition Warning Light: A red indicator light becomes ON when the ignition switch is switched on giving an indication that the battery is discharging. It remains in this condition as long as the vehicle is on the rest position or idling at a speed below that of the cutout points closing speed. The warning light is connected in parallel with the series winding of the cutout relay. The ignition warning light is connected between the live terminal of the generator brush and the ignition switch terminal. The fig shows the circuit diagram of the ignition warning light.



When the contacts of the cutout are open, the battery current flows through the closed ignition switch, the warning light and generator to earth. As the generator speed increases to the extent that the cutout contact points close, the red light is virtually put out of circuit because generator current starts flowing through the cutout series windings, the switch and ammeter to the battery.

Direction Indicators: The direction indicators permit the driver to signal his intention to make a right or left turn. In beginning the standard fitment on vehicles was semaphore type of direction indicator. It was mounted on the side of the vehicle and when driver intended to make a turn, an illuminated red or amber arm was shown on the side of the vehicle. The hinged arm having lamp was actuated by small solenoid.

These days flashing type of direction indicator is a standard fitment whose circuit diagram is shown in fig. below.

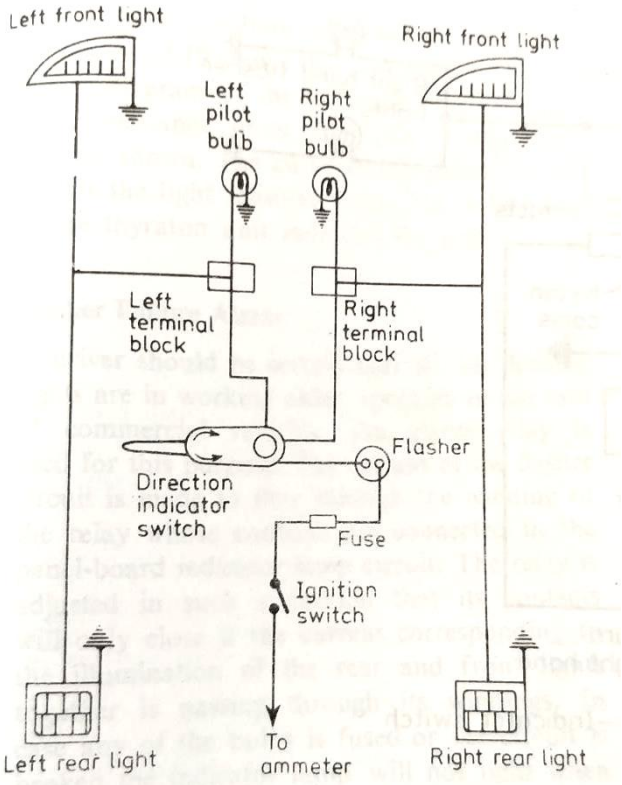


Fig. Circuit Diagram of flashing type direction indicator

When the signal lever is moved in either direction, the circuit is completed between the battery and the proper indicating lights on the front and the rear of the vehicle as well as on the dashboard. The circuit is completed through a flasher unit which is device that closes and opens the circuit about 70 to 80 times per minute. This sends a flashing signal which is more noticeable than a steady light. The flashing action takes place because of a thermostatic blade in the flasher unit. When the blade is heated due current flowing through the winding of the flasher, it wraps thereby opening a pair of contacts. It in turn opens the circuit. After this the blade cools and straightens to close the circuit.

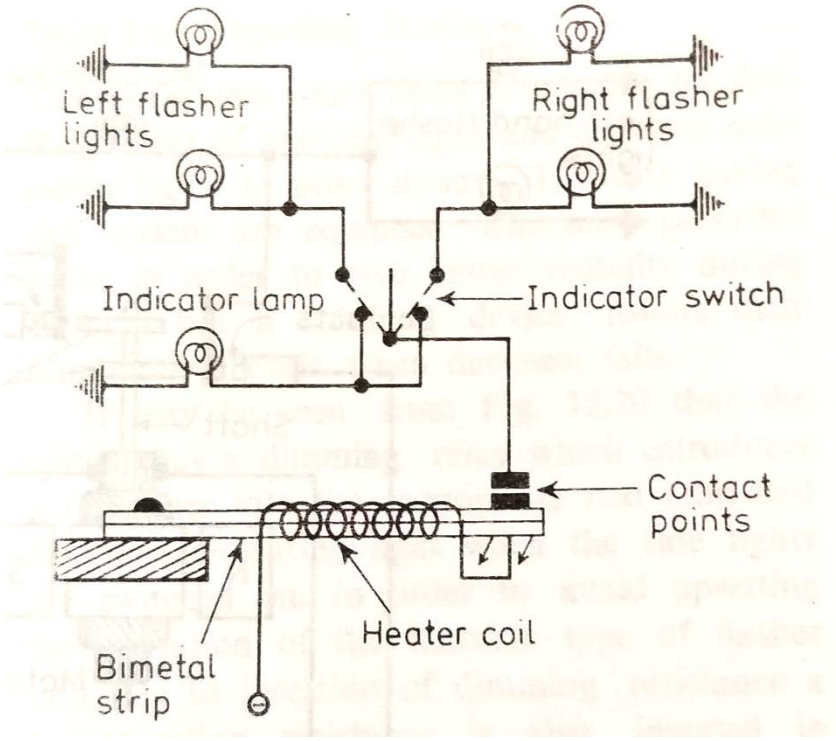


Fig. Typical circuit diagram of a flashing indicator using bimetal strip

The figure above shows the bimetal strip type of flashing indicator used on cars.