ELECTRONIC CONTROL OF CARBURATION

Basic carburation

Figure 13 shows a simple fixed choke carburettor, which shows the principles and operation of this device. The float and needle valve assembly ensure a constant levelof petrol in the float chamber. The Venturi causes an increase in air speed and hencea drop in pressure in the area of the outlet. The main jet regulates how much fuel canbe forced into this intake air stream by the higher pressure now apparent in the floatchamber. The basic principle is that as more air is forced into the engine then more fuel will be mixed into the air stream.

Figure 14 shows the problem with this very simple system; the amount of fuel forcedinto the air stream does not linearly follow the increase in air quantity. This means further compensation fuel and air jets are required to meet all operating requirements.

Figure 15 shows a variable Venturi carburettor, which keeps the air pressure in the Venturi constant, and uses a tapered needle to control the amount of fuel.

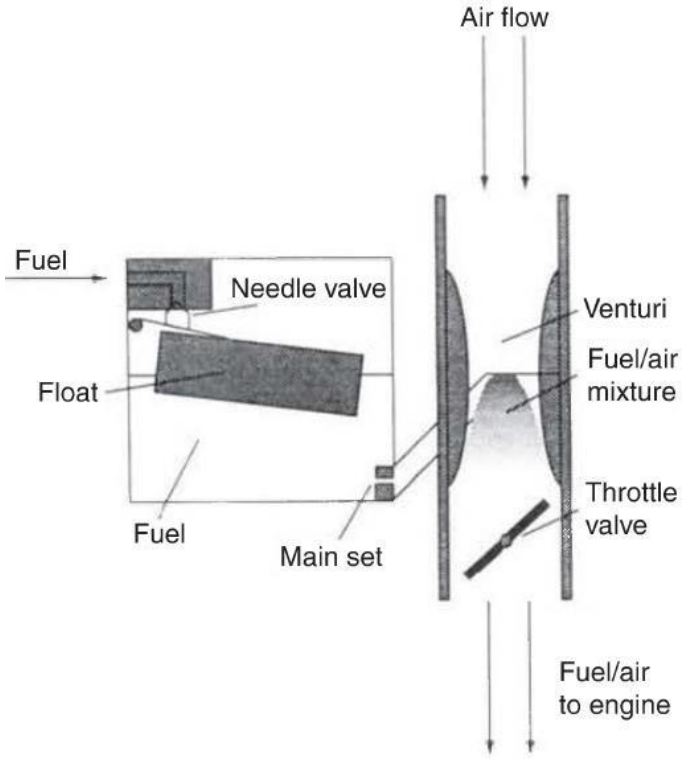

Figure 13 Simple fixed choice carburettor

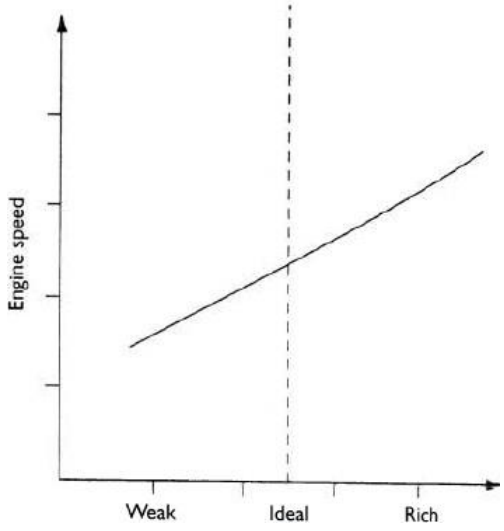

Figure 14. Fuel forced into the air stream does not linearly follow the increase in air quantity with a simple fixed choke carburettor

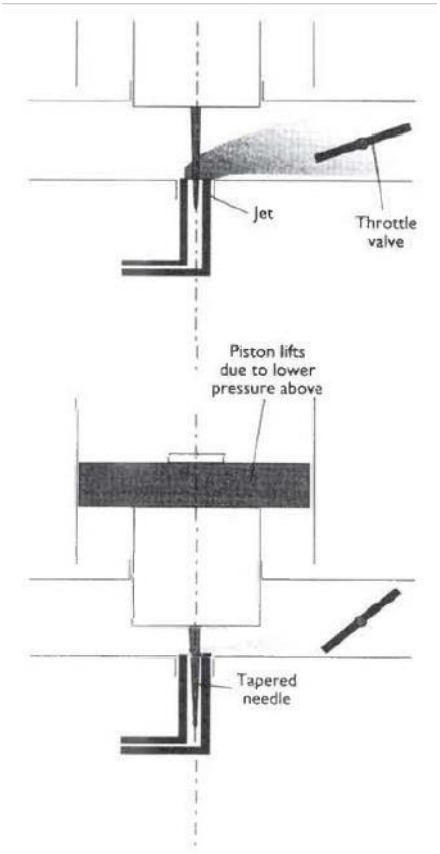

Figure 15. Variable Venturi carburettor

Areas of control

One version of the variable Venturi carburettor (Figure 16) has been used with electronic control. In general, electronic control of a carburettor is used in the followingareas.

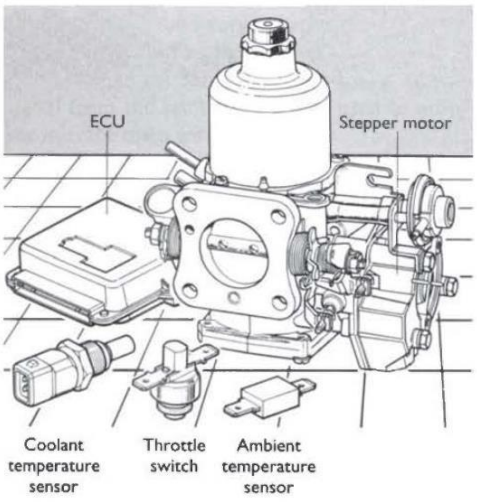

Figure 16. HIF variable Venturi carburettor with electronic control components

Idle speed
Controlled by a stepper motor to prevent stalling but still allow a very low idlespeed to improve economy and reduce emissions. Idle speed may also be changed in response to a signal from an automatic gearbox to prevent either the engine from stalling or the car from trying to creep.

Fast idle
The same stepper motor as above controls fast idle in response to a signal fromthe engine temperature sensor during the warm up period.

Choke (warm up enrichment)
A rotary choke or some other form of valve or flap operates the choke mechanism depending on engine and ambient temperature conditions.

Overrun fuel cut off
A small solenoid operated valve or similar cuts off the fuel under particular conditions. These are often that the engine temperature is above a set level, theengine speed is above a set level and that the accelerator pedal is in the off position.

The main control of the air–fuel ratio is a function of the mechanical design andis very difficult to control by electrical means. Some systems have used electronic control of a needle and jet but this did not prove to be very popular.