Compound Carburettor 44 PHH (horizontal)
Description of

SOLEX compound carburettor type 44 PHH
(horizontal)

The Solex 44 PHH is a compound carburettor of the horizontal type for use in high-performance sports cars. In it are incorporated all the most recent developments in the technique of carburetion.

1. General Description.

The compound carburettor has two barrels, each with a throttle butterfly. The primary barrel may be distinguished externally by its throttle lever.

The throttle butterfly in the primary barrel is opened by the throttle lever, which is connected by a rod to the accelerator. It is actuated mechanically by depressing the accelerator pedal.
The driver has no direct control over the movement of the throttle butterfly in the secondary barrel. This is opened automatically when the depression in the primary barrel reaches a pre-determined level. The depression needed to open the throttle butterfly in the secondary barrel is attained when the engine is running at approximately half maximum revolutions, with the throttle butterfly of the primary barrel fully opened. The secondary barrel is then opened automatically. The float chamber on this type of carburettor is mounted centrally between the two barrels, and is in communication with atmospheric air. It is closed at the top by the float chamber cover, from which the float is suspended. The cover also holds the needle valve and the tapped boss for connecting the petrol pipe.

2. Starting Device.

The starting device is connected to the primary barrel. It consists of a strangler butterfly situated in the air-intake of the primary barrel, and is normally open. The strangler spindle is mounted eccentrically.
Figure 3  Sectional diagram
When the driver pulls out the choke control, situated on the dashboard, the strangler butterfly is closed by means of a cable. In addition the strangler lever actuates a further lever connected to the throttle butterfly in the primary barrel, which is slightly opened on closing the strangler butterfly. This opening of the throttle butterfly is necessary in order to allow the depression present in the inlet manifold to be effective in the mixing chamber, and to ensure a higher idling-speed after the engine has been started.

The powerful depression created in the mixing chamber by the closing of the strangler butterfly drews from the main jet system a rich emulsion, which helps to ensure quick and certain starting of the engine. The air required for this mixture is fed through the strangler butterfly, which opens and closes rapidly on its
freely-moving eccentric spindle. The limits of its movements are controlled by two coil-springs.

The starting device is of the “progressive” type, i.e., each position of the choke control gives a pre-determined variation of the opening of the strangler butterfly, and of the finely-adjusted butterfly aperture.

After the engine has been started, its speed can be varied as required, by gradually pushing-in the choke control. The starting device also enables the car to be driven away whilst the engine is still cold. As soon as the engine is sufficiently warm, the starting device must be put off by fully returning the choke control, as otherwise excessive fuel consumption will result.

When the engine is warm, the starting device should not be used.

3. Slow running adjustment.

The normal slow running adjustment is effected in the primary barrel only. It differs from the usual method in that the air used for slow running is taken from the mixing chamber via the choke tube through a calibrated orifice, (which replaces the pilot jet air-bleed), into the slow running system.
The idling mixture is controlled by the pilot jet g, which meters the fuel, and the volume control screw, by which the volume of idling mixture is regulated.

The fuel drawn through pilot jet g from the main jet system, mingles with the slow-running air, forming an emulsified mixture. This slow-running mixture is then led to three orifices (one idling and two by-pass orifices), which open into the throttle body near the butterfly. The flow through the idling hole nearest the carburettor flange can be regulated by the volume control screw. The two by-pass holes nearer the butterfly edge assist the smooth change-over from idling to normal running. They first come into operation when the throttle butterfly is opened slightly. The slow-running emulsion is transformed into the idling mixture by the air-stream passing through the butterfly aperture.

With the assistance of the volume control screw, the proportion of fuel in the slow-running mixture can be regulated. By turning the screw inwards a weaker slow-running mixture is obtained; turning the screw outwards gives a richer mixture.

The slow-running adjustment screw, which bears against the butterfly lever, controls the engine revolutions at idling speed. The adjustment of this screw either increases or decreases the butterfly aperture at the closed position of the butterfly. Idling revolutions are increased by turning the screw inwards, and reduced by turning it outwards.
Beside the primary barrel, the secondary barrel also has a slow-running adjustment. In general, however, this is only used to improve the change-over when the secondary barrel throttle butterfly is opened. The volume control screw is then fully screwed in.

![Diagram of secondary barrel and associated parts]

Figure 7  Secondary barrel not yet opened

4. Main Carburation.

The main air passage of the primary barrel has a choke tube and in front of it a diffuser. An outlet channel opens into the diffuser, supplying fuel or fuel emulsion. The outlet channel is connected to a cylindrical well, into which flows the fuel from the float chamber via the main jet carrier, into which is screwed the main jet Gg. From above, an emulsion tube dips into the well. The tube is fitted into the float chamber cover, and held by the screwed air correction jet a.

The intake of the secondary barrel has a diffuser similar to that in the primary barrel, but has no choke tube, as the secondary barrel is only brought into operation at higher engine speeds. Main jet carrier with main jet Gg, emulsion tube, and air correction jet a are symmetrically positioned. A component of special
importance is the overflow control tube, through which the emulsion must pass to reach the outlet tube of the diffuser. This precaution is necessary in order to cancel the action of the depression rising between the carburettor and the air-filter. This depression is transmitted to the main jet system of the secondary barrel, with the throttle butterfly closed, and would cause flooding if the overflow control tube were not incorporated. Should the fuel flood in spite of this precaution, especially as the result of a dirty air-filter, it is sucked up by a special lead in the narrowest part of the choke tube of the primary barrel.

The operation of the secondary barrel is automatically assisted by a depression chamber. The butterfly spindle of the secondary barrel is loaded with a counterweight. This is fitted to a lever, at the lower end of which is a connecting link. This again is coupled to a connecting lever, which is moved by the diaphragm rod in the depression chamber. The depression chamber contains a diaphragm under pressure from a diaphragm spring. The depression side of the diaphragm is connected by a lead to the mixing chamber of the primary barrel or more precisely to the narrowest part of the choke tube. At rest, the throttle butterfly of the secondary barrel is closed. When the depression in the primary barrel has reached a specified level, it is able to overcome the resistance of the weighted lever system and of the diaphragm spring, and to open the throttle butterfly of the secondary barrel.
Through two non-return ball valves (one in the air-bleed cap of the depression chamber, one in the connection of the depression channel), it is ensured that sudden movement of the throttle butterfly cannot occur.

A returning device, consisting of a connecting lever with a set screw on the butterfly spindle of the primary barrel ensures the disconnection of the secondary barrel when the accelerator pedal is released.

The operation of the carburettor is summarized below:

a) Normal use.

When at rest, the fuel is at a high level in the float chamber, and in the two wells into which it flows via the two main jets. The level is approximately 28—30 mm below the float chamber cover jointing face.

When the throttle butterfly of the primary barrel is opened, the depression begins to work on the outlet channel of the diffuser. Under its influence fuel is drawn from the well via the outlet channel and thoroughly mixed with the in-flowing air from the air inlet nozzle.

Through the air correction jet a come increasing quantities of air, which through the holes in the emulsion tube forms an emulsion with the fuel flowing through the main jet Gg. This emulsion contains more air when engine revolutions increase, thus preventing over-enrichment of the mixture.

b) Maximum efficiency.

When the engine is running at half maximum revolutions with the throttle butterfly of the primary barrel fully opened, the depression in the choke tube has risen sufficiently to enable it to pull the diaphragm in the depression chamber against the resistance of the counterweight and spring. Immediately, the throttle butterfly of the secondary barrel begins to open, the transfer being assisted by an emulsion supplied through the two by-pass holes of the slow-running system. As the throttle butterfly opens progressively, the delivery of emulsion is taken over by the main jet system, and enables the engine to attain its maximum efficiency.

It is especially important that the depression in the primary choke tube reaches only at full throttle the level required to operate the secondary butterfly. If the driver has only depressed the accelerator pedal without reaching full throttle, the secondary barrel cannot operate.

5. Acceleration Pump.

The acceleration pump is a mechanically operated diaphragm pump situated underneath the carburettor, and connected by a lever to the butterfly spindle of the primary barrel. When the throttle butterfly is closed the pump diaphragm is pressed outwards by the diaphragm spring. As the pump chamber is connected, via a non-return ball valve, with the float chamber, it is normally filled with fuel.
When the throttle butterfly of the primary barrel is opened, this movement is transmitted by the lever to the diaphragm, and the fuel is forced into the mixing chamber of the primary barrel through a second non-return ball valve and the pump jet with calibrated injector tube. This pressure stroke of the pump enriches the mixture from the main jet and gives an effective acceleration. During the pressure stroke the non-return ball valve in the fuel inlet from the float chamber prevents a return flow of fuel.

On closing the throttle butterfly again, the diaphragm spring initiates the suction stroke of the pump. The depression in the pump cavity opens the non-return ball valve in the fuel inlet, whilst the second valve in the fuel outlet stops the entrance of air from the mixing chamber into the pump system, and the pump cavity becomes filled with fuel.

It should be noted that the supplementary supply of fuel is only obtained from the pump stroke. An alteration of the pump jet only alters the duration of the injection, because the calibration of this jet establishes the rate of flow in relation to a unit of time.

If the operation of the acceleration pump is impeded, it may generally be attributed to dirt (filter gauze of 2nd. non-return ball valve, pump jet and injection tube).