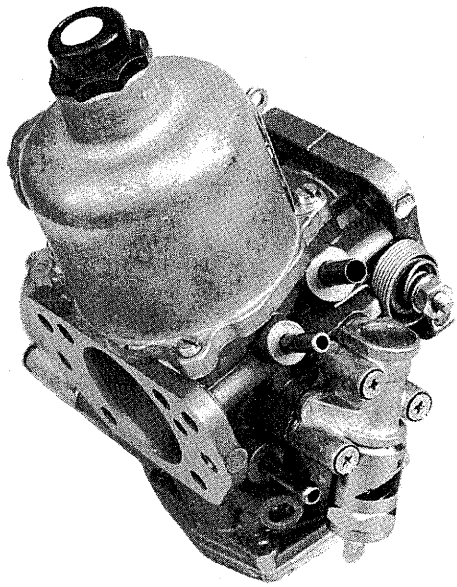


Chapter 8 Type HIF

Contents

1 Introduction

The Type HIF (Horizontal Integral Float Chamber) carburettor is the most recent development of the SU instrument working on the constant-vacuum principle. It has been designed primarily to meet the requirements of exhaust emission control carburation systems. Functionally similar to previous types, the instrument uses the variable choke/constant depression principle to achieve the precise mixture ratio required to control the toxic elements of exhaust emission to within statutory requirements. It differs from previous types in that additional mixture required for cold starting is supplied separately to that from the main jet. It is manufactured in the larger sizes only; HIF4, HIF6 and HIF7 being 1.5 in, 1.75 in and 1.875 in throttle bore diameters, respectively. Metric equivalents of the 1.5 in and 1.75 in diameters are 38 mm and 44 mm respectively, hence the HIF38 and HIF44 types.

The other characteristic feature of the unit is the absence of a separate float chamber. The float and inlet valve mechanism are contained in a housing underneath the carburettor body, giving the unit a distinctive appearance. This housing also contains a temperature-sensitive device which alters the main jet position in relation to the metering needle, thereby automatically adjusting the mixture ratio to compensate for changes in fuel viscosity due to changes in fuel temperature (see Chapter 1). This enables the carburettor to maintain a very accurate mixture ratio control over a range of operating conditions.

An overrun valve is incorporated in the throttle disc on some versions, to limit the depression when the throttle is closed during deceleration.

2 Float chamber assembly

The float chamber, incorporated in the body casting below the choke bore, is sealed by a removable cover plate and rubber gasket. It houses a moulded plastic float, hinged upon a pivot screwed into the wall of the housing, a spring-loaded needle valve assembly, and the jet operating mechanism.

On ASU versions, the cover plate forms the link base for the ASU. On FASD versions, a plastic pick-up tube channels fuel from the float chamber to the FASD.

3 Mixture control

The mechanism consists of a right-angled adjusting lever riveted to a bi-metal blade, the end of which engages with the base of the jet assembly. The lever is flexibly secured to the body by a spring-loaded screw, and is adjusted by the jet adjusting screw in contact with one of its limbs. Screwing in and out (from outside) of the jet adjusting screw lowers and raises the jet respectively, giving a fine degree of mixture control. At any position of this lever, the bi-metal assembly has an overriding control function, and will compensate for variation in fuel viscosity due to temperature changes.

Note that the height of the jet is not adjusted for cold start conditions, this function being performed by a separate device. Once the jet height has been set, no further adjustment is necessary and to frustrate attempted tampering, provision is made for fitting a sealing plug in the adjusting screw tapped hole.

4 Jet assembly

The jet assembly differs from previous types chiefly in respect of its redundancy in cold start conditions. It also differs considerably in construction, being of aluminium alloy and not brass, and has a separate pressed-in brass orifice forming the jet proper.

The integral plastic moulding at its lower end forms an inlet for fuel, an articulated connection for the end of the bi-metal jet lever (which controls its height), a stop to limit its upward movement, and a means of identification (of right or left-hand interconnection, see Fig. 8.2). The size of the jet (0.090 in or 0.10 in) is given by the absence or presence of a machined groove at the top of the jet tube. The length of the jet also varies according to the carburettor type. The jet assembly is not repairable, and must be replaced by a new part complete if damaged.

5 Cold start enrichment devices

Additional mixture required for cold starting is supplied by a separate cold start valve and is independent of the main jet.

The cold start valve consists of a starter valve body, a valve spindle which rotates through a limited arc within it, and an O-ring and V-seal to seal the valve body in its housing, and to seal the valve spindle in the valve body, respectively. A metal seal cover is fitted to prevent damage to the V-seal. The assembly is fitted into a bored-out housing in the side of the carburettor, and is operated by a lever and a return spring.

The valve body has a hole drilled through its wall which is linked, via the annular space in the housing bore, with a fuel supply passage. An air bleed hole breaks into this passage above the fuel level (controlled by float).

The spindle is hollow, and is linked to the passage which terminates in the carburettor mixing chamber at the back of the bridge. A hole in the wall of the spindle corresponds with that in the valve body when the spindle is in a certain position. At each side of the hole is a tapering, machined groove. The varying depth of this groove gives a progressive throttling effect as the spindle is turned to different positions.

On manual choke versions, the cold start device is operated by cable, and increased engine speed is obtained by a fast idle cam, which partially opens the throttle valve. On the later electronic type carburettors, the cold start device is operated electrically by a stepper motor, in conjunction with a computerised control unit.

On some twin carburettor engines, the previously-described cold

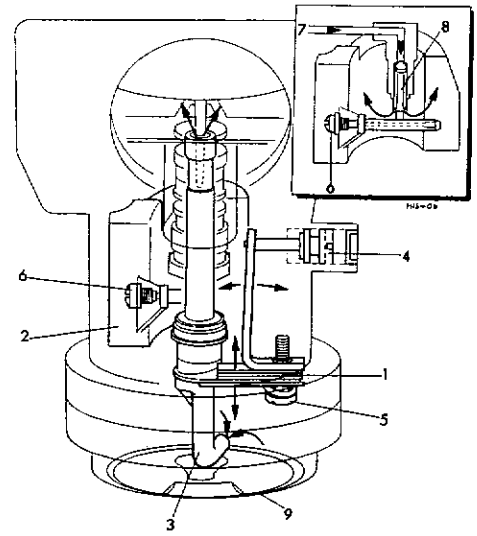


Fig. 8.1 HIF carburettor float chamber layout (Sec 2)

1 Bi-metallic assembly
2 Float
3 Jet head
4 Jet adjusting (mixture) screw
5 Bi-metallic assembly retaining screw
6 Float pivot screw
7 Fuel inlet
8 Needle valve
9 Cover

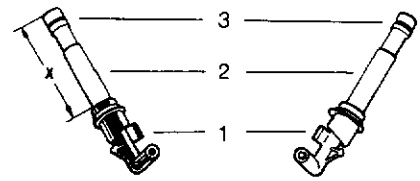


Fig. 8.2 Jet identification (Sec 4)

1 Jet head – black/right-hand connection, white/left-hand connection
2 Jet assembly
3 Jet size identification – no groove/0.09 in, one groove/0.10 in
Dimension X = 1.5 in for HIF 4/6 carburettors, 1.3 in for HIF 7 carburettors

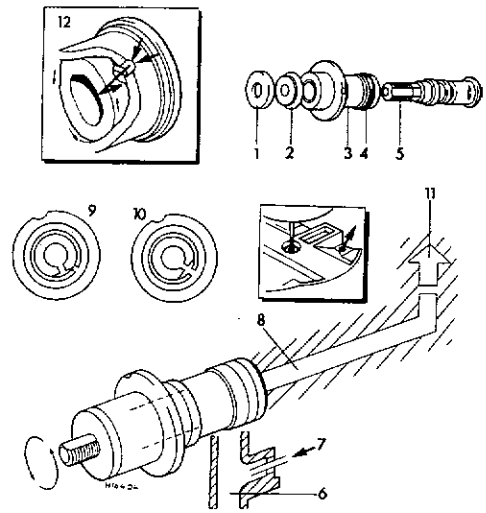


Fig. 8.3 Cold start enrichment device (Sec 5)

1 End seal cover
2 End seal
3 Starter valve body
4 O-ring
5 Valve spindle
6 Fuel supply
7 Air bleed
8 Fuel delivery to jet bridge
9 Commencement of enrichment
10 Maximum enrichment
11 Enrichment outlet
12 Fuel flow through valve

start device is not fitted to either carburettor, but a separate device supplies a rich mixture automatically during the engine starting and warm-up period.

6 Piston and needle

The spring-loaded needle assembly is secured in the piston by the needle locking screw. A flanged collar at the top of the needle bears against a protrusion on the needle guide, which tilts it under the action of the spring. The needle is thus biased towards a particular position in the jet, either forwards or backwards depending upon design of needle guide (location of protrusion). An etched alignment mark on the underside of the needle guide ensures correct assembly. The mark must be between the transfer holes.

7 Operation

Cold starting

With the choke control (on the car's instrument panel) pulled fully out, the cold start valve is rotated to its fully open position, when the hole in the inner spindle aligns with the hole in the valve body, providing a maximum free area for fuel flow. The fuel level in the feed passage is below the air bleed, and there is no flow of fuel until a depression is generated in the mixing chamber of the carburettor.

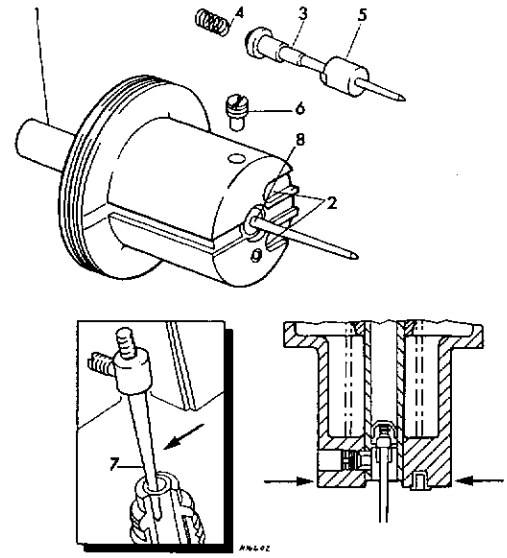


Fig. 8.4 Piston and needle components (Sec 6)

1 Piston rod
2 Transfer holes
3 Jet needle
4 Needle spring
5 Needle guide
6 Locking screw
7 Needle biased in jet
8 Etch-mark

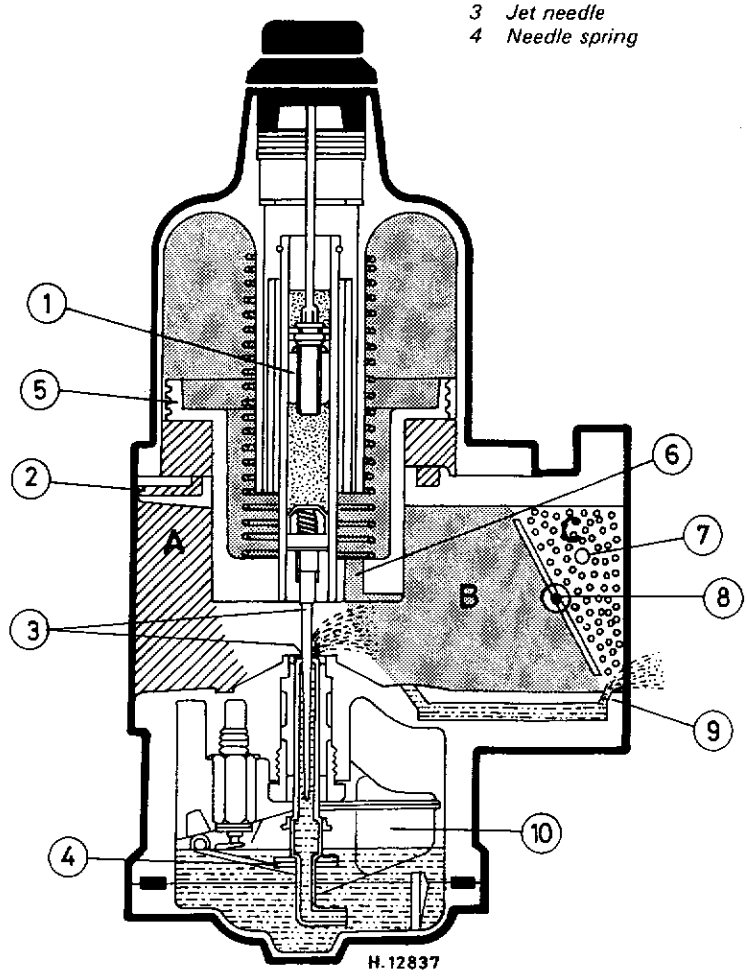


Fig. 8.5 Diagram of HIF carburettor operation (Sec 7)

1 Damper and oil reservoir
2 Atmosphere pressure port
3 Needle and jet
4 Bi-metal jet lever
5 Piston
6 Vacuum transfer holes
7 Mixture enrichment port
8 Throttle valve
9 Bypass idle port
10 Float
A Atmospheric pressure
B Continuous depression
C Manifold depression

When the depression is generated by turning over the engine (on the starter motor), fuel is drawn up out of the feed passage, and mixes with air drawn through the air bleed to form an emulsion in the annulus surrounding the valve body. The mixture flows through the port in the valve body, through the corresponding hole in the inner spindle, through the hollow spindle, and is discharged into the mixing chamber of the carburettor.

Gradual return of the choke control to its fully home position results in a corresponding progressive reduction in rich-mixture quantity delivered. As the main air valve (piston) will also have opened when the engine fired, the net mixture strength will also weaken.

On electronic type carburettors (denoted by an 'E' suffix), the cold start device is operated electrically by a stepper motor. A computerised control unit (ECU – electronic control unit) receives signals from the engine coolant thermistor, air temperature sensor, accelerator pedal and ignition coil, and from this information computes the correct choke position. Using electrical impulses, the stepper motor is moved to its correct position within a 120° arc, the first 40° operating the fast idle cam only. The system also incorporates a vacuum valve to further enrich the mixture on acceleration during engine warm-up.

On some twin carburettor installations, as FASD (fully automatic starting device) is attached to the side of one of the carburettors, and draws its fuel from the carburettor float chamber. Air is supplied to the top of the unit from the air cleaner mounted on the carburettors. A starter jet with tapered metering needle supplies the fuel. A spring-loaded air valve is located in the air inlet, and may be opened by manifold vacuum through a delay valve. The bi-metallic vacuum delay valve is fitted between the FASD and carburettor. It prevents the air valve opening during engine cranking, and so provides a rich mixture for starting. When the engine starts, a computerised control module supplies current to the vacuum delay valve, which then opens the air valve to supply sufficient air for the engine to run.

The air/fuel mixture through the FASD is controlled by the shut-off valve and starter jet, and since the valve is connected directly to the tapered metering needle, the mixture volume may be progressively reduced by moving the two components downwards. The valve movement is controlled by a wax capsule in contact with the engine coolant, and in addition, the vacuum on the engine side of the FASD helps to close the valve. When normal engine temperature is reached, the shut-off valve will have completely shut, and normal air/fuel mixture will be supplied by the twin carburettors alone.

An alternative to the FASD is the ASU (automatic starting unit), which is also fitted to one carburettor of a twin carburettor installation. This unit functions in a similar manner to the AED (automatic enrichment device) described in Chapter 9, except that it is attached to the bottom of the carburettor instead of being separate with its own fuel supply.

Full throttle

With the engine at normal running temperature and the cold start valve (where fitted) out of action, the carburettor will function as a normal H-Type unit, mixture quantity and strength delivered being dependent upon the interaction of the throttle opening, the manifold depression and the fuel needle jet relationship.

Acceleration

Temporary enrichment for acceleration is provided by the resistance to upward movement of the piston, caused by the hydraulic damper. It is single-acting, and has no effect on downward movement, allowing the piston to respond immediately during deceleration.

Overrun

An overrun condition occurs when the vehicle is 'driving the engine', for example, when descending a hill with the throttle closed. In this condition, very high manifold depression is produced, which is not conducive to efficient 'clean' combustion. The maximum depression is governed on some versions by the operation of a spring-loaded plate valve in the throttle disc, which opens at a predetermined value to admit air into the mixing chamber, and thus limit the depression.

Idling

When idling, the mixture is conducted through a small bore passageway below the 'floor' of the main choke bore, to emerge at a point adjacent to the bottom edge of the throttle plate, where a cut-out

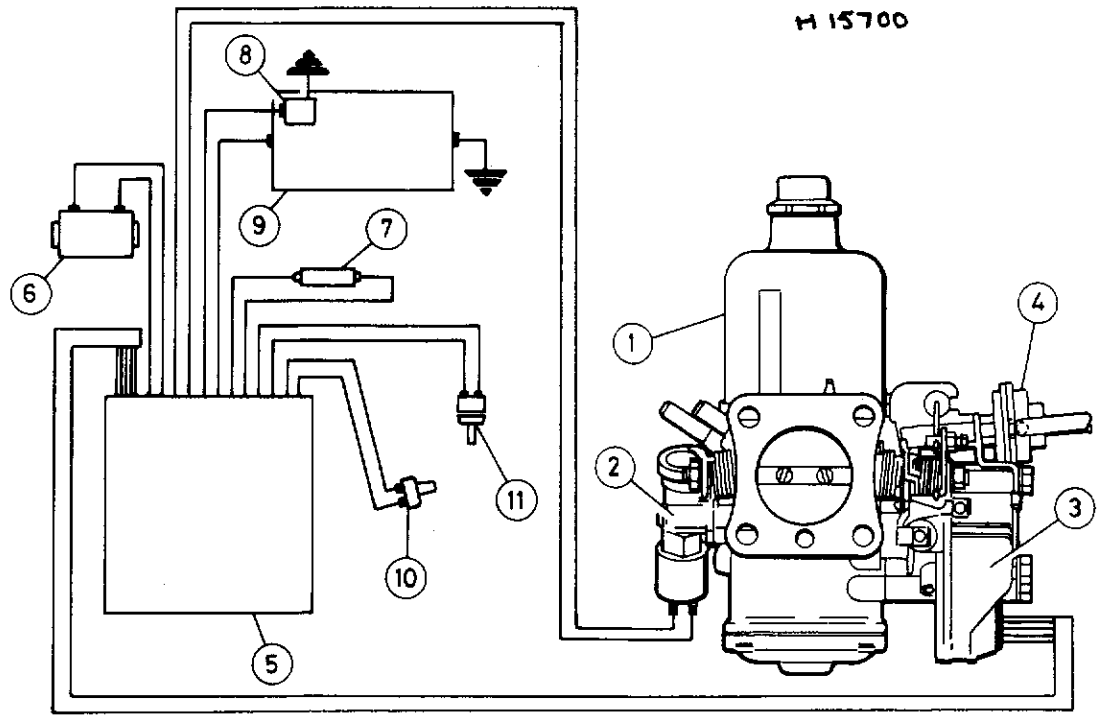


Fig. 8.6 Diagram of typical electronic type HIF carburettor (Sec 7)

1 *Carburettor*
2 *Fuel shut-off valve*
3 *Mixture control stepper motor*
4 *Vacuum switch*
5 *Electronic control unit*
6 *Ignition coil*
7 *Ambient air temperature sensor*
8 *High engine temperature warning lamp*
9 *Engine temperature gauge*
10 *Accelerator pedal switch*
11 *Coolant temperature thermistor*

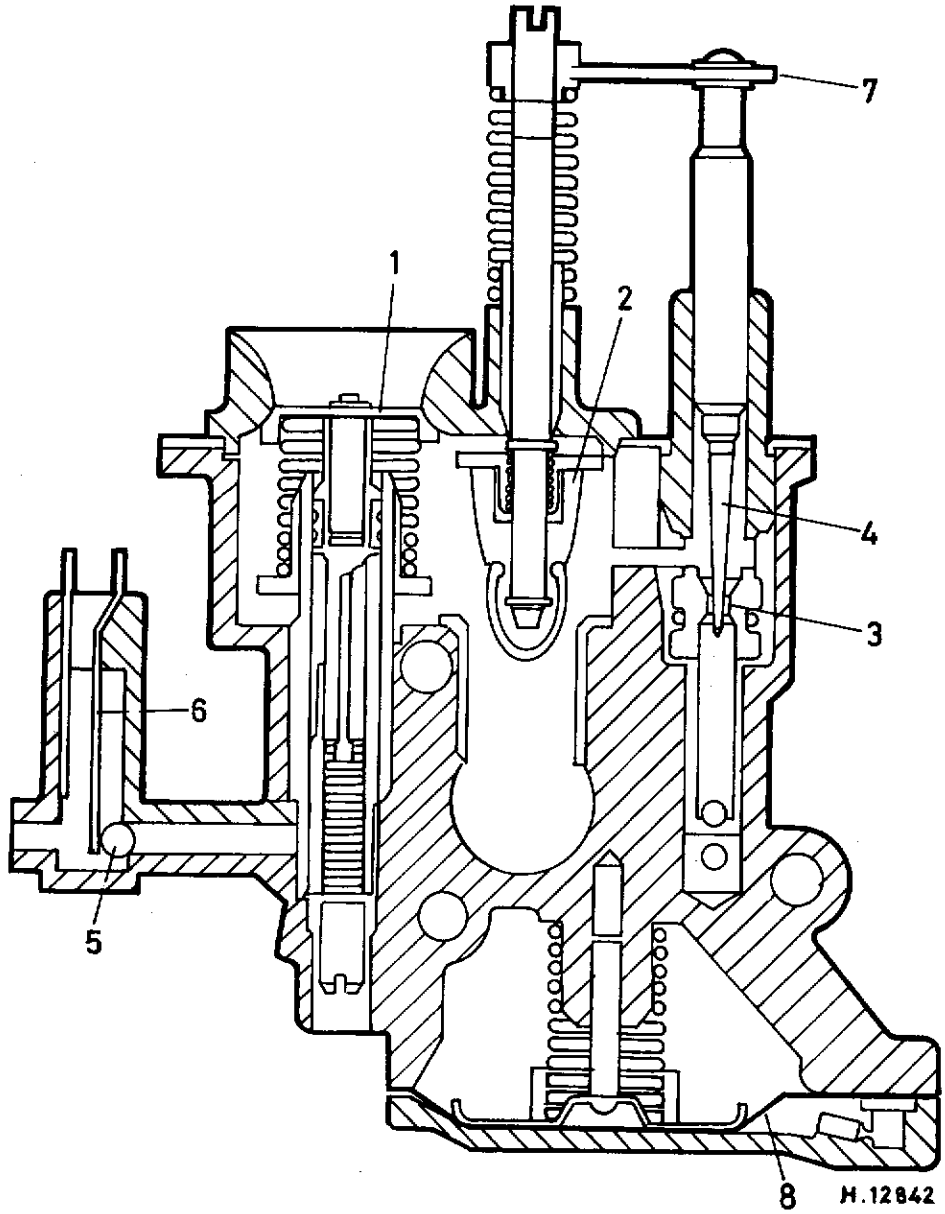


Fig. 8.7 Cross-section of the FASD (Sec 7)

1 *Vacuum controlled air valve*
2 *Shut-off valve*
3 *Starter jet*
4 *Tapered metering needle*
5 *Vacuum delay valve*
6 *Bi-metallic strip*
7 *Needle carrier*
8 *Vacuum-operated accelerator pump*

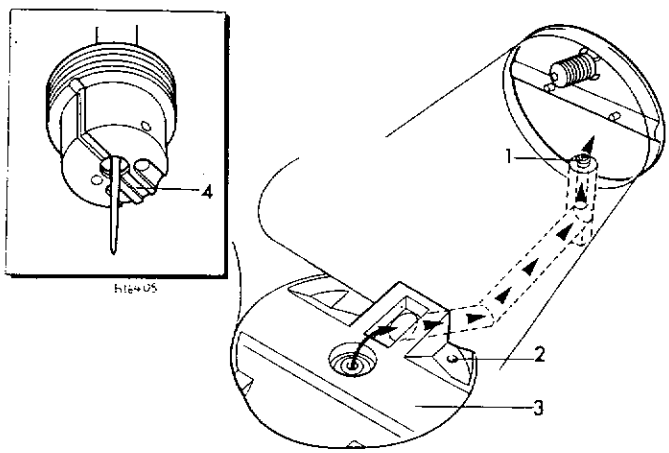


Fig. 8.8 Bypass idle system (Sec 7)

1 *Outlet at throttle valve*
2 *Cold start enrichment outlet*
3 *Jet bridge*
4 *Slot in piston*

is formed. This results in the mixture velocity being considerably higher than if it were induced normally, due to the much smaller cross-sectional area, with more complete atomization of the mixture, particularly at the local high depression at the throttle plate cut-out.

Fuel temperature variation

At all phases of operaton described above, the precise mixture ratio is also subject to the height of the main jet, which is controlled by the fuel temperature compensator. With increasing fuel temperature the jet is raised, and with decreasing temperature it is lowered. Thus the variation in fuel flow which would normally ensue as a result of the change of viscosity is compensated for by an inverse and proportional change of annular fuel flow area, and the actual flow is maintained at a constant value.

8 Special overhaul procedures

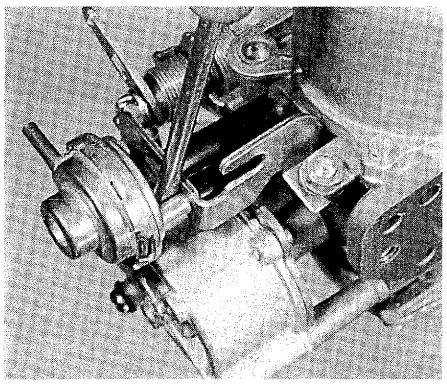
1 Refer to Chapter 4.
2 Service and repair kits are generally available under SU part numbers, according to *vehicle* model. One gasket pack is available for all HIF carburettors, under the part number AUE 821S. The 'S' suffix indicates that throttle plate screws are included.
3 The throttle diameters applicable to the carburettor models are as follows:

Carburettor model	Throttle diameter
HIF4	1 1/2"
HIF6	1 3/4"
HIF7	1 7/8"
HIF38	38.0 mm (1.50 in)
HIF44	44.0 mm (1.73 in)

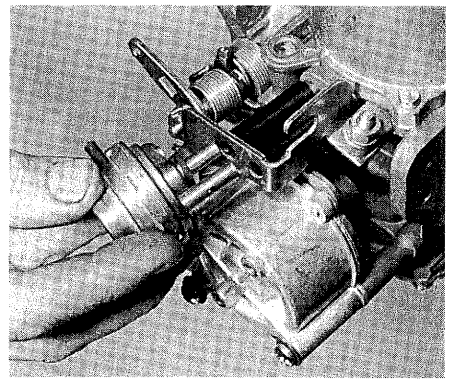
4 On some HIF carburettors, and in particular on the HIF38 fitted to some Austin Metro 1.0 HLE models, a carburettor vent filter assembly may be fitted. This screws into the float chamber, and should be removed periodically for cleaning.

9 Disassembly

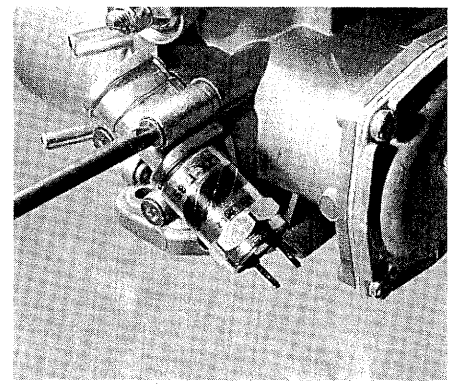
1 Thoroughly clean the exterior of the carburettor.
2 On electronic type carburettors, remove the vacuum switch by levering it from the mounting bracket. Remove the sealing washer from the short stub pipe (photos).
3 On electronic type carburettors, unscrew the three retaining screws and remove the fuel shut-off valve and solenoid assembly (photos). Recover the gasket.
4 Unscrew the damper rod from the suction chamber (photo). On Turbo versions, first unscrew the securing clamp. On some versions it will be necessary to pull the guide clip from the top of the piston rod (Fig. 8.11). Drain the oil from the piston rod. If necessary, the valve may be removed from the damper rod after extracting the spring clip (photo).
5 Unscrew the three retaining screws and raise the suction chamber. At the same time, lift the piston and withdraw the assembly from the carburettor body, taking care not to damage the metering needle (photos).
6 On the ball-bearing type suction chamber, push up the piston, then extract the circlip from the top of the piston rod (photo).
7 Withdraw the piston and spring from the suction chamber (photo).
8 Unscrew the needle guide locking screw and withdraw the needle, guide and spring from the piston (photos).
9 If necessary, remove the screw and piston guide from the carburettor body (photo).
10 Where applicable, remove the FASD from the side of the carburettor, with reference to Section 13.
11 Where applicable, remove the ASU from the bottom of the carburettor, with reference to Section 11.
12 Except on ASU versions, mark the relationship of the float chamber



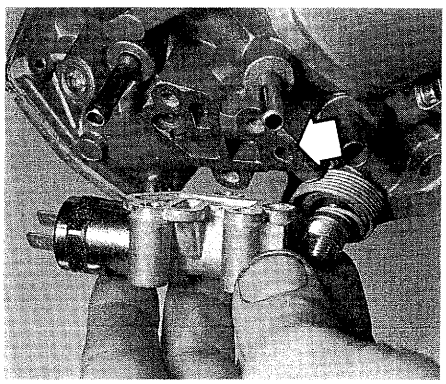
9.2A Using a screwdriver to prise the vacuum switch ...



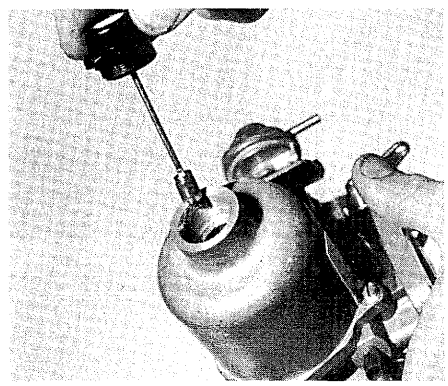
9.2B ... from the mounting bracket



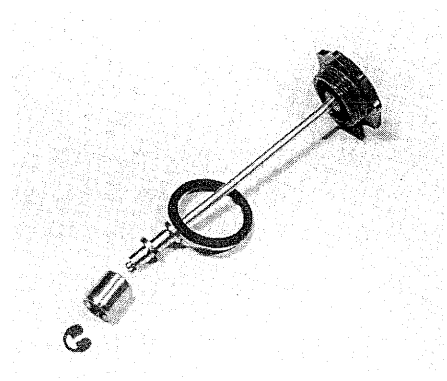
9.3A Extract the screws ...



9.3B ... and remove the fuel shut-off valve and solenoid assembly (gasket arrowed)

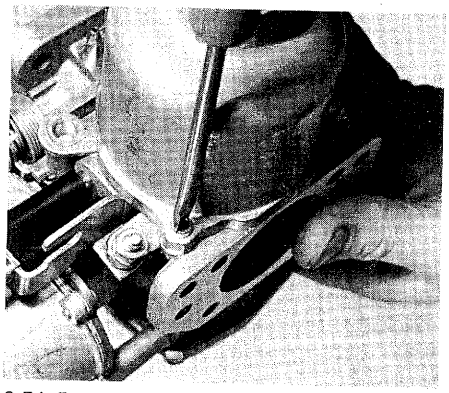


9.4A Removing the damper rod

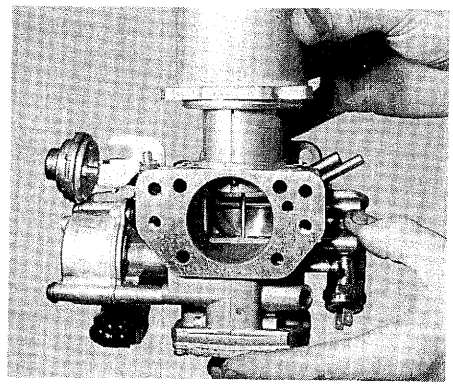


9.4B Dismantled damper rod valve

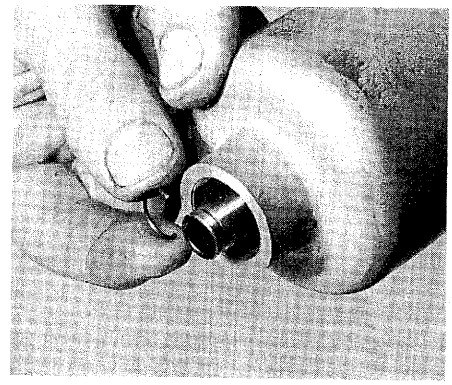
cover to the carburettor body. Unscrew the four retaining screws and lift off the cover, then remove the O-ring seal (photos).
13 Unscrew the jet adjusting lever retaining screw and withdraw the jet and adjusting lever assembly. Disengage the jet from the lever (photos).
14 Where an FASD is fitted, turn the pick-up elbow away from the float (photo).
15 Unscrew the float pivot screw and lift out the float (photos). Discard the screw seal.
16 Remove the float needle, then unscrew the needle valve seat from the base of the carburettor. Where applicable, separate the filter from the seat (photos).
17 Unscrew the jet bearing locking nut and withdraw the jet bearing. Recover the washer (photos).
18 Remove the circlip from the lower end of the piston lifting pin, recover the spring and withdraw the pin.
19 Note the location of the throttle return spring and levers. Unscrew the nut after bending up the tabs, and remove the washers, levers and return spring (photos).
20 Note which way round the throttle disc is fitted, then carefully unscrew the retaining screws. Slide the disc from the slot in the spindle (photo).
21 Remove the throttle spindle and the spindle seals (photos).
22 This completes the dismantling procedure on all but manual choke versions. On the electronic type carburettor, do not attempt to remove the mixture control stepper motor as it is set during manufacture, and may not operate correctly if disturbed. Note also that the stepper motor is a low-voltage unit, and must not be connected to a 12-volt supply. It is not possible to obtain a new stepper motor, so if it is proved faulty, the complete carburettor must be renewed.
23 On manual choke carburettors, note how the spring is attached to the fast idle cam lever (photo). Bend back the locktabs, then unscrew the nut and remove the washer.
24 Hold the return spring against the main body, and use a screwdriver to prise the cam lever from the end of the cold start spindle. Remove the spring.
25 Remove the end cover and spindle seat.
26 Remove the two screws and withdraw the retaining plate, cold



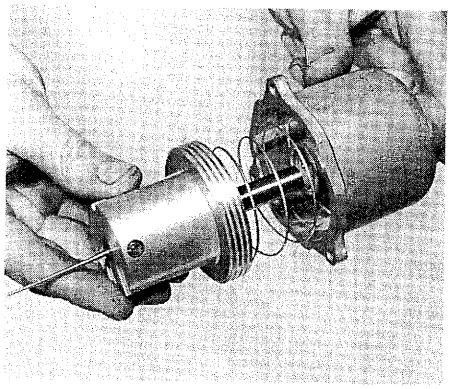
9.5A Extract the screws ...



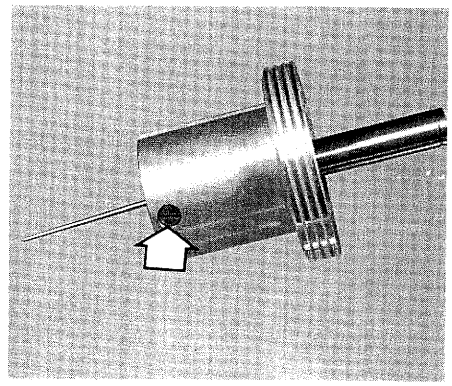
9.5B ... and withdraw the suction chamber and piston assembly



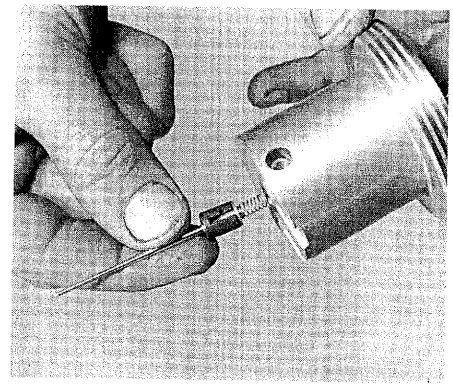
9.6 Removing the circlip from the top of the piston rod on the ball-bearing type suction chamber



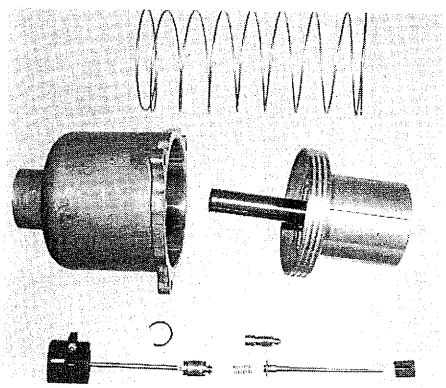
9.7 Separating the piston and spring from the suction chamber



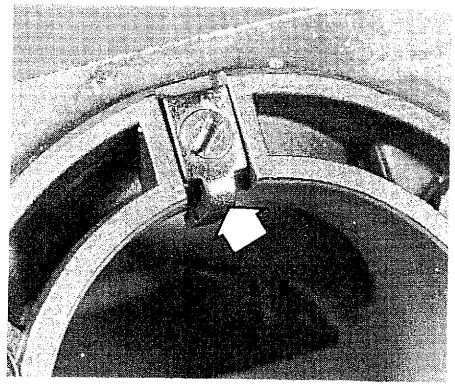
9.8A Unscrew the needle guide locking screw (arrowed) ...



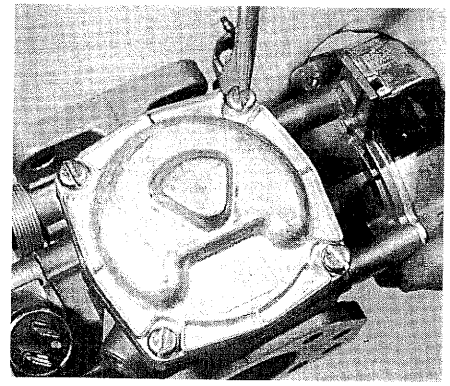
9.8B ... and withdraw the needle, guide and spring



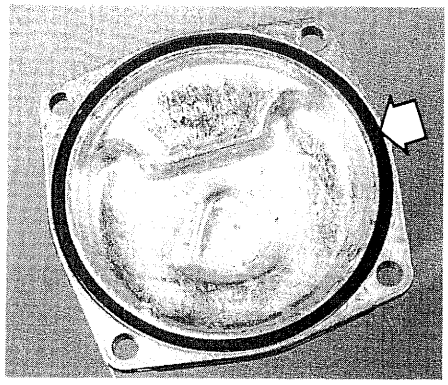
9.8C Piston and suction chamber components



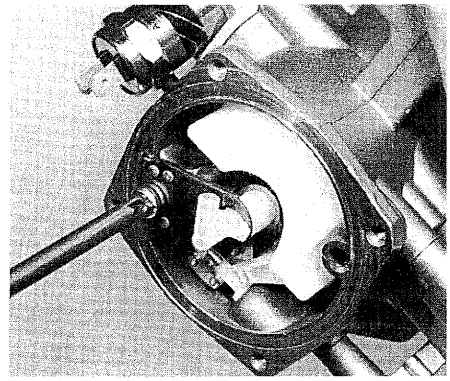
9.9 Piston guide (arrowed)



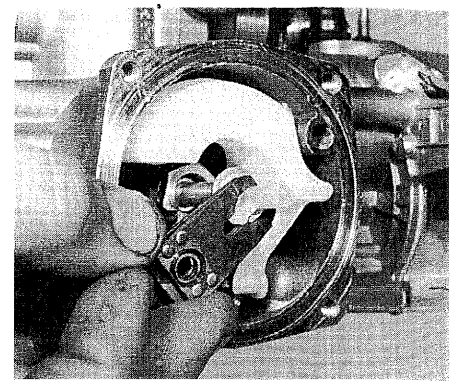
9.12A Removing the float chamber cover screws



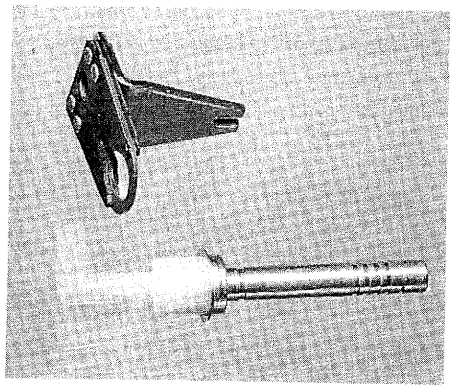
9.12B O-ring seal (arrowed) on the float chamber cover



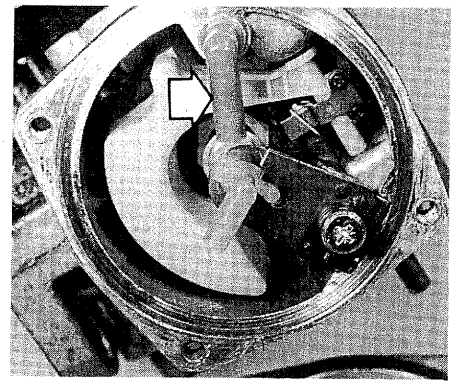
9.13A Remove the screw and spring ...



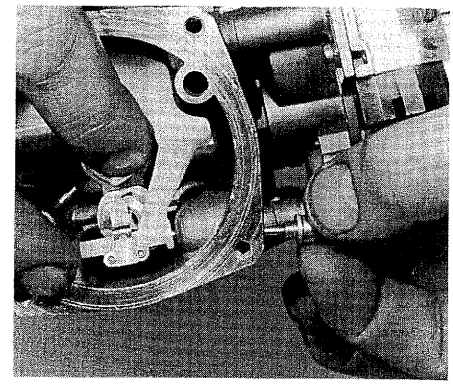
9.13B ... and withdraw the jet and adjusting lever assembly



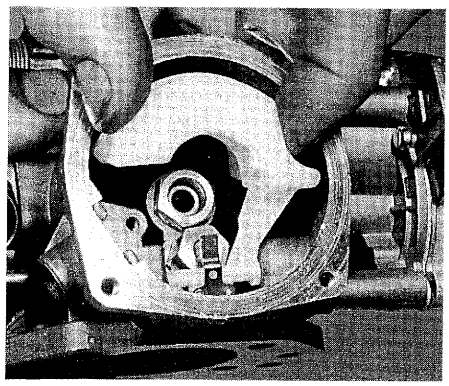
9.13C Jet separated from the adjusting lever



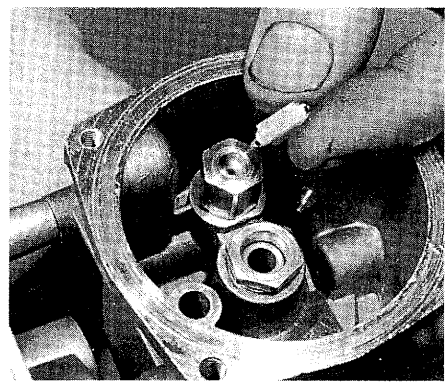
9.14 Pick-up elbow (arrowed) fitted to an FASD-equipped carburettor



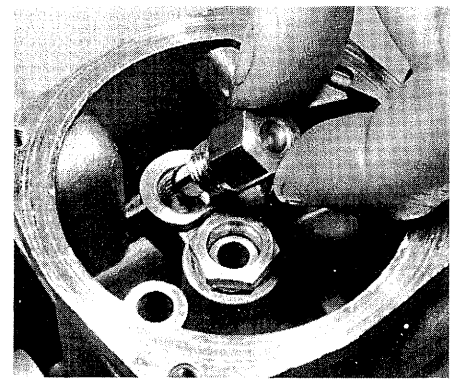
9.15A Unscrew the float pivot screw ...



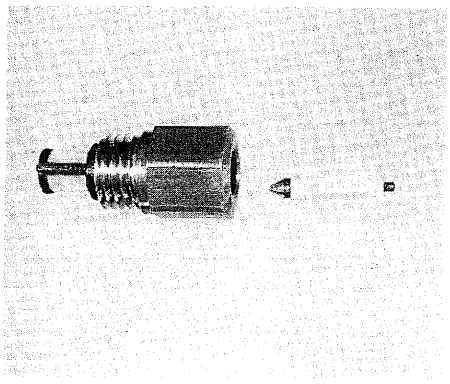
9.15B ... and lift out the float



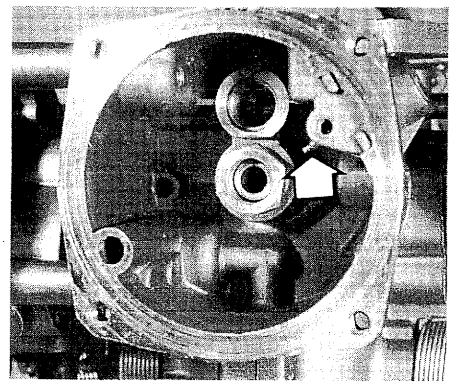
9.16A Removing the float needle



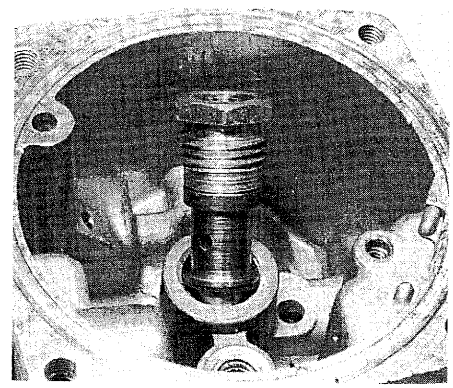
9.16B Removing the needle valve seat



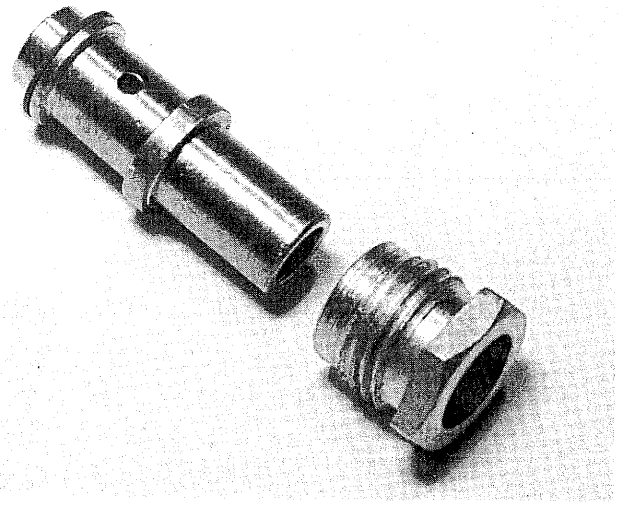
9.16C Needle valve seat and float needle



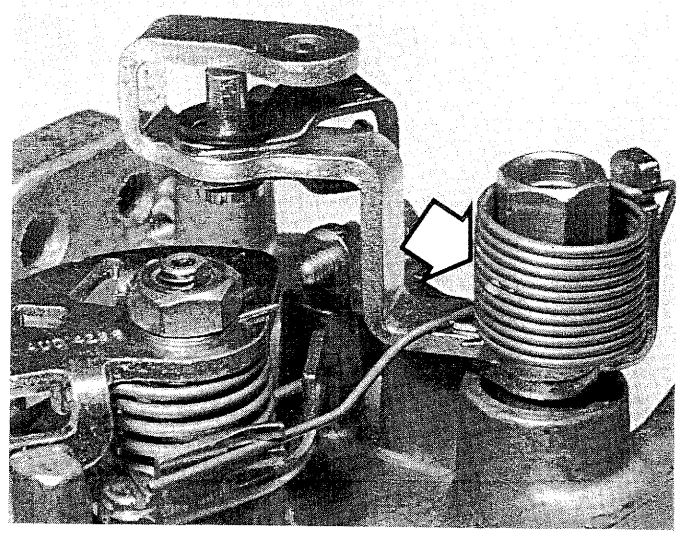
9.17A Jet bearing and locking nut location. Note inner tip of mixture adjustment screw (arrowed)



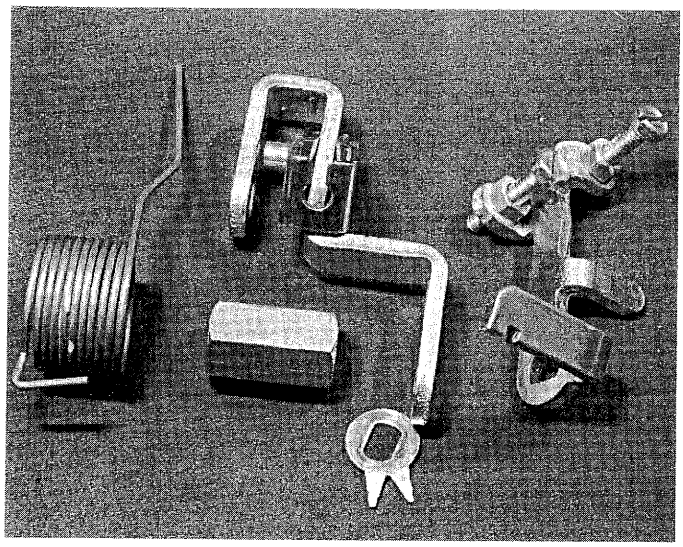
9.17B Removing the jet bearing and locking nut



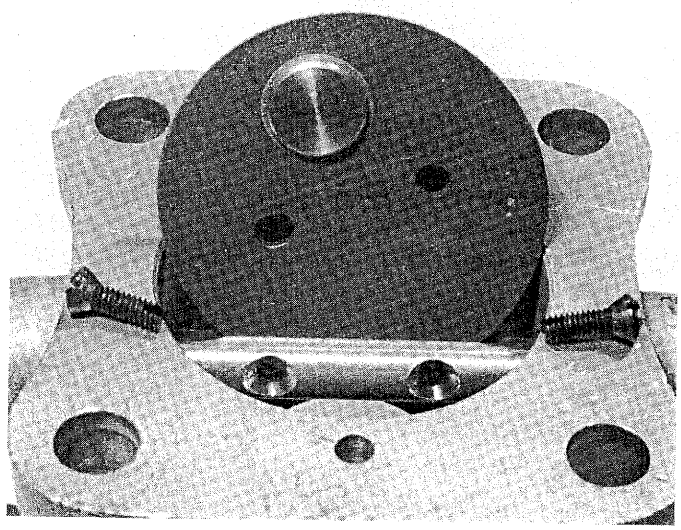
9.17C Locking nut separated from jet bearing



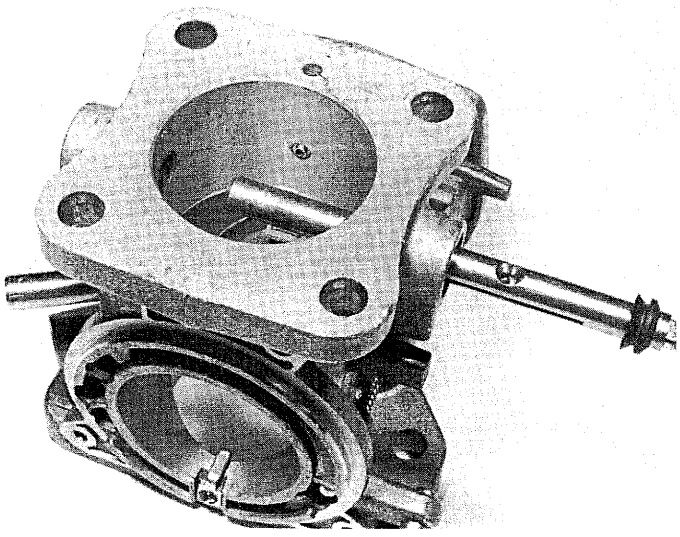
9.19A Throttle return spring (arrowed)



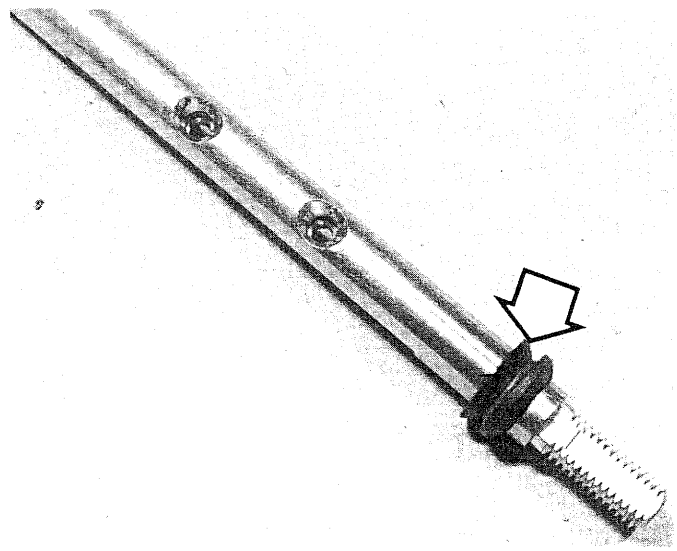
9.19B Throttle lever components



9.20 Throttle disc removal



9.21A Removing the throttle spindle



9.21B Throttle spindle and seal (arrowed)

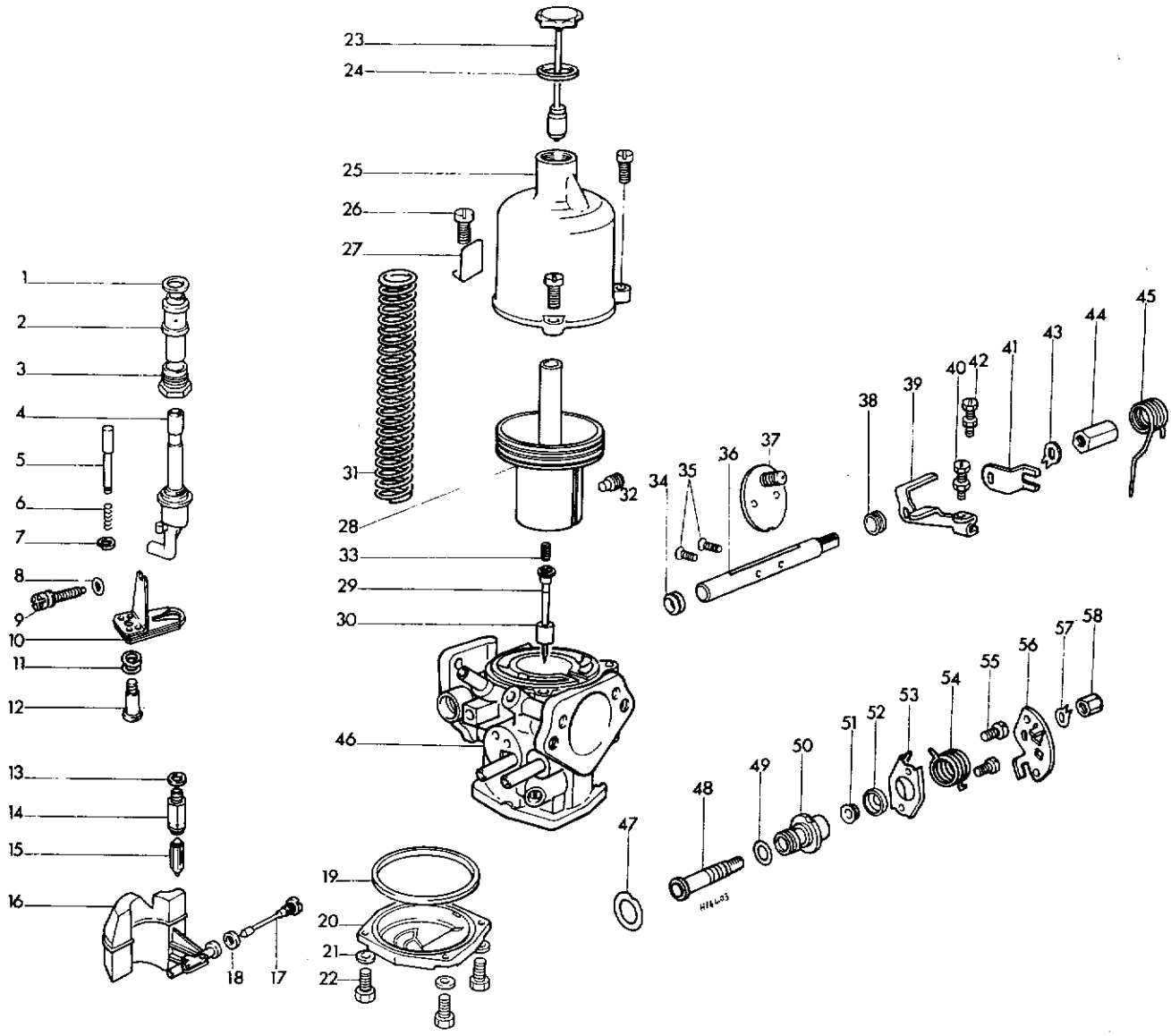


Fig. 8.9 Exploded view of manual choke HIF carburettor for twin carburettor installation (Sec 9)

1 *Jet bearing washer*
2 *Jet bearing*
3 *Jet bearing nut*
4 *Jet assembly*
5 *Lifting pin*
6 *Lifting pin spring*
7 *Circlip*
8 *Adjusting screw seal*
9 *Jet adjusting screw*
10 *Bi-metallic jet lever*
11 *Jet spring*
12 *Jet retaining screw*
13 *Needle seat washer (if required)*
14 *Float needle*
15 *Float needle*
16 *Float*
17 *Float pivot*
18 *Pivot seal*
19 *Float chamber cover seal*
20 *Float chamber cover*
21 *Spring washer*
22 *Cover screw*
23 *Piston damper*
24 *Damper washer*
25 *Suction chamber*
26 *Chamber screw*
27 *Identity tag*
28 *Piston*
29 *Jet needle*
30 *Needle guide*
31 *Piston spring*
32 *Needle retaining screw*
33 *Needle spring*
34 *Throttle spindle seal*
35 *Throttle disc screws*
36 *Throttle spindle*
37 *Throttle disc*
38 *Throttle spindle seal*
39 *Throttle actuating lever*
40 *Fast idle screw and nut*
41 *Throttle lever*
42 *Throttle adjusting screw and nut*
43 *Tab washer*
44 *Retaining nut*
45 *Throttle spring*
46 *Body*
47 *Cold start seal*
48 *Cold start spindle*
49 *O-ring*
50 *Cold start body*
51 *Spindle seal*
52 *End cover*
53 *Retaining plate*
54 *Cold start spring*
55 *Retaining screw*
56 *Fast idle cam*
57 *Tab washer*
58 *Retaining nut*

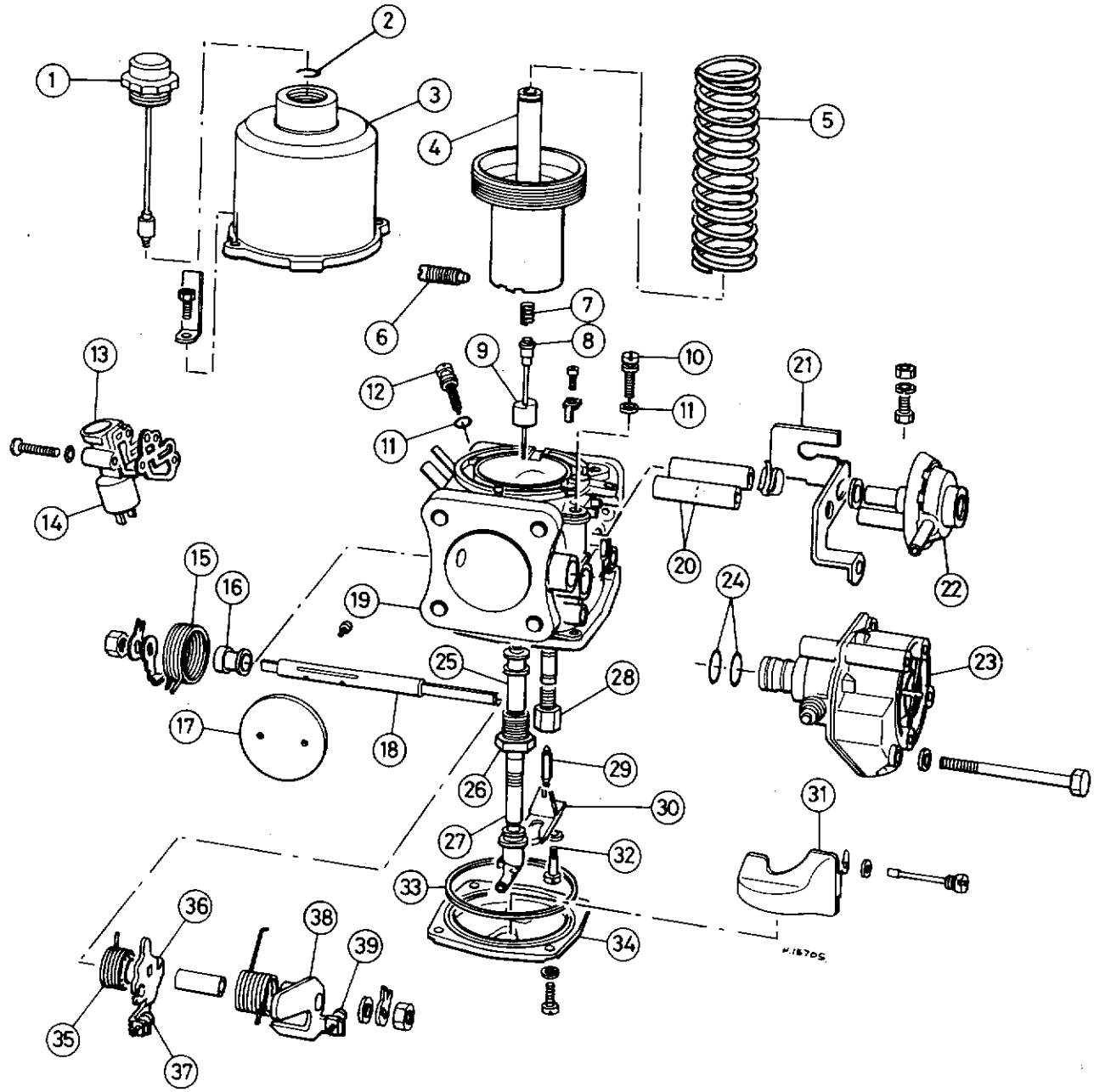


Fig. 8.10 Exploded view of electronic type HIF carburettor (Sec 9)

1 *Piston damper*
2 *Circlip*
3 *Suction chamber*
4 *Piston*
5 *Piston spring*
6 *Locking screw*
7 *Needle bias spring*
8 *Metering needle*
9 *Needle guide*
10 *Throttle adjusting screw*
11 *O-ring*
12 *Mixture adjusting screw*
13 *Fuel shut-off valve housing*
14 *Fuel shut-off valve solenoid*
15 *Throttle return spring*
16 *Throttle spindle seal*
17 *Throttle disc*
18 *Throttle spindle*
19 *Carburettor body*
20 *Vacuum tubes*
21 *Bracket*
22 *Vacuum switch*
23 *Mixture control stepper*
24 *Stepper motor O-rings*
25 *Jet bearing*
26 *Jet bearing nut*
27 *Jet assembly*
28 *Needle valve seat*
29 *Needle*
30 *Bi-metal jet lever*
31 *Float*
32 *Jet retaining screw*
33 *O-ring*
34 *Float chamber cover*
35 *Throttle return spring*
36 *Lost motion link*
37 *Throttle lever adjustment screw*
38 *Throttle lever*
39 *Fast idle adjustment screw*

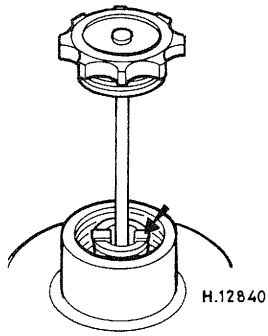
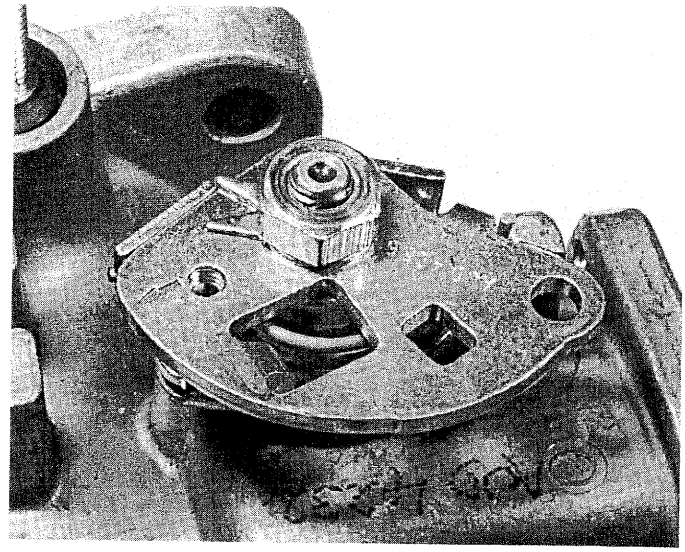
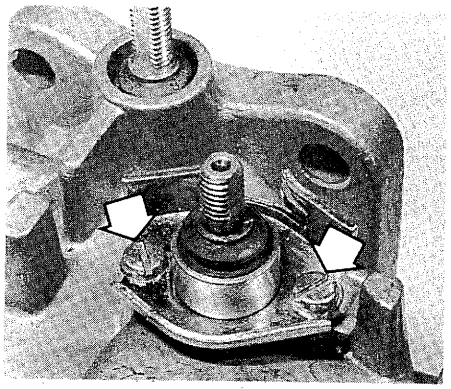


Fig. 8.11 Piston damper guide clip position (Sec 9)

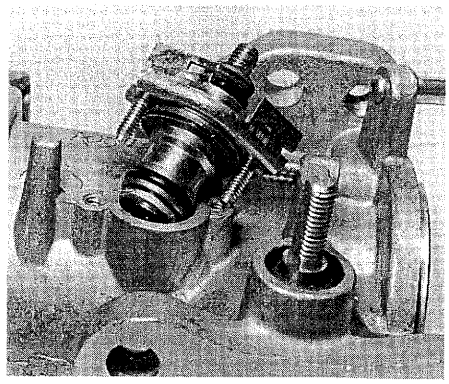
start body, and gasket (photos).
27 Remove the O-ring from the end of the cold start spindle, and withdraw the spindle from the main body. Remove the cold start seal (photo).
28 For instructions on cleaning, inspection and repair, refer to Chapter 4.



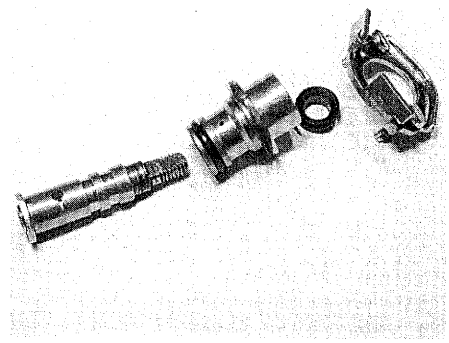
9.23 Fast idle cam



9.26A Remove the screws (arrowed) ...



9.26B ... and withdraw the cold start body assembly



9.27 Dismantled cold start assembly

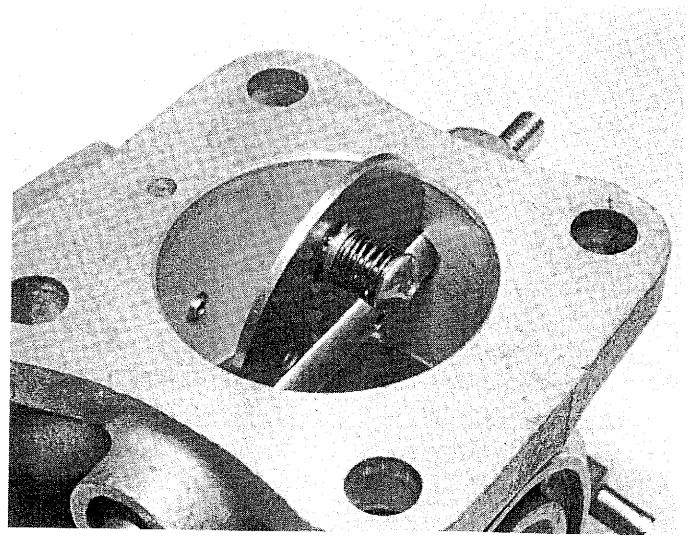
10 Assembly

Manual choke carburettors

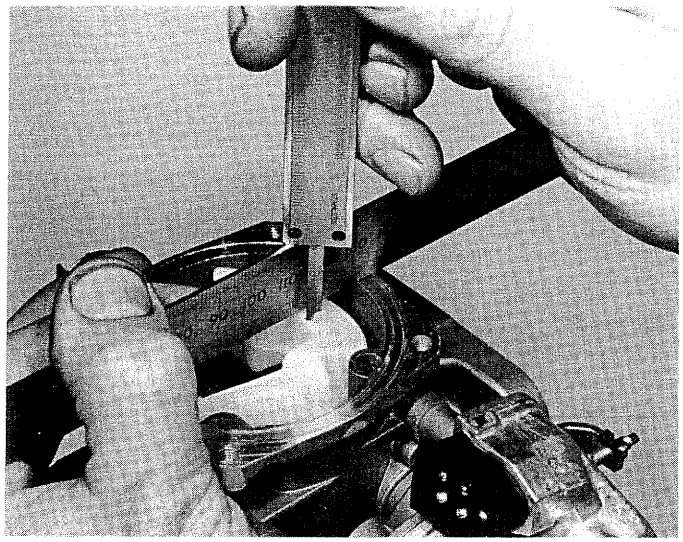
1 On manual choke carburettors, locate the cold start seal in the main body with the cut-out uppermost.
2 Insert the cold start spindle with its hole uppermost, then fit the new O-ring.
3 Fit the cold start body with the cut-out uppermost, followed by the retaining plate with the slotted flange facing the throttle spindle location. Use a new gasket, then insert and tighten the retaining screws.
4 Fit the spindle seat and end cover, following by the spring, cam lever, lockwasher and nut. Make sure that the spring is correctly engaged, then tighten the nut and bend over the locktabs to lock.

All carburettors

5 On all carburettor types, fit the seal to the throttle spindle, then lightly oil the spindle and insert it into the main body. Press the outer seal into the recess in the main body.
6 Slide the throttle disc into the spindle slot in its previously-noted position (photo). Close the throttle and insert the screws, however do not tighten the screws at this stage.
7 Fit the throttle return spring, levers and washers in their previously-noted positons, and tighten the nut. Bend the tabs over the nut to lock it. Make sure that the return spring is correctly located.
8 Slightly open the throttle, and allow it to snap shut several times in order to centralise the disc. Also move the spindle laterally, to



10.6 Inserting the throttle disc



10.14 Checking the float level dimension

determine its central position. Fit new throttle disc screws and tighten them, then open the throttle and spread the screw ends sufficiently to lock them.
9 Insert the piston lifting pin in the main body, locate the spring, and fit the circlip.
10 Locate the washer on the jet bearing, insert the bearing in the main body, and secure by tightening the locking nut.
11 Fit the filter to the needle valve seat. Insert and tighten the needle valve seat in the base of the carburettor. Locate the float needle in the seat.
12 Locate the float in the carburettor, then fit a new seal to the pivot screw, and insert and tighten the screw.
13 Where fitted, turn the FASD pick-up elbow towards the float.
14 With the carburettor inverted, allow the float to close the needle valve under its own weight. Meaure the distance from the centre of the float to the face of the main body, as shown in Fig. 8.12. The distance should be 0.040 to 0.060 in (1.02 to 1.52 mm). A steel rule and vernier calipers may be used to check the distance (photo). Note that it will be necessary to record the width of the rule and deduct this from the overall distance. If adjustment is necessary, carefully bend the brass contact arm on the float as required.
15 Engage the jet with the cut-out in the adjusting lever, ensuring that the jet head moves freely. Position the jet in the jet bearing and, at the same time, engage the slot in the adjusting lever with the protruding tip of the mixture adjustment screw. Secure the assembly with the retaining screw and spring.
16 Except on ASU versions, fit a new O-ring seal to the float chamber cover. Fit the cover with the previously-made marks aligned, and secure with the four retaining screws.
17 Where applicable, refit the ASU to the bottom of the carburettor, with reference to Section 11.
18 Where applicable, refit the FASD to the side of the carburettor, with reference to Section 13.
19 Refit the piston guide, and secure with the screw.
20 Refit the piston needle, spring and guide to the piston, ensuring that the guide is flush with the underside of the piston, and the guide slot aligned with the locking screw location. Where applicable, the triangular etch-mark on the guide should be between the two vacuum transfer holes in the piston. Refit and tighten the locking screw.
21 Temporarily refit the piston and suction chamber to the carburettor body without the spring. Engage the piston in its guide, and, with the suction chamber in its correct position relative to the retaining screws, mark the piston-to-suction chamber relationship with a pencil. Remove the piston and suction chamber.
22 Fit the spring to the piston, align the previously-made marks, and slide the suction chamber over the piston and spring. Avoid turning the piston in the suction chamber, otherwise the spring will be wound up.
23 On the ball-bearing type suction chamber, push the piston up and refit the circlip to the piston rod.
24 Refit the piston and suction chamber assembly, taking care not to damage the metering needle. Insert and tighten the three retaining screws.
25 Assemble the valve to the damper rod, and fit the spring clip.
26 Fill the piston rod with oil. On standard suction chambers (ie without a damper rod guide clip, or upper circlip on the piston rod), the level must be 0.5 in (13 mm) above the top of the hollow piston rod. On ball-bearing suction chambers with a damper rod guide clip, the level should be at the bottom of the guide clip. On ball-bearing suction chambers with a circlip on the top of the piston rod, the level should be 0.25 in (6.5 mm) below the top of the hollow piston rod.
27 Insert and tighten the damper rod and, where applicable, press the guide clip into the top of the piston rod at the same time. On Turbo versions, refit and tighten the damper securing clamp.
28 On the electronic type carburettor, fit the fuel shut-off valve and solenoid assembly, together with a new gasket. Insert and tighten the three retaining screws.
29 On the electronic type carburettor, fit the sealing washer to the short stub pipe on the vacuum switch. Press the switch into position on the mounting bracket.

11 Automatic starting unit (ASU – twin carburettors) – testing, removal, overhaul and refitting

Testing

1 Should it be suspected that the ASU is not operating correctly, carry out the following test.
2 Remove the air cleaner, and check that the ASU outlet hose is

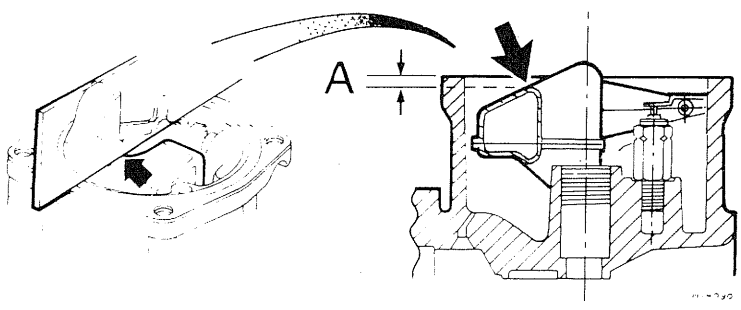


Fig. 8.12 Checking the float level dimension (Sec 10)

A = 0.040 to 0.060 in (1.02 to 1.52 mm)

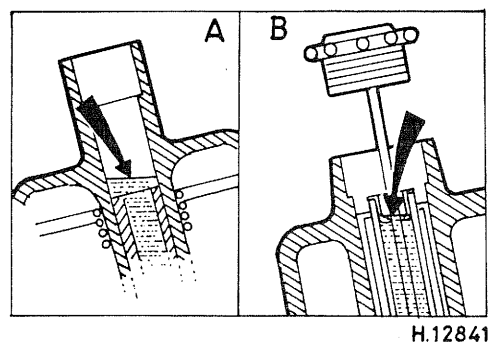


Fig. 8.13 Piston damper oil level (Sec 10)

A Standard suction chamber B Ball bearing suction chamber

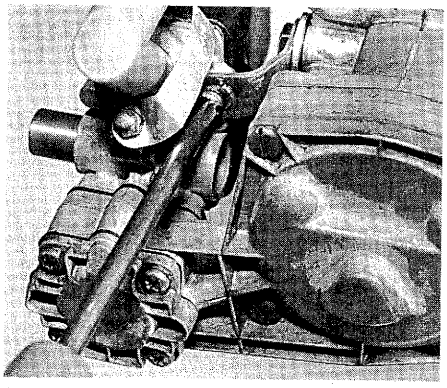
secure and that the fuel level in the carburettor with the ASU attached is correct.
3 Remove the ASU air filter and intake hose after loosening the two clips.
4 With the engine cold, start the engine for five seconds, then switch off.
5 Disconnect the outlet hose and check that the ASU outlet port is moist with fuel. If not, refit the outlet hose, partially block the inlet port, and start the engine for a further five seconds only.
6 Disconnect the outlet hose and check again that the ASU outlet port is moist with fuel. If it is now, the internal thermostatic unit is proved faulty, and the ASU should be replaced.
7 Run the engine to normal operating temperature, then check that the ASU inlet port is closed, using a strip of paper to detect any suction through the port. If it is open, the unit is faulty.
8 Refit the intake hose and special air filter, and tighten the two clips.
9 A further test may be made if difficult hot starting is experienced. With the engine hot, remove the outlet hose and blank off the port in the inlet manifold. If the engine now starts better, the ASU is proved defective. Check that the outlet hose is firmly secured, and is not deteriorated.

Removal

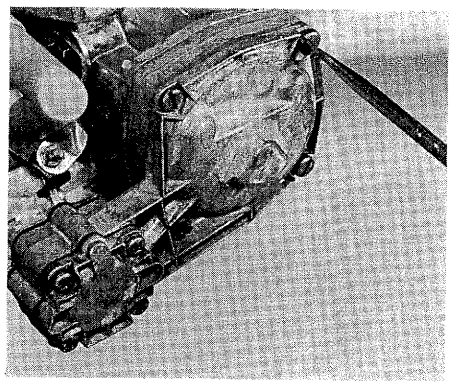
10 First remove the carburettor with the ASU attached. On some models, it may be possible to remove the ASU without removing the carburettor, although this is not recommended.
11 Loosen the clips and disconnect the inlet and outlet hoses, if not already removed.
12 Remove the screw securing the ASU to the upper support bracket (photo).
13 Extract the screws which hold the spacer plate and ASU adaptor plate to the carburettor (photo). Remove the ASU from the carburettor.
14 Remove the upper O-ring, spacer plate, and lower O-ring (photos).

Overhaul

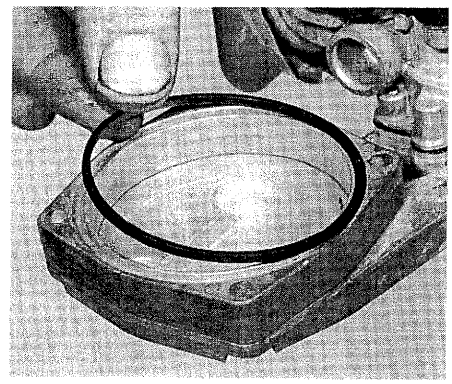
15 Pull the plastic cover from the top of the ASU (photo).
16 Remove the screws, and lift the ASU from the adaptor plate (photo).
17 Remove the diaphragm, location dowel, spring, and plunger from the top of the adaptor plate (photos).
18 Turn the adaptor plate over, and remove the bottom cover, diaphragm, and location dowel (photos).
19 Remove the clamp screw and clamp, then pull out the air inlet stub and remove the O-ring (photos).
20 Remove the screws, and separate the cover from the valve body (photo). The bi-metal unit loading spring will probably remain in the top cover.
21 Remove the gasket. Note how the bi-metal unit is located, then lift it from the cut-outs in the valve body (photo).
22 Prise out the O-ring from the top of the fuel metering needle assembly (photo).
23 Remove the screws, and lift the valve body from the ASU body (photo).
24 Remove the gasket. Note the location of the air valve, then remove it from the ASU body (photo).
25 Thoroughly clean all the components, and examine them for wear and damage. Check the diaphragms for splits and pin holes. Blow clear all internal drillings using low air pressure.
26 Commence reassembly by locating the air valve in the ASU body. With the spring correctly positioned, check that the valve closes properly.
27 Refit the valve body together with a new gasket, then insert and tighten the screws.
28 Locate a new O-ring over the fuel metering needle assembly.
29 Locate a new gasket on the valve body, and refit the bi-metal unit in its previously-noted position.
30 Check that the bi-metal unit loading spring is in the top cover. Refit the top cover and tighten the screws.
31 Locate a new O-ring on the air inlet stub. Refit the air inlet stub, and secure with the clamp and screw.
32 Press the location dowel in the bottom of the adaptor plate, and refit the diaphragm and bottom cover.
33 With the adaptor plate upright, insert the plunger, and refit the



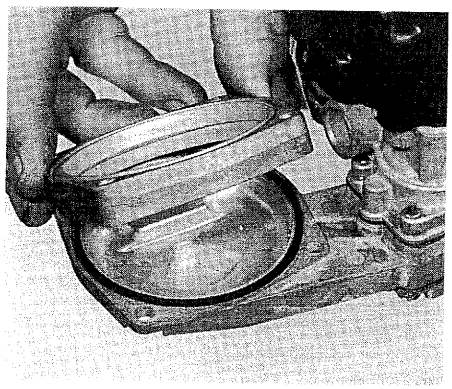
11.12 Removing ASU upper support bracket screw



11.13 Removing the ASU-to-carburettor adaptor plate screws

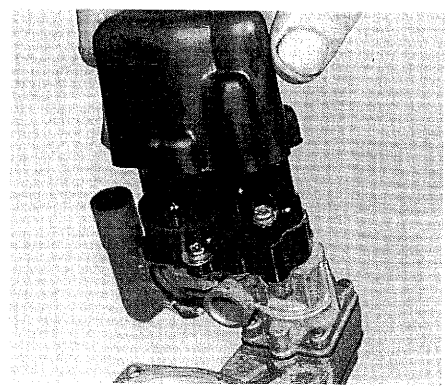


11.14A Removing the upper O-ring ...

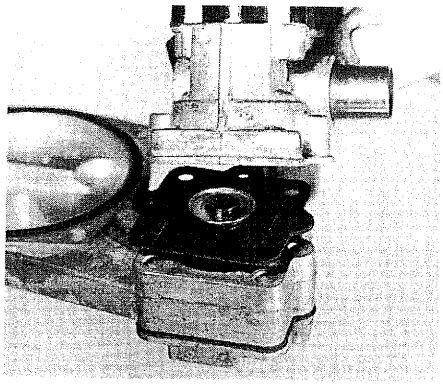


11.14B ... spacer plate ...

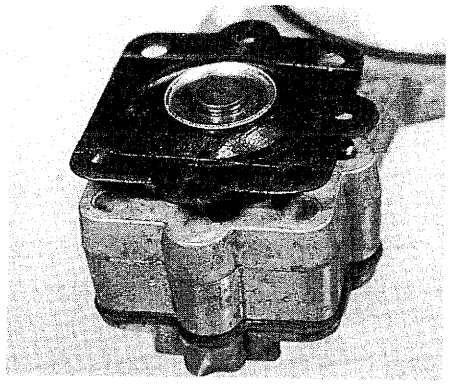
11.14C ... and lower O-ring



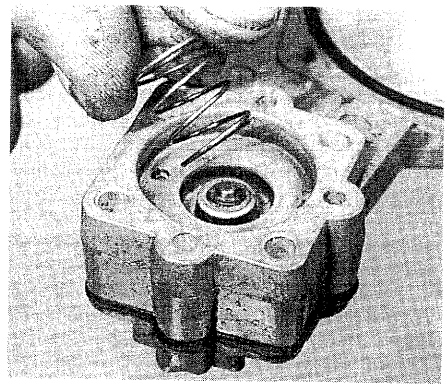
11.15 ASU top cover removal



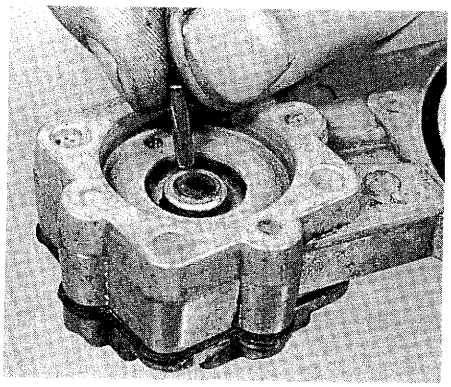
11.16 Removing the ASU from the adpator plate



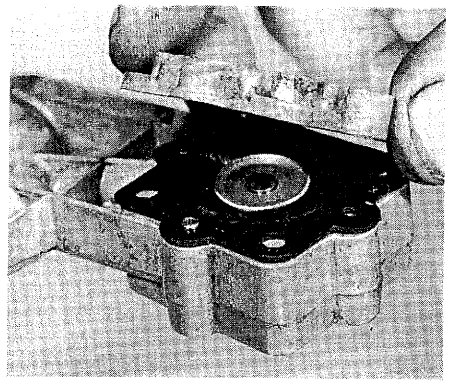
11.17A Remove the diaphragm ...



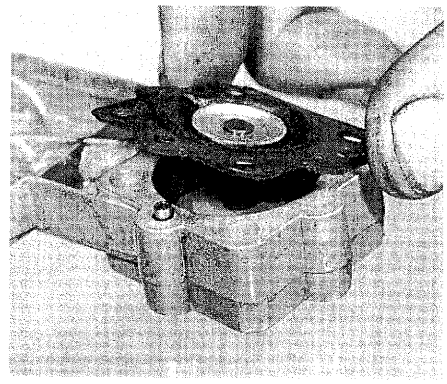
11.17B ... spring ...



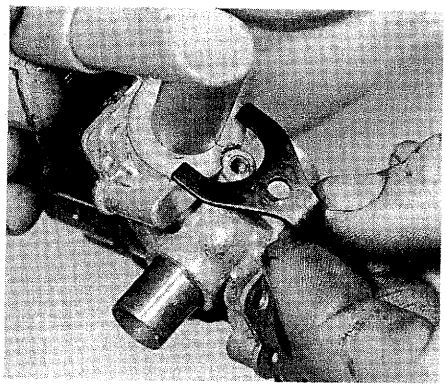
11.17C ... and plunger



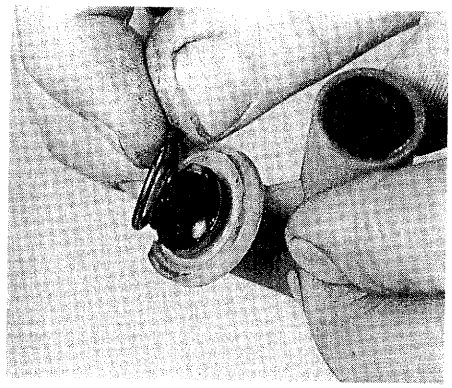
11.18A Remove the bottom cover ...



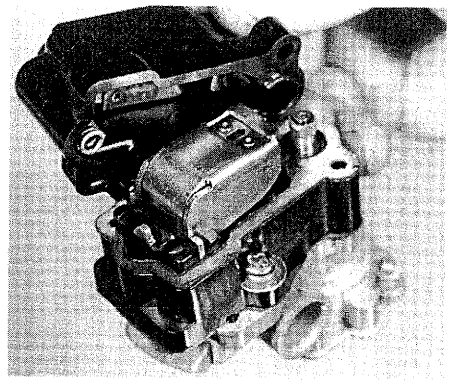
11.18B ... diaphragm, and location dowel



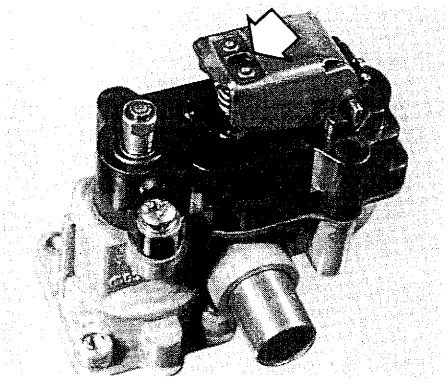
11.19A Air inlet stub and clamp removal



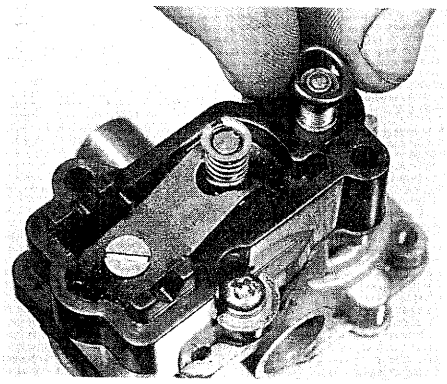
11.19B Air inlet stub O-ring removal



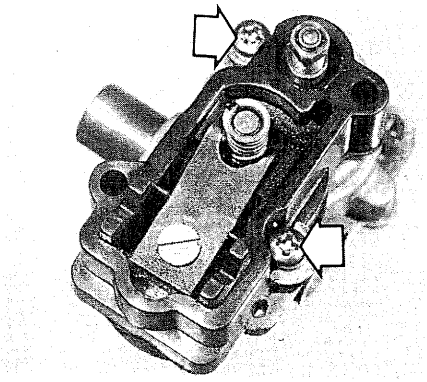
11.20 Valve body cover removal



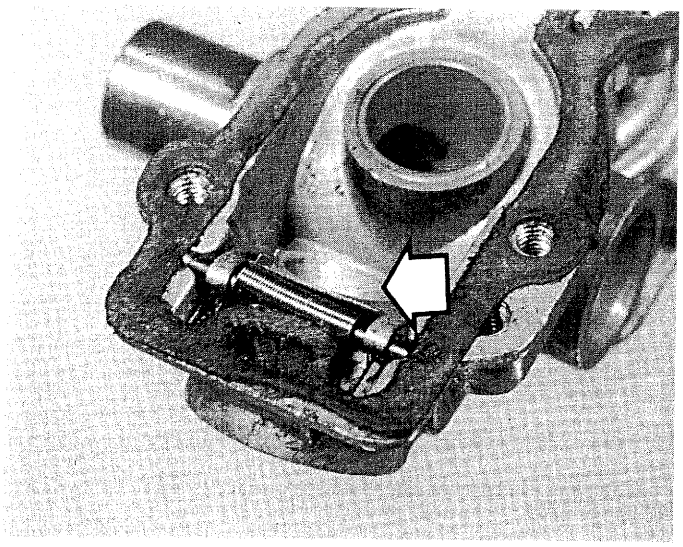
11.21 Bi-metal unit (arrowed)



11.22 Fuel metering needle O-ring removal



11.23 Valve body securing screws



11.24 Air valve location (arrowed)

spring, location dowel and diaphragm.
34 Press the cover and adaptor plate onto the ASU, then insert and tighten the screws.
35 Press the plastic cover on the top of the ASU.

Refitting

36 Refitting is a reversal of removal, but fit new O-rings either side of the spacer plate. Make sure that the associated air hoses are in good condition.

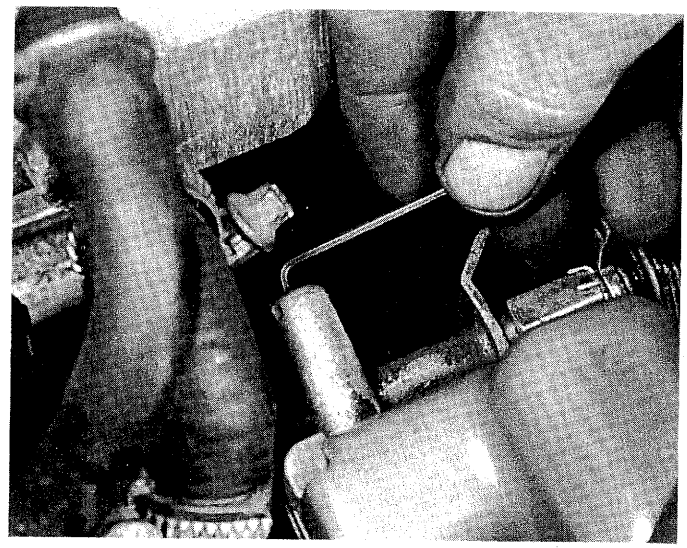
12 Fully automatic starting device (FASD – twin carburettors) – checking and adjustment

Checking

1 Check that fuel is being delivered to the carburettor with the FASD attached, by temporarily disconnecting the feed pipe, and switching on the ignition for a few seconds.
2 If the cooling system has recently been drained and refilled, make sure that all air has been purged from the coolant. The presence of air around the wax capsule inside the FASD will reduce the movement of the shut-off valve during the warm-up period, resulting in an over-rich mixture.
3 To check that the FASD cuts out correctly, run the engine to normal operating temperature, then connect an exhaust gas analyser to the exhaust tailpipe. Record the CO percentage at idle speed. Disconnect the FASD outlet hose at the inlet manifold, blank off the manifold aperture, and check that the CO reading remains as previously recorded, or drops very slightly. The FASD is proved faulty if the CO reading drops significantly, or fluctuates. Stop the engine, re-connect the outlet hose, and disconnect the exhaust gas analyser.
4 It is possible for a fault to occur in the FASD control module (usually located behind the instrument panel) or its associated wiring, which prevents the vacuum delay valve opening. In such a case, the engine will start well from cold, and will run well when hot, but in the intervening period will show symptoms of excessive richness (eg lumpiness and black smoke). This condition is confirmed if battery voltage is not present across the delay valve terminals when the engine is running.
5 If starting is satisfactory, but the FASD seems to stay on too long, check that the coolant is circulating freely past the wax capsule. On some models, there is a restrictor in the hose between the FASD and the radiator, which may become blocked. Furthermore, on some models (notably Rover 2300/2600) it is possible for the coolant feed to be blocked by the fitting of an incorrect (early pattern) inlet manifold gasket.
6 Reluctance to start and run when cold may be due to fuel starvation. Remove the FASD adaptor (accessible after removing the float chamber cover on the carburettor), and check that the non-return valve ball is not dislodged.

Adjustment

7 To carry out adjustment, it will be necessary to obtain a means of determining when airflow through the FASD has ceased. A circle of 100 gram weight paper 2.64 in (67.1 mm) in diameter, with a central 0.5 in (13.0 mm) diameter hole may be used for this purpose. A means of accurately measuring the temperature of the FASD water jacket is also required, and for this purpose, temperature-sensitive adhesive labels should be obtained.
8 Remove the air cleaner or inlet duct from the carburettors.
9 Prise out the rubber plug from the end of the adjustment tube, and insert a 1.5 mm Allen key so that it engages the adjuster (photo).
10 Wipe clean the water jacket, and attach a 65°C (150°F) temperature-sensitive label as shown in Fig. 8.14.
11 Start the engine (cold) and allow it to idle. If the engine will not start, turn the Allen key two turns clockwise and try again.
12 With the engine idling, locate the paper airflow detector over the FASD air intake, so that the passage of air holds it in place (photo).
13 As soon as the water jacket temperature reaches 65°C (150°F), turn the Allen key clockwise slowly until the paper airflow detector falls from the air intake, indicating that the flow of air has ceased. Should the detector fall *before* 65°C (150°F) is reached, turn the Allen key anti-clockwise one turn, then reposition the detector. The adjustment must be completed within 30 seconds of the 65°C (150°F) temperature being reached, otherwise the engine must be allowed to cool for at least one hour before starting again.
14 Remove the Allen key, and refit the rubber plug. Refit the air cleaner or inlet duct.



12.9 1.5 mm Allen key inserted in the FASD

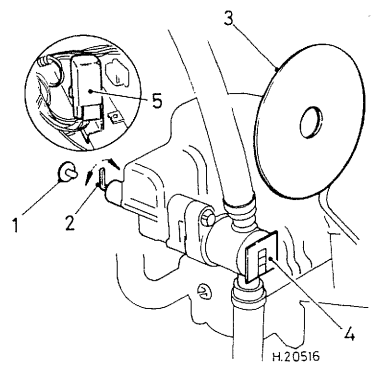


Fig. 8.14 Adjusting the FASD (Sec 12)

1 *Rubber plug*
2 *Allen key*
3 *Paper shut-off indicator*
4 *Temperature indicator*
5 *Control module*

12.12 Locating the paper airflow detector over the FASD air intake

13 Fully automatic starting device (FASD – twin carburettors) – removal, overhaul and refitting

Removal

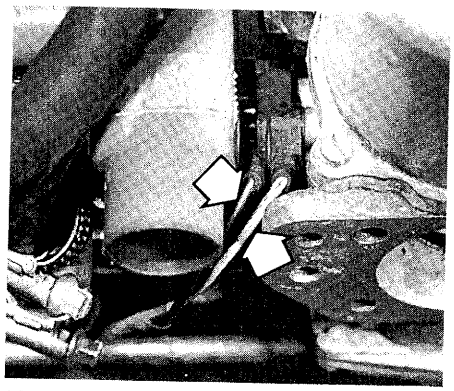
1 Unbolt and remove the air cleaner assembly from the carburettors.
2 Disconnect the FASD air inlet and outlet hoses, and also the delay valve wiring (photo).
3 Drain the cooling system, then loosen the clips and disconnect the coolant hoses from the FASD water jacket (photo). Alternatively, fit hose clamps to the hoses before disconnecting them.
4 On some models it may be possible to remove the FASD leaving the carburettor in position. Otherwise, disconnect the fuel hose, vacuum hose(s), accelerator cable and linkage, then unscrew the mounting nuts and remove the carburettor from the inlet manifold.
5 Unscrew the through-bolts and withdraw the FASD from the carburettor (photos). Be prepared for fuel spillage.
6 Remove the delay valve from the carburettor. Peel the gaskets from the carburettor and delay valve (photos).

Overhaul

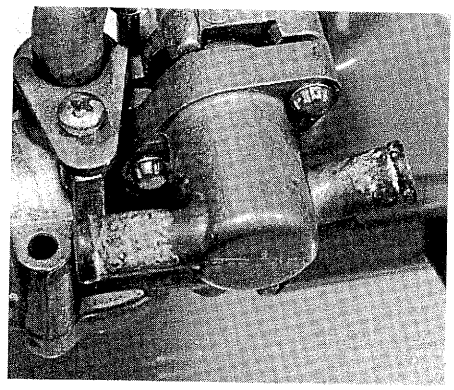
7 Clean the external surfaces of the FASD.
8 Extract the screws, and remove the cover from the accelerator pump diaphragm (photo).
9 Remove the diaphragm, and lift the spring from the plastic guide/valve (photos).
10 Release the plastic guide/valve from the spring clip and remove it (photos).
11 Clean and examine the parts for wear and damage (photos). Check the diaphragm for pin holes or splits. Renew the parts as necessary. Note that it is not possible to remove the air inlet cover, as it is rivetted in position.
12 Commence reassembly by engaging the plastic guide/valve with the spring clip.
13 Insert the spring through the plastic guide/valve, then fit the diaphragm with the square tab aligned with the vacuum hole in the main body.
14 Fit the cover, and hold it down against the spring tension, making sure the screw holes are aligned. Insert and tighten the screws evenly.

Refitting

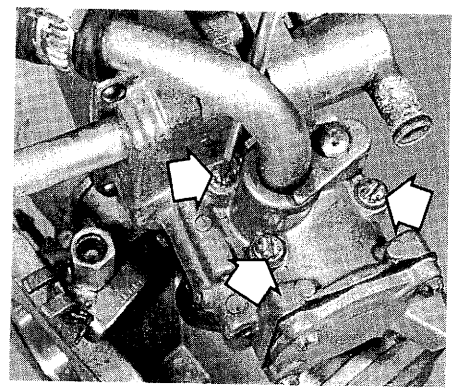
15 Refitting is a reversal of removal, but clean the mating surfaces and fit new gaskets. Refill the cooling system.



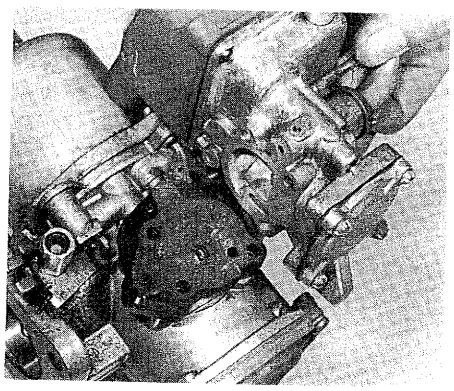
13.2 FASD delay valve wiring (arrowed)



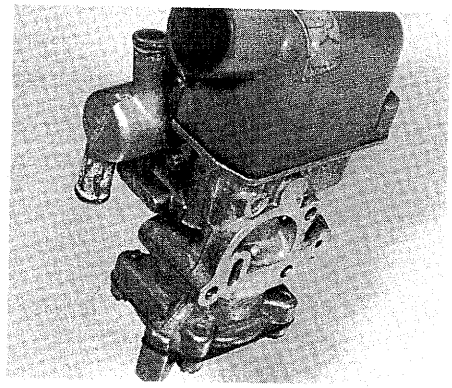
13.3 FASD water jacket



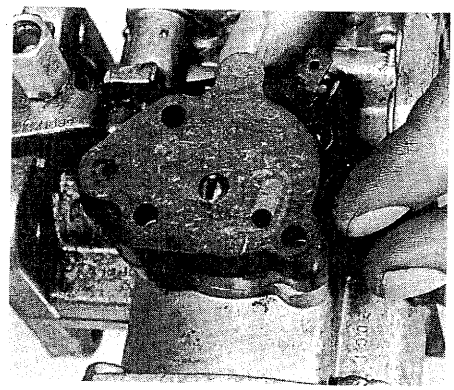
13.5A Remove the through-bolts (arrowed)



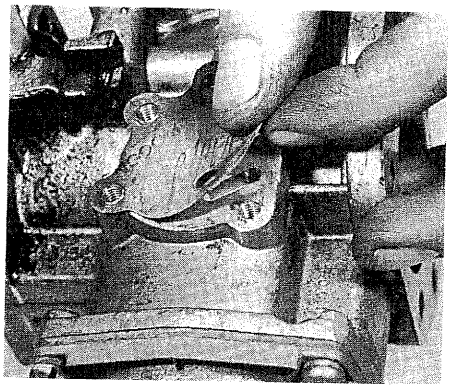
13.5B ... and withdraw the FASD

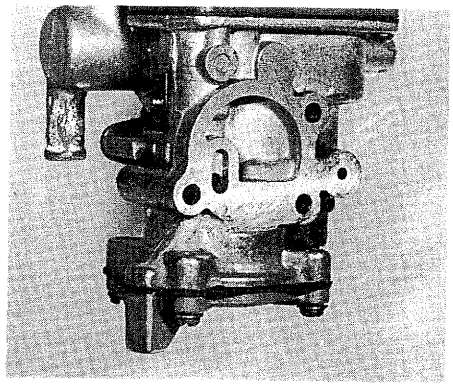


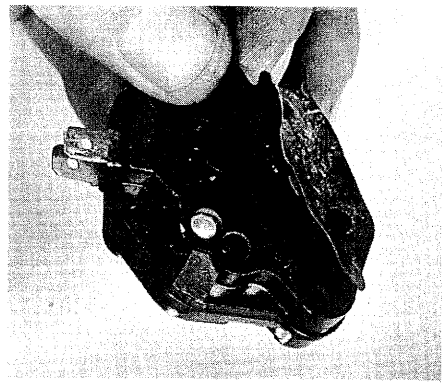
13.5C The FASD removed

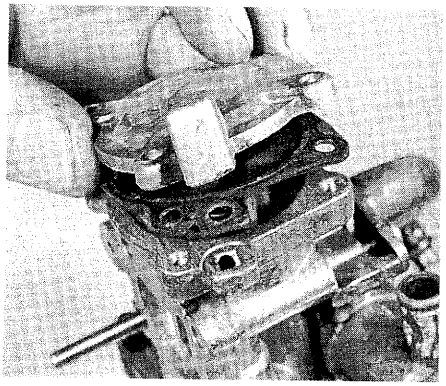


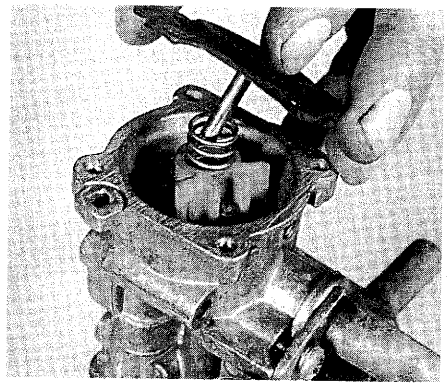
13.6A Delay valve removal

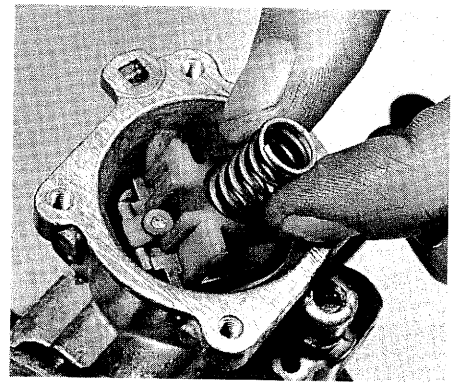

13.6B Peel the gasket from the carburettor

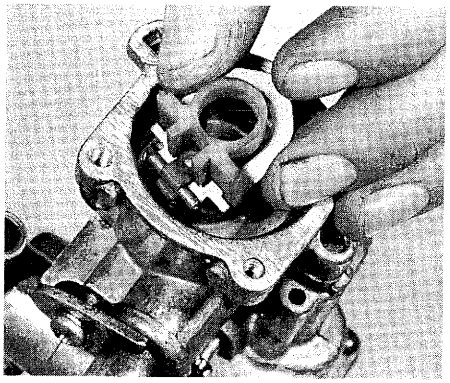

13.6C Delay valve location face on the carburettor

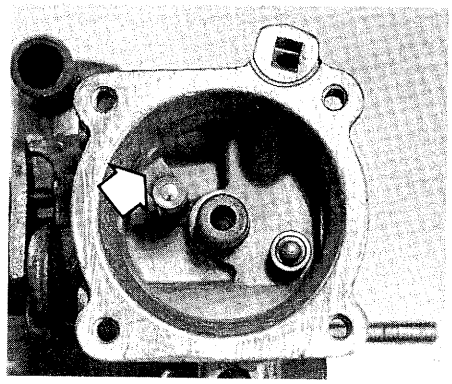

13.6D Removing the gasket from the delay valve

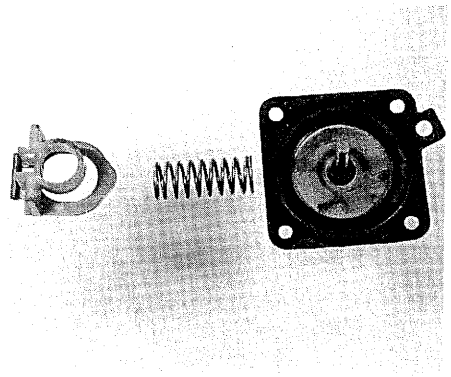

13.8 Accelerator pump diaphragm cover removal


13.9A Remove the accelerator pump diaphragm ...


13.9B ... and spring


13.10A Removing the plastic guide/valve


13.10B Plastic guide/valve retaining spring


13.11 Accelerator pump diaphragm components

14 Tuning

Note: *Refer to Chapter 3 for notes on tuning, with particular reference to preliminary procedures.*

Single carburettor installations

1 Set the throttle adjusting screw. Run the engine to working temperature, then switch off.
2 Where necessary, remove the air cleaner or plenum chamber.
3 Unscrew the throttle adjusting screw until it is just touching its stop with the throttle valve shut (photo).
4 Where applicable, check that the cold start lever is fully closed (cold-start device out of action), and that the fast idle adjusting screw is well clear of the cam. Failure to observe this may result in the throttle being held open when, by external examination, it appears closed.
5 Turn the throttle adjusting screw 1 1/2 turns clockwise to set the throttle to its initial position.
6 Set the jet height. Remove the suction chamber and piston with reference to Section 9.
7 Check that the needle guide is flush with the bottom face of the piston.
8 Turn the mixture adjustment screw until the top of the jet is flush with the top of the jet guide. Now turn the screw 2 turns clockwise (photos). If the mixture adjusting screw is covered by a small blue or red tamperproof plug, hook this out with a small screwdriver and discard it.

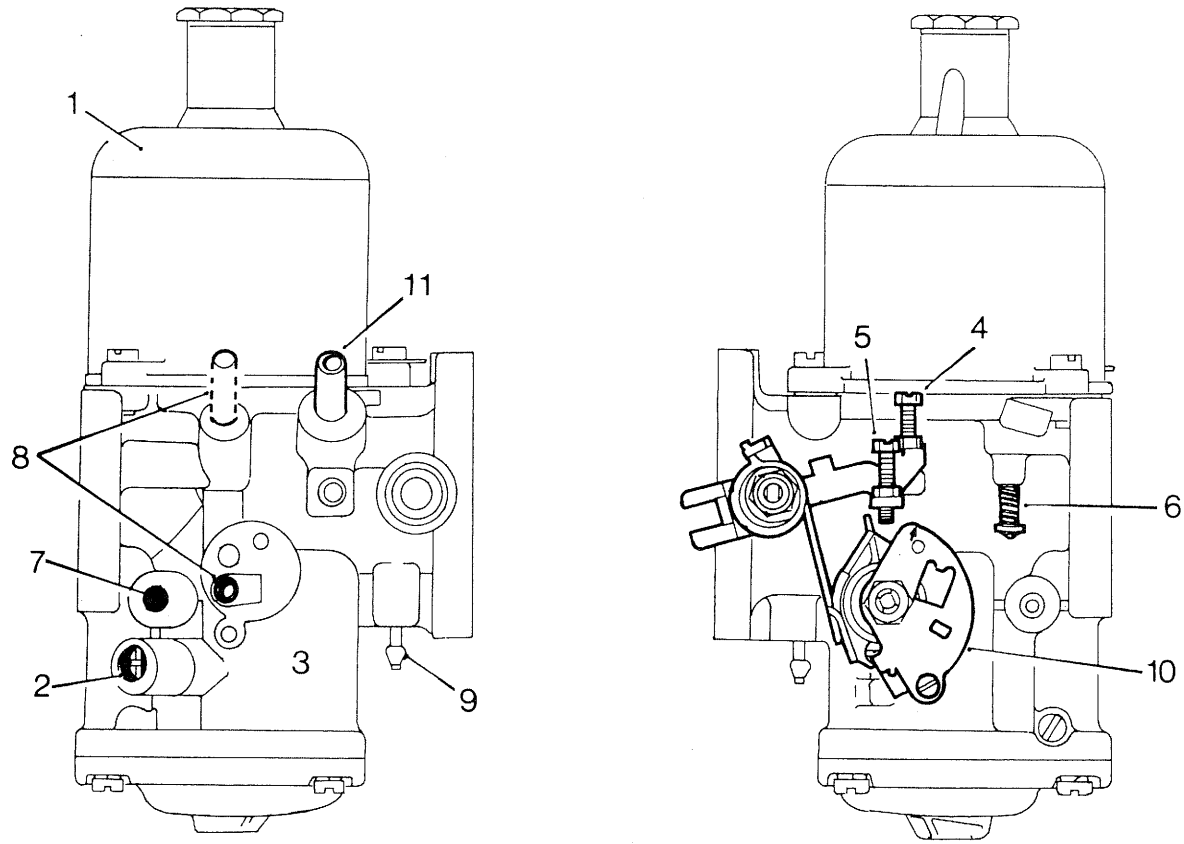
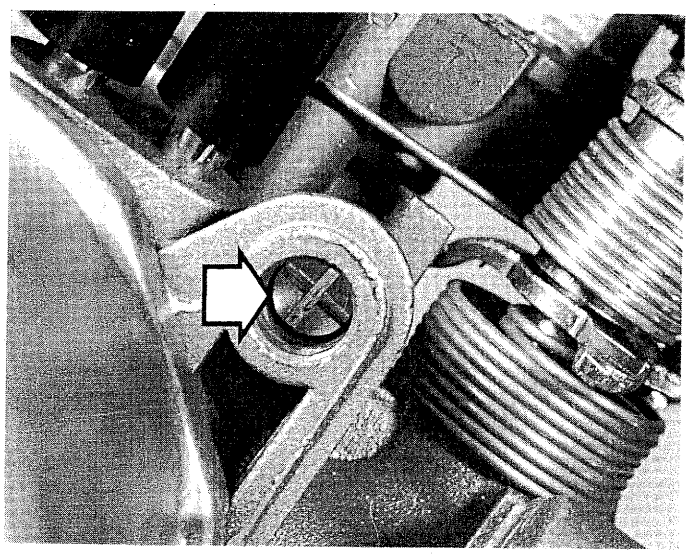
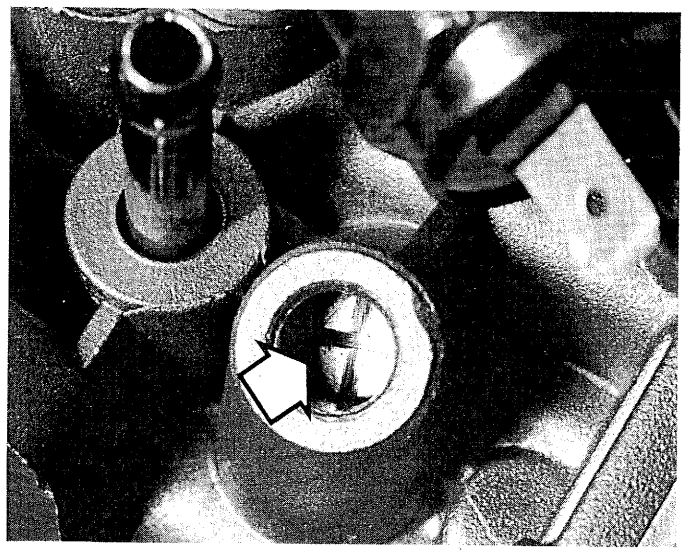


Fig. 8.15 Manual choke HIF carburettor tuning points (Sec 14)

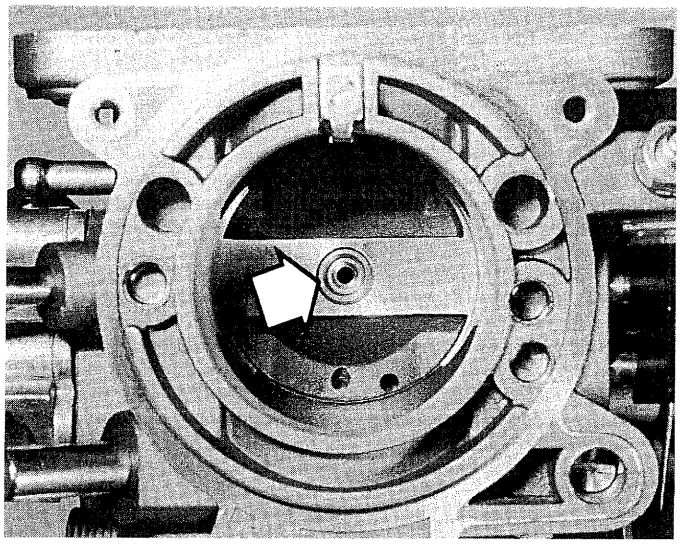
1 Suction chamber
2 Mixture adjusting screw
3 Float chamber
4 Throttle adjusting screw
5 Fast idle adjusting screw
6 Piston lifting pin
7 Fuel inlet
8 Vent tube (alternative positions)
9 Ignition vacuum advance connection
10 Cold start fast idle cam
11 Crankcase ventilation connection



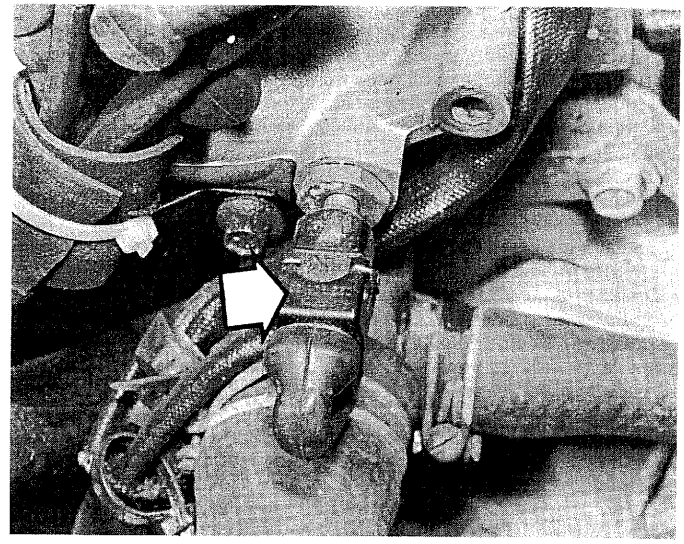
14.3 Throttle adjusting screw location (arrowed)



14.8A Mixture adjusting screw location (arrowed)



14.8B Upper view of the jet (arrowed)



14.14 Coolant thermistor wiring plug (arrowed)

9 Refit the piston and suction chamber, together with the damper, with reference to Section 10.
10 Set the idle speed and mixture. Refit the air cleaner or plenum chamber. Note that where these items conceal the carburettor adjustment screws, do not refit them, but position them near the carburettor and re-connect the vacuum hoses.
11 Connect a tachometer to the engine, and a CO exhaust gas analyser to the exhaust tailpipe. If an exhaust gas analyser is not available, it will not be possible to adjust the mixture setting accurately, although a reasonable adjustment may be possible.
12 Run the engine at a fast idle speed until it reaches its normal operating temperature. Where an electric cooling fan is fitted, this must have started and stopped at least once. Continue to run the engine for a futher five minutes before commencing adjustment.
13 Increase the engine speed to 2500 rpm for 30 seconds, and repeat this at three-minute intervals during the adjustment procedure. This is necessary to clear both the inlet manifold and exhaust system.
14 On electronic type carburettors fitted with a stepper motor (eg HIF44E), disconnect the wiring plug from the coolant thermistor (photo), and join the two plug terminals together with a suitable length of wire. This will ensure that the stepper motor mixture control remains fully off. Turn the throttle adjusting screw to reduce the idle speed to 900 rpm.
15 If the cooling fan is running, wait until it stops, then turn the

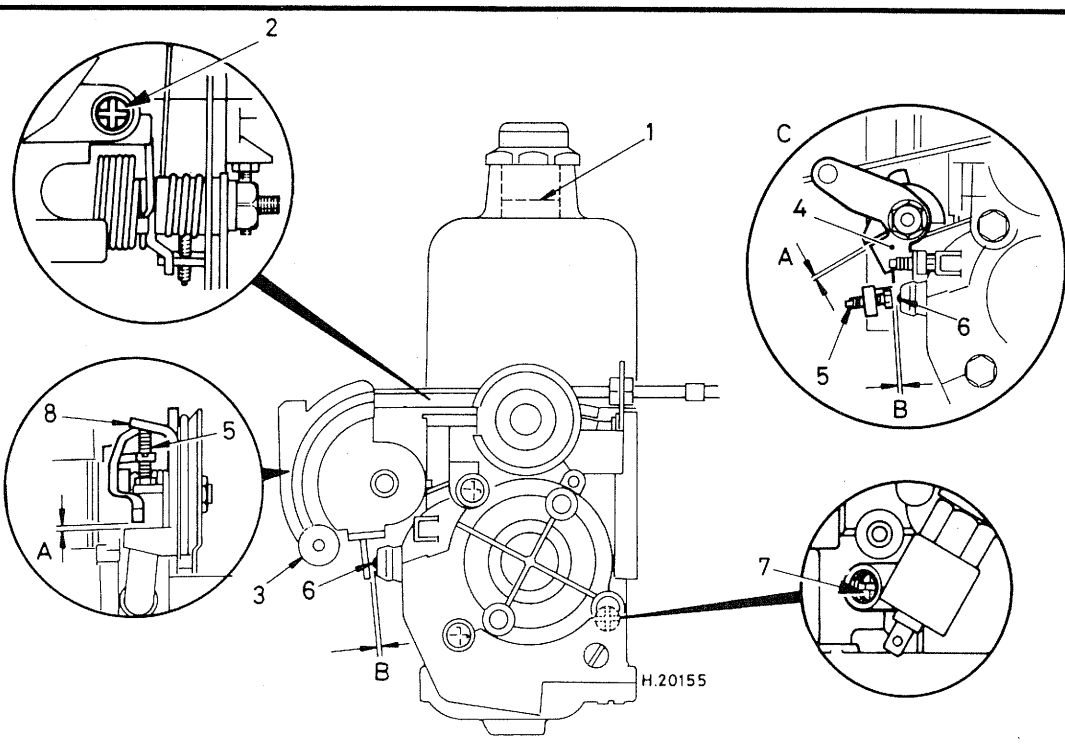


Fig. 8.16 Electronic type HIF carburettor tuning points (Sec 14)

1 *Piston damper oil level*
2 *Idle speed adjusting screw*
3 *Progressive type throttle cam*
4 *Throttle lever adjusting screw*
5 *Fast idle adjusting screw*
6 *Fast idle push rod*
7 *Mixture adjusting screw*
8 *Lost motion adjusting tag*
A *Lost motion gap*
B *Fast idle gap*
C *Throttle lever and linkage*

throttle adjusting screw to give the desired idle speed. On electronic type carburettors, it is recommended that the desired idle speed be approached from a higher speed, because if the speed drops more than 100 rpm below the recommended speed, the throttle jacking system will be activated. If this occurs, increase the idle speed on the throttle adjusting screw, and wait 2 minutes for conditions to stabilise before repeating the adjustment.

16 On electronic type carburettors, switch off the engine and check the clearance between the fast idle pushrod and the adjustment screw (Fig. 8.16) using feeler gauges. If necessary, turn the adjustment screw to obtain a minimum clearance of 0.005 in (0.13 mm). Also check that the throtte lever lost motion gap is 0.07 ± 0.01 in (1.8 ± 0.25 mm). If necessary, turn the adjustment screw or, on models with a throttle cam, bend the tag to obtain the correct clearance.

17 With the engine idling, slowly turn the jet adjusting (mixture) screw clockwise (to enrich) or anti-clockwise (to weaken), until the fastest idle speed which is consistent with even running is obtained. Now slowly turn the screw anti-clockwise until the engine speed just begins to drop. If an exhaust gas analyser is being used, adjust the screw to obtain the desired CO percentage reading (typically 2.5 ± 1.0%).

18 Reset the idle speed if necessary, then switch off the engine.

19 Set the fast idle speed (manual choke carburettors). Pull out the choke control knob until the arrow on the fast idle cam is aligned with the fast idle adjusting screw.

20 Start the engine, and check that the fast idle speed is as desired (typically 1100 to 1300 rpm). If necessary, turn the fast idle adjusting screw to obtain the correct speed.

21 Switch off the engine, and push in the choke control knob. Make sure that the mixture control lever is fully returned, and the choke cable correctly adjusted.

22 Set the fast idle speed (electronic type carburettors). Remove the bridging wire fitted to the coolant thermistor wiring plug in paragraph 14, however leave the plug disconnected.

23 Disconnect the two wires from the ambient air temperature sensor, located in the front of the engine compartment. Remove the sensor, and join the two wires together using a strip of metal.

24 Start the engine. The stepper motor should move the fast idle pushrod to the fast idle position, and the engine should run at the desired fast idle speed (typically 950 to 1150 rpm). If necessary, turn the fast idle adjusting screw to obtain the correct speed.

25 Switch off the engine, and check that the minimum clearance still exists between the fast idle pushrod and adjustment screw, as described in paragraph 16.

26 Re-connect the ambient air temperature sensor and the coolant thermistor wiring plug.

27 On all models, refit the air cleaner or plenum chamber where applicable, then make a final check that the idle speed and mixture are correct.

28 Remove the tachometer and exhaust gas analyser.

Multiple carburettor installations

29 Set the jet height. Run the engine to working temperature, then switch off. Make sure that the manual choke, where fitted, is fully off.

30 Remove the air cleaner or plenum chamber as applicable.

31 Working on each carburettor in turn, remove the suction chamber and piston with reference to Section 9, then turn the mixture adjustment screw until the jet is flush with the top of the jet guide. Now turn the screw 2 turns clockwise to set the jet at its initial position. If the screw is covered by a tamperproof plug, hook this out and discard it. Refit the suction chamber and piston, with reference to Section 10.

32 Set the throttle adjusting screws. Slacken the clamping bolt on the throttle spindle interconnection coupling between the carburettors.

33 Unscrew both throttle stop adjusting screws until they are both just touching their stops with the throttles closed. Turn both scews clockwise 1½ turns exactly, and tighten the locknuts where applicable. Check that the fast idle adjustment screw is clear of the throttle opening mechanism.

34 Set the idle speed and mixture. Connect a tachometer to the engine, and a CO exhaust gas analyser to the exhaust tailpipe. If an exhaust gas analyser is not available, it will not be possible to adjust the mixture setting accurately, although a reasonable adjustment may be possible.

35 Re-tighten the clamping bolt on the throttle spindle interconnection coupling, then run the engine at a fast idle speed until it regains its normal operating temperature. Where an electric cooling fan is fitted, this must have started and stopped at least once. Continue to run the engine for a further five minutes before commencing adjustment.

36 Increase the engine speed to 2500 rpm for 30 seconds, and repeat this at three-minute intervals during the adjustment procedure. This is necessary to clear both the inlet manifold and exhaust system.

37 Loosen the clamping bolt on the throttle spindle interconnection coupling.

38 On electronic type carburettors fitted with a stepper motor, disconnect the wiring plug from the coolant thermistor, and join the two plug terminals together with a suitable length of wire. This will ensure that the stepper motor mixture controls remain fully off.

39 If the cooling fan (where fitted) is running, wait until it stops, then turn the throttle stop adjusting screws by equal amounts to give the desired idle speed. On electronic type carburettors, it is recommended that the desired idle speed be approached from a higher speed, because if the speed drops more than 100 rpm below the recommended speed, the throttle jacking system will be activated. If this occurs, increase the idle speed on the throttle adjusting screws, and wait 2 minutes for conditions to stabilise before repeating the adjustment.

40 To make sure that both carburettors are synchronised, use a length of tubing placed between the carburettor intake and the ear, and adjust the throttle screws fractionally until the hiss from both units is the same. For a more accurate setting, use a balancing device (flow meter) in accordance with its manufacturer's instructions.

41 On electronic type carburettors, check the fast idle and throttle lever clearances as previously described in paragraph 16.

42 With the engine idling, turn the jet adjusting (mixture) screws by equal amounts clockwise (to enrich), or anti-clockwise (to weaken), until the fastest idle speed which is consistent with even running is obtained. If an exhaust gas analyser is being used, adjust the screws by equal amounts to obtain the desired CO percentage reading (typically 2.5 ± 1.0%).

43 If necessary, re-adjust the throttle stop adjusting screws by equal amounts until the correct idle speed is obtained again.

44 Re-tighten the clamping bolt on the throttle spindle interconnection coupling, while holding the lever against its fork. The interconnection rod endfloat should be approximately 0.032 in (0.8 mm).

45 Set the fast idle speed (manual choke carburettors). Pull out the choke control knob until the arrows on both fast idle cams are aligned with the fast idle adjusting screws.

46 Check that the fast idle speed is as desired (typically 1100 to 1300 rpm). If necessary, turn the fast idle adjusting screw to obtain the correct speed, making sure that both screws are in contact with the fast idle cams.

47 Push in the choke control knob and switch off the engine. Make sure that the mixture control lever is fully returned, and the choke cable correctly adjusted.

48 Set the fast idle speed (electronic type carburettors). Remove the bridging wire fitted to the coolant thermistor wiring plug in paragraph 38, however leave the plug disconnected.

49 Disconnect the two wires from the ambient air temperature sensor, located in the front of the engine compartment. Remove the sensor, and join the two wires together using a strip of metal.

50 Start the engine. The stepper motors should move the fast idle pushrods to the fast idle position, and the engine should run at the desired fast idle speed (typically 1100 to 1300 rpm). If necessary, turn the fast idle adjusting screws to obtain the correct speed, making sure that both screws are in contact with the fast idle pushrods.

51 Switch off the engine, and check that the minimum clearance still exists between the fast idle pushrods and adjustment screws as described in paragraph 16.

52 Re-connect the ambient air temperature sensor and the coolant thermistor wiring plug.

53 On all models, remove the flowmeter (if used), then refit the air cleaner or plenum chamber as applicable.

54 Make a final check that the idle speed and mixture are correct.

55 Remove the tachometer and exhaust gas analyser.