Description of Carburetors

I. Downdraft Carburetor for Models 180, 180 a and 180 b

Models 180 and 180 a

A. General

Models 180 and 180 a are equipped with a Solex downdraft carburetor Type 32 PICB. This carburetor has a suction canal with a diameter of 32 mm and a central air entry. The starter mechanism, the idle system, the main carburetion system as well as the accelerating pump work essentially on the same principles as the double-downdraft carburetor (Fig. 07-0/1).

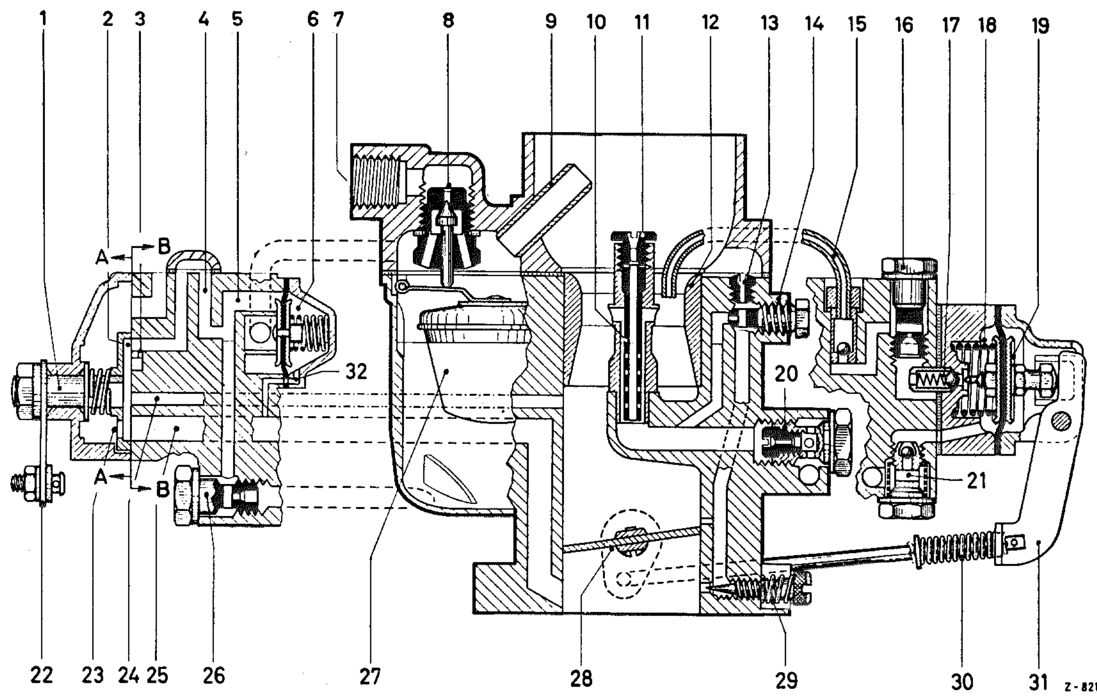


Fig. 07-0/1

Solex Carburetor Type 32 PICB

1 Starter rotary slide valve
2 Graded intake bore in starter flange for fuel canal (4)
3 Graded intake bore in starter flange for fuel slot (39)
4 Fuel canal to starter system
5 Air canal from starter air valve to fuel canal (4)
6 Starter air valve
7 Fuel-line connection in carburetor cover
8 Float neddle valve
9 Vent tube for float chamber
10 Mixing tube holder with mixing tube
11 Air correction jet
12 Air horn
13 Idle air jet
14 Idle fuel jet
15 Injection tube
16 Pump jet
17 Ball valve
18 Diaphragm spring
19 Pump diaphragm
20 Main jet plug with main jet
21 Ball valve
22 Starter lever
23 Starter air bore in starter rotary slide valve
24 Additional air canal
25 Starter mixture canal
26 Starter fuel jet
27 Float
28 Throttle valve
29 Idle mixture adjustment screw
30 Connecting rod with pressure spring
31 Pump arm
32 Vacuum canal for starter air valve

B. Starter Mechanism

The starter mechanism of the carburetor works in two stages on the rotary slide valve principle. The starter mechanism is actuated by a bowden cable with a pull knob on the instrument panel. If the starter knob is pulled right out, the starter mechanism is set to the "cold-start position". If the starter knob is pressed in about halfway, the starter mechanism is set to the "warm-up position". If the starter knob is pressed in completely, the starter mechanism is out of operation.

Connecting the choke control is described in Job No. 30-6.

a) Cold Start Position

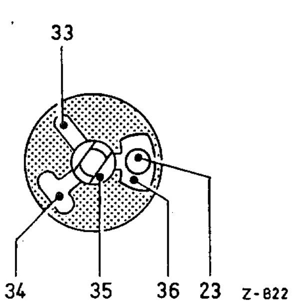
(Starter knob pulled right out)

In this position of the starter mechanism the bore (23) in the starter rotary slide valve is in the center of the starter mixture canal (25) in the starter flange of the carburetor housing.

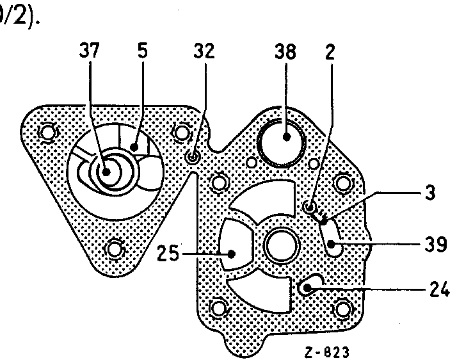
In the 1st phase of the cold start the partial vacuum obtaining in the suction tube exerts an influence on the starter system via the starter mixture canal (25) when the engine is being started. As a result fuel from the float chamber is drawn into the fuel canal (4) through the starter fuel jet (26). A certain amount of air enters at the same time through the notch in the carburetor cover which connects up with the float chamber; as a result a kind of pre-mixture is present in the fuel canal (4) leading to the starter rotary slide valve.

The notch is designed above all to prevent fuel from being drawn up by the siphon effect when the starter mechanism is inoperative and if the starter rotary slide valve should have a slight leak.

The pre-mixture enters the chamber (33) of the starter rotary slide valve through the graded bore (2) of the fuel canal (4) (Figs. 07-0/1 and 07-0/2).



Starter rotary slide valve



Starter flange of carburetor housing

Fig. 07-0/2

2 Graded bore of fuel canal (4)
3 Graded intake bore in starter flange for fuel slot (39)
5 Air canal form starter air valve to fuel canal (4)
23 Starter air bore in starter rotary slide valve
24 Additional air canal
25 Starter mixture canal
32 Vacuum canal for starter air valve
33 Chamber in starter rotary slide valve
34 Chamber in starter rotary slide valve
35 Mixing chamber in starter rotary slide valve
36 Cavity in starter rotary slide valve
37 Air canal from float chamber to starter air valve
38 Starter air canal
39 Fuel slot in starter flange

At the same time air is drawn from the suction canal of the carburetor via the canal (24) into the chamber (34) of the starter rotary slide valve. This additional air combines with the pre-mixture in the mixing chamber (35) of the starter rotary slide valve. From the mixing chamber this fuel-air mixture passes into the cavity (36) of the starter rotary slide valve. Here it mixes with the air which comes via the starter air canal (38) through the starter air bore (23) in the starter rotary slide valve which acts as a starter air jet. Through the starter mixture canal (25) this mixture now passes into the suction canal of the carburetor where it combines with the air streaming through the throttle valve gap to produce the finished starting mixture. Fig. 07-0/3 shows the mode of action of the starter mechanism during the 1st phase when the engine is being started.

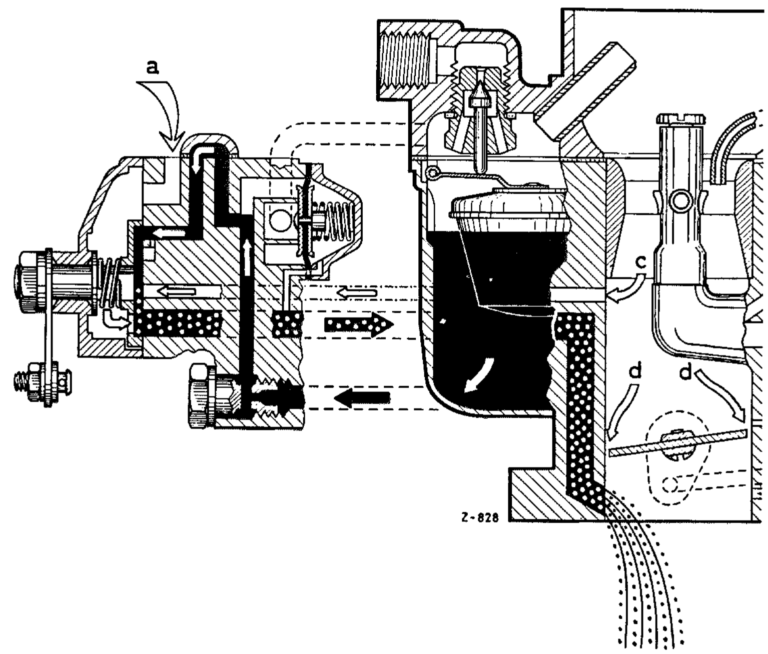


Fig. 07-0/3

Cold start — Phase 1
When starting the engine
(Starter air valve closed)

a) Starter air entry
c) Additional air entry from suction canal
d) Main air entering through throttle valve gap

As soon as the engine has started, the 2nd phase of the cold start begins. The increase in engine speed brings about an effective partial vacuum beneath the throttle valve. This partial vacuum exerts a pull on the spring-loaded side of the diaphragm of the starter air valve (6) via the vacuum canal (32) (see Fig. 07-0/4).

Due to the partial vacuum effect the starter air valve opens and admits more air to the starter system from the float chamber via the air canal (5) and the fuel canal (4). This additional air immediately leans out the starting mixture after the engine has started, thus ensuring the proper running conditions for the engine. Fig. 07-0/4 shows the mode action of the starter mechanism after the engine has started.

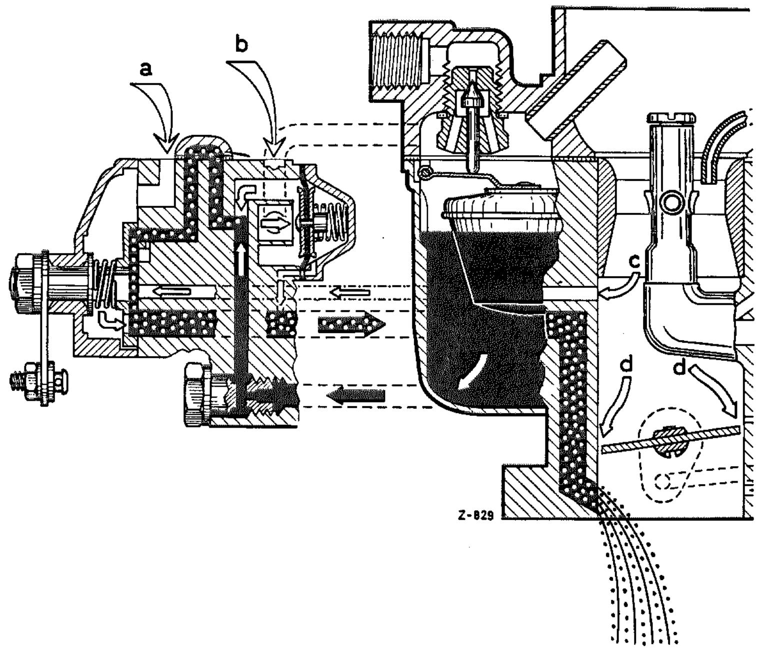


Fig. 07-0/4

Cold start — Phase 2
After the engine has started
(Starter air valve opened)

a) Starter air entry
b) Additional air entry via the starter air valve
c) Additional air entry from suction canal
d) Main air entering through throttle valve gap

b) Warm-Up Position

(Starter knob pushed halfway in)

As soon as the engine has warmed up a little, the starter knob can be pushed in halfway. As a result, the starter rotary slide valve is turned toward the right via the starter lever (22); the chamber (33) of the slide valve is now opposite the slot (39) of the starter flange (see Fig. 07-02). Since the chamber (33) is no longer connected with the fuel canal (4) by the bore (2), but only by the fine-graded bore (3), the amount of fuel admitted is greatly decreased and the start mixture is leaned out further. Fig. 07-0/5 shows the mode of action of the starter mechanism during warming-up.

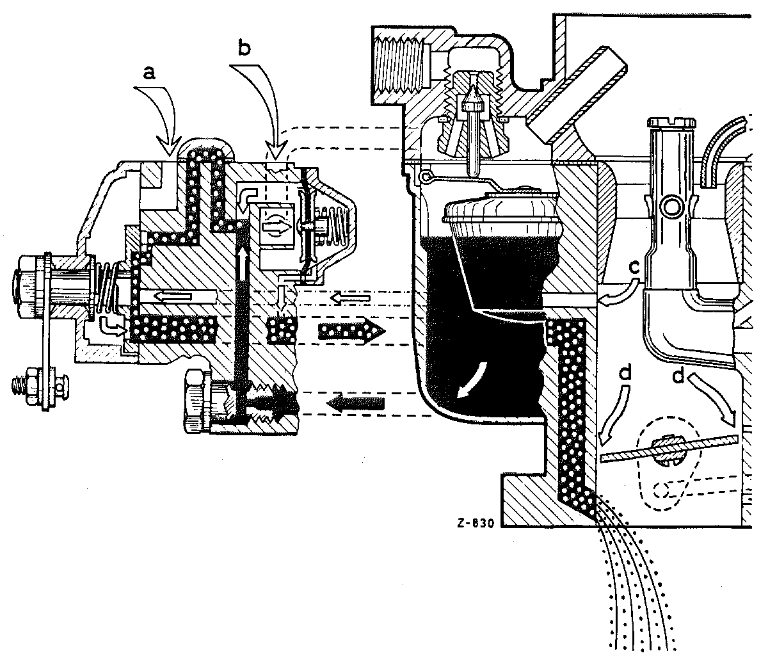


Fig. 07-0/5

Warm-up position
(Starter air valve open)

a) Starter air entry
b) Additional air entry via the starter air valve for attenuating the start mixture
c) Additional air entry from suction canal
d) Main air entering through throttle valve gap

c) Driving Away with Starter Knob Pulled Out

When the car is driven away with the starter knob pulled out, the partial vacuum in the suction canal is transferred upward by the opening of the throttle valve. As a result, the supply of start mixture from the canal (25) decreases. This is compensated for by the start mixture drawn in via the additional air canal (24) so that the supply of start mixture to the engine remains unaffected.

If as a result of quick acceleration from low engine speed the throttle valve is opened still further, the partial vacuum suddenly drops. The starter aire valve (6) which had opened immediately the engine started now closes again so that the starter system produces a rich start mixture for the change-over just as it did at starting. As soon as the engine reaches sufficient speed, the starter air valve, actuated by the partial vacuum which is increasing again, once more opens and leans out the start mixture. By this automatic action of the starter air valve the cold engine is supplied with a correctly proportioned start mixture suitable for all conditions and a satisfactory change-over to the main carburetion system is ensured when the starter knob is pulled. Fig. 07-0/6 shows the mode of action of the starter mechanism when the car is being driven away.

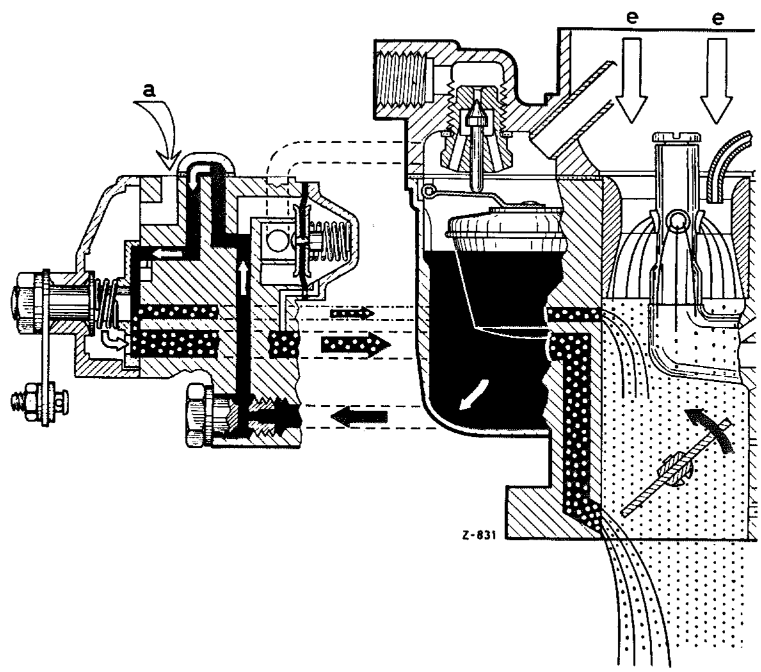


Fig. 07-0/6

Change-over with starter mechanism in action
(Starter air valve closed)

a) Starter air entry
e) Main air supply

Note: As a rule the car should be driven away with the starter mechanism in the "warm-up position". However, at very low temperatures the car can be driven away with the starter mechanism in the "cold-start position".

d) Starter Mechanism Inoperative

(Starter knob pushed right in)

When the starter knob is pushed right in, the starter rotary slide valve is turned to the right to a point where both the graded bore (2) and the slot (39) in the starter flange are completely covered. The starter mixture canal (25) is also closed. The starter system is now put out of action. In order to prevent fuel from being drawn from the starter system, when the starter mechanism is inoperative, but if the starter rotary slide valve is not quite tight, a notch as described in Section a) has been made in the carburetor cover. This notch connects the float chamber with the fuel canal (4). For that reason only air and no fuel can be drawn in from the starter system, when a slight leakage is present in the starter rotary slide valve.

C. Idle System

The idle system of the carburetor consists of the idle fuel jet, the idle air jet and the idle mixture adjustment screw.

a) Idle – Phase 1

The fuel which is drawn in via the idle fuel jet (14) is mixed with the air from the idle air jet (13), forming a mixture which passes into the idle canal (40). In the idle position a further supply of air for the idle mixture enters through the by-pass bores (42) above the throttle valve and then passes into the suction canal through the idle mixture bore (41) and combines with the air streaming through the throttle valve gap to form the final idle mixture (Fig. 07-0/7).

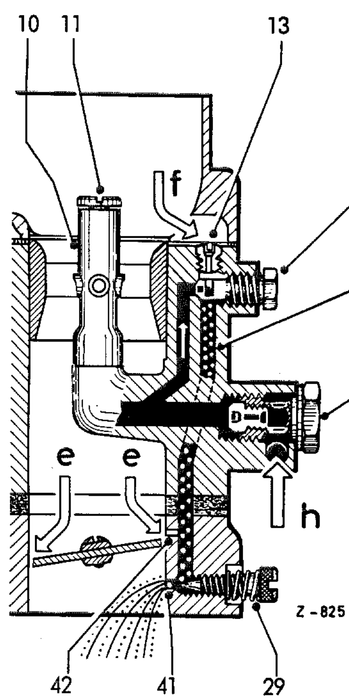


Fig. 07-0/7

Idle — Phase 1

e) Main air supply
f) Entry of idle air
h) Fuel feed

10 Mixing tube holder with mixing tube
11 Air correction jet
13 Idle air jet
14 Idle fuel jet
20 Main jet plug with main jet
29 Idle mixture adjustment screw
40 Idle canal
41 Idle mixture bore
42 By-pass bores

The cross-section of the idle mixture bore (41) can be varied by moving the idle mixture adjustment screw (29). When the idle mixture adjustment screw is slackened, the mixture is enriched.

The idle speed is adjusted by means of the idle adjustment screw on the throttle valve lever (see Job No. 01-3, Section K).

b) Idle – Phase 2

When the throttle valve is being slightly opened, idle mixture flows through both the idle mixture bore (41) and the by-pass bores (42). The by-pass bores now serve to ensure a proper changeover to the main carburetion system (Figs. 07-0/7 and 07-0/8).

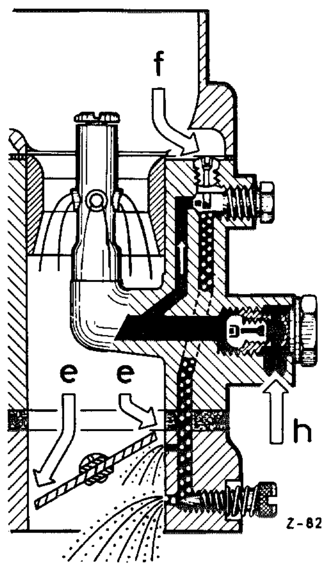


Fig. 07-0/8

Idle — Phase 2
(Throttle valve slightly open)

e) Main air supply
f) Entry of idle air
h) Fuel feed

Note: a) In the suction canal of the carburetor at the same height as the by-pass bores, but offset to one side there is a further bore which leads to a threaded union in the carburetor housing and takes the distributor vacuum line.

b) The carburetor for Model 180 a as from Engine End No. 8506159 has a bore on the carburetor flange which serves as a connection for a vacuum test gage and which is closed with a grub screw.

D. Main Carburetion System

In its standard form the downdraft carburetor Type 32 PJCB has a float chamber with float and float needle valve in the carburetor cover. The float chamber is ventilated by the tube (9) in the carburetor cover. The carburetor parts for the main carburetion system are the air horn, the main jet and the air correction jet with mixing tube (see Fig. 07-0/1).

From the float chamber the fuel flows via the main jet screwed into the main jet plug (20) into the mixing tube holder (10). If the throttle valve is opened still further, that is beyond the idle position phase 2, the partial vacuum which has moved further upward causes fuel to be drawn through the outlet bores of the mixing tube holder and this fuel is mixed with the air entering through the air intake branch in the carburetor cover.

When the fuel level in the mixing tube holder decreases as a result of the increasing partial vacuum, i. e. at higher engine speed, compensating air enters through the air correction jet (11) which, through the small bores in the mixing tube mixes with the fuel flowing through the main jet. With increasing engine speed the proportion of air in the mixture increases so that overenrichment of the fuel-air mixture is prevented and an almost uniform proportion of fuel to air is ensured over the whole speed range (Figs. 07-0/7 and 07-0/9).

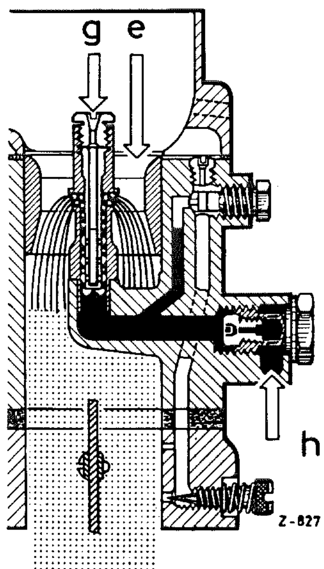


Fig. 07-0/9

Main carburetion system
(Throttle valve in full-load position)

e) Main air supply
g) Entry of compensating air
h) Fuel feed

E. Accelerating Pump

The accelerating pump No. 73 is a so-called "mixture enriching" pump which means that in the upper load range the fuel-air mixture is enriched via the pump system. In contrast to the "neutral" pumps this "mixture enriching" pump has a ball valve (17) which permits an enrichment of the fuel-air mixture only in the upper load range of the engine. The ball valve is actuated by the pump diaphragm via the throttle valve shaft, the connecting rod and the pump arm. In the upper load range the tip of the diaphragm pin (19) keeps the ball valve (17) open. In relation to the degree of vacuum obtaining in the air horn, additional fuel is drawn in from the pump system via injection tube (15) when the ball valve is open, and the fuel-air mixture is thus enriched.

The enrichment delivery point varies with the individual carburetor types (see Section F).

The main purpose of the accelerating pump, however, is to spray extra fuel into the mixing chamber of the suction canal when the accelerator pedal is depressed, in order to achieve a smooth speed build-up and good acceleration.

Pump arm (31) of the accelerating pump is connected with the throttle valve shaft by means of connecting rod (30). With the throttle valve closed, diaphragm (19) is pushed outward by the diaphragm spring (18). Since the pump chamber is connected with the float chamber by way of ball valve (21), it is filled with fuel.

When operating the accelerator pedal connecting rod (30) will move pump arm (31). The pump arm will then push the diaphragm inwards so that the fuel in front of the diaphragm is injected by way of ball valve (17), pump jet (16), the ball valve in the injection tube holder (15) and finally the injection tube itself.

During the injection, ball valve (21), which operates as a check valve is closed. When the accelerator pedal moves back, diaphragm spring (18) will push diaphragm (19) back. Now, ball valve (21) operates as a through-way valve while the ball valve in the injection tube holder (15) operates as a check valve and prevents the penetration of air from the carburetor suction canal into the pump system (Fig. 07–0/10).

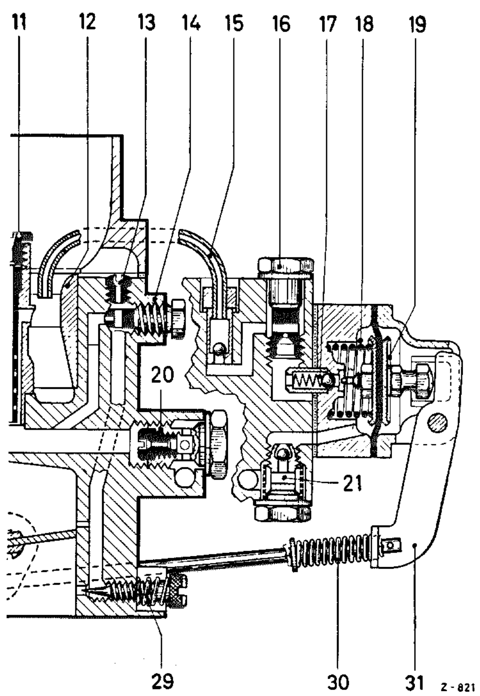


Fig. 07–0/10

11 Air correction jet
12 Air horn
13 Idle air jet
14 Idle fuel jet
15 Injection tube
16 Pump jet
17 Ball valve
18 Diaphragm spring
19 Pump diaphragm
20 Main jet plug with main jet
21 Ball valve
29 Idle mixture adjustment screw
30 Connecting rod
31 Pump arm

The injection amount for the carburetor of Model 180 should be 0.7–1.0 cc/stroke, and for the carburetor of Model 180 a 0.9–1.2 cc/stroke. The addition of shims between the pump arm and the cotter pin in the connecting rod will change the injection amount within narrow limits only, because this will simultaneously change the enrichment delivery point of the fuel/air mixture via the pump system. Replace pump diaphragm, if required. However, a test should be made previously as to whether the connecting rod and the pump arm moves without obstructions. In addition, the position of the cotter pins in the connecting rod should be checked. (Refer to Note of Section F). Following the installation of a new diaphragm or the adjustment of the injection amount the enrichment delivery point should be checked (refer to Job No. 01–3, Section H).

F. Technical Specifications of Solex Downdraft Carburetor Type 32 PJCB

Carburetor		Model 180	Model 180 a
Air horn "K"		25	26
Main jet "Gg"		0125	0150
Air correction jet "a"		200	205
Mixing tube "s"		10	1
Mixing tube holder (reserve)		5.5	5.3
Idle fuel jet "g"		55	50
Idle air jet "u"		1.5	1.5
Acceleration pump		No. 73 (enriching)	
Injection amount cc/stroke		0.7–1.0	0.9–1.2
Pump jet "Gp"		50	60
Injection tube		low (not graded)	high (0.5 graded)
Beginning of mixture enrichment via pump system		Throttle valve angle 27°–33°	Throttle valve angle 36°–40°
Pump diaphragm	Bolt length mm	$21.0^{+0.75}_{-0.3}$	20.5 ± 0.1
	Plate dia mm	22	
Starter fuel jet "Gs"		180	
Starter air bore in rotary slide valve of starter, mm ϕ		5.5	
Float needle valve		1.5	2.0
Float weight (Float of nylon) g		5.7	
Fuel level mm		16–20	
Angle of inclination of throttle flap		8°	
Bore in throttle valve, mm ϕ		—	2.5
By-pass bores, mm ϕ		1.1/1.1	1.2/1.0

Note: Carburetor for Models 180 and 180 a

a) The length of the pump diaphragm bolt is measured from the dome against which the pump arm rests to the tip of the pin actuating the ball valve in the accelerating pump (Fig. 07–0/10 a).

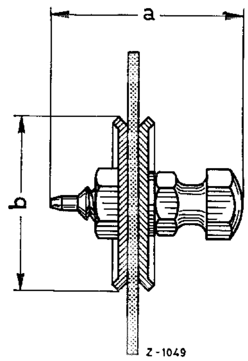


Fig. 07–0/10 a

a) Bolt length
b) Plate diameter

b) Position of cotter pins in connecting rod.

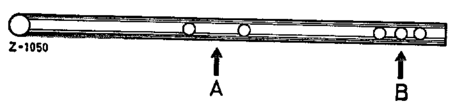


Fig. 07–0/10 b

A Cotter pin at pressure spring
B Cotter pin at pump arm

	Pump diaphragm installed			
	Bolt length 21 mm Diaphragm plate ⌀ 22 mm	Bolt length 19.0 mm Diaphragm plate ⌀ 16 mm	Bolt length 20.5 mm Diaphragm plate ⌀ 16 mm	Bolt length 20.5 mm Diaphragm plate ⌀ 22 mm
Cotter pin A	left cotter-pin hole	right cotter-pin hole	left cotter-pin hole	
Cotter pin B	center cotter-pin hole			
Shim between pump arm and cotter pin B	—		1 mm	—

c) The injection amount of the accelerating pump is measured with the throttle valve in the **idle position,** whereas the enrichment delivery point is checked with the throttle valve **completely closed.**

Carburetor for Model 180 a

d) Up to Engine End No. 85 14427 the carburetor was equipped with a mixing tube holder (reserve) 5.5 and an air correction jet "a" 230.

As from Engine End No. 8514428 a mixing tube holder (reserve) 5.3 and an air correction jet "a" 220 have been installed.

e) Up to Engine End No. 8515851 the carburetor was equipped with an air correction jet "a" 220 (see "d" as from Engine End No. 8514428), a pump jet "Gp" 70, an injection tube "low" (0.5 graded) and a pump diaphragm with a bolt length of 19.0±0.1 mm and a plate diameter of 16 mm. In the case of carburetors with this type of pump diaphragm the enrichment begins at a throttle valve angle of 55°–60°. As from Engine End No. 8515852 an air correction jet "a" 210, a pump jet "Gp" 60, an injection tube "high" and a pump diaphragm with a bolt length of 20.5±0.1 mm have been installed (enrichment delivery point at 40°–44° throttle valve angle).

f) From Engine End No. 8515852 to Engine End No. 8516090 the carburetor was equipped with an air correction jet "a" 210. As from Engine End No. 8516091 an air correction jet "a" 205 has been installed.

g) As from Engine End No. 9504458 (as from Carburetor No. 1398 489) the plate of the pump diaphragm has been enlarged from 16 mm diameter to 22 mm diameter and the enrichment delivery point has been changed from 40°–44° to 36°–40° throttle valve angle.

h) If complaints are received about jerky running of the car under partial load or about uneven speed build-up, the carburetor can be modernized subsequently provided, however, that it has a mixing tube holder (reserve) 5.3. The mixing tube holder should only be replaced under very special circumstances and only by an experienced mechanic. A suitable sleeve, together with a stud bolt M 6, a hexagon nut and a washer should be used to press off the mixing tube holder. When fitting the new mixing tube holder make sure that it is properly seated and fits tightly in the carburetor housing. When installing a new pump diaphragm, check the injection amount of the accelerating pump and the enrichment delivery point (see Job No. 01–3, Section H).

i) The mixing tube holder (reserve) 5.3 (installed as a standard part as from Engine End No. 8514428) is marked with the number 5.3 stamped in the side.

Carburetor for Model 180

k) Up to Engine End No. 3504026 a brass float weighing 12.5 g was fitted. A nylon float has been installed as a standard part as from Engine End No. 3504027.

Model 180 b, 180 c

A. General

The engines of models 180 b and 180 c are provided with a Solex Downdraft Carburetor 34 PJCB.

Carburetor 34 PJCB has a suction canal dia. of 34 mm.

The starter mechanism, the idle system and the main carburetion system are the same as for the downdraft carburetor 32 PJCB (up to now installed in model 180 a). For model 180 c the mixing tube holder is provided with a polyamide ball, which prevents the fuel in the float housing from flowing back when the vehicle is heavily braked and thereby prevents stalling of the engine, in addition, model 180 c is provided with a float needle valve having a cut-off tip.

The acceleration pump used for carburetor 34 PJCB is a so-called "neutral" pump (carburetor 32 PJCB has a strengtening or enriching pump). With a neutral acceleration pump the engine is able to take in additional fuel by way of the injection tube (15) and bore (17) from the pump system at partial load and at full load, depending on the vacuum in the air horn, without operating the accelerating pump (Fig. 07–0/10 c).

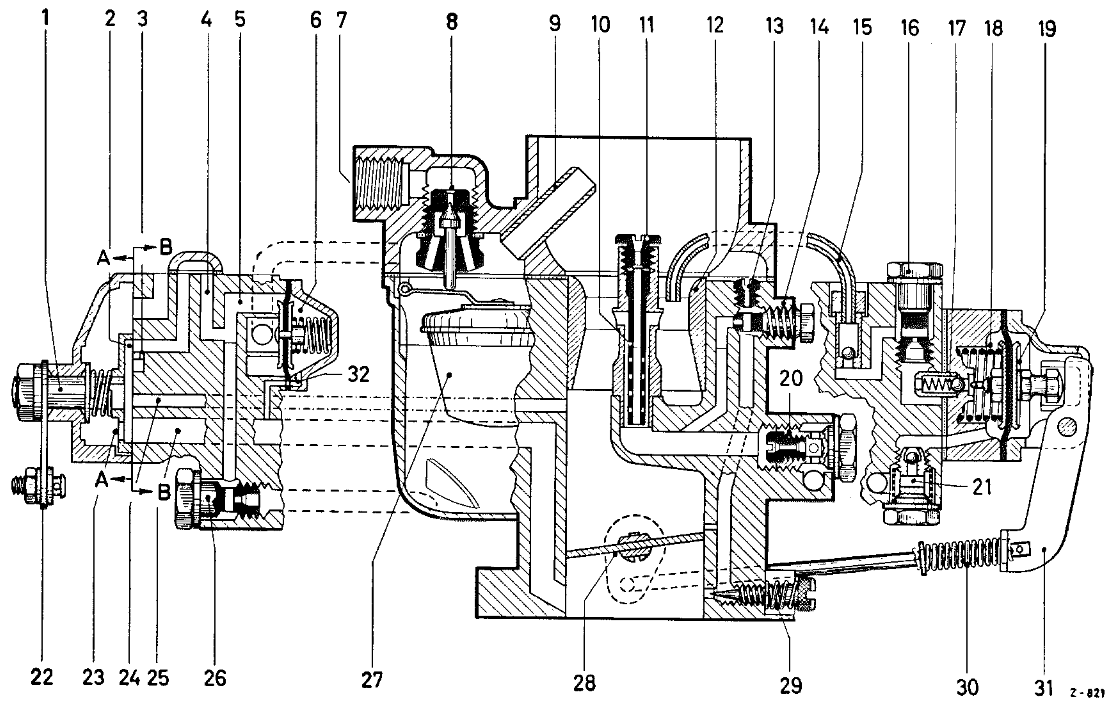


Fig. 07–0/10 c

Solex Carburetor 34 PJCB

1 Starter rotary slide valve
2 Graded intake bore in starter flange for fuel canal (4)
3 Graded intake bore in starter flange for fuel slot
4 Fuel canal to starting system
5 Air canal from starter air valve to fuel canal (4)
6 Starter air valve
7 Fuel line connection in carburetor cover
8 Float needle valve
9 Vent tube for float chamber
10 Mixing tube holder with mixing tube
11 Air correction jet
12 Air horn
13 Idle air jet
14 Idle fuel jet
15 Injection tube
16 Pump jet
17 Bore
18 Diaphragm spring
19 Pump diaphragm
20 Main jet plug with main jet
21 Ball valve
22 Starter lever
23 Starter air bore in starter rotary slide valve
24 Additional air canal
25 Starter mixture canal
26 Starter fuel jet
27 Float
28 Throttle valve
29 Idle mixture adjustment screw
30 Connection rod with pressure spring
31 Pump arm
32 Vacuum canal for starter air valve

B. Technical Specifications of Solex Downdraft Carburetor Model 34 PJCB

Carburetor	**Model 180 b**	**Model 180 c**
Air horn "K"	28	
Main jet "Gg"	0150	0145
Air correction jet "a"	195	180
Mixing tube "s"	1	49
Mixing tube holder (reserve)[1]	5.5	
Idle fuel jet "g"	55	
Idle air jet "u"	1.3	
Accelerating pump	No. 72 (neutral)	
Injection amount cc/stroke	1.0–1.2	0.7–1.0
Pump jet "Gp"	50	80
Injection tube	high (0.5 graded)	
Pump Diaphragm plate dia. mm	22	
Position of cotter pins in connecting rod to accelerating pump (Fig. 07–0/10 d)	"c" and "e"	"b" and "e"
Starter fuel jet "Gs"	180	
Starter air bore in starter rotary slide valve	5.5	4
Float needle valve	2.0[2]	
Float weigth (float of nylon) g	5.7	
Fuel level mm	16–18	
Angle of inclination of throttle valve	8°	
By-pass bore mm ϕ	1.2/1.2	
Stabilizing hole	1.5	

[1]) Model 180 c with polyamide ball valve.
[2]) Model 180 c with float needle valve having cut-off tip.

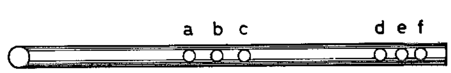


Fig. 07–0/10 d

Connecting rod of accelerating pump

II. Double Downdraft Carburetor for Models 220 a and 219

A. General

Models 220 a and 219 have a Solex double downdraft carburetor Type 32 PAATI. To all intents and purposes the double downdraft carburetor combines two separate carburetors in one housing. It has two 32 mm diameter suction canals each with its own main carburetion system and idle system. The accelerating pump and the starter mechanism, however, supply both suction canals of the carburetor together. The float chamber and the air intake occupy a central position (Fig. 07-0/11).

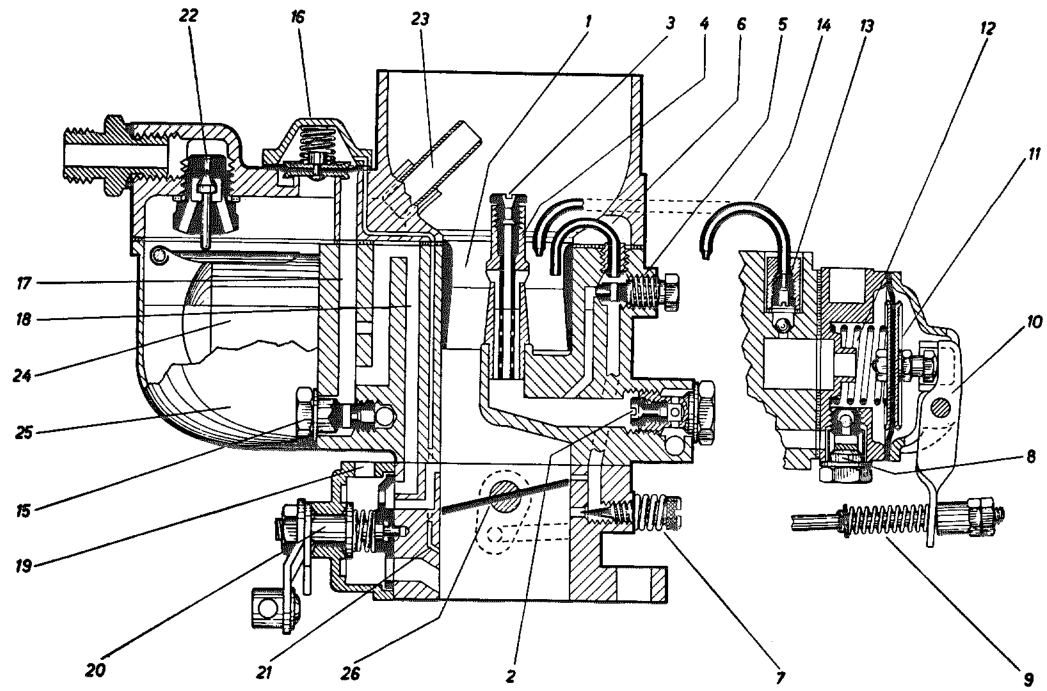


Fig. 07-0/11

Solex Carburetor Type 32 PAATI

1 Air horn
2 Main jet plug with main jet
3 Air correction jet
4 Mixing tube holder with mixing tube
5 Idle fuel jet
6 Idle suction tube
7 Idle mixture adjustment screw
8 Ball valve
9 Connecting rod with pressure spring and adjusting nuts
10 Pump arm
11 Pump diaphragm
12 Diaphragm spring
13 Fuel jet in injection tube
14 Injection tube
15 Starter fuel jet
16 Starter air valve
17 Air canal from starter air valve to fuel canal (18)
18 Fuel canal to starter system
19 Starter air bore
20 Starter rotary slide valve
21 Vacuum canal for starter air valve
22 Float needle valve
23 Vent tube for float chamber
24 Float
25 Float chamber
26 Throttle valve

Note: a) Fig. 07-0/11 shows the 1st version carburetor without grey cast-iron flange on the throttle valve section. The 2nd version carburetor with grey cast-iron flange has been installed in Model 220 a as a standard part as from Engine End No. 4502815.

b) The new version of the carburetor for Model 219 (installed as a standard part as from Engine End Nos. 10–9501619 and 11–9500384) (as from Solex Carburetor No. 3 908 566) has idle air jets instead of the idle suction tubes shown above (for details see Section F).

B. Starter Mechanism

The starter mechanism of the carburetor works in two stages on the rotary slide valve principle. The starter mechanism is actuated by a bowden cable with a pull knob on the instrument panel. If the starter knob is pulled right out, the starter mechanism is set at the "cold-start position". If the starter knob is pressed in about halfway, the starter mechanism is set at the "warm-up position". If the starter knob is pressed in completely, the starter mechanism is inoperative. Connecting the choke control is described in Job No. 30-6.

a) Cold-Start Position

(Starter knob pulled right out)

When the starter mechanism is in this position, the aperture (34) in the starter rotary slide valve (20) is in the center of the starter mixture canal (30) in the starter flange of the carburetor housing.

In the 1st phase of the cold start the partial vacuum obtaining in the suction tube exerts an influence on the starter system via the starter mixture canal (30) when the engine is being started. As a result fuel from the float chamber is drawn into the fuel canal (18) through the starter fuel jet (15). A certain amount of air enters at the same time through the notch in the carburetor cover which connects up with the float chamber; as a result, a kind of pre-mixture is present in the fuel canal (18) leading to the starter rotary slide valve.

The notch is designed primarily to prevent fuel from being drawn up by the siphon effect when the starter mechanism is inoperative and if the starter rotary slide valve should have a slight leak.

Through a graded bore in the fuel canal (18) the pre-mixture enters the starter mixing chamber (27) behind the rotary slide valve via the fuel slot (28) in the starter flange and the graded bore (33) in the slide valve (Figs. 07-0/12 and 07-0/13).

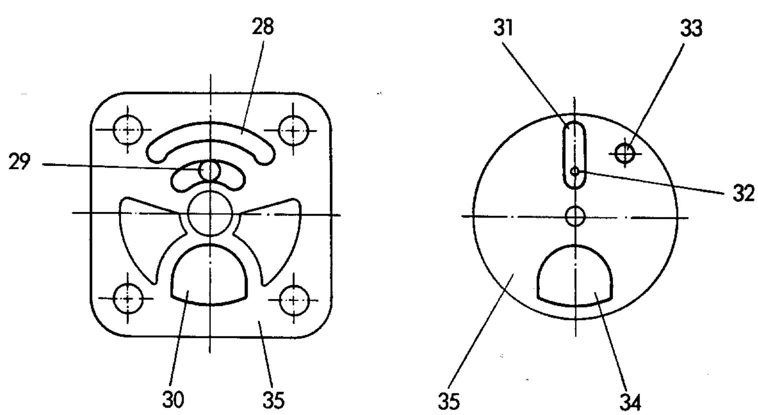


Fig. 07-0/12

Starter flange of carburetor housing

28 Fuel slot in starter flange for fuel canal (18)
29 Canal for additional air
30 Starter mixture canal
31 Chamber in starter rotary slide valve
32 Graded bore in starter rotary slide valve

Starter rotary slide valve

33 Graded fuel intake bore in starter rotary slide valve
34 Aperture in starter rotary slide valve for starter mixture canal (30)
35 Sealing surface

At the same time air is drawn from the suction canals of the carburetor through the canal (29). In the chamber (31) of the starter rotary slide valve this additional air mixes with the pre-mixture which enters the starter mixing chamber (27) via the graded bore (32) in the starter rotary slide valve. Here the mixture combines with the pre-mixture entering through the graded bore (33) in the starter rotary slide valve and the air entering through the starter air bore (19) in the starter housing which acts as a starter air jet. The fuel-air mixture which is now formed passes through the aperture (34) in the starter rotary slide valve and the starter mixture canal (30) into the two suction canals of the carburetor and together with the air streaming through the throttle valve gap forms the final start mixture. Fig. 07-0/13 shows the mode of action of the starter mechanism phase 1 when the engine is being started.

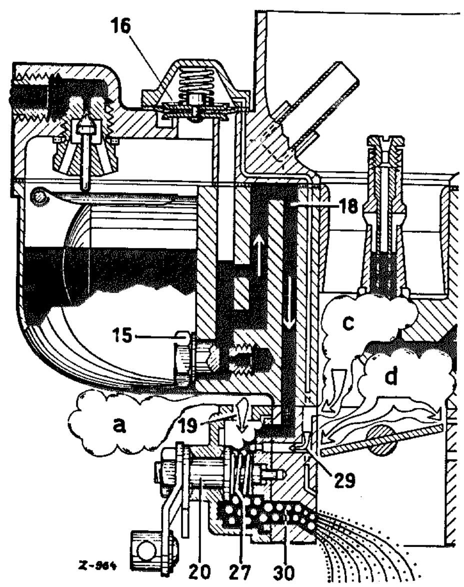


Fig. 07-0/13

Cold start — phase 1
When starting the engine
(Starter air valve closed)

a) Starter air entry
c) Additional air entry from suction canals
d) Main air entering through throttle valve gap

15 Starter fuel jet
16 Starter air valve

18 Fuel canal
19 Starter air bore
20 Starter rotary slide valve
27 Starter mixing chamber
29 Canal for additional air
30 Starter mixture canal

As soon the engine has started, the 2nd phase of the cold start begins. The increase in engine speed brings about an effective partial vacuum beneath the throttle valves. This partial vacuum exerts a pull on the spring-loaded side of the diaphragm of the starter air valve (16) via the vacuum canal (21) (see Fig. 07-0/14).

As a result of the partial vacuum effect the starter air valve (16) opens and admits more air into the starter system from the float chamber via the air canal (17) and the fuel canal (18). This additional air immediately leans out the start mixture after the engine has started, thus ensuring the proper running conditions for the engine. Fig. 07-0/14 shows the mode of action of the starter mechanism after the engine has started.

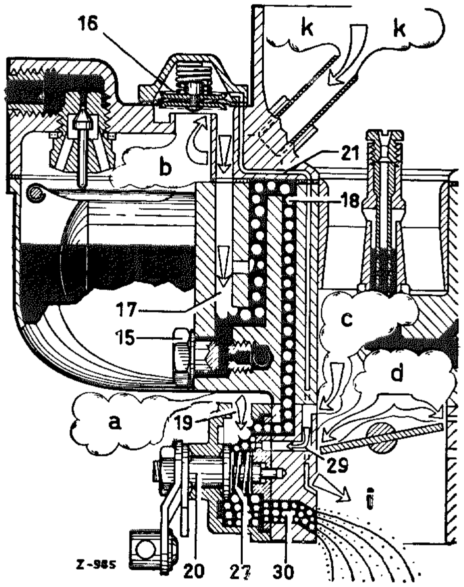


Fig. 07-0/14

Cold start — phase 2
After the engine has started
(Starter air valve opened)

a) Starter air entry
b) Additional air entry via the starter air valve
c) Additional air entry from suction canals
d) Main air entering through throttle valve gap
i) Partial vacuum
k) Air entry into float chamber
15 Starter fuel jet
16 Starter air valve
17 Air canal from starter air valve to fuel canal (18)
18 Fuel canal
19 Starter air bore
20 Starter rotary slide valve
21 Vacuum canal to starter air valve
27 Starter mixing chamber
29 Canal for additional air
30 Starter mixture canal

b) Warm-Up Position

(Starter knob pushed halfway in)

As soon as the engine has warmed up a little, the starter knob can be pushed in halfway. As a result, the starter rotary slide valve is turned toward the right via the starter lever; the graded bore (33) in the slide valve is covered by the sealing surface (35) on the starter flange (see Fig. 07-0/12). Since the starter mixing chamber (27) is no longer connected with the fuel canal (18) by the bore (33), but only by the fine-graded bore (32) in the starter rotary slide valve, the amount of fuel admitted is greatly decreased and the start mixture is leaned out further. Fig. 07-0/15 shows the mode of action of the starter mechanism during warming-up.

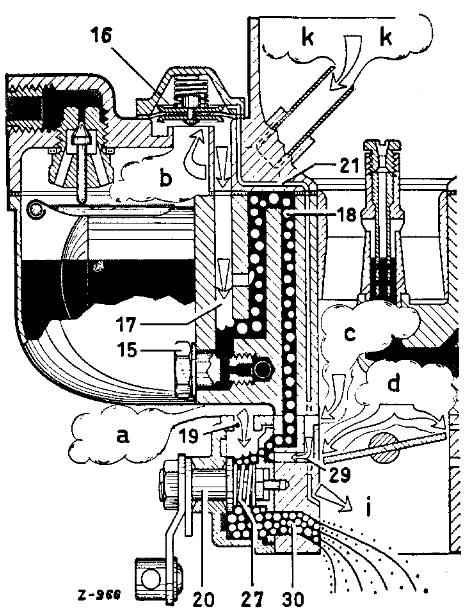


Fig. 07-0/15

Warm-up position
(Starter air valve opened)

a) Starter air entry
b) Additional air entry via the starter air valve
c) Additional air entry from suction canals
d) Main air entering through throttle valve gap
i) Partial vacuum
k) Air entry into float chamber
15 Starter fuel jet
16 Starter air valve
17 Air canal from starter air valve to fuel canal (18)
18 Fuel canal
19 Starter air bore
20 Starter rotary slide valve
21 Vacuum canal to starter air valve
27 Starter mixing chamber
29 Canal for additional air
30 Starter mixture canal

c) Driving Away with Starter Knob Pulled Out

When the car is driven away with the starter knob pulled out, the partial vacuum in the suction canals is shifted upward by the opening of the throttle valves. As a result, the supply of start mixture from the canal (30) decreases. This is compensated for by the start mixture drawn in via the additional air canal (29) so that the supply of start mixture to the engine remains unaffected.

If as a result of quick acceleration from low engine speed the throttle valves are opened still further, the partial vacuum suddenly drops. The starter air valve (16), which had opened as soon as the engine started, now closes again, so that the starter system produces a rich start mixture for the change-over just as it did at starting. As soon as the engine reaches sufficient speed, the starter air valve, actuated by the partial vacuum which is increasing again, once more opens and leans out the start mixture. By this automatic action of the starter air valve the cold engine is supplied with a correctly proportioned start mixture suitable for all conditions and a satisfactory change-over to the main carburetion system is ensured when the starter knob is pulled. Fig. 07-0/16 shows the mode of action of the starter mechanism when the car is being driven away.

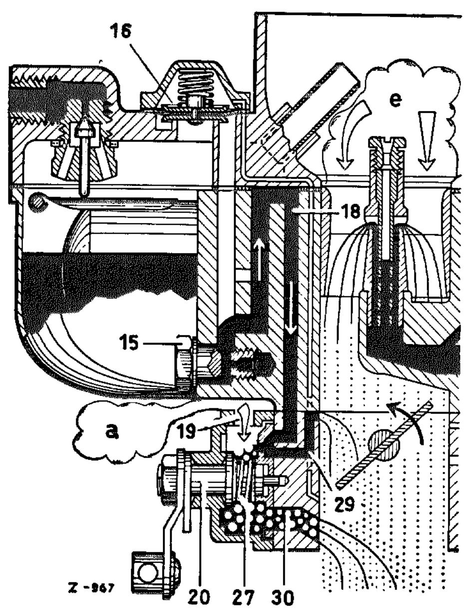


Fig. 07-0/16

Change-over with starter mechanism in action
(Starter air valve closed)

a) Starter air entry
b) Main air supply

15 Starter fuel jet
16 Starter air valve
18 Fuel canal
19 Starter air bore
20 Starter rotary slide valve
27 Starter mixing chamber
29 Canal for additional air
30 Starter mixture canal

Note: As a rule the car should be driven away with the starter mechanism in the "warm-up position". However, at very low temperatures the car can be driven away with the starter mechanism in the "cold-start position".

d) Starter Mechanism Inoperative

(Starter knob pushed right in)

When the starter knob is pushed right in, the starter rotary slide valve is turned to the right to a point where both the graded bore (33) and the graded bore (32) and the fuel slot (31) in the starter rotary slide valve are completely covered (see Fig. 07-0/12). The starter mixture canal (30) is also closed. The starter system is now out of action.

In order to prevent fuel from being drawn from the starter system, when the starter mechanism is inoperative, but if the starter rotary slide valve is not quite tight, a notch as described in Section a) has been made in the carburetor cover. This notch connects the float chamber with the fuel canal (18). For that reason only air and no fuel can be drawn in when there is a slight leak in the starter rotary slide valve.

C. Idle System

Each of the suction canals of the carburetor has its own separate idle system. For this reason the carburetor has two idle fuel jets, two idle suction tubes (or idle air jets) and two idle mixture adjustment screws.

a) Idle – Phase 1

The fuel which is drawn in via the idle fuel jet (5) is mixed with the air from the idle suction tube (6) (or the idle air jets), forming a mixture which passes into the idle canal (36). In the idle position a further supply of air for the idle mixture enters through the by-pass slot (37) (or the by-pass bores) above the throttle valve and then passes into the suction canal through the idle mixture bore (38) and combines with the air streaming through the throttle valve gap to form the final idle mixture (Fig. 07-0/17).

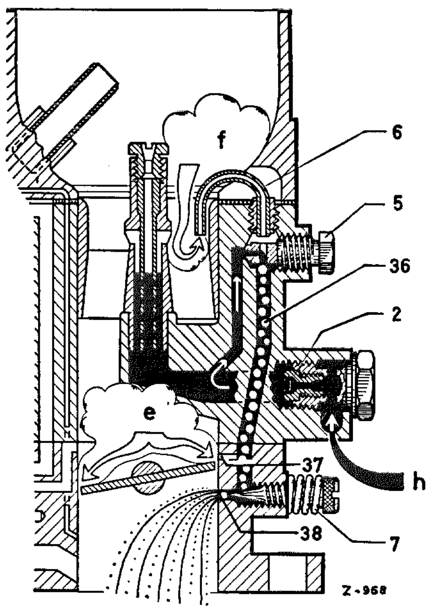


Fig. 07-0/17

Idle — phase 1

e) Main air supply
f) Entry of idle air
h) Fuel feed

2 Main jet plug with main jet
5 Idle fuel jet
6 Idle suction tube
7 Idle mixture adjustment screw
36 Idle canal
37 By-pass slot
38 Idle mixture bore

The cross-section of the idle mixture bores can be varied by means of the idle mixture adjustment screws (7). The idle mixture is leaned out when the idle mixture adjustment screw is turned in and is enriched when it is backed out.

The idling speed is adjusted by means of the idle adjustment screw on the throttle valve lever (see Job No. 01-3, Section K).

b) Idle – Phase 2

When the throttle valve is being slightly opened, idle mixture emerges both through the idle mixture bore (38) and the by-pass slot (37) (or the by-pass bores). The by-pass openings now serve to ensure a proper change-over to the main carburetion system (see Fig. 07-0/17).

Note: a) Up to Engine End Nos. 10 95 01618 and 11 95 0083 the carburetor had two idle suction tubes and a by-pass slot in each suction canal. As from Engine End Nos. 10 95 01619 and 11 95 00384 the carburetor has two idle air jets and in each suction canal two by-pass bores and a compensating bore below the air horn (see Section F).

b) In the right-hand suction canal of the carburetor at the same height as the by-pass slot or the by-pass bores as the case may be, but slightly offset to one side, there is a bore which leads to the threaded union on the throttle valve housing and which serves as a connection for the vacuum line to the distributor.

c) Recent carburetors have a bore on the carburetor flange for the connection of a vacuum tester; the bore is closed by a grub screw.

D. Main Carburetion System

The working principles of the main carburetion system are the same on the Solex double downdraft carburetor Type 32 PAATI as on the single downdraft carburetor.

In its standard form the double downdraft carburetor has a float and a float needle valve in the carburetor cover. The float chamber is ventilated through the tube (23) in the carburetor cover. For each of the carburetor suction canals there is an air horn, a main jet and a mixing tube holder with mixing tube and air correction jet (see Fig. 07–0/11).

From the float chamber the fuel flows into the mixing tube holder (4) through the main jet screwed into the main jet plug (2). If the throttle valve is opened beyond the idle position, phase 2, the partial vacuum moves upward and fuel is drawn from the outlet bores of the mixing tube holder and mixes with the air entering through the air intake branch of the carburetor cover.

When the vacuum effect increases at higher engine speeds the fuel level in the mixing tube holder decreases and compensating air enters through the air correction jet (3) and passes through the small bores in the mixing tubes and combines with the fuel flowing through the main jet to form a mixture. With increasing engine speed the proportion of air in the mixture increases so that overenrichment of the fuel-air mixture is prevented and the engine receives a more or less uniform mixture over the whole speed range (Fig. 07–0/18).

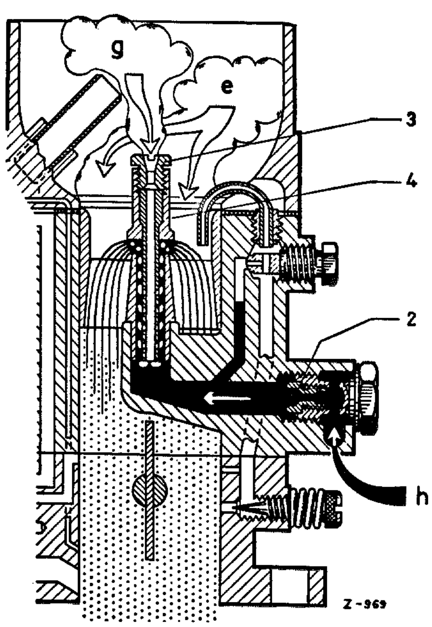


Fig. 07–0/18

Main carburetion system
(Throttle valve in full-load position)

e) Main air entry
g) Entry of compensating air
h) Fuel feed

2 Main jet plug with main jet
3 Air correction jet
4 Mixing tube holder with mixing tube

E. Accelerating Pump

The accelerating pump No. 92 is a so-called "neutral" pump, i. e. the engine can draw in fuel from the pump system via the injection tubes according to the degree of depression prevailing in the suction tube.

The main purpose of the accelerating pump, however, is to spray extra fuel into the mixing chambers of the suction canals when the accelerator pedal is depressed, in order to achieve a smooth speed build-up and good acceleration.

The pump arm (10) of the accelerating pump is connected to the throttle valve shaft by the adjustable connecting rod (9). When the throttle valves are closed, the diaphragm (11) is pressed outward by the diaphragm spring (12). Since the pump chamber is connected to the float chamber via the ball valve (8), it is filled with fuel.

When the accelerator pedal is depressed, the pump arm (10) is moved by the connecting rod (9). During this operation the pump arm presses the diaphragm inward so that the fuel in front of the diaphragm is injected via the two ball valves located below the bracket for the injection tubes (14), via the fuel jets (13) and the injection tubes.

During the injection the ball valve (8), which operates as a check valve, is closed. When the accelerator pedal is released, the diaphragm spring (12) presses the diaphragm (11) back. The ball valve (8) now operates as a through-way valve, whereas the ball valves below the bracket for the injection tubes (14) operate as check valves and prevent air from the carburetor suction canals from entering the pump system. (Fig. 07-0/19).

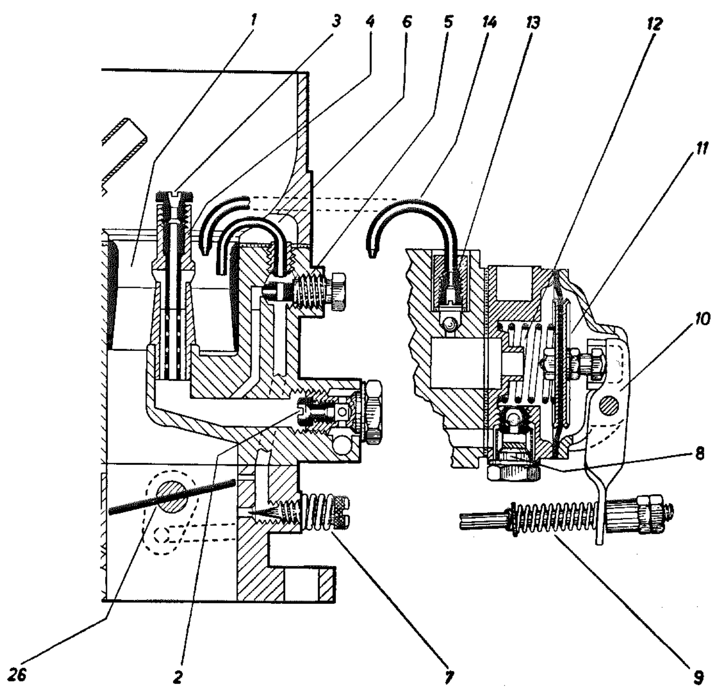


Fig. 07-0/19

1 Air horn
2 Main jet plug with main jet
3 Air correction jet
4 Mixing tube holder with mixing tube
5 Idle fuel jet
6 Idle suction tube
7 Idle mixture adjustment screw
8 Ball valve
9 Connecting rod with pressure spring and adjusting nuts
10 Pump arm
11 Pump diaphragm
12 Diaphragm spring
13 Fuel jet in injection tube
14 Injection tube
26 Throttle valve

Note: a) Instead of the conventional pump jets the double downdraft carburetor is provided with fuel jets (13) in injection tubes (14).

b) This version of the neutral accelerating pump carries no plate valve as a stop for the diaphragms.

Extra fuel from the pump system, in accordance with the vacuum in the air horns, is effected without operating the pump arm of the accelerating pump.

The injection amount for both injection tubes should be 1.3–1.5 cc/stroke together. Changes can be made by setting the adjusting nuts on connecting rod (9). Turning the nuts down will increase the pump stroke and thereby the injection amount, turning the nuts out will decrease stroke and amount.

The nuts may be tightened only to the point where pump arm (10) lifts from the diaphragm, because otherwise the injection will not start immediately when the throttle valves open. A change of the fuel jets (13) in the injection tubes (14) would not change the injection amount, but only the period of the injection. The connecting rod and the pump arm should move without sticking.

For adjustment of injection amount on the accelerating pump refer to Job No. 01–3, Section H.

F. Technical Specifications of Solex Double Downdraft Carburetor Type 32 PAATI

Carburetor	**Models 220 a and 219** (up to engine end No. 10–9501618 and 11–9500383)	**Model 219**
Air horn "K"	24	
Main jet "Gg"	0130	0125
Air correction jet "a"	170	165
Mixing tube "s"	0	
Mixing tube holder (reserve)	4.8	
Idle fuel jet "g"	47.5	50
Idle suction tube	1.8	—
Idle air jet "u"	—	1.1
Accelerating pump	No. 92 (neutral)	
Injection amount cc/stroke	1.3–1.5	
Fuel jet in injection tube	0.5	
Injection tube	low (0.5 graded)	
Starter fuel jet "Gs"	150	
Starter air bore in starter housing, mm ϕ	5.5	
Float needle valve	2.0	
Float weight (float of nylon) g	7.2	
Fuel level mm	13–15	15.5–17.5
Angle of inclination of throttle valves	8°	
Bore in throttle valves, mm ϕ	1.5	
By-pass slots mm	0.9 × 3.45	—
By-pass bores mm ϕ	—	1.25 and 0.7
Stabilizing hole, mm ϕ	—	1.5

Note: Model 220 a up to engine end No. 55 05551 with a float of brass having a weight of 21 g. Float of nylon has been installed as a standard part as from engine end No. 55 05552.

III. Compound Downdraft Carburetor for Model 220 S

A. General

Model 220 S is equipped with two Solex compound downdraft carburetors Type 32 PAITA which are built on the same principles as the carburetor used in Model 190 (Fig. 07-0/20)

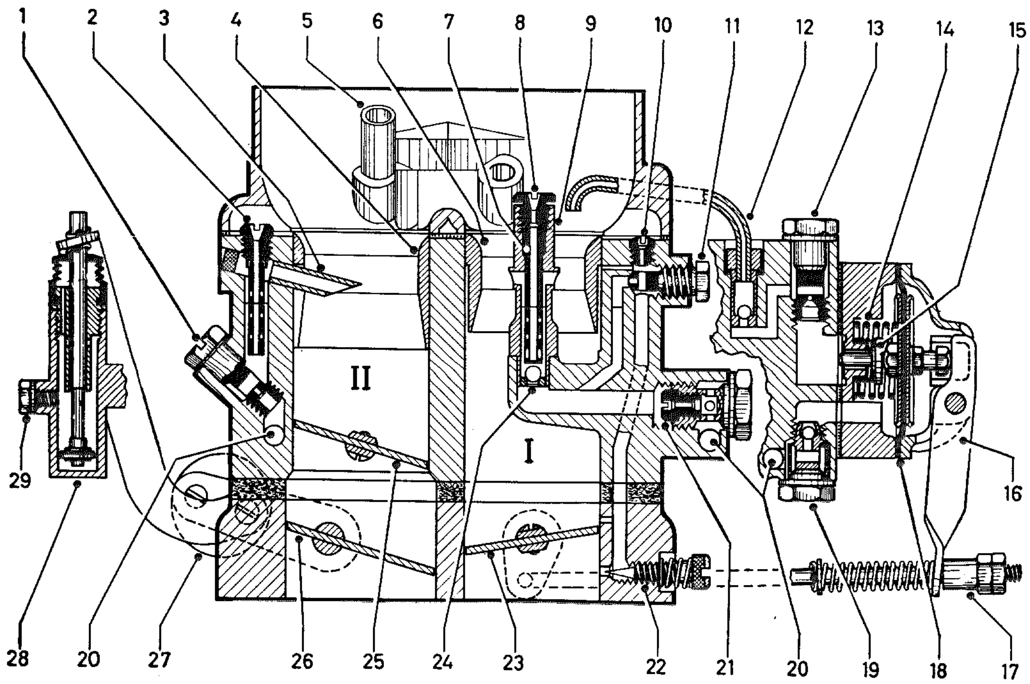


Fig. 07-0/20

Solex Carburetor Type 32 PAITA
I Stage 1 II Stage 2

1 Main jet of Stage 2
2 Air correction jet with mixing tube of Stage 2
3 Discharge tube to main carburetion system Stage 2
4 Air horn of Stage 2
5 Float chamber vent tube
6 Air horn of Stage 1
7 Mixing tube of Stage 1
8 Air correction jet of Stage 1
9 Mixing tube holder
10 Idle air jet
11 Idle fuel jet
12 Injection tube
13 Pump jet
14 Diaphragm spring
15 Plate valve with bore
16 Pump arm
17 Connecting rod with pressure spring and adjusting nuts
18 Pump diaphragm
19 Ball valve
20 Fuel feed
21 Main jet plug with main jet of Stage 1
22 Idle mixture adjustment screw
23 Throttle valve of Stage 1
24 Boll valve in mixing tube holder
25 Throttle valve of Stage 2
26 Vacuum valve
27 Counterweight with lever
28 Oil shock-absorber for vacuum valve
29 Plug and filler screw

The carburetor for Model 220 S differs from the carburetor of Model 190 in the following details:

a) The carburetor jets etc. (see Section E).

b) The height of the carburetor cover from the separating surface to the upper edge of the air intake branch is 33 mm in the carburetor for Model 220 S and 43 mm in the carburetor for Model 190.

c) In the carburetor for Model 220 S the tube (5), cast integral with the carburetor cover and ventilating the float chamber, is not graded (see Fig. 07-0/20).

d) Recent models have a bore in the carburetor flange for the connection of a vacuum tester; this bore is closed with a grub screw.

B. Arrangement and Function of Throttle Valves

The actuating linkage for the throttle valves of stages 1 and 2 has been modified (Fig. 07-0/21). However, the arrangement and the function of the throttle valves correspond to the description given in Workshop Manual Model 190.

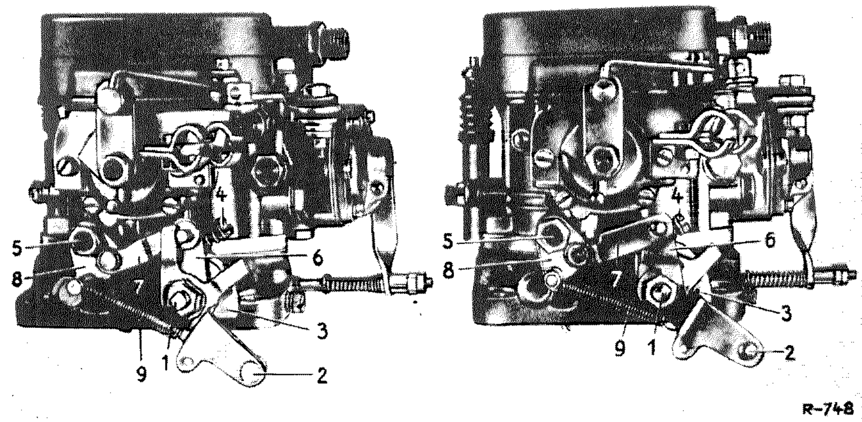


Fig. 07-0/21

1st Version

1 Throttle valve of Stage 1
2 Throttle valve lever
3 Abutment
4 Idle adjustment screw
5 Throttle valve shaft of Stage 2

2nd Version

6 Relay lever
7 Relay arm
8 Drag lever
9 Tension spring

The carburetors with the 1st version of the actuating linkage were installed as a standard part up to Engine End Nos N 85 04580 and Z 85 01748. The carburetors with the 2nd version of the actuating linkage have been installed as a standard part as from Engine End Nos N 85 04581 and Z 85 01749.

C. Starter Mechanism

On Model 220 S, as from Engine End Nos N 75 11273 and Z 75 00522 carburetors with a three-stage starter mechanism were installed. In the cold-start position (starter knob pulled right out) and in the warm-up position (starter knob pushed halfway in) the functioning of the starter mechanism is as described in the Model 190 Workshop Manual.

In the new third position, warm-up position II (starter knob pushed in about 3/4 of the way), the engine receives in addition to the idle mixture an additional mixture from the starter system when the normal running temperature has not yet been reached; this additional mixture ensures satisfactory idling of the engine even at this stage. When the engine is warming up, warm-up position I (starter knob pushed in about halfway) may cause overenrichment of the mixture; by using warm-up position II (starter knob pushed in about 3/4 of the way) the starter mechanism can now remain operative until the engine has reached the working temperature of at least 70° C. This is of particular advantage in cars with a hydraulic automatic DB clutch, since when a gear is engaged, the shift surge is so strong that the idling speed may decrease and cause the engine to stall. Furthermore, the shift surge is slightly larger when the oil in the hydraulic automatic clutch is cold than when it has warmed up to operating temperature.

Warm-Up Position II

(Starter knob pushed in about 3/4 of the way)

When the engine is warmed up, but if the idling speed with the starter mechanism inoperative is still too low, the starter knob can be pushed in about 3/4 of the way. As a result, the starter rotary slide valve is turned toward the right as seen from warm-up position I. The chamber (19) of the slide valve is now opposite the second part (26) of the split fuel slot in the starter flange on the carburetor housing. Since this second part of the slot is connected to the first part (22) of the fuel slot only by a very fine graded bore, the amount of fuel passed from the starter mechanism is decreased still further (Fig. 07-0/22).

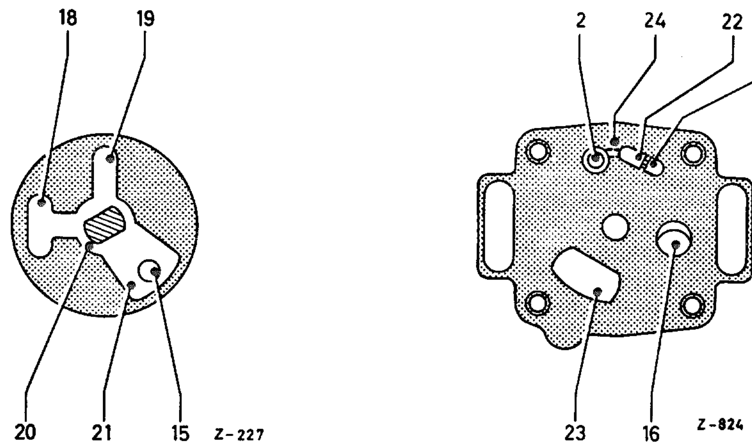


Fig. 07-0/22

Starter rotary slide valve

Starter flange
of carburetor housing

2 Graded bore of fuel canal
15 Starter air bore in starter rotary slide valve
16 Graded bore of additional air canal
18 Chamber in starter rotary slide valve
19 Chamber in starter rotary slide valve
20 Mixing chamber in starter rotary slide valve
21 Cavity in starter rotary slide valve
22 Fuel slot, part 1
23 Starter mixture canal
24 Graded intake bore for fuel slot
26 Fuel slot, part 2

D. Scavenging Device for Fuel System

a) General

On Model 220 S a scavenging device for the fuel system can be installed as an optional extra. Even at high outside temperatures and when driving in a line of traffic, this scavenging device prevents the formation of vapor bubbles in the fuel system. The scavenging device consists mainly of the return valve (3) on the front carburetor which is connected to the fuel tank by the hose (7) and the fuel return line (12).

The fuel return valve is actuated mechanically by the pump arm (9) of the accelerating pump (8). When the return valve is open, the excess fuel runs back into the fuel tank through the return valve and the return line. This fuel circulation cools the fuel line and prevents the formation of vapor bubbles.

With the carburetor linkage in the idle position and the throttle valves slightly open, the valve pin of the return valve, which is fitted with a sealing cone, is pressed outward by the pressure spring so that the bore remains open for the fuel flow. When the throttle valves are opened further, the pump arm (9) by overcoming the elastic force, presses the valve pin far enough in to close the bore to the passage of fuel and thus interrupts the scavenging process (see Fig. 07-0/23).

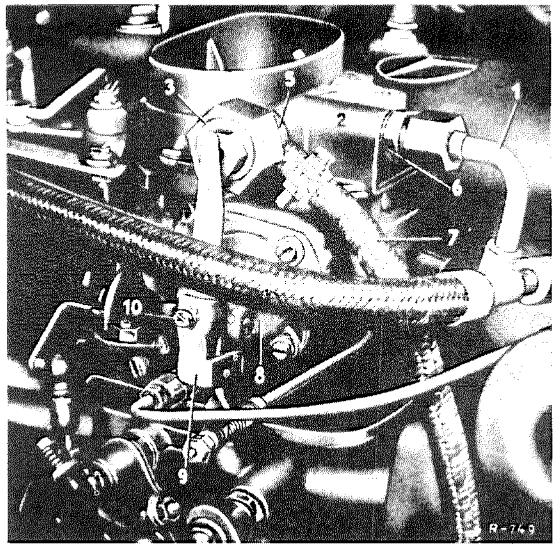


Fig. 07-0/23

1 Fuel pressure line
2 Connector at carburetor cover
3 Fuel return valve
4 Fiber gaskets
5 Ring connector
6 Threaded union
7 Hose for fuel return line
8 Accelerating pump
9 Pump arm
10 Adjusting screw and lock nut

The return mechanism is adjusted by means of the adjusting screw (10) on the pump arm with the throttle valve of Stage 1 completely closed. In this position there must still be a valve travel of 0.4–0.6 mm (see Fig. 07-0/24).

b) Subsequent Installation of Scavenging Device

1. Disconnect and remove the fuel pressure line at the fuel feed pump and at the carburetors.
2. Remove the carburetor cover of the front carburetor. Unscrew the float needle valve and the threaded union for the fuel pressure line.
3. Drill through the front part of the connector (2) on the carburetor cover which was hitherto closed, using a 7 mm diameter drill, and tap an M 12×1.5 thread (Fig. 07-0/24).
4. Clean the carburetor cover and carefully remove all chips.
5. Fit the carburetor cover and screw the threaded union (6) for the fuel pressure line into the front connection of the carburetor cover. If necessary, use a new fiber sealing ring (see Fig. 07-0/25).
6. Screw the fuel return valve (3) with fiber sealing rings (4) and ring connector (5) into the side connection hitherto used for the fuel pressure line and tighten (see Fig. 07-0/24).

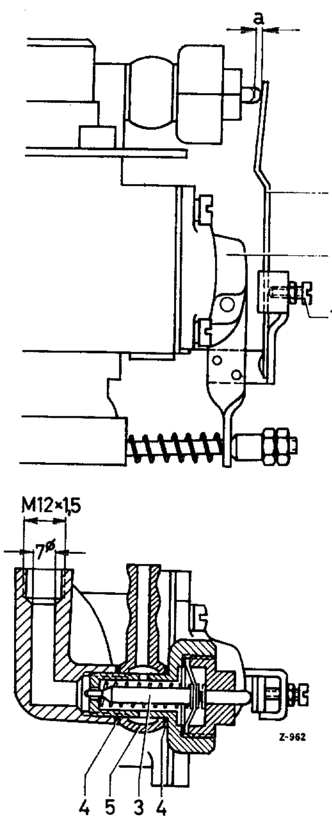


Fig. 07–0/24

a) Travel of fuel return valve

3 Fuel return valve
4 Fiber sealing rings
5 Ring connector
8 Accelerating pump
9 Pump arm
10 Adjusting screw and lock nut

7. Slide the hose (7) of the fuel return line onto the ring connector (5) and fasten with a hose clip (see Fig. 07–0/25).

8. Connect the new fuel pressure line (1) (Fig. 07–0/25).

9. Unscrew the accelerating pump (8) and remove the cover taking care not to damage the pump diaphragm. After carefully tapping out the shaft remove the pump arm (see Fig. 07–0/24).

10. Install the new pump arm (9) and drive in the shaft. Screw the cover to the accelerating pump making sure that the pump diaphragm is correctly positioned. Screw the accelerating pump to the carburetor.

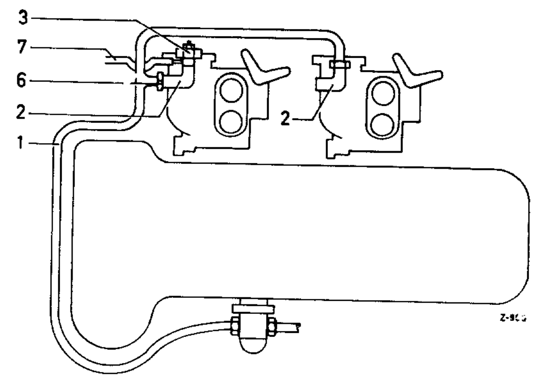


Fig. 07–0/25

1 Fuel pressure line
2 Connectors at carburetor cover
3 Fuel return valve
6 Threaded union
7 Hose for fuel return line

If necessary, use a new rubberised-fabric gasket (see Fig. 07–0/24).

11. Remove the extension for the filler neck of the fuel tank. As shown in Fig. 07–0/26 drill a 9.5 mm diameter hole into the filler tube (14) of the extension and braze the union (11) D 6 DIN 7613 for connecting the fuel return line.

12. Fit the front part (12) of the fuel return line onto the chassis base panel along the propeller shaft cover and fasten it with six fixing clips using oval head tapping screws and spring washers (Fig. 07–0/27).

Note: a) When fitting the front part of the fuel return line make sure that there is enough space for the front end of the line between the right longitudinal member of the chassis and the subframe. Fasten the line to the longitudinal member in such a way that it cannot be damaged by the movements of the subframe.

b) In order to avoid damage to the fuel return line (12) grind down the welding seam along the longitudinal member over a length of approx. 10 cm (see Fig. 07–0/27).

13. Slide the hose (7) onto the fuel return line (12) and fasten with a hose clip.

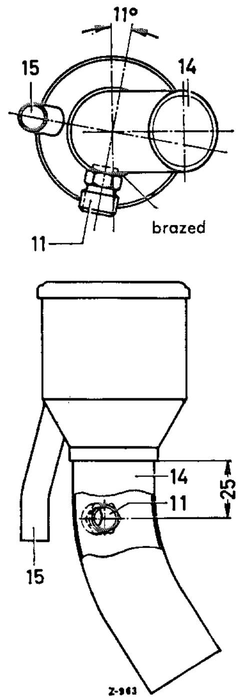


Fig. 07–0/26

11 Fuel return line union
14 Fuel filler tube
15 Pipe for air vent line

14. Fit the rear part (13) of the fuel return line above the chassis cross member and connect to the front part (12) of the line. Then fasten the line (13) to the chassis base panel by three fixing clips using oval head tapping screws and spring washers (see Fig. 07–0/27).

15. Install the extension of the fuel tank filler neck making sure that the hoses and the upper and lower parts of the rubber cuff are correctly positioned. Connect the fuel return line.

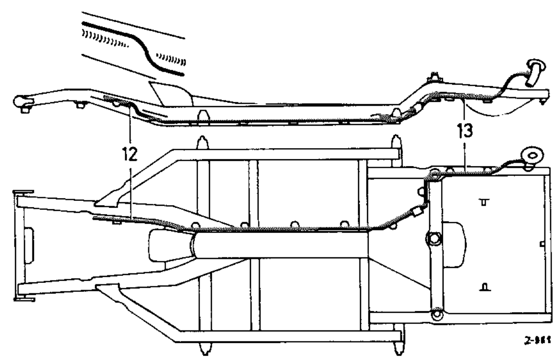


Fig. 07-0/27

12 Fuel return line (front part)
13 Fuel return line (rear part)

16. Adjust the injection amount of the accelerating pump (see Job No. 01-3, Section H).

17. Detach the spring-loaded push rod at the throttle valve lever of the front carburetor. Then back off the idle adjustment screw until the throttle valve of stage 1 is completely closed. Turn in the adjusting screw (10) on the pump arm until the return valve is completely closed. Then back the adjusting screw out again until the valve pin of the return valve has travelled the specified distance "a" of 0.4–0.6 mm. Then lock the adjusting screw with the hexagon nut (Fig. 07-0/24).

18. Check the basic adjustment of the carburetor linkage and adjust the idle (see Job No. 01-3, Section K).

List of Parts

Number required	Designation	Part No. or DIN designation
1	Fuel return valve with ring connector	000 070 10 46
1	Pump arm	000 070 13 21
1	Fuel pressure line	180 070 11 32
1	* Fuel return line (front part)	180 470 00 72
1	* Fuel return line (rear part)	180 470 01 72
9	* Fixing clips	1×8 DIN 72571
9	* Spring washers	B 5 DIN 137
9	* Oval head tapping screws	B 4.2×9.5 DIN 7981
1	* Fuel hose	B 8×12×480 DIN 73379
2	* Hose clips	S 15/9 Zy N 288 a
1	* Union	D 6 DIN 7613

Note: In some engines the fuel return valve (without ring connector), the pump arm and the fuel pressure line have already been installed as standard parts.

In these cases only the fuel return line has to be installed subsequently in order to make the scavenging device complete. For this purpose the parts marked with an asterisk and a ring connector (Part No. 000 990 19 88) are required.

E. Technical Specifications of Solex Compound Downdraft Carburetor Type 32 PAITA

Details of the Carburetor	Model 220 S	
	Stage 1	Stage 2
Air horn "K"	23	27
Main jet "Gg"	0125	0130
Air correction jet "a"	200	190 c with mixing tube
Mixing tube "s"	44	—
Mixing tube holder with polyamide ball valve (reserve)	5.7	—
Idle fuel jet "g"	47.5	—
Idle air jet "u"	1.8	—
Idle air bore	1.5	—
Accelerating pump	No. 841 (neutral)	
Injection amount cc/stroke	1.1—1.3	
Pump jet	80	
Injection tube	high (0.5 graded)	
Starter fuel jet	100	
Starter air bore in starter rotary slide valve	3.0	
Float needle valve	2.0	
Float weight (float made of nylon) g	7.3	
Fuel level mm	19—21	
Angle of inclination of throttle valves	8°	17°
Angle of inclination of vacuum valve	—	170
By-pass bores	1.15/1.15	—
Filling capacity of oil shock-absorber Engine oil SAE 10 W cm³	—	approx. 1.2

Note: a) As from Engine End No. N 85 05174 and Z 85 02038 the carburetors have been equipped with a mixing tube holder (reserve) 5.7. Up to Engine End Nos N 85 05173 and Z 85 02037 a mixing tube holder (reserve) 5.5 was installed.

b) As from Engine End No. 65 03594 the idle air jet "u" 1.8 has been installed as a standard part. Up to Engine End No. 65 03593 an idle air jet "u" 1.2 was used. The carburetors on these engines should always be subsequently equipped with an idle air jet "u" 1.8.

IV. Compound Cross-Draft Carburetor for Model 190 SL

A. General

Model 190 SL is equipped with two Solex carburetors Type 44 PHH. These horizontal compound carburetors are also known as cross-draft carburetors and have been developed for sports cars with high maximum speeds. They incorporate the latest advances in carburetor design (Figs. 07-0/28 and 07-0/29).

Solex Carburetor Type 44 PHH

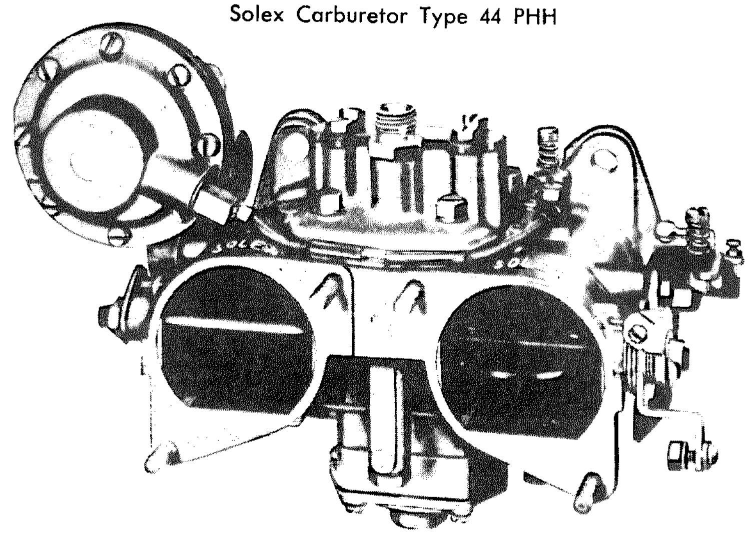


Fig. 07–0/28

Air suction-tube side

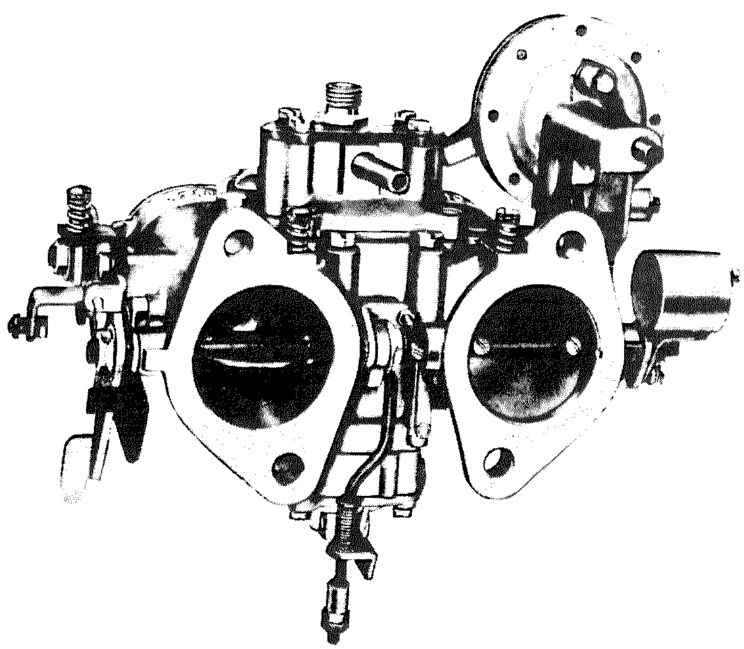


Fig. 07–0/29

Engine side

Two versions of this carburetor have been installed in cars of Model 190 SL. The 1st version has a sand-cast carburetor housing (installed up to Engine End No. 55 00708) and the 2nd version has a die-cast carburetor housing (installed as from Engine End No. 55 00709). The two versions of the carburetor work on the same principle (Figs. 07–0/30 and 07–0/31).

The subsequent installation of die-cast carburetors is described in Job No. 01–4.

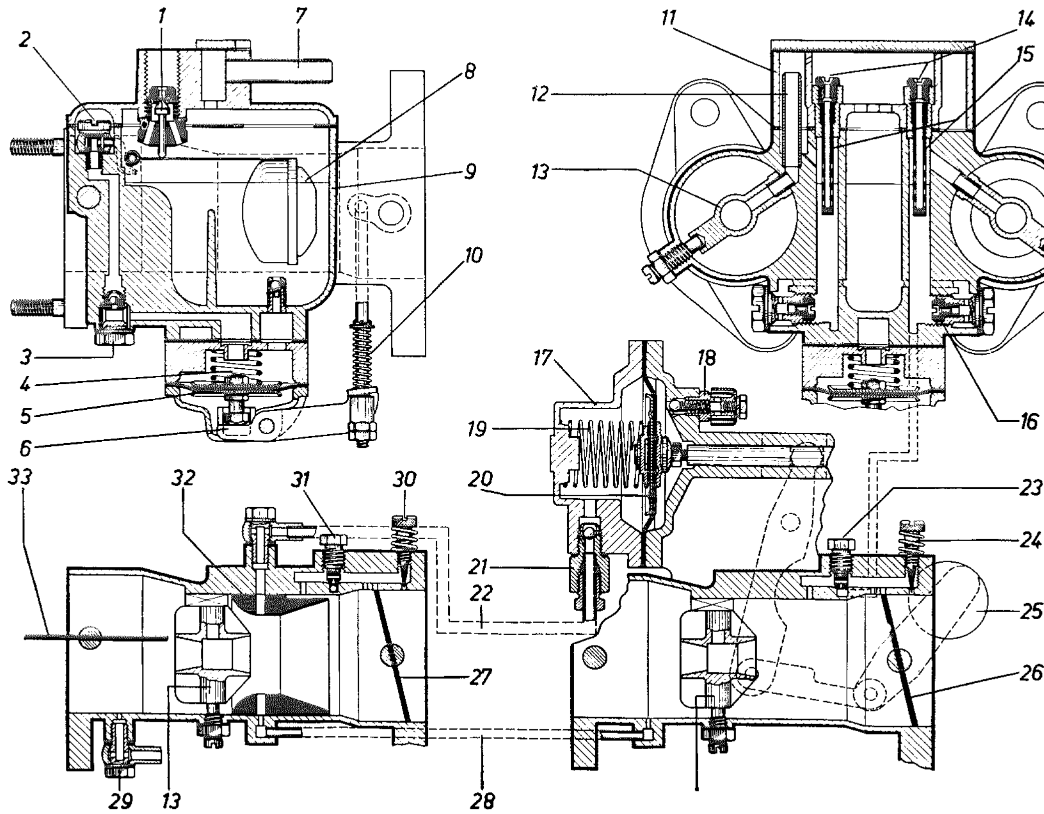


Fig. 07–0/30

Solex Carburetor Type 44 PHH

(Die-cast carburetor)

I Stage 1 **II** Stage 2

1 Float needle valve
2 Pump jet
3 Ball valve for accelerating pump
4 Diaphragm spring
5 Pump diaphragm
6 Pump arm
7 Connection for fuel overflow line and float chamber ventilation
8 Float
9 Float chamber
10 Connecting rod with pressure spring and adjusting nuts
11 Carburetor cover
12 Overflow control tube
13 Diffuser
14 Air correction jets
15 Mixing tubes
16 Main jet plug with main jets
17 Vacuum box
18 Ball valve (delay valve on atmosphere side)
19 Diaphragm spring
20 Diaphragm
21 Ball valve (delay valve on vacuum side)
22 Vacuum line
23 Idle fuel jet of stage 2
24 Idle mixture adjustment screw of stage 2
25 Throttle valve lever of stage 2 with counterweight
26 Throttle valve of stage 2
27 Throttle valve of stage 1
28 Fuel suction line
29 Union for fuel outlet line
30 Idle mixture adjustment screw of stage 1
31 Idle fuel jet of stage 1
32 Air horn
33 Choke valve

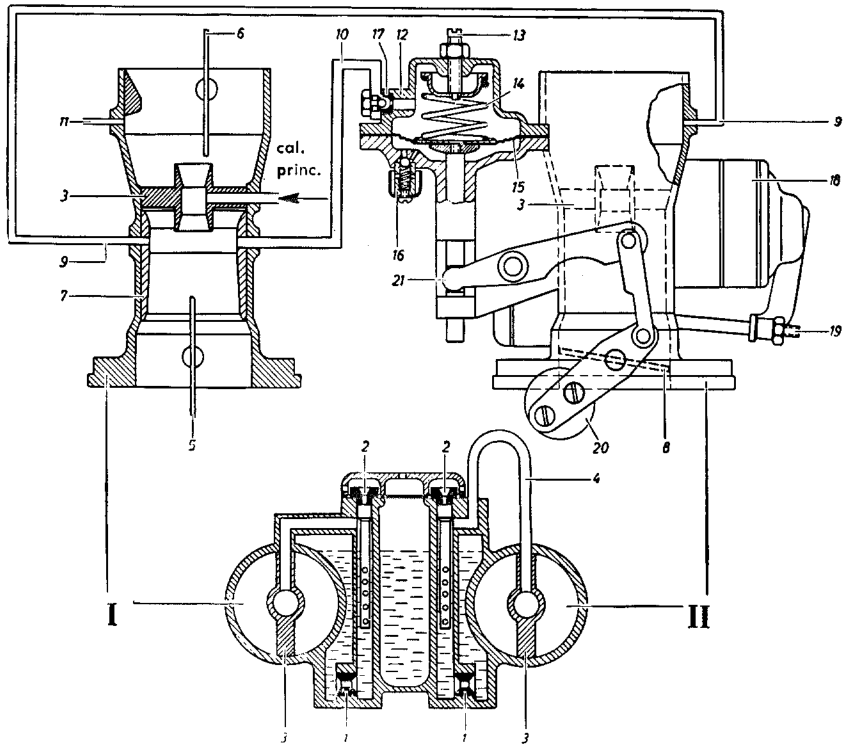


Fig. 07–0/31

Solex Carburetor Type 44 PHH

(Sand-cast carburetor)

I Stage 1 II Stage 2

1 Main jets
2 Air correction jets with mixing tubes
3 Diffuser
4 Overflow control tube
5 Throttle valve of stage 1
6 Choke valve
7 Air horn
8 Throttle valve of stage 2
9 Fuel suction line
10 Vacuum line to vacuum box
11 Fuel outlet line
12 Vacuum box
13 Adjusting screw
14 Diaphragm spring
15 Diaphragm with diaphragm rod
16 Ball valve (delay valve on atmosphere side)
17 Ball valve (delay valve on vacuum side)
18 Accelerating pump
19 Connecting rod with pressure spring and adjustment nuts
20 Throttle valve lever of stage 2 with counterweight
21 Relay lever

B. Arrangement and Function of the Throttle Valves

The compound cross-draft carburetor has two suction canals with one throttle valve each. Each suction canal forms one "stage" and there is no connection between the throttle valve (27) of stage 1 and the throttle valve (26) of stage 2 (see Fig. 07–0/30). Whereas the throttle valve shaft of stage 1 is actuated as usual via the throttle valve lever (38), the throttle valve of stage 2 is opened automatically via the vacuum box (17). The diaphragm (20) in the vacuum box is connected to the throttle valve lever (25) of stage 2 by means of the diaphragm rod (34), the relay lever (35) and the relay arm (36). In the "at rest" position the diaphragm (20) is pushed to the right by the diaphragm spring (19) and thus closes the throttle valve of stage 2.

The counterweight on the throttle valve lever (25) prevents the throttle valve of stage 2 from fluttering when it is closed. The space to the left (spring side) of the diaphragm in the vacuum box is connected via the vacuum line (22) to the suction canal of stage 1 at the narrowest point of the air horn (32).

The space to the right of the diaphragm (atmosphere side) is under atmospheric pressure. The vacuum obtaining in the air horn of stage 1 when the throttle valve is fully open causes the throttle valve (26) of stage 2 to open at an engine speed of approx. 3500 rpm. The two ball valves (delay valves) (21) on the vacuum side and (18) on the atmosphere side of the vacuum box prevent a sudden opening of the throttle valve of stage 2 (Figs. 07–0/32 and 07–0/33).

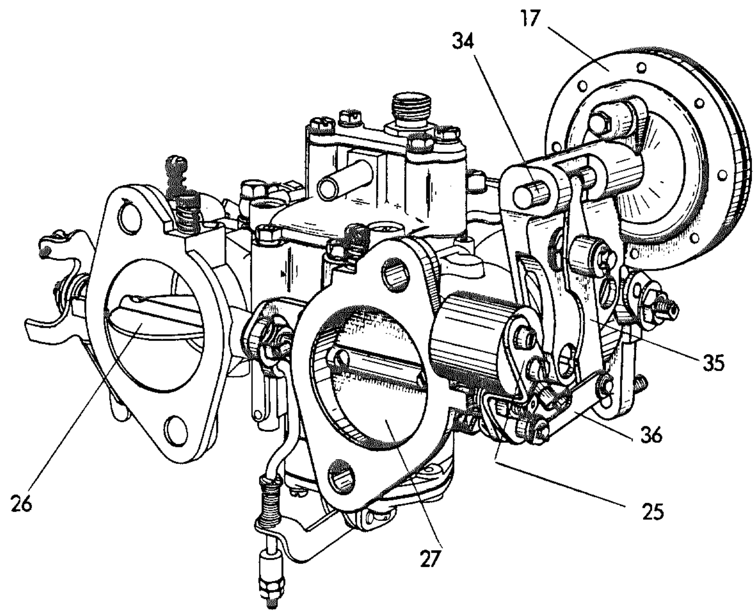


Fig. 07–0/32

Throttle valve of stage 2 not yet operative
(Stage 1 in full-load position)

17 Vacuum box
25 Throttle valve lever of stage 2 with counterweight
26 Throttle valve of stage 2
27 Throttle valve of stage 1
34 Diaphragm rod
35 Relay lever
36 Relay arm

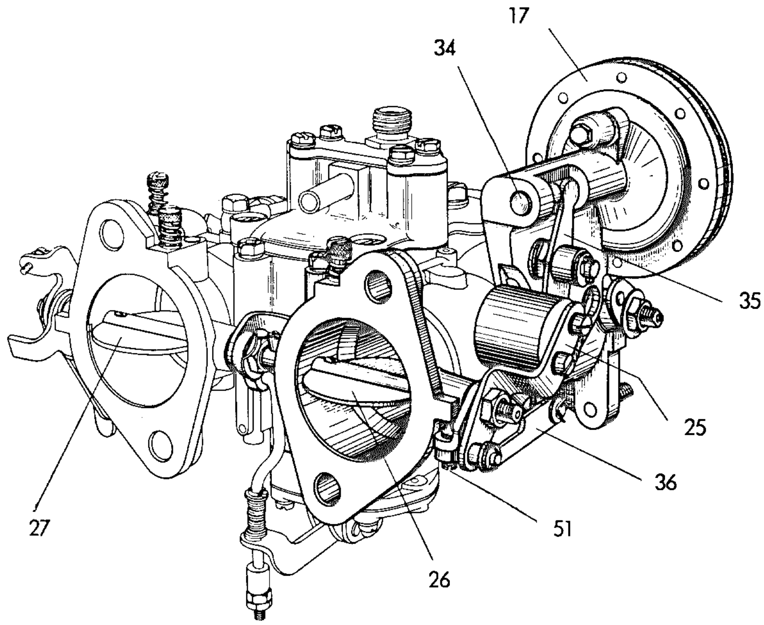


Fig. 07–0/33

Throttle valve of stage 2 operative
(Stages 1 and 2 in full-load position)

17 Vacuum box
25 Throttle valve lever of stage 2 with counterweight
26 Throttle valve of stage 2
27 Throttle valve of stage 1
34 Diaphragm rod
35 Relay lever
36 Relay arm
51 Aperture limiting screw for throttle valve of stage 2

When the accelerator pedal is released, the so-called automatic return mechanism of stage 2 causes the throttle valve of stage 2 to be closed by the throttle valve shaft of stage 1. The automatic return mechanism consists of the relay lever (59) on the throttle valve shaft (53) of stage 1, the set screw (69), the clamping strap (67) of the clamping screw (68) and the abutment screw (70) screwed into the throttle valve shaft (61) of stage 2 (Fig. 07–0/34).

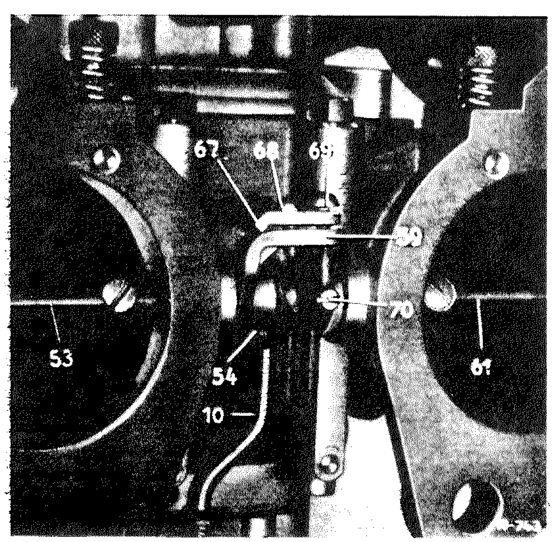


Fig. 07–0/34

10 Connecting rod with pressure spring
53 Throttle valve shaft of stage 1
54 Transmission lever for connecting rod of accelerating pump
59 Relay lever
61 Throttle valve shaft of stage 2
67 Clamping strap
68 Button head screw (clamping screw)
69 Button head screw (set screw)
70 Abutment screw

In the idle position of the carburetor linkage the set screw (69) must rest against the abutment screw (70) without any clearance.

When the two throttle valves of stages 1 and 2 are fully opened, the set screw also rests against the abutment screw, so that the throttle valve shaft of stage 1 makes stage 2 automatically inoperative when the accelerator pedal is released.

The automatic return mechanism of stage 2 should be adjusted after the idle adjustment has been made (see Job No. 01–3, Section K).

C. Starter Mechanism

The starter mechanism of the carburetor works on the choke valve system, a stepless and progressive system in which there is a fixed relationship between choke valve position and start mixture enrichment. The starter mechanism is actuated by a pull knob on the instrument board and a bowden cable. The starter mechanism consists of a choke valve in the suction canal of stage 1; the choke valve shaft (71) is offset from the center of the suction canal.

In the sand-cast carburetors the starter mechanism is located in a special choke valve section screwed to the carburetor housing. The die-cast carburetors have no special choke valve section and the choke valve shaft is located in the carburetor housing itself.

When the starter mechanism is not in operation under normal running conditions, the choke valve (33) is open (Fig. 07–0/35).

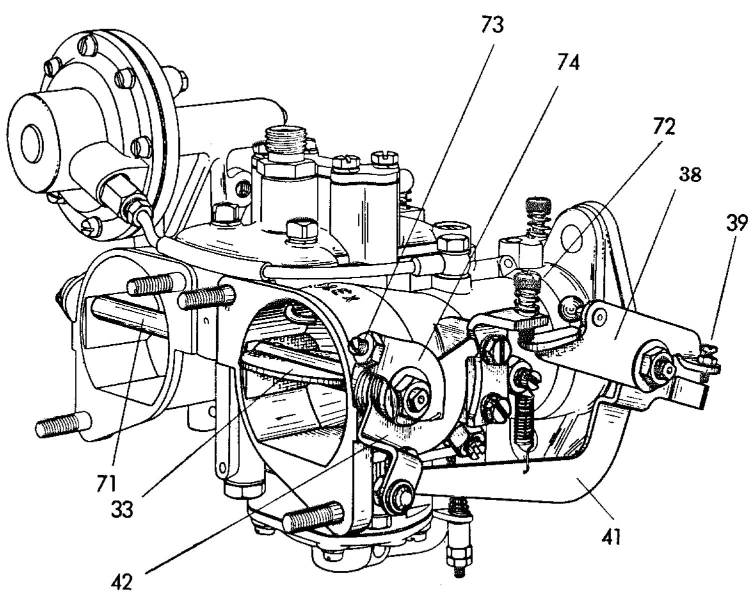


Fig. 07–0/35

Normal running position — Starter mechanism inoperitive
(Choke valve open)

33 Choke valve
38 Throttle valve lever of stage 1
39 Adjusting screw
41 Relay lever
42 Choke valve lever with cam plate
71 Choke valve shaft
72 Idle adjustment screw
73 Adjusting screw
74 Abutment

When the knob is pulled out, the starter mechanism is in operation and the choke valve (33) is closed (Fig. 07–0/36).

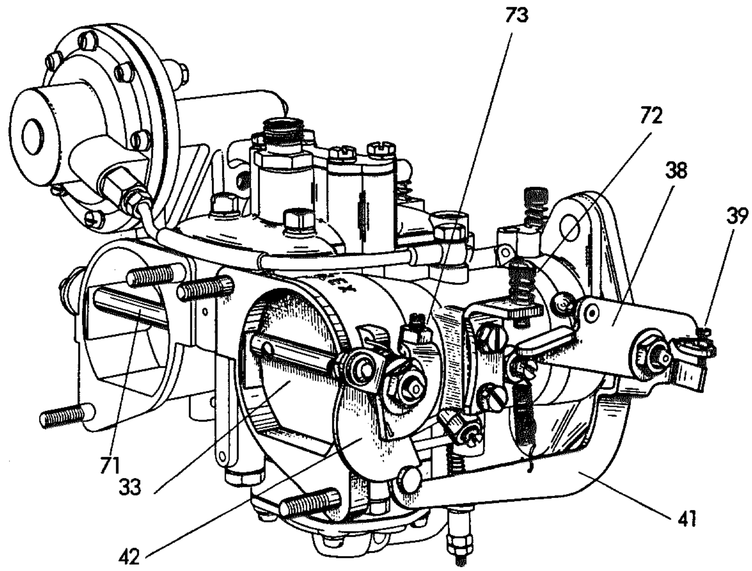


Fig. 07–0/36

Starter mechanism operative
(Choke valve closed)

33 Choke valve
38 Throttle valve lever of stage 1
39 Adjusting screw
41 Relay lever
42 Choke valve lever with cam plate
71 Choke valve shaft
72 Idle adjustment screw
73 Adjusting screw

The choke valve is closed by a coil spring; it is opened by a relay lever when the engine has started.

When the choke valve closes, the throttle valve (27) of stage 1 is automatically opened approx. 5° by the choke valve lever (42) with cam plate and the relay lever (41) (Fig. 07-0/37).

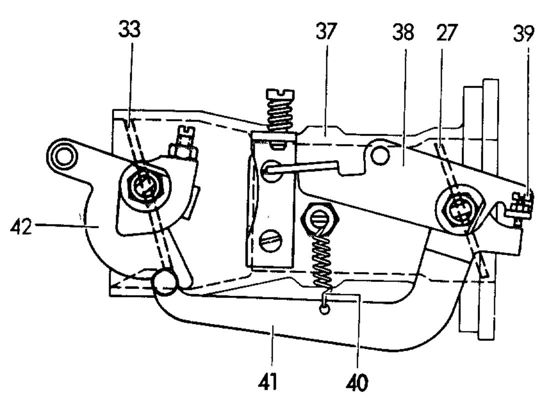


Fig. 07-0/37

Starter mechanism

27 Throttle valve of stage 1
33 Choke valve
37 Carburetor housing
38 Throttle valve lever of stage 1
39 Adjusting screw
40 Tension spring
41 Relay lever
42 Choke valve lever with cam plate

The throttle valve must open in order to ensure that the vacuum building up in the suction tube can become effective in the mixing chamber of the carburetor and in order to ensure proper starting and running of the engine.

Note: a) The cam plate on the choke valve lever (42) and the relay lever (41) are fitted to the rear carburetor only. The throttle valve on the front carburetor is automatically opened by the control shaft of the carburetor linkage (see Fig. 07-0/35).

b) When the choke valve is closed there must be a clearance of 1.0 mm between the adjusting screw (73) on the abutment (74) and the choke valve lever (42) (see Fig. 07-0/35).

c) When the starter mechanism is inoperative, the choke valve must be fully open. The stop lever on the choke valve shaft must rest against the carburetor housing. This point needs particular attention when the choke cable is being connected (see also Job No. 30-6).

d) When the starter mechanism is inoperative, there must be a clearance of approx. 0.4 mm between the adjusting screw (39) on the throttle valve lever and the relay lever (41) when the carburetor linkage is in the idle position. The tension spring must press the relay lever against the cam plate of the choke valve lever (see Fig. 07-0/35).

Cold Start

When the engine is being started, the closed choke valve (33) produces an effective vacuum in the diffuser (13) of stage 1, so that sufficient fuel is drawn from the main supply system to provide a mixture rich enough to start the engine cold. When the engine has started, the pressure flow regulates the opening of the choke valve (33) against the pressure of the coil spring, with the result that the combustion air necessary for the start mixture can enter (Fig. 07-0/38).

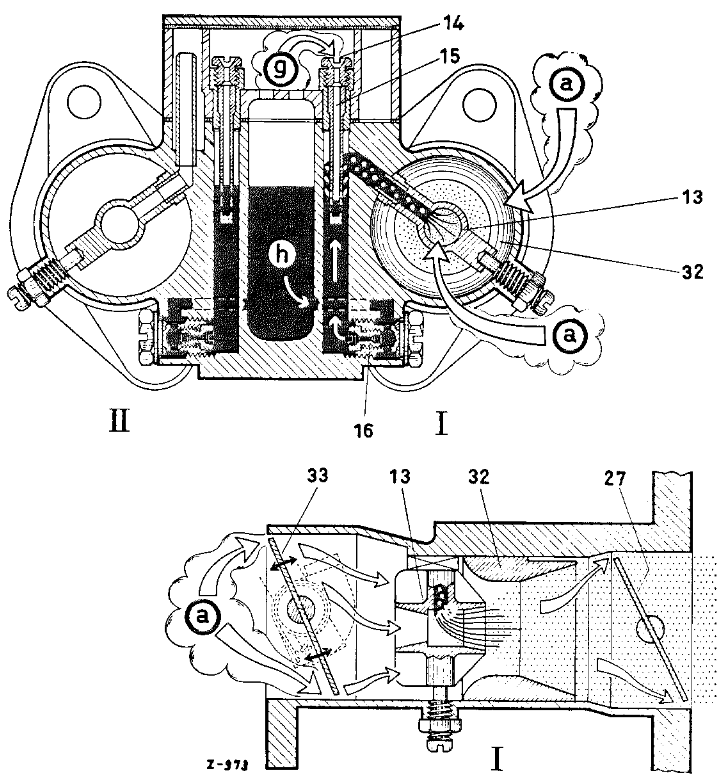


Fig. 07-0/38

Cold start
(After engine has started)

I Stage 1 II Stage 2

a) Starter air entry
g) Entry of compensating air for main carburetion system
h) Fuel feed
13 Diffuser
14 Air correction jet
15 Mixing tube
16 Main jet plug with main jet
27 Throttle valve of stage 1
32 Air horn
33 Choke valve

By slowly pushing in the pull knob the engine speed can be adapted to the driving situation.

There is no objection to warming up the engine with the starter mechanism in operation. However, the starter mechanism should be switched off by pushing the knob right in as soon as the engine has reached normal working temperature. When the engine is warm, the knob must not be pulled to start the engine.

D. Idle System

The carburetor has two idle systems, one for stage 1 and one for stage 2. The idle system of stage 1 serves the normal purpose of supplying the engine with the idle mixture required and of ensuring a satisfactory change-over to the main carburetion system.

The idle system of stage 2 only serves to improve speed build-up when stage 2 is brought into operation.

Idle System of Stage 1

The difference between the idle systems in die-cast and sand-cast carburetors is that in the die-cast carburetor the idle air supply is drawn from the mixing chamber in the suction of the carburetor and passes via the recess in the air horn (32) through the idle air bore (43) (replacing the idle air jet) into the idle canal (45), whereas in the sand-cast carburetor the idle air passes into the idle canal through the idle air jet (44) from outside (Figs. 07-0/39 and 07-0/40).

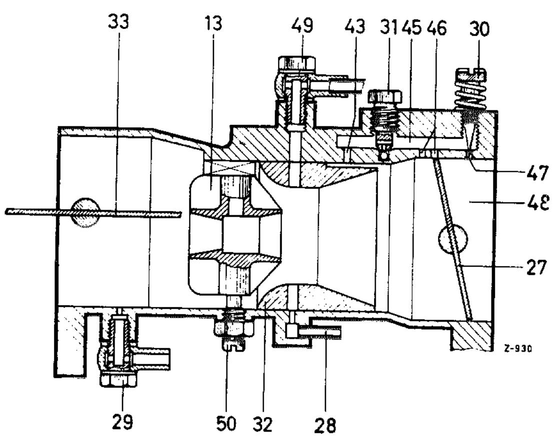


Fig. 07-0/39

Idle system of stage 1
(Die-cast carburetor)

13 Diffuser
27 Throttle valve of stage 1
28 Fuel suction line
29 Union for fuel outlet line
30 Idle mixture adjustment screw of stage 1
31 Idle fuel jet of stage 1
32 Air horn
33 Choke valve
43 Idle air bore of stage 1
45 Idle canal of stage 1
46 By-pass bores of stage 1
47 Idle mixture bore of stage 1
48 Suction canal of stage 1
50 Retaining screw for diffuser

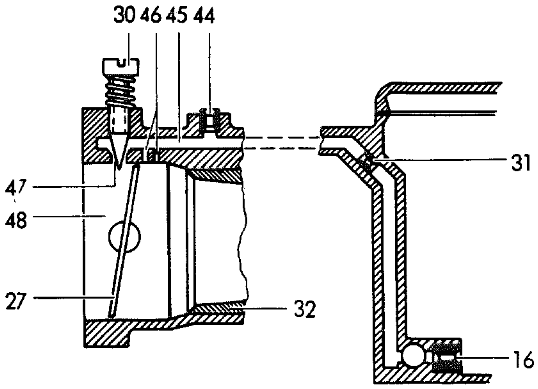


Fig. 07-0/40

Idle system of stage 1
(Sand-cast carburetor)

16 Main jet
27 Throttle valve of stage 1
30 Idle mixture adjustment screw of stage 1
31 Idle fuel jet of stage 1
32 Air horn
44 Idle air jet
45 Idle canal of stage 1
46 By-pass bores of stage 1
47 Idle mixture bore of stage 1
48 Suction canal of stage 1

a) Idle Phase 1

The fuel which is drawn in via the idle fuel jet (31) mixes with the air entering through the idle air bore (43) forming a mixture which then passes into the idle canal (45). When the throttle valve (27) is in the idle position, a further supply of air enters through the rear by-pass bore (46); the idle mixture enters the suction canal through the idle mixture bore (47) and through the front by-pass bore (46) and combines with the air flowing past the throttle valve to form the final idle mixture (Figs. 07-0/39 and 07-0/41).

The section of the idle mixture bore can be varied by the idle mixture adjustment screw (30) (Fig. 07-0/41). The final idle mixture can be leaned out by tightening the idle mixture adjustment screw and enriched by slackening it. The idle speed is adjusted with the idle adjustment screw (72) on the throttle valve lever (38) (see Job No. 01-3, Section K, and Fig. 07-0/36).

b) Idle Phase 2

When the throttle valve is opened slightly, idle mixture emerges both through the idle mixture bore (47) and the rear by-pass bore (46). The two by-pass bores now ensure a smooth change-over from the idle to the main carburetion system (see Figs. 07-0/39 and 07-0/41).

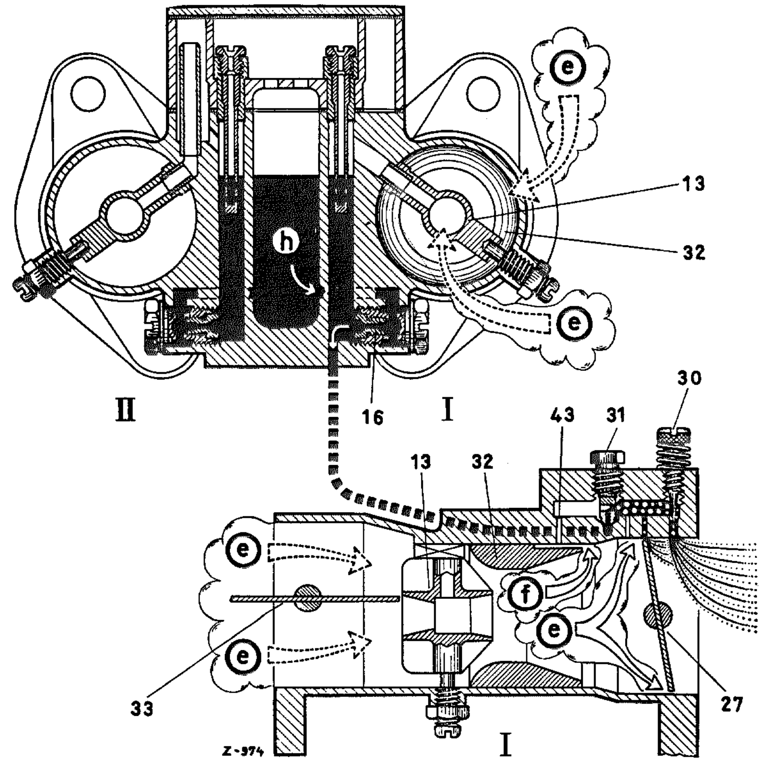


Fig. 07-0/41

Idle — Phase 1

I Stage 1 II Stage 2

e) Entry of main air
f) Entry of idle air
h) Fuel feed

13 Diffuser
16 Main jet plug with main jet
27 Throttle valve of stage 1
30 Idle mixture adjustment screw of stage 1
31 Idle fuel jet of stage 1
32 Air horn
33 Choke valve
43 Idle air bore of stage 1

Idle System of Stage 2

The 2nd stage of the carburetor also has an idle system which is used only to improve the speed build-up when the 2nd stage is brought into operation. When the engine is idling, is in the partial-load range and in the full-load range up to approx. 3500 rpm, the idle system of stage 2 is not in operation, since both the mixture adjustment screw (24) and the throttle valve (26) of stage 2 are closed.

The idle air supply for the idle system of stage 2 of both die-cast and sand-cast carburetors is drawn in from the mixing chamber in the suction canal through the idle air bore (63) (Figs. 07-0/42 and 07-0/43).

Note: As from Engine End No. 65 01133 the die-cast carburetors have only one by-pass bore in stage 2.

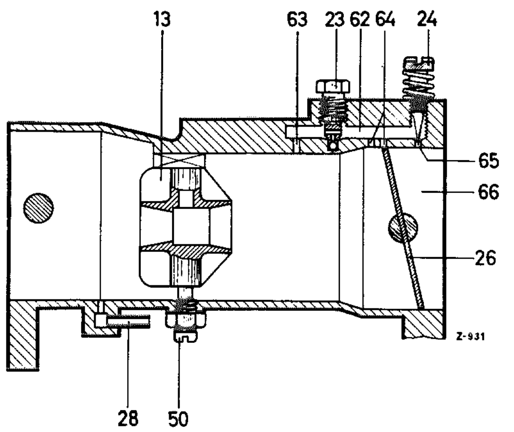


Fig. 07-0/42

Idle system of stage 2
(Die-cast carburetor)

13 Diffuser
23 Idle fuel jet of stage 2
24 Idle mixture adjustment screw of stage 2
26 Throttle valve of stage 2
28 Fuel suction line
50 Retaining screw for diffuser
62 Idle canal of stage 2
63 Idle air bore of stage 2
64 By-pass bores of stage 2
65 Idle mixture bore of stage 2
66 Suction canal of stage 2

When the engine reaches a speed of approx. 3500 rpm under full load, the throttle valve (26) of stage 2 begins to open. The fuel drawn in through the idle fuel jet (23) combines with the air entering through the idle air bore (63) to form a mixture in the idle canal (62). This mixture emerges at the by-pass bores (64) as soon as the throttle valve (26) of stage 2 opens. This additional enrichment of the fuel-air mixture prevents a change-over shock when stage 2 is brought into operation (see Figs. 07-0/42 and 07-0/43).

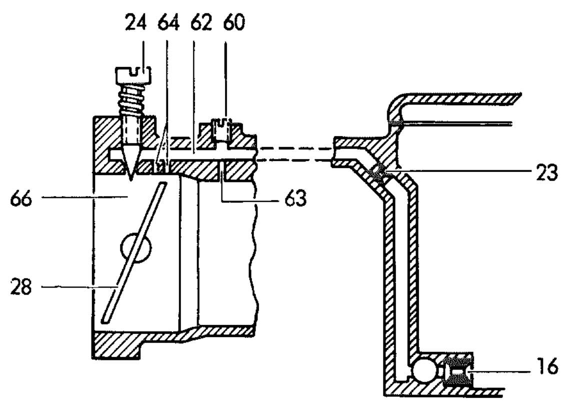


Fig. 07-0/43

Idle system of stage 2
(Sand-cast carburetor)

16 Main jet
23 Idle fuel jet of stage 2
24 Idle mixture adjustment screw of stage 2
26 Throttle valve of stage 2
60 Grub screw
62 Idle canal of stage 2
63 Idle air bore of stage 2
64 By-pass bores of stage 2
66 Suction canal of stage 2

Note: The idle mixture adjustment screw of stage 2 remains closed.

E. Main Carburetion System

The float chamber (9) of the carburetor is located in the center between the two suction canals. The connection (7) connects the float chamber with the outside air via the fuel overflow line. The float chamber is closed at the top by the carburetor cover (11). The cover carries the float valve (1) and the threaded union for the fuel line.

The suction canal of stage 1 has an air horn (32) with a diffuser (13) installed in front of it. The outlet tube for the fuel and the fuel mixture opens into the diffuser. By a canal the outlet tube is connected with a cylindrical cavity which is supplied with fuel from the float chamber via the main jet (16) screwed into the main jet plug. The mixing tube (15), which is held in the carburetor by the air correction jet (14), projects from above into the cylindrical cavity.

The suction canal of stage 2 has the same type of diffuser as stage 1, but it has no air horn because stage 2 is only brought into operation at relatively high engine speeds. Main jet plug with main jet, mixing tube and air correction jet are arranged symmetrically to stage 1.

Particular importance attaches to the overflow control tube (12) in stage 2 through which the fuel mixture must pass on its way to the outlet tube of the diffuser (13) of stage 2. This device is necessary in order to counteract the effect of the partial vacuum which is formed in the air suction tube between carburetor and air filter. When the throttle valve of stage 2 is closed, this partial vacuum acts also on the main carburetion system of this stage and would flood it, i. e. without the overflow control tube, fuel would be drawn from the diffuser and – mixed with inlet air – would pass to stage 1 through the air suction tube (Fig. 07-0/44).

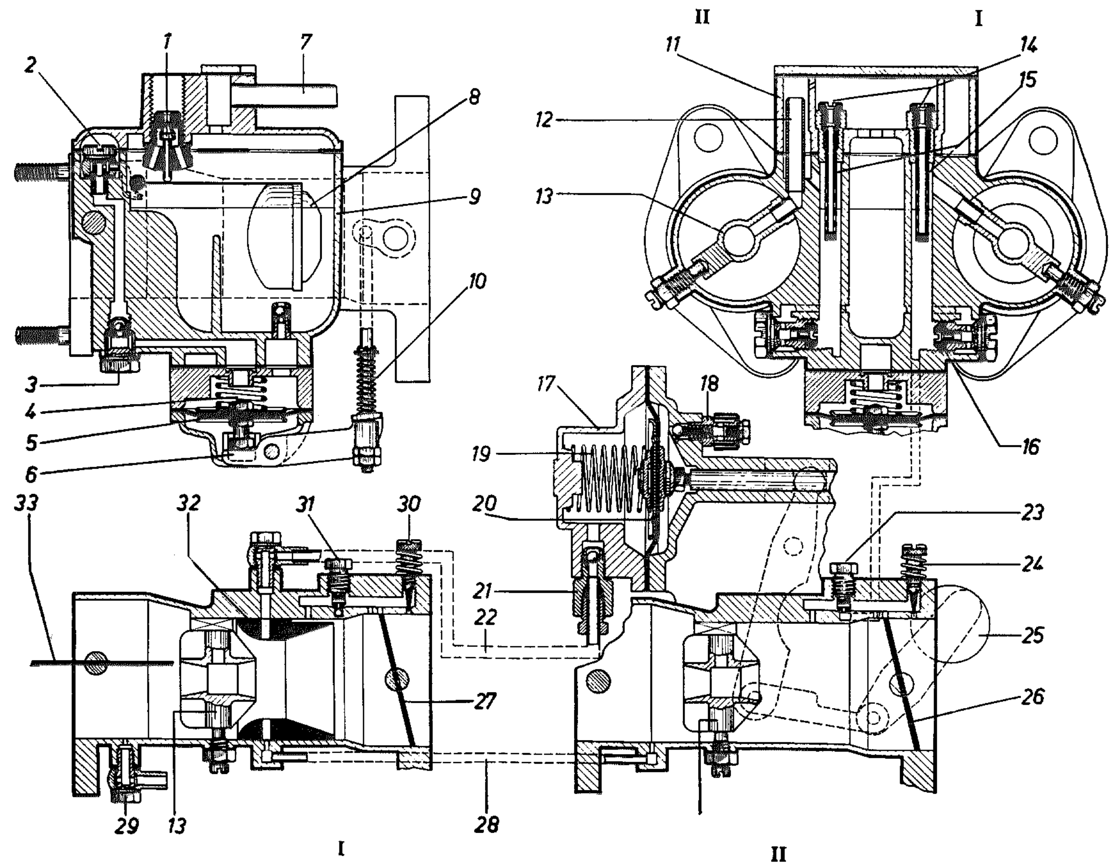


Fig. 07-0/44

I Stage 1 **II** Stage 2

1 Float needle valve
2 Pump jet
3 Ball valve for accelerating pump
4 Diaphragm spring
5 Pump diaphragm
6 Pump arm
7 Connection for fuel overflow line and float chamber ventilation
8 Float
9 Float chamber
10 Connecting rod with pressure spring and adjusting nuts
11 Carburetor cover
12 Overflow control tube
13 Diffuser
14 Air correction jets
15 Mixing tubes
16 Main jet plug with main jets
17 Vacuum box
18 Ball valve (delay valve on atmosphere side)
19 Diaphragm spring
20 Diaphragm
21 Ball valve (delay valve on vacuum side)
22 Vacuum line
23 Idle fuel jet of stage 2
24 Idle mixture adjustment screw of stage 2
25 Throttle valve lever of stage 2 with counterweight
26 Throttle valve of stage 2
27 Throttle valve of stage 1
28 Fuel suction line
29 Union for fuel outlet line
30 Idle mixture adjustment screw of stage 1
31 Idle fuel jet of stage 1
32 Air horn
33 Choke valve

Note: a) Fig. 07-0/44 shows the die-cast carburetor. As far as the main carburetion system is concerned, the sand-cast carburetor works the same way, the only difference is in the arrangement of the canals and jets (see 07-0/31).

b) In the die-cast carburetor the compensating air passes to the correction jet through the fuel overflow line and in the sand-cast carburetor through two openings which are located at the side of the carburetor cover and are covered by strainers.

c) In both types of carburetors the float chamber is ventilated through the fuel overflow line whose connection has a 6 mm internal diameter in the die-cast carburetor and a 4 mm internal diameter in the sand-cast carburetor.

d) Arrangement and mounting of the float in the carburetor cover are the same for both types. The floats themselves have the same weight, but differ in their shape and must not be mixed up.

e) In the sand-cast carburetor the overflow control tube is screwed to the carburetor housing, whereas in the die-cast carburetor it is located inside the carburetor (see Figs. 07-0/31 and 07-0/44).

a) Partial-Load and Full-Load Range at Low Engine Speed

(Only stage 1 in operation)

Normally the fuel level is the same in the float chamber and in the two cylindrical cavities into which the fuel flows through the main jets (16).

When the throttle valve (27) of stage 1 is opened, the partial vacuum begins to have an effect on the outlet tube of the diffuser. As a result, fuel is drawn from the cylindrical cavity via the outlet tube of the diffuser and is mixed with the air entering through the air inlet branch. Compensating air enters through the air correction jet (14) in progressively larger amounts, passes through the bores of the mixing tube (15) and combines with the fuel flowing through the main jet to form a mixture. Air enrichment increases with increasing engine speed, thus preventing overenrichment of the mixture (Fig. 07-0/45).

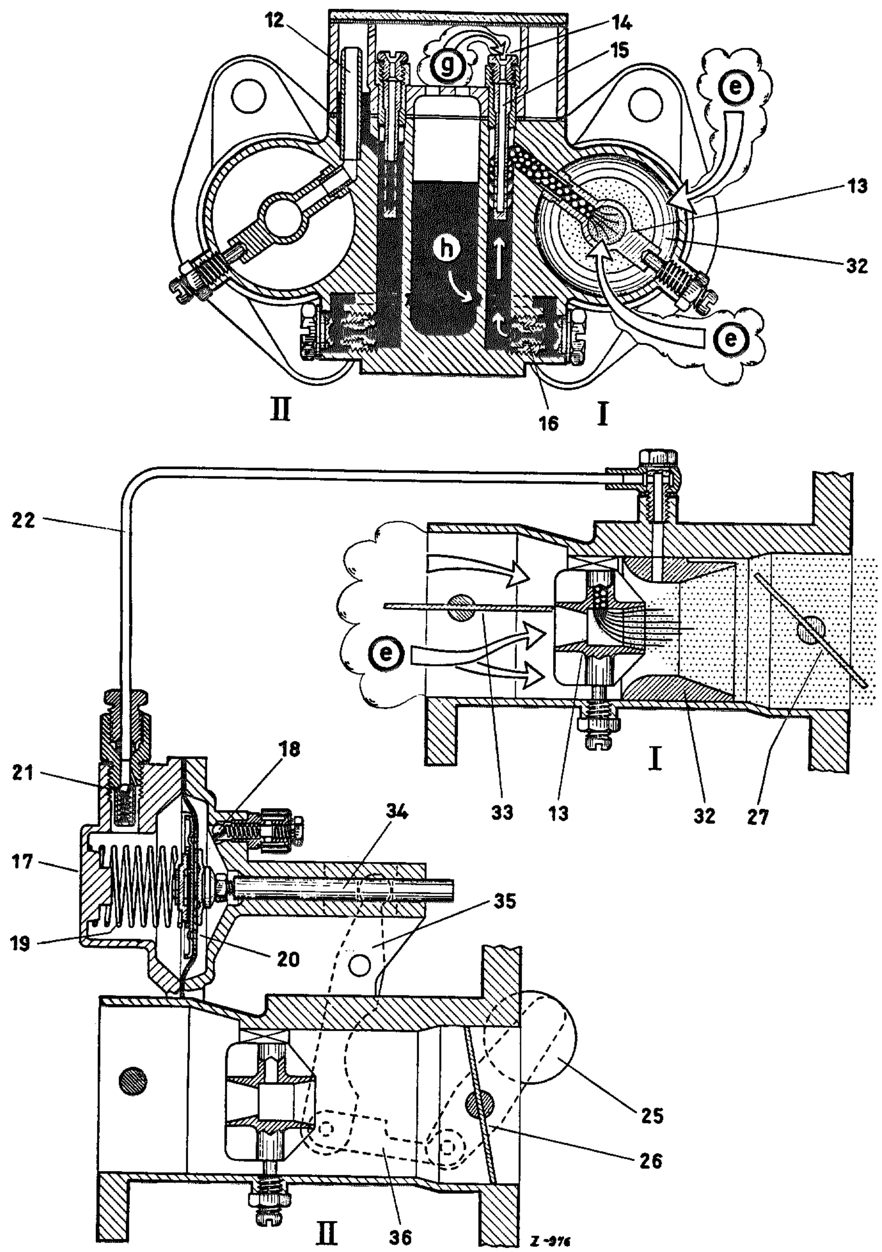


Fig. 07-0/45

Function in partial-load range and in full-load range at low engine speed (Only stage 1 in operation)

I Stage 1 **II Stage 2**

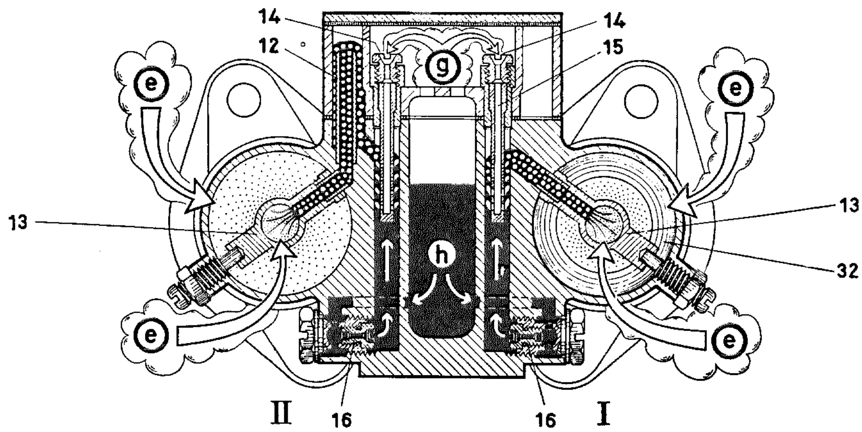
e) Entry of main air
g) Entry of compensating air for main carburetion system
h) Fuel feed

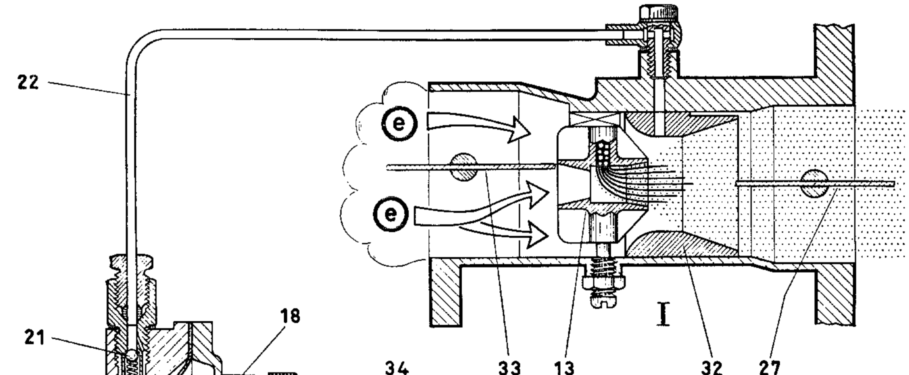
12 Overflow control tube
13 Diffuser
14 Air correction jets
15 Mixing tubes
16 Main jet plug with main jets
17 Vacuum box
18 Ball valve (delay valve on atmosphere side)
19 Diaphragm spring
20 Diaphragm
21 Ball valve (delay valve on vacuum side)
22 Vacuum line
25 Throttle valve lever of stage 2 with counterweight
26 Throttle valve of stage 2
27 Throttle valve of stage 1
32 Air horn
33 Choke valve
34 Diaphragm rod
35 Relay lever
36 Relay arm

b) Full-Load Range at High Engine Speed

(Stage 2 brought into operation)

When the engine has reached approx. 3500 rpm with the throttle valve of stage 1 completely open, the partial vacuum in the air horn has increased to such an extent that through the vacuum line (22) it begins to operate the vacuum box (17) by overcoming the weight and the spring pressure. As a result, the throttle valve (26) of stage 2 begins to open; the change-over is made easier by the fuel mixture which emerges through the by-pass bores (64) of the idle system of stage 2. With increasing throttle valve opening the supply of mixture is taken over by the main jet system of stage 2, so that the engine can reach its full output.





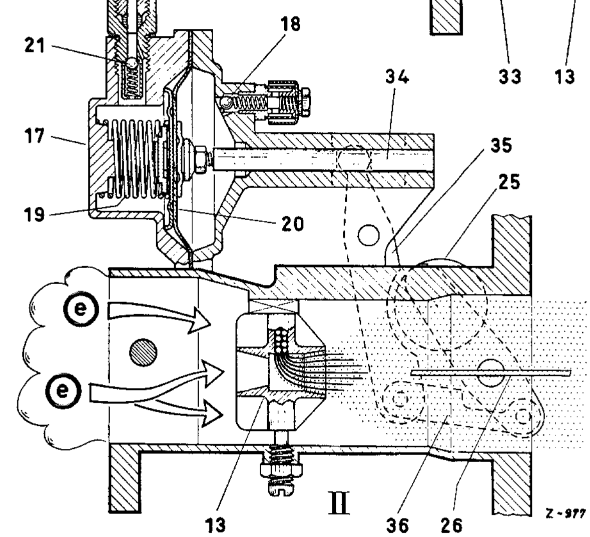


Fig. 07-0/46

Function in full-load range at high engine speed (stage 2 brought into operation)

I Stage 1 II Stage 2

e) Entry of main air
g) Entry of compensating air for main carburetion system
h) Fuel feed

12 Overflow control tube
13 Diffuser
14 Air correction jets
15 Mixing tubes
16 Main jet plug with main jets
17 Vacuum box
18 Ball valve (delay valve on atmosphere side)
19 Diaphragm spring
20 Diaphragm
21 Ball valve (delay valve on vacuum side)
22 Vacuum line
25 Throttle valve lever of stage 2 with counterweight
26 Throttle valve of stage 2
27 Throttle valve of stage 1
32 Air horn
33 Choke valve
34 Diaphragm rod
35 Relay lever
36 Relay arm

Note: The amount of vacuum required to bring the 2nd stage into operation can only be achieved under full load. Over the whole partial-load range only stage 1 is in operation.

F. Accelerating Pump

The "neutral" pump No. 82 is used as an accelerating pump for both the sand-cast and the die-cast carburetor. With this type of pump the engine draws in fuel from the pump system via the injection tube according to the degree of vacuum obtaining in the intake pipe.

However, the main task of the accelerating pump is to spray additional fuel into the mixing chamber of the suction canal of stage 1 when the accelerator pedal is depressed; as a result, speed build-up and acceleration are improved.

The accelerating pump is located at the bottom of the carburetor housing between the two suction canals (Fig. 07-0/47).

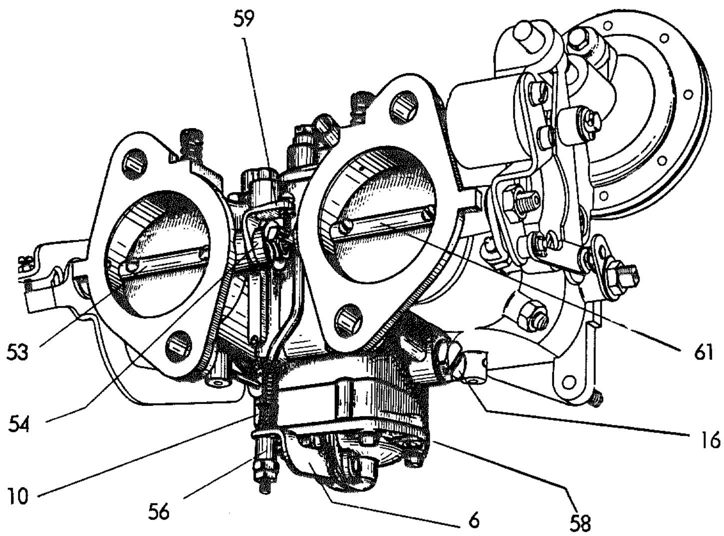


Fig. 07-0/47

6 Pump arm
10 Connecting rod with pressure spring
16 Main jet plug with main jet
53 Throttle valve shaft of stage 1
54 Transmission lever
56 Adjusting nuts
58 Accelerating pump
59 Relay lever for automatic return mechanism of stage 2
61 Throttle valve shaft of stage 2

The pump arm (6) of the accelerating pump is connected to the throttle valve shaft (53) of stage 1 by the adjustable connecting rod (10) and the transmission lever (54). When the throttle valve is closed, the diaphragm spring (4) presses the pump diaphragm (5) outward. Since the pump chamber is connected with the float chamber via the ball valve (55) the pump chamber is filled with fuel.

When the accelerator pedal is depressed, the pump arm (6) is moved via the connecting rod (10). The pump arm in turn presses the diaphragm (5) inward so that the fuel which is in front of the diaphragm is injected through the ball valve (3), the pump jet (2) and the graded injection tube (52).

During the injection period the ball valve (55) now operating as a check valve is closed. When the accelerator pedal is released, the diaphragm spring (4) presses the diaphragm (5) back. The ball valve (55) now operates as a through-way valve, whereas the ball valve (3) works as a check valve and prevents air from entering the pump system from the suction canal (Fig. 07-0/48).

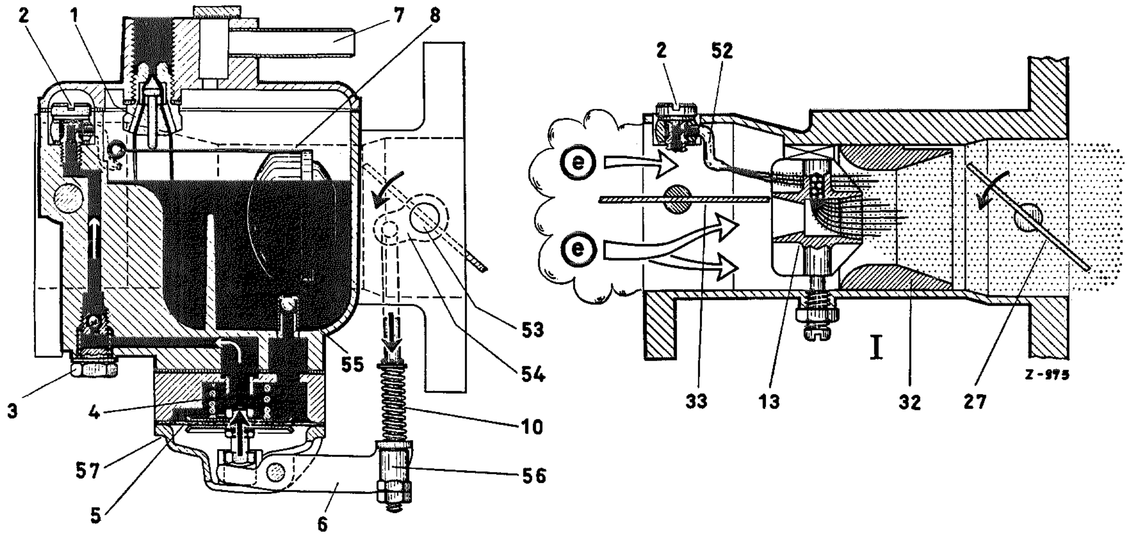


Fig. 07-0/48

Acceleration

I Stage 1

e) Entry of main air

1 Float needle valve
2 Pump jet
3 Ball valve of accelerating pump
4 Diaphragm spring
5 Pump diaphragm
6 Pump arm
7 Connection for fuel overflow line and float chamber ventilation
8 Float
10 Connecting rod with pressure spring
13 Diffuser
27 Throttle valve of stage 1
32 Air horn
33 Choke valve
52 Injection tube
53 Throttle valve shaft of stage 1
54 Transmission lever
55 Ball valve for accelerating pump
56 Adjusting nuts
57 Cover

Depending on the degree of vacuum obtaining in the suction canal, extra fuel can be drawn in from the pump system without operating the pump arm of the accelerating pump.

The injection amount of the accelerating pump can be varied by adjusting the adjusting nuts (56) on the connecting rod (10). When the nuts are tightened, the pump stroke and in consequence the injection amount is increased and vice versa.

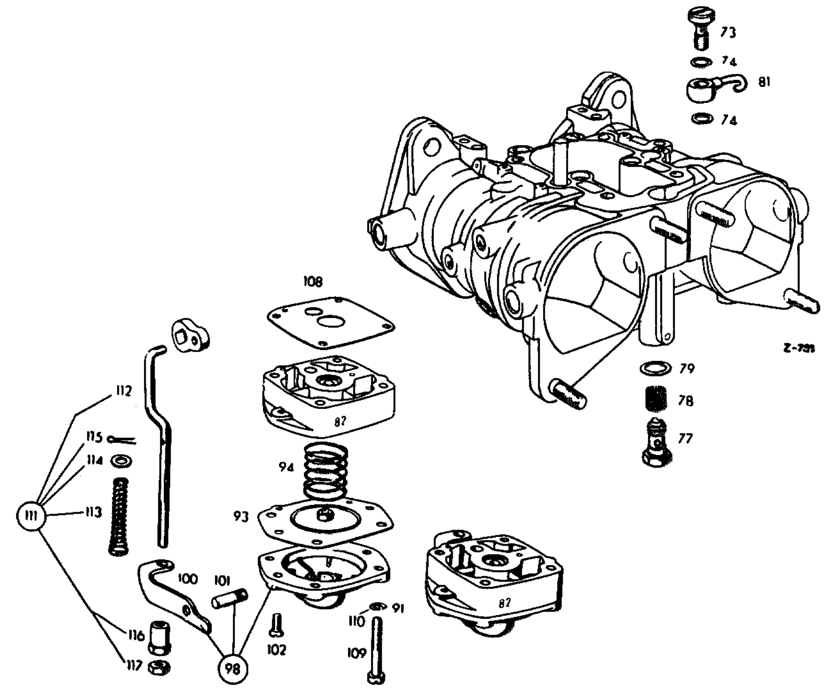


Fig. 07–0/49

Accelerating pump
(Die-cast carburetor)

13 Transmission lever on throttle valve shaft stage 1
73 Pump jet
74 Fiber sealing ring
77 Ball valve
78 Stainer for ball valve
79 Fiber sealing ring
81 Injection tube
91 Accelerating pump
93 Pump diaphragm
94 Diaphragm spring
98 Cover (complete)
100 Pump arm
101 Pump arm shaft
102 Oval head countersunk screw
108 Rubberised-fabric gasket
109 Cheese head screw
110 Lock washer
111 Connecting rod (complete)
112 Connecting rod
113 Pressure spring
114 Washer
115 Cotter pin
116 Shoulder nut (adjusting nut)
117 Hexagon nut (lock nut)

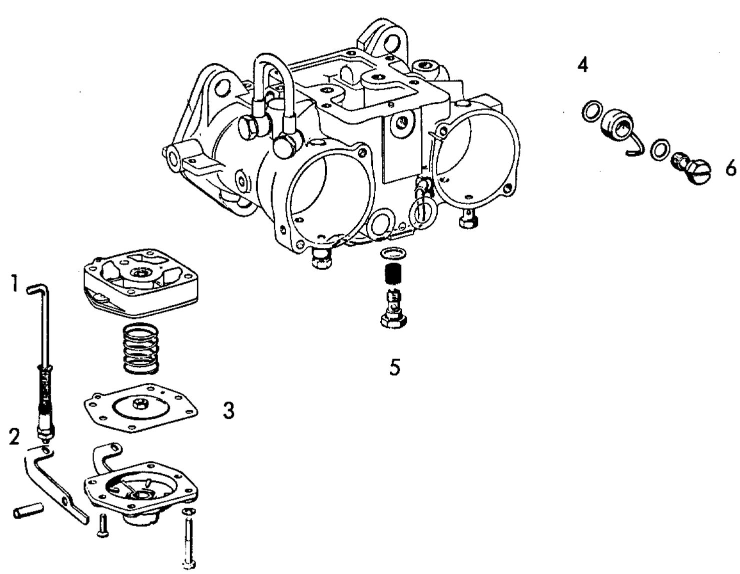


Fig. 07–0/50

Accelerating pump
(Sand-cast carburetor)

1 Connecting rod (complete)
2 Pump arm
3 Pump diaphragm
4 Injection tube
5 Ball valve
6 Pump jet

The adjusting nuts (56) must not be tightened until the pump arm (6) moves away from the diaphragm since in that case injection would not take place immediately the throttle valve is opened. The injection amount of the accelerating pump should be 0.4–0.6 cc/stroke. Adjustment of the injection amount is described in Job No. 01-3, Section H.

Note: a) This version of the neutral accelerating pump has no plate valve as a stop for the diaphragm.

b) In the case of the die-cast carburetor the fuel line to the accelerating pump is calibrated by the ball valve (55) with a diameter of 0.5 mm (installed as a standard part as from Engine End No. 55 01823). In all engines with Engine End Nos between 55 00709 (in which the first die-cast carburetors were installed) and 55 01822 the fuel line to the accelerating pump can be calibrated subsequently by installing the calibrated sleeve Part No. 000 071 03 40 on the ball valve (see also Job No. 01–3, Section I).

c) Sand-cast and die-cast carburetors differ in the arrangement of the canals in the carburetor housing and in the arrangement and design of the injection tube and the pump jet (Figs. 07-0/49 and 07-0/50).

G. Fuel Exhaust Device

When the throttle valves of stages 1 and 2 are suddenly closed at high engine speeds, some fuel may remain in the suction canals of the carburetors.

This would enrich the mixture in stage 2 and would have an undesirable effect both at idling speed and when the throttle valves are opened. For this reason the fuel left in stage 2 is drawn off via the fuel suction line (4) and passes into the suction canals of stage 1 and from there into the mixing chambers of te suction canals.

When the engine is not running, the fuel accumulating in stage 1 of both carburetors runs off through the fuel outlet line (16) and ensures that the engine will start properly when hot. The arrangement of the fuel suction line and the fuel outlet line for the die-cast carburetors is shown in Fig. 07–0/51.

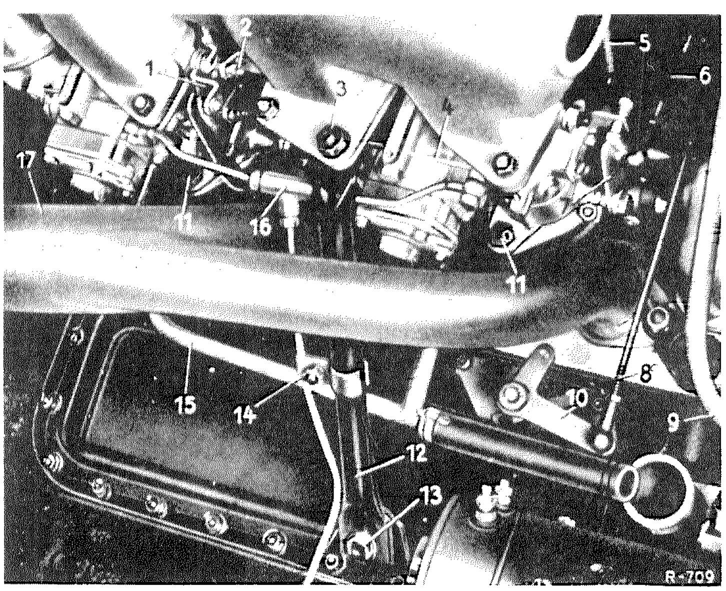


Fig. 07–0/51

1 Choke valve lever of rear carburetor
2 Choke valve lever of front carburetor
3 Hexagon nut
4 Fuel suction line
5 Return spring for carburetor linkage
6 Push rod from control shaft to throttle valve lever of front carburetor
7 Throttle valve lever
8 Push rod from angle lever on crankcase to control shaft
9 Fuel overflow line
10 Angle lever
11 Hexagon screw
12 Strut for supporting air suction tube
13 Hexagon screw
14 Pipe clip
15 Cooling water return line for pre-heating of intake pipe
16 Fuel outlet line
17 Exhaust manifold

In the die-cast carburetors the fuel suction line is firmly connected to the carburetor housing, whereas in the sandcast carburetors the line is connected from the outside (Fig. 07–0/52).

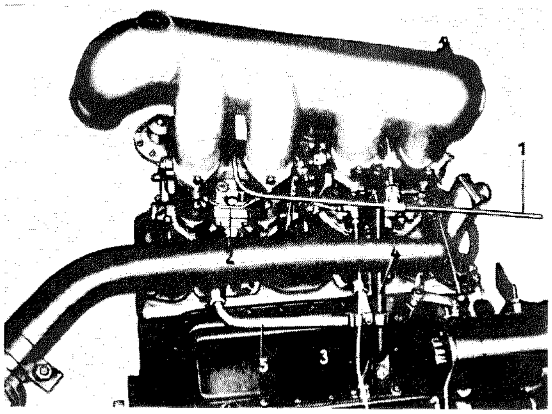


Fig. 07–0/52

1 Fuel overflow line
2 Fuel suction line
3 Fuel outlet line
4 Strut for supporting air suction tube
5 Cooling water return line for pre-heating of intake pipe

H. Hot-Start Mechanism

In order to ensure that the engine also starts at high outside temperatures a hot-start mechanism is incorporated in the carburetor system; it is operated by a pull knob and bowden cable from the instrument panel. When the hot-start control is pulled, the throttle valves of stage 2 are forced open by the angle levers. This enables the evaporated fuel to be drawn off quickly. As soon as the engine has started, the pull knob should be released quickly. The accelerator pedal must be depressed fully before the hot-start control is pulled since otherwise the throttle valves of stage 1 would be opened via the automatic return mechanism levers of stage 2 and this might result in a distortion of the levers (Figs. 07–0/53 and 07–0/54).

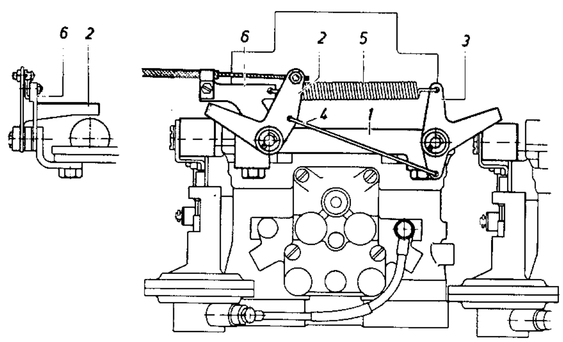


Fig. 07–0/53

1 Bearing bracket
2 Angle lever for rear carburetor
3 Angle lever for front carburetor
4 Connecting strap
5 Return spring
6 Bracket for return spring on bearing bracket

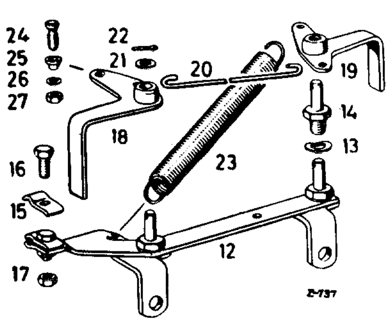


Fig. 07–0/54

12 Bearing bracket for hot-start control
13 Spring washer
14 Pivot pin
15 Fixing clip for hot-start control
16 Hexagon screw
17 Hexagon nut
18 Rear angle lever for hot-start control
19 Front angle lever for hot-start control
20 Connecting strap for angle lever
21 Washer
22 Cotter pin
23 Return spring
24 Fixing screw for bowden cable on angle lever
25 Bushing
26 Washer
27 Hexagon nut

Under normal conditions the hot-start mechanism is not required for starting the engine at normal running temperature; fully depress the accelerator pedal as usual.

I. Installation of Electrical Idle Cut-Out Valves

Engines with high compression ratios have a tendency to self-ignition when fuels of low anti-knock value are used and when outside temperatures are high; as a result, there is after-firing when the engine is switched off.

Fuels should have a minimum anti-knock rating of 92 according to the research method (ROZ); when fuels of a lower anti-knock rating are used and heavy after-firing occurs when the engine is switched off, electrical idle cut-out valves manufactured by the firm of Solex can be subsequently installed in the die-cast carburetors (Fig. 07–0/56).

Note: Because of the different arrangement of the idle fuel jets these electrical idle cut-out valves cannot be subsequently installed in sand-cast carburetors.

The idle cut-out valves (Part No. 000 071 02 92), together with the special idle fuel jets size 55 (Part No. 000 071 28 36) are screwed in in place of the standard idle fuel jets. When the ignition is switched on, the electro-magnet (8) in the valve moves the magnet core (2), the valve needle (9) opens up the idle fuel jet (1) and the idle system of the carburetor can fulfil its normal function.

When the ignition is switched off, the current to the electro-magnet (8) is interrupted and the valve needle (9) is forced on to the sealing cone (10) by a pressure spring (3). Now the idle system is cut off from its fuel supply and after-firing of the engine is therefore no longer possible.

If anything should happen to interrupt the electrical operation of the valve (blown fuse, burnt-out electro-magnet, etc.), it is possible to put the cut-out valve out of operation in the open position by unscrewing the threaded sleeve (4) (Fig. 07–0/55) after having removed the valve cap (5).

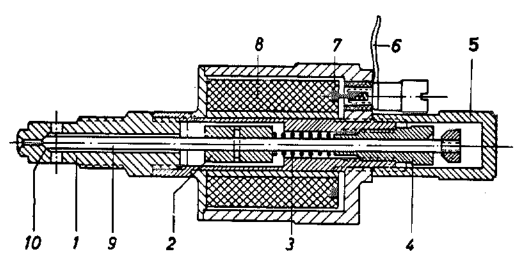


Fig. 07–0/55

1 Idle fuel jet
2 Magnet core
3 Pressure spring
4 Threaded sleeve
5 Valve cap
6 Electric lead
7 Contact ring
8 Electro-magnet
9 Valve needle
10 Sealing cone

In engines from Engine End No. 55 00709 (in which the die-cast carburetors were first installed) to Engine End No. 55 01822 these cut-out valves can be installed subsequently only when the mixing tube No. 43 has been installed in stage 1 and if the fuel flow to the accelerating pump is regulated by a calibrated sleeve.

As from Engine End No. 55 08123 mixing tube No. 43 has been installed in stage 1 as a standard part and the fuel line to the accelerating pump has been calibrated (see also Job. No. 01–3, Section I).

Work Involved

1. Unscrew the idle fuel jets of stage 1 on both carburetors and screw in the complete idle cut-out valves (1), together with the special jets (see Fig. 07–0/56).

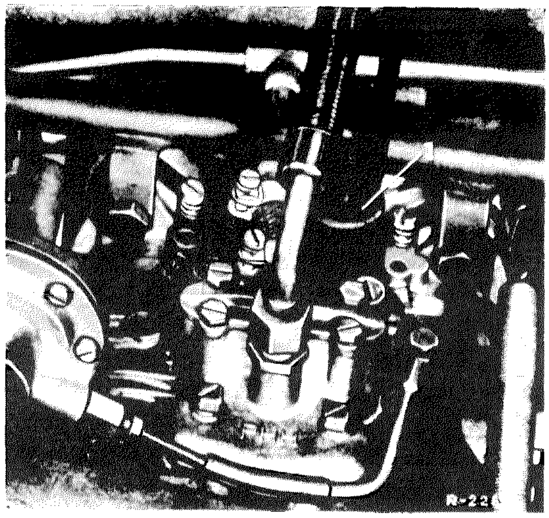


Fig. 07–0/56

1 Solex electrical idle cut-out valve,
(Part No. 000 071 02 92)
with special jet size 55
(Part No. 000 071 28 36).

Note: The standard idle fuel jets cannot be used when the idle cut-out valves are installed.

2. Connect the two idle cut-out valves by a cable 400 mm long and fasten the cable to the fuel line with a cable holder. Lay a cable 1100 mm long from the idle cut-out valve of the rear carburetor along the hot-start control cable to the cowl and then lay the cable, together with the lead of the flash signal mechanism through the rubber grommet into the interior of the car and to the fuse box. Then fix the cable to the hot-start control cable and the fuel line by four cable holders (Fig. 07–0/57).

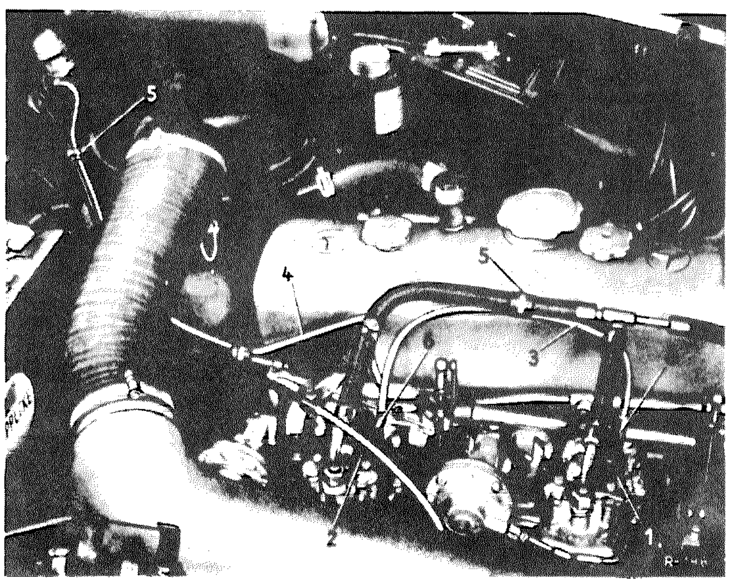


Fig. 07–0/57

1 Idle cut-out valve on front carburetor
2 Idle cut-out valve on rear carburetor
3 Cable 400 mm long
4 Cable 1100 mm long
5 Cable holder with pad
6 Rubber hose

3. Connect the cable leading from the idle cut-out valves to the fuse box to the consumer side of the 8-ampere fuse (No. 3 or No. 4), together with the horn or reversing light switch cables.

Note: a) The cable must have a section of at least 1 sq. mm. Cover the cable sockets on the idle cut-out valves with an oil and fuel-resistant rubber hose so that no parts are exposed. Use suitable small cable sockets (e. g. the 3.5×0.5 mm sockets produced by the firm of Noris) for connecting the cable to the idle cut out valves in order to exclude the danger of short-circuits. To prevent possible damage use a pad between the cable holder (5) and the cable (see Fig. 07-0/57).

b) When adjusting the idle make quite sure that the idle mixture adjustment screw of stage 2 and the throttle valve of stage 2 are completely closed on both carburetors (see Job No. 01-3, Section K).

K. Technical Specifications of Solex Compound Crossdraft Carburetor Type 44 PHH

Details of the Carburetor	Model 190 SL			
	Sand-Cast Carburetor (Installed up to Engine End No. 55 00708)		**Die-Cast Carburetor** (Installed as from Engine End No. 55 00709)	
	Stage 1	Stage 2	Stage 1	Stage 2
Suction canal diameter	40		40	
Air horn "K"	26	—	26	—
Main jet "G"	125	180	130	160
Air correction jet "a"	170	120	180	160
Mixing tube "s"	1	19	43	42
Mixing tube holder (reserve) (cast into carburetor housing)	7	7	7	7
Idle fuel jet "g"	50	50	55	55
Idle air jet "u"	1.7	—	—	—
Idle air bore	—	1.7	1.7	1.7
Accelerating pump	No. 82 (neutral)		No. 82 (neutral)	
Injection amount cc/stroke	0.4–0.6		0.4–0.6	
Pump jet "Gp"	40		50	
Injection tube	Special version (0.4 graded)		Special version (0.8 graded)	
Float needle valve	2.0		2.0	
Float weight (brass float) g	10		10	
Float adjustment mm	39–40		37–38	
Angle of inclination of throttle valves	13°	13°	13°	17°
Angle of inclination of choke valve	13	—	13°	—
By-pass bores mm ⌀	1.3/1.7	1.3/1.7	1.3/1.7	1.7

Note: a) Mixing tube "s" has been installed as a standard part, together with the calibrated fuel line to the accelerating pump as from Engine End No. 55 01823. From Engine End No. 55 00709 (when the die-cast carburetors were first installed) to Engine End No. 55 01822, mixing tube "s" 42 was installed and the fuel line to the accelerating pump was not calibrated.

b) Idle fuel jets "g" 55 have been installed as standard parts as from Engine End No. 65 01365. Up to Engine End No. 65 01364 idle fuel jets "g" 50 were used.

c) The dimension given for the float adjustment refers to the distance from the separating surface of the carburetor cover (with gasket) to the upper edge of the vertical float wall.

d) On the die-cast carburetors the throttle valve of stage 2 has been installed at an angle of 17° as from Engine End No. 65 01133. Up to Engine End No. 65 01132 the throttle valve angle of inclination was 13°

e) The by-pass bore in the suction canal of stage 2 in the die-cast carburetor has a diameter of 1.7 mm as from Engine End No. 65 01133. Up to Engine End No. 65 01132 the suction canal of stage 2 had two by-pass bores with a 1.3 and 1.7 mm diameter.

V. Carburetor Altitude Adjustment

A. General

At high altitudes the carburetor, with a standard set of jets delivers too rich a mixture, a result of the decrease in atmospheric pressure. Engine performance will drop and fuel consumption will become unnecessarily high; to prevent this it is generally sufficient to provide the carburetor with a smaller main jet to re-establish the correct fuel-to-air mixture in order to attain the highest possible performance at the prevailing atmospheric pressure. On the compound carburetors of models 190 190 b, 220 S and 190 SL only the main jets of the 1st stage need be replaced by smaller ones. Basically the main jet for altitude adjustment should be selected as small as possible, though the drop in performance should not be too high. If the main jets installed for altitude driving is too small, or if a main jet, selected for altitude operations is run at full load in normal altitudes, there is the danger that the engine will overheat because the mixture supplied by the carburetor is too lean

B. Selection of Main Jets

For proper selection of main jets for altitude adjustment with regard to the individual models refer to the table below which provides data on size of main jets.

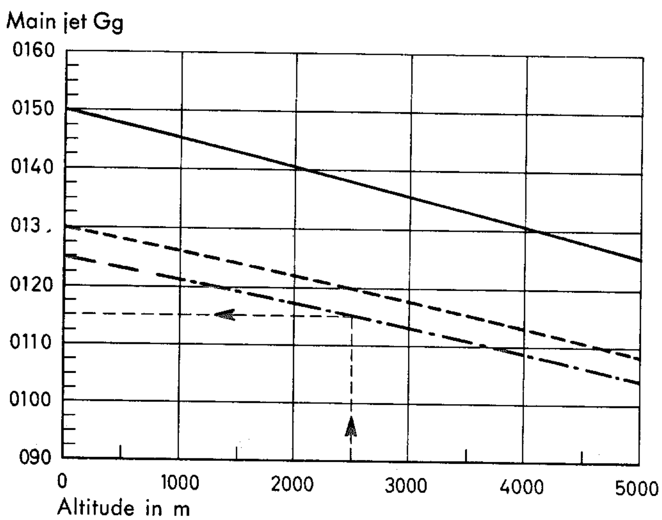


Fig. 07–0/58

———— With standard main jet "Gg" 0150: Models 180 a, 180 b

– – – – – With standard main jet "Gg" 0130: Models 220a, 219 (up to engine end No. 10–9501618 and 11–9500383). Model 190 SL (with die-cast carburetors)

— · — With standard main jet "Gg" 0125: Models 180, 190 190 b, 220 S Model 219 (as from engine end No. 10–9501619 and 11–9500384) Model 190 SL (with sand-cast carburetors)

Example: Model 180

Standard main jet:	"Gg" 0125
Main jet at 2500 m altitude:	"Gg" 0115

C. Solex Altitude Corrector

Instead of changing to smaller main jets, models 180 a, 180 b, 180 c, 190, 190 b and 220 S may use Solex altitude correctors, together with the standard main jets. By means of the altitude corrector the engine will receive the correct fuel/air mixture for any altitude or any atmospheric pressure. The altitude corrector is particularly recommended for vehicles which drive frequently both at normal and at high altitudes.

The aneroid compensator built into the altitude corrector controls the fuel supplied to the main jet automatically in dependence of the prevailing atmospheric pressure (Fig. 07–0/59).

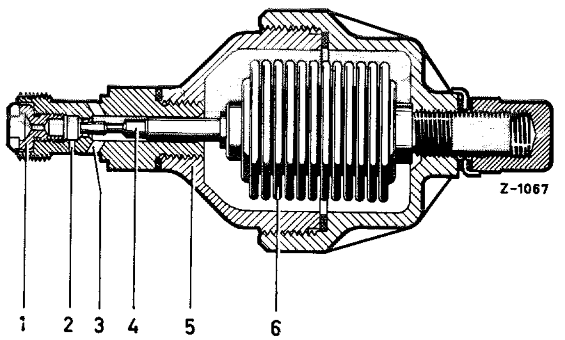


Fig. 07–0/59

1 Main jet
2 By-pass bore
3 Fuel intake bore
4 Needle
5 Housing
6 Capsule pack

There are different altitude correctors for the various models (refer to table).

Model	Altitude Corrector Part No.	By-pass bore mm diameter	Main jet "Gg"
180, 180 a, 180 b	000 072 02 05	1.3	0150
180 c	000 072 04 05		0145
190, 190 b, 220 S	000 072 01 05	1.0	0125

Note: a) For compound downdraft carburetors of models 190, 190 b and 220 S the altitude corrector is used only for the main jet of the 1st stage.

b) On the double downdraft carburetor of models 219, 220 a, and on the compound crossdraft carburetor of model 190 SL the altitude corrector can not be installed for lack of space.