Section II
ENGINE

The longitudinal and cross sections of the engine are shown in Figs 2-1 and 2-2.

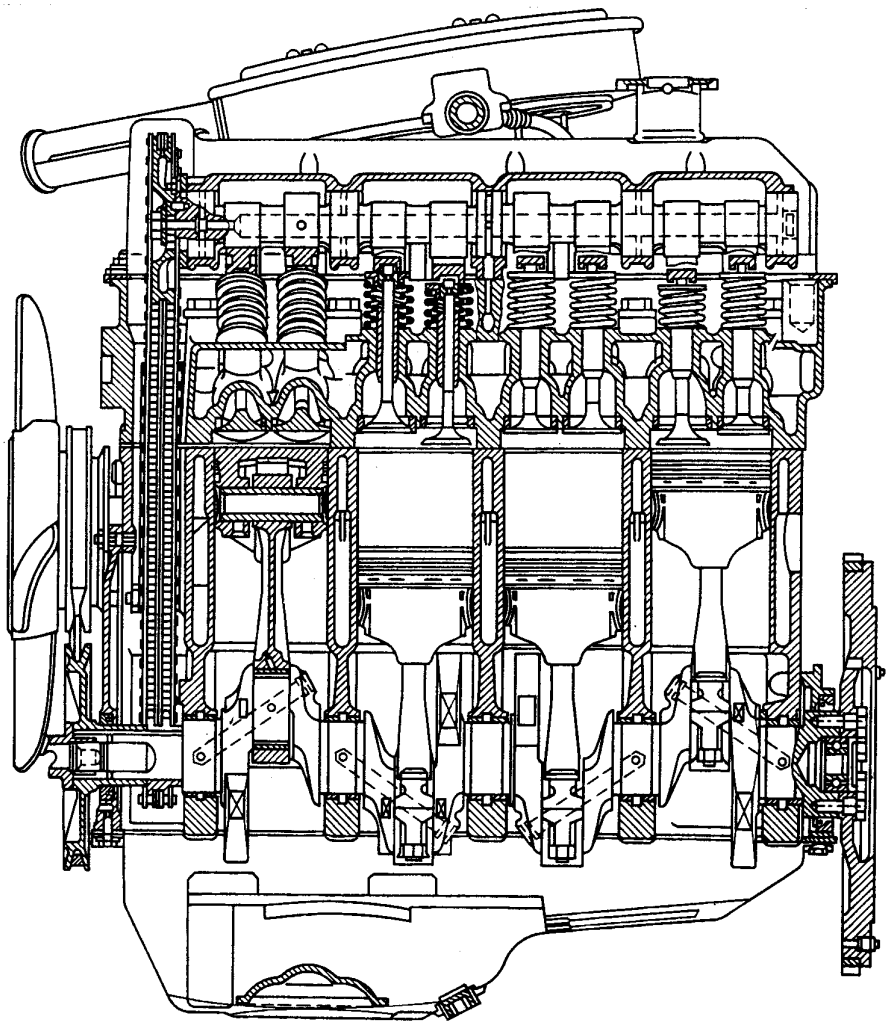


Fig. 2-1. Engine. Longitudinal Section

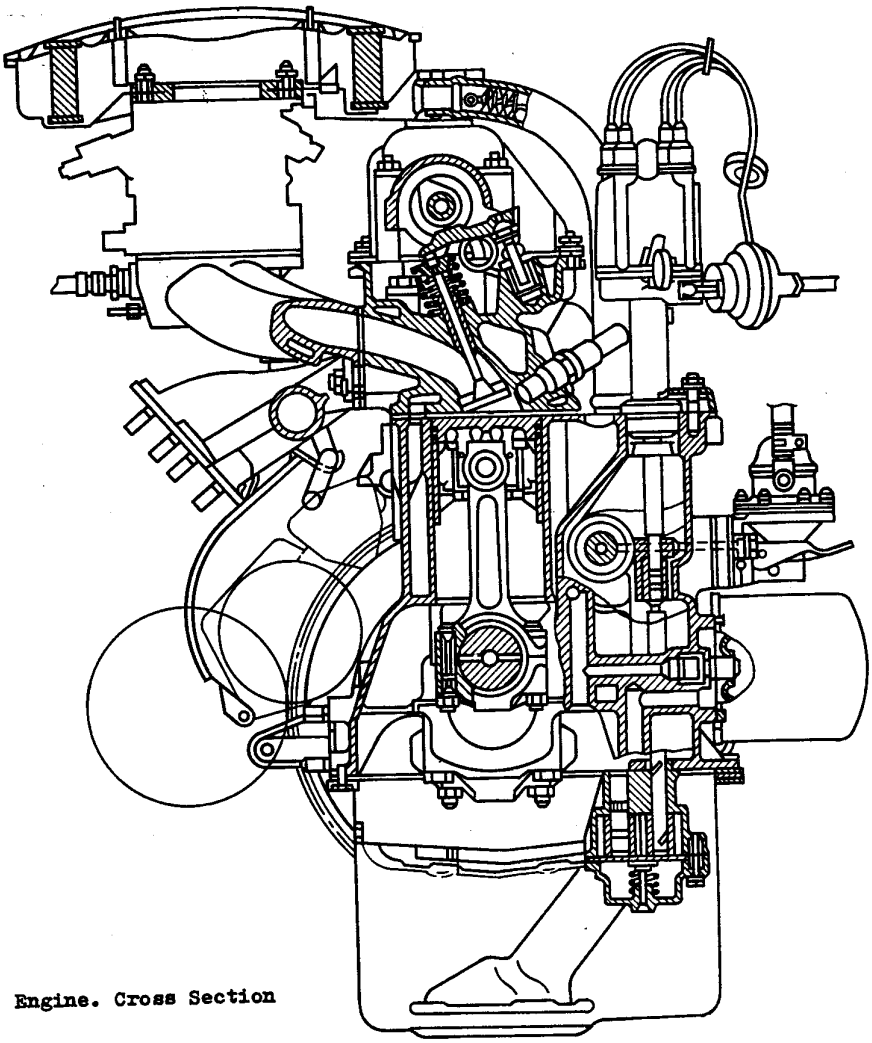


Fig. 2-2. Engine. Cross Section

TROUBLE SHOOTING

Cont'd

Cause	Remedy
Engine Fails to Start	
1. No. fuel in carburettor:	
(a) fuel pipes or carburettor and fuel pump filters clogged	(a) wash and airblast fuel tank and pipes and filters
(b) fuel pump faulty	(b) examine fuel pump and replace faulty parts
2. Ignition system inoperative	2. See Chapter "Ignition System"
3. Carburettor choke valve remains closed when starting engine	3. Eliminate poor tightness of carburettor choke mechanism
Engine Runs Unevenly or Stalls When Idling	
1. Wrong idling adjustment	1. Adjust idling speed
2. Air inleakage through damaged drain pipe	2. Replace drain pipe
3. Air inleakage through damaged hose leading from intake manifold to brake vacuum booster	3. Replace damaged hose
4. Air inleakage through gaskets in joints between intake manifold and carburettor or cylinder head	4. Tighten up nuts or replace gaskets
5. Wrong clearances between valve rockers and camshaft cams	5. Adjust clearances
6. Carburettor faulty:	
(a) carburettor	(a) airblast jets and

Cont'd

Cause	Remedy
jets or channels obstructed	channels
(b) water in carburettor	(b) remove water from carburettor, drain sediment from fuel tank
(c) choke mechanism diaphragm leaky	(c) replace diaphragm
7. Ignition system faulty	7. See Chapter "Ignition System"

Engine Lacks Power and Pickup

1. Carburettor throttle valves open incompletely	1. Adjust throttle valve control linkages
2. Air cleaner clogged	2. Replace cleaner element
3. Ignition system faulty	3. See under "Ignition System"
4. Fuel pump faulty	4. Check pump performance and replace damaged parts
5. Carburettor faulty:	
(a) acceleration pump defective	(a) check pump capacity, replace faulty parts
(b) main jets clogged	(b) airblast jets
(c) choke valve opens incompletely	(c) adjust choke valve linkage
(d) wrong fuel level in float chamber	(d) adjust carburettor float setting
6. Wrong valve rocker-to-cam clearances	6. Adjust clearances
7. Poor compression, below 1 MPa (10 kgf/cm^2):	
(a) defective cylinder head gasket	(a) replace gasket
(b) burning of pistons, breaking or sticking of piston rings	(b) decarbonize piston grooves and rings, replace defective rings and pistons
(c) poor seating of valves	(c) replace faulty valves, reface seats
(d) excessive wear of cylinders and piston rings	(d) replace pistons, rebore and hone cylinders

Crankshaft Main Bearing Knocks

As a rule this knocking is of a dull metallic nature, detected when the throttle valve is sharply opened at idling speed. Grows with increase of crankshaft speed. Excessive crankshaft end play causes a sharper sound with uneven intervals most conspicuous during gradual throttling up and down

Cont'd

Cause	Remedy
1. Spark advance angle too early	1. Adjust ignition timing
2. Oil pressure too low	2. See "Oil Pressure Too Low at Idling Speed"
3. Loosening of flywheel bolts	3. Tighten up to specified torque
4. Excessive clearance between main journals and their bearing shells	4. Grind journals and replace shells
5. Excessive clearance between thrust half-rings and crankshaft	5. Replace thrust half-rings by new and thicker ones

Big-End Bearing Knocks

Usually knocking of big-end bearings is sharper than that of the main bearings. It is heard at engine idling speed when the throttle valve is sharply opened. The origin of knocking can be easily identified by disconnecting spark plug wires one after another.

1. Insufficient oil pressure	1. See "Oil Pressure Too Low at Idling Speed"
2. Excessive clearance between big-end journals and shells	2. Replace shells and grind journals

Piston Slaps

As a rule it is a dull knocking caused by slackness of piston in the cylinder. It is best audible at a low engine speed and under a load.

1. Excessive piston-to-cylinder clearance	1. Replace pistons, rebore and hone cylinders
2. Excessive piston ring side clearance	2. Replace rings or pistons with rings

Valve Knocks

Excessive clearances in valve gear cause characteristic knocks, usually with regular intervals. Knocking frequency is lower than that of any other engine knocks, since the valves are operated by the camshaft which rotates at half the crankshaft speed.

1. Excessive valve-to-rocker clearances	1. Adjust clearances
2. Valve spring broken	2. Replace spring
3. Excessive clearance between valve stem and guide	3. Replace worn parts
4. Wear of camshaft cams	4. Replace camshaft and valve rockers
5. Loosening of adjusting bolt locknut	5. Adjust valve rocker-to-cam clearance and tighten locknut

Cont'd

Cause	Remedy

Camshaft Drive Chain Noise

The camshaft drive chain noise becomes noticeable against the background of general engine noise in case of excessive clearances between the chain and sprockets and it is particularly loud at low engine speed.

1. Chain becomes slack through natural wear	1. Tension chain
2. Chain tensioner shoe or damper broken	2. Replace tensioner shoe or damper
3. Chain tensioner plunger rod jamming	3. Eliminate jamming

Oil Pressure Too Low at Idling Speed of Warm Engine

1. Foreign matter getting under reducing valve of oil pump	1. Clean valve of foreign matter and burrs, wash out oil pump
2. Oil pump gears worn	2. Repair oil pump
3. Excessive clearance between crankshaft main journals and bearing shells	3. Grind journals and replace shells

Oil Pressure Too High in Warm Engine

Oil pump reducing valve jamming	Replace valve

Excessive Oil Consumption

1. Oil leaking past engine seals	1. Tighten fastenings or replace gaskets and glands
2. Wear of piston rings, pistons or cylinders	2. Rebore cylinders and replace pistons and rings
3. Broken piston rings	3. Replace rings
4. Gummed slots in oil control rings or cutouts in piston grooves	4. Remove carbon deposits from slots and cutouts
5. Valve oil-deflecting caps worn or damaged	5. Replace caps
6. Heavy wear of valve stems or guides	6. Replace valves, repair cylinder head

Excessive Fuel Consumption

1. Choke valve fails to open completely	1. Adjust choke valve linkage
2. High resistance to car motion	2. Check and adjust tyre pressure, brake system, front wheel alignment
3. Wrong ignition timing	3. Adjust ignition timing

Cont'd

Cause	Remedy
4.* Ignition distributor vacuum spark timer faulty	4.* Replace vacuum timer or ignition distributor
5. Carburettor fuel level too high:	
(a) carburettor needle valve or its gasket leaky	(a) look for foreign particles between valve seat and needle; replace gasket or valve, if necessary
(b) jamming or friction interfering with normal motion of float; float leaky	(b) examine float and replace it, if necessary
6. Carburettor air jets clogged	6. Clear up jets

Engine Overheats

1. Slackening of pump and alternator drive belt	1. Adjust belt tension
2. Lack of coolant in cooling system	2. Add coolant into cooling system
3. Wrong ignition timing	3. Adjust ignition timing
4. Radiator heavily soiled on outside	4. Clean radiator with jet of water
5. Thermostat faulty	5. Replace thermostat
6. Defective valve in radiator cap [opening pressure below 0.05 MPa (0.5 kgf/cm^2)]	6. Replace cap
7. Coolant pump faulty	7. Check, replace or repair coolant pump

Rapid Drop of Coolant Level in Expansion Tank

1. Radiator damaged	1. Replace or repair radiator
2. Damaged hoses or pipe joint gaskets	2. Replace damaged hoses or gaskets
3. Coolant leaking from heater cock	3. Replace cock
4. Loosening of hose clamps	4. Tighten up clamps
5. Coolant leaks through coolant pump gland	5. Replace gland
6. Radiator cap or its gasket damaged	6. Replace cap
7. Cylinder head gasket damaged	7. Replace gasket

* Defects relating to the engines with carburettor 2107-1107010-20.

Place the car on a lift or inspection pit. emove the hood. Take away the spare wheel and emove its supporting tube.

Disconnect the wires from the storage battery id from the engine-mounted electrical devices.

Drain the coolant from the radiator, cylin-er block and heater; for this purpose unscrew the lugs on the L.H. side of the cylinder block and a the radiator bottom tank; shift the heater ontrol upper lever to the right (this lever pens the heater cock) and take off the caps from he expansion tank and the radiator.

Caution

To avoid damaging the radiator, unscrew the rain plug with one wrench and hold the plug union oldered into the radiator with another. Preferab-y use a socket or box wrench not to mutilate the lug faces

emove the fan shroud, first disconnecting ts halves. Disconnect the coolant inlet and out-et hoses from the engine and take off the radia-or complete with the thermostat and hoses.

Remove the air cleaner, first disconnecting he hoses, removing the cover and the filter ele-ent.

Unscrew the nuts which hold the muffler inlet pipe to the exhaust manifold. Detach the inlet pipe from the bracket on the gearbox and ease it down.

Detach the throttle valve control rod and choke valve cable from the engine.

Disconnect the fuel feed hose from the engine and detach the hoses laid to the heater and vacuum brake booster.

Using articulated socket wrench 02.7812.9500, unscrew the bolts which hold the starter to the clutch housing. Unscrew the bolts which fasten the clutch housing cover to the lower part of the housing. Using articulated socket wrench A.55035, turn off the clutch housing-to-cylinder block bolts.

Suspend cross beam TCO-3/379 from a lifting tackle and sling the engine by the shackle installed on the exhaust manifold front fastening stud at the R.H. side and by the clutch housing fastening hole at the L.H. side.

Tension the tackle chain a little, unscrew the nuts which fasten engine front mount pads 3 (Fig. 2-3) to the side brackets and unscrew the nuts and the bolt which fastens the front axle housing to the engine brackets.

Take out the engine, first moving it upward to withdraw the mount pad bolts from the bracket holes, then shift it forward so as to pull the end of the gearbox clutch shaft out of the bearing in the crankshaft flange.

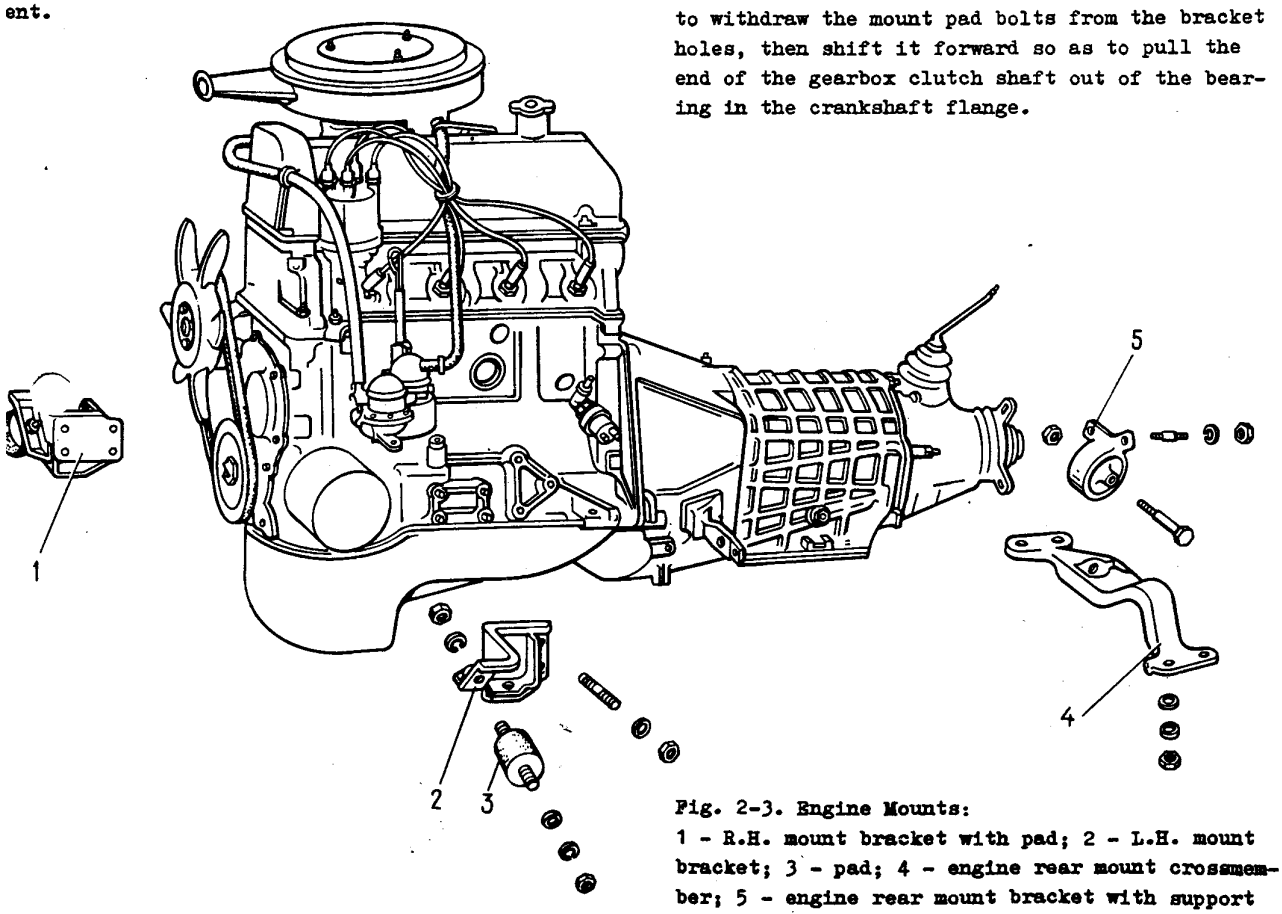


Fig. 2-3. Engine Mounts:
1 - R.H. mount bracket with pad; 2 - L.H. mount bracket; 3 - pad; 4 - engine rear mount crossmember; 5 - engine rear mount bracket with support

Remove the heat-insulating shield of the starter, the starter proper and the hot air intake complete with the inlet hose. Remove two side brackets from the cylinder block complete with the engine front mount pads.

Unscrew the clutch fastening bolts and remove the clutch.

To install the engine reverse the removal operations. Pay particular attention to the connection of the engine with the gearbox: the clutch shaft should enter accurately into the splines of the clutch driven disc. Besides, for proper alignment of the engine with the transfer case, the aligning washers of the engine front mount pads must enter the corresponding holes in the side brackets.

ENGINE DISASSEMBLY

Wash the engine on the washing stand, put it on the disassembly bench and drain the oil sump.

Disconnect the hoses and throttle valve control rod from the carburettor and remove the latter.

Remove the fuel pump and ignition distributor; unscrew the spark plugs and the coolant temperature transmitter with wrench 67.7812.9514.

Take off the alternator and coolant pump drive belt, remove the alternator and its bracket.

Remove the coolant pump, disconnecting the heater pipe from the pump and exhaust manifold.

Detach the coolant outlet pipe and the pipe conducting coolant to the heater and remove them from the cylinder head.

Using remover tool A.60312 unscrew and take off the oil filter with the gasket (Fig. 2-4).

Unscrew the oil pressure and oil pressure warning lamp transmitters and remove their unions. Take off the crankcase breather cover, the oil sump and the oil pump. Take off the retainer of the oil separator drain pipe and take out the crankcase breathing oil separator.

Remove the crankshaft pulley securing the flywheel with fixing tool A.60330/R (Fig. 2-10) and unscrewing the crankshaft starting jaws with wrench A.50121 (Fig. 2-5).

Remove the cylinder head cover and the cover of the camshaft chain drive. Unscrew the bolts of the camshaft and oil pump drive shaft sprockets.

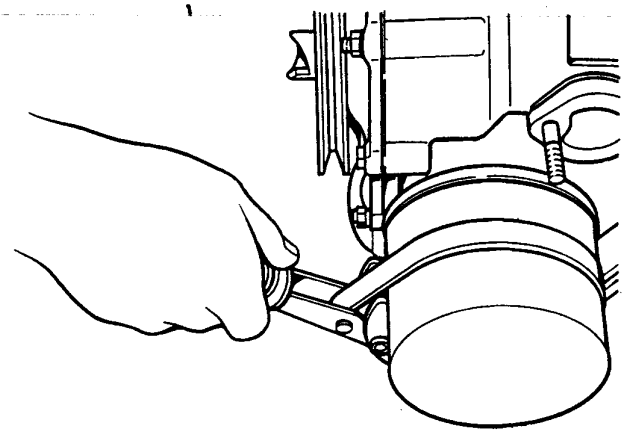


Fig. 2-4. Removing Oil Filter with Remover Tool A.60312

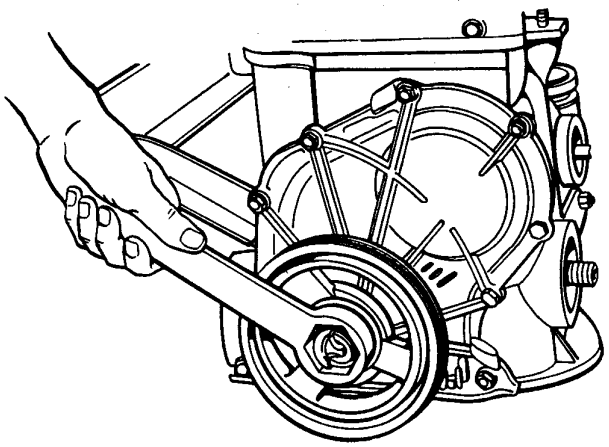


Fig. 2-5. Unscrewing Crankshaft Starting Jaw with Wrench A.50121

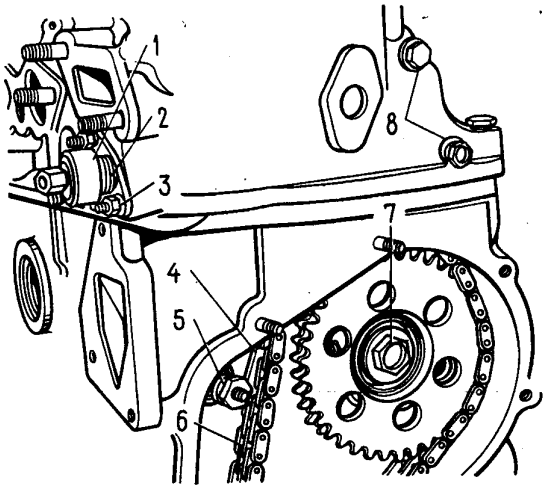
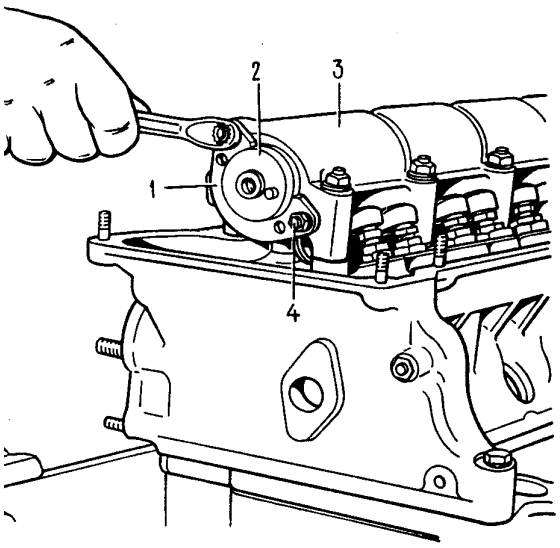
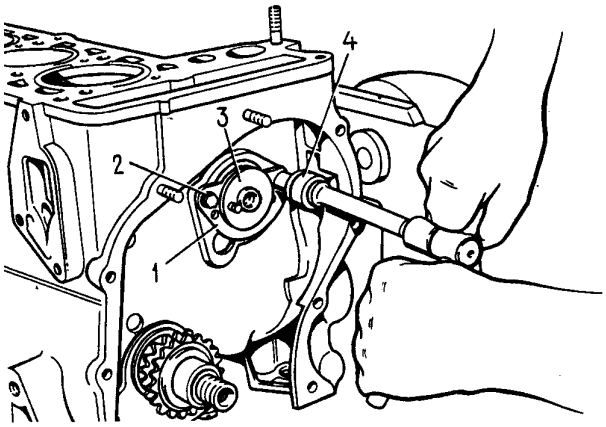


Fig. 2-6. Removing Chain Tensioner and Damper:
1 - tensioner cap nut; 2 - tensioner body;
3 - tensioner fastening nut; 4 - tensioner shoe;
5 - shoe bolt; 6 - camshaft drive (timing) chain;
7 - oil pump drive shaft sprocket bolt; 8 - damper bolts

Loosen cap nut 1 (Fig. 2-6) of the chain tensioner, unscrew nuts 3 which hold it to the cylinder head, remove the tensioner and, unscrewing bolt 5, take off chain tensioner shoe 4.



g. 2-7. Removing Camshaft Thrust Flange:
- ust flange; 2 - camshaft; 3 - bearing housg; - thrust flange fastening stud



g. 2-8. Removing Oil Pump Drive Shaft:
- thrust flange; 2 - flange bolt; 3 - oil pump
iv haft; 4 - wrench

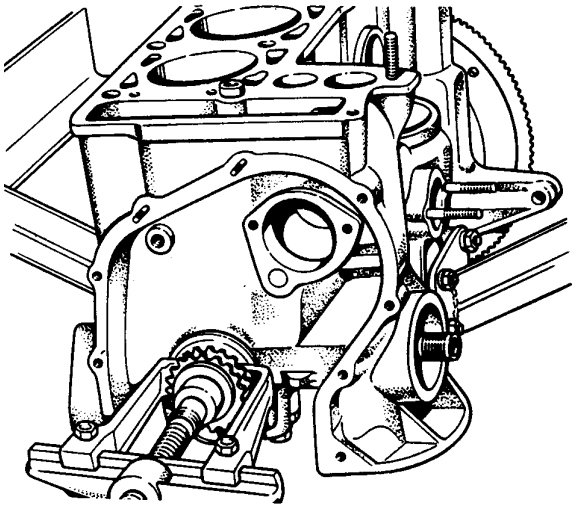


Fig. 2-9. Removing Crankshaft Sprocket with General-Purpose Remover Tool A.40005/1/7

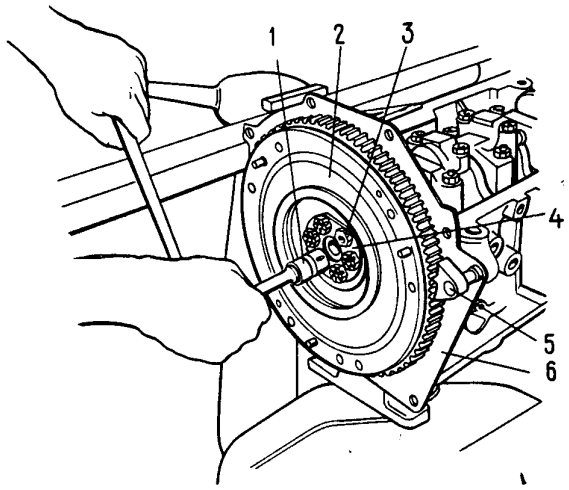


Fig. 2-10. Removing Flywheel:
1 - wrench; 2 -flywheel; 3 - flywheel bolt;
4 - washer; 5 - fixing tool A.60330/R to prevent turning of flywheel; 6 - clutch housing front cover

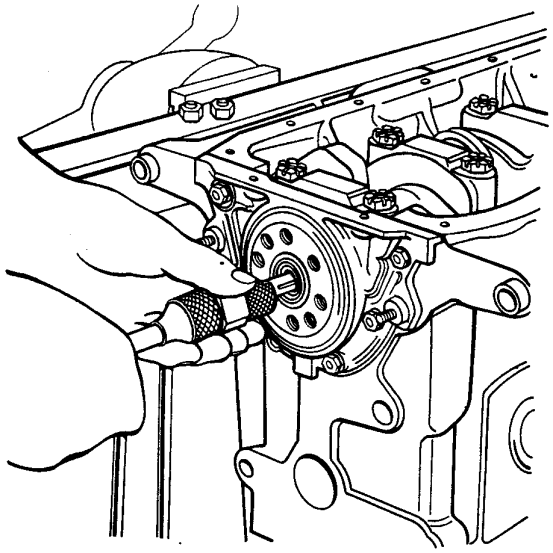


Fig. 2-11. Pressing Out Gearbox Shaft Bearing from Crankshaft with Remover Tool A.40006

Unscrew the chain limiting pin, take off the drive sprockets of the oil pump and camshaft and take out the chain.

Loosen the nuts of studs 4 (Fig. 2-7). Take off the camshaft bearing housing. Unscrew the nuts of studs 4, remove thrust flange 1 and take out the camshaft taking care not to damage the surfaces of the bearing housing supports.

Unscrew the cylinder head bolts and take off the head complete with the exhaust and intake manifolds.

Remove thrust flange 1 (Fig. 2-8) of the oil pump drive shaft and take the shaft out of the cylinder block.

Using general-purpose remover tool A.40005/1/7 from set A.40005, remove the sprocket from the crankshaft (Fig. 2-9).

Unscrew the connecting rod bolt nuts, take off the connecting rod caps and lift out the pistons with the connecting rods cautiously through the cylinders.

Note. When disassembling the engine, mark the piston, connecting rod, main and big-end bearing shells so as to install them back where they belong during subsequent reassembly.

Install fixing tool 5 (Fig. 2-10), unscrew bolts 3, take off washer 4 and pull the flywheel from the crankshaft. Remove the front cover of the clutch housing.

Using remover tool A.40006, take out the gearbox clutch shaft bearing from its bore in the crankshaft (Fig. 2-11).

Remove the crankshaft gland holder.

Unscrew the main bearing cap bolts, take out the caps complete with the lower shells, remove the crankshaft, the upper shells and the thrust half-rings on the rear support.

ENGINE ASSEMBLY

Put a washed and cleaned cylinder block on the stand and screw in any missing studs.

Insert shells without grooves into the bed and cap of the middle bearing; install shells with grooves into the remaining bearing beds and caps.*

Note. The engine cylinders, pistons and glands, bearing shells and thrust half-rings of the crankshaft should be lubricated with engine oil before installation.

Place the crankshaft on the main bearings and insert two thrust half-rings into the sockets of the rear support (Fig. 2-12); the half-rings should be selected by thickness as instructed under "Crankshaft and Flywheel". Install the main bearing caps in accordance with their marks (Fig. 2-13).

Caution

Install the main bearing caps into the cylinder block where they belong. For this purpose the cylinder block and its bearing caps are marked with the same conventional number (Figs 2-13 and 2-24).

Install the thrust half-rings with their recesses facing the thrust surfaces of the crankshaft. The steel-aluminium half-ring should be placed at the front side of the rear support and the cerametallic (yellow) half-ring, at the rear side.

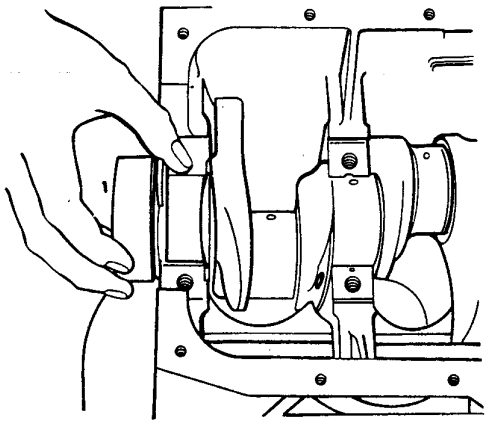


Fig. 2-12. Installing Thrust Half-Rings on Rear Support

Put the gland holder gasket on the crankshaft flange and insert the clutch housing front cover bolts into the holder holes (Fig. 2-14). Slip the holder with the gland on mandrel 41.7853.4011, move it from the mandrel onto the crankshaft flange and fasten it to the cylinder block.

Install clutch housing front cover 6 (Fig. 2-10) with the aid of two aligning bushings.

Install the flywheel on the crankshaft with the mark (tapered hollow) near the rim facing the axis of the big-end journal of No. 4 cylinder, lock the flywheel with fixing tool A.60330/R and bolt it up to the crankshaft flange.

Using an inserter bushing from set 02.7854.9500, insert the pistons with connecting rods into the cylinders (Fig. 2-15). Set 02.7854.9500 comprises an inserter bushing for the standard-size pistons and bushings for the repair-size pistons (0.4 and 0.8 mm oversize). Therefore, select the inserter bushing corresponding to the size of the piston being installed.

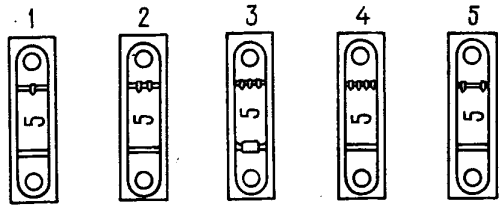


Fig. 2-13. Marks on Main Bearing Caps (bearings are counted from engine front) and Cylinder Block Code Number

* Since 1986 lower shells of the main bearings without grooves on the inner surface are used.

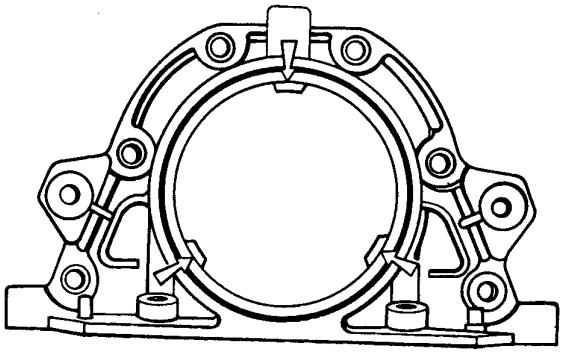
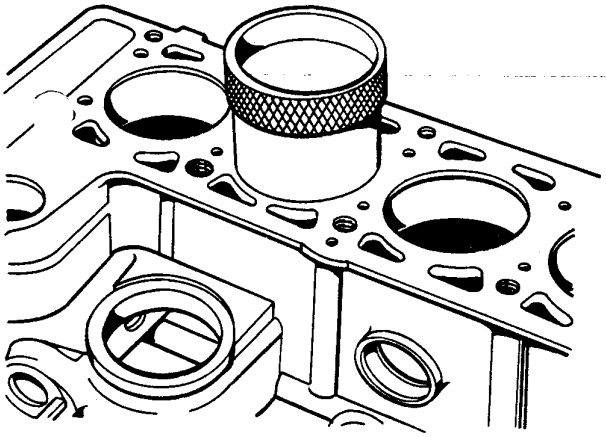
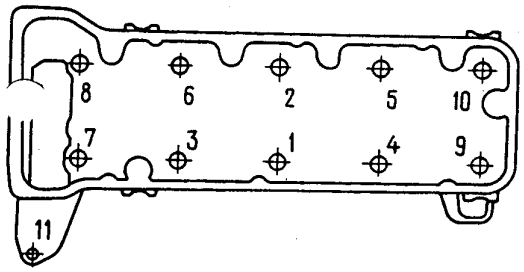


Fig. 2-14. Crankshaft Rear Gland Holder. Arrows Indicate Lugs for Aligning Holder with Crankshaft Flange



ig. 2-15. Installing Piston with Piston Rings into ylinder with Piston Inserter Bushing from Set 2.7854.9500



g. 2-16. Sequence of Tightening Cylinder Head Bolt

Caution

The hole for the pin in the piston is offset 2 mm, therefore the pistons should be installed ito the cylinder with the mark "∏" facing the igine front.

Put the bearing shells into the connecting ds and their caps. Join the connecting rods with

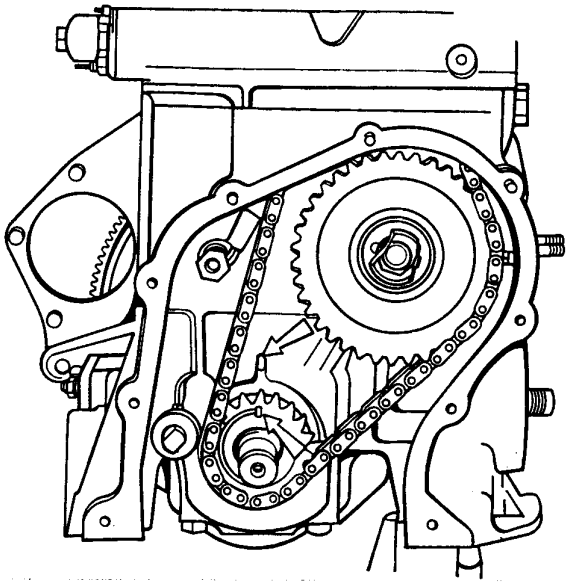


Fig. 2-17. Alignment of Timing Marks on Crankshaft Sprocket and on Cylinder Block

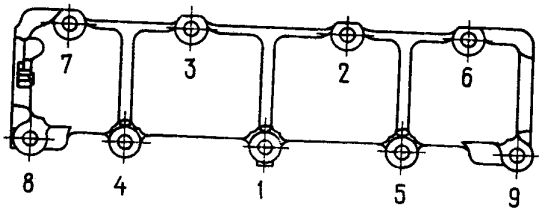


Fig. 2-18. Sequence of Tightening Camshaft Bearing Housing Nuts

the crankshaft journals, install the caps and tighten the connecting rod bolts.

Install the sprocket on the crankshaft. Install the oil pump drive shaft and fasten it by the thrust flange.

Using two aligning bushings install the cylinder head on the cylinder block compete with the gasket, exhaust and intake manifolds. Tighten the fastening bolts in two steps in the sequence shown in Fig. 2-16:

- tighten bolts 1 through 10 preliminarily with a torque of 33.3 - 41.16 N.m (3.4 - 4.2 kgf.m);
- tighten bolts 1 through 10 finally with a torque of 95.94 - 118.38 N.m (9.79 - 12 kgf.m) and bolt 11 with a torque of 31.36 - 39.1 N.m (3.2 - 3.99 kgf.m).

Turn the flywheel so that the mark on the crankshaft sprocket registers with the mark on the cylinder block (Fig. 2-17).

Install the sprocket on the camshaft assembled with the bearing housing and turn the shaft so that the mark on the sprocket faces the mark on the bearing housing (Fig. 2-19). Remove the sprocket and, without changing the position of the

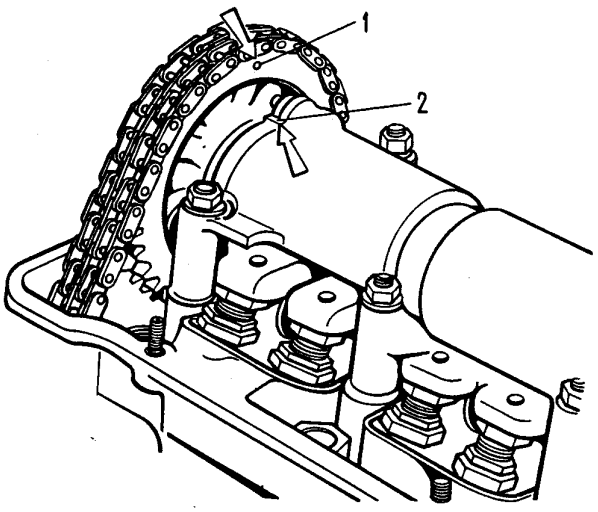


Fig. 2-19. Alignment of Timing Marks on Camshaft Sprocket and on Bearing Housing:
1 - mark on sprocket; 2 - mark on bearing housing

camshaft, install the bearing housing on the cylinder head and fasten it by tightening the nuts in the sequence shown in Fig. 2-18.

Install the chain damper on the cylinder head.

Install the camshaft drive chain as follows:

- put the chain on the camshaft sprocket and move it into the drive space, seeing that the mark on the sprocket lines up with the mark on the bearing housing (Fig. 2-19). Do not tighten the sprocket bolt all the way home;

- install the sprocket on the oil pump drive shaft, also without tightening the fastening bolt completely;

- install the tensioner shoe and the tensioner proper, without tightening the cap nut to allow the tensioner spring to press down the shoe; screw the chain limiting pin into the cylinder block;

- turn the crankshaft two revolutions in its regular direction thereby ensuring the required chain tension; check to see that the marks on the sprockets are aligned with the marks on the cylinder block (Fig. 2-17) and on the bearing housing (Fig. 2-19);

- if the marks are in alignment, lock the flywheel with fixing tool A.60330/R (Fig. 2-10), tighten up finally the sprocket bolts, the chain tensioner cap nut and lock the sprocket bolts by the lock washers; if the marks fail to coincide, repeat the chain installation operations.

Adjust the valve rocker-to-cam clearances.

Install the camshaft drive cover (Fig. 2-20) with the gasket and gland on the cylinder block without tightening the fastening bolts and nuts all the way. Using mandrel 41.7853.4010, align the cover relative to the end of the cra tighten up its fastening bolts and n

Install the crankshaft pulley a starting jaws.

Install the oil filter, screwing cylinder block union handtight. Insta separator of the crankcase breathing the breather cover and secure the ret oil separator drain pipe.

Install the oil pump and the oil its gasket.

Install the coolant pump, alterna and alternator. Run the belt over the adjust its tension.

Install the heater radiator inlet the outlet connection on the cylinder the heater radiator outlet pipe to the pump and exhaust manifold.

Install the gauge transmitters.

Install the oil pump and ignition drive gear. Install the ignition distr adjust ignition timing. Screw in the sp and tighten them with torque-indicating 67.7812.9515.

Install the fuel pump as instructe "Fuel System".

Install the carburettor and connec hoses.

Install the cylinder head cover wi ket and fuel line bracket.

Install the air cleaner; for this p secure the hoses on the air cleaner body cleaner body with the gasket on the carb install the supporting plate and fasten with nuts. Put in the filter element and the cleaner cover.

Fill the engine with oil through th throat on the cylinder head cover.

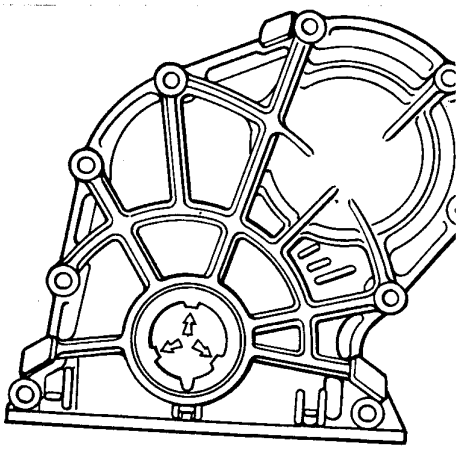


Fig. 2-20. Camshaft Drive Cover. Arrows Sh for Aligning Cover with Crankshaft Pulley

ENGINE STAND TESTS

A repaired engine shall be subjected to stand tests (running-in) at no-load in accordance with the following program:

2 min at 850 - 900 rpm

3 min at 1000 rpm

4 min at 1500 rpm, and

5 min at 2000 rpm.

While running-in a repaired engine do not operate it at maximum speed.

Mount the engine on the stand, start it and check for:

- water and fuel leaks between the mating parts, from the pipe joints and past the gaskets;
- oil pressure;
- ignition timing;
- idling speed;
- abnormal knocking.

In case of abnormal knocking or other defects, stop the engine, correct the defects and resume the tests.

If oil leaks are detected past the gasket between the cylinder head and cover or past the gaskets between the engine oil sump, cylinder block and covers, tighten the corresponding bolts with the recommended torque. If leakage persists, check for correct installation of the gaskets and replace them, if necessary.

A repaired engine is not yet run-in, therefore friction of the working surfaces of new parts offers a considerable resistance to rotation; consequently, a certain working-in period is required.

This applies particularly to the engines where pistons, big-end and main bearings were replaced, the crankshaft journals were ground and the cylinders honed. Therefore, the running-in program should always end on the car driven at the speeds recommended for the early stages of car operation.

ENGINE CHECKOVER ON CAR

After installing the engine on the car check it carefully for correct mounting.

Run the engine for some time and check the following:

- leaks of coolant and fuel at the pipe joints; tighten the joints, if necessary;
- oil leaks;
- see that the carburettor control linkage ensures complete closing and opening of the throttle and choke valves and adjust the linkage, if necessary;
- alternator drive belt tension; adjust, if necessary;
- see that the wire contacts of electrical equipment are in good condition;
- check to see that the warning lamps on the instrument panel function as they should.

Caution

Do not check the engine and the car on a stand with running drums without additional rollers under the front wheels.

CYLINDER BLOCK

The main dimensions of the cylinder block are shown in Fig. 2-21.

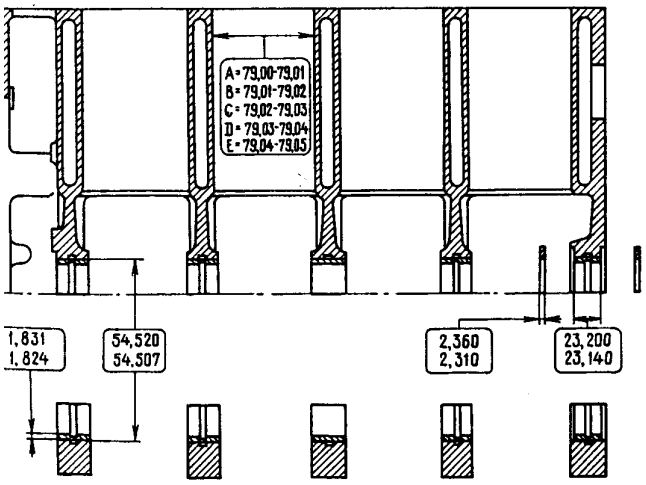


Fig. 2-21. Main Dimensions of Cylinder Block

GENERAL CLEANING AND INSPECTION

Wash the cylinder block thoroughly and clean the oil channels. Airblast and dry the cylinder block, particularly its oil channels.

Examine the cylinder block and replace it, if cracked in the supports or elsewhere.

CYLINDER BLOCK TIGHTNESS CHECK

If there is a suspicion that the coolant penetrates into the crankcase, the cylinder block can be checked for tightness on a special stand. For this purpose plug the holes in the cooling jacket and deliver water at a room temperature under a pressure of 0.3 MPa (3 kgf/cm^2).

There should be no water leaks from the cylinder block in the course of 2 min.

If oil gets into the coolant, before proceeding to disassembling the engine check the cylinder block for cracks in the oil channel zones. For this

purpose drain the coolant from the cooling system, remove the cylinder head, fill the cylinder block cooling jacket with water and deliver compressed air into the vertical oil channel in the cylinder block. If air bubbles appear in the water filling the cooling jacket, replace the cylinder block.

Cylinders

Check the cylinders for wear which should not exceed 0.15 mm (the maximum tolerable value).

The cylinder bore is measured with an internal gauge (Fig. 2-22) in four zones, both along and across the engine (Fig. 2-23). Ring gauge 67.8125.9501 is used to set the internal gauge to zero.

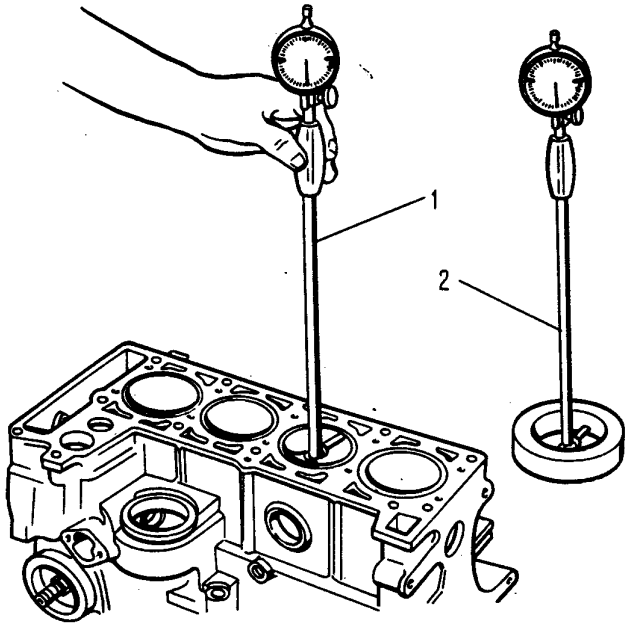


Fig. 2-22. Measuring Cylinders with Internal Gauge: 1 - internal gauge; 2 - zeroing internal gauge by check gauge

Note. The cylinders in the block are divided into five diameter classes A, B, C, D and E in steps of 0.01 mm. The class of the cylinder is marked on the lower face of the block (Fig. 2-24). The same face and the main bearing caps bear a conventional number of the cylinder block which indicates that the bearing caps belong to this particular block.

In zone No. 1 the cylinders practically do not wear, so this zone may be used as a reference one for determining cylinder wear in other three zones.

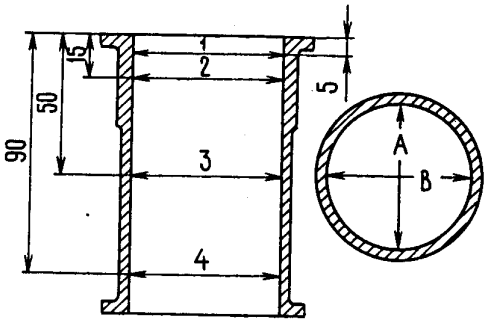


Fig. 2-23. Cylinder Measurement Diagram: A and B - directions of measurements; 1, 2, 3, 4 - zone numbers

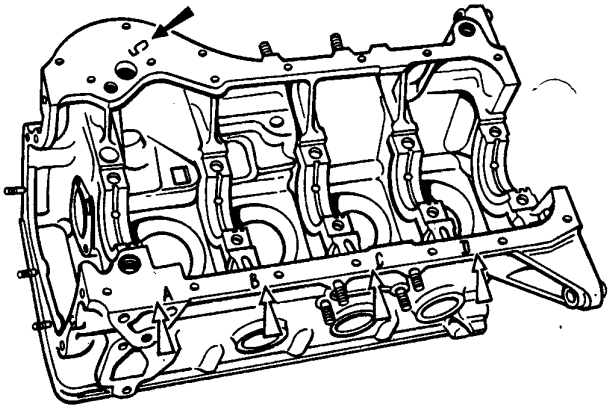


Fig. 2-24. Cylinder Block Marked with Cylinder Size Group (White Arrows) and Cylinder Block Code Number (Black Arrow)

If the maximum wear exceeds 0.15 mm, bore the cylinders to match the nearest repair size of the piston (0.4 or 0.8 mm oversize) with an 0.03 mm allowance in diameter for honing. Then hone the cylinders to the diameter providing the designed clearance between the piston of the selected repair size and the cylinder equal to 0.06 - 0.08 mm.

CYLINDER HEAD JOINTING SURFACE

The upper face of the cylinder block may be distorted. Therefore, check this surface with a straightedge and a set of feeler gauges. Place the straightedge on the diagonals of the cylinder block and in the middle, both lengthwise and crosswise. If the surface is out-of-true by more than 0.1 mm, replace the cylinder block.

The main dimensions of the connecting rod and piston group are given in Fig. 2-25.

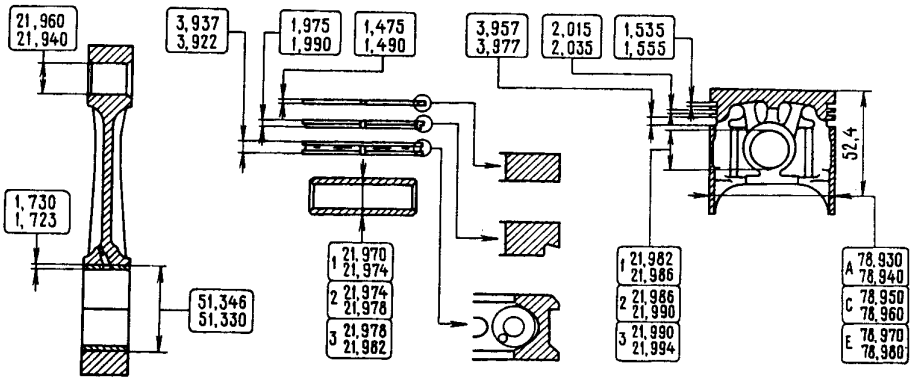


Fig. 2-25. Main Dimensions of Piston, Connecting Rod, Piston Pin and Piston Rings

PRESSING OUT PISTON PIN

The piston pin should be removed on a press, using driver A.60308 and a support with a cylindrical hollow to receive the piston. Take care to remove the piston rings before driving out the piston pin.

The removed parts can be reused if they are but slightly worn and undamaged. Therefore, mark the parts during disassembly so as to reassemble them in the original sets.

CLEANING

Remove carbon deposits from the piston crown nd ring grooves and clean the lubricating channels f the piston and connecting rod from all deposits.

Examine the parts thoroughly for probable amage. Cracks of any nature on the piston, piston ings, pin, connecting rod and its cap are imperissible and call for immediate replacement of a. Replace the bearing shells if they are eeply scratched or heavily worn.

PISTON-TO-CYLINDER MATCHING

The designed clearance between the piston and ylinder (for new parts) is 0.06 - 0.08 mm. The learance is determined by measuring the cylinders nd pistons and fitting the pistons and cylinders elonging to the same class. The maximum clearance caused by wear) should not exceed 0.15 mm.

Note. The diameter of the piston is checked in he plane perpendicular to the piston pin at a istance of 52.4 mm from the piston crown Fig. 2-25).

The pistons are divided into five classes (A, , C, D and E) by the outside diameter, in 0.01 mm teps and into three categories, in 0.004 mm steps by the diameter of the piston pin hole. The class of the piston (letter) and the category of the piston pin hole (figure) are indented on the piston crown.

If the clearance in a used engine exceeds 0.15 mm, select the pistons to the cylinders to provide the clearance as close to the designed value as possible.

Delivered for spares are pistons of classes A, C and E. These classes permit matching the piston to any cylinder as both the pistons and cylinders are divided into classes with a certain overlapping of dimensions.

CHECKING PISTON-TO-PIN CLEARANCE

The piston pin is press-fitted into the small end of the connecting rod with an interference and is free to rotate in the piston bosses.

Note. With respect to the outside diameter the piston pins are divided into three categories in

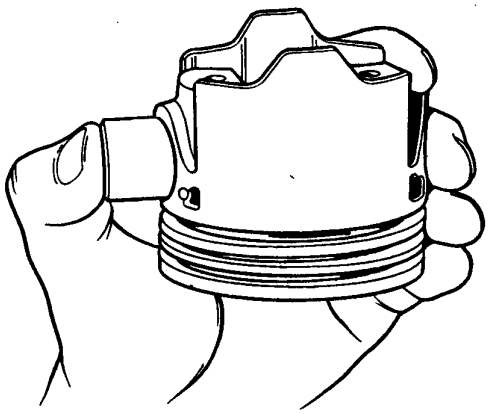


Fig. 2-26. Piston Pin Should Go in Under Thumb Pressure

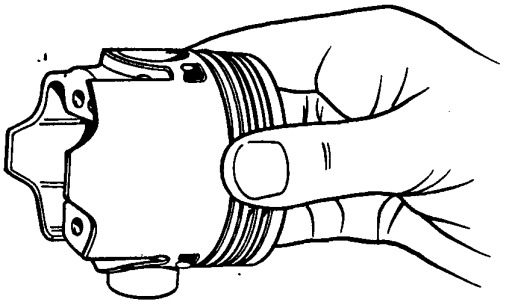


Fig. 2-27. Checking Piston Pin Fit

steps of 0.004 mm. The category is marked by paint on the end of the pin: blue for the 1st category, green for the 2nd one and red for the 3rd category.

The fit of the piston pin in the piston is checked by coating the pin with engine oil and inserting it into the piston boss. The fit is considered correct if the pin enters the hole under thumb pressure (Fig. 2-26) and does not fall out of the boss (Fig. 2-27) of the piston held with the pin positioned vertically.

If the pin slides out of the boss, use a replacement pin of the next larger category. If, however, the pin belongs to the 3rd category, both the piston and the pin must be replaced.

CHECKING PISTON-TO-RING CLEARANCE

The side clearance of the piston rings should be measured as shown in Fig. 2-28, installing the ring into the corresponding groove.

The assembly clearance should be
0.045 - 0.077 mm for the upper compression ring,
0.025 - 0.057 mm for the 2nd compression ring
and 0.020 - 0.052 mm for the oil control ring.
The wear limit is 0.15 mm.

The ring joint gap should be checked with a set of feeler gauges, inserting the rings into a gauge whose inside diameter is equal to the nominal diameter of the ring, true to ±0.003 mm.

The gap should range from 0.25 to 0.45 mm for all rings. File off the jointing surfaces of the ring if the gap is insufficient and replace the ring, if it is too big.

CHECKING BEARING SHELL-TO-CRANKSHAFT CLEARANCES

The clearance between the bearing shells and the crankshaft journals can be checked by calculations (by measuring the parts) or with a piece of calibrated plastic wire in the following order:

- clean thoroughly the working surfaces of the shell and big-end journal and install the connecting rod with the piston on the big-end journal in accordance with their numbers;
- put a piece of calibrated plastic wire on the big-end journal, install the connecting rod and its cap and tighten the nuts with a torque of 50.96 N.m (5.2 kgf.m);
- remove the cap and determine the flattening of the wire (Fig. 2-29) against the scale on the wire packing, thus finding the clearance.

If the clearance is within the tolerance limits (0.036 - 0.086 mm) or does not exceed the wear limit (0.10 mm), the shells may be used without changing the diameter of the big-end journals.

If the clearance exceeds the 0.10 mm wear limit, use replacement shells (Table 2-1) and grind the big-end journals to the repair size specified under "Crankshaft and Flywheel".

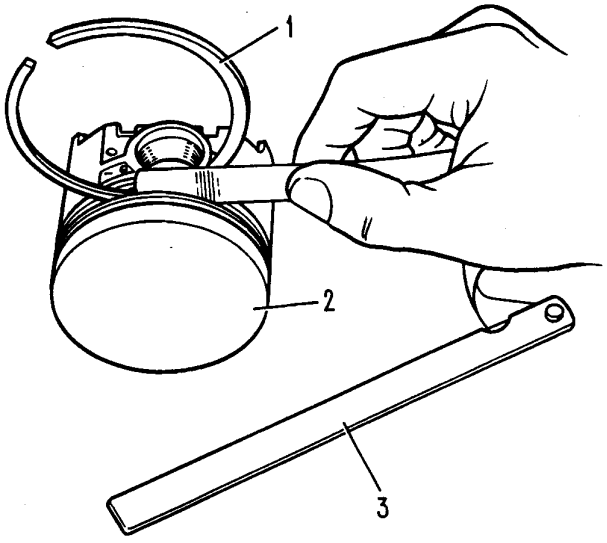


Fig. 2-28. Checking Piston Ring Side Clearance:
1 - piston ring; 2 - piston; 3 - set of feeler gauges

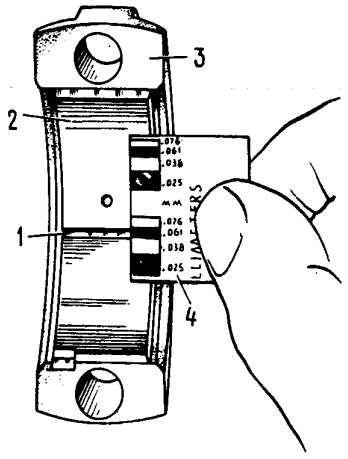


Fig. 2-29. Measuring Width of Flattened Calibrated Wire Against Scale:
1 - calibrated wire; 2 - shell; 3 - big-end bearing cap; 4 - scale

Table 2-1

Thickness of Connecting Rod Bearing Shells, mm

Nominal	Oversize			
	0.25	0.50	0.75	1.0
1.723	1.848	1.973	2.098	2.223
1.730	1.855	1.980	2.105	2.230

Figures 0.25, 0.50, etc. indicate the reduction in the diameter of the big-end journals after grinding.

CHECKING PISTON MASS

The pistons in the engine should be of the same mass, true to ±2.5 g.

If a set of pistons belonging to the same mass group is not available, they can be adjusted for mass by removing some metal from the base of the piston pin boss as shown by arrows in Fig. 2-30. However, the metal must not be removed deeper than 4.5 mm relative to the nominal height of the piston (59.40 mm) while the removal of metal in width should be limited by a diameter of 70.5 mm.

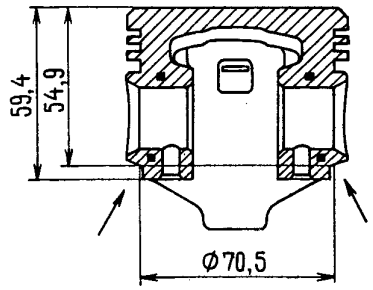


Fig. 2-30. Points (Shown by Arrows) Where Metal Can Be Removed to Equalize Piston Weights

ASSEMBLING CONNECTING ROD AND PISTON GROUP

To provide for an interference fit of the piston pin in the small end of the connecting rod, heat the latter to 240 °C for expanding its small end. For this purpose place the connecting rods into an electric oven.

If the oven has already been brought to a temperature of 240 °C, hold the connecting rods there for 15 min.

For correct jointing of the pin with the connecting rod, press in the pin as rapidly as possible, since the connecting rod cools quickly after which the position of the pin will be impossible to change.

To prepare the piston pin for assembly put it on shaft 1 (Fig. 2-31) of tool 02.7853.9500. Fit guide 3 on the end of this shaft and secure it

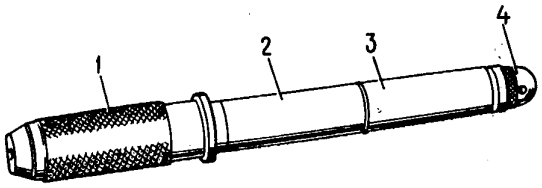


Fig. 2-31. Tool 02.7853.9500 for Press-Fitting Piston Pin into Piston and Connecting Rod End: 1 - tool shaft; 2 - piston pin; 3 - guide; 4 - thrust screw

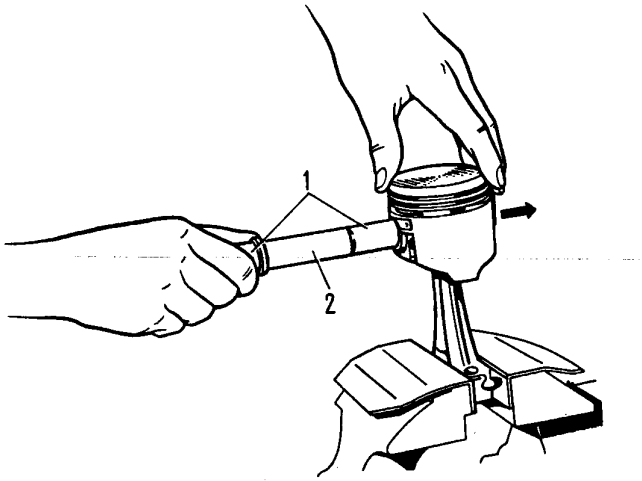


Fig. 2-32. Press-Fitting Piston Pin into Connecting Rod Small End: 1 - tool 02.7853.9500; 2 - piston pin. The piston should rest on connecting rod end as shown by arrow

with screw 4. Do not overtighten the screw to avoid seizure due to heat expansion of the pin caused by contact with the hot connecting rod.

Take the connecting rod out of the oven and clamp it quickly in a vice. Put the piston on the connecting rod, aligning the pin hole in the piston with the hole in the small end of the connecting rod. Using tool 02.7853.9500, push the piston pin into the piston boss and into the connecting rod small end (Fig. 2-32) until the shoulder of the tool comes in contact with the piston.

During this operation the piston boss should be pressed against the small end of the connecting rod in the direction of the force applied for press-fitting the pin (shown by arrow in Fig. 2-32). In this way the piston pin will occupy the correct position.

Caution

The piston and connecting rod should be jointed so that the mark "П" on the piston is located at the side of the oil outlet hole in the connecting rod big end.

Allow the connecting rod to cool down and lubricate the piston pin with engine oil through the holes in the piston bosses.

When installing the piston rings, space their joints at 120°. The step on the outer surface of the 2nd (scraper) compression ring should be directed down and the chamfers on the outer surface of the oil control ring should face upward (Fig. 2-25).

The connecting rod is machined jointly with the cap and the caps are not interchangeable. In order not to confuse them during assembly, the connecting rod and the corresponding cap are marked with the number of the cylinder they belong to. During assembly see that the figures on the connecting rod and cap are located on the same side.

CHECKING PISTON PIN FIT

After assembling the connecting rod with the piston pin and piston check the pin fit with a torque-indicating wrench and tester A.95615 as follows:

- clamp tester base 4 (Fig. 2-33) in a vice and install the piston pin-connecting rod assembly on it;
- lower indicator bracket 8, insert threaded spindle 3 into the pin hole and move it into the piston boss until spindle head 2 thrusts against the end of the pin;
- screw nut 5 on the end of the spindle and draw up the nut against the support to take up the clearances, if any;
- lift indicator bracket 8 to a horizontal position, secure it by handle 7 and set dowel 1 of indicator 9 on head 2 of the spindle inserted into the pin;
- set the indicator to zero and insert stop 6 into the slot of the threaded spindle to keep the latter against turning;
- using a torque-indicating wrench, tighten spindle nut 5 with a torque of 12.7 N.m (1.3 kgf.m) which corresponds to an axial load of 3.92 kN (400 kgf).

The fit of the pin in the connecting rod is correct if, after withdrawing the torque wrench and returning the nut to the initial position, the indicator pointer returns to zero.

If the pin slips in the connecting rod small end, replace the connecting rod by a new one.

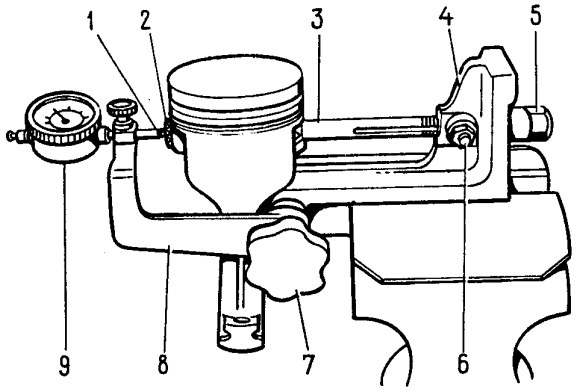


Fig. 2-33. Assembled Piston-Pin-Connecting Rod Group Installed on Tester A.95615 for Pin Pressing-Out Test:
1 - indicator dowel in contact with end of spindle; 2 - spindle head in contact with piston pin; 3 - threaded spindle with slot; 4 - base; 5 - spindle nut; 6 - spindle stop; 7 - bracket clamp handle; 8 - indicator bracket; 9 - indicator

CHECKING CONNECTING ROD BIG END AND PISTON PIN AXES FOR PARALLELISM

Before installing an assembled connecting rod and piston group on the engine, check their axes for parallel alignment (Fig. 2-34).

To check align the connecting rod big end (without bearing shells) on extensible blades 2 and put gauge 4 on the piston crown. Using a set of feeler gauges check the clearance between the vertical plate of the jig and the vertical surface of the gauge at a distance of 125 mm from the corner or the upper end of the gauge, depending on whether it contacts the plate by the corner or the upper end.

The clearance should not be over 0.4 mm. Replace the connecting rod if the clearance is larger.

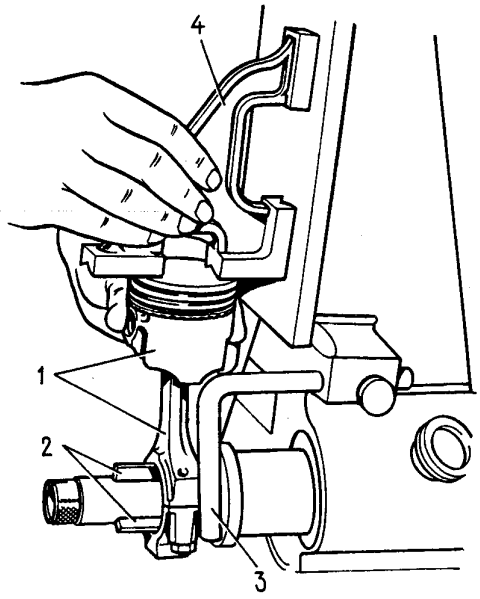


Fig. 2-34. Checking Axes of Piston Pin and Connecting Rod Big End for Parallelism:
1 - assembled connecting rod-pin-piston group; 2 - extensible blades; 3 - thrust bar; 4 - gauge

The main dimensions of the crankshaft are iven in Fig. 2-35.

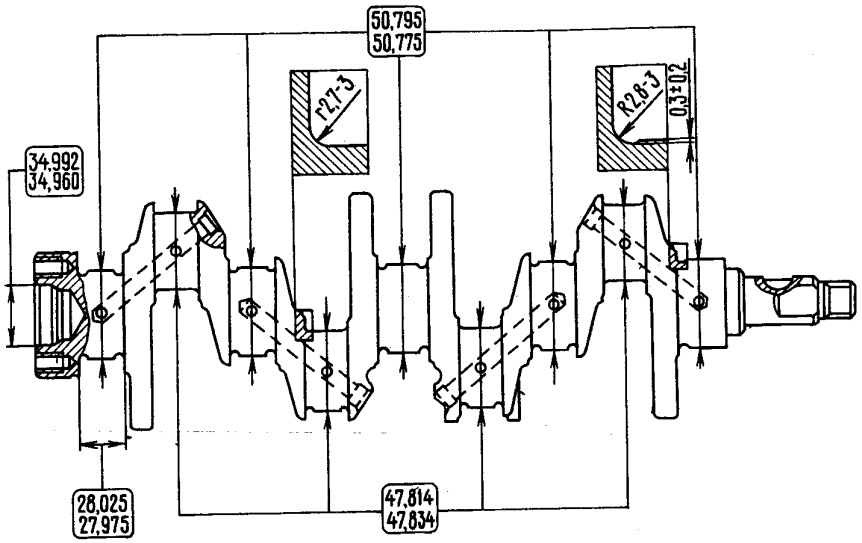


Fig. 2-35. Main Dimensions of Crankshaft Main and Big-End Journals and Fillets

CLEANING LUBRICATING CHANNELS

Remove the channel plugs. Run counterbore A.94016/10 fitted on spindle A.94016 through the plug sockets. Wash the channels thoroughly with gasoline and blow them with compressed air.

Install new plugs with the aid of driver A.86010 and lock-punch them at three points for higher reliability.

CRANKSHAFT MAIN AND BIG-END JOURNALS

Checking. Put the crankshaft on two V-blocks (Fig. 2-36) and using a dial indicator, check:

- runout of the main journals which should not exceed 0.03 mm;
- runout of the seating surfaces for the sprocket and the gearbox clutch shaft bearing; the maximum permissible runout is 0.04 mm;
- displacement of the big-end journal axes relative to the plane passing through the axes of the big-end and main journals; the maximum permissible displacement is ±0.35 mm;

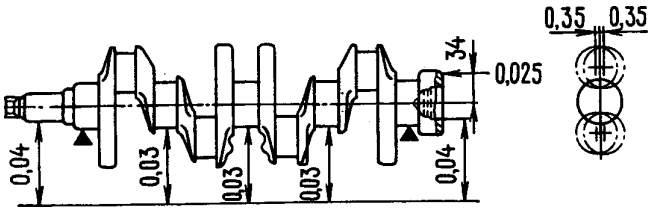


Fig. 2-36. Permissible Runout of Crankshaft Basic Surfaces

- out-of-squareness of the flange end surface relative to the crankshaft axis; with the crankshaft rotated, the indicator installed at the side, 34 mm from the shaft axis, should read runout not exceeding 0.025 mm (Fig. 2-36).

There should be no cracks on the main and big-end journals and webs of the crankshaft, otherwise the crankshaft should be replaced.

The surfaces of the crankshaft mating with the active edges of the glands should be free from scratches, scores and nicks.

Measure the diameters of the main and big-end journals. Grind the journals if their wear exceeds 0.03 mm or out-of-roundness is greater than 0.03 mm and also if the journals are scored or notched.

Grinding. Grind the main and big-end journals reducing their size by 0.25 mm to provide the diameters specified in Tables 2-2 and 2-3 and journal fillet radii as shown in Fig. 2-35.

Table 2-2

Diameter of Big-End Journals, mm

Nominal	Undersize			
	0.25	0.50	0.75	1.0
47.814	47.564	47.314	47.064	46.814
47.834	47.584	47.334	47.084	46.834

After grinding and finishing the journals, wash the crankshaft thoroughly to remove the remaining abrasive particles. Wash the lubricating channels several times with gasoline under pressure first

Table 2-3

Diameters of Main Journals, mm

Nominal	Undersize			
	0.25	0.50	0.75	1.0
50.775	50.525	50.275	50.025	49.775
50.795	50.545	50.295	50.045	49.795

removing the channel plugs. Mark No. 1 web of the crankshaft with the figure showing the reduction of the journal size (M 0.25; BE 0.50).

The out-of-roundness and taper of the main and big-end journals after grinding should not be over 0.007 mm.

MAIN BEARING SHELLS

The shells must not be subjected to any fitting operations. In case of scores, scratches and separations, they should be replaced.

Check the shell-to-journal clearances as follows:

- put a piece of calibrated plastic wire on the journal;
- install the main bearing caps complete with the shells and tighten the cap bolts with a torque of 80.36 N.m (8.2 kgf.m);
- remove the caps, find the amount of flattening of the calibrated wire against the scale provided on its packing (Fig. 2-37), thus determining the clearance.

The clearance between the main journals and bearing shells can also be found by calculations, measuring the diameters of the main journals and shell beds, and the thickness of the shells.

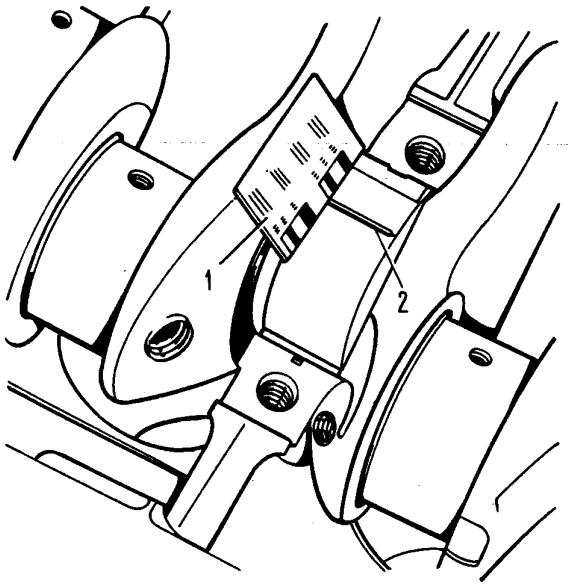


Fig. 2-37. Measuring Clearance with Scale:
1 - scale; 2 - calibrated wire

The nominal designed clearance is 0.050 - 0.095 mm. If the clearance is less than the maximum permissible limit (0.15 mm), the shells may be used again. If the clearance exceeds the maximum permissible limit, replace the shells on the journals with new ones. If the crankshaft journals are worn and reground to a repair size, replace the shells with repair size ones (of increased thickness, see Table 2-4).

Unobstructed turning of the crankshaft is an indication of correct assembly and journal-to-shell matching.

Table 2-4

Thickness of Main Bearing Shells, mm

Nominal	Oversize			
	0.25	0.50	0.75	1.0
1.824	1.949	2.074	2.199	2.324
1.831	1.956	2.081	2.206	2.331

The figures 0.25, 0.50, etc. denote the reduction in the diameter of the main journals after grinding.

FLYWHEEL

Examine the teeth of the flywheel ring gear; replace the flywheel if they are damaged.

The flywheel surfaces mating with the crankshaft and the clutch driven disc should be perfectly flat and free from scratches and scores.

If surface 3 (Fig. 2-38) of the flywheel mating with the clutch driven disc is scratched, turn it on a lathe, cutting off not more than 1 mm of metal. Then machine surface 2 to provide a size of (0.5±0.1) mm and parallelism of surfaces 2 and 3 relative to surface 1. The permissible nonparallelism is not over 0.1 mm as measured at extreme points of surfaces 2 and 3.

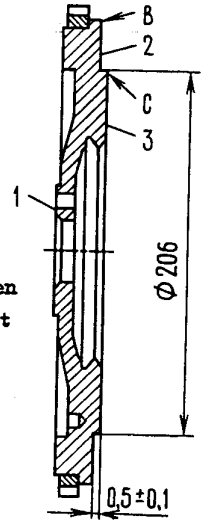


Fig. 2-38. Flywheel:
1 - flywheel-to-crankshaft flange fastening surface; 2 - clutch mounting surface; 3 - clutch driven disc supporting surface; B - point for checking runout of surface 2; C - point for checking runout of surface 3

Install the flywheel on a mandrel, aligning it y the mounting hole until it bears against surface (Fig. 2-38) and check the runout of surfaces 3 nd 2. The runout read by the indicator at points B nd C should not exceed 0.1 mm.

CHECKING CRANKSHAFT END CLEARANCE

The end play of the crankshaft is limited by wo thrust half-rings installed at both sides of he rear main bearing. The half-ring at the front ide of the bearing is of the steel-aluminium type, hile that at the rear side is a cerametallic yellow) one. The half-rings are available in ominal size (2.310 - 2.360 mm thick) and oversize 2.437 - 2.487 mm thick).

The end clearance between the thrust half- ings and the thrust surfaces of the crankshaft can e measured as follows:

- install an indicator on a magnetic support nd insert the blades of two screwdrivers as shown n Fig. 2-39;

shift the crankshaft with the screwdrivers nd note the indicator reading. It should be within .06 and 0.26 mm.

If the clearance exceeds the maximum permis- ible limit of 0.35 mm, replace the thrust half- ings by new ones 0.127 mm oversize.

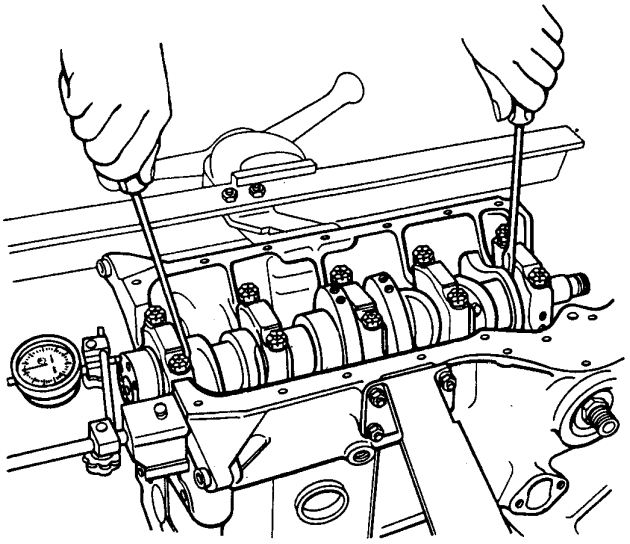


Fig. 2-39. Checking Crankshaft End Clearance

Note. The end clearance of the crankshaft can also be checked on the car-mounted engine using tool 67.8701.9510. In this case axial displacement of the crankshaft is produced by pressing and releasing the clutch pedal, and the end clearance is determined by measuring the displacement of the crankshaft front end.

CYLINDER HEAD AND VALVE GEAR

The main dimensions of the cylinder head are iven in Fig. 2-40.

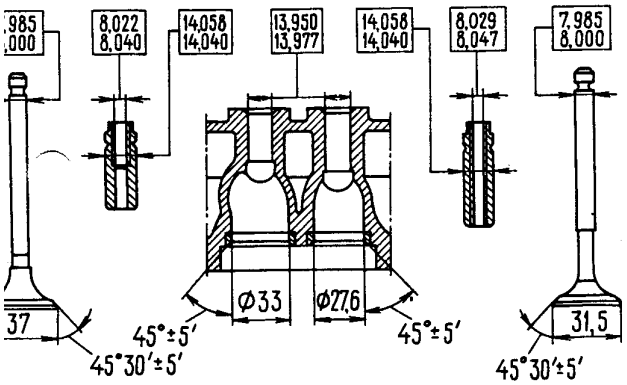


Fig. 2-40. Basic Dimensions of Cylinder Head, Valves and Valve Guides

REMOVAL AND INSTALLATION ON CAR-MOUNTED ENGINE

The cylinder head should be removed from the ar-mounted engine if its defects do not call for he removal of the engine, also when the maintenance ork is confined to decarbonization of the combus- tion chamber and valves. To remove the cylinder head, proceed as follows:

- remove the spare wheel;
- drain the coolant from the radiator and cylinder block and remove the air cleaner;
- disconnect the wires from the storage battery, spark plugs and from the coolant tempera- ture transmitter; disconnect the choke valve con- trol cable from the carburettor;
- using wrench 67.7812.9514 unscrew the spark plugs and the coolant temperature transmitter;
- disconnect the throttle valve control rods from the intermediate lever on the cylinder head cover and take off the cover;
- turn the crankshaft to align the mark on the pulley with the longer mark on the valve gear cover (Fig. 7-19), and the mark on the camshaft sprocket with the mark on the camshaft bearing housing (Fig. 2-19);
- disconnect the hose from the heater inlet pipe and detach the heater outlet pipe bracket from the exhaust manifold;
- disconnect the hoses from the carburettor, intake manifold and from the cylinder head cooling jacket outlet pipe;
- disconnect the starter protective shield and the muffler inlet pipe from the exhaust manifold;

Note. It is good practice to leave the exhaust and intake manifolds with the carburettor on the cylinder head. They can be removed later, when disassembling the cylinder head.

- loosen the cap nut of the chain tensioner, force off the tensioner rod with a tyre iron and fix it with the cap nut;

- remove the camshaft sprocket and the bearing housing complete with the camshaft;

- turn off the cylinder head-to-block bolts and remove the cylinder head.

To reinstall the cylinder head, reverse the removal operations, observing the following requirements:

- do not forget to install the gaskets of the cylinder head and its cover;

- tighten the cylinder head bolts in the sequence shown in Fig. 2-16 and the nuts of the camshaft bearing housing studs, in the sequence shown in Fig. 2-18.

Tighten the cylinder head bolts in two steps:

1st step - tighten bolts No. 1 through 10 (Fig. 2-16) with a torque of 33.32 - 41.16 N.m (3.4 - 4.2 kgf.m);

- 2nd step - tighten bolts No.1 through 10 with a torque of 95.94 - 118.38 N.m (9.79 - 12 kgf.m) and bolt No. 11 with a torque of 31.36 - 39.1 N.m (3.2 - 3.99 kgf.m).

When installing the cylinder head cover with its gasket, tighten the cover nuts with a torque not over 8 N.m (0.8 kgf.m) to avoid fracturing the gasket at the fastening holes and wraping the cover. It is recommended that the cover gasket should be replaced by a new one during engine repairs. Having installed the cylinder head check and time the ignition.

DISASSEMBLY AND ASSEMBLY

Put the cylinder head on plate A.60335.

Disconnect the exhaust and intake manifolds complete with the carburettor (simultaneously the hot air intake is removed).

Disconnect the outlet pipe of the cooling jacket.

Disconnect the pipe conducting the coolant to the heater.

Remove valve rockers 11 (Fig. 2-41) and take off their springs 12.

Loosen locknuts 14, unscrew adjusting bolts 13 and their bushings 15.

Install tool A.60311/R as shown in Fig. 2-42, compress the valve springs and free the spring locks. Portable tool A.60311/R can be replaced by stationary jig 02.7823.9505.

Remove the valve springs with retainers and seats. Turn over the cylinder head and take out the valves from its underside.

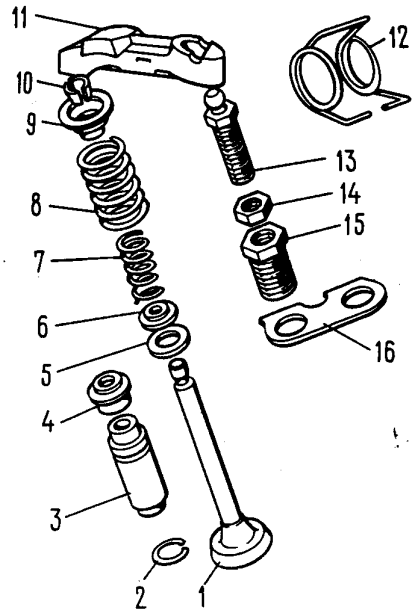


Fig. 2-41. Valve Gear Parts:
1 - valve; 2 - locking ring; 3 - valve guide; 4 - oil-deflecting cap; 5 - outer spring seat; 6 - inner spring seat; 7 - inner spring; 8 - outer spring; 9 - spring retainer; 10 - rocker spring locks; 11 - valve rocker; 12 - lever spring; 13 - adjusting bolt; 14 - adjusting bolt locknut; 15 - adjusting bolt bushing; 16 - rocker spring locking plate

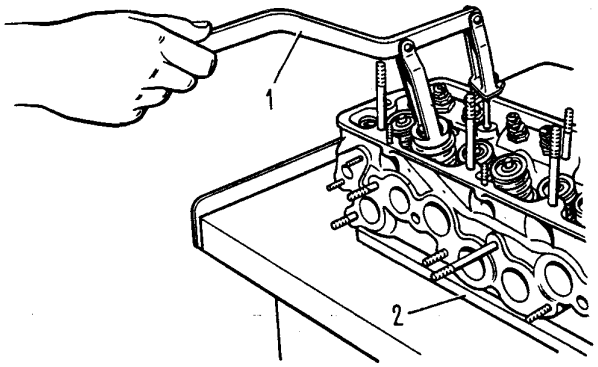


Fig. 2-42. Removing Valve Springs:
1 - tool A.60311/R; 2 - assembly plate A.60335

Remove the oil-deflecting caps from the valve guides.

Assemble the cylinder head by reversing the disassembly operations.

CLEANING CYLINDER HEAD

Install the cylinder head on support A.60353.

Decarbonize the combustion chambers and the surfaces of exhaust channels with a wire brush clamped on an electric drill. Clean and examine the

ılet channels and the oil channels leading to the ılve rockers.

CHECKING AND GRINDING VALVE SEATS

The shape of the valve seat faces is illus-ɾated in Figs 2-43 and 2-44.

The seat faces (in the zone of contact with ıe valves) should be free from pin-point pits, ɔrrosion and damage. Minor damage can be corrected ɾ grinding the seats. In so doing try to remove as ɪttle metal as possible. Grinding can be performed ɪther manually or with a grinding machine.

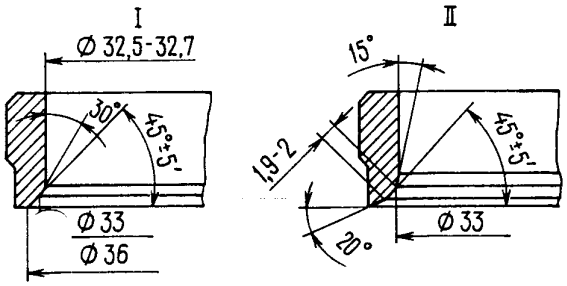


Fig. 2-43. Inlet Valve Seat Contour: I - new seat; II - refaced seat

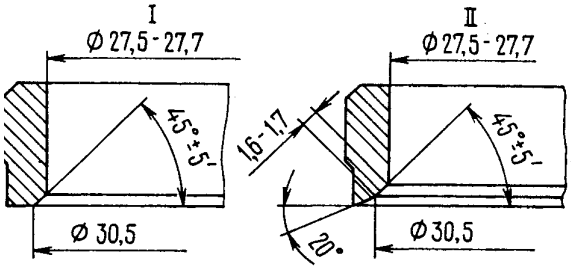


Fig. 2-44. Exhaust Valve Seat Contour: I - new seat; II - refaced seat

Grind the seats as follows:

- put the cylinder head on support A.60353, ınsert spindle A.94059 into the valve guide and ɐcarbonize the seat faces with counterbores .94031, A.94092 (exhaust valve seats) and A.94003, .94101 (inlet valve seats). The counterbores hould be secured on spindle A.94058 and aligned by ilot spindle A.94059;

Note. Spindles A.94059 are available in two ɪfferent diameters: A.94059/1 for inlet valve ıides and A.94059/2 for exhaust valve guides.

- put spring A.94069/5 on pilot spindle .94059, install tapered wheel A.94078 (for exhaust ılve seats) or wheel A.94100 (for inlet valve ɜats) on spindle A.94069, secure the spindle in ıe grinding machine and reface the valve seat ?ig. 2-45).

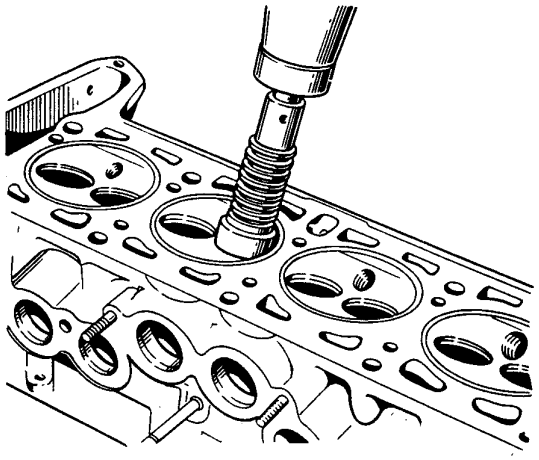


Fig. 2-45. Valve Seat Refacing

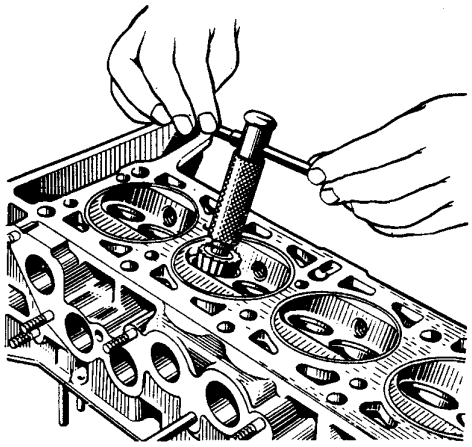


Fig. 2-46. Chamfering Valve Seat Face with Counterbore Installed on Spindle A.94058

At the moment of contact between the grinding wheel and the valve seat the machine should be turned off to avoid vibration which will distort the seat face.

It is recommended that the grinding wheel should be dressed frequently with diamond tools.

Bring the width of the working face on the exhaust valve seats to the values specified in Fig. 2-44, using 20° counterbore A.94031 and counterbore A.94092 which removes cold-working on the inside diameter. The counterbores should be slipped on spindle A.94058 and, like during the grinding, aligned by spindle A.94059.

Bring the width of the working face of the inlet valve seats to the values specified in Fig. 2-43, first machining the internal face with counterbore A.94003 (Fig. 2-46) to obtain a diameter of 33 mm, then the 20° face with counterbore A.94101 until the width of the working face is 1.9 - 2 mm.

VALVES

Remove carbon deposits from the valves. Check to see that the valve stem is not distorted and the valve head is not cracked; replace the valve if it is found to be damaged.

Look for excessive wear and damage of the working face. When refacing the valve on the grinding machine, ensure a face angle of $45^{\circ}30' \pm 5'$ and see that the cylindrical part of the valve head is not thinner than 0.5 mm after grinding. Take care not to remove the hard alloy coating from the face of the exhaust value.

VALVE GUIDES

Check the clearance between the valve guides and the valve stem, measuring the diameter of the stem and the hole in the valve guide.

The assembly clearance for new guides is 0.022 - 0.055 mm (inlet valves) and 0.029 - 0.062 mm (exhaust valves). The maximum wear limit is 0.15 mm.

If the guide-to-valve clearance is too big and cannot be eliminated by replacing the valve, replace the valve guides with the aid of mandrel A.60153/R (Fig. 2-47).

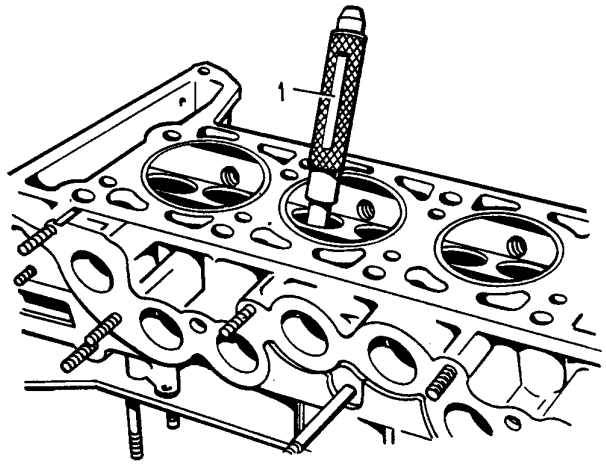


Fig. 2-47. Pussing Out Valve Guides:
1 - mandrel A.60153/R

To replace two guides of the inlet and exhaust valves in cylinders No. 1 and No. 4, unscrew two studs of the camshaft bearing housing since they interfere with the installation of the mandrel.

Drive in the valve guides complete with the locking ring until the latter comes to bear against the surface of the cylinder head.

Having pressed-in the guides, ream out their holes with reamers A.90310/1 (inlet valve guides) and A.90310/2 (exhaust valve guides). Then grind the valve seat and bring the width of the working face to the required dimensions specified above.

VALVE GUIDE OIL-DEFLECTING CAPS

In the oil-deflecting caps there should be no separations of rubber from the metal, no cracks and heavy wear of the working edge.

During engine repairs it is recommended that the caps should always be replaced by new ones.

Replace the damaged oil-deflecting caps having removed the cylinder head not to bend the valve stems. To press-fit a new cap use mandrel 41.7853.4016.

VALVE ROCKERS

Examine the active surfaces of the rocker which are in contact with the valve stem, the camshaft cam and the spherical end of the adjusting screw. Replace the rocker if these surfaces are scored or notched.

If the rocker adjusting screw or its bushing is distorted or damaged, replace the faulty part.

VALVE SPRINGS

Make sure that the springs are not cracked and have not lost their resilience. For this purpose check them for deformation under load (Figs 2-48, 2-49, 2-50).

Dimension A (Fig. 2-50) of the rocker springs (non-compressed) should be 35 mm and dimension B under a load of 51 - 73.5 N (5.2 - 7.5 kgf) should be 43 mm.

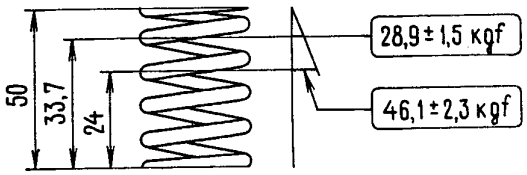


Fig. 2-48. Main Data for Checking Valve Outer Sprin

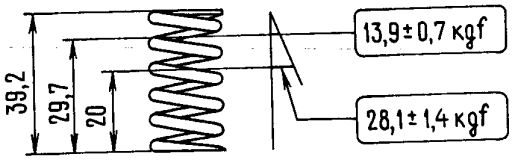


Fig. 2-49. Main Data for Checking Valve Inner Spri

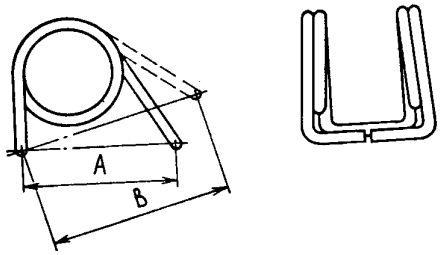


Fig. 2-50. Checking Valve Rocker Spring:
A - free length; B - length under a load

CYLINDER HEAD GASKET

The surfaces of the gasket should be free rom any signs of damage. They should be smooth, ree of dents, cracks, swelling and fractures. eparation of the outer layers from the metal is mpermissible.

The edgings of the holes should have no racks, burns and separations.

CHECKING VALVES FOR TIGHT SEATING

Clean carefully the seats and valves and istall the cylinder head on support A.60353 Fig. 2-51).

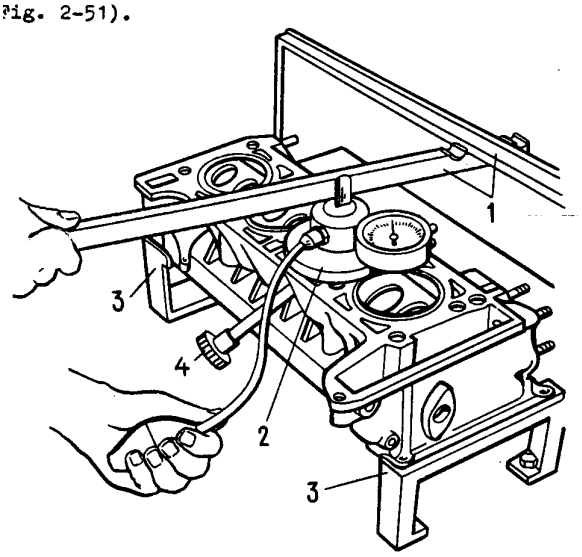


Fig. 2-51. Checking Valves for Tight Seating: 1 - holder A.60041/2; 2 - tester A.60148; 3 - support A.60353; 4 - stopper A.60018 for spark plug wells

Insert the valves into the corresponding guides and stop the wells for the spark plugs with stoppers A.60018.

Set tester A.60148 in the position shown in Fig. 2-51 and, pressing the lever hard, keep forcing in the air with a rubber bulb until the pressure gauge reads 50 kPa (0.5 kgf/cm^2); there should be no pressure drop within 10 s.

If the valve faces fail to be in tight contact with the seats, air leakage will be indicated by the pointer moving towards the zero division. If so, grind again the valve face and the seat in the cylinder head with due care.

Tight seating of the valves can also be checked by pouring kerosene into the inlet and exhaust chambers of the cylinder head. There should be no kerosene leaks through the valves in the course of 3 min.

CYLINDER HEAD TIGHTNESS TEST

To check the cylinder head cooling jacket for tightness by water proceed as follows:

- install the parts of tester A.60334 (Fig. 2-52) on the cylinder head;
- keep forcing water under a pressure of 0.5 MPa (5 kgf/cm^2) by the pump into the cylinder head.

There shall be no water leaks from the cylinder head within two min. A cracked cylinder head must be replaced.

To check the cylinder head for tightness by compreseed air proceed as follows:

- install the parts from the set of tester A.60334 on the cylinder head;
- dip the cylinder head in water heated to 60 - 80 °C and let the head warm up for 5 min;
- deliver compressed air at a pressure of 0.15 - 0.2 MPa (1.5 - 2 kgf/cm^2) into the cylinder head.

There should be no air escape from the head during 1 - 1.5 min.

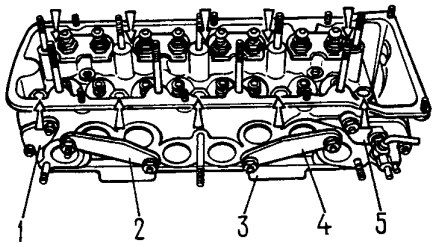


Fig. 2-52. Checking Cylinder Head for Tightness on Tester A.60334:
1, 2, 4 - blank plugs; 3 - tester plate; 5 - flange with water inlet union

CAMSHAFT AND DRIVE

The main dimensions of the camshaft and camshaft bearing housing are given in Fig. 2-53, while Fig. 2-54 illustrates a section through the cylinder head and block across the inlet valve.

ADJUSTING CAM-TO-ROCKER CLEARANCE

Adjust the clearances on a cold engine, having first adjusted the timing chain tension. After adjustment the clearance should be 0.14 to 0.17 mm.

0.005/.006"

Proceed as follows:

- turn the crankshaft clockwise until the mark on the camshaft sprocket gets in line with the mark on the bearing housing which will correspond to the end of the compression stroke in No. 4 cylinder. In this position adjust the clearance of the exhaust valve in No. 4 cylinder (8th cam) and in the inlet valve of No. 3 cylinder (6th cam);

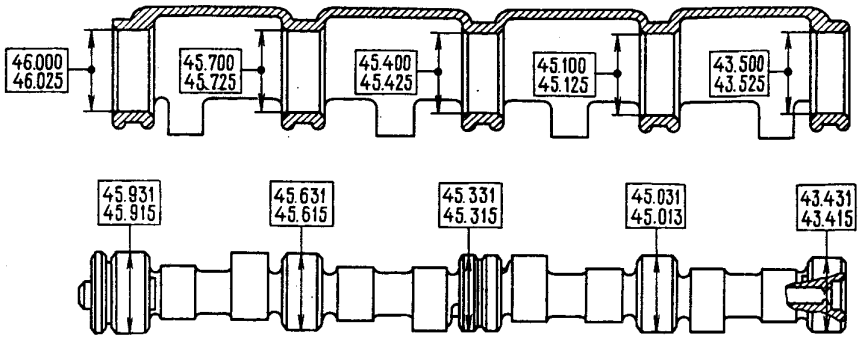


Fig. 2-53. Main Dimensions of Camshaft and of Bores in Camshaft Bearing Housing

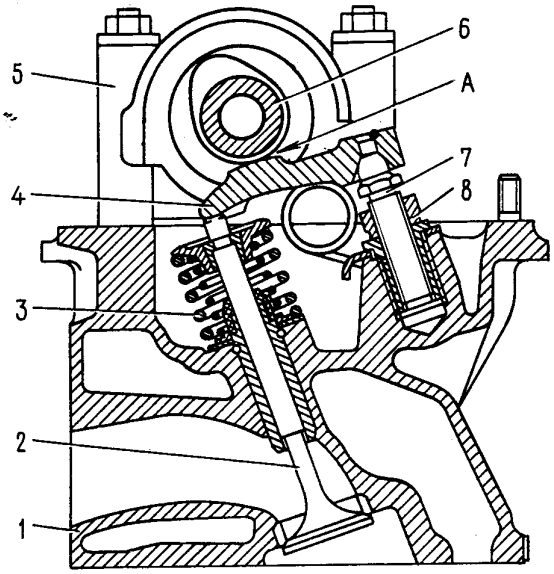


Fig. 2-54. Cylinder Block and Head. Section Through Inlet Valve:

1 - cylinder head; 2 - valve; 3 - spring; 4 - valve lever; 5 - bearing housing; 6 - camshaft; 7 - adjusting bolt; 8 - bolt locknut
A - rocker-to-cam clearance

- loosen the locknut of the rocker adjusting bolt;

- insert flat feeler gauge A.95111, 0.15 mm thick, between the rocker and the camshaft cam and turn the bolt in or out with a wrench, securing

Table 2-5

Sequence of Valve Clearance Adjustment

Crankshaft rotation, deg.	End of compression stroke in cylinder No.	Number of adjusted valves (cams)
0	4	8 and 6
180	2	4 and 7
360	1	1 and 3
540	3	5 and 2

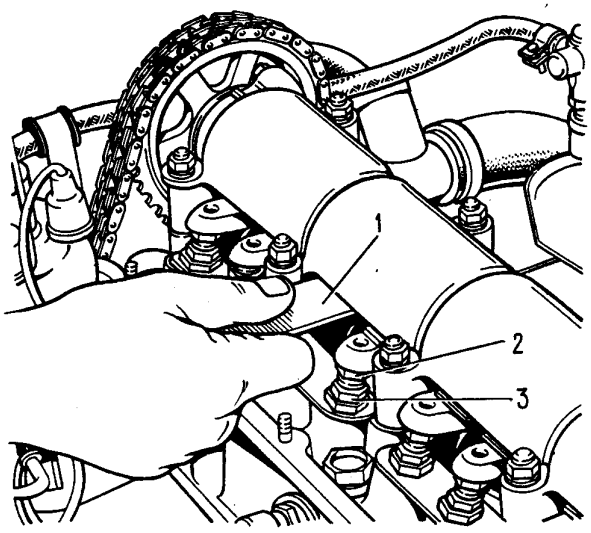


Fig. 2-55. Checking Rocker-to-Cam Clearance:
1 - feeler gauge A.95111; 2 - adjusting bolt; 3 - adjusting bolt locknut

the bolt by the locknut until, with the locknut tightened, the feeler gauge goes in with a slight drag (Fig. 2-55);

- having adjusted the clearance in the exhaust valve of No. 4 cylinder and inlet valve of No. 3 cylinder, turn the crankshaft each time through 180° and adjust the clearances in the sequence specified in Table 2-5.

ADJUSTING CHAIN TENSION

Loosen tensioner nut 1 (Fig. 2-56). This will free spindle 3 and the chain will be tensioned by shoe 7 (Fig. 2-57) which is acted upon by spring 8 (Fig. 2-56).

Turn the crankshaft 1-1.5 revolutions in the normal direction. The tensioner spring which actuates the shoe will automatically set the proper chain tension.

Tighten tensioner nut 1; as a result, spindle 3 will be clamped by the collets of retainer 9 so

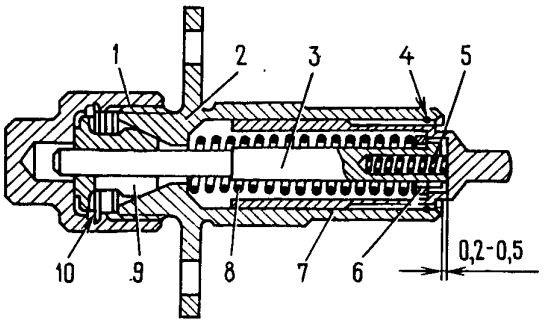


Fig. 2-56. Chain Tensioner. Sectionalized:
1 - cap nut; 2 - tensioner body; 3 - spindle;
4 - spring ring; 5 - plunger spring; 6 - washer;
7 - plunger; 8 - spring; 9 - retainer; 10 - spring ring

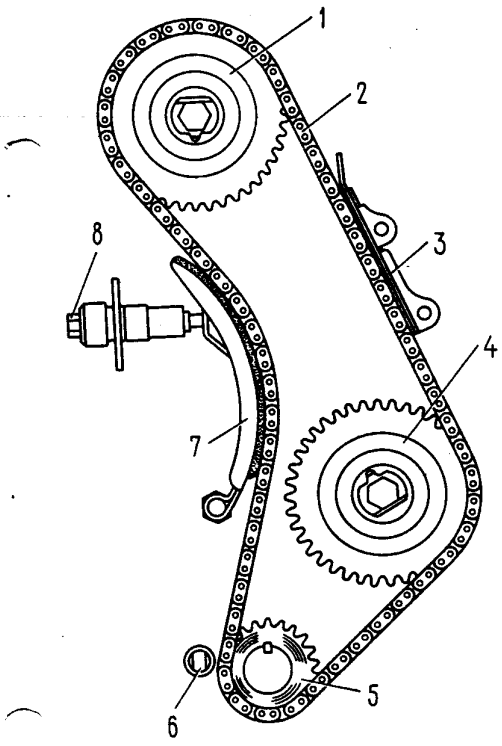


Fig. 2-57. Camshaft and Accessory Drive Diagram:
1 - camshaft sprocket; 2 - chain; 3 - chain damper;
4 - oil pump drive sprocket; 5 - crankshaft sprocket; 6 - limiting pin; 7 - tensioner shoe;
8 - chain tensioner

that on the running engine plunger 7 will be loaded by spring 5 alone. This spring forces the plunger off the head of spindle 3 and the clearance between the two is filled with oil on the running engine, this oil functioning as a shock-absorbing medium during chain impacts.

Due to a guaranteed clearance of 0.2 - 0.5 mm between spindle 3 and plunger 7, in case of strong chain impacts spring 8 starts functioning too.

CHECKING CAMSHAFT

Scores, nicks, scratches and aluminium galling from the bearing housings are not tolerable on the camshaft journals.

Wear exceeding 0.5 mm on the working surfaces of the cams, and scores and faceting are not tolerable.

Put the camshaft with its extreme journals on two V-blocks placed on a surface plate and check radial runout of the middle journals with an indicator. The runout should not exceed 0.04 mm, otherwise the camshaft should be trued up on a straightening press.

Note. The cars turned out before 1982 were furnished with camshafts whose cams were induction hardened. Since April 1982 the camshafts with nitrided cams are installed. Since 1984 each shaft bears the mark of the year of its manufacture. Since 1985 some cars are furnished with the camshafts with chilled cams. These camshafts are distinguished by a hex belt between the No. 3 and No.4 cams.

CHECKING CAMSHAFT BEARING HOUSING

Wash and clean the camshaft bearing housing and the oil channels.

Check the diameter of holes in the supports. If the clearance between the camshaft journals and supports exceeds the 0.2 mm wear limit, the bearing housing should be replaced.

The internal supporting surfaces should be smooth and free of scores. Replace the housing if these surfaces are damaged.

Examine the housing for cracks and replace it, if cracked.

CHAIN TENSIONER

Disassembly and assembly. To disassemble the chain tensioner remove cap nut 1 (Fig. 2-56), retainer 9 and spring ring 4, then take out plunger 7, spring 5 and spindle 3 complete with spring 8 and washer 6.

To reassemble reverse the disassembly procedure.

Inspection. See that retainers 9 and spindle 3 are not scored and the mating surfaces of the shoe and plunger are free of deep notches. Replace any damaged parts.

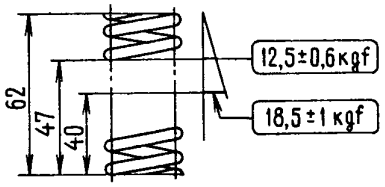


Fig. 2-58. Main Data for Checking Tensioner Spring

The resilience of the tensioner spring should be within the limits indicated in Fig. 2-58. Replace the spring if it is weak.

Inspect the shoe and damper for heavy wear and replace them, if necessary.

CAMSHAFT DRIVE CHAIN

Wash the chain in kerosene and examine its links. The rollers and sideplates should be free from chipping, cracks and other kinds of damage.

The chain is apt to become stretched in service. It is considered serviceable if the tensioner is capable of ensuring its adequate tension, i.e. when the chain is stretched by not more than 4 mm.

Check the stretching of the chain on a device equipped with two rollers 1 (Fig. 2-59) for installing the chain. Stretch the chain with a force of 294 N (30 kgf) then slacken it to 147 N

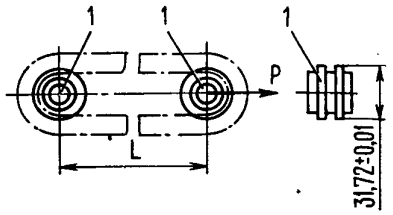


Fig. 2-59. Chain Wear (Stretching) Check Diagram: 1 - rollers

(15 kgf), repeat both operations and measure distance L between the roller axes.

For a new chain distance L between the roller axes is $(495.3^{+0.5}_{+0.1})$ mm. Replace the chain if it is stretched to 499.5 mm.

Before installing the chain on the engine coat it with engine oil.

COOLING SYSTEM

A diagram of the cooling system is shown in Fig. 2-60.

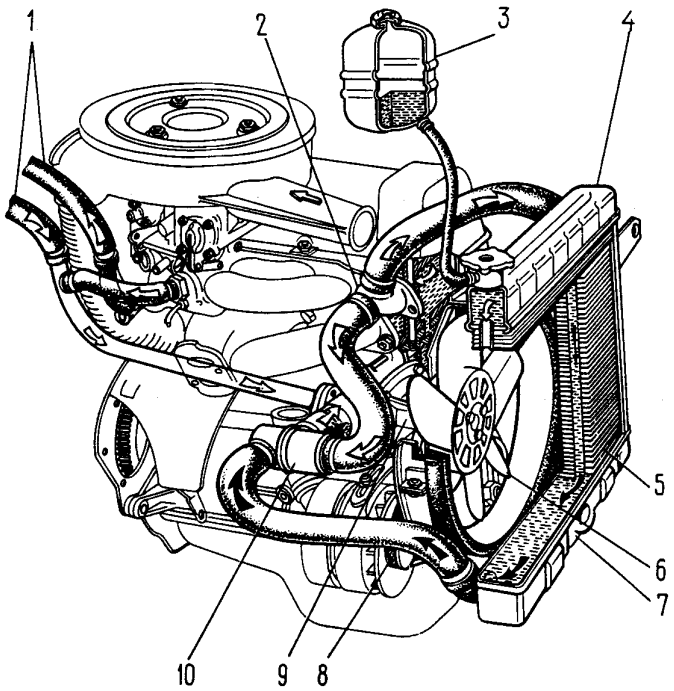


Fig. 2-60. Cooling System:
1 - body heater radiator inlet and outlet hoses; 2 - outlet connection; 3 - expansion tank; 4 - radiator top tank; 5 - radiator cooling fins; 6 - fan; 7 - radiator bottom tank; 8 - pump drive belt; 9 - coolant pump; 10 - thermostat

CHECKING COOLANT LEVEL AND SPECIFIC GRAVITY

The quantity of coolant in the cooling system is checked by the liquid level in the expansion tank. On a cold engine (15 - 20 °C) the level should be 3 - 4 cm above the "MIN" mark on the expansion tank.

Caution

It is good practice to check the coolant level on a cold engine since the volume of heated coolant increases so that its level in a hot engine may rise considerably.

If necessary, check the specific gravity of coolant with a hydrometer. It should be 1.078 - 1.085 g/cm^3 for TOCOЛ A-40M liquid used in the VAZ cars.

If the coolant level in the expansion tank is lower than prescribed and its specific gravity is too high, add some distilled water. If the specific gravity is normal, add some coolant of the grade contained in the system.

If the specific gravity of the coolant is lower than prescribed for the cold season, take care to replace it with a proper grade.

FILLING COOLING SYSTEM

As a rule, the cooling system is filled either when the coolant has to be changed, or after engine repairs. To fill the system:

- remove the radiator and expansion tank caps and open the heater cock;

- pour 10.7 l of coolant into the radiator; eep pouring until the liquid starts flowing from he radiator throat; then replace the radiator cap;

- pour the remaining coolant into the expan- ion tank and put in place its cap;

- run the engine idle for 1 - 2 min to emove any air pockets.

Allow the engine to cool down and recheck the oolant level. If it drops below the prescribed ark and there are no leaks in the system, add up he required amount of coolant.

ADJUSTING PUMP DRIVE BELT TENSION

The tension of the belt should be checked by easuring its deflection between the alternator and ump pulleys or between those of the pump and crank- haft. The tension is considered correct when eflection A of the belt (Fig. 2-61) under a force f 98 N (10 kgf) is within 10 - 15 mm and deflec- ion B is from 12 to 17 mm.

To tension the belt loosen the alternator ast ng nuts, push the alternator away from the ngine and retighten the nuts.

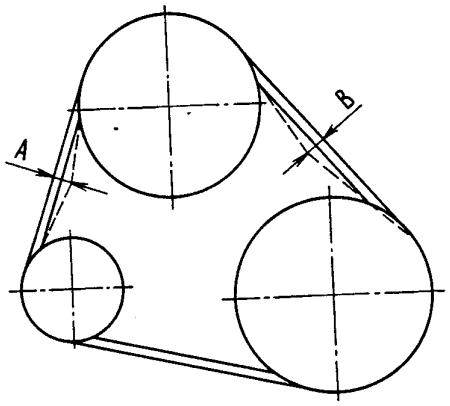


Fig. 2-61. Checking Pump Drive Belt Tension

COOLANT PUMP

Disassembly

To disassemble the pump:

- detach the pump body from cover 2 (Fig.2-62);

- secure the cover in a vice using gaskets and ake the impeller from the shaft with remover tool .40026 (Fig. 2-63);

- remove hub 2 (Fig. 2-64) of the fan pulley rom the shaft with remover tool A.40005/1/5;

- turn out lock screw 9 (Fig. 2-62) and take ut the bearing with the pump shaft;

- pull gland 11 out of body cover 2.

Inspection

Check the end play of the bearing. This opera- ion is mandatory when the pump was very noisy in peration. The clearance should not exceed 0.13 mm

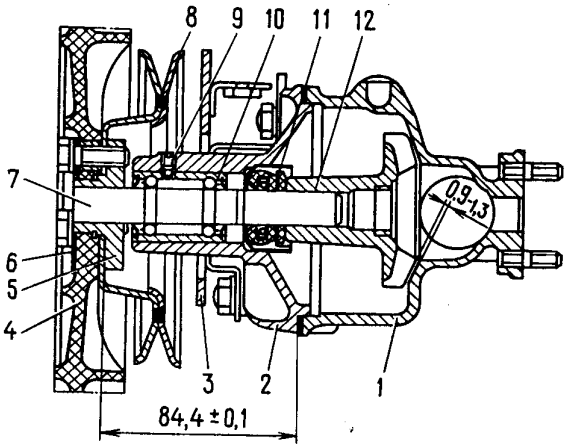


Fig. 2-62. Coolant Pump. Longitudinal Section:
1 - body; 2 - cover; 3 - fan shroud bracket;
4 - fan; 5 - pulley hub; 6 - cover plate;
7 - shaft; 8 - pulley; 9 - bearing lock screw;
10 - bearing; 11 - gland; 12 - impeller

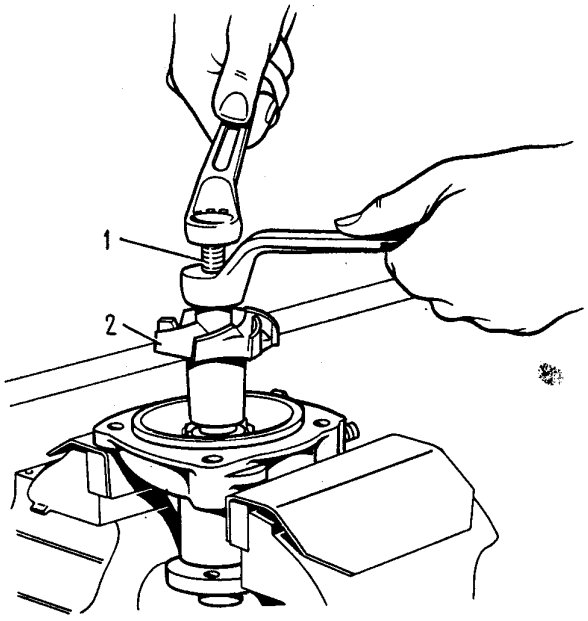


Fig. 2-63. Removing Pump Impeller:
1 - remover tool; 2 - impeller

under a load of 49 N (5 kgf). Replace the bearing if the clearance is larger.

It is good practice to replace the pump gland and the pump-to-cylinder block gasket during repairs.

Examine the pump body and cover; there should be no distortions and cracks.

Assembly

To assemble the pump:

- using a mandrel install the gland without cocking into the body cover;

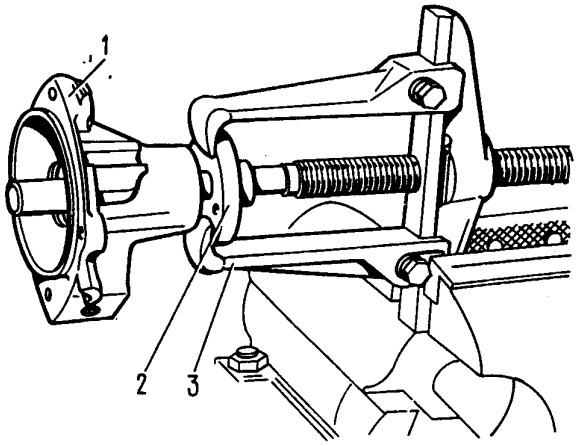


Fig. 2-64. Removing Pulley Hub:
1 - pump body cover; 2 - pulley hub; 3 - remover tool

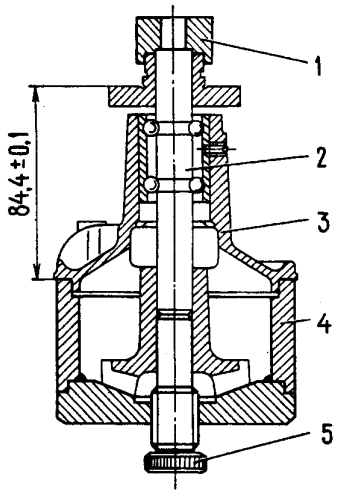


Fig. 2-65. Installing Impeller on Pump Shaft with Tool A.60430:
1 - support; 2 - pump shaft; 3 - pump body cover; 4 - sleeve; 5 - setting screw

- drive in the bearing with the shaft into the cover, seeing that the lock screw socket is in line with the hole in the pump body cover;

- turn in the bearing lock screw and lock-punch the socket along the contour to prevent the screw from working loose;

- using installation tool A.60430 (Fig. 2-65) force the pulley hub on the shaft ensuring a dimension (84.4±0.1) mm. If the hub is made of ceramet, only a new hub should be pressed on;

- press-fit the impeller on the shaft with installation tool A.60430, ensuring a clearance of 0.9 - 1.3 mm between the impeller blades and the pump body;

- assemble the pump body with the cover, installing the gasket in between.

THERMOSTAT

Check the temperature at which the thermostat main valve starts opening and measure the travel of the valve.

For this purpose place the thermostat on a БС-106-000 stand, immersing it into a tank with water or coolant. Touch the indicator rod bracket against the bottom of main valve 9 (Fig. 2-66).

The initial temperature of the liquid in the tank should be 73 - 75 °C. Raise the liquid temperature gradually at the rate of 1 °C per minute approximately, stirring the liquid constantly so as to obtain uniform temperature throughout its volume.

The temperature at which the valve starts opening is the temperature at which the travel of the main valve reaches 0.1 mm.

Replace the thermostat if the temperature of the beginning of opening of the main valve is other than (80±2) °C [(83±2) °C for the valve of PPR production)], or the valve travel is shorter than 6.0 mm.

The simplest check of the thermostat can be made directly on the car. Having started a cold engine, hand-feel the radiator; if the thermostat is in order, the bottom tank of the radiator should start getting warmer when the pointer of the coolant temperature gauge is about 3 - 4 mm from the red zone on the scale, which corresponds to 80 - 85 °C.

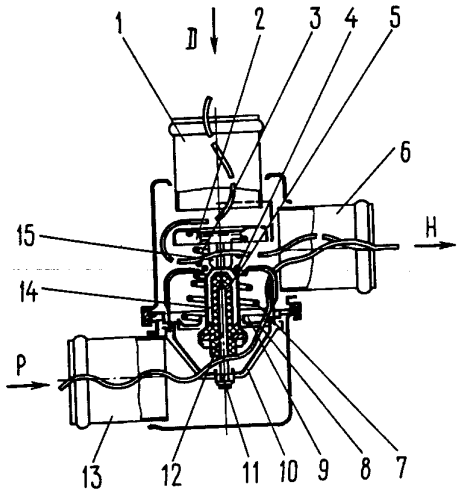


Fig. 2-66. Thermostat:
1 - inlet connection (from engine); 2 - bypass valve; 3 - bypass valve spring; 4 - sleeve; 5 - rubber insert; 6 - outlet connection; 7 - main valve spring; 8 - main valve seat; 9 - main valve; 10 - holder; 11 - adjusting nut; 12 - piston; 13 - inlet connection (from radiator); 14 - filler; 15 - case; D - coolant from engine; P - coolant from radiator; H - coolant to pump

RADIATOR

Removal from Car

To remove the radiator from the car:

- take away the spare wheel and remove its supporting tube;
- drain the radiator and the cylinder block by removing the drain plugs from the radiator bottom tank and the cylinder block; open the heater cock and remove the radiator filler cap;

Caution

To avoid damaging the radiator, unscrew the drain plug of the bottom tank with one wrench, applying another one to the plug union soldered into the radiator. Unscrew the plug with a socket or box wrench to prevent mutilation of the plug faces.

- disconnect the coolant hoses from the radiator;
- remove the fan shroud, first separating its halves;
- unscrew the radiator-to-car body bolts and take the radiator out of the engine compartment.

Tightness Test

The radiator can be checked for tightness in a water bath.

Plug the radiator connections, feed in air at a pressure of 0.1 MPa (1 kgf/cm^2) and dip the radiator into the water bath for at least 30 s. There should be no air bubbles.

Minor leaks can be corrected by soft-soldering; a heavily damaged radiator should be replaced by a new one.

LUBRICATING SYSTEM

The design of the lubricating system is shown in Fig. 2-67.

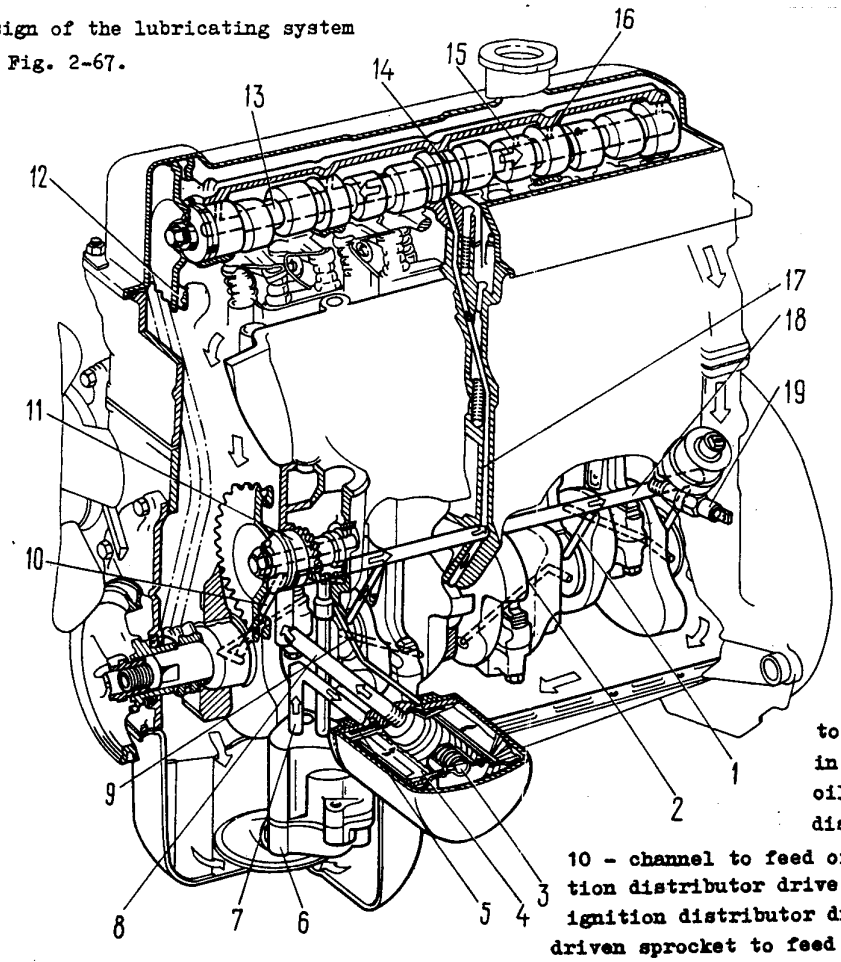


Fig. 2-67. Lubricating System:
1 - channel to feed oil to main bearing; 2 - channel to feed oil from main bearing to big-end bearing; 3 - oil pump by-pass valve; 4 - paper filter element; 5 - antidrain valve; 6 - oil pump; 7 - channel to feed oil from pump to filter; 8 - horizontal channel in cylinder block to feed oil from filter to main oil line; 9 - channel in cylinder block to feed oil to pump and ignition distributor drive gear; 10 - channel to feed oil to oil pump and ignition distributor drive shaft; 11 - oil pump and ignition distributor drive shaft; 12 - channel in driven sprocket to feed oil to chain; 13 - camshaft; 14 - circular groove on middle supporting journal of camshaft; 15 - channel in camshaft cam; 16 - channel in camshaft supporting journal; 17 - vertical channel in cylinder block to feed oil to valve gear; 18 - main oil line; 19 - electric oil pressure transmitter and oil pressure warning lamp transmitter

REPLACING OIL

Change the oil while the engine is still hot. Wait at least 10 min after opening the drain hole to provide for complete drainage of oil.

While replacing the oil be sure to replace the oil filter too. It can be removed with the aid of remover A.60312 (Fig. 2-4).

Install the filter by screwing it in hand-tight.

Every 30000 km of run wash the lubricating system with ВНИИНП-ФД oil in the following order:

- stop the engine, drain the used oil and, without removing the oil filter, pour in the detergent oil ВНИИНП-ФД to the "MIN" mark on the oil dipstick (2.9 l);
- start the engine and run it at the minimum idle speed for 10 min;
- drain all detergent oil and remove the old oil filter;
- install a new oil filter and pour in fresh lubricating oil of the grade suited to the season.

OIL PUMP

The main dimensions of the oil pump and its drive are given in Fig. 2-68.

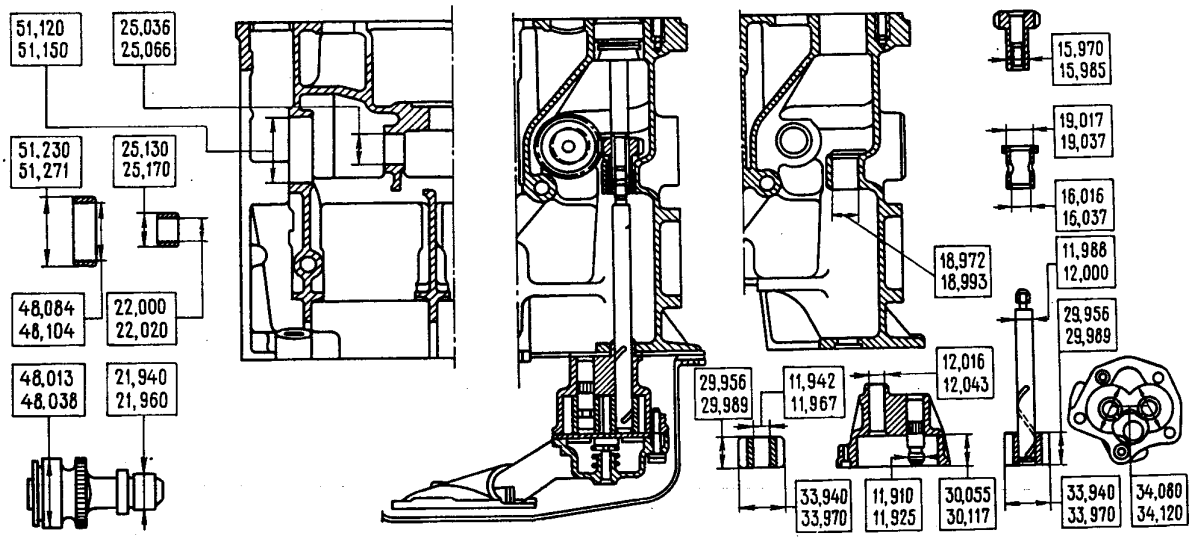


Fig. 2-68. Basic Dimensions of Oil Pump and Drive

Removal and Installation

If the oil pump alone has to be repaired, remove the engine from the car (see "Engine Removal"), mount it on a turnover stand, drain oil from the engine sump, turn over the engine and remove the oil sump. Then unscrew the oil pump fastening bolts and take off the pump complete with the intake connection.

To install the pump reverse the removal operations.

Disassembly and Assembly

Clamp the pump in a vice taking care not to damage the body and do the following:

- unscrew the bolts and remove the intake connection complete with the oil reducing valve;
- remove pump body cover 3 (Fig. 2-69) and take the pump shaft with the drive gear, then the driven gear, out of the body.

To assemble clamp the pump cautiously in a vice and proceed as follows:

- install the drive gear with the shaft into the pump body and slip the driven gear on the axle in the body;
- install the body cover, the reducing valve with the spring and fasten the intake connection to the pump body.

Note. The gears in the assembled pump should rotate smoothly and without jamming when the drive shaft is being turned by hand.

Checking Pump Parts

Wash all parts of the disassembled pump in kerosene or gasoline and blow them with compressed air; then examine the pump body and cover; replace any cracked parts.

Using a set of feeler gauges, check the clearances between the gear teeth, also between the gear tips (outside diameters of the gears) and the pump body walls (Fig. 2-70) which should be, respectively, 0.15 mm (maximum permissible 0.25 mm) and 0.11 - 0.18 mm (maximum permissible 0.25 mm). If the clearances exceed the permissible limits, replace the gears or, if necessary, the pump body too.

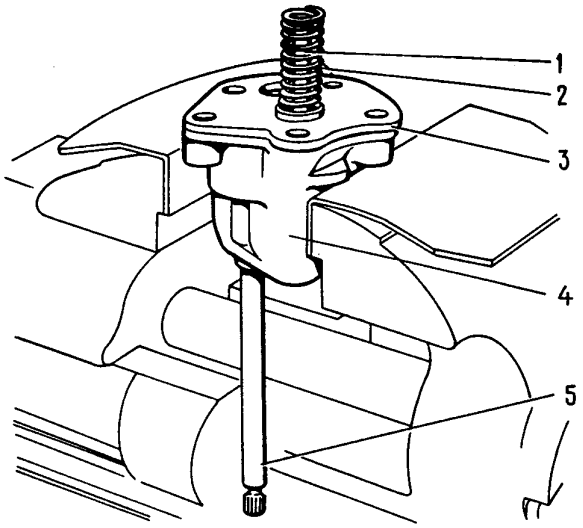


Fig. 2-69. Disassembling Oil Pump:
1 - reducing valve; 2 - spring; 3 - cover; 4 - body; 5 - shaft

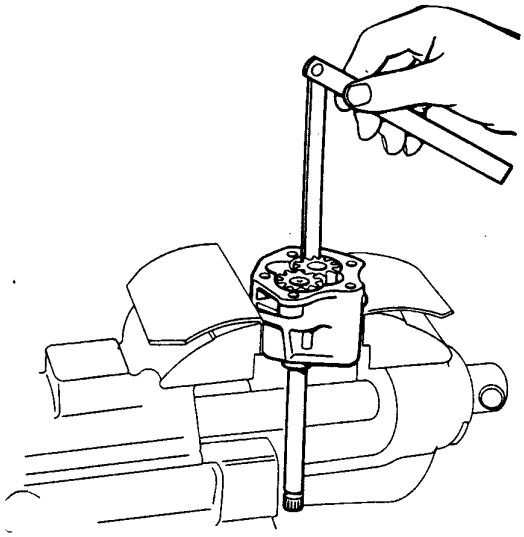


Fig. 2-70. Checking Radial Clearance in Oil Pump

Using a feeler gauge and a straightedge (Fig. 2-71), check the clearance between the gear faces and the surface of the body; this clearance should be 0.066 - 0.161 mm (maximum permissible 0.2 mm).

If the clearance is larger than 0.2 mm, replace the gears or the pump body, depending on whichever is worn heavier.

Measure the parts to determine the clearance between the driven gear and its axle. It should be 0.017 - 0.057 mm (wear limit being 0.1 mm). Besides, measure the clearance between the pump shaft and the bore in the body. This clearance should be 0.016 - 0.055 mm (maximum permissible 0.1 mm). If the clearances exceed the limits, replace the worn parts.

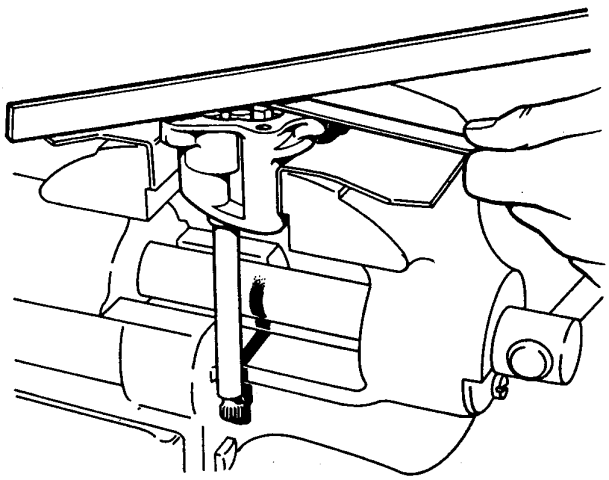


Fig. 2-71. Checking Axial Clearance in Oil Pump

Checking Reducing Valve

When repairing the oil pump, take care to examine the reducing valve. Pay attention to the condition of the valve and body surfaces since dirt or deposits on the mating surfaces may cause jamming. The mating surfaces of the valve should be free from nicks and burrs which may decrease pressure in the system.

Check the valve spring for resilience against the data given in Fig. 2-72.

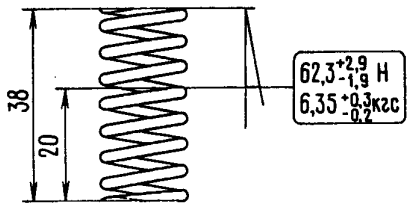


Fig. 2-72. Basic Data for Checking Reducing Valve Spring

OIL PUMP DRIVE SHAFT AND GEARS

The shaft journals and the active surface of the eccentric should be free from dents and notches.

The teeth of the oil pump and ignition distributor drive gears should not be chipped, otherwise replace the defective shaft or the gear.

OIL PUMP DRIVE SHAFT BUSHES

Check the inside diameter of the bushes, their fit in the bores and alignment of the oil hole in the front bush with the channel in the cylinder block (turning of the bush). The inside surface of the bushes should be smooth and free of scores.

Measure the diameters of the shaft and bushes and determine the clearances between the bushes and the bearing surfaces of the shaft. If the clearance

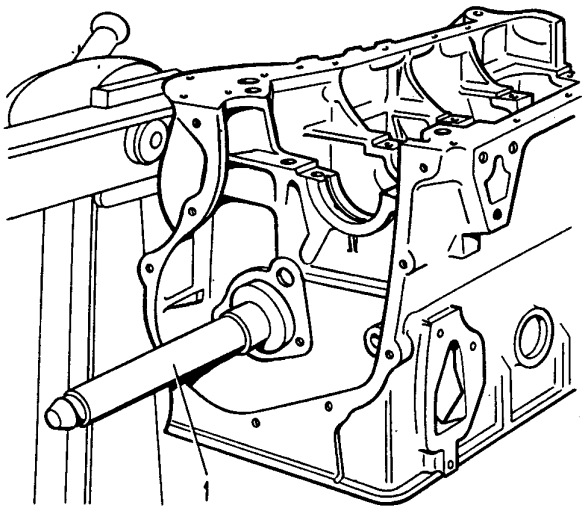


Fig. 2-73. Removal and Installation of Oil Pump Drive Shaft Bushes:
1 - driver A.60333/1/2

exceeds the 0.15 mm wear limit, also if the bushes are damaged on the surface or loose in the bores, replace them by new ones.

Both installation and removal of the bushes should be performed with driver A.60333/1/2 (Fig. 2-73), observing the following requirements:

- the bushes must be press-fitted into their bores so that the oil hole in the front bush is lined up with the lubrication channel in the cylinder block;
- after press-fitting the bushes must be finished to the exact inside diameter (for dimensions see Fig. 2-69). To ensure perfect axial alignment of the shaft bushes, ream both of them jointly with the aid of reamer A.90353.

OIL PUMP DRIVE GEAR BUSH

Check the bush for reliable press-fitting in the bore. Replace the bush if its inside surface is rough and scored.

To force the bush in or out use driver A.60326/R (Fig. 2-74).

After press-fitting ream out the bush to 16.016 - 16.037 mm.

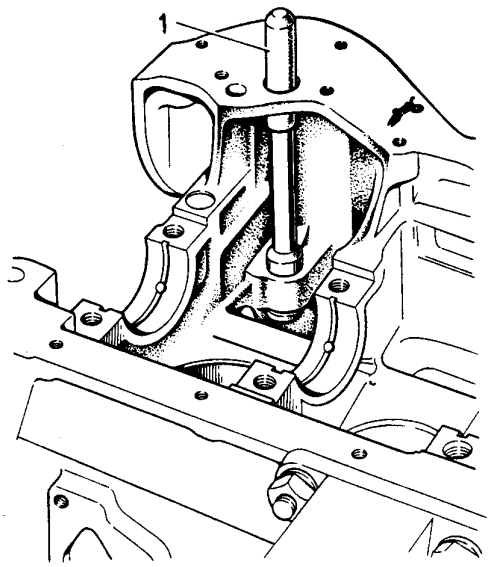


Fig. 2-74. Pressing Out Oil Pump and Ignition Distributor Drive Gear Bush:
1 - driver A.60326/R

CRANKCASE BREATHING SYSTEM

WASHING

To wash the system disconnect breathing hoses 4 and 8 (Fig. 2-75) from the connections, take flame arrester 5 out of hose 4, remove breather cover 3 and wash them with gasoline or kerosene.

It is also necessary to wash the carburettor

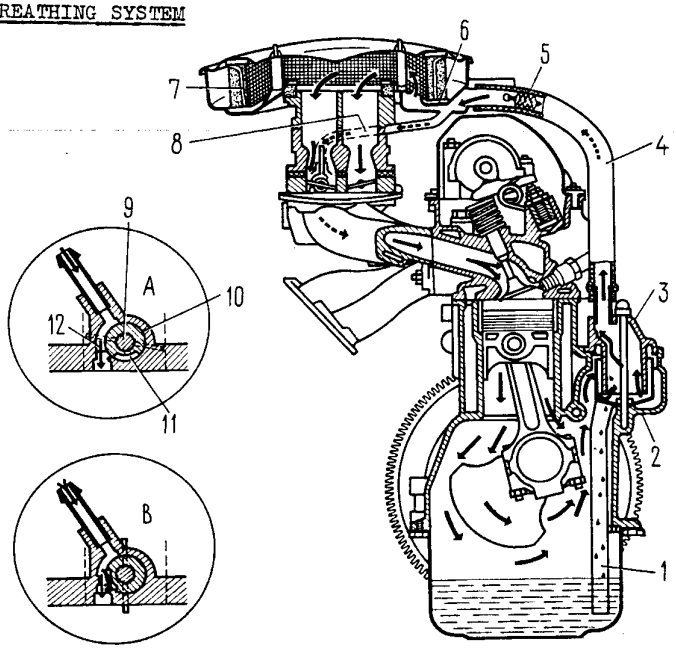


Fig. 2-75. Crankcase Breathing System:
A and B - operation of carburettor fume valve unit at low (A) and high (B) crankshaft speeds;
1 - oil separator drain pipe; 2 - oil separator; 3 - breather cover; 4 - gas drawout hose; 5 - flame arrester; 6 - drawout manifold; 7 - air cleaner filtering element; 8 - crankcase fume recirculation hose; 9 - primary throttle valve shaft; 10 - fume valve; 11 - fume valve groove; 12 - calibrated orifice

fume valve and the air cleaner spaces and connections which conduct the drawn-out gases.

Since 1987, crankcase fume recirculation hose 8 is laid to reach oil separator 2.

FUEL SYSTEM

AIR CLEANER

To remove the air cleaner take off its cover, lift out the filter element, unscrew the fastening nuts (Fig. 2-77) and remove the cleaner body with the gasket. Now disconnect the hoses.

When installing the air cleaner take care to position its cover properly. In summer (at temperatures above +15 °C) put the cover so that blue mark A (Fig. 2-76) is in line with black arrow 3. In winter (at temperatures below +15 °C) set the cover to align red mark B with the arrow.

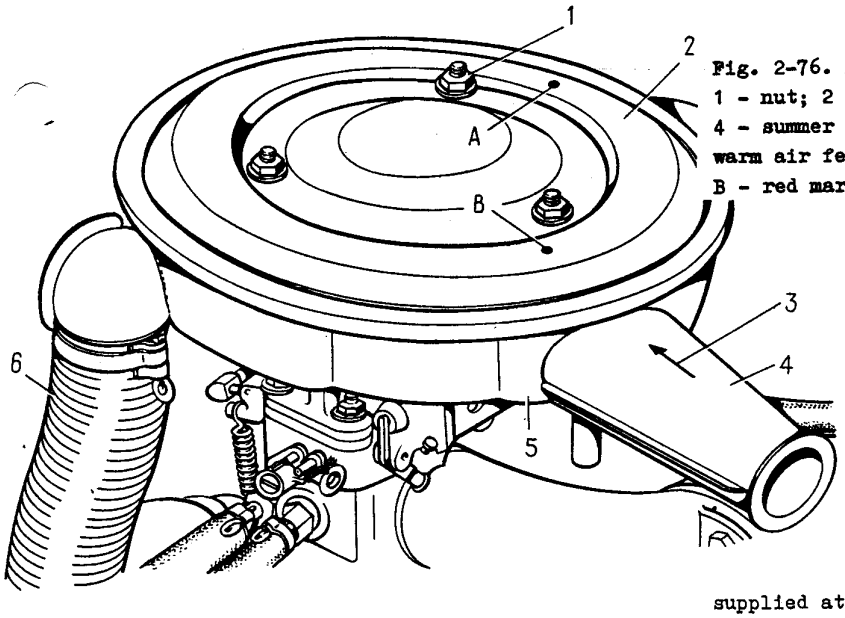


Fig. 2-76. Air Cleaner:
1 - nut; 2 - cleaner cover; 3 - indicating arrow; 4 - summer air intake; 5 - cleaner body; 6 - winter warm air feed hose; A - blue mark SUMMER (ЛЕТО); B - red mark WINTER (ЗИМА)

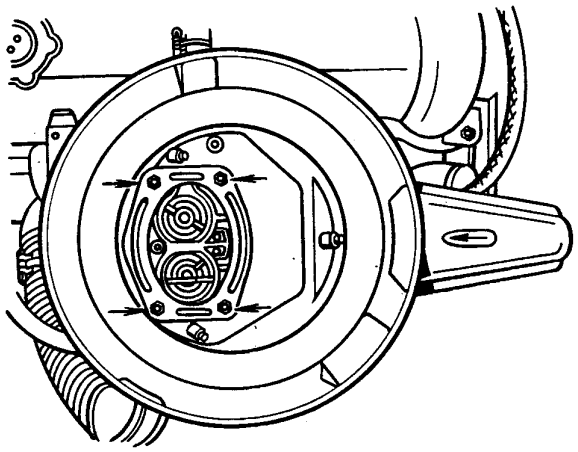


Fig. 2-77. Removing Air Cleaner. Arrows Show Cleaner-to-Carburettor Fastening Nuts

FUEL PUMP

The design of the fuel pump appears in Fig. 2-78.

Checking Pump

Insufficient supply of gasoline to the carburettor may be caused by some fault of the fuel pump or by clogging or damage of the fuel lines.

To identify the cause of the trouble disconnect the hose from discharge connection 1 and work hand-priming lever 8 to see whether the fuel is supplied at all. If not, disconnect the hose from suction connection 4 and check for vacuum built up at the outlet of this connection. If vacuum is created, the trouble should be traced to a damaged line; if not, the pump is at fault.

Disassembly, Inspection and Checking of Parts

To disassemble the pump unscrew the bolt of cover 5, remove the cover and filter 2. Then turn out the screws fastening the body to the lower cover, detach these parts from each other, take out the diaphragm unit and the spring.

Wash all parts in gasoline and blow them with compressed air.

Check the condition of the pump springs.

Look for probable jamming of the valves. Examine the diaphragms. They should be free from cracks and age-hardening.

After inspection replace all worn or damaged parts by new ones. The pump gaskets must always be

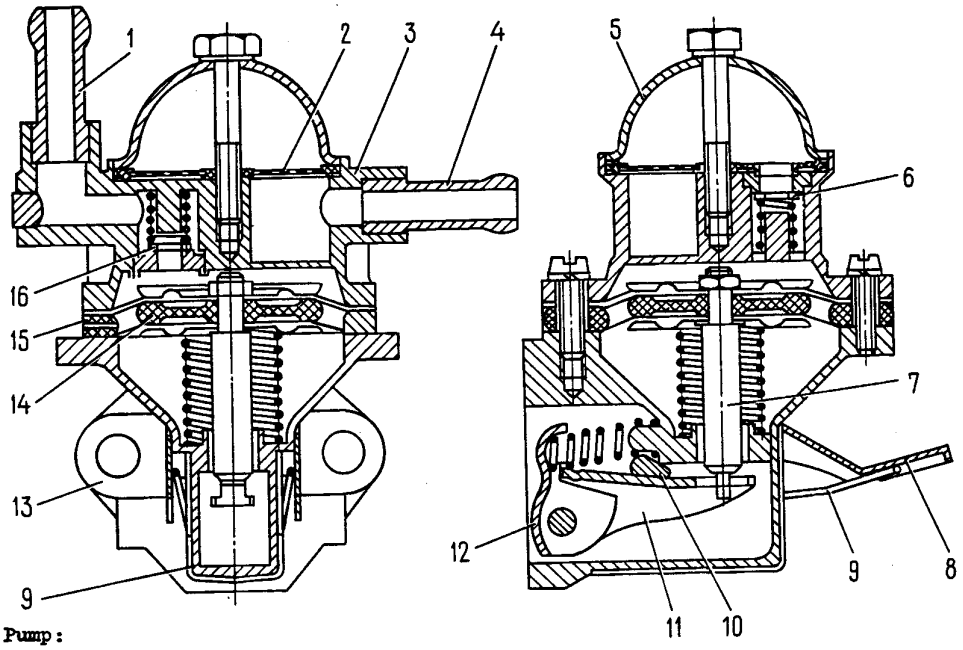


Fig. 2-78. Fuel Pump:
1 - discharge connection; 2 - filter; 3 - body; 4 - suction connection; 5 - cover; 6 - suction valve; 7 - rod; 8 - hand-priming lever; 9 - spring; 10 - eccentric; 11 - rocker; 12 - operating lever; 13 - lower cover; 14 - inner spacer; 15 - outer spacer; 16 - discharge valve

replaced by new ones; before installation, coat them with a thin layer of lubricant.

Installation of Pump

Correct installation of the fuel pump will be ensured by using two of the following three gaskets:

A - 0.27 - 0.33 mm thick;

B - 0.70 - 0.80 mm thick;

C - 1.10 - 1.30 mm thick.

To install the pump, refer to Fig. 2-79 and proceed as follows.

Install the heat-insulating spacer on the cylinder block, putting gasket A in between, and place gasket B on the spacer surface contacting the pump. Using fixture 67.7834.9506 measure distance d (the minimum protrusion of the pump pushrod determined by slowly turning the crankshaft). If distance d is within 0.8 - 1.3 mm, secure the pump on the engine; if it is smaller than 0.8 mm, replace gasket B by gasket A; if distance d is larger than 1.3 mm, replace gasket B by gasket C. Recheck distance d and secure the pump on the engine. Remember that the cylinder block and the heat-insulating spacer should always be separated by gasket A.

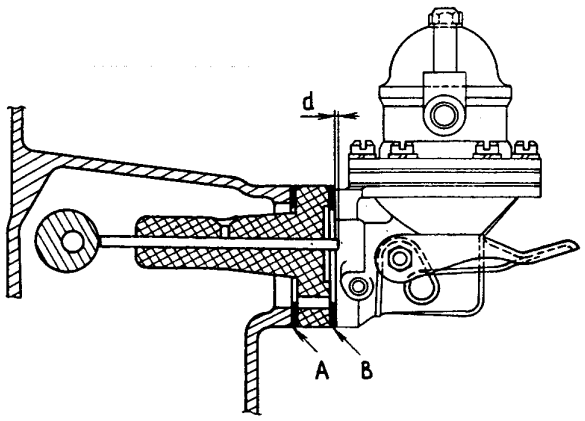


Fig. 2-79. Diagram for Checking and Adjusting Travel of Pump Drive Pushrod:
A - gasket 0.27 - 0.33 mm thick; B - gasket 0.70 - 0.80 mm thick; d - pushrod travel

FUEL TANK

Removal and Installation

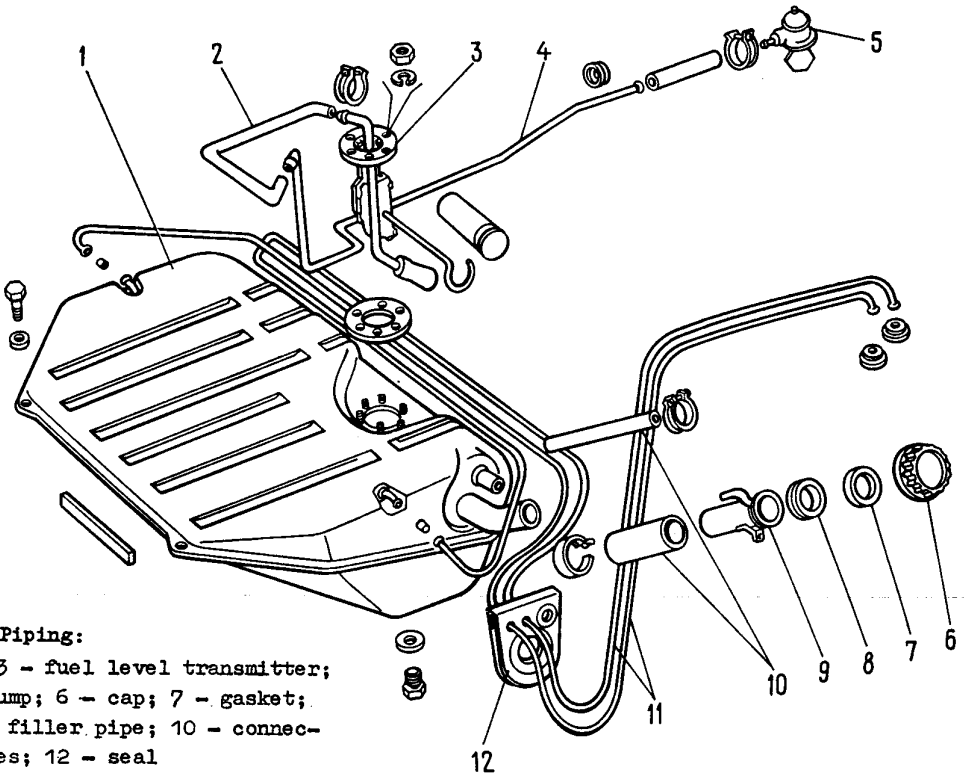
To remove the fuel tank from the car:

- unscrew cap 6 (Fig. 2-80) of filler pipe 9 and drain gasoline;
- remove the rear seat, turn off the fastening screws of the R.H. and L.H. linings of the wheel arches and remove the R.H. lining;
- turn off the fastening screws and remove the cover of the fuel tank compartment;
- remove the hoses which connect the fuel tank with the filler pipe, disconnect the wires and hose from the fuel level transmitter, unscrew the fastening bolts and remove the tank.

To install reverse the removal operations.

Cleaning and Inspection

Remove the fuel level transmitter, wash the tank with gasoline to remove sediments. Then wash it with a stream of hot water and steam-treat it to remove remnants of gasoline.



ig. 80. Fuel Tank and Piping:
- fuel tank; 2 - hose; 3 - fuel level transmitter;
- fuel pipe; 5 - fuel pump; 6 - cap; 7 - gasket;
- filler pipe seal; 9 - filler pipe; 10 - connec-
ng hoses; 11 - vent hoses; 12 - seal

Examine the fuel tank closely along the joint make sure there are no leaks and, if necessary, ft-solder the leaky point.

Caution

Soldering is permitted only on a thoroughly shed tank containing no gasoline fumes which may nite during soldering.

CARBURETTOR

to 1980 the VAZ-2121 cars had been equipped th carburettors 2106-1107010. This number is st on the lower flange of the carburettor body.

Beginning from 1980 the VAZ-2121 cars are tted with carburettors 2107-1107010-20 jointly th the ignition distributor type 30.3706-02 121-3706010-10) which incorporates a vacuum ark timer. However, some of the cars may be ovided with carburettor 2107-1107010-10 jointly th a conventional ignition distributor (without e vacuum spark timer). On these carburettors the mber is given on the nameplate secured to the rburettor cover.

The carburettor 2106-1107010 is of the emul-on double-barrel downdraft type. It incorporates balanced float chamber and a system for drawing e crankcase gases into the after-throttle space rankcase fume recirculation system) (Fig. 2-81). e idling system has a heated zone of the rottle valves and an electromagnetic valve of the

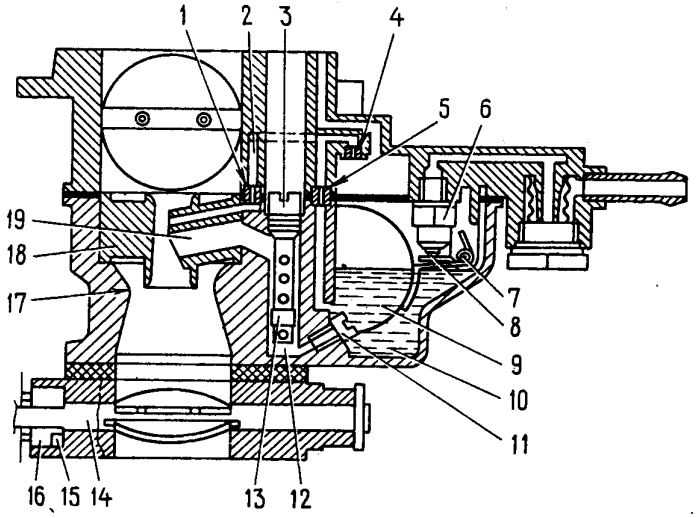


Fig. 2-81. Carburettor Main Metering System and Econostat (econostat atomizer is in carburettor secondary barrel. In this diagram it is shown as if being located in primary barrel):
1 - econostat emulsion jet*; 2 - econostat emulsion channel*; 3 - main metering system air jet;
4 - econostat air jet*; 5 - econostat fuel jet*;
6 - needle valve; 7 - float pivot; 8 - needle ball;
9 - float; 10 - float chamber; 11 - main fuel jet;
12 - emulsion well; 13 - emulsion tube; 14 - primary throttle valve shaft; 15 - fume valve groove;
16 - fume valve; 17 - larger venturi; 18 - smaller venturi; 19 - atomizer

* Not provided on carburettor 2106-1107010

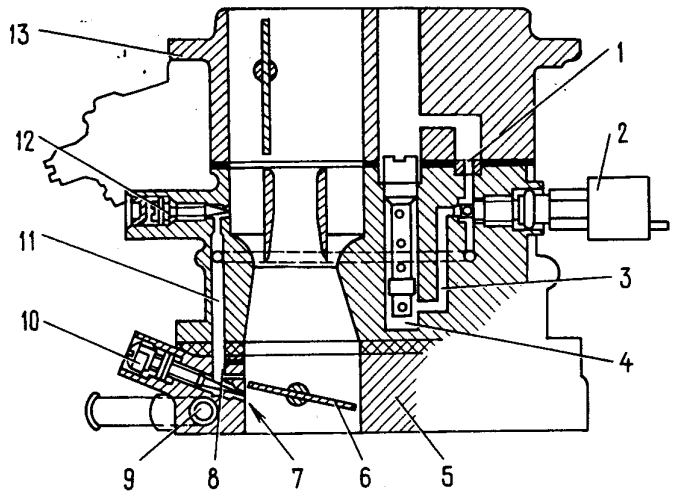


Fig. 2-82. Idling System of Carburettor 2106-1107010:
1 - air jet; 2 - shutoff valve; 3 - fuel channel; 4 - emulsion well; 5 - throttle valve housing; 6 - primary throttle valve; 7 - screw-adjusted hole; 8 - progression holes; 9 - throttle valve housing heating channel; 10 - adjusting screw; 11 - emulsion channel; 12 - additional air adjusting screw; 13 - carburettor upper body

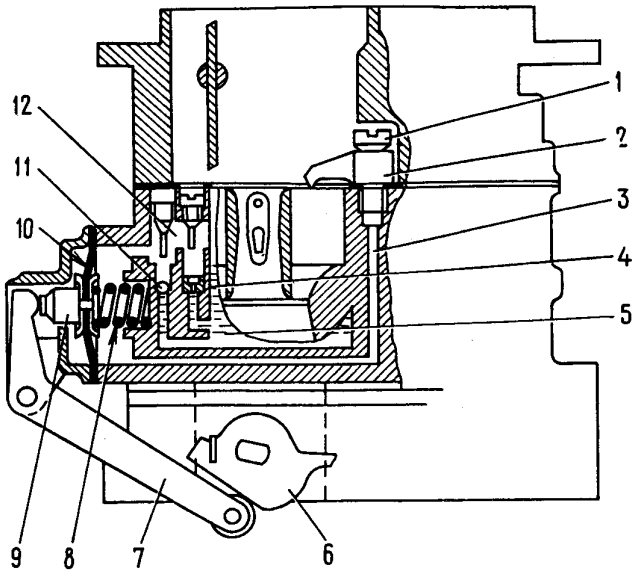


Fig. 2-84. Acceleration Pump. Diagrammatic:
1 - delivery ball valve; 2 - atomizer; 3 - fuel channel; 4 - bypass jet; 5 - float chamber; 6 - acceleration pump operating sector; 7 - operating lever; 8 - pump return spring; 9 - diaphragm cup; 10 - pump diaphragm; 11 - inlet ball valve; 12 - gasoline vapour chamber

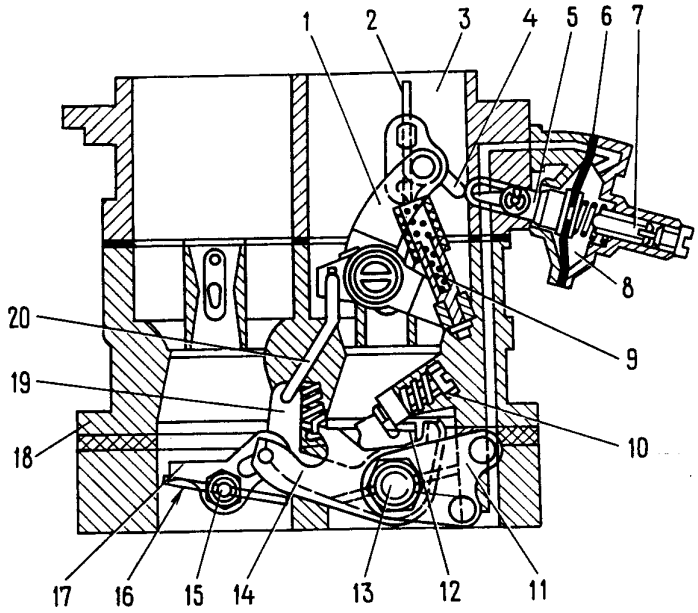


Fig. 2-83. Choke Mechanism and Linkage of Carburettors 2106-1107010, Diagrammatic:
1 - choke control lever; 2 - choke valve; 3 - carburettor primary barrel air horn; 4 - rod; 5 - choke mechanism rod; 6 - diaphragm; 7 - adjusting screw; 8 - space communicating with after-throttle space; 9 - telescopic link; 10 - primary throttle valve adjusting screw; 11 - throttle valve operating lever; 12 - sector; 13 - primary throttle valve shaft; 14 - lever on primary throttle valve shaft; 15 - secondary throttle valve shaft; 16 - secondary throttle valve; 17 - lever; 18 - carburettor body; 19 - lever; 20 - rod

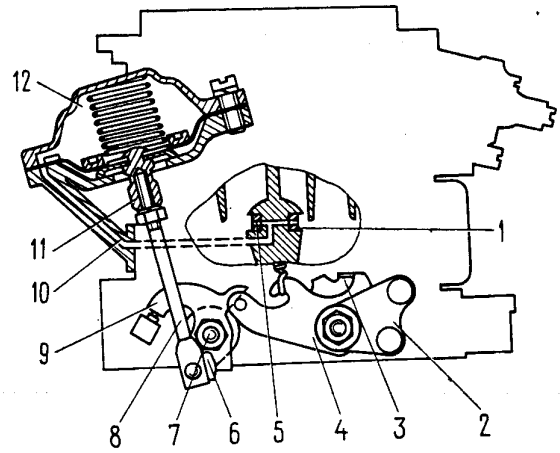


Fig. 2-85. Secondary Throttle Valve Operating Mechanism of Carburettors 2107-1107010-10 and 2107-1107010-20:
1 - pneumatic actuator jet in primary barrel venturi; 2 - throttle valve operating lever; 3 - lever rigidly linked with primary throttle valve shaft; 4 - secondary throttle valve opening limiting lever; 5 - pneumatic actuator jet in secondary venturi; 6 - lever spring-connected with lever 9; 7 - secondary throttle valve shaft; 8 - pneumatic actuator rod; 9 - secondary throttle valve operating lever; 10 - vacuum channel to pneumatic actuator; 11 - rod bushing; 12 - secondary throttle pneumatic actuator

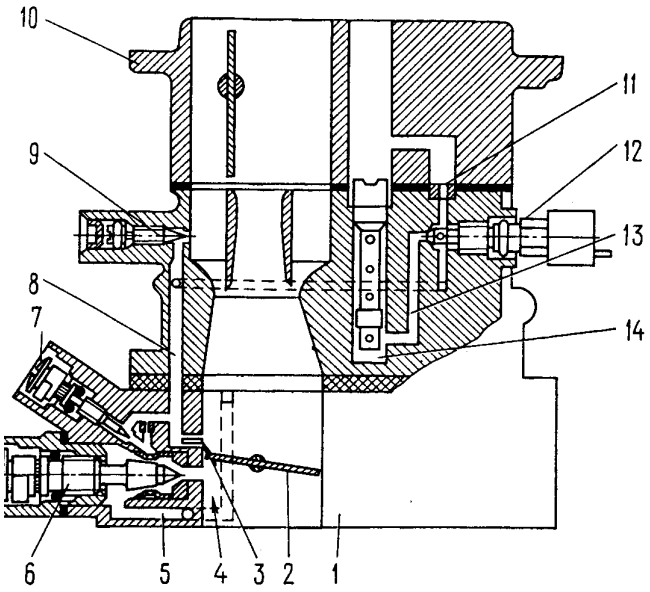


Fig. 2-86. Idling System of Carburettors 2107-1107010-10 and 2107-1107010-20:
1 - throttle valve housing; 2 - primary throttle valve; 3 - progression holes; 4 - screw-adjusted hole; 5 - air inlet channel; 6 - idle speed adjusting screw; 7 - idle mixture adjusting screw; 8 - idling system emulsion channel; 9 - additional air adjusting screw*; 10 - carburettor upper body; 11 - idling system air jet; 12 - shutoff valve; 13 - idling system fuel channel; 14 - emulsion well

* Installed on some carburettors

idling jet in the primary barrel (Fig. 2-82). A system of levers ensures the successive opening of the throttle valves; the choke valve has a diaphragm-type mechanism for starting a cold engine (Fig. 2-83). A diaphragm-type mechanically-operated acceleration pump (Fig. 2-84) supplies fuel into the primary barrel.

The carburettor 2107-1107010-10 is distinguished by different calibration data (see Table 2-6), provision of an enrichment device (econostat), pneumatically-operated secondary throttle valve (Fig. 2-85) and a modified idling system (Fig. 2-86). There is no heating of the throttle valve zone in these carburettors. The carburettor 2107-1107010-10 is fully interchangeable with the 2106-1107010 model and can be installed on the cars manufactured before 1980.

The carburettor 2107-1107010-20 differs from the 2107-1107010-10 model by different diameters of some jets and a provision of a pipe for feeding vacuum to the ignition distributor vacuum spark timer. This carburettor can be used instead of 2106-1107010 carburettors on the cars turned out before 1980. However, in this case the conventional ignition distributor (without vacuum spark timer) must be replaced by the ignition distributor type 30.3706-02 with such timer.

The calibration data of carburettors are tabulated below.

Adjustment of Engine Idle Speed

The idle speed adjusting elements (Figs 2-87 and 2-88) include air-fuel ratio (idle mixture) adjusting screw 2 and mixture quantity (idle speed) adjusting screw 1.

To prevent the Owner from interfering with the factory setting of the carburettor, screws 1 and 2 of carburettors 2107-1107010-10 and 2107-1107010-20 (only screw 2 of carburettor 2106-1107010) are provided with pressed-on limiting plastic bushings which allow the screws to be turned through half a revolution only. If the CO con-

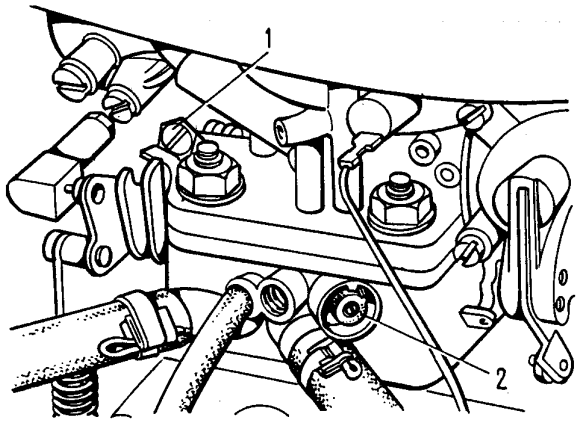


Fig. 2-87. Idling System Adjusting Screws in Carburettors 2106-1107010:
1 - idle speed adjusting screw; 2 - idle mixture adjusting screw

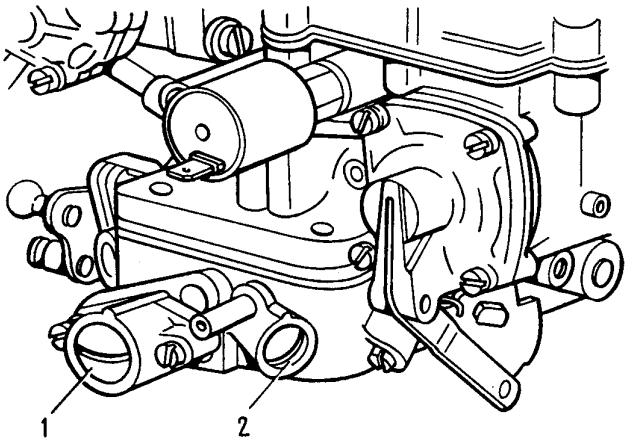


Fig. 2-88. Idling System Adjusting Screws in Carburettors 2107-1107010-10 and 2107-1107010-20:
1 - idle speed adjusting screw; 2 - idle mixture adjusting screw

Table 2-6

Carburettor Calibration Data

Parameters	2106-1107010		2107-1107010-10 2107-1107010-20		2105-1107010-10 2105-1107010-20	
	1st barrel	2nd barrel	1st barrel	2nd barrel	1st barrel	2nd barrel
Venturi diameter, mm	23	24	22	25	21	25
Mixing chamber diameter, mm	32	32	28	36	28	32
Mixture atomizer calibration number	4	4	3.5	4.5	3.5	4.5
Diameter of main fuel jet, mm	1.30	1.40	1.12*	1.50	1.07*	1.62
Diameter of main air jet, mm	1.50	1.50	1.50	1.50	1.70	1.70
Emulsion tube calibration number	F 15	F 15	F 15	F 15	F 15	F 15
Diameter of idling and progression system fuel jet, mm	0.45	0.60	0.50	0.60	0.50	0.60
Diameter of idling and progression system air jet, mm	1.70	0.70	1.70	0.70	1.70	0.70
Diameter of orifice of acceleration pump atomizer, mm	0.40	-	0.40	-	0.40	-
Diameter of acceleration pump bypass jet, mm	0.40	-	0.40	-	0.40	-
Capacity of acceleration pump per 10 full strokes, cm^3	7±25 %	-	7±25 %	-	7±25 %	-
Diameter of econostat fuel jet, mm	-	-	-	1.50	-	1.50
Diameter of econostat air jet, mm	-	-	-	1.20	-	1.20
Diameter of econostat emulsion jet, mm	-	-	-	1.50	-	1.50
Diameter of choke mechanism air jet, mm	0.70	-	0.70	-	0.70	-
Diameter of secondary throttle pneumatic actuator jet, mm	-	-	1.50	1.20	1.20	1.00
Distance from float to carburettor upper body with gasket (Dimension A, Fig. 2-89), mm	6.5-0.25		6.5-0.25		6.5-0.25	
Clearances at valves for adjusting choke mechanism (Fig. 2-100), mm:						
choke valve (clearance B)	7±0.25		5.5±0.25		5±0.5	
throttle valve (clearance C)	0.85-0.95		0.9-1.00		0.7-0.8	

* 1.15 mm for carburettor 2107-1107010-10; 1.09 mm for carburettor 2105-1107010-10.

tent in the exhaust gases cannot be adjusted with these bushings in position, turn the screws until the bushing heads are broken, remove the screws, take off their bushings and turn the screws back into the carburettor.

Note. The bushings installed at the Manufacturing Plant are blue, while those installed at Service Stations, red.

The idling speed should be adjusted on a warm engine (coolant temperature 90 - 95 °C or oil temperature 75 - 90 °C) with well-adjusted valve clearances and a correct ignition advance angle.

To adjust proceed as follows:

2106-1107010 carburettors

Using screw 1 (Fig. 2-87) set a crankshaft speed of 720 - 800 min^{-1} as read by the stand tachometer.

Rotating screw 2 bring the concentration of CO* in the exhaust gases to 1.5 - 2.5 % at the given position of the throttle valve.

Using screw 1 bring the crankshaft speed again to 720 - 800 min^{-1}.

If necessary, restore the concentration of CO to 1.5 - 2.5 % with screw 2.

Press the plastic limiting bushing on screw 1 as shown in Fig. 2-89 b.

Carburettors 2107-1107010-10 and 2107-1107010-2

Using screw 1 (Fig. 2-88) bring the crankshaft speed to 850 - 900 min^{-1} as read by the stand tachometer.

Rotating screw 2 bring the concentration of CO* in the exhaust gases to 0.5 - 1.2 % at the given position of screw 1.

Rotate screw 1 to restore the crankshaft speed to 850 - 900 min^{-1}.

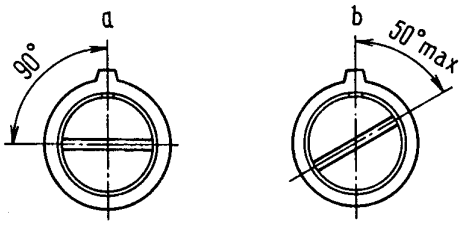
If necessary, rotate screw 2 to restore the concentration of CO to 0.5 - 1.2 %.

Press the plastic limiting bushings on the screws, orientating the bushing slots relative to the locating projections as shown in Fig. 2-89.

Adjustment of Fuel Level in Float Chamber

The fuel level required for normal functioning of the carburettor is ensured by correct setting of

* Reduced to 20 °C and 1013 GPa (760 mm Hg).



ig. 2-89. Installation of Limiting Bushings on
iling System Adjusting Screws:
- on idle speed adjusting screw; b - on idle mix-
ure adjusting screw

he serviceable elements of its shut-off device
Fig. 2-90).

The distance between the float and gasket 10
ontacting the carburettor upper body (dimension A)
hould be (6.5±0.25) mm; this distance can be adjust-
d by bending tongue 8. The bearing surface of the
ongue should be perpendicular to the needle valve
xi d should be free from jags and dents.

o check this distance use gauge 67.8151.9505.
old the upper body vertically, with float tongue 8
ouching lightly upon ball 5 of needle valve 4
ithout making it sink.

The maximum travel of the float [(8±0.25) mm]
an be adjusted by bending stop 3. Needle valve
eturn yoke 6 should not interfere with free move-
ent of the float.

Install the carburettor upper body and
ake sure that the float moves clear of the float
hamber walls.

Note. The setting of the float must be checked
henever the float or the needle valve is replaced;
n the latter case the valve sealing gasket must
lso be replaced.

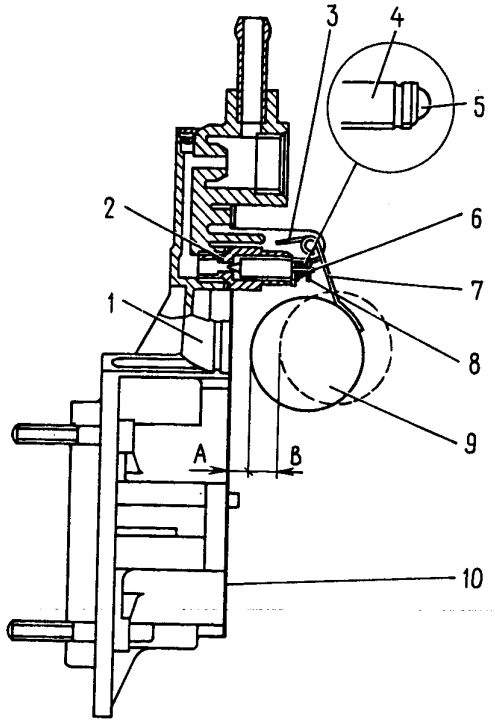
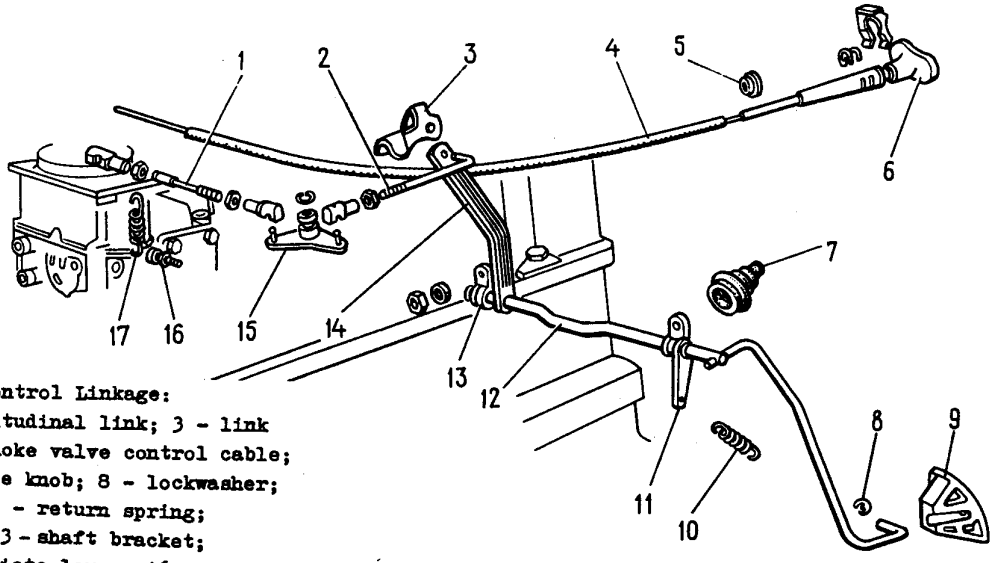


Fig. 2-90. Float Chamber Fuel Level Adjustment:
1 - carburettor upper body; 2 - needle valve seat;
3 - stop; 4 - needle valve; 5 - needle ball;
6 - valve needle return yoke; 7 - float arm;
8 - tongue; 9 - float; 10 - gasket

Adjustment of Carburettor Control Linkage

With accelerator pedal 9 fully depressed (Fig. 2-91) the primary throttle valve should be wide open and the throttle valve lever should have no additional travel. When the pedal is released the throttle valve should be tightly closed. If



ig. 2-91. Carburettor Control Linkage:
- cross link; 2 - longitudinal link; 3 - link
astening shackle; 4 - choke valve control cable;
and 7 - seals; 6 - cable knob; 8 - lockwasher;
- accelerator pedal; 10 - return spring;
1 - lever; 12 - shaft; 13 - shaft bracket;
4 - lever; 15 - intermediate lever; 16 - return
pring fastening screw; 17 - return spring

these requirements are not satisfied, the position of the pedal and throttle valve can be coordinated by changing the length of link 2 which is done by screwing its head on or off. Simultaneously check and, if necessary, adjust the length of link 1. The centre-to-centre distance of its heads should be 80 mm.

The cable and its casing should be positioned so that the choke valve is fully closed when knob 6 is pulled all the way out and fully open when the knob is pushed in.

Removal and Installation of Carburettor

Remove the air cleaner.

Disconnect link 1 (Fig. 2-91) and return spring 17 from the throttle valve operating lever. Detach choke valve control cable 4 from the carburettor.

Disconnect the hoses from the carburettor. Stop the ends of the fuel and coolant hoses to rule out leakage of fuel and coolant.

Remove the carburettor. Stop the inlet hole of the intake manifold with a plug.

To install the carburettor reverse the removal operations. After installation adjust the throttle control linkage and the idle speed of the engine.

Disassembly of Carburettor

Remove return spring 7 (Fig. 2-92) of the lever limiting the opening of secondary throttle valve.

Undo and detach link 8 from the throttle valve lever.

Disconnect pneumatic actuator rod 9 from the secondary throttle valve operating lever*.

Compress the spring of telescopic link 4 and disconnect it from three-arm lever 3.

Detach the upper body with the gasket from the carburettor body, trying not to damage the upper body and the float.

Turn out the fastening screws, disconnect the throttle valve housing from the carburettor body, taking care not to damage the air-fuel passage adapter bushings pressed into the carburettor body, and the bushing sockets. Detach cautiously the heat-insulating gasket.

Disassemble the carburettor upper body (Fig. 2-93):

- using a driver, carefully push float pivot 16 out of the brackets (in the direction of the bracket with cut-out) and pull out the pivot with unserrated flat-nose pliers. Remove the float and needle valve 15 taking care not to damage the float tongues;
- remove upper body gasket 11, unscrew needle valve seat 14, unscrew plug 13 and take out fuel filter 12;

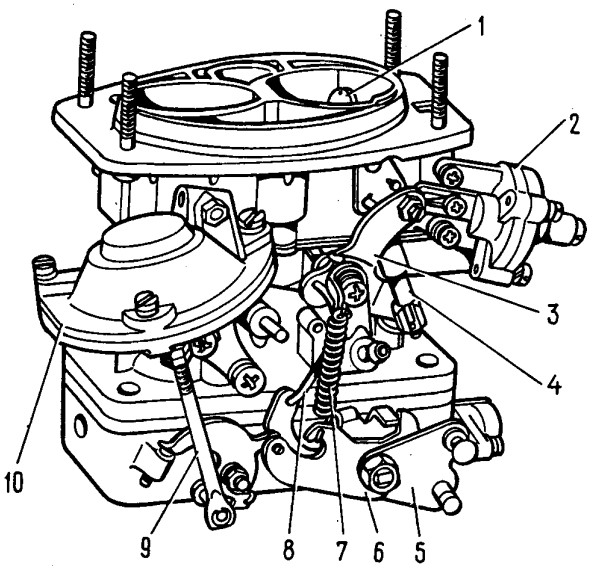


Fig. 2-92. Carburettor 2107-1107010-20 Viewed from Throttle Control Linkage:
1 - choke valve; 2 - choke mechanism; 3 - choke valve control lever; 4 - telescopic link; 5 - primary throttle valve operating lever; 6 - secondary throttle valve opening limiting lever; 7 - return spring; 8 - link connecting primary throttle valve with choke mechanism control linkage; 9 - pneumatic actuator rod; 10 - pneumatic actuator

- disconnect telescopic link 7 and choke mechanism link 19 from the lever of choke valve shaft 8;
- turn out two screws of choke mechanism body 6 and remove the latter;
- turn out three screws of choke mechanism cover 2 and take off the cover with adjusting screw and spring 3;
- remove diaphragm 4.

Disassemble throttle valve housing (Fig. 2-94)

- turn out idle mixture adjusting screw 18;
- remove the fastening screws of idle speed adjusting screw bushing 17 (Fig. 2-95) and take it off complete with screw 16 ;
- unbend the tab of lockwasher 2 (Fig. 2-93) and unscrew nut 1 which fastens the levers on the primary throttle valve shaft;
- remove the lockwasher, levers 3, 5, 8 and 21 with washers 7 and bushing 6 from the primary throttle valve shaft, then take off spring 20 and fume valve 19;
- unscrew nut 9 which fastens lever 10 on the secondary throttle valve shaft and remove the lever with the washers.

On carburettors 2107-1107010-10 and 2107-1107010-20 remove two levers with washers and a spring from the secondary throttle valve shaft (Fig. 2-95).

* Carburettors 2107-1107010-10 and 2107-1107010-20.

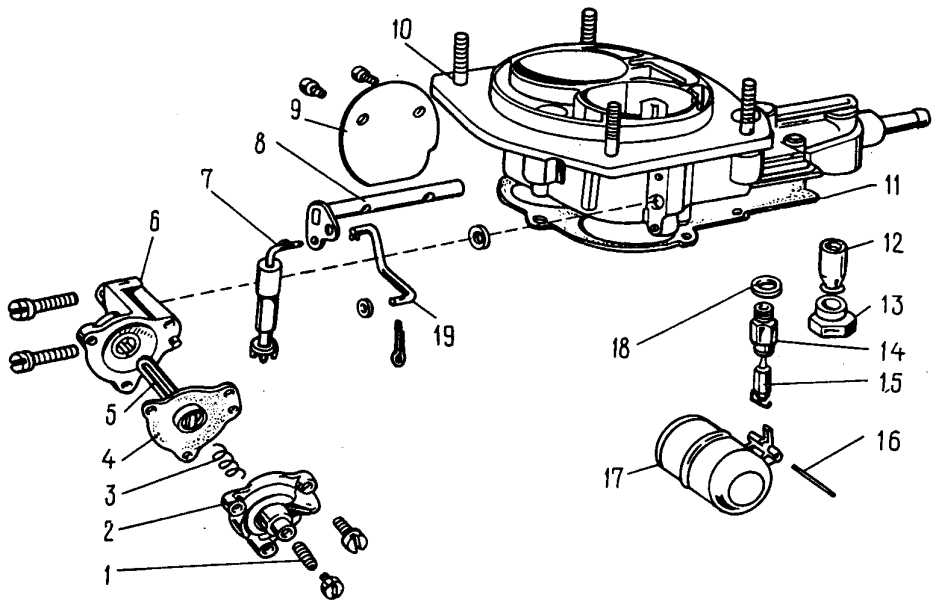


Fig. 2-93. Carburettor Upper Body Parts:
1 - adjusting screw; 2 - choke mechanism cover; 3 - spring; 4 - diaphragm; 5 - diaphragm rod; 6 - choke mechanism body; 7 - telescopic link; 8 - choke valve shaft; 9 - choke valve; 10 - carburettor upper body; 11 - gasket; 12 - filter; 13 - filter plug; 14 - needle valve seat; 15 - needle valve; 16 - float pivot; 17 - float; 18 - gasket; 19 - choke mechanism link

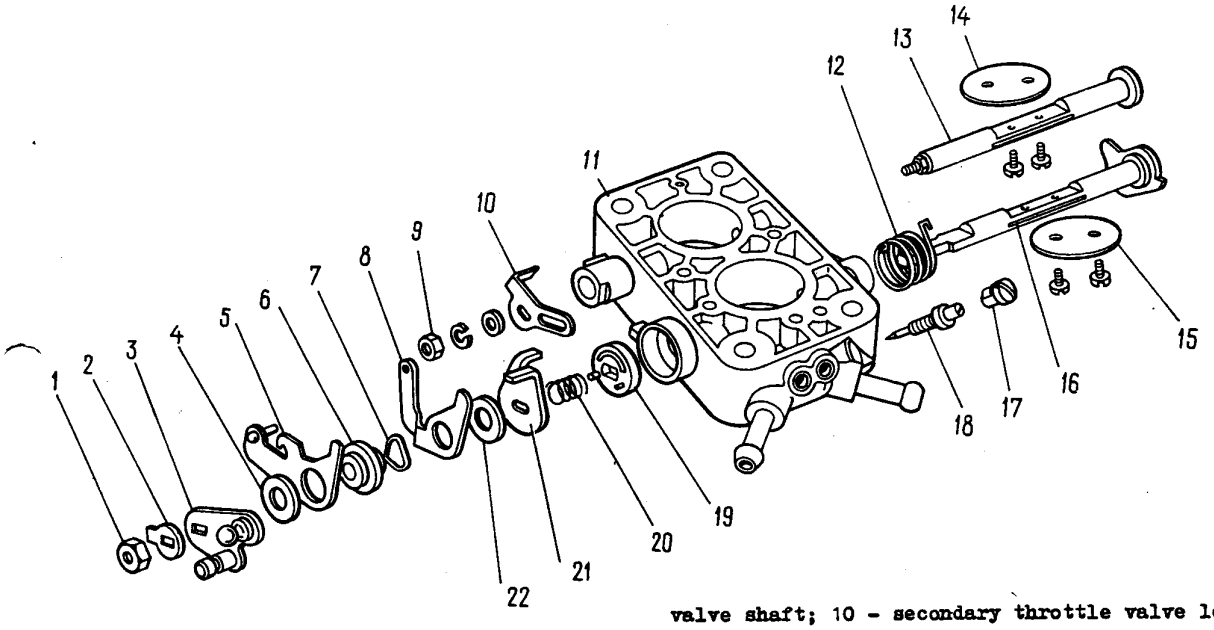
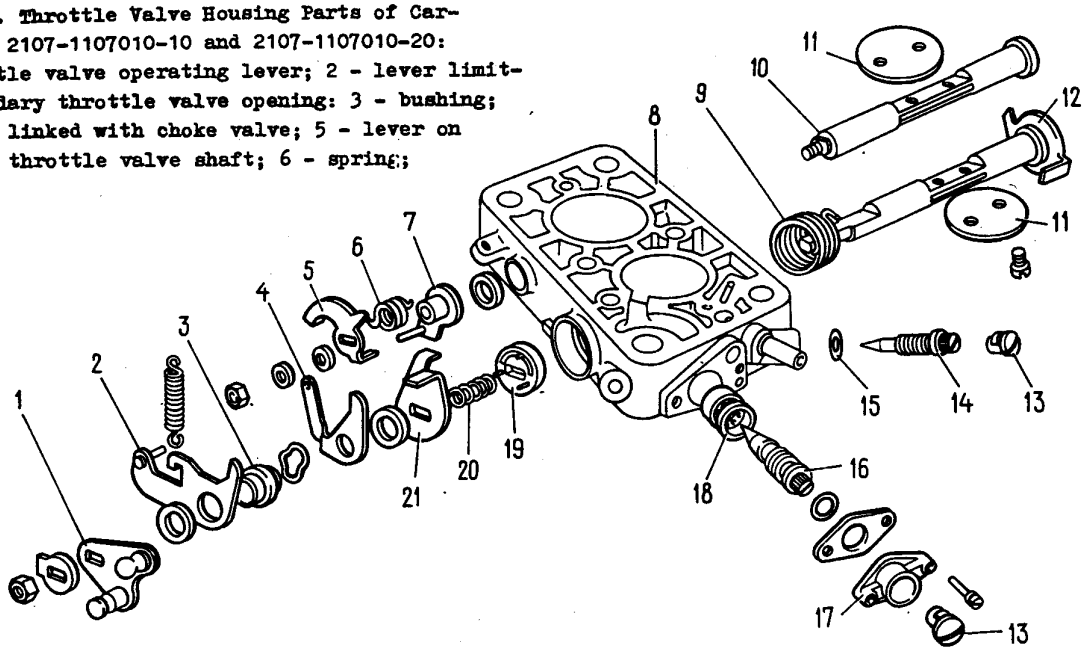


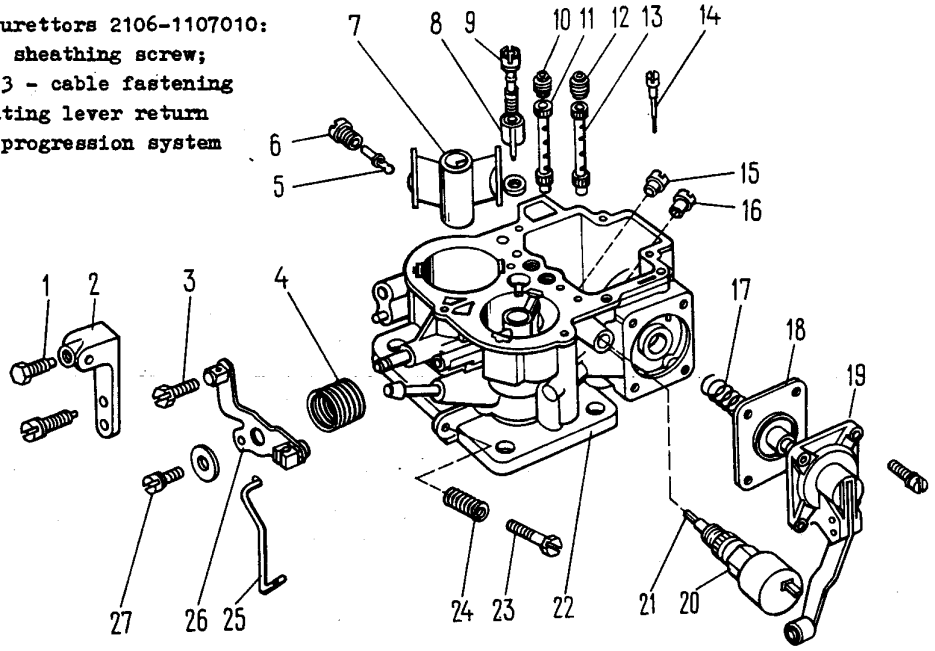
Fig. 2-94. Throttle Valve Housing Parts of Carburettors 2106-1107010:
1 - nut for fastening levers on primary throttle valve shaft; 2 - lockwasher; 3 - throttle valve operating lever; 4 - washer; 5 - secondary throttle valve operating lever; 6 - bushing; 7 - spring washer; 8 - lever linked with choke mechanism; 9 - nut for fastening lever on secondary throttle valve shaft; 10 - secondary throttle valve lever; 11 - throttle valve housing; 12 - primary throttle valve return spring; 13 - secondary throttle valve shaft; 14 - secondary throttle valve; 15 - primary throttle valve; 16 - primary throttle valve shaft; 17 - screw limiting bushing; 18 - idle mixture adjusting screw with sealing ring; 19 - fume valve; 20 - spring; 21 - primary throttle valve shaft lever; 22 - washer

Fig. 2-95. Throttle Valve Housing Parts of Carburettors 2107-1107010-10 and 2107-1107010-20:
1 - throttle valve operating lever; 2 - lever limiting secondary throttle valve opening: 3 - bushing; 4 - lever linked with choke valve; 5 - lever on secondary throttle valve shaft; 6 - spring;



7 - lever linked with pneumatic actuator; 8 - throttle valve housing; 9 - primary throttle valve return spring; 10 - secondary throttle valve shaft; 11 - throttle valves; 12 - primary throttle valve shaft; 13 - limiting bushing; 14 - idle mixture adjusting screw; 15 - sealing ring; 16 - idl speed adjusting screw; 17 - idle speed adjusting screw bushing; 18 - mixing bushing; 19 - fume valve; 20 - fume valve spring; 21 - primary throttle valve shaft lever

Fig. 2-96. Body Parts of Carburettors 2106-1107010:
1 - choke valve control cable sheathing screw; 2 - cable sheathing bracket; 3 - cable fastening screw; 4 - choke valve operating lever return spring; 5 - secondary barrel progression system



fuel jet; 6 - fuel jet body; 7 - smaller venturi; 8 - acceleration pump atomizer; 9 - acceleration pump valve-screw; 10 - secondary barrel main air jet; 11, 13 - emulsion tubes; 12 - primary barrel main air jet; 14 - acceleration pump adjusting screw; 15, 16 - secondary and primary barrels main fuel jets; 17 - acceleration pump return spring; 18 - acceleration pump diaphragm; 19 - acceleration pump cover; 20 - shutoff valve; 21 - idle fuel jet in shutoff valve; 22 - carburettor body; 23 - throttle valve opening adjusting screw; 24 - lock spring; 25 - throttle valve operating rod; 26 - choke valve operating lever; 27 - lever screw

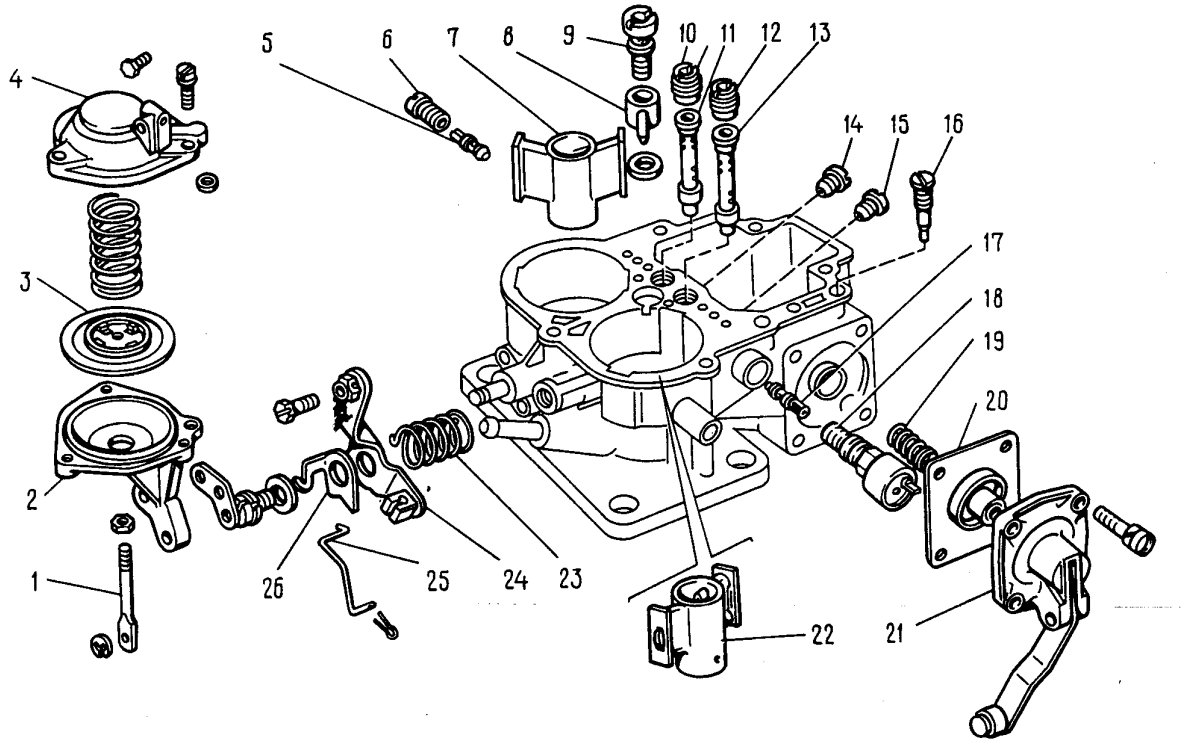


Fig. 2-97. Body Parts of Carburettors 2107-1107010-10 and 2107-1107010-20:
- secondary throttle valve pneumatic actuator rod; 2 - pneumatic actuator body; 3 - diaphragm; - pneumatic actuator cover; 5 - secondary barrel progression system fuel jet; 6 - fuel jet body; - smaller venturi; 8 - acceleration pump atomizer; 9 - acceleration pump valve-screw; 10, 12 - econdary and primary barrels main air jets; 1, 13 - secondary and primary barrels emulsion tubes; 14, 15 - secondary and primary barrels main fuel jets; 16 - acceleration pump adjusting screw; 17 - primary barrel idling system fuel jet; 18 - shutoff valve; 19 - acceleration pump return spring; 20 - acceleration pump diaphragm; 21 - accelerator pump cover; 22 - primary barrel smaller venturi; 23 - choke valve lever return spring; 24 - choke valve operating lever; 25 - link for connection with throttle valve; 26 - throttle valve return spring bracket

Disassemble the carburettor body (Fig. 2-96):

- turn out screw 27 of choke valve operating lever 26, remove the lever and spring 4, detach rod 25 from the lever;
- turn out the screws of acceleration pump cover 19, remove the cover with the lever and acceleration pump diaphragm 18 with return spring 17;
- turn out main air jets 10 and 12, overturn the body and, striking it gently, shake emulsion tubes 11 and 13 out of their wells;
- unscrew fuel jet body 6 and take it out complete with jet 5; turn out shutoff valve 20;
- remove valve-screw 9 and take off atomizer 8 of the acceleration pump with gaskets and turn out acceleration pump adjusting screw 14;
- turn out screw 23 which adjusts the opening of the throttle valve;
- take out smaller Venturis 7;
- unscrew main fuel jets 15 and 16;
- turn out the screw and remove bracket 2 which holds the casing of the choke valve control cable.

On carburettors 2107-1107010-10 and 2107-1107010-20 remove the pneumatic actuator of the secondary barrel throttle valve instead of bracket 2.

To disassemble the pneumatic actuator, turn out three fastening screws of cover 4 (Fig. 2-97) and remove the cover, then the spring and diaphragm 3 with the rod.

Cleaning and Inspection

Fuel filter. Wash the filter in gasoline and blow it with compressed air. Examine the filter and the tapered sealing bend of the filter plug. Replace the filter or plug, if damaged.

Float mechanism. The float must be neither damaged nor distorted. The mass of the float should be 11 - 13 g. The contact surfaces of the needle valve and its seat shall be free of defects interfering with the valve tightness. The valve should be free to move in its socket and its ball should move freely, without jamming. Replace any faulty parts with new ones.

Carburettor upper body. Clean the upper body and all holes and passages of dirt and oil. Wash the upper body in gasoline or acetone and blow it out with compressed air. Examine the sealing surfaces of the upper body. If the upper body is damaged, replace it by a new one.

Choke mechanism. Clean all the parts of the choke mechanism, wash them in gasoline and airblast. Examine the parts closely and replace any damaged ones.

Jets and emulsion tubes. Clean the jets and emulsion tubes of dirt and gummy deposits. Wash them in acetone or gasoline and blow through with compressed air.

Caution

Do not clear up the jets with metal tools or pieces of wire, nor wipe them and other carburettor parts with cotton wool, fabric or rags since the remaining lints may obstruct the fuel-emulsion path.

In case of heavy obstruction, clean the jets with a softwood needle wetted with acetone.

Carburettor shutoff valve (Fig. 2-98). In case of erratic valve functioning check for jamming of the valve needle and measure resistance of the coil which should be 150-160 Ω at 20 °C. If it is other than nominal, replace the shutoff valve.

Carburettor body. Clean the body of dirt and oil. Wash the body and its passages with gasoline or acetone and blow out with compressed air. If necessary, clean the passages and emulsion wells with special reamers. Examine the sealed surfaces of the body and replace the body, if they are damaged.

Acceleration pump. Clean, wash and airblast the pump parts. Check the ball for ease of motion in valve-screw 9 (Fig. 2-96) and the condition of the sealed surfaces and gaskets.

Check the movable elements of the pump (lever, roller, diaphragm parts) for ease of movement. There should be no jamming. The diaphragm should be intact, without deformations. Replace any damaged parts by new ones.

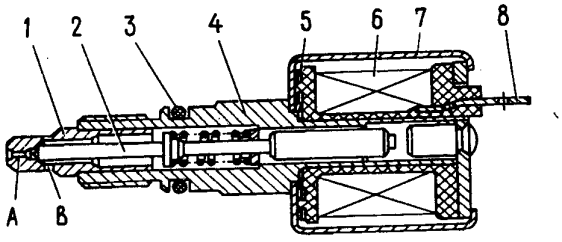


Fig. 2-98. Carburettor Shutoff Valve:
1 - idle fuel jet; 2 - needle; 3 - sealing ring; 4 - valve body; 5 - contact plate; 6 - coil; 7 - coil housing; 8 - plug; A - jet calibrated orifice; B - fuel outlet hole into idling system emulsion channel

Secondary throttle valve pneumatic actuator. Clean, wash and airblast the parts. Examine the diaphragm. It should be perfectly intact.

Throttle valve housing. Clean the parts and wash them with gasoline or acetone. Inspect the parts and replace those damaged.

Assembly of Carburettor

To assemble the carburettor, reverse the disassembly operations observing the following requirements:

- the float should rotate freely on its pivot, without rubbing against the chamber walls;
- the needle valve should slide easily in its socket, without cocking and jamming and the valve drive link should not interfere with the movement of the float tongue.

To avoid confusing the jets of the primary and secondary barrels at assembly, take a note of their markings and install them in conformity with the table of calibration data given at the beginning of this chapter.

Main air jets 3 (Fig. 2-81) are marked on the upper surface of their heads (e.g. "150") which denotes the diameter of the jet orifice (1.50 mm).

Main fuel jets 11 bear figures on the side surface ("130") which likewise denote the diameter of the jet orifice (1.30 mm).

Emulsion tubes 13 are marked on the cylindrica surface in the lower part. The figures on the tubes (e.g. "F15") stand for the tube calibration number.

Smaller Venturis 18 also bear figures (e.g. "4") which denote the calibration number of the atomizer orifice.

The idle fuel jets have figures indented on the cylindrical band (e.g. "45" or "60"); these figures denote the diameter of the orifice (0.45 or 0.60 mm).

Installation of Secondary Throttle Valve Pneumatic Actuator. To connect rod 8 (Fig. 2-85) tc lever 6 on the secondary throttle valve shaft proceed as follows:

- turn the secondary throttle valve to a vertical position;
- press pneumatic actuator rod 8 all the way and, holding bushing 11 against turning, turn the rod in or out, thus adjusting its length until the hole in the end of rod 8 gets in line with the pin on lever 6;
- slip rod 8 on the pin of lever 6 and secure it with a lockwasher;
- fasten rod 8 with a locknut, using another wrench to keep bushing 11 against turning.

Post-Assembly Adjustment and Checks of Carburettor

Position of throttle valves in carburettor 2106-1107010. With lever 4 (Fig. 2-99) in a positi where the upper lug of lever 3 contacts lever 2,

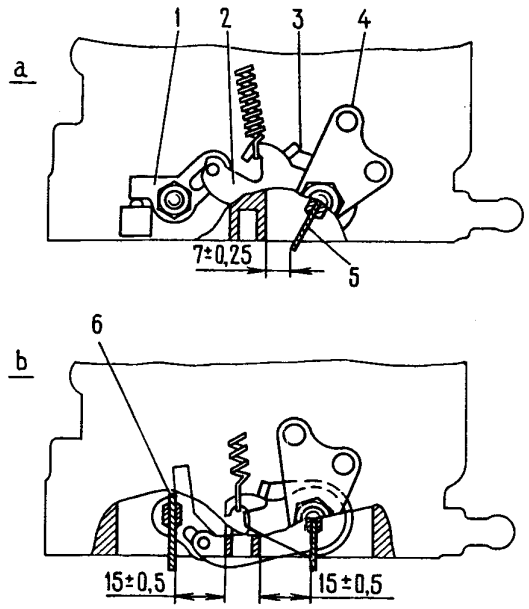


Fig. 2-99. Adjusting Full and Partial Opening of Throttle Valves in Carburettor 2106-1107010:
a - adjusting partial opening of primary throttle valve; b - adjusting position of secondary throttle valve:
1 - lever on secondary throttle valve shaft;
2 - secondary throttle valve operating lever;
3 - lever rigidly linked with primary throttle valve shaft; 4 - throttle valve operating lever;
5 - primary throttle valve; 6 - secondary throttle valve

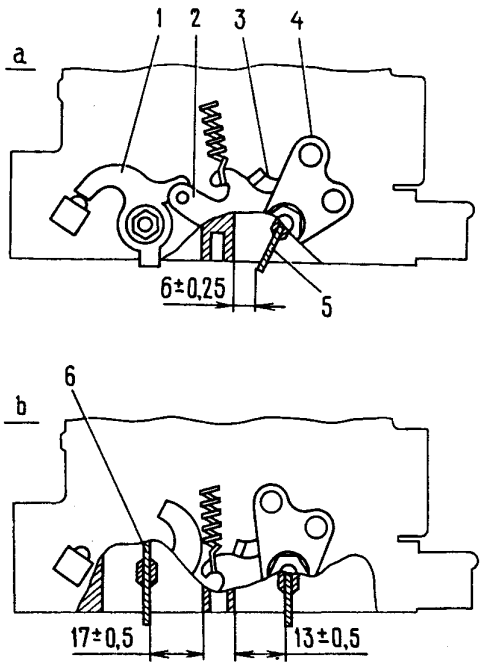


Fig. 2-100. Adjusting Position of Throttle Valves in Carburettors 2107-1107010-10 and 2107-1107010-20:
a - primary throttle valve partially open;
b - throttle valves fully open; 1 - lever on secondary throttle valve shaft; 2 - secondary throttle valve operating lever; 3 - lever rigidly connected with primary throttle valve shaft;
4 - throttle valves operating lever; 5 - primary throttle valve; 6 - secondary throttle valve

the primary throttle valve should be partially open [(7±0.25) mm]. This opening can be adjusted by bending the upper lug of lever 3.

Both throttle valves should be fully open when lever 4 is turned to the extreme position in which the lug of lever 3 bears against a special boss on the throttle valve housing (Fig. 2-99 b).

This position of the throttle valves should be adjusted by bending the lower lug of lever 3.

Position of throttle valves of carburettors 2107-1107010-10 and 2107-1107010-20. Check the throttle valves for full opening by turning their operating levers all the way to stop.

The maximum opening of the primary throttle valve [(13 ±0.5) mm] should be adjusted by bending the lower lug of lever 3 (Fig. 2-100).

The maximum opening of the secondary throttle valve [(17±0.5) mm] should be adjusted by screwing the pneumatic actuator rod in or out.

Partial opening of the primary throttle valve at which the upper lug of lever 3 contacts lever 2 (Fig. 2-101, a) should be (6±0.25) mm. This distance is adjusted by bending the upper lug of lever 3.

Choke mechanism. When lever 1 (Fig. 2-101) is turned all the way counter-clockwise, the choke valve should be tightly closed. In this position of the lever the end of link 3 should be located in the end of the slot of choke mechanism rod 4, without moving the latter. This requirement can be met by bending link 3.

When the choke valve is tightly closed, the primary throttle valve must be partially open, i.e. through 0.85 - 0.95 mm (clearance C is the distance between the valve and chamber wall at the progression holes of the idling system). This clearance can be adjusted by bending link 7.

A completely closed choke valve should be opened through (7±0.25) mm (clearance B) by choke mechanism rod 4 when the latter is shifted by hand all the way to the right. This opening can be adjusted by screw 5.

In carburettors 2107-1107010-10 and 2107-1107010-20 clearance B should be (5.5±0.25) mm and clearance C, 0.9 - 1.0 mm.

Acceleration pump capacity. This should be measured by ten complete strokes (turns) of throttle valve operating lever 4 (Fig. 2-100). Fuel discharged from the pump atomizer during these ten strokes should be collected into a measuring glass. Its volume should range from 5.25 to 8.75 cm^3.

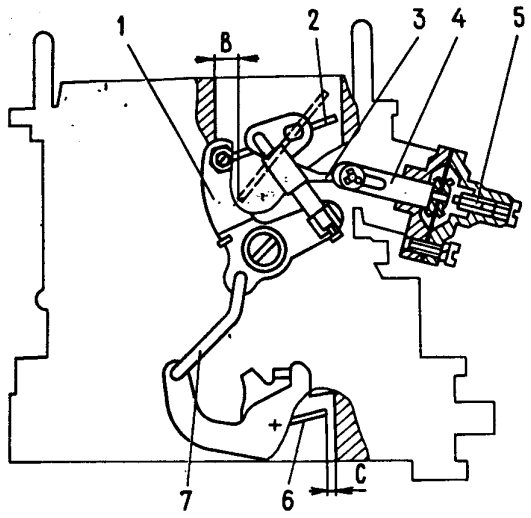


Fig. 2-101. Adjusting Choke Mechanism Control Linkage:
1 - choke valve operating lever; 2 - choke valve; 3 - choke mechanism link; 4 - choke mechanism rod; 5 - adjusting screw; 6 - primary throttle valve; 7 - throttle valve operating link

Before the checks make ten trial strokes of lever 4 in order to fill up the acceleration pump passages.

Tightness of needle valve should be checked on a stand which is capable of delivering fuel to the carburettor under a pressure of 30 kPa (3 m H_2O). After the fuel level has settled in the test tube of the stand, it must not drop for 10 - 15 s. If the level drops, this should be attributed to the leakage of fuel through the needle valve.

EXHAUST SYSTEM

Exhaust gases are discharged from the engine through the exhaust manifold, muffler inlet pipe 1 (Fig. 2-102), auxiliary muffler 6 and main muffler 7.

The joint between the exhaust manifold and muffler inlet pipe flanges is sealed by gasket 2. The muffler pipes are interconnected by clamps 5.

The mufflers and their pipes are suspended from the car at three points.

The inlet pipe is fastened to bracket 4 which is mounted on the gearbox rear cover. The main muffler is fastened to the body floor by two straps while the tail pipe, by rubber pad 9.

The welded mufflers complete with pipes constitute inseparable units and, in case of failure, they should be replaced by new ones.

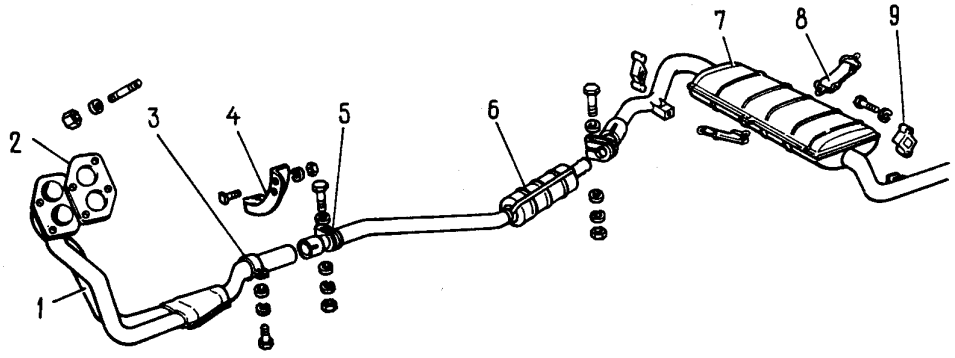


Fig. 2-102. Exhaust System:
1 - muffler inlet pipe; 2 - gasket; 3 - inlet pipe-to-gearbox clamp; 4 - inlet pipe-to-gearbox bracket; 5 - muffler pipe connecting clamp; 6 - front auxiliary muffler; 7 - main muffler; 8 - main muffler fastening strap; 9 - tail pipe fastening pad