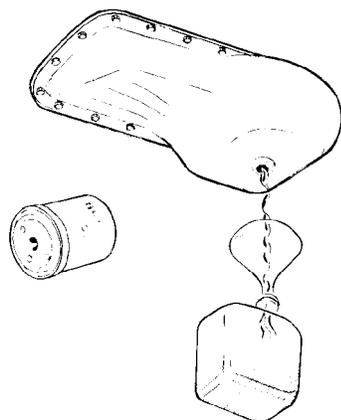


## Camshafts and tappets, replacement

Special tools: [999 5021](#) , [999 5199](#)



### Replacement of camshafts due to wear

It is imperative that engine be flushed clean before installing new components.

In most cases, damage to tappets and camshafts is due to engine oil contamination.

### Flush engine

Change oil and filter.

Run engine for approx. 10 minutes.

Drain oil and remove filter.

Install camshafts.

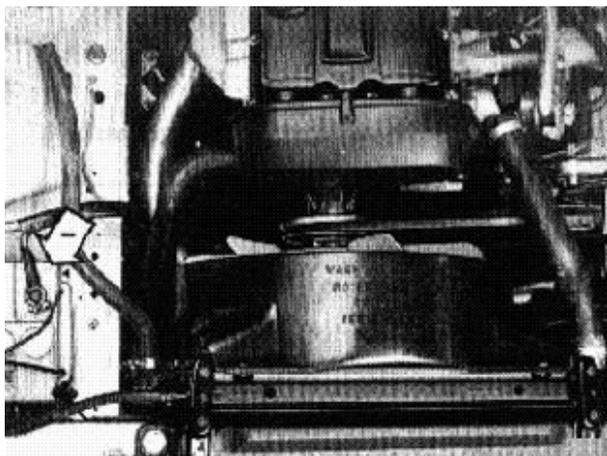
Fit new filter and fill engine with fresh oil of correct grade.

### Removal of camshafts

**Note!** Procedure describes removal of all tappets. To ensure sealing function of liquid sealing compound between camshaft carrier and cylinder head, tappets should be exposed only on one side at a time.

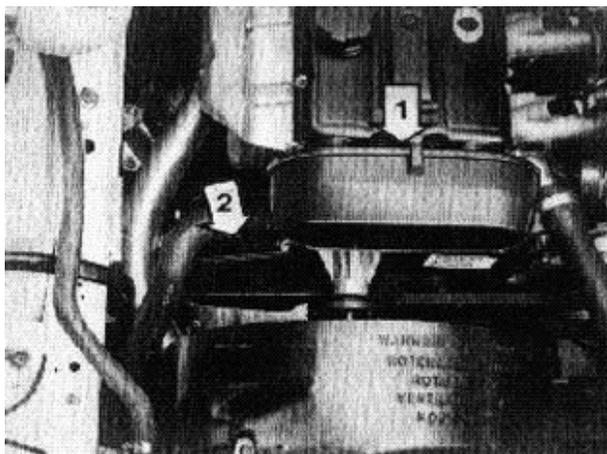
### Remove/disconnect:

- battery earth lead
- alternator drive belt
- radiator fan and pulley



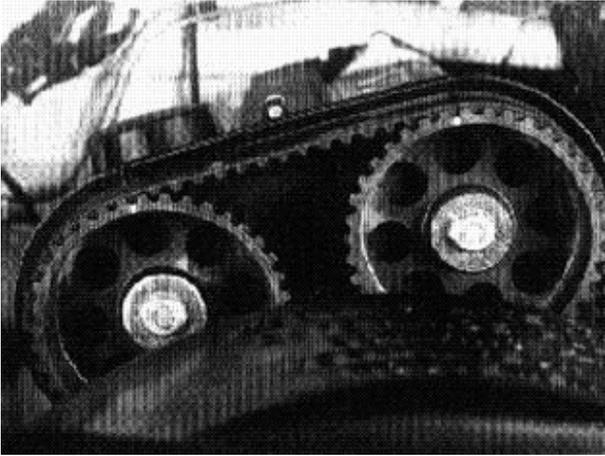
### Remove transmission covers (1) and (2)

Remove upper (1) and lower (2) transmission covers.



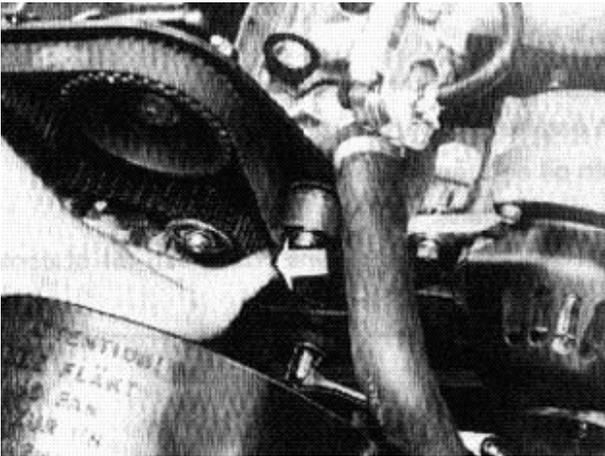
### Align camshaft/crankshaft markings

Turn engine to TDC position in No.1 cylinder.  
Check that markings on camshaft pulleys are aligned with those on transmission mounting plate.



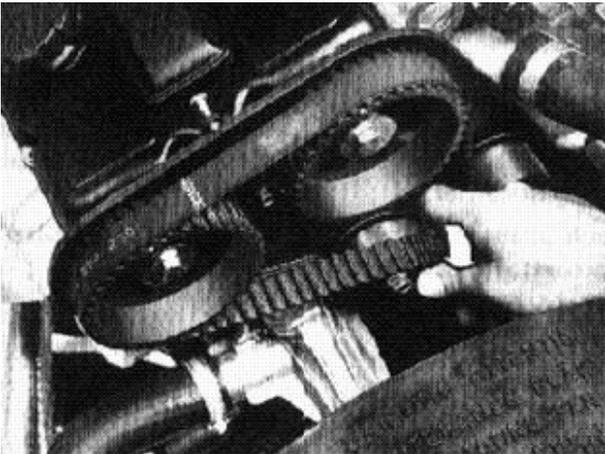
### Slacken tensioner locknut

Remove protective rubber cap over locknut.  
Slacken locknut.  
Compress tensioner spring.  
Tighten locknut.



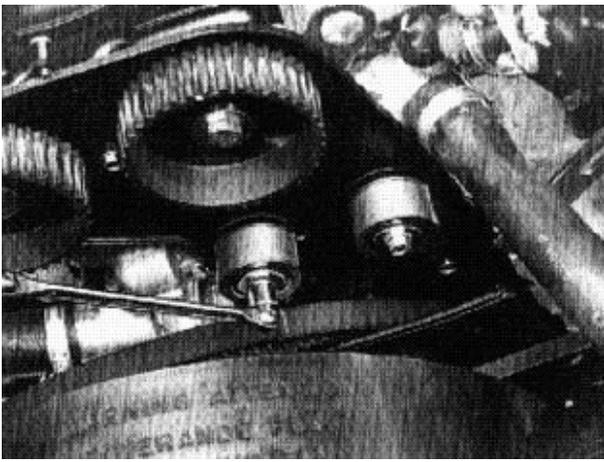
### Remove timing belt from crankshaft pulleys

**Caution!** Crankshaft and camshafts must not be rotated while timing belt is slack or has been removed.



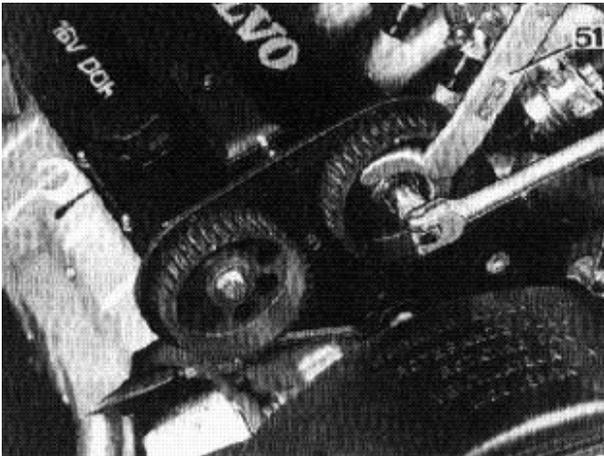
### Remove timing belt idlers

Check pulley surfaces and bearings.



### Remove camshaft drive pulleys

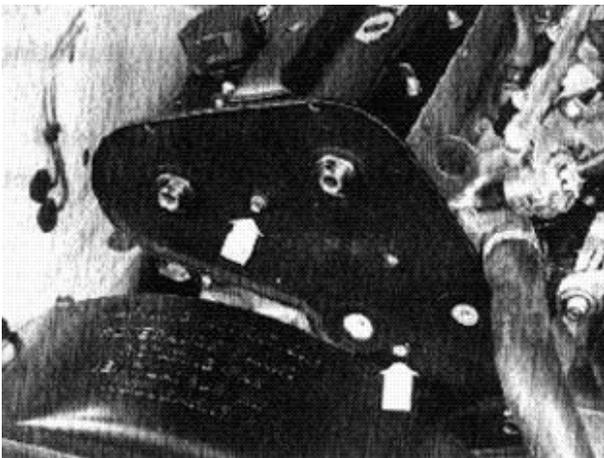
Use counterhold [999 5199](#) .



### Remove:

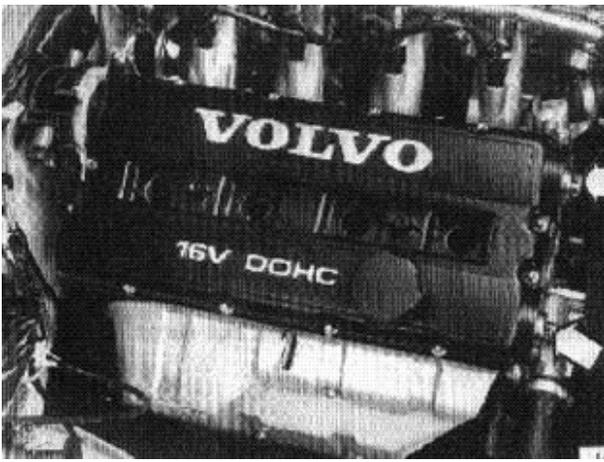
- upper section of transmission mounting plate
- ignition lead cover plate
- ignition leads at plugs and distributor cap
- ignition coil high-tension lead at distributor cap

**Note! Always grip ignition leads by caps when removing to avoid damage to leads.**



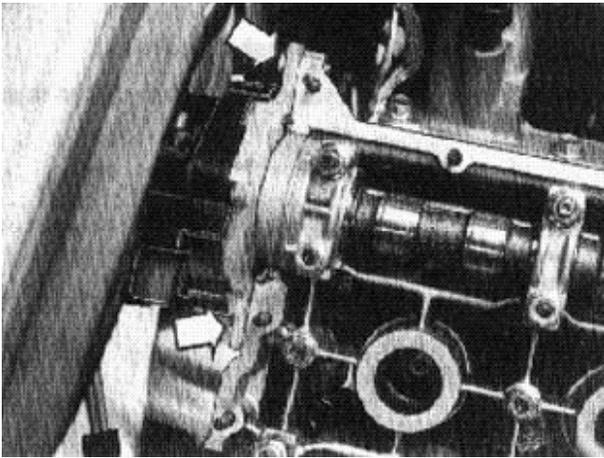
### Remove valve cover and gaskets

Remove gasket remains and clean joint faces.



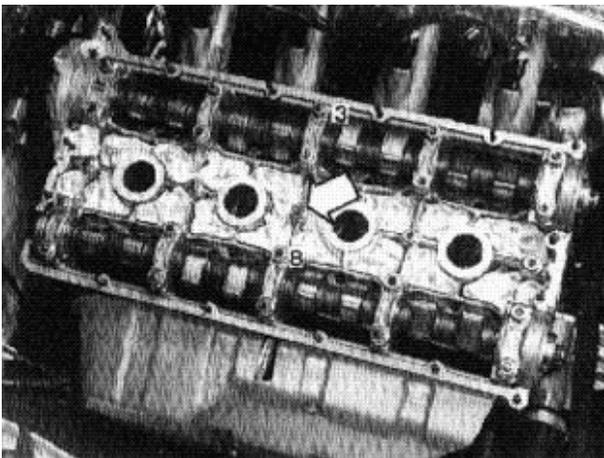
### Detach distributor housing from camshaft carrier

Note! Remove ignition lead clip beside left-hand bolt.



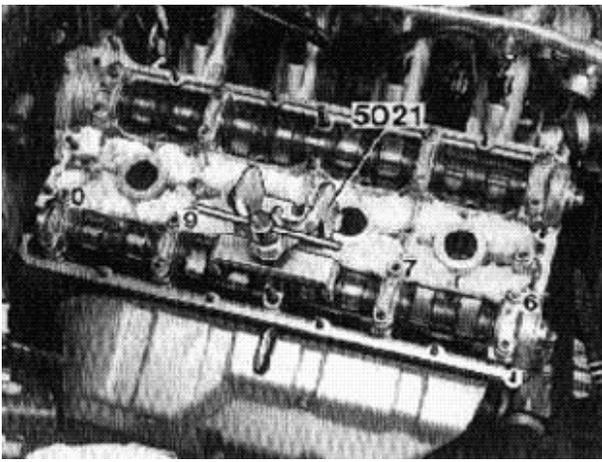
### Remove camshaft centre bearing caps

Plug openings in camshaft carrier (around spark plug wells) with paper.  
Remove camshaft centre bearing caps (No.3 on intake side, No.8 on exhaust side). Mark caps as required.  
Remove third nut in central bolted joint.



### Remove exhaust side camshaft

Use press tool [999 5021](#) . Place tool in No. 8 bearing cap position.  
Clamp press tool on camshaft.  
Remove remaining bearing cap nuts and caps (6, 7, 9 and 10).  
Inspect bearing surfaces for signs of wear.  
Remove press tool [999 5021](#) and lift out camshaft.



### Remove intake side camshaft

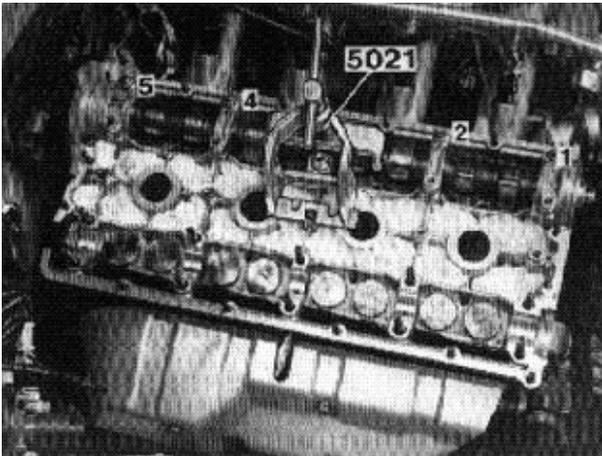
Use press tool [999 5021](#) . Place tool in No. 3 bearing cap position.

Clamp press tool on camshaft.

Remove remaining bearing cap nuts and caps (1, 2, 3 and 5).

Inspect bearing surfaces for signs of wear.

Remove press tool [999 5021](#) and lift out camshaft together with distributor.

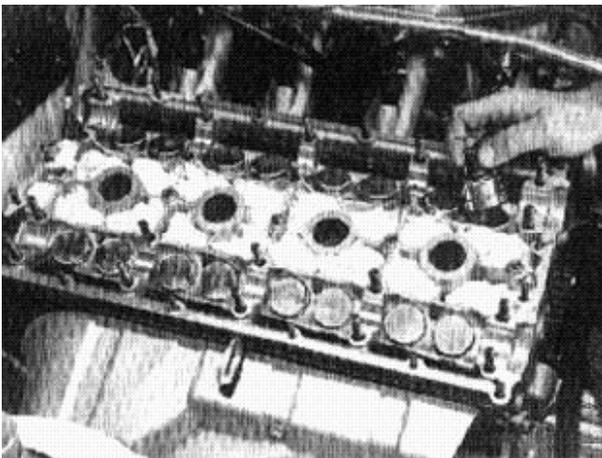


### Remove tappets from camshaft carrier

Magnet or suction cup may be used to facilitate tappet removal.

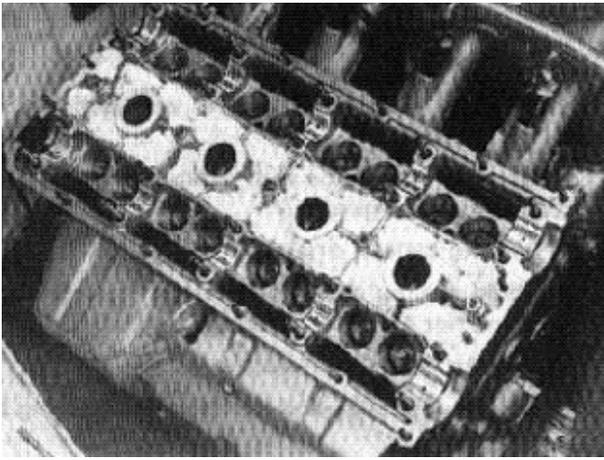
Inspect tappets for signs of wear.

**Note! Store tappets upside down to prevent drainage of oil. Ensure tappets are placed in order they must not be interchanged.**



### Clean/inspect camshaft carrier

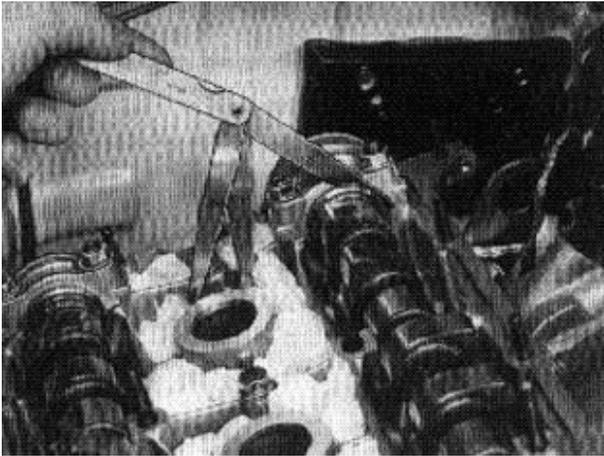
Clean and inspect camshaft bearings and tappet bores for signs of wear.



## Camshaft axial clearance

### Check camshaft axial clearance

Place camshafts in position.  
Install rear bearing caps and tighten nuts.



Axial clearance.....

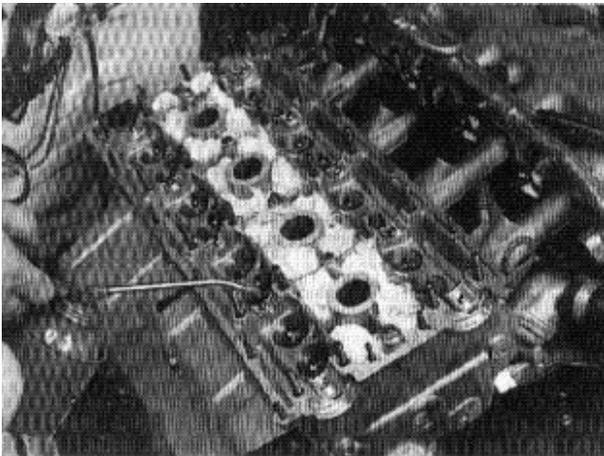
**0.05-0.40 mm (0.0020-0.0157 in)**

Measure clearance with feeler gauges.  
Install new rear bearing cap if clearance is excessive.  
Remove bearing caps and camshafts.

## Camshaft installation

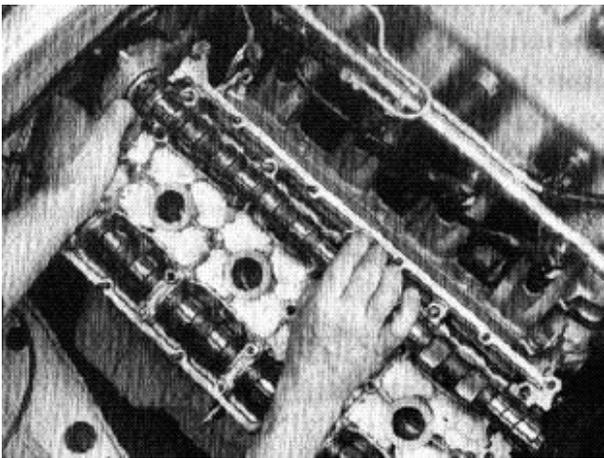
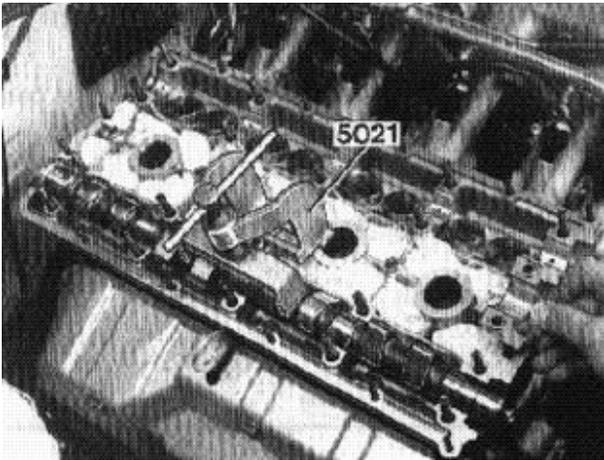
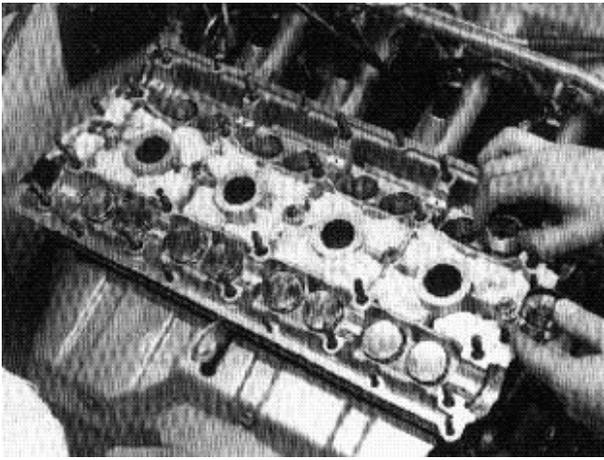
### Oil components

Oil bearings and sliding surfaces on camshaft carrier,  
bearing caps, camshafts and tappets.



## Insert tappets

Tappets **must** be replaced in original order.



### Install exhaust side camshaft

Place camshaft in camshaft carrier with pulley guide pin facing upwards.

Press camshaft into place with press tool [999 5021](#) (using rear bearing cap as guide).

Install bearing caps in original order.

Apply liquid sealing compound to joint face between camshaft carrier and front bearing cap (No. 6).

Install bearing cap nuts in stages.

Remove press tool [999 5021](#) and install centre bearing (8).

### Install intake side camshaft

Place camshaft in camshaft carrier with pulley guide pin facing upwards.

**Note!** Turn distributor shaft to align driver with markings on distributor housing.

Fit housing and rotor shaft with **new** O-rings.

Press camshaft into position with press tool [999 5021](#) (using rear bearing cap as guide).

Install bearing caps in original order.

Apply liquid sealing compound to joint faces between camshaft carrier and front and rear bearing caps (Nos. 1 and 5).

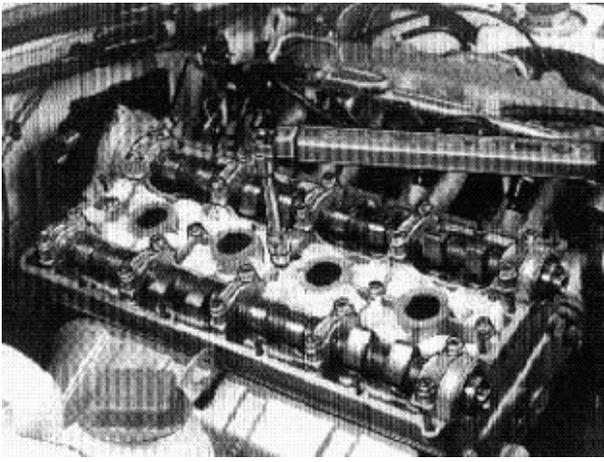
Install bearing cap nuts in stages.

Remove press tool [999 5021](#) and install centre bearing cap (8).

Install camshaft carrier centre nut.

### Tighten bearing cap nuts and centre nut

Tighten to **20 Nm** (15 ft.lb).

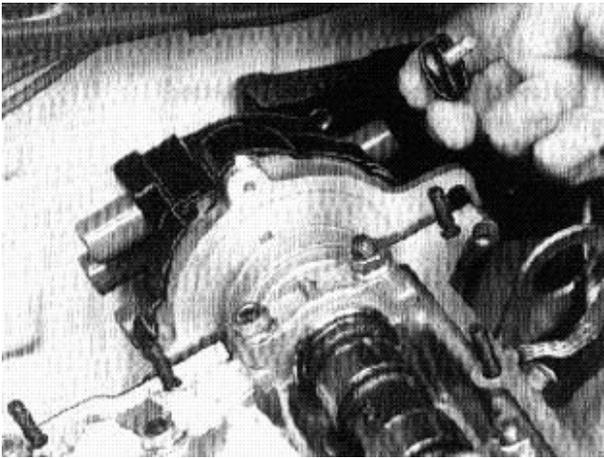


### Refit distributor

Reconnect high-tension lead between distributor cap and ignition coil.

Remove paper in camshaft carrier openings.

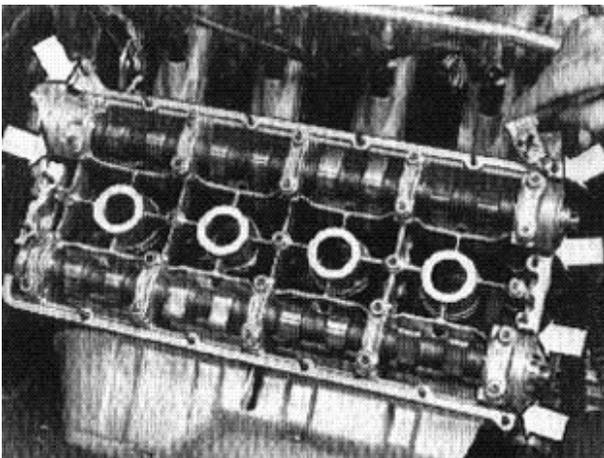
**Note! Replace ignition lead clip beside left-hand bolt.**



### Seal front and rear camshaft bearing caps

Use silicone sealer.

Apply bead of sealer to angle between cap and joint face.



### Install new gaskets and replace valve cover

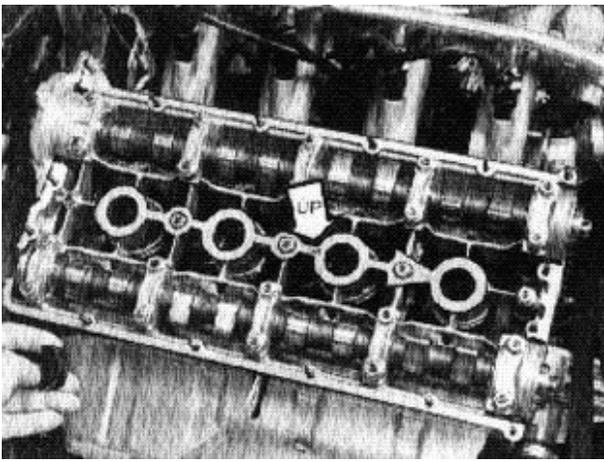
Inspect rubber seal behind camshaft **on exhaust side**.

Position spark plug well gasket with arrow pointing to No.1 cylinder and marking facing upwards.

Shape outer gasket to fit camshaft bearing caps.

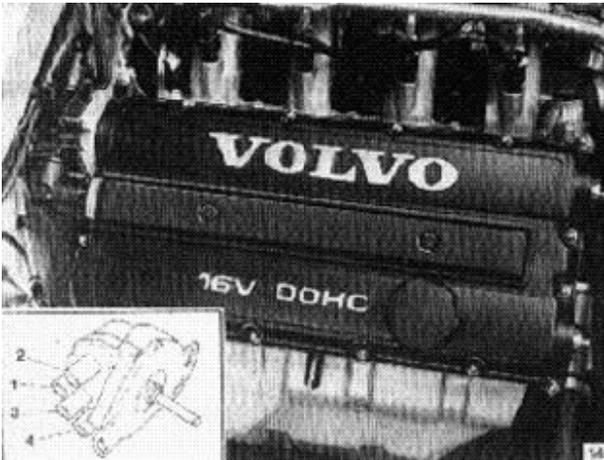
Place gasket in position and replace valve cover.

**Note! Remember to connect earth lead to distributor.**



**Install:**

- ignition leads (in correct firing order)
- ignition lead cover plate



**Fit camshaft front oil seals**

Fit seals as described in operations F12 [Camshaft seals, replacement](#) -F24 .

**Note!** Install new oil filter and fill engine with fresh oil of correct grade.

**Caution!** Some noise may be heard from tappets when engine is first started. However, this will disappear as tappets are filled with oil.

Engine must not be run at speed higher than 3000 r/min while tappet noise is present.

