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3 Cylinder unit

4 Crankshaft, camshaft, crankcase

5 Blower side

6 Flywheel side

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9 Dismantling and reassembling, engine complete

10 Special tools

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General engine data

	Designation of type	F1L 511	F1L 511 W	F2L 511	F2L 511 W
1	Total piston displacement cm^3	825		1650	
2	Working cycle	Four-stroke diesel			
3	Combustion system	Direct injection W = 2-stage combustion system			
4	Bore mm	100			
5	Stroke mm	105			
6	Weight of engine according to VDMA kg	116		155	
7	Direction of rotation	When facing flywheel left counterclockwise			
8	Rated speed max. 1/min	3000			
9	Minimum idle speed 1/min	950 ± 50			
10	Compression ratio	17 : 1 FL 511 W = 19 : 1			
11	Compression pressure bar	29 - 31			
12	Firing order	———		2 - 1	
13	Dimensions of engine with oil bath air cleaner and fuel filter				
14	Overall length mm	459,5		571	
15	Overall width mm	525		525	
16	Overall height mm	694		731	

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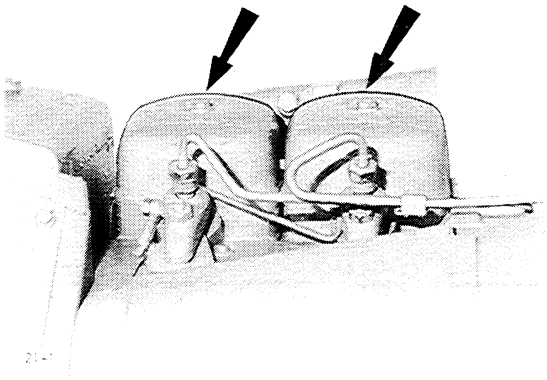
After-tightening angles and torque,

	Designation of type	F1L 511	F1L 511 W	F2L 511	F2L 511 W
230	After-tightening angles in degrees	Preloading a) 15 Nm ;	b) 30 Nm ;	c) 40 Nm	
231	Cylinder head bolts	c) $45^\circ + 45^\circ + 45^\circ + 30^\circ = 165^\circ$			
232	Nuts for rocker arm bracket	28 Nm			
233	Nut for rocker arm pin	40Nm			
234	Bolt for rocker chamber cover	7 - 15 Nm			
235	Bolt for rocker cover with decompression device	20 - 22 Nm			
236	Screws for governor leaf spring	10 Nm			
237	Protective sleeve for damping spring	26,5 - 33,5 Nm			
238	Bolts for tappet bridge	———			
239	Main bearing bolts (bearing bracket)	b) $30^\circ + 30^\circ = 60^\circ$			
240	Fastening bolts for bearing bracket in crankcase	b) $30^\circ + 30^\circ = 60^\circ$			
241	Big-end bolts	b) $30^\circ + 60^\circ = 90^\circ$			
242	Bolts for cast rocker chamber	———			
243	Flywheel bolts	b) $30^\circ + 60^\circ = 90^\circ$			
244	Flywheel nuts	———			
245	Counter-weight bolts	b) 60°			
246	Anti-fatigue bolt for cooling blower	a) M8x80 DIN 931 - 10.9 $= 45^\circ$ b) M12x135 DIN 931 - 8.8 $= 90^\circ$			
247	Grooved nut - blower	———			
248	Bolt for fan drive	———			
249	Anti-fatigue bolts at the front crankshaft end	———			

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ADJUSTING VALVE CLEARNACE

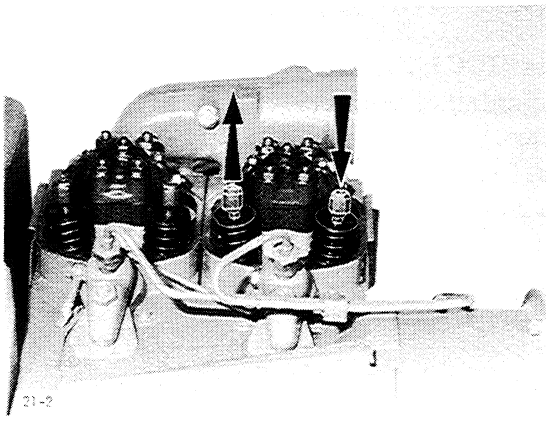


2-1

Attention:

Adjust valve clearnace with engine cold, i.e. the engine must have cooled down to ambient temperature.

1. Remove rocker chamber covers. Fig. 2-1

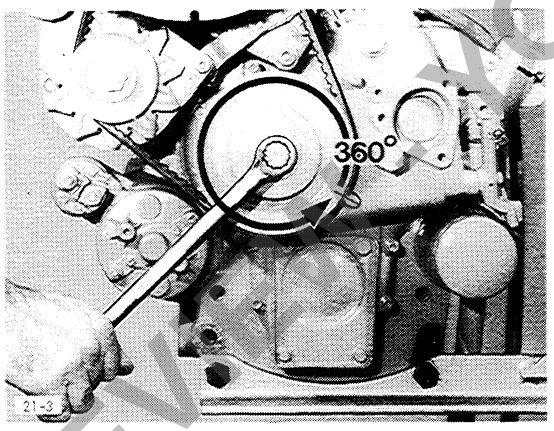


2-2

2. Turn engine until valves of cylinder No. 2 overlap. Fig. 2-2

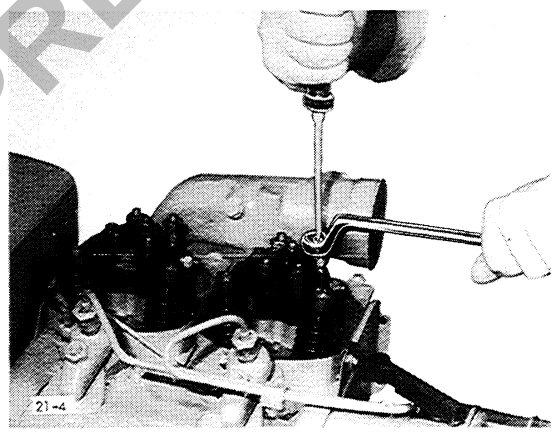
Note:

Valves overlapping means: Exhaust valve about to close, inlet valve about to open. Both pushrods are now non-rotatable.



2-3

3. Turn engine further by one complete revolution (360°). Fig. 2-3



2-4

4. Adjust valve clearnace at cylinder No. 2. Release locknut of adjusting screw. Insert feeler gauge between rocker arm and end of valve stem. Correct clearance by means of adjusting screw. Tighten locknut and recheck the adjustment with feeler gauge.

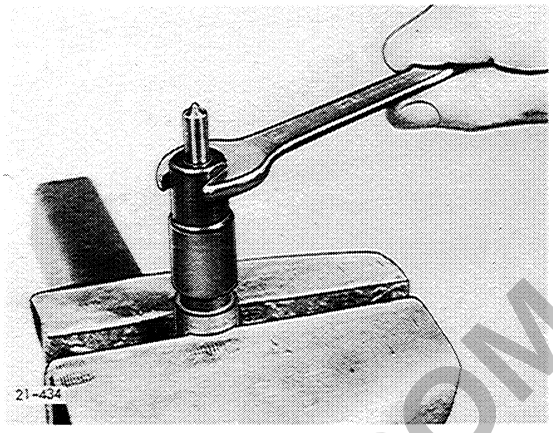
Fig. 2-4

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DISMANTLING AND REASSEMBLING INJECTOR - Direct Injection

DISMANTLING

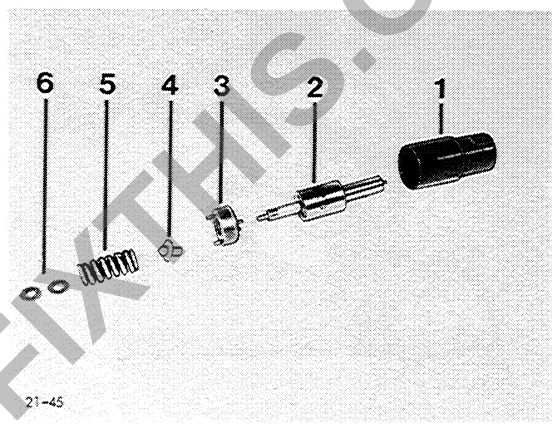
1. Undo union nut.
Fig. 7-45



7-45

Sequence of disassembly:

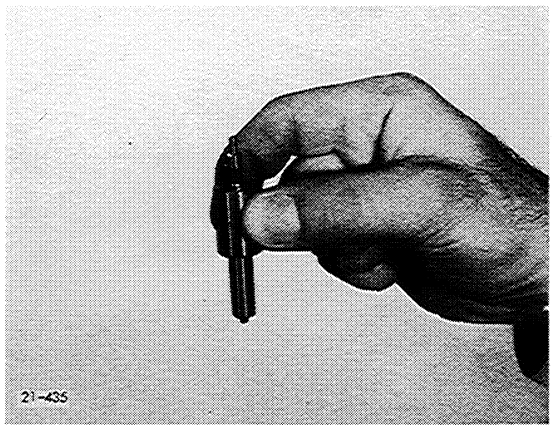
1) Union unit; 2) Injection nozzle, consisting of nozzle body with nozzle needle; 3) Intermediate piece; 4) Plunger; 5) Compression spring; 6) Shims
Fig. 7-46



7-46

2. Wash all parts in clean diesel fuel and blow out with compressed air.

3. The nozzle needle is a lapped fit in the nozzle body and neither component may be fitted to another one. Do not touch the nozzle needle with the fingers. When the nozzle body is held vertically, the nozzle needle should slide down slowly and smoothly on its seating under its own weight.
Fig. 7-47



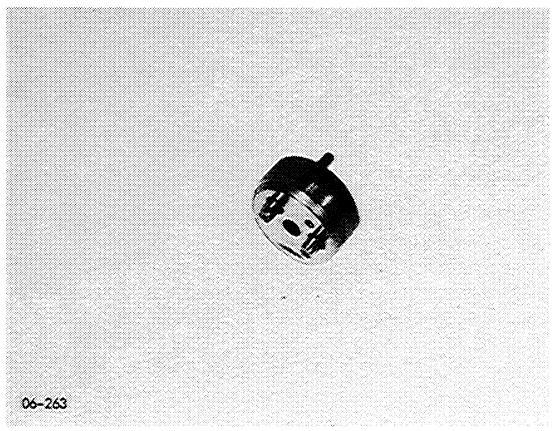
7-47

4. If the nozzle needle does not slide down smoothly, wash injection nozzle again in diesel fuel. Renew, if necessary.

Note:

New injection nozzles must likewise be washed in clean diesel fuel.

5. Check seating faces of the intermediate piece for wear and the centering pins for firm fit.
Fig. 7-48



7-48

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	No	FL 511	FL 511 W	
1	6067	X	X	Assembly stand for clamping down air-cooled engines on only one side
2	2461	X	X	Compressiometer
3	100010 100020 100050	 X X	X	Fitting for the record of compression pressure
4	100400	X	X	Dial gauge 0,01 mm for adjusting and mesuring devices
5	100640	X	X	Adjusting device for determining the top dead centre
6	101500	X	X	High-pressure hand feed pump for checking and adjusting static commencement of delivery
7	101510	X	X	Waste receiver for high-pressure hand feed pump
8	101900	X	X	Gauge for reading the tightening degrees for cylinder head bolts

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FOREWORD

This Workshop Manual informs our customers and Service partners about repair and adjustment work on the DEUTZ diesel engine. It is presumed that this work will be carried out by qualified personnel.

This Manual has been made up in a manner which ensures quick visual comprehension of the contents. This is achieved by illustrations and graphic symbols as substitute for the respective text. This layout permits universal use, because the illustrations and symbols are also largely understood by those being unable to read and write.

Aspects of operation and maintenance are not dealt with in this Manual; they are contained in the Engine Operation Manual.

This Workshop Manual is not regularly updated. Any engineering changes having been introduced in the meantime will be considered in the next issue. Therefore, please refer to the Technical Circulars where engineering changes are announced when appropiate.

General:

- This Workshop Manual has been prepared using our best knowledge and experience, taking into account safety and environmental aspects.

- It has to be ensured that everyone concerned with repair or adjustment work on the engine has this Workshop Manual available, reads it and understands it.

- It has to be ensured that all equipment, hand and special tools required for proper execution of repair work are in good condition.

- Failure to comply with this Workshop Manual may result in malfunction of the engine, short lifetime of components, personal injury or damage to porperty and environment for which we take nor responsiblity.

- Engine components such as springs, clips, flexible retainining rings, electric equipment, pipes, etc. involve a risk of damage or personal injury if handled in an improper way. It is therefore essential that no one attempts to do any work on the engine unless he has the necessary experience of the various tools, materials and methods.

- To ensure best efficiency, reliability and lifetime of the engine and its components, only original spare parts may be used for the repair.

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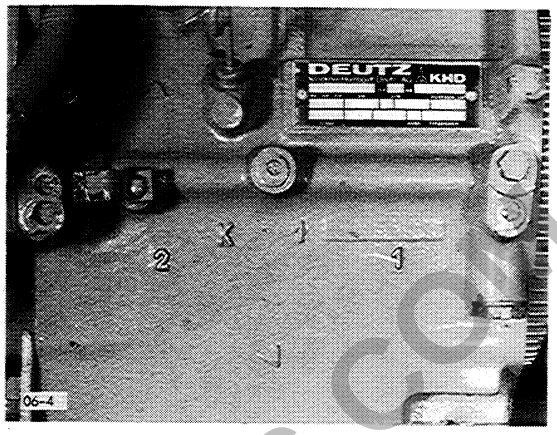
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GENERAL INSTRUCTIONS FOR SHOP WORK

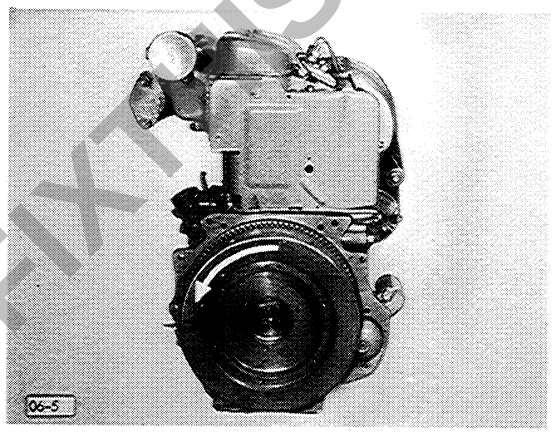
Utmost cleanliness, accuracy etc. are essential prerequisites for carrying out work on the engine.

Cleaning components of the electrical and injection systems call for particular care. For carrying out repairs etc. be sure to use only appropriate tools. See also Section 10 for "SPECIAL TOOLS".

The number of cylinders (F1L or F2L) is marked on the LH side of the crankcase as viewed from the engine's driving end (Fig. 1-4). The crankshaft rotation is counter-clockwise (CCL), likewise as viewed from the driving end.
Fig. 1-5



1-4



1-5

When dismantling the engine, mark the components of the motion parts, timing gears, cylinders and pistons in consecutive order, unless already provided. Again start from the driving end.

Put down removed components carefully to avoid damage. Gauge all wearing parts. Where the wear limits are reached or even exceeded, replace components or overhaul them. Gaskets and washers must be replaced in any case.

For component Nos. see parts list pertaining to your particular engine. Use only genuine Deutz parts. Heavy-duty parts are identified by a special Deutz inspection mark.

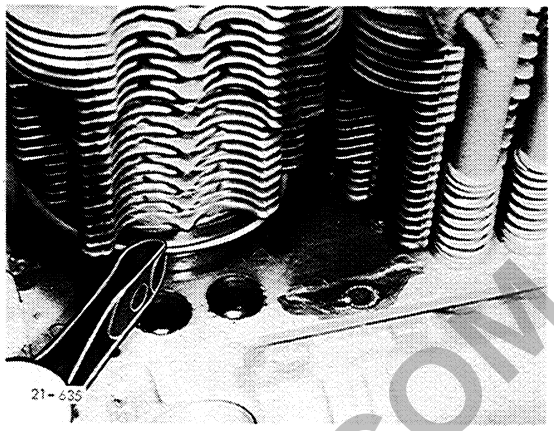
If bearings or pistons are defective, inspect crankshaft and connecting rods for cracks, preferably using the magnaflux method. Be sure to trace the cause of such defects. For work on the removed engine, it is recommended to use the swivelling-type assembly stand No. 6066 for double-sided clamping, or No. 6067 for single-sided clamping.

Important:

It is a good plan to entrust difficult work to the local Deutz distributor.

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- If the clearance is too large, lift up the cylinder a little and cut through appropriately-sized shim with side-cutting pliers, and remove shim. Fig. 2-79



2-79

Note:

Available for correcting the piston crown clearance are shims of 0.2 and 0.5 mm thickness. In the case of shim-pack heights of 0.5 mm and over, a 0.5 mm thick shim should be used instead of several shims of 0.2 mm thickness. At least one shim should be provided underneath the cylinder for sealing purposes.

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REMOVING AND REFITTING CYLINDER

Cylinder head and relevant air cowling baffles are removed.

Special tool required:

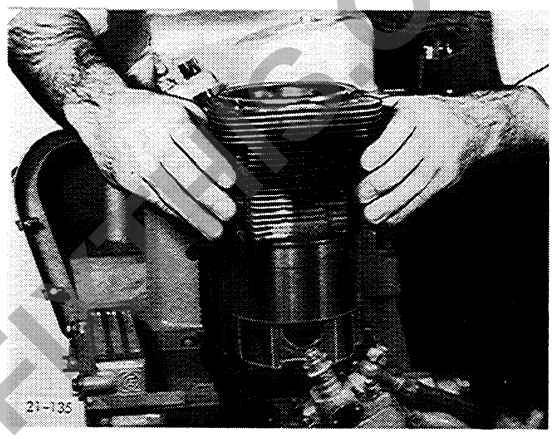
Piston ring compression sleeve ..... No. 130530

REMOVING

1. Remove cylinder.
Fig. 3-58

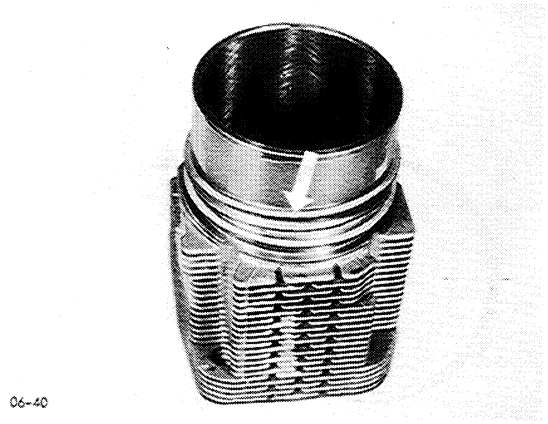
Note:

Be sure the piston will not tilt over so as to get damaged.



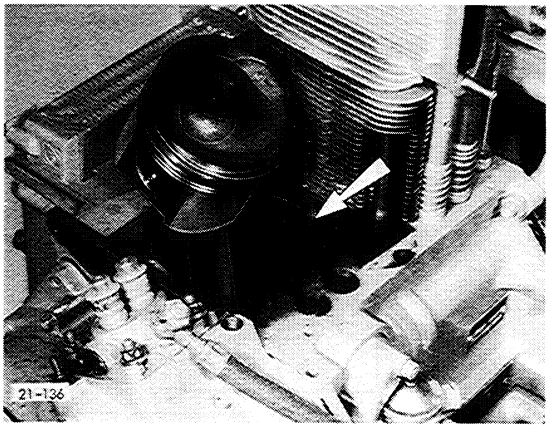
3-58

2. Remove shims from cylinder.
Fig. 3-59



3-59

3. Check that cylinder seat on crankcase is smooth and flat.
Fig. 3-60
Recondition seat if damaged (see Chapter 4).



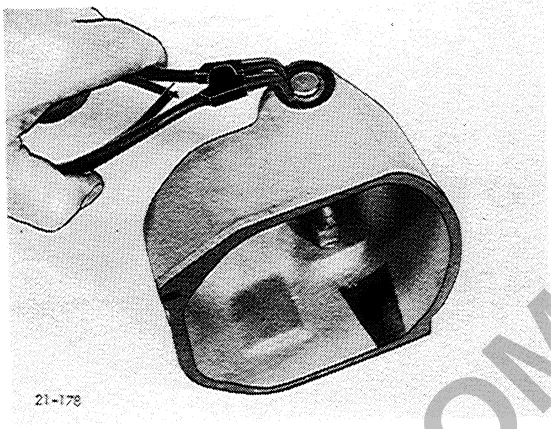
3-60

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DISMANTLING AND REASSEMBLING DECOMPRESSION DEVICE
F1L 511

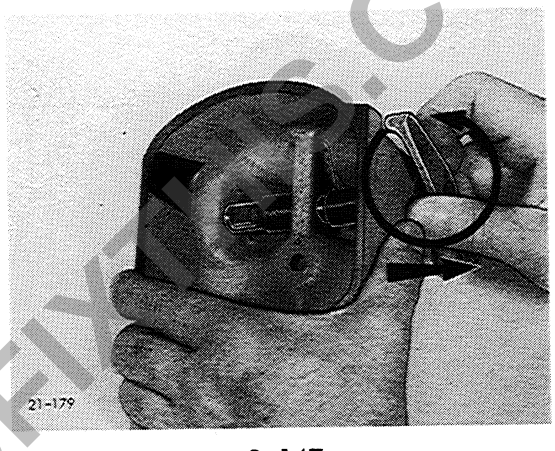
DISMANTLING

1. Remove circlip.
Fig. 3-146



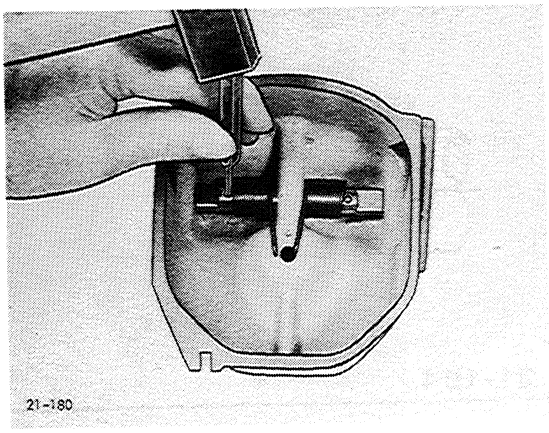
3-146

2. Pull shaft outwards and unload springs.
Fig. 3-147



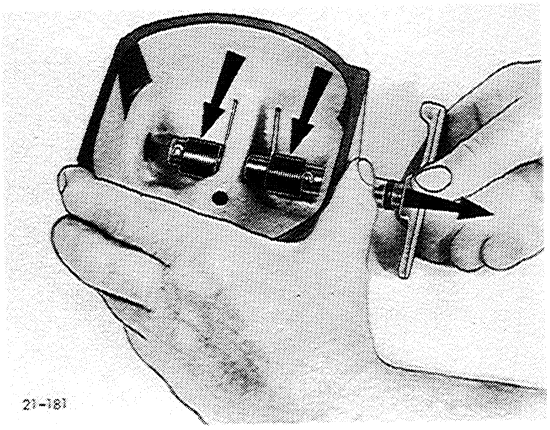
3-147

3. Drive out notched pins.
Fig. 3-148



3-148

4. Remove shaft. Take out springs.
Fig. 3-149

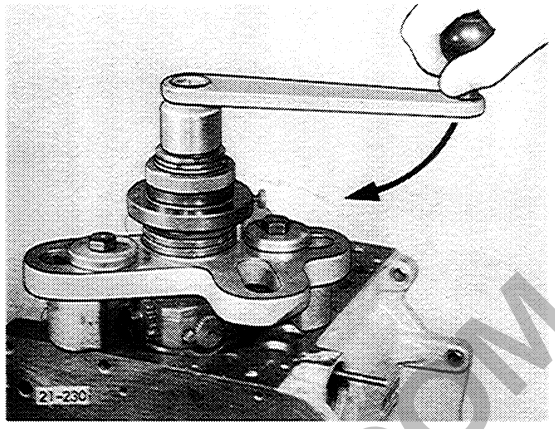


3-149

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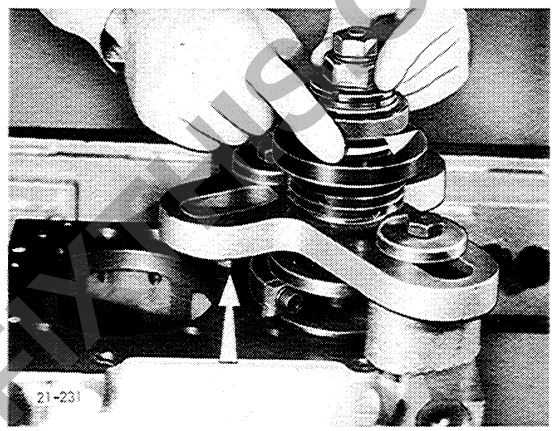
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9. Turn spindle clockwise to reface the cylinder seating.
Fig. 4-48



4-48

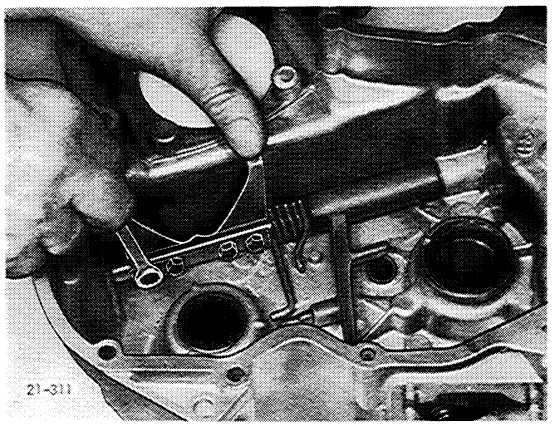
10. Undo setscrew, raise tool holder from reworked surface by turning knurled nut, and remove refacing device.
Fig. 4-49



4-49

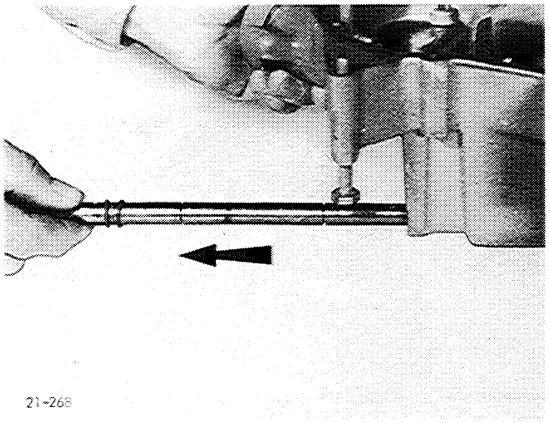
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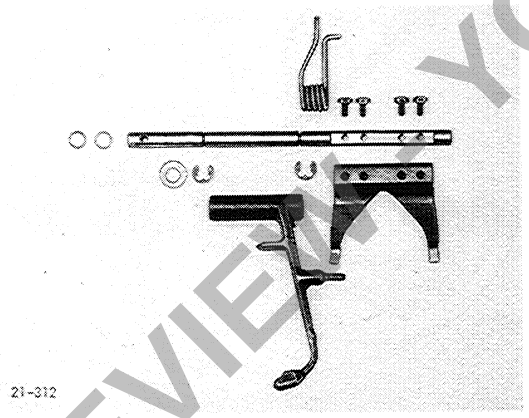
5-88

21. Remove fastening screws.
Fig. 5-88



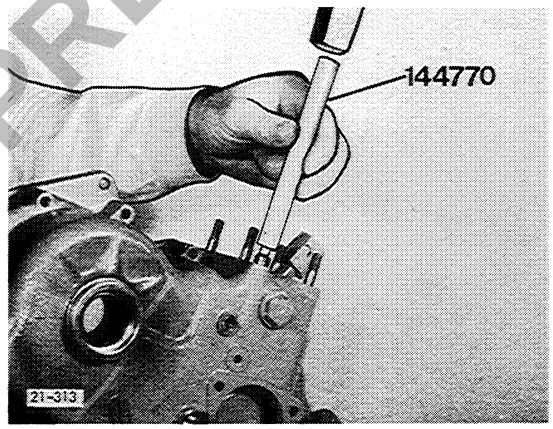
5-89

22. Withdraw speed control shaft. Remove governor lever, fuel allowance spring and governor leaf spring.
Fig. 5-89



5-90

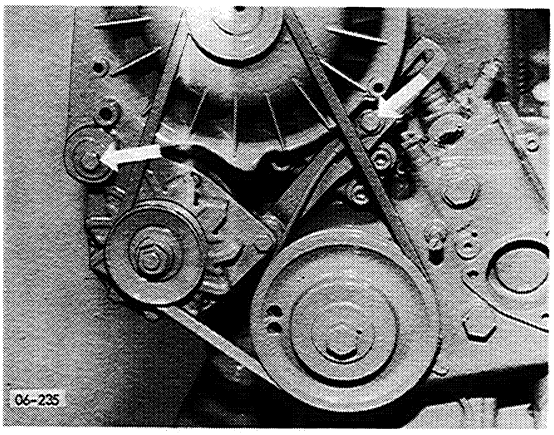
23. Inspect governor components for wear.
Fig. 5-90



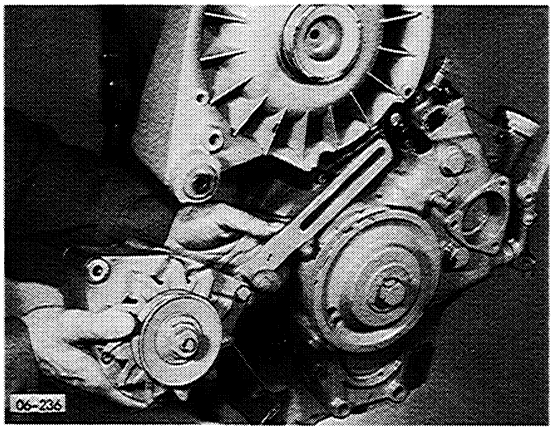
5-91

24. Fit sealing rings for starting fuel allowance thrust pin.
Fig. 5-91

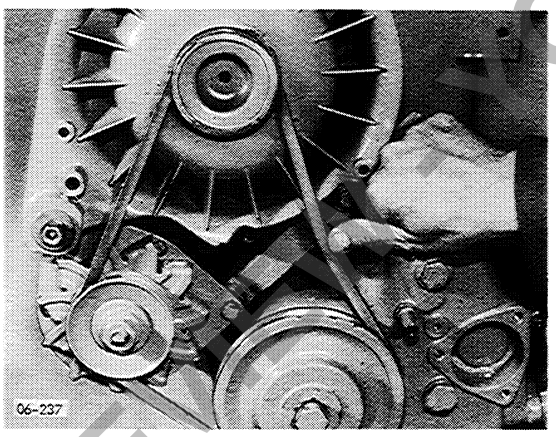
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5-181



5-182



5-183

REMOVING AND REFITTING THE ALTERNATOR

1. Unscrew bolt "A". Take off V-belt. Remove bolt "B".
Fig. 5-181

2. Remove alternator.
Fig. 5-182

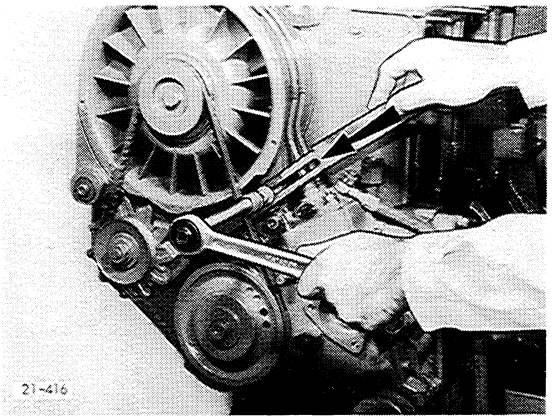
Refitment is carried out in reverse order.

Note:

Check alignment of V-belt pulleys. Correct any misalignment by means of shims at alternator. V-belt is correctly tensioned if it deflects inwards under thumb pressure by 10 - 15 mm (0.4 - 0.6 in.).
Fig. 5-183

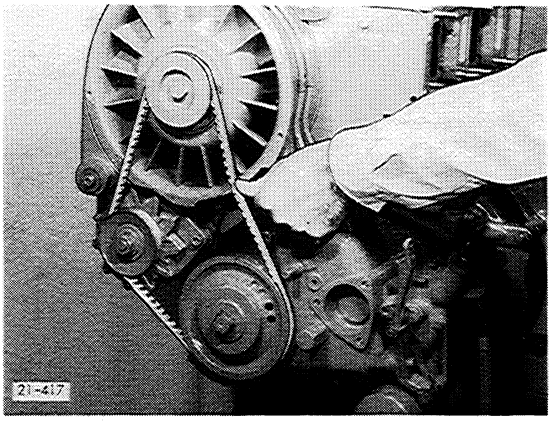
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7-21

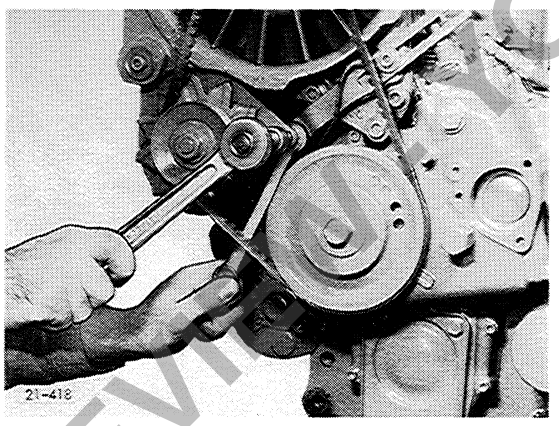
18. On engines with alternator, screw in fastening bolt and tension the V-belt.
Fig. 7-21



7-22

Note:

The V-belt is correctly tensioned if it deflects inwards under thumb pressure by 10 - 15 mm (0.4 - 0.6 in.).
Fig. 7-22

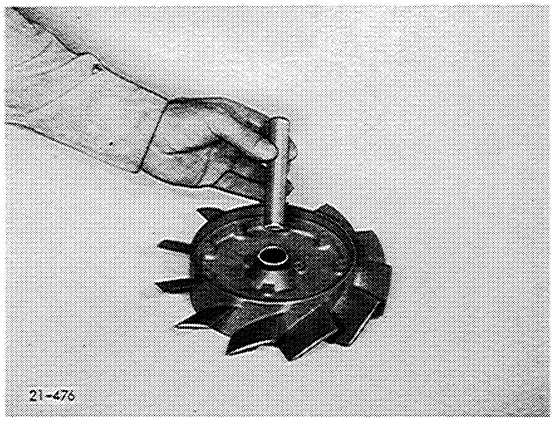


7-23

19. Tighten screw connection at alternator.
Fig. 7-23

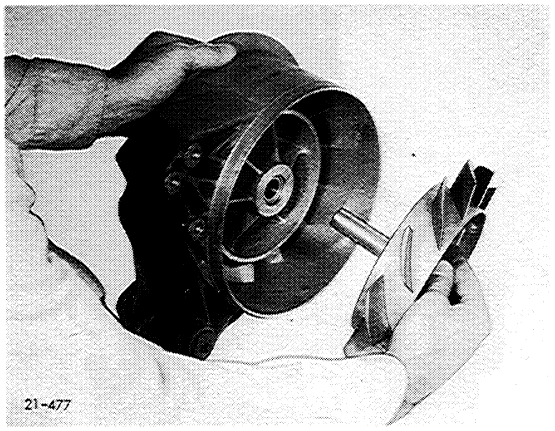
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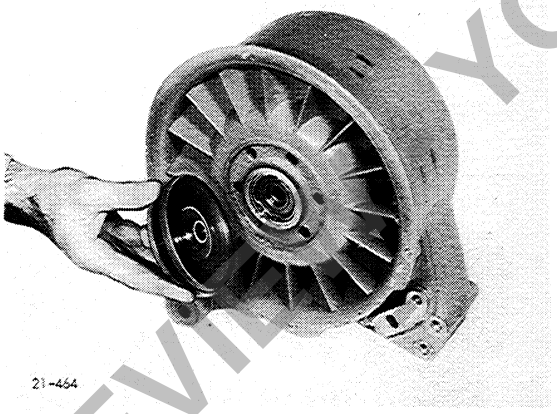
8-27

17. Insert quill shaft in impeller.
Fig. 8-27



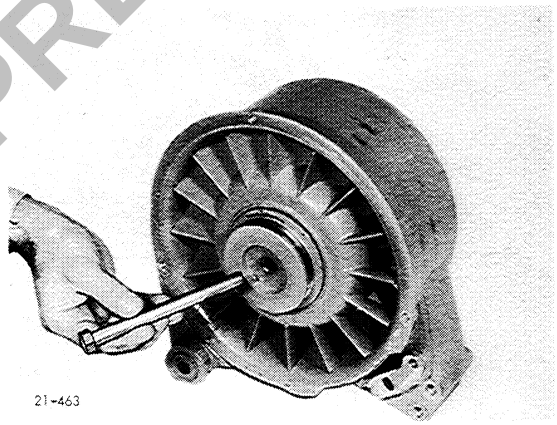
8-28

18. Install impeller.
Fig. 8-28



8-29

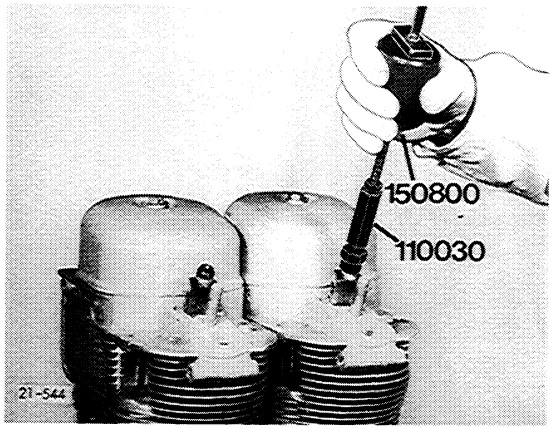
19. Position V-belt pulley.
Fig. 8-29



8-30

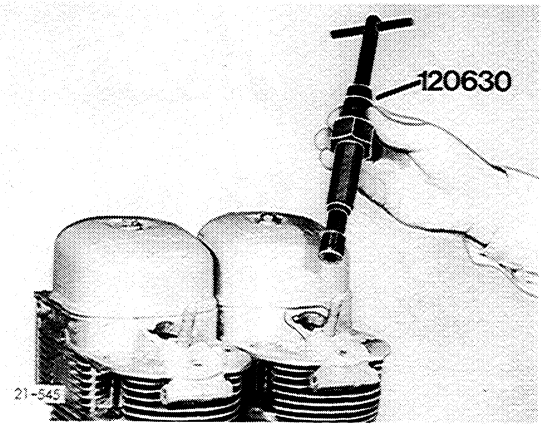
20. Push in clamping bolt.
Fig. 8-30

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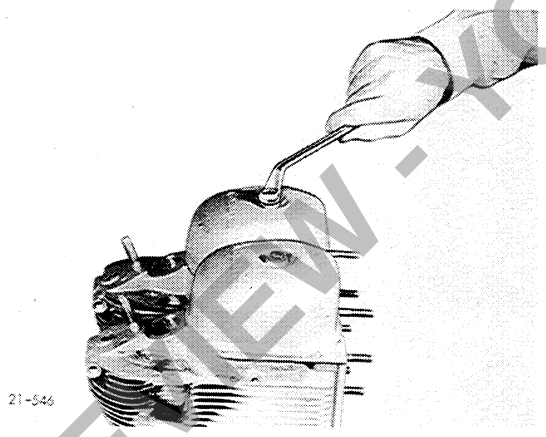
9-28

27. Extract injectors.
Fig. 9-28



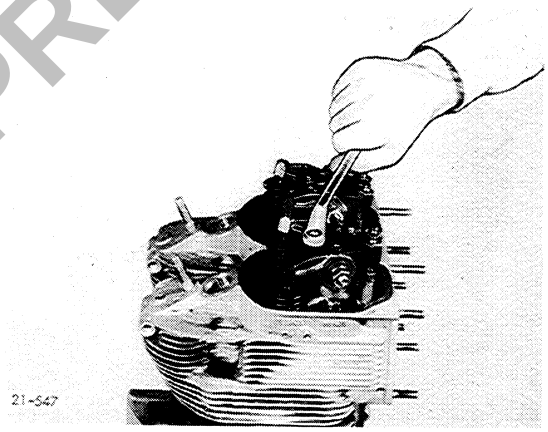
9-29

28. Remove sealing ring.
Fig. 9-29



9-30

29. Remove rocker covers.
Fig. 9-30

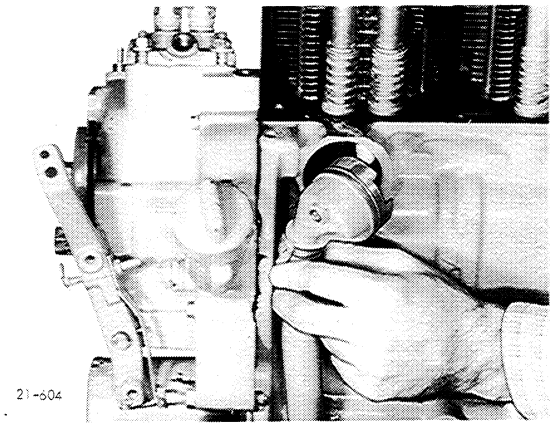


9-31

30. Remove rocker brackets.
Fig. 9-31

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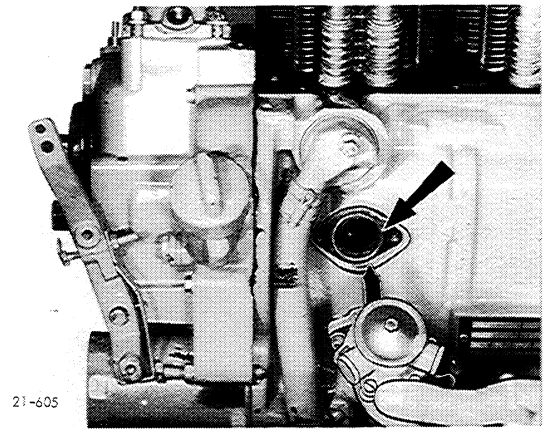


9-132

132. Fit breather box complete with O-seal.
Fig. 9-132

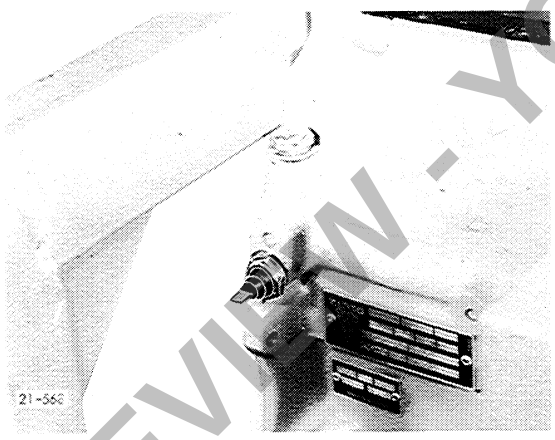
Note:

Fit copper sealing ring beneath mounting nut. Breather boxes for 1- and 2-cylinder engines differ.



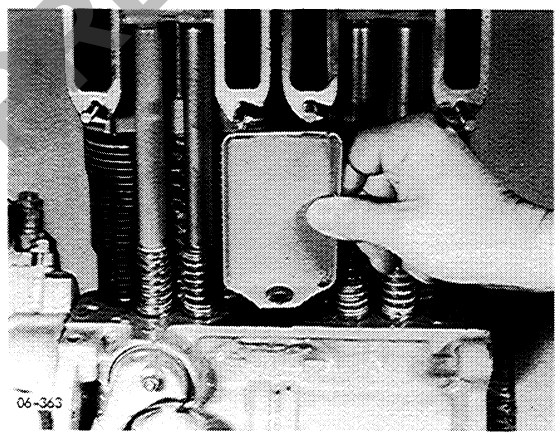
9-133

133. Affix O-seal with grease into recess in crankcase. Mount fuel feed pump.
Fig. 9-133



9-134

134. Insert oil dipstick provided with new sealing ring and install oil pressure switch.
Fig. 9-134



9-135

135. Mount stay plate.
Fig. 9-135

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