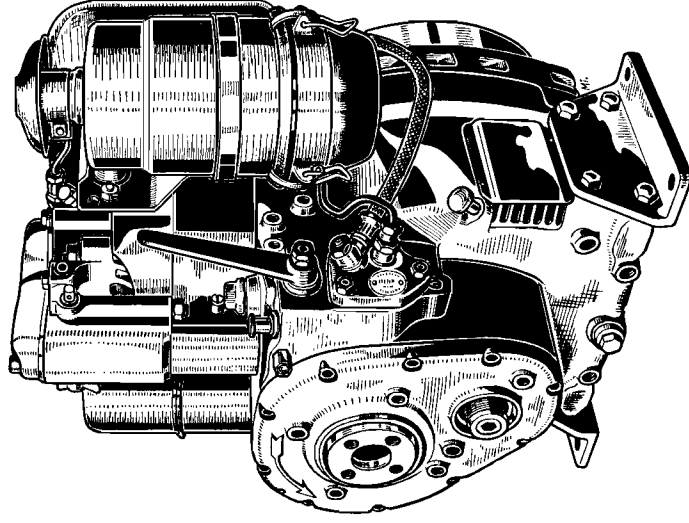


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**HATZ**  
DIESEL

# INSTRUCTION BOOK



## TYPES

ES 71 E 71

ES 75 E 75

ES 79 E 79

ES780 E780

ES785 E785

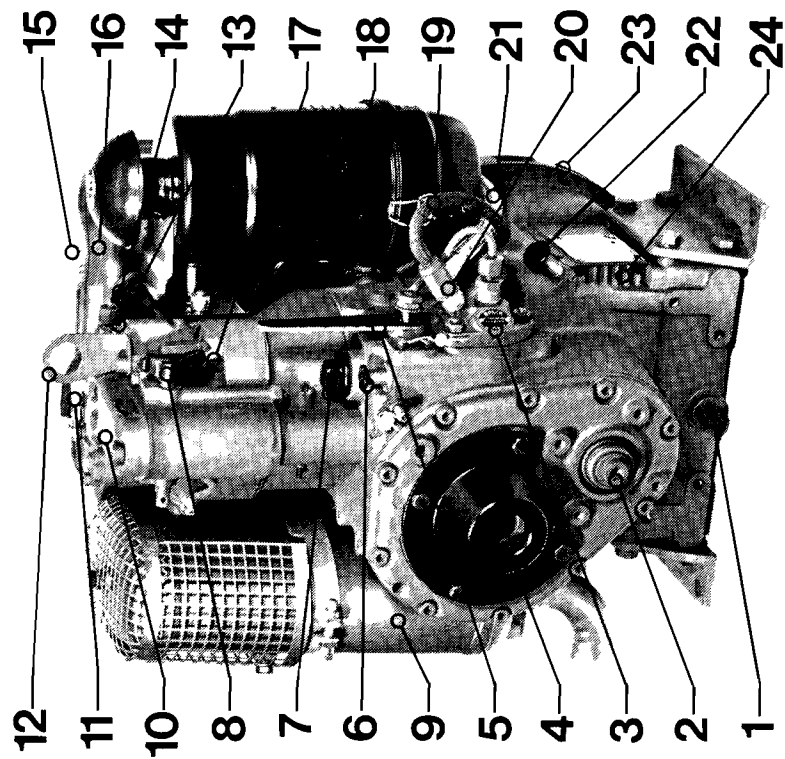
# FOR THE ACTUAL OPERATOR

Protection tax DM 2.-

- 1 Drain plug
- 2 Crankshaft
- 3 Injection pump
- 4 Camshaft
- 5 Speed control lever
- 6 Extra fuel button
- 7 Oil filling cap
- 8 Decompression lever
- 9 Silencer
- 10 Cylinder head cover
- 11 Fuel leak-off-pipe
- 12 Lifting strap
- 13 Filling screw for starting oil
- 14 Ignition paper holder

- 15 Cover for fuel tank
- 16 Fuel tank  
(with incorporated fuel filter)
- 17 Inlet openings for cooling air
- 18 Oilbath-airfilter
- 19 venting pipe x)
- 20 ventring valve x)
- 21 Fuel feed pipe
- 22 Dipstick
- 23 Outlet openings for cooling air at flywheel.
- 24 Inlet openings for cooling air at crankcase (oil cooler)

x) only at engines with automatic venting device.



Picture 1

## TECHNICAL DATA

Type	E 71	E 75	E 79	E 780	E 785
Design	Four-stroke				
Number of cylinders	1				
Bore	71	75	82	82	85
Stroke	80	80	80	100	110
Cubic capacity	316	353	422	528	625
Comb. method	Turbulence chamber				
Compr. ratio	1 : 23	1 : 23	1 : 23	1 : 22	1 : 22
Sense of rotation (Flywheel)	anti-clockwise				
Mean Piston speed (at n = 3000 min <sup>-1</sup> )	8	8	8	10	11
Cooling air required x)	6	6	7,2	7,9	13
Combustion air required	0,47	0,53	0,6	0,8	0,9
Oil sump capacity approx.	1,2	1,2	1,2	2	1,8
Specific Lubrication oil consumption related to full power	2 - 3				
Injection pump	BOSCH				
Injection nozzle	BOSCH				
Injection pressure	110 + 8				
Net-Weight	47	49	53	67	87
permiss. tilting in all directions	20	20	20	25	25
Tappet clearance (at cold engine)	36	36	36	46	46
	0,10 mm				

x) at n = 3000 min<sup>-1</sup>

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Technical data

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Removeable maintenance chart between page 12 and 13

## 1. Method of operation and design

### 1.1. Method of operation.

The engine works on a fourstroke turbulence-chamber principle.

### 1.2. Design.

The light metal crankcase contains crankshaft (running on roller bearings), camshaft (running on ball bearings), complete governor system and injection pump. The channels for cooling air, cooling ribs for oil cooling, and openings for the exit of cooling air, are cast in one piece with the crankcase, in an appealing and serviceable way.

At the engines in „E“-version the power can be taken from the flywheel as well as from camshaft, the latter with a reduction ratio of 1 : 4. On the governor side of the engine, the crankshaft is provided with an additional bearing, and here it is also possible to take off the full engine power, after attachment of a special flange.

Power take-off on types „ES“ is possible only on flywheel side not at governor side.

Starting is always effected at the camshaft, with a reduction ratio of 1 : 4. A particularly strong slide bearing is used as a connecting rod bearing. A cylinder with vertically arranged cooling ribs ensures trouble-free cooling and a long life. In the cylinder head of special aluminium alloy, with cast-in turbulence chamber and shrunk valve-seat rings, provided with vertical cooling ribs, the injection valve, the rocker and the ignition paper holder or glow plug, are placed. Furthermore, the decompression device and the crankcase breather device are incorporated in the cylinder head.

### 1.2.1. Cooling

A generously designed blower incorporated in the flywheel draws the cooling air past the vertical ribs of cylinder head and cylinder. The hot air is forced out radially at the flywheel. Additional cooling air is drawn in passing by two oil-coolers, arranged at the right and left side of the crankcase. Failure of the cooling system is impossible. Insufficient cooling is only possible if cooling ribs at cylinder head, oil-cooler inlets or the flywheel blower itself, are choked with

dust etc. or if owing to improper installation of engine, cooling air cannot be drawn in freely, or hot air cannot be blown out sufficiently.

### 1.2.2. Airfilter

In order to ensure the least wear and the longest life of the engine possible, an oilbath-airfilter with a high cleaning effect is indispensable. Damage caused by dust means negligence.

### 1.2.3. Injection system

The amount of attrition and the length of the service life of the injection pump and injection nozzle are primarily dependent on the purity of the fuel. Therefore, a fuel filter is built into the fuel tank (tank is not in every case mounted onto the engine), through which the fuel passes to the injection pump and from there to the injection nozzle.

### 1.2.4. Lubrication

Lubrication is essential for the engine life. Oil level has to be checked daily. The engine is lubricated by means of the trouble-free and servicefree HATZ centrifugal pressure lubrication system which provides the big end with pressure lubrication and lubricates the whole drive mechanism and governor system by means of splash oil. Thus no separate oil pump, no separate oil filter, no oil relief valve, no oil pipes and no grease nipples and therefore no oil leaks.

### 1.2.5. Speed control

The position „start“ of the control lever „a“ corresponds with the highest operating speed. By moving the control lever between „start“ and „stop“ you can choose the speed you wish. The engine keeps the selected speed whatever the load.

see:

pict. 1

see:

pict. 8

see:

see:

## 2. Running material

### 2.1. Fuel

#### 2.1.1.

All sorts of Diesel fuel can be used if conforming to the minimum requirements of one of the following specifications:

- DIN 51601
- BS 2869 A1 / A2
- ASTM D 975 - 2 D

#### 2.1.2.

Resistance to low temperatures (according to DIN 51 601)

Winter fuel: -12° C (261 K)

Sommer fuel: 0° C (273 K)

The resistance to low temperatures (cloud point) can be improved:

a) by adding of kerosene (paraffin oil) according to the following chart:

#### Recommended percentage of kerosene (paraffin oil)

at ambient temperature	sommer fuel	winter fuel
-10° C (263 K)	20 %	-
-15° C (258 K)	50 %	-
-20° C (253 K)	-	20 %
-30° C (243 K)	-	50 %

b) by use of highly concentrated special liquids which are available on the market.

Please get further informations from your supplier for use and handling.

### 2.2. Lubricants

#### 2.2.1.

Use only HD-oils according to API-Classification CC or CD and keep to the sort chosen.

If an engine was in operation a long time with oils of lower quality (e. g. API-specification CC) avoid changing to oils of higher quality (CD).

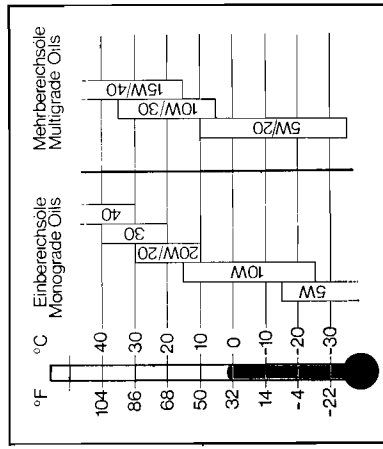
If unavoidable, carry out the following oil change within occasionally 10 - 20 operating hours.

#### 2.2.2.

The use of oil with too high a degree of viscosity leads to starting trouble because of too high friction at piston and bearings.

### Therefore:

Use oil with the correct degree of viscosity according to the following chart:



The data shown are related to the ambient temperature during starting procedure in the early morning.

#### 2.2.3.

The oil consumption of an engine is normally anything up to 0,4 litres in 10 hours running, but this may occasionally be exceeded in the case of a new engine. Providing that the oil level is checked daily, however, the engine may be run regardless; for after a running time of 100 to 200 hours the oil consumption will be fully normalised.

## 3. Preparation for the first start

### 3.1. Filling with oil and checking oil level

#### 3.1.1. Engine

Clean area around oil screw „a“ and fill up with lubricating oil.

#### Note:

Wait about one minute after filling up, since the oil runs only slowly into the crankcase. Then check oil with dip-stick „b“. Oil has to reach up to mark „c“. Excessive oil leads to starting trouble, loss of power and overheating. Oil level below mark „a“ leads to damage of bearings or pistons. Engine has to be in a vertical position when checking oil level.

pict. 3  
Techn.  
Data

pict. 4

### 3. 1. 2. Oilbath-airfilter

Fill lubricating oil into oil container „a“ of filter. Oil level must not be either above or below mark „b“. Use oil with same viscosity as for crankcase.

see:  
pict. 5

### 3. 2. Filling with fuel

Remove fuel tank cap „a“ and fill with clean diesel fuel.

pict. 6

#### Note:

Avoid spilling as fuel may smear over cooling ribs and shovels of blower wheel, thus affecting cooling.

### 3. 3. Bleeding of fuel injection system – after fuel is filled into tank –

(not necessary at engines equipped with automatic venting device)

#### 3. 3. 1.

Put speed control lever in „stop“ position.

pict. 7, 8

#### 3. 3. 2.

Unscrew screw „b“. Leave screw loose until fuel emerges completely free of bubbles.

pict. 7

Tighten screw „b“.

### 3. 4. Automatic venting device of the injection system (additional equipment)

#### Functioning:

The injection pump is connected with the fuel tank by means of an additional fuel pipe (venting pipe). When topping up fuel the fuel enters into the injection pump, mounts into the venting pipe and thus displaces the air which was before in the pipe. Now the injection system is vented (instead of bleeding as before), the engine can now be started.

Due to the pumping effect of the fuel feed pump fuel is flowing all the time through the injection pump, through the venting pipe into the fuel tank (see direction of the arrow).

#### Remark:

Engines without automatic venting device can be equipped subsequently with this kind of equipment. Thereby trouble-free running without any bleeding of the fuel system.

## 4. Starting of engine

Starting is simplified by an automatic decompression device. The meanings of the various positions of lever „a“ for decompression are:

0 Starting position (engine has compression).

1 Engine is decompressed with automatic off.

2 Engine is decompressed with automatic on. Compression is switched on automatically after approx. 4 turns of starting handle (Longest way of automatic).

3, 4, 5, 6 or other position  
Engine is decompressed with automatic on. Compression switches on automatically according to position of lever, after correspondingly fewer turns of starting handle. (Shortened way of automatic).

#### Attention:

Decompression lever „a“ to be turned in direction of arrow only. Exception: From position „1“ to „0“ can be turned back directly.

### 4. 1. Preparation of start

#### 4. 1. 1.

Speed control lever „a“ in start position.

pict. 7/8

#### 4. 1. 2.

Automatic decompression lever „a“ in position „1“

pict. 9

#### 4. 1. 3.

Pull extra fuel button „b“

pict. 8

#### 4. 1. 4.

Insert starting handle and turn in direction of arrow until engine can be turned easily.

pict. 10

### 4. 2. Starting (with automatic decompression)

#### 4. 2. 1.

Turn decompression lever „a“ in direction of arrow and put into position 2, 3, 4, 5, 6 or 7.

pict. 9

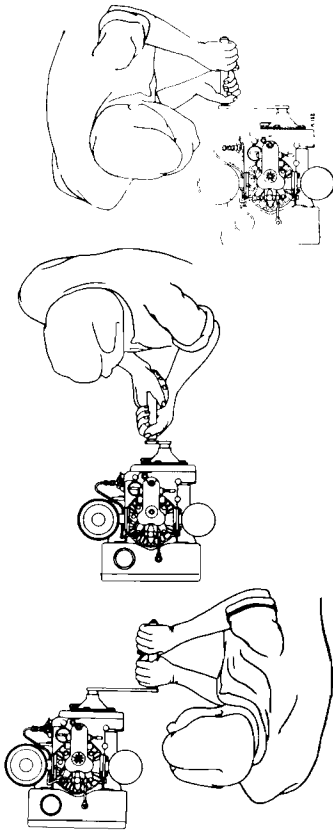
#### 4. 2. 2.

Take hold of starting handle with hands, turn with increasing speed. When decompression lever reaches position 0 (compression), the highest possible speed has to be obtained. Engine starts and goes to highest operating speed. Extra fuel button goes back by itself.

pict. 10

**Attention !**

Take correct position to engine and pay attention to correct position of hands on handle according to sketch.



incorrect

incorrect

correct

see:

**Advice:**

Allow engine to get warm for 1 - 2 minutes before loading.

**4.3. Starting at flywheel side**

Prepare for start, but put handle „a“ on to the square head upon flywheel side and insert pinion „b“; driving pin has to gear fully into crank jaw „c“.

**Start with automatic** as explained.

**Attention !**

Take correct position to engine and pay attention to correct position of hands at handle according to sketch.

**4.4. Starting at low temperatures**

Easy turning of the engines is essential for a good start. For this reason use oil with low viscosity.

Prepare for start. The following starting aids may be chosen

4.4.1.

Filling screw for starting oil. Clean area around filling screw „a“. Take off screw and fill up with 5 - 10 cm<sup>3</sup> lubricating oil or with a mixture of lubricating oil and fuel (ratio 1 : 1). Refasten screw with wrench and start engine at once.

4.4.2.

Ignition paper (not necessary when using „start pilot“).

Unscrew ignition paper holder „a“.

Insert ignition paper into holder with white end inside holder. Check proper insertion of ignition paper as follows:

Hold ignition paper so that ignition paper holder is hanging freely. If it does not fall off, ignition paper is firmly inserted.

Screw in ignition paper holder. Then start engine.

4.1.

pict. 11

4.2.

page 9

pict. 12

pict. 13

# Maintenance of your HATZ-Diesel-engine

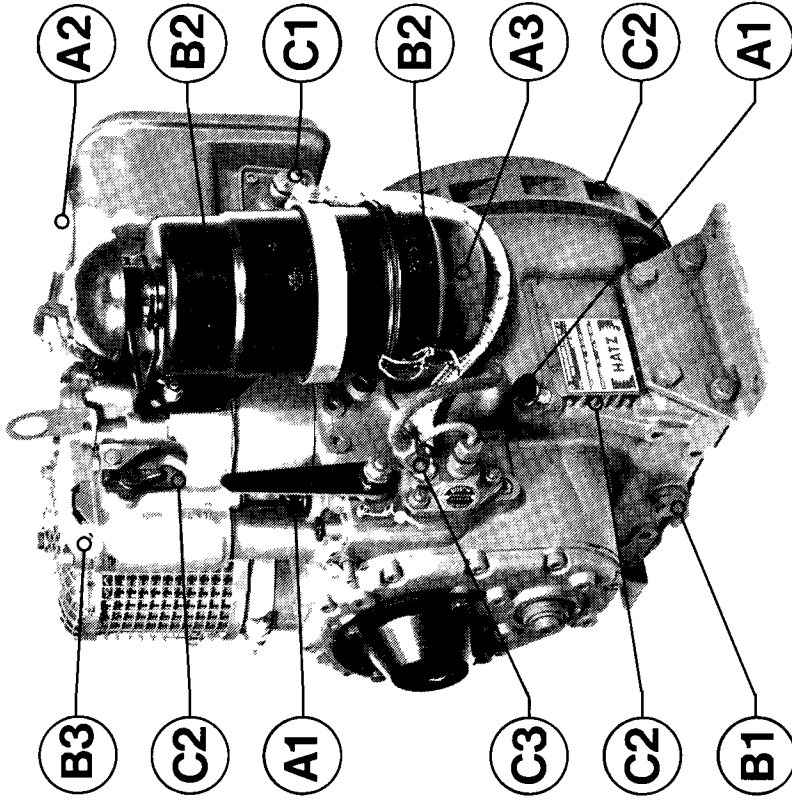
The best guarantee for a long working life and constant readiness of the engines is correct and regular maintenance. The engine is built in such a way that the necessary maintenance work is reduced to a minimum, and can be done easily and quickly.

see:

## Note:

At new or overhauled engines after the first 25 operating hours:

1. Change lubricating oil
2. Check tappet clearance and adjustment of de-compression device and adjust if necessary.
3. Tighten fixing nuts and screws of oilbath airfilter, exhaust, fuel tank and other accessories.



## A Daily maintenance before starting:

- |           |   |                 |
|-----------|---|-----------------|
| <b>A1</b> | Check oil level and refill to top mark of dipstick.                 | 2. 2.; 3. 1.    |
| <b>A2</b> | Fill tank with diesel fuel.   | 2. 1.; 3. 2.    |
| <b>A3</b> | Check oilbath airfilter with regard to oil level and contamination. | 3. 1. 2.; 7. 2. |

## B Maintenance after 150 operating hours:

- |           |  |              |
|-----------|--|--------------|
| <b>B1</b> | Change lubricating oil.  | 7. 1.        |
| <b>B2</b> | Clean oilbath airfilter.   | 7. 2.        |
| <b>B3</b> | Check tappet clearance and adjustment of de-compression; correct if necessary. | 7. 3.; 7. 4. |

## C Maintenance when required:

- |           |   |       |
|-----------|---|-------|
| <b>C1</b> | Change fuel filter element.   | 7. 5. |
| <b>C2</b> | Check cooling ribs and cooling air inlet openings for dirt; clean if necessary. | 7. 6. |
| <b>C3</b> | Check venting valve for proper function.  | 7. 7. |

## D Maintenance at engines which run only periodically:

- |           |   |       |
|-----------|---|-------|
| <b>B1</b> | Change lubricating oil at least after 6 months even at less than 150 operating hours. | 7. 1. |
|-----------|---|-------|



see:

**Note:**  
Only use ignition paper of 7 mm  $\phi$ . Bigger sizes do not fit into holder. Smaller sizes cannot be inserted firmly and may fall out during starting procedure, thus causing the following trouble: compression fails as ignition paper lodges under valve, or the engine cannot be turned as ignition paper is lodged between piston and cylinder head.

4. 4. 3.

**„Startpilot“**

„Startpilot“ is a liquid in an aerosol bottle. This increases the readiness of the engine to fire at low temperatures. Push button of bottle for about 1 - 2 seconds shortly before or during starting, spraying liquid directly into inlet of air-filter. Note instructions on bottle. One spray bottle is sufficient for 80 - 100 starts.

pict. 14

**4. 5. Starting with electrical starting device**

4. 5. 1.

Speed control lever „a“ in „start“ position.

pict. 7 / 8

4. 5. 2.

Decompression lever „a“ in position „1“

pict. 9

4. 5. 3.

Pull extra fuel button „b“

pict. 8

4. 5. 4.

Pull glow starting switch in position „1“ and preglow for about 1 minute

pict. 27

4. 5. 5.

Then pull through glow starting switch into position „2“. Starter will switch on. After having obtained highest starting speed, put decompression lever back to position 0 (compression).

pict. 27

When engine runs, starter acts as dynamo (at engine types E 71 / 75 / 79 / 780).

pict. 28

E 785 is equipped with starter and threephase alternator.

pict. 29

**5. Stopping engine**

Never stop engine while on full load.

Always continue operation with no load for a short time before stopping.

Stop engine only by putting speed control lever „a“ into position „stop“.

pict. 7 / 8

**Attention !**

Do not stop engine with decompression lever „a“.

pict. 9

## 6. Regular Maintenance

The best guarantee for a long working life and constant readiness of the engine is correct and regular maintenance. The engine is built in such a way that the necessary maintenance work is reduced to a minimum, and can be done easily and quickly.

### Important:

With new or generally overhauled engines after the first 25 operating hours:

1. Change oil.
2. Check tappet clearance and adjustment of decompression device; adjust if necessary.
3. Re-tighten fixing screws for airfilter, exhaust silencer, fuel tank and other accessories.

### A Daily maintenance before starting

- A1** Check oil level; refill to top mark of dipstick.
- A2** Fill with fuel. (According to size of tank and engine load refill several times daily in order to avoid interruptions of work).
- A3** Check oilbath-airfilter with regard to oil level and contamination. Clean, if necessary.

### B Maintenance after 150 operating hours

- B1** Change lubrication oil;
- B2** Clean oilbath-airfilter
- B3** Check tappet clearance and adjustment of decompression device adjust if necessary.

### C Maintenance when required

- C1** Exchange fuel filter.
- C2** Check cooling ribs and inlet openings of cooling air for dirt and clean if necessary.
- C3** Check venting valve for proper function.

### D Maintenance at engines which run only periodically:

- B1** Change lubricating oil at least after 6 months even at less than 150 operating hours.

## 7. Carring out maintenance work

### 7.1. Oil change

Oil change should be effected only with warm engine, by removing oil drain plug „a“. Drain oil. Clean magnetic end of oil drain plug. Refill with lubricating oil to upper mark of dipstick.

### 7.2. Cleaning of oilbath-airfilter

Take off oil container „a“ of oilbath-airfilter. Clean oil mud from container. Refill with lubricating oil up to mark „b“. Remove leaves, straw, etc., from air-intake-tube respect. rain protection cap „c“. In case of airfilters with detachable filter element, take off this part and wash in fuel. If air intake tube „b“ is smeered, clean with brush in fuel.

### 7.3. Adjustment of tappet clearance

Tappet clearance is for both valves 0,10 mm if engine is cold; Check adjustment only if engine is cold.

- 7.3.1. Put decompression lever „a“ in position „0“
  - 7.3.2. Take off cover of cylinderhead.
  - 7.3.3. Turn engine until compression resistance can be felt.
  - 7.3.4. Check gap between rocker and valve stem with feeler gauge „c“ of 0,10 mm.
  - 7.3.5. Should gap be incorrect, loosen hexagon nut „a“.
  - 7.3.6. Regulate adjusting screw „b“ with screwdriver, so that feeler gauge, after retightening of nut „a“, can be pulled between rocker and valve stem with a just perceptible resistance being felt.
  - 7.3.7. Fit cover of cylinder head; check for proper sealing of gasket.
- see: 2.2.; 3.1.  
2.1.; 3.2.  
3.1.2.  
7.2.  
7.1.  
7.2.  
7.3.; 7.4.  
7.5.  
7.6.  
7.7.  
7.1.

see:

pict. 15  
pict. 4

pict. 5

pict. 16

pict. 9

pict. 1

pict. 17

#### 7. 4. Adjustment of decompression

Adjustment of decompression is necessary if in position „1“ respect. „2“ . . . „7“ of decompression lever engine is not decompressed. Adjust decompression screw as follows:

7. 4. 1.  
Take off cover of cylinder head
7. 4. 2.  
Turn engine into the same position as for adjusting clearance
7. 4. 3.  
Put decompression lever „a“ to position „1“
7. 4. 4.  
Loose hexagon nut „a“ and turn adjusting screw „b“ of decompression device, till rocker touches the valve stem. Then move adjusting screw another quarter turn (90°) and secure by tightening hexagon nut „a“.
7. 4. 5.  
Fit cover of cylinder head; take care to proper position of gasket.

#### 7. 5. Exchange of filter element:

7. 5. 1.  
Empty fuel tank
7. 5. 2.  
Dismantle fuel filter by loosening the 4 fixing screws. Remove hexagon nut „a“ and take off filter element „b“.
7. 5. 3.  
Place new paper gasket „c“, slip new filter element on and retighten.
7. 5. 4.  
Reassemble fuel filter, tighten fixing screws.
7. 5. 5.  
Fill up with fuel and bleed injection system (not necessary at engines equipped with automatic venting device).

see:

pict. 9

pict. 9

pict. 18

pict. 19

page 10

#### 7. 6. Cleaning of cooling ribs and blower.

In case of especially dirty operating conditions the cooling ribs at cylinder and cylinder head as well as flywheel fan have to be cleaned. In case of dry dirt it will do if you remove the dirt with a bottle brush. Finally blow off engine with compressed air.

In case of cooling ribs smeered with oil use cleaning liquid and heavy water jet and finally blow off with compressed air. After re-assembly of cooling air ducts run engine warm in order to avoid rust formation. In any case check reason for contamination and remedy leaky spots (oil or fuel outlets), if necessary with the aid of an expert.

#### 7. 7. Checking proper function of venting device

At any troubles with the injection system and especially after a longer period of no-operation check automatic venting device for function.

Disconnect venting pipe „b“ from pipe connection „a“ at fuel tank and turn engine by crank handle or electric starter.

Caused by pulsating effect of injection pump fuel should emerge from pipe corresponding with the movement of pump plunger.

At irregularities remove venting valve „a“ and check by shaking for free movement of internal valve ball. If necessary, clean or - if unserviceable - replace the whole unit.

see:

pict. 22,  
23, 24

pict. 20

pict. 21

## 8. Engine trouble and remedies

### 8. 1. Engine does not start

The cause is certainly not to be found on injection pump or injection nozzle. Try once again to start engine while carefully observing starting instructions, (especially when starting at low temperatures).

Possible cause	Remedies	see:	Possible cause	Remedies	see:
<b>8. 1. 1. Fuel supply insufficient</b> a) Fuel tank empty b) Air in injection system c) Fuel filter clogged (ascertainable, if after screwing off fuel pipe „b“ no fuel emerges).	Fill with fuel, bleed injection system x) Fill with fuel, bleed injection system x) Change fuel filter element Fill with fuel, bleed injection system x)	3. 2. 3. 3. 3. 2. 3. 3. 7. 5. 3. 2. 3. 3.	<b>8. 1. 5. Engine cannot be turned</b> Ignition paper lodged between piston and cylinder head	Remove ignition paper from compression chamber	9. 2.
<b>8. 1. 2. Engine is hard to turn</b>	Drain oil and fill with oil of lower viscosity.	2. 2. 7. 1.	<b>8. 2. Smoke from exhaust</b> At the same time the engine may lack power (speed drops). The cause is not to be found at injection pump. 8. 2. 1. Airfilter clogged 8. 2. 2. Tappet clearance incorrect 8. 2. 3. Adjustment of decompression device incorrect 8. 2. 4. Injection nozzle defective 8. 2. 5. Excessive oil in crankcase	Clean airfilter Adjust tappet clearance Adjust decompression device Exchange injection nozzle Drain oil to normal level	7. 2. 7. 3. 7. 4. 9. 3. 7. 1.
<b>8. 1. 3. Engine has no compression</b> a) No tappet clearance b) Irregularity at decompression device c) Ignition paper in valve seat	Check and adjust tappet clearance Check and adjust decompr. device Remove ignition paper from valve seat	7. 3. 7. 4. 9. 1.	<b>8. 3. Engine lacks power</b> (speed drops), no smoke from exhaust 8. 3. 1. Speed control lever will not stay in position 8. 3. 2. Air in injection system 8. 3. 3. Fuel filter clogged	Retighten nuts „e“ Fill with fuel, bleed injection system x) Exchange fuel filter element (no cleaning) Fill with fuel, bleed injection system x)	pict. 8 3. 2. 3. 3. 7. 5. 3. 2. 3. 3.
<b>8. 1. 4. Engine fires but does not start</b>	a) Pull extra fuel button before starting b) Drain oil and fill with oil with lower viscosity. c) Bleed injection system x)	7. 1. 3. 2.	x) not necessary at engines equipped with automatic venting device.	x) not necessary at engines equipped with automatic venting device.	x) not necessary at engines equipped with automatic venting device.

Possible cause	Remedies	see:
<b>8. 4. Engine is over-heating</b> 8. 4. 1. Lack of cooling air  8. 4. 2. Excessive oil in crankcase 8. 4. 3. Irregularity in injection system	Clean cooling air inlet, clean cooling ribs  Drain oil to normal level  Replace injection nozzle resp. contact your nearest HATZ-Service-Agency	7. 7.  7. 1.  9. 3.
<b>8. 5. Engine stops suddenly</b> 8. 5. 1. Fuel supply incorrect a) Fuel tank empty  b) Fuel filter clogged (ascertainable if after taking off fuel feed pipe no fuel emerges) c) Vacuum in fuel tank  8. 5. 2. Speed control lever goes by itself to „stop“ 8. 5. 3. Lack of lubricating oil	Fill up with fuel, bleed injection system x)  Change fuel filter element bleed injection system x)  clean aeration openings in cap screw  Retighten nuts „e“  Engine has to be repaired, by no means try to keep the engine running with seized big end.	3. 2. 3. 3.  7. 5. 3. 2.  pict. 8

x) not necessary at engines equipped with automatic venting device.

## 9. Remedies for break downs

see:

**9. 1. Remove ignition paper from valve seat** (ignition paper in valve seat is recognizable by no compression resistance and a whispering sound, when engine is turned and decompression lever stands in position „0“; the concerned valve shows excessive clearance.

pict. 9

- 9. 1. 1.  
Remove cover of cylinder head
- 9. 1. 2.  
Turn engine into TDC-position of piston.

**9. 1. 3.**  
Fill 10 - 20 cm<sup>3</sup> lubricating oil into combustion chamber to achieve dissolving of ignition paper.

pict. 12

**9. 1. 4.**  
After a few minutes time turn engine and knock with hammer handle carefully at rocker.

pict. 25

**9. 1. 5.**  
Turn decompression lever into position „1“ and turn engine to eject oil and dissolved ignition paper.

pict. 9

**9. 1. 6.**  
Start engine while carefully observing starting instructions.

4.

### 9. 2. Remove ignition paper from compression chamber

**9. 2. 1.**  
Fill 5 - 10 ccm lubricating oil through oil screw „a“ into compression chamber.

pict. 12

**9. 2. 2.**  
Rock at flywheel with starting handle or by hand against resistance, until engine can be turned. The ignition paper has dissolved in the lubricating oil.

**9. 2. 3.**  
Engine can be started normally.

### 9.3. Change of injection nozzle

9.3.1. Unscrew fuel pressure pipe and fuel-leak-off-pipe.

9.3.2. Remove hexagon nuts from injection valve and take out injection valve.

**Note:** Do not lose gasket; should it come off with injection valve, replace at once.

9.3.3.

Remove cap nut „a“ from injection valve and exchange injection nozzle „b“ with needle.

9.3.4.

When re-assembling, pay attention to correct succession and position of parts; clean all parts with utmost care.

9.3.5.

Replace injection valve. Check for proper seat of joint washer.

see:

pict. 1

### 11. Preservation of engine

At interruptions of operation for more than three months we recommend the following:

11.1.

After occasionally 3 months of no-operation operate engine for about 10 minutes.

11.2.

Subsequently close opening of airfilter, exhaust and crank-case.

11.3.

Fill up fuel tank completely (no air should be left in tank) to avoid formation of condensed water.

At interruption of operation for more than 12 months contact your HATZ-Service-Agency.

see:

pict. 26

### 10. Special rules for electric equipment

**At engines equipped with threephase alternator (engine type E 785)**

10.1.

Keep battery connected and key in switch box.

10.2.

Do not change „+“ — and „—“ poles of battery.

10.3.

Replace burnt out control bulb immediately

10.4.

Avoid short circuits; do not ground cables for checking purposes.

10.5.

When arc-welding disconnect wiring from generator and put the ground terminal of the welding set as close as possible to the welding area.

10.6.

When cleaning engine with heavy water jet, avoid splashing water to components of electric equipment.

If unavoidable, disconnect battery and dry all components with compressed air before connecting battery and starting engine.

pict. 29

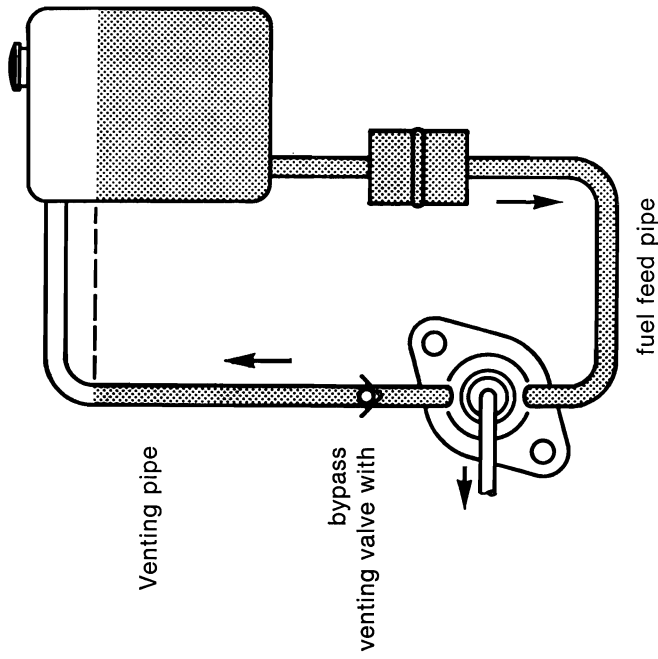


# Pictures to Instruction book

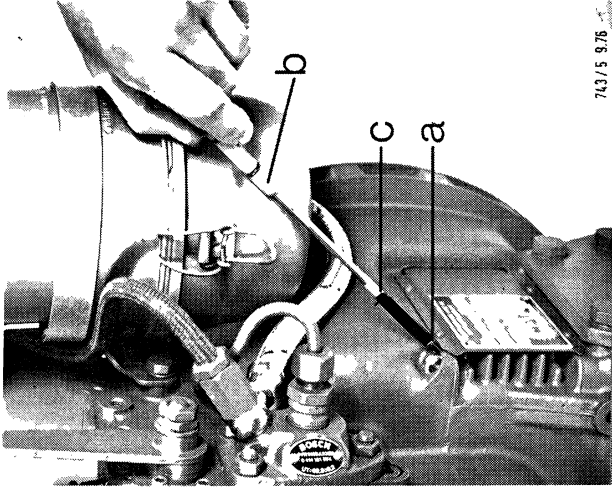
Engine-Types	ES	71	E	71
	ES	75	E	75
	ES	79	E	79
	ES	780	E	780
	ES	785	E	785

from Picture No. 2 to Picture No. 29

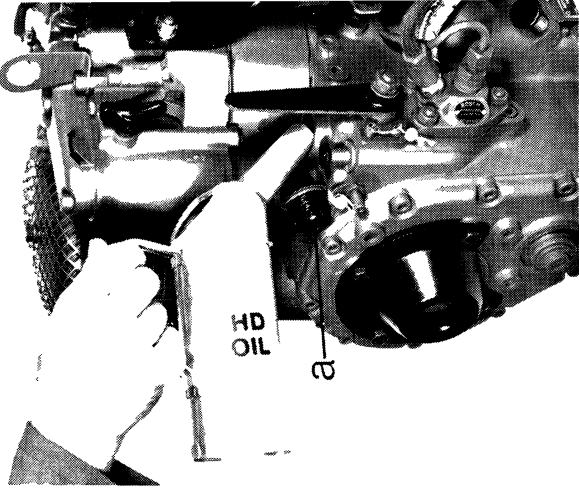
**AUTOMATIC VENTING DEVICE OF THE INJECTION SYSTEM**



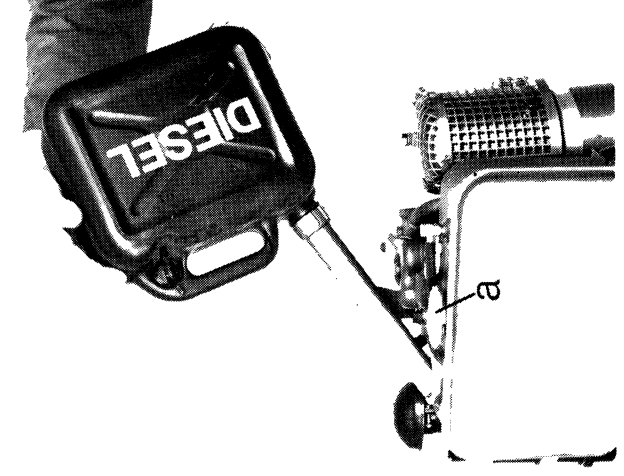
Picture 2



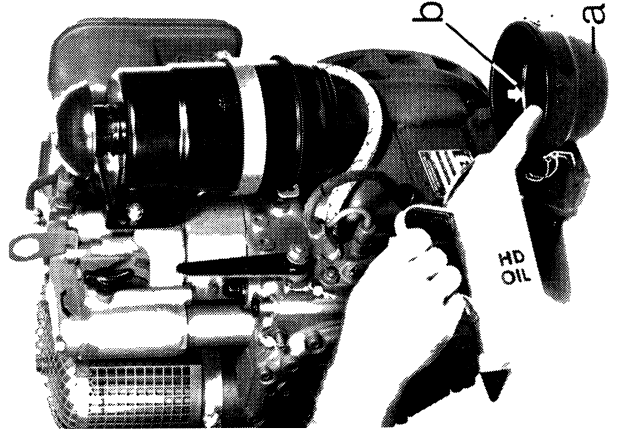
Picture 4



Picture 3



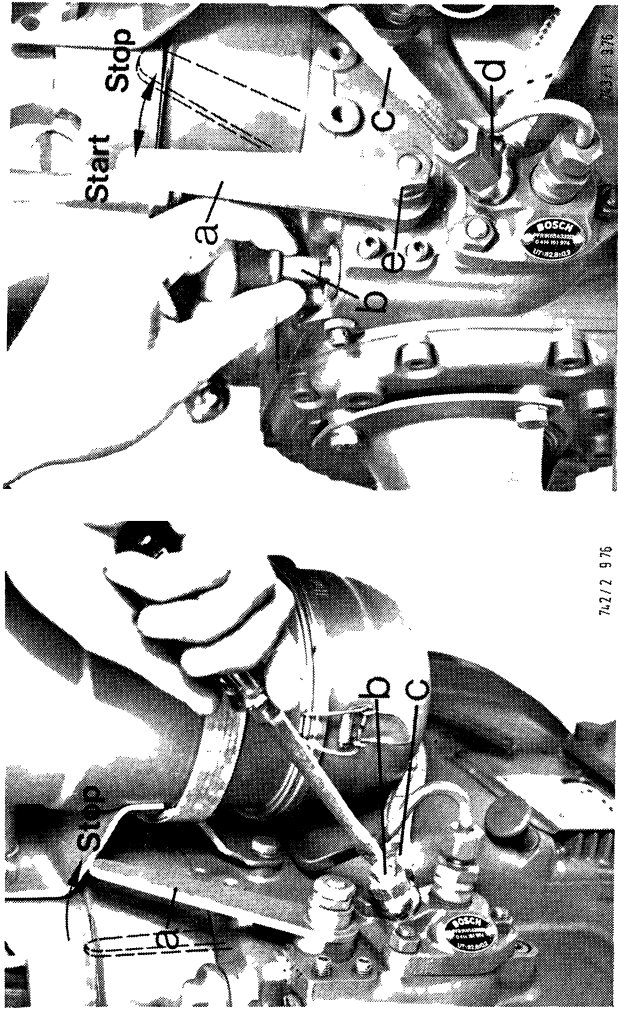
Picture 6



Picture 5

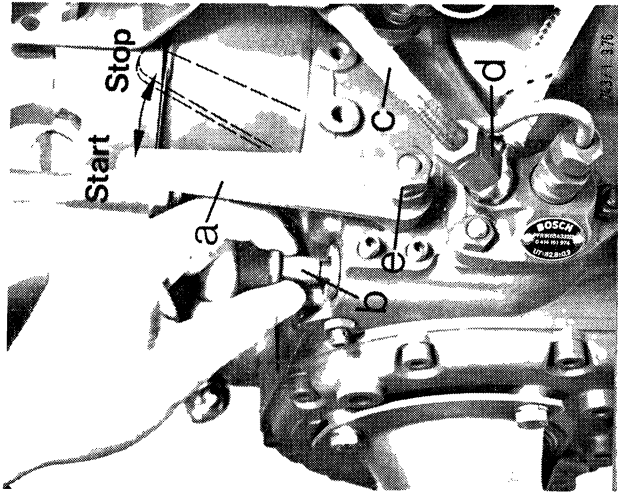
743/5 9.76





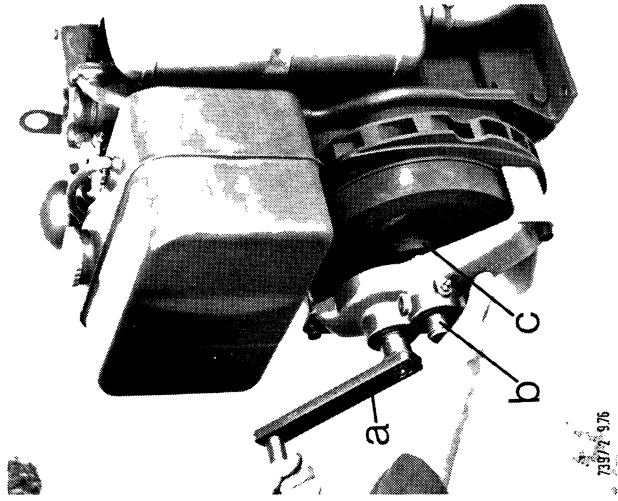
Picture 7

74212 9/76



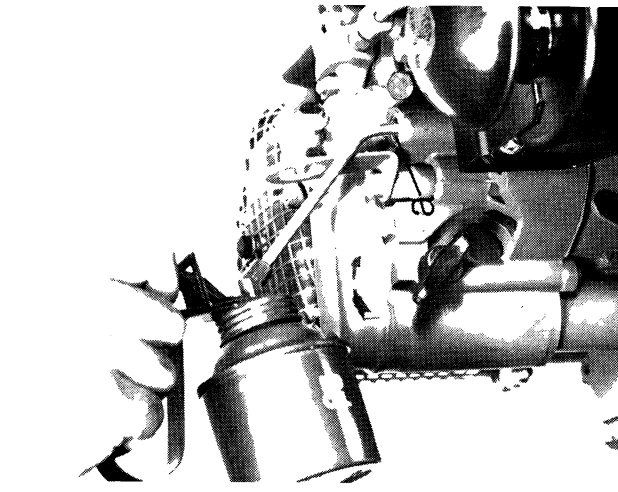
Picture 8

74314 9/76

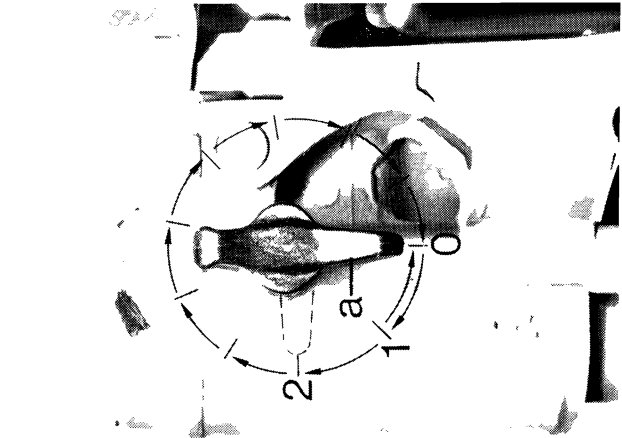


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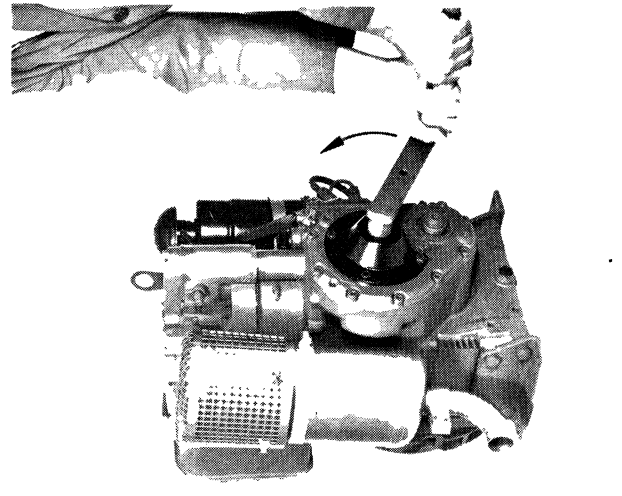
73872 9/76



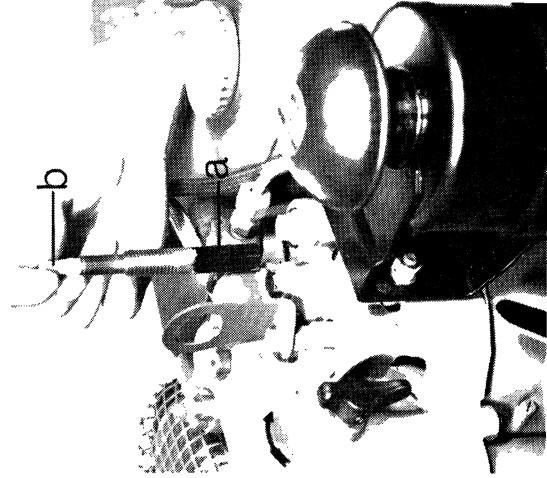
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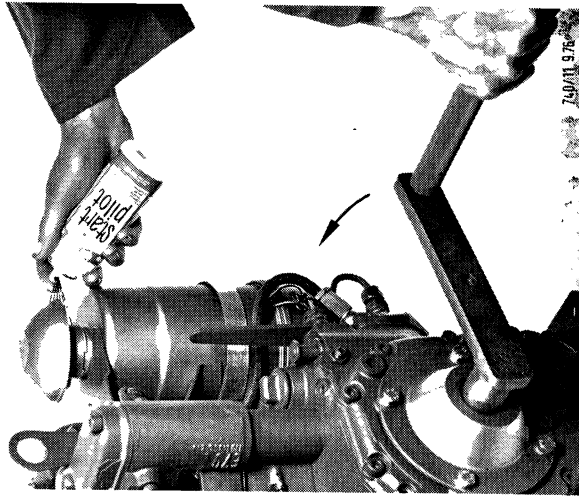
Picture 9



Picture 10

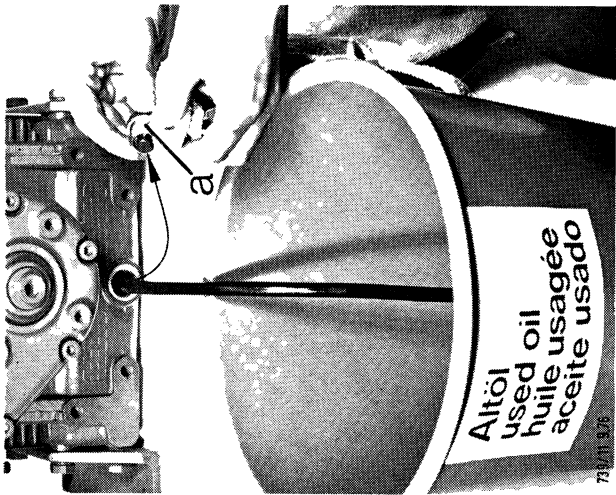


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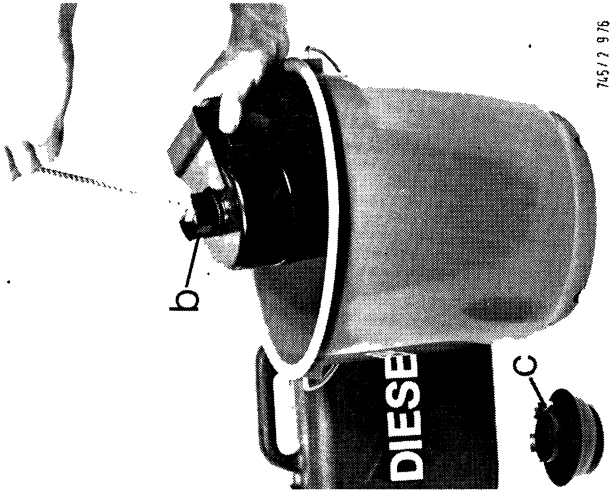


Picture 14

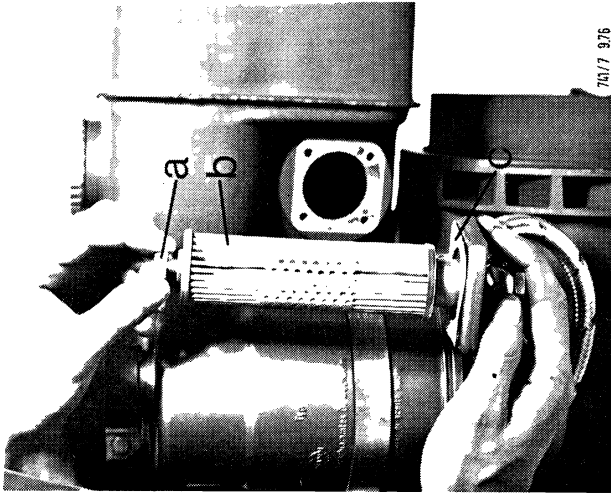
74011 9/76



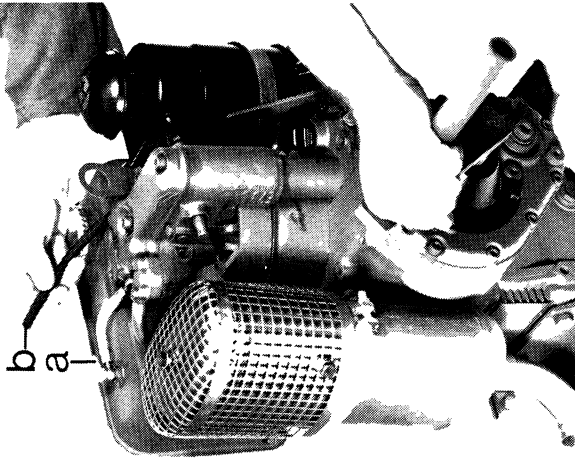
Picture 15



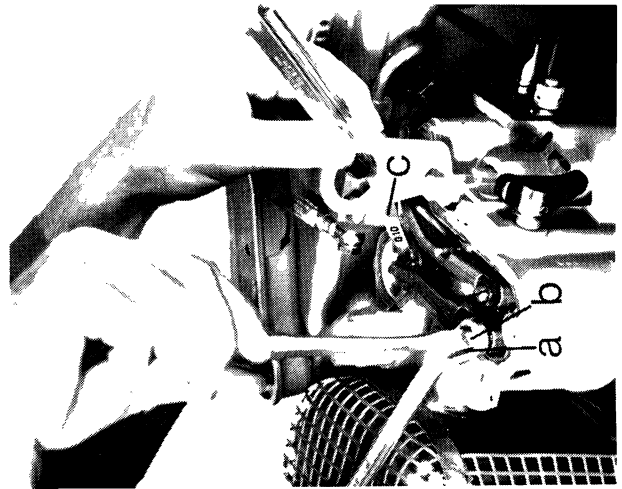
Picture 16



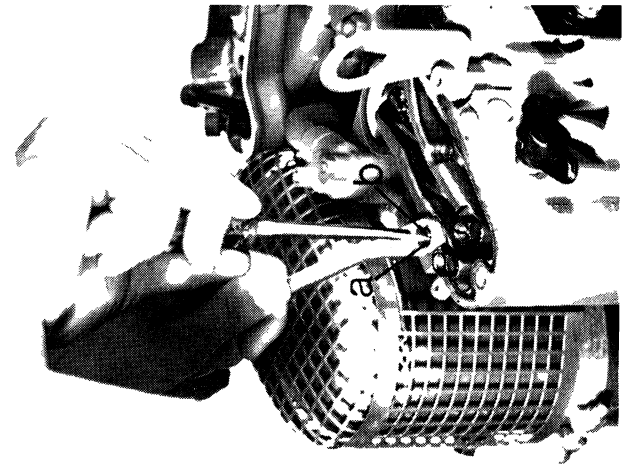
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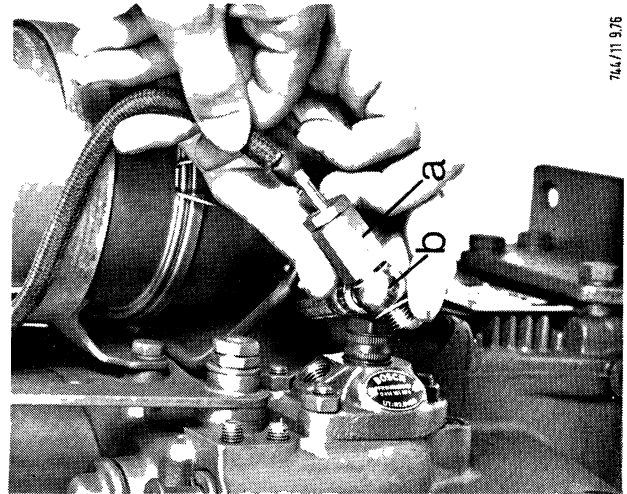
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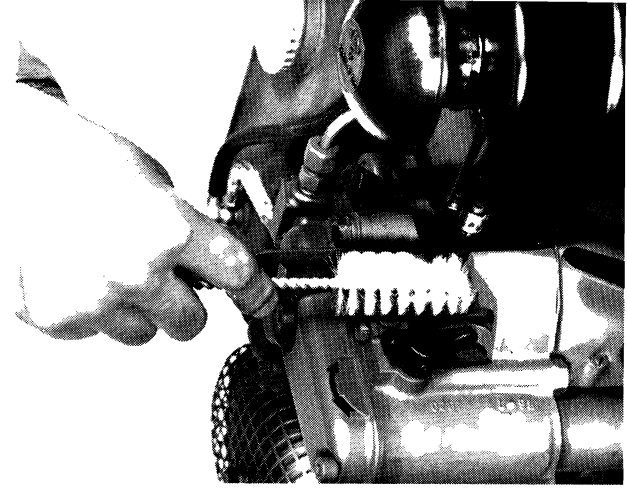
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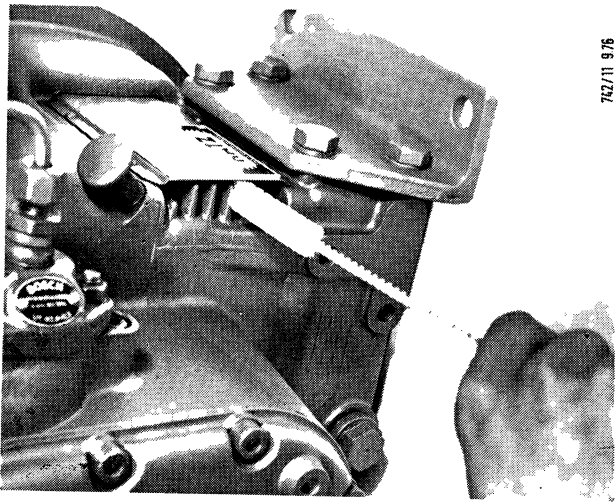
Picture 18



Picture 21

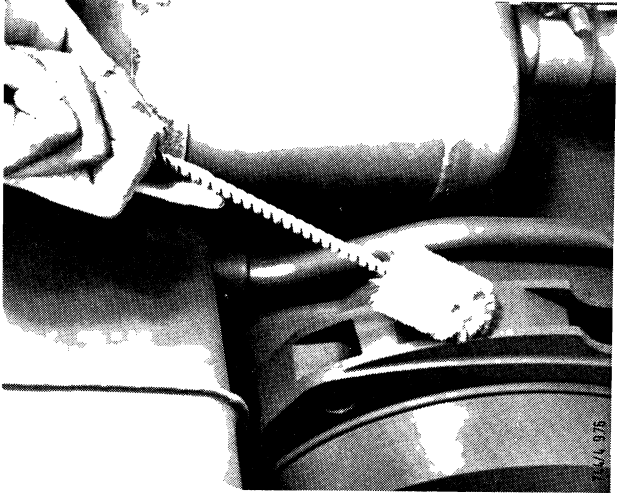


Picture 22



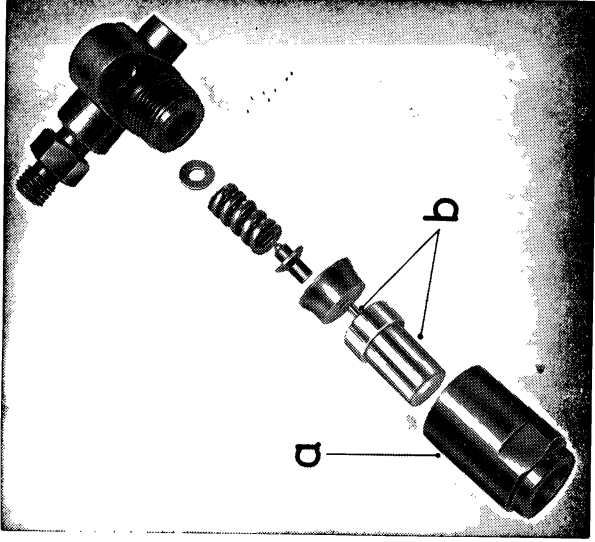
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Picture 23

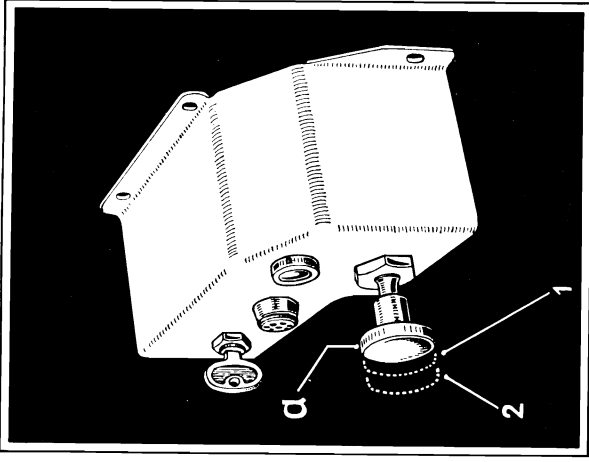


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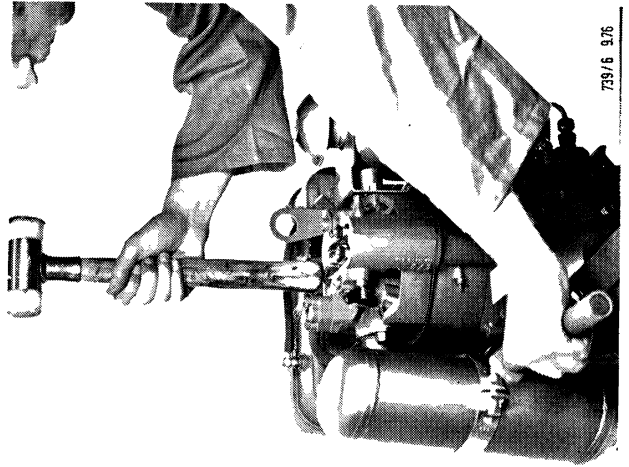
Picture 24



Picture 26

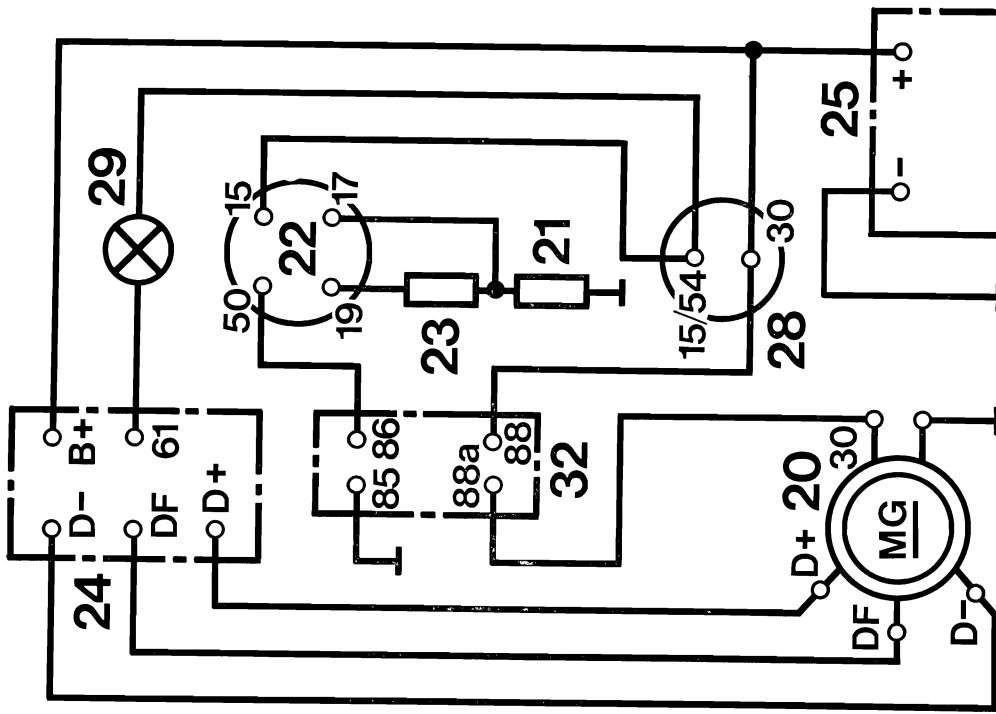


Picture 27



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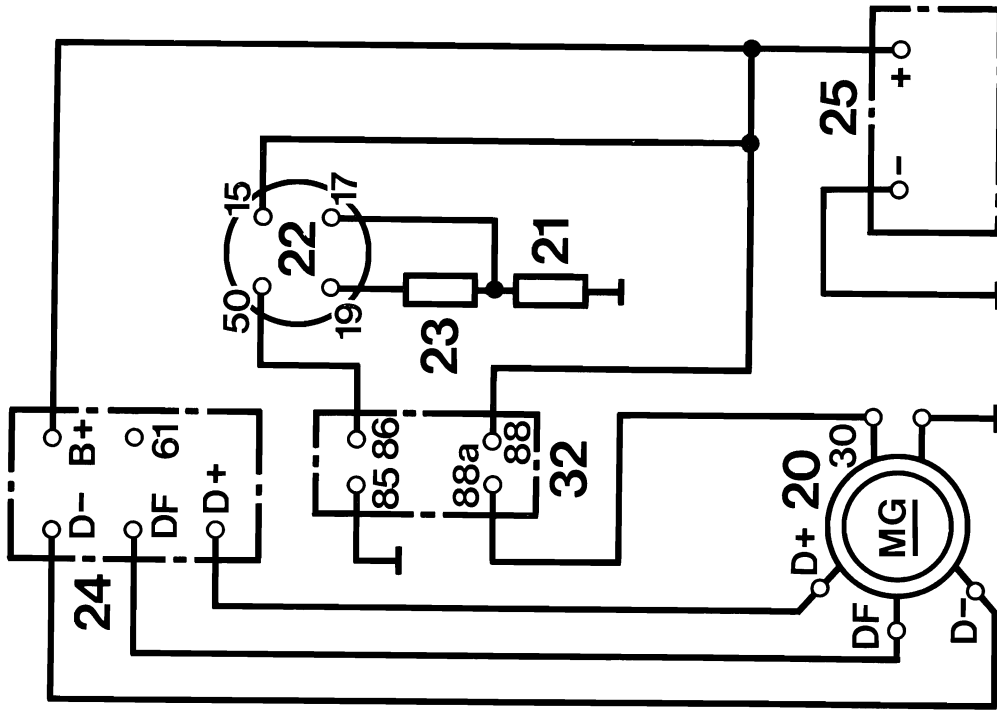
Picture 25



Wiring diagram for engines with Dynamo-starter (E 71 - E 75 - E 79 - E 780), when switch box and charging indicator lamp is mounted.

- 20 = dynamo starter
- 21 = glow plug
- 22 = glow starting switch
- 23 = glow controller
- 24 = regulator
- 25 = battery
- 28 = switch box
- 29 = charging indicator lamp
- 32 = starter relay

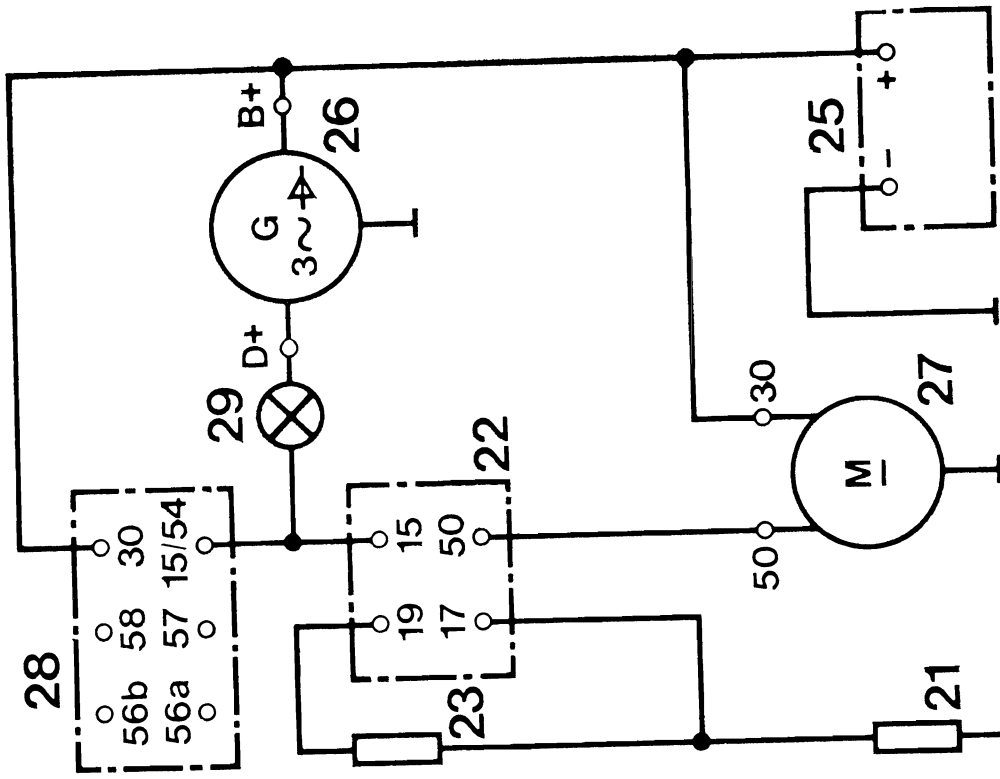
Picture 28



Wiring diagram for engines with Dynamo-starter (E 71 - E 75 - E 79 - E 780), when no switchbox and charging lamp is mounted.

- 20 = dynamo starter
- 21 = glow plug
- 22 = glow starting switch
- 23 = glow controller
- 24 = regulator
- 25 = battery
- 32 = starter relay

Picture 28a



Wiring diagram for engines with three-phase-alternator  
(E 785)

- 21 = glow plug
- 22 = glow starting switch
- 23 = glow controller
- 25 = battery
- 26 = dynamo with mounted regulator
- 27 = starter
- 28 = switch box
- 29 = charging indicator lamp