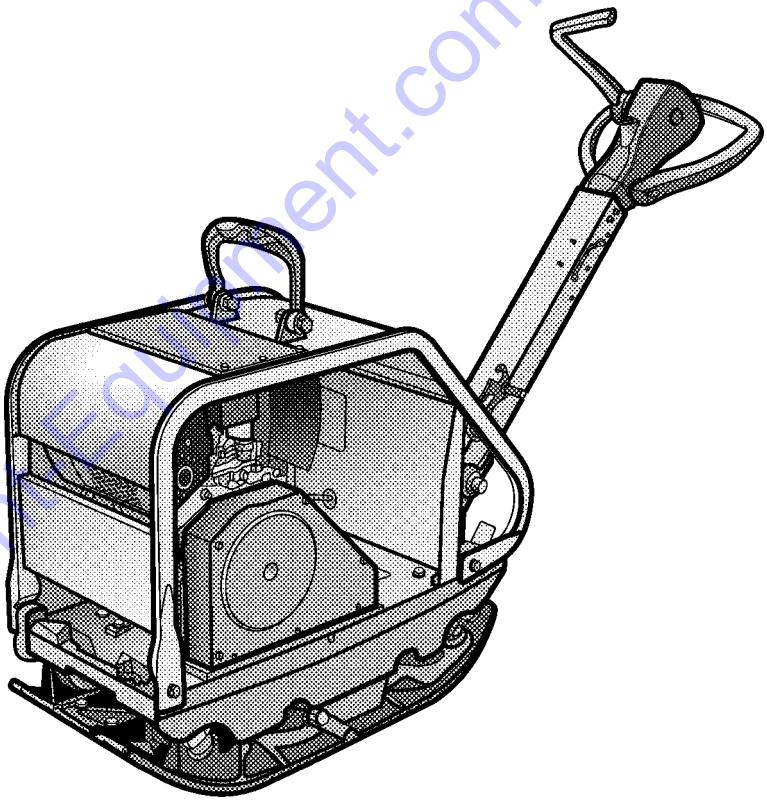
BOMAG

Operating instructions
Maintenance instructions

This manual is in accordance with product liability laws and safety regulations

BPR 35/42 D - BPR 35/60 D

S/N 101 690 41 ....> S/N 101 690 42 ....> S/N 101 690 43 ....> S/N 101 690 44 ....>



CE

Vibratory plate

Catalogue number
008 041 61

02/2007

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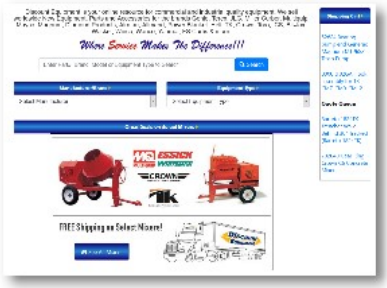

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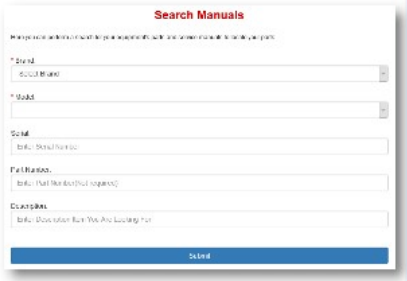

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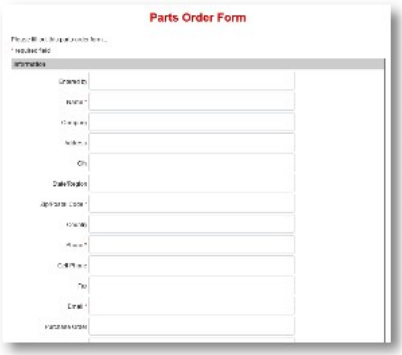

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If the machine is equipped with a battery :

CALIFORNIA
Proposition 65 Warning

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.
Wash hands after handling.

If the machine is equipped with a diesel engine :

CALIFORNIA
Proposition 65 Warning

The engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

These BOMAG - machines are products from the wide product range of BOMAG compaction equipment. BOMAG's vast experience, coupled with the most modern production and testing methods, such as lifetime tests of all important components and highest quality demands, ensure highest reliability of your machine.

Using these instructions will

- help you to become acquainted with the machine.
- avoid faults caused by unprofessional operation.

Observing the maintenance instructions will

- increase the reliability of the machine during use on site,
- prolong the lifetime of the machine,
- reduce repair costs and downtime.

BOMAG does not assume liability for the function of the machine

- if the machine is handled in a way, which does not comply with the use it is intended for,
- if it is used for purposes other then the ones mentioned in these instructions.

No warranty claims can be lodged for damage resulting from

- operating errors,
- insufficient maintenance and
- the use of wrong fuels and lubricants.

Please note!

This manual was written for operators and maintenance personnel on construction sites.

You should only operate the machine after you have been instructed to do so and by following these instructions.

Please observe strictly the safety regulations.

Please observe also the guidelines of the civil engineering liability association "safety rules for the operation of road rollers and soil compaction equipment", as well as the applicable instructions for the prevention of accidents.

For your own safety you should only use genuine BOMAG spare parts.

To comply with the technical development we reserve the right of modifications without prior notification.

These operating and maintenance instructions are also available in other languages.

In addition you can obtain a spare parts catalogue from your BOMAG dealer by just stating the serial number of your machine.

Information for the correct use of our machines in earth and asphalt construction is also available from your BOMAG-dealer.

The notes mentioned above do not constitute an extension of the warranty and liability conditions, which are part of the general terms of business of BOMAG.

We wish you much success with your BOMAG machine.

BOMAG GmbH & Co. OHG

Printed in Germany

Please fill in

. . . . . .

Machine type (Fig. 1)

. . . . . .

Serial No. (Fig. 1 and 2)

. . . . . .

Engine type (Fig. 3)

. . . . . .

Engine No. (Fig. 3)

i Note

Fill in the above listed data when receiving the machine.

Upon receipt of the machine our organization will instruct you about correct operation and maintenance.

Please observe strictly all safety regulations and notes on potential dangers!

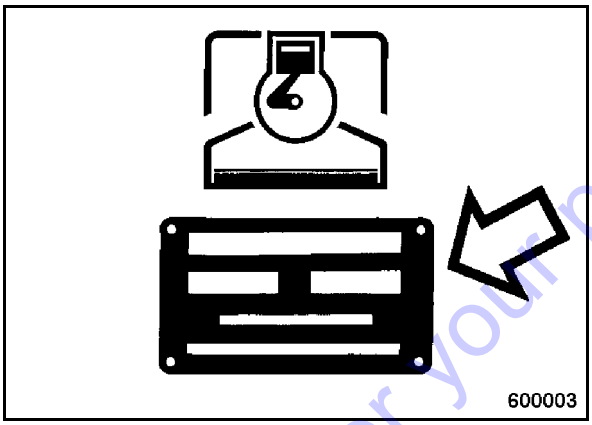


Fig. 1

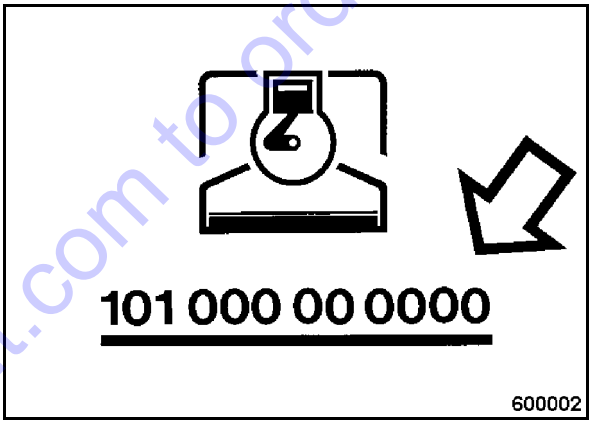
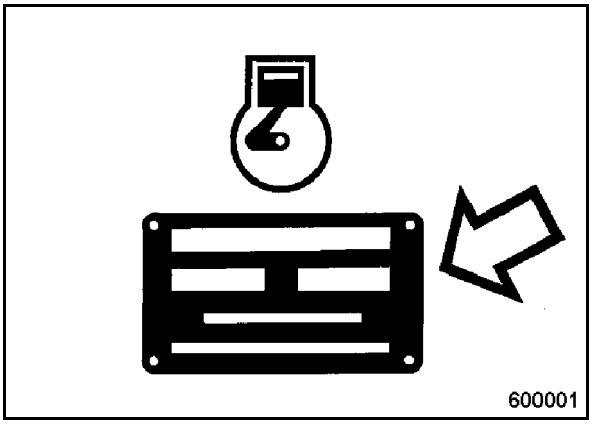


Fig. 2



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1 Technical Data

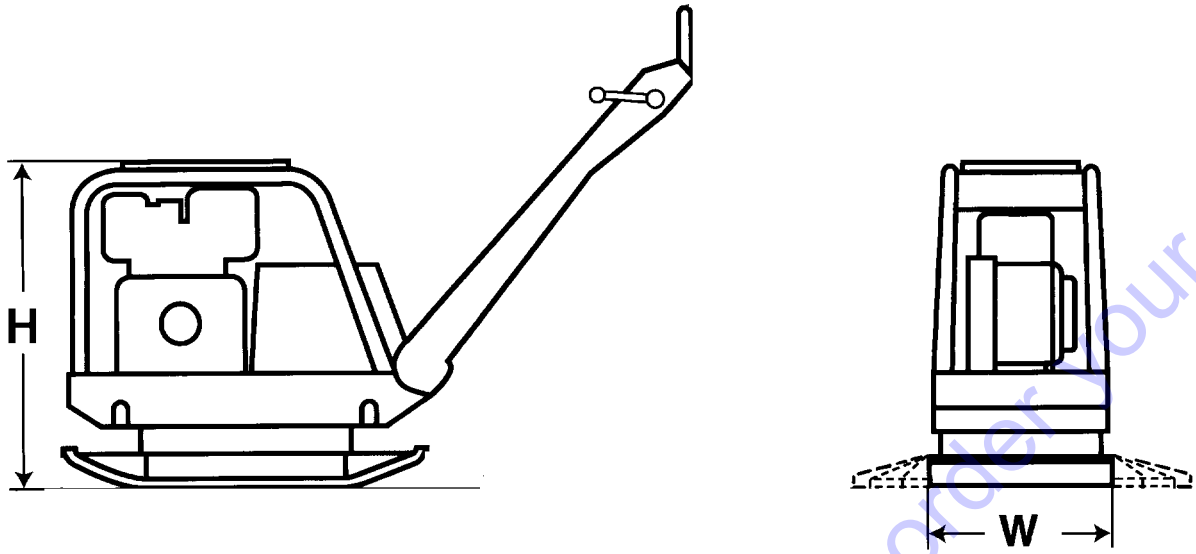

Fig. 4

Dimensions in mm	Working width W	lowest passing height H
BPR 35/42 D BPR 35/42 D (E-Start)	420	687

*

		BPR 35/42 D	**BPR 35/42D with E-Start**
Weights			
Operating weight (CECE)	kg	205	225
Travel characteristics	soil dependent		
Working speed	m/min	27	27
Gradability	%	32	32
Drive			
Engine manufacturer		Hatz	Hatz
Type		1B20	1B20
Cooling		Air	Air
Number of cylinders		1	1
Rated power ISO 9249	kW	3,1	3,1
Rated speed	min-1	3000	3000
Starting device		Recoil starter	Electric starter
Fuel		Diesel	Diesel
Drive system		mechanical (V-belt)	mechanical (V-belt)

*		BPR 35/42 D	BPR 35/42D with E-Start
Exciter system			
Frequency	Hz	80	80
Centrifugal force	kN	35	35
Filling capacities			
Fuel	l	3	3

* The right for technical modifications remains reserved

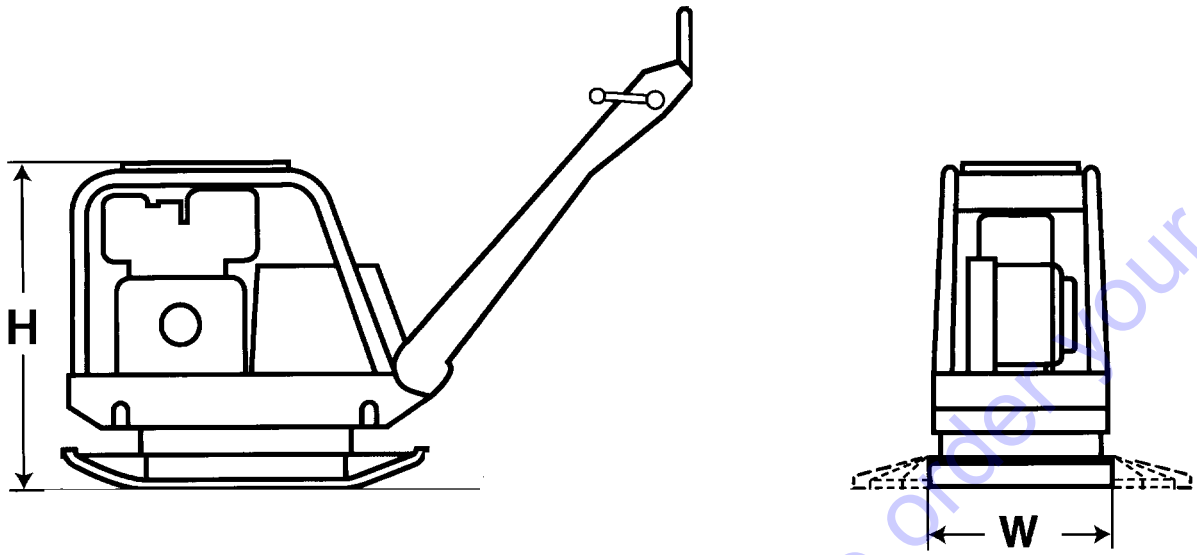

Fig. 5

Dimensions in mm	Working width W	lowest passing height H
BPR 35/60 D BPR 35/60 D with E-Start	600	687

*

		BPR 35/60 D	**BPR 35/60 D with E-Start**
Weights			
Operating weight (CECE)	kg	220	240
Travel characteristics	soil dependent		
Working speed	m/min	27	27
Gradability	%	32	32
Drive			
Engine manufacturer		Hatz	Hatz
Type		1B20	1B20
Cooling		Air	Air
Number of cylinders		1	1
Rated power ISO 9249	kW	3,1	3,1
Rated speed	rpm	3000	3000
Starting device		Recoil starter	Electric starter
Fuel		Diesel	Diesel
Drive system		mechanical (V-belt)	mechanical (V-belt)

*		BPR 35/60 D	BPR 35/60 D with E-Start
Exciter system			
Frequency	Hz	80	80
Centrifugal force	kN	35	35
Filling capacities			
Fuel	l	3	3

* The right for technical modifications remains reserved

The following noise and vibration data acc. to

- EC Machine Regulation edition 98/37/EC and

- the noise regulation 2000/14/EG, noise protection guideline 2003/10/EC

- Vibration Protection Regulation 2002/44/EC

were determined during conditions typical for this type of equipment and by application of harmonized standards.

During operation these values may vary because of the existing operating conditions.

Noise value

sound pressure level on the operator's stand:

L_{pA} = 91 dB(A) BPR 35/42 D with tube frame, determined acc. to ISO 11204 and EN 500

L_{pA} = 92 dB(A) BPR 35/60 D with tube frame, determined acc. to ISO 11204 and EN 500

Guaranteed sound power level:

L_{WA} = 103 dB(A) BPR 35/42 D with tube frame, determined acc. to ISO 3744 and EN 500

L_{WA} = 105 dB(A) BPR 35/60 D with tube frame, determined acc. to ISO 3744 and EN 500

⚠ Danger

Loss of hearing!

Wear your personal noise protection means (ear defenders) before starting operation.

Vibration value

Hand-arm vibration:

Vector total of the weighted effective acceleration in three orthogonal directions:

Weighted total vibration value

BPR 35/42 D a_{hw} = 6.2 m/sec^2 with hood on crushed rock determined acc. to ISO 5349 and EN 500

BPR 35/42 D a_{hw} = 7.3 m/sec^2 with tube frame on crushed rock determined acc. to ISO 5349 and EN 500

BPR 35/60 D a_{hw} = 5.7 m/sec^2 with hood on crushed rock determined acc. to ISO 5349 and EN 500

BPR 35/60 D a_{hw} = 6.7 m/sec^2 with tube frame on crushed rock determined acc. to ISO 5349 and EN 500

⚠ Caution

Observe the daily vibration load (Industrial safety acc. to 2002/44/EEC).

2 Safety regulations

General

This BOMAG machine is built in accordance with the latest technical standard and the valid technical rules and regulations. However, dangers for persons and property may arise from the machine if it is:

- put to unintended use,
- operated by untrained personnel,
- modified or altered in an unprofessional way,
- the applicable safety regulations are not observed.

Each person involved in operation, maintenance and repair of the machine must therefore read and apply these safety regulations. If necessary this should be confirmed by obtaining the signature of the customer.

Furthermore the following regulations and instructions are obviously also valid:

- all applicable instructions for the prevention of accidents,
- generally acknowledged safety and road traffic regulations,
- country specific regulations.

Intended use

This machine must only be used for:

- compaction of all types of soil,
- repair work on all types of soil,
- reinforcement of pedestrian walkways,
- work in trenches,
- filling and compaction of hard shoulders.
- The machine should be checked by an expert once every year.

Unintended use

Dangers may, however, arise from the machine if it is used by untrained personnel in an unprofessional way or if it is used for purposes other than those mentioned in these instructions.

Who is allowed to work with the machine?

The machine must only be operated by trained and authorized persons who are at least 18 years of age. The responsibilities for the operation of the machine must be clearly specified and complied with.

Persons under the influence of alcohol, medication or drugs must not operate, service or repair the machine.

Maintenance and repair tasks require specific knowledge and must therefore only be carried out by trained and qualified personnel.

Conversions and alterations to the machine

Unauthorized conversions to the machine are prohibited for safety reasons.

Original parts and accessories have been specially designed for this machine. We wish to make expressly clear that we have not tested or authorized any original parts or special equipment not supplied by us. The installation and/or use of such products can impair the active and/or passive driving safety. The manufacturer expressly excludes any liability for damage resulting from the use of non-original parts or accessories.

Safety notes in the operating and maintenance instructions:

⚠ Danger

Paragraphs marked like this highlight possible dangers for persons.

⚠ Caution

Paragraphs marked this way highlight possible dangers for machines or parts of the machines.

i Note

Sections marked like this provide technical information concerning the optimal economical use of the machine.

Environment

Sections marked like this highlight activities for the safe and environmental disposal of fuels and lubricants as well as replaced parts.

Safety stickers on the machine

Keep safety stickers in good condition and legible and follow their meaning.

Replace damaged and illegible safety stickers.

Loading the machine

Secure the machine against turning over or slipping off.

Persons are highly endangered if they

- step under loads being lifted or
- stand under loads being lifted

Secure the machine on the transport vehicle against rolling off, slipping and turning over.

Starting the machine

Before starting

Become acquainted with the equipment, the control elements, the working principle of the machine and the working area.

Wear your personal protective outfit (hard hat, safety boots, etc.). Wear ear defenders.

Before starting the machine check whether:

- the machine shows any obvious faults
- all guards and safety elements are in place
- the controls are fully functional
- the machine is free of oily and combustible material
- all grips are free of grease, oils, fuel, dirt, snow and ice.

Use only machines which are serviced at regular intervals.

Do not use any starting aids like start pilot or ether.

For starting move your feet out of the danger zone of the base plate.

Starting in closed rooms

Exhaust gases are highly dangerous! Always ensure an adequate supply of fresh air when starting in closed rooms!

Operation

Operate the machine only with the steering rod folded down.

Guide the machine so hat your hands do not hit against solid objects, danger of injury.

Watch out for unusual noises and development of smoke. Perform trouble shooting and have the fault corrected.

Operate the machine only with full engine speed, as otherwise the centrifugal clutch will be destroyed.

Do not let the machine run unattended.

Parking the machine

Park the machine on level, firm ground.

Before leaving the machine:

- park the machine so that it cannot turn over,
- shut the engine down.

Mark machines, which could be in the way, with a clearly visible sign.

Filling the fuel tank

Refuel only with the engine shut down.

Do not refuel in closed rooms.

No open fire, do not smoke.

Do not spill any fuel. Catch running out fuel, do not let it seep into the ground.

Maintenance

Maintenance work must only be carried out by qualified and authorized personnel.

Keep unauthorized persons away from the machine.

Do not perform service work while the engine is running.

If possible, park the machine on level and firm ground.

Working on the engine

Drain the engine oil at operating temperature - danger of scalding!

Wipe off spilled oil, catch running out oil and dispose of environmentally.

Store used filters and other oil containing materials in a specially marked container and dispose of environmentally.

Working on electric components

Before starting to work on electric components disconnect the battery and cover it with insulating material.

Working on the battery

When working on the battery do not smoke, do not use open fire.

Do not let skin and clothes come in contact with acid.

In case of injuries caused by acid flush the respective parts with clear water and consult a doctor for medical advice.

Do not place any tools on the battery, danger of short circuit.

When recharging the battery remove all plugs to avoid an accumulation of explosive gases.

Dispose of old batteries environmentally.

Working on the fuel system

No open fire, do not smoke, do not spill any fuel.

Catch running out fuel, do not let it seep into the ground and dispose of environmentally.

Cleaning

Do not clean the machine while the engine is running.

Do not use gasoline or other combustible substances for cleaning purposes.

When using steam cleaning equipment do not subject electric parts to the direct water jet or cover it beforehand.

Do not guide the water jet directly into the air filter and into the air intake opening.

After maintenance work

Reinstall all protective devices after completing the maintenance work.

Repair

Repair work must only be performed by qualified and authorized persons. Use our repair instructions for this work.

Exhaust gases are highly dangerous! Always ensure an adequate supply of fresh air when starting in closed rooms!

Mark defective machines by attaching a warning note to the steering handle.

3 Indicators and Controls

3.1 General notes

Please read this section thoroughly before operating this machine if you are not yet conversant with the indicators and control elements. All functions are described in detail hereunder.

Paragraph 4 Operation contains only concise descriptions of the individual operating steps.

3.2 Controls

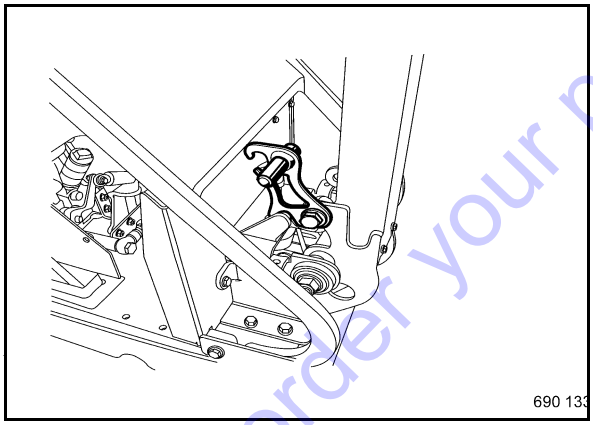

Fig. 6

Locking lever (Fig. 6)

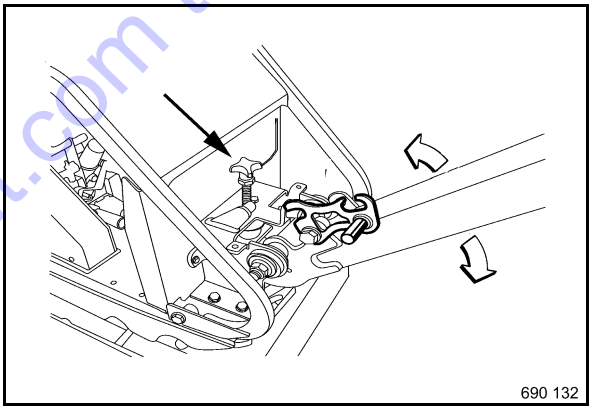

Fig. 7

Height adjustment (Fig. 7) of steering rod.

i Note

Pull the locking lever up to fold the steering rod down.

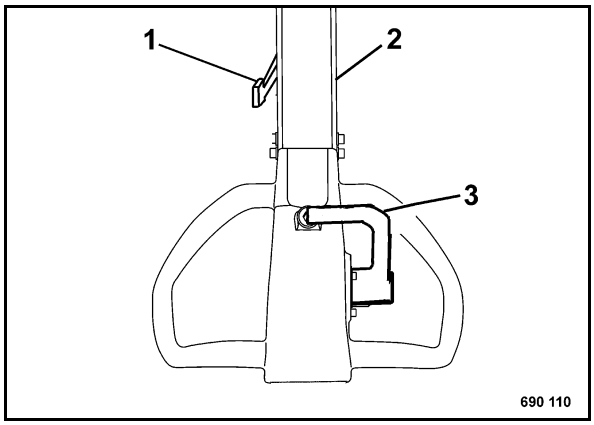

Fig. 8

Controls (Fig. 8).

1 Throttle lever

2 Steering rod

3 Travel lever

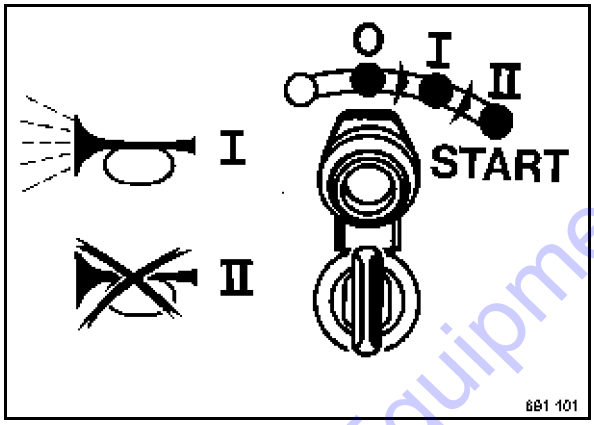

Fig. 9

Optional equipment

Start the engine electrically (Fig. 9).

Ignition key position "0", warning buzzer off.

Ignition key position "I", warning buzzer on.

Ignition key position "II", the engine will start.

4 Operation

4.1 General

If you are not yet acquainted with the controls and indicating elements on this machine you should thoroughly read chapter 3 “Indicators and control elements” before starting work.

All indicators and control elements are described in detail in this chapter.

4.2 Before starting work

Please observe strictly the safety regulations in chapter 2 of these operating and maintenance instructions.

Refer also to the detailed description in the chapter “Maintenance”.

Top up missing lubricants according to the maintenance instructions.

- Park the machine on ground as level as possible.
- Check fuel tank and fuel lines for leaks.
- Check the engine oil level, if necessary fill up to the top mark.
- Check the fuel level, fill up if necessary.
- Check the dry air filter service indicator.
- Check the condition of the complete machine and all screw joints for tight fit.

⚠ Danger

Loss of hearing!

Wear your personal noise protection means (ear defenders) before starting operation.

4.3 Folding down the steering rod

⚠ Danger

Danger of injury!

Shock by spring force!

The steering rod is resilient in operating position.

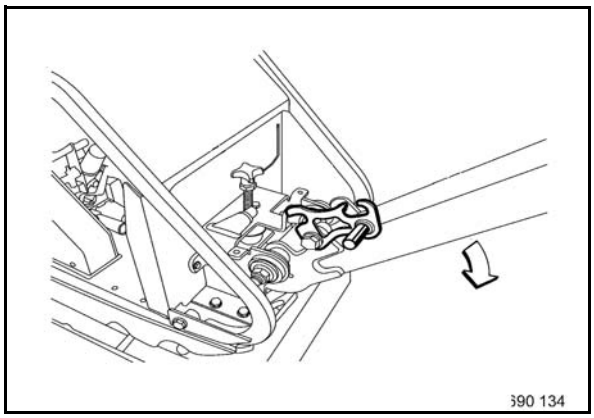

Fig. 10

- Pull locking lever (Fig. 10) up and fold the rod down, so that steering rod can swing freely.

4.4 Starting with recoil starter

⚠ Danger

Danger of explosion!

Do not use any starting aid spray.

Before starting make sure that there are no persons in the danger area of engine or machine and that all safety installations are in place.

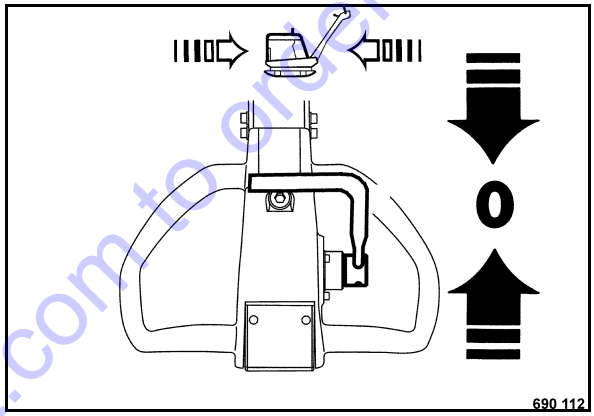

Fig. 11

- Shift the travel lever (Fig. 11) to position "0".

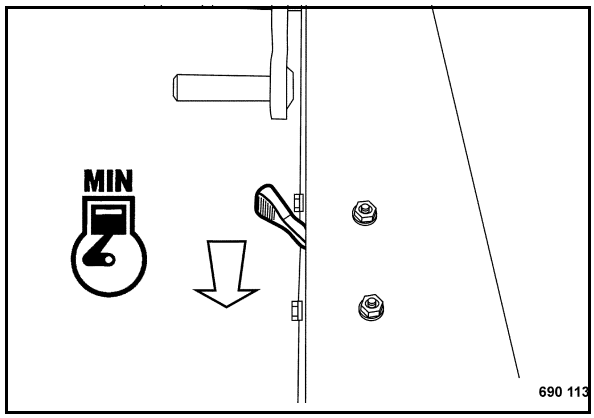

Fig. 12

- Set the throttle lever (Fig. 12) to position "MIN" (idle speed).

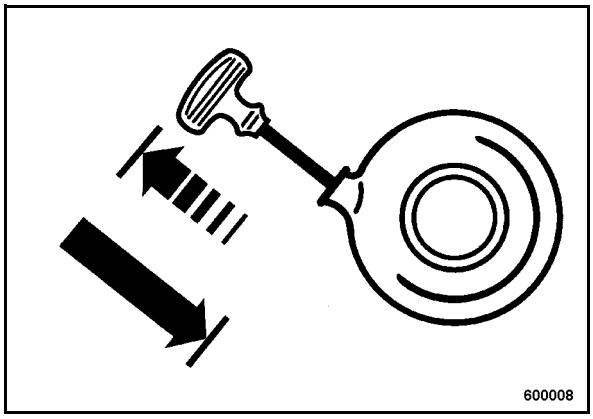

Fig. 13

- Slightly pull the starter handle (Fig. 13), until resistance can be felt (compression pressure), but do not pull out completely.
- Guide the starter rope back by hand.

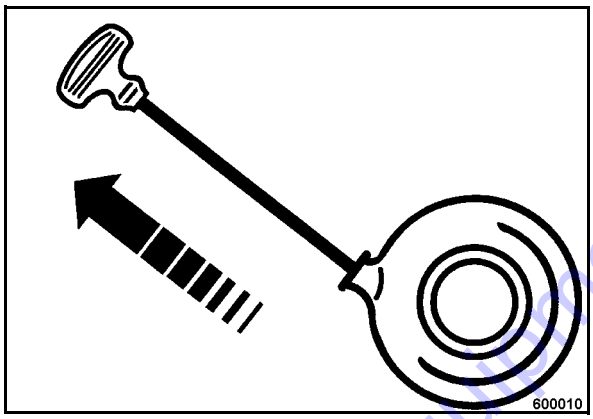

Fig. 14

- Pull the rope by the starter handle quickly and powerful as far out as possible (Fig. 14).

i Note

Do not let the starter handle hit back against the engine.

- If the engine does not start during the first attempt, repeat the starting process.

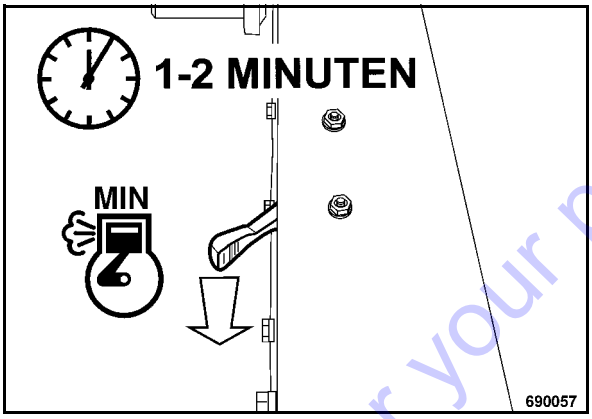

Fig. 15

- Run the engine warm for approx. 1 to 2 minutes in idle speed.

4.5 Start the engine electrically*.

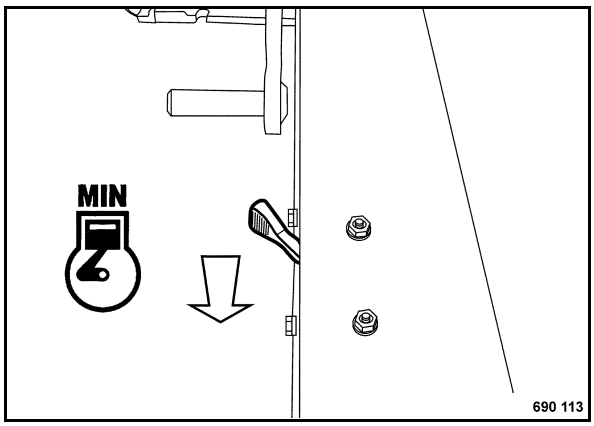

Fig. 16

- Set the throttle lever (Fig. 16) to position "MIN" (idle speed).

⚠ Danger

Danger of injury!

Before starting make sure that there are no persons in the danger area of engine or machine and that all safety installations are in place.

Do not use starting aid sprays or other inflammable fluids for starting.

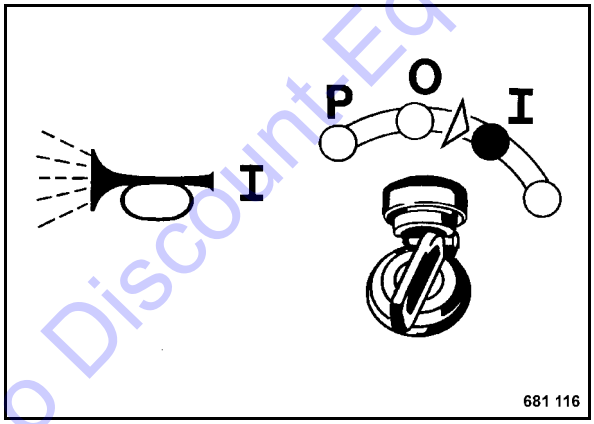

Fig. 17

- Turn the ignition key to position "I" (Fig. 17), the warning buzzer sounds.

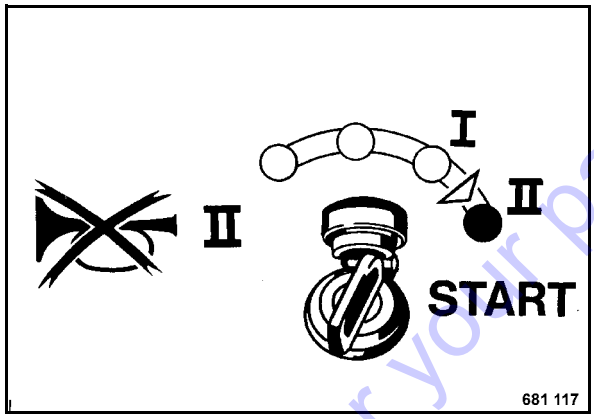

Fig. 18

- Then turn the ignition key further to position "II" (Fig. 18), the engine will start.
- As soon as the engine runs, guide the ignition key back to position I.

The warning buzzer stops.

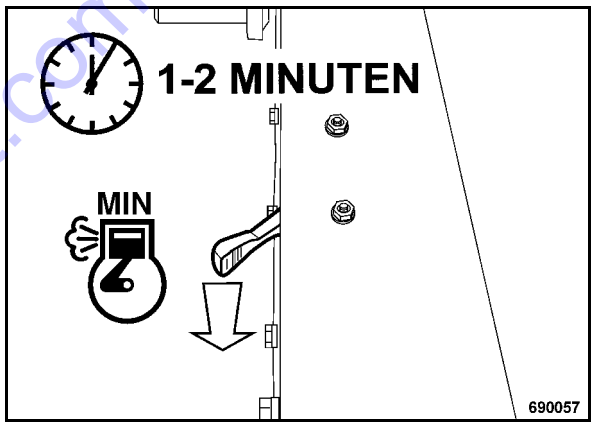

Fig. 19

- Run the engine warm for a short while before starting work (Fig. 19).
- Operation of the vibratory plate can be started once the engine has warmed up for a while.

⚠ Caution

When the engine is running leave the ignition key in position I.

If the starting attempt takes longer than 10 seconds wait at least 15 seconds before trying again.

Excessive running of the starter will discharge the battery.

* Optional equipment

4.6 Starting with jump leads

Note

Use this starting method if the starter battery is empty.

- Remove the cover from the battery.

Caution

Incorrect connection will cause severe damage in the electric system.

The auxiliary battery must have the same voltage as the normal starter battery.

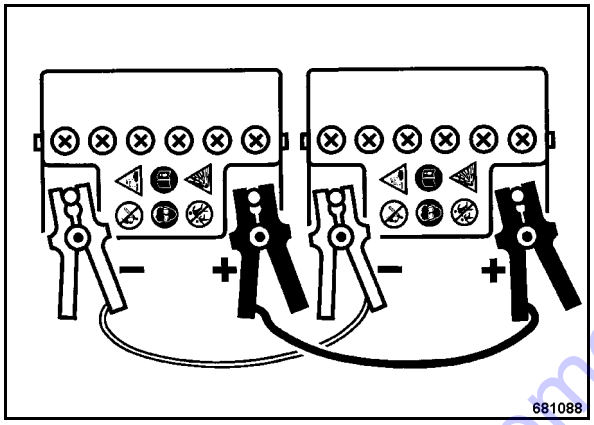

Fig. 20

- Connect the plus poles of auxiliary battery and starter battery with the jump cable (Fig. 20).
- Connect the minus poles of starter battery and auxiliary battery with the second jump cable.
- Perform the starting process as described before.
- When the engine is running disconnect the cable from the minus poles first and then the cable from the plus poles.

Note

This method avoids short circuits caused by contact between plus and minus cables.

- Reassemble the battery cover.

4.7 Work/operation

Note

Operation of the vibratory plate can be started as soon as the engine responds to short throttle commands.

Danger

Danger of accident!

Operate the machine only with the steering rod folded down.

Guide the machine only by the steering rod.

Wear your personal noise protection (ear defenders).

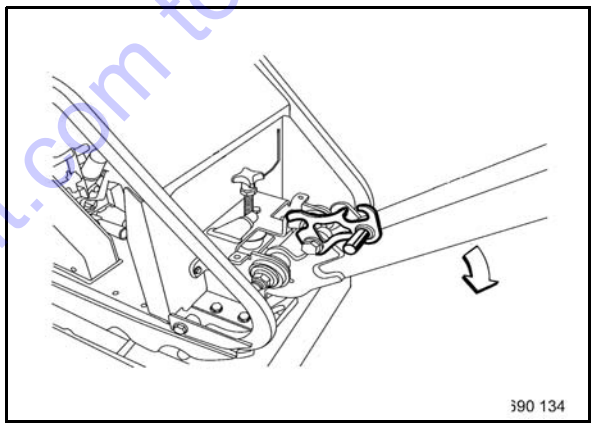

Fig. 21

- Pull the locking lever (Fig. 21) up and fold the steering rod down.

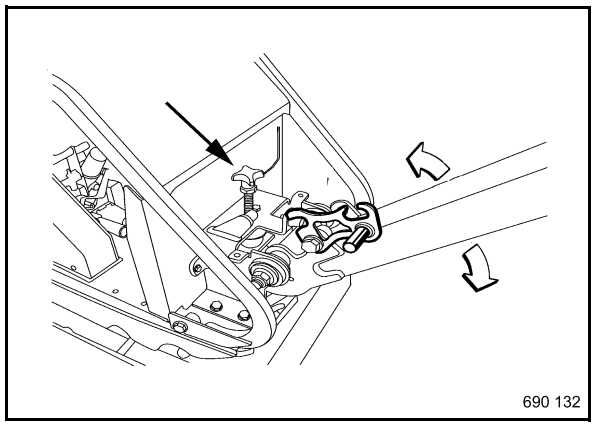

Fig. 22

- Adjust the steering rod with the height adjustment (Fig. 22) to the height of your body.

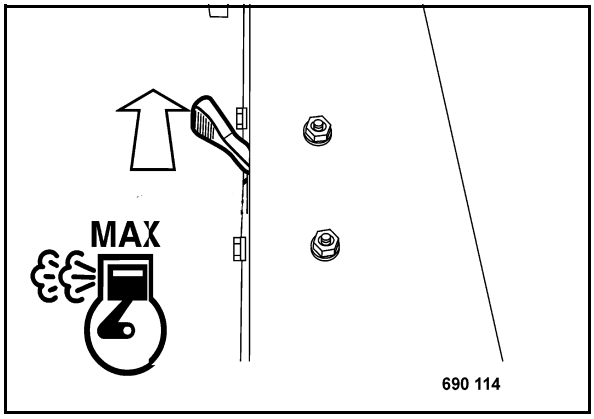

Fig. 23

- Set the throttle lever (Fig. 23) to position "MAX".

⚠ Caution

Operate the vibratory plate only with full engine speed, as otherwise the centrifugal clutch will be destroyed.

i Note

For short breaks you should always return the throttle lever to idle speed position, this avoids premature wear of the centrifugal clutch.

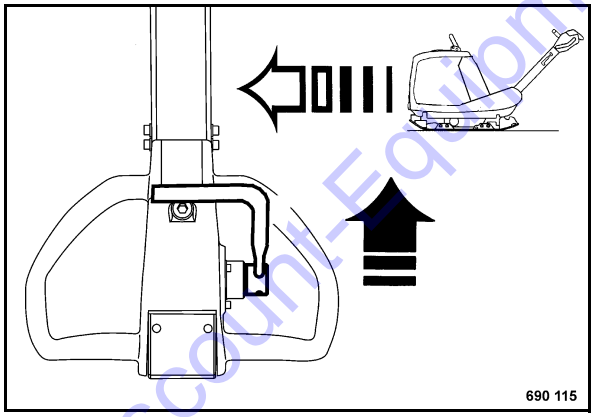

Fig. 24

- Move the travel lever (Fig. 24) forward as required for the desired speed.

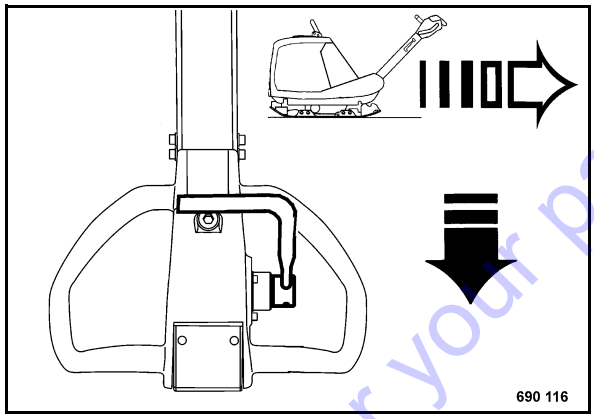

Fig. 25

- Move the travel lever (Fig. 25) backwards as required for the desired speed.

The machine vibrates forward or backwards with a speed, which is in accordance with the chosen travel lever position.

i Note

If the machine moves forward with considerably reduced speed, pull the travel lever completely back and shift it forward again.

If the vibratory plate got stuck

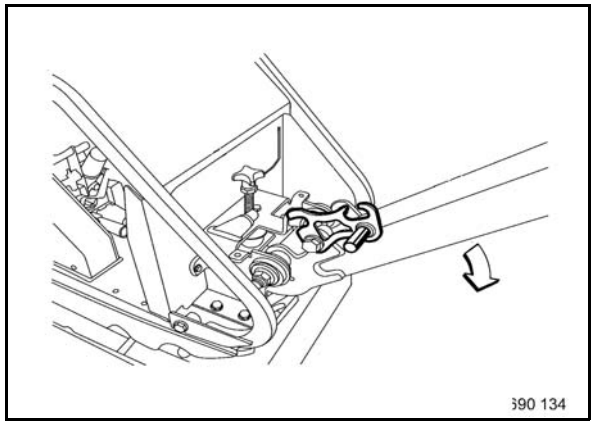

Fig. 26

- Lock the steering rod (Fig. 26) in the first locking position.

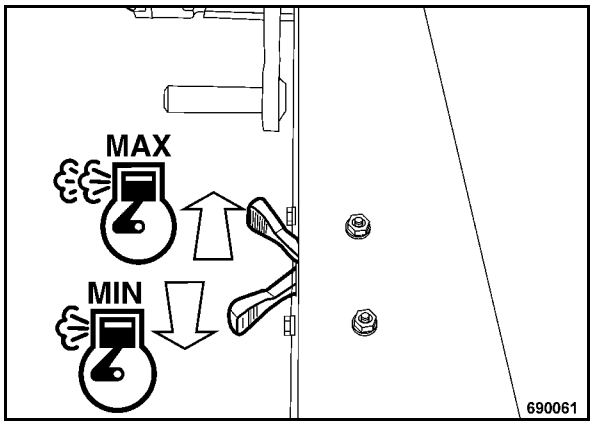

Fig. 27

- Keep moving throttle lever (Fig. 27) between "MIN" and "MAX" throttle position.
- At the same time pull the vibratory plate by the steering rod to the right and left, until it comes free.

⚠ Danger

Danger of accident!

As a measure to avoid injury the machine must only be guided from the side by the steering handle

4.8 Shutting the engine down

⚠ Caution

Do not shut the engine down all of the sudden from full speed, but let it idle for a while for temperature equalization.

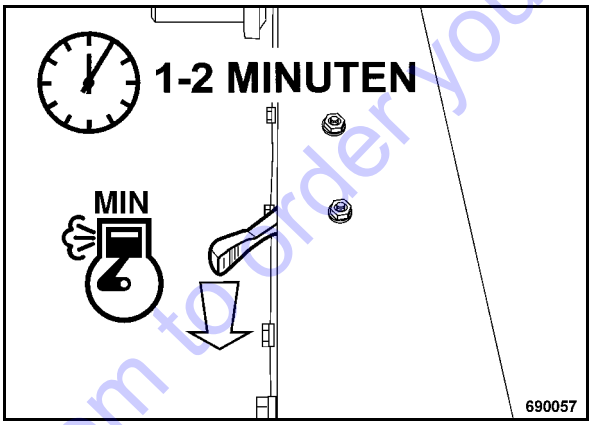

Fig. 28

- Shift the throttle lever to position "MIN" (Fig. 28) and let the engine run with idle speed for a short while.

Vibration is shut down.

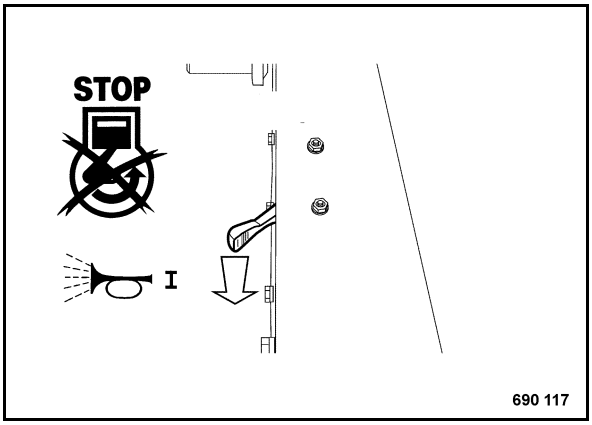

Fig. 29

- Set the throttle lever to position "STOP" (Fig. 29), the warning buzzer sounds.

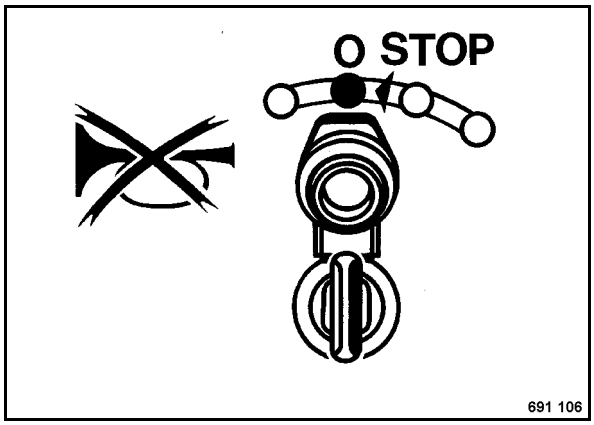

Fig. 30

- Turn the ignition key to position "0" and pull it out. The warning buzzer stops.

4.9 Loading

⚠ Danger

Danger of accident!

Make sure that persons are not endangered by the machine tipping or sliding off.

Tie the machine down, so that it is secured against rolling, sliding and turning over.

For lifting the machine attach the lifting gear only to the lifting hook.

The machine must not swing about when being lifted.

Use only safe lifting gear of sufficient load bearing capacity

Do not stand or step under loads being lifted.

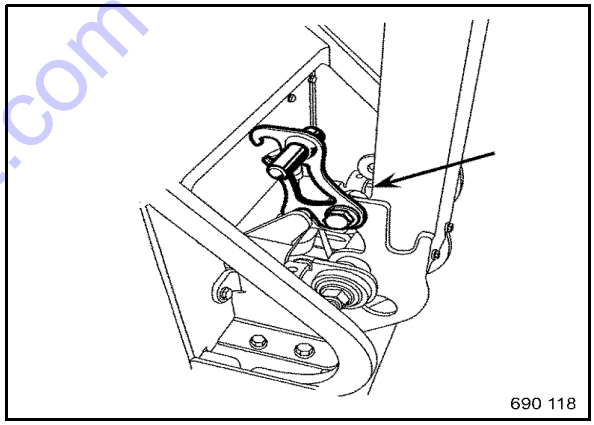

Fig. 31

- Adjust the steering rod (Fig. 31) in upright position and lock it in the last locking position.

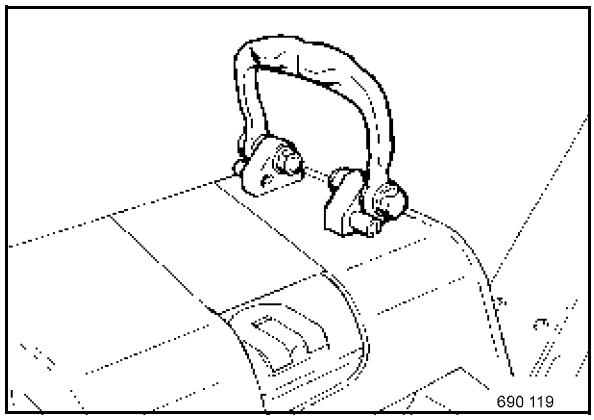

Fig. 32

- Fold the lifting hook (Fig. 32) up.

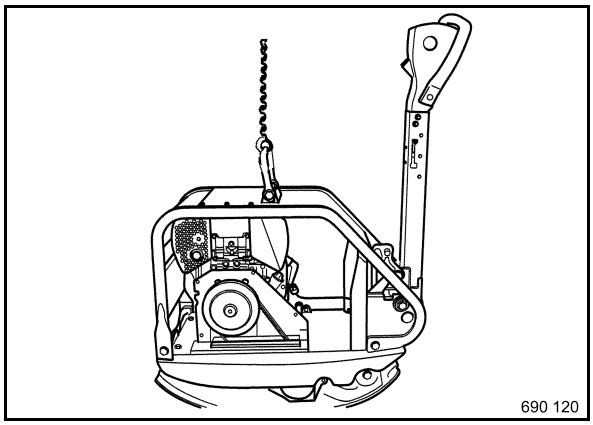

Fig. 33

- Always attach the lifting gear (rope) to the lifting eye to load the vibratory plate on a transport vehicle (Fig. 33).

⚠ Danger

Danger of accident!

Tie the machine down on the transport vehicle, so that it is secured against slipping, sliding and turning over!

5 Maintenance

5.1 General notes on maintenance

When performing maintenance work observe the applicable safety regulations and especially safety regulations in chapter 2 of these operating, maintenance and repair instructions.

Thorough maintenance of the machine ensures maximum reliability and prolongs the lifetime of important components. The effort necessary for this purpose is only of minor significance when being compared with the problems, which may arise, if these instructions are not observed.

- Clean machine and engine thoroughly before starting maintenance work.
- For maintenance work park the machine on level ground.
- Maintenance work must generally be carried out with the engine shut down.

Environment

During maintenance work catch all oils and fuels and do not let them seep into the ground. Dispose of oils and fuel environmentally.

Notes on the fuel system

The lifetime of the diesel engine is decisively depending on the cleanliness of the fuel.

- Keep the engine free of dirt and water as this could damage the injection elements of the engine.
- Zinc lined drums are not suitable for storing fuel.
- The fuel drum should rest for a longer period of time before drawing off fuel.
- Under no circumstances must the drum be rolled to the tapping pint just before drawing off fuel.
- When choosing the storage place for fuel, make sure that spilled fuel will not cause any damage.
- Do not let the suction hose disturb the sludge on the bottom of the drum.
- Do not draw off fuel from near the bottom of the fuel drum.
- Fuel left in the fuel drum is not suitable for the engine and should only be used for cleaning purposes.

Notes on the engine performance

Combustion air and fuel injection rates of the diesel engine have been carefully adjusted and determine the engine's performance and temperature level as well as the quality of the exhaust gas.

If your machine has to operate permanently in "thin air" (at high altitudes) and with full power, you should consult the after sales service of BOMAG or the service department of the engine manufacturer.

5.2 Fuels and lubricants

Engine oil

Use winter engine oil for winter operation!

To ensure perfect cold starting it is important to choose the viscosity (SAE grade) of the engine oil with respect to the ambient temperature.

During winter operation below -10°C the oil change intervals must be shortened.

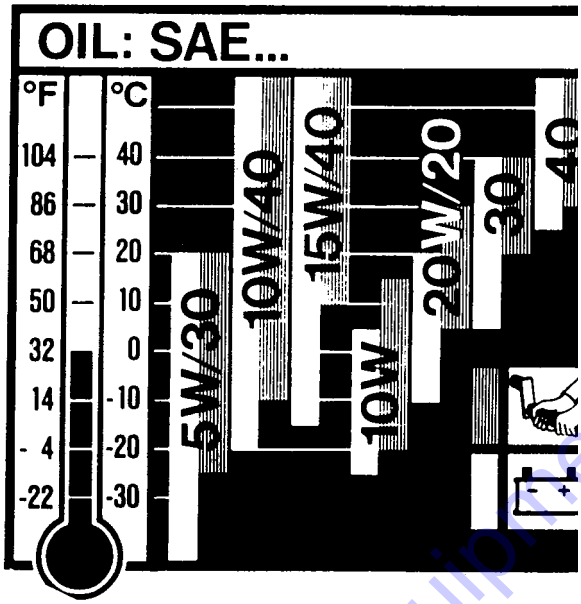

Fig. 34

Lubrication oil with a too high viscosity index will cause starting difficulties. The temperature when starting the engine is therefore decisive for selecting the correct viscosity for winter operation.

Oil viscosity

Since the viscosity of the lubrication oil changes with the temperature, the ambient temperature at the engine's operating location determines the viscosity class (SAE-grade) to be chosen (see diagram).

Although cold stating abilities may be impaired if the temperature occasionally drops below the limit (e.g. use of SAE 15W/40 down to -15°C), this will not cause any damage to the engine.

Temperature related lubrication oil changes can be avoided by using multi-purpose engine oils.

The following oil change intervals apply also for multi-purpose oils.

Regular lubrication oil changes

The longest permissible time for an oil filling in the engine is 1 year.

Oil quality

You should preferably use oils of API-quality class CD-CE-CF-CG, or CCMC-D4/D5/PD2 (SHPD). When using oils of lower quality standard the oil change intervals must be reduced.

Oil change intervals

Oil change intervals for oil quality

API: CD-CE-CF-CG = 6 months

CCMC-D4/D5/PD2 (SHPD) = 6 months

⚠ Caution

These intervals apply when using a diesel fuel with a sulphur content of max. 0.5 % by weight and an ambient temperature higher than -10°C (14°F).

- When using fuel with a sulphur content of more than 0,5% to 1% or at ambient temperatures below -10°C (14°F) the oil change intervals in the table must be halved. For fuels with a sulphur content higher than 1% to 1,5% the engine oil must have a TBN of approx. 12 x %S-content when the oil change intervals are halved.

Lubrication oil quality classes

The API-classification is used to classify the oil quality. The lubrication oil manufacturer is responsible for the correct classification of the product.

i Note

When changing to a higher alloyed oil quality after a longer operating period, we recommend the first oil change of this higher quality oil to be performed after approx. 25 operating hours.

Fuels

Quality

You should only use commercial brand diesel fuels with a sulphur content below 0,5% and ensure strict cleanliness when filling in fuel. A higher sulphur content has an effect on the oil change intervals. Use only winter diesel fuel for lower ambient temperatures. Top up fuel in time so that the fuel tank does not run dry.

The following fuel specifications are permitted:

EN 590 DIN 51601; Nato Codes F-54, F-75, F-76;

BS 2869: A1 and A2; ASTM D 975-78:

1-D and 2-D; VV-F-800 a: DF-A, DF-1 and DF-2.

Winter fuel

For winter operation use only winter diesel fuel, to avoid clogging of the fuel system due to paraffin separation. Under extremely low temperatures paraffin separation can also be expected with winter diesel fuel. .

5.3 Table of fuels and lubricants

Assembly	Fuel or lubricant		Quantity approx. Attention Observe the level marks
	Summer	Winter	
Engine	Engine oil API: CD-CE-CF-CG		approx. 0.9 l (BPR 35/42 D) approx. 0.9 l (BPR 35/60 D)
	SAE 10W/40 (-20°C to +30°C) (-4°F to +86°F) SAE 15W/40 (-10°C to +40°C) (+14°F to +104°F)		
	SAE 30 (+5°C to +30°C) (+41°F to +86°F)	SAE 10W (-5°C to -30°C) (+23°F to -22°F)	
	SAE 40 (+25°C to +40°C) (+77°F to +104°F)	SAE 20W/20 (+10°C to -10°C) (+50°F to +14°F)	
- Fuel	Diesel	Winter diesel fuel (-12°C) (+10.4°F)	3 l (BPR 35/42 D) 3 l (BPR 35/60 D)
Vibrator shaft housing	as engine oil		0,4 l
Steering rod	Hydraulic oil HV 32		approx. 0,4 l

5.4 Running-in instructions

For the start-up or new machines of overhauled engines the following maintenance work must be performed:

⚠ Caution

During the running-in period up to approx. 200 operating hours check the engine oil level two times every day.

Depending on the engine load the oil consumption will drop to its normal level after a running time of approx. 100 to 200 operating hours.

After 25 operating hours

- Change the engine oil.
- Check engine and machine for leaks.
- Check the valve clearance, adjust if necessary.
- Retighten the fastening screws for air filter, exhaust silencer, fuel tank and other attachments.
- Tighten the screw connections on the machine.
- Check the vibration drive V-belt, retighten it if necessary.

5.5 Maintenance chart

With all maintenance intervals perform also the work for preceeding shorter intervals.

Pos.	Description	Note
Maintenance every day		
5.6 5.7 5.8	Clean machine/engine Check the fuel level Check the engine oil level	
Maintenance every month		
5.9 5.10	Check the condition of the battery, grease the poles Clean the dry air filter	
Maintenance every 6 months		
5.11 5.12 5.13 5.14 5.15 5.16 5.17 5.18	Check the oil level in the vibrator housing Change the engine oil Clean the engine oil filter V-belt tension Check, adjust the valve clearance Clean cooling fins and cooling air intake opening Clean the exhaust screen Change the dry air filter	
Dim. mm (inch)		
5.19 5.20 5.21 5.22	Change the fuel filter Change the oil in the vibrator housing Check the rubber buffers Draw the water out of the fuel tank	
As required		
5.23	Retighten the bolted connections Check the machine visually	

5.6 Clean machine/engine

i Note

Dirty operating conditions, particularly lubrication oil and fuel deposits on the cooling fins of the engine and the cooling air intake opening have an adverse effect on the cooling of the engine. You should therefore immediately seal any oil or fuel leaks near fuel tank, cylinder or cooling air intake and subsequently clean the cooling fins.

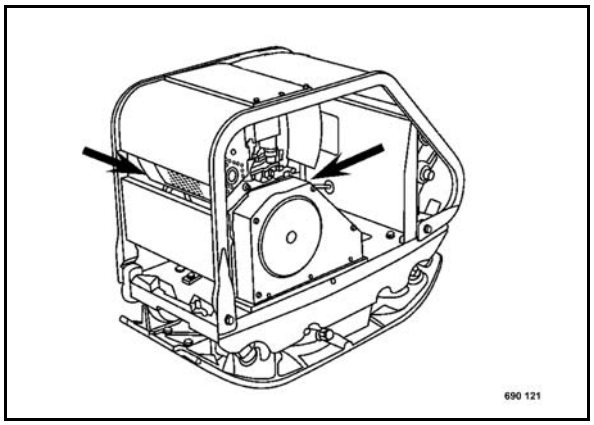

Fig. 35

- Do not guide the water jet directly into the cooling air openings of the recoil starter, into the dry air filter and on electrical equipment (Fig. 35).
- After wet cleaning run the engine warm to evaporate all water residues and to avoid corrosion.

5.7 Checking the fuel level

⚠ Danger

When working on the fuel system do not use open fire, do not smoke, fire hazard!

Do not refuel in closed rooms.

Refuel only with the engine shut down.

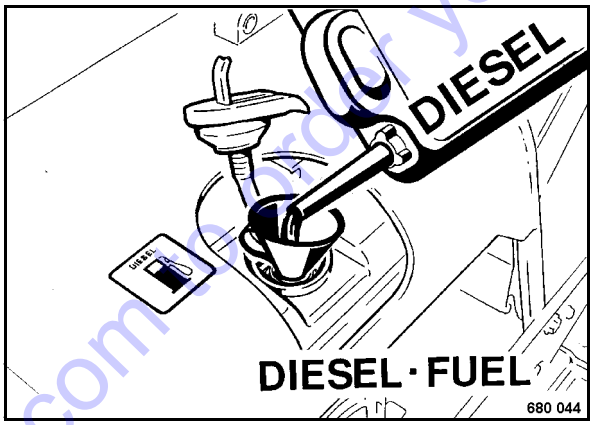

Fig. 36

- Clean the area around the fuel filler cap, remove the filler cap (Fig. 36).

⚠ Caution

Dirty fuel can cause malfunction or even damage of the engine.

- Fill in fuel through a funnel with screen.
- Close the tank tightly.

For quality of fuel refer to the table of fuels and lubricants.

5.8 Checking the engine oil level

- Place the machine on level ground, so that the engine is in horizontal position.

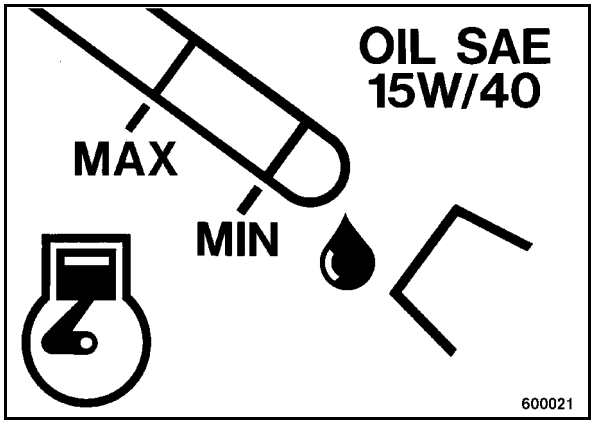

Fig. 37

- Shut the engine down.
- Pull the oil dipstick (Fig. 37) out, clean it with a clean cloth and reinsert it until it bottoms.
- Pull the dipstick back out and read the oil level.

Nominal value:

The oil level should reach the top mark. If the oil level is too low top up oil immediately.

For quality and quantity of oil refer to the table of fuels and lubricants.

- Check the seal on the dipstick, if necessary use a new one.
- Push the dipstick in until it bottoms.

5.9 Checking the condition of the battery*, greasing the poles

⚠ Danger

Danger of injury!

When working on the battery do not smoke, do not use open fire.

Do not let skin and clothes come in contact with acid.

Wear protective goggles.

Do not place any tools on the battery.

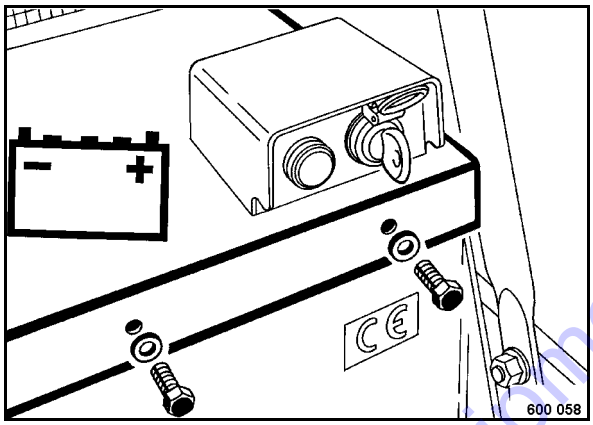

Fig. 38

- Unscrew the fastening screws (Fig. 38) for the cover plate and fold the cover up.
- Take the vibration insulation mats off.

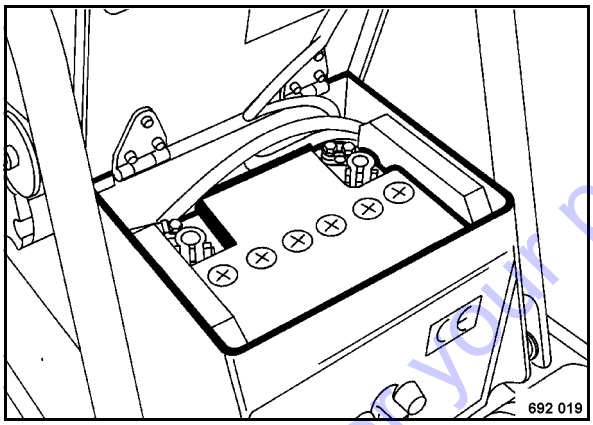

Fig. 39

- Take the battery (Fig. 39) out and clean the battery compartment.
- Clean the outside of the battery.
- Clean the battery poles and pole clamps and cover them with acid free grease (vaseline).
- Check the fastening of the battery.
- Check the condition of the vibration insulation mats, replace if necessary.
- After servicing the battery close the cover again.

Non-maintenance free batteries

⚠ Caution

Top up missing fluid with distilled water.

- Open the plugs and check the acid level, if necessary top up with distilled water.

With control inserts:

The acid level must reach the bottom of the control inserts.

Without control inserts:

Acid level 10 to 15 mm above the upper edge of the lead plate, measure with a clean wooden stick.

With transparent battery housing:

Acid level up to the mark on the housing.

Maintenance free batteries

Perform only the following points:

- Check the battery for cleanliness.

* Option

- Clean the poles.
- Tighten the terminal clamps.

⚠ Caution

Dispose of old batteries environmentally.

⚠ Danger

Development of gas!

If possible remove the plugs when recharging the battery, to avoid an accumulation of highly explosive gases.

5.10 Check the air filter, replace if necessary.

⚠ Caution

Do not use gasoline or hot fluids to clean the filter cartridge.

Dry air filter cartridges with damaged filter element or seal ring must be replaced in any case. It is therefore recommended to keep at least one filter element in stock.

Replace the air filter cartridge after five times cleaning, but at the latest after half a year.

Each cleaning interval must be marked with a cross on the filter element.

Cleaning does not make sense if the filter element is covered with a sooty deposit. Use a new filter cartridge.

Incorrectly handled filter cartridges may be ineffective because of damage (e.g. cracks) and cause damage to the engine.

In case of wet or oily dirt replace the filter element.

Do not run the engine without air filter.

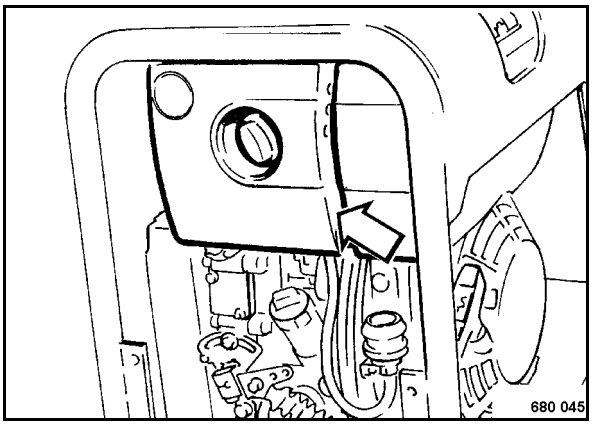

Fig. 40

- Remove the air filter cover (Fig. 40).

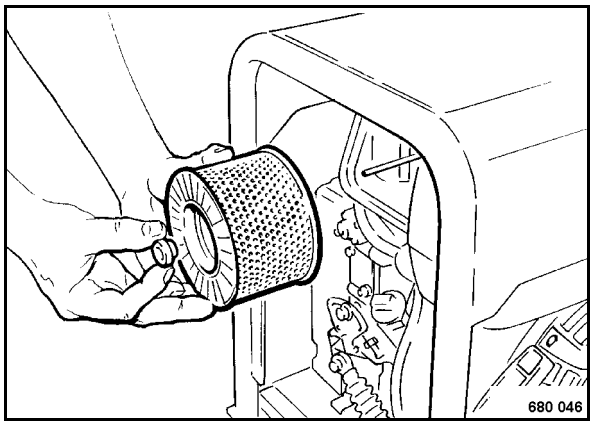

Fig. 41

- Unscrew the knurled nut and take the air filter cartridge off (Fig. 41).

⚠ Caution

The clean air side must be kept clean of dirt and foreign particles.

Do not blow the inside of the filter housing out with compressed air.

- Wipe the inside of the filter housing only with a clean cloth.
- Clean the cover thoroughly.

⚠ Danger

Eye injury!

Wear safety goggles.

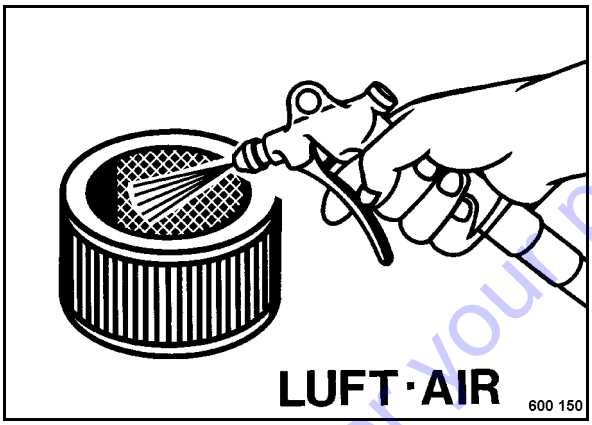

Fig. 42

- Blow the filter cartridge (Fig. 42) out from inside to outside with dry compressed air (max. 5 bar).
- Check the filter cartridge for damage, replace if necessary.

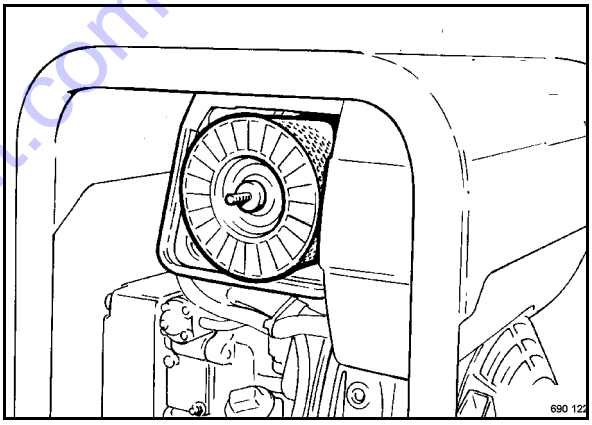

Fig. 43

- Insert the filter cartridge (Fig. 43) into the housing and fasten it with the knurled nut.
- Assemble the filter cover, ensure correct fit of cover and seal.

5.11 Checking the oil level in the vibrator housing

i Note

Stand the machine on level ground.

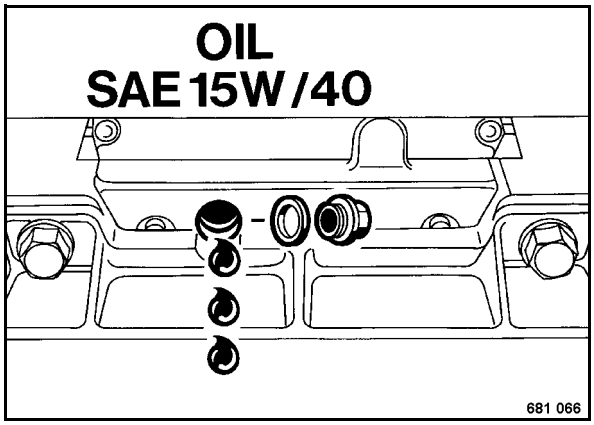

Fig. 44

- Unscrew the level plug (Fig. 44) and check the oil level.

The oil level must reach the bottom edge of the level bore, top up oil if necessary.

For quality and quantity of oil refer to the table of fuels and lubricants.

- Screw the level plug back in with a new seal ring.

5.12 Changing the engine oil

⚠ Caution

Park the machine on level ground.

Drain the engine oil only when the engine is warm.

Environment

Catch running out old oil, do not let it seep into the ground and dispose off environmentally.

⚠ Danger

Danger of scalding when draining off hot engine oil.

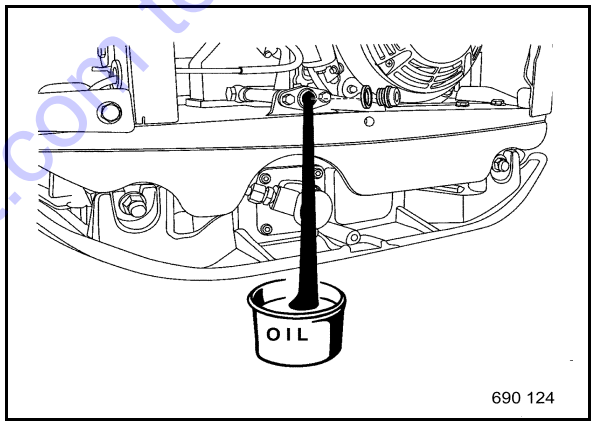

Fig. 45

- Unscrew the oil drain plug and catch running out old oil (Fig. 45).
- Clean the oil drain plug and screw it back in with a new seal ring.

⚠ Caution

Clean the engine oil filter before filling in new oil, see next section.

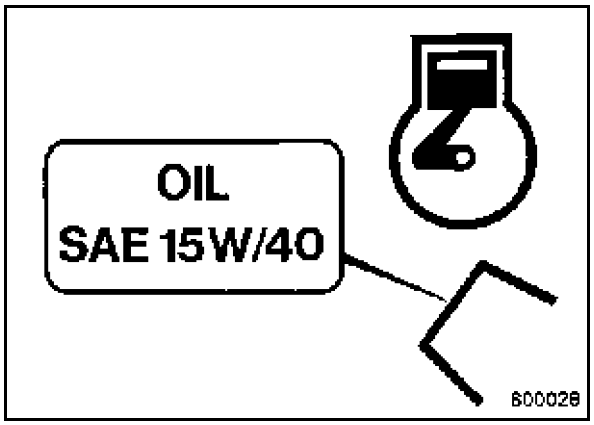

Fig. 46

- Fill in new engine oil (Fig. 46).

For quality and quantity of oil refer to the table of fuels and lubricants.

- Push the dipstick in again.
- Perform a test run, inspect drain plug and oil filter for leaks.

5.13 Clean the engine oil filter

⚠ Caution

Remove and clean the engine oil filter only after draining off the engine oil.

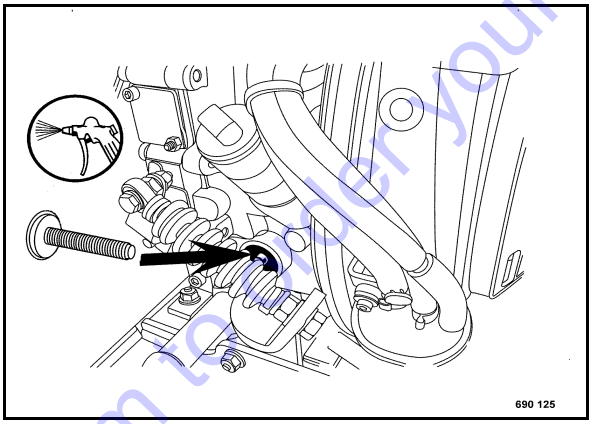

Fig. 47

- Loosen the fastening screw and pull the engine oil filter out of the housing (Fig. 47).
- Blow the engine oil filter out with compressed air from inside to outside.
- Cover the seal slightly with oil.
- Push the engine oil filter into the housing and tighten the fastening screw.
- After filling in engine oil perform a short test run and check for leaks, if necessary tighten the fastening screw.

5.14 Check, tighten, replace the V-belt

Check the V-belt

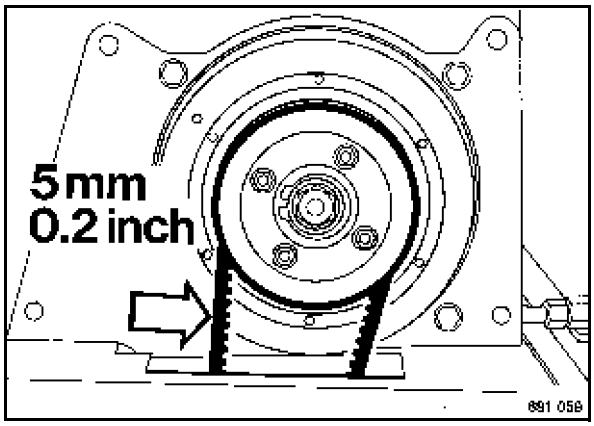

Fig. 48

- Remove the V-belt guard.
- Check the condition and tension of the V-belt (Fig. 48), replace the V-belt if damaged.

Compression measurement, see picture.

Tightening the V-belt.

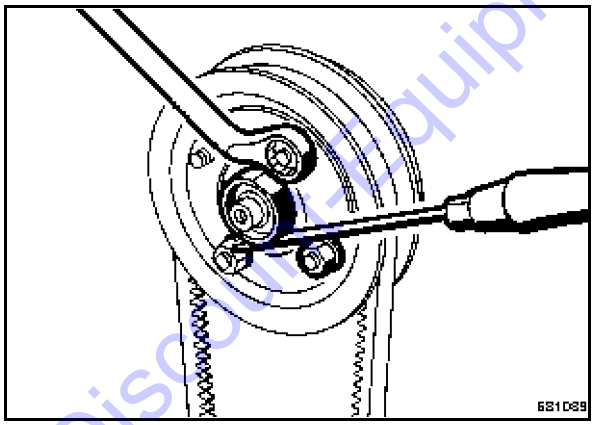

Fig. 49

- Block the V-belt pulley with a screwdriver (Fig. 49).
- Unscrew the nuts and remove the washers.

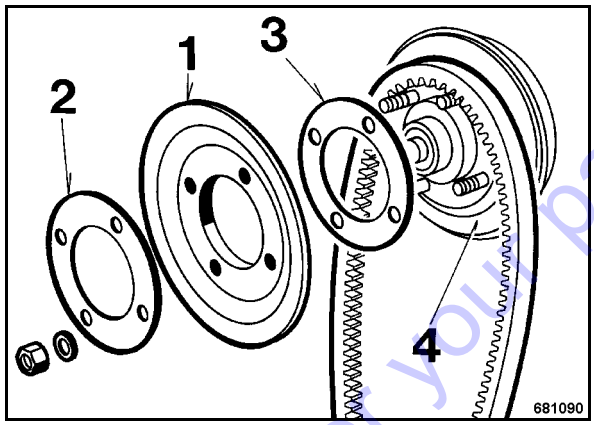

Fig. 50

- Take off the front V-belt pulley half (1) (Fig. 50) with the shims (2) positioned in front.
- Take one or two shims (3) from in front of the rear V-belt pulley half (4) as required to tension the V-belt.
- Lay the V-belt over the threaded bolts.
- Attach the front V-belt pulley half with the removed shims.
- Assemble the washers, turn on and tighten the nuts.

⚠ Caution

Do not squash the V-belt, keep turning the drive while tightening the nuts.

- Check the V-belt tension, if necessary correct by removing or adding shims.
- Assemble the V-belt guard.

⚠ Caution

Check the V-belt tension again after a running time of approx. 25 operating hours, retighten if necessary.

Changing the V-belt

⚠ Caution

Take care of differences in V-belt length, see spare parts catalogue.

- Take the V-belt off the upper V-belt pulley (see tensioning the V-belt).

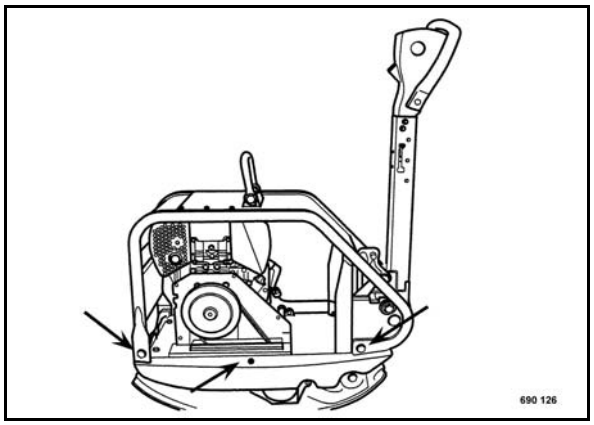

Fig. 51

- Loosen the rear nuts (Fig. 51) on both sides for a few turns.
- Unscrew the front nuts on both sides.

⚠ Danger

Danger of squashing!

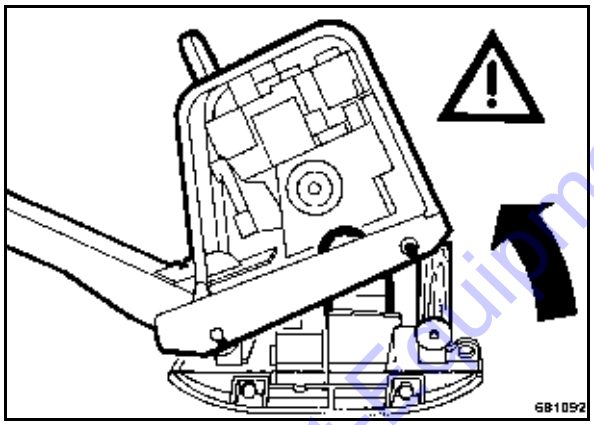

Fig. 52

- Raise the engine carrier plate at the front and support it (Fig. 52).

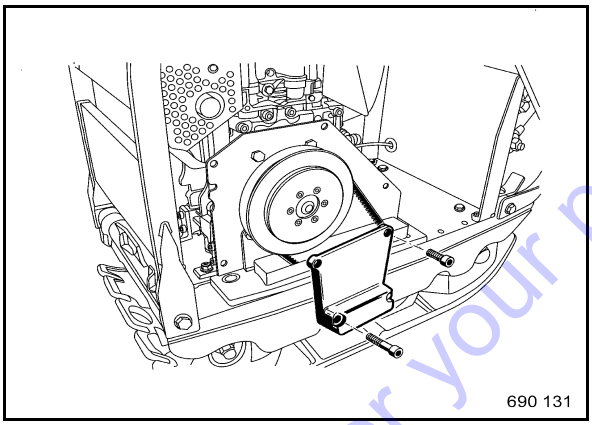

Fig. 53

- Unscrew the screws (Fig. 53) and take off the cover.
- Install a new V-belt, assemble the cover, fasten the engine carrier plate and tension the V-belt as described above.
- Assemble the V-belt guard.

⚠ Caution

Check the V-belt tension again after a running time of approx. 25 operating hours, retighten if necessary.

5.15 Check, adjust the valve clearance

⚠ Caution

The engines are equipped with an automatic valve clearance adjustment, the valve clearance does therefore not need to be checked and adjusted.

5.16 Cleaning cooling fins and cooling air intake opening

i Note

Dirty operating conditions, especially lubrication oil and fuel deposits on the cooling fins of the cylinder and in the cooling air intake reduce the cooling power. You should therefore immediately seal any leaks in the area of the fuel tank, the cylinder or the cooling air intake and clean the cooling fins after.

Dry dirt

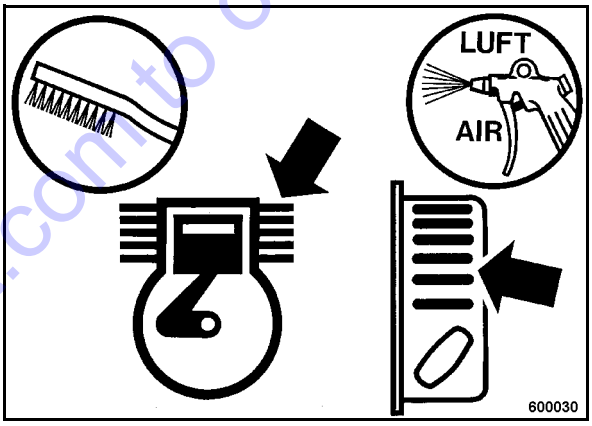

Fig. 54

- Dry clean the entire cooling air area like cylinder head, cylinder flywheel blower and blow it out with compressed air (Fig. 54).

Wet or oily dirt

⚠ Danger

Fire hazard!

Do not use any inflammable solvents.

⚠ Caution

Do not spray directly on electric assemblies and plug connectors or dry them with compressed air immediately after.

Find the cause of oily dirt and have leaks sealed by the after sales service of BOMAG.

Do not hold the water jet directly into the air filter, the exhaust and the electric system (if present).

- Disconnect the battery*.
- Spray the entire cooling air area with cleaning solution (e.g. cold cleansing agent), let it soak in for a while and clean off with a sharp water jet.
- Run the engine warm for a short while to avoid corrosion.

5.17 Cleaning the exhaust screen

⚠ Danger

Danger of burning!

The exhaust is very hot during and after operation. Perform this work only after cooling down.

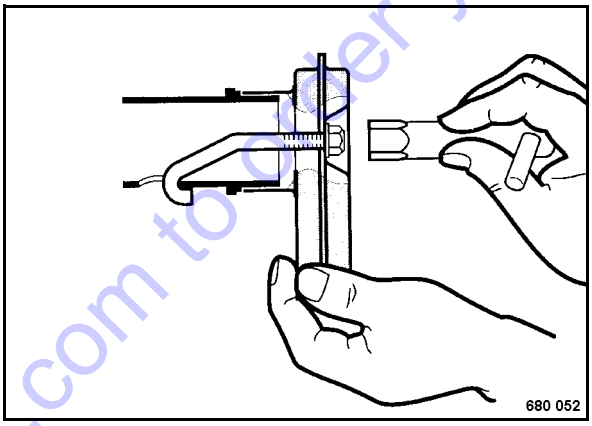

Fig. 55

- Unscrew the fastening nut (Fig. 55), remove the exhaust screen and the fastening bracket.

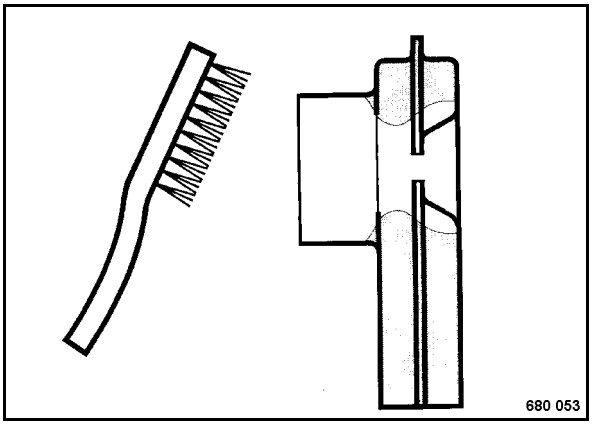

Fig. 56

- Clean deposits on the screen insert with a suitable wire brush (Fig. 56).
- Examine the exhaust screen for cracks or fractures, replace if necessary.

* Option

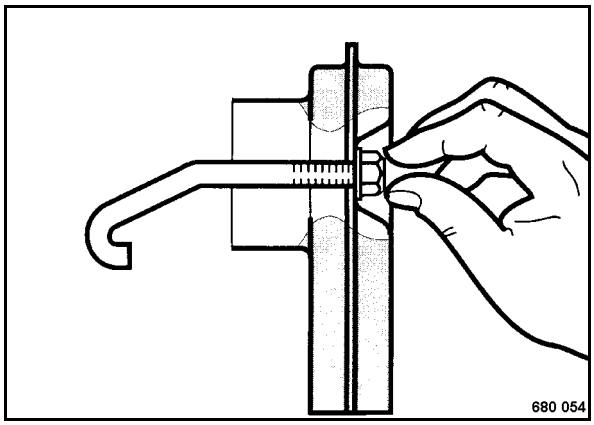

Fig. 57

- Insert the fastening bracket into the opening in the exhaust screen and screw the fastening nut for approx. 1 turn (Fig. 57).

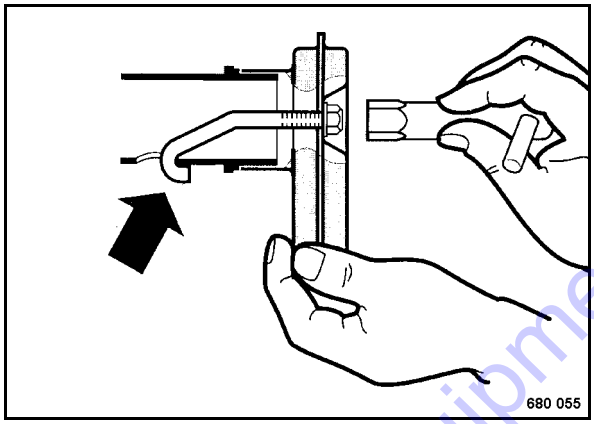

Fig. 58

- Slide the exhaust screen on with the fastening bracket (Fig. 58).
- Hook the fastening bracket into the bore and tighten the fastening nut.

5.18 Changing the dry air filter

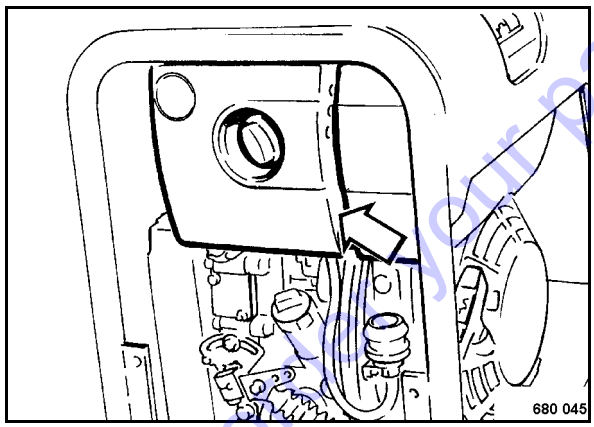

Fig. 59

- Remove the air filter cover (Fig. 59).

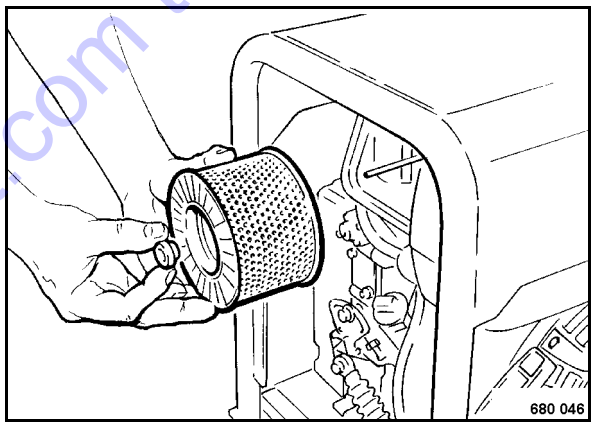

Fig. 60

- Unscrew the knurled nut and take the air filter cartridge out (Fig. 60).

⚠ Caution

No dirt or foreign particles must enter the clean air side.

Do not blow the filter housing out with compressed air.

- Clean the inside of the filter housing only with a clean cloth.
- Clean the cover thoroughly.

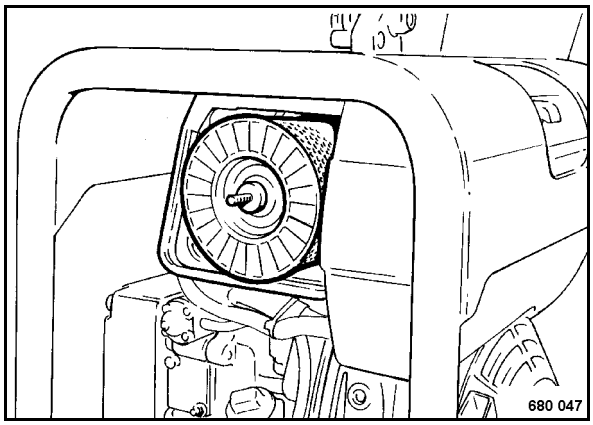

Fig. 61

- Insert the filter cartridge (Fig. 61) into the housing and fasten it with the knurled nut.
- Assemble the filter cover, ensure correct fit of cover and seal ring.

5.19 Changing the fuel filter

⚠ Danger

When working on the fuel system do not use open fire, do not smoke, fire hazard! Do not spill any fuel, do not inhale any fuel fumes.

⚠ Caution

The change interval of the fuel filter depends on the cleanliness of the fuel. If necessary the maintenance must be performed every six months.

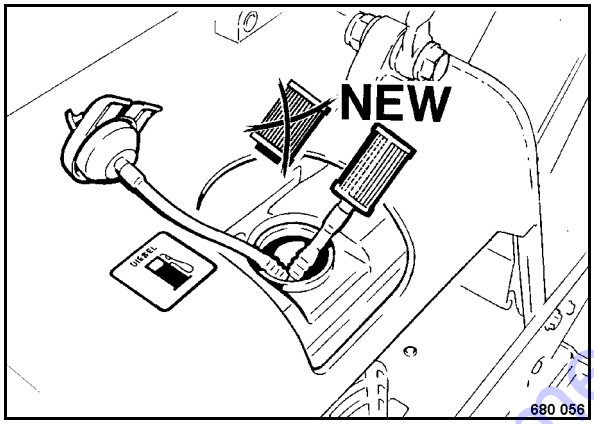

Fig. 62

- Open the quick lock on the tank (Fig. 62).
- Pull the fuel filter by the hose out of the tank.
- Pull the fuel hose off the fuel filter and push it onto the new fuel filter.

Environment

Dispose of the used filter environmentally.

- Insert the fuel filter into the tank and attach the quick lock.

i Note

The fuel system is automatically bled.

5.20 Change the oil in the exciter shaft housing

Environment

Environmental damage!

Catch running out old oil, do not let it seep into the ground and dispose off environmentally.

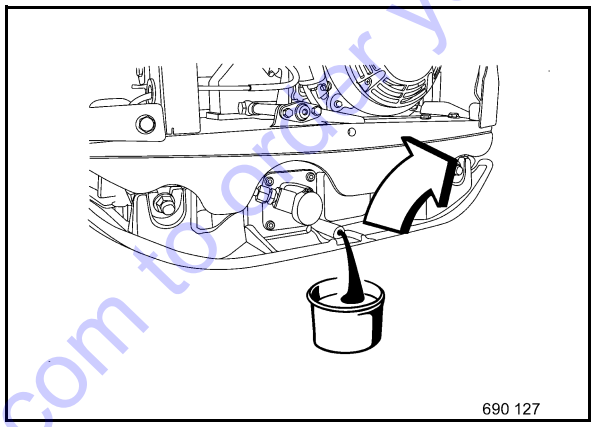

Fig. 63

- Unscrew plug (Fig. 63), catch old oil.
- Turn the screw back in with a new seal ring.
- Stand the machine on a level base.

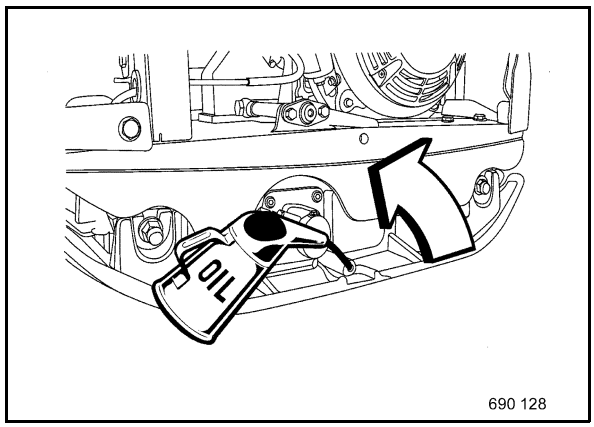

Fig. 64

- Unscrew plug (Fig. 64) and fill in engine oil.

For quality and quantity of oil refer to the table of fuels and lubricants.

i Note

The oil level must reach the bottom edge of the bore .

- Turn the screw back in with a new seal ring.

5.21 Checking the hydraulic oil level and topping up

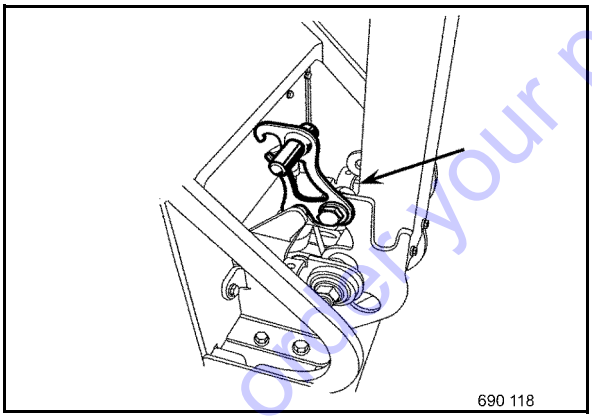

Fig. 65

- Adjust the steering rod (Fig. 65) in upright position and lock it in the last locking position of the detent rail.

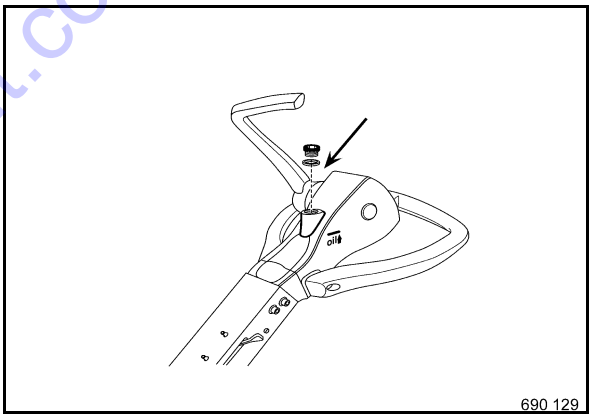

Fig. 66

- Unscrew the plug (Fig. 66).
- Move the travel lever to reverse position and hold it.

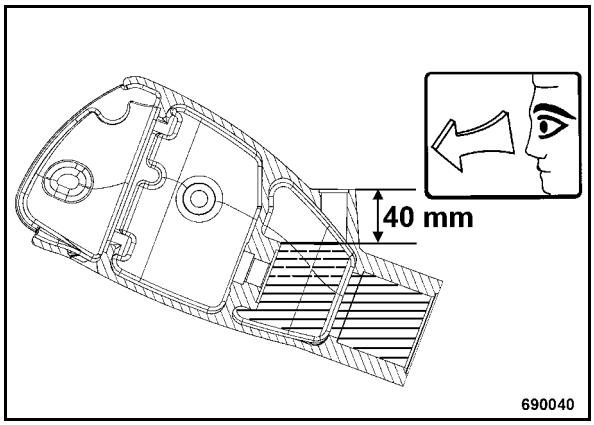

Fig. 67

- Check whether the hydraulic oil level is approx. 40 mm below the filler opening (Fig. 67), top up if necessary.

For quality of oil refer to the table of fuels and lubricants.

Filling up hydraulic oil

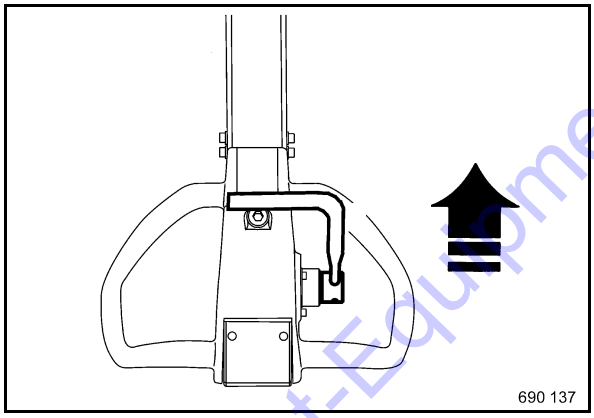

Fig. 68

Note

Lay a cloth down before slackening the venting screw.

- Shift the travel lever forward against the stop.

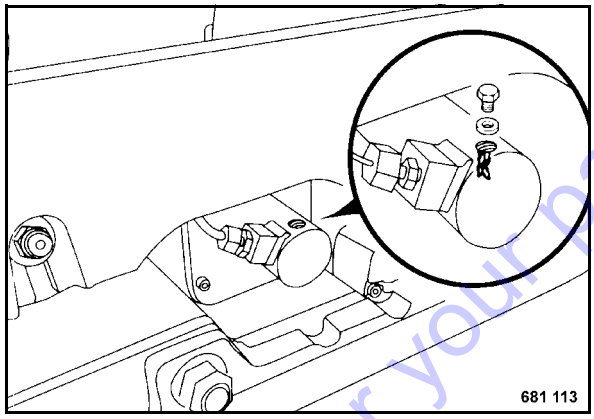

Fig. 69

- Slacken the bleeding screw.
- Wait until all air has escaped (Fig. 69).
- Tighten the bleeding screw.

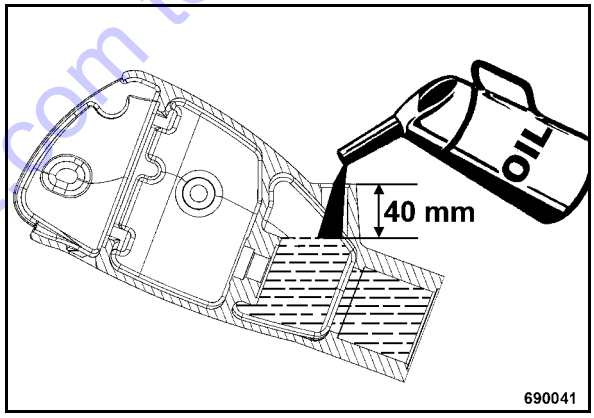

Fig. 70

- Fill in hydraulic oil to approx. 40 mm below the edge of the filler opening (Fig. 70).

Note

After bleeding check the hydraulic oil level, top up if necessary.

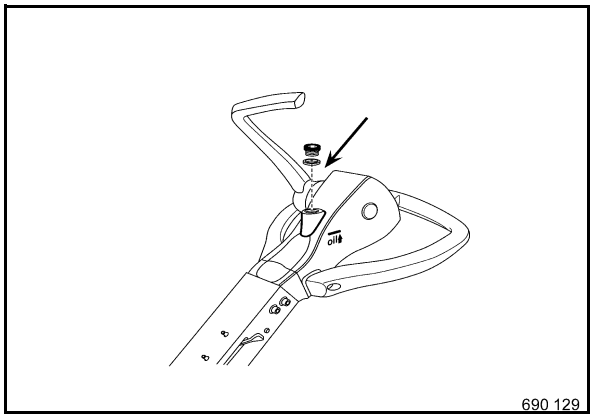

Fig. 71

- Tighten the plug (Fig. 71).

⚠ Caution

Tighten the plug with the specified tightening torque.

5.22 Checking the rubber buffers

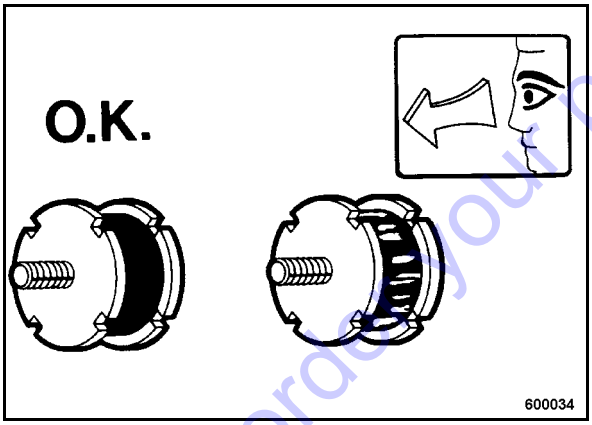

Fig. 72

- Check all rubber buffers (Fig. 72) for cracks and broken out bits and replace if damaged.
- Check the rubber buffers for tight fit.

5.23 Drawing the water out of the fuel tank

⚠ Danger

When working on the fuel system do not use open fire, do not smoke, fire hazard! Do not spill any fuel. Fire hazard!

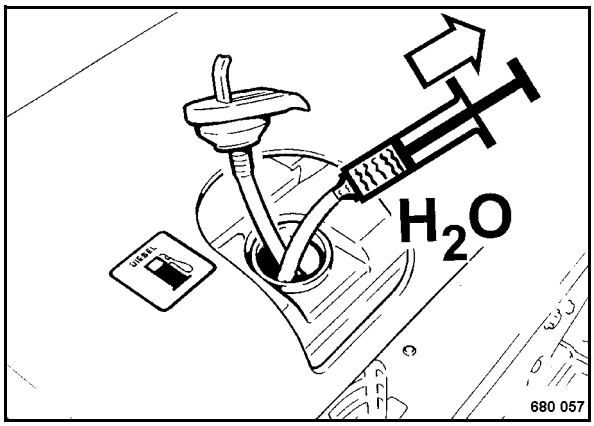

Fig. 73

- Open the quick lock on the tank (Fig. 73).
- Fit an approx. 350 mm long PE-hose to a conventional injection syringe (>20 ml).
- Insert the hose down to the bottom of the tank and draw off the water/fuel mixture.
- Repeat this procedure until only fuel is visible.

Environment

Catch the fuel/water mixture and dispose of environmentally.

5.24 Retightening the bolted connections

- Check all bolted connections for tight fit, retighten if necessary.
- Check the machine for damage and leaks, have repaired if necessary.

5.25 Tightening the screws

i Note

Self locking nuts must always be replaced by new ones after they have been unscrewed.

Bolt dimensions	Tightening torques* ft - lb		
	8.8	10.9	12.9
M4	2	3	4
M5	4	7	7
M6	7	11	13
M8	18	26	33
M10	37	55	61
M12	65	91	108
M14	101	145	173
M16	156	221	264
M18	213	303	361
M20	304	426	513
M22	413	559	695
M24	524	738	885
M27	774	1092	1308
M30	1047	1482	1770

Fig. 74

*Strength classes for screws with untreated, non-lubricated surfaces. The quality designations are stamped on the screw heads.

8.8 = 8 G

10.9 = 10 K

12.9 = 12 K

The values result in a 90% utilization of the screw's yielding point at a coefficient of friction of μ total = 0.14.

The compliance with the tightening torques is to be checked with torque wrenches.

The tightening torques are not applicable when using MoS_2 lubricants.

5.26 Engine conservation

If the engine is to be shut down for a longer period of time (e.g. during the winter) we recommend the following conservation measures for the engine to avoid corrosion:

- Clean the engine including the cooling system: with cold cleansing agent or, even better, with a steam cleaner.
- Run the engine warm and shut it down.
- Drain the still warm engine oil and fill in anti-corrosion engine oil.
- Drain the fuel from the fuel tank, mix it well with 10% anti-corrosion oil and fill it in again. Instead of mixing anti-corrosion oil with the fuel it is also possible to fill the tank with injection pump testing oil with anti-corrosive properties (e.g. Calibration Fluid B).
- Run the engine for 10 minutes until all lines, filters, pump and nozzles are filled with the conserving mixture and the new engine oil is distributed to all parts.
- After running the engine remove the valve cover and spray the rocker chamber with a mixture of diesel fuel and 10% anti-corrosion oil. After this screw the cover back on.
- Crank the engine several times by hand (throttle lever in stop position) to spray the combustion chamber.
- Take the V-belt off and spray the grooves in the V-belt pulleys with anti-corrosion oil. Remove the anti-corrosion oil before taking the machine back into operation.
- Close the air intake opening on the air filter and the exhaust tube.

i Note

Depending on weather conditions these conserving measures will provide protection for approx. 6 - 12 months.

The conserving oil must be replaced by engine oil according to the API- (MIL) classification before taking the machine into service.

Anti-corrosion oils are those that comply with the MIL-L-21260 or TL 9150-037/2 resp. Nato Code C 640/642.

⚠ Caution

Mark a machine with a conserved engine by attaching a clearly visible warning tag.

6 Trouble shooting

6.1 General notes

The following work must only be carried out by qualified and trained personnel or by the BOMAG sales service.

Please observe strictly the safety regulations in chapter 2 of these operating and maintenance instructions.

Faults occur frequently due to the fact, that the machine has not been properly operated or serviced. Therefore, whenever a fault occurs, read through these instructions on correct operation and maintenance. If you cannot locate the cause of the fault or eliminate it yourself by following the trouble shooting charts, you should contact our customer service departments at our branch office or dealers.

On the following pages you will find a selection of fault remedies. It is quite obvious that we were not able to list all possible causes for faults.

6.2 Replacing the injection pump

Disassembly

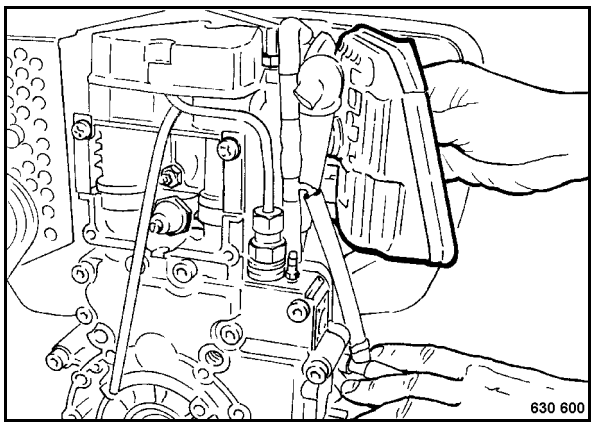

Fig. 75

- remove the air filter bracket (Fig. 75).

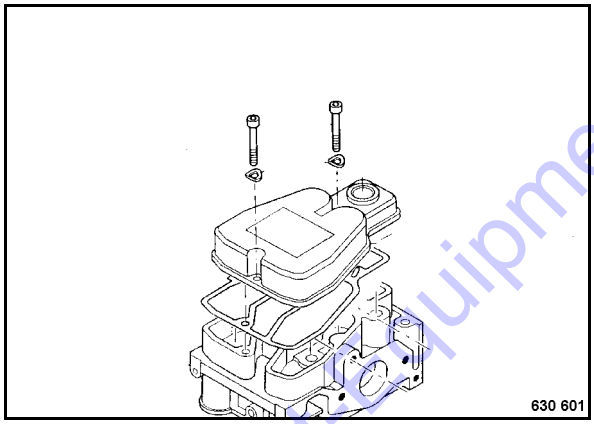

Fig. 76

- Remove the valve cover (Fig. 76).

⚠ Danger

Fire hazard!

When working on the fuel system do not use open fire, do not smoke.

Do not spill any fuel, do not inhale any fuel fumes.

Environment

Environmental damage!

Catch running out fuel, do not let it seep into the ground.

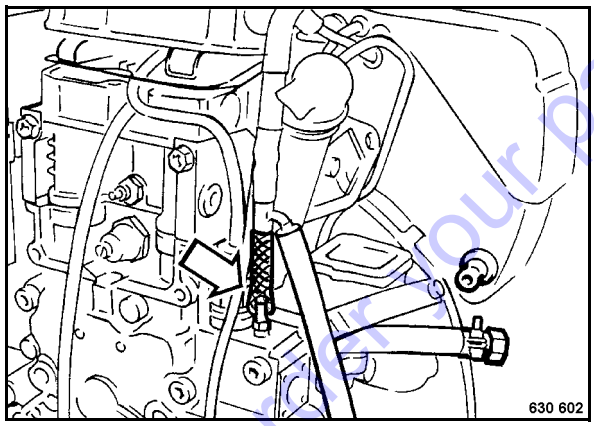

Fig. 77

- Pull the fuel hose off the leakage socket on the pump (Fig. 77).
- Place a suitable container under the hose socket to catch running out fuel.

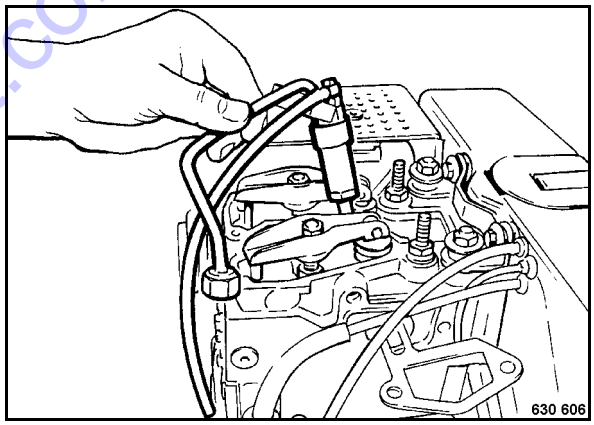

Fig. 78

- Disassemble the injection nozzle (Fig. 78) completely with the nozzle connection.

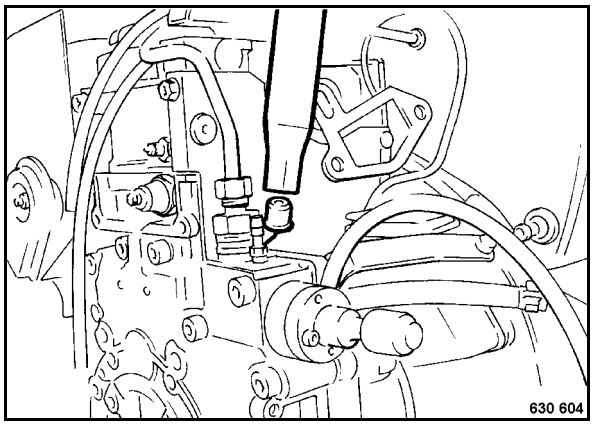

Fig. 79

- Remove the crankcase ventilation socket (Fig. 79).

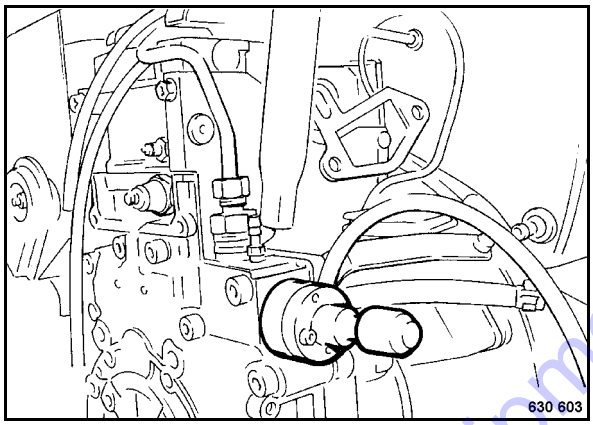

Fig. 80

- Unscrew the oil shut-off valve (Fig. 80).

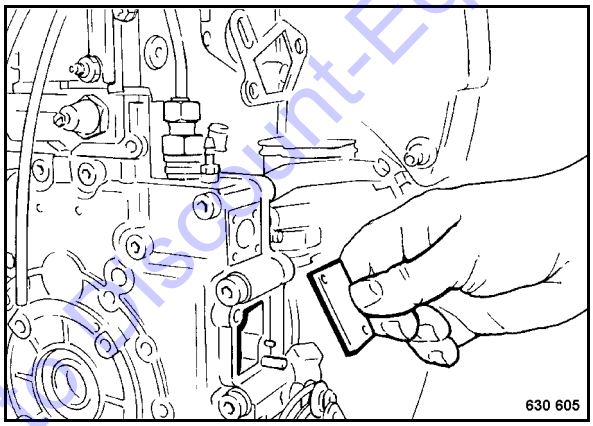

Fig. 81

- Take the locking plate (Fig. 81) off.

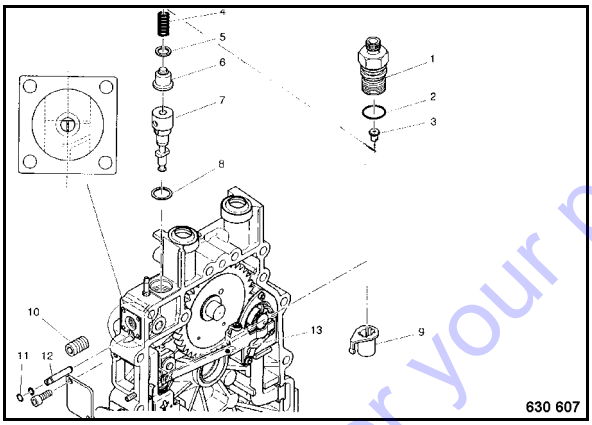

Fig. 82

- Screw the pressure valve holder 1 (Fig. 82) on with the O-ring (2).
- Remove filling piece (3), spring (4), seal ring (5) and pressure valve (6).

⚠ Caution

After pressing the pump element out hold the control sleeve (9) so that it does not drop into the engine case!

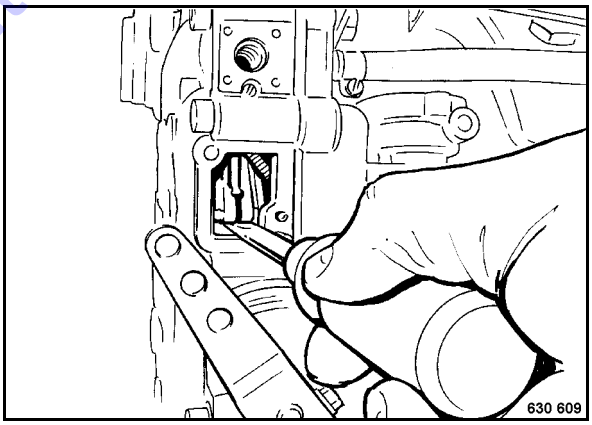

Fig. 83

- Unhook the pump piston (Fig. 83) from the rocker arm to the injection pump.

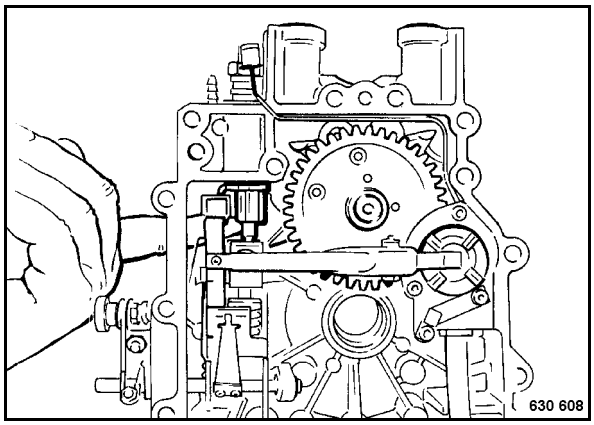

Fig. 84

- Press the pump element (Fig. 84) up with your finger through the opening on the side and lift it out with a magnetic rod.
- Take the compensation shim 8 (Fig. 82) out.

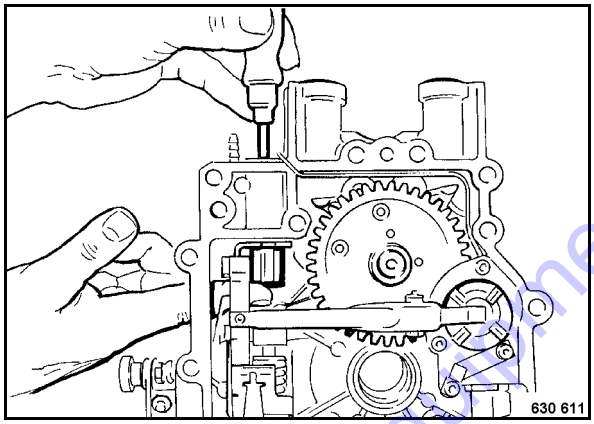

Fig. 85

- Insert a screwdriver from the top to secure the control sleeve (Fig. 85) against falling down.

Assembly

⚠ Caution

Before inserting the pump element hold the control sleeve 9 (Fig. 82), so that it cannot fall into the engine housing!

- Hold the control sleeve and take the previously inserted screwdriver out.
- Insert the compensation shim 8 (Fig. 82).

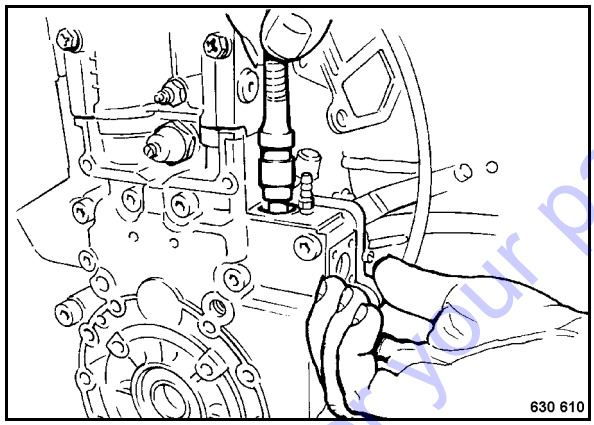

Fig. 86

- Insert the pump element (Fig. 86), ensure correct position of the suction hole (bore with taper) and of the element flag (the number with 400 or 4.. should be on the side opposite the suction bore).

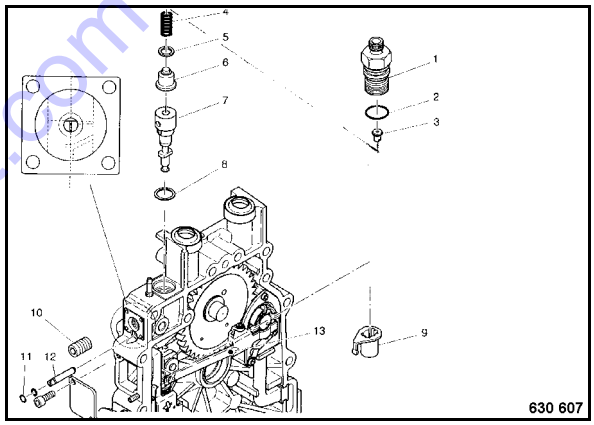

Fig. 87

- When inserting the element group make sure that the plunger flag is inserted through the control sleeve (for easier installation slightly turn the control sleeve from side to side) and that the eccentric pin (12) engages in the groove of the element cylinder (Fig. 87).
- Attach the pump piston to the injection pump rocker arm.
- Assemble parts 6...1, tighten the pressure valve holder only lightly (approx. 10 Nm).
- Turn the throttle lever fully to the right and lock it.
- Lift the pump piston up for approx. 2 mm.
- Now check the position of the starting slot to the suction bore (through the bore which held the low oil level shut-off device). The starting

slot must be in line with the suction bore or max. 1 slot width displaced to the left. If this condition is not met remove the flap (11) with a marking needle and correct the position by turning the eccentric (12).

- Tighten the pressure valve holder with 35+/-2Nm.
- Assemble the engine.

6.3 Engine faults

Faults	Possible cause	Remedy
Engine does not start or poor starting	Engine start button not pressed and/or too long waiting time	Press the start button and start within 10 seconds.
	Fuel supply not correct Fuel tank empty	Fill in fuel
	Incorrect valve clearance	Check the valve clearance, adjust it if necessary.
	Fuel filter clogged (can be noticed if no fuel runs after pulling the fuel line off).	Change the fuel filter, fill in fuel
	Charge level of battery too low	Charge the battery
Engine hard to crank	Oil of too high viscosity	Drain the oil and fill in oil with lower viscosity
Engine has no compression	No valve clearance	Check and adjust the valve clearance
Black exhaust fumes The engine power may also be low (speed drops) This is not caused by the injection pump	Air filter clogged	Clean the air filter
	Valve clearance not correct	Adjust the valve clearance
	Injection nozzle defective	Change the injection nozzle
	Too much oil in the crankcase	Drain the oil down to the 'Max'-mark on the dipstick
Poor engine power (engine speed drops)	The throttle lever does not stay in the chosen position.	Tighten the nuts
No exhaust fumes	Air in the injection system	Check the function of the bleeding valve
	Fuel filter dirty	Change the fuel filter
Engine overheating	Cooling air flow restricted	Clean the cooling air inlet Clean the cooling fins
	Injection system not working correctly	Have the injection system examined
	Too much oil in the crankcase	Drain the oil down to the 'Max'-mark on the dipstick

Trouble shooting

Faults	Possible cause	Remedy
Engine stalls	Fuel supply not correct	
	Fuel tank empty	Fill in fuel
	Fuel filter clogged (can be noticed if no fuel runs after pulling the fuel line off).	Change the fuel filter Check the function of the bleeding valve
	Vacuum in the fuel tank	Clear the ventilation bore in the tank filler cap.
	The throttle lever returns to "stop"-position by itself	Tighten the nuts
	Lack of oil	Have the engine repaired, stop work immediately (risk of total engine damage!)
Engine runs at high speed, but no vibration	Centrifugal clutch defective	Change the centrifugal clutch
	V-belt	Check tension, replace if necessary

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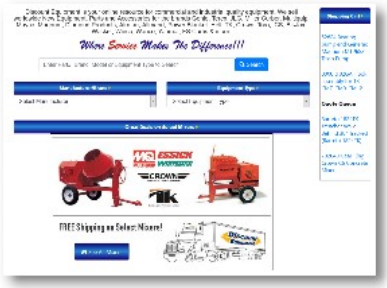

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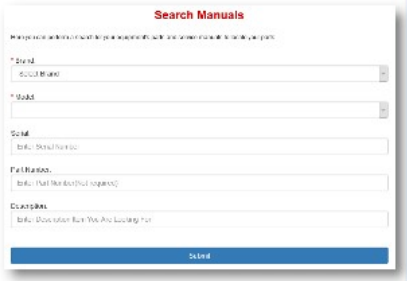

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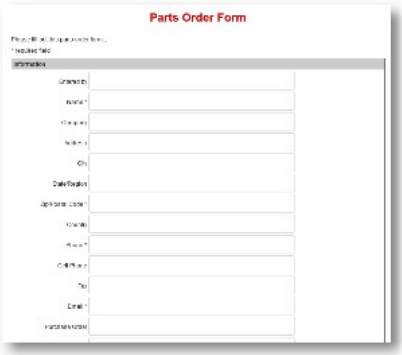

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