**Technology – you can depend on**

# Operators Manual

**version B0507**

**English**

**No.93944**

# Champion C 3000

Tractor mounted -universal
Forage harvester

# C3000

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## Operating Instruction distribution
## B 0507
## Nr. 90533

Chapter

## "Made in West Germany"

Claims arising from construction, especially those concerning the design, will not be accepted as we must reserve the right to make modifications.
Repairs or modifications to the machine must comply with machinery safety regulations of 1.12.68.

# OPERATING INSTRUCTIONS

## 1. Foreword

In addition to a detailed technical description, these operating instructions also give general and specific explanations on the function and correct operation of the Champion harvester, as well as troubleshooting.

As technical solutions constantly have to be developed and adapted to the latest scientific and technical operating knowhow, we reserve the right to make modifications as necessary.

The terms "right" and "left" refer to the forward travel of the machine.

There are additional operating instructions for the Champion harvester with the detector unit.

Keep a note of the serial number of your machine on the page provided at the end of the operating instructions. Your dealer will need these details to supply the correct spare parts promptly.

Figure 1

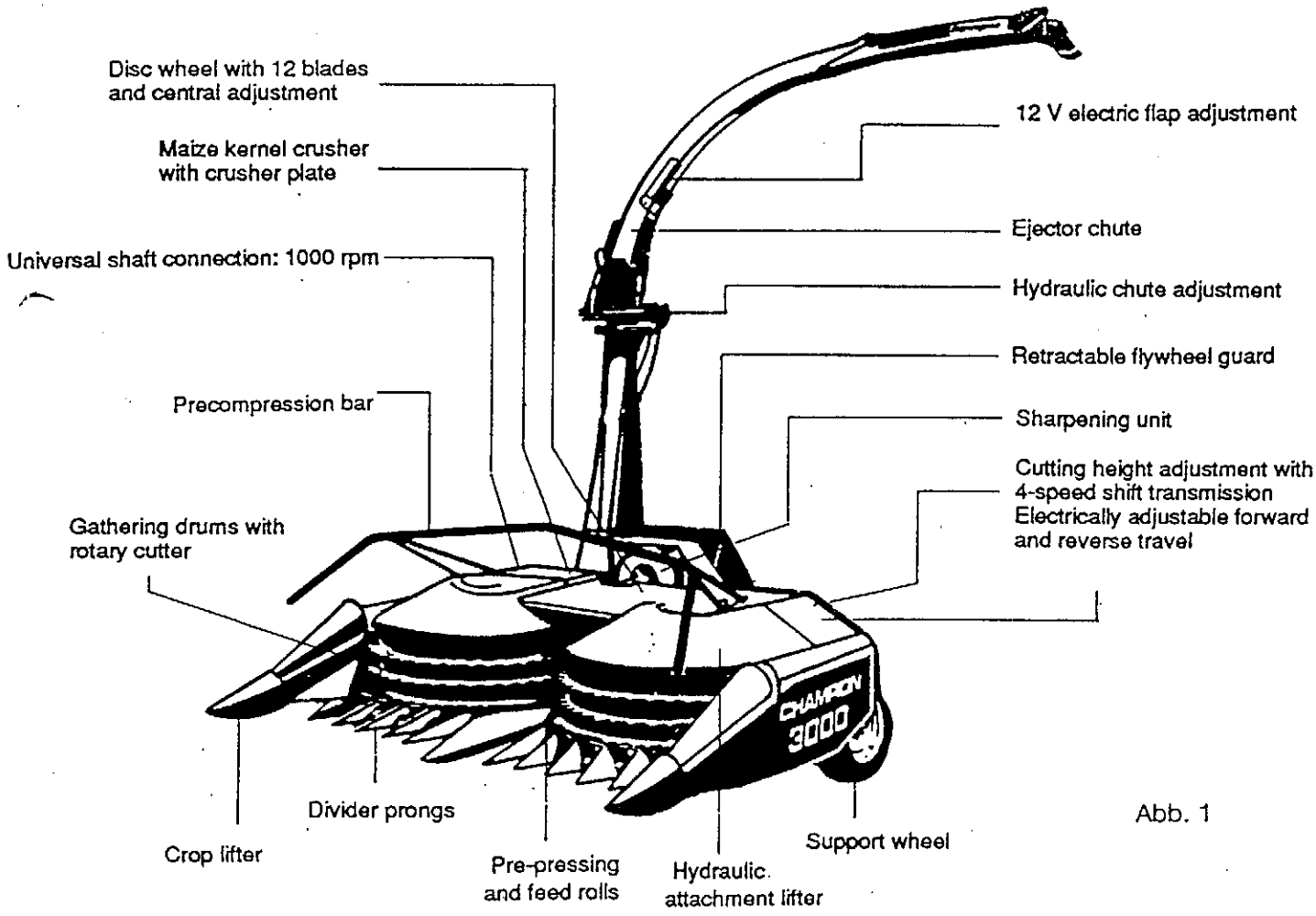


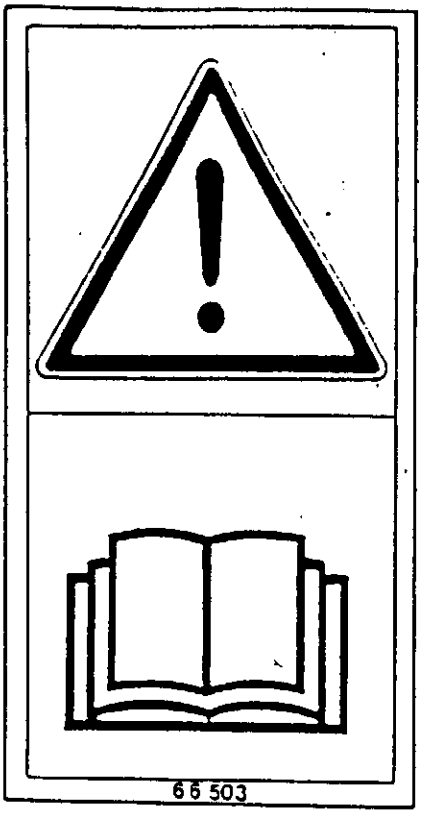

Abb. 1

# 2. Range of use

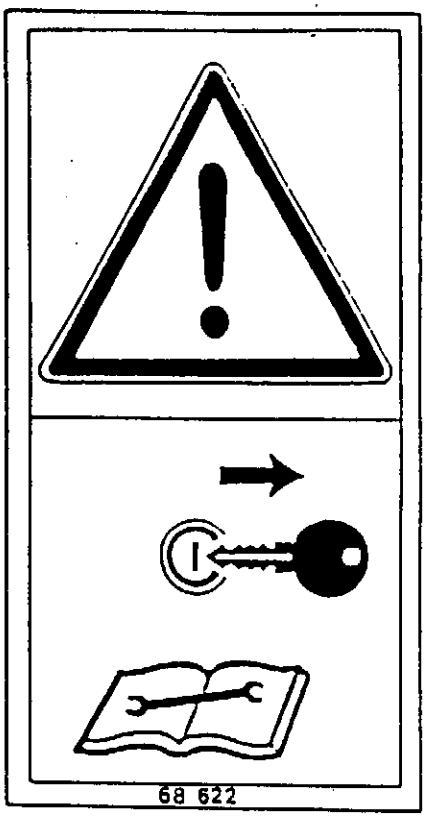
The Kemper universal precision crop chopper is suitable for harvesting silage maize and other crops.
The chopper can be fitted with optional MAIZE HEADER or *GRASS* PICK-UP for grass. The harvester can be used with a tractor or as an attachment on a selfpropelled machine.
The Champion precision crop-chopping machine is tested for industrial safety. In accordance with equipment safety regulations, the Champion should only be used as directed. Any other use excludes liability for resulting damage. Use of the machine in accordance with instructions also includes compliance with our Operating and maintenance conditions, as well **as** the exclusive use of original Kemper spare Parts. The Champion should only be used, serviced and repaired by those trained in , operation of the machine and its inherent dangers. (see UW 1.1 § 1).

# ACCIDENT PREVENTION REGULATIONS

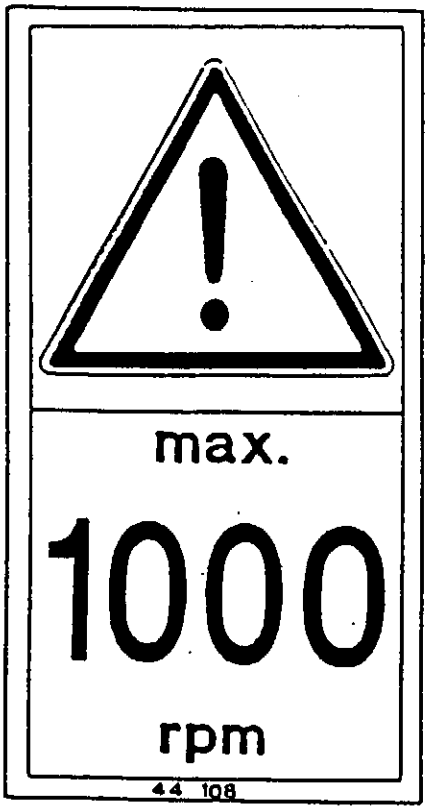
1. Do not stand in the crop intake path.
2. The sharpening unit should only be operated from the side, with the flywheel box closed. Wear safety goggles.
3. Do not feed crop in manually, or by foot from behind.
4. Make sure PTO shaft lever is "Off" and tractor engine turned off when working on the crop-chopper.
   Caution: the blade rotors continue to run when the gathering drums have stopped.
5. The crop-lifter guard should be retracted for road travel.
6. Do not open flywheel box when machine is in motion. Caution: machine continues to run for a while when switched off.
7. Check that all blades are securely fixed.
8. Connect universal shaft coupling with care.
9. Ensure universal shaft guard is in good order at all times and secure protective tube in position.
10. Do not alter the number of ribs on the universal shaft guard.
11. When working under the machine, it must be supported.
12. On public roads, the ejector chute should be rotated so that the end of the chute, or crop unit, does not project over the side or back.
13. StVZO (road traffic) lights regulations must be observed.
14. When the flywheel is in operation, do not stand within swivelling radius of the ejector chute.
15. Attachments should only be fitted when the machine is on flat ground.
16. Release pressure in unit before disconnecting hydraulic lines. In the event of injury due to hydraulic oil ejected under pressure, seek medical attention.
17. We recommend the use of suitable ear defenders.
18. Before checking machine for blockages, disconnect all drives, switch off engine and ensure all parts have come to a standstill.
19. The height of the machine should not exceed 4.30 m in order to avoid fouling high voltage overhead lines.
20. The crop attachment must be secured with the mechanical locking lever to prevent it from inadvertently dropping down when in transit in road traffic.
21. All machine operating components must be positioned next to the tractor seat guard.
22. The hydraulic system operates under high pressure. Any hoses showing signs of leaks, rupture or damage must be changed immediately. In addition, all hoses and lines must be exchanged after a maximum of 6 years.
23. The maximum admissible oil pressure is 180 bar.
24. Only use original Kemper spare parts.

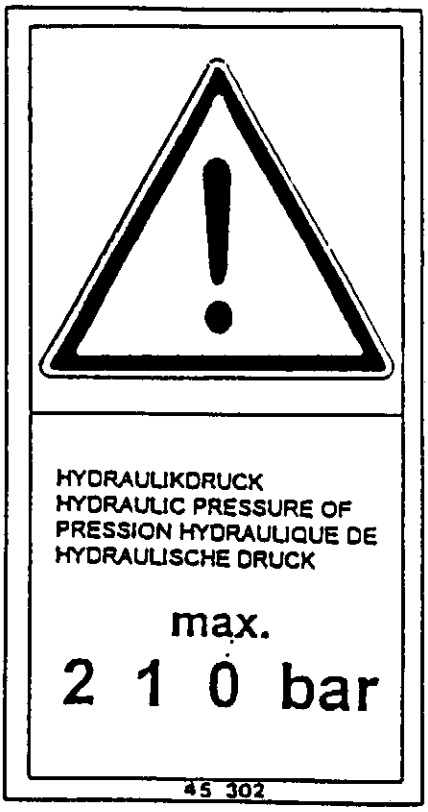


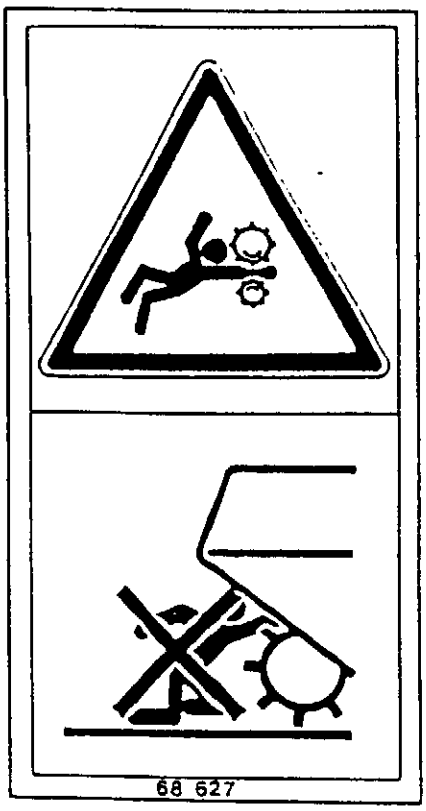

Carefully read operator´s manual before handling the machine. Observe instructions and safety rules when opening.



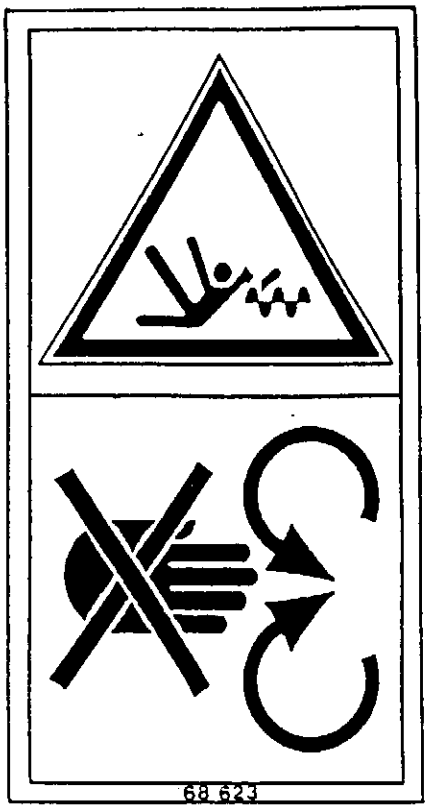

Schut off engine and remove key before performing maintenande or repair work.



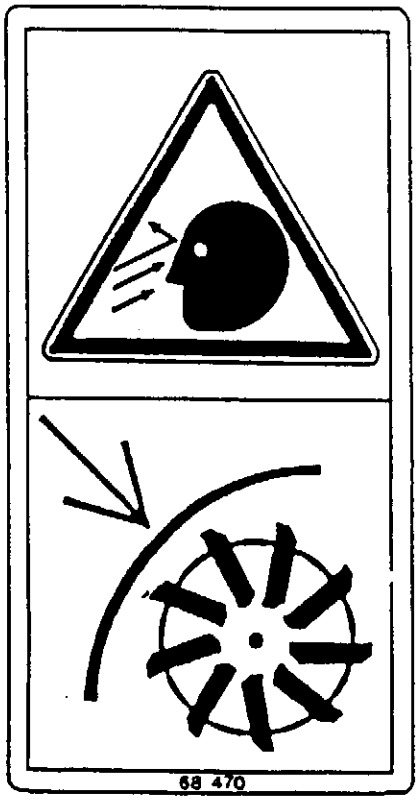





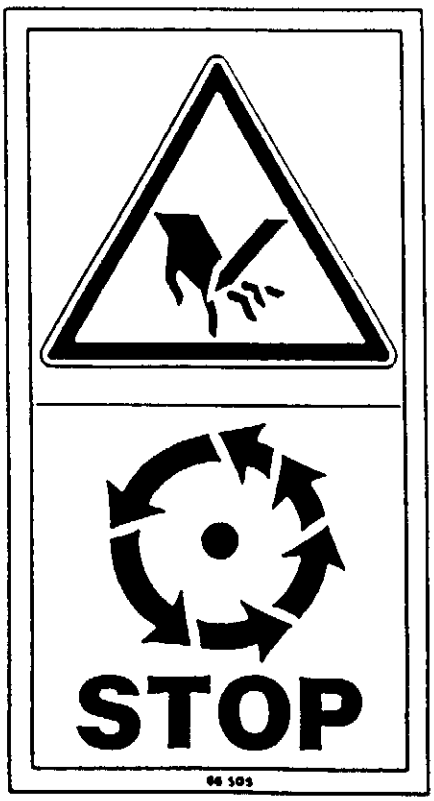

Never reach into pick-up area as long as tractorengine is running with PTO connected.



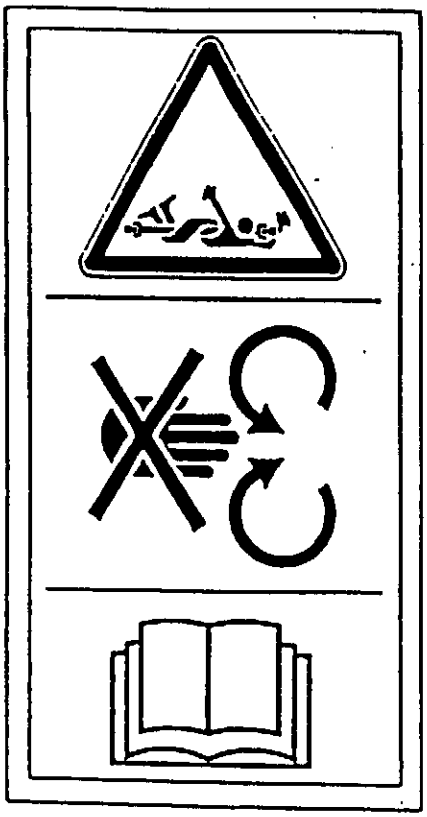

Never reach into rotating auger.




Grinding only with closed disc wheel.
Use safety goggles




Wait until all machine components have completely stopped before touching them.



Stay clear of rotating drive line to avoid personal injury.

Read operator´s manual.

Change porous hoses immediately.

**Dear Customer**

You have made a good choice. We are pleased to congratulate you on your selection of a KEMPER machine. As your partner we offer quality and performance, together with reliable service.
In order to be able to evaluate the conditions of use of our agricultural machines, and to take these requirements into consideration in the development of new units, we ask you to provide some information. This also allows us to inform you selectively of new developments.

**Product Liability and Customer Information**

Product liability instructs manufacturers and dealers to hand over the instruction manual with each machine and to give the customer practical instruction on operation, safety and maintenance.
A multiple form (A, B, C) similar to the one illustrated below is supplied with each Operator's Manual. Confirmation is required that the customer has taken possession of the machine and the Operator's Manual.
For this purpose, send the signed document A to Kemper. Document B is retained by the dealer who supplied the machine. Document C is retained by the customer. At the same time you will be assured that warranty is given.

**EC Certificate of Conformity**

This product has been submitted to the CE test and has obtained the CE approval mark in conformity with the EC Directive 2006/42/EC. A CE Certificate of Conformity is supplied with this manual. This certificate must be handed over to the final owner of the machine together with the Operator's Manual.

**Handing over the Operator's Manual**

**Attention!** Even if the machine is sold at a later date by the customer, the Operator's Manual must be handed over to the new owner.

**Receipt** C

[1] Type: | | | | | | | | | |

Machine No.: | | | | – | | | | | |

[4] Delivery Date | | | | | | | | |

[2] Customer Address:

[5] Address of authorized dealer/importer

Company Stamp/Signature

[3] I purchased the machine described under (1)

**With the delivery of the machine I received the Operator's Manual No. ...**

Customer signature _____ Date _____

Copy for customer

Company Stamp/Signature, if not identical with (5)

[6] The machine was delivered to customer in conformance with specifications.

Signature of Customer Service _____ Date _____

**Maschinenfabrik KEMPER GmbH & Co. KG - Postfach 1352 - D-48694 Stadtlohn**

# 3. Technical description

3.1 At the 1985 SIMA International Agricultural Machinery Show in Paris, the CHAMPION crop chopper was awarded a

## SILVER MEDAL

This is awarded for new developments representing a technical advance in the mechanisation of agriculture. Kemper was the only foreign manufacturer to receive this award in 1985.

3.2 The Champion was awarded the medal for the technical advance of its new type of MAIZE HEADER with a working width of 300 cm which harvests silage maize as well as forage-type crops irrespective of rows, and feeds it to the chopper unit.

3.3 The forage crop is cut by saw blades positioned under the actual rotation intake point. As there is no fixed counter-blade would normally be the case, maintenance costs for a saw blade rotating at high speed, cutting freely through the crop, are virtually nil in practice.

3.4 The rotating feed system consisting of two gathering drums is of simple design and minimizes serving and maintenance costs, as there are no wear parts (such as chains).

3.5 Behind the gathering drums is the feed roll housing, with two precompression rolls and two feed rolls. There are two gear drives to support the main bearing points, minimizing maintenance costs.

3.6 The chopper consists of a compensated, adjustable flywheel, 12 cutting blades, 12 exchangeable faceted shear bars, 12 rocker paddles, double-sided coated shear bar, smooth plate and exchangeable crusher plate for grain cracking

3.7 An integral sharpening stone is provided for precision grinding of the chopper blade.

3.8 4 chopping lengths can be set by means of a transmission gear.

3.9 In the event of sudden malfunction, the operator can switch the header into reverse, neutral or forward from the cab.

3.10 The maize header and grass pick-up can be interchanged easily by means of quick-acting couplings.

3.11 The grass pick-up has a narrow spacing between tines and a large diameter intake auger.

3.12 The chute has replaceable wear plates and is driven through 300 degrees by a hydraulic motor. The worm gear is hydraulic motor driven.

The upper half of the chute is spring-balanced to enable the chute to be raised and lowered easily by one person. A security spring on the side has to be pressed down before the flap lever can be released.

3.13 The chute top flap is driven by a 12 Volt motor.

**3.14** The PTO has a one-way clutch fitted on the machine side. There are 4 combinations for coupling the machine;

| | |
|---|---|
| 1 3/8 - 6 | 1 3/8 - 21 |
| 1 3/4 - 6 | 1 3/4 - 20 |

2 types of PTO can be supplied for tractors under and over 200 hp.

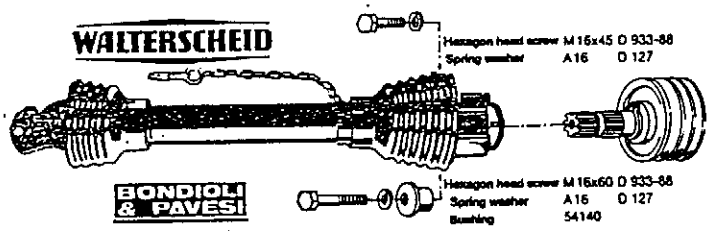



Fig. 2

**3.15** The crop chopper can be used with a tractor as well as a front-mounted unit on self-propelled vehicles.

**3.16** Tractor requirements:

A 150 hp minimum

B. For hydraulic regulation of the chute, 1 double acting control valve and for hydraulic lifting of the header 1 single acting control valve.

C. To avoid **current loss**, the 7 pole 12 Volt plug must be connected with a 4-core cable.

\+ connection with fuse to terminal 54 g
\- connection to terminal 31

Connection must be made **direct** to the battery.

**3.17** When using self-build machines, please note the following:

A. The manufacturer's specification for maximum admissible PTO shaft drive torque

B. The PTO drive and PTO shaft must turn without vibration or interference.

C. An overrun clutch must be provided on the machine side.

# 4. Technical Description

## 4.1 3-point hitch and header gears

The 3 point hitch has two connection facilities: in the middle of the machine or offset 150 mm on the side.
You should select the connection affording the lowest cardan shaft extension in the working position. The gap between the chopper casing and flat ground should be about 5 cm. After coupling the machine, release the 3-point hitch hydraulic system on the control valve and limit the dropping distance by means of a chain, for example.

## 4.2 Movable header

The header unit (maize header or pick-up) is hinged onto the chopper with a main spring balance. Adaptation to ground contour is achieved with the two height-adjustable skids on the maize header divider prongs and the small wheels on the grass pick-up. The header must be secured against inadvertent lowering with the mechanical locking bolts when the machine is moved on the road.

## 4.3 Combined transmission and reversing gearbox

Forward, reverse and neutral position of the gathering drums is controlled from the tractor cab. 4 different chopping lengths can be set on the gearbox. **To avoid damage do not change gear whilst in motion.**

## 4.4 Drive

The drive is factory set for connection to the 1000 rpm PTO.

## 4.5 Main drive PTO shaft

The PTO shaft must be adjusted to suit the tractor. The telescopic shaft covers must overlap each other by at least 150 mm. The over-run clutch is mounted on the chopper side.

## 4.6 Hydraulic header lift

The header is lifted with two single-acting hydraulic rams.

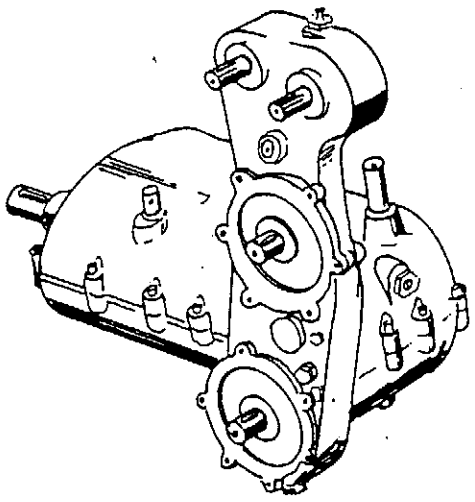


Fig. 3

**4.7** Overload safety clutches on the chopper. The Champion is equipped with 4 overload safety devices.

1. Ball clutch in the bevel gear drive of the gathering drums.
2 Slip clutch on the gathering drum PT0
3 Ball clutch on the top feed roll drive
4 Ball clutch on the bottom feed roll drive

**4.7.1** Ball clutch in gathering drum gears. The gathering drum gear System has an integral ball clutch. In the event of overload, the ball clutch notches another graduation further. If the ball clutch continues to engage, contact the factory.

# Seperatly deliverd equipement C3000

## Equipement depending order

Separatly packed is the command terminal, the electric motor, screws, power cable lever to adjust fly wheel, operators manuel , parts catalog , PTO shaft and perforated plates.

Equipement

plates

PTO shaft under 200 hp

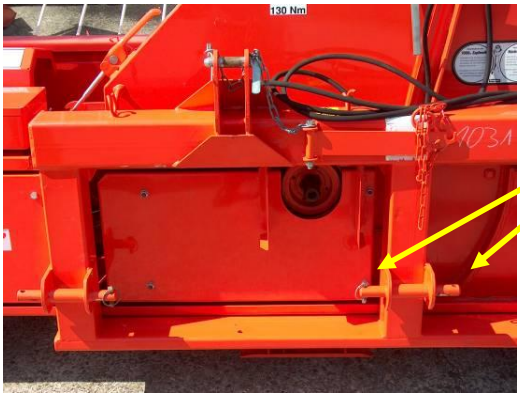
PTO shaft over 200 hp

# 5.1 Basic adjustments C3000

## Mounting on tractor

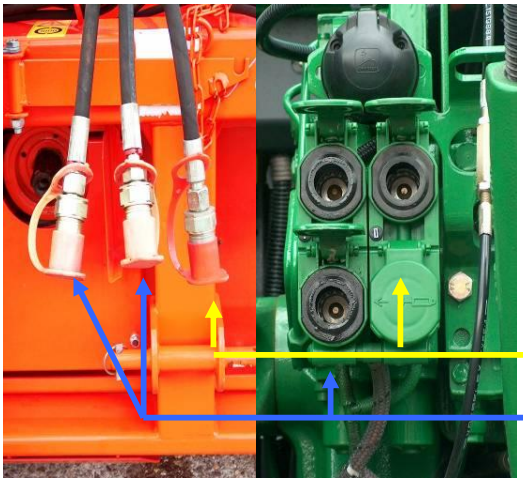
Connect the 3-point hydraulic of the tractor with the chopper. Fix bottom attachment points against lateral movement.
Choose tractor hydraulic on „Position“ control
Choose PTO 1000 U/pm

## 3-point hitch




The 3 point hitch has two connection facilities: in the middle of the machine or offset 150 mm on the side.
You should select the connection affording the lowest cardan shaft extension in the working position.
The gap between the chopper casing and flat ground should be about 5 cm

## Hydraulic connection



The chopper needs two hydraulic valves 1 doubble effect and
1 simple effect
Clean hydraulic tubes before connecting.

*SE = header cylinder*

*DE= Chute move*

# 5.1 Basic adjustments C3000

## Electric connections


The header needs 12 V electricity
Battery +connect with red cable
Battery – connect with blue cable

Socket fix on rear ail

## Support wheels

The height of the chopper can be adjusted by the support wheels.

1. If there is uneven ground
2. To choose height for mounting on tractor

The gap between the chopper casing and flat ground should be about 5 cm

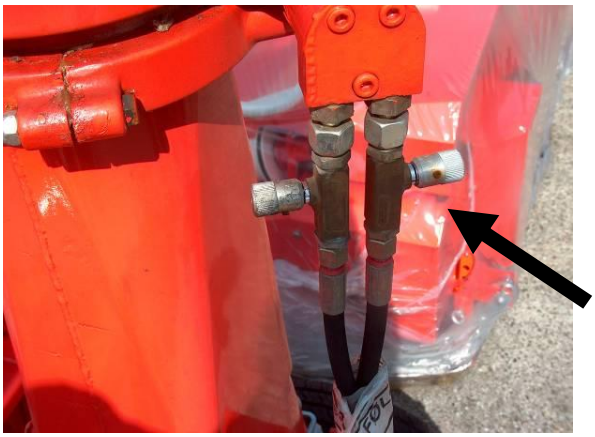
## Horizontal attachment

The chopper must be attached in horizontal position

The top-point is fixing the chopper parallel behind the tractor

# 5.1 Basic adjustments C3000

## Rotating speed of the chute



The chute is rotated by a hydraulic motor. The speed of the chute motor can be set by 2 adjustable one-way restrictors.

## Transportpositon chute

To respect the legal transport height of 4 m, use transport facility.
Take off security blade and lift security lever. Put distance bloc into chute and fix chute in bottom position.

Upper fixing point
lower fixing point

The springs helps to move up and down the chute The higher the tension is the easier it is to move.

# 5.1.1 Preparing to work C3000

## Assemble chute

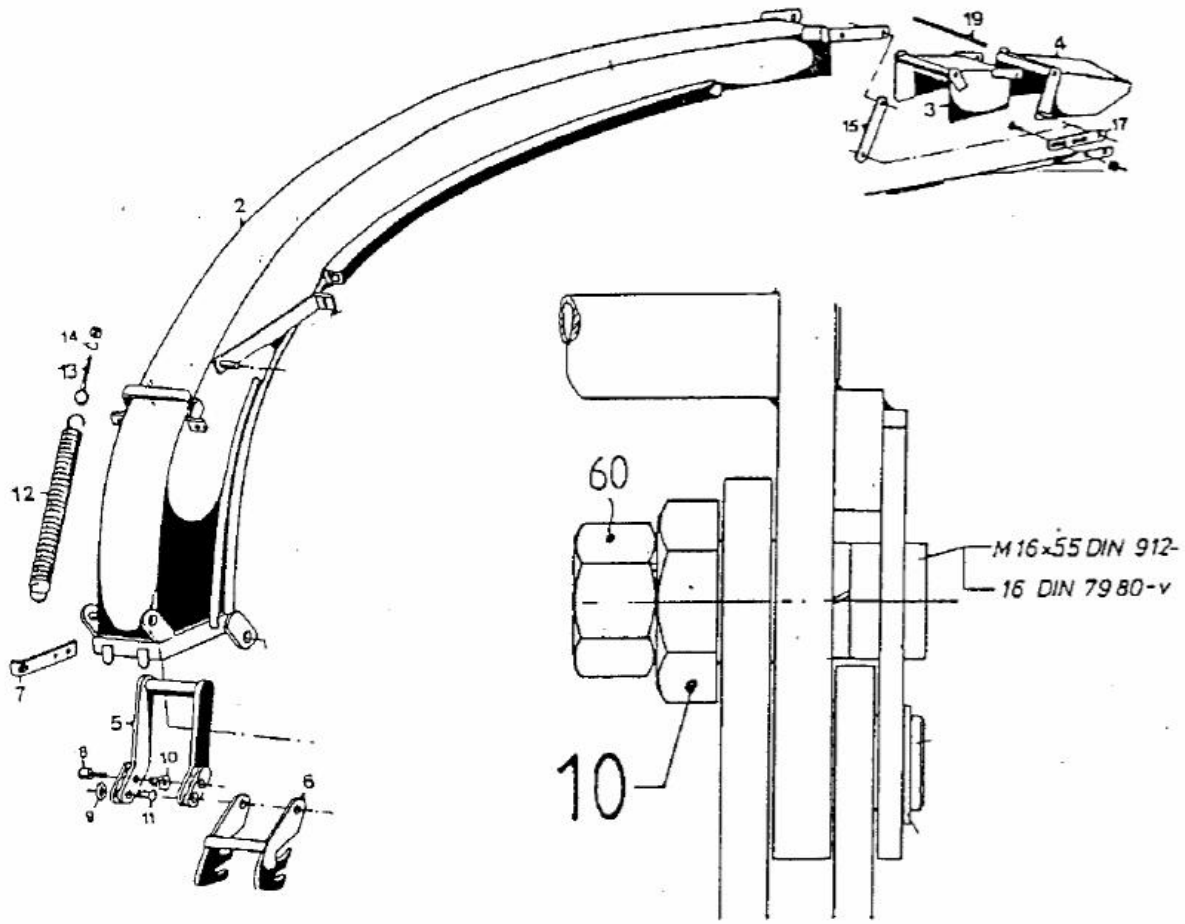
Fix electric motor on chute of new chopper.

Take of bolt
release screw and put motor in position

The cable is connected with motor by passing thru tube

Make sure that chute can turn without crashing the cable. Let big loop to cable.

## NOTES ON EJECTOR CHUTE




1. Top chute section fixed to lower support by means of parts 5 and 6.

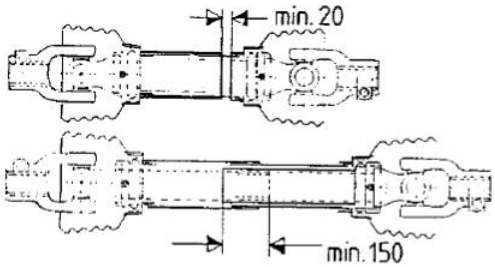
2. There will be a certain degree of wear in the first few days of use. This wear must be eliminated regularly by means of the eccentric nut 10, especially at the beginning.

# Basic adjustments C3000

## Adapt PTO shaft

**Attention:** ball clutch has always to be fixed on the chopper side!

The length has to be adapted corresponding to the tractor. The minimum doubling of the shaft is 150mm




The PTO shaft for tractors over 200hp **cannot be adapted** !!

Tractors with more than 200 hp need special frame adapter The distance between chopper and frame is lifted up of 115mm.

Weld on the adapters after adjustment!

## Main drive

The Champion chopper is factory set for connection to the 1000 rpm PTO

# Basic adjustments C3000

To adapt PTO shaft, take off cardan protector Release small screw.

Hold top and turn tube protector. Security will release.

Pull back tube.


The ball clutch is fixed on the chopper shaft with a 16X45 8.8 bolt. For security reasons the bolt is fitted with Loctite and torque.

# Basic adjustments C3000

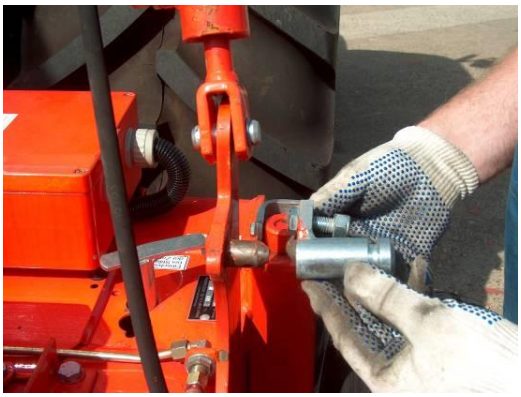
Push shaft up to the end . Clean PTO shaft.

Fit screw from the inner side of the PTO shaft.


Clean screw M 16X45 8.8 from grease and dirt. Put Loctite 234 on.

Screw is fixed with a torque of 190 Nm. Reassamble PTO shaft protector the other way back.

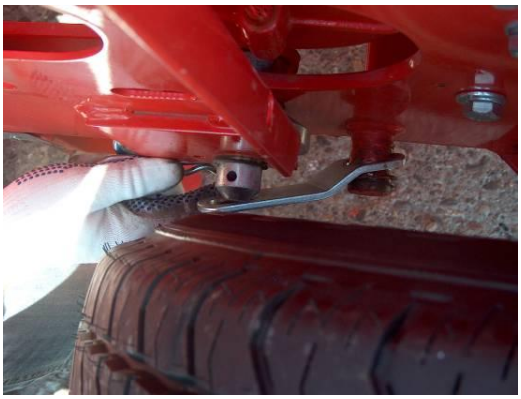
## Connecting the header



To connect the header take of spring adapter if working also with pick-up.

Push connecting plate away.

To avoid damages on cylinders lift them before connecting header.



Move backwards and connect at first bottom fixing points. Safe with lock pin.

Release security and lift stand.

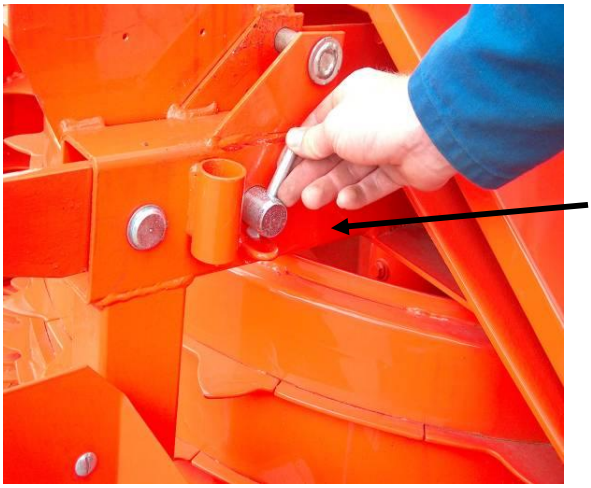
Conncet top attachment and safe with lock pins.

**Attention: connect friction clutch on chopper gearbox**
Which shaft to choose look cutting length

**Important!**

Before first use of the machine make a service on friction clutch. Tighten bolts. Let chopper turn for 10 seconds. Discs will slip. Then release bolts up to top completely.

## Release transportation securities



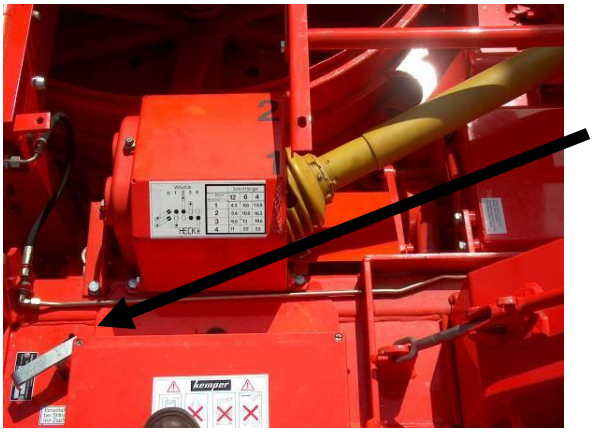
Transportation securities have to be put on the road. To unlock pull blot out.

The header is hinged onto the chopper with a main spring balance. Adaptation to the ground contour is achieved with the two height-adjustable skids.

Big shocks by turning in the end of the field are taken of the header.

# 5.3 Maize harvesting C3000

## Cutting length



The cutting length gearbox has two possibilities to change gears. To pass lever into second position gearbox has to be in neutral position.

**Attention**
**To pass between gears 1+2 to 3+4 gear levers have always to be in neutral position.**

| A Feed | Drum rpm | Chaff length | B Gear | C Gear |
|---|---|---|---|---|
| 1 | 11 | 4,3 | 2 | 2 |
| | 14 | | 2 | 1 |
| | 18 | | 1 | 2 |
| | 23 | | 1 ▼ | 1 |
| 2 | 12 | 5,4 | 2 | 2 |
| | 17 | | 2 | 1 |
| | 20 | | 1 ▼ | 2 |
| | 27 | | 1 ▼ | 1 |
| 3 | 16 | 6,5 | 2 | 2 |
| | 21 | | 2 ▼ | 1 |
| | 24 | | 1 ▼ | 2 |
| | 32 | | 1 | 1 |
| 4 | 28 | 11 | 2 ▼ | 2 |
| | 36 | | 2 | 1 |
| | 40 | | 1 ● | 2 |
| | 54 | | 1 ● | 1 |

▼ Preferential gear combination

● Do not use this gear combination!

Rotor too fast – Danger of accident


**Do never use Gear 4 If you need different cutting length take of 6 knives!**

**Less power is needed**

# 5.3 Maize harvesting C3000

## Intake speeds & cutting length adjustment

The speed of the feeding and intake devices is adjustable for each harvesting condition and crop type. The gearbox with reverse is particularly user-friendly.
There are two header drive speeds as well as **4** speeds for the precompression and feed rolls. A further Stage is available in the gathering drum Spur gear. With these ratios in three gears, this gives a total of 12 different speeds for the gathering drums. This is of great advantage for harvesting as the universal crop chopper offers optimum adaptation to the degree of ripeness of the crop.

## Intake speeds

Uniform intake of the crop substantially affects the performance of the crop chopper and chopping quality. The correct gathering drum speed should be selected, and to achieve the optirnum result should be in the region of 25 - 30 rprn. See also values shown on chart.
Spur gears B and C each have 2 PT0 stubbs
1 = fast
2 = slow

## PTO shaft position

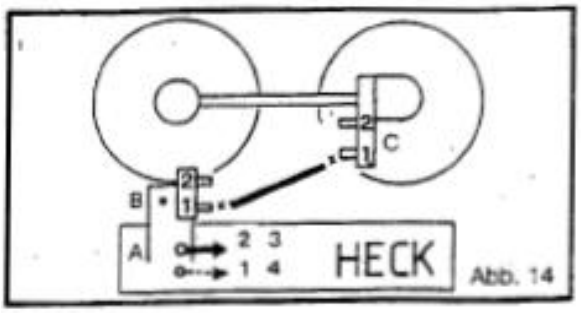


Abb. 14

**Chopping lengths - grain cracking - interchangeable plate**
For optimum harvesting and minimum power requirement, the longest acceptable chop length should be used.
The dry matter content will dictate use of the cracking plate. The Champion is designed with easily interchangeable smooth plate for grass and cracking plate for maize.
See chapter interchangeable plate

# 5.3 Maize harvesting C3000

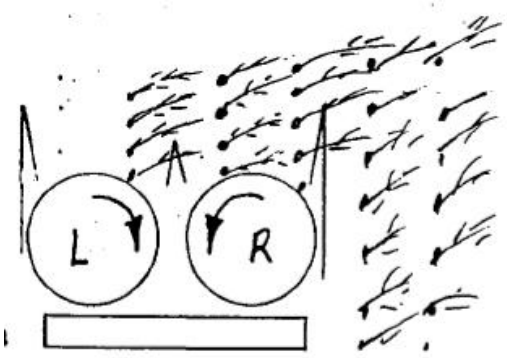
## Harvesting laid maize

I

It is impossible to give specific rules as the conditions always vary so enormously but here is some general advice.

- Drive at an angle to the laying direction as far as possible. .
- For laid maize as per the sketch opposite, it is recommended that only rows should be harvested together.

The outer left fourth row is the hardest to harvest in view of the gathering drum direction and the laid position of the maize.




- Maintain speed in the crop.
- Vary gathering drum speed.
- Keep machine horizontal as far as possible.

## Crop lifters

In very laid crops, crop lifters may be necessary. In this case, 1 crop lifter will be fitted at the front of each gathering drum before the small divider prongs, part N' 55965.

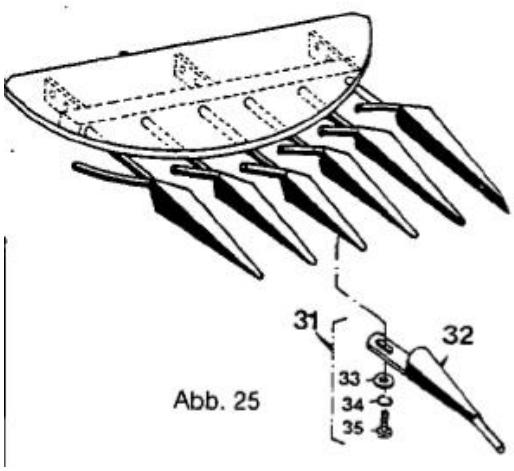



Abb. 25

## Switch off rotating dividers

The rotating dividers can be switched off.
Lift lever an pull sideways to release v-belt

## Road protector

In road position pull down protector

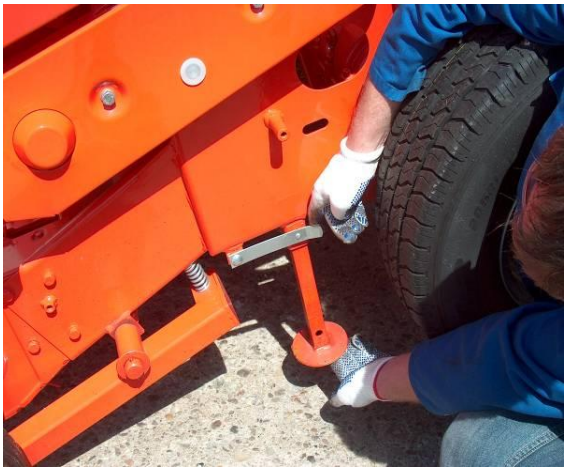
In working position lift up an fold protector.

# 5.4 Modification for Grass Harvesting C3000

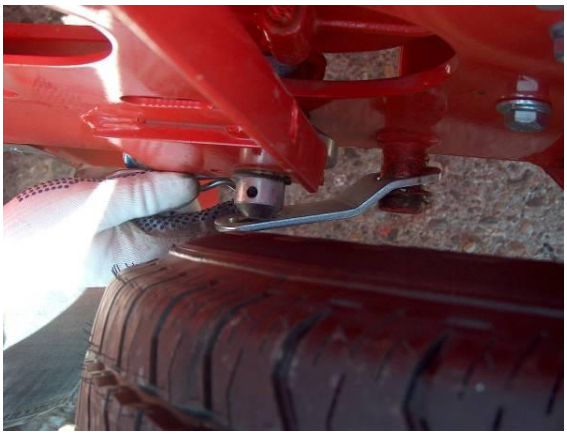
## Mounting Pick-up

The Pick-up should only be mounted on choppers **with Metalldetector**!
Grass harvesting contains a higher risk to pick up metall parts.

Connect pick-up with bottom points and release stand.



Release security and lift stand.



Close at first bottom connection point.

# 5.4 Modification for Grass Harvesting C3000

Drop down chopper to get pick – up close. Connect spring and support

Connect cylinder to lift pick-up and safe with lock pin.

Connecting PTO shaft

Push simple spider on gearbox shaft of pick-up.

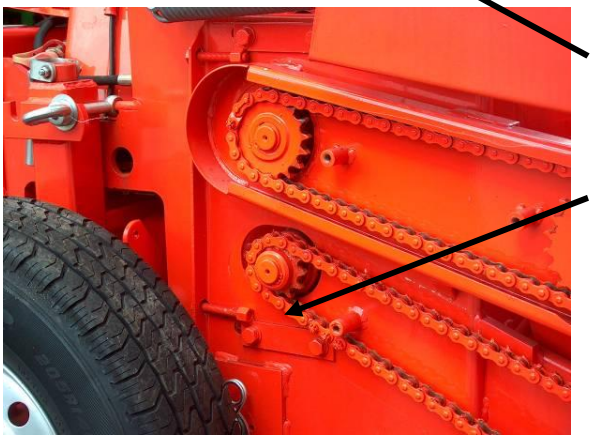
**Attention: connect friction clutch on chopper gearbox**
Which shaft to choose look cutting length

**Important!**

Before first use of the machine make a service on friction clutch. Tighten bolts. Let chopper turn for 10 seconds. Discs will slip. Then release bolts up to top completely.

# 5.4 Modification for Grass Harvesting C3000


Control and grease daily chain of pick-up.
To control use special perforation.
To tighten chains take off protector.



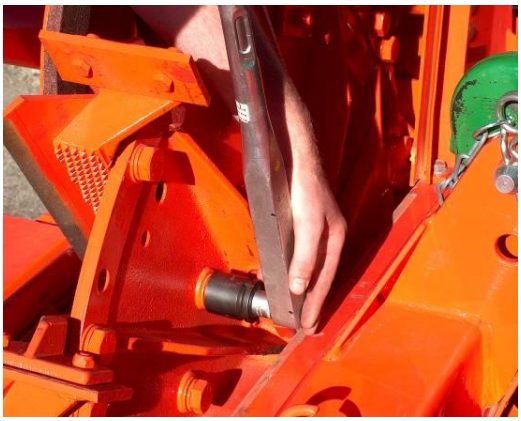
Release bolts of protector and use tighten bolts for higher tension

After tightening lock security bolts and replace protector.

# 5.4 Modification for grass harvesting C3000

## Take out 6 knives


For grass harvesting it is necessary to take out 6 knives with knive holder.



Release three bolts M 20X 45 8.8

Take out complete knive holder

The interchangeable perforatetd plates have to be replaced by the smooth plates for grass. See interchangeable plates

# 5.4 Modification for grass harvesting C3000

## Special checks before using for grass harvesting

1. Drive with a maximum of 6 blades only (as new a set as possible). See Table 26
2. Remove all other blades, blade holders and elevator paddles.
3. Tighten all the screws on the blade wheel with a torque wrench.
   Blade holders and elevator paddles = M20 = 360 Nm
   Blade fastening screws = M 12 = 130 Nm
4. Sharpen the blades and adjust the blade wheel
   Difference to ledger plate = 0.2-0.5 mm. See Illustration 22/23
5. Check ledger plate and turn-over or replace if necessary. Shorten both, install and bundle the side ledger plates ensuring there are no spaces between them. (Illustration 21) Tighten all screws!
6. Rotate the elevator paddles if the edges are excessively rounded.
7. Replace damaged elevator paddles immediately.
8. Check both smooth wear bases in the chopping unit. Replace if necessary.

## Pick-up attachment intake speed

The pick-up should not be operated faster than necessary. This will reduce unnecessary wear. The infeed setting of **4** produces a cutting length of 11. increased cutting lengths can be achieved by evenly removing the chopping blades, beating arms and elevator paddles.
The PT0 shaft connection is from B2 to D. (Pick-up drive). The PT0 shaft connection is from B1 to D when in feed 3 is used for harvesting. The revolutions of the pick-up and the auger can be further reduced by changing from B 1 to B 2 when driving speed and crop allow.

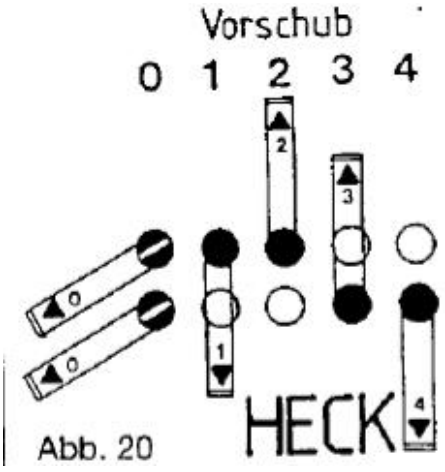


Abb. 20

| kemper | Schnittlängen | | |
|---|---|---|---|
| Messer / Vorschub | 12 | 6 | 4 |
| 1 | 4,3 | 8,6 | 12,9 |
| 2 | 5,4 | 10,8 | 16,2 |
| 3 | 6,5 | 13 | 19,5 |
| 4 | 11 | 22 | 33 |

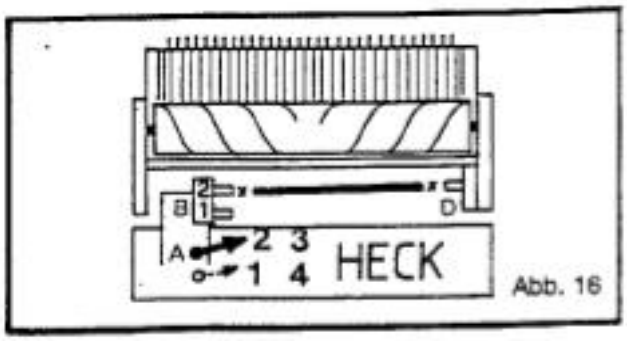


Abb. 16

# 5.5 Whole crop harvesting C3000

## Operating instructions for whole crop silage

In view of the growing interest in this form of Silage, a kit has also been developed for the Champion 3000 (for whole crop silage, winter barley, winter wheat, field beans, alfalfa, rape-seed, etc) for the pick-up, with which whole crop silage is possible in certain circumstances. The primary function of the header is for coarse-stemmed maize. Taking into account the advice below, in corresponding favorable conditions, such as standing dry crops, a good result can be achieved, but certain compromises are necessary for the cutting height, due to the construction principle and cutting system design.
Laid crops can also be successfully harvested, depending on the type of ground.
In extreme conditions, such as laid wet crops with undergrowth On sandy ground, experience in traveling speed, direction and the use of crop lifters is necessary.
.

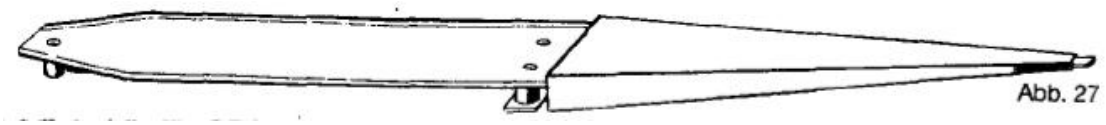


Abb. 27

## Accessories for Whole Crop Silage method

- Middle divider prongs: these are necessary for improved circulation in the channel and an improved stubble patter. Order N' 51995 (remove trapezoidal housing at end of centre divider).
- Cracking plate for further cracking of the crop. Part No. 52605.
- Stalk lifters See point 5.9. Part N ' 55965

## Forward speed, cutting rotor speed, gathering drum speed

In our experience, high speeds must be maintained for whole crop silage harvesting. As the traveling speed and gathering drum speed are interdependent, only general guidelines can be given here, as the crop itself is also a factor of influence.

**Forward speed**
To maintain a proper material flow it is important to have a large quantity of crop (as for short maize).
Forward speed should be 10-12km/h.

# 5.5 Whole crop harvesting C3000

**Generel**
To obtain a proper cut, the rotation speed of the saws for thin-stemmed crops should be higher than for maize or sunflowers.
In our experience, it is correct when the gathering drum speed is at least 28-36 rpm.

**CAUTION** The maximum speed of the gathering drum of 40 to 54 rpm must not be used due to the risk of injury (see introduction 4.12). The saw speed would likewise be too high.

**Note:**
It can be seen from the chart that when selecting the corresponding feed to achieve the required cutting length, there are only certain ways of connecting the plug combinations on the PT0 for the pick-up unit drive.

e.g.

| | |
|---|---|
| Chopping length | 6.5 mm |
| F. e-e.d - | 3 |
| PT0 connection | 1-1 |

**12 chopper blades**
(values shown in brackets for 6 chopper blades

| A Feed | Drum rpm | Harvesting length | B gear | C gear |
|---|---|---|---|---|
| 3 | | 6,5 (13) | | |
| | 32 | | 1 ▼ | 1 |
| 4 | 28 | 11 (22) | 2 | 2 |
| | 36 | | 2 ▼ | 1 |

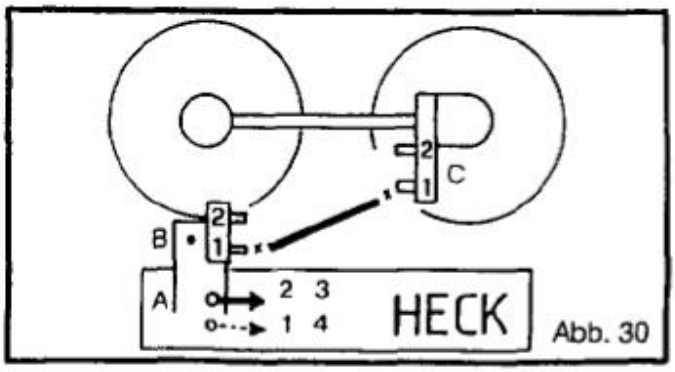


Abb. 30

# 5.6 Sharpening Device C3000

To obtain an optimum chopping quality use the sharpening device several times a day.

## Working with the Sharpening Device

Start chopper; PTO with **580 rpm**;
**header is out of work!**
The disc must revolve when sharpening; eventually the revolutions of the tractor must be increased until sparks fly.

open sharpening stone protector

Release security bolt of sharpening device.

Move the sharpening disc carefully towards the blades. After contact has been made between blade and sharpener, turn the rear star handle a further ¼ turn.
After this adjustment, the shaft of the sharpening disc is prevented from moving further against the blade by the star handle on the side.

**Note:** The sharpening disc is harder with increased revolutions and softer with reduced revolutions. If the sharpening disc seems to be too hard it is because of the high number of revolutions of the blade wheel. Too hard: reduce revolutions Too soft: increase revolutions With too many revolutions there will be a smooth and shiny sharpening disc surface. With a lower number of revolutions, the disc will have a good grip. If this does not happen immediately, the contact pressure should be increased for a short while. It is often enough to slightly score the wheel with a flex.

After sharpening:
- turn back sharpening device
- fix it with lock bolt
- close protector

# 5.6 Sharpening Device C3000

## Adjust chopping wheel!

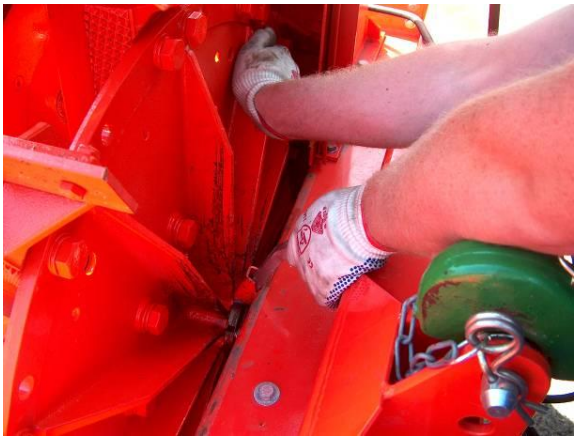
After sharpening the chopping wheel must be adjusted towards the counter blade. Even to compensate for wear check twice daily that the blades are parallel to the share bar.

Open wheel protector.

Release securing spring to release nut.

Insert 16 mm rod in adjusting nut

# 5.6 Sharpening Device C3000

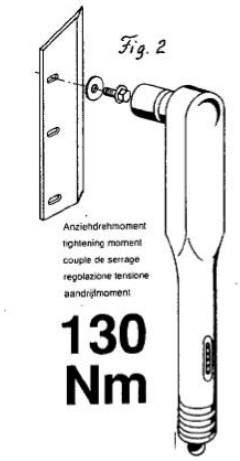


Turn flywheel manualy until the blades touch the share bar.

Then turn flywheel one spring turn back.

The flywheel should not touch the share bar. Repeat adjustment.
The gap between the blades and share bar should not exceed 0,5 mm.

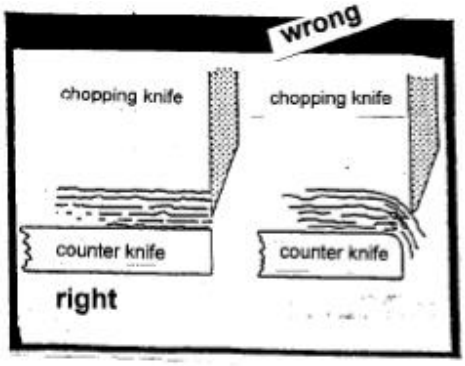
The blades positionning is obtained by the long wholes. Even often sharpend blades can be set close to the shear bar.




**Attention: Respect torques**

# 5.6 Sharpening Device C3000

## Change or turn shear bar!




Control counter blades often.This saves fuel and ensures good chop quality

See prcompression drums

## Ejector plates

A high transportation performance of the chopped crops is depending on good ejectors. They can be turned four times.

## Alignment of the flywheel

The flywheel is completely aligned at the factory. For this reason use only genuine Parts. Blades. blade holders & rocker paddles can only be changed as pairs.

The maxirnum allowable weight difference is 20 grams.

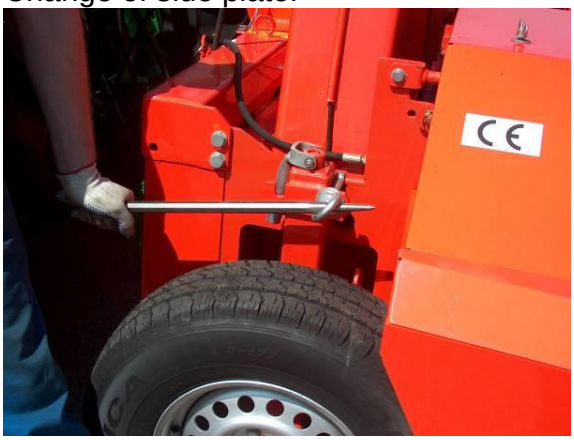
# 5.7 Interchangable plates C3000

**Depending of the harvesting crop the ground plate of the chopping wheel has to be changed.** The Champion is designed with easily interchangeable:

- Smooth plate for grass
- Perforatetd cracing plate for maize
- By using a perforated plate the corn is better cracked. A more powerful tractor is needed.
- If the C3000 is equipped with UNICRACKER a smooth plate is needed

## The Champion chopper has a bottom and a side plate.

Change of side plate:




Lift chopper
Release bolt and
Fold support wheel sideway

Release lever and pull plate

Take out plate on bottom side of chopper
Lift wheel a little bit.

# 5.7 Interchangable plates C3000

**Improtant:**
Place center bolts into wholes in housing for correct working

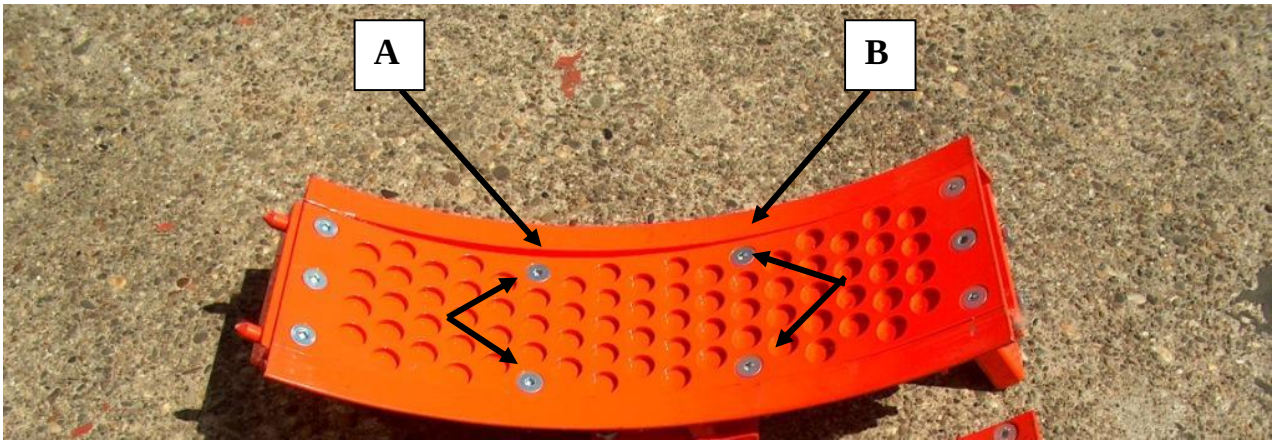
## The side cracing plate can adjusted to different corn diameters

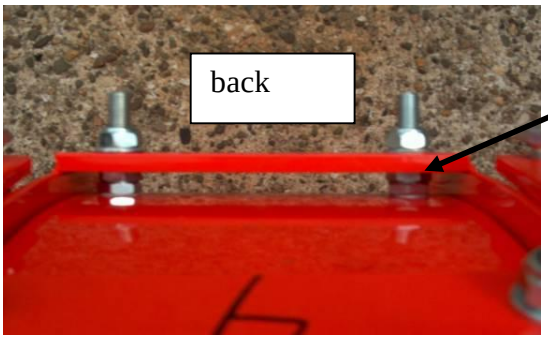
The cracking plate works by means of an interchangeable perforated plate and varying the gap from the rocker paddles: The plate must fit flush at the bottom.

The gap is 8 mm at section A-B, and 3 mm at section C-D.

The bolt **A** is factory side put at 10 mm distance.

The bolt **B** is factoy side put at 3 mm distance.




Release security nuts
After changing the distance tighten security nuts.

# 5.7 Interchangable plates C3000

At the top the plate should be fitted as close as possible to the rocker paddles for ejection capacity.

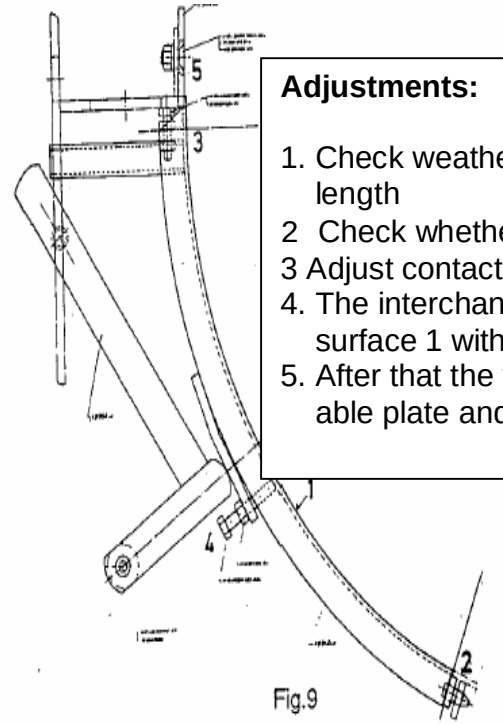


Fig.9

**Adjustments:**

1. Check weather the interchangeable plate covers the entire length
2 Check whether the contact points coincide
3 Adjust contact point II if necessary. with screw M4x10
4. The interchangeable plate can be applied to sealing surface 1 with screws M12x60
5. After that the wear plate is positioned on the interchange-able plate and screwd tight.

# 5.7 Interchangable plates C3000

## Change of the bottom plate

Lift chopper to change. The bottom plate ca be changed by releasing ten bolts.

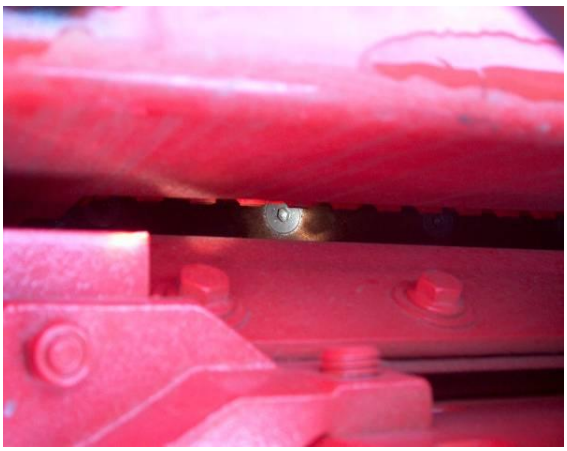
10er release bolt

## Dobble use of plates

The effective use of the cracking plates can be doubled by turning working direction.

# 5.8 Check and change shear bar C3000 and adjust smooth roller

## Check shear bar



From the top of the fly wheel the shear bar can be checked visually

To change shear bar lift up intake rollers. Therefore release one tour both sides the upper front bolts

Take of bottom bolts on both sides.
M12X 30: 2 left side
2 right side

## 5.8 Check and change shear bar C3000 and adjust smooth roller

Lift up feed rollers with a long tube.

The PTO shaft will open. For readjusting PTO shaft has to be put in together

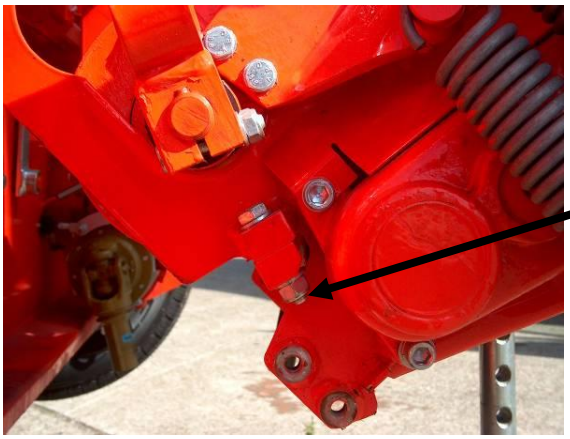
Before working put stand under lifted rollers.

# 5.8 Check and change shear bar and adjust smooth roller C3000

## Change shear bar

The shear bar can be checked, changed or turned

## Adjust scraper of smooth roller

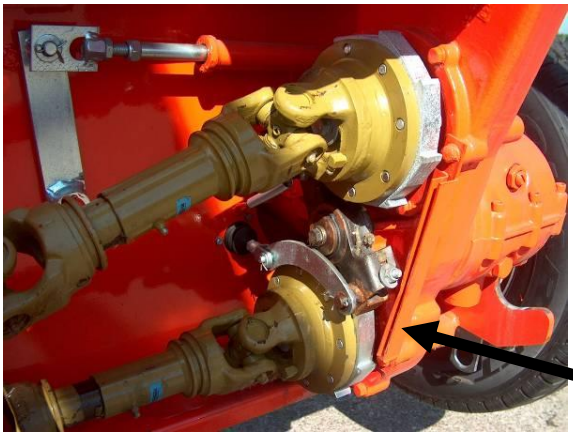


To adjust scraper release bolt M12. Adjust the scraper so that the gap between this and the smooth roller is no more than 0,5 mm and tighten screws firmly.

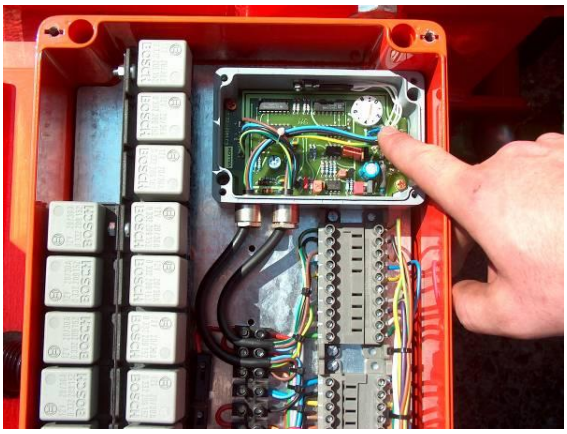
# 5.9 Metalldetector C3000

If the chopper is equipped with a metaldetector there are some hints:

- Electronical steering box
- bottom rubber feed drum ;
- clutch grips between drums and gearbox



The sentivity of the metal detector can be adapted. Turn potentiometer in box.
**1 = less senitive**
**8 = very sensitiv**



In the electronic box there is a 8 ampere fuse.
To open press and turn housings

**Before harvesting check function of detector**

1. **Electric on, PTO off**
2. **push joystick in position intake**
3. **push carefully a metal part close to .the rubber drum**
4. **clutch grip is closing Detector okay**
5. **If clutch grip does not close contact your dealer**

**Automatic fuel intake stop**

# 5.9 Metalldetector C3000

The drive for the two front gathering drums, precompression and feed rollers is via the PTO, flywheel and gearbox. If foreign objects or clods cause, a blockage, the fuel flow to the intake System can .be cut off instantly (lever 10 at position "Autom. **0")** or can be put into reverse drive.
An impulse is passed via lever switch 10 to the lifting spindle 27, which releases the tension on the triple V-belt, thus cutting off the fuel supply.
The lifting spindle 27 continues to turn and the lever 68 of gear 30 moves to the neutral position.

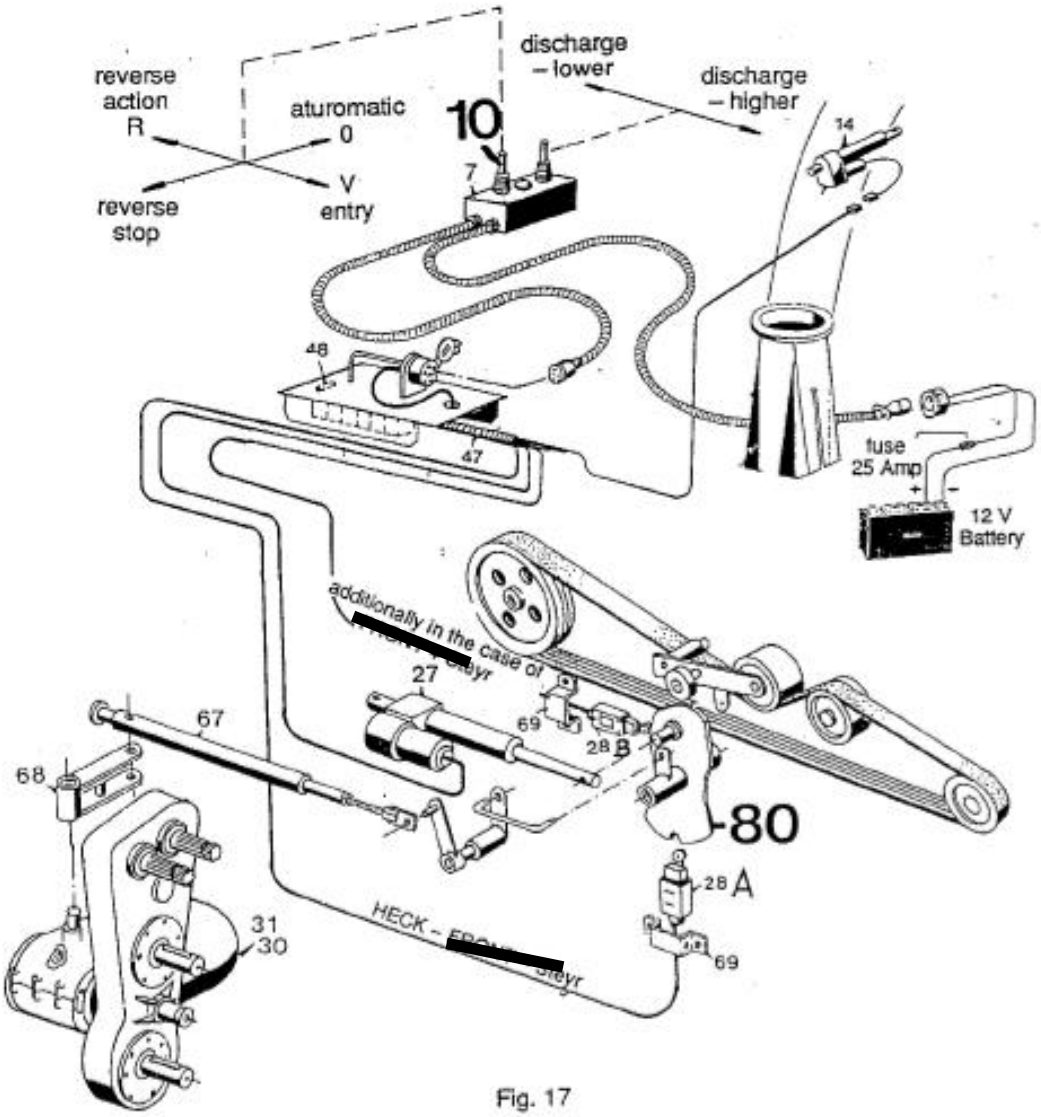



Fig. 17

## Adjustment after repair or replacernent

When checking the System or replacing components, please follow the instructions below: Fig.

# 5.9 Metalldetector C3000

1. The lifting spindle 1 is first connected to the cam plate 2 and set at an angle of 5° [position **0).** In this position, the tension roller is in the middle of the cam plate.
2. The position switch 28A is then in the centre.
3. The operating lever 5 is likewise in the centre position (ball clutch).
4. After these basic adjustments, the distance between connections ***6*** and 7 is a dimension X.

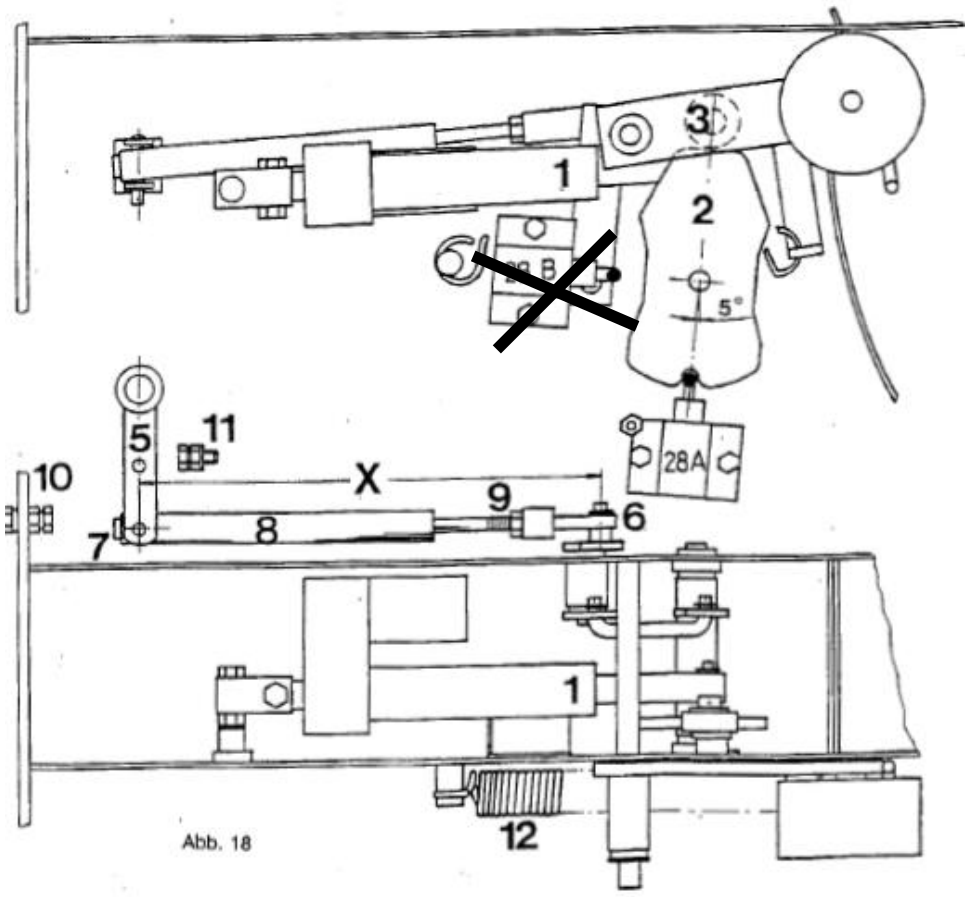


Abb. 18

5. This distance X can be adjusted on spring cylinder 8 by means of nut 9. Spring cylinder 8 is then connected to operating lever *5.* The two adjusting screws 10 and 11 act as stops to limit the forward and reverse travel of the gear lever.
   **Adjustment:** Set operating lever in end position by means of the spring cylinder, turn screw 112 turn anti clockwise and lock with a lock nut.

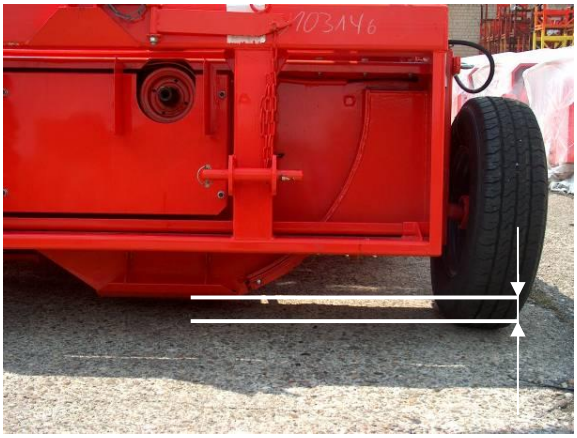
6**.** Spring 12 is particularly critical for correct V-belt tension. It should therefore be checked regularly.
7. The position switch 28A detects the position of the lifting spindle I: forwards, neutral or reverse. The correct position is when the tension roller 3 is the Same distance from the carn plate *2* in forward or reverse.drive. '

8. The limit switch 28B cuts off the current to the lifting spindle 1 just before it reaches its end position. (Versions with detector only).

# 5.10 Working with the chopper C3000

## Working conditons of the header

Connect header in base position so that PTO shaft is horizontal. Choose length of the top point so that chopper is vertical behind the tractor.



To avoid damages on the chopper during the work adjust support wheel to obtain 5 cm between ground and the fly wheel housing.


Lift tractor hydraulic about 12 cm that wheels do not touch the ground by harvesting.

**To lift header at the end of the field use only hydraulic cylinders on the chopper.**

# 5.10 Working with the chopper C3000

## PTO revolutions


Use PTO 1000 rpm

To obtain an regular an good chopping quality keep PTO revolutions regular.

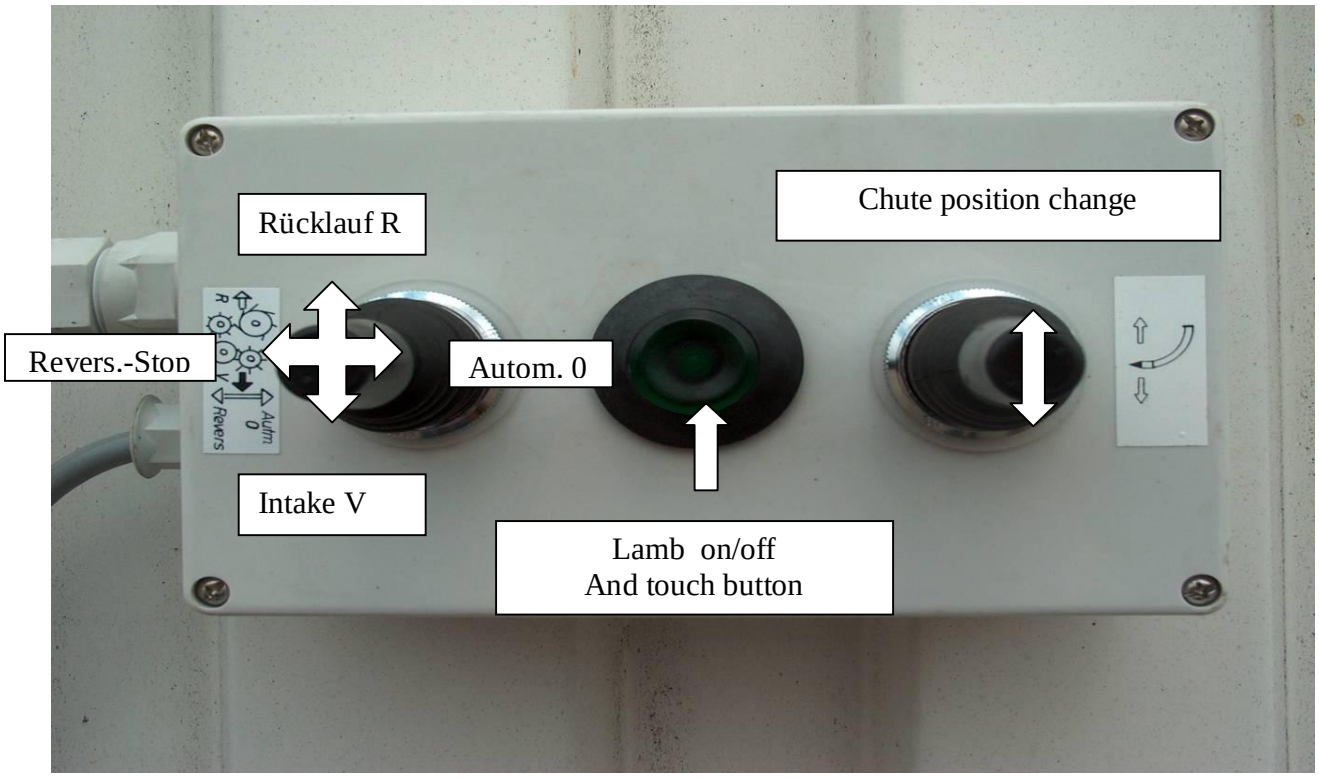

Never use 4 th gear for security reasons and to protect gearbox.
If you need different cutting length take out knives.

## Connecting intake components


When commissioning the crop-chopper, whether with the rnaize header or the grass pick-up, we always recommend running the intake unit with the tractor idling. Due to the always speed of the blade rotors and relatively high oscillating mass, intake at full speed should be avoided as far as possible. Engaging and disengaging (reversing in the event of blockages) at full speed, including in quick succession, can then be done provided the blade rotors more or less maintain their speed in relation to idling.

# 5.10 Working with the chopper C3000

## Command terminal




„Revers – Stop“ =function activ only with metal detector. To release grip security

„Revers“ = gearbox moves backwards

„Intake“ = gearbox runs intake

Automatic O = gearbox changes into neutral position

## 6. Lubrication Chart

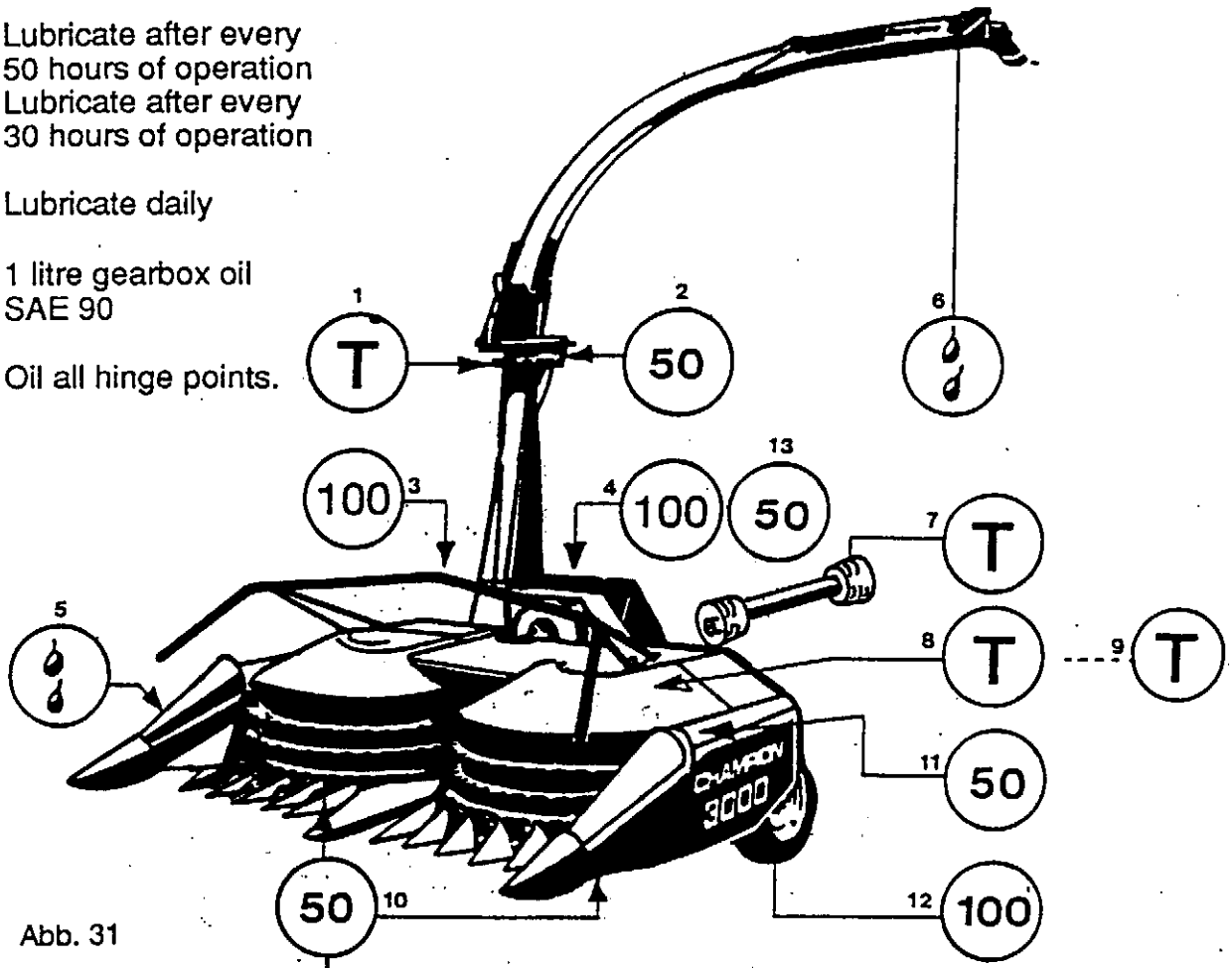
50 = Lubricate after every 50 hours of operation

30 = Lubricate after every 30 hours of operation

T = Lubricate daily

1 = 1 litre gearbox oil SAE 90

= Oil all hinge points.

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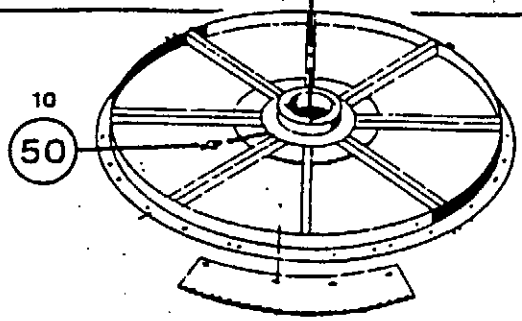


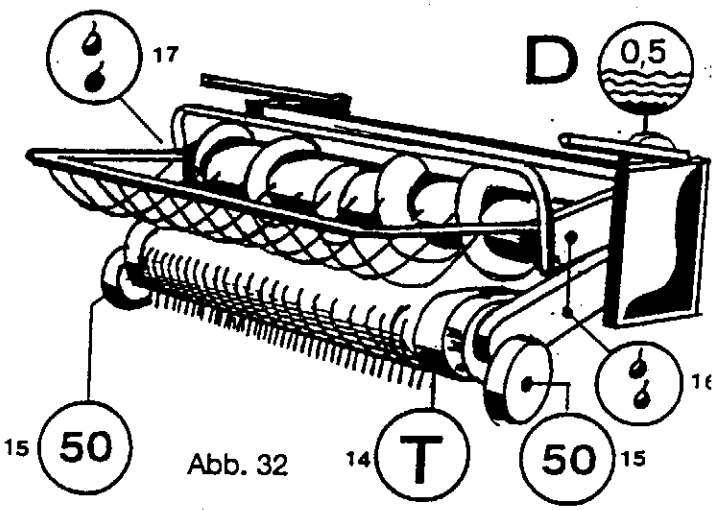
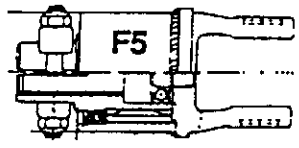




Abb. 32

Abb. 33

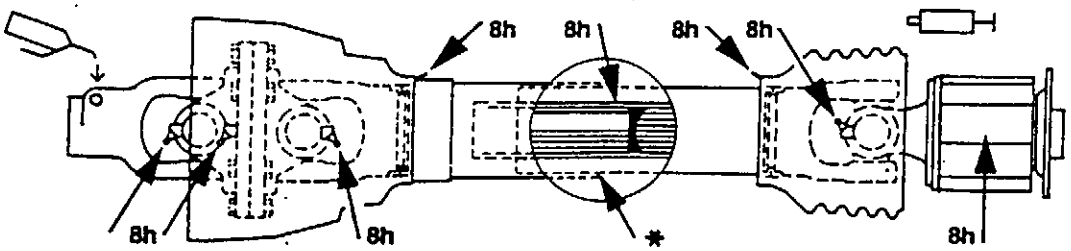
Schmierplan
Frequency of lubrication
Plan de graissage




**Vor Inbetriebnahme abschmieren**

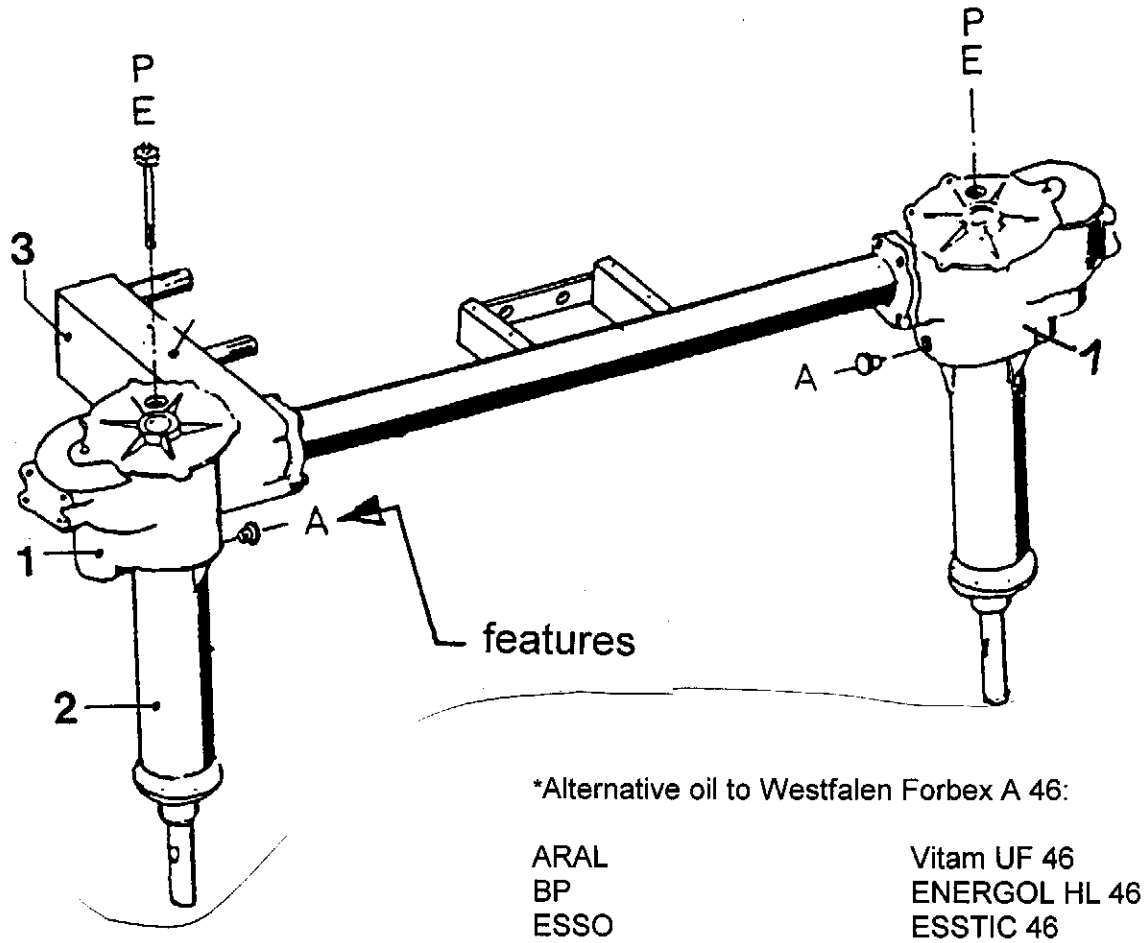
**Grease before putting into operation**

**Graisser avant mise en service**




* Im Winterbetrieb sind die Schutzrohre zu fetten, um ein Festfrieren zu verhindern!
* When used in winter, the guard tubes must be greased to prevent them from freezing solid!
* Avant l'utilisation en hiver, graisser les tubes protecteurs contre le gel!

h = Betriebsstunden
h = hours in operation
h = heures en service




*Alternative oil to Westfalen Forbex A 46:

| | |
|---|---|
| ARAL | Vitam UF 46 |
| BP | ENERGOL HL 46 |
| ESSO | ESSTIC 46 |
| MOBIL | D.T.E. medium oil |
| SHELL | TELLUS C 46 |
| TEXACO | RANDO Oil 46 |

**Changes to Champion C 3000 spur wheel angular drive**

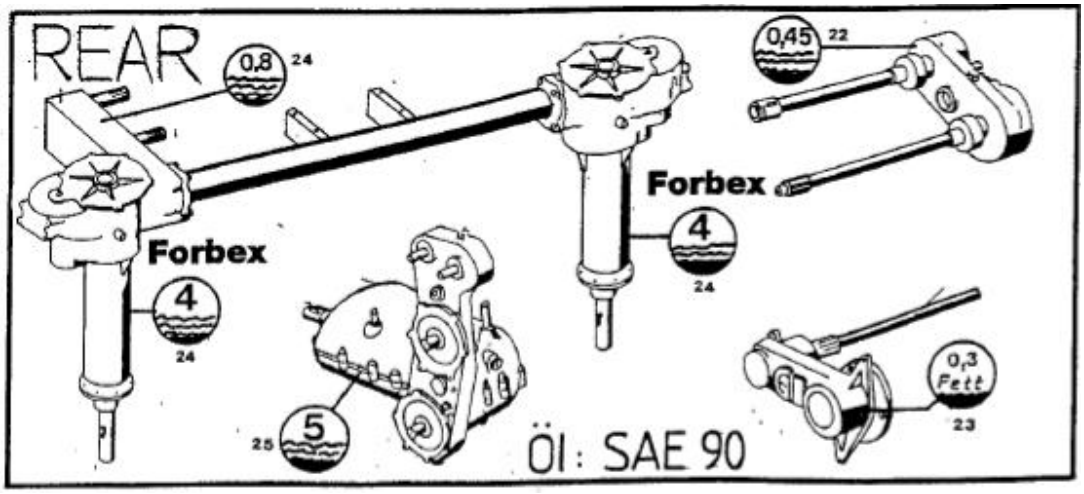
Starting with Machine No. 96 - 46495, model 96 a modified drive has been installed on the Champion C 3000:

A Case 1 is filled with approx. 2.5 litres of Forbex A 46*
B Case 2 is filled with high quality roller bearing grease (Gresalit LZ 7 Westfalen)

During repairs or oil change please make sure that:

1. Due to the high load on the gears, use only high quality gear oil SAE 90.
   Gear 1 = approx. 2.5 litres
   Gear 2 = approx. 0.8 litres
2. Roller bearing grease in Case 2 is changed only during repairs
3. A test run with the tractor in idling speed should be made after installing the gear or changing the oil.
4. After an appropriate waiting period, the oil level should be re-checked with the dipstick P.
5. The new gear can be recognized by the position of the discharging screw.

1.Chute rotation point - 2 nipples
2 Worm gear
3 Front flywheel bearing
4 Rear flywheel bearing
5 Torpedo dividers - Rotation point
6 Hinged part of ejector double flap
7 Drive PT0
8 PT0 for gathering drums
9 PT0 for feed rolls
11 Feed roll bearings - 2 nipples
12 Spindle - thrust capstan
13 Flywheel hub and flywheel shaft = 2 x
14 Pick-up bearing cam-plate
15 Height adjustable support wheels
16 Roller chains - worm-gear and pick-up
17 Hinged points on holding down device
20 Spur gear Drums
21 Transmission gear Drums
22 Spur gear Precornpression roll
23 Spur gear Feed roll
24 Transmission gear 3 gears
25 Reverse gear 2 gears
26 Spurgear Pick-up
For detector:
27 Spur gear Precompression roll
28 Spurgear Feed roll



# 7 SERVICE AND MAINTENANCE

An essential criterion for profitable operation of your new Champion is constant servicing and maintenance. It depends on you whether you incur expensive repairs due to superficial treatment of these points.

h = hours

**tractor protective sheld, universal joint shaft protector and protective device on side of apparatus are to be regularly maintained.**

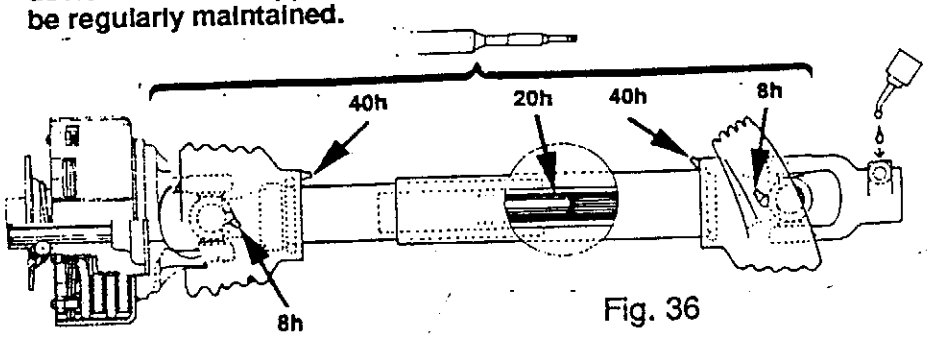



Fig. 36

## 7.1 DAILY MAINTENANCE

- Sharpen chopping blades several times a day
- Adjust flywheel so that it is centred over shear bar
- Adjust flywheel at least twice daily even if blades have not been ground.
- Check all 16 saw blades under gathering drums, check for blockages due to foreign objects
- Check shear bar
- Lubricate according to chart
- Tighten all bolts and screws

## 7.2 WEEKLY MAINTENANCE

- Tighten all bolts on flywheel
- Check shear bar - reverse if necessary
- To change shear bar - Remove header. Remove the 4 bolts at the bottom of the feed-roll housing and slacken the 2 at the top. Tilt housing upwards to access the shear bar.
- Lubricate according to chart.

## 7.3 YEARLY MAINTENANCE

- Clean and preserve machine parts.
- Change all gearbox oil. Watch quantities on refill !
- Check all wear parts.
- Order original spares in good time
- Check V-belt
- Check friction couplings on cardan shaft
- Check hydraulic lines and connections
- Check entire housing with feed and precompression rolls

## 7.4 SERVICE AND MAINTENANCE AT BEGINNING OF SEASON

- Read Operators Manual again.
- "Run up" and check bearings for overheating, noise, etc.
- Lubricate machine completely.
- Check all bolts for tightness.
- Check saw blades, crop chopper blades and shear bar.

### TIGHTENING TORQUES

| | | |
|---|---|---|
| **M12** | = | **70 Nm** |
| **M16** | = | **180 Nm** |
| **M18** | = | **250 Nm** |
| **M20** | = | **360 Nm** |

Abb. 37

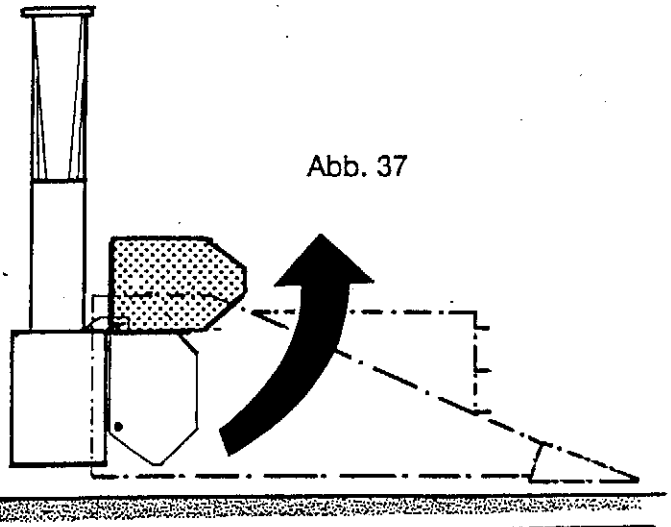
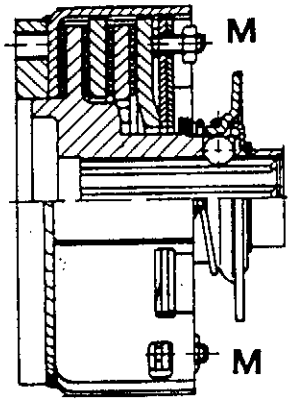


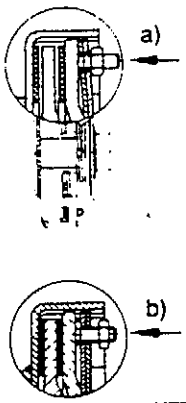
Fig. 37

Abb. 38




WALTERSCHEID

K92




| (D) | (GB) | (F) | (NL) | (I) |
|---|---|---|---|---|
| Vor Ersteinsatz und nach längerer Stillstandszeit Arbeitsweise der Reibkupplung überprüfen. | Prior to first utilisation and after long periods out of use check working of disc clutch. | Avant la première utilisation et après un arrêt de fonctionnement prolongé, vérifier le fonctionnement du limiteur à friction. | Bij de eerste maal in gebruikname en na langere tijd buiten gebruik te zijn, de platensliptkoppeling op goede werking kontroleren. | Prima dell'impiego e dopo prolungata inattività controllare il funzionamento del limitatore di coppia. |
| a) Muttern anziehen, wodurch Reibscheiben entlastet werden. Kupplung durchdrehen. | a) Tighten nuts until friction discs are released. Rotate clutch fully. | a) Serrer les écrous sous lesquels les disques à friction sont délestés. Tourner le limiteur. | a) Moeren aantrekken, daardoor komen de koppelingsplaten vrij. Koppeling doordraaien. | a) Stringere i dadi in modo da sbloccare i dischi ferrodi. Far girare il limitatore di coppia a vuoto. |
| b) Muttern bis Gewindeauslauf zurückdrehen. | b) Turn nuts fully back. | b) Desserrer les écrous jusqu'à l'extrémité du filetage. | b) Moeren terugdraaien tot einde schroefdraad. | b) Allentare i dadi fino all'estremità del filetto. |
| Kupplung ist wieder einsatzbereit. | Clutch is ready for use. | Le limiteur à friction est prêt a fonctionner. | Koppeling is weer gebruiksklaar. | Il limitatore è nuovamente reinserito. |

Fig. 38

## 7.5 CHECKLIST FOR SAFE USE OF THE CHAMPION

Smooth operation can only be achieved with a technically perfect machine that is properly maintained every day. Follow separate instructions for detector version.

1. **Check torpedo dividers**

   Torpedo dividers must be height-adjustable and the outer dividers must turn easily.

2. **Gathering drums**

   Bearings and fixings to be checked on large gathering drums.

3. **Saw blade rotor**

   Check saw blades and cleaner for condition, sharpness and adjustment. To avoid imbalance: only change in opposite pairs.

4. **Pick-up**

   Check the pick-up drum for any broken tines and bent prongs. Check curved path for alignment. If worn, this must be replaced to ensure good tine control.

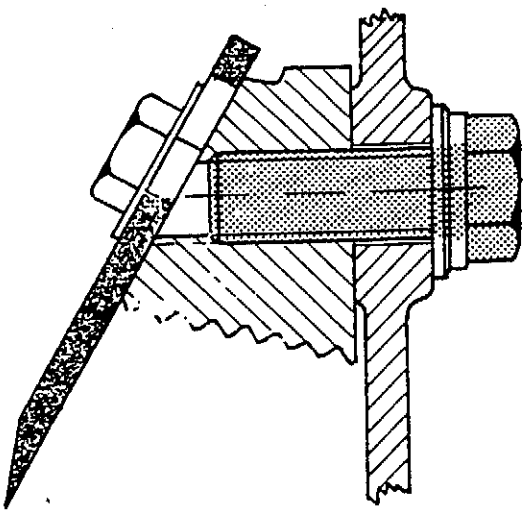


Fig. 39

**Important:**
Screw M20 x 50 must not press against chopper blade.

5. **Check intake units**

   Check state of precompression rolls, feed rolls and bearings.
   Important note: adjustment of stripping plate to last smooth roll - this must always be close to the roll but should not hinder rotation.

## 6. Check shear bar

Every machine operator must bear in mind that a crop chopper is designed to achieve high-performance techniques. The chopper components need maximum power and must therefore always be in prime condition. Shear bars should therefore be checked daily.

## 7. Flywheel

Clean screw fixing surfaces on the crop chopper and firm screw seatings taking into account the specified torque values are prerequisites for safe operation. Good chopping quality and low power consumption can only be achieved with properly ground blades in top condition. The striker plates under the blades are to be checked for war, adjustment and soiling. Adjust blades to centre.

## 8. Smooth plate / Cracker plate

These two plates must be in good condition.

## 9. Hydraulics

Check whether all hoses, couplings and connections are in order.

## 10. Electrics

In addition to the general system functions, the servomotor for reverse gear and the limit switch should be checked, as fast changeover of the entire intake unit in the event of a blockage is dependent on this function.

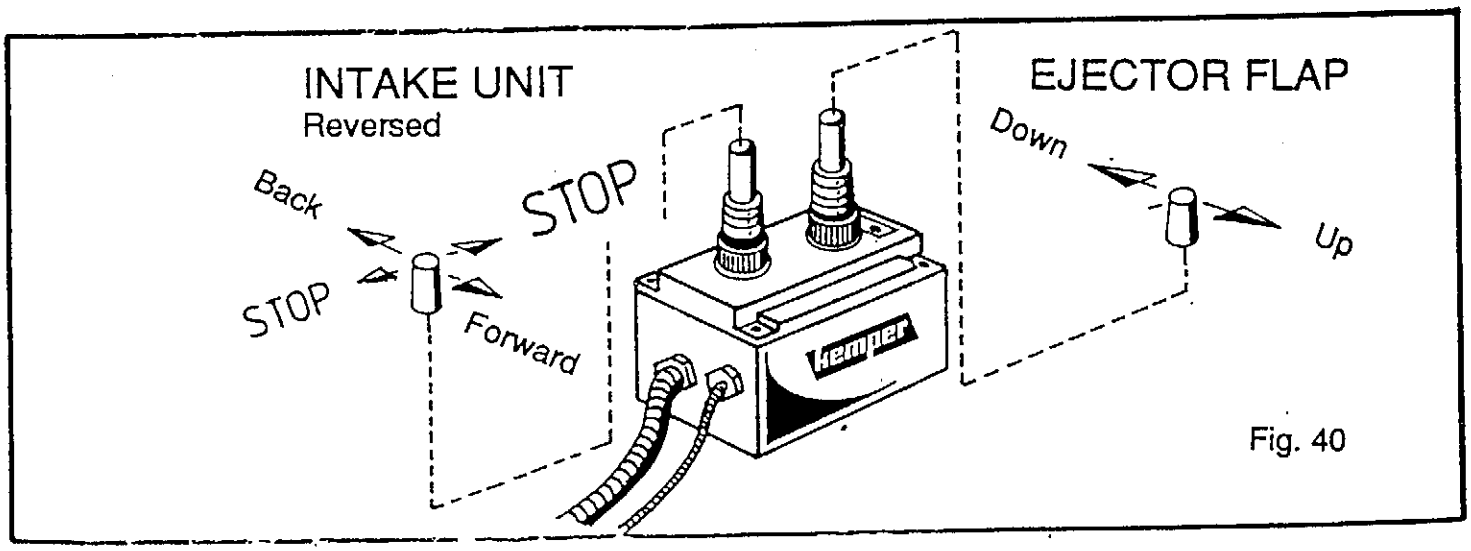



Fig. 40

# 8. TROUBLESHOOTING

1. **Problem**
Gathering drum stops

**Cause**
Foreign objects causing blockage

**Remedy**
Switch into reversing gear
Remove foreign objects

---

2. **Problem**
Gathering drum does not collect up enough

**Cause**
Gathering drum and travelling speed wrong

**Remedy**
Increase gathering drum speed - see page 6

---

3. **Problem**
Stems poorly cut

**Cause**
Cutting blades blunt or worn out
Wrong intake speed
Driving speed too high

**Remedy**
Change blades

---

4. **Problem**
Poor chopping quality

**Cause**
distance between chopping blade and counter blade too large

**Remedy**
sharpen blades - adjust centrally

---

5. **Problem**
Increased power consumption

**Cause**
Saw blades blunt
Shear bar blunt

**Remedy**
Sharpen blades
Fit new shear bar

---

6 **Problem**
Corn not cut correctly
Stem pieces in chopped crop

**Cause**
Distance too great between chopping blade and shear bar
Revolution count too low

**Remedy**
Centrally adjust blade wheel
Increase rpm and maintain a minimum of 1000 rpm constantly

7 **Problem**
Header too low

**Cause**
Spring tension on pick-up spring balance too low
Skids adjusted too high

**Remedy**
Increase spring balance tension on plates

Re-adjust skids to lower position

---

8 **Problem**
Sharpening device vibrates

**Cause**
rpm of blade wheel too high
Pressure of sharpening unit too great

**Remedy**
decrease rpm and pressure

---

9 **Problem**
reversing gear motor not working

**Cause**
Voltage too low

**Remedy**
Check that 4-quad cable is directly connected to battery
See point S3.16 C.

---

10 **Problem**

Vibration of machine indicates that leaves, weeds and dirt collected under the blade rotors are causing imbalance

**Cause**
Leaves

**Remedy**
Clean blade rotors
Check cleaners on both rotors

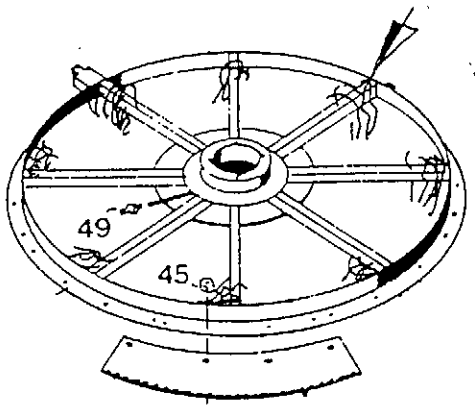



Fig. 41

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11 **Problem**
Leaves collected in rear intake channel on strippers

**Remedy**
Clean strippers if tines bent up or down on gathering drum

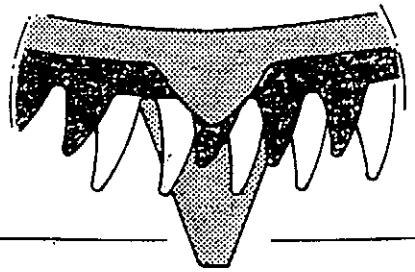
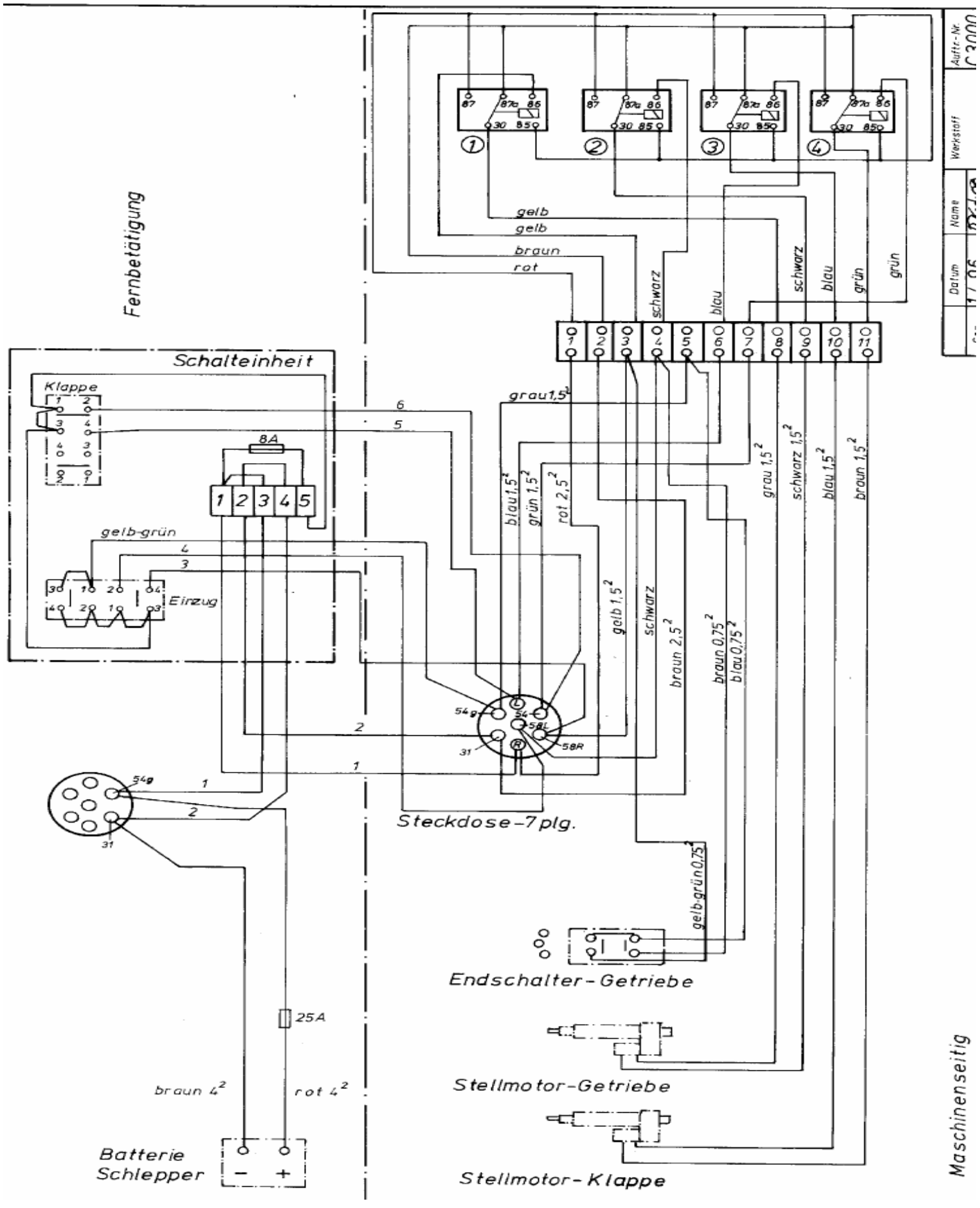
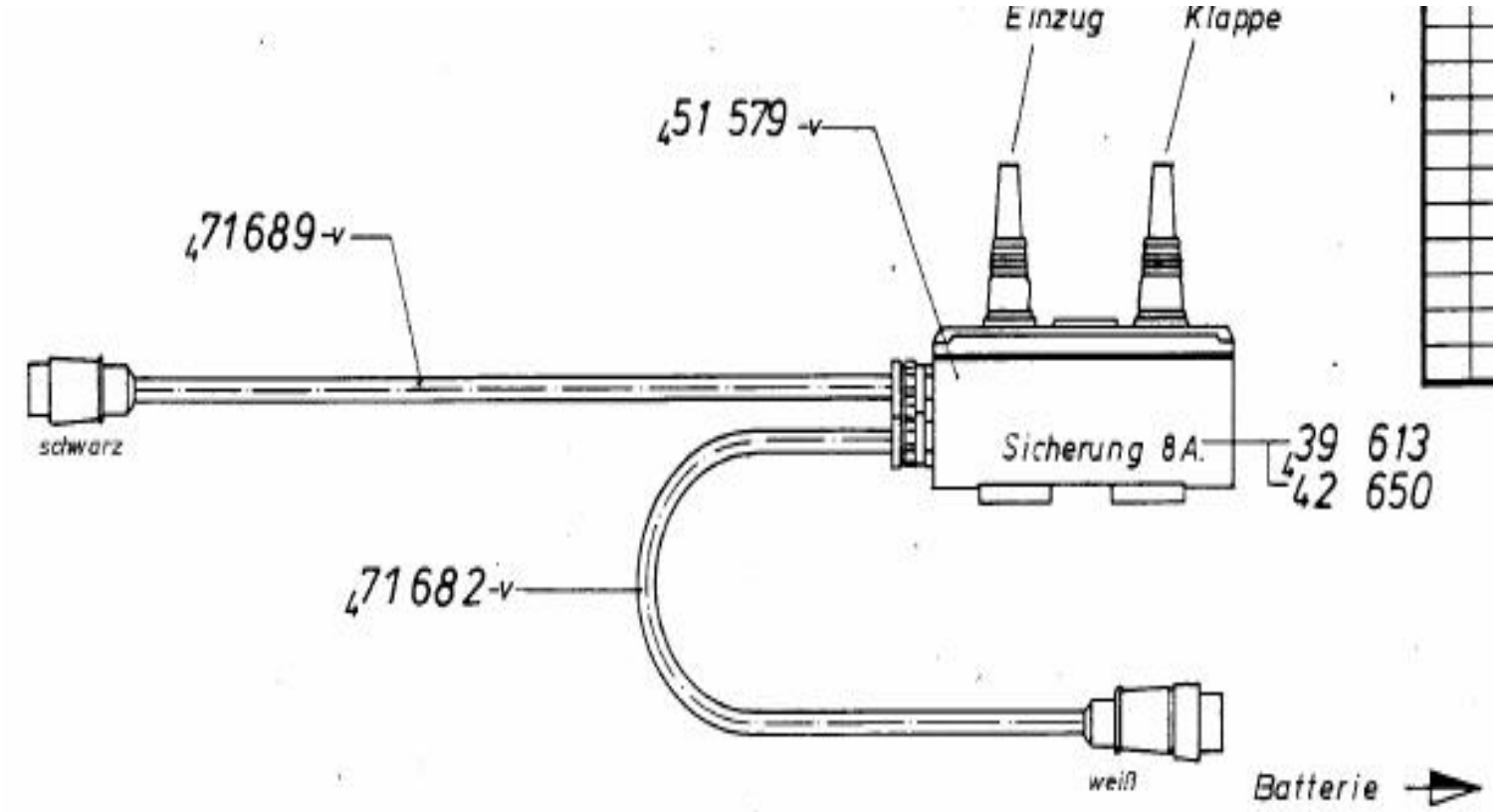


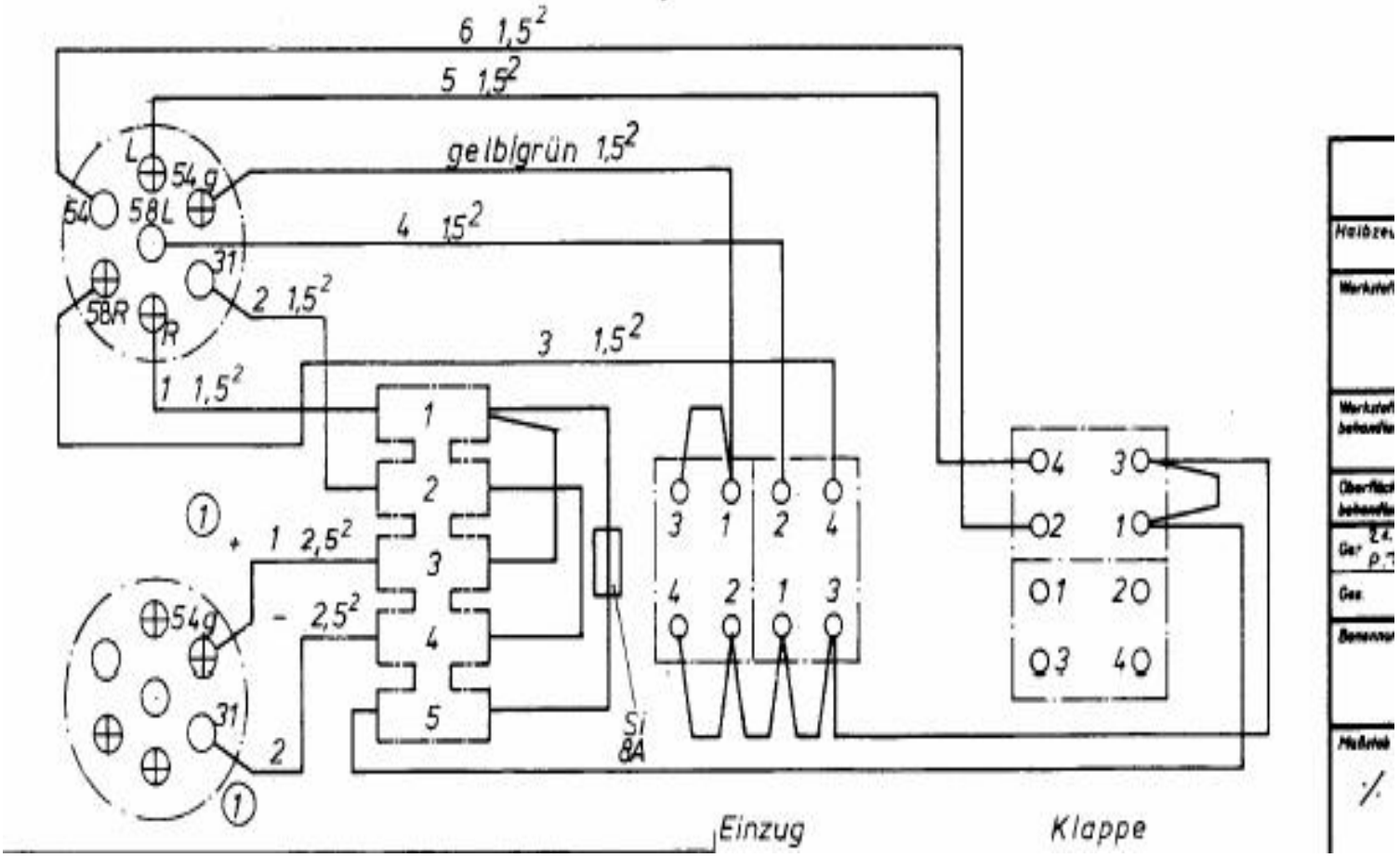
Fig. 42

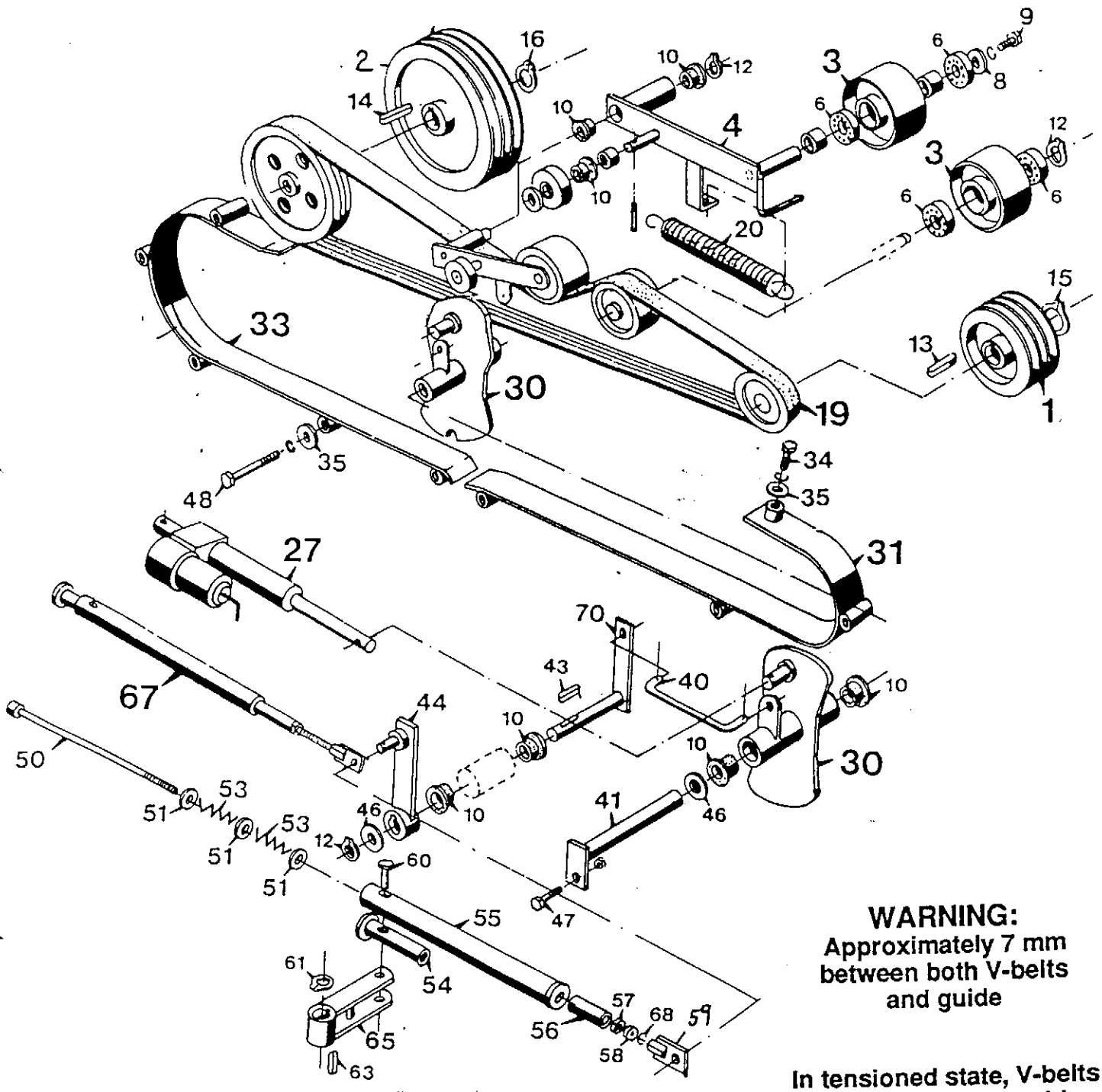
# 9.1 Circuit diagram C3000



## 9.2 Circuit diagram - Remote control C3000

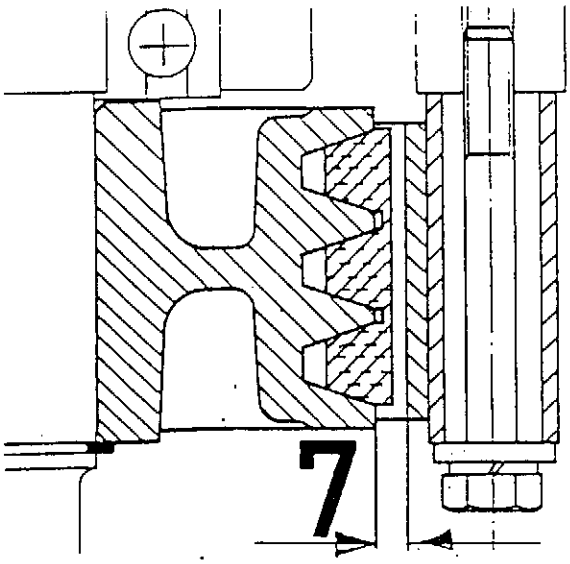


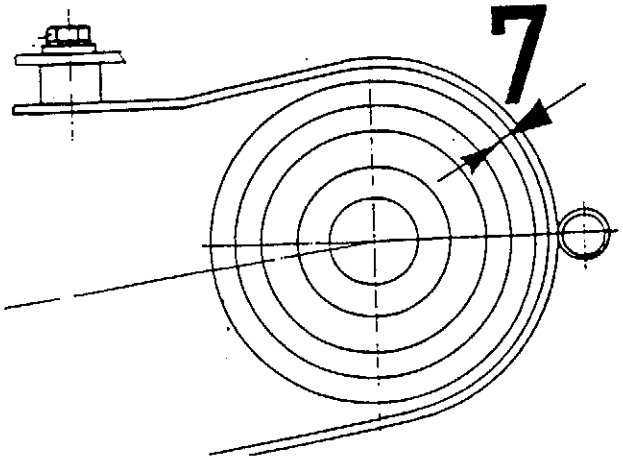






**WARNING:**
**Approximately 7 mm between both V-belts and guide**

**In tensioned state, V-belts should not touch guide.**



# SCHEMATIC DIAGRAM

## ASSEMBLY AID
## SHOWING CHAMPION - REAR

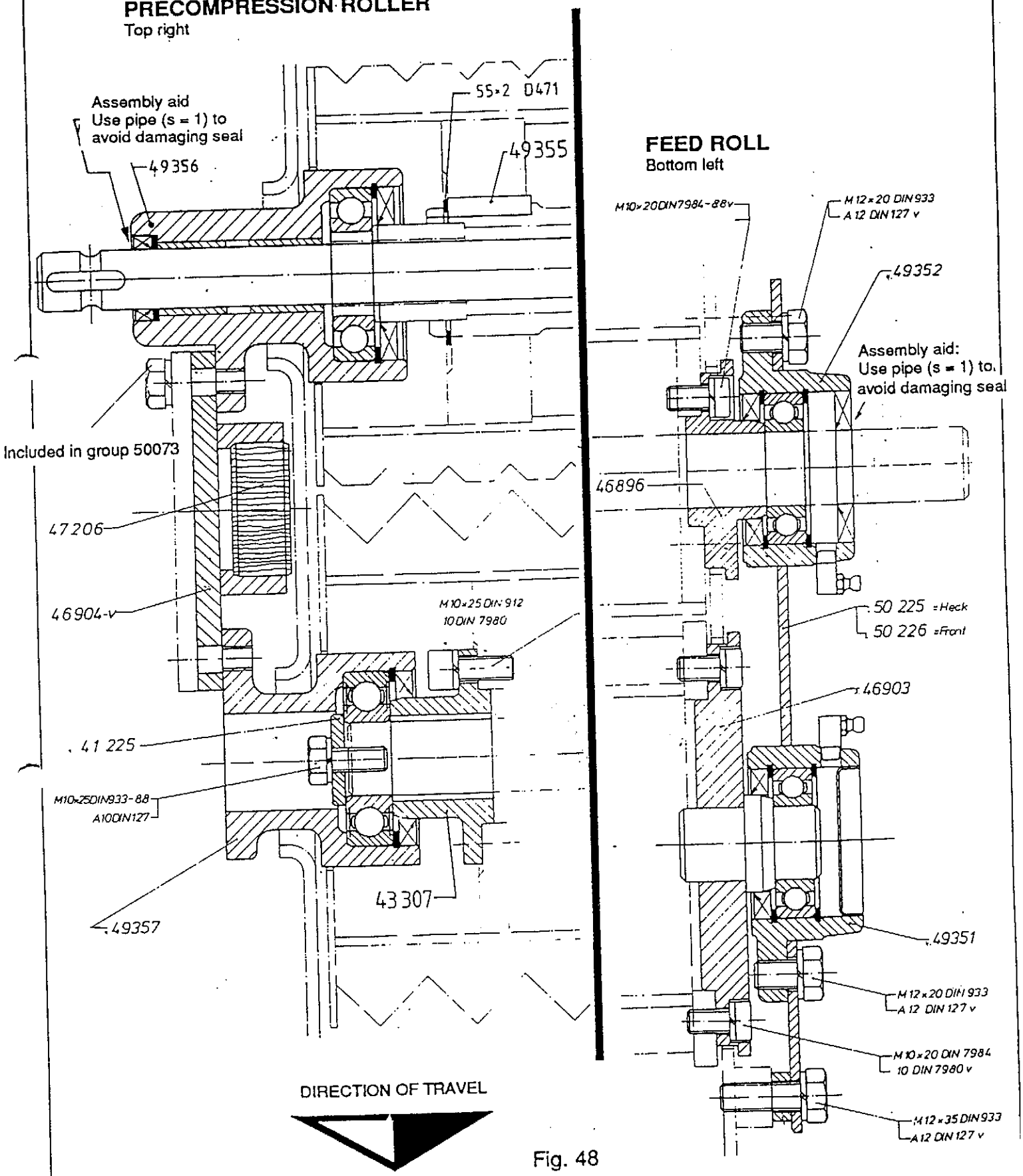



Fig. 48

# FEED AND PRECOMPRESSION ROLLS WITHOUT DETECTOR

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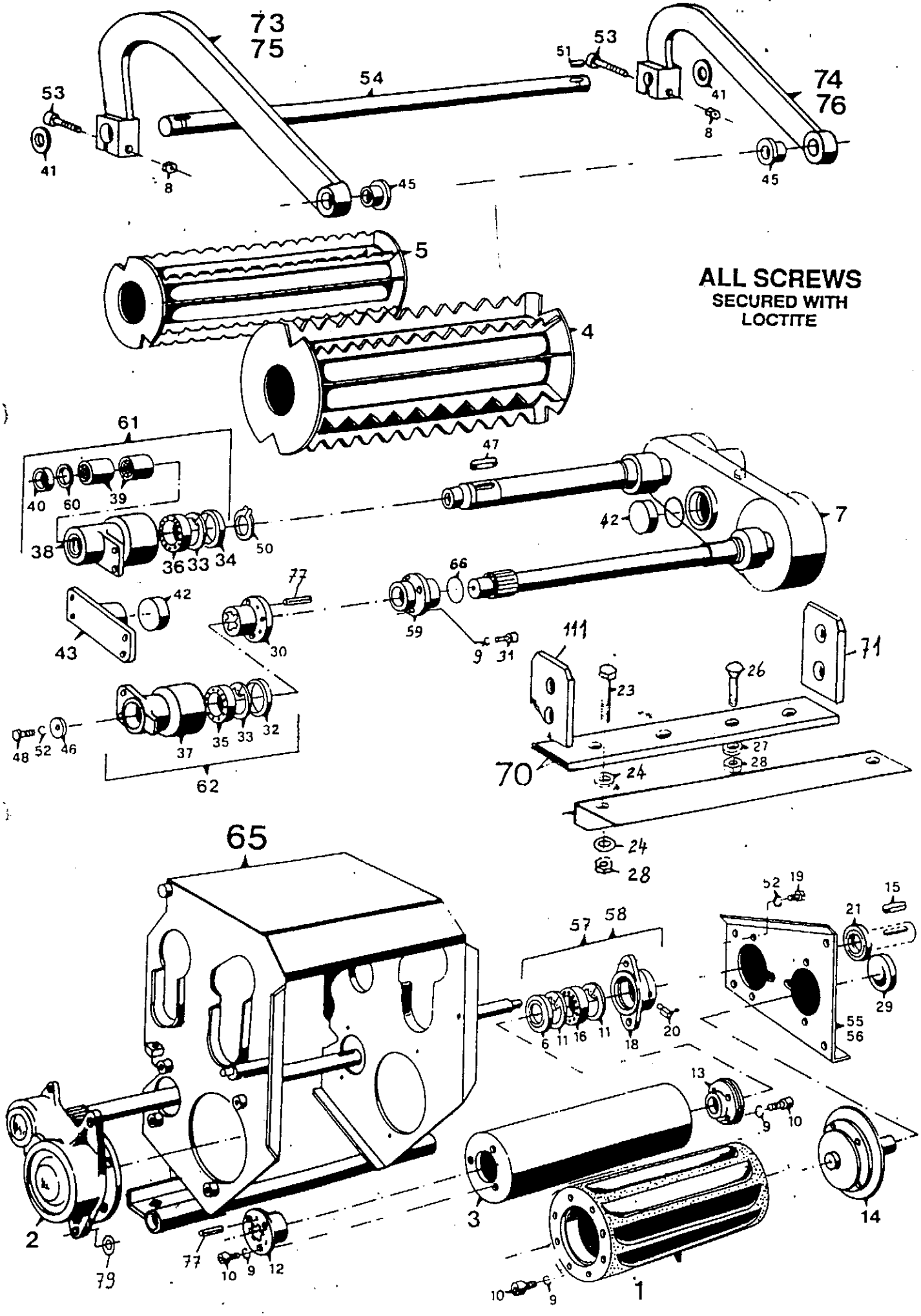
Edition: 8705



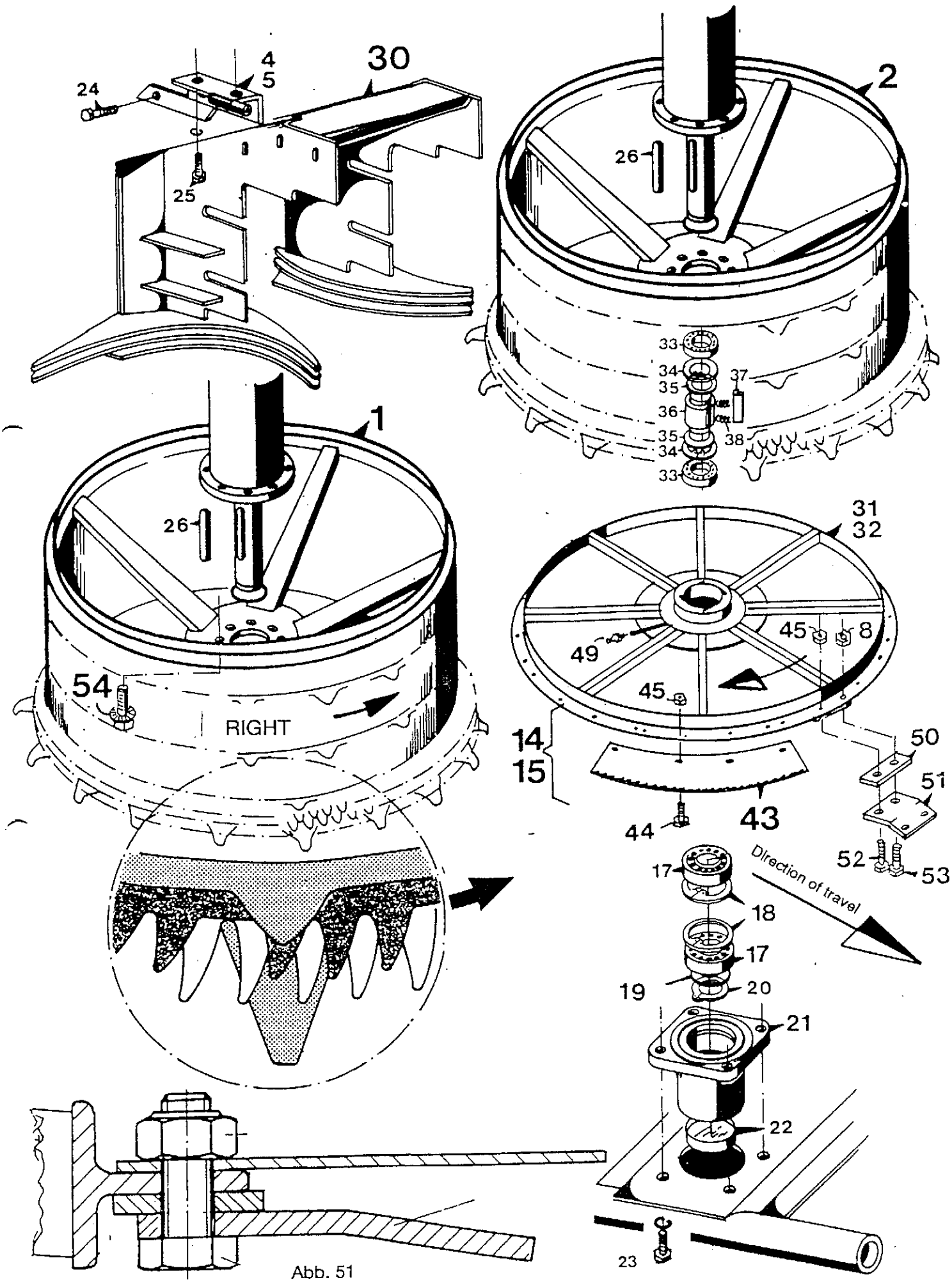

30
4
5
24
25
2
26
33
34
35
36
37
38
1
54
RIGHT
31
32
45
8
49
14
15
50
51
44
43
52
53
Direction of travel
17
18
19
20
21
22
23

Abb. 51

| | Nr. | Part N° | Description | | N° Off | Remark |
|---|---|---|---|---|---|---|
| | 1 | 53032 | Gathering drum | right | 1 | |
| | 2 | 53031 | Gathering drum | left | 1 | |
| | 4 | 50300 | Mount | left | 1 | |
| | 5 | 50301 | Mount | right | 1 | |
| | 8 | 04615 | Hexagon nut | M10 D985-v | 4 | |
| | 14 | 55403 | Blade rotor with blade, left | | 1 | |
| | 15 | 55402 | Blade rotor with blade, right | | 1 | |
| | 17 | 38328 | Deep groove ball bearing | 6208-2RS D625 | 4 | |
| | 18 | 11817 | Securing ring | 80x2,5 D472 | 4 | |
| | 19 | 05827 | Adaptor plate | 40x50x0,1 D988 | x | |
| | 20 | 12773 | Securing ring | 40x2,5 D471 | 2 | |
| | 21 | 49174 | Flanged bearing | | 2 | |
| ◆ | 22 | 28027 | Sealing cover | 80 D442 | 2 | |
| | 23 | 04202 | Hexagon screw | M12x35 D933-v | 8 | |
| | 24 | 03740 | Hexagon screw | M12x30 D933-v | 6 | |
| | 25 | 12289 | Hexagon screw | M12x20 D933-v | 4 | |
| | 26 | 51962 | Parallel key | B12x8x70 D6885 | 2 | |
| | 30 | 53035 | Stripper housing | | 1 | |
| | 31 | 53164 | Blade rotor | right | 1 | |
| | 32 | 53165 | Blade rotor | left | 1 | |
| | 33 | 36868 | Deep groove ball bearing | 6008-2RS | 4 | |
| | 34 | 09569 | Securing ring | 68x2,5 D472 | 4 | |
| | 35 | 51800 | Adaptor plate | 55x68x1 | 4 | |
| | 36 | 51001 | Hub | | 2 | |
| ◆ | 37 | 51793 | Profile key | | 2 | |
| ◆ | 38 | 51075 | Pressure spring | | 4 | |
| ◆ | 43 | 53030 | Saw blade | | 16 | |
| ◆ | 44 | 05639 | Hexagon screw | M8x16 D933-v | 60 | |
| ◆ | 45 | 03422 | Hexagon nut | M8 D985-v | 64 | |
| | 49 | 53182 | Lubricating nipple | BM6 D71412 | 2 | |
| ◆ | 50 | 55200 | Plate | | 4 | |
| ◆ | 51 | 55204 | Cleaner | | 4 | |
| ◆ | 52 | 04225 | Hexagon screw | M8x25 D933-v | 4 | Shear screw |
| | 53 | 04219 | Hexagon screw | M10x30 D933-v | 4 | |
| | 54 | 55205 | Securing screw | M12x30-v | 16 | |

kemper

# PRECOMPRESSION ROLL SPUR GEAR

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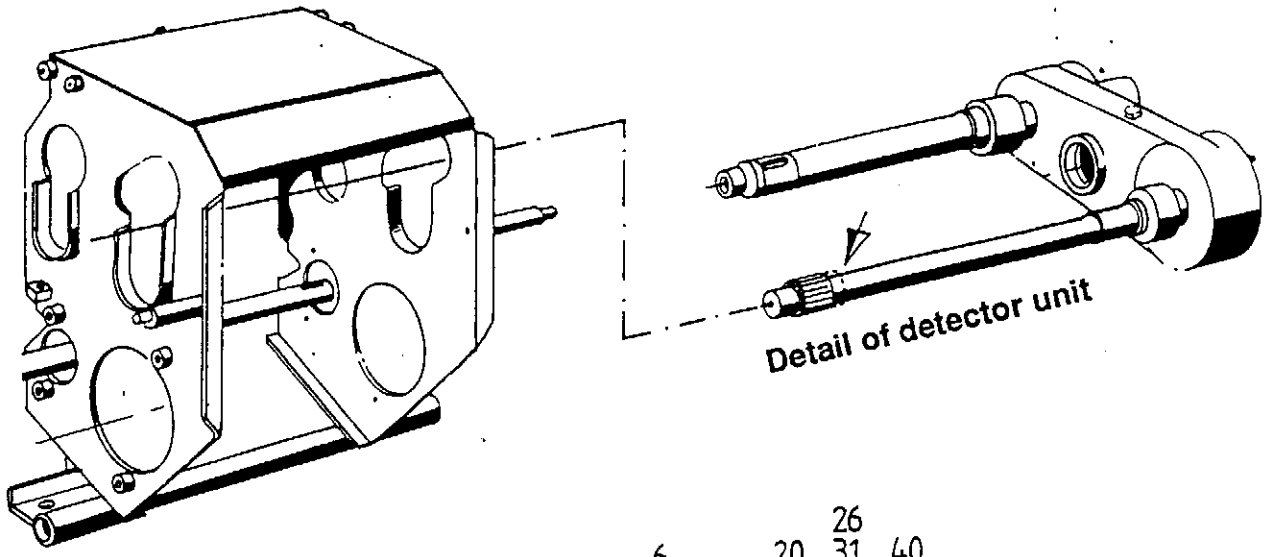
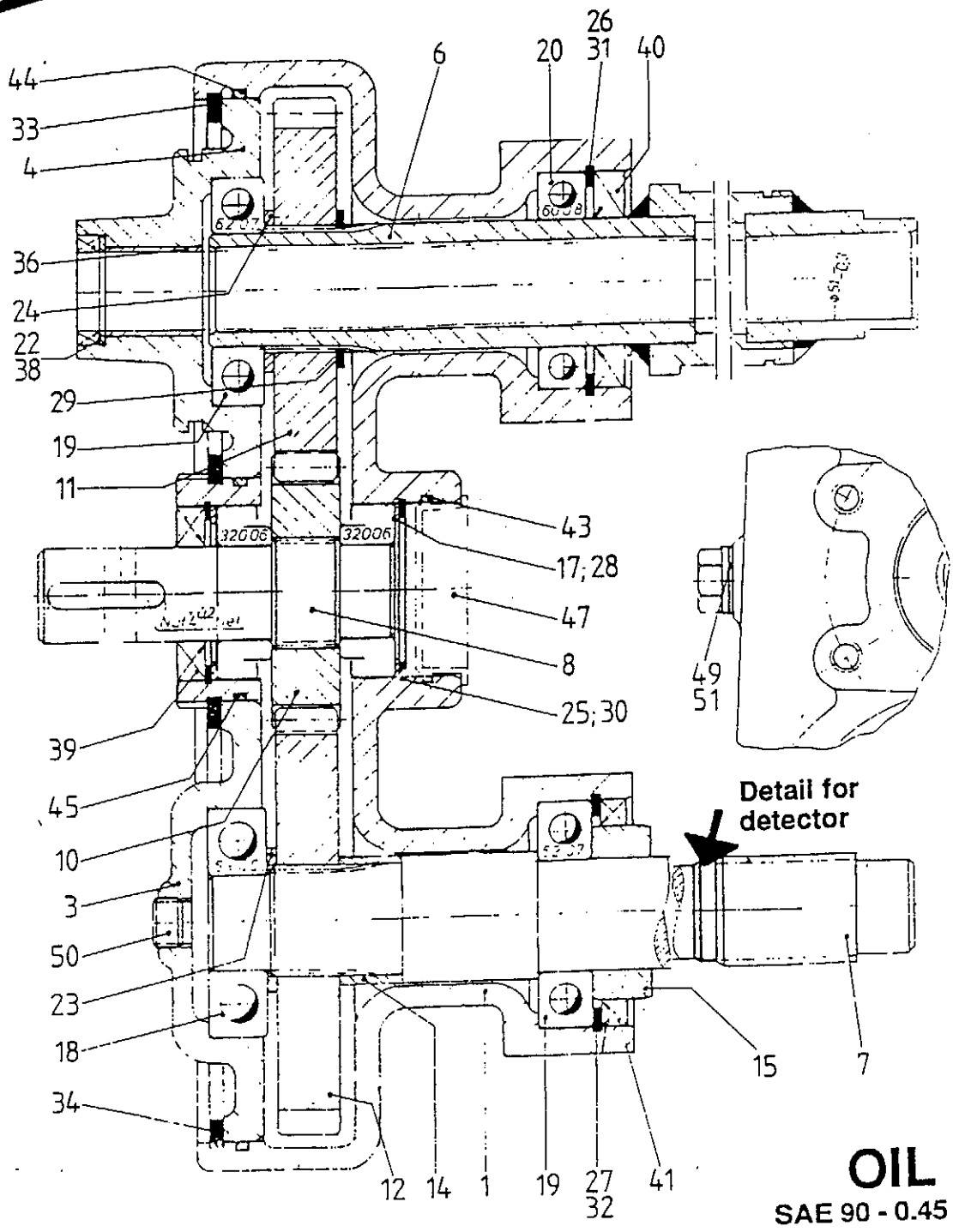
Edition: 8705



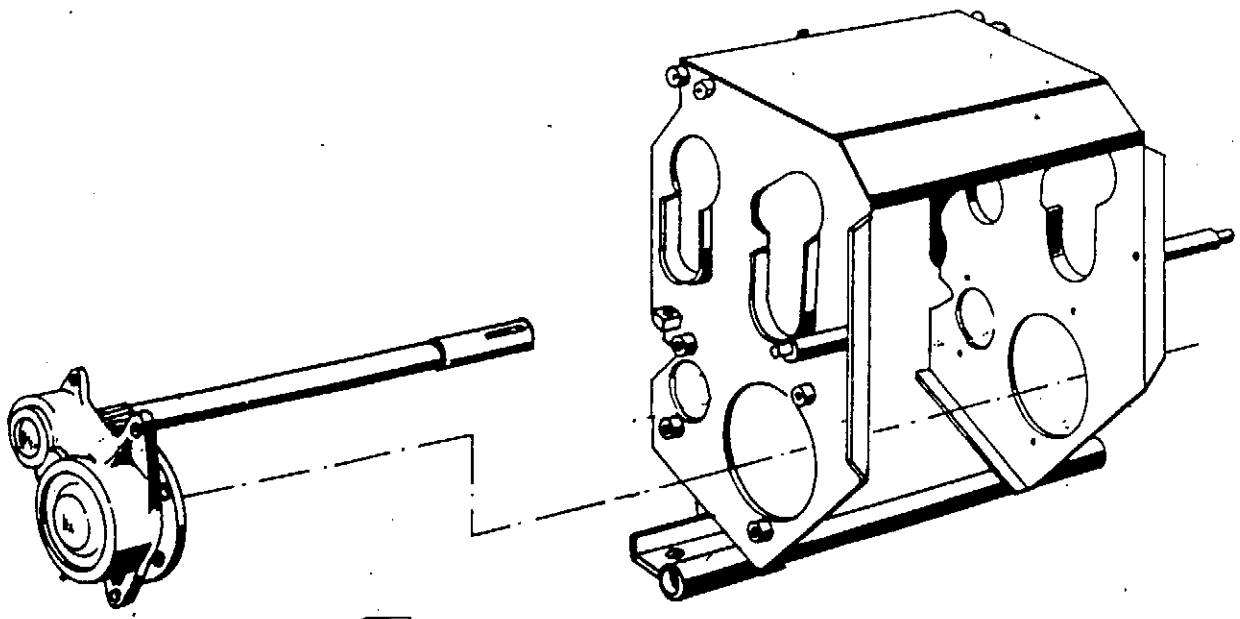

**OIL**

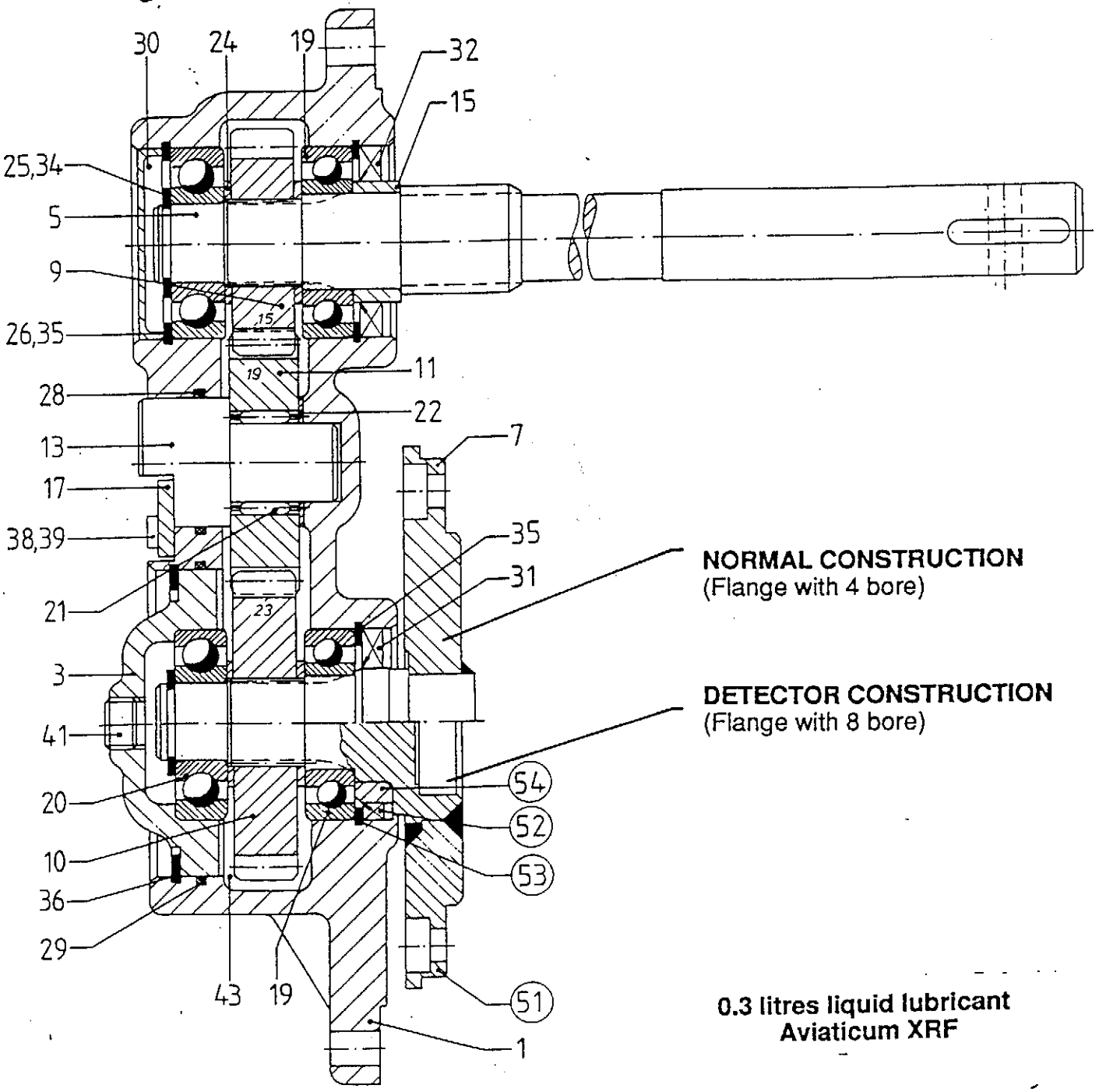
SAE 90 - 0.45 litre

kemper

# FEED ROLL SPUR GEAR

Sheet No. 96 - 1253
Edition: 8705



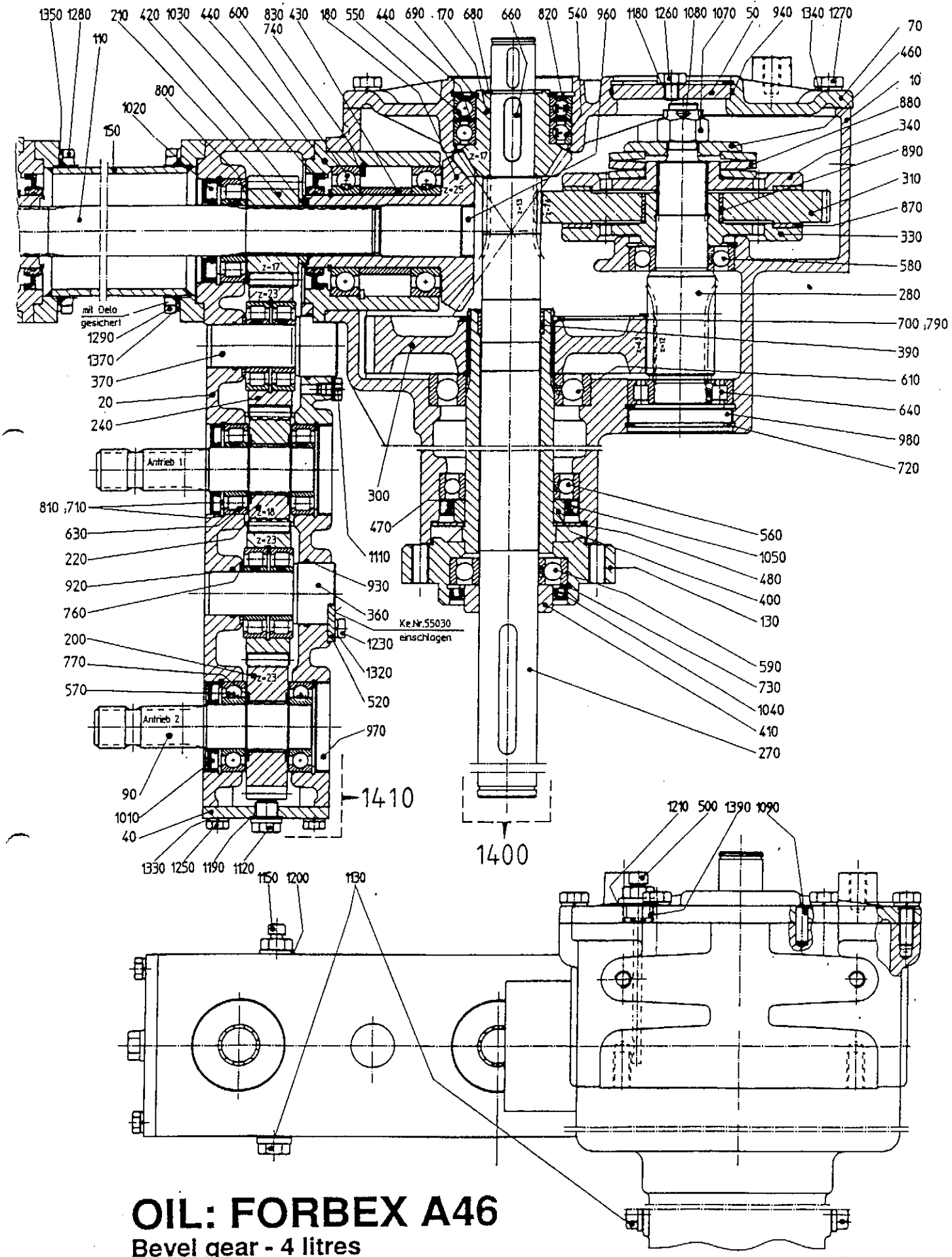



**NORMAL CONSTRUCTION**
(Flange with 4 bore)

**DETECTOR CONSTRUCTION**
(Flange with 8 bore)

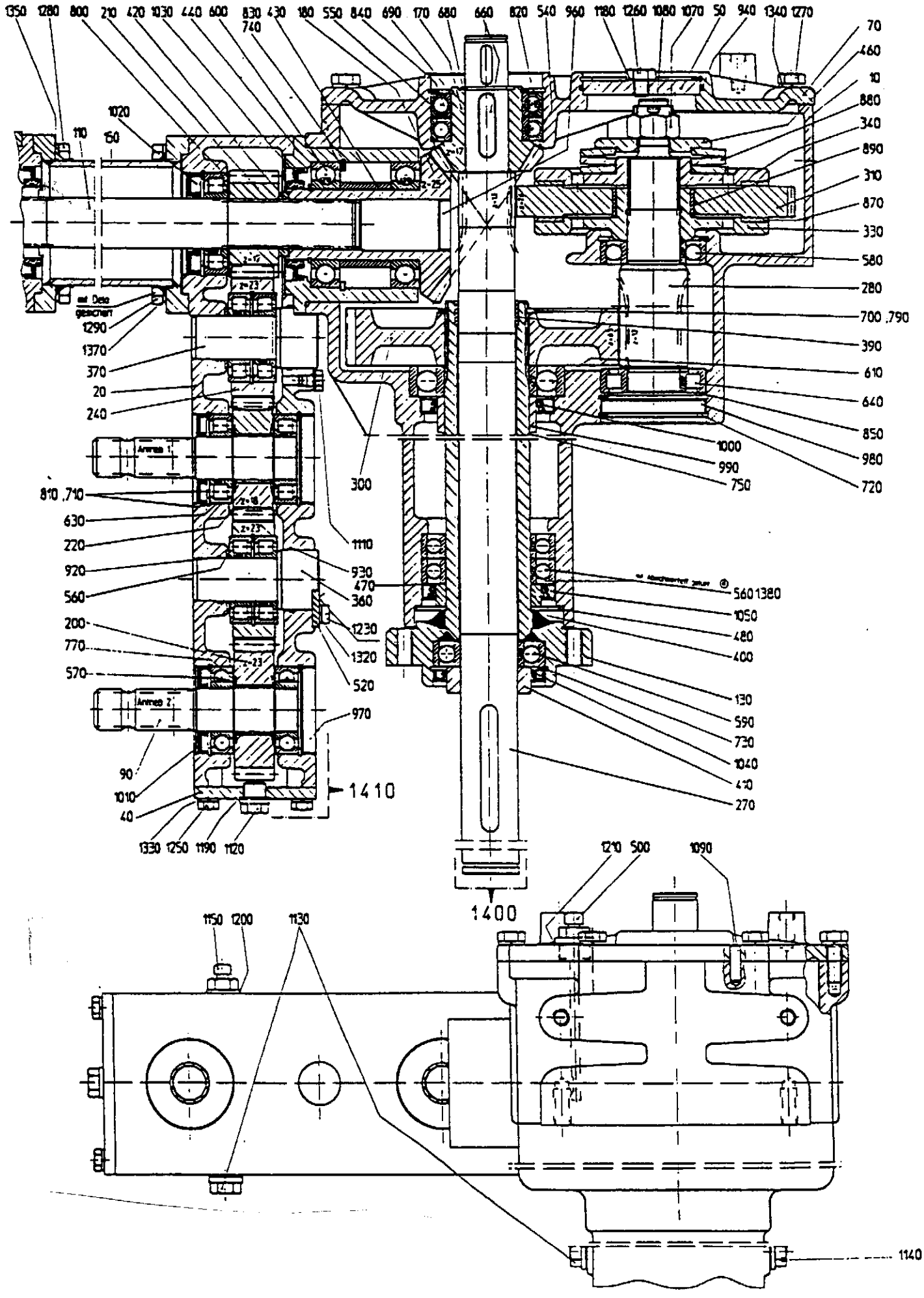
**0.3 litres liquid lubricant**
**Aviaticum XRF**

## FOR MACHINES 96 - 41450 - BUILT 1990, WITH FRICTION COUPLING




# OIL: FORBEX A46

**Bevel gear - 4 litres**
**Spur gear - 0.8 litres**


1350 1280 800 210 420 1030 440 600 830 430 180 550 840 690 170 680 660 820 540 960 1180 1260 1080 1070 50 940 1340 1270
740
70
460
10
880
340
890
310
870
330
580
280
700 ,790
390
610
640
850
980
720
1000
990
750
1020
110
160
1290
1370
370
20
240
300
810 ,710
630
220
920
560
200
770
570
1110
930
470
360
1230
1320
520
970
90
1010
40
1330 1250 1190 1120
1410
560 1380
1050
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400
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1040
410
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1090
1150 1200
1130
1140

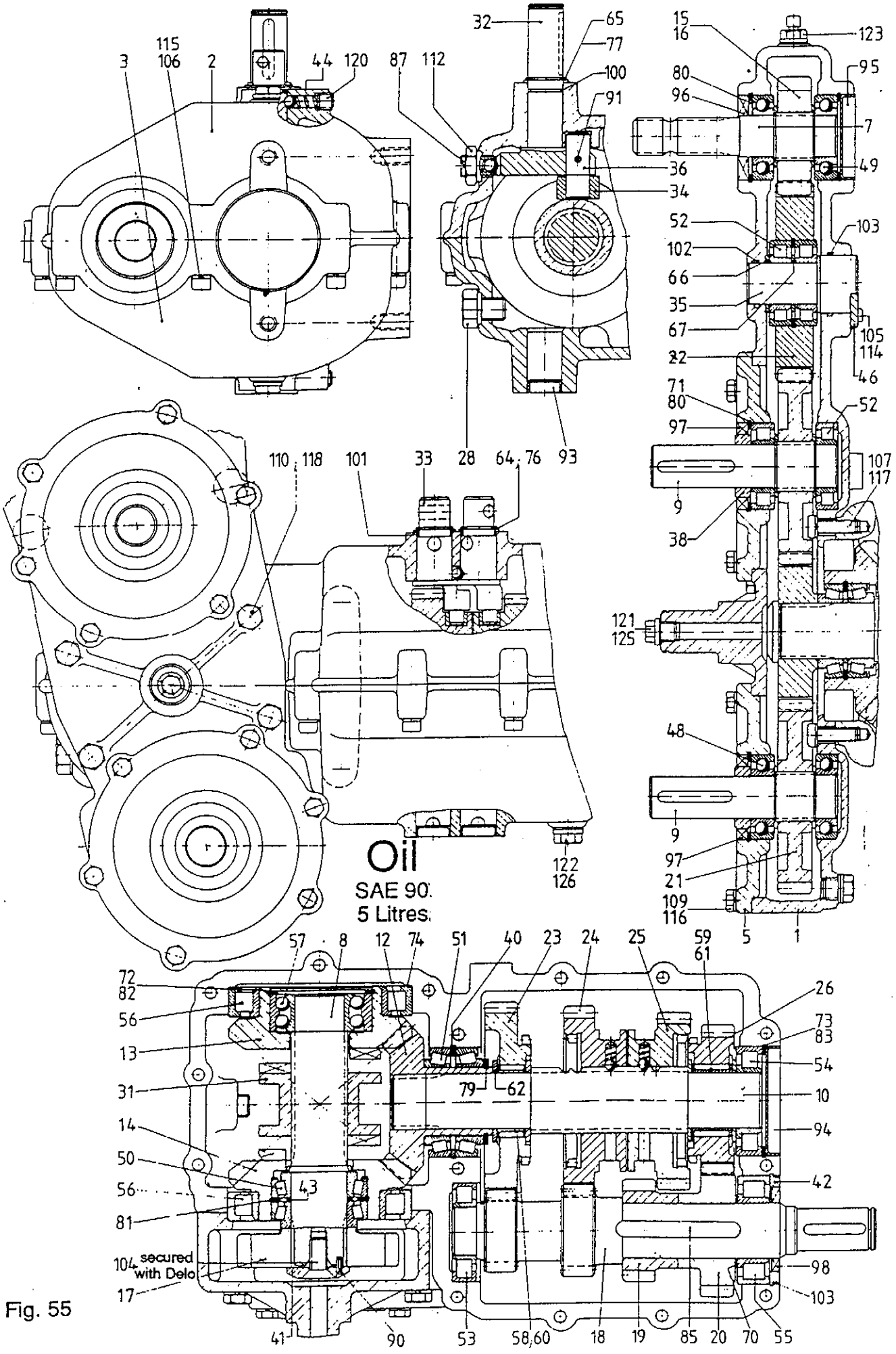


Fig. 55