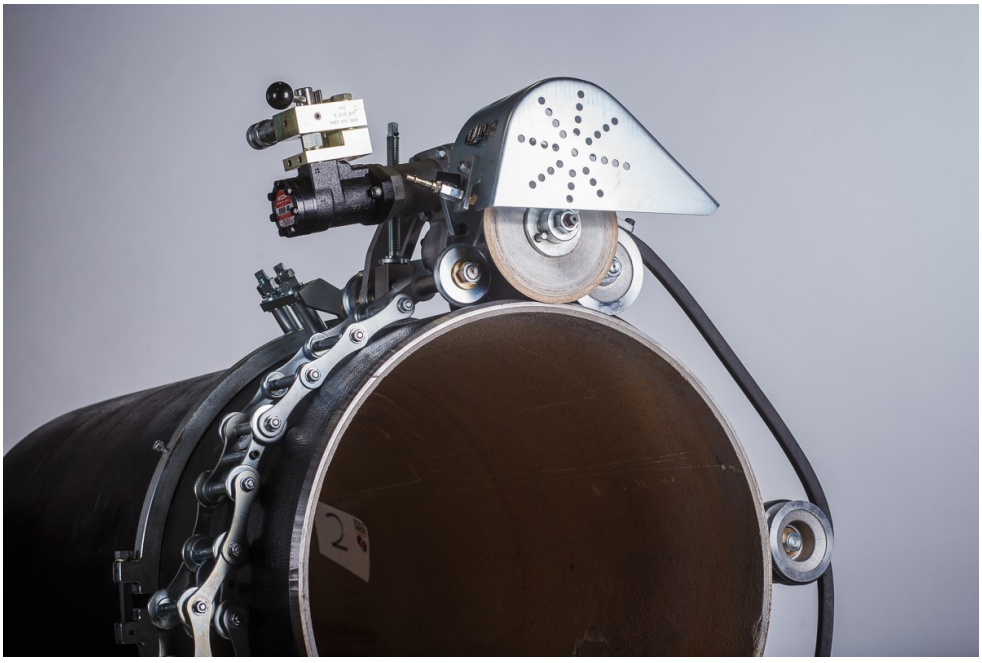
STEVE VICK INTERNATIONAL

SOLUTIONS FOR THE REPAIR RENOVATION AND DECOMMISSIONING OF PIPELINES



N600 Keel Cutter

Operating Instructions

Steve Vick International Ltd

Treenwood Industrial Estate, Bradford on Avon, Wiltshire, BA15 2AU, UK

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CONTENTS

1. INTRODUCTION

Since its foundation in 1981, Steve Vick International has been at the leading edge of trenchless techniques for the repair and renovation of underground **gas** distribution pipes.

In the UK, we are a major supplier to the gas distribution networks and many of our techniques have become accepted practice in the industry. We constantly seek to provide our customers with renewal methods which will minimise their costs and maximise their production.

The company has been supplying pipe handler equipment to the **water** utilities and their contractors for over 20 years. More recently we have entered the market with pipe cutting equipment and our sealant technology has been successfully adapted for use in the waste water sector.

In 2014 the company relocated and can be found at:

Steve Vick International Ltd
Treenwood Industrial Estate
Bradford on Avon
Wiltshire
BA15 2AU

Phone: +44 (0)1225 864 864
Email: info@stevevick.com
Website: stevevick.com
Social Media: #stevevick

2. SPECIFICATION

2.1 Keel Cutter

Machine Model:	Keel Cutter N600
Type of pipe:	Ductile iron, cast iron, cement, plastic (P.E) and steel (Tungsten carbide tipped (TCT) blades must be used for steel)
Nominal diameter of pipe:	250mm to 1,500mm ID
Maxi. depth of cut:	50mm with 200mm diameter diamond or TCT blade
Belt type	C30, C40 & C45
Circumferential cutting speed:	Approx. 100mm per minute depending on material and its thickness
Gear box oil:	Any gear oil of EP140 rating
Machine dimensions:	Height 340mm x Width 530mm x Length 450mm
Weight of machine:	36kgs
Hydraulic Power Requirement	N.B. Steve Vick International Ltd would be pleased to quote for the supply of a suitable hydraulic power pack
Flow/pressure:	Max. flow rate—30litres/min Max pressure—140 bar
Spray unit:	10 litre capacity, maximum working pressure 6 bar

2. SPECIFICATION (CONTINUTED)

2.2 POWER PACK

	20lt Power pack	30lt Power pack
Fuel Type	Petrol CE	Petrol CE
Engine Type	Honda GX270	Honda GX390
Power (hp/kw)	9 / 6.6	13 / 9.6
Hydraulic Flow (l/min/ gallon)	20 / 5	30 / 8
Pressure (Bar)	140	140
Weight (KG)	60	72
Weight (LBS)	132	158
Power of demand	Yes	Yes
Noise level dB(A) / LWA	104	104
Dimensions LxWxH (mm)	750 x 530 x 570	780 x 540 x 615
Dimensions LxWxH (in)	23 x 18 x 18	31 x 22 x 25

2.3 List of contents

The N600 Keel Cutter starter kit includes the following:
N600 Keel Cutter including hydraulic motor, pulley assembly, double pulley wheel, 2 x C30 drive belts, 2 x C40 Drive belts, 2 x C45 drive belts, 6 x extension chains, water pump, spray jet, 7 x steel wedges, toolbox.

3. SAFETY AND PRECAUTIONS

3. 1. The following PPE must be worn at all times:

A. Safety goggles
B. Hard hat
C. High visibility jacket
D. Gloves
E. Steel toe cap footwear

3.2 Ensure a banksman is employed to assist with lowering the cutter into the trench and is able to shut off the hydraulic power in an emergency.

3.3 Inspect the Power Pack and Keel Cutter for any oil leaks.

3.4 Inspect all hydraulic hoses for any damage.

3.5 Ensure the blade guard is fully functional.

3.6 Ensure you have selected the correct blade for the material being cut.

3.7 Ensure the hydraulic isolation valve works.

4. OPERATING INSTRUCTIONS

N.B it is essential that during operation a banksman is employed above the excavation in order to shut off the power packs hydraulic supply should the operator in excavation be unable to stop the flow at the machine.

4.1 Cutting without the guide ring system

For smaller pipe sizes, 250mm to 900mm, it is possible to set up the machine to cut without using guide rings system. For diameters greater than 900mm use the guide ring system which ensures the blade makes a square cut all the way round the pipe. If you are not using the guide ring system, move on to 6.2 below.

4.2 Use of the guide ring system

The use of a guide ring is intended to ensure that a truly accurate cut is achieved and use of this system is particularly useful when cutting large diameter pipes.

Guide rings for specific diameter pipe and shim are available on demand.

The N600 machine is supplied with a guide ring attachment as shown in Fig. 4.

The first step is to mark the position of the guide ring relative to where the pipe is to be cut. With the position of the cut marked, measure 392mm along the pipe where the machine is to be placed and make a mark as shown in Fig. 1.

Figure 1

To ensure the guide ring is attached to the pipe squarely, use of shim steel as shown in Fig.2 is a simple way of ensuring a square line is drawn around the pipe. If a length of shim steel about $1^{1/2}$ times the circumference of the pipe is wrapped around the pipe with one edge at the marked position 392mm from the cut and the shim steel overlapped so that both edges of the shim steel are in line, then position of the guide ring can be marked using chalk around the edge at the marked 392mm position.

Figure 2

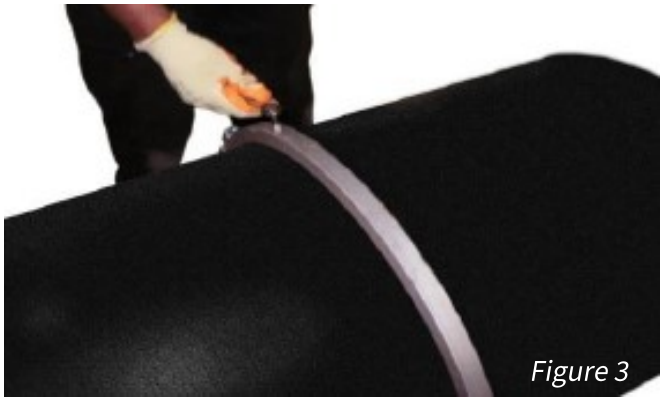


Figure 3

4. OPERATING INSTRUCTIONS (CONTINUED)

The guide ring can now be fitted around the pipelining up the edge of the ring nearest the position of the cut with the circumferential chalk mark. Bolt the two halves of the guide ring together and tighten the jacking screws such that an even spacing is achieved between the guide ring and the pipe. (Fig. 3.)

4.3 Setting up the machine on the pipe

Make sure that there is enough clearance around and under the pipe for the machine to make a complete rotation, this would normally be approximately 340mm in height and 530mm width.

Before placing the machine on the pipe, make sure that you have the correct blade fitted i.e. a diamond blade to cut cast and ductile iron, cement or asbestos or a tungsten carbide tipped (TCT) blade for steel.

Place the machine on the pipe with the blade above the point you wish to cut and when using the guide ring then guide wheels should be paced over the ring as shown in Fig. 4(b). Adjust the guide wheel assembly on the machine such that the wheels will run centrally on the guide ring as shown in Fig. 4(a).

The machine must “sit” on the pipe with a solid base without undue rocking. This should be checked by holding the machine by the drive shaft and a comfortable point on the other side of the cutter (see Fig. 4a), and moving the machine in its four contact wheels backwards and forwards gently, checking that all 4 wheels move together and the Keel is sitting solidly on the pipe. If it does not then the surface of the pipe may need to be further cleaned with a wire brush or other appropriate tools.

Figure 4a

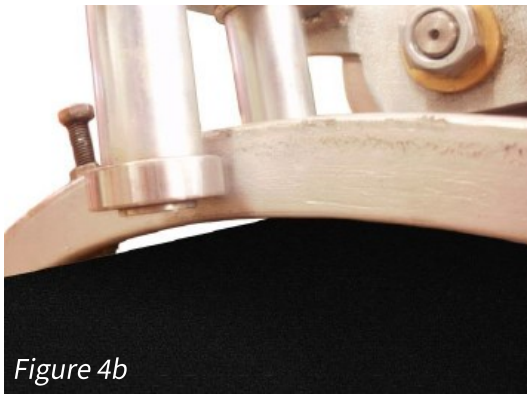


Figure 4b

4.4 Assembling the drive pulleys

Next, the pulley assembly must be attached onto the drive belts. **NB** The correct size belts should be fitted to the drive pulleys on the machine before placing the machine on the pipe.

For pipes up to 300mm (12inch) diameter the shortest “C-30” drive belt should be fitted between the pulleys on the main machine and then pulley assembly.

For pipe sizes 350-450mm (14-18inch) diameter, the “C-40” drive belt should be used.

For pipe sizes 500-150mm (20-60inch) diameter, the “C-40” drive belts should be fitted between the machines drive wheels and the double pulley assembly and the “C-45” drive belts between the double pulley and the single pulley.

4. OPERATING INSTRUCTIONS (CONTINUED)

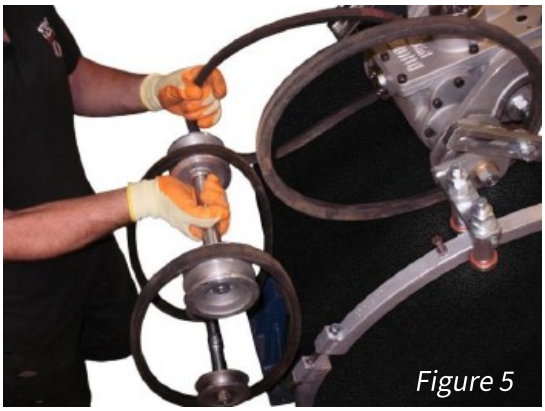


Figure 5

4.5 Next the chain, or chains should be joined to the few links of chain already attached to the machine (see Fig. 6) before wrapping it around the pipe and connecting it to the single pulley assembly with the long tension adjusting screw at its maximum length (see Fig. 7).

Figure 6

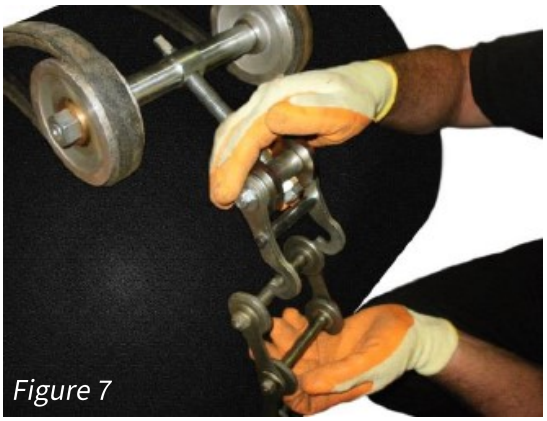


Figure 7

4.6 Using a straight edge, for example, a steel rule or a spirit level, line up the outside edge of the drive wheel with the outside edge of the pulley wheel as shown in Fig. 8.

DO NOT try to line up the pulley on the guide ring side of the machine, only do so on the blade side.

Figure 8

4.7 When you are satisfied that the machine is secure and the pulley assembly is in line, tighten the pulley assembly with the ratchet provided (Fig. 9). There needs to be quite a firm tension on the drive belts, but it is possible to over-tighten, so try to apply a normal fan belt type tension.

When this is completed, check again that the drive wheel and the pulley assembly are in line.

You are now ready to attach the hydraulic and water/oil spray hoses to the machine to commence the cut.

Figure 9

4. OPERATING INSTRUCTIONS (CONTINUED)

4.8 Connecting the hoses and commencing the cut

Connect the hydraulic hoses to the **Keel** motor before starting the power pack (Fig. 10), then attach the spray hose and tap to the cutter guard (Fig. 11).

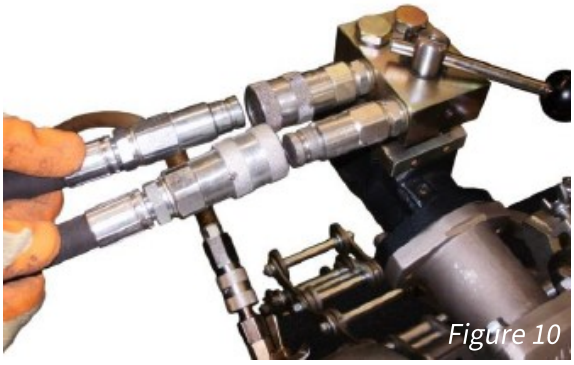


Figure 10

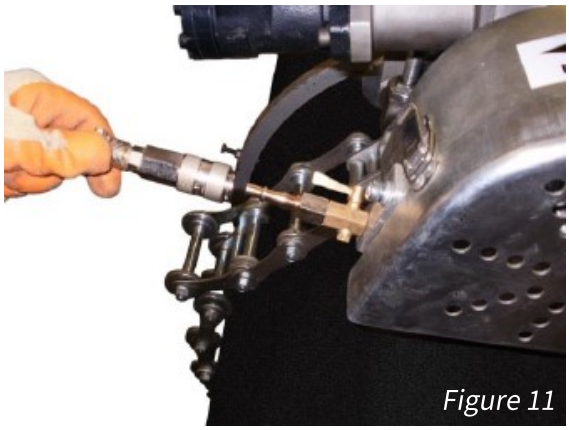


Figure 11

4.9 The sprat unit should be filled with water and pumped up to a pressure between 3-4mbar, registered on the built-in pressure gauge (see Figs. 12 through 14). This will ensure an adequately powered water jet is produced. Make sure that the jet lands on the blade. It the water jet stops during a cut, simply increase the tank pressure back up to 3-4bar and/or re-fill the spray tank.

Figure 12

Figure 13

Pressure realise valve

Figure 14

Any residual pressure in the tank can be vented using the release valve on the top of the tank before opening for re-filling (Fig. 14).

4.10 Before starting the power pack, the machine must be in neutral and not drive (see Fig. 15.)

When the drive in neutral, turn on the power pack and start the hydraulic flow (Fig. 16).

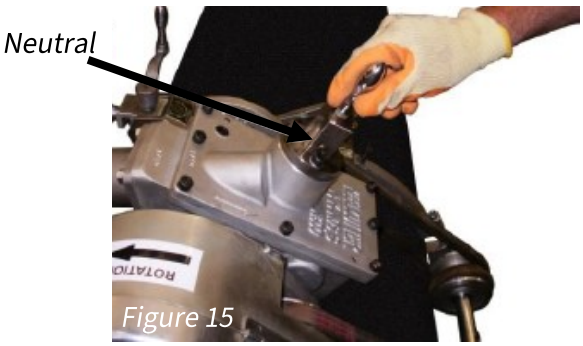


Figure 15

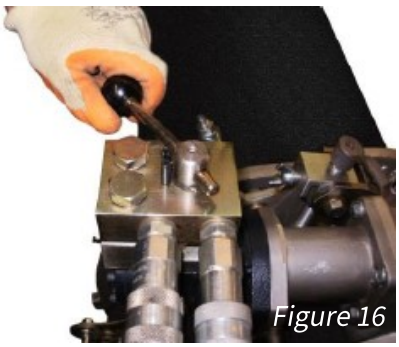
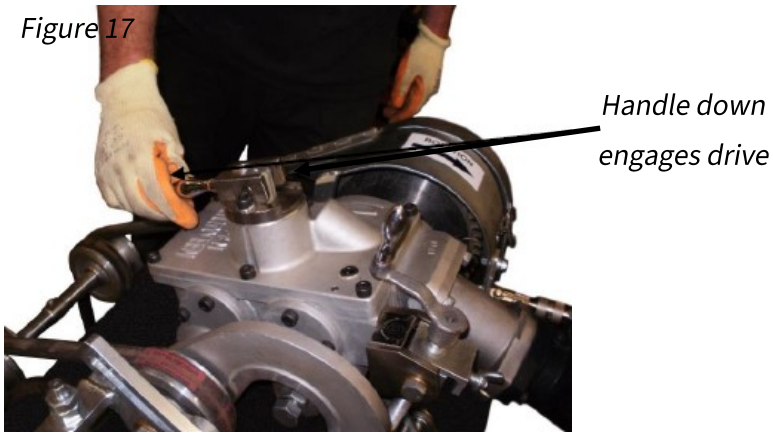


Figure 16

4. OPERATING INSTRUCTIONS (CONTINUED)

4.11 When you are sure the cut is through the pipe wall, check the drive wheel is in line with the pulley and start the drive by pushing the feed valve handle down (see Fig. 17).

Figure 17



4.12 The **Keel** will drive itself round the pipe but you will need to keep checking the pulley is in line. Place the ruler against both machines and pulley's drive wheel (Fig. 5) ensuring they are in alignment remembering to always take the line from the Keel Cutters drive wheel as your guide. To adjust the line use the hide hammer by tapping the pulley on the side nut, not the wheel, until the pulley is in line.

4.13 You **must** also put the steel wedges in the cut at regular intervals around the pipe, such as, 2 o'clock, 4 o'clock, 8 o'clock and 10 o'clock. This will make sure that an even gap is kept around the pipe, thus reducing the pressure on the blade.

4.14 As the Keel Cutter climbs up the pipe make sure to check the belt tension as gravity increases the chances of the Keel Cutter slipping, if required tighten the belts until grip is re-established.

4.15 When the machine has rotated a full circumference, and the blade has met with or just gone past the original cut, place the cutter in neutral. Do not turn off the blade rotation until you have raised the blade from the pipe. Now turn off the blade rotation until you have the power pack. To remove the machine from the pipe undo the pulley assembly by loosening the threaded bar using the ratchet provided. When there is sufficient slack you can unhook the chains and remove the machine from the pipe.

5. CUTTING STEEL PIPE

When cutting cast iron or ductile pipe the motor speed is approximately 600-800rpm which is acceptable for the diamond blade BUT when cutting steel TCT blade must be used and the maximum speed for this blade is 250rpm. This reduction is achieved by fitting a control valve (Fig. 15) in the hose line before the motor.

If you do not have the control valve, please contact Steve Vick International or your supplier who will be pleased to supply one.

5.1 Set up N600 as per manual until connecting hoses.

5.2 Connect the flexible hose on the control valve onto quick release couplings on the motor and the hoses from the power pack onto back of valve block.

5. CUTTING STEEL PIPE (CONTINUED)

5.3 Set control on mark 5, this should be the correct setting for cutting.

5.4 With the drive lever in neutral, (straight out, not up or down) start up power pack and switch on flow.

5.5 Ensure the water hose is connected and suitable soluble oil is mixed with the water to enable easier cutting of steel. Suitable oil would be Shell Dromus oil mixed in the ration 50:1 water to oil.

5.6 Start the cut by lowering the blade slowly with the feed screw (advisable), until cut is through but if the machine seems to be struggling with the cut, set up to mark 6.

5.7 Place the drive lever in the downward position, the cutter will now rotate.

5.8 Please make sure the belts are tight and the pulley's are kept lined up.

Figure 18a

Set control valve on setting 5

Figure 18b

6. FITTING BLADES

N.B If fitting blades during a cutting operation, it is imperative that the hydraulic power pack is turned off.

To fit the Diamond Blade:

Remove drive plate from shaft. Place blade onto cutter holder, ensuring that the 2 holder pins are clean through the holes on the blade, and the correct side of the blade is facing out. Blades are marked with a direction of rotation arrow on the face (Fig. 19(a)).

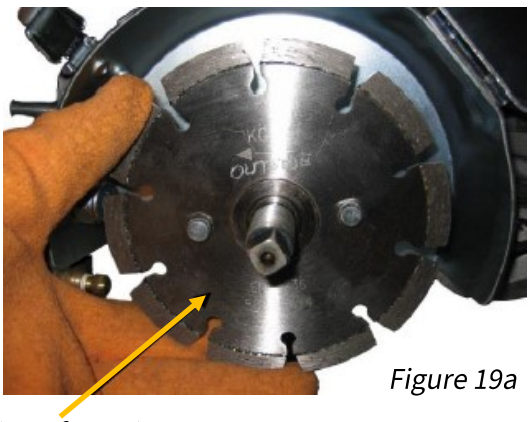


Figure 19a

Direction of rotation: Anti-clockwise

Figure 19b

6. FITTING BLADE (CONTINUED)

It is imperative that blades are fitting with this rotation arrow facing in the same direction as the arrow on the safety guard.

If in doubt, tub your finger along the cutting edge of the blade. You should be able to feel a smooth direction and a rougher direction. Place the blade on the cutter holder ensuring that the rough edge is running with the arrow on the cutter guard. Replace the drive plate, making sure the plate is flat against the blade, secure plate using nut washers with a firm torque (see Fig.19(b)), it may be necessary to also use the swivel handle to provide resistance (seen in Fig. 22).

Figure 20

Rotation Direction Arrow on top of Guard

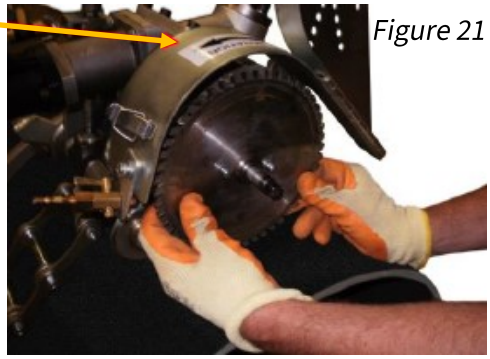


Figure 21

Figure 22

7. BEVELLING

N.B Due to the width of the bevel and cutting blade an extended arbour is required. This is listed in the parts and price list and should be used even when not being used as a cutting and bevelling tool.

7.1 Remove standard blade arbour and fit the bevel arbour. Place over the arbour, the depth stop. The depth stop should always be touching the top of the pipe surface as to ensure a smooth consistent bevel. The bevel spacer is then used to prevent rubbing of the cutting blades on the machine. If placing the blades face to face it can bend the cutting blade and affect the accuracy of the cut. Over the dividing spacer the cutting blade is then fitted and locked in place with the extended blade washer.

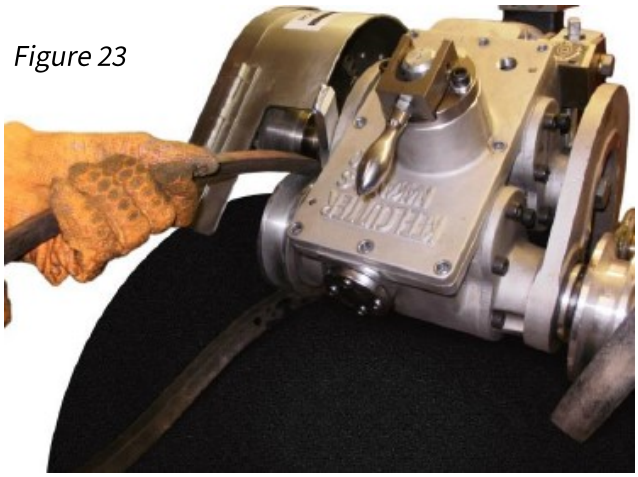
8. FITTING DRIVE BELTS

N.B If fitting belts during a cutting operation, it is essential that the hydraulic power pack is turned off.

8.1 The drive belts must be inspected at regular intervals, to ensure that the belts have not perished in any way or that the belts have not stretched and gone below the edge of the drive wheel. This is essential because, if the belts for any reason are faulty, the cut of the machine may start to spiral. This, and operator error, are the main reasons for any "run out" of a cut. If you think the belts need to be replaced, **both belts** must be changed at the same time to ensure even wear.

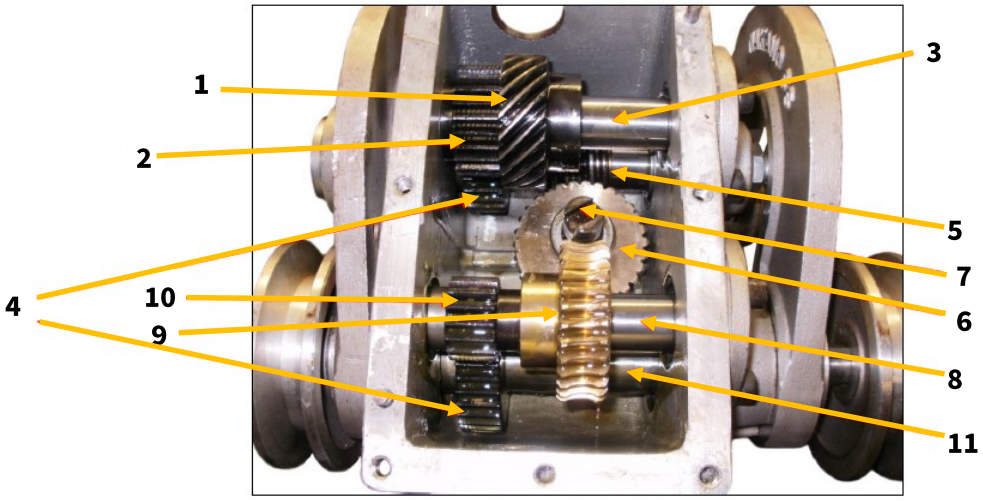
8.2 When fitting, removal of the blade and guard is not necessary for the N600 model due to the larger space available around the wheels. Simply remove the used belts from the wheels and replace them with fresh belts (see Fig. 23).

Figure 23



9. INTERNAL COMPONENTS

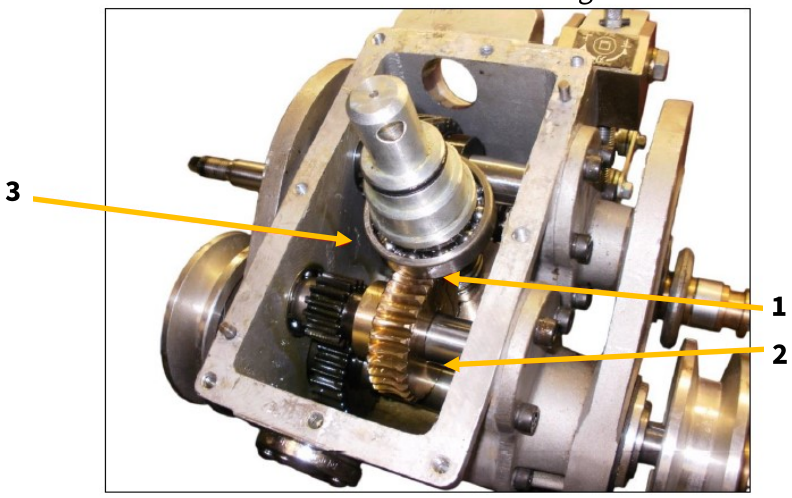
Figure 24 - Gears & Spacers



1. Spiral Gear (K034)
2. Soar Gear (K037)
3. No. 1 Centre Shaft (K013)
4. Soar Gear (K036)
5. Drive Shaft (K014)
6. Worm Wheel (K039)
7. No. 2 Centre Shaft (K015)
8. No. 3 Centre Shaft (K016)
9. Worm Wheel (K035)
10. Spar Gear (K038)
11. Drive Shaft (K017)

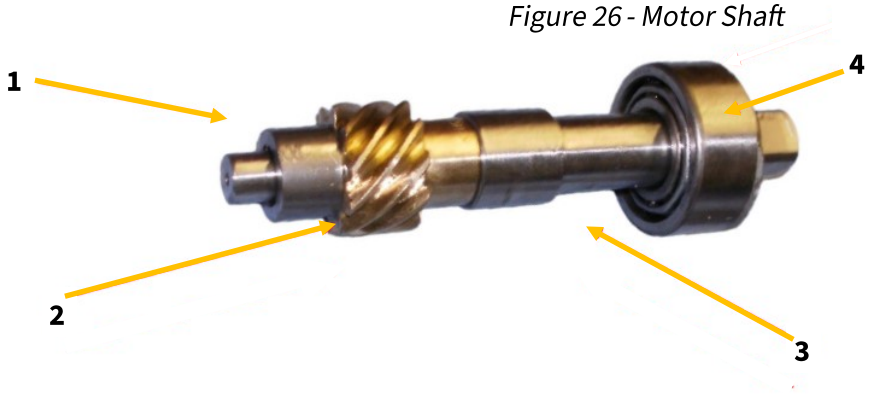
9. INTERNAL COMPONENTS (CONTINUED)

Figure 25 - Clutch Assembly



1. Worm (K040) 2. Bearing (K085) 3. Clutch Connecting Axis (K019)

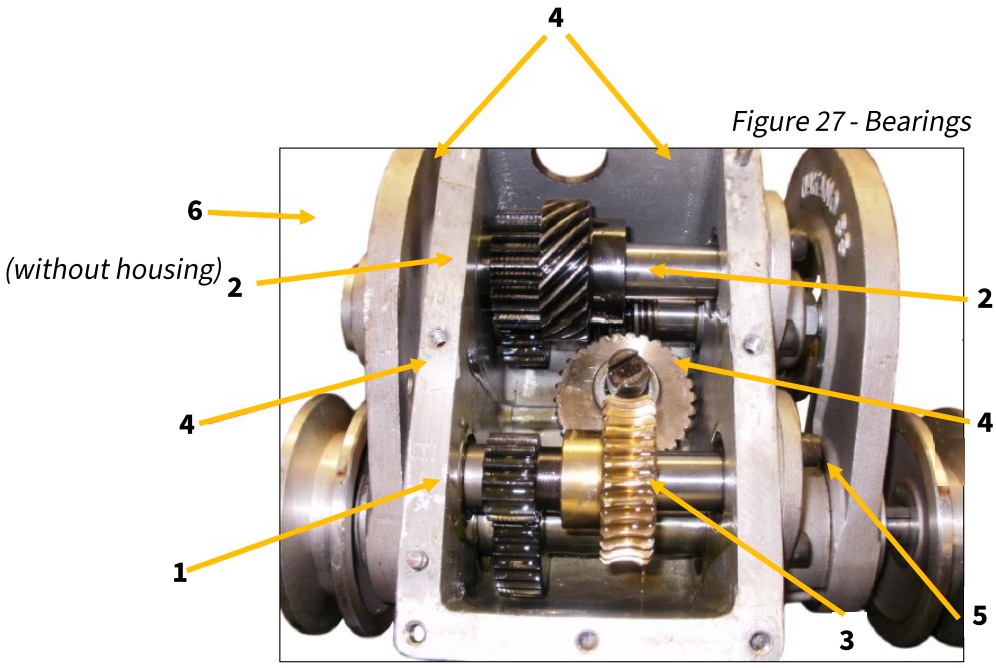
Figure 26 - Motor Shaft



1. Collar (K027)
2. Spiral Gear (K033)
3. Input Shaft (K012)
4. Bearing (K080)

9. INTERNAL COMPONENTS (CONTINUED)

Figure 27 - Bearings



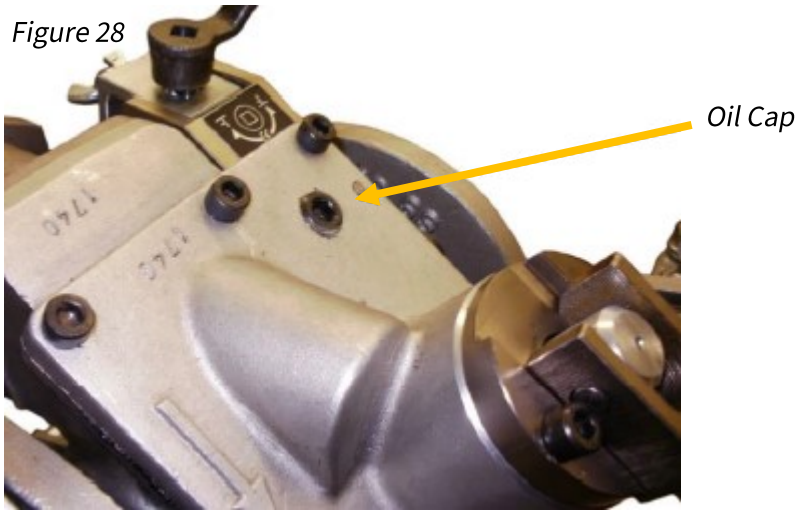
1. K80
2. K81
3. K82
4. K83
5. K86
6. K179

10. DISASSEMBLY INSTRUCTIONS

10.1 In order to gain access to the internals of the N600 Keel Cutter, you will need to disassemble and remove certain parts first. Before proceeding to disassemble any part of the Keel Cutter, be sure to drain the oil from the body by unscrewing the cap in the top of the body (see Fig. 28) and positioning the Keel Cutter upside down, allowing the oil to drain. Make sure you have a suitable receptacle to collect the oil to refill afterwards.

Ensure the receptacle is clean so as to avoid contaminating the oil if you intend to use it again.

Figure 28



10. DISASSEMBLY INSTRUCTIONS (CONTINUED)

10.2 Next, unscrew the bolts fixing the motor to the body of the keel cutter and remove the motor. The 'Motor Shaft' should now be visible; this also needs to be removed in order to open the cover of the body (Figs. 29a to 29c) It may be necessary to use a slide hammer or similar tool to remove the shaft as it has been tight fit.

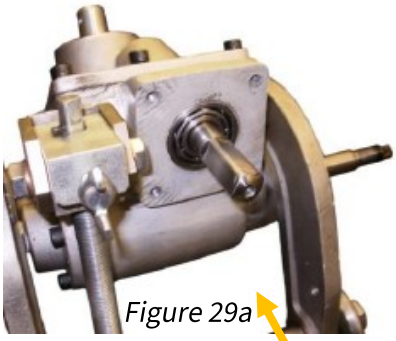


Figure 29a

Attach Slide Hammer Here

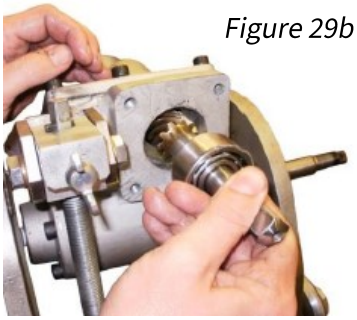


Figure 29b

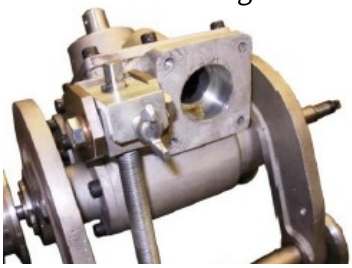


Figure 29c

10.3 Now unscrew the bolts fixing the gear handle and bracket to the body (Fig. 30). Remove the sliding pin from the gear handle and remove the bracket from the body, exposing the 'Clutch connecting axis' (Fig. 31).

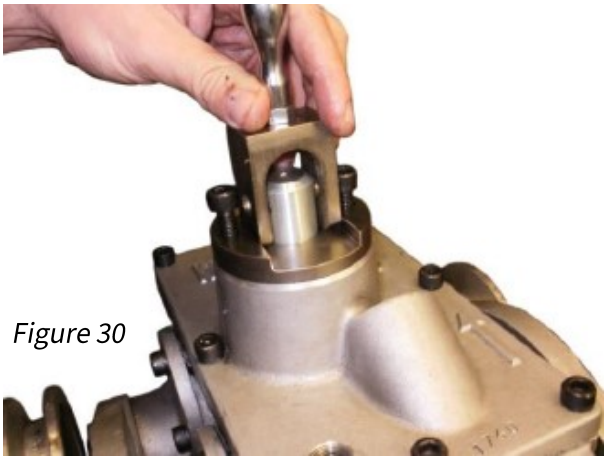


Figure 30

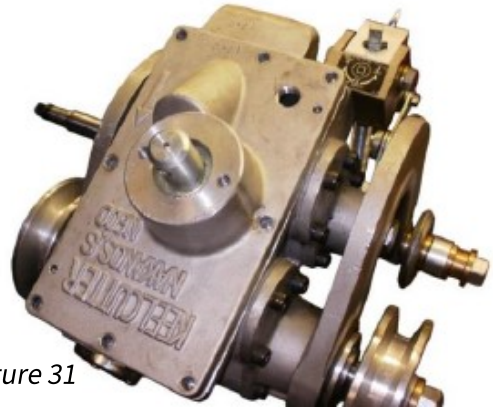


Figure 31

10.4 Then proceed to unscrew the eight bolts fastening the top cover to the body. Once unscrewed simply remove the cover from the body to gain access to the internal components of the Keel Cutter.

10.5 When removing the cover from the body you will break the seal between these two components. Once you have finished inspecting the internals of the Keel Cutter you will need to re-attach the cover to the body. It is **VITAL** that before you re-attach the cover, you must reseal the body with gasket sealants so as to prevent oil from leaking. Simply apply the gasket sealant around the top face of the body (Fig. 32) and wipe away any excess that spills out after placing the cover on top of the body.

10. DISASSEMBLY INSTRUCTIONS (CONTINUED)

Figure 32