AUSTRALIAN EMERGENCY
MANUAL

CHAIN SAW OPERATION

NATURAL DISASTERS ORGANISATION

First Published 1992

ISBN 0 642 18006 7

Adapted, edited and published by the Natural Disasters Organisation

Typeset by the Directorate of Departmental Publications, Department of Defence

Printed in Australia by Union Offset Co Pty Ltd, Fyshwick ACT

THE AUSTRALIAN EMERGENCY MANUAL SERIES

Publishing status: A = Available; D = under Development, P = Planned

AEM - DISASTER RESCUE (3rd edition)	A
AEM - LAND SEARCH OPERATIONS (incorporating Urban Search)	A
AEM - FLOOD RESCUE BOAT OPERATION	A
AEM - STORM DAMAGE OPERATIONS	A
AEM - COMMUNITY EMERGENCY PLANNING GUIDE	A
AEM - COMMUNICATIONS	A
AEM - ROAD ACCIDENT RESCUE	A
AEM - TRAINING MANAGEMENT	A
AEM - CHAIN SAW OPERATION	A
AEM - MAP READING AND NAVIGATION	D
AEM - FOUR WHEEL DRIVE VEHICLE OPERATION	D
AEM - VERTICAL RESCUE	D
AEM - OPERATIONS CENTRE MANAGEMENT	D
AEM - LEADERSHIP	D
AEM - PRINCIPLES OF INSTRUCTIONAL TECHNIQUES	D
AEM - DISASTER MEDICINE	D
AEM - DISASTER RECOVERY AND RELIEF	P
AEM - EVACUATION PROCEDURES	P

NB. Manuals will be issued subject to availability and guidelines in the latter paragraphs of the foreword, page v.

AMENDMENT LIST

Amendment		Effected	
No.	Date	Signature	Date

FOREWORD

THE PURPOSE OF THIS MANUAL IS TO PROVIDE A BASIC REFERENCE FOR CHAIN SAW OPERATION, PARTICULARLY IN EMERGENCY SITUATIONS SUCH AS DURING STORM DAMAGE OPERATIONS AND GENERAL DISASTER RESCUE. THE MANUAL IS INTENDED FOR USE IN PLANNING, TRAINING AND OPERATIONS BY ALL EMERGENCY/DISASTER PERSONNEL AND ORGANISATIONS.

CHAIN SAW OPERATION, BY ITS VERY NATURE CAN BE A HIGH RISK ACTIVITY. THE NATURAL DISASTERS ORGANISATION ACCEPTS NO RESPONSIBILITY FOR ANY ACCIDENT OR INJURY CAUSED BY MISUSE OR MISINTERPRETATION OF INFORMATION CONTAINED IN THIS MANUAL. MOREOVER, THE READING OF THIS MANUAL ALONE, CANNOT BE CONSIDERED ADEQUATE TRAINING FOR A RESCUER. KNOWLEDGE MUST BE LINKED WITH TRAINING, PRACTICAL EXPERIENCE, AND STRICT ADHERENCE TO SAFETY

THE INFORMATION IN THIS MANUAL HAS BEEN ADAPTED LARGELY FROM THE MANUAL 'USING A CHAIN SAW SAFELY-THE OPERATORS' HANDBOOK, PUBLISHED BY THE FORESTRY COMMISSION OF NSW, WHICH HAS KINDLY GRANTED COPYRIGHT PERMISSION TO THE NATURAL DISASTERS ORGANISATION. (REFER TO PAGES VII AND XIII) ADAPTION AND DEVELOPMENT OF THIS MANUAL WAS UNDERTAKEN BY A NATIONAL WORKING PARTY REPRESENTATIVE OF THE STATE AND TERRITORY EMERGENCY SERVICES. THE WORKING PARTY WAS INITIATED AND SPONSORED BY THE NATURAL DISASTERS ORGANISATION

THE MANUAL IS ISSUED IN LOOSE-LEAF FORM TO FACILITATE AMENDMENT AND INSERTION OF INDIVIDUAL ORGANISATIONAL SUPPLEMENTS.

AS SITUATIONS CHANGE AND IMPROVED TECHNIQUES ARE DEVELOPED THE CHAIN SAW OPERATION MANUAL WILL BE AMENDED AND UPDATED BY THE NATIONAL WORKING PARTY.

PROPOSED CHANGES SHOULD BE FORWARDED TO THE DIRECTOR GENERAL, NATURAL DISASTERS ORGANISATION, AT THE ADDRESS SHOWN BELOW THROUGH THE RESPECTIVE STATE TERRITORY COUNTER-DISASTER ORGANISATION.

THE USE OF TRADE NAMES IN THIS MANUAL IS NOT INTENDED TO BE RESTRICTIVE, PREFERENTIAL OR PROMOTIONAL RATHER, TRADE NAMES ARE USED WHERE DESCRIPTIVE CLARITY IS REQUIRED.

ENQUIRIES SHOULD BE SENT TO THE DIRECTOR GENERAL NATURAL DISASTERS ORGANISATION, PO BOX 1020 DICKSON ACT 2602 AUSTRALIA

ACKNOWLEDGEMENT

THE NATURAL DISASTERS ORGANISATION (NDO) GRATEFULLY ACKNOWLEDGES THE MAJOR CONTRIBUTION TO THE CONTENT OF THIS MANUAL MADE BY THE FORESTRY COMMISSION OF NSW THROUGH ITS AGREEMENT TO WAIVER COPYRIGHT FEES FOR USE OF INFORMATION IN THE PUBLICATION 'USING A CHAIN SAW SAFELY - THE OPERATORS HANDBOOK'.

THE HANDBOOK WAS SELECTED AS THE BEST AND MOST COMPREHENSIVE OF SEVERAL SIMILAR AUSTRALIAN PUBLICATIONS TO FORM THE BASIS FOR ALL TECHNICAL CHAIN SAW INFORMATION APPEARING IN THE 'AUSTRALIAN EMERGENCY MANUAL - CHAIN SAW OPERATION', FOR WHICH IT HAS BEEN ADAPTED.

THROUGH THIS GESTURE THE FORESTRY COMMISSION OF NSW HAS MADE A VALUABLE CONTRIBUTION TO AUSTRALIA'S EMERGENCY MANAGEMENT CAPABILITY. ACCORDINGLY, NDO HAS DISPLAYED THE COMMISSION'S LOGO AND NAME IN THIS MANUAL AS A FURTHER TOKEN OF APPRECIATION

CONTENTS

Forestry Commission of New South Wales
Conserving forests for our future

PREFACE

The Forestry Commission of New South Wales has been managing and conserving State Forests since 1916. Throughout this time we have always been conscious of the terrible havoc natural disasters can cause, and we have seen at first hand the work and dedication of permanent staff and volunteers who routinely risk injury and even death in their efforts to help fellow Australians in time of fire, flood, storm and earthquake.

It is therefore a great pleasure for us to contribute to this Australian Emergency Manual in recognition of the importance of both the Manual and the work generally of the Natural Disasters Organisation

The Commission's publication, *'How to Use a Chain Saw Safely'* was developed from our accumulated experience in forestry work over more than 75 years. For example, its third edition, printed in late 1991, incorporates changes recommended by the Commission's senior training staff to accommodate the latest techniques and technology.

Its distribution to the public is part of the Commission's commitment to ensuring the people of New South Wales can enjoy **all** the benefits of their forests as fully and as safely as possible.

Through careful management, we aim to ensure that these forests not only continue to yield material benefits in a sustainable and renewable way, but that their scientific, ecological and cultural values are preserved and, where possible, enhanced.

For more information on forest safety or any other aspect of forest management, I invite you to contact the Commission in Sydney or any of our offices located throughout New South Wales.

Hans Drielsma
Chief Executive

CHAPTER ONE

INTRODUCTION TO CHAIN SAW OPERATION

PROFESSIONAL ATTITUDE AND SKILLS

1.01 It is essential that the chain saw operator develop a professional attitude and skills for all aspects of operation.

A professional chain saw operator should:

a. have a keen sense of safety;

b. care for equipment (ie carry out regular chain saw maintenance including engine tuning and minor repairs),

c. be able to confidently assess a tree to be felled with regard to it's natural lean, presence of dangerous limbs, defects and the influence of any wind;

d. be able to fell a tree as close to the desired direction of fall as possible;

e. have a sense of responsibility towards the environment;

f. plan ahead,

g. work at a steady pace;

h concentrate at all times when involved in chain saw operations; and

i. use sound, low risk techniques.

1.02 TRAINING

To achieve the above the operator must be trained, practiced and kept up to date with appropriate current developments.

EQUIPMENT

1.03 The basic range of equipment which is considered essential for safe efficient chain saw operation is detailed in the two following paragraphs.

1.04 PERSONAL ITEMS

These should include the following.

a. Hard hat.

b Ear-muffs.

c Visor or safety glasses

d. Strong work boots (steel cap preferred) with strong ankle support and a deep non slip tread

e Reasonably close fitting clothes.

f. Cut-resistant trousers or chaps

1.05 TOOLS AND SUPPORT ITEMS

a. **General:**

(1) Sharp axe.

(2) Sledge hammer.

(3) Wedges (different sizes).

(4) Suitable fuel mix and chain oil container.

(5) Spare air filter & spark plug.

(6) Tool pouch & belt.

b. **Chain Saw:**

(1) Combination spanner.

(2) Engine tuning screw driver.

(3) Chain sharpening files (both flat and round)

(4) Chain sharpening angle gauge and/or chain sharpening file guide.

(5) Depth gauge setter

(6) Sprocket nose grease gun.

ANNEX A TO
CHAPTER ONE

TERMINOLOGY

Back Cut (Felling Cut) - This is the final cut, or release cut.

Bind - Refers to the tension and compression relationship in a log. If wood in compression is cut last then the log may bind and the saw may jam.

Boring - Using the saw to 'bore' (cut) a hole into a tree or piece of timber.

Chain Brake - A device activated by the operator's hand or by inertia to stop rotation of the chain in a 'kickback' situation.

Cross Cutting - Usually refers to operations that involve cutting across the grain of the timber. It generally refers to timber that is not free-standing (i.e. fallen trees).

Cutting Attachment - The combination of the guide bar, the sprocket and the saw chain are referred to as the cutting attachment.

Defect - Any irregularity in the tree, such as hollow areas, burnt out areas, rotten areas etc

Double Leader - A tree with a trunk that forks into two trunks (See Figure 7:8)

Felling - The process of cutting down a tree.

Guide Bar (Cutter Bar) - The bar which guides and supports the saw chain. (See Figure 1A.1)

Hangers - Broken branches left lodged up in a tree.

Hang-Ups - Trees that have lodged together after felling.

Holding Wood (Hinge Wood) - This is the part of the tree that is not cut when felling. It acts as a hinge controlling the tree's fall.

Kickback - An uncontrolled sudden upward or backward motion of the guide bar which may occur when the moving saw chain, particularly towards the nose of the bar, contacts an obstacle that it cannot cut through

Limbing - Cutting branches off a felled or standing tree.

Power Head - The motor of the chain saw.

Ripping - Cutting wood fibre along the grain of the wood

Scarf - A wedge which is cut out of the tree to direct it in the desired line of fall. It controls the tree allowing a smooth, steady fall It also serves as a means of breaking the holding wood

Sprocket - The sprocket is the chain drive gear which pulls the chain around the bar.

Stag - A tree that has had its centre burnt out or that has some other major defect.

Widow Maker - A tree branch or other hazard that may fall and injure the operator or other persons.

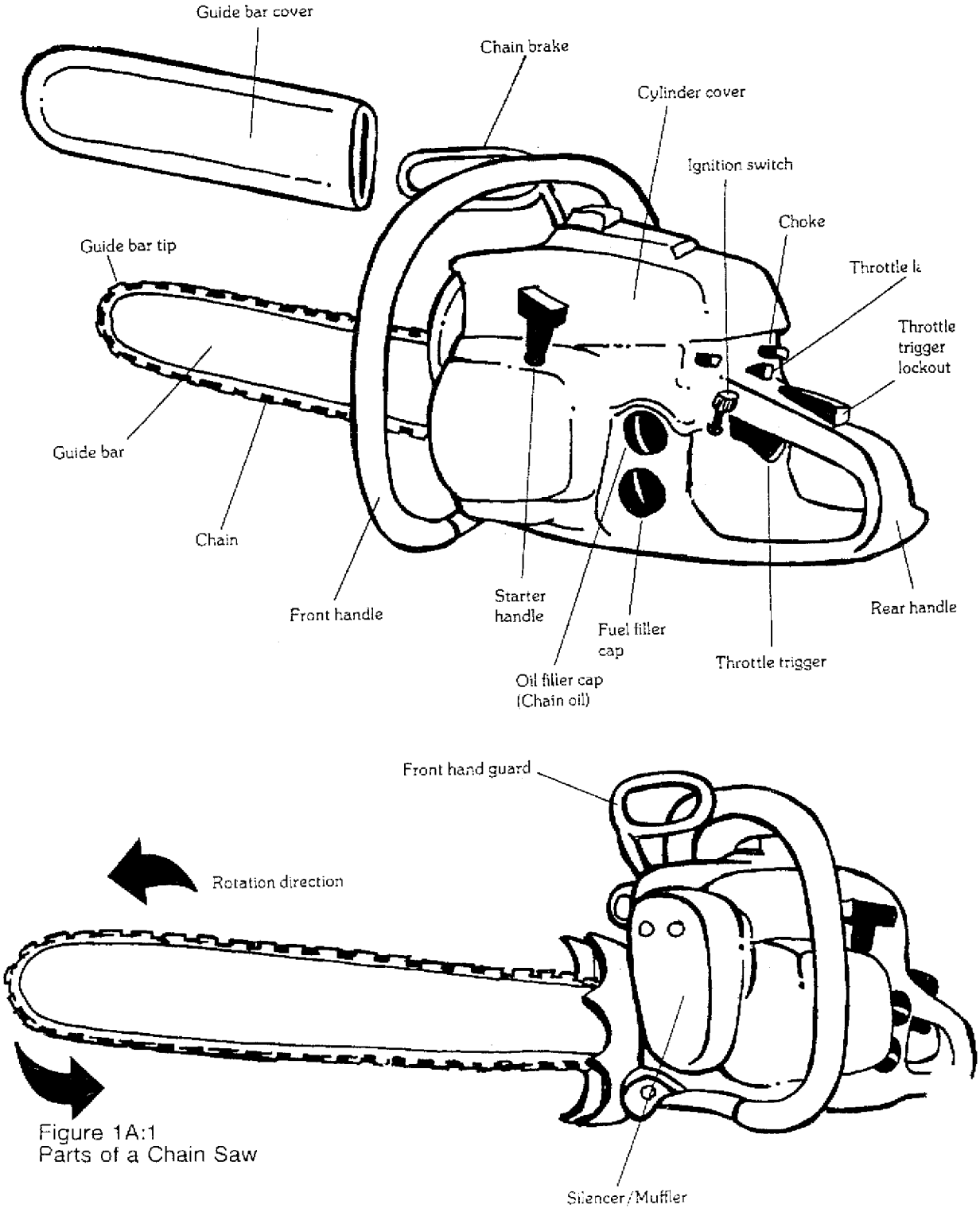


Figure 1A:1
Parts of a Chain Saw

CHAPTER TWO

SAFETY

INTRODUCTION

2.01 The use of a chain saw in the hands of an incompetent person can be very dangerous. Before attempting to use a chain saw you should have completed an approved course of instruction. Before using any chain saw you should thoroughly read the owner's manual to ensure you are familiar with all aspects of the particular saw.

2.02 Once fully trained in chain saw operation, the best defence against accidents is combining knowledge and common sense.

STARTING POSITION

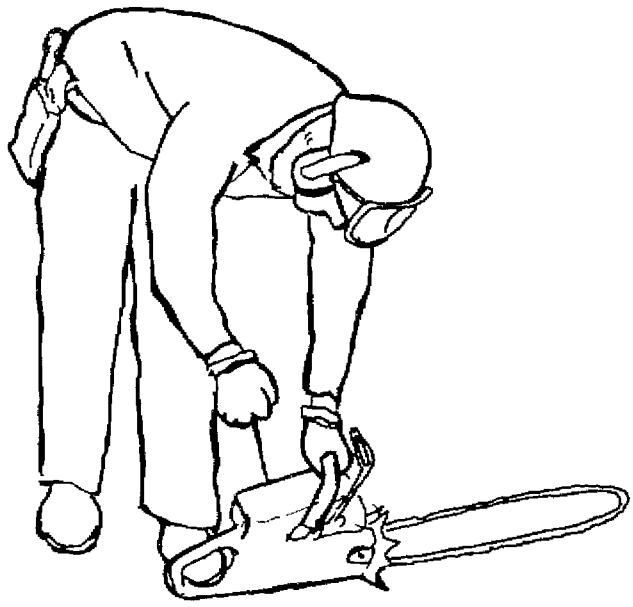
2.03 To correctly start the saw (when cold), proceed as follows:

a **Step 1** - Place the saw on the ground

b. **Step 2** - Clear away any obstacles, particularly near the tip of the guide bar and ensure all personnel are clear of the area.

c. **Step 3** - Place the left foot through the rear handle and left hand on the front handle. (See Figure 2:1)

d **Step 4** - Pull the starter rope with the right hand.



Start saw on ground without help

Figure 2:1
Starting Position

'DO'S' AND 'DON'TS' OF CHAIN SAW OPERATION

2.04 DO'S

For the sake of safety and efficiency, **do:**

a. think before you act;

b think safety;

c. plan ahead;

d. clear the work area;

e. use personal protective equipment;

f. start the saw correctly;

g. hold the saw firmly with both hands with your thumb wrapped around the front handle;

h. ensure you have a firm footing;

g. identify escape routes;

h consider the safety of all personnel in your work area;

i. stop the saw if carrying it for a distance or over obstacles; and

j. when carrying a running saw short distances activate the chain break.

2.05 DON'TS

For the sake of safety and efficiency, **do not:**

a start the saw at the place of refuelling (move away at least four meters before starting);

b. smoke around fuel oil;

c. refuel with the engine running;

d. touch the chain when the motor is running;

e. cut with a loose or dull chain

f. wave a running saw around;

g approach a person operating a chain saw, especially from behind;

h. work by your self; and

i. allow a running chain to contact dirt or rocks

PROTECTION FROM OCCUPATIONAL HAZARDS

2.06 FALLING LIMBS AND BRANCHES

Always wear a safety helmet. Do not re-enter the felling area until adjacent trees have settled (wait at least two minutes in large hardwoods). Keep a sharp watch for hanging limbs etc.

2.07 EYE INJURIES

Wear a mesh visor attached to a safety helmet, or safety glasses.

2.08 INDUSTRIAL DEAFNESS

Hearing can be seriously impaired by the noise of a chain saw. Wear ear protection. Remember a hearing aid will not overcome high frequency hearing loss.

2.09 FOOT INJURIES

Wear heavy work boots with a deep patterned sole and adequate ankle support. Safety boots with steel toe caps are ideal.

2.10 REYNAUD'S PHENOMENON ('WHITE FINGERS')

This is caused by vibration. It mainly occurs in cold climates. Initially a tingling sensation occurs in the tips of the fingers, finally becoming white and numb. Keep hands warm and ensure the saw's anti-vibration mounts are in good condition.

2.11 BACK INJURIES

Use correct lifting techniques. Seek assistance when lifting heavy or awkward objects.

2.12 KICKBACK DANGER

Inspect the chain brake regularly. Do not operate the saw if brake is not functioning correctly. Only use safety (anti-kick) chain.

2.13 SAFETY DISTANCE

Keep at least two and half times the length of the tree being felled between operators.

2.14 HAND TOOLS

Keep cutting edges covered when not in use Replace damaged handles. Do not use wedges with burred heads.

2.15 OTHER CONSIDERATIONS

Take extra care when using a chain saw in wet or windy conditions. Watch out for power lines (may be concealed by foliage). Consider potential risk of fire and have appropriate fire protection available. Beware of fumes when operating a chain saw in areas of poor ventilation. Beware of wire, nails, bolts etc that may be in or around wood or trees.

KICKBACK

2.16 Kickback is one of the most common causes of chain saw accidents. It occurs when a moving chain contacts an obstacle and rather than cutting through it, recoils.

2.17 CAUSES

The chain can recoil when either of the following occur:

a. Too much of the cutter bites into the wood and cannot sever it because:

(1) at the tip of the bar the cutters are more exposed;

(2) depth gauges are too low; or

(3) depth gauges are not rounded and bury into the wood.

b. An obstacle contacts the front of the depth gauge.

2.18 REACTION

When the cutter hits an obstruction it cannot cut, an opposing force is delivered to the guide bar. The bar is thrown out of the cut (backwards and upwards) and can hit the operator if he she is in line with the bar when this occurs (lacerated left hands are quite frequent as often when a kickback occurs the operator looses his her grip, lacerations to the neck and face may also result).

2.19 Speed of 'flight' of the guide bar in a kickback situation can approach 80k/h - much faster than a normal person's reaction time. (See Figure 2:2). Operators therefore need to be constantly aware of the risk of kickback.

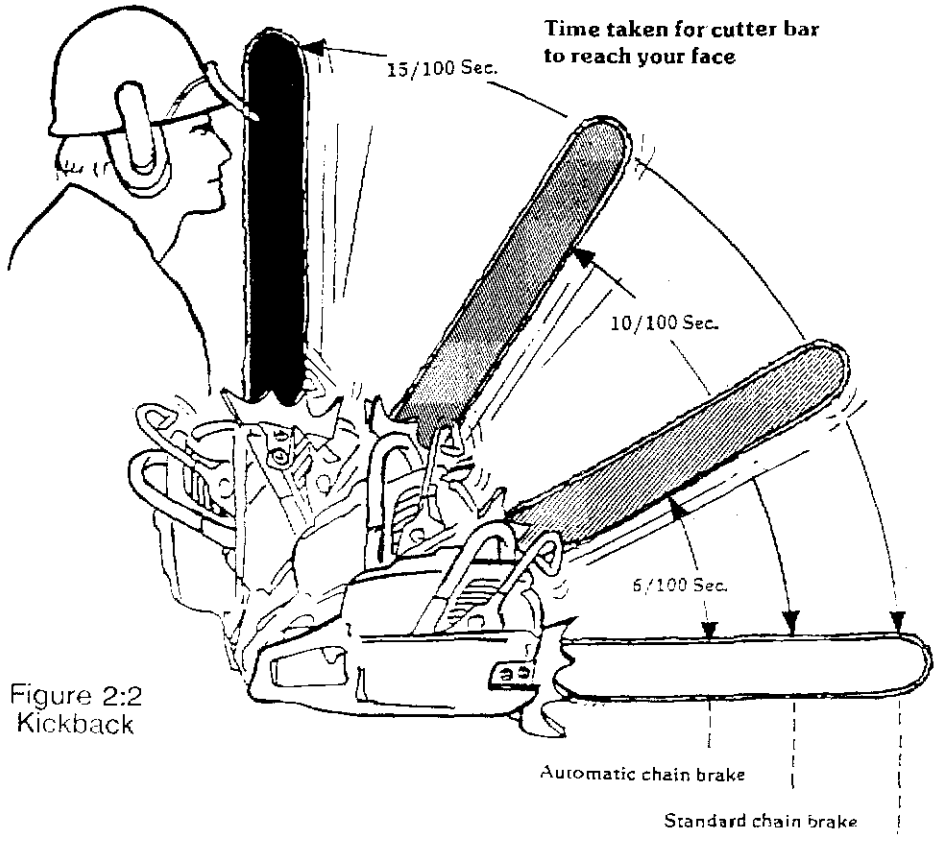


Figure 2:2
Kickback

AVOIDING KICKBACK

2.20 SAFETY MEASURES

The following points should be observed to reduce the possibility of kickback occurring:

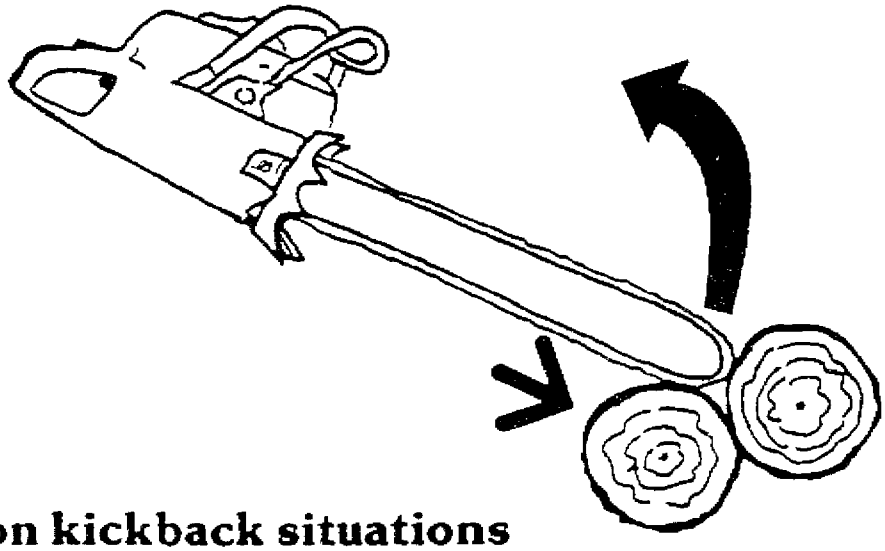
a. Maintain a firm grip (good footing, keep the saw close to the body, straight wrist and thumb wrapped around front handle).

b Cut at peak revs (more chance of cutting through an obstruction)

c. Be conscious of where the tip of the bar is at all times

d Use correct boring techniques.

e. Avoid limbing with the upper section of the guide bar tip.



Common kickback situations

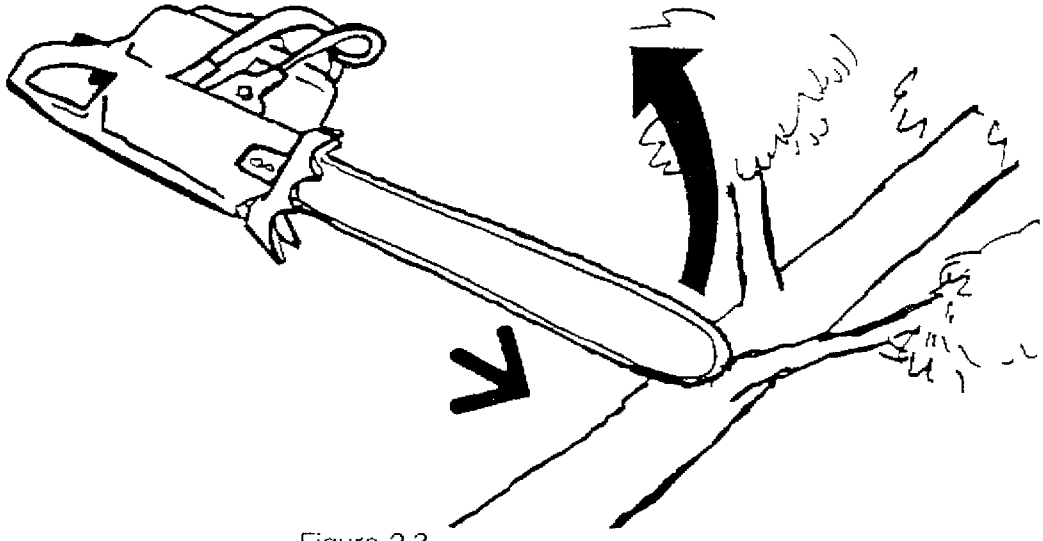


Figure 2 3

f. Sharpen chain correctly.

g. Tension chain correctly.

h. Set depth gauges correctly

i. Round the front of depth gauges well.

j. Ensure the chain brake is functioning correctly.

k. Only use safety chain (anti-kickback chain).

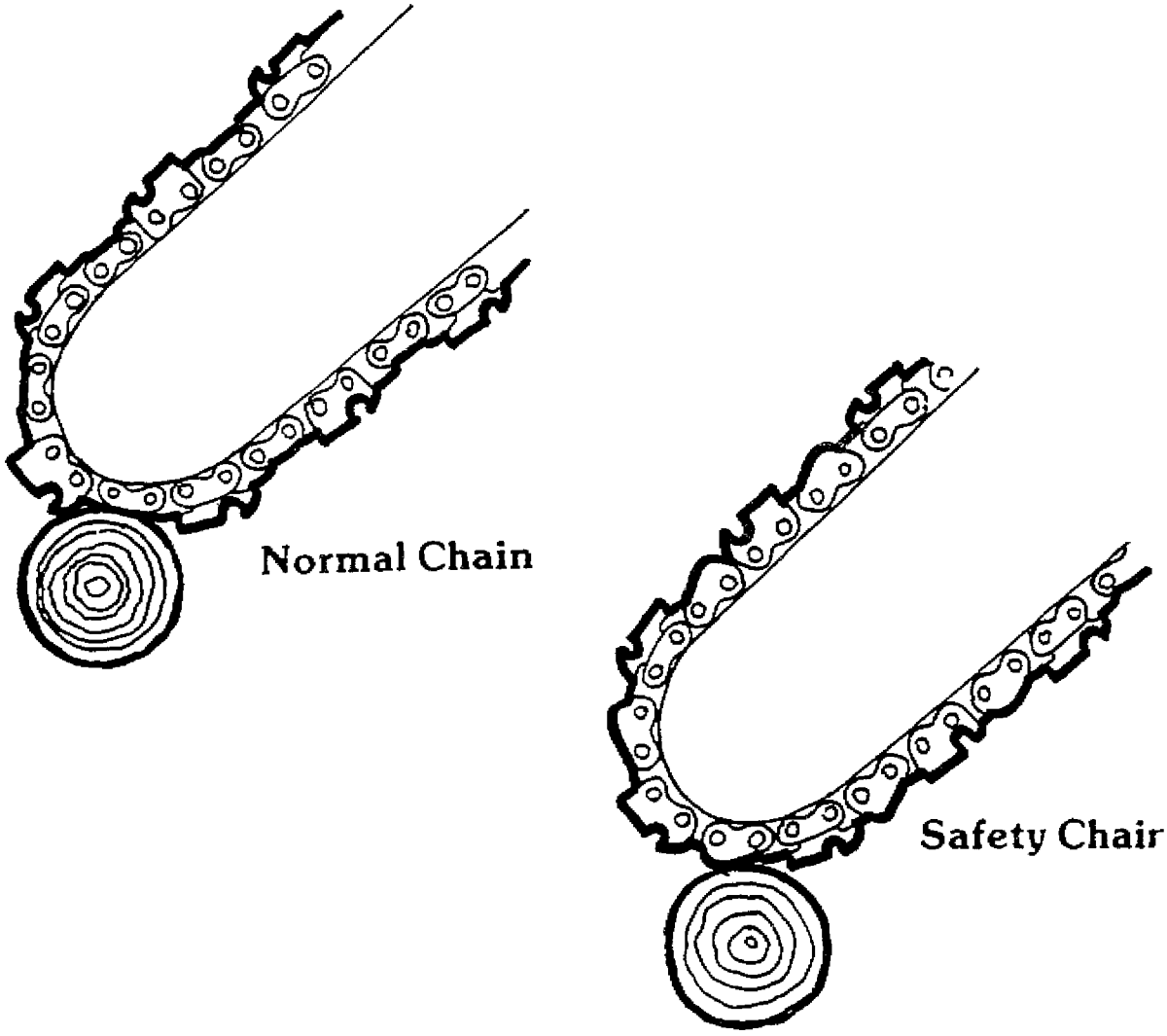


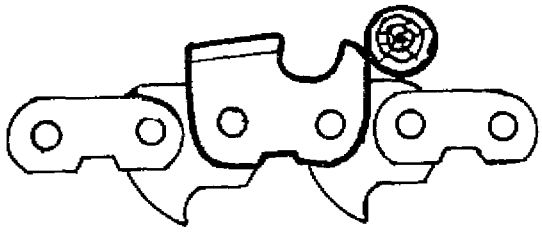
Figure 2:4
Safety Chain

l. Use sprocket tip guide bars. Kickback is effectively reduced due to the extra tension of the chain and the reduced tip danger area.

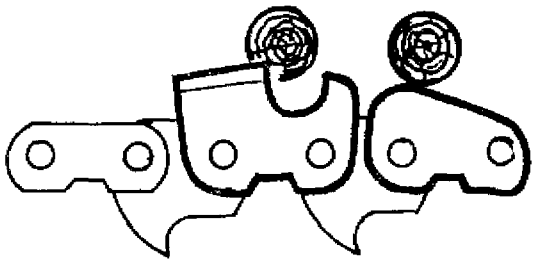
2.21 CHAIN DESIGN

Some years ago, chain makers designed a ramp into the link strap between the cutters. The purpose of the ramp was to ease the cutter's depth gauge over obstacles. This design is called **1st Generation** Safety Chain. See Figure 2:5

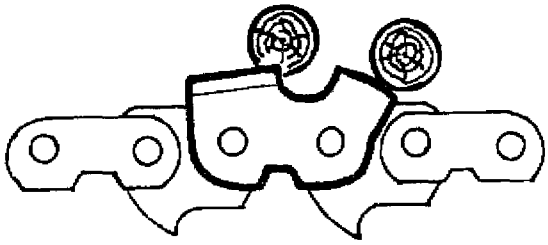
2.22 Further development of this design was to do away with the ramp on the link strap and design it into the depth gauge This design is called **2nd Generation** Safety Chain.



Standard chain
Obstacle strikes vertical face of depth gauge



1st generation safety chain
The ramp on the link strap guides the obstacle onto the cutter



2nd generation safety chain
The cutter's depth gauge has the ramp built in, thus smoothly guiding the obstacle onto the cutter

Figure 2:5
Safety Chains

2.23 GUIDE BAR DESIGN

A great deal of work has also been done to reduce the actual danger area on the guide bar tip. Standard hard tip bars have been produced with a narrower profile, thus reducing the kickback danger area of the bar.

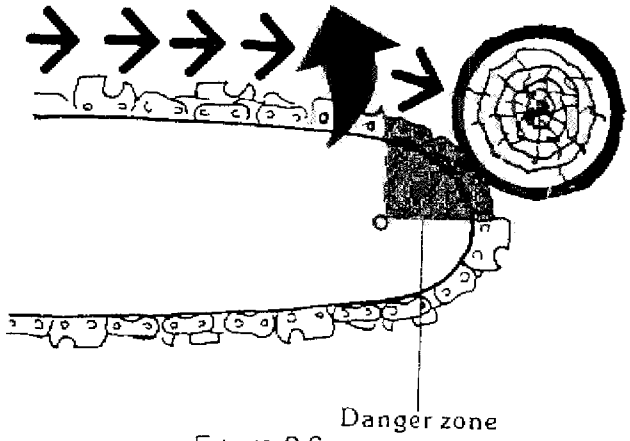


Figure 2:6
Guide Bar Danger Zone

2.24 SPROCKET TIP BAR

Following this development sprocket tip bars were produced. These allowed chains to be tensioned tighter, thus reducing kickback potential. Sprocket tip bars also allow lower profile bars to be produced as a result of the reduced friction.

2.25 SHARK NOSE TIP BAR

A further development along these lines is the shark nose tip bar. This design is not a consideration in large saws because the shark nose tip is not efficient in the boring operation. Also shark nose tip bars cannot be reversed to 'even-out' wear.

2.26 CHAIN BRAKE

It is essential that the chain brake is operatable at all times. The chain brake must be checked before using the saw. By frequent operation of the brake throughout the day, the brake's internal components are kept free from an accumulation of dirt and saw dust. For chain brake adjustment, refer to a competent chain saw mechanic.

CHAPTER THREE

THE CUTTING ATTACHMENT

SPROCKET/GUIDE BAR/CHAIN

3.01 MAINTENANCE

The cutting attachment on a chain saw does the real work when the saw is operating. Therefore it is essential that all three components, sprocket guide bar chain are properly maintained for the saw to be used efficiently and safely.

3.02 The sprocket guide bar/chain, work as an inter-related trio. If any one of these parts is not in good working order, problems will result in the other two eg A loose chain will cause rapid wear behind the tip of the bar and to the sprocket.

SPROCKETS

3.03 The clutch transmits power through the clutch drum to the sprocket. The sprocket pulls the chain around the bar and through the wood. The sprocket is a gear, and gear terminology is used to name its parts.

3.04 TYPES

The three types of sprockets in common use are;

a. the **spur** (fixed) sprocket;

b. the **rim** (floating) sprocket: and

c. the **cloverleaf** sprocket.

3.05 SPUR SPROCKET

Spur sprockets have wide tooth faces which engage the chain's drive link tangs. These wide faces help in the alignment of the chain to the cutter bar groove The spur sprocket supports the chain on the tip of the teeth and the drive link tangs sit between the sprocket teeth.

3.06 Spur sprockets are permanently attached to the clutch drum They have the advantages of good bark & chip removal but tend to be hard on the chain.

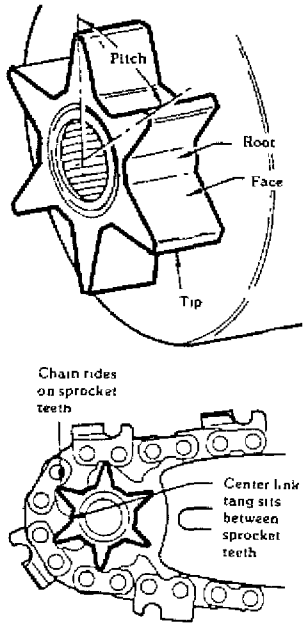


Figure 3·1
The Spur Sprocket

3.07 RIM SPROCKET

Rim sprockets look like a wheel because they have the sprocket teeth mounted between two rims. The rims support the tie straps thus allowing the chain to run smoother with less wear. The drive link (tangs) of the chain are engaged by the faces of the sprocket teeth. Chip removal is by way of discharge holes on the side of the rim. See Figure 3:2 These discharge holes face away from the clutch drum

3.08 The rim sprocket is mounted on a splined hub, welded to the clutch drum. This spline allows the rim sprocket to self-align with the guide bar groove.

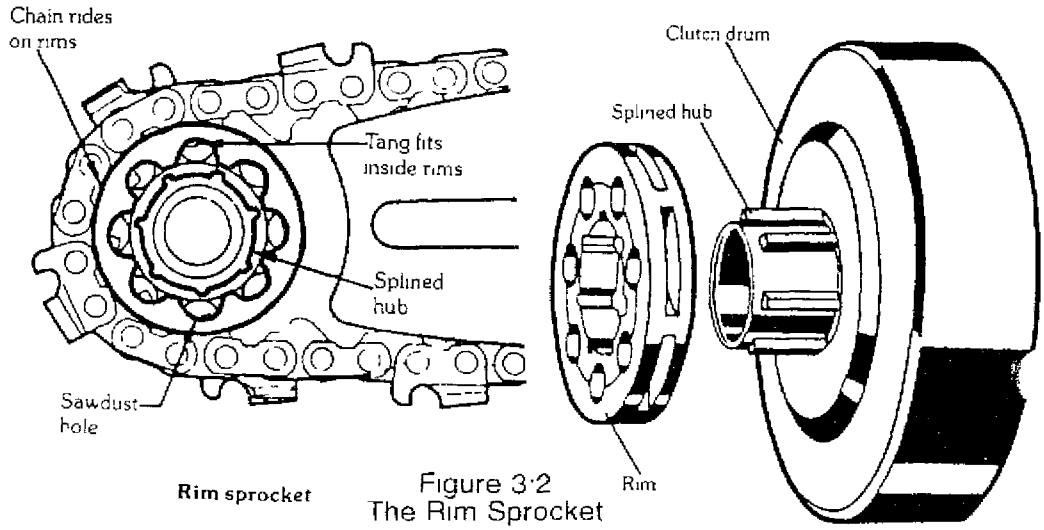


Figure 3·2
The Rim Sprocket

3.09 CLOVERLEAF SPROCKET

Cloverleaf sprockets are similar to rim sprockets but differ in that the rims are not continuous, but are alternately opened to resemble a cloverleaf. Drive is the same as for rim sprockets but they give better chip removal. This type of sprocket is generally fitted to cheap or hobby saws.

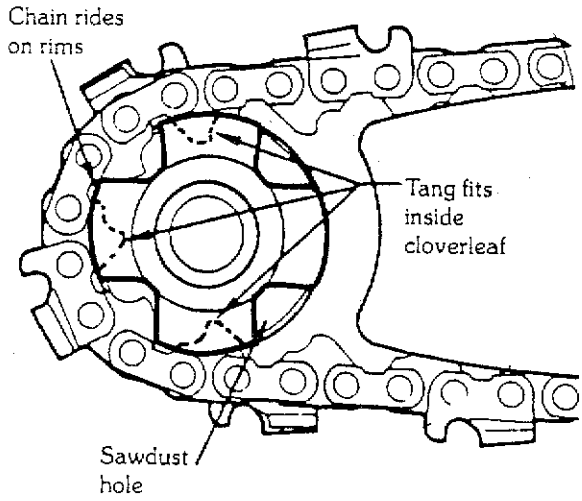


Figure 3:3
The Cloverleaf Sprocket

3.10 SPROCKET PITCH

It is important that chain and sprocket pitch are matched. The pitch of the chain is determined by measuring the distance between three adjacent rivets and dividing by two.

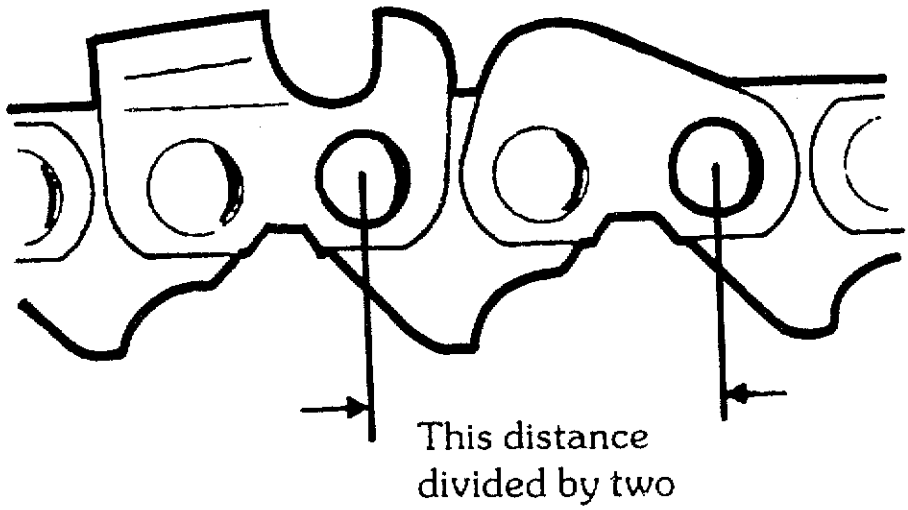


Figure 3:4
Sprocket Leaf Pitch

3.11 SPROCKET REPLACEMENT

Drive sprockets are subjected to extreme heat and friction, and considerable wear. A worn sprocket will damage and weaken a chain beyond repair, cause a loss of cutting power, accelerate bar wear and make it difficult to tension the chain correctly.

3.12 Manufacturers recommend installing a new sprocket with each new chain fitted. However, sprocket life can be extended by using two chains per sprocket. chains being alternated daily

3.13 AVOIDING SPROCKET PROBLEMS

a. Replace when worn with the correctly pitched sprocket.

b Two new chains = a new sprocket.

c. Keep the chain well sharpened.

d. Keep the chain correctly tensioned.

e. Grease the sprocket bearing regularly.

f. Keep the guide bar rails in good order

g. Maintain a good oil flow in the guide bar groove.

GUIDE BARS (CUTTER BARS)

3.14 There are four types of guide bars in common use:

a Solid tip bar.

b. Roller tip bar.

c. Sprocket tip bar.

d. Shark nose tip bar.

3.15 SOLID NOSE BAR

As most of the friction between the guide bar and the chain is generated at the tip of the bar and most wear occurs there, the solid tip bar has a layer of hard-wearing stellite around the nose of the bar. Solid tip bars are made in wide and narrow profile.

3.16 ROLLER TIP BAR

In an early attempt to reduce friction at the tip of the bar, a roller nose was developed. Its disadvantages are that material such as twigs can get in the unsupported part of the chain behind the roller tip causing the chain to flick off the bar. The roller tip is easily knocked out of alignment and the tip and under side of the bar receive poor lubrication due to the gap behind the roller nose. The roller tip bar has now been replaced by sprocket tip bars.

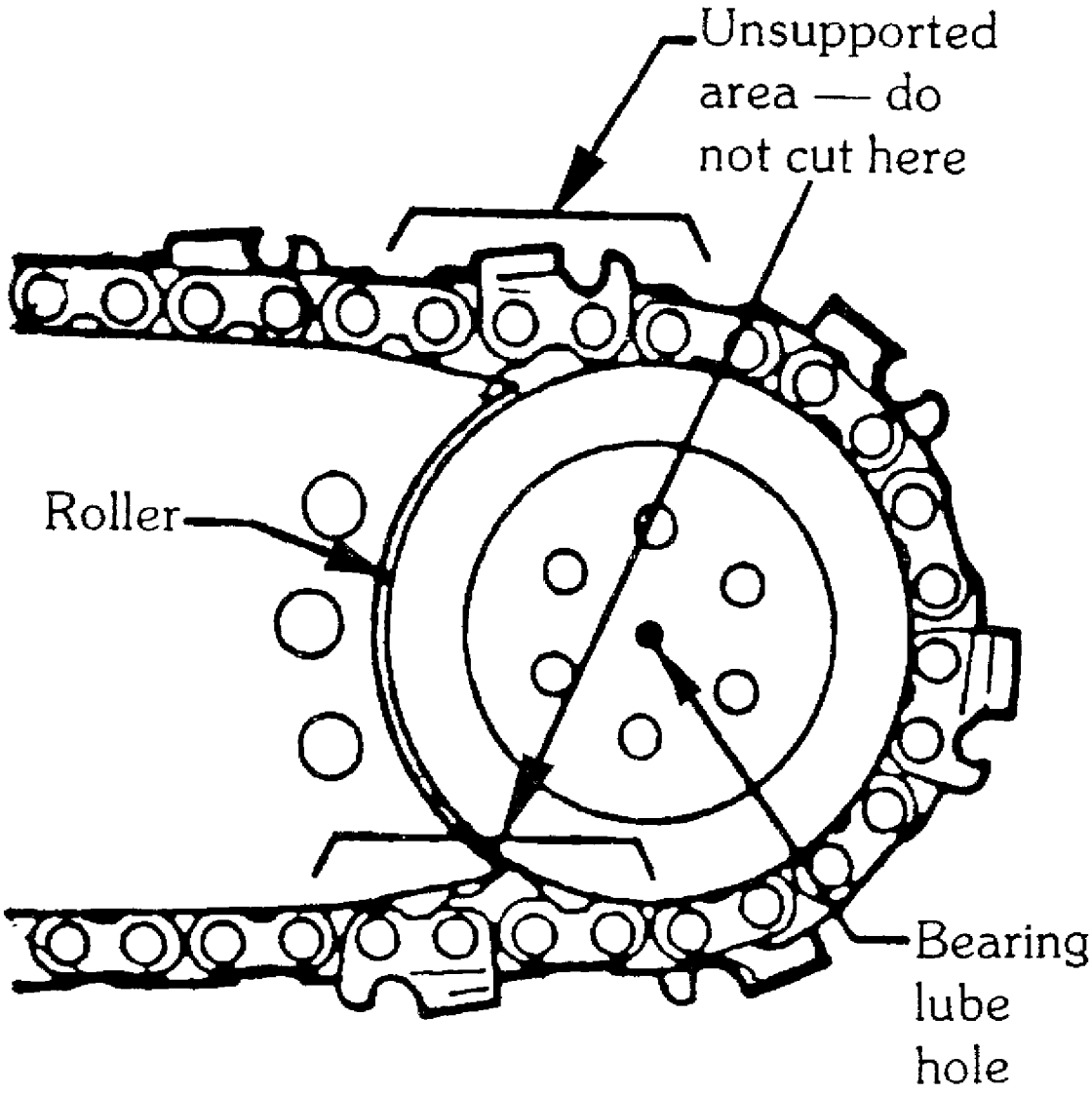


Figure 3-5
The Roller Tip Bar

3.17 SPROCKET TIP BAR

The sprocket tip bar is more successful than the other two types as i retains the full profile of the hard tip bar and incorporates a sprocke which lifts the chain off the bar as it goes around. The teeth of the sprocket must be the same pitch as that of the chain. Advantages o both the roller tip and sprocket tip bars are that by reducing friction more power is available for cutting and the chain can be run tighte reducing wear on sprocket, bar and chain.

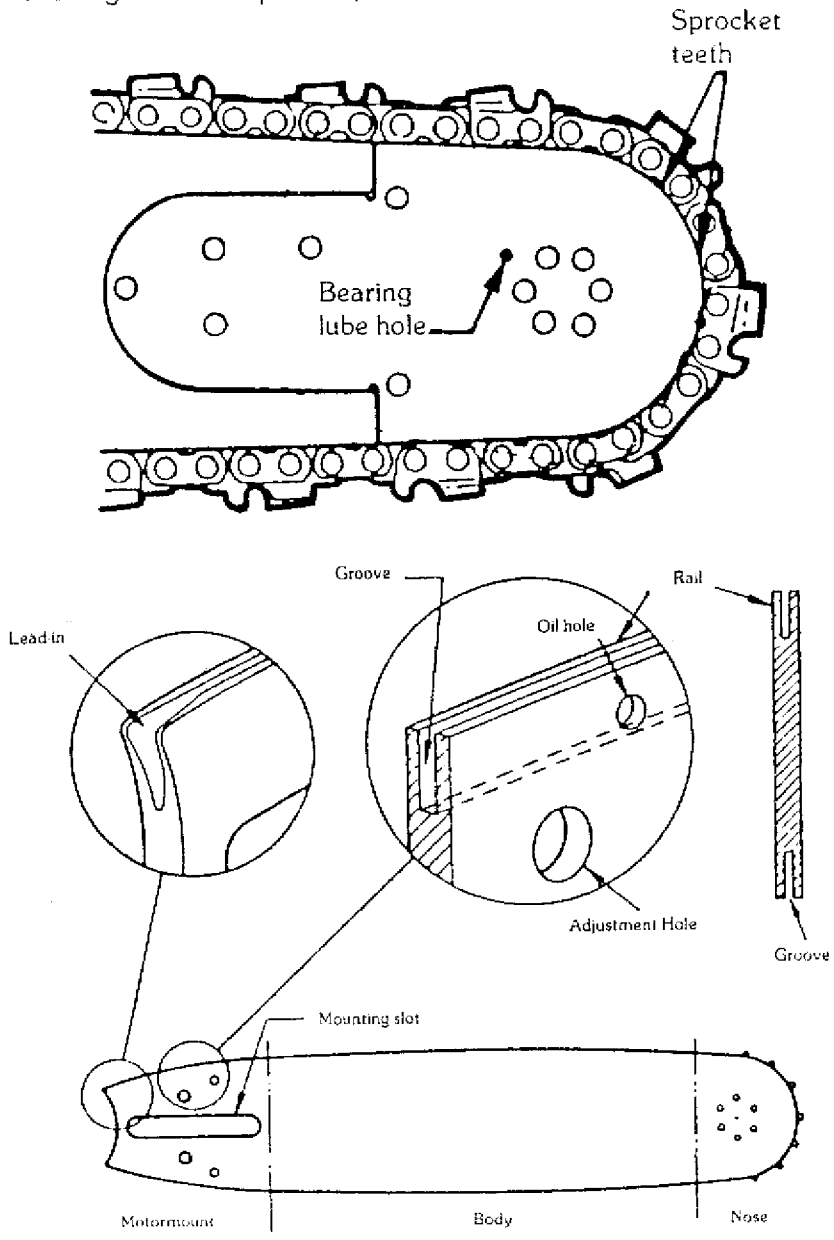


Figure 3:6
The Sprocket Tip Bar

3.18 SHARK NOSE TIP BAR

Similar to sprocket tip bars except the profile of the tip has been modified to reduce the kickback area.

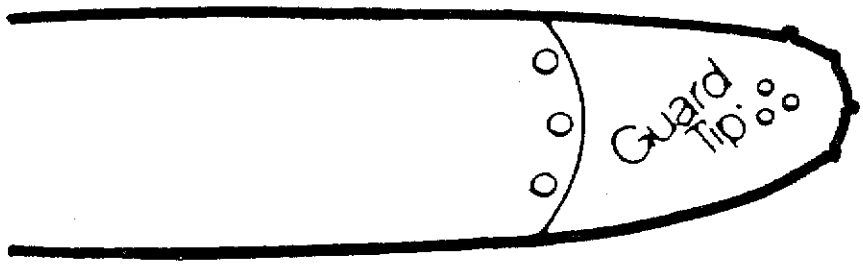


Figure 3:7
The Shark Nose Tip Bar

3.19 GUIDE BAR MAINTENANCE

Proper maintenance procedures for the guide bar are dealt with in Chapter 4, paragraph 11.

CHAINS

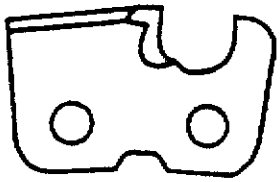
3.20 Chains are made in many different types, shapes and sizes, but for safe, effective operation all chains need;

a. to be sharpened correctly;

b. to be lubricated;

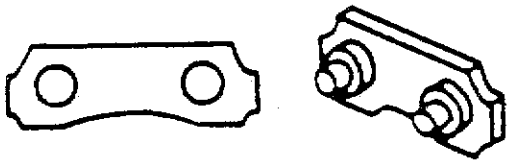
c. to be tensioned correctly; and

d. their depth gauges set correctly.

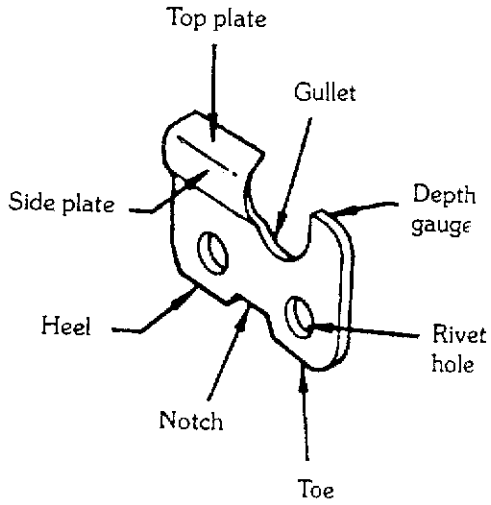


Cutter

Drive links



Tie straps



Cutter

Rivets

Figure 3:8
Chain Components

3.21 DRIVE LINK

The tang is the part of the drive link which meshes with the sprocket to drive the chain. The hook of the tang picks up oil and carries it along the bar for lubrication. The hook also forms a scraper which keeps the bar groove clean The tang, by riding in the bar groove keeps the chain aligned on the bar. Drive links come in different gauges (thickness) and must match the gauge of the guide bar.

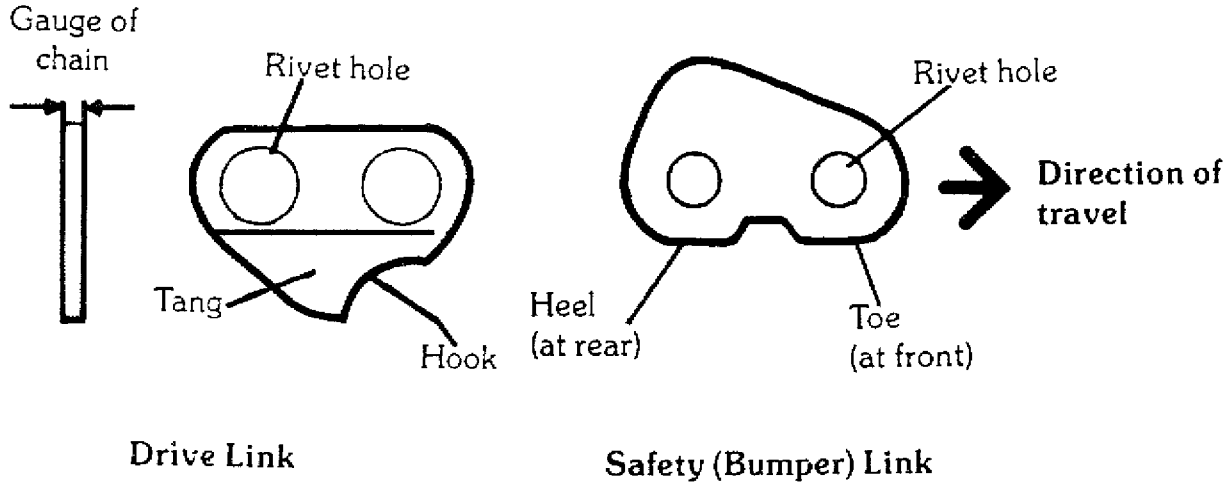


Figure 3.9
Drive and Bumper Links

3.22 TIE STRAPS

The tie strap is the connecting link between the cutter and the drive links, as well as a spacing link between the cutters

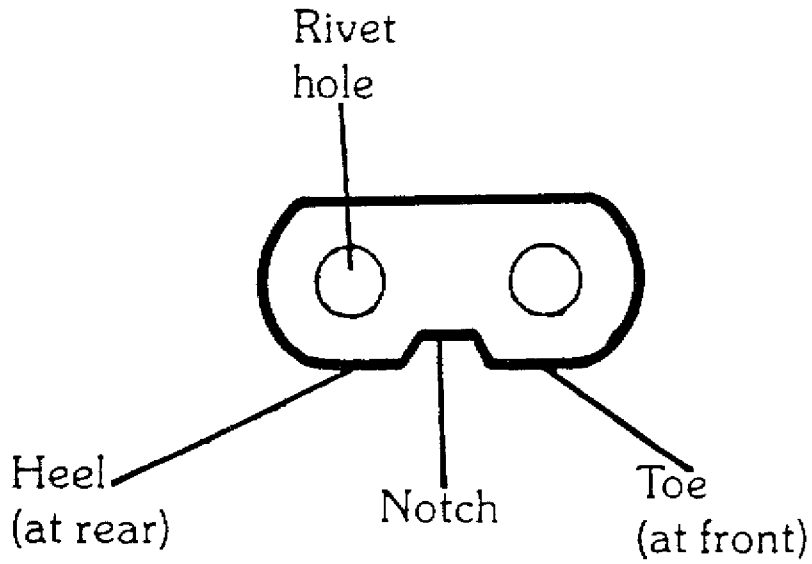


Figure 3.10
Tie Straps

3.23 SET

The amount of set decreases as the cutter top plate is worn backwards and the side plate slopes inwards towards the rear to the cutter. This is the reason why some well worn chains will not successfully cut thick heavy bark (ie - reduced amount of set).

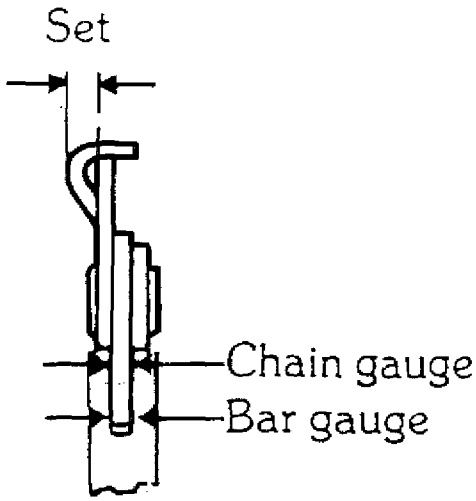


Figure 3.11
Chain Set

3.24 KERF

This is the width of the cut made into the wood by the chain.

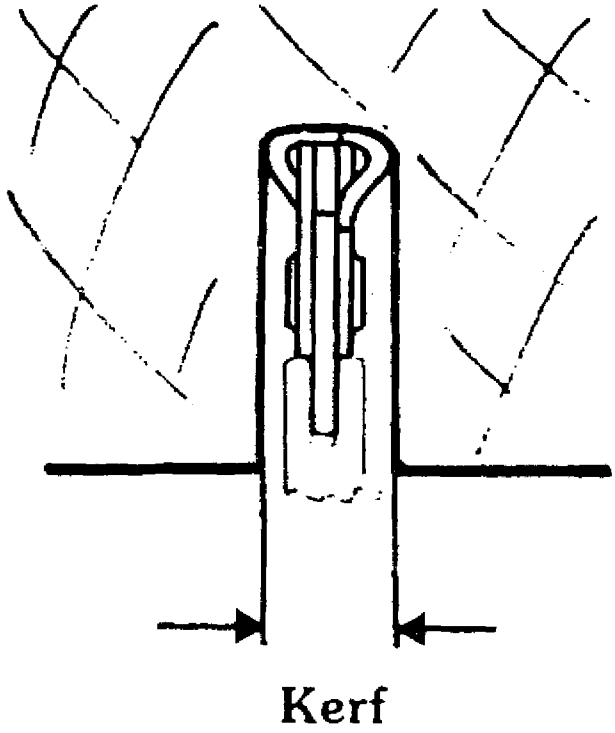


Figure 3:12
Kerf

3.25 GAUGE

This is the thickness of the tang of the drive link.

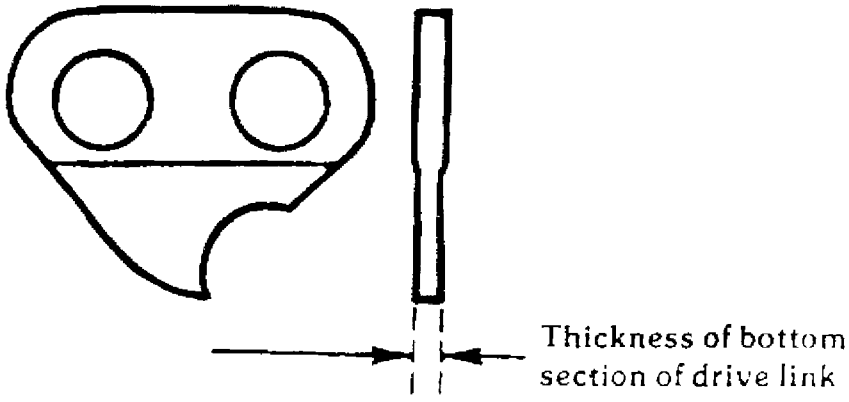


Figure 3:13
Gauge

3.26 CUTTERS

A saw chain has both left and right cutters. Each cutter has a top plate and side plate which are sharpened to a fine edge and regularly require re-sharpening to keep the chain operating at peak performance.

3.27 HOW A CUTTER WORKS

The top plate feeds the cutter into the wood and the side plate severs the side of the cutting track. The working corner (intersection of top and side plates), severs the cross grain. To control the amount of wood taken at one bite each cutter has a finger like projection at the front called a depth gauge

3.28 The base of each cutter comprises three sections. They are the toe, the heel and the notch. The toe at the front and the heel at the rear slide on the guide bar. The notch provides clearance between the chain and the spur sprocket.

3.29 CUTTER TYPES

Most cutters fall into one of three categories. These are.

a **round** or **chipper** profile:

b **square** or **chisel profile:**

c **semi-square** or **semi-chisel** profile.

3.30 **ROUND OR CHIPPER PROFILE**

Slow cutting but stays sharper longer due to it's large cutting corner.

3.31 **SQUARE OR CHISEL PROFILE**

Fast cutting but has a fine cutting corner, which is easily blunted in abrasive cutting conditions.

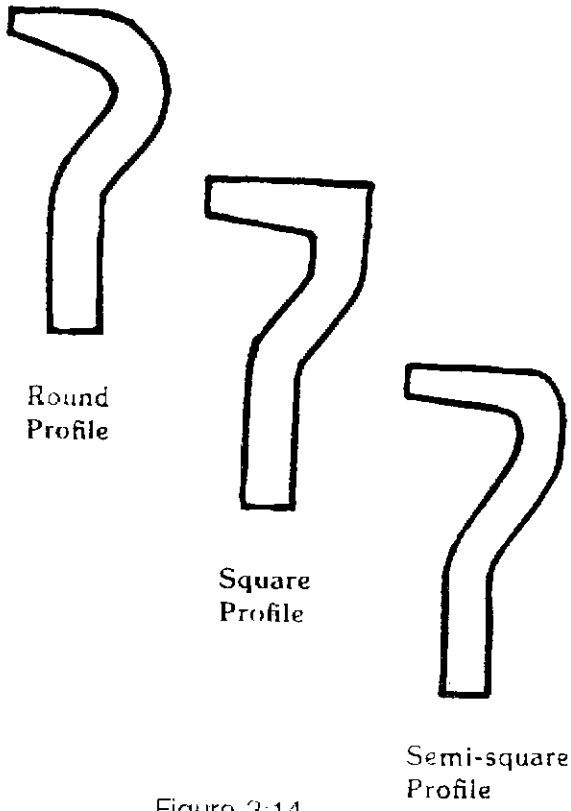


Figure 3:14
Round and Square Profile Cutters

3.32 **SEMI-SQUARE OR SEMI-CHISEL PROFILE**

This is a compromise between a round and a square profile.