CHAPTER THREE

TROUBLESHOOTING

Diagnosing snowmobile ills is relatively simple if you use orderly procedures and keep a few basic principles in mind.

Never assume anything. Do not overlook the obvious. If you are riding along and the snowmobile suddenly quits, check the easiest, most accessible problem spots first. Is there gasoline in the tank? Has a spark plug wire fallen off? Check the ignition switch. Maybe that last mogul caused you to accidentally switch the emergency switch to OFF or pull the emergency stop "tether" string.

If nothing obvious turns up in a cursory check, look a little further. Learning to recognize and describe symptoms will make repairs easier for you or a mechanic at the shop. Describe problems accurately and fully. Saying that "it won't run" isn't the same as saying "it quit at high speed and wouldn't start," or that "it sat in my garage for 3 months and then wouldn't start."

Gather as many symptoms together as possible to aid in diagnosis. Note whether the engine lost power gradually or all at once, what color smoke (if any) came from the exhaust, and so on. Remember that the more complicated a machine is, the easier it is to troubleshoot because symptoms point to specific problems.

You do not need fancy equipment or complicated test gear to determine whether repairs can be attempted at home. A few simple checks could save a large repair bill and time lost while the snowmobile sits in a dealer's service department. On the other hand, be realistic and do not attempt repairs beyond your abilities. Service departments tend to charge heavily for putting together disassembled components that may have been abused. Some will not even take on such a job — so use common sense; do not get in over your head.

OPERATING REQUIREMENTS

An engine needs three basics to run properly: correct gas/air mixture, compression, and a spark at the right time. If one or more are missing, the engine will not run. The electrical system is the weakest link of the three. More problems result from electrical breakdowns than from any other source; keep this in mind before you begin tampering with carburetor adjustments.

If the snowmobile has been sitting for any length of time and refuses to start, check the battery (if the machine is so equipped) for a charged condition first, and then look to the gasoline delivery system. This includes the tank, fuel petcocks, lines, and the carburetor. Rust may have formed in the tank, obstructing fuel flow. Gasoline deposits may have gummed up carburetor jets and air passages. Gasoline tends to lose its potency after standing for long periods. Condensation may contaminate it with water. Drain old gas and try starting with a fresh tankful.

Compression, or the lack of it, usually enters the picture only in the case of older machines. Worn or broken pistons, rings, and cylinder bores could prevent starting. Commonly, a gradual power loss and harder and harder starting will be readily apparent in this case.

PRINCIPLES OF 2-CYCLE ENGINES

The following is a general discussion of a typical 2-cycle piston-ported engine. The same principles apply to rotary valve engines except that during the intake cycle, the fuel/air mixture passes through a rotary valve assembly into the crankcase. During this discussion, assume that the crankshaft is rotating counterclockwise.

In **Figure 1,** as the piston travels downward, a scavenging port (A) between the crankcase and the cylinder is uncovered. Exhaust gases leave the cylinder through the exhaust port (B), which is also opened by downward movement of the piston. A fresh fuel/air charge, which has previously been compressed slightly, travels from the crankcase (C) to the cylinder through scavenging port (A) as the port opens. Since the incoming charge is under pressure, it rushes into the cylinder quickly and helps to expel exhaust gases from the previous cycle.

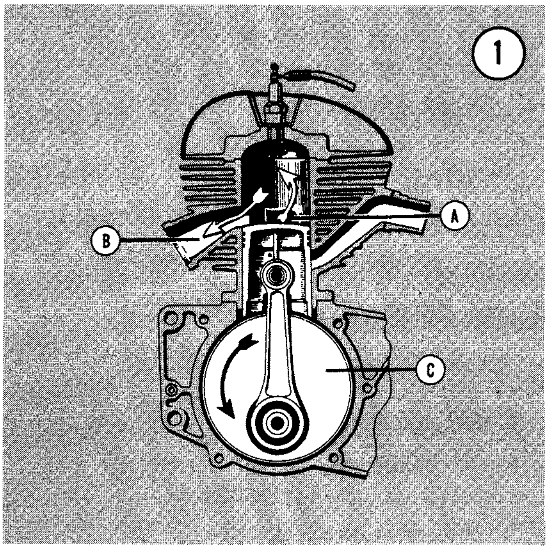
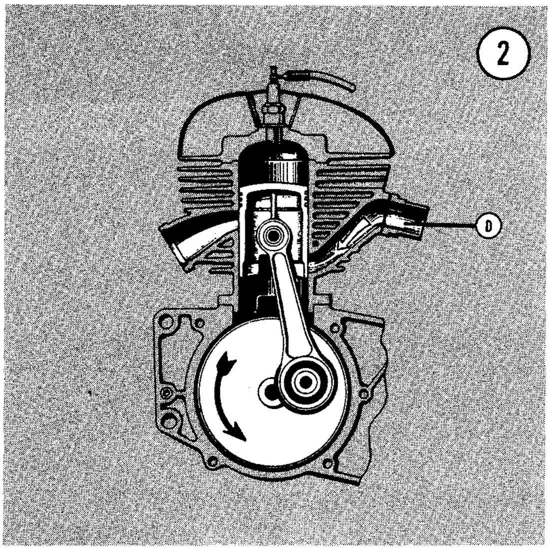


Figure 2 illustrates the next phase of the cycle. As the crankshaft continues to rotate, the piston moves upward, closing the exhaust and scavenging ports. As the piston continues upward, the air/fuel mixture in the cylinder is compressed. Notice also that a low pressure area is created in the crankcase at the same time. Further upward movement of the piston uncovers intake port (D). A fresh fuel/air charge is then drawn into the crankcase through the intake port because of the low pressure created by the upward piston movement.

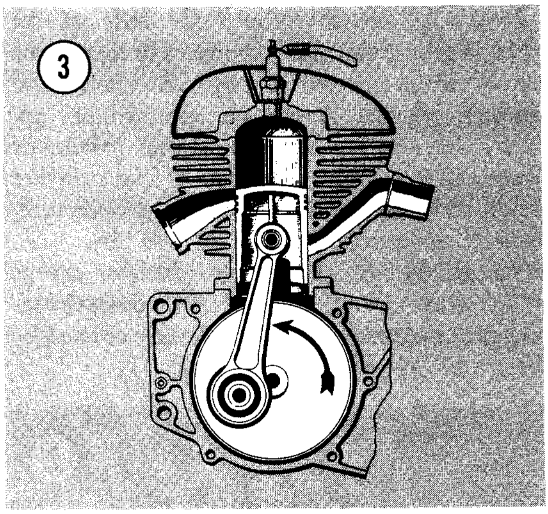


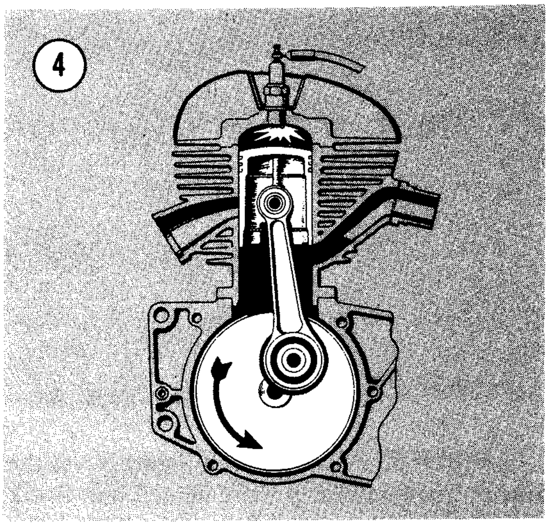
The third phase is shown in **Figure 3**. As the piston approaches top dead center, the spark plug fires, igniting the compressed mixture. The piston is then driven downward by the expanding gases.

When the top of the piston uncovers the exhaust port, the fourth phase begins, as shown in **Figure 4**. The exhaust gases leave the cylinder through the exhaust port. As the piston continues downward, the intake port is closed and the mixture in the crankcase is compressed in preparation for the next cycle. Every downward stroke of the piston is a power stroke.

ENGINE STARTING

An engine that refuses to start or is difficult to start can try anyone's patience. More often than not, the problem is very minor and can be





found with a simple and logical troubleshooting approach.

The following items provide a beginning point from which to isolate an engine starting problem.

Engine Fails to Start

Perform the following spark test to determine if the ignition system is operating properly.

1. Remove a spark plug.
2. Connect spark plug connector to spark plug and clamp base of spark plug to a good grounding point on the engine. A large alligator clip makes an ideal clamp. Position spark plug so you can observe the electrode.
3. Turn on ignition and crank engine over. A fat blue spark should be evident across spark plug electrode.

WARNING

On machines equipped with CDI *(capacitor discharge ignition), do not hold spark plug, wire, or connector or a serious electrical shock may result.*

4. If spark is good, check for one or more of the following possible malfunctions:
   a. Fouled or defective spark plugs
   b. Obstructed fuel filter or fuel line
   c. Defective fuel pump
   d. Leaking head gasket (see *Compression Test)*
5. If spark is not good, check for one or more of the following:
   a. Burned, pitted, or improperly gapped breaker points
   b. Weak ignition coil or condenser
   c. Loose electrical connections
   d. Defective CDI components — have CDI system checked by an authorized dealer.

Engine Difficult to Start

Check for one or more of the following possible malfunctions:

a. Fouled spark plugs
b. Improperly adjusted choke
c. Defective or improperly adjusted breaker points
d. Contaminated fuel system
e. Improperly adjusted carburetor
f. Weak ignition coil
g. Incorrect fuel mixture
h. Defective reed valve
i. Crankcase drain plugs loose or missing
j. Poor compression (see *Compression Test)*

Engine Will Not Crank

Check for one or more of the following possible malfunctions:

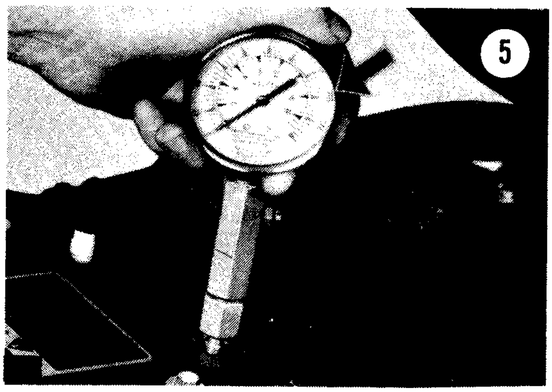
a. Defective recoil starter
b. Seized piston
c. Seized crankshaft bearings
d. Broken connecting rod

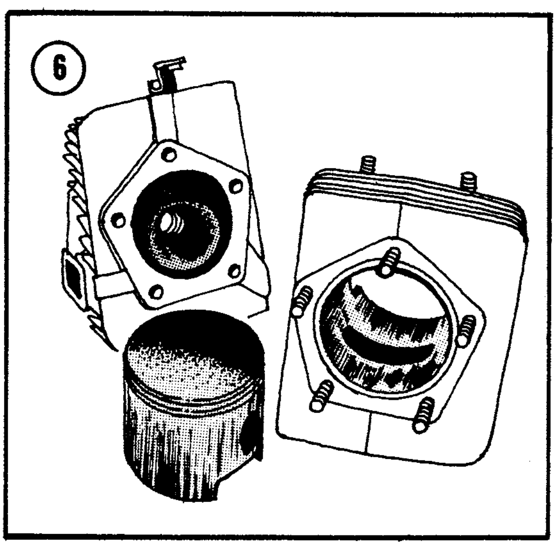
Compression Test

Perform compression test to determine condition of piston ring sealing qualities, piston wear, and condition of head gasket seal.

1. Remove spark plugs. Insert a compression gauge in one spark plug hole (**Figure 5**). Refer to Chapter One for a suitable type of compression tester.

2. Crank engine vigorously and record compression reading. Repeat for other cylinder. Compression readings should be from 120-175 psi (8.4-12.30 kg/cm²). Maximum allowable variation between cylinders is 10 psi (0.70 kg/cm²).





3. If compression is low or variance between cylinders is excessive, check for defective head gaskets, damaged cylinders and pistons, or stuck piston rings.

ENGINE PERFORMANCE

In the following discussion, it is assumed that the engine runs, but is not operating at peak efficiency. This will serve as a starting point from which to isolate a performance malfunction.

The possible causes for each malfunction are listed in a logical sequence and in order of probability.

Engine Will Not Idle

a. Carburetor incorrectly adjusted
b. Fouled or improperly gapped spark plugs
c. Head gasket leaking — perform compression test
d. Fuel mixture incorrect
e. Spark advance mechanism not retarding
f. Obstructed fuel pump impulse tube
g. Crankcase drain plugs loose or missing

Engine Misses at High Speed

a. Fouled or improperly gapped spark plugs
b. Defective or improperly gapped breaker points
c. Improper ignition timing
d. Defective fuel pump
e. Improper carburetor high-speed adjustment (Walbro and Bendix carburetors) or improper main jet selection (Mikuni carburetor)
f. Weak ignition coil
g. Obstructed fuel pump impulse tube

Engine Overheating

a. Too lean fuel mixture — incorrect carburetor adjustment or jet selection
b. Improper ignition timing
c. Incorrect spark plug heat range
d. Intake system or crankcase air leak
e. Cooling fan belt or coolant pump drive belt broken or slipping
f. Cooling fan or coolant pump defective
g. Leak in liquid cooling system
h. Damaged or blocked cooling fins

Smoky Exhaust and Engine Runs Rough

a. Carburetor adjusted incorrectly — mixture too rich
b. Incorrect fuel/oil mixture
c. Choke not operating properly
d. Obstructed muffler
e. Water or other contaminants in fuel

Engine Loses Power

a. Carburetor incorrectly adjusted
b. Engine overheating
c. Defective or improperly gapped breaker points
d. Improper ignition timing
e. Incorrectly gapped spark plugs
f. Weak ignition coil
g. Obstructed muffler
h. Defective reed valve

Engine Lacks Acceleration

a. Carburetor mixture too lean
b. Defective fuel pump
c. Incorrect fuel/oil mixture
d. Defective or improperly gapped breaker points
e. Improper ignition timing
f. Defective rotary valve

ENGINE FAILURE ANALYSIS

Overheating is the major cause of serious and expensive engine failures. It is important that each snowmobile owner understand all the causes of engine overheating and take the necessary precautions to avoid expensive overheating damage. Proper preventive maintenance and careful attention to all potential problem areas can often eliminate a serious malfunction before it happens.

Fuel

All Ski-Doo snowmobile engines rely on a proper fuel/oil mixture for engine lubrication. Always use an approved oil and mix the fuel carefully as described in Chapter One.

Gasoline must be of sufficiently high octane (90 or higher) to avoid "knocking" and "detonation."

Fuel/Air Mixture

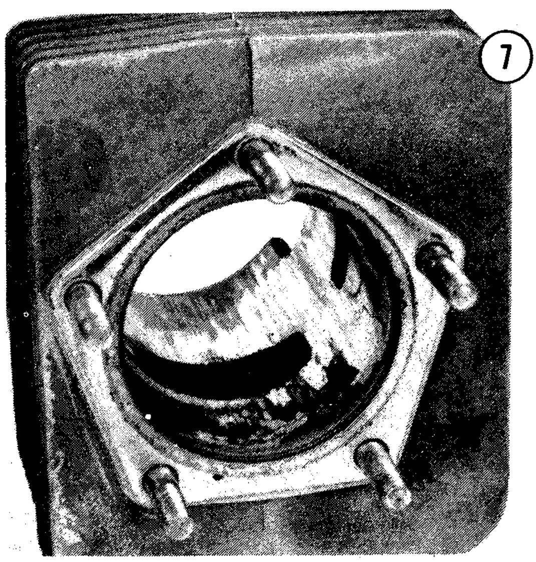
Fuel/air mixture is determined by carburetor adjustment (Tillotson) or main jet selection (Mikuni). Always adjust carburetors carefully and pay particular attention to avoiding a "too lean" mixture.

Heat

Excessive external heat on the engine can be caused by the following:

a. Hood louvers plugged with snow
b. Damaged or plugged cylinder and head cooling fins
c. Slipping or broken fan belt
d. Damaged cooling fan or coolant pump
e. Operating snowmobile in hot weather
f. Plugged or restricted exhaust system

See **Figures 6 and 7** for examples of cylinder and piston scuffing caused by excessive heat.



Dirt

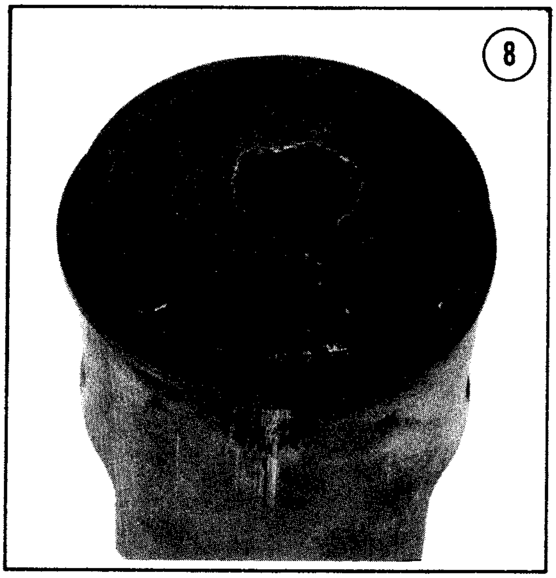
Dirt is a potential problem for all snowmobiles. The air intake silencers on all models are not designed to filter incoming air. Avoid running snowmobiles in areas that are not completely snow covered.

Ignition Timing

Ignition timing that is too far advanced can cause "knocking" or "detonation." Timing that is too retarded causes excessive heat buildup in the cylinder exhaust port areas.

Spark Plugs

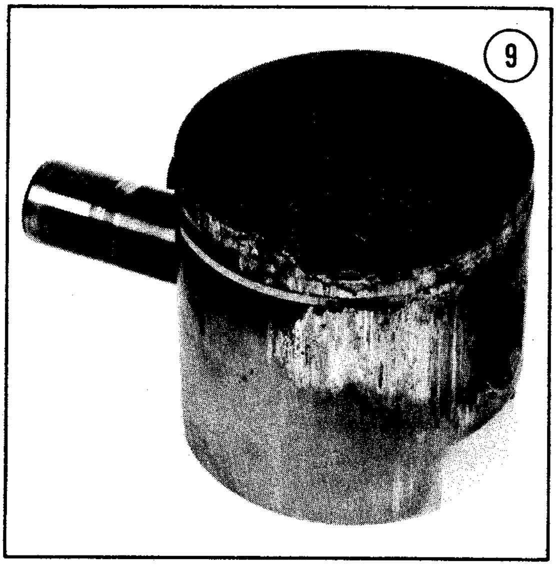
Spark plugs must be of a correct heat range. Too hot a heat range can cause preignition and detonation which can ultimately result in piston burn-through as shown in **Figure 8**.



Refer to Chapter Two for recommended spark plugs.

Preignition

Preignition is caused by excessive heat in the combustion chamber due to a spark plug of improper heat range and/or too lean a fuel mixture. See **Figure 9** for an example of a melted and scuffed piston caused by preignition.



Detonation (Knocking)

Knocking is caused by a "too lean" fuel mixture and/or "too low" octane fuel.

ELECTRICAL SYSTEM

The following items provide a starting point from which to troubleshoot electrical system malfunctions. The possible causes for each malfunction are listed in a logical sequence and in order of probability.

Ignition system malfunctions are outlined under *Engine Starting* and *Engine Performance,* covered earlier.

Lights Will Not Light

a. Bulbs are burned out
b. Loose electrical connections
c. Defective switch
d. Defective lighting coil

Bulbs Burn Out Rapidly

Incorrect bulb type

Lights Too Bright or Too Dim

Defective lighting coil

Discharged Battery

a. Defective battery
b. Low electrolyte level
c. Dirty or loose electrical connections
d. Defective lighting coil
e. Defective rectifier

Cracked Battery Case

a. Discharged battery allowed to freeze
b. Improperly installed hold-down clamp
c. Improperly attached battery cables

Starter Motor Does Not Operate

a. Loose electrical connections
b. Discharged battery
c. Defective starter solenoid
d. Defective starter motor
e. Defective ignition switch

Poor Starter Performance

a. Commutator or brushes worn, dirty, or oil soaked
b. Binding armature
c. Weak brush springs
d. Armature open, shorted, or grounded

POWER TRAIN

The following items provide a starting point from which to troubleshoot power train malfunctions. The possible causes for each malfunction are listed in order of probability. Also refer to *Drive Belt Wear Analysis,* later in this chapter.

Drive Belt Not Operating Smoothly in Drive Pulley

a. Face of drive pulley is rough, grooved, pitted, or scored
b. Defective drive belt

Uneven Drive Belt Wear

a. Misaligned drive and driven pulleys
b. Loose engine mounts

Glazed Drive Belt

a. Excessive slippage
b. Oil on pulley surfaces

Drive Belt Worn Narrow in One place

a. Excessive slippage caused by stuck track
b. Too high engine idle speed

Drive Belt Too Tight at Idle

a. Engine idle speed too fast
b. Distance between pulley incorrect
c. Belt length incorrect

Drive Belt Edge Cord Failure

a. Misaligned pulleys
b. Loose engine mounting bolts

Brake Not Holding Properly

a. Incorrect brake cable adjustment or air in hydraulic brake system
b. Brake lining or pucks worn
c. Oil saturated brake lining or pucks
d. Sheared key on brake pulley or disc

Brake Not Releasing Properly

a. Weak or broken return spring
b. Bent or damaged brake lever

Leaking Chaincase

a. Gaskets on drive shaft bearing flange
b. Cracked or broken chaincase

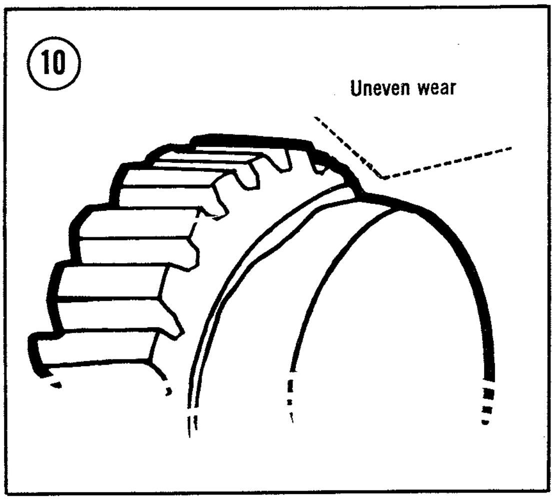
Rapid Chain and Sprocket Wear

a. Insufficient chaincase oil
b. Misaligned sprockets
c. Broken chain tension blocks

DRIVE BELT WEAR ANALYSIS

Uneven Belt Wear

Uneven belt wear on only one side as shown in **Figure 10** is usually caused by a loose engine mount or pulley misalignment. Also check for rough or scratched pulley surfaces.



Glazed Belt

A glazed or baked appearance on the edge of the belt as shown in **Figure 11** is usually the result of some mechanical difficulty. Pulley shafts may be rusted or the drive pulley may have worn or missing flyweights/rollers. Refer this type of belt wear to a dealer. He has the expertise to pinpoint the malfunction.

Worn Top Width

Excessive wear in the top width of the belt **(Figure 12)** can be caused by erratic drive pulley actuation or rough or scratched pulley surfaces. If all mechanical systems are functioning properly, the belt may just be worn out. Replace drive belt if its width is ⅛ in. (3mm) less than new. Refer to Chapter Seven.

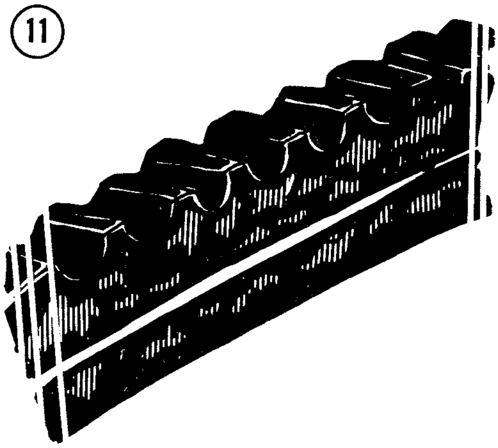
Belt Worn In One Section

Spot wear such as shown in **Figure 13** is often caused by a frozen or too tight track. Check also for a too high idle speed, incorrect belt length, incorrect pulley distance, or a malfunction in the drive pulley.

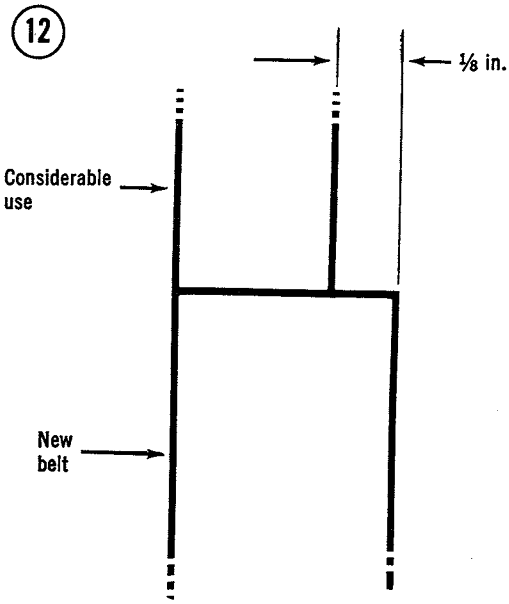
Belt Edges Worn Concave

Concave edge wear as shown in **Figure 14** is caused by using an improper drive belt or roughness on pulley surfaces.

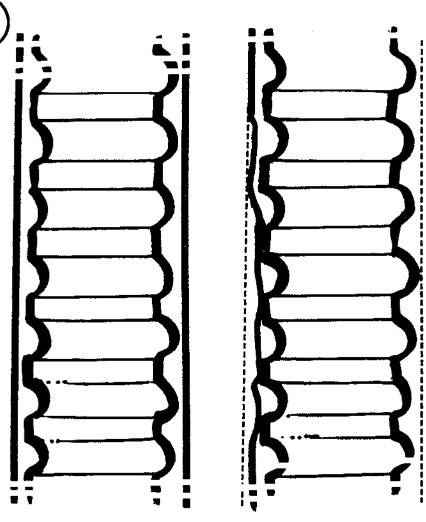
11



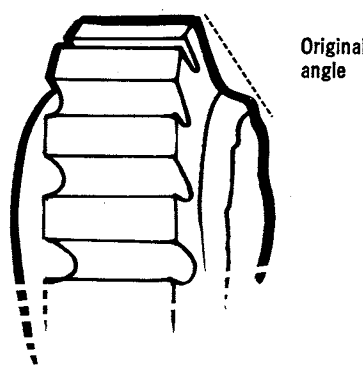
12



13



14



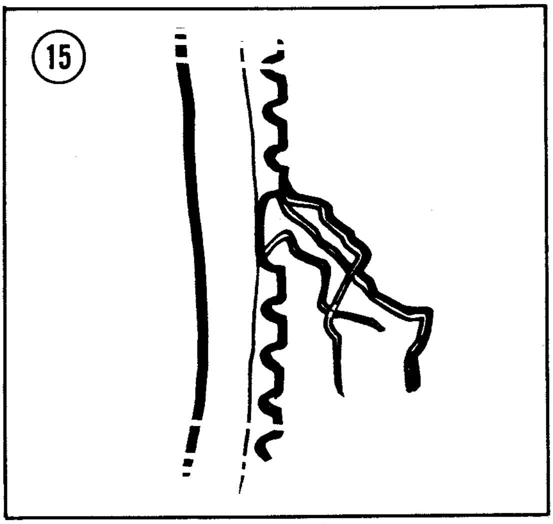
3

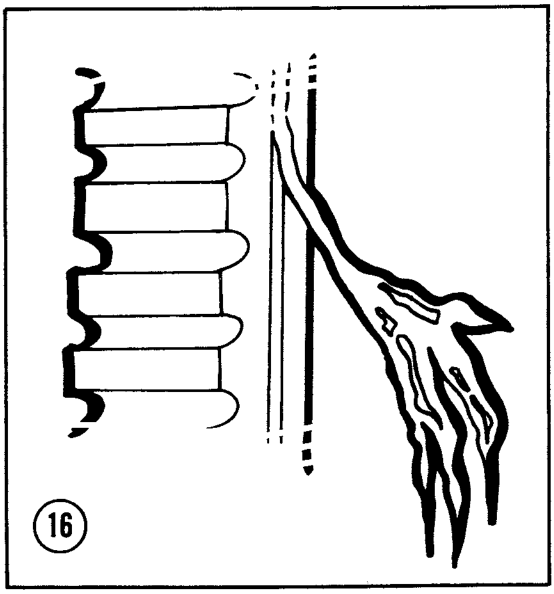
Belt Disintegration

Belt disintegration as illustrated in **Figure 15** is the result of excessive belt speed caused by using an improper drive belt or oil on pulley surfaces. Incorrect gear ratio may also cause belt disintegration. Refer malfunction to a dealer for his analysis.

Edge Cord Breakage

The type of edge cord breakage shown in **Figure 16** is usually caused by pulley misalignment. Refer to Chapter Seven for applicable pulley alignment procedure.





Flex Crack Between Cogs

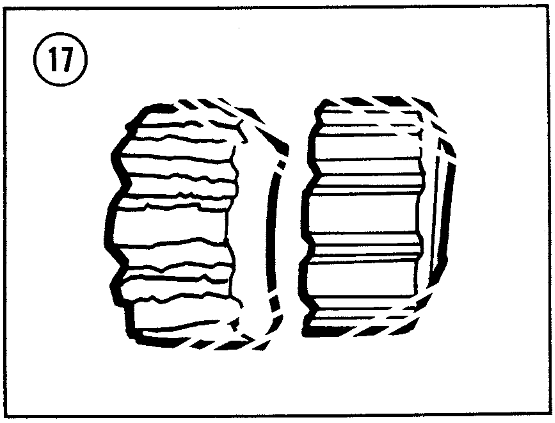
Cracks appearing between belt cogs (**Figure 17**) generally indicate that the belt has lost its flexibility and must be replaced.

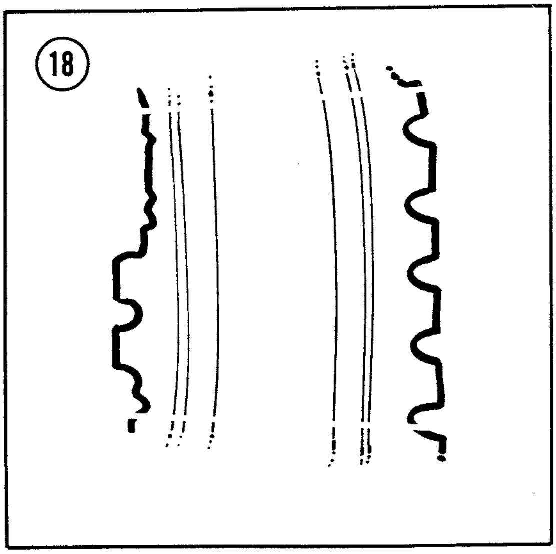
Sheared Drive Cogs

Sheared cogs as shown in **Figure 18** can be a result of improper belt installation as well as violent erratic drive pulley engagement. Enlist the help of a dealer to determine the full nature of the malfunction.

Belt "Flip-Over"

Drive belt "flip-over" at high speed (**Figure 19**) is usually caused by improper pulley alignment. Also check that the belt is the exact type specified for your machine.





SKIS AND STEERING

The following items provide a starting point from which to troubleshoot ski and steering malfunctions. The possible causes for each malfunction are listed in order of probability.

Loose Steering

a. Loose steering post bushing
b. Loose tie rod ends
c. Worn spindle bushings
d. Stripped spindle splines

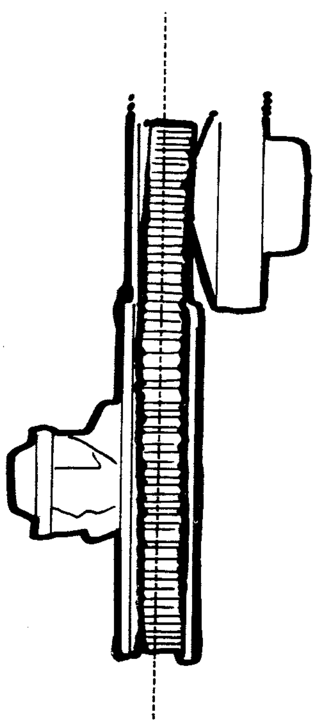
Unequal Steering

a. Improperly adjusted tie rods
b. Improperly installed steering arms

Rapid Ski Wear

a. Skis misaligned
b. Worn out ski runner shoes

19



TRACK ASSEMBLY

The following items provide a starting point from which to troubleshoot track assembly malfunctions. The possible causes for each malfunction are listed in order of probability.

Frayed Track Edge

Track is misaligned.

Track Grooved on Inner Surface

a. Track too tight
b. Frozen bogie wheel(s)
c. Frozen rear idle-shaft bearing

Track Driving Ratcheting

Track is too loose.

Rear Idlers Turning on Shaft

Rear idler shaft bearings are frozen.

Bogie Wheels Not Turning Freely

Bogie wheel bearing is defective.

Bogie Assemblies Not Pivoting Freely

Bogie tube and axle are bent.

TRACK WEAR ANALYSIS

The majority of track failures and abnormal wear patterns are caused by negligence, abuse, and poor maintenance. The following items illustrate typical examples. In all cases the damage could have been avoided by proper maintenance and good operator technique.

Obstruction Damage

Cuts, slashes, and gouges in the track surface are caused by hitting obstructions such as broken glass, sharp rocks, or buried steel. See **Figure 20**.

Worn Grouser Bars

Excessively worn grouser bars are caused by snowmobile operation over rough and non-snow covered terrain such as gravel roads and highway roadsides (**Figure 21**).

Lug Damage

Lug damage as shown in **Figure 22** is caused by lack of snow lubrication.

Ratcheting Damage

Insufficient track tension is a major cause of ratcheting damage to the top of the lugs. See **Figure 23**. Ratcheting damage can also be caused by too great a load and constant "jack-rabbit" starts.

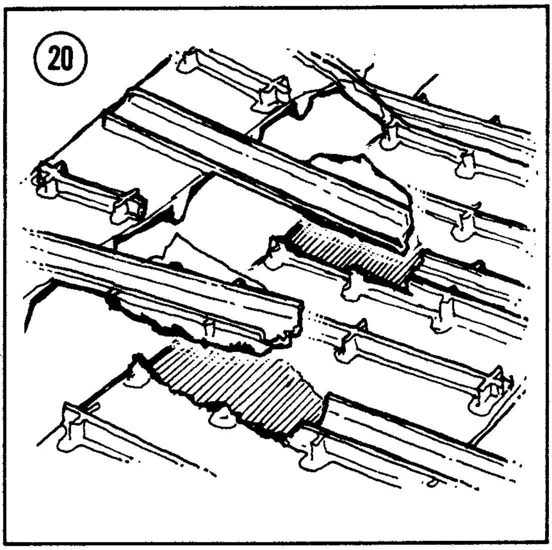
Overtension Damage

Excessive track tension can cause too much friction on the wear bars. This friction causes the wear bars to melt and adhere to the track grouser bars. See **Figure 24**. An indication of this condition is a "sticky" track that has a tendency to "lock up."

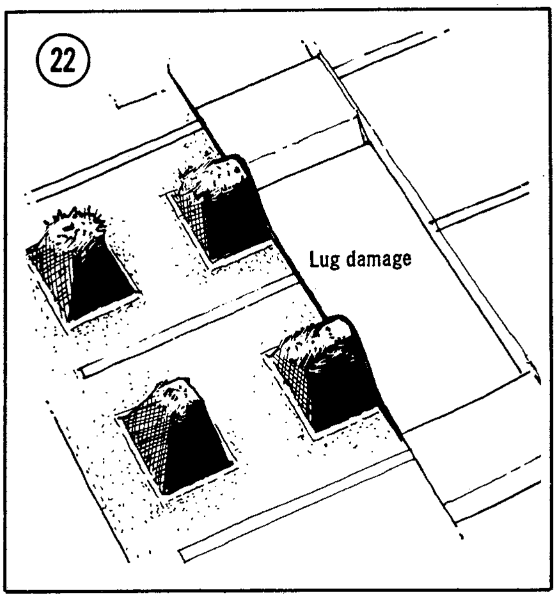
Loose Track Damage

A track adjusted too loosely can cause the outer edge to flex excessively. This results in the

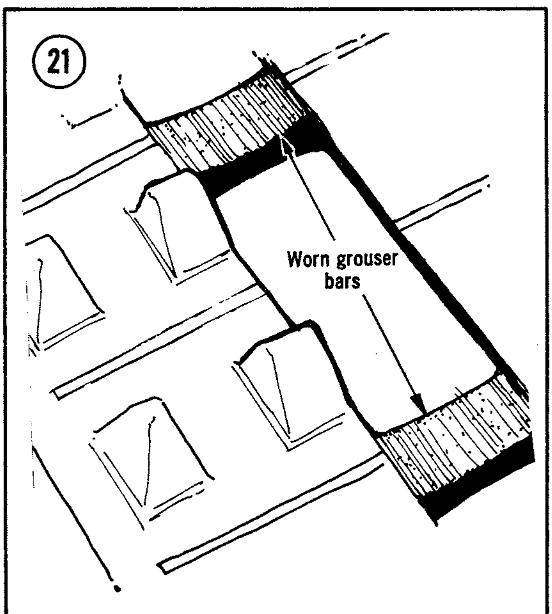
20



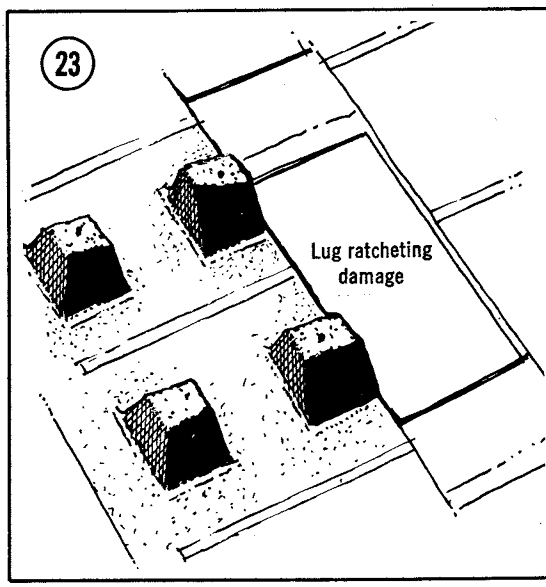
22



21



23



type of damage shown in **Figure 25**. Excessive weight can also contribute to the damage.

Impact Damage

Impact damage as shown in **Figure 26** causes the track rubber to open and expose the cord. This frequently happens in more than one place. Impact damage is usually caused by riding on rough or frozen ground or ice. Insufficient track tension can allow the track to pound against the track stabilizers inside the tunnel.

Edge Damage

Edge damage as shown in **Figure 27** is usually caused by tipping the snowmobile on its side to clear the track and allowing the track edge to contact an abrasive surface.