

# TABLE OF CONTENTS

|                      | SUB-SECTION      | TITLE<br>SUSPENSION                        | PAGE               |  |
|----------------------|------------------|--|--------------------|--|
| <b>SECTION<br/>1</b> | 1-1              | Bogie Wheel System                         | 1-01-01            |  |
|                      | 1-2              | Slider Suspension                          | 1-02-01            |  |
|                      | 1-3              | Rear Hub                                   | 1-03-01            |  |
|                      | 1-4              | Drive Axle                                 | 1-04-01            |  |
|                      | 1-5              | Track                                      | 1-05-01            |  |
|                      |                  | <b>TRANSMISSION</b>                        |                    |  |
|                      | 1-6              | General – Torque Converter<br>Pulley Guard | 1-06-01<br>1-06-03 |  |
|                      | 1-7              | Drive Belt                                 | 1-07-01            |  |
|                      | 1-8              | Drive Pulley                               | 1-08-01            |  |
|                      | 1-9              | Driven Pulley                              | 1-09-01            |  |
|                      | 1-10             | Brake Mechanism                            | 1-10-01            |  |
|                      | 1-11             | Chain Case                                 | 1-11-01            |  |
|                      | 1-12             | Gear Box                                   | 1-12-01            |  |
|                      | 1-13             | Drive Chain                                | 1-13-01            |  |
|                      |                  | <b>STEERING AND SKI SYSTEM</b>             |                    |  |
| 1-14                 | Steering System  | 1-14-01                                    |                    |  |
| 1-15                 | Ski System       | 1-15-01                                    |                    |  |
| <b>SECTION<br/>2</b> |                  | <b>ENGINE</b>                              |                    |  |
|                      | 2-1              | General                                    | 2-01-01            |  |
|                      | 2-2              | Engine – One Cylinder                      | 2-02-01            |  |
|                      | 2-3              | Air Silencer                               | 2-03-01            |  |
|                      | 2-4              | Decompressor                               | 2-04-01            |  |
|                      | 2-5              | Engine Timing – One Cylinder               | 2-05-01            |  |
|                      | 2-6              | Engine – Two Cylinder                      | 2-06-01            |  |
|                      | 2-7              | Engine Timing – Two Cylinder               | 2-07-01            |  |
|                      | 2-8              | Cleaning                                   | 2-08-01            |  |
|                      | 2-9              | Inspection                                 | 2-09-01            |  |
|                      | 2-10             | Rewind Starter                             | 2-10-01            |  |
|                      | 2-11             | Carburetor                                 | 2-11-01            |  |
| 2-12                 | Trouble Shooting | 2-12-01                                    |                    |  |
| <b>SECTION<br/>3</b> |                  | <b>ELECTRICAL</b>                          |                    |  |
|                      | 3-1              | General                                    | 3-01-01            |  |
|                      | 3-2              | Electrical Charts                          | 3-02-01            |  |
|                      | 3-3              | Spark Plug                                 | 3-03-01            |  |
|                      | 3-4              | Merc-O-Tronic                              | 3-04-01            |  |
|                      | 3-5              | Electric Starter                           | 3-05-01            |  |
| 3-6                  | Battery          | 3-06-01                                    |                    |  |
| <b>SECTION<br/>4</b> |                  | <b>BODY AND FRAME</b>                      |                    |  |
|                      | 4-1              | Body                                       | 4-01-01            |  |
|                      | 4-2              | Frame                                      | 4-02-01            |  |
| <b>SECTION<br/>5</b> |                  | <b>TOOLS</b>                               |                    |  |
| 5-1                  | Special Tools    | 5-01-01                                    |                    |  |

## SECTION 1

| <b>SUB-SECTION</b>             | <b>TITLE</b>               | <b>PAGE</b> |
|--------------------------------|----------------------------|-------------|
| <b>SUSPENSION</b>              |                            |             |
| 1-1                            | Bogie Wheel System         | 1-01-01     |
| 1-2                            | Slider Suspension          | 1-02-01     |
| 1-3                            | Rear Hub                   | 1-03-01     |
| 1-4                            | Drive Axle                 | 1-04-01     |
| 1-5                            | Track                      | 1-05-01     |
| <b>TRANSMISSION</b>            |                            |             |
| 1-6                            | General — Torque Converter | 1-06-01     |
|                                | Pulley Guard               | 1-06-03     |
| 1-7                            | Drive Belt                 | 1-07-01     |
| 1-8                            | Drive Pulley               | 1-08-01     |
| 1-9                            | Driven Pulley              | 1-09-01     |
| 1-10                           | Brake Mechanism            | 1-10-01     |
| 1-11                           | Chain Case                 | 1-11-01     |
| 1-12                           | Gear Box                   | 1-12-01     |
| 1-13                           | Drive Chain                | 1-13-01     |
| <b>STEERING AND SKI SYSTEM</b> |                            |             |
| 1-14                           | Steering System            | 1-14-01     |
| 1-15                           | Ski System                 | 1-15-01     |

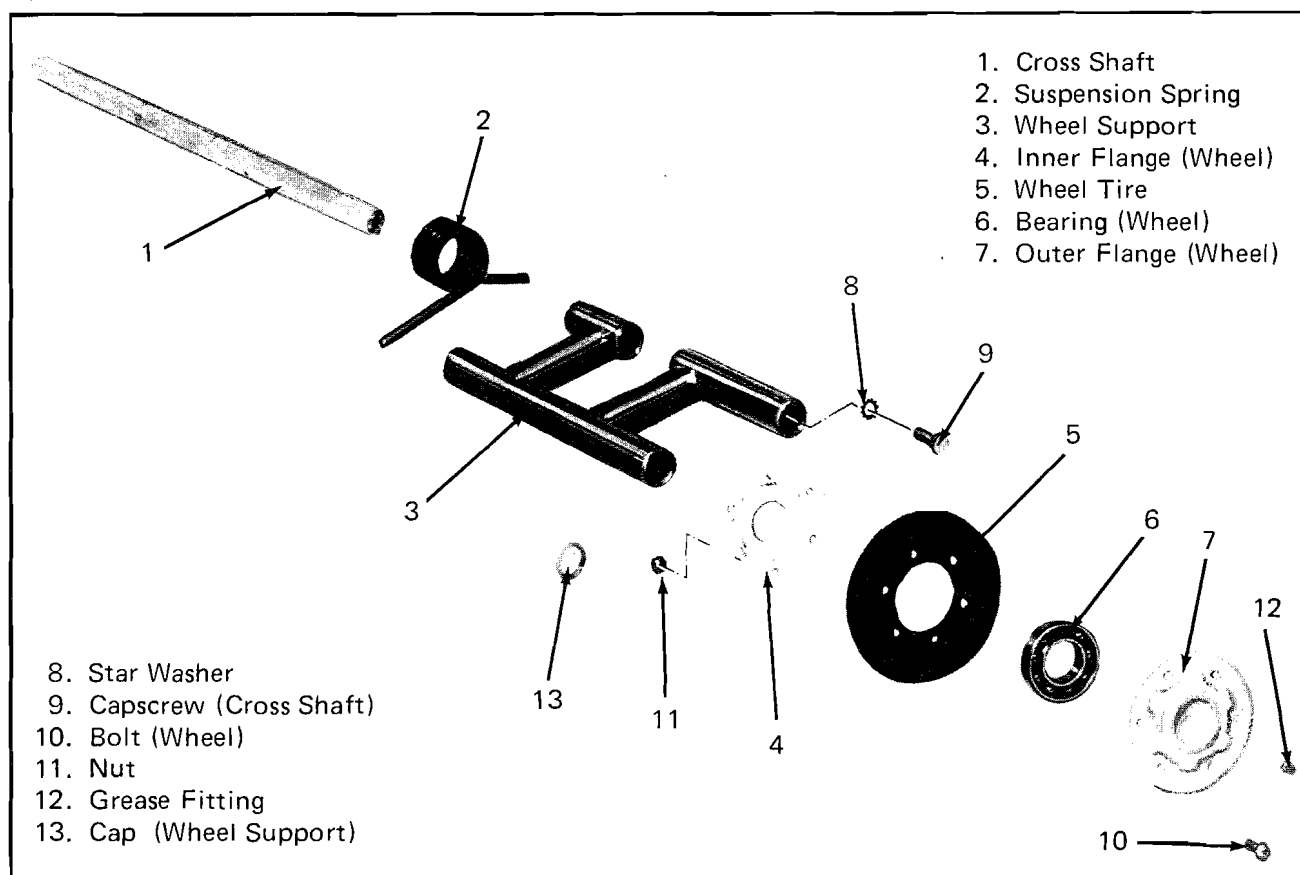
## SECTION 1 SUSPENSION

### 1-1 BOGIE WHEEL SYSTEM

1-1

#### (A) GENERAL

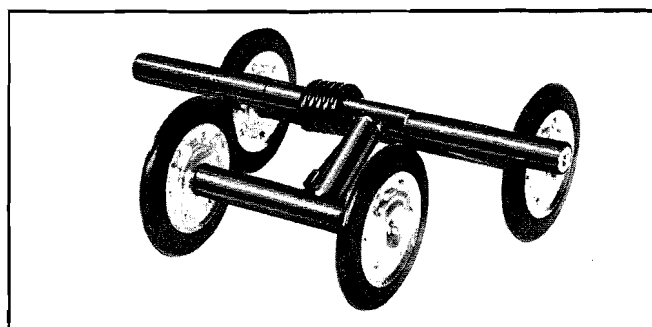
The Ski-Doo snowmobile's ability to negotiate any snow covered terrain and to handle well at all speeds is the direct result of an especially designed bogie wheel system. Correct lubrication, maintenance, repair and overhaul procedure of this system will ensure smoother operation of the vehicle.



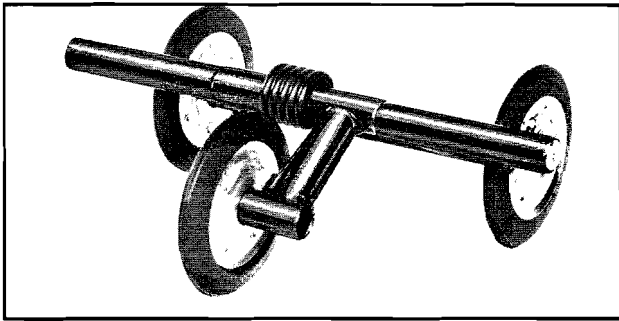
**BOGIE WHEEL SET AND LEGEND (GENERAL)**

The bogie wheel system of all 1970 and '71 Ski-Doo snowmobile models is similar in design and fabrication, except for the following variations:

- The system of the Elan models consists of 3-sets of bogie wheels. The front set incorporates 4-wheels while the center and rear sets are made up of 3-wheels each.

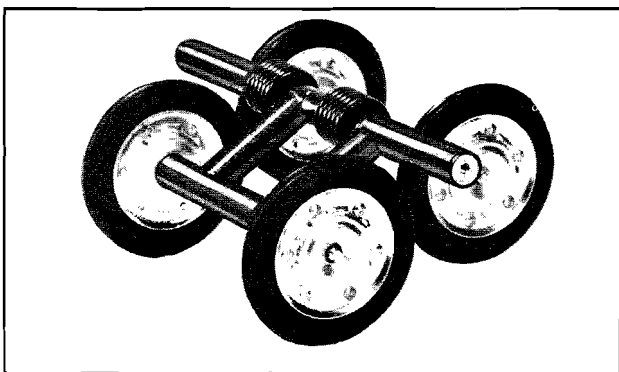


**BOGIE WHEEL SET – FRONT (ELAN ONLY)**



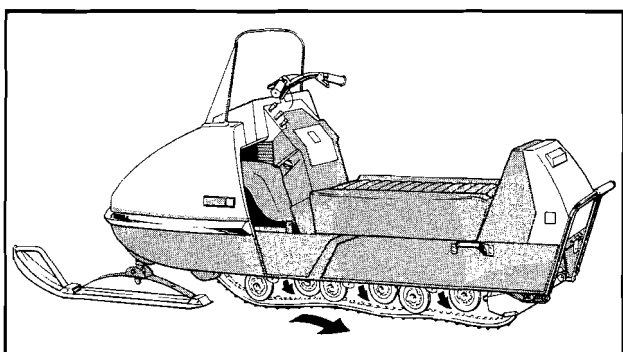
**BOGIE WHEEL SET (ELAN ONLY)**

- Each system of the 1970 and '71 Olympique, Nordic, T'NT and Skandic models consists of 3-sets of bogie wheels, each set incorporating 4-wheels.
- The system of the 1970 Alpine/Invader and the 1971 Valmont models consists of 6-sets of bogie wheels (3-sets per track), each set incorporating 4-wheels.



**BOGIE WHEEL SYSTEM (TYPICAL)**

- The 1971 Alpine bogie wheel system is made up of 8-sets of bogie wheels (4-sets per track), each set consisting of 4-wheels.

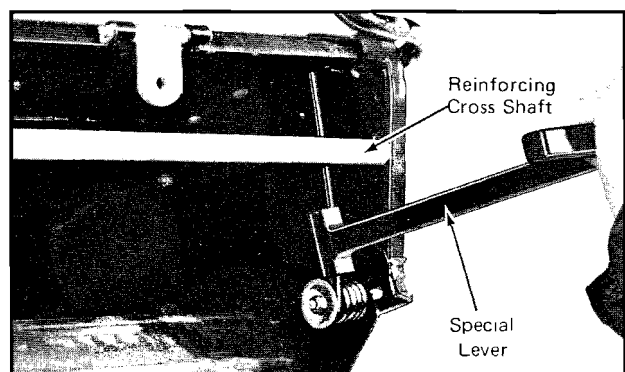


**BOGIE WHEELS IN ACTION**

**(B) REMOVAL**

1. Raise and block the rear of vehicle off the ground.
2. On 1970 Nordic and T'NT models, remove the reinforcing cross shaft by removing capscrews and star washers securing shaft to frame.
3. Release track tension by unhooking the link plate springs using special lever (refer item 1, Section 5,) (fig. 1-1-1).

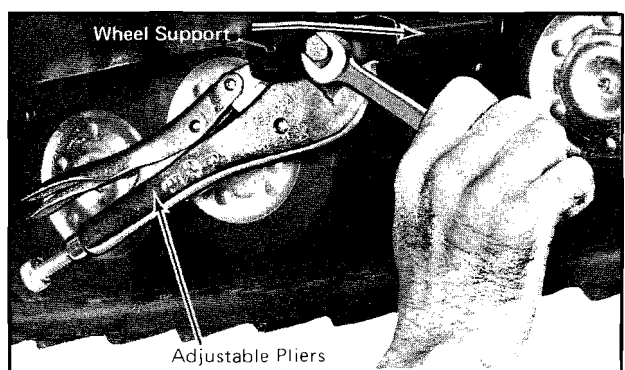
**NOTE:** Special lever (item 1) is applicable to all models except Elan models.



1-1-1

4. Commencing at center bogie wheel set (except 1971 Alpine models), remove the capscrews and star washers securing cross shaft to frame. On '71 Alpine models, commence removal with either of the two center bogie wheel sets.

**NOTE:** To prevent shaft from rotating while removing capscrew, apply pressure on the wheel support using adjustable pliers (fig. 1-1-2).



1-1-2

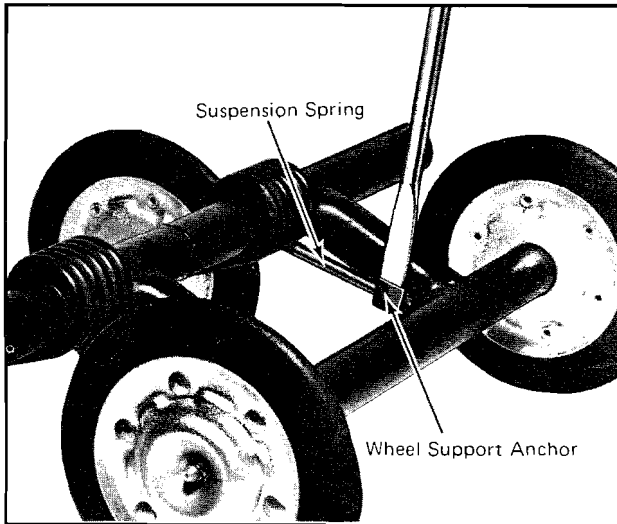
5. Remove bogie wheel set.

**NOTE:** Identify each set of bogie wheels as to installation position (i.e. forward, center(s) and rear). Identification will assist you during Installation procedures.

6. Repeat step 4 to remove remaining bogie wheel sets.

**(C) DISASSEMBLY**

1. Straighten wheel support anchor(s) and unhook suspension spring(s) (fig. 1-1-3).



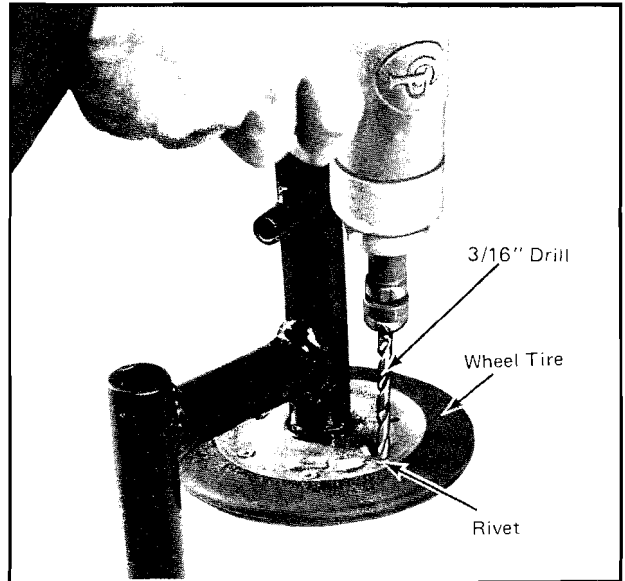
1-1-3

2. Pull out cross shaft from supports and remove the spring(s).

**NOTE:** Spring(s) must be retained with the bogie wheel set from which it has been removed. The wire gauge of the spring(s) varies in diameter. See NOTE, Paragraph (F), step 5.

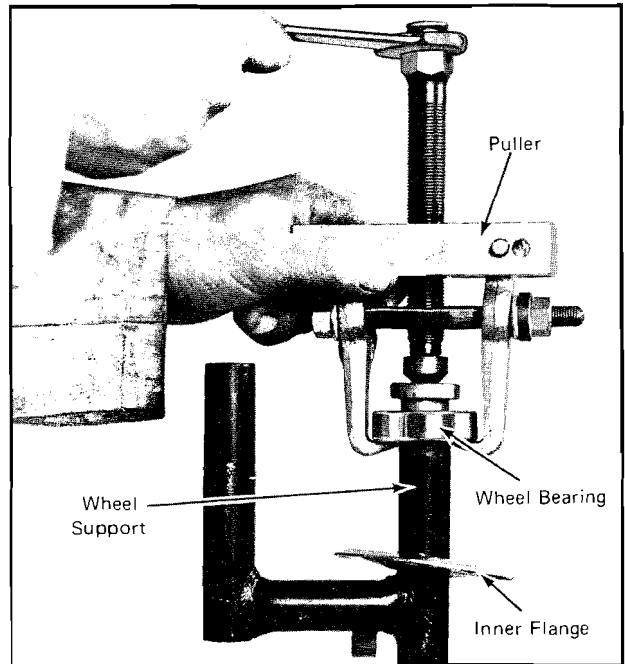
3. Using a 3/16 inch dia drill, remove rivets securing outer flange and wheel tire to inner flange (fig. 1-1-4). It is important to remember that the back wheel of the center and rear bogie wheel set on the Elan models has a wider tire. Remove outer flange and wheel tire.

**NOTE:** Do not unscrew grease fitting from outer flange unless damaged, and replacement is necessary.



1-1-4

4. With an appropriate bearing puller, remove wheel bearing from support by pulling it by inner race (fig. 1-1-5). Remove inner flange.



1-1-5

**(D) CLEANING**

1. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.

2. Clean grease and dirt from wheel tires with a clean cloth.

**CAUTION:** Do not use cleaning solvent on wheel tires as it may permanently distort the component.

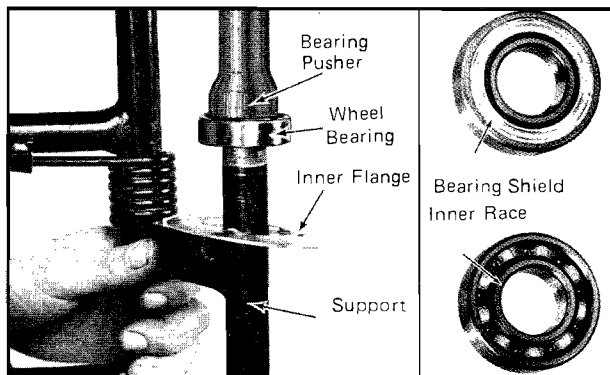
3. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

**(E) INSPECTION**

1. Visually inspect all components for wear, cracks, distortion and other damage. Replace as necessary.
2. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
3. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).

**(F) ASSEMBLY**

1. Prior to assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.
2. Place inner flange and wheel bearing on support. Ensure that bearing shield is facing towards inner flange, then press down on the inner race until bearing is sitting flush with support end (fig. 1-1-6).

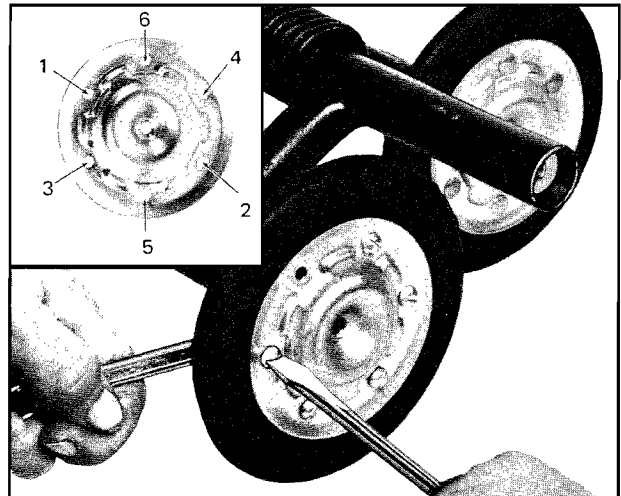


1-1-6

3. Position tire and outer flange on wheel support. Secure inner flange and wheel tire to outer flange with six (6) bolts and nuts.

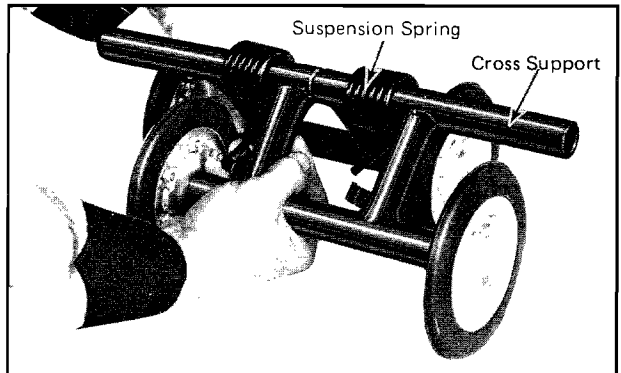
**NOTE:** On all Elan models, ensure wider tire is installed on single wheel.

4. Tighten attaching parts securing wheel flanges and tire following the sequence shown in figure 1-1-7.



1-1-7

5. Position suspension spring(s) on wheel supports (fig. 1-1-8).

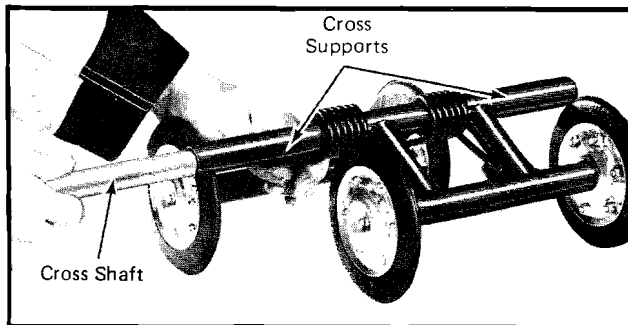


1-1-8

**NOTE:** On Elan models, the suspension springs are 9/32 inch diameter. On all other models, except the 1971 Alpine/Valmont, the front and center bogie wheels sets are equipped with 1/4 inch dia springs and the rear bogie wheel set incorporates 9/32 inch dia springs. The 1970 Alpine/Invader and 1971 Alpine/

Valmont incorporate two (2) 1/4 inch dia springs on each bogie wheel set.

6. Apply a thin coat of low temperature grease on cross shafts and insert shafts into supports (fig. 1-1-9). Close wheel support anchor(s) over suspension spring end(s).



1-1-9

### (G) INSTALLATION

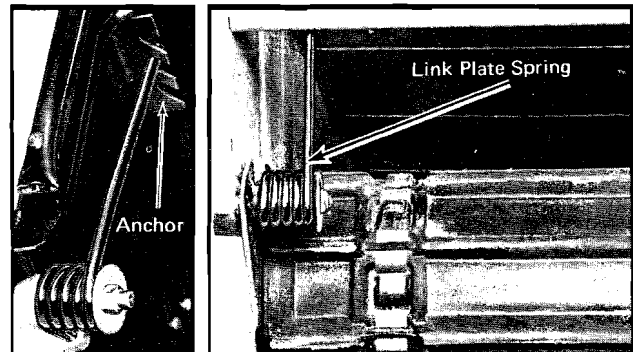
1. With rear of vehicle supported off the ground, position front bogie wheel set in location and secure to frame using star washers and capscrews.
2. Secure rear and then the remaining bogie wheel set(s) to frame.

**NOTE:** On Elan models, position front bogie wheel set so that wider wheel support is towards front of vehicle. Position

the rear and center sets so that the single wheel is towards back of vehicle.

3. Using special lever (item 1), apply track tension by hooking the link plate springs to the anchors.

**NOTE:** On all 1971 models except Elan, place link plate springs in middle position of 3-position slotted anchors (fig. 1-1-10).



1-1-10

4. Using a low pressure grease gun filled with low temperature grease, lubricate each bogie wheel until grease appears at joint. Wipe off excess grease.
5. On 1970 Nordic and T'NT models, install reinforcing cross shaft by securing shaft to frame with star washers and capscrews.
6. Set vehicle on the ground.

# SUSPENSION

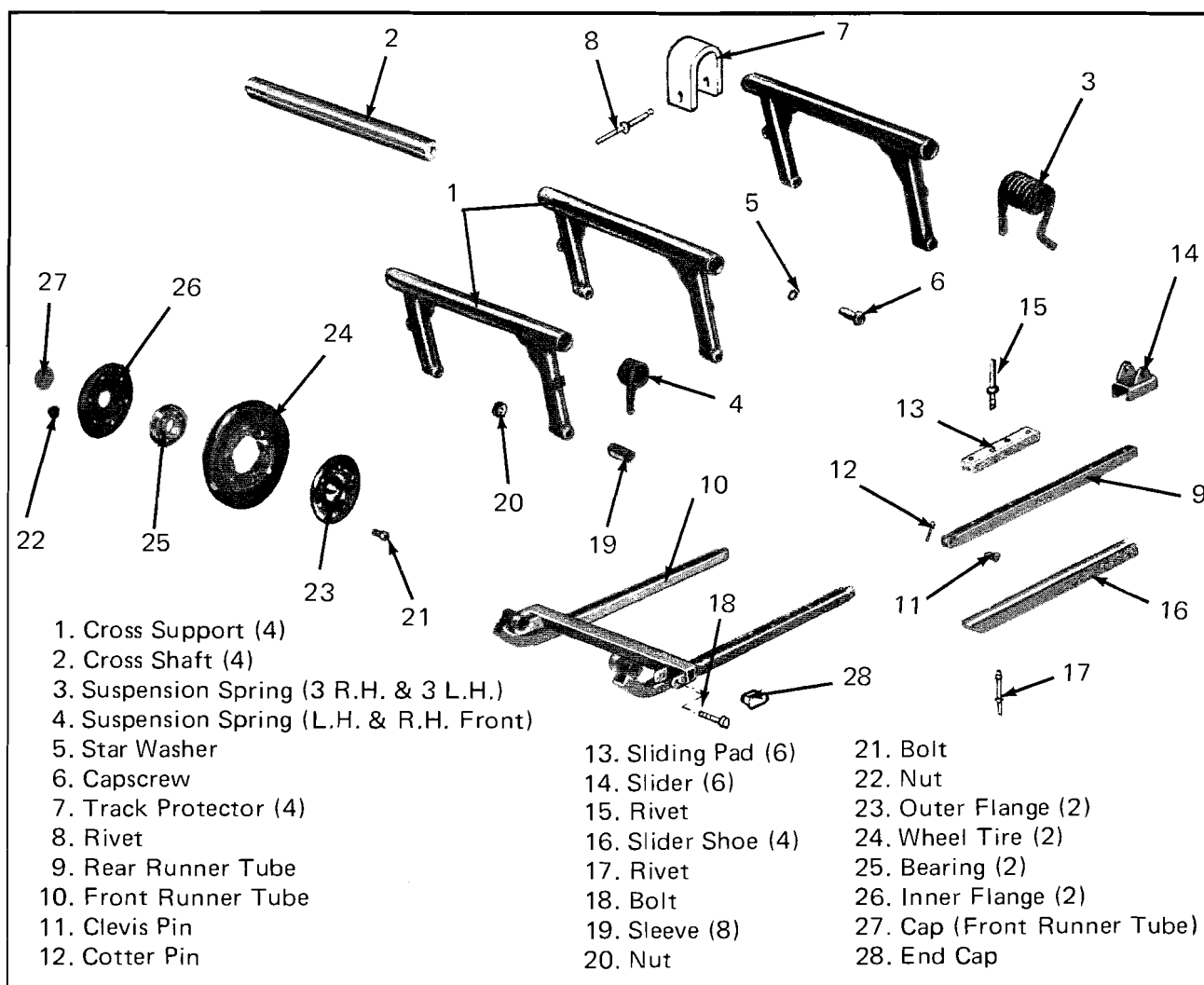
## 1-2 SLIDER SUSPENSION (1970 Models)

1-2

### (A) GENERAL

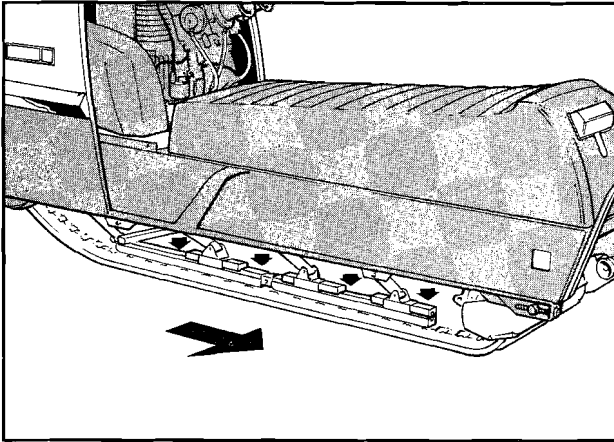
Basically, the principle of the slider suspension is to create a uniform downward pressure acting over a maximum area of track. This gives the vehicle greatest possible contact with the underlying snow surface.

- The 1970 slider suspension is secured to the frame of the vehicle while the 1971 system is of a unit construction attached to the frame via side members.
- Track "flapping" on the 1970 system is controlled by means of track protectors installed on the two rear cross supports. On the '71 vehicle, the track protectors are replaced by stop boundings and two wheels affixed to the rear cross support eliminate flapping.



DISASSEMBLED VIEW OF SLIDER SUSPENSION (1970)

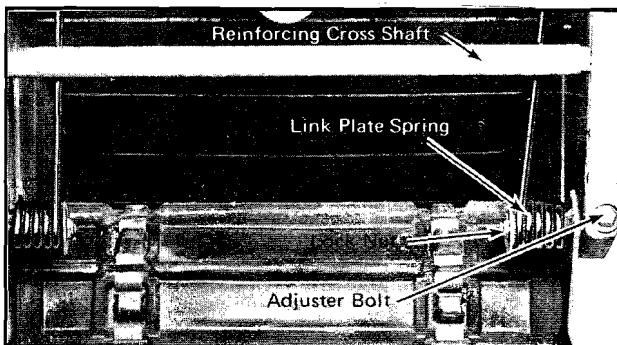




SLIDER SUSPENSION IN ACTION

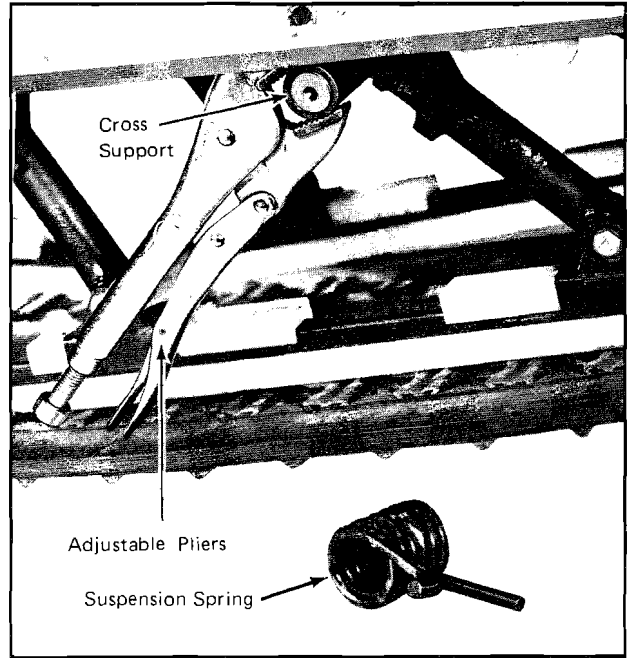
**(B) REMOVAL**

1. Lift and block the rear of the vehicle off the ground.
2. Remove the reinforcing cross shaft by removing capscrews and star washers securing shaft to frame (fig. 1-2-1).
3. Release track tension by loosening link plate spring lock nuts and unscrewing the track adjuster bolts until end of bolts are flush with the side of the eye bolts (fig. 1-2-1).



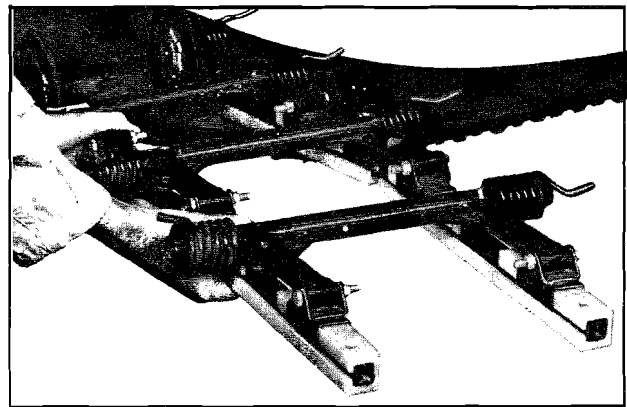
4. Using special lever (refer Section 5, item 1), unhook link plate springs.
5. Remove capscrews and star washers securing four (4) cross shafts to frame.

**NOTE:** To prevent cross shaft from rotating, remove suspension spring on side of removed capscrew and apply pressure on the cross support using adjustable pliers (fig. 1-2-2).



1-2-2

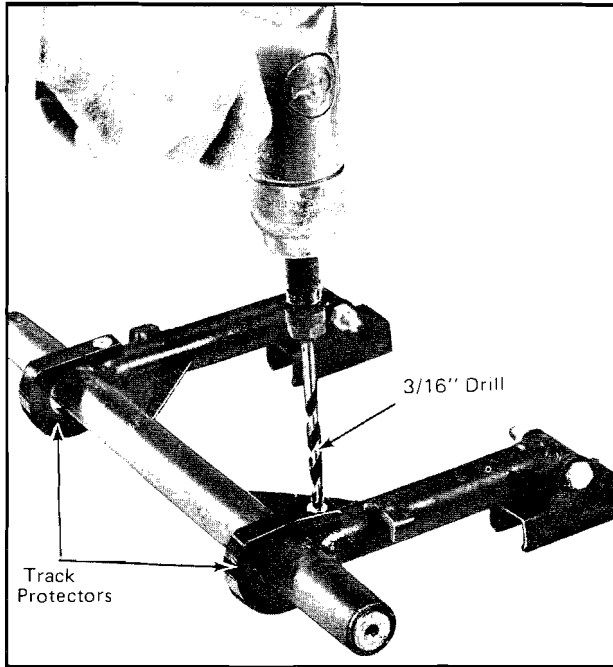
6. With attaching parts removed, the complete slider suspension will drop down allowing the assembly to be withdrawn from the track (fig. 1-2-3).



1-2-3

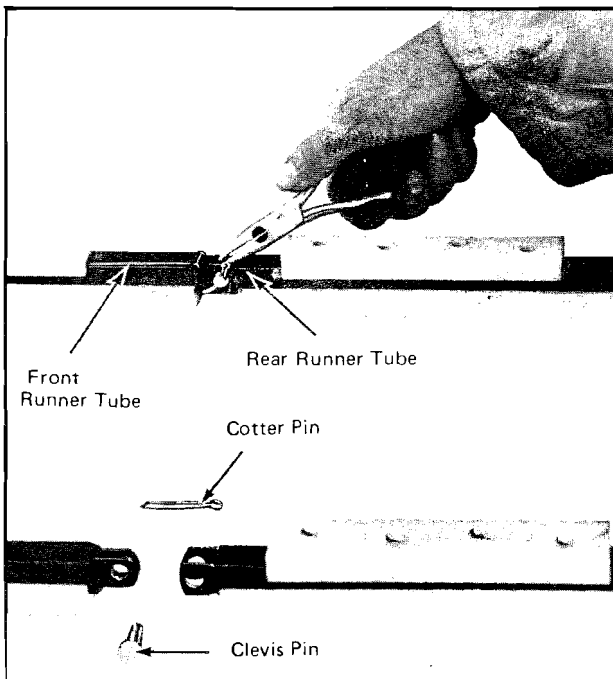
**(C) DISASSEMBLY**

1. Straighten spring anchors on cross supports and remove the suspension springs from the supports.
2. Slide the rear three cross supports from the sliding pads.
3. Using a 3/16 inch dia drill, remove rivets securing the track protectors to the rear, and second from the rear cross supports (fig. 1-2-4).



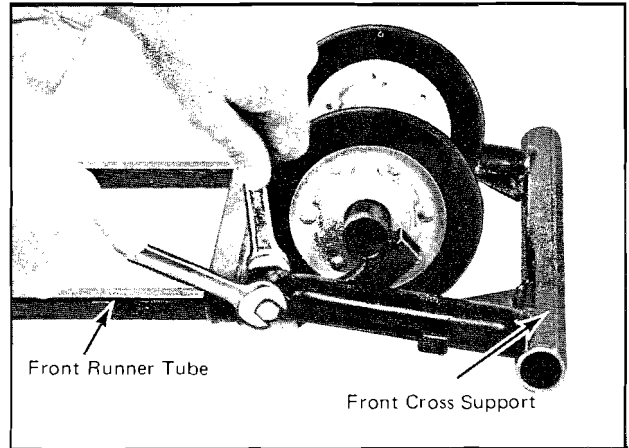
1-2-4

4. Remove bolts securing six (6) sliders to supports. Remove sleeves.
5. Separate the front and rear runner tubes by removing attaching cotter pins and clevis pins (fig. 1-2-5).



1-2-5

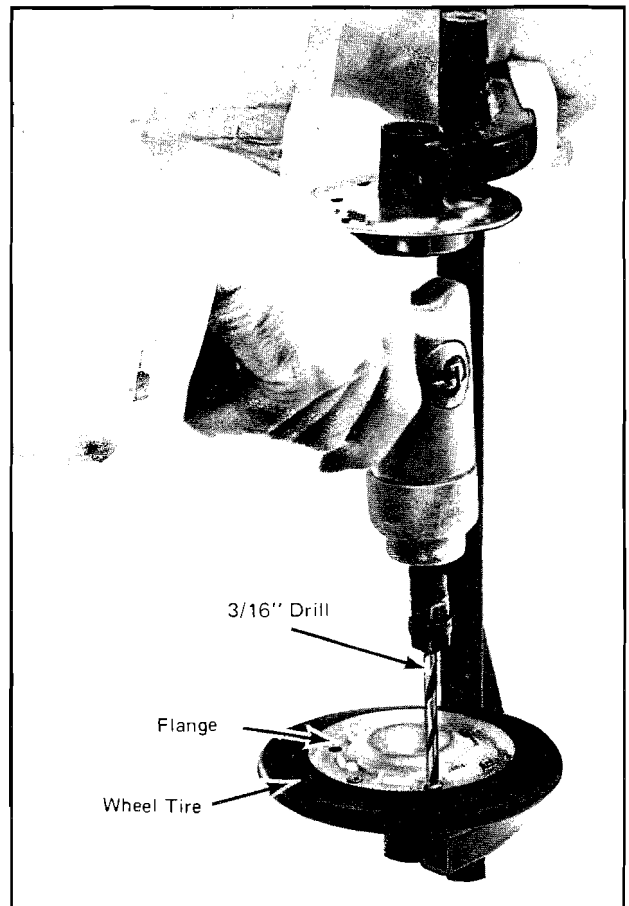
6. Remove bolts securing front cross support to front runner tube. Remove sleeves (fig. 1-2-6).



1-2-6

7. Using a 3/16 inch dia drill, remove rivets attaching outer flange and wheel tire to inner flange (fig. 1-2-7). Remove outer flange and wheel tire.

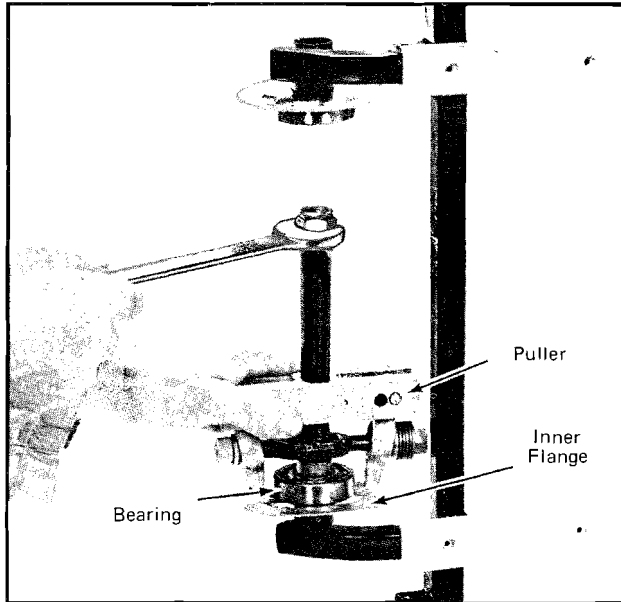
**NOTE:** Do not unscrew grease fitting from outer flange unless damaged, and replacement is necessary.



1-2-7

8. With an appropriate bearing puller, remove wheel bearing from front runner tube and remove the inner flange (fig. 1-2-8).

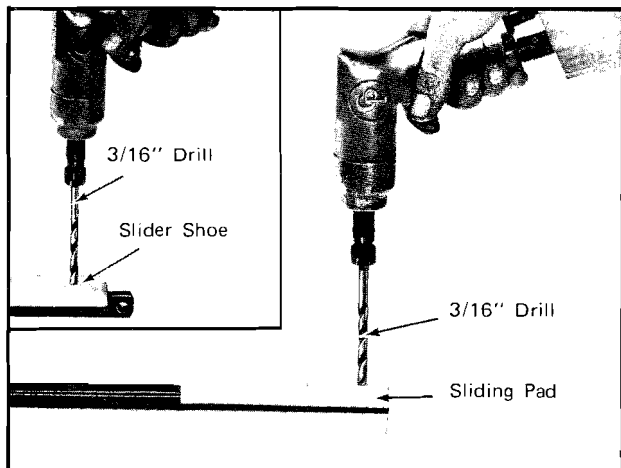
**NOTE:** Always remove the bearing by pulling it by the inner race.



1-2-8

9. Using a 3/16 inch dia drill, remove rivets securing sliding pads and slider shoes to the runner tubes (fig. 1-2-9).

**NOTE:** If head of rivets securing slider shoe to runner tube is flush with contact surface, shoe is excessively worn and must be discarded and replaced during Assembly procedure.



1-2-9

## (D) CLEANING

1. Clean grease and dirt from sliding pads, slider shoes, rubber tires and track protectors with a clean cloth.

**CAUTION:** Do not use cleaning solvent on pads, shoes, tires or protectors as it may permanently damage the component.

2. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.
3. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

## (E) INSPECTION

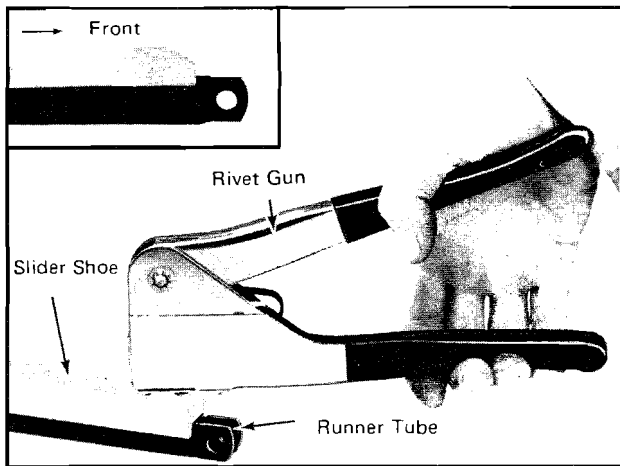
1. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).
2. Ensure that slider shoes are not worn to the extent mentioned in NOTE, Paragraph (C), step 9. If so, shoes must be replaced.
3. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
4. Visually inspect all other components for wear, cracks, distortion and other possible damage. Replace as necessary.

## (F) ASSEMBLY

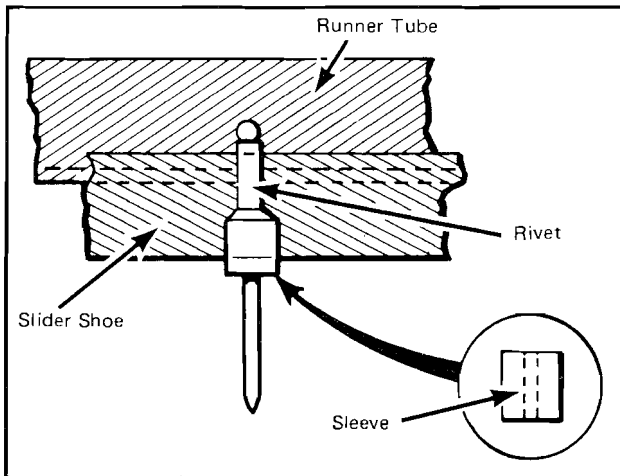
1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.

2. Position slider shoes (angle of shoes must be facing forward) on rear and front runner tubes and insert rivets. Secure shoes firmly using a rivet gun (fig. 1-2-10).

**NOTE:** If slider shoes to be installed are new, the head of the rivet gun may not come in contact with the rivets due to the thickness of the new shoes. If so, a small sleeve seated on the rivet head will assist in easier riveting action (fig. 1-2-11).



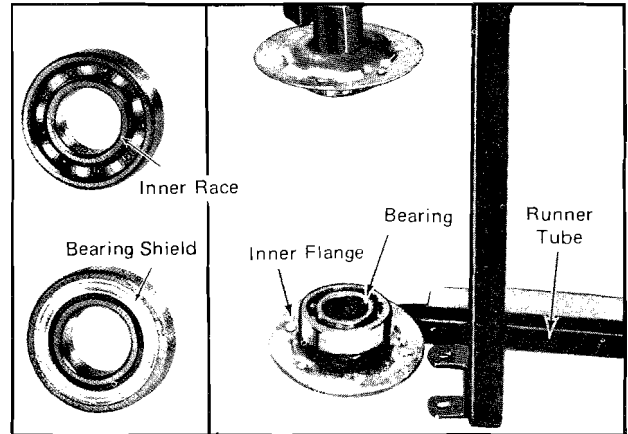
1-2-10



1-2-11

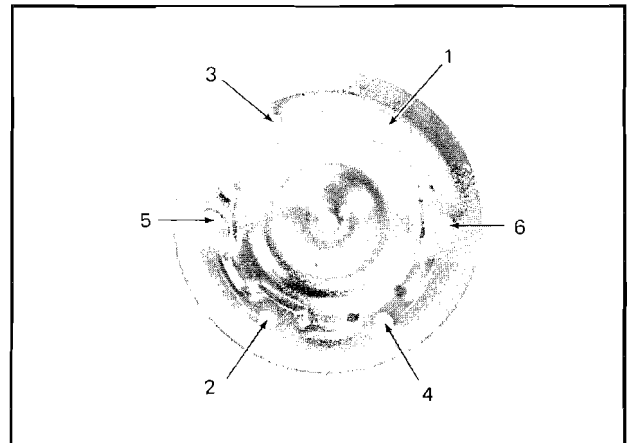
3. Position sliding pads on runner tubes, insert rivets and secure pads firmly.

4. Place inner flange and wheel bearing on front runner tube. Ensure that bearing shield is facing towards inner flange, then press down on the inner race until the bearing is sitting flush with support end (fig. 1-2-12).



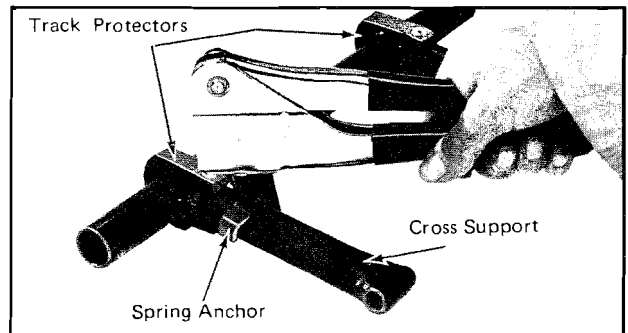
1-2-12

5. Position wheel tire and outer flange on support. Secure the inner flange and wheel tire to outer flange with six (6) bolts and nuts. Tighten attaching parts securing wheel flanges and tire following the sequence shown in figure 1-2-13.



1-2-13

6. Using a rivet gun, secure track protectors to the rear and second from rear cross supports (fig. 1-2-14). Install protectors with flat surface on same side as spring anchor.

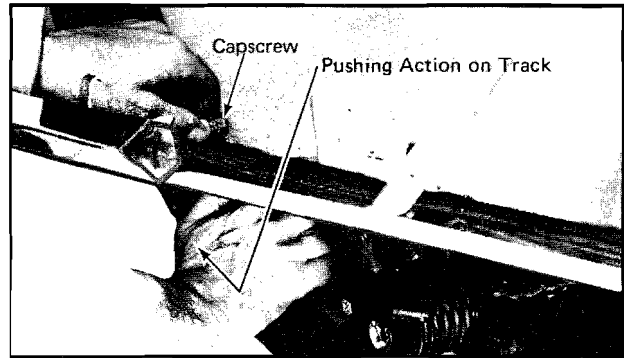


1-2-14

7. Join the rear and front runner tubes with clevis pins and cotter pins.
8. Insert sleeves in arms of cross supports. Secure cross supports to sliders by means of bolts and nuts. Slide the three (3) rear supports onto the sliding pads.
9. Insert sleeves and then bolt front support to front runner tube.
10. Apply a light coat of low temperature grease on cross shafts and insert the shafts into cross supports.
11. Position suspension springs and close the cross support anchors over the spring ends.

### (G) INSTALLATION

1. With the rear of the vehicle still raised off the ground and track tension released, position slider suspension assembly within the track.
2. Start installation procedure by aligning the threaded hole of the first cross shaft with the first hole in the frame. Secure the cross shaft to frame (fig. 1-2-15).



1-2-15

3. Repeat step 2 to secure the second, third and rear cross shaft.
4. Using special lever (item 1), hook link plate spring to anchors. Install reinforcing cross shaft.
5. Lubricate front runner tube wheels using a low pressure grease gun filled with low temperature grease until lubricant appears at joint. Wipe off excess grease.
6. Apply track tension as detailed in sub-section 1-5, Paragraph (J).
7. Carry out track alignment procedure as described in sub-section 1-5, Paragraph (K).
8. Set vehicle on the ground.

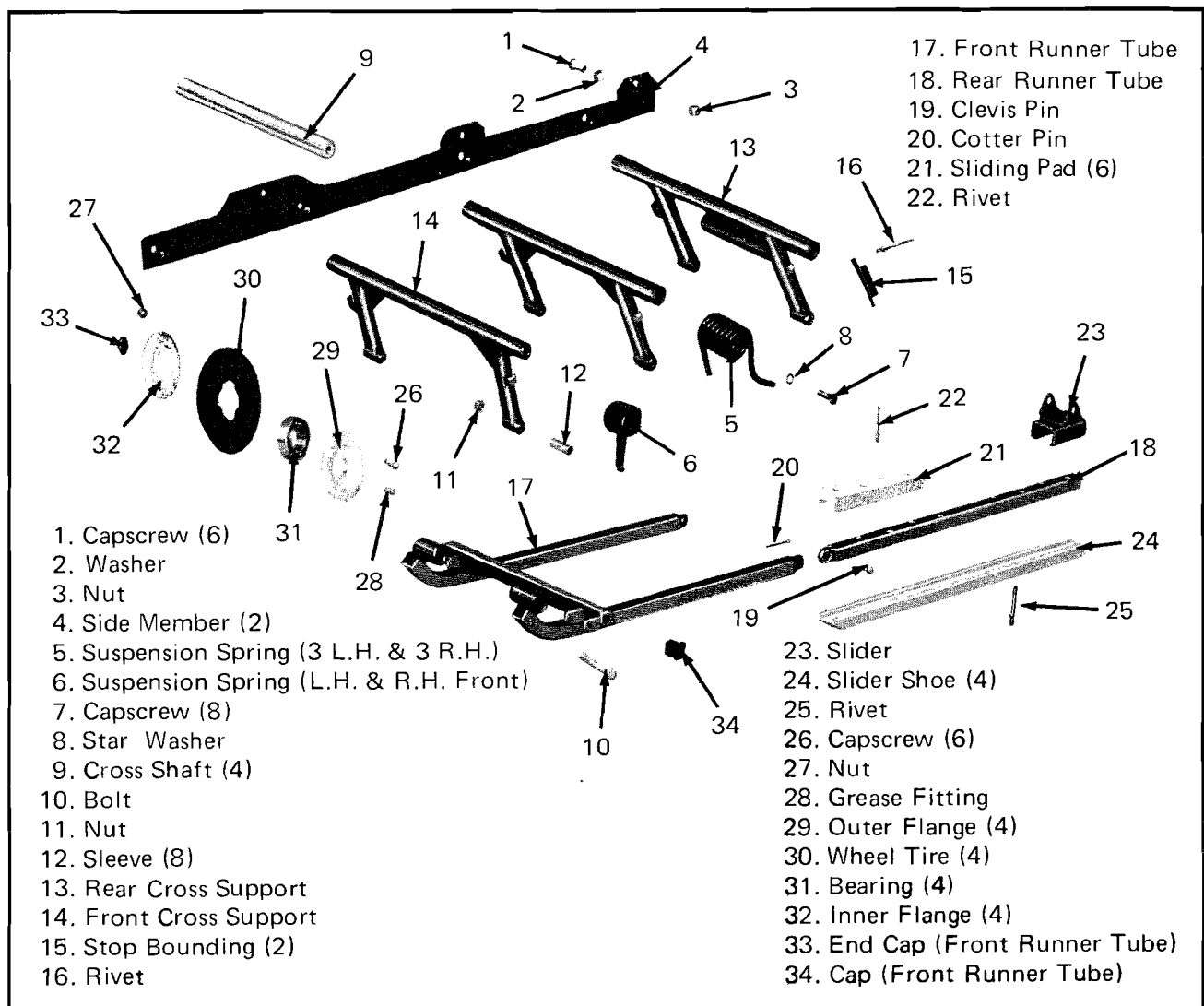
# SUSPENSION

## 1-2-1 SLIDER SUSPENSION (1971 Models)

### (A) GENERAL

Basically, the principle of the slider suspension is to create a uniform downward pressure acting over a maximum area of track. This gives the vehicle greatest possible contact with the underlying snow surface.

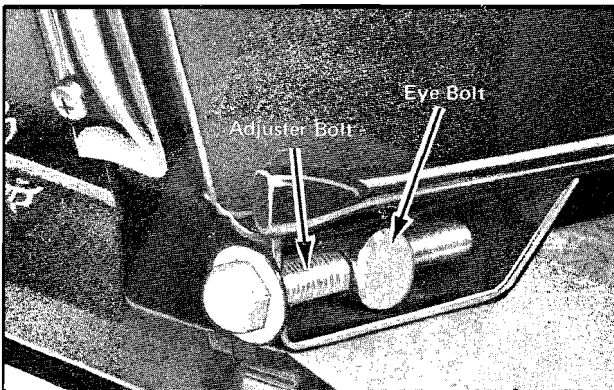
- The 1970 slider suspension is secured to the frame of the vehicle while the 1971 system is of a unit construction attached to the frame via side members.
- Track “flapping” on the 1970 system is controlled by means of track protectors installed on the two rear cross supports. On the '71 vehicle, the track protectors are replaced by stop bounding and two wheels affixed to the rear cross support eliminate flapping.



DISASSEMBLED VIEW OF SLIDER SUSPENSION (1971)

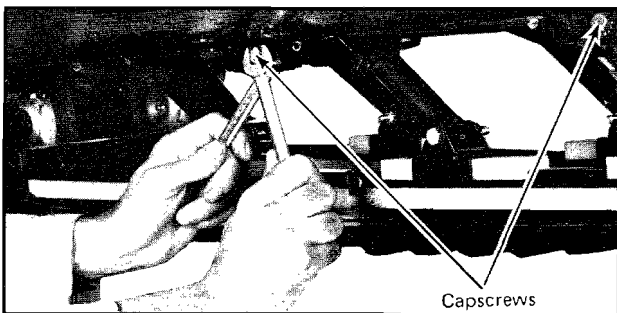
**(B) REMOVAL**

1. Raise the rear of the vehicle and support it off the ground.
2. Release track tension by loosening link plate spring lock nuts and track adjuster bolts until the ends of the bolts are flush with the side of the eye bolts (fig. 1-2-16).



1-2-16

3. Using special lever (item 1), unhook link plate springs.
4. Remove capscrews, washers and nuts securing side members to frame (fig. 1-2-17).



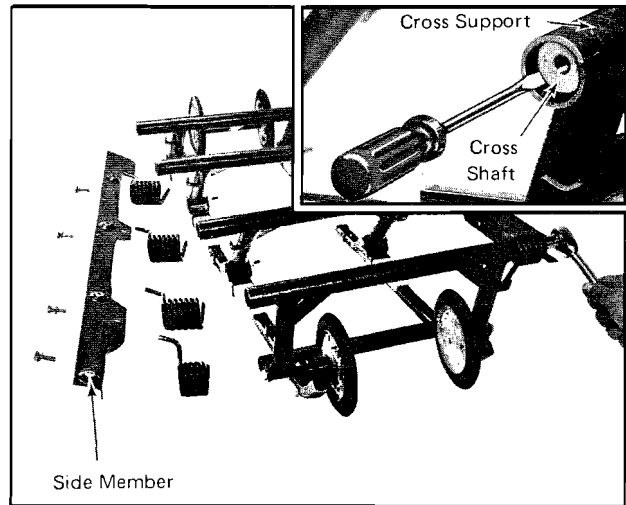
1-2-17

5. With capscrews, washers and nuts removed, the complete slider suspension assembly can be withdrawn from the track.

**(C) DISASSEMBLY**

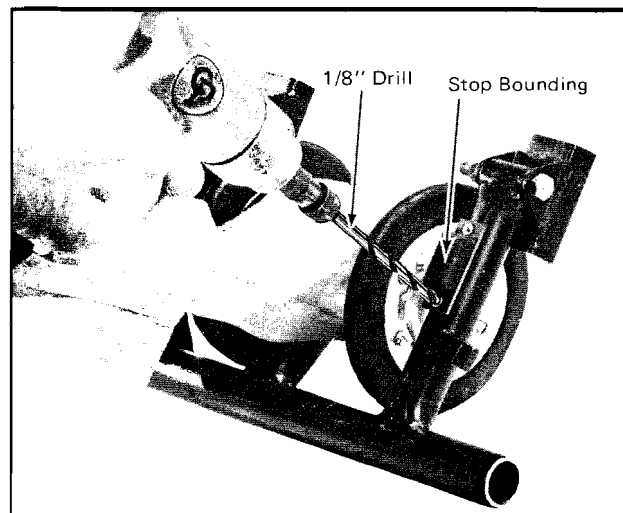
1. Remove capscrews and star washers securing side members to cross shafts. Remove eight (8) suspension springs and pull out the cross shafts from cross supports.

**NOTE:** To prevent the cross shafts from rotating within the cross supports, wedge a screwdriver blade between the cross shaft and cross support (fig. 1-2-18).



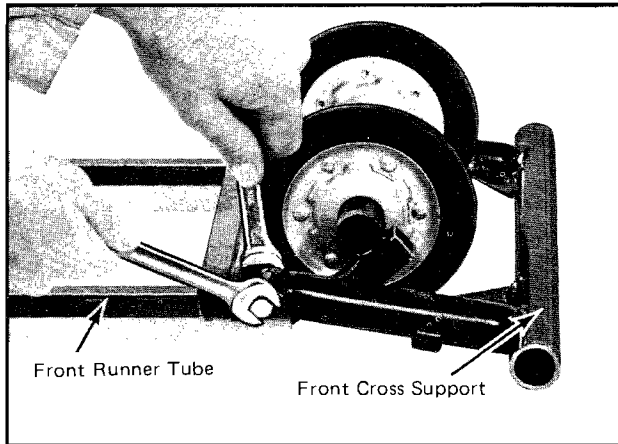
1-2-18

2. Slide the three (3) rear cross supports from the sliding pads.
3. Using a 1/8 inch dia drill, remove the rivets attaching the stop bounding to the rear cross support (fig. 1-2-19).



1-2-19

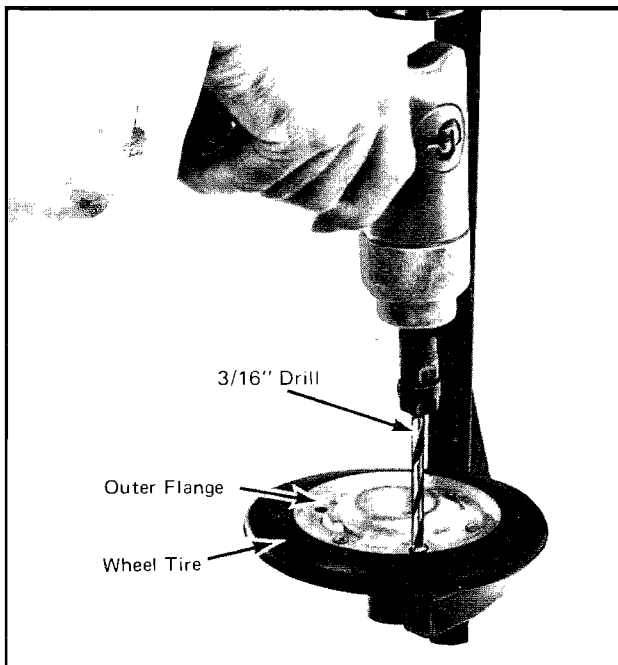
4. Remove bolts securing sliders to support and remove the sleeves.
5. Remove the cotter pins and clevis pins attaching the front and rear runner tubes.
6. Remove bolts securing front cross support to front runner tube (fig. 1-2-20).



1-2-20

7. To remove the rear cross support wheels and front runner tube wheels, use a 3/16 inch dia drill and remove the rivets securing outer flange and wheel tire to inner flange (fig. 1-2-21). Remove outer flange and wheel tire.

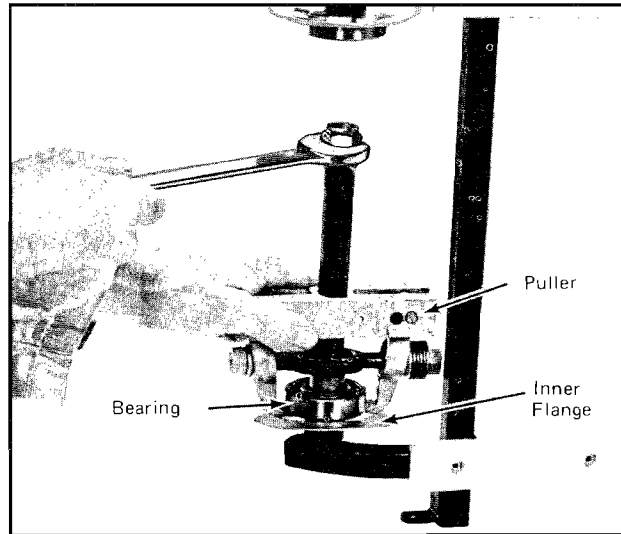
**NOTE:** Do not unscrew grease fitting from outer flange unless damaged, and replacement is necessary.



1-2-21

8. With an appropriate bearing puller, remove wheel bearing from support and remove inner flange (fig. 1-2-22).

**NOTE:** Always remove the bearing by pulling it by the inner race.



1-2-22

9. Using a 3/16 inch dia drill, remove the rivets attaching slider pads and slider shoes to runner tubes.

**NOTE:** If head of rivets securing slider shoe to runner tube is flush with contact surface, shoe is excessively worn and must be discarded and replaced during Assembly procedure.

**(D) CLEANING**

1. Clean grease and dirt from sliding pads, slider shoes, rubber tires and stop bindings with a clean cloth.

**CAUTION:** Do not use cleaning solvent on pads, shoes, tires or bindings as it may permanently damage the component.

2. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.

3. Place all other components in a container of cleaning solution. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

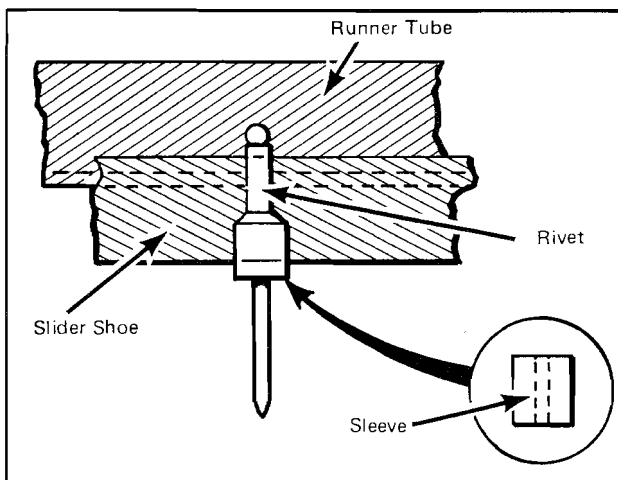


**(E) INSPECTION**

1. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).
2. Ensure that slider shoes are not worn to the extent mentioned in NOTE of Paragraph (C), step 9. If so, shoes must be replaced.
3. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
4. Visually inspect all other components for wear, cracks, distortion and other possible damage. Replace as necessary.

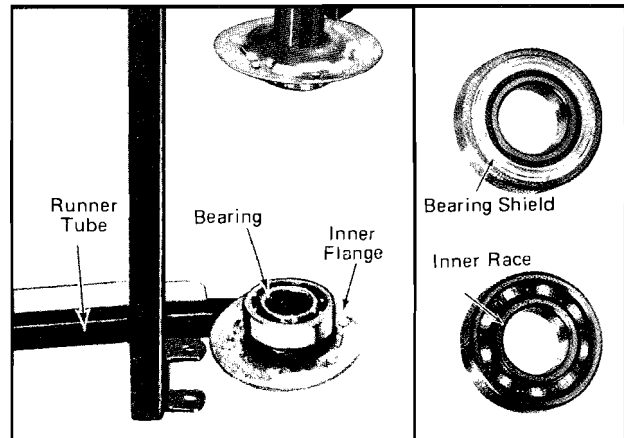
**(F) ASSEMBLY**

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.
2. Position slider shoes (angle of shoe must be facing forward) on rear and front runner tubes and insert rivets. Secure shoes firmly using a rivet gun. Due to the thickness of the slider shoe, the head of the rivet gun may not come in contact with the rivets. If so, a small sleeve seated on the rivet head will assist in easier riveting action (fig. 1-2-23).



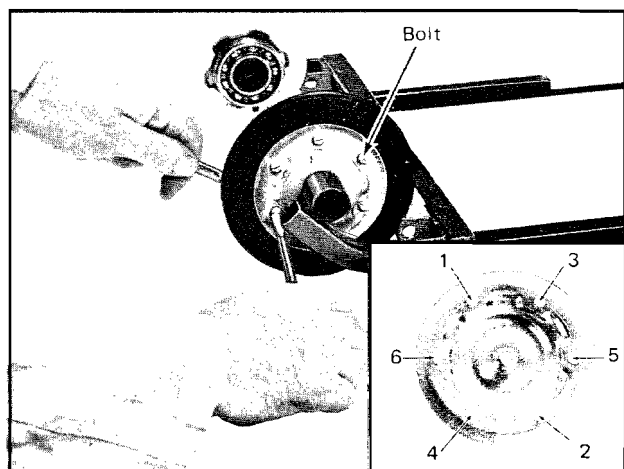
1-2-23

3. Position sliding pads on runner tubes, insert rivets and secure pads firmly.
4. Position inner flange and wheel bearing on the runner tube. Ensure that the bearing shield is facing towards inner flange, then press down on the inner race until bearing is sitting flush (fig. 1-2-24).



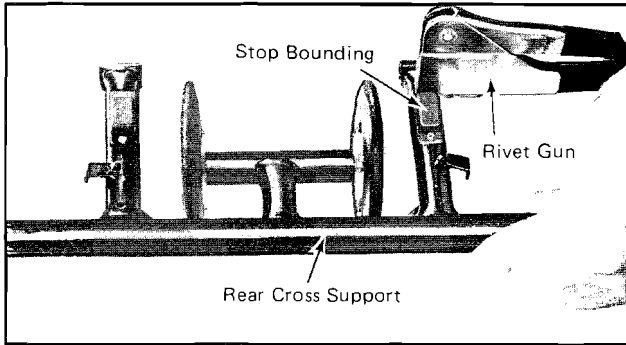
1-2-24

5. Repeat step 4 to install inner flange and wheel bearing on the cross support.
6. Position wheel tire and outer flange on support. Secure the inner flange and wheel tire to outer flange with six (6) bolts and nuts.
7. Tighten attaching parts securing wheel flanges and tire following the sequence shown in figure 1-2-25.



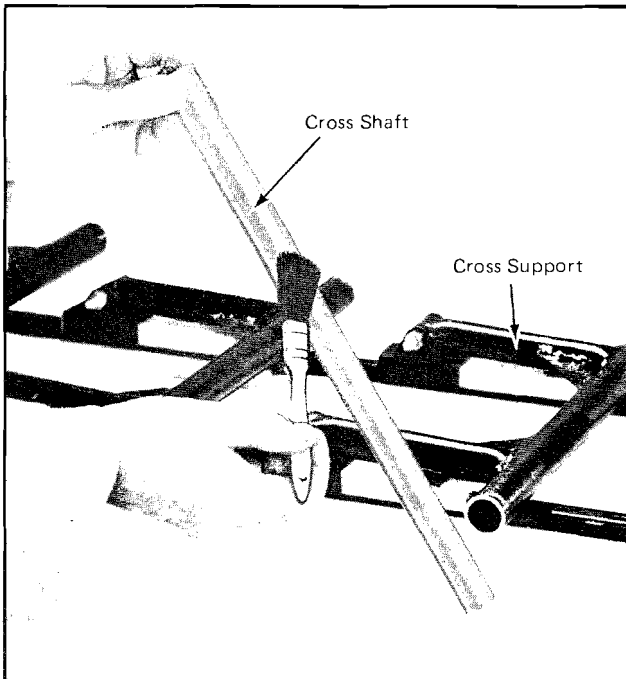
1-2-25

8. Using a rivet gun, secure the stop boundaries to rear cross support (fig. 1-2-26).



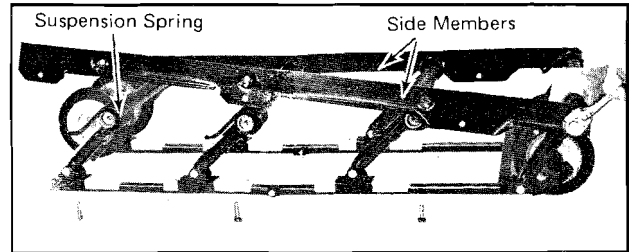
1-2-26

9. Connect rear and front runner tubes with clevis pins and cotter pins.
10. Insert sleeves in arms of cross supports. Secure cross supports to sliders by means of bolts and nuts. Slide the three (3) rear supports onto the sliding pads.
11. Insert sleeves and then bolt front support to front runner tube.
12. Apply a light coat of low temperature grease on cross shafts and insert shafts into cross supports (fig. 1-2-27).



1-2-27

13. Position suspension springs and close the cross support anchors over the spring ends. Secure the side members using washer and capscrews (fig. 1-2-28).

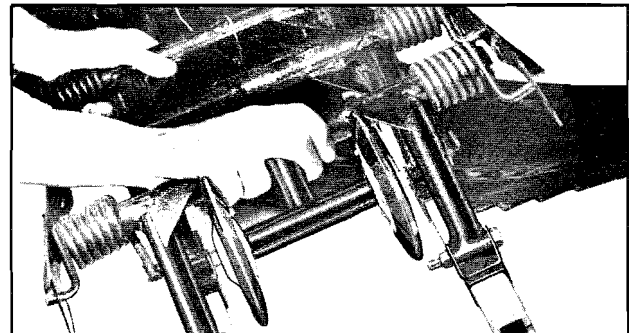


1-2-28

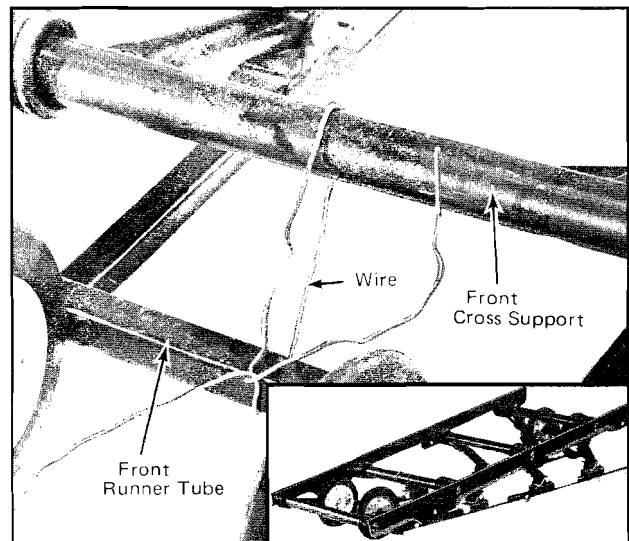
**(G) INSTALLATION**

1. With rear of the vehicle still raised off the ground and track tension released, position slider suspension unit within the track (fig. 1-2-29).

**NOTE:** Due to the confines of the track and to ease installation procedures, collapse the slider suspension unit by applying downward pressure on the front cross support. Then using a fairly strong length of wire, tie the front cross support and the front runner tube together (fig. 1-2-30).



1-2-29



1-2-30

1-02-12

## SLIDER SUSPENSION (1971)

2. Secure the side members of the slider suspension to frame by means of cap-screws, washers and nuts. Cut and discard the temporarily installed wire.
3. Using special lever (item 1), hook link plate springs into middle position of 3-position slotted anchors.
4. Lubricate front runner tube wheels and rear cross support wheels using a low pressure grease gun filled with low temperature grease until lubricant appears at joint. Wipe off excess grease.
5. Apply track tension as detailed in sub-section 1-5, Paragraph (J).
6. Carry out track alignment procedure as described in sub-section 1-5, Paragraph (K).
7. Set vehicle on the ground.

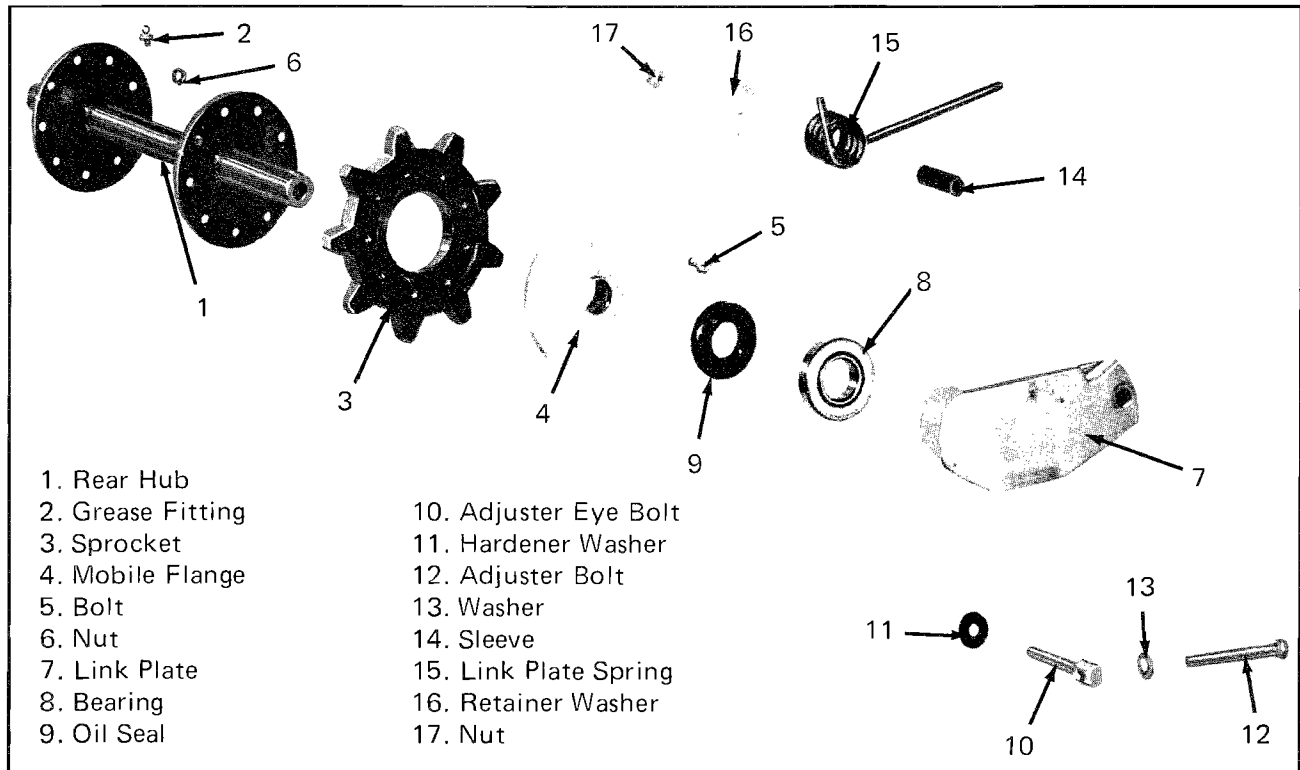
# SUSPENSION

## 1-3 REAR HUB

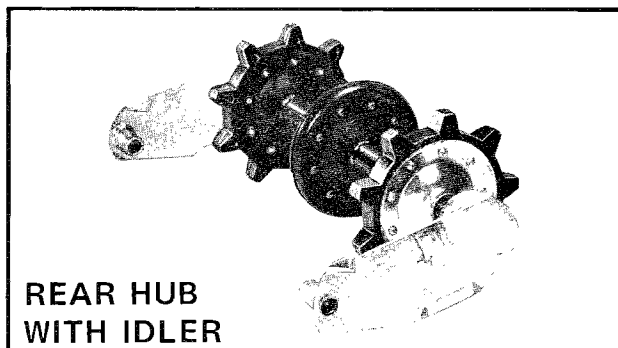
1-3

### (A) GENERAL

The flexible action obtained through the link plates and springs provides the rear hub with the endurance to hold the track in a straight and even plane. The link plate assemblies achieve surer handling and even track wear.



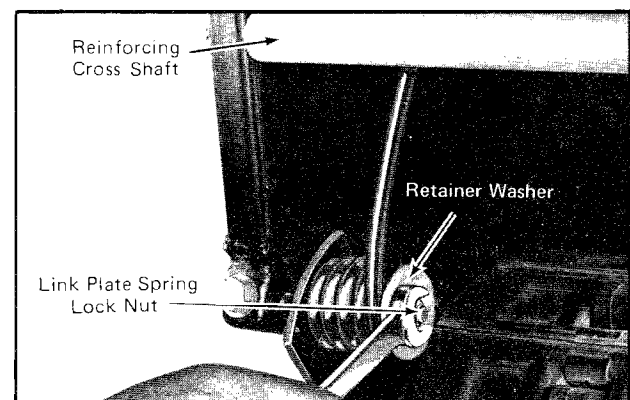
DISASSEMBLED VIEW OF 1971 REAR HUB



### (B) REMOVAL

1. Lift and block rear of vehicle off the ground.

2. Remove the link plate spring lock nuts and retainer washers (fig. 1-3-1).

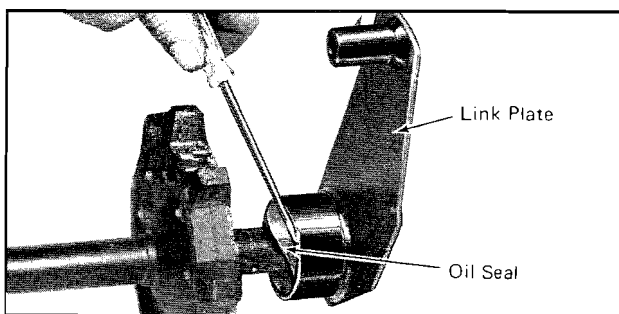


1-3-1

3. Using special lever (item 1), unhook link plate springs.
4. On 1970 Nordic and T'NT models, prior to unhooking the link plate springs, remove the reinforcing cross shaft by removing capscrews and star washers securing shaft to frame.
5. Remove track adjuster bolts, link plate springs, eye bolts, hardener washers and adjuster sleeves.
6. Withdraw rear hub from vehicle.

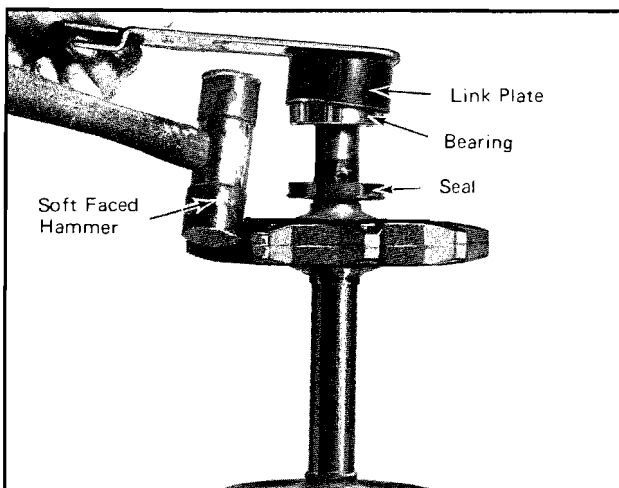
### (C) DISASSEMBLY

1. Unscrew grease fitting(s) from hub.
2. With a small screwdriver, pry out oil seal from the groove of each link plate (fig. 1-3-2).



1-3-2

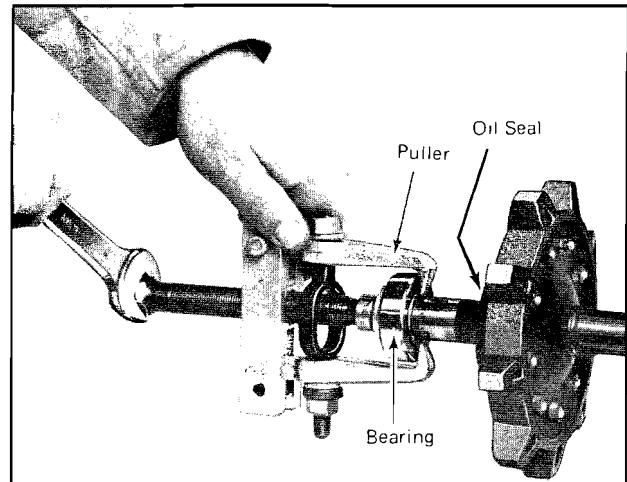
3. Pull the link plates from the bearings. To disengage the link plates it may be necessary to use a soft faced hammer (fig. 1-3-3).



1-3-3

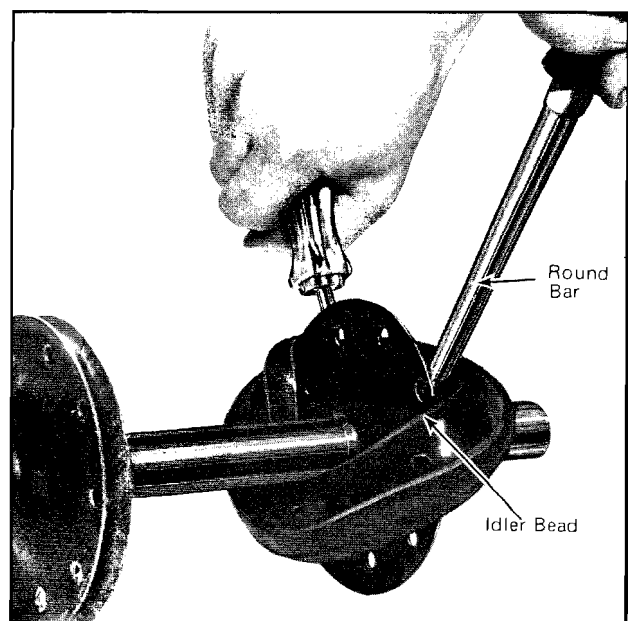
4. Using an appropriate bearing puller, remove bearings from the hub. Remove seals.

**NOTE:** Always remove the bearing by pulling it by the inner race (fig. 1-3-4).



1-3-4

5. Remove nine (9) nuts and bolts attaching each mobile flange and sprocket to the hub. Remove flanges and sprockets.
6. On models with rear hub equipped with idler, remove bolts and nuts securing idler flanges. Apply liquid soap or petroleum jelly on bead of idler. Using two screwdrivers (round bars), pass idler over flanges (fig. 1-3-5).



1-3-5

**(D) CLEANING**

1. Clean grease and dirt from sprockets, oil seals and idler with a clean cloth.

**CAUTION:** Do not use cleaning solvent on sprockets, oil seals or idler as it may permanently damage the component(s).

2. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.
3. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

**(E) INSPECTION**

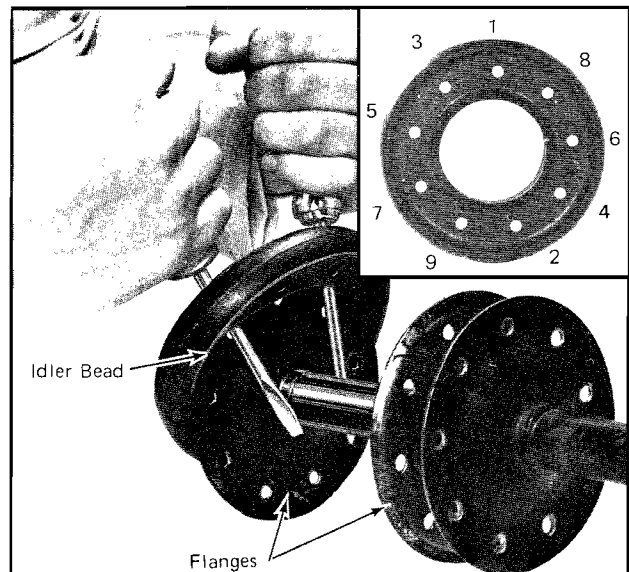
1. Visually inspect sprockets for damage or worn teeth, cuts or distortion. If damage is evident, replace sprocket(s). Refer to Paragraph (H) for Sprocket Change Over.
2. Visually inspect oil seals for cuts or other damage. Replace defective oil seal(s).
3. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).
4. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
5. Visually inspect all other components for signs of wear, cracks and other possible damage. Replace damaged part(s).

**(F) ASSEMBLY**

1. Prior to Assembly procedure, ensure all

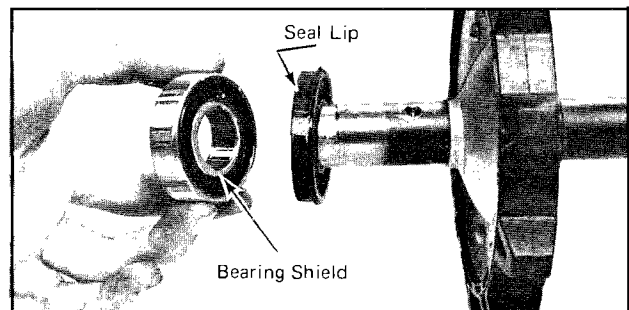
components are clean and all defective parts have been repaired or replaced.

2. On models with rear hubs equipped with idler, apply liquid soap or petroleum jelly on bead of idler. Pass idler over flanges using two screwdrivers (round bars). Bolt idler flanges together following the sequence shown in figure 1-3-6.



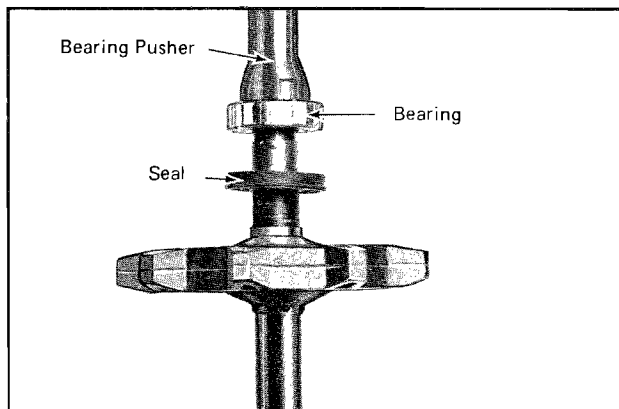
1-3-6

3. Secure sprocket and mobile flange to each fixed flange of hub. Ensure the bolts are tightened equally to eliminate the possibility of polyurethane or rubber distortion. Tighten attaching bolts following the sequence shown in figure 1-3-6.
4. Position an oil seal and a bearing on each end of hub. The lip of the oil seal must be facing outward and the shield of the bearing must be facing the hub sprocket (fig. 1-3-7).



1-3-7

5. Correctly position bearing by pressing bearing down on inner race until it is flush with end of hub (fig. 1-3-8).

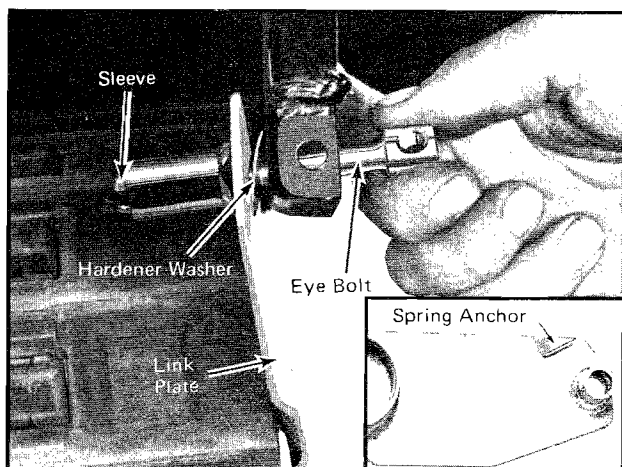


1-3-8

6. Press link plates onto bearings and insert oil seals into link plates. Rim of oil seal must sit correctly in groove of link plates.
7. Install grease fitting(s).
8. Using a low pressure grease gun filled with low temperature grease, lubricate the rear hub. After lubricating, ensure that seals remain in position.

### (G) INSTALLATION

1. With rear of vehicle off the ground, position the rear hub within the track. Ensure that the link plate spring anchors on the link plates are upward (fig. 1-3-9).

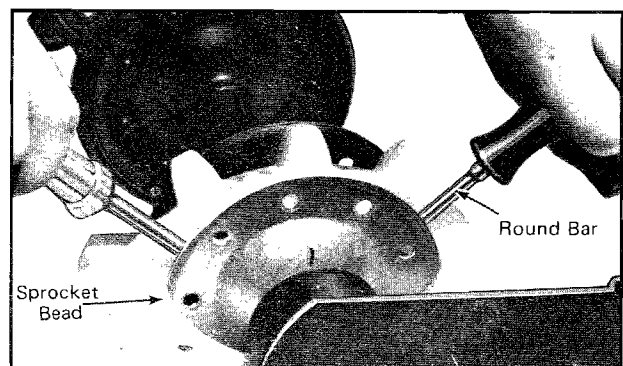


1-3-9

2. Install sleeves, hardener washers, and eye bolts (fig. 1-3-9).
3. Partially screw in the track adjuster bolts.
4. Hook the link plate springs. On all 1971 models except Elan, hook springs into middle position of 3-position anchors. On all 1970 models hook springs into their respective anchors. On all Elan models, hook springs into frame.
5. Install retainer washers and partially tighten the link plate spring lock nuts.
6. Apply track tension as detailed in sub-section 1-5.
7. Carry out track alignment procedure as described in sub-section 1-5.
8. Set vehicle on the ground.

### (H) SPROCKET CHANGE OVER

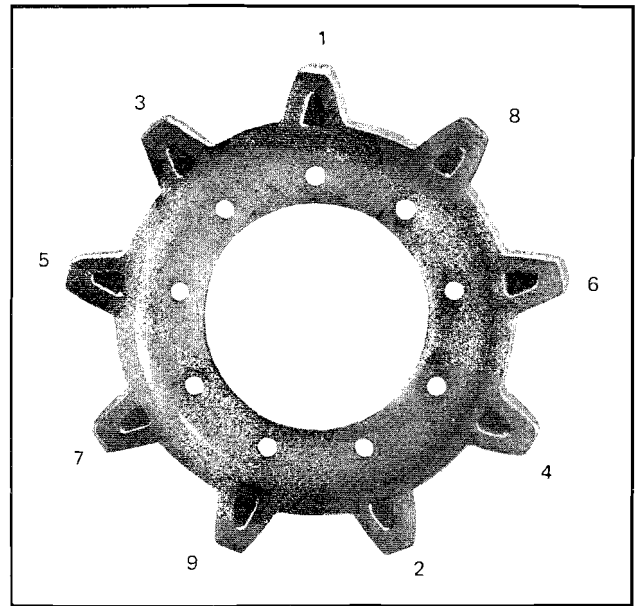
1. Remove rear hub from vehicle, refer Paragraph (B), preceding.
2. On all 1970 models and '71 vehicles equipped with 18 inch track, remove grease fitting on side of defective sprocket.
3. Remove the nine (9) bolts and nuts attaching the mobile flange and sprocket to the rear hub.
4. Apply liquid soap or petroleum jelly on sprocket bead and with two screwdrivers (round bars), pass the sprocket over flange and link plate (fig. 1-3-10).



1-3-10

5. Reverse Change Over procedure to install new sprocket.

**NOTE:** Tighten attaching bolts following the sequence shown in figure 1-3-11. When attaching the sprockets, ensure that the bolts are tightened gradually and equally. This procedure will avoid possible polyurethane or rubber distortion.



1-3-11



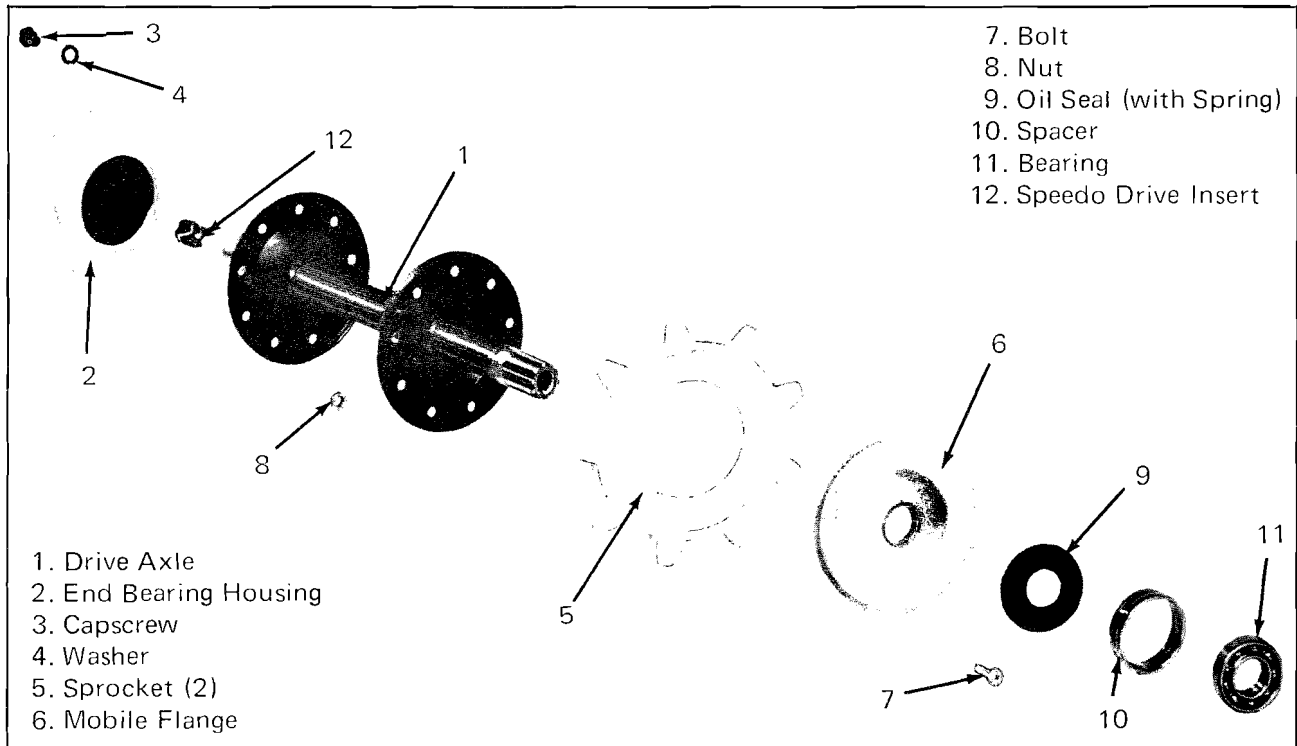
# SUSPENSION

## 1-4 DRIVE AXLE

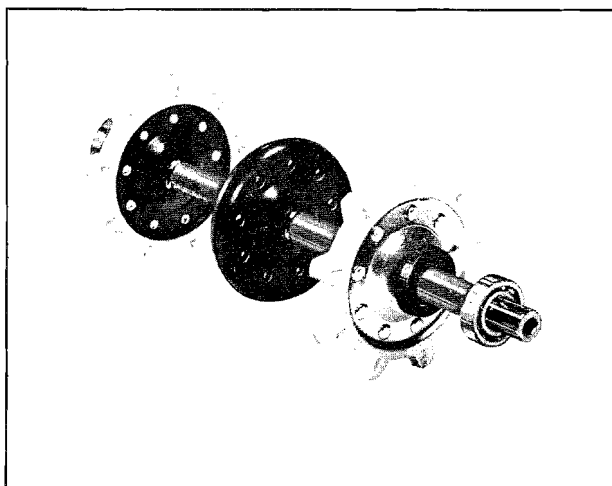
### (A) GENERAL

1-4

The functions of the drive axle(s) is to transmit power from the drive chain to the track(s). This is achieved with two (2) sprockets, affixed to the drive axle(s), the teeth of which mesh with the track notches, thus engaging the track.



DISASSEMBLED VIEW OF 1971 DRIVE AXLE



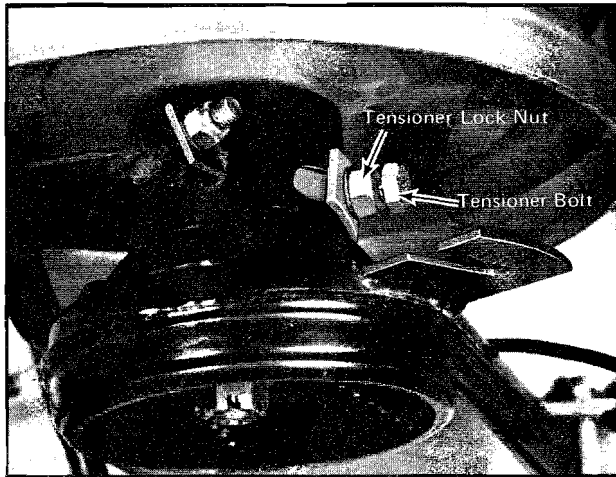
GENERAL VIEW OF DRIVE AXLE (with Idler)

### (B) REMOVAL

(All Models, except Alpine/Invader and Valmont)

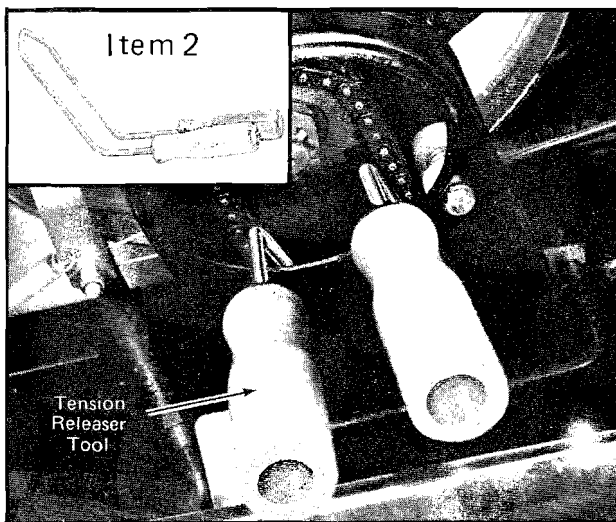
1. Tilt or remove the cab.
2. Remove the pulley guard, refer to subsection 1-6.
3. Remove lower access plug from chain case and drain the chain case oil into a catch pan by tilting the vehicle on its left side.
4. Pry the inspection cover (upper plug) from the chain case.

5. On 1970 models, release drive chain tension as follows.
  - (a) Partially unscrew the tensioner lock nut.
  - (b) Using a soft faced hammer, gently knock the tensioner bolt counter-clockwise (fig. 1-4-1).



1-4-1

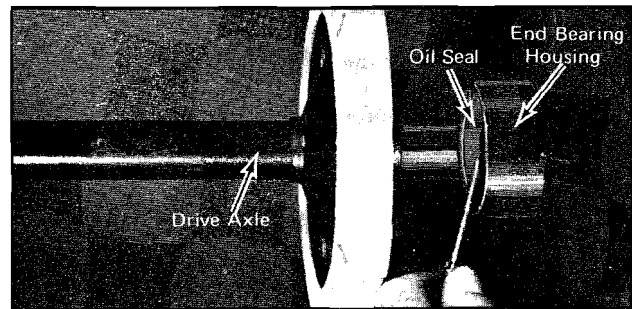
**NOTE:** On 1971 models, drive chain tension is released by inserting tension releaser tool (refer Section 5, item 2), (fig. 1-4-2).



1-4-2

6. Raise and block rear of vehicle off the ground.
7. Remove either the bogie wheel system (refer sub-section 1-1) or the slider suspension assembly (refer sub-section 1-2).

8. Remove rear hub as detailed in sub-section 1-3.
9. With a small screwdriver, pry out oil seals from chain case and end bearing housing (fig. 1-4-3).

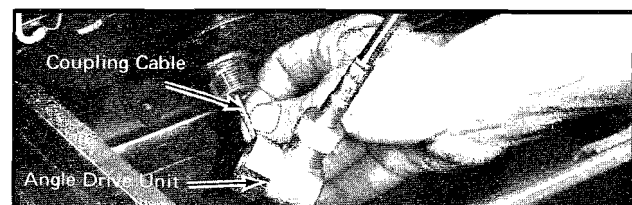


1-4-3

10. On 1971 Elan and Olympique electric models, disconnect battery cables from posts, remove battery cover, battery and seat.

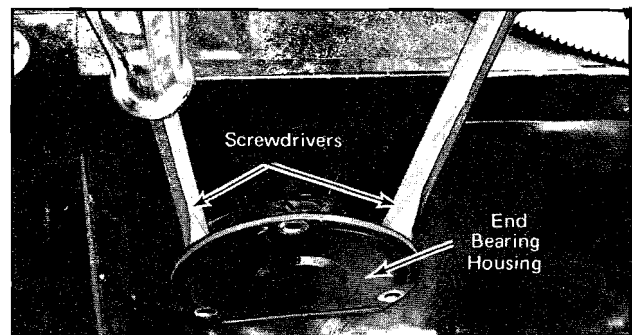
**NOTE:** The battery seat on Elan models is not removable.

11. If the vehicle is equipped with a speedometer, remove angle drive unit and coupling cable (fig. 1-4-4).



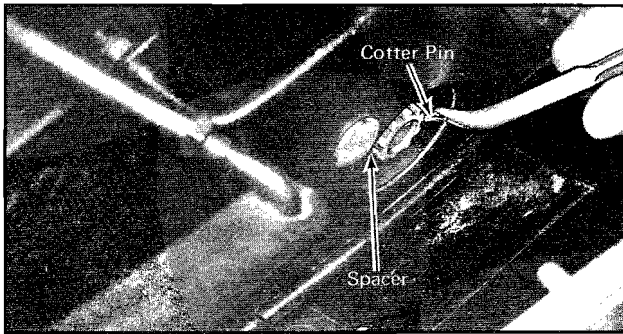
1-4-4

12. Remove the three (3) capscrews securing end bearing housing to frame. Pry the housing from the frame with two screwdrivers (fig. 1-4-5).



1-4-5

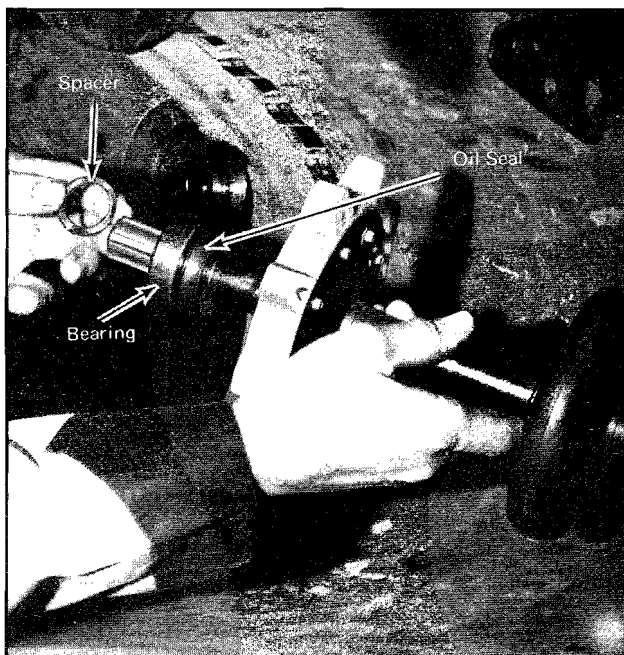
- Remove the cotter pin and spacer from the chain case side (fig. 1-4-6).



1-4-6

- On Olympique models 1970 and '71 "399" and '71 "399E", remove the chain case assembly as described in sub-section 1-11.
- Release drive sprockets teeth from track notches at the same time pulling the drive axle towards the end bearing side of frame. This action will disengage the axle splines from the chain case lower sprocket.
- Remove drive axle from vehicle and pull out spacer (fig. 1-4-7).

**NOTE:** There is no spacer installed on Elan models.



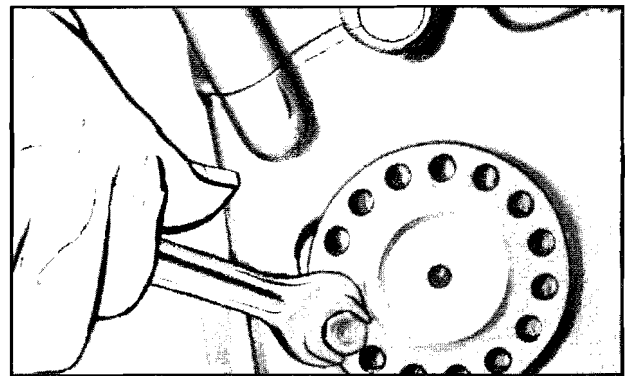
1-4-7

**(C) REMOVAL**

**All Alpine/Invader and Valmont Models**

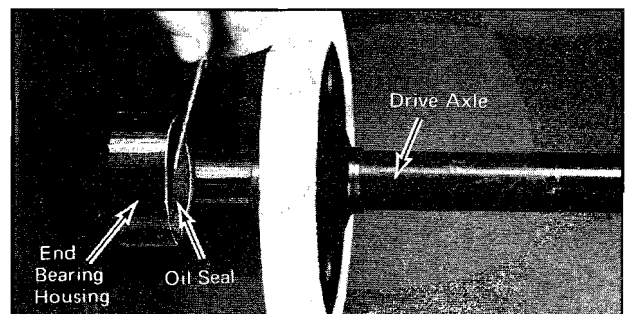
**NOTE:** The following procedure is applicable to removal of either one or both drive axles of vehicle.

- Remove cab from vehicle.
- Pry the inspection cover from the bottom right side of gear box.
- Release drive chain tension by removing tensioner capscrew at bottom left of gear box and rotating tensioner until maximum slackness is obtained (fig. 1-4-8).



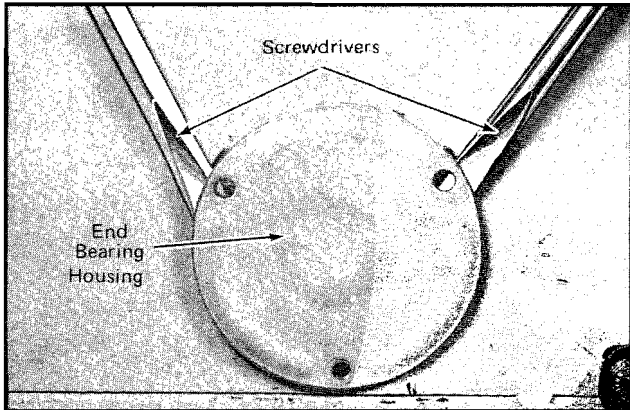
1-4-8

- Remove the bogie wheel system (refer sub-section 1-1) and rear hub (refer sub-section 1-3).
- Slightly tilt vehicle either on left or right side and place catch pan directly beneath end bearing housing oil seal.
- With a small screwdriver, pry out oil seal from lowest end bearing housing and drain gear box oil (fig. 1-4-9).



1-4-9

7. Remove remaining oil seal from end bearing housing and center frame.
8. Remove the three (3) capscrews securing end bearing housing to frame. With two screwdrivers inserted between the housing and frame, pry out housing (fig. 1-4-10).



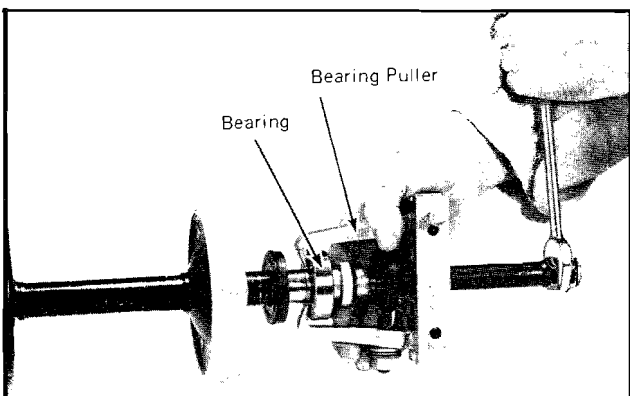
1-4-10

9. Release drive sprocket teeth from track notches at the same time pulling the drive axle towards the end bearing side of frame. This action will disengage the axle from the gear box lower sprocket.
10. Remove drive axle from within the track.

**(D) DISASSEMBLY**

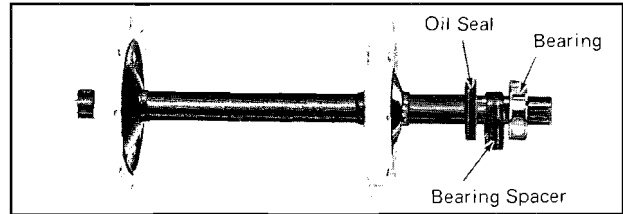
1. With an appropriate bearing puller, remove bearing from each end of axle. Remove oil seals.

**NOTE:** Always remove the bearings by pulling it by the inner race (fig. 1-4-11).



1-4-11

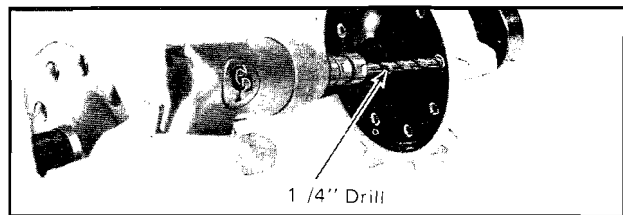
**NOTE:** On Olympique 399 and 399E models, remove the bearing spacers and oil seals (fig. 1-4-12).



1-4-12

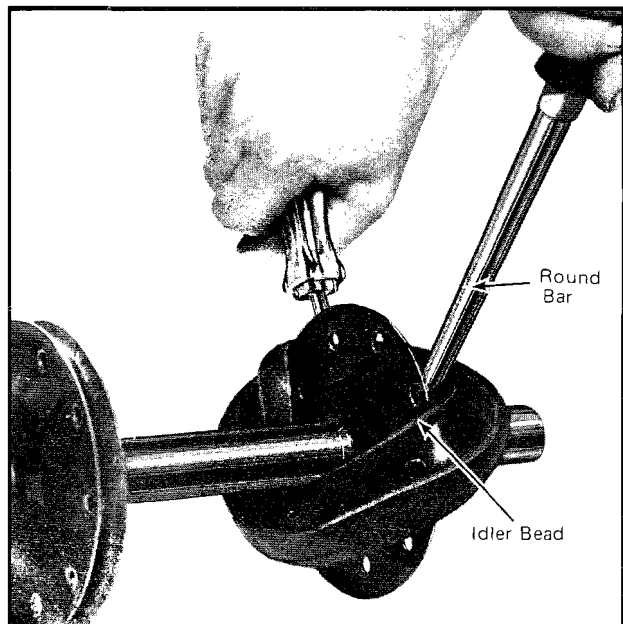
2. Detach and remove mobile flanges and sprockets from axle.

**NOTE:** On 1970 vehicles, the flanges and sprockets are secured with bolts and nuts. On all '71 models, they are attached with 1/4 inch dia rivets (fig. 1-4-13).



1-4-13

3. On models with drive axles equipped with an idler, remove bolts or rivets (whichever is applicable) securing mobile flange. Apply liquid soap or petroleum jelly on bead of idler and pass idler over the flanges (fig. 1-4-14).



1-4-14

**(E) CLEANING**

1. Clean grease and dirt from sprockets, oil seals and idler with a clean cloth.

**CAUTION:** Do not use cleaning solvent on sprockets, oil seals or idler as it may permanently damage the component(s).

2. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate bearings by dipping in clean engine Ski-Doo Oil.
3. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

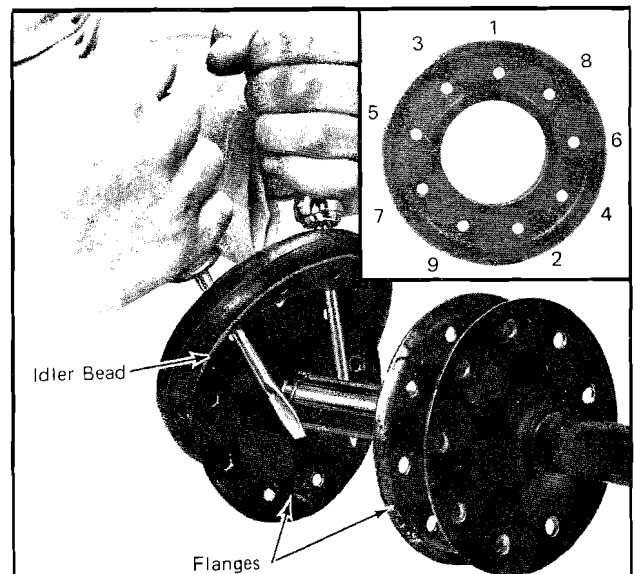
**(F) INSPECTION**

1. Visually inspect sprockets for damage or worn teeth, cuts or distortion. If damage is evident, replace sprocket. Refer to Paragraph (K) for Sprocket Change Over.
2. Visually inspect oil seals for cuts or other damage. Inspect oil seal spring. If damaged or stretched, spring must be replaced. Replace defective oil seals.
3. Visually inspect general condition of all bearings (e.g. pitted or missing ball bearings), freedom of movement and radial free play. Replace defective bearing(s).
4. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
5. Visually inspect all other components for signs of wear, cracks and other possible damage. Replace damaged part(s).
6. Visually inspect drive axle for cracked,

worn and/or twisted splines. If splines are damaged drive axle must be replaced.

**(G) ASSEMBLY**

1. Prior to Assembly procedures ensure all components are clean and all defective parts have been repaired or replaced.
2. On models with drive axles equipped with an idler, apply liquid soap or petroleum jelly on bead of idler. Pass idler over flanges using two screwdrivers (round bars). Bolt idler flanges together following the sequence shown in figure 1-4-15.



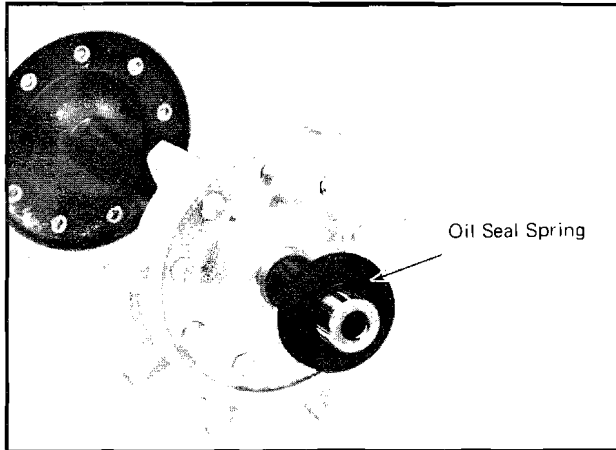
1-4-15

3. Secure sprocket and mobile flange to each fixed flange of hub by means of bolts and nuts. Tighten attaching bolts following the sequence shown in figure 1-4-15.

**NOTE:** When attaching the idler or sprockets, ensure that bolts are tightened gradually and equally. This procedure will avoid possible polyurethane or rubber distortion.

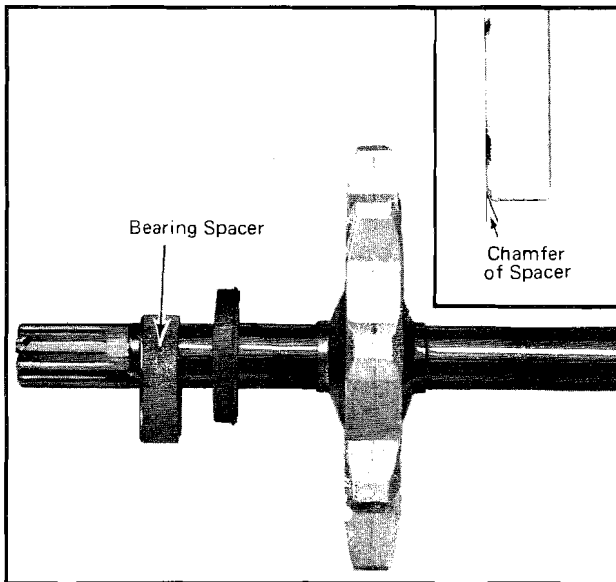
4. Position an oil seal on each end of axle.

The spring of the oil seal must be facing towards end of axle (fig. 1-4-16).



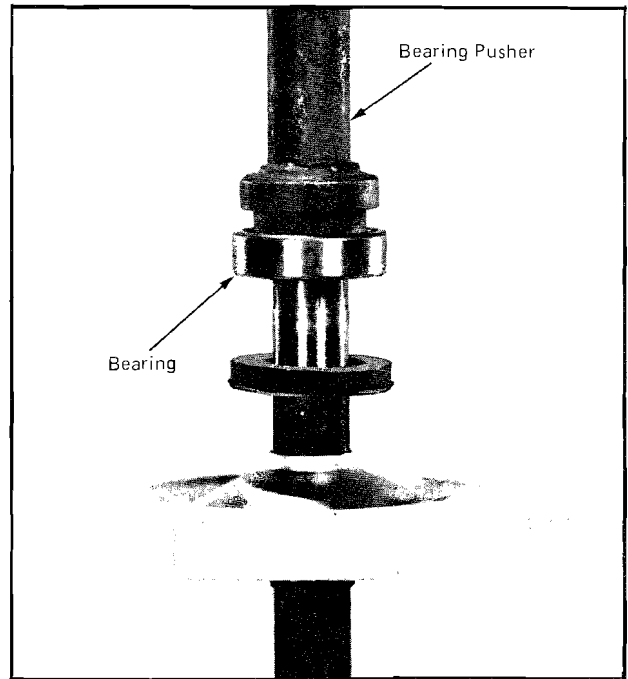
1-4-16

5. On Olympique 399 and 399E models, position bearing spacer on the splined end of drive axle with chamfered side of spacer facing away from sprocket (fig. 1-4-17).



1-4-17

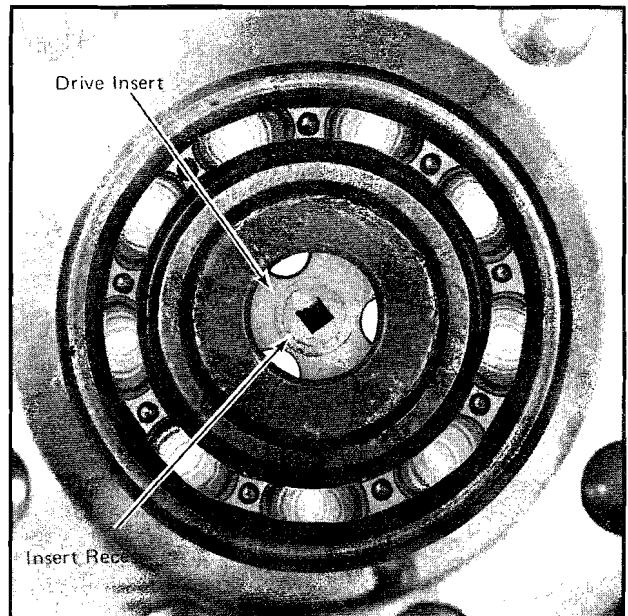
6. Place a bearing with shield facing sprocket on each end of axle. With an appropriate pusher, push the bearings by the inner race into position. The bearing on the splined side of axle must be pushed until it is seated on bearing stop. The end housing bearing must be pushed until bearing becomes flush with end of drive axle (fig. 1-4-18).



1-4-18

**(H) INSTALLATION**  
**(All Models except Alpine/Invader and Valmont)**

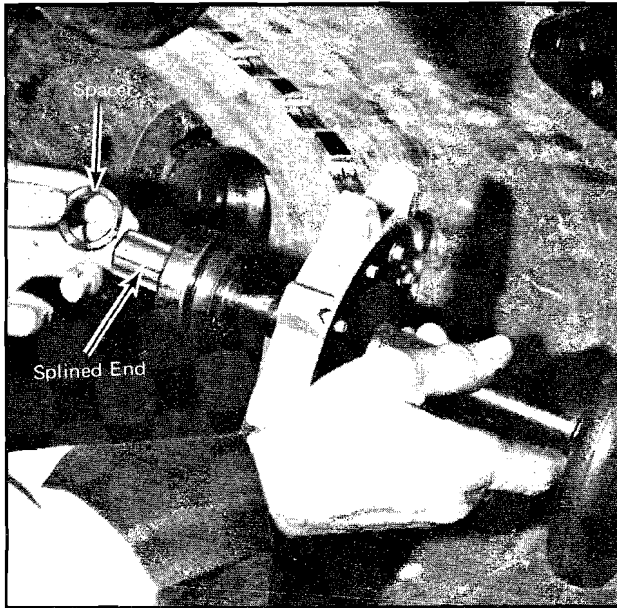
1. If the drive axle to be installed is a new component and the vehicle is equipped with a speedometer, a new speedo drive insert must be installed (driven) into the axle end. Ensure that insert is flush with axle end and ensure that the insert recess is facing outward (fig. 1-4-19).



1-4-19

- Place a spacer on the splined end of drive axle (fig. 1-4-20).

**NOTE:** The spacer is not installed on Elan models.

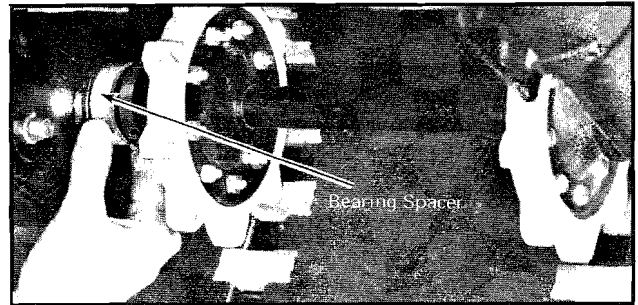


1-4-20

- From the left side of vehicle, insert the drive axle within the track. Push the end bearing through the orifice in right side of frame. Pull the splined end of axle into chain case lower sprocket.
- Position the end bearing housing into frame and over axle bearing and secure the housing to frame with three (3) capscrews.
- For vehicles equipped with speedometer, install coupling cable and angle drive unit.
- On Olympique models 1970 and '71 "399" and '71 "399E", install the chain case assembly as described in sub-section 1-11.
- On Olympique 399 and 399E models, push bearing spacer into chain case (fig. 1-4-21).
- Place a spacer on chain case side of axle and secure with a new cotter pin.
- On 1971 Elan and Olympique electric

models, install seat, battery and cover. Connect battery cables.

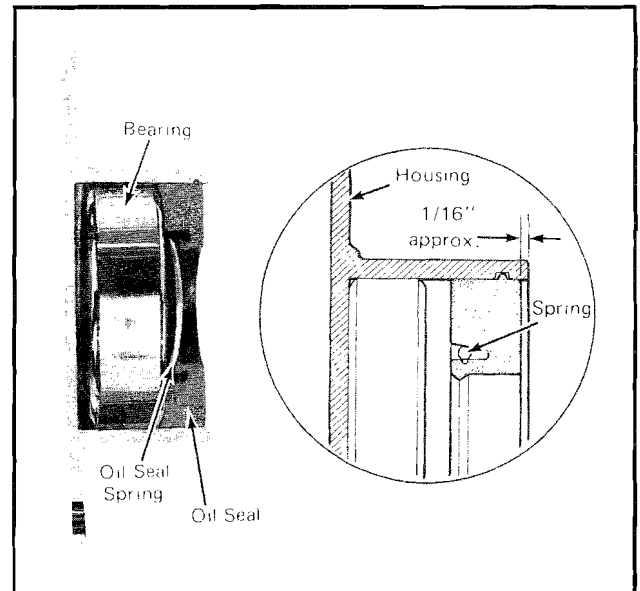
**NOTE:** Elan models do not incorporate a removable battery seat.



1-4-21

- Install oil seals.

**NOTE:** A gap of approximately 1/16 inch should exist between the end of the bearing housing and the oil seal (fig. 1-4-22).



1-4-22

- Install rear hub as detailed in sub-section 1-3.
- Install either the bogie wheel system (refer to sub-section 1-1) or the slider suspension unit (refer to sub-section 1-2).
- On 1970 models, adjust drive chain tension to 1/4 inch maximum free play

and tighten tensioner lock nut (fig. 1-4-23).



1-4-23

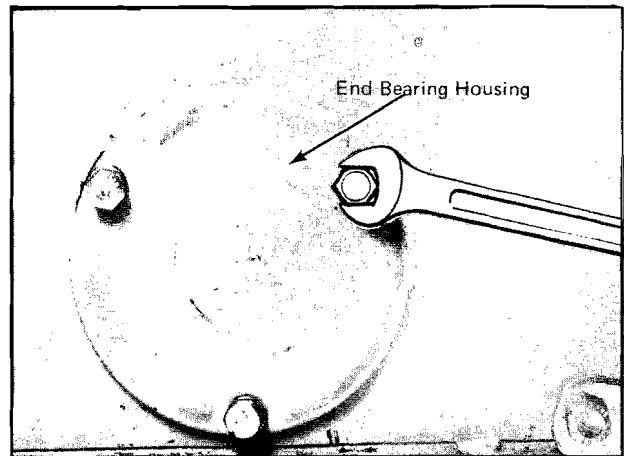
14. On 1971 models, remove tension releaser tool (item 2).
15. Install access plug and pour 8 ounces of Ski-Doo Chain Case Oil into chain case. Install inspection plug.
16. On 1970 and '71 Olympique models, refer to sub-section 1-9 and carry out pulley alignment. On all 1970 models, check brake adjustment and correct if necessary. Refer to sub-section 1-10.
17. Install pulley guard and cab.
18. Apply track tension as detailed in sub-section 1-5.
19. Carry out track alignment procedure as described in sub-section 1-5.
20. Set vehicle on the ground.

(J) **INSTALLATION**  
(1970 and '71 Alpine/Invader and Valmont Models)

**NOTE:** The following procedure is applicable to installation of either one or both drive axles of vehicle.

1. With the rear of vehicle supported off the ground, position drive axle assembly within track. Insert splined end of axle into lower sprocket of gear box.
2. Push the end bearing housing into frame and over end bearing. Secure housing to

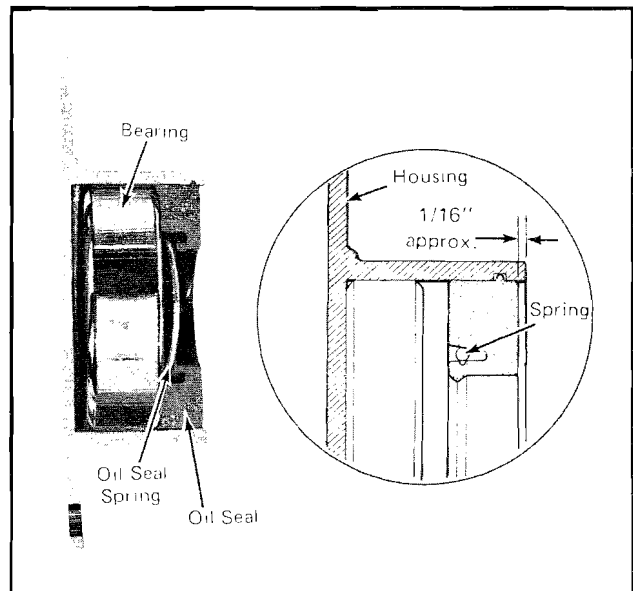
frame with three (3) capscrews (fig. 1-4-24).



1-4-24

3. Install oil seals.

**NOTE:** A gap of approximately 1/16 inch should exist between the end of the bearing housing and the oil seal (fig. 1-4-25).

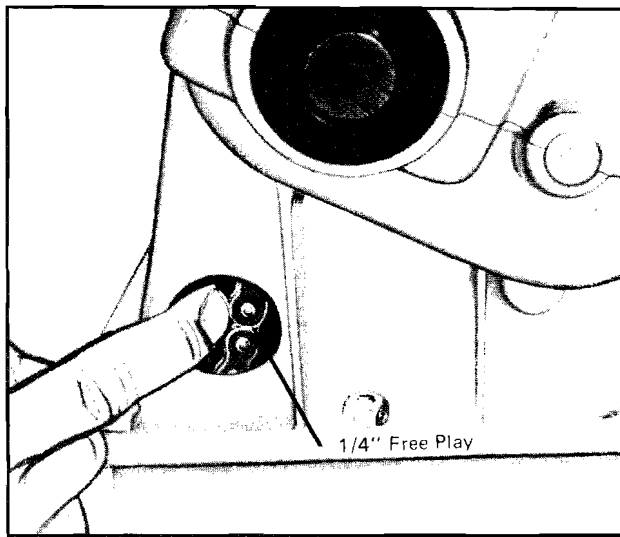


1-4-25

4. Install rear hub as detailed in sub-section 1-3.
5. Install bogie wheel system as described in sub-section 1-1.
6. Adjust chain tension by rotating gear box tensioner until 1/4 inch maximum free play is achieved (fig. 1-4-26).



**NOTE:** Ensure that gear box mounting nuts are well tightened before proceeding with chain tension.



1-4-26

7. Install inspection plug.
8. Remove the red plug on top of gear box and fill the gear box with Ski-Doo Chain Case Oil.

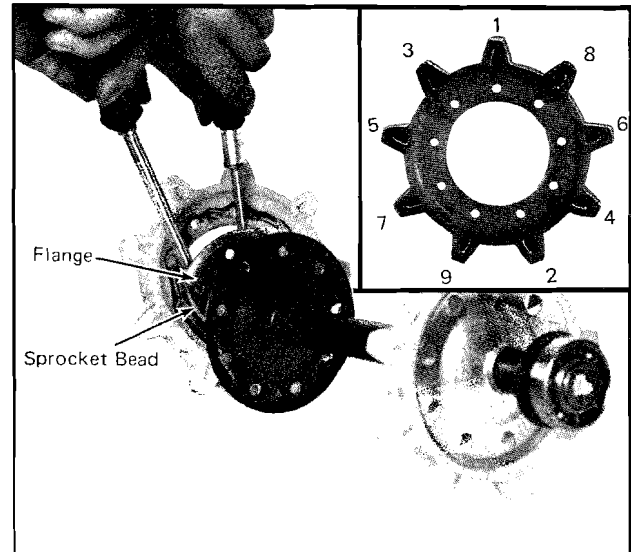
**NOTE:** On 399R and 399ER models, the oil capacity of the gear box is 12 ounces or 2-1/4 inches when checked with dip stick. The gear box capacity of the 640ER model is 16 ounces or 3-1/4 inch level on dip stick.

9. Install vent plug.
10. Install cab.
11. Apply track tension as detailed in sub-section 1-5.
12. Carry out track alignment procedure as detailed in sub-section 1-5.
13. Set vehicle on the ground.

**(K) SPROCKET CHANGE OVER**

1. Remove drive axle from vehicle, refer Paragraph (B) or (C), preceding.

2. Remove the nine (9) bolts and nuts or rivets attaching the mobile flange and sprocket to drive axle.
3. Apply liquid soap or petroleum jelly on sprocket bead and with two screwdrivers (round bars) pass the sprocket over flange (fig. 1-4-27).



1-4-27

4. Reverse Change Over procedure to install new sprocket.

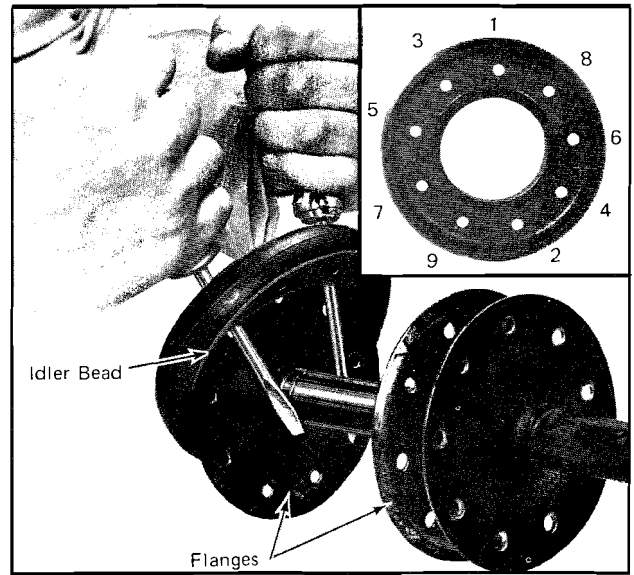
**NOTE:** Tighten attaching bolts following the sequence shown in figure 1-4-27.

**(L) IDLER CHANGE OVER**

1. Remove drive axle as detailed in Paragraph (B) or (C). Remove sprocket as described in Paragraph (K).
2. Remove the nine (9) bolts and nuts (or rivets) attaching the mobile flange and idler to drive axle.
3. Apply liquid soap or petroleum jelly on sprocket bead and with two screwdrivers (round bar) pass the idler over flange (fig. 1-4-28).
4. Reverse Change Over procedure to install new idler.

**NOTE:** Tighten attaching bolts following the sequence shown in figure 1-4-28. When attaching the idler, ensure that

bolts are tightened gradually and equally. This procedure will avoid possible rubber distortion.



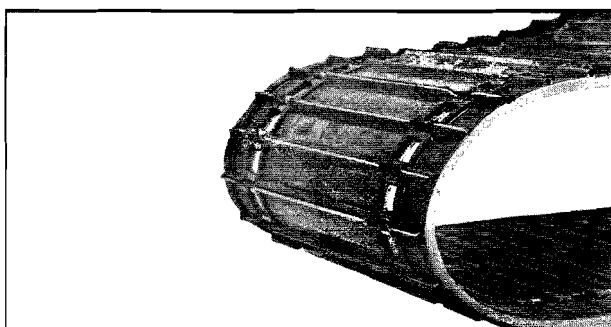
# SUSPENSION

## 1-5 TRACK

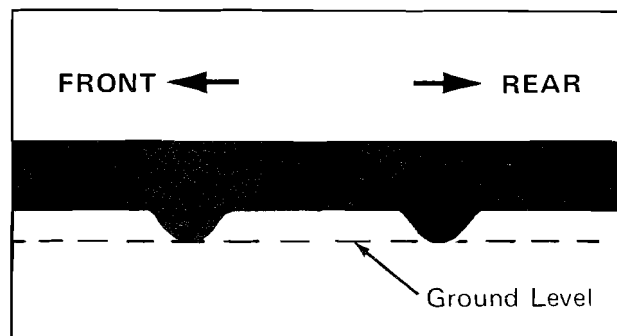
### (A) GENERAL

The track has three (3) main functions:

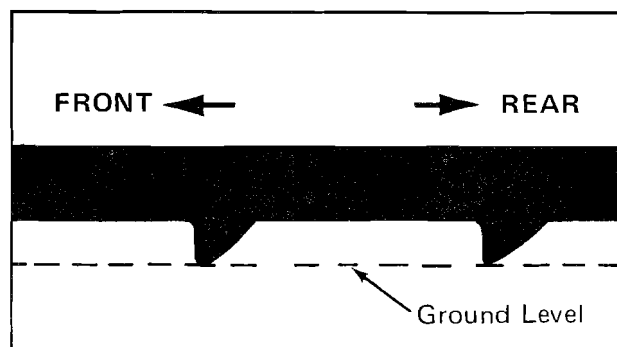
- (i) to provide a cushioning action to surface jolts or bumps.
- (ii) to provide traction enabling the vehicle to drive itself forward.
- (iii) to provide a means of greater stoppage.



GENERAL VIEW OF TRACK



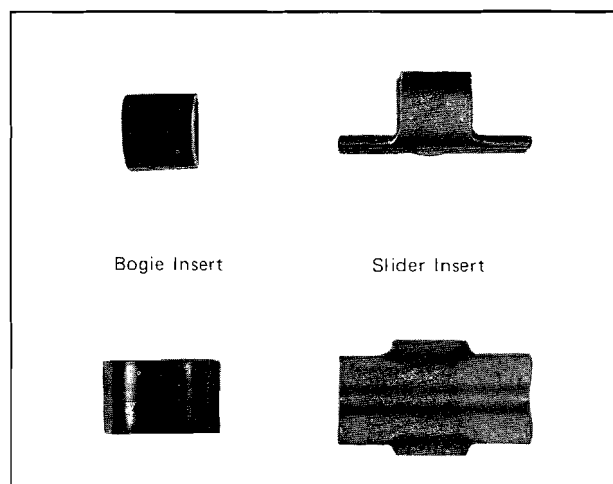
1-5-1 OLD PROFILE TRACK



1-5-2 NEW PROFILE TRACK

### (B) TRACK INSERTS

The track inserts are designed to aid the sprocket teeth to correctly sit into the track notches. Without these inserts continual abrasion would wear and cut the track, therefore always replace a missing or damaged insert(s) as soon as noticed.



1-5-3

### (C) REMOVAL OF TRACK(S)

1. Raise and block rear of vehicle off the ground.
2. Remove either the bogie wheel system (refer sub-section 1-1) or slider suspension unit (refer sub-section 1-2).
3. Remove rear hub as detailed in sub-section 1-3.
4. Remove drive axle as described in sub-section 1-4.
5. Withdraw the track(s) from beneath the vehicle.

### (D) CLEANING

1. Remove dirt and any other deposit on interior and exterior sides of track(s) with a clean cloth.

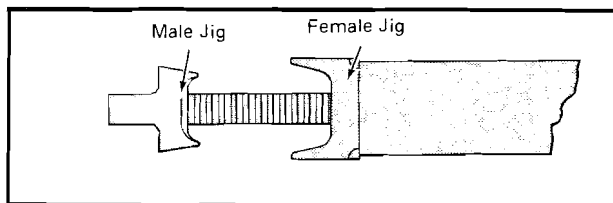
**(E) INSPECTION**

1. Visually inspect track, for large cuts and abnormal wear. Inspect track for broken rods (integral within track). If excessive damage is evident and rods are broken, replace track.
2. Inspect track for damaged or missing inserts. Replace defective insert(s).

**(F) INSTALLATION OF TRACK INSERT(S)**

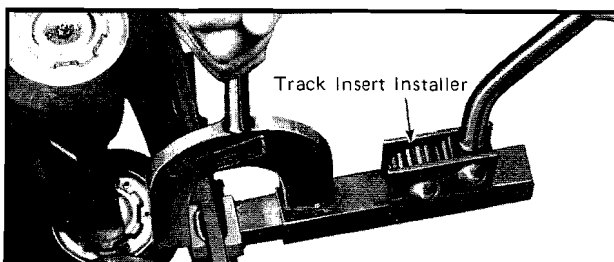
**NOTE:** Installation of insert(s) can be performed with either the track(s) installed on or removed from the vehicle.

1. Tilt vehicle or track on its side to expose the track notches and place insert into position.
2. Position the track insert installer (refer Section 5, item 3) with the male jig on top of track insert and the female jig below the insert (fig. 1-5-4).



1-5-4

3. Apply pressure on handles of track insert installer (Clip-O-Matic) to close and lock the insert onto track notch (fig. 1-5-5).



1-5-5

4. If track has been removed from vehicle, install track as detailed in Paragraph (G).

**(G) INSTALLATION OF TRACK(S)**

1. Raise and block rear of vehicle off the

ground. Position track(s) beneath the vehicle.

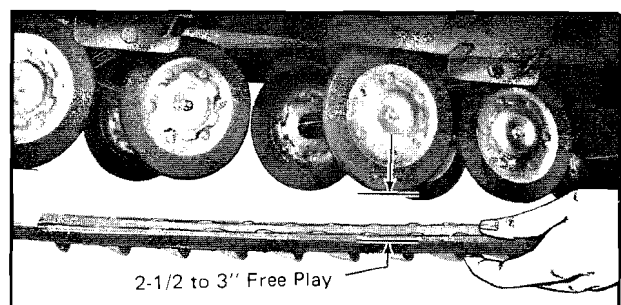
**NOTE:** When installing the new profile track, ensure the right angle of the bearing surface of the track ribs is facing the front of vehicle (fig. 1-5-2)

2. Install drive axle as described in sub-section 1-4.
3. Install rear hub as detailed in sub-section 1-3.
4. Install either the bogie wheel system (refer sub-section 1-1) or the slider suspension assembly (refer sub-section 1-2).
5. Apply track tension as detailed in Paragraph (H) for vehicles equipped with bogie wheel system or (J) for models equipped with slider suspension unit.
6. Carry out track alignment procedure as detailed in Paragraph (K).

**(H) TRACK TENSION (Bogie Wheel System)**

1. To check track tension (free play) on all 1970 and '71 vehicles equipped with a bogie wheel system use the following procedure.

- (a) With rear of vehicle blocked off the ground and the center(s) bogie wheel set(s) horizontal, apply a moderate downward hand pressure on middle position of track. Distance between bottom of wheel and inner side of track must be 2-1/2 to 3 inches on each side of track (fig. 1-5-6).



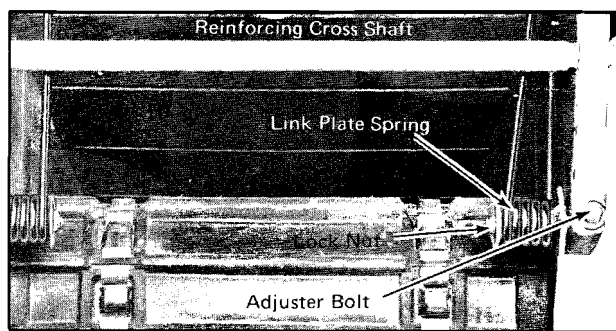
1-5-6

2. To adjust track tension (free play) on all 1970 and '71 vehicles equipped with a bogie wheel system use the following procedure.

- (a) On all 1971 models except Elan, ensure link plate springs are in the middle position of the 3-position slotted anchors.

**NOTE:** Do not attempt to correct track tension by advancing or retarding the link plate springs in their anchors.

- (b) Loosen link plate spring lock nuts located on inner side of link plate springs.
- (c) Turn adjuster bolts clockwise to tighten track(s) and counterclockwise to slacken track(s) (fig. 1-5-7).



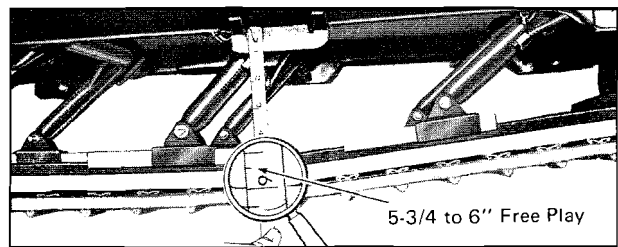
1-5-7

- (d) After track tension is adjusted equally, align the track(s) as detailed in Paragraph (K).

**(J) TRACK TENSION  
(Slider Suspension)**

1. To check track tension (free play) on vehicles equipped with slider suspension unit use the following procedure.

- (a) Raise and block rear of vehicle off the ground.
- (b) Using a rule, measure the distance from footboard to inside of track. The distance should be 5-3/4 to 6 inches on each side of track (fig. 1-5-8).



1-5-8

2. To adjust track tension (free play) on all 1970 and '71 vehicles equipped with slider suspension, use the following procedure.

- (a) On all 1971 models ensure link plate springs are in the middle position of the 3-position slotted anchors.

**NOTE:** Do not attempt to correct track tension by advancing or retarding the link plate springs in their anchors.

- (b) Loosen link plate spring lock nuts located on inner side of link plate springs.
- (c) Turn adjuster bolts clockwise to tighten track and counterclockwise to slacken track (see fig. 1-5-7).

- (d) After track tension is adjusted equally, align the track as detailed in Paragraph (K).

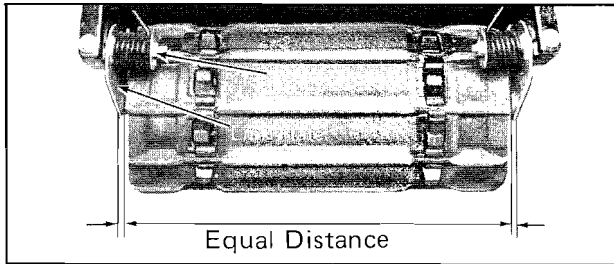
**(K) TRACK ALIGNMENT**

**CAUTION:** Track tension (free play) and alignment are inter-related. DO NOT adjust one without the other. Track tension procedure must be carried out prior to track alignment. On all 1971 vehicles, never try to align the track(s) by advancing or retarding the link plate springs in their anchors.

1. To check track alignment use the following procedure.

- (a) With rear of vehicle supported off the ground, start engine and allow the track(s) to rotate SLOWLY.

- (b) Check if track(s) is well centered and turns evenly on rear sprockets. The distance between edge of track and link plate must be equal on both sides (fig. 1-5-9).



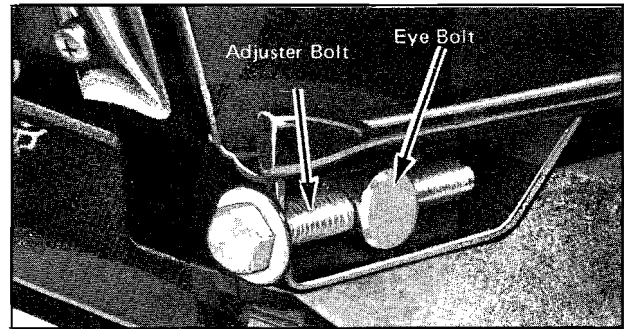
1-5-9

2. To align track(s) use the following procedure.

- (a) Loosen link plate spring lock nut

on side where the track is closest to the link plate (fig. 1-5-9).

- (b) Turn track adjuster bolt on same side clockwise until the track realigns. (fig. 1-5-10).



1-5-10

- (c) Tighten link plate spring lock nuts.

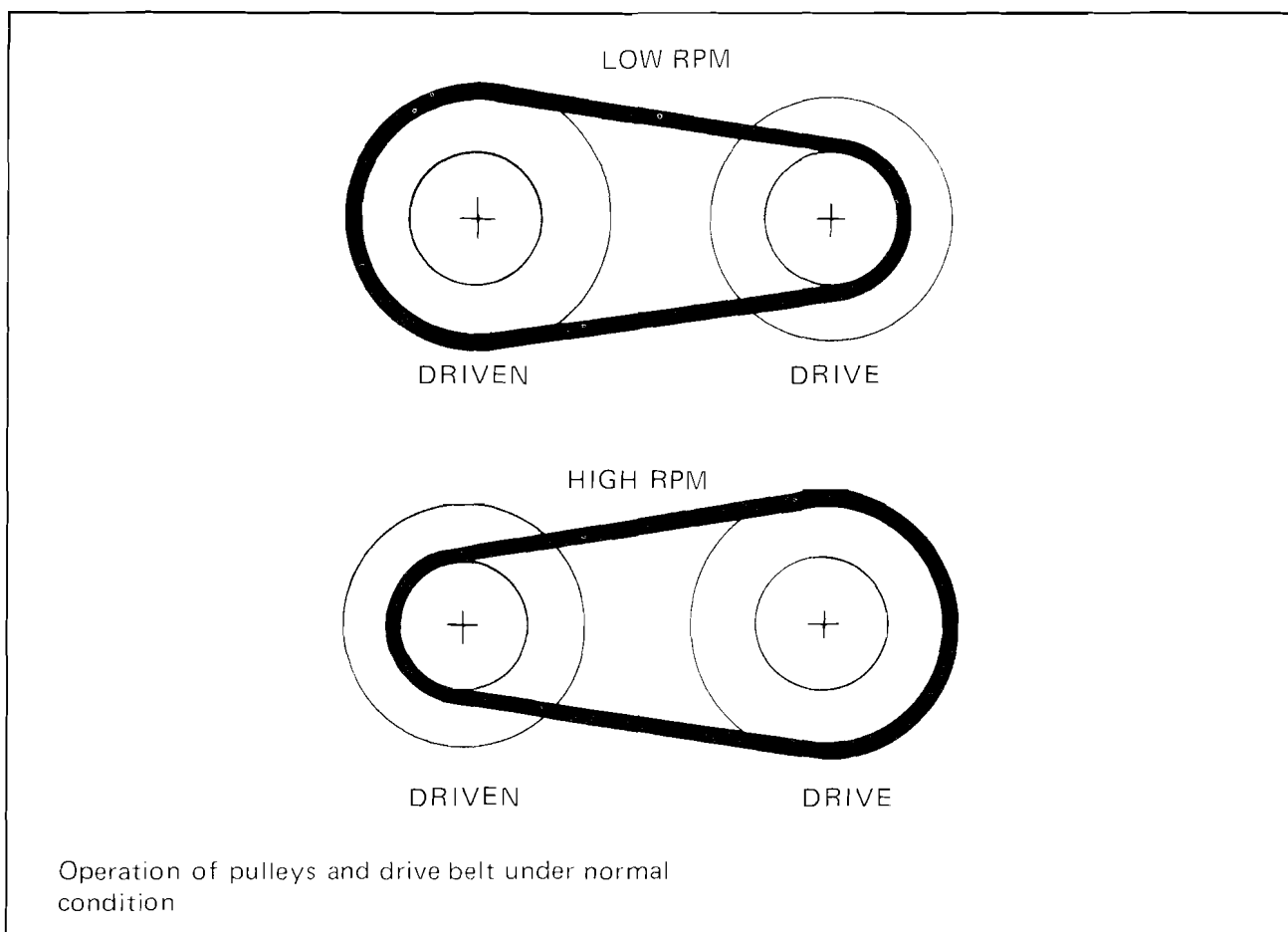
# TRANSMISSION

## TORQUE CONVERTER

### GENERAL

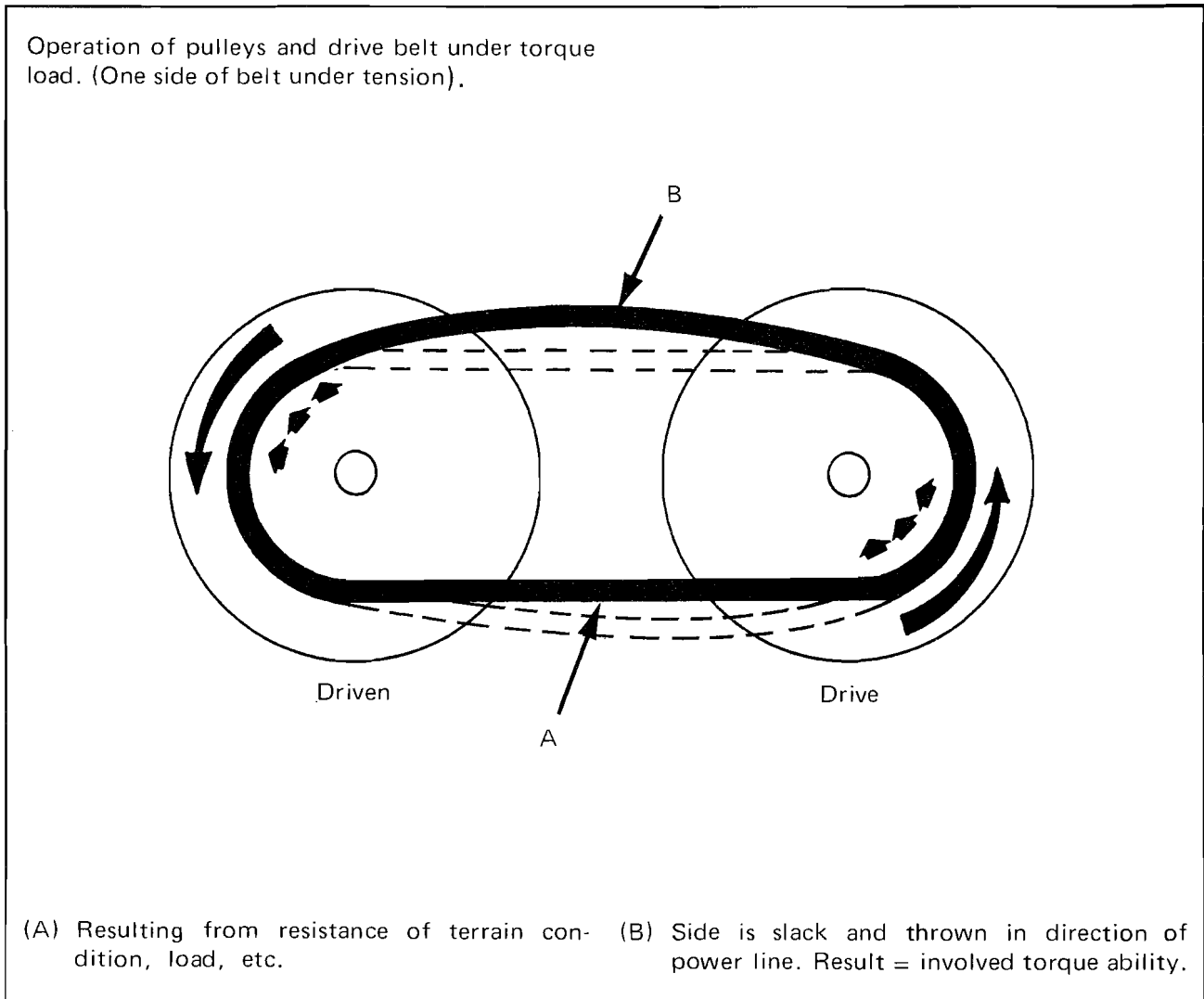
If engine power was transmitted directly to the drive axle, the Ski-Doo snowmobile would be able to move forward at a fairly reasonable speed. However, should the vehicle encounter bumps or rough terrain this method of transmitting power would be insufficient to drive the vehicle over the hazards. Therefore, to provide the additional power strength (torque), the Ski-Doo snowmobile incorporates a power transmittal assembly consisting of a drive pulley, driven pulley and drive belt. To explain the fundamentals of each component and the assembly operation, we will follow the power line which is defined as follows.

- (a) Power line – direction of the power obtained from the engine.
- (b) Power take-off – crankshaft.
- (c) Drive pulley – a pulley assembly connected to the engine crankshaft and consisting of a spring loaded pulley half, a fixed pulley half and a centrifugal governor incorporating pressure levers.



Piston movement rotates the crankshaft on which the drive pulley is affixed. The rotation (RPM) causes the pressure levers to apply pressure on the outer pulley half of drive pulley thus causing a pulling action on the drive belt (torque). An opposite reaction is caused during power cut-down or under torque load.

- (d) Drive belt – a rubber and cloth belt installed over the drive pulley and driven pulley.
- (e) Driven pulley – a pulley assembly mounted on a shaft with one of the pulley halves free and counter balanced with a loaded spring. When the drive belt pulls against the pulley halves, the sliding pulley half opens against the loaded spring and the rotating belt pressure forces the pulley shaft to rotate. An opposite reaction is caused during power cut-down or under torque load.
- (f) Driven pulley shaft – shaft on which the outer pulley half is fixed and connected to a drive chain by means of a sprocket incorporated within the chain case.
- (g) Drive chain – an encased chain linked over sprockets affixed to the driven pulley shaft and drive axle.



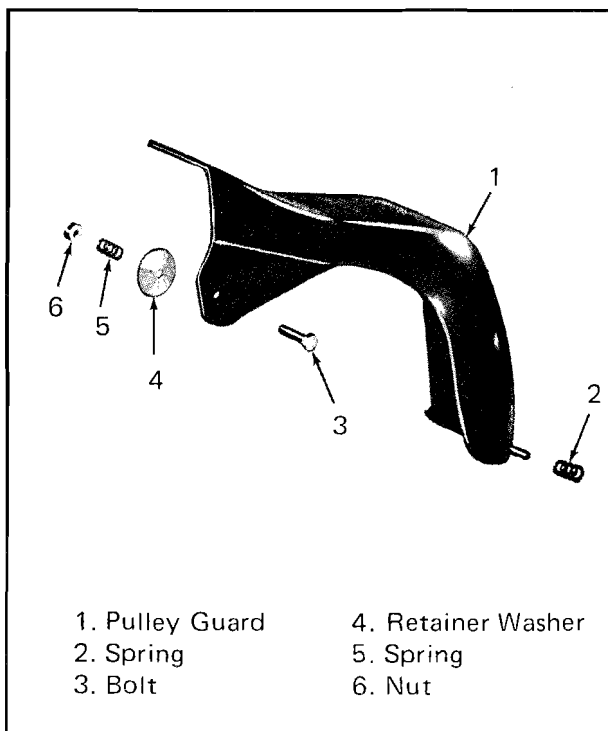


## 1-6 PULLEY GUARD

### (A) GENERAL

All Ski-Doo snowmobiles incorporate a protective pulley guard. The guard prevents the driver from inadvertently catching his foot in the drive pulley and/or drive belt during operation of the vehicle. It protects the driver from possible injury due to flying segments of a broken drive belt or other loosened components.

**WARNING:** When engine is running, it is imperative that the pulley guard is installed in position for safety reasons.

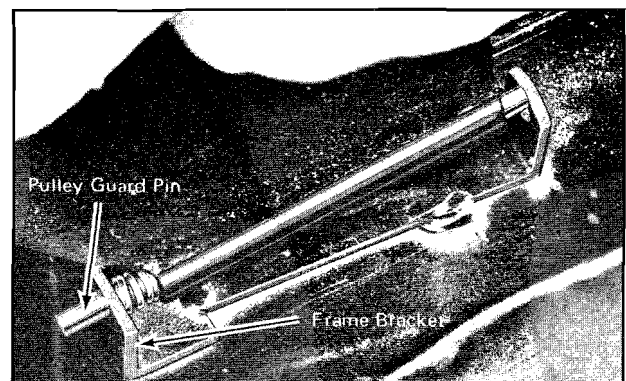


EXPLODED VIEW OF PULLEY GUARD

### (B) REMOVAL

**NOTE:** The following procedures in Paragraphs (B) to (G), are applicable to all vehicles except the Elan models. On Elan models, the pulley guard is an integral part of the console.

1. Remove or tilt the cab.
2. Disengage pulley guard pin (integral with guard) from bracket of frame (fig. 1-6-1).



3. Slide bolt out from chain case bracket or pulley guard holder and remove pulley guard.

### (C) DISASSEMBLY

1. Remove spring from pulley guard pin.
2. Remove the nut securing the upper spring, retainer washer and bolt to pulley guard.

### (D) CLEANING

1. Remove dirt and any other deposit on interior and exterior sides of guard with a clean cloth.

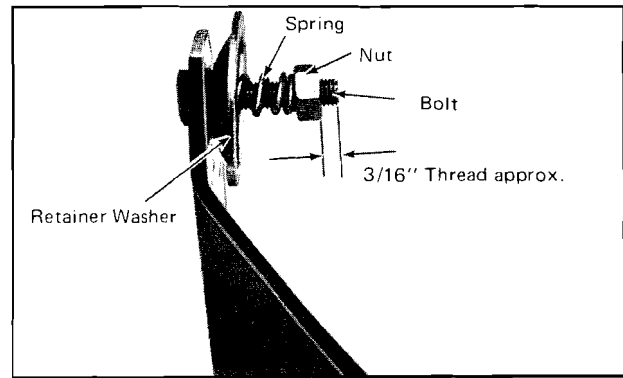
### (E) INSPECTION

1. Visually inspect guard for cracks and other damage. If damaged, do not attempt to repair. Pulley guard must be replaced.

2. Check tension of lower spring by verifying engagement of pin. When installed, free play between guard and frame bracket should not be greater than 1/16 inch. If free play is exceeded, replace spring.
3. Inspect threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.

#### (F) ASSEMBLY

1. Prior to Assembly procedure ensure all components are clean and damaged parts have been repaired or replaced.
2. Insert bolt through pulley guard.
3. Place retainer washer and spring on bolt. Secure bolt by means of nut. Tighten nut until 3/16 inch of thread is visible through nut (fig. 1-6-2).



4. Position spring on pulley guard pin.

#### (G) INSTALLATION

1. Slide pulley guard bolt into bracket of chain case or pulley guard holder.
2. Engage pulley guard pin into bracket of frame.
3. Install or close cab.

# TRANSMISSION

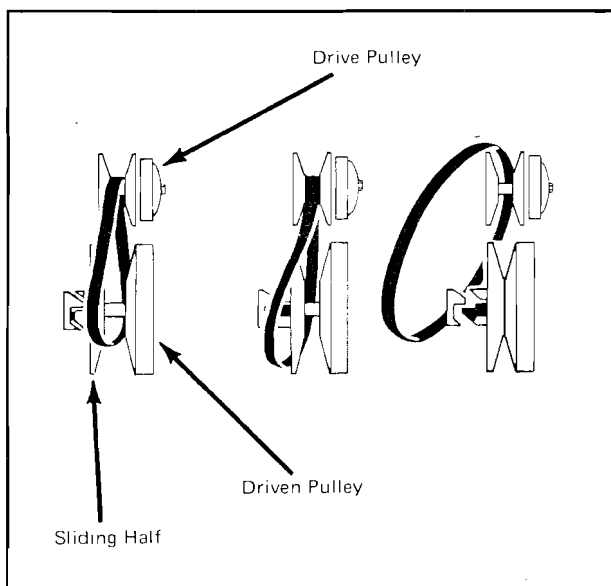
## 1-7 DRIVE BELT

### (A) GENERAL

The function of the drive belt is to transmit power from drive pulley to driven pulley. Always inspect the drive belt whenever the vehicle is undergoing maintenance and repair procedures or when performance of vehicle is unsatisfactory.

### (B) REMOVAL (All Models except Alpine/Invader and Valmont)

1. Tilt or remove the cab.
2. Remove pulley guard as detailed in subsection 1-6.
3. Open the driven pulley by twisting and pushing the sliding half and hold in open position (fig. 1-7-1).



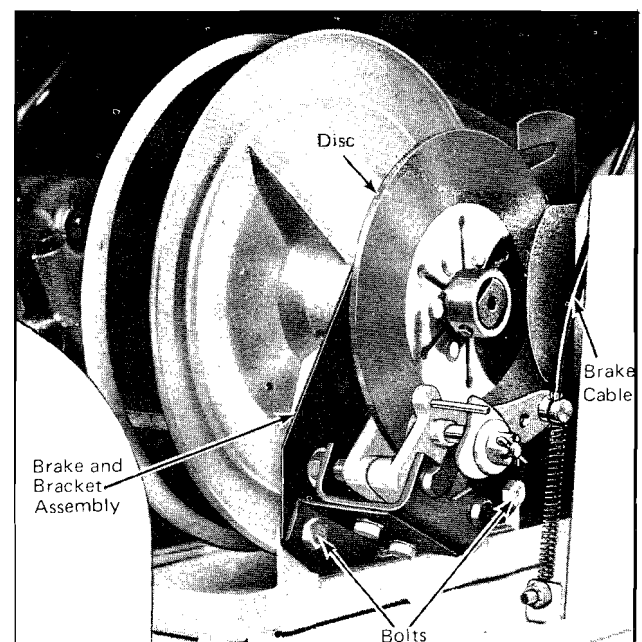
1-7-1

4. Slip the drive belt from the driven pulley and remove belt by passing it over the drive pulley.

### (C) REMOVAL (All Alpine/Invader and Valmont Models)

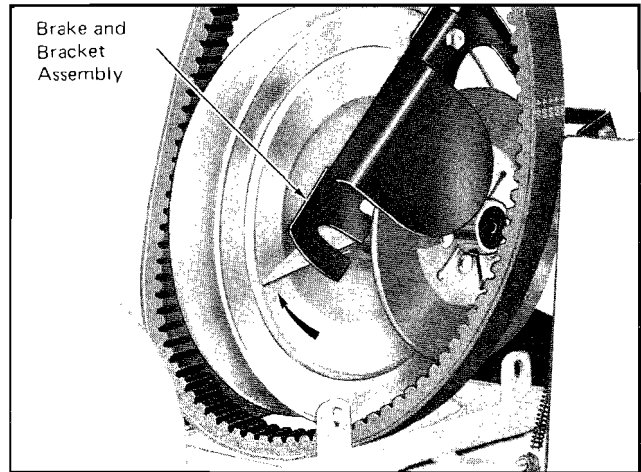
**NOTE:** Ensure transmission lever is in neutral position.

1. Remove cab.
2. Remove pulley guard as detailed in subsection 1-6.
3. Disconnect brake cable at cable ferrule on disc brake outer half.
4. Remove two (2) nuts and bolts securing the lower brake bracket to frame and pivot brake and bracket assembly 1/2 turn (fig. 1-7-2).



1-7-2

5. Open driven pulley by twisting and pushing sliding half and hold in open position.
6. Pull bottom of belt towards driven pulley and slip belt over top edge of fixed half.
7. Slip belt out from drive pulley (centrifugal governor).
8. Remove belt completely from vehicle by passing it under driven pulley and disc brake assembly (fig. 1-7-3).



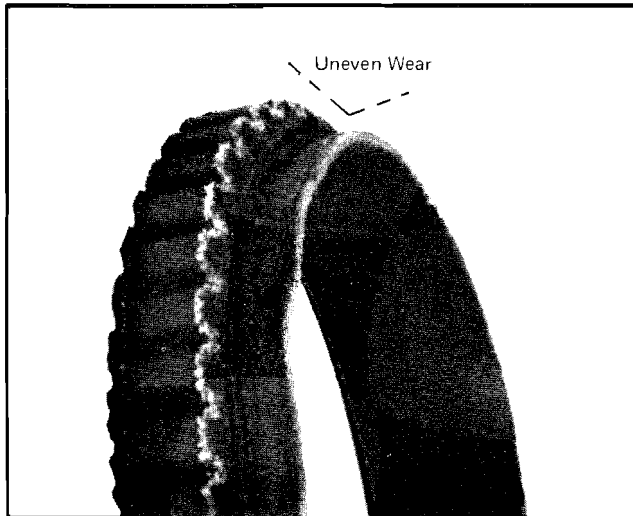
1-7-3

**(D) DRIVE BELT TROUBLE SHOOTING CHART**

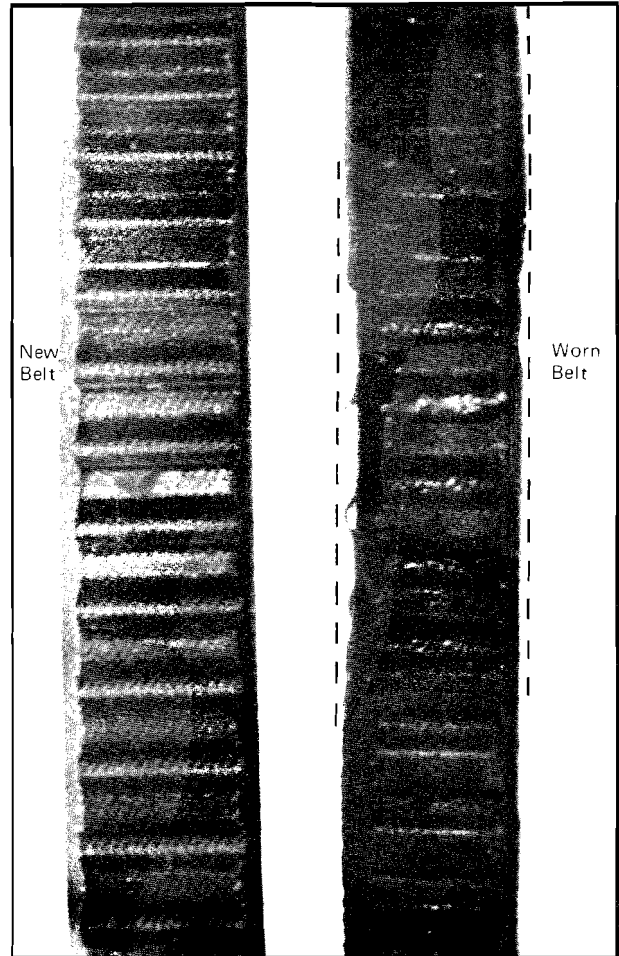
To determine malfunctions of the transmission system due to improper installation and/or wear of drive belt, a trouble shooting chart has been drawn up to assist in detecting such troubles. Research has proven that excessive wear and breakage of the drive belt can be eliminated by correct periodic inspection and maintenance. A drive belt of less than 7/8 inch width must be replaced.

| SYMPTOM   | CAUSE   | REMEDY   |
|---|---|--|
| 1. Uneven belt wear on one side only<br>See Fig. 1-7-4                | (a) Loose engine mount<br><br>(b) Pulley misalignment   | (a) Tighten engine mount nuts equally (400-420 inch-pounds)<br><br>(b) Align pulleys   |
| 2. Belt glazed excessively or has baked appearance.<br>See Fig. 1-7-5 | Excessive slippage caused by<br><br>(a) Insufficient pressure on belt sides<br><br>(b) Rusted drive or driven pulley shafts<br><br>(c) Oil on pulley surfaces<br><br>(d) Incorrect centrifugal governor installed | (a) Check drive pulley for worn or missing pressure lever<br><br>(b) Clean shaft with steel wool and lubricate with Ski-Doo Clutch Lube<br><br>(c) Clean pulley surfaces with fine emery cloth and clean cloth<br><br>(d) Install correct governor |

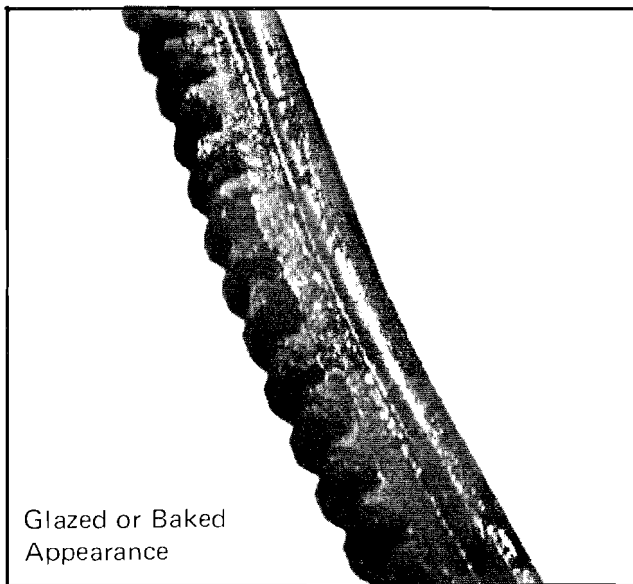
| SYMPTOM  | CAUSE   | REMEDY  |
|--|---|---|
| <p>3. Belt worn excessively in top width.<br/>See Fig. 1-7-6</p> | <p>(a) Excessive slippage due to irregular outward actuation movement of drive pulley</p> <p>(b) Rough or scratched pulley surfaces</p> <p>(c) Improper belt angle</p>                    | <p>(a) Carry out inspection as detailed in sub-section 1-8</p> <p>(b) Repair or replace pulley</p> <p>(c) Using unspecified type of belt. Replace belt with correct Bombardier belt</p> |
| <p>4. Belt worn narrow in one section.<br/>See Fig. 1-7-7</p>    | <p>Excessive slippage in drive pulley caused by:</p> <p>(a) Frozen or too tight track</p> <p>(b) Drive pulley (clutch) not functioning properly</p> <p>(c) Engine idle speed too high</p> | <p>(a) Liberate track from ice or check track tension and alignment</p> <p>(b) Repair or replace drive pulley</p> <p>(c) Reduce engine RPM</p>  |
| <p>5. Belt too tight during engine idle.</p>                     | <p>(a) Idle speed too high</p> <p>(b) Incorrect belt length</p> <p>(c) Incorrect pulley distance</p>  | <p>(a) Reduce engine RPM</p> <p>(b) Using unspecified type of belt. Replace belt with correct Bombardier belt</p> <p>(c) Readjust to specifications, refer to sub-section 1-9</p>       |
| <p>6. Belt sides worn concave.<br/>See Fig. 1-7-8</p>            | <p>(a) Excessive ride out on drive pulley</p>   | <p>(a) Check for proper distance between pulleys, refer to sub-section 1-9</p> <p>(b) Using unspecified type of belt. Replace belt with correct Bombardier belt</p>                     |



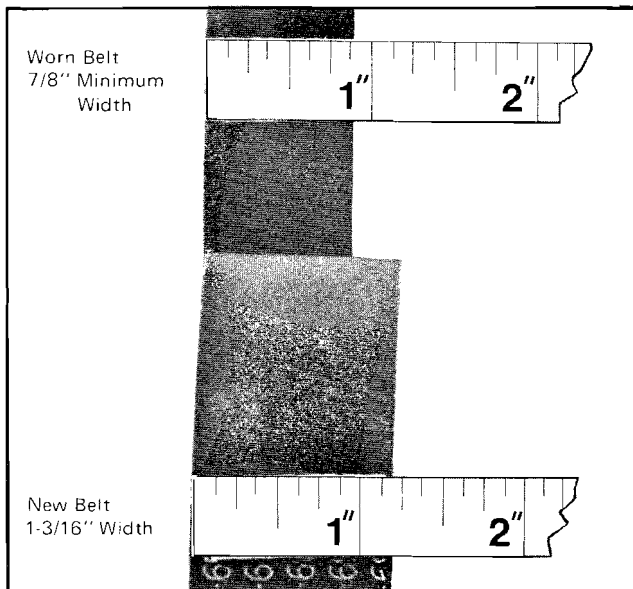
1-7-4



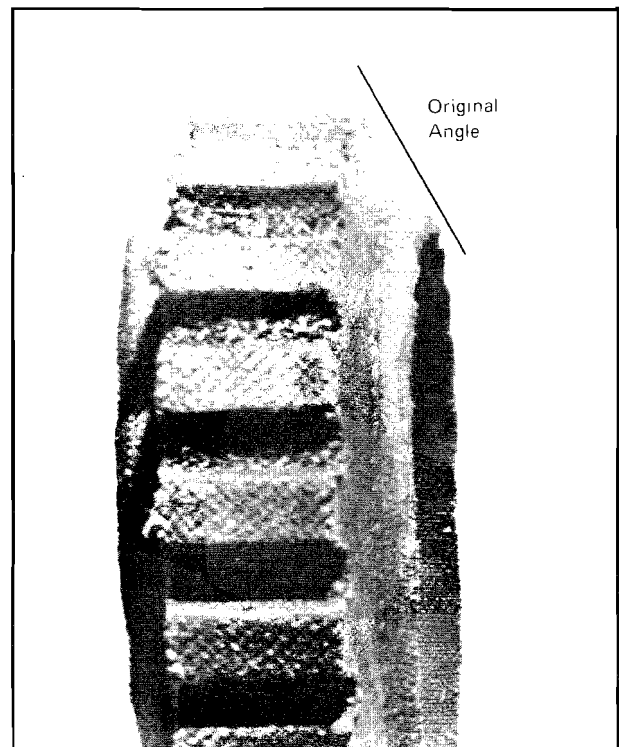
1-7-7



1-7-5

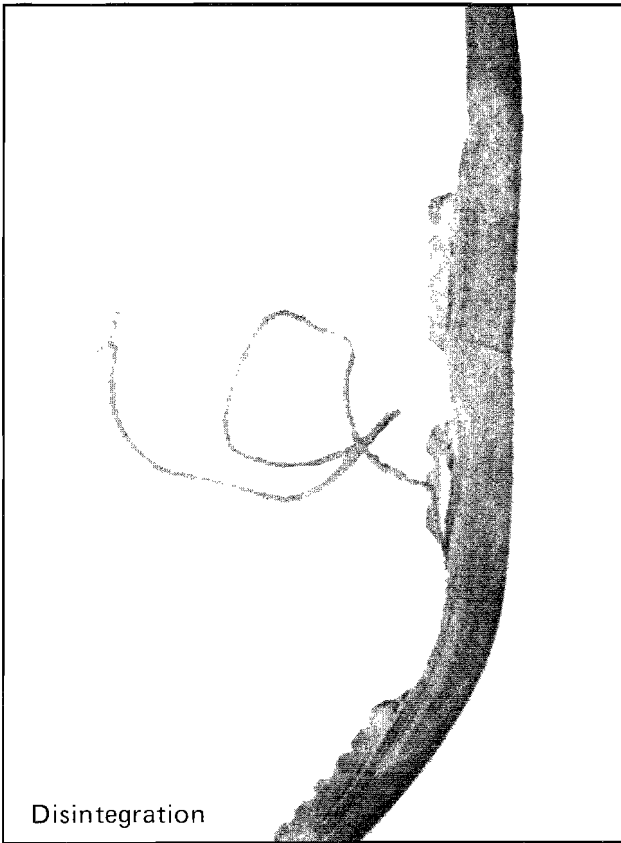


1-7-6

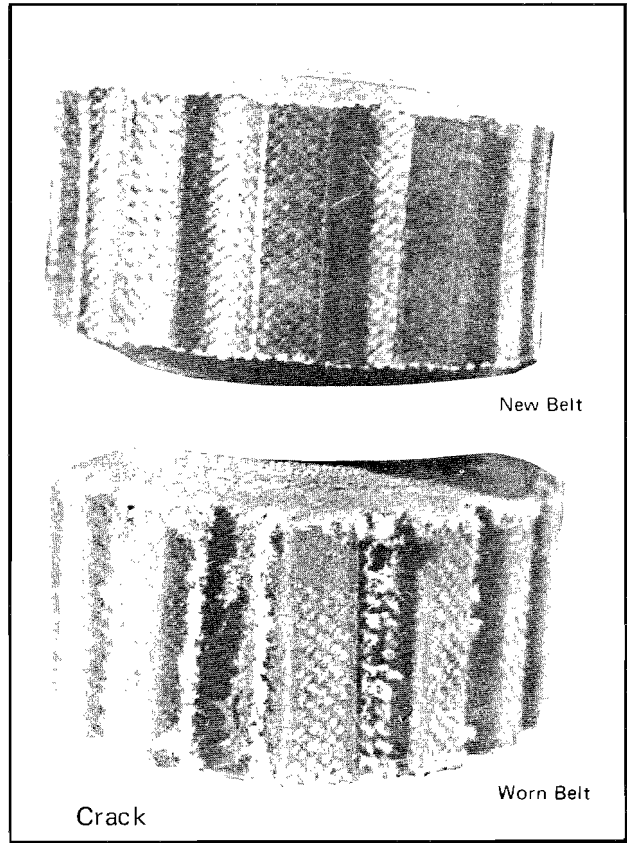


1-7-8

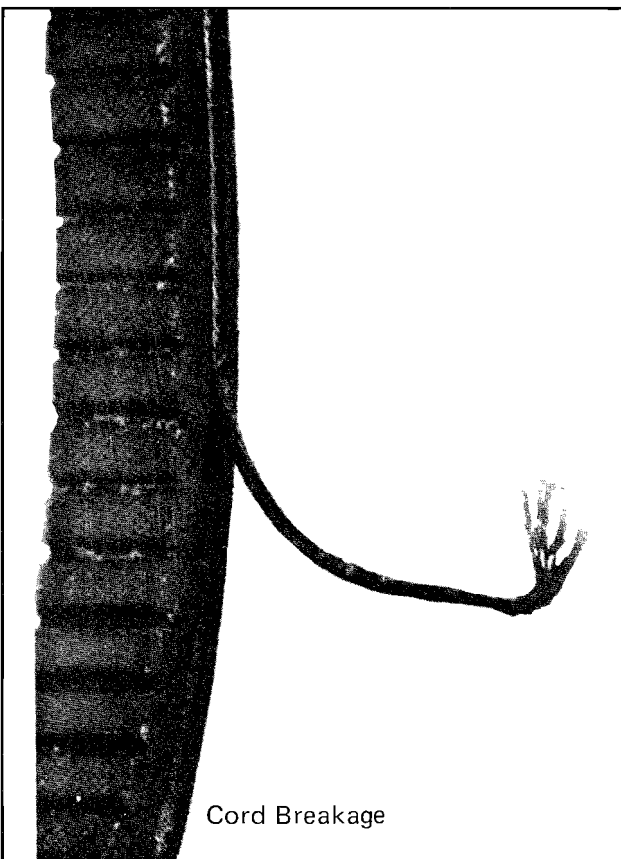
| SYMPTOM   | CAUSE   | REMEDY   |
|---|---|--|
| <p>7. Belt disintegration.<br/>See Fig. 1-7-9</p>                                   | <p>(a) Excessive belt speed</p> <p>(b) Oil on pulley surfaces</p> <p>(c) Incorrect gear ratio</p>   | <p>(a) Using unspecified type of belt. Replace belt with correct Bombardier belt</p> <p>(b) Clean pulleys surfaces with fine emery cloth and clean cloth</p> <p>(c) Install specified sprocket (Correct gear ratio)</p>                                |
| <p>8. Belt "Flip-Over" at high speed.</p>   | <p>(a) Pulley misalignment</p> <p>(b) Belt excessive speed</p> <p>(c) Excessive ride out on drive pulley</p> <p>(d) Incorrect sprocket ratio</p>  | <p>(a) Align pulleys</p> <p>(b) Using unspecified type of belt. Replace belt with correct Bombardier belt</p> <p>(c) Check for proper distance between pulleys, refer to subsection 1-9</p> <p>(d) Install specified sprocket (Correct gear ratio)</p> |
| <p>9. Belt edge cord breakage. See Fig. 1-7-10</p>                                  | <p>(a) Pulley misalignment</p>  | <p>(a) Align pulleys</p>   |
| <p>10. Flex cracks between cogs.<br/>See Fig. 1-7-11</p>                            | <p>(a) Considerable use, belt wearing out</p>   | <p>(a) Replace belt</p>  |
| <p>11. Sheared cogs, compression section fractured or torn.<br/>See Fig. 1-7-12</p> | <p>(a) Improper belt installation</p> <p>(b) Belt rubbing stationary object on pulleys</p> <p>(c) Violent engagement of drive pulley (clutch)</p> | <p>(a) Refer Paragraph (E) or (F)</p> <p>(b) Check drive components</p> <p>(c) Grease, replace spring or drive pulley</p>  |



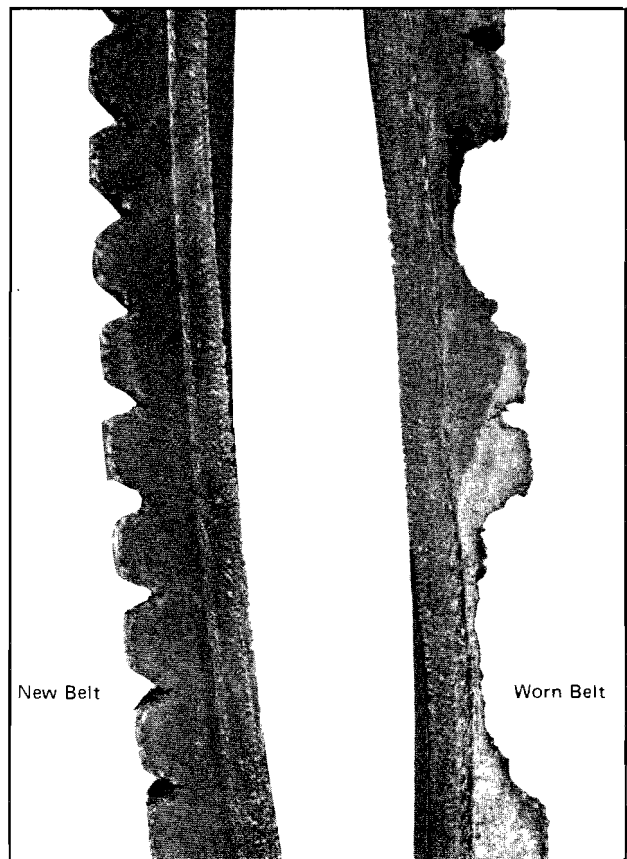
1-7-9



1-7-11



1-7-10



1-7-12



**(E) INSTALLATION**  
**(All Models except**  
**Alpine/Invader and Valmont)**

1. Prior to Installation procedure, ensure drive belt has been cleaned with a clean cloth and belt is in good condition.
2. Slip belt over drive pulley and pass it over driven pulley from the outer cam side of driven pulley.
3. Open the driven pulley by twisting and pushing the sliding half until belt is in position.
4. Install pulley guard as detailed in sub-section 1-6. Install or close cab.

**(F) INSTALLATION**  
**(All Alpine/Invader**  
**and Valmont Models)**

1. Prior to Installation procedure, ensure

drive belt has been cleaned with a clean cloth and belt is in good condition.

2. With brake and bracket assembly rotated 1/2 turn, slip drive belt beneath driven pulley.
3. Slip belt over drive pulley.
4. Open driven pulley by twisting and pushing sliding half and hold in open position. Slip drive belt over fixed half.
5. Pivot brake and bracket assembly into position and install bolts to secure lower brake bracket to frame.
6. Insert brake cable into cable ferrule. Check brake cable adjustment as detailed in sub-section 1-10.
7. Install pulley guard as detailed in sub-section 1-6 and install cab.

# TRANSMISSION

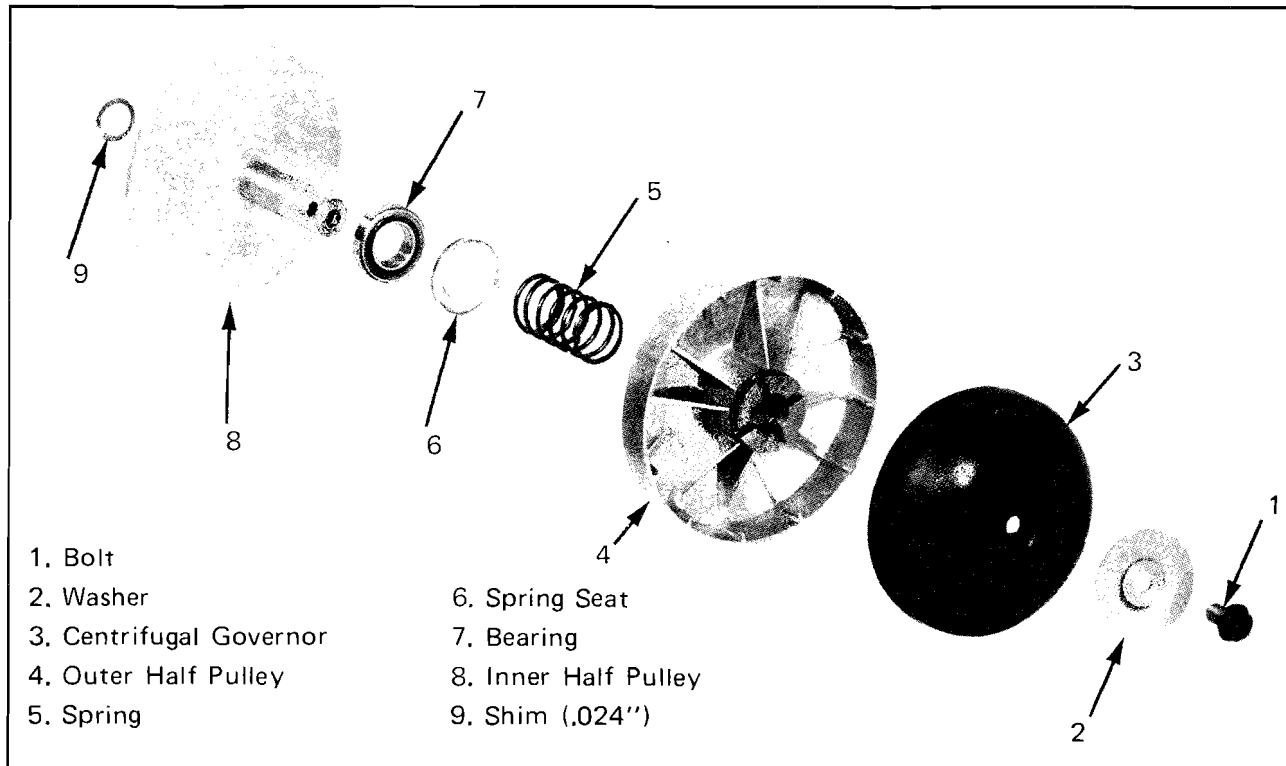
## 1-8 DRIVE PULLEY

### (A) GENERAL

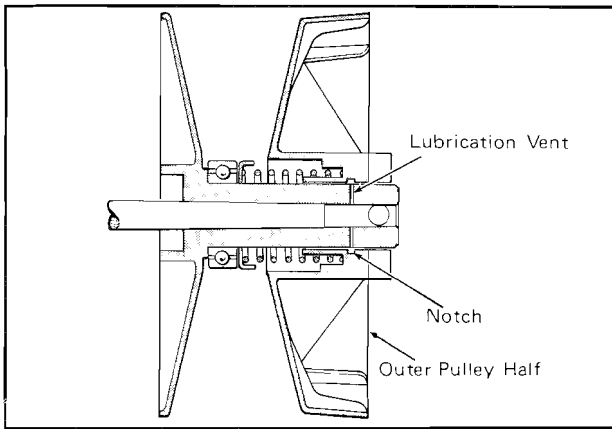
The Drive Pulley is a variable pitch pulley which transmits power from the engine to the driven pulley by means of a drive belt. The important changes in design and fabrication of the 1971 drive pulley are:

- Both the inner and outer pulley halves of the drive pulley are made of aluminum. This metal is light weight, corrosion resistant and repels engine and belt heat during operation of the vehicle. The shaft of the '71 pulley and the complete '70 pulley are made of steel.
- A hollowed inner half pulley shaft contains a reserve of Ski-Doo Clutch Lube. During pulley operation this grease is forced through the lubrication vent in the shaft and becomes trapped within the lubrication notch of the outer half pulley. From there, outer half pulley activation distributes the grease along the pulley shaft and the pulley is lubricated. (See line drawing on page 1-08-02). On the 1970 pulley, lubrication is accomplished by manually distributing grease along shaft length.
- 1971 Pressure levers contained within the centrifugal governor are mounted on a lever holder. 1970 pressure levers are riveted directly to centrifugal governor brackets.

1-8



EXPLODED VIEW OF DRIVE PULLEY (1971 MODELS)



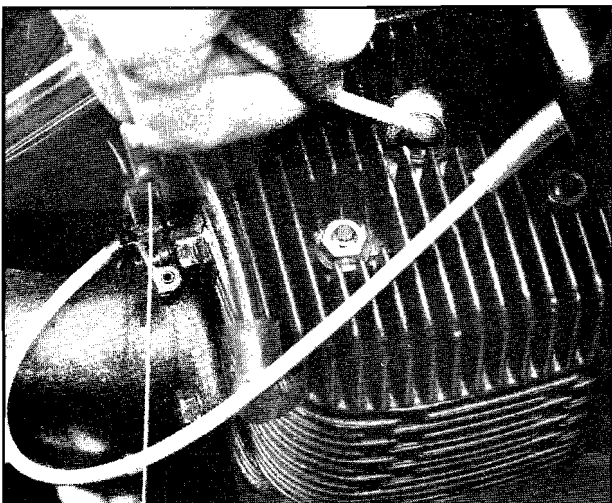
LINE DRAWING OF GREASE APERTURE

**(B) REMOVAL**  
**(All Models**  
**with One Cylinder Engine)**

1. Remove or tilt cab.
2. Remove pulley guard, refer to sub-section 1-6.
3. Remove drive belt, refer to sub-section 1-7.
4. Remove spark plug and position the piston 3/4" to 1-1/4 inches. **BEFORE TOP DEAD CENTER.**

**NOTE:** Make sure that the piston closes the exhaust port.

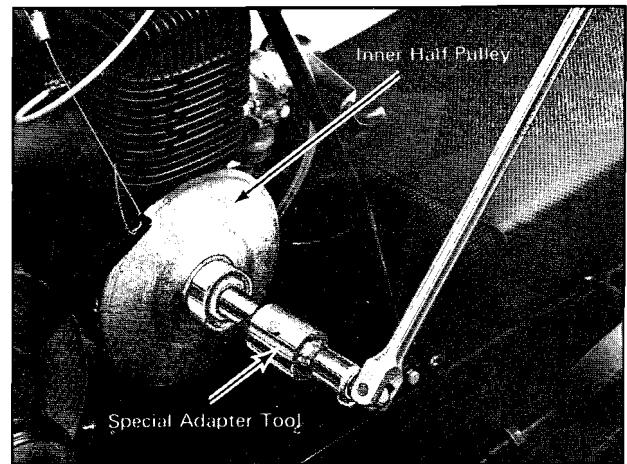
5. Lock crankshaft in position by inserting starter rope into spark plug hole (fig. 1-8-1). For final lock, pull rewind starter rope slightly.



1-8-1

6. Remove centrifugal governor bolt, washer, centrifugal governor, outer half pulley spring and spring seat from shaft of inner half pulley.
7. Using special adapter tool, remove inner half pulley (fig. 1-8-2).

**NOTE:** Do not remove bearing from inner half pulley unless bearing and/or inner half pulley is damaged, and replacement is necessary. Refer to Paragraph (D) for bearing replacement.



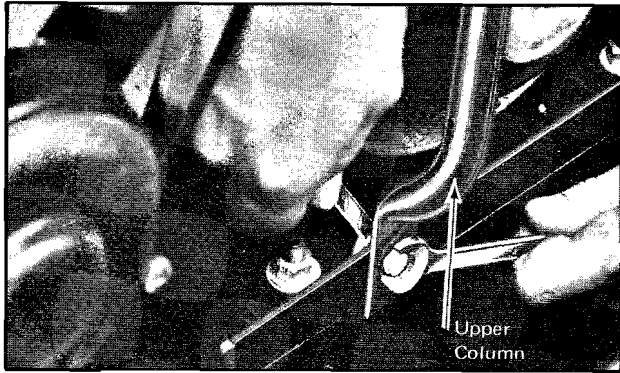
1-8-2

8. Remove starter rope from spark plug hole.

**(C) REMOVAL**  
**(All Models**  
**with Two Cylinder Engine)**

1. Remove or tilt cab.
2. Remove pulley guard as detailed in sub-section 1-6.
3. Remove drive belt, refer to sub-section 1-7.

**NOTE:** On 1970 and '71 T'NT 640, T'NT 775 and Nordic 640E models remove bolts attaching upper column bracket to frame to enable removal of drive pulley (fig. 1-8-3).

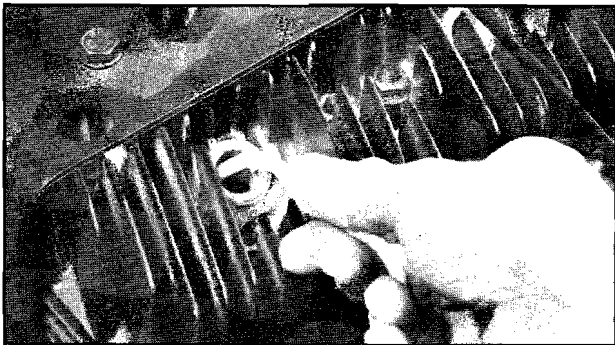


1-8-3

4. Remove spark plugs and position the Power Take Off side piston 3/4" to 1-1/4 inches. BEFORE TOP DEAD CENTER.

**NOTE:** Make sure that the P.T.O. side piston completely closes the exhaust port.

5. Lock crankshaft in position by inserting starter rope into P.T.O. side spark plug hole (fig. 1-8-4). For final lock, pull re-wind starter rope slightly.



1-8-4

6. Remove centrifugal governor bolt, washer, centrifugal governor, outer half pulley, spring and spring seat from inner half pulley.

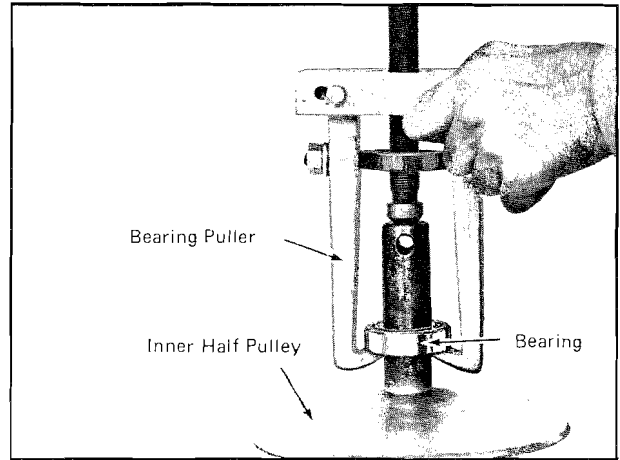
7. Using a special adapter tool, remove inner half pulley from crankshaft.

**NOTE:** Do not remove bearing from inner half pulley unless bearing and/or inner half pulley is damaged, and replacement is necessary. Refer to Paragraph (D) for bearing replacement.

8. Remove starter rope from spark plug hole.

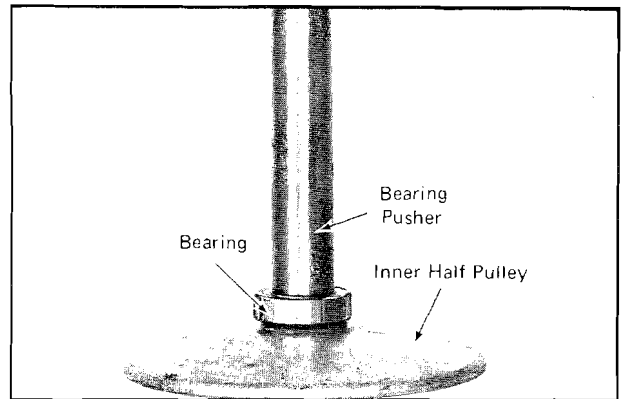
**(D) Inner Half Pulley Bearing Replacement**

1. Using an appropriate bearing puller, remove bearing from pulley by pulling it by inner race (fig. 1-8-5). Replace either bearing or inner half pulley.



1-8-5

2. Position bearing on shaft of inner half pulley. Using a bearing pusher, press bearing down by the inner race until bearing is properly seated (fig. 1-8-6).



1-8-6

**(E) CLEANING**

1. To remove grease and dirt, place all components (except bearings) in a container of cleaning solvent. Dry using compressed air or a dry cloth.

2. Remove stationary objects (rust and/or rubber accumulation — belt wear) from inner half pulley shaft with fine steel wool. Wipe shaft with a clean cloth.

3. Remove stationary objects (rust and/or rubber accumulation) from inner and outer half pulleys with fine emery cloth. Wipe pulley halves with a clean cloth.
4. Remove any other deposits on all other components using a firm bristle brush.
5. If paint has been removed from centrifugal governor, apply a new coat using appropriate Ski-Doo Paint.

### (F) INSPECTION

1. Visually inspect inner and outer pulley halves for scratches, grooves and/or rough surfaces. Remove defects using fine emery cloth. Wipe pulley halves with a clean cloth.
2. Check centrifugal governor for worn or missing pressure lever(s). Replace centrifugal governor if necessary.
3. Check for broken or distorted spring. Replace defective spring.
4. Visually inspect all other components for wear, cracks, distortion and other possible damage. Replace as necessary.
5. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
6. Inspect general condition of bearing (installed or removed from pulley shaft) e.g. pitted or missing ball bearings, freedom of movement and radial free play. Replace defective bearing, refer to Paragraph (D), Bearing Replacement.

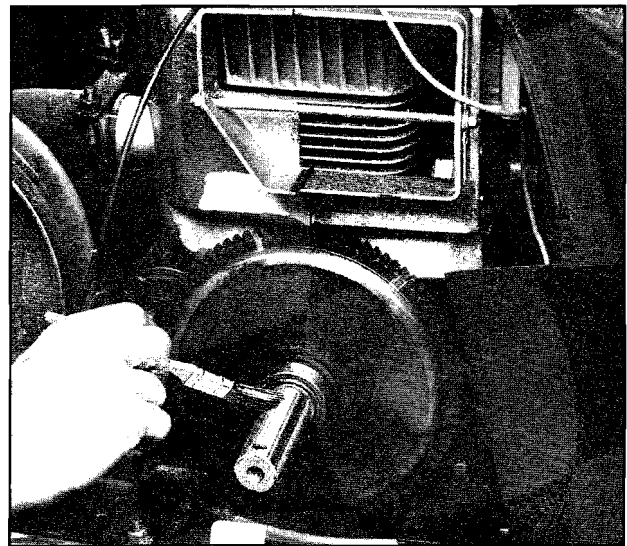
### (G) INSTALLATION

1. Position the piston (on double cylinder P.T.O. side piston)  $3/4$  to  $1-1/4$  inches AFTER TOP DEAD CENTER.

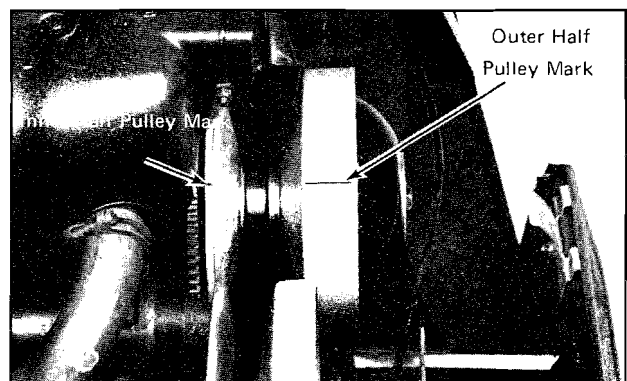
**NOTE:** Make sure that the piston is closing the exhaust port.

2. Insert a length of starter rope into spark plug hole (P.T.O. side for double cylinder) to lock crankshaft in position.
3. Lubricate crankshaft thread with Ski-Doo Clutch Lube and install inner half pulley.
4. On all 1970 models, apply a thin coat of Ski-Doo Clutch Lube on inner half pulley shaft (fig. 1-8-7). Position spring seat, spring and outer half pulley on shaft.

**NOTE:** On all 1971 models, make sure that the inner half pulley mark and the outer half pulley mark are aligned (fig. 1-8-8).

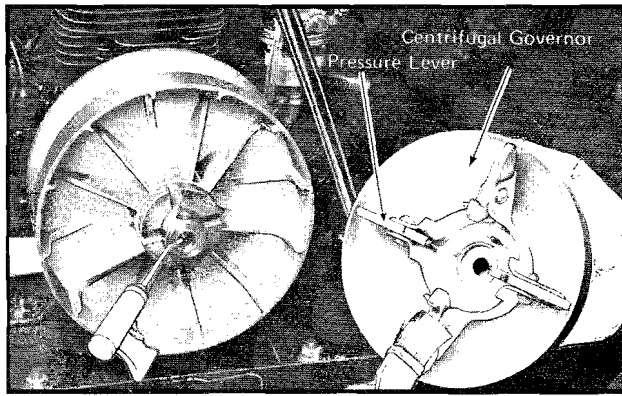


1-8-7

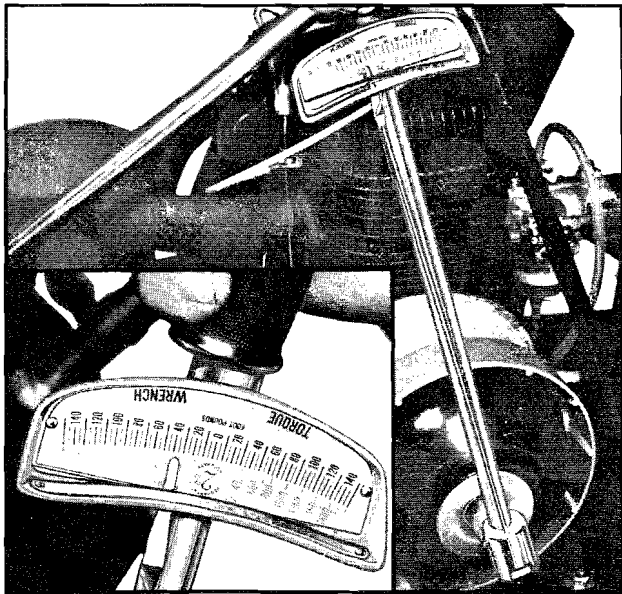


1-8-8

5. On all 1971 models, pack Ski-Doo Clutch Lube into bolt hole of inner half pulley shaft (fig. 1-8-9).
6. Apply a light coat of Ski-Doo Clutch Lube to the four (4) pressure levers of the centrifugal governor (See fig. 1-8-9).



1-8-9



1-8-10

7. Lubricate threads of governor attaching bolt with Ski-Doo Clutch Lube. Install centrifugal governor, washer and bolt.
8. Torque governor bolt to 400 to 475 inch-pounds (fig. 1-8-10).
9. Wipe off excess lubricant from drive pulley.

**CAUTION:** Excess of lubricant on pulley shaft or misalignment of mark on pulley halves can allow the lubricant to penetrate drive belt causing belt slippage and/or deterioration.

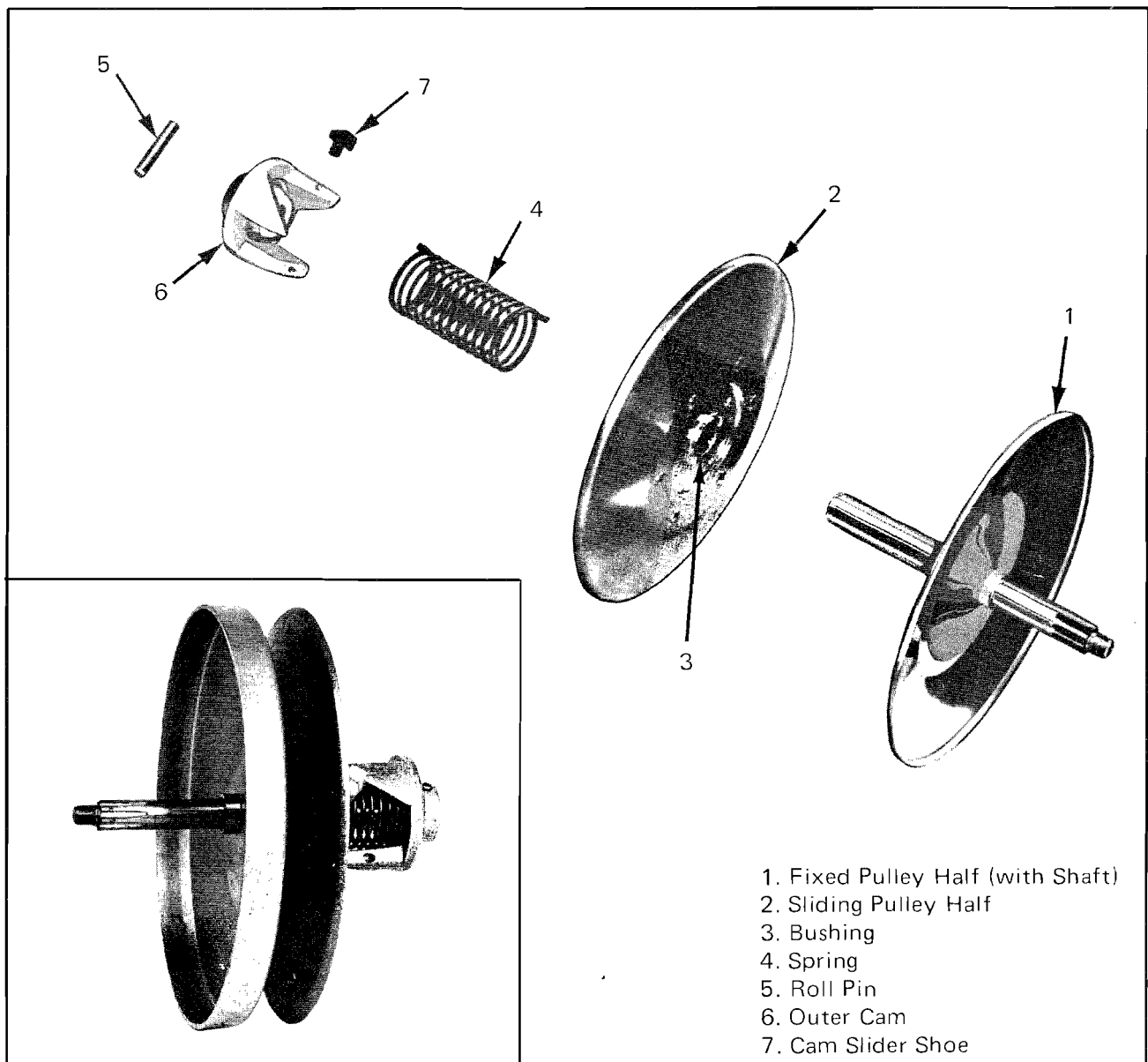
10. Unlock crankshaft by pulling out starter rope from spark plug hole.
11. Install spark plug(s).
12. Check pulley alignment, refer to sub-section 1-9.
13. Install drive belt (refer sub-section 1-7) and pulley guard (refer sub-section 1-6).
14. Install or close cab.

# TRANSMISSION

## 1-9 DRIVEN PULLEY

### (A) GENERAL

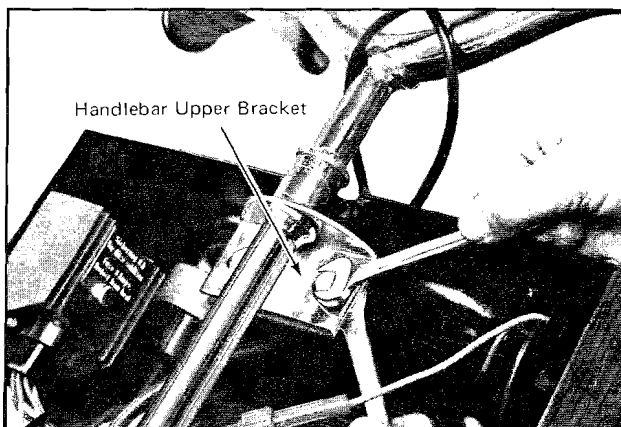
The driven pulley is a variable pitch pulley which transmits power from the drive pulley to the drive axle sprocket by means of the drive chain mounted on two sprockets. Belt engagement transmitting power to driven pulley cause the chain entrainment. Spring pressure on the sliding pulley half maintains face contact with belt under all operating conditions.



EXPLODED VIEW OF DRIVEN PULLEY

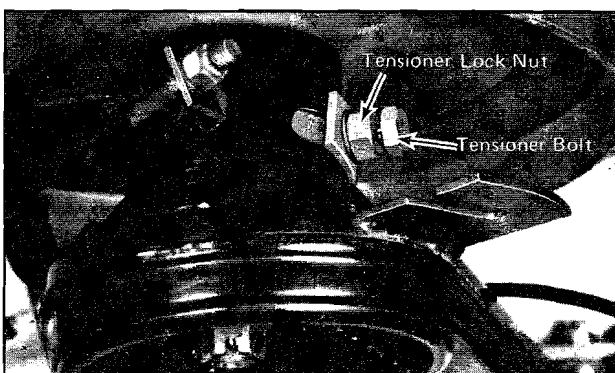
**(B) REMOVAL**  
**(All Models except**  
**Alpine/Invader and Valmont)**

1. Tilt or remove the cab.
2. Remove pulley guard, refer to sub-section 1-6.
3. Remove drive belt, refer to sub-section 1-7.
4. Remove muffler from engine.
5. On vehicles equipped with 15 inch track, remove bolts and nuts securing steering column upper bracket (fig. 1-9-1).

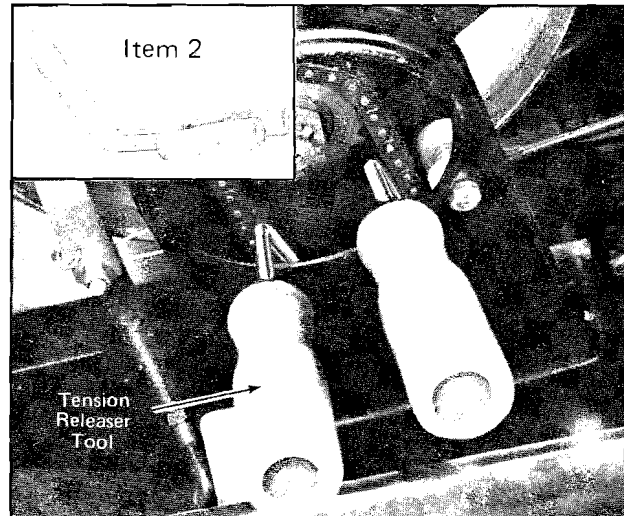


1-9-1

6. Pry out inspection cover from chain case.
7. On 1970 models, slacken drive chain tension by partially unscrewing tensioner lock nut. Using a soft faced hammer, gently knock tensioner bolt counter-clockwise (fig. 1-9-2). On 1971 models, release chain tension by inserting a chain tension releaser tool (item 2), (fig. 1-9-3).

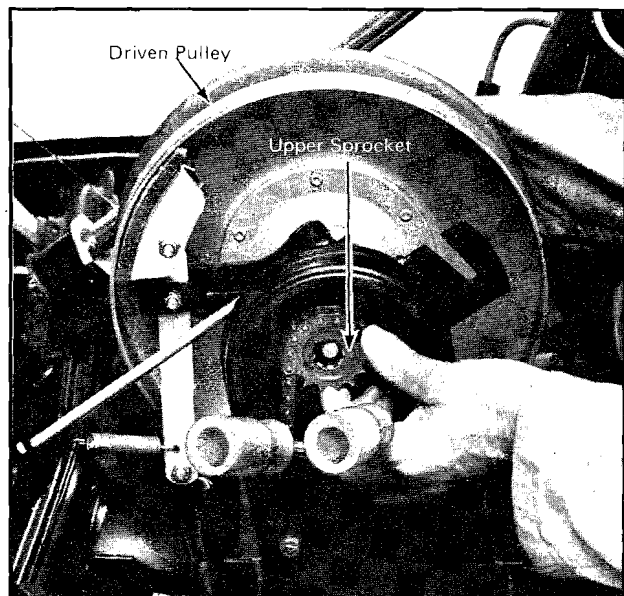


1-9-2



1-9-3

8. Remove cotter pin, castellated nut and spring washer from driven pulley shaft within chain case.
9. Hold upper sprocket with chain in position and pull out driven pulley towards engine side (fig. 1-9-4).

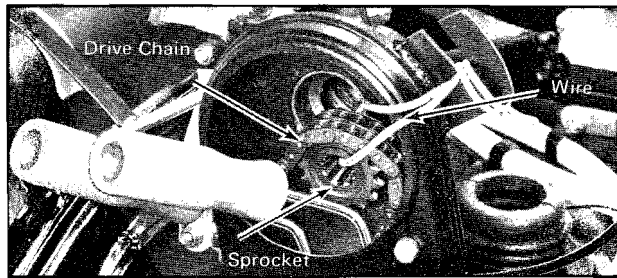


1-9-4

**CAUTION:** Exercise care while removing driven pulley to ensure that bearing cone does not fall into chain case.

10. Remove bearing cone from bearing cup and attach sprocket and drive chain with a wire to prevent them from falling into chain case (fig. 1-9-5).

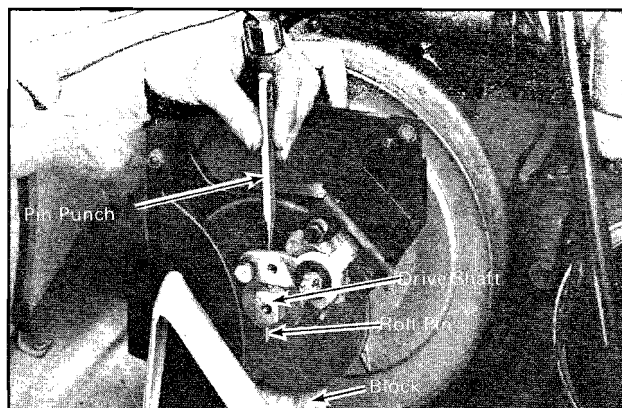




1-9-5

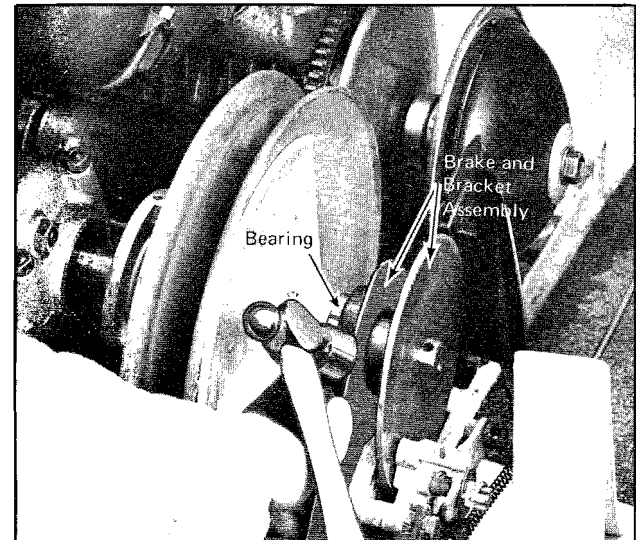
**(C) REMOVAL  
(All Alpine/Invader  
and Valmont Models)**

1. Remove cab.
2. Remove pulley guard, refer to sub-section 1-6.
3. Remove drive belt, refer to sub-section 1-7.
4. With brake and bracket assembly rotated 1/2 turn, support assembly by positioning a locally manufactured block (5-3/8 x 3 x 1 inches) under drive shaft.
5. Remove pulley guard holder.
6. Using a hammer and a pin punch, remove roll pin locking disc in position (fig. 1-9-6).
7. With a hammer, tap on inner side of brake and bracket assembly to disengage it from the bearing (fig. 1-9-7).
8. On all 1970 models, remove washer, spring washer, disc and spacer.



1-9-6

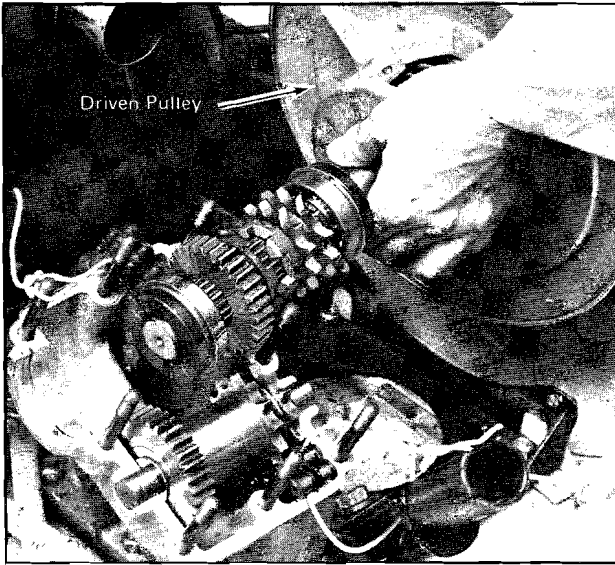
9. On all 1971 models, remove disc, spring washer and spacer.



1-9-7

10. Remove muffler from engine.
11. Remove nuts securing steering column lower bracket from the gear box. Slacken bolts and nuts securing steering column upper retainer plate.
12. Disconnect brake and throttle cables at ferrule and pivoting slug located on the handlebar. Pull steering column rearwards to provide working space and allow removal of gear box housing.
13. Disconnect transmission rod from gear box by removing cotter pin, spring and washer.
14. Remove eight (8) nuts securing gear box upper housing. Loosen housing using a soft faced hammer.
15. Release chain tension to maximum slackness by rotating eccentric tensioner.
16. Separate chain as detailed in sub-section 1-13.

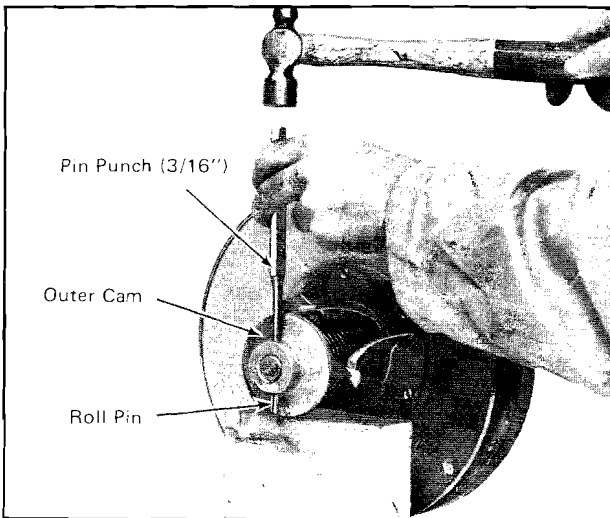
18. Withdraw assembled driven pulley (fig. 1-9-8).



1-9-8

**(D) DISASSEMBLY**  
 (All Models except  
 Alpine/Invader and Valmont)

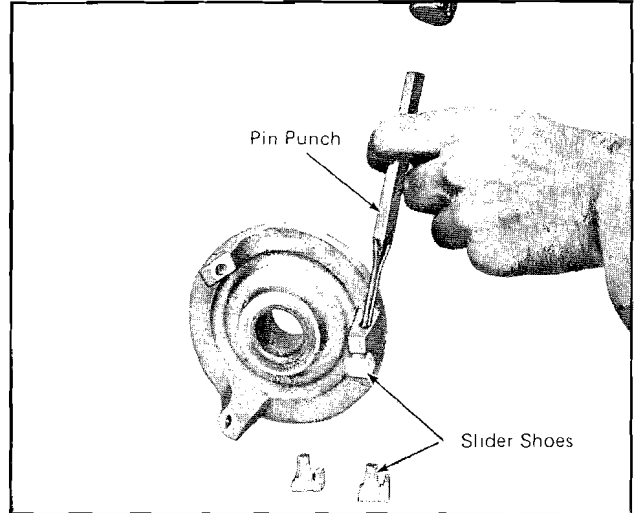
1. Place a support under outer cam and using a pin punch (3/16 inch), push roll pin locking cam to fixed pulley half shaft (fig. 1-9-9).



1-9-9

2. Pull off outer cam, spring and sliding pulley half from fixed pulley half shaft.  
 3. Using a pin punch, remove outer cam slider shoes from outer cam (fig. 1-9-10).

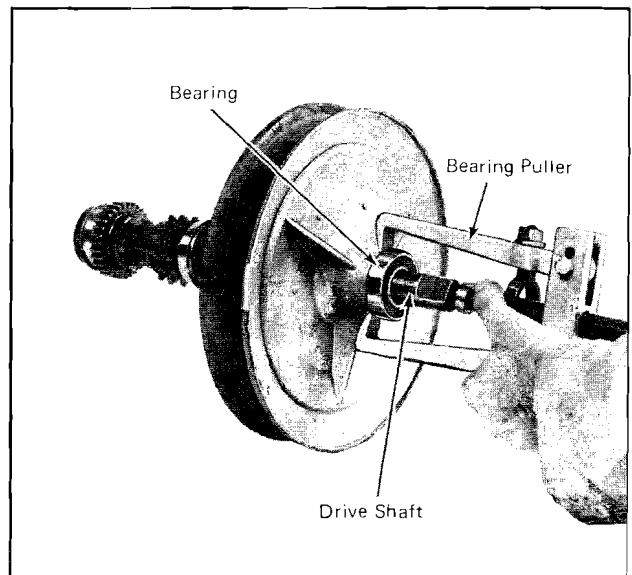
**NOTE:** Do not remove bushing from sliding pulley half unless bushing is damaged, and replacement is necessary. Refer to Paragraph (F), Bushing Replacement.



1-9-10

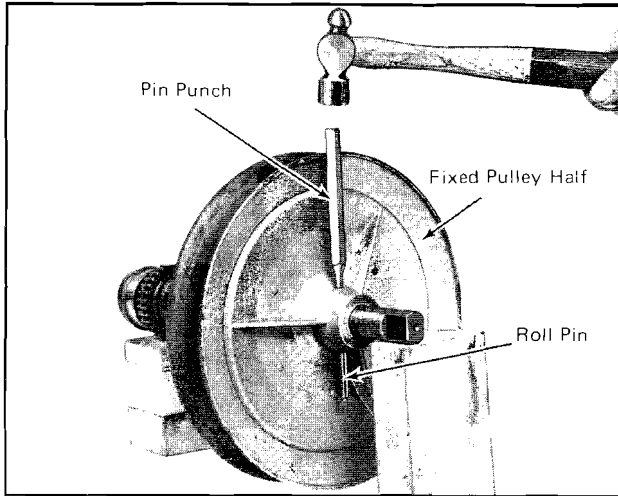
**(E) DISASSEMBLY**  
 (All Alpine/Invader  
 and Valmont Models)

1. Using a suitable bearing puller, remove bearing from drive shaft (fig. 1-9-11).



1-9-11

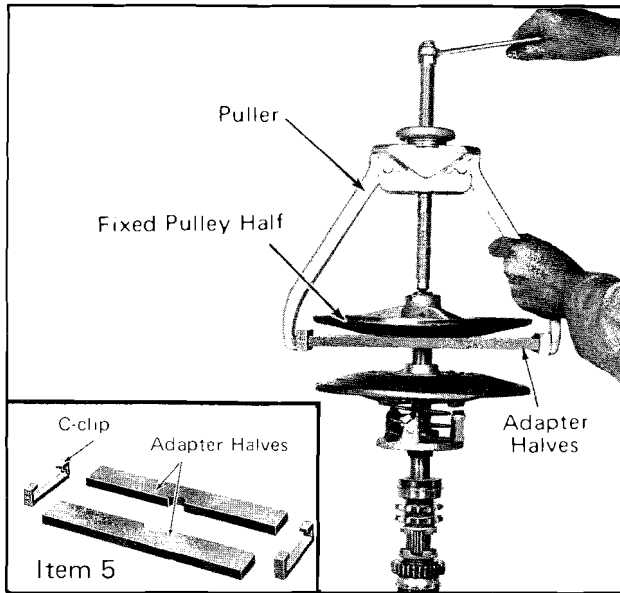
2. Using a pin punch and hammer, remove inner pins installed in larger roll pin securing fixed pulley half to shaft. Remove larger roll pin (fig. 1-9-12).



1-9-12

- Open sliding pulley half and insert both halves of special puller adapter (item 5) between pulley halves. Install C-clips. Install puller and remove fixed pulley half (fig. 1-9-13).

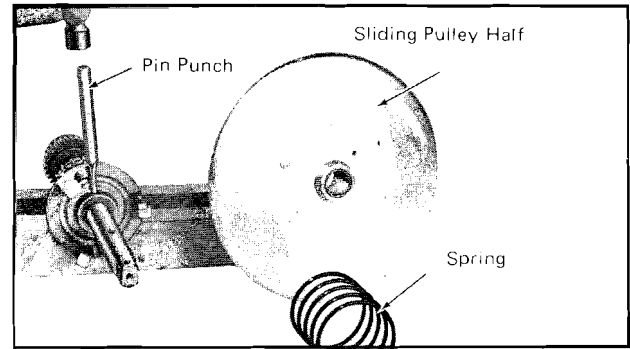
**NOTE:** If necessary, heat hub of fixed pulley half to facilitate removal.



1-9-13

- Remove sliding pulley half and spring. With a pin punch and hammer, remove roll pins securing outer cam (fig. 1-9-14).

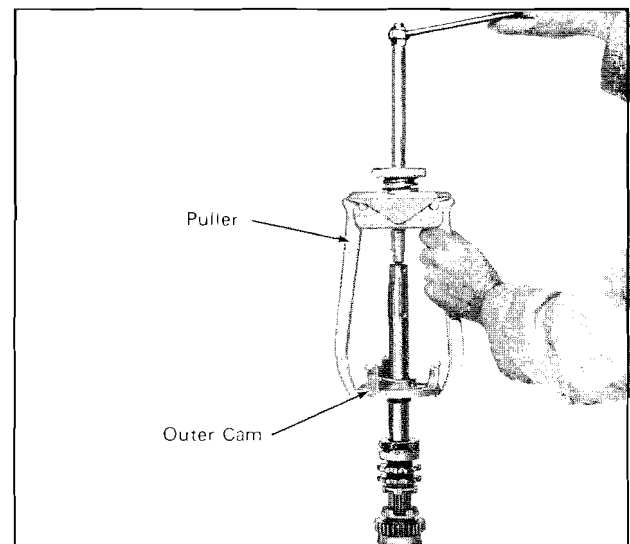
**NOTE:** Do not remove bushing from sliding pulley half unless damaged, and replacement is necessary. Refer to Paragraph (F), Bushing Replacement.



1-9-14

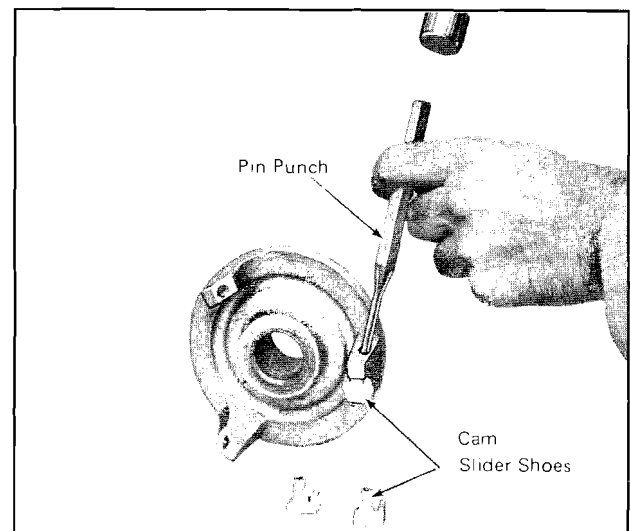
- Install puller and remove outer cam from drive shaft (fig. 1-9-15).

**NOTE:** If necessary, heat outer cam to facilitate removal.



1-9-15

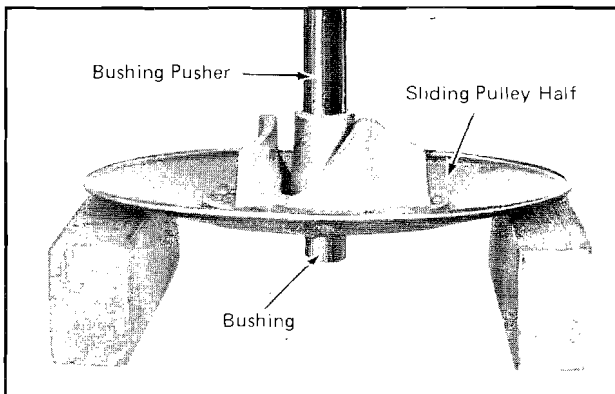
- Using a pin punch, push cam slider shoes from outer cam (fig. 1-9-16).



1-9-16

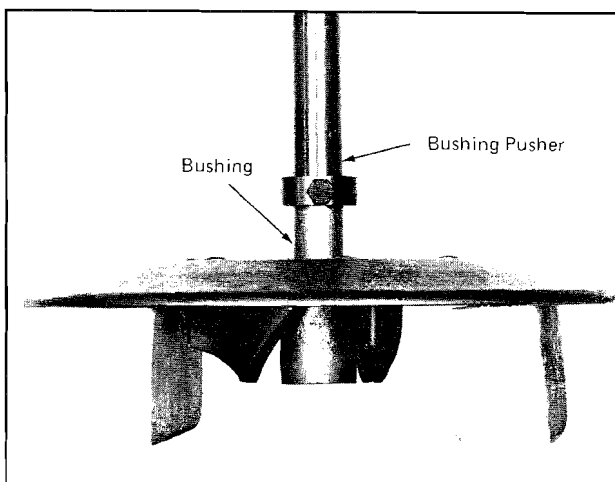
### (F) Replacement of Sliding Pulley Half Bushing

1. Using an appropriate bushing pusher, press bushing from pulley (fig. 1-9-17).



1-9-17

2. Position a new bushing in hole of sliding pulley half. Using bushing pusher, press down until bushing is flush with edge of pulley mounting hole (fig. 1-9-18).



1-9-18

### (G) CLEANING

1. Clean grease and dirt from cam slider shoes with a clean cloth.

**CAUTION:** Do not use cleaning solvent on shoes as it may permanently damage the components.

2. To remove grease and dirt, place all

components in a container of cleaning solvent. Dry using compressed air or a dry cloth.

3. Remove stationary objects (rust and/or rubber accumulation – belt wear) from fixed pulley half shaft with fine steel wool. Wipe shaft with a clean cloth.
4. Remove stationary objects (rust and/or rubber accumulation) from fixed and sliding half pulleys with fine emery cloth. Wipe pulley halves with a clean cloth.
5. Remove any other deposits on all other components using a firm bristle brush.

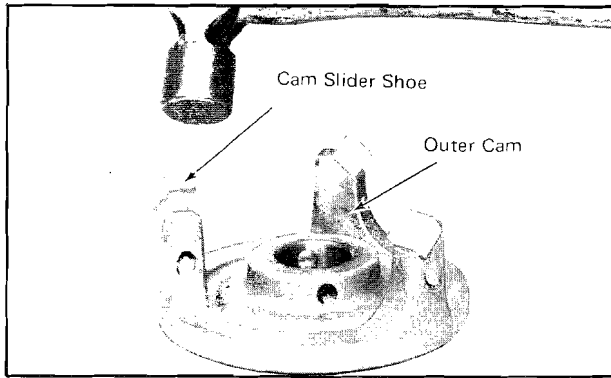
### (H) INSPECTION

1. Visually inspect cam slider shoes for worn or damaged contact surfaces. Replace defective shoes.
2. Inspect fixed and sliding pulley halves for scratches, grooves and/or rough surfaces. Remove defects using fine emery cloth. Wipe pulley halves with a clean cloth.
3. Check for broken or distorted spring. Replace defective spring.
4. Visually inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged components.
5. Inspect internal surface of bushing (installed or removed) for off-center wear or other damage. Replace defective bushing as detailed in Paragraph (F), Bushing Replacement.

### (J) ASSEMBLY

(All Models except Alpine/Invader and Valmont)

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.
2. Using a hammer, install cam slider shoes on outer cam (fig. 1-9-19).

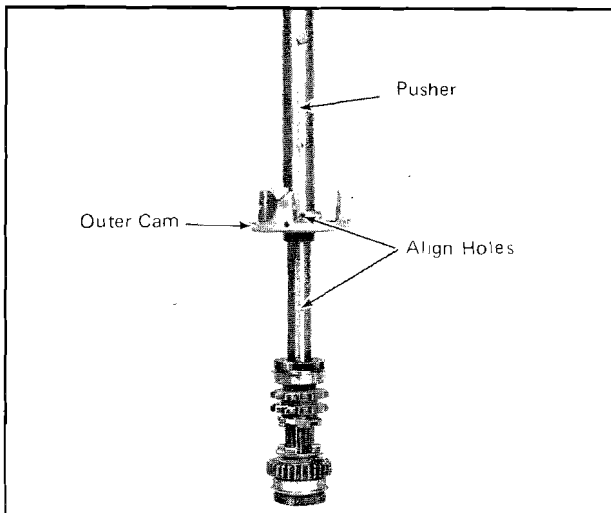


1-9-19

3. Position sliding pulley half, spring and outer cam on fixed pulley half shaft.
4. Hold sliding pulley half in position and rotate clockwise (when facing cam) outer cam 2/3 of a turn, then lock cam by driving a roll pin through cam and shaft.

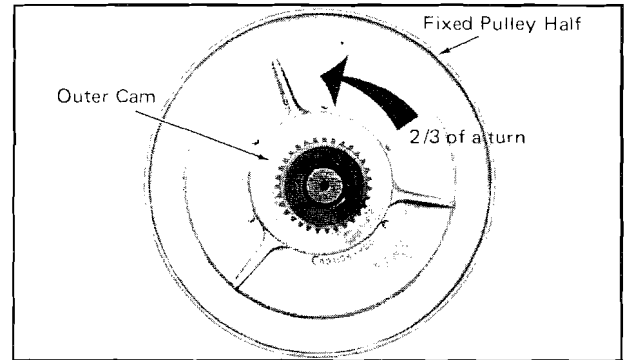
**(K) ASSEMBLY**  
**(All Alpine/Invader**  
**and Valmont Models)**

1. Install cam slider shoes on outer cam.
2. Position outer cam on drive shaft ensuring that hole in cam aligns with holes in shaft.
3. Using an appropriate pusher, press down on outer cam until hole in cam mates with third hole in shaft (fig. 1-9-20). Install larger roll pin then small roll pins to lock outer cam in position.



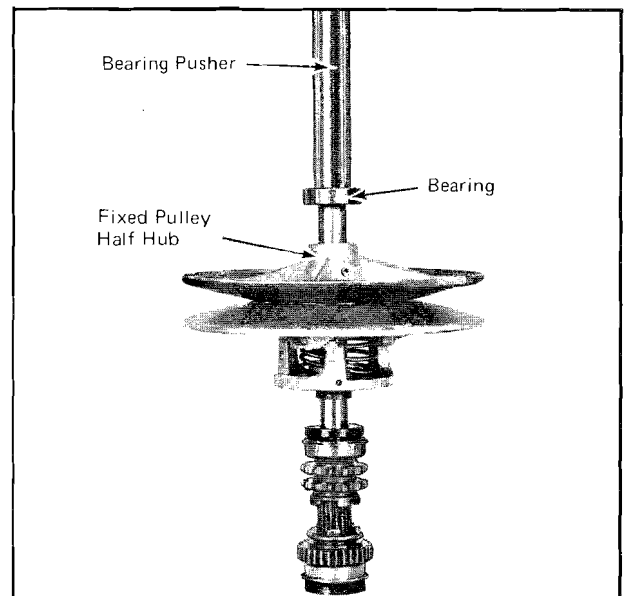
1-9-20

4. Place spring and sliding pulley half over shaft. Insert spring hook into hole of outer cam. Align hole in sliding pulley half with the other end of spring. Turn sliding pulley half counterclockwise 2/3 of a turn (when facing outer cam) and hold in position (fig. 1-9-21).



1-9-21

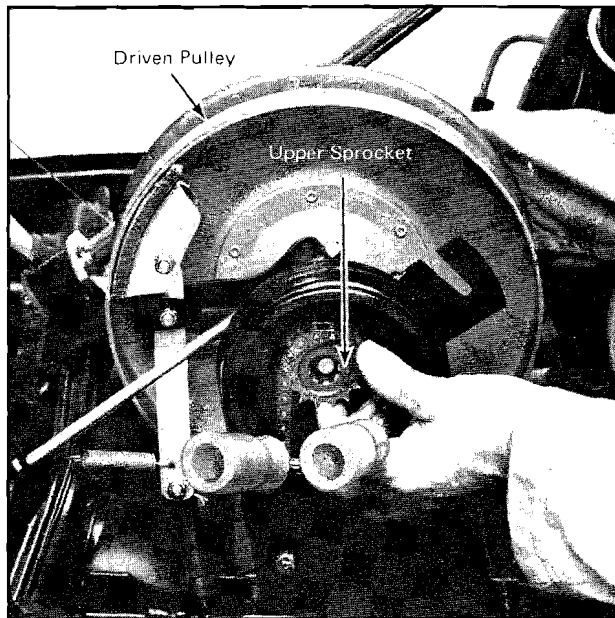
5. Align hole in fixed pulley half with holes in shaft. Position fixed pulley half on shaft and push using pusher until hole in pulley half mates with second hole of drive shaft. Using a pin punch and hammer, install larger roll pin and then small roll pins.
6. Using an appropriate bearing pusher, press bearing until it sits on fixed pulley half hub (fig. 1-9-22).



1-9-22

**(L) INSTALLATION**  
**(All Models except**  
**Alpine/Invader and Valmont)**

1. With the drive chain tension released, position the bearing cone in the bearing cup. Hold upper sprocket with chain in position and insert assembled driven pulley shaft through chain case and sprocket (fig. 1-9-23).



1-9-23

2. Install spring washer and castellated nut.

**NOTE:** Tighten castellated nut, then back off nut 1/6 of a turn and lock in position with cotter pin. It is imperative that nut is backed off or damage may occur due to a burned or seized bearing on drive pulley shaft.

3. On 1970 models apply drive chain tension by rotating eccentric tensioner until free play of 1/4 inch is obtained. Tighten tensioner lock nut.

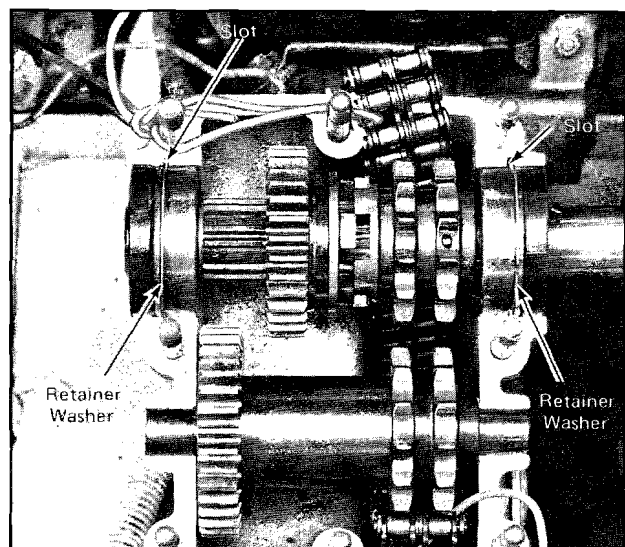
**NOTE:** On 1971 models apply chain tension by removing releaser tool from chain case.

4. Check chain case oil level, level off if necessary. Install inspection cover.
5. Install engine muffler.

6. On 15 inch track vehicles, bolt handle-bar upper bracket in position.
7. Check pulley alignment as detailed in Paragraph (M), following.
8. Install drive belt as described in subsection 1-7.
9. Install pulley guard as detailed in subsection 1-6.
10. Close or install cab.

**(M) INSTALLATION**  
**(All Alpine/Invader**  
**and Valmont Models)**

1. Position drive shaft of assembled driven pulley so that retainer washers align with slots of gear box casing (fig. 1-9-24).

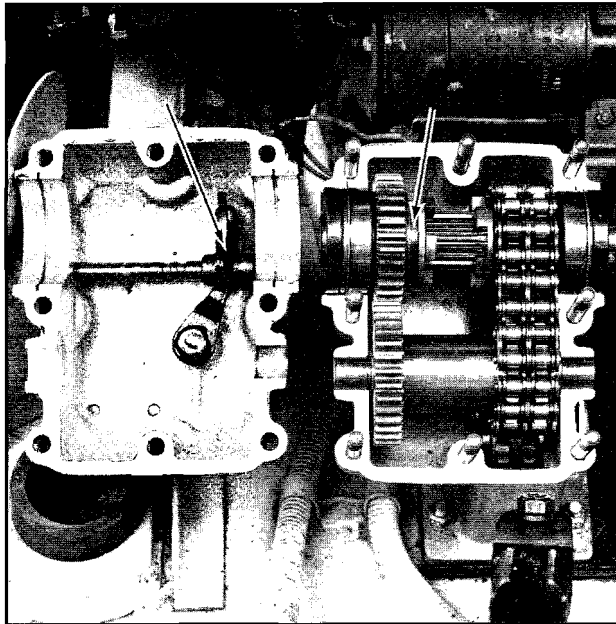


1-9-24

2. Place a clean cloth beneath drive shaft and in gear box casing to prevent foreign matter and/or removed components from falling into bottom of casing.
3. Connect drive chain using a double connecting link.

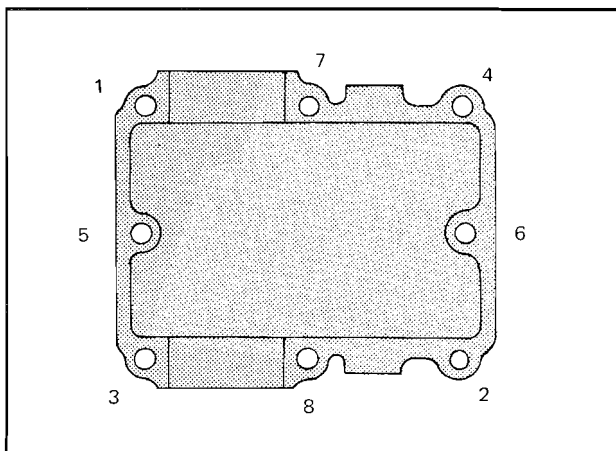
**NOTE:** The locking clip should be installed on opposite side of driven pulley.

4. Position gear change fork in gear box cover so that it aligns with slot of sliding gear in gear housing (fig. 1-9-25).



1-9-25

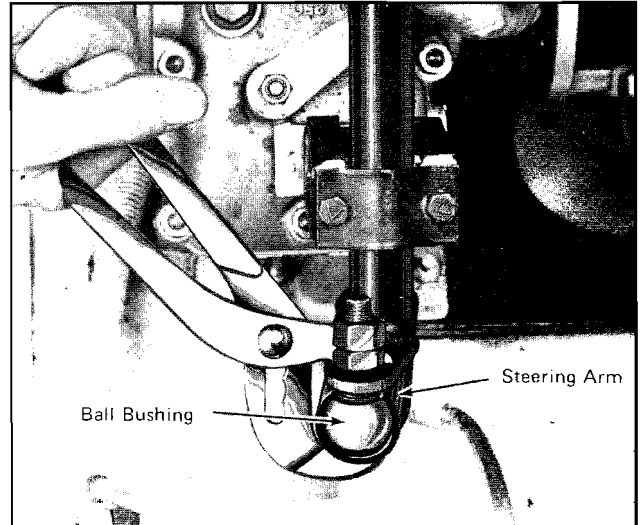
5. Apply a thin coat of L. 700 Crankcase Glue on contact surface of gear box casing.
6. Install gear box cover and secure with eight (8) nuts. Torque nuts to 250 inch-pounds following the sequence shown in figure 1-9-26.



1-9-26

7. Hook up gear box rod and secure with spring, washer and cotter pin.
8. Lower steering column and insert ball bushing into steering arm.

**NOTE:** If difficulty is encountered, use pliers to align column ball bushing and steering arm (fig. 1-9-27).

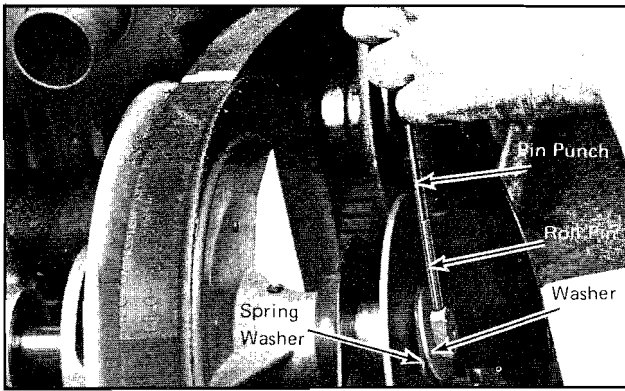


1-9-27

9. Secure bracket to gear box housing with two (2) nuts. Tighten bolts and nuts securing upper retainer plate.

**NOTE:** On 1970 Alpine/Invader models, the distance between the upper retainer plate and the gear box bracket must be 17-3/4 inches. On 1971 Alpine/Valmont models, the distance must be 15-1/2 inches.

10. Connect throttle and brake cables and housings at handlebar.
11. Install drive belt as detailed in subsection 1-6.
12. Install muffler to engine.
13. Position spacer on drive shaft. On all 1971 models install spring washer. On all vehicles install brake and bracket on shaft with disc between brake shoes then push bracket until it sits on bearing.
14. Install bolts and nuts securing brake and bracket assembly to frame.
15. On 1970 models, install spring washer and washer.
16. Using a pin punch and hammer, install roll pin through disc and shaft (fig. 1-9-28).

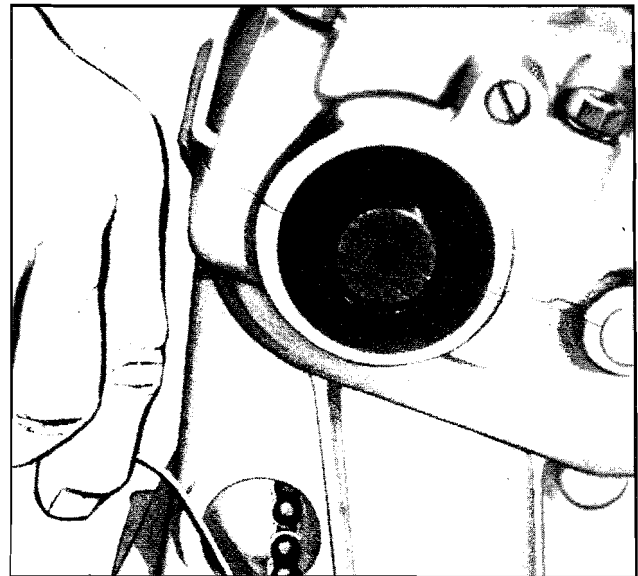


1-9-28

17. Install pulley guard holder.
18. Remove capscrew and lock washer locking gear box tensioner. Remove inspection cover.
19. Adjust drive chain tension to obtain 1/4 inch free play maximum by turning tensioner clockwise or counterclockwise. Secure tensioner in position with lock washer and capscrew.
20. Check gear box oil level using a rigid wire as dipstick. Oil level in 399 models

should be 2-1/4 inch on dipstick. On 640 models, oil level should be 3-1/4 inch (fig. 1-9-29). Replenish, if required, with Ski-Doo Chain Case Oil. Install inspection cover and vent plug.

21. Install pulley guard as detailed in subsection 1-6 and install cab.



1-9-29



# TRANSMISSION

## 1-9-1 PULLEY ALIGNMENT

### (A) ALIGNMENT OF DRIVE AND DRIVEN PULLEYS (All Models except Alpine/Invader and Valmont)

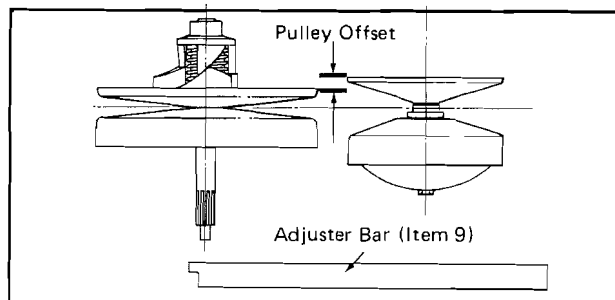
Reduced vehicle performance (loss of engine power) is often due to misalignment of drive and driven pulleys. Misalignment may also result in excessive drive belt wear. If alignment is suspect or if either one or both pulleys have been removed from vehicle during any overhaul procedure, drive and driven pulley alignment must be verified.

#### IMPORTANT

If pulley offset cannot be obtained through removal and/or installation of maximum permissible quantity of chain case and/or crankshaft shims, check frame, chain case and chain case components for distortion and damage. Replace damaged or distorted component(s).

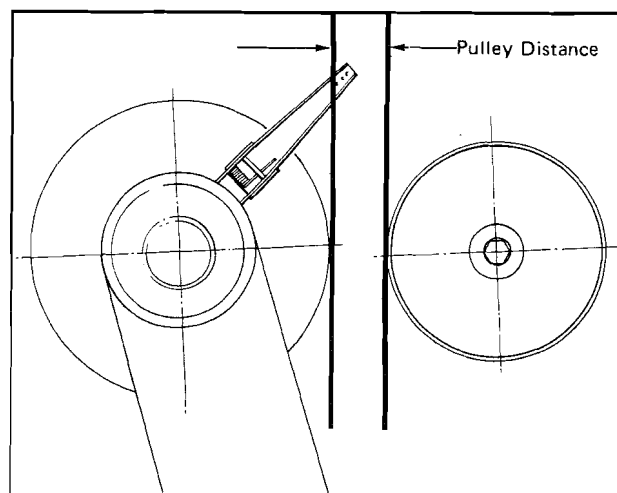
#### 1. Alignment Check

- (a) Tilt or remove the cab.
- (b) Remove pulley guard as detailed in sub-section 1-6.
- (c) Remove drive belt as detailed in sub-section 1-7.
- (d) Check tightness of engine mount nuts. Nuts must be torqued to 400 to 420 inch-pounds.
- (e) Ensure the driven pulley halves are adjoined before checking pulley offset.
- (f) Using the appropriate adjuster bar (item 8) check for correct offset of pulleys as follows:(refer figure 1-9-30).



- (i) On all 1970 vehicles except T'NT 340, pulley offset must be 1/2 inch towards engine side.
- (ii) On all 1970 T'NT 340 models, pulley offset must be 3/8 inch.
- (iii) Pulley offset for all 1971 vehicles must be  $1/2 \pm 1/32$  inch.

- (g) Check that distance between drive and driven pulleys is as follows: (fig. 1-9-31).

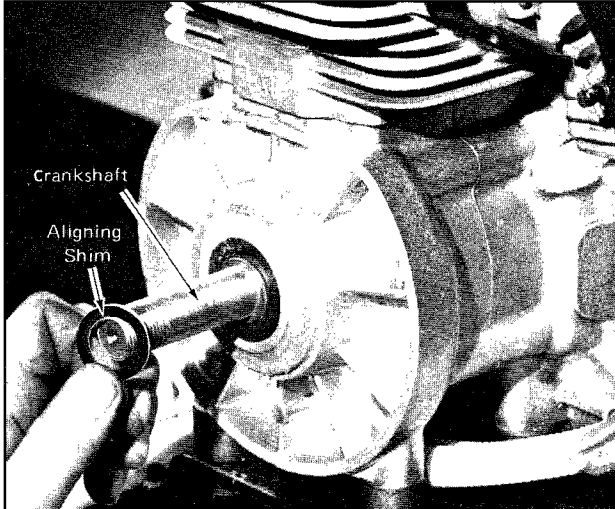


- (i) On all 1970 vehicles, pulley distance must be  $1-7/8 + 0 - 1/16$  inch.
- (ii) On all 1971 models, pulley distance must be  $1-7/8 \pm 1/32$  inch.

#### 2. Alignment Offset Adjustment

- (a) If offset between drive and driven pulleys is GREATER than specifications adjust as follows:

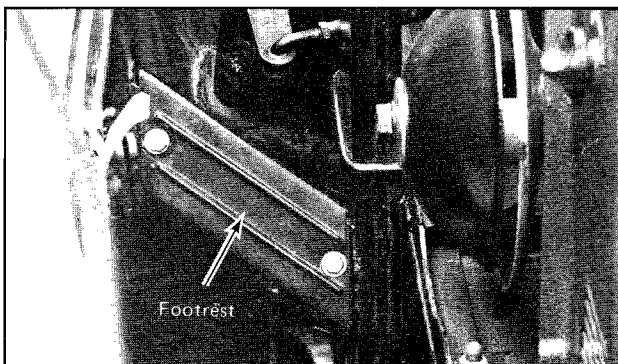
- (i) Remove drive pulley assembly as detailed in sub-section 1-8.
- (ii) Install required thickness of aligning shims on crankshaft (fig. 1-9-32).



1-9-32

**NOTE:** Never install more than five (5) shims on the crankshaft.

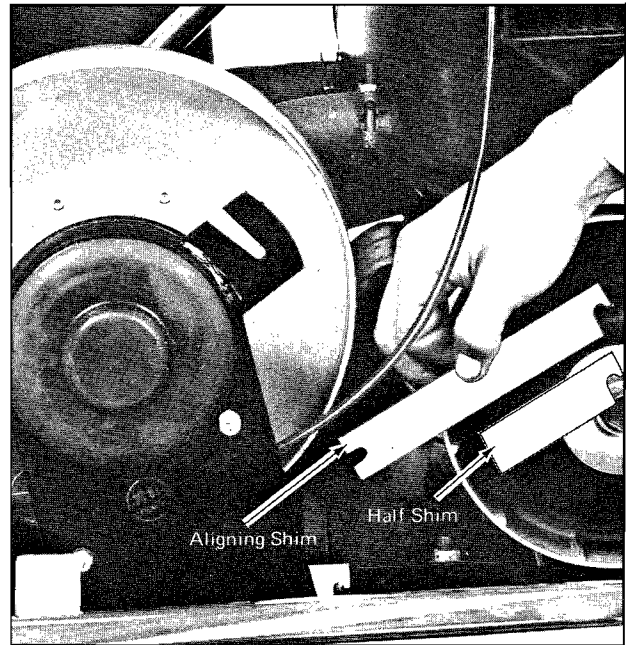
- (iii) Install drive pulley assembly as detailed in sub-section 1-8.
- (b) If offset between drive and driven pulleys is LESS than specifications adjust as follows:
  - (i) Loosen nuts securing chain case "U" clamp and lower bracket to frame.
  - (ii) On 1970 vehicles equipped with 18 inch track, loosen bolts securing footrest to chain case (fig. 1-9-33).



1-9-33

- (iii) Insert required thickness of aligning shims between chain case and frame. Total quantity of shims must not exceed three (3) (fig. 1-9-34).

**NOTE:** Shims may be cut in half and installed to correct a crooked chain case.



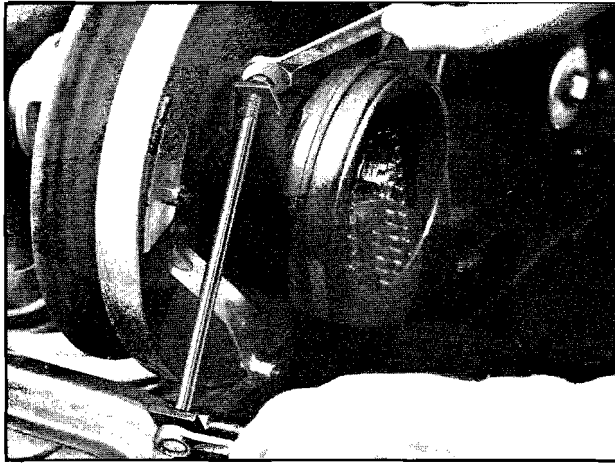
1-9-34

- (iv) Tighten chain case "U" clamp and lower bracket nuts. Verify pulley distance is within specifications.
- (v) On all 1970 vehicles equipped with 18 inch track, tighten bolts securing footrest to chain case.

### 3. Alignment Distance Adjustment

- (a) If distance between drive and driven pulleys is not to specifications adjust as follows:
  - (i) Loosen nuts securing chain case "U" clamp and lower bracket to frame.
  - (ii) On 1970 vehicles equipped with 18 inch track, slacken bolts securing footrest to chain case (see fig. 1-9-33).

- (iii) If the distance is LESS, tighten the nut on the special screw or hinge rod until distance is 1-7/8 inch between pulleys (fig. 1-9-35).



1-9-35

**NOTE:** On Elan models, to increase or decrease distance between pulleys tighten or loosen nut securing hinge at reinforcing cross support of frame.

- (iv) If the distance is MORE, loosen the nut on the special screw or hinge rod and gently tap the chain case rearward to decrease the distance. Retighten clamps.
- (b) After completing drive and driven pulley alignment check the following.
  - (i) On 1970 models, ensure that free play of drive chain tension is 1/4 inch maximum.
  - (ii) On 1970 and 1971 models, check that brake applies fully when brake lever is 1/4 inch from handlebar.
  - (iii) Recheck pulley alignment.

**(B) ALIGNMENT OF DRIVE AND DRIVEN PULLEYS (All Alpine/Invader and Valmont Models)**

1. Due to the installation position and

method of attachment of the engine and gear box mountings, the distance between the drive and driven pulleys is not adjustable. Therefore any distance misalignment is due to loosening of engine and/or gear box mounting attaching parts and/or damage to a major component sustained as a result of rough handling. There is no pulley offset adjustment if offset is less than specified tolerance ( $1/2 \pm 1/32$  inch) due to the same technical reason mentioned above.

**IMPORTANT:** If distance between pulleys or if offset is less than specifications, inspect frame, gear box bottom plate and engine mounts for wear, damage, secureness of mounting, distortion and/or missing parts. Repair or replace defective part(s).

**2. Alignment Check**

- (a) To check if offset between drive and driven pulleys is GREATER than specification ( $1/2 \pm 1/32$  inch), refer to Paragraph (A), step 1 for procedure.

**3. Alignment Offset Adjustment**

- (a) If offset between drive pulleys is GREATER than specification, adjust as follows:
  - (i) Remove drive pulley assembly as detailed in sub-section 1-8.
  - (ii) Install required thickness of aligning shims on crankshaft.

**NOTE:** Never install more than five (5) shims on crankshaft.

- (iii) Install drive pulley assembly as detailed in sub-section 1-8.
- (iv) Check that brake applies fully when brake lever is 1/4 inch from handlebar grip.
- (v) Recheck pulley alignment.

# TRANSMISSION

## 1-10-1 BRAKE MECHANISM

### (A) GENERAL

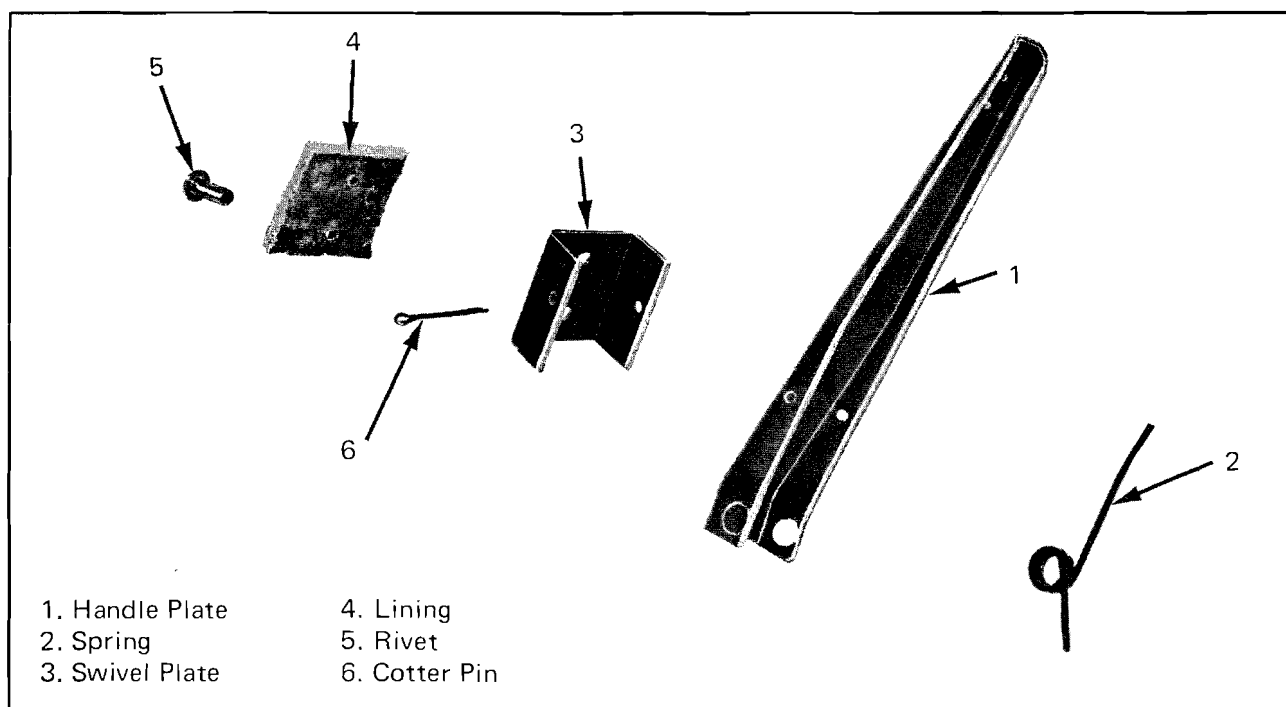
1. There are three (3) types of brakes installed on Ski-Doo snowmobiles; pivot, drum and disc type.

(a) Pivot: A mechanical pivoting arrangement consisting of a swivel plate and handle plate secured to the chain case bracket. The swivel plate which incorporates the brake lining, pivots to bear against the driven pulley when the brake cable is activated thereby decreasing vehicle speed.

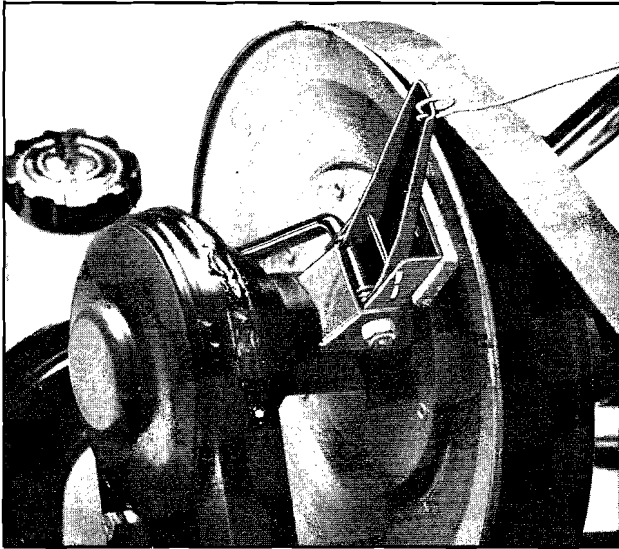
(b) Drum: A lever incorporating a brake shoe to which the brake lining is riveted. The brake shoe lever is attached to the chain case bracket. Applying the handlebar brake lever causes the brake shoe and lining to come in contact with the drum (driven pulley rim) effecting reduced speed.

(c) Disc: A disc plate and caliper brake shoe arrangement mounted on a bracket. The disc is secured to and rotates with the driven pulley shaft during operation of the vehicle. Activating the handlebar brake lever causes the caliper assembly to close and bear against both sides of the disc resulting in vehicle slowdown.

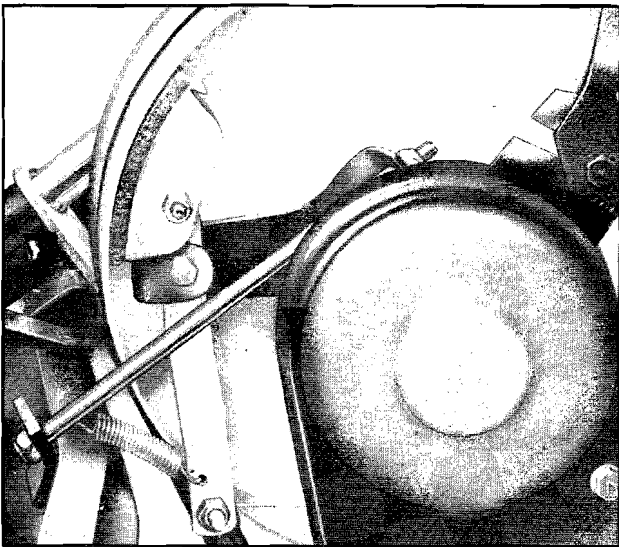
Brake release is controlled by a spring either secured to the lever (handle plate) or incorporated on the brake cable.



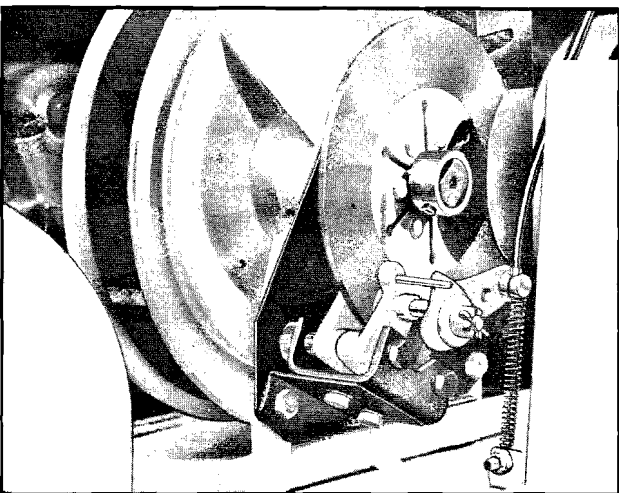
DISASSEMBLED VIEW OF ELAN BRAKE (PIVOT TYPE)



PIVOT TYPE BRAKE



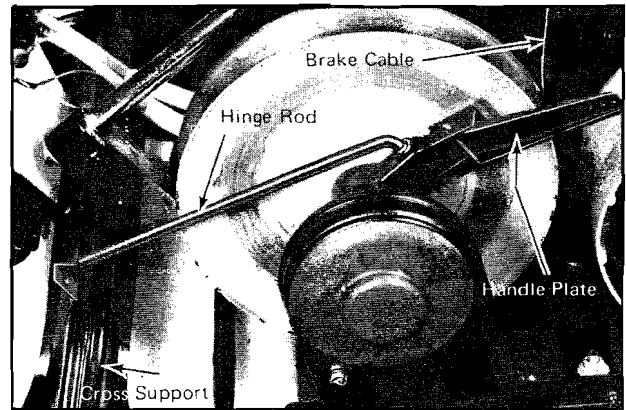
DRUM TYPE BRAKE



DISC TYPE BRAKE

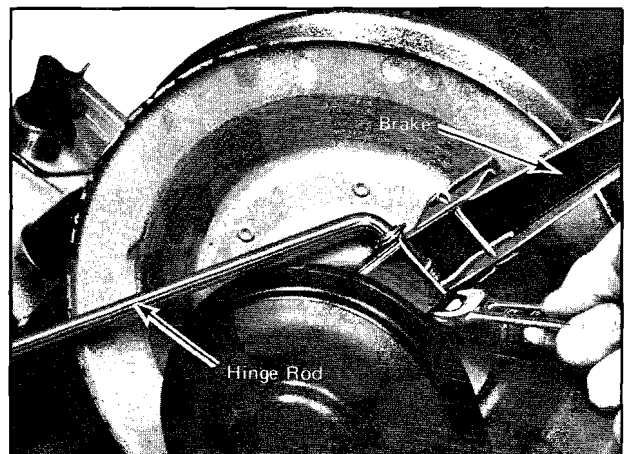
**(B) REMOVAL**  
**(All Elan Models)**

1. Tilt cab and remove the console.
2. Remove the drive belt as detailed in sub-section 1-7.
3. Disconnect the brake cable from the handle plate. Remove nut securing hinge rod to reinforcing cross support at frame (fig. 1-10-1).



1-10-1

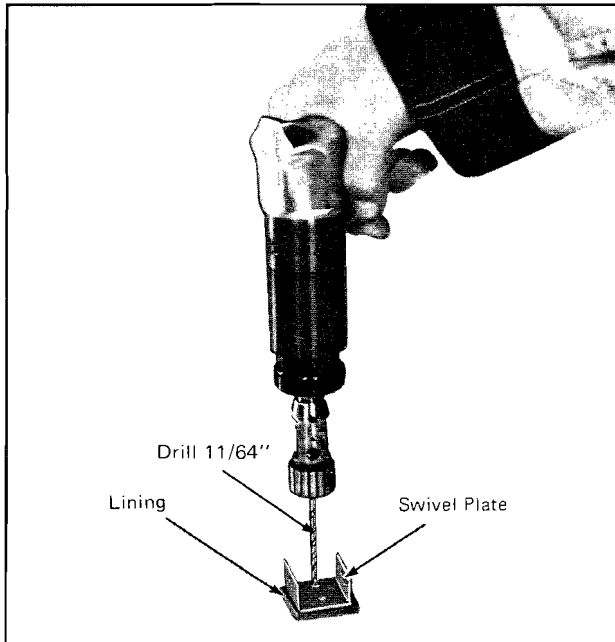
4. Remove "U" clamp securing chain case and remove aligning shims. Loosen nut attaching chain case lower bracket to frame.
5. Disengage hinge rod from cross support by pulling chain case towards drive pulley.
6. Remove nut securing hinge rod to chain case bracket. Remove hinge rod, spring and brake mechanism (fig. 1-10-2).



1-10-2

**(C) DISASSEMBLY**

1. Remove and discard the cotter pin securing handle plate to swivel plate.
2. Using a 11/64 inch dia drill, remove the rivets attaching lining to swivel plate (fig. 1-10-3).



1-10-3

**(D) CLEANING**

1. Clean grease and dirt from hinge rod, handle and swivel plates and spring using a firm bristle brush.
2. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

**(E) INSPECTION**

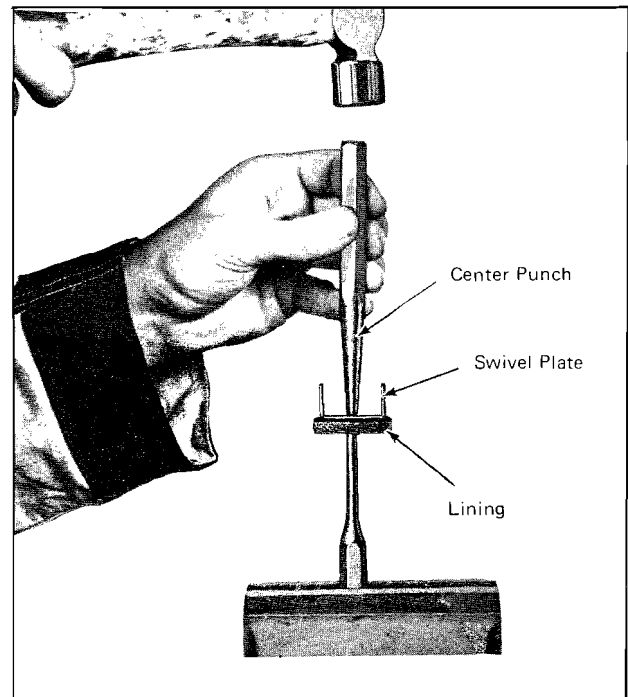
1. Visually inspect hinge rod, swivel and handle plates for wear or distortion. Replace defective component(s).
2. Inspect the hinge rod for stripped, crossed or otherwise damaged threads. Replace damaged rod.
3. Inspect brake lining for wear and oil-soakage. Rivet heads must be embedded below upper surface of lining. Replace worn or oil-soaked lining.

**NOTE:** If lining is oil-soaked, check chain case oil seal for correct installation position. Wipe off oil from pulley.

4. Check brake spring for weakness and/or distortion. Replace defective spring.

**(F) ASSEMBLY**

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.
2. Using center and flat head punches and a hammer, secure the lining to the swivel plate using appropriate rivets (fig. 1-10-4). Secure rivets using a flat head punch.



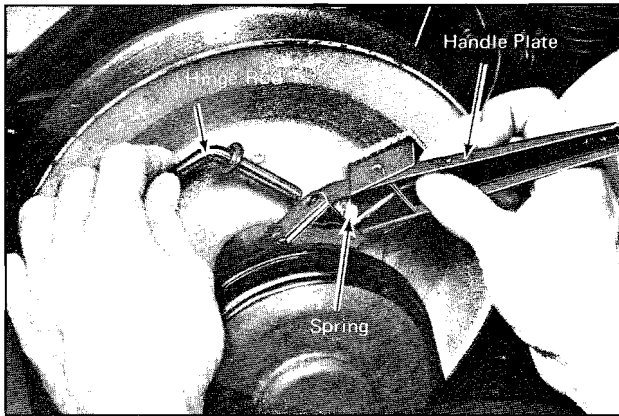
1-10-4

3. Position the swivel plate on the handle plate and secure the unit using a new cotter pin.

**(G) INSTALLATION**

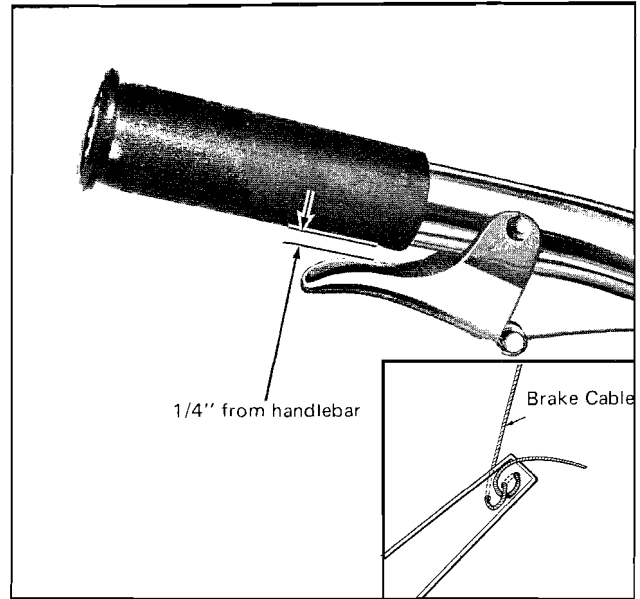
1. Place the spring into handle plate with the long wire end beneath the cotter pin. Hold the spring in location and position the handle plate into chain case bracket. Insert hooked end of hinge rod through

bracket, loops of spring and handle plate. Secure rod to chain case bracket with nut (fig. 1-10-5).



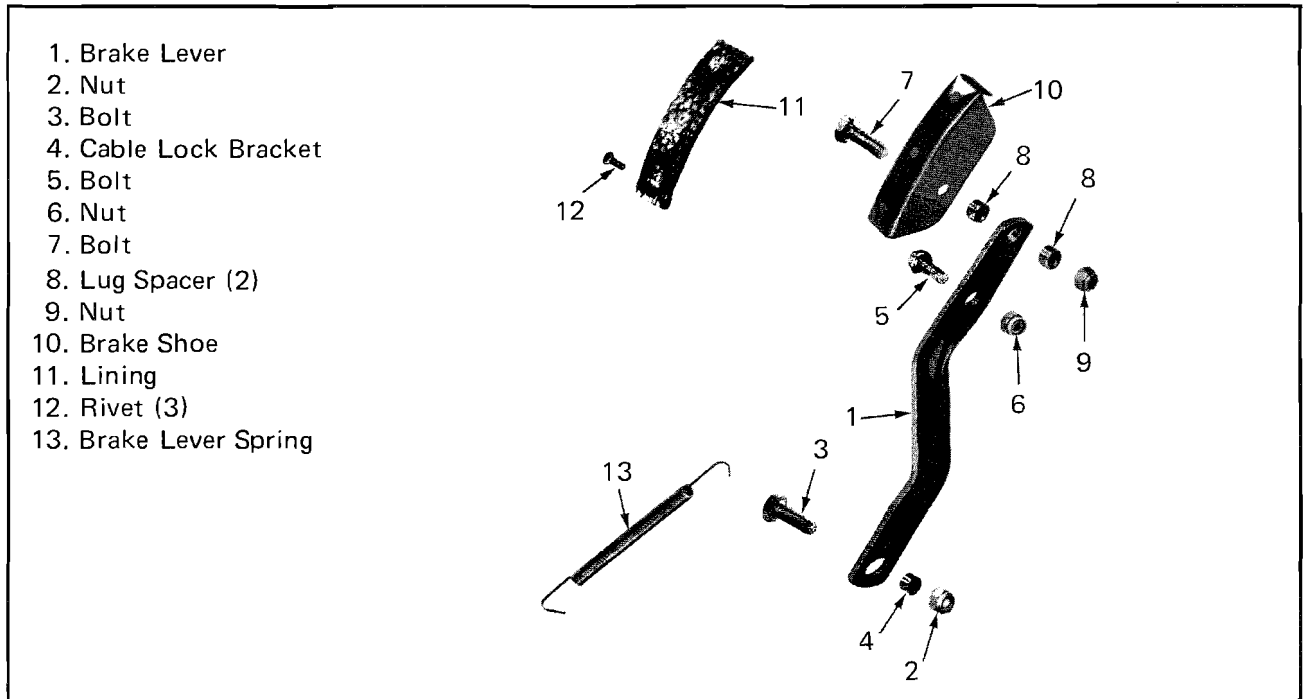
1-10-5

2. Pull the chain case forward until free end of hinge rod passes through appropriate hole in reinforcing cross support of frame. Install and finger tighten nut on rod end.
3. Install chain case "U" clamp and previously removed aligning shims.
4. Check pulley alignment as detailed in sub-section 1-9.
5. Connect brake cable to handle plate and adjust cable length until brake applies fully with brake lever is 1/4 inch from handlebar (fig. 1-10-6).
6. Install drive belt as detailed in sub-section 1-6.
7. Install console and close cab.



1-10-6

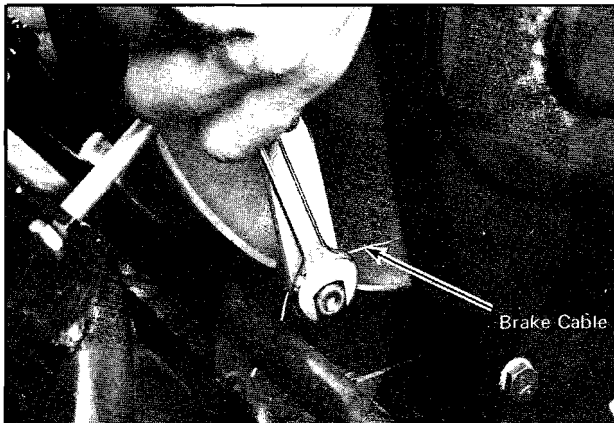
## 1-10-2 BRAKE (All T'NT, Olympique and Nordic Models)



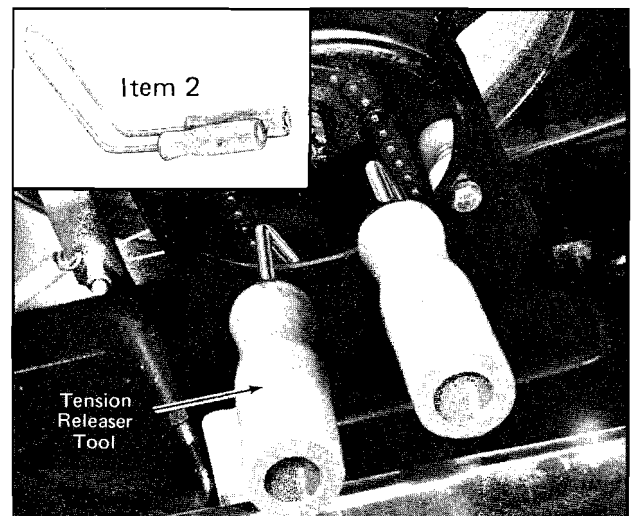
DISASSEMBLED VIEW OF DRUM TYPE BRAKE

### (A) REMOVAL

1. Tilt or remove cab.
2. Remove pulley guard as detailed in sub-section 1-6.
3. On 1971 models, remove drive belt as detailed in sub-section 1-7.
4. Disconnect brake lever spring. Remove nut, screw, cable lock bracket securing brake cable to brake lever (fig. 1-10-7).
5. On 1970 models, remove nut and bolt attaching brake lever to chain case bracket. Remove brake mechanism from vehicle.
6. On 1971 models, carry out the following:
  - (a) Remove inspection cover. Insert chain tension releaser tool (item 2), (fig. 1-10-8).



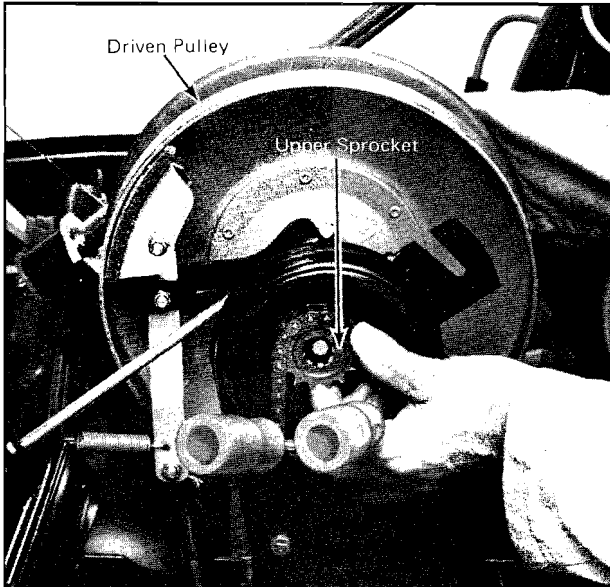
1-10-7



1-10-8

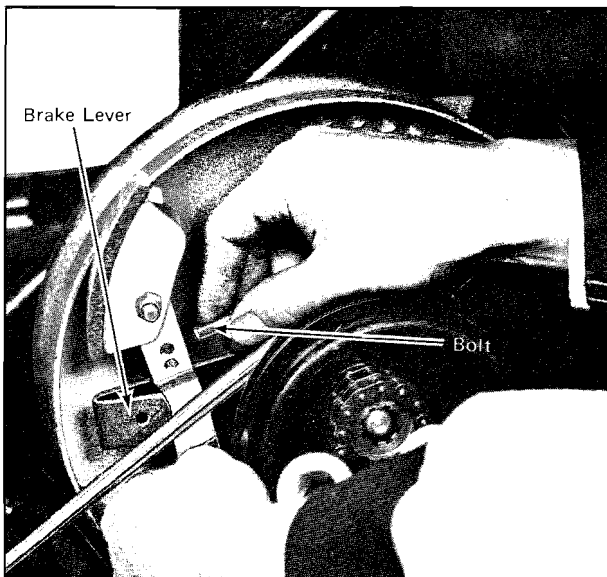


- (b) Remove cotter pin, castellated nut and washer securing upper sprocket to driven pulley shaft. Push driven pulley shaft inwards until shaft end is flush with outer flange of upper sprocket (fig. 1-10-9).



1-10-9

- (c) Remove bolt and nut securing brake lever to chain case bracket. Remove brake mechanism from vehicle (fig. 1-10-10).

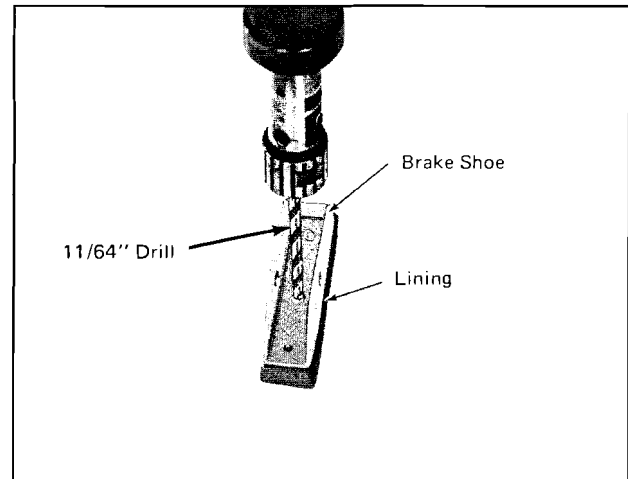


1-10-10

### (B) DISASSEMBLY

1. Remove brake shoe from brake lever by removing nut, lug spacers and screw.

2. Using a 11/64 inch dia drill, remove the rivets attaching lining to brake shoe (fig. 1-10-11).



1-10-11

### (C) CLEANING

1. Clean grease and dirt from all components (except brake lining) using a firm bristle brush.
2. If paint has been removed apply a new coat using appropriate Ski-Doo Paint.

### (D) INSPECTION

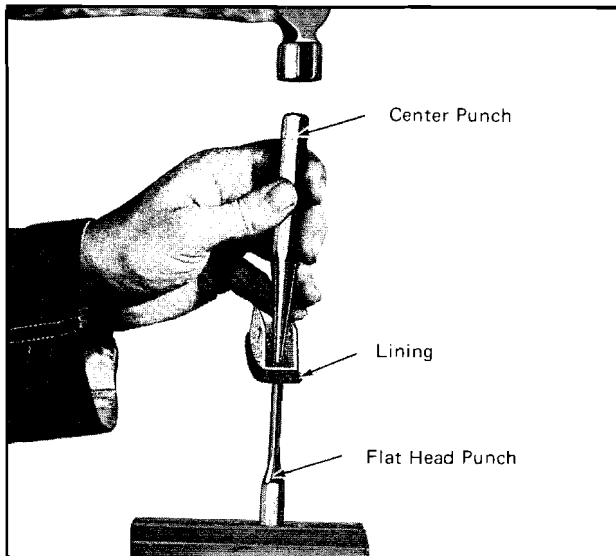
1. Visually inspect brake lining for wear. Rivet heads must be embedded below upper surface of lining. Replace worn lining.

**NOTE:** If lining is oil-soaked, check chain case oil seal for correct installation position. Wipe off oil from pulley.

2. Visually inspect all other components for wear or damage. Replace as necessary.

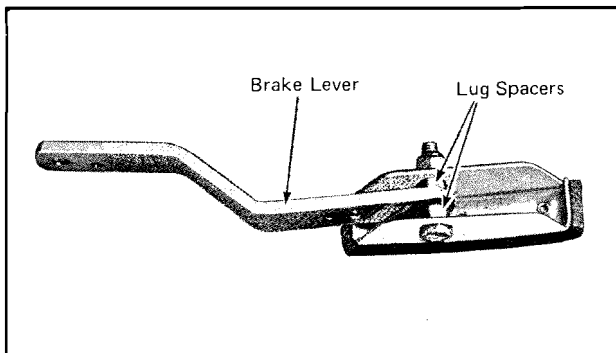
### (E) ASSEMBLY

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced.
2. Place the brake lining on the brake shoe. Using a center punch and hammer secure lining using appropriate rivets (fig. 1-10-12). Secure rivets using a flat head punch.



1-10-12

3. Secure the shoe assembly to the brake lever using a nut, screw and lug spacers (fig. 1-10-13).



1-10-13

4. Position cable lock bracket on the brake lever and install screw and nut. Tighten nut finger tight.

**(F) INSTALLATION**

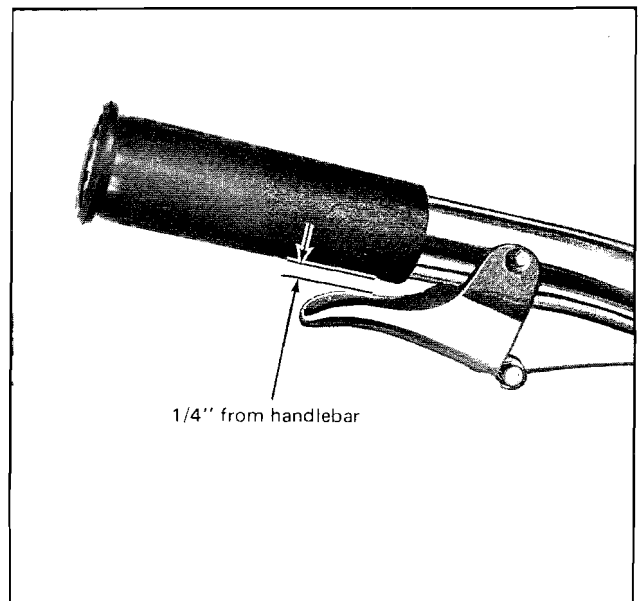
1. Attach the brake lever to the chain case bracket using a nut and bolt. Tighten nut until lever pivots freely but all side play is eliminated. Hook the brake lever spring into position.
2. Using light machine oil, lubricate all moving metal parts of brake.

**NOTE:** Avoid getting oil on brake shoe.

3. On 1971 models, push the driven pulley shaft through chain case sprocket. Install washer and castellated nut. Remove chain tension releaser tool (item 2) from chain case.

**NOTE:** Tighten castellated nut fully then back off nut 1/6 of a turn and install new cotter pin. It is imperative that nut is backed off or damage may occur due to a burned or seized bearing on driven pulley shaft.

4. Connect brake cable between cable lock bracket and brake lever. Adjust brake cable so that brake applies fully when hand lever is 1/4 inch from handlebar. Tighten cable attaching nut (fig. 1-10-14).



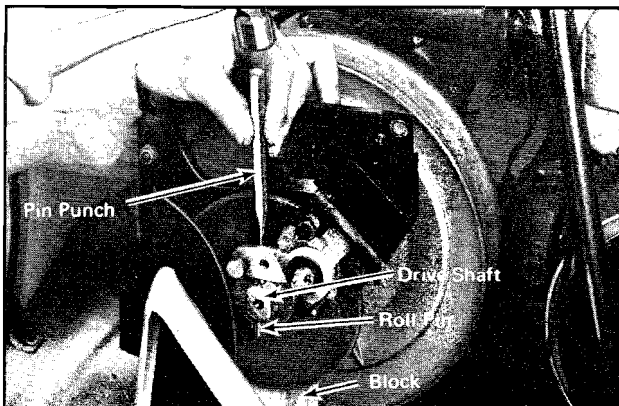
1-10-14

5. On 1971 models, install drive belt as detailed in sub-section 1-7.
6. Install pulley guard as detailed in sub-section 1-6.
7. Install or close cab.

### 1-10-3 BRAKE (All Alpine/Invader and Valmont Models)

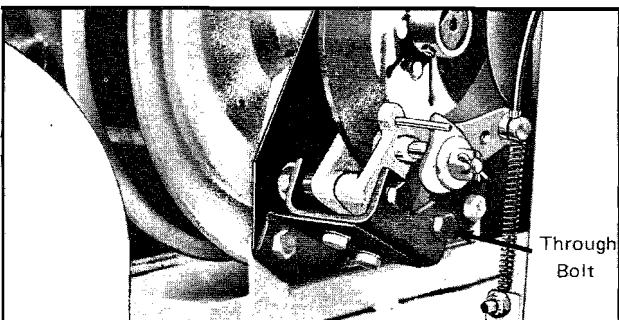
#### (A) REMOVAL

1. Remove cab. Remove pulley guard as detailed in sub-section 1-6.
2. Disconnect brake cable from disc brake unit and frame by removing nut, washer and cable lock bracket. Remove spring from cable.
3. Remove bolts securing pulley guard holder to brake bracket.
4. Brace driven pulley shaft by positioning a locally manufactured block (5-3/8 x 3 x 1 inches) under assembly. Using a hammer and pin punch, remove roll pin locking disc in position (fig. 1-10-15).



1-10-15

5. Remove nuts and through bolts securing brake unit to support and remove spacers and disc brake unit halves (fig. 1-10-16).

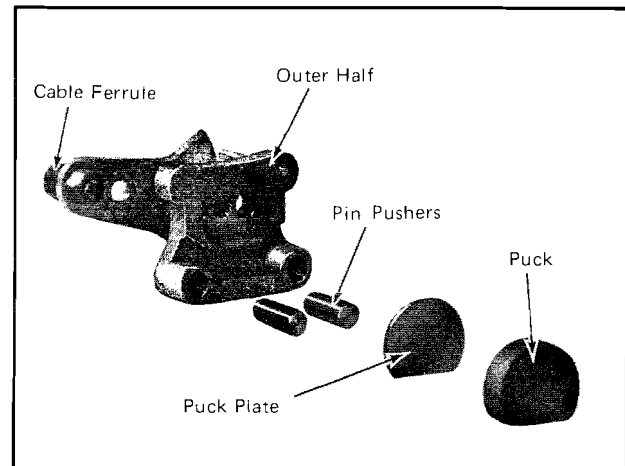


1-10-16

6. On 1970 models, remove washer, spring washer, disc and spacer.
7. On 1971 models, remove disc, spring washer and spacer.

#### (B) DISASSEMBLY

1. Remove puck (brake lining), puck plate and pin pushers from outer half of disc unit (fig. 1-10-17).



1-10-17

**NOTE:** Do not remove glued puck from inner half unless damaged or worn, and replacement is necessary.

2. Remove brake cable ferrule and nut.

#### (C) CLEANING

1. Clean dirt and grease from all components using a firm bristle brush and a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

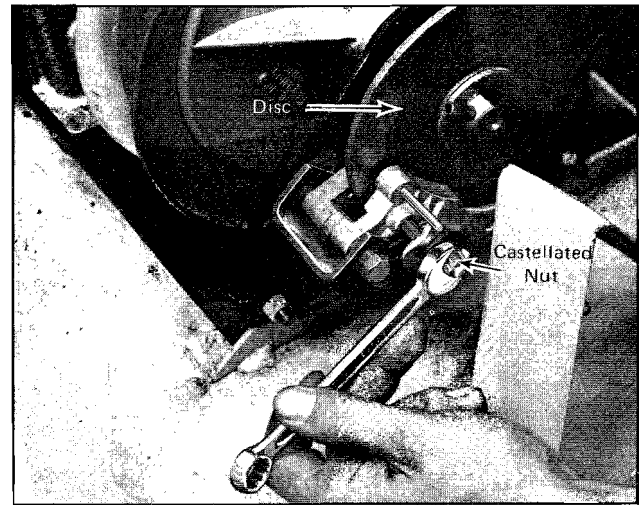
#### (D) INSPECTION

1. Check disc pucks (installed or removed) for damage or wear.
2. Check brake lever spring for weakness and/or distortion. Replace defective spring.
3. Inspect all threaded parts for stripped, crossed or otherwise damaged threads.

4. Visually check all other components for wear and/or damage. Replace defective part(s).

### (E) ASSEMBLY

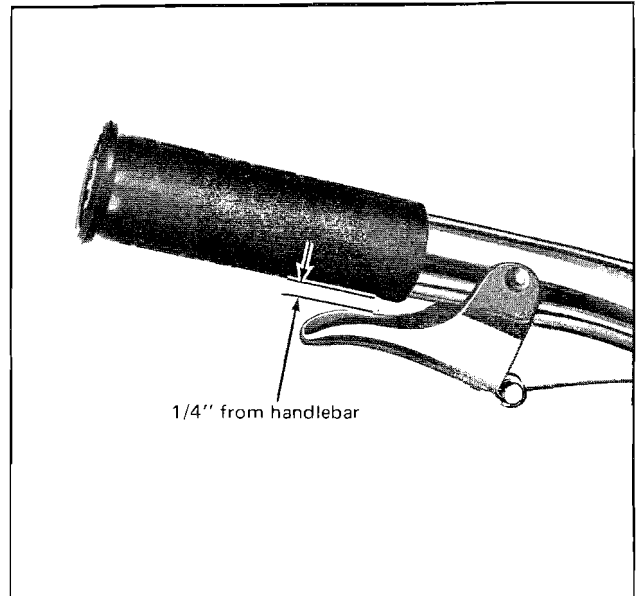
1. Prior to Assembly procedure, ensure all parts are clean and all defective components have been repaired or replaced.
2. On 1970 models, install spacer, disc, spring washer and washer on driven pulley shaft.
3. On 1971 models, install spacer, spring washer and disc.
4. Using a pin punch and hammer install roll pin securing the installed components to shaft.
5. Position the pulley guard holder in location and secure using bolts and nuts.
6. Secure brake cable ferrule with nut to lever of outer half.
7. Install the two (2) pin pushers in location with the round end facing towards lever of outer half. Position puck plate and place puck into outer half.
8. Align inner and outer halves in location. Insert the through bolts with spacers. Secure with spacers and nuts.
9. Remove cotter pin from castellated nut on disc unit.
10. Check free play. If pucks are too far from disc, tighten castellated nut until a disc/puck friction is felt (fig. 1-10-18). Back off nut  $1/6$  of a turn. Install new cotter pin.



1-10-18

11. Insert brake housing through ferrule then install cable spring and adjust and secure brake cable to frame.

**NOTE:** The brake hand handle must be  $1/4$  inch from handlebar when fully applied (fig. 1-10-19).



1-10-19

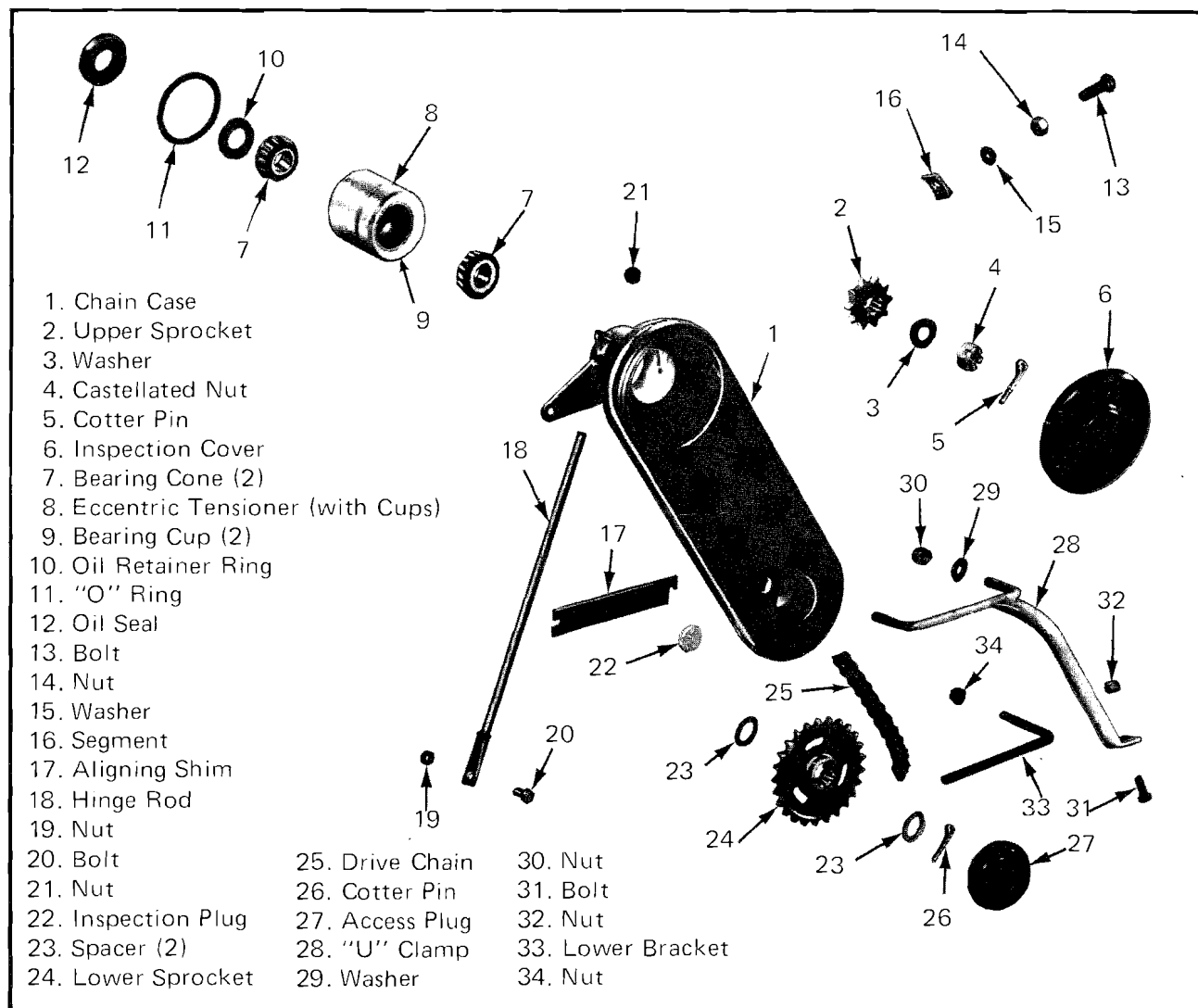
12. Install pulley guard as detailed in subsection 1-6. Install cab.

# CHAIN CASE

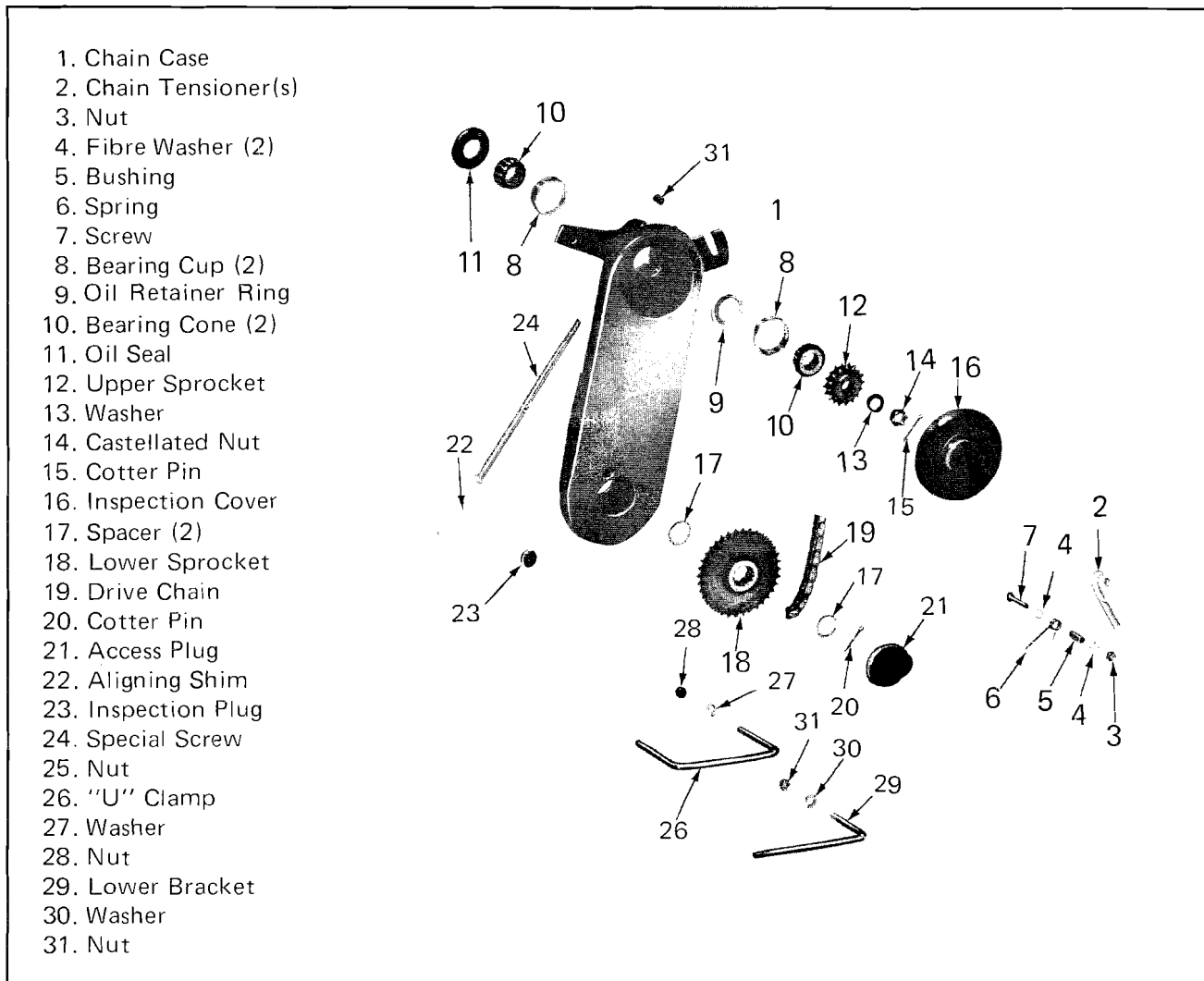
## 1-11 CHAIN CASE (All Models except Alpine/Invader and Valmont)

### (A) GENERAL

The chain case mechanism of the Ski-Doo snowmobile is connected to the driven pulley shaft and drive axle. Incorporate within the case are upper and lower sprockets, a drive chain and a chain tensioner(s). On 1970 models, chain tension is controlled by an eccentric tensioner while chain tension on 1971 models is automatically applied by tensioner(s). Oil contained within the case lubricates the chain and lower components. Chain rotation acts as an oil conveyor to lubricate the upper sprocket and bearings.



DISASSEMBLED VIEW OF 1970 CHAIN CASE

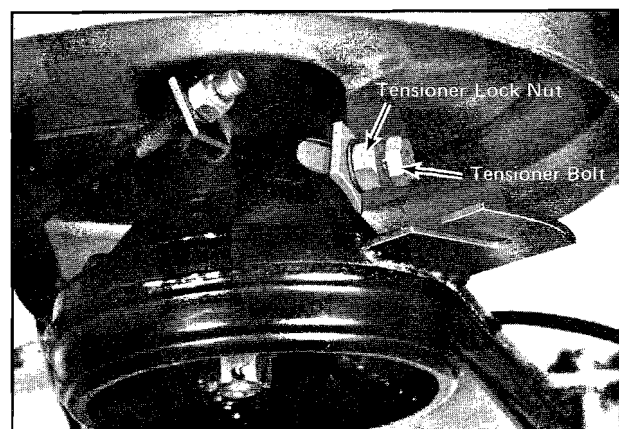


DISASSEMBLED VIEW OF 1971 CHAIN CASE

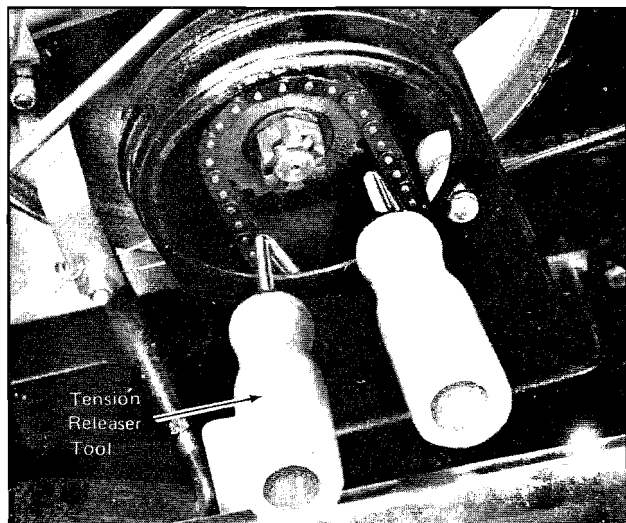
**(B) REMOVAL**

1. Tilt or remove the cab.
2. Remove pulley guard as detailed in sub-section 1-6.
3. On Elan models, remove console as detailed in Section 4.
4. Remove drive belt as described in sub-section 1-7. Remove inspection plug.
5. On 1970 models, release drive chain tension as follows:
  - (a) Partially unscrew the tensioner lock nut.

- (b) Using a soft faced hammer, gently knock the tensioner bolt counter-clockwise (fig. 1-11-1).

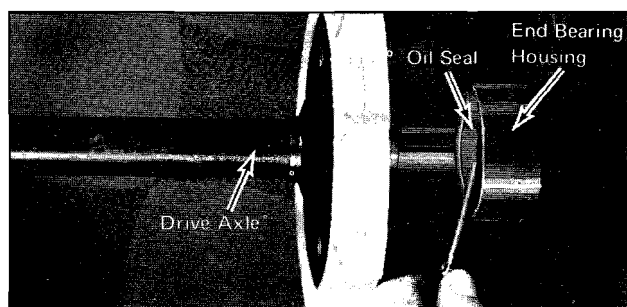


**NOTE:** On 1971 models, drive chain tension is released by inserting tension releaser tool (item 2), (fig. 1-11-2).



1-11-2

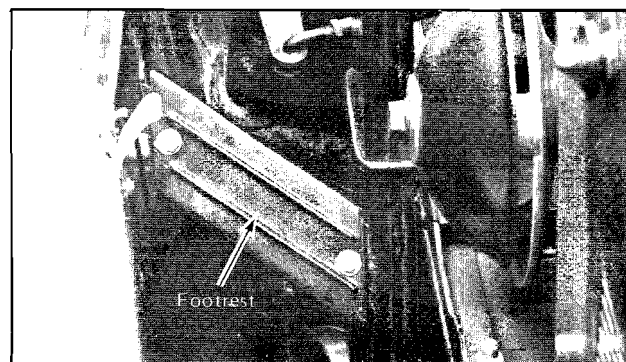
6. Raise and block rear of vehicle off the ground
7. Using special lever (item 1), release track tension by unhooking link plate springs.
8. On 1970 Nordic and T'NT models, prior to unhooking the link plate springs, remove the reinforcing cross shaft by removing capscrews and star washers securing shaft to frame.
9. Position a catch pan beneath the chain case. With a small screwdriver, pry out oil seal from chain case and drain oil into catch pan (fig. 1-11-3).



1-11-3

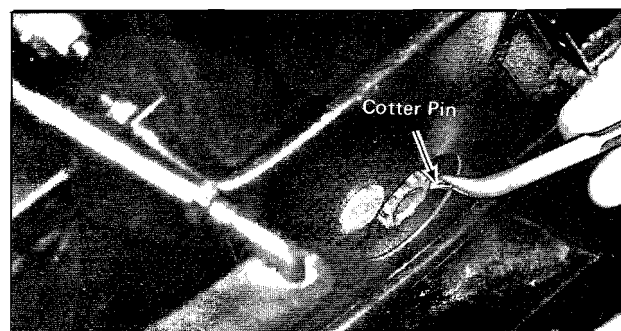
10. Disconnect brake cable and housing at brake lever.
11. On 1970 models equipped with 18 inch

track, remove footrest secured to the frame and chain case (fig. 1-11-4).



1-11-4

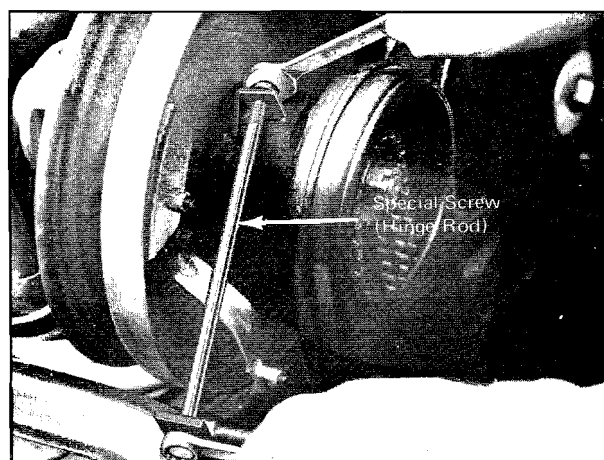
12. Pry out the lower access plug. Remove cotter pin locking lower sprocket and remove spacer (fig. 1-11-5).



1-11-5

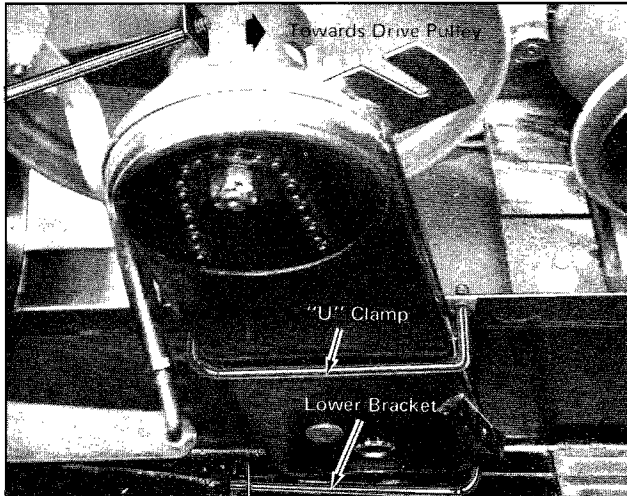
13. Remove nut on special screw (hinge rod) at chain case bracket (fig. 1-11-6).

**NOTE:** On Elan models, remove nut securing hinge rod to reinforcing cross support.



1-11-6

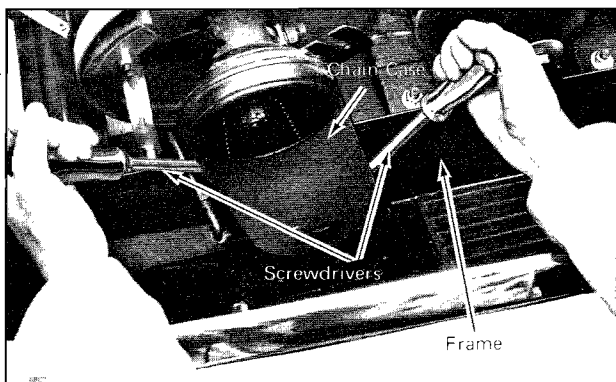
14. From the inner side of frame, remove the nut securing chain case lower bracket and remove the bracket.
15. Remove nuts, washers and "U" clamp holding the chain case to the frame. Remove the chain case shim(s) if installed. Unhook brake lever spring. Move chain case towards drive pulley to disengage special screw (hinge rod) (fig. 1-11-7).



1-11-7

16. Using two (2) large screwdrivers, inserted between chain case and frame, pry the complete assembly from vehicle (fig. 1-11-8).

**NOTE:** On 1971 models, remove chain tension releaser tool (item 2) from chain case.

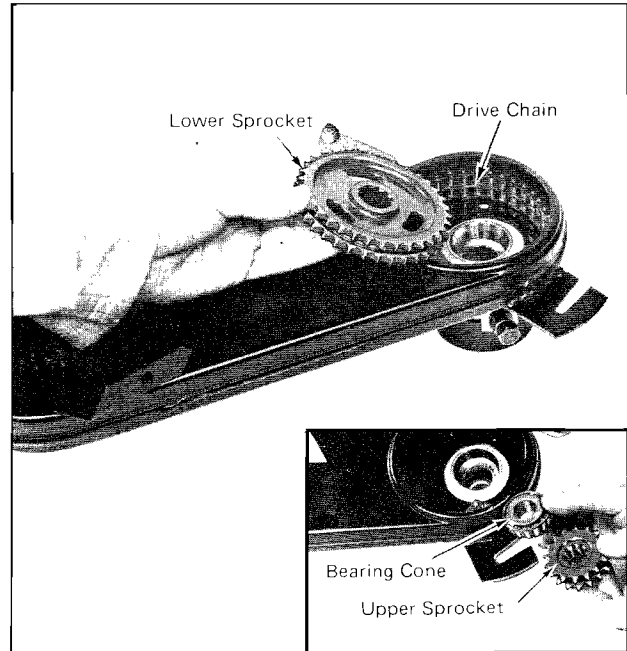


1-11-8

### (C) DISASSEMBLY (All 1970 Models)

- 1 Remove cotter pin, castellated nut and spring washer from driven pulley shaft.

2. Pull the driven pulley assembly from the chain case and lay chain case on a worktable.
3. Spread drive chain around inside of chain case and while restraining chain at access port, tilt chain case to remove the upper sprocket, bearing cone and lower sprocket through inspection port (fig. 1-11-9).

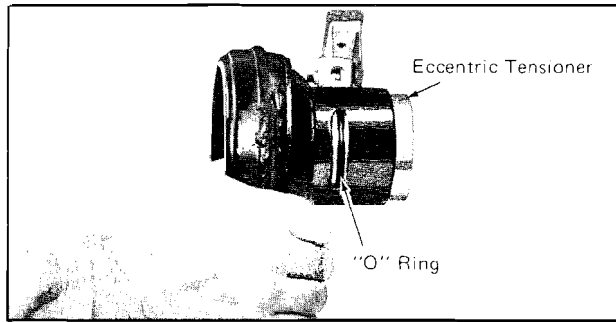


1-11-9

4. Pull the drive chain towards the inspection port and remove the chain from the chain case.
5. Remove the chain tensioner bolt assembly from the eccentric tensioner. The bolt assembly consists of a bolt, nut, washer and segment.
6. Using your thumbs, carefully push the eccentric tensioner through the back of the chain case (fig. 1-11-10). Exercise care not to damage "O" ring while removing tensioner assembly.

**NOTE:** Do not disassemble eccentric tensioner, unless components show signs of damage or wear. If required to disassemble, refer to Paragraph (D).





1-11-10

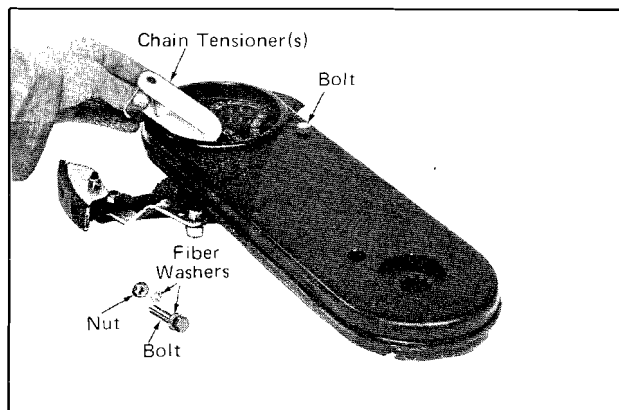
#### (D) DISASSEMBLY OF ECCENTRIC TENSIONER

1. With a suitable tool, remove the oil seal from tensioner.
2. Remove the rear bearing cone.
3. Should the bearing cups and/or oil retainer ring show signs of damage, remove cups from the tensioner using a drive punch and a hammer. Remove oil retainer ring.

#### (E) DISASSEMBLY (All 1971 Models)

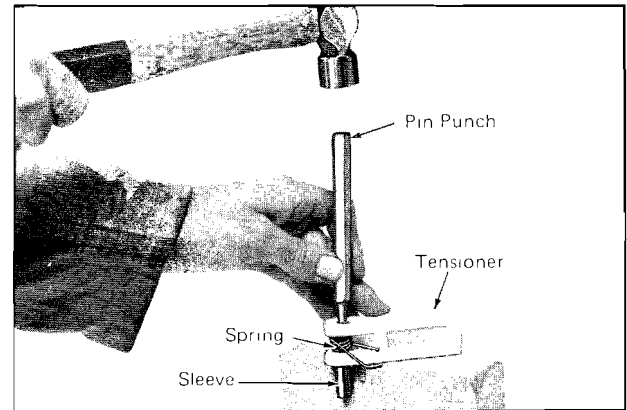
1. Remove cotter pin, castellated nut and spring washer from driven pulley shaft.
2. Pull the driven pulley assembly from the chain case and lay case on a worktable.
3. Remove bolt(s), fiber washers and nut(s) securing chain tensioner(s) located within the chain case. Remove tensioner(s) (fig. 1-11-11).

**NOTE:** On Elan models, there is only one (1) tensioner installed in chain case.



1-11-11

4. Using a pin punch, remove tensioner(s) spring by pushing on one side of sleeve. Remove spring and sleeve (fig. 1-11-12).



1-11-12

5. Spread drive chain around inside of chain case and while restraining chain at inspection port, tilt chain case so that upper sprocket, bearing cone and lower sprocket can be removed through inspection port (see fig. 1-11-9).
6. Pull the drive chain towards the inspection port and remove the chain from the chain case.

**NOTE:** Do not remove bearing seal, bearing cone, bearing cups or oil retainer ring unless damaged, and replacement is necessary. If required, remove and discard bearing seal. Remove bearing cones, bearing cups and oil retainer ring. To remove cups, use a pin punch and a soft faced hammer.

#### (F) CLEANING

1. Clean grease and dirt from tensioner(s) with a clean cloth.

**CAUTION:** Do not use cleaning solvent on tensioner(s) as it may damage the component(s).

2. Clean grease and dirt from sprockets in a separate container of cleaning solution. Use of a separate container is to prevent damage to sprocket teeth. Dry with compressed air or a clean cloth.

3. To clean bearing(s) and chain, remove grease and dirt using a soft paint brush. Immerse bearing(s) and chain in a clean container of cleaning solution. Dry with a clean cloth and lubricate the components by dipping in a clean engine Ski-Doo Oil.
4. Remove dirt and grease from interior of chain case with a clean cloth. Ensure that interior is completely dried out prior to Assembly procedure.

**WARNING:** When cleaning chain case, remove brake shoe from chain case bracket to prevent cleaning solvent from coming into contact with brake shoe and lining.

5. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth. If paint has been removed, apply a new coat using appropriate Ski-Doo Paint.

#### (G) INSPECTION

1. Visually inspect chain for cracked, damaged or missing link rollers. Replace defective chain.
2. On 1970 models, inspect eccentric tensioner assembly for defective oil seal, bearing cones, bearing cups, oil retainer ring and "O" ring. Disassemble, if required, and replace defective component(s). Refer to Paragraph (D).
3. On 1971 models, inspect for defective oil seal, bearing cones, bearing cups and oil retainer ring. Remove damaged component(s) from chain case, refer to Paragraph (E). NOTE of step 6.
4. Visually inspect sprockets for damaged or worn teeth, or distortion. If damage is evident, replace sprocket(s).
5. Inspect bearing cones (removed or in-

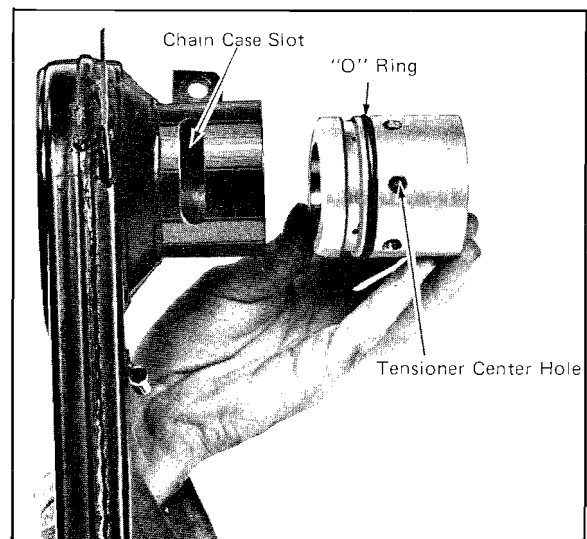
stalled) for secureness of mounting (e.g. pitted or missing roller bearings), freedom of movement and radial free play. Replace defective bearing cone(s).

6. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged component(s).
7. Visually check all other components for signs of wear, cracks and other possible damage. Replace damaged part(s).

#### (H) ASSEMBLY (All 1970 Models)

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced. If chain case required cleaning, install brake shoe lever to chain case bracket.
2. Stretch "O" ring over eccentric tensioner and install in correct "O" ring groove. Position tensioner assembly so that center hole in tensioner aligns with middle of chain case slot (fig. 1-11-13).

**NOTE:** If eccentric tensioner has been disassembled, assemble as detailed in Paragraph (J).

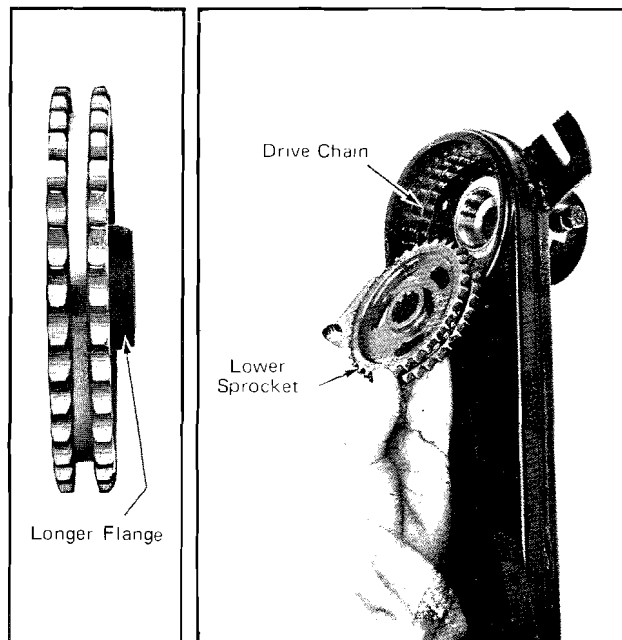


1-11-13

3. Apply a light coat of low temperature grease on eccentric tensioner. Insert tensioner into chain case until holes align

with chain case slot. Ensure that "O" ring is not damaged when passed at slot or rolls during installation.

- Place and position chain around inside of chain case. Place lower sprocket (with longer flange towards inside of case) through inspection port and holding chain, tilt case until sprocket slides down to its installation position (fig. 1-11-14).



1-11-14

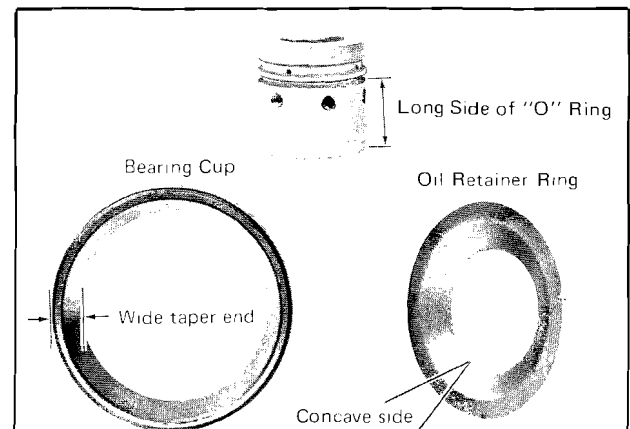
- Install bearing cone and position upper sprocket (longer flange towards inside of case) and drive chain in place.
- Holding chain and upper sprocket in position, insert driven pulley shaft through eccentric tensioner and sprocket. Install spring washer and castellated nut.

**NOTE:** Tighten castellated nut fully then back off 1/6 of a turn and lock in position with a cotter pin. It is imperative that nut is backed off or damage may occur due to a burned or seized bearing cone on driven pulley shaft.

- Install tensioner bolt assembly through slot of chain case and into center hole of eccentric tensioner. Do not tighten bolt assembly.

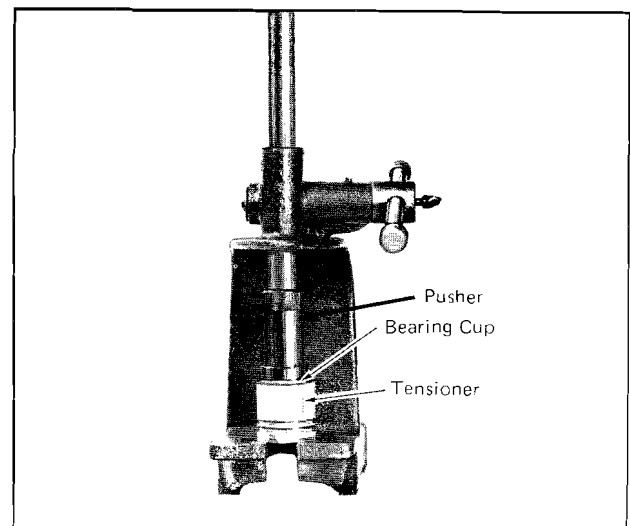
## (J) ASSEMBLY OF ECCENTRIC TENSIONER (All 1970 Models)

- On long side of "O" ring groove position oil retainer ring with concave side of ring seated on shoulder within the tensioner. Sit bearing cup in tensioner aperture. Cup must be seated so that wider taper end is facing oil retainer ring (fig. 1-11-15).



1-11-15

- Using an appropriate bearing pusher, gently press down on cup until it is seated on oil retainer ring (fig. 1-11-16).



1-11-16

- Install second bearing cup into aperture in tensioner using procedure detailed in step 2, above.
- On side of oil retainer ring, position a bearing cone into bearing cup.

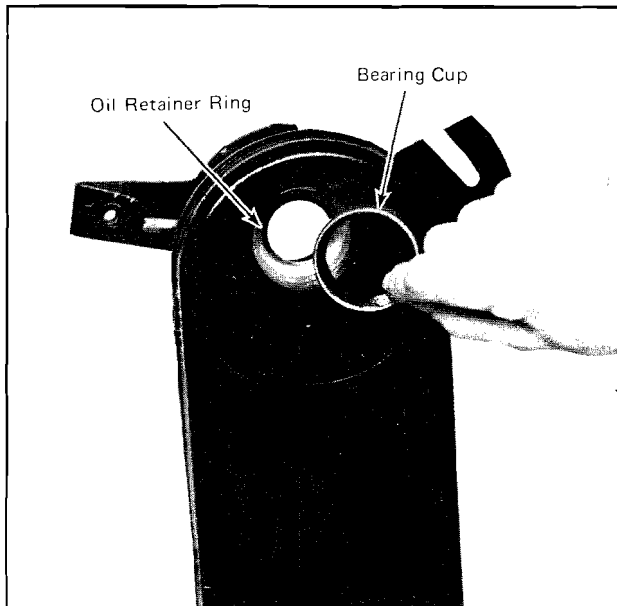
5. Position oil seal (Lip facing inside of tensioner) over bearing cone. Using an appropriate pusher, gently press oil seal down until it is seated flush with edge of tensioner.

### (K) ASSEMBLY (1971 Models only)

1. Prior to Assembly procedure, ensure all components are clean and all defective parts have been repaired or replaced. If chain case required cleaning, install brake shoe lever to chain case bracket.

**NOTE:** If bearing cup(s) and oil retainer ring has been removed and replacement is necessary use the following procedure.

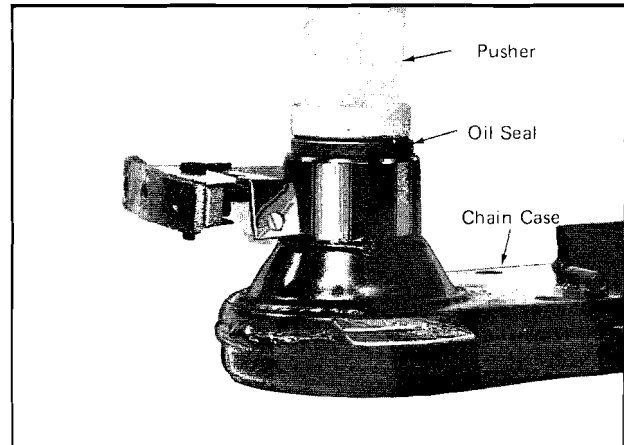
- (a) Position oil retainer ring with concave side of ring seated on shoulder within the chain case. Sit bearing cup in chain case aperture. Cup must be seated so that wider taper end is facing retainer ring (fig. 1-11-17).



1-11-17

- (b) Using an appropriate bearing pusher, push bearing cup into chain case until it is seated on oil retainer ring.
- (c) Install second bearing cup into opposite aperture in chain case using procedure detailed in step (b), above.

- (d) On opposite side of oil retainer side position a bearing cone into bearing cup.
- (e) Using an appropriate pusher, press a new oil seal into the chain case hub. Oil seal must sit flush with case hub edge (fig. 1-11-18).



1-11-18

2. Install and spread drive chain around inside of case and place lower sprocket (with longer flange towards inside of case) through inspection port. Holding chain, tilt case until sprocket slides down to its installation position (See fig. 1-11-14).
3. Install spring and sleeve into chain tensioner(s)
4. Insert tensioner(s) into chain case and secure with bolt(s), fiber washers and nut(s). Tensioner must be installed with spring end seated against side of chain case.
5. Install bearing cone and position upper sprocket (longer flange towards inside of case) and drive chain in place.
6. Holding chain and upper sprocket in position, insert driven pulley shaft through chain case and sprocket. Install spring washer and castellated nut.

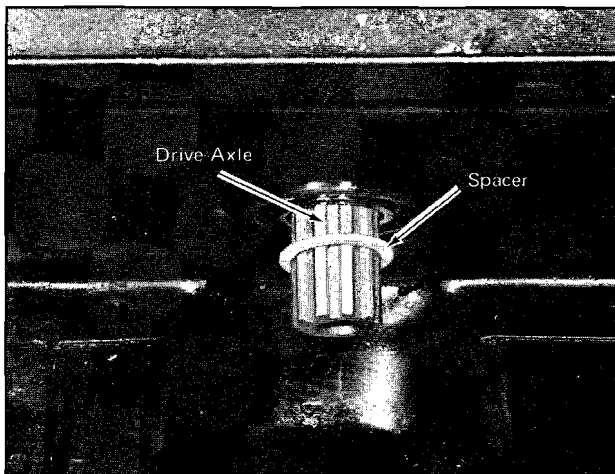
**NOTE:** Tighten castellated nut fully then back off 1/6 of a turn and lock in posi-

tion with a cotter pin. It is imperative that nut is backed off or damage may occur due to a burned or seized bearing cone on driven pulley shaft.

7. Install chain tension releaser tool (item 2) into chain case.

**(L) INSTALLATION**

1. With rear of vehicle off the ground and prior to installing chain case, ensure that spacer has remained on drive axle (fig. 1-11-19).



1-11-19

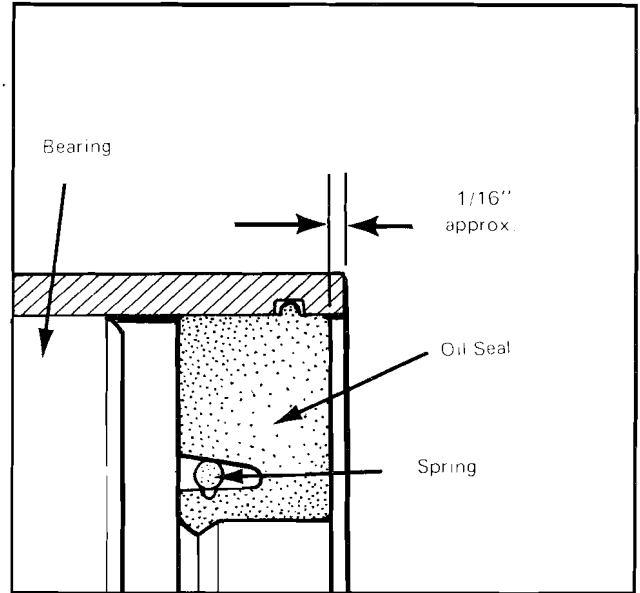
**NOTE:** The spacer is not installed on Elan models.

2. Position assembled chain case and driven pulley over drive axle. Ensure that chain case lower sprocket is properly engaged with axle splines. Push chain case onto frame.
3. Install spacer and cotter pin to secure lower sprocket to axle.
4. Install lower access plug.
5. Install special screw (hinge rod).
6. Install lower bracket, "U" clamp and previously removed aligning shims.

**NOTE:** Do not fully tighten attaching parts prior to carrying out pulley alignment.

7. Install oil seal into chain case flange.

**NOTE:** A gap of approximately 1/16 inch should exist between the end chain case flange and oil seal (fig. 1-11-20).



1-11-20

8. Carry out pulley alignment as detailed on page 1-9-11.
9. On 1970 models, adjust drive chain tension to 1/4 inch free maximum play and tighten tensioner lock nut (fig. 1-11-21.)

**NOTE:** On 1971 models, remove chain tension releaser tool (item 2), from chain case.



1-11-21

10. On 1970 models equipped with 18 inch track, install footrest and secure to frame and chain case.
11. Pour 8-ounces of Ski-Doo Chain Case Oil into chain case. Install inspection cover.

12. Connect brake cable and housing to brake lever and chain case. Connect brake lever spring.  
**NOTE:** Brake lever spring is not installed on Elan models.
13. On 1970 models, check brake adjustment as described in sub-section 1-10.
14. Using special lever (item 1), apply track tension by hooking link plate spring in spring anchors.
15. On 1970 Nordic and T'NT models, secure reinforcing cross shaft to frame using star washers and capscrews.
16. Install drive belt as detailed in sub-section 1-7.
17. Install pulley guard as detailed in sub-section 1-6.
18. On Elan models, install console as described in Section 4.
19. Close or install cab.
20. Set vehicle on the ground.

# TRANSMISSION

## 1-12 GEAR BOX (All Alpine/Invader and Valmont Models)

### (A) GENERAL

All Alpine/Invader and Valmont models are equipped with a gear box. Engine power transmitted to the driven pulley is equally transmitted to the gear box because of the common shaft passing through both assemblies. The method of interconnection and operation of the components of the gear box enables forward and reverse movement of the vehicle.

### DESCRIPTION

The gear box consists of an upper and lower housing each incorporating various components which mesh together to permit forward or reverse vehicle motion. The upper housing (cover) incorporates a gear change lever, a gear change fork and an index rod. The gear change fork incorporates a spring-loaded ball which engages in one of three grooves of the index rod. The major components of the lower housing are a drive shaft assembly, a lay shaft assembly, a tensioner axle and a lower sprocket which are interconnected via a drive chain. The drive chain is seated on individual sprockets of each assembly.

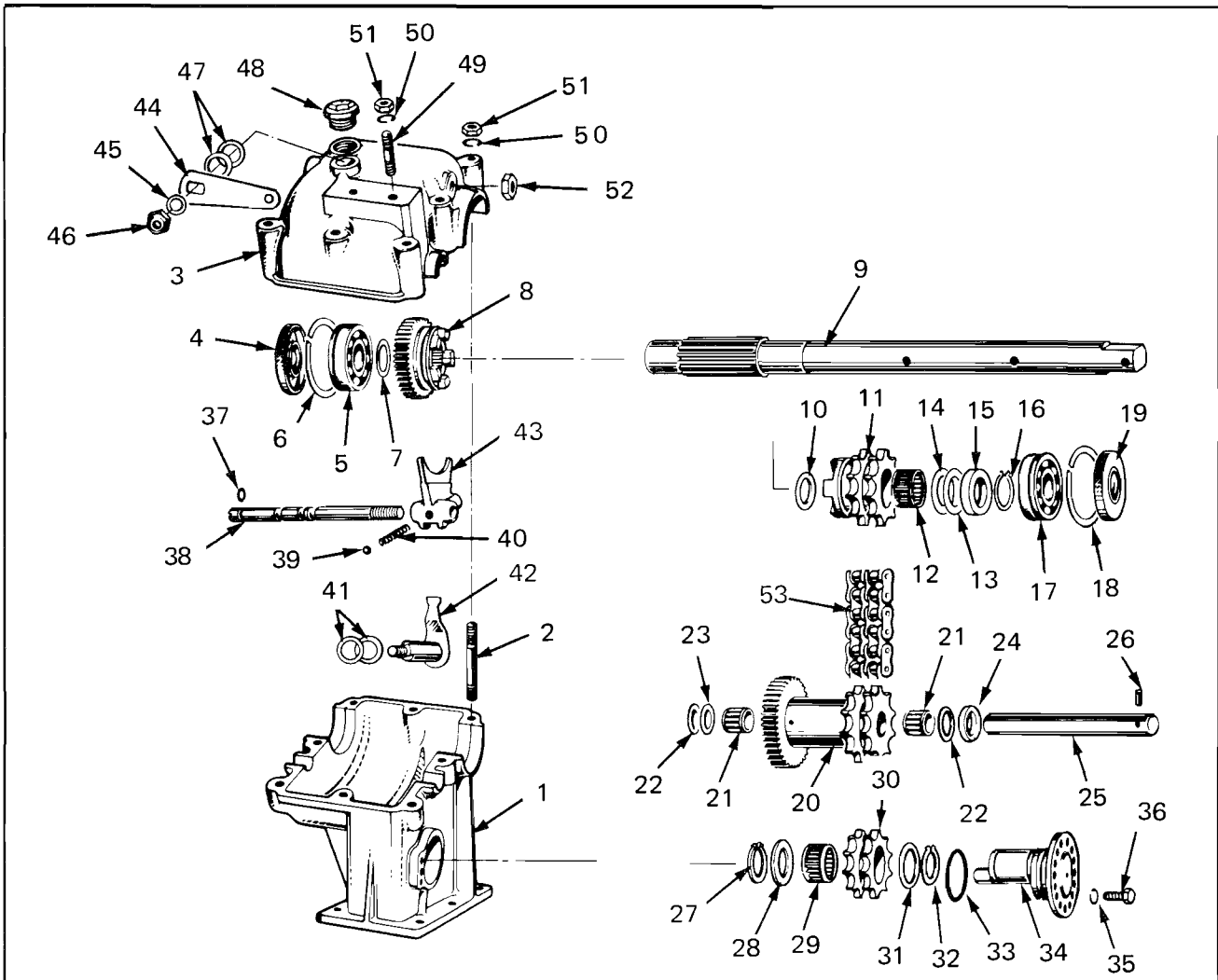
1-12

### PRINCIPLE OF OPERATION

Positioning of the controlling transmission rod selects one three of operating positions of the gear box; Forward, Neutral or Reverse. The rotating direction of the chain entrainment is determined through the position of a sliding gear installed on the drive shaft. The position and engagement of the sliding gear is controlled by the gear change fork lever incorporated on the index rod of the upper housing (cover). Each groove in the index rod represents an operating direction of the vehicle, e.g. Forward, Neutral or Reverse.

- Forward:** the sliding gear is slid along the drive shaft to become interlocked with the drive notches of the sprocket.
- Neutral:** The sliding gear is positioned midway between the shift sprocket and the lay shaft gear.
- Reverse:** The sliding gear is slid to the extremity of the drive shaft and becomes engaged with the teeth of the lay shaft gear.

Drive chain tension is controlled through the eccentricity of the tensioner axle.



- |                                      |                        |                       |
|--------------------------------------|------------------------|-----------------------|
| 1. Lower Housing Assembly            | 18. Groove Ring        | 36. Capscrew          |
| 2. Stud                              | 19. Oil Seal           | 37. "O" Ring          |
| 3. Upper Housing<br>(Gear Box Cover) | 20. Lay Shaft Gear     | 38. Index Rod         |
| 4. Oil Seal                          | 21. Needle Cage        | 39. Ball              |
| 5. Ball Bearing                      | 22. Shim               | 40. Spring            |
| 6. Groove Ring                       | 23. Shim               | 41. Shim              |
| 7. Shim                              | 24. Distance Sleeve    | 42. Gear Change Shaft |
| 8. Sliding Gear                      | 25. Lay Axle           | 43. Gear Change Fork  |
| 9. Drive Shaft                       | 26. Dowel Tube         | 44. Gear Change Lever |
| 10. Washer                           | 27. Circlip            | 45. Washer            |
| 11. Shift Sprocket                   | 28. Washer             | 46. Lock Nut          |
| 12. Needle Cage                      | 29. Needle Cage        | 47. Shim              |
| 13. Shim                             | 30. Tensioner Sprocket | 48. Vent Plug         |
| 14. Shim                             | 31. Washer             | 49. Stud              |
| 15. Distance Sleeve                  | 32. Circlip            | 50. Lock Washer       |
| 16. Circlip                          | 33. "O" Ring           | 51. Nut               |
| 17. Ball Bearing                     | 34. Tensioner Axle     | 52. Nut               |
|                                      | 35. Washer             | 53. Drive Chain       |

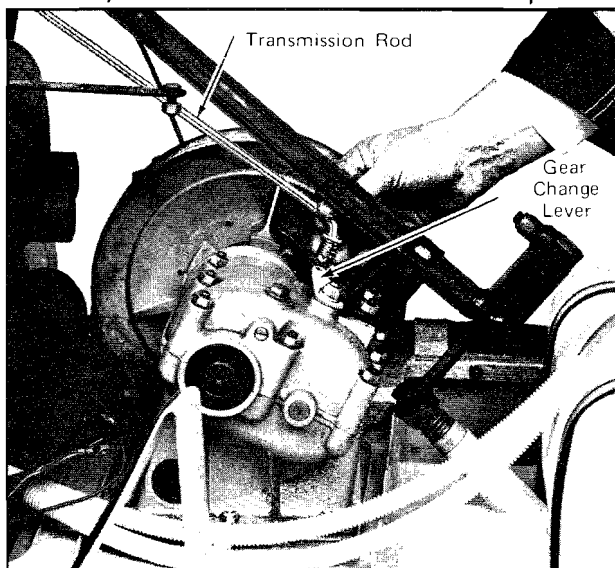
DISASSEMBLED VIEW OF GEAR BOX



**(B) REMOVAL**

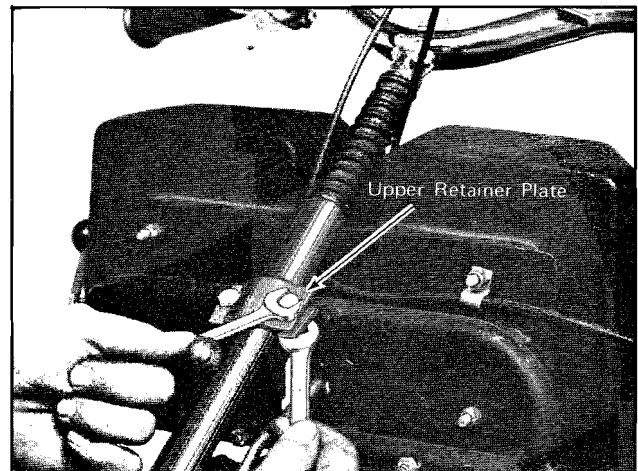
1. Remove cab. Remove console on Valmont models. Lift and block vehicle off the ground.
2. Remove pulley guard as detailed in subsection 1-6.
3. Remove drive belt as detailed in subsection 1-7.
4. Remove muffler from engine.
5. Disconnect the brake and throttle cables and housings from levers at handle bar.
6. Disconnect the transmission rod from the gear change lever by removing a cotter pin, spring and washer (fig. 1-12-1).

**NOTE:** On all 1970 Alpine/Invader models, pull the transmission rod rearward to permit removal of gear box from vehicle. On 1971 Alpine/Valmont models, lift disconnected end of rod upward.



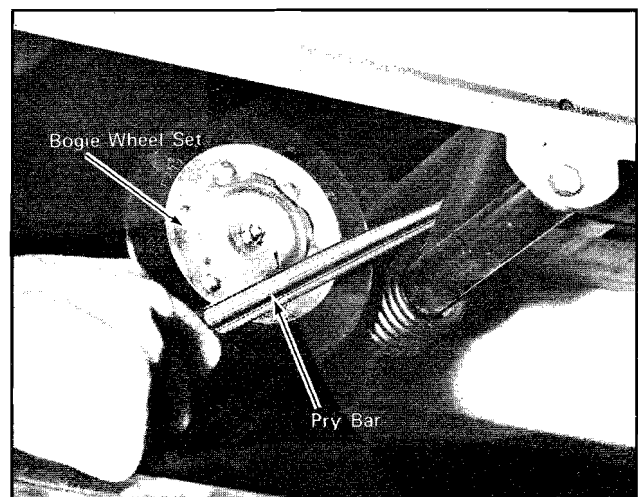
1-12-1

7. Disconnect the brake cable housing from the brake lever ferrule located at the disc brake mechanism.
8. Remove nuts securing lower bracket to the gear box cover. Slacken the upper retainer plate bolts and nuts (fig. 1-12-2) and pull the steering column rearward out of gear box area.



1-12-2

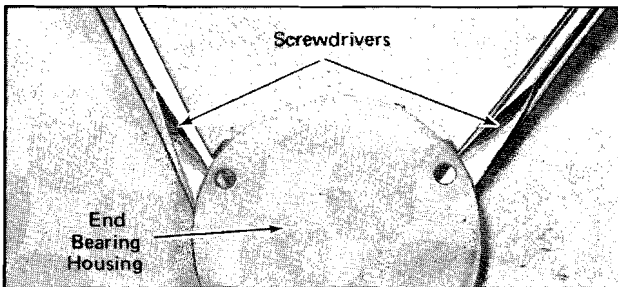
9. Pry the inspection cover from gear box.
10. Remove the drive chain tensioner cap-screw and washer and rotate tensioner plate to obtain maximum chain slackness.
11. Using special lever (item 1), unhook link plate springs to release track tension. Insert a pry bar between structural members of center(s) bogie wheel set and pry set upward to reversed installation position (fig. 1-12-3). Reverse remaining bogie wheel sets.



1-12-3

12. Remove the rear hubs as detailed in subsection 1-4.
13. Slightly tilt vehicle either on left or right side and place a catch pan directly beneath lowest end bearing housing oil seal.

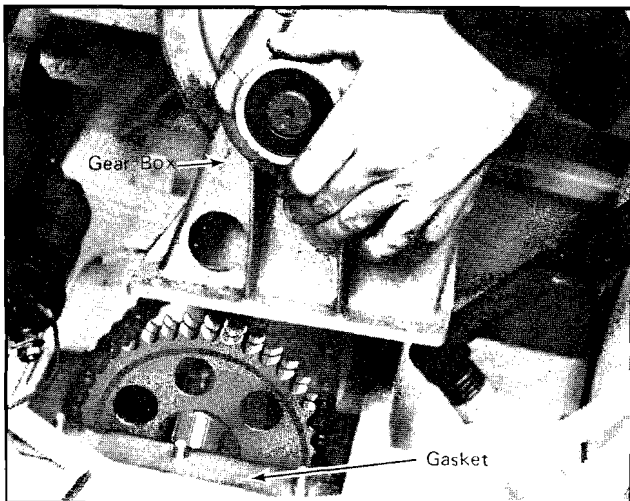
14. With a small screwdriver, pry out oil seal from lowest end bearing housing and drain gear box oil. Remove remaining oil seals from end bearing housing and center frame.
15. Remove the three (3) capscrews securing each end bearing housing to frame. With two (2) screwdrivers inserted between the housing and frame, pry out housings (fig. 1-12-4).



1-12-4

16. Release drive axle sprocket teeth from track notches while at the same time pulling the drive axle towards end bearing side of frame. This action will disengage the axle splines from the lower sprocket of the gear box. Allow drive axles to remain within the track area.
17. Remove the six (6) nuts securing the gear box to frame. Remove gear box and gasket (fig. 1-12-5).

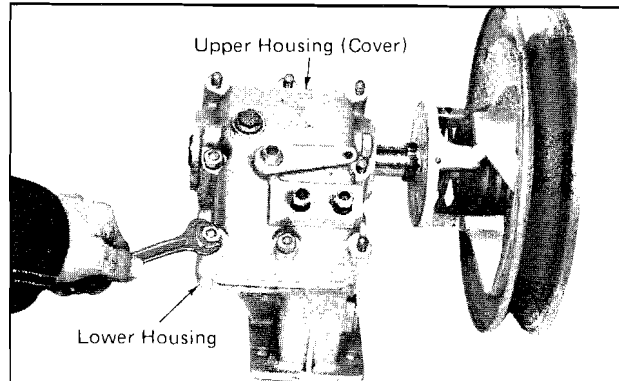
**NOTE:** On all 1970 models, remove bottom plate and gasket.



1-12-5

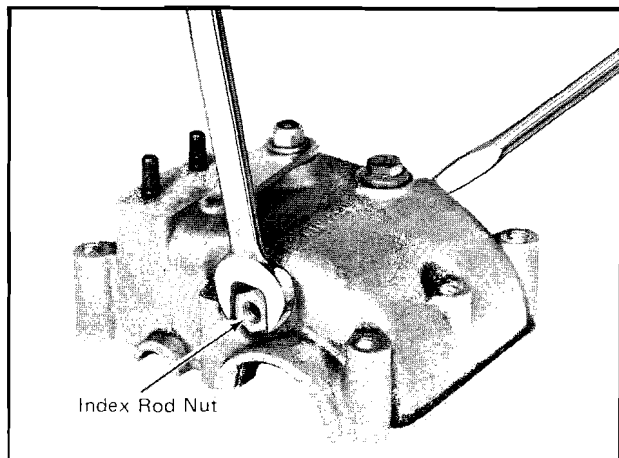
**(C) DISASSEMBLY**

1. Remove gear box lower sprocket from the drive chain.
2. Remove the eight (8) nuts securing the upper housing (cover) to lower housing assembly (fig. 1-12-6).



1-12-6

3. To loosen the bonding between the upper housing and lower housing, tap the housing with a soft faced hammer and lift the cover free.
4. To disassemble the upper housing (cover), use the following procedure:
  - (a) Hold one end of the index rod with a screwdriver and remove the nut from the rod (fig. 1-12-7).

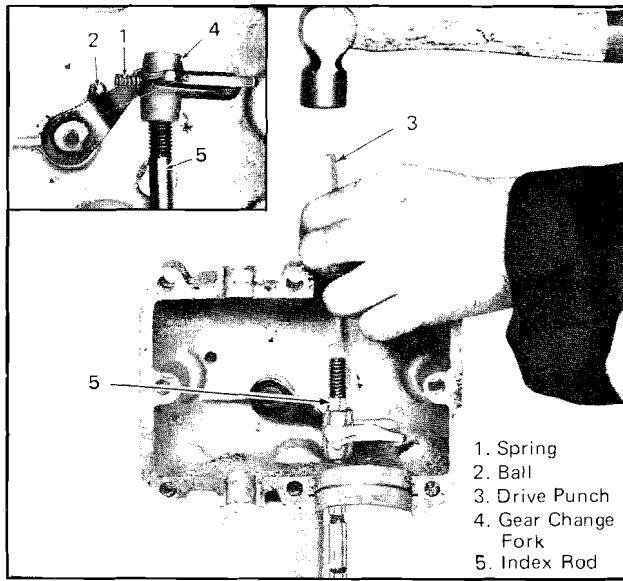


1-12-7

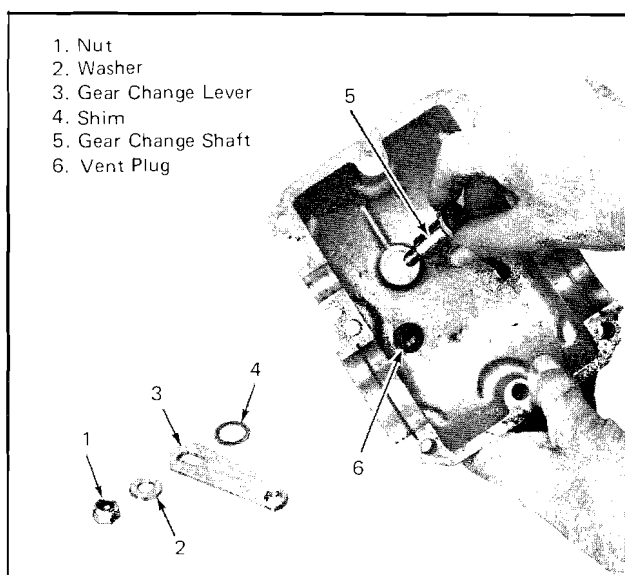
- (b) Unscrew the index rod from the housing. Using a pin punch, drive the rod through the gear change fork until the threaded portion of the rod is approximately 1/4" into the fork.

Firmly hold the fork and carefully pull the rod from the fork and housing (fig. 1-12-8).

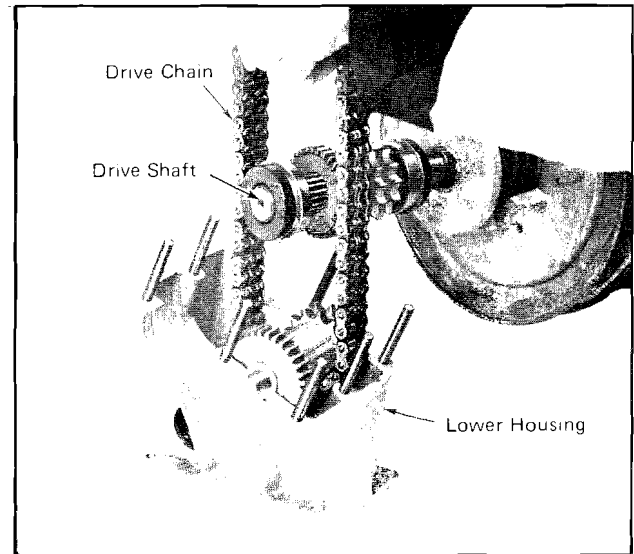
**WARNING:** The gear change fork incorporates a spring-loaded ball. Ensure that spring and ball do not fly out during removal of index rod. Remove "O" ring from rod.



(c) Remove the nut, washer, gear change shaft assembly and shim(s). Pull the gear change shaft assembly from the housing cover. Remove the vent plug (fig. 1-12-9).

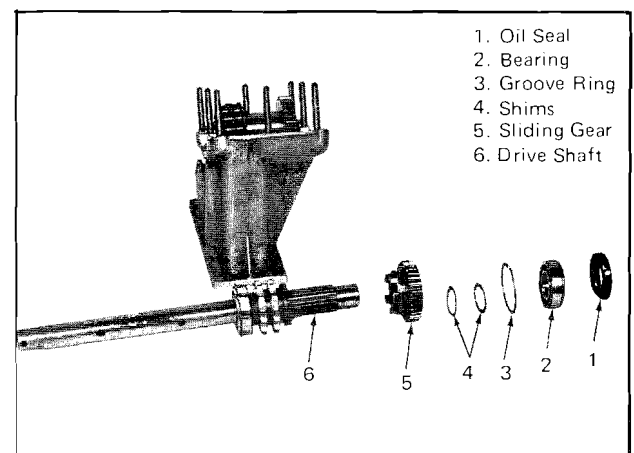


5. Lift the drive chain from the sprocket and remove the drive shaft assembly from the lower housing (fig. 1-12-10)



6. To disassemble the drive shaft assembly use the following procedure:

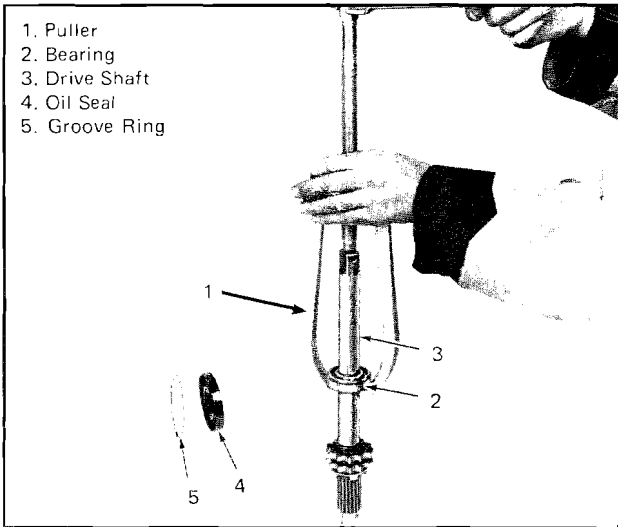
- (a) Remove brake and bracket assembly (refer to sub-section 1-10) and driven pulley (refer to sub-section 1-9).
- (b) Remove the oil seal, ball bearing with groove ring, shim(s) and sliding gear from splined end of shaft (fig. 1-12-11). Remove groove ring from bearing.



(c) Remove the oil seal, and groove ring from the driven pulley side of shaft. Remove groove ring from bearing (see fig. 1-12-12).

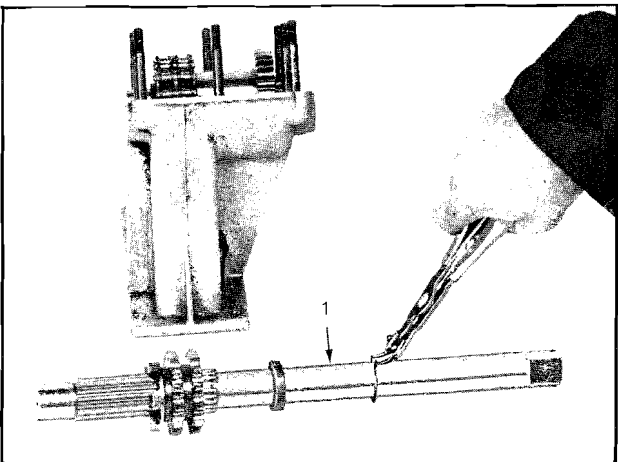
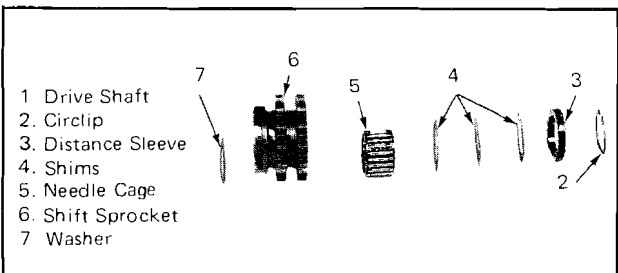
(d) Using an appropriate bearing puller, remove the bearing from the driven pulley side of shaft (fig. 1-12-12).

**NOTE:** The bearing must always be pulled by the inner race.



1-12-12

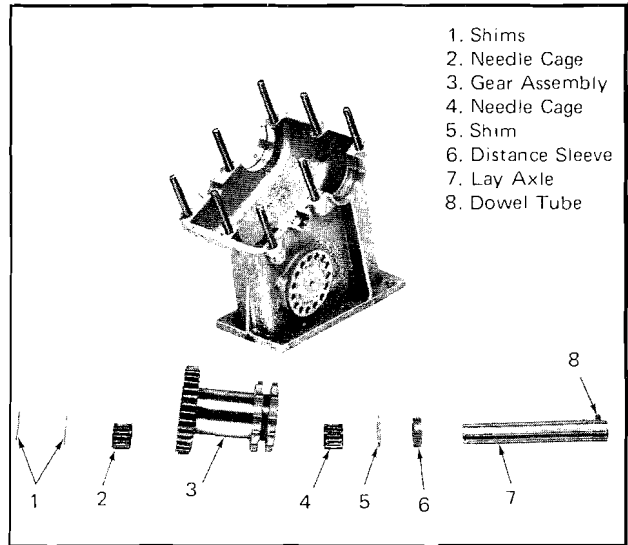
(e) Using needle pliers, remove a circlip from drive shaft. Remove the distance sleeve, shims, needle cage, shift sprocket and washer from the shaft (fig. 1-12-13).



1-12-13

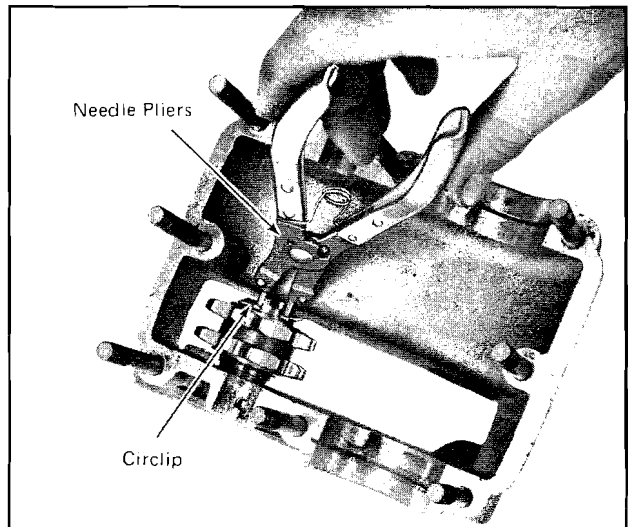
7. Lift the drive chain and remove the lay shaft from the lower housing. Disassemble the lay shaft by removing shims, needle cage, gear assembly, needle cage, shims and distance sleeve from lay axle (fig. 1-12-14). Remove the drive chain.

**NOTE:** Do not remove the dowel tube from lay axle unless damaged and replacement is necessary.



1-12-14

8. Using needle pliers, unlock two (2) circlips on the tensioner axle assembly (fig. 1-12-15).

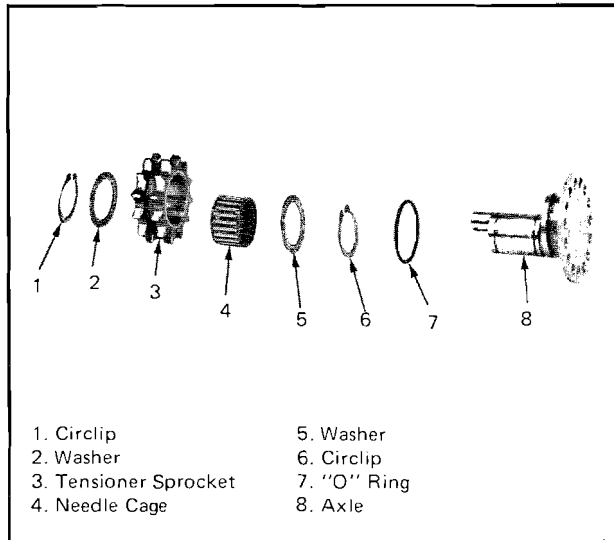


1-12-15

9. Partially withdraw tensioner axle. Remove circlip, washer, tensioner sprocket, needle cage, washer and circlip. Pull the

axle from the lower housing and remove the "O" ring from the axle of the tensioner (fig. 1-12-16).

**NOTE:** Do not unscrew studs from lower housing unless damaged, and replacement is necessary.



1-12-16

#### (D) CLEANING

1. Immerse each gear and sprocket into a container of cleaning solvent. Dry using compressed air.
2. Remove dirt and grease from interior and exterior surfaces of upper and lower housings using a firm bristle brush. Ensure that interiors are completely dried out prior to Assembly procedure.
3. Remove rust formation or dirt on driven pulley shaft using fine steel wool. Wipe shaft using a clean dry cloth.
4. To clean bearings, remove grease and dirt using a soft paint brush. Immerse all bearings in a clean container of cleaning solution. Dry with a clean cloth and lubricate all bearings by dipping in clean engine Ski-Doo oil.

5. Clean drive chain with a soft paint brush and lubricate in clean engine Ski-Doo oil.
6. Clean dirt deposits from oil seals with a clean cloth.

**CAUTION:** Do not use cleaning solvent on oil seals as it may permanently damage the part(s).

7. Place all other components in a container of cleaning solvent. Remove rust or any other deposits using a firm bristle brush. Dry using a clean cloth.

#### (E) INSPECTION

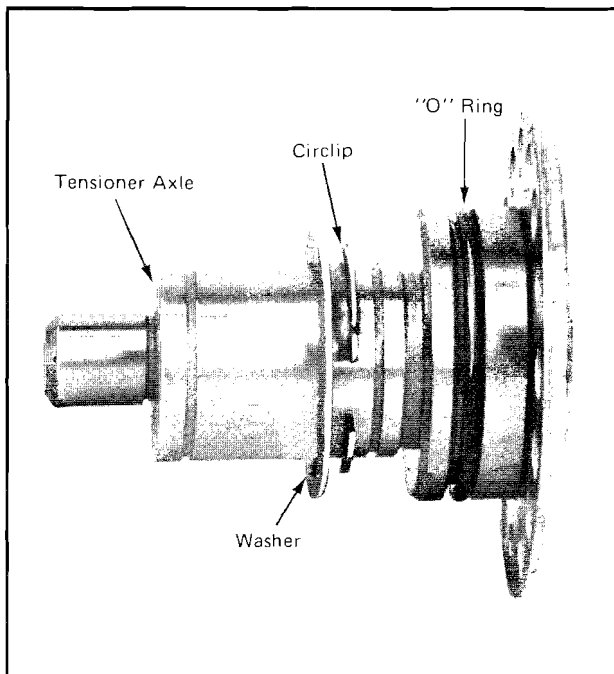
1. Check general condition of chain linkage. Visually inspect drive chain for cracked, damaged or missing link rollers. Inspect secureness of riveted heads of double link pins or single pins.
2. Visually inspect oil seals for cuts or other damage. Inspect oil seal spring. If spring is damaged or stretched, it must be replaced. Replace defective oil seal(s).  
  
Inspect sprockets and gears for damage or worn teeth, or spline distortion. If damaged, replace defective component(s).
4. Inspect general condition of all bearings (e.g. pitted or missing roller bearings), freedom of movement and radial free play. Replace defective bearing(s).
5. Inspect drive shaft for deflection, worn or twisted splines. If splines are damaged drive shaft must be replaced.
6. Inspect all threaded parts for stripped, crossed or otherwise damaged threads. Replace damaged part(s).
7. Visually inspect all other components

for signs of wear, cracks and other possible damage. Replace defective part(s).

### (E) ASSEMBLY

1. Prior to assembly procedure, ensure all components are clean and all damaged parts have been repaired or replaced.
2. To assemble and install the tensioner axle in the lower housing use the following procedure.
  - (a) Position a new "O" ring into appropriate groove in tensioner axle. Slide a circlip and washer on the axle (fig. 1-12-17).

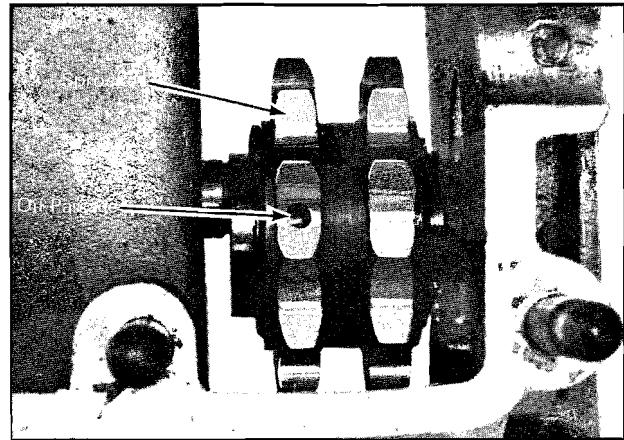
**NOTE:** Do not seat the circlip into its notch at this time.



1-12-17

- (b) Insert the axle through the larger hole in side of lower housing assembly.
- (c) Through upper aperture of lower housing insert the sprocket with needle cage, washer and circlip onto the tensioner axle.

**NOTE:** The oil passage in sprocket must be installed as shown in figure 1-12-18.



1-12-18

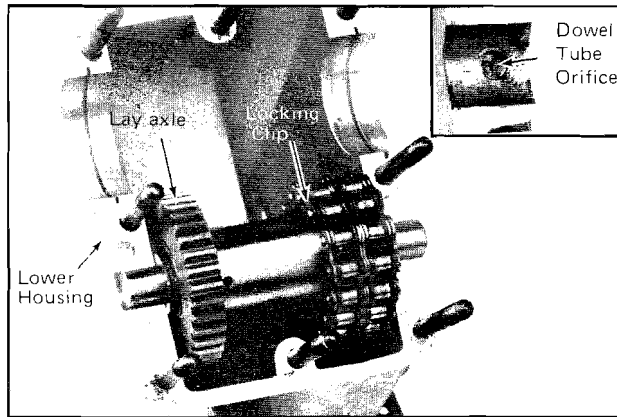
- (d) Pull the sprocket towards tensioner plate of axle and at the same time, push the axle into correct location within housing. This pull/push action will properly seat the axle in position and the circlip into the axle notch.
  - (e) Place the sprocket washer on rim of eccentric portion of sprocket and position the second circlip into the notch.
3. To assemble and install the lay gear into the lower housing use the following procedure:

**NOTE:** If the dowel tube has been removed from the lay axle, install the tube into axle using a soft faced hammer.

- (a) Slide the distance sleeve, shim (1mm), needle cage, lay gear assembly, needle cage and shims onto the lay shaft. (See fig. 1-12-14).
- (b) Place the assembled lay gear into position on lower housing.
- (c) Using a feeler gauge, check end play between assembled lay shaft and walls of lower housing. Endplay must be between 0.006 and 0.012 inch. If end play is not within tolerance, remove end shim and add required thickness of shim(s) to take up end play. Reinstall previously removed end shim and place drive chain over sprocket teeth. Place the assembled lay gear into location making sure

that the dowel tube sits in the orifice in the lower housing (fig. 1-12-19).

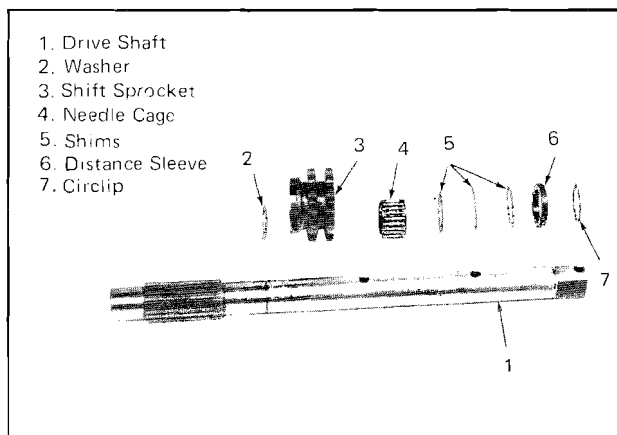
**NOTE:** Drive chain must be positioned on lay gear sprocket so that locking clip is facing the lay gear.



1-12-19

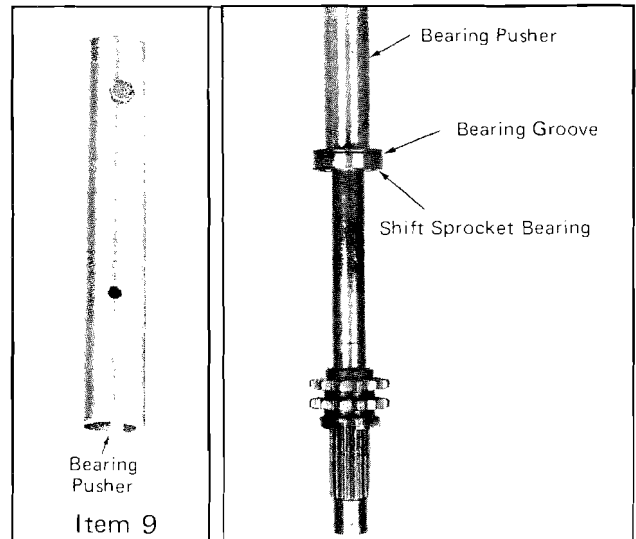
4. To assemble and install the drive shaft assembly into the lower housing, use the following procedure:

- (a) Slide the washer, shift sprocket, needle cage, shims, distance sleeve and circlip onto the driven pulley side of shaft.
- (b) Using a feeler gauge, check total free play between components installed on shaft. Free play must not exceed 0.006 to 0.012 inch. If free play is not within tolerance, remove circlip and distance sleeve from shaft. Add required thickness of shim to take up free play. Install distance sleeve and circlip on shaft (fig. 1-12-20).



1-12-20

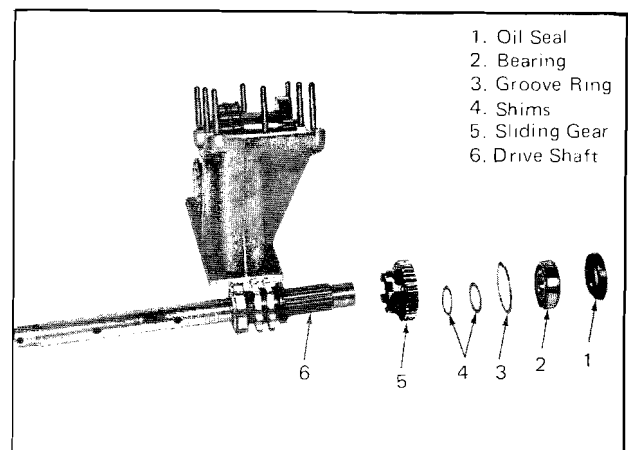
- (c) Position the shift sprocket bearing on the drive shaft with groove of bearing on driven pulley side of shaft. Using a special bearing pusher (item 9), push the bearing into place on shaft (fig. 1-12-21). Install the groove ring into location in bearing groove. Slide the oil seal onto shaft. Ensure that oil seal spring is facing bearing.



1-12-21

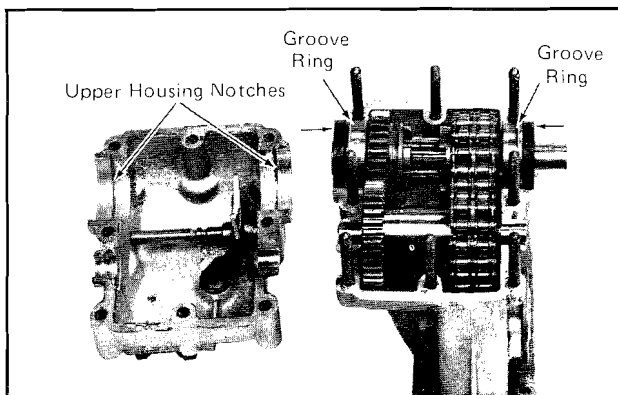
- (d) Slide the sliding gear, shim, bearing with groove ring and oil seal, on splined end of shaft (fig. 1-12-22).

**NOTE:** Ensure bearing is placed on shaft with groove ring farthest away from sliding gear and oil seal spring of oil seal is facing bearing.



1-12-22

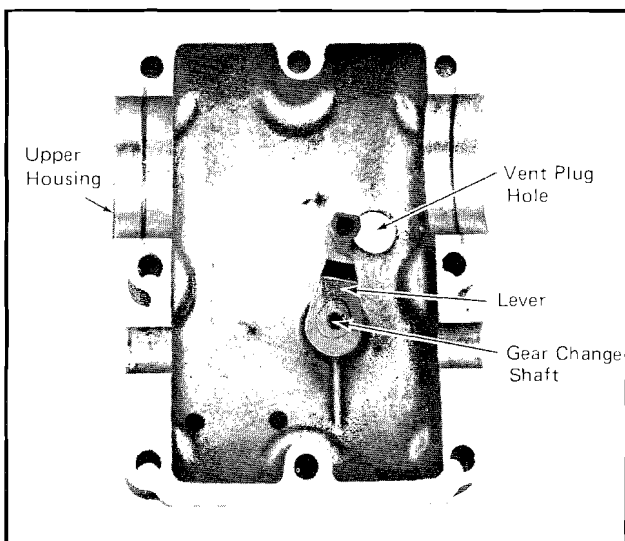
- (e) Install driven pulley (refer sub-section 1-9) and disc brake mechanism (refer sub-section 1-10) on the drive shaft.
- (f) Lift the drive chain and pass the geared end of shaft onto the lower housing. Ensure the groove ring on the bearings is correctly seated in the housing grooves
- (g) Sit the drive chain over shift sprocket teeth.
- (h) Apply hand pressure on outer side of oil seals to push and sit seals tight against the bearings (fig. 1-12-23).



1-12-23

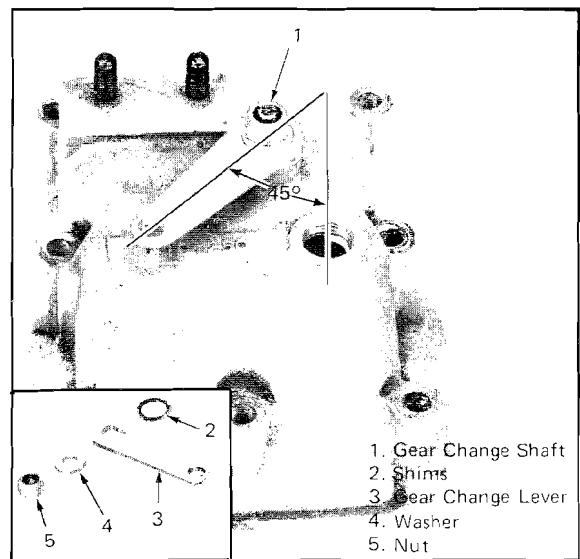
5. To assemble the upper housing (cover) use the following procedure:

- (a) Insert the gear change shaft through hole of upper housing (fig. 1-12-24). Ensure that lever of gear change shaft is positioned toward vent plug hole.



1-12-24

- (b) Using a soft faced hammer, carefully tap shaft into position.
- (c) Install shim, gear change lever, washer, gear shaft. Torque nut to 200 inch pounds.
- (d) Using a feeler gauge, check that free play of gear change shaft is within tolerance of 0.006 at 0.012 inch. If free play is not within tolerance, record discrepancy. Remove nut, washer, gear change lever, shim and gear change shaft. Divide discrepancy by 2 and install required thickness of shim on gear change shaft. Install shaft into upper housing. Install standard shim and additional thickness of shim on gear change shaft. Install gear change lever on shouldered end of change shaft so that lever and vent plug hole form a 45 degree angle. Install washer and nut. Torque nut to 200 inch pounds (fig. 1-12-25).

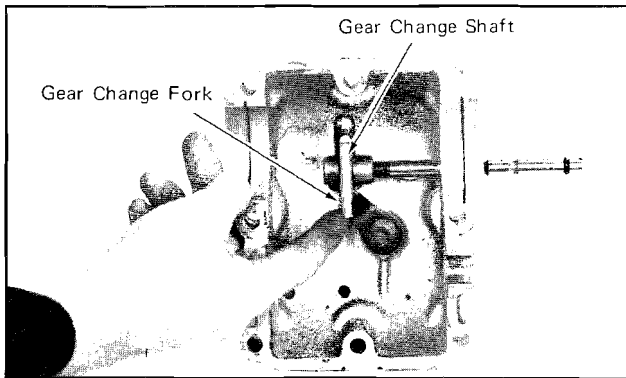


1-12-25

- (e) Position a new "O" ring on index rod. Partially insert the threaded end of index rod through hole adjacent to vent plug hole in upper housing.
- (f) Position the gear change fork on the gear change shaft assembly. Push the index rod approximately 1/4 inch into the change fork.

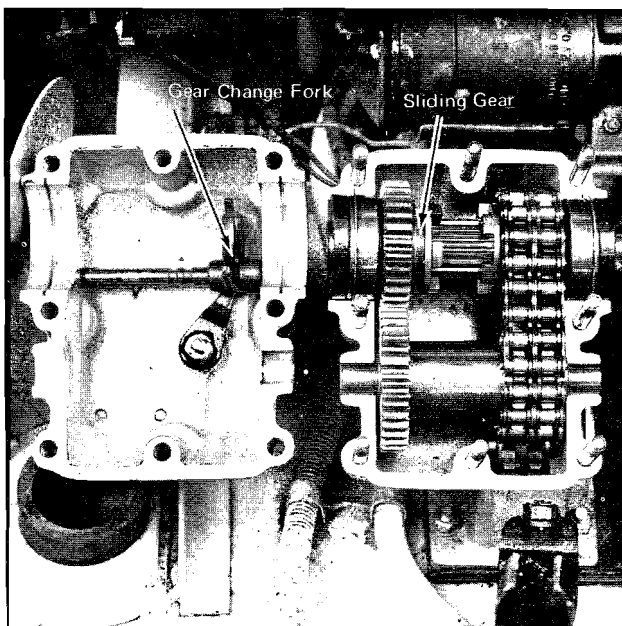


- (g) Insert the spring and ball bearing into hole of gear change fork (fig. 1-12-26). Using a suitable tool, depress the ball and spring so that the index rod can be totally inserted through the gear change fork.



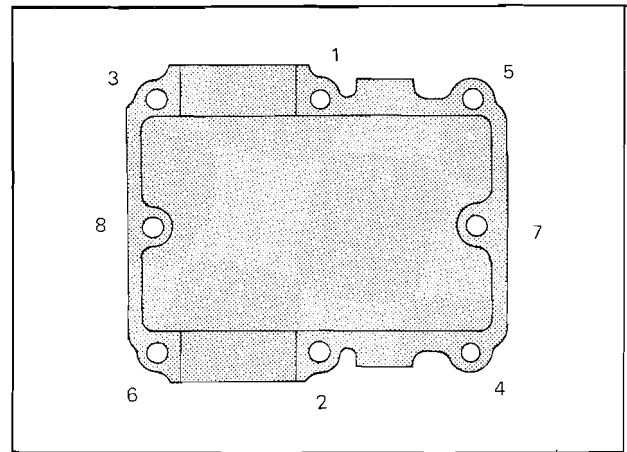
1-12-26

- (h) Screw the index rod into threaded hole of upper housing. Secure assembly with appropriate nut.
- (i) Apply a light coating of L700 Crankcase Glue on contact surfaces of upper and lower housings.
- (j) Push the sliding gear against drive shaft bearing and push the gear change fork towards the vent plug hole until ball engages with appropriate groove in index rod (fig. 1-12-27).



1-12-27

- (k) Position the upper housing over studs of lower housing and using a soft faced hammer, carefully tap the upper housing into position.
- (l) Install the eight (8) lockwashers and nuts. Securing nuts must be crossed torqued to 250 inch pounds in the sequence shown in figure 1-12-28.



1-12-28

**(F) INSTALLATION**

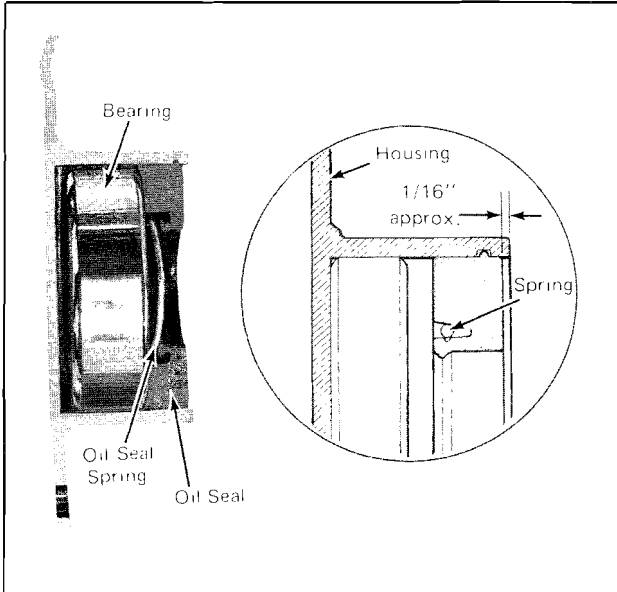
1. On all 1970 models, correctly position gasket and bottom plate over studs secured to frame. Place second gasket on bottom plate.

**NOTE:** On 1971 models, position gasket on frame studs.

2. Place lower sprocket in drive chain.
3. Secure gear box to frame with six (6) nuts. Torque nuts to 180 to 200 inch pounds.
4. From the left side of vehicle, insert the drive axle within the track. Push the end bearing through the orifice in right side of frame. Pull the splined end of axle into chain case lower sprocket. Install opposite drive axle.
5. Position each end bearing housing into frame and over axle bearing and secure the housings to frame with three (3) capscrews.

6. Install oil seals.

**NOTE:** A gap of approximately 1/16 inch should exist between the end of the bearing housing and the oil seal (fig. 1-12-29).



1-12-29

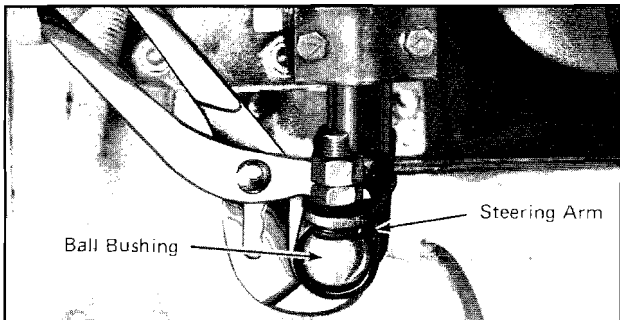
7. Install rear hubs as described in subsection 1-3.

8. Insert a pry bar between structural members of bogie wheel set and reverse each set to its original position.

9. Hook up transmission rod to gear box lever and secure with spring, washer and a new cotter pin.

10. Lower steering column and insert ball bushing into steering arm.

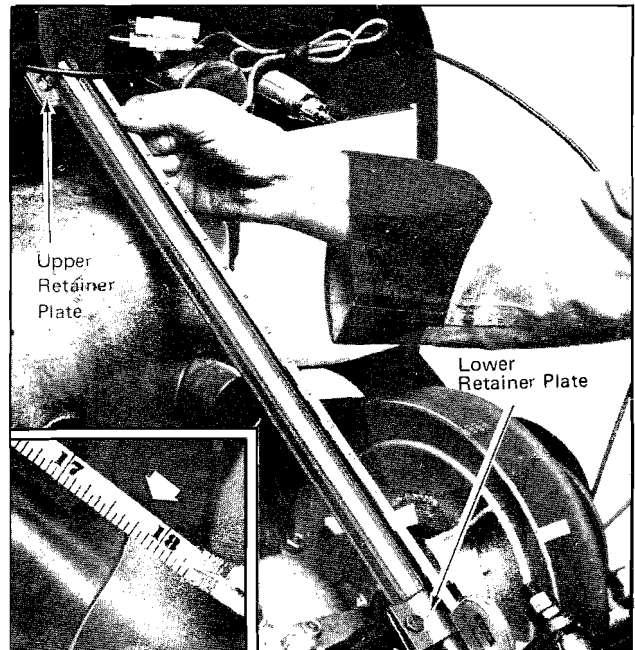
**NOTE:** If difficulty is encountered, use pliers to align column ball bushing and steering arm (fig. 1-12-30).



1-12-30

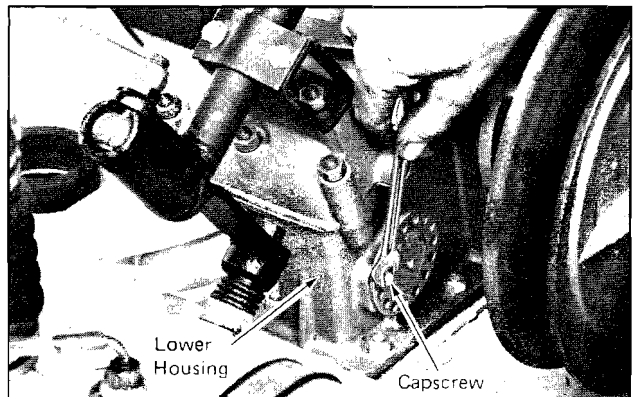
11. Secure steering column bracket to gear box cover with two (2) nuts. Tighten bolts and nuts securing upper retainer plate.

**NOTE:** On 1970 Alpine/Invader models, the distance between the upper retainer plate and the gear box bracket must be 17-3/4 inches. On 1971 Alpine/Valmont models, the distance must be 15-1/2 inches (fig. 1-12-31).



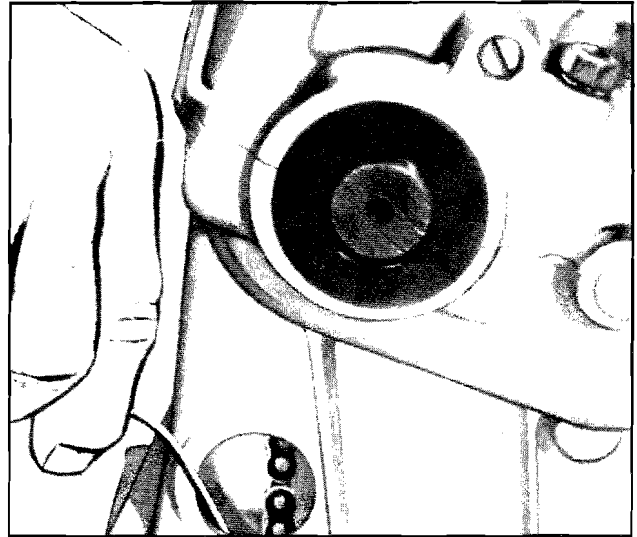
1-12-31

12. Remove capscrew and lock washer. Rotate the tensioner axle, clockwise or counterclockwise, to obtain 1/4 inch maximum free play of drive chain. Install lockwasher and capscrew. Tighten capscrew (fig. 1-12-32).



1-12-32

13. Connect throttle and brake cables and housings at handlebar.
14. Install muffler to engine.
15. Connect brake cable housing to brake lever ferrule located at the brake mechanism. Check that brake applies fully with brake lever 1/4 inch from handlebar grip.
16. Fill the gear box with Ski-Doo Chain Case Oil.  
**NOTE:** On 399R and 399ER models, the oil capacity of the gear box is 12 ounces or 2-1/4 inches when checked with rigid dipstick. The gear box capacity of the 640ER model is 16 ounces or 3-1/4 inch level on dipstick (fig. 1-12-33).
17. Install filler and vent plug. Install rubber inspection plug.
18. Install drive belt as detailed in sub-section 1-7.
19. Carry out pulley alignment as detailed on Page 1-19-11.
20. Apply track tension as detailed in sub-section 1-5.
21. Carry out track alignment procedure as detailed in sub-section 1-5.
22. Install pulley guard as detailed in sub-section 1-6, and install cap.
22. Install pulley guard as detailed in sub-section 1-6. Install console on Valmont model. Install cab.
23. Set vehicle on the ground.



1-12-33

# TRANSMISSION

## 1-13 DRIVE CHAIN

### (A) GENERAL

The drive chain is installed in either the chain case or gear box. The Alpine/Invader and Valmont models incorporate a gear box while a chain case is installed on all other models.

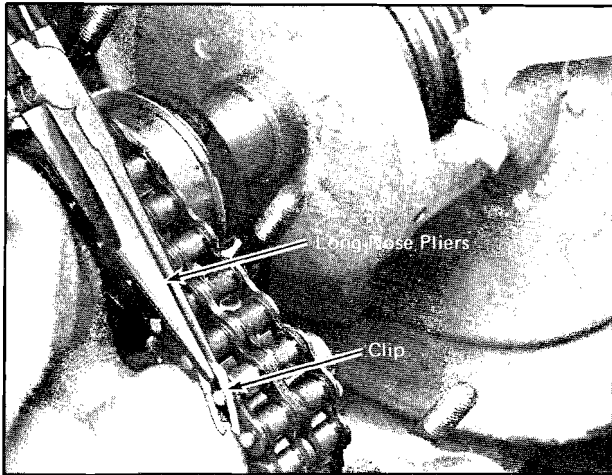
- There are three (3) variations of the Bombardier drive chain – a single 1/2 inch pitch, a double 1/2 inch pitch and a double 3/8 inch pitch.
- There are also two (2) types of chains – detachable and endless.
- The table below lists the type of drive chain installed on all 1970 and '71 Ski-Doo snowmobiles.
- The information contained in this sub-section explains the procedures for separating, lengthening and shortening the drive chain.

### TABLE OF APPLICABLE DRIVE CHAINS

| SINGLE 1/2 INCH PITCH |           |       | DOUBLE 3/8 INCH PITCH |           |           |     |
|-----------------------|-----------|-------|-----------------------|-----------|-----------|-----|
| Year                  | Model     |       | Year                  | Model     |           |     |
| 1970                  | Olympique | 12/3  | 1970                  | Olympique | 399       |     |
|                       | Olympique | 335   |                       | T'NT      | 340       |     |
|                       | Olympique | 335E  |                       | Nordic    | 399       |     |
|                       | T'NT      | 292   |                       | Nordic    | 399E      |     |
| 1971                  | Elan      | 250   |                       | Nordic    | 640E      |     |
|                       | Elan      | 250E  |                       | T'NT      | 399       |     |
| DOUBLE 1/2 INCH PITCH |           |       |                       | T'NT      | 640       |     |
|                       |           |       |                       | Skandic   | 335       |     |
|                       |           |       |                       | 1971      | Olympique | 300 |
| 1970                  | Alpine    | 399R  |                       |           | Olympique | 335 |
|                       | Alpine    | 399ER | Olympique             |           | 335E      |     |
|                       | Invader   | 640ER | Olympique             |           | 399E      |     |
| 1971                  | Alpine    | 339R  | Olympique             |           | 399       |     |
|                       | Alpine    | 339ER | Nordic                |           | 399       |     |
|                       | Alpine    | 640ER | Nordic                |           | 399E      |     |
|                       | Valmont   | 399R  | Nordic                |           | 640E      |     |
|                       | Valmont   | 399ER | Skandic               |           | 335       |     |
|                       | Valmont   | 640ER | T'NT                  |           | 292       |     |
|                       |           |       | T'NT                  | 340       |           |     |
|                       |           |       | T'NT                  | 440       |           |     |
|                       |           |       | T'NT                  | 640       |           |     |
|                       |           |       | T'NT                  | 775       |           |     |

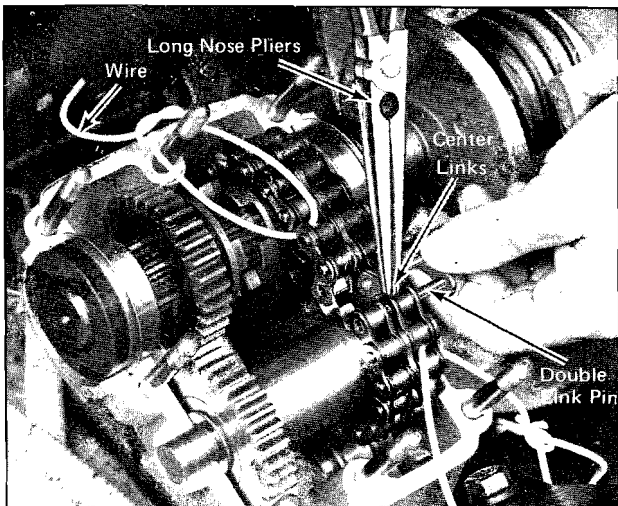
**(B) SEPARATING DETACHABLE CHAIN  
(On All Alpine/Invader and  
Valmont Models – So Equipped)**

1. Place a clean cloth beneath chain and in lower housing to prevent foreign matter and/or components from falling into bottom of housing.
2. Using long nose pliers, remove clip locking double link pin (fig. 1-13-1). Remove outer link.



1-13-1

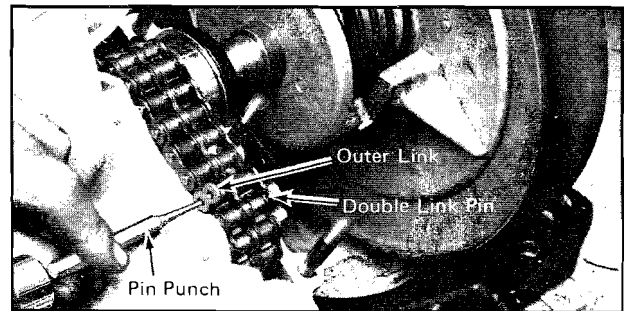
3. Insert two (2) pieces of wire through chain on each side of double link pin to be removed. Hook wires to lower housing studs to secure chain ends. With a pair of long nose pliers, hold center links and withdraw double link pin (fig. 1-13-2). Remove center links.



1-13-2

**(C) SEPARATING ENDLESS  
DOUBLE CHAIN  
(On All Alpine/Invader and  
Valmont Models – So Equipped)**

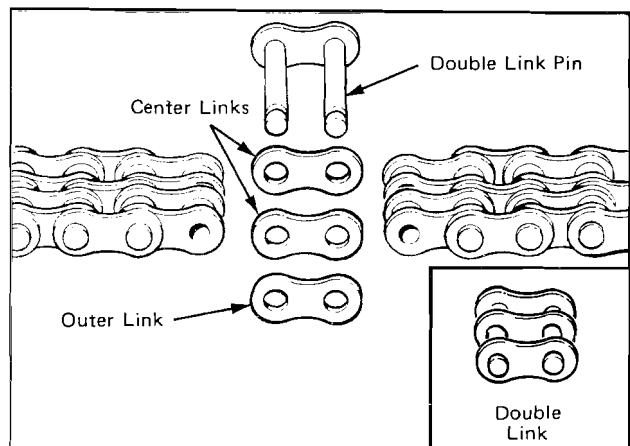
1. Place a clean cloth beneath chain and in lower housing to prevent foreign matter and/or other components from falling into bottom of housing.
2. Using a pin punch and hammer, tap gently on double link pin to disengage riveted heads of pin. Remove outer link. (fig. 1-13-3).



1-13-3

3. Insert two (2) pieces of wire through chain on each side of double link pin to be removed. Hook wires to lower housing studs to secure chain ends.
4. Using pin punch and hammer, tap gently on double link pin and remove two center links and link pin. (fig. 1-13-4).

**NOTE:** Connect drive chain using a double connecting link in place of previously removed components.



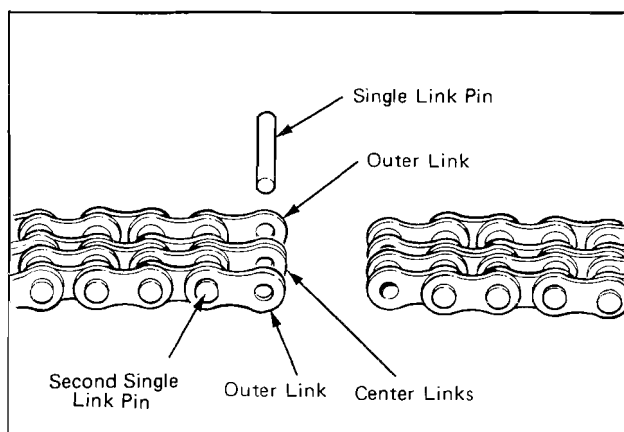
1-13-4

**(D) SEPARATING ENDLESS DOUBLE CHAIN**  
(On All Models except Alpine/Invader and Valmont)

1. Removal chain case as detailed in sub-section 1-11.
2. Using a pin punch and hammer, tap gently on double link pin to disengage riveted heads of pin. Remove outer link.
3. Tap gently on double link pin and remove two center links and link pin (see fig. 1-13-4).

**NOTE:** If link pin removed was a single link pin, the outer link in step 2., the two center links and outer link in step 3. will not be detached without gently tapping out a second single link pin (see fig. 1-13-5).

**NOTE:** If the chain is to be lengthened, remove second link pin. Remove outer link, center links and outer link.



1-13-5

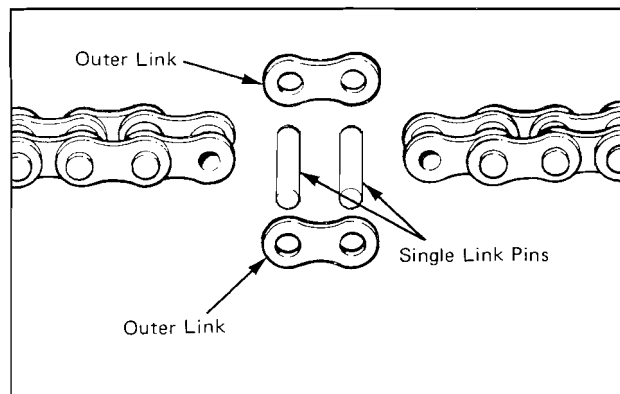
4. Carry out shortening or lengthening procedure and install chain case as detailed in sub-section 1-11.

**(E) SEPARATING ENDLESS SINGLE CHAIN**

1. Using a pin punch and hammer, gently tap on single link pin to disengage riveted head of pin. Remove pin to separate chain.

2. Remove second single link pin with a pin punch and hammer. Remove two (2) outer links (fig. 1-13-6).

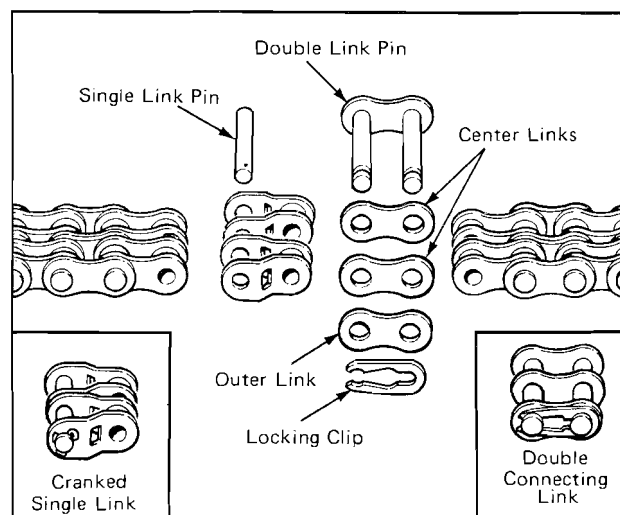
**NOTE:** Connect single chain using a single connecting link.



1-13-6

**(F) LENGTHENING DOUBLE CHAIN**

1. To lengthen a 1/2" or 3/8" inch pitch double chain 1/2 link, use the following procedure (fig. 1-13-7).



1-13-7

- (i) Separate drive chain as detailed in Paragraph (B), (C) or (D).

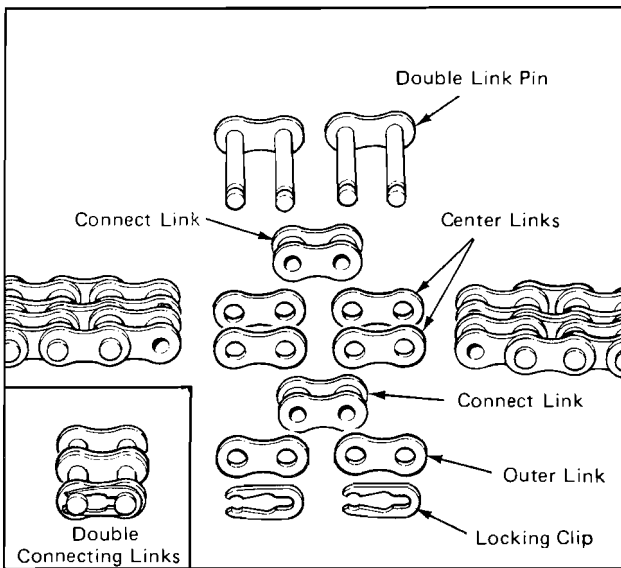
**NOTE:** If link pin removed in Paragraph C was a single link pin, remove second link pin. Remove outer link, center links and outer link.

- (ii) Remove a cotter pin and single link pin from a cranked single link.

- (iii) Connect the cranked single link to one free end of the chain with the removed pin and cotter pin.
- (iv) Join other free end of chain to cranked single link with a double connecting link.

**NOTE:** A double connecting link consists of a double link pin, two (2) center links, an outer link and a locking clip.

- 2. To lengthen 1/2 or 3/8 inch pitch double chain 1 link, use the following procedure (fig. 1-13-8).



1-13-8

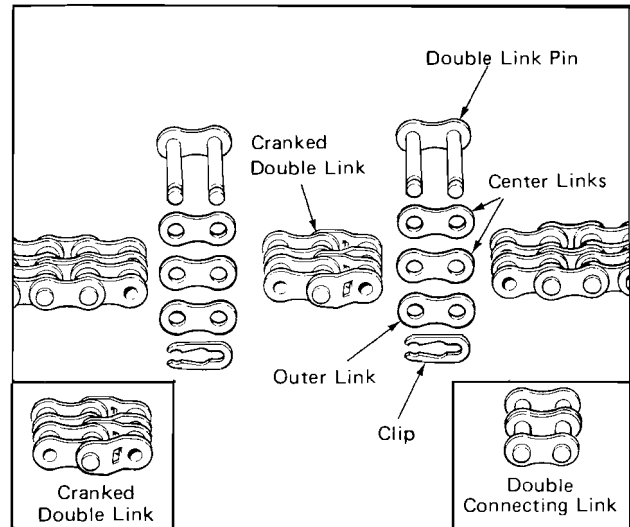
- (i) Separate drive chain as detailed in Paragraph (B), (C) or (D).

**NOTE:** If link pin removed in Paragraph (C) was a single link pin, remove second link pin. Remove outer link, center link and outer link.

- (ii) Secure two (2) connect links to each free end of chain with two (2) double connecting links.

**NOTE:** Each double connecting link consists of a double link pin, two (2) center links, an outer link and a locking clip.

- 3. To lengthen 1/2" or 3/8" inch pitch double chain 1-1/2 links, use the following procedure (fig. 1-13-9).



1-13-9

- (i) Separate drive chain as detailed in Paragraph (B) or (C).

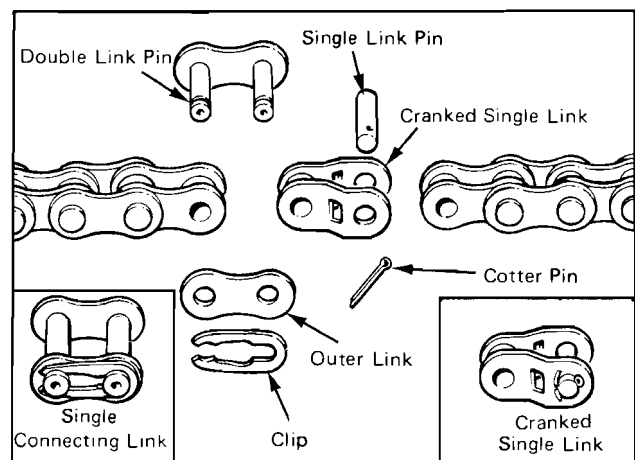
**NOTE:** If link pin removed in Paragraph (C) was a single link pin, remove second link pin. Remove outer link, center link and outer link.

- (ii) Secure a cranked double link to each free end of chain with two (2) double connecting links.

**NOTE:** Each double connecting link consists of a double link pin, two (2) center links, an outer link and a locking clip.

**(G) LENGTHENING SINGLE CHAIN**

- 1. To lengthen 1/2 inch pitch single chain 1/2 link, use the following procedure (fig. 1-13-10).

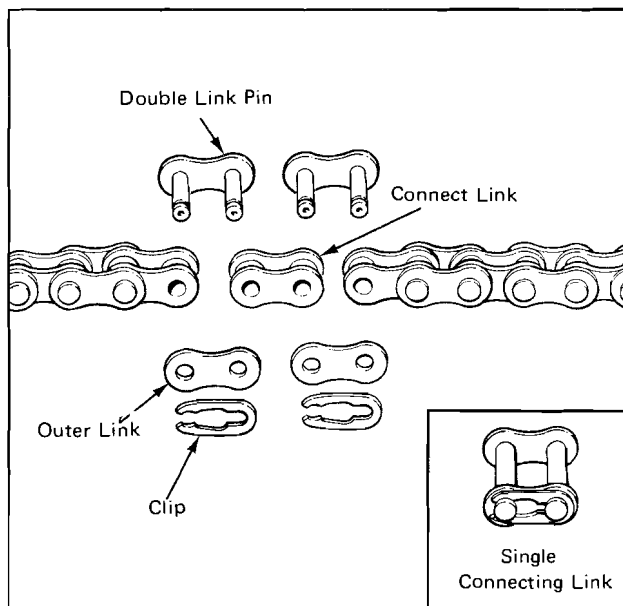


1-13-10

- (i) Separate drive chain as detailed in Paragraph (D).
- (ii) Remove a cotter pin and a single link pin from a cranked single link.
- (iii) Connect the cranked single link to one free end of the chain with the removed link pin and cotter pin.
- (iv) Join the other end of chain to cranked single link with a single connecting link.

**NOTE:** A single connecting link includes a double link pin, an outer link and a locking clip.

- 2. To lengthen 1/2 inch pitch single chain 1 link, use the following procedure (fig. 1-13-11).



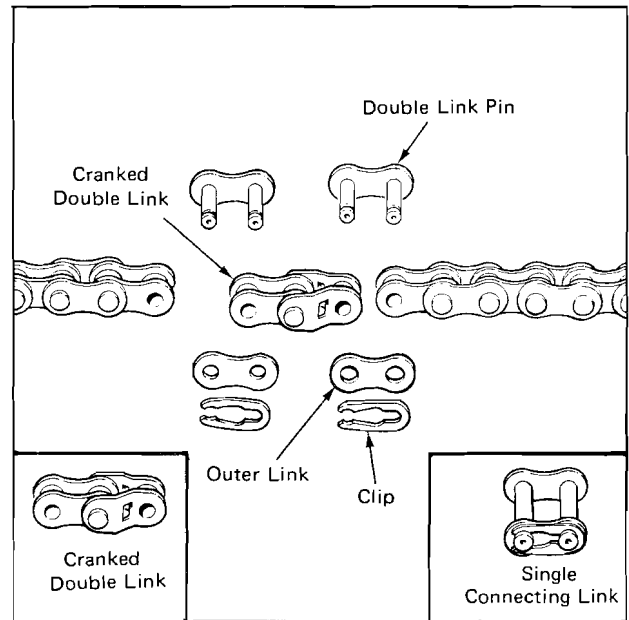
1-13-11

- (i) Separate drive chain as detailed in Paragraph (E).

- (ii) Secure one (1) connect link to each free end of chain with two (2) single connecting links.

**NOTE:** Each single connecting link consists of a double link pin, an outer link and a locking clip.

- 3. To lengthen 1/2 inch pitch single chain 1-1/2 links, use the following procedure (fig. 1-13-12).



1-13-12

- (i) Separate drive chain as detailed in Paragraph (E).
- (ii) Secure a cranked double link to each free end of chain with two (2) single connecting links.

**NOTE:** Each single connecting link consists of a double link pin, an outer link and a locking clip.

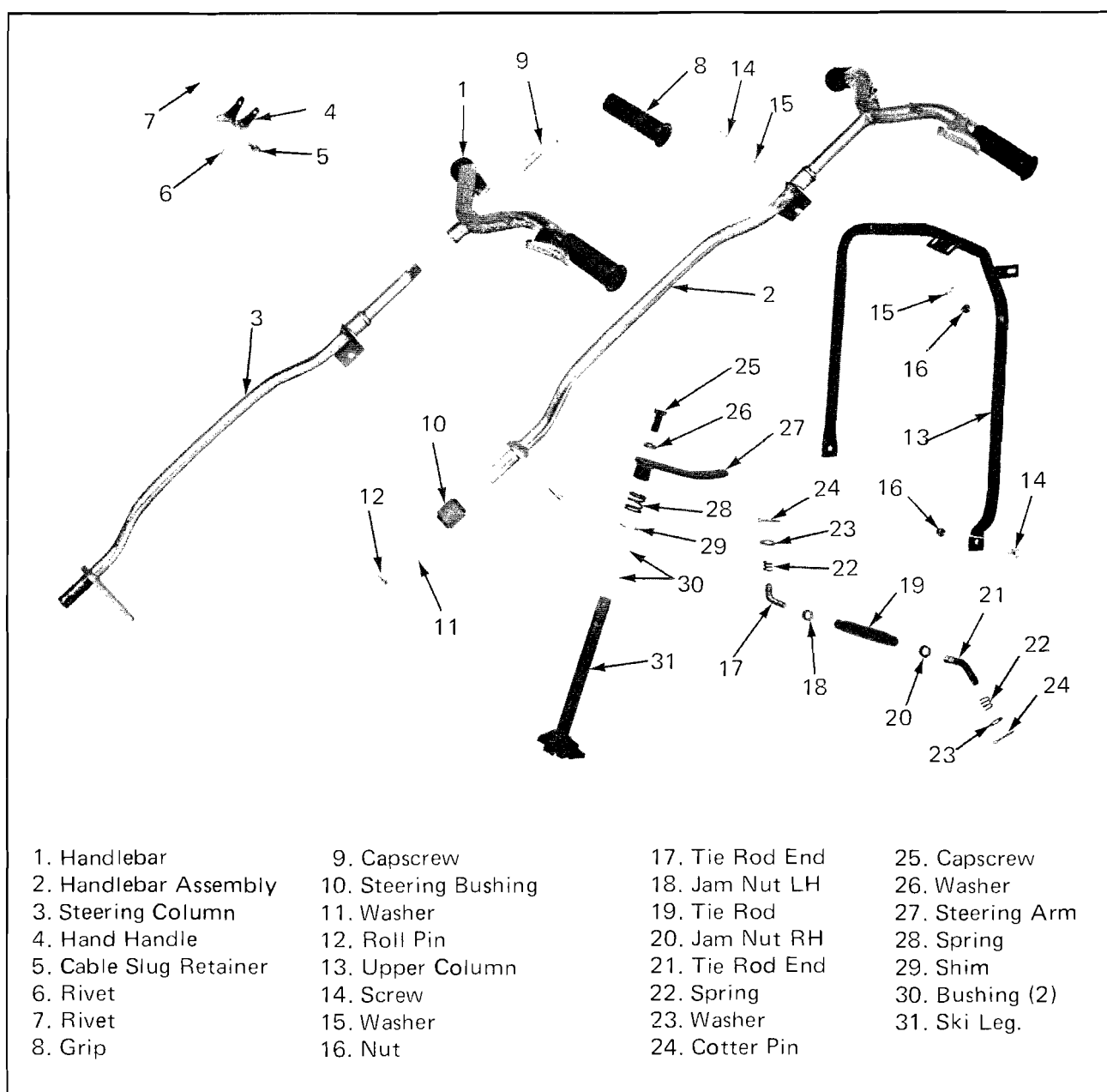


# STEERING SYSTEM

## 1-14 STEERING

### (A) GENERAL

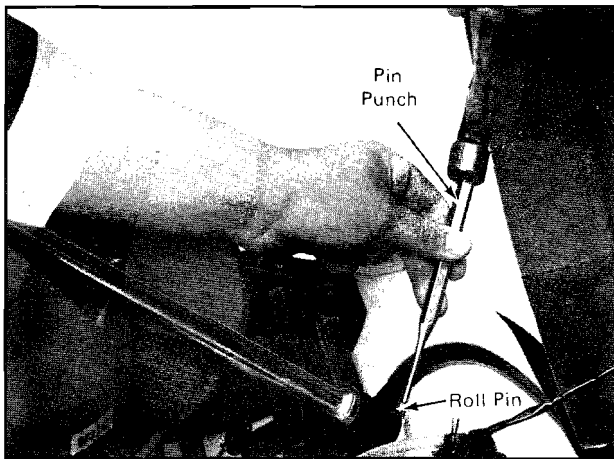
The basic steering system of the Ski-Doo snowmobile is a handlebar affixed to a steering column. Rotation of the handlebar causes a push-pull action of the steering linkage of the lower steering column/steering arm(s). It is the pull and/or pushing forces on the steering arm(s) that cause the turning of the ski(s).



DISASSEMBLED VIEW OF STEERING (TYPICAL)

**(B) REMOVAL**  
**(All Elan Models)**

1. Tilt cab and remove console.
2. Disconnect brake and throttle cables and housing from the handlebar.
3. Remove cotter pin, washer and spring securing upper tie rod to steering column. Push the tie rod end from the column.
4. Using a pin punch and a hammer, drive the roll pin from the steering column. Remove washer (fig. 1-14-1).

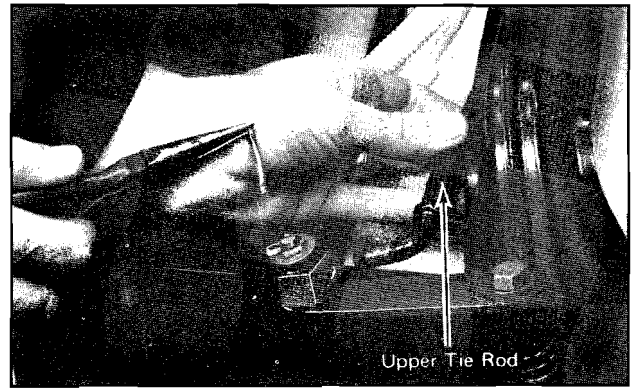


1-14-1

5. Remove the "U" clamp affixing the steering column to upper column.
6. Pull the steering column from the steering bushing and remove the steering column from the vehicle.

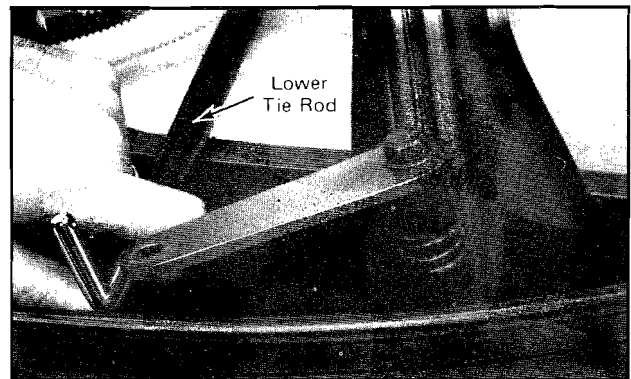
**NOTE:** Do not remove steering bushing unless damaged or worn and replacement is indicated.

7. Disconnect all electrical connections and switch blocks from dash panel. Push the brake and throttle cables and housings through dash panel. Unbolt the upper column from the frame and remove the column from the vehicle.
8. Remove cotter pin holding upper tie rod to swivel block. Pull upper tie rod from the block and remove it from the vehicle (fig. 1-14-2).



1-14-2

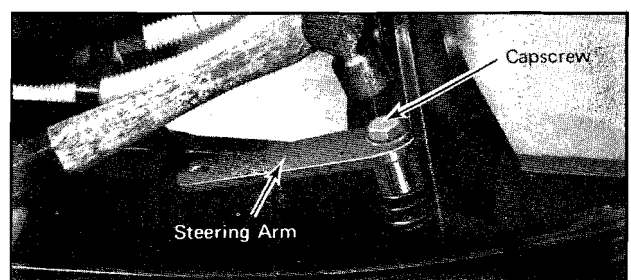
9. Remove cotter pins, washers and springs from lower tie rod. Remove swivel block from right hand steering arm tie rod end. Disengage tie rod from steering arms by turning skis in opposite direction of tie rod end disengagement (fig. 1-14-3).



1-14-3

10. Remove capscrews attaching steering arm to ski leg. Remove washer, steering arm and spring from ski leg splines.

**NOTE:** Should the steering arm be too tight on the ski leg spline, loosen capscrew 3 to 4 turns and tap gently on the capscrew head with a hammer (fig. 1-14-4). Vehicle must be lifted off the ground for this operation.



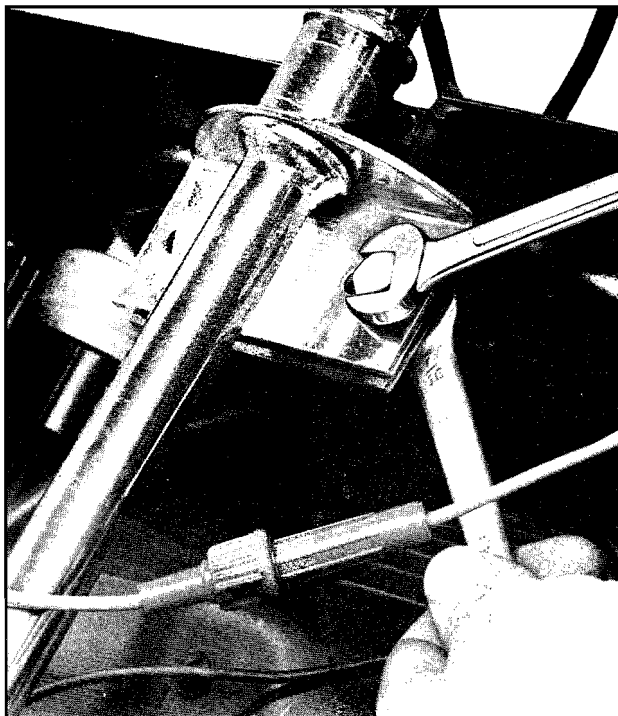
1-14-4

11. Pull the ski leg/ski assembly from the vehicle.
12. Remove ski coupler nut and ski coupler bolt.

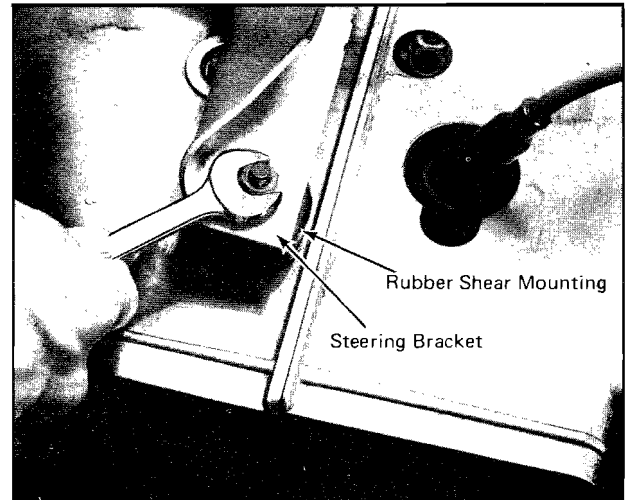
**(C) REMOVAL  
(All Olympique Models)**

1. Tilt or remove cab from vehicle..
2. On all 1971 models remove console as detailed in Section 4.
3. Disconnect brake and throttle cables and housings from handlebar.
4. Remove the cotter pins, washers and springs from the tie rod ends (steering column side) and pull the tie rods from the column.
5. Remove the two (2) bolts affixing the steering column to the upper column (fig. 1-14-5).

**NOTE:** On all 1970 "399" models, the upper column is replaced by a steering bracket affixed to the rubber shear mountings on the engine (fig. 1-14-6).



1-14-5



1-14-6

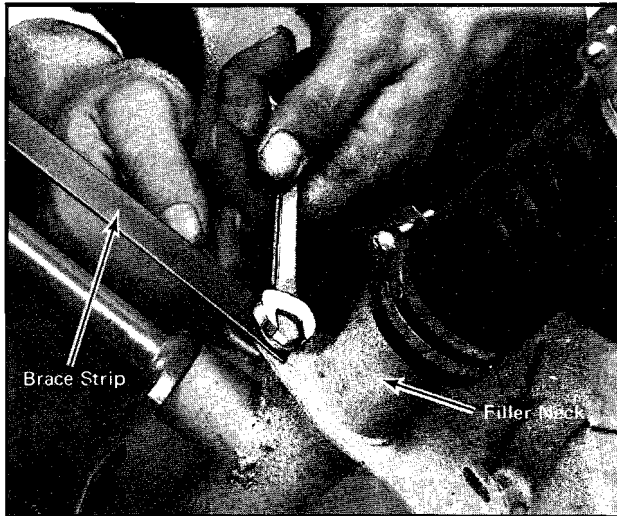
6. Remove steering column using the following procedure:
  - (a) On all 1970 vehicles, pull the steering column from the steering bushing and remove the steering column from the vehicle.

**NOTE:** Do not remove steering bushing from the vehicle unless damaged and replacement is indicated.

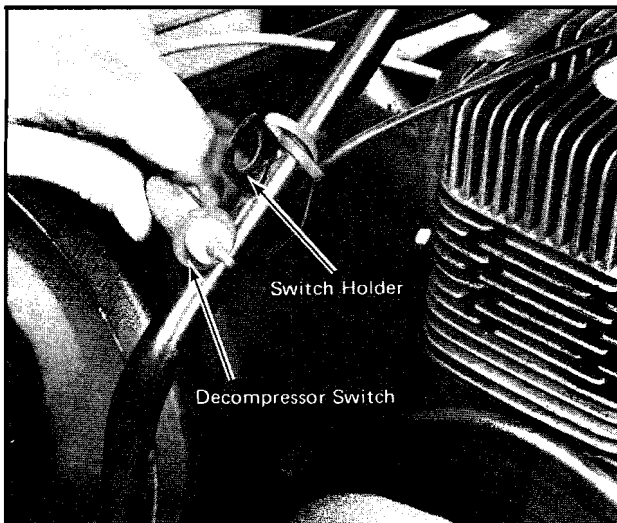
- (b) On all 1971 models, using a pin punch and a hammer, drive the roll pin holding the steering column to the frame reinforcing cross support. Remove washer. Pull the steering column from vehicle. Do not remove steering bushing from the vehicle unless damaged and replacement is necessary.
    - (c) On all 1970 "399" models with a steering bracket affixed to the cylinder head distance nuts carry out the following procedure:
      - (i) Remove the two (2) nuts and washers attaching the bracket to the studs and remove the bracket.
      - (ii) Unscrew the two (2) studs from the cylinder head distance nuts.
7. On all 1970 vehicles, remove bolt and washer affixing the brace strip to filler neck (fig. 1-14-7). Remove brace strip.

Remove the two (2) nuts attaching upper column to frame. Remove column from vehicle.

**NOTE:** On all 1970 models, except the "399" model, it is necessary to remove the decompressor switch/knob from upper column prior to upper column removal (fig. 1-14-8).

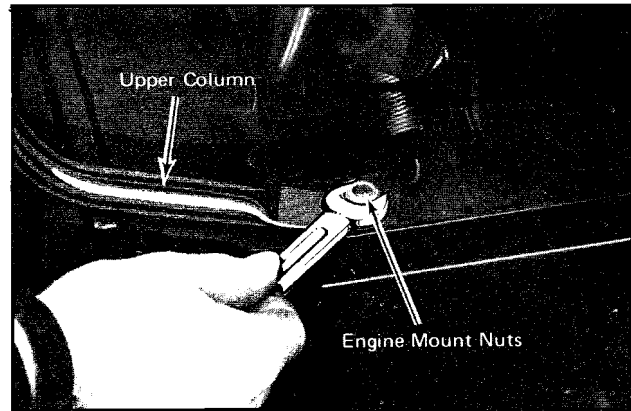


1-14-7



1-14-8

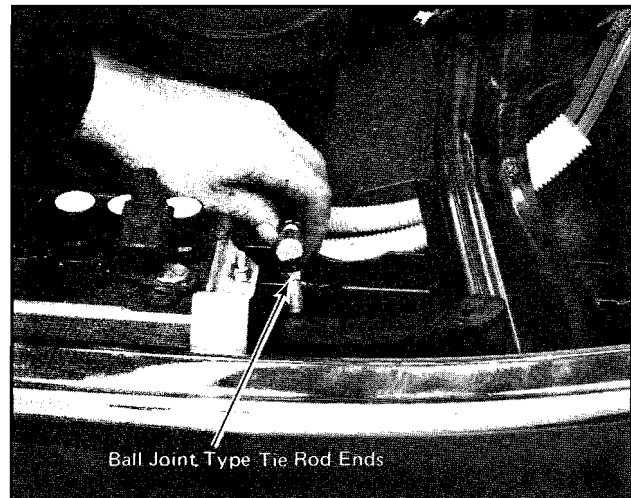
8. On all 1971 vehicles, disconnect all electrical connections and switch blocks from dash panel. Push the brake and throttle cables and housings through the dash panel. Unbolt dash panel from upper column and remove two (2) engine mount nuts and washers. Lift the column from the carriage bolts (fig. 1-14-9).



1-14-9

9. Remove the cotter pins, washers and springs from the tie rod ends (steering arm side). Push the rods from the steering arms. Remove tie rods from vehicle.

**NOTE:** On all 1971 models, the tie rod ends on the steering arm side are ball joint type. In this case, unscrew the nuts attaching the tie rod ends to the steering arms and remove the tie rods (fig. 1-14-10).

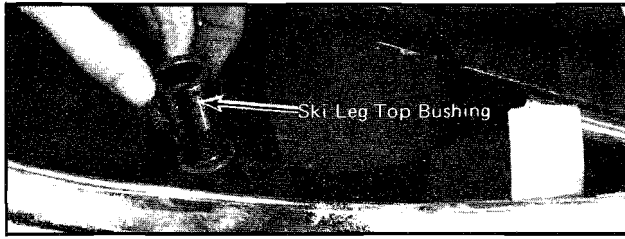


1-14-10

10. Remove capscrew attaching steering arm to ski leg. Remove washer, steering arm and spring from splines of the ski leg.

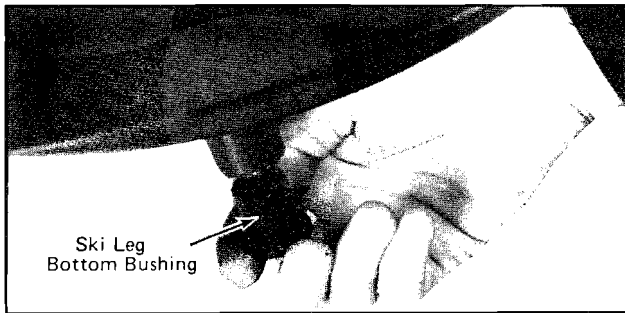
**NOTE:** Should the steering arm be too tight on the ski leg splines, loosen capscrew 1 to 2 turns and tap gently on the capscrew head with a hammer.

11. On all 1971 models, remove the ski leg top bushing (fig. 1-14-11).



1-14-11

12. Pull the ski leg/ski assembly from the vehicle.
13. On all 1971 models, remove ski leg bottom bushing (fig. 1-14-12).



1-14-12

14. Remove ski coupler nut and ski coupler bolt.
15. Repeat applicable steps 10 to 14 to remove opposite steering arm.

**(D) REMOVAL**  
**(All T'NT Models)**

1. Tilt or remove cab from vehicle.
2. Disconnect brake and throttle cables and housings from handlebar.
3. On all vehicles with detachable handlebar, remove capscrew and pull the handlebar from the steering column splines.
4. Remove the cotter pins, washers and springs from the tie rods (steering column side) and push the tie rods from the column.
5. Remove steering column using the following procedure:
  - (a) On all 1970 vehicles, remove the two (2) bolts affixing the steering column to the upper column and pull the steering column from the vehicle.

**NOTE:** Do not remove steering bushings from vehicle unless damaged and replacement is indicated.

- (b) On all 1971 models, using a pin punch and a hammer, drive the roll pin holding the steering column to the frame reinforcing cross support. Remove washer. Unbolt the steering column from the upper column and pull the steering column from the steering bushing and remove the steering column from the vehicle.

**NOTE:** On all 1970 models equipped with 18 inch track, the upper column is replaced by a steering bracket affixed to the rubber shear mountings on the engine.

- (c) On all 1970 models with a steering bracket affixed to the cylinder head distance nuts, carry out the following procedure:
  - (i) Remove the two (2) nuts and washers attaching the bracket to the studs and remove the bracket.
  - (ii) Unscrew the two (2) studs from the cylinder head distance nuts.

6. On all 1970 vehicles equipped with 18 inch track, remove bolt and washer affixing the brace strip to filler neck. Remove brace strip (See fig. 1-14-7).
7. Remove the two (2) bolts attaching the upper column to frame and lift the column from vehicle.
8. Remove the cotter pins, washers and springs from the tie rod ends (steering arm side) and push the rods from the steering arms.

**NOTE:** On all 1971 T'NT 15 inch track models, the tie rod ends on the steering arm side are ball joint type. In this case, unscrew the nuts attaching the tie rod ends to the steering arms and remove tie rods from vehicle. (See fig. 1-14-10).

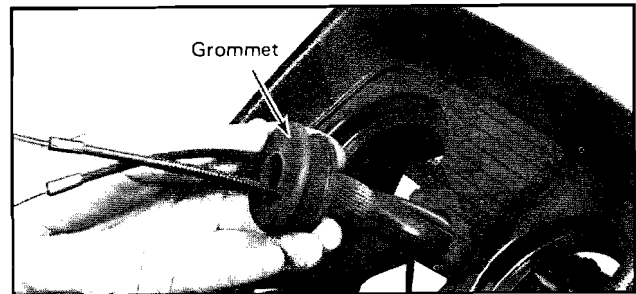
9. Remove capscrew attaching steering arm to ski leg. Remove washer, steering arm and spring from splines of the ski leg.

**NOTE:** Should the steering arm be too tight on the ski leg splines, loosen capscrew 3 to 4 turns and tap gently on the capscrew head with a hammer. (Vehicle must be lifted off the ground for this operation).

10. On all 1971 models, remove the ski leg top bushing. (See fig. 1-14-11).
11. Pull the ski leg/ski assembly from the vehicle.
12. On all 1971 models, remove the ski leg bottom bushing. (See fig. 1-14-12).
13. Remove ski coupler nut and ski coupler bolt.
14. Repeat applicable steps 9 to 13 to remove opposite steering arm.

### (E) REMOVAL (All Nordic Models)

1. Tilt cab.
2. Disconnect brake and throttle cables and housings from the handlebar.
3. Remove capscrew and pull the handlebar from the steering column splines.
4. Remove cotter pins, washers and springs from tie rods ends (steering column side) and pull the tie rods from the column.
5. Using a pin punch and a hammer, drive the roll pin holding the steering column to the frame reinforcing cross support. Remove washer.
6. On all 399 models, open lower access cover and remove upper access cover.
7. Pull the console grommet from the steering column (fig. 1-14-13).



1-14-13

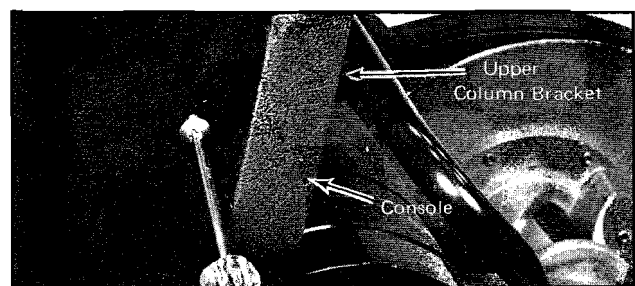
8. On all 640 models, tilt console towards seat.
9. Unbolt the steering column from the upper column. On all 640 models, remove "V" bracket.

**NOTE:** On all 1970 models, the upper column is replaced by a steering bracket affixed to the rubber shear mountings on the engine.

10. On all 1970 models with a steering bracket affixed to the cylinder head distance nuts, carry out the following procedure:
  - (a) Remove the two (2) nuts and washers attaching the bracket to the studs and remove the bracket.
  - (b) Unscrew the two (2) studs from the cylinder head distance nuts.
11. Pull the steering column from the steering bushing and remove the steering column from the vehicle.

**NOTE:** Do not remove steering bushing from vehicle unless damaged and replacement is indicated.

12. On all 1971 "399" models, unbolt console from upper column brackets (fig. 1-14-14).



1-14-14

13. Remove the two (2) bolts attaching upper column to frame and lift the column from the vehicle.
  14. Remove the cotter pins, washers and springs from the tie rod ends (steering arm side) and push the rods from the steering arms. Remove tie rods from the vehicle.
  15. Remove capscrew attaching steering arm to ski leg. Remove washer, steering arm and spring from ski leg splines.
- NOTE:** Should the steering arm be too tight on the ski leg splines, loosen capscrew 3 to 4 turns and gently tap on the capscrew head with a hammer. (Vehicle must be lifted off the ground for this operation.)
16. On all 1971 models, remove ski leg top bushing.
  17. Pull ski leg/ski assembly from vehicle.
  18. On all 1971 models, remove ski leg bottom bushing. (See fig. 1-14-12).
  19. Remove ski coupler nut and ski coupler bolt.
  20. Repeat applicable steps 15 to 19 to remove second steering arm.

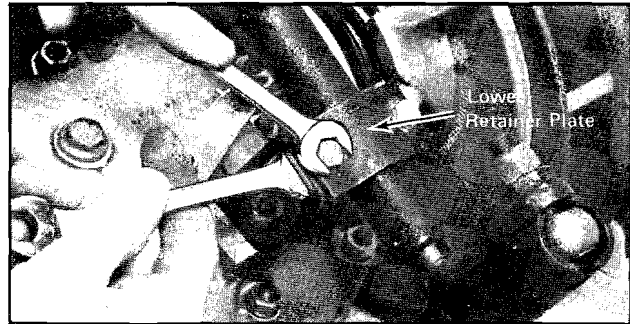
**(F) REMOVAL  
(All Alpine/Invader  
and Valmont Models)**

1. Remove cab as detailed in Section 4.

**NOTE:** On all 1971 Valmont models, remove console.

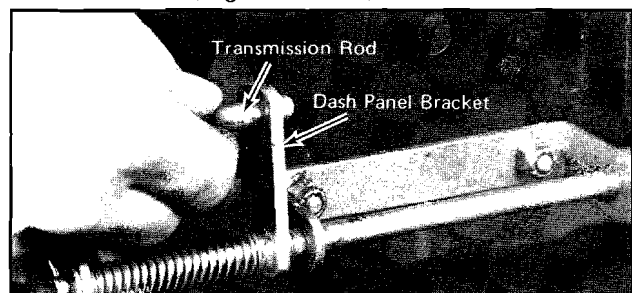
2. Disconnect brake and throttle cables and housings from handlebar.
3. Remove capscrew and washer attaching handlebar to steering column. Pull the handlebar from steering column splines and remove the spring.
4. Remove muffler from vehicle.

5. Remove the two (2) bolts attaching upper retainer plate to upper column bracket. Remove plate.
6. Remove the two (2) bolts affixing lower retainer plate to steering bracket (fig. 1-14-15). Remove plate.



1-14-15

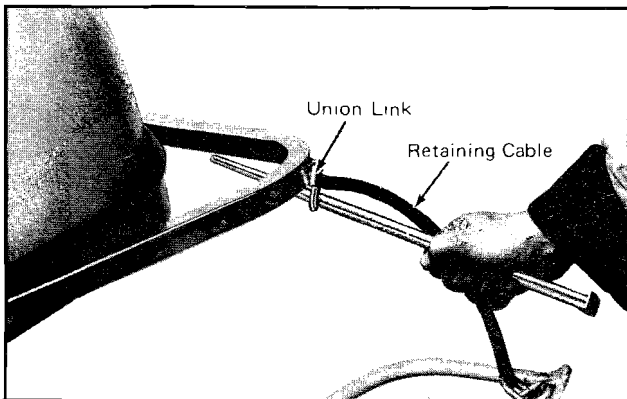
7. Lift the ball bushing from the steering channel and remove the steering column from vehicle.
8. Remove cotter pin, washer and spring affixing the transmission rod to gear change lever. Disengage the rod from the lever.
9. Disconnect all electrical connections and switch blocks from dash panel.
10. Remove the brake and throttle cables from dash panel by passing it through appropriate orifice or anchor of the panel.
11. On all 1971 models, remove the four (4) nuts and cable bracket attaching dash panel to upper column and remove the dash panel and brackets from vehicle.
12. On all 1971 models, remove cotter pin affixing transmission rod to dash panel bracket and disengage the rod from the bracket (fig. 1-14-16).



1-14-16

13. Remove transmission rod from vehicle.
14. Remove the two (2) bolts affixing the upper column to frame and remove the column.
15. Remove the capscrew, washer, steering arm and spring from ski leg splines.

**NOTE:** On 1970 Alpine/Invader, open union link and disconnect retaining cable from the front bumper. (fig. 1-14-17).



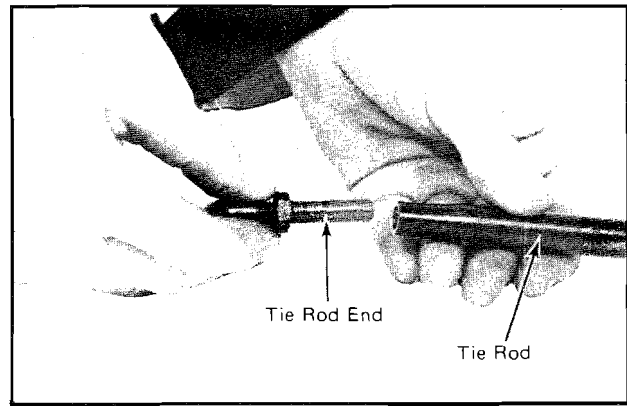
1-14-17

16. Lift the front of vehicle off the ground and pull the ski leg/ski assembly from the vehicle.
17. Remove the ski coupler bolt and remove ski leg from ski.

**(G) DISASSEMBLY**  
(All Models except  
Alpine/Invader and Valmont)

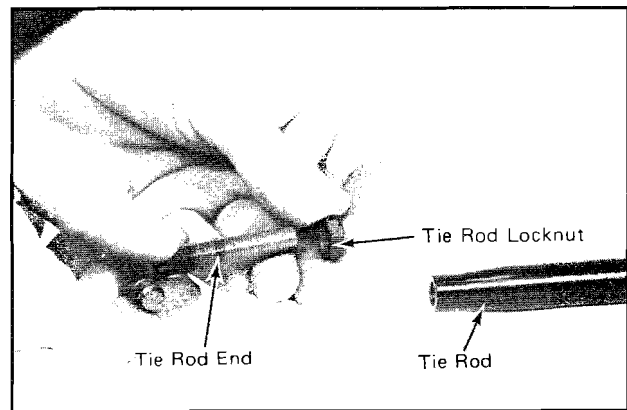
1. To disassemble the handlebar, refer to Paragraph (J).
2. Slacken the locknuts holding the tie rod ends in position.
3. Unscrew the tie rod ends from the tie rods (fig. 1-14-18).

**NOTE:** The tie rod ends have right hand and left hand threads. The tie rod end attached to the steering column incorporated left hand thread while the tie rod end attached to the steering arm has a right hand thread.



1-14-18

4. Remove the tie rod end locknuts (fig. 1-14-19).

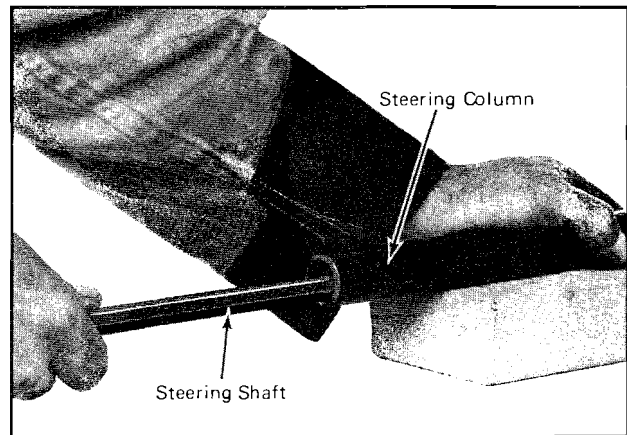


1-14-19

**(H) DISASSEMBLY**  
(All Alpine/Invader  
and Valmont Models)

1. Slide the steering shaft from the steering column (fig. 1-14-20).

**NOTE:** Do not remove steering bushings unless damaged and replacement is indicated.



1-14-20