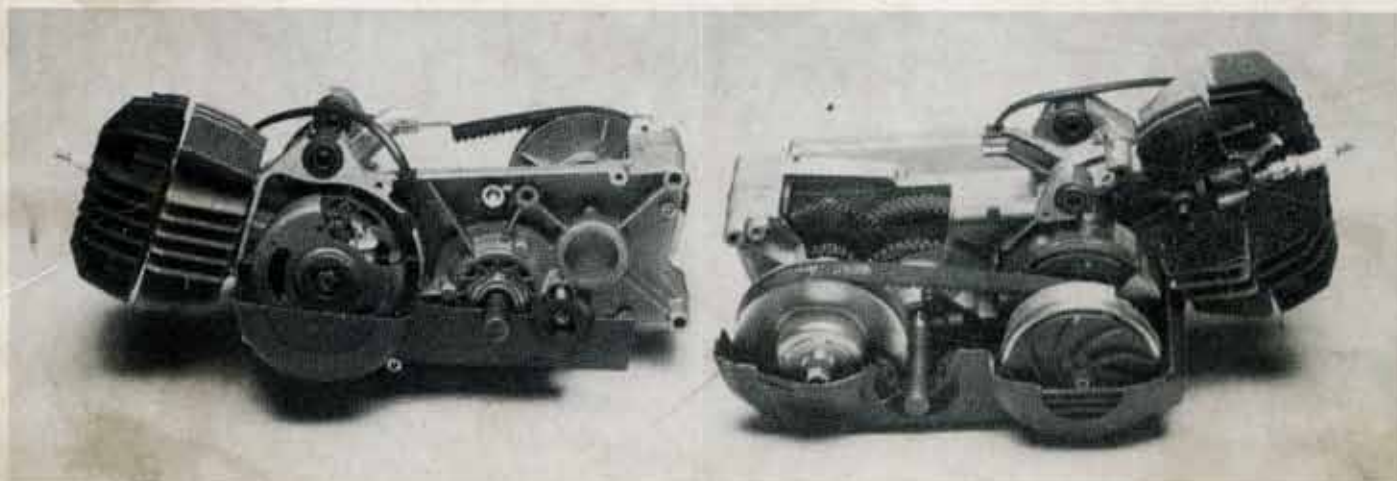


**WORLD CHAMPION**

**DERBI**  
**RABASA**



**49 c.c. FLAT REED  
"START" ENGINE**

# **REPAIR MANUAL**

**PART N.º – NM 207.77**

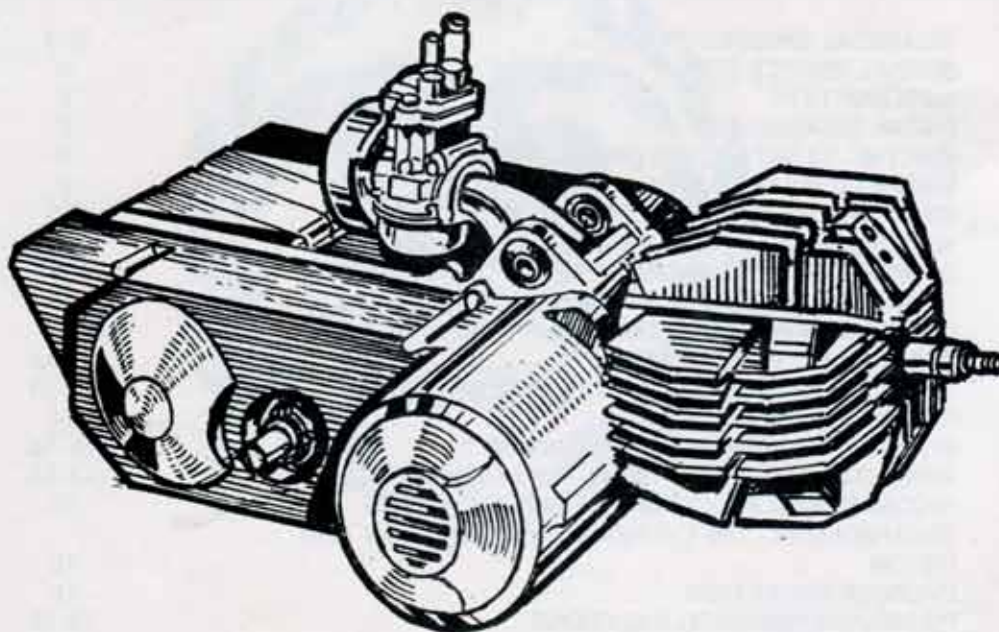


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## 1. TECHNICAL SPECIFICATIONS 49cc FLAT REED VALVE ENGINE

### Motor:

Number of cylinders . . . . .	One aluminum cylinder with interior coating of nickel and silicon carbide ("Scapimet").
Type . . . . .	Two stroke/air cooled.
Bore X Stroke . . . . .	39.87 x 40 mm.
Cylinder displacement . . . . .	49cc.
Fuel Intake System . . . . .	Crankcase reed valve induction with triple transfer port distribution.
Compression ratio . . . . .	Clockwise (viewed from the magneto side).
Maximum engine RPM . . . . .	6.500.

### Carburetor:

Type . . . . .	Dell'Orto SHA 12-12 with cable activated choke. Intake silencer with incorporated filter which is removable for easy cleaning.
----------------	--

### Clutch, Primary Transmission and Variator Ratio:

Clutch . . . . .	Fully automatic, centrifugal 50% increased contact surface and isolated from primary transmission.
Primary Transmission . . . . .	One helicoidal gear and reducer in constant mesh on needle bearings.
Transmission oil . . . . .	150cc (5 oz.) 30W Four cycle oil.
Variator . . . . .	New high torque variator driven by six centrifugal weights with the broadest range of variator ratio available on automatic scooters in the world. Self cooled by forced air ventilation.

### Maximum Surmountable

Incline: . . . . .	30% without pedal assist.
Fuel mixture . . . . .	50:1 (2%).

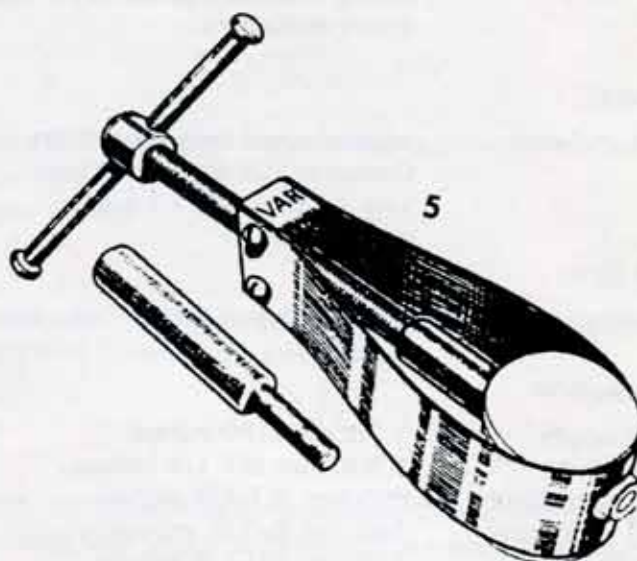
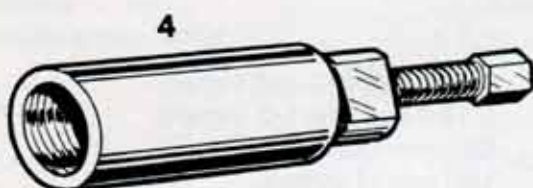
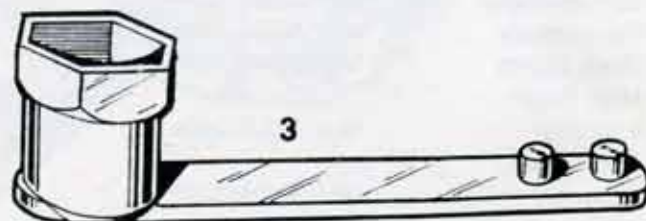
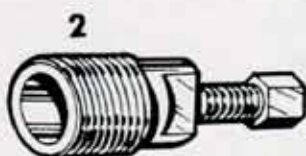
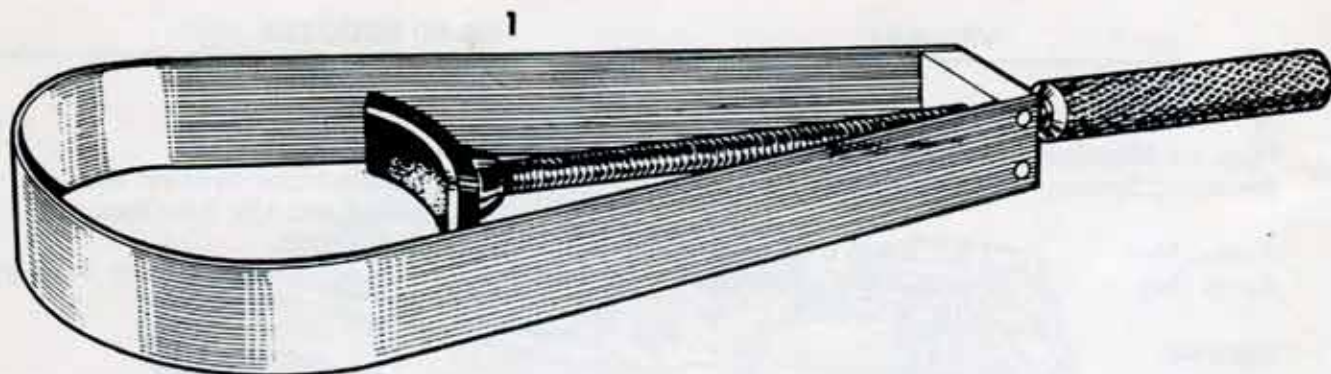


## VEHICLE SPECIFICATIONS

VARIANT	DS-50 SCOOTER
<b>Ignition:</b>	
Flywheel Magneto . . . . .	Motoplat 6v 43w.
Electronic System . . . . .	Not Applicable.
Timing Mark . . . . .	Motoplat electronic flywheel with battery load and 12v 32w light.
Spark Plug . . . . .	1.8 – 2 mm BTDC.
	Bosch W5AC, Champion L-82, NGK B7HS.
<b>Lighting:</b>	
Headlamp . . . . .	6v 25/25 High/Low beam.
Taillamp . . . . .	12v 25/25w High/Low beam.
Stoplamp . . . . .	12v 5w.
Speedometer light . . . . .	12v 10w.
Turnsignals . . . . .	Not Applicable.
Dash Lights . . . . .	Four 12v 10w.
High Beam Indicator . . . . .	Two 12v 1.2w.
Turnsignal Indicator . . . . .	12v 1.2w.
	12v 1.2w.
<b>Suspension:</b>	
Front . . . . .	Central axis telescopic fork.
	Central axis telescopic fork. Effective travel 80 mm.
Rear . . . . .	Swing-arm and hydraulic shock absorbers.
	Swing-arm and hydraulic shock absorbers. Effective travel 60 mm.
<b>Brakes:</b>	
Front and rear . . . . .	Internal-expanding shoe drum.
	Internal-expanding drum. Diameter 105 mm.
	Diameter 105 mm. Total braking surface 9.152 square millimeters.
<b>Fuel tank:</b>	
Capacity . . . . .	3.360 Liters (0.9 U.S. Gallons).
	6 liters (1.6 U.S. Gallons).
<b>Dimensions:</b>	
Total length . . . . .	1.780 mm (70 inches).
Wheel base . . . . .	1.725 mm (67-1/4 inches).
Maximum Width . . . . .	1.180 mm (46-1/2 inches).
Road Clearance . . . . .	670 mm (26-1/2 inches).
Seat Height . . . . .	100 mm (4 inches).
Dry Weight . . . . .	770 mm (30-1/8 inches).
	795 mm (31-1/4 inches).
	55 kg. (125 lbs.).
	60 kg. (132 lbs.).

## VEHICLE IDENTIFICATION NUMBERS

<b>Engine:</b>	Located on the top, right of engine crankcase towards rear of engine.
<b>Frame:</b>	17 character located on manufacturers certification label riveted to front section of frame.



## 2. SPECIAL TOOLS

REFERENCE #	DESCRIPTION	PART NUMBER
1	Universal flywheel/band wrench	F100005
2	Flywheel extractor (Non electric start models)	0008253010
	Flywheel extractor (Electric start models)	F100039
3	Magneto flywheel spanner/35 mm wrench	0008253290
4	Clutch hub and driven pulley Extractor	0008254740
5	Piston pin extractor	F100025



## VEHICLE SPECIFICATIONS

### VARIANT

### DS-50 SCOOTER

#### Ignition:

Flywheel Magneto . . . Motoplat 6v 43w.  
 Electronic System . . . Not Applicable.  
 Timing Mark . . . 1.8 – 2 mm BTDC.  
 Spark Plug . . . Bosch W5AC, Champion  
 L-82, NGK B7HS.

Not Applicable.  
 Motoplat electronic flywheel with  
 battery load and 12v 32w light.  
 1.8 – 2 mm BTDC.  
 Bosch W5AC, Champion L-82, NGK B7HS.

#### Lighting:

Headlamp . . . 6v 25/25 High/Low beam.  
 Taillamp . . . 6v 5w.  
 Stoplamp . . . 6v 10w.  
 Speedometer light . . . 6v 1.2w.  
 Turnsignals . . . Not Applicable.  
 Dash Lights . . . Not Applicable.  
 High Beam  
 Indicator . . . Not Applicable.  
 Turnsignal  
 Indicator . . . Not Applicable.

12v 25/25w High/Low beam.  
 12v 5w.  
 12v 10w.  
 Not Applicable.  
 Four 12v 10w.  
 Two 12v 1.2w.  
 12v 1.2w.  
 12v 1.2w.

#### Suspension:

Front . . . Central axis telescopic fork.  
 Rear . . . Swing-arm and hydraulic  
 shock absorbers.

Central axis telescopic fork. Effective travel  
 80 mm.  
 Swing-arm and hydraulic shock absorbers.  
 Effective travel 60 mm.

#### Brakes:

Front and rear . . . Internal-expanding shoe drum.  
 Diameter 105 mm. Total bra-  
 king surface 9.152 square  
 millimeters.

Internal-expanding drum. Diameter 105 mm.  
 Total braking surface 9.152 square  
 millimeters.

#### Fuel tank:

Capacity . . . 3.360 Liters (0.9 U.S. Gallons).

6 liters (1.6 U.S. Gallons).

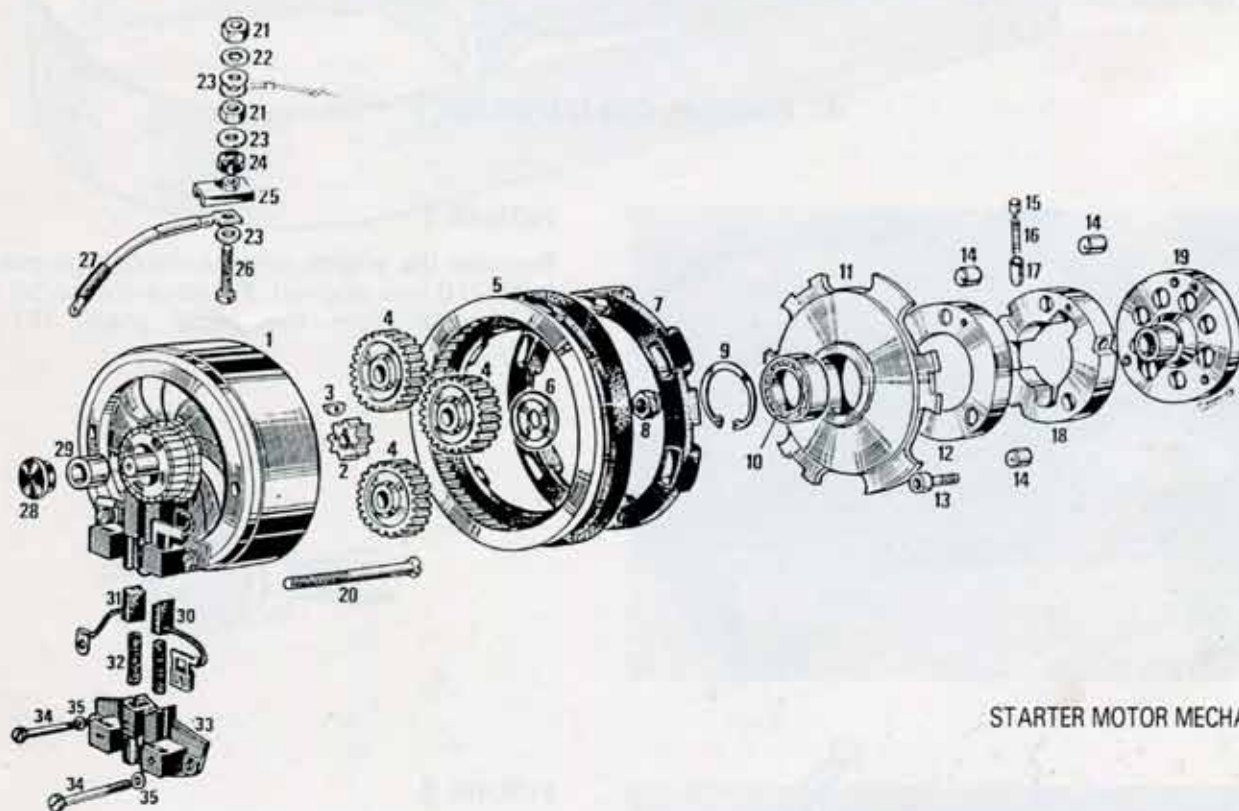
#### Dimensions:

Total length . . . 1.780 mm (70 inches).  
 Wheel base . . . 1.200 mm (47-1/4 inches).  
 Maximum Width . . . 690 mm (27-1/8 inches).  
 Road Clearance . . . 140 mm (5-1/2 inches).  
 Seat Height . . . 770 mm (30-1/8 inches).  
 Dry Weight . . . 55 kg. (125 lbs.).

1.725 mm (67-1/4 inches).  
 1.180 mm (46-1/2 inches).  
 670 mm (26-1/2 inches).  
 100 mm (4 inches).  
 795 mm (31-1/4 inches).  
 60 kg. (132 lbs.).

## VEHICLE IDENTIFICATION NUMBERS

**Engine:** Located on the top, right of engine crankcase towards rear of engine.  
**Frame:** 17 character located on manufacturers certification label riveted to front section of frame.



STARTER MOTOR MECHANISM

FIGURE 2A

## DISASSEMBLING THE STARTER MOTOR MECHANISM

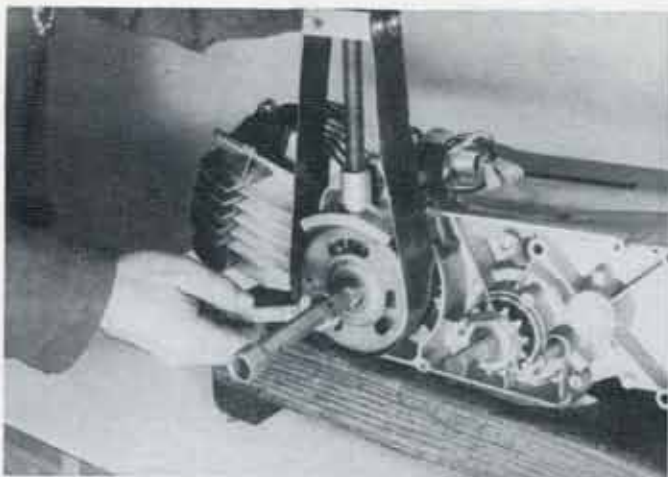
Starting with the components attached to the magneto flywheel:

- Remove the starter motor rubber shock plate assembly and bearing (#7, #9, #10 & #11) as an assembly by holding the magneto flywheel stationary with one hand and turning the shock plate counterclockwise with the other hand. Gently pull outward on the shock plate assembly while turning it counterclockwise.
- Remove the three allen bolts (#13) securing the starter cam support bushing (#19) to the flywheel. (5 mm allen wrench).
- Remove the starter cam assembly from the magneto assembly (nos. 12, 14, 15, 16, 17, 18 & 19). Take care not to loose any of the springs or machined rollers.

To remove the starter motor from the starter motor housing proceed as follows:

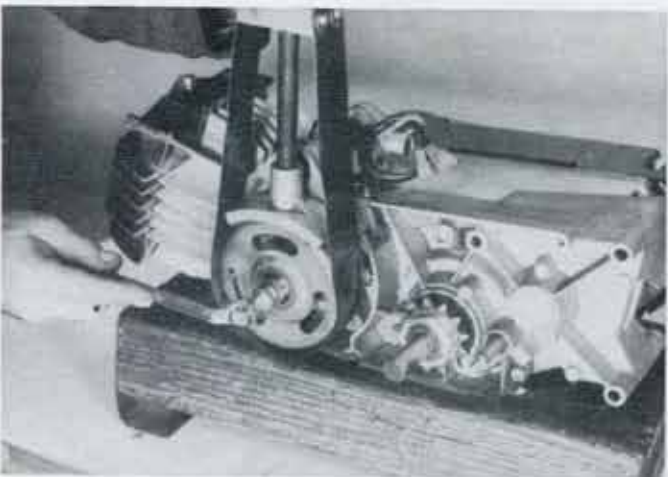
- Remove the starter motor ring gear (#5) by lifting the ring gear out of the starter motor housing.
- Remove the starter motor pinion nut (#8) by using a reversible air ratchet.
- Remove the washer (#6) from the pinion shaft.
- Remove the three reduction planetary gears (#4).
- Remove the starter motor pinion gear (#2). (Not necessary unless replacement is needed).
- Remove the pinion gear woodruff key (#3). (Not necessary unless replacement is needed).
- Remove the starter motor (#1) from the starter motor housing by removing the two allen bolts (#20). (3 mm allen wrench).
- Unplug the positive lead (#27) from the starter motor positive brush (#30) and remove starter motor assembly from housing.





**FIGURE 3**

Remove the magneto flywheel nut, (**LEFTHAND THREAD**), by holding the flywheel stationary using the flywheel wrench Part # F100005 and a 14 mm wrench.



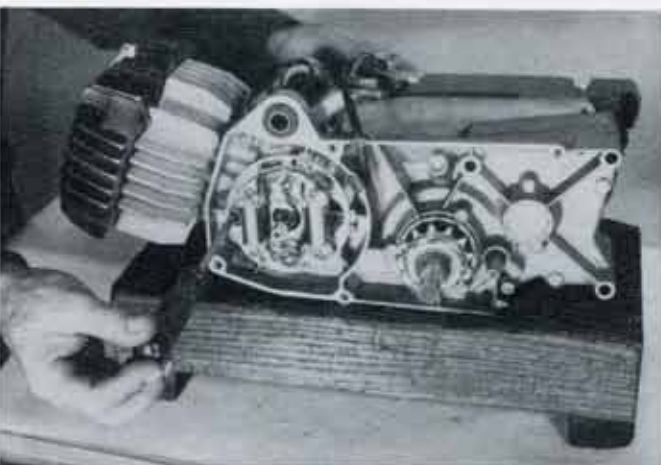
**FIGURE 4**

With the flywheel wrench (#F100005) still in place on the flywheel, install the (\*)flywheel puller. Once the flywheel puller is **fully** threaded into the flywheel, turn the puller center bolt slowly clockwise until the flywheel breaks free from the crankshaft.

**\* NOTE**

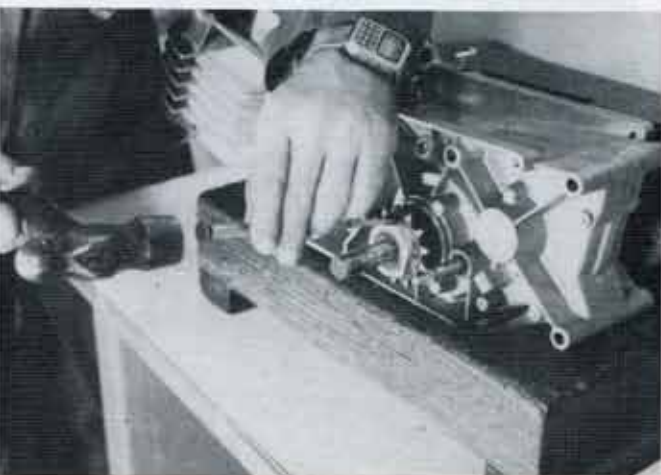
DERBI Engines with conventional **breaker point ignition** systems require flywheel puller #0008253010.

DERBI Engines equipped with the Motoplat **electronic Ignition** system require flywheel puller part #F100039.



**FIGURE 5**

Remove the three phillips head screws securing the stator plate assembly to the engine and remove the stator plate. Remove the flywheel key from the crankshaft.



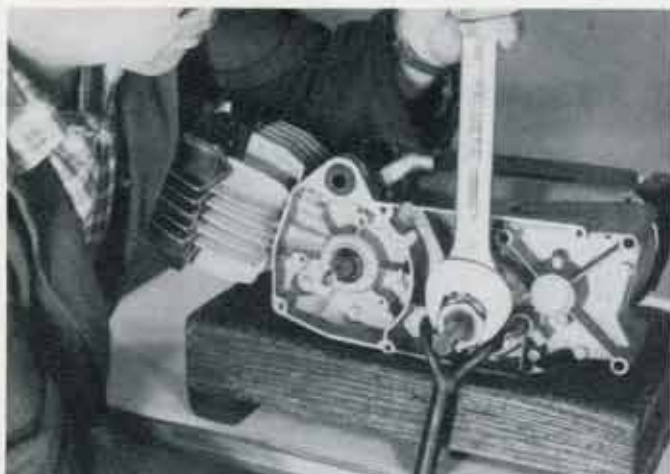
**FIGURE 6**

Fold back the tabs on the countershaft sprocket nut lock plate by using a small chisel or drift punch and a hammer. Flatten the lock tabs so that the countershaft sprocket nut can be removed.

**NOTE**

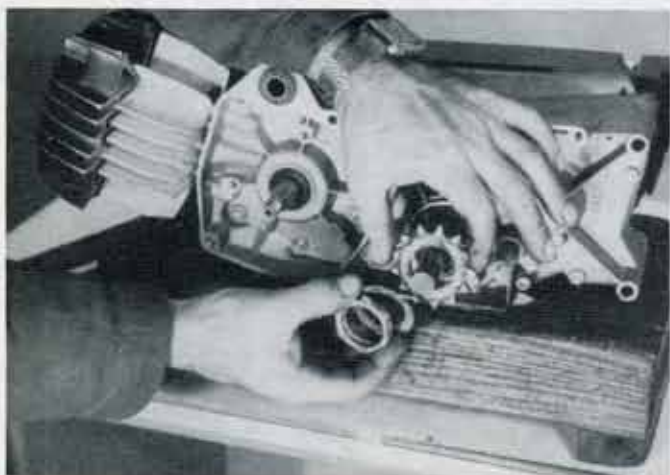
It is not necessary to remove the countershaft sprocket to split the engine cases. The countershaft sprocket need only be removed if replacement is necessary or service must be performed to the countershaft.





**FIGURE 7**

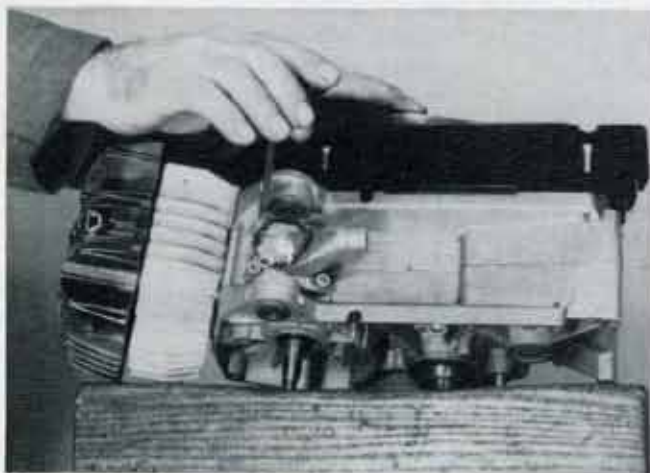
Hold the countershaft sprocket stationary by using special tool # 14-0507. While holding the countershaft sprocket remove the retaining nut using a 36 mm wrench. (Right Hand Thread).



**FIGURE 8**

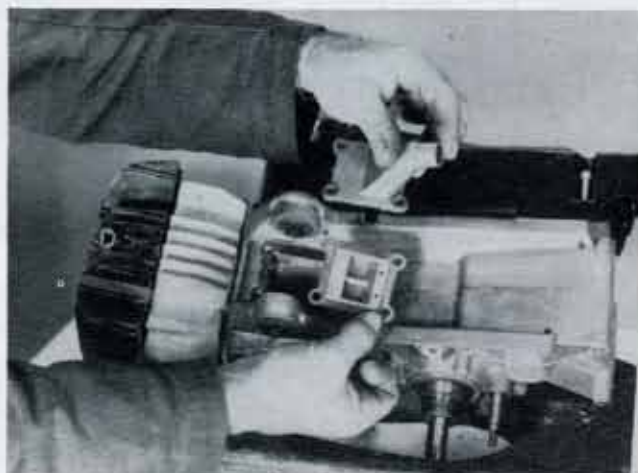
Remove the lockplate and countershaft sprocket. **Gently** prying on the backside of the countershaft sprocket may be necessary to remove the sprocket from the countershaft.

## 5. DISASSEMBLING THE INTAKE MANIFOLD AND REED VALVE



**FIGURE 9**

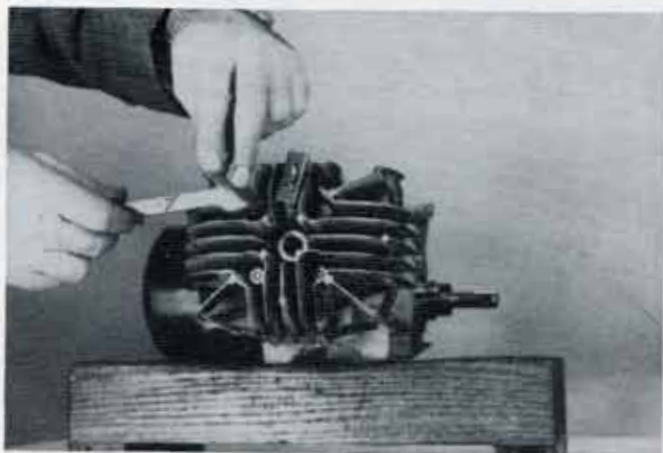
Remove the four allen bolts and lockwashers holding the intake Manifold to the engine case (5 mm allen wrench).



**FIGURE 10**

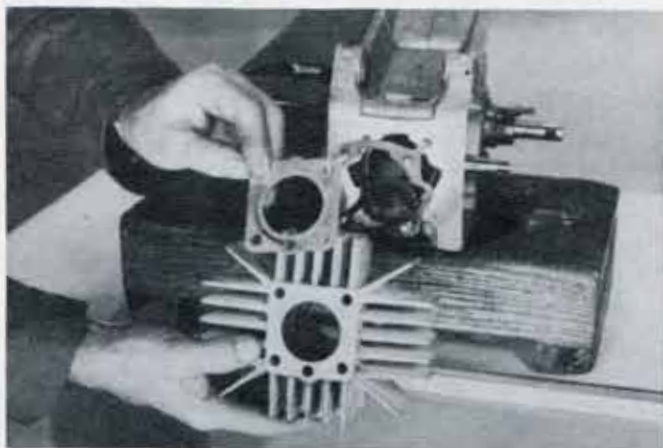
Remove the Intake Manifold and reed valve assemblies using caution to prevent damage to the reed valve.

## 6. DISASSEMBLING THE CYLINDER HEAD, CYLINDER AND PISTON



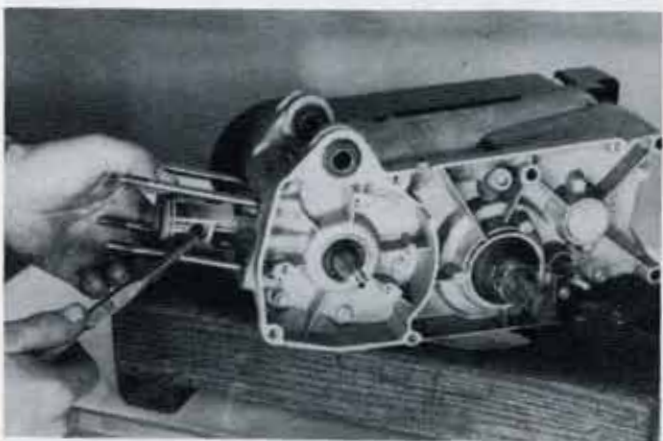
**FIGURE 11**

Remove the four retaining nuts and washers holding the cylinder head to the cylinder studs. (11 mm socket). Remove the cylinder head.



**FIGURE 12**

Remove the cylinder head gasket, the cylinder and cylinder base gasket carefully to prevent damaging the piston and rings.

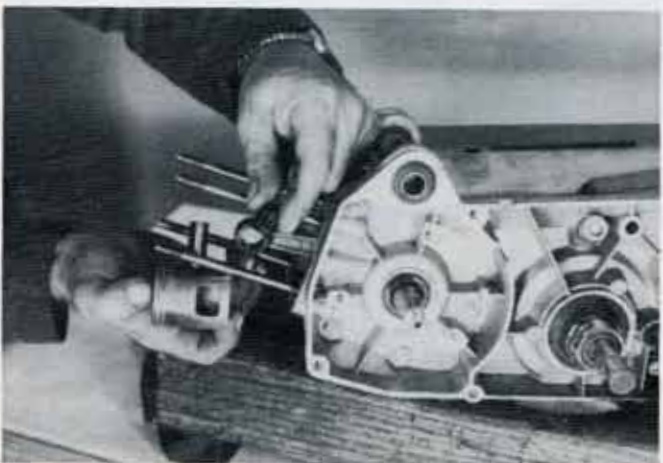


**FIGURE 13**

Remove the circlips retaining the wrist pin from both sides of the piston.

**NOTE**

If servicing the cylinder and piston only, close up the crankcase opening using a shop towel to prevent accidentally dropping the circlips into the crankcase.



**FIGURE 14**

Remove the piston wrist pin by gently pushing it out from either side of the piston. The universal piston pin extractor (#F100025) will aid in the removal of the wrist pin. Remove the piston assembly and wrist pin bearing and inspect for excess wear.

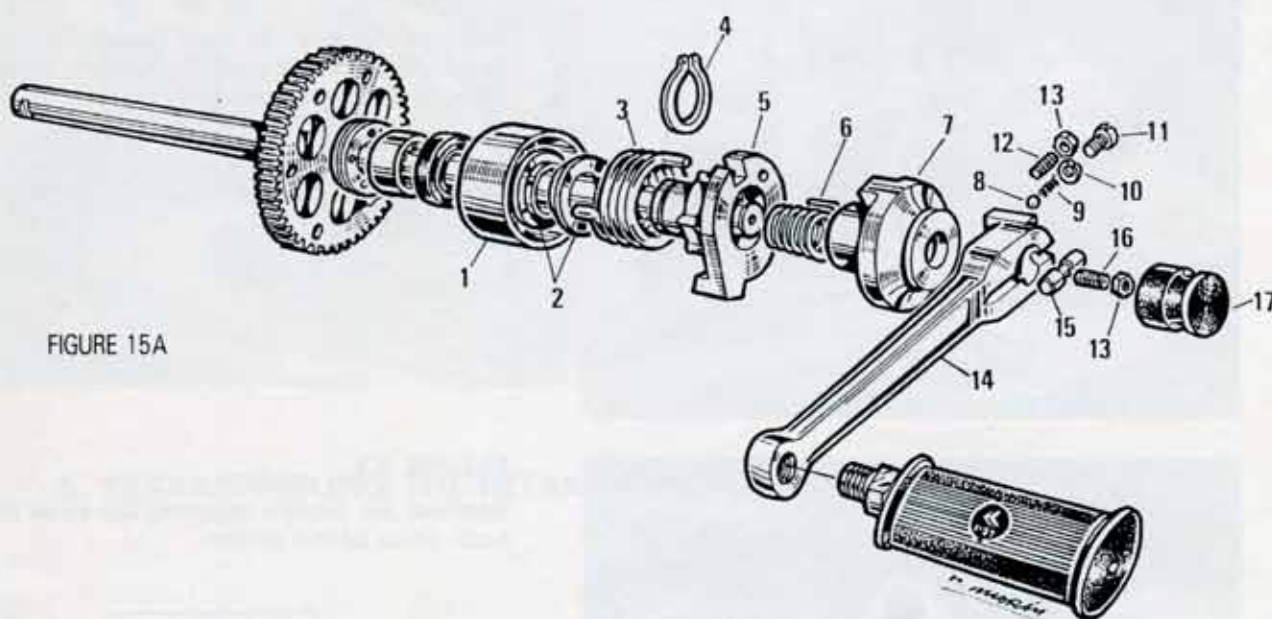


## 7. ENGINE DISASSEMBLY – VARIABLE SPEED CLUTCH SIDE



**FIGURE 15**

Remove the four allen bolts securing the right hand transmission cover. On Derbi Mopeds other than the **DS-50 Scooter** remove the pedal arm and pedal assembly (11 mm wrench). Then remove the transmission cover. Removal of the transmission cover on the DS-50 is covered under figure 15A below.



**FIGURE 15A**

**FIGURE 15A**

To remove the transmission cover from the Derbi DS-50 Scooter, the retracting pedal arm assembly must first be removed.

Proceed as follows:

- Remove the pedal shaft rubber end plug (#17) by pulling it off the pedalshaft.
- Remove the 8 mm nut (#13) from the threaded stud (#16).
- Remove the threaded stud from the end of the pedal shaft using a 2.5 mm allen wrench. Once removed, the dowel pin (#15) will drop out of the pedalshaft.
- Remove the slotted screw (#11) the lockwasher (#10) the spring (#9) and the ball bearing (#8) from the top of the pedal arm.
- Gently slide the pedal arm (#14) off the pedal shaft. The pedal arm guide (#7) will also slide off the shaft with the pedal arm.
- Remove the spring (#6) from the pedal shaft.
- The remainder of the assembly shown in #'s 1 through 5 will come off the pedal shaft as one unit with the transmission cover.





**FIGURE 16**

Remove the allen bolt securing the cooling fan to the crankshaft and variator assembly (5 mm allen wrench). Remove the cooling fan.

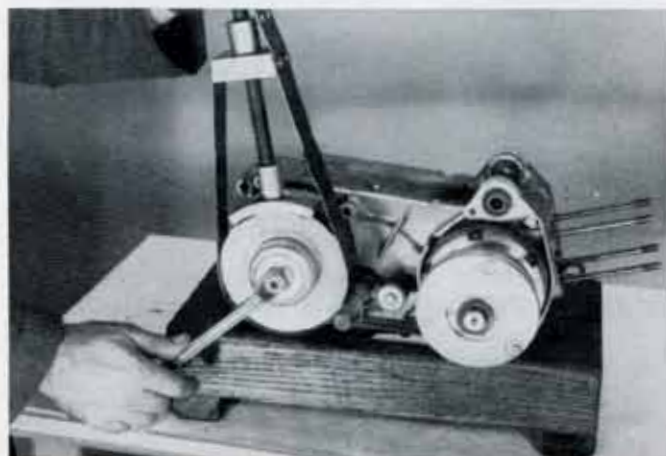


**FIGURE 17**

Remove the V-Belt from the engine by rotating the front variator assembly counterclockwise while walking the belt off the rear pulley assembly.

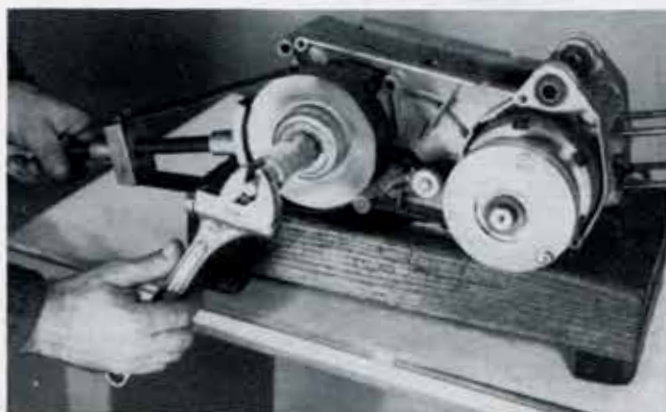
**CAUTION**

Take care not to trap your finger between the rear pulley assembly and the belt.



**FIGURE 18**

Remove the driven pulley assembly retaining nut by holding the assembly stationary using the universal flywheel wrench (#F100005) and a 14 mm wrench to remove the retaining nut (**LEFT HAND THREADED**).



**FIGURE 19**

With the universal band wrench (#F100005) still in place, install the pulley extractor tool (#0008254740) onto the outer half of the driven pulley assembly. Tighten the pulley extractor center bolt **slowly** (12 mm wrench) while holding the pulley extractor tool body stationary (18 mm wrench).

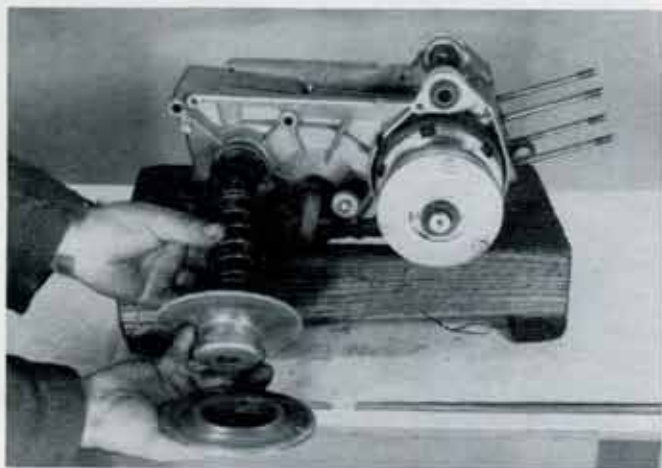
**NOTE**

A spacer may be required to be used in conjunction with the pulley extractor tool (#0008254740) so that the center bolt of the tool will make contact with the end of the driven pulley shaft. If a spacer is required, install the spacer inside the body of the extractor so that it is positioned between the extractor center bolt and the driven pulley shaft when the puller is installed onto the outer half of the pulley assembly.

**CAUTION**

The driven pulley assembly is spring loaded. When utilizing the driven pulley extractor, apply tightening pressure on the tool **VERY SLOWLY** and stand off to one side of the assembly when attempting to remove with the puller.

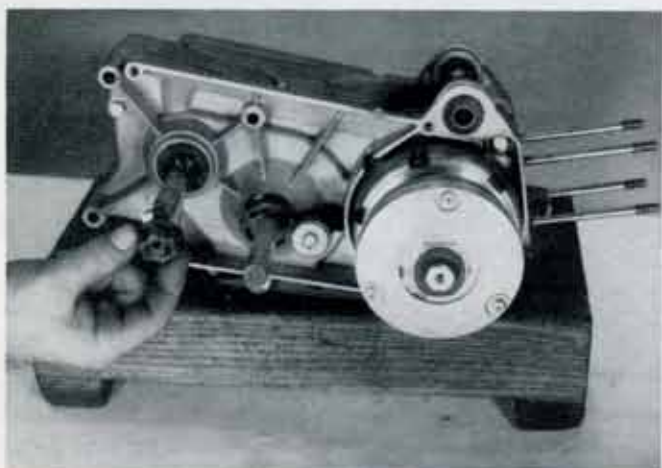




**FIGURE 20**

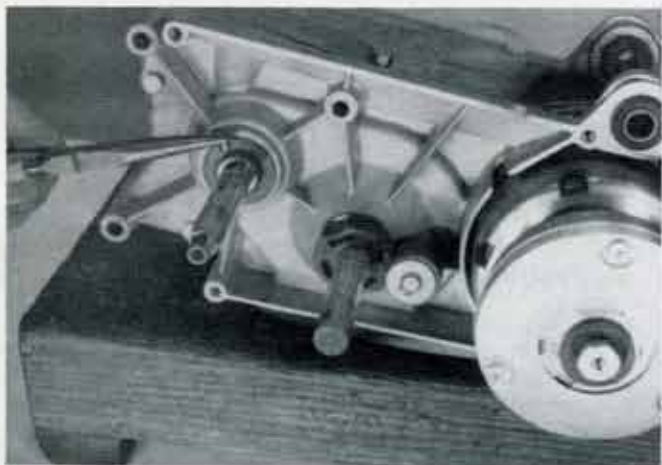
This is a detailed view of the driven pulley dismantled.

- Remove the large spring.
- Remove the black nylon driven pulley cam from the shaft.



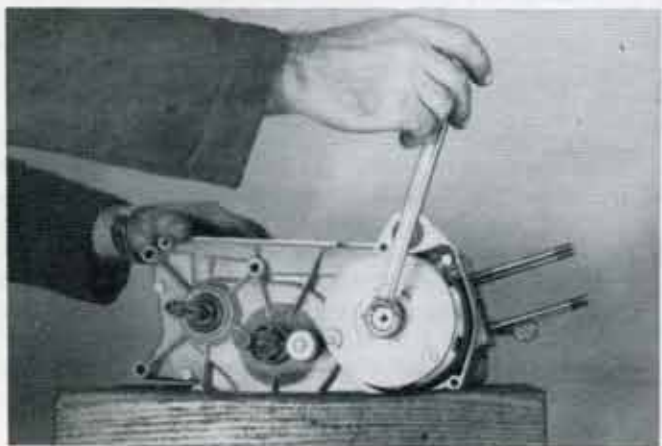
**FIGURE 21**

Remove the driven pulley drive cog from the driven pulley shaft.



**FIGURE 22**

Remove the driven pulley drive cog locating pin from the shaft carefully using a pair of pliers. Then remove the machined steel bushing from inside the driven pulley shaft seal and slide off the shaft.

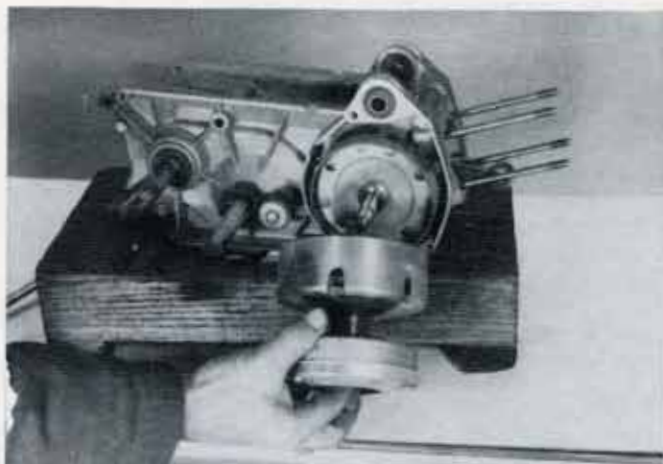


**FIGURE 23**

Remove the crankshaft clutch nut holding the variator and clutch hub assembly on the crankshaft (17 mm **Left Hand Thread**).

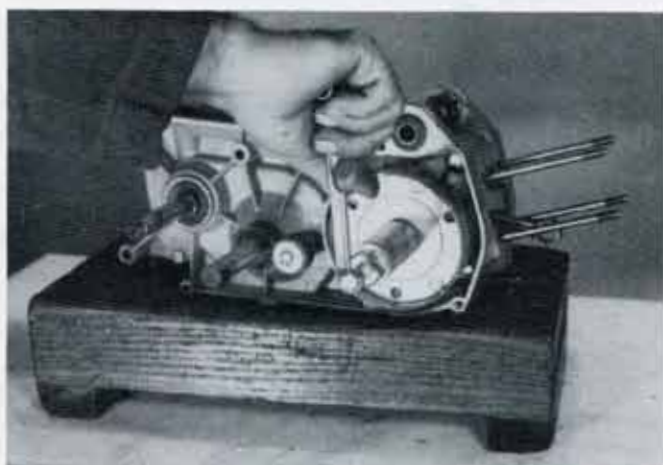
**NOTE**

The crankshaft must be held stationary to remove this nut. The use of the universal flywheel wrench (#F100005) on the magneto flywheel will facilitate the removal of the clutch nut.



**FIGURE 24**

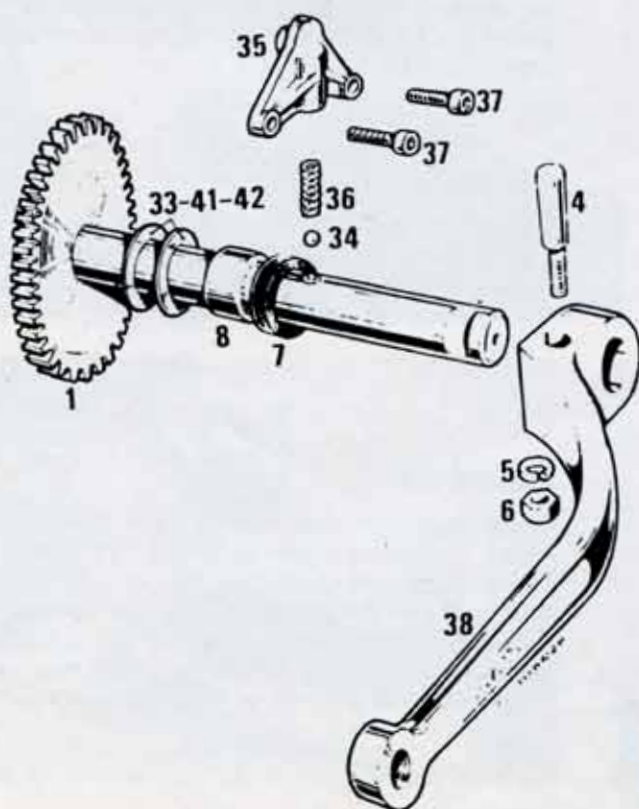
Remove the variator assembly from the crankshaft by carefully sliding it off the end of the crankshaft.



**FIGURE 25**

Remove the drive clutch assembly from the crankshaft using the special extractor tool (#0008254740) (12 mm and 18 mm wrenches).

### FOR ENGINES NOT EQUIPPED WITH ELECTRIC START

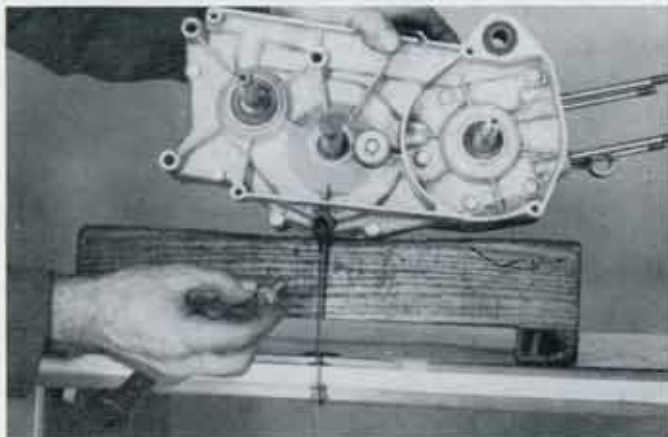


**FIGURE 26**

Remove the pedal shaft detent mechanism (#35) from the right engine case half. To do so remove the two allen bolts (#37) with a 4 mm allen wrench. Take special care not to loose the detent ball (#34) and spring (#36).

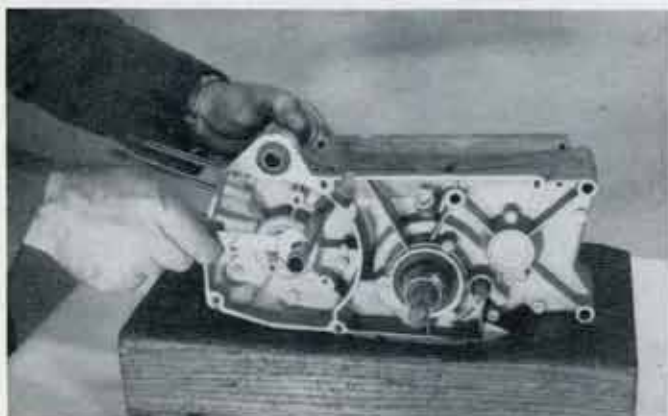


## 8. ENGINE DISASSEMBLY - SEPARATING THE CRANKCASE HALVES



**FIGURE 27**

Drain the oil from the engine crankcase prior to separating the crankcase halves. The oil drain plug is located on the right lower section of the engine crankcase (14 mm wrench or 8 mm allen wrench).



**FIGURE 28**

Remove the nine bolts and nuts holding the crankcase halves together (10 mm wrench).

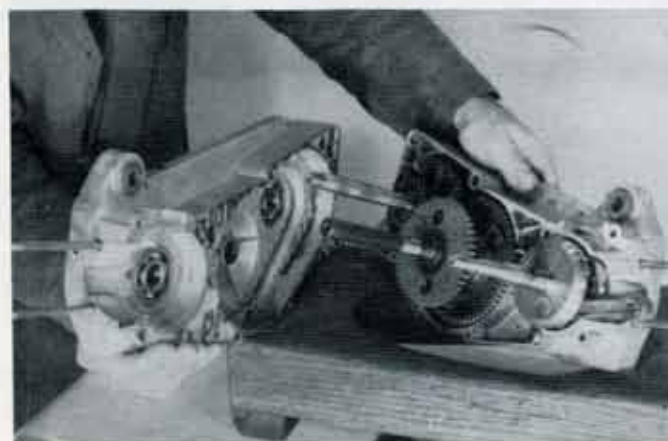


**FIGURE 29**

When all the crankcase bolts have been removed, separate the two crankcase halves by tapping alternately on the right side of the pedal shaft and the end of the crankshaft with a plastic or nylon mallet.

**NOTE**

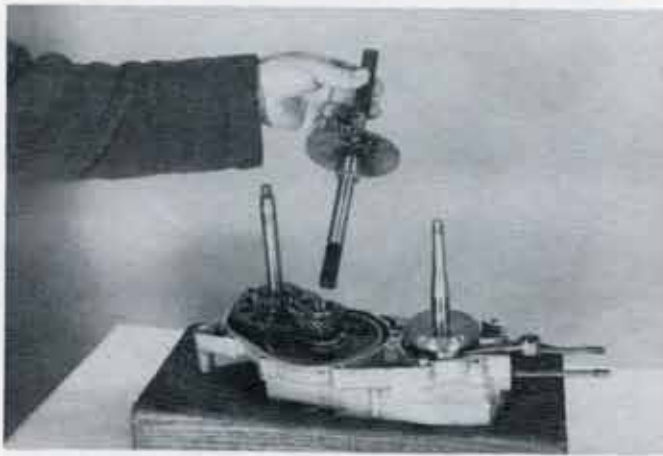
To prevent any distortion to the threads on the end of the crankshaft, it is advisable to reinstall the **Left Hand Threaded** 17 mm nut fully onto the crankshaft prior to tapping it with the mallet.



**FIGURE 30**

Once the crankcase halves have been separated, access can now be made to the internal gears and components, all of which are mounted into the left crankcase half. An inspection and, if necessary, disassembly should be done to correct any problems which may exist in this internal portion of the engine transmission.

## 9. ENGINE DISASSEMBLY – THE INTERNAL TRANSMISSION

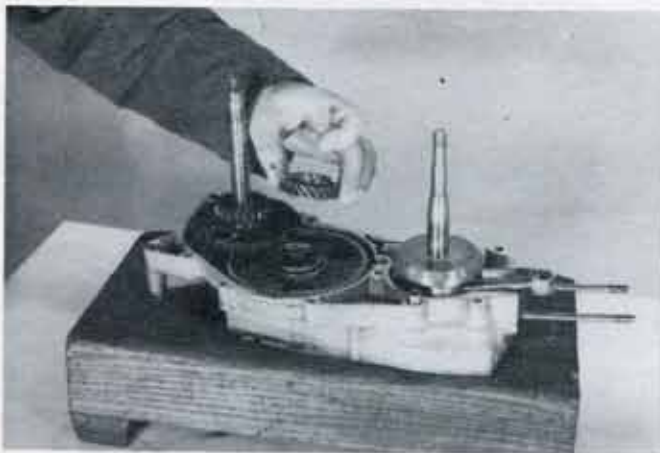


**FIGURE 31**

Carefully remove the pedal shaft from the left crankcase half of the engine.

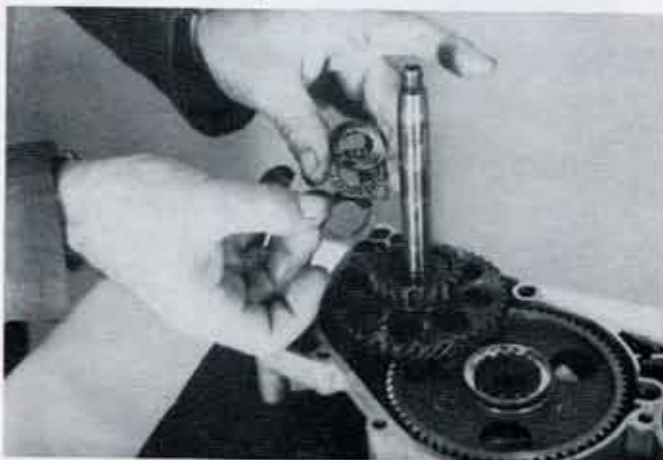
**NOTE**

Take special care to note any shims which may be present on the pedal shaft as these shims will have to be reinstalled in the same position when reassembling the engine.



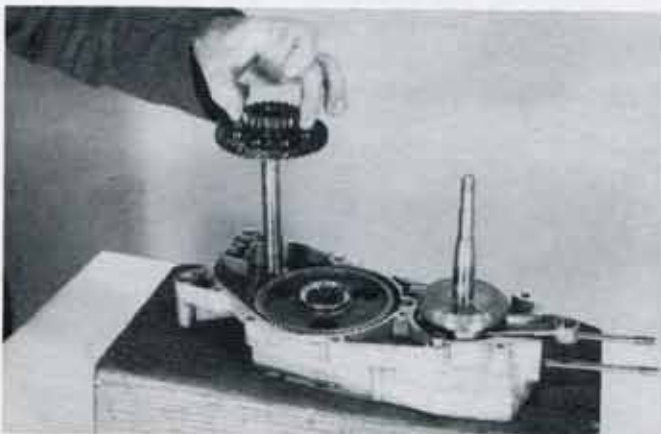
**FIGURE 32**

Remove the pedal drive pinion gear and the starter drive pinion coupling spring as one assembly.



**FIGURE 33**

Remove the axial thrust bearing and shim from the driven pulley shaft.



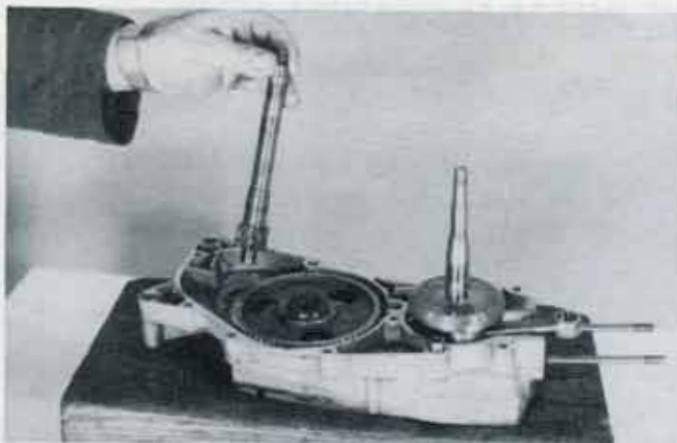
**FIGURE 34**

Remove the pedal pinion and starter gear sub-assembly.

**NOTE**

Take special care to note any shims which may be present on the pedal shaft as these shims will have to be reinstalled in the same position when reassembling the engine.





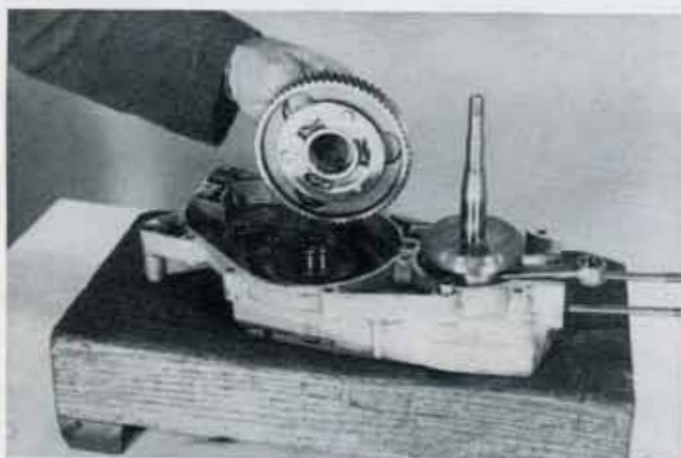
**FIGURE 35**

Remove the driven pulley shaft from the left crankcase half.



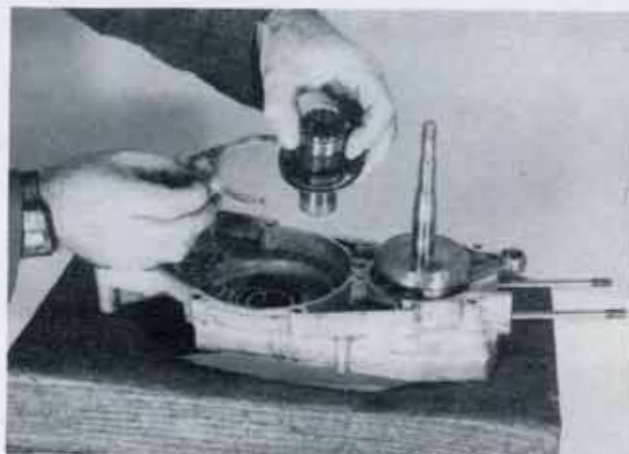
**FIGURE 36**

Remove the retaining circlip on the center of the reduction transmission gear.



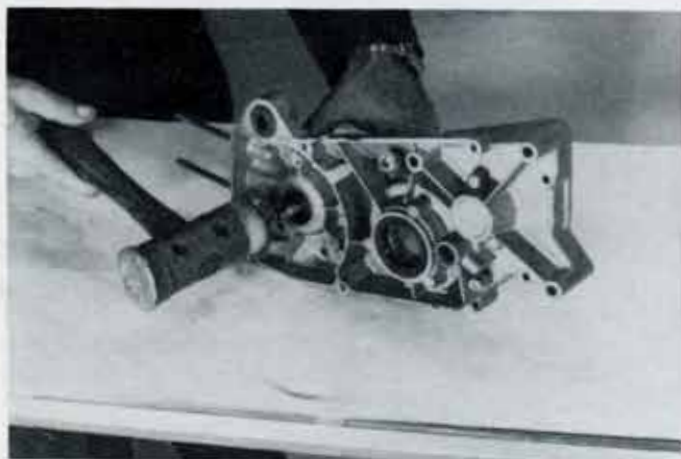
**FIGURE 37**

Remove the reduction transmission gear subassembly from the left crankcase half.



**FIGURE 38**

Remove the engine engagement dog mechanism and the engagement sliding fork subassembly.



**FIGURE 39**

Remove the crankshaft and connecting rod assembly as one unit by gently tapping the crankshaft with a plastic or nylon mallet.

**NOTE**

To prevent any distortion to the threads on the end of the crankshaft it is advisable to reinstall the **Left Hand Threaded 14 mm** flywheel nut fully onto the crankshaft prior to tapping it with the mallet.

## 10. VARIATOR AND DRIVE CLUTCH DISASSEMBLY



**FIGURE 40**

Remove the three screws securing the variator weight cover to the variator assembly (Phillips screwdriver).



**FIGURE 41**

Hold the Variator/clutch drum stationary using the flywheel wrench (F100005).

Fold back the tabs on the variator nut lock plate by using a small chisel or drift punch and a hammer. Flatten the lock tabs so that the variator nut can be removed.

Remove the variator nut (**Right Hand Thread**).

**NOTE**

DERBI uses two different size variator nuts in their normal production (35 mm and 36 mm).



**FIGURE 42**

Remove the centrifugal weight cover by pulling it straight out of the weight housing.

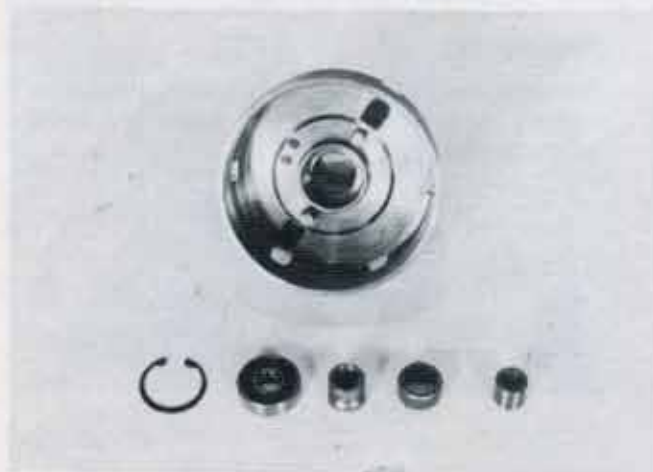
Remove the six (6) centrifugal weight roller assemblies.



**FIGURE 43**

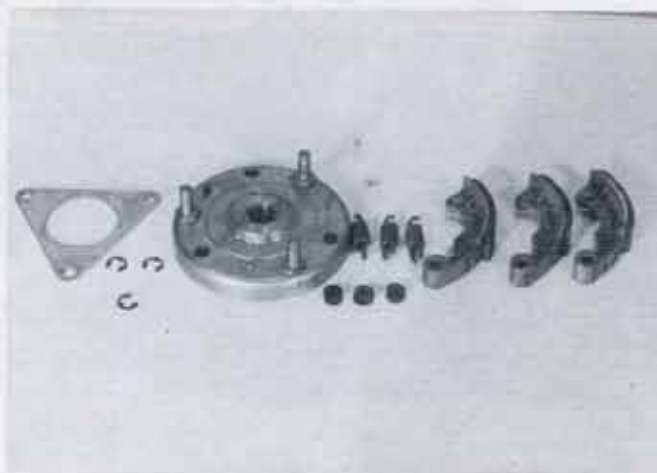
This figure illustrates the starting clutch shoe assembly dismantled from the variator/clutch drum.





**FIGURE 44**

This figure illustrates the variator/clutch drum dismantled completely including the internal bearings and machined bushings.



**FIGURE 45**

This figure illustrates the starting clutch drum and drive clutch assembly completely dismantled.

## 11. RECOMMENDED INSPECTIONS AND MAINTENANCE PRIOR TO ENGINE REASSEMBLY

Once the engine has been completely dismantled, it is recommended that the following operations be performed as preventive maintenance to prolong engine life and avoid more serious problems from occurring in the future.


**11.1:** Remove the carbon deposits from the crown of the piston, the cylinder head combustion chamber and cylinder exhaust port using very fine emery cloth. The carbon deposits are a by-product of the exhaust gasses produced by the combustion of the oil/gasoline mixture. Excessive buildup of carbon is often one of the major causes for loss of engine power.

**11.2:** Before reusing the original cylinder, the cylinder bore must be carefully checked for scratches or scoring in the Nickel-Silicon coating which could lead to a loss of power. Should the cylinder require replacement, the replacement cylinder is sold as a kit including a matched piston assembly, piston rings, wrist pin and clips. (No wrist pin bearings are included).

**11.3:** If installation of a new piston assembly is required, the new piston must be matched to the cylinder being used. DERBI utilizes a series of five (5) sort sizes during the manufacture of their cylinder kits. The replacement piston must be the same sort size as that indicated on the cylinder being used. The sort letter for the piston is stamped into the crown of the piston (A thru E). The sort letter for the cylinder is stamped into the head gasket surface at the top of the cylinder.

**EXAMPLE:** Cylinder sort Markings: **MB0287** Where the "B" represents the sort series and the "287" or 2/87 represents the month and year of manufacture. In this instance the date of manufacture is the 2nd month, February, of 1987.

## NICKEL/SILICON CARBIDE CYLINDER & PISTON SORT TABLE

SORT LETTER	PISTON DIAMETER	+ or - 0.0025 mm	CYLINDER DIAMETER	+ or - 0.0025 mm	PISTON TO CYLINDER CLEARANCE LIMITS	SPARE PART NUMBER
A	39.845 mm	39.8425 mm to 39.8475 mm	39.860 mm	39.8575 mm to 39.8625 mm	<div style="text-align: center;"> MINIMUM 0.010 mm      MAXIMUM 0.020 mm </div>	OF02500091/A
B	39.850 mm	39.8475 mm to 39.8525 mm	39.865 mm	39.8625 mm to 39.8675 mm		OF02500091/B
C	39.855 mm	39.8525 mm to 39.8575 mm	39.870 mm	39.8675 mm to 39.8725 mm		OF02500091/C
D	39.860 mm	39.8575 mm to 39.8625 mm	39.875 mm	39.8725 mm to 39.8775 mm		OF02500091/D
E	39.865 mm	39.8625 mm to 39.8675 mm	39.880 mm	39.8775 mm to 39.8825 mm		OF02500091/E

Piston Ring End Gap:

**MINIMUM**  
0.006 INCH  
0.15 MM

**MAXIMUM**  
0.018 INCH  
0.30 MM

As indicated in the sort table above, the minimum allowable piston to cylinder clearance is 0.010 MM, and the maximum allowable clearance is 0.020 mm. If the piston to cylinder clearance exceeds the maximum value of 0.020 MM, a piston from the next size sort may be able to be used provided the piston to cylinder clearance meets or exceeds the minimum value of 0.010 mm. (See sort table above).

**11.4:** Check the condition of the piston rings for excessive wear and proper end gap. Frequently piston to cylinder clearance of 0.017 MM or even 0.018 MM need not mean changing the piston but merely the rings.

**Standard Piston Ring Depth = 1.7 MM to 1.75 MM**

**Standard Piston Ring Height = 1.5 MM**

**11.5:** When replacing a piston, the fit of the piston may require gentle pressure to install the piston into the cylinder. The nickel/silicon plating of the cylinder bore is an anti-seize material which allows for the very tight tolerances of piston to cylinder clearance as previously outlined.

**11.6:** When reinstalling a DERBI piston, the arrow ( → ) reference mark stamped into the crown of the piston must face or point to the exhaust port of the cylinder.

### CAUTION

Installing the piston incorrectly or backwards will result in piston and or cylinder damage.



**11.7: VARIABLE SPEED DRIVEN PULLEY SPRING:** The spring located in the variable speed driven pulley must be checked for fatigue when the assembly is dismantled. This spring is of vital importance to the proper operation of the variator assembly. The free length of this spring when new is 84 mm. This spring should be changed when its nominal free length decreases by 3 mm or more.

**NOTE**

See Diagram 3 ref #38 Page 29.

**11.8: DRIVE CLUTCH AND STARTING CLUTCH SHOES:** The starting clutch and drive clutch shoes should be visually inspected for wear whenever the clutch assemblies are dismantled or exposed. The clutch shoe assemblies are of a special design that ensures correct operation so long as the lining material is not completely worn away, therefore some wear in these special clutch linings will not affect the performance of the variable speed clutch.

Listed below are the original thicknesses for both the drive clutch and starting clutch pad material. These clutch assemblies should be replaced when the remaining clutch pad material wears to a thickness of less than 1 mm. Failure to replace the clutch shoes at the proper wear interval will cause damage to the contact surfaces on the corresponding clutch drums and necessitate their replacement as well.

	Original Clutch Pad Thickness	# of Pads Per Assy.	Diagram No.	Reference No.	Page #
Starting Clutch Shoe	4 MM	2	3	12	29
Drive Clutch Shoe	5 MM	3	3	6	29

**11.9: CRANKCASE TRANSMISSION BEARINGS:** The support bearing mounted into the crankcase halves for both the pedal shaft and the driven pulley shaft must be inspected for excessive wear prior to engine reassembly. If the transmission oil has been changed at the recommended intervals and the proper transmission oil level has been maintained it is not likely that the transmission bearings will have to be replaced.

To replace the transmission bearings in the crankcase halves proceed in the following manner:

- Remove the oil seal situated on the outboard side of the crankcase half for each bearing to be replaced.
- Heat the crankcase half being serviced using an over or a propane torch to a temperature of 175 – 195 degrees Fahrenheit (80 – 90 Celsius).
- Remove the bearing to be replaced by gently tapping the bearing inward from the outside of the crankcase half.
- Lubricate the leading edge of the outer bearing race on the new bearing to be installed.
- Using a piece of tube the same diameter as that of the outer bearing race being installed, tap the new bearing fully into its seated position in the crankcase half.

**NOTE**

The engine case half being serviced must be heated in the same manner as outlined above for bearing removal.

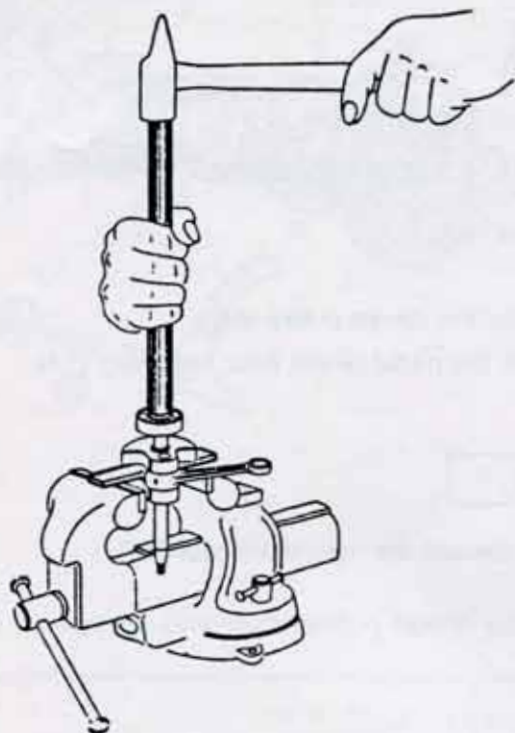
**CAUTION**

Applying pressure to the inner bearing race of the new bearing during installation will result in damage to the new bearing.

- Install **NEW** oil seals into the outboard side of the crankcase halves.



**10.10: CRANKSHAFT SUPPORT BEARINGS:** The crankshaft support bearing on both the clutch and magneto side of the crankshaft should be inspected for excessive wear, binding and bearing cage rupture or distortion.



**FIGURE 46**

When replacing the crankshaft support bearings, the new bearings are to be installed onto the crankshaft by supporting the crankshaft counter weight assembly on a steel blade spanning the open jaws of a vise. Drive the bearing home against the counterweight using a tube with the same diameter as the inner race of each bearing. (Refer to Figure #46). Lubricate the bearing well with a generous amount of two cycle oil.

**NOTE**

It is strongly recommended that both crankshaft support bearings be replaced as standard procedure when rebuilding an engine because of a lubrication related failure.

## 12. ENGINE REASSEMBLY – THE INTERNAL CRANKCASE COMPONENTS

**NEVER INSTALL USED GASKETS OR SEALS!** Always replace the oil seals and gaskets during and engine rebuild!!

Assembly of the internal crankcase components always starts with the left crankcase half (Magneto side) and finishes up with the mating of the right crankcase half to the left half once the internal components have been installed into the left crankcase half.

- Install NEW crankshaft bearings onto the crankshaft as outlined under 11.10.
- Lubricate the crankshaft and bearings thoroughly with two cycle oil.
- Heat the left crankcase half, where the crankshaft bearing seats, evenly with a propane torch to a temperature of 175 – 195 degrees Fahrenheit (80-90 degrees Centigrade). Once this temperature is reached white smoke will begin to rise from the crankcase half.
- Install the crankshaft assembly into the left crankcase half by gently pushing into place. Check that the crankshaft and support bearings are fully seated into the left crankcase half.

**NOTE**

If the crankcase half is heated sufficiently and the support bearing is adequately lubricated, the crankshaft will literally drop into place and fully seat the support bearing in the case half. The use of force to seat the crankshaft into the crankcase half will cause damage to the crankshaft and support bearing and may cause damage to the crankcase half.



REFER TO ASSEMBLY DIAGRAM # 1 PAGE 23 FOR THE FOLLOWING ASSEMBLY PROCEDURES:

- Install the reduction bushing mechanism (19) and the reduction bushing engagement fork assembly (22) into the left crankcase half.
- Install the reduction gear subassembly (27) onto the reduction bushing (19) and secure with the circlip (40).
- Install the drive pinion stop washer (28).

REFER TO ASSEMBLY DIAGRAM #2 PAGE 23 FOR THE FOLLOWING ASSEMBLY PROCEDURES:

- Install the driven pulley shaft (4) into the left crankcase half.
- Install the driven pulley shaft washer (6).
- Install the pedal pinion gear subassembly (8 & 11) onto the driven pulley shaft.
- Install the axial bearing (16) onto the inner diameter of the pedal pinion gear assembly (11).

**NOTE**

The roller side of the axial bearing must be outward or toward the right crankcase half.

- Install the axial bearing thrust washer (10) onto the driven pulley shaft and up against the axial bearing.

REFER TO ASSEMBLY DIAGRAM # 1 PAGE 23 FOR THE FOLLOWING ASSEMBLY PROCEDURES:

- Install the following components onto the left side of the pedal shaft assembly (25) up against the fixed gear.
- Thrust washer (9).
- The pedal drive pinion bushing (10).
- The pedal drive pinion and spring shifter fork (11 & 12).
- Install the pedal shaft assembly with components onto the left crankcase half.

**CAUTION**

When installing the pedal shaft assembly into the left crankcase half, extreme care must be used to ensure that the end of the spring shifter fork (12) bent on a 90 degree angle is located properly into the recess of the left crankcase half.

- Install the two thrust washers (13) onto the right side of the pedal shaft up against the fixed gear.





### 13. REASSEMBLING THE CRANKCASE HALVES

- Support the left crankcase half and internal components on wooden blocks high enough off the work bench so that the pedal shaft is clear of the workbench surface.
- Fit the crankcase gasket to the left crankcase half. **A NEW** gasket should be used every time the crankcase halves are opened to ensure an oil tight seal when reassembling. The **NEW** gasket should be thoroughly coated with two cycle oil or a lightweight grease to ensure a uniform seal.
- Heat the right crankcase half, where the right crankshaft bearing seats, evenly with a propane torch to a temperature of 175-195 degrees Fahrenheit (80-90 degrees Centigrade). Once this temperature is reached white smoke will begin to rise from the crankcase half.
- Slide the right crankcase half down over the crankshaft, pedal shaft and driven pulley shaft.
- Tap the right crankcase half evenly around its outer perimeter with a plastic mallet until the right crankcase half comes fully to rest against the left crankcase half.

#### NOTE

Take special care not to misalign the crankcase gasket while joining the two crankcase halves together.

- Install the crankcase locking bolts into the crankcase from the right side of the crankcase.

#### IMPORTANT

The locking nuts for the crankcase bolts must be situated on the left side (Magneto Side) of the crankcase assembly.

- Before tightening the crankcase bolts, check that the crankshaft, the pedal shaft and the driven pulley shaft rotate freely.
- Tighten the crankcase bolts and nuts **progressively** to a final torque of 7.5 ft./lbs. (1 kg/m).
- Recheck that the crankshaft, pedal shaft and driven pulley shaft all turn freely once the crankcase bolts have been fully torqued.
- Install **NEW** crankshaft oil seals into both the right and left side of the crankcase.

#### IMPORTANT

The crankshaft oil seals must be installed properly to ensure proper engine performance. The side of the oil seal with the lip and spring must face inwards toward the crankshaft. The seals must also be carefully installed and fully seated into the crankcase so that the outside surface of the seal is flush with the crankcase.

- Once the oil seals have been properly fitted to the crankcase check that the crankshaft still rotates freely.

### 14. REASSEMBLING THE PISTON, CYLINDER & CYLINDER HEAD

- Inspect the piston wrist pin bearing and replace if necessary.
- Lubricate the piston wrist pin and install the piston onto the connecting rod by gently sliding the wrist pin through the piston and into the wrist pin bearing.



### CAUTION

When reinstalling a Derbi piston, the (arrow (→)) reference mark stamped into the crown of the piston must face or point to the exhaust port of the cylinder. Incorrect installation of the piston will result in a loss of power and also in piston and cylinder damage.

- Fit a **NEW** set of wrist pin clips into their corresponding grooves on the piston.

### CAUTION

Take extreme care to locate the wrist pin clips fully into the grooves on the piston without altering or distorting the original shape of the wrist pin clips. Failure to locate the piston pin clips correctly will result in a piston pin clip backing out of the piston causing severe piston and cylinder damage.

- Check the piston rings to be used for the proper end gap in the cylinder [.006 inch (0.15 mm) to .018 inch (0.30 mm)].
- Install the piston rings onto the piston.
- Install a **NEW** cylinder base gasket. Thoroughly coat both sides of the cylinder base gasket with two cycle oil or a light weight grease to ensure a uniform seal.
- Bring the piston to top dead center (T.D.C.) and position the piston rings so that the ring end gaps are positioned correctly in relation to the piston ring retaining pins in the ring lands.
- Thoroughly lubricate the piston assembly and the cylinder bore using 2 cycle oil.
- Install the cylinder onto the piston by compressing the piston rings with your fingers and slowly lowering the cylinder down over the piston till it comes to rest on the base gasket.
- Wipe any excess oil residue from the head gasket surface of the cylinder and the cylinder head.
- Install a **NEW** cylinder head gasket taking care to position the gasket correctly on the cylinder.

### NOTE

The decompression cutout in the head gasket must be aligned with the decompression port drilled into the cylinder directly above the exhaust port.

- Before fitting the cylinder head to the engine, check the decompression valve assembly in the cylinder head. Refit the spark plug and check the decompression valve for leakage by pouring fuel into the combustion chamber. If leakage is detected, disassemble the decompression valve assembly and clean thoroughly. Replace the "O" ring seal on the valve stem if necessary.
- Install the cylinder head onto the four (4) cylinder studs and bring the cylinder head to rest against the cylinder head gasket.
- Install the four (4) cylinder head washer.
- Install the four (4) 11 mm cylinder head nuts and torque evenly to 10-11 ft./lbs. (1.40-1.50 kg/m).

### WARNING

The cylinder head nut torque is critical to the proper operation of the engine. Inadequate torque will result in a loss of compression due to leakage. Over torquing the cylinder head will result in eventual cylinder bore distortion and possible piston to cylinder seizure.



## 15. REASSEMBLING THE MAGNETO/ADJUSTING THE IGNITION TIMING

For engines equipped with breaker point type ignition proceed as follows:

- Install the magneto flywheel key onto the crankshaft.
- Install the stator plate onto the left crankcase half using the three phillips screws. Do not tighten the phillips screws completely as the stator plate may have to be rotated slightly to obtain the proper timing adjustment.
- Install the magneto flywheel onto the crankshaft by lining up the machined groove on the inner diameter of the flywheel with the flywheel key on the crankshaft.

### IGNITION TIMING (BREAKER POINT IGNITION)

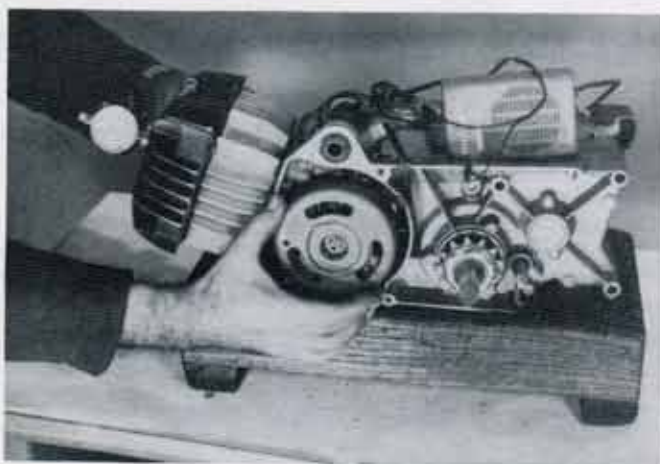


FIGURE 47

Check the ignition point gap by rotating the magneto flywheel so that the ignition point rubbing block is positioned on the highest point of the flywheel timing cam lobe.

The ignition point gap specification is 0.35 mm-0.4 mm as indicated by the engraved markings on the flywheel. The ignition point gap should be checked using a feeler gauge (Part #F100038).

If the ignition point gap requires adjustment, loosen the point set securing screw and adjust the point gap while the points are positioned on the highest point of the flywheel timing cam lobe. Once the point gap has been properly set retighten the point set securing screw without disturbing the point gap adjustment.

- To check or adjust the ignition timing a piston timing tool or dial indicator is required:
- Install the timing tool or dial indicator into the spark plug hole.
- Rotate the magneto flywheel slowly **CLOCKWISE** until the timing tool or dial indicator registers top dead center (T.D.C.). Zero the timing tool or dial indicator.
- Rotate the magneto flywheel **COUNTERCLOCKWISE** slowly until the timing tool or dial indicator registers 1.8 mm. The piston is now positioned at the proper timing mark of 1.8 mm B.T.D.C. (before top dead center). This is the precise point in normal engine rotation (clockwise) at which the ignition points should begin to open.

The most accurate method of determining the precise moment the points open is with the use of a timing light, Ohm meter or acoustic timing indicator. To incorporate one of these instruments correctly, the magneto harness must be fully disconnected from the main wiring harness. The positive lead from the meter being used is to be connected to the green wire on the magneto. The ground lead from the meter being used is to be connected to an engine ground.



To adjust the ignition timing, proceed in the following manner:

- Using the timing gauge or dial indicator, position the piston at 1.8 mm before top dead center.
- Hook up the timing light or Ohm meter as previously described.
- Using your finger reach through the openings in the magneto flywheel and rotate the stator plate clockwise or counterclockwise until the meter indicates the ignition points are just opening.
- Tighten the three phillips screw securing the stator plate to the engine taking care not to shift the stator plate while tightening.
- Recheck the engine timing by rotating the magneto flywheel one full turn clockwise. As the piston comes up to 1.8 mm B.T.D.C. (before top dead center) your meter should register a break in ignition point contact.

### **IMPORTANT**

Ignition point gap must be checked and adjusted prior to setting ignition timing. Adjusting ignition point gap will alter ignition timing and necessitate ignition timing readjustment.

- Install the washer and locknut holding the magneto flywheel onto the end of the crankshaft (**Left Hand Thread**).
- Torque the flywheel nut (Left Hand Thread) to 28 ft./lbs/ (3.80 kg/m). To do so, hold the magneto flywheel stationary using the universal flywheel wrench # F100005 and a 14 mm socket.
- Recheck the ignition timing once the flywheel has been fully installed to make certain the ignition timing was not affected while the flywheel was being tightened.

## **16. REASSEMBLY – ELECTRONIC FLYWHEEL & ADJUSTING THE TIMING**

- Install the electronic flywheel base plate to the engine using the three (3) phillips head screws.
- Install the magneto flywheel key onto the crankshaft.
- Install the electronic stator assembly onto the base plate using the three (3) screws and lockwashers. Don not tighten the screws completely as the electronic stator unit may have to be rotated slightly to obtain the proper timing adjustment.
- Install the magneto flywheel onto the end of the crankshaft by lining up the machined groove on the inner diameter of the flywheel with the flywheel key on the crankshaft.
- Install a timing tool or dial indicator into the spark plug hole.
- Rotate the flywheel counterclockwise so that the piston is positioned 1.8 mm B.T.D.C. (before top dead center). With the piston positioned in this manner the small (2 mm) hole in the flywheel should be directly aligned with the 5 mm deep reference mark on the top surface of the electronic stator unit (approximately 4:30 position when looking at the flywheel). A small finishing nail can be used to insert through the 2 mm flywheel reference hole to determine if it is properly aligned with the electronic stator reference mark while the piston is positioned 1.8 mm B.T.D.C. (before top dead center).

Should the reference marks not line up, rotate the electronic stator unit clockwise or counterclockwise on its base plate, without moving the flywheel until both reference marks line up with the piston in the 1.8 mm B.T.D.C. position.

- Secure the three (3) screws holding the electronic stator base plate.



- Secure the three (3) screws holding the electronic stator unit to the base plate.
- Install the washer and locknut holding the magneto flywheel onto the end of the crankshaft (Left Hand Thread).
- Torque the flywheel nut (**LEFT HAND THREAD**) to 28 ft./lbs. (3.80 kg/m). To do so, hold the magneto flywheel stationary using the universal flywheel wrench # F100005 and a 14 mm socket.
- Check that the timing has not been altered, while tightening the magneto flywheel retaining nut, **before** reassembling the electric start mechanism to the engine.

## 17. TRANSMISSION REASSEMBLY – THE VARIABLE SPEED CLUTCH

REFER TO ASSEMBLY DIAGRAM #3 PAGE 29 FOR THE FOLLOWING ASSEMBLY PROCEDURES

- Reassemble the three drive clutch shoes (6) onto the drive clutch drum. The drive clutch shoes should be replaced if the clutch pad material remaining on the clutch shoes is less than 1 mm thick.
- Install the drive clutch drum assembly (3) onto the end of the crankshaft. The tapered inner diameter of the drive clutch assembly and the crankshaft must be free from any grease or oil residue.
- Reassemble the outer clutch drum/variator half (14). The clutch drum bearing (8) is sealed on one side. This bearing must be thoroughly greased and then installed with the sealed side of the bearing facing the engine crankcase.
- Install the starting clutch shoe set (12) into the clutch drum/variator half (14).

### NOTE

When refitting or replacing the starting clutch shoe set the starting clutch shoes must be installed with the word Derbi facing outward from the clutch drum. The starting clutch assembly should be replaced if the clutch pad material present is less than 1 mm thick.

- Install the caged needle bearing (16) into the variator axle and grease thoroughly.
- Install the variator speed limiting washer (45) onto the variator axle.

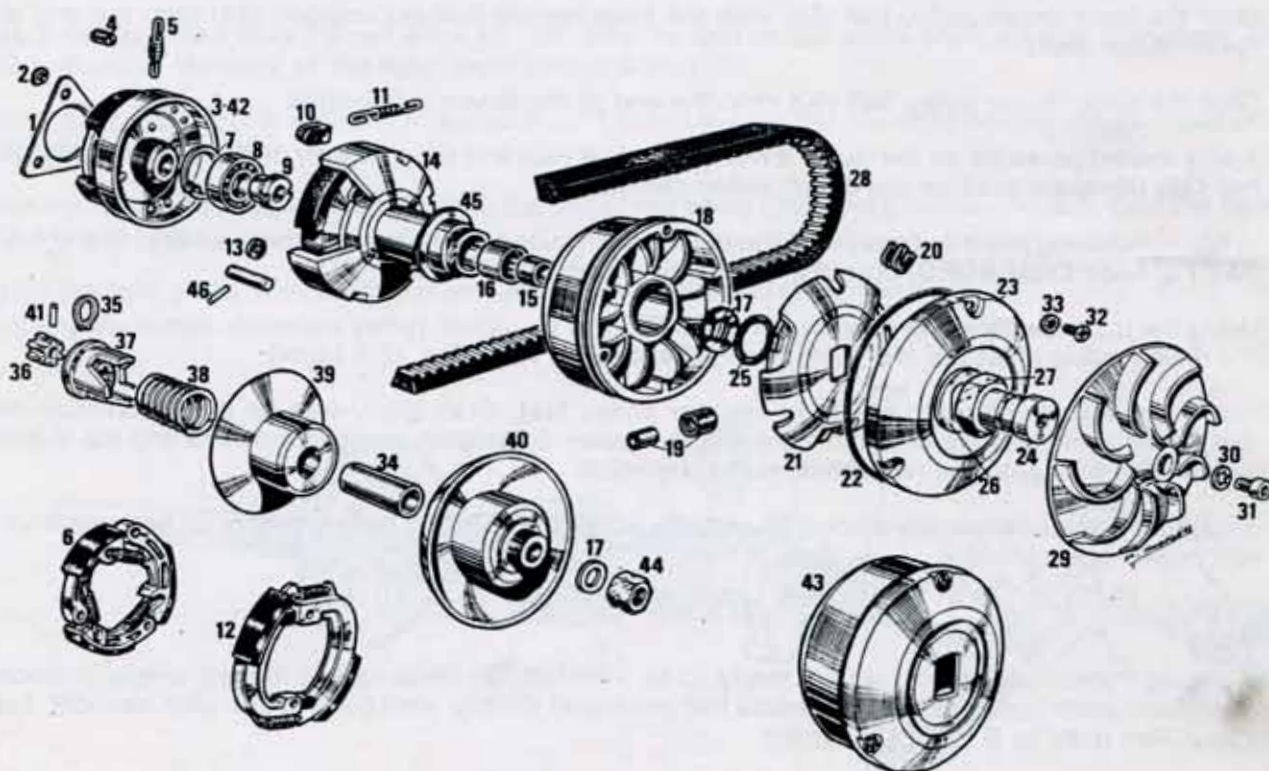
SHIM WIDTH  
8 mm  
5 mm  
No Shim installed

VEHICLE MAXIMUM TOP SPEED  
25 m.p.h. (40 Km/Hr)  
30 m.p.h. (48 Km/Hr)  
30 m.p.h. plus

- Reinstall the six (6) centrifugal weight assemblies (19) into the moveable pulley half of the variator (18). Grease the centrifugal weight assemblies thoroughly.
- Install the centrifugal weight cover (21) with the six (6) centrifugal weight rubber stops (20).
- Install the centrifugal weight drum top cover (23) after inspecting and reinstalling the large "O" ring (22) onto the outer diameter of the centrifugal weight drum (18). Secure the cover (23) using the three lockwashers (33) and three phillips head screws (32).



- Slide the assembled centrifugal weight drum assembly onto the variator axle.
- Slide the lockwasher (26) onto the end of the variator axle assembly and up against the centrifugal weight drum assembly.
- Install the centrifugal weight cover nut (27) onto the end of the variator axle (Right Hand Thread) and torque to 15 ft./lbs. (2.0 kg/m). The use of the universal flywheel wrench (# F100005) will facilitate in holding the variator assembly stationary.
- Fold one edge of the washer (26) over so that it is at a 90 degree angle and contacts one of the wrench flats on the centrifugal weight cover nut (27) thus locking the nut in place.
- Slide the variator assembly onto the end of the crankshaft and fully up against the drive clutch assembly (3).
- Slide the spacer (15) onto the crankshaft and locate it inside the variator axle and up against the caged needle bearing (16).
- Slide the washer (17) onto the crankshaft and locate it up against the spacer (15).
- Install the "O" ring (25) midway onto the crankshaft nut (24). Replace the "O" ring (25) if cracked or dry rotted.
- Install the crankshaft nut (24) (**LEFT HAND THREAD**) and torque to 18 ft./lbs. (2.50 kg/m) (17 mm socket). The use of the universal flywheel wrench (# F100005) on the magneto flywheel will hold the crankshaft stationary so that the clutch side crankshaft nut (24) can be properly tightened.
- Locate the fan (29) onto the end of the crankshaft nut (24) and secure with the lockwasher (30) and allen bolt (31). Tighten the allen bolt cautiously as overtightening will damage the fan.
- Spin the variator assembly on the crankshaft. The variator assembly should rotate independently of the crankshaft and drive clutch assembly when spun by hand.



**DIAGRAM #3:  
VARIATOR AND CLUTCH ASSEMBLY**



## 18. DRIVEN PULLEY REASSEMBLY

Before fitting the driven pulley assembly to the driven pulley shaft it is necessary to reinstall the pedal shaft detent positioning mechanism to the right crankcase half. This mechanism incorporates a spring loaded ball detent which maintains the pedal arms and pedals at a horizontal position to the road surface when the pedals are not in use. This mechanism is used only on Derbi engines not equipped with electric start. Refer to Diagram # 1 page 23 for the following procedures:

- Install the ball bearing (4) and spring (3) into the detent housing (1). The spring should be checked for cracks or fatigue and replaced if necessary.
- Bolt the detent housing to the right crankcase using the two allen bolts (2) and torque to 4 ft./lbs. (.50 kg/m).

REFER TO DIAGRAM #3 PAGE 29 FOR THE FOLLOWING DRIVEN PULLEY ASSEMBLY STEPS

- Insert the steel dowel pin (41) into the driven pulley shaft.
- Slide the inner pulley half drive cog (36) onto the driven pulley shaft and locate the cut out section of the drive cog (36) around the steel dowel pin (41). With the drive cog properly positioned the circlip (35) will prevent the steel dowel pin (41) from dropping out of the driven pulley shaft when rotated.
- Slide the driven pulley cam (37) onto the driven pulley shaft and locate properly onto the drive cog (36).
- Install the driven pulley spring (38) into the driven pulley cam (37).
- Slide the inner driven pulley half (39) with the inner bronze bushing installed (34) onto the end of the driven pulley shaft.
- Slide the outer driven pulley half (40) onto the end of the driven pulley shaft.
- Apply inward pressure on the outer driven pulley half (40) and twist slightly until the inner driven pulley half (39) positions itself on the driven pulley cam (37).
- While maintaining inward pressure on the outer driven pulley half (40) install the washer (17) and nut (44) (**LEFT HAND THREADED**) onto the end of the driven pulley shaft.
- Using the universal flywheel wrench # F100005, hold the driven pulley assembly stationary and torque the driven pulley shaft nut (44) (Left Hand Threaded) to 18 ft./lbs. (2.5 kg/m).
- Install the V-Belt (28) onto the front variator pulley first. Start the V-Belt on the top section of the rear driven pulley. Rotate both the front and rear pulley assemblies counterclockwise and the V-Belt will locate itself fully onto the rear driven pulley assembly.
- Rotate the variator assembly clockwise and check that the V-Belt is turning evenly on both the front and rear pulley assemblies.

The plastic transmission cover is now ready to be installed. On Derbi variant models simply position the transmission cover onto the right crankcase half and install the four allen bolts (5 mm allen wrench). Torque the four allen bolts to 8 ft/lbs (1.0 kg/m).



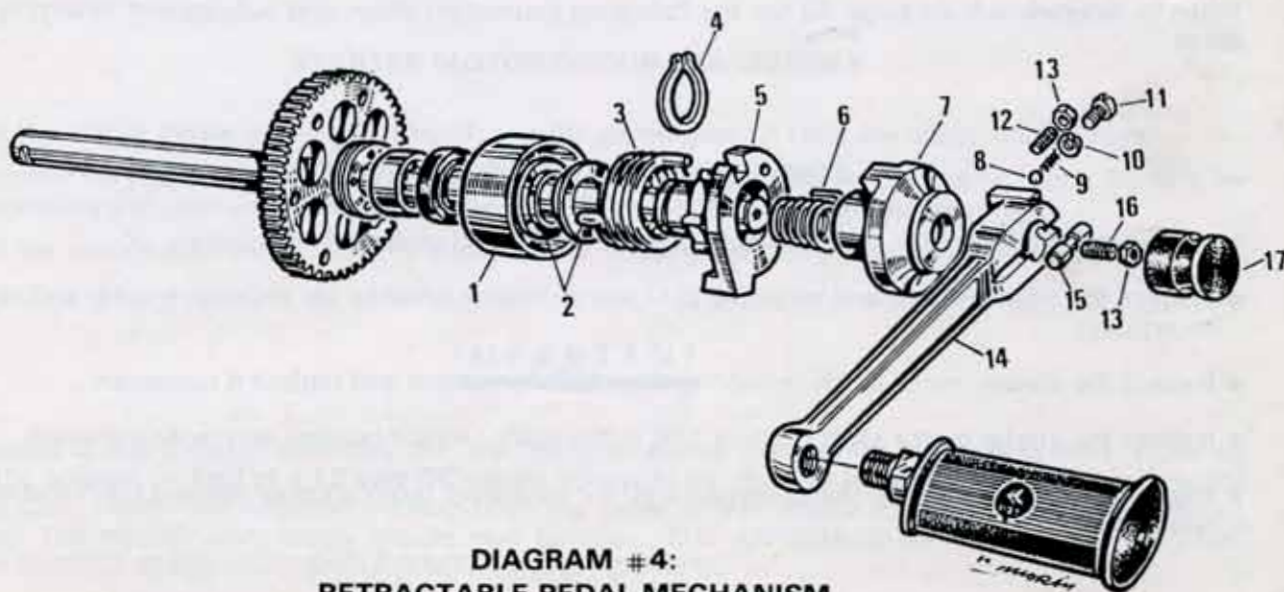
On the Derbi DS-50 Scooter reassembly of the retractable right side pedal mechanism must be completed. To do so refer to diagram #4 below and proceed as follows:

- Install items 1 through 5 onto the transmission cover.
- Position the transmission cover onto the right crankcase half and install the four allen bolts (5 mm allen wrench). Torque the four allen bolts to 8 ft./lbs. (1.00 kg/m).
- Slide the spring (6) all the way down the right side of the pedal shaft so that it come to rest inside the return bushing (5).

**NOTE**

The spring (6) must be installed onto the pedal shaft as pictured. The straight length of the spring coil material must be pointed inwards.

- Slide the pedal arm guide bushing (7) onto the pedal axle and position over the spring (6) and interlock with the return bushing (5).
- Slide the retractable pedal arm (14) onto the pedal shaft and position the pedal arm between the two protruding tabs on the transmission cover.
- Install the ball (8), spring (9), lockwasher (10) and screw (11) into the central hole on the end of the right crankarm (14).
- Install the threaded stud 05 mm 80 x 16 (12) into the inboard hold on the end of the right crankarm (14) so that it engages the inside lip on the pedal arm guide bushing (7). (2.5 mm allen wrench).
- Install the 8 mm nut (13) onto the threaded stud (12) and tighten the nut while holding the threaded stud with a 2.5 mm allen wrench.
- Slide the right pedal arm limit pin (15) into the end of the pedal shaft.
- Install the threaded stud 05 mm 80 x 12 (16) into the end of the pedal shaft so that it engages the reduced center diameter of the right pedal arm limit pin (15).
- Install the 8 mm nut (13) onto the threaded stud (16) and tighten the nut while holding the threaded stud (16) with a 2.5 mm allen wrench.
- Slide the rubber pedal shaft cap (17) onto the end of the pedal shaft and position correctly over the pedal arm limit pin (15).
- Install the right pedal onto the pedal arm (Right Hand Thread) (15 mm wrench).



**DIAGRAM #4:  
RETRACTABLE PEDAL MECHANISM**



## 19. REASSEMBLY – REED VALVE AND INTAKE MANIFOLD

The reed valve assembly must be checked for deterioration and fatigue. The reed plates should firmly seal against the body of the reed valve assembly. Failure of the reed plates to seal properly will cause a loss of engine power and may cause an erratic idle condition.

The reed valve assembly is equipped with two (2) reed plate stops. These stops are pre-adjusted to allow a maximum reed plate opening of 8 mm. The reed plate stops should be checked for proper adjustment prior to installing the reed valve assembly into the engine.

Should the reed valve assembly show signs of fatigue or deterioration it can either be replaced as a complete unit or the individual components are available as replacement parts (refer to your parts manual).

- Install a **new** set of reed valve gaskets. Thoroughly coat both sides of the reed valve gaskets with two cycle oil or a lightweight grease to ensure a uniform seal.
- Align the reed valve assembly with the crankcase and install checking that the reed valve assembly is fully seated into the crankcase.
- Align the intake manifold with the reed valve assembly and install the four allen bolts with **new** split ring type lock washers (5 mm allen wrench). Torque the four intake manifold bolts to 7.5 ft./lbs. (1.00 kg/m).

### CAUTION

Proper torquing of the intake manifold bolts is critical to the performance and reliability of the engine. The use of a thread locking compound is recommended to ensure that the bolts do not work loose from vibration. The use of inadequate torque will not provide an air tight seal at the reed valve gasket surfaces. The use of excessive torque will cause the intake manifold to warp and develop serious air leaks at the reed valve gasket surfaces. Excessive torque will also result in thread damage to the crankcase mount holes.

## 20. REASSEMBLY – THE ELECTRIC STARTER GROUP

Before reassembly is begun on the electric starter group, the following inspections should be performed to insure that the starting mechanism will work properly once fully assembled and installed onto the engine.

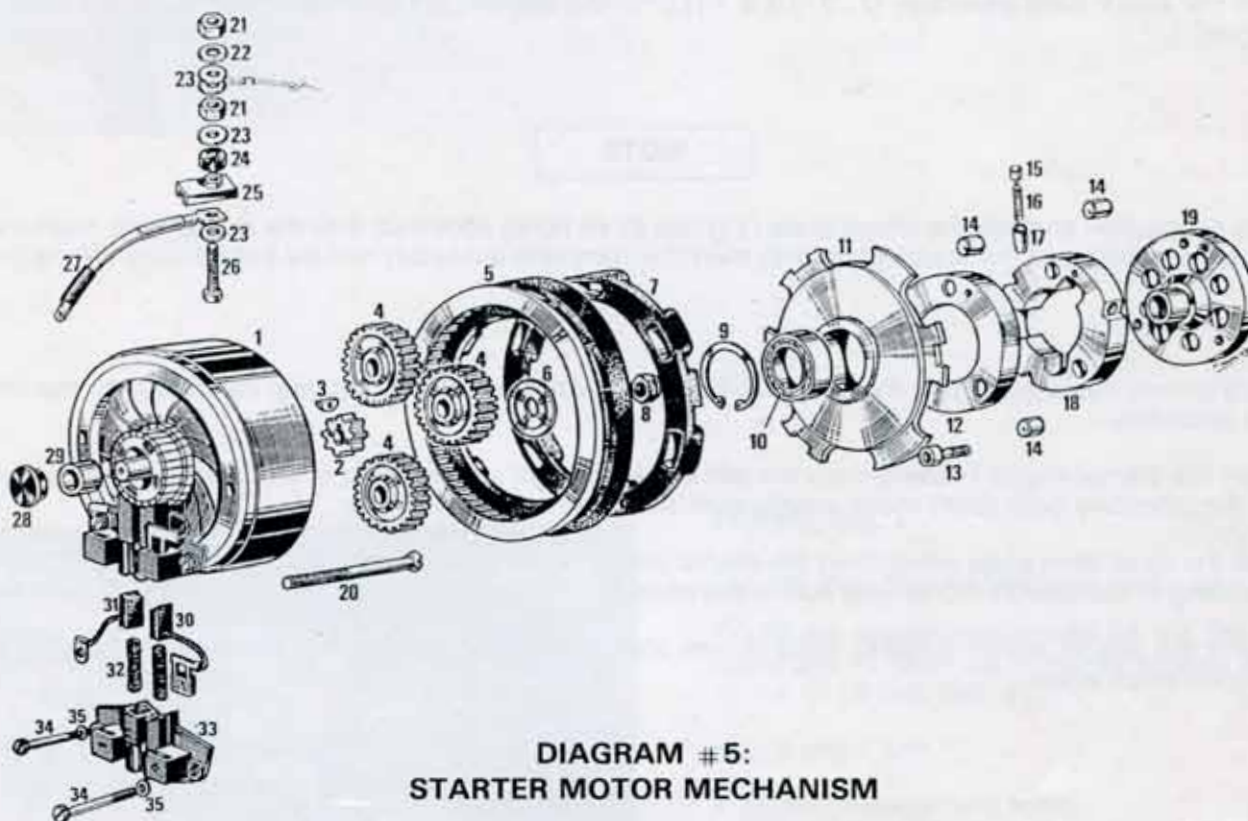
Refer to diagram #5 on page 33 for the following inspection steps and subsequent assembly procedures.

### STARTER MOTOR GROUP INSPECTION

- Inspect the starter motor brush housing (33) for cracks and replace if necessary.
- Inspect the positive (30) and negative (31) starter motor brushes for excessive wear and replace if necessary.
- Inspect the starter motor brush tension springs (32) for fatigue and replace if necessary.
- Inspect the starter motor shaft bushing (29) in the starter motor housing and replace if worn.
- Inspect the three planetary reduction gears (4) for excessive tooth wear or missing teeth and replace if necessary.



- Inspect the starter motor pinion gear (2) and replace if necessary.
- Inspect the starter assembly ring gear (5) for cracks or excessive tooth wear and replace if necessary.
- Inspect the starter assembly shock pad (7) for tears and replace if necessary.
- Inspect the starter assembly shock plate bearing (10) for excessive wear or bearing cage rupture and replace if necessary.
- Check that the machined rollers (14), guide pins (17) and springs (16) are in good condition and interact smoothly with the starter cam housing (18 & 12).



**DIAGRAM #5:  
STARTER MOTOR MECHANISM**

### **STARTER MOTOR GROUP REASSEMBLY**

- Install the starter motor pinion gear key (3) and the pinion gear (2) onto the starter motor shaft.
- Reconnect the positive (+) lead (27) from the starter motor assembly to the starter motor housing by reassembling the positive contact post (nos. 21 – 26) onto the starter motor housing.
- Install the electric start motor into the starter motor housing and secure the two screws (20).

### **IMPORTANT**

We suggest at this stage of assembly that the starter motor be checked for proper operation. To do so attach the positive (+) lead of a **12 volt DC** power source to the positive (+) terminal of the starter motor housing (26). Attach the negative (-) lead from the same power source to ground (the starter motor housing). The electric start motor should now function. **THE AMPERAGE RATING OF THE 12 V DC POWER SOURCE BEING USED SHOULD NOT EXCEED 2 AMPS.**



- Install the starter motor housing lubrication cap (28) after lightly lubricating the bushing (29).
- Lightly grease the planetary gear teeth (4) and install the planetary gears onto the starter motor taking special care to properly mesh the planetary gear teeth with the starter motor pinion (2) gear teeth.
- Install the washer (6) onto the starter motor pinion shaft and secure the lock nut (8) using an air ratchet (**Right Hand Thread**).
- Install the starter cam assembly onto the magneto (nos. 12 thru 19) and tighten the three allen bolts (13) (5 mm allen wrench).
- Install the sealed bearing (10) onto the shock plate (11) and secure with the circlip (9).
- Mount the rubber shock dampener (7) onto the shock plate (11).
- Install the shock plate assembly (7, 9, 10 & 11) onto the starter cam mechanism bolted to the magneto flywheel.

#### NOTE

On later production engines the shock plate (11) has three holes added so that the starter cam mechanism can be assembled onto the shock plate first then the complete assembly can be bolted onto the magneto flywheel.

- Lightly grease the internal gear teeth on the ring gear (5) and install the ring gear carefully onto the shock plate assembly.
- Mount the starter motor housing onto the left crankcase half slowly using even pressure on all sides so that the planetary gear teeth mesh evenly with the teeth on the ring gear.
- Install the three allen bolts which hold the starter motor housing to the engine. Check to see that there is no binding in the starter motor and sub assemblies prior to tightening the securing bolts completely.
- Tighten the starter motor housing bolts (5 mm allen wrench) and check the starter motor for smooth operation once again.

## 21. COUNTERSHAFT SPROCKET INSTALLATION

- Inspect the countershaft sprocket to be used and replace with a new sprocket if the sprocket teeth show excessive signs of wear.
- Lubricate the inner diameter of the countershaft sprocket and slide it fully onto the countershaft.
- Install the countershaft nut lock plate onto the countershaft.
- Install the countershaft sprocket nut onto the countershaft and torque the nut to 22 ft./lbs. (3.00 kg/m).
- Fold over one edge of the countershaft sprocket nut lock plate so that it is at a 90 degree angle and contacts one of the wrench flats on the countershaft sprocket nut thus locking the nut in place. (Small chisel, hammer and drift punch).
- On engines equipped with electric start, install the plastic counter shaft sprocket cover using the three allen bolts (4/5 mm allen wrenches).
- On engines not equipped with electric start, install the left crankcase cover using the four allen bolts (5 mm allen wrench).

## 22. TRANSMISSION OIL SERVICE

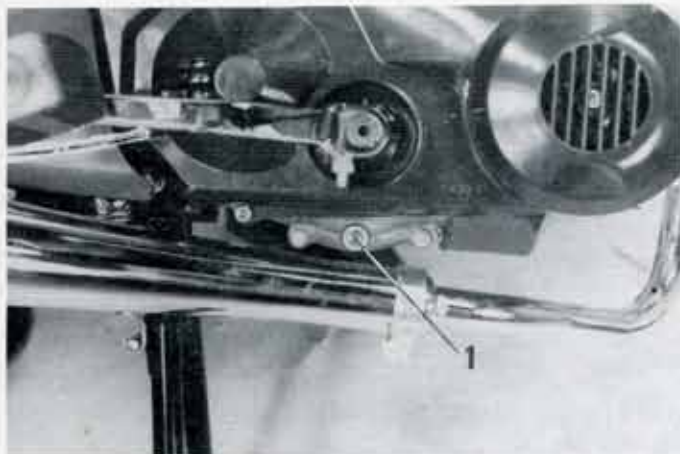


FIGURE 48

### DRAINING THE TRANSMISSION OIL

Remove the oil drain bolt located on the bottom right side of the engine. Once the oil has complete draining reinstall the oil drain bolt marking certain that the gasket is on the drain bolt. (fig. 1).

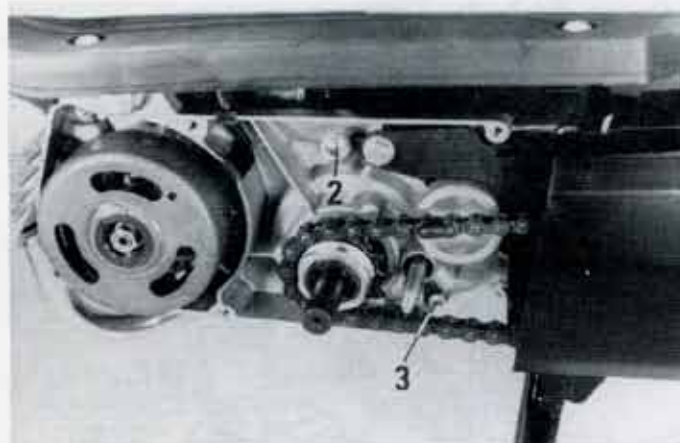


FIGURE 49

### FILLING THE TRANSMISSION WITH OIL

To fill the transmission with oil the following components must be removed to gain access to the oil fill bolt (fig. #2).

- Left pedal arm.
- Engine engagement knob.
- Left engine cover.

Once access has been gained to the oil fill bolt, remove the bolt and gasket and fill the transmission with 150 cc. (5 oz.) of **30 weight 4 cycle oil**. Reinstall the oil fill bolt and gasket and tighten.

### CHECKING THE TRANSMISSION OIL LEVEL

To check the oil level in the transmission remove the oil level check bolt (fig. #3). If the oil level is proper, oil will begin to drip out through the level check hole. If the oil level appears to be low, slowly add oil through the oil fill hole until the oil level rises and oil begins to drip out through the oil level hole. Reinstall the oil level bolt and gasket.



## 23. CARBURETOR SERVICE

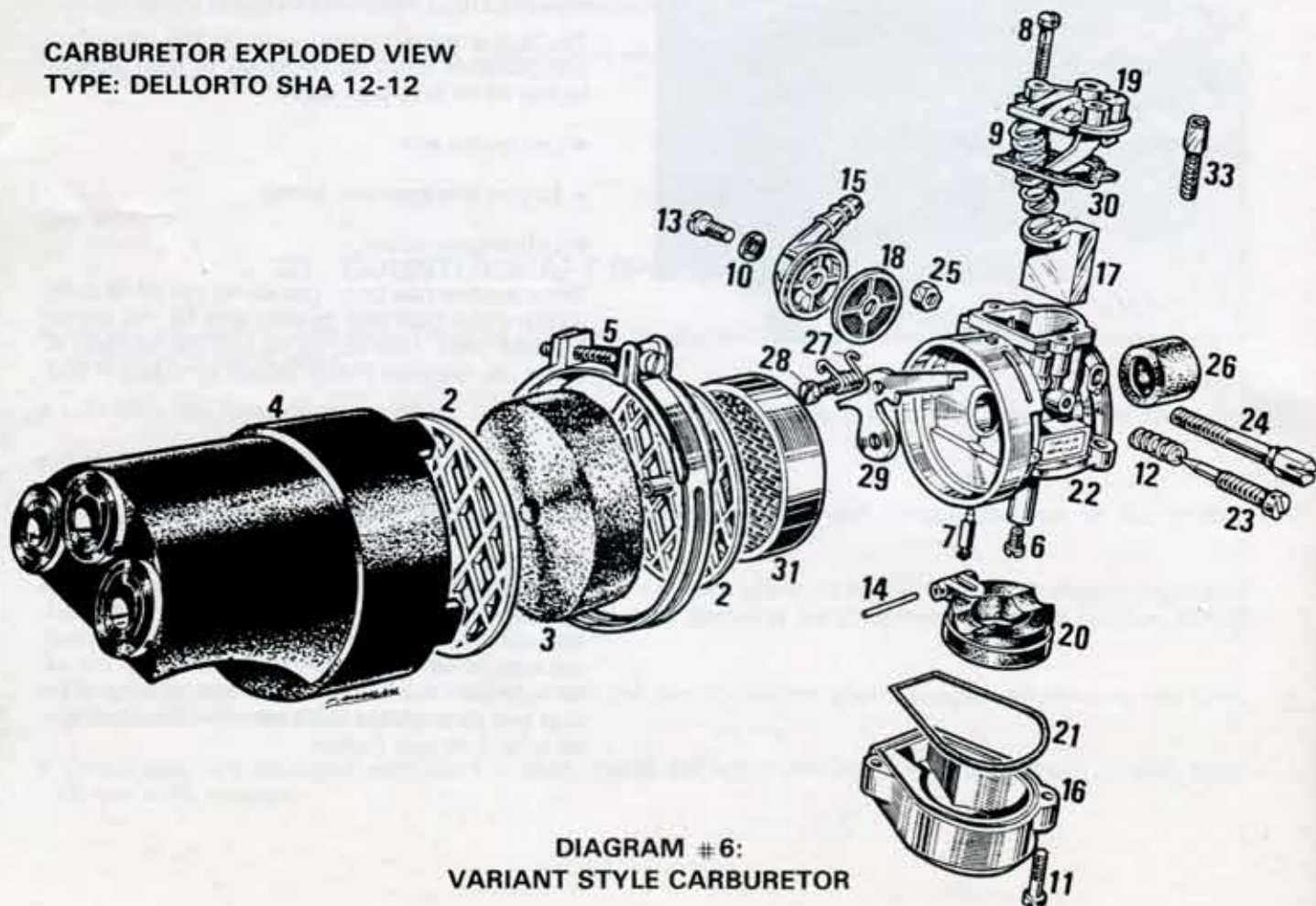
To remove the carburetor from the engine proceed as follows:

- Turn the fuel valve knob to the "OFF" position and disconnect the fuel line from the carburetor banjo.
- Loosen the clamping bolt which secures the carburetor to the intake manifold.
- Work the carburetor off the intake manifold by rocking the carburetor side to side and pulling the carburetor towards the rear of the moped.
- Remove the carburetor from the throttle and choke cable by removing the two screws which hold the throttle slide cover to the carburetor body.
- Remove the throttle slide cover, spring and throttle slide as one assembly and let hang from the moped.

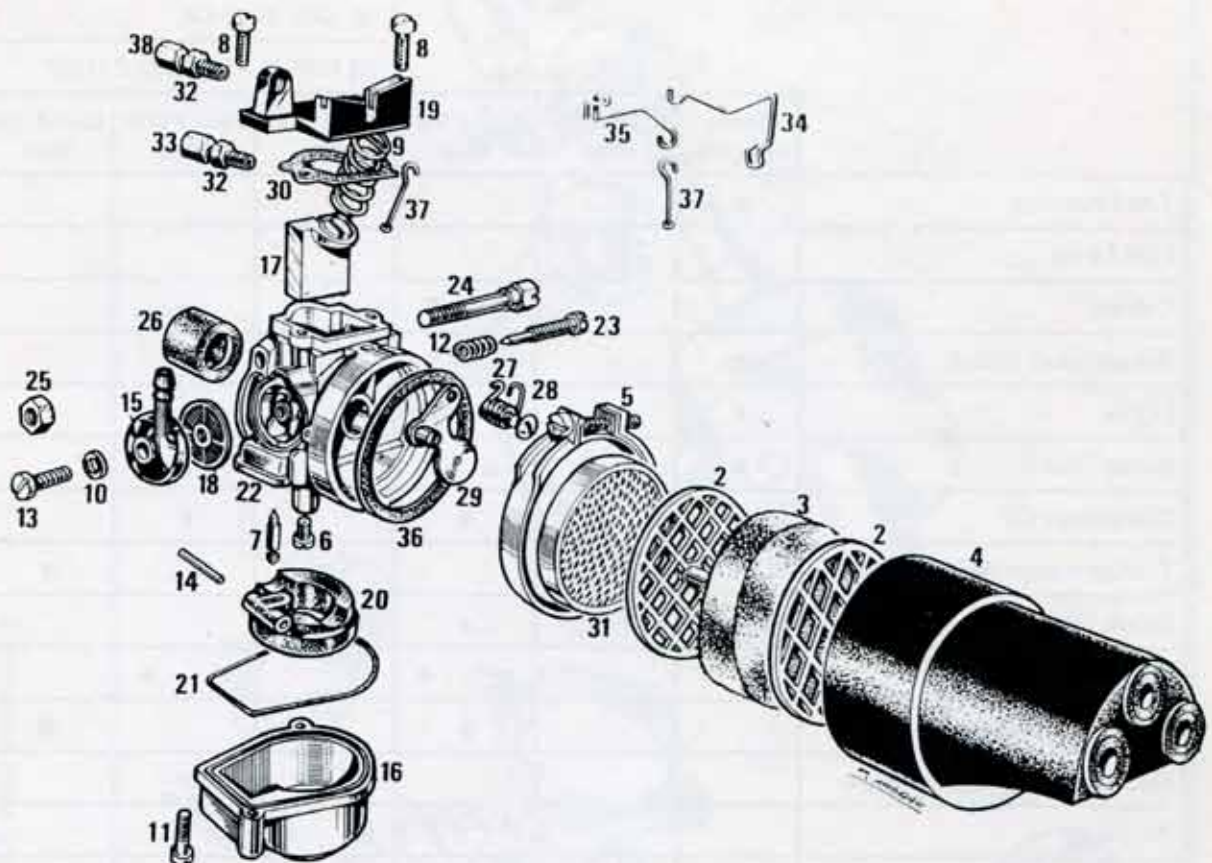
To reinstall the carburetor proceed as follows:

- Check that the plastic bushing on the intake manifold is in good condition. Replace with a new bushing if necessary.
- Check that the four allen bolts securing the intake manifold are properly tightened to 7.5 ft./lbs. (1.00 kg/m). (5 mm allen wrench).
- Install the throttle slide cover, spring and throttle slide back into the top of the carburetor. Install a new gasket in the throttle slide cover if torn.
- Tighten the two screws which secure the carburetor slide cover to the carburetor body. Once tightened check that the throttle slide operates smoothly and returns to the idle position without binding. Also check that the choke plate operate smoothly.
- Install the carburetor back onto the intake manifold fully.
- Tighten the carburetor clamp while making certain that the carburetor is positioned straight on the intake manifold. (Not cocked to one side).
- Reconnect the fuel line securely to the carburetor and check for fuel leaks by turning the fuel valve on.

### CARBURETOR EXPLODED VIEW TYPE: DELLORTO SHA 12-12



**CARBURETOR EXPLODED VIEW  
TYPE: DELLORTO SHA 12-12**



**DIAGRAM #7:  
DS-50 STYLE CARBURETOR**

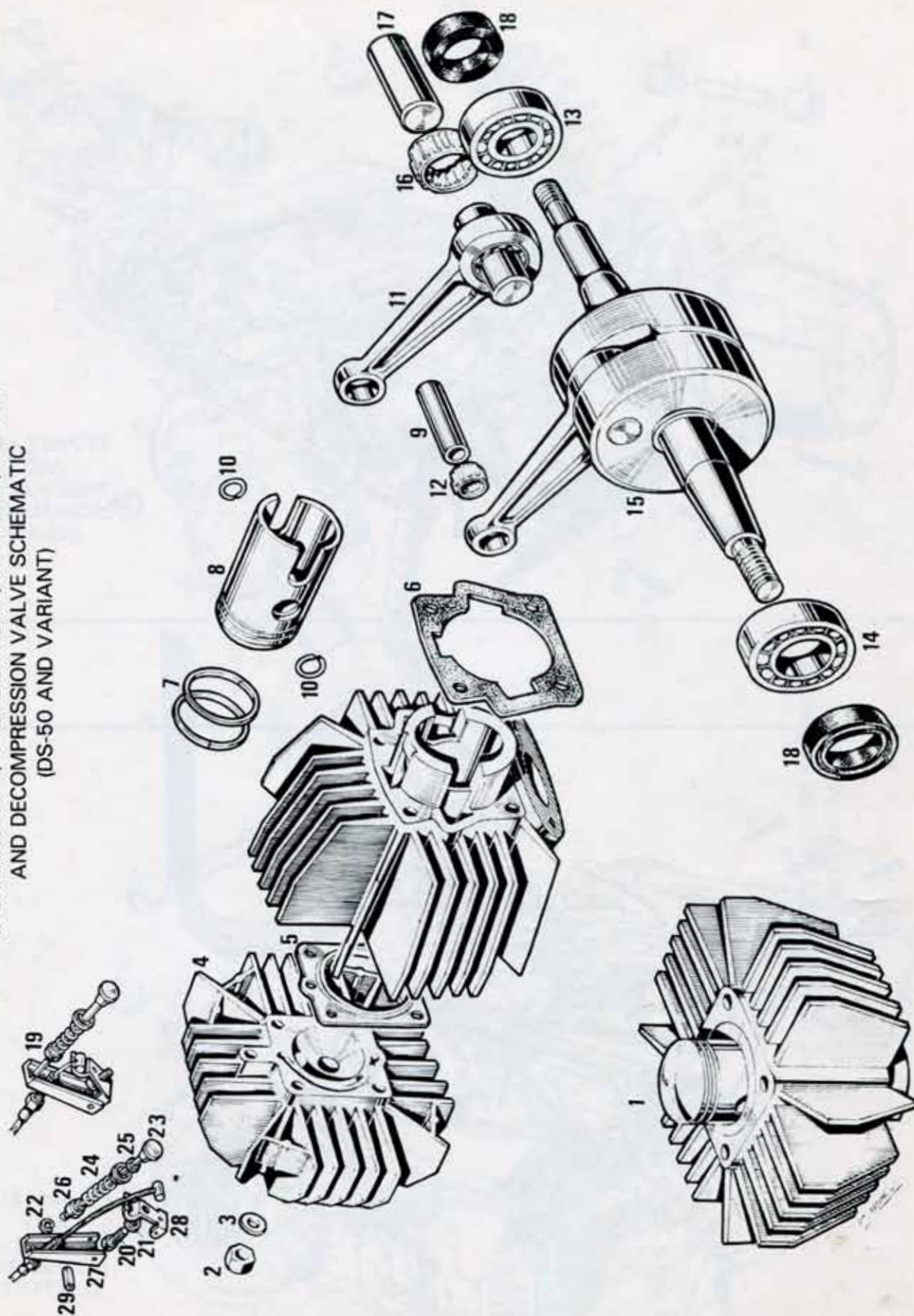
DIAGRAM REFERENCE NUMBER	DESCRIPTION	DIAGRAM REFERENCE NUMBER	DESCRIPTION
2	Air filter grid	19	Carburetor top/slide cover
3	Fiber air filter	20	Float
4	Air filter box	21	Float chamber "O" ring
5	Air filter box clamp assy.	22	Carburetor body
6	Main fuel jet	23	Idle adjustment screw
7	Float needle valve	24	Carburetor clamp bolt
8	Slide cover screw	25	Carburetor clamp nut
9	Throttle slide return spring	26	Intake manifold bushing
10	Fuel banjo screw gasket	27	Choke plate return spring
11	Float bowl screw	28	Choke plate mount stud
12	Idle screw tension spring	29	Choke plate
13	Fuel inlet banjo screw	30	Carburetor top cover gasket
14	Float hinge pivot pin	31	Metal mesh air filter
15	Fuel inlet banjo	32	Cable adjuster nut
16	Float bowl	33	Cable adjuster
17	Throttle slide	34	Throttle cable linkage
18	Fuel inlet filter	35	Choke cable linkage
		36	Air filter box gasket
		37	Linkage Rod (throttle slide)
		38	Cable adjuster



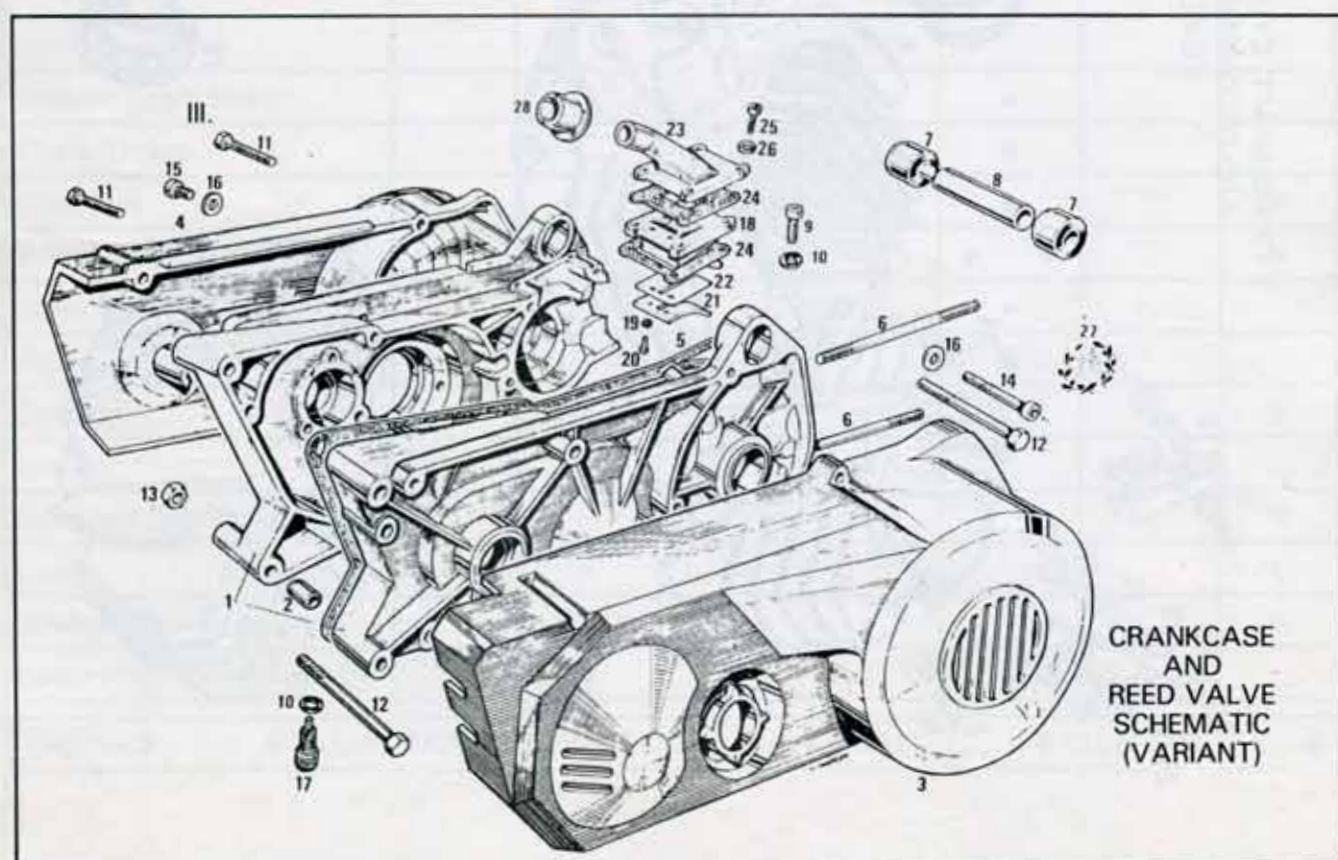
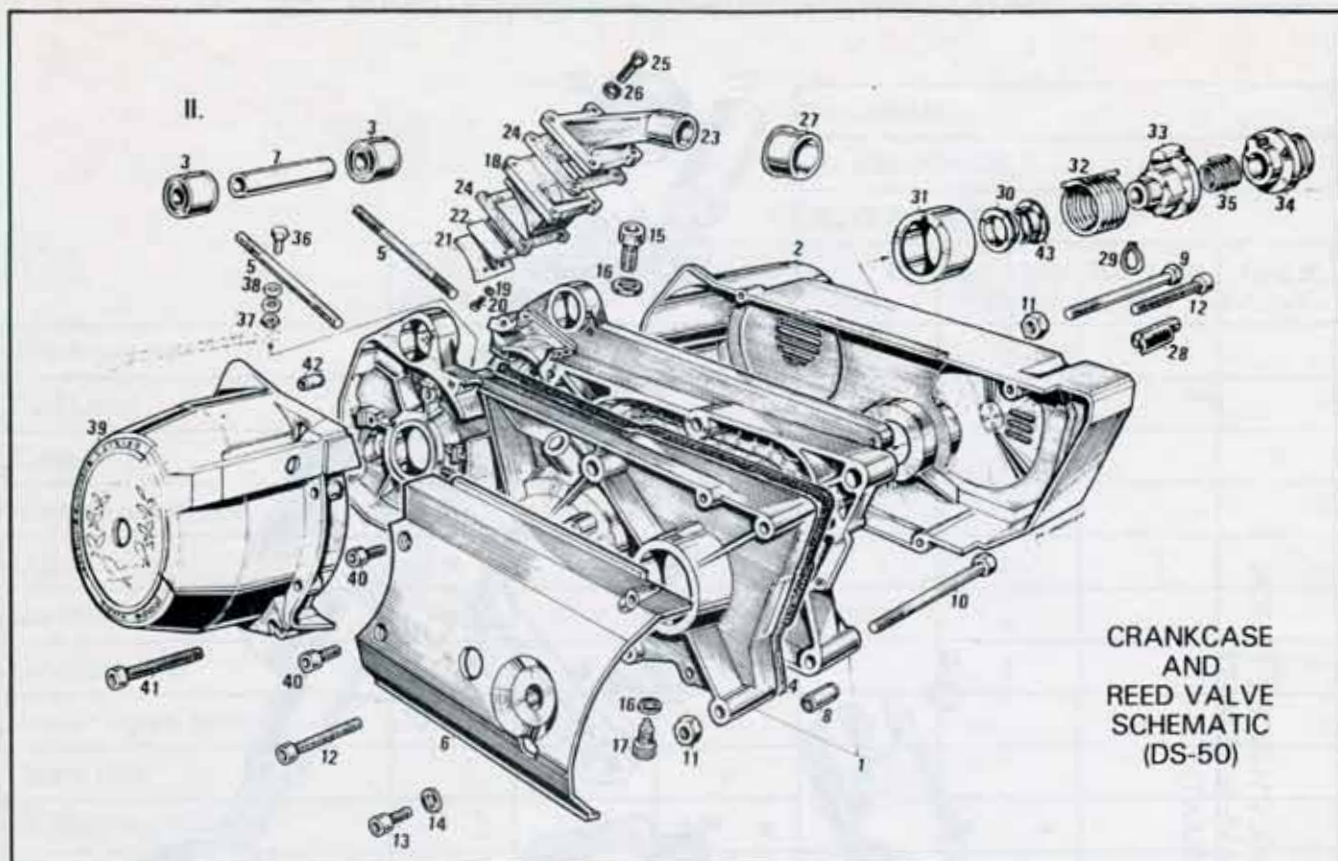
## 24. MAINTENANCE AND LUBRICATING CHART

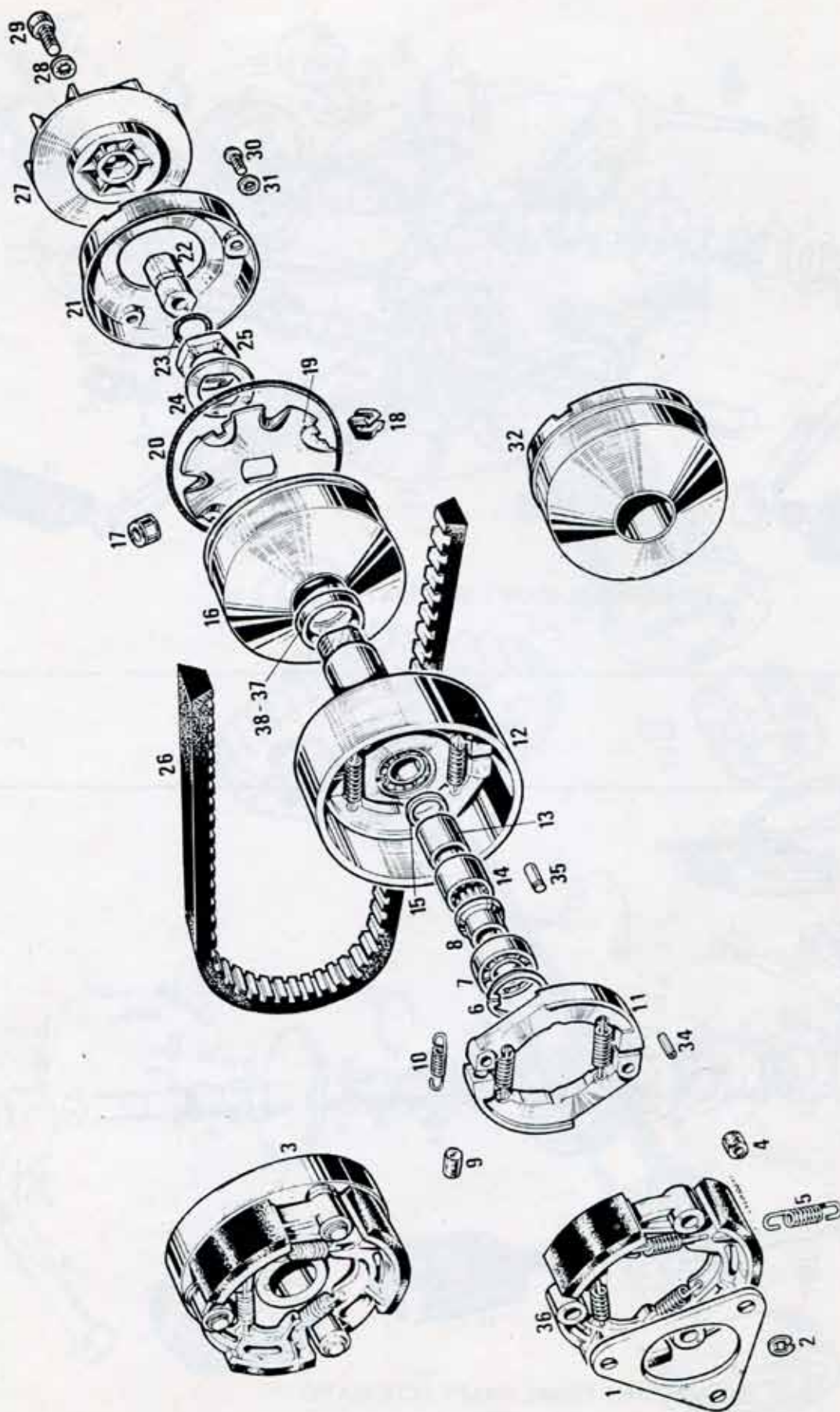
(A) GREASE							
(B) SAE 30W OIL							
(C) CHAIN AND CABLE LUBE							
	Before Each Trip	A. First 300 Miles	A First 900 Miles	Each 1.800 Miles	Each 3.600 Miles	Each 6.000 Miles	Type of Lubrication
Tire Pressure	■						
Fuel Level	■						
Cables	■		■ ★				A
Suspension Check	■						
Lights	■						
Brake Check	■				▲		
Crankcase Oil		◆	■		◆		B
Transmission Belt		■		■		◆	
Spark Plug			▲	◆			
Muffler and Silencer			■ ●		■ ●		
Tighten Nuts, etc.			■			■	
Electric Start Maintenance					★		A
Air Filter				■ ●			
Carburetor				▲ ●			
Cylinder Head, Piston					●		
Check Timing					■		
Front Fork					◆		A
Wheel Bearings					■ ★		A
Brake Shoes					●		
Piston Ring-Cylinder Gap					■		
Steering				★			A
Ignition		▲		■		◆ Contact	
Front and Rear Brake Levers			★	★			C
Chain		★	★				C
Speedometer Drive		★	★				A
Battery Distilled Water Refill		■	★				
CHECK-UP ..... ■ ADJUSTMENT ..... ▲ LUBE ..... ★ PARTS ..... ◆ CLEANING ..... ●							

I. CRANKSHAFT, CYLINDER HEAD, CYLINDER, PISTON  
AND DECOMPRESSION VALVE SCHEMATIC  
(DS-50 AND VARIANT)



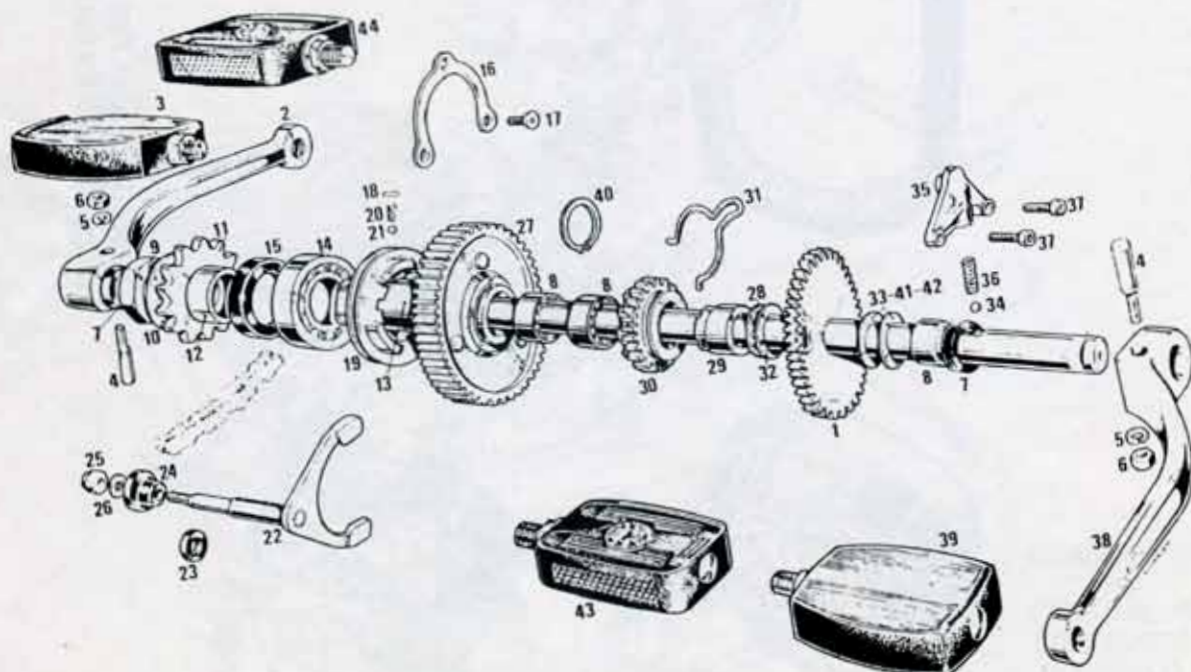
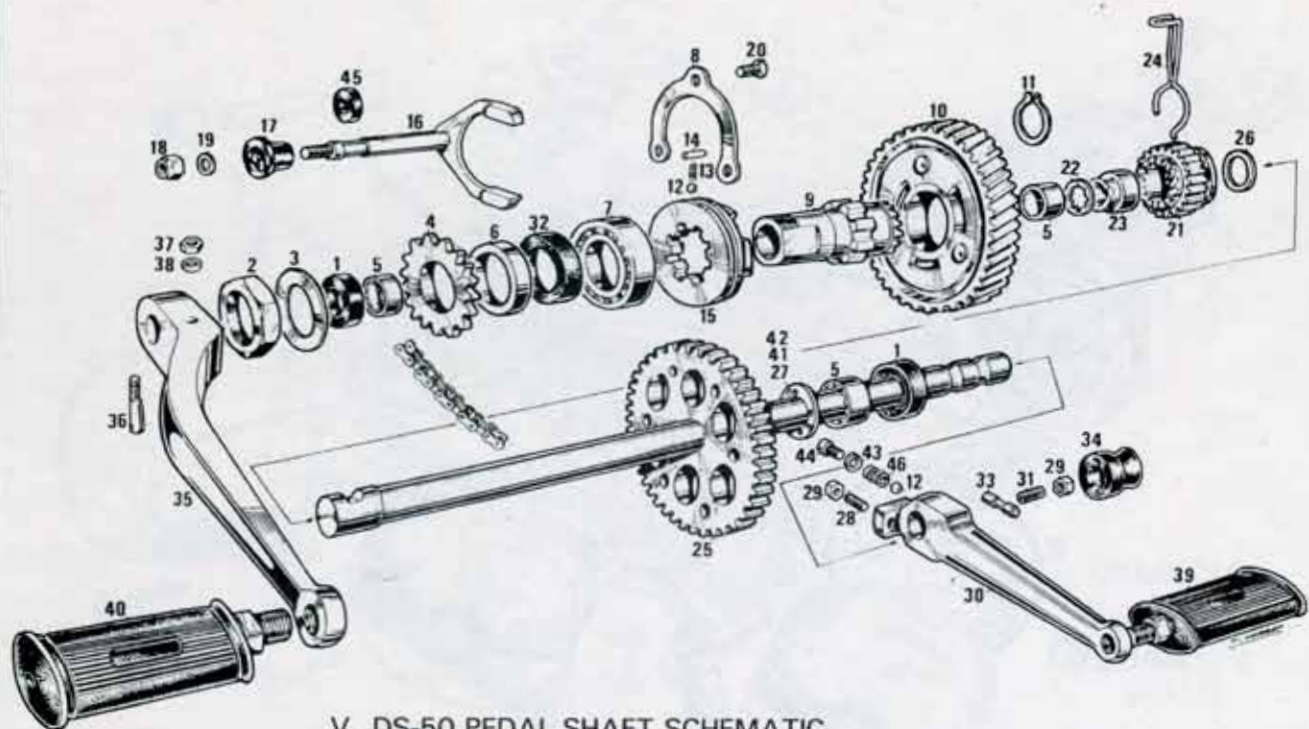


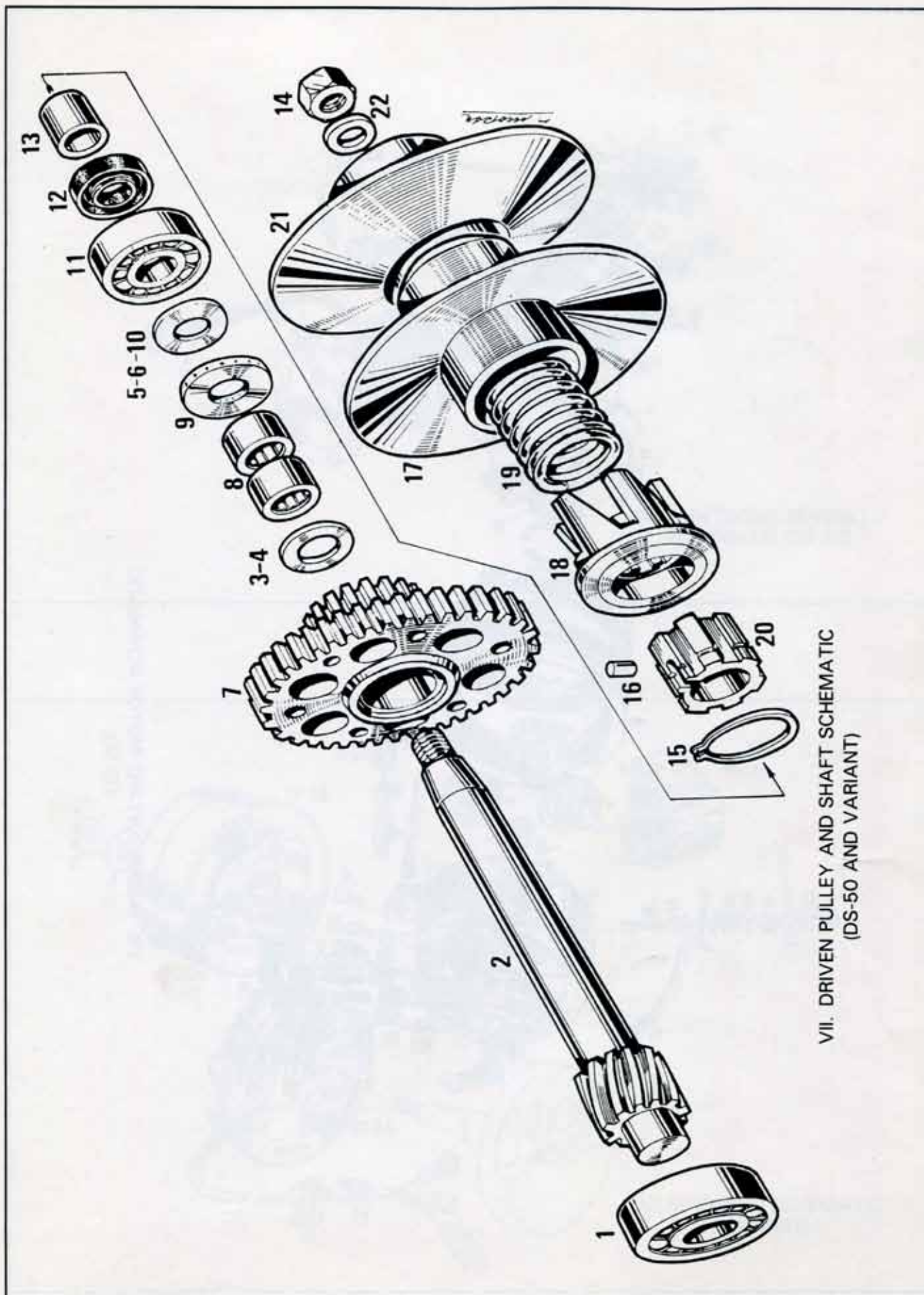




IV. CLUTCH AND VARIATOR SCHEMATIC  
(DS-50 AND VARIANT)





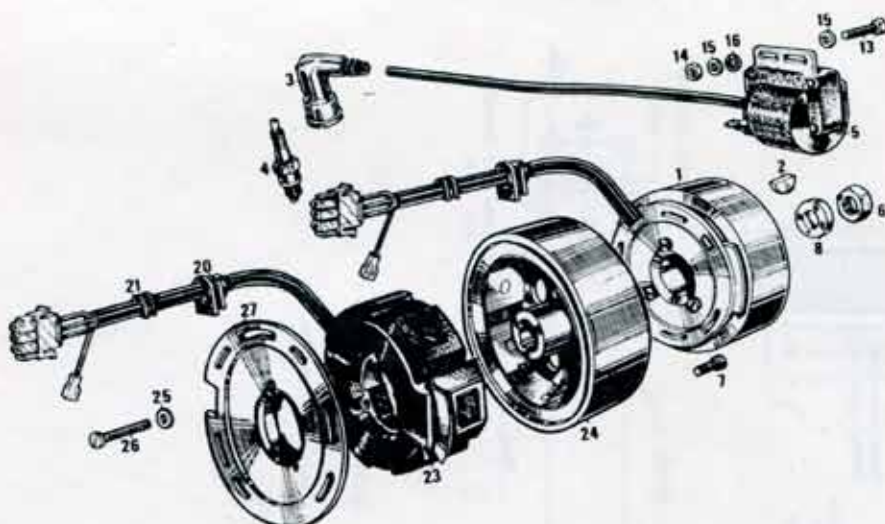


VII. DRIVEN PULLEY AND SHAFT SCHEMATIC  
(DS-50 AND VARIANT)

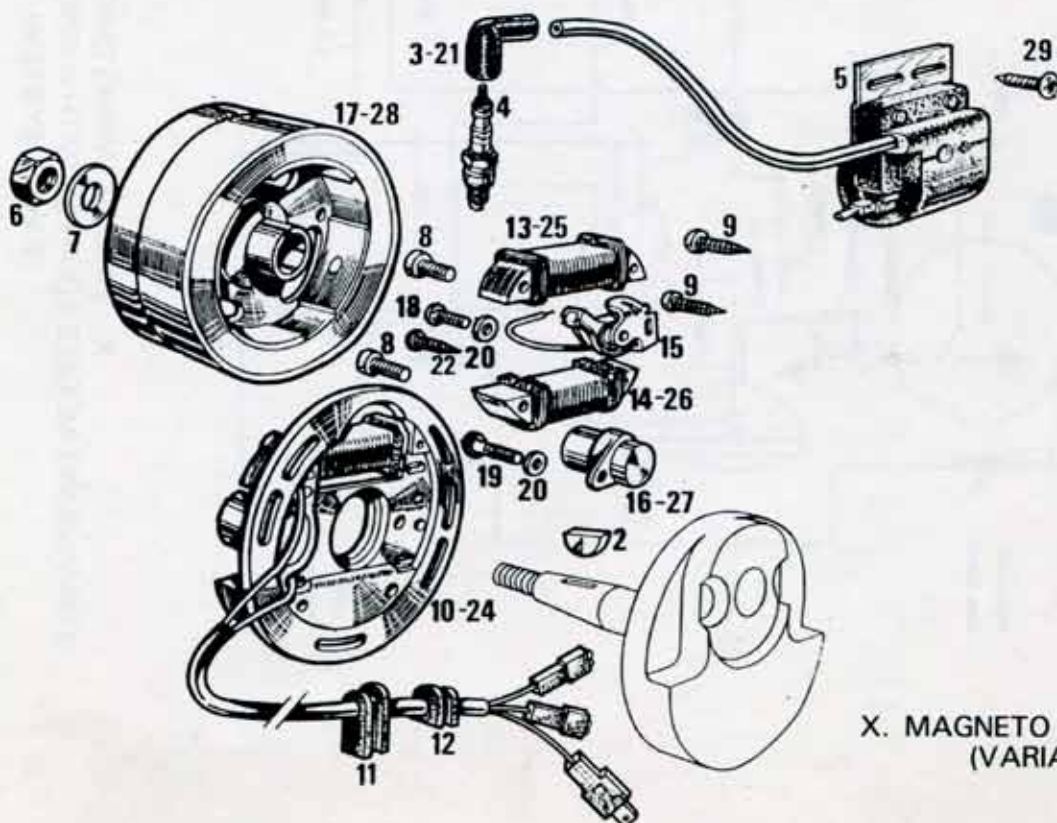




VIII. ELECTRIC START MOTOR SCHEMATIC  
(DS-50)

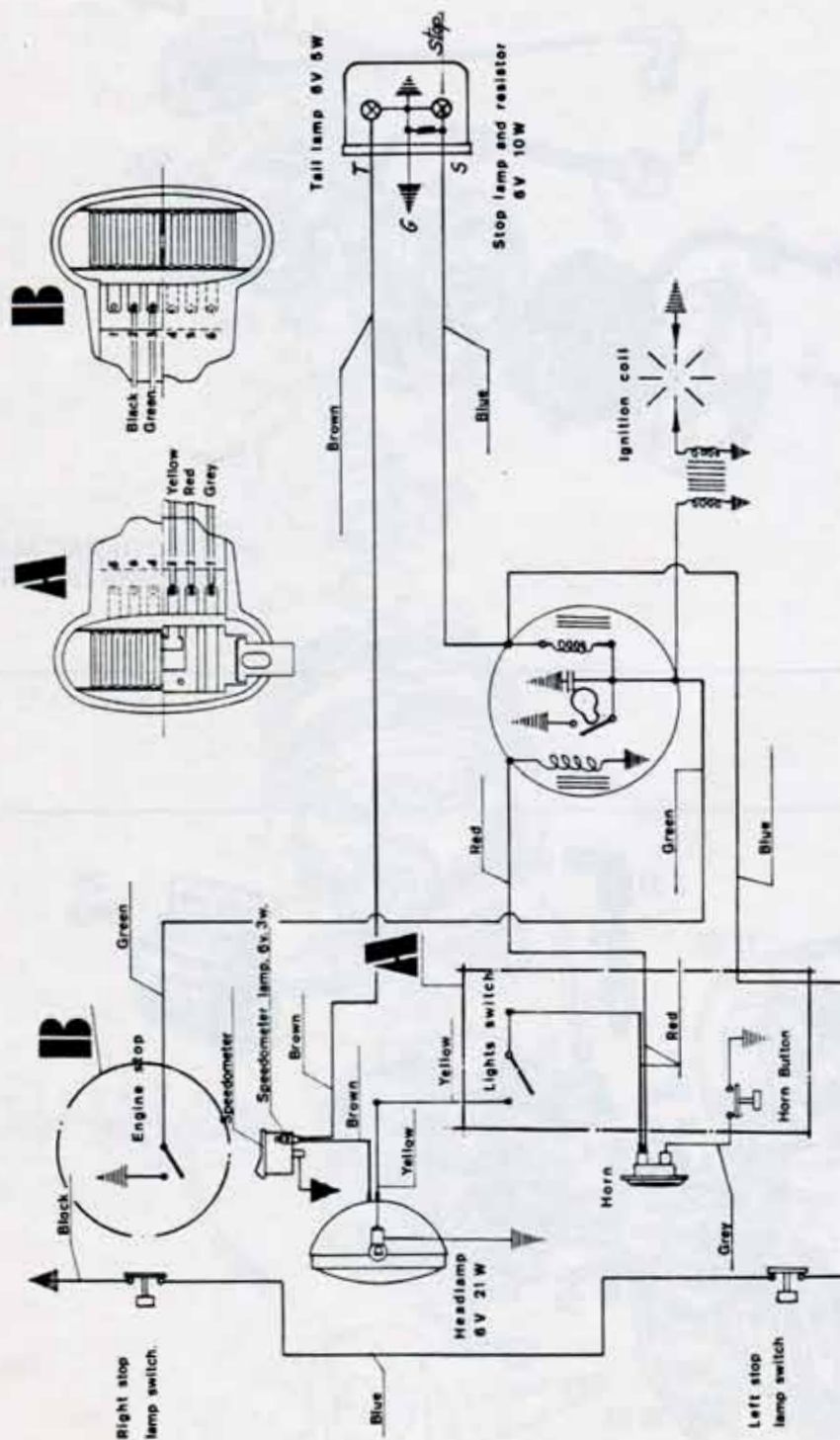


IX. ELECTRONIC MAGNETO SCHEMATIC (DS-50)

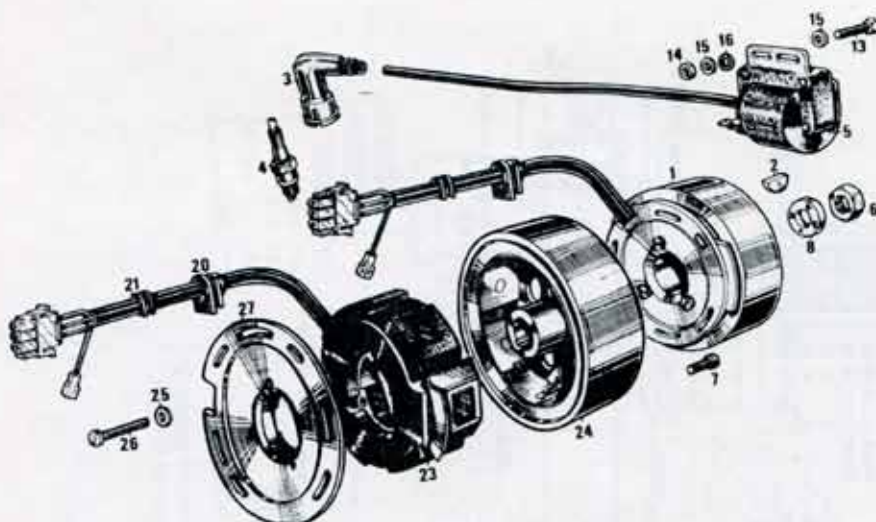


X. MAGNETO SCHEMATIC (VARIANT)

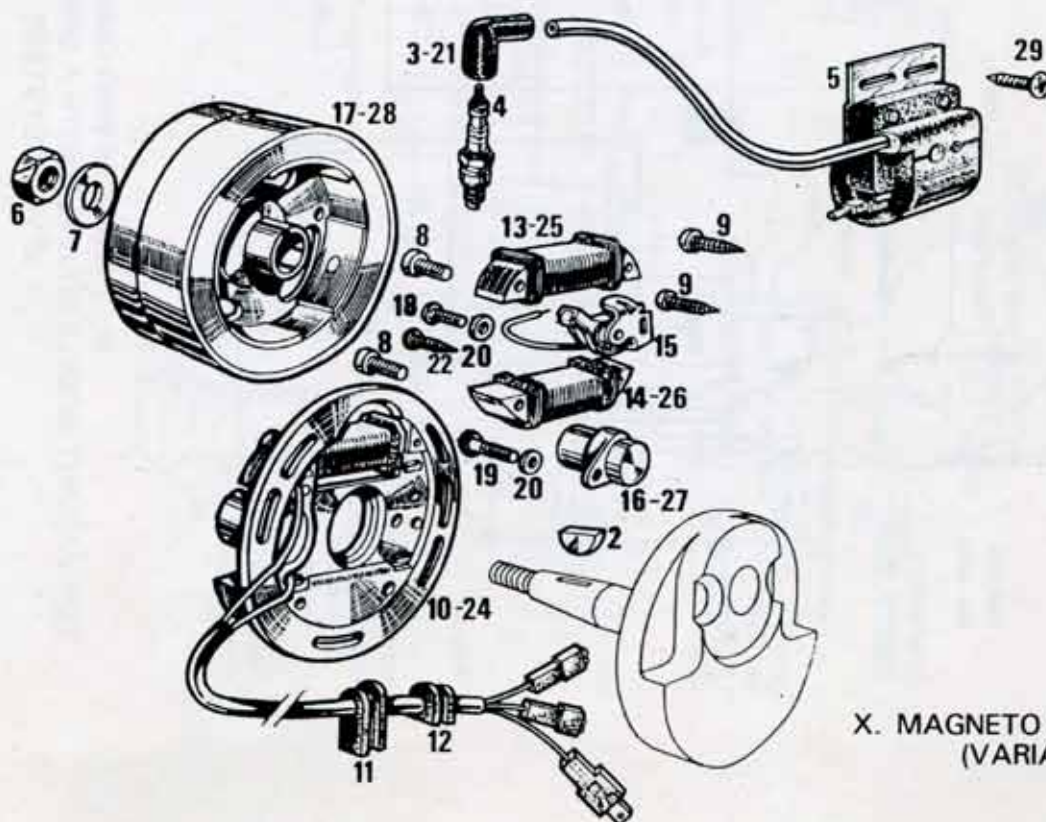




XI. VARIANT WIRING DIAGRAM  
(FOR VARIANT MODELS EQUIPPED WITH A SINGLE FILAMENT HEADLAMP)  
(6 VOLT SYSTEM)

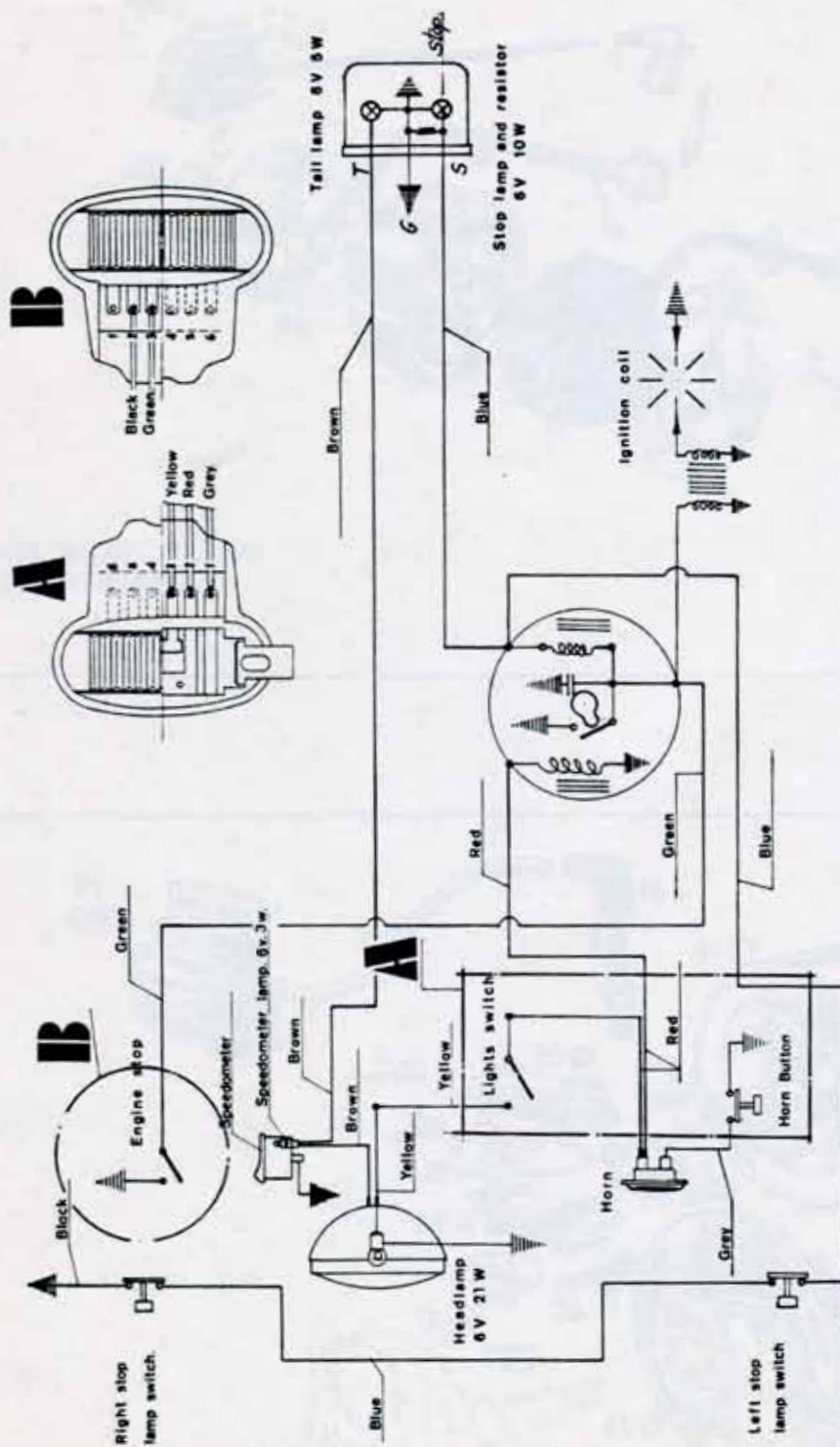


IX. ELECTRONIC MAGNETO SCHEMATIC (DS-50)

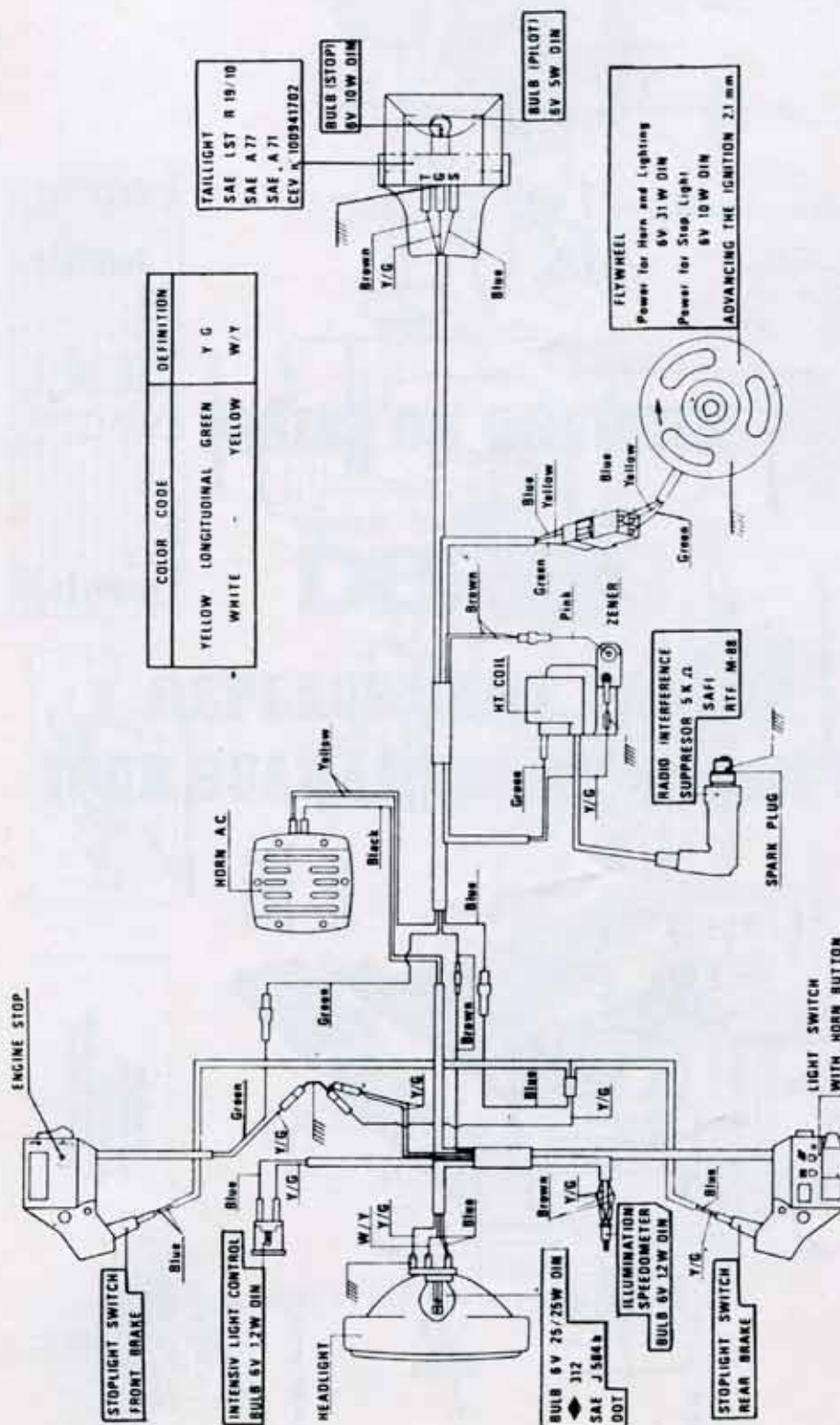


X. MAGNETO SCHEMATIC (VARIANT)





XI. VARIANT WIRING DIAGRAM  
(FOR VARIANT MODELS EQUIPPED WITH A SINGLE FILAMENT HEADLAMP)  
(6 VOLT SYSTEM)



XII. VARIANT WIRING DIAGRAM  
(FOR VARIANT MODELS EQUIPPED WITH A DUAL FILAMENT HEADLAMP)  
(6 VOLT SYSTEM)



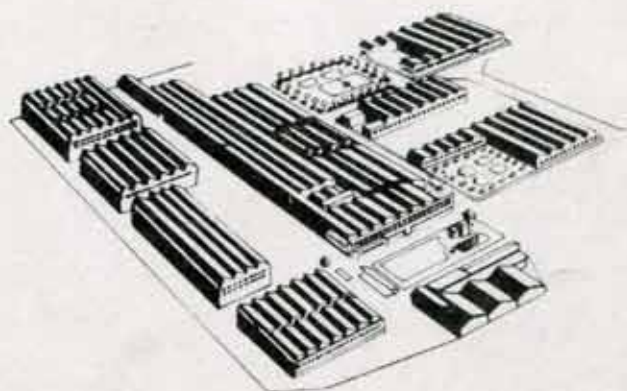




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