

# OPERATION AND MAINTENANCE MANUAL

## 202 MA SERIES AIR MOTORS (NON REVERSIBLE , FLANGE MOUNTED)

MODEL	COM. NO.	FREE SPEED (rpm)	MAX. POWER (HP)	TORQUE AT MAX. POWER (ft. lbs)	STALL TORQUE (ft. lbs)
* 202MA-50	04664637	55	0.38		
* 202MA-80	04664645	90	0.39		
* 202MA-200	04664652	225	0.41	19.6	
202MA-350	04664660	400	0.41	10.8	22.5
202MA-550	04664678	600	0.42	7.4	14.5
202MA-850	04664686	1000	0.43	4.5	9.5
202MA-2250	04664694	2700	0.43	1.7	3.5
202MA-3500	04664702	4200	0.44	1.1	2.3

### \* CAUTION

These motors are not recommended for applications requiring more than 25 ft. lbs. torque.



### ▲ WARNING

READ THIS MANUAL CAREFULLY BEFORE INSTALLING,  
OPERATING OR SERVICING THIS EQUIPMENT.

### IMPORTANT INSTRUCTIONS

- Always operate, inspect and maintain this tool in accordance with American National Standards Institute Safety Code for Portable Air Tools (ANSI B186.1) and any other applicable safety codes and regulations.
- For safety, top performance and maximum durability of parts, operate this tool at 6.3 Kg/cm<sup>2</sup> (90 psig) maximum air pressure.
- Use 1/4" bore hose pipe

### ▲ WARNING

- Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool.
- The use of other than genuine IR-Wadco parts may result in safety hazards, decreased tool performance and increased maintenance costs and may invalidate all warranty claims.



For parts and service information, contact your local ARO distributor, or the Customer Service Dept. of the Ingersoll - Rand Distribution Center, White House, TN at PH : (615) 672 - 0801, Fax : (615) 672 - 0801



## INGERSOLL-RAND WADCO TOOLS LTD.



## WARNING LABEL IDENTIFICATION



### WARNING



FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.



	<p> <b>WARNING</b></p> <p>Always wear eye protection when operating or performing maintenance on this tool.</p>
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	<p> <b>WARNING</b></p> <p>Always wear hearing protection when operating this tool.</p>
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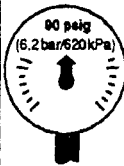

	<p> <b>WARNING</b></p> <p>Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.</p>
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	<p> <b>WARNING</b></p> <p>Air powered tools can vibrate in use. Vibration, repetitive motions or uncomfortable positions may be harmful to your hands and arms. Stop using any tool if discomfort, tingling feeling or pain occurs. Seek medical advice before resuming use.</p>
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	<p> <b>WARNING</b></p> <p>Do not carry the tool by the hose.</p>
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	<p> <b>WARNING</b></p> <p>Do not use damaged, frayed or deteriorated air hoses and fittings.</p>
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	<p> <b>WARNING</b></p> <p>Keep body stance balanced and firm. Do not overreach when operating this tool.</p>
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	<p> <b>WARNING</b></p> <p>Operate at 90 psig (6.2 bar/620 kPa) Maximum air pressure.</p>
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## PLACING TOOL IN SERVICE

### LUBRICATION

Oil : Ingersoll - Rand No. 10 Lubricant

Grease : Ingersoll - Rand No. 28 Lubricant

We recommend the use of an air line lubricator in the air supply line. Attach the unit as close to the tool as practical. After each forty hours of operation, or as experience indicates, introduce 1.5cc of the recommended grease. Do not grease excessively. Too much grease in the Gear Case will cause heating.

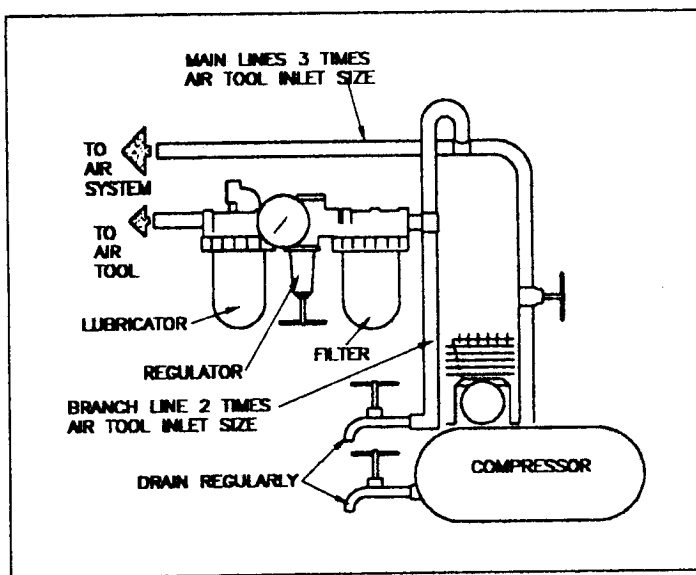
Grease leakage from the Spindle end is also an indication that an excessive amount of grease has accumulated within the Gear Box.

Whenever the Gear end of the Motor is disassembled, lubricate the gear train as follows :

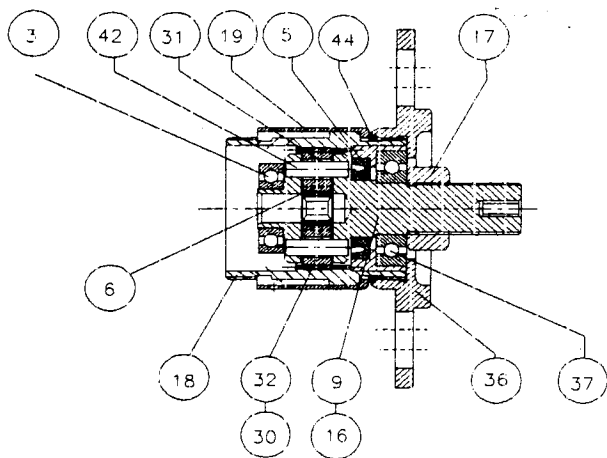
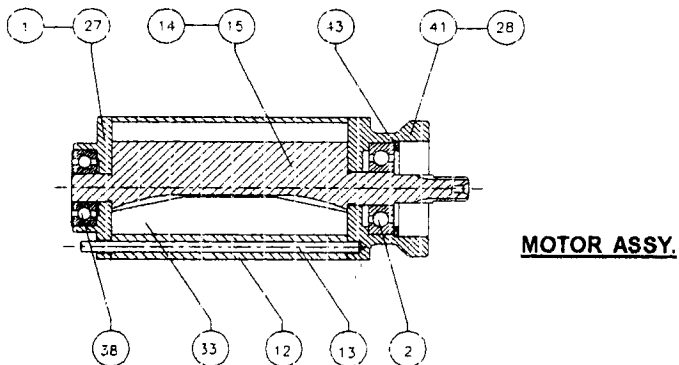
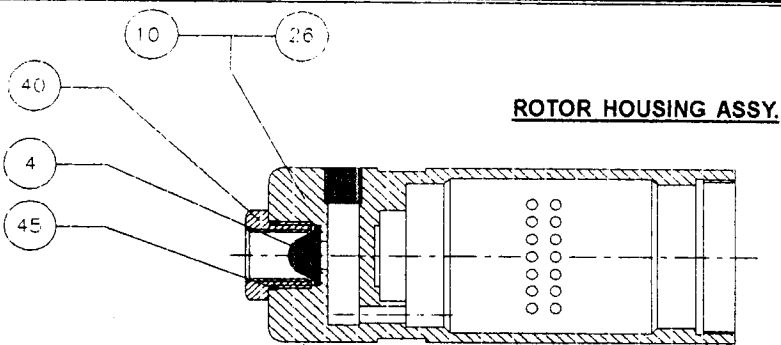
For Single Reduction Motors ( 2250 & 3500 rpm ), work approximately 20cc of the recommended grease into the gearing and around the Bearings and on the Spindle.

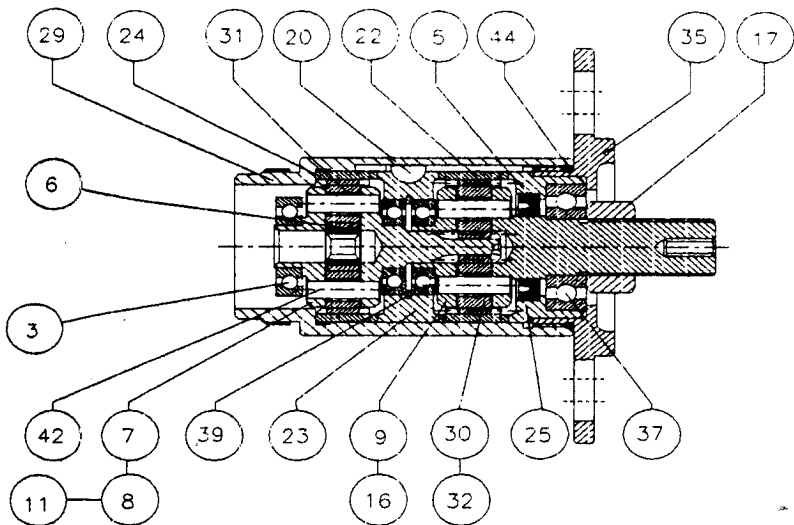
For Double Reduction Motors ( 350, 550 & 850 rpm ), work approximately 25cc of the recommended grease into the gear train and around the Bearings and on the Spindle.

For Triple Reduction Motors ( 50, 80 & 200 rpm ), work approximately 30cc of the recommended grease into the gear train and around the Bearings and on the Spindle.

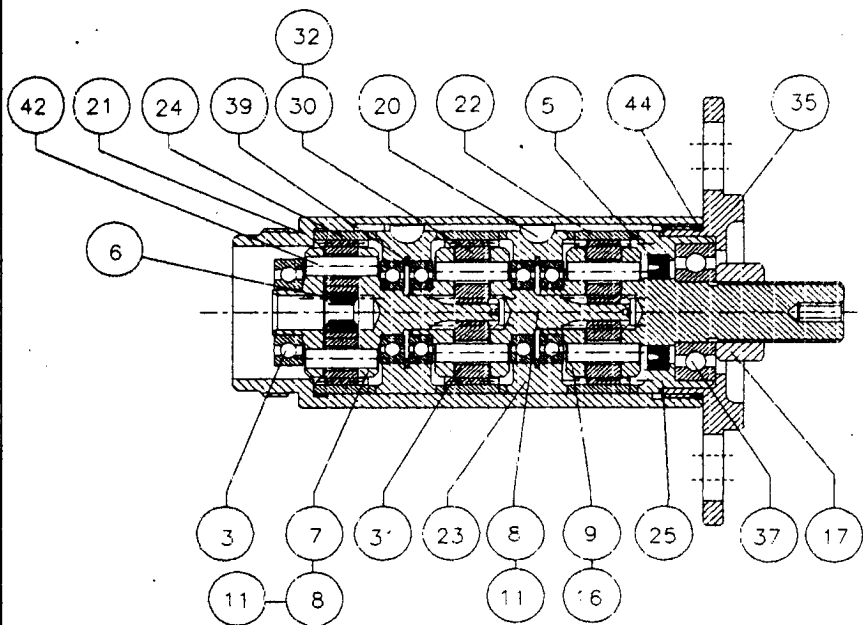


Always use an air line lubricator with this tool. A filter regulator and lubricator (FRL) unit is recommended.





**GEAR BOX ASSY. ( 202 MA - 350, 550, 850 )**



**GEAR BOX ASSY. ( 202 MA - 50, 80, 200 )**

**BILL OF MATERIAL**

202 MA - \*

Sr.No.	DESCRIPTION	*50	*80	*200	*350	*650	*850	*2250	*3500
1	UPPER CENTRE PLATE	0	0	0	0	0	0	1	1
2	BEARING	1	1	1	1	1	1	1	1
3	BEARING	5	5	5	3	3	3	1	1
4	STRAINER	1	1	1	1	1	1	1	1
5	OIL SEAL	1	1	1	1	1	1	1	1
6	SUN WHEEL	0	1	3	0	1	2	0	1
7	DRIVE SHAFT	0	1	0	0	1	0	0	0
8	DRIVE SHAFT	0	0	2	0	0	1	0	0
9	SPINDLE	1	1	0	1	1	0	1	0
10	ROTOR HOUSING	0	0	0	0	0	0	1	1
11	DRIVE SHAFT	2	1	0	1	0	0	0	0
12	CYLINDER BUSHING	1	1	1	1	1	1	1	1
13	CYLINDER PIN	1	1	1	1	1	1	1	1
14	ROTOR	0	1	1	0	1	1	0	1
15	ROTOR	1	0	0	1	0	0	1	0
16	SPINDLE	0	0	1	0	0	1	0	1
17	NUT	1	1	1	1	1	1	1	1
18	GEAR CASE	0	0	0	0	0	0	1	1
19	MUFFLER	0	0	0	0	0	0	1	1
20	KEY	2	2	2	1	1	1	0	0
21	OUTER CASE	1	1	1	0	0	0	0	0
22	INT. GEAR RING	2	2	2	1	1	1	0	0
23	BEARING CARRIER	2	2	2	1	1	1	0	0
24	INT. GEAR RING	1	1	1	1	1	1	0	0
25	INSERT	1	1	1	1	1	1	0	0
26	ROTOR HOUSING	1	1	1	1	1	1	0	0
27	UPPER CENTRE PLATE	1	1	1	1	1	1	0	0
28	LOWER CENTRE PLATE	1	1	1	1	1	1	0	0
29	OUTER CASE	0	0	0	1	1	1	0	0

**BILL OF MATERIAL**

202 MA - \*

Sr.No.	DESCRIPTION	*50	*80	*200	*350	*550	*850	*2250	*3500
30	IDLER GEAR (18 T)	6	4	0	4	2	0	2	0
31	NEEDLE ROLLER	90	90	90	60	60	60	30	30
32	IDLER GEAR (15 T)	0	2	6	0	2	4	0	2
33	ROTOR BLADE	5	5	5	5	5	5	5	5
34	NAME PLATE	1	1	1	1	1	1	1	1
35	FLANGE	1	1	1	1	1	1	0	0
36	FLANGE	0	0	0	0	0	0	1	1
37	BEARING	1	1	1	1	1	1	1	1
38	BEARING	1	1	1	1	1	1	1	1
39	INTERNAL CIRCLIP	2	2	2	1	1	1	0	0
40	REDUCER	1	1	1	1	1	1	1	1
41	LOWER CENTRE PLATE	0	0	0	0	0	0	1	1
42	IDLER GEAR PIN	6	6	6	4	4	4	2	2
43	SPACER	1	1	1	1	1	1	1	1
44	'O' RING	1	1	1	1	1	1	1	1
45	'O' RING	1	1	1	1	1	1	1	1

**MINOR TUNE - UP KIT  
FOR 202 MA SERIES  
AIR MOTORS  
P/NO. TK 1003**

Sr. NO.	Part Name	Qty
4	Strainer	1
5	Oil Seal	1
33	Rotor Blade	5
44	'O' Ring	1
45	'O' Ring	1

**MAJOR TUNE - UP KIT  
FOR 202 MA SERIES  
AIR MOTORS**

Sr. NO.	Part Name	Quantity reqd. for each Models of 202 MA Series							
		50	80	200	350	550	850	2250	3500
		2	Bearing	1	1	1	1	1	1
3	Bearing	5	5	5	3	3	3	1	1
4	Strainer	2	2	2	2	2	2	2	2
5	Oil Seal	2	2	2	2	2	2	2	2
6	Sun Wheel	-	1	3	-	1	2	-	1
20	Key	2	2	2	1	1	1	-	-
30	Idler Gear (18T)	6	4	-	4	2	-	2	-
31	Needle Roller	90	90	90	60	60	60	30	30
32	Idler Gear (15T)	-	2	6	-	2	4	-	2
33	Rotor Blade	10	10	10	10	10	10	10	10
37	Bearing	1	1	1	1	1	1	1	1
38	Bearing	1	1	1	1	1	1	1	1
39	Internal Circlip	2	2	2	1	1	1	-	-
42	Idler Gear Pin	6	6	6	4	4	4	2	2
43	Spacer	1	1	1	1	1	1	1	1
44	'O' Ring	2	2	2	2	2	2	2	2
45	'O' Ring	2	2	2	2	2	2	2	2
<b>Major Tune - Up Kit P/N</b>		<b>TK5027</b>	<b>TK5028</b>	<b>TK5015</b>	<b>TK5016</b>	<b>TK5017</b>	<b>TK5018</b>	<b>TK5019</b>	<b>TK5020</b>



## DISASSEMBLY

### General Instructions



1. Always disconnect the air supply before doing any maintenance.
2. Always use protective eye wear when performing maintenance on a tool or when operating a tool.
3. Do not disassemble the tool any further than necessary to replace or repair damaged parts.
4. Do not disassemble the Motor unless you have a complete set of new gaskets and 'O' rings for replacement.
5. Do not remove any part which is a press fit in or on a subassembly unless the removal of that part is necessary for repair or replacement.
6. Whenever grasping a tool or part in a vice, always use leather - covered or copper - covered vice jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members and housings.
7. The modular construction of 202 series motors permits selective disassembly whereby gearing can be separated from the power unit and disassembled without removing the motor from the Rotor Housing, or the motor can be removed and disassembled without removing the gear train from the gear chambers. This is especially true for the high torque ratios ie, double and triple reduction motors. Because of the modular construction, the steps in the following disassembly procedures can be sequentially changed to meet the particular situation.

### Disassembly of Gear Box

#### A. For Single Reduction Models ( 2250 & 3500 rpm models ).

1. Unthread Flange ( 36 ) ( Left hand thread )
2. Take out ' O ' Ring ( 44 ) and Muffler ( 19 ).
3. Holding the Spindle ( 9 / 16 ) stationary using an allen key 4 mm A/F, remove the Nut ( 17 ) with a Spanner 19 mm A/F.
4. Use a Spanner 36 mm A/F to loosen the Gear Case ( 18 ) from the Rotor Housing ( 10 ). The Motor assembly will also come out along with the Gear Case Assembly.
5. Hold the Gear Case ( 18 ) in a vice.
6. Tap end of Spindle ( 9 / 16 ) using a soft hammer. The Spindle Assembly along with the Motor Assembly will come out.
7. Lightly grasp the shaft portion of the Spindle in Copper - covered vice jaws.
8. Pull the Motor Assembly, so that Spindle Assembly gets separated from it.
9. Hammer out the Idler Gear Pins ( 42 ) from the Spindle so that Idler Gear ( 30 / 32 ), Sun Gear ( 6 ) and Needle Rollers ( 31 ) can be taken out.

#### B. For Double and Triple Reduction Models ( 50, 80, 200, 350, 550 & 850 rpm models ).

1. Hold the tool in a vice clamping it on the Rotor Housing ( 26 ).
2. Loosen the Flange ( 35 ) ( Left hand thread ).

3. Holding the Spindle ( 9 / 16 ) stationary using an allen key 4 mm A/F, remove the Nut ( 17 ) with a Spanner 19 mm A/F.
4. Use a spanner 36 mm A/F on the Outer Case ( 21 / 29 ) to loosen the Gear Box Assembly from the Rotor Housing ( 26 ). The motor assembly will also come out along with the Gear Box Assembly from the Rotor Housing ( 26 ).
5. Place a wedge shaped tool between the Lower Centre Plate ( 28 ) and Outer Case ( 21 / 29 ). Hammer slightly to separate the Motor Assembly from the Gear Box Assembly.
6. Place an aluminium or plastic rod over the races of Bearing ( 3 ) at the smaller diameter end of Outer Case ( 21 / 29 ) and hammer out all the Drive Shaft, Bearing Carrier, Spindle and Insert Assemblies.
7. Tap shaft end of the Spindle ( 9 / 16 ) gently with a soft hammer to take it out from Insert Assembly.
8. Tap shaft end of Drive Shaft Assembly to remove it from Bearing Carrier Assembly.
9. Hammer out the Idler Gear Pin ( 42 ) from the Spindle ( 9 / 16 ) and Drive Shafts ( 7 / 8 / 11 ), so that Idler Gears ( 30 / 32 ) and Needle Rollers ( 31 ) can be taken out.
10. If any of the Bearing needs to be replaced, take it out from the assembly.

#### Disassembly of the Motor

1. Tap drive end of Rotor ( 14 / 15 ) with a soft hammer, motor will come apart.
2. If the Upper Centre Plate bearing ( 38 ) needs to be replaced, press it out from the Upper Centre Plate ( 1 / 27 ).
3. Remove the Cylinder Pin ( 13 ).
4. Lift off the Cylinder Bushing ( 12 ).
5. Remove the Rotor Blades ( 33 ).
6. If the Lower Centre Plate Bearing ( 2 ) needs to be replaced, press it out from Lower Centre Plate ( 28 / 41 ).

#### ASSEMBLY

##### General Instructions



1. Always use protective eye wear when performing maintenance on a tool or operating a tool.
2. Always press on the inner ring of a ball - type bearing when installing the bearing on a shaft.
3. Always press on the outer ring of a ball - type bearing when installing the bearing in a bearing recess.
4. Check every bearing for roughness. If an open bearing must be cleaned, wash it thoroughly in clean solvent and dry with a clean cloth. Work grease thoroughly into every open bearing before installation. Sealed or shielded bearings should never be cleaned.
5. Except for bearings, always clean every part and wipe every part with a thin film of oil before installation.

6. When grasping a Motor or one of its parts in a vice, always use leather or copper vice jaw covers to protect the surface of the part and reduce the likelihood of damage. This is particularly important when clamping threaded members, shafts with splines etc.
7. Apply 'O' Ring lubricant to each 'O' Ring before assembly.

### **Assembly of Motor & Housing**

1. Press the Upper Centre Plate ( 1 / 27 ) and the Bearing ( 38 ) onto the Rotor Shaft.
2. Replace the Cylinder Pin ( 13 ) into the Cylinder Bushing ( 12 ).
3. Place the Cylinder Bushing ( 12 ) over the Rotor ( 14 or 15 ), aligning the Cylinder Pin ( 13 ) in the Cylinder Bushing ( 12 ) with the dowel hole in the Upper Centre Plate ( 1 / 27 ).
4. Apply a film of light oil to each Rotor Blade ( 33 ) and insert a Rotor Blade, straight edge out, into each vane slot in the Rotor ( 14 / 15 ). If new Rotor Blades are required, replace the entire set.
5. Grasp shoulder of Upper Centre Plate ( 1 / 27 ) in a vice having leather covered jaw.
6. Check the Lower Centre Plate ( 28 / 41 ) for wear. If there is excessive wear replace with a new one.
7. Press the Lower Centre Plate ( 28 / 41 ) and Bearing ( 2 ) onto the Rotor Shaft aligning the Cylinder Pin ( 13 ) in the Cylinder Bushing ( 12 ) with the dowel hole in the Lower Centre Plate ( 28 / 41 ).
8. Replace Spacer ( 43 ) next to Lower Centre Plate Bearing ( 2 ).
9. Hold Rotor Housing ( 10 / 26 ) in a vice so that the open side is at the top
10. Insert the Motor Assembly into the Rotor Housing aligning the Cylinder Pin in the Upper Centre Plate ( 1 / 27 ) and the blind hole in the Rotor Housing.
11. Clean the face of the Reducer ( 40 ) and Strainer ( 4 ) in a suitable cleaning solution before assembling into the tool. Assemble Strainer ( 4 ) in the Reducer ( 40 ). Also assemble 'O' Ring ( 45 ).
12. Using a wrench tighten the Reducer ( 40 ) onto the Rotor Housing.

### **Assembly of Gear Box**

1. Stick 15 nos. of Needle Rollers ( 31 ) into the inner diameter of the Idler Gear ( 30 / 32 ) using grease.
2. Place the shoulder of the Drive Shaft ( 7 / 8 / 11 ) / Spindle ( 9 / 16 ) on the vice jaws.
3. Place the Idler Gear ( 30 / 32 ) with Needle Rollers ( 31 ) inside the slot of the Drive Shaft ( 7 / 8 / 11 ) / Spindle ( 9 / 16 ).

**IMP :- In models where Sun Gears ( 6 ) are to be used introduce it before assembly of Idler Gears.**

4. Press the Idler Gear Pin ( 42 ) inside.

#### **A. For Single Reduction Models ( 2250 & 3500 rpm models ).**

1. Assemble Oil Seal ( 5 ) inside the Gear Case ( 18 ) so that the concave face faces the splined portion of Gear Case.
2. Insert the Spindle Assembly from inside the Gear Case ( 18 ) threaded end first.

3. Support the unthreaded end of the Spindle ( 9 / 16 ). Lubricate Bearing ( 37 ) with the recommended grease. Install it in the recess in the Gear Case pressing the outer race of bearing.
4. Holding the Spindle ( 9 / 16 ) from rotating using an allen key 4mm A/F tighten the nut with Spanner 19mm A/F.
5. Lubricate Bearing ( 3 ) with recommended grease. Install it on the Spindle ( 9 / 16 ) pressing the inner race of the bearing.
6. Hold the Rotor Housing Assembly on the A/F in a vice.
7. Tighten the Gear Case Assembly using a Spanner 36mm A/F on to the Rotor Housing Assembly.
8. Assemble the Muffler ( 19 ) with the large diameter end going first.
9. Coat ' O ' Ring lubricant over the ' O ' Ring and install it in the groove on the Flange ( 36 ).
10. Tighten the Flange ( 36 ) on to the Gear Case ( 18 ) ( Left hand thread ).

**B. For Double and Triple Reduction Models ( 50, 80, 200, 350, 550 & 850 rpm models ).**

1. Install Internal Circlip ( 39 ) inside the Bearing Carrier ( 23 ) using Circlip pliers.
2. Lubricate Bearings ( 3 ) with the recommended grease and install in the Bearing Carrier ( 23 ).
3. Assemble Oil Seal ( 5 ) inside the Insert ( 25 ) so that the concave face is facing the wide mouthed end of insert.
4. Insert the Spindle Assembly from inside the Insert ( 25 ) thread end first.
5. Lubricate Bearing with the recommended grease. Support the unthreaded end of Spindle ( 9 / 16 ). Install Bearing ( 37 ) in the recess in the Insert ( 25 ) pressing it on the outer race.
6. Coat inside of Internal Gear Ring ( 22 ) with the recommended grease.
7. Replace Internal Gear Ring ( 22 ) meshing it with Idler Gears ( 30 / 32 ). The teeth of Internal Gear Ring ( 22 ) should go into the slot of Insert.
8. Assemble the Bearing Carrier ( 23 ), meshing its slot with the teeth of Internal Gear Ring ( 22 ).
9. Press Drive Shaft Assembly into the Bearing ( 3 ) of the Bearing Carrier.

**IMP :- After this, for triple reduction models one more set of assemblies of Internal Gear Ring, Bearing Carrier and Drive Shaft consisting of steps 8 - 9 has to be done.**

10. Replace Internal Gear Ring ( 24 ) meshing it with the Idler Gears ( 30 / 32 ). The teeth of Internal Gear Ring should go into the slot of Bearing Carrier ( 23 ).
11. Replace Key/s ( 20 ) inside the slot of the Bearing Carrier/s ( 23 ).
12. Push the whole Gear Ring Assembly into the Outer Case ( 21 / 29 ) so that the Key ( 20 ) goes into the keyway.
13. Apply a film of ' O ' Ring lubricant to the ' O ' Ring ( 44 ). Replace it in the groove of the Flange ( 35 ).
14. Engage the threads of the Flange ( 35 ) to that of the Outer Case ( 21 / 29 ) and tighten it ( Left hand thread ).
15. Holding the Spindle ( 9 / 16 ) from rotating using an allen key 4mm A/F tighten the Nut ( 17 ) with Spanner 19mm A/F.
16. Engage the threads of the Outer Case ( 21 / 29 ) to that of the Rotor Housing ( 26 ) and tighten it.

## TROUBLE SHOOTING GUIDE

Trouble	Probable Cause	Solution
Motor will not operate	Rotor shaft and idler gears binding due to improper installation	Using an allen key, turn the output shaft. If the force to be applied is very great considering the gear ratio, the gearing is improperly installed and must be reassembled. See Paragraphs .for assembly of the gearing
	Spline in shaft of drive shaft and idler gears binding due to improper installation	Solution same as above
	Rotor Blades do not move out of their slots	The centre - punch mark on Rotor Housing A/F should be upper most while clamping the tool in horizontal position.
Loss of power	Low air pressure at motor	Check air supply. For top performance, the air pressure, must be 90 psig (6.3 Kg/cm <sup>2</sup> )at the inlet
	Worn Vanes	Install a new Set of Vanes
	Inadequate motor lubrication	Check air line lubricator. Refer to page 3 for lubrication specifications
	Worn or damaged parts	Disassemble the motor and examine parts. Replace any worn or damaged parts
Motor heats up	Inadequate lubrication	Refer to Lubrication Section on Page 3
Gear Box heat up beyond normal increase	Improper lubrication	Refer to Lubrication Section on Page 3
Grease leakage	Too much grease in the gear box	Refer to Lubrication Section on Page 3