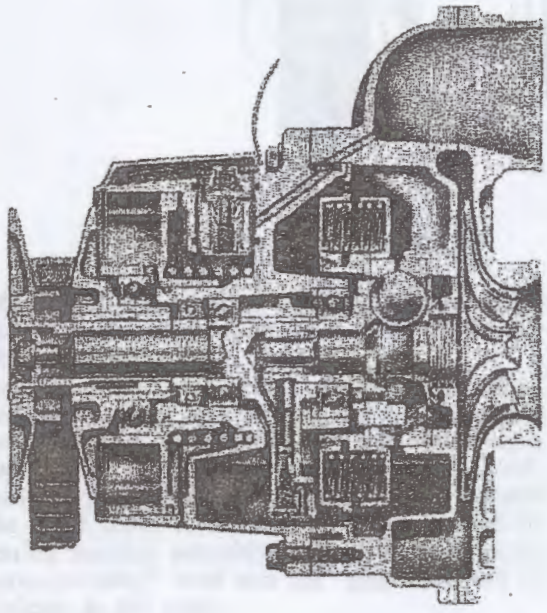
PAXTON

SUPERCHARGER
SHOP SERVICE MANUAL
MODEL VS-57



PAXTON PRODUCTS

929 OLYMPIC BLVD
SANTA MONICA, CALIFORNIA

The supercharger, Model VS-57S, is of the single-stage, centrifugal type. (See Fig. 105).

Drive power is taken from the engine crankshaft through a single-cog type V belt and a variable-ratio pulley fitted to the input shaft of the supercharger.

A planetary drive system is incorporated between the input and the output shafts to increase the speed of the impeller. It is a ball bearing, friction-type system which eliminates the use of gears. Spring-loaded ball races automatically take up any wear that might develop in the drive.

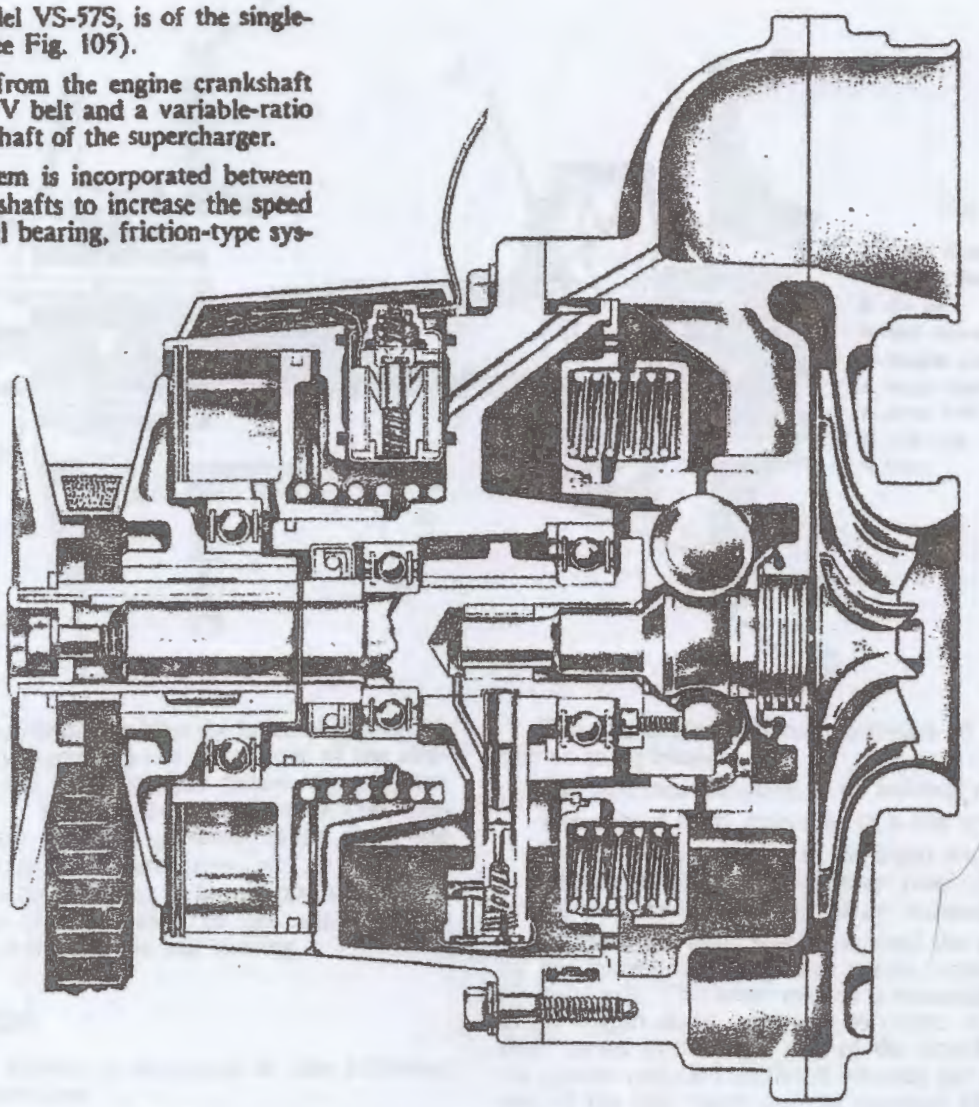


FIG. 105

The lubrication system is completely self-contained and does not require any connections to the engine lubricating system. An internal oil sump holds eight (8) ounces of Type A automatic transmission fluid. The piston-type oil pump works off a cam ground into the input shaft. A dipstick oil gauge, located in the bearing housing assembly, is marked to indicate the "safe operating" level and the "add oil" level of the lubricant in the sump.

OPERATION

It is necessary to drive the impeller at a very high speed to obtain the required boost in pressure. This is accomplished by incorporating two separate phases of shaft speed step-up. The first is at the variable-ratio pulley which is keyed to the shaft, and the second point is at the planetary drive system between the input and the output shafts.

The variable-ratio pulley offers a 1.3-1 rpm increase over the crankshaft speed when it is in the fully closed position. When the pulley is fully opened the increase is 2.3-1. Thus, when the flanges are fully closed, the supercharger is operating in "low blower". When the flanges are fully separated, the supercharger is being driven in "high blower". Movement of the rear or sliding flange of the pulley is automatically controlled by the functioning of the control system. Operation and function of the control system is explained in the section under Control System.

The belt tensioning arm and the idler pulley apply pressure against the drive belt and cause the belt to pull down into the pulley. This separates the flanges during the shifting cycle from "low" to "high" blower.

The planetary drive system, incorporated between the input and output shafts, is the second point of rpm step-up. The ratio of the system is a constant 1-4.4, and does not vary under any operating conditions. When the supercharger is in "low blower" the impeller is turning approximately 5.7 times as fast as the crankshaft (1 x 1.3 x 4.4). In "high blower", the impeller is being driven approximately 10 times faster than the crankshaft (1 x 2.3 x 4.4). However, when the supercharger is in "high blower" and the engine is turning at high rpm, the regulating action of the control system limits the boost output to a predetermined level.

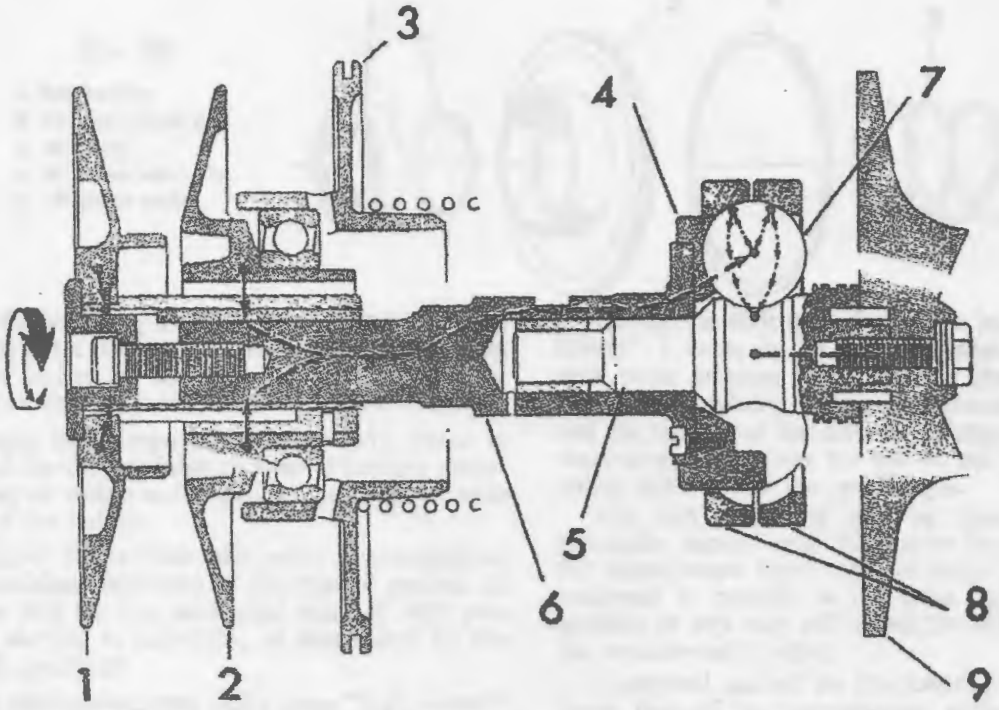


FIG. 106

1. Fixed flange
2. Sliding flange
3. Air piston
4. Ball driver
5. Output shaft
6. Input shaft
7. Drive ball
8. Ball race
9. Impeller

The control system regulates the boost output of the supercharger by governing the movement of the sliding flange of the variable-ratio pulley. Simply, the control system is a solenoid-operated valve that controls the passage of boost pressure, taken from the discharge throat of the supercharger, into an air chamber. Within the air chamber is an air piston which is coupled to the sliding flange of the variable-ratio pulley through a thrust-type ball bearing.

DRIVE SYSTEM

The drive system is composed of the following component assemblies:

a. Variable-ratio Input Pulley
b. Input Shaft
c. Planetary Drive System
d. Output Shaft

The power flow through the drive system of the supercharger starts at the variable-ratio pulley assembly (1 and 2, Fig. 106), through the input shaft (6), through the ball driver (4), through the drive balls (7), and to the output shaft (5) and impeller (9).

In understanding the planetary system, it may be compared to a simple planetary gear system.

The ball driver and balls compare to a planetary carrier and pinions.

The ball race compares to an internal ring gear.

The output shaft compares to a sun gear.

The ball driver serves as the input and rotates the 5 balls inside of their stationary race (8) which in turn drives the output shaft at an increased speed.

As the drive balls revolve around the cage formed by the outer races, they also rotate around their individual axis. This latter motion is transmitted directly to the output shaft, causing it to rotate. As the output shaft serves as the inner race of the planetary system, the system ratio is calculated between the inner diameter of the ball races and the raceway of the output shaft.

COMPONENT ASSEMBLIES

Variable-Ratio Input Pulley

The principle component parts of the variable-ratio pulley consists of:

1. Internally splined fixed flange (4, Fig. 107) which is splined to a hub (6) that is keyed to the input shaft.

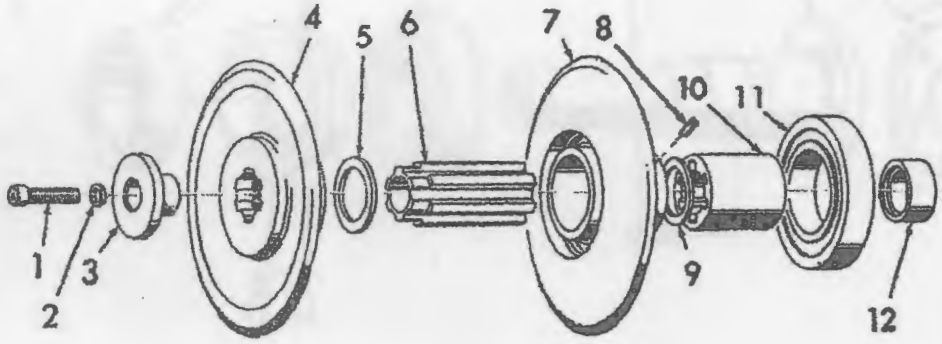


FIG. 107

1. Capscrew
2. Lock washer
3. Retainer
4. Fixed flange
5. Washer
6. Splined hub
7. Sliding flange
8. Pin
9. Stop washer
10. Bushing
11. Ball bearing
12. Shaft seal spacer

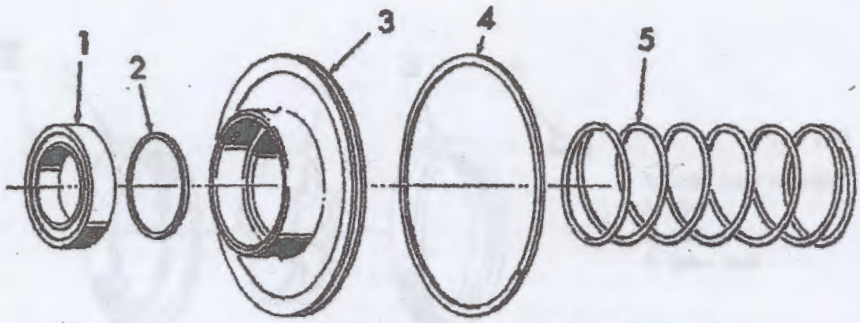


FIG. 108

1. Ball bearing
2. Air piston inner ring
3. Air piston
4. Air piston outer ring
5. Air piston spring

2. A sliding flange (7) that has a splined bushing (10) insert that permits the flange to slide along the surface of the hub and still continue to drive the input shaft.

A sealed, thrust-type ball bearing (11), fitted to the rear of the sliding flange, is used to transfer movement of an air piston to the flange to accomplish ratio shifting of the pulley.

Shifting of the variable-ratio pulley is accomplished by the combined functions of the control system, an air piston, and the belt tensioning arm and idler pulley. The shifting is automatic, as determined by engine load conditions.

When the supercharger shifts from "high blower" to "low blower", it is a result of boost pressure (taken from the discharge throat) being passed into an air chamber, or cylinder, containing the air piston. The pressure behind the piston (3, Fig. 108) drives it forward the movement is transmitted to the sliding flange of the pulley assembly through a ball bearing. The pressure is sufficient to overcome the tension applied to the drive belt by the belt tensioning arm and, as the pulley flanges close, the belt is forced to the top of the pulley and the speed of the input shaft is reduced. An equalizer spring (5) behind the piston helps to overcome the effect of the tensioning arm against the drive belt.

During idle speed engine operation the drive belt and variable-ratio pulley are in the "high blower" position as there is insufficient boost pressure being developed to drive the air piston forward. As the engine speed is increased, the boost pressure output reaches the level required to drive the piston forward and shift the supercharger into the "low blower" range. The spring behind the air piston serves to equalize the tension exerted by the belt tensioning arm against the drive belt, thereby holding the level of pressure required for this function to a minimum.

During the shift cycle from "low blower" to "high blower", a valve in the control system closes to prevent boost pressure from entering the air chamber. The pressure within the chamber bleeds, or vents off, and the tension on the drive belt (exerted by the belt tensioning arm) causes the belt to pull down into the pulley and separate the two flanges.

The belt tensioning arm, or idler arm, is geometrically located with relation to the center line of the supercharger input shaft to apply proper tension, measured in pounds, to the drive belt. Altering its position in any way will affect the shifting cycles of the variable-ratio pulley.

Computed against the crankshaft pulley, the minimum ratio of the variable-ratio pulley is 1.3-1. The maximum ratio, when the flanges are fully separated, is 2.3-1.

Input Shaft

The composite input shaft is the central shaft in the drive system and is supported in the bearing housing by two ball bearings (1 and 3, Fig. 109). The oil pump assembly (2) fits on the shaft between the two bearings. The plunger of the oil pump is actuated by a camway ground into the input shaft. A ball driver (6), fastened to the rear of the input shaft by five screws, rotates the drive balls of the planetary drive system. A bushing (7), inserted in the input shaft, serves to pilot the output shaft. This bushing also has a function in the lubrication system.

The input shaft is keyed directly to the variable-ratio pulley and always turns at the rpm speed being turned by the pulley.

Planetary Drive System

The ratio of the system remains constant under all conditions and is 1 : 4.40, input to output shaft.

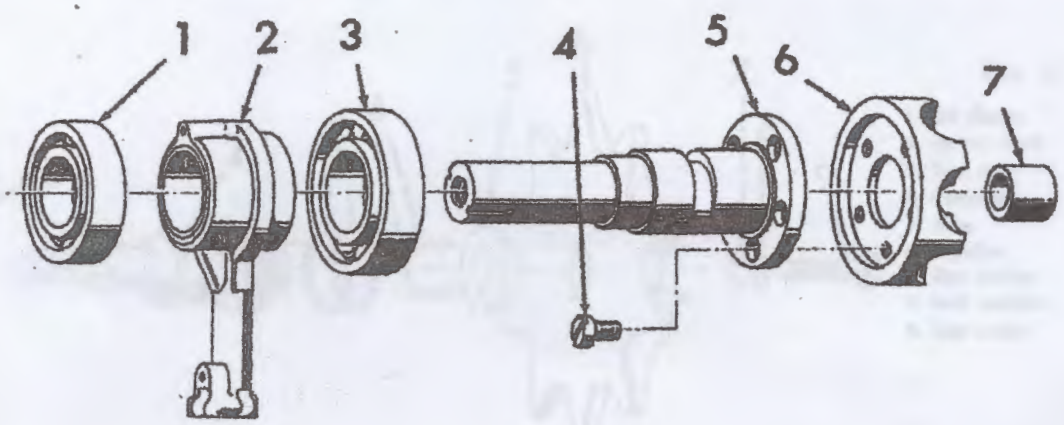


FIG. 109

1. Ball bearing
2. Oil pump
3. Ball bearing
4. Screw
5. Input shaft
6. Ball driver
7. Bushing

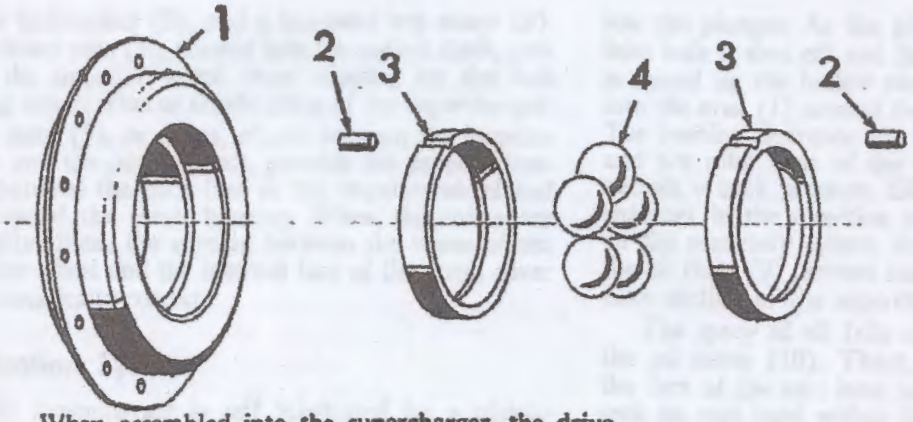


FIG. 110

1. Race load assembly
2. Pin
3. Ball race
4. Drive ball

When assembled into the supercharger, the drive balls are enclosed between and revolve around the inside faces of the two ball races (3, Fig. 110). As the drive balls (4) are turned (by the ball driver) around the races, they also revolve around their own axis. It is this revolving motion that is transmitted to drive the output shaft, as the output shaft forms the inner raceway of the planetary system (See Fig. 111). One ball race is fitted into the scroll housing and the second race is fitted into the collar of the race load assembly. A pin (2, Fig. 110) is fitted through the outer face of each ball race to prevent turning within their respective bores.

The race load assembly, through compression of internal springs when the supercharger is assembled, applies pressure evenly around the front ball race (See Fig. 112).

The design of the overall system provides for maximum drive with minimum slippage, while also providing for the take-up of any wear that might develop in the ball races or drive balls.

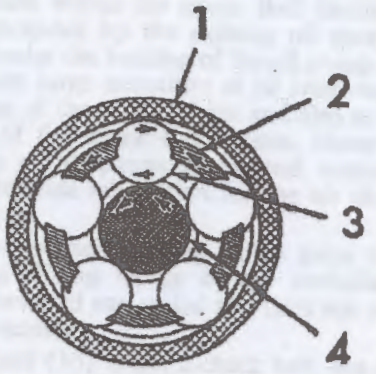


FIG. 111

1. Ball race (stationary)
2. Ball driver
3. Drive ball
4. Output shaft

Output Shaft

The output shaft, as part of the drive system, is the rotating inner raceway of the planetary system. The ratio step-up of 1 : 4.40, therefore, is calculated between the inner contact surface of the ball races and the outer contact surface of the output shaft.

A slinger ring (1, Fig. 113) and two oil seal rings (3) are used at the front of the output shaft to prevent oil from leaking out around the impeller and into the scroll housing.

The impeller wheel (6) fits onto a pilot hub on the end of the output shaft and is retained by a washer

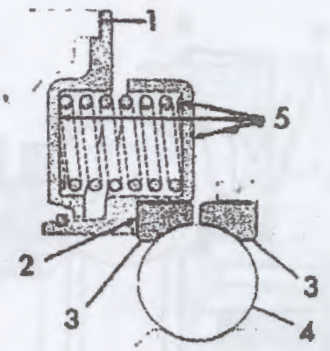


FIG. 112

1. Contact point between assembly and housing
2. Pressure applied at this point
3. Ball race
4. Drive ball
5. Race load assembly

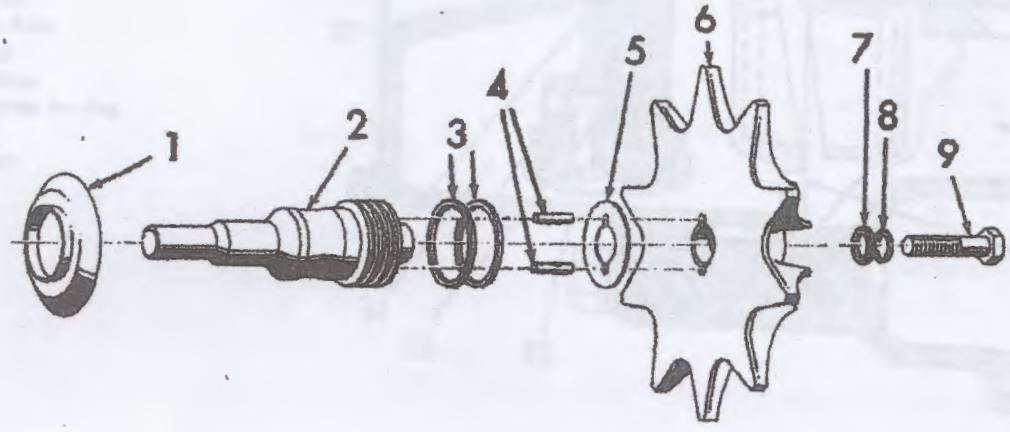


FIG. 113

1. Oil slinger
2. Output shaft
3. Seal ring
4. Dowel pin
5. Shim
6. Impeller
7. Flat washer
8. Lock washer
9. Cap screw

(1), a lockwasher (8), and a hex-head cap screw (9). Two dowel pins (4), pressed into the output shaft, prevent the impeller wheel from slipping on the hub during acceleration or deceleration of the supercharger.

A shim (5), or shims, placed between the impeller wheel and the output shaft, provide for proper clearance between the back face of the impeller wheel and the face of the scroll housing. When the shims are correctly fitted, the spacing between the vanes of the impeller wheel and the internal face of the scroll cover is automatically correct.

Lubrication System

The supercharger is self lubricated by a piston-type oil pump which works off a camway ground into the input shaft. The oil sump holds eight ounces of lubricant—Type "A" automatic transmission fluid.

NOTE: Use only the recommended lubricant, as this type lubricant is designed for high heat range applications. The use of standard automotive engine oil will result in oil breakdown and cause serious damage to the supercharger.

In operation, the oil pump plunger (17, Fig. 114) is operated by the input shaft—a spring (13) under the plunger holds the plunger in constant contact with the camway (5) ground into the input shaft. On the upward or intake stroke the plunger follows the low part of the cam and oil is taken from the sump (14) in through the screen and into the lower chamber below the plunger. As the plunger is pushed down the inlet hole is shut off and the oil in the lower chamber is forced up the hollow stem of the plunger and out into the area (1) around the back of the output shaft. The bushing clearance (6) between the insert bushing and the pilot boss of the output shaft provides the necessary back pressure. Oil is then forced out of the chamber in the direction of the arrows and sprayed on the planetary system drive balls. Slinger (8) and the oil rings (9) prevent loss of lubricant into the diffuser section of the supercharger.

The spray of oil falls into the forward section of the oil sump (10). There, small holes (11) around the face of the race load assembly permits the oil to seek its own level within the sump. Ball bearings (4 and 7) are lubricated by the existing oil spray and seepage of oil under the bushing of the oil pump. Shaft seal (3) prevents large quantities of oil from entering the front section of the supercharger and also serves to keep dirt out of the lubricating system. However, a small quantity of oil passes under and around the spacer (2) to provide lubrication for the air chamber and the air piston.

The thrust-type ball bearing which joins the air piston and the sliding flange of the variable-ratio pulley is prelubricated and sealed and does not require additional lubrication.

The small ball (16) is not a check ball, but serves only to seal the drilled passage where it enters the body casting of the oil pump.

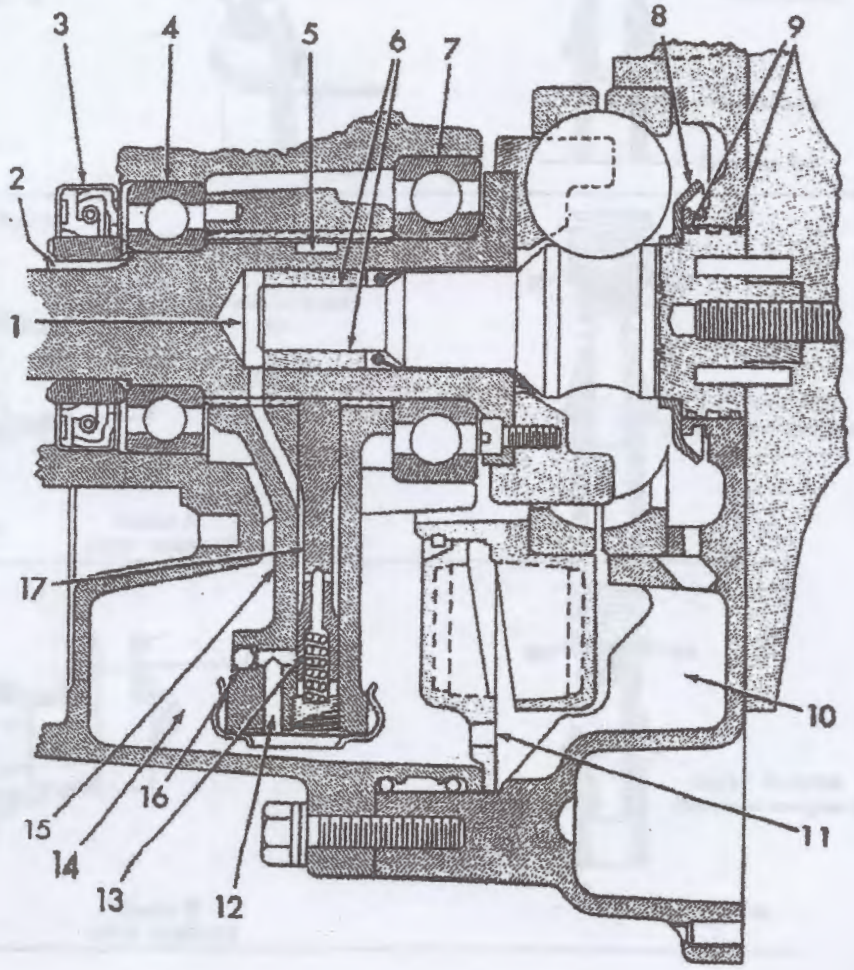


FIG. 114

1. Chamber behind output shaft
2. Spacer
3. Shaft seal
4. Ball bearing
5. Camway
6. Bushing clearance
7. Ball bearing
8. Slinger
9. Oil rings
10. Oil sump
11. Oil hole
12. Pump inlet
13. Spring
14. Oil sump
15. Oil pump housing
16. Plug
17. Plunger

Control System

The control system of the supercharger regulates the output of the supercharger by controlling the movement of the sliding flange of the variable-ratio pulley. In effect, the system is an electrically operated valve which controls the passage of boost pressure, taken from the discharge throat, into an air chamber. A piston within the chamber is coupled directly to the sliding flange of the pulley through a thrust-type ball bearing.

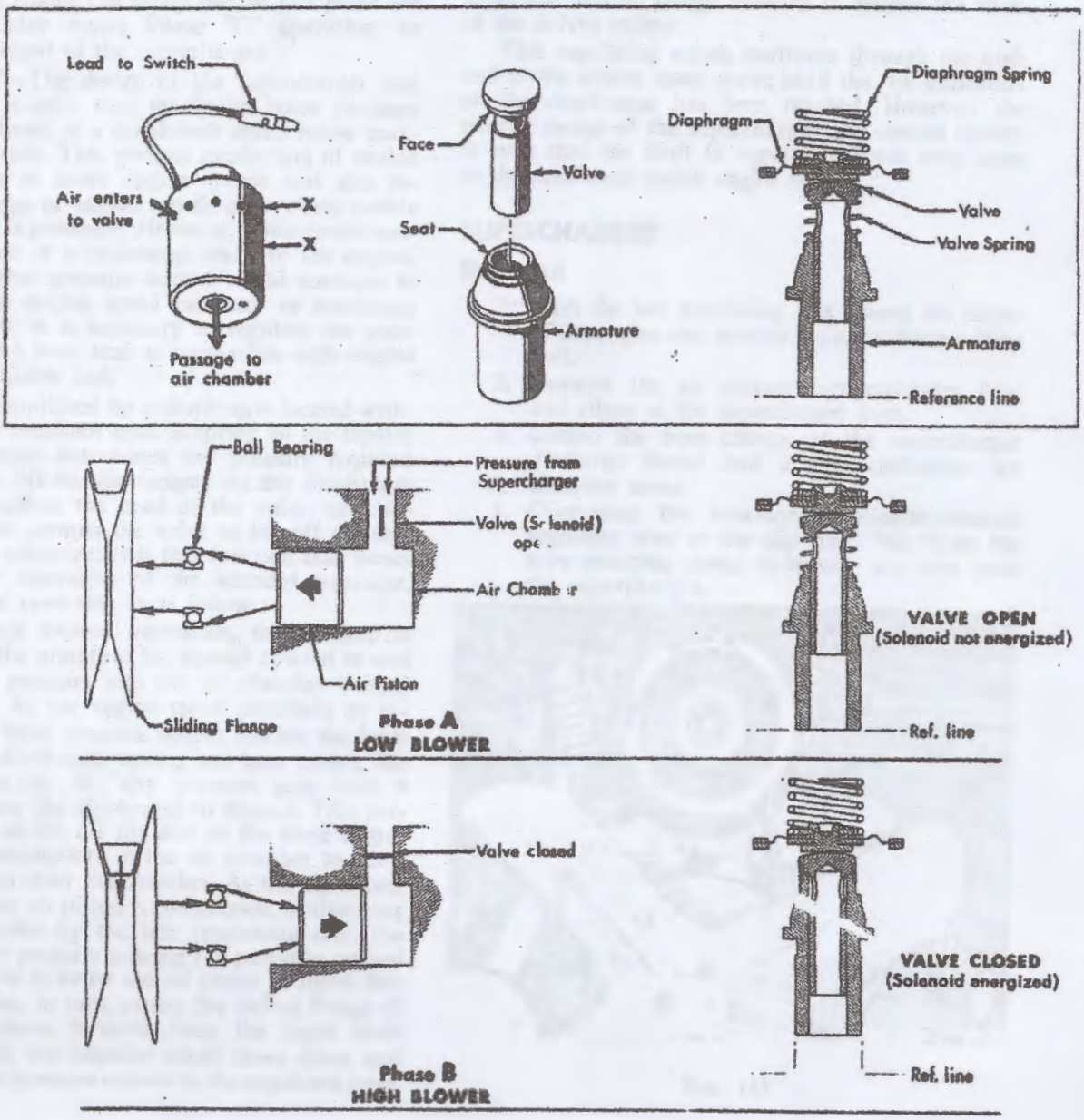
The main electrical component of the system is a solenoid regulator, which is energized by the closing of an external switch. Located in the bearing housing, the regulator intersects an air passage leading between the discharge throat and the air chamber. The external switch is a kick-down type switch operated by depressing the accelerator pedal.

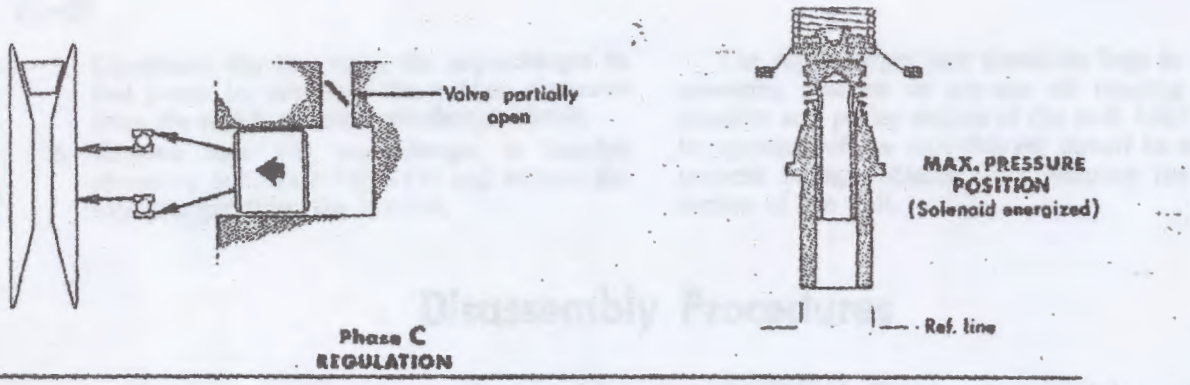
The switch is set in conjunction with the throttle linkage to close the circuit at approximately ⅞ throttle opening. This closing of the kick-down switch energizes the solenoid regulator.

The solenoid regulator has three phases of operation.

Phase "A"—The solenoid regulator is not energized and the valve is open, permitting boost pressure to enter the air chamber. The air poston is driven forward, closing the variable-ratio pulley and the supercharger is operating in "low blower". Minimum horsepower is required to drive the supercharger during this phase, as the supercharger is not producing high level output. This phase extends across the cruising range of the engine, where the engine does not demand, and cannot use, boost pressure. Under acceleration or full load demand of the engine, the supercharger shifts into Phase "B" operation.

Phase "B"—As soon as the solenoid regulator is energized, the armature lifts and seals against the valve stem to block the passage of boost pressure to the air chamber. When the source of constant pressure is removed from behind the air piston, the pressure that exists in the chamber bleeds off. This permits the tension exerted against the drive belt by the belt tensioning arm to pull the belt down into the





variable-ratio pulley and move the sliding flange backward, driving the air piston back into the air chamber. The supercharger is now in the "high blower" range of operation and the boost pressure output is increased.

As the engine speed increases under full throttle, the boost pressure output also continues to increase until it reaches a predetermined level, as based upon that which the engine can safely use. At this point the solenoid regulator enters Phase "C" operation, to regulate the output of the supercharger.

Phase "C"—The design of the supercharger and drive system is such that maximum boost pressure output is produced at a crankshaft speed below maximum engine rpm. This permits production of usable boost pressure at lower engine speeds and also increases the range of engine speeds over which usable boost pressure is produced. However, if maximum output is produced at a mid-range speed of the engine, it is obvious that pressure output would continue to increase as the engine speed increases to maximum rpm. Therefore, it is necessary to regulate the pressure output to a level that is compatible with engine design and available fuel.

This is accomplished by a diaphragm located within the solenoid regulator case. A spring on the topside of the diaphragm determines the pressure required to distend and lift the diaphragm. As the diaphragm is positioned against the head of the valve, any upward movement permits the valve to lift off the seat formed by the armature. It is this function that forms the Phase "C" operation of the solenoid regulator. The mechanical operation is as follows:

During "high blower" operation, the solenoid is energized and the armature has moved upward to seal the passage of pressure into the air chamber behind the air piston. As the engine speed continues to increase and the boost pressure output reaches the level for which the diaphragm spring has been preset, for example: 4 lbs./sq. in., any pressure gain over 4 pounds will cause the diaphragm to distend. This permits the valve to lift off the seat to the same degree and open the passageway to the air chamber to allow boost pressure to enter the chamber. As the equalizing spring behind the air piston is compressed, neutralizing the tension exerted by the belt tensioning arm, the small amount of pressure passing the partially opened valve is sufficient to cause the air piston to move forward. This action, in turn, causes the sliding flange of the pulley to move forward, thus, the input shaft speed is reduced, the impeller wheel slows down and the boost output pressure returns to the regulated level.

At this point, with the valve still partially opened and the pulley semi-closed, any increase in engine speed will also increase the boost pressure output. This will reflect in greater distension of the diaphragm and a larger opening in the passageway as the valve stem follows the diaphragm. A still greater volume of boost pressure is permitted to enter the air chamber to again drive the sliding flange forward to reduce the ratio of the driven pulley.

This regulating action continues through the high end of the engine speed curve until the full limitation of the diaphragm has been reached. However, the overall design of the supercharger and control system is such that the limit of regulation holds very close to the maximum usable engine rpm.

SUPERCHARGER

Removal

1. Push the belt tensioning arm toward the center of the engine and remove the supercharger drive belt.
2. Remove the air cleaner-to-supercharger hose and elbow at the supercharger inlet.
3. Loosen the hose clamps at the supercharger discharge throat and at the carburetor air chamber cover.
4. Disconnect the kick-down switch-to-solenoid regulator wire at the slip connector. Open the wire retaining clamp to remove the wire from the supercharger.

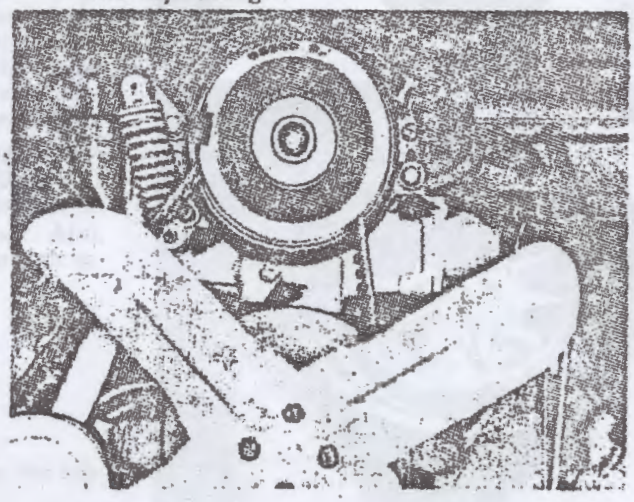


Fig. 115

5. Disconnect the line from the supercharger to fuel pump by removing the rubber connector from the nipple on the supercharger throat.
6. Remove four (4) supercharger to bracket mounting bolts (see Fig. 115) and remove the supercharger from the bracket.

The supercharger unit should be kept in a normal operating position to prevent oil running into the impeller and pulley section of the unit. Inlet and outlet openings of the supercharger should be covered to prevent foreign objects from entering the impeller section of the unit.

Disassembly Procedures

Before starting disassembly work the technician should become familiar with the following precautionary measures and observe them during all phases of repair and maintenance.

Cleanliness—Work only upon a clean, hard surfaced bench. All tools and wiping rags should be free of dirt and deposits of oily grit. Also, all containers should be clean and only fresh, clean solvents and oils should be used.

Proper Tools—The use of proper tools will reduce the possibility of damage occurring during disassembly and assembly procedures. The supercharger is a precision built engine accessory and "brute force" is not required for maintenance and repair work.

Rust and Oxidation—The working surfaces of the drive assemblies are microfinished and the presence of either rust or oxidation will seriously damage the parts. For this reason, never handle the output shaft, drive balls, or ball races barehanded. Instead, wear clean, dry cloth gloves or use well oiled patches of clean cloth to handle the parts. Lint-free paper wiping towels (Scott Industrial Wipers, or equivalent) can be used for this purpose.

Steel Wool and Abrasives — Never use steel wool or any form of abrasive material to clean the input and output shafts, drive balls or ball races, as such practice will destroy the micro-finish. Surface aberrations or pits, regardless of size, will result in noisy and rough operation and cause ultimate failure of the supercharger. There are no short cuts when you are working on precision equipment. Therefore, carefully follow all phases of the instruction information and you will avoid trouble. All repair work must be performed with the supercharger removed from the engine. Any accumulation of oil, dirt, or grime should be removed from exterior surfaces by application of cleaning solvent and wiping with rags or industrial wipers. DO NOT immerse the supercharger in the solvent as damage to the solenoid regulator will result. Also, avoid the use of compressed air during this cleaning operation.

SCROLL COVER

Removal

Remove the oil gauge dip-stick and empty the lubricant from the oil sump.

Remove the scroll cover and gasket by first removing the retaining screws and then lifting, not twisting, the cover from the housing and dowels.

CAUTION: The impeller wheel is precision machined and balanced to permit turning safely at speeds in excess of 25,000 rpm. Any chipping, deep surface scratches or gouging will destroy the balance and can result in serious damage when the supercharger is reassembled and operated. Therefore, do not use pliers to hold the impeller wheel while removing the retaining screw. Also, do not use a screwdriver or other tool, to pry the impeller wheel off the output shaft.

Should the impeller wheel be chipped or badly gouged, do not attempt to dress out or repair the damage but, instead, replace the part. This is the ONLY safe practice under such conditions.

Install the J-6684 Impeller Holding fixture (See Fig. 116) and remove the retaining cap screw and washer. Insert the Impeller Puller, J-6690 (See Fig. 117) into the impeller and turn it clockwise until the

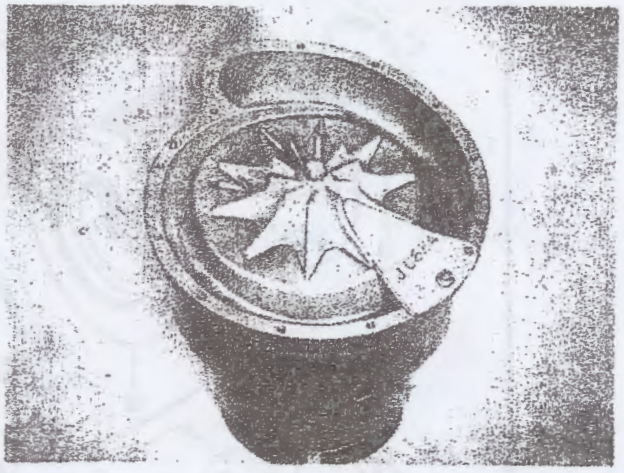


FIG. 116

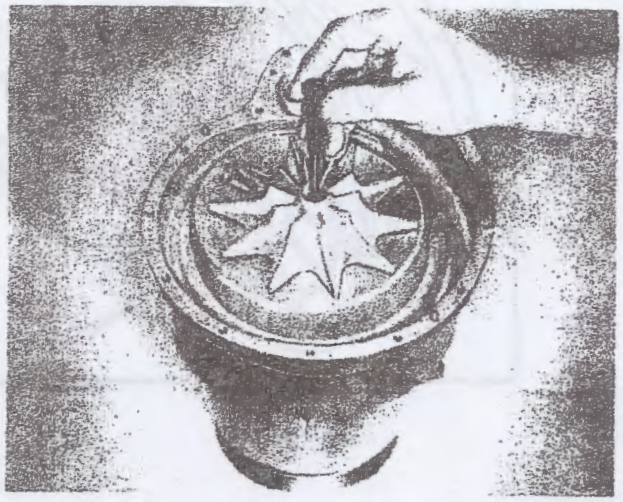


FIG. 117

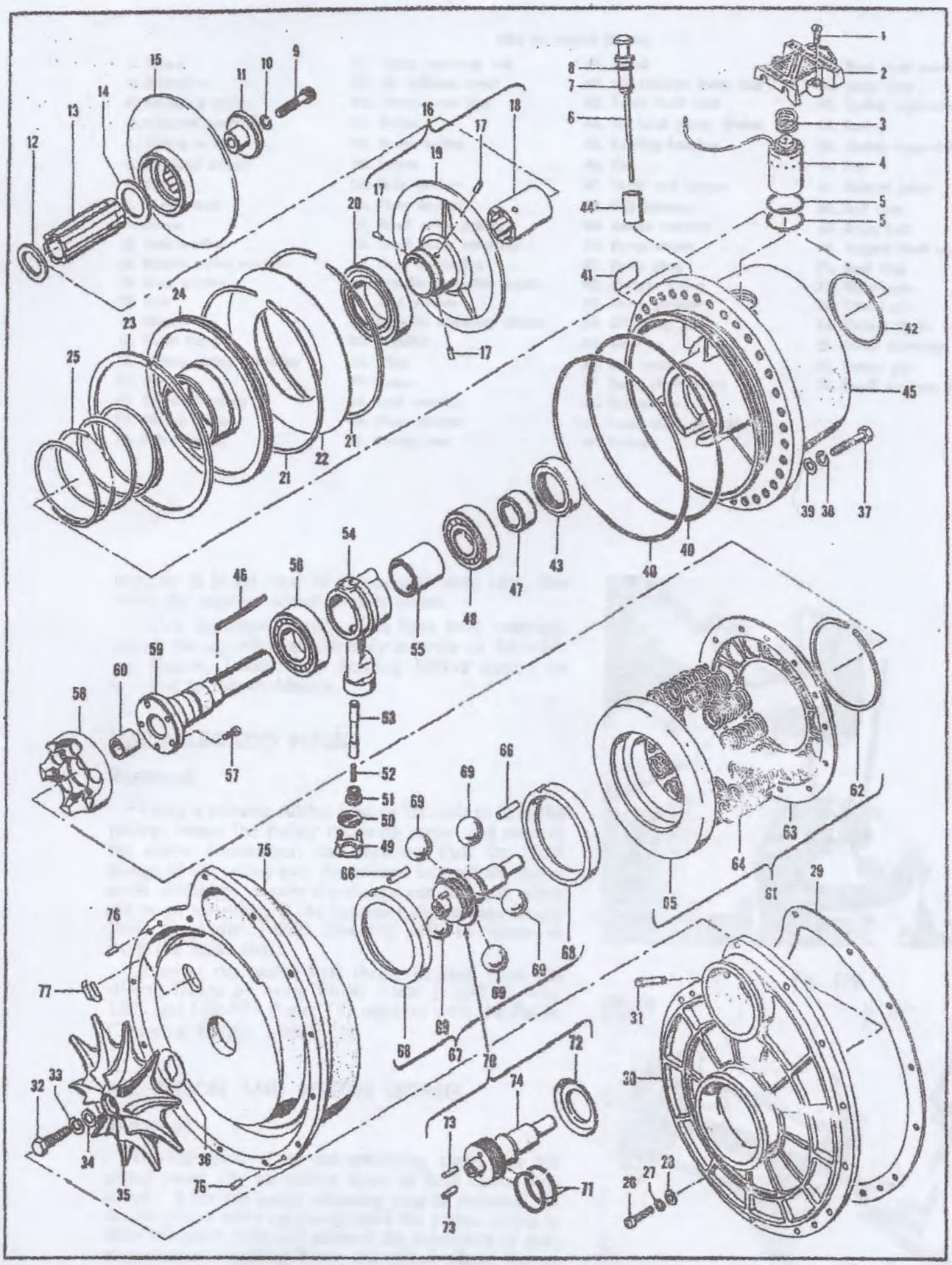

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Fig. 118

KEY TO PARTS IN FIG. 118

1. Screw
2. Medallion
3. Retaining spring
4. Solenoid assembly
5. O-ring seal
6. Oil level gauge
7. Spring
8. O-ring seal
9. Screw
10. Lock washer
11. Driven pulley retainer
12. Stop washer
13. Hub
14. Washer
15. Fixed flange
16. Sliding pulley assembly
17. Pin
18. Splined bushing
19. Sliding flange
20. Ball bearing
21. Cover retaining ring
22. Air cylinder cover
23. Piston outer ring
24. Piston
25. Piston spring
26. Screw
27. Lock washer
28. Plain washer
29. Scroll cover gasket
30. Scroll cover assembly
31. Hose connection
32. Impeller retaining screw
33. Lock washer
34. Impeller retaining washer
35. Impeller
36. Shim
37. Screw
38. Lock washer
39. Plain washer
40. O-ring seal
41. Decal
42. Air cylinder inner ring
43. Input shaft seal
44. Oil level gauge sleeve
45. Bearing housing
46. Key
47. Shaft seal spacer
48. Ball bearing
49. Screen retainer
50. Pump screen
51. Pump plug
52. Plunger spring
53. Pump plunger
54. Oil pump body
55. Bushing
56. Ball bearing
57. Input shaft screw
58. Ball driver
59. Input shaft assembly
60. Bushing
61. Race load assembly
62. Snap ring
63. Spring cage—rear
64. Spring
65. Spring cage—front
66. Pin
67. Output drive
68. Ball race
69. Drive ball
70. Output shaft assembly
71. Seal ring
72. Oil slinger
73. Dowel pin
74. Output shaft
75. Scroll assembly
76. Dowel pin
77. Scroll air hole cover

impeller is lifted clear of the output shaft boss. Remove the impeller wheel shim or shims.

After the impeller and shims have been removed, mount the supercharger assembly securely on the holding fixture, J-6689. The holding fixture should be fastened to the workbench.

VARIABLE-RATIO PULLEY

Removal

Using a suitable rubber hose or fan belt to hold the pulley, loosen the pulley retaining screw and remove the screw, lockwasher, and retainer. Pull the fixed flange of the pulley and the splined hub off the input shaft. Although usually the flange and hub will come off as an assembly, if the splined hub remains on the shaft, use Puller J-6693 (See Fig. 119) to remove it from the input shaft.

Remove the sealed ball thrust bearing from the sliding flange by using Puller Plate J-1298 (1, Fig. 120) and HM-925 Puller (3) together with the Puller Centering Button J-6685 (2).

AIR PISTON AND PISTON SPRING

Removal

During removal of the retaining rings and air piston cover, the air piston must be held down constantly. After the inner retaining ring is removed, let the air piston come up slowly until the piston spring is fully extended. This will prevent the possibility of personal injury resulting from the coiled piston spring forcibly ejecting the air piston from the air chamber.

Push in on the hub of the air piston to compress the piston spring and remove pressure from the air piston cover. Insert a screwdriver in the notch at the bottom of the bearing housing and snap out the outer retaining

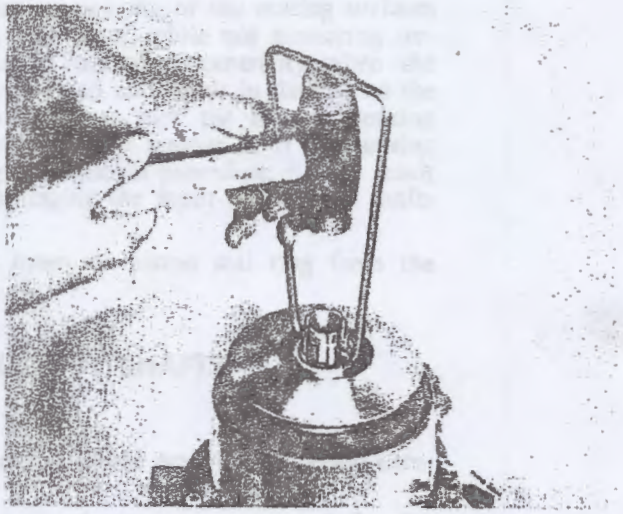

FIG. 119

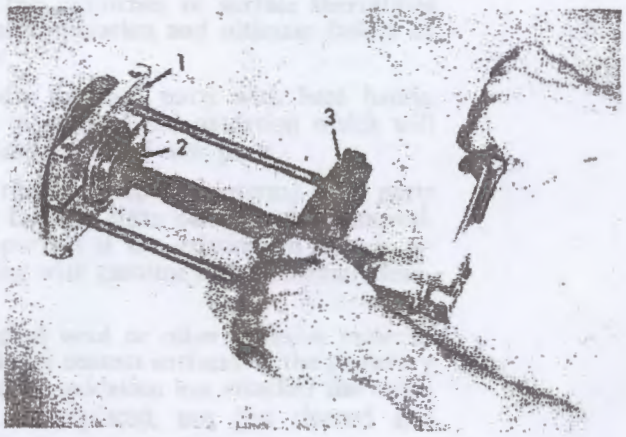

FIG. 120

1. Puller Plate J-1298
2. Centering Button J-6685
3. Puller HM-925

FIG. 121

1. Retaining ring 2. Air piston cover

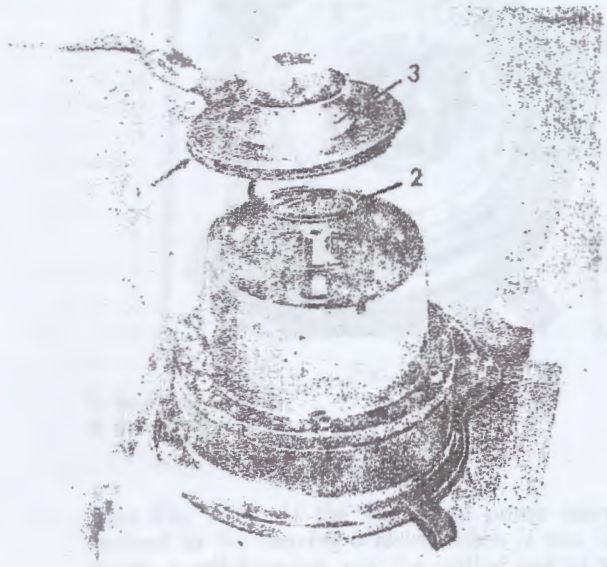

FIG. 122

2. Oil seal ring 3. Air piston
Piston spring

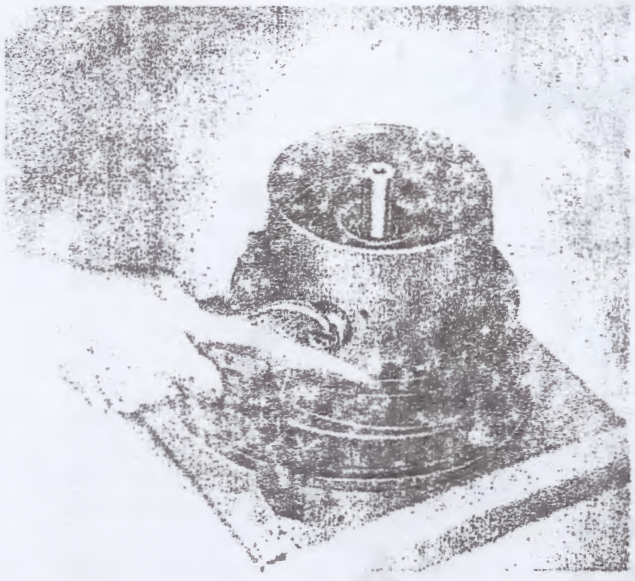

FIG. 123

ring (See Fig. 121). Remove the air piston cover and then snap out the inner retaining ring.

The air piston and the piston spring can now be lifted from the air chamber of the bearing housing (See Fig. 122). Remove the large oil seal ring from the air piston.

BEARING AND SCROLL HOUSING

Disassembly

Remove the medallion and solenoid regulator spring. Remove the solenoid regulator from the bearing housing by grasping the top shoulder of the regulator with vise-grip pliers and then pulling straight out (See Fig. 123). Remove the two sealing rings from the solenoid regulator well.

Scribe an index mark on the scroll and bearing housings for locating purposes during assembly.

Remove the hex-head screws, lockwashers and flat washers which retain bearing housing to scroll housing. Remove the bearing housing by twisting it free of the scroll housing. After the housings are separated, remove the two sealing "O" rings from the bearing housing. Do not use a screwdriver or other tool to pry the housings apart. To do so will result in either breaking out a section of the side wall of the scroll housing or gouging of the mating surfaces of the housings. The latter, while not appearing serious, can cause the loss of concentricity when the housings are reassembled and result in damage to the drive system. Also, never rock the bearing housing back and forth to loosen or remove it. If the housing is rocked during the removal procedure, it may result in bending or damaging the input and output shafts and bearings.

Remove the inner air piston seal ring from the housing.

INPUT AND OUTPUT SHAFTS

Removal

Before proceeding, please read the following carefully.

Handle the internal moving parts carefully. Do not "throw" the drive balls, ball races, or other parts into containers. Pits, scratches, or surface aberrations will result in noisy operation and ultimate failure of the supercharger.

Do not handle the steel parts with bare hands. This can result in rusting and oxidation which will necessitate the installation of new parts.

To prevent rusting, keep the internal steel parts submerged in a bath of clean oil following removal. This is very important if the existing oil film is removed by washing with gasoline or commercial cleaning solvent.

Do not use steel wool or other abrasive material to clean or polish the contact surfaces of the planetary system. Once rust or oxidation has attacked the metal the parts must be replaced, not just cleaned and polished.

Remove the input shaft and oil pump assembly

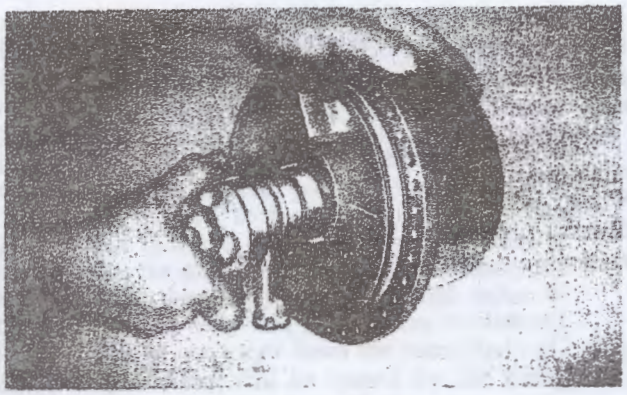

FIG. 124

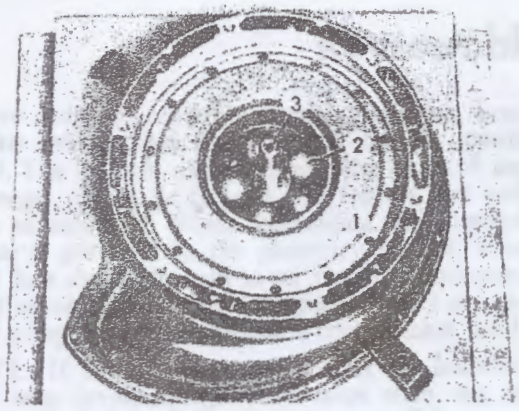

FIG. 125

1. Race load assembly
2. Drive balls
3. Output shaft

(See Fig. 124). If the shaft and pump assembly remained in the bearing housing when it was lifted free of the scroll housing, tap the pulley end of the input shaft with a rubber mallet to drive the assembly out

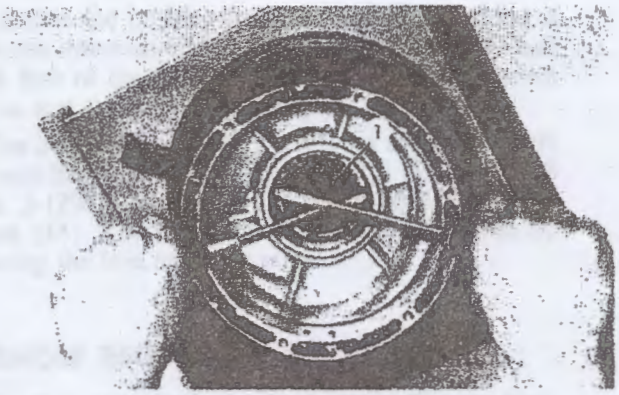

FIG. 126

1. Anvil J-6687

of the housing. Press the input shaft oil seal out of the bearing housing.

Remove the race load assembly (1, Fig. 125) from its position in the scroll housing.

Do not attempt to disassemble the race load assembly without the use of an arbor press. The internal springs are exerting sufficient force to cause personal injury or damage to the assembly if released suddenly.

Remove the drive balls (2) of the planetary system by lifting the output shaft (3) until the balls are free of the rear ball race. The output shaft can then be removed by pulling it free of the scroll housing.

The ball races can be removed by lifting or tapping them from their respective seats in the race load assembly and the scroll housing. J-6687 anvil is used to pry against when removing the scroll housing race (See Fig. 126).

INPUT SHAFT AND OIL PUMP

Disassembly

Remove the hub key (6, Fig. 127) and the shaft-

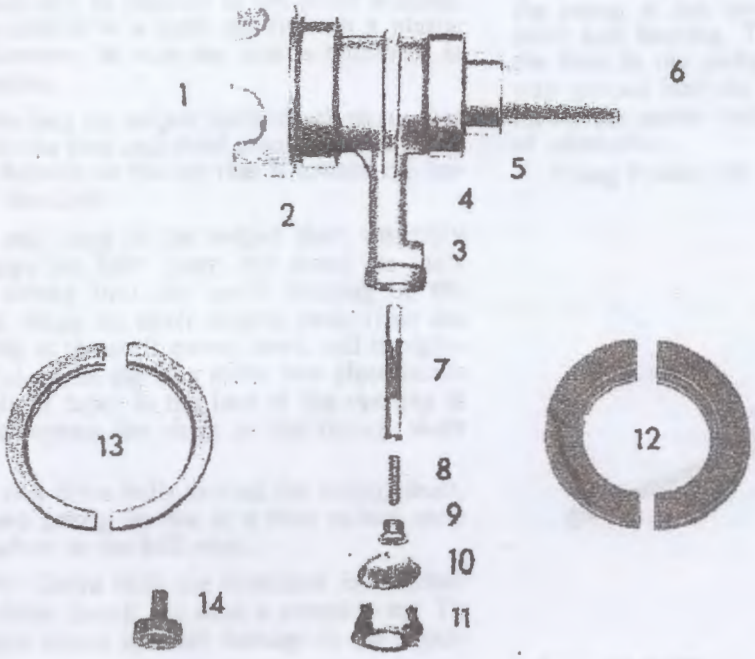

FIG. 127

1. Ball driver
2. Ball bearing
3. Pump body
4. Ball bearing
5. Shaft seal spacer
6. Hub key
7. Plunger
8. Spring
9. Spring retainer
10. Screen
11. Screen retainer
12. Collets J-6729
13. Collets J-1298-3
14. Centering Button J-6686

seal spacer (5) from the input shaft and pull the small bearing (4) from the shaft using HM-925 Puller, J-1298 Plate, J-6729 Collets (12), and J-6686 Centering Button (14).

Spring the screen retainer (11) off the lower end of the oil pump and then remove the screen (10). Screw out the slotted-head plunger spring retainer (9) and shake the coil spring (8) out of the pump body. Provided that the pump plunger (7) failed to shake out, hold the pump body steady and rotate the input shaft until the plunger is at the high point of the cam. The pump body will now be free to slide off the input shaft. Do not try to force the pump body off the shaft. Any binding will be caused by the pump plunger hanging in the camway of the input shaft, and several revolutions of the shaft will serve to free it.

Remove the bushing from the body by pushing it out in the direction of the staking tang. The small ball at the foot of the pump is staked in place and serves only to seal the drilled passageway.

The last large ball bearing (2) on the input shaft may now be removed by using HM-925 Puller, J-1298 Plate, J-1298-3 Collets (13), and J-6686 Centering Button (14). The ball driver (1) can be removed by removing the five retaining screws.

SOLENOID REGULATOR ASSEMBLY

The solenoid regulator must not be disassembled. In event of failure, the unit must be replaced.

Reassembly Procedures

Before starting assembly work, the work area should be well cleaned and all dirty rags or towels removed. The internal and external components of the supercharger should be cleaned and free of dirt and deposits of oily grit. When assembling the internal drive parts, particularly the planetary system, even lint and dust should be held to an absolute minimum. Also, *all moving parts should be oiled as they are assembled* using Type "A" automatic transmission fluid.

NOTE: If the following instructions are followed step by step (even though some steps seem out of order), the assembly of the supercharger will be more easily accomplished.

SCROLL HOUSING SECTION

Reassembly

Place a race pin in the recess in the left side of the ball race housing.

Place a ball race in position in the scroll housing. The ball race should be a light tap fit with a plastic or rawhide hammer. Be sure the race is bottomed in the scroll housing.

Before installing the output shaft, check to see that the rings are in the first and third grooves of the shaft, and that the chamfer on the top ring is toward the impeller end of the shaft.

Turn the seal rings on the output shaft assembly so that the gaps are 180° apart, and insert the shaft (dowel pins down) into the center opening of the scroll housing. Angle the shaft slightly away from the gap in each ring as the shaft moves down, and straighten it to vertical as the top ring slides into place inside the bore. A slight taper in the face of the opening is provided to compress the rings as the output shaft seats.

Place the five drive balls around the output shaft, then push down gently on one at a time to seat each in its proper place on the ball race.

CAUTION: Drive balls are furnished in matched sets of five. Never install less than a complete set. To do so can cause severe internal damage to the supercharger.

Place another race pin in the recess in the side of the race load assembly and install the remaining race.

Place the race load assembly into position, ball race down, over the drive balls.

BEARING HOUSING SECTION

Reassembly

Install the ball retainer, or driver, on the end of the input shaft and tighten the retaining screws to a minimum of 30 inch/pounds (if a torque wrench is not available, use a 9" screwdriver and tighten as tight as possible).

Using Pusher Set, J-6688 (1, Fig. 128), press the large ball bearing (2) onto the input shaft until it is seated against the shoulder (the lettering on the bearing should face down away from the oil pump).

Slide the oil pump body, with bushing insert, onto the shaft. When installing the pump body, make sure the pump is not upside down before installing the outer ball bearing. That is, when correctly installed, the bore in the pump body will align with the camway ground into the input shaft. Failure to properly install the pump body will result in a complete lack of lubrication.

Using Pusher Set J-6688, press the small ball bear-

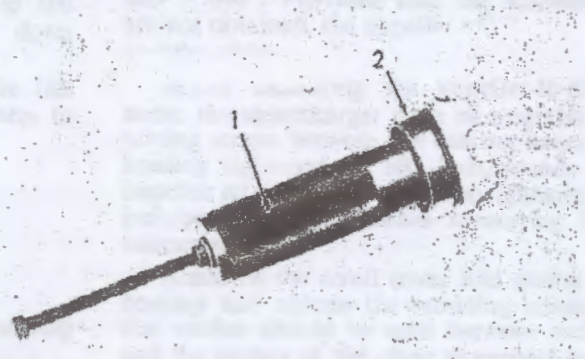

FIG. 128

1. Pusher Set J-6688 2. Ball bearing

ing into place on the shaft with the letters up away from the oil pump.

Install the oil pump plunger with the spring opening toward the plug, plunger spring, and the oil pump plug in the oil pump body, and secure the screen to the end of the pump body with the screen retainer.

Install the inner air piston ring on the boss of the bearing housing, and lock the ends of the ring together.

Press the input shaft seal into position inside the bearing housing with the lips of the seal facing rearward or toward the impeller.

Install the sealing "O" rings (two required) in the inside and outside grooves of the housing shoulder. Do not install the ring or rings in the center groove. This groove is part of the air passageway system and, if it is blocked, the control system will malfunction.

Lightly oil the two small "O" rings and install them in the channels within the regulator well. Oil the sides of the solenoid regulator, and push it down past the two "O" rings until it is firmly seated.

Install the outer air piston ring in the groove of the air piston. (Location of the gap is not important).

Place the air piston spring in the nose section of the bearing housing and then slide the air piston into place. Oil liberally. Push in on the piston, depressing the spring, and install the rear retaining ring on the inside of the air chamber.

Install the dust shield, and secure in place with the outer retaining ring.

Using an oil can containing Type "A" transmission fluid, fill the bore of the oil pump (through the screen) and then rotate the output shaft while holding the oil pump body. Do this several times until oil can be seen pulsating just under the screen which will indicate that the oil pump is functioning.

Install the input shaft assembly in the bearing housing.

Place the shaft sealing spacer over the pulley end of the input shaft and push it down into position into the shaft seal.

BEARING HOUSING TO SCROLL HOUSING

Reassembly

Oil all moving parts with Type "A" automatic transmission fluid.

Observe the alignment marks and install the bearing housing onto the scroll housing and secure it with six (6) hex-head cap screws, lockwashers, and flat washers. The cap screws should be tightened to 100 inch/pounds. (Tighten the bearing housing down evenly to prevent loss of concentricity between the drive system and the housing assemblies). The flat washers must be placed under the lockwashers to prevent gouging the housing.

VARIABLE-RATIO PULLEY

Installation

Press the thrust bearing onto the rear of the sliding flange of the variable-ratio pulley.

Insert the special washer into the rear of the (fixed) flange of the pulley. The chamfered inside of the special washer should face the rear of the pulley flange.

Press the splined pulley hub into place in the front (fixed) flange of the pulley. Place the sliding pulley stop washer on the input shaft.

Position the sliding flange of the pulley to the splined hub. The sliding flange should mate closely but slide easily. If it fails to do so, clean burrs on the splines.

Slide the key into the keyway of the input shaft (the key should slide easily in the groove and not have to be forced).

Push the variable-ratio pulley assembly down into position on the end of the input shaft, and secure with the retainer, lockwasher, and screw. Tighten to 200 inch/pounds torque, and use a rubber hose or fan belt to hold the pulley assembly.

Place the retaining spring on top of the solenoid regulator and install the supercharger medallion. The retaining spring must always be in place as it also serves to ground the solenoid case to the supercharger.

Remove the supercharger from the special holding fixture so that the impeller can be installed.

IMPELLER

Installation

The impeller should be fitted to the output shaft to show an approximate clearance of .040" between the rear of the impeller and the face of the diffuser section. Shims of varying thickness are available to readily accomplish this fitting.

Wipe the face of the diffuser to free it of any foreign material, and then measure the depth of the face of the output shaft below the face of the diffuser. This measurement is normally about .015".

Once this figure is obtained, .040" should be added to it as a basis for selection of the proper end play shim.

After determining the depth and correct shim, or shims, to use, the impeller and shims are assembled to the boss of the output shaft. Secure with a flat washer, lockwasher, and hex-head cap screw tightened to 200 inch/pounds torque, using impeller holding tool, J-6684.

Use a feeler gauge to check the clearance between the impeller and diffuser face at several points around the impeller. The allowable tolerance of clearance is: .035" - .040". Provided that the allowable clearance are not obtained, the impeller must be removed and the shim or shims changed.

Before measuring the impeller-to-diffuser clearances, the supercharger must be assembled and all retaining screws between the bearing housing and scroll housing tightened to 100 inch/pounds torque. The impeller retaining screw must be tightened down to 200 inch/pounds torque before measuring for allowable tolerances.

Assemble the scroll cover and gasket to the scroll housing and tighten the retaining screws securely. A flat washer should be used between each lockwasher and the surface of the cover to prevent gouging.

CHECKING

Rotate the input pulley several times to insure that there is no internal binding and that the impeller is not dragging against either the diffuser face or the scroll cover. During this check the pulley should turn rather hard, but should neither grab nor ratchet while being turned.

After the supercharger is assembled to the mounting bracket, the oil sump should be filled with eight (8) ounces of Type "A" automatic transmission fluid. This should bring the oil level to the top mark on the dip stick. It is recommended that the input pulley be turned rapidly at least twelve revolutions, after the lubricant is added, to prime the oil pump. This will prevent the possibility of a "dry" start.

SUPERCHARGER

Installation

Prior to mounting the supercharger on the engine, rotate the input pulley several times to insure that there is no internal binding and that the impeller is not dragging against either the diffuser face or the scroll cover. During this check the pulley should turn rather hard, but should neither grab or ratchet while being turned.

Position the outlet hose and hose clamps on the carburetor air chamber connection.

Start the supercharger discharge throat into the outlet hose and mount the supercharger on the mounting bracket. Install the four (4) retaining cap screws and lockwashers.

Position the hose connection and tighten the two (2) hose clamps.

Install the air cleaner-to-supercharger inlet hose and elbow.

Connect the supercharger-to-fuel pump line by slipping the rubber connector over the nipple at the supercharger discharge throat.

Connect the kick-down switch-to-solenoid regulator wire at the slip connection, place the wire in the retaining clamp on the supercharger, and bend the clamp into place.

Fill the supercharger oil sump with eight (8) ounces of automatic transmission fluid, Type "A". It is recommended that the input pulley be turned rapidly at least twelve revolutions after the lubricant is added to prime the oil pump. This will prevent the possibility of a "dry" start.

Push the belt tensioning arm towards the center of the engine and install the supercharger drive belt. CAUTION: Under no circumstances should the supercharger be operated above the idle speed with the supercharger outlet hose disconnected from the carburetor air chamber.

SUPERCHARGER MOUNTING BRACKET

Removal

Remove the supercharger as outlined under Supercharger-Removal.

Drain the cooling system just enough to bring the coolant level below the water pump manifold opening. Disconnect the upper radiator hose from the water outlet. Then remove the four Allen head bolts, (see Fig. 129) nuts and lock washers and, remove the mounting bracket from the water pump manifold.

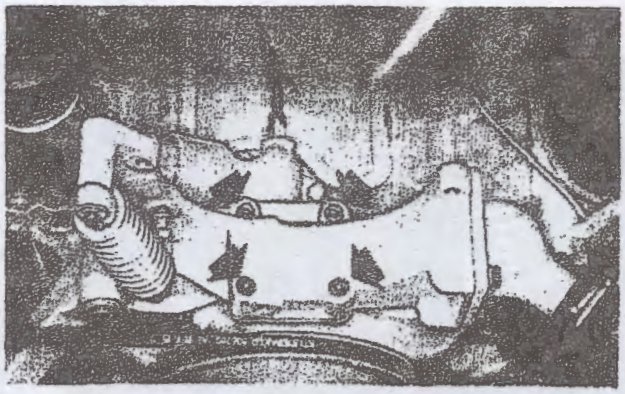

FIG. 129

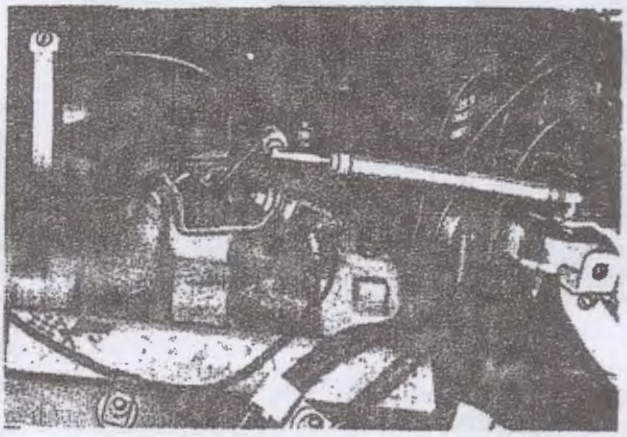

FIG. 130

Installation

Place a new gasket on the water pump manifold. Position the mounting bracket on the manifold and install the Allen head bolts, lock washers and nuts.

Install the supercharger as outlined under Supercharger-Installation. Connect the upper radiator hose to the water outlet.

Fill the cooling system.

KICK-DOWN SWITCH

Adjustment

Adjust the supercharger kick-down switch by loosening the lock nuts on each side of the switch bracket. Adjust the switch so that with a wide-open throttle the switch plunger will be depressed and the auxiliary throttle outer lever will rest against the threaded sleeve of the kick-down switch. (See Fig. 130). In effect, this adjustment will also provide a wide-open throttle stop.

BELT TENSIONING ARM AND IDLER PULLEY

Removal and Installation

To remove the tensioning arm, (see Fig. 131) first remove the drive belt and generator belt. Remove the tensioning arm and spring retaining lock rings and washers. Then remove the arm and spring as an assembly.

When reassembling the tensioning arm and spring, install the nylon inserts in the tensioning arm and tensioning spring end. Oil the new inserts before installation. Install the arm assembly and install the retaining washers and lock rings. Install the generator and supercharger drive belts.

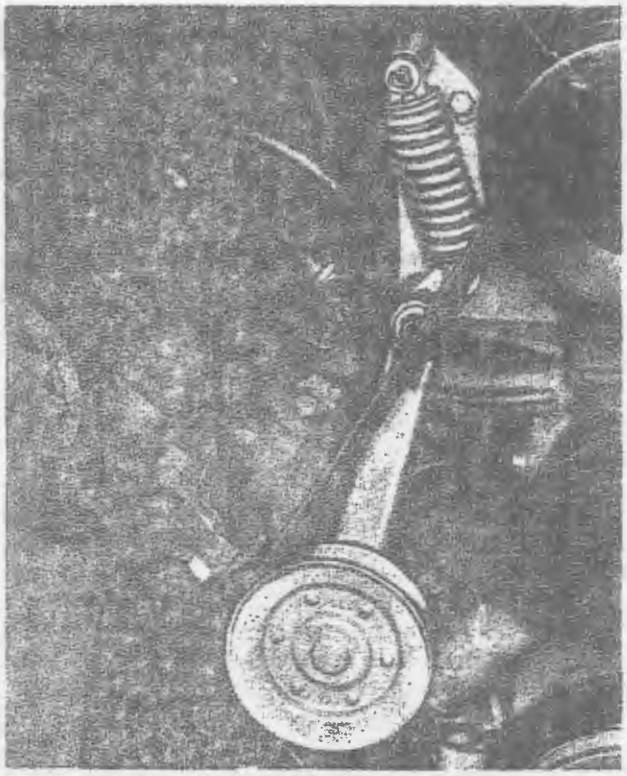

FIG. 131

Testing

1. With the engine at rest or idling the belt will usually be in the bottom of the groove (high blower position). If the belt is positioned midway on the drive pulley this does not indicate that there is anything wrong with the supercharger. The position of the drive belt is controlled by the air piston spring and the bolt tensioning arm spring. With normal tensioning it is possible for the drive belt to ride midway on the supercharger drive pulley.
2. With the engine running at approximately 1500 rpm, the belt should start to leave the bottom of the groove and begin to climb up.
3. With the engine running at 3500 rpm (no load), the belt should be running near the top of the pulley (low blower position).
4. With the engine at 3500 rpm (no load), manually operate the regulator kick-down switch. The belt should go immediately to the bottom of the pulley groove (high blower position). Releasing the kick-down switch should allow the belt to return immediately to the top (low blower position).
5. Remove the pipe plug located at the rear of the cover, normally used for setting the idle speed, and using a low reading pressure gauge, connect it to the air chamber cover. Pressure at this point should indicate approximately 5 lbs. at 3500 rpm with the kick-down switch closed (in high blower).
6. Fuel pump pressure should be checked at idle by disconnecting the line at the air chamber base and hooking the gauge on the open line. A pressure reading of 5½ to 7 lbs. (0,387 to 0,49 kgs.) should be recorded.

Diagnosis

I If variable-ratio pulley does not operate or operates sluggishly—(Supercharger does not shift).

1. Spline may be burred.
2. Spline dirty and sticky—This could be caused from belt material.
3. Rough or gummy pulley—Pulley should have polished faces.
4. Tensioning arm binding—Should be free on pivot pin and have a slight end play so washers will turn free.
5. Solenoid regulator not operating — An audible click should be heard with the ignition on each time the switch is depressed. The circuit should be connected to the 12 volt side of the ignition coil resistor.

II Supercharger Pressure Boost Pressure Too Low Pulley—Shifts—Okay—

1. Improperly operating solenoid regulator.
2. Hose leakage between supercharger inlet and carburetor air chamber.
3. Carburetor air chamber, leaking air, could be gaskets or leaking flapper valves.
4. Dirty air cleaner.
5. Malfunction of supercharger such as air leakage by seals, etc. Necessary to overhaul supercharger.

Supercharger Tools

The following tools are required for servicing the supercharger:

1	J-6684	Impeller Holding Tool
1	J-6690	Impeller Puller
1	J-6693	Spline Hub Puller
2	J-6729	Collets (Brg. Removal) Used with J-1298 (1 Set)
1	J-6686	Centering Button Used With HM925 (Small)
1	J-6685	Centering Button Used With HM925 (Big)
1	J-6687	Cone (Anvil)
1	J-6688	Bearing Pusher and Screw Set
1	J-6689	Supercharger Holding Fixture