

Instruction 51-1021
4-6-06

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Because every industry has a leader

Installation Instructions: S&S® Pinion Shafts for Big Twin

DISCLAIMER:

S&S parts are designed for high performance, off road, racing applications and are intended for the very experienced rider only. The installation of S&S parts may void or adversely effect your factory warranty. In addition such installation and use may violate certain federal, state, and local laws, rules and ordinances as well as other laws when used on motor vehicles used on public highways, especially in states where pollution laws may apply. Always check federal, state, and local laws before modifying your motorcycle. It is the sole and exclusive responsibility of the user to determine the suitability of the product for his or her use, and the user shall assume all legal, personal injury risk and liability and all other obligations, duties, and risks associated therewith.

The words Harley®, Harley-Davidson®, H-D®, Sportster®, Evolution®, and all H-D part numbers and model designations are used in reference only. S&S Cycle is not associated with Harley-Davidson, Inc.

SAFE INSTALLATION AND OPERATION RULES:

Before installing your new S&S part it is your responsibility to read and follow the installation and maintenance procedures in these instructions and follow the basic rules below for your personal safety.

- Gasoline is extremely flammable and explosive under certain conditions and toxic when inhaled. Do not smoke. Perform installation in a well ventilated area away from open flames or sparks.
- If motorcycle has been running, wait until engine and exhaust pipes have cooled down to avoid getting burned before performing any installation steps.
- Before performing any installation steps disconnect battery to eliminate potential sparks and inadvertent engagement of starter while working on electrical components.
- Read instructions thoroughly and carefully so all procedures are completely understood before performing any installation steps. Contact S&S with any questions you may have if any steps are unclear or any abnormalities occur during installation or operation of motorcycle with a S&S part on it.
- Consult an appropriate service manual for your motorcycle for correct disassembly and reassembly procedures for any parts that need to be removed to facilitate installation.
- Use good judgment when performing installation and operating motorcycle. Good judgment begins with a clear head. Don't let alcohol, drugs or fatigue impair your judgment. Start installation when you are fresh.
- Be sure all federal, state and local laws are obeyed with the installation.
- For optimum performance and safety and to minimize potential damage to carb or other components, use all mounting hardware that is provided and follow all installation instructions.
- Motorcycle exhaust fumes are toxic and poisonous and must not be inhaled. Run motorcycle in a well ventilated area where fumes can dissipate.

IMPORTANT NOTICE:

Statements in this instruction sheet preceded by the following words are of special significance.

WARNING

Means there is the possibility of injury to yourself or others.

CAUTION

Means there is the possibility of damage to the part or motorcycle.

NOTE

Other information of particular importance has been placed in italic type.

S&S recommends you take special notice of these items.

WARRANTY:

All S&S parts are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of twelve (12) months from the date of purchase. Merchandise that fails to conform to these conditions will be repaired or replaced at S&S's option if the parts are returned to us by the purchaser within the 12 month warranty period or within 10 days thereafter.

In the event warranty service is required, the original purchaser must call or write S&S immediately with the problem. Some problems can be rectified by a telephone call and need no further course of action.

A part that is suspect of being defective must not be replaced by a Dealer without prior authorization from S&S. If it is deemed necessary for S&S to make an evaluation to determine whether the part was defective, a return authorization number must be obtained from S&S. The parts must be packaged properly so as to not cause further damage and be returned prepaid to S&S with a copy of the original invoice of purchase and a detailed letter outlining the nature of the problem, how the part was used and the circumstances at the time of failure. If after an evaluation has been made by S&S and the part was found to be defective, repair, replacement or refund will be granted.

ADDITIONAL WARRANTY PROVISIONS:

- (1) S&S shall have no obligation in the event an S&S part is modified by any other person or organization.
- (2) S&S shall have no obligation if an S&S part becomes defective in whole or in part as a result of improper installation, improper maintenance, improper use, abnormal operation, or any other misuse or mistreatment of the S&S part.
- (3) S&S shall not be liable for any consequential or incidental damages resulting from the failure of an S&S part, the breach of any warranties, the failure to deliver, delay in delivery, delivery in non-conforming condition, or for any other breach of contract or duty between S&S and a customer.
- (4) S&S parts are designed exclusively for use in Harley-Davidson® and other American v-twin motorcycles. S&S shall have no warranty or liability obligation if an S&S part is used in any other application.

PRODUCT INFORMATION

S&S® pinion shaft kit, PN 33-2024, has been designed as a composite replacement and is made to fit stock Harley-Davidson® flywheels and S&S SE and L style flywheels in 1958 to early 1981 big twin engines. It can also be used in 1954 to 1957 engines, if crankcases are modified. S&S PN 33-2024 shaft effectively replaces Harley-Davidson® #24006-54A, 24006-58 and 24006-73.

**All reference to Harley-Davidson® part numbers is for identification purposes only. We in no way are implying that any of S&S Cycle's products are original equipment parts or that they are equivalent to the corresponding Harley-Davidson® part number shown.*

To use S&S pinion shaft 33-2024 in 1954 to 1957 crankcases, perform the following operations:

1. Remove pressed-in bearing race in the right crankcase.
2. Bore cast-in bearing retainer out to 2.125" to accept larger diameter later 1958 to 1981 press-in race.
3. A shim must be fabricated to space later pressed-in bearing race out to earlier bearing race position.

The S&S pinion shaft kit, PN 33-2027, is designed to fit stock Harley-Davidson® flywheels from late 1981 to 1989 and S&S SL and BL style flywheels for late 1981 and later engines. S&S PN 33-2027 replaces Harley-Davidson® #24006-80, 24006-83 and 24006-87. S&S pinion shaft kits, parts 33-2028 and 33-2029, are identical to 33-2027 in design and application except they have bearing surface diameters of +.001" and +.002" oversize respectively. S&S Shaft 33-2028 replaces Harley-Davidson® #24020-87 and shaft 33-2029 replaces Harley-Davidson® #24021-87.

NOTE: When using S&S 33-2027 pinion shaft in 1990 and later engines with S&S flywheels, pre-1989 oil pump drive gear and pinion gear must be used as stock gears for 1990 and later style, straight pinion shaft will not fit S&S shaft.

INSTALLATION PROCEDURE

1. Thoroughly clean shaft and blow air through oil holes in both ends of shaft to insure no foreign material is trapped in oil passageway.
2. 33-2024 only - Press brass plug in gear cover end of shaft until it bottoms against shoulder in hole. For engines 1954 to 1972 with side oiling gear covers, use solid plug. For 1973 to early 1981 engines with end oiling gear covers, use plug with $\frac{3}{32}$ " hole.

NOTES:

- When S&S pinion shaft 33-2024 is used in 1973 to 1981 engines with end oiling gear covers, side oiling feed hole for 1954 to 1972 engines does not have to be plugged. Amount of oil lost through side oil feed hole in bearing surface of shaft is insignificant if gear cover bushing is fit correctly to end of pinion shaft.

- In 1954 to 1972 engines, oil is fed to connecting rods once per revolution, through an oil hole inside of pinion shaft bearing surface. Oil hole in pinion shaft aligns with oil feed hole in pinion shaft bushing pressed in gear cover. Later engines, 1973 to present, feed oil continuously to connecting rods through a hole in end of pinion shaft. Before proceeding, check your gear cover to determine which of these oiling systems your engine uses. Early engines from 1954 to 1972 which have been converted with a special gear cover bushing to oil connecting rods using 1973 to present style oiling methods require brass plug with drilled oil metering hole - follow instructions for 1973 and later engines.
- If a 1972 or earlier gear cover is converted to end feed style oiling, or if a groove is machined around bearing surface of pinion shaft to allow oil to feed continuously, low oil pressure will result unless crankcase and oil pump are also updated to 1973 and later oiling system.

CAUTION

- Low oil pressure due to use of 1973 and later style end oiling pinion shaft in 1972 and earlier engines may cause overheating, premature wear, and damage to engine components.
 - Installing solid end plug in 1973 and later engines will result in insufficient oil flow to connecting rods, causing premature wear and damage to connecting rod bearings and other internal engine components.
3. Inspect key ways and oil holes in flywheels for burrs. Remove burrs if necessary.

NOTE: S&S does not recommend lapping tapers to remove burrs. This practice tends to distort the taper by removing material unevenly around the circumference. This makes flywheels difficult if not impossible to true. In addition the lapping process work hardens the surface of the taper. The resultant hard surface makes it very difficult to pull shaft into taper. Lapped flywheel tapers are also very difficult to resurface if repairs are ever needed.

4. Check keys in key ways of shaft. Keys should be light hand press fit in key ways. If key is too tight in key way, sand side of key with fine sand paper on a metal plate or other flat surface. Do not hammer key into key way.

CAUTION

Hammering tight key into key way may result in irreparable damage to shaft.

5. With key in shaft, insert into respective tapered hole in flywheel and check to see that key does not bottom in key way of flywheel taper. If key bottoms out, file or sand flat side of key, not rounded side, until shaft with key in place fits in flywheel without bottoming out.
6. Assemble flywheel and shaft. Use stock factory torque specifications (140 to 170 ft-lbs.) in stock, cast iron flywheels. For S&S® forged steel flywheels tighten nut to 275 to 300 ft-lbs. S&S® recommends that green Loctite® (RC609) or similar thread locking product be used on taper of shaft, threads of shaft, and face of nut.
7. Blow air through connecting rod oil feed hole in end of pinion shaft after flywheel, crankpin and pinion shaft have been assembled to insure that passageway is open.

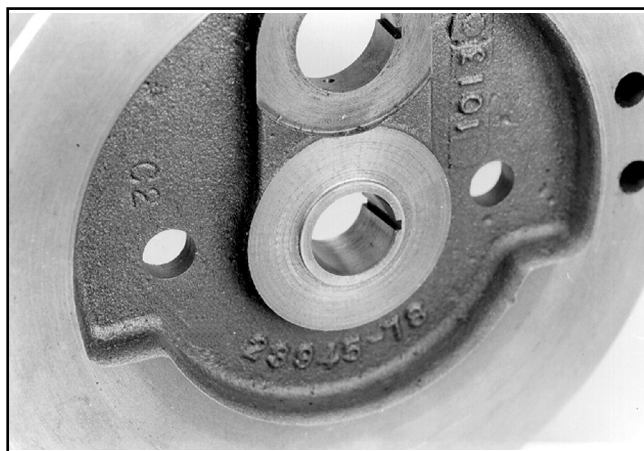
⚠ CAUTION

Restricted or blocked oil passage may result in insufficient oil flow, and cause premature wear and damage to internal engine components.

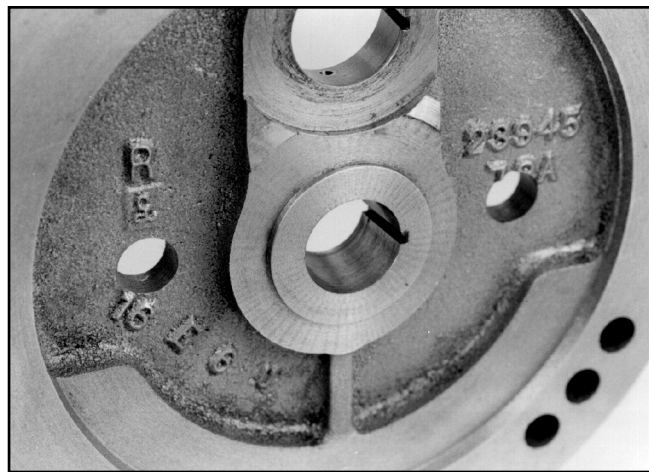
8. Finish assembling and truing flywheels.
9. Select correct size main bearings per Harley-Davidson® factory procedures. Consult appropriate Harley-Davidson® manual for style of bearings used.
10. Install main bearings on pinion shaft.

NOTES:

- There are two styles of flywheels which will accept the S&S 33-2027 pinion shaft. Stock 1981 to 1986 style flywheels are machined with a small diameter shoulder around the pinion shaft taper to accept a main bearing thrust washer. **See Picture 1.** Stock 1987 to 1989 and all current production S&S flywheels for late 1981 and later engines, are machined with a large diameter shoulder around the pinion shaft taper. This shoulder is designed to eliminate the main bearing thrust washer previously used. **See Picture 2.**

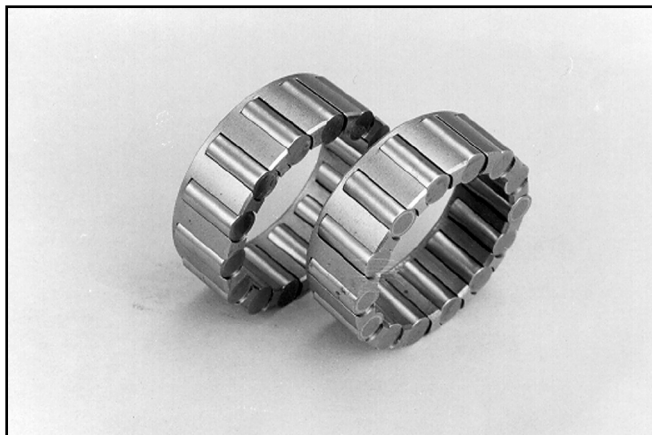


Picture 1



Picture 2

There are three types of pinion main bearings which may be used with S&S 33-2024 and 33-2027 pinion shafts. **Picture 3** shows the 1958 to 1986 style bearings which consist of two open ended steel cages and drop in roller bearings. The 1987 to 1993 style (FAG) bearings consist of two stamped steel cages with roller bearings installed. **See Picture 4.**

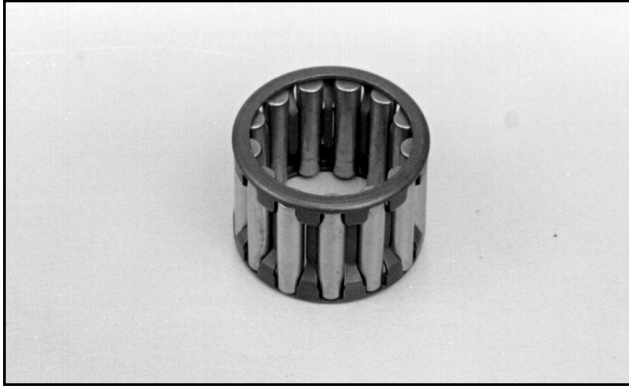


Picture 3



Picture 4

- Bearings from 1994-'99 consist of one stamped steel cage with a single seat of rollers installed. **See Picture 5.**



Picture 5

- The combinations of thrust washers and bearings shown in this instruction sheet are typical for most installations. Individual circumstances may, however, require that engine builder space bearings in a different manner. Engine builder must insure that bearing assembly rotates freely on pinion shaft and that rollers are positioned so they are entirely supported by the bearing race.
- There is no specification for pinion bearing assembly end play. A good rule of thumb is that if an additional thrust washer can be installed and bearings can still rotate freely, and are still supported by race, install it. If not, leave it out.

A. 1954-1986 bearings

1. 1954 to early 1981 flywheels or S&S® SE or L style flywheels, and S&S pinion shaft 33-2024 - Two .070" thrust washers are normally used. Typical washer and bearing arrangement - .070" washer against flywheel, bearings, .070" washer, and snap ring. **See Figure 1.**

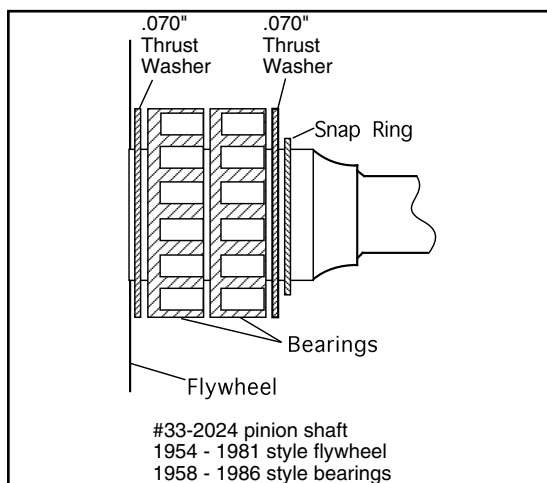


Figure 1

2. 1981- 1986 stock flywheels and S&S pinion shaft 33-2027 - two .070" thrust washers and one .050" thrust washers are normally used. Typical washer and bearing arrangement - .070" washer against flywheel, bearings, .070" washer, .070" or .050" washer, and snap ring. **See Figure 2.**

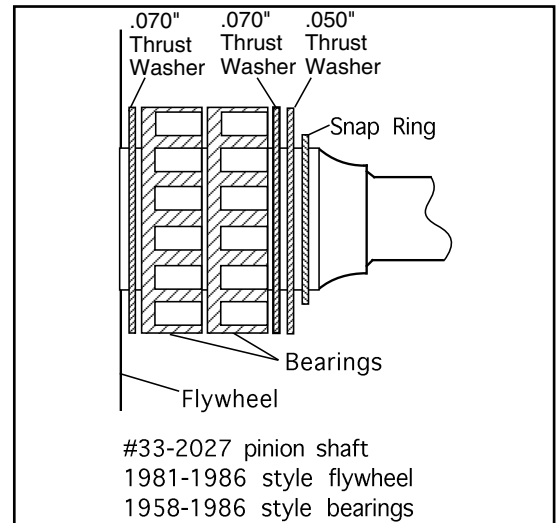


Figure 2

3. 1987 to 1989 big twin flywheels or S&S SL or BL flywheels for 1981 and later, and S&S pinion shaft 33-2027—one .070" thrust washer and one .050" thrust washer are normally used. Typical washer and bearing arrangement— .050" washer against flywheel, bearings, .070" washer, and snap ring. **See Figure 3.**

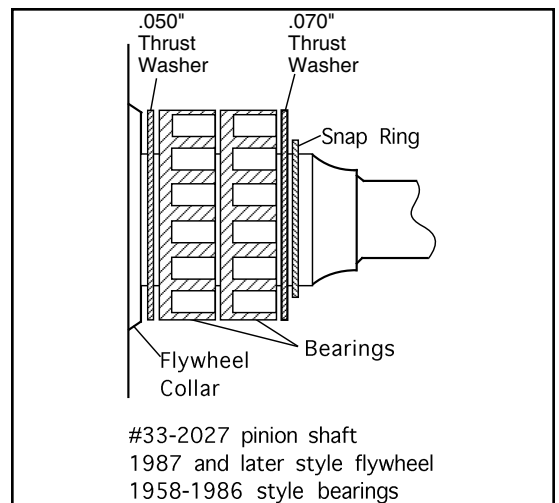


Figure 3

NOTE : It may be necessary to install bearing cages so that open side faces flywheel in order to position rollers entirely on the bearing race.

B. 1987 to 1993 big twin bearings

1. 1954 to early 1981 stock flywheels or S&S® SE or L style flywheels and S&S pinion shaft 33-2024. No thrust washers are normally used. Typical bearing arrangement - bearings against flywheel and snap ring. See Figure 4.

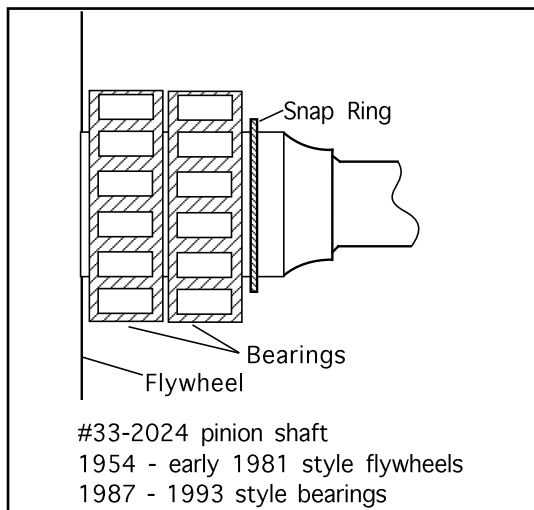


Figure 4

2. 1981 to 1986 big twin flywheels and S&S pinion shaft 33-2027—extra .070" main bearing thrust washer supplied in kit is normally used. Typical washer and bearing arrangement - .070" washer against flywheel, bearings, and snap ring. See Figure 5.

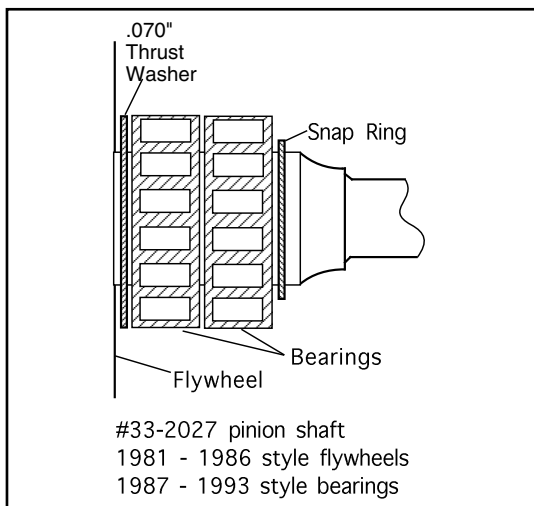


Figure 5

3. 1987 to 1989 big twin or S&S SL or BL style flywheels for 1981 and later, and S&S pinion shaft 33-2027 - No thrust washers are normally used. Typical arrangement - bearings against flywheel, and snap ring directly against bearing. See Figure 6.

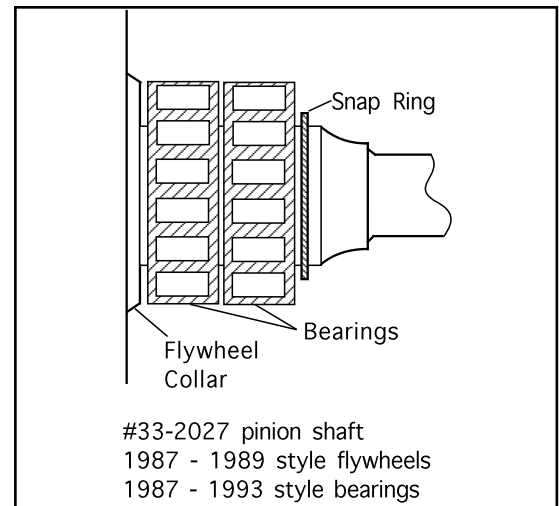


Figure 6

C. 1994 and later single roller style bearings

NOTE: Late style larger diameter bearing retaining clip S&S PN 31-4021 or Harley-Davidson® #11177A must be used with late style 1994 and later single roller pinion bearings. Earlier style smaller diameter retaining clip may not sufficiently contact late style bearing cage to safely hold bearing cage in place. Refer to Harley-Davidson® Service Bulletin M-1042, 4-19-94. S&S recommends that late style retaining clip be used with all types of pinion bearings.

CAUTION

Use of earlier style retaining clip with late style single roller bearing may result in bearing failure and serious engine damage.

*All reference to Harley-Davidson® part numbers is for identification purposes only. We in no way are implying that any of S&S Cycle's products are original equipment parts or that they are equivalent to the corresponding Harley-Davidson® part number shown.

1. 1954 to early 1981 big twin or S&S® SE or L style flywheels and 33-2024 - No thrust washers are normally used. Typical bearing arrangement - bearings against flywheel and snap ring. **See Figure 7.**

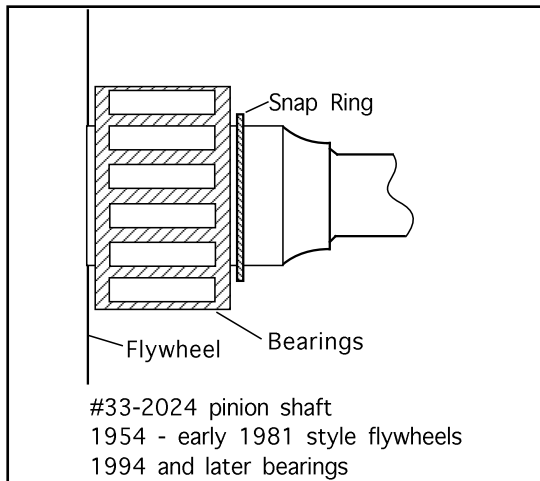


Figure 7

2. 1981 to 1986 big twin flywheels - Two .050" thrust washers are normally used. Typical arrangement - .050" washer, bearing cage, .050" washer, and snap ring. **See Figure 8.**

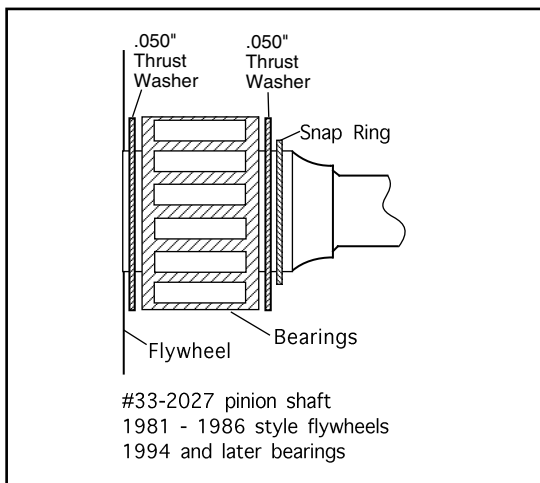


Figure 8

3. 1987 to 1989 big twin or S&S SL or BL flywheels for 1981 and later, and S&S pinion shaft 33-2027 - No thrust washers are normally used. Typical arrangement - Bearing cage against flywheel, and snap ring directly against bearing cage. **See Figure 9.**

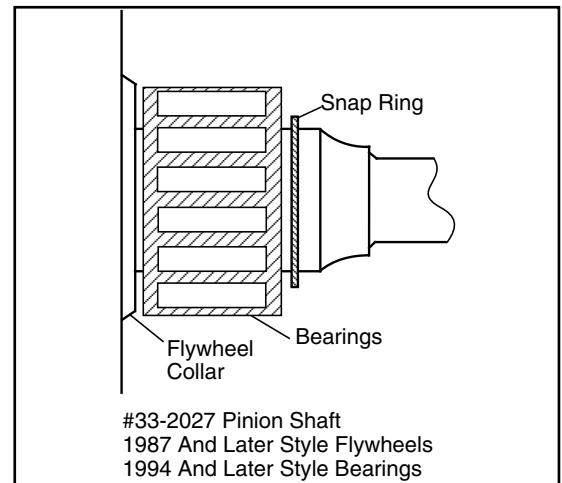


Figure 9

11. Install flywheel assembly in driveside crankcase. Temporarily install camside crankcase. Check to be sure pinion bearing rollers are fully supported by bearing race. Adjust bearing spacing as needed.

NOTES:

- Final placement of flywheel thrust washers is determined by position of main bearings in main bearing race. Main bearings should be spaced so rollers are completely supported by race surface.
- Thin thrust washers placed between flywheel and bearing cage will sometimes drop between flywheel collar and bearing surface of pinion shaft. A slightly thicker thrust washer will usually solve this problem. Also, thrust washers normally have a larger inside chamfer on one side of washer than on other side. Placing smaller chamfer toward bearing cage will help minimize this problem. Thrust washers of various thickness can be obtained from local bearing houses. Custom thickness thrust washers can be made by surface grinding a thicker thrust washer.

12. Final assemble crankcases.
13. Install oil pump drive gear, spacer, and pinion gear on pinion shaft. Apply Loctite® to threads of pinion gear nut and torque to 45 ft-lb.

NOTES:

- Oil pump drive gear spacer will not completely fill gap between oil pump drive gear and pinion gear. A gap of up to .125" may exist, and is normal. Function of spacer is to prevent pinion shaft oil pump drive gear from disengaging from oil pump drive shaft gear if engine is turned backward. During normal operation, oil pump drive gear is pulled toward pinion shaft bearing boss.
- Be sure oil pump drive gear is installed with chamfered side toward pinion shaft bearing boss. See Figure 10.

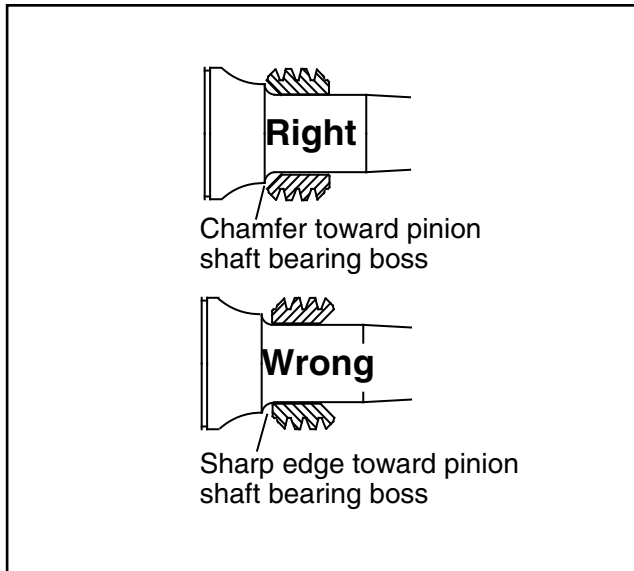


Figure 10

CAUTION

If oil pump drive gear is installed with sharp edge against radius on pinion shaft bearing boss, sharp edge may nick radius. This can result in a stress riser that may cause shaft to break. See Figure 10.

14. Install cam, breather gear, and gear cover according to Harley-Davidson® factory procedure.

NOTE: Gear cover should slide into place with little or no resistance. If gear cover will not slide on easily, cause of resistance must be determined and corrected. Under no circumstances should cover be forced into place.

CAUTION

Forcing gear cover on may subject pinion shaft to unwarranted side loading and flexing which during operation can cause shaft to fatigue and break.



Because every industry has a leader