Triple Maintenance Manual

Section 5 - Clutch & Transmission Service

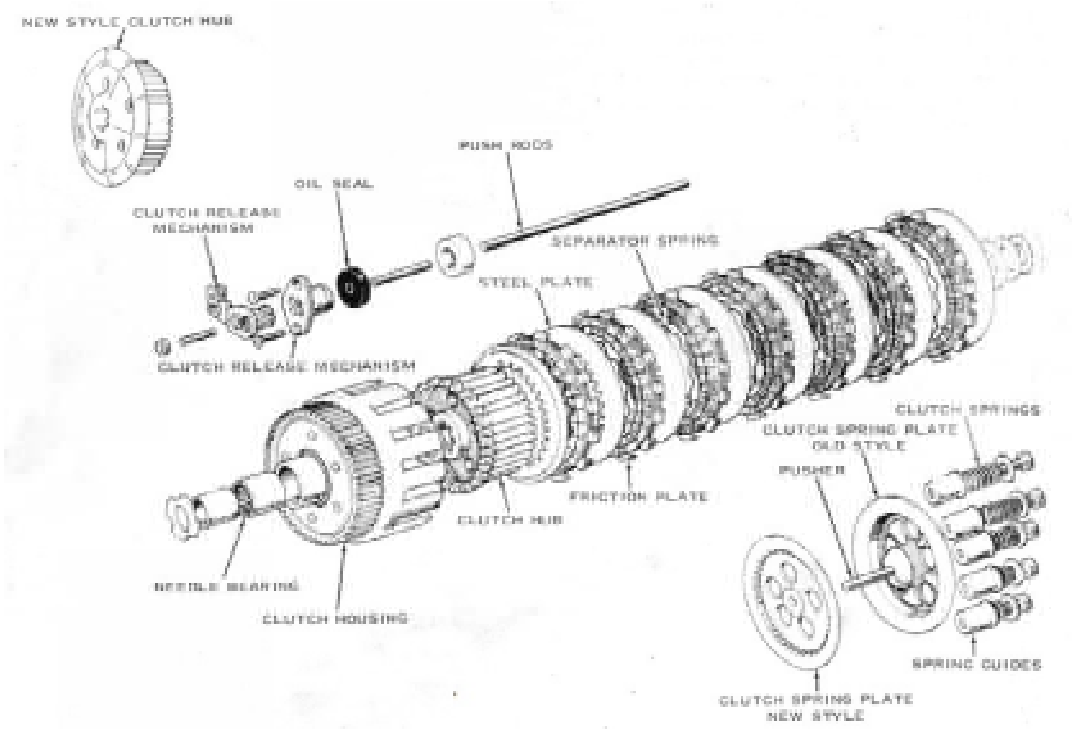
Index

Chapter 5
Clutch and Transmission Service

All Kawasaki three-cylinder models offered for sale to the general public have had oil-bath-type clutches. The racing H1R's and H2R's are equipped with dry-type air-cooled clutches. Only the wet-type clutch of the standard-production motorcycles will be covered.

CLUTCH

The clutch is a multiplate one with alternating steel and friction plates. These friction plates are turned by the clutch housing. The tabs on the outside edge of each friction plate fit between the fingers on the clutch housing. The steel plates are splined on their inner edges. These splines engage the splines of the clutch hub in the center of the clutch. The hub is in turn splined to the transmission driveshaft. The springs of the clutch spring plate press the steel and friction plates together to engage the clutch. The power of the engine is transferred from the primary pinion (on the end of the crankshaft) to the clutch housing, which turns the hub through the clutch plates. The hub turns the transmission. To disengage the clutch, a rod pushes through the center of the hollow driveshaft and forces the clutch spring plate away from the clutch plates. The plates are separated by rippled circular springs that act on the spline teeth of the steel plates. Without them the clutch would drag when the lever was pulled, even though properly adjusted.

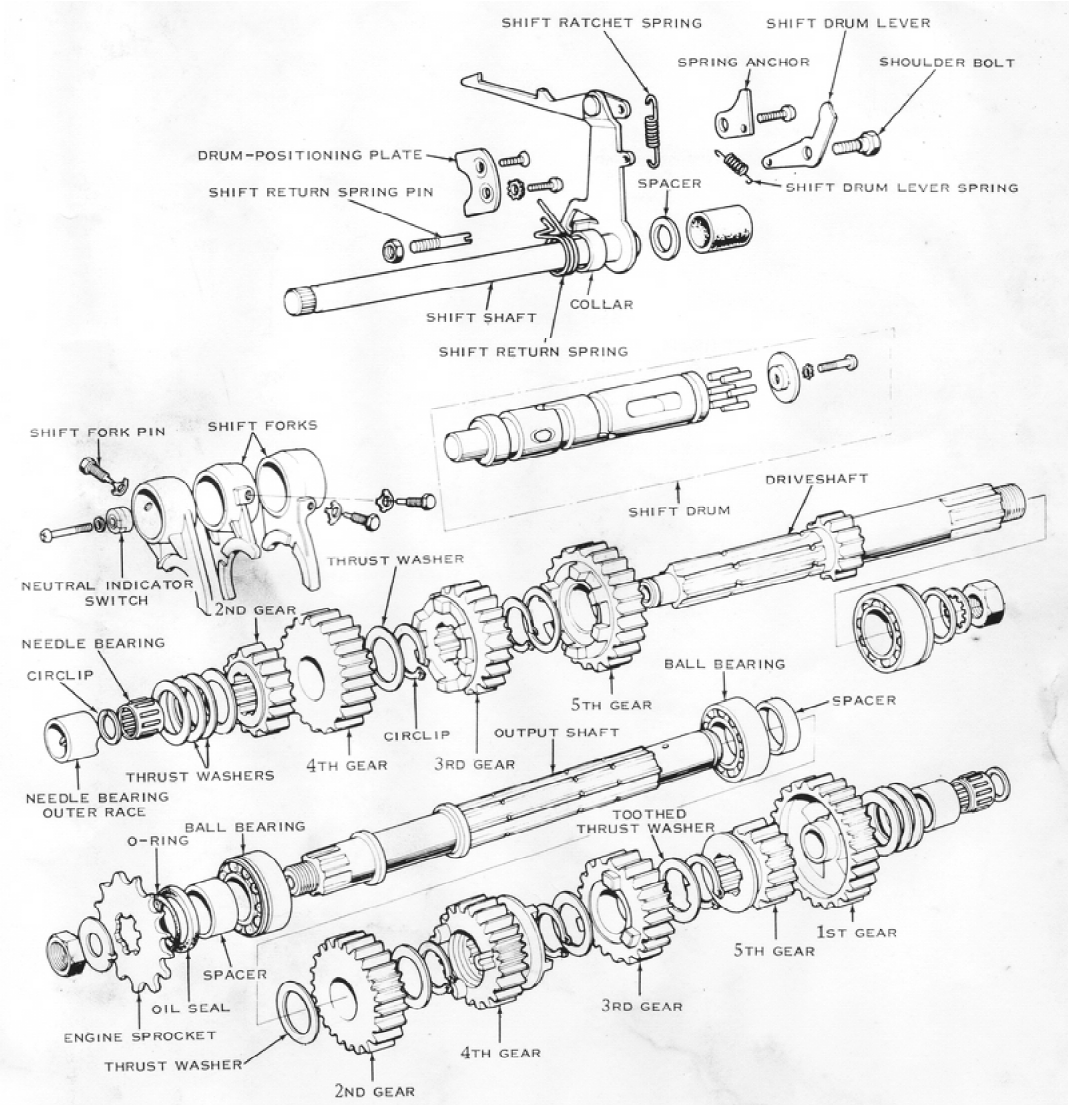


This is the H-series clutch. The clutch hub and the spring plate were changed to the new style on the H1 during the 1972 model year. The H2 models have the old-style hub with the new-style spring. The S-series clutch is very similar. It has the old-style spring plate but with built-in spring guides. The S-series clutch hub was changed to the new style for the 1973 model year.

TRANSMISSION

All three-cylinder Kawasaki's have constant-mesh, five-speed transmissions in two basic variations. Each shaft has five gears on it, each of which is constantly meshed with the corresponding gear on the opposite shaft. Some of the gears are splined or fastened permanently to the shaft and some are free to spin on the shaft. On each shaft, the splined or fixed gears alternate with the free-spinning type. A splined or fixed gear on one shaft always meshes with a free-spinning gear on the other shaft and vice-versa. Three gears in the transmission, two on the driveshaft. and one on the output shaft are splined and have circumferential grooves

into which forks fit. The forks ride on shafts or on a drum that has cam grooves in its surface which move the forks laterally when the drum is rotated. Turning this shift drum moves the forks and, with them, the splined or "slider" gears. The slider gears have dogs (square or round projections) on their sides which can engage other dogs or holes in the adjacent free-spinning gears, thereby locking them to the shaft on which they ride. This transmits the rotation of the driveshaft to the output shaft. Each gear ratio is selected by moving the splined slider gears sideways to engage different free-spinning gears. The accompanying illustrations show how the power is transmitted through the gears. Only one set of three gears is actually transmitting power at any one time.



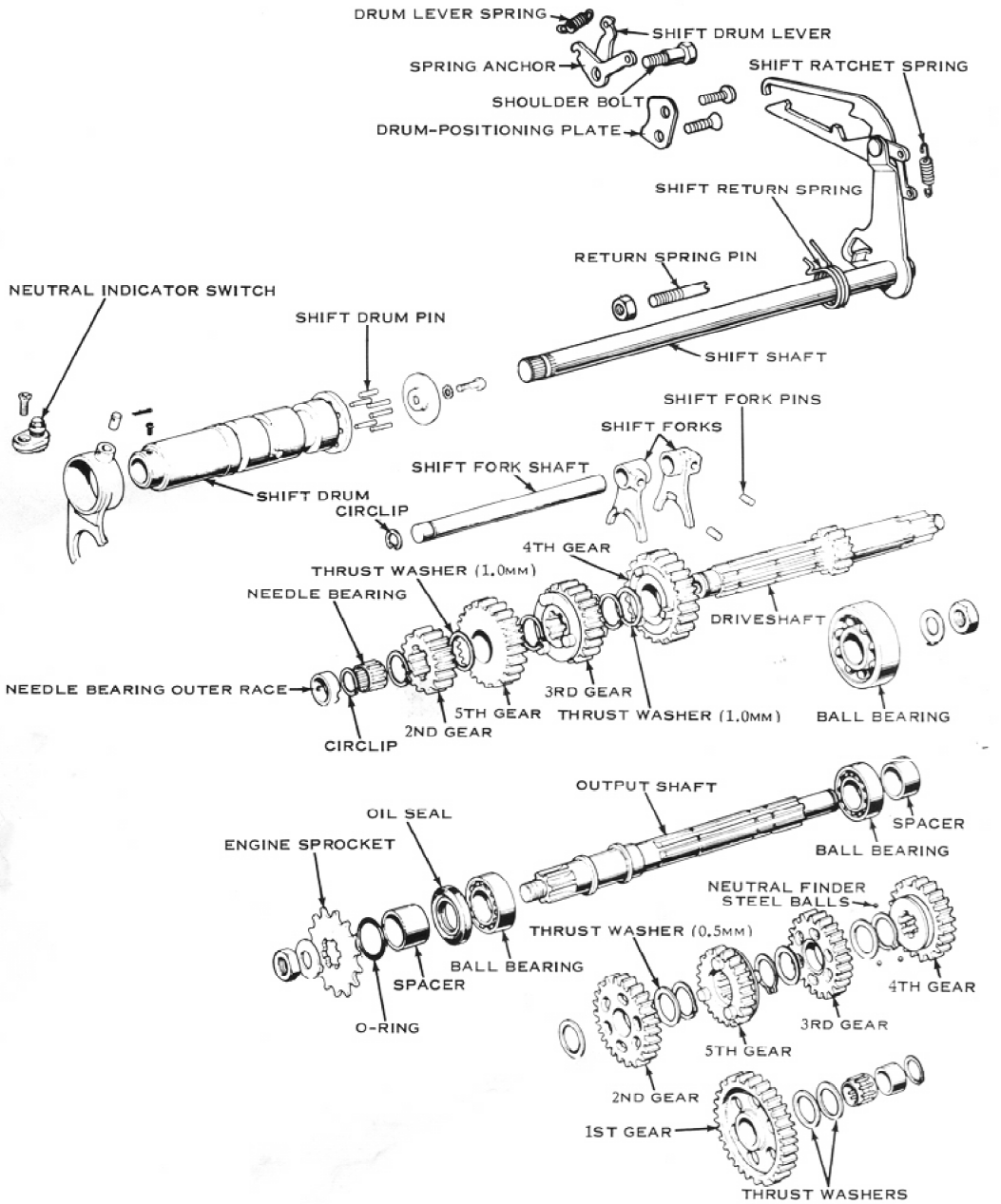
The H1 and H2 have almost identical transmissions. The H2 differs in that it is more strongly built to withstand the torque of the 750cc engine. This is an H1D transmission which incorporates the many improvements that have been made to this model over the years.

Note: The O-Ring shown behind the engine sprocket should be located between the spacer and ball bearing.

The shift drum can rotate to any of six possible positions to select the five "speeds" and neutral. The shift drum is rotated by a ratchet mechanism that hooks onto six pins in the end of the drum. The shift drum "set levers" are spring loaded to lock the drum into any one of the six possible positions. When the shift pedal is moved, the hooks on the ratchet pull or push on the drum pins to rotate the drum. When the shift pedal is released, it returns to its rest position (it is spring loaded) and the drum is locked into position.

As mentioned previously, there are two basic transmissions used in the Kawasaki three-cylinder models. All the S-series models (S1 through S3) have the same transmission. The H1 and H2 models have a similar transmission, but there are almost no interchangeable parts between the two H-series transmissions and the S-series transmission. Very few of the same parts are used in the H1 and H2 transmissions, though the transmissions are almost identical. Most differences in the H1 and H2 transmissions lie in the different gear ratios required for the two engines, whose power characteristics are very different. The H1 is essentially a high-speed engine whereas the H2 is capable of good horsepower output at relatively low rpm.

There are three principal differences between the H- and S-series transmissions. The most noticeable difference is how the shift forks are supported. In the S-series transmission, the 4th/5th shift fork is carried on the shift drum and the 1st/3rd and 2nd forks are carried on a separate shaft (but are still controlled by the drum). In the two H-series transmissions all three of the shift forks ride on the drum. The other difference is in the order in which the gears are stacked on the shafts. In the S-series transmission, the order (from the right-hand side of the engine) is 1st, 4th. 3rd, 5th, and 2nd. In H-series transmissions the order is 1st, 5th, 3rd. 4th. and 2nd. The third major difference in the S- and H-series transmissions is the positive neutral finder of the S-series. The H-series does not have this feature, because its shift pattern is slightly different from the S-series pattern in that neutral is on the "bottom" of the pattern below 1st, instead of between 1st and 2nd as in the S-series. This pattern makes it easier to find neutral on the H-series machines when idling. The positive neutral finder does the same for the S-series transmission.



This is the S-series transmission. It differs from the H-series transmission in that it is more lightly built; two shift forks are carried on a shaft separate from the shift drum; the positions of the 4th and 5th gears have been switched on the two shafts; a positive neutral finder is incorporated in 4th gear on the output shaft, and the shift pattern places neutral between 1st and 2nd, rather than the unconventional placement below 1st, as on the H-series.

Note: The output shaft should be shown and assembled in the following sequence: ball bearing, o-ring, spacer, oil seal, sprocket.

The positive neutral finder consists of three balls that rest in grooves in the transmission output shaft, inside of holes in the inner circumference of 4th gear. Fourth gear, in this transmission, is moved to the right to engage 1st gear. The balls are carried along with 4th gear when it is moved to change gears. The grooves are cut so that 4th gear can move to the right to engage 1st gear while the motorcycle is stopped, but they will not allow 4th gear to move far enough to the left so that the shift drum can rotate far enough to push 5th gear to the left and engage 2nd. In other words, when the motorcycle is standing still, neutral can be selected from 1st gear or vice-versa; but the transmission will not go beyond neutral into 2nd. It stops positively in neutral when shifted up from 1st gear. However, when the bike is in motion the output shaft is turning, and the balls are forced outward by centrifugal force into the holes in 4th gear until they no longer engage the grooves in the output shaft. At this time the gear can be moved far enough to allow the transmission to shift beyond neutral into 2nd.

SERVICING THE CLUTCH AND TRANSMISSION

DISASSEMBLING

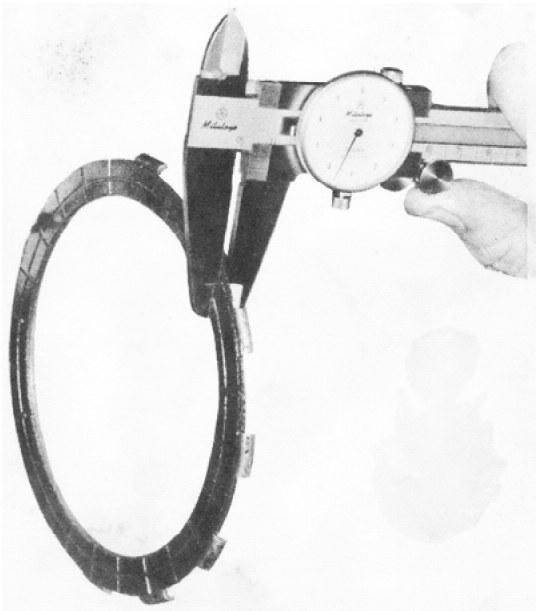
The disassembly of both the S- and H-series transmissions and clutches is very similar, and it is covered together in the engine disassembly section of Chapter 4.

CLEANING AND INSPECTING

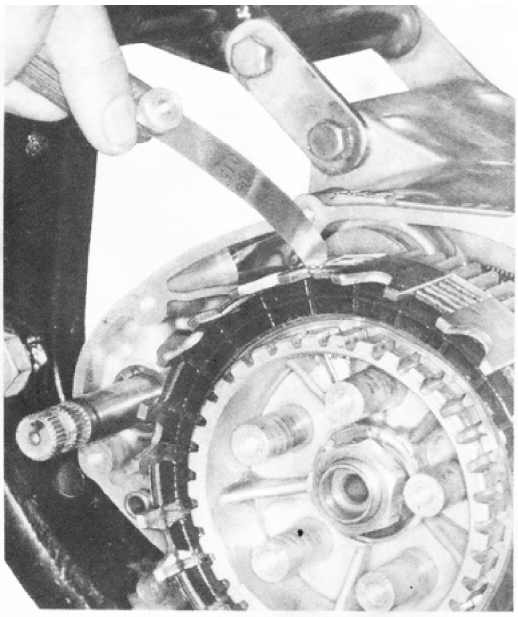
When the transmission and clutch have been disassembled, wash the parts in clean solvent. **CAUTION: Do not use gasoline or an alkaline solvent. Use a commercially available solvent sold especially for cleaning engine parts. Gasoline is a fire hazard, and alkaline solvents will attack the aluminum parts.** If a source of compressed air is available, it should be used to blow the parts dry. **CAUTION: Do not spin the ball bearings with compressed air, as they have no lubricant after being cleaned and will be ruined.** When the bearings have been cleaned and dried, lubricate them with 20- or 30-weight oil, and then spin them with your fingers. If they spin freely with no grinding or scraping noises, they are in good condition.

CLUTCH

If the clutch has been slipping, the most common causes are worn friction plates and weakened springs or improper oil. Measure the thicknesses of the friction plates and compare them to the specifications at the end of this chapter. If any of the plates are thinner than the service limit, they must be replaced. Check the friction plates carefully for cracks, breaks, or glazing. Each of these problems can cause the clutch to slip, and in each case the plates must be replaced. Measure the clearance between the friction plate tabs and the clutch housing fingers with the plates set into the clutch housing. If the clearance is greater than the specification given at the end of this chapter, the plates and possibly the housing will have to be replaced.

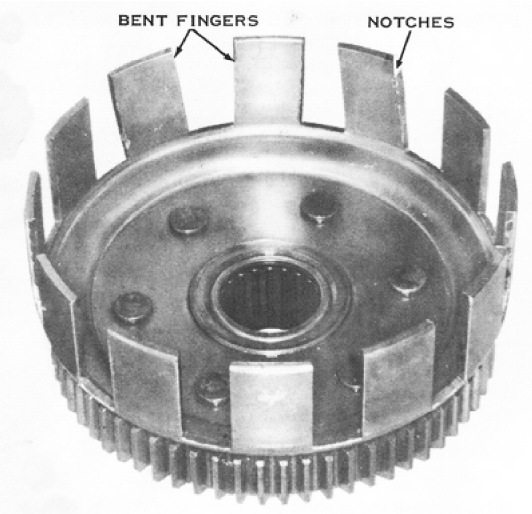


Measure the friction plate thickness. If it is less than the service limit given at the end of this chapter, the clutch will slip on acceleration.

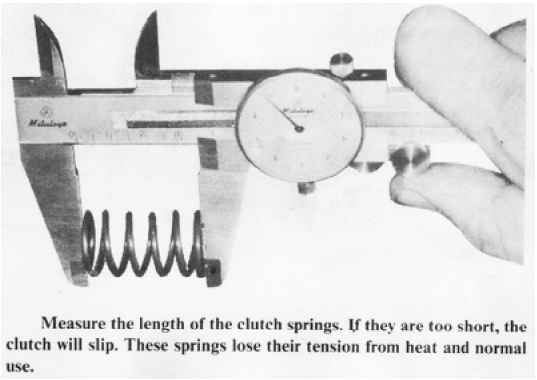


Measure the clearance between the friction plate tabs and the clutch housing fingers. Too much clearance will make the clutch rattle when it is engaged with the transmission in neutral. Too little clearance will cause the clutch to slip because the tabs will hang up the fingers and prevent satisfactory engagement.

The clutch housing on S-series models is hard, anodized aluminum and can be worn at the fingers by the friction plate tabs. This wear is in the form of notches which can catch the plate tabs during engagement and make the clutch slip momentarily.



The edges of the clutch housing fingers can become notched by the pounding of the friction plate tabs. The tabs can then catch on the notches and make the clutch slip momentarily when the clutch lever is released. Note the bent fingers, caused by trying to hold the housing from turning with a bar stuck through the fingers while removing the clutch hub nut.



Measure the length of the clutch springs. If they are too short, the clutch will slip. These springs lose their tension from heat and normal use.

Measure the lengths of the clutch springs and compare them to the specifications at the end of this chapter. If the springs are shorter than the service limit or if the shortest spring is over 2.0mm shorter than the longest, the springs must be replaced. **CAUTION: Do not shim the springs to make the clutch "stronger." The extra tension will press the clutch release rods together so tightly that the ends can weld together from the extreme heat of friction. Also, the clutch pull will be very stiff, and the clutch release mechanism will wear out in a very short time. Special stiffer clutch springs, that are sold for racing use, can also produce these results unless these precautions are taken: do not hold the clutch disengaged for more than a few seconds at a time, and frequently disassemble and lubricate the release mechanism with heavy grease.**

The clutch release mechanism is a nylon screw inside a nylon nut. When the screw is turned it travels inside the nut, pushing on the clutch pushrods. These rods push the clutch spring plate, and this relieves the pressure of the clutch springs on the steel and friction plates to allow the clutch to disengage. If the release mechanism is adjusted too tight or if the clutch cable has no slack, the clutch will slip and wear out prematurely.

Check the pushrods for straightness by rolling them on a flat surface. The ends of the pushrods should not be galled. Slight damage can be cleaned up with a fine oilstone or a piece of fine-grit emery paper on a hard, flat surface. Do not attempt to repair a badly damaged pushrod end, as you will remove the case-hardened outer shell. The softer material thus exposed would wear very quickly under the extreme pressure present when the clutch is disengaged.

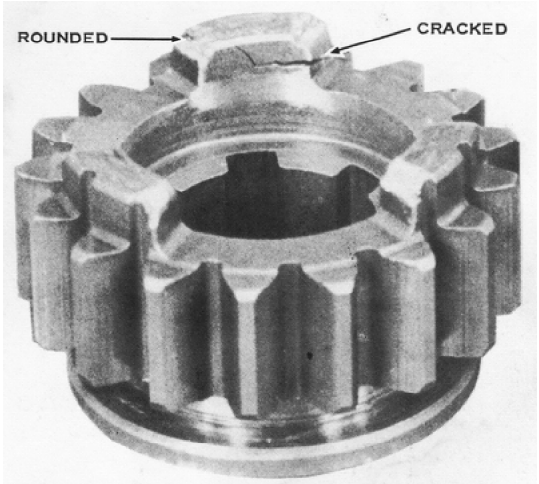
All H2 models have a 5/16" steel ball between the end of the long pushrod and the clutch spring plate pusher. This steel ball must not be worn or discolored; if it is, replace it. The ends of the pushrods can also be discolored. If the discoloration is severe, they must be replaced. The discoloration is evidence of heat buildup caused by lack of lubrication or by holding the clutch disengaged for long periods of time, as when waiting at a stoplight.

The bushing and needle bearing inside the clutch housing do not ordinarily wear very much. To test for wear hold the bushing about halfway out of the rear of the housing and rock it sideways. If it moves perceptibly, replace the bushing and the housing.

The clutch gear is fastened to the back of the housing with rivets and incorporates rubber dampers to cushion the shock of clutch engagement. Twist the gear while holding the housing. If the gear moves easily, the entire housing must be replaced, because the rubber dampers are worn out. If the gear can be pulled away from the back of the housing perceptibly, the rivets have stretched, and the housing assembly must be replaced. The clutch housing comes complete with the gear as a replacement part.

Inspect the teeth of the clutch gear and primary pinion for wear marks or erosion. Either type of damage will cause a whining noise from the primary drive. If either gear has definite wear marks, eroded or broken teeth, both gears should be replaced. Minor damage to the gear teeth can be dressed with an oilstone.

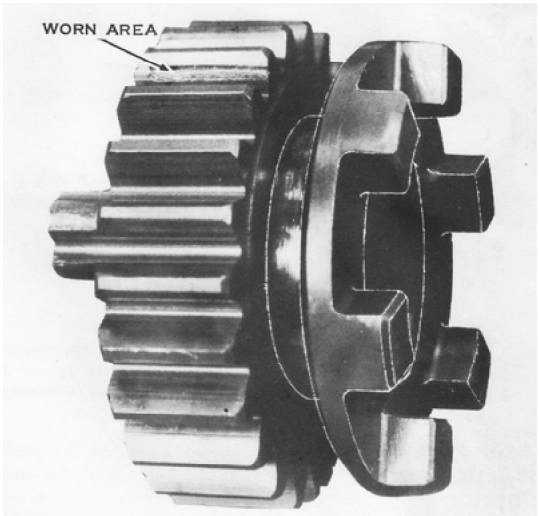
TRANSMISSION PARTS



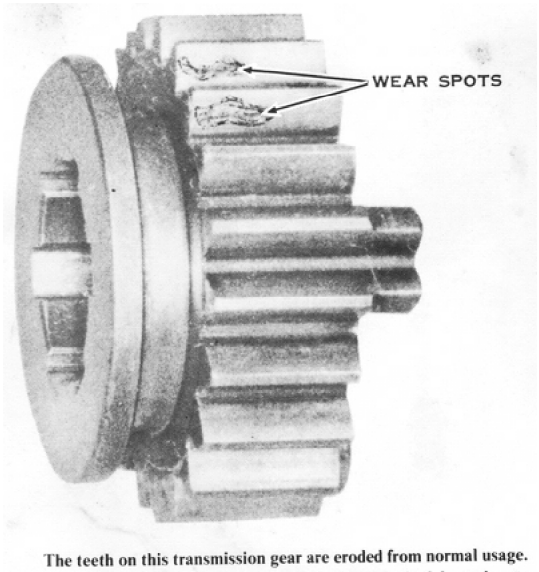
The engagement dogs on this gear have rounded badly, and one dog has almost been broken off by shifting without the clutch. This type of damage causes the transmission to jump out of gear on acceleration and deceleration.

Inspect all transmission gears, including the kickstarter gears. If any teeth are chipped or broken, or if the faces of the teeth are heavily marked or eroded, the gear should be replaced. Check that the corners of the engagement dogs are not rounded. If they are, the transmission will slip out of gear under acceleration. **CAUTION: Gears with rounded dogs must be replaced**. The engagement holes in some of the gears may have rounded edges as well. These gears must also be replaced. These kinds of gear damage are caused primarily by improper riding habits; sudden starts, hard or incomplete shifts, and shifting without the clutch are hard on transmission gears.

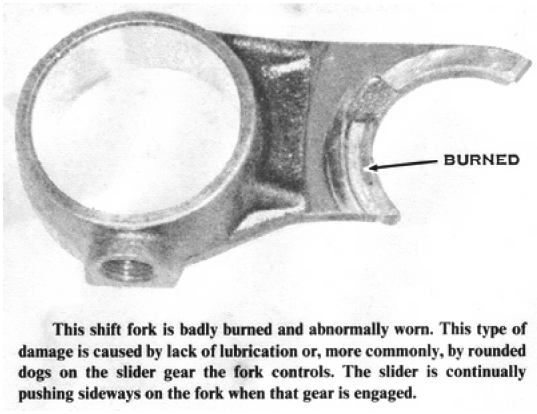
Inspect the inside diameter of the output shaft 1st gear and of the driveshaft 5th gear. If the gear is discolored around the hole or if the bushing is worn so that the small oil dimples have disappeared, the gear must be replaced. These two gears, more of the time than any of the other gears, turn at a speed different from the shaft on which they ride. Therefore, they are the most likely to show this type of wear. If the gear has discolored (turned a blue black color around the hole), it has overheated from lack of lubrication, caused by an oil leak. Check the shafts for the same discoloration and replace them if they have turned blue black anywhere from heat. The discoloration is caused by the heat changing the hardness characteristics of the metal's surface. If these parts are reused, they will wear out quickly. and can cause other damage at the same time.



This gear was removed from the same transmission and shows the mark of an extremely hard shift. If this gear were reused, it would be noisy, would wear out the gear it meshed with, and might break.



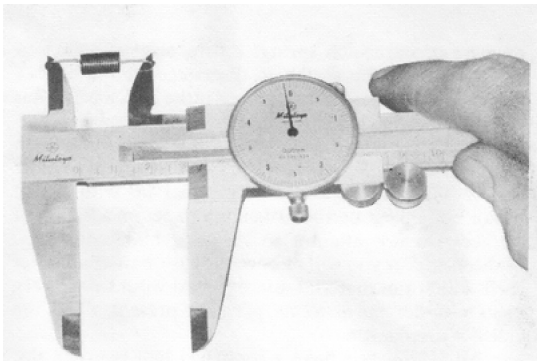
The teeth on this transmission gear are eroded from normal usage. The transmission was rebuilt when the motorcycle had logged over 25,000 miles. This gear could not be reused although only two teeth were badly eroded.



This shift fork is badly burned and abnormally worn. This type of damage is caused by lack of lubrication or, more commonly, by rounded dogs on the slider gear the fork controls. The slider is continually pushing sideways on the fork when that gear is engaged.

The ends of the shift forks that fit into the grooves in the gears are the most likely spots to wear. To check for this wear, slip the fork into the groove of the gear it shifts, and measure the clearance between the fork and the groove with a blade-type thickness gauge. The clearance should be 0.05 to 0.25mm (0.0020 to 0.0098 in.). If the forks are worn and have slightly more clearance. they are still usable if the clearance is 0.6mm (0.024 in.) or less, as this is the service limit. If the clearance is greater than this, replace the fork and the gear. The ends of the fork can also be discolored by overheating caused by lack of oil. If they are discolored, they must be replaced. Check the groove in the corresponding gear as well. If it is also discolored, replace it. Check the pins on the forks that ride in the grooves in the shift drum. If they are noticeably worn, they must be replaced to insure smooth, positive shifting. **CAUTION: Bent shift forks cannot be straightened; they must be replaced.**

Many oil leaks can be traced to faulty oil seals. Check the inner lip of the seal to be sure it is smooth. If the seal is cracked or torn, it will leak. Check the surface of the shaft where the seal rubs against it. If it is scratched or nicked, it will quickly wear out a new seal.

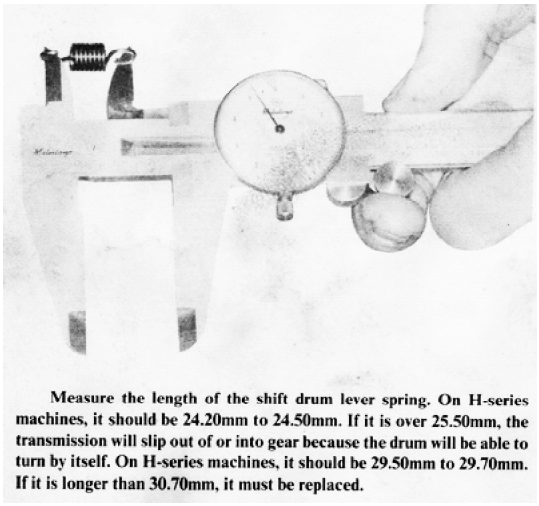


Measuring the length of the shift ratchet lever spring. On both H- and S-series machines, this spring should be 27.40mm to 27.70mm. If it is over 28.70mm, it will not have enough tension to hold the shift ratchet hooks against the shift drum pins. This will result in undershifting and even nonshifting.

The transmission shafts must be straight and smoothly finished all over. As mentioned above, discoloration means overheating. Small nicks and scratches on the splines or on the seal surface can be repaired, if they are not too deep, by lightly polishing the affected spot with a piece of fine-grained emery cloth that has been oiled. Wrap the emery cloth around a steel bar or a wrench handle to make it easier to handle.

Inspect the shift ratchet mechanism for cracks, or bent or broken parts. Extreme wear on the ratchet hooks or weakened springs will cause poor shifting. Measure the springs with a vernier caliper. If they are longer than the specifications listed at the end of this chapter, they have lost their tension and must be replaced. If the straight ends of the shift return spring are bent or worn, the shift lever may not return to center after shifting. Replace the return spring if it is damaged.

The shift drum levers hold the shift drum in position when a gear has been selected. If the rounded ends of the levers are worn, if the pivot holes or pivot step-bolt are worn, or if the spring has lost its tension, the transmission will overshift on both up and down shifts and can slip out of or into gear at any time.



Measure the length of the shift drum lever spring. On H-series machines, it should be 24.20mm to 24.50mm. If it is over 25.50mm, the transmission will slip out of or into gear because the drum will be able to turn by itself. On H-series machines, it should be 29.50mm to 29.70mm. If it is longer than 30.70mm, it must be replaced.

The return spring pin must be tight in the engine case or under- and overshifting can result. If the pin is loose and cannot be tightened, the case threads are stripped. The most reliable repair (and the most expensive) is to replace the crankcase set. The top and bottom halves are not available separately. If this is not feasible, remove the pin and clean the threads and the hole in the case with an oilless solvent such as trichloroethylene. Coat the threads with a layer of a permanent threadlocking compound such as Kawasaki Super Liquid Lock-K or Loc-tite Formula B. Screw the pin into the case as tightly as it will go without slipping, and allow it to cure for at least six hours in a warm, dry place.

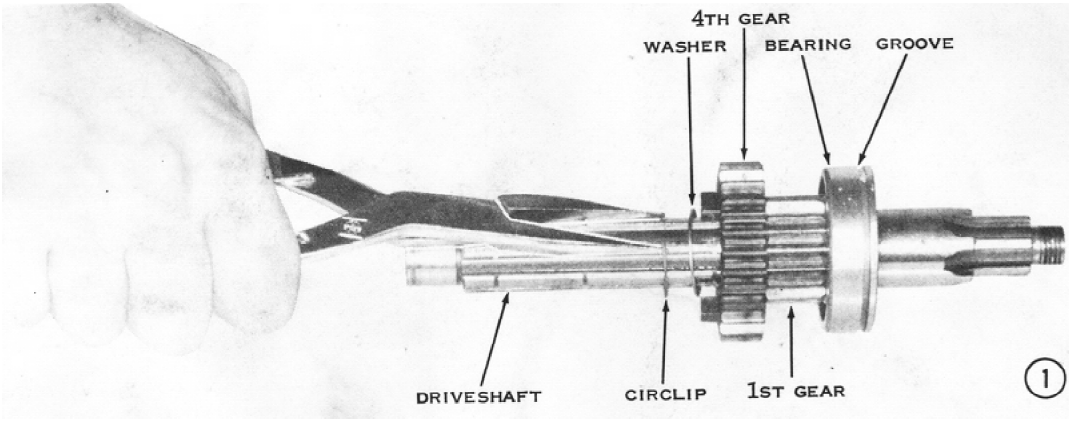
The shift ratchet lever on the end of the shift shaft must be tightly fastened in place. If it is not, it may be welded or replaced. If it is welded, be sure the welding does not obstruct the bushing that goes inside the coil of the return spring, and that it does not get on the flat end of the shift shaft on S-series models, as the flat end bears against a boss in the right-hand engine cover to locate the shaft. On H-series models, the shaft protrudes through the right-hand engine cover to allow an optional shift lever to be mounted on the right side. The end of the shaft in this case must not have any weld splatters, or the oil seal in the right-hand engine cover will be destroyed and leak oil.

ASSEMBLING THE S-SERIES TRANSMISSION

This section will cover only the assembly of the S-series transmission. The disassembly of the S- and H-series transmissions and the assembly of the H-series transmission are covered in Chapter 4.

During transmission assembly, be sure to keep all parts as clean as possible. After the transmission has been assembled and installed in the upper half of the engine crankcase, pour a liberal quantity of good quality SAE IOW-30 motor oil (class SE) over the transmission gears before joining the case halves. Use the same oil to fill the transmission after the engine has been installed in the frame.

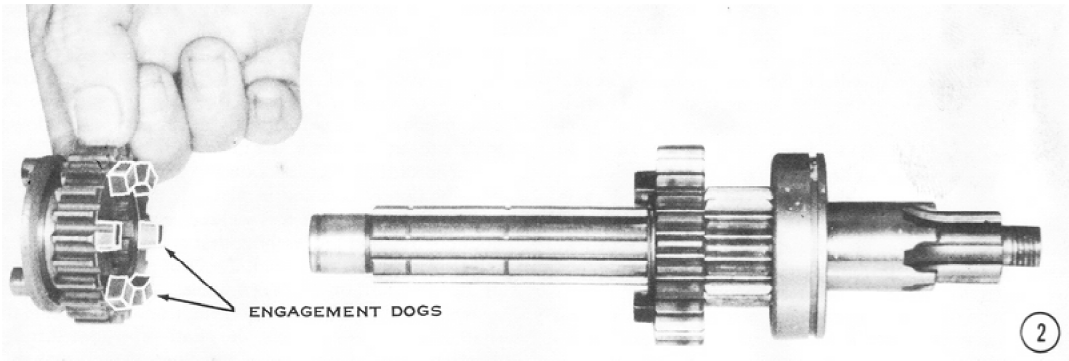
DRIVESHAFT



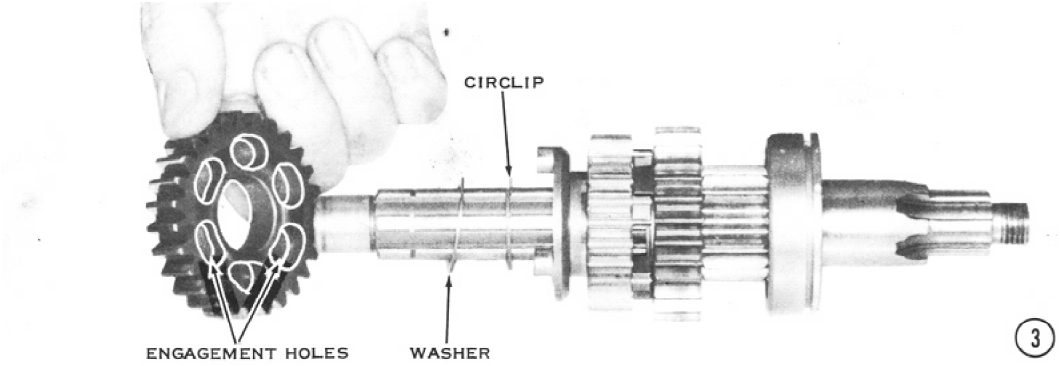
1) Install ball bearing number 6205N on the threaded end of the driveshaft, with the groove facing away from the 1st gear teeth. Push the bearing solidly against the gear teeth. Slip the driveshaft 4th gear (25 teeth) onto the other end of the shaft, with its engagement dogs facing away from the gear teeth machined on the shaft. Install a 1.0mm-thick toothed washer and secure the gear and washer with a new

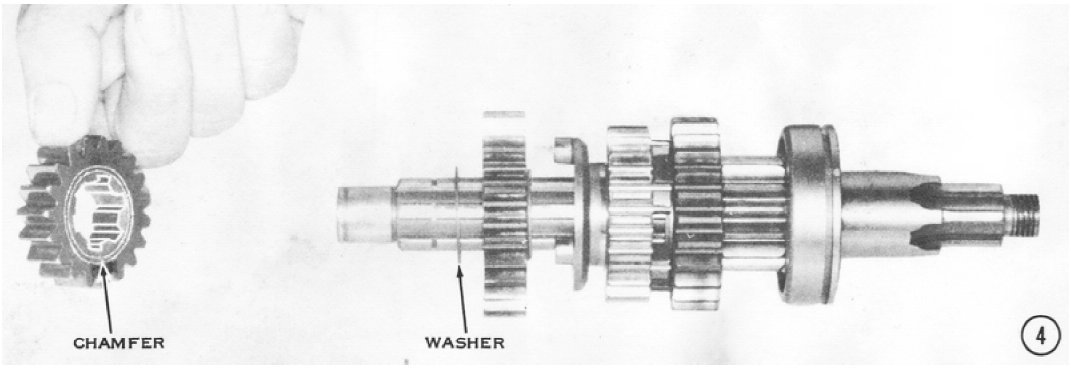
circlip in the groove closest to the gear. **CAUTION: Be sure the sharp edge of the circlip faces away from the washer. The sharp edge holds the groove of the shaft better than the rounded edge. CAUTION: New circlips must be used, as the old ones lose their tension. If a circlip comes loose, the transmission could shift erratically or slip out of gear.**

2) Install the driveshaft 3rd gear (23 teeth) with its 6-dog side facing toward the gear just installed.

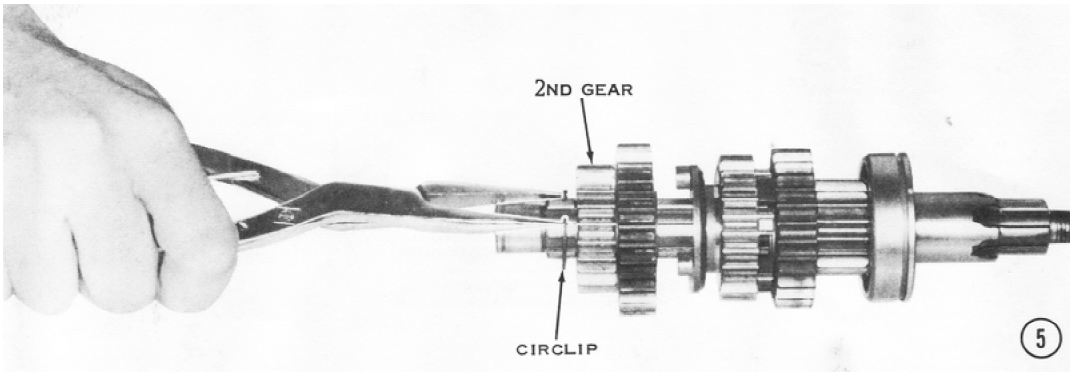


3) Install a circlip, with its sharp edge toward the 3rd gear. Slip a l.0mm-thick toothed washer onto the driveshaft, and then install the driveshaft 5th gear (27 teeth) with its dog engagement holes facing toward the 3rd gear.

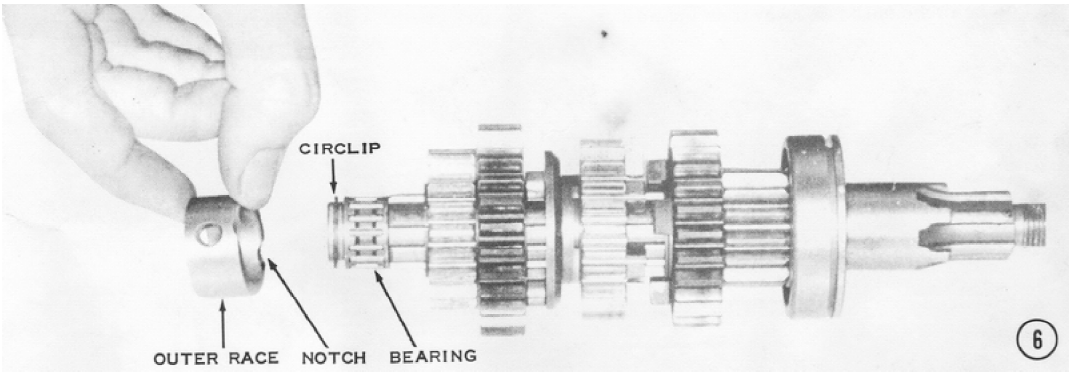




4) Install another l.0mm-thick toothed washer, and then slide the 2nd gear (19 teeth) into place. **CAUTION: The chamfered inner edge of the gear must face the washer just installed. If it is turned around, the gear will crush the circlip and bend it out of its groove during shifts into 5th gear. This would allow the transmission to slip out of 5th gear.**

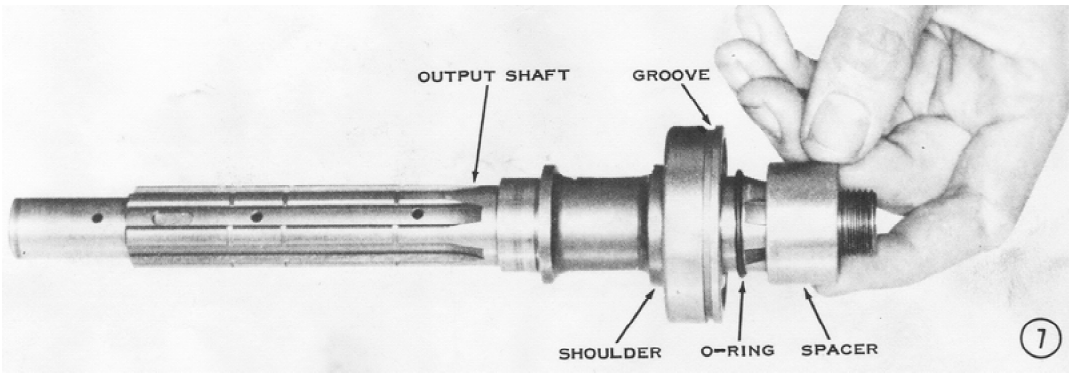


5) Using circlip pliers, install the last circlip in the final groove with its sharp edge facing away from the driveshaft second gear.

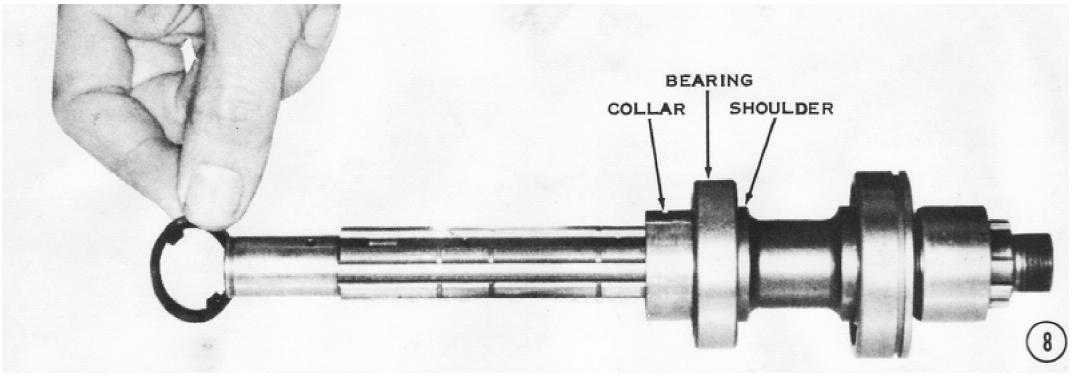


6) Slide on the caged needle bearing. Secure it with a small circlip, and then slip the outer race over the needle bearing with the notched edge toward the gears on the shaft.

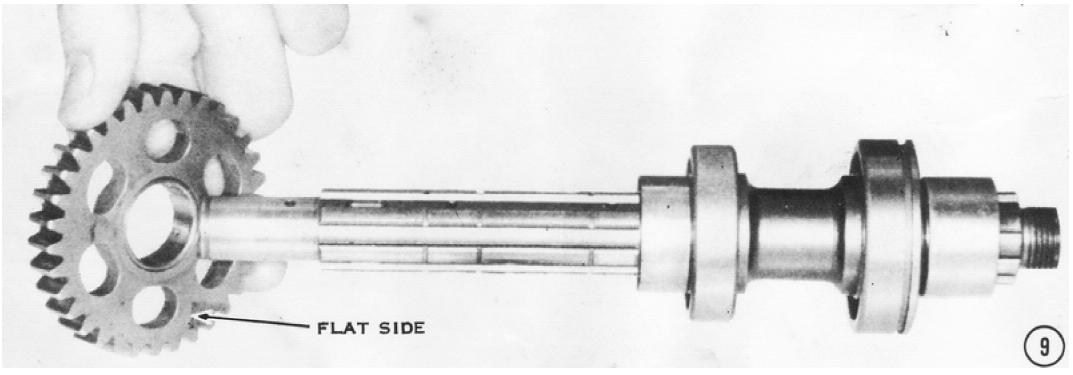
OUTPUT SHAFT



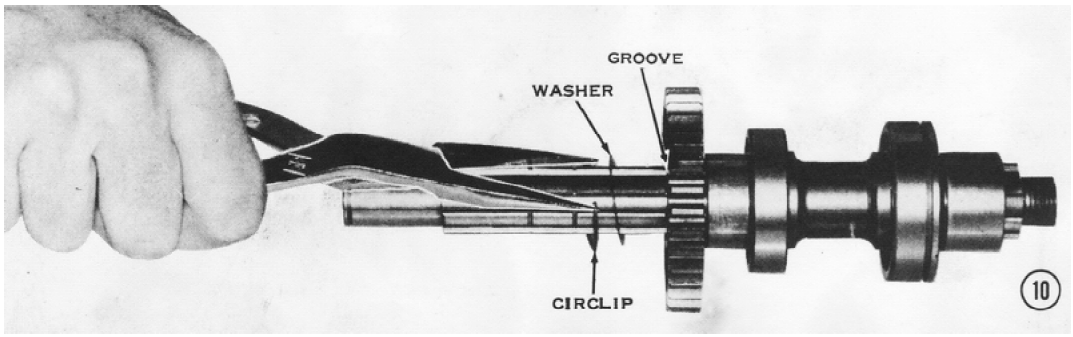
7) Install ball bearing number 6205N onto the threaded end of the output shaft, with the groove facing away from the shoulder. Slip the O-ring into place as shown, and then push on the sprocket spacer until the 0-ring is squeezed between it and the bearing.



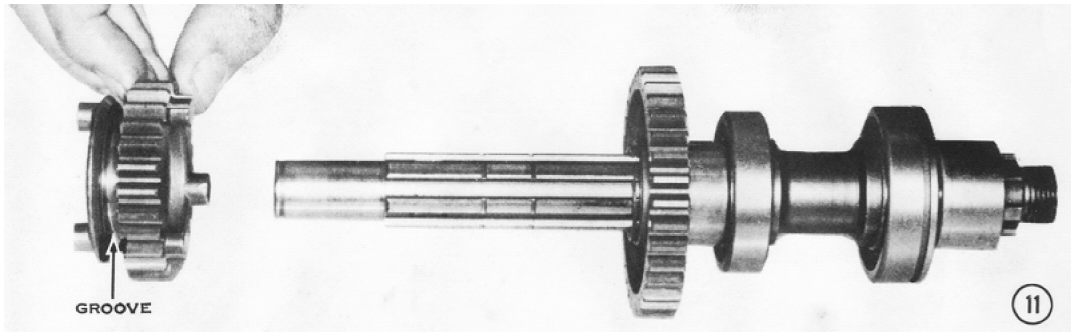
8) Slip the smaller ball bearing, number 6005, onto the long end of the shaft and seat it against the shoulder. Put on the collar and a 0.5mm-thick toothed washer.



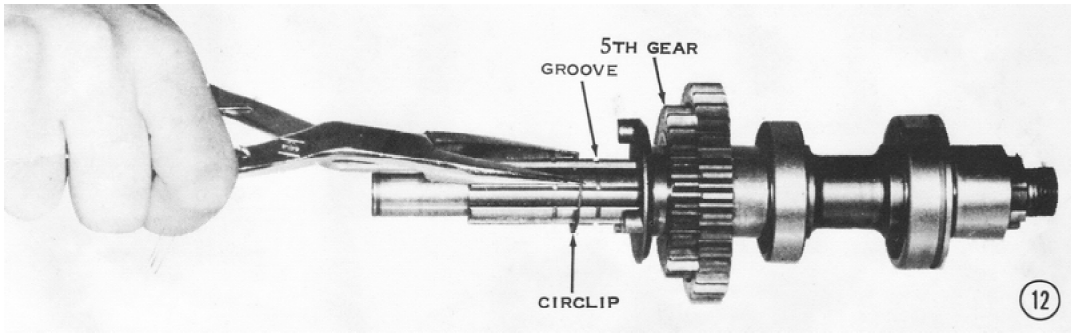
9) Install the output shaft 2nd gear (34 teeth), with its flat side against the collar (recessed side away from the collar).



10) Put another 0.5mm-thick toothed washer on the output shaft next to the gear just installed. Secure it with a circlip in the groove closest to the gear. The sharp edge of the circlip must face away from the washer.

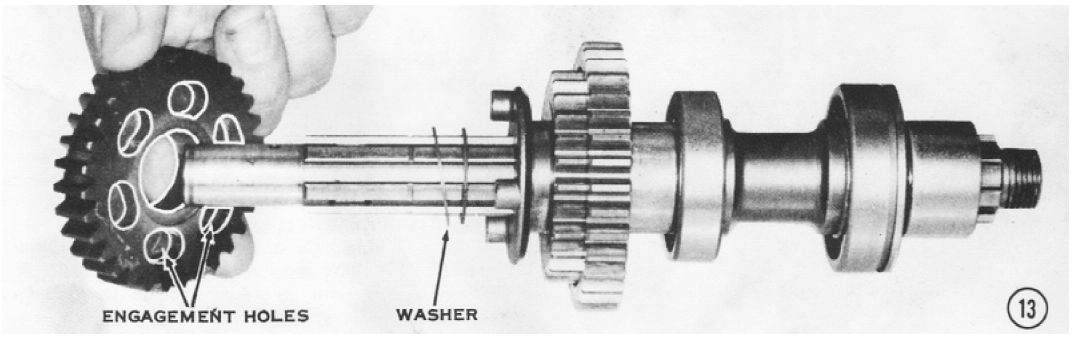


11) Slip the output shaft 5th gear (26 teeth) onto the shaft so that its shift fork groove is facing away from the output shaft 2nd gear installed in step 9.

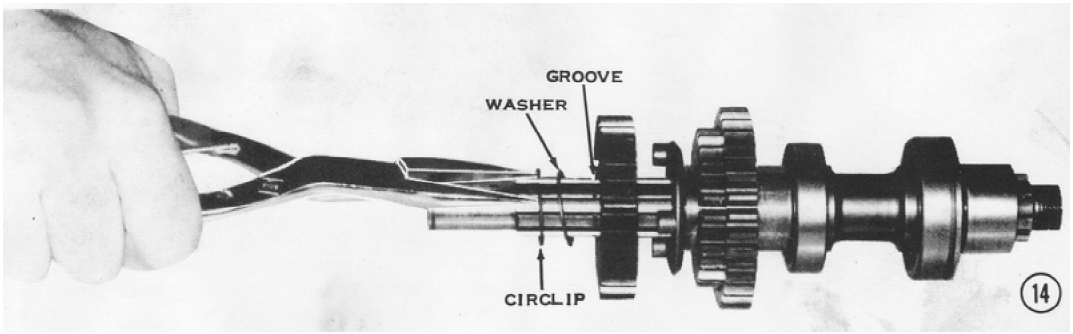


12) Install a circlip into the next groove with its sharp edge facing toward the 5th gear.

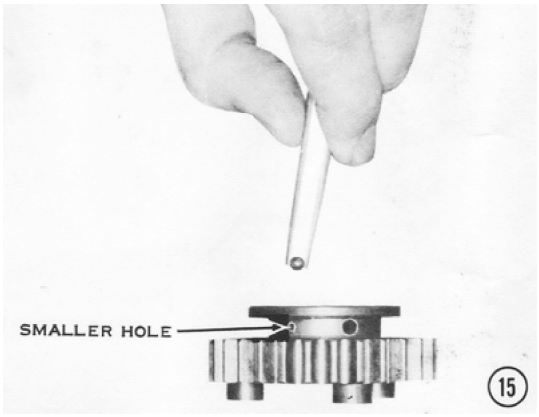
13) Slip on a 1.0mm-thick toothed washer, and then install the 3rd gear (31 teeth), so that its dog engagement holes are facing toward the gears already installed.

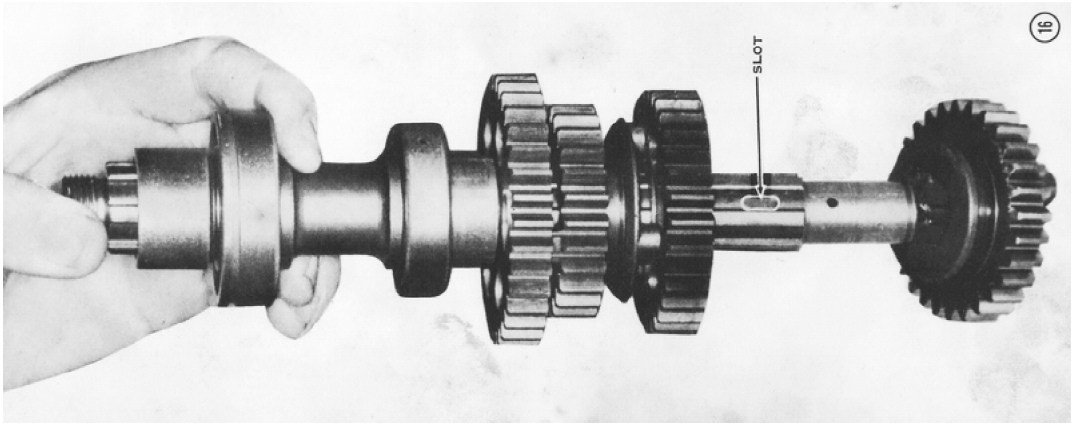


14) Add another 1.0mm-thick toothed washer, then install a circlip in the next groove with its sharp edge away from the toothed washer.

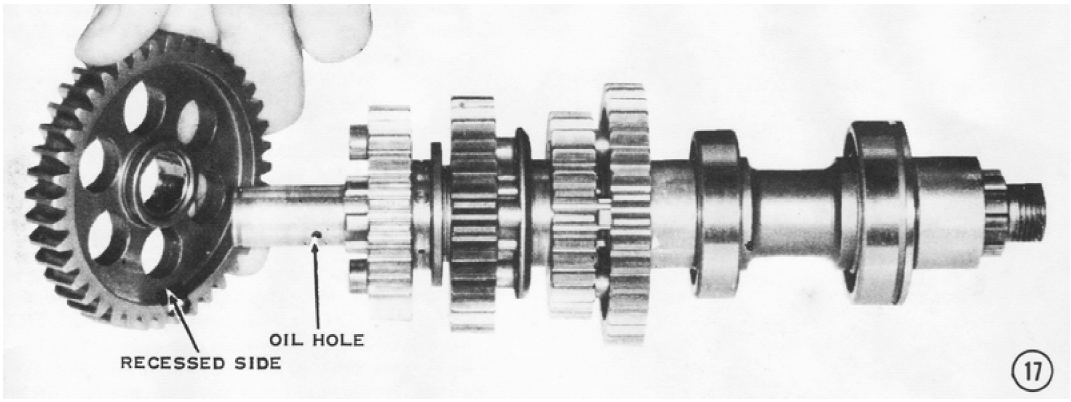


15) To install the output shaft 4th gear, position it on a flat surface with the holes toward the top as shown. From the inside, insert one steel ball into each of the three small holes. **CAUTION: Do not use grease to hold the balls, as this will prevent the mechanism from working properly. The grease will hold the balls out of the slots in the output shaft, making the neutral finder inoperative until the grease is melted by the transmission oil, which could take hundreds of miles of operation.**

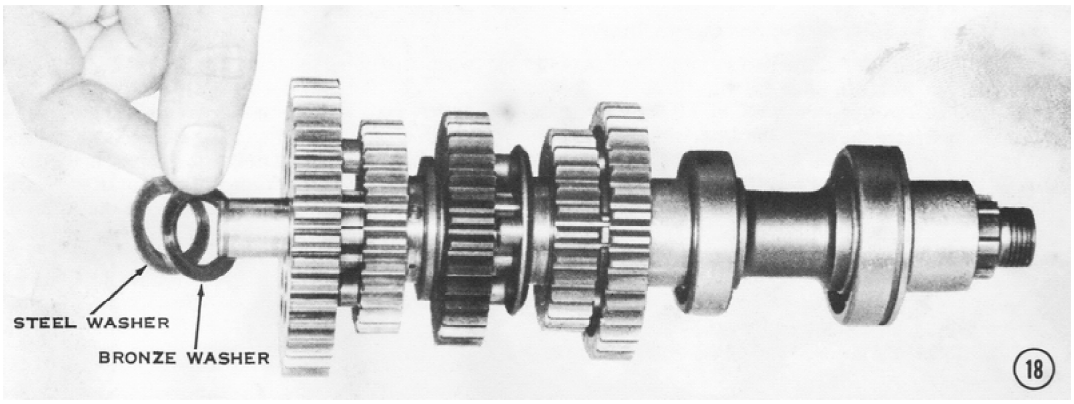




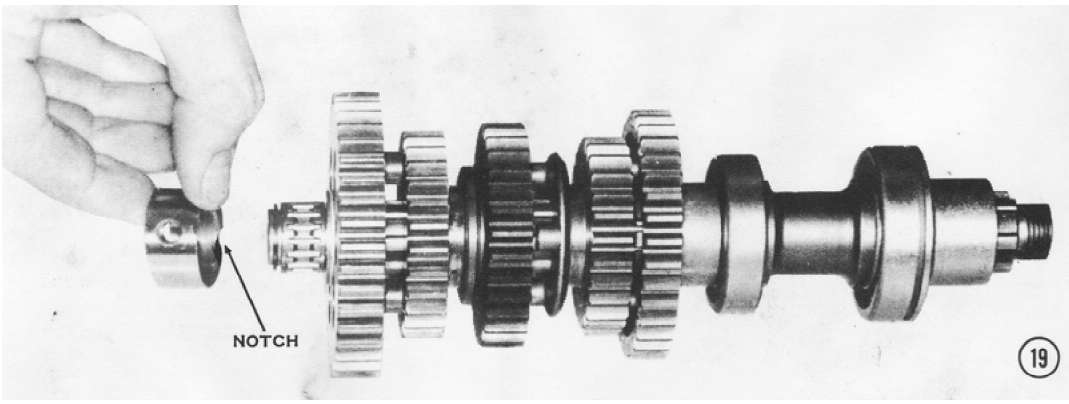
16) Lower the output shaft into the center of the 4th gear. Be careful to align the shaft so that the balls align with the slots in the shaft. Now lift the gear care fully onto the splines of the shaft until it is butted against the 3rd gear. Lay the shaft on its side so one of the balls falls into its slot. The gear will now be locked onto the shaft. Check that the gear moves freely back and forth the length of the slot without binding.



17) Install the 1st gear (40 teeth) with its recessed side toward the 4th gear. **CAUTION: Check that the oil hole is open. If it is blocked, the gear could seize on the shaft.**



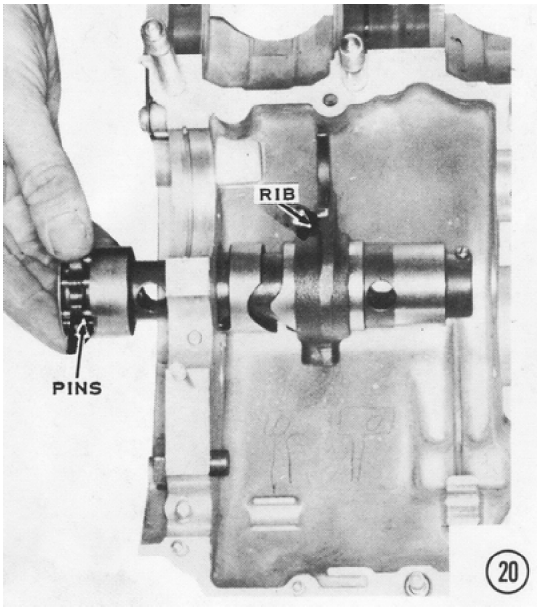
18) Put on the last thrust washers. The phosphor bronze (yellow-colored) washer goes on first and then the steel washer.



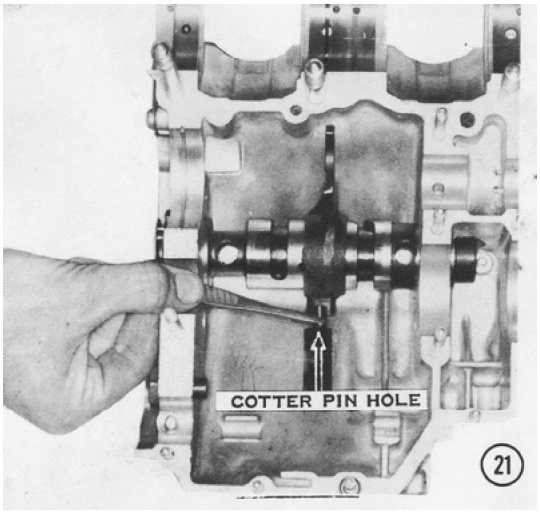
19) Slip on the caged needle bearing and secure it with a circlip. Slide on the bearing outer race with the notched edge toward the 1st gear.

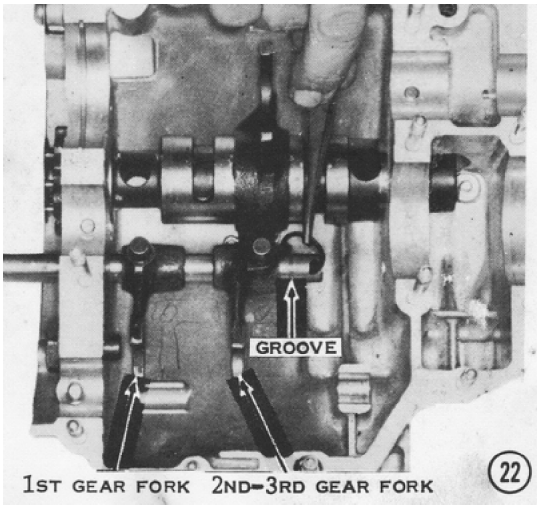
INSTALLING THE SHIFT DRUM, FORKS, AND SHAFTS

20) Slip the shift drum partway into the side of the upper engine case half. Slide the 4th-5th shift fork over the drum in the position shown. **CAUTION: Be sure the rib is facing toward the end of the drum with the pins in it.**

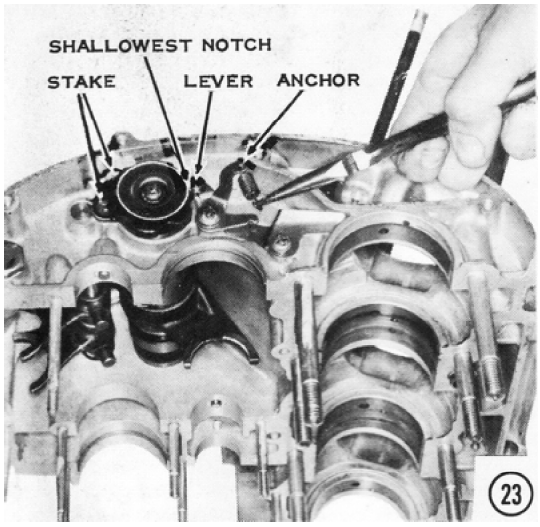


21) Push the drum the rest of the way into the upper case half. Position the shift fork about halfway along the drum, and then insert the pin, long end first, into the hole in the shift fork boss. *NOTE: The pin fits into the center of the three grooves in the drum.* Note the small hole in the pin, which must align with the hole through the shift fork boss. Insert a new cotter pin from the left, and then bend the ends over.

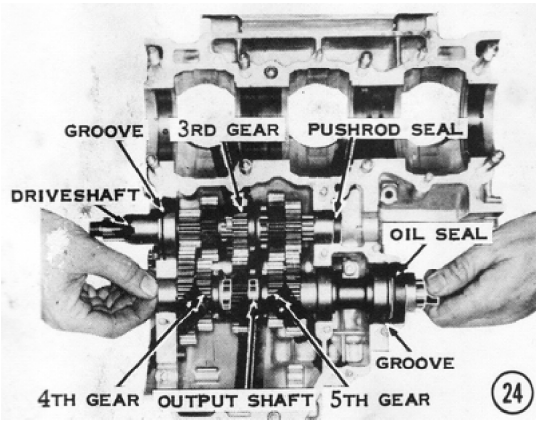




22) Push the grooved end of the shift fork rod into the case, and then slide the 1st gear shift fork onto it. *NOTE: The 1st gear f fork has the pin in line with the fork ears.* Slide on the 2nd-3rd shift fork with the offset pin. Slide an E-clip into the groove in the shaft, and then push the shaft all the way into the case. The pins on the forks fit into the other two grooves in the shift drum.



23) Install the drum retainer plate as shown. and then stake the edges of the countersunk head screws to prevent their loosening. **CAUTION: The screws must be no more than 16mm long or they will go through the case wall and lock the 1st gear.** Position the drum lever and spring anchor as shown, and then insert the shoulder screw. Be sure the lever moves freely. *NOTE: Use only a round-headed shoulder screw as shown here. A hex-headed shoulder bolt can catch on the gear-change ratchet, causing erratic or under shifting. A nonshoulder screw or bolt will prevent the lever from working freely.* **CAUTION: Do not overtighten this screw, as it can prevent the lever from holding the drum in position, which will allow the transmission to slip out of gear and make precise gear changes impossible.** Hook the spring between the levers as shown. **CAUTION: The upper end of the spring must hook toward the inside, or the end of the spring could catch on the clutch gear and be damaged.** Turn the drum so that the roller on the drum lever fits into the shallowest notch in the plate on the end of the drum as shown. so that when assembled the transmission will be in neutral.



24) Put the oil seal over the sprocket spacer on the output shaft with the marked side facing out, and then position the two shafts in the case as shown. The shift fork on the drum must fit into the groove in the driveshaft 3rd gear. The shift forks on the shaft must fit (from left to right) into the grooves in the output shaft 4th and 5th gears. The grooves in the ball bearings on both shafts must fit the alignment rings in the case. The needle bearing outer races on both shafts have holes that must fit on alignment pins in the case. Install the clutch pushrod oil seal flat against the end of the output shaft with the marked side facing out.

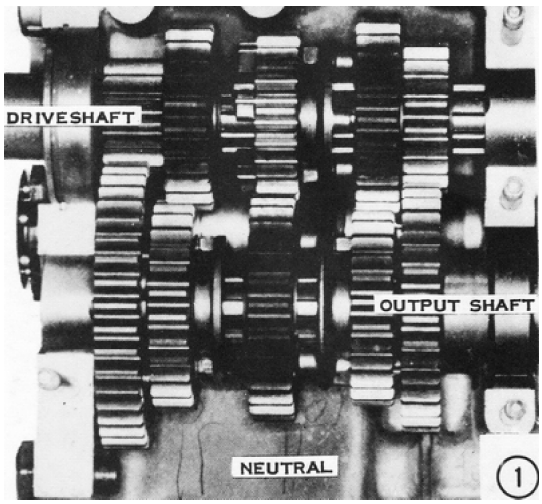
ADJUSTING THE TRANSMISSION GEAR ENGAGEMENT

After you have completed assembling the transmission shafts and the shifting mechanism, but before you join the engine crankcase halves, check the gear engagement in each of the six positions. The gear positions are illustrated in the photos.

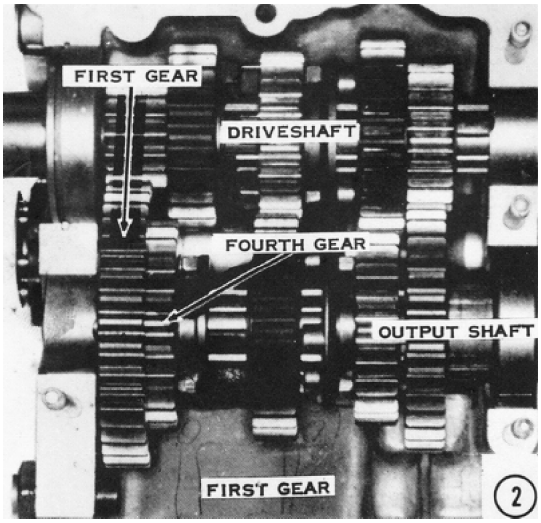
If you have experienced transmission shifting problems or if your transmission goes out of or into gear by itself, it should be adjusted by adding shims (special washers of certain thicknesses) in some locations. The following procedures describe how to adjust the S- and H-series transmissions.

Some extra parts may be needed for adjusting your transmission. In the S-series procedure, the 0.5mm-thick washers can be purchased from a Kawasaki dealer as part number 92024-035: the 1.0mm-thick washers are listed as part number 92024-034. In the H-series procedure, the part numbers are listed as they are required, as there are different numbers for the washers used in different places.

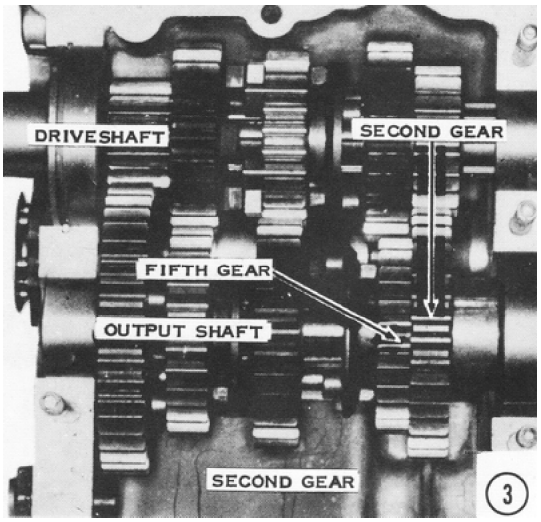
S-Series Models



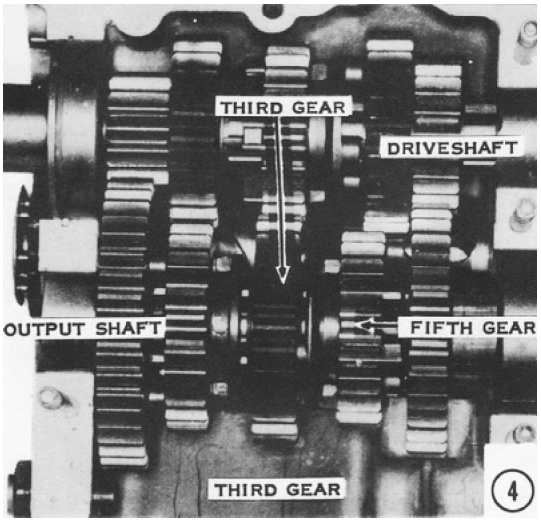
1) **NEUTRAL.** When the transmission gears are in this position, none of the dogs on the three slider gears are engaged with the dogs or holes on the adjacent gears. Check that each shaft turns freely without interfering with the other. A slight tendency for one shaft to turn the other is acceptable.



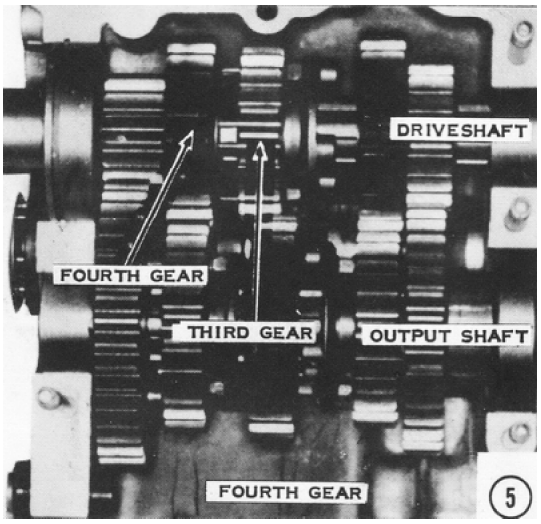
2) **FIRST.** While slowly turning the driveshaft, turn the shift drum clockwise to shift the gears into this position for first gear. The shift dogs of 4th gear on the output shaft should show from the back through the holes in the 1 st-gear output shaft. If they do not, check that there are two 1.0mm thrust washers between it and the wall of the case. If the dog engagement is still not sufficient with two washers, check for a bent shift fork or a worn shift fork pin.



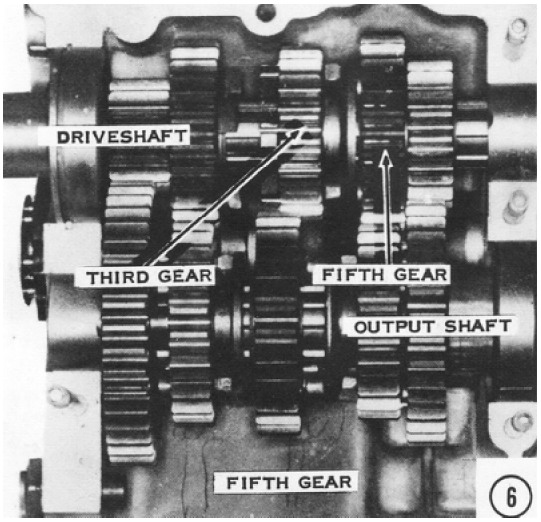
3) **SECOND.** Hold the top neutral finder mechanism ball up with a magnetized pin punch or similar magnet, and then turn the shift drum counterclockwise until the gear positions are like this for second gear. There is one 0.5mm thrust washer on each side of the 2nd gear output. If the 5th gear output does not mesh with it completely, both washers should be put on the outside of the gear (on the side toward the engine sprocket). **CAUTION: If both thrust washers are moved to the outside of the 2nd gear output, 5th gear may not disengage completely in neutral. Check to be sure this does not happen. If it does, you must leave the thrust washers as they were originally installed and look for some other problem. Check for a bent shift fork or a worn shift fork pin.** *NOTE: Be sure the bearing-locating ring is in place to hold the shaft in its proper position laterally.*



4) **THIRD.** Turn the driveshaft slowly and shift the transmission into third gear. Check that the dogs on the 5th gear output firmly engage the holes in the 3rd gear output. If the 3rd gear output is too far from the 5th gear output, it can be moved by changing the thrust washers on either side of it. Originally the gear has a 1.0mm washer on each side. To move 3rd-gear output to either side, replace one of the washers with a 0.5mm washer and place another 0.5mm washer on the other side with the original 1.0mm washer. In this manner, the gear can be moved 0.5mm to either side. **CAUTION: There must be at least one 0.5mm or one 1.0mm thrust washer between the gear and the circlip. If there isn't, the spinning gear will force the circlip out of its groove and two gears will be engaged at once, causing major transmission damage.**

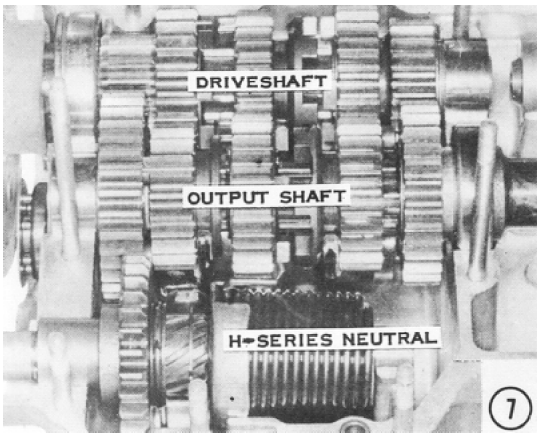


5) **FOURTH.** Continue to fourth gear by turning the shift drum farther clockwise. In this position, the driveshaft 3rd gear must firmly engage the driveshaft 4th gear. The dogs should overlap at least 4.0mm. If they do not, the driveshaft 4th gear can be moved closer to the driveshaft 3rd gear by replacing the 1.0mm washer between it and the circlip with a 0.5mm washer and adding a 0.5mm washer between driveshaft 4th gear and the teeth cut into the shaft. **CAUTION: If the driveshaft 4th gear is moved closer to the driveshaft 3rd gear, check that there is at least 1.0mm clearance between the dogs of the driveshaft 4th and 3rd gears when the transmission is in neutral. Less clearance than this will cause the transmission to go into two gears at once under operating conditions. The driveshaft 4th gear must be moved to its original position to avoid severe transmission damage. If this is the case, look for a bent shift fork.**

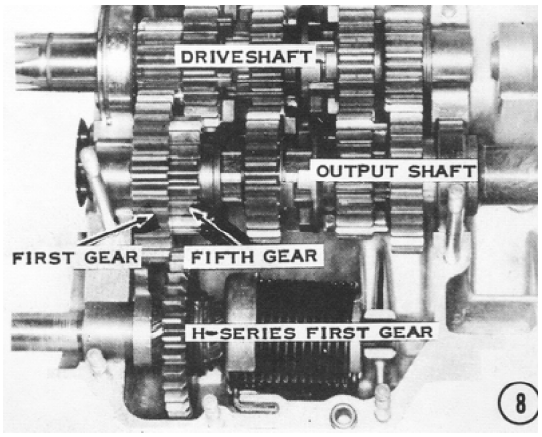


6) **FIFTH.** Turning the shift drum one more notch clockwise will shift the transmission, into fifth gear. In this position, the driveshaft 3rd gear must firmly engage the holes in the driveshaft 5th gear. If they do not, the driveshaft 5th gear can be moved closer to the driveshaft 3rd gear by replacing the 1.0mm washer between it and the circlip with a 0.5mm washer. Add another 0.5mm washer between the driveshaft 5th and 2nd gears. **CAUTION: Again, make sure there is at least 1.0mm clearance between the driveshaft 5th gear and the dogs on the driveshaft 3rd gear when the transmission is in neutral. If there is not enough clearance, move the driveshaft 5th gear back to its original position and look for a bent shift fork.**

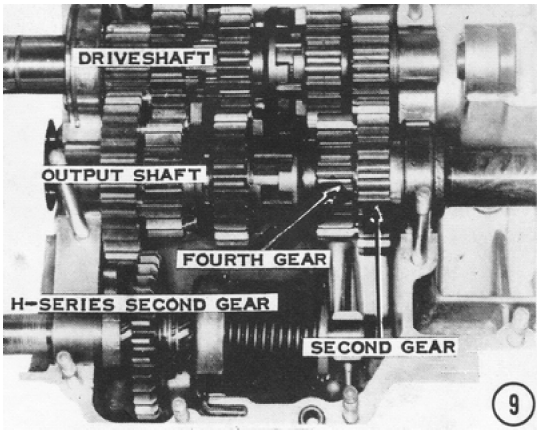
H-Series Models



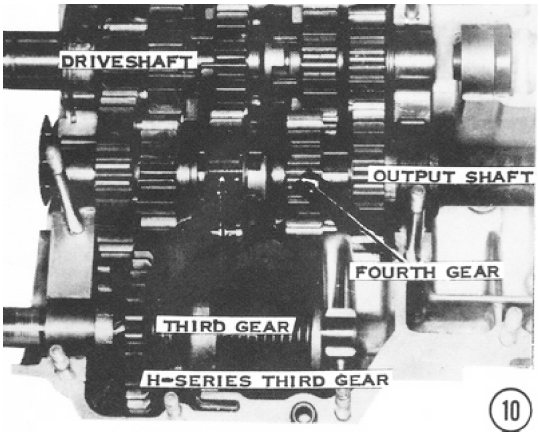
7) **NEUTRAL.** Some H-series models may need to have the transmission gears shimmed to make them engage fully and shift properly. This gear position is neutral. Be sure the shafts can spin independently. A slight tendency for one shaft to turn the other is normal.



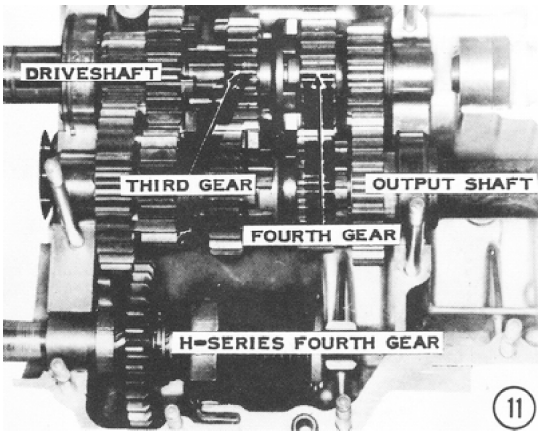
8) **FIRST.** Turn the shift drum until the gears are in this position for first gear. If the motorcycle has had a tendency to jump out of first gear, the output shaft 5th gear may not be engaging the 1st gear output all the way. Add a 0.5mm washer (P/N 92022-144) between the 1st gear output and the outer bearing race. If this makes the shaft hard to turn, the washer must be removed. The problem is most likely a bent shift fork or improperly machined shift drum. The offending part must be replaced.



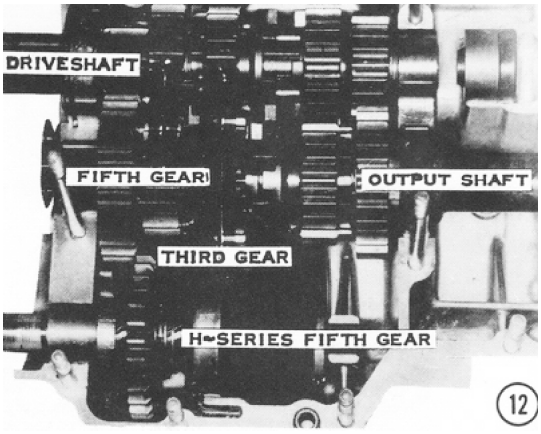
9) **SECOND.** Turn the shift drum another notch, so that the gears are in this position for second gear. If the unit has had a tendency to jump out of second, the 2nd gear output may not be close enough to the 4th gear output. To move it closer, remove the 1.0mm washer between it and the circlip and replace it with a 0.5mm washer (P/N 92022-225) on each side of the gear. This moves the 2nd-gear output 0.5mm closer to the 4th gear output. If the dogs of the two gears now hit each other when the transmission is in neutral, the 2nd gear output must be returned to its original position; the problem is elsewhere.



10) **THIRD.** Now turn the shift drum to the 3rdgear position as shown. A tendency to jump out of 3rd gear is usually caused by the washer (between the 3rd gear output and the circlip) spinning with the 3rd gear output and wearing against the circlip. Eventually the circlip is forced out of the groove in the shaft and the 3rd gear output moves far enough away from the 4th gear output so that their dogs can no longer engage. Replace the worn washer with a toothed washer (P/N 92024-033) that cannot spin.



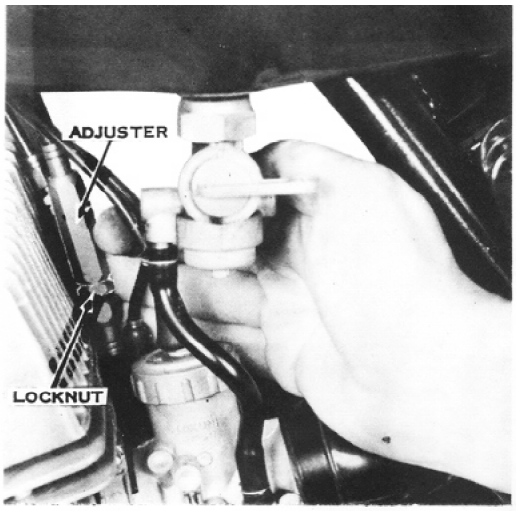
11) **FOURTH.** Turn the shift drum to put the transmission in 4th gear as illustrated. If the transmission will not stay in 4th, the 4th-gear driveshaft may be moved closer to the 3rd gear drive to allow the dogs to engage fully. Insert a 0.5mm washer (P/N 92022-144) between the bronze and steel washers on the end of the shaft near the needle bearing. This moves 2nd and 4th gears drive closer to the 3rd gear drive. If the shaft turns hard, take out the shim; the problem is elsewhere. If the shaft turns freely, but the dogs of 3rd and 4th gears output hit each other with the transmission in neutral, move the 0.5mm washer to a position between the 4th gear drive and the circlip that holds it in place. This will prevent the gear from moving on the shaft.



12) **FIFTH.** Finally, shift the transmission into this position for fifth gear. To cure a tendency to jump out of fifth gear, first measure the clearance between the dogs of 5th and 3rd gears, on the driveshaft, with the transmission in neutral. If the clearance is less than 2.0mm, the problem is elsewhere. If the clearance is greater than 2.0mm, the 5th gear drive must be moved closer to the 3rd gear drive for better dog engagement. Remove the 1.0mm washer between the 5th gear drive and its circlip and replace it with two 0.5mm washers (P/N 92022-225), one on each side of the 5th gear drive.

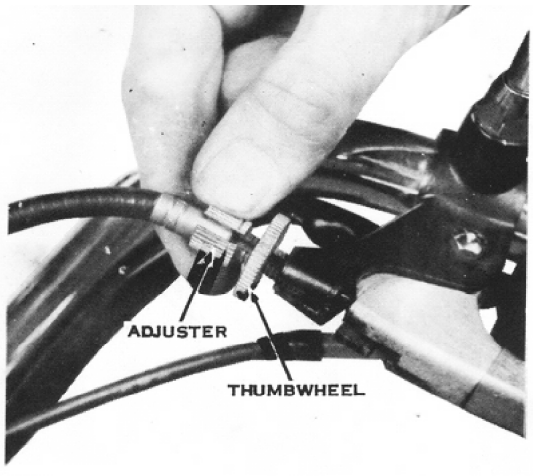
CLUTCH ADJUSTMENT

There are actually two adjustments that must be made to assure proper clutch operation. First, loosen the cable adjuster thumbwheel at the handlebar lever, then turn the adjuster all the way into the lever bracket to give as much slack as possible. Next remove the chain case cover. Loosen the locknut on the cable adjuster. This adjuster is on the clutch cable under the fuel tank, just above the carburetors. Turn the adjuster until the arm on the clutch release mechanism points downward at a slight angle from the horizontal, about 8 o'clock. Tighten the locknut. Now adjust the release mechanism itself. Loosen the locknut. Turn the adjuster screw in until resistance is felt, back off 1/8 turn, and then hold the screw in that position while tightening the locknut as shown. Replace the chain case cover.

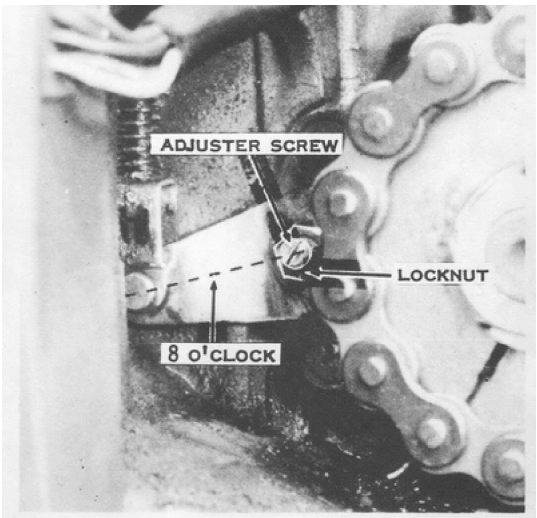


This is the main clutch cable adjuster. Use it to position the clutch release mechanism arm at 8 o'clock after the adjuster at the hand lever has been turned all the way into the lever bracket.

The hand lever should now have about an inch of free travel at the ball end before the resistance of the clutch springs is felt. If it does not, loosen the thumb wheel and turn the adjuster as required. If you wish, the clutch may be adjusted for more cable slack to place the lever nearer the handgrip. This will help accommodate a smaller hand more comfortably. **CAUTION: Be sure the clutch disengages entirely when the lever is pulled to the grip. If the motorcycle is more difficult to push by hand with the engine off, in gear, with the clutch pulled, than with the transmission in neutral, the clutch is dragging and must be adjusted with less cable slack.**



Use this adjuster at the clutch hand lever for small changes in lever play between normal clutch adjustments. It should be turned all the way into the lever bracket at the beginning of the clutch adjustment procedure.



The clutch release mechanism is properly located at 8 o'clock for a correctly adjusted clutch.

TRANSMISSION SPECIFICATIONS [mm and (in.)]

H1 MODELS

	1st	2nd	3rd	4th	5th
Gear Ratios	2.20 (33/15)	1.40 (28/20)	1.09 (25/23)	0.92 (23/25)	0.81 (21/26)

	Standard	Service Limit
Shift Fork Groove-to-Shift Fork Clearance	0.05-0.25 (0.0020-0.0098)	0.6 (0.024)
Shift Drum Lever Spring Length	24.20-24.50 (0.953-0.965)	25.50 (1.003)
Shift Ratchet Lever Spring Length	27.40-27.70 (1.078-1.091)	28.70 (1.130)

H2 MODELS

	1st	2nd	3rd	4th	5th
Gear Ratios	2.17 (26/12)	1.47 (28/19)	1.11 (20/18)	0.92 (23/25)	0.81 (17/21)

	Standard	Service Limit
Shift Fork Groove-to-Shift Fork Clearance	0.05-0.25 (0.0020-0.0098)	0.6 (0.024)
Shift Drum Lever Spring Length	24.20-24.50 (0.953-0.965)	25.50 (1.003)
Shift Ratchet Lever Spring Length	27.40-27.70 (1.078-1.091)	28.70 (1.130)

S-SERIES MODELS

	1st	2nd	3rd	4th	5th
Gear Ratios	2.86 (40/14)	1.79 (34/19)	1.35 (31/23)	1.12 (28/25)	0.96 (26/27)

	Standard	Service Limit
Shift Fork Groove-to-Shift Fork Clearance	0.05-0.25 (0.0020-0.0098)	0.6 (0.024)
Shift Drum Lever Spring Length	29.50-29.70 (1.161-1.169)	30.70 (1.209)
Shift Ratchet Lever Spring Length	27.40-27.70 (1.078-1.091)	28.70 (1.130)

CLUTCH SPECIFICATIONS [mm and (in.)]

	Standard	Service Limit
H1 MODELS		
Spring Length	36.0 (1.417)	34.0 (1.339)
Friction Plate Thickness	2.7-2.9 (0.106-0.114)	2.5 (0.098)
Friction Plate Tab-to-Clutch Housing Clearance	0.1-0.4 (0.0039-0.0157)	—
H2 MODELS		
Spring Length	32.0 (1.26)	30.0 (1.18)
Friction Plate Thickness	2.7-2.9 (0.106-0.114)	2.5 (0.098)
Friction Plate Tab-to-Clutch Housing Clearance	0.09-0.40 (0.0035-0.0157)	—
S1 MODELS		
Spring Length	34.5 (1.358)	32.5 (1.280)
Friction Plate Thickness	3.0 (0.118)	2.7 (0.106)
Friction Plate Tab-to-Clutch Housing Clearance	0.05-0.45 (0.0020-0.0177)	—
S2 AND S3 MODELS		
Spring Length	28.7 (1.130)	26.7 (1.051)
Friction Plate Thickness	3.0 (0.118)	2.7 (0.106)
Friction Plate Tab-to-Clutch Housing Clearance	0.05-0.45 (0.0020-0.0177)	—