Common Repair Procedures for Your Mark V

Even the best machines, no matter how well they are designed or maintained, may occasionally break down. The Shopsmith Mark V is no different. It contains some parts, such as drive belt and bearings, that wear slightly each time you use the machine. Over a period of years, sometimes decades, these parts eventually wear out.

To keep the Mark V’s ‘down time’ to a minimum, it’s built with as few of these parts as possible. The few wearing parts in the machine are made of durable materials, to extend their useful life. And when one of these parts finally does wear out, your Mark V is designed to be simply and quickly repaired.

General Repair Considerations

If you should need to repair your Mark V, follow some simple guidelines:

- First, be sure that you unplug the machine before you start a repair procedure. Don’t rely solely on the power switch.
- Strip the machine down, removing all accessories, so that you don’t scrape yourself on sharp blades or bits.
- As discussed in the Service chapter, refer to the exploded views in the “Parts List” or in this chapter so that you can see how the Mark V comes apart and goes together. To eliminate confusion, the repair procedures in this manual refer to the parts by their name and part number. If you are unsure of a procedure, match the part number in the instructions with the part number in the exploded views. This will help you to understand how to proceed.
- Disassemble the Mark V in an organized manner. Make notes so that you can easily remember the sequence of bolts, washers, and nuts. It also helps to lay things out in neat rows on your workbench.
- Plug the machine in and run the motor when you need to change the speed setting, unless otherwise instructed. In some cases, you can turn the speed dial very slowly with one hand while spinning the main spindle with the other. When you’ve reset the speed dial, remember to unplug the machine before you continue with the repair procedure.
- As you put the Mark V back together, be sure to tighten all parts properly. All parts should be secure, of course, but some parts can be easily overtightened. Overtightening may crack a casting or cause a bearing to wear prematurely. The following procedures point out those parts that can be overtightened.
- When you’ve reassembled the Mark V, realign and readjust the machine, following the procedure described in the Alignment and Adjustment chapter in the Use section.
- Once you have finished with your repairs, check that the power switch is “Off” before you plug your Mark V back in to a power source.

WARNING: Use ONLY Shopsmith replacement parts. Other parts may not be manufactured to our specifications, and may endanger the machine — or you.
How to Replace the Drive Belt

To replace the drive belt (504193) that connects the motor shaft and idler shaft, follow this procedure:

1. **Loosen the drive belt.** Turn on the Mark V, run it down to "Slow" speed, then turn it off and unplug it. With the motor off, reset the speed dial to "Fast". This will loosen the drive belt on the sheaves.

2. **Remove the belt cover (504238).** Slide the headstock and carriage to the right (toward the base mount) along the way tubes as far as they will go. Secure the headstock and carriage locks, then remove the two screws (513608) holding the belt cover to the headstock. Slide the belt cover off the headstock and to the left along the way tubes, out of the way.

   **Tip:** If you have mounted drive hubs on the auxiliary spindles, you'll have to remove the belt cover before you can remove the belt cover.

3. **Remove the drive belt from the motor shaft.** Hook the drive belt that connects the drive shaft and the idler shaft over the rim of the lower float sheave. Slowly turn the motor by hand, letting the belt ride off the sheave. (See Figure 1.) Slide the belt completely off the drive shaft, then push it up and back into the headstock, away from the upper floating sheaves. (See Figure 2.)

4. **Remove the nameplate (504241).** Pry it off the back of the headstock with a screwdriver.

5. **Detach the upper (control) sheave from the speed changer.**

   Look inside the headstock through the nameplate opening. On the end of the control sheave (504181) is a retaining loop (504187) hooked over a leaf spring. The leaf spring is
attached to the control arm quadrant (504221), part of the speed changing mechanism. Depress the leaf spring and swing the retaining loop toward you off the spring. (See Figure 3.)

6. **Remove the drive belt.** Make sure the speed dial is set to "Fast", then squeeze the upper sheaves together. Work the drive belt around them and pull it through the nameplate opening. (See Figure 4.)

7. **Replace the drive belt.** To replace the drive belt or install a new one, reverse this procedure.

Figure 3. To detach the control sheave (1) from the speed changer, depress the leaf spring (2) on the control arm quadrant (3) and swing the retaining loop (4) off the spring.

Figure 4. Work the drive belt around the upper sheaves and pull it through the nameplate opening.
How to Replace the Poly V-belt

To replace the Poly V-belt (504170) that connects the idler shaft and the drive shaft, follow this procedure:

1. **Remove the drive belt** (504193), following the procedure described in "How to Replace the Drive Belt" in this chapter.

2. **Loosen the Poly V-belt.** With a 1/4" Allen wrench, remove the bolt, lock washer, and nut (502038, 120379, and 120373) under the idler shaft. (See Figure 5.) This bolt secures the eccentric bushing (504190) in the headstock. Also remove the Phillips screw and washer (501643 and 501630) that keep the bushing and the idler shaft from slipping out of the casting. (See Figure 6.)

   Insert a medium blade screwdriver into the slot in the eccentric bushing (504190), and turn the bushing so that the slot points straight down, toward the bottom of the headstock casting. (See Figure 7.) With a 5/32" Allen wrench, loosen the setscrew (133367) in the bottom of the eccentric bushing. (See Figure 8.) This setscrew holds the idler shaft (504178) in the bushing. When the

---

Figure 5. Completely remove the bolt, lock washer, and nut under the idler shaft.
Figure 6. Also remove the Phillips screw and washer that keep the eccentric bushing and idler shaft from slipping out of the headstock casting.
Figure 7. Turn the eccentric bushing so that the slot points down.
setscrew is loose, slip the eccentric bushing out of the casting, over the idler shaft. (See Figure 9.) This will loosen the Poly V-belt.

3. **Remove the drive shaft**
   (511546). Advance the quill feed as far as it will go, and secure the quill lock to keep it from retracting. With a blade screwdriver, pry out the retaining ring (501259) that holds the drive shaft in the headstock casting. (See Figure 10.) Take hold of the upper auxiliary spindle and pull the drive shaft from the casting. (See Figure 11.) Be sure the Poly V-belt is loose and doesn’t catch on the drive shaft as you pull it free.

**Tip:** The drive shaft fits very snug in the headstock casting, and may be difficult to remove by hand. If this is the case, loosen the setscrew (501634) in the top of the headstock with a 5/32” Allen wrench. (See “How to Replace the Drive Sleeve” in this chapter.) Extend the quill until the quill splines disengage from the nylon drive sleeve (501294). Turn the main spindle 1/6 turn by hand, so that the splines are mismatched. Then push the drive shaft out of the headstock by retracting the quill.

4. **Remove the Poly V-belt**
   Working through the nameplate opening and the bottom of the headstock, maneuver the upper sheaves (504180) and 504181) and idler shaft under the control arm quadrant (504221) and back into the
headstock. (See Figure 12.) Remove the belt from the idler shaft when the shaft is free of the casting. Let the shaft and sheaves sit on the motor until you're ready to install a new belt.

5. **Replace the Poly V-belt.**
Replace the belt or install a new one by reversing the procedure described here. Be careful not to overtighten the setscrew that holds the idler shaft in the eccentric bushing, just 'snug it up.' If you tighten the setscrew too tight, the shaft and bearing will run hot.

6. **Tension the Poly V-belt.**
Before you tighten the bolt, lock washer, and nut that secure the eccentric bushing in the casting, tension the Poly V-belt, following the procedure described in "Checking Belt Tension" in the "Maintenance" chapter.

When you're satisfied that the belt is properly tensioned, tighten the bolt that keeps it from turning in the casting. But be careful not to overtighten. Overtightening will break the casting. As with the setscrew, just 'snug it up.'

7. **Replace the drive belt,** reversing the procedure in "How to Replace a Drive Belt".

---

**How to Replace the Drive Sleeve**

To replace the nylon drive sleeve (501294) that connects the drive shaft to the main spindle, follow this procedure.

1. **Remove the nameplate (504241)** by prying it off the back of the headstock with a screwdriver.
2. **Remove the quill and main spindle (504545 and 504546).** On top of the headstock, between the quill lock and quill feed slot, there is a setscrew (501634) that keeps the quill from advancing all the way out of the headstock. If your machine has never been worked on before, this screw is covered with gray putty. Dig out the putty with a penknife, and back out the setscrew 2 full turns. (See Figure 13.) Advance the quill until you feel the rack disengage from the quill feed pinion (501312). **Do not let go of the quill feed lever!** Continue to hold onto the lever and pull the quill out of the headstock. (See Figures 14 and 15.) Set the quill aside, then tighten the quill lock so that the lever can't spin.
3. **Remove the drive sleeve.** With a long-shanked, large blade screwdriver, reach up into the headstock through the nameplate opening. Insert the blade of the screwdriver behind the drive sleeve, then twist the screwdriver to loosen the sleeve on the shaft. (See Figure 16.) This will take a good, strong
twist since the sleeve has an internal ring clip that seats in a groove on the drive shaft. Once you have popped the clip out of the groove, work the drive sleeve off the shaft by wiggling it with your hand.

4. **Replace the drive sleeve.**
Replace the sleeve or install a new one by pressing it back onto the shaft until you feel the internal ring clip into the groove in the drive shaft. Once you’ve got the sleeve started on the shaft, you can easily push it on the rest of the way with a long dowel. (See Figure 17.)

5. **Replace the quill,** simply reversing the procedure you used to remove it. Turn the main spindle until it slips into the nylon drive sleeve. Also, the groove in the top of the quill must line up with the setscrew in the top of the headstock. Tighten this setscrew until it ‘bottoms out’ in the groove, then back it out 1/8-1/4 turn.

**Tip:** If, by accident, you should happen to let go of the quill feed handle and the spring, restore the tension on the spring following the procedure in “Tensioning the Quill Feed”.

6. **Replace the nameplate,** lining up the pins with the tabs in the headstock casting.

---

**Tensioning the Quill Feed**
The quill feed should be tensioned so that the quill retracts easily and smoothly, but not so tight that the spring bends when the quill is fully extended. You should need to adjust or restore the tension on the quill, follow this procedure:

1. **Remove the quill,** following the procedure described in Step 2 of “How to Replace the Drive Sleeve” in this chapter.

2. **Adjust the tension.** With your hand on the quill feed lever, release the quill feed lock and slowly let the lever unwind. When the tension has been relieved, rewind the lever 3 full turns clockwise (as you look at the headstock from the front or speed dial side). This will restore the tension to its original factory setting.

3. **Replace the quill,** following the procedure in Step 5 of “How to Replace the Drive Sleeve” in this chapter.
How to Remove and Clean the Speed Changer

Fine sawdust can accumulate on various parts of the speed changing mechanism and interfere with its operation, even if you blow out the headstock regularly. If the speed dial becomes hard to turn and lubricating the motor shaft and idler shaft does not relieve the problem, clean the speed changing mechanism following this procedure:

1. Set the speed dial to "Fast". With the Mark V running, turn the speed dial to "Fast". Turn off the machine and unplug it.

2. Detach the speed changer from the sheaves. With a blade screwdriver, pry off the nameplate. Look inside the headstock through the nameplate opening. On the end of the upper floating sheave is a retaining loop hooked over a leaf spring. The leaf spring is attached to the control arm quadrant (504221), part of the speed changing mechanism. Depress the leaf spring and swing the retaining loop toward you, off the spring. (Refer to Step 4 in "How to Replace the Drive Belt" in this chapter.)

3. Remove the control handle (504229). Insert a 3/32" Allen wrench in the hole in the side of the control handle and loosen the setscrew holding the handle to the speed control shaft (504216). (See Figure 18.) Pull the control handle free of the shaft.

4. Remove the speed dial and speed changer. Remove the three screws and washers (448027 and 115545) that hold the speed dial and speed changer in the headstock. The screw furthest toward the right also holds a spring (504228) on the outside and a nylon clip (513034) inside the headstock. To keep from losing the clip, reach inside the headstock through the nameplate opening and hold it while loosening the screw. (See Figure 19.) When you've removed all three screws, pull the speed dial (504225) and the speed changer out of the headstock. (See Figure 20.)

Be careful not to loose the small spring (504196) behind the dial. This spring keeps the speed dial from rattling when the machine is running.

5. Clean the speed changing mechanism. To clean the speed changer, thoroughly scrub the idler gear (504220) and the interlocking teeth of the speed dial on the front of the assembly with a small, stiff brush (such as a toothbrush) soaked in mineral spirits or turpentine. (See Figure 21.) Then turn the speed control shaft (504216) until the control arm quadrant (504221) swings free of the worm gear. (See Figure 22.) Scrub the worm gear and quadrant teeth until they are free of grease and sawdust.

Wipe all parts dry with a clean rag. Put a tiny dab of cup grease or "furnace bearing" grease on the worm gear. Then re-engage the worm gear and the quadrant, turning the control shaft clockwise as far as it will go.
Figure 19. The speed changer is held to the headstock with three screws. The screw farthest to the right also holds a nylon clip inside the headstock. To keep from losing the clip, reach inside the nameplate opening and hold it while you're loosening the screw.

Figure 20. When all three screws are removed, pull the speed dial and speed changer out of the headstock. Be careful not to lose the small spring behind the dial.

Figure 21. Scrub the idler gear and the interlocking teeth of a speed dial with a small brush dipped in mineral spirits.

Figure 22. To reach the teeth of the control arm quadrant, turn the speed control shaft until the quadrant swings free of the worm gear.
6. **Install the speed changer.**

Replace the anti-rattle spring in the headstock casting. Install the speed dial and speed changer, taking care not to turn the control shaft. Fasten the speed changer in the headstock with the two screws on the left, then install the screw on the right, along with the leaf spring on the outside. This leaf spring helps keep the control handle from turning when the machine is running. The end of the spring should rest between two small bumps on the speed changer. (See Figure 23.)

After you start the right hand screw, reach inside the headstock and hold the nylon clip in place. The clip should thread itself onto the screw as you tighten it. When all screws have been tightened down, secure the wiring inside the headstock behind the nylon clip. (See Figure 24.)

7. **Install the control handle.**

Turn the speed dial by hand so that the arrow on the headstock indicates speed setting "Fast". Replace the control handle on the control shaft so that the setscrew lines up with the depression in the shaft, then tighten the setscrew. Finally, hook the retaining ring on the end of the upper floating sheave over the control arm quadrant and replace the nameplate.

8. **Test the speed changing mechanism.**

When you've reassembled the speed changing mechanism, check that the power switch is "Off". Plug the Mark V in and turn it on. Run the speed dial from "Fast" to "Slow" and back again several times to be sure that everything is working smoothly.

---

**Figure 23:** The far right screw that holds the speed changer in the headstock also holds a leaf spring to the speed changer. This leaf spring helps keep the control handle from turning when the machine is running.

**Figure 24:** Secure the wiring that runs between the motor and the power switch behind the nylon clip.
How to Align the Lower Sheaves

Non-aligned sheaves (504207 and 504208) won’t mesh together properly, and make it extremely hard to change speeds. If the alignment is extremely poor, the Mark V may lose power at high speeds — the spindles will stop while the motor continues to run. If the sheaves should creep out of alignment, follow this procedure:

**WARNING:** This procedure can be dangerous if performed incorrectly. DO NOT attempt to remove the spring (509226) from the motor shaft while aligning the sheaves.

1. Remove the belt cover (504238). Slide the headstock and carriage to the right (toward the base mount) along the way tubes as far as they will go. Secure the headstock and carriage locks, then remove the two screws (513608) holding the belt cover to the headstock. Slide the belt cover off the headstock and to the left along the way tubes, out of the way.

   **Tip:** If you have mounted drive hubs on the auxiliary spindles, you’ll have to remove before you can remove the belt cover.

2. Remove the drive belt from the motor shaft, following the procedure described in Step 3 of “How to Replace the Drive Belt” in this chapter.

3. Prop the sheaves open. Hook your hand over the end of the motor shaft. Pull the lower floating sheave (504208) towards you with your fingers. (It’s held in place by a strong spring, so this will take some effort.) From underneath, insert a scrap of 3/4” thick wood between the sheaves to keep them apart, as shown in Figure 25. (The scrap of wood should be small enough to still allow you to turn the motor shaft by hand.) Release the floating sheave slowly to make sure the scrap will keep it from springing back.

   **WARNING:** When inserting this scrap of wood, and all during the remainder of this procedure, be EXTREMELY careful not to place your fingers where they might be pinched between the sheaves, should the scrap come loose.
Repair Procedures

Tip: From this point on, most people find it easier to work with the machine in the vertical position. If you want, move the carriage and the headstock as far to the right (toward the base mount) as they will go and secure the locks. Tape or tie the belt cover to the way tie bar (504264), then stand the Mark V up.

4. Loosen the lower stationary sheave (504207) on the motor shaft. In the bottom of the motor pan directly below the sheaves, you will see a small, round hole. Looking through this hole with a flashlight, you'll see the back of the stationary sheave (also called the fan sheave). While looking through this hole, rotate the motor shaft until you see the Allen setscrew that secures the stationary sheave to the shaft. Loosen this setscrew one full turn, using the 5/32" Allen wrench. (See Figure 26.) Be careful not to remove this setscrew from the sheave completely, or you will have to remove the motor pan to retrieve it.

When the sheave is loose, insert a blade screwdriver through the bottom of the motor pan so that it sticks up between the fan blades on the sheave and keeps it from turning.

5. Align the sheaves. Insert another blade screwdriver into the indentations on the back of the floating sheave. Use the second screwdriver as a lever to turn the floating sheave slightly, while keeping the stationary sheave from turning. Twist the floating sheave so that it aligns with the stationary sheave. (See Figure 27.)

6. Tighten the stationary sheave down. Remove the screwdrivers and the scrap of wood holding the sheaves apart. Hook the heel of your hands over the end of the motor shaft and work the floating sheave back and forth a few times with your fingers to see if the sheaves mesh without sticking. If they mesh smoothly, reach back into the hole in the motor pan with the 5/32" Allen wrench and tighten the setscrew in the stationary sheave.

7. Replace the V-belt and belt cover, reversing the procedure you used to remove them. If you've set the Mark V up in the vertical position, lower it and tighten the headrest lock. Check that the power switch is "Off", then plug the Mark V in, turn it on, and run the speed dial from "Fast" to "Slow" and back again several times to be sure that everything is working properly.
How to Reposition the Stationary Sheave

If the Mark V makes a metal-on-metal scraping or clanging sound when it runs, it may be because the stationary sheave (504207) is rubbing or hitting the motor housing (504206). To reposition the sheave so that it doesn't contact the housing, follow this procedure:

1. **Remove the motor**, following Steps 1 through 5 in “How to Replace the Power Cord”, later in this chapter.

2. **Remove the floating sheave (504208) from the motor (504292)**, following Steps 1 through 3 in “How to Replace the Motor” later in this chapter. Get someone to help you with this operation. Removing a sheave from the motor is a two-man job and it can be dangerous if done improperly.

3. **Reposition the stationary sheave (504207)**. Loosen the Allen screw that secures the stationary sheave to the motor shaft. (See Step 4 in “How to Align the Lower Sheaves” in this chapter.) Pull or pry the stationary sheave out from the motor so that it's about 1/8"-1/4" away from the motor housing. Secure the Allen screw, then spin the motor by hand to make sure the sheave no longer rubs against the housing.

4. **Reinstall the floating sheave on the motor**, following the instruction in Step 4 of “How to Replace the Motor” later in this chapter.

5. **Replace the motor** in the Mark V, reversing the procedure you followed to remove it.
How to Replace the Power Switch

If you have a defective power switch (513458), do not attempt to operate your Mark V. This can be very dangerous. Replace a broken switch immediately, following this procedure:

1. **Remove the nameplate** by prying it off the back of the headstock with a screwdriver.

2. **Remove the defective switch.**
   Make absolutely sure the Mark V is unplugged. With a blade screwdriver, unscrew the special nut (503947) that holds the power switch in the headstock. (See Figure 28.) If necessary, tap the screwdriver lightly with a hammer to loosen the nut. Remove the nut, unhook the electrical wires from behind the nylon clip inside the headstock, and pull the switch and washer (115551) out through the nameplate opening. (See Figure 29.)

3. **Disconnect the wires from the switch.** Refer to the wiring diagram provided to see if the colors and the positions of the wires connected to the switch match the diagram. (See Figure 30.) If there is any discrepancy, make a new diagram. It's extremely important that you know how to reconnect the wires to their original positions before you disconnect them.
   When you're ready, disconnect the wires from the switch by simply pulling the clips off the leads. Discard the old switch, don't try to repair it.

4. **Reconnect the new switch.**
   Reconnect the wires to the new switch, pushing the clips onto the leads. Be sure to follow the wiring diagram and any notes you may have made exactly. (See Figure 30.)

5. **Install the switch.** Push the switch and the wires back inside the headstock and into its hole. Replace the nut and tighten it securely. Finally, hook the bundle of wires back behind the nylon clip and replace the nameplate.

Figure 28. Use a blade screwdriver to loosen the special nut that holds the power switch in the headstock.

Figure 29. Remove the nut and pull the power switch out of the headstock through the nameplate opening.

Figure 30. The colors and the positions of the wires connected to the power switch should match this diagram. If not make a note before you disconnect them.
How to Replace the Power Cord
To replace the power cord (513970), follow this procedure:

1. **Disconnect the power switch**, following the procedure described in “How to Replace the Power Switch” in this chapter.

2. **Remove the drive belt from the motor shaft**, following the procedure described in Step 3 of “How to Replace the Drive Belt” in this chapter.

3. **Stand the Mark V up in the vertical position**. Remove the motor pan screw (513608) on the right side of the headstock (the side closest to the table). Slide the headstock and the carriage all the way to the right (toward the base mount) and tighten the locks. Tape or tie the belt cover to the way tube tie bar (504264). Stand the Mark V up in the vertical position and secure the base lock.

4. **Loosen the table height lock** and remove the table. Then replace the table on the opposite side of the carriage. (See Figure 31.) Swing the table into the drill press position so that it will serve as a work surface when you drop the motor pan. Also, put a scrap board or several sections of newspaper on the table to protect the surface.

5. **Drop the motor pan (504212)**. Remove the four remaining screws (513608) holding the motor pan to the headstock. Be careful not to let the pan drop, just lower it gently onto the worktable. (See Figure 32.)

6. **Remove the motor (504292)**. Unscrew the ground wire from the back of the motor. (See Figure 33.) Remove the four screws (191966) holding the motor in the motor pan. Hold the motor securely so that it doesn’t roll off the table when the screws are disconnected.

Figure 31. Stand the Mark V up and switch the table to the opposite side of the carriage so that it can serve as a work surface when you remove the motor.

Figure 32. Remove the screws holding the motor pan to the headstock, then gently lower it onto the worktable.

Figure 33. Remove the ground wire from the motor as shown. The wire is usually green.
6. Remove the old power cord.
Cut the ties (513065) that keep the electrical wires bundled together.
With a pair of pliers, grasp the strain relief (513664) on the bottom of the motor pan where the cord enters the headstock. (See Figure 34.) Squeeze the strain relief so that the ridges disengage from the motor pan, then pull the strain relief and the old cord out through the hole in the pan.

7. Install the new power cord and strain relief. Wrap the new strain relief (which comes with the replacement cord kit) around the new cord about 18" from the 'wire connector' end — 7”-8" from where the insulation begins. (See Figure 35.) Thread the new power cord through the hole in the motor pan. Compress the strain relief with a pair of pliers to seat it in the pan.

8. Assemble the headstock. Bolt the motor in the motor pan and attach the ground wire to the motor. Bundle the wires back together with electrical tape, then replace the motor in the headstock, reversing the procedure you used to remove it.

Figure 34. Grasp the strain relief with a pair of pliers and compress it so that you can pull both the strain relief and the old power cord out of the motor pan.

Figure 35. Wrap the strain relief around the new power cord about 18" from the 'wire connector' end (the end opposite the plug).
How to Replace the Motor

To replace a burned-out motor (504302), follow exactly the same procedure described in "How to Replace the Power Cord" in this chapter. However, instead of reinstalling the old motor, replace it with a new one.

You'll also have to remove the lower sheaves (504207 and 504208) from the old motor shaft and install them on the new motor. In order to do this, you'll have to remove an extremely strong spring (509226). This is a two-man job and can be dangerous if done improperly. If you wish, send the old motor back to us when you order your new one. We'll have our Product Reconditioning Department switch the floating sheave from the old motor to the new one for a small fee, then send it back to you fully assembled. This will save you time, and eliminate a possible hazard.

Should you wish to remove the spring yourself, first get a helper. Make sure that both you and your helper are wearing eye protection, then follow this procedure:

1. Make a 'spring retaining' board and post. Drill a 1" diameter hole in a board 3/4" x 2-1/2" x 16". This board can be used to compress the motor shaft spring (509226) so that you can remove and replace the retaining ring (501645). Also hammer a small finishing nail into the end of a 3/4" diameter x 12" long dowel so that 1/8"-1/4" of the nail sticks out of the end of the dowel. (See Figure 36.) This will help you guide the spring on and off the motor shaft.

Figure 36. Following these drawings, make a 'spring retaining' board and post to help you remove the lower sheaves from the motor.
2. Remove the retaining ring.
Stand the old motor on its back end, motor shaft pointing up. Place the hole in the board over the motor shaft and have your helper press down with both hands against the washer and spring. Remove the retaining ring from the end of the motor shaft using C-ring pliers. (See Figure 37.)

When you have removed the ring, hold the 'spring retaining' post firmly on the motor shaft so that the head of the finishing nail rests in the hole in the end of the shaft. Have your helper slowly release the tension on the spring, raising the board so that the washer (504565) and spring ride up the post. (See Figure 36.)

WARNING: Be careful that neither you nor your helper hold your faces or any other parts of your bodies over the motor in case the motor shaft spring flies off.

3. Remove the sheaves and other parts. When the tension is completely relieved, remove the washer, spring, floating sheave, stationary sheave, and long key (504208) from the old motor shaft.

4. Install the sheaves on the new motor. Insert the long key into the groove in the new motor shaft. Slide the stationary sheave onto the shaft, and tighten the Allen screw. (The stationary sheave should be 1/8" - 1/4" away from the motor housing.) Then slide the floating sheave on the shaft and make sure the sheaves mesh properly. (If they don't, refer to "How to Align the Lower Sheaves" in this chapter.) Slide the spring onto the shaft, and put the washer on top of the spring.

Place the 'spring retaining' board on top the washer so that the hole in the washer is centered in the hole in the board. Put the 'spring retaining' post on the motor shaft. Have your helper compress the spring onto the shaft. When the spring is completely compressed, remove the post and install the retaining ring. Slowly release pressure on the board just in case the retaining ring doesn't hold.