

Installation of Retaining Rings Using Manual or Automated Methods

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 (Photos courtesy of Rotor Clip Company)

Design engineers often specify retaining rings to replace more expensive fasteners and eliminate costly machining operations. But the full potential for savings is dependent upon another factor: the assembly method you use to install your retaining rings.

Hand tools—pliers, applicators and dispensers—are used exclusively in some plants because they assure fast, economical ring assembly. Other plants rely on automated installation equipment to meet volume requirements. Choosing the best tool can speed assembly, assure accurate ring installation and greatly increase your company's production volume.



Fig 3

Applicator tools are used to install retaining rings that do not have lug holes.

Product design also has a direct effect upon assembly tools and methods. If a ring must be seated in a groove, location of the groove often determines whether or not the fastener must be installed with hand tools. A ring installation where the groove is accessible before and after other parts are assembled is vastly different from a design in which the ring will be surrounded by other parts. How the ring will function also is a factor: a flat ring assembled on a shaft against other components can be installed differently from a bowed ring used to secure adjacent parts under spring pressure.

Finally, you get into the economics of production volume and the relationship of ring installation to other assembly processes. How many rings must be assembled per minute...per hour...per year? Are parts assembled at work tables or along mechanized conveyor lines?

The answers to all the questions above will determine the type of retaining ring tool that is best suited for your application.

Pliers for Axial Assembly of Internal/External Retaining Rings

Retaining ring pliers are among the least expensive, most useful all-around tools for installing and removing axial-type rings. Most can be used for more than one ring type and size. The pliers have formed handles for operator comfort and adjustable stops to set the tip spacing for the specific ring being assembled. A spring returns the tips to the original setting after the ring



Fig 1 and Fig 2

Pliers with special tips use the lug holes of axial retaining rings to install them into grooves.

Factors to Consider in Tool Selection

Before selecting tools, you should evaluate certain factors that affect every assembly line. The first is the ring type your operators will be handling. Most axially-installed rings—the kind seated inside a bore or housing or slipped over the end of a shaft—have special lugs with holes for pliers (**Fig. 1**). The lugs serve as a device for holding the ring and positioning it for ultimate release in the groove (**Fig.2**). Radially-assembled rings don't have any lugs and require a different assembly method and tool (**Fig. 3**)

Ring size is another important factor. An external ring for a .125 inch (3.175mm) diameter shaft is a relatively small fastener and must be handled carefully to avoid overspreading during installation. A 5 inch (125mm) ring, on the other hand is a hefty spring-steel part which needs substantial force to be expanded or contracted for assembly like the special ratchet plier shown in **Fig. 4**.

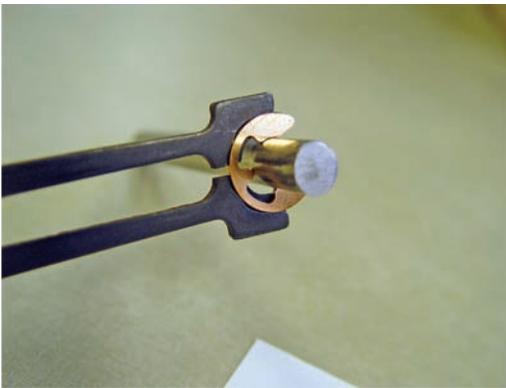


Fig 4

Heavy duty ratchet pliers provide enough force to install large axial retaining rings.

**Fig 5**

Pliers to install internal retaining rings (top) and external retaining rings (bottom). The screw mechanisms on both act as “stops” to prevent the tool from over expanding (external) or over compressing (internal) the ring.

**Fig 6**

Applicator tool installing a radial ring into a groove.

**Fig 7**

Dispensers hold taped stacks of retaining rings which can be ejected one at a time using an applicator tool.

is installed and pressure on the handles is released. This last feature is especially important for high-speed assembly because automatic re-setting of the tips enables the operator to pick up the next ring without adjusting the tool.

While most retaining ring pliers look deceptively simple, the geometry of retaining ring pliers is highly complex. Tips are shaped carefully to assure maximum grip on the ring and are hardened for better performance and durability. Jaws are designed to avoid twisting and the pliers provide the best possible combination of mechanical advantage and comfort in the operator’s hand.

Internal ring pliers are used to compress rings so they may be inserted into a bore or housing; external ring pliers expand rings for assembly over the end of a shaft or similar part. Both types have adjustable stops, as previously mentioned, which limit the travel of the tips (**Fig. 5**).

Dispensers and Applicators for Radial Assembly of External Retaining Rings

Radially-assembled rings are installed on a shaft or other part directly in the plane of the groove and require different assembly methods. Since there are no lugs with holes for pliers, you need another kind of assembly tool to pick up the ring, hold it securely while it is being installed and then release it when it is seated in its groove.

Radial ring applicators serve this purpose. The applicators have a split, fork-like blade with a milled recess on the underside (**Fig. 6**). The tool is used to pick up the ring and carry it to the work. Because the ring’s gripping power in the groove is greater than the gripping power of the blade, the ring remains in the assembled position when the ring is seated in a groove and the applicator is withdrawn.

Applicators are designed to be used with the dispensers. Radial retaining rings must be purchased as tape-stacked or shrink wrapped cartridges in order to be loaded onto the dispenser (**Fig. 7**). The operator merely places the cartridge on a rail on the bracket and permits the rings to slide down to the base. When the tape wrapper is removed, the rings are ready for use.

Automatic Assembly Tools

Higher productivity can be achieved using pneumatic retaining ring tools (**Fig. 8**). These pneumatic hand tools automate assembly using a compressed air line (85 psi). They consist of a power pack and tips which open and close in response to a control usually located on the body of the tool. They can also be used on internal/external, inch/metric retaining rings (axial, with lug holes).

The demands of high volume assembly sometimes require that a company design and build its own automated retaining ring assembly equipment. Before designing and building such equipment, however, contact the manufacturer for a list of guidelines that should be followed to ensure maximum up time and problem-free operation.

It is strongly suggested to think ahead in terms of product assembly when considering retaining rings for your next application. In this way you can select retaining rings not only for their design advantages, but also for the cost-savings potential they offer on the production line.

**Fig 8**

A pneumatic tool uses compressed air to automatically install internal or external axial retaining rings.