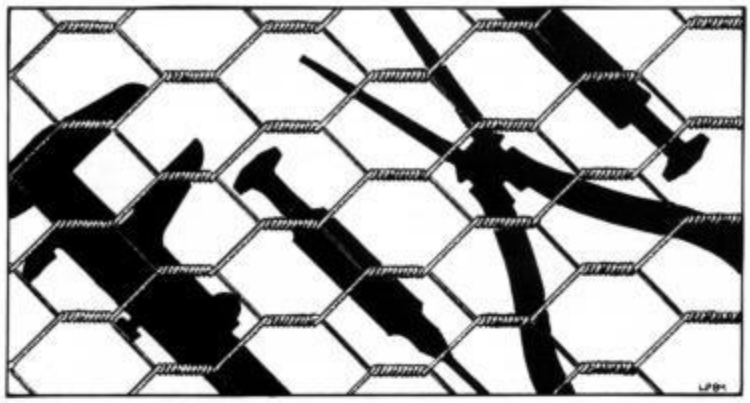

LENS REPAIR TECHNIQUES

by Yukio Ikegami

Photographic equipment has changed dramatically over the past twenty years. Brass, steel, leather and glass are now becoming obsolete as technology introduces new materials. The technology may change, but the basic tools and techniques of photographic repair are as valid today as they were years ago.

In the following article, I will discuss the tools and techniques of photographic lens repair. These tools and techniques are basic to the repair process. I strongly recommend the use of the proper tools and the proper techniques when repairing any equipment. The job will be easier as well as professional if the correct tools are used.

The technicians' tool bin should include a selection of the following: screwdrivers, hammers, rubber friction wrenches, lens cleaning tissue, syringes, glue and paint. Additional tools may be helpful as you discover the techniques that work best for you.

SCREWDRIVERS

One of the major causes of scratches and damaged screw heads is the use of screwdriver blades that don't fit. Japanese manufacturers are now using standard screws with standard slot sizes. The various manufacturers of screwdriver blades don't always use the same standard sizes and sometimes, the blades will not fit the screw heads correctly.

I suggest that you grind your own blade for proper fit. When grinding your own blades, there are two things that should be considered: 1) The diameter of the blade head and shaft should be slightly smaller than the screw head; 2) The blade should fit the slot tightly as shown in Figure 1.

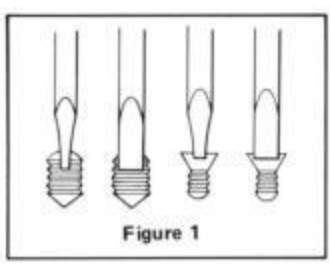

Figure 1

Tool Crib

HAMMERS

A wood or rawhide hammer has many uses in the repair shop, especially with lens repair. This type of hammer can strike smooth surfaces without damaging the threaded areas. Common uses for wood or rawhide hammers include smoothing rough spots from helicoid assemblies while the lens is still assembled, and reshaping small pieces of metal such as filter rings and diaphragm stop-down levers.

Rawhide and wood hammers are available in several sizes and weights. I suggest a wood hammer with a head size of approximately one and one-half inches diameter and three inches long. The head should be made of a good, hard wood such as oak or maple.

RUBBER FRICTION WRENCHES

Rubber friction wrenches are a necessary tool for the lens repair technician. Rubber friction wrenches come in many sizes. The rubber friction wrench is often used when conventional spanners won't do. The rubber friction wrench works well to remove name rings, lens assemblies and some retaining rings. You can expect to get the same strength and torque as a steel spanner when the correct size friction wrench is used for the job. The rubber friction wrench will not leave tool marks that are often caused by other wrenches.

SYRINGE

A very useful tool for the technician's bin is the syringe. There are two common types of syringes, glass and plastic. They are excellent for dispensing such things as glue, paint and acetone. I recommend the glass syringes because the glue won't stick to them and the paint won't stain them. However, before filling the syringe with glue, it should be lubricated with a very thin grease to prevent the plunger from sticking. The two popular sizes of syringes are 5cc and 10cc. A selection of sizes and contents will keep your materials at hand for easy use.

LENS CLEANING TISSUE

As simple as it may sound, lens cleaning tissue is a very important tool. Many repair shops may use ordinary tissue for cleaning. I do not recommend common tissue for cleaning lenses for several reasons: 1) They come apart in chemicals, leaving lint residue in hard to reach places, making more work for you; 2) Ordinary tissues absorb too much cleaning solution causing you to use excessive amounts of solution. I recommend

genuine lens cleaning tissues or a brand of tissues known as Kimwipes. Both of these tissues clean very well and leave minimal amounts of lint.

GLUE

There are two excellent adhesives that I recommend for lens repair. Three Bond of America, Inc. distributes these adhesives: No. 1401 for sealing retaining rings and lens screws; and No. 1303 for sealing and setting lock screws, lens mounts, helicoid to rear mounts and zoom guides. Adhesive No. 1303 hardens when in an airtight area. This adhesive may dry out if placed in a syringe, so use this adhesive in the container that it comes in. Adhesive No. 1401 may be transferred to the syringe for easy use.

PAINT

Basically, there are four types of paint you should stock in the repair shop. They are: Flat Black Resin Paint, Water Base Paint, Black Enamel, and Flat Black (very flat).

The flat black resin and water base paints are used for painting the edge of optics. The black enamel is used to cover the outer ring set screws and general appearance touch up. The very flat black paint is used for the inner housings and anywhere there may be a problem with reflections. This extremely flat black is available through Vivitar Central Parts Service.

REPAIR TECHNIQUES

I would like to pass along a few helpful hints that have worked well for me and should make your work easier. These techniques, with the above materials and tools, should provide good results.

REPAIRING DENTED FILTER RINGS

The best solution for impacted filter rings is replacing them with new ones. It is possible to re-form the impacted rings so that they are functional again.

A special tool made for re-forming an impacted area is the Vivitar Body and Fender Kit. To straighten the filter frame, set the impacted area of the lens into the correct size cutout of the block, impacted side down. Strike the hardwood wedge with a wood or rawhide hammer to pound out the dented area of the filter frame (Figure 2). Pound out the dent slightly

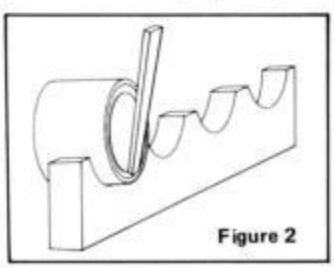

Figure 2

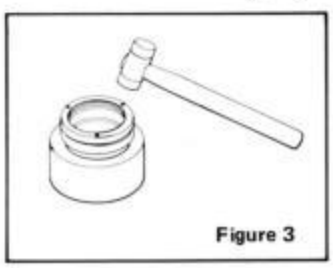

Figure 3

Yukio Ikegami began his career in optics at Tokyo Koki Seisaku-Sho (now Tokina Optical) as an assembler in 1965. He moved to the production department where he worked as an engineer in mechanical and optical production. Mr Ikegami has worked in the product development area on prototype lenses, training the assembly line and QA of product. In 1970, he came to Ponder & Best (Vivitar) as a factory representative. Mr. Ikegami left Tokina to work at Vivitar in 1979 as a Senior Technician. His invaluable experience in lens production and repairs has enabled Vivitar to provide quality services and, in 1981, Mr. Ikegami became Supervisor in the Optical Services Department.

larger than the ring diameter. Then lift the filter frame from the block and, using the hammer, carefully pound inward on the outer metal frame (of the impacted area) to make the ring as round as possible with the edges straight. Don't use any metal instruments for this procedure because they may cause major damage to the filter threads or cosmetic damage to the part being repaired. When you use the block for lens re-forming, be sure that the impacted area is not resting on the block.

The Thread Chaser is a handy tool to clean threaded portions of filter rings after re-forming them with the Body and Fender Kit. The Thread Chaser is also available through Vivitar Central Parts.

Any time you repair impacted areas of lenses, you should double check for internal damage, especially to the male threads of the helicoid assembly rings.

REPAIRING DAMAGED HELICOIDS

Minor damage to the helicoid assembly can be caused by sand or impact. As long as the damage is not too severe, the helicoid can usually be saved by using lapping compound to smooth out the rough areas.

The first step in repairing a damaged helicoid is to disassemble the lens, taking care to mark the place on both helicoid parts where they come apart. Wash the helicoid thoroughly with trichlorethelene. Then, mix some lapping compound with oil or thin grease and apply a thin coat to both sides of the helicoid threads. Assemble the helicoid and work back and forth several times. It may be necessary to repeat this process several times to achieve smooth results. Use caution when lapping the helicoid. Too much play in the lens can result from overlapping the helicoid.

If the helicoid is cross-threaded by impact and you want to save it, remove the helicoid guides and any other moveable parts. Place the cross-threaded helicoid on a flat steel block and pound down the high side of helicoid using a wood hammer (Figure 3). Assemble and lap the helicoid assembly. You will hear a slight clicking sound when the threads are in the correct position. After lapping be sure to clean all lapping compound from the helicoids.

To reassemble the helicoid, find the position you marked earlier and assemble while checking for smoothness. If the helicoid is still rough, repeat the lapping process once again.

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PAINTING THE LENS ELEMENTS

Not all manufacturers offer replacement optical elements that have painted edges. It is often necessary to paint these edges or touch up areas of lens elements. There are two types of paint that I recommend for painting the edges of elements: A water base and a resin base paint.

The resin paint is used only for painting the tapered edges of lens elements. It may be necessary to apply a thin coat of flat black paint over this resin paint to reduce any possible flare.

Before painting the optics, first consider the best way to hold it while painting. I suggest the use of a motorized base (Figure 4). This base is simply a box that holds a motor which is restricted to 60 rpm or less. The motor optic painting unit has several different platforms to hold the various sizes of optics while painting.

Carefully clean the optic edge to be painted with a freon/methanol mixture. If the edge is not completely cleaned of all fingerprints or substances, the paint may separate or not stick to the element.

To paint the element, choose the proper size platform and place it on the motorized painting unit. Carefully center the element on the platform.

The water base paint is used for the optic edge. The drying time for this paint is approximately 15 minutes. (If you are re-painting optic elements that have been water damaged or the paint is separating, soak the element in a resin paint thinner or acetone until the paint is soft and can be removed with a razor blade. Carefully clean the surface and apply the paint.)

The resin paint is used only for the beveled edge of an element. This paint adheres to the edge better, however, you must use caution not to apply too much paint or the element may not fit properly in its housing. This paint must dry naturally. It should also be allowed to dry overnight. Resin paint is very difficult to remove once it has dried. Acetone will not remove resin paint after it has dried, so use caution.

CLEANING OPTICS

Use a genuine lens cleaning tissue for the best results. A cleaning solution consisting of 70% freon and 30% methanol will not harm plastic name rings. Do not use a mixture of less than 60% freon because too much alcohol may cause spotting. Additional cleaning solutions that work well are ether/methanol and acetone/thinner, however, these mixtures may cause damage to plastic areas of the lens.

To clean the optic, fold the cleaning tissue around your finger and apply the cleaning solution to the tip of the tissue. Start cleaning the lens from the center in an increasing circular motion towards the outside edge. Repeat this procedure until the lens is completely clean.

To clean optics while they are still in the lens housing, wrap a sheet of lens cleaning tissue around the tip of straight tweezers and dip the tip of the tissue into the solution. Then reach into the housing with the tweezers and clean the element as described above.

Cleaning minor fungus and water spots from the elements can be accomplished by using light face oil. Rub your fingers on your face to pick up the oil, and then polish the element with your fingers until the fungus or water spots dissolve. After removing the spots, completely clean the optics with cleaning solution and tissue.

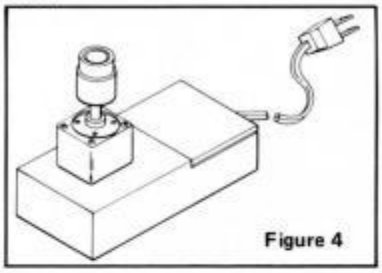

Figure 4

ADJUSTING LENS FOCUS

Whenever you make an adjustment to a lens, be sure to check the focus. You can either use a collimator or a camera body of known accuracy to check the focus of the lens. Check the tolerance of the infinity focus. The chart on page 23 lists the tolerance for all focal lengths.

Single Focal Length Lenses – the most common way to focus this type of lens is by limiting the amount of travel of the helicoid assembly and adjust the focus by one of the following methods: 1) Look for the setscrews on the focusing ring or under the focusing grip and loosen the screws. Move the helicoid to the correct position, tighten the setscrews and check the focus once again. On some of the older model lenses, you must drill and tap new holes for the new infinity position. 2) If there are no setscrews on the focusing ring, remove the name ring or the filter ring and look for the screws that hold the focusing ring to the helicoid assembly. There are usually three screws that you can loosen to adjust the infinity focus. Once again, check the focus of the lens after the adjustment.

Zoom Lenses – adjusting the focus of a zoom lens is more complicated than the single focal length lens. Usually, there are at least two adjustments you must make to focus the lens, the long focus at infinity and the short focus at infinity. There are several ways that the distance between the lens flange and the helicoid are restricted at the short focal length of the lens. Lenses may have a helicoid stop located just above the aperture ring under a cosmetic covering tube, shims between the flange and rear lens mount or, a ring attached to the lens mount which acts as a helicoid assembly stop to restrict the distance between the lens mount and the helicoid assembly. Adjust the focus at infinity of the short focal length by altering one of the above distance restricting settings, depending on the construction of the lens. After this adjustment is made, it is then necessary to adjust the long focal length at infinity by either adjusting the position of the helicoid in relationship to

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the focus ring infinity stop or by adjusting the position of the element. Always go back and check the short length focus after you have adjusted the long focal length. One focal length adjustment will affect the other, so it is necessary to go back and forth between the short and long focal lengths to adjust each until both are focused correctly at infinity.

I hope you find these recommendations of tools and techniques helpful with the repair of your lenses. I invite you to test these procedures and, I invite your comments on what we hope will be a helpful section of the Vivitar Service Spectrum. ■

Focusing Tolerences

Wide Angle	Standard	Medium Telephoto
–0.00mm +0.03mm	–0.00mm +0.02mm	–0.00mm +0.06mm
Long Telephoto	**Zoom Lens**	
–0.00mm +0.10mm	–0.00mm +0.10mm	