TIP 50a — Adding a Microscope Ring Light/Roger Ronnie

Florescent ring lights put the light right where you need it

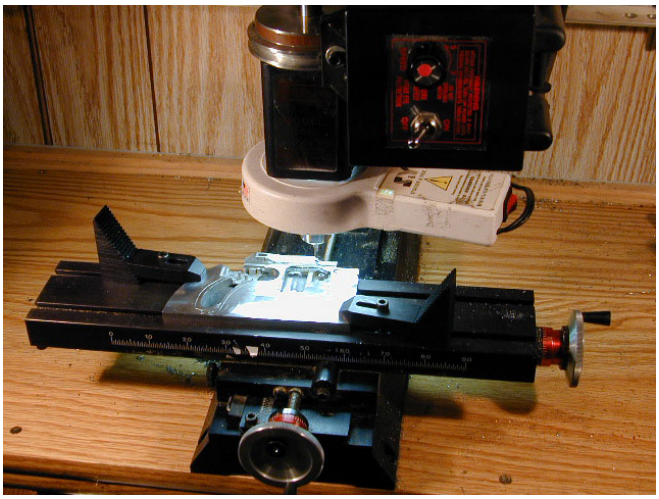

Photo 1—Ring lights are made to be installed around a camera lens to give even lighting for photos, but these small lights work well on a mill too.

The small 3" florescent ring light shown mounted to Roger Ronnie's mill is made by Stocker & Yale and is called a "Lite Mite". It was designed for use on a microscope. Although Roger found this one used one on eBay at a great price, they are also available new. One supplier we found through a Google search for “Stocker Yale, Lite Mite” is LabTek at **www.labtek.net**. Maybe you'll get lucky and find one on eBay too. They are available in various color temperatures of light from daylight (5100 K) to 3200 K, black light, yellow (photo resist) and high frequency models for less “flicker.” The lamps should last about 7000 hours, but as Roger notes they are a bit “spendy” if a replacement is needed— about $38 each.

Roger mounted his light to the bottom of the headstock with two screws. After he mounted it he figured he could have put a little more thought into the mounting system and used some oversize holes with radial slots that would allow him to install and remove the light without taking the screws all the way out, but he says this is still easy to remove if needed.

Some of the newer ring lights for microscopes and cameras are turning to LED illumination instead of florescent. This offers the additional advantage of producing less heat, although the ones we found for cameras and microscopes in searches of the Internet were rather expensive— in the $300.00-$475.00 range.

— Roger Ronnie,

Rapid City, SD

Another way to attach the light/Bill Maxwell

Bill Maxwell of Brighton, Michigan took a look at Roger's tip above, bought a light and attached it, adding an easy way to remove it. He attached an angle bracket using the lower motor mount screw and then used three rare earth magnets that he obtained from Lee Valley Supply to attach the light. That way the light just pops on and off without having to deal with any attachment screws. He also repainted the light to match the black finish of the Sherline mill. Bill says he has also now placed some aluminum foil between the light and the mill head to reduce the distraction of the extra light that leaks through that space and is looking for the right scrap of aluminum to machine a better looking piece to fill that gap.

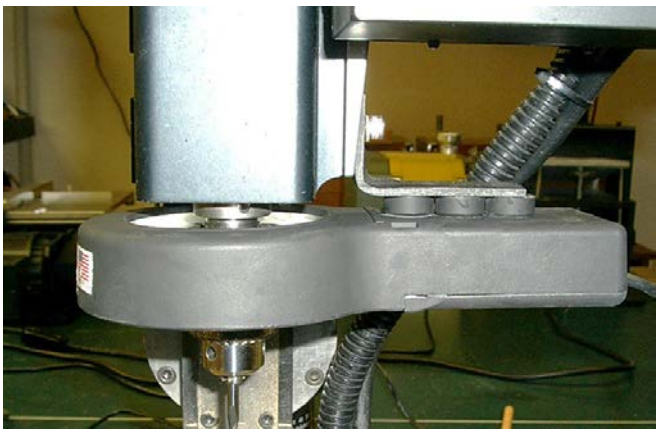

Photo 2

Continued on Page 2

TIP 50b — Making an LED Ring Light/Perry Murlless

Making an LED ring light for your Sherline Mill

Richard Perry Murlless is a technical writer who submitted a nicely done file in PDF format on how to make your own ring light for about $92 in parts and tools. If you already have a slitting saw and some of the parts like wires and heat-shrink tubing it would be even less. This is a substantial savings over purchasing a new microscope ring light. He even gives you Radio Shack part numbers and material sources in his list.

To view his PDF file please continue to the following pages.

Making A Ring Light For The Sherline Lathe/Mill

Introduction

The Sherline website describes in its *Tips from Sherline Machinists* (Tip 50 – Bright, even light for your mill—Roger Ronnie), how to use a commercially available ring light to illuminate the area around a part being machined. I found this to be a great idea except that, for me, the price was prohibitive and the ring light was too thick and wide for my taste.

Several years ago, I read an online article describing how to make a ring light out of light emitting diodes (LED) for use on digital cameras. I subsequently made one out of aluminum on my Sherline and have since used it often to make close up photos of my models and machining projects.

I decided that I would use the same method to make a ring light for my Sherline, with the following modifications:

- Substitute acetal for aluminum
- Use brighter LEDs
- Easily removed from the headstock

Setup

1. Using a faceplate as a template, on one end of a 3” diameter x 2” thick piece of acetal, mark 3 slots for the faceplate.
2. Using a 7/16” drill, make a hole, ½” deep at the approximate center of each slot.
3. Square up and secure the acetal to the faceplate with 3/8” #8 pan head sheet metal screws with washers. See Figure 1: Faceplate Mounting, below
4. On the lathe, face and turn the acetal to 3” diameter.

Figure 1: Faceplate Mounting

Cutting The Center Hole

1. Center your rotary table on mill and mount faceplate with the acetal attached.

2. Use a ¼” square end mill to cut a 1 ¼” diameter hole 5/8” deep. See Figure 2: Milling Center Hole, below.

Figure 2: Milling Center Hole

Machining For The LEDs

1. Use a 5/16” end mill to cut a slot .200” deep, 1.2185” from the center point of the ring. See Figure 3: Milling The LED Slot, below.
2. Use a 3/16” end mill to pilot drill the holes for the LEDs, .15” deep. My #10 drill (.1935”) would not fit in the space between the ring and the mill head, so I finished drilling the holes after the ring was cut from the acetal block. Rotate the rotary table the appropriate number of degrees for how ever many LEDS you will use and drill the next hole.

Figure 3: Milling The LED Slot

Milling The Wire Exit

1. Use a 3/16” ball-nosed end mill to cut a single slot .15” deep between the depression for the LEDs and the outside wall of the ring. Center this slot equidistant between any two LED holes.

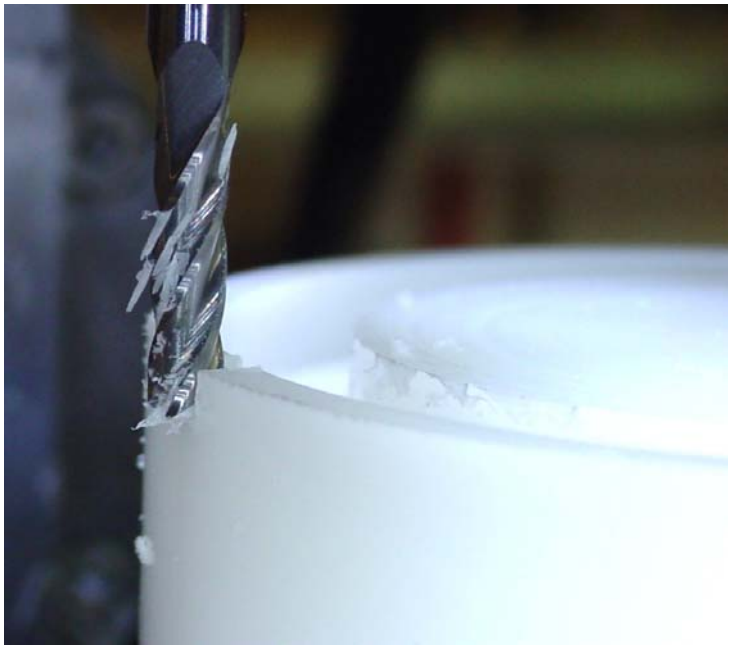

Figure 4: Power Connector Wire Exit

Cutting Off The Front Ring

1. I used a 3” diameter slitting saw, .032” thick with a ½” arbor hole to cut off the front ring at .35” thick. About 1/3 of the way through the cut, the saw blade began to bind. I tried lubricating the blade with alcohol. This helped somewhat but, after cutting about 2/3 of the way through the material, there was too much friction between the blade and the acetal so I backed the blade out of the material, lowered it an additional .035” and repeated my cut until it was at approximately the same point as the first cut. I then returned the blade to its original height and finished cutting through the material.

Figure 5: Cutting Off The Ring

Forming The Back Ring

1. Using any convienent end mill, clean up the top of the acetal remaining on the faceplate. This can also be done on the lathe if you want a superior finish.
2. To avoid interfering with the bearing washer mounting screws, use a 3/16” end mill to drill 2 .05” deep clearance holes .943” from center and 180 degrees apart. If you will use magnets to hold your ring light to the headstock, you should create mounting holes for them at this time. The magnets I used were 6 mm in diameter by 2 mm thick, so I used a ¼” end mill at 0.9” from center to drill holes approximately 0.0785” deep. I used 2 magnets, 180 degrees apart from each other and 90 degrees apart from the mounting screw clearance holes.
3. Using a similar technique to the one described in Cutting Off The Front Ring, above, I cut off the back ring so it would be .100” thick.

Figure 6: Finished Front & Back Ring

Preparing & Soldering The LEDs

1. Bend both LED leads 90 degrees in the same direction, 3/16” from the base of the LED. Do this so that all the short leads (cathode) are on the same side and facing the same direction when viewed from the top of the LED.
2. Trim LED leads so that the horizontal portion is ¼” long.
3. Gently insert the LEDs into the front side of the front ring with the leads pointing counter-clockwise around the ring. This will secure the LEDs in the correct positions for soldering.
4. Solder all the LED anodes together with #26 solid wire with cut lengths of heat shrinkable tubing slid over the wires between solder connections. Leave a ½” “pigtail” of wire at the end of the LED string for the power connector leads.
5. Repeat the previous step for all the LED cathodes.
6. Solder the power connector leads to the pigtails. The results should look similar to those shown in Figure 7: Soldering The LEDs, below.

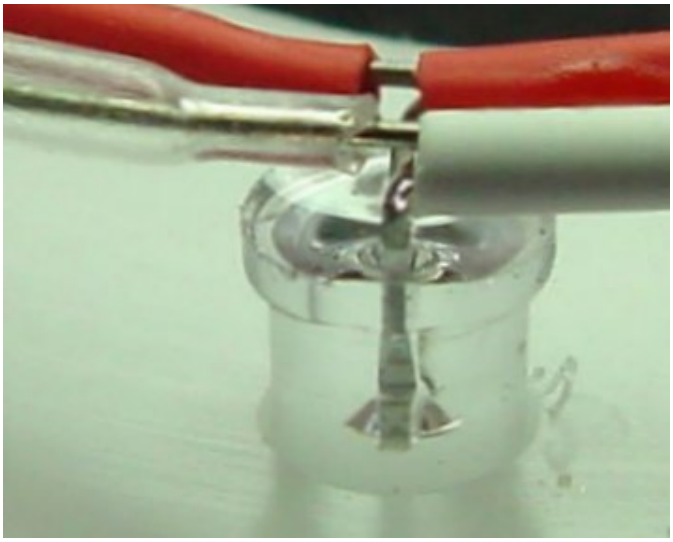

Figure 7: Soldering The LEDs

Installing The LEDs

1. Gently remove the LED string from front of the front ring.
2. Flip the front ring over and firmly press the LEDs into the holes, remembering to line up the string so that the power connector leads rest in the wire exit.
3. If your LEDS do not fit snugly in their respective holes, apply a small amount of cyanoacrylate glue between the base of the LED and the light ring.
4. Apply a small amount of gap-filling cyanoacrylate to the contact point between the power connector lead cutout and the power connector leads. This will act as a strain relief.

Attaching The Front & Back Rings

5. Mount the front ring face down in a 3 or 4-jaw chuck. GENTLY close the jaws so that the front ring is held captive but not distorted.
6. Test fit the back ring by dropping onto the front ring secured in the chuck. This will align the two rings.
7. Remove the back ring and apply a thin line of gap-filling cyanoacrylate glue to the area between the center hole and the inner edge of the LED slot.
8. Drop the back ring onto the front ring and press down until the glue sets. I used an extra chuck with its jaws adjusted to rest on the back ring near the center hole.
9. When the glue has set, you can remove any excess from the center hole by scraping it off with a hobby knife.

Finishing Up

I used 6 LEDs in my light ring and, as you can see in Figure 8: Ring Light In Use, below, they provide enough light to illuminate the work area. You can use more LEDs but if you do, be sure that the sum of the LED currents (25 mA x number of LEDS) does not exceed the current capacity of the power supply.

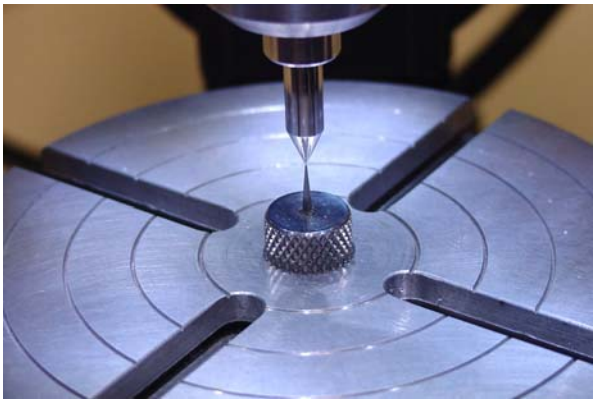

Figure 8: Ring Light In Use

Bill of Materials

Part	Description/Number	Vendor	Cost
Acetal Plastic	3” x 2” Natural	Onlinemetals.com	$10.04 + $1.50 cut fee
LEDs	5mm White, 11000 mcd Water Clear Lens. Number: 67-1695-ND	Digikey.com	$1.47 each.
Power Supply	3 volt, 700 mA Wall Adapter Number: 273-023	Radioshack.com	$18.99
Power Lead	6” Power Lead. Number: 273-1742	Radioshack.com	$3.39
Wire	Pretinned Solid Bus Wire (24AWG). Number: 278-1341	Radioshack.com	$2.99
Head Shrink Tubing	Multicolor Heat-Shrink Tubing (12-Pack). Number: 278-1610	Radioshack.com	$2.99
Slitting Saw	4” x .032” x ½” arbor, 220 teeth, HSS. Number: 73302325	Mscdirect.com	$23.31
Magnets, 6mm x 2mm (2)	Neodymium Super Magnet, Small Kit. Number: 250 0778	Cyberguys.com	$29.95

LED Nomenclature & Symbology

If you are unfamiliar with the nomenclature and symbology for the standard T 1 ¾ LED package, Figure 9: LED Nomenclature & Symbology, shown below, should help.

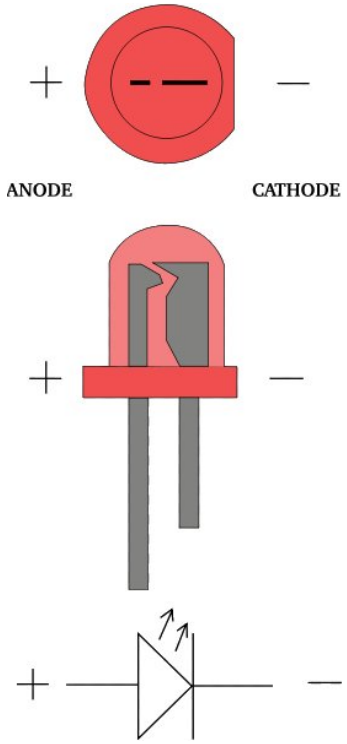

Figure 9: LED Nomenclature & Symbology