A Woodturning Project

MAKING A KALEIDOSCOPE

Presentation to Glendale Woodturners Guild
Sunday, January 13, 2002

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I. Overview: History and Current Interest, Types of Scopes

II. Components for this Scope: wooden barrel (turned), mirror system, object chamber, brass ends.

III. Step-by-Step Instructions

1. Begin by gluing together four pieces of hardwood (your choice) measuring 10 1/2 inches long into a square. The "side" pieces should be 1 3/8 inches wide and, depending on the thickness of the stock, not less than 3/4 inches, the "top" and "bottom" pieces 3 inches plus wide. Each of the four inside dimensions should be 1 3/8 inches.

2. "Chuck" the blank into the lathe using tapered square and centered softwood plugs, press fitted into the ends of the blank. I use a threaded Morse taper #2 center at the drive end of the lathe.

3. Turn the blank round to a final finished diameter of 2 3/16 inches.

4. Secure one end of the former blank, now barrel, to a chuck (mine is a Nova) at the drive end of the lathe and then secure the other end via a center rest--mine is a homemade one made with three skate wheels, design courtesy Al Sils and Don Comer.

5. Place a 1 7/8 inch Forstner bit in a drill chuck in the tail stock and wind it into the end of the barrel to a depth of about 3/4 to 1 inch.

6. Bandsaw the end of the barrel where the chuck jaws have bitten into it to a finished length of 9 1/4 inches, including truing the ends on a disc sander.

7. Turn a large dowel, 2 inches diameter minimum, and bandsaw it to about 2 inches long, then chuck it at the drive end and taper it slightly so the round circle you have just drilled in the barrel will fit snugly over it.

8. Chuck the barrel at this end, with the former tailstock wedge at the tailstock end and with a parting tool cut a shoulder or rabbit at each end 1/4 inch wide and 3/32 inch plus deep.

9. Fit the .040 brass ends, 2 1/2 inches outside diameter, (obtained from the author) on each end and disc sand as needed for a close fit. Note, the length dimension of the barrel is not critical in this regard.

10. Obtain three first-surface mirrors (from the author) 8 1/2 inches long and 1 3/16 inches wide.

11. Lay the mirrors, first-surface down, on the table, space them 1/16 inch apart and connect them with three strips of 3/4 inch masking tape. Turn over, peal off the protective film starting at the corner, and swab each mirror with acetone or Bestine (trademark for a rubber cement solvent).

12. Fold up mirrors, holding them at each end, from back to front, each edge on top of the next one forward. Tape closed and hold up to see that all triangles have straight lines. If a line is wavy it signals that the mirror is slightly "bent;" untape and fold again. Then tape close to both ends and the middle with standard duct or furnace tape. Next, using two-sided Scotch tape, put three rings, each about an inch wide, of single-thickness felt around the mirror assembly.

13. Obtain three lenses (from the author), two plain glass, one frosted glass, each 1 3/4 inches in diameter and one copper spacer ring (from the author), also 1 3/4 inches in diameter and 3/8 inches long .

14. Select 36 pieces of melted-round stained glass (from the author) from eight or ten colors for the object chamber according to taste and preference. Study the colors available to see what combination you might want. Colors include: three shades of blue, two red, two green, two yellow or amber, and one orange.

15. Glue one of the clear glass lenses to the copper ring using silicone, available in a tube at hardware stores. Do not use epoxy. Silicone is used because it is easy to disassemble the scope and repair it as needed.

16. At the eyepiece end of the barrel, cut a square piece of clear glass to fit the square interior and "tack" it at each corner with a drop or two of silicone so it is level with the wooden end. Then after dry and firm run a bead of silicone along each side.

17. Using an aerosol can of "dry" air" (Radio Shack) blow out the dust from the mirror system and insert it into the barrel toward the eyepiece. Twist to line up with the 3/8 inch eyepiece at the other end. Secure the mirror system by tamping rubber bands on each side of the mirrors with tweezers, making sure the mirror system is close to the top of the barrel.

18. Put the 36 stained glass "beads" into the object chamber, put the frosted glass , on top, frost side down, and secure with a rubber band. Insert this assembly into the end of the scope, pushing down on the mirrors, cover with the open brass end and hold up to the

light.

19. Turn the scope to ascertain what combinations of patterns you prefer. Turn it left to right and then right to left. Ideally (in my judgment) half the time the scope will be entirely filled with glass, the other half, as you turn, will comprise triangles, octagons, circles, etc. interspersed with white space. Add or subtract pieces of glass as desired to obtain the right combination and/or colors.

20. Glue frosted glass lens to the object chamber with silicone. When dry push chamber down into barrel so that the mirror triangle is flush with the lens. The end at the eyepiece need not be so; in fact, there will be a little space in this setup, because your eye does not focus on much less than eight inches.

21. Attach brass ends with silicone. Voila! you have a genuine custom-made kaleidoscope.

IV. SPECIAL TOOLS REQUIRED

1. Glass Cutting Board A board made of two thicknesses of 3/4 inch birch plywood, measuring 15 x 22 inches. Across the long side, a 3/4 inch thick hardwood strip 1 1/2 inches wide x 22 inches long. Adjacent an aluminum strip 1 1/2 inches wide, 1/8 inch thick and 22 inches long. Drill and countersink screw holes just 1/2 inch center from the board edge of the strip so the plastic T bar on the glass cutter can ride over these screws.

2. Fletcher T Square Glass Cutter , listed as Circle Mate II, for cutting first-surface mirrors on the cutting board.

3. Fletcher Circle Glass Cutter No. 32 for cutting lenses.

4. Rapid Fire Kiln Model Six, Evenheat Kiln Inc. for melting stained glass.

5. Glastar Diamond Star Model Glass Grinder for smoothing edges of lenses.

6. Pistol Grip Glass Cutter for various glass cutting requirements.

#406 KALEIDOSCOPES

This drawing is our gift to you, from all the people involved in producing The American Woodshop®.

Blessings, Scott Phillips

Materials

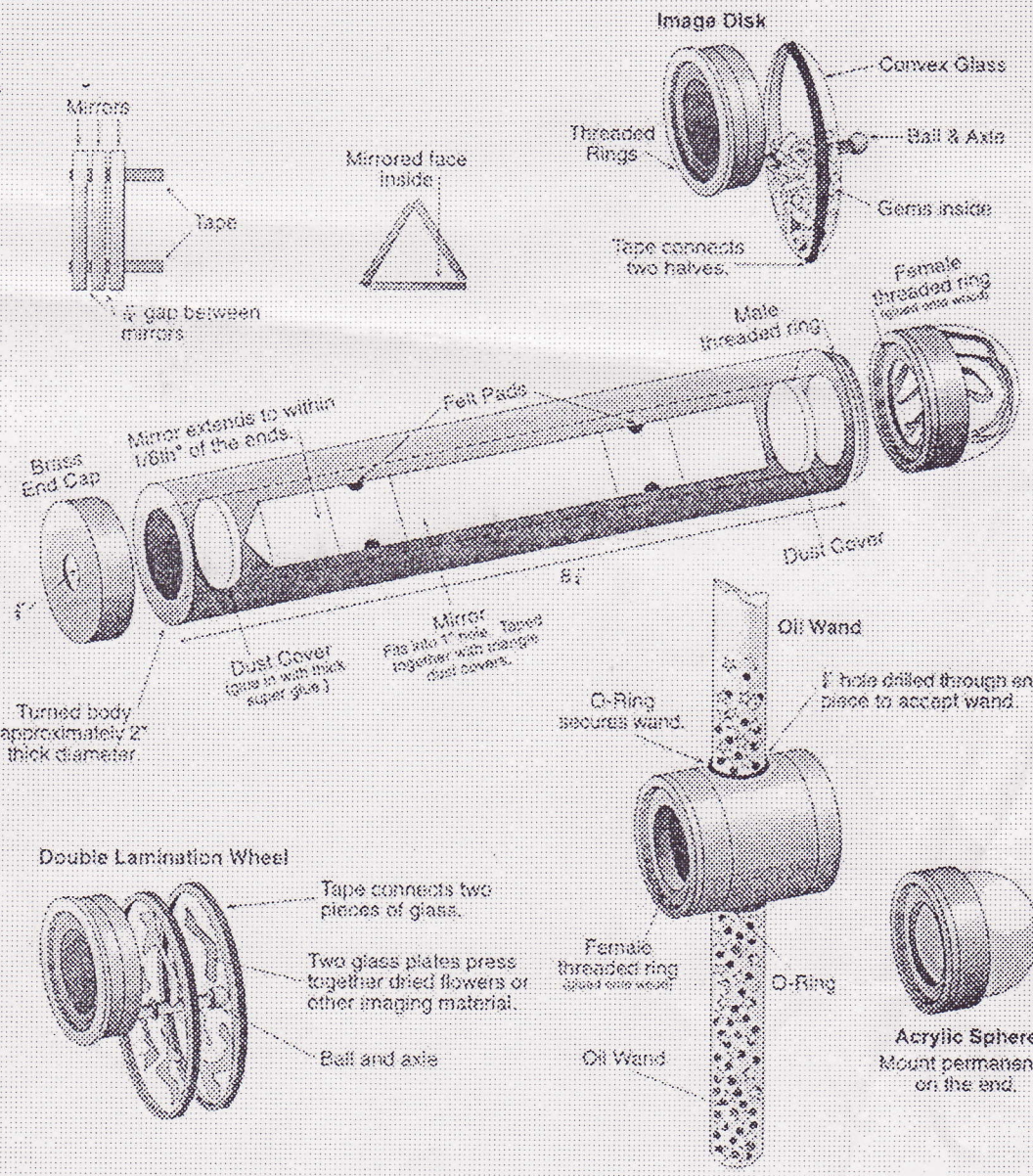
TIP: The only complete source for kaleidoscope parts that I know of is:

Penn State Industries
2850 Comly Road
Philadelphia, PA 19154
800 - 377 - 7297

Thanks to Penn State for their help.

THINK ABOUT SAFETY!

This plan is designed to help you make the Kaleidoscope. Enjoy your work! Read, understand and follow all product use instructions. Follow all tool and product guidelines and safety directions. Work safely!



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