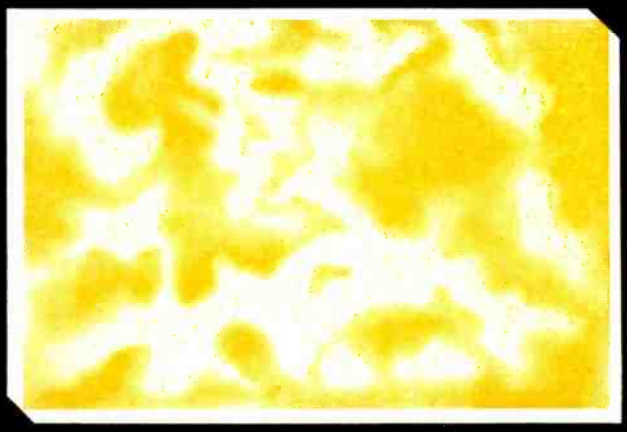


LOW-CO$T HI-FI COLOR ORGAN

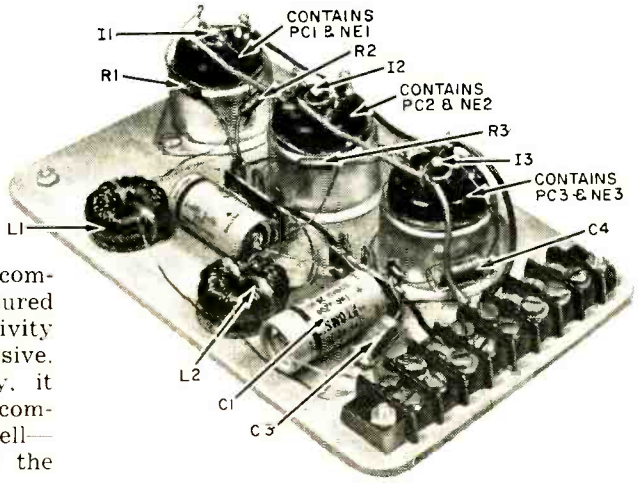
Bring hi-fi music to life with a light display that follows the sound. This unique circuit gives you 75 watts of light for less than $9.00

By DON LANCASTER

HOW WOULD you like to add the intricate patterns of dancing, colored light to your hi-fi setup? Now you can do so without spending a fortune thanks to POPULAR ELECTRONICS' low-cost color organ. To start at the beginning, a color organ is a device that sorts out the highs, the middles, and the lows from music and uses these notes to modulate (control) three colored light sources. You literally watch the music. By reflecting the light onto a broken display surface, the lights grow and dance with the changing pitch and volume of the music. By diffusing the light, the entire rainbow of colors can be produced.

To date, color organs have been expensive, complex devices, using SCR's, Biswitches, Triacs, or transistors as light modulators preceded by fancy tone filters. A simple control chassis meant a pitifully small display, perhaps one or two watts of light at most, while a larger one meant great cost and complexity. POPULAR ELECTRONICS' color organ, on the other hand, is very easily built, and should cost you less than $9 even if you have to buy everything brand-new. And the payoff is that the unit, operating from the speaker terminals of your hi-fi set, will control 75 to 90 watts of colored light!

Fig 1. The photo (right) indicates the approximate location of parts on the 1/4" x 4 1/4" x 7" piece of aluminum. The photocells are mounted under the shells (see text), which act as light shields. Wind L1 and L2 as described in text; mount them on a layer of tape or of other insulating material.



How It Works. To get away from complex design problems, the unit featured here has a fairly low input sensitivity so that considerable, but not excessive, audio drive is required. Secondly, it uses a fairly recent semiconductor component—the Delco LDR-25 photocell—and an unusual circuit to simplify the control chassis but retain a high power control capability.

Basically, the principle behind the color organ is use of the input audio to drive three pilot lamps and then *amplify the light to the display power level!* An inductance in series with one of the bulbs acts as a low-pass filter; a capacitor in series with a second acts as a high-pass filter; a third pilot lamp is made series resonant in the middle of the audio spectrum with an *LC* series filter.

The next step is to "amplify" the light output of the pilot lamps by "watching" each bulb with an LDR-25 photocell. These photocells control the power flow-

Fig. 3 (below) shows wired shield-socket unit with neon, pilot lamps in place. Fig. 4 (the mechanical drawing below the photo) shows how wound toroid is secured to base with lacing twine; 3/4" disc insulates it from heat sink. Fig. 5 (bottom drawing) indicates how leads are connected to terminal strip using "Y" lugs. Spaghetti sleeve must be employed.

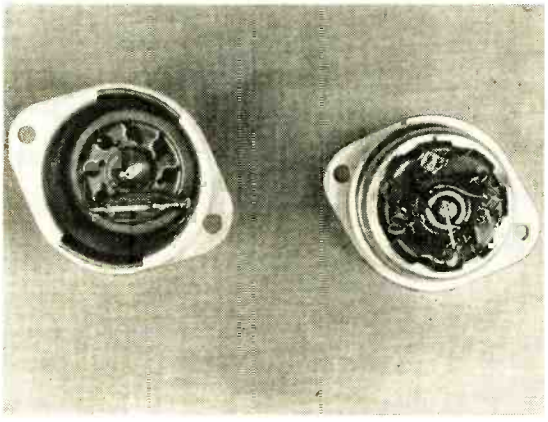
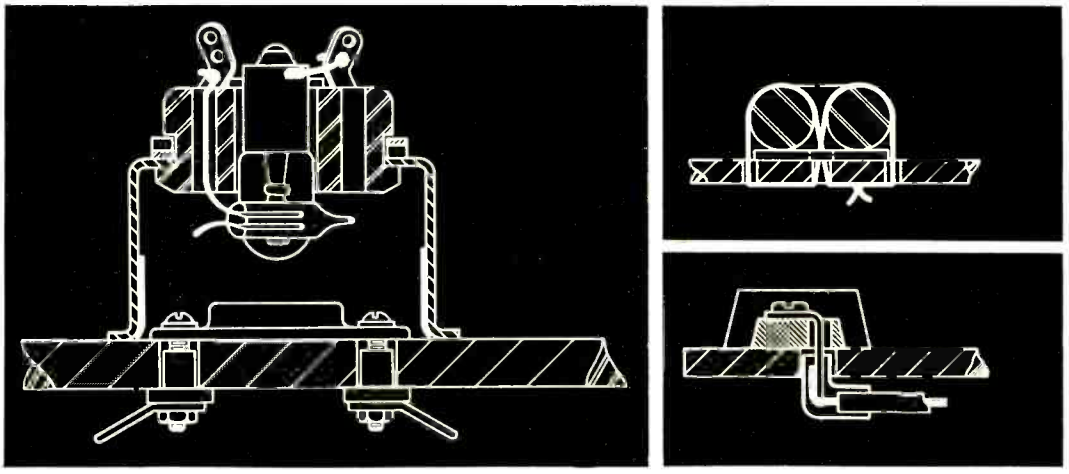


Fig. 2. Modify octal socket by drilling out center to 13/32"; remove odd pins 1, 3, 5, and 7, and wire as shown. The photocell must be centered under shield assembly; mounting hardware comes with cell.



ing to the big display bulbs. A little light *in* (a fraction of a watt) produces a lot of light *out* (25 watts).

Practical Details. The LDR-25 photocells will easily handle the display power if the mounting and illuminating instructions are followed. A large slab of aluminum is used as a heat sink for the photocells (*PC1, PC2,* and *PC3*). If If you care to add a fan to cool the heat sink, you can run 50 watts per channel instead of just 25. Even without a fan, the photocells can handle a total of 75 watts continuously, or up to 90 watts if you stick to a 20-minute-or-less operating cycle.

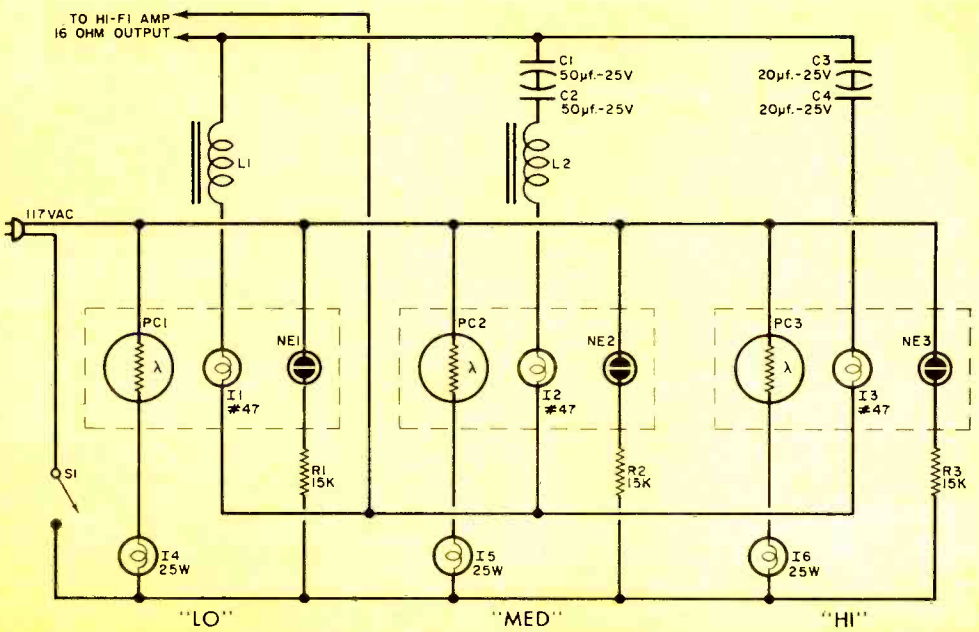
Two refinements complete the color organ. Light shields must be provided for the photocells to prevent the display and room lights from locking the photocells on. These are simply recessed shell tube socket mounts, ready to go at 11 cents each. If the color organ was operated with only the music lights (*I1 I2, I3*) shining on each photocell, the bulbs would remain off for low musical passages, giving a choppy appearance.

By shining a small amount of light on the photocells *all the time,* the display remains barely lit, permitting the lights to follow the music smoothly. This feature increases display sensitivity of input audio, and prevents the display bulbs from cooling off (insuring that high

PARTS LIST

C1, C2—50-μf., 25-volt electrolytic capacitor
C3, C4—20-μf., 25-volt electrolytic capacitor
I1, I2, I3—#47 pilot lamp
I4, I5, I6—117-volt, 25-watt light bulb (one red, one blue, one green)
*L1—Approx. 3-mh., 0.6-ohm coil; made with Arnold A4-800-250-HA-P core filled with #24 enamel wire**
*L2—Approx. 1.2-mh., 0.3-ohm coil; made with same core as L1 but filled with #22 enamel wire**
NE1, NE2, NE3—NE-2 neon bulb
PC1, PC2, PC3—Delco LDR-25 photocell
R1, R2, R3—15,000-ohm, ½-watt resistor
3—Retainer ring octal socket (Amphenol Type "S")
3—Mounting shell for light shield (Amphenol Type 61-61 or equivalent)
1—8-conductor barrier terminal strip (Cinch-Jones Type 8-140 or equivalent)
4—"U" lugs for use with above
1—¼" x 4½" x 7" aluminum plate
3—Cleat socket to take 117-volt a.c. display lamp
Misc.—3-lug tie points, line cord, silicone grease, lacing twine, chassis feet, 6-32 hardware, spaghetti, wire, solder, display materials

*Available from Arnold Electric Company, Marengo, Ill., @ 25 cents each



current surges through a cold display bulb will not destroy the photocells). The "bias" light is provided by small neon lamps (*NE1*, *NE2*, *NE3*) inside each light shield. Each lamp is connected to the power line with a series resistor. The value of this resistor determines the display background level.

Two electrolytic capacitors back-to-back are used in the middle and high range audio filters (*C1* and *C2*, and *C3* and *C4* respectively). They are cheaper than large bipolar capacitors and do the same job. The coils are simply enameled magnet wire wound on two low-cost powdered iron toroids. Fill the toroids as full as possible with wire. Counting turns is unnecesary; exact inductances are not critical. The circuit values were experimentally determined to give a good and lively separation and balance to each channel.

The circuit was left "stripped" to conserve costs. Switches, a cabinet, a fuse, and the fan may be added at any time. Background potentiometers could also be included to set the "out" display brightness and balance colors.

Construction. Start with a ¼" x 4" x 7½" slab of soft aluminum (you may be able to purchase this at the local junkyard). Break all sharp edges with a file and use steel wool on the aluminum to get a good finish. Drill holes for mounting the recessed shell tube socket mounts, the photocells, the barrier terminal strip, the two tie strips, the two toroids, and the chassis feet (see Fig. 1 on page 44 to get an idea of layout).

Be sure to follow the mounting instructions supplied with the photocells. Use silicone grease between each one and the chassis; do not overtighten the mounting nuts.

Drill out the centers of the tube sockets to clear the #47 pilot lamps and remove all odd pins from the sockets. Complete the connections between the pilot lamps and the neon bulbs by using the remaining socket pins. Add two small pieces of good electrical tape to the inside of the shields where they might possibly contact the electrically hot tops of the photocells. Next, mount the octal sockets on their shields, bulbs in, terminals out. The shields may now be mounted on the chassis. Three-lug solder tie points are mounted with the

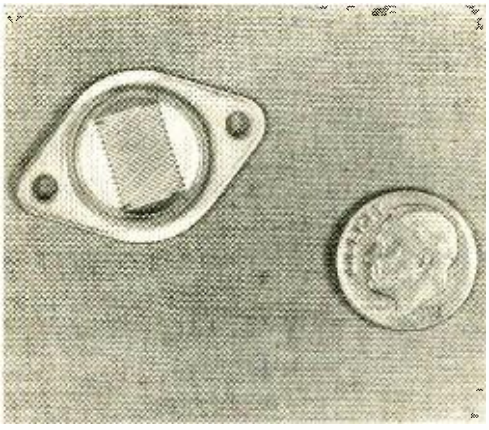


Fig. 6. LDR-25 photocell is small as comparison with dime shows, but can handle considerable power.

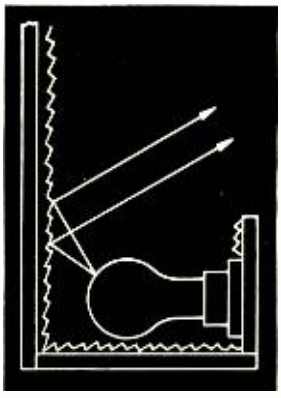


Fig. 7. Display using crumpled aluminum foil can be a simple adaptation of that shown in Fig. 10. Reflected light is more pleasing to watch.

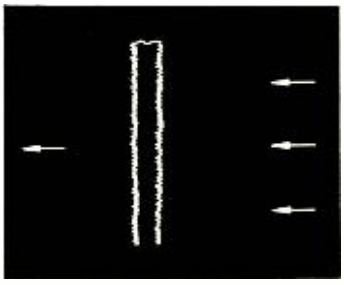


Fig. 8. For color mix, diffuser can be made with a piece of sandpapered plastic or frosted ground glass.

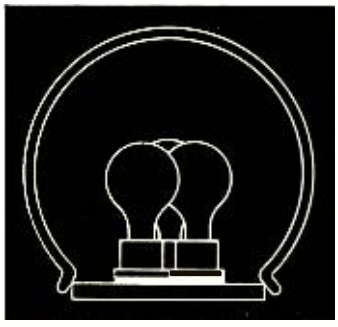


Fig. 9. Fish bowl frosted with lye or sandblasted will create a wide-angle display unit.

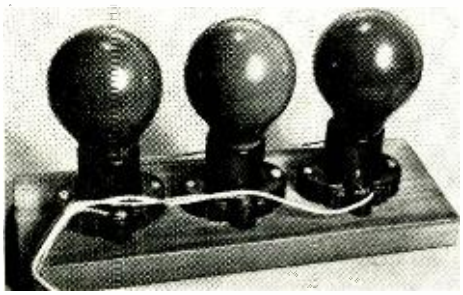


Fig. 10. Build this simple display for testing your color organ. Simply mount cleat sockets on wood base and install three 25-watt bulbs. Display can later serve as light source for a more elaborate setup.

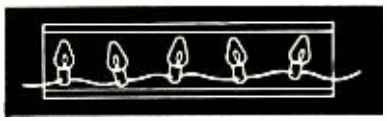


Fig. 11. Another way of making a display is to use series strings of Christmas lights (one five-bulb string per channel). To diffuse the light, run each of the strings through a piece of frosted plastic tubing (below). Remember, when using this type of display, that you must keep within the 25-watt per channel limit of the photocells. Interesting color mix is possible by using lamps of different hues.

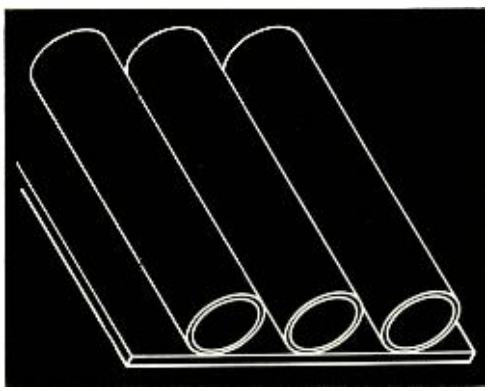
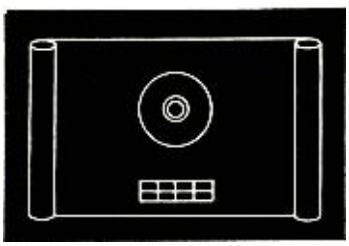


Fig. 12. An adaptation of the idea above, this one makes use of frosted plastic tubes—again with Christmas lights—attached to the front of the speaker enclosure in a manner similar to organ pipes.



first two shields (as illustrated in Fig. 1 on page 44).

Wind the coils using enameled (but otherwise uninsulated) magnet wire. Fill one toroid with #24 wire, the other with #22. Do not substitute wire sizes. Work your way circularly around the core, adding layer after layer, until there is no more open space left in the core center. Mount the coils on an insulator (tape, fish paper, etc.) and sew them to the chassis with string or lacing twine as detailed in Fig. 4.

Wire in the resistors and capacitors as shown in the schematic and Fig. 1. (Note that the electrolytics are connected back-to-back.) Add the remaining wiring, completing the circuit. The high-level a.c. connections to the barrier terminal strip are made from the bottom using "Y" type connectors. Be sure to slip a length of spaghetti over each connection as shown in Fig. 5.

Wiring and Testing. Double-check the wiring of your color organ before placing it in operation: A mistake can ruin your hi-fi. Also check to make sure that no connection exists between the 117-volt a.c. circuit and the leads to the audio amplifier.

The simple display shown in Fig. 10 should be built for initial tests. It is simply a piece of pine, three cleat sockets, and red, blue, and green 25-watt light bulbs. To test display operation, connect it up and plug it in. All the display bulbs should light dimly. If necessary, adjust *R1*, *R2*, and *R3* to get the desired background level and balance.

Make the connections to the audio amplifier speaker terminals and slowly turn up the volume. The color organ should be "on the air." Since speaker volume will be too loud when color organ operation is optimum, you may want to either mismatch the speaker or add an L-pad to quiet it down.

Displays. A number of display ideas are shown in Figs. 7 through 12. Although the simple three-bulb display in Fig. 10 will work, the display will be much prettier if you scatter the light on crumpled aluminum foil (Fig. 7), diffuse it (Figs. 8 and 9), or work out any of several other possibilities.

Regardless of the type of display you select, your color organ will add new fascination to your hi-fi listening. —30—