

# Shop Air Filter

*Whether ripping at the table saw or finish sanding, airborne dust is a nuisance every woodworker has to deal with. Here is an inexpensive solution that will clear the air in your shop.*



It doesn't take too much sawing or sanding to kick up a lot of dust. And a shop full of airborne dust is not a good place to work.

**AIR FILTER.** There is a way to get rid of airborne dust. Professional shops often have a separate filter unit that will remove potentially harmful shop dust from the air. Unfortunately, these units aren't cheap. So I designed a heavy-duty Shop Air Filter that uses three furnace filters to clean the air. There are two pre-filters at the intake end of the unit and one at the exhaust end.

By the time the air passes through the last filter, there's not much dust left to trap. The results are dusty furnace filters and cleaner air.

To make the unit even more efficient, I used pleated furnace filters instead of the standard fiberglass mesh furnace filters. These filters are com-

monly available and only cost a couple dollars more. (For more information on the variety of filters available, see the Shop Info article on page 92.)

Changing the filters is easy too. To get at them, the bottom of the case isn't permanently attached. I used tongue and groove joinery, so it slides open in either direction, and the filters simply drop down (see inset photo).

**BLOWER.** To circulate the air through the shop, I used a squirrel cage blower with an enclosed motor. This blower is easily the most expensive part of this project. But it's a workhorse that's worth every penny. It'll circulate the air in a 250 sq. ft. shop in about 5 minutes. (A used blower from your local heating and air conditioning contractor could be used as an inexpensive alternative.)

**CASE.** The filters and the blower are housed in a simple, open-ended case.

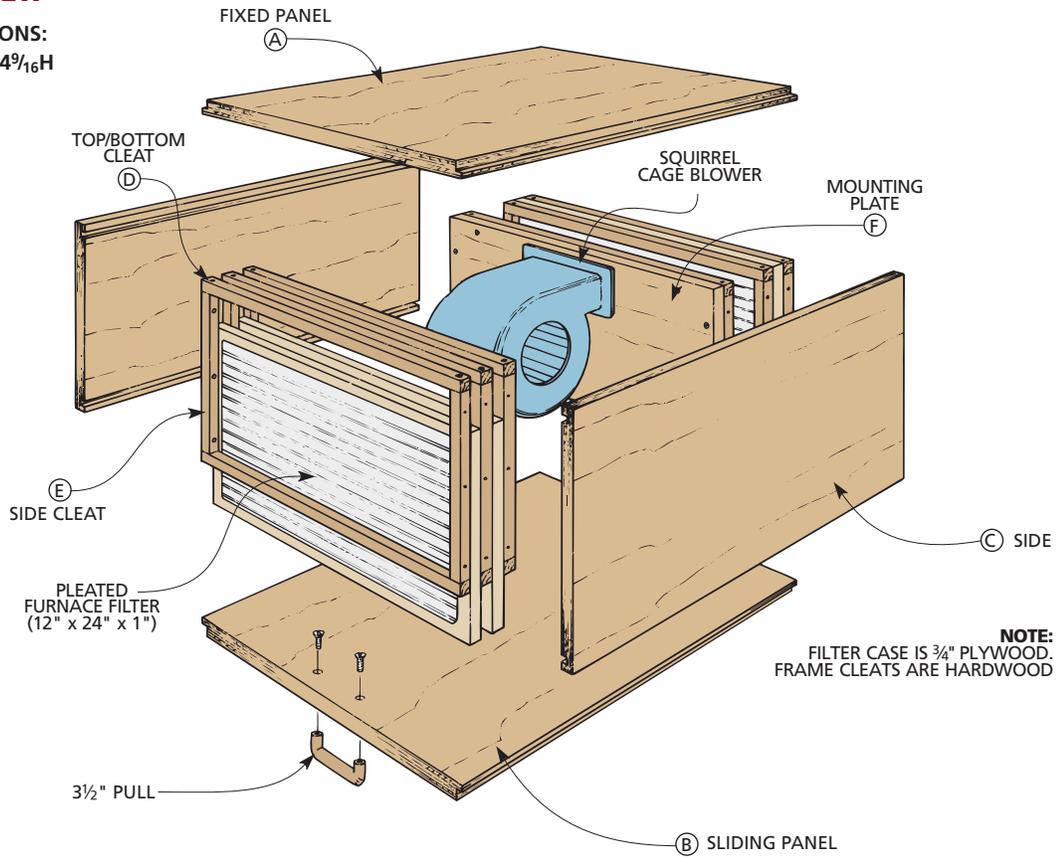
For the wood, I used just three board feet of hardwood and a little over half a sheet of  $\frac{3}{4}$ "-thick plywood.

**SMALL AREA SHOP FILTER.** Since many woodworkers don't have large workshops, I'm also including plans for a small air filtering system.

Instead of a heavy-duty squirrel cage blower to move the air, this air filter uses two bathroom exhaust fans. For more on this unit, see the Woodworker's Notebook on page 98.

## EXPLODED VIEW

OVERALL DIMENSIONS:  
25<sup>1</sup>/<sub>2</sub>W x 31<sup>3</sup>/<sub>4</sub>D x 14<sup>9</sup>/<sub>16</sub>H



**NOTE:**  
FILTER CASE IS <sup>3</sup>/<sub>4</sub>" PLYWOOD.  
FRAME CLEATS ARE HARDWOOD

## MATERIALS LIST

### WOOD

<b>A</b> Fixed Panel (1)	<sup>3</sup> / <sub>4</sub> ply - 24 <sup>3</sup> / <sub>4</sub> x 31 <sup>3</sup> / <sub>4</sub>
<b>B</b> Sliding Panel (1)	<sup>3</sup> / <sub>4</sub> ply - 24 <sup>11</sup> / <sub>16</sub> x 31 <sup>3</sup> / <sub>4</sub>
<b>C</b> Sides (2)	<sup>3</sup> / <sub>4</sub> ply - 13 <sup>1</sup> / <sub>2</sub> x 31 <sup>3</sup> / <sub>4</sub>
<b>D</b> Top/Btm. Cleats (12)	<sup>3</sup> / <sub>4</sub> x <sup>3</sup> / <sub>4</sub> - 24
<b>E</b> Side Cleats (12)	<sup>3</sup> / <sub>4</sub> x <sup>3</sup> / <sub>4</sub> - 10 <sup>1</sup> / <sub>2</sub>
<b>F</b> Mounting Plate (1)	<sup>3</sup> / <sub>4</sub> ply - 12 x 24

### HARDWARE SUPPLIES

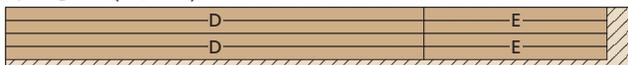
(1) Squirrel cage blower
(3) 12" x 24" x 1" pleated furnace filters
(62) No. 8 x 1 <sup>1</sup> / <sub>4</sub> " Fh woodscrews
(12) No. 8 x 1 <sup>3</sup> / <sub>4</sub> " Fh woodscrews
(10) No. 8 x 2 <sup>1</sup> / <sub>2</sub> " Fh woodscrews
(5) No. 10 x <sup>5</sup> / <sub>8</sub> " Ph screws
(5) No. 10 flat washers
(2) 3 <sup>1</sup> / <sub>2</sub> " pulls w/ screws

## CUTTING DIAGRAM

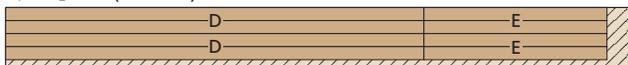
<sup>3</sup>/<sub>4</sub> x 3<sup>1</sup>/<sub>2</sub> - 36 (.9 Bd. Ft.)



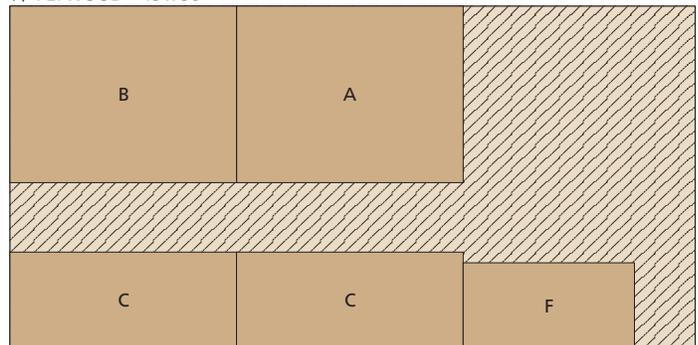
<sup>3</sup>/<sub>4</sub> x 3<sup>1</sup>/<sub>2</sub> - 36 (.9 Bd. Ft.)



<sup>3</sup>/<sub>4</sub> x 3<sup>1</sup>/<sub>2</sub> - 36 (.9 Bd. Ft.)



<sup>3</sup>/<sub>4</sub>" PLYWOOD - 48 x 96



## CASE

To build the Shop Air Filter, I started with the case. The case is made up of four pieces: a fixed panel (A), a sliding panel (B), and two sides (C) (Fig. 1). The size of the case really depends on the size of the furnace filters you use. I used 12" x 24" pleated furnace filters.

But I found that my furnace filters weren't exactly 12" x 24". They're a little smaller. So before cutting the case parts to size, measure the filters you intend to use. Then make the case opening  $\frac{1}{8}$ " larger in width and height. This way the filters will fit well.

Also, to help the sliding panel open and close easily, it's  $\frac{1}{16}$ " narrower than the fixed panel (Fig. 1).

**LOCKING RABBET.** To hold the filter case together, I used a locking rabbet joint (Fig. 2a). A locking rabbet provides an air-tight seal between the sides and the fixed panel. It also has another advantage — allowing the sliding panel to open and close without any special hardware.

**ASSEMBLY.** When both the tongues and the grooves have been cut in the case pieces, the filter case can be glued up (Fig. 2). The easiest way to do this is to build it upside down. (Set the sliding panel aside for now.)

## FURNACE FILTERS & BLOWER

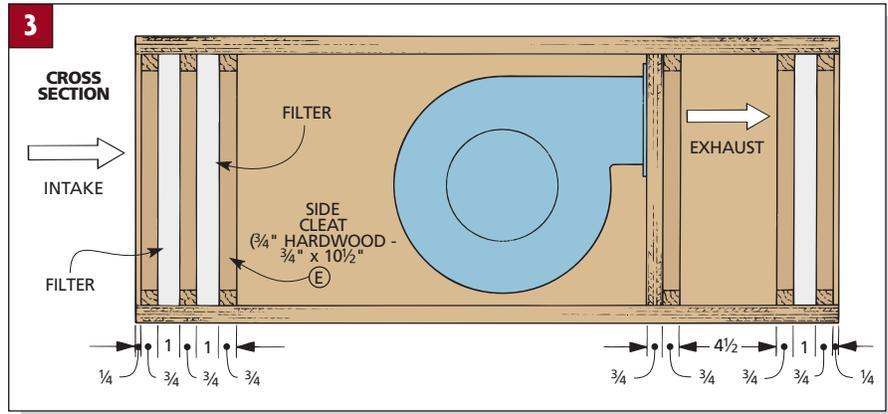
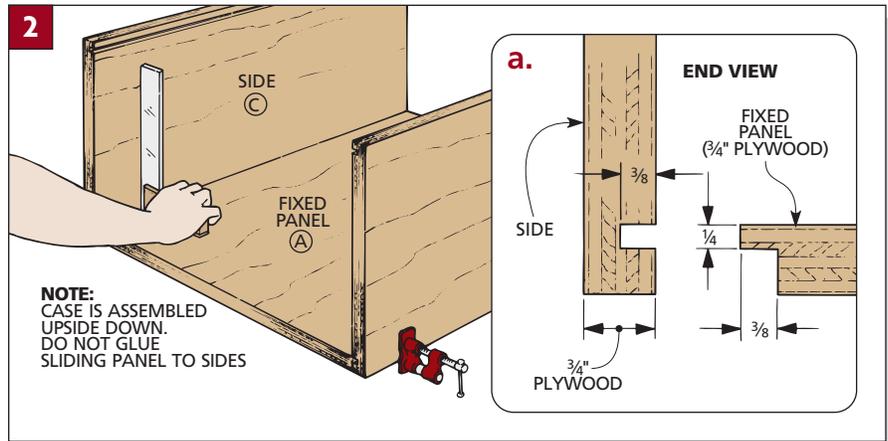
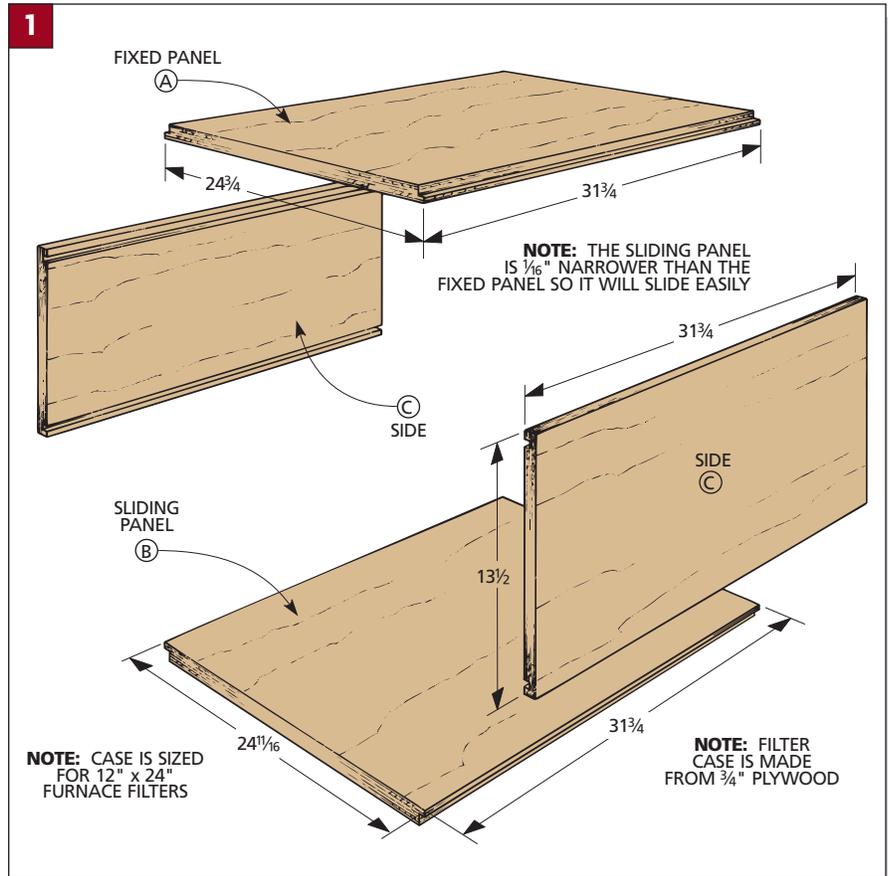
To position the furnace filters and blower inside, I added simple frame cleats (D, E) (Fig. 4). These cleats are  $\frac{3}{4}$ "-square strips of hardwood that are screwed to the inside of the case to form a frame.

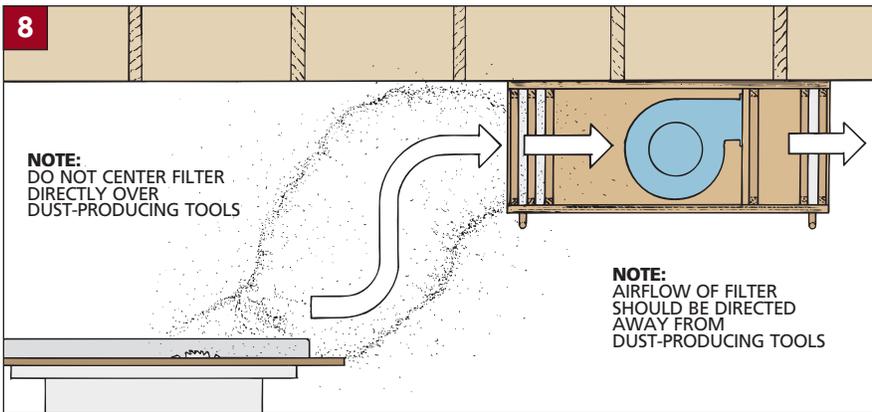
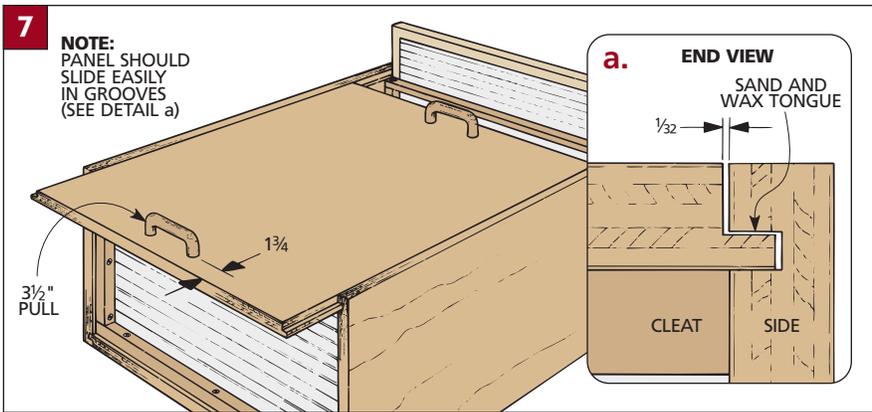
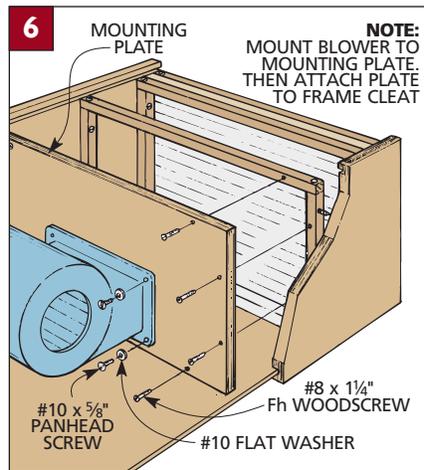
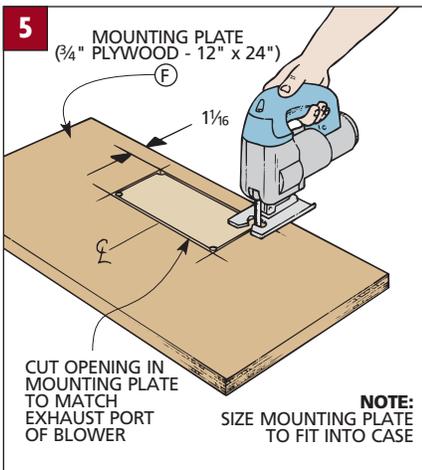
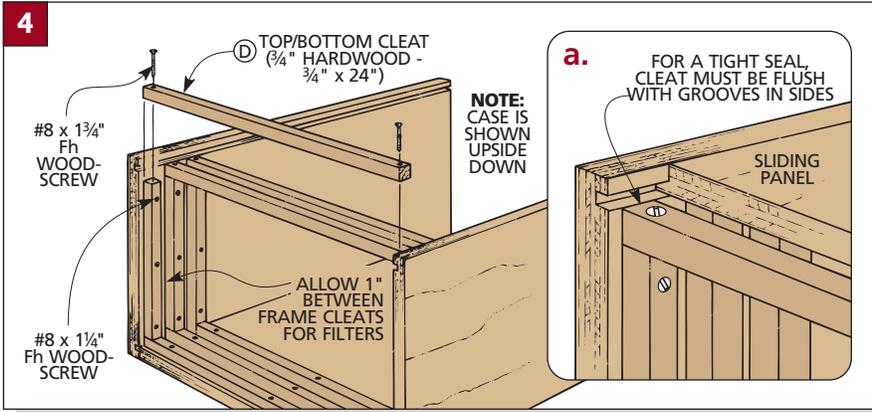
The cleats must end up flush with the grooves in the sides (Fig. 4a). This ensures a tight seal between the cleats and the sliding panel. This is especially important since the sliding panel isn't glued in place.

**Note:** Most of the cleats are screwed to the case with  $1\frac{1}{4}$ " woodscrews (Fig. 4). But the last cleats are screwed into the end grain of the side cleats, so here I used  $1\frac{3}{4}$ " woodscrews for extra strength.

**FILTER FRAMES.** The air filter requires five sets of frame cleats to hold the filters (Fig. 3). Three sets sandwich the two intake filters, and two sandwich the exhaust filter.

To allow for the filters, space the frame cleats 1" apart (Fig. 3). Experiment with the spacing here. If the filters are too tight, they're hard to change because they tend to catch on the cleats.





**MOUNTING THE BLOWER.** There's one last set of cleats that form a frame near the center of the case (Fig. 3). This frame supports the blower. But I couldn't screw the blower directly to the frame. Instead, I made a mounting plate (F) out of plywood (Fig. 5).

To make the mounting plate, first cut a piece of plywood to fit inside the case. Then cut an opening in the plate to match the exhaust port on the blower (Fig. 5).

Screw the blower to the mounting plate first (Fig. 6). Then screw the plate to the center cleats.

**FITTING THE PANEL.** The last step is to install the sliding panel (Fig. 7). This panel already has tongues that fit the grooves in the case sides. If the fit is tight, sand the tongues until they slide smoothly (Fig. 7a). A little wax will help.

Finally, I attached pulls near the ends of the sliding panel (Fig. 7). They give you something to grab onto when sliding the panel open to change the filters.

## LOCATING THE UNIT

This filter unit should be located so all the dust is drawn into the intake filters (Fig. 8). You don't want it centered directly over a dust-producing machine like a table saw or sanding table. The reason is simple. You don't want to blow dusty air around, just clean air.

**CEILING-MOUNTED.** To suspend it from the ceiling, all you will need to do is screw it to the ceiling joists.

But be careful. This filter unit isn't light. So before you attempt to mount it, locate and drill the mounting holes first. Then be sure to get plenty of help when lifting the filter into position.

And if your ceiling is low (as in a basement), consider mounting it on a wall, as shown in the photo below.



For the most versatility, the air filter can be mounted to the ceiling or to a wall (as shown in the photo above). Either way it's highly efficient.

# WOODWORKER'S NOTEBOOK

This inexpensive filter is the perfect size for a small shop. It also works great in larger shops for filtering the air around a table saw or a stationary sander.

## SMALL AREA SHOP FILTER

■ While this filter isn't really big enough for a large shop, it's perfect for filtering the air around one or two dust-producing tools like a table saw or a stationary sander.

■ Instead of using three furnace filters like the Shop Air Filter, this Small Area Shop Filter uses only one. And to circulate the air around the shop, it uses two bathroom exhaust fans instead of a heavy-duty blower. These inexpensive fans are readily available at home centers.

**Note:** Before starting, it's best to have the exhaust fans on hand. Sizes can vary and it would be a shame to build the unit only to find that the parts that you've purchased aren't the right size.

■ Another consideration is the size of the furnace filter used. I decided on a 16" x 20" filter. Then I sized the case to hold a single filter that slides into grooves in the sides and becomes the bottom of the case.

**Note:** Here again, I used a pleated furnace filter — not your typical fiberglass mesh filter (refer to the Shop Info article on page 92). Also, the filters won't be exactly 16" x 20". They'll be slightly smaller. So measure your filter and build the case to fit around it.

■ To build the small air filter, start by cutting the case sides (A) to finished size from 3/4"-thick plywood (Fig. 1). (The length of the sides should match the length of the filter.)

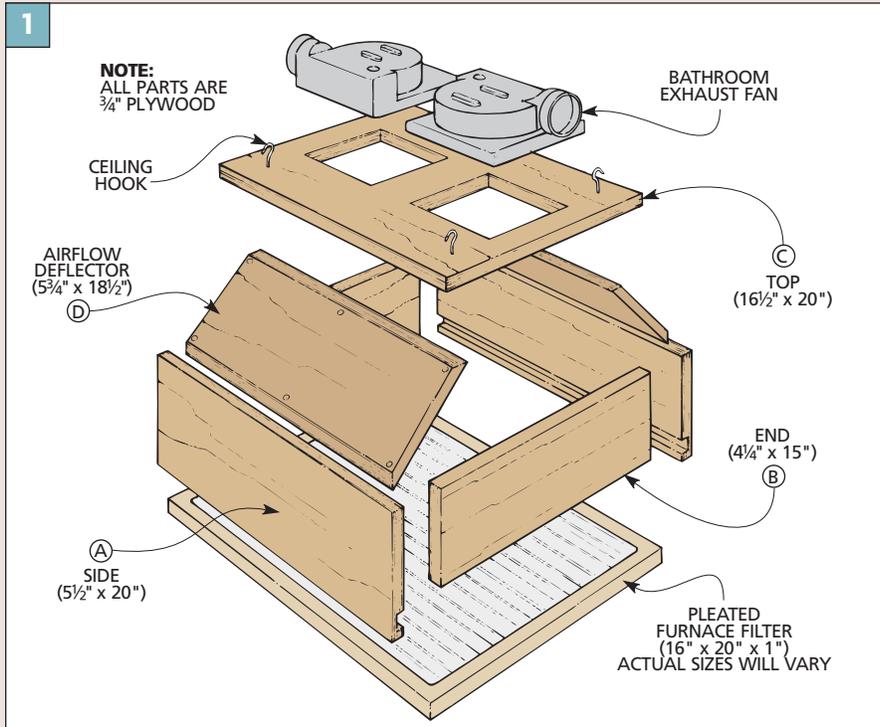
■ Next, cut a 1/2"-deep groove in each side to hold the furnace filter (Fig. 2).

■ After the grooves have been cut, the next step is to add the ends (B). But the ends aren't the same width as the sides. They're cut so they end up flush with the top of the groove in each side (Fig. 2). This way, the filter will slide in easily but will still keep a tight seal.

**Note:** The length of the ends depends on the actual size of the filter. They should equal the actual width of the filter minus 7/8".

■ Now, the sides and the ends can be glued and screwed together (Fig. 2).

■ The next step is to add the top (C) (Fig. 3). It's cut to cover the case



## MATERIALS LIST

### WOOD

- A** Sides (2) 3/4 ply - 5 1/2 x 20
- B** Ends (2) 3/4 ply - 4 1/4 x 15
- C** Top (1) 3/4 ply - 16 1/2 x 20
- D** Airflow Deflectors (2) 3/4 ply - 5 3/4 x 18 1/2

### HARDWARE SUPPLIES

- (2) Bathroom exhaust fans
- (1) 16" x 20" x 1" furnace filter

- (8) No. 8 x 2" Fh woodscrews
- (12) No. 8 x 1 1/4" Fh woodscrews
- (12) No. 8 x 1 1/2" Fh woodscrews
- (1 tube) Siliconized latex caulk
- (2) No. 8 hex head sheet-metal screws
- (2) 3"-dia. metal duct, 24" long
- (4) Ceiling hooks
- (1) 48"-long chain (cut into four pieces)

assembly and then is glued and screwed in place. (Mine was 16½" x 20".)

■ Now cut two square openings in the top piece for the intake ports on the fans (Fig. 3). Make them ½" smaller in both directions. But don't attach the exhaust fans quite yet. There are a couple of things to do first.

■ To make the airflow more efficient, add two deflectors (D) to help direct the air into the fans (Figs. 4 and 5).

■ Wire the exhaust fans now, because it's much harder to do this *after* they've been attached to the case. If you're not comfortable doing this yourself, hire a qualified electrician.

■ Now all that's left is to attach the fans. To do this, I didn't glue or screw them in place. Instead, I used siliconized latex caulking to create an air-tight seal (Fig. 6). (I found out the hard way that regular silicone caulking won't adhere to the plastic bodies on the exhaust fans.)

■ After the caulk is dry, you need to do something about the exhaust ports on the fans. These fans are powerful — they push the filtered air away with such force that they disturb the air below the filter. This means a lot of dusty air floating around that never gets pulled through the filter.

The solution is to add a 24" length of 3"-dia. duct to extend the exhaust ports away from the unit (Fig. 7). (This way the dusty air hangs beneath the unit until it can be drawn up through the filter.)

■ The last step is to hang the filter unit. But you can't just screw the unit in place to the ceiling joists — the exhaust fans are in the way. So the unit has to be suspended from the ceiling. To do this, I used four ceiling hooks and some short lengths of chain (Fig. 7).

■ Since the fans draw the air straight up through the filter, it's best to suspend it directly above an area, like a table saw or sanding station, where a lot of your shop dust is created.



**Grooves.** The grooves allow you to easily slide the filter in and out, but they're positioned to provide an airtight seal.

