Goof-Proof Clamping
Strategies for panels, casework, boxes, and more

By Jim Harrold

Behind every successful glue-up or project assembly you’ll find one or more clamping operations that ensured flat surfaces, square corners, and tight joints. To help you succeed at your next clamping assignment, I’ll tackle the most common glue-ups, including flat panels, casework, and mitered assemblies, showing you shop-proven methods that guarantee quality results. But before I begin, I’d like for you to make these prep tips part of your woodworking regimen:

Prep Tips

• Check your tool settings to ensure that when face-jointing, planing, and edge-jointing, your stock faces are parallel and that the edges are straight and perpendicular to the faces. Only then can you produce assembly-ready parts.
• Provide a flat surface upon which to work, such as a workbench or torsion box.
• Gather everything you need, including the right type and number of clamps.
• Make a dry run-through of the clamping operation.
• Use white glue or Titebond Extend for complex glue-ups or when gluing several parts at once. Do large glue-ups in sections.
• Finally, never force improperly-prepared stock into alignment with clamps. Instead, rework the stock to ensure that you have flat parts with true edges.
**Edge-joining flat panels**

Flat panels include table and cabinet tops, solid door and case panels, and even simple cutting boards. Begin by arranging your prepared stock for the best grain and color match. When you’re satisfied, mark a diagonal line from the center of one panel edge to each end of the opposite edge, forming a large triangle. Now you can quickly position the boards in the correct order by reassembling the triangle.

To protect your workbench from glue drips, cover it with a plastic sheet, kraft paper, or a cut-to-size and varnished piece of $\frac{3}{4}$” MDF. Place a pair of risers on the workbench, and position the panel boards on them, as shown in Photo A. These provide the clearance needed to apply the clamps and cauls at the panel ends. I made my inverted-T risers from scrap 2×4s and 1×4s and covered the top edge of each 2×4 with plastic packaging tape to keep them from sticking to the panel. To center clamping pressure on the panel thickness, place a dowel of the same thickness along each edge of the panel. The dowels also act as clamp pads to eliminate panel-edge damage.

To align the boards at the panel ends, make four straight-edged cauls at least as long as the panel width. I made my cauls by ripping scrap 2×4s in half and covering the glue-up contact edges with packaging tape.

**Position bar clamps under the boards resting on the risers; keep additional bar clamps, cauls, and caul clamps at the ready. Now apply the glue.**

**Big Boy Clamps**

Most panel and carcase clamping employs these clamp types. Each has advantages and disadvantages from function to cost.

**Pipe Clamps**

- Pipe clamps are inexpensive.
- You can keep several pipe lengths on hand and switch one set of clamp heads from a shorter pipe to a longer one as needed.
- Some pipe clamps tip over easily—just what you don’t need during a glue-up.
- Pipe clamps are heavy, making it difficult to lift a glued-up assembly off the workbench.
- Allowing the pipe to contact wet glue will leave a penetrating black stain.
- Jaws are not parallel to the bar.

**Parallel-Jaw Clamps**

- Tall jaws offer more clamping surface.
- Parallel jaws that stay 90° to the clamp bar can help square up a carcase.
- Plastic jaw faces protect workpiece edges.
- These clamps are heavy and share the weight disadvantages of pipe clamps.
- Parallel-jaw clamps cost more than pipe clamps and aluminum-channel clamps.

**Aluminum-Channel Clamps**

- Aluminum channels don’t cause staining when contacting wet glue.
- The squared-off clamp head design resists tipping.
- Light weight eases the handling of a glued-up assembly.
- Moderate cost is more than pipe clamps, but less than parallel-jaw clamps.
- Jaws are not parallel to the bar.
To determine the number of bar clamps necessary for a panel glue-up, see sidebar below. See also “Big Boy Clamps” on previous page for a look at three popular types of clamps used in larger glue-ups.

Next, stand all but the first board on edge and apply glue to each edge. Spread the glue evenly and modestly with a flux brush or the threads of a carriage bolt. Once clamped, each panel joint should have a small, continuous line of glue squeeze-out.

Now lay the panel boards flat on the risers and apply clamps, as shown in Photo B. Immediately clamp paired cauls to the ends of the panel. Apply just enough even clamp pressure along the lengths of the cauls in order to bring the taped surfaces into full contact with the panel. Work back and forth from bar clamps to caul clamps, tightening each in succession until all clamps are tight, the joints are closed, and the board surfaces are aligned.

Finally, remove the excess glue that squeezed out along the panel joints. Wipe up the glue on open-grained woods such as oak with a wet rag. Make sure to use enough water to dissolve the glue, and wipe thoroughly several times, rinsing the rag frequently between wipes. For tight-grained woods such as maple, wait for the glue to congeal but not harden, and remove it with a paint scraper, lifting the glue from the surface.

**Tip Alert**

If an alignment problem occurs during the glue-up, lay a piece of scrapwood on the high area, and hit it in place with a mallet before the clamps are tightened.
Carcase construction

Gluing and clamping a cabinet carcase requires a flat work surface larger and closer to the floor than a typical workbench. Here, in two steps, I show how to add a divider between a top and bottom, and then how to permanently add and square the unit with sides. Later, the back and face frame would be added.

With the carcase parts cut to shape and all dadoes and rabbets formed, temporarily position one side on the assembly table, inside face up, to serve as a spacer. Apply glue in the carcase bottom and top divider dadoes. Dry-fit the carcase bottom into the side bottom dado and the carcase top into the side top rabbet, and capture the divider in the top and bottom divider dadoes.

Now position cauls on the carcase top and bottom, centered on the divider dadoes. In this case, I disc-sanded a shallow arc on one edge; the arc inclines 1/8" from the center of the caul to each end. As before, I covered the convex curved edges with plastic packaging tape. Clamp pressure at the caul ends flattens it against the assembly and exerts greater pressure at the center. This is handy when the center of the glue-up is out of reach for even those clamps having the deepest throats.

Making sure the edges of the divider, top, and bottom are flush at the front, apply bar clamps and tighten them enough to hold the cauls and carcase parts together. You may need to move the case corners over the edge of the table in order to turn the clamp handles. Squaring braces (shop-made or store-bought) help hold the parts together when you’re working alone and adjusting the clamps and cauls as shown in Photo C.

Loosen the brace clamps as needed to allow the divider to fully seat in the dadoes. Then tighten the bar clamps. Finally, reposition/reclamp the squaring brace clamps.

Tip Alert

Do not depend on a framing square to true up a carcase. Framing squares are notoriously inaccurate, and even if you have one that is spot on, a slight curve or bow in a carcase member can throw off your measurement.

Online Extra

To establish a flat assembly surface, consider building a torsion box platform such as the Knockdown Assembly Table in issue 29 (June/July 09), page 33, or visit woodcraftmagazine.com/onlineextras.
With the glue dry, remove the clamps and separate the top/bottom/divider assembly from the carcass side, and lay the assembly front face down on the assembly table. Apply glue to the side outer rabbets and dadoes and add them to the top/bottom/divider assembly. Now center cauls on the side rabbets and dadoes, position clamps at the caul ends, and tighten the clamps. Check the carcass for square, as shown in Photo D. If the carcass is not square, apply clamp pressure across the larger diagonal.

**Mitered frames and boxes**

Mitered assemblies present a special challenge. That’s because applying clamping pressure to angled surfaces lubricated by wet glue often causes the parts to slide out of alignment. Here are some solutions for dealing with these tricky glue-ups.

Gluing up a flat mitered frame can be easy as long as the frame has four sides. But an octagonal frame doesn’t give you any convenient clamping surfaces. Here’s where strapping or filament tape comes to the rescue, as shown in Photo E. This type of tape doesn’t stretch or tear like other tapes. Now, apply glue to the miters and finish the glue-up, as shown in Photo F.

For a mitered-corner box, make a set of miter cauls like the ones shown in Photo G from ¼” plywood and ¾ x ¾” solid stock. Secure a miter caul to each box side with a spring clamp, apply glue to the miters, and assemble the box sides. Apply clamps across the corners, as shown. Consider using two clamps per corner to close any gaps. As an alternate method for applying pressure across

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**Image Descriptions**

**E**

Use strapping tape to join the frame segments point to point, making sure they meet without gaps or overlaps.

**F**

Roll up the joined segments, pulling them tightly together and securing the last joint with more tape.

**G**

The angled surfaces of the miter cauls align clamping pressure perpendicular to the glue surfaces, making it easy to pull the miters together without slippage.

**H**

Secure one end of the surgical tubing to a box side with a spring clamp; then wrap the tubing around the box, stretching it as you wrap.
wide joints, consider wrapping the assembled box with surgical tubing as shown in Photo H. For boxes with shorter walls, you may get by with a strap clamp.

A cheval mirror frame with a round top would be difficult to clamp if the segments were already rounded. Instead, over-size the frame pieces when cutting them and include clamping ears as shown in Photo I. These let you effectively pull the pieces together. Later, you’ll trim and sand the curve to final shape and size.

“Clamping ears” let you draw the segments together at the outside of the curve. A bar clamp at the open end draws together the inside of the curve.

**Bonus Tips and Helpers**

For pipe clamps, two short pipes make one long one with the help of a simple pipe coupling.

Sleeves made of plastic pipe separate clamp pipes and glue, eliminating black stains.

The flexible plastic core of a disposable foam brush makes the perfect glue spreader.

A pair of notched rails keeps tipsy pipe clamps upright.
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