

PREPARING THE SURFACE

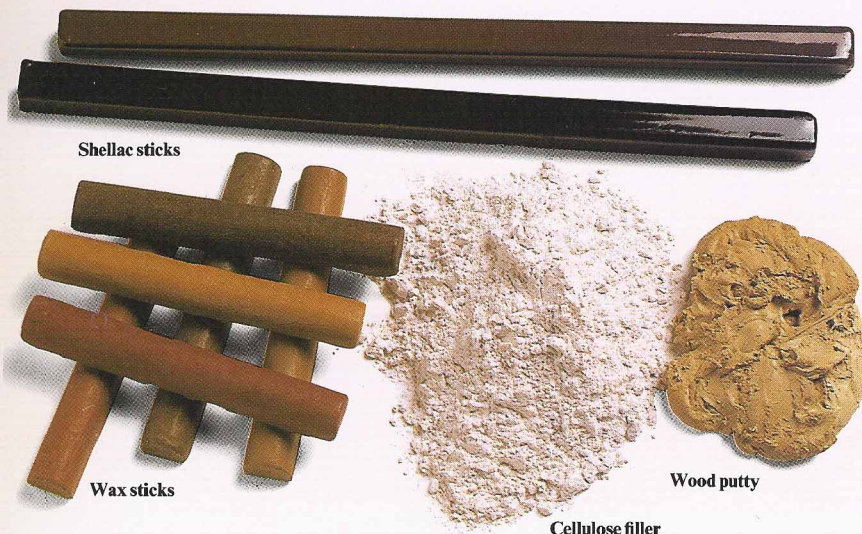
Wood must be smooth, clean and free from blemishes before you apply a surface finish. Paint may cover minor imperfections, but a clear finish will exaggerate every defect, including fine scratches across the grain. Preparing the surface is the first essential stage of finishing wood.

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FILLING HOLES AND CRACKS

When selecting wood, you should reject poor-quality materials exhibiting cracks, holes and dead knots, but occasionally it is necessary to accept a less-than-perfect sample, especially when buying wood that is rare or temporarily in short supply. Even when you have chosen carefully, cracks can open up at a later stage and must be dealt with before you apply a finish.



Shellac sticks

Wax sticks

Wood putty

Cellulose filler

Wood putty

A commercial hole filler is a stiff paste made to fill small holes and cracks before applying a clear or opaque finish.

Although fillers are made in a range of colors resembling various common species of wood, at best you can only expect a close match and the match will hardly ever be perfect. However, you can adjust the color of the filler with a drop of wood stain—but since hole fillers may be water-, lacquer- or oil-based, make sure you always use a similarly constituted stain.

Cellulose filler

If you are planning to apply an opaque paint finish, you can fill blemishes with ordinary spackle or water putty mixed to a stiff paste.

Shellac sticks

Sticks of solidified shellac are ideal for repairing a crack or small knot holes before applying any type of finish. They are made in dozens of wood-like colors.

Wax sticks

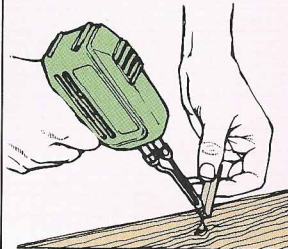
Filling sticks of carnauba wax mixed with resins and coloring pigments are used to disguise small worm holes and hair-line cracks in wood. It is advisable to use them only for work that is to be wax-polished, as most finishes will not dry over a wax-filled hole. Special wax crayons are made for retouching scratches in polished surfaces.

Using fillers

Press filler into the blemish with a small flexible blade, such as an artist's palette knife, or even the tip of a chisel. When the filler has set hard, sand it flush with the surface of the wood. If the color match isn't satisfactory, touch in the filler with minute quantities of artist's oil paint, using a fine paintbrush. Let the paint dry thoroughly before applying a surface finish.

Melting a shellac stick

Using the tip of a warm soldering iron, melt the shellac, allowing it to drip onto the blemish. While the shellac is still soft, dip the tip of a chisel in water and use it to press the shellac into the crack or knot. When the shellac is cool and hard, pare it flush with a chisel then sand it with very fine sandpaper.



Melt shellac with a soldering iron

Filling with a wax stick

Sand the surface of the wood and seal it with shellac before filling with wax. Use a warmed knife blade to soften the wax and to press it into cracks or small holes. As the wax hardens, scrape it flush with the knife, then burnish it with the back of a piece of sandpaper.

RAISING A DENT

If you accidentally dent a workpiece, lay a damp cloth over the blemish and apply the tip of a heated soldering iron. The heat generates steam, which causes the wood fibers to swell locally, lifting the dented section flush with the surrounding surface. Allow the wood to dry before sanding.

SAFETY WITH SURFACE FINISHES

When finishing wood, take the following precautions to safeguard health and safety:

- Most of the materials used to finish wood are flammable, so store them in a separate building away from your workshop and your house.
- Keep finishes and thinners locked away from children. If a child should swallow any, do not attempt to make the child vomit but seek medical advice immediately.
- Oily rags are a fire risk. They should be opened flat and allowed to dry outdoors before you throw them away.
- Install a fire extinguisher.
- Don't smoke while applying finishes.
- Inhaling solvent fumes can be very unpleasant, if not actually harmful. Follow manufacturers' instructions with regard to toxicity, and wear a face mask or respirator if you experience any discomfort.
- Provide adequate ventilation and don't spray finishes unless you have proper exhaust facilities.
- Wear protective gloves when applying wood stains.
- Wear barrier cream to protect your hands, and use a skin cleanser to remove paint or other finishes before washing with soap and hot water. Do not use paint thinners to clean your hands.
- If you splash a finish in your eyes, flush them with water and consult the warning label for further action.

SANDING WOOD

Power sanders relieve a woodworker of the chore of smoothing large flat areas—but for best-quality work, give the wood at least one final light sanding by hand.

Abrasive papers

A variety of abrasive materials glued to paper backing sheets are used to smooth wood and hardened surface finishes. All these abrasives are known collectively as sandpaper, though this term was originally used to describe glasspaper only.

Glasspaper is pale yellow in color. It wears quickly and, although not really suitable for fine woodwork, is a cheap option for sanding softwoods. It is also known as flintpaper.

Garnet paper is made from a reddish-brown natural mineral that forms hard particles with sharp cutting edges. Garnet paper is a good-quality abrasive both for softwoods and hardwoods.

Aluminum-oxide paper is even harder than garnet paper. It is produced in standard-size sheets for handwork and is also used widely as an abrasive for power tools. Aluminum-oxide papers are available in different colors. This type of abrasive is especially good for sanding dense hardwoods.

Silicon-carbide paper varies from dark gray to black. It is made from a synthetic material and is used mainly for finishing metals or, with water as a lubricant, for smoothing paintwork between coats. Often referred to as “wet-or-dry paper,” it is used without a lubricant for sanding hardwoods. A pale-gray silicon-carbide paper dusted with zinc-oxide powder that acts as a dry lubricant is preferable for rubbing down French polish, which would be spoiled by using water as a lubricant.

Grading sandpaper

Sandpapers are graded according to abrasive-particle size and are roughly classified as having very coarse, coarse, medium, fine or very fine grit. They are also graded by number (typically from 600 to 40 or, using another system, from 9/0 to 1)—the higher the number, the finer the grit. Use progressively finer grits, so that each grade removes the scratches left by the previous paper. As a guide, coarse to fine grades are suitable for general work and very fine grades for cutting back surface finishes.

In addition, there are closed-coat or open-coat types of sandpaper. Closed-coat papers have particles grouped closely together for fast sanding, whereas open-coat abrasives have large gaps between the particles, which clog less readily, and so are better for resinous softwoods.

| Sandpaper grades | | |
|------------------|-----|-----|
| Very coarse | 40 | 1 |
| | 60 | ½ |
| Coarse | 80 | 0 |
| | 100 | 2/0 |
| | | |
| Medium | 120 | 3/0 |
| | 150 | 4/0 |
| | 180 | 5/0 |
| Fine | 220 | 6/0 |
| | 240 | 7/0 |
| | 280 | 8/0 |
| | | |
| Very fine | 320 | 9/0 |
| | 360 | — |
| | 400 | — |
| | 500 | — |
| | 600 | — |

Sanding by hand

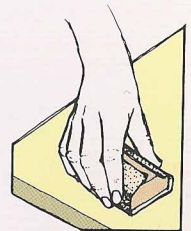
Tear sheets of sandpaper into convenient strips over the edge of a bench. Wrap a strip around a cork sanding block and use it to smooth a flat workpiece, always working with the grain (1). Take care not to round over sharp corners inadvertently when you approach an edge—but if you want to remove the arris (the sharp “line” where two surfaces meet), sand a chamfer deliberately, using the same block (2). Wrap sandpaper around a shaped block when you are sanding moldings (3).

Lay aside sanding blocks and use your fingertips to apply pressure to sandpaper when smoothing curved surfaces or for very light sanding (4). When sandpaper becomes clogged with wood dust, tap it against the workbench to clear the abrasive particles.

When the surface appears to be as smooth as possible, in order to raise the grain, dampen the wood with a wet rag and leave it to dry. A final light sanding will then remove the fine fibers, leaving a perfect finish. Finally, remove the wood dust with a cloth dampened with mineral spirits, or use a commercial “tack rag” (a cloth impregnated with resin).

Sanding end grain

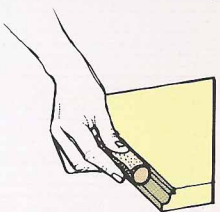
Rub your finger along the surface of end grain before sanding. It will feel rougher in one direction and relatively smooth in another. Sand in the smoother direction for a superior finish.



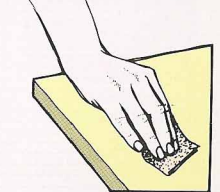
1 Sanding flat work



2 Removing an arris



3 Sanding a molding



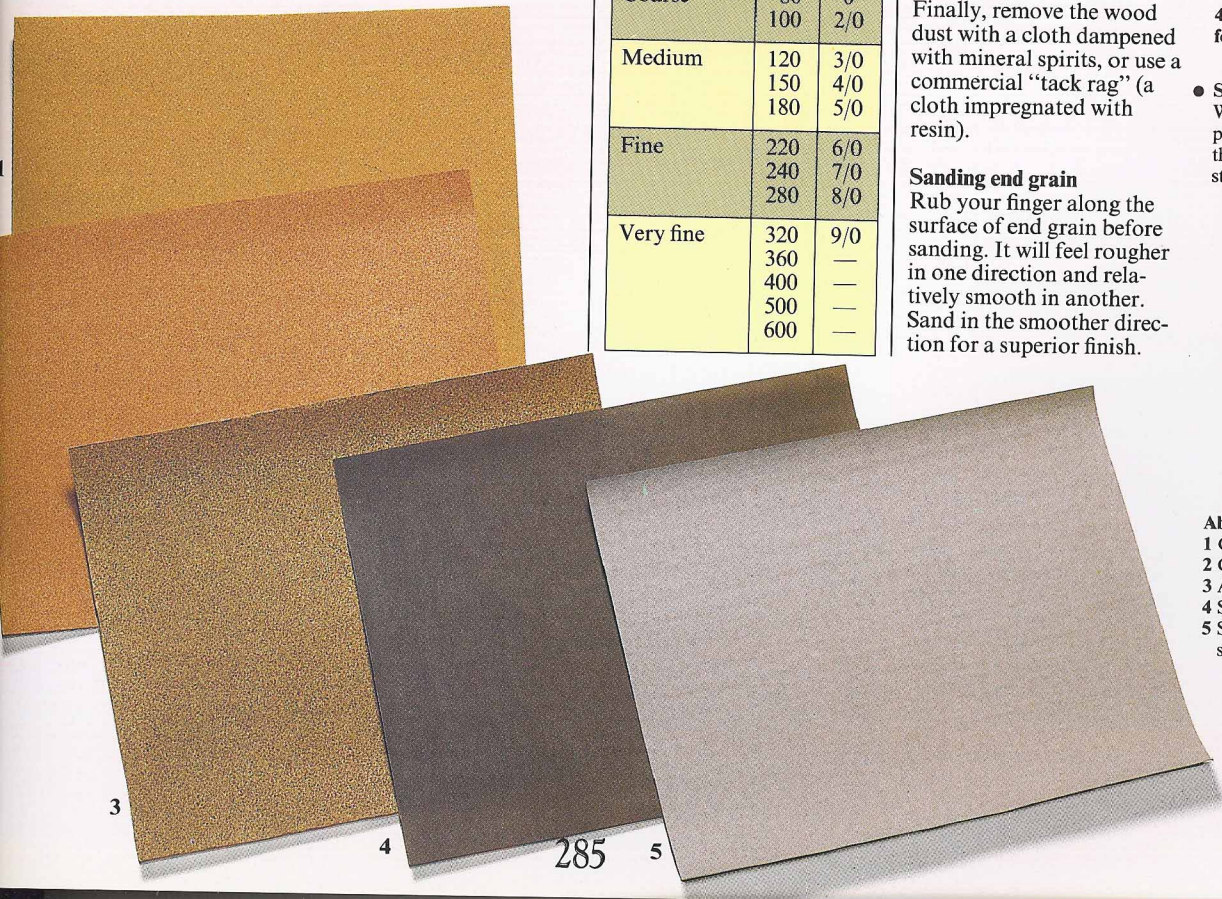
4 Use fingertip pressure for light sanding

Storing sandpaper

Wrap sheets of sandpaper in plastic to keep them dry while being stored.

Abrasive papers

- 1 Glasspaper
- 2 Garnet paper
- 3 Aluminum-oxide paper
- 4 Silicon-carbide paper
- 5 Self-lubricating silicon-carbide paper



3

4

285

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BLEACHING AND STAINING

FILLING THE GRAIN

Always fill the pores of coarse-textured open-grain woods such as mahogany, walnut, oak and ash with a grain filler before applying a glossy finish. If you omit this process, a pitted, uneven finish will result.

The best method is to apply successive coats of varnish, rubbing down in between, until the pores are filled. Color-matching of filler to wood is then not needed. However, this is a laborious process, so most woodworkers prefer to use a commercial grain filler sold as a thin paste colored to match a variety of woods. Choose a filler slightly darker than your wood, since filler dries to a lighter tone and you can always adjust its color by adding a compatible wood stain to the paste.

Rub the filler onto the wood with circular strokes, using a coarse cloth to remove any excess filler, and let it harden overnight before sanding very lightly with a fine-grade paper in the direction of the grain.

Filling stained wood

If you fill the wood after staining, the dried filler can only be sanded very lightly or you will change its color – and if you stain after filling, uneven absorption may result in patchiness. The safest way is to seal the stained wood with a coat of the intended clear finish, then once it is dry, fill the grain. This way, the sealer coat will protect the color when you sand the filler.

Using sanding sealer

In place of grain filler, use a commercial sanding sealer when preparing fine-textured woods or man-made boards for finishing. Brush the sealer on and sand it when dry with a fine-grade paper. Seal again and rub down the dried surface with 0000 grade (extra-fine) steel wool. Some varnishes may not adhere satisfactorily when applied over sanding sealer.

In most cases, a woodworker will apply a clear finish directly to a sanded workpiece, but occasionally it may be necessary to bleach discolored wood before polishing or varnishing. Conversely, you might want to enhance the color of an unusually dull piece of wood with a light coat of stain or use stain to blend poorly matched samples of the same species of wood.

BLEACHING WOOD

Two-part commercial wood bleaches remove the color from wood by chemical action. Having applied the bleach itself, it is necessary to use a neutralizer to arrest the process. Not all woods bleach successfully. Chestnut or rosewood, for example, do not respond favorably to bleach, whereas oak or birch react well. Always test a sample of the wood before attempting to bleach your workpiece. Wood bleach is a potent chemical – so follow the manufacturer's recommendations with care. Wear protective gloves, goggles, old clothes and an apron whenever you handle the chemicals.

Apply an even coat of bleach to the wood, using a clean white rag or an old bristle or nylon brush. Keep checking on the reaction for up to 20 minutes and, as soon as the required tone is achieved, wash the surface with the neutralizer. After about four hours, wash the wood again with clean water, leave it to dry and then sand it smooth.

Wood stains

- 1 Colored water-based stain on maple
- 2 Walnut water-based stain on beech
- 3 Light-oak alcohol-based stain on beech
- 4 Red-mahogany oil-based stain on beech



Fill the grain of coarse-textured wood



Bleached utile



1

286

2

3

4

WOOD STAINS

Wood must be perfectly clean, grease-free and sanded smooth in the direction of the grain before you apply wood stain. After using a powered orbital sander, sand by hand to remove the swirls of fine cross-grain scratches left on the wood. Unless you wet the wood first and sand it smooth, a water-based stain will raise the grain, leaving a rough surface after it dries.

TYPES OF STAIN

Ready-mixed wood stains are available in an enormous range of colors from most paint or hardware stores, but dry, powdered pigments that you have to mix for yourself usually have to be bought from a specialist supplier. Ready-mixed stains are very convenient, but many professionals recognize the advantages of being able to mix the exact colors they want using dry pigments.

Water-based stain

Water-based stains flow and penetrate well and, because they are relatively slow to dry, it is easy to get an even distribution of color. You can even shade water stains when they are on the wood, using a damp rag to remove color. Once it is dry, any wood finish may be applied over a water stain. You can buy ready-mixed stain or dry, water-soluble aniline powder. To make your stain, mix about 1oz (30g) of the powder in 1 quart (1 litre) of warm water. Let the stain cool before applying it.

Alcohol-based stain

Alcohol-based stains are not popular with amateur woodworkers because, being dissolved in methylated alcohol, they dry very fast and skillful application is required to avoid overlaps and hard edges showing when the stain dries. For this reason, alcohol-based stains are often sprayed on. This type of stain will not raise the grain of the wood. Buy it ready-mixed or in powder form to be mixed with alcohol, using the same pro-

portions recommended for a water stain. Adding a little shellac (French polish) makes it easier to brush on alcohol stain and helps bind the pigment.

An alcohol-based stain may "bleed" through a subsequent coat of French polish or brushed-on cellulose lacquer, but a sprayed lacquer finish will not be affected in the same way.

Oil-based stain

Oil-based stains evaporate reasonably quickly, but there is usually plenty of time to achieve a satisfactory result. These stains, based on mineral spirits and oil-based solvent naphtha, will not raise the grain. Oil-based stains will be redissolved by the solvent content of polyurethane varnish and wax polish. Seal the stained surface with one coat of shellac sanding sealer before applying varnish and two coats before applying wax. Oil stains are only available ready-mixed.

APPLYING WOOD STAIN

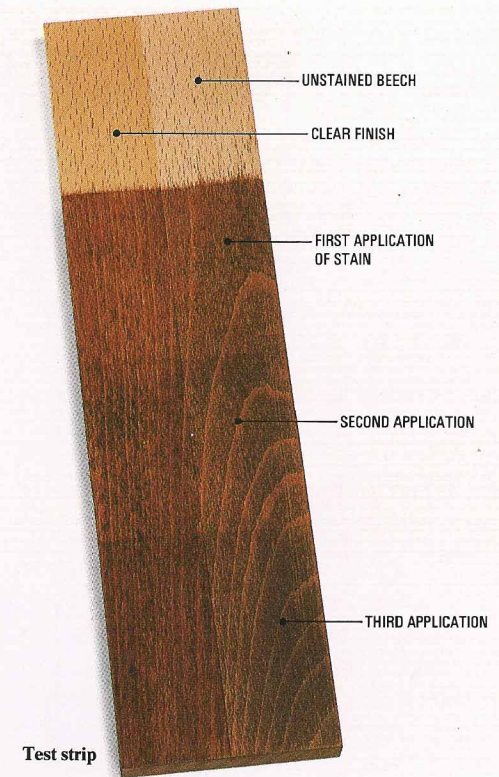
You can apply stain to a flat area of wood with a good-quality paintbrush or a paint pad. Spread the stain liberally and evenly; work with the grain and blend wet edges as quickly as possible. As soon as you have applied a coat of water stain, wipe the wet surface with a soft, dry cloth to distribute the color evenly and absorb excess stain.

You may prefer to apply stain with a ball of clean rag – especially if you have to color a vertical panel, since it is easier to control runs. Using a rag is also the only really practical way to stain turned components. Wearing protective gloves, saturate the rag in stain, then squeeze it out to avoid dripping spots of color on the wood. Drips and runs may show through the finished coat of stain unless you can blend them before they begin to dry.

MAKING A TEST STRIP

Each species of wood absorbs stain differently, affecting the color of the stain as it dries. The type of finish you use to overlay the stain also has an effect on its color and tone.

Before you stain a workpiece, make a test strip, using a scrap of the same wood. Paint the test strip with one coat of stain and allow it to dry; then paint the strip with a second coat, but leave a small section of the first application exposed for comparison. Two coats of stain are normally sufficient, but for the purposes of the test make three or even four applications and leave them to dry thoroughly. Paint a band of clear finish along one half of the test strip to see how it affects each coat of stain.



FUMING WOOD

Exposure to ammonia fumes chemically colors woods that contain tannic acid. Oak – the most popular wood for fuming – turns a golden honey color to a medium-dark brown, depending on the length of exposure. Mahogany, chestnut and walnut can also be colored with ammonia.

You can obtain a strong ammonia solution (27 to 30 percent) from a retail pharmacy or chemical-supply house. Alternatively, you can use ordinary household ammonia, though expect the process to be slower. Ammonia irritates the eyes, nose and throat – so build a fume cupboard either outside or in a well-ventilated room and wear goggles plus a face mask or respirator when handling the chemical.

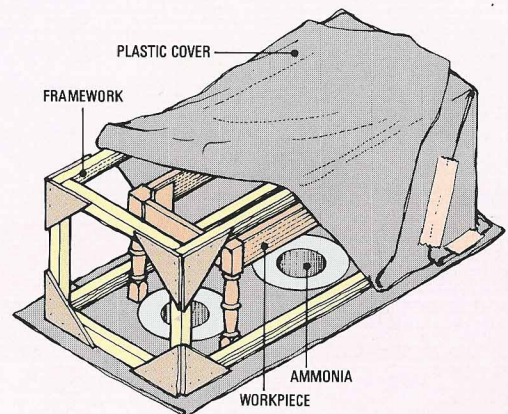
Making a fume cupboard

To construct a makeshift fume cupboard, make a scrap-wood framework to enclose the workpiece, then drape the frame with black plastic sheeting to create an airtight tent. Seal all seams and joints with duct tape. Don't use transparent

plastic, as daylight can affect the color change.

Place several saucers containing ammonia solution inside the tent along with the workpiece. Do not include metal hardware or exposed screws, since they will stain the wood.

Leave the tent sealed for about 24 hours to obtain a medium-dark color. Check from time to time if you want a lighter tone. Even when you remove the workpiece, the reaction will continue for a while and the wood will darken still further.



Home-made fume cupboard

FRENCH POLISH

French polish, the most celebrated wood finish of Victorian times, is still very popular today. The polish is made by dissolving shellac, a secretion of the lac insect, in industrial alcohol. It can be burnished to an almost glass-like texture that belies its vulnerability to scratching and its susceptibility to alcohol and water, which etch the surface leaving white stains. Despite these obvious disadvantages, French polish is such an attractive finish that many woodworkers are prepared to put in hours of practice in order to master the technique.

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French polishes

- 1 Unfinished mahogany
- 2 Mahogany finished with button shellac
- 3 Mahogany finished with garnet shellac
- 4 White shellac on maple

TYPES OF SHELLAC

“Orange” and “white” liquid shellacs are widely available commercially, or you can make your own blends by dissolving dry shellac flakes in methylated alcohol. Once mixed, liquid shellac has a limited shelf life, after which it will not dry hard.

Blond shellac

This is the highest grade of shellac flakes, ranging from super-blond, the lightest in color, to various grades known as “lemon.”

Button and garnet shellac

Button-lac was once shellac sold in the form of discs or “buttons,” but these have not been available for years. Now the term is used to describe a less-refined grade of shellac flake that is darker in color than the blond and lemon varieties. Garnet is a rich red-brown in color.

Orange shellac

Commercial liquid shellac suited to most wood finishing purposes, with a longer shelf life than commercial “white” shellac. It is usually sold in 3lb cut, or three pounds of dry shellac mixed with one gallon of alcohol by the manufacturer. This is a good rough guideline for mixing dry shellacs as well.

White shellac

Bleached “white” shellac has a short shelf life in dry form, and is therefore always sold premixed. Its liquid shelf life is short. It is suitable for use on marquetry or other low-wear applications, especially over light-colored woods.

Dewaxed shellac

Natural shellac contains waxes that very slightly dull the appearance of the film, but also make it more flexible. To achieve finishes of the highest gloss and hardness, manufacturers remove the wax.

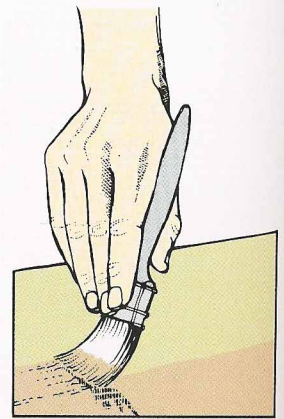
Colored shellacs

Shellacs can be tinted with alcohol-soluble dyes. A green color can be used to “tone down” raw-red mahogany; a red-brown will enrich dull-brown wood.

BRUSHING SHELLAC

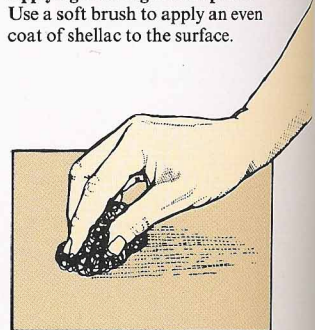
Traditional French polishing demands skill and practice before you can achieve perfect results. Consequently, many woodworkers prefer to brush slightly thinned shellac onto the wood then rub down between coats rather than apply the polish in the traditional manner.

The technique for brushing shellac is easy to master. Use a soft brush to apply an even coat, then after 15 to 20 minutes, rub down lightly with self-lubricating silicon-carbide paper and apply a second coat. Having applied a third coat in the same way, rub it down with 0000 steel wool dipped in wax polish, then after five minutes, burnish with a soft cloth.



Applying brushing French polish

Use a soft brush to apply an even coat of shellac to the surface.



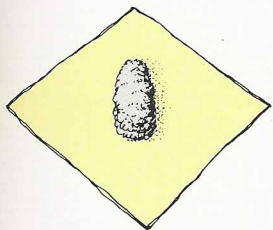
Rubbing down with steel wool
Rub the final coat lightly in the direction of the grain.

TRADITIONAL FRENCH POLISHING

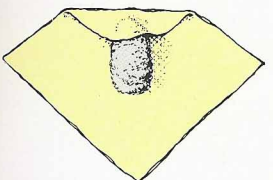
Traditionally, French polish is applied, thin layer upon layer, using a ball of cotton wrapped in a white linen rag to make a soft pad known as a "rubber."

Making a rubber

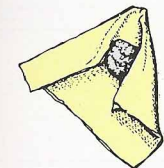
Upholsterer's skin wadding is the best material for making a rubber, but ordinary cotton will do almost as well. Take a handful of the material, squeeze it roughly egg-shaped and place it in the center of a 9 to 12in (225 to 300mm) square of linen (1). Fold the fabric over the cotton (2), then turn in the edges (3), gathering the loose material in the palm of your hand (4). Smooth out any wrinkles across the sole of the pad.



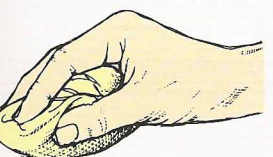
1 Place ball of wadding on a square of linen



2 Fold one corner



3 Turn in the edges



4 Hold in the palm of your hand

Charging a rubber

Unfold the linen square, then, holding the rubber in the palm of your hand, pour shellac polish onto the pad until it is fully charged but not absolutely saturated. Fold the rubber again, as described left, and press it against a scrap board to squeeze out the polish and distribute it evenly across the sole. Use your fingertip to apply a drop of linseed oil to the sole to act as a lubricant.

Applying the polish

To apply French polish to a flat surface, first make overlapping circular strokes with the rubber, gradually covering the whole panel with shellac (1). Then go over the surface again, this time using figure-eight strokes (2). Varying the stroke ensures an even coverage. Finish with straight overlapping strokes parallel to the grain (3).

Very little pressure is required with a freshly charged rubber, but gradually increase the pressure as the work proceeds. Always keep the rubber on the move, sweeping it on and off the surface at the beginning and end of each complete coverage. If you stop with the rubber in contact with the work, it will stick and scar the polish, in which case you must let it harden thoroughly before rubbing it down with very fine self-lubricating silicon-carbide paper. Recharge your rubber with polish as necessary and add another spot of linseed oil when the rubber starts to drag.

Assuming the first application is free from blemishes, leave it to dry for about half an hour, then repeat the process. Build up four or five coats in this way, then leave the shellac to harden overnight. Keep your rubber in a screw-top glass jar while you allow the polish to dry.

The next day, sand out any runs, dust particles or rubber marks with silicon-carbide paper before applying another four to five coats of polish. Judge for yourself when you have built up a protective body of polish with the required depth of color, but 10 to 20 coats will be sufficient.

Polishing moldings and carvings

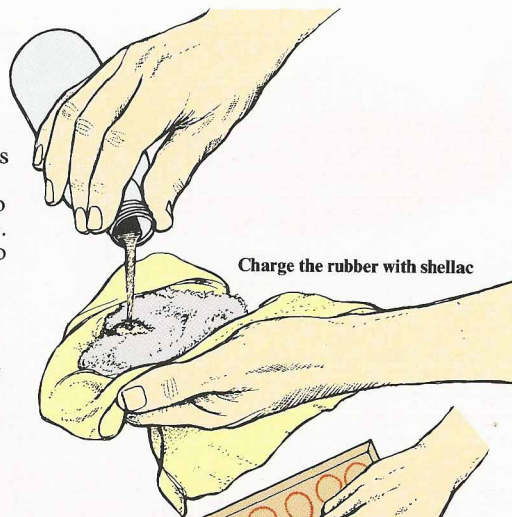
Panels with large shallow moldings can be polished with a rubber, but use a soft brush to apply slightly thinned shellac to deep moldings or carvings. A squirrel-hair brush from a specialist supplier is ideal, but you can make do with an ordinary good-quality paintbrush. Apply the polish relatively quickly and evenly, but not too quickly or it will run. When the shellac has hardened, spirit off with a rubber as described below, but only burnish lightly or you will remove too much polish from the high points.

Spiriting-off

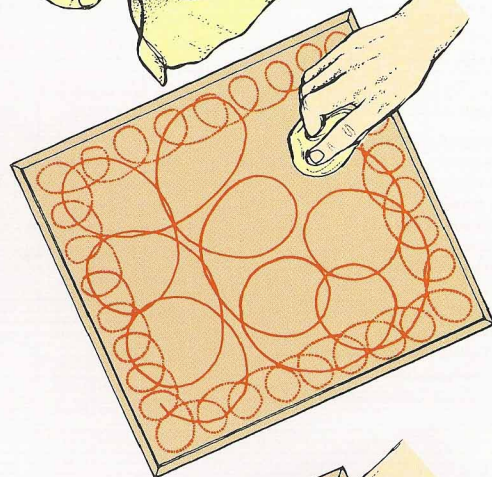
The linseed-oil lubricant leaves streaks in the surface of the polish. Remove the streaks and burnish the polish to a gloss finish using a rubber practically empty of shellac but with a few drops of methylated alcohol on the sole. Apply the rubber to the polished surface using straight parallel strokes only, gliding on and off the panel at the beginning and end of each stroke. Recharge with more methylated alcohol as soon as the rubber begins to drag. Leave the work for a couple of minutes to see if the streaking disappears. If it doesn't, spirit off again until you have achieved the required finish. After half an hour, burnish the surface with a dry, soft rag, then leave the work for at least a week to harden completely.

Creating a satin finish

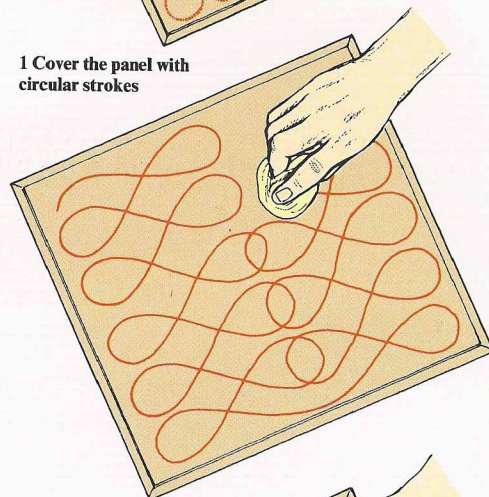
If you don't care for a high-gloss finish, matte the fully hardened surface by rubbing it lightly with a ball of 0000 steel wool dipped in soft wax polish. Use straight, parallel, overlapping strokes until the surface is dulled evenly, then burnish it to an attractive satin sheen with a soft cloth, adding a little more wax polish if necessary.



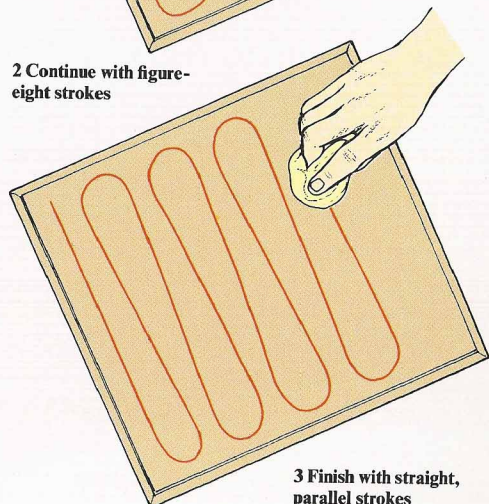
Charge the rubber with shellac



1 Cover the panel with circular strokes



2 Continue with figure-eight strokes



3 Finish with straight, parallel strokes

LACQUER, VARNISH AND PAINT

Lacquer, varnish and paint are grouped together here because these finishes are applied in similar ways, either by brush or spray gun. Consult the label for

appropriate solvents, time between coats and precautions for use. Most paints are in effect clear lacquers or varnishes with additional pigments.

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Lacquers, varnishes and paint

- 1 Cellulose lacquer on maple
- 2 Clear catalyzed lacquer on pine
- 3 Black catalyzed lacquer
- 4 Clear polyurethane varnish on utile
- 5 Tinted polyurethane varnish on oak
- 6 Solvent-based paint on pine

Nitrocellulose lacquer

This has been a popular industrial wood finish for decades, primarily because it dries extremely quickly. There are special brushing varieties, but lacquer normally has to be sprayed on to achieve the desired result. Lacquer dries by solvent evaporation, leaving a surface layer that is partly redissolved by the next application – a process that eventually results in one integral coat of lacquer.

Nitrocellulose lacquer is practically water-clear and will hardly change the color of the wood to which it is applied. It forms a hard finish that is resistant to heat and moisture.

Catalyzed lacquers

A catalyzed lacquer cures by chemical action – the lacquer won't set without the introduction of a hardener. With precatalyzed lacquers, the catalyst and lacquer are mixed by the manufacturer, although setting does not occur until the finish is exposed to air. An acid-catalyzed lacquer is supplied as two separate components for the woodworker to mix just before applying it to the work. Catalyzed lacquers are very transparent – they are also exceptionally hard-wearing and stain-resistant. Both gloss and matte lacquers are available, and you can buy opaque black and white acid-catalyzed lacquers as well as the more familiar clear variety. All catalyzed lacquers can be diluted with special thinners for spraying and some are formulated for brushing on. Most are extremely toxic.

Varnishes

Synthetic resins such as polyurethane are used to make modern wood varnishes that are heat-resistant, waterproof and extremely hard-wearing. Although most varnishes can be used straight from the can, some are supplied with a catalyst that is added just before the varnish is applied. These two-part varnishes are so resistant to abrasion that they are used for finishing wooden floors, but they have a relatively short pot life and adhesion between coats is not always satisfactory. They also give off unpleasant fumes.

Exterior-grade varnishes are made to be weather-resistant – and “yacht varnish,” which will withstand exposure to salt water, is especially suitable for coastal climates.

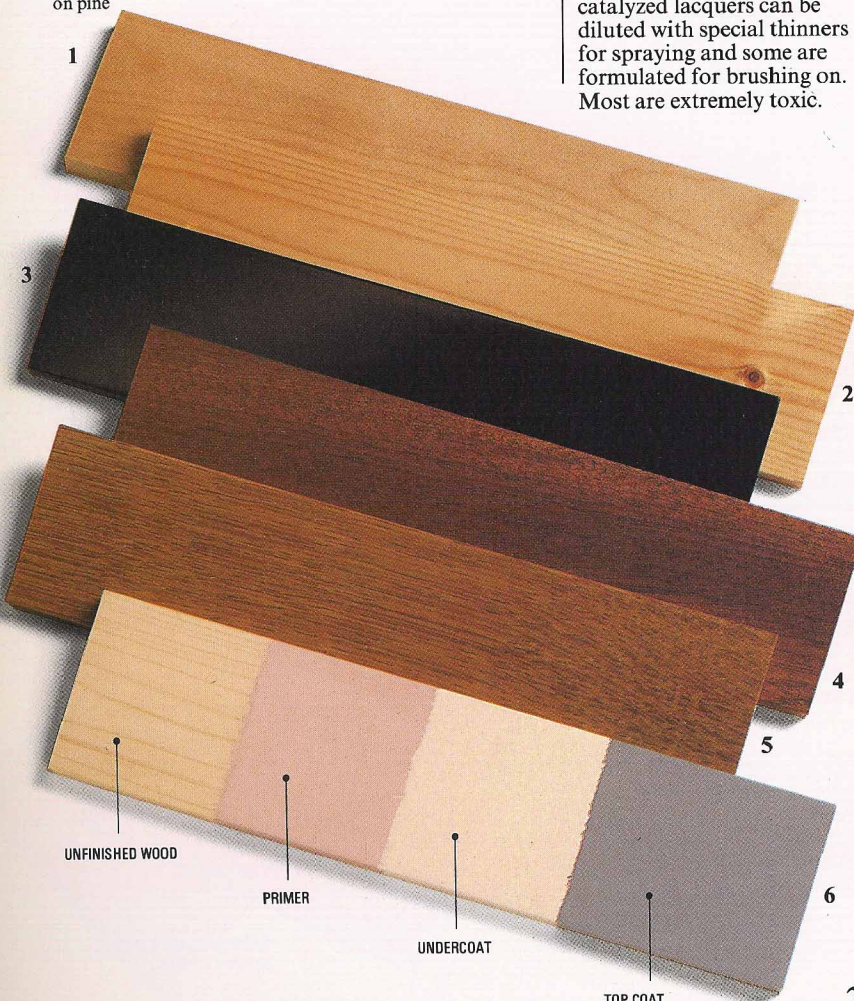
There are clear varnishes that dry to a matte, satin or gloss finish, and tinted varnishes are available for coloring wood. As a tinted varnish does not penetrate the wood like a true stain, there is always the possibility of color loss due to localized wear. As a safeguard, apply one or two additional coats of clear varnish to preserve the color. Tinted varnish is useful for adjusting the color of a workpiece that has already been varnished. You can apply varnish with a paintbrush or dilute it with thinner for spraying.

Paint

Solvent-based paints for wood are made from solid pigments suspended in a synthetic resin, such as alkyd, vinyl, acrylic, urea or polyurethane, mixed with oil. Certain additives alter the quality of the paint to make it glossy, matte, satin, fast-drying and so on. Most solvent-based paints have a liquid consistency, but you can also buy thixotropic (nondrip) paints that are jelly-like in the can and flow only when agitated by brushing them onto a surface.

Paints with specific properties are used in sequence to build up a hard-wearing protective coating. A primer is used first, to seal the bare wood and prevent absorption of subsequent coats. It is followed by one or two applications of a heavily pigmented undercoat to obliterate the primer and build up a body of paint. The final top coat provides a wipe-clean surface of the required color and texture.

Opaque paints are intended for finishing cheap hardwood as well as softwood and man-made boards. Resin-based paints can be applied by brush, and all but thixotropic paints can be sprayed. Water-based paints will raise the grain if used to finish wood.



CLEANING PAINTBRUSHES

When you have finished work, brush out excess paint, varnish or lacquer on newspaper in order to clean the bristles. Flex the brush in the finish-maker's recommended thinner (mineral spirits for most paints and varnishes), then wash the dirty thinner from the bristles with hot soapy water and rinse them. Shape the bristles with your fingers while they are still wet. When dry, wrap the bristles in soft paper and slip an elastic band around the ferrule of the brush to secure the wrapping.

APPLYING FINISHES BY BRUSH

Spraying produces the most professional-looking finish, but it is expensive to build and equip a spray booth that complies with health and safety recommendations. Consequently, applying clear finishes and paints with a brush is the only viable option for many amateur woodworkers. However, provided you use well-maintained, good-quality brushes and exercise care and patience, you can achieve more than satisfactory results employing ordinary workshop facilities. Buy a range of brushes – say ½, 1 and 2in (12, 25 and 50mm) wide – for general work, and a 4in (100mm) brush for coating large flat surfaces.

Brushing cellulose lacquer

It requires a certain amount of experience to apply a brushing lacquer without leaving brush marks or ridges that are difficult to rub down. First, using a soft cloth or a brush, apply lacquer thinned by 50 percent to act as a sealer coat. Load a soft brush with full-strength lacquer and, holding the bristles at a shallow angle to the horizontal surface, lay the finish onto the surface with long, straight strokes. Don't attempt to brush it out like varnish, and avoid going back over the same area twice. Quickly pick up wet edges with fresh lacquer and allow the brush marks to flow out by themselves. Build up two or three coats of lacquer, rubbing down with very fine silicon-carbide paper in between. Each coat usually takes about an hour to dry – but check the manufacturer's instructions. If you are unhappy with the appearance of the final coat, flatten it with sandpaper again and apply a commercial rubbing compound with a soft cloth to buff the finish.

Some experienced woodworkers prefer to use a "pull-over solution" made from one part cellulose thinner mixed with three parts mineral spirits to put the final shine on nitro-cellulose lacquer. This is not an easy technique to perfect and you must take care to avoid stripping the surface by applying too much solution. Having flattened the lacquer with silicon-carbide paper, moisten a cloth pad with pull-over solution and apply it to the surface, using overlapping circular strokes followed by straight ones in the direction of the grain, as when applying French polish.

Applying acid-catalyzed lacquer

Chemical composition and balance is crucial to the curing of acid-catalyzed lacquer, so it is essential to follow the manufacturer's recommendations for mixing the components and preparing the surface of the wood. Clean the wood well, since the presence of grease or wax, for example, can delay curing for days.

Mix just enough lacquer for your needs, and don't return the residue to the original container or the entire contents will become unusable.

The specific method of application may differ from product to product, but as a rule you can brush a liberal coat of lacquer onto the wood, spreading it with straight, parallel strokes along the grain. There is no need to brush it out like varnish – just leave the film to settle naturally. When you are coating a large area, work relatively quickly to blend wet edges before the lacquer starts to set. This will probably take between 10 and 15 minutes. Apply a second coat about two hours later and, having rubbed it down lightly with very fine silicon-carbide paper to remove dust particles, add a third coat two hours after that. For perfect adhesion between coats, try to apply all three in the same day.

If you want a mirror finish, leave gloss lacquer to harden for 24 hours, then buff it with a polishing compound on a soft cloth. For a satin finish, rub the gloss lacquer with 0000 steel wool dipped in wax polish then buff with a clean, soft rag.

Applying varnish

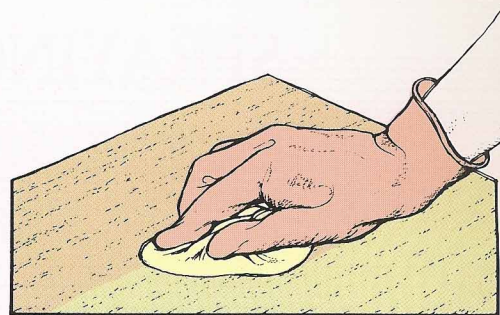
When finishing bare wood with clear or tinted varnish, first apply a sealer coat thinned by 10 to 20 percent with mineral spirits. Use a soft cloth pad to rub it into the wood in the direction of the grain, or brush on the sealer coat where a pad would be inconvenient.

Apply the second coat by brush not less than six hours later – and if more than 24 hours have elapsed between coats, key the surface of gloss varnish with a very fine silicon-carbide paper. Remove the wood dust, using a cloth dampened with mineral spirits, before brushing on the varnish. For a hard-wearing surface, apply a third coat in the same way.

To load a brush with varnish, dip only the first third of the bristles into the finish and touch it off on the inside of the container to remove excess liquid. Do not drag the bristles across the rim of the can, as that promotes bubbles in the varnish – which, if transferred to the work, may end up set in the surface coating.

Paint the varnish onto the wood, brushing it in different directions to spread the finish evenly and blend each new coat with the wet edges of the previous application. Finally, "lay off" with light strokes in the direction of the grain. Don't brush back over a coat of varnish once it has begun to set or you will leave permanent brush marks. If this should happen, leave the finish to harden overnight then rub out the brush marks and any other blemishes with silicon-carbide paper lubricated with water.

If dust particles settle on your final gloss surface, either rub down and varnish again or modify the finish with steel wool and wax. Dip 0000 steel wool in wax polish and burnish the surface in the direction of the grain. Buff the treated surface with a rag to raise an attractive soft sheen free from obvious imperfections.



Apply a sealer coat of varnish with a cloth pad

Applying paint

Most solvent-based paints are applied like varnish, brushing them out to provide an even cover, then laying off with parallel strokes of the brush. However, there is no need to brush out thixotropic paints – instead, apply a fairly liberal coat of paint, brushing with virtually parallel strokes only, and leave the brush marks to flow out naturally.

Allow enough time for each coat of paint to dry according to the manufacturer's instructions, then rub down with a very fine silicon-carbide paper and wipe the surface clean with a rag. Leave the final top coat to dry overnight in a dust-free environment before handling the workpiece again.

AVOIDING RUNS IN PAINT OR VARNISH

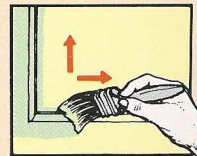
If you neglect to brush out a liberal coat of normal solvent-based paint or varnish on a vertical surface, it will sag to form a heavy ridge similar in appearance to a draped curtain. Prevent "curtaining" by applying an even coat, then lay off with upward brush strokes (1).

Teardrop runs are caused by flexing a loaded brush against a molding or the corner of a panel. Always apply paint along moldings – never across them – and pay particular attention to brushing out in both directions from corners where two moldings meet (2).

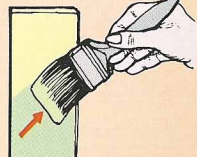
When painting up to the edge of a panel, brush outward away from the center (3). If you brush back against the arris, you will scrape paint off the bristles, leaving it to run down.



1 Laying off



2 Brush out from corners



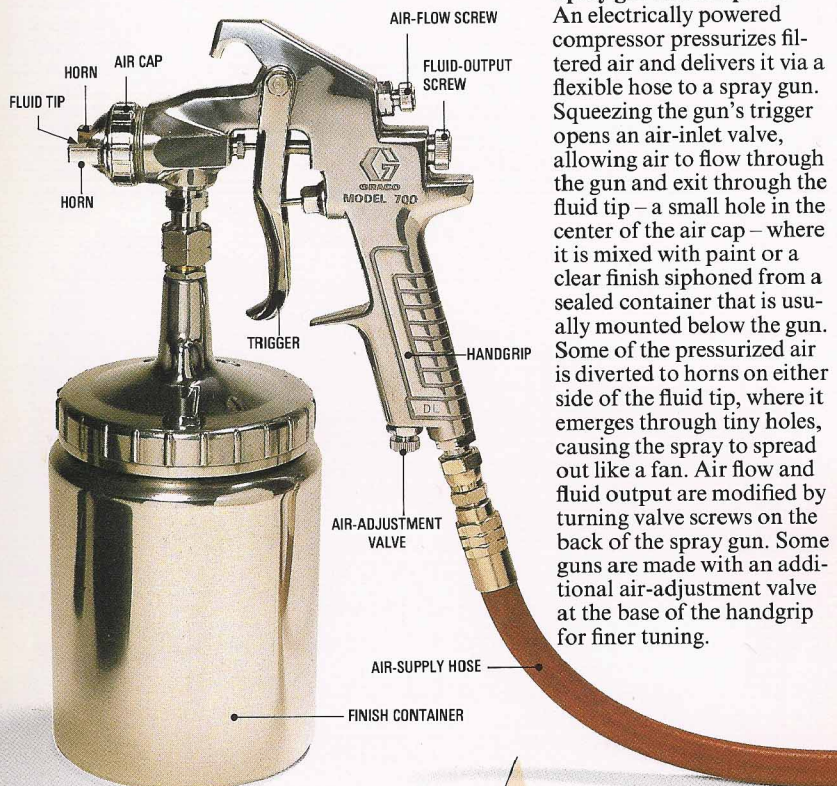
3 Brush toward edge

SPRAYING WOOD FINISHES

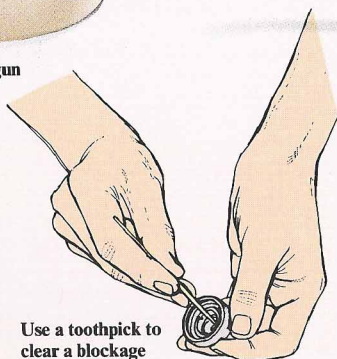
Once you have mastered the basic techniques, you can finish a workpiece with a perfectly even coat of varnish, paint or lacquer, using a spray gun and compressor. When these volatile finishes are distributed as a fine mist in the air, they form a potentially explosive environment and constitute a serious health hazard. You should therefore either spray woodwork outside or build a spray booth equipped with an efficient exhaust system. However, check with your local authorities to see if you are allowed to spray in your locality and to make sure that you will not be violating any fire or safety regulations.

SPRAYING EQUIPMENT

Paint-spraying equipment mixes pressurized air with a liquid finish and deposits it in the form of very fine particles on the surface of the work.



Spray gun



Use a toothpick to clear a blockage

Spray gun and compressor

An electrically powered compressor pressurizes filtered air and delivers it via a flexible hose to a spray gun. Squeezing the gun's trigger opens an air-inlet valve, allowing air to flow through the gun and exit through the fluid tip – a small hole in the center of the air cap – where it is mixed with paint or a clear finish siphoned from a sealed container that is usually mounted below the gun. Some of the pressurized air is diverted to horns on either side of the fluid tip, where it emerges through tiny holes, causing the spray to spread out like a fan. Air flow and fluid output are modified by turning valve screws on the back of the spray gun. Some guns are made with an additional air-adjustment valve at the base of the handgrip for finer tuning.

Cleaning a spray gun

When you have finished spraying, empty the finish container and add clean thinner. Operate the gun until perfectly clear thinner emerges, then release the air pressure, dismantle the air cap and clean the components with a rag dampened in solvent. Use a wooden toothpick to clear a paint blockage in the cap.

Building a spray booth

The only safe way to spray indoors is to construct a fully enclosed booth that will isolate this activity from the rest of the workshop. Install a powerful exhaust fan on an outside wall to remove noxious solvent fumes. However, these fumes create such a flammable atmosphere that even a sparking electric motor can cause them to ignite – so obtain a fan with an explosion-proof motor from a specialist supplier and fit a paint filter in front of the fan to collect the overspray. You will also need explosion-proof lamps that can be switched on or off from outside. Check with your supplier that your compressor is safe to use inside the booth, or install it outside with a connection for the hose fitted to the booth wall. Ideally, include a water trap at this point to prevent moisture in the pressurized air from condensing in the hose and spoiling the work. To hold small workpieces, make a turntable, using a disc of chipboard screwed to an old swivel-chair base, and stand it in front of the filtered fan. Support larger pieces on sawhorses.

SPRAYING SAFELY

Always follow the spray-equipment manufacturer's advice regarding health and safety. In addition:

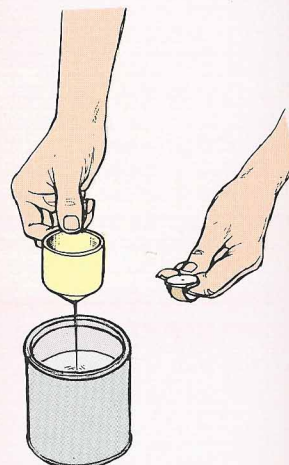
- Wear goggles and a respirator, even when spraying outside.
- Construct a properly equipped spray booth.
- Never smoke, and extinguish all naked flames when spraying.
- Keep young children away from spraying equipment.
- Never aim a spray gun at anyone.
- Disconnect the equipment and release the pressure in the air hose before trying to clear a blocked spray gun.

THINNING PAINT, VARNISH OR LACQUER

All finishes, most of which are sold in a brushable consistency, must be diluted with the appropriate thinner to render them fluid enough to be sprayed. Check manufacturers' recommendations for the type of thinner to use and the ideal ratio of thinner to finish.

Having measured out and mixed the components, use the following rough rule of thumb to test the consistency of the finish. Stir the finish with a wooden stick, then lift it out and watch how the finish runs from the tip. When the finish runs in a steady, continuous stream, it is about right for spraying. A slow, interrupted stream indicates an over-thick consistency that will not spray efficiently. It is not so easy with this method to tell when a finish is too fluid, but a short burst of diluted finish sprayed onto a vertical practice board will give you a clue – if it runs almost at once, it is too thin.

For a more accurate gauge of consistency, obtain a viscosity cup from the spray-equipment manufacturer. Fill the cup, which is similar to a funnel, with thinned finish and time how long it takes to empty. Adjust the consistency until the time corresponds with the recommended figure.



Use a viscosity cup to test the consistency of a finish

SEE ALSO

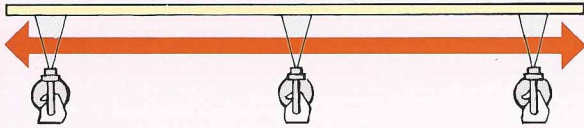
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BASIC SPRAYING TECHNIQUES

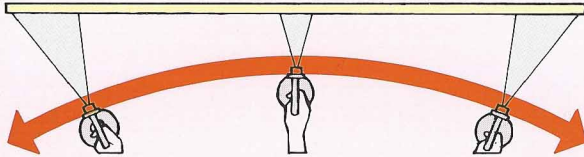
If you have never sprayed finishes before, it is best to practice on a piece of scrap board before spraying a workpiece.

Spraying a vertical panel

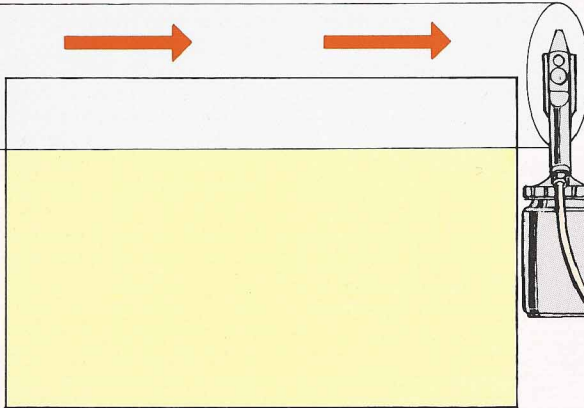
To spray a vertical panel, hold the gun approximately 8in (200mm) away from the surface, with the air horns turned horizontally to create a vertical fan-shaped spray pattern. Point the gun directly at the work and keep it moving on a path parallel to the surface throughout one pass (1). Avoid swinging the gun in an arc (2) or the finish will be applied thinly at each end of the pass. Squeeze the trigger just before each pass, and don't release it until the spray pattern is clear of the work at the other end (3). Aim the center of the spray pattern at the edge of the panel. On the return pass, overlap the previous application by about 50 percent (4) and continue with overlapping passes until you have covered the panel with finish.



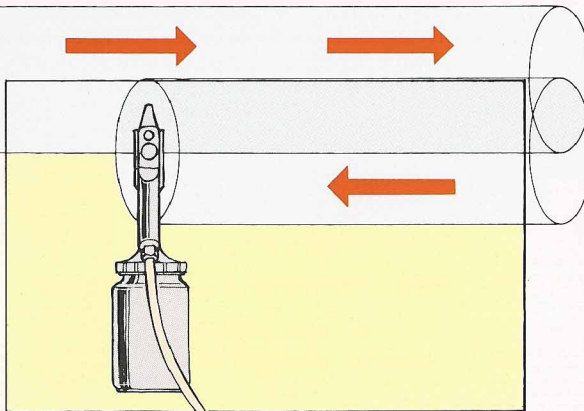
1 Move a spray gun on a path parallel to the work



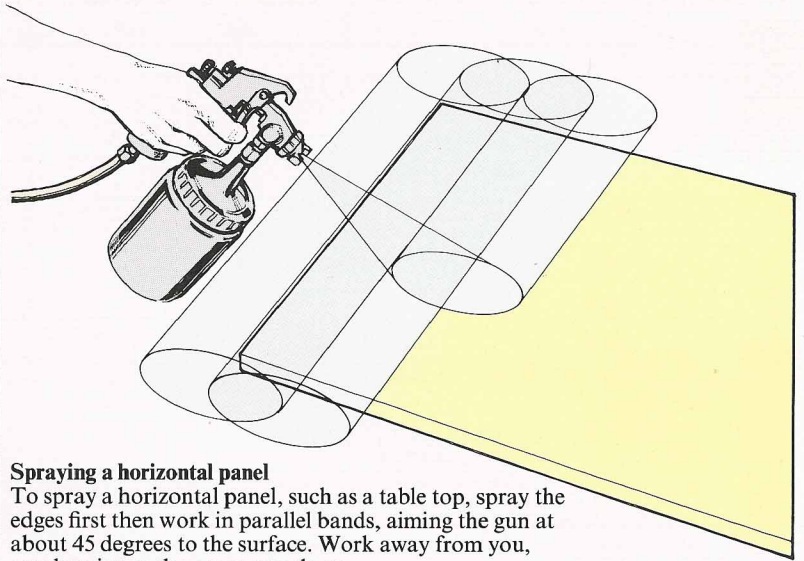
2 Swinging the gun produces an uneven coverage



3 Start and finish clear of the work

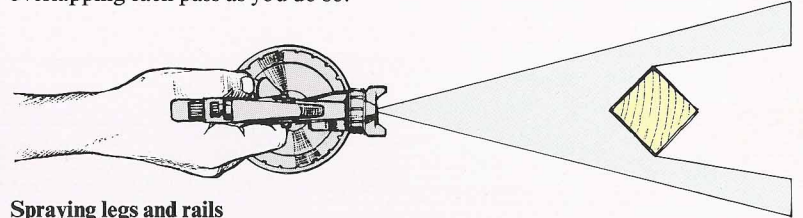


4 Overlap previous application on the return pass



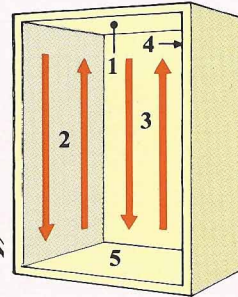
Spraying a horizontal panel

To spray a horizontal panel, such as a table top, spray the edges first then work in parallel bands, aiming the gun at about 45 degrees to the surface. Work away from you, overlapping each pass as you do so.



Spraying legs and rails

Aim the gun at a corner to spray two sides of a leg or rail simultaneously. Spray from the opposite side of the leg to coat the remaining surfaces.



Spray enclosed surfaces in sequence

Spraying inside a cabinet or drawer

When you spray the inside of a cabinet or drawer, be systematic and concentrate on spraying each surface in turn to achieve even coverage. Spray the underside of the top panel first, followed by one side, always using overlapping vertical passes. Continue across the back of the cabinet or drawer in the same way. Then spray the other side, and finally the bottom surface. Spray the outside after finishing the interior.

HVLP TECHNOLOGY

A new approach to spraying – called High Velocity, Low Pressure, or HVLP – is finding its way into the woodshop. Here's why.

Traditional spraying uses a relatively small amount of air under high pressure to atomize the coating and transfer it to the work. The air compressor usually requires a large storage tank to provide a continuous supply of pressurized air.

HVLP takes a different approach. Instead of a compressor, a single or multi-stage turbine delivers a large quantity of air through larger hoses at relatively low pressure. Working with a spray gun designed for this air supply, you will get a better coating of the surface, with less blow-back, overspray and waste.

Costs of the two systems are roughly comparable, and application patterns and gun-handling techniques are very similar.

OIL AND WAX

Oil and wax are among the easiest wood finishes to apply, no experience being necessary in order to achieve first-rate results. Unlike varnishes and lacquers that coat the surface, oil penetrates the wood without leaving a film that holds brush marks or other blemishes – and provided you use a fast-drying variety, it does not form a sticky surface to attract dust particles. Wax is used as a finish in its own right and also as a dressing over varnish and lacquer.

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● Restoring an oil finish

If the surface becomes scratched or stained, you can easily renovate it – simply by applying a dash of fresh oil.

Oil and wax polishes

- 1 Danish oil on iroko
- 2 Clear wax on oak
- 3 Antique wax on oak

WOOD-FINISHING OILS

Oil is traditionally used to treat naturally oily woods such as *teak* and *afroformosa*, which tend to reject the majority of finishes. But it is equally suitable for other hardwoods – and even for softwoods, which it endows with a rich amber color. Oil's water-resistant properties are particularly advantageous for exterior woodwork. Moreover, a subsequent application nourishes oiled wood suffering from the effects of exposure to the sun. However, it is not suitable as a finish for the interior of drawers or cupboards, where it could stain the contents.

Linseed oil

Raw linseed oil is suitable for small objects only. It can take up to three days to dry, by which time it may be covered with fluff and dust. Boiled linseed oil is marginally better since it dries after 24 hours, but neither oil forms a hard, durable finish.

Tung oil

Pure tung oil, also known as China wood oil, is the most durable oil finish. It shrugs off water and is resistant to heat and alcohol. It takes 24 hours to dry, but careful rubbing down with very fine silicon-carbide paper between coats will produce a superb finish. Apply five or six coats in all.

Danish and teak oils

Tung oil and other vegetable oils usually form the basis of a number of commercially prepared finishes known variously as Danish or teak oils. Driers are incorporated in these oils to shorten the time between applications to about six hours. Heat, alcohol and water may temporarily leave white stains on the surface, but they disappear quickly. More permanent blemishes can be effaced with a wipe of fresh oil.

Salad-bowl oil

Most wood-finishing oils contain toxic materials. However, you can buy non-toxic "salad-bowl oil" for wooden counter tops, chopping blocks and other objects, such as bowls and spoons, that come into contact with food. Or, if you prefer, use olive oil, or other edible oils, instead.

WAXES

In the past, woodworkers made paste wax by dissolving a mixture of beeswax and hard carnauba wax in turpentine. These raw materials are still available, but there are so many excellent ready-made preparations on the market that most woodworkers do not find it necessary to make their own.

Wax makes for an attractive mellow finish that seems to improve with age. It is produced in a range of colors, from practically transparent for pale woods to deep brown "antique polishes" that create the impression of an aged patina and will disguise scratches in a finished surface.

Silicones are added to some polishes to make them easier to buff, but if they penetrate the wood, they are difficult to remove and will repel practically any other finish should the workpiece ever have to be restored.

Liquid or cream waxes

Liquid or cream waxes are fluid enough to be brushed onto the wood. Two or three applications are required to build up a protective body of polish.

Paste wax

A paste wax, made to a slightly thicker consistency, is ideal for application with a pad of very fine steel wool or lint-free rag. On hardening, it can be buffed with a clean soft rag to an impressive luster.

Woodturning wax stick

A stick of wax, hard enough to be used as a friction finish, is rubbed against a workpiece spinning on a woodturning lathe.

APPLYING OIL

Apply a generous coat of Danish or teak oil to a clean well-prepared surface with a cloth pad or paintbrush. Leave it to soak into the wood for a few minutes, then wipe over the surface with a clean rag to absorb excess oil. Six hours later, apply a second coat and leave it to dry overnight.

The next day apply one more

coat, and buff it to create a sheen.

It takes longer to finish a surface with pure tung oil. After the initial coating, applied liberally with a brush and rubbed over as already described, apply several thinner coats to allow the oil to dry between applications. If dust particles adhere to the surface during the 24-hour drying period, rub it down lightly with very fine sandpaper in the direction of the grain.

APPLYING WAX

Although you can apply wax directly to bare wood, it is an advantage to seal the surface first with a varnish or, for superior-quality work or oil-stained wood, with two coats of shellac sanding sealer or white French polish. Sealing prevents the initial coat of wax from being absorbed too deeply into the grain, especially when you are using a liquid wax. It also prevents dirt from sinking through the wax and permeating the wood over a period of time.

Having flattened the sealer coats with very fine silicon-carbide paper, if you are using a liquid wax, apply the first liberal coat with a brush or use a soft cloth pad to rub it into the wood with circular strokes first and then straight ones in line with the grain. One hour later, buff up the wax and apply a thin coat with the pad in the direction of the grain only. Add a third coat, if needed, similarly and buff it as before. Leave the wax to harden for several hours, then burnish the surface vigorously with a clean soft rag.

If you decide to use a paste-wax polish, apply it with a pad of 0000 steel wool, rubbing with the grain only, and bring it to a shine with a soft cloth.

