



Photo 1

Fast & Effective Finish Restoration, Part 1

Varnish & Polymerized Tung Oil Overcoat

By Ray C. Perkins Jr., Ph. D, Physical Chemist, and
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Introduction

For those of us who color and coat inanimate articles for a living, the hardest question to answer is, "What can you do to make this look better?" The "this" in front of you is a 30-70 year old vertical piano: dull and/or thin and/or "alligatored" finish, Miss Kitty scratches, a memorial to Uncle Harry's beer bottle (or cigarette), and some sort of goo that reminds you of a Blob movie from the 50s. The first response that comes to mind is, "How 'bout we give it to the Guard for target practice?" But, we never actually give voice to that first response — no money in it — and, in any event, the question is a serious one.

What do we do with the tens of thousands of modest pianos which float through new-piano outlets with constant regularity, pianos with plenty of musical life left in them and that could provide a low-cost and small-space solution for many households? As often as not, we clean off the goo (mostly), "pen" the edges and scratches, burn-in the worst of the dings, maybe apply a tinted wax, maybe apply a "satinized" wiping finish or, if we're lucky, convince the contents of a can of quasi-opaque spray toner to adhere to the prominent surfaces. Four hours later the result is not too bad, maybe even better, but seldom truly good and certainly

not satisfying nor lasting. And the storeroom or shop (ours included) is littered with experiments which sometimes work and sometimes don't.

The Task at Hand

Our challenge was the creation of a quick but effective finish restoration process, targeted at that piano which often finds itself an orphan and candidate for the landfill. That challenge was defined by three criteria:

- No more than one day's work,
- Consistent from finish to finish, and
- Pleasing to both the eye and the customer.

Since we're going through the trouble to write this article, it's probably obvious that we succeeded. A vertical piano takes no more than day's work including disassembly, surface preparation, finish application and reassembly. We've successfully applied the process to old shellac, varnish and lacquer finishes. In all cases the old finish was restored to clarity, with grain colors prominent and the patina of age preserved. We're truly excited about making this new restoration process a mainstay of our repertoire — and expanding what we've learned to other applications.

Materials

- Hard Sealer™
- Table Top™
- Terrycloth towels
- Blue contractor paper towels
- Maroon finish pads
- Tack Cloths
- Color repair materials
- Odorless mineral spirits
- Hand sanding block
- 220 grit sandpaper
- Plastic craft bottles
- Food storage containers
- Natural bristle brush

From the outset we favored a varnish as the likely overcoat finish. Unlike many finishes, varnishes undergo important chemical changes as part of the "curing" process. Resin and oil molecules interact with oxygen from the air, forming crosslinks between individual molecules to create tough, flexible and durable surfaces. At the same time, varnishes lend themselves to a variety of application approaches and are readily modified to alter important properties such as film thickness, open time and recoat interval. They also readily bridge across and soften gaps, toughen edges, and do not interact negatively with silicones. Given a thoroughly clean surface with a little "tooth," varnishes can be persuaded to adhere to almost anything.



Photo 2 — Scrub the surface to be cleaned with mineral spirits using 3M maroon finishing pad.

Why We Chose Products From Sutherland Welles Ltd.™

The specific products we chose come from the "Murdoch's" line of products, one of many manufactured and marketed by Sutherland Welles Ltd.™ of Morrisville, VT. The mainstay of the Sutherland Welles Ltd.™ offering is a uniquely formulated polymerized tung oil. As our finishing forefathers long ago boiled linseed oil to create a coating which cures in the average human's lifetime, Sutherland Welles Ltd.™ has developed a careful process of heating and cooling pure tung oil, almost an annealing process, which results in a product which preserves all the good things about native tung oil, while making it finish more amenable to modern finishing practices. Many of their finishes have a pleasant citrus-nutty odor.

The specific products we selected had provided excellent results for us in the refinishing of "real" furniture: products which the company names Hard Sealer™ and Table Top™ varnish. Hard Sealer™ is an almost pure, polymerized tung oil; amended lightly with a uralkyd as a hardener. Table Top™ is a "short" uralkyd resin/polymerized tung oil varnish developed to emulate a French polish appearance while tough enough for commercial bar tops. Taken together, these two products, along with mineral spirits, can be seen as part of general system in which the "cut" of oil to uralkyd can be varied infinitely in order to achieve the desired outcome. This flexibility was crucial to the success of our efforts. These products go a long way. We typically use less than a cup of each per vertical piano.

Cleaning and Surface Preparation

Who knows what evil lurks in the heart of a decades old finish? To be on the safe side, we assumed that all manner of evil lurks there and the first part of our restoration process is aggressive cleaning. Mineral spirits are brushed onto each surface and aggressively scrubbed with maroon synthetic finishing pads (See photo 2). If you're counting — and we do — pads are rubbed back and forth 20 times in the direction of the grain across each square inch of each surface. Take particular care with inside corners and woodworking detail. After scrubbing and while still wet,

continued on next page



Photo 3 — Wipe off old finish residue with clean terry cloth shop towel.

the nasty stuff is removed with terrycloth shop towels, the nasty stuff typically being gray-black in appearance. (See photo 3.) Fresh mineral spirits is applied to the surface and is wet-sanded with 220 grit sandpaper on a soft-backed block (See photo 4.) four strokes only in the direction of the grain (See the “Caution!” below.) Removal of this round of spirits should show a more amber color on the towel, indicating that the upper layer of the old finish (the tired layer) has been successfully removed. To complete the surface preparation process, wipe each surface with a clean terry towel, soaked lightly with mineral spirits, and rubbed dry with yet another, absolutely clean, dry towel (not shown). Repeat this process until no color appears on the wet towel — if the surface is not clean none of what follows in the process has any chance of success.



Photo 4 — Apply fresh mineral spirits, scrubbing with 220 grit sandpaper.

Once the spirits have fully evaporated, the surface will appear dull, scratched and fairly ugly; but this is precisely what you want to see. (See Photo 5) Decades of accumulated polish, dirt, wax and who-knows-what have been cleaned from the surface. The tired, upper layer of old finish has been removed and the surface has a nice tooth for anchoring the new finish. You will also have exposed numerous areas in need of color repair, almost certainly along the edges, but in other areas as well. Now is the time to perform the first round of color repair using any and all techniques favored by the individual finisher. Fortunately,



Photo 5 — Cleaned surface will look unappealing when done properly.

this process allows for color repair throughout the entire process and, indeed, color repair and finish restoration can be integrated for very nice results (A variation of this application procedure will be covered next month in Part 2).

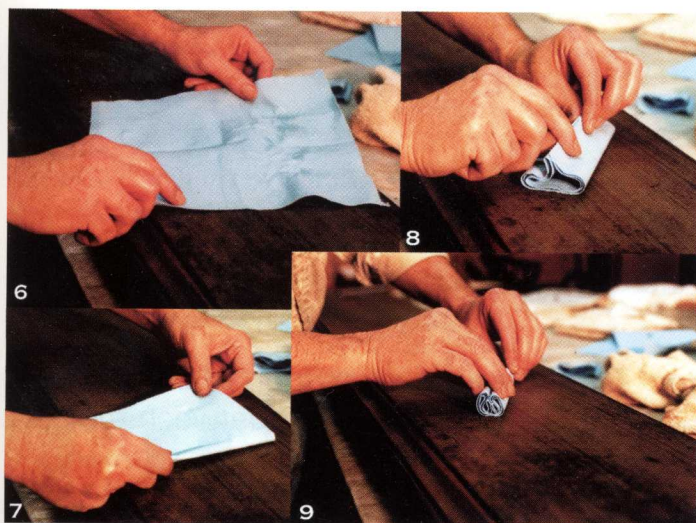
Caution! Before proceeding to the next section, it must be pointed out that not all surfaces require the aggressiveness noted above. For many surfaces — decals, milled edges, scrollwork, legs, etc. — the sanding step may be eliminated, in fact should be eliminated in order to avoid sand-scratch telltales. You may find that the finish-pad washing step resurrected the old finish sufficiently so that no further work is required. If so, count your blessings and get on with the next project!

Pad Application of Finish

We present not one but two methods for applying finish, each of which has its own particular niche and skill set. These will be described in great detail, but first it's useful to comment on finish restoration *per se*.

The key to finish restoration as a process hinges on two realizations. First, we're finishing a finish, not finishing wood. Second, we must isolate what's “down” from what's “up”. The first realization implies that approaches which work for refinishing may or may not work for restoration of an existing finish. Indeed, our initial approaches (approaches which work well for refinishing) led us to some very unsatisfactory restoration results (hazing, blushing, etc.). The second realization implies that we must train the existing surface, varied as it may be from piano to piano or within a single square inch of surface area, to accept a common overcoat. Otherwise our restoration process is hit-or-miss, hardly something on which to hang one's fortunes. Through a combination of trial-and-error and much head scratching by us and experts at Sutherland Welles Ltd.®, we eventually developed a technique which not only addressed both restoration challenges but created a general method for laying up the new finish altogether.

The solution was the development of both a finish formulation and application technique which formed an



Photos 6-9 — Creating the “pad” for applying the finish.

effective barrier atop the old finish. “Odorless” mineral spirits, Table Top™ varnish and Hard Sealer™ were mixed in proportions of:

- 10 parts odorless mineral spirits
- 10 parts Table Top™ Varnish
- 1 part Hard Sealer™

(e.g., 1/4 cup each of mineral spirits and varnish, and one teaspoon of Hard Sealer™). These proportions provide a finish with low viscosity and good flow properties while maintaining a reasonable solids content. This finish formulation we deem our “pad finish” and find it convenient to prepare in small amounts, stored in plastic craft bottles with removable lids. As the name implies our finish formulation is pad-applied to the existing surface. Pads are formed as shown in Photos 6-9. A single “blue” paper towel is folded into quarters, opposite edges brought together and rolled into a multilayered pad capable of holding a great deal of Pad Finish. The pad is allowed to absorb finish to the level of saturation but not so wet that finish drips from the pad. Food storage containers such as that shown in the background are convenient as application vessels, but should not be used for storage purposes.

Start with the pad several inches from one end of the surface, applying little if any downward pressure (see Photo 10). Move the pad smoothly toward the edge and complete the stroke just beyond the edge (lifting the pad at the edge creates bubbles, while allowing the pad to drop at the edges creates drips). Position the pad at the now wet edge and slowly but smoothly move the pad toward the other end. For a five-foot stroke, e.g. a lid, the entire stroke should take around 10 seconds. Refresh the pad by lowering it by a quarter inch in pad finish and repeat with a new stroke, slightly overlapping the previous stroke until the entire surface is covered. For many old finishes, the pad application approach is sufficient, three or four coats providing a vivid, polished, clear appearance. Under our conditions, 60 degrees F and 50 percent humidity, the surface may be



Photo 10 — Use “pad” to apply finish, beginning a few inches from edge.

recoated in 20 minutes or so. As it takes us around 45 minutes to pad-apply finish to all surfaces of a small vertical piano (spinnet or console, e.g.), once the process is begun the finisher simply moves from piece to piece and all finish is applied in less than three hours.

Progress in the pad-application of finish is typical. Early coats leave areas of dull appearance, the dullness disappearing with addition of successive coats. Small breaks in the old finish are progressively filled or the edges softened. Some surfaces attain a “finished” appearance faster than others, and may be dropped out of the pad-application rotation, shortening the work time. As with pad finishing in general, plan the work for a given piece: hit edges first, work “far” to “near” and work “bottom” to “top.” For the lid shown, apply finish to the milled edges first, then to the lid surface starting away from your body, then working toward it. Had the lid surface been itself broken into separate planes (more typical in the music stand area) work the uppermost surfaces last. Make sure that inside corners are filled on applying finish to the first surface of the corner. Open time is generally around two minutes so that surfaces can be touched up slightly before the finish begins to tack up, although early coats may be more quickly absorbed. Curiously, old alkyd (varnish) finishes may lead to beads of pad finish forming in the first or even second coat of pad finish. Should this occur, continue to gently pad the surface without rewetting the pad until the beads settle down and flatten on their own (it’s curious to speculate that even after decades of “cure time” that the old varnish retains some ability to chemically interact with a fresh alkyd.). An old finish which is heavily alligatored leads to an important variation in both the nature of the finish and how it is applied.

In next month’s article we will discuss a brush and wipe technique of applying the finish. ▣

Fast & Effective Finish Restoration, Part 2

Varnish & Polymerized Tung Oil Overcoat

By Ray C. Perkins Jr., Ph. D, Physical Chemist, and
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In last month's article (see the October 2004 *Journal*) we learned the techniques for wiping on the first coat of finish with a pad. We will begin this month by building up the finish with a brush.

Brush-and-Wipe Application of Finish

- 1 part Hard Sealer™: 1 part Table Top™ varnish

For any restoration using these methods, at least one coat of pad finish must be applied in order to isolate the old finish from the new finish. Once that is done, finish may be applied in a manner less demanding of skill or to create a more rapid build up of new finish (see Photos 1a and 1b). Mix together equal portions of Hard Sealer and Table Top varnish. Apply sparingly but evenly to the surface with a soft-bristle brush. This is an aggressive process, starting with spots of finish in the center of the surface, brushing it out to the edges, smoothing crossgrain and along the grain. Allow the finish to rest until it "takes" and momentarily holds a fingerprint (generally five to seven minutes, but can be faster for very thin coats). Remove unset finish with quarter-folded "blue" paper towels, first in a circular motion, then along the grain, turning the pad frequently to obtain a fresh surface. At the end of this process, the removal towel should not appreciably drag when wiped across the surface.

This approach has two benefits. First, a brush-and-wipe approach requires less skill than does pad application.

Indeed, for an altogether satisfactory satin appearance, brush-and-wipe can constitute the bulk of the restoration process. For the last coat, apply finish as described and wipe off immediately. The second benefit of a brush-and-wipe application is in smoothing heavily alligatored finishes. More finish is applied per application, and the wiping process progressively smooths the old finish into a more acceptable appearance. A higher polished look is achieved through application of two coats of pad finish above the brush-and-wipe applications.

Brush-and-wipe applications require more time for the skilled worker than do pad finish applications (90 minutes versus 45 minutes for a small vertical piano). Also, the recoat interval is lengthened to about an hour (ready when no tackiness is felt on any part of the surface). As the recoat interval is still generally shorter than the time required for brushing and wiping an entire piano, work moves progressively until a satisfactory build-up of finish is achieved. At that point, application of two coats of pad finish completes the process. It is this combination approach – pad plus



Photo 1a & b — Finish can be spread from center toward edges with a soft-bristled brush (a). Later, wipe off unset finish (b).

brush-and-wipe – that was used to good effect on the 60-year-old varnish finish.

Results

Pad and brush-and-wipe were used in tandem to restore the heavily alligatored finish on the 60-year-old Fischer spinet (see Photo 2-7). A single coat of pad finish was applied to a clean and prepared surface, followed by two brush-and-wipe coats and topped off with two coats of pad finish. The images tend to speak for themselves (no, the “before” pictures are not out of focus!). Surface defects were “repaired” with a minimum of extra effort and alligatoring was significantly softened. The natural woodgrain appearance was restored to a satisfying clarity, color and depth.

Variations on a Theme

- **Toners** – Both the pad finish and brush-and-wipe finish may be adapted for use as toners. For pad finishes, oil-based colorants such as those from Mohawk (see Part 1) may be added at up to a ratio of 1:10, colorant-to-finish. The recoat interval is slightly longer but not appreciably so. A tinted pad finish may be prepared using one of several polymerized tung-oil stains available from Sutherland Welles, Ltd., using the stain as a substitute for Hard Sealer. Either colorants or tung-oil stains may be added to brush-and-wipe finishes up to a 10:1 ratio of finish to colorant or stain. More color depth is achieved with the oil-based colorants relative to the tung-oil stains, but at the expense of clarity.
- **Topical Staining/Amalgamation** – Alcohol-based stains may be applied directly to old finishes in order to repair color for larger areas or as a general toner. Bear in mind that shellacs, varnishes and lacquers dissolve in alcohol, and this is both a good thing and a bad thing. It is a good thing in that careful application partially reamalgamates the old surface while imparting color. It's a bad thing in that quite a mess can be created through overly working a surface or through accidents such as drips. While the results can be very effective, practice on small, inconspicuous areas. Finally, you've now created an uncured surface, and should wait anywhere from 10 minutes to an hour before applying new finish.
- **In-Situ Work** – In principal our restoration process should be adaptable to non-shop application (home or retailer). Certainly known cleaners (e.g. Murphy's Oil Soap at five parts water, one part soap) may substitute for mineral spirits in the cleaning process. If this is done, parts must be allowed a generous amount of time to dry prior to application of finish. Also, “odorless” as an adjective for mineral spirits should more correctly be replaced by “less

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Photo 2 — Before



Photo 3 — After



Photo 4 — Before

Fast & Effective Finish Restoration

continued from previous page

odorful,” truth be told. Therefore some level of air exchange/exhaust should be used in all cases. Finally, Sutherland Welles, Ltd. does offer a “citrus thinner” which could substitute for odorless mineral spirits, though we have yet to test this product.

- Grand Pianos – Our restoration methods should be immediately applicable to grand pianos as well as verti-



Photo 5 — *After*



Photo 6 — *Before*

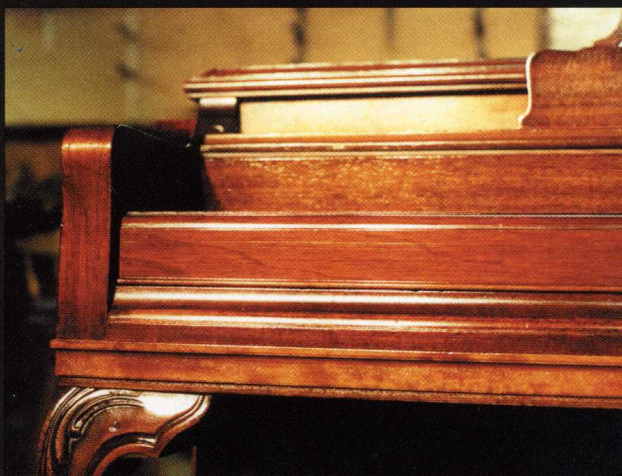


Photo 7 — *After*

icals. While a vertical piano takes about a day to complete, it's likely that a complete finish restoration of a grand piano would take about a week. While this is only an estimate, it's probably a good one. Disassembly and cleaning alone can easily take more than a day. Plan on a day each for lids and rim, and we're up to over three days. Throw in legs, music desk and assorted blocks, props and other bits, and another day is down the chute. That leaves about a day for a little metal polishing and re-assembly. Refreshing only prominent surfaces should, of course, take less time. In any event, careful thought will need to be given to physically reaching all areas of the back lid, and to the avoidance of lap marks on the case.

Summary

We have developed a finish restoration process that appears to be both fast and effective. For small to mid-size vertical pianos, the entire process takes about a day. The resulting “new” finish is attractive (reminiscent of a French polish), tough, serviceable and readily maintained. Old defects are softened, transformed into “character marks,” while the unique patina of aging is preserved.

We think that this process breathes a new life into the perennial problem of the thousands of modest pianos, still perfectly lively as musical instruments but put out of commission due to their undesirability as pieces of furniture. We also think that our restoration process could well provide an intermediate solution between simple cleaning/touch-up and complete refinishing for pianos of all sizes and styles.

Finally, we are profoundly impressed by the quality of the finish products that form the basis of our process. We have a couple of nice, old rosewood Steinway studio uprights sitting over in the corner, just begging for a new finish.

That's a story for another day!

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