

Fusing: A comparison of tools for fusing

PRINCIPLES of FUSING

Adhesion vs fusion

Wax bonds with wax

Foundation of well fused encaustic painting is fusing to the substrate, usually wood, but in any case a porous absorbent material. Melted wax penetrates the openings in the material and bonds to itself. It is locked into the structure of the substrate, creating roots that anchor the painting to it. Subsequent layers build on this foundation, wax bonding to wax, layer after layer.

I hear sometimes an adage that all one needs to do to fuse properly is to turn the surface shiny. This may or may not be the case and depends on how much wax is added in the layer.

Proper fusing requires that new wax bonds well to old wax. So one of the issues is how to bond that newly added layer to the previous surface without disrupting the imagery that was built up before.

PRINCIPLES of HEAT TRANSFER

Transferring heat from a hot source to a cool object is affected by several variables:

- Temperature of the source

- Temperature of the object

- Proximity of the source to the object

- Duration of heat transfer

- Physical properties of the object – in general this is a constant when considering the wax surface, but sometimes the substrate's properties come into play too (see below).

Temperature of the heat source is itself variable: there is a range of temperatures dissipating away from the origin of the heat spreading out in a shape that is the "Heat Brush"

Isotherms: weather isotherms

- Flame isotherms

Feeling the shape of a flame: unexpected results

Effects of the heat brush beyond the visible, certainly understandable with heat gun, but also with torches. One needs to learn the shape or at least the distance and range of effect of one's heat brushes.

Another aspect of heat transfer is the depth of heat effects. How deep the heat penetrates is critical in fusing. This is also determined by the same variables: temp of source and object, duration of contact, & proximity. Applying a hotter source briefly can quickly fuse a thin layer, while a cooler source for a longer duration of application might penetrate deeper. What also matters is how the materials hold heat. Wood and wax will act differently in this regard. Wood has insulating properties and might stay hot longer than the wax once heated. This is what I believe causes a lot of "the bubble problem". Wood has moisture and this is released as vapor when heated. Feel the back of a panel, esp. early on in a piece. Less of a problem when wax is deeper and fusing doesn't penetrate to the wood. Allow the panel to cool! Also when fusing delicate surfaces, if the wax is near melting temp the heat will penetrate deeper and could cause disruption of established imagery.

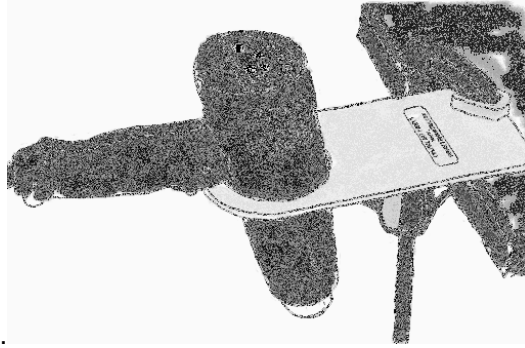
Types of heat transfer:

- Conduction: Hot iron – direct heat transfer from one object in contact with another; also occurs within the layers of wax and support as heat conducts from the surface

- Convection: Torches and heat guns: ignited gas or electrical resistance coils heat air that transfers heat to wax

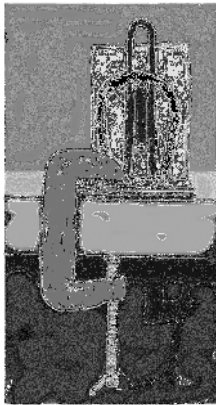
SAFETY

All fusing tools can burn you and start fires. It is vital that the area where the tool is stored when not in your hand is safe and there is no chance that the hot tip can contact inflammable materials (such as paper towels, or skin). Most tools are unstable and will tip over. I recommend simple and convenient holsters or stands to secure the torch, iron or heat gun when you set it down. Most hot irons come with metal wire stands but they tend to be unstable as well. They can be attached to a piece of wood with mirror clips. Heat guns can be holstered in a 3" hole cut in a small piece of



plywood that can be clamped to a table.

A bicycle water bottle cage fixed to an L-bracket of wood can also be clamped to a table edge to hold most torches (with 3" diameter canisters).



Other options would be to have a non-flammable surface, such as metal, or tile to set the tool on.

Torches can quickly ignite paper and wood so attention must be paid at all times to where the flame is pointed. A torch should never be left on when out of your hand. Even heat guns can catch paper on fire if the hot tip contacts paper.

Keep a fire extinguisher handy at all times. Wet rags can be handy to douse small flames. Either a nearby sink or a bucket of cold water should be available for burns.

COMPARISON OF TOOLS

Tacking iron

Up to 400 degrees

Focal "conduction" of heat through direct contact.

Initial saturation of panel with wax or medium. Direct contact assists penetration of wax into substrate at point of contact without overheating panel. Consider waxing sides of panel if you want to return to clean wood sides. Can remove excess wax later with tacking iron without melting into surface wax.

Good in collage, fusing paper, dried leaves, etc. Allows pressing down on object while fusing. If object tends to lift or curl may hold in place with cold tool while moving iron to new position.

Good for flattening areas of unwanted texture without disturbing surrounding area. Some artists use for final smoothing of surface. Needs light touch. Otherwise can also be used for textural effects.

Heat Guns

Wagner HT3500, Makita HG1100; temperature range 250-1350 degrees, dual fan speeds

Best if have separate control of fan and temperature.

Easier to control with lower temperature settings than torches, but slower.

Better for fusing fine texture, low fan and lower temp

Better for fusing flammable objects such as paper. Includes techniques involving paper or heat sensitive materials such as stencils or masking.

Main disadvantage is blower fan which can cause ripples in melted wax.

Attachments: spreader directs flatter heat shape, reduction nozzle to focus air flow

Torches

In general hotter and faster fusing than with heat gun, but takes more practice to learn control.

Once learned torches offer a much wider range of fusing options.

Propane: 1000-3000 degrees

MAPP (maximum power propylene) 3600-5000 degrees

Butane: up to 3200 degrees

Iwatani torch: 2300 degrees

Lenk torch: 2400 degrees

Blazer pencil torch: 2500 degrees

When heating, temperature actually lower than rating due to heat transfer loss.

Propane torches

Standard manual vs self igniting (Benzomatic TS 7000)

Large canisters heavy, results in arm and neck fatigue, and increases distance to work.

Benzomatic torch head allows holding torch, not canister

Butane torches

“Crème Brulee” : small, many varieties available. Refillable. Some self igniting.

Wall Lenk LPT 500 – holds a lot of butane. Stable base. Self igniting. Variable flame with lock to keep on. Large flame for general fusing down to micro flame. Small and light weight.

Iwatani (grey and white, not green and orange) TC-CB Pro; “Coke can” size canisters. Not refillable. Butane canister with “notched” collar (see resource list). Light weight and fits hand well. Trigger ignition, tends to become harder to ignite with time and use. Has two controls, one for fuel and second for air flow. Allows range of flame from intense hot flame to soft “feathery” flame. Good for a range of fusing from fast deep, general surface melting to very light, shallow fusing of delicate marks or texture.

Micro or pencil torches

Some have tendency to go out when inverted (Benzomatic micro torch)

Blazer PT4000: Refillable butane. Tiny flame with small heat shape. Able to fuse very small areas well without affecting nearby regions, such as adjacent colors or built up sculptural areas. Also can be helpful in some repair situations, such as corner or edge chips.

Note: Metal fatigue- heatguns or torches may fatigue causing flaking of hot metal resulting in pitting of encaustic surface which only worsens with further heating. Occurs more when used at higher temperatures.