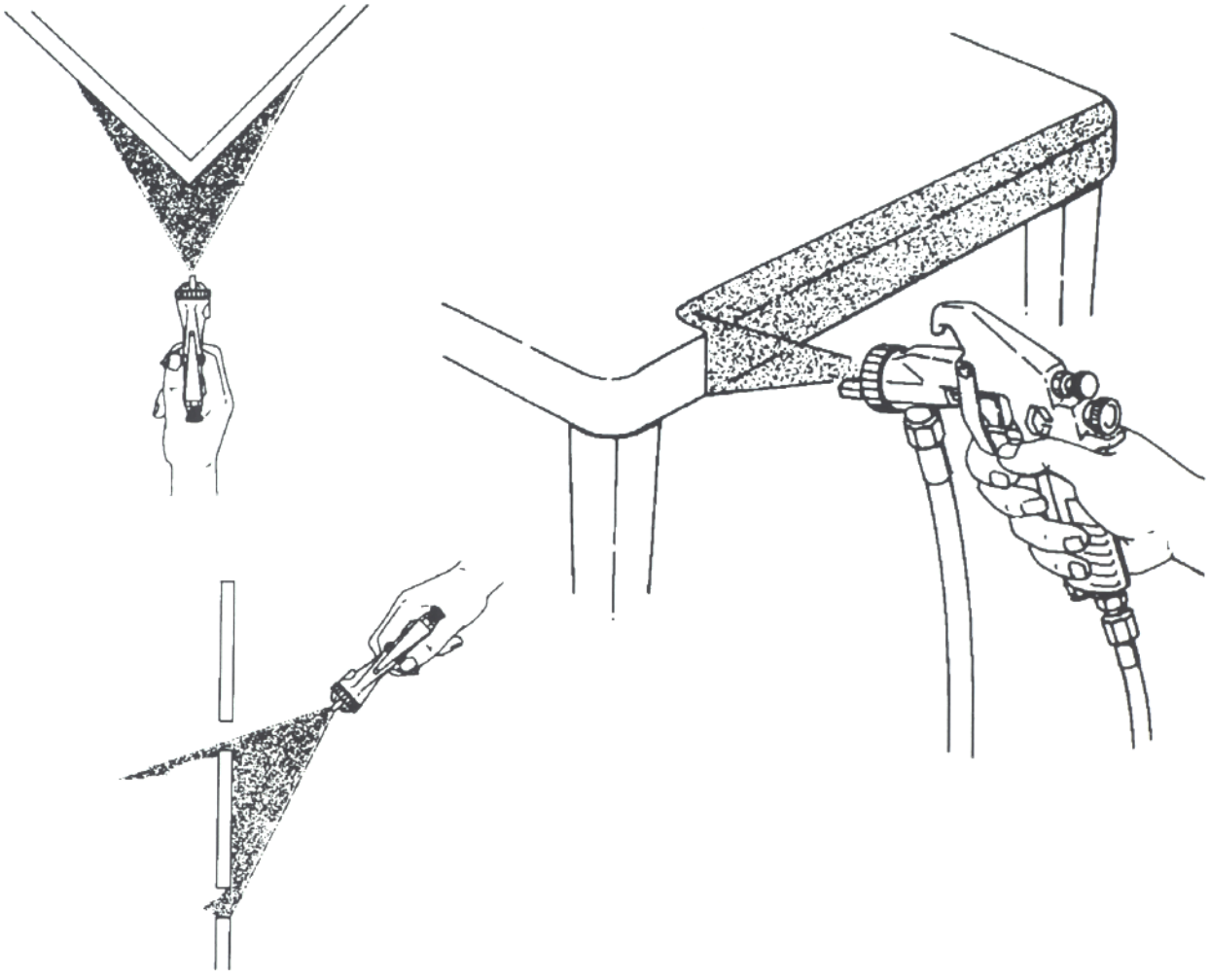
AIR SPRAY TECHNIQUES

Videotape Summary



TRAINING

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INDEX

I. AIR SPRAY BASICS

Definition of Atomization:

The break-up of fluid into small droplets.

Definition of Air Spray:

Air spray uses compressed air to break up fluid into small atomized droplets.

Advantages of Air Spray:

1. **Versatile Application Tool.** A variety of coatings can be sprayed with proper adjustments of air and fluid, coupled with operator technique.
2. **Low Capital Investment.** Air compressor and fluid delivery system are the only additional equipment needed.
3. **Versatile Fluid Feed Systems.** Selection of fluid delivery system ranges from siphon cups to low pressure circulating system.
4. **Fine Finish.** (Decorative Coatings.) The finest decorative type finishes are obtained with air spray because of versatility of adjustment along with variety of tip and air cap selections.
5. **Excellent for Metallics.** Air spray is well suited to paint with metallics where color match is critical.

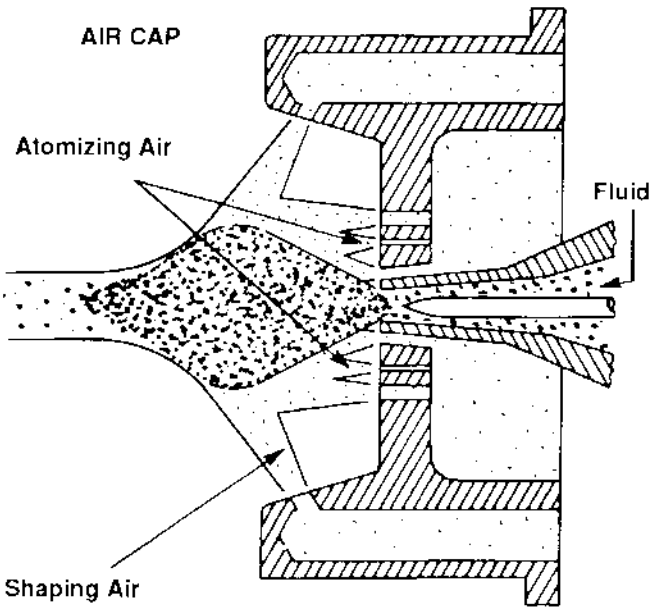


Figure 1. Air Spray Atomization

II. ADJUSTMENTS

System Adjustments

There are two types of air spray systems:

1. Pressure Feed System (see figure 2)

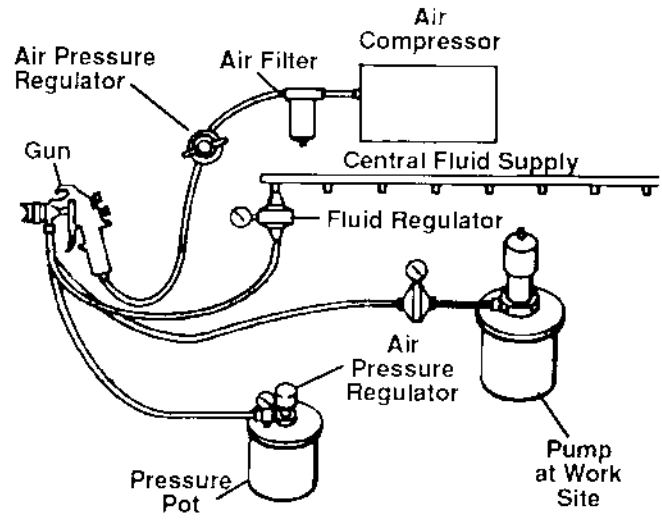


Figure 2. Pressure Feed System

2. Siphon Feed System (see figure 3).

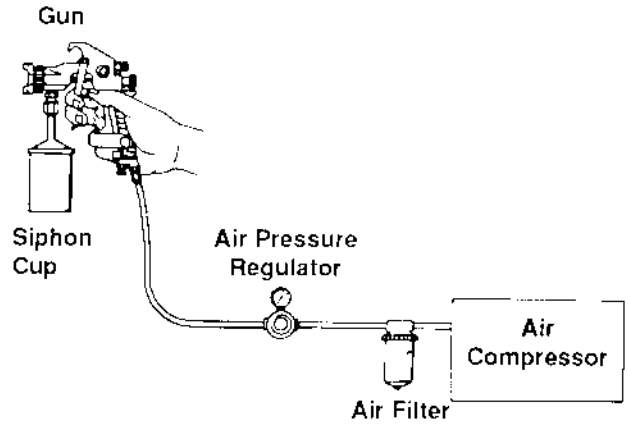


Figure 3. Siphon Feed System

There are two areas of adjustment in the pressure feed system, air and fluid.

1. The air pressure is controlled by an air regulator in the main air line to the gun. This air should be filtered.
2. Fluid flow is controlled either by a fluid regulator, or the regulator on the pressure pot (see figure 2, page 3).

There is only one adjustment in the siphon feed system, the air. The air pressure (PSI) and air flow (CFM) can be controlled by the system air pressure regulator and air compressor size. Fluid delivery can be restricted by the fluid adjusting valve on the gun (see Fluid at Gun Adjustment).

Air At Gun Adjustment

There are two means of adjusting air at the gun. The Pattern Adjusting Valve and the Air Adjusting Valve (see figure 4).

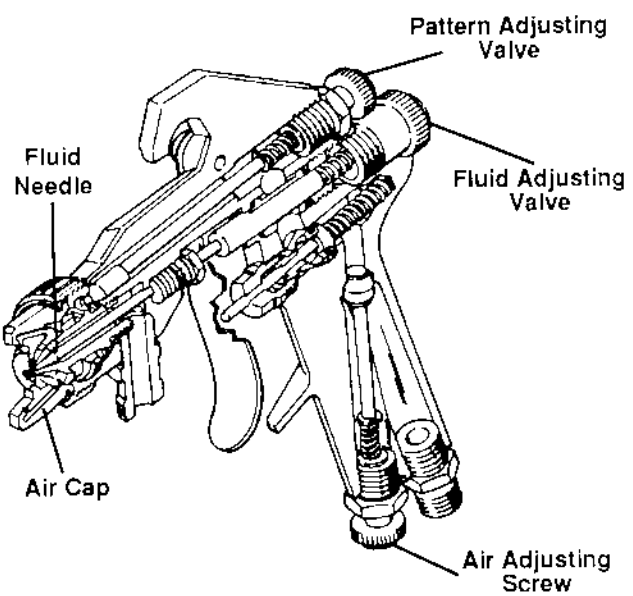


Figure 4. Air and Fluid Adjustments

Pattern Adjusting Valve

The pattern adjusting valve regulates air to the "horns" of the gun air cap. Horn air controls the shape of the spray pattern.

1. When the pattern adjusting valve is closed (turned completely clockwise), a round pattern results (see figure 5).

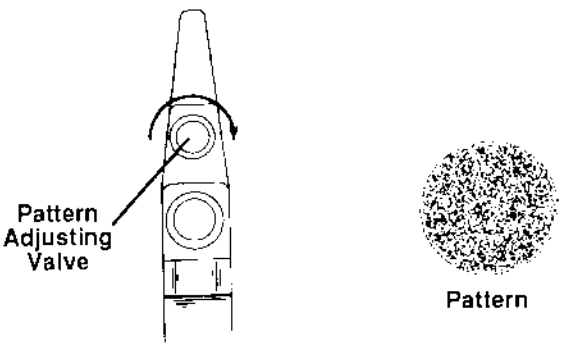


Figure 5. Round Pattern

2. Opening the pattern adjusting valve (turn counter clockwise) produces an increasingly wider and flatter fan pattern (see figure 6).

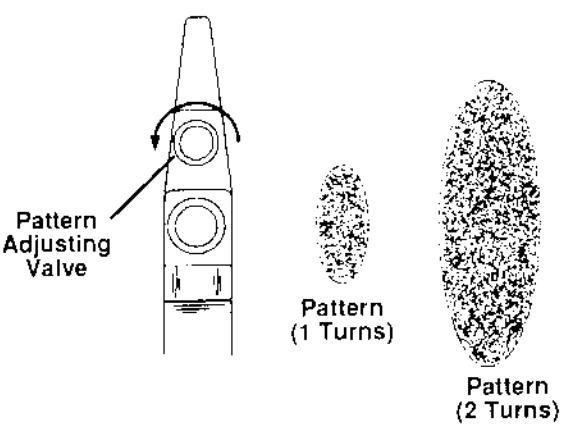


Figure 6. Fan Pattern

3. When the maximum spray pattern (widest fan) is achieved, additional turns will not affect the pattern.

Air Adjusting Valve

The air adjusting valve (see figure 7) controls only the flow of air (CFM) to the air cap and has no effect on air pressure (PSI). The valve is often referred to as the "cheater" valve as it is used to restrict air without adjusting the air regulator.

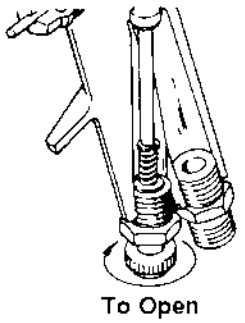


Figure 7. Air Adjusting Valve

1. Closing the air adjusting valve (turn clockwise) restricts the air flow.
2. Opening the air valve (counter clockwise) increases the volume (flow) of air. This will affect the degree of atomization, but will not change the spray pattern.
3. The air cap (CFM) specification will determine the (CFM) requirements of the gun.

Fluid at Gun Adjustment

Fluid Adjusting Valve

The fluid adjusting valve (see figure 8) controls the volume of fluid by restricting fluid flow. It does not affect the pressure (PSI) of the fluid.

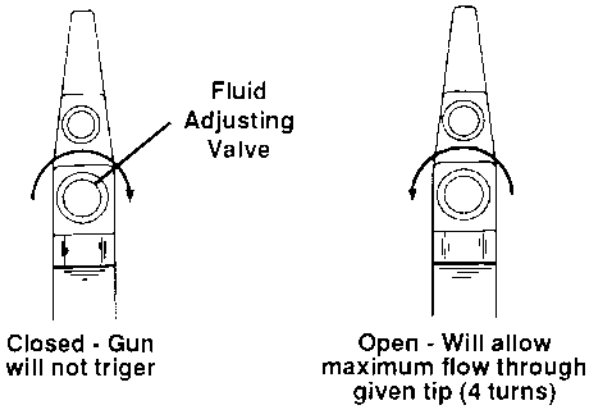


Figure 8. Fluid Adjusting Valve

1. Closing the valve (turn clockwise) restricts the volume of fluid.
2. Opening the valve (turn counter clockwise) increases the volume of fluid. Trigger travel and tension will increase as the valve is opened.

NOTE: When fluid regulation is possible (pressure feed systems) it is best to regulate pressure rather than restricting material flow with needle.

III. SPRAY TECHNIQUES

In any industrial spray application, careful study of the correct spraying techniques for each work piece configuration can be very profitable, saving both time and material. This section will divide spraying techniques into four separate areas:

- Operator Technique
- Gun Movement
- Work Piece Configuration
- Special Techniques

The successful combination of these four areas will generate the best quality finish, with the least effort and the lowest cost.

Operator Technique

Gun Position

Hold the air spray gun with a firm but comfortable grip. Use the index and middle fingers to trigger the spray gun. Let the gun be a natural extension of the arm (see figure 9).

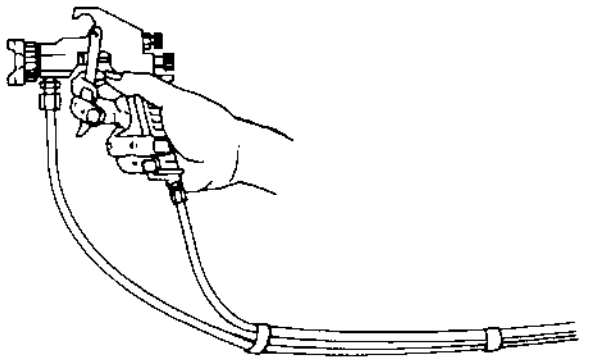


Figure 9. Gun Position

Hose Position

Hold the spray gun in one hand, and hold the air and fluid hoses in the other hand. Leave enough hose slack to allow for free and easy movement of the spray gun. Tape or tie the fluid and air hoses together to provide for more comfort while spraying (see figure 10).

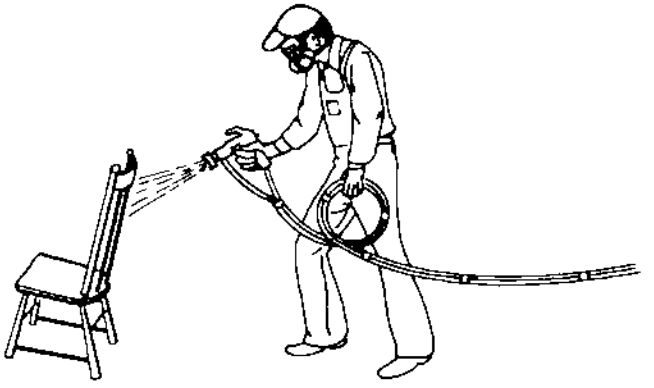


Figure 10. Hose Position

Body Position

There are no fast rules about body positioning, but there are several suggestions. While facing the work piece, stand with your legs a little wider than shoulder width. Position the leg opposite the spray gun back slightly. Pivot on the forward foot during your spray strokes, and keep your knees slightly flexed. Use a smooth and flowing arm movement, pivoting the wrist at the beginning and end of each stroke. Always keep the gun perpendicular to the work piece.

Gun Movement and Position

Distance

The distance of the air spray gun to the part should remain constant. Keep the air spray gun nozzle approximately 8-10 inches from the work piece during each spray stroke (see figure 11). Holding the gun farther from the part puts a thinner coat of material on the part and causes a wider spray pattern. If the gun is held at too great a distance from the work piece, the solvents in some coatings will evaporate before reaching the work piece, causing a dry spray. Holding the gun closer to the surface puts more paint on the surface, causing runs and sags and producing a narrow pattern.

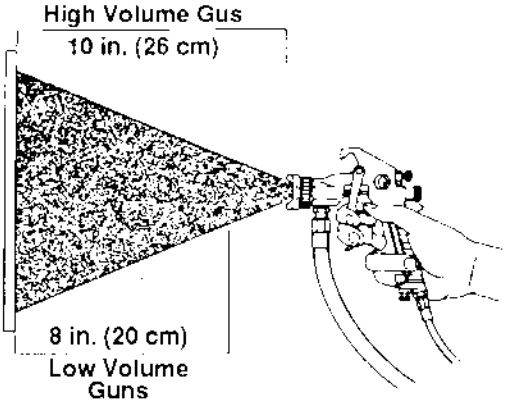


Figure 11. Gun Distance from Work Piece

NOTE: When distance increases
Spray pattern width increases
Transfer efficiency decreases.

When distance decreases
Spray pattern width decreases
Transfer efficiency increases.

Position

Hold the gun perpendicular to the surface whenever possible to reduce uneven paint coverage. Tilting the gun up or down causes a heavy build up of paint on the top or bottom of the spray pattern.

Arcing the gun causes a light coverage of paint on the left and right side of the pattern. Both arcing and tilting the gun create an angle from which paint can escape from the surface with the rebounding air (see figure 12).

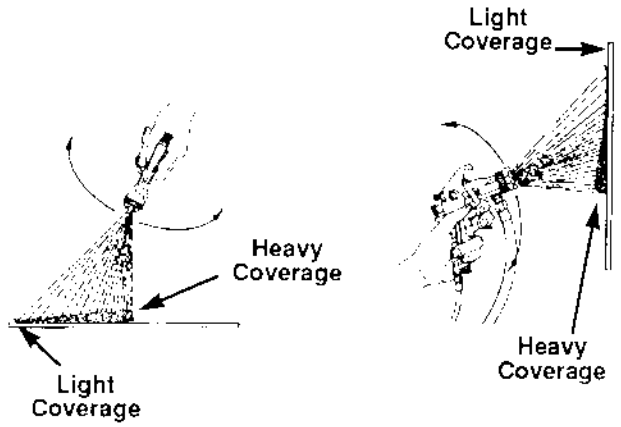


Figure 12. Arcing/Tilting

Triggering

Timing your triggering movement is the key to even coverage of paint on the work piece. Start the stroke before triggering the gun and release the trigger before the stroke ends. This stroke and triggering provides a "lead and lag" for more even paint coverage. Proper triggering conserves material and prevents excessive paint build up at the beginning and end of each stroke.

Overlap

Alternate your spray strokes from left to right, then right to left. If the first stroke begins on the left side of the work piece, move the gun down at the end of that stroke and begin the second stroke at the right side. To judge the amount of overlap needed in the spray stroke, aim the spray gun at the bottom of the previous stroke, to give a 50% overlap. To maintain an even coating thickness, you must overlap 50% (see figure 13).

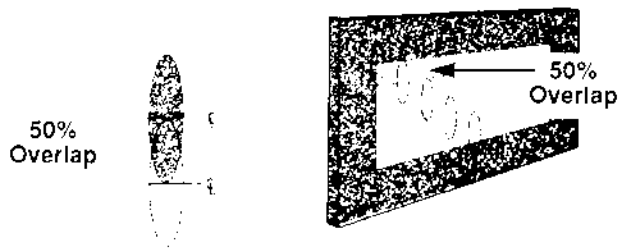


Figure 13. Overlap

Spray Speed

Ideal operator spray speed is from 2 to 3 feet per second. Slower speeds result in runs. Faster speeds result in thin coats of paint.

Work Piece Configuration

All air spray guns can produce horizontal and vertical spray patterns. When air cap horns are in a vertical position a horizontal spray pattern in produced. Air cap horns in a horizontal position produce a vertical pattern. Most operators use a vertical spray pattern. However, based on a particular work piece configuration, the horizontal pattern can be more efficient.

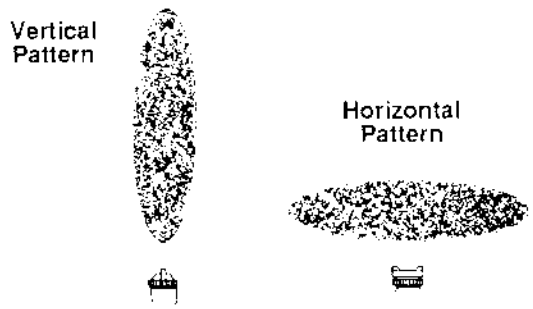


Figure 14. Horizontal and Vertical Spray Patterns

When a new work piece configuration is introduced on the paint line, it is a good practice to rehearse your spray strokes before doing the actual work. Rehearsing the gun movement for a part will allow the operator to save paint by reducing overspray, reduce fatigue by using more effective gun movements, and produce a finer quality finish. This section examines various work piece configurations and recommends spraying techniques using the least effort, with minimum material waste, to provide the best quality finish.

Banding

Panel Banding. To reduce overspray on a part, a "banding" technique is used. A vertical stroke at each end of a large panel is used rather than trying to cover the ends with horizontal strokes. This will reduce paint usage and overspray.

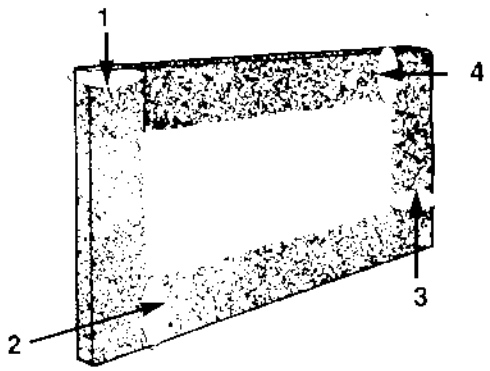


Figure 15. Panel Banding

Edge Banding. The banding technique should also be used on the edges and outside corner of the part. The edge of the part is sprayed and the top surface is banded. This same technique should be used when spraying the outside corner of a box or cabinet.

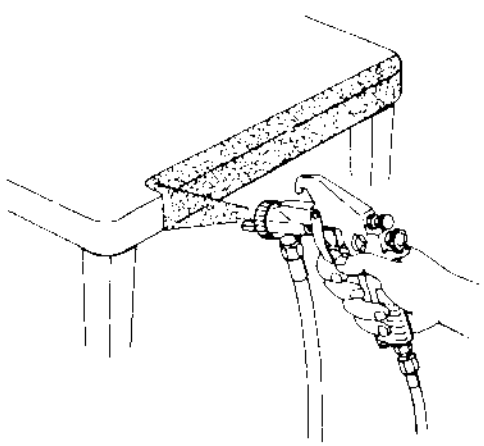


Figure 16. Banding Edges

Corners

Inside. To apply an even coat of paint to an inside corner and avoid double coating the same area, use vertical strokes to spray the area adjacent to the corner. Spray each side of a corner separately using a horizontal pattern.

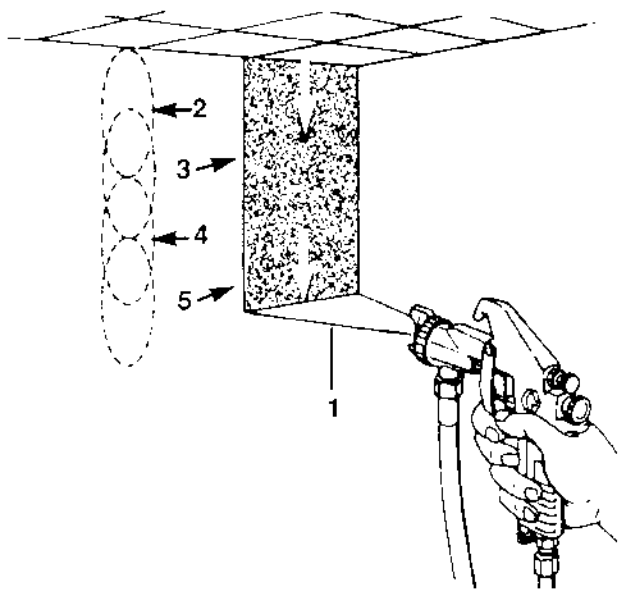


Figure 17. Inside Corners

Outside. To spray the outside of a corner, a straight on method is used. The adjoining surfaces are banded as the outside corner is sprayed.

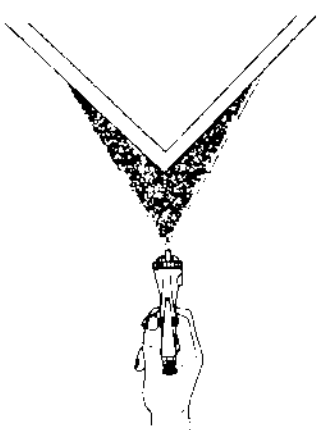


Figure 18. Outside Corner

Flat Surfaces

Short/Vertical. When spraying small or large vertical flat part configurations, use the banding technique. Using a horizontal pattern, band the edges of the part. After banding the edges of the part, finish the part with horizontal strokes.

Spray the side of the part that will not be the finished side first (Class B side), then spray the Class A side. Should there be any overspray turbulence, it will not appear on the finished (Class A) side of the part.

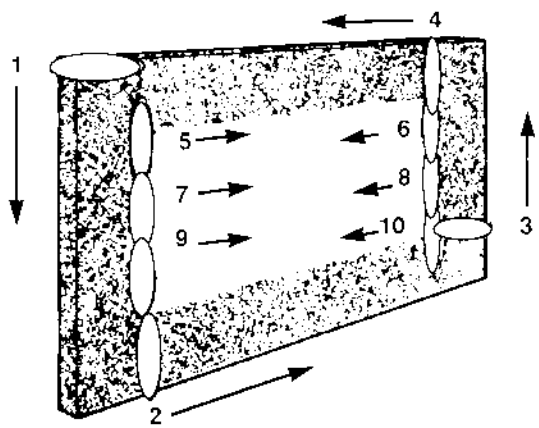


Figure 19. Short/Vertical Flat Surfaces

Long/Vertical. A long vertical surface is sprayed with horizontal strokes in sections from approximately 18" to 36" wide. The large range of 18" to 36" will accommodate the different physical size of operators. With practice, you will find the distance most comfortable to suit your needs. As with a small vertical flat part, the same banding technique is used on each end of a long vertical flat part.

The same triggering technique is used as with a smaller panel only each section is overlapped approximately four inches. The overlap area will be made invisible by feathering the spray pattern in the four inch area. Feathering the spray pattern is accomplished by opening the trigger only slightly, allowing less material to be sprayed on the part. This allows a thinner coat of material to be applied on the overlapped area.

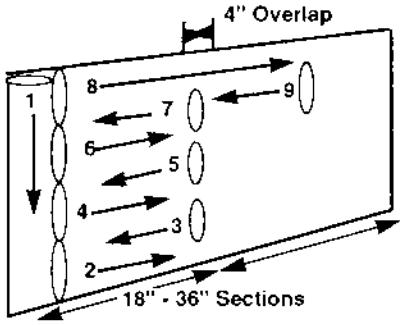


Figure 20. Long/Vertical Flat Surfaces

Level Surfaces. Start on the near side of a level surface and work to the far side of the part.

Some gun tilt is necessary when spraying a level surface to direct the overspray. The tilt of the gun will direct overspray to the uncoated surface.

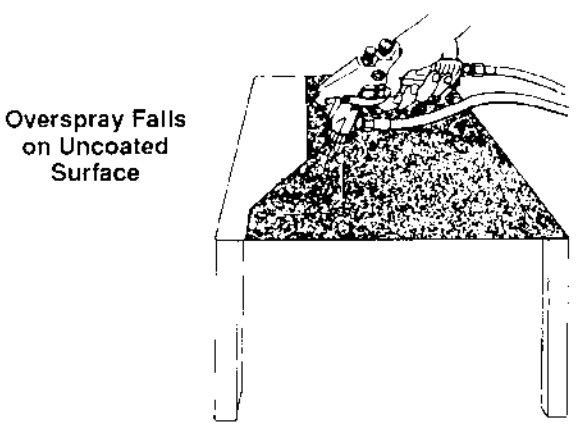


Figure 21. Level Surfaces

When a siphon feed gun and cup is used to spray a part that requires tilting, caution should be taken not to tilt the gun to excess. If the gun is tilted to excess, the air vent hole in the lid of the cup may clog, preventing the flow of material from the gun, or paint may drip from the vent hole and spoil the finish.

When spraying upward with a siphon feed cup gun, be sure the vent hole is positioned in front of the fluid inlet, and that the curved fluid tube remains in the material.

Open Work

Open work is sprayed with a single stroke on both sides of the work. To maximize the coverage of the material on the part, the gun is held at an angle to the part.

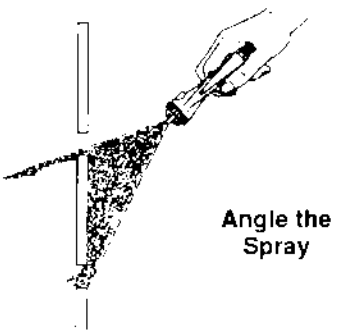


Figure 22. Open Work Spraying

Round Surfaces

Small cylinder shapes, such as furniture legs, are sprayed with a round spray pattern, using three or four vertical strokes. A vertical pattern and stroke can be used, but the gun movement must be quicker to prevent sags and runs.

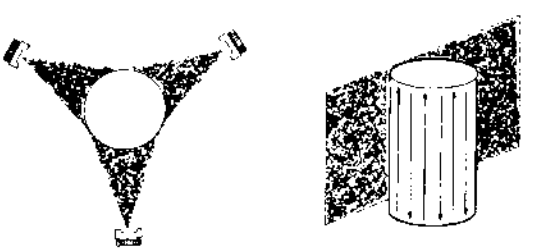


Figure 23. Small Cylinders (use vertical gun strokes)

Large cylinders are sprayed similar to a flat vertical surface, only with shorter strokes. A smaller diameter cylinder is sprayed with lengthwise spray strokes.

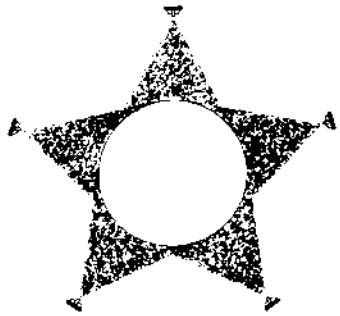


Figure 24. Medium Cylinders (use vertical strokes)

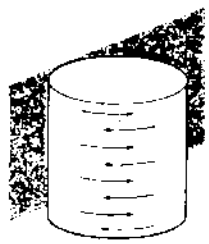


Figure 25. Large Cylinders (use horizontal strokes)

Slender Surfaces

When spraying slender surfaces, choose a spray pattern that fits the part to be finished. Either a narrower horizontal pattern or a large vertical pattern should be used to minimize the overspray. Try not to spray with a spray pattern that is too large.

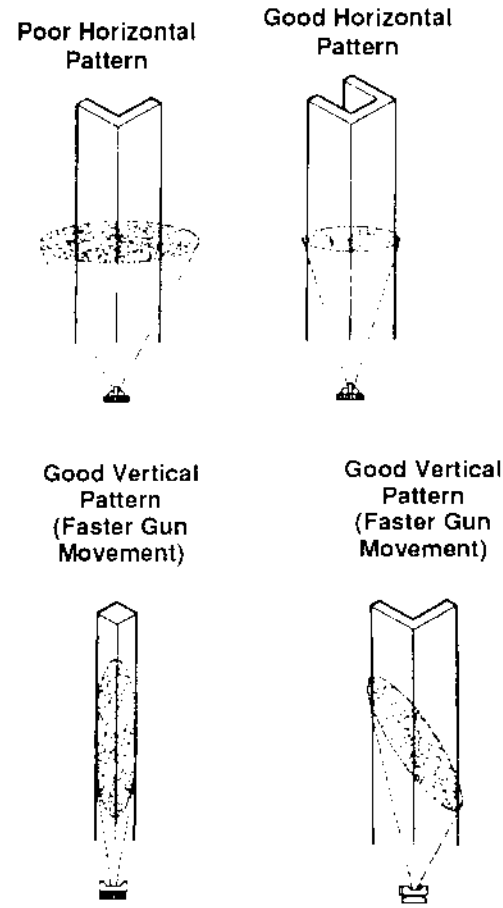


Figure 26. Slender Surfaces

SPECIAL TECHNIQUES

Special technique finishes are unique finishes that can be created by adjustments to the gun or special air cap, fluid tip and needle combination. The three most common Special Techniques are:

1. Spatter or specking
2. Misting, shading or blending
3. Veiling

Spatter or Specking (Pressure Feed)

Spatter or specking is the result of coarse atomization. This comes from a low material flow rate and low air pressure. The small irregular particles spatter or speckle the surface. Hold the gun a greater distance than the normal (14"-20") from the work piece.

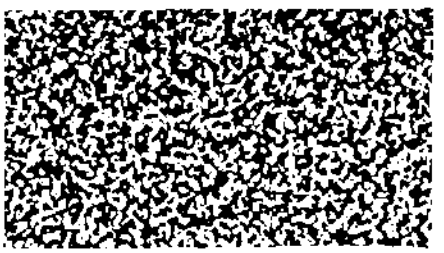


Figure 27. Spatter or Specking

Move the gun slowly to let the particles drift out of the gun. Particle spacing depends on speed of gun movement and overlapping. Special coatings are available for spattering. Regular paint is often used, and applied with little or no thinning.

Misting, Shading or Blending

Misting, shading or blending is the effect of atomization obtained with a specially designed air cap and round spray pattern.

The material is thinned to help obtain a fine atomization, and a small fluid tip is used to allow a low flow rate. The gun distance will vary with the desired spray pattern; a larger pattern is the result of holding the gun further from the sprayed substrate. In the wood industry, shading is the process of staining the lighter sap wood to match the darker heart stained wood.

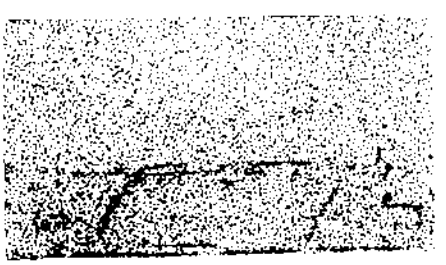


Figure 28. Misting, Shading or Blending

Veiling (Pressure Feed)

Veiling is a swirling, cobweb effect of the spray pattern. It comes from a continuous stream, or stringing effect of the atomized material. Veiling materials are specially formulated, and seldom require thinning. Never trigger the gun when spraying veiling materials. Keep the gun open, and use a criss-cross figure eight movement to cobweb and swirl the spray pattern. When the gun is first triggered, a small deposit of material may mark the surface. To prevent this, trigger the gun away from the finished surface and then move on to the finished surface.

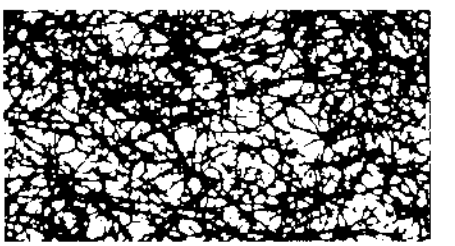


Figure 29. Veiling

Note: Atomization air is not used to break-up the material, only to help carry it to the surface. This is a fine adjustment, and pressure which is too high will break up the streams.

Gun distances and angles can be varied to give different styles. Ordinary lacquers and other coatings will not veil. The continuous stream of material is due to the special nature of the material, and its resistance to atomize.

IV. TROUBLE SHOOTING/PREVENTIVE MAINTENANCE

WARNING

Chemicals, paints, solvents and other materials can cause serious personal injury if not used correctly. Follow all safety precautions and instructions provided by the chemical manufacturers. Wear protective clothing and devices where directed.

CAUTION

Never use caustic alkali solutions for cleaning the equipment. Most pumps and spray guns are made of aluminum alloy metals which will corrode and be damaged by such solutions.

Trouble Shooting

Spray Patterns

When there are problems with the spraying pattern, it will generally involve two areas:

1. Air cap
2. Fluid Tip

To determine if it is one or the other, first spray the problem pattern. Then invert the air cap and spray again. If the pattern inverts itself, the problem is with the air cap. If the pattern stays the same, the problem is usually with the fluid tip.

The following are some common spray pattern problems and possibilities for correction.

Problem: Heavy Pattern on Top or Bottom

Figure 30. Top and Bottom Pattern Problems

Cause

1. Horn holes plugged on air cap.
2. Fluid tip obstructed or damaged.

Remedy

1. Clean off air cap.
2. Clean/replace the fluid tip and needle.

Problem: Heavy Left or Right Pattern

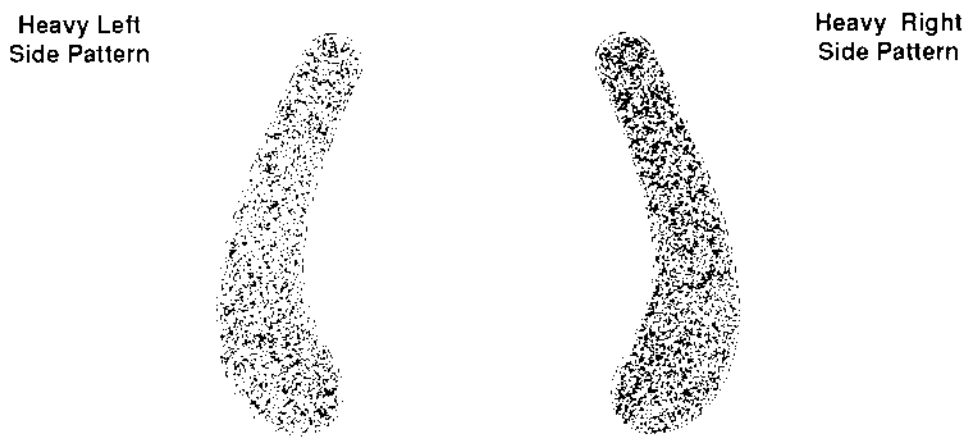


Figure 31. Left and Right Side Pattern Problems

Cause	Remedy
1. Opposite side horn holes plugged.	1. Clean off the air cap.
2. Dirt on the fluid tip.	2. Clean off the fluid tip.

Problem: Fluttering or Spitting Spray

Cause	Remedy
1. Insufficient fluid in material container.	1. Fill container.
2. Dry or worn fluid needle packings, and loose packing nut permitting air to get into fluid passage (siphon feed).	2. Lubricate or replace packing or tighten packing nut.
3. Loose fluid tip or damaged tip seat and needle.	3. Tighten or replace tip and needle.
4. Dirt between fluid tip, taper seat and body.	4. Clean.
5. Loose or cracked coupling at fluid inlet. (Siphon feed only.)	5. Tighten or repair.
6. Loose fluid tube in the cup or tank.	6. Tighten.

Problem: Split Bell-Shaped Pattern

Figure 32. Split Bell-Shaped Pattern

Cause	Remedy
1. Insufficient paint.	1. Turn fluid adjusting valve open (counter clockwise) or increase fluid pressure.
2. Too much atomizing air pressure.	2. Reduce air pressure or correct by using air adjusting valve.

Problem: Heavy Center Pattern

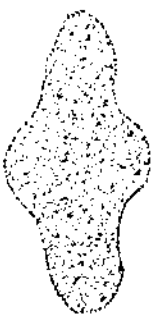


Figure 33. Heavy Center Pattern

Cause	Remedy
1. Atomizing air is too thick.	1. Increase air pressure.
2. Material too thick.	2. Reduce viscosity.
3. Too much material.	3. (a) Lower fluid flow at fluid adjusting valve. (b) Reduce fluid pressure.

Problem: Finish Has Streaks

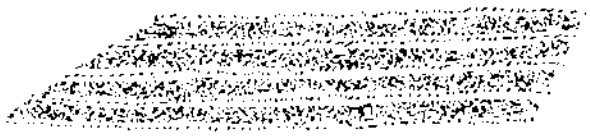


Figure 34. Streaked Pattern

Cause

1. Last coat applied too wet.
2. Too much air pressure.
3. Insufficient air.
4. Spray pattern not uniform.
5. Improper overlap technique.

Remedy

1. Apply drier finish with multiple strokes.
2. Use least air pressure possible.
3. Increase air pressure.
4. Clean or replace air cap.
5. Use 50% overlap technique.

Problem: Material Leaking from the Gun

Cause

1. Worn or damaged fluid needle, tip or spring.
2. Packing dry, loose or worn.
3. Incorrect needle.

Remedy

1. Replace with matched, lapped tip and needle.
2. Lubricate, tighten or replace.
3. Replace with proper needle.

PREVENTIVE MAINTENANCE

WARNING

Always shut off air and fluid supply to gun and relieve pressure before attempting any service.

An air spray gun is a precision finishing tool manufactured to close engineering tolerances. The gun must be kept clean and lubricated. The following data is the daily operator maintenance required to keep the gun in good operating condition.

Start-Up

1. With a lightweight oil, lubricate the air spray gun daily at the points shown in figure 35. Periodically lubricate the fluid needle spring with a lightweight grease or petroleum jelly.

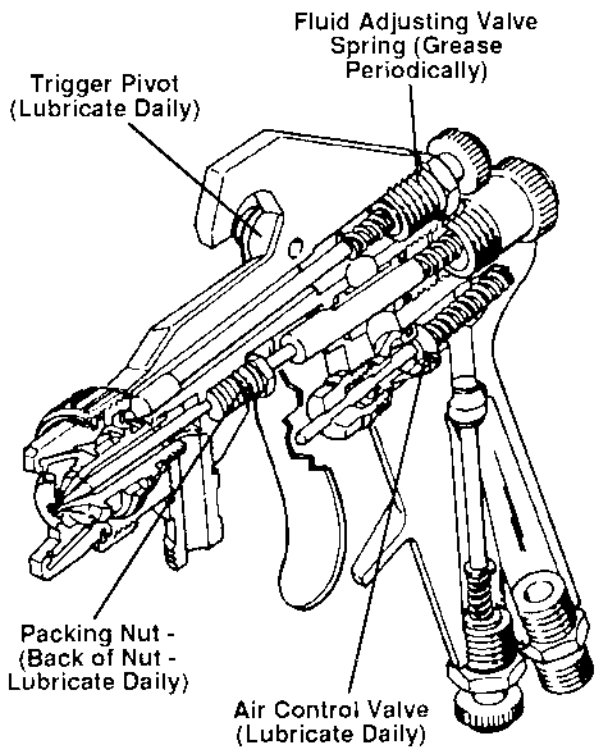


Figure 35. Maintenance Diagram

2. Keep the system air filter as clean as possible. Drain the air filter daily.
3. Remove the gun from the solvent cup and clean the air cap. Be certain the solvent used is compatible with the paint being sprayed.

Shut Down

Shut down both the fluid handling and air supply of the air spray system. Relieve both air and fluid pressure at the gun. Immerse only the fluid tip and air cap of spray gun in a compatible solvent.

CAUTION

Do not immerse the entire gun in the solvent. This causes scale deposits and other foreign material to form in the air passages which later could either clog the air cap or be sprayed onto the surface of the part.

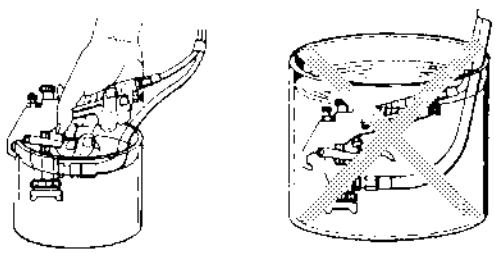
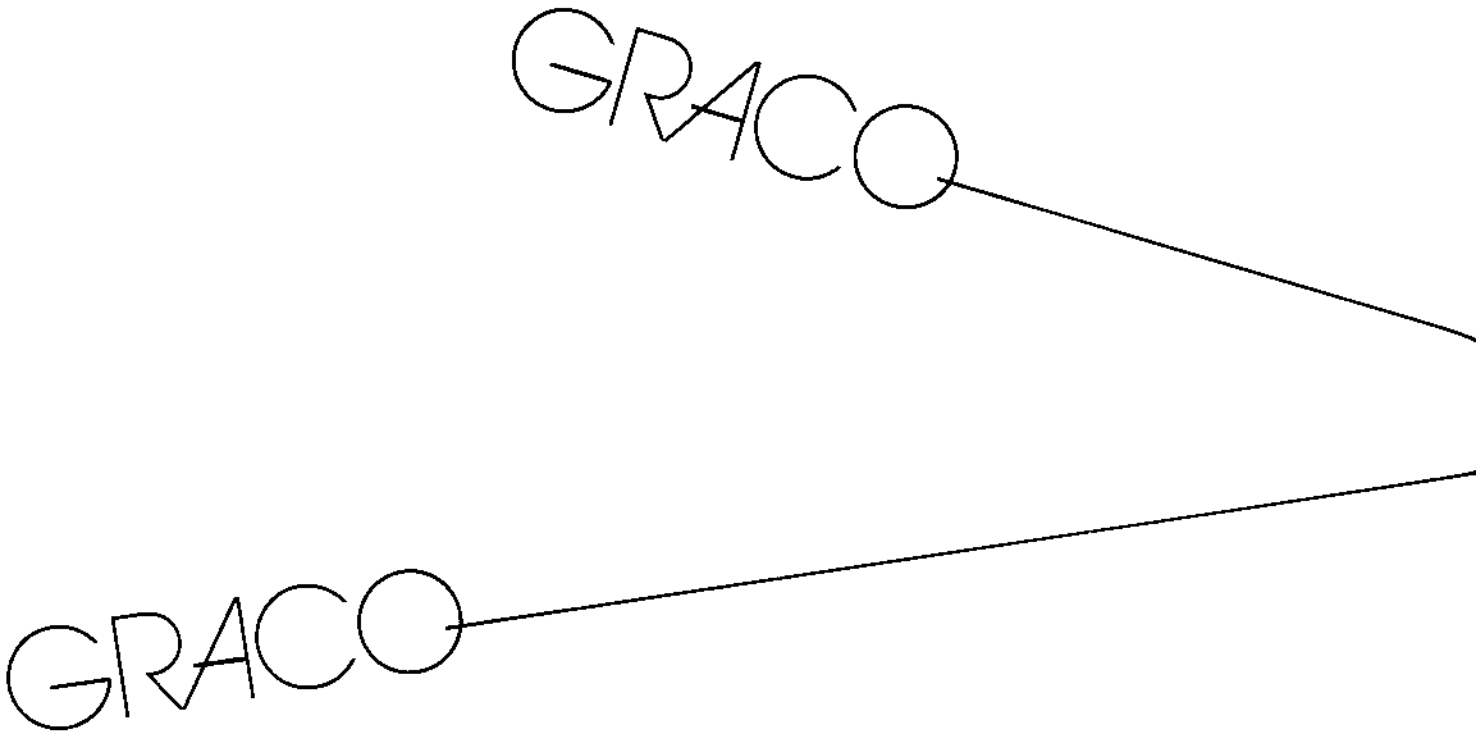
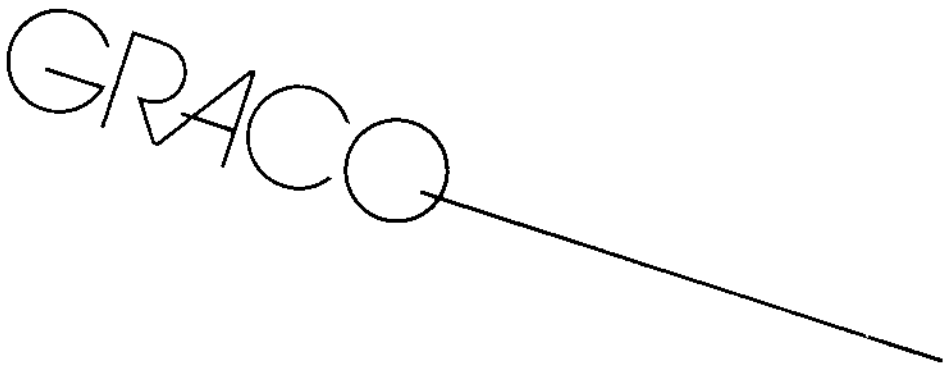


Figure 36. Cleaning Fluid Tip and Air Cap





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