AIRLESS SPRAY PAINTING

INTRODUCTION

Airless spray painting gets its name from the fact that no compressed air is used with the paint to form the spray. Atomization occurs when the paint is pumped at high pressures and is then released through a spray tip. The forcing of the paint material by means of high pressure through a very small orifice causes atomization. The principle of airless spray painting is often compared to the spray created by the nozzle on a garden water hose.

TECHNICAL INFORMATION

Airless spraying is also known as hydraulic spraying because it uses the principles of hydraulics, which is the science of creating pressure by the movement of fluids. These pumps drive the paint through high-pressure hoses, usually 3/8 inch inside diameter (ID), to a specially designed airless spray gun.

The airless spray gun differs from those used with conventional air spray systems. Basically, the airless gun is a passageway for the paint. It has changeable spray tips for different types of paint materials and different types of spray patterns. There is no air cap and only one orifice. Only one hose, the high-pressure paint hose, is connected to the gun. A typical airless spray gun is shown in Figure 1-1.

Because no air is mixed with the paint, airless systems are capable of applying paint with less fogging. The speed at which paint is supplied to the gun in the airless system makes it a faster method of spraying than the conventional air spray method.

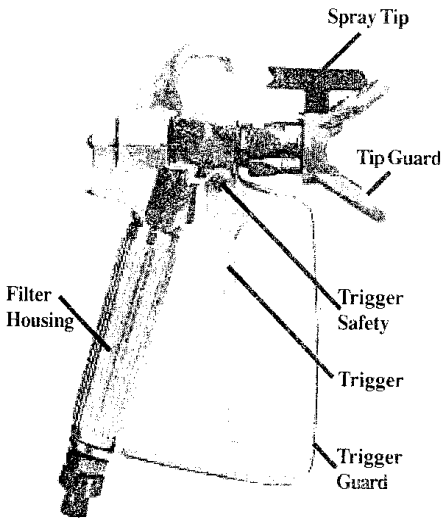


Figure 1-1— *Typical Airless Spray Gun*

CAUTION

Because Airless Spray Units
Develop Extremely High-Pressures:

◆**NEVER** Put your hand or fingers in front of gun.

◆**NEVER** Point the gun at your body - or at anyone else.

BEFORE Turning "ON" pump:	•	ALWAYS	Follow the manufacturer's recommendations on maximum pressures and operating instructions.
	•	ALWAYS	Lock the gun trigger in "OFF" position - and - check all connections.
	•	ALWAYS	Use grounded high-pressure fluid hose and ground the pump before starting.
BEFORE removing any part of equipment (including tip):	•	ALWAYS*	1. Shut off pump.
	•	ALWAYS	2. Release gun pressure.
	•	ALWAYS	3. Lock the gun trigger in **"OFF"** position.
			*NOTE: Also follow 1, 2 and 3 when discontinuing spraying operation.

SAFETY FIRST
THEN PROCEED

Figure 1-2— *Airless Equipment Safety Poster*

Airless spray provides higher production rates than conventional air spray systems because the airless method delivers more material at a faster rate. In addition, when spray guns are used high above ground level away from the compressor or pump, the high-pressure airless fluid pump delivers the material to the spray gun more easily.

It should be recognized that both methods have their limitations as well as advantages. The airless spray system equipment can spray only coatings which will atomize or break apart into drops of uniform size without the added force of compressed air. Certain mastics, vinyls, and chlorinated rubber formula coatings will not atomize uniformly when using an airless spray system.

Advantages of Airless Spray:

- Production speed
- Lower overspray
- Fewer pieces of equipment (does not require compressor or pressure pot)

Disadvantages of Airless Spray:

- Injection hazard
- Difficulty in creating a fine finish

Airless spray painting is particularly efficient on painting jobs where there are large surface areas unbroken by trim, doorways, or windows. The airless spray pattern for coating large areas may be adjusted up to 24 inches or more in width.

Because the airless spray gun shoots the material to the surface rather than blowing or floating it to the surface as conventional air spray systems do, it is often more effective in covering rough textured surfaces.

SAFETY WATCH

Injection Injuries: Liquid Bullets

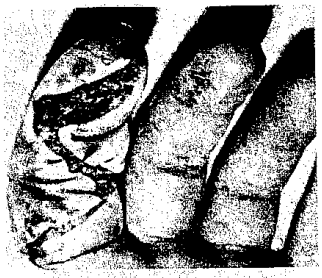
By Syndee Holt

Injection injuries — even the phrase will make a grown man flinch. The airless spray equipment that makes your job easier can make your life quite painful if you don't follow some simple safety precautions. Never treat an injection injury as a simple cut; you must treat it as though you had been shot with a poisonous bullet.

Airless spray equipment operates by forcing liquids at very high pressure through a very small, precise opening. Grease guns, spray guns, diesel injectors, paint guns, concrete guns, and plastic injectors all operate between 600 and 12,000 pounds per square inch (psi) velocity. This can drive the fluids you are spraying through your body tissue at an excess of 600 feet per second if the nozzle is four inches or less from your body — about the velocity of a rifle.

The military uses the same general technique to administer their vaccinations without hypodermic needles. They just put the injection nozzle on your arm and fire. The velocity of the stream is so strong that the vaccine is atomized through your skin without breaking it. It's not painless, but it is practical for the purposes of mass inoculation. The medical personnel administering the vaccinations are at risk of injection injury. Likewise, animal handlers can suffer injection injuries when vaccinating chicken and pig stock. Even fire-fighters have reported injection injuries from their high-powered water jets.

On coatings jobsites, these easily prevented injuries do occur, whether through accident, inattention, or poor work habits. Simple care and attention to detail will help keep you from becoming a statistic.



It was estimated that 1 in 600 hand injuries were by injection.

Looking at Statistics

Injection injuries happen most commonly to men, ages 21 to 59, on a new job or using a new tool. Over 75 percent of injection injuries reported are to the index finger of the hand not holding the tool. The second most common injury site is the fleshy area below the thumb of the hand not holding the tool. The typical injury occurs with an entry point at the tip of the finger, but the velocity of the pressure can drive the injected substance from fingertip to palm, injuring the surrounding tissues and destroying blood vessels, similar to a gunshot wound.

Grease is the most commonly injected fluid, closely followed by paint. Oil-based paints cause more injury than water-based paints; however, both will cause rapid tissue death.

The number of injection injuries is difficult to assess, but a group at the University of Colorado estimated that one in 600 hand injuries treated in their emergency department were injection injuries.

There are several factors that determine the severity of the injury:

- The type and amount of the liquid injected. A highly toxic material will have a more negative effect than a clean water injection. The temperature and viscosity of the material will also affect the injury.
- The injection velocity.
- The time between injury and treatment.
- The part of the body that is injured and whether the injected liquid was introduced into the bloodstream.

Treating Injection Injuries

The injury site may appear to be only a small puncture wound with very little pain, often with a small amount of the injected fluid dripping out of the wound. Don't mistake this rather unremarkable looking injury for anything less than an injury that can lead to amputation or even death.

Since the injected material acts as a projectile, there may also be a small exit wound. The amount of pain experienced at the time of injection is a very poor indicator of the extent of damage; within even a few hours of a paint or paint thinner injection, the injury site will grow in pain intensity as tenderness and discoloration of the skin start to occur. It may take a couple of days for other

injected substances, such as grease, to start to cause this damage.

Prompt treatment of ANY injection injury is absolutely necessary. Typically, most patients with injection injuries report to the medical facility after their work day is complete and the injury site has started to swell and hurt. This delay can be critical to treatment.

It is important to tell the medical personnel treating you that you have suffered an injection injury, what substance you were working with, and the estimated velocity of the machine you were operating. According to Stan Stutzka of the California Poison Control System, "It's not the injected substance that is critical, but the pressure at which it was injected. A toxin injected at a low pressure may not be as critical as water injected at an extremely high rate of pressure."

In addition to information about the airless sprayers' velocity, also bring the Material Safety Data Sheet (MSDS) for the injected coating. This will help the medical personnel to provide the correct treatment.

Some medical personnel may also be fooled by the small wound and not start the radical treatment necessary, so make sure that the treatment team understands injection injuries and their treatments. This type of injury should be considered a surgical emergency. If you suspect that you have suffered an injection injury, go immediately to a hospital emergency room, NOT urgent care or a physician's office.

The treatment may involve a tetanus shot if yours is not current, as well as a preliminary x-ray to see the area of injection and the amount of tissue already involved.

Since the injured tissue is susceptible to bacteria, an antibiotic is often prescribed to prevent secondary infections. The damaged tissue and injection material will be immediately removed under anesthesia, in a procedure called debridement.

The medical team may also need to decompress the injury area by cutting the skin areas open to relieve the swelling pressure and release the toxic chemicals injected. This can result in substantial wound areas. Further debriding may be necessary as the surrounding tissue becomes involved over the next couple of days. The medical team may also need to

PREVENTION OF INJECTION INJURIES

Prevention of this type of injury is completely avoidable. Here are some simple rules:

- NEVER point an airless sprayer towards your hand or body. Treat it as you would a loaded gun.
- NEVER use your hand to stop a leak in the sprayer.
- NEVER put your finger or hand in contact with the nozzle.
- NEVER remove the safety spacer at the tip of the gun. This spacer is placed to reduce the possibility of injection through the skin.
- NEVER spray in the vicinity of open flame, pilot lights, electrical outlets, or other sources of ignition.
- NEVER allow hoses to become kinked, or to vibrate against rough or sharp surfaces.
- NEVER spray in an enclosed area without proper ventilation to remove vapors.

▶ PREVENTION CONTINUED PAGE 16

SPRAY TIPS

When using an airless spraying system, the airless spray is atomized (broken up) into a fluid composed of tiny droplets, without the use of compressed air. A coating is pumped under high pressure through a fluid hose to the spray gun, which delivers the coating through the tip. The tip controls the flow of material and creates the spray pattern. The specific functions of an airless spray tip are:

1. Determine the fluid flow or amount of the coating applied.
2. Create back pressure in the line for an evenly atomized pattern.
3. Create the spray pattern and fan width.

Spray tips come in various styles, but the most common style of spray tip is the "RAC" tip. "RAC" is an abbreviation for reverse-a-clean (or commonly referred to in the field as a reversible tip). There are two great advantages of using RAC tips. First of all, these tips are easy to unclog. Secondly, RAC tips are much safer since sprayers do not have to have their fingers in front of the tip to perform 'unclogging'. Figure 2-14 is an illustration of a common RAC tip.

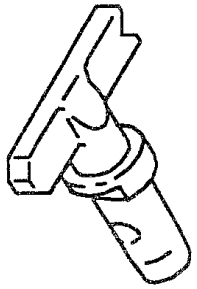


Figure 2-14—*Common RAC Tip*

It needs to be pointed out that even though it is relatively easy to unclog a RAC tip by reversing it, you must do so correctly. Many sprayers have accidentally gotten covered in paint by not paying attention during the reversing process. When using a RAC tip, it is important that you rotate the tip all the way until it stops (the tip actually has a shoulder that stops the tip rotation when you are cleaning the tip) before triggering the spray gun. It is important to know that the top of RAC tips have an arrow shape, the 'notch' is at the back and the point is at the front of the tip.

Spray tips are usually identified by a numerical system. By looking at the notched part of the spray tip (see Figure 2-15), a 3-digit number can be seen.

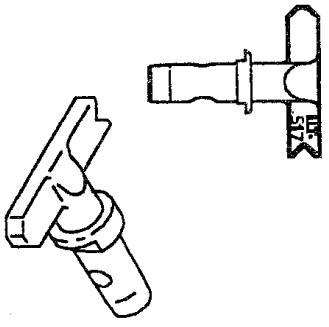


Figure 2-15—*Common RAC Tip*

PREVENTION FROM PAGE 16

- NEVER leave a spray unit that is pressurized unattended. The unit should be shut off, the pressure released, the trigger's safety engaged, and the power shut off to the unit.
- ALWAYS follow the coating and solvent manufacturers' safety guidelines, as well as those of the spray equipment manufacturer.
- ALWAYS wear gloves and goggles, but don't count on these to "save" you.
- ALWAYS use the correct-sized sprayer tip for the material being sprayed to prevent clogging.
- ALWAYS inspect the hoses, connections, and fittings for signs of damage, and proper fit before using.
- ALWAYS use approved grounded outlets and extension cords of the voltage and frequency noted on the motor.

treat you for any acute reactions to the chemicals injected.

Amputation is often unavoidable, especially in injuries to the fingers. Paint and paint thinner cause the most amputations with estimates as high as 48 percent of these injuries ending in amputation. Even if amputation is avoided, the finger or toe may be too stiff to be usable. Other complications can include infection, permanent contraction of the injured digit, and chronic pain. Physical and occupational therapy will be critical after the initial injury treatment to help restore as much use as possible to the injured area.

Even air or clean water injection injuries need treatment. Air injection will usually require antibiotics, splinting, and elevation of the injured area. Clean water injection will usually require debriding, antibiotics, and elevation of the injured area.

Although these injuries are not common, according to the Fluid Power Safety Institute, "Over 99 percent of the people wh service, repair, and troubleshoot hydraulic systems have been subject to the exact dynamics that trigger a high-pressure injection injury. However, the 'liquid bullet' either missed or deflected off its target." That means just about everyone who uses an airless sprayer has created the perfect set of circumstances that could have led to this injury and the potential loss of limb.

If you have any questions regarding a possible injection injury, call the Poison Control Hotline at (800) 222-1222. CP

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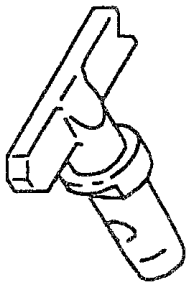

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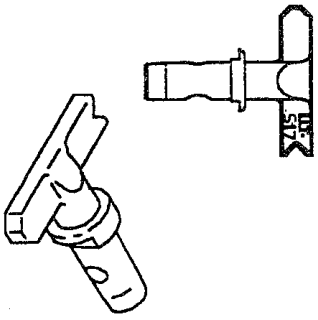

Figure 2-15—*Common RAC Tip*

The three-digit number refers to two different things. Figure 2-15 has the number .517 stamped on it. The first number, in this case the number 5, refers to the fan width of the tip. To determine the fan width, at 12 inches from the substrate being sprayed, you simply multiply the first number (in this example the number 5) by 2 to determine the fan width of the spray tip. The .517 tip will have a fan width of approximately 10 inches (2 times the first number, which was 5) at 12 inches from the substrate. An applicator determines the appropriate fan width when selecting a fan tip based on the substrate. For example, an applicator may choose a .311 spray tip, which would give you a 6-inch fan width at 12 inches from the substrate. Another example of spray tip selection would be an applicator choosing a .519 spray tip when spraying drywall, resulting in a 10-inch fan width. The remaining two digits (in the original example, the number 17) refer to the actual spray tip width. Tips are measured in thousandths of an inch increments, so the number 17 means that the tip has a width of 17 thousandths of an inch (.017). Thinner materials are sprayed with tips that have smaller openings. Below you will find a listing of commonly sprayed coatings and their recommended tip size.

Recommended Width Tip Sizes Material	**Tip Width**
lacquer and stain	.011 to .013
oil based paint	.013 to .015
average latex paint	.015 to .019
heavy water based	.021 to .025
block filler	.025 to .035

Spray tip wear will vary because it is dependent upon the coating being sprayed. Three common rules-of-thumb for spray tip wear are:

1. Tip wear occurs with normal use.
2. The greatest wear occurs within the first 30 gallons of material sprayed.
3. Most tips are worn out after 100-150 gallons.

Tips are expensive, and there is no reason why we shouldn't help out our employers in getting the most for their spray tip buck.

There are six basic causes of premature spray tip wear:

1. Excessive pressure
2. Abrasive material
3. Paint not strained
4. Filters not used
5. Wrong size filters
6. Old and/or dirty hose

There are several ways to avoid premature spray tip wear. A professional painter uses the following methods to get the most out of their spray tips:

1. Use the least amount of pressure required to atomize material and cover the surface.
2. Strain all material.
3. Use filters on the spray system.
4. Clean all filters after use.
5. Remove spray tips before cleaning sprayer.
6. Clean tips with a soft bristle brush.

Airless Spray Problems and Their Causes

Some of the more common problems concerning spray pattern shape and spray gun performance in airless spray work are described in Figure 2-16. Included in this chart are suggestions on how to correct the possible causes of these problems. In developing airless spray gun techniques, this chart is helpful to recognize problems in spray gun handling techniques as well as problems in spray equipment performances.

TYPE AND DESCRIPTION OF PROBLEM	POSSIBLE CAUSE(S) OF PROBLEM
AIRLESS SPRAY PATTERN SHAPE PROBLEM	
Tails	➡ Inadequate paint flow ➡ Paint not atomizing, too heavy or fibrous ➡ Paint flowing too slowly ➡ Worn nozzle tip ➡ Low pump pressure
Heavy Centered Pattern	➡ Worn nozzle tip ➡ Paint won't atomize with airless
Distorted Pattern	➡ Partially plugged or worn spray tip
Pattern Changes Size	➡ Pulsating paint pressure ➡ Insufficient power to pump ➡ Leak in tubing or hose ➡ Paint too thick ➡ Pump not adequate
Round Pattern	➡ Worn nozzle tip ➡ Paint too heavy for tip ➡ Paint won't atomize with airless
Heavy Ends of	➡ Inadequate paint flow

Figure 2-16 — *Common Airless Spray Painting Problems and their Causes*

Material hose connections should also be kept clean, since dried material on hose connections can cause cross-threading or looseness in the fitting.

When the hose is in use, it should be laid out in the straightest line possible. If a curve in the hose cannot be avoided, it should be a wide curve, not a sharp bend. High-pressure hoses should never be kinked or bent sharply when used on the job or in storage.

Airless Pump Maintenance

Airless spray equipment, if properly operated and maintained, requires minimum maintenance. A proactive versus a reactive approach to maintenance is the most efficient method for any maintenance program. A proactive approach centers around preventive maintenance. For example, how do you clean a clogged tip? A reactive solution, especially if you are using a reversible spray tip, is to rotate the spray tip 180° and trigger the spray gun to blow out the unwanted clog by using the pressure from the airless system to 'clean itself'.

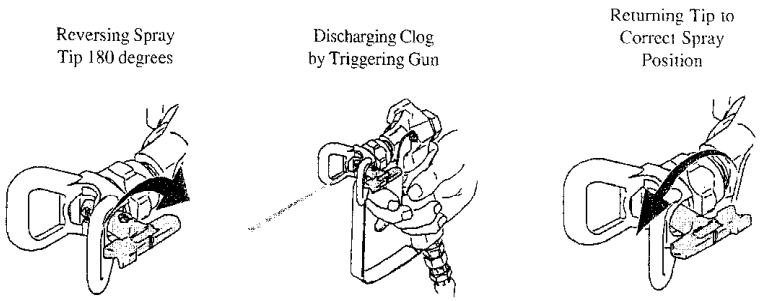

Figure 3-1—*Unclogging RAC tip*

A proactive approach to the clogging problem is to first ask how the material that is clogging the tip got there in the first place. There are a variety of answers to the proactive question, "How did the 'clog' get there in the first place?".

- Not straining material
- Incorrect use of filters
- Dirty, damaged filters

Maintenance concerns are usually the result of a lack of proper cleaning, either before or after using the spray equipment. Airless sprayer maintenance (proactively) actually starts when you open up the first bucket of material to be sprayed. **All material to be sprayed should first be strained!** Straining coating materials is a simple but extremely important process in which unwanted debris (commonly referred to as 'trash') is filtered out of a coating before it is allowed to be pumped into an airless system for spraying. Trash in material to be sprayed can come from a variety of sources: age of material, how and where material was previously

stored (especially in regard to temperature), and commonly from debris in buckets used to mix or 'box' paint. Straining of paint prior to spraying greatly reduces the amount of trash that may be the direct cause of many maintenance problems. Material strainers are easily obtained at paint suppliers. Straining of paint, as a proactive maintenance measure, reduces the amount of unwanted material that enters the airless spray system.

Next on the list of proactive maintenance measures is the correct use of filters that are a part of a spray system. There are usually two different filters, besides the use of a strainer, in most airless spray systems. The primary filter is attached to the pump.

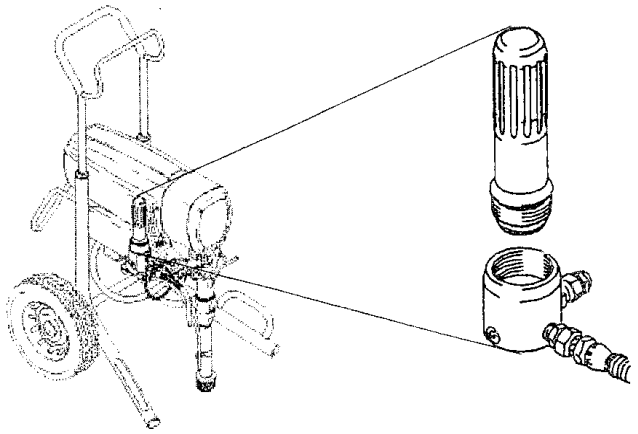

Figure 3-2—*Filter Housing for Pump*

The filter housing is found by looking at the area of a pump where hoses are actually connected to the pump (see Figure 3-2). Proactive pump maintenance requires that you always keep your filters clean and in good working order. Filters wear out with use, and need to be replaced as necessary. A pump filter that is damaged, or not properly cleaned after previous use, will not function properly. The complete removal of, or non-use of, a pump filter only increases the potential for clogging problems (which is a even worse problem if you do not strain your paint first). It is important to make sure that when replacing a worn out or damaged filter that the replacement filter is the correct filter for that particular pump. Prior to cleaning or replacing a filter, it is important to take notice of how the filter is placed in the filter housing, so that you know how to properly reinstall the cleaned or new replacement filter. Some manufacturers have designed their filters in a manner that only allows for the filter to be reinserted into the filter housing correctly.

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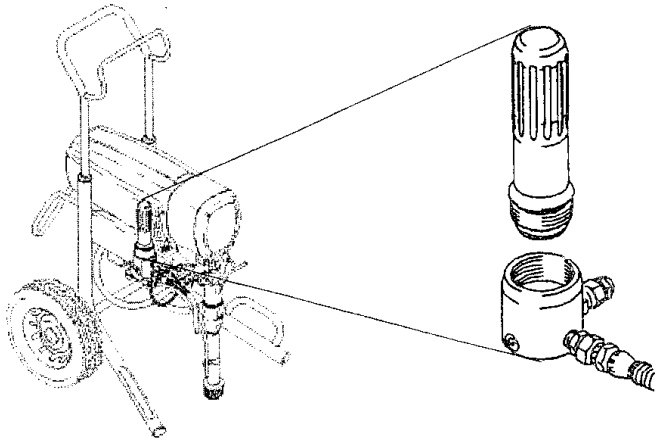

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A second type of filter is also built into the spray gun. Similar to a pump filter, a damaged spray gun filter, or the non-use of a spray gun filter, only increases the possibility of trash in the material that is to be sprayed. When cleaning or replacing filters, it is of the utmost importance **that the spray system is completely depressurized. Never forget that an injection hazard exists any time you are working with or around pressurized airless spray equipment!**

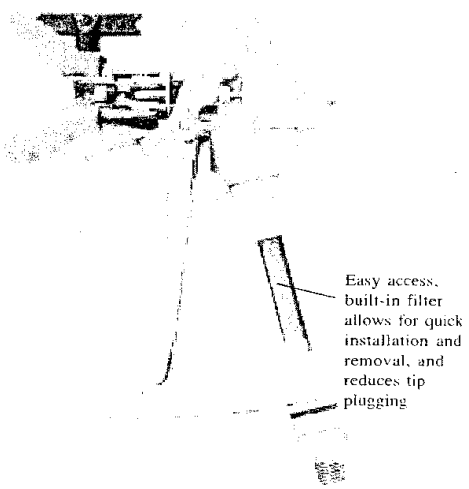

Figure 3-3—*Spray Gun Filter*

Now that we have discussed the importance of material filtering, let's continue to think proactively about other airless spraying maintenance concerns. But, before continuing with maintenance concerns, we first need to discuss the basics of how an airless pump works. The hydraulic action of a piston, that travels up and down inside a cylinder creating a vacuum, sucks the material up through a pick-up tube from a material container.

After the material is pressurized, it is delivered to a hose which in turn delivers the pressurized material to a spray gun. Triggering the spray gun allows the pressurized material to leave the airless system. To create pressure inside a pump cylinder, which gives an airless system the pressure to atomize materials, the piston travelling inside the cylinder must have enough clearance between the piston and the cylinder wall to allow piston movement. Reduced atomizing pressures, leaking of material at the top of the cylinder, and eventual complete loss of pump pressure are the direct result of excessive clearance between the piston and the cylinder wall. The distance between the cylinder wall and the pump piston cannot be tight or too loose.

Before using airless spray equipment, it is recommenced by most equipment manufacturers that you apply 'throat oil' to the pump piston rod. Throat oil is a lubricant that is used to keep the piston, and more importantly, the packings inside the pump cylinder, lubricated.

the pump cylinder) as the packings are flattened by the downward movement of the packing adjustment nut. It is best to make the small adjustments with the packing adjustment nut. One of the quickest ways to ruin a pump's packings is to overtighten the packing adjustment nut. Overtightening of the packing adjustment nut prematurely overflattens the packings, which causes the packings to have more friction than necessary by rubbing the cylinder wall. Increased and unnecessary friction from overtightening of the packing adjustment nut causes the packings to wear out to the point that they cannot be flattened. This results in a pump that leaks and will eventually cause a loss of pump pressure. When a pump leaks continually or starts losing pressure, it is time to replace the pump's packings.

All pump maintenance shall be in accordance with specific manufacturer's recommendations.

Setting up and Cleaning Airless Equipment

Cleanup procedures are equally important for airless spray equipment and for conventional air spray equipment. Dried material collected anywhere in the spray system will cause problems when the equipment is used again. It should be remembered that it is easier to clean the spray equipment when the material is still wet.

Reading and Following Instructions

In cleaning and assembling the spray equipment for use, the applicator should follow the instructions provided by the spray equipment manufacturer. It is extremely important to keep the operator's manuals, and other technical sheets that come with the equipment, handy for quick reference. These materials list the step-by-step instructions for using and properly maintaining the equipment, and usually include a troubleshooting list of possible causes of malfunctions.

The following are the general steps to perform when setting up and shutting down airless spray equipment. Remember that the best guide for working with any specific model of equipment is the manufacturer's original instructions.

Setup of Electric Airless Spray Pump

- Be sure the pump switch is turned off, and that the electric cord is not in the outlet.
- Attach material hose and spray gun without the spray tip to the fluid pump.
- Make sure that all hose connections are tight.
- Plug electric cord into a GFCI outlet.
- Make sure the pump pressure regulator is closed or at the lowest pressure setting.
- Stir and strain material.
- Place pump head or suction tube in material.
- Open valve on pump to allow material to enter pump.

- Aim spray gun into a grounded metal or plastic waste container.

- Remember that the pump and its attached material hose were probably filled with solvent during storage, and this solvent must be flushed out before beginning to spray.
- Adjust pressure regulator until pump begins to operate, preferably with gun trigger on to ease pump start-up effort.
- While the pump is operating slowly, pull the spray gun trigger. Trigger until a steady stream of paint is flowing.
- Shut off pump. Make sure all material pressure is released by pulling the trigger until no more paint flows. Keep the spray gun in contact with hand and aimed into the grounded container.
- Lock the gun trigger and pull electric cord from the outlet.
- Insert spray tip, filter, and gasket. Always use the spray gun wrench to tighten any retainer nuts.
- Check material hose and connections for any sign of leakage.
- Connect electric power cord and turn on pump. Adjust pressure regulator.
- Test spray pattern.

Shutting Down Electric Airless Pump

- Turn off pump. Pull electric cord from outlet.
- Release pressure in the hose by triggering gun into a container, then release pressure by activating the pressure release valve as shown in Figure 3-6.
- When no more material flows from the spray gun, set safety lock, remove spray tip, and place in solvent. NOTE: Never submerge the entire spray gun in solvent.
- Place the pump head or siphon tube in proper solvent.

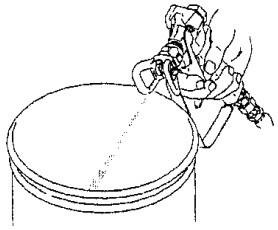

Figure 3-6—*Safe Way to Release Hose Pressure*

Safety Notes:

- Always use appropriate personal protective equipment.
- Use metal bucket to conduct static charge to the ground.
- The gun should be held against the metal bucket at all times when the fluid flows.
- Connect electric cord. Turn on pump with pressure at lowest setting. Allow solvent to pump through the spray system. Release solvent by triggering spray gun into the bucket.
- Allow solvent to flow through airless system until the solvent comes out clean.
- Release all cleaning solvent from the spray gun and paint hose if the pump is shut down for paint color change.

INTRODUCTION

There are safety measures which are unique to airless spray. The high operating pressures used in airless spray systems and the greater build-up of static electricity require that applicators take special safety practices seriously.

Airless Gun Safety

Never point the airless spray gun at any part of your body or at another person. Once the fluid pump is started on airless equipment, spray from the gun can penetrate the human skin like a hypodermic needle. For this reason, according to federal safety regulations, all airless spray guns must have an automatic or manual safety lock to prevent accidental triggering.

All safety locking mechanisms must always be tested prior to use of the gun. Any locking mechanism that is not operational must be adjusted, repaired, or replaced.

Figure 4-1 shows the position of the safety device on a typical spray gun. Once it is locked, the trigger cannot be pulled to activate the spray. Spray gun safety devices vary in design. Applicators must familiarize themselves with the particular safety devices before using any airless spray system.

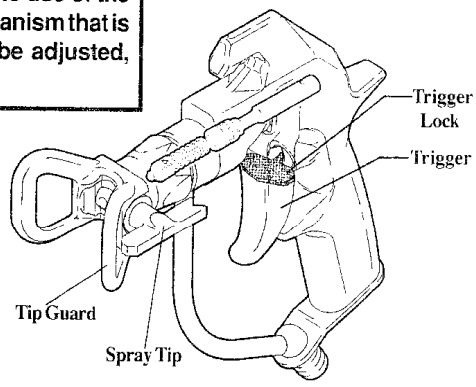

Figure 4-1— *Illustration of an Airless Gun Safety Lock*

Airless spray guns have a metal trigger guard that gives additional protection in case the spray gun is dropped or bumped. Spray tip guards and trigger guards keep the applicator's hand from coming into direct contact with the end of the spray gun and act as a warning and reminder to keep the hands away.

Never operate a spray gun without tip guards.

Gun Handling Habits

The airless applicator should develop the habit of automatically engaging the trigger safety lock when not spraying. When the applicator is carrying a spray gun containing material under pressure or when the fluid pump is running, fingers should be away from the trigger and the spray gun held by the grip handle. When a loaded spray gun is not in use, it should be hung by the hook with the tip pointed toward the ground. Most airless guns have a hook built into the body of the gun for this purpose.

Handling Airless Spray Tips

The airless applicator must not remove the spray tip unless the fluid pump has been shut off and all pressure released in the material hose.

The operator must remember that the pressure remains in the paint hose until it is released at the spray gun or through a pressure release valve on the fluid pump.

> To be sure the system is depressurized, trigger the gun a final time to make sure that there is no longer any material pressure in the hose.

In Case of Injection

If material is accidentally injected into the skin, the operator should seek medical help immediately. Even if the wound does not bleed or appear to be very serious, it must be remembered that paint has been injected under the skin where it may enter the blood stream. The physician treating the injury should be told the composition of the material and the solvents in the spray being used. If possible, bring the material safety data sheet (MSDS) for the injected material to the emergency room. Call 1-412-681-6669 to get information critical to the treatment of the spray injection injury.

Safety with Hoses and Connections

All hoses used with airless spray fluid pumps and guns must be high-pressure hose. This means that they must be constructed specifically for high-pressure airless spraying. All connections and fittings must also be built for high-pressure work, with the proper size and thread type specified by the hose manufacturer.

Although the airless spray hoses are constructed to withstand pressures of 5,000 psi, hoses should not be expected to withstand careless or rough treatment. When handling pressurized airless spray hoses, remember that the jet from a rupture in the paint hose can be as dangerous as the spray from the spray gun itself.

Margins of Safety

Manufacturers' charts give the maximum working pressures for hoses and connections, and specify the proper hoses and connections to be used together. The tested maximum hose pressures should be considerably higher than the pressures the applicator actually uses. In other words, allow a margin of safety by using materials and equipment that are capable of holding higher pressures than those used on the job.

Working with Hoses

Airless material hoses should never be bent or kinked. Hoses should be carefully stretched out in the straightest line possible. If curves cannot be avoided, they should be wide and gradual, never sharp bends.

All material hose and equipment connections in airless spraying must be tightened by a wrench.

The airless applicator should keep a careful watch for proper care of the hose at the job site. It should never be left where equipment can be rolled over it, never dragged on a rough surface or concrete floors, and never exposed to moving parts of machinery.

Static Electricity

The airless spray applicator must also be concerned with the buildup of static electricity. As the material travels through the hose, it builds up friction which creates static electricity. If allowed to collect on the material hose, static electricity can produce sparks and arcing that will cause explosions in vapor-filled air. To prevent this, always use grounded airless material hoses.

Fluid pumps, other spray equipment, and metal objects in the working area, including material containers, must also be grounded. Static electricity can build up in ungrounded objects, eventually causing them to become fully charged and generate sparks.

Airless Spray Gun Safety

- Never aim the spray gun at yourself or other workers.
- Never hold your hand over the spray tip at the end of the spray gun.
- Never remove any part of the spray gun without shutting down the fluid pump and activating the pressure release valve.
- Keep a grounded metal waste container near your work to spray into when it is necessary to relieve the pressure in the fluid hose and spray gun.
- Always remove clogged spray tips from the spray gun before cleaning.
- When the airless spray gun is not in use, always engage the safety lock.
- Do not remove or modify any part of the spray gun assembly.