BINKS

TRAINING DIVISION

Air Assisted Airless Spraying

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Spray guns and equipment have come a long way over the last 50 years. From the earliest wooden handle spray guns to the durable, drop-forged aluminum spray guns of today, they have allowed us to increase production speed and spray virtually any coating, while providing us with the finest degree of atomization or finish possible in a manual operation.

Unfortunately, some factors negate the advantages of compressed air atomization. Concern over paint costs have led to studies which indicate that much more coating is wasted than actually deposited on parts. An average transfer efficiency of 25%—30% can be achieved using compressed air atomization, and this process makes it difficult to spray into recesses or cavities. Thus, we sacrifice efficiency for a fine finish.

Our attention in the 1960s turned to another process of atomization, known as airless spraying, which releases fluid under relatively high pressure through a small hole or orifice in the spray gun to achieve atomization. This allows us to spray much faster and reach into recesses and cavities without all of the fog associated with air spray. However, with some coatings, we cannot achieve fine atomization.

Another limitation is the hazard of hydraulic or paint injection. The fluid stream can inject itself into the body with any immediate contact as it exits the gun or hose.

So, with airless, we increase our transfer efficiency to an average of 40%—50%, increase production speeds, and have the ability to spray into recesses. However, in some cases, we lack the fine finish obtained with the compressed air atomization process, and airless requires strict adherence to safety, maintenance, and cleanup instructions.

The next step toward maximum efficiency was combining the best features of compressed air atomization and airless atomization to form a process called air-assisted airless. This process provides faster application of material than compressed air, a soft spray that results in reduced fog and waste, and the ability to penetrate into recesses and cavities while still achieving a fine atomization, which is so important on certain substrates such as wood. This system works best with slow to medium production line speeds, and thin to medium viscosity materials. It is ideally suited for stains, fillers, glazes, lacquers and polyurethanes. Recent attempts to reduce emissions and hazardous wastes through improved application efficiency has led to refinements of all types of spray atomization systems including the process of air assisted airless. A new generation of air assisted airless is now available that includes the benefits of HVLP (high volume low pressure) atomization. This new system is often referred to as Hydraulically Assisted HVLP. It combines the speed of air assisted airless with the finish quality, EPA acceptance and superior finish of conventional HVLP.

A typical system consists of a spray gun, a pump, some hoses, and clean compressed air of adequate pressure and volume. It may be used with small containers, such as a 5-gallon pail, for small jobs, or it may siphon from large 55-gallon drums for large jobs.

An air-assisted airless spray gun combines features found in both air and airless spray guns. It uses a special fluid nozzle tip to partially atomize the material using the airless principle previously discussed.

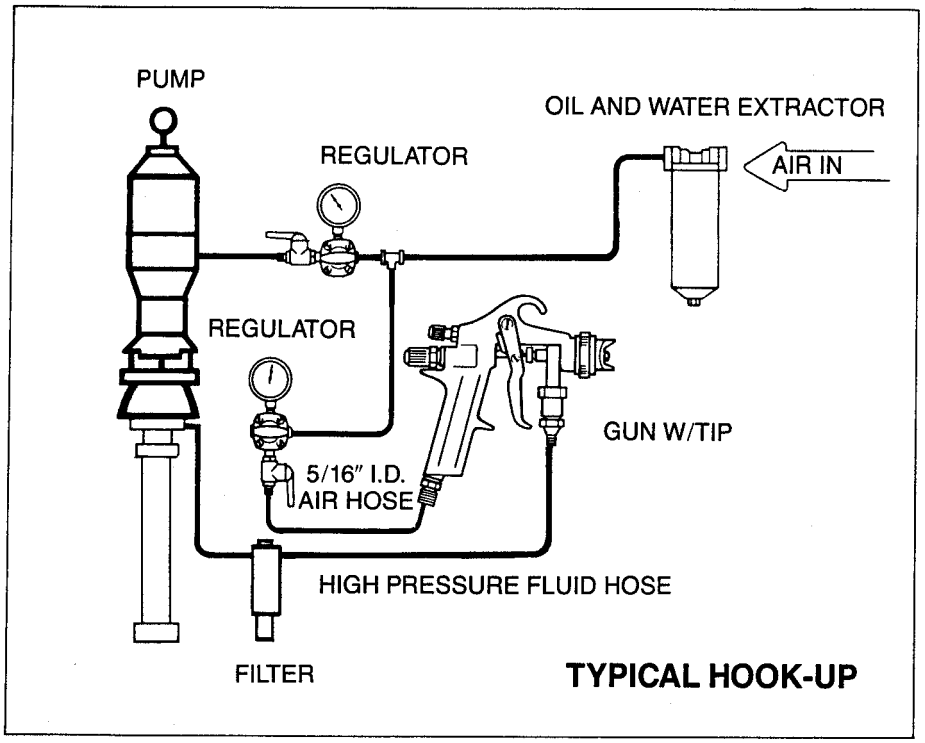
Atomization then is completed with compressed air from the horns and face of the air nozzle, which surrounds the airless tip. Without the compressed air, we would have a coarsely atomized and poorly defined pattern. With it, we have a finely atomized coating approaching that of compressed air atomization.

A fluid supply is necessary also, and in this situation, material is delivered to the spray gun by means of a pump. These pumps deliver material at pressures usually between 150 to 1000 psi. The most widely used pumps for this purpose are conventional air-driven reciprocating pumps with an 8:1 power ratio. It is important to properly control these pumps with air and fluid regulators so pressures never become excessive.

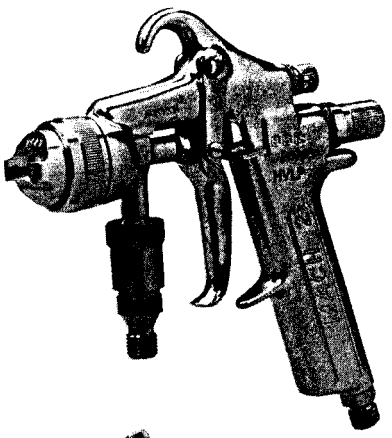
Let's examine how the system works. First, the coating must be selected and prepared according to the material supplier's recommendations regarding mixing, straining, thinning, and viscosity. The pump now must be primed at a low pressure to fill the system up to the spray nozzle with the coating. This is accomplished by slowly opening the pump regulator and ball valve, allowing air to cycle the pump. With the atomizing air regulator still in the off or closed position, triggering the spray gun and slowly increasing the fluid pressure produces a spray pattern.

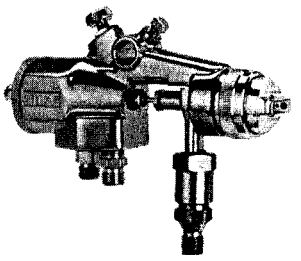
The spray pattern should have what is referred to as "tails," which is a balanced pattern in the center, but inadequately atomized coating on both the top and bottom of the pattern. Increasing the fluid pressure will not necessarily eliminate this problem, and could cause excessive fog and overspray later when attempting to atomize a pattern with compressed air. Introducing compressed air into the spray pattern completes the atomization and eliminates "tails". This is accomplished by starting a zero pressure on the atomization air regulator and slowly increasing the air pressure until the "tails" disappear and a well balanced spray pattern is produced. Since this spray gun works similar to a HVLP gun, the incoming air must pass through a restrictor within the gun body. Actual atomizing air pressures will be considerably less than incoming pressures. For most light consistency coatings only several psi of air pressure will be required. Medium to heavy consistency coatings will require atomizing air pressures close to 10 psi. Never exceed the maximum allowable air pressure settings set forth by your local EPA authority. Adjustments of the spray pattern size or shape can be accomplished by adjusting the fan control knob on the spray gun and by changing the fluid tips. It is advised that you experiment with a variety of fluid tips and air nozzles and to be patient when setting pressures in order to achieve best results. This process is different than either air or airless and therefore the spray operators should learn to adjust their techniques to get the best results.

HYDRAULICALLY ASSISTED HVLP GUNS AND OUTFITS

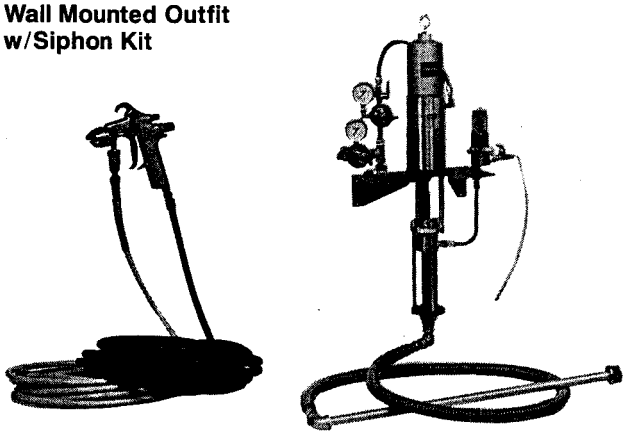


TYPICAL HOOK-UP

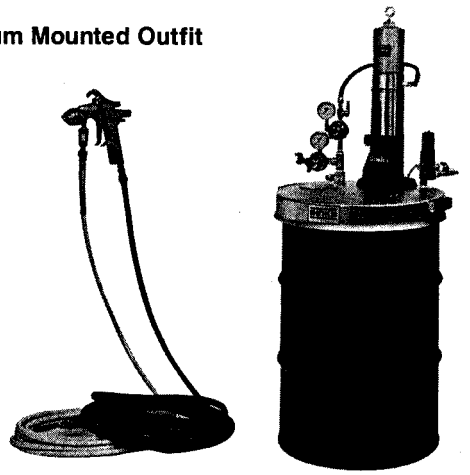




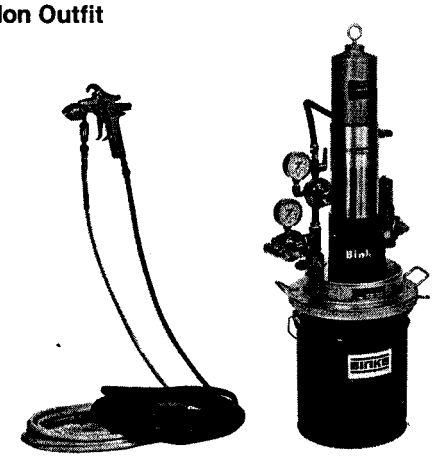
Wall Mounted Outfit w/Siphon Kit



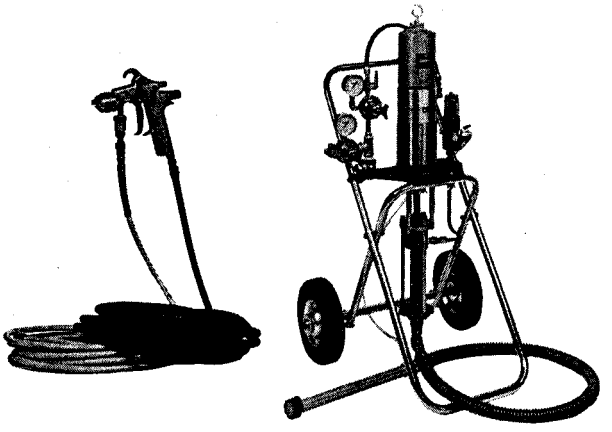
Drum Mounted Outfit



5 Gallon Outfit



Mobile Cart Outfit



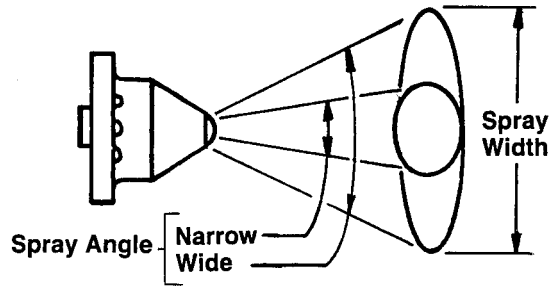
HYDRAULICALLY ASSISTED HVLP TIP SELECTION

The following general table may be of some help when choosing nozzle tip orifices.

Nozzle Tip Orifices	Viscosity Range	Like
.009–.011	Very Thin	Acetone
.011–.013	Thin	Water
.015–.021	Medium	SAE #10 Oil
.026–.036	Heavy	SAE #50 Oil

Example: Tip No. 9-9138

Orifice Diameter .013 — **Approximate Included Spray Angle 80°**



Binks MACH 2 HYDRAULICALLY ASSIST HVLP SPRAY GUN TIPS

Airless Tip Assembly Part Number	Orifice In.	Flow Rate at 500 PSI Oz./Min.	Spray Angle (degrees)	Spray Width ■
9-9092	.009	5.12	25	5
9-9094	.009		40	7
9-9096	.009		65	9 1/2
9-9098	.009		80	10 1/2
9-9112	.011	7.68	25	5 1/2
9-9114	.011		40	7 1/2
9-9116	.011		65	10
9-9118	.011		80	11 1/2
9-9132	.013	10.24	25	5 1/2
9-9134	.013		40	8
9-9136	.013		65	11
9-9138	.013		80	12 1/2
9-9152	.015	14.08	25	5 1/2
9-9154	.015		40	8 1/2
9-9156	.015		65	11
9-9158	.015		80	13

Airless Tip Assembly Part Number	Orifice In.	Flow Rate at 500 PSI Oz./Min.	Spray Angle (degrees)	Spray Width ■
9-9182	.018	20.48	25	6 1/2
9-9184	.018		40	10
9-9186	.018		65	13 1/2
9-9188	.018		80	15
9-9212	.021	28.16	25	7
9-9214	.021		40	11
9-9216	.021		65	15
9-9218	.021		80	17
9-9262	.026	42.24	25	7 1/2
9-9264	.026		40	12
9-9266	.026		65	17
9-9268	.026		80	19
9-9312	.031	60.16	25	7 1/2
9-9314	.031		40	12
9-9316	.031		65	17
9-9318	.031		80	19
9-9362	.036	81.92	25	7 1/2
9-9364	.036		40	12
9-9366	.036		65	17
9-9368	.036		80	19

Flow rates shown with a specific gravity of 1.0 (water).
■Spray width @ 12" from work.

PERFORMANCE CHARACTERISTICS OF SPRAY METHODS

	Air Spray	Airless Spray	Hydraulically Assisted HVLP
Finish Appearance	Excellent.	Coarse.	Very good.
Transfer Efficiency	Low.	20–30% better than air spray.	50–60% better than air spray.
Fluid Flow Control	Limited to very low to medium flow rates, usually less than 30 fl. oz/min.	Limited to high and very high flow rates, normally over 25 fl. oz/min.	Wide range of flow rates: normally from 5 fl. oz/min to over 50 fl. oz/min.
Booth Maintenance	Lots of overspray and fog, so booth maintenance is high.	Less overspray and fog, booth maintenance is low.	Least overspray and fog. Booth maintenance lower than airless spray.
Pattern Adjustment	Yes.	No.	Yes.
Tip Plugging	Virtually none.	Yes. Adequate filtration required.	Yes. Adequate filtration required.
Equipment Life	Very long, because fluid pressures are low.	High tip wear and shorter pump life because very high fluid pressures required.	Less tip wear and longer pump life because substantially lower fluid pressures than airless spray.
Energy Consumption	Poor efficiency in atomizing liquid. High air consumption.	Good efficiency in atomizing liquid.	Moderate efficiency.
Noise	Noisy.	Quiet.	Quiet.
Emission Level	High.	Low.	Low.

PRECAUTIONARY NOTES

The following precautions must be observed for personal safety and for protection of equipment:

1. Keep air compressors as far away as feasible from painting area in order to lessen the possibility of compressor contamination and to aid in keeping the equipment clean.
2. Operating with excess fluid and air pressures does not improve the finish, but only shortens the life of the equipment, increases wear of the spray gun fluid tip, and leads to reduced transfer efficiency.
3. Never attempt to remove the hose or gun before releasing the pressure from the outfit.
4. Never use standard hardware to modify the pump. Use high pressure fittings only.
5. The special high pressure nylon braided hose supplied is standard equipment by Binks. This hose must not be kinked, bent, or subjected to abrasion.
6. Under no circumstances should the spray gun be carelessly handled, nor its spray (particularly when the nozzle is removed) directed at close proximity to any part of the human body.
7. Never attempt to change the spray tip without first relieving pressure or disengaging spray gun trigger.
8. Carefully handle the hose connections, joints, and seating surfaces on the spray gun to prevent damage to the sealing surfaces.

SAFETY ALERT

Avoid Static Sparking with High Pressure Spraying Equipment.

For Binks Electric Airless Outfits, Air Operated Outfits, and Airless Line Stripers.

Static electricity charge builds up by high velocity liquid flowing through a hose during flushing, cleaning or spraying operations. Proper grounding of the airless system safely dissipates this charge.

All high pressure airless systems must be grounded to avoid dangerous static sparking, explosion, or fire when spraying or flushing with flammable liquids.

HOW TO AVOID STATIC SPARKING

- Use Binks NO-WIRE conductive hose in all airless spraying operations. Be sure gun and hose have continuity. Check continuity weekly with ohmmeter.
- Make sure the airless pump is grounded. Never operate the unit when it is on a non-grounded platform. Connect grounding wire from air motor to an appropriate grounded receptacle.
- When flushing or cleaning with a combustible solvent, always use an open metallic container for receiving the waste solvent. Ground the solvent receptacle.
- Bond the spray gun to the waste container with a grounding wire. Be sure there is good metal to metal contact.
- Remove spray tip when flushing the airless system. Operate the pump at the lowest possible pressure.

FLUSHING OR CLEANING HIGH PRESSURE SPRAYING EQUIPMENT

The flushing or cleaning operation must be performed in a well ventilated area. Other electrical equipment must not be operated during the flushing. If the flushing is done in a spray booth, the exhaust fan must be operating. Refer to solvent manufacturer's instructions for safety precautions and warnings.

1. Stop pump and relieve pressure by slowly turning the pressure relief valve.
2. Remove nozzle tip from gun.
3. Ground waste receptacle. Use an open metallic receptacle only.
4. Bond spray gun and waste container with grounding wire.
5. Be sure pump is grounded. Never operate the pump while it is on a non-grounded platform such as: a wood pallet, in a station wagon, or on a truck.
6. Operate the pump at the lowest possible pressure and direct the stream into the waste container. Flush until solvent runs clear.
7. Stop pump and relieve pressure.

WARNING—HIGH PRESSURE—WARNING

UP TO 1000 POUNDS PER SQUARE INCH
DO NOT POINT SPRAY GUN AT ANY PART OF THE HUMAN BODY
FLUID UNDER HIGH PRESSURE CAN PENETRATE THE SKIN AND CAUSE SEVERE INTERNAL INJURY

IN CASE OF INJURY, OBTAIN MEDICAL ATTENTION IMMEDIATELY
BE SURE TO REPORT NATURE OF INJURY AND TYPE OF FLUID OR SOLVENT TO THE DOCTOR

Be sure you understand ALL of the instructions thoroughly BEFORE operating any part of an airless equipment system.

CONSULT YOUR BINKS REPRESENTATIVE TO CLEAR UP ANY ITEMS OF INSTRUCTION YOU DO NOT UNDERSTAND.

BINKS

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