Problem:
Manual application of liquids (such as growth regulators) with a spray-wand can cause worker injury, as well as waste of chemicals and plant loss.

- Worker must squeeze and hold spray-wand trigger up to 25 times per minute.
- Highly repetitive hand closure can cause inflammation of the tendons in the carpal tunnel.
- Mental counts to “time” the discharge can result in inconsistent or improper amounts.
- Many spray-wands currently in use are not appropriate for long reaches, resulting in prolonged poor wrist posture.

One Solution:
Use a semi-automated, metered liquid applicator to provide a precise dose to each plant and to eliminate repetitive hand closure.

- Eliminates virtually all of the repetitive hand-squeezing motion.
- Can reduce waste of chemicals and plant loss.
- Curved wand design improves wrist posture for long reaches.
- Can improve productivity.
- Can document production, if fitted with a counter.
How Does the Applicator Work?

The system has three parts: a) the electric controls box, b) the metering cylinder assembly, and c) the check valve-fitted spray-wand. It uses a tractor’s 12-volt battery to power the timer module and to create 120-volt electricity that powers the solenoid valve. Liquid is alternately supplied to each side of the double-acting cylinder, which meters a precise dose through the discharge hose. An adjustable momentary delay provides time between discharges to move the wand to the next plant. A spring-loaded check valve at the end of the spray wand ensures that excess liquid does not flow out of the spray gun between discharges.

How Can I Make a Metered Liquid Applicator?

The applicator is composed of off-the-shelf components with the exception of a steel frame. It requires a qualified electrician for wiring and assembly of the electrical components. Material costs should be about $500.

Caution! Proper assembly of the liquid applicator requires specific expertise. Consult a trained electrician or engineer for advice and assistance. The assembled liquid applicator should be tested initially using potable water, not chemicals.

The electric controls box houses the power converter, ground fault interrupter, system toggle switch, terminal strip, fuses, and timer module.

The cylinder metering assembly consists of a steel frame with a double-acting double-rod cylinder, an adjustable stop for the cylinder, an air purging valve, and a solenoid valve with inlet/outlet hose adapters.

The spray gun can be any pistol-style wand, or one modified to pistol style, to allow for a neutral wrist position with an outstretched arm.

For a free parts list and detailed instructions on how to make the metered applicator, write to:

UC Ag Ergonomics Research Center
Bio & Ag Engineering, UC Davis
One Shields Avenue
Davis, CA 95616-5294

Operational Tips:

Trapped air in the solenoid valve, tubing, cylinder, or hose will affect the accuracy of the system. To help avoid this problem, the cylinder ports face upward, and the 4-way valve is located directly above the cylinder. A bypass valve for purging air from the hose is provided. Rough handling of the discharge hose can cause unwanted discharge. Handle the hose relatively gently unless the spray-wand valve is closed. For more information about this system, please visit the UC-AERC web site at http://ag-ergo.ucdavis.edu.

Contact Information:

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