# ARTICLES

## AEROSOL SPRAY UNITS FOR CONTROL OF BITING INSECTS

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Roadhouses, camps, private homes and other small installations may be protected from the attacks of mosquitoes and other biting insects by use of aerosol spray units developed in Alaska in the season of 1949 (Figure 1). The design of these units may be varied to suit individual problems, but all utilize special air operated nozzles to drift a mist of very small droplets of insecticide over the area to be protected. A single nozzle, operated by a very small diaphragm-type compressor, will usually take care of an area such as the front yard of an ordinary home. Larger areas require the use of a compressor of greater capacity and a series of nozzles spaced 50 to 100 feet apart along the windward side (Figure 2).

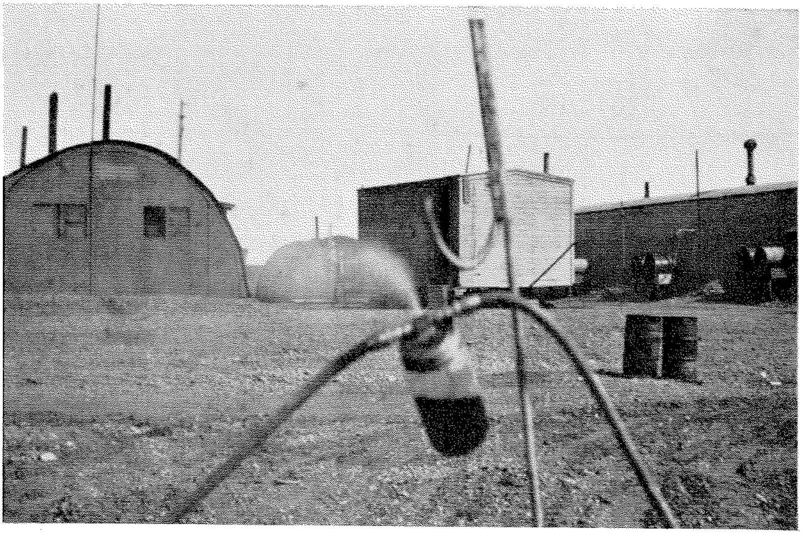

Fig. 1. Aerosol Spray Unit in Use at Umiat, Alaska—July 1949.

The nozzles are usually attached to fruit jar reservoirs and are of the simple "flit-gun" type (Figure 3). They contain certain features that cause them to break the spray solution into very small droplets. This is essential if the spray is to remain air-borne long enough to be effective. The design of the nozzle also insures efficient use of material.

During periods of light and variable air movement, when the insects are most troublesome, the insecticidal mist fans out from each nozzle in a wide V. The length of this V depends on the size of the droplets and on the velocity of the air. Theoretical considerations and the experience of last year indicate that air carriage for 300 feet may usually be expected. Turbulence of the air is frequently advantageous in that it spreads the spray around.

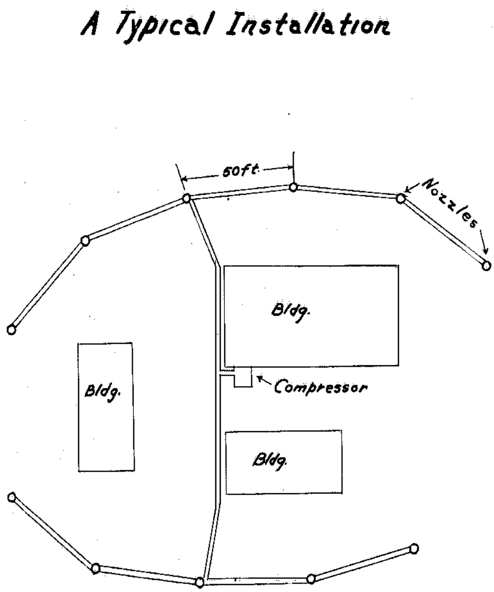


Fig. 2. Arrangement of nozzle units in relation to buildings.

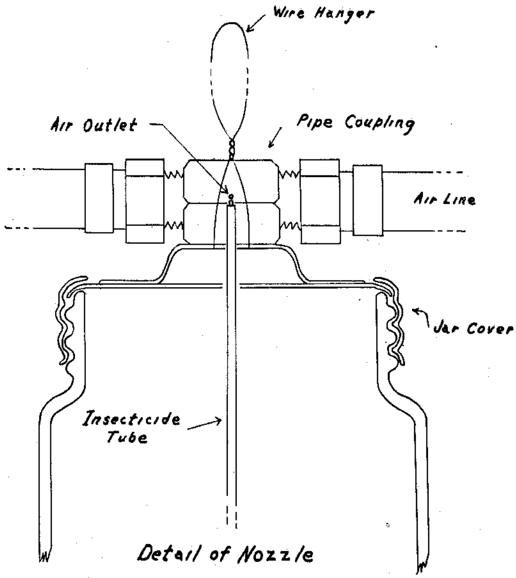


Fig. 3. Details of construction of nozzle unit.

It was found at one camp on the Arctic slope that mosquitoes were moving and biting in steady winds of 10 miles per hour. In this case, the mist from each nozzle was carried in long straight streams permitting the mosquitoes to come in between the streams and bite before being affected by the insecticide.

Although a single nozzle may be enough to protect an ordinary home, it is some trouble to move it with each change of the wind. It is sometimes preferable to set two or three nozzles at favorable locations and move the compressor to them. This works very well if a small electrically driven compressor is used and power lines are brought to each nozzle location. Another method is to leave the compressor in one location and run an air line to each nozzle so that any one nozzle can be put in operation by turning a valve.

The same considerations apply to the construction of the larger units that operate a series of nozzles. The whole outfit may remain in place, the nozzle lines may be made stationary and only the compressor moved, or the whole outfit may be moveable. In most cases it is best to start with a portable unit and add alternate nozzle lines as need for them is demonstrated and as their proper location is determined. After a few months' operation it is often found that the light air movements prevailing at the times of insect attacks come from only one or two directions so that the installation need not be as elaborate as originally expected.

There are a number of light-weight diaphragm-type compressors now on the market that are surprisingly cheap and efficient at the low pressures required for this work. Gasoline driven compressors are, of course, heavier but necessary where electric power is not available. The piston type compressors commonly used in garages are heavier and more expensive than is necessary for this type of spraying. They may be preferred however, where they are also needed for tire inflation or other purposes requiring high working pressures. The compressor capacity required for a job can be estimated as slightly less than one cubic foot per minute of free air for each nozzle. A diaphragm compressor rated at 4.7 cubic feet per minute operates five to six nozzles satisfactorily.

Ordinary air hose of ¼ inch, inside diameter, is usually used for the air lines although copper tubing or iron pipe may be used in permanent installations. Fittings of the "quick connecting" type greatly facilitate the setting up and dismantling of units that are frequently moved. Ordinary fittings, however, are much cheaper and are quite satisfactory for most installations.

The nozzles are attached to the tops of the reservoirs and are designed so that all of those on a single air line are put in operation by simply turning on the compressed air. Brass pipe couplings with holes bored in their sides with a No. 58 wire gauge drill (.048 inch, diameter) serve as air jets. The air line is connected to each end of the coupling so that the compressed air may pass through it and on to the next nozzle.

The insecticide solution is brought to the nozzle by suction through a tube soldered to the bottom of the coupling and extending into the reservoir. The top of this tube is centered in the air jet by bending. The insecticide tube and its relation to the air jet is the critical part of the nozzle. It is essential that the end of the tube be thin-walled, smooth and sharp-edged, and that it stand at exactly right angles to the air jet.* If the top of the tube is uneven, thick walled, or bent in the direction of the air stream, the spray droplets will be too large. If the top of the tube is bent toward the jet, air will be driven into the reservoir and the nozzle will not function. Air is wasted if the top of the tube is too far from the opening of the air jet or is not exactly centered in the stream.

The tip of the insecticide tube is made

* These features were suggested by Mr. C. N. Husman, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

of seamless steel or brass tubing, preferably of 20 gauge hypodermic needle tubing, .025 inch, inside diameter. The end is squared and carefully sharpened. About a quarter of an inch of this sharpened end is then cut off and soldered into the end of a piece of 1/4 inch soft copper tubing long enough to reach the bottom of the reservoir.

The coupling that forms the air jet is fastened to the top of the reservoir by means of a piece of thin metal that is bent upward to allow space for tightening the fittings. A double wire loop around this part of the assembly helps hold the parts together while they are being soldered and furnishes a hanger for the nozzle during operation.

Properly constructed nozzles deliver about one quart of insecticide per hour, therefore Mason fruit jars of one or two quart capacity serve well as reservoirs. The nozzle assembly is attached to the jar lid so that the jar can be removed for filling by unscrewing the ring. Metal cans of larger capacity may be used but lack transparency so that the need of refilling cannot be seen from a distance.

The only insecticide that has been used in the unit thus far is a 20 per cent solution of DDT in Velsicol NR-70. This has been satisfactory under ordinary conditions but acts somewhat slowly. In cases where mosquitoes are moving rapidly and in great numbers, as they do in the Arctic, it has been found that some may come in and bite before being knocked down. Studies to develop improved insecticide formulas are planned for next season.