

AN IMPROVED MODEL OF A BATTERY-POWERED ASPIRATOR<sup>1,2</sup>

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**ABSTRACT.** Detailed instructions are provided to modify a commercially available, battery-powered, leaf/grass blower into a portable, hand-held aspirator for collecting adult mosquitoes and other small dipterans. Directions are given also to convert paper cups into interchangeable collection containers for use with the aspirator.

To enhance the efficiency of collecting adult mosquitoes in selected habitats, various types of portable, battery-powered aspirators have been independently built or modified from commercially available vacuums. These aspirators are technically described in the literature, and each possesses unique handling characteristics and operational capabilities (Bailey 1966, Carver 1967, Hayes et al. 1967, Davis and Gould 1973, Meyer et al. 1983, McCreadie et al. 1984, Meek et al. 1985). The portable aspirator, shown in Fig. 1, offers greater air flow, extended operational life, substantial flexibility in sampling adult mosquitoes resting in confined and difficult to reach habitats and requires less modification than many of the models referenced previously. This commercially available, grass/leaf blower<sup>3</sup> was specifically modified by the authors to sample adult mosquitoes in roadside catch basins and in constricted, adjoining drain pipes.

The original blower consists of 2 major components, the plastic main body and the detachable extension pipe. The motor and fan are housed in the cylindrical portion of the main body, and the rechargeable, cadmium batteries are located in the handle. The cylindrical extension pipe is tapered and slightly curved at the distal end. The proximal end is inserted into the main body and secured in place by twisting the pipe to allow its 2 locking lugs to seat into corresponding grooves. Retail cost of the entire blower unit is about U.S. \$45.00, which includes the main body, detachable extension pipe, 5 batteries *in situ* and a charger.

The original blower can be converted into 2 versions of the aspirator, and the details are described herein. An elongate version that in-

cludes the extension pipe permits the sampling of adult mosquitoes resting in habitats that are difficult to reach by hand-held aspirators (McCreadie et al. 1984, Meek et al. 1985). The shorter version is used without the pipe to sample adult mosquitoes in close proximity to the collector. Because the manufacturer designed the original blower to operate with or without the extension pipe, changing from one version of the aspirator to the other is quick, simple and requires no modification to the locking system securing the pipe to the main body of the original blower.

Conversion of the blower into an aspirator, however, does require modification, and begins with the removal of 5 screws located along the main body. This allows it to be separated longitudinally, thus exposing the fan, motor and batteries. By disconnecting the electrical wires of the battery pack at the point of attachment to the motor and reattaching them in reverse order, the rotation of the fan is reversed, thereby producing a suctioning action.

Two rigid, plastic drinking cups or tumblers (473 ml or 16 fl oz) also are used in the conversion of the blower to both versions of the aspirator. These tapered, concession-type cups should have a minimum of a 9 cm (3.5 inches) inner diam opening at the top to receive the collection container, to be described later. The cup is relatively inexpensive, easy to obtain and minimizes the cost of modification.

*Elongate version:* The extension pipe is modified by cutting off the tapered section. This procedure results in a circular distal end of the pipe. One of the cups is modified for attachment to the distal end of the extension pipe. Depending on its tapered profile, a selected portion of the cup bottom is transversely cut away and discarded, thereby leaving a 6.9 cm (2.7 inches) inner diam opening to the bottom edge of the remaining cup. This opening allows the lower edge of the cup to fit tightly inside the distal end of the extension pipe. The cup is secured in place with generous amounts of epoxy glue. It is important to ensure that an airtight seal is obtained with the epoxy glue around the juncture. The modified extension pipe now can be at-

<sup>1</sup> Mention of a commercial product does not imply recommendation for use or endorsement for sale by the Louisiana State University Agricultural Center.

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<sup>3</sup> Model 900.798770 Craftsman® Cordless Broom. Sears, Roebuck and Co., Chicago, IL 60684.

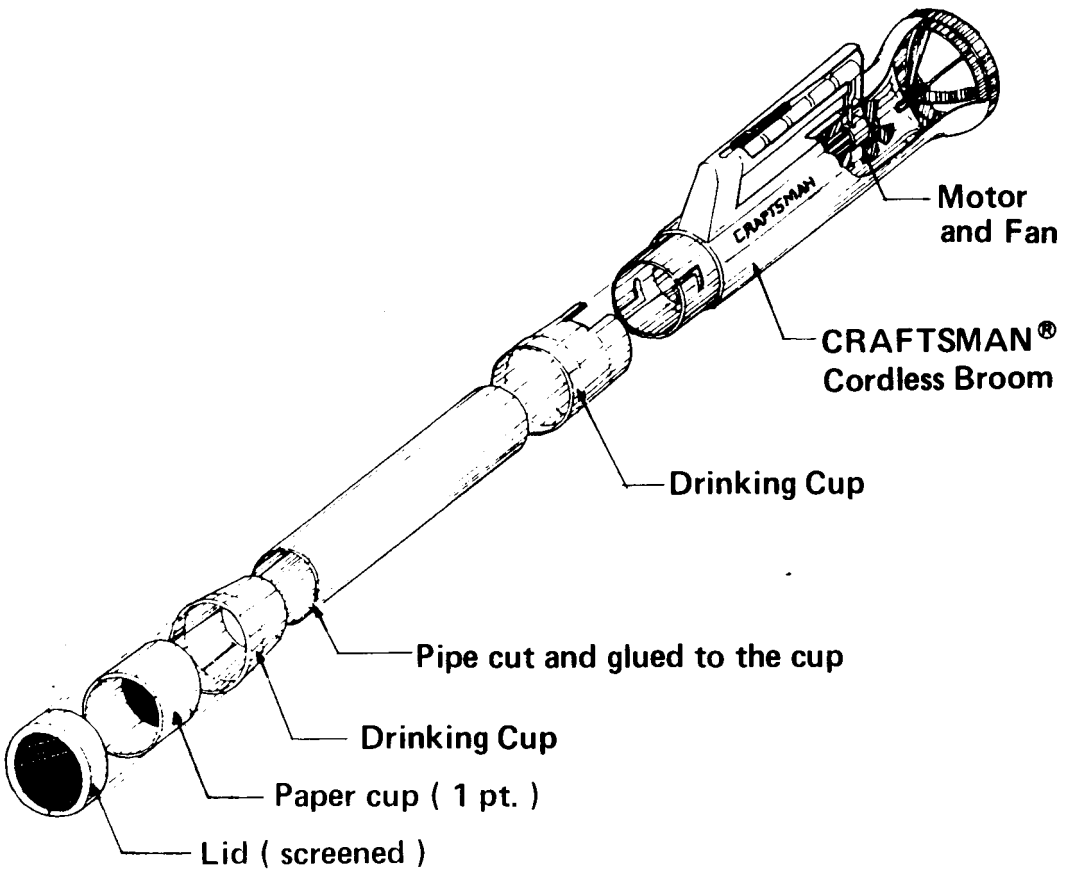


Fig. 1. Craftsman® Cordless Broom, model 900.798770 (Sears, Roebuck and Co.), modified for aspirating small flying insects.

tached to the main body of the aspirator and is ready for operation. The entire weight of the elongate version of the aspirator is about 1.46 kg (3.2 lb) and has a total length of 118 cm (46.5 inches).

*Short version:* After removing the extension pipe from the main body of the aspirator, a short version of the aspirator can be constructed for collecting mosquito adults in more confined areas. The second plastic cup is modified also, as described previously, and attached to the main body of the aspirator. The lower portion of the cup is transversely cut away and discarded, thereby leaving a 7.4 cm (2.9 inches) inner diam opening in the remaining cup. In addition, 2 opposing rectangular sections are cut from the lower edge of the cup. Each section measures about 1.5 cm high  $\times$  4 cm wide (0.6  $\times$  1.6 inches) to permit the cup to fit over the air intake opening of the main body and against the base of the handle (Fig. 1). The cup is secured to the main body by 4, 5/16  $\times$  5/16, hex-head screws (not shown in Fig. 1) set in holes drilled

Table 1. List of supplies to modify a commercially available, battery-powered grass/leaf blower into a suction device to collect resting adult mosquitoes

Item	Quantity	Total cost (approx.)
Craftsman® Cordless Broom, model 900.798770	1	\$39.95
Plastic drinking tumblers	2	1.94
Epoxy glue sticks	2	0.60
5/16 $\times$ 5/16, hex-head screws	4	0.60
1-pint, paper cup w/lid	1	0.32
Swatch of plastic screen, 32 $\times$ 32 mesh, 3-inch square	2	0.12
		\$43.53

equidistant around the juncture of the cup and main body. This cup remains in place even when the extension pipe is attached to the main body. However, the screws allow the cup to be removed if maintenance is required within the main body of the aspirator. The short version of the aspirator weighs 1.22 kg (2.7 lb) and is 65 cm (25.6 inches) long.

Table 2. Mosquito adult collections from inside a street catch basin using a hand-held, battery-powered aspirator modified from a commercially available grass/leaf blower.<sup>1</sup>

Species	January						February					
	11	12	17	20	23	24	25	30	31	8	13	22
<i>Culex</i>												
<i>erraticus</i>	72	52	14	20	49	24	15	3	1	2	0	30
<i>restuans</i>	1	4	3	3	0	2	2	10	8	4	28	0
<i>quinquefasciatus</i>	12	18	45	3	4	15	17	11	3	5	163	3
<i>Anopheles quadrimaculatus</i>	1	0	0	1	11	1	0	0	0	0	0	0

<sup>1</sup> Craftsman® Cordless Broom, model 900.798770 (Sears and Roebuck Co., Chicago, IL).

Cylindrical 473 ml (1 pint) paper cups with lids<sup>4</sup> are used as collection containers with the aspirator. The paper cups do require a slight modification prior to their use. A centered 6.4 cm (2.5 inches) diam hole is cut in the flat portion of the paper cup lid, and a corresponding hole is cut in the paper cup bottom. A circular 7.6 cm (3 inches) diam patch of 32 × 32 mesh, plastic screen<sup>5</sup> is placed inside the lid to cover the hole and secured with hot glue. The interior surface of the paper cup bottom is fitted with a similar patch of screen and glued. The modification to the paper lid is optional. However, the screened lid allows collected mosquitoes to feed on soaked raisins or other carbohydrate sources during transport back to the laboratory, etc. The mesh size of the screen is optional also. The 32 × 32 mesh screen is recommended also to facilitate the collection of small bodied, hematophagous flies. Aluminum screen may also be used, but plastic screen is less costly and offers more flexibility when subjected to rigorous handling in the field. A complete listing of items required for the modification of the blower to the aspirator is provided in Table 1.

Prior to collecting, the screened lid is removed and the paper cup is set snugly into the opening of the plastic cup attached to the distal end of the extension pipe or the main body, as described previously. Upon completion of sampling, the lid is placed on the paper cup while the aspirator continues to operate in maintaining control of collected specimens.

The paper cup offers a substantial degree of versatility when capturing adult mosquitoes in the field. Because the paper cup is not permanently attached to either plastic cup, it can be quickly interchanged to reduce total collection time. In addition, the paper cup permits parti-

tioning of select numbers of adult mosquitoes during the collection process, and permits compact storage and transport from field to the laboratory. The paper cups also are disposable, due to their low cost and simple construction.

After all modifications were completed, several performance tests were conducted and replicated by the authors regarding air flow and operating time. All tests were conducted using both versions of the aspirator with paper cups in place and fully charged batteries (i.e., charged for 16 h per manufacturer suggestion). The air flow was measured with a propeller-driven anemometer on 3 occasions for 1 min each. The period of continuous operation for the aspirator was determined on 3 separate occasions also.

The aspirator operated efficiently for an average of 45 min with a minimum air flow of 2.1 m<sup>3</sup>/min (75 ft<sup>3</sup>/min). Use of the aspirator under field conditions indicated that the air flow rate was more than sufficient to capture flying or resting adult mosquitoes and did not cause undue damage to collected specimens (Table 2).

One discrepancy noted is that the aspirator does not have a multiposition switch to regulate air flow. The spring-loaded switch on the handle is convenient; however, it must be constantly pushed forward to keep the aspirator functioning.

In summary, this aspirator is powerful, has a long operational period, offers substantial versatility in sampling adult mosquitoes in a variety of habitats and is ruggedly constructed to withstand considerable field abuse.

#### REFERENCES CITED

- Bailey, S. F. 1966. A suction-type collecting apparatus for mosquitoes. *Mosq. News* 26:585.  
 Carver, H. D. 1967. A portable aspirator for collecting mosquitoes. *Mosq. News* 27:128-129.  
 Davis, E. W. and D. J. Gould. 1973. A portable suction apparatus for collecting mosquitoes. *Mosq. News* 33:246-247.  
 Hayes, R. O., G. E. Kitaguchi and R. M. Mann. 1967.

<sup>4</sup> Fonda Cup and Container Group. Saxon Industries, Inc., Union, NJ 07083.

<sup>5</sup> Chickopee, P. O. Box 2537, Gainesville, GA 30501.

- The "CDC sweeper," a six-volt mechanical aspirator for collecting adult mosquitoes. *Mosq. News* 27:359-363.
- McCreadie, J. W., M. H. Colbo and G. F. Bennett. 1984. A trap design for the collection of hematophagous diptera from cattle. *Mosq. News* 44:212-216.
- Meek, C. L., M. V. Meisch and T. W. Walker. 1985. Portable, battery-powered aspirators for collecting adult mosquitoes. *J. Am. Mosq. Control Assoc.* 1:102-105.
- Meyer R. P., W. K. Reisen, B. R. Hill and V. M. Martinez. 1983. The "AFS sweeper," a battery-powered backpack mechanical aspirator for collecting adult mosquitoes. *Mosq. News* 43:346-350.