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A NEW PORTABLE ASPIRATOR FOR CULICIDAE AND OTHER WINGED INSECTS

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ABSTRACT. A new type of portable aspirator is described. The aspirator uses as a suction device a fan that normally cools computers, in conjunction with other structural elements especially designed to cope with the greater suction power available. The device proved to be efficient, strong, light, easy to use, and silent.

The ability to capture mosquitoes and other winged insects of medical importance is crucial to the study of their bionomics and disease relationships, and for population monitoring. The equipment used for capturing insects has gradually improved with the introduction of lighter, stronger, more transparent, and hence more functional materials (Dowell 1965, Coluzzi and Petrarca 1973, Meyer et al. 1983, Meek et al. 1985, Perdew and Meek 1990).

With the intent of further improvement, we set out to construct a new type of portable mechanical aspirator using a recently marketed fan normally utilized for cooling computers. The fan has been adapted to a suction device along with other structural elements to provide maximum suction efficiency.

The aspirator (Figs. 1, 2, and 3) consists of a suction tube, an entrapment cartridge, and the motor unit respectively). The suction tube is constructed from a cylinder of transparent plastic, 38 mm diam × 400–800 mm long (Fig. 1A). The actual length of the tube can be set at the user's discretion because length apparently does not influence the performance of the device. Insects at rest on different surfaces such as walls and ceilings are often beyond the reach of the field worker. The suction tube, which is already of sufficient length, also can be extended or retracted by a simple telescopic mechanism (100–150 mm) consisting of a polyvinylchloride (PVC) coupling. Because flying insects frequently move erratically and at relatively high speed, we have enlarged the mouth of the tube so it is compatible with efficient functioning. The entrapment cartridge is a transparent cylinder (50 mm diam × 200 mm long) that forms the container in which the insects are sequestered (Fig. 1B). This component is inserted into the motor unit via a PVC bell reducer (80–50 mm diam × 100 mm long) that is fixed with mastic to a plastic retaining ring at the base of the reducer (Fig. 1C). The base of cartridge is covered with a 0.7-mm nylon mesh screen. With a rubber stopper sealing off the top of the entrapment cartridge, it becomes the holding container for the collection and provides the user with the option of interchangable containers for separating samples. The motor unit consists of a motor fan (made in Germany by PAPST) and an electric battery (Fig. 1C). An on/off switch is mounted on the retaining ring to facilitate ease of operation. The motor unit is secured to the plastic retaining ring by 4 screws (3 mm diam × 12 mm long). The suction fan measures 80 × 80 × 25 mm and is very silent, operating at a noise level of only 30 decibels. The motor driving the fan is a brushless, direct-current type consuming

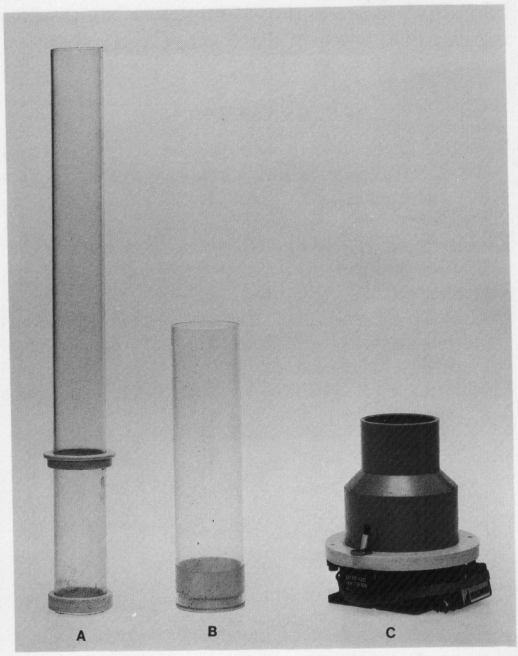

Fig. 1. Elements of portable aspirator. A. Suction tube; B. entrapment cartridge; C. motor unit.

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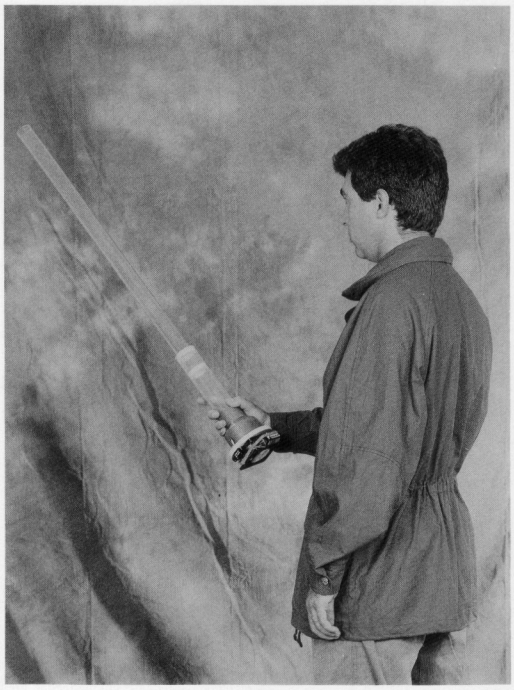

Fig. 2. Aspirator in action illustrating the ease of handling.

only 2.6 watts, which corresponds to a current of 216 mA. This allows the use of small, long-life batteries in the 6–12 volt range. We have opted for a 9-volt battery that combines high power output with long life and very compact dimensions. It can be secured to the side of the large motor housing by means of a sturdy elastic band or sticky tape. If greater power and longer life are required, a rechargeable 12-volt battery can be used and carried separately by a shoulder harness. The disadvantages are the greater weight of the battery (3 kg) and the presence of the electric cable, which can hamper the operator's freedom of movement. The aspirator can be secured to the wrist by a plastic or webbing strap attached to the motor housing. This leaves the hands free to exchange a new empty cartridge in the field. When the apparatus is dismantled, it is suitable for storage in a bag. The overall weight of the apparatus varies from 550 to 650 g (including the 9-volt battery), depending on the length of the suction tube and the type of battery being used. The cost per aspirator, regardless of model type discussed, is approximately U.S. $160. This cost includes the total unit with the battery, accessories, etc. This may seem expensive but we have to take into account many of the components that are hand-made.

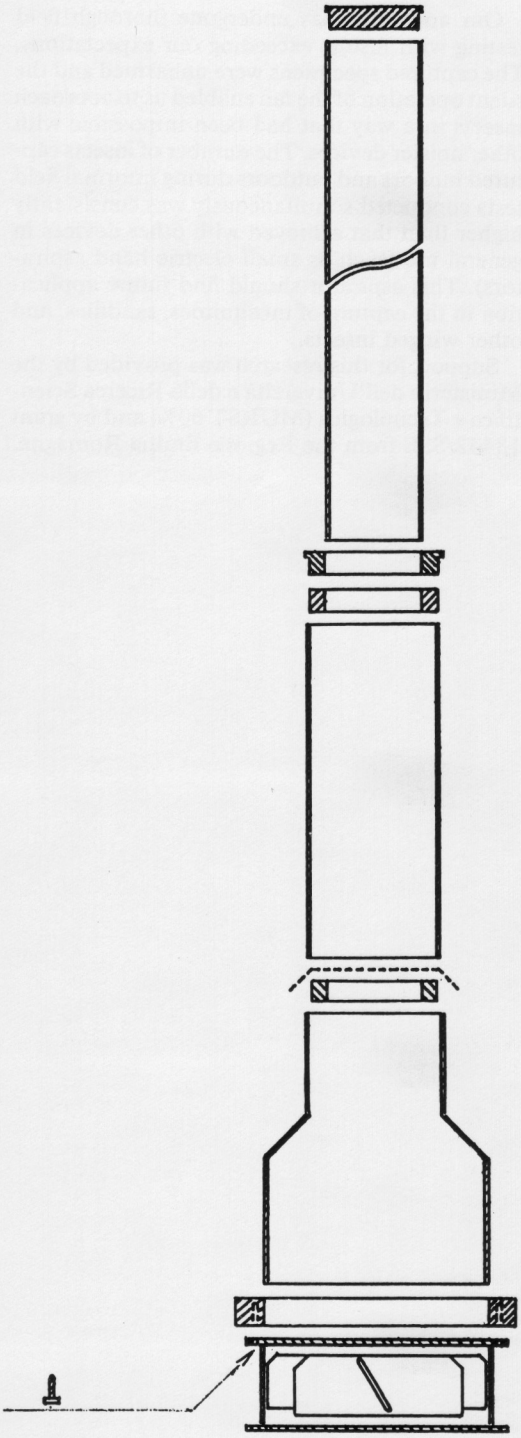

Fig. 3. Diagram of aspirator in transverse section.

Our apparatus has undergone thorough field testing with results exceeding our expectations. The captured specimens were unharmed and the silent operation of the fan enabled us to approach insects in a way that had been impossible with other noisier devices. The number of insects captured indoors and outdoors during informal field tests conducted simultaneously was consistently higher than that achieved with other devices in general use (such as small electric hand aspirators). This aspirator should find future application in the capture of mosquitoes, sandflies, and other winged insects.

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REFERENCES CITED

Coluzzi, M. and V. Petrarca. 1973. Aspirator with paper cup for collecting mosquitoes and other insects. Mosq. News 33:249–250.

Dowell, F. H. 1965. A heavy-duty power aspirator for collecting large number of adult mosquitoes. Mosq. News 25:325–327.

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.

Perdew, P. E. and C. L. Meek. 1990. An improved model of a battery-powered aspirator. J. Am. Mosq. Control Assoc. 6:716–719.