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Transparent Plastic Incubator for the Anaerobic Glove Box

EDWARD BALISH,* JAMES F. BROWN, AND TRACY D. WILKINS

Departments of Surgery and Medical Microbiology, University of Wisconsin Medical School, Madison, Wisconsin 53706, and the Anaerobe Laboratory, Virginia Polytechnic Institute, Blacksburg, Virginia 24060*

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An incubator designed for use inside an anaerobic glove box is described. The incubator is made of transparent plastic material, has sliding plastic doors, and can be made in various sizes from readily available materials.

The anaerobic glove box of Aranki and Freter (1) has made the isolation, cultivation, and identification of fastidious anaerobic bacteria a relatively easy task for clinical and research laboratories. Standard bacteriological techniques can be used in the anaerobic glove box to culture strict anaerobes, media can be prepared in the conventional manner on the laboratory bench, and the glove box can be designed to fit the space requirements and work load of any given laboratory. The efficient and convenient operation of an anaerobic glove box has been described in detail (2). A complete glove box and accessories are available commercially (Coy Laboratory Products, Inc., Ann Arbor, Mich.).

One of the problems with the anaerobic glove box has been incubation facilities for inoculated culture plates and tubes. A glove box user has three choices for incubation of plates and tubes: (i) purchase a commercial incubator that will fit inside the glove box; (ii) use heated catalyst boxes to heat the whole glove box at the desired incubation temperature; or (iii) use the GasPak jar (Baltimore Biological Laboratory, Cockeysville, Md.) or another suitable container to enclose plates and tubes so that an anaerobic atmosphere (80% N_2, 10% H_2, and 10% CO_2) is maintained inside the container when it is removed from the glove box and incubated in a conventional laboratory incubator. All of these choices have drawbacks. The removal of tubes and plates from the anaerobic glove box in a sealed container is not practical and wastes time and effort, because the closed container has to be placed back into the glove box to maintain anaerobic conditions during an inspection of the tubes and plates. We also considered commercial incubators that would fit into our anaerobic glove boxes. We found that the commercial incubators were not only too tall and too deep for use in the glove boxes, but they also had hinged doors. The space in front of an incubator with a hinged door cannot be used efficiently in the glove box, because the swing of the door interferes with equipment or supplies in that area. We chose also not to heat up the entire glove box. A heated glove box is uncomfortable to work in and causes stored media to dry out. Also, excessive condensation forms on the floor and in the gloves, thereby causing contamination and clean-up problems.

We have built an incubator that is both inexpensive and practical, having features that would be useful for incubating tubes and plates inside the anaerobic glove box.

MATERIALS AND METHODS

The materials and supplies used in the construction of the incubator, as detailed here, are provided only as guidelines for those who might have trouble in purchasing some of them. Most of the components (or compatible substitutes) would be available from local lumber or electrical supply houses.

Plastic. Transparent plastic (Plexiglas, Rohm and Haas Co., Philadelphia, Pa.) was chosen as the main construction material. A 3- by 4-foot (0.92- by 1.22-m) sheet of 0.25-inch (0.64-cm) acrylic plastic cost $18.00. We used 41 square feet (3.77 m^2) ($72.00) of the transparent plastic to build a large unit (47 by 12 by 28 inches [119.4 by 30.5 by 71.1 cm]) and 30 square feet (2.76 m^2) ($54.00) for a smaller unit (27 by 12 by 28 inches [68.6 by 30.5 by 71.1 cm]). Ethylene dichloride (Rohm and Haas Co.) was used to bond the plastic together. The manufacturer's directions should be followed to assure a good bonding of the plastic.

Heat source. Two strip heaters (Cromalux 11 V, 250 W, model no. SIZX133, Edwin L. Wiegland Co., Pittsburgh, Pa.; $10.00 each) were used as heat sources.

Thermostat. A thermostat (Fenwall, model no. 17362-17, −50 to +400°F [−45.6 to +204°C]; $6.00, from Herbach and Rademan Inc., Philadelphia, Pa.) was used to control the temperature at 35 or 37°C. We also installed an indicator light (115 V neon, with a 22K resistor) parallel to the thermostat to show when the heating units were functioning.

Air circulation. A blower fan (Rototron, model no. WR-2A1, $20.00, Rotron Inc., Woodstock, N.Y.) was also installed to circulate the warm air to main-

tain an even temperature throughout the incubator. Variable-height shelving brackets were attached to the sides and back of the incubator. Also, each shelf had 11 15/16-inch (2.4-cm) holes drilled in it (2 inches [5.1 cm] apart) to facilitate air flow and maximize uniformity of temperature in the incubator. Other items, like the grooved plastic railing for the sliding doors, the Transite Board (an asbestos-cement board; Asbesto-Fab Inc., Milwaukee, Wis.), toggle switches, wiring, and conduit can be purchased at any electronic or building supply outlet.

RESULTS

Figure 1 shows the finished incubator. We have built two sizes: a large unit (47 inches wide, 28 inches high, and 12 inches deep) and a smaller unit (27 inches wide, 28 inches high, and 12 inches deep). The smaller unit was made to fit in front of the large circular opening of the anaerobic glove box or in the center of the glove box between two work stations. The large unit has to be placed along one side of the glove box. The incubator is transparent, and the plates, tubes, etc. can be seen without opening the incubator doors. The sliding doors on the incubator are another distinct advantage, since the floor space in front can be used efficiently. The incubator shelves are adjustable, and we have found that drilling holes in the shelves (three rows of 11 15/16-inch holes) helps to equalize the temperature (±1°C) between the top and bottom of the incubator. All thermostat adjustment knobs and the indicator light should face the sliding-door side of the incubator to facilitate adjustments. Some may find sliding doors on both sides of the incubator to be a distinct advantage.

Figure 2 shows the 0.5-inch (1.3-cm) conduit (used to shield the 18-gauge wiring from the heating units), the arrangement of 0.25-inch Transite and the aluminum cover around the heating units, and the separation of the aluminum housing from the Transite by porcelain insulators.

DISCUSSION

The transparent plastic incubator is convenient, efficient, and very workable within the anaerobic glove box. The incubator could be built to any desired size by most machine shops. The size of the incubator can be varied to

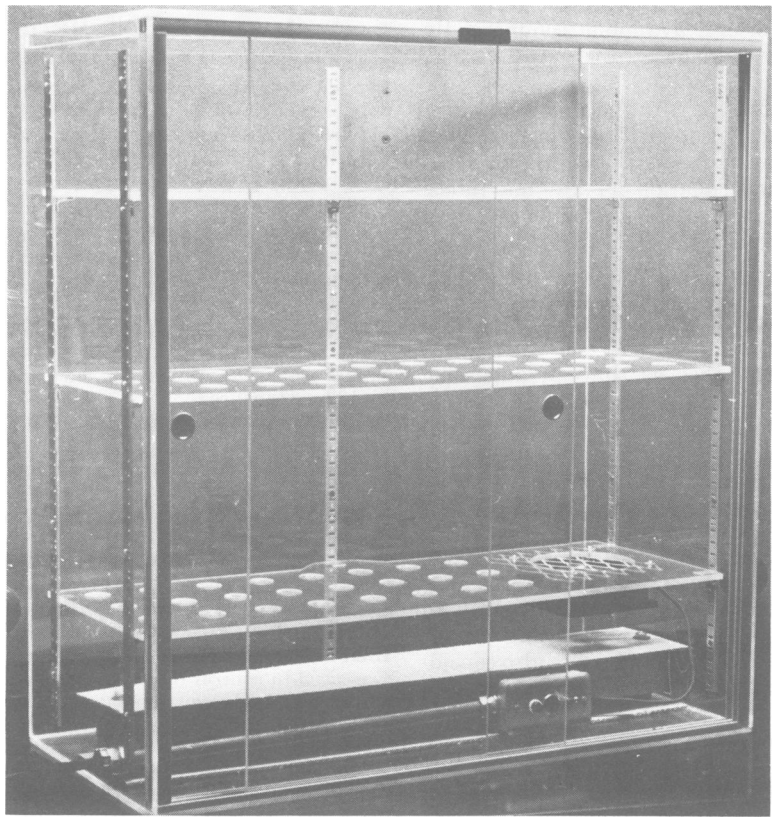

FIG. 1. *Overall view of the transparent plastic incubator.*

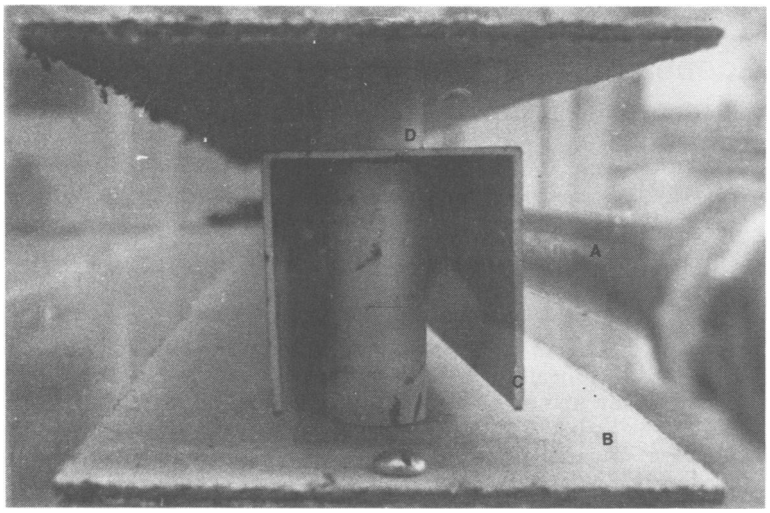

FIG. 2. *The 0.5-inch conduit (A) is used to shield the 18-gauge wiring from the heating units. Also shown is the Transite insulation (B) and the aluminum cover (C) around the heating units, as well as the separation of the aluminum housing from the Transite by porcelain insulators (D).*

fit the incubation needs of the investigator. Although we have detailed the various components we used in building our incubators, any reliable heating unit and thermostat, etc., could be used in the incubator. Shielding the heating unit from the plastic with insulation (i.e., asbestos board or Transite) is recommended. The small blower fan is also recommended, because a more uniform temperature between top and bottom shelves is achieved when it is used. The costs we have encountered are as follows. The large incubator (47 inches wide, 28 inches high, and 12 inches deep) costs $525.00 as constructed by our shops. The smaller unit (27 inches wide, 28 inches high, and 12 inches deep) costs $450.00 to build. We feel these are very competitive costs when pricing commercial incubators of comparable size without as many convenient features for use in the anaerobic glove box.

ACKNOWLEDGMENTS

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