

Hyperthermia Caused by the Emerson Postoperative Ventilator: A Solution to the Problem

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Kirch and DeKornfeld have reported the occurrence of unexpected hyperthermia while using the Emerson Postoperative Ventilator.¹ They noted that the temperature of air delivered by the ventilator varied from 85 to 105 F and suggested that the variation was caused by ambient temperature changes in the room and in the ventilator. We have had the same experiences while using this ventilator. We suspected that the problem involved overheating of the Emerson's humidifier. The ventilator was disassembled and it was discovered that, in the electrical circuit used, a Chromax ring heating element heated the platform, which was rated at only 75 watts (see fig. 1); therefore, although the heating element was rated at 300 watts on a 240-volt circuit and decreased to 150 to 180 watts on a 127-volt circuit (in use in this hospital), this lower wattage was still above that recommended for the 75-watt base plate and thus resulted in overheating. To control the heat being applied to the humidifier we decided to use a voltage-limiting device rather than a high-wattage variable resistor (potentiometer) because of the large size of and amount of heat generated by an appropriate potentiometer. The voltage limiter (Powerstat) was mounted in a frame and attached to the casement (Part G of Emerson's Volume Controlled Ventilator Parts List, dated July 1967). The electrical wiring was disconnected at the heater and extended to the Powerstat, with the output connected to the heating element with a variable control (see fig. 2). This modification was tested for four days during continuous operation of the ventilator at varying temperatures to allow identification of any fault or overheating of components. The temperature was checked at the patient connector at various settings of the Powerstat, which can be from 0 to 100. Within this range the temperature could be varied

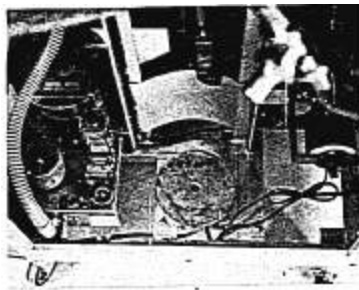


Fig. 1. Disassembled unit, showing heating element and Powerstat attached.

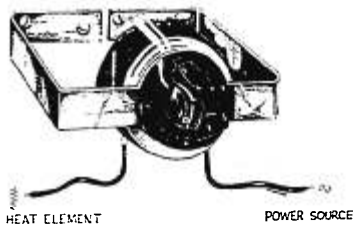


Fig. 2. Voltage limiter.

from 75 to 107 F. At a setting of 47 on the Powerstat the temperature was 95 degrees at the patient connector.

This adaptation has been of great value in controlling the temperature output and humidification of the Emerson volume-limited ventilator. It is mounted in such a way that heat elaborated by the Powerstat does not materially effect ambient temperature. This simple adaptation cost less than \$20. Parts can be obtained as normal stock from commercial concerns.*

REFERENCE

1. Kirch, T. J., and DeKornfeld, T. J.: An unexpected complication (hyperthermia) while using the Emerson postoperative ventilator, *ANESTHESIOLOGY* 28: 1106, 1967.

Received from Fitzsimons General Hospital, Denver, Colorado.

* The device used in this modification was Powerstat, Type 10B Variable Transformer, by Superior Electric Company, Bristol, Connecticut. Ron D. Davison prepared the graphic illustrations for figures 1 and 2.