NASA TECH BRIEF

NASA Headquarters

Temperature and Humidity Control of Simulated Human Breath

The problem:

Simulation of the exhaled human breath is provided by the recently developed breathing metabolic simulator (see Notes). The exhaled breath which the simulator provides must be identical in temperature and humidity to that of a human who is subjected to conditions ranging from rest to hard work.

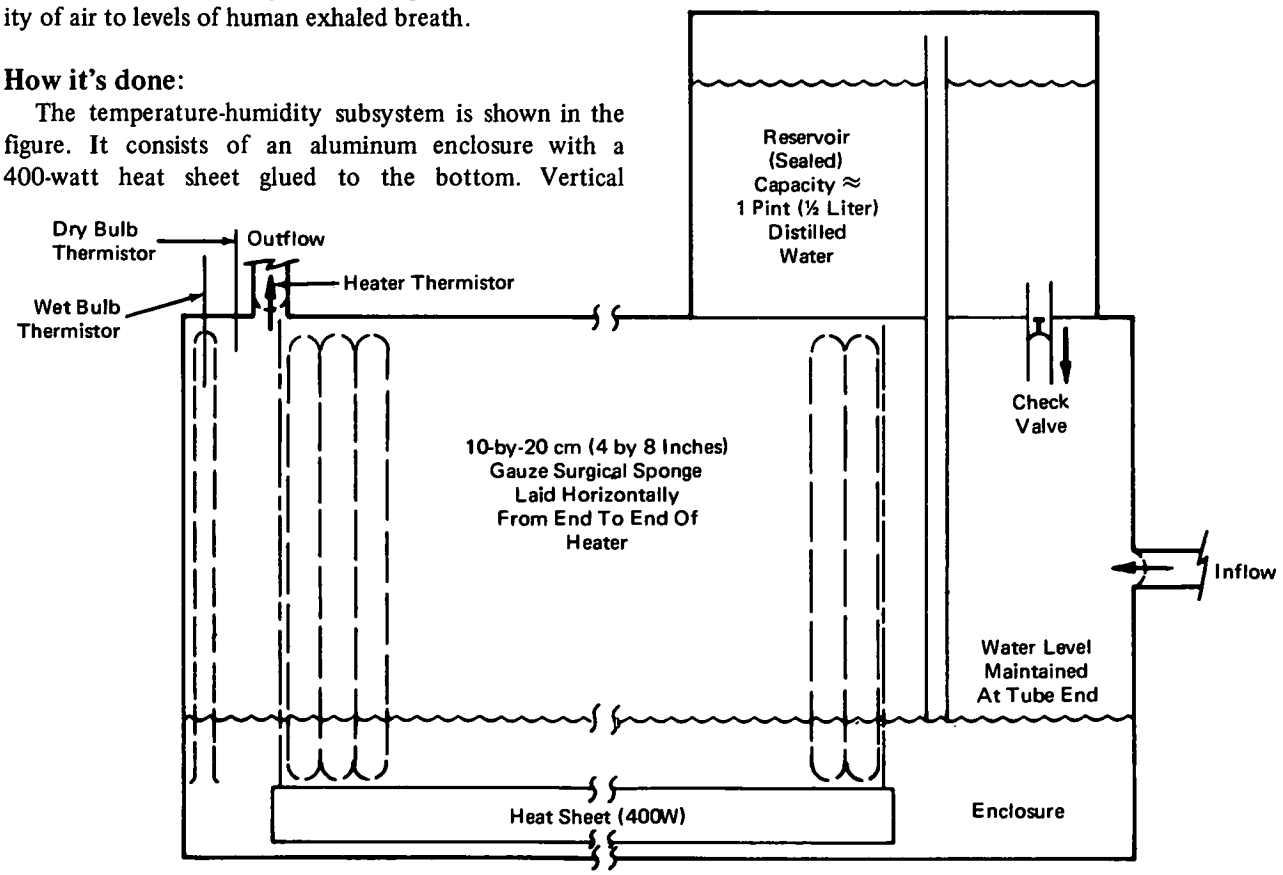
The solution:

A subsystem was developed for the breathing metabolic simulator which adjusts the temperature and humidity of air to levels of human exhaled breath.

How it's done:

The temperature-humidity subsystem is shown in the figure. It consists of an aluminum enclosure with a 400-watt heat sheet glued to the bottom. Vertical separators (perforated metal) are fastened to the sides at the heater ends and separate the chamber into three areas. The main area is filled with a 10-by-20-cm (4-by-8-inch) gauze surgical sponge which sits in water covering the heater and acts as the moisture transfer media by wicking action.

The inlet end of the chamber contains an inlet connection and check valve and is topped by a sealed reservoir of approximately half liter (one pint) capacity. Water level is maintained in the chamber at the bottom



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level of a tube. This tube connects the chamber to the top of the reservoir. The reservoir also has a shorter outlet with a check valve. (Relative air pressure is maintained in the reservoir to control water release).

The outlet end of the chamber contains both wet and dry bulb thermistors, used for monitoring exhaled humidity, and an outlet connection with check valve.

In operation the heater, when energized remotely, is controlled by a thermistor located in the outlet connection to maintain outlet temperature at 37±1°C (98.6±2°F). Relative humidity is maintained by the chamber configuration requiring airflow through the surgical sponge. The chamber has been sized such that, even under the largest simulated breath volume, the complete breath volume will be retained in the chamber for one complete breath cycle.

Notes:

1. Additional information is contained in the following Tech Briefs: B72-10657 (HQN-10766), B72-10658 (HQN-10776), B72-10659 (HQN-10777), and B72-10661 (HQN-10779).
2. Requests for further information may be directed to:
   Technology Utilization Officer
   NASA Headquarters
   Code KT
   Washington, D. C. 20546
   Reference: B72-10660

Patent status:

NASA has decided not to apply for a patent.

Source: R. G. Bartlett and
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IBM Corp.
under contract to
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