HUMIDIFICATION OF THE RESPIRATORY TRACT IN HFJV
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Humidification and heating of the inspired air are obvious prerequisites for the long-term use of high-frequency ventilation in patients with respiratory insufficiency. Reports on successful application (1, 2) as well as the own clinical experience, that high-frequency ventilation with cold dry gas results in restlessness and discomfort of awake patients within 2 to 3 hours of application, initiated the development of a heater-humidifier-system to be used in conjunction with a VS 600 high-frequency jet ventilator, Acutronic Medical Systems, Switzerland, for which such an equipment is not yet on sale (3, 4).

The requirements with respect to humidity and temperature of inspired gas when the upper respiratory tract is by-passed by intubation or tracheostomy are well documented and there exists a wide variety of technical realizations to achieve "physiological atmospheric conditions" in conventional mechanical ventilation (5). However, all classes of existing equipment - heat- and moisture exchangers, gas-driven or mechanically actuated nebulizers, water-bath humidifiers - add a substantial compressible volume to the insufflation part of the patient circuit and, thereby, reduce the pressure-rise during the insufflation phase. The basic characteristic of high-frequency ventilators, i.e. the gas pressure remains constant regardless of the ventilation phase, is impaired. The use of conventional humidifiers in combination with high-frequency ventilators does not comply with the principle that the internal compressive volume and the internal compliance of the patient circuit be minimal (6).
Our approach to add about 30 mg water per liter of insufflated gas and simultaneously rise the temperature to 33 to 36° Celsius without changing the gas-flow characteristics of the high-frequency ventilating unit is depicted diagrammatically in Fig. 1.

FIGURE 1. 1 wet gas warming spiral, 2 thermostat-regulated boiler, 3 servounit, 4 one-way valve, 5 warm water bath, 6 microinfusion pump, 7 water-warming spiral, 8 patient.

The gas which is delivered by the jet ventilator is warmed up by passing the delivery tube in form of a spiral through a water bath, the temperature of which is thermostatically kept at 57° Celsius. About 30 ml of water are pumped per hour through a second coil in the water bath by means of a