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Back Pressure Check Valves a Hazard

To the Editor:—The correct functioning of the anesthesia apparatus is essential to safe anesthesia, so a careful pre-operative check, including one for absence of gas leaks, is accepted good practice. However, a recent hazardous episode indicates that using the O_2 flush valve to pressurize the system may not detect some major leaks.

An Ohio Unitrol® apparatus, just serviced by the manufacturer's serviceman, was checked prior to use. The O_2 flush was used to pressurize the breathing system which was found to be gas tight.

Following intubation of the trachea the return of gas to the bag was less than expected. The placement of the tracheal tube, the gas tightness of the tracheal tube cuff, and breathing system were all found satisfactory. The system was filled with oxygen from the O_2 flush, and the fresh gas flow set at two liters each of N_2O and O_2, and a muscle relaxant was given. Ventilation was controlled with a ventilator while a CVP line was inserted. When this was completed it was noticed that the O_2 analyzer had not been activated. When switched on it indicated 18 per cent O_2 in the system and the Perkin Elmer mass spectrometer confirmed this. The N_2O was discontinued and enflurane 2 per cent added. Manual ventilation again indicated diminished gas return but a check showed the tracheal tube to be correctly placed, and the cuff and breathing system to be gas tight. The patient by then was hypertensive and tachycardic. The mass spectrometer reading of 0 per cent enflurane directed attention to the vaporizer where hidden behind it was found the solution to the mystery. The metal tubing which conveys the gases to the common gas outlet had been left disconnected after servicing (fig. 1). Upon its reconnection the gas return to the reservoir bag became normal and the rest of the anesthesia was uneventful. Later review showed that 1) the Ohio Unitrol® apparatus has a check valve between the vaporizers and the common gas outlet to prevent fluctuating pressure in the breathing system influencing the vaporizer's output,[1] and 2) the O_2 flush's oxygen comes directly from the reducing valves or the pipeline supply, thus bypassing the flowmeter and vaporizer. The abrupt rise in pressure in the breathing system from the O_2 flush closed the check valve, thus preventing escape of gas and discovery of the leak.

The gas tightness of the machine's internal system should be checked simultaneously with the breathing system by setting a two-liter flow on the O_2 flowmeter before the system is filled with the O_2 flush. The flow from the flowmeter will prevent the check valve from closing. As the pressure in the breathing system rises, the flowmeter float should dip, if the internal system is reasonably gas tight. Had we done this, the failure of the float to dip would have indicated a significant leak.

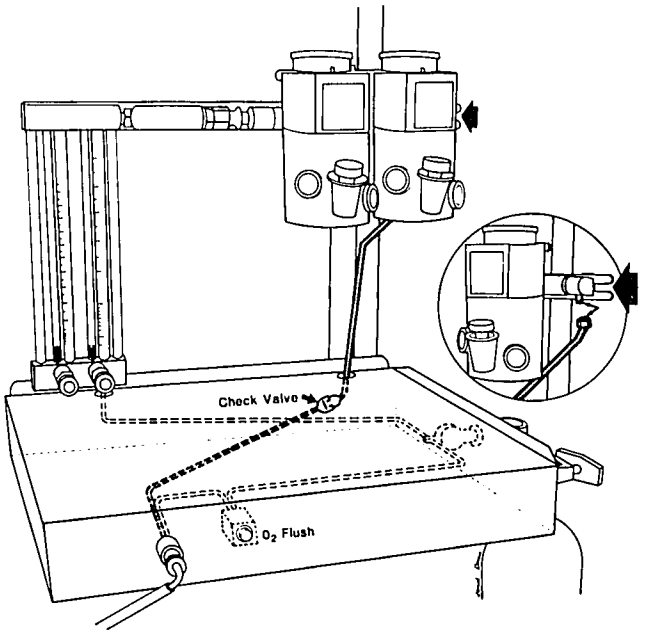

FIG. 1. Ohio Unitrol apparatus showing where the metal gas supply tubing had been left disconnected after servicing.

Capan and colleagues[2] also had difficulty in detecting a total loss of fresh gas supply when the gas supply tubing to an Ohio Ethrane® vaporizer became detached. These vaporizers also incorporate back pressure check valves.

This near accident gives point to the warning now affixed to each machine serviced by "Ohio Medical Products, Notice; This machine has recently been serviced by an Ohio Medical Products Service Representative. During the service procedures, setting of the controls, patient circuit components, and other auxillary devices may have been changed. CHECK the machine for proper set up prior to clinical use."

We must emphasize that with this apparatus the breathing bag will not collapse, when testing for leaks, no matter how great the leak in the machine's internal circuit. Only a failure of the flowmeter float to dip during the test will indicate such an internal leak.

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Exposed O_2 Flush Hazard

To the Editor:—At the end of an outpatient dental anesthesia using a Dupaco Compact 75® machine, as the drapes were being removed, the telethermometer was dislodged accidentally from the shelf above the machine. The box fell directly onto the vertically mounted O_2 flush knob jamming it into the mechanism (fig. 1). Fortunately, the anesthesiologist was just then loosening the tape fixing the tracheal tube. He immediately turned and saw the O_2 flush was jammed, and realizing the danger, disconnected the Y piece from the tracheal tube. So by prompt action the patient came to no harm, but the machine continued to discharge a high flow of O_2 until the O_2 supply was cut off. Had this accident occurred earlier when the patient's head was draped, it is doubtful whether the response could have been quick enough to prevent serious damage to the patient's lungs.

Had this O_2 flush knob been protected, say by a surrounding rim, as is now required by American National Standard Z79.8.1979, the possibility of such an accident would have been prevented.

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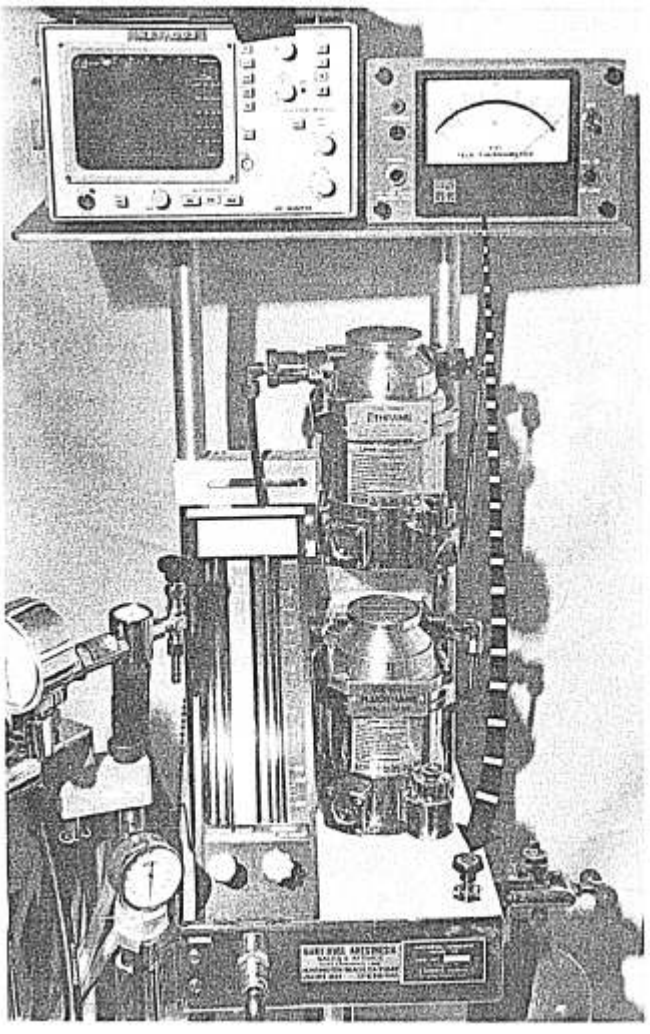

FIG. 1. A Dupaco 75® machine. The arrow indicates the telethermometer's fall onto the vertically mounted O_2 flush knob.