A RESPIRATION MONITOR FOR USE DURING ANAESTHESIA

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Particularly during neurosurgical operations on infants and small children, access to the patient is often limited, and when an open T-piece technique is in use it may be difficult to observe changes in the respiratory pattern. A temperaturer-sensitive device, the electrical resistance of which in warm (expired) air is lower than in cooler (inspired) air, and a simple Wheatstone bridge circuit permit a semiquantitative display of tidal air movement on a suitable ammeter. One arrangement which has been used successfully is shown in figure 1; it is based on a thermistor type US 23 (Standard Telephone and Cables Ltd.), and without further amplification requires a 50 microammeter. The potentiometer in series with the two Mallory type RM 12R batteries incorporates an “on-off” switch, and is desirable for larger tidal volumes or when the greater sensitivity of a 25 microammeter is preferred.

A more complicated and sensitive circuit is shown in figure 2; this uses the same batteries, and two type OC 71 Mullard transistors. The available gain is increased to about times 60 so that a less expensive 0–1 milliammeter is suitable. The components cost up to about £6, compared to approximately twice this for the circuit shown in figure 1; they may be assembled in an hour or two, and together with the ammeter fit in a box small enough to rest on the anaesthetic trolley.

Due to the extremely small size, mounting of the thermistor requires care. The following description refers to only one of several possible methods. Under binocular magnification (up to times 50), the thermistor leads are laid on small mounds of plasticine, and lengths up to the bead are insulated with thin coats, first of cellulose paint, then of shellac; silicone rubber solution is also suitable. When dry, the wires are brought through a hollow brass insert which is then cemented into the wall of a curved Knight or Nosworthy metal connector so that the thermistor bead just protrudes freely into the lumen. A flat perspex block, to which two small terminals have been attached and with a central hole for the brass insert, is then cemented to the outer surface of the connector. If suitable tools are available, the whole operation (except for drying of the Araldite) can be completed in about 2 hours.
FIG. 2
Transistor bridge circuit suitable for 0–1 milliammeter.

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