

METHODS

AN IMPROVED PORTABLE DRY SPIROMETER

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The operating principle of the portable dry spirometer is based on the use of an anemometric sensor. As is apparent from the diagram (Fig. 1) the air passes through a vane wheel seated on the axle of a worm gear with which

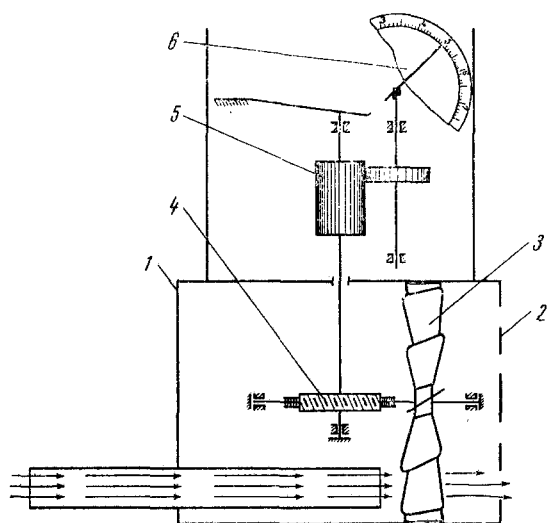


Fig. 1. Basic diagram of the spirometer. 1) Housing; 2) grating; 3) vane wheel; 4) worm-gear pair; 5) reducing gear; 6) scale.

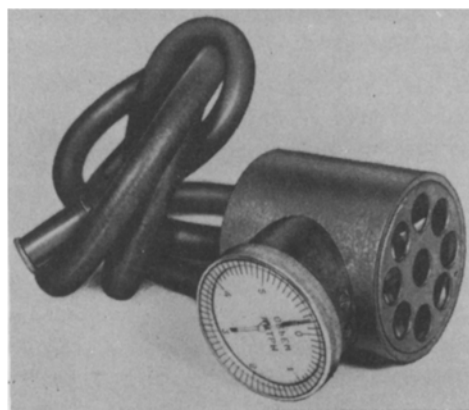


Fig. 2. General view of spirometer.

a reducing gear, having an indicator on the outgoing axle, is permanently coupled. For maximal elimination of the effect of inertia on the instrument readings the nave of the vane wheel, which rotates in agate bearings, is made of capron and the vanes of khostofan (polyethylene). To increase the accuracy of the spirometer readings the negligible moment of inertia of the vane wheel is taken into account when calibrating its scale.

Numbering of the rotating scale of the instrument, which is made of plastic, is done every 1000 ml, and the divisions are marked off from 0 to 6500 ml every 100 ml (Fig. 2). If the vital capacity of the lungs is greater than the maximal calibration of the scale (6500 ml), then the value exceeding it is added.

The portable dry spirometer is intended for measuring the vital capacity of lungs and the magnitude of supplemental air. The connection of the portable dry spirometer to an oxygen mask or to a valve box makes it possible by a visual count of the number of revolutions of the indicator during expiration to determine the total value of pulmonary ventilation and the respiratory rate for practically any time interval and under various conditions.

The instrument is simple and convenient to use and in comparison with existing instruments of a similar type it is quite portable. The weight of the spirometer is 70 g and measures 50 × 48 × 65 mm. The resistance to respiration at the start of expiration is 15-20 and during work with the instrument is 5-8 mm H₂O. The instrument in a case measuring 130 × 80 × 65 mm and with a set of interchangeable mouth pieces weighs 300 g (Fig. 2). The technical (VNIIMIiO) and clinical (TsNIIFK in Moscow, S. P. Botkin Hospital, Vishnevskii Institute, etc.) data indicate a sufficiently high reliability and accuracy of the readings of the portable dry spirometer (within 5%) in comparison with similar instruments.

The lightness and simplicity in handling permits the wide use of the portable dry spirometer in clinical, out-patient, and pediatric practice as well as in sports and military medicine.

The portable dry spirometer is presently being produced by the Kiev Medical Equipment Plant.