Nov. 24, 1959 W. SANDELOWSKY 2,914,064

RESPIRATORS

Filed March 14, 1957

FIG. 1.

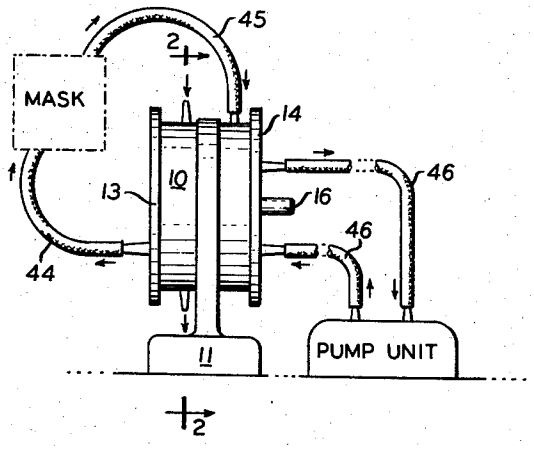


FIG. 2.

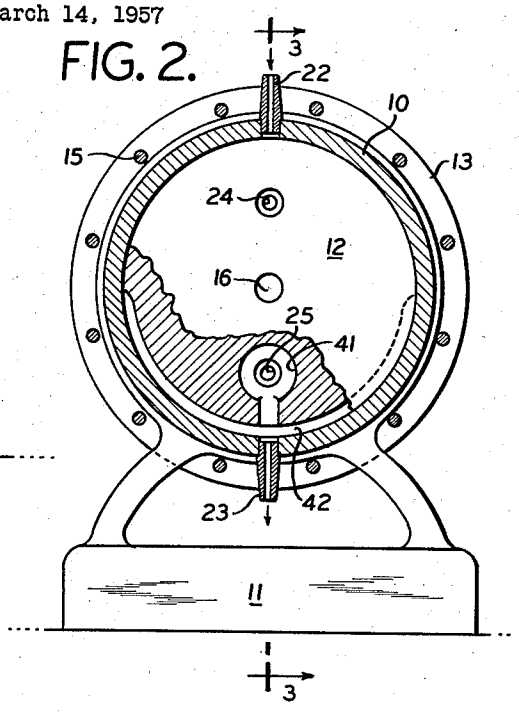


FIG. 3.

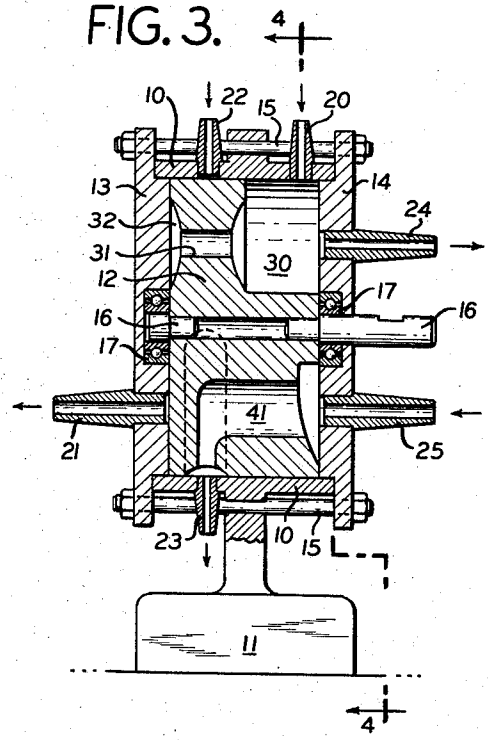
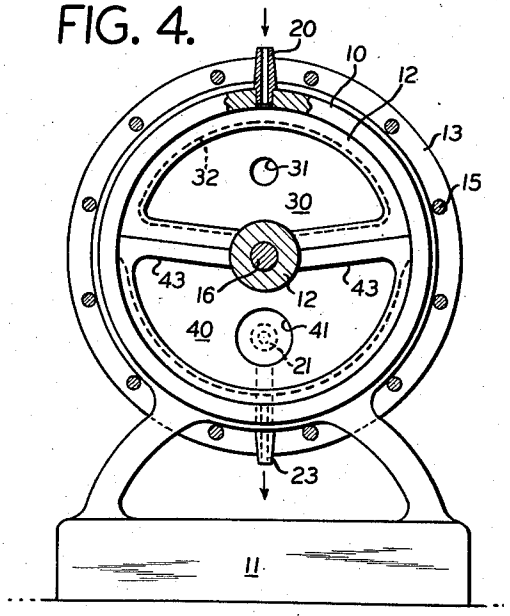


FIG. 4.



INVENTOR
WERNER SANDELOWSKY
BY
ATTORNEY.

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RESPIRATORS

Werner Sandelowsky, Farmingdale, N.Y.

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3 Claims. (Cl. 128—29)

This invention relates to respirators.

More particularly, the invention is concerned with respirators of the type used for the treatment of any of a variety of respiratory conditions and involving the supplying and exhausting of air, often with medication, to the lungs under controlled pressure and vacuum conditions.

The general object of the invention is to provide a valving mechanism capable of use in conjunction with available air supply or air pumping devices, for controlling the application of positive and negative pressure to a mask, and thereby produce controlled inhalation and exhalation.

With this and still other objects which will appear in mind, a mechanism embodying the invention in a preferred form will now first be fully described with reference to the accompanying drawing, and the features forming the invention will then be pointed out in the appended claims.

In the drawing:

Fig. 1 is a schematic side elevation of a mechanism embodying the invention in a preferred form;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Figs. 2 and 4; and

Fig. 4 is a section on the line 4—4 of Fig. 3.

The valve unit, which is best shown in Figs. 2–4, comprises a cylinder **10**, supported on a base **11**, and containing the valve body or rotor **12**. Face plates **13**, **14** are secured to the cylinder by means of bolts or tie rods **15** and support the rotor shaft **16** by means of anti-friction bearings **17**. The cylinder and face plates are provided with six posts and hose or tubing connection fittings, one pair of ports **20**, **21** connecting to the patient's mask, another pair **22**, **23** connecting to atmosphere and a third pair **24**, **25** connecting to the pump unit, all as indicated in Fig. 1. The rotor **12** has ports and passages for suitably connecting the six casing ports, as follows. First of all, the rotor **12** has a passage or opening **30** against face plate **14**, so as to communicate with port **24** or **25**, according to rotor position, and also opening against the near side of the cylinder **10** so as to communicate with port **20**, or not, depending on rotor position. Communicating with opening **30** is a bore **31** leading to an arcuate channel or groove **32** against face plate **13**, so as to communicate with port **21**, or not, according to rotor position.

The passages and openings just described occupy about one half the rotor (the upper half in the position of the figures). The lower half of the rotor comprises an opening **40** against face plate **14** for communicating with the port or fitting **25**, and the opening **40** communicates, in turn, through a bore **41** with a peripheral groove **42** which establishes communication with either the port **23** or the port **22**, according to the position of the rotor. The upper and lower halves of the rotor are sealed off from each other against the face plate **14** by a partition or wall **43**.

In operation, it will be understood that the pump unit contains desired negative and positive pressure in a manner well understood in itself and forming in itself no part of the present invention.

The mask, indicated schematically in Fig. 1, may be of any usual type such as now used for basal metabolism tests and other purposes and is connected through rotor hoses or tubing **44**, **45** to the fittings **20** and **21**, as shown. Suitable filters or medicament atomizers may be inserted in the lines **44** and **45**, according to the treatment to be given and in accordance with present practice. In the position of the figure, connection is established from the mask through tubing **45** and fitting **20** to the rotor space **30** and hence through fitting **24** and tubing **46** to the pump unit, thus producing exhalation, under a vacuum or negative pressure determined by the adjustment of the pump unit in the usual way. The air pumped through the pump unit is conducted through tubing **46** to fitting **25** and hence through rotor spaces **40**, **41** and **42** to the port or fitting **23** where it is discharged to atmosphere. Rotation through about a quarter turn from the position shown will reverse this operation, so that rotor space **40** is now in communication with fitting **24** and connects this fitting through bore **40** and peripheral groove **42** with port or fitting **22**, so that the pump unit suction is now connected to atmosphere. At the same time rotor space **30** will have been brought into operative position with respect to fitting **25** connected to the pump high pressure or discharge side so that air from the pump will be delivered through bore **31** and to the arcuate channel **32** and hence to fitting **21** and tube **44** leading to the mask. Under these conditions, controlled inhalation will be produced. The air may be obtained directly from the atmosphere of the room or by connecting fitting **22** to any suitable source and may be modified or supplemented in any desired manner.

The time ratio as between inhalation and exhalation may readily be controlled by varying the peripheral spaces **30** and **41** and will ordinarily be arranged so that the ratio of inspiration or inhalation to expiration or exhalation will be about 1 to 1.3. Other ratios may, however, be selected if desired.

It will be observed that the design of the valving unit is such as to permit thorough cleaning and even sterilization of the rotor if desired, by unfastening the tie elements **15**, separating the face plates and removing the rotor.

What is claimed is:

1. In a therapeutic respirator apparatus having an air pump and a mask for supplying and exhausting air to and from the patient, a valving mechanism comprising a ported casing comprising a cylindrical body and removable face plates having supply and exhaust connections to atmosphere, to the pump and to the mask, and a unitary rotor having passages for alternately connecting the pump discharge to the mask and the pump suction to atmosphere and the pump discharge to atmosphere and the pump suction to the mask.

2. In a therapeutic respirator apparatus having an air pump and a mask for supplying and exhausting air to and from the patient, a valving mechanism comprising a ported casing having supply and exhaust connections to atmosphere, to the pump and to the mask, and a rotor having passages for alternately connecting the pump discharge to the mask and the pump suction to atmosphere and the pump discharge to atmosphere and the pump suction to the mask, the said pasages being so proportioned as to give a ratio of about 1 to 1.3 between time of inhalation and expiration.

3. In a therapeutic respirator apparatus having an air pump and a mask for supplying and exhausting air

to and from the patient, a valving mechanism comprising a unitary cylindrical rotor body having on one face thereof a diaphragm separating the two sides thereof, the rotor having an opening on one side of the said diaphragm communicating with a face of the cylindrical profile of the rotor and with the periphery of the said profile, and a bore leading from the said opening to the opposite face of the rotor, the rotor further having an opening in the first said face on the opposite side of the said diaphragm closed off from the periphery of the rotor and a bore connecting the second said opening to the rotor periphery adjacent the opposite face of the rotor and to the opposite face thereof, and a casing comprising a cylindrical body and removable face plates cooperating with the said rotor, the said cylindrical body having opposed air intake and discharge ports for co-

operating with the second said bore opening into the periphery of the rotor, a port for connection to a mask in the second said face plate in position for cooperating with the second said bore, a second port for connection to the mask positioned in the cylindrical casing for co-operation with the first mentioned rotor openings, and a pair of diametrically opposite ports in the first said face plate positioned for cooperating with the said openings on the two sides of the said diaphragm.

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