ABSTRACT

A medical face mask for supplying gas/air mixture to a patient comprising a hollow body portion adapted to cover the nose and mouth of the patient and an inlet portion for adjustably supplying said gas/air mixture. The body portion includes an inlet opening and at least one outlet. The inlet portion of the mask comprises a venturi throat in communication with the inlet opening in the body portion and includes first and second apertured members, said second member is mounted to the inlet portion and has a plurality of apertures and a gas inlet means. Said first member is rotatably mounted to said second member and has a plurality of apertures adapted for the selective registry with said apertures in said second member.

5 Claims, 4 Drawing Figures
MEDICAL FACE MASKS

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

FIG. 1 is a front perspective view of a medical face mask.

FIG. 2 is a side view of the mask of FIG. 1 illustrating the various gaseous flows that occur in use, and FIGS. 3 and 4 are front views of details of the mask of FIGS. 1 and 2.

The mask of the Figures has a hollow body portion 1 formed of a translucent pliable plastics material. The body portion 1 is of appropriate configuration to be fit-able to a patient's face so as to contain the nose and mouth, the mask being fitted to the patient utilizing an elastic cord secured to holes 2 in lugs 3 extending from the rim portion 4 of the body portion 1, this rim portion 4 extending laterally of the remainder of the body portion 1 to facilitate close fitting of the mask to the patient's face.

An inlet portion 5 of the mask is formed by a rigid tube 6 that extends from the body portion 1. A disk 7 is fast in the tube 6 at its free end, that is at its end remote from the body portion 1. An inlet jet 8 rigid with the disk 7 extends through the centre of the disk 7 such that a venturi throat exists at the free end of the tube 6. A further disk 9 is rotatably mounted on the jet 8 outside the tube 6, this disk 9 being urged into face-to-face contact with the disk 7 by a compression spring 10 mounted on the jet 8 and acting between the disk 9 and a shoulder 11 on the jet 8. The outer end of the jet 8 is formed for having connected to it a gas supply pipe.

The two co-operating disks 7 and 9 constitute air inlet means positioned to permit air to be drawn into the mask by the action of gas entering the mask through the venturi throat. To this end, and referring to FIGS. 3 and 4, the disks 7 and 9 are apertured. The disk 7 has four apertures A, B, C and D, equi-angularly spaced-apart on the same pitch circle diameter but of different diameters. In the illustrated example shown the diameters are A = 0.1470 inch, B = 0.2130 inch, C = 0.2130 inch and D = 0.28125 inch spaced at 60° apart on a pitch circle diameter of 0.4 inch. The disk 9 has four corresponding apertures a, b, c and d which, in one position of the disk 9 relative to the disk 7, align with the apertures A, B, C and D respectively. To ensure that air flow through the apertures that are in line with one another is, in most positions of the disk 9 relative to the disk 7, determined by the sizes of the apertures A, B, C and D, the apertures b, c and d are each of slightly larger diameter than the corresponding apertures B, C or D. In the illustrated example a = 0.1285 inch, b = 0.234375 inch, c = 0.28125 inch and d = 0.34375 inch in diameter.

In addition to the apertures A, B, C and D the disk 7 is provided with a pip 12 directed towards the disk 9 and disposed on the same pitch circle diameter as the apertures A, B, C and D for engagement with either one of two closed bores 13, 14 in the disk 9 on the same pitch circle diameter as the apertures a, b, c and d and equi-angularly spaced apart therefrom and from each other. In the illustrated example the pip 12 is 0.125 inch in diameter and the bores 13, 14 are each 0.134 inch in diameter. The pip 12 can alternatively be engaged in the aperture a or in the aperture b as discussed below.

The mask is used as follows. The particular example illustrated is intended to have its jet 8 connected to an oxygen source supplying oxygen at a flow rate within the range of 8 to 14 litres per minute, and to operate within acceptable limits up to a flow rate of 19 litres per minute. Oxygen entering the mask through the jet 8 (dotted lines 15 in FIG. 2) causes air to be drawn in through whichever of the apertures in the two disks 7 and 9 are in alignment (chain dot lines 16). The thus oxygen-enriched air enters the mask body portion 1 to be inhaled by the patient. The length and inner diameter of the tube 6, and the diameter of the orifice of the jet 8, are such that the jet of oxygen entering the tube 6 breaks up within the tube 6 before entering the body portion 1 and the resultant turbulent gas flows within the tube 6 (illustrated in FIG. 2) prevent oxygen not inhaled by the patient, and exhaled air, re-entering the tube 6. The excess oxygen and exhaled air is permitted to leave the mask through apertures 17 in the mask body 1 (chain lines 18). In this illustrated example the tube 6 is 3 inches long, its inner diameter is 1 inch, and the jet orifice is 0.144 inch in diameter.

The desired oxygen concentration in the gas stream entering the mask body portion 1 is selected by adjusting the position of the disk 9 relative to the disk 7, percentage concentrations of 50 percent, 60 percent, 70 percent and 80 percent, within ±1 percent at oxygen flow rates of from 8 litres per minute to 14 litres per minute being obtainable with the illustrated mask by setting the disk 9 as follows:

Pip 12 engaged in bore 13, apertures a, b, c and d respectively aligned with apertures A, B, C and D - 50 percent oxygen concentration.

Pip 12 engaged in bore 14, apertures b, c and d respectively aligned with apertures A, B and C, apertures a and D blanked off - 60 percent oxygen concentration.

Pip 12 engaged in aperture a (blanking this aperture off), apertures c and d aligned with apertures A and B, apertures b, C and D also blanked off - 70 percent oxygen concentration.

Pip 12 engaged in aperture b (blanked off), apertures a and d aligned with apertures D and A, apertures c, b and C also blanked off - 80 percent oxygen concentration.

In the last position (80 percent oxygen concentration), although the pip 12 is a very loose fit in the aperture b, the relative sizes of the apertures a and D and d and A are such that the apertures A and a are always open throughout the range of movement permitted to the disk 9 in this position.

It will be appreciated that the various settings described above are obtained by positive locations of the pip 12 in either the bore 13, the bore 14, the aperture a or the aperture b, the setting being altered by withdrawing the disk 9 against the action of the spring 10, rotating the disk 9 and releasing it again. Appropriate scale markings carried by the disk 9 line up with a fiducial line on the disk 7 for each of these settings.

We claim:

1. A medical face mask comprising a hollow body portion adapted to fit over the nose and mouth of a patient, said body portion having an inlet opening and at least one outlet opening, and an inlet portion including a venturi throat in communication with said inlet open-
ing and having first and second apertured members, said second apertured member being fast with said inlet portion and including a plurality of apertured, said sec-
ond apertured member including gas inlet means for in-
troduction of a gas into said venturi throat, and said first apertured member being rotatably mounted to said second apertured member and including a plurality of apertures adapted for registry with selected apertures of said second member to permit selectable amounts of air into said venturi throat.

2. A medical face mask as set forth in claim 1 wherein said apertures in each of said first and second members are disposed on a common pitch circle, said circles each being coaxial about the axis of rotation of said first apertured member and of the same radius as the other.

3. A medical face mask as set forth in claim 1 wherein said first aperture member is rotatably 
mounted to said gas inlet means, and said gas inlet 
means including biasing means for biasing said first 
member against said second member.

4. A medical face mask as set forth in claim 1 wherein said second aperture member includes at least apertures A, B, C and D and first aperture member in-
cludes at least corresponding apertures a, b, c and d, each of said apertures having centers positioned on corresponding pitch circles of the same diameter and said centers being positioned about 60° apart.

5. A medical face mask as set forth in claim 4 wherein apertures b, c and d are each slightly larger than corresponding apertures B, C and D and where the diameters of said apertures are related as follows: A<b=C<d and a<b<c<d.