

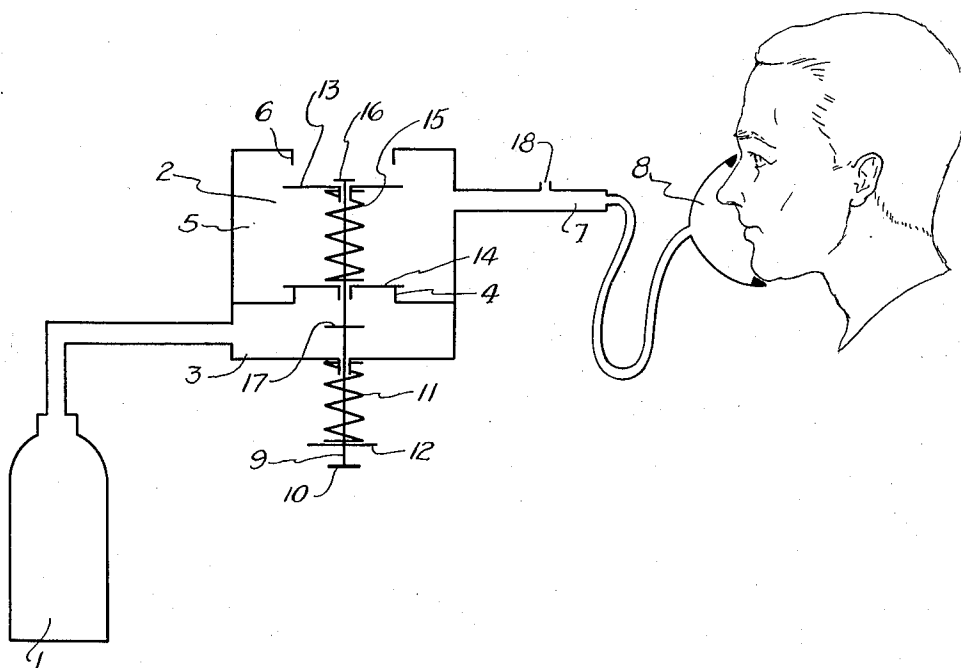
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APPARATUS FOR REMOVING OF SECRETIONS FROM AIR DUCTS AND LUNGS

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APPARATUS FOR REMOVING OF SECRETIONS FROM AIR DUCTS AND LUNGS

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This invention relates to the removal of secretions from air ducts and lungs.

Sick persons who cannot cough because of weakness or paralysis of the lungs are very highly subject to the danger of pneumonia because of the accumulation of secretions and mucus in the lungs. Ordinarily coughing is the natural method of eliminating secretions and mucilage from the air ducts and the lungs. The danger of congestion is especially high when an apparatus is used for forced respiration and such apparatus requires special attention in order to make sure that the air ducts are free of mucus before forced respiration takes place.

Heretofore the air ducts have been cleared of mucus by means of suction pumps or catheters. This has the disadvantage in that, although the air ducts may be cleared, the apparatus does not clear the fine passages of the lungs.

The object of this invention is to produce an apparatus which will clear the air ducts and lungs of mucus by means of an artificially produced cough.

In general, the object is accomplished by means of a face mask or mouthpiece connected to a container by means of a valve and a vacuum flask. The valve is operated very suddenly and momentarily for a short period to produce an artificial cough. This cough is sufficient to draw the mucus and other secretions from the lung without damage thereto. The mouth and/or nose of the person, therefore, communicates through the apparatus with a vacuum of short duration causing an air suction impact which draws the mucus from the lungs and air ducts.

A simple form of the apparatus is composed of a face mask or mouthpiece joined to a vacuum flask and to the atmosphere by means of an additional valve. This apparatus has the advantage that the face mask or mouthpiece can be worn by the person before the time a cough is to be produced. Thus the person is able to obtain air through the additional air valve, and a cough is produced only upon the opening of a valve to the vacuum flask. The valves are constructed so that the air valve is closed when the vacuum suction valve is opened and, therefore, a loss of the vacuum is avoided.

Preferably the valves are arranged so that, when the face mask is worn by the person, the air valve is ordinarily open while the suction valve is closed. Both valves are joined to a control means so that they are both actuated at the same time. Moreover, the control is such that the air valve is closed before the suction valve is opened and vice versa. This insures the preservation of the vacuum.

In order to operate both valves at the same time the two valve heads are coaxially mounted on a single valve stem, the movement of which opens one valve and closes the other.

In the above construction, the valve heads are slidably mounted on the valve stem. A pressure coil spring holds the two valve heads in spaced relation, with the respective valve seats facing each other. Two stops on

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the valve stem control the movement of the movable valve heads, the stops being so arranged that the air valve head is normally open, while the second stop limits the movement of the valve stem after the air valve has been closed and the suction valve opened. A second coil spring is mounted on the valve stem to hold the valve stem in a position so that the air valve is ordinarily open with the suction valve closed.

An air equalizing bore is preferably incorporated in the air line leading from the valve housing to the face mask.

The means by which the objects of the invention are obtained are described more fully with reference to the accompanying schematic drawing which shows a cross-sectional view through the apparatus.

A vacuum flask 1 for providing the suction is connected by a tube to the valve housing 2. A partition through the housing forms a chamber 3, the partition containing a suction valve seat 4 through which communication is established to chamber 5. An air valve seat 6 opens chamber 5 to the atmosphere. A tube 7 connects chamber 5 to the face mask 8, which mask covers the nose and mouth of the sick person. Valve stem 9 enters housing 2. This stem has a handle or knob 10 on the end thereof and is held in a withdrawn position by a compression spring 11 which extends between housing 2 and the flange stop 12.

Slidably mounted on stem 9 are the air valve head 13 and the suction valve head 14 which are kept spaced apart by the coil spring 15 which is weaker than the spring 11. Air valve head 13 is retained upon stem 9 by means of the end stop flange 16. A collar 17 on stem 9 within chamber 3 is for the purpose of contacting and lifting suction valve head 14 upon inward movement of stem 9. The distance between collar 17 and suction valve head 14 is at least as great or greater than the distance between air valve head 13 and air seat 6 so that upon inward movement of stem 9 air valve head 13 will close before suction valve head 14 opens and vice versa.

In the position of the valves shown in the drawing, a person is breathing the atmosphere through the open air valve, with the suction valve being closed.

To produce an artificial cough, knob 10 is pushed suddenly inwardly and then quickly released. Inward movement of stem 9 first relieves spring 15 so that this spring expands and pushes valve head 13 into closed position upon seat 6. Thereupon, collar 17 contacts valve head 14 and establishes the passage between the vacuum flask 1 and face mask 8. The suddenly applied suction loosens the mucus in the lungs and air ducts of the person and draws the mucus up into at least the mouth of the person. Upon quick release of the valve stem, the spring 11, bearing against stop 12, withdraws stem 9 and collar 17 so that the compression exerted by stop 16 upon spring 15 quickly closes suction valve 14, while at substantially the same time, the air valve is opened. The time between the opening and the closing of the suction valve is approximately from 1.5 to 2 seconds, with the vacuum in flask 1 being approximately 150 cm. WS. Secretions and mucus which has been drawn into the upper portions of the air ducts and into the mouth are removed by ordinary aspirating means.

Bore 18 in line 12 opens into the atmosphere and is for the purpose of making a slow pressure compensation with the atmosphere upon the closing of suction valve 14 in order to prevent the movement of the mucus particles back into the lungs.

Having now described the means by which the objects of the invention are obtained,

We claim:

1. An apparatus for removing fluids and mucus from

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the air ducts and lung cavities of a person comprising an air face mask, a vacuum flask, tube means extending between said mask and flask for forming an air passage therebetween, a suction valve mounted in said tube means, an air valve joined to said tube means and connecting said face mask with the atmosphere, said suction valve being positioned between said vacuum flask and said air valve, and actuating means connected to said suction valve and air valve for momentarily opening said suction valve to allow communication between said vacuum flask and said face mask and simultaneously closing said air valve to produce a vacuum in said face mask and an artificial cough in the person.

2. An apparatus as in claim 1, said actuating means being connected to close said air valve before opening said suction valve. 15

3. An apparatus as in claim 2, said actuating means comprising a valve stem coaxial with said suction and air valves.

4. An apparatus as in claim 3, said suction and air valves each comprising a valve head, and each head being slidably mounted on said stem and spaced from the other head. 20

5. An apparatus as in claim 4, further comprising a valve spring extending between the suction valve head and 25

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the air valve head for elastically separating the heads.

6. An apparatus as in claim 5, further comprising a stop flange on the air valve head end of said stem, and a collar on said stem for lifting the suction valve head.

7. An apparatus as in claim 6, said collar being positioned on said stem for lifting said suction valve head after said air valve head is closed.

8. An apparatus as in claim 7, further comprising stem spring means for holding said suction valve head normally closed. 10

9. An apparatus as in claim 8, further comprising an air equalizing bore in said tube means between said suction valve and said face mask.

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