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APPARATUS FOR ADMINISTERING AND CONSERVING GAS

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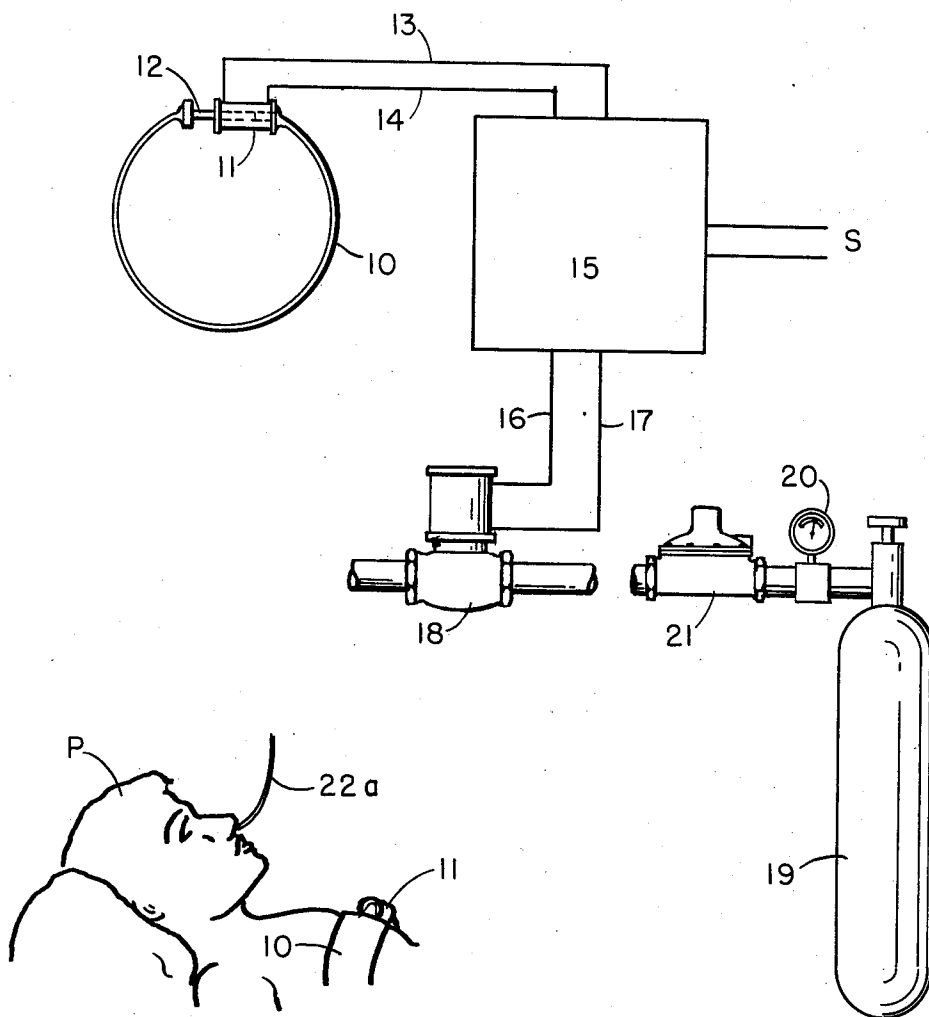


Fig 1

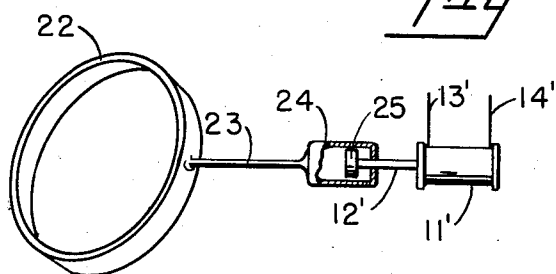


Fig 2

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APPARATUS FOR ADMINISTERING AND CONSERVING GAS

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4 Claims. (Cl. 128—203)

The invention pertains to apparatus for administering gases in general, but more in particular to the administering of oxygen and to the conservation thereof during its administration.

Patients being treated for many respiratory diseases are frequently given oxygen during the course of treatment. In hospitals, tubercular sanitariums and other rest homes, the source of the oxygen is often centrally located within the building and is piped through special ducts to the several rooms in the area where such patients are confined. Suitable regulators and valves, of course, are supplied; but when using the oxygen, the patient must choose either the conventional oxygen tent or the face mask. The latter cannot be made suitably comfortable to the patient, while the tent prohibits conversation which is sometimes necessary and helpful.

The most objectionable feature of the entire system is the waste of the oxygen to which, it seems, no thought has been given in the prior art. In this system the flow of oxygen remains constant during the patient's respiratory cycle. It is readily understandable that during the time of the patient's exhalation, that quantity of oxygen is lost, or at least the greater portion of it. While the quantity of oxygen lost to one patient in a day's time might seem small, the amount over a period of time is considerable. In fact, the waste in a single hospital amounts to hundreds and even thousands of dollars in a year's time.

One of the objects of the present invention, therefore, is the conservation of that quantity of oxygen which might be wasted in the conventional method of administration.

Another object of the invention is the provision of apparatus operated by the patient himself to control his oxygen flow only during the inhalation period of his breathing cycle.

A further object of the invention is the provision of apparatus permitting oxygen flow during the period of a patient's inhalation and which permits such flow regardless of the amplitude of the cycle.

Still another object of the invention is the provision of apparatus, a portion of which is worn and operated by the patient as a control means; such control means being electrically connected to other portions of the apparatus for the control of the flow of oxygen.

Other objects and advantages of the invention will become apparent in the course of the following detailed description when viewed together with the accompanying drawing in which:

Fig. 1 illustrates, more or less diagrammatically, the apparatus embodying my invention in an oxygen administering and conserving mechanism.

Fig. 2 is an alternate construction of an expansible belt worn by the patient and carrying the oxygen control means.

In the drawing numeral 10 designates a belt adapted to be positioned around the abdomen and chest of the patient. In this manner any expansion or contraction of the patient's chest or abdomen will be sufficient to operate

the oxygen control system. The belt, of course, may be constructed of any material, but preferably of some non-flexible fabric so as to be as comfortable as possible for wearing by the patient.

5 Affixed to one end of the belt is a coil 11 having a hollow core and associated with a plunger 12 fastened to the opposite end of the belt 10. Thus, when the patient expands the chest or abdomen during breathing, the plunger 12 is moved longitudinally in the core of the coil 11. The result is the generation of a small electrical current within the coil 11. This electrical phenomenon of generating a small current by moving an iron core within a coil is used considerably in the electronic field for the control of lighting, sound, in frequency stabilization and in other uses. It is not believed, however, to have ever been used in a device made according to the teachings of the present invention.

The leads 13 and 14 are electrically connected to an amplifying unit designated generally by the numeral 15, which uses the normal 115 volt current supply "S." The purpose of the amplifying unit is to receive the small current generated in the coil 11 and to amplify it to a usable value.

Electrical leads 16 and 17 extend from the amplifying unit 15 and are connected to an electrically operated solenoid valve 18. This valve 18 is the final control valve from the oxygen supply designated, in this instance, by the numeral 19. Between the source of supply and the valve 18 are the usual gages 20 and regulators 21.

30 On the discharge side of the valve 18 the patient P receives the oxygen intra-nasally by means of a catheter tube 22A. This permits greater comfort for the patient than the use of the conventional face mask.

The operation of the device will be described by the following example. Let it be supposed that a patient is confined with a respiratory disease; and in the treatment of the disease oxygen is administered by the mechanism of the present invention. The patient dons the belt 10 and positions the same around his chest or abdomen. 40 After inserting the catheter tube 22A the main oxygen supply is turned on together with the electrical supply to the amplifying unit 15.

Each time the patient expands his chest in breathing, the core 12 is moved longitudinally in the coil 11 generating a small current. This current is amplified by the unit 15 to open the solenoid valve 18 to discharge the oxygen to the patient through the catheter tube 22A.

Included in the electrical circuits in the amplifying state may be tubes, transistors, or selenium rectifiers which permit current flow uni-directionally so that upon immediate cessation of the current flow, the solenoid valve will close and cut off the oxygen supply. Thus when the patient inhales, he receives oxygen; but at the peak of his chest expansion and the point of exhalation, the current ceases and consequently his oxygen. It can now be seen that the patient receives oxygen only as he needs it during the inhalation period of his respiratory cycle. Thus, theoretically, one-half of the oxygen which was formerly maintained at a constant flow, is saved.

It will be remembered that regardless of the position of the iron core 12 in the coil, the system is responsive only to the distance the core travels and the time of the travel. If the patient takes a deep breath and expels only a portion of it before another is taken, the system is responsive only to the extent of the patient's inhalation and the oxygen is turned on and off correspondingly.

Fig. 2 illustrates an alternate belt 22 which, in this instance, simulates an inner tube of an automobile tire. A hollow stem 23 is attached to the tube 22 on one end and to a valve cylinder 24 on the other end. Within the cylinder 24 is a piston 25 affixed to the end of the movable core 12'. The coil 11' may be identical with that

3

of the above-described coil 11 with its electrical leads 13' and 14' connected to the amplifying stage as pointed out above.

The invention is simple in its construction and may be easily operated. Savings by the use of the invention are inestimable since one-half of the oxygen used by conventional open catheter systems may now be saved. Other uses and methods of construction could be made in the invention without departing from its spirit and scope as defined by the following claims.

I claim:

1. In apparatus for the conservation of a gas being administered to a patient during illness, a belt adapted to be worn by the patient and positioned around the chest region thereof, means on said belt responsive to the respiratory cycle of the patient for generating an electrical current, means for utilizing said current only in a uni-directional flow thereof, means for amplifying said current, a source of gas supply including a supply line to said patient, an electrically operable solenoid valve in said line and means for utilizing said amplified current to operate said valve whereby said patient may receive the gas only during the inhalation period of his respiratory cycle.

2. In apparatus for the conservation of a gas being administered a patient during illness, a belt adapted to be worn by the patient and positioned around the chest region thereof, means on said belt for generating an electrical current in response to the expansion and contraction of the patient's chest during breathing, means for utilizing only that portion of the current generated during the inhalation period of the breathing cycle, means for amplifying said current, a gas supply source and a supply line to said patient and an electrically operable solenoid valve in said line, said current generating means on said belt adapted to operate said solenoid for the discharge of a quantity of gas to said patient.

4

3. A device for the administering and conservation of a gas to a patient during illness comprising, a belt adapted to be worn by the patient around his chest region, an electrical current generating means fastened to said belt, a source of gas supply including a supply line to said patient, an electrically operable normally closed solenoid valve in said line, means for utilizing said generated current to open said valve to discharge a quantity of gas to said patient, said current generating means being responsive only to the inhalation period of said patient's breathing cycle.

4. In apparatus for the conservation of a gas being administered to a patient during illness, a belt adapted to be worn by the patient and positioned around his chest region, an electric current generating means on said belt operable by the chest expansion and contraction of the patient during his respiratory cycle, means for amplifying only that portion of the current generated during the expanding of the patient's chest, a source of gas supply including a supply line to said patient, an electrically operable valve electrically associated with said current generating means and responsive in degree of opening to the amount of current generated by said generating means, said valve adapted to control the amount of gas delivered to said patient.

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