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COMBINED AIR COOLING HUMIDIFYING APPARATUS FOR OXYGEN TENTS

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FIG. 1

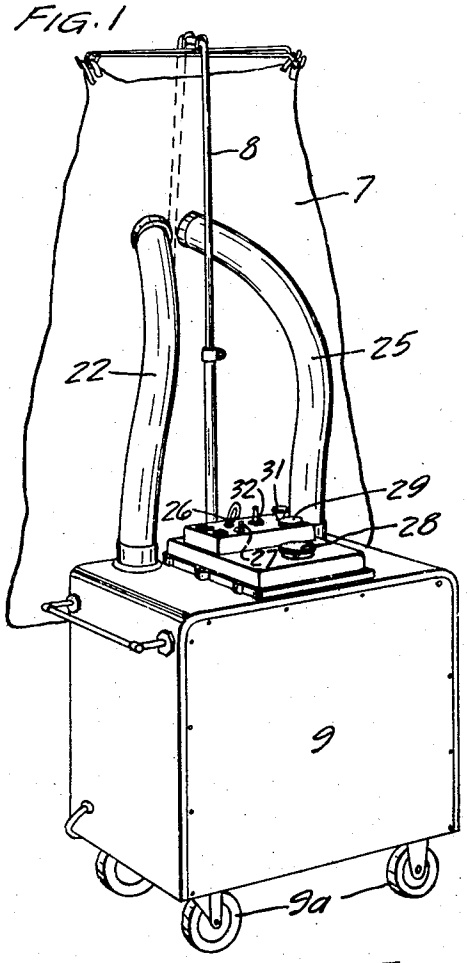


FIG. 3

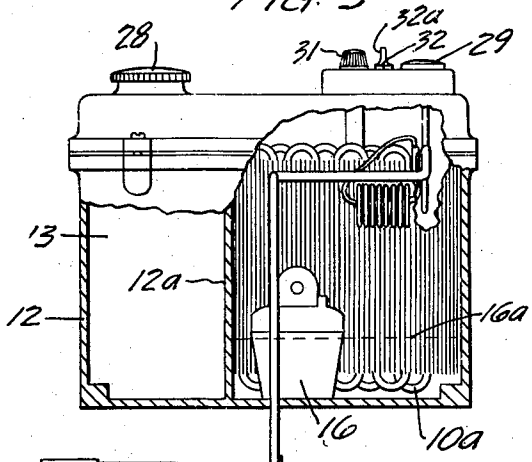


FIG. 4

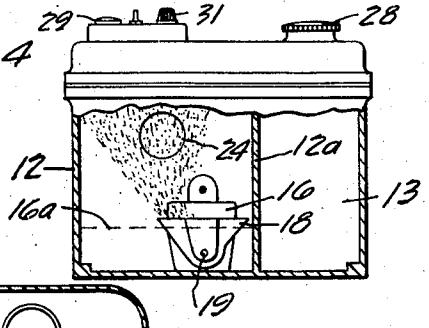
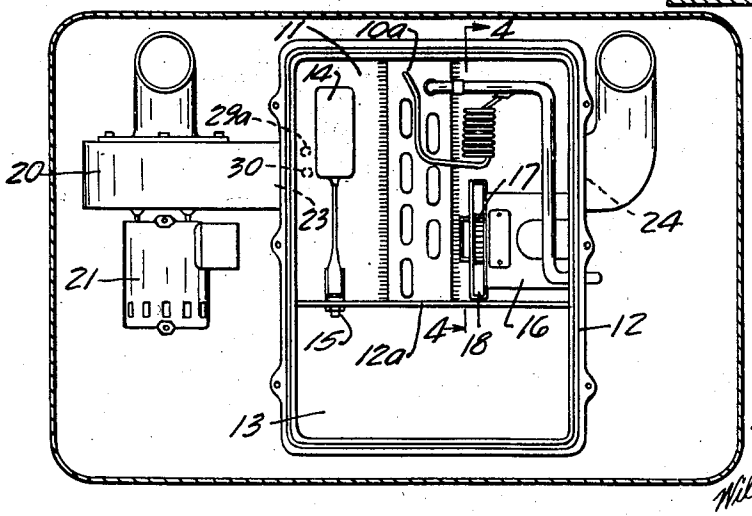


FIG. 2



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COMBINED AIR COOLING HUMIDIFYING APPARATUS FOR OXYGEN TENTS

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4 Claims. (Cl. 128—191)

This invention relates generally to a cooling and humidifying system for the air in oxygen tents and the like.

It has long been a problem to provide simultaneous cooling and humidifying of the air in an oxygen tent since conventional cooling systems cause considerable reduction in the relative humidity of the air within the tent and this dry air tends to irritate rather than clear up difficulties in the respiratory tract, and, in many instances, causes coughing spasms.

It is an object of this invention to provide a dual system for cooling and humidifying the air within an oxygen tent.

It is another object to provide apparatus having a refrigerated heat exchanger which cools both the humidifying water and the air circulated therethrough whereby cooled moisture-laden air may be blown into the oxygen tent to thus maintain a predetermined relative humidity as well as air temperature therein.

It it still another object to provide apparatus constructed to withdraw warm air from an oxygen tent, cooling and humidifying said air, and recirculating the same back into the tent whereby a high oxygen content thereof may be maintained along with a controlled humidity.

More specifically, it is an object to provide a combination cooling and humidifying system for the air in oxygen tents whereby the air and humidifying liquid are simultaneously cooled by a refrigerating coil having a portion thereof submerged below the liquid level and having a blower for drawing air from the oxygen tent and delivering the same through said coil to cool said air which is then humidified and further cooled with cold mechanically diffused liquid immediately before being discharged back into the oxygen tent.

It is still a further object to provide a system for cooling and humidifying air wherein cold liquid is dispersed into the air in a fine spray to both cool and humidify said air.

These and other objects and advantages of this invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views and in which:

Fig. 1 is a perspective view showing my apparatus as attached to a conventional oxygen tent;

Fig. 2 is a top plan view of the cooling and humidifying apparatus with the cover removed and showing the blower and air intake and outlet connected with said apparatus;

Fig. 3 is a side elevational view of the complete apparatus with portions of the casing broken away; and

Fig. 4 is a vertical fragmentary sectional view taken substantially along the line 4—4 of Fig. 2.

As illustrated in the accompanying drawings, I show a conventional type of oxygen tent 7 having an upstanding supporting structure 8 for holding said tent 7 in upwardly spaced relation above the patient's bed. The tent 7 is, of course, constructed of air-tight material to form a sealed closure around the patient to receive oxygen therapy.

I provide a cooling and humidifying system for recirculating air taken from within the tent, cooling and humidifying the same, and blowing the same back into the tent under pressure. The apparatus is housed within a suitable casing such as the wheeled casing 9 having the wheels 9*a* mounted thereunder. A conventional refrigeration system, designated as an entirety by the numeral 10, is mounted within the lower portion of casing 9 and has an evaporating coil 10*a* housed within the cooling and humidifying chamber 11 of the air conditioning casing 12 mounted in the upper portion of said wheeled casing 9. The casing 12, in the form shown, is divided into two compartments, a liquid storage compartment 13 and the air conditioning compartment 11, and a partition 12*a* provides such a division in the form of the invention illustrated.

A float valve 14 is swingably mounted in compartment 11 and controls the flow of liquid from the supply reservoir 13 through an inter-communication conduit 15 extending through partition 12*a*. The level of the liquid in air conditioning compartment 11 is maintained so that the lower portion of the cooling coil 10*a* is submerged below the surface thereof, a suitable liquid level being shown by the dotted lines 16*a* of Figs. 3 and 4.

A mechanical liquid vaporizer, designated as an entirety by the numeral 16, is mounted within the air conditioning chamber 11 on the outlet side of cooling coil 10*a*, as best shown in Fig. 2, and has a high speed motor enclosed within a waterproof casing. This motor drives a high speed liquid dispersing and vaporizing impeller 17 journalled for rotation in an open topped impeller housing 18 which closely surrounds the outer periphery of impeller 17 at the bottom thereof and diverges outwardly therefrom toward the top to permit said impeller to discharge a vaporized spray upwardly in a diverging discharge pattern. The lower portion of the housing 18 has a liquid inlet 19 formed therein to permit the water level therewithin to be maintained equal to the level within the air conditioning chamber 11 which is controlled by the float valve 14.

A blower 20 driven by an electric motor 21 is provided for drawing the air out of the tent 7 through conduit 22 and discharging said air through an air inlet 23 into said air conditioning chamber 11 on the intake side of said heat exchanger cooling coil 10*a*. An air discharge outlet 24 is disposed through the opposite side of casing 12 and discharges the cooled humidified air back into the tent 7 through conduit 25. Obviously, both outlet 24 and inlet 23 are disposed a substantial distance above the liquid level within the air conditioning chamber 11.

The refrigeration system 10 and the motor 21 are controlled by a master switch having the control button 26 best shown in Fig. 1, and the motor of vaporizer 16 is controlled by button 27. A filler cap 28 permits easy filling of liquid supply reservoir 13. A dial type thermometer 29 has its temperature sensing element 29*a* disposed in front of the air inlet 23 and the refrigeration system thermostat of conventional design has its sensing element 30 also disposed in close association to said air inlet 23 and has a control knob 31, best shown in Figs. 1 and 3, for varying the setting thereof.

The following is a description of the operation of the invention disclosed herein. If it is desired to both cool and humidify the air simultaneously, both of the switch buttons 26 and 27 are shifted to "on" position and the control knob 31 turned to the desired cooling position whereby the operation of the refrigeration system will be thermostatically controlled. The air is drawn from

the tent 7 through intake tube 22 by the blower 20 and is discharged into the air conditioning chamber 11 through intake opening 23. The air flows through the cooling coils 10*a* and into the humidifying portion of chamber 11 where the mechanically vaporized moisture is constantly dispersed by the vaporizing impeller 17. It should be noted that the position of the densest dispersion from said impeller is disposed directly in front of the outlet 24 in order to obtain maximum absorption of the moisture by the cooled air which has been passed through the coil 10*a* and is traveling outwardly through the outlet 24 back into the oxygen tent 7 through conduit 25. Since the lower portion of the cooling coil 10*a* is submerged below the water surface, said coil of course continuously cools the water so that said water being diffused into the area through which the air is constantly flowing will also serve to further reduce the temperature of said air and will also serve to substantially saturate said air as the same passes through the humidifying portion of chamber 11. While it is true that this saturation temperature is relatively low, it should be noted that even at this temperature a substantial amount of moisture is added to the air after the same has been cooled by being passed through the coils 10*a* and the humidity thereof is materially increased by this humidifying operation and a healthful humidity is maintained constantly in the air within the oxygen tent 7 even after the same has been warmed by the heat produced by the patient's body and breathing confined therewithin. Obviously, in certain instances, high relative humidity is not necessary or desirable and, in such instances, the cooling system may be operated without the vaporizer 16. It is also obvious that any desired means for introducing oxygen into the tent may be used such as connecting the same for discharge directly into the air conditioning chamber 11 as by the oxygen inlet tube 32 extending downwardly into said chamber and controlled by any suitable valve such as the stop valve 32*a*.

It will be seen that I have provided a relatively simple, yet highly efficient, apparatus for controllably maintaining a predetermined temperature within an oxygen tent and constantly humidifying the air therein simultaneously with the cooling thereof. The coils 10*a* not only cool the air but also cool the humidifying liquid whereby the liquid spray further cools the air passed therethrough while humidifying the same.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of my invention, which consists of the matter shown and described herein and set forth in the appended claims.

What I claim is:

1. Air conditioning apparatus particularly adapted for use in conditioning the air of an oxygen tent, said apparatus comprising a casing defining an air conditioning chamber, mechanism within said chamber for maintaining a predetermined liquid level therein, heat exchanger cooling means disposed in said chamber and having a minor portion thereof submerged below the liquid level in said chamber with a substantially greater major portion thereof disposed above the liquid level and extending transversely across said chamber and occupying a major portion of the cross sectional area of the chamber, a blower discharging air into said air conditioning chamber through an inlet disposed on one side of said cooling means and directing substantially the entire discharge onto said heat exchanger cooling means, said air conditioning chamber having a discharge outlet on the opposite side of said cooling means adapted to be connected with an oxygen tent, and means disposed between said opposite side of the cooling means and said outlet for discharging a finely divided spray of the liquid in said air conditioning chamber with the most densely dispersed area of discharge disposed substantially adjacent the air discharge outlet to substantially saturate said air discharged through said outlet.

2. The structure set forth in claim 1 and said blower being adapted to be connected with the oxygen tent for withdrawing the air therefrom, and said heat exchanger cooling means comprising a refrigeration coil.

3. Air conditioning apparatus particularly adapted for use with an oxygen tent and producing simultaneous cooling and humidifying of the air circulated therethrough, said aparatus comprising a casing defining an air conditioning chamber therein, mechanism within said chamber for maintaining a predetermined liquid level therein, a heat exchanger element mounted in said chamber and extending laterally from a point adjacent one side of said chamber to a point adjacent the opposite side of said chamber, said heat exchanger element having a portion thereof submerged below said liquid level with a substantially greater portion thereof disposed above said liquid level, means operatively associated with said heat exchanger element for cooling the same, said chamber having an air inlet in communication therewith and disposed on one side of said heat exchanger element, said chamber also having an air outlet in communication therewith and disposed on the opposite side of said heat exchanger element, blower means in communication with said air conditioning chamber for causing air to flow into said chamber through said inlet, about the portion of the heat exchanger element disposed above said liquid level and out through said outlet, a spray producing rotor at least partially submerged below said liquid level and having means operatively associated therewith for producing high speed rotation thereof to discharge a spray of liquid upwardly into the air passing through said chamber, said spray producing rotor being disposed between said heat exchanger element and said air outlet, said rotor rotating in one direction, a divergent housing surrounding the outer periphery of said rotor thereby defining a discharge portion to produce an upwardly directed vaporized spray in a diverging discharge pattern, said discharge portion being positioned adjacent said air outlet such that the densest discharge of the vaporized spray is disposed directly in front of the air outlet in order to obtain maximum absorption of the moisture by the cooled air passing through said chamber.

4. The structure as set forth in claim 3 wherein said chamber has an oxygen inlet connected therewith for introducing oxygen into the air passing through the chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

1,669,971	Collins	May 15, 1928
1,976,228	Hutzel	Oct. 9, 1934
2,123,742	Offen	July 12, 1938
2,143,628	Lea	Jan. 10, 1939
2,531,506	Geneck	Nov. 28, 1950
2,677,253	Lee	May 4, 1954

FOREIGN PATENTS

679,265	Great Britain	Sept. 17, 1952