Jan. 29, 1963 F. J. EICHELMAN 3,075,523

COMBINATION OXYGEN TENT AND NEBULIZER

Filed Sept. 8, 1955 3 Sheets-Sheet 1

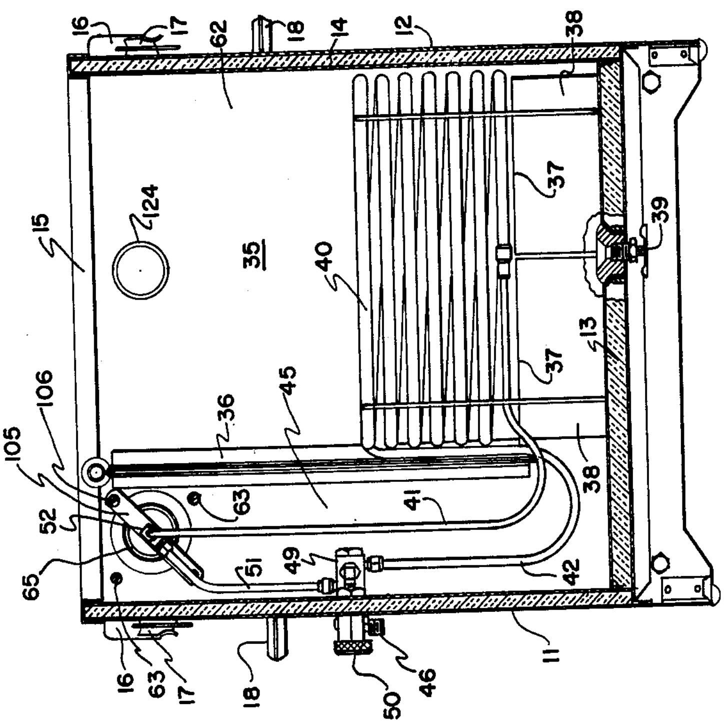

FIG. 2

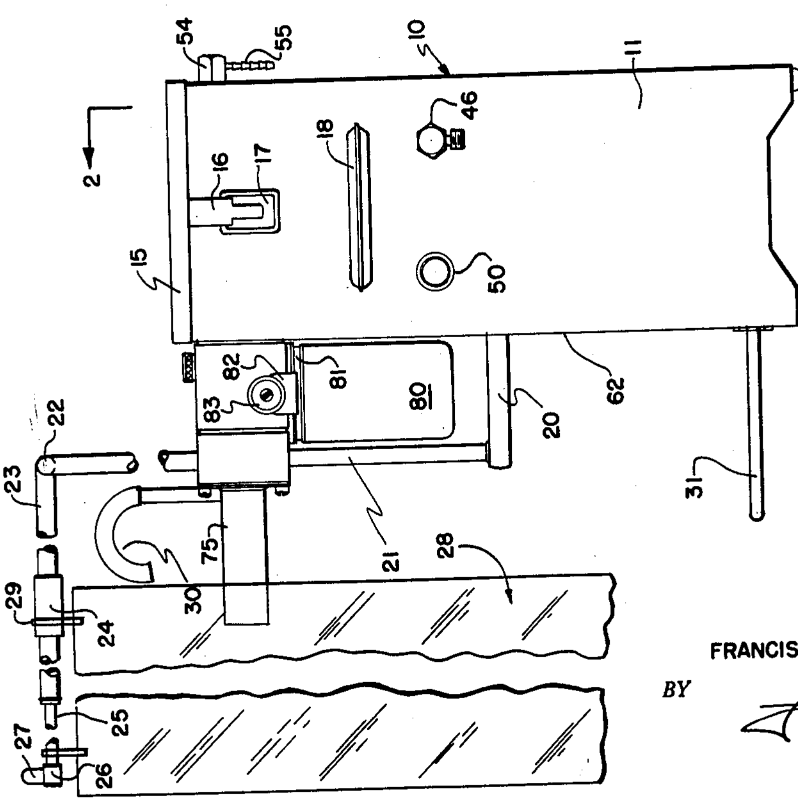

FIG. 1

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COMBINATION OXYGEN TENT AND NEBULIZER

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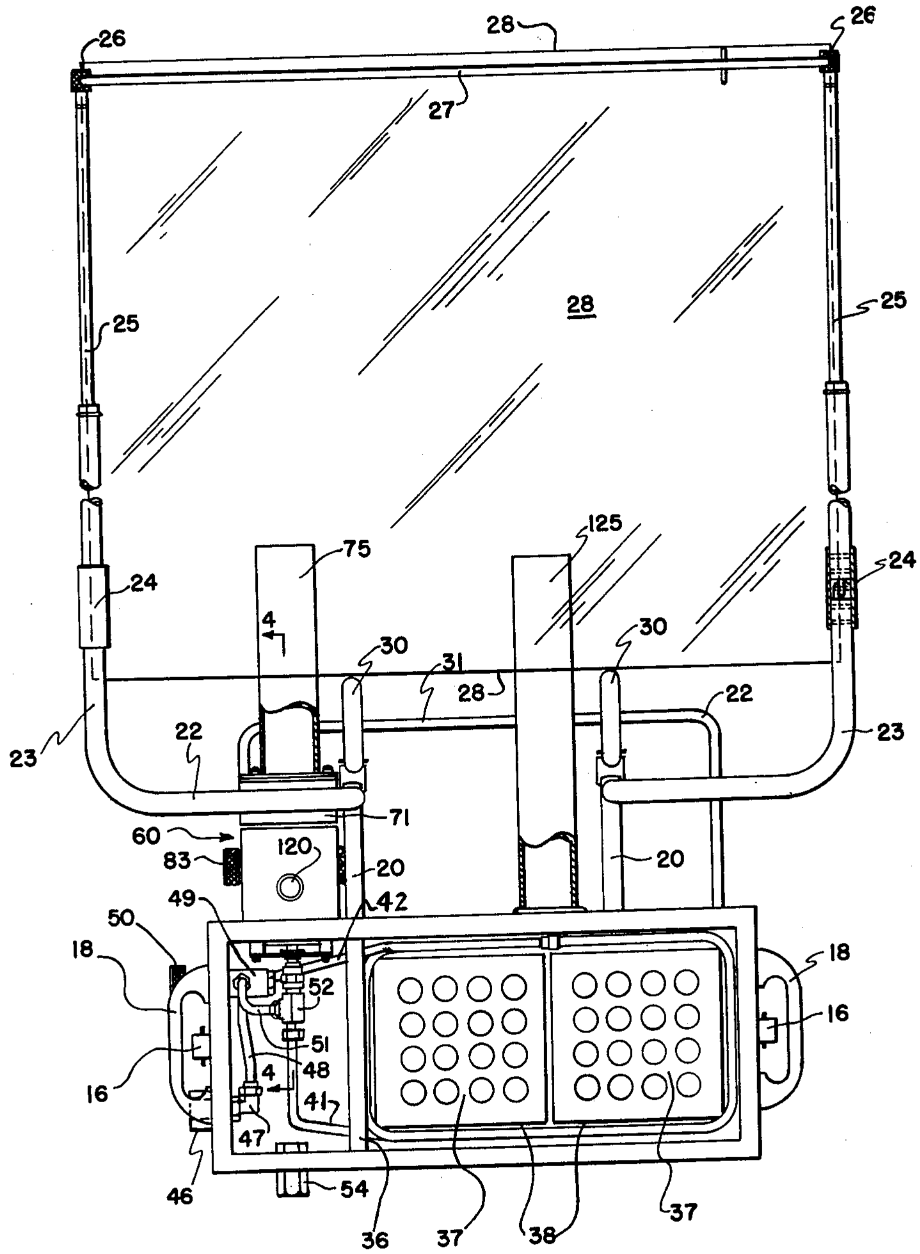

FIG. 3

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COMBINATION OXYGEN TENT AND NEBULIZER

Filed Sept. 8, 1955 3 Sheets-Sheet 3

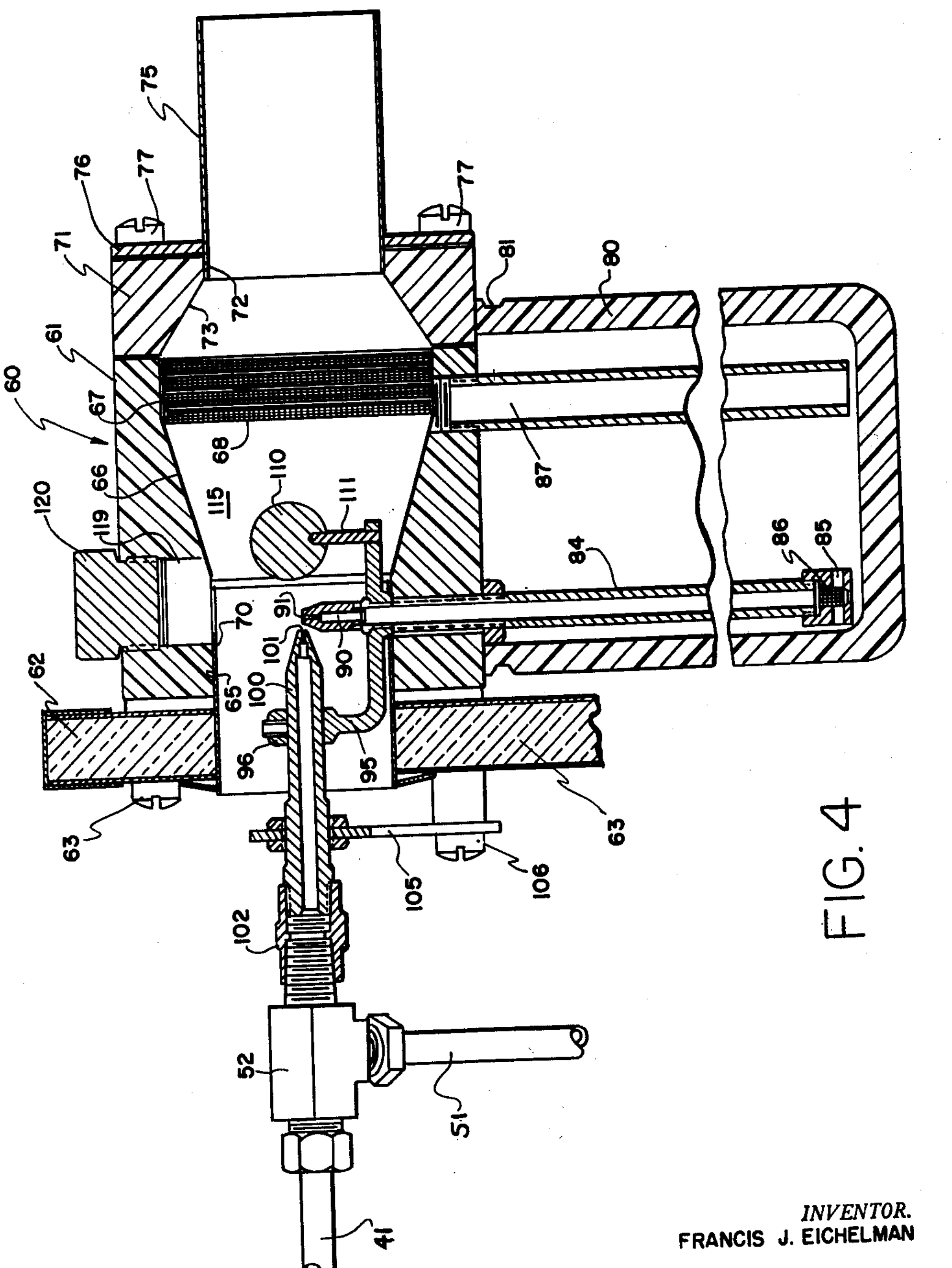

FIG. 4

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COMBINATION OXYGEN TENT AND NEBULIZER

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16 Claims. (Cl. 128—191)

This invention relates in general to the field of inhalation therapy and more particularly to the administration of oxygen by means of an oxygen tent and associated canopy for confining the special atmosphere thus provided at the point of its use. Specifically, this invention is concerned with the combination of a nebulizer and an oxygen tent, whereby a high volume of liquid is entrained in a gaseous stream of oxygen and cooled in the tent apparatus prior to its delivery into an associated canopy.

Inhalation therapy involving the administration of oxygen to a patient by means of a canopy to confine the gas and an associated tent for preparing the oxygen-enriched atmosphere to be delivered into the canopy is well known. For a more complete treatment of this particular subject, reference may be had to "Effective Inhalation Therapy" and particularly chapter 28, by Doctors E. R. Levine, A. L. Barach, J. W. Peabody and M. S. Segal, published by National Cylinder Gas Company, Chicago, Illinois, 1953. In general, the oxygen tent is the apparatus through which the oxygen is circulated prior to its injection or entry into the associated canopy. Conventional oxygen tents are primarily of two types, the ice cooled type and the iceless type.

In the former, as the name implies, the tent apparatus is essentially a chest or insulated cooling chamber for containing a quantity of cracked ice. Oxygen is passed into such a cooling chamber and through or over the ice in an effort to cool the oxygen, in order to control somewhat the temperature within the canopy.

The other general type of oxygen tent is known as an iceless tent, since it is provided with mechanical refrigerating apparatus of well known type, generally involving compressor, coils, condenser, refrigerant media, and a prime mover. Since it is preferable that oxygen tents be mobile, the prime mover in an iceless tent is generally an electric motor. In this type of tent it is apparent that there is no inherent means available for humidifying the oxygen, and it has been customary in the past to bubble the supply of oxygen through water prior to its entrance into the tent to humidify the atmosphere in the canopy. In this latter procedure considerable disadvantages are encountered. First, it is a fact that in a bubble type of humidifier wherein the oxygen is merely bubbled through a liquid, regardless of any control of the rate of flow of the gas, there can not be provided sufficient moisture to be of substantial therapeutic value. Second, the use of a conventional humidifier, even of the nebulizer type, within the canopy itself, is disadvantageous because most such available humidifiers have rather small throughput capacities, and are designed primarily for use in connection with small enclosures for local inhalation therapy, such as masks and the like. Moreover, it is impossible with such an arrangement to obtain proper recirculation, so that in general, although temperature within the canopy itself can be controlled by means of the refrigerating apparatus in the tent, high humidities or atmospheres with high liquid content within the canopy can not be achieved, or if achieved at all, the moitsure is provided in such large particle sizes that it precipitates rapidly within the canopy.

Applicant has overcome all of the foregoing disadvantages by the provision of an improved high volume nebulizer in combination with the tent cooling apparatus itself, whereby in a single unit there is provided a simple and positive control of the temperature as well as control of liquid entrainment or humidifying operations and recirculation. All of this takes place outside of the canopy and thereby achieves a superior therapy control arrangement without interfering with the comfort or other treatment of the patient. Moreover, applicant has achieved, by combining the high volume nebulizer with the tent cooling apparatus itself, volume liquid entrainment and higher humidity conditions within tent canopies heretofore thought impossible without detracting from close temperature control within the canopy itself.

It is accordingly the principal object of this invention to provide in combination, improved apparatus for maintaining highly efficient temperature and canopy atmosphere control.

Another object of this invention is to provide a highly efficient high volume nebulizer in combination with an oxygen tent of either the iceless or ice cooled variety.

It is a further object in conjunction with the immediately foregoing object, to provide an oxygen tent capable of recirculating and rehumidifying the recirculated atmosphere incoming from the tent canopy to thereby achieve maximum humidity within the tent canopy while maintaining optimum temperature conditions therein and without interfering with or inconveniencing the patient or affecting other treatment desired within the canopy itself.

These objects and additional advantages and features of applicant's invention will become more readily apparent as the following description proceeds, taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a side elevation of the tent apparatus in combination with the high volume nebulizer and associated apparatus for suspending a tent canopy.

FIG. 2 is a cross-sectional view on line 2—2 of FIG. 1.

FIG. 3 is a top plan view of the tent combination with the high volume nebulizer, and particularly illustrating the manner in which the suspension means for suspending the canopy is adjustably associated with the tent itself; and

FIG. 4 is a cross-sectional view taken on line 4—4 of FIG. 3, illustrating the construction of the new high volume nebulizer per se.

Referring now more particularly to FIG. 1 of the drawings, numeral **10** represents an oxygen tent. As is somewhat conventional in oxygen tents, particularly of the ice cooled variety, which is portable and suspended from the head of a hospital type bed, the tent generally is rectangular in shape and is provided with double side and bottom walls **11**, **12** and **13**, between which a suitable insulating material **14** such as fiberglass or the like is placed. The walls and bottom of the chest may, of course, be made of any appropriate material. In the preferred embodiment illustrated, this material is a high alloy sheet steel of the stainless variety. A closure member **15** is provided which, like the walls **11** and **12**, is preferably of dual wall construction and provided with an intermediate layer of insulating material (not shown) similar to that between walls **11** and **12**. The cover **15** is provided on each side with suitable securing devices such as toggle clasps **16** which engage lugs **17** provided for that purpose on the exterior side walls. Preferably on the same side walls that support the lugs **17** and somewhat below, there are provided carrying handles **18**.

The side of the tent adapted to face the bed is provided with a pair of tubular members **20** (FIG. 3) projecting centrally thereof, and from the ends of these tubular members **20** extend upwardly individual canopy supporting rods **21** (FIG. 1). These rods **21** extend upwardly preferably above the top of the tent **10** from about 2 to 4 feet whereat they are bent outwardly as at **22** and then again at right angles to extend generally horizontally at 23, preferably over the edges of a standard hospital size bed. The forwardly extending horizontal members 23 are each provided with a slide ferrule and hinge arrangement 24 for detachment or folding of the canopy supporting members when not in use, and telescoping extensions 25 for adjusting the longitudinal extent of the canopy suspension to accommodate the particular size of canopy prescribed. To maintain a certain amount of rigidity in the canopy supporting structure, a forward cross rod 27 is provided which is insertable into appropriate bores in knurled knobs 26 at the outer ends of the telescoping extensions 25. The canopy itself, indicated in reduced size at 28 in FIG. 1 is generally a transparent plastic enclosure suspended from the supporting structure by suitable straps or rings such as 29 and at its base tucked under the mattress of the bed.

Adjacent the upstanding portions 21 of the tubular members forming the canopy support, a pair of hook-like members 30 may be provided so that the entire tent including the canopy supporting arrangement may be suspended at the rear of the head of a conventional hospital type bed by hooking the members 30 over the top rail. To maintain the tent 10 upright when suspended from the bed rail as discussed above, and so that the canopy support is properly arranged, a bumper member in the form of a tube 31 is secured to the lower end of the tent and maintains it in spaced relationship and upright position with respect to the head of the bed from which it is suspended.

The inside of the tent 10 is provided with a vertical wall 36 which does not extend the full depth of the enclosure but terminates a suitable distance above the bottom 13, the purpose of which will be described later. The partition 36 generally divides the interior of the tent into two compartments, one about half as large as the other. The larger compartment 35 is adapted to hold a supply of ice and this is accomplished by means of perforate ice supporting drain plates 37 supported by suitable depending supports or legs 38 at about the level of the bottom of the partition wall 36. The bottom of the tent chest is provided with a suitable drain valve 39 from which ice water may be withdrawn as necessary.

Immediately above the ice supporting plates 37 and arranged about the lower portion at least of the walls of the ice containing compartment 35, is provided a continuous tubular coil 40, terminating at one end in a conduit 41 and at the other end in a conduit 42. These conduits extend under the partition 36 and into the smaller chamber 45.

Mounted in the side wall 11 of the tent 10 is the main oxygen supply inlet 46 provided with a threaded fitting to which may be secured a conduit such as a hose from any suitable gas supply such as for example one or more manifolded cylinders or from a piped gas supply system. The oxygen inlet 46 terminates interior of the wall 11 in an elbow 47 (FIG. 3). A short length of conduit 48 extends from the elbow 47 into a valve block 49, forming part of a two-way valve 50 also attached to the wall 11 and situated adjacent the oxygen inlet 46. From the block 49 of the two-way valve 50, a conduit 51 (FIG. 2) extends directly to a header 52 supplying the nebulizer 60 to be described later. The conduit 42 forming one end of the coil 40 is also connected to the block 49 of the two-way valve 50, and the other end 41 of the coil 40 is connected to the nebulizer header 52. The tent 10 is further provided with an additional oxygen inlet 54, preferably capped or valved, conveniently shown provided with a barbed end (FIG. 1) to which another supply conduit such as a hose may be readily secured.

The two-way valve 50 is manually operable to two positions and is arranged so that in one position oxygen entering the inlet 46 is passed from one outlet of the valve directly through the conduit 51 to the nebulizer header 52. In the other position of the valve 50, the oxygen entering the inlet 46 is not permitted to pass directly to the nebulizer through conduit 51, but is passed from another outlet of the valve through the conduit 42 and coil 40 in heat exchange relationship with the cooling media, and then through the conduit 41 to the nebulizer 60 by way of the nebulizer header 52. In this way, should the temperature in the canopy fall below the desired temperature, the valve may be manipulated so that uncooled oxygen is passed into the canopy until the temperature has been properly adjusted.

In certain instances, where more than a momentary or short-term adjustment is necessary to maintain a desired temperature or humidity in the canopy, the two-way valve may be manipulated so that the oxygen entering the inlet 46 is passed through the coil 40 to the nebulizer, and a flow meter (not shown) upstream of the inlet 46 is adjusted to permit only a portion if the amount of oxygen required for the patient to flow into the inlet 46. Another oxygen conduit is then attached from the supply to the second or additional valved oxygen inlet 54, and another flow meter (not shown) upstream of this inlet 54 is adjusted to provide the remainder of the required oxygen flow uncooled directly into the tent 10 and through a venturi of the nebulizer 60, as described below in connection with the function of the nebulizer and tent combination. In this manner, it will be seen that, should some fairly substantial temperature unbalance be noted in the canopy, it can be stabilized quickly by manipulation of the two-way valve 50 and thereafter the stabilized temperature may be maintained by utilizing a combination of uncooled gas entering through the oxygen inlet 54, mixed with cooled oxygen having been passed through the coil 40, the relative amounts of oxygen passing through the inlets 46 and 54 being regulated by flow meters (not shown) upstream of these connections. Such flow meters are readily available and are standard equipment in any installation requiring or utilizing an oxygen tent, and are considered conventional, necessary auxiliary equipment. It will also be noted that the amount of liquid nebulized and introduced into the canopy may also be varied.

The nebulizer apparatus 60 comprises a block-like housing 61 which is secured to a wall 62 of the tent chest 10 by suitable means such as a bracket and bolts 63. In the apparatus illustrated the nebulizer assembly 61 is preferably secured to the other side of the wall 62 of the tent 10 between the wall and the tent supporting structure 21, in which position it is readily accessible to an attendant for cleaning and replenishing of the liquid supply and yet is in a position where it is substantially protected from damage by virtue of the adjacent members 20, 21, 22 and 31 of the canopy supporting structure. The block-like nebulizer housing 61 is preferably of a clear plastic material and is provided with a central bore 65 flaring outwardly in an intermediate section at 66, to a larger diameter bore 67 at an opposite end concentric with the bore 65. The bore 65 is provided with a tubular member 70 which is press fit into the bore 65 and extends rearwardly therefrom. The tubular member 70 may be of any material and is preferably of a substantially non-corrosive metal, and forms an auxiliary housing for the nebulizer gas and liquid jets to be described later. Within the larger size bore 67 at the outwardly flared end of the intermediate bore 66 are positioned a series of mesh screening members 68, preferably of woven stainless steel wire or rod. In the apparatus illustrated there are four such pieces of mesh 68, which are placed with respect to one another at random so that the openings defined by the mesh are not in register. The purpose for this screening mesh will be described later in conjunction with the operation of the nebulizer.

The forward or delivery end of the housing 61 is completed by another block 71, preferably of the same material as 61, which is centrally bored at 72 and then flared outwardly at 73 to its greatest diameter, which is substantially the same as the diameter of the bore of 67 which holds the wire mesh 68 in the block 61. Together the flared walls 66 and 73 form a venturi chamber centrally and transversely of which the screening 68 is located. From the forward end of the bore 72, there extends a tubular member 75, the purpose for which is to project through an opening (not shown) for that purpose in an associated canopy 28. The forward assembly 71 is secured to the nebulizer main housing 61 by means of a plate 76, preferably of metal, and screws 77 in the manner best illustrated in FIG. 4, thereby completing the nebulizer housing.

Beneath and suspended from the nebulizer housing 61 is a receptacle 80 adapted to contain the liquid to be nebulized. The receptacle 80 may be formed of any suitable material, but preferably is of a translucent plastic material for resistance to breakage in handling and to render its interior readily visible. The receptacle 80 is preferably provided at its upper end with a peripheral groove 81 for engagement by one or more oppositely spaced inturned clamps 82, adjustably secured to the block 61 by a threaded hand wheel arrangement 83, one of which is illustrated in FIG. 1. The receptacle may be easily removed and replaced by manipulation of either of these clamps.

Extending from the tubular housing 70 within the block 61 and downwardly into the receptacle 80 is a tubular withdrawal conduit 84, at its lower end provided with a plurality of intake ports 85 and screening material 86, to prevent the ingress of sediment or other solids which may collect at the bottom of the receptacle. The upper end of the tubular member 84 terminates in a liquid jet 90 having an orifice 91 and mounted on a bracket 95, which is secured by any suitable means such as by brazing to the tubular housing 70. One end 96 of the bracket 95 is provided with a guide opening, through which a gas nozzle 100 extends, provided with a restricted orifice 101. The gas nozzle 100 is maintained in place by means of another bracket 105, which is secured to the inside of the wall 62 of the tent chest 10 by means of screws or bolts, such as 106. The position of this bracket and the bolts is more clearly illustrated in FIG. 2. The rear end of the gas nozzle 100 is connected by a threaded coupling 102 to the nebulizer header 52, as best illustrated in FIG. 4.

At the forward end of the bracket 95 there is positioned a target member or impingement surface 110, which is secured to the bracket 95 by means of a leg 111. The preferably spherical target member 110 is positioned within the venturi chamber 115 formed by the flaring walls 66 and 73 in the housing assembly 61 and 71. The bracket 95 maintains the relative positions of the gas nozzle 100, the liquid nozzle 90, and the target member 110 in a preadjusted position adapted to secure maximum nebulization of liquid. This is best accomplished by forming and positioning the bracket 95 so that the gas nozzle 100 extends substantially axially into the tubular housing 70 to a position in which its orifice 101 is closely adjacent the orifice 91 of the liquid nozzle 90. The orifice end of the liquid nozzle 90 is preferably tapered toward the orifice 91 which is preferably positioned in a plane slightly above the center of the orifice 101 of the gas nozzle 100. In this manner, gas issuing from the gas nozzle 100 will strike first the tapered end of the liquid nozzle 90, and be deflected upwardly adjacent the liquid orifice 91 and therefrom against the target 110, the center of which is substantially in line with the projected axis of the gas nozzle 100, but at a greater distance from the liquid nozzle orifice 91 than the latter is positioned from the gas nozzle orifice 101.

This nebulizer is adapted to nebulize and deliver a high volume of liquid in minute particle sizes in the range of 3 microns or less. To insure that particle sizes

delivered through the delivery tube 75 into the canopy are substantially uniform, the screening 68 is provided so that larger moisture particles are deposited thereagainst and drain through the tube 87 back into receptacle 80 and the liquid supply.

The device is completed with a transverse bore 119 forming an inspection port preferably in the upper portion of the nebulizer main housing 61 and the tubular chamber 70 in the vicinity of the liquid and gas nozzles 90 and 100, and is provided with a suitable closure member 120. In this manner the operating apparatus may be inspected by removal of the closure 120, and particularly if for any reason the liquid nozzle becomes clogged, it is readily accessible and may be cleaned by inserting a fine wire through the inspection port 119 into the liquid orifice 91.

It will be noted that the rear of the housing 70 opens into the tent chamber 45. In the other or ice containing chamber 36 of the tent 10 there is another port 124, forwardly of which extends a second tube 125 which projects into the canopy 28. It will be noted that the venturi chamber 115 of the nebulizer creates an area of low pressure rearward thereof within the housing 70 so that moisture laden gas entering the canopy through the delivery tube 75 is recirculated from the canopy through the return tube 125 into the larger ice chamber 35 of the tent 10, in which it will be cooled. As this recirculated atmosphere is cooled by the ice, a certain amount of moisture and dissolved impurities will be condensed out and washed by the melting ice to the bottom of the tent 10 where it and melted ice is withdrawn from time to time through the drain valve 39. The thus cooled atmosphere is then passed below the partition 36 through chamber 45, into the housing 70, and again through the nebulizer by way of the venturi chamber 115. In this manner a constant circulation, recooling and humidification of the canopy atmosphere is achieved without mechanical means necessitating moving parts. It should also be noted that the venturi arrangement of the nebulizer 60 will draw oxygen admitted directly into the tent by way of the additional oxygen inlet 54, through the nebulizer venturi and into the canopy 28 without increasing the nebulizing rate of the nebulizer. In this manner extra oxygen may be introduced for such purposes as flushing the tent and canopy, varying the percentage introduction of liquid into the canopy, varying the volume of recirculated canopy atmosphere, and as referred to earlier, effecting to some degree, temperature control and maintenance within the canopy.

It will be seen, therefore, that by combining a high volume nebulizer directly with an oxygen tent apparatus, numerous advantages are achieved. In addition to accomplishing recirculation of the atmosphere within the canopy itself by means requiring no mechanical moving parts, the recirculated atmosphere is simply and efficiently additionally cooled and fully resaturated as it is repassed through the nebulizer apparatus.

It will be apparent to those skilled in the art that applicant's combination of a high volume nebulizer and an oxygen tent is applicable not only to an ice cooled type of tent as illustrated in the preferred embodiment herein, but is equally applicable to the so-called iceless tent in which mechanical refrigerating apparatus is substituted for the ice chest refrigeration means presented here. In conventional iceless or mechanically refrigerated tents, it has been heretofore necessary to provide a mechanical blower apparatus in the form of a fan or squirrel cage type of impeller for moving and recirculating the canopy atmosphere and, as noted hereinbefore in connection with the iceless tent, applicant's invention may dispense with this movable mechanical apparatus. However, in certain installations where it is desired to move higher volumes of gas, it is entirely feasible that applicant's combination may include, particularly in an iceless type of tent, a blower apparatus. This may be equally true in the ice cooled type of tent where additional higher volumes of circulated atmosphere are required. Such requirements are directly dependent upon the size of the canopy employed, which obviously regulates the control volume of the atmosphere in which the patient is treated.

Likewise, although applicant discloses herein a preferred embodiment of high volume nebulizer, it is obvious that other high volume nebulizers may be substituted in applicant's combination and function in the same manner with either the ice cooled or iceless variety of tent apparatus. It will be apparent, therefore, that certain modifications will be suggested to those skilled in the art, and all such modifications as come within the spirit of this invention are intended to be included within its scope, as defined by the appended claims.

I claim:

1. In an oxygen tent apparatus for controlled inhalation thereapy in association with a canopy, the combination comprising a heat insulated cooling chamber, a tubular coil within said chamber for passage of an oxygen-containing gas in heat exchange relationship with a cooling medium, a liquid nebulizer adapted to entrain particles of finely divided liquid in said oxygen, a gas nozzle for said nebulizer in communication with the outlet end of said tubular coil, and a by-pass conduit in communication with said gas nozzle for shunting uncooled oxygen-containing gas at preselected times directly to the nebulizer.

2. In an oxygen tent apparatus for controlled inhalation therapy in association with a canopy, the combination comprising a heat insulated cooling chamber, a tubular coil within said chamber for passage of an oxygen-containing gas in heat exchange relationship with a cooling medium, a liquid nebulizer adapted to entrain particles of finely divided liquid in said oxygen-containing gas, a gas nozzle for said nebulizer in communication with the outlet end of said tubular coil, a two-way valve adapted to admit oxygen-containing gas from a source thereof, the inlet end of said tubular coil communicating with one outlet of said valve, and a by-pass conduit communicating the other outlet of said valve directly with the nebulizer gas nozzle, said valve being operable in one position to pass the oxygen-containing gas through said tubular coil and in the other position to pass uncooled oxygen-containing gas directly to the gas nozzle in the nebulizer.

3. In an oxygen tent apparatus for controlled inhalation therapy in association with a canopy, the combination comprising a heat insulated cooling chamber, a tubular coil within said chamber for passage of an oxygen-containing gas in heat exchange relationship with a cooling medium, a liquid nebulizer adapted to entrain particles of finely divided liquid in said oxygen-containing gas, a gas nozzle for said nebulizer in communication with the outlet end of said tubular coil, a two-way valve adapted to admit the oxygen-containing gas from a source thereof, the inlet end of said tubular coil communicating with one outlet of said valve, and a by-pass conduit communicating the other outlet of said valve directly with the nebulizer gas nozzle, said valve being operable in one position to pass the oxygen-containing gas through said tubular coil and in the other position to pass uncooled oxygen-containing gas directly to the gas nozzle in the nebulizer, whereby adjustment of temperature in the canopy may be obtained, and another inlet for entry of substantially uncooled oxygen-containing gas from a source thereof in communication with said nebulizer, by means of which in conjunction with manipulation of the two-way valve to pass oxygen-containing gas through the tubular coil, the adjusted temperature of the canopy atmosphere may be maintained and the oxygen concentration and liquid content in the canopy may be varied.

4. In an oxygen tent apparatus for controlled inhalation therapy in association with a canopy, the combination comprising a heat insulated cooling chamber, a tu-

bular coil within said chamber for passage of an oxygen-containing gas in heat exchange relationship with a cooling medium, a liquid nebulizer adapted to entrain particles of finely divided liquid in said oxygen-containing gas, a gas nozzle for said nebulizer in communication with the outlet end of said tubular coil, a two-way valve adapted to admit oxygen-containing gas from a source thereof, the inlet end of said tubular coil communicating with one outlet of said valve, and a by-pass conduit communicating the other outlet of said valve directly with the nebulizer gas nozzle, said valve being operable in one position to pass oxygen-containing gas through said tubular coil and in the other position to pass uncooled oxygen-containing gas directly to the gas nozzle in the nebulizer, whereby adjustment of temperature in the canopy may be obtained, and another inlet for entry of substantially uncooled oxygen-containing gas from a source thereof in communication with said nebulizer, by means of which in conjunction with manipulation of the two-way valve to pass oxygen-containing gas through the tubular coil, the adjusted temperature of the canopy atmosphere may be maintained, means including a venturi chamber communicating the interior of the canopy with the cooling chamber through said nebulizer, and another means spaced from said last mentioned means also communicating the interior of the canopy with the cooling chamber whereby recirculation of the canopy atmosphere through the cooling chamber and nebulizer is achieved and the oxygen concentration and liquid content of the canopy atmosphere varied.

5. An oxygen tent apparatus comprising in combination, an insulated cooling chamber, a canopy supporting structure secured to one side of the cooling chamber, a pair of hook-like members attached to the base of said canopy supporting structure for suspending the tent from a bed rail, a bumper element secured to the same side of said chamber and below the base of the canopy supporting structure to space the tent from the bed and maintain it upright, a liquid nebulizer provided with a gas nozzle and a venturi secured to said chamber and within the space defined by the base of the canopy supporting structure and said bumper, said venturi being in communication with the interior of the cooling chamber and the space beneath the canopy supporting structure, another conduit spaced from said nebulizer also communicating the interior of the cooling chamber and the space within the canopy supporting structure, a tubular coil within said cooling chamber the outlet of which is in communication with the nebulizer gas nozzle, and means for communicating the inlet of said tubular coil with a source of uncooled oxygen-containing gas.

6. An oxygen tent apparatus as claimed in claim 5, including valve means operative in one position to pass the oxygen-containing gas through said tubular coil to the nebulizer and in another position to pass uncooled oxygen-containing gas directly to the nebulizer, and another inlet for direct entry of substantially uncooled oxygen-containing gas into the nebulizer venturi independent of said valve means where, by selective use the temperature of the canopy atmosphere may be regulated and maintained and the liquid content of the canopy atmosphere varied.

7. An oxygen tent apparatus as claimed in claim 6, in which said insulated cooling chamber is adapted to contain a supply of ice.

8. Apparatus for controlled inhalation therapy administered within a canopy for confining a special atmosphere at the point of its use, comprising in combination a canopy, a tent external of the canopy divided into two communicating chambers, a tubular coil disposed in one of said chambers for the passage of a gaseous stream in heat exchange relationship with a cooling medium, means communicating said one chamber with said canopy, and a liquid nebulizer adapted to entrain particles of finely divided liquid in said gaseous stream in communication with the other of said chambers, said nebulizer being

provided with a gas nozzle in communication with the outlet end of said tubular coil and with a venturi chamber communicating said other of said chambers and said canopy.

9. Apparatus as claimed in claim 8, in which the chamber containing the tubular coil is adapted to contain a supply of ice.

10. A nebulizer for entraining minute particles of liquid in a gaseous steam, comprising a main housing provided with a central longitudinal bore, said bore being flared at an intermediate portion to provide a venturi chamber, a gas nozzle, a liquid nozzle and an impacting surface spaced apart and positioned substantially at the inlet side of the venturi chamber, and metal wire mesh screening material positioned centrally within and transversely of the venturi chamber, said apparatus adapted to pass a stream of gas under pressure from the gas nozzle to adjacent the liquid nozzle to draw liquid therethrough into the stream and impact it into particles against the impacting surface and thereafter to deposit only the larger liquid particles on the mesh screening so that a substantially uniform moisture laden cloud issues from the outlet end of said venturi chamber.

11. A nebulizer for entraining minute particles of liquid in a gaseous stream, comprising a main housing provided with a central longitudinal bore, said bore being flared at an intermediate portion to provide a venturi chamber, a gas nozzle, a liquid nozzle and an impacting surface spaced apart and positioned substantially at the inlet side of the venturi chamber, and a plurality of non-registering metal wire mesh screens positioned within the venturi chamber in the area of its maximum expansion and transversely of the venturi chamber, said apparatus adapted to pass a stream of gas under pressure from the gas nozzle to adjacent the liquid nozzle to draw liquid therethrough into the stream and impact it into particles against the impacting surface and thereafter to deposit only the larger liquid particles on the mesh screening so that a substantially uniform moisture laden cloud issues from the outlet end of said venturi chamber.

12. A nebulizer as claimed in claim 11, including an auxiliary tubular housing extending from the inlet end of said longitudinal bore, said gas nozzle, liquid nozzle and impacting surface being spaced apart substantially within and axially of said tubular housing.

13. A nebulizer as claimed in claim 11, including a receptacle adapted to contain liquid to be nebulized suspended below said main housing, a tube extending from said liquid nozzle to adjacent the bottom of said receptacle, and means for draining liquid deposited on said screening material into the receptacle.

14. A nebulizer for entraining minute particles of liquid in a gaseous stream, comprising a main housing provided with a central longitudinal bore, said bore being flared at an intermediate portion to provide a venturi chamber, a receptacle adapted to contain liquid to be nebulized suspended below said main housing, said receptacle being provided with a groove, at least one releasable clamp secured to said main housing and adapted to engage said groove to secure the receptacle in place beneath the housing, a gas nozzle, a liquid nozzle, a tube extending from said liquid nozzle to adjacent the bottom of said receptacle, an impacting surface spaced apart and positioned substantially at the inlet side of said venturi chamber, a plurality of non-registering mesh screens positioned within the venturi chamber in the area of its maximum expansion and transversely of the venturi chamber, said apparatus adapted to pass a stream of gas under pressure from the gas nozzle to adjacent the liquid nozzle to draw liquid therethrough into the stream and impact it into particles against the impacting surface and thereafter to deposit only the larger liquid particles on the mesh screening so that a substantially uniform moisture laden cloud issues from the outlet end of said venturi chamber, and means for draining liquid deposited on said screen material into the receptacle.

15. A nebulizer for entraining minute particles of liquid in a gaseous stream, comprising a main housing provided with a central longitudinal bore, said bore being flared at an intermediate portion to provide a venturi chamber, a gas nozzle, a liquid nozzle, an inspection port in said main housing adjacent the gas and liquid nozzles and a closure for said port, an impacting surface spaced apart and positioned substantially at the inlet side of the venturi chamber, and a plurality of non-registering mesh screens positioned in the venturi chamber in the area of its maximum expansion and transversely of the venturi chamber, said apparatus adapted to pass a stream of gas under pressure from the gas nozzle to adjacent the liquid nozzle to draw liquid therethrough into the stream and impact it into particles against the impacting surface and thereafter to deposit only the larger liquid particles on the mesh screening so that a substantially uniform moisture laden cloud issues from the outlet end of said venturi chamber.

16. In combinatioin, an oxygen tent canopy, oxygen tent apparatus for controlled inhalation therapy in association with said canopy, means including a cooling chamber external of the canopy for passing an oxygen-containing gas in heat exchange relationship with a cooling medium, a liquid nebulizer at the outlet end of said means for entraining particles of finely divided liquid in said gaseous stream and passing said moisture laden gas into said canopy to establish an atmosphere therein, means including a venturi chamber in said nebulizer for causing recirculation of the established atmosphere in said canopy through said cooling chamber and said nebulizer wherein the recirculated atmosphere is further cooled and saturated, and means for adjusting and maintaining a predetermined temperature of the atmosphere within said canopy.

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