

Jan. 5, 1971

J. D. VALENTA

3,552,141

CONTROLLED ENVIRONMENT TENT

Filed July 19, 1968

2 Sheets-Sheet 1

FIG. 2

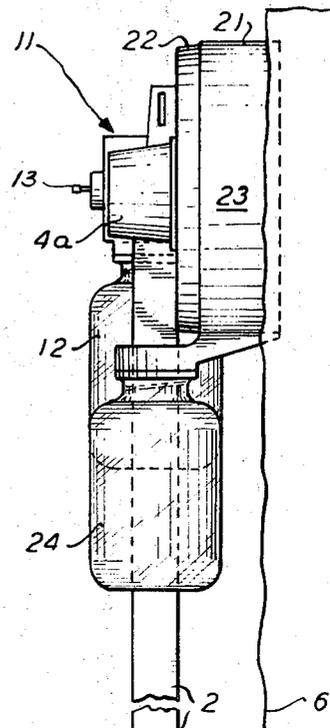
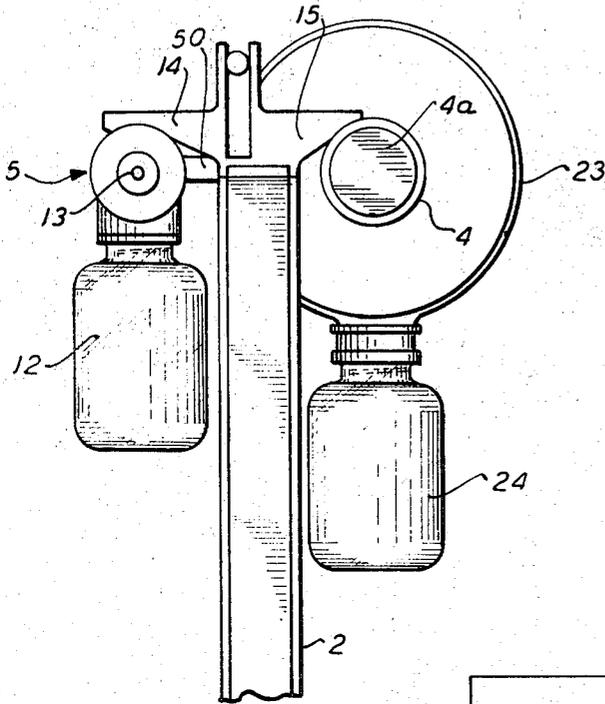
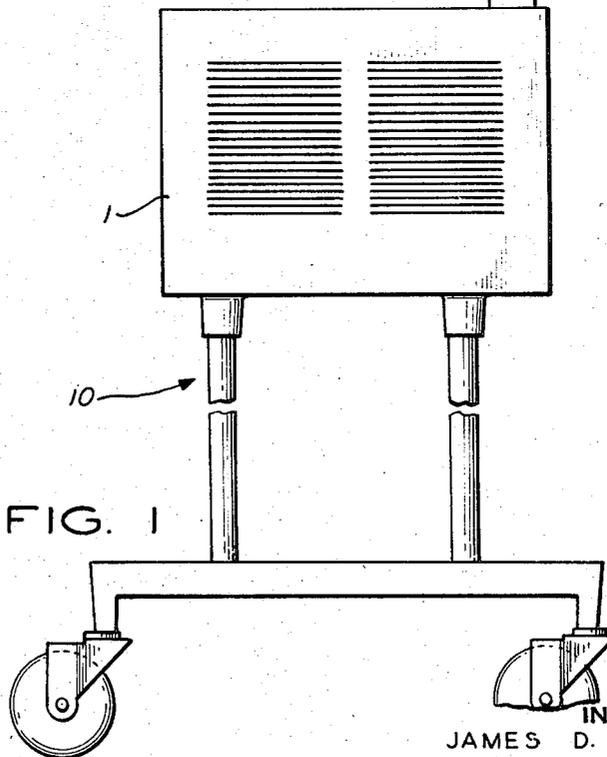


FIG. 1



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FIG. 3

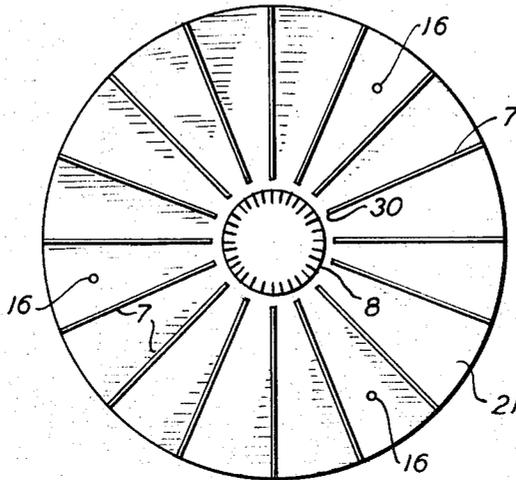
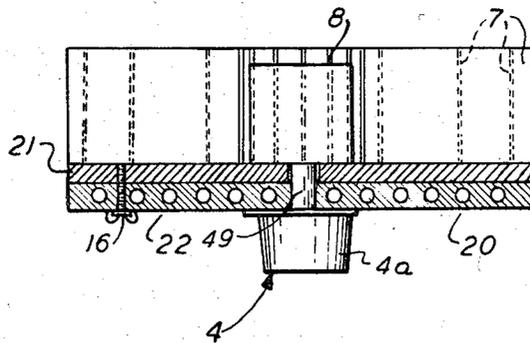


FIG. 4



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CONTROLLED ENVIRONMENT TENT

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U.S. Cl. 62—407

4 Claims

ABSTRACT OF THE DISCLOSURE

A controlled environment tent having a mechanical refrigeration system with removable and sterilizable heat exchange apparatus.

BACKGROUND OF THE INVENTION

This invention relates to apparatus for the treatment of respiratory ailments, as for example, in the treatment of croup.

Prior art apparatus of this type has provided humidity and temperature control of the environment in which the patient is enclosed with desired introduction of medicament whereby the relative humidity is generally increased while the temperature is decreased.

Since the same humidification and refrigeration apparatus is utilized with subsequent patients, the prior art apparatus has also attempted to facilitate removal of this apparatus for cleaning and sterilization to prevent cross-contamination.

However, in this attempt, the cooling means has been merely an ice-bucket which would be removed and treated or replaced for each new patient. The major problem with using ice as a coolant is the insufficiency of the cooling effect. Mechanical refrigeration systems, on the other hand, provide a sufficient cooling effect but inherently result in a more difficult cleaning and sterilization procedure.

Applicant has solved the latter problem in his present invention by providing a mechanical refrigeration system which has an easily removable and autoclavable heat exchange surface to reduce cross-contamination and provide sufficient tent environment cooling.

SUMMARY

Applicant's invention is directed toward a novel two-part heat exchanger held mechanically together with the finned plate and fan being easily separable from the refrigerant coil plate and being easily autoclaved once separated therefrom.

It is thus an object of the present invention to provide a heat-exchange surface which is readily removable from the refrigeration system of a controlled environment tent and sterilizable as, e.g., by autoclaving to reduce cross-contamination and provide the desired cooling of the tent atmosphere.

The foregoing objects and other objects, features and advantages will become apparent in the light of the following description and claims taken with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of the pediatric mist tent, the refrigeration system and heat exchange apparatus associated therewith;

FIG. 2 is a front view of the humidification and heat exchanger;

FIG. 3 is an end view of the finned plate; and

FIG. 4 is a cross-sectional view of the heat exchanger.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more specifically to the drawings with reference characters, in FIG. 1 a portable stand 10 supports a refrigeration unit 1 including conventional compressor and condenser apparatus. A rectangular tube 2 extends upwardly from the unit 1 and encloses the refrigerant lines.

The humidification and heat exchanger apparatus generally designated at 11 in FIG. 1 comprises, as shown in FIG. 2 a conventional nebulizer assembly 5 having a water reservoir jar 12 and inlet 13 for connection to a source of compressed air and/or pure oxygen as the case may be. The gas flow as in the conventional nebulizer draws moisture from the reservoir by negative pressure under venturi principles and supplies the canopy with moisture particles carried thereby. Thus, the nebulizer assembly fitting into a canopy opening and supported by an arm 14 of tube 2 humidifies the closed environment and supplies fresh air and/or pure oxygen thereto.

In the following disclosure it is to be noted that applicant distinguishes the heat exchanger from the heat exchange apparatus in that the latter does not include cooling coil plate 22 and blower motor 4a.

A second arm 15 of tube 2 supports the heat exchanger. The heat exchanger includes a cooling coil plate 22; a finned plate 21; and a blower unit 4 with motor 4a as shown in FIG. 4, shaft 49 extending through coil plate 22 and finned plate 21, and blower wheel 8 fitted on shaft 49 within a cut-away at 30 of the cold fins 7. The finned plate 21 has a condensation bottle 24 attached to a sheath 23 for receipt of condensate when the atmosphere within the tent contacts the cold fins 7 and plate 21. Sheath 23 circumferentially surrounds fins 7 and extends approximately one-quarter of an inch beyond the fins so that canopy 6 can be snugly fit thereover. The sheath is preferably removable from plate 21 to facilitate cleaning and autoclaving.

A tube 50 connects sheath 23 with nebulizer assembly 5 to provide an air passage from the sheath-tent environment to the nebulizer body. The velocity with which the air is entrained into the nebulizer (due to the blower and compressed gas) assists in propelling the nebulizer generated fog into the tent.

As shown in FIGS. 3 and 4, the heat exchange apparatus comprises a finned plate 21, preferably of cast aluminum with radially extending fins 7 integrally attached on one side thereof. The plate fins 7 are cut away at 30 to receive the blower wheel 8 while the plates 21 and 22 each have a hole for receiving the motor shaft 49. Attached to the heat exchange apparatus and, specifically, finned plate 21 by, e.g., thumb screws 16 is cooling coil plate 22, preferably an aluminum casting enclosing spirally configured refrigerant coil 20, preferably made of copper. The coil plate could merely be a flat aluminum sheet pressing the coil 20 against plate 21. In either case, the coil is in fluid flow relation with the refrigerant lines in tube 2 for recirculation of refrigerant through unit 1.

In operation the nebulizer assembly supplies moisture to the canopy while refrigerant circulates through the refrigerant lines and coil 20. Coil 20 cools finned plate 21 which by blower circulatory action cools the canopy atmosphere with which it comes into contact. When another patient is to utilize the tent, the finned plate 21, the blower wheel 8 and the sheath 23, which were the only heat exchanger components to have come into substantial contact with the canopy atmosphere of the previous patient, are removed from the coil plate 22 and shaft 49 and sterilized as by autoclaving to reduce cross-con-

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tamination of patients thereby. The nebulizer assembly 5 can also be removed and sterilized.

It is intended that all matter contained in the above description or shown in the accompanying drawing shall be considered illustrative and not in a limiting sense. For purposes of definition, the term cleaning procedures shall be considered to include sterilizing.

Having described the invention, what I claim is:

1. A controlled environment tent construction in combination with an environmental conditioning system, said tent construction comprising a canopy overlying and enclosing a patient support, said environmental conditioning system comprising mechanical refrigeration apparatus and heat exchange apparatus, said refrigeration apparatus including refrigerant cooling and transporting means, said transporting means includes a cooling coil in association with first plate means, said heat exchange apparatus being in contact with the tent environment through an opening in said canopy for cooling said environment and being releasably secured to said transporting means in heat conducting relation thereto to permit easy removal of said exchange apparatus for cleaning procedures, said heat exchange apparatus includes second plate means which comprises a plate having fins extending radially on one side thereof, said finned plate having an opening therethrough with the fins being cut-away adjacent said opening, and said heat exchange apparatus further includes a blower wheel extending into said cut-away and being fitted on a motor shaft extending through said opening and a sheath circumferentially enclosing said fins and extending from the finned plate into said canopy such that the tent environment can be forceably brought into and out of contact with the second plate means by the action of said blower wheel to cool said environment.

2. A controlled environment tent construction in combination with an environmental conditioning system, said tent construction comprising a canopy overlying and en-

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closing a patient support, said environmental conditioning system comprising mechanical refrigeration apparatus and heat exchange apparatus, said refrigeration apparatus including refrigerant cooling and transporting means, said transporting means including a cooling coil in association with a first plate means, said heat exchange apparatus positioned within the overlying canopy in contact with the tent environment for cooling said environment and including second plate means in heat conducting relationship with said first plate means, said heat exchange apparatus being releasably secured to said transporting means whereby said transporting means is protected from contact with the tent environment.

3. The combination as set forth in claim 2 wherein said heat exchange apparatus further includes a blower wheel within the tent environment fitted on a motor shaft extending through an opening in said second plate means and a sheath circumferentially surrounding said second plate means and extending into said canopy such that the tent environment can be forceably brought into and out of contact with the second plate means by the action of said blower wheel to cool said environment.

4. The combination as set forth in claim 3 wherein said sheath further includes means for collecting condensate formed on said second plate means.

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