

Feb. 13, 1940.

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2,190,613

REFRIGERATING APPARATUS

Filed April 30, 1936

2 Sheets-Sheet 1

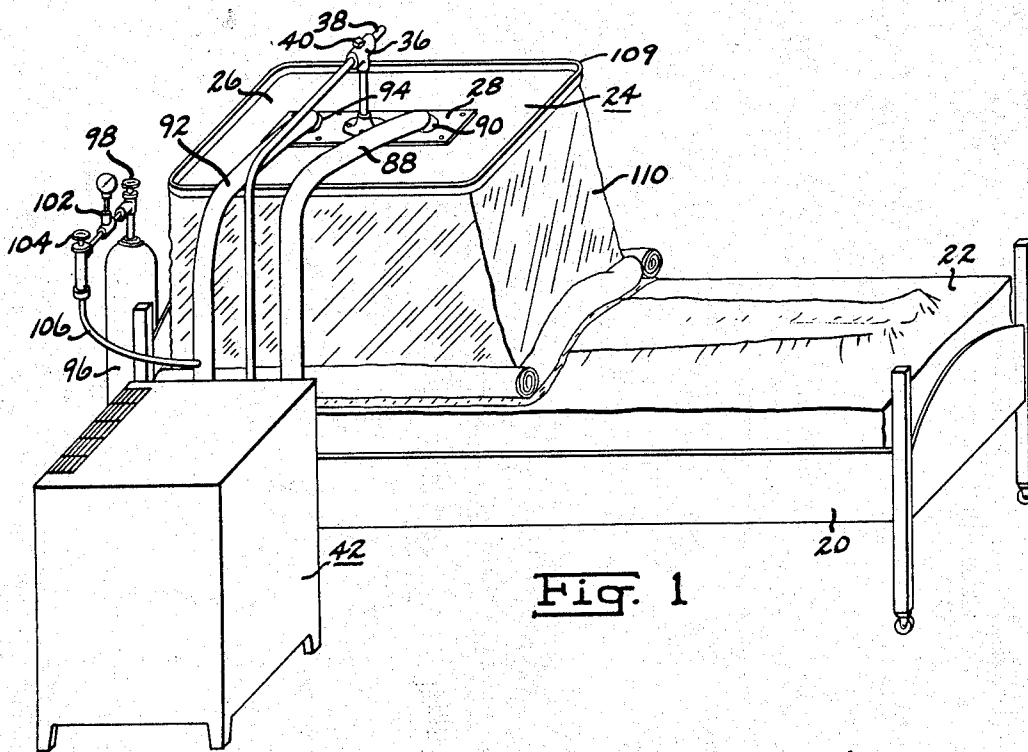


Fig. 1

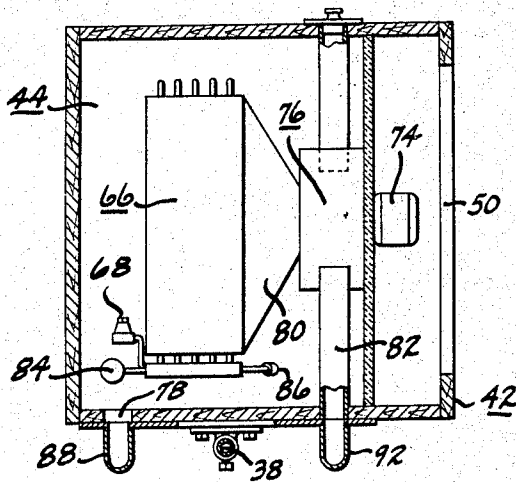


Fig. 3

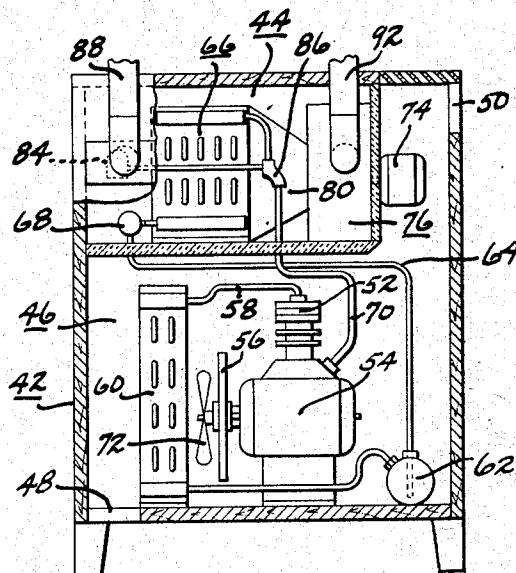


Fig. 2

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2 Sheets-Sheet 2

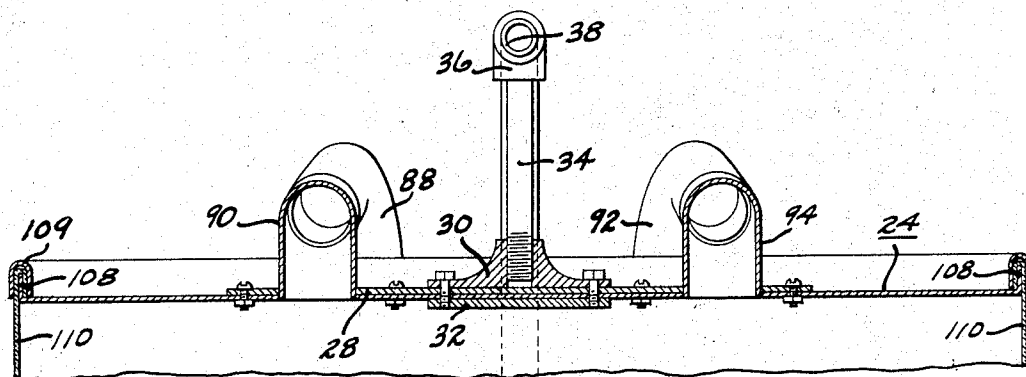


Fig. 4

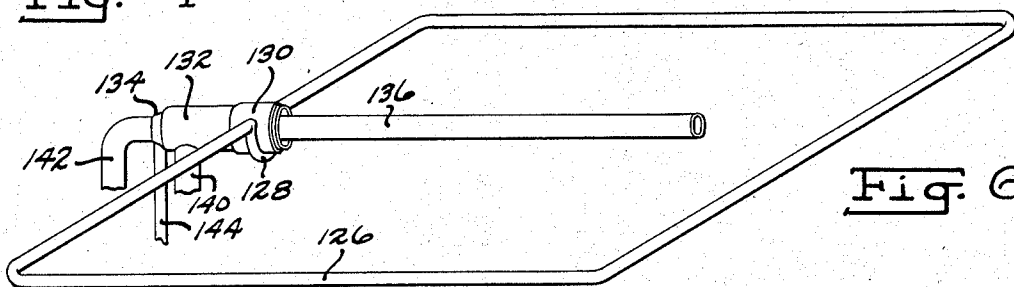


Fig. 6

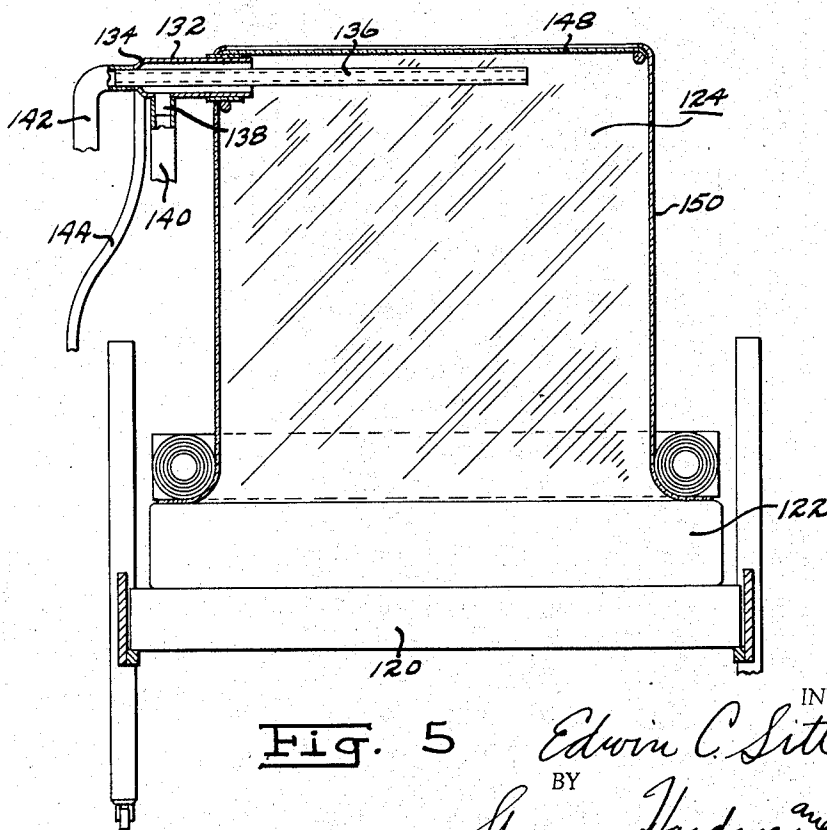


Fig. 5

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REFRIGERATING APPARATUS

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Application April 30, 1936, Serial No. 77,249

4 Claims. (Cl. 128—191)

This invention relates to refrigerating apparatus and more particularly to refrigerated oxygen administering apparatus.

Although oxygen therapy has been known for a number of years, its practical application on a large scale is still in its infancy. Heretofore, oxygen administering apparatus has not been particularly attractive or particularly comfortable and has been relatively high in initial cost and requires considerable attention.

It is an object of my invention to provide a more efficient, economical and desirable oxygen administering apparatus which will also be low in initial cost and simple in operation in order to encourage much more wide spread use of oxygen therapy wherever such treatment is advantageous.

It is another important object of my invention to provide an oxygen administering apparatus having an enclosure substantially entirely transparent in order to avoid the injurious psychological impression of being boxed in.

It is still another object of my invention to provide an oxygen tent or enclosure which is formed substantially entirely by a flexible transparent rubber-like material.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a perspective view of one form of my invention;

Fig. 2 is a vertical sectional view through the refrigerated air cooling apparatus for the oxygen tent;

Fig. 3 is a horizontal sectional view through the air cooling apparatus shown in Figs. 1 and 2;

Fig. 4 is a vertical sectional view through the top of the tent shown in Fig. 1;

Fig. 5 is a vertical sectional view through another form of oxygen administering apparatus including the tent; and

Fig. 6 is a fragmentary view of the supporting means of the tent shown in Fig. 5.

Briefly, in Fig. 1, I have shown an oxygen administering apparatus including a tent having an upper metal top provided with depending side walls extending downwardly to the bed, which are formed of a transparent rubber-like material. This tent encloses the head and upper portion of the body of the patient lying in the bed and is sufficiently high to permit the patient to sit up in the bed without interference. At the

side of the bed is a refrigerating unit for withdrawing air from the tent, cooling the air and returning the cooled air to the tent in order to keep the tent at the proper temperature. At the rear of the bed is an oxygen tank together with flow control and pressure reducing valves in order to control the flow of oxygen into the supply air pipe from the refrigerating unit to the top of the tent.

In the second form of my invention the supporting means for the tent is made of a square loop which also supports the detachable air supply and withdrawing pipes which are concentric with each other, and which through a supporting rod support the loop which in turn supports the tent. The tent is of an inverted bag shape which slips over the loop from the top so that the upper part of the bag is supported by the loop which is located within the bag. This tent or enclosure is made entirely out of a transparent rubber-like material and extends down to the bed clothing on the bed. This tent is also sufficiently high to allow the patient to sit up in the bed without interference. It will be noted that there is practically no interference with normal light upon the patient by the enclosure and thus very little impression of being boxed in is found in this particular apparatus.

Referring now to the drawings and more particularly to Fig. 1, there is shown a bed 20 provided with bed clothing 22 for supporting a patient in the bed. Extending over the head end of the bed is a tent or enclosure generally designated by the reference character 24. This tent has an upper metal top 26 substantially square or rectangular in shape which is provided with a central plate 28 fastened thereto and a threaded flange member 30 which is fastened through the sheet metal top 26 to a plate 32 on the bottom side of the top 26. This threaded flange member 30 receives a threaded tubular member or pipe 34 which extends directly upwardly to a T-connection 36.

This T-connection 36 is slidably mounted upon the supporting rod 38 normally held in a fixed position by a set screw 40 which clamps the T-connection to the rod 38. This rod 38 is generally an inverted L-shape and has its lower end fastened to the refrigerating unit 42 located at the side of the bed, which refrigerating unit has its external configurations so made as to resemble an ordinary night table. This refrigerating unit 42 contains an insulated sealed and enclosed upper chamber 44 where the air from the tent is cooled and a lower chamber 46 containing a re-

refrigerant liquefying apparatus which is provided with an inlet opening 48 in the bottom of the cabinet and an outlet opening 50 in the upper rear portion of the cabinet.

5 The refrigerant liquefying apparatus located in the liquefying chamber 46 includes a compressor 52 driven by an electric motor 54 through pulley and belt means 56 for compressing refrigerant and forwarding the compressed refrigerant through a supply conduit 58 to a condenser 60 where the compressed refrigerant is liquefied and cooled in a receiver 62. From the receiver 62 the liquid refrigerant is forwarded through a supply conduit 64, under the control of a suitable expansion control device 68, to a refrigerant evaporating means 66 located in the upper compartment 44. The refrigerant evaporates in the evaporating means under reduced pressure and is returned to the compressor through the return conduit 70. The electric motor 54 is also provided with a fan 72 for drawing air through the inlet 48 and the condenser 60 into the compartment 46 and circulating the air over the motor and compressor and receiver and thence discharging 25 the air through the outlet 50.

Located in this compartment 46 is an electric motor 74 which has its drive shaft extending through the rear wall of the compartment 44 to a centrifugal fan 76 located in the compartment 30 44, which draws air into the compartment 44 through an inlet 78 and thence through the passages in the evaporating means 66 and through a collecting hood 80 into the interior of the fan from which the air is discharged under pressure 35 through an outlet duct 82. The temperature of the evaporating means is controlled by a thermostatic suction line valve means which includes a temperature sensitive bulb 84 located between the inlet 78 and the evaporating means 66. This 40 temperature sensitive bulb 84 is operably connected with a suction line valve 86 which controls the withdrawal of refrigerant from the evaporating means 66 in order to control the amount of cooling effect upon the air circulated through the apparatus without starting and 45 stopping the refrigerant apparatus.

The inlet 78 to the compartment 44 is connected by a flexible air conducting duct means 88 with an elbow 90 which is fastened to the metal top 26 of the tent or enclosure. Likewise 50 the discharge duct 82 is connected by a flexible supply duct 92 with an elbow 94 which is connected to the metal top 26 for supplying cooled air to the tent or enclosure. The oxygen tank 55 96 is located at any convenient point and is provided with a shut off valve 98 and a pressure regulating supply valve 102 and a second regulating valve 104 for controlling the supply of oxygen through the tube 106 to the flexible supply duct 60 92 which carries the oxygen along with the supply air into the tent or enclosure.

The upper metal top 26 of the tent or enclosure is provided with an up-turned flange 108 which extends entirely around its four edges. 65 The side walls 110 are formed of a transparent flexible rubber-like material, generally in the form of a large tube or duct which has its upper edges folded over the up-turned flange 108 which extends around the edge of the upper metal top 70 26. This folded over upper edge of the side walls is held in place by a clamping means 109, U-shaped in cross section, extending entirely around and over the up-turned flange 108 and the folded over upper edge of the side walls. This clamp 75 may be in one piece or it may be in four pieces,

one for each side of the top. It may be made of metal or rubber, or rubber covered metal. These side walls may be readily removed by removing the clamping means and may be readily replaced or renewed by folding over the upper edges over 5 the up-turned flange of the top wall and again applying the clamps.

The material which forms the side walls of the tent is a thermoplastic thin transparent sheet material, commercially known as "Pliofilm" 10 which contains rubber, tin and a chloride compound. In making this material, pale crepe rubber is put into solution and is chemically reacted upon in this condition. After the completion of the reaction, the rubber is precipitated in a fine granular form, in which it is thoroughly washed and dried. The fabrication of this synthetic resin into finished usable material is carried out on an ordinary mill, where it is formed into thin rubber-like transparent thermoplastic sheets. The crepe rubber contains no sulphur or sulphur bearing agents. 20

In Figs. 5 and 6, I have shown an improved form of my invention. In Fig. 5, there is shown a bed 120 provided with a mattress and bed 25 clothing 122 above which there is provided a tent or enclosure generally designated by the reference character 124. This tent or enclosure is supported by a square or rectangular loop 126 of steel tubing or rod which at the middle of one 30 side is provided with a U-shaped loop portion 128 which receives a sleeve 130 which is welded thereto. This sleeve 130 is slidably received with a fairly snug fit by an outer tube 132 which has its outer end reduced as shown at 134 and welded 35 to a smaller inner tube 136.

This outer tube 132 is provided with an outlet 138 at its lower portion which receives a flexible air conducting tube or duct 140 for withdrawing air from the enclosure. The smaller tube 136 40 receives the supply air conducting duct 142 which supplies the cooled air and oxygen from the refrigerating unit to the smaller tube which carries it into the opposite side of the tent or enclosure 124. A supporting rod 144 which is similar to the supporting rod 38 found in Fig. 1 has its upper end fastened to the lower rear portion of the neck end or reduced portion of the outer tube 45 132.

The walls of the tent or enclosure include a top wall 148 of substantially the same size as the 50 loop 126 which has the upper edges of the side walls 150 fastened thereto, preferably by the application of heat and pressure. However, other suitable fastening means may be used, such as any form of glue or cement or some form of 55 adhesive tape or a stitching process. Preferably, this material is a flexible transparent rubber-like material of the same or substantially the same composition as the material used for the side walls 110 of the tent 24 in Fig. 1. 60

In operation, air is withdrawn from the upper part of the tent between the concentric inner and outer tubes 136 and 132 through the outlet and the duct 140 to the refrigerating unit where 65 the air is cooled by the refrigerating apparatus similar to that designated by the reference character 42 in Fig. 1 and again supplied through the supply duct 142 to which oxygen is also administered from the oxygen tank in suitable 70 quantities, and carried to the tube 136. The tube 136 carries the cooled air and oxygen to the opposite side of the tent.

This tent, like the tent 24 is sufficiently high to permit the patient to readily sit up in the bed 75

within the tent without any interference. Light can come in through the transparent top and walls of the enclosure without any restriction except from the small area covered by the loop

- 5 126, the supply and return pipe 132 and 136, the supply and return ducts 140 and 142, as well as the supporting rod 144, all of which are rather small in diameter and do not appreciably cut off the light to the patient.
- 10 The tent is put in place by first withdrawing the assembly including the tubes 132 and 134 from the sleeve 130 and the loop 126 and then inserting the loop 126 into the tent or enclosure 124 so that it rests against the inside of the top of the
- 15 tent or enclosure. The tent or enclosure is provided with an aperture which tightly receives the sleeve 130. Then this tent, including the loop 126 and the sleeve 130, is connected to the supporting means by slipping the sleeve 130 over the
- 20 outer tube 132 so that the loop 126 and the tent 124 is supported by the outer tube 132 and the supporting rod 144.

- The side walls of the tent are sufficiently long to extend down to the bed clothing upon the bed.
- 25 Thus, my tent has been greatly simplified by making the inlet and outlet tubes concentric and by using them to support the loop which forms the framework for supporting the tent. This makes the apparatus low in cost and highly desirable from almost every standpoint. The refrigerating unit is economical and gives an excellent control of the temperatures within the enclosure. The material used in the walls of the
- 30 tent permits the escape of carbon dioxide with considerable ease, but presents a much greater resistance to any passage of oxygen therethrough. It is apparent that this material may be readily replaced when necessary.

- While the form of embodiment of the invention
- 40 as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

- 45 1. A tent including a loop means, means for

supporting the loop means over a body supporting means, an enclosure in the form of an inverted bag enclosing and supported by said loop means, one of said means being provided with means for conducting air to and for withdrawing air from said enclosure, said enclosure having its side walls extending downwardly to the body supporting means.

2. A tent including a horizontal loop means, means for supporting the loop means over a body supporting means, an enclosure in the form of an inverted bag enclosing and supported by said loop means, one of said means being provided with means for conducting air to and for withdrawing air from said enclosure, said enclosure having its side walls extending downwardly to the body supporting means, said inverted bag-like enclosure being formed entirely of a translucent rubber-like sheet material.

3. A transparent tent for patients resting upon a body supporting means comprising a generally horizontal loop means extending over the body supporting means, fluid conduit means connected to said loop means, means for supporting said conduit means and said loop means so that the loop means extends over a body supporting means, and flexible rubber-like translucent sheet means greater in area than the area enclosed by the loop means extending over said loop means and having the edge portions hanging down and extending to the body supporting means, said sheet means being substantially sealed to said conduit means.

4. A tent including a generally horizontal loop means, an air conducting means for delivering air and for supporting said horizontal loop means and a flexible rubber-like transparent sheet means extending over and being supported by said loop means to form the tent, said sheet means tightly receiving said air conducting means, said tent formed by said sheet means receiving air from said air conducting means.

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