Sept. 21, 1937. R. S. GAUGLER 2,093,834

REFRIGERATING APPARATUS

Filed April 30, 1934 6 Sheets-Sheet 1

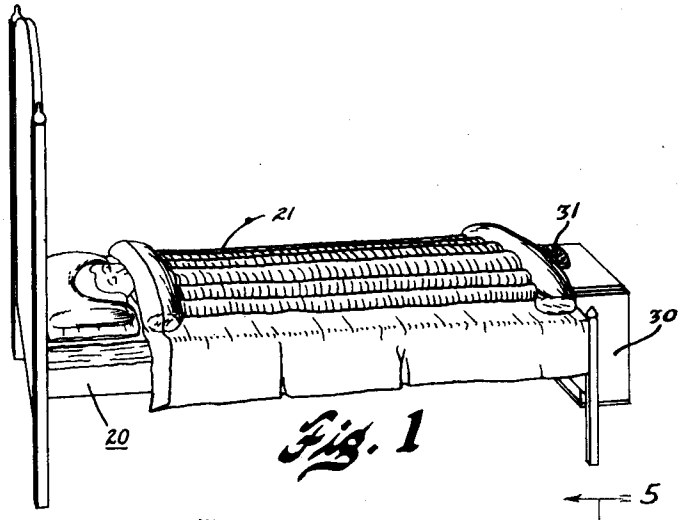


Fig. 1

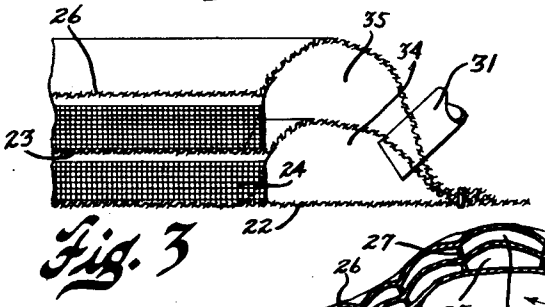


Fig. 3

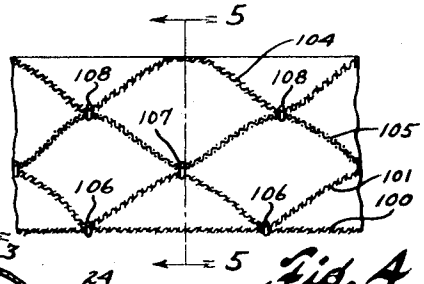


Fig. 4

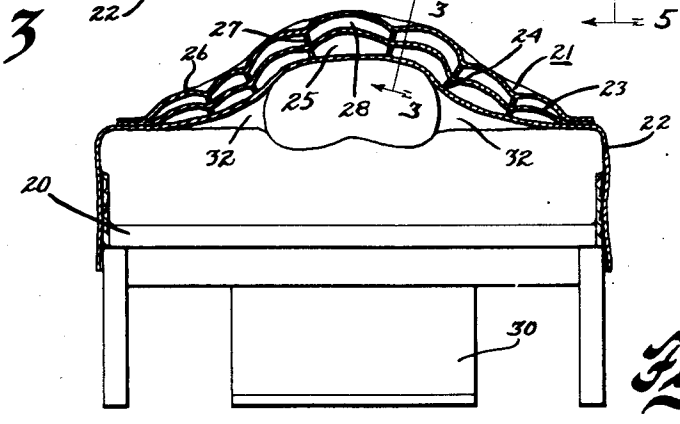


Fig. 2

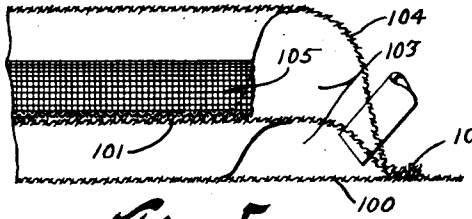


Fig. 5

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REFRIGERATING APPARATUS

Filed April 30, 1934 6 Sheets-Sheet 2

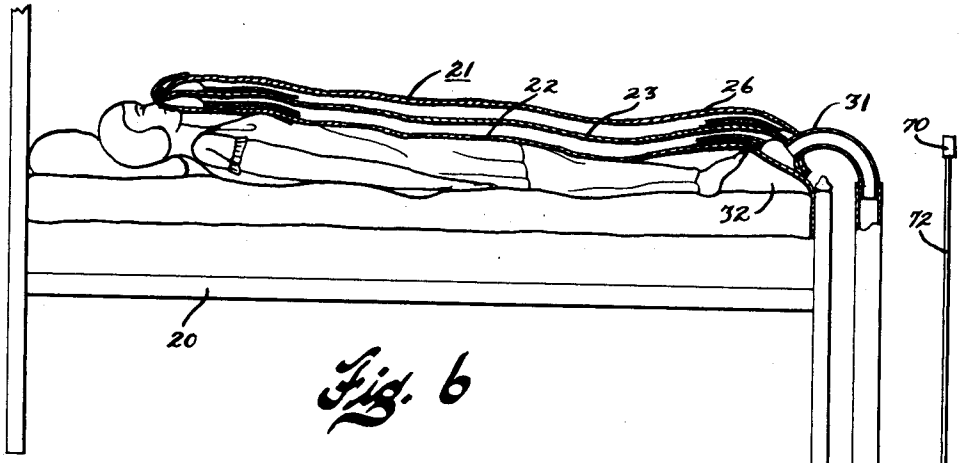


Fig. 6

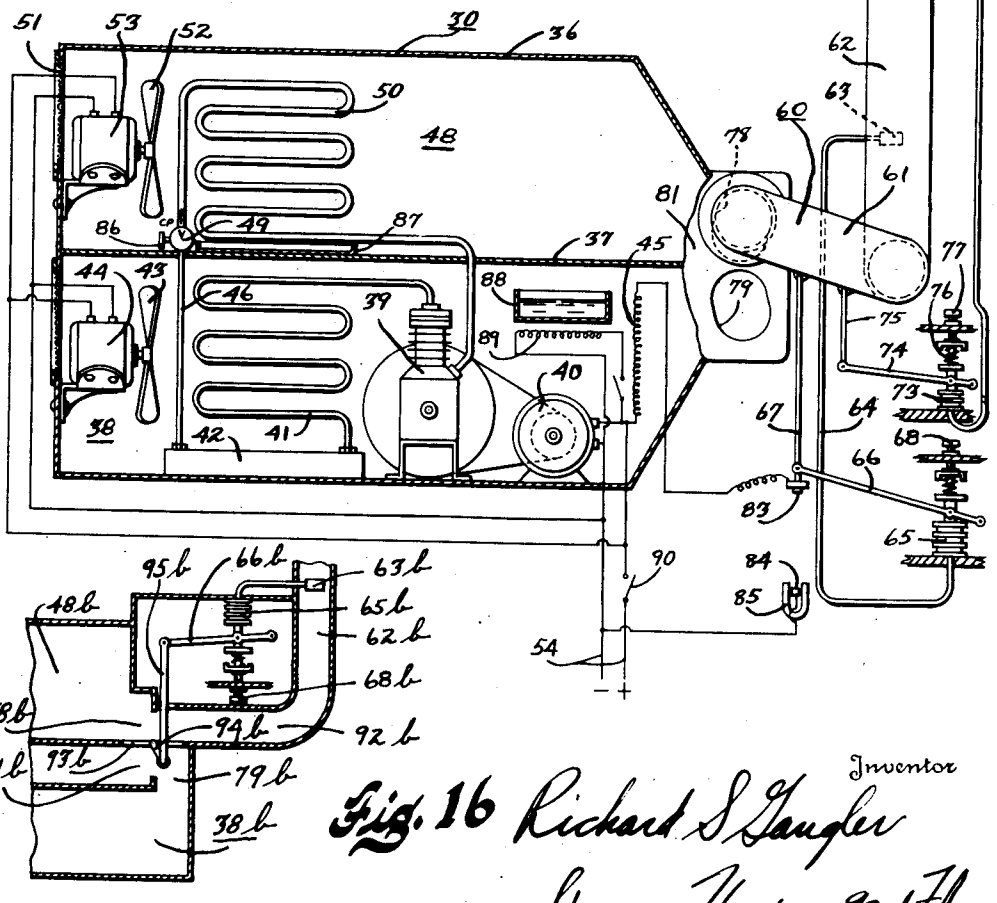


Fig. 16

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REFRIGERATING APPARATUS

Filed April 30, 1934 6 Sheets-Sheet 3

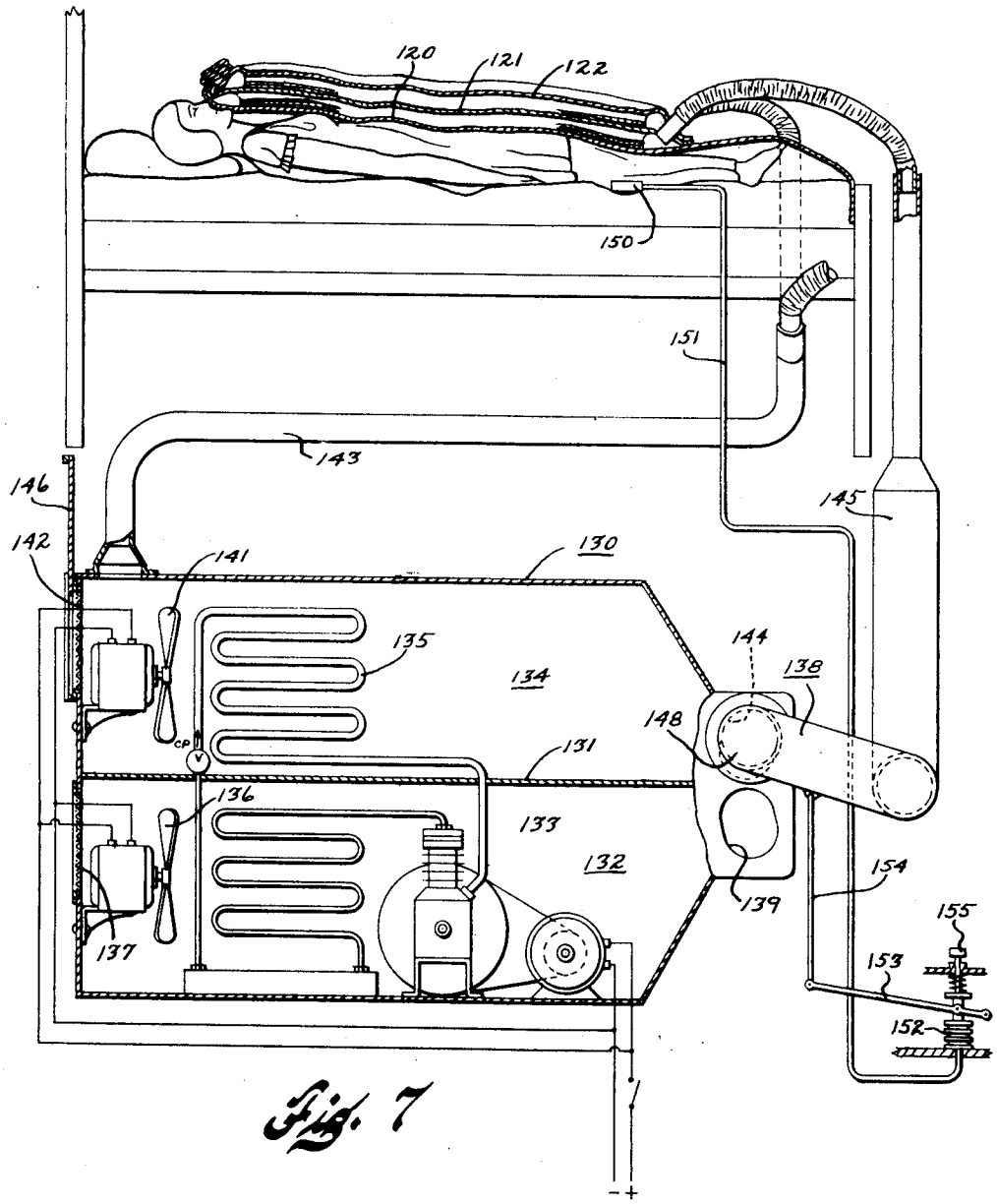


Fig. 7

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REFRIGERATING APPARATUS

Filed April 30, 1934 6 Sheets-Sheet 4

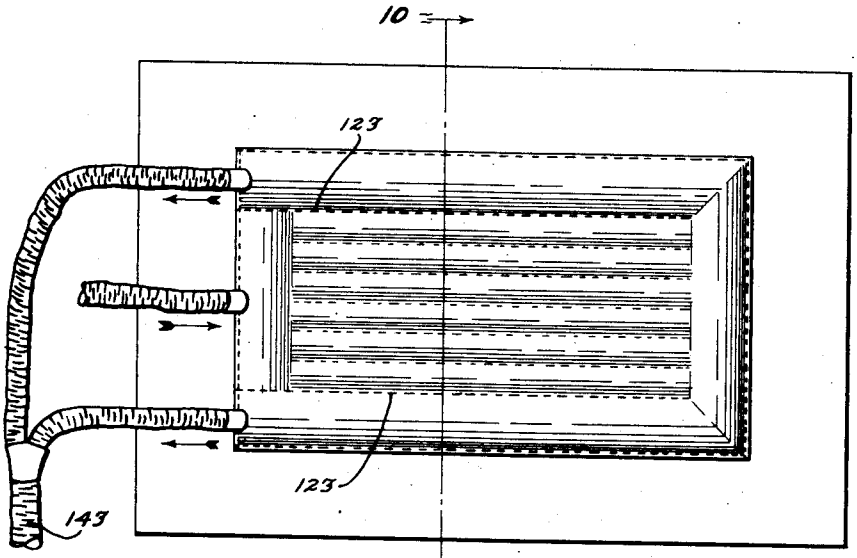
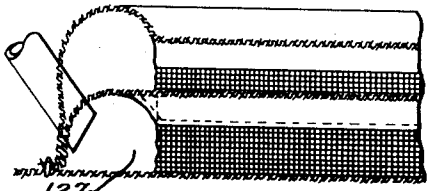


Fig. 8



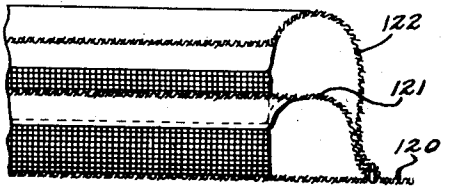
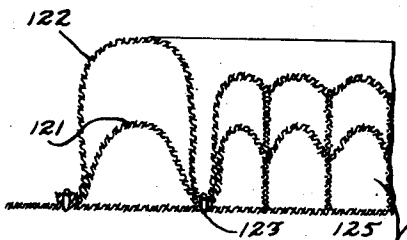


Fig. 9



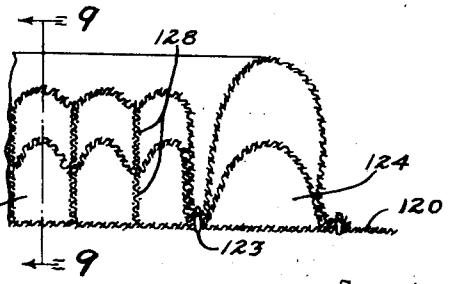


Fig. 10

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REFRIGERATING APPARATUS

Filed April 30, 1934 6 Sheets-Sheet 5

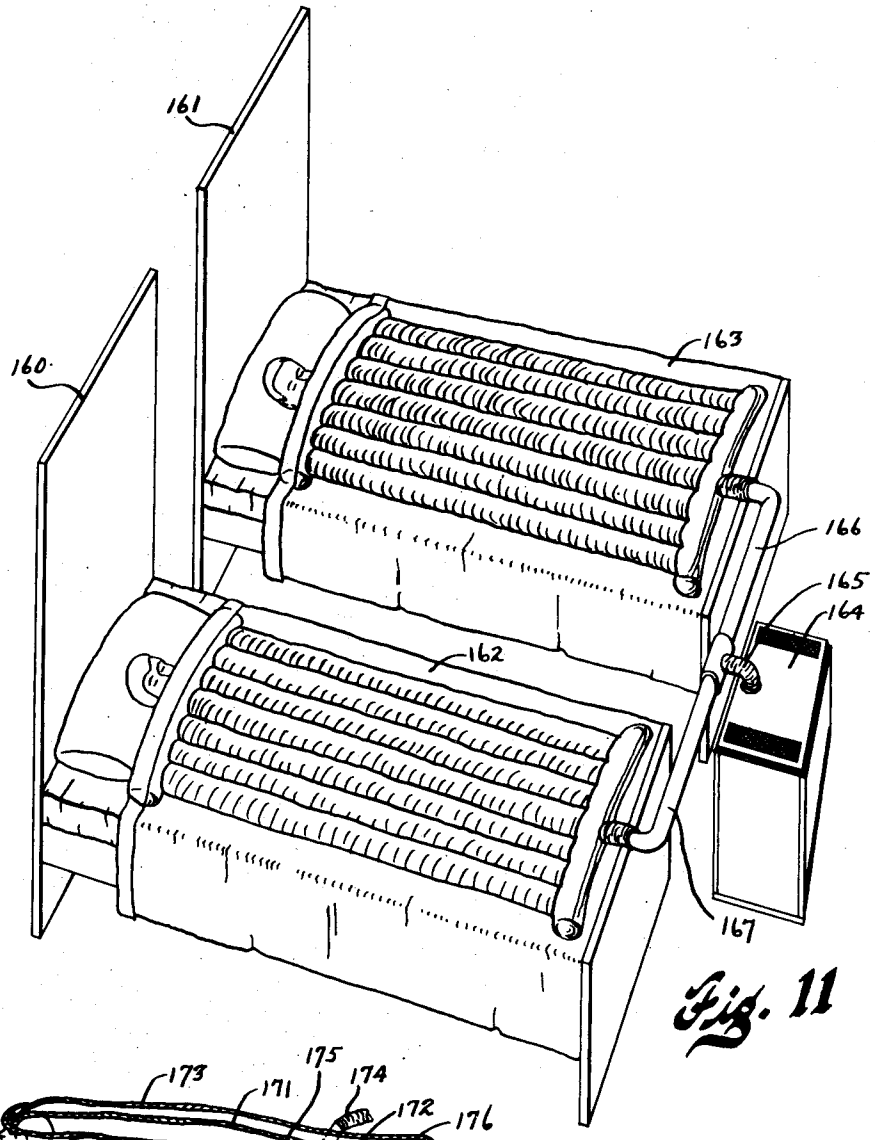


Fig. 11

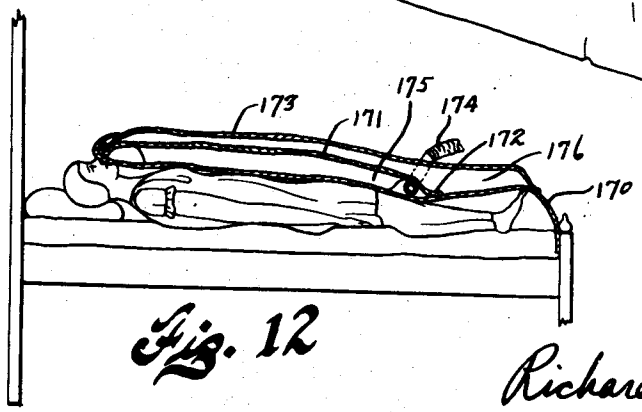


Fig. 12

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REFRIGERATING APPARATUS

Filed April 30, 1934 6 Sheets-Sheet 6

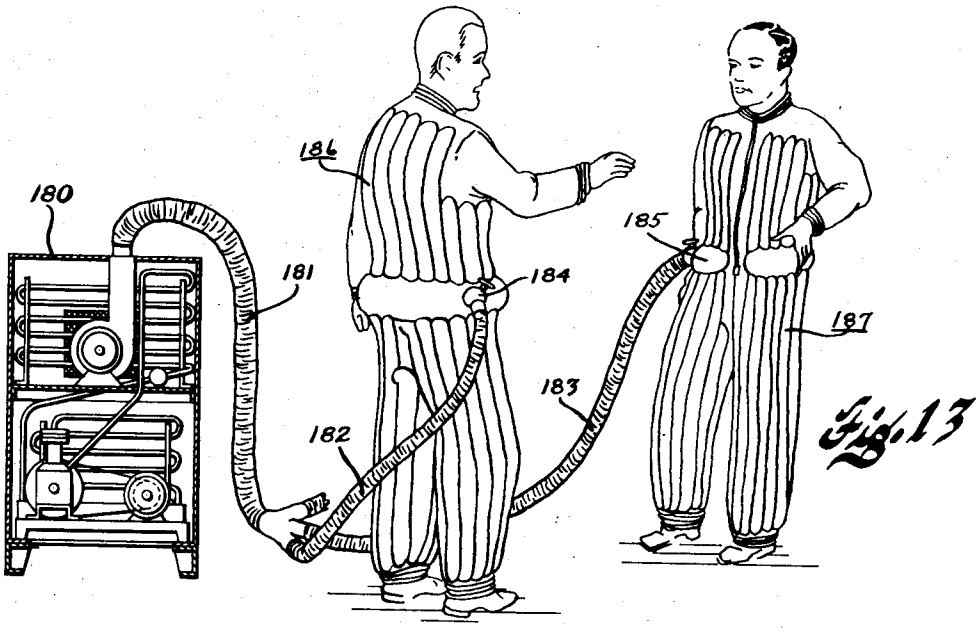


Fig. 13

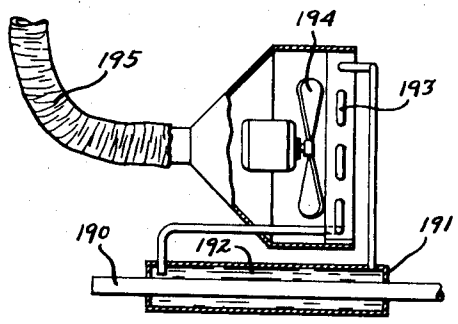


Fig. 14

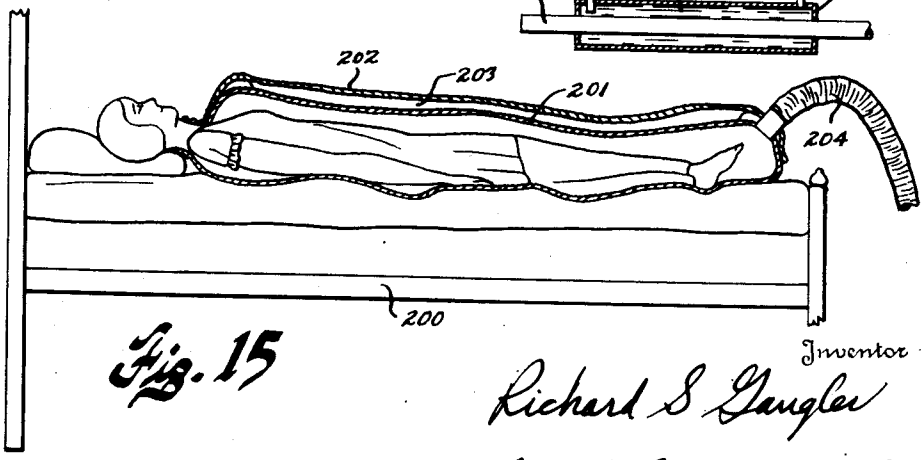


Fig. 15

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Patented Sept. 21, 1937

2,093,834

UNITED STATES PATENT OFFICE

2,093,834

REFRIGERATING APPARATUS

Richard S. Gaugler, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application April 30, 1934, Serial No. 723,078

11 Claims. (Cl. 128—145)

This invention relates to refrigerating apparatus and more particularly to a personal type of air conditioning.

Heretofore air conditioning equipment has been required to condition the air within the entire room or space occupied by persons desiring the comfort of air conditioning. If air conditioning were confined to the immediate vicinity of such persons, the equipment would be much less expensive both in initial cost and in operating expense. An application of this scheme which appears to have great possibilities is that of air conditioning beds since every one spends a continuous period of about one-third of each day in bed.

Attempts have been made to provide air conditioning enclosures for beds, some of which provide a complete enclosure for the bed while another merely provides curtains around the sides of the bed into which the cool air is introduced and confined therein by gravity. The general public, however, is unaccustomed to such enclosures and would experience a feeling of confinement which would prevent their widespread use. In addition, the initial cost of such enclosures is considerable and the operating expenses, while less than for a complete room, are still sufficiently high to prevent their use for those of limited means.

I, by my invention, propose to overcome these objections and to provide a personal type of air conditioning means which in outward appearance and in its use is little different from those replaced thereby and which also is sufficiently low in initial cost and operating expense to permit its purchase and use by persons of limited means.

My air conditioned enclosure employs a covering or enclosure for the body very similar as to material as well as to use and appearance to that now in ordinary use providing therein a means for diffusing the discharge of conditioned air over and surrounding the body to provide an air conditioned environment for the body as well as providing insulating air pockets, and to this enclosure I supply conditioned air or treating medium from a small inexpensive air conditioning or treating device capable of heating and cooling the air as required at a low operating cost.

More specifically I provide a covering for the body formed of ordinary fabric cloth or sheeting in a plurality of layers sewed or held together to form a plurality of enclosures into one of which I supply the conditioned air or treating medium from which some of the air diffuses through the sheeting into contact with the body to provide an air conditioned environment for the body while some air diffuses through the sheeting into a second enclosure to form an inflated insulating air layer.

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 transverse sectional view through the mid portion of Fig. 1;

Fig. 3 is a fragmentary sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a modified fragmentary section similar to that shown in Fig. 2;

Fig. 5 is a sectional view along the line 5—5 of Fig. 4;

Fig. 6 discloses a longitudinal sectional view of the bed shown in Fig. 1 together with a diagrammatic illustration of the air conditioning apparatus and system therefor;

Fig. 7 discloses a sectional view of a bed together with an air conditioning system, shown diagrammatically, illustrating a modified form of my invention embodying recirculation of the air;

Fig. 8 is a plan view of the air blanket shown in Fig. 7;

Fig. 9 is a longitudinal sectional view of the air blanket shown in Fig. 8 taken along the line 9—9 of Fig. 10;

Fig. 10 is a transverse sectional view of the air blanket taken along the line 10—10 of Fig. 8;

Fig. 11 is a perspective view disclosing a multiple air conditioning system embodying my invention applicable to twin beds;

Fig. 12 is a longitudinal sectional view through a bed embodying another form of my invention;

Fig. 13 discloses another application of my invention, particularly intended for persons required to work in hot or cold places;

Fig. 14 discloses a heating apparatus for the air conditioning suits shown in Fig. 13 suitable for use in an airplane, and

Fig. 15 discloses another application of my invention in the form of a sleeping bag.

Fig. 16 is a diagrammatic view of a simplified form of control apparatus.

Referring to the drawings and more particularly to Fig. 1, there is shown an ordinary wooden bed 20 provided with springs, a mattress and a pillow in the usual manner together with the

usual sheet covering the mattress. However, instead of the ordinary blankets or other bed clothing, I provide what I term an air blanket generally designated by reference character 21. This air blanket preferably is made up of a plurality of layers or sheet portions of muslin or percale sheeting or other suitable material as best shown in Fig. 2. The lower layer or sheet portion of this air blanket, designated by the reference character 22, is preferably a sheet similar in size to an ordinary bed sheet and may be formed out of similar material which is porous to a certain degree. This sheet extends over the sides and lower end of the bed.

Upon the upper side of the sheet I sew or otherwise suitably fasten a second sheet portion designated by the reference character 23 which may also be made of a similar porous material such as muslin or percale sheeting. This provides an air space between the sheet portion 23 and the sheet 22. In order to prevent the excessive bulging of the sheets when air is supplied to this air space, I connect this sheet and sheet portion by ordinary fabric mesh, screening, or netting designated by reference character 24. This permits the free flow of air through this enclosure and yet prevents excessive bulging of the sheet portion 23.

On top of the sheet portion 23 I provide a second sheet portion 26 which is fastened to the first sheet portion 23 and the sheet 22 by being sewed therethrough around its edge portions and also by being connected at intermediate points by fabric webbing, netting or screening designated by reference character 27 in a manner similar to the netting or screening designated as 24. This provides a second air enclosure 28 between the top sheet portion 26 and the intermediate sheet portion 23. This top sheet portion 26 may be made of the same material as the other sheet portions but if desired may be made of some impervious material.

At the foot of the bed or some other convenient place I place an air conditioning apparatus 30 enclosed in a neat attractive cabinet which may resemble an ordinary night table. This cabinet may either heat or cool the air and supply the air under pressure through flexible tubing 31 to cross duct 34 which distributes the flow of air within the air space or enclosure 25 formed between the lower sheet or sheet portion 22 and the intermediate sheet portion 23. From this enclosure 25 the air which is under a supplied pressure will diffuse through the sheet 22 into the spaces such as the space 32 beneath the air blanket to provide an air conditioned environment surrounding the body of the person sleeping in the bed. Preferably a sufficient supply of air is provided and preferably the air diffuses through the sheet 22 at a sufficient rate so that the air beneath the blanket is of substantially the same temperature as the air which is supplied by the air conditioning apparatus. This will provide an immediate environment of conditioned air surrounding the person sleeping in the bed. The air is also filtered in its diffusion through the sheet 22.

Most of the air which thus diffuses through the sheet 22 into the spaces beneath the air blanket escapes around the head of the person sleeping in the bed and thus provides conditioned air around the head of the person. If desired, the upper end of the air blanket may be pulled over the nose of the person so that the person will breathe the conditioned air. This is particularly beneficial to persons afflicted with hay-fever and asthma. While most of the air which is supplied to the air space or enclosure 25 diffuses through the sheet 22 into contact with the persons sleeping in the bed, some diffuses through the intermediate sheet portion 23 into the second enclosure or air space 28, thus forming an insulating air space or insulating air pockets. If the top sheet portion 26 is made of a porous material, a slow diffused flow of air is thus provided into and out of the insulating air space 28 thereby carrying away and disposing of any heat leakage from the air in the room so that this insulating air space is maintained at substantially the temperature of the conditioned air supplied to the air blanket and in this way heat transfer is prevented between the air conditioned enclosure beneath the air blanket and the air in the room since the mattress of the bed provides excellent insulation beneath the person and the air conditioned enclosure surrounding the person sleeping. The air blanket may be provided with cross ducts 34 and 35 at the head and foot ends of the blanket as shown in Fig. 3 merely by stopping the mesh or screening 24 and 27 short of the head and the foot ends of the intermediate and top sheet portions 23 and 26. The fastening together of the sheet and sheet portion by the mesh or screen portions 24 and 27 provides the air blanket with a pleasing fluted appearance when it is inflated with conditioned air. During the daytime when the apparatus is not in use the air blanket may be covered by a spread as is customary. This air blanket is washable and may be readily washed in the usual manner similar to ordinary bed sheets.

Referring now more particularly to Fig. 6, for a disclosure of the air conditioning appparatus proper and its application to the air blanket there is illustrated diagrammatically the cabinet 30 having outer walls 36 forming an enclosure which is divided into two parts by a partition 37. Within one of the enclosures 38 formed thereby there is provided a refrigerant compressing apparatus including a refrigerant compressor 39 driven by an electric motor 40 for compressing the refrigerant and forwarding the compressed refrigerant to a condenser 41 where the compressed refrigerant is liquefied and collected in a receiver 42. The condenser 41 and the compressor 39 are cooled by a blast of air provided by the fan 43 driven by the electric fan motor 44 and which creates a pressure within the enclosure 36. By discharging or blowing air over the warm condenser, compressor and electric motor, these units of the refrigerating system are cooled and a source of heated air is provided. This heating may be augmented by providing an electric heater 45.

The refrigerant liquefied by the refrigerant condensing apparatus located within the chamber or compartment 38 is conducted through a refrigerant supply conduit 46 into the compartment 48 where a suitable expansion valve or restrictor 49 is provided for controlling the flow of liquid refrigerant through the evaporator 50. Air from the room is drawn through a screened opening 51 into the enclosure 48 by a fan 52 which is driven by an electric fan motor 53 connected in parallel electric circuit relation with the fan motor 44 and the electric compressor motor 40 to a source of electric energy 54. The fan 52 discharges a blast of air over the cold surfaces of the evaporator 50 and creates a pres-

sure within the enclosure 48 to provide a source of cooled air.

Any suitable form of control means may be employed for maintaining the air supplied to the air blanket at a proper temperature but as a preferred form I provide an air selecting or mixing device 60 comprising a pivoted duct arm 61 communicating with the discharge duct 62 connecting through the flexible tubing 31 to the air space 25 in the air blanket and capable of selective communication with the enclosures 38 and 48 within the air conditioned cabinet to provide either heated or cooled air or any required mixture thereof in order to provide the proper supply of air at a proper temperature and humidity to the air space 25 within the air blanket 21. This pivoted duct portion 61 may be automatically moved to its proper selective position by a thermostatic control means which includes a thermostatic bulb 63 charged with a volatile or expansive fluid and located in the air stream of the outlet or discharge duct 62. This thermostatic bulb is connected by tubing 64 to a bellows 65 which operates a lever 66 connected by a link 67 to the pivoted selective duct portion 61.

This temperature control mechanism is provided with a selective manual adjustment 68 comprising spring means and a threaded adjusting means for varying the tension upon the spring means which opposes the expansion of the bellows in varying degrees according to the adjustment thereof so as to make it possible to secure almost any desired temperature of air in the outlet duct 62. However, for ordinary purposes I find that a temperature of between 75° F. and 85° F. is most suitable. Where the air temperature of the room is either greatly warmer or greatly colder than normal, an additional temperature control may be provided including a thermostatic bulb 70 charged with a volatile or thermal expansive fluid and located within the free air within the room. This thermostatic bulb 70 is connected by tubing 72 to a small metal bellows 73 connected by a multiplying lever 74 and a link 75 to the pivoted duct portion 61 so as to compensate for the effect of the air temperature of the room upon the heat transfer conditions between the air conditioned space beneath the blanket and the air in the room. This temperature control may also be provided with an adjustable regulating spring 76 and a threaded adjusting means 77 to regulate the amount of room temperature compensation provided in the selective thermostatic control.

The pivoted duct portion under the control of the temperature regulating apparatus is moved so that its mouth or inlet portion 81 selectively communicates with the outlet ports 78 and 79 of the air cooling enclosure 48 and the air heating enclosure 38. When the mouth 81 of the pivoted duct portion 61 is in direct communication with the port 78 the maximum cooling is obtained. In intermediate positions the mouth 81 of the pivoted duct means 61 may communicate partly with the port 78 and partly with the port 79 so as to supply a mixture of cooled and heated air to the space 25 of the air blanket. In order to supply warm air, the mouth 81 may move to a position in direct communication with the port 79 whereby heated air is supplied to the air space 25. If more heating is required, the electric heater 45 is supplied with electric energy by the closing of the switch contacts 83 and 84, of which the contact 83 is connected to the link 67 so that when the pivoted duct means is moved to the extreme heating position, this contact 83 makes engagement with its cooperating contact 84 to close the electric heater circuit 45. In this way sufficiently heated air may be provided even when the room temperature is rather cold. A permanent magnet 85 is provided to prevent arcing of the contacts in opening and closing.

The humidity of the cooled air may be controlled by the temperature of the evaporating means 50. The temperature of the evaporating means 50 may be controlled by a manual adjusting means 86 provided upon the expansion valve 49 so as to control the evaporating temperature within the evaporator 50 and by this means it is possible to bring the temperature of the air to be cooled below its dew point so as to condense moisture therefrom. This moisture may be collected in a drip pan 87 located beneath the evaporator 50.

Likewise, means may be provided for humidifying the warm air when desired by providing a pan 88 containing water which rests upon an electric heater coil 89 connected in parallel electric circuit relation with the electric heater 45. This electric heater 89 evaporates the water at a desired rate in order to supply additional humidity to the air when hot air is required for the air blanket. By employing this humidifying apparatus and by suitably regulating the temperature regulating apparatus to obtain the maximum heating of the air, this apparatus may be employed to produce a mild fever in the person in the bed. In order to use the apparatus for producing a fever the adjusting screws 77 and 68 are adjusted so as to increase the tension upon the loading springs for the bellows 65 and 73 preferably as far as possible so as to raise the temperature of the air delivered to the bed to 130 or 140° F. The knife switch which controls the energization of the heater 89 is closed and the receptacle 88 is provided with an ample supply of hot water. Under such an adjustment the pivoted duct portion 61 will move to cover the opening 79 and the contacts 83 and 84 will be closed so that the heater 45 as well as the heater 89 will be in operation and by heating the water in the receptacle 88 and by heating the air by the compressing apparatus and the electric heater the temperature of the air and the humidity will be raised to a point which will cause a fever. The production of a fever may be aided by having a room temperature in which the apparatus is located as high as possible. The use of artificially created fever has been found very useful in treating certain diseases, and with this apparatus, may conveniently be used as an effective treatment for common colds. Medicinal compounds may also be placed within the pan 88 to form beneficial vapors. For convenience and clearness, the fans 43 and 52 have been shown as of the propeller type, but because of the higher efficiency I prefer to use the centrifugal type of fan in each case in order to efficiently provide the necessary air pressure for supplying the conditioned air under pressure to the air space 25 of the air blanket 21. The entire apparatus may be controlled by a manual switch 90.

If desired, other means for heating and cooling may be employed such as electric heaters, steam, hot water, or hot air from a heating system for providing heated air while ice, solidified carbon dioxide, cold water, or cold air may be employed for providing cold air for my air blanket.

In Figs. 4 and 5 a modified form of air blanket

is shown. In this form a full size sheet of muslin or percale sheeting is employed upon the bottom, this being designated by the reference character 100. Sewed to this full size sheet is a second or intermediate smaller sized sheet portion 101 of a similar material which is sewed to the full size sheet 100 around the edges thereof and as shown at 102 and is also sewed longitudinally with the stitching in parallel but which stitching terminates short of the head and foot ends of the sheet portion so as to provide cross manifolds, such as the manifold 103, at the foot and head ends of the air blanket. A third or top sheet portion 104 is likewise sewed to the intermediate sheet portion 101 and the full size sheet 100 by being sewed to the other sheet portions around its edges as shown at 102 in order to provide the second air space or enclosure. The top sheet portion 104 and the intermediate sheet portion 101 are connected together to prevent bulging, and to present a fluted appearance, by cords or fish netting 105 extending in a zigzag fashion between the sheet portions and which is sewed or fastened to the intermediate sheet portion at the mid points between the sewed connections 106 by the knotting or stitching 107 and is fastened to the top sheet portion by knotting or stitching 108 which is located at the intermediate points of the cord or netting 105 between the stitchings 107. This form provides an air blanket of an attractive fluted appearance which may be easily made.

In Fig. 7, I have shown an air blanket type of air conditioning system which provides for the recirculation of the cooling air. In this air blanket there is shown a lower full sized sheet 120 to which are fastened, by sewing around the edges thereof, sheet portions 121 and 122 of substantially equal size. These sheets and sheet portions may be made of any suitable material such as a muslin or percale sheeting. These sheet portions are preferably sewed to the full size sheet 120 by sewing or stitching around their edge portions. It should be noted that in this form the upper sheet portions 121 and 122 are shorter than those found in the form shown in Fig. 6. This air blanket has been made in this way so as to prevent the cooling of the feet. It has been found that some persons feel uncomfortable if their feet are cooled as much as the remainder of their body and for this reason the air blanket shown in Fig. 7 is not provided with the air spaces extending over the feet.

The air blanket 120 shown in longitudinal section in Fig. 7 is better shown in Figs. 8, 9 and 10. In this form of air blanket, as stated before, the sheet portions 121 and 122 are sewed to the full size sheet 120 by sewing around the edge portions of the sheet portions 121 and 122. In addition these sheet portions 121 and 122 are sewed to the full size sheet portion 120 along the dotted line 123 shown in Fig. 8 and in Fig. 10 to form a U-shaped return duct 124 in the blanket. The supply duct portions designated by the reference character 125 are formed in the intermediate portions of the air blanket. The air blanket is provided with a distributing air duct 127 located at the lower or foot end of the sheet portions, which duct distributes the incoming air through the fluted supply duct portions 125 through which the air flows until it reaches the outer U-shaped return duct 124 which extends across the head portion of the air blanket as well as along both side portions. The sheet portions 122 and 121 are connected together and to the full size sheet 120 by mesh or webbing 128 to form the fluted air blanket structure similar to the first described modification.

Referring now again to Fig. 7, there is shown an air conditioning cabinet or enclosure 130 provided with a dividing wall 131 dividing the enclosure into an air heating compartment 132 containing the refrigerant liquefying apparatus 133 and an air cooling enclosure or compartment 134 containing the refrigerant evaporator 135 which is connected through the wall or partition 131 to the refrigerant liquefying apparatus 133. An electrically driven fan 136 is provided for drawing in air from the room through the screen opening 137 and discharging the air over the warm surfaces of the refrigerant liquefying apparatus to heat the air. This heated air may be discharged into the air in the room or into the selective pivoted duct control means 138 through the port 139. An electrically driven fan 141 connected in electrical parallel circuit relation with the motor driven fan 136 and the electrically driven refrigerant liquefying apparatus is provided within the air cooling compartment 134 for drawing air from the room through the screened aperture 142 as well as from the return air duct 143 which connects at a plurality of points with the return air duct 124 in the air blanket 120. This air is discharged over the surfaces of the evaporator 135 which cools and dehumidifies the air as required and discharges the air through the outlet port 144 into the pivoted selective duct portion 138 of the discharge duct 145 when required or out into the room when heated air and not cooled air is required for supplying the proper temperature of air to the air blanket.

The amount of re-circulation may be controlled by the sliding door 146 which is provided for partially or wholly closing the screened opening 142 which permits the entrance of air from the room into the cooling compartment 134. The pivoted selective air duct portion 138 has a mouth 148 which is adapted to register with either of the outlet ports 139 or 144, wholly or partially, as required, in order to supply air at the proper temperature to the air blanket. This pivoted duct portion 138 is controlled by a charged thermostat bulb 150 located within the air conditioned enclosure beneath the air blanket within the bed and connected by the tubing 151 to the metal bellows 152 which through a multiplying lever 153 and a link 154 selectively controls the position of the pivoted duct portion 138 and the connection of its mouth with the outlet ports 139 and 144. Manual adjusting means 155 comprising a spring and adjusting screw acting upon the spring means to control the expansion of the metal bellows 152 is provided for regulating the temperature of the air supplied through the air blanket in order to provide an air conditioned environment according to the desires of the person sleeping beneath the blanket. As in the other embodiments the sheets and sheet portions are preferably made porous so that a considerable amount of air diffuses into the space beneath the air blanket and so provides an air conditioned environment for the person sleeping therein while a lesser portion diffuses into the air spaces provided between the intermediate sheet portion 121 and the upper or top sheet portion 122. If desired, this form of blanket may be used with the air conditioning system shown in Fig. 6.

In Fig. 11 there is shown an application of my invention to twin beds. In this figure twin beds 160 and 161 are each provided with the air

blankets 162 and 163 which may be similar to those illustrated in Figs. 1 to 6 or similar to that shown in Fig. 12. These air blankets 162 and 163 are supplied with properly conditioned air from an air conditioning unit 164 of ample size which discharges the conditioned air under pressure into an outlet duct 165 which conducts the air through a common air manifold 166 and 167 to the air blankets 162 and 163.

In Fig. 12 there is shown a longitudinal section of a bed and air blanket therefor comprising a full size bottom sheet 170 to which is sewed or otherwise suitably fastened an intermediate sheet portion 171 which extends from the head portion of the full size sheet 170 to a point designated by the reference character 172 which is about above the knees of the person sleeping in the bed beneath the blanket. This sheet portion 171 is preferably fastened to the full size sheet 170 by being sewed thereto around its edge portions and being connected by knotting, quilting or similar means at intermediate points to prevent the excessive inflation of this intermediate sheet portion 171. The top sheet portion 173, on the contrary, extends from the head portion of the full size sheet 170 to the extreme foot portion thereof so as to provide an air insulating space over the entire body of the person sleeping under the blanket.

Thus in this form the air is supplied from a suitable conditioning means like that shown in Fig. 6 by the supply duct 174 to the air space 175 between the intermediate sheet portion 171 and the full size sheet 170. From this air space 175 the air under pressure diffuses through the sheet 170 into direct contact with the body of the person sleeping thereunder in order to provide an air conditioned environment for the body while some of the air diffuses into the air insulating enclosure 176 which forms an insulating air space over the top of the air enclosure 175 as well as the feet of the person sleeping under the air blanket. This form is very comfortable for both winter and summer use.

In Fig. 13 there are shown two workmen provided with clothing into which cool air may be supplied from an air conditioning means 180 through a common supply duct 181 and individual supply ducts 182 and 183 under the control of the regulating valves 184 and 185. This clothing in the form of jumpers or air suits 186 and 187 may be made of three sheets or thicknesses of material sewed together so as to provide two air spaces in a manner similar to that of the previously described air blankets. The air is introduced into the air space closest to the body and this air diffuses therefrom in both directions, some into contact with the body and some into second air space which forms the air insulating space.

However, if desired, these suits may be made similar to the sleeping bag shown in Fig. 15 and the air discharged into the interior of the enclosure provided by the air suits and the air permitted to escape therefrom through one or more layers of the material used. Instead of the air conditioning device shown in Fig. 13 these suits may be supplied with compressed air from a compressed air line which is ordinarily rather cool and low in relative humidity. I find these suits are suitable for working in hot places such as around furnaces in industrial plants as well as for persons subjected to a cold environment such as those working in icehouses or out in the open. For extremely hot situations, the suits should be made of asbestos or similar fireproof cloth; otherwise, ordinary cloth or fabric goods may be used.

These suits may also be used by aviators for high altitude flights and an apparatus like that shown in Fig. 14 may be used for this purpose. In Fig. 14 there is shown an exhaust pipe 190 of the internal combustion engine used for propelling the airplane and surrounding this pipe in heat exchange relation therewith is provided a water or liquid chamber 191 containing water or other fluid 192 which may be evaporated by the heat supplied by the hot exhaust gases. The evaporated liquid rises into the heat exchange device 193 formed of fins in serpentine tubing through which air is drawn by the electrically driven fan 194 in order to warm the air and this warm air is discharged through the air duct 195 to the air suits. While the air suits 186 and 187 are shown in the form of jumpers they may take any convenient form such as the form of an overcoat or other types of clothing.

In Fig. 15 there is shown a bed 200 provided with a sleeping bag 201 capable of receiving a human being and provided with an additional sheet portion 202 providing an insulating air space 203 around the top portions of the sleeping bag. The sleeping bag 201 completely surrounds the person therein except for the head thereof and is supplied with conditioned air through the air duct 204 which discharges directly into the interior of the bag 201 at some suitable point in a manner similar to that described for the air clothing in connection with Fig. 13.

In Fig. 16 there is disclosed a simplified form of control apparatus applicable to either of the forms of air conditioning apparatus illustrated diagrammatically in Figs. 6 and 7. In this simplified form, the enclosure containing the evaporating means and the cooled air under pressure is designated by the reference character 48b and is provided with an outlet 78b forming part of a butterfly type of double two-way control valve. The enclosure 38b contains the refrigerant liquefying means and warm air under pressure and is provided with an outlet 79b directly opposite the outlet 78b. An outlet 91b leading to the room is provided for discharging waste air while the discharge duct 62b connecting with the air blanket connects to the outlet 92b which is directly opposite the outlet 91b. A butterfly valve 93b controls the flow of air from the enclosures 48b and 38b into the discharge duct 62b and the room outlet according to the temperature requirements.

For this purpose, the butterfly valve 93b is provided with an actuating lever arm connected by a link 95b to a multiplying lever 66b operated by a metal bellows 65b under the control of a manually adjustable spring and screw control mechanism. This bellows 65b is connected by tubing to a thermostatic bulb 63b located within the discharge duct 62b and charged with a volatile or thermal expansive fluid.

According to the temperature requirements as measured by the thermostatic bulb 63b, the butterfly valve 93b is moved to assume various positions. The butterfly valve may be moved to one extreme position to provide a free flow of air from the cooled air or evaporator enclosure 48b to the discharge duct 62b and from the warm air enclosure 38b directly to the outlet 91b leading directly to the room. When the butterfly valve is moved substantially 90° from this position a free flow of air is provided from the cooled air enclosure to the outlet 91b leading to the

room and from the warm air enclosure 38b to the discharge duct 62b. Under control of the thermostat bulb 63b the butterfly valve 93b may be moved to any position from one of these extremes to the other in order that air of the proper temperature may be supplied automatically.

Thus, I have provided a personal type of air conditioning equipment which may be used by persons desiring air conditioning equipment with little or no change of personal habits and which is capable of widespread application and is low in both initial cost and operating expense.

While the form of embodiment of the invention 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:

1. A ventilating means including an inflatable covering for the human body, said covering comprising at least three sheet portions of a flexible material held together to form a plurality of enclosures and means for continuously conducting air under pressure into one of the enclosures between two of the sheet portions to keep the covering inflated and in contact with the body, one of the sheet portions being porous to permit the continuous diffused escape of air therefrom into contact with the body.

2. A ventilating means including an inflatable covering for the human body, said covering comprising at least three sheet portions of a flexible material held together to form a plurality of enclosures and means for continuously conducting air under pressure into one of the enclosures between two of the sheet portions, said two sheet portions being porous to permit the diffused escape of air therefrom into contact with the body and into another of the enclosures.

3. A conditioning means including air tempering means, an inflatable covering for a human body, said covering comprising a porous flexible sheet means, said air tempering means including means forcing the air through the flexible sheet means into direct contact with the body, said air tempering means including temperature responsive means for selecting and providing air of the proper temperature for said flexible sheet means.

4. A conditioning means including air tempering means, an inflatable covering for a human body, said covering comprising a porous fabric sheet means, said air tempering means including means for forcing the air through the fabric sheet means into direct contact with the body, said air tempering means including means for conducting tempered air to the flexible sheet means, and means responsive to the air supplied to the flexible sheet means for controlling the air tempering means.

5. A conditioning means for the human body including body clothing having a plurality of layers of fabric forming a plurality of superimposed air spaces therebetween, and means for supplying air under pressure into one of the air spaces between the layers of fabric, said fabric permitting the diffused discharge of air therefrom into contact with the body.

6. A conditioning means including an inflatable covering for the human body, said covering comprising a plurality of sheet portions of a flexible material held together to form an enclosure, another sheet portion of a flexible material being joined to one of the above mentioned sheet portions to form a larger enclosure covering a larger area, and means for introducing air into the first mentioned enclosure.

7. An inflatable article for providing a zone of ventilated air in the vicinity of a body, said article including at least three sheet portions of flexible material positioned one on top of the other and held together to form two enclosures between the sheets located one above the other, said sheet portions having means providing communication between said enclosures, one of said sheet portions nearest the body being porous to permit the diffused escape of a fluid from one of the enclosures, and means for continuously conducting air under pressure to one of said enclosures, to inflate the enclosures and to provide a diffused discharge of air upon the body.

8. An inflatable article for providing a zone of ventilated air in the vicinity of a body, said article including at least three sheet portions of flexible material positioned one on top of the other and held together to form two enclosures between the sheets located one above the other, said sheet portions having means providing communication between said enclosures, one of said sheet portions nearest the body being porous to permit the diffused escape of a fluid from one of the enclosures, means for connecting dispersed portions of said sheet portions to limit the distance between the sheets, and means for continuously conducting air under pressure to one of said enclosures, to inflate the enclosures and to provide a diffused discharge of air upon the body.

9. An inflatable article for providing a zone of ventilated air in the vicinity of a body, said article including at least three sheet portions of flexible material positioned one on top of the other and held together to form two enclosures between the sheets located one above the other, said sheet portions having means providing communication between said enclosures, said sheet portions being quilted to limit the distance between the sheets and to provide a neat tufted appearance, and means for conducting air to one of said enclosures.

10. An inflatable article for providing a zone of ventilated air in the vicinity of a body, said article comprising a plurality of sheet portions positioned upon one another and held together to form an enclosure between the sheet portions, means for conditioning air and conducting the conditioned air under pressure to said enclosure between the sheet portions, one of said sheet portions nearest the body being porous to provide for the discharge of air from the enclosure into contact with the body, and means responsive to the temperature of the air within said conducting means for controlling said conditioning means.

11. An inflatable article for providing a zone of ventilated air in the vicinity of a body, said article comprising a plurality of sheet portions positioned upon one another and held together to form an enclosure between the sheet portions, one of said sheet portions nearest the body being of porous fabric to provide for the discharge of air from the enclosure into contact with the body, means for heating and cooling air, mixing means for providing any desired proportion of the heated and cooled air, temperature responsive means for selecting the proper proportion of heated and cooled air, and means for conducting the air selected by the temperature responsive means to said enclosure between the sheet portions.

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