May 27, 1941. W. L. MORRISON 2,243,570

COOLING DEVICE

Filed Aug. 12, 1933 4 Sheets-Sheet 1

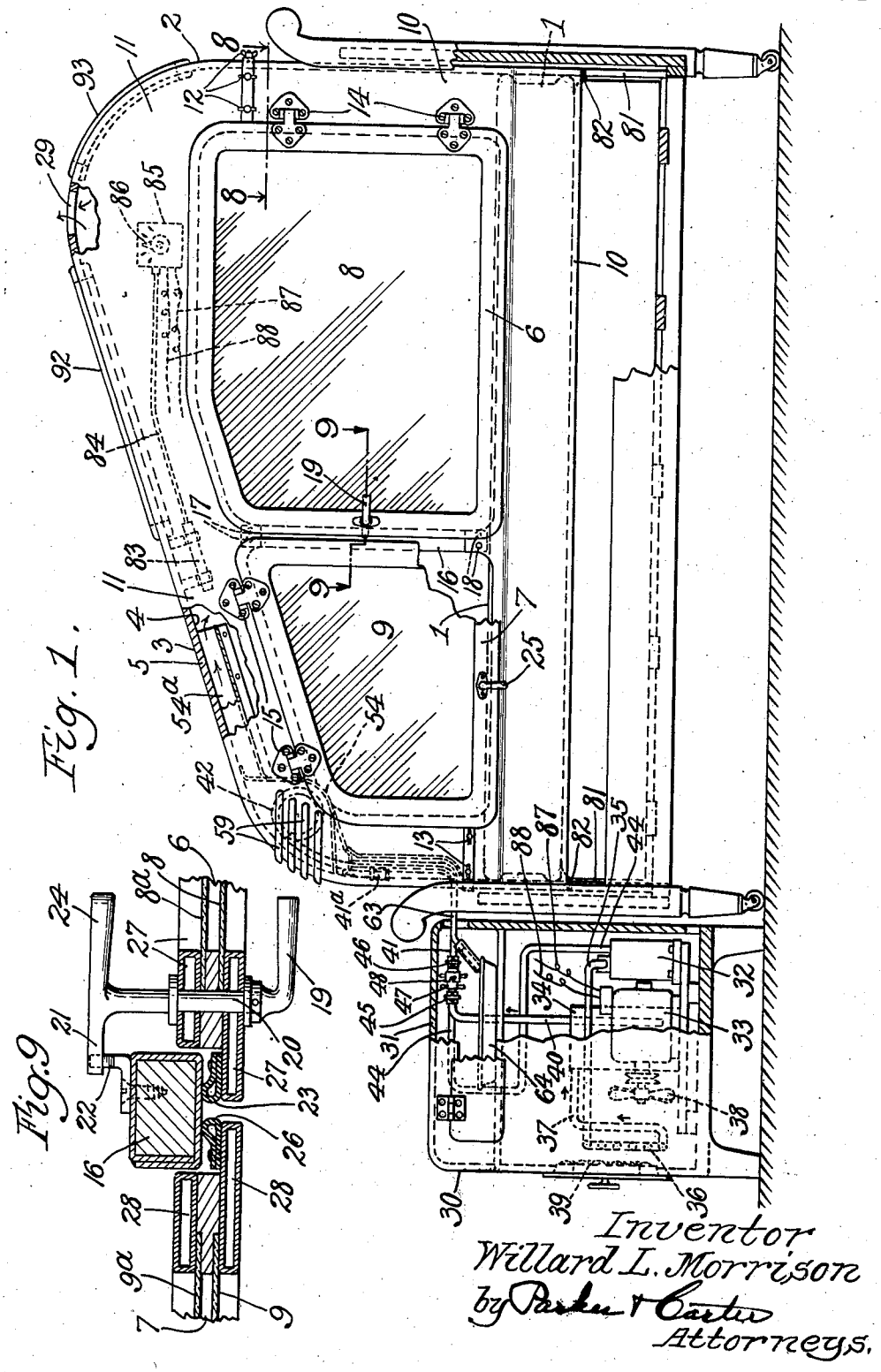


Fig. 1.

Fig. 9

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Fig. 2.

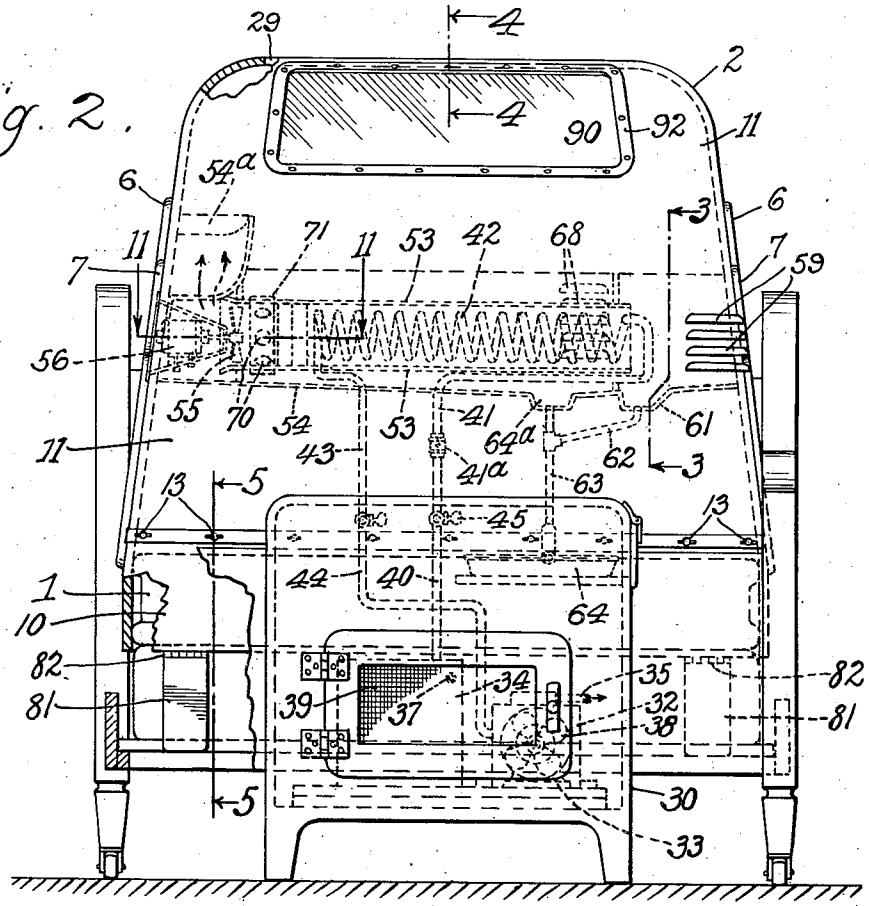


Fig. 3.

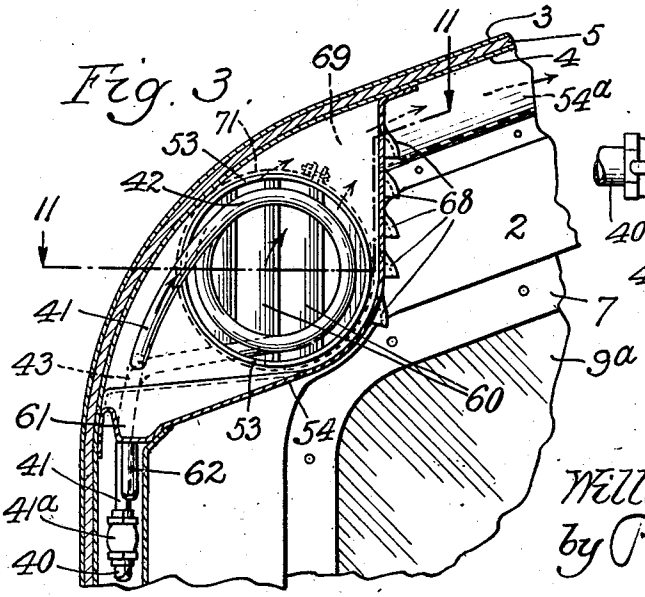
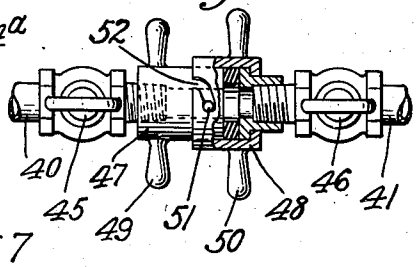


Fig. 10



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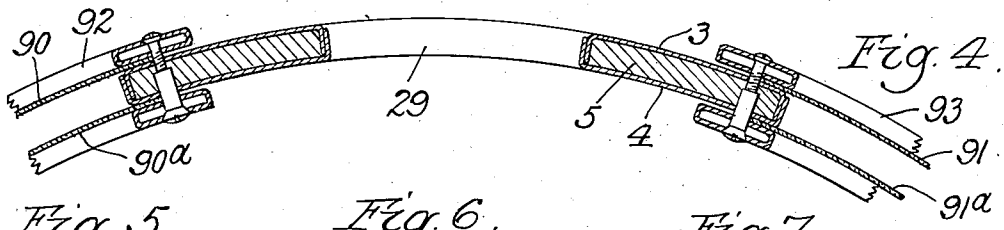


Fig. 4.

Fig. 5.

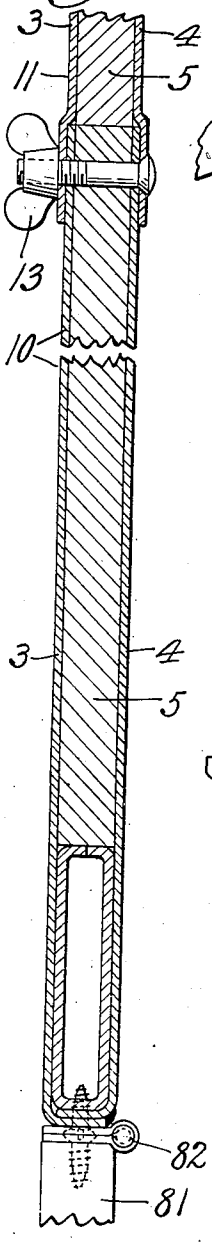


Fig. 6.

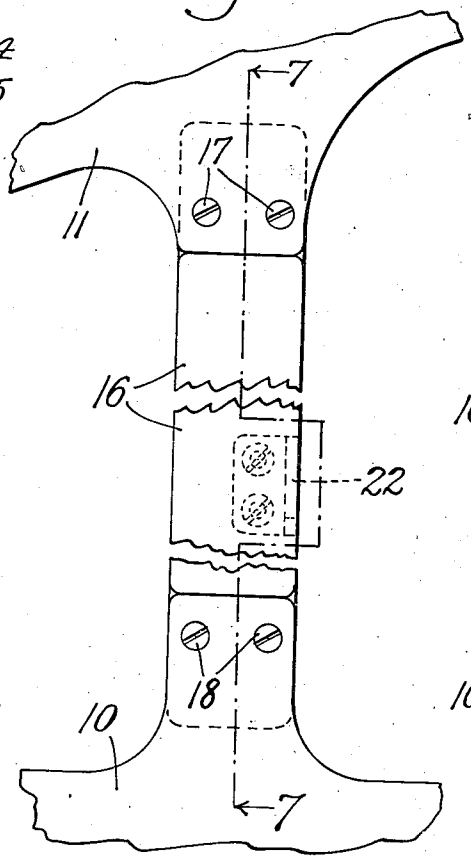


Fig. 7.

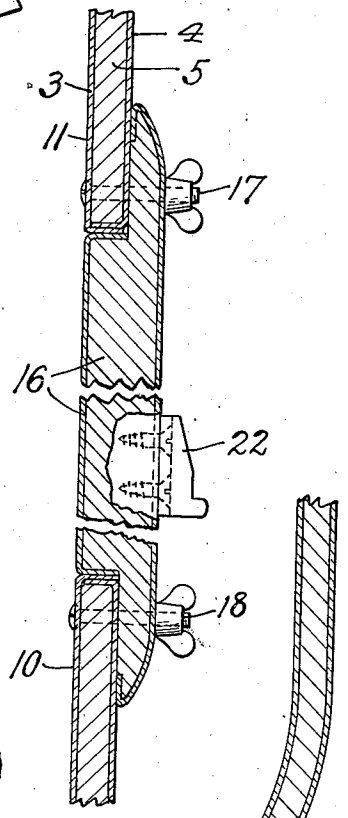
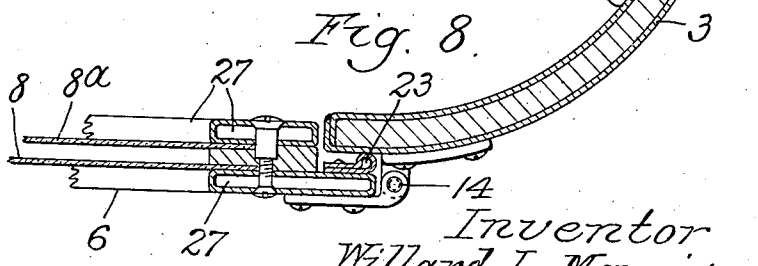


Fig. 8.



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Fig. 13

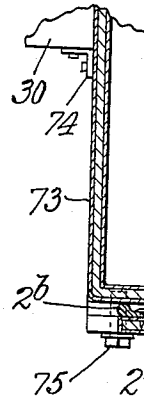


Fig. 12

Fig. 11

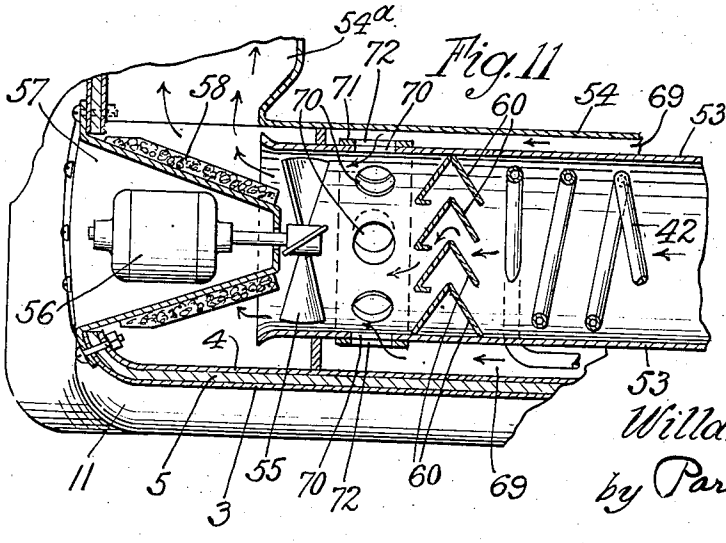
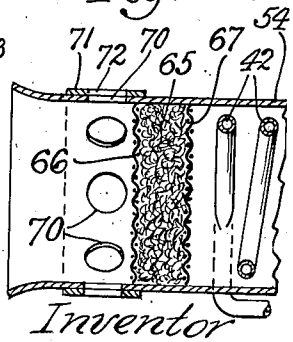


Fig. 14.



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UNITED STATES PATENT OFFICE

2,243,570

COOLING DEVICE

Willard L. Morrison, Lake Forest, Ill.

Application August 12, 1933, Serial No. 684,817

11 Claims. (Cl. 62—140)

This invention relates to cooling devices and has for its object to provide a new and improved device of this description. The invention has as a further object to provide a cooling device to be used in a room or compartment and which may receive one or more persons. The invention has as a further object to provide a cooling device which may be placed in a room or compartment and which may receive one or more persons who will be in a cool atmosphere but which is not used to cool the room or compartment. The invention has as a further object to provide a piece of furniture, such as a bed or chair, with means for cooling one or more persons using such bed or chair. The invention has a further object to provide a cooling device which will be cheap in construction and effective in operation and which can be applied to any piece of furniture. The invention has as a further object to provide a cooling device particularly adapted and effective for hay fever patients. The invention has other objects which are more particularly pointed out in the accompanying description.

Referring now to the drawings,

Fig. 1 is a side view showing a bed embodying one form of the cooling device;

Fig. 2 is an end view of the bed shown in Fig. 1;

Fig. 3 is an enlarged sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is an enlarged sectional view taken on line 4—4 of Fig. 2;

Fig. 5 is an enlarged sectional view taken on line 5—5 of Fig. 2;

Fig. 6 is an enlarged view of the center post between the two doors of the canopy.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 6;

Fig. 8 is an enlarged sectional view taken on line 8—8 of Fig. 1;

Fig. 9 is an enlarged sectional view taken on line 9—9 of Fig. 1;

Fig. 10 is an enlarged view with parts broken away showing the coupling for the pipe leading to the expansion coil;

Fig. 11 is an enlarged sectional view taken on line 11—11 of Figs. 2 and 3;

Fig. 12 is a view showing a modified construction;

Fig. 13 is an enlarged view taken on line 13—13 of Fig. 12;

Fig. 14 is a sectional view through the pipe in which the air is cooled showing a modified construction of the device for removing moisture and other materials from the air.

Like numerals refer to like parts throughout the several figures.

The extreme summer atmospheric conditions to which people in the north temperate zone are subjected makes them not only uncomfortable but reduces their vitality, their energy and effectiveness, and these effects are multiplied in the southern and tropical countries. The cost of cooling buildings and rooms and compartments at present is comparatively high and the result is that few buildings or compartments are being cooled. Furthermore, with the high wet and dry bulb temperatures very little sleep is possible with most people and sound or proper sleep is not, as a rule, secured.

The present invention has for one of its objects to provide a simple and effective means for permitting one or more persons to be in a cooled and dehumidified atmosphere without the expense of conditioning the entire building, compartment or room. For purposes of illustration I have shown the invention as used in connection with pieces of furniture, such as beds. In Figs. 1 to 11, for example, I have shown in detail one form of device particularly adapted for the purpose intended. In this construction a bed of any of the usual types may be used. This bed may have the ordinary springs and any suitable mattress 1. A receptacle 2 for the cooled air is provided and its lower edge extends all the way around the mattress 1, the mattress forming the bottom of the receptacle and forming the sealing device for sealing the bottom opening to prevent the warm air from entering. The receptacle or covering device 2 may be made of any suitable material. I prefer to make it of light material, such as aluminium, although it may be made of any metallic or non-metallic material adapted for the purpose. When the receptacle is made of aluminum it is preferably made with an outer section 3 and an inner section 4 with heat insulating material 5 between them, as shown in Figs. 4, 5 and 8.

Doors are provided at the side of the cover or receptacle 2 so that the party or parties may get into and out of the bed and so that the bed may be made up. In the construction shown I have provided two doors 6 and 7. These doors have frames extending about them. Within these frames are a plurality of transparent sheets 8 and 9 which may be of any suitable transparent material, such as glass, Celluloid, Cellophane or the like.

In order to facilitate the handling of the cover or receptacle, I prefer to build it into sections,

there being a bottom section 10 and a top section 11. These sections are connected together by the fastening devices 12 and 13. The dividing line at the end carrying the door 6 is up high enough so that the hinges 14 of this door may be placed on the same section, as for example the section 10. The door 7 has its hinges 15 connected with the section 11 so that when the device is separated one door will be with one section and the other door with the other section. Intermediate the doors 6 and 7 is a center post 16. This center post is removably connected with the sections 10 and 11 by the fastening devices 17 and 18 so that when it is desired to separate the device into its two sections, this can be done by removing the fastening devices 12 and 13 and 17 and 18. The doors 6 and 7 preferably have a plurality of transparent sheets, the door 6 having the sheets 8 and 8a and the door 7 having the sheets 9 and 9a, see Fig. 9. These sheets have an air space between them so as to act as heat insulating mediums.

The door 6 is provided with a handle 19 on the outside which is connected with the shaft 20 which is rotatably mounted in the door, and there is a locking member 21 inside the cover or receptacle 2 which engages a fixed locking member 22 attached to the center post 16, the latter locking member having an inclined face so that when the two locking members are brought into engagement the door is pressed inwardly. There is a packing member 23 entirely around the door which, by the closing of the door, is pressed tightly against the edges of the door opening to form a seal joint. There is also a handle 24 on the inside of the cover or receptacle so that any one on the inside can manipulate it to open and close the door. The door 7 has a handle 25 which also has a locking member engaging an inclined locking member which presses the door inwardly, and this door also has the packing member 26 extending entirely therearound which is pressed tightly against the edge of the door opening to make a seal joint.

The frames of the doors may be formed in any desired manner. As herein shown there is a frame member on the outside and the inside and these frame members are hollow, as shown at 27 and 28. The cover or receptacle is preferably so arranged that its bottom edge comes down substantially to the bottom edge of the mattress, the mattress projecting up into the casing so as to have an extended bearing surface all the way around to insure its acting as a seal for the bottom of the receptacle. At the top of the receptacle I prefer to have one or more air outlets 29.

Some means is provided for properly cooling the receptacle 2. As herein shown, I have illustrated a cooling or refrigerating unit 30 in a suitable casing 31 which may be separate from the bed or other piece of furniture, but in proximity thereto. This cooling or refrigerating unit may be of any suitable form. For purposes of illustration I have shown it as consisting of a compressor 32 operated by a motor 33. A tank 34 is provided for the refrigerant. The compressor is connected to this tank by means of a pipe 35 which leads through the condenser 36 and connects with the pipe 37 connected with the tank 34. A fan 38 operated by the motor directs air on the condenser. This air passes out through a screen 39 into the room. A pipe 40 leads from the tank 34 to the pipe 41 in the receptacle 2, which pipe 41 leads to the cooling coil 42. The pipe 41 is provided with an expansion valve 41a which may be of any suitable type, the refrigerant being expanded as it passes therethrough. A pipe 43 in the receptacle leads from the cooling coil 42 to the pipe 44 of the cooling unit which connects with the compressor 32. The pipes 40 and 44 are arranged so that they can be easily and quickly disconnected from the pipes 41 and 43 so that the cooling unit may be disconnected from the receptacle. This connection is arranged so that these pipes can be disconnected without letting much of the refrigerant escape.

Any suitable connection for this purpose may be used. I have shown the connection between the pipes 40 and 41 in Fig. 10. The pipe 40 has a valve 45 by means of which it may be closed, and the pipe 41 has a valve 46 by means of which it may be closed. Interposed between these valves are the coupling members 47 and 48 with the handles 49 and 50. When it is desired to disconnect these pipes the two valves are closed. The handles 49 and 50 are then grasped and the coupling members turned relatively until the pin 51 is moved from the slot 52, whereupon the two pipes are separated. The pipes 43 and 44 have a similar coupling and uncoupling arrangement.

The cooling coil 42 in the receptacle is arranged in an inner conduit 53. Surrounding the conduit 53 is an outer conduit 54. Air is drawn through the conduit 53 in any desired manner, as by means of a fan 55 run by a motor 56 connected with the receptacle 2. This motor is located in a small compartment 57 surrounded by heat insulating walls 58 so that the heat developed by the motor will not affect the interior of the receptacle. This also makes the compartment 57 sound proof so that the occupants are not disturbed by its operation. Air from the room passes through openings 59 in the receptacle 2 and into the conduit 53, coming into contact with the cooling coil 42.

Some means is provided for removing the moisture from this air and for removing dust, pollen and the like from it before the air is passed into the receptacle 2. The air from the room being cooled below its entering dew point gives up a portion of its moisture to the cold surface of the cooling coil. This moisture may be picked up by the air stream and carried as "entrained moisture." To remove this entrained moisture I have illustrated in Fig. 11 a series of baffles 60 against which the air strikes so that its direction is changed in order to cause the moisture to be removed therefrom. This moisture falls down on the bottom of the conduit 53 which has its other end inclined downwardly and runs into the drip pan 61 and is conducted by pipes 62 and 63 to the drip pan 64 and can be removed when desired. There is also a drip pan 64a which receives any moisture that may accumulate in the outer conduit 54, the moisture dropping off and running into this receptacle, and then running down through the pipe 63 into the pan 64.

In Fig. 14 I have shown a construction where there is placed at the end of the conduit 54 an air cleanser of any suitable form, which consists of the air cleansing material 65 placed in between two sieve like members 66 and 67. The air passed through this cleanser has the moisture, dust, pollen and other impurities removed therefrom. Air is also taken from the interior of the receptacle 2 and mixed with the outside air after it has been passed through the conduit 53. The air from the receptacle 2 passes through the openings 68, see Fig. 2, into the space 69, see Fig. 11, between the conduits 53 and 54 and is drawn

by the fan along this space between the conduits and then passes through the openings 70 into the conduit 53 and mixed with the air therein.

Means is provided for regulating the relative amount of air taken from the receptacle 2 and from the room outside said receptacle. I have shown a simple means of doing this which consists of a ring 71 surrounding the conduit 53. This ring is provided with holes 72 which register with the holes 70 in the conduit 53, see Fig. 11. By moving this ring the size of these holes can be controlled as desired. The air from the outside and the air from the receptacle are then thoroughly mixed and moved by the fan up into the receptacle 2, through the duct 54a.

It will therefore be seen that by means of this construction the cold air passing in contact with the cooling coil is tempered by the air taken from the compartment, the two bodies of air being mixed so as to secure the desired temperature in the compartment. It will further be seen that the desired mixture can easily be secured by properly adjusting the ring 71.

The air taken from the receptacle may have some moisture due to the evaporation from the body of the person therein. This air therefore, mixed with the other air in the proper proportions, will secure a mixture having the proper moisture so that the individuals in the receptacle will not have the effect of a too cold or too dry air. I may use in connection with the air cleanser a substance like silica-gel to extract moisture from the air, and the air thus having its moisture extracted would make the bed fairly comfortable to sleep in even without cooling. It will further be noted that not only is the air passing to the receptacle properly conditioned by having the proper temperature, proper moisture, and being properly cleansed of impurities or pollens, but there is a circulation of air through the receptacle, as part of the air passes out through the opening 29.

In Fig. 12 I have shown a modified construction. In this construction the receptacle 2a is not only open at the bottom, but at the end. This receptacle fits down over the mattress which, as in the other case, acts as the sealing device for the open bottom. The end 13 of the receptacle 2a has the coil and fan and associated parts connected therewith and is separate from the receptacle 2a and is fastened in position in any desired manner. It may be fastened to the bed if desired, but I prefer to fasten it to the refrigerating unit 30 by means of the fastening pieces 74. The receptacle 2a is pivoted at 75 to some fixed part, preferably the end 13. The receptacle has on the outside at each side handles 76 so that it may be moved about its pivots to the dotted position shown in Fig. 12 to permit the occupants to enter. It has on the inside on both sides the handles 77 so that the occupants may lift it to this dotted line position when they desire to leave the bed. In this case there are windows 78 on both sides and made of a plurality of transparent plates. Connected either with the part 13 or the receptacle 2a, and extending all the way around the edges of the part 13, is a packing member 2b which, when the receptacle is in its operative position, forms a tight packing sealing connection between the receptacle 2a and the part or end 13.

Some means is preferably provided for holding the receptacle in its up position for the purpose of making the bed. This may be done by providing at one side the links 79 and 80. The link 79 is pivoted to the receptacle and is pivoted to the link 80 which is connected with the bed. When the receptacle is lifted the links are straightened out, as indicated in dotted lines, and hold the receptacle in this position. To return the receptacle to its operative position pressure is applied to the links where they are pivoted together to move them out of line, whereupon the receptacle can be lowered. These links may be on both sides if desired. The receptacle is preferably provided with supporting legs which engage the bed and limit the downward movement of the receptacle. In the construction of Figs. 1 and 2 there are two folding legs 81 at each end, the legs being pivoted at 82 to the receptacle so that they may be moved up out of the way when not in use.

Within the receptacle, whatever the form thereof, I prefer to provide an automatic controlling means for the motor 33 of the refrigerating unit. Any suitable device for this purpose may be used. As herein shown I have illustrated a thermostatic bulb 83 which is connected to a capillary thermostatic line 84 leading to an adjustable pressure switch 85 inside the receptacle. Any usual switch of this type may be used and the device may be set as desired by means of the indicating point 86. Associated with this switch are the conductors 87 and 88 which lead to the motor 33. This device is set so that when the desired condition in the apartment is present the device will act to disconnect the motor 33 from the circuit and stop the operation of the refrigerating unit until the condition in the receptacle requires it to be again operated, whereupon it is operated. It will therefore be seen that the proper conditions in the receptacle are therefore automatically obtained.

I have shown the device in connection with a bed, but it is of course evident it may be used in other ways by being placed on other pieces of furniture, such as chairs, sofas and the like, and the seats thereof may be used as the closing and sealing member in the place of the mattress. The device might also be placed directly on the floor and properly sealed at the bottom.

In order to provide additional lighting means I have shown the windows 92 and 93 located at the top of the receptacle. The windows have a plurality of transparent sheets 90, 90a and 91, 91a with air spaces between as shown in detail in Figure 4.

The use and operation of my invention are as follows:

The receptacle can be easily and quickly installed on any piece of furniture for which it is adapted, or in any position desired. The refrigerating unit will then be brought into position and the pipes properly connected as hereinbefore set out so that the refrigerant is circulated through the cooling coil 42. Air is then taken from the room, that is, is taken from the outside of the receptacle through the openings 59 and passed through the pipe or casing around the coil 42 so as to be brought into contact with this coil. This air is conditioned by having the moisture, dust, pollen and other impurities removed therefrom and by being cooled. Air from the receptacle passes into the conduit 69 and is mixed with the air which has been cooled by the coil 42, and this mixture is delivered into the receptacle, the fan 55 acting on both the air from the outside of the receptacle and the air from the inside of the receptacle. This fan may be a constant speed fan or it may be a fan whose

speed can be regulated, and in that event the amount of air can be regulated by regulating the speed of the motor. This air when discharged into the receptacle will be in the proper condition so far as moisture, temperature and freedom from impurities or pollen is concerned, so that the occupants of the bed may be comfortable in every particular. By having the transparent receptacle, that is the receptacle with windows, this allows the interior to be illuminated from the outside so as to avoid the heat of a light of any kind on the inside. The lighting is therefore secured without interferring with the temperature.

The receptacle may be arranged with suitable means for conversing by people on the outside and the inside. When used for hospital patients a microphone can be installed inside with a loud speaker outside so that any sound or talking of the occupant of the bed can be heard on the outside.

It will be seen that this device may be moved from room to room or from point to point as desired. By having the refrigerating unit separate from the bed and receptacle the noise and vibration from the refrigerating unit is not transferred to the receptacle and the bed or other piece of furniture. This refrigerating unit can be easily and quickly connected to or disconnected from the apparatus in the receptacle.

I claim:

1. A cooling and ventilating device for persons to be applied to a bed having a mattress thereon. comprising a receptacle, the receptacle being open at the bottom and positioned over the bed, the lower edge of the receptacle being rigid and extending downwardly past the upper face of the mattress so that the mattress projects into the open bottom of the receptacle the lower end of the receptacle tightly engaging the edges of the mattress all the way around, such engagement forming a resilient sealing device extending entirely therearound for sealing said open bottom to prevent the escape of the cool air, said receptacle having its upper part spaced away from the mattress substantially throughout the length of the mattress so as to be spaced away from the body of the occupant on the mattress throughout the entire length of the occupant's body, and means for cooling said receptacle.

2. A cooling and ventilating device for persons to be applied to a bed having a mattress thereon, comprising a receptacle, the receptacle being open at the bottom and positioned over the bed, said receptacle having two stiff ends, one of said ends being located between the head of the bed and the mattress, the other of said ends being located between the foot of the bed and the mattress, the lower inside face of each of said ends engaging the associated vertical end face of the mattress, the lower portions of the sides of said receptacle engaging the associated vertical side faces of said mattress so that the mattress projects upwardly into said receptacle the lower end of the receptacle tightly engaging the edges of the mattress all the way around, and forming a resilient seal for the bottom thereof to prevent the escape of the cool air, the upper part of said receptacle being supported upon the ends and sides thereof in a position spaced away from the mattress substantially throughout the length of the mattress so as to be spaced away from the body of the occupant on the mattress throughout the entire length of said body, and means for cooling said receptacle.

3. A cooling and ventilating device for persons comprising a receptacle having an inlet at one end thereof and an outlet at the other end thereof, a mattress forming the bottom of said receptacle upon which the person rests said receptacle completely covering the entire mattress, refrigerating apparatus comprising a cooling element on the interior of said receptacle and an air moving device for causing air to move through said inlet past said cooling element into said receptacle and out of said outlet, said inlet and outlet and the portion of the receptacle connecting them being spaced above the person lying on the mattress so that the main current of air passes through said receptacle above and entirely along the person lying on the mattress whereby such person will be out of the direct flow of the air.

4. A cooling and ventilating device for persons comprising a receptacle having an inlet at one end thereof and an outlet at the other end thereof, a mattress forming the bottom of said receptacle upon which the person rests said receptacle completely covering the entire mattress, refrigerating apparatus comprising a cooling element on the interior of said receptacle and an air moving device for causing air to move through said inlet past said cooling element into said receptacle and out of said outlet, said cooling element and air moving device being located in the receptacle within the boundaries of said mattress, said inlet and outlet and the portion of the receptacle connecting them being spaced above the person lying on the mattress so that the main current of air passes through said receptacle above and entirely along the person lying on the mattress whereby such person will be out of the direct flow of the air.

5. A cooling and ventilating device for persons, comprising a receptacle having a space into which a person to be cooled is received, said receptacle located in a room, an evaporator in said receptacle, means for bringing air from outside the receptacle into contact with said evaporator in the receptacle so that it will be cooled, and means for mixing air from the receptacle with said outside air from outside the receptacle so as to provide a cooled air mixture and directing such mixture into the space in the receptacle into which the person to be cooled is received.

6. A cooling and ventilating device for persons, comprising a receptacle having a space into which a person to be cooled is received, said receptacle located in a room, an evaporator in said receptacle, means for bringing air from outside the receptacle into contact with said evaporator in the receptacle so that it will be cooled, means for mixing air from the receptacle with said outside air from outside the receptacle so as to provide a cooled air mixture and directing such mixture into the space in the receptacle into which the person to be cooled is received, and an air outlet in the upper part of said receptacle above the point where the head of the person is located.

7. A cooling and ventilating device for persons, comprising a receptacle adapted to receive the person, an evaporator located in said receptacle above the position normally occupied by said person, a cooling unit separate from the receptacle and separately supported, and connecting means for connecting said cooling

unit with the evaporator in the receptacle, and an outlet in the receptacle spaced from the evaporator and located above said evaporator.

8. In an air conditioning device, the combination of means including a canopy for isolating a zone of immediate occupancy, supporting means for said canopy, a motor, compressor and condenser associated with said supporting means but located outside said canopy, and an evaporator, supported within said canopy by said supporting means and positioned to cool the air in said canopy and circulate it by convection.

9. In an air conditioning device, the combination of means including a canopy for isolating a zone of immediate occupancy, supporting means for said canopy, a motor, compressor and condenser associated with said supporting means but located outside said canopy, and an evaporator, supported within said canopy by said supporting means and positioned to cool the air in said canopy and circulate it by convection, said canopy being such as to permit a change of air therein by the passage of air through restricted openings.

10. In an air conditioning device, the combination of means including a canopy for isolating a zone of immediate occupancy, supporting means for said canopy, a motor, compressor and condenser associated with said supporting means but located outside said canopy, and an evaporator, supported within said canopy by said supporting means and positioned to cool the air in said canopy and circulate it by convection, and means to catch and conduct outside said canopy the moisture condensing on said evaporator.

11. In an air conditioning device, the combination of means including a canopy for isolating a zone of immediate occupancy, supporting means for said canopy, a motor, compressor and condenser associated with said supporting means but located outside said canopy, and an evaporator, supported within said canopy by said supporting means and positioned to cool the air in said canopy and circulate it by convection, and means to catch and conduct outside said canopy the moisture condensing on said evaporator, said means comprising a series of louvre plates so disposed below said evaporator as to permit a downward motion of air therethrough but to carry condensate to one side, a trough for catching said condensate and means for conducting said condensate to a receiving vessel.

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