ABSTRACT
A bed having a horizontal portion received beneath a person lying on the bed and through which air is circulated upwardly toward the person, with the bed also having a structure at its end projecting upwardly above the level of the horizontal portion and discharging air from that elevated location generally horizontally toward the person and preferably past an adjustable louver assembly. Both types of circulation are preferably produced by a fan contained within the mentioned end structure.

12 Claims, 6 Drawing Figures
BED WITH CIRCULATED AIR

BACKGROUND OF THE INVENTION

This invention relates to improved bed structures designed to increase the comfort of a person or persons using the bed. Certain features of the invention have been shown in my Disclosure Document No. 0183390 filed in the U.S. Pat. Office Apr. 11, 1973, and entitled "Vent-A-Bed".

There have in the past been proposed various types of beds, mattresses, or the like in which air has been circulated through a portion of the bed, for instance through the mattress, for assisting in maintaining a proper temperature condition and thereby rendering the bed more comfortable to a user. For example, certain circulation systems of this general type have been shown in U.S. Pat. Nos. 2,461,432, 3,230,556, 2,400,790, 3,644,950, 3,266,664 and 2,493,067.

SUMMARY OF THE INVENTION

The present invention provides an improved air circulation type bed in which the comfort enhancing effect of the circulated air is increased by providing for two different types of air circulation toward and past a user's body, preferably in proportions and at temperatures which are controllable to enable the user to adjust the circulation conditions to suit his own individual desires and to compensate for any ambient temperature conditions which may be encountered.

To achieve these results, a bed embodying the invention includes a first structure which extends horizontally beneath a person lying on the bed and is adapted to circulate air upwardly through the top of that structure and toward the user's body, and a second structure projecting upwardly at an end of the bed to a location above the surface on which the user's body rests, and adapted to discharge air from that location over the user's body. Fan means are provided for maintaining both types of circulation, and may include a common fan serving both purposes. The fan means may be located within the interior of the discussed end structure, which may contain a chamber leading the circulated air to both of the discharge locations. The air which is discharged from the elevated location may be controlled in volume by suitable means, preferably taking the form of louvers which are easily adjustable to vary the rate of flow and/or the direction of flow from the end structure. The horizontal structure is desirably located beneath and supports a mattress, which is permeable to upward flow of air from the horizontal structure through the mattress to the user's body.

Suitable means may be provided for changing the temperature of the circulated air, as by provision of a heating element or a cooling element or both, desirably located within the hollow end structure.

BRIEF DESCRIPTION OF THE DRAWING

The above and other features and objects of the invention will be better understood from the following detailed description of the typical embodiments illustrated in the accompanying drawings in which:

FIG. 1 is a perspective view of a first bed arrangement embodying the invention;
FIG. 2 is an enlarged vertical section taken on line 2—2 of FIG. 1;
FIG. 3 is an exploded perspective representation of the FIG. 1 bed;
FIG. 4 is a reduced plan view of the FIG. 1 bed;
FIG. 5 is a view similar to FIG. 2, but showing a variational arrangement; and
FIG. 6 is a transverse section taken on line 6—6 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. 1, I have shown generally at a bed arrangement constructed in accordance with the invention, and including a main support frame 11, a mattress 12, a horizontally extending hollow air circulating unit 13 for emitting air upwardly through the mattress, and a headboard assembly 14 projecting upwardly at the head end of the bed. A pair of lamp holders 15 may be provided at opposite sides of the headboard structure 14, and may be secured thereto if desired.

The main support frame 11 may be of any convenient horizontally rectangular construction (see FIG. 3), having four-corner legs 16 projecting downwardly for engagement with a floor surface, and/or for warming the peripheral side and end elements 17 and 18 defining a rectangular recess 19 adapted to receive the air circulating unit 13. The unit 13 may be supported by frame 11 in any convenient manner, as by crosspieces 20 and upwardly facing surfaces 21 on support strips or flanges 22 carried at the inner sides of the peripheral elements 17 and 18.

The mattress 12 is of conventional horizontally rectangular shape, having an upper horizontal surface 23 for supporting a user's body. The mattress is of an air permeable character, adapted to pass circulated air upwardly therethrough from the unit 13 to the upper side of the mattress for cooling and/or warming the occupant of the bed. For this purpose, the mattress may be a conventional spring type mattress, in which air can flow upwardly past the springs within the mattress, and upwardly through all of the layers of fiber material or the like utilized as cushioning material, and also upwardly through the fabric employed as the covering of the mattress. The air can flow upwardly through the mattress across substantially its entire horizontal extent, though the rate of flow need not be great to accomplish the purposes of the invention.

The air circulating unit 13 located beneath the mattress is of the same horizontally rectangular cross-section as the mattress itself, being defined by an upper rectangular horizontal wall 24, a rectangular horizontal bottom wall 25, two parallel vertical opposite side walls 26, a transverse vertical end wall 27 extending across the foot end of the unit, and a transverse vertical end wall 28 extending across the head end of the unit but containing an elongated rectangular air inlet aperture 29 (FIG. 2) through which air may enter unit 13 from the headboard structure 14. The top wall 24 of unit 13 contains a large number of apertures 30 (FIGS. 2 and 3), through which the circulated air discharges upwardly to the underside of the mattress, for flow upwardly through the mattress to its upper side and to the user of the bed.

The headboard 14 is hollow and takes the form essentially of an upwardly projecting rectangular box containing and defining an inner air circulation chamber 31. More particularly, the headboard 14 may have a rear vertical wall 32 (FIG. 2), two opposite parallel side walls 33 extending perpendicular to rear wall 32, and a horizontal top wall 34. At locations spaced above the floor surface 35, the headboard unit 14 may contain and carry a horizontal rectangular bottom wall 36.
parallel to the top wall 34. At its front side, the headboard unit 14 has near its lower end a rectangular frame portion 37 lying in a vertical plane disposed transversely of the front to rear axis 38 of the bed, and defining a rectangular opening 39 through which air from the interior of the headboard assembly can flow into the previously mentioned surrounding rectangular forward opening 29 of unit 13. The frame 37 is secured to apertures 39 with respect to aperture 29 of unit 13, in any appropriate manner, as by a gasket 40 (FIG. 3) clamped between frame 37 and unit 13. The frame end unit 13 may be secured tightly together in suitable manner, as by screws 139 or the like at different locations about the periphery of aperture 39.

Above the location of frame 37 and its aperture 39, the forward side of headboard assembly 14 may be formed by a pair of parallel vertical transverse boards or walls 41, which are imperforate and project upwardly above the plane 42 of the horizontal top surface 23 of the mattress. Horizontal members 43 and 44 may connect these walls 41 together at their upper and lower ends. Extending upwardly between horizontal member 43 and the top wall 34 of the headboard structure, there may be provided at a central location a narrow vertical wall 45, which may carry controls 46 manually actuable to control the operation of the fan, heating elements, cooling elements, lamps on table 15, and any other apparatus to be controlled.

At opposite sides of the central control panel 45, the headboard assembly 14 contains and defines two rectangular apertures 47 lying essentially in a common vertical plane 48 (FIGS. 1 and 2) disposed transversely of the previously mentioned axis 38. More particularly, the upper and lower horizontal edges 49 and 50 of these two airflow apertures 47 may be defined by the top wall 34 and the discussed wall 43 respectively. The outer vertical side edges 51 and 52 of these apertures may be formed by side walls 33 of the headboard assembly, while the inner vertical edges 53 and 54 of apertures 47 may be defined by the opposite sides of panel 45.

For controlling the direction and quantity of air blown through apertures 47, there are mounted within these apertures two sets of louvers 55 and 56, whose individual slats or flow control elements 57 are mounted by individual shafts 58, connected into side walls 33 and a pair of inner walls 59 at opposite sides of panel 45, for individual pivoting movement about parallel vertically spaced horizontal axes 60 lying in the previously mentioned vertical transverse plane 48. Appropriate control elements 61 may be provided for adjusting the positions of these louvers, between each of two fully closed positions and a fully opened parallel horizontal position represented in broken lines in FIG. 2. The control elements 60 may be conventional manually actuated levers attached to conventional louver actuating mechanisms of known type.

At the rear side of headboard assembly 14, the back wall 32 contains an air inlet aperture 62 (FIG. 2), which may be rectangular and may be the only opening through which air can enter the interior chamber 31 within the headboard. A fan 63 may be mounted in chamber 31 just forwardly of the inlet aperture 62, and generally opposite and rearwardly of louver assemblies 55 and 56 and the central panel 45 therebetween, and may be driven rotatably about a horizontal axis 64 by an electric motor 65 to draw air forwardly through apertures 62 and aim it toward the louvers. Motor 65 may be mounted in any suitable manner, as by providing a mounting spider or frame 66 which supports the motor and fan rigidly, but passes air forwardly through openings in the spider.

Air from the fan can flow forwardly through the louvers if open, and can also flow downwardly within chamber 31 and then curve forwardly through opening 29 into the interior aperture 13. A forwardly curved bottom wall 67 may be provided for directing the air flow smoothly into unit 13, as illustrated in FIG. 2. A heater element 68 and a cooling element 168 are desirably located within chamber 31 at appropriate locations, typically at the illustrated locations vertically between fan 63 and the bottom of chamber 31, to heat or cool the air as it flows toward unit 13. These heating and cooling elements may be any suitable type of electrical or other units for the purpose, and both typically extend across the entire width of chamber 31. Two of the control knobs 46 may control thermostats on panel 45 for regulating heater 68 and cooler 168 respectively, to produce any desired temperature within the unit. The temperature responsive control elements of these thermostats may be located on the back of the panel 46 or be located at a point within chamber 31 downwardly beyond elements 68 and 168, or at any other convenient location of exposure to the air flow.

Another of the control knobs 46 may serve to turn fan motor 65 on or off, and/or control its speed. To now describe the use of the bed assembly of FIGS. 1 through 4, assume that the ambient area is very cold and it is desired to warm the bed and its occupant. Under these conditions, the operator turns heater 68 and fan motor 65 on, to commence circulation of air forwardly through aperture 62, past fan 63 and downwardly past heater 68, and into the unit 13 beneath mattress 12. The heated air flows upwardly from unit 13 through its top apertures 30 and then flows upwardly through the air permeable mattress 12 to the user, to keep the mattress and the user warm. The user may also open one or both of the louver assemblies 55 and 56, to any desired amount, to allow some of the air from fan 63 to flow forwardly through and past the louvers, and across the upper side of the mattress, to warm the air above the mattress and further increase the comfort of the user. The louvers may be opened to a condition directing some of the air downwardly from the louvers, or horizontally outwardly from the louvers, or upwardly if desired, to thus give a full range of control of the direction and volume of air emitted through the louvers, as compared with the rate of air flow through the unit 13 beneath the mattress, or to close off completely the air flow through the louvers if desired. Under some circumstances, the air flow through the louvers may be even more positively closed off by insertion of a removable heat insulating vertical wall 70 behind the louvers. This wall is retained removably by appropriate detachable fasteners represented at 71, and may be rendered accessible for removal from chamber 31 by swinging top wall 34 of the headboard assembly upwardly about a rear hinge 72 connecting it to back wall 32 of the headboard. If it is desired to cool rather than heat the bed and occupant, cooling element 168 is turned on instead of heater 68, and the flow of cool air is regulated to suit the user as discussed above.

FIGS. 5 and 6 show a variational arrangement similar to that of FIGS. 1 to 4, except in the respects specifically set forth below. The arrangement of FIGS. 5 and
6 includes a headboard assembly 14a which is similar to assembly 14 of FIGS. 1 to 4 but is adapted for use with an essentially conventional box spring 73 and superimposed mattress 74, mounted on a conventional rectangular bed frame 175. This accessory type unit of FIGS. 5 and 6 includes a horizontal rectangular unit 75, which serves the purpose of the unit 13 of FIG. 1, but is received vertically between the box springs 73 and mattress 74. Unit 75 is hollow and receives circulated air from chamber 31a in headboard unit 14a through a flexible hose 76 connected into the lower portion of the chamber 31a in lieu of the communication apertures 29 and 39 of the first form of the invention. Unit 75 has parallel upper and lower walls 77 and 78, the former of which contains a large number of apertures 79 through which air flows upwardly to mattress 74, for passage upwardly through the mattress to the person using the bed. The bottom wall 78 of unit 75, and its vertical edge walls 80, may be imperforate, to confine all air from conduit 76 against escape from unit 75 except through the upper opening 79. Appropriate means are provided within the interior of unit 75 for supporting upper wall 77 from lower wall 78 while allowing flow of air rearwardly from conduit 76 to all of the apertures 79. For this purpose, a series of inclined interior support walls 81 extending longitudinally of unit 75 may be provided within the interior of that unit, in the zig-zag pattern illustrated in FIG. 6, to provide a series of longitudinally extending parallel passages 82 through which air from conduit 76 may flow longitudinally to the locations of the different apertures 79. The head ends of the inclined support walls 81 may terminate at 83 (FIG. 5) at a location spaced from the end wall 84 of unit 75, to allow flow of the air transversely into the various different air flow passages 83. Any other convenient or desirable interior support structure between the upper and lower walls 77 and 78 of unit 75 may of course be substituted for the typical zig-zag wall arrangement illustrated.

Louveres corresponding to those shown at 55 and 56 (FIG. 1) may be provided in FIG. 5, as represented at 56a in that figure. Also, a fan 63a driven by a motor 65a circulates air in the same manner as fan 63 in the first form of the invention. In FIG. 5, in lieu of the heater element 68 and cooling element 168, I have typically illustrated a single heat exchange coil 68a, which may be the heat exchange coil of a heat pump 168a mounted within chamber 31a, and placed in appropriate communication with air at the outside of the building, as through a conduit represented at 268a. This heat pump 168a is controlled by one of the knobs corresponding to that shown at 46 in FIG. 1, to either heat or cool the air as it flows to the fan from inlet aperture 62a, under the control of an appropriate thermostat if desired. As in the first form of the invention, the louvers may be actuated to any of their various possible positions, to either close off all air flow forwardly through the louvers, or direct controlled amounts of air downwardly at an angle, horizontally, or upwardly, at any angle thought optimum under the particular circumstances ensuing at a certain time.

While certain specific embodiments of the present invention have been disclosed as typical, the invention is of course not limited to these particular forms, but rather is applicable broadly to all such variations as fall within the scope of the appended claims.

I claim:
1. In a bed, the combination comprising:
   a body supporting assembly having a mattress-top surface on which a person using the bed rests and which is cushioned to yieldingly support and be deformed by the user's weight, and is constructed to pass air upwardly through said mattress-top surface to the user's body, said assembly including means forming a chamber or plurality of chambers beneath said surface adapted to conduct a circulation of air and from which said air may flow upwardly through said mattress-top surface and to the user;
   a hollow housing at an end of said body supporting assembly communicating with said chamber or chambers beneath the mattress-top surface in a relation delivering air thereto along a first path, said housing having an upper portion projecting upwardly to a level above that of said mattress-top surface and containing an air discharge outlet through which air discharges along a second path at a level above that of said mattress-top surface in a direction to flow over a person lying thereon; and power driven fan means within said housing at said end of the body supporting assembly and operable to produce two different flows of air from said housing, one being along said first path from the housing through said chamber or chambers and then upwardly through said mattress-top surface to the user, and the second flow being from the housing along said second path and through said discharge outlet above the mattress-top level and over the user's body.
2. The combination as recited in claim 1, in which said power driven fan means includes a common fan within said housing operable to discharge air along both of said paths.
3. The combination as recited in claim 1, including means for controllably varying the proportion of air discharged by said fan means along said two paths respectively.
4. The combination as recited in claim 1, including means for controllably varying the quantity of air delivered through said discharge outlet.
5. The combination as recited in claim 1, including louver means adjustable to regulate the flow of air along said second path.
6. The combination as recited in claim 1, including means within said housing for changing the temperature of air flowing along at least one of said paths.
7. The combination as recited in claim 1, including means within said housing for changing the temperature of air flowing along both of said paths.
8. The combination as recited in claim 1, in which said fan means includes a common fan contained within said upwardly projecting portion of said end structure and discharging air along both of said paths.
9. The combination as recited in claim 8, in which said air discharge outlet faces generally toward a person lying on the bed there being louvers in said outlet adjustable to variably control the airflow therethrough.
10. The combination as recited in claim 9, in which said upwardly projecting portion of said housing contains an opening at a backside thereof facing away from the bed and through which air is drawn inwardly by said fan, said fan being positioned to direct discharged air generally horizontally towards said louvers, there being a temperature changing element within said housing past which air is circulated by the fan and acting to controllably change the temperature of the air circulated by said fan.
11. The combination as recited in claim 10, in which said means forming said chamber or chambers includes a hollow rectangular structure connected at one end to said housing to receive air therefrom and having openings at its upper side through which air circulates upwardly, said body supporting assembly including a box spring beneath said hollow structure and a mattress above said hollow structure and having said mattress-top surface at its upper side.

12. The combination as recited in claim 1, in which said means forming said chamber or chambers includes a hollow rectangular structure connected at one end to said housing to receive air therefrom and having openings at its upper side through which air circulates upwardly, said body supporting assembly including a box spring beneath said hollow structure and a mattress above said hollow structure and having said mattress-top surface at its upper side.

* * * *