United States Patent [19]

Starr

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[45] **Dec. 30, 1975**

[54] **BED WITH CIRCULATED AIR**

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[52] **U.S. Cl.** **5/284;** 5/347

[51] **Int. Cl.²** **A47C 19/00**

[58] **Field of Search** 5/284, 347

[56] **References Cited**

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1,891,903	12/1932	Bang	5/284
2,186,142	1/1940	Lieberman	5/284
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Primary Examiner—Robert L. Wolfe
Assistant Examiner—Andrew M. Calvert
Attorney, Agent, or Firm—William P. Green

[57] **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

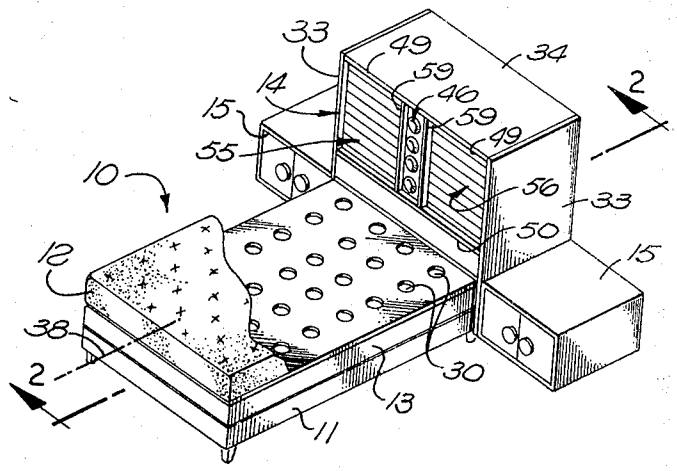
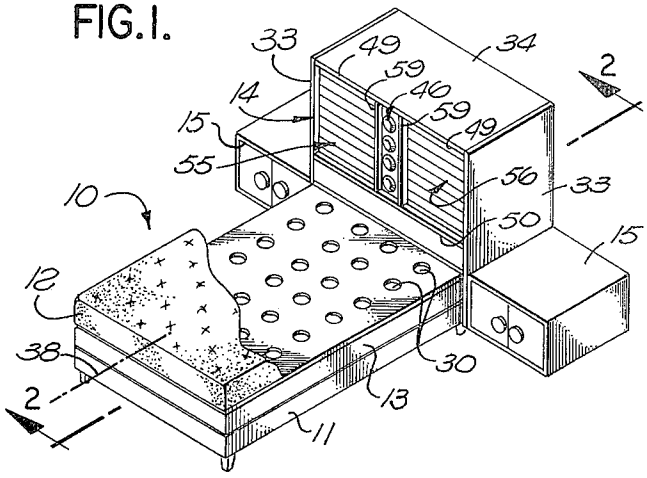


FIG. 1.



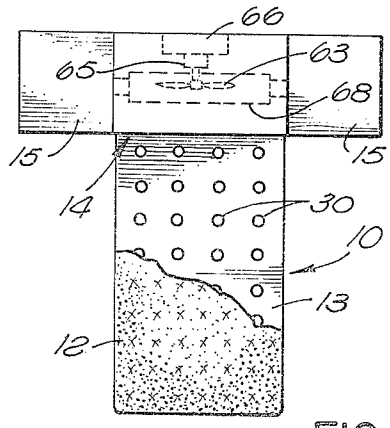


FIG. 4.

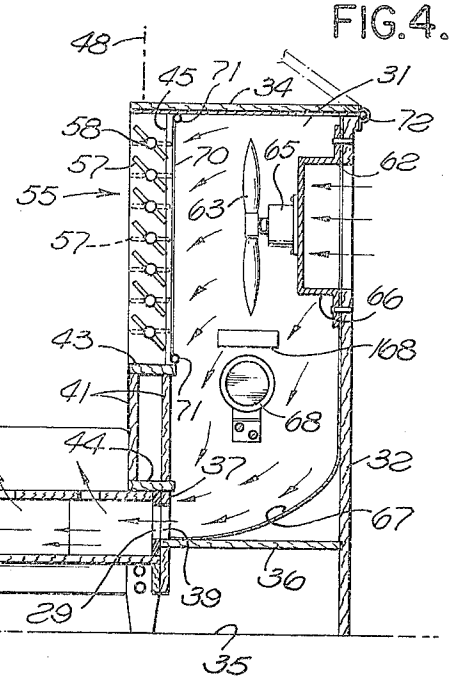


FIG. 2.

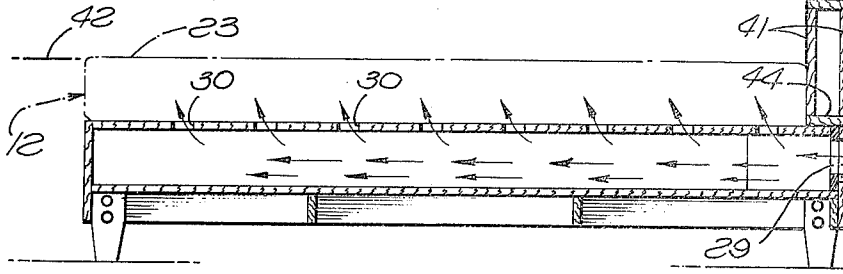
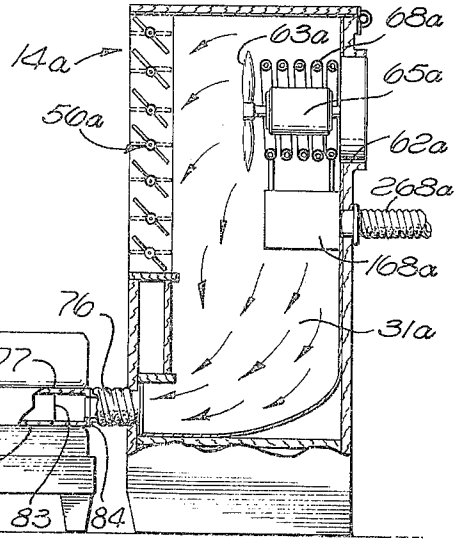


FIG. 5.



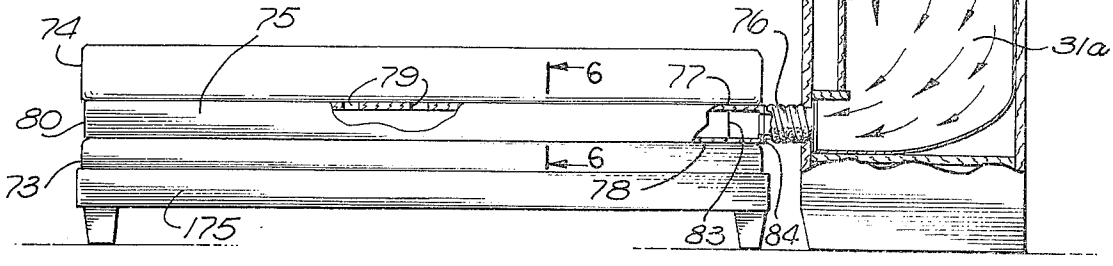
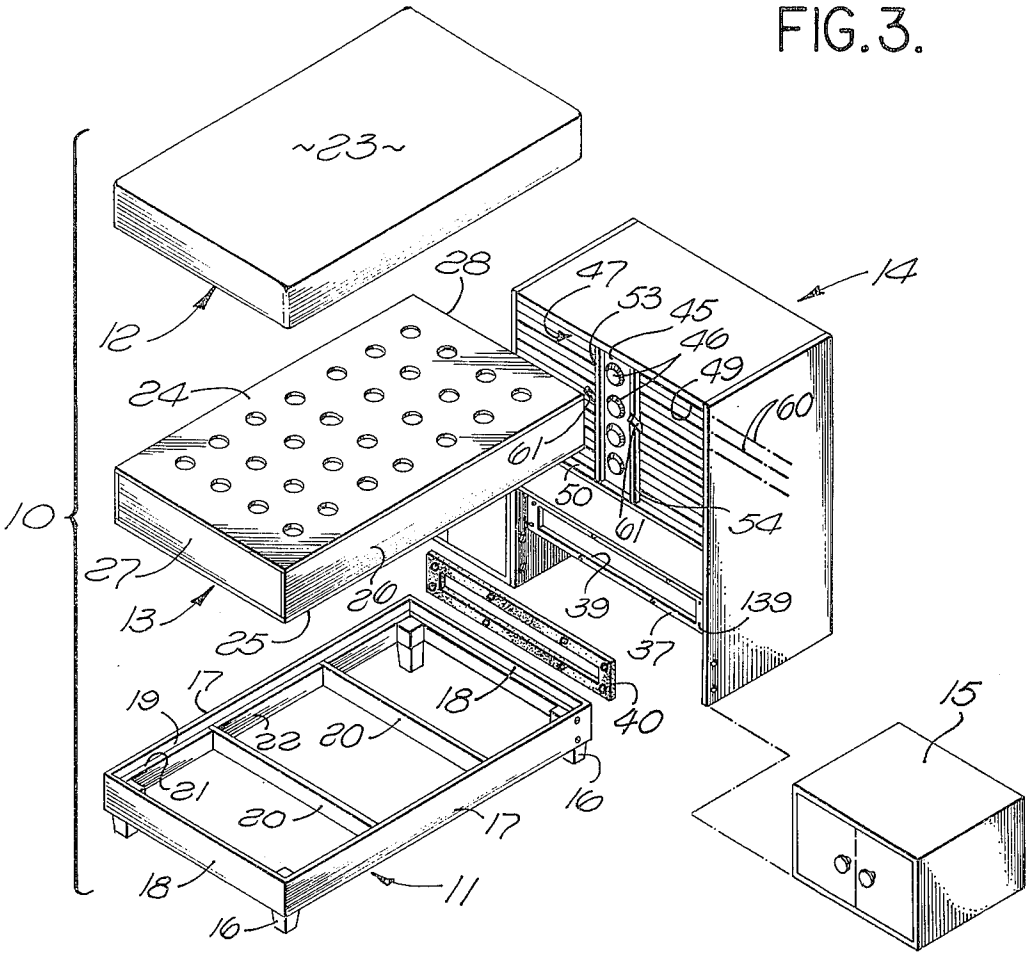


FIG. 3.


~23~
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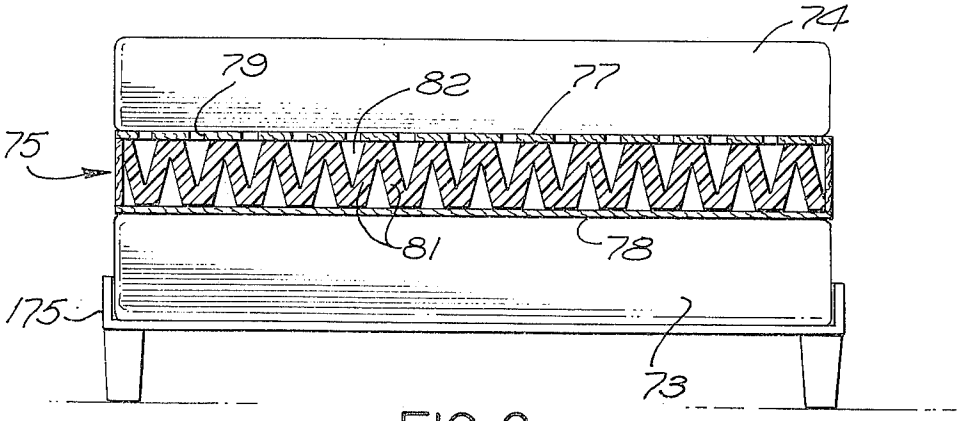

74
79
82
77
75
81
78
175
73

FIG. 6.

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. 018390 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, as 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, 3,266,064 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 **10** 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 tables **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 having 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 cieculated 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 upperside 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 correspondingly rectangular forward opening **29** of unit **13.** The frame **37** is sealed entirely about aperture **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 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 either 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 inner 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 of unit **13.** A forwardly curving 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 controlled temperature of air in 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 **14***a* through a flexible hose **76** connected into the lower portion of the chamber **31***a* 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.

Louvers corresponding to those shown at **55** and **56** (FIG. **1**) may be provided in FIG. **5**, as represented at **56***a* in that figure. Also, a fan **63***a* driven by a motor **65***a* 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 **68***a*, which may be the heat exchange coil of a heat pump **168***a* mounted within chamber **31***a*, and placed in appropriate communication with air at the outside of the building, as through a conduit represented at **268***a*. This heat pump **168***a* 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 **62***a*, 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 controlably 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 controlably 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 include 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 controlably 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.

* * * * *