Nov. 9, 1937. E. C. SITTLER 2,098,316

METHOD OF AND APPARATUS FOR CREATING AN ARTIFICIAL FEVER

Filed July 22, 1933 3 Sheets-Sheet 1

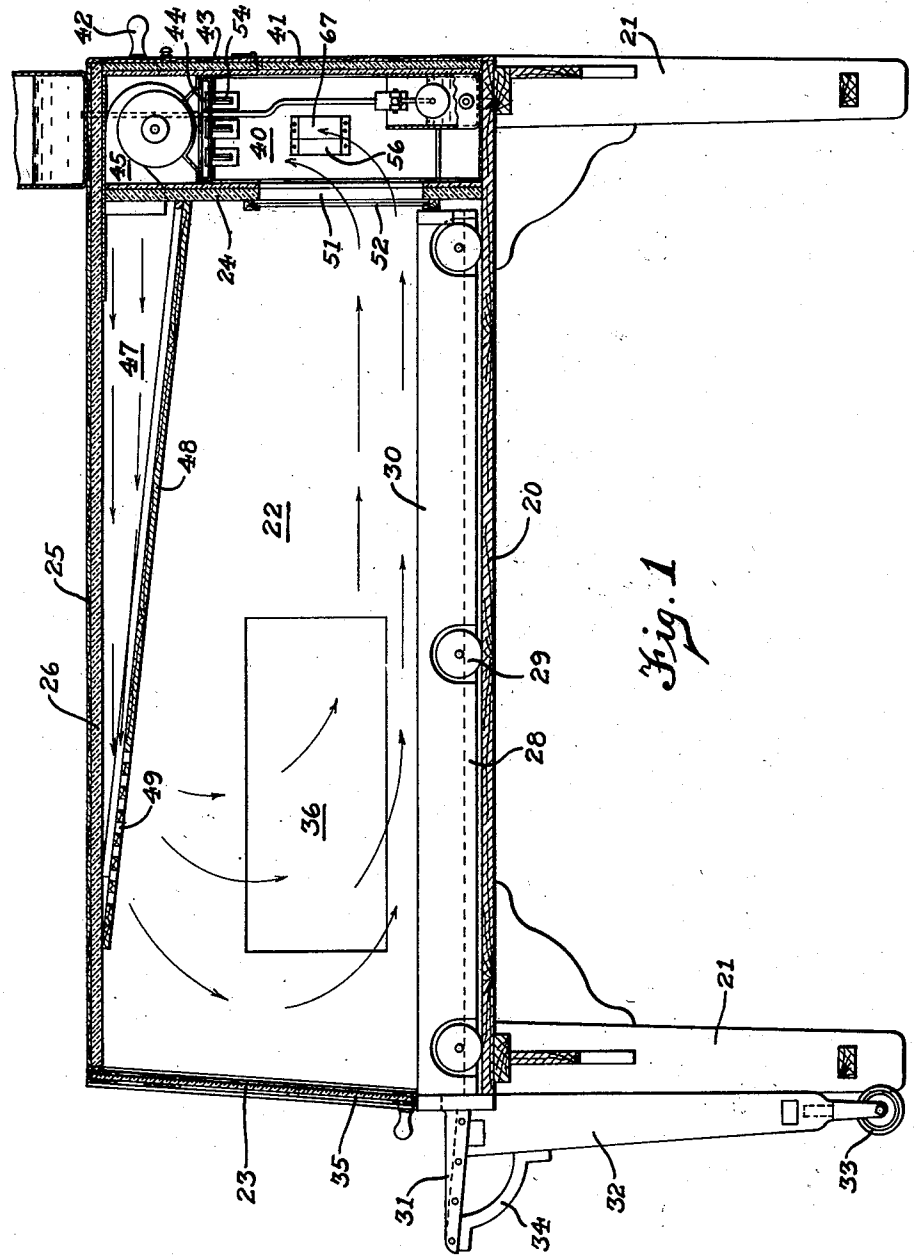


Fig. 1

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Filed July 22, 1933 3 Sheets-Sheet 2

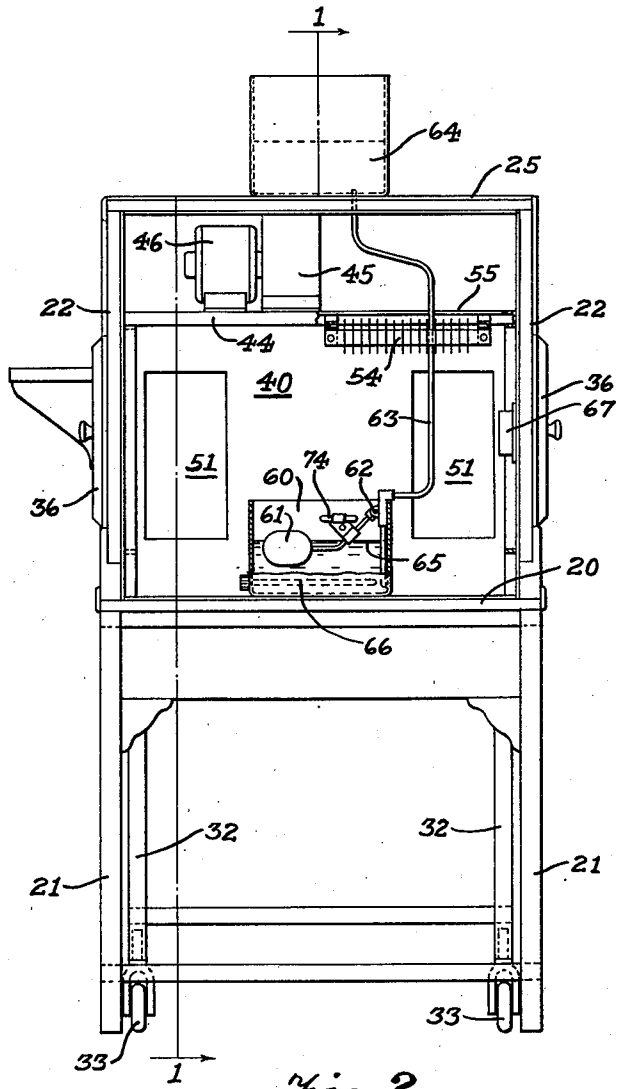


Fig. 2

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Filed July 22, 1933 3 Sheets-Sheet 3

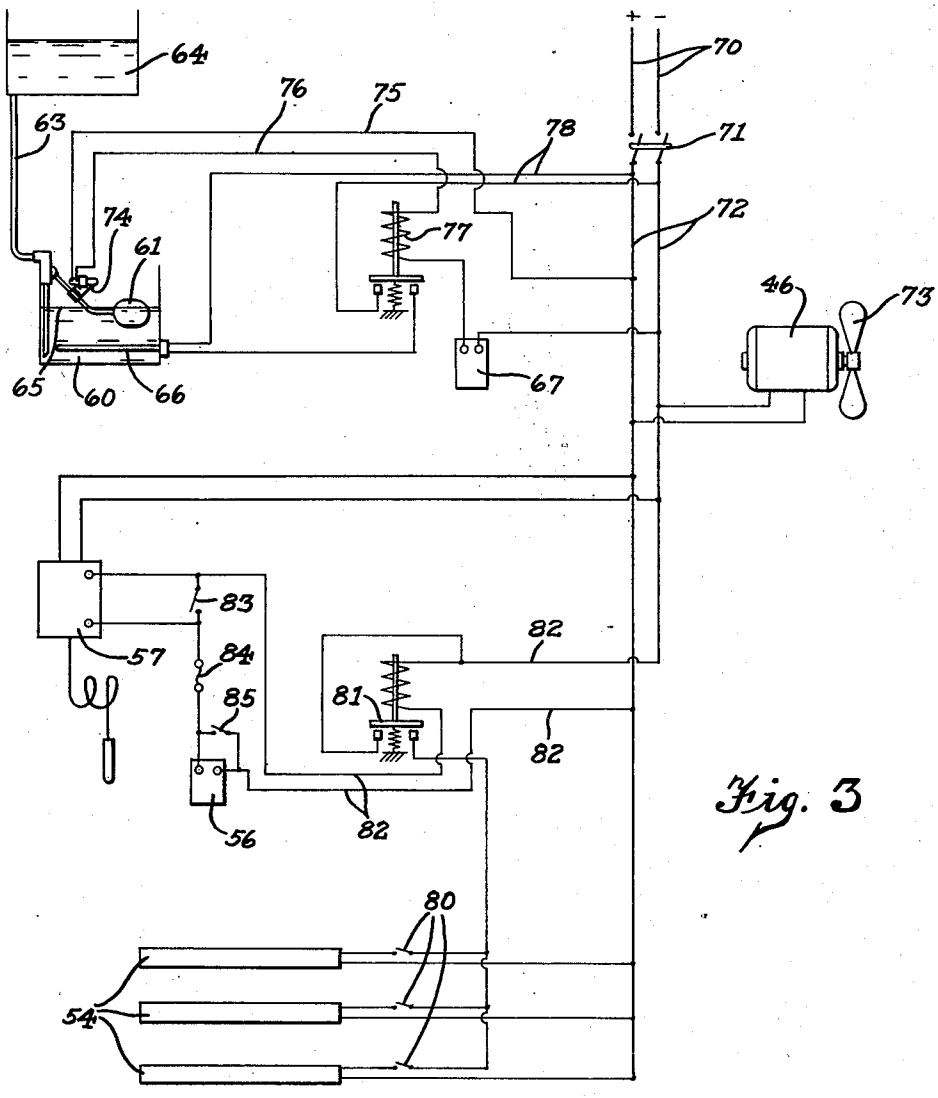


Fig. 3

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UNITED STATES PATENT OFFICE

2,098,316

METHOD OF AND APPARATUS FOR CREATING AN ARTIFICIAL FEVER

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Application July 22, 1933, Serial No. 681,750

9 Claims. (Cl. 128—373)

This invention relates broadly to methods of and apparatus for producing and maintaining in human bodies a condition of fever for the purpose of preventing, curing, or at least materially relieving certain diseases.

It has been found that a condition of fever, or, in other words, a body temperature at least several degrees above normal, to a maximum of about 107° F. has a decided remedial effect upon certain diseases. This fact has been known to the medical profession for some time although the exact action in such cases is still more or less unknown. Many different ways have been suggested of producing such a fever, but all of them have detrimental effects upon the patient or are rather expensive. One of these methods which has been tried is that of subjecting the patient to a disease which produces a fever, such as malaria. Another method is by the injection of substances such as foreign proteins which will cause a fever. However, such methods are rather dangerous to say the least, and, furthermore, the fever cannot be properly controlled by such methods.

A number of different types of artificial machines have been suggested for creating a fever, particularly those which produce a fever by the high frequency alternating current. Such machines are extremely expensive, difficult to operate, and unless very carefully supervised, will subject the patient to severe burns. Other methods have the objection that they seriously weaken the patient.

It is an object of my invention to provide a safe method of and apparatus for controlling body temperature which will make the patient as comfortable as possible while taking the treatment without weakening the patient to any serious degree.

It is a further object of the invention to provide a simplified and inexpensive method and apparatus for producing a fever in the human body.

It is another object of my invention to provide a method of and apparatus for controlling body temperature by circulating air over the body and controlling the temperature and humidity thereof in such a way that the body temperature can be accurately regulated.

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 vertical longitudinal sectional view through one form of apparatus for carrying out my improved method taken upon the line 1—1 of Fig. 2;

Fig. 2 is an end view of the cabinet shown in Fig. 1 with the back cover removed so as to show the circulating, heating, humidifying, and control means; and

Fig. 3 is a wiring and control diagram showing the electrical connections of the heating, humidifying, and air circulating apparatus.

Referring to the drawings, and more particularly to Fig. 1, there is shown a cabinet having a plane supporting surface 20 with supporting legs 21 extending to the floor for supporting the cabinet. Extending upwardly from the plane supporting surface 20 are the side walls 22 and end wall 23 at one end and a second end or partition wall 24 near the other end. Above the plane supporting surface 20 there is provided a top wall 25. The side, end, and top walls are preferably insulated with some suitable form of insulation, such as a cellular fiber board, designated by the reference character 26.

Resting upon the plane supporting surface 20 there is a removable mattress support or framework 28 provided with rollers 29 which permit the framework to roll from one end to the other upon the plane supporting member 20. The framework 28 carries a suitable mattress, such as an air mattress 30 upon which the patient may recline. At the end of the frame 28 adjacent the end wall 23 there is provided a head rest 31 for supporting a pillow upon which the patient's head may rest and a pair of legs 32 extending downwardly and provided with suitable castors or rollers 33 at their lower end which rest upon the floor. Beneath the head rest 31 there are provided the brackets 34 which may serve as handles so that the frame 28 with the mattress 30 may be pulled out of the cabinet and the patient readily and easily removed from the cabinet in this manner. The end wall 23 of the cabinet is provided with an opening in order to receive the body of the patient, which opening is closed by the slide door 35 provided with a notch to receive the neck of the patient. Within the slide wall 22 of the cabinet there are provided suitable slide doors 36 so that the patient can be properly attended to by the nurse.

At the opposite end of the cabinet there is provided a compartment or duct means which contains the air circulating and treating means, together with suitable control means therefor.

This compartment 40 is formed by the end or partition wall 24, the side walls 22, the lower supporting surface 20, the top wall 25, as well as a removable back cover 41. This back cover is provided with a knob 42 for facilitating its removal and also is provided with a door 43 for controlling the amount of fresh air drawn into the compartment and circulated through the cabinet.

Within the upper portion of the compartment 40 there is provided a shelf 44 which supports a forced draft or air circulating means comprising a centrifugal fan or blower 45 which is driven by an electric motor 46. The fan 45 removes air from the conditioning compartment 40 and discharges it into a duct 47 which extends along the upper portion of the cabinet and which is formed by the side walls 22, the top wall 25, and a partition wall 48 which extends beneath the top wall 25 but at an angle thereto. The end portion of the partition member 48 is provided with a plurality of apertures 49 which direct and discharge the air from the duct means over the upper portion of the body of the patient resting upon the mattress 30. The air which is discharged from the duct means into this portion of the cabinet is withdrawn through a pair of openings 51 situated in the wall 24. These openings 51 are provided with slide doors 52 for controlling the rate of air circulation within the cabinet. Thus, the fan 45 draws the air from the portion of the cabinet in which the patient rests through the openings 51 under control of the slide doors 52 into the compartment 40, and there adds whatever fresh air is desired through the opening provided by the fresh air door 43 and under the control thereof, and then discharges this air into the duct 47 and from there through the apertures 49 into the patient's compartment.

In order to produce a fever and to control body temperature, there is provided within the compartment 40 a heating and humidifying apparatus which is controlled by a suitable thermostat and humidistat. This heating and humidifying may be done in any convenient way. However, as shown, in order to heat the air, I provide a plurality of strip heaters 54 beneath an opening 55 in the shelf 44. These strip heaters are supported by the shelf 44 and consist of electrical resistance elements which produce heat when electric energy is passed therethrough. The electric energy applied to these strip heaters 54 is preferably under the control of a suitable air thermostat 56 mounted in the compartment 40 or by a suitable rectal thermometer and thermostat 57 shown in Fig. 3, but this may also be done manually. If this is done manually, the attendant or nurse reads the temperatures of the patient by means of an indicating device or thermometer and then makes the necessary adjustments to the heating and humidifying apparatus.

I also provide water evaporating means within the compartment 40 for humidifying and controlling the humidity of the circulating air. This humidifying apparatus comprises a float tank 60 containing a float controlled valve means comprising a float means 61 and a valve means 62 operated thereby, which controls the flow of water through a supply tube 63 which supplies water to the float tank 60 from the upper reservoir 64 resting upon the tube 25 of the cabinet. The float controlled valve means controls and maintains a certain level of water within the float tank 60, which level is designated by the reference character 65. Within the lower portion of the float tank and beneath the level 65 of the water therein, there is provided an electrical heating means 66 which evaporates the water within the float tank 60 preferably under the control of a suitable humidistat 67 mounted in the compartment 40 in order to add water vapor to the circulating air. In this way I have provided for the control of the humidity of the circulating air, as well as thermostatic control for the heating means and the control of air circulation including admission of fresh air to the cabinet.

Referring now more particularly to Fig. 3, which shows the wiring diagram of the apparatus, there is shown electrical conductors 70 which supply electrical energy to the apparatus under the control of a suitable main switch 71. The main switch 71 controls the flow of electrical energy to the electrical conductors 72. Connected to the electrical conductors 72 is the fan motor 46 which in this view, for the purpose of simplifying the illustration, is shown as provided with a propeller type fan 73 for providing air circulation. In the upper portion of this figure, there is shown partially diagrammatically the reservoir 64 with the tube 63 leading therefrom to the evaporating means or float tank 60. Mounted upon the float arm of the float 61 of the float tank 60 there is provided a mercury type switch 74 which is connected by an electrical conductor 75 with one of the electrical conductors 72 and by an electrical conductor 76 with a suitable relay 77 which control the supply of electrical energy through the electrical conductors 78 to the electrical heating means 66. When the float 61 is in normal position, the switch 74 remains closed and permits the electric heating means to operate under control of the humidistat 67. However, should the water level 65 be reduced a predetermined amount, the switch 74 will open the relay circuits 75, 76, and prevent the heating means from operating when the water level is too low because of some failure of the apparatus or neglect of an attendant or nurse. The humidistat 67 is in series with the switch 74 and the relay 77, and thus through the relay 77 controls the application of electric energy to the electrical heating means 66 so as to control the amount of water vapor provided by the evaporating means 60.

In the lower portion of Fig. 3 is shown the strip heaters 54, each of which is provided with a suitable manual switch 80 in order to provide a manual control of the heating means and of the application of electric energy to each of the strip heaters. The strip heaters 54 are connected to one of the electrical conductors 72 and through a relay switch 81 to the other of the electrical conductors 72. The relay switch 81, which controls the application of electric energy to the strip heaters 54, is controlled either by the manual switches or by either of the thermosaic swiches 56 or 57. The relay 81 is provided with electric energy for its operation through electrical conductors 82 which supply electric energy from the electrical conductors 72. The rectal thermometer 57, which may be an indicating recording potentiometer with suitable control devices in order to provide a thermostatic control of the flow of electric energy is connected in series with one of the electrical conductors 82. This rectal thermometer and thermostat 57 must be very accurate. A manual switch 83 is shunted around the rectal thermometer and thermostat 57 so that this may be cut out and the heating controlled either manually or by the air thermostat 56. Within this

portion of the electric circuit provided by the electrical conductors 82 there is also provided a special safety fuse 84 which is so made that it will blow out or prevent the flow of current and thus permit the relay 81 to open when its temperature reaches some suitable figure, such as 270° F.

In series with this safety fuse and the rectal thermostat 57 and switch 83 is the air thermostat 56 which is situated within the compartment 40. This thermostat 56 is also adapted to control the electric energy flowing to the strip heaters 54 through the medium of the relay 81. This thermostat 56 is also provided with a shunt under the control of the switch 85 which permits the thermostat 56 to be cut out of this portion of the circuit so that either a manual control or a control by the rectal thermostat 57 may be employed. As stated before, these thermostats control the energization of the relay 81 and in this way control the application of electric energy to the strip heaters 54.

I find that by maintaining the proper circulation of air, together with the proper amount of humidity and the proper temperature of the air, a fever is produced which can be accurately controlled both manually and by the automatic control devices which I have provided. The temperature of the air and the percentage humidity thereof may be varied through rather wide limits. In general any temperature ranging from a temperature slightly above the fever temperature desired up to the highest temperature endurable by the human body, with percentage humidity coordinated therewith, may be used, although from a comfort standpoint I prefer to avoid extreme high limits of temperature and humidity. I have found that very good results are obtained when the air temperature is maintained between 130° F.–150° F. with percentage humidity between 89%–49%. In this range, when it is desired to bring about the condition of fever within a period of about one hour, I recommend the use of a wet bulb temperature of 126° corresponding to the following temperatures and humidities as indicated on any standard temperature-humidity chart:

Temperature	Percent humidity
150	49
148	53
146	55
144	59
142	63
140	66
138	70
136	74
134	79
132	84
130	89

The forced draft air circulation aids materially in making the patient comfortable while the fever is being produced and maintained. As soon as the treatment is over, the heaters and the humidifier may be turned off so that the patient may return gradually to normal condition. I find that my apparatus by reason of its excellent air circulation, temperature control, and humidity control will rapidly raise the body temperature to the desired figure in a very short time and will maintain that temperature as long as desired. Thus, I have provided a method of and apparatus for producing a fever within a short time and maintaining the fever as long as desired while keeping the patient as comfortable as possible during the febrile period.

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 body temperature controlling apparatus comprising walls forming a cabinet having a main compartment for receiving the body portion of a human body with the head extending without the main compartment at one end thereof and with the feet at the other end thereof, means for creating an artificial fever in the human body including means for heating and humidifying air, duct means for conducting air between the foot end of the main compartment and the head end of the main compartment, and forced draft means for circulating air through said duct means.

2. A body temperature controlling apparatus comprising walls forming a cabinet having a main compartment for receiving the body portion of a human body with the head extending without the main compartment at one end thereof and with the feet at the other end thereof, means for creating an artificial fever in the human body including means for heating and humidifying air, duct means for conducting air between the foot end of the main compartment and the head end of the main compartment, and forced draft means for circulating air through said duct means and means for controlling the circulation of air.

3. A body temperature controlling apparatus comprising walls forming a cabinet having a main compartment for receiving the body portion of a human body with the head extending without the main compartment at one end thereof and with the feet at the other end thereof, means for creating an artificial fever in the human body including means for heating and humidifying air, duct means for conducting air between the foot end of the main compartment and the head end of the main compartment, and forced draft means for circulating air through said duct means and a door and door opening for admitting fresh air to the duct means when desired.

4. The method of artificially inducing fever in the human body which method comprises subjecting the human body to a surrounding atmosphere by circulating said atmosphere over the body, and controlling and correlating the relative temperature and humidity of the circulating atmosphere with respect to body temperature to induce fever in the human body.

5. The method of artificially inducing fever in a human body and for controlling said artificially induced fever which comprises subjecting a human body to circulatory air currents therearound and in correlating the relative temperature and humidity of such circulatory air to induce fever in the body, and in controlling the artificially induced fever by also controlling the temperature and humidity of the air in accordance with the body temperature of the human body.

6. The method of artificially inducing fever in a human body which comprises subjecting the human body to circulatory currents of air thereround, and in coordinating the temperature and humidity of such circulatory air so as to artificially induce a controllable fever in the body.

7. The method of artificially inducing fever in the human body which method comprises sub-

jecting the human body to a surrounding atmosphere by circulating said atmosphere over the body, and controlling and correlating the relative temperature and humidity of the circulating atmosphere within narrow limits to produce and maintain a condition of fever in the human body.

8. The method of artificially inducing fever in the human body which comprises subjecting the human body to a surrounding atmosphere maintained at a temperature ranging from a low temperature limit of about the ultimate body temperature desired and a higher temperature limit endurable by the human body, and a humidity of the order of 50% to 75%, and circulating the said atmosphere over the body.

9. The method of artificially inducing fever in the human body which comprises subjecting the human body to a surrounding atmosphere maintained at a temperature of about 135° F. to 155° F. and at a humidity of the order of 50% to 75%, and circulating the said atmosphere over the body.

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