THERAPEUTIC COOLING DEVICES FOR DOMESTIC AND HOSPITAL USE

FIG. 4

FIG. 5
THERAPEUTIC COOLING DEVICES FOR DOMESTIC AND HOSPITAL USE

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Application April 27, 1953, Serial No. 351,082

2 Claims. (Cl. 128—400)

The present invention relates to improvements in therapeutic apparatus, and more particularly to a cooling system in which a refrigerating apparatus is employed and operates in connection with a heat transfer system to thereby supply a coolant to body and member enclosing cooling applicators.

One object of the invention, is to provide a therapeutic device including a cooling system for cooling infected and ailing parts of the human body by providing a series of differently shaped applicators having internal cooling chambers arranged such that the applicator may enclose a portion of a body member infected or otherwise ailing so that the temperature will be maintained constant without requiring replenishing of the coolant as is generally the case in connection with cooling pads and ice bags.

Another object, is to provide an applicator for patients in hospital and the like, which is maintained in a cool condition at a predetermined temperature by means of a heat exchange system through a compressor, expander and condenser refrigerating system.

Another object, is to provide a cooling system for cooling various portions of a patient's body to reduce fever and for use in the treatment of fracture, swelling of the limbs, sinus conditions and various other ailments in which a fever condition in a localized part of the body is prevalent.

Another object, is to provide a cooling system for cooling various parts of the human body and in which the temperature can be maintained constant at a pre-determined value and can be regulated, or adjusted to a preselected temperature.

Another object, is to provide a cooling applicator which is shaped to enclose a portion of a body member in order to distribute the coolant over a uniform area of the affected patient's body.

Another object, is to provide a cooling applicator in the form of an elongated pad which can be wrapped about a patient's limb and thereby partially enclose a portion of a body member to effectively reduce the temperature where fever conditions exist.

Another object, is to provide an applicator for the cranium which is formed of complementary sectional units connected together by lacing or flexible tieing elements to permit the sections to be adjusted to various head sizes. The sections being hollow and connected by flexible tubing to the refrigerating apparatus, and to one another to permit circulatory flow therethrough.

Another object, is to provide a cooling applicator for use in the treatment of various infections in which fever conditions exist, and which can be used in hospitals and the like for reducing the temperature of feverish infected parts of the body and the body members.

Another object, is to provide a cooling applicator which is formed of flexible material, and is provided with a series of internal sinuous flow passageways for conduct ing the coolant to all portions of the applicator and thereby distributing the cooling medium uniformly in the applicator.

Another object, is to provide a cooling applicator for various portions of a patient's body in which the coolant may be supplied directly from the condenser coil of the refrigerating apparatus.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawings wherein—

Figure 1 is a diagrammatic view of the therapeutic apparatus showing the automatic refrigerating system and the applicator connected in heat transfer relation with the condenser coil or evaporator of the refrigerating unit. The various controls for circulating the coolant through the applicator and maintaining the temperature of the applicator constant is also shown.

Figure 2 is an enlarged top elevational view of an applicator pad showing a portion thereof broken away to illustrate the manner in which the coolant passes through a sinuous passageway and is finally discharged to the heat transfer tank.

Figure 3 is a side elevational view of a slightly modified form of the invention showing the applicator in the form of a waterproof envelope which is elongated to enable the same to be positioned in body member enclosing relation on a patient's limbs.

Figure 4 is a side elevational view of a still further modified form of the invention showing the applicator in the form of a helmet to fit the cranium, and showing the manner in which the coolant is supplied to the sections of the applicator and transferred from one section to the other, and;

Figure 5 is a rear elevational view of the helmet-shaped applicator showing the manner in which the complementary sections are connected by lacing or other flexible tieing elements to enable the helmet-shaped applicator to be adjusted to various head sizes.

In the drawings, and more in detail, attention is directed to Figure 1 wherein the reference character A will generally designate a refrigerating unit contained in a casing 1a of appropriate shape and size to accommodate the mechanical refrigerating apparatus.

The mechanical refrigerating apparatus includes a compressor 1 operated by an electric motor 2 which is adapted to be electrically connected to a domestic source of electrical energy such as the 110 volt house current supplied to dwellings, institutions and hospitals. The refrigerant gas is circulated through a conventional refrigerating system, and is pumped through a pipe 3 to the condenser 4 as illustrated by the arrows, and is supplied to the receiver 5. A pipe 6 connects the receiver to the evaporator coil 7 which corresponds to the conventional cooling coil. The gas is returned to the compressor 1 through a pipe 7a. The temperature responsive control switches for the motor 2 are not shown, but are associated with the refrigerant system to operate intermittently in accordance with a fixed temperature.

Mounted in the casing 1a is a heat transfer tank 8 in which the evaporator or cooling coil 7 is suspended. The tank 8 is filled with a coolant liquid such as a brine solution which is adapted to be supplied to the applicators shown in Figs. 2 to 5 inclusive under pressure so that the coolant liquid will circulate to and from the applicator, and similarly through the heat transfer tank 8.

Mounted adjacent the upper end of the heat transfer tank 8 is a pipe coupling to which is attached the inlet of a rotary pump 10 which is adapted to be driven by an electric motor 11. The armature shaft of the motor being connected in the conventional manner to the rotor shaft of the pump 10. A flexible pipe or tube 12 is connected to the discharge outlet of the pump 10 and
is connected to the applicator 13 (Figs. 1 and 2) which includes a flexible envelope 13 formed of rubber or other suitable material and provided with transversely extending partitions 13b forming a sinuous passageway 14 such that the coolant liquid 9 will traverse the applicator pad lengthwise and finally be discharged through the flexible return pipe 15. The sinuous path of the coolant liquid is indicated by the directional arrows shown in Figure 2. After the coolant has circulated through the applicator pad 13, and has been discharged through the return pipe 15, it is then conducted to the heat transfer tank 8 through the pipe fitting 16.

In order to control the circulatory flow of the coolant to the applicator pad 13, a thermostat 17 is connected in the motor circuit and is interposed in the motor supply source in lines 18–19. A switch 20 is likewise connected in the circuit to enable the energization of the motor 11 to be interrupted when desired. Connected to the thermostat 17 is a thermocouple 17' which is placed in heat transfer relation with the return pipe 12 such that a small current will actuate the thermostat 17 and thereby interrupt the energization of the motor 11 when the temperature of the applicator pad 13 reaches a predetermined degree.

The applicator 13 may be placed on the affected or feverish portion of the patient's body and the motor 11 energized by closing the switch 20. It being assumed that the motor 2 has been previously energized by being connected to a source of electrical energy. As the temperature of the coil 7 is reduced, the coolant liquid is likewise reduced, and when the coolant is pumped through the sinuous passageways 14 in the applicator pad 13, the pad is cooled, and similarly the affected portions of the body in feverish condition are likewise cooled. Thus, body heat is absorbed from the affected portion of the body and the fever is relieved considerably.

In the modified form of the invention shown in Figure 3, the applicator is in the form of an elongated envelope 22 constructed of rubberized fabric or the like and is provided interiorly with a rubber tube 23 arranged in a zig-zag manner to provide a sinuous flow path. The coolant 9 is supplied to the rubber tube 23 through the flexible pipe 12 as before, and is returned to the heat exchange tank 8 through the discharge pipe 15. Tapes 24, or other taping elements are attached to one end of the flexible envelope 22 so that the applicator can be wrapped around the limb 1 shown by dotted lines and tied in its limb encircling position to partially enclose the affected area in which fever or the like exists.

In the modified form of the invention shown in Figures 4 and 5, the applicator is shaped similar to a helmet and includes complementary sections 25 and 26 formed of rubber having an interior hollow chamber for permitting the flow of the cooling solution 9. The complementary sections 25 and 26 are provided with adjacent lacing tabs 27 which are adapted to overlap and be connected by flexible taping elements such as lacing or the like 28. In order to connect the hollow applicator helmet-shaped sections 25 and 26 for fluid flow, a rubber or other flexible pipe 30 extends across the frontal portion of each section and permits the cooling liquid 9 to flow from the complementary section 25 to the section 26.

Cooling liquid is supplied to the complementary section 25 of the applicator through a pipe 30 which has one end connected to the applicator, and the opposite end connected to the discharge opening of the pump 10. The direction of liquid flow is shown by the arrows (Fig. 5). After the coolant liquid has passed through the sections 25 and 26, it is then returned to the heat transfer tank 8 through the flexible pipe 31. The flexible pipes 30 and 31 are similar in construction to the flexible pipes 12–15 in the forms of the invention shown in Figures 1 to 3 inclusive, and may be formed of rubber or rubber composition.

In operation, the helmet-shaped applicator is first adjusted to the cranial or head H of a patient afflicted with severe headache or a sinus condition. When the sections are adjusted they are firmly secured in place by the lacing 28 as shown in Figure 5. Cooling liquid is then circulated through the sections 25 and 26 as before described, which conducts body heat from the afflicted area and thus reduces the fever condition.

The helmet-shaped applicator can be used in applications where reduced temperatures are recommended for such conditions as severe headaches and the like, which have heretofore been treated with ice bags and pads which requires considerable effort in reducing the ice for insertion in the ice bag, and in addition requires constant changing upon melting of the ice.

It is to be understood that the forms of the invention hereafter shown and described, are to be taken as preferred embodiments, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the scope of the subjoined claims.

What I claim is:

1. In a therapeutic applicator, a pair of complementary applicator sections formed of flexible inner and outer walls to provide internal liquid passageways in each section, flexible taping elements adjustably connecting said sections together, said sections being shaped to fit the contour of a patient's head and to extend across the top and down to the neck at the rear thereof, a tube having its ends connected to the applicator sections to permit the passage of cooling fluid from one section to the other, a flexible tube connected to one of said sections and adapted to conduct cooling fluid to the applicator, and a flexible tube connected to the other section for conducting cooling fluid away from said applicator.

2. In a therapeutic applicator adapted to be connected to a heat dissipating device, comprising a headpiece formed of two similarly shaped sections shaped to conform to the contour of a patient's head, each of said sections being formed of flexible material and provided with inner and outer walls to form a hollow coolant space therebetween, said headpiece extending from the forehead and across the top of the head and terminating at the rear near the neckline, flexible taping elements connecting said sections to permit the same to be adjusted to various head sizes, a tube having its ends connecting said sections and communicating said coolant spaces thereof, a tube connected to one of said sections to conduct cooling fluid to said hollow coolant spaces, and a tube connected to the other of said sections for conducting cooling fluid away from said headpiece to said heat dissipating device.

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