COLD WEATHER CLOTHING SUIT

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ABSTRACT

Cold weather clothing suits which are adapted to be worn by a user are formed from an air tight fabric with air distribution means therein and air heating and circulating means whereby the circulation of heated air maintains desired temperature in the suit.

5 Claims, 4 Drawing Figures
COLD WEATHER CLOTHING SUIT

SUMMARY OF THE INVENTION:

This invention relates to cold weather clothing incorporating a heating and circulating unit for heating the interior of the clothing. As will be obvious from the description to follow, the fabric of which the clothing is constructed may be made air tight, because of the provision of the heating and circulating unit.

The invention therefore, provides cold weather clothing wherein the temperature inside the clothing is controllable and is not dependent on the duration of the user's absence from the last heated abode, and wherein the reduction of condensation due to the employment of a heating and circulating unit, allows the use of air tight instead of porous material for the clothing, whereby greater insulation is achieved.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the drawings:

FIG. 1 is a schematic of the costume worn by a user;

FIG. 2 shows a cross-section of the costume at a contact point showing the lining used to permit air flow;

FIG. 3 shows a cross-section of the lining at a hot air distributing conduit; and

FIG. 4 shows a cross-section of the heating and circulating unit.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS:

In the discussion of FIGS. 1 to 3, it will be assumed that the heating and circulating unit to be described hereafter, includes a means for heating air (preferably a controlled mixture of return air from inside the suit and of outside air) to form the atmosphere of the inside of the suit and means to cause movement of heated air through output line 12 to various corners of the suit and to receive air from the inside atmosphere of the suit at input tube 14. Tube 14 is open at one end to the blower, as shown in FIG. 4, and at the other end to the inside of the suit where it receives air flowing between the suit and the wearer's body, as hereinafter described. It will be seen that the output air is supplied along line 12 through manifold 16 to output lines 18 which are connected and arranged to convey the heated air produced by the unit to the extremities of the suit, as shown. The openings 20 are openings from the ends of conduits 18 to the inside of the suit.

FIG. 3 shows a cross-section of the lining, with tubing 18 incorporated therein. Thus it will be seen that the heated air produced by the heating and circulating unit is connected directly to the extremities of the suit, and of course there is no limitation on the number of conduits which may be used in this method.

The suit may be worn with the user's face exposed, as indicated schematically in FIG. 1, or with a respirator mask, if desired or necessary. However this mask is not shown as it forms no part of the present invention.

For the purposes of this invention, it will be sufficient to assume that the air for breathing is obtained exterior to the atmosphere produced in the suit by the equipment in accord with the invention. The air issuing from the outlet ports 20 of the tubing, finds its way back inside the suit (between the suit and the wearer) to an inlet port for the inlet tube 4. In those locations where the suit fits loosely, the air path will be available and will maintain, with varying degrees of thickness and temporary interruptions due to contact, a flow path which insulates the wearer from the outer insulation.

At areas such as the knees and shoulders which are in almost constant contact and where such return flow paths might not be available, there is preferably provided, a fibrous underlining spacer 60 (see FIG. 2) between the insulating layer and the wearer, providing an entangled fibrous matte, between whose fibres, may flow the air. Such matte is illustrated schematically in FIG. 2.

Due to the internal heating method and the air circulation paths the suit may now be made air tight instead of porous, with much greater insulating effect.

One of the preferred forms of construction of the suit material however (see FIG. 3) would be having an outer layer 62 of tough cloth made air tight with silicone or other plastic material. Inside of this is an insulating layer 64 and inside this again would be metallized reflective plastic 66. If desired, the sequence of insulation and reflective plastic could be repeated as many times as necessary.

FIG. 4 shows the heating and circulating unit for the device. The heating and insulating unit is provided in a fireproof container 30 having an air intake louver 32 to allow inflow of the necessary air for combustion. The heater shown schematically in FIG. 4 may be an open flame such as an alcohol lamp 36, as shown, or a catalytic oxidation unit or other compact, suitable source of heat. It will be noted here, that the combustion products of this operation are not circulated to the suit in the preferred embodiment nor do they form the atmosphere for breathing, since they exit via chimney 37 and hence the concern about the composition of the combustion products need not be as great.

Located to be directly heated by the heater is a thermal to electric transducer of any desired form such as the "Seebeck" module. Such a module may, inter alia, be purchased from General Instruments, Thermoelectric Division, 65 Gouverneur Street, Newark, N.J., U.S.A. The heating is applied to one side of this module 40 and the other side of the module is cooled by a heat sink or heat exchanger 42 and, as is well known, the electricity produced, is proportional to the temperature difference across the module. The heat sink comprises, a heat exchanger of any desired design, wherein the heat input is provided by the air in the combustion chamber and the heat output side is provided to the output gases of a blower 38. As schematically shown in the preferred embodiment, the preferred heat exchanger comprises copper vanes located to radiate into the air path of air driven by the blower from conduit 14 to conduit 12. The vanes are located in heat conducting relationship to the remainder of the heat sink to draw their heat therefrom. Thus the air heated by the burner is used, through the heat exchanger, to heat the air from the blower which is conducted to the extremities of the suit while the air from the blower, at the same time, cools the heat exchanger and the flame remote side of the module. It will be noted that there is no interchange permitted between the air forming the suit atmosphere and the combustion gases for the burner.

The electrical output from the module is applied to drive an electric motor 74 which in turn is used to drive the blower. The blower provides its output to the heated air conduits as illustrated in FIG. 1 between
conduits 14 and 12 and receives its air from an intake inside the costume and preferably just at the lower portion of the chest. The heating is provided by the heat exchanger to provide a warm atmosphere inside the suit.

The motor used is a small low voltage direct current motor operating on the voltage supplied by the electric output from the thermo-electric module.

At the input to the blower, a controllable aperture 44 is provided to the tube 14 to allow interchange of outside air with the air being circulated in the suit. This interchange is achieved in controllable amounts in the preferred form of the invention, comprising a vane 48 rotatably mounted on a threaded control member 50 at a junction 52 which allows free rotation of the joined parts. The movement of the threaded member 50 and the vane 48 transversely of the conduit is controlled by a knob 54 located exterior of the casing. The vane 48 is shaped to completely close the conduit 14 when wholly retracted therein. Guides maintain the vane 48 against rotation and in an orientation perpendicular to the longitudinal axis of the conduit. The shape of the vane is such as to substantially close the conduit 14 through air flow, when the vane is completely contained in the conduit. On the other hand, the thickness of the threaded member is such that air may flow freely therearound along the conduit over such part of the threaded member as is contained within the conduit. The aperture 44 is dimensioned to allow the movement of the vane into and out of the casing. The knob-remote end 54 of the rotary junction 52 is designed to partially close the aperture 44. At one extreme position, with the control knob rotated so that the vane is completely outside the conduit 14 and end 54 is partially closing aperture 44, maximum flow takes place through conduit 14 and minimum air exchange takes place with the outside. At the other extreme position, with the vane effectively closing conduit 14, substantially all air received travelling down conduit 14 toward the vane, is expelled to atmosphere above the vane, through aperture 44, and all air required by the blower is obtained from the atmosphere beneath the vane through aperture 44. The proper adjustment is a compromise between the need to retain as much of the warm air as possible, and the need to exchange enough air to avoid condensation.

In practice the best setting for the control knob is that which achieves 2—3 percent per cycle.

While I have described my invention with particular reference to the drawings, such is not to be considered as limiting its actual scope.

Having thus described this invention, what is asserted as new is:

1. A cold weather clothing suit incorporating air tight fabric which forms an insulated wall between the body of the user and the outside, the wall being so shaped as to have small openings at the hands, feet and chest of the user in addition to a large opening at the user's face, the suit comprising:
   a combined air blowing and heating unit with a first input port and a second output port, the unit inducing air in the first port, heating the induced air, and discharging the heated air through the second port;
   a hollow tube with a vent to the outside disposed intermediate its ends, the tube being connected at one end to the chest opening and connected to the first port at its other end, thus enabling previously heated air from the interior of the suit to be withdrawn through the chest opening and mixed with incoming air from the outside, the mixture passing through the air blowing and heating unit for recycling; and
   manually operable means extending into the tube through the vent and adapted to vary the relative proportions of previously heated air and incoming air in the mixture.

2. The suit of claim 1 wherein the inside surface of the wall is coated with a metallized reflective plastic, said tubing means being disposed in the plastic.

3. The suit of claim 2 wherein the plastic coating is covered by an insulating layer which is itself coated by another coating of metallized reflective plastic.

4. The suit of claim 3 wherein the unit is characterized by a heating section that produces waste gases by combustion, and wherein the unit is further characterized by an air intake louver for introducing outside air into the heating section and a chimney to vent said gases to the outside without allowing said gases to enter the tubing means.

5. The suit of claim 4 wherein the heating section includes means to produce a flame, and a thermal to electric transducer heated by the flame, the electric output energy from the transducer being used to power the blower section.