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2 Sheets-Sheet 1



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3,000,616 BODY WARMER James O. Spangler, Box 272, Heavener, Okla. Filed Oct. 10, 1958, Ser. No. 766,477 2 Claims. (Cl. 257–12)

This invention relates generally to devices for warming the human body, and more particularly, has reference to a device falling in this general category, designed especially for warming the extremities of one's limbs.

The present application is concerned with an embodiment of the invention so designed as to warm the feet and the hands using heat emanating from another portion of the body, with the warming action resulting from periodic collapse of one or more bladder-like members incorporated in the device. Said periodic collapse, in accordance with the invention, produces circulation through a system closed to outside air, with a recycling action taking place in said system for the purpose of making repeated use of previously warmed air flowing within said system.

While this illustrated and described embodiment is considered novel, the invention, as will presently appear, is capable of certain variations or modifications, and it is envisioned that the principles of the invention could be applied for the purpose of warming some selected portion or portions of the body, in substitution of or in addition to the warming of the extremities. Still further, as will presently appear, it is also considered that the invention can make use, if desired, of supplementary warming means, which will be additive to or in substitution of the use of body warmth.

In any event, it is the broad object of the present invention to provide a device for warming selected portions of the body, through the use of air warmed by a part of the body spaced from the portion that is to be warmed.

Another object of importance is to effect the operation of the device by producing a pumping action in a closed system of tubing extending between the warmth producing and the warmed portions of the body. 40

Yet another object is to cause the pumping action to take place responsive to the normal walking or running movements of the body.

Another object is to provide a device of the character 45 stated, which, if desired, can be either partially or completely deactivated whenever desired by the user, with minimum difficulty and with a minimum loss of time.

Another object is to provide a device of the character stated which will not interfere, except perhaps to a relatively inconsequential degree considering the benefits to be obtained from the use of the device, with the normal activities of the user.

A further object of importance is to provide a body warming device which, in a preferred embodiment, will 55 effect warming of the feet, and will permit auxiliary tubing that extends to the hands, to be connected in the flow path of the recycled air, at the option of the user.

Still another object is to so form the device that it can be initially charged with a supply of air by the user, in a 60 short time.

A further object of importance is to provide a body warming device of the character stated which will be completely concealed when in use, will be adapted for incorporation in specially prepared garments, or will alternatively be adapted to be worn underneath one's ordinary wearing apparel.

A further object of importance is to so form the device as to permit it to be manufactured in a single size, or perhaps in no more than a very few sizes, thus to lower 70 the cost of manufacture. 2

Other objects will appear from the following description, the claims appended thereto, and from the annexed drawings, in which like reference characters designate like parts throughout the several views, and wherein:

FIGURE 1 is a perspective view of a body warming device according to the present invention, an individual wearing the same being shown in dotted lines;

FIGURE 2 is an enlarged, somewhat diagrammatic view of the device per se, portions being broken away;

FIGURE 2a is a fragmentary view similar to FIGURE 2, with a main valve in a second position so as to connect the auxiliary tubing into the main system for warming the hand;

FIGURE 3 is an enlarged sectional view substantially on line **3—3** of FIGURE 1;

FIGURE 4 is a still further enlarged, detail sectional view substantially on line 4—4 of FIGURE 1;

FIGURE 5 is an enlarged longitudinal sectional view through the foot warming members of the device, said members being shown in the relative positions assumed thereby during normal walking movements of the user; and

FIGURE 6 is a transverse sectional view on line 6-6 of FIGURE 5, on a scale enlarged above that of FIGURE 5.

Referring to the drawings in detail, the body warming device comprising the present invention has been generally designated 10 in the several figures of the drawings. As will be noted from FIGURE 1, the device comprises, essentially, a system of tubes, extending to selected portions of the body that are to be warmed, said tubes being operatively related in combination with a novelly arranged assemblage of valved fittings, a main air container or reservoir, and bladder-like warming elements located in contact with or in close proximity to the parts of the body that are to be warmed.

The warming device 10 includes a comparatively large, generally flat main container or reservoir 12, so designed as to have one face 13 thereof in direct contact with a selected area of the human body b. In the present instance, the container 12 overlies and is in contact with the abdomen. However, it will be understood that this is merely one example of a container that can be used to advantage. Obviously, the container could be larger than that shown. Then again, the container could overlie not only the abdomen, but also the chest of the wearer, thus covering a substantially greater area of the body than the container could be disposed in contact with the back, could extend completely about the waist, or could be otherwise located.

It is at this time thought mainly essential that the container be designed to closely hub the portion of the body which it overlies, while being of a flexibly walled material, so as to flex during movements of the body b, to such extent as is necessary not to unduly impede said movements. Then too, the material of the container. where it is in contact with the body should be such as to permit rapid heat exchange between the body and the container interior. The outer wall 15 of the container could undoubtedly be of the same material, since there would be little heat lost through said outer wall. Alternatively, the outer wall might be of a material different from that used for the inner wall 13, and could have heat-insulative qualities to minimize heat loss therethrough. These are considered details which are thought sufficiently obvious to one skilled in the art as not to require special illustration herein.

It is preferred, further, to provide an opening in the outer wall 15, surrounded by a threaded neck 14, said opening being normally closed by a complementarily

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threaded plug 16, as shown in FIGURE 3. By removal of the plug 16, the entire device can be deactivated. A further purpose is served by the normally plugged opening, in that one can supplement the warming action produced by heat transfer from the body to the container interior, by inserting a pre-warmed length of material through the opening to be confined in the container in a manner to warm air flowing about the inserted object. Said object has not been shown, but could be a flexible, hollow member containing a substance that can be 10 warmed in advance. Such products are already known, and are adapted to be either warmed or coded, to maintain in a correspondingly warmed or refrigerated state articles in close proximity thereto.

In any event, in the illustrated example, the device is 15 adapted to operate, utilizing body heat only in a manner to warm selected portions of the body, as for example the hands and feet.

The container 12 can be supported against the body bin any of various ways. By way of example, there is 20 shown a waist-band or belt 18, having suspension hooks 20 detachably connectable to apertured ears 21 provided upon the upper edge of the container. Any of various other means might well be employed for the purpose of holding the container against the body.

It is desirable that means be provided for charging the container with a supply of air, and in the illustrated example (see FIGURE 2) I utilize a fitting 22 communicating with the container interior, together with a tube 24 connected to said fitting at one end and having a 30 fitting 26 at its other end in which is provided a check The valve 28 permits flow only toward the valve 28. container 12.

Thus, the tube 24 may normally be left coiled in an inoperative position as in FIGURE 1. Whenever it is 35 desired to charge the container with a supply of air that is thereafter to be recycled within the device, one inserts the fitting 26 in his mouth, and blows therethrough to provide the container with the charge of air. It may be noted that the air blown into the container in this manner 40will be pre-warmed, to some extent since it is emanating from the mouth.

At this point, it is worthy of note that although the walls of the container 12 are flexible, it is important that they not be expandable, that is, at all times there should 45 be no distension of the container walls, by reason of the fact that even temporary enlargement of the cubic area of the container interior is to be avoided. Obviously, any of various plastic or rubber materials will answer the purpose well.

Referring to FIGURE 2, extending downwardly from the lower edge of the container, in transversely spaced relation, are identical but opposite main inlet fittings 30. In spaced relation to the fitting 30, and preferably at or near the top edge portion of the container, there are identical but opposite outlet fittings 32 each of which has a check valve 33 opening only in a direction to permit flow out of the container through fittings 32.

Connected to the fittings 32 are main air supply tubes 34, extending downwardly along the legs of the user to foot warming members generally designated 36.

The members 36 can be of the form shown, wherein they are adapted to be worn within conventional shoes. Alternatively, they can be in the form of shoes or boots, as long as they have characteristics which are to be described in detail immediately hereinafter.

The members 36 shown by way of example are so designed as to be double-walled throughout, with the walls being of flexible, though not expandable material. Thus, the chamber 40 defined between the walls of the member 7036 will not expand in cubic area, during operation of the device, beyond its maximum expansion shown for the left hand member 36 in FIGURE 5.

The foot warming members 36, thus, include doublewalled sole portions 38, defining between them a cham- 75

ber for warmed air, extending over substantially the full area of the bottom of the wearer's foot. The sole portion 38 is adapted to overlie the sole of a shoe S of conventional construction (see FIGURE 5) in the illustrated example. Sole portion 38, at its front end, is integral with a toe portion 42, which is also of double-

walled construction and which overlies the sides and top of the wearer's foot, at the toe of the foot, fitting snugly within the toe portion of the shoe. The chamber 40 extends within the sides and top of the toe portion 42, so as to warm the enclosed, toe part of the wearer's foot.

The sole portion 38, at its rear end, is integral with a double-walled heel portion 44, overlying the sides and back of the wearer's heel. Again, the construction is such as to provide communication between the hollow sole portion 38 and the sides and back of the heel portion 44.

The arrangement shown is merely one example of a foot warming member. This term, it should be noted, is used broadly herein, and could apply to a complete shoe or boot, in an arrangement such that the member 36 eliminates the need for outer foot wear such as a shoe as shown in FIGURE 5. Such shoe or boot, as will be un-derstood, would be of double-walled construction over 25 either its entire area or at least over a substantial portion of said area.

The arrangement illustrated, of course, is one that would be usable with any kind of outer footwear, so long as said footwear is of a size such as to permit one to insert the foot-enclosing member 36 without discomfort to normal walking, running, or other physical activity. In the arrangement shown, the size of the foot member 36 would be such as to permit its insertion within a shoe falling inside a predetermined range of different sizes of shoe length and width.

For the purposes of the present application, it is mainly important to note that the construction of the foot warming member 36 is such as to cause the same to underlie the foot, in contact with the portions to be warmed, with the sole portion 38 being designed to collapse under the weight of the wearer's body during the taking of a step, as shown at the right in FIGURE 5. Further, the material of at least the top wall of the sole portion 38, and the inside walls of the toe and heel portions 42, 44, respectively, should have a high rate of thermal conductivity or heat The same material can be used for the foot exchange. members 36 as for the container 12.

Secured to opposite sides of the heel portion 44 of each member 36 are relatively short connecting tubes 46, communicating with the chamber 40. One of these is detachably connectable to the lower end of the adjacent tube 34. The other is similarly connectable to a main return tube 48 extending back to the container 12.

The detachable connection permits the members 36 to be completely separated from the remaining components of the device, to deactivate the device, in the event one of the other deactivating means capable of being used is not in position to be conveniently employed.

Further, the arrangement permits the tubes 34, 48 to be disconnected from the adjacent, associated member 36, 60 after which the connecting tubes 46 of said member 36 can be temporarily plugged. The result is that there is provided a foot receiving member, which as indicated above could be a complete shoe or boot, having an air chamber hermetically sealed for the moment against the 65 admission of outside air. The sealed air chamber, of course, has thus served two purposes, one of these being the provision of an air cushion making walking or running more comfortable, and the other being the provision of insulation surrounding the foot and taking the form of a dead air space, well known as an excellent heat insulator.

Alternatively, lines 34, 48 might remain connected to the member 36, while being temporarily closed off through the provision of hose or tubing clamps, not shown, of conventional design. It is known to provide devices on lengths of rubber tubing, swiftly operable to positions closing the tubing temporarily against the flow of air or liquids therethrough.

Referring to FIGURE 4, each fitting 30 is of a threeway or T type. Thus, each fitting 30 may be considered as including an outlet 50 comprising the means connecting return line 48 in communication with reservoir 12. Each fitting 30 further includes an inlet 52, connected directly to the line 48, and a laterally projecting auxiliary outlet 54.

The outlet 50 of the fitting is check valved as at 56, with the check valve permitting flow only from the fitting into the container or reservoir 12.

Each fitting includes a valve core 58, providing in cooperation with the fitting a three-way valve 59. Valve core 58 can be adjusted to the position shown in FIGURE 2, connecting line 48 directly with the interior of container 12 while closing off communication between auxiliary outlet 54 and line 48.

Alternatively, core 58 can be moved to the position 20 shown in FIGURE 2a. In this position, the core connects line 48 in communication with auxiliary outlet 54, while preventing communication between the line 48 and the container 12.

In still another position, not shown, the core 58 might be adjusted 180 degrees from the position thereof shown in FIGURE 2a. This would connect outlet 50 in communication with outlet 54 while still closing off line 48. In such an arrangement, as will presently appear, the portion of the warming system that extends to the feet would be deactivated, while the portion extending to the hands would remain operative.

Connected to each of the auxiliary outlets 54 is an auxiliary supply line or tube 60, extending to and communicating with a flattened, hollow, flexibly walled hand warming element 62. Element 62 may be inserted directly in one's glove, in contact with the palm of the hand. In this event, the element would be shaped, in a typical embodiment, in the manner shown in FIGURE 2, with a generally semicircular outer configuration, having a straight edge formed with a plurality of recesses 64 adapted to receive the proximal ends of the fingers.

Alternatively, the elements 62 could comprise complete gloves, dispensing with the need for gloves of conventional types. In this event, the complete gloves would be double-walled, in the same manner as the elements 36, and 45might have detachable connections to the tubes extending thereto along the arm of the wearer's body b. Such gloves, thus, could be detached from their associated tubes, and sealed to provide insulation of the dead air type surrounding the hand. 50

Again, this is thought sufficiently obvious as not to require special illustration herein.

Extending from each element or hand warming member 62 is a return line 66. Return lines 66 may be appropriately termed auxiliary return tubes, and extend to 55 and are connected with auxiliary inlet fittings 68 provided upon the container or reservoir 12. Fittings 68 have check valves 70, that permit flow only from tubes 66 into the container.

To maintain the tubes 60, 66 in proper position upon 60 the shoulders, said tubes may be clipped together lightly by retaining sleeves or clips 72 (FIGURE 1).

In use, the device may be worn under conventional garments. Alternatively, the device might be incorporated in a flying suit, military battle dress, etc. In either 65 event, the arrangement of the device would be substantially as shown in FIGURE 1. Assuming that the device is to be placed in use, one first charges the container 12 with air, by blowing through the fitting 26. Thereafter, and on the further assumption that only the feet are to 70 be warmed, one would adjust the valve cores 58 to the position shown in FIGURE 2.

Thereafter, heat is transferred from body b to the air within the reservoir 12, through the wall 13, said wall having as previously noted herein a high rate of thermal 75

conductivity. In normal walking, one foot would have the weight of the body imposed thereon, while the other foot would not. In other words, the weight of the body is transferred from one foot to the other constantly during normal walking or running activities as shown in FIGURE 5.

When the weight of the body is imposed upon a member 36, the sole portion 38 thereof is collapsed as shown at the right in FIGURE 5. This causes air within said member 36 to be expelled through return line 48, the air flowing into the container 12 as shown by the arrows in FIGURE 2.

This displaces air already within the container 12, the displaced air having been warmed in the manner previously described. The only outlets from the container for the displaced air are the outlets 32. Air flowing out of the container 12 through the outlet fittings 32, of course, cannot return to the container due to the check valve 33.

Since the weight of the body is on one foot, there is no room within the chamber 40 of the member 36 receiving said foot, for the displaced air. In other words, when one has his weight upon the right foot, warmed air flows out of the container 12 only through the line 34 extending to the left foot. Subsequently, when the weight is placed on the left foot, warm air is displaced from the container 12 only through the tube 34 extending to the right foot.

In this way, responsive to normal walking or running activities, there is a continuous recycling of warmed air through a closed system, in a manner to circulate air through each member 36, on the taking of each step.

If one were standing still rather than walking or running, circulation can still be provided, by "marking time," or merely by transferring the body weight from one foot to the other at closely spaced intervals. Even an up and down wiggling motion of the foot can produce operation of the device, it is believed.

Assuming that one were to desire to include in the cycle the portions of the system extending to the hands, the valve cores 58 would be adjusted to the position shown in FIGURE 2*a*. It will now be observed that during the normal walking or running activities, air flowing back toward the container 12 through lines 48 is caused to flow not into the container 12, but rather, into the lines 60 extending to the member 62. Said air, after circulation through the auxiliary return line 66.

It will be apparent that the device makes use, in a novel manner, of heat normally thrown off by the body b, putting such heat to good use in warming other parts of the body that would nomally tend to become cold due to being extremities, or due to being unduly exposed to the weather. One might, for example, use the device to warm the ears, through the provision of members overlying the ears, thus preventing frostbite of these portions of the body.

The body warmer illustrated and described can thus comprise a valuable accessory, as for example to the military during long campaigns in cold climates or under wintry conditions. Many troops are rendered wholly or partially inactive, due to frostbite, frozen hands or feet, or other conditions resulting from severe cold.

It is believed apparent that the invention is not necessarily confined to the specific use or uses thereof described above, since it may be utilized for any purpose to which it may be suited. Nor is the invention to be necessarily limited to the specific construction illustrated and described, since such construction is only intended to be illustrative of the principles of operation and the means presently devised to carry out said principles, it being considered that the invention comprehends any change in construction that may be permitted within the scope of the appended claims.

What is claimed is:

1. A body warmer comprising a resilient and compress-

ible torso engaging heat transfer air reservoir having upper and lower edges and opposed end edges, valved air input means on the reservoir at said upper edge, air return check valves on said reservoir at said upper edge and located at opposite sides of said input means, air outlet check valves on said reservoir at said ends, and two laterally spaced combination valves on said reservoir at said lower edge, two hollow hand warmer elements, return tubes connected to and extending between said elements, and said air return check valves, outgoing tubes 10 connected to and extending between said combination valves and the hand warmer elements, air transfer tubes extending between and connected at one end to said air outlet check valves, and hollow compressible foot warmer elements to which the other ends of the transfer tubes 15 are connected, and return flow tubes connected at one end to said foot warmer elements and to said combination valves, said combination valves having check valves providing one-way flow of air into said reservoir and having ports severally communicating with said air transfer tubes and said return flow tubes, and a manual valve element for selectively closing one of said ports at a time.

2. A body warmer comprising a resilient and compressible torso engaging heat transfer air reservoir having 25 upper and lower edges and opposed end edges, valved air input means on the reservoir at said upper edge, air return check valves on said reservoir at said upper edge and located at opposite sides of said input means, air outlet check valves on said reservoir at said ends, and 30

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two laterally spaced combination valves on said reservoir at said lower edge, two hollow hand warmer elements, return tubes connected to and extending between said elements, and said air return check valves, outgoing tubes connected to and extending between said combination valves and the hand warmer elements, air transfer tubes extending between and connected at one end to said air outlet check valves, and hollow compressible foot warmer elements to which the other ends of the transfer tubes are connected, and return flow tubes connected at one end to said foot warmer elements and to said combination valves, said combination valves having check valves providing one-way flow of air into said reservoir and having ports severally communicating with said air transfer tubes and said return flow tubes, and a manual valve element for selectively closing one of said ports at a time, said foot warmer elements comprising elongated bodies longer than a foot, said bodies having sole engaging portions and walls upstanding from said sole engaging 20 portions, including side portions to engage opposite sides of a foot, and heel and toe portions for engaging over the heel and toes of a foot.

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