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FOOT WARMER

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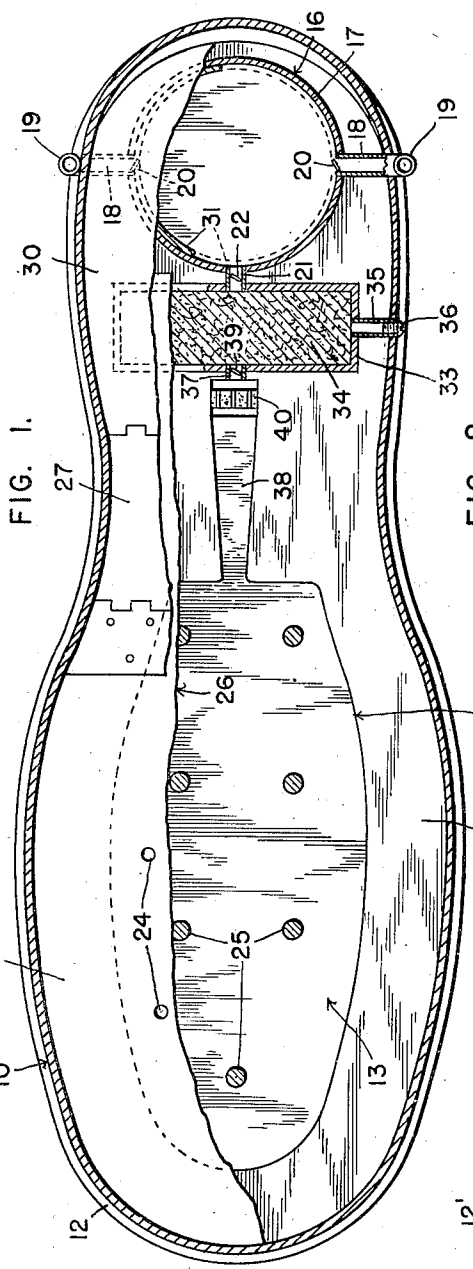


FIG. 1.

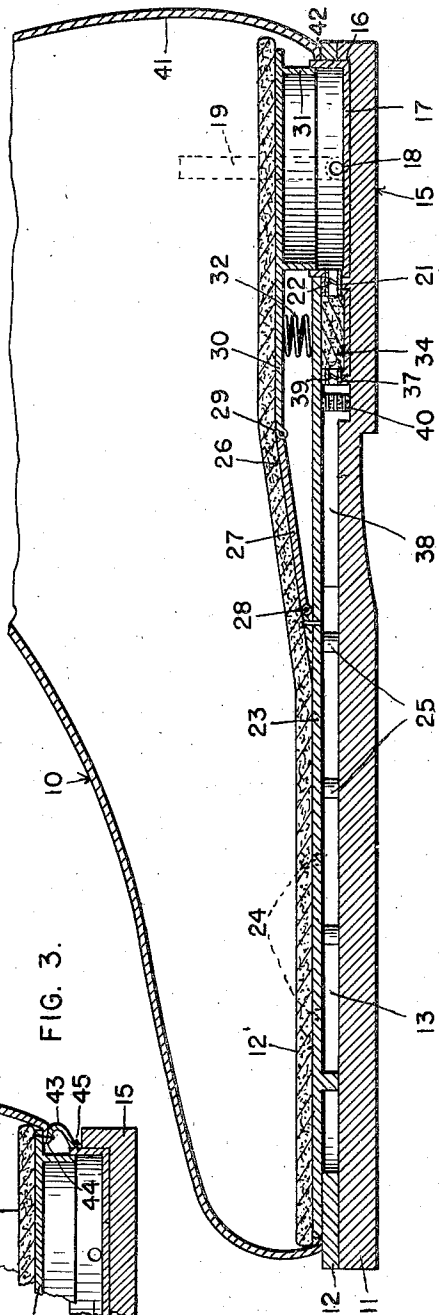


FIG. 2.

FIG. 3.

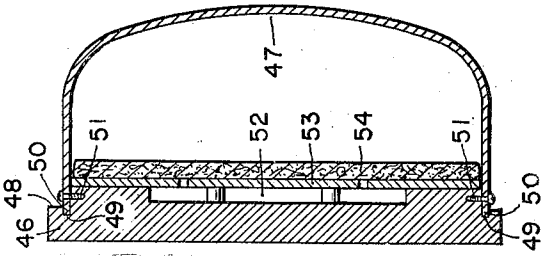


FIG. 4.

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FOOT WARMER

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7 Claims. (Cl. 36—2.6)

1

The present invention relates to an improved foot warmer, and more particularly to means for circulating heated air into and through the bottom of a boot, shoe or the like.

An important object of the invention consists in forming between the inner and outer soles of the shoe a compartment or chamber which communicates with the interior of the shoe, and associating with the compartment heat generating means in the form of a catalyst such as spongy platinum or platinum black which upon being brought into contact with vaporizable fluid such as alcohol vapors mixed with air, generates heat, and this heat is utilized to heat the air that is circulated into and through the compartment and into the sole of the shoe to warm the foot of the wearer.

A further object consists in providing means in the heel of the shoe for forcing air through a passage communicating with the compartment and positioning in the path of the air before it reaches the sole of the shoe, a container in which is positioned absorbent material which is saturated with alcohol so as to provide a vaporizable fluid that mixes with the air as it discharges through said passage. Also positioned in the passage in front of the vaporizable fluid container, is a suitable catalyst such as a pellet or block of perforated spongy platinum or platinum black, which upon the treated air being brought into contact therewith, generates heat that warms the air prior to its introduction into the air compartment and the sole of the shoe.

Other objects and advantages of the invention will be apparent from the following description when taken in conjunction with the accompanying claims and drawings.

Referring to the drawings in which is shown several preferred embodiments the invention may assume:

Figure 1 is a plan view of a shoe or boot with parts in section, and having the improved foot warmer associated therewith.

Figure 2 is a longitudinal central sectional view of Figure 1.

Figure 3 is a detail sectional view of a modified construction of shoe showing the connection of the counter with the heel and

Figure 4 is a transverse view of a modified form of shoe construction with which the foot warmer may be associated.

Referring to the drawings in which like numerals indicate like parts in the several figures, 10 designates a shoe or boot which is provided between its outer sole 11 and its inner sole 12' with an air compartment 13 preferably formed by cutting out a portion of the upper surface of the midsole as at 14. The heel 15 of the shoe is provided with an inwardly disposed cylindrical recess 16 in which is positioned a cylindrical metal member 17 that is closed at its bottom and has an open upper end. Oppositely disposed ports or passages 18 extend laterally from the cylinder 17 and project outwardly from the shoe and may have connected to their outer ends vertically disposed tubular members 19 that extend upwardly from the shoe for the purpose of conducting atmospheric air into the cylinder 17. Flap valves 20 are positioned in the ports 18 for controlling the introduction of air into the cylinder 17. An air outlet port or passage 21 extends forwardly and centrally from the cylinder 17 and is provided with a flap valve 22. Preferably interposed between the outer sole 11 and the inner sole 12' and extending over the compartment 13 is a thin flat metallic reinforcing member or plate 23 which extends from the toe to the heel of the shoe and is shaped to conform with the interior configuration of the sole and shank. The plate 23 is provided with a series of openings 24 for communicating the compartment 13 with the interior of the shoe. The plate 23 rests on the midsole 12 and the compartment 13 may be provided with downwardly projecting spaced pillars 25 for supporting the portion of the plate 23 extending over the compartment. A displaceable member or metal plate 26 conforming in shape with the shank and heel, is positioned within the shoe and preferably comprises a forward inclined section 27 which is pivoted as at 28 to the plate 23 and is hinged as at 29 to a rear section 30 that extends over the recess 16 in the heel. The section 30 has a depending annular flange 31 of substantially the same diameter as the inner diameter of the cylinder 17 and which constitutes a reciprocating piston movable in the cylinder. The insole 12' is made of felt or other soft material and overlaps the section 30 of the member 26 so that the foot of the user comfortably fits into the shoe. The cylinder 17 constitutes a compression chamber through which air is forced by the reciprocation of the piston 31, which in turn is operated by the foot or movement of the heel of the user, either when walking, standing or sitting. The flap valves 20 are arranged to move inwardly while the flap valve 22 is movable outwardly so that when the piston 31 is raised relative to the cylinder 17, the suction created opens the valves 20 in order to allow atmospheric air to enter the cylinder 17 through the ports 18. At

2

the same time the flap valve 22 is closed by the suction created in the cylinder. Conversely, upon movement of the piston 31 into the cylinder 17, the air is compressed and the valves 20 are automatically closed while the valve 22 is opened to allow the compressed air to be forced through the passage 21. The piston 31 is normally maintained in its raised position by a coil spring 32 confined between the flat plate 23 and the member 26.

Extending transversely of the heel is a rectangular casing or container 33 in which is positioned suitable absorbent material such as cotton, wool, or felt 34, that is saturated with a vaporizable fluid such as alcohol vapor that is introduced into the casing 33 through a pipe 35 that may be closed by a threaded plug 36. The saturated absorbent material 34 is of sufficient porosity to allow the air from the cylinder 17 to pass therethrough and mix with the alcohol vapor and if desired suitable openings may be provided in the absorbent material for facilitating the passage of the air into and through the casing 33. The treated air from the casing 33 discharges through a restricted pipe or passage 37 that in turn communicates with a longitudinally extending passage 38 that may be of tapered shape (Fig. 1) and which communicates at its forward end with the compartment 13, for establishing communication between the compartment 13 and the cylinder 17. A flap valve 39 which opens outwardly is positioned in the pipe 37 so as to be responsive to the movement of the piston 31 to open and close the same. Positioned in the passage 38 adjacent the outlet pipe 37 is a catalyst which may be formed of spongy platinum or platinum black molded into a perforated pellet or block 40. The pellet 40 is arranged in the path of the treated air as it issues from the casing 33 so that upon contact of the air mixed with the alcohol vapors, with the pellet, heat is generated and the heated air passes through the perforated pellet into passage 38 and the compartment 13, from where it escapes through the openings 24 into the shoe below the insole 12' so as to warm the foot of the user.

The counter or rear portion 41 of the shoe may be connected at its lower end as at 42 to the heel 15 in any suitable manner. In order to permit free movement of the foot within the shoe so as to allow easy operation of the piston 31 by movement of the heel of the user. the counter 41 may be connected to the heel 15 in the manner as shown in Figure 3. In this particular construction the lower end of the counter 41 is attached to a flexible strip of material 43 and to the rear section 30 of the member 26, by any suitable means 44. The lower end of the strip 43 is connected as at 45 to the cylinder 17 and operates as a bellows upon displacement of the piston 31. The insole 12' which is made of felt or wool provides a protective strip extending over the members 23 and 26 so that the foot of the user may comfortably fit within the shoe and the piston 31 may be operated without any physical discomfiture to the foot of the user. Spring 32 serves normally to maintain the section 30 and the piston 31 in their raised position. The heating unit parts are so disposed in the shoe that they may be readily removed.

In operation, the foot of the user is movable within the shoe 10 so that upon depression of the section 30 of the member 26 by the heel, the piston 31 is moved downwardly to close the flap valves 20 and open the flap valves 22 and 39 in

order to force the air confined in the cylinder outwardly through the passage 21 into the casing or container 33 where the air mixes with the alcohol vapors and then is discharged through the pipe 37 into contact with the perforated pellet 40 of catalytic material, with the result that the heat generated heats the air as it passes through the perforated pellet into the chamber 38, from where the heated air is conducted into the compartment 13 and through the openings 24 into the shoe so as to warm the foot of the user. Upon release of the downward pressure on the piston 31, the spring 32 forces the section 30 of the member 26 and the piston 31 upwardly, and the suction created in the cylinder 17 opens the flap valves 20 and closes the flap valves 22 and 39 so as to allow air to be introduced into the chamber 17 through the lateral passages 18 in order that the heating operation may be repeated. To prevent the clogging of the air passages 18 when the heat warming unit is used in inclement weather or when it is necessary to travel over muddy ground, the extension pipes 19 are provided which project upwardly from the sides of the heel and are so positioned as not to interfere with the movement of the foot when walking.

In the modified form of the invention shown in Figure 4, means are provided for detachably connecting the outer sole 46 to the upper 47 of the shoe, so as to facilitate removing the sole and heel from the shoes to permit access to the heating unit, for the purpose of replacement or repair. The sole 46 is formed with a reduced shoulder portion 48 that extends completely around the shoe and has a recess 49 into which extends the lower end 50 of the upper so as to be detachably connected thereto by the threaded bolts 51 that fit into complementary threaded openings in the sole 46. The shoe is otherwise similar to the form previously described and the sole is formed with a compartment 52 for receiving the heated air and a reinforcing plate 53 together with the insole 54. The catalyst while shown in the form of molded pellets may be formed of granules and confined loosely in a perforated container positioned in the path of the treated air.

Thus it will be seen that simple, efficient and economical means are provided whereby atmospheric air is initially introduced into the shoe and is treated with a vaporizable fluid prior to being brought into contact with a catalyst that heats the treated air so that the same may be circulated into the interior of the shoe to warm the foot of the wearer. The inner sole 12' may be provided with openings for facilitating the circulating of the heated air into the shoe.

It is to be understood that the forms of the invention shown are merely illustrative of preferred embodiments and that such changes may be made as fall within the purview of one skilled in the art without departing from the spirit of the invention and the scope of the claims.

I claim:

1. In combination with a shoe having an air compartment between the inner and outer soles, said compartment communicating with the interior of the shoe, an air compressor in the heel of the shoe and operable by movement of the foot, valve means for controlling the flow of air into and through said compressor, a passage communicating the air compartment with said compressor, vaporizable fluid means in said passage for treating the air forced from the air compressor into said compartment, and catalytic

material in said passage in the path of the treated air for heating the latter prior to its discharge into the air compartment and sole of the shoe.

2. In combination with a shoe having an air compartment between the inner and outer soles, said compartment communicating with the interior of the shoe, an air compressor in the heel of the shoe and operable by movement of the foot, valve means for controlling the flow of air into and through said compressor, a passage communicating the air compartment with said compressor, a container in said passage, said container having therein absorbent material saturated with alcohol, the alcohol vapors being arranged to mix with the air as it passes through the container, and a perforated pellet of catalytic material in said passage in the path of the treated air for heating the latter prior to its discharge into the air compartment and into the sole of the shoe.

3. In combination with a shoe having an air compartment between the inner and outer soles, said compartment communicating with the interior of the shoe, the heel of the shoe having an inwardly disposed recess, a cylinder in said recess having valve controlled air inlet and outlet passages, a movable member in said shoe and having a depending annular portion constituting a piston arranged to reciprocate in said cylinder for forcing air therethrough, the bottom of said shoe having a passage communicating the cylinder with said air compartment, a receptacle communicating with said passage and containing vaporizable fluid for treating the air as it passes through the receptacle, a catalytic material in said passage in front of said receptacle and in the path of the treated air for generating heat when the treated air contacts with it so as to warm the air prior to its introduction into the compartment and the sole of the shoe.

4. In combination with a shoe having an air compartment between the inner and outer soles, said compartment communicating with the interior of the shoe, the heel of the shoe having an inwardly disposed recess, a cylinder in said recess having valve controlled air inlet and outlet passages, a movable member in said shoe and having a depending annular portion constituting a piston arranged to reciprocate in said cylinder for forcing air therethrough, the bottom of said shoe having a passage communicating the cylinder with said air compartment, a receptacle communicating with said passage and containing absorbent material saturated with alcohol for treating the air as it passes through the receptacle, a perforated pellet of spongy platinum in said passage in front of said receptacle and in the path of the treated air for generating heat when the treated air contacts with it so as to warm the air prior to its introduction into the compartment and the sole of the shoe.

5. In combination with a shoe having an air compartment between the inner and outer soles, said compartment communicating with the interior of the shoe, a flat perforated member between the outer sole and the inner sole and extending over said compartment, the heel of the shoe having an inwardly disposed recess, a cylinder in said recess having valve controlled air inlet and outlet passages, a hinged sectional member pivoted at one end to said flat member and having its opposite end extending over said cylinder and provided with a depending annular flange movable into and out of the cylinder, yieldable means for normally urging the annular member away from the cylinder, the bottom of the shoe having a passage communicating the outlet of the cylinder with said compartment, a receptacle communicating with said passage and containing vaporizable fluid for treating the air as it passes through the receptacle, catalytic material in said passage in front of said receptacle and in the path of the treated air for generating heat when the treated air contacts with it so as to warm the air prior to its introduction into the compartment and the sole of the shoe.

6. In combination with a shoe having an air compartment between the inner and outer soles, said compartment communicating with the interior of the shoe, a flat perforated member between the outer sole and the inner sole and extending over said compartment, the heel of the shoe having an inwardly disposed recess, a cylinder in said recess having valve controlled air inlet and outlet passages, a hinged sectional member pivoted at one end to said flat member and having its opposite end extending over said cylinder and provided with a depending annular flange movable into and out of the cylinder, yieldable means for normally urging the annular member away from the cylinder, the bottom of the shoe having a passage communicating the outlet of the cylinder with said compartment, a receptacle communicating with said passage and containing absorbent material saturated with alcohol for treating the air as it issues from said cylinder, a perforated block of platinum black in said passage in front of the receptacle and in the path of the treated air for heating the latter prior to its discharge into the air compartment and into the sole of the shoe.

7. In combination with a shoe having an air compartment between the inner and outer soles, said compartment communicating with the interior of the shoe, an air compressor in the heel of the shoe and operable by movement of the foot, valve means for controlling the flow of air into and through said compressor, a passage communicating the air compartment with said compressor, vaporizable fluid means in said passage for treating the air forced from the air compressor into said compartment, catalytic material in said passage in the path of the treated air for heating the latter prior to its discharge into the air compartment and the sole of the shoe, and means for detachably connecting the outer sole to the shoe to permit access to the interior of the shoe.

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