ABSTRACT

A method for the manufacture of insulating and protective inner boots particularly well suited for use by skiers. An inner boot produced in accordance with the present invention is characterized by an integral tongue and is manufactured by an injection molding technique wherein the injected plastic foam material is excluded from regions where cuts are to be made to define the integral tongue.

7 Claims, 9 Drawing Figures
MANUFACTURE OF PROTECTIVE FOOTWEAR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to footwear and particularly to insulated stockings of the type particularly well suited for use in ski boots. More specifically, this invention is directed to the manufacture of socks or inner boots to be fitted in skiing footwear. Accordingly, the general objects of the present invention are to provide novel and improved articles and methods of such character.

2. Description of the Prior Art

Most quality ski boots are presently comprised of molded plastic material. In the molding of such boots it is extremely difficult to introduce therein inner layers of cushion-like material for protecting the user's foot. During many skiing maneuvers a skier's leg occupies a forwardly inclined position relative to the foot and this positioning often results in painful contact between the skier's instep and also the foreleg at the ankle level with the interior of the boot.

All ski boots include a thick tongue portion which is detachable from the boot and which serves to protect the portion of a leg and foot juxtaposed thereto. However, after a period of use, these tongues tend to slip to the side whereby, instead of protecting the foot, they often constitute an obstructing extra layer. Also, the manner by which the tongue is fastened to the boot, usually a sewn seam, forms a rim or fold which often bruises the foot.

In the interest of overcoming the above briefly discussed problems, it has been proposed to separately manufacture a cushioned sock or inner boot which is then fitted in the molded plastic boot. In some cases these fitted socks are formed by the injection of plastic foam material between a pair of envelopes. This procedure will provide a sock which corresponds to the shape of the foot and comfortable footwear is thus theoretically obtained. Such prior art fitted or molded socks, however, have been difficult to use and have not successfully solved the above briefly described problems.

SUMMARY OF THE INVENTION

The present invention overcomes the above briefly discussed and other deficiencies and disadvantages of the prior art by providing for the manufacture of insulated stockings particularly well suited for use in ski boots. In accordance with the present invention a sock is formed from plastic material in a single piece in a mold about a form or last. After the molding step is completed, cuts are made from the upper edge of the leg portion of the sock down to the area of the instep to thereby define a tongue which facilitates introduction of the foot into the resulting sock. Thus, the manufacture of a sock in accordance with the present invention consists of stretching a sock made of fibrous material, for example jersey wool, on a form, the sock exactly fitting the shape of the form whereby folds or other deformations in the sock are avoided. Thereafter, the sock covered form is placed in a mold and plastic material is injected into the mold around the sock. After the plastic material has cured the article thus obtained is removed from the mold and a pair of cuts are made from the leg portion down to the area of the instep to form the tongue.

A sock produced in accordance with the present invention can be perfectly molded to the foot and ankle and, when the ski boot is fastened, affords complete protection without forming a fold. The present invention also makes it possible to provide a sock conformed to the position which it must occupy when placed in a ski boot.

In accordance with one embodiment of the invention, a first sock which conforms to the shape of the form is covered by a second sock of larger dimensions. The form covered with both socks is thereafter placed in a mold and plastic material injected between the two socks. Thereafter, as described above, the molded sock is removed from the mold and cuts made to define the tongue.

In accordance with the present invention it is preferable to employ a mold and cooperating form which define, by means of projections, regions from which the injected plastic material will be excluded. Such regions may, for example, define where the cuts are to be made to form the tongue.

The use of the cooperating form and mold may also be employed in the interest of providing a cavity into which plastic material can be subsequently injected with the sock on the foot of the user whereby portions of the sock are molded directly to the foot. In order to prevent any injected plastic material which may leak into the cavity portions from joining the oppositely disposed portions of the two socks or liners which form the cavities to one another, a sheet of plastic material to which the injected plastic material does not adhere may be placed between the inner and outer liner socks in such areas.

In accordance with a further embodiment of the invention, a layer of "pliable" material may be placed between the two liner socks prior to injection of the plastic whereby such pliable material will upon use of the sock be directly molded to the user's foot and will assume the precise shape of the foot. This results in portions of the foot, and particularly the malleoli, being fully and perfectly protected.

To prevent socks formed in accordance with the present invention from tearing, the exposed edges of the liner socks are joined together by means of a seam, weld or suitable adhesive.

The plastic material which is injected during the course of manufacture of an insulated sock in accordance with the present invention will typically be polyurethane foam since this material is both flexible and isothermal.

The present invention also relates to thermal socks manufactured in accordance with the above briefly described techniques and particularly to socks characterized by two layers of fabric separated by a layer of molded plastic material and having cuts, produced after molding, which form an integral tongue. Socks in accordance with the present invention may also include regions at least initially devoid of foamed plastic material; such regions, for example, defining the places where the slots are produced to form the tongue.

BRIEF DESCRIPTION OF THE DRAWING

The present invention may be better understood and its numerous objects and advantages will become apparent to those skilled in the art by reference to the accompanying drawing wherein like reference numerals
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refer to like elements in the several figures and in which:

FIG. 1 is a side elevation view, partly broken away, depicting a step in the manufacture of an insulated sock in accordance with a first embodiment of the present invention.

FIG. 2 is a cross-sectional side elevation view depicting a step in the manufacture of an insulated sock in accordance with the present invention performed subsequent to the step depicted in FIG. 1.

FIG. 3 is a cross-sectional side elevation view of a step in the manufacture of an insulated sock in accordance with the present invention performed subsequent to the step of FIG. 2.

FIG. 4 is a perspective view of a sock manufactured in accordance with the technique of the present invention represented in FIGS. 1–3.

FIG. 5 is a cross-sectional side elevation view of a step in the manufacture of a thermal insulated sock in accordance with a second embodiment of the invention.

FIG. 6 is a cross-sectional view, taken along line VI—VI of FIG. 5, depicting the manufacture of a sock in accordance with the second embodiment of the invention.

FIG. 7 is a perspective view of a thermally insulated sock produced in accordance with the embodiment of FIGS. 5 and 6.

FIG. 8 is a cross-sectional view, taken alone line VIII—VIII of FIG. 7, of the thermal sock of FIG. 7.

FIG. 9 is a perspective view of a further embodiment of a thermal insulated sock in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In order to manufacture the inner boot shown in FIG. 4, a pair of liners or socks 1 and 2 are fitted on a form or lasting as shown in FIG. 1. The socks 1 and 2 are comprised of fabric, typically jersey wool, and the inner sock 2 will be stretched so as to conform precisely to the shape of form 3. The outer sock 1 is of larger dimension than inner sock 2 in order to define a space between the socks 1 and 2.

As shown in FIG. 2, the form 3 with the socks 1 and 2 thereon is placed in a mold 4. Mold 4 is comprised of two interlocking portions and the interior of the mold; i.e., the mold cavity, is designed to correspond to the outer surface of the sock to be manufactured; the mold imprint providing a free space between the mold inner walls and the form 3.

As may be seen from FIGS. 1–3, the outer sock 1 includes a tip 5 through which an injection molding pipe 6 extends. A plastic material which forms a foam, for example polyurethane foam, is injected through tip 5 into the region between the socks 1 and 2. The foam material expands into the space between the two socks and presses the outer sock 1 against the mold thereby forming or defining the outer surface of the desired product.

The mold 4 typically includes projections which tightly fit against the form 3. The injected plastic material is unable to flow into the areas between the socks 1 and 2 which correspond to the projections on the interior of the mold cavity. In the embodiment being described, the mold 4 includes a pair of projections 7, only one of which is represented in FIG. 3, which extend from the upper edge of the mold down to the area of the instep. As will be described below, the projections 7 define the tongue 8 of the insulated protective sock of FIG. 4.

After the molded article is removed from mold 4 slits 9 are produced along the region defined by the projections 7 as shown in FIG. 4 to thereby form the tongue 8. Thereafter, a seam 10 will be formed to join the exposed edges of the socks 1 and 2 to thereby complete the manufacturing process. As will be obvious, the thermal sock of FIG. 4 can be easily fitted on a wearer's foot and the tongue 8 will fully and perfectly protect the instep and the leg of the wearer.

A second embodiment of the present invention is depicted in FIGS. 5–8. In order to manufacture the sock shown in FIG. 7, a form 12 is employed. A first or inner sock 13 of wool or other suitable material is positioned on form 12 and is stretched so as to correspond precisely to the shape of the form without any folds. Thereafter, a second or outer sock 14, also made of a suitable fabric, is fitted on form 12 and, like the inner sock 13, stretched so as to conform to the shape of the form. As shown in FIG. 5, the form 12 with socks 13 and 14 thereon is then placed in the cavity of a mold 15.

As in the case of mold 4 of the above described embodiment, mold 15 comprises projections which define the lines along which the tongue 16 of the sock will be cut. Additionally, as may be best seen from a joint consideration of FIGS. 5 and 6, mold 15 includes projections 18 which also bear against the form 12 and prevent the penetration of the foam material into the regions defined thereby.

The sock 14 comprises a tip 19 which extends through an opening 28 in mold 15. The plastic foam material is injected via tip 19.

Referring to FIG. 6, a flexible sheet of material 20 is positioned between socks 13 and 14 in the region defined by the projections 18. Sheet 20 will be selected so as to be comprised of a material to which the foam will not adhere. Thus, sheet 20 will typically be comprised of polyvinyl chloride. Even if the mold and form meet perfectly, there is a residual possibility that a small amount of the foam will penetrate into the region between socks 13 and 14 within the area defined by projections 18. The layer 20 insures that the socks 13 and 14 will not be joined together by the foam in these regions and thus insures that there will be a void for the purposes to be described below.

When the molding process is completed, the sock is removed from mold 15 and the slits 21 produced to define tongue 16. Thereafter the seam 23 is made along the exposed edges of socks 13 and 14.

At the time of purchase of ski boots, the purchaser will put on socks, such as the socks of FIG. 7, and fit them into the boots. Thereafter, the wearer's malleoli are provided with protection by injecting foam material through tip 19, the material injected at this time spreading into the cavity formed between socks 13 and 14 by means of mold projections 18 and sheet 20 during the initial molding step.

FIG. 9 depicts a sock for ski boots which is generally designated by reference numeral 25. Sock 25 was produced in a manner identical to that described above in the discussion of FIGS. 1–4 and the same reference numerals have been employed to designate the same elements in FIG. 9 and FIGS. 1–4. In the FIG. 9 embodi-
ment layers 26 of a "pliable" material were introduced between the inner and outer socks prior to molding. Layer 26 is comprised of a material which is capable, under a minimum degree of pressure and at approximately the same temperature as that of the human body, of being deformed to correspond precisely to a particular shape. The layers 26 were applied to inner sock 2 at places corresponding to the malleoli prior to placing outer sock 3 on the form and molding was thereafter effected. During molding the layers 26 of "pliable" material were enclosed in the foam.

During use, after the socks have been worn within ski boots for a certain time, the heat of the wearer's foot and the pressure exerted on layers 26 will deform the layers 26 so that they correspond perfectly to the shape of the malleoli.

While preferred embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.

What is claimed is:
1. A method of manufacturing a protective sock, the sock including a sectional element of arcuate cross-section which defines an integral tongue, the method including the steps of:
   - installing a sock-like inner liner comprised of a fabric material on a form whereby the inner liner corresponds exactly to the shape of the form;
   - placing the liner covered form in a mold;
   - injecting plastic material into the mold around the form and liner;
   - preventing flow of the injected plastic material into at least a pair of spatially displaced elongated arcuate regions extending from the upper edge of the desired sock to the area of the instep;
   - permitting the injected material to cure so as to define a molded one piece sock; and
   - cutting the upper leg portion of the molded sock to the instep along lines defined by the regions from which the injected plastic material has been excluded to define an integral tongue.

2. The method of claim 1 further comprising:
   - positioning a sock-type outer liner of larger dimensions than the inner liner over the form and inner liner prior to the injection of plastic material, the plastic material thereafter being injected between the inner and outer liners and being prevented from entering the arcuate regions between said lin-...