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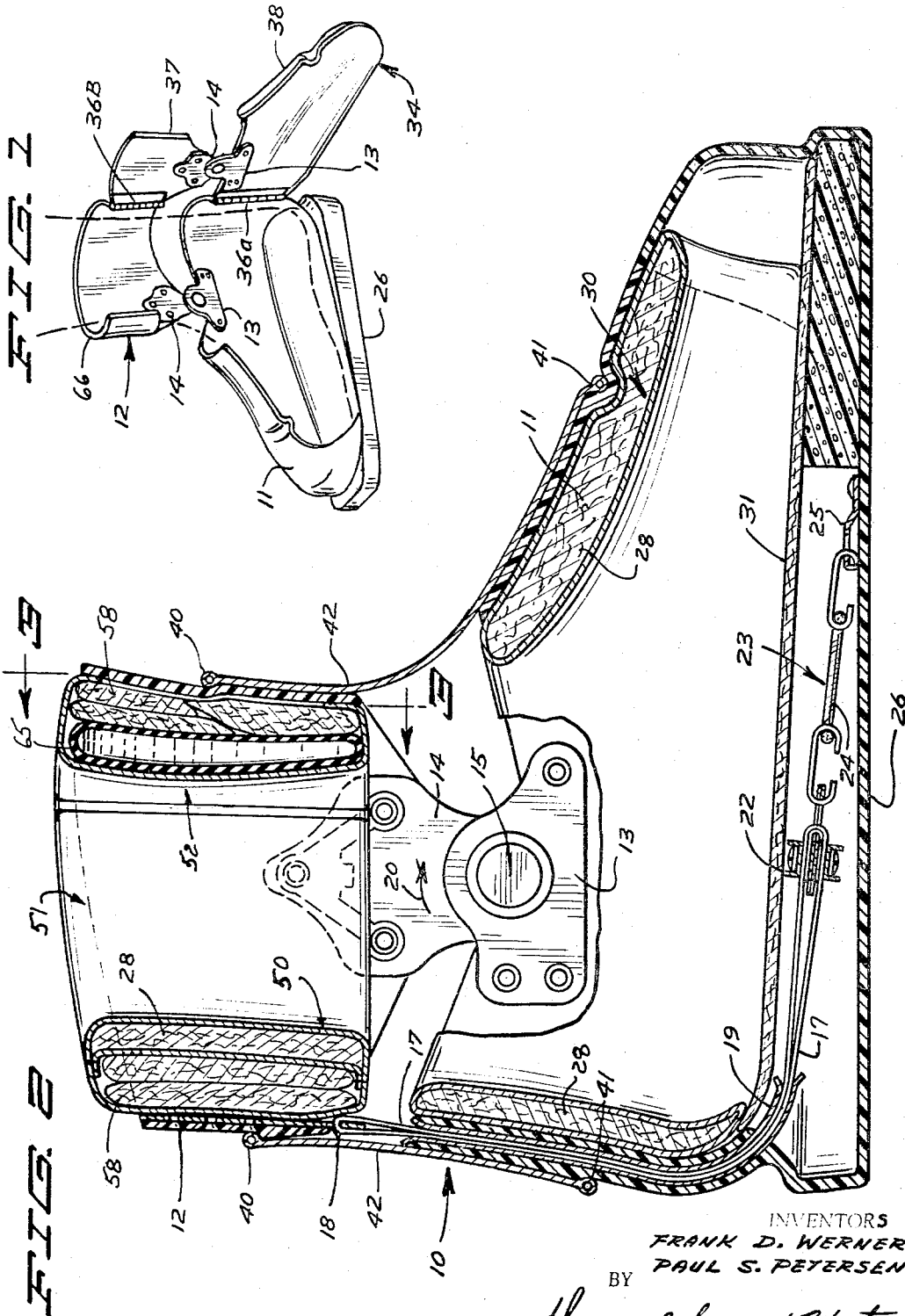
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3,374,561

HYDROSTATIC PAD FOR SKI BOOT

Filed Oct. 20, 1965

2 Sheets-Sheet 1



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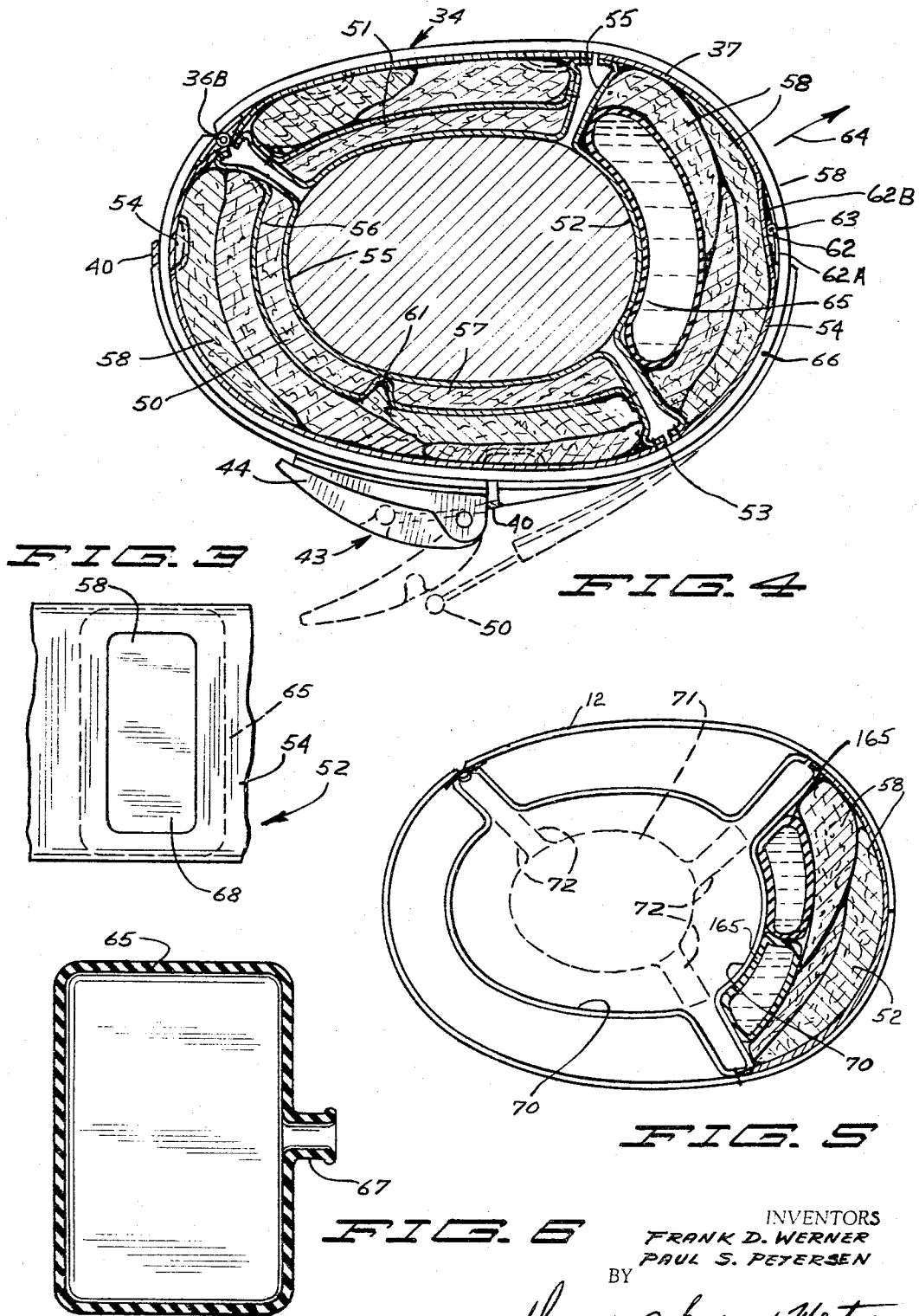


FIG. 6

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1

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HYDROSTATIC PAD FOR SKI BOOT

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13 Claims. (Cl. 36—2.5)

ABSTRACT OF THE DISCLOSURE

A ski boot having a base portion and a cuff portion with access means to permit foot insertion and access means that hold the foot of the wearer of the boot securely, and which includes padding in the cuff portion that holds the lower part of the leg of the wearer and which has a quickly conformable pad at the high load portions of the cuff. The quickly conformable pad distributes shock loads caused during skiing along the longitudinal length of the leg to equalize the pressure on the leg and thereby increase its ability to withstand the high load.

This invention relates to an improved padding arrangement for ski boots, and more particularly to padding used in the ankle cuff of the boot.

It has been found in the development of hard, rigid shell ski boots having articulated ankle pieces, in particular, that conformable padding which is very comfortable and satisfactory on the main parts of the foot and will hold the foot securely in the shell, does not conform to changing conditions rapidly enough when the ankle cuff is pivoted forwardly to provide good comfort for the leg at the front portions thereof. The padding conforms well around the balance of the leg where there is a good deal of flesh padding the bones, but the front of the leg bone is very close to the skin and when high loads are incurred during this forward flexing, discomfort can result, unless a pad between the leg and boot conforms quickly to distribute the loads on the leg uniformly.

This is further aggravated when the forward pivoting of the ankle is resisted by resilient members, and the force necessary to pivot the ankle piece becomes substantial.

Use of liquid pads in ski boots for the holding of the lower portions of the foot in the boot have been unsatisfactory because of the "rolling" action and "changing" between the portions of the pad. The foot is not held securely and will move inside the shell. This cannot be tolerated for good skiing control.

However, it has been found that a combination of the two types of padding in the ankle cuff portion, using a hydrostatic or fluid filled pad at the front of the cuff and using slowly conformable padding elsewhere in the cuff and in the lower boot, holds the leg and foot firmly for control and there is no discomfort at the leg bone area when the leg is pivoted forwardly.

Therefore, it is an object of the present invention to present a boot which has a quickly or easily conformable pad in the front portions of the cuff adjacent to the leg bone area.

It is another object of the present invention to present a hydrostatic pad for use in the front portions of the cuff of a ski boot to provide comfort when the boot cuff is pivoted forwardly.

It is a still further object of the present invention to present a hydrostatic pad for the use in the front portion of a ski boot ankle cuff which is easily made and conforms rapidly to different shapes pressed against the pad, and which is used in combination with slowly conformable padding in the rest of the boot.

2

Other objects are inherent in the following description and will become apparent as the description proceeds.

In the drawings,

FIG. 1 is a perspective view of a typical boot utilizing inner pads made according to the present invention;

FIG. 2 is a vertical sectional view of a ski boot having pads made according to the present invention installed in the cuff portion thereof;

FIG. 3 is a fragmentary front elevational view taken as on line 3—3 in FIG. 2;

FIG. 4 is a sectional view taken transversely through the ankle cuff portion of the boot of FIG. 2;

FIG. 5 is a schematic representation of the padding system which is used to accommodate different size legs without changing the perimeter of the pads; and

FIG. 6 is a sectional view of a hydrostatic pad made according to the present invention.

Referring to the drawings and the numerals of reference thereon, a ski boot illustrated generally at 10 is comprised of two portions, namely a lower shoe portion 11 and an ankle cuff portion 12. The lower portion 11 has a pair of brackets 13, 13 fixedly attached thereto and a second pair of brackets 14, 14 are pivotally mounted on a transverse axis 15 to the brackets 13, 13. The brackets 14, 14 are releasably attached to permit limited vertical sliding movement of the cuff portion 12.

The ankle cuff portion can thus pivot about its transverse axis with respect to the lower portion of the boot. This pivotal axis substantially aligns with the pivotal axis of the ankle of the wearer of the boot so that the wearer can move his lower leg fore and aft with respect to the lower portion of the boot. The lower edge portions of the cuff are spaced upwardly from the lower portion of the boot to permit this pivoting.

The forward pivoting of the cuff is resisted by a pull strap 17 which is made of suitable webbing and which is attached to a bracket 18 that in turn is attached to the cuff adjacent the rear portions thereof. The strap 17 passes down through a provided guide tube 19 and is attached to a bracket 22. A plurality of tension members 23 are hooked into the bracket 22 (there are usually three tension members or more in a boot). Each tension member has an elastomeric center section 24 which will resiliently yield to permit the strap 17 to slide when the boot pivots forwardly in direction as indicated by the arrow 20. The cuff moves bracket 18 which pulls on strap 17 and through bracket 22 to the tension members. The opposite ends of the tension members from bracket 22 are hooked into another bracket 25 attached to the sole 26 of the boot. The tension members have end hooks that fit within provided openings in the brackets. The resistance to forward pivotal movement is obtained from the elastomeric center sections 23 and if more resistance is necessary, more members are hooked into place in the brackets. It can be seen that the rearward movement of the cuff can be mechanically stopped in any convenient manner so that the cuff will return to its centered position when the force of the leg is removed. The tension members also increase greatly in resistance as the cuff pivots forwardly. The forces on the leg thus can get very high during sudden skiing maneuvers.

The boot is provided with a suitable insole 31 that is supported above the brackets 22 and 25 in a suitable manner.

The boot shell is made out of a hard, rigid material, such as a thin fiberglass reinforced epoxy or it could be of a metal material or other lightweight, rigid substance. The material is not damaged by heat or water or cold and provides a hard exterior. The interior surface of the cuff section 12 and the lower section 11 are lined with suitable padding. The lower section of padding is shown

only schematically at 30 and it is comprised as individual pad members that are releasably attached to the boot and are located so as to hold the foot in the lower portion of the boot snugly with respect thereto. Any movement of the foot will be transmitted to the boot and result in movement of the outer shell of the boot.

The pads in the lower portion of the boot are filled with a conformable material made up of discrete particles, comprising small spheres made of a phenolic resin, glass or other suitable materials, for example material sold under the trademark "Microballoons." These particles are covered with a very thin coating of a lubricating oil or grease. The resulting material is such that it will conform to a shape exactly when subjected to the shape for a repeated number of times or under high uniform pressure, but will resist any changes in shape from sudden, sharp movements. It will be termed a slowly conformable material because it does not change in shape rapidly. The absolute conformability of the material under repeated loads is desirable so that a good fit is obtained and its resistance to change from sudden loads means good control is obtained by the skier. This material is illustrated at 28. It is more fully disclosed and its usages more fully defined in the copending application of Frank D. Werner et al., Ser. No. 463,757, filed June 14, 1965, for Conformable Pad and Material for Use Therein.

Access to the interior of the boot is provided by a door assembly illustrated generally at 34 which will open so that a foot can be inserted into the boot, after which the door 34 is closed and held in closed position. The padding then holds the foot firmly within the boot.

The door assembly is hinged to the main part of the boot with a suitable hinge member having a lower section 36A and an upper section 36B. As can be seen, the cuff assembly separates into two sections so that a foot can be slid into the main part of the boot. The door is made up of a door lower section 38 and a door cuff section 37, which pivot as a unit about the upright hinge members 36A and 36B. When the door is closed, the ankle cuff section 12 will pivot as a unit about axis 15.

The door is held closed by encircling it with a pair of cable assemblies, namely an upper cable assembly 40 and a lower cable assembly 41. The cable assemblies are retained in a piece of material termed a "shroud" 42 and are encased in upper and lower marginal hems in the shroud. The shroud is of a material which will enclose the open portions between the cuff and the lower section of the boot and excludes snow.

The cable assemblies 40 and 41 are each held closed (encircling the door and boot) with a suitable overcenter clamp illustrated at 43. The overcenter clamp can be of any usual or preferred type, and as shown, has a lever 44 which can be lifted up to release a spherical ball 50 that is attached to a first end of each of the cables and which seats within a provided ball socket or receptacle in the lever. The second end of each cable is attached to its respective clamp base. The ball can be removed from the socket when the lever is released. The lever will go overcenter when it is against the boot so that the ball is held tightly by the overcenter action. The cables will wrap around the top or cuff of the boot and around the lower portion of the boot, as shown, and hold the door closed and the foot snugly within the boot.

The assemblies for holding the door closed are shown briefly because they form no part of the present invention. Luggage clamps could be used for holding the door closed, or the shroud and cable assemblies shown in the co-pending application of Frank D. Werner et al., Ser. No. 444,220, filed Mar. 31, 1965, for Ski Boot Improvements, can also be used.

The cuff padding in the cuff section 12 is of a special nature. The pads, as can be seen in FIG. 4 are divided into three separate pad units. These pads are 50, 51 and 52. The pad 50 is of quite long length and extends from the hinge 36B to the position indicated at 53 alongside

and near the front part of the leg. The pads 50 and 51 are each made with a relatively stiff plastic backing member 54, a soft leather outer covering 55, for example kangaroo leather, which is sewed or otherwise fastened at its edges to the backing member 54 and an intermediate layer 56 is sewed or otherwise fastened in place. The outer cover is attached to the back member at its marginal edges adjacent the interior of the cuff. There are no side members on the pads. The intermediate layer is used to form a thin pocket 57 filled with the conformable material previously described. The pocket formed between the backing member 54 and the intermediate member 56 of pads 50 and 51 is filled with pillows illustrated at 58 of the conformable material. These pillows or packets are just small bags filled with the slowly conformable material previously described and inserted into provided slits or small openings in the backing members 54 (the opening in the pad 52 is shown in FIG. 3). The pillows take up space between the cuff and the leg so that the leg is held firmly by the pads. Both pads 50 and 51 are filled with these packets of material and the number of packets 58 will depend on the size of the leg in the boot. For thin legs more pillows are needed.

The intermediate layer 56 for the pad 50 is divided into two sections as at 61 to prevent the material 57 from shifting along this outer layer during use.

The pads 50 and 51 are snapped into place with suitable snap fasteners, one part of which is attached to the cuff section and the other part of which is attached to the backing member 54.

The backing member 54 can be of a suitable plastic material, known as ABS and relatively thin, yet with some stiffness.

The pads 50 and 51 could be of other material that is not real soft. Some harder types of molded foam rubber or plastic would work. This would also be termed slowly conformable.

The pad 52 which is at the front of the cuff and engages the leg bone when the leg is in place in the boot, has an outer soft covering 55 of kangaroo leather or similar material and the backing member 54 of ABS plastic. However, it does not have an inner divider as the previous pads 50 and 51 did. The backing member 54 for pad 52 is hingedly attached with a hinge 62 to the cuff section 66 which is on the main part of the boot. The parting line is shown at 63. One side of the hinge 62 is attached as at 62A to the cuff section 66 on the main part of the boot and the other part of the hinge is attached to the pad 52 as at 62B so that the pad is held by this hinge. The pad 52 is not attached at all to the door cuff section 37 and when the door opens the cuff section 37 moves away from the pad 52. The pad can swing out of the way of the leg on hinge 62, in direction as indicated by the arrow 64 to permit the leg to be removed from the boot or inserted into the boot. Pad 51 moves with the door section of the cuff.

The pad 52 has at least one inner container 65 made of an elastomeric material. The container does not stretch much, and can be covered with cloth to prevent stretching. The container is fluid tight. The container 65 extends vertically along the cuff within the outer cover 55 and is inserted through the backing member 54 through an opening 68. The opening 68 is larger than that used for pads 50 and 51. It must be of size so that the container 65 will go into the pad. It can be seen that the container has a longer longitudinal length than a transverse width. It extends transversely across the front of the leg and for less than 120° of arc.

As can be seen in FIG. 6, the container 65 has a filler opening defined by a neck 67 in which a fluid, usually a liquid, is introduced into the interior of the container. Usually a liquid such as water with suitable additives to prevent freezing will be used. The container 65 is then sealed by cementing the neck 67 shut to prevent leaks, or it can be sealed in any other desired manner.

5

The container, filled with an easily flowing fluid or liquid, is inserted through the opening 68 in the pad 52. The container is placed directly under the outer covering and positioned so that it is directly ahead of the leg within the boot. Suitable pillows 58 filled with the conformable material, namely discrete particles covered by a lubricating material, previously described are then placed until the leg is held comfortably. These pillows 58 are also inserted through the opening 68.

Sufficient pillows 58 are introduced in all of the pads so that the leg is held firmly when the boot door 34 is closed. The material in the conformable pads 58 will flow sufficiently to fill up all of the space between the rigid cuff sections 12 of the boot and the leg. For convenience of illustration, space has been left in the drawings between the pads in the cuff. This would all be filled, however. This conformable material will flow under repeated or continuous pressure. When subjected to sharp shock forces it will not conform well but will resist this force. Thus, it is important that the quickly conformable cushion comprising the fluid or liquid filled container 65 is against the leg bone of the wearer of the boot. When the wearer pivots his leg forwardly against the cuff, which pivoting is resisted by the tension members 23 as previously described, the fluid in bag 65 will flow to conform to the shape of the leg. Very little stretching of the bag is tolerated, but the fluid within the bag will shift slightly, filling out the corners of the bag and conforming to the shape of the member that is engaging it.

This will give a more uniform pressure support on the leg bone and will not cause discomfort when the leg is pivoted forwardly very far. If the front pad did not conform there would be high pressure points on the leg, causing discomfort. As the cuff pivots forwardly, of course, the force required to pivot the cuff will increase and thus the pressure on the leg will increase. The free flowing fluid in the container 65 insures that the pressure is uniformly distributed, and that the conforming is done instantaneously for sudden sharp movements which are normally present during skiing.

The fluid filled container should extend less than 120° around the front of the leg. Also several narrow fluid filled containers could be used. As shown in FIG. 5, two containers 165, 165 (or more) are placed between the boot and the front of the leg. The use of several containers more effectively restricts lateral flow or exchange of fluid, while allowing free exchange of fluid for conformability in the vertical direction. This gives a higher degree of lateral support. The conformable pillows 58 that back up the containers 165 are also shown in FIG. 5. The two containers 165, 165 are narrower transversely in relation to their length than when a single container 65 is used. The longitudinal axes of the containers should be placed parallel to the leg bone.

The rest of the pads, 50 and 51 of the slowly conformable material, will hold the legs solidly during the normal stance in skiing and will insure that any movement of the leg is transmitted by the pads directly to the cuff, then to the brackets and to the lower portion of the boot and thus to the ski to which the boot is attached. The rigid construction of the shell insures that this movement is transferred to the ski.

The benefits of the slowly conformable material which will transmit sudden forces, such as the moving of the leg to edge the ski, are available and the benefits of a quickly conformable pad, namely a fluid or liquid filled container 65, is available to provide comfort on the leg bone. The combination of slowly conformable material for the main padding and the quickly conformable material in the front of the ankle cuff portion of the boot to prevent discomfort in all of these normal skiing movements gives superior results.

In FIG. 5 the principle behind using three pads in the cuff with the outer covers sewed to the backing member adjacent the cuff is illustrated. As previously explained,

6

pillows 58 of material can be inserted into each of the pads 50, 51 or 52 to accommodate different leg sizes. The outer layers of each pad must be large enough to accommodate the additional pillows for small legs and yet when a large leg is in the boot, the outer covers must not be so loose that they bunch and fold.

By using three pads substantially equally divided around the cuff and held against the cuff at their edges, the linear length of the coverings is substantially the same whether a large or small leg is in the cuff. When a large leg is in the boot, the pads are as shown at 70, where most of the pad outer covering is in contact with the leg.

With a small leg, shown exaggerated in dotted lines at 71, the pillows fill the pads and very little of the pad covering touches the leg but much more of the pad cover is used in extending from the cuff to the leg. These lines of extension are shown at 72. With the large leg, less of the pad cover is used, going from the leg to the cuff and so the total length of the outer cover remains about the same.

What is claimed is:

1. A boot having a lower portion and ankle cuff portion, padding means in the ankle cuff portion comprising three separate pads, each pad having a backing member and a cover member, the marginal edges of the cover member being attached directly to the backing member adjacent the outer periphery of the backing member, said backing member being contiguous to the interior of the cuff portion, two of said pads being positioned to hold the leg of a wearer of the boot firmly on three sides thereof, and a third of said pads being positioned adjacent the front of the leg of a wearer of the boot and containing a fluid material which will quickly conform to configurations pressed thereagainst, said third pad extending for less than 120° of arc along the front of the cuff, and being greater in longitudinal direction than transverse dimension, and the longitudinal direction of said third pad extending uprightly substantially parallel to the leg bone of a wearer of the boot.

2. A ski boot comprising a lower portion made of substantially rigid material and lined with interior padding, a cuff portion pivotally mounted to said lower portion about an axis substantially corresponding to the pivotal axis of an ankle of a wearer of the boot, a door to permit access to the interior of the boot movable between open and closed positions, and padding means in said cuff portion and lining the interior thereof, said padding means comprising first pad means which will hold the leg of the wearer snugly and resist sudden pressures along the sides and rear of the leg of the wearer, and second pad means which will conform quickly to the shape of a member pressed thereagainst aligned with the front portions of the leg bone of the wearer.

3. The combination as specified in claim 2 wherein said second pad means comprises a liquid filled container having a longitudinal axis extending substantially parallel to the leg bone of the wearer.

4. The combination as specified in claim 3 wherein the transverse dimension of the liquid filled container extends for less than 120° of arc adjacent the front of the cuff.

5. A ski boot comprising a lower portion made of a substantially rigid material and lined with interior padding of a slowly conformable material that holds the foot firmly with respect to the boot, a cuff portion pivotally mounted to said lower portion about an axis substantially corresponding to the pivotal axis of an ankle of a wearer of the boot, resilient means to resist forward pivoting of said cuff portion beyond a normal centered position, foot access means to the interior of the boot, and padding means in said cuff portion and lining the interior thereof, said padding means comprising portions which will hold the leg of the wearer snugly and resist sudden pressures along the sides and rear of the leg of the wearer, and a fluid filled pad which will conform quickly to a shape

7

pressed thereagainst positioned forward of and aligned with the front portions of the leg bone of the wearer.

6. The combination as specified in claim 5 wherein said fluid filled pad is filled with a freely flowing liquid.

7. The combination as specified in claim 6 wherein the liquid is water.

8. A boot having a lower portion and an ankle cuff portion articulated to the lower portion along an axis substantially corresponding to the pivotal axis of the ankle of a wearer of the boot, means to resiliently restrict said ankle cuff portion against forward pivoting, first padding means in said cuff portion to firmly hold the leg of a wearer of the boot on three sides thereof, said first padding means being filled with a slowly conformable material, and second padding means adjacent the front of the leg bone of a wearer of the boot, said second padding means extending for less than 120° arc along the front of the cuff portion of the boot and being filled with a fluid material that will quickly conform to the configuration of objects pressed thereagainst.

9. A boot comprising a boot shell having a cuff portion which extends above the ankle of a wearer of the boot, said cuff portion being pivotally mounted so as to permit fore and aft movement of a leg of the wearer of the boot, means on the boot to resiliently resist forward movement of said cuff portion and the lower portion of the leg of a wearer of the boot, padding means in said cuff portion interposed between the boot shell and the leg of a wearer of the boot, said padding means including a fluid filled pad located in a frontal sector of said cuff portion so as to be aligned with and contacted by the leg bone of a wearer of the boot when the leg bone is pivoted forwardly against the action of the resilient means.

10. A ski boot having a lower portion and an ankle

8

cuff portion articulated to the lower portion along an axis substantially corresponding to the pivotal axis of the ankle of a wearer of the ski boot and substantially surrounding the lower leg of the wearer of the boot above the ankle pivotal axis, first padding means in said cuff portion to firmly support the leg of the wearer in areas of the cuff not subjected to high rapidly changing loads during use, and second padding means in the areas of the cuff encountering high rapidly changing loads during use, said second padding means including a container substantially filled with a fluid material that will quickly conform to the configuration of the leg pressed thereagainst.

11. The boot of claim 10 wherein the lower portion and the ankle cuff portion are made of a substantially rigid material.

12. The combination as specified in claim 11 wherein the first padding means extends around the cuff for a major portion of the periphery of the cuff.

13. The combination as specified in claim 12 wherein the first padding means is filled with a slowly conformable material.

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PATRICK D. LAWSON, *Primary Examiner.*