United States Patent

Hornung

[15] **3,686,778**

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[54] **SKI BOOT OR SHOE**

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[30] **Foreign Application Priority Data**

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May 23, 1970 Germany.....P 20 25 283.9

[52] **U.S. Cl.**.....**36/2.5 AL**
[51] **Int. Cl.**.....**A43b 00/00**
[58] **Field of Search**.....36/2.5 R, 2.5 AL

[56] **References Cited**

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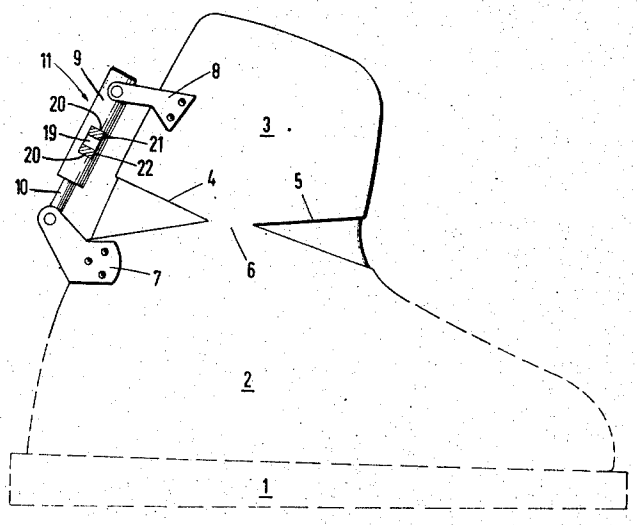
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Primary Examiner—Patrick D. Lawson
Attorney—Mason, Fenwick & Lawrence

[57] **ABSTRACT**

A ski-boot, molded from rubber or plastics, in which the neck portion of the upper is bendable relative to the foot portion. A connection, such as a piston and cylinder arrangement, prevents relative bending of the two portions from an initially chosen infinitely adjustable fixed position until the bending force exceeds a pre-set value. Any subsequent bending is limited by adjustable stops, and the pre-set value of bending force can also be adjusted.

9 Claims, 9 Drawing Figures



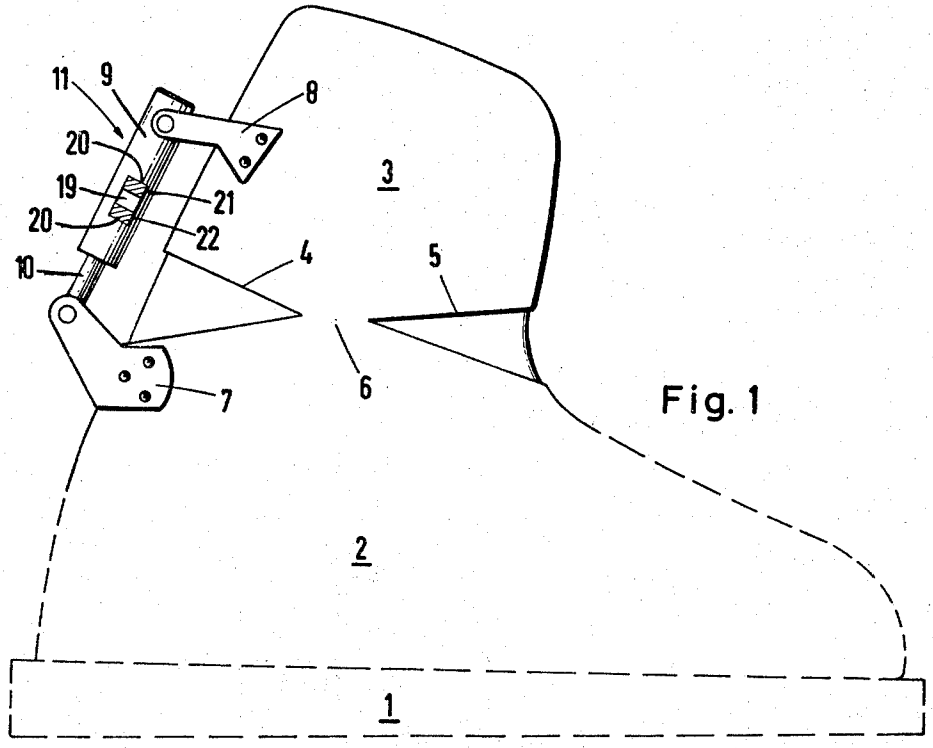


Fig. 1

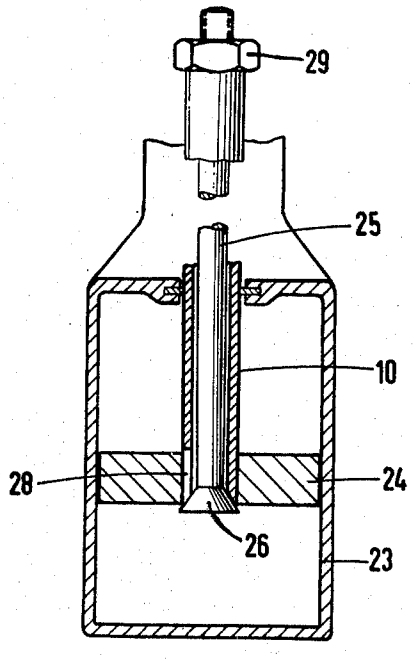


Fig. 3

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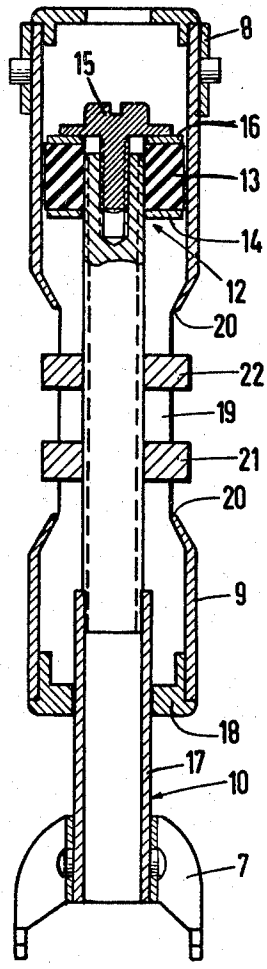


Fig. 2

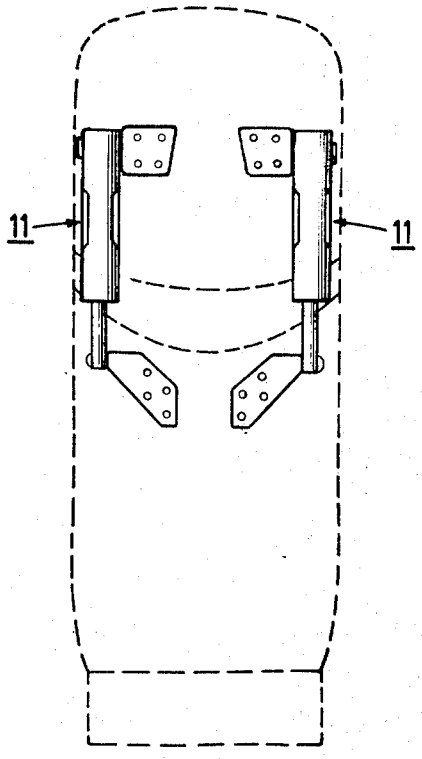


Fig. 4

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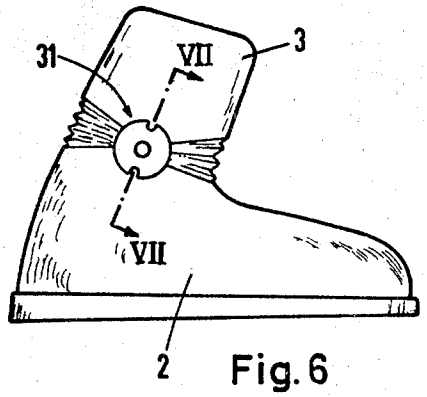


Fig. 6

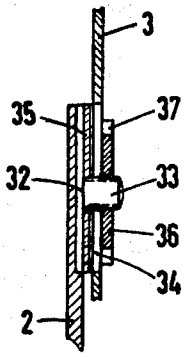


Fig. 7

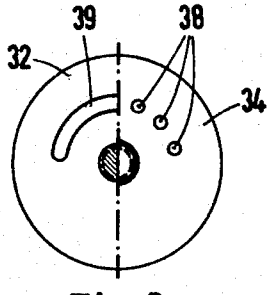


Fig. 8

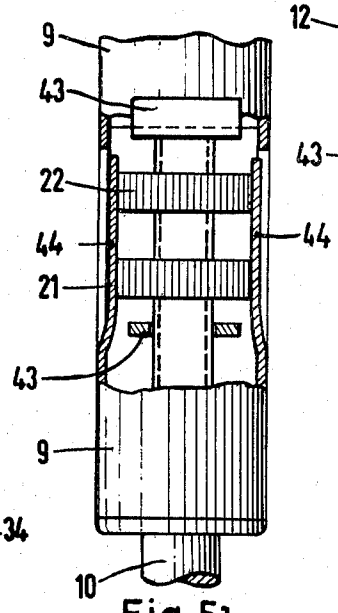


Fig. 5b

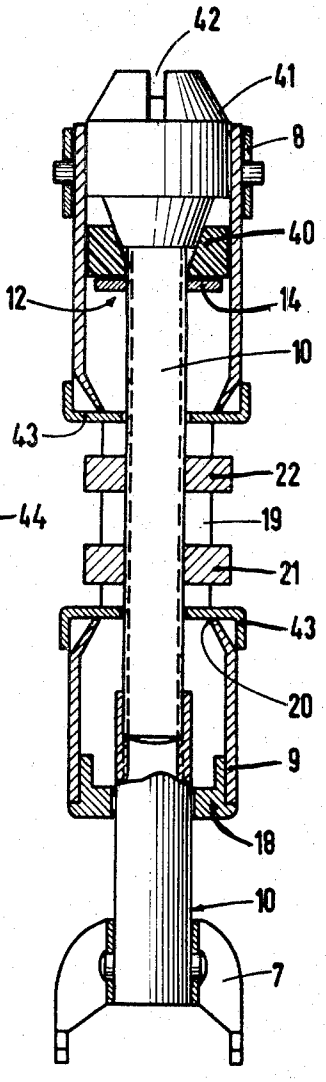


Fig. 5a

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SKI BOOT OR SHOE

The invention relates to a ski boot or shoe wherein the neck portion of the upper is pivotal or capable of bending relative to the first portion of the upper about a transverse axis located substantially at the height of the ankle.

Ski boots or shoes wherein the neck portion of the upper is pivotal relative to the foot portion of the upper about an axis extending substantially at the level or height of the ankle are known. It is the object of this design to make the ski boot or shoe as rigid as possible relative to lateral tilting movements of the ankle without, however, restricting the freedom of movement, necessary for skiing, forwardly and rearwardly about the axis of the ankle. A ski boot or shoe has also already been disclosed wherein the pivoting position of the neck of the upper relative to the lower portion of the upper is influenced by a resilient connection between the neck of the upper and the sole (United States Pat. No. 3,313,046).

The resilient connection in the case of this ski boot or shoe endeavours always to pivot the neck portion of the upper into a position such as would correspond to an upright or even rearwardly declined position of the skier. This resilient connection results, however, when maintaining the forward lean necessary for skiing, in exerting on the skier a spring force tending to compel a straightened position or rearward lean and which increases proportionately as the skier moves further into the forward lean. This may, however, result in a hindrance to exact guiding of the skis by the skier.

Ski boots or shoes are also known wherein the neck of the upper is cut to afford a predetermined forward lean. However, such cutting for forward lean does not take into account the fact that every skier adopts an individually varying forward lean and in particular it does not take account of the fact that, in many movement phases in modern skiing, a definite rearward lean attitude is necessary.

According to the invention, there is provided a ski-boot in which the foot and neck portions of its upper are bendable relative to one another, the bending movement being restricted by connecting means fixing the relative position of the neck portion and foot portion, the relative position being infinitely variably adjustable.

Due to the design according to the invention of the ski boot or shoe, every skier is enabled to select that forward lean position which is most advantageous for him.

Preferably, the connecting means include individually adjustable force applying means, whereby said relative position may be fixed until the force tending to bend the neck portion relative to the foot portion exceeds a value set by said force applying means. In this way, it is possible to put the neck portion of the upper, when the value is exceeded, for example due to a straightening movement of the leg, into a new position which will be comfortable for the skier. Advantageously, the supporting connection is so designed that the retaining force is a friction force. This may be achieved by various constructions. Thus, for example, in a first embodiment, the connecting means includes a cylinder connected to one of said portions, a piston slidable in said cylinder and connected to the other of said portions and means for adjusting the force required to move said piston relative to said cylinder. Advantageously, with this arrangement, the piston consists of a plug made of a deformable material, for example rubber, and guided in an open cylinder. The piston or plunger may, however, also comprise an axially slotted ring made of a wear-resisting material and be secured at the end of a piston rod between a pressure plate and an adjusting cone which spreads it apart. This latter embodiment has the advantage of only slight wear and more sensitive adjustability.

Alternatively, the connecting means may comprise a first connecting member on the neck portion, a second connecting member on the foot portion relatively rotatable with respect to said first connecting member and means for adjusting the friction between said members. With this arrangement, each of the connecting elements may consist of a pressure disc and the adjusting means comprise a screw and nut connection.

In order that the present invention will be better understood the following description is given, merely by way of example, reference being made to the accompanying drawings, wherein:

FIG. 1 is a lateral view of one embodiment of ski boot according to the invention having a supporting connection arranged at the rear side of the boot;

FIG. 2 is a longitudinal section through the supporting connection of FIG. 1;

FIG. 3 is a longitudinal section through a further embodiment of a supporting connection;

FIG. 4 shows a ski boot according to the invention, as seen from the rear and wherein the supporting connection is comprised of two piston and cylinder arrangements arranged one on each side of the heel portion;

FIG. 5*a* is a longitudinal section through a modified connection;

FIG. 5*b* is a longitudinal section through the connection of FIG. 5*a* but taken in a perpendicular plane;

FIG. 6 is a lateral view of a further embodiment of ski boot;

FIG. 7 is a section taken along the line VII—VII of FIG. 6;

FIG. 8 shows a diagrammatic, partially sectioned lateral view of the connecting elements shown in FIGS. 6 and 7.

Referring to FIG. 1, the ski boot consists of a sole 1, a foot portion 2 and a neck portion 3 of an upper connected to the foot portion. The neck portion of the upper 3 is connected with the foot portion by means of a narrow web 6 formed by front and rear incisions 4 and 5. The web 6 provides a pivotable or bendable connection between the neck portion 3 and the lower foot portion 2, due to its resilience which renders it similar to a hinging arrangement. However, instead of the web 6, the pivotability could also be afforded by providing an articulation or hinging arrangement.

Secured to the rear side of the foot portion 2 and the neck portion 3 are elements 7 and 8 respectively. Secured in articulated fashion to the upper element 8 is a cylinder 9 and to the lower strip 7 the end of a piston rod 10 of a piston and cylinder arrangement 11. The elements 7 and 8 consist, in the embodiment illustrated, of sheet metal or plastics moulded elements. However, it would also be possible to provide in place thereof, when manufacturing the ski boot by a moulding process, appropriate retaining means directly attached thereto by moulding.

As will be seen in FIG. 2, the cylinder 9 of the piston- and cylinder arrangement 11 consists of a tube which is open at both ends and in which a piston 12 secured to the end of the piston rod 10 is guided. The piston 12 consists of a plug 13 made of a resiliently deformable material, preferably rubber, which is compressed between a pressure plate 14 secured to the piston rod 10 and a further pressure plate 16 urged by an adjusting screw 15 adapted to be screwed into the piston rod 10. Axial guiding of the piston 12 in the cylinder 9 is afforded by the arrangement whereby the piston rod 10 is screwed into a sleeve 17 guided in a cover or lid 18 at the lower end of the cylinder 9.

The cylinder 9 has, approximately half way along, on both sides, slots 19 the end edges 20 of which are pressed inwardly. The edges 20 constitute stops for the adjusting nuts 21, 22 screwed on to the piston rod 10 and with the aid of which the displacement of the piston 12 within the cylinder 9 may be adjusted. Thus the stops limit the pivoting movement of the neck portion 3 relative to the foot portion of the upper 2.

Due to the compression of the plug 13 between the pressure plates 14 and 16, the latter is - depending on the magnitude of the compression force applied by the adjusting screw 15 - pressed to a greater or lesser extent against the cylinder walls and is therefore fixed in that position until the force due to bending of the upper reaches a preset value. Due to the use of rubber or plastics of correspondingly resilient behavior for example polyurethane foamed material or the like, as the material for the plug 13, this mode of fixing is, however, not absolutely rigid but has a predetermined degree (determined by the deformability of the rubber) of resilience. This resilience is, however, restricted within relatively narrow limits.

Pressed into the upper end of the cylinder 9 is a lid or cover which is formed with an aperture, through which the adjusting screw 15 may be tightened to a greater or lesser degree so that the retaining force of the piston 12 in the cylinder 9 may be varied. In order to afford the skier a means of controlling the magnitude of the retaining force, the adjusting screw 15 may have a scale associated with it. Similarly, there may be arranged at each of the lateral apertures 19 in the cylinder 9 a scale enabling the skier to read off the maximum forward lean, measured for example in angular degrees, at the upper adjusting nut 21 and the extreme rear position at the lower adjusting nut 22.

FIGS. 5*a* and 5*b* show a modified construction, in which the piston 12 consists of a ring 40 made of a wear resisting material and slotted in the direction of its longitudinal axis. The ring 40 bears on a lower pressure plate 14 which is secured on the piston rod and is radially spread-apart from its upper side by an adjusting cone 41 adapted to be screwed on to the piston rod 10. The conical part of adjusting cone 41 extends into a correspondingly formed central bore in the ring 40. At its upper end, the adjusting cone 41 is formed with a transverse slot 42 by means of which it may, for example, with the aid of a coin, be screwed to a greater or lesser extent into the cylinder 9. In so doing, it spreads the ring apart to a greater or lesser degree, so that the ring enters into a corresponding frictional engagement with the cylinder walls.

The apertures 19 formed on both sides half way along the cylinder 9 are, in this embodiment, connected together by a perforated transverse web 43 to form stops for the adjusting nuts 21, 22 screwed on to the piston rod 10. In the wall portions of the cylinder 9 remaining standing adjacent the apertures 19, there are punched-out resilient tongues 44 (FIG. 5*b*) which press inwardly on to the knurled periphery of the adjusting nuts 21, 22 and prevent unintentional rotation thereof.

In the embodiment of FIG. 3, the piston rod 10 is guided, in sealed arrangement, in a closed cylinder 23 filled with an hydraulic medium as a damping liquid. Secured, again, to the end of the piston rod is a piston 24 guided in the cylinder 23. The securing of the piston 24 on the piston rod 10 is effected for example by pressing on to the end of the piston rod. The piston rod 10 is designed to be hollow and guided for longitudinal displacement therein is a valve stem 25 the lower end of which carries a valve cone 26 fitted into a corresponding valve seat 27 at the end of the piston rod. The piston rod is slotted at its end 28, starting from the valve seat 27, over a length somewhat greater than the length of the piston 24. The valve stem 25 projects out of the upper end of the sleeve 17 and is adapted to be adjusted in its axial position within the piston rod 10 by means of an adjusting nut 29 at its end. Due to the axial displacement of the valve stem 25, however, it is possible to provide a more or less large throttle aperture in the valve seat 27, to throttle the throughflow of damping liquid through the slot 28 on to the opposite piston side to a greater or lesser degree, when thrust forces act on the piston. The throttle effect exerted on the damping liquid corresponds to the frictional engagement of the piston 12 in the embodiment according to FIG. 2. Instead of the throttle device shown in FIG. 3, a large number of equivalent constructions would of course be possible.

The supporting connection according to the invention may expediently also be so designed or arranged that it also permits the use of modern piston-type ski connecting systems which have a spring piston projecting upwardly at the rear side of the ski boot or shoe. For this purpose, the piston and cylinder of the piston and cylinder arrangement may be designed to be flat, for example rectangular or oval, in cross-section and the flat side thereof may face the ski boot. As shown in FIG. 4, it is also possible to provide two piston and cylinder arrangements 11 arranged one on each side of the heel portion of the ski boot and between which the piston of a piston-type ski connecting arrangement is located. With this type of arrangement, there is the additional advantage that the spacing of each piston and cylinder arrangement 11 relative to the boot may be kept relatively small, without thereby bringing about unintentional limitation of the pivoting movement of the neck portion of the upper 3 in the forward direction in consequence of the fact that the piston and cylinder arrangement bears against the boot itself and thereby prevents further movement. Since the mutual abutment, necessary during skiing, of the inner faces of the boot must, however, not be hindered, the spacing of both laterally arranged piston and cylinder arrangements must not be made excessively large.

The neck of the upper 3 of the ski boot shown in FIG. 6, is connected with the foot portion of the upper 2, for pivoting in the forward and rearward directions, by an

articulation means designated 31 as a whole and serving as a supporting connection. As shown in FIGS. 7 and 8, the articulation or hinging means comprises, in its simplest embodiment, a pressure disc 32 which is secured to the lower portion of the upper 2 and carries a threaded pin 33. The pressure disc 32 is connected with the foot portion of the upper 2 either by direct injection (on manufacturing the boot by injection moulding) or by means of conventional securing means. Correspondingly, there is secured to the neck portion of the upper 3 overlapping the foot portion of the upper 2 a pressure disc 34 formed with a central bore through which the threaded pin 33 projects. The facing faces of the pressure discs 32 and 34 bear on a friction disc 35 which is arranged between them and is made from a wear-resisting material. The friction disc produces adequately high coefficient of friction and, due to its deformability, compensates for surface unevenness between the pressure discs 32 and 34, at the same time affording uniform abutment. By means of a nut 36 adapted to be screwed from the exterior on to the threaded pin 33, the friction disc 35 is tensioned to a greater or lesser extent between the two pressure discs 32 and 34, thereby producing, in the hinge 31, a correspondingly larger or smaller resistance against pivoting. The nut 36 has, at the outer edge thereof, spanner faces 37 serving for the rotation thereof. At the same time, there may be provided in the zone of the outer periphery of the nut 36 a scale on which the retaining force may be read-off with the aid of appropriate scale values.

FIG. 8 shows an embodiment of the hinge 31 wherein limitation of the pivoting zone forwardly and rearwardly becomes possible. For this purpose, there are formed in the outer pressure disc 34, on a circle extending concentrically to the pivot axis or to the axis of the threaded pin 33, bores 38 into which pins (not shown) may be inserted with predetermined arcuate spacing. The pins extend through circular elongate apertures, which are also arranged concentrically to the pivot axis, into corresponding elongate apertures 39 formed in the inner pressure disc 32. Optionally, within the pressure disc 32, yet a further disc (not shown) may be connected with the foot portion of the upper 2, having bores corresponding to the bores 38, into which the inner end of the limiting pins may snap.

Due to the design according to the invention of a supporting connection between the foot portion of the upper and the neck of the upper of the ski boot, it becomes possible for the skier himself to select and adjust, in infinitely variable manner, his forward lean angle in the position most advantageous for him. Additionally, the forward lean position or pivoting position of the neck of the upper can be determined by an individually adjustable retaining force which, in the event of a predetermined degree of overstressing, may be overcome and results in the adjustment of a fresh forward lean or pivoting position due to a damped movement. Furthermore, in each forward lean or pivoting position selected by the skier himself no force is exerted on the ankle joint which might force the skier out of a position once the latter has been selected. Thus, with the supporting connection according to the invention it becomes possible for the skier, after commencing a downhill run, to select a considerably extended position of the neck of the upper relative to the lower portion of the upper, whereby he can travel or stand comfortably in the ski boots. The invention may be varied in many ways. Thus, in particular, it would be conceivable to arrange the supporting connection designed as a piston and cylinder arrangement not at the rear side of the ski boot, but at the outer side or forwardly, whereby any impairment of the functioning of piston-type ski connections is completely excluded.

I claim:

1. A ski-boot comprising, in combination:
   a. a molded upper;
   b. a foot portion of said upper;
   c. a neck portion bendable relative to the foot portion about a transverse axis in the vicinity of the ankle of a wearer of the boot;
   d. connecting means connecting the neck portion to the foot portion to fix the relative position of said neck portion and said foot portion against forward or rearward pivotal movement;
   e. infinitely variable adjusting means controlling said relative position between upper and lower limits; and
   f. adjustable release means in said connecting means for releasing said neck portion and foot portion for permitting forward or rearward pivotal movement of the neck and foot portions in response to the application of a predetermined force in accordance with the state of adjustment of said adjustable release means.

2. A ski-boot according to claim 1 wherein said connecting means includes stop means effective to limit relative movement between said neck portion and said foot portion when said predetermined force has been exceeded.

3. A ski-boot as claimed in claim 1 wherein said adjustable release means includes a cylinder connected to one of said portions, a piston slidable in said cylinder and connected to the other of said portions and means for adjusting the force required to move said piston relative to said cylinder.

4. A ski-boot as claimed in claim 3, wherein said piston comprises a plug of deformable material.

5. A ski-boot as claimed in claim 4, and further comprising a piston rod connected to said other member, a pressure plate mounted on said piston rod and an adjusting cone axially movable on said piston rod and wherein said plug consists of a longitudinally slotted ring of wear resistant material, mounted between said pressure plate and cone, so as to be spread apart as said cone is moved towards said pressure plate.

6. A ski-boot as claimed in claim 3, and further comprising a first element connected to said neck portion and a second element connected to said foot portion, and wherein said cylinder is articulated to one of said elements and said piston is articulated to the other of said elements.

7. A ski-boot as claimed in claim 3, wherein said cylinder is a closed cylinder filled with hydraulic medium and further comprising means defining a throttling aperture in said piston.

8. A ski-boot as claimed in claim 1, wherein said connecting means comprise a first connecting member on the neck portion, a second connecting member on the foot portion relative rotatable with respect to said first

connecting member and said adjustable release means comprising means for adjusting the friction between said members.

9. A ski-boot as claimed in claim 8, wherein said connecting members each comprise pressure discs and wherein said adjusting means comprise a screw and nut connection.

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