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Salomon

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[54] **FIXING SKI BOOTS TO SKIS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** .....**280/11.35 C**

[51] **Int. Cl.** **A63c 9/00**

[58] **Field of Search** .....280/11.35 R, 11.35 K, 280/11.35 C, 11.35 T, 11.35 D, 11.35 A, 11.35 E, 11.35 H

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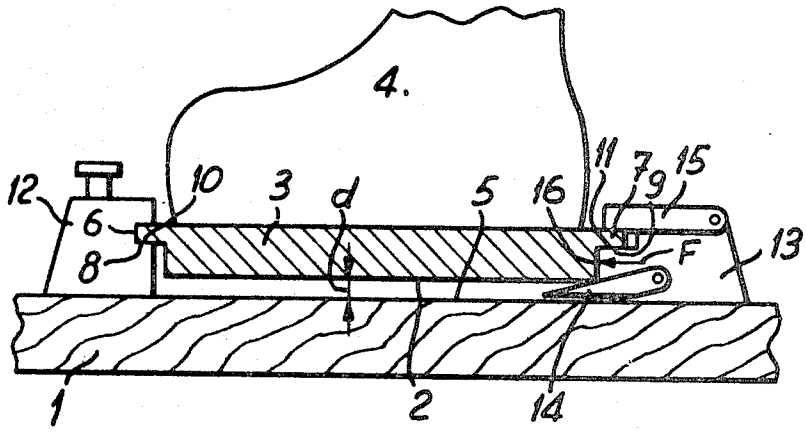
[57] **ABSTRACT**

A ski boot comprises a rigid substantially flat sole having a lower surface for walking and support surfaces, distinct from and above the lower surface, located at toe and heel ends of the sole. Bearing surfaces on toe and heel bindings cooperate with said support surfaces to hold the boot on a ski with said lower surface spaced apart from the upper surface of the ski.

8 Claims, 11 Drawing Figures



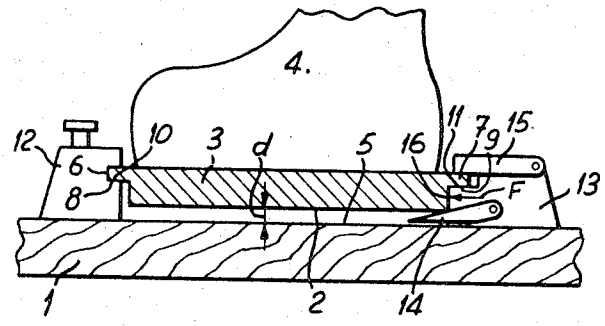


FIG.1

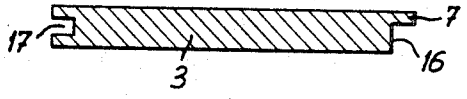


FIG.2

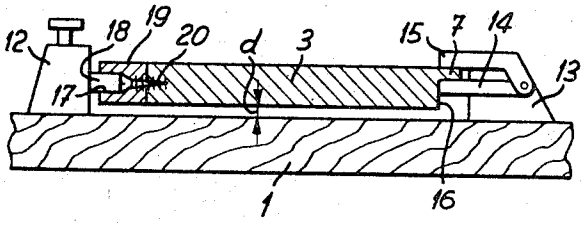


FIG.3

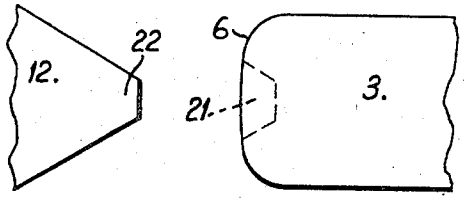


FIG.4

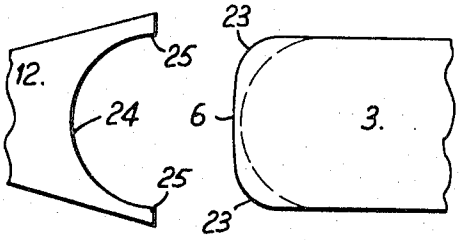


FIG.5

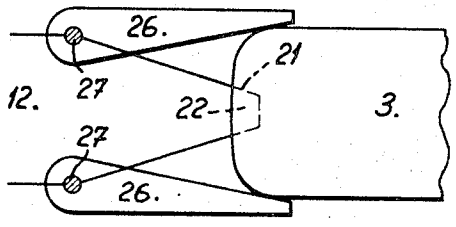


FIG.6

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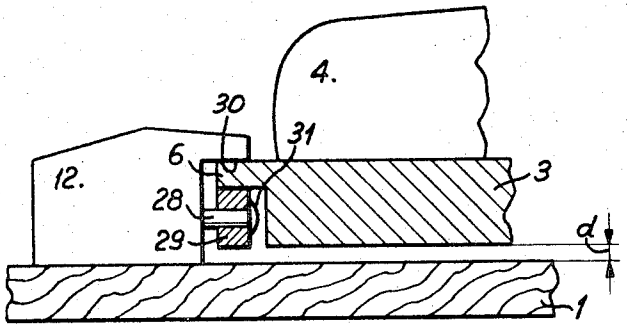


FIG.7

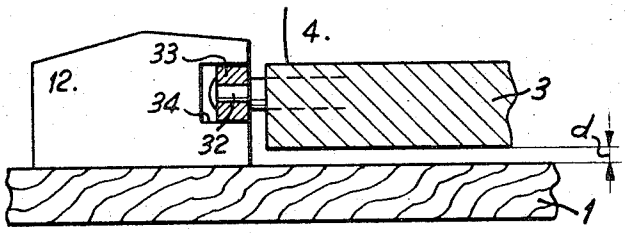


FIG.8

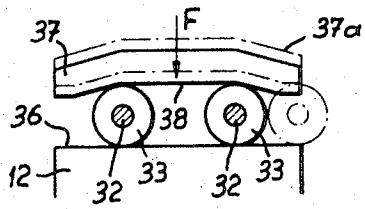
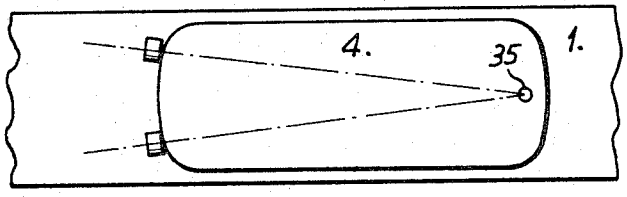


FIG.9

FIG.10



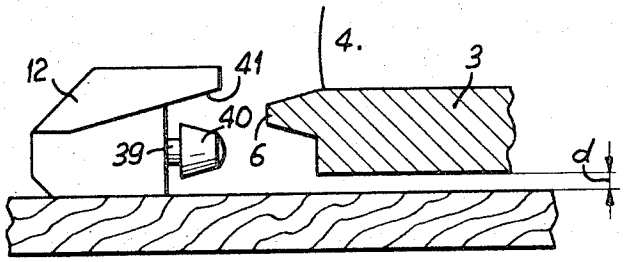


FIG.11

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FIXING SKI BOOTS TO SKIS

This invention relates to safety bindings for releasably holding ski boots onto skis.

Up to date, the soles of ski boots have been designed to fulfill contradictory requirements: firstly they must have a good grip on the ground, especially on slippery surfaces such as hard-packed snow and ice to enable the skier to walk safely, and secondly they must be able to slide transversally of the ski when the binding releases, for example in the case of a fall.

This situation has led to the widespread use of anti-friction devices, generally plates on the ski which contact the sole directly, or indirectly through a piece fixed on the sole. The use of such anti-friction devices is undesirable since it means that the effort necessary for release of the binding may vary according to the condition of the sole of the boot. Moreover, it is difficult for the ski binding manufacturer to establish accurate instructions for adjustment of the bindings. These instructions generally take the form of tables giving the binding adjustment as a function of the skier's weight and degree of skiing skill. However, the tables cannot take into account the type of anti-friction plate used, its positioning on the ski, and the characteristics of the sole of the boot which are all important factors affecting correct adjustment of the binding.

It is an object of the invention to overcome these drawbacks.

According to the invention, there is provided a combination of a ski boot and a ski, said ski boot comprising a rigid sole having a toe end and a heel end. The sole comprises a substantially flat lower surface for contact with the ground when the boot is used for walking and first and second support surfaces distinct from and located above said lower surface at said toe and heel ends respectively. The ski comprises a first toe-stop binding member and a second heel-stop binding member fixed on an upper surface thereof. The first and second binding members comprise means for releasably holding a boot on the ski including first and second bearing surfaces, said first and second bearing surfaces cooperating with said first and second support surfaces to support the boot with said lower surface spaced apart from the upper surface of the ski.

The ski boot is therefore suspended above the upper surface of the ski. The boot does not directly contact the ski nor does it indirectly contact the ski by any member other than the toe-stop and heel binding members. The surfaces by which the boot rests on the toe-stop and heel bindings are quite distinct from the lower surface of the sole. Consequently, these support surfaces can assume suitable slip properties, either due to inherent characteristics of the surface or by cooperation with a suitable bearing device, while the lower surface can be made of a material with non-slip properties and with a contour to give the boot good gripping properties for walking without detriment to release of the bindings.

The combination of a ski boot and ski according to the invention has numerous advantages over known systems. Notably, the provision of an independent anti-friction device and its fixation onto the ski are eliminated. The problem of fitting the boot onto the ski when the boot sole and/or ski is covered with snow is also avoided. Also, the stress required to release the bindings is independent of the positioning of an anti-friction plate. Consequently, the tables provided by the manufacturer for adjustment of lateral release of the bindings are not effected by the fitter who, with known systems, may omit to fit the correct anti-friction device, or may incorrectly place it. As a result, the axis of pivoting of the boot for lateral release is no longer defined by the edge of an anti-friction plate, but by the construction of the bindings.

The accompanying drawings show, schematically and by way of example, several embodiments of the invention. In the drawings:

FIG. 1 is a side elevation, partly in cross-section, of a ski boot fixed on a ski according to a first embodiment of the invention,

FIG. 2 is a longitudinal cross-section through a second embodiment of sole,

FIG. 3 shows a modification of the sole of FIG. 2 mounted on a ski,

FIGS. 4, 5 and 6 are partial plan views of fourth, fifth and sixth embodiments of the invention,

FIGS. 7 and 8 are partial longitudinal cross-sections of seventh and eighth embodiments,

FIG. 9 is an end elevational view of a ninth embodiment,

FIG. 10 is a schematic plan view corresponding to FIG. 9, and

FIG. 11 a partial longitudinal cross-section of a tenth embodiment.

Referring to FIG. 1, to enable transmission to a ski 1 of the weight of a skier and the efforts he exerts on the ski without contact between an anti-slip lower surface 2 of the sole 3 of a ski boot 4 and the upper surface 5 of the ski 1, the sole 3 has support surfaces 8 and 9 respectively on front and rear edges 6 and 7. The surfaces 8 and 9 cooperate with corresponding bearing surfaces 10 and 11 on a toe-stop binding member 12 and a heel binding member 13 provided with conventional safety release mechanisms to enable release of the boot 4 from the ski 1 in the event of an exaggerated stress between these two elements. For example, the heel binding is designed to release in the case of a vertical shock, whilst the toe-stop binding is designed to release in the case of a lateral shock.

The edge 6 of sole 3 is urged towards the toe-stop 12 by spring means (not shown) incorporated in the heel binding 13 acting on the rear surface 16 of the heel of the sole according to arrow F. Binding 13 also comprises a pedal 14 upon which the sole comes to bear only during fitting of the boot onto the ski to cause closure of a jaw 15 which engages on the upper surface of the sole 3 to hold the boot in place.

The boot 4 is thus suspended above the ski 1, surfaces 2 and 5 being separated by a distance *d*, the only liason between the boot and ski being provided via the front and rear edges 6 and 7 and the heel surface 16 of the boot.

The coefficient of friction between the support area 8 and the bearing area 10 must be low to ensure good operation of the device. For example, a sheet of metal is attached to edge 6 of the sole to cover the surface 8. Alternatively, the support surfaces 8 and 9 can be treated or arranged in any suitable manner to make them slip easily on the bearing surfaces 10 and 11.

FIG. 2 schematically shows a boot sole 3 one end of which has an arcuate housing 17 opening towards the front end of the boot. Housing 17 forms an anti-friction bearing capable of engaging on a finger 18 (see FIG. 3) carried by a toe-stop member. This sole 3 has a rear edge 7 and heel surface 16 similar to before.

FIG. 3 shows a modification in which the housing or bearing 17 is formed in a piece 19 fixed by means of one or more screws 20 to the front end of a sole 3. The rear part of the sole is the same as before, but edge 7 is supported on a pedal 14 the downward movement of which is limited while the upper surface of edge 7 is held by a jaw 15.

In FIG. 4, an end 6 of a sole 3 has a hollow 21 able to cooperate with a protuberance 22 carried by toe-stop 12. In FIG. 5, the hollow 21 of FIG. 4 is replaced by two laterally disposed hollows 23 provided in edge 6 of sole 3. Binding 12 carries a stirrup piece 24 having two arms 25 which can engage in the hollows 23 to support the boot.

FIG. 6 shows a combination of the embodiment of FIG. 4, in which the sole 3 has a hollow 21 and the binding 12 a protuberance 22, with two wings 26 pivotally mounted about axes 27 on binding 12. The wings 26 are held against the sides of the sole 3 by means of a conventional device allowing release of the boot in the case of an exaggerated lateral stress, and, possibly, at the same time holding the sole 3 onto the ski.

FIG. 7 shows an embodiment in which the toe-stop 12 (or alternatively the heel binding 13) carries a substantially horizontal axle 28 about which a resilient roller 29 is rotatably mounted. The front edge 6 of sole 3 thus engages between this roller and a shoulder 30 of stop 12. Axle 28 terminates with a rounded head 31 which limits any possible friction between the front surface of the sole 3 and the axle 28. Such a roller 29 thus noticeably reduces any resistance of the movement between the front part of sole 3 and the stop 12. As a modification, the shoulder 30 could be replaced by one or more rollers.

FIG. 8 shows a system similar to that of FIG. 7, but in which an axle 32 is fixed to the sole 3 of a boot 4 and carries a roller 33 capable of freely turning thereabout. The toe-stop 12 (or alternatively the heel binding 13) has a transversal groove 34 along which the roller can roll in the case of lateral release of the boot 4 in relation to the ski 1.

FIGS. 9 and 10 show an embodiment in which the sole 3 of a boot 4 carries two axles 32 each supporting a rotatably mounted roller 33. As shown in FIG. 10, the axles 32 converge towards a vertical axis 35 about which the boot can pivot for lateral release from the ski. A toe-stop 12 (or alternatively heel binding 13) for cooperation with such a boot comprises a fixed support surface 36 and a mobile jaw 37 urged by means of a spring (not shown) in the direction of arrow F. Jaw 37 has a laterally concave lower surface 38 thus ensuring centring of the rollers 33 and hence of the boot 4 on ski 1. In the case of an exaggerated transversal stress between the boot and ski, the rollers 33, by tending to escape, move the jaw 37 upwards against the action of the spring to the position shown in dotted-dashed lines until the rollers are freed. Preferably, to even further reduce friction, the rollers are of trunco-conical shape. In this case, the rollers 33 play an active part in release of the binding.

FIG. 11 shows a last embodiment in which a toe-stop 12 (or heel binding 13) carries an axle 39 about which a trunco-conical roller can rotate. The upper part of binding 12 has, facing the roller 40, an inclined shoulder 41 forming a stop. The front edge 6 of the boot sole 4 is shaped to correspond to the space between the shoulder 41 and roller 40. Such a mounting system ensures an automatic centering of the boot 4 in relation to the toe-stop 12 whatever be the state of wear of the edge 6. The more the shoulder 41 is inclined, the more pronounced is the centring effect. Of course, as a modification, shoulder 41 could be replaced by or provided with one or more rollers so that the edge 6 of the sole 3 would always be satisfactorily held in position between two roller bearings.

As can be observed from the figures of the drawings, in all of the described systems, the lower surface of the sole 3 of the boot 4 is supported at a distance *d* away from the upper surface 5 of the ski 1.

I claim:

1. A combination of a ski boot and a ski, said ski boot comprising a rigid sole having a toe end and a heel end, said sole comprising a substantially flat lower surface for contact with the ground when the boot is used for walking and first and second outwardly open support surfaces distinct from and located above said lower surface at said toe and heel ends respectively, said ski comprising a first toe-stop binding member and a second heel-stop binding member each fixed on an upper surface thereof, said first and second binding members including first and second bearing surfaces cooperating with said first and second support surfaces to support the boot with said lower boot surface spaced apart from the upper surface of the ski, said first and second bearing surfaces being, in operation, rigidly fixed on the upper surface of the ski, at least one of said first and second support surfaces comprising a downwardly facing surface of a downwardly and outwardly open recess in the respective end of said sole, at least the cooperating one of said first and second bearing surfaces being formed by an upwardly facing shoulder on the respective one of said first and second binding members, said first and second binding members further including means for releasably holding said boot on said first and second bearing surfaces.

2. A combination of a ski boot and a ski according to claim 1, in which at least one pair of cooperating support and bearing surfaces comprises means for providing a low coefficient of friction between said cooperating surfaces.

3. A combination of a ski boot and a ski according to claim 2, in which at least one of the first and second support surfaces comprises a metallic plate on said downwardly facing surface of said recess.

4. A combination of a ski boot and a ski according to claim 1, in which said first support surface is formed by a housing in said sole, said housing opening in the general direction of the toe end of the sole, said first bearing surface projecting from the first toe binding and being adapted to engage in said housing.

5. A combination of a ski boot and a ski according to claim 1, in which at least one of the surfaces of the cooperating pairs of support and bearing surfaces com-

prises at least one roller rotatably mounted about a substantially horizontal axis.

6. A combination of a ski boot and a ski according to claim 5, in which said at least one roller is trunco-conical.

7. A combination of a ski boot and a ski according to claim 5, in which said boot is releasable from the ski by pivoting about a vertical axis, said at least one roller is rotatably mounted about substantially horizontal axes converging towards said vertical axis.

8. A combination of a ski boot and a ski according to claim 7, in which the surface cooperating with said at least roller is concave in lateral cross-section.

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