United States Patent [19]

Edmund

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[54] SAFETY SKI BINDING

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

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

[58] **Field of Search** .....280/11.35 T

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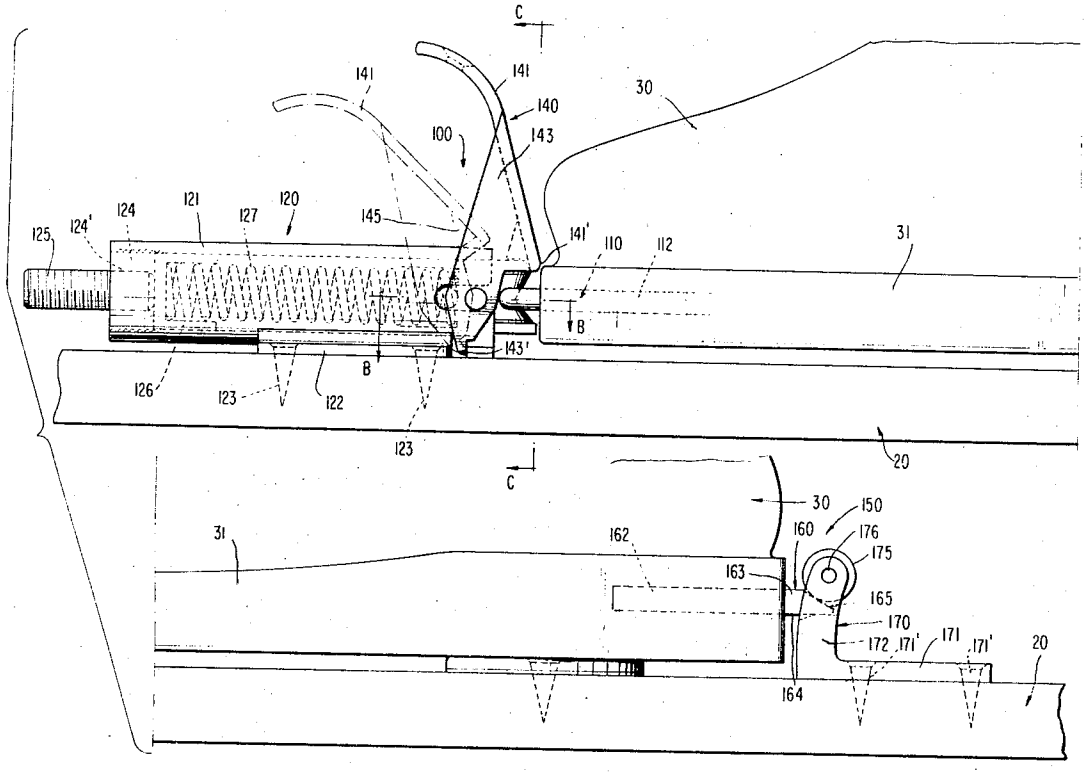
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Primary Examiner—Leo Friaglia
Assistant Examiner—Robert R. Song
Attorney—Craig, Antonelli, Stewart & Hill

[57] **ABSTRACT**

A safety ski binding in which the bottom of the ski boot is held out of contact with the top of the ski to thereby eliminate the influence of frictional forces on the safety release feature.

22 Claims, 23 Drawing Figures



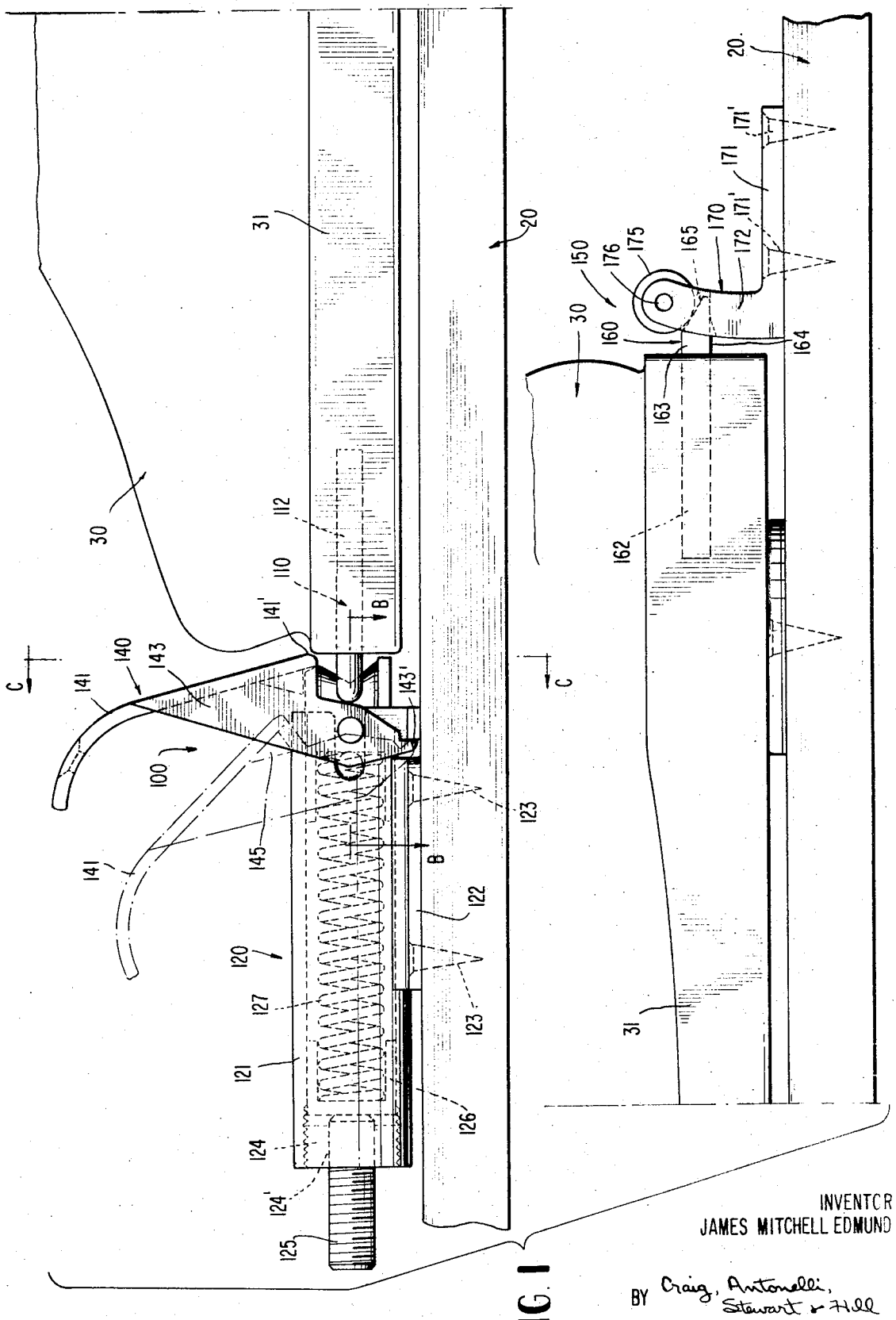


FIG. 1

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ATTORNEYS

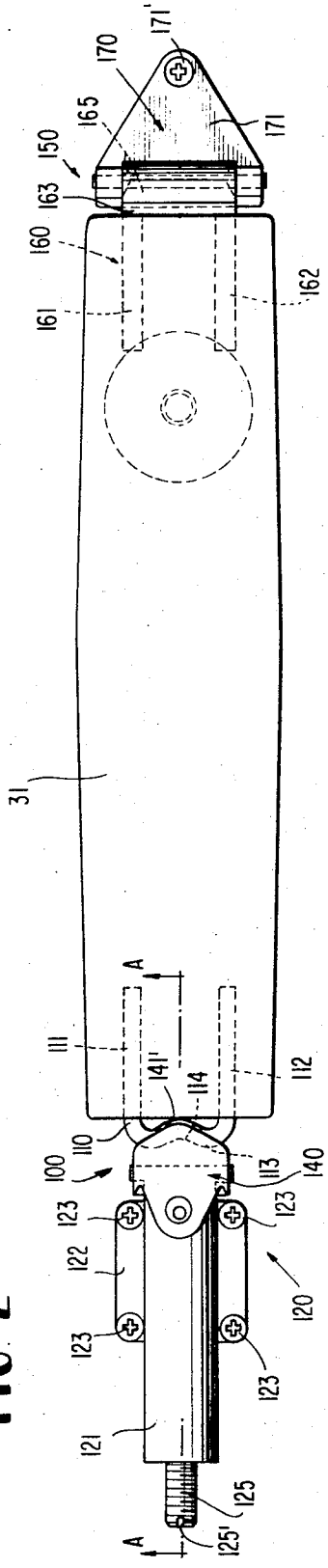


FIG. 2

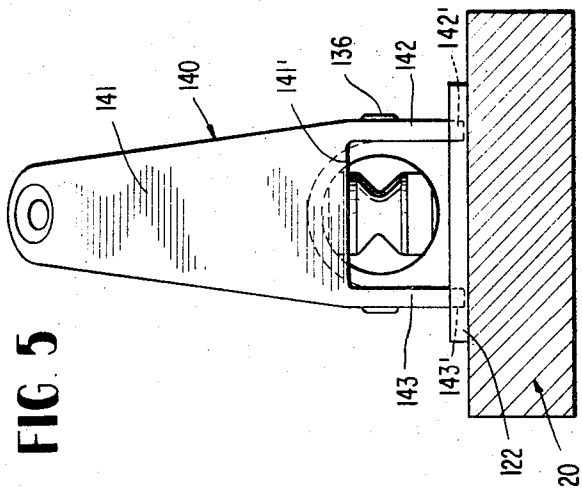


FIG. 5

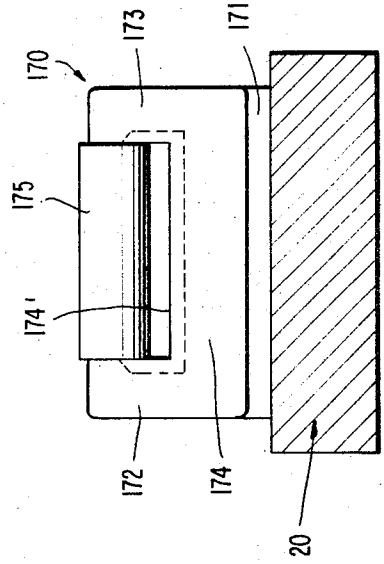


FIG. 4

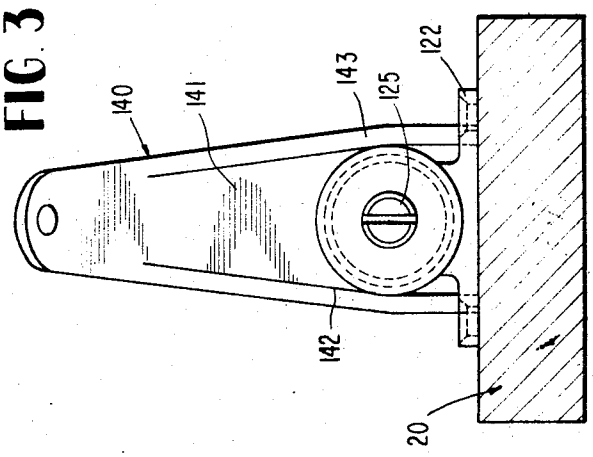


FIG. 3

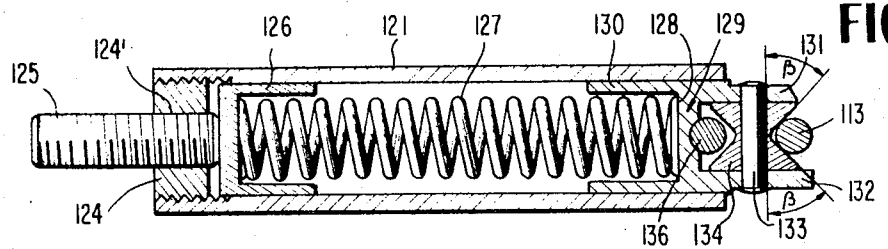


FIG. 6

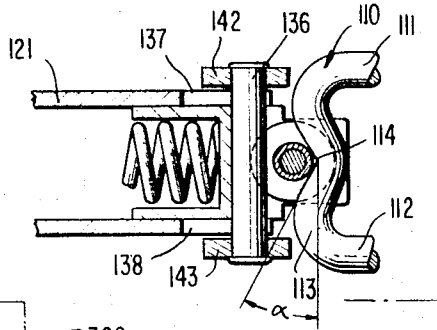


FIG. 7

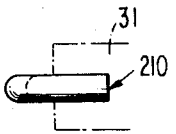


FIG. 8a

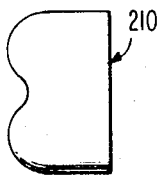


FIG. 8b

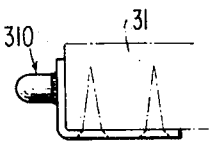


FIG. 9a

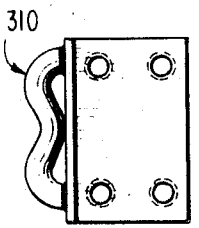


FIG. 9b

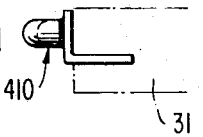


FIG. 10a

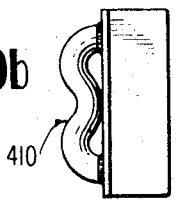


FIG. 10b

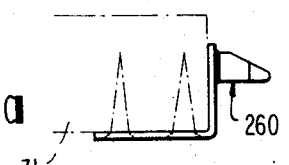


FIG. 11a

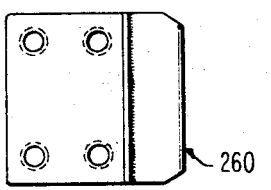


FIG. 11b

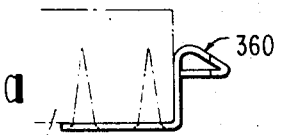


FIG. 12a

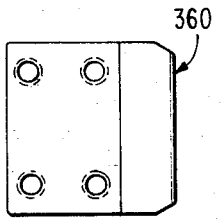


FIG. 12b

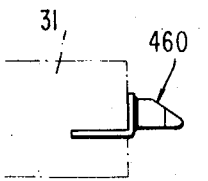


FIG. 13a

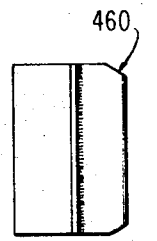


FIG. 13b

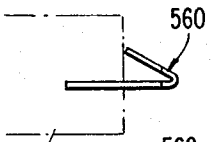


FIG. 14a

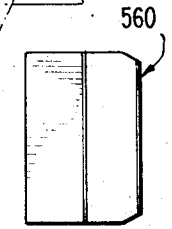


FIG. 14b

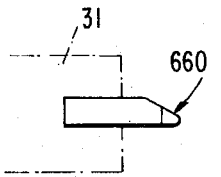


FIG. 15a

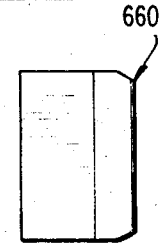


FIG. 15b

SAFETY SKI BINDING

The present invention relates to a safety ski binding and, more particularly, to a safety ski binding, in which the bottom of the ski boot is held out of contact with the top of the ski to thereby eliminate the influence of frictional forces on the safety release feature.

Ski bindings have generally two important functions: namely, (a) they must be able to clamp the ski boot firmly to the ski during the normal maneuver when skiing downhill and (b) when the skier loses control of his skis during a downhill run and one or the other of the skis deviates from its desired course, threatening to twist the skier's leg severely, the safety binding must release the clamping action and permit the boot to disengage from the ski in order to save the leg from injury.

A large number of different designs of ski bindings are presently commercially available which perform the aforementioned functions (a) and (b) fairly well under certain favorable conditions. However, with all of these prior art ski bindings, these two functions (a) and (b) are not met satisfactorily under certain conditions.

The function (a) of firmly clamping the ski boot to the ski is usually not completely fulfilled, due to the necessity of a vertical clearance of about one-sixteenth of an inch in the toe-restraining device and the boot toe, permitting a certain amount of rocking motion of the boot on the ski top, both longitudinally and, more importantly, laterally. This characteristic of the prior art bindings makes the edging action of the skis less positive and precise than desirable. Racers have frequently sacrificed safety for the sake of firm edging characteristics by tying their boots substantially rigidly to the skis, for example, with so-called "long thongs" or by tightening the toe and heel adjustments of their safety bindings to the point where the safety release capability thereof is substantially negated.

The function (b), i.e., safety release, with the low clamping pressures recommended for recreational skiers, functions as designed in most cases, provided the weight of the skier is not concentrated on the toe when a twisting fall occurs. However, if the skier is thrown forward or forward and to one side, for example, when side slipping unexpectedly into a bump, the friction of the forward portion of the boot sole, where it contacts the ski surface, as well as the increased friction in the toe release mechanism due to the weight loading, may increase the release force required in the binding to more than double that normally obtained when the weight of the skier is concentrated on the heel. This factor is believed to be a major cause of broken legs and of sprained ankles and knees suffered by a skier when skiing at relatively higher speeds on bumpy terrain.

Several ski binding designs presently available attempt, with partial success to minimize the friction in the toe area by employing a metal plate attached to the boot toe, extending under the toe portion of the sole and resting on a metal ski plate (U.S. Pat. No. 3,338,587, U.S. Pat. No. 3,410,568 and U.S. Pat. No. 3,504,922). The means consisting of the metal plate attached to the boot toe in these prior art devices in conjunction with a portion of the boot toe plate which engages the toe unit of the binding, provide exclusively metal-to-metal contact, with resulting lower friction than exists where an elastomeric boot sole bears directly on the ski top or on a metal ski plate. However, the boot plate utilized in these prior art devices quickly becomes scratched and roughened from walking on gravelly or gritty surfaces and the resulting higher friction, relative to the ski plate, readily rises to 0.2 or higher, causing the binding release force to again be greatly dependent upon the weight distribution of the skier at the instant of release.

One of the important advantages of the present invention resides in the fact that the frictional resistance to a lateral safety release of the toe unit is reduced to a minimum with the result that the release torque is practically independent of the fore- and aft-weight distribution of the skier at the instant of release. This is achieved according to the present invention by means of a boot toe lug which protrudes forwardly from the end of the boot sole and which engages with a roller that has a vertical axis, which, in turn, is rotatably mounted in a cross head. The cross head slides in a cylindrical bore which is aligned longitudinally with respect to the ski. A compression-type cylindrical spring contained in the bore bears against the cross head, thrusting the roller against the boot toe lug. The spring pressure is adjustable by means of a screw which bears against a spring follower located in the cylindrical bore, forwardly of the spring. The boot toe lug may be conveniently formed by bending a piece of steel rod into the desired shape while the roller may have an hour-glass shape of complementary configuration, designed to fit the depressed portion of the boot toe lug.

The heel of the boot is securely held in place by means of a boot heel lug having tapering surfaces converging toward one another which engage with the complementary surfaces of the ski-mounted heel support, of which one surface is formed by a cylindrical roller or the like with a transverse axis.

The significant improvement with the ski binding of the present invention is realized by the fact that the bottom surface of the ski boot, most importantly, the forward portion of the bottom surface of the boot normally does not come in contact with the top of the ski, the toe lug being the only part by means of which the forward portion of the boot touches a support structure fixed on the ski and similarly, the boot heel lug being the only part by means of which the rearward portion of the boot touches a support structure fixedly mounted on the ski. However, in case of older style ski boots which do not have a completely rigid sole as presently used, a simple turn-table type of ski plate may be employed, located near the heel end of the boot sole, to carry part of the weight of the skier. The turntable, being located at or near the center of rotation when lateral release of the boot toe occurs, will not impede the release.

The toe lug, in accordance with the present invention, is so formed that it acts as a detent cam having a central depression which is complementary to and fits closely the hour-glass-shaped roller of the ski-mounted toe unit and thereby holds the boot toe firmly in place until a lateral twisting force sufficiently great to endanger the skier's leg is imposed, at which point the roller is cammed forwardly by one or the other of the sloping sides of the toe lug, depending upon the direction of the twist, until the lug comes free of the roller and the boot is released from the ski.

In the toe piece arrangement of the present invention, a lever is used which performs two functions. When inserting the ski boot into the binding, the lever engages the boot toe lug, acting as a cam to guide the toe lug into proper position; as the lever is pushed forward under the pressure from the toe lug, it in turn pushes the cross head forward, permitting the toe lug to drop into place, in engagement with the complementary roller. The lever is also especially shaped so as to engage the toe lug central depressed portion and to guide the toe lug into engagement with the complementary roller. Thus, the lever acts as a component of a simple "step-in" device for inserting the boot into the binding. However, the lever is also employed again to release the toe unit when a skier desires to remove his boot from the ski, by simply pressing on the lever manually or with a ski pole tip which displaces the cross head together with the complementary roller forwardly, thereby permitting the skier to lift the boot out of the binding.

These and further objects, features and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, several embodiments in accordance with the present invention, and wherein:

FIG. 1 is a side elevational view of a safety ski binding in accordance with the present invention with a ski boot in the binding on the ski;

FIG. 2 is a top plan view on the ski binding of FIG. 1, on a reduced scale, with the ski omitted for sake of clarity and showing only the sole of a ski boot;

FIG. 3 is a front elevational view on the toe unit of the safety binding in accordance with the present invention;

FIG. 4 is a rear elevational view on the heel unit of the safety ski binding in accordance with the present invention;

FIG. 5 is a partial elevational view taken along line C—C of FIG. 1;

FIG. 6 is a partial cross-sectional view, taken along A—A of FIG. 2;

FIG. 7 is a partial cross-sectional view, taken along line B—B of FIG. 1;

FIGS. 8*a* and 8*b* are, respectively, side elevational and top plan views of one embodiment of a toe lug in accordance with the present invention;

FIGS. 9*a* and 9*b* are, respectively, side and top plan views of a modified embodiment of a toe lug in accordance with the present invention;

FIGS. 10*a* and 10*b* are, respectively, side and top plan views of a still further modified embodiment of a toe lug in accordance with the present invention;

FIGS. 11*a* and 11*b* are, respectively, side and top plan views on a rear lug in accordance with the present invention; and

FIGS. 12*a* and 12*b*, FIGS. 13*a* and 13*b*, FIGS. 14*a* and 14*b* and FIGS. 15*a* and 15*b* are, respectively, side and top plan views of four further modified embodiments of a heel lug in accordance with the present invention.

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, and more particularly to FIG. 1, reference numeral 20 generally designates a ski, shown only partially, onto which is clamped a boot generally designated by reference numeral 30 which includes a boot sole 31. The safety ski binding, as such, consists of a toe unit generally designated by reference numeral 100 and of a heel unit generally designated by reference numeral 150. The toe unit 100 consists of a toe lug generally designated by reference 110, which, in the embodiment of FIGS. 1 through 7 consists of a piece of steel rod bent into the shape shown in FIG. 2, i.e., having two leg portions 111 and 112 connected by a cross piece 113 with a central depression 114. The two legs 111 and 112 may be inserted into longitudinal holes drilled in the toe end of the boot sole 31, or, alternatively, may be molded in place during boot manufacture. These leg portions 111 and 112 may be securely held in place by any suitable bonding agent, preferably by an epoxy resin which provides great adhesive strength, yet is easy to use.

The ski-mounted toe support generally designated by reference numeral 120 consists of a cylindrical housing 121 which is fixedly mounted on the top of the ski 20 by means of the plate portion 122 (FIGS. 1, 2, 3, and 5) utilizing conventional screws 123. The forward end of the housing 121 has an internal thread which receives an externally threaded stop member 124, itself provided with an internally threaded bore 124'. A threaded adjusting member 125, for example, provided with a slot 125' (FIG. 2) at its forward end to facilitate adjustment, is screwed into the internally threaded bore 124' of the stop member 124 and bears against a piston-like spring-retaining member 126 (FIGS. 1 and 6), constituting the forward abutment for the coil spring 127 accommodated within the housing 121. At its rearward end, the coil spring 127 rests against the end wall 128 (FIG. 6) of the cross head generally designated by reference numeral 129, which forms a forwardly extending cup-like spring-receiving portion 130 and includes two vertically spaced rearwardly extending arm portions 131 and 132 (FIG. 6) rotatably supporting thereon by means of a vertical pivot pin 133 a roller member 134 which has a cross section of approximately hour-glass shape (FIG. 6). The cross head 129 is slidably mounted relative to the cylindrical housing 121 and carries a cross pin 136 slidably received in longitudinal slots 137 and 138 (FIG. 7) of the cylindrical housing 121. As can be readily seen, the spring tension of spring 127 can be adjusted by screwing the adjusting member 125 more or less into the stop member 124, thereby determining the release force of the safety binding as will be described more fully hereinafter.

A lever generally designated by reference numeral 140 includes a curved, transversely extending main lever portion 141 and two longitudinal side portions 142 and 143 extending at right angle to the main portion 141; the side portions 142 and 143 are pivotally supported on the cross pin 136 to enable pivotal movement of the lever 140. As can be seen from FIG. 1, the lateral portions 142 and 143 are each provided with a downwardly extending prong-like projection 142' and 143' extending from the lower end thereof below the pivot axis of the cross pin 136 to engage with slots in the base portion of housing 121 when the lever 141 is pressed forward either manually or by means of a ski pole whereby the cross pin 136 forces the cross head structure 129 forwardly against the force of the spring 127 and thereby permits disengagement of the toe lug 110 from the roller 134.

An advantageous angle for sloping the sides of the cross piece pp3 forming the depression **114** is an angle of about 25°, designated in FIG. 7 by angle α which will provide a lateral release force of about one-half as great as the spring thrust.

The hour-glass-shaped roller **134** has its flared surface preferably formed at such an angle β (FIG. 6) of about 60° relative to the roller axis that the toe lug **110** will not disengage vertically until the upward force reaches a value at least about twice that of the spring thrust. This will prevent an undesired vertical release of the toe unit when the skier assumes a "sitting-back" position. The lower lip or arm **132** of the cross head structure **129** preferably extends slightly rearwardly beyond the outer diameter of the hour-glass-shaped roller **134**, thereby acting as a stop when the skier steps into the binding and thus insuring that the toe lug **114** does not snap into a position below the roller **134**.

The lever **140** forms with the lower end portion **141'** of the main surface **141** a guide surface for guiding the toe lug **110** into the proper position relative to the roller **134**, and for that reason is of substantially complementary shape to the depression **114**, as can be seen best from FIG. **2**.

The heel unit of the safety binding in accordance with the present invention generally designated by reference numeral **150** consists of a heel lug generally designated by reference numeral **160** and of a ski-mounted heel support structure generally designated by reference numeral **170**. In the embodiment of FIGS. **1** and **2**, the heel lug **160** again consists of two leg portions **161** and **162** suitably anchored in longitudinal holes drilled for that purpose in the heel of the ski boot by means of an epoxy resin or molded in place during the manufacture of the boot. The two leg portions **161** and **162** are connected by means of a cross piece **163** forming a substantially horizontal bottom surface **164** and a sloping top surface **165**.

The ski-mounted heel structure **170** includes a plate portion **171** by means of which the heel structure **170** is secured to the top of the ski **20**, for example, by means of screws **171'**. The plate portion **171** carries lateral upright roller support members **172** and **172**, which rotatably support thereon the cylindrical roller **175** by means of a pin **176**. The lateral members **172** and **173**, in fact, are joined by a cross member **174** (FIG. 4) having a substantially horizontal surface **174'** so that the cylindrical roller **175**, rotatable about a transverse axis, engages the inclined surface **165** of the heel lug **160** while the flat bottom surface **164** of the heel lug rests on the flat surface **174'** of the ski-mounted heel structure. In the actual construction, the plate **171**, the lateral members **172** and **173** and the cross member **174** may be made in one piece.

Additionally, in the construction shown, the portion of the ski-mounted heel structure which forms the two supports for the end of the pin **176** on which the roller **175** rotates, also engage the rear side portions of the heel lug **160**, thereby holding the heel lug and thus the boot heel firmly against sideways motion.

The forward edges of the flat horizontal surface and of the vertical surfaces of the pin supports **172** and **173** are suitably beveled to facilitate insertion of the boot heel lug **160**.

The angle of the inclined upper surface **165** of the heel lug **160** is so chosen that the resultant downward force of the heel roller **175** against the heel lug **160** is about twice the thrust of the toe spring **127**. As a result thereof, the heel lug **160** is wedged into a firm, shake-free engagement with the heel support structure **170**, resulting in unexcelled edging qualities for the ski-binding-boot combination. Despite the firm hold-down force developed in the heel-lug, the heel roller **175** permits the heel lug **160** to roll upward and forward until the boot becomes disengaged from the ski, when the skier is unexpectedly thrown forward and the tensile force on the skier's Achilles' tendon approaches a dangerous magnitude. One of the desirable simplifying features made practical by the roller-equipped toe piece and heel piece construction according to the present invention is that an appropriate spring-loading of both toe and heel units is achievable with only one single spring which in turn has only one simple adjustment. Yet, the correct ratio of heel hold-down force to toe-restraining transverse force is reliably maintained throughout the entire adjustment range.

Although the embodiment illustrated in FIGS. **1** through **7** includes a longitudinally movable spring-loaded toe-restraining structure while the heel-restraining structure is fixed, it is practical to reverse this arrangement, employing a fixed toe piece and a spring-loaded heel piece, otherwise functionally similar to the arrangement shown and described herein.

The boot toe lug and boot heel lug may be constructed in several ways to suit different methods of manufacture and different methods of attachment to the boot sole. In the embodiment of FIGS. **1** through **7**, the toe lug **110** is shown as a rod bent to the appropriate shape, with the two legs thereof inserted into longitudinal holes drilled into the toe end of the boot sole, with the two legs thereof inserted into longitudinal holes drilled into the toe end of the boot sole, or, alternatively, molded in place during boot manufacture.

FIGS. **8***a* and **8***b* illustrate a toe lug **210** which is formed from one piece of flat metal, or molded or cast in one piece from metal, or from a rigid, suitably reinforced plastic, designed for insertion in a transverse slot in the front portion of the boot sole.

FIGS. **9***a* and **9***b* illustrate a toe lug **310** in which a bent rod portion is welded or brazed to an L-shaped piece of sheet metal suitable for fastening to the underside of the toe end of the boot sole by means of screws.

FIGS. **10***a* and **10***b* illustrate a toe lug in which a bent rod portion is welded or brazed to an L-shaped piece of sheet metal suitable for insertion into a transverse slot sawed into the toe end of the sole or alternatively molded in place during boot manufacture.

Whereas FIGS. **1** through **7** illustrate a heel lug **160** formed of solid metal with integral leg portions **161** and **162** which are inserted into longitudinal holes drilled into the heel end of the boot sole, or alternatively, molded in place during boot manufacture. FIGS. **11***a* and **11***b* illustrate a heel lug which is formed from a piece of solid metal with an inclined upper surface and a flat bottom surface, welded or brazed to an L-section piece of sheet metal, provided with holes for attaching to the bottom side of the heel end of the boot sole by means of screws.

FIGS. **12***a* and **12***b* illustrate a heel lug which is formed by bending a single piece of sheet metal so as to provide a suitably proportioned heel piece engaging

portion, which also includes an L-section forward portion provided with holes for attachment to the underside of the heel end of the boot sole by means of screws.

FIGS. 13*a* and 13*b* illustrate a heel lug formed by welding or brazing a piece of solid metal, provided with an inclined upper surface and a flat lower surface, to an L-section piece or sheet metal, designed for insertion into a transverse slot sawed into the heel end of the boot sole, or, alternatively, molded in place during boot manufacture.

FIGS. 14*a* and 14*b* illustrate a heel lug formed of a single piece of sheet metal, bent so as to provide a suitably proportioned heel piece engaging with an inclined upper rearward surface and a flat rearward lower surface and with a flat forward portion, designed for insertion into a transverse slot sawed into the heel end of the boot sole, or, alternatively, molded in place during boot manufacture.

FIGS. 15*a* and 15*b* illustrate a heel lug formed of a single solid piece of steel or rigid, suitably reinforced plastic provided with a continuous flat bottom surface and an inclined end surface, with the main portion thereof adapted to be inserted into a transverse slot sawed into the heel end of the boot sole, or, alternatively, molded in place during boot manufacture.

The installation of the toe lug and heel lug of any design as illustrated and described herein can be readily done in the usual retail shop for skis by employing a simple drilling jig or sawing or routing jig, as the case may be, to make the necessary holes or saw or routing cuts in the boot sole with proper accuracy.

In case where the toe and heel lugs are assembled to the boot by insertion into drilled holes or sawed or routed slots, a suitable adhesive such as an epoxy-type may be employed in order to obtain a more rigid and permanent installation.

In summary, the following advantages are obtainable with a ski binding according to the present invention:

Friction is reduced to a degree never before achieved, by an arrangement whereby the toe end of the boot touches the ski-mounted unit only in rolling contact.

The heel unit, in conjunction with the toe unit, provides a completely rigid and shake-free attachment to the ski until a twisting or heel-lifting force becomes sufficiently great to initiate the safety release.

The toe and heel lugs secured to the boot sole are clear of the ground and free from the disadvantage of metal boot sole plates which not only mar the floors but are subject to scratching and consequent high friction when the user walks on a gritty surface. Furthermore, since the heel and toe lugs of the present invention engage rollers, rather than sliding on fixed surfaces, the binding friction will be only slightly affected by any scratching or other surface roughening of the lug surface which may occur.

The binding is very easy to use, permitting simple and easy step-in insertion of the boot and has a simple, direct-acting adjustment. The release lever also functions very easily when removing the boot from the ski.

Another unique advantage of the binding in accordance with the present invention resides in the fact that the adhesion of snow to the boot sole does not interfere with the insertion of the boot into the binding since the boot sole is one-eighth inch or thereabout clear of the ski top when in use.

The installation, as well as the adjustment of the safety binding in accordance with the present invention, is simple and straight forward, thereby minimizing the requirement for experienced personnel.

While I have shown and described several embodiments in accordance with the present invention, it is understood that the same is not limited thereto, but is susceptible of numerous changes and modifications as known to those skilled in the art. For example, though the construction shown herein employs a toe lug having, in effect, a notched protruding portion, designed to engage a single-hour-glass-shaped roller, other modifications of the basic design could obtain the same effect. For example, the toe lug could be prong-shaped to fit between two hour-glass-shaped rollers, having parallel vertical axes. The two rollers could also be carried in a cross head, suitably guided and restrained so as to permit a low friction reciprocating motion of the cross head, longitudinal with respect to the ski, and spring-loaded so that the rollers would press against the toe lug with appropriate force. Similarly, in lieu of a cylindrical housing, any other suitably shaped housing could be used.

The essential feature of the present invention resides in that the toe lug is supported in a roller or rollers so that the forward portion of the boot sole does not touch the ski and so that frictional resistance to lateral disengagement of the boot toe is mainly rolling friction rather than sliding friction. If so desired, the cross head structure carrying the toe piece roller or rollers may also be guided by fixed axis rollers in its reciprocating motion, thereby eliminating practically all sliding friction. However, this is normally not necessary since smooth and well-lubricated guideways, suitably protected from the weather can insure a sufficiently low frictional resistance to longitudinal cross-head movement in order that the overall disengagement resistance, for practical purposes, is independent of the weight distribution of the skier at the moment of release.

Consequently, it is obvious that the present invention is susceptible of numerous changes and modifications as known to those skilled in the art and I, therefore, do not wish to be limited to the details shown and described herein, but intend to cover all of those changes and modifications as are encompassed by the scope of the appended claims.

What I claim is:

1. A safety ski binding which includes a toe structure and a heel structure, characterized by means releasably holding at least the entire forward portion of the underside of the sole of the ski boot spaced from the surface of the ski including toe and heel lug means projecting forwardly and rearwardly from the boot sole, and fixedly mounted toe and heel support means on the ski each including anti-friction roller means for engagement with the respective lug means to provide a suspension of the ski boot from said surface and an anti-friction roller action at both the toe and heel support means about a respective pivot axis so that also a downward force on the toe support means is resisted by an anti-friction roller action, one of said support means including spring means for spring-loading the binding to normally clamp the boot to the ski while enabling release in case of a predetermined force.

2. A safety ski binding according to claim 1, characterized in that only one spring is used in the safety binding.

3. A safety ski binding according to claim 1, wherein said toe and heel support means including the anti-friction roller means thereof hold the entire underside of the sole of the ski boot spaced from the surface of the ski to thereby form an exclusively anti-friction suspension of the ski boot and to thereby minimize variations in the force necessary to operate the ski binding release as a result of variations in the weight distribution while simultaneously avoiding variations in the frictional forces that might otherwise affect the release.

4. A safety ski binding according to claim 3, characterized in that the toe lug means engages with a roller means rotatably supported in the toe support means about a substantially vertical axis and restraining the toe lug means against lateral movement of the boot in the absence of a force overcoming the spring-loading by said spring means.

5. A safety ski binding according to claim 4, characterized in that the heel support means includes a roller means rotatable about a substantially horizontal axis which engages with an inclined surface of the heel lug means.

6. A safety ski binding according to claim 5, characterized in that the other surface of the heel lug means is substantially horizontal and engages with a substantially horizontal surface in said heel support means.

7. A safety ski binding according to claim 6, characterized by lever means pivotally mounted in the toe support means for guiding the toe lug means into proper engagement with the toe roller means and for enabling disengagement of the toe roller means from said toe lug means by depressing said lever means.

8. A safety ski binding according to claim 7, characterized in that said toe support means includes a housing containing therewithin a spring, the forward end of said spring resting against an abutment and the rear end of said spring resting against a cross-head structure slidably mounted relative to the housing, said cross-head structure rotatably supporting the toe roller means.

9. A safety binding according to claim 3, wherein said spring means spring loads the toe support means to enable a displacement thereof in the forward direction of the ski against the force of the spring means.

10. A safety ski binding according to claim 9, characterized by means in the toe support means operable to guide the toe support means into engagement with the toe lug means as well as to actuate the spring means for purposes of disengagement of the toe support means from said toe lug means.

11. A safety ski binding according to claim 1, characterized in that the heel support means includes a roller means rotatable about a substantially horizontal axis which engages with an inclined surface of the heel lug means.

12. A safety ski binding according to claim 1, characterized in that the other surface of the heel lug means is substantially horizontal and engages with a substantially horizontal surface in said heel support means.

13. A safety binding according to claim 11, characterized in that the roller means is substantially cylindrical.

14. A safety ski binding according to claim 1, characterized by lever means pivotally mounted in the toe support means for guiding the toe lug means into proper engagement and for enabling disengagement of the toe support means from said toe lug means by depressing said lever means.

15. A safety ski binding according to claim 1, characterized in that said lug and support means maintain a predetermined free clearance between the underside of the ski boot sole and the top of the ski over the entire area of the ski boot sole.

16. A safety ski binding according to claim 15, characterized in that only one spring is used in the safety binding.

17. A safety binding according to claim 1, characterized in that substantially exclusively relative rolling movement between respective toe lug and support means enables release of the binding.

18. A safety ski binding according to claim 1, wherein said spring means spring loads the toe support means to enable a displacement thereof in the forward direction of the ski against the force of the spring means.

19. A safety ski binding according to claim 1, characterized in that the ski boot is supported exclusively by said toe and heel support means with respect to the ski.

20. A safety ski binding which includes a toe structure and a heel structure, characterized by means releasably holding at least the entire forward portion of the underside of the sole of the ski boot spaced from the surface of the ski including toe and heel lug means projecting forwardly and rearwardly from the boot sole, and fixedly mounted toe and heel support means on the ski each including anti-friction roller means for engagement with the respective lug means, one of said support means including spring means for spring-loading the binding to normally clamp the boot to the ski while enabling release in case of predetermined force, said toe support means including a housing containing therewithin a spring, the forward end of said spring resting against an abutment and the rear end of said spring resting against a cross-head structure slidably mounted relative to the housing, said cross-head structure rotatably supporting a toe roller means.

21. A safety ski binding according to claim 20, characterized by lever means pivotally mounted in the toe support means for guiding the toe lug means into proper engagement with the toe roller means and for enabling disengagement of the roller means from said toe lug means by depressing said lever means.

22. A safety ski binding which includes a toe structure and a heel structure, characterized by means of releasably holding at least the entire forward portion of the underside of the sole of the ski boot spaced from the surface of the ski including toe and heel lug means projecting forwardly and rearwardly from the boot sole, and fixedly mounted toe and heel support means on the ski each including anti-friction roller means for engagement with the respective lug means, one of said support means including spring means for spring-loading the binding to normally clamp the boot to the ski while enabling release in case of predetermined force, said toe and heel support means including the anti-friction roller means thereof holding the entire underside of the sole of the ski boot spaced from the surface to

thereby minimize variations in the force necessary to operate the ski binding release as a result of variations in the weight distribution while simultaneously avoiding variations in the frictional forces that might otherwise affect the release, the toe lug means engaging with a roller means rotatably supported in the toe support means about a substantially vertical axis and restraining the toe lug means against lateral movement of the boot in the absence of a force overcoming the spring-loading by said spring means, said roller means having a substantially hour-glass shape while the toe lug means includes a transversely extending portion with a depression substantially complementary to the hour-glass shape.

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