United States Patent [19]

Von Besser

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[45] **Apr. 8, 1975**

[54] **SKI BINDING APPARATUS**

[76] Inventor: **Kurt Von Besser,** 2734 W. Giddings, Chicago, Ill. 60625

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[21] Appl. No.: **338,595**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 263,295, June 15, 1972.

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

[51] **Int. Cl.** **A63c 9/08**

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

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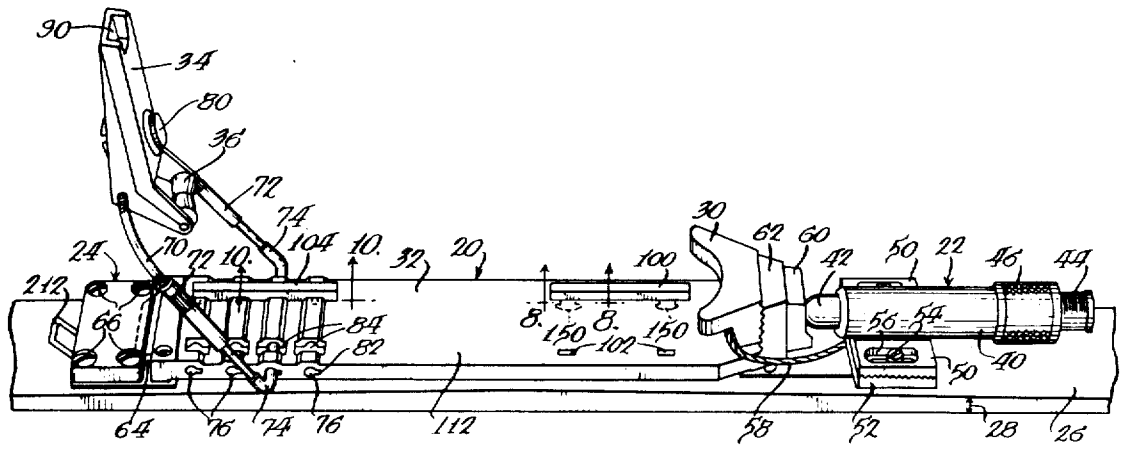
Primary Examiner—David Schonberg
Assistant Examiner—Milton L. Smith
Attorney, Agent, or Firm—Wegner, Stellman, McCord, Wiles & Wood

[57] **ABSTRACT**

A sole plate has a beveled tongue urged by a spring biased toe unit into one of plural angled recesses in a rear retainer plate. To change the ratio of upward to lateral release pressure, the rear retainer plate is rotated in order to position a different angled recess into engagement with the beveled tongue. To provide cant or forward lean adjustment, skew strips having snap-fit connectors are inserted into apertures in the sole plate. The sole plate includes an adjustable height toe bracket which is skewed by use of an adaptor member or by use of a modified toe bracket with an angulated toe engaging surface, and a skewable heel lever for releasably locking a ski boot to the sole plate.

34 Claims, 18 Drawing Figures



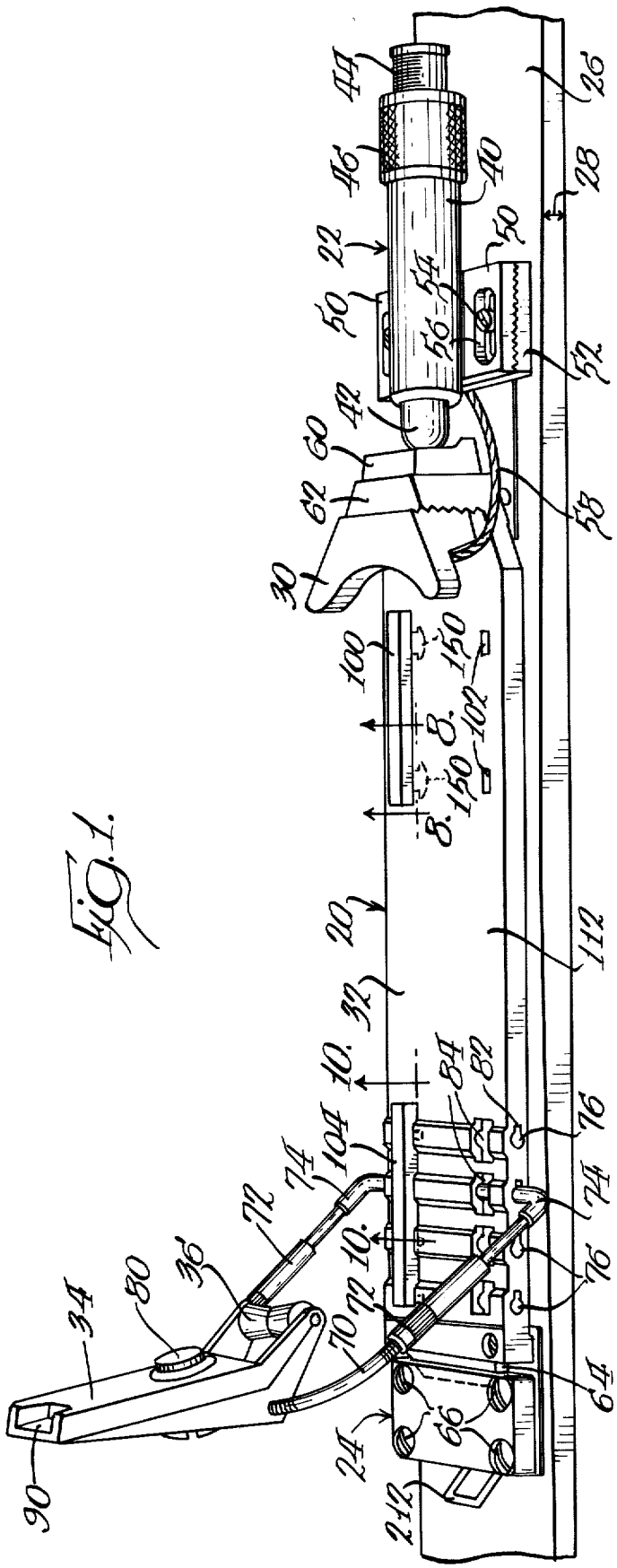
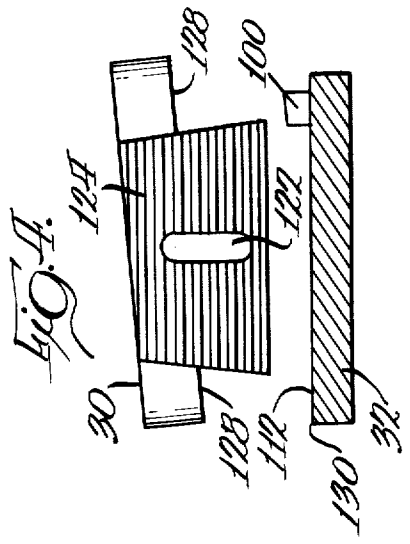


Fig. 1.



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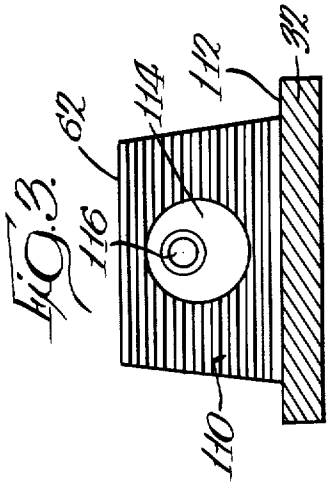

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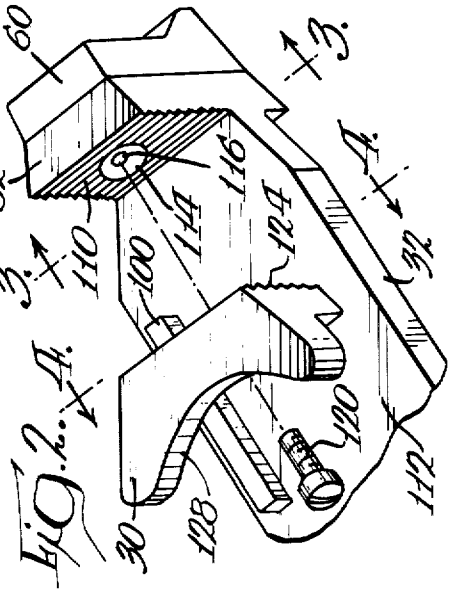

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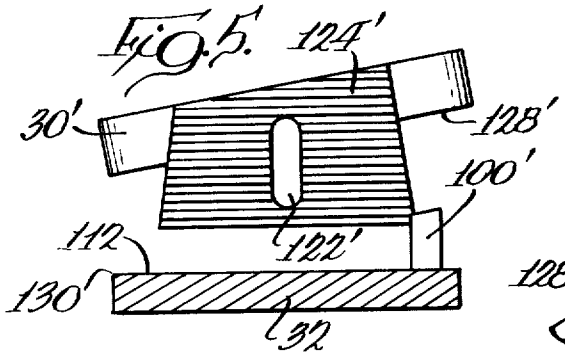

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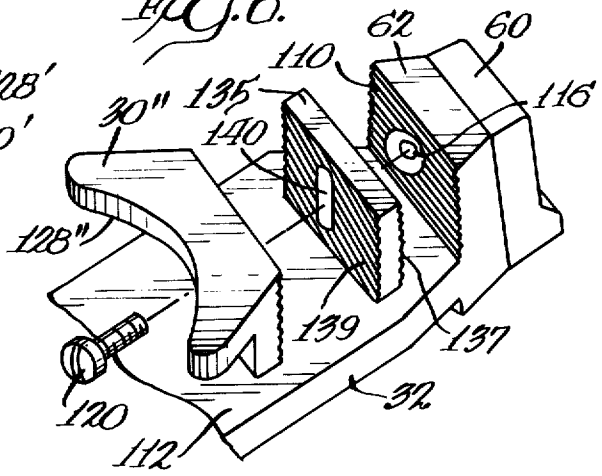

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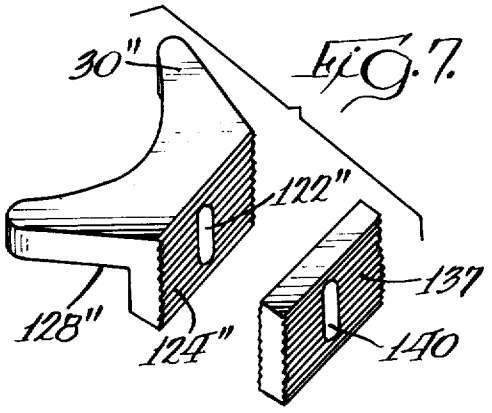

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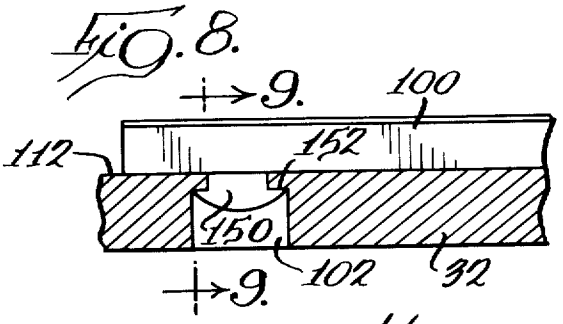

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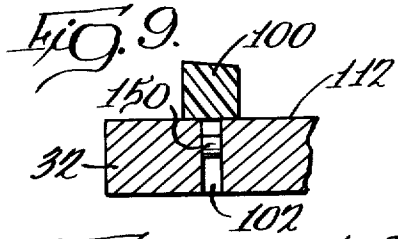

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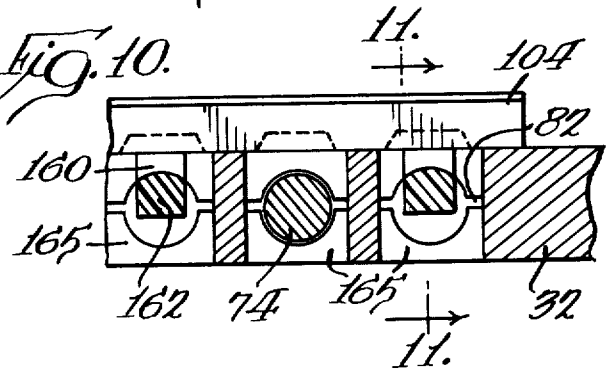

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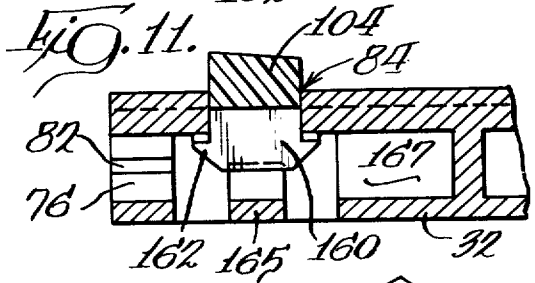

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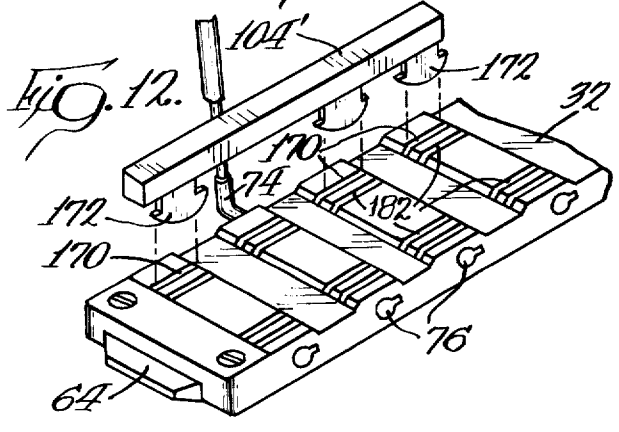

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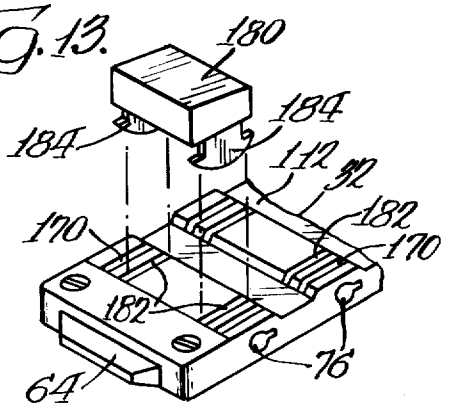

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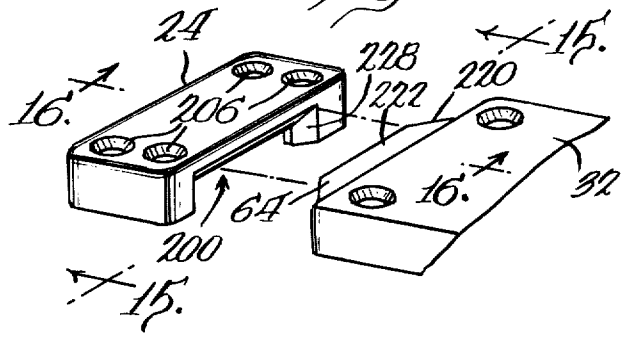

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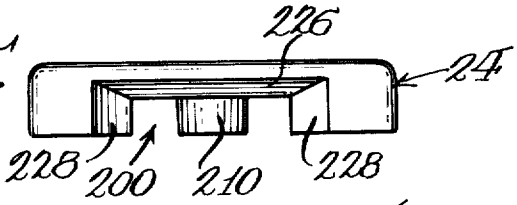

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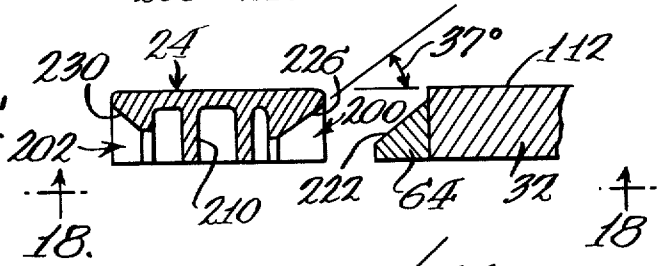

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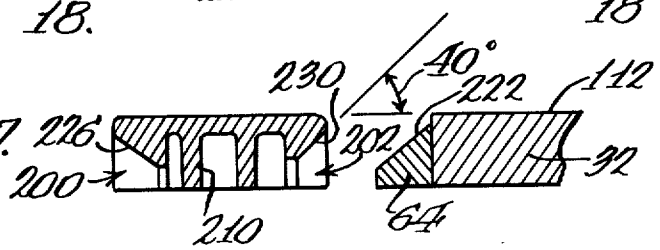

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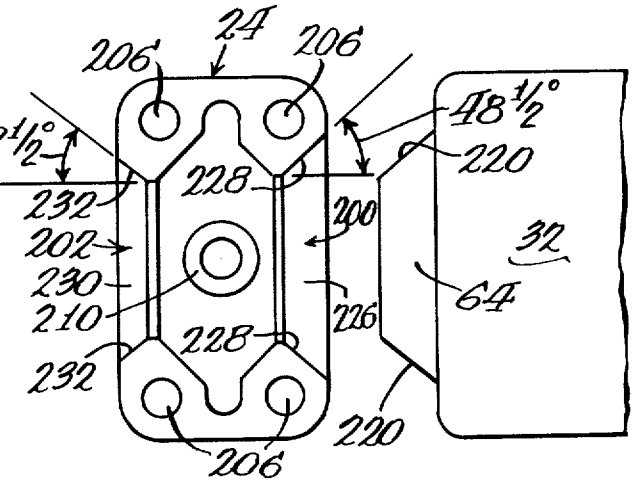

SKI BINDING APPARATUS

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my co-pending application Ser. No. 2,63,295, filed June 15, 1972, entitled "Ski Binding Apparatus and Method of Mounting."

BACKGROUND OF THE INVENTION

This invention relates to ski bindings having improved adjustable means for adapting the binding to a particular skier.

To provide cant adjustment for a skier, it has been conventional to mount wedge shaped cant strips under the toe and heel units. A less satisfactory method is to insert a wedge shaped cant strip in the ski boot, between the bottom sole of the boot and the skier's foot. Both of these methods have disadvantages. Often, a skier will not appreciate the need for a cant adjustment until after he has purchased and mounted a ski binding to his ski. The addition of a cant strip may require remounting of the toe and heel units, which operation whould be performed by experienced personnel in a ski shop or in a speciality ski binding mounting shop. If the cant strip is not properly adapted to the particular ski binding, the release function of the ski binding may be impaired. The use of a cant strip within a ski boot defeats the foot fitting design which is essential to proper skiing.

Forward lean composition creates the same type of problems as have been present in cant compensation. A forward slanting wedge may be used to raise the heel portion of a ski binding. However, this may increase the forward pressure on the toe unit, or otherwise may interfer with the release characteristics of the toe unit. If the forward slanting wedge is placed within a ski boot, the same problem exists as is present with a cant wedge in a ski boot.

After skiing with a cant or a forward lean adjustment, the skier may wish to remove the adjustment due to difficulty in adapting to the device. Wedges which are mounted under the toe and heel units cannot be readily removed except in a ski shop, requiring another remounting of the ski binding.

Skier of different abilities abilities may require different ratios of upward to lateral release pressure in addition to the usual overall release pressure adjustment. For example, an expert skier may use a sitting back skiing technique which increases pressure in the upward direction, while not affecting a pressure change in the lateral direction. To remain in prior bindings, such a skier would increase the overall release pressure adjustment, thereby undesirably increasing the release pressure needed for a lateral release. It has been very difficult to change the ratio of upward to lateral release without designing a different model ski binding. The problem is especially critical in a sole plate binding in which the ratio is fixed by the shape of the socket which receives a spring biased release pin. Also, it would be desirable to provide a release pressure adjustment which does not depend on spring pressure or other resilient members.

SUMMARY OF THE INVENTION

In accordance with the present invention, the problems noted above with respect to prior ski bindings have been overcome. The applicant's ski binding can

be readily modified even after mounting to provide cant or forward lean compensation. If the skier then later desires to remove the angulation device, this can be accomplished with a minimum of equipment and without requiring any remounting of the binding. The cant and forward lean adjustments do not change the release settings, or otherwise affect the release functions of the ski binding. this allows a skier to add the angulation adjustment himself, without fear of changing the release setting or interferring with the release function of the ski binding.

A kit of parts can be provided to adapt the ski binding to several different angles of cant or forward lean. The only adjustment tool which is required is a screwdriver or its equivalent, and the adjustment can be readily accomplished while the skier is on a ski slope. Furthermore, the cant or forward lean adjustment can be removed quickly, without changing the release setting nor requiring any adjustment to the primary mounting of the ski binding to the skis.

To change the ratio of upward to lateral release pressure, it is merely necessary to rotate a heel retainer plate to a different position. A plurality of spaced recesses are located in the heel retainer plate, and each incorporates a different angular relationship with respect to a beveled tongue on the sole plate. If necessary, the change in release pressure can be accomplished on a ski slope.

One object of this invention is the provision of an improved ski binding having a slant producing device which can be readily attached to provide cant or forward lean compensation. The slant adjustment for the ski binding requires no remounting of the ski binding, and can be simply removed by a skier, even while on a ski slope, if desired.

Another object of this invention is the provision of an improved ski binding having means for changing the ratio of upward to lateral release pressure. One further feature is a ski binding which allows a change in release pressure, without requiring a change in spring bias pressure, by changing the angles of mating release surfaces.

Other objects and features of the invention will be apparent from the following description, and from the drawings. While illustrative embodiments of the invention are shown in the drawings and will be described in detail herein, the invention is susceptible of embodiment in many different forms and should be understood that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a ski binding using a sole plate, and which incorporates the present invention;

FIG. **2** is an exploded view of the toe portion of the ski binding of FIG. **1**;

FIG. **3** is a front plan view of the upright toe ear, taken along lines **3—3** of FIG. **2**;

FIG. **4** is a rear plan view of the toe bracket and the sole plate with a cant strip, taken along lines **4—4** of FIG. **2**;

FIG. **5** is a rear plan view, similar to FIG. **4**, of a different toe bracket and the sole plate with a different cant strip, for providing a different angular cant;

FIG. 6 is an exploded view of the toe portion of a modified ski binding which incorporates an adaptor member;

FIG. 7 is an exploded view, looking to the rear, of the adaptor member and toe bracket shown in FIG. 6;

FIG. 8 is a side sectional view of the front cant strip secured to the sole plate, taken along lines 8—8 of FIG. 1;

FIG. 9 is a front sectional view of the front cant strip secured to the sole plate, taken along lines 9—9 of FIG. 8;

FIG. 10 is a side sectional view of the rear cant strip secured to the sole plate, taken along lines 10—10 of FIG. 1;

FIG. 11 is a front section view of the rear cant strip secured to the sole plate, taken along lines 11—11 of FIG. 10;

FIG. 12 is an exploded view of an alternate embodiment for securing a different rear cant strip to the sole plate;

FIG. 13 is an exploded view of an alternate embodiment for mounting a forward lean strip to the rear of the sole plate shown in FIG. 12;

FIG. 14 is an exploded view of the heel portion of the ski binding of FIG. 1;

FIG. 15 is a rear plan view of the heel retainer plate, taken along lines 15—15 of FIG. 14;

FIG. 16 is a side plan view of the heel portion of the ski binding, taken along line 16—16 of FIG. 14;

FIG. 17 is a side plan view of the heel portion of the ski binding, similar to FIG. 16, but with the heel retainer plate being rotated by 180°; and

FIG. 18 is a bottom plan view of the heel portion of the ski binding, taken along lines 18—18 of FIG. 16.

GENERAL DESCRIPTION OF THE SKI BINDING

In FIG. 1, a ski binding is illustrated which includes a sole plate unit 20 which is releasably secured to a toe release unit 22 and a heel retainer unit 24, each of which are mounted to a ski 26 having a minimum ski height 28 adjacent the ski binding. Sole plate unit 20 includes a toe ear bracket 30 which is adjustable in height and is set for the thickness of the extending toe portion of a ski boot sole. The ski boot sole is releasably secured to a sole plate 32 by secondary release means, as a heel lever 34 having a roller 36 which bears against the extending heel portion of the ski boot sole to clamp it firmly against the sole plate 32.

Toe release unit 22 forms the primary biased release means and includes a tubular housing 40 containing a helical pressure bias spring which bears against an axially movable release pin 42. The pressure of the internal spring against the release pin 42 is varied by movement of an adjustment screw 44 which controls the compressed length or bias of the internal spring. A lock sleeve 46 surrounds the screw 44 and is rotatable into engagement with the tubular housing 40 to prevent inadvertent rotation of the adjustment screw 44.

The tubular housing 40 has extending flanges 50 which detachably mount the upper spring biased release pin assembly to a lower plate 52 which is fixedly secured to the ski 26. The lower plate 52 has a ribbed, toothed or serrated upper surface which meshes with a corresponding surface of flange 50. Each flange 50 is retained in engagement with the lower plate 52 by an extending lock screw 54 which passes through an elongated slot 56 in the flange 50 and into engagement with an internally threaded bore within the lower plate 52. The lock screws 54 may be rotated to release the upper spring biased assembly for movement parallel with the ski to different detented positions. A front safety cable 58 may be used to retain the sole plate unit 20 to the toe release unit 22, and hence to the ski 26, during a release.

Release pin 42 mates with a release socket 60 mounted within an integral upstanding ear 62 of the sole plate 32. The release socket 60 has a concave arcuate contour with forwardly extending side portions to control the lateral pressure, and a forwardly extending bottom portion to control the upward pressure necessary to retract the axially restrained pin 42 sufficiently into housing 40 to clear the socket and hence release the sole plate unit 20 from retention on the ski 26. Typically, the bottom portion extends further forward than the side portions (which are of equal extent on both sides) so that the ratio of upward to lateral release pressure is greater than one. Of course, it is possible to change this ratio by using a different socket 60 having different forward extents for the side bottom portions.

The spring biased pressure of the release pin 42 against the socket 60 urges the sole plate unit 20 rearwardly and thus urges a beveled rear tongue 64 into engagement with one inclined recess within heel retainer plate 24. The heel plate 24 is mounted to ski 26 by a plurality of screws 66 located in counter-sunk bores.

Heel lever 34 rotatably grips a cable 70 which terminates in a pair of cylindrical fine adjustment sleeves 72 each having an internal thread which engages a screw head attached to an arm 74 movable between a plurality of gross adjustment cylindrical holes 76 formed in the sole plate 32. To longitudinally position the heel lever 34 for a particular ski boot, the ski boot is placed on the sole plate 32 with the toe of the boot under the toe ear bracket 30. The arms 74 are moved between the holes 76 to provide a gross adjustment which places roller 36 immediately adjacent or touching the heel extension of the ski boot sole. Further longitudinal adjustment is done by rotating the sleeves 72, so that when heel lever 34 is raised, it locks or clamps the rear of the boot securely to the sole plate 32. An adjusting screw 80 controls the distance that lever 34 is offset from the rear of the ski boot. The arms 74 are retained within holes 76 by a transverse pin which prevents the arms from being withdrawn from the sole plate when the heel lever 34 is located in the locking position. The arms 74 may be rotated so as to position the transverse pin adjacent a key slot 82 made in the sole plate 32 to allow access to channel slots 84 formed on opposite sides of the sole plate 32.

During skiing, an excessive force on the ski binding will cause the sole plate unit 20 to be released at the socket 60 and/or at the heel retainer unit 24. The sole plate unit 20, however, remains attached to the ski boot. To reinsert the sole plate unit after a release, the beveled tongue 64 is placed in the recess in the rear heel retainer 24, and a centrally located indent on the bottom of socket 60 is placed vertically over the release pin 42. Thereafter, the skier exerts downward and forward pressure to cause the release pin 42 to retract into the housing 40 and then snap outwardly into the concave socket. To step out of the entire binding after skiing, the skier places the tip of his ski pole in a recess 90 and exerts downward and outward pressure against the heel lever 34. The skier can now step out of the ski

binding, leaving the sole plate unit **20** retained between the toe and heel units.

CANT/FORWARD LEAN ADJUSTMENT

To provide cant compensation, a front cant strip **100** is snap-fit into one of two series of aperture lock means as slots **102** in sole plate **32,** each series being adjacent a different side of the sole plate. A rear cant strip **104** is snap-fit into one of the two channels **84** which are longitudinally aligned with the front slots **102.** The heights of the front and rear cant strips **100** and **104** are selected to cause the ski boot to have a slant or skew with respect to planar top surface **112** of the sole plate **32,** which surface **112** is coplanar with the top of the ski **26.** The toe bracket **30** has a sole engaging surface which is coplanar with the skew plane produced by the cant strips **100** and **104.**

In FIGS. **2–4,** the details of the toe bracket **30** and associated front cant strip **100** are illustrated. Toe bracket **30** is vertically adjustable in height to compensate for the varying thicknesses of different ski boot soles, and is adjustable along a skew for maintaining the desired skew or cant for the ski boot sole. Integral ear **62** carries on its rear facing surface a plurality of spaced ribs **110** each of which is parallel to upper surface **112.** Socket **60** has a reduced diameter neck portion **114** which is snugly fit within a circular bore in the integral ear **62.** An internally threaded metal insert **116** is located in neck **114** and receives therein an adjustment screw **120** which extends through an elongated vertical slot **122** in the ear bracket **30.**

The forward face of toe bracket **30** carries spaced ribs **124** which mate with ribs **110** and similarly are parallel to the upper surface **112.** As seen best in FIG. **4,** the toe bracket **30** has a lower sole engaging surface **128** which is at a skew or angle with respect to the horizontal ribs **124.** The angle of the lower sole engaging surface **128,** illustratively represented in FIG. **4** as 5° tilt with respect to horizontal, is selected to correspond to the cant angle produced by cant strip **100.** The effective height of ear bracket **30** with respect to the cant plane may be changed to compensate for different thickness ski boot soles by loosening screw **120** and moving the toe bracket. Then, the screw **120** is tightened in order to cause the ribbed surfaces **110** and **124** to fixedly mate.

The cant angle is controlled by the height of the cant strip, and the lateral or transverse position of the cant strip with respect to the opposite longitudinal edge **130** of the sole plate. A boot sole which rests on cant strip **100** and edge **130** has an illustratively represented skew of 5° with respect to the planar top surface **112.**

In FIG. **5,** a 10° cant or skew is provided by a modified cant strip **100'** which has an increased height with respect to upper surface **112.** A modified toe bracket **30'** is also provided in which the lower sole engaging surface **128'** is at a similar 10° angle with respect to upper surface **112.** While the upper surface of toe brackt **30'** has been illustrated as parallel to the lower sole engaging surface **128,** it will be apparent that such construction is not necessary, and the upper surface may be parallel with upper surface **112,** or may assume any other shape as desired. To accomodate different skiers who require varying degrees of cant compensation, several combinations of toe brackets **30** and cant strips **100** may be provided, each combination providing the same angular tilt.

In FIGS. **6** and **7,** modified embodiment is illustrated which allows a normal, mounted ski binding to be later converted by an adaptor kit which adds cant compensation. An unmodified toe bracket **30''**, generally similar to the toe bracket **30** previously described, includes a lower sole engaging surface **128''** which is parallel with ribs **124''** and with the upper surface **112** of sole plate **32.** An elongated slot **122''** in toe bracket **30''** allows a skier to vertically adjust the height of the toe bracket in order to compensate for the varying thickness of different ski boot soles.

When the skier desires to add cant compensation to the ski binding, a kit may be purchased which provides a pair of front and rear cant strips, and an adaptor member **135** which is inserted between toe bracket **30''** and integral ear **62.** Member **135** may take the form of a metal or plastic plate with a forward facing surface which carries vertically spaced ribs **137** parallel with upper surface **112.** A rear facing surface carries ribs **139** which are at a skew with respect to planar surface **112,** with the angle of skew corresponding to the cant angle produced by the cant strips provided in the kit. Adaptor plate **135** also incorporates an elongated vertical slot **140** to allow height adjustment for the toe bracket **30''**. When adaptor plate **135** is inserted between the toe bracket **30''** and the integral ear **62,** it cants the lower sole engaging surface **128''** so as to be parallel with the angled ribs or grooves **139.** Furthermore, the sole thickness adjustment for toe bracket **30''** can be changed by loosening screw **120** and moving both the adaptor plate **135** and the toe bracket **30''** with respect to ear **62.**

By rotating or flipping adaptor plate **135** by 180°, so that the angular ribs **139** face ribs **110,** and the unangled ribs **137** mate with ribs **124''**, a cant in the opposite direction is provided. In this case, the forward and rear cant strips would be mounted in the slots provided on the opposite side of the sole plate. To allow a skier to experiment as to the best cant, an adaptor kit may contain several adaptor plates **135,** each providing a different degree of tilt, and several corresponding height cant strips. The adaptor members and the cant strips may be color coded, or otherwise identified so as to indicate the particular adaptor plate which should be used with a particular pair of cant strips.

Adaptor member **135** may be formed by a thin strip of a flat compressible material which limits surface slippage. For example, a strip of neoprene impregnated, double adhesive tape may be used to provide a friction fit between the ear **62** and toe bracket **30''**. The ribs **110** and **124''** would press into the resilient foam on each side of the double coated neoprene tape, with the screw **120** maintaining the friction connection between the toe and ear units. While such a construction does not provide a positive detent as does the ribbed adaptor plate, the use of the foam tape allows a skier to tilt the toe bracket **30''** by any desired angle. A similar modification would be to use serrated surfaces in place of the ribbed surfaces **110** and **124.** This allows the adaptor member to be eliminated by directly mating the serrated surfaces.

In FIGS. **8** and **9,** the mounting for forward cant strip **100** is illustrated in detail. The forward cant strip **100** is formed of semi-resilient plastic, and has a pair of integral downwardly extending T-shaped tongues **150** which form snap-fit connectors which are not easily removable from the sole plate **32.** Slot **102** has a narrow

neck adjacent the upper surface **112**, into which the flexible T-shaped tongue **150** is urged. The ends or pair of resilient extensions of the tongue snap outwardly over a shoulder **152** which joins the narrow neck to the main body of the slot **102**. When the cant strip **100** is to be removed, the elongated body of the cant strip may be twisted or otherwise forced in order to disengage the pair of T-shaped tongues **150** from the corresponding shoulders **152**, and/or to break off the tongues from the main body of the cant strip.

In FIGS. **10–11**, the mounting for the rear cant strip **104** is illustrated in detail. The rear cant strip **104** includes a plurality of inverted T-shaped tongues **160** with extending elements **162** which are transverse to the longitudinally extending sole plate (and hence are 90° with respect to corresponding elements on tongue **150** of the forward cant strip **100**). The tounges **160** extend into existing bores **76** which are used to provide longitudinal adjusment for the heel lever **34**. Since one set of opposed bores **76** carry the arms **74** (see FIG. **1**), the tongues **160** which would be located in the same bores are broken off before the rear cant strip is inserted.

As seen in FIG. **11**, each channel **84** is divided into outer and inner sections, for wide and narrow width boot soles, respectively, which sections are separated by a center divider **165**. When the transverse pin of arm **74** is aligned with slot **82**, the arm can be inserted into the outer section, and then the heel lever **34** can be rotated to its heel engaging position which causes the transverse pin to be rotated out of alignment with slot **82**. The pin is then captured in the space to the right of slot **82** and to the left of the center divider **165**. When a ski boot of lesser width is to be accommodated, the arm **76** is manipulated so as to rotate the transverse pin up and over the center divider **165** and into the inner section of the channel **84**. Again, when the heel lever is returned to its heel engaging position, the transverse pin on arm **74** is captured between divider **165** and an interior cylindrical bore **167** formed in the center of the sole plate. The bore **167** forms an inner support and bearing surface for the ends of the arm **74**.

In the empty bores which do not carry arm **74**, the elements **162** of the tongue **160** are snap-fit into the hollow interior, and retain the rear cant strip **104** to the sole plate **32**. When the rear cant strip is to be disengaged, a screw driver may be wedged underneath the rear cant strip and manipulated so as to disengage and/or break off the tongue. The rear cant strip described above can be used without requiring any modification to the rear end of the sole plate. However, the sole plate can be modified as indicated in FIG. **12** to provide special connectors for the rear cant strip **104**.

In FIG. **12**, a modified sole plate **32** is illustrated which includes a series of slots **170** which receive a modified inverted T-shaped tongue **172** of a rear cant strip **104'**. The extending elements of tongue **172** are aligned with the longitudinal extent of the sole plate and the rear cant strip **104'**, and hence are similar to the tongues **150** provided for the forward cant strip **100**. Thus, the extending ends of tongues **172** are rotated 90° with respect to the extending ends of tongues **160** in FIGS. **10** and **11**. The tongue corresponding to the position at which arm **74** is inserted into a bore **76** has been snapped off in order to not interfer with the arm.

The heel lever **34**, as seen in FIG. **1**, can be canted to provide the same sole engaging angle for roller **36** as exists for the sole engaging surface **128** of the toe bracket **30**. For this purpose, the fine adjustment sleeves **72** are rotated so as to shorten one link and lengthen the other link between the arms **74** and the heel lever **34**, thereby canting the roller **36**.

In FIG. **13**, forward lean compensation is provided by a forward lean strip **180** which extends into one pair of a series of slots **182** which are spaced inward from slots **170**. A pair of inverted T-shaped tongues **184** may be snap-fit into slots **182** in order to securely mount the forward lean strip **180** to the sole plate **32**.

To provide the least amount of forward lean, strip **180** is mounted in the last pair of slots **182** in the sole plate **32**. To provide a greater amount of forward lean, that is, a larger included angle between the top planar surface **112** and the boot sole, the strip **180** may be moved forwardly into engagement with slots **182** which are closer to the toe retention unit. Thus different amounts of forward lean can be provided depending on the particular pair of slots **182** in which the strip **180** is located.

If desired, the strip **180** may include a forward section of substantial length in order to provide support under the ski boot for the weight of the skier. Similarly, the cant strips **100** and **104** may include a transverse section which extends across the sole plate **32** in order to provide support for the canted sole of the ski boot. However, with many present day rigid soled ski boots, the ski boot itself is sufficiently rigid to eliminate the requirement for intermediate support between the toe and the raised heel section which rests on strip **180**, or between the pair of sole edges.

The forward lean strip **180** in FIG. **13** is used in place of the cant strips **100** and **104** shown in FIGS. **1–12**. If it is desired to provide both forward lean and cant, both the cant strips and the forward lean strip can be mounted on a single sole plate **32** if the strips are modified so as to provide a sloping surface which has both forward lean and cant. For example, the forward cant strip **100** would have a continously decreasing height from its rearmost position to its forwardmost position, and the maximum height of the forward cant strip **100** must be less than the lowest height of the forward section of the rear cant strip **104**. Similarly, the forward lean strip **180** must have a gradual transverse slope in order to not interfer with the cant compensation.

UPWARD TO LATERAL RATIO/RELEASE PRESSURE ADJUSTMENT

In FIGS. **14–18**, a means for changing the ratio of upward to lateral release pressure is illustrated in detail. The heel retainer plate **24** includes a first bearing recess **200** and a second bearing recess **202** locaated on opposite sides of the plate. The plate **24** may be integrally molded of metal or plastic, and includes a plurality of counter sunk bores **206** for the screws **66** (see FIG. **1**) which attach the heel plate to the ski. A center cylindrical knub **210** extends downwardly into the opening between the pair of recesses **200** and **202** and into abutment surface with the top of the ski. A safety ring **212** (see FIG. **1**) is captured by knub **210** to provide a mounting holder for a rear safety strap. If desired, the skier may use both the front safety cable **58** and a rear safety strap affixed to ring **212** in order to

provide two point fixation which prevents the ski **26** from windmilling in a fall.

The beveled tongue **64** of the sole plate **32** has a pair of side bearing or cam surfaces **220** which converge toward the rear, and an upper bearing or cam surface **222** which is skewed downwardly with respect to the top plane **112** of the sole plate **32.**

Release recess **200** is defined by a sloping top bearing wall **226** which forms an angle of 37° with resepct to plane **112,** and a pair of inclined side bearing walls **228** which form an angle of 48 ½° with respect to a longitudinal axis of the ski binding. For clarity, the angles of the surfaces and walls are exaggerated in the drawings. The angles of the top and side bearing walls **226** and **228** with respect to the cam surfaces **220** and **222** define the amount by which tongue **64** is inserted within the heel retainer plate **24,** and hence the amount of upward and lateral movement required to withdraw the tongue. This in turn defines the ratio of the upward to lateral release pressure required to cause the tongue **64** to move out of engagement with the bearing recess **200.**

In order to change the ratio of upward to lateral release pressure, recess **202** includes bearing walls which define different angles. A top bearing wall **230** defines an angle of 40° with respect to plane **112,** and a pair of side bearing walls **232** define an angle of 52 ½° with respect to the longitudinal axis of the ski binding. When recess **202** faces the sole plate, as illustrated in FIG. **17,** the beveled tongue **64** extends a greater distance into the heel plate **24.** This changes the ratio of the upward to lateral release pressure required to disengage the sole plate from the heel retainer unit. For a similar setting of spring pressure, as determined by the longitudinal position of plunger **44** in FIG. **1,** different amounts of release pressure are required.

If a skier desires to change the release pressure ratio, it is merely necessary to remove the adjustable screws **66** of FIG. **1** and rotate the adjustable heel retainer plate **24** by 180°, after which the screws **66** are replaced and engage the same mounting holes within the ski **26.** Thus, it is not necessary to remount the ski binding unit in order to change the ratio of upward to lateral release pressure.

Since a change in the release ratio also may change the amount of release pressure required in a given direction, it may be necessary for the skier to alter the longitudinal detented position of the spring biased toe unit **22.** As seen in FIG. **1,** the lock screws **54** may be rotated so as to allow the flange **50** to be moved with respect to the ribbed lower plate **52.** When the axial spring bias pin **42** is properly located, the lock screws **54** may be rotated to mesh or fixedly detent the ribbed lower surface of the flange with the corresponding ribbed surface of the lower plate.

While only two different recesses **200** and **202** are illustrated, it will be understood that additional recesses may be provided if desired. For example, plate **24** may be of square cross section, and have a separate recess in each of the four sides of the square. The plate would then be rotated 90°, 180°, or 270° to select one of four different ratios of upward to lateral release pressure. Furthermore, by locating the bores **206** at corners of the square, the same mounting holes in the ski **26** could be used to remount the heel plate. Thus, a skier can change his release ratio while on a ski slope, if desired, merely by use of a screw driver or similar device.

Desirably, an open channel is provided between the recesses **200** and **202** in order to prevent snow and ice from building up within the recess. While a change in release pressure has been effected by changing the angles of the walls of the recess, it will be apparent that a similar result can be obtained by changing the angles of cam surface **222** with respect to the angle of side cams **220,** or by providing a tongue **64** which can be replaced with a different tongue. Furthermore, the recess could be located in the sole plate, with the heel retainer plate carrying a plurality of tongues. Other modifications and changes can be made within the scope of the invention.

I claim:

1. A ski binding for releasably securing a ski boot to a ski and for maintaining a sole of the ski boot at a skew with respect to an upper surface of the ski, comprising:

sole plate means releasably securable to both the ski and the ski boot and having planar surface means and securing means for releasably securing the ski boot sole to the sole plate means,

skew producing means securable to the sole plate means for maintaining the ski boot sole at a skew with respect to the planar surface means including at least one skew member having a main body portion with an extent along the planar surface means and

tongue means extending outward from the main body portion of the skew member for securing said skew member to said planar surface means,

said planar surface means includes aperture lock means for receiving said tongue means to hold the main body portion in abutting relation to the planar surface means, and

primary release means for releasably holding the sole plate means to the ski with the planar surface means parallel to the ski upper surface, including bias means for releasing the sole plate means in the presence of a release force.

2. The ski binding of claim **1** wherein said tongue means comprises a snap-fit member having resilient extensions, said aperture lock means comprises an aperture located in said planar surface means and having a narrow neck of smaller extent than the resilient extensions and a shoulder for receiving the resilient extensions to secure the resilient extensions with the aperture.

3. A ski binding for releasably securing a ski boot to a ski and for maintaining a sole of the ski boot at a cant with respect to an upper surface of the ski, comprising:

sole plate means releasably securable to both the ski and the ski boot and having planar surface means containing a first plurality of apertures spaced along one side of the planar surface means and a second plurality of apertures spaced along the other side of the planar surface means, and securing means for releasably securing the ski boot sole to the sole plate means,

at least one removable cant member having a main body portion with an extent parallel to the longitudinal axis of the ski and a plurality of tongue members extending from the main body portion and insertable into one of the first and second plurality of apertures for securing said cant member to said planar surface means and disengageable from said one of the first and second plurality of apertures to

allow a different cant member to be secured to said planar surface means, and

primary release means for releasably holding the sole plate means to the ski with the planar surface means parallel to the ski upper surface, including bias means for releasing the sole plate means in the presence of a release force.

4. A ski binding for releasably securing a ski boot to a ski and for maintaining a sole of the ski boot at a cant with respect to an upper surace of the ski, comprising:

sole plate means releasably securable to both the ski and the ski boot and having planar surface means and securing means for releasably securing the ski boot sole to the sole plate means including an upright member extending from the planar surface means, bracket means having a sole engaging surface for engaging an offset portion of the ski boot sole, bracket mounting means for affixing the bracket means to the upright member with the sole engaging surface at a predetemined cant with respect to said planar surface means,

an elongated cant member having connector means for securing the elongated cant member to the planar surface means, said cant member having a height to cause the ski boot sole when resting on the cant member and one side of the sole plate means to have the same predetermined cant as the sole engaging surface, and

primary release means for releasably holding the sole plate means to the ski with the planar surface means parallel to the ski upper surface, including bias means for releasing the sole plate means in the presence of a release force.

5. The ski binding of claim **4** wherein said bracket mounting means includes adjustment means for affixing the bracket means at different heights from the planar surface means to accommodate different ski boot soles, said adjustment means maintaining the sole engaging surface at said predetermined cant.

6. The ski binding of claim **4** wherein said connector means is securable in right side lock means spaced along the right side of the planar surface means or in left side lock means spaced along the left side of the planar surface means to thereby produce an opposite cant.

7. The ski binding of claim **6** wherein said right side and left side lock means each comprises a plurality of aperture means spaced longitudinally along the right side and the left side, respectively, of the sole plate means and generally parallel with the axis of the ski, and the connector means comprises a plurality of extending elements securable within the plurality of aperture means for securing the cant member to the sole plate means.

8. The ski binding of claim **4** including a second elongated cant member having connector means for securing the second cant member to the planar surface means at the rear of the first named cant member, the second cant member having a height to cause the ski boot sole, when resting on the first and second cant members and said one side of the sole plate means to have the same predetermined cant as the sole engaging surface.

9. The ski binding of claim **8** wherein the sole plate means includes lever means spaced opposite from the upright member for securing an opposite offset portion of the ski boot sole to the sole plate means, a plurality of adjusment bores longitudinally spaced in the sole plate means, a pair of arm means securing said lever means to opposite sides of the sole plate means with at least one of the arm means extending into one of the longitudinally space bores, a longitudinal channel connecting at least some of the plurality of longitudinally spaced bores, the longitudinal channel forming a portion of the connector means for securing one of the cant members to the sole plate means.

10. The ski binding of claim **9** wherein the one cant member has a plurality of tongues which extend through the channel and into the longitudinally spaced bores to secure the one cant member to the sole plate means, the plurality of tongues being adapted to be removed from an elongated body member in order to allow removal of the tongue which otherwise would be inserted in the bore in which the arm is located.

11. A ski binding for releasably securing a ski boot to a ski and for maintaining a sole of the ski boot at a cant with respect to an upper surface of the ski, comprising:

release means for releasably securing the ski boot to the ski including an upright member extending substantially perpendicular to the ski upper surface and having a series of parallel spaced first ribs, bracket means having a sole engaging surface for engaging the ski boot sole,

cant means for canting the ski boot sole at a predetermined angle with respect to the ski upper surface, and

said release means includes adjustment means for affixing the bracket means at different heights along said upright member and for maintaining the sole engaging surface at the same angle with respect to the ski upper surface as produced by the cant means, said adjustment means includes a plurality of parallel spaced second ribs which mate with the frist ribs to prevent movement of the bracket means, lock means for maintaining the first and second ribs in abutment, the sole engaging surface being at said angle with respect to at least one of said first and second ribs.

12. The ski binding of claim **11** wherein the second ribs are substantially perpendicular to an elongated slot, said upright member includes an internally threaded bore, and screw means extending through said elongated slot and into engagement with said internally threaded bore to secure the bracket means to the upright member at different heights depending on the location of the screw means within the elongated slot.

13. The ski binding of claim **12** wherein said bracket means has an extending member with a lower surface defining the sole engaging surface and being at said predetermined angle with respect to the first and second ribs.

14. The ski binding of claim **12** wherein said bracket means includes an extending member with a lower surface defining the sole engaging surface, said bracket means having a plurality of spaced third ribs, plate means having on one side said plurality of second ribs which mate with the first ribs of the upright member and on an opposite side a plurality of fourth ribs which mate with the third ribs of the bracket member, the second and fourth ribs on opposite sides of the plate means being at a skew corresponding to the predetermined angle.

15. A ski binding for releasably securing a ski boot to a ski and for maintaining a sole of the ski boot at a cant

with respect to an upper surface of the ski, comprising:

release means for releasably securing the ski boot to the ski including an upright member extending substantially perpendicular to the ski upper surface, bracket means having a sole engaging surface for engaging the ski boot sole and first surface means which mates with second surface means on the upright member to locate the sole engaging surface parallel with the upper surface of the ski and at different detented vertical positions,

cant means for canting the ski boot sole at a predetermined angle with respect to the ski upper surface, and

adaptor means located between the first and second surface means for tilting the sole engaging surface by said predetermined angle.

16. The ski binding of claim **15** wherein said adaptor means can be inserted between the first and second surface means in a flipped position to tilt the sole engaging surface at the same predetermined angle but of opposite cant.

17. The ski binding of claim **15** wherein said release means includes sole plate means releasably securable to both the ski and the ski boot sole and having a planar surface, said upright member extending substantially perpendicular upward from the planar surface of the sole plate means, bias means mountable to the ski for releasably holding the sole plate means to the ski with the planar surface parallel to the ski upper surface, and the cant means being detachably securable to the sole plate means when the adaptor means is being utilized for canting the ski boot sole by said predetermined angle with respect to the planar surface.

18. The ski binding of claim **17** wherein said sole plate means includes lever means spaced at an opposite end of the planar surface from the upright member to secure an opposite end of the ski boot sole to the sole plate means, a pair of arm means extending from said lever means for securing the lever means to opposite sides of the sole plate means, at least one of the arm means including an adjustment member for changing the effective length of the arm means to allow the lever means to tilt by said predetermined angle.

19. A ski binding for releasably securing a ski boot to a ski, comprising:

sole plate means with socket means for receiving a biased release element and boot securing means for releasably securing the ski boot to the sole plate means,

retainer means mountable to the ski and having a retainer surface mating with a retainer surface on the sole plate means, the biased release element urging the retainer surfaces into mating contact, the positions of the retainer surfaces establishing the ratio of upward to lateral release pressure necessary to release the ski boot in the upward and lateral directions, respectively, and

adjustable means effective to change the position of at least one of the retainer surfaces to establish a different ratio of upward to lateral release pressure.

20. The ski binding of claim **19** wherein the retainer means includes a plurality of separate retainer surfaces spaced about a retainer member, each retainer surface of the retainer member having a different position when in abutting relation with the retainer surface of the sole plate means.

21. The ski binding of claim **20** wherein said retainer member comprises plate means having a plurality of recesses located on different sides of the plate means, each recess being formed by inclined walls corresponding to the retainer surfaces of the retainer member, said adjustable means comprises a plurality of screw means for securing the plate means to the ski with one side adjacent the retainer surface of the sole plate means, the screw means being removable to allow the plate means to be rotated to a different side containing a recess.

22. The ski binding of claim **20** wherein the separate retainer surfaces of the retainer member when in the active position contact the retainer surface of the sole plate means at different longitudinal positions, the release means includes lower plate means mounted to said skis, upper release means detachable from said lower plate means and including said biased release element extending therefrom for mating with the socket means, said upper release means includes lock means to detachably secure the upper release means to said lower plate means at any desired one of a plurality of spaced detent positions relative to the lower plate means in order to maintain the retainer surfaces in engagement.

23. A ski binding for releasably securing a ski boot to a ski, comprising:

sole plate means releasably securable to the ski boot,

forward retainer means for releasably securing a forward portion of the sole plate means to the ski,

rear retainer means for releasably securing a rear portion of the sole plate means to the ski,

the sole plate means includes at least one bearing surface in contact with at least one bearing surface of the retainer means and movable out of contact to release the sole plate means from the retainer means in response to a release force, and

means to change the angle of at least one of said bearing surfaces to change the release force necessary to release the sole plate means from the retainer means.

24. The ski binding of claim **23** wherein one retainer means includes at least two bearing surfaces each of a different fixed angle, only one of the fixed angle bearing surfaces being in engagement with the bearing surface of the sole plate means to establish the release force necessary to release the sole plate means, the angle change means being effective to place the other of the fixed angle bearing surfaces in engagement with the bearing surface of the sole plate means.

25. The ski binding of claim **23** wherein one retainer means includes a spring release element urged into engagement with the sole plate means, the other retainer means includes the bearing surface which is maintained in contact with the bearing surface of the sole plate means by the bias pressure of the spring release element.

26. The ski binding of claim **25** wherein the angle change means changes the angle of the bearing surface on the other retainer means and thereby changes the longitudinal position of the sole plate means with respect to the one retainer means, said one retainer means includes lower plate means mounted to the ski and detachable upper means carrying the spring release element, and longitudinal adjust means for mounting the detachable upper means to the lower plate means at a plurality of longitudinally detented positions.

27. The ski binding of claim 25 wherein the bearing surfaces have a lateral section to control the lateral release pressure necessary to disengage the sole plate means in a lateral direction with respect to the ski and an upward section to control the upward release pressure necessary to disengage the sole plate means in an upward direction with respect to the ski, and said angle change means alters the ratio of the angles between the lateral and upward sections to change the ratio of lateral to upward release pressure.

28. The ski binding of claim 27 wherein the bearing surface of the sole plate means comprises a beveled tongue having a downward slope corresponding to the upward section and a pair of converging side slopes corresponding to the lateral section, the other retainer means comprises plate means having at least two recesses each defined by a top wall and a pair of side walls, the top wall being inclined to vertical and corresponding to the upward section and the side walls being inclined to the longitudinal axis of the ski and corresponding to the lateral section, the ratio of the angles of the top to side walls being different for the two recesses, and the angle change means allowing a different one of the recesses to mate with the beveled tongue of the sole plate means.

29. A ski binding for releasably securing a ski boot to a ski, comprising:

sole plate means releasably securable to the ski boot and having a first release element,

retainer means for releasably securing the sole plate means to the ski and having a second release element in mating engagement with the first release element and relatively movable out of contact therewith to release the sole plate means from the retainer means in response to a release force,

one of the release elements comprising a member having a plurality of ratio establishing sections including a top surface defining an upward release pressure and a side surface defining a lateral release pressure, the top and side surfaces for each section being different to thereby change the ratio of upward to lateral release pressure when a different section is positioned into engagement with the other of the release elements.

30. The ski binding of claim 29 wherein each of the sections comprises a recess formed in the member and defined by an upward sloped wall and a side sloped wall corresponding to the top and side surfaces, respectively.

31. The ski binding of claim 30 wherein the other of the release elements comprises a bearing element which extends into one of the recesses in the member, and spring release means biasing the bearing element into mating engagement with the sloped walls of the one of the recesses whereby the angle of the sloped walls establishes the upward and lateral release pressures necessary to disengage the bearing element from the sloped walls.

32. A ski binding for releasably securing a ski boot to a ski, comprising:

sole plate means releasably securable to the ski boot and having a socket adjacent one end and a beveled tongue adjacent the opposite end,

a retainer plate having a plurality of separate tongue receivable recesses formed in separate sides of the plate, each tongue receivable recess being defined by a top wall inclined to vertical and a pair of side walls inclined to the horizontal axis of the ski, the ratio of the angles of the inclined top and side walls being different for each separate recess, and

a spring biased element for engaging the socket to urge the beveled tongue into one of the separate recesses so that the ratio of upward to lateral release pressure necessary to move the beveled tongue out of engagement with the one recess is controlled by the ratio of the angles of the inclined walls of the one recess and can be changed by changing the recess which receives the beveled tongue.

33. The ski binding of claim 32 wherein the separate recesses formed in the retainer plate have an open channel therebetween.

34. The ski binding of claim 32 wherein the retainer plate has a plurality of symmetrically located fasteners for securing the retainer plate to the ski, the fasteners being disengageable to allow the retainer plate to be rotated to a side containing another recess and then engageable at the same positions on the ski.

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