

Nov. 12, 1968

P. K. WILEY

3,410,568

TENSION ADJUSTABLE RELEASABLE SKI BINDING

Filed June 6, 1966

2 Sheets-Sheet 1

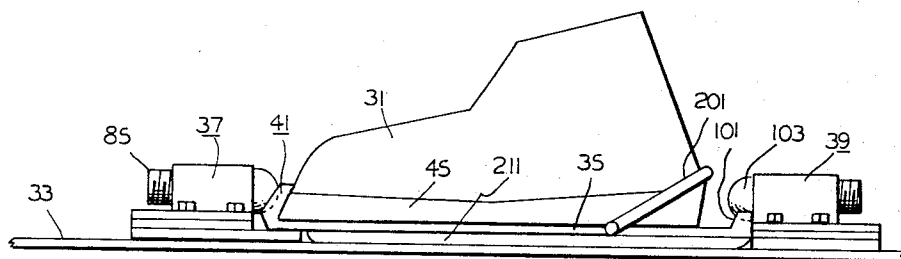


FIG. 1

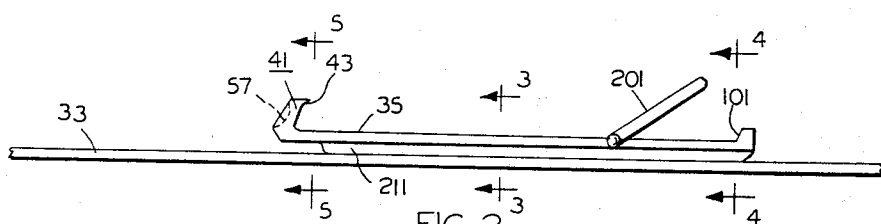


FIG. 2

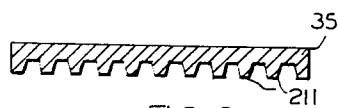


FIG. 3

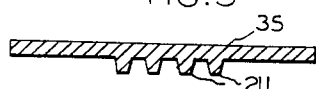


FIG. 4



FIG.5

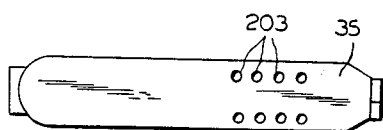


FIG.6

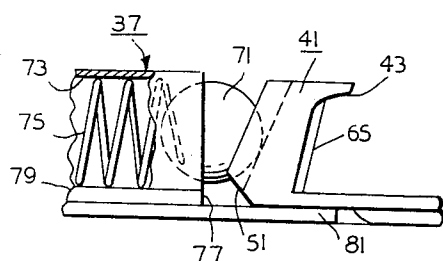


FIG. 9

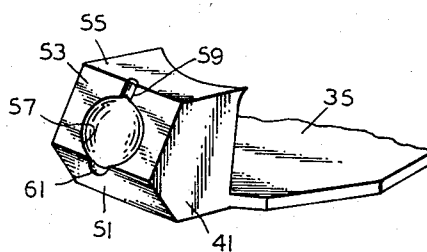


FIG.7

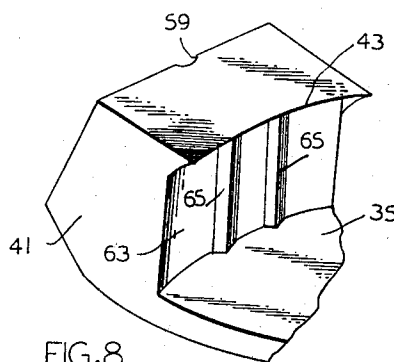


FIG. 8

INVENTOR

PHILIP K.WILEY

BY

Wilfred G. Caldwell

ATTORNEY

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P. K. WILEY

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2 Sheets-Sheet 2

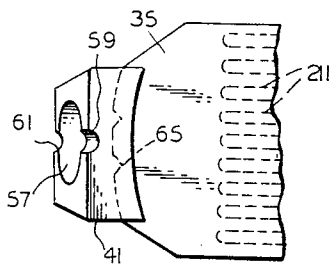


FIG. 10

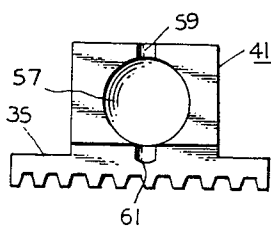


FIG. 11

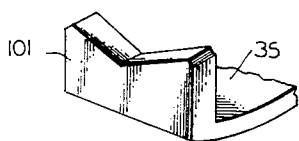


FIG. 12

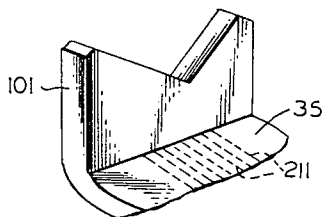


FIG. 13

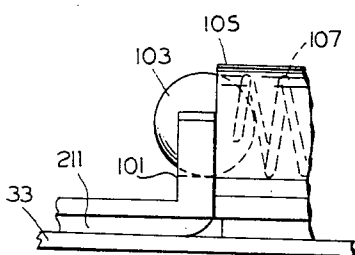


FIG. 14

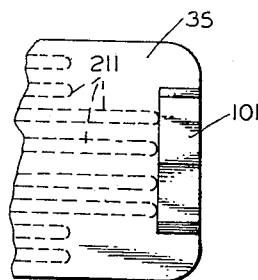


FIG. 15

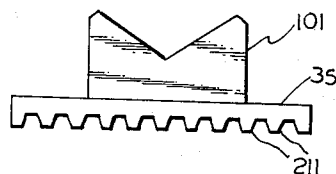


FIG. 16

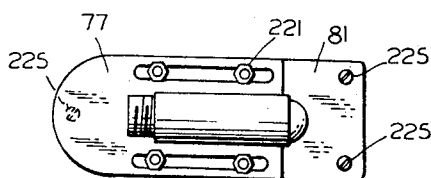


FIG. 17

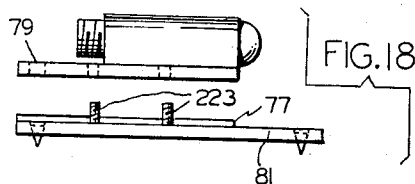


FIG. 18

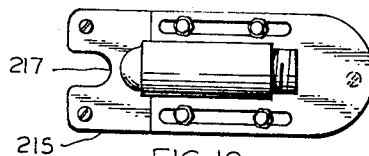


FIG. 19

INVENTOR
PHILIP K. WILEY

BY

Welford G. Caldwell

ATTORNEY

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3,410,568
TENSION ADJUSTABLE RELEASABLE
SKI BINDING

Philip K. Wiley, 326 W. 7th St.,
Traverse City, Mich. 49684
Filed June 6, 1966, Ser. No. 555,294
9 Claims. (Cl. 280—11.35)

ABSTRACT OF THE DISCLOSURE

A releasable ski binding having plate means adapted to be affixed to various sizes of boots and to be received between forward and rear convex surfaced means affixed to the ski and adjustably biased into engagement with the plate means. The forward end of the plate means is shaped to permit easier release of the boot in one direction than in another and the convex surfaced means may be adjustably mounted on the ski by separate mounting means.

The present invention relates to a novel releasable ski binding wherein a plate is detachably secured to each of the skier's boots, and comprises a portion of the break-away mechanism. A forward and rear mount, preferably of the same or similar design, cooperate respectively with the plate of each boot, in a mutually interacting fashion, to apply a predetermined tension for retaining the skier to the ski for normal skiing conditions, at a pressure to avoid bone fractures.

Releasable ski bindings have long been known, but none has heretofore provided a universal releasable mounting structure in which any lateral, medial, torsional, rotational, forward, backward, or upward force, applied to the boot, above a predetermined minimum will cause release, as enabled by the present invention.

The foregoing primary object of the invention is achieved through ball bearings to receiving means contacts, established between the respective mounts and the forward and rear end of the plate. Each plate carries a forward and rear upriser in which each upriser may be notched, socketed or the combination present to receive the associated ball bearing with release being effected by compressional forces applied to the spring biased ball bearings to force one or the other, or both, away from its receiving means, depending upon the type fall.

Since extreme pressures or forces are encountered even in normal skiing, the ball bearings and associated springs are of large size, capable of maintaining the plate to the ski attachment free of play for all normal skiing maneuvers. These large balls and their associated springs also absorb small sharp shocks ("chatter" in the skiing vernacular) which are frequently encountered during skiing. Such "chatter" might cause an unwanted release with its associated danger to the skier if smaller balls and springs were used.

It has been shown that a 92 pound force, directed either laterally or medially, at a point one inch behind the boot toe, will fracture the leg of the average 150 pound advanced intermediate skier. It has also been shown that any skiing maneuver in any snow can be performed if the binding is set to release at 58 pound pressure at a point one inch behind the toe. This invention can be readily set to release at any desired level, thereby affording a varying amount of safety as desired by the individual skier. Hence, the invention incorporates adjustability for the spring tensioning to accommodate various sized skiers, as well as boot sizes and further adjustability is provided to eliminate play between the boot and the ski.

It is commonly known among skiers that the ease of skiing in various snow conditions (e.g. powder, pack or

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ice) varies with the longitudinal relationship of the boot toe with the longitudinal center of the ski. This invention allows the skier to make this adjustment as he deems necessary. This is an added advantage of this invention.

An advantage of the invention is a solid, play free heel which, nevertheless, releases quickly in the dangerous forward fall. This type of fall is commonly seen when a ski tip is inadvertently caught or buried in the snow. This is universally recognized as one of the most dangerous situations encountered by the skier. With this invention, the heel, in a forward fall, releases at a significantly less upward force than the upward force required to release the heel during normal skiing. During the forward fall the toe receiving means compresses the toe ball bearing spring and the upriser of the plate becomes jammed up against the toe release frame. This small forward motion of the boot, relative to the ski, places the heel upriser of the plate in such a position relative to the heel ball bearing that much easier heel release is thereby obtained.

An advantage of the invention resides in the ready reentry into or exit from the ski binding by the skier without resort to levers, straps or other appliances. In this respect, the bottom of the plate is preferably flat in order that the weight of the skier, when exerted downwardly on either ball bearing, will cause the same to retract against its spring tension sufficiently to enable the plate to pass to the underside of the ball bearing and receive the same in the associated upriser locking concavities. Thus, during normal skiing the forward and rearward ball bearings protrude into the notches or receiving means and are received rather snugly thereby to fix the skier's position relative to the ski. The lower portions of the uprisers may be bevelled further to facilitate re-entry.

At the conclusion of the skiing period, the skier may release himself from the skis by releasing the heel cable release to exit from both the plate and the binding, thereby leaving the plate affixed in the ski receiving means, or exit may be made by exerting a sharp upward pressure on the toe, or by employing a ski pole tip to exert a downward pressure in a specially provided toe upriser slot which unseats the front or toe ball bearing, thereby releasing the boot with the plate attached.

Considering now more specifically the structure and preferred characteristics and dimensioning thereof, it should be pointed out that the heel upriser is preferably biased flush against the rear mount, but that a spacing of the order of $\frac{3}{10}$ inch to $1\frac{3}{4}$ inch is purposely established between the toe upriser and the forward mount. This dimension is given for one-inch ball bearings and a $\frac{3}{4}$ -inch die spring, approximately $1\frac{1}{2}$ inches in length, which when compressed, will exert 50 to 60 pounds pressure (measured after $\frac{1}{4}$ -inch spring deflection) on the forward ball bearing, in the direction of the skier. It is understood that the binding may be adjusted so that it will function with the heel upriser in a non-flush position in relationship with the heel frame, although the preferred position is flush.

The toe spring forces the heel upriser against the front surface of the heel release tube. Only when a force starts to move the heel upriser against the heel ball bearing does the heel spring begin to resist, i.e. generally upwardly or laterally.

Vertical adjustment for the mounts is provided primarily for play elimination. Adjustment downwardly of the mount, relative to the ski, forces the ball bearing downwardly, thereby applying pressure to its associated upriser to eliminate play. This is true because each ball bearing is restrained from passing out of its associated mount by an opening less than the diameter of the ball. In a typical mount the ball bearing protrudes of the order of

$\frac{7}{16}$ of an inch for cooperating with plate uprisers. If V-notched uprisers are employed, it can be readily appreciated that downward pressure is exerted on these uprisers by the respective ball bearings through contact with these uprisers, upon proper adjustment, thereby eliminating play in any direction.

In the example presented, for purposes of illustration but not limitation, the binding may be set where an upward pressure at the heel of the order of 110 pounds is required to effect heel release, wherein a $\frac{3}{16}$ -inch gap is provided at the forward mount. If, as in a forward fall, this gap is closed, the heel will now release with an upward pressure of the order of 35 to 60 pounds. The marked safety of this heel in forward fall is thus demonstrated. And yet, the high spring pressures and retaining ability of this type heel in normal skiing may thus be appreciated and enjoyed with safety.

In the preferred design, forward and rearward tubes carry the compression springs and urge the ball bearings in the direction of the plate respectively. The balls are retained by collars or through having the protruding ends of the tubes slightly pinched in order that the maximum diameter of the ball will not pass through the open end. Adjustability of spring tension is provided by a threaded plug adapted to be screwed into the tubes the appropriate distance for the individual using the safety bindings. Vertical adjustability is provided through shimming. In this respect, both longitudinal and vertical adjustment are provided through a pair of plates for each mount, the lower plate being permanently affixed to the ski by screws. This lower plate has studs extending upwardly. These studs pass through longitudinal slots in the upper plate in order that longitudinal adjustment may be set by tightening the upper plate to the lower plate through nuts provided for the studs. At the same time, the appropriate shim(s) may be included between the plates for good vertical alignment of the ball bearing with the receiving means. Vertical adjustment is provided to eliminate play between the plate and the ski. Adjustment of the biasing between the spring and the ball bearing, or the compression of the spring, may be made by movement of the spring retaining structure.

Further adjustment is provided to accommodate various size boots, if desired. Such adjustment is made in the mount longitudinally of the ski. The anchoring means for the mount need not be moved, but the spring and ball bearing carrying fixture is moved relative to its anchoring means to further open or further close the spacing between the forward and rear mounts. Either or both mounts may be equipped for such adjustments, thereby locating the boot in the proper position relative to the ski. Adjustment for the individual boot size is provided through a plurality of connections for a releasable heel cable for securing the boot to the plate, perforations in the outer edges of the plate at longitudinally spaced positions are provided to receive the ends of the heel cable for the particular size boot worn. In this respect, a single plate will accommodate various size skiers, and the boot is retained to the plate by placing the boot toe under a rim carried by the toe upriser and securing it on the rear by a forward urging heel cable. Additional coupling of the boot to the plate may be had, particularly where soft boots are worn, through a conventional long thong attachment. However, in this respect, it should be noted that additional safety is provided because the long thong is anchored to the releasable plate rather than to the ski itself.

In addition, it should be pointed out that this structure is adaptable to conventional or special long thong attachments for stiffening the boot, and suitable to safety cords for preventing separated skis from running wild down the slope.

With the foregoing in mind, it is among the objects of this invention to provide a releasable ski binding which

relies solely on spring tensioning for maintaining the boot fixed to the ski during normal skiing.

It is a further object of the invention to provide such a ski binding incorporating ball bearing or similar type surface to notched or similar concave surfaced plate connections.

Another object of the invention is to provide mounting structure for the ball bearings capable of vertical and longitudinal adjustment relative to the ski.

A still further object of the invention is the provision of a reliable releasable ski binding, enabling universal release, prior to fracture, regardless of the type force applied to the skier's legs and,

A further object of the invention is to provide such a releasable ski binding which permits the skier automatically to enter or exit from the skis without resort to levers, buckles or straps, or other manually manipulated appliances.

Another object of the invention is the provision of a releasable ski binding adapted to fit any size boot and accommodate any size skier without any permanent attachments to the ski boot, thereby providing a suitable rental apparatus.

Yet another object is the provision of such a ski binding attachment capable of a rigorous retaining action, yet readily releasable at the will of the skier through the provision of an unseating arrangement for the front ball to release the plate from the mounts.

The invention will be better understood from a reading of the following detailed description thereof when taken in conjunction with the drawing wherein:

FIG. 1 is a view in side elevation of the ski binding with boot affixed to the releasable plate and the plate carried on the ski and retained by the front and rear mounts.

FIG. 2 shows the releasable plate per se in side elevation.

FIGS. 3, 4 and 5 are sections taken through the plate, and FIG. 6 is a view in plan of the plate.

FIG. 7 is a view in perspective showing the forward upriser of the plate.

FIG. 8 is another view of the forward upriser of the plate.

FIG. 9 is a view in side elevation of the forward upriser of the plate in working relationship with the forward mount.

FIG. 10 is a view in plan of the structure of FIG. 9.

FIG. 11 is a front elevational view of the upriser of FIGS. 7 and 8.

FIG. 12 is a view in perspective of the heel upriser. FIG. 13 shows the heel upriser and the plate in section.

FIG. 14 is a view of the heel upriser in operative relation with the rear mount.

FIG. 15 is a view in plan of the heel upriser and a portion of the plate.

FIG. 16 is a view in front elevation of the heel upriser and showing a section of the plate.

FIG. 17 is a detailed view in plan of the forward mount.

FIG. 18 is a detailed view in side elevation of the forward mount, and

FIG. 19 is a detailed view in plan of the rear mount. Reference to the detailed drawings will show that the release, principle per se is the same as that disclosed in my co-pending application Ser. No. 504,624, filed October 24, 1965, for "Tension Adjustable, Releasable Ski Binding and Method," now Patent No. 3,338,587 issued August 29, 1967.

In FIG. 1, boot 31 is shown in skiing position on ski 33, being attached to releasable plate 35, in turn detachably held to ski 33 by forward mount 37 and rear mount 39.

The plate 35 per se is best seen in FIG. 2, wherein the forward end includes toe retainer means in the form of

upriser 41 which has an inwardly turned rim 43 provided to receive the sole 45 of boot 31. The upriser 41 includes the ball receiving means in the form of a recess or socket 57.

This structure is best seen in the detailed views of FIGS. 7 thru 11, wherein the upriser 41 comprises a solid piece of stainless steel or the like, having a forward bevelled surface 51, a tapered forward face 53 and a top surface 55. The upriser 41 may be welded to plate 35 or otherwise affixed thereto. Alternatively, the entire releasable plate with uprisers may be ruggedly cast but, as will be pointed out, it must withstand considerable forces, multiplied by a lever action.

A socket or recess 57 is formed in the tapered face 53 and a slot or trough like recess 59 communicates from the upper surface 55 with the socket 57. Similarly, a guide opening 61 opens from socket 57 into tapered surface 51.

The rear surface 63 of upriser 41 is best seen in FIG. 8 and is preferably slightly arcuate although it can be straight. A plurality of vertical ribs 65 protrude from surface 63 to provide a better gripping and centering of the boot 31 to the plate 35.

In FIG. 9 the upriser 41 is shown in operative relation with the forward mount 37. The forward ball 71, may comprise, for example, a stainless steel ball bearing of 1 inch diameter carried by tubular housing 73 and biased outwardly by compression spring 75. The ball opening of tube 73 is smaller than the over-all diameter of the tube and permits slightly less than half of ball 71 to be urged outwardly thereof. The ball is seated in socket 57, and it should be noted that one or more shims 77 may be employed between the plates 79 and 81 of the forward mount for vertical adjustment of the ball 71 relative to the socket 57 (as best seen in FIGS. 17 and 18).

It is important to note the spacing between the forward edge of plate 79 and the tapered surface 51 of upriser 40. This gap of the order of $\frac{1}{16}$ to $\frac{1}{4}$ inch from the junction of bevelled surface 51 and tapered surface 53 to the forward edge of tube 73 is intentionally provided to permit forward movement of the skier relative to the ski upon impact with an obstacle, thereby insuring ready heel release through co-action of the forward and rear mounting structures.

The spring pressure of spring 75 against ball 71 is controlled by turning threaded plug 85 (FIG. 1) further in or out of tube 37 (FIG. 9). The spring 75, by way of example, may comprise a $\frac{3}{4}$ by $1\frac{1}{2}$ –2 inch long die spring of medium high pressure. The rear mount may incorporate the same structure or preferably include a high pressure spring.

It is the release pressure of the plate 35 from the mounts 37 and 39 which is critical for the safety of the individual skier. This release pressure may be determined in several fashions. The first is by the well-known Release-Check Method of Gordon Lipe or by the Snap Tester Method. In the event precalibrated devices are not available, the skier may even set this binding for his own use. For example, he may gradually tighten the springs until he can not "ski" out of the binding in hard maneuvers. The pressure for the heel release may readily be set by the skier to a point where he can just barely fall forward out of the heel release without undue discomfort.

The heel release mechanism, while admitting of the same structure, preferably comprises a V-notched upriser 101 (FIGS. 12 thru 16) to receive the ball 103. In addition, the upriser 101 fits flush against the forward opening of tube 105 which carried the compression spring 107. Otherwise the structure is identical.

The reason that the V-notched upriser 101 is preferred is because it is easier to maintain the flush relationship of the upriser to the tube 105, wherein the ball 103 is not compressed rearwardly but, rather, the upriser 101 forms a contact type set for the ball 103. Obviously, compression of spring 107 is required for any type release at the

heel, be it vertical or lateral. This arrangement also facilitates adjustment for safe skiing.

Returning to FIGS. 1 thru 6, the boot 31 is retained to the plate 35 by heel cable 201 of conventional design. This may comprise a spring lever operated type heel cable 201 which tightens the boot heel with associated groove to the plate 35. In FIG. 6, plate 35 is shown provided with a plurality of longitudinally spaced apart apertures 203 to permit accommodating different size boots to a single size plate 35.

The cable 201 urges the boot 31 forward under rim 43 to permit the rib 65 to bite into the sole providing better gripping thereof. A conventional metal cap may be used on the forward end of the boot sole for co-action with these ribs, if desired.

As best seen in FIGS. 1 thru 6, the plate 35 is equipped with longitudinal reinforcing ribs 211 which extend the major length thereof to prevent fracture of the plate upon release. Tremendous forces are developed near the rearward portion of plate 35 because the plate is being retained at upriser 101 by ball 103, whereas the skier is being retained to plate 35 by cable 201 at its junction point with the plate, and when the heel is pivoted upwardly a bending force is developed between these two points. The reinforcing longitudinal ribs 211 extend at the extreme rear only in the central portion thereof, as seen in FIG. 15, because of the rear mount plate 215 which includes groove or U-shaped opening 217 to accommodate the ribs (FIG. 18).

Both mounting structures are otherwise identical with upper plate 77 (FIGS. 17 and 18) being adjustable relative to lower plate 81 through the provision of washers and nuts 221 for studs 223. The lower plate 81 is secured permanently to the ski by screws 225 and plate 81 carries the studs 223 in fixed position.

Normally, the skier will exit from the skis by simply releasing cable 201 and sliding the toe out from under rim 43, thereby leaving the plate affixed in the mounting. However, ready exit and also removal of the plate are provided through the trough like groove 59 by the skier simply pushing the tip of his ski pole down this trough to unseat forward ball 71, permitting the toe with plate attached to be lifted, or permitting removal of the plate after the skier has exited. The small groove 61 at the lower end of socket 57 serves as a guide for ready entry into the binding.

Other and further modifications of the invention may readily occur to those skilled in the art from a reading of this disclosure and, accordingly, it is intended that the invention be limited only by the scope of the attached claims.

What is claimed is:

1. A releasable ski binding for retaining a boot to a ski during normal skiing and releasing the boot from the ski under abnormal conditions, comprising, in combination, concave surfaced receiving means adapted to be affixed to the boot and to extend forwardly and rearwardly thereof; forward and rear convex surfaced means; separate mounting means for the forward and rear convex surfaced means adapted to be affixed to the ski, in spaced apart positions, freely to accommodate the boot and receiving means; and means biasing each convex surfaced means into its associated receiving means; said forwardly extending receiving means being relieved rearwardly and upwardly and rearwardly and downwardly from a point located forward of and below the rearmost extent of the convex surfaced means to permit easier release in a lateral direction than in an upward direction relative to the ski.

2. The binding of claim 1 wherein the convex surfaced means comprise balls and housings therefor out of which said balls project; said biasing means comprise springs in said housings; and means affixed to said housings to adjust the tension of said springs.

3. The binding of claim 2 wherein said rearwardly

extending concave surfaced means is in pressure contact with said rear housing and said forwardly extending concave surface is disposed in said forward receiving means with a gap between said forward mounting means and said forward housing.

4. The binding of claim 3 wherein the receiving means comprise a plate having a forward and a rear upriser.

5. The binding of claim 4 including a heel cable adapted to be connected to said plate and retain the boot thereto.

6. The binding of claim 5 wherein said rear upriser comprises a V-notched element adapted to receive the rear ball.

7. The binding of claim 6 wherein said forward upriser comprises a lower bevelled surface and an upper tapered surface, the latter including a socket for said forward ball.

8. The binding of claim 7 wherein said tapered surface includes a trough-like opening and said bevelled surface includes a slot opening, both openings being in communication with said socket.

9. The binding of claim 8 wherein each housing includes a flat plate; separate plates attachable to the skis; uprisers in said separate plates; said flat plates including longitudinal slots; and means for tightening each flat plate to a separate plate.

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BENJAMIN HERSH, *Primary Examiner.*

MILTON L. SMITH, *Assistant Examiner.*