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SNAP-ON RELEASE SKI BINDING
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Continuation of application Ser. No. 140,137, Sept. 22, 1961. This application Nov. 23, 1964, Ser. No. 414,512
13 Claims. (Cl. 280—11.35)

This application is a continuation of application Serial No. 140,137 filed September 22, 1961 as a continuation-in-part of application Serial No. 844,284 filed October 5, 1959. Both of these prior applications are now abandoned.

The present invention concerns a ski binding of the type which provides for automatic release of the ski from the ski boot under conditions where, if the ski remained attached to the boot, injury to the skier might result. Bindings of the category indicated are used especially by recreational skiers whose interest is in downhill skiing, a type of skiing best accomplished if the heel of the ski boot as well as the toe is restrained against lifting from the ski.

The early-day bindings whereby both the boot heel and the boot toe were held down on the ski precluded relative angular movement between the boot and ski. Thus, when the ski was deflected or arrested in its motion, the boot partook of the effects, a condition which frequently resulted in injury to the skier, particularly ankle or leg injuries. Similarly, when the skier through simple loss of balance suffered a fall, the lack of provision for any relative angular movement between the boot and ski often caused injury to the skier.

With the advent of mechanical tows, downhill skiing greatly increased in popularity with a commensurate increase in accidents, some of a very serious nature. This led to the development of the so-called "safety" bindings, various types of which now are commercially available. These bindings are of varying effectiveness considered as a group, and the effectiveness of any given binding may vary greatly depending on its adjustment. All depend on the use of a coil spring acting in compression or tension to yieldably maintain a clamp or equivalent part in binding relation to the ski boot. In theory, the loading of the spring is such that the binding will not release under the stress and strain of normal skiing, but only in the event of an unusual or abnormal force, as occasioned by a fall or a slope condition leading to a fall, e.g., a rut or obstacle. In practice, however, due to error or poor judgment on the part of the ski shop attendant or the skier himself, the spring setting is frequently faulty with the result that the binding is incapable of releasing under a force as just indicated or it becomes loosened with loss of the ski during normal skiing, causing a fall.

The springs employed in the prior bindings exert a force always acting in the direction tending to maintain the boot on the ski. Thus, even at the point of the release under the accident condition, the spring, in a manner of speaking, is fighting rather than aiding the release. With some designs, the ski may strike a rut, for example, causing the boot to become appreciably angled on the ski without becoming detached therefrom, the result being that as the skier continues down the slope the ski is subject to detachment during a normal maneuver, a potentially dangerous condition.

With most of the prior bindings, considerable time and bending acrobatics are required for the skier to effect the attachment of the ski to the boot and to detach the ski when the time has come for a rest period or when the ski day is over. In either case, this expenditure of time and effort is annoying and irritating to the skier, substantially subtracting from the pleasure of the sport. At the beginning of the ski day the skier is frequently cold and uncomfortable and anxious to get on the slope as speedily

as possible so as to warm up through the skiing exercise. Conversely, at the end of the ski day he is generally fatigued, and desirous of assuming a posture of relaxation in the comfortable environment of the shelter house. Often the skier during the course of the ski day may refrain from removing his skis—as for a coffee break, which would give him a much needed rest lessening the possibility of an accident, simply because of the nuisance of removing and reattaching his skis.

Although the objects of the invention are surely implicit in the foregoing, the principal objects will be recited with particularity.

Thus, a principal object is to provide a ski binding in which the spring setting or adjustment is taken out of the hands of the skier and made so simple that the possibility of error on the part of the ski shop attendant is rendered most remote.

Another object is to provide a binding in which the spring means under the accident condition throw over center and, accordingly, do not fight the release at the point of the release or permit of the development of relative angular misalignments between the ski and boot such as are conducive to accidents.

Still another object is to provide a binding which allows the skis to be literally snapped on with the skier erect and which may be quickly detached through the use of the ski pole without any bending acrobatics or direct manual manipulation of the binding.

Additional objects and features of the invention will be apparent from the following detailed description going to a preferred embodiment illustrated by the accompanying drawings in which:

FIGURE 1 is a broken elevation, with certain parts appearing in section;

FIGURE 2 is a plan view on the line 2—2 in FIGURE 1;

FIGURE 3 is a fragmentary plan illustrating the action of the release mechanism in the horizontal plane;

FIGURE 4 is a section on the line 4—4 in FIGURE 1;

FIGURE 5 is a view on the line 5—5 in FIGURE 1; and

FIGURE 6 is a view similar to FIGURE 4 but showing the parts comprising the toe mechanism in released position.

Referring first to FIGURE 1, the numeral 10 denotes the ski which has affixed thereto a toe plate 12 and a heel plate 14. These plates may be secured to the ski as through the use of screws.

The ski boot 16, shown in phantom lines, carries a toe fixture 18 and a heel fixture 20 suitably secured to the boot, the use of screws again being contemplated—note screws 19 in FIGURE 2 where the boot is omitted.

The toe fixture 18 comprises a rounded pin or button 22 which may be an integral part of the fixture. Heel fixture 20 is formed with a concavity 24 and is recessed at 26 for a purpose which will later appear. Perforations 28 (FIG. 5) are present for the purpose of "long thongs" should the skier desire to use these.

As shown in FIG. 1, concavity 24 serves to accommodate a pin 30 comprised in the heel mechanism 32. Such pin is formed with a flange 34 which receives the thrust of a plurality of spring washers 38 arranged in pairs as shown within a chamber 35 also housing shims 37. These washers are reacted on by a plug 40 threaded into the housing 42 and having one or more blind bores 44 to accommodate a tool used in the threading-in of the plug. It is preferred that the housing 42 be of cylindrical conformation.

The heel mechanism 32 like the toe mechanism 50, now to be discussed, may be secured to the ski by flat-headed screws 52.

The toe mechanism 50 includes a housing formed of

two parts 54 and 56 which may be die castings. These housing members, which are joined by screws 57, together form a spherical seat for a ball 58. The latter is an integral part of a swivel pin 60.

In addition to the ball 58, swivel pin 60 comprises a second ball portion 62 and a socket portion 64 designed to accommodate the pin or button 22 carried by the toe fixture 18.

The ball portion 62 (FIG. 4) is received between plungers 66 and 68, the inner ends of which are formed to provide a socket for the accommodation of such ball portion. At its outer end each of the plungers 66 and 68 is of reduced diameter 74 and is there surrounded by a Belleville or spring washer 70. A screw 76 threaded into the plungers, 66, 68 secures the spring washer 70 to the plunger. Shims 72 will be seen located between the spring washer and the screw head. A spacer 80 and annular shims 81 locate the outer peripheral portion of each of the Belleville or spring washers 70.

The Belleville washers 70 in the preferred construction illustrated are designed to throw over center under a predetermined load corresponding to an accident condition as hereinafter explained.

Referring to plungers 66 and 68, it is to be observed that each such plunger is formed with a recess 82 and 84 respectively. These recesses accommodate the ends of the short arms of bell cranks 86 and 88 pivotally supported by the lower housing member 56. A lever 90 also finding pivotal support in the lower housing member 56 overlies the bell cranks 86 and 88 and as shown in FIGS. 1-3 extends forwardly of the rounded portion of the housing of the toe mechanism. The lever 90 has a concavity at 90a for a reason later made clear. A pivotally mounted lid or cover 92 is biased by a torsion spring 94 in the direction toward the rounded portion of the toe mechanism housing and overlies the outer end of the lever 90. The pivot pin 96 for the lid 92 finds its support in the lower housing member 56. Also supported by the lower housing member 56 is a spring release element 100, the bulk of which is contained by the upper housing member 54. Such element is formed with a concavity 102 adapted to seat the tip end 110 (FIG. 6) of a ski pole and terminates in a wedge portion 104 best seen in FIGS. 4 and 6. The concavity 102 as seen in FIG. 4 is disposed in an opening 106 in the upper housing member 54.

Operation

With the swivel pin 60 in its position as shown in FIGS. 1, 2 and 4, the skier to affix the boot 16 to the ski has merely to center the pin 22 in the socket 64 and to force the heel of the boot downwardly to locate the heel pin 30 in the concavity 24, this action being facilitated by the recess 26, the walls of which serve to guide the boot heel as required. As should be evident, the described action is accompanied by compression of the spring washers 38 as the pin 30 retracts before it seats in the concavity 24. These washers 38 hold the heel of the boot on the ski and, with the swivel pin 60 disposed with its axis paralleling that of the ski, maintain the pin 22 in its socket 24. The gauge of such spring washers employed at the heel is a function of the weight and skiing ability of the skier. Chamber 35 is dimensioned to accommodate the number of spring washers needed to additively attain the required spring deflection. Shims 37 occupy excess space. At the ski shop or other point of sale the spring washers are contained in individual boxes as determined by their gauges, each box being appropriately marked to indicate the weight range to which the washers are normally applicable.

To remove the boot from the ski, the skier has only to seat the tip end 110 of one of his ski poles (FIG. 4) in the concavity 102 formed in the release device 100 and to apply to the pole such downward force as necessary to spread the plungers 66 and 68 sufficiently to enable

swiveling of the pin 60 (FIG. 3). Thus, by a simple turning movement of the boot the skier is freed from the ski. Using the spring washers contemplated by the illustrated construction, the washers snap over center on the parting of the plungers 66 and 68 which through the action of the bell cranks 86 and 88 cause the lever 90 to swing upwardly. Such upward swinging of the lever 90 raises the lid 92, as illustrated in phantom lines in FIG. 1, and the skier is accordingly advised that the springs 70 are in over-center position. To prepare for the next skiing exercise, the skier merely places the tip end of the ski pole in the depression 90a and forces the lever 90 back to its normal position (FIG. 4). This rotates the bell cranks 86 and 88 in the direction bringing about inward movement of the plungers 66 and 68 and return of the spring washers 70 to their operative position.

On the foregoing, it is to be emphasized that at no time is the skier required to bend over to manually manipulate any lever or other contrivance. The ski is simply snapped on and the steps required to release the ski and reset the spring washers 70 are quickly accomplished through the simple expedient of two quick jabs with the ski pole.

Spring washers 70, like the spring washers 38, are selected in relation to the weight and skiing ability of the skier. In other words, the heavier and/or more powerful the skier the more the resistance of the spring washers employed. Shims 81 are used to compensate for different thicknesses of the metal of the spring washer. Here again, no adjustment need be made by the skier, the proper spring loading at the toe being in effect purchased along with the bindings. Also here again, the spring washers at the place of sale are contained in individual boxes or cartons, the label in each case identifying the spring washer in terms of the weight of skier with respect to which it was designed and indicating the required number of shims to be installed with the washer.

Now as to the operation of the binding in avoiding injuries, assuming an accident condition tending to result in a twisted or broken ankle or leg, the release is as illustrated by FIGURE 3. From such a figure it will be observed that the abnormal force has caused the swivel pin 60 to axially displace the plunger 66 to a point where the spring 70 has been thrown over center, assuring breaking of the ball and socket connection between the ski boot and the swivel pin.

In the event of a backward fall, both spring washers at the toe are normally axially displaced a distance causing over-center deflection of the spring washers. Here, of course, the swivel pin 60 rotates counterclockwise in a vertical plane and through a distance assuring disengagement of the button 22 from the socket 64.

Where the accident condition is such as to induce a forward fall, the release occurs first at the heel. As well understood by those familiar with release bindings, it is highly desirable, if not essential, that the spring loading at the heel very substantially exceed the loading at the toe. Thus for an individual of average skiing ability weighing in the order of 180-190 lbs., a heel loading of from 160-175 lbs. is considered near optimum. This is to be compared to a spring loading at the toe of 40 lbs., in either direction of twist, giving a total resistance of 80 lbs. on a backward fall. Spring washers suited for the practice of the invention are available from responsible manufacturers.

The fact that the skier is not required to manually manipulate the binding on the slope after a fall represents a major advantage of the present binding. Thus the skier after regaining his feet, and with the ski connected to the boot by the usual loose "safety strap," has only to weight the ski with the boot, punch the reset lever with one of his poles and thereafter snap on the ski. With the prior bindings many novice skiers, the individuals who suffer the most falls, are unable to reattach the ski on the slope and must maneuver to a flat

surface, frequently the bottom of the slope, to effect the reattachment.

While the invention has been specifically described in terms of a preferred embodiment, it is to be understood that no limitation to such embodiment is intended, since substantial changes may be made within the scope of the appended claims.

What I claim is:

1. In a ski binding, a body portion adapted for support by the ski, spring means carried by said body portion and means for operatively interconnecting said spring means and the ski boot, said spring means acting normally to prevent a relative displacement of the boot and ski but being adapted of itself to throw over center to allow such displacement when subjected to a predetermined load corresponding to an accident condition.

2. A ski binding in accordance with claim 1 where said spring means is a spring washer.

3. In a ski binding toe piece, a mechanism comprising a pair of spaced spring washers having a common axis, means for mounting said mechanism on the ski ahead of the ski boot with the convex sides of said washers in face-to-face relation and with said axis disposed transverse the ski, and means operably connecting the toe of the boot and said mechanism so that said toe is normally restrained against upward displacement by the conjoint action of said washers and against lateral displacement by individual action thereof, said toe piece being further characterized in that when subjected to an abnormal load reflective of an accident condition tending to laterally displace the toe of the boot the involved washer passes over center with a snap action to release its restraint of the toe of the boot.

4. A toe piece as defined by claim 3 where said last means comprises a pair of plungers disposed end-to-end between said washers and a swivel element located mediate the toe of the boot and said plungers, said swivel element having a portion operatively associated with said plungers and a portion engaging with a fixture carried by the toe of the boot.

5. Apparatus for attaching a ski boot to a ski, said apparatus comprising a mechanism carried by the ski forwardly of the toe of the boot incorporating a pair of plungers which together form a socket, said plungers having a common axis extending transverse the ski, a spring washer associated with each plunger to bias the same toward the other plunger, means providing an operative connection between the toe of the boot and said mechanism, said means including an element having a portion finding accommodation in said socket, and means associated with said boot and said ski releasably restraining the heel of the boot against upward displacement, each of said washers being adapted to snap over center to free the corresponding plunger and to open said socket when subjected to a load reflective of an accident condition tending to displace the toe of the boot laterally on the ski.

6. Apparatus for attaching a ski boot to a ski, said apparatus comprising a fixture on the boot at the toe thereof, a mechanism carried by the ski forwardly of the toe of the boot incorporating a pair of axially displaceable plungers which together form a socket, said plungers being disposed in end-to-end relation with their axes transverse the ski, a spring washer associated with each said plunger to bias the same toward the other plunger, swivel means accommodated in part within said socket and having operable connection with said fixture so that the toe of said boot by force of said spring washer is releasably restrained against upward or sidewise movement on the ski, and means associated with said boot and said ski releasably restraining the heel of the boot against upward displacement and serving additionally to maintain said connection between said swivel means and said fixture, said spring washers each being designed to snap over center to open said socket and free said swivel means

when subjected to a load reflective of an accident condition tending to displace the toe of the boot laterally on the ski.

7. Apparatus for attaching a ski boot to a ski, said apparatus including a fixture on the boot at the toe thereof comprising a pin extending forwardly of the boot and having a rounded head, a mechanism carried by the ski forwardly of the toe of the boot including a housing having therein a pair of axially displaceable plungers which together form a socket, said plungers being disposed with their axes transverse the ski, a spring washer associated with each said plunger within said housing to bias the plunger toward the other plunger, retainer means for each said spring washer, a swivel pin having a ball portion fulcrumed in said housing and a ball portion disposed in said socket, said swivel pin further comprising a socket portion extending rearwardly of said housing and accommodating said first-mentioned pin, said mechanism by force of said spring washers releasably restraining said boot against upward or sidewise movement on the ski, and means associated with said boot and said ski releasably restraining movement of the boot longitudinally on said ski, said last means operating in coaction with said mechanism.

8. Apparatus according to claim 7 additionally comprising wedge means finding support in said housing and depressible to spread said plungers against the load of said spring washers thereby to free said swivel pin for angular movement.

9. Apparatus for attaching a ski boot to a ski, said apparatus including a fixture on the boot at the toe thereof comprising a pin extending forwardly of the boot and having a rounded head, a mechanism carried by the ski forwardly of the toe of the boot including a housing having therein a pair of axially displaceable plungers which together form a socket, said plungers being disposed with their axes transverse the ski, a spring washer associated with each said plunger within said housing to bias the plunger toward the other plunger, said spring washers being capable of over-center deflection under a predetermined load, retainer means for each said spring washer, a swivel pin having a ball portion fulcrumed in said housing and a ball portion located forwardly of said first ball portion disposed in said socket, said swivel pin further comprising a socket portion extending rearwardly of said housing and accommodating said first-mentioned pin, said mechanism by force of said spring washers releasably restraining said boot against upward or sidewise movement on the ski, a second fixture carried by said boot at the heel thereof, a second mechanism carried by said ski rearwardly of said boot and incorporating a stack of spring washers the axes of which parallel the ski, and pin means accommodated in a concavity in said second fixture, said pin means being under the load of said stack of spring washers and acting in cooperation with said first mechanism to normally restrain said boot against longitudinal movement on said ski.

10. Apparatus according to claim 9 additionally comprising wedge means finding support in said housing and depressible to spread said plungers thereby to cause said spring washers to deflect over center, said swivel pin thus being freed for angular movement.

11. Apparatus conforming to claim 9 further comprising a bell crank lever operably connected to each said plunger for swinging movement as the corresponding spring washer deflects over center, said bell crank levers being pivotally supporting by said housing, and a third lever pivotally supported by said housing and operably associated with said bell crank levers for displacement therewith, said third lever as displaced being manipulatable by the skier to reverse the movement of said bell crank levers thereby to deflect said spring washers back over center in the opposite direction.

12. In a ski binding mechanism comprising a pair of

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plungers disposed with their axes transverse the ski, each of said plungers being biased in the direction toward the other by spring means capable of over-center deflection, each of said spring means having positive connection with the corresponding plunger, a bell crank lever operably connected to each said plunger for swinging movement as the corresponding spring deflects over center, and a third lever operably associated with said bell crank levers for displacement therewith, said third lever as displaced being manipulatable by the skier to reverse the movement of said bell crank levers thereby to deflect said spring means back over center in the opposite direction.

13. In a ski binding mechanism comprising within a housing a pair of plungers each of which is axially biased in the direction toward the other by a spring washer capable of over-center deflection, said plungers together forming a socket for the reception of an element through which said mechanism acts to secure the ski boot to the ski, wedge means finding support in said housing and depressible to spread said plungers thereby to cause said spring washers to deflect over center, said element being thus freed for limited movement.

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