United States Patent

[11] 3,618,965

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[54] **SAFETY DEVICE FOR SKIS**
9 Claims, 14 Drawing Figs.

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

[51] **Int. Cl.** **A63c 11/00,**
A63c 9/08

[50] **Field of Search** 280/11.35
C, 11.35 Y

[56] **References Cited**

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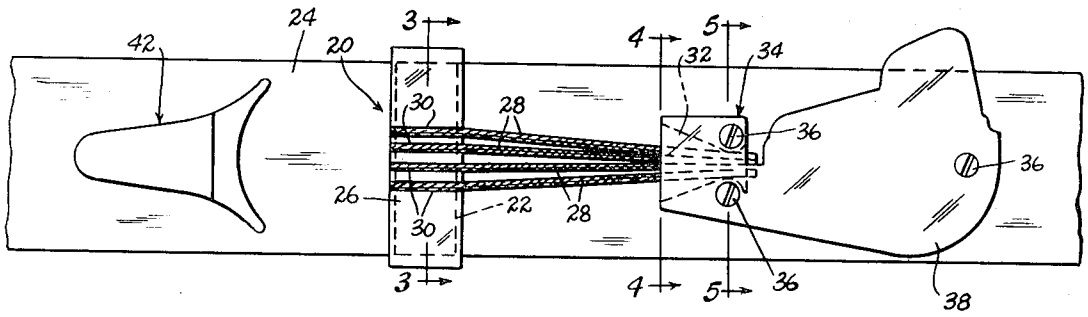
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Primary Examiner—Benjamin Hersh
Assistant Examiner—Milton L. Smith
Attorney—Kingsland, Rogers, Ezell, Eilers & Robbins

ABSTRACT: A novel safety device for materially reducing friction between a ski and a skier's boot sole, particularly in the area of the ball of the foot, on release of the toe binding. One embodiment includes a Teflon tapepiece secured on a ski in the area beneath the ball of a foot for transverse pendulum engagement by the lower surface of a small stainless steel plate pivotally mounted on the ski by a plurality of stainless steel cable segments. A modification includes the stainless steel plate secured to a belting supported capable of transverse pendulum movement. A second modification includes two ball bearing discs mounted transversely of a ski in the ball of the foot area against which the ball of the foot portion of a boot is disposed.



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SHEET 1 OF 2

Fig. 1.

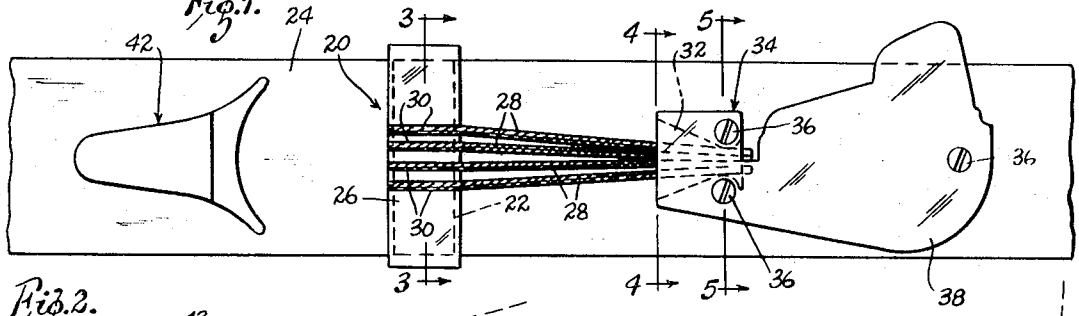


Fig. 2.

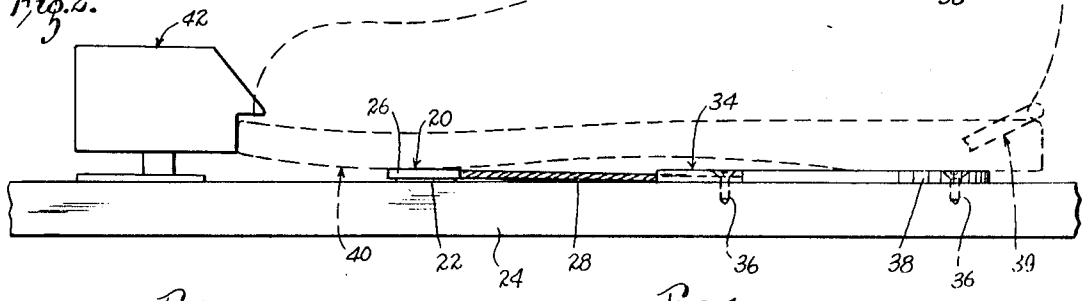


Fig. 3.

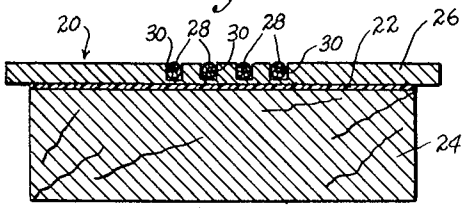


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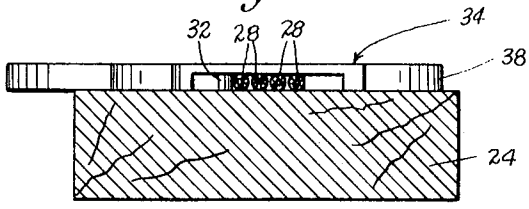


Fig. 6.

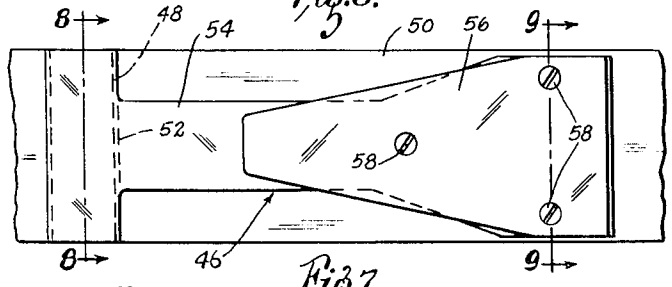


Fig. 5.

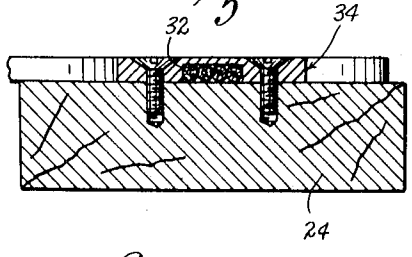


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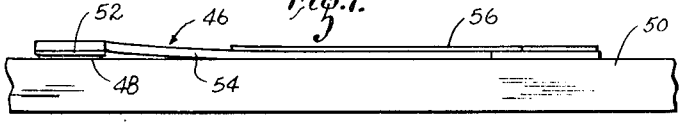


Fig. 10.

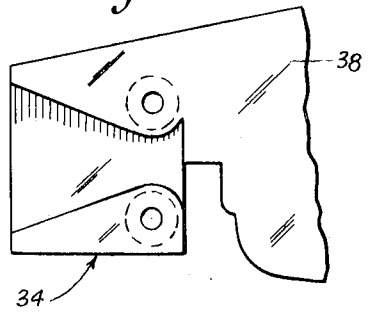


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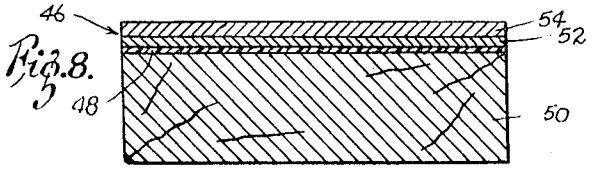
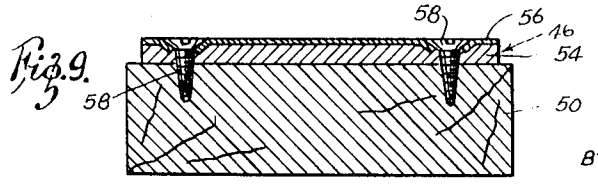


Fig. 9.



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Fig. 11.

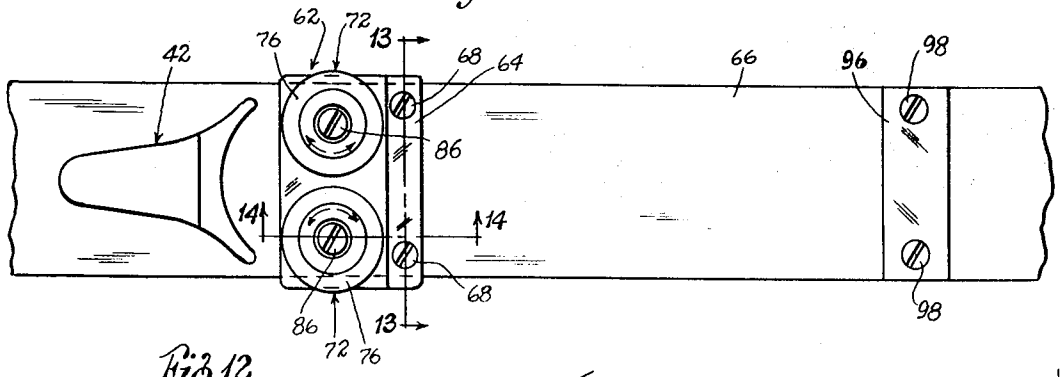


Fig. 12.

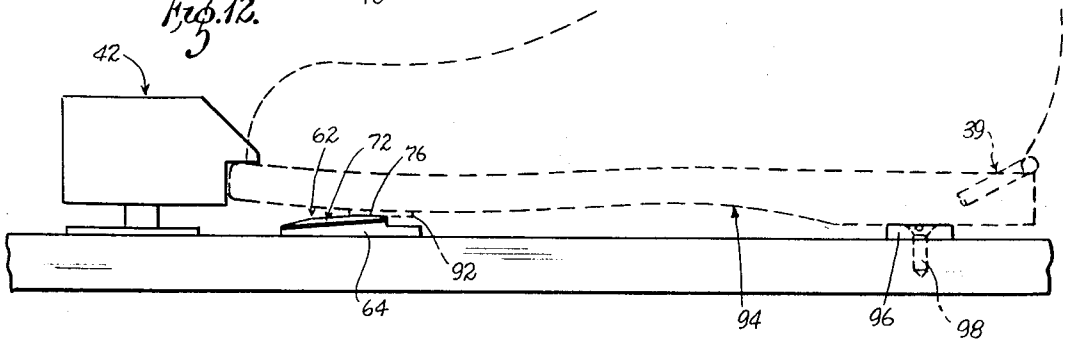


Fig. 13.

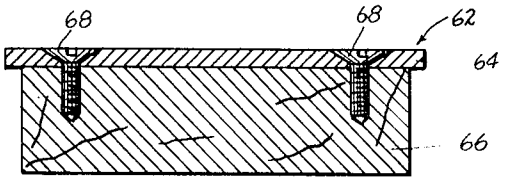
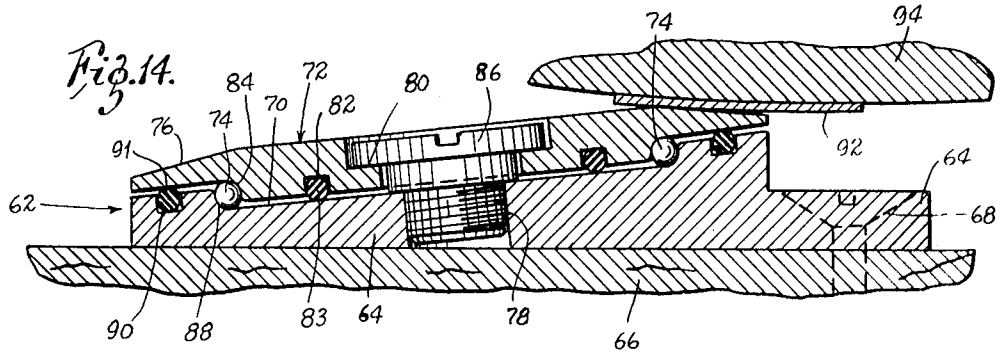


Fig. 14.



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SAFETY DEVICE FOR SKIS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to the skiing art, and more particularly to novel safety devices for skis to reduce friction between the sole of a skier's boot and a ski to materially assist in rendering ski boot toe releases effective.

2. Scope of the Prior Art

Over the years, skiers have become increasingly safety conscious and consequently, a wide variety of automatically releasable ski bindings are now available which securely fasten a skier's boot to the ski under normal skiing conditions but which release the skier's boot in response to abnormally strong lateral pulling forces caused by the lever action of the skis during a fall or other skiing mishap. Injuries most frequently occur when a poorly controlled maneuver results in such a mishap, but with forces exerted in such a way that the bindings do not release readily. When this happens, unless the binding releases before the resulting stress in the skier's legs becomes too great, one or both legs may suffer a twist sufficiently severe to sprain muscles, tear ligaments or fracture bones. Prevention of this type of injury requires lateral release of the toe unit of the ski binding to permit the skier's boot to move laterally out of the binding. When a force exerted from either side of the boot becomes strong enough, it overcomes the spring force in the toe binding and the boot pivots on its heel and moves out of the heel binding and off the ski. This neglects friction between boot sole and ski, which broadly is the subject of this patent. Therefore, the degree of lateral force required to overcome the spring force of the toe binding is critical, since it must be less than the force which would cause serious injury to the leg of the skier.

While commercially available toe bindings are adjustable to permit presetting of a release force safe for the individual skier, it has been found that such bindings frequently fail to release at the preset force under actual use conditions, and, therefore, do not prevent injuries as intended.

Evidence is mounting that one of principal causes of ski release failure and, hence, of lower extremity skiing injuries is friction between boot sole and ski.

Helpful information is found in an article by J. O. Outwater and M. S. Woodard, of the University of Vermont entitled *Skiing Forces And Fractures*. The authors have worked out a method for estimating the strength of the leg bone in torsion by measuring the proximal width of the tibia (this is the width of the tibia at the knee joint), and, by consulting a chart employing Messerer's, data, arriving at the torque range for the bone. These men also used instruments attached to skis being used in normal skiing conditions to determine the maximum twisting force exerted during skiing, i.e., a continuous measurement of the torsional and forward forces during actual skiing. The article makes mention of the friction between boot and ski as an undesirable factor.

With this information, a series of tests was designed by the applicant to measure the torque necessary to cause the toe binding to release. The torsional strength of the applicant's tibia, according to Outwater's and woodard's data, is 1,125 kg.-cm., or converted to English measurements, 980 inch-pounds. According to Outwater, the maximum torsion exerted during any skiing maneuver is approximately 225 inch-pounds.

Tests were performed with a Marker toe binding with visual setting and a Marker Rotomat heel binding. The toe binding was set with a Lipe Release Check, using the number 11 on the plunger, within the recommended setting for the 165-pound weight of the applicant.

The twist necessary to break the release was measured under three conditions: (1) with no weight on the ski; (2) with all of the weight on the ball of the foot in the binding; and (3) with the weight evenly distributed on the two feet, but also forward on the ball of the foot.

Since most skiing is done with the weight forward on the balls of the feet, many falls are taken with weight forward, for example, hitting a patch of heavy snow unexpectedly, which could also produce a slow twist.

It was found that the toe release gives adequate protection with no weight on the ball of the foot, but when the weight is forward, the additional friction between boot and ski, added to the release resistance of the binding, produces a condition very close to or in excess of the strength of the leg bone in torsion.

With no weight forward, the bonding released at 434 to 455 inch-pounds. This is adequate protection, and should not mean excessive binding release. With the weight forward on one foot however, the torque went up to 1,020 to 1,100 inch-pounds above the 980 inch-pounds breaking strength of the leg. The figures for the torsional strength of the bone are, of course, only an approximation, and could be as much as 15 percent in error. The breaking point, then could be as low as 833 inch-pounds, considerably less than it takes to release the binding.

Even with weight evenly distributed between the two feet, but still forward on the ball of the foot, release occurred at 750 to 800 inch-pounds, dangerously near the breaking point of the leg.

Thus, there has long existed the need for devices to augment the functioning of boot toe safety release units to render them effective in use.

BRIEF DESCRIPTION OF THE INVENTION

In brief, a preferred embodiment of the present invention comprises a Teflon strip and the like adapted to be secured to the top of a ski in the area of the sole of the boot of a skier beneath the ball of the foot and a stainless steel plate and the like adapted to be mounted on a ski for pendulum, movement engagement with said Teflon strip upon pivotal movement of the boot of a skier on release of the boot toe. A modification comprises a pair of ball bearing mounted discs adapted to be secured at an angle to a ski in the area of the ball of the boot of a skier and a metal plate adapted to be secured to the sole of the boot in the ball of the foot area for engagement with the discs.

Thus, objects of the present invention are to provide novel ski safety devices of the kind heretofore discussed which fulfill the long need therefor, which are adapted to function effectively in reducing friction and leg fractures for a long period of time with minimum care and maintenance, which can be applied readily to skis and successfully employed with minimum instructions and minimum maintenance, and which otherwise fulfill the objects and advantages sought.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a safety device for assisting in rendering a toe-binding release effective incorporating the teachings of the present invention mounted on a ski in relation to a releasable toe binding, the ends of the ski being broken away for conservation of space;

FIG. 2 is a side elevational view thereof, the lower part of a ski boot being illustrated in broken lines;

FIGS. 3, 4 and 5 are enlarged vertical transverse cross-sectional views taken on the lines 3—3, 4—4, and 5—5, respectively, of FIG. 1;

FIG. 6 is a view similar to FIG. 1, showing a modified safety device mounted on a ski;

FIG. 7 is a side elevational view thereof;

FIGS. 8 and 9 are enlarged vertical transverse cross-sectional views taken on the lines 8—8 and 9—9 respectively, of FIG. 6;

FIG. 10 is an enlarged bottom view of the front portion of the cable clamp member of FIG. 1;

FIG. 11 is a view similar to FIG. 1, illustrating a further modification;

FIG. 12 is a side elevational view thereof, the lower portion of a ski boot being shown in broken lines;

FIG. 13 is an enlarged vertical transverse cross-sectional view taken on substantially the line 13—13 of FIG. 11; and

FIG. 14 is a further enlarged vertical longitudinal cross-sectional view taken on substantially the line 14—14 of FIG. 11.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings more particularly by reference numerals, 20 indicates a novel safety device for materially reducing the friction between the sole of a ski boot and a ski in the area of the ball of the foot as a skier's foot pivots about the heel on release of the toe binding on sufficient lateral stress being applied for some reason to release, the toe binding. The safety device 20 includes a Teflon strip or block 22, or other low-friction plastic and the like, adapted to be, and illustrated, secured to a ski 24 by suitable adhesive or the like, and a smooth stainless steel plate 26, and the like, as smooth polished chrome steel and other nonrusting metals, also adapted to be, and illustrated, mounted on the ski 24 for pendulum movement in engagement with the Teflon strip 22 by a plurality of metal cable segments 28, as stainless steel, galvanized aircraft cable, and the like. The cables 28 are separated at one end and spot welded or the like in spaced parallel grooves 30 in the plate 26 and are contiguous at the other end and captured in the narrow end of a flared channel 32 in a clamp 34 secured to the ski 24 by screws 36. The clamp 34 may include an integral elevating heel plate portion 38, as shown, if desired, which is needed with heel bindings having no heel plate, as the diagrammatically indicated heel binding 39. The flared channel 32 permits limited movement of the cable segments 28 and a pendulum movement of the plate 26 in respect to the Teflon strip 22 and the ski 24. Rest or centered position of the plate 26 is that shown in FIG. 1, which is automatic under the influence of the cable segments. This is a feature of the present invention. Stops, which could fail, and projecting possibly dangerous elements are eliminated.

Thus, the sole of a ski boot 40 will engage the plate 26 in the area beneath the ball of the foot of the skier, pressing the plate 26 against the Teflon strip 22. Upon release of a conventional releasable toe binding diagrammatically shown at 42 on predetermined lateral stress for any cause, friction between the engaging smooth surfaces of the Teflon plate 22 and the stainless steel plate 26 is so small that the boot 40 will readily pivot free of the toe binding 42 without injury to the skier's leg.

In FIGS. 6–9 is illustrated a novel modified safety device 46 which includes a Teflon strip or block 48 adapted to be, and illustrated, secured by cement to the upper side of a ski 50 in the area beneath the ball of the foot of a skier and a stainless steel plate 52 and the like also adapted to be, and shown mounted on the ski 50 for pendulum movement in engagement with the Teflon strip 48 by means of a T-member 54. The plate 52 is cemented to he head of the T-member 54 which may be made of belting material some one-eighth inch in thickness, or other suitable flexible material having a high fatigue factor and which automatically centers the plate 52 in its rest position. A plate 56 of the configuration shown and screws 58 secure the T-member 54 to the ski 50, the plate 56 functioning both as a securing guide for the T-member 54 and as a heel plate for a skier's boot for proper positioning thereof.

In respect to both safety device 20 and 46, any dirt, etc., that may get on the strips 22 and 48, or on the plates 26 and 52 can be readily wiped off by the skier, as by the gloved hand, simply upon raising the latter from the former.

The safety device 46, as the safety device 20, reduced effectively the heretofore experienced friction between a boot sole and a ski, functioning in a manner manifest from the foregoing description. Manifestly, both devices 20 and 46 are marked improvements upon a metal plate applied to the sole of a ski boot and a Teflon piece on a ski, since the plate so attached quickly becomes marked and damaged in wear.

A further modified novel safety device 62 is shown in FIGS. 11–14, which includes a mounting plate 64 adapted to be, as illustrated, secured to a ski 66 by screws 68 in the area beneath the ball of the foot of a skier and spaced rearwardly from a releasably toe binding 42. The plate 64 has a sloping platform 70 which supports two disc members 72 on ball bearings 74. Each disc member 72 is of the radial cross section clearly shown in FIG. 14 including an annular outer beveled portion 76, a central threaded opening 78, an annular shoulder 80, an annular O-ring channel 82, and a ball bearing race 84. A shouldered screw 86 threadedly engages the opening 78 and traps each disc member 72 for free rotary movement, the head of the screw 86 lightly engaging the annular shoulder 80, but permitting rotation of the disc member 72. A low-friction washer may be used on the screw 86. A ball bearing race 88 and an annular O-ring channel 90 are provided in the platform 70 for each disc member 72. Inner and outer O-rings 83 and 91, respectively, of low-friction material are disposed in the channels 82 and 90, respectively, which protect the ball bearings 74 from dirt, moisture, etc., and retain applied lubricants. A stainless steel plate 92 is adapted to be, and is illustrated secured by screws, or the like to the outer sole of a ski boot 94, which may be used if desired. A heel plate 96 may be provided and secured by screws 98 to the ski 66 to compensate for the raised position of the forward part of the boot 94, if needed.

It is clear from the foregoing that the safety device 62, as the safety devices 20 and 46, materially reduces the lateral friction hazard heretofore, existing in the contact of a skier's boot sole with a ski in the area beneath the ball of the foot. Upon release of the toe binding 42 for any reason, the skier's boot 94 will readily pivot right or left about the heel, since the disc members 72 will freely rotate either way as required under lateral movement of the plate 92, friction being greatly reduced thereby to a safe level, so that no injury results to the leg of the skier.

It is manifest that there have been provided novel safety devices for skiing which fulfill the objects and advantages sought therefor.

It is to he understood that the foregoing description and the accompanying drawing have been given by way of illustration and example. It is also to be understood that changes in form of the elements, rearrangement of parts, and substitution of equivalent elements, which will be obvious to those skilled in the art, are contemplated as within the scope of the present invention which is limited only by the claims which follow.

What is claimed is:

1. A safety device for a ski adapted to materially reduce the friction between the boot sole of a skier and the ski in the area beneath the ball of the foot in pivotal action about the heel upon release of the toe by a toe binding due to excessive lateral pressure comprising a first low-friction member adapted to be secured to the upper side of a ski in the area beneath the ball of the foot of a skier, said first member being a Teflon strip, and the like, a second low-friction member adapted to be secured to a ski for pendulum movement transversely thereof and in engagement with said first friction member, said second member being a smooth metal plate, and the like and means for so supporting said second member on a ski, said supporting means comprising a plurality of metal cable segments, one end of each of which is secured to said plate, and a mounting plate, the other end of each cable segment being secured to said mounting plate.

2. The combination of claim 1 in which said cable segments automatically center said plate in rest position for use.

3. A safety device for a ski adapted to materially reduce the friction between the boot sole of a skier and the ski in the area beneath the ball of the foot in pivotal action about the heel upon release of the boot toe by a toe binding due to excessive lateral pressure comprising a first low-friction member adapted to be secured to the upper side of a ski in the area beneath the ball of the foot of a skier, said first member being a Teflon strip, and the like, a second low-friction member adapted to be secured to a ski for pendulum movement transversely thereof and in engagement with said first, friction

member, said second member being a smooth metal plate, and the like, said supporting means including a T-member of resilient material, said plate being secured to the head of said T-member the stem of said T-member being securably to a ski.

4. The combination of claim 3 in which said T-member automatically centers said plate in rest position for use.

5. A safety device for a ski adapted to materially reduce the friction between the boot sole of a skier and the ski in the area beneath the ball of the foot in pivotal action about the heel upon release of the boot toe by a toe binding due to excessive lateral pressure comprising a mounting plate adapted to be secured to a ski in the general area beneath the ball of the foot of a skier, a pair of disc members rotatably mounted on said plate adapted to be engaged by the boot sole of a skier, said disc member being adapted to rotate in either direction as required upon pivotal movement of an engaging skier's boot about the heel.

6. The combination of claim 5 and including a steel plate adapted to be secured to the outsole of a skier's boot in position for engagement with said disc members.

7. The combination of claim 5 in which said disc members are disposed at an angle to the base of said mounting, each disc member including a beveled annular portion feathering to the periphery adapted to be engaged by the boot sole of a skier.

8. The combination of claim 7 in which each disc member is supported from the mounting plate by ball bearings.

9. The combination of claim 8 and including inner and outer O-rings between each disc member and mounting plate protecting said ball bearings.

* * * * *