Nov. 4, 1952 M. H. CUBBERLEY 2,616,714

SAFETY SKI BINDING

Filed May 26, 1950 2 SHEETS—SHEET 1

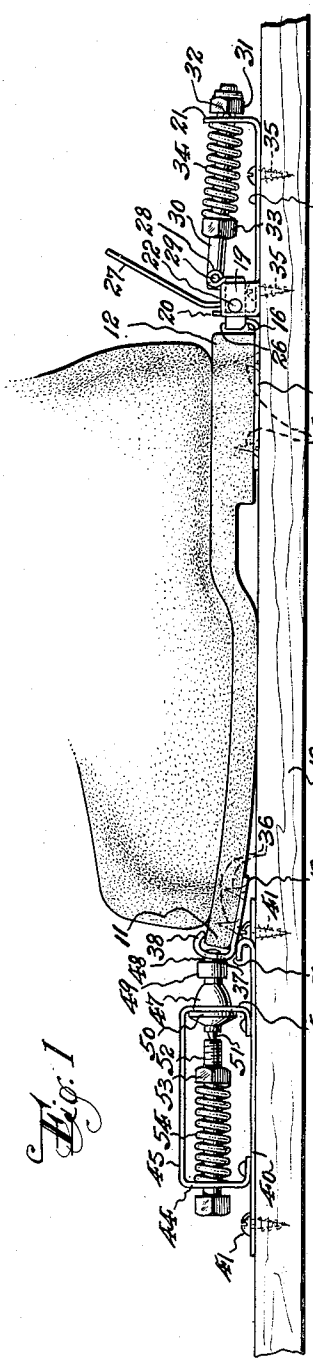


Fig. 1

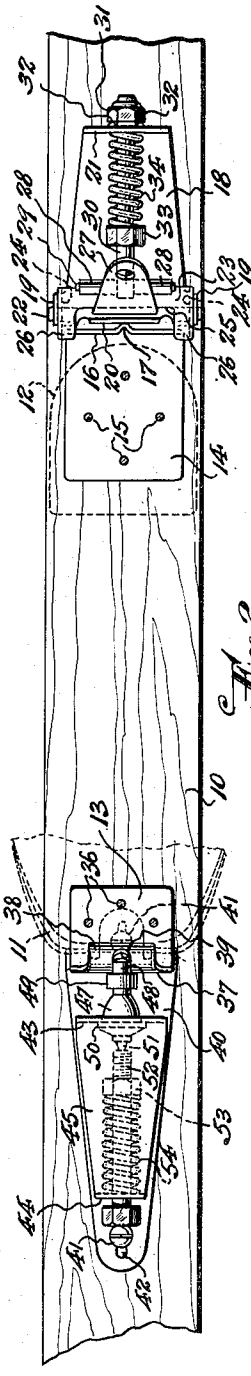


Fig. 2

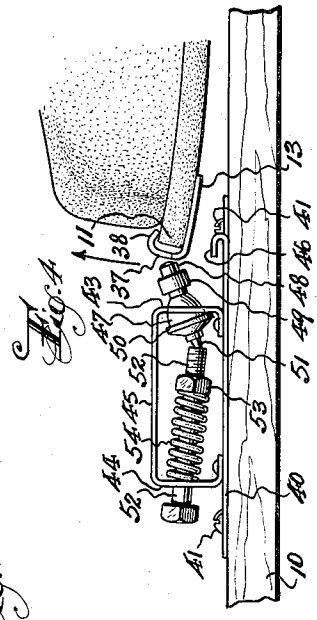


Fig. 4

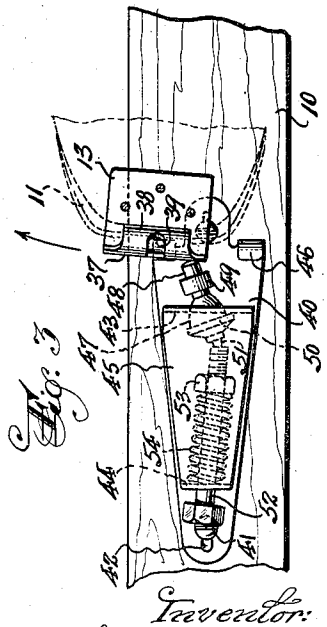


Fig. 3

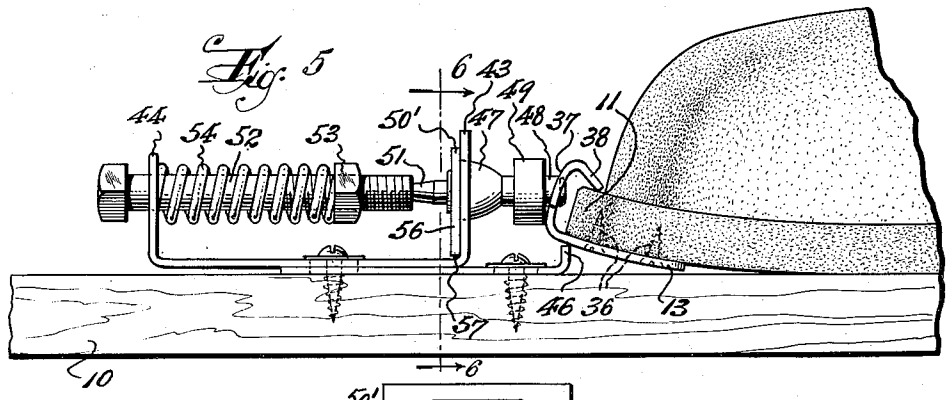
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SAFETY SKI BINDING

Filed May 26, 1950 2 SHEETS—SHEET 2

Fig. 5



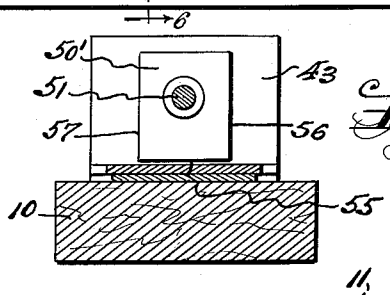
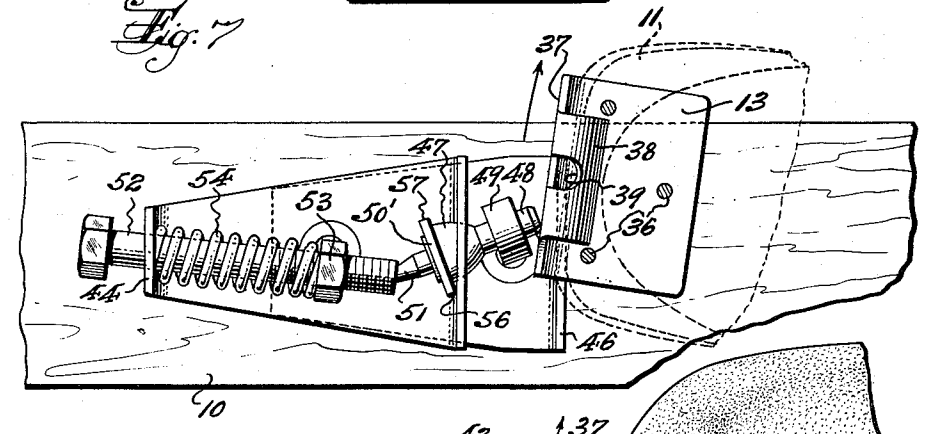




Fig. 6

Fig. 7



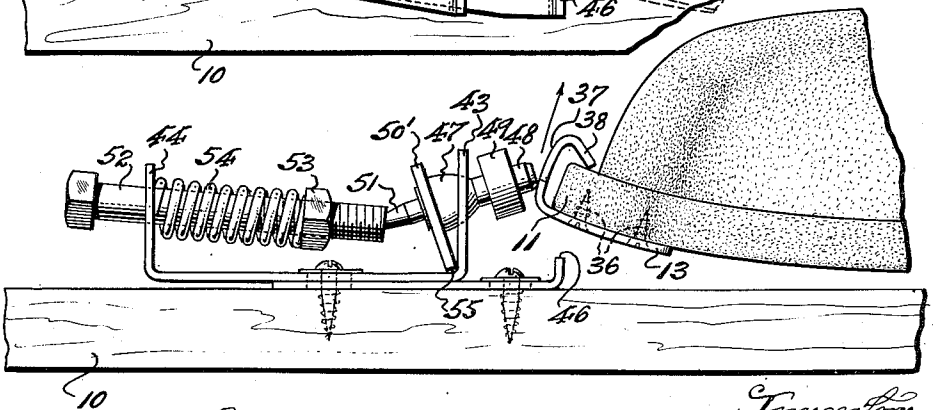




Fig. 8

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# UNITED STATES PATENT OFFICE

2,616,714

## SAFETY SKI BINDING

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Application May 26, 1950, Serial No. 164,334

11 Claims. (Cl. 280—11.35)

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This invention relates to an improved construction of safety ski binding or attachment harness of the type which is subject to quick and easy manipulation whereby to detachably attach a ski to the user's ski boot, and which, under certain conditions, is self-releasing for freeing the boot from the ski.

The present invention has for an object to provide a novel ski binding whereby the toe and heel of a ski boot are separately engaged and held attached to the ski by front and rear spring-loaded retaining devices which are adapted to independently exert regulatable predetermined hold down pressure upon the boot in direction substantially perpendicular to the plane of the ski, whereby to normally bind the ski to the boot; said clamping devices (as a safety factor) being respectively so constructed that each is independently yieldable to force tending to lift the boot away from the ski, if the lifting force exceeds the normal spring induced hold down pressure of either clamping device, so that, in either case, the boot will be automatically released from the ski; the toe clamping device being additionally yieldable to laterally directed or twisting thrust if the force of such thrust exceeds the normal spring induced holding pressure.

The invention has for a further object to provide, in a ski binding, a novel construction of spring-loaded boot toe holding device which is self-releasing under excessive force exerted in any angular direction within a range of arc of 180° above the plane of the ski.

Another object of the invention is to provide, in a ski binding, a novel construction of spring-loaded boot toe holding device which so functions that it offers greater resistance to automatic release under lifting force exerted perpendicular to the plane of the ski than it does to releasing force exerted parallel or transversely angular to the plane of the ski.

Othere objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

Illustrative embodiments of this invention are shown in the accompanying drawings, in which:

Fig. 1 is a fragmentary side elevational view of a ski equipped with the novel ski binding of this invention, the retaining devices of which are respectively shown in their operative holding relation to the toe and heel of a ski boot, whereby to attach the ski to the boot; and Fig. 2 is a plan view of the ski and ski binding of Fig. 1, the heel and toe portions of the engaged ski boot being shown by broken lines.

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Fig. 3 is a plan view of the ski boot toe holding device, showing the same in boot releasing condition under the thrust of excessive force exerted parallel or transversely angular to the plane of the ski; and Fig. 4 is a side elevational view of the ski boot toe holding device, showing the same in boot releasing condition under the thrust of excessive upwardly directed force exerted perpendicular to the plane of the ski.

Fig. 5 is a side elevational view, on an enlarged scale, of a modified construction of the ski boot toe holding device, shown in its operative relation to the boot toe; and Fig. 6 is a detail transverse vertical sectional view, taken on line 6—6 in Fig. 5.

Fig. 7 is a plan view of the modified construction of ski boot toe holding device, showing the same in boot releasing condition under the thrust of excessive force exerted parallel or transversely angular to the plane of the ski; and Fig. 8 is a side elevational view of the modified construction of ski boot toe holding device showing the same in boot releasing condition under the thrust of excessive upwardly directed force exerted perpendicular to the plane of the ski.

Similar characters of reference are employed in the hereinabove described views, to indicate corresponding parts.

Referring to the drawings, the reference character 10 indicates the body of a ski, and the reference characters 11 and 12 respectively indicate toe and heel portions of a ski boot to which the ski is to be operatively attached.

In order to adapt the ski boot for cooperation with the toe holding device of this invention, the sole of the boot is equipped with a specially designed toe plate 13, and the heel of the ski boot is also equipped with a specially designed heel plate 14.

The heel plate 14 is affixed to the bottom of the boot heel 12, as by fastening screws 15, and so that its rearward portion projects somewhat beyond the rear end of said boot heel. The rearward end of the heel plate 14 terminates in an upstanding flange or abutment 16 of suitable height. Said flange or abutment is preferably provided with a rearwardly projecting perpendicular fulcrum nosing 17, the purpose of which will be later herein disclosed.

The heel holding device, in a preferred form thereof, is substantially of the same form and construction disclosed in my copending application for Letters Patent Ser. No. 70,739, filed January 13, 1949, now Patent No. 2,573,955, patented November 6, 1951, and comprises a carrier frame formed by a bottom plate 18 having at its

opposite sides, adjacent to its inner end, transversely aligned, upstanding bearing ears 19. The inner end of the bottom plate 18 is provided with an upstanding stop member 20 of reduced width. The outer end of the bottom plate 18 is provided with an upstanding perforate thrust bearing member 21. Extending between and supported by the bearing ears 19 is a transverse pivot pin or shaft 22. Fulcrumed on said pivot pin or shaft 22 is a clamp plate 23 which is provided at its opposite sides with dependent perforate side flanges 24 through which the pivot pin or shaft 22 extends so as to provide a fulcrum about which the clamp plate 23 can turn. The medial forward marginal portion of the clamp plate 23 is cut back, as at 25, to form forwardly projecting clamp tongues 26 at the respective sides of the clamp plate. These clamp tongues are bordered at their outer sides by the forward portions of the dependent side flanges 24 of the clamp plate 23. Said clamp tongues 26 are adapted to straddle the stop member 20 of the carrier frame, thus holding the heel plate 14 and boot heel against lateral displacement or shift. Integral with the clamp plate 23, and extending upwardly and rearwardly from said cut back forward marginal portion 25 thereof, is a lever member 27 by means of which the clamp plate can be manually actuated. Integral with the media rearward marginal portion of the clamp plate 23 is a pair of laterally spaced knuckle members 28. Pivotally joined to the rear end of the clamp plate 23 by a cross pin 29, which is carried by the knuckle members 28, is the forward end of a rearwardly extending thrust rod 30. The rearward end portion of said thrust rod 30 extends slidably through the perforate thrust bearing member 21 of the carrier frame, being thus fulcrumed on the latter, at a somewhat upward inclination relative to the horizontal plane of the pivot pin or shaft 22 about which the clamp plate 23 turns; the degree of such inclination being predetermined by a stop nut 31 which is threaded onto the rearward end of said thrust rod 30, to normally abut stop projections 32 with which the thrust bearing member 21 is provided. The forward portion of the thrust rod 30 is provided with screw threads and threaded thereon is an adjustable thrust nut 33. Mounted on and around the thrust rod 30, intermediate the thrust nut 33 and the thrust bearing member 21 of the carrier frame, is a compression spring 34. The bottom plate 18 of the carrier frame is affixed to the ski 10 by screws 35.

The toe plate 13 of the boot is also affixed to the toe portion 11 of the boot sole, as by fastening screws 36. The forward portion of the toe plate 13 projects somewhat forwardly beyond the extremity of the toe portion 11 of the boot sole. The forward end of the toe plate terminates in an upstanding flange 37, from the upper end of which extends a keeper tongue 38 which is rearwardly and downwardly bent to overlap and strongly grip the top marginal part of the toe portion 11 of the boot sole, thus reenforcing the toe plate against displacement from operative relation to the latter. Intersecting the juncture of the flange 37 and keeper tongue 38 of the toe plate 13 is a centrally disposed indenting notch or seat 39 adapted to be engaged by a member of the boot toe holding device, as will presently be more fully explained.

The boot toe holding device, in one illustrative embodiment thereof as shown in Figs. 1 to 4 inclusive, comprises a base plate 40 which is suitably affixed to the ski 10, preferably by fastening screws 41 which pass downwardly through slots 42 in said base plate, whereby the latter can be longitudinally adjusted upon the ski, so as to dispose the boot toe holding device for proper engagement with the size of boot worn by the ski user. Affixed to the base plate 40 is a longitudinally disposed carrier frame comprising a perpendicular inner end plate 43 and a perpendicular outer end plate 44 bridged by a top plate 45. The outer end plate 44 is perforated, and provides a thrust bearing plate for purposes presently to be disclosed. The inner end portion of the base plate 40 is provided with upwardly offset abutment members 46 upon which the toe plate 13 of the boot sole impinges or rests, when the boot is footed upon the ski 10, whereby to properly position the toe plate for engagement by the boot toe holding device.



Extending through an opening in the inner end plate 43 of the carrier frame, to project outwardly therefrom toward the toe portion 11 of the ski boot, is a latching member 47 of substantially conical form, the base of which fits the opening in said inner end plate 43. Said latching member terminates at its outer end in an axially projecting latching stud 48. This latching stud preferably includes a diametrically enlarged annular stop portion 49 disposed intermediate its free end portion and the body of the latching member 47. The latching member 47 is provided at its inner end with a diametrically enlarged annular fulcruming flange 50 which normally bears flatly against the inner face of the carrier frame end plate 43. Projecting axially rearward from said fulcruming flange 50 is a coupler pin or stud 51. Extending slidably through the outer end or thrust bearing plate 44 of the carrier frame is a thrust rod 52, the forward end of which is pivotally engaged by the coupler pin or stud 51 of the latching member 47. Said thrust rod 52 is normally axially aligned with the latching member 47 and its latching stud 48. Said thrust rod 52 is provided with screw threads and threaded thereon is an adjustable thrust nut 53. Mounted on and around the thrust rod 52, intermediate the outer end or thrust bearing plate 44 and the thrust nut 53, is a compression spring 54, the tensional pressure or thrust of which can be predetermined by adjusting the thrust nut 53.

To attach the ski to the user's boot, the latter is applied to the ski between the toe and heel holding devices. To permit this, the heel holding device is opened by swinging downward the lever member 27, thus upswinging the clamp plate 23 and thereby raising the clamp tongues 26 out of the way, so that the boot may be footed upon the ski, with the boot toe plate 13 inserted beneath the latching stud 48 of the boot toe holding device in such manner as to seat said latching stud in the notch or seat 39 of said toe plate 13 (see Figs. 1 and 2). This being done, the heel 12 of the boot is brought down on the ski so as to position the upstanding flange or abutment 16 of the heel plate 14 in front of the open heel clamping device, and in the path of down-swinging movement of said clamp plate 23 and its clamp tongues 26. The boot being thus footed upon the ski 10, the fulcrum nosing 17 of the heel plate 14 will be abutted against the stop member 20 so that the boot is engaged between the toe and heel holding devices and thereby held against longitudinal shift or dis-

placement. The heel holding device is now closed by swinging upward the lever member 27 to thereby lower the clamp tongues 26 over the flange or abutment 16 of the heel plate, whereby, under the tensional thrust of the compression spring 34, to normally secure the boot heel against uplifting displacement from the ski, unless excessive uplifting force overcomes said spring tension. Owing to the provision of the stop nut 31, the downward holding position of the clamp tongues 26 can be so limited as to avoid frictional resistance to lateral oscillation of the heel plate flange or abutment 16 relative to said clamp tongues 26 about the fulcruming nosing 17 as a pivot under automatic boot releasing conditions, as will presently be explained.

It will be understood that, when the heel holding device is operative, the toe holding device will be also operative by reason of the seating of the locking stud 48 in the notch or seat 39 of the toe plate 13, so that the toe of the boot is normally held against both upward and lateral displacement from the ski, unless the tensional thrust of the compression spring 54 is overcome by abnormal uplifting or laterally exerted force.

It will be obvious, in the event of a fall or other occurrence which induces an abnormal force tending to separate either the toe or heel of the boot from the ski, and which is in excess of the force of the spring loading, that either the toe or the heel holding device, as the case may be, will snap open, and thus release the boot from the ski. If one holding device snaps open the boot will be displaced therefrom and will pull away from the other holding device, even if the latter remains closed.

The heel holding device holds the heel of the boot down upon the ski so long as the force of the spring induced holding pressure (which acts perpendicularly to the plane of the ski) is not exceeded by a counterrelease force. On the other hand, the toe holding device holds the toe of the boot against displacement from the ski so long as the force of the spring induced holding pressure (which acts both perpendicular and parallel to the plane of the ski) is not exceeded by an upwardly directed or laterally directed counterrelease force.

In the toe holding device the latching means provided by the elements 47, 48, 49, 50 and 51 constitute a bell-crank type of lever which is fulcrumed by the periphery of the fulcruming flange 50 upon the inner face of the inner end plate 43 of the carrier frame. The outer arm of this lever includes the latching stud 48, and the inner or opposite arm of said lever includes the coupler pin or stud 51. Normally the lever thus provided, when the fulcruming flange 50 flatly abuts the inner end plate 43 of the carrier frame, being held in such condition by the tension of the compression spring 54, disposes the coupler pin or stud 51 and latching stud 48 in axial alignment with the thrust rod 52, as shown in Figs. 1 and 2, thereby disposing the latching stud 48 subject to the embrace of the toe plate notch or seat 39 and thus in operative holding relation to the boot toe, and so as to resist both lateral and uplifting displacement of the latter from the ski.

When the boot toe holding device is in the above described retaining relation to the boot toe, in the event a twisting force, i. e. a lateral force in either direction, is transmitted to the boot toe in amount in excess of the holding force exercised by the compression spring 54, the latching stud arm of the lever is swung laterally or transversely angularly about a peripheral point of the fulcrum flange 50 which impinges upon the inner end plate 43 of the carrier frame. Such movement of the lever swings the coupler pin arm of the lever in opposite direction, and thus, by the exerted leverage thereof, moves the thrust rod 52 rearwardly against the tension of the compression spring 54. If such twisting or laterally applied force is continued and is great enough to effect the required amplitude of lever movement, the latching stud 48 will be withdrawn from the toe plate notch or seat 39, thus freeing the boot toe from the ski (see Fig. 3). Such lateral movement of the boot toe will cause the boot heel plate to pivot about its fulcrum nosing 17, and after the boot toe is freed from the toe holding device, boot heel will readily pull away from the heel holding device even though the latter remains closed. It will be obvious, that corresponding releasing action of the toe holding device will occur in response to an uplifting force perpendicular to the plane of the ski (see Fig. 4), if such force is sufficient to overcome the tension of the compression spring 54.

In the form of toe holding device shown in Figs. 1 to 4, the fulcruming flange 50 of the latching lever is of circular periphery so that the radial offset of the lever fulcrum is the same for all directions of lever movement. Under these circumstances, the latching lever requires application thereto of the same amount of releasing force regardless of direction of application whether said direction is lateral, transversely angular or perpendicularly upward; in other words the resistance to release of the boot toe offered by the compression spring 54 is uniform with respect both to twisting or laterally exerted releasing force and to uplifting releasing force. In some cases, however, it may be preferable that greater resistance to releasing force applied perpendicularly upward be offered by the toe holding means than that offered to releasing force applied laterally or in transverse directions. Means to modify the toe holding device for such differential operation is shown in Figs. 5 to 8. Such modified form of the toe holding device comprises the substitution in the latching lever structure, for the annular fulcruming flange 50 of circular periphery, of a rectangular fulcruming flange 50', which is so related to the longitudinal axial alignment of the latch stud 48 and coupler pin or stud 51 that its bottom fulcruming edge 55 is perpendicularly offset therefrom a greater distance than are the laterally offset distances of the opposite side fulcruming edges 56 and 57, the offsetting distances of which are alike. Under these circumstances, the lengths of the bell-crank leverage arms are greater in the perpendicular plane of the latching lever structure than they are in the transverse plane of said latching lever structure, and consequently the throw of said lever structure in perpendicular plane is of greater amplitude than is the throw thereof in transverse plane. As a consequence of this, compression spring 54 must be compressed to a greater degree to effect release of the uplifted boot toe than is necessary to effect release of the laterally or transversely moved boot toe, and therefore greater resistance to boot toe uplifting force is offered by the compression spring 54 than is offered by the latter to lateral or transverse force applied to the boot toe. In other words, greater release force must be applied for uplifting release

of the boot toe than is necessary to be applied for lateral release of said boot toe. This will be understood by comparison of the showings of Figs. 8 and 7 of the drawings.

It may here be pointed out that the boot toe holding device according to this invention is not dependent upon associated use with the particular style or construction of boot heel holding device shown in the drawings and above described, and, although the latter is perhaps preferable, various other and different forms of heel holding devices may be utilized within the broader aspects of my invention.

While I have described my invention in preferred embodiments thereof, it is to be understood that the words which I have used are words of description rather than of limitation, and that changes within the purview of the appended claims may be made without departing from the true scope and spirit of my invention in its broader aspects.

What I claim is:

1. A ski binding comprising longitudinally spaced holding devices adapted to respectively engage a ski boot at toe and heel portions thereof, the boot toe holding device including a toe plate affixed to the ski boot, said toe plate having a projecting portion indented by a seating notch, holding means cooperative with said toe plate, said holding means comprising a latching lever and a spring actuated thrust means, a universal joint connecting said lever and thrust means in end to end relation, means to support the thus connected lever and thrust means in normal axial alignment with the outer end of the lever engaged in the seating notch of the toe plate with boot toe holding effect, and the lever having a radially extending fulcruming flange intermediate its ends and normally bearing flatly against a portion of the support under the pressure of the thrust means, peripheral portions of the fulcruming flange providing fulcrum points about which the lever may selectively pivot upon said portion of the support when the outer end of the lever is subjected to transversely applied or uplifting force sufficient to overpower the counterforce of the thrust means, thereby to disengage the lever from the seating notch of the toe plate with boot toe releasing effect.

2. A ski binding as defined in claim 1 including means for adjusting the tensional force exerted by the spring actuated thrust means upon the lever.

3. In a ski binding having longitudinally spaced holding devices adapted to respectively engage a ski boot at toe and heel portions thereof, a boot toe holding device comprising a toe plate affixed to the ski boot, said toe plate having a projecting portion indented by a seating notch, a latching lever means, a support through which the lever means extends, the lever means having a radially extending fulcruming flange intermediate its ends and adapted to normally bear against the inner face of said support, the outer end of the lever means normally engaging in said seating notch of the toe plate with boot toe holding effect, spring actuated thrust means, means to support said thrust means, and means to pivotally couple the inner end of the lever means with the thrust means, peripheral portions of said fulcruming flange providing fulcrum points about which the lever means may selectively pivot when its outer end is subjected to transversely applied or uplifting force sufficient to overpower the counterforce of the spring actuated thrust means, thereby to disengage the lever means from the seating notch of the toe plate with boot toe releasing effect.

4. A ski binding as defined in claim 3 including means for adjusting the tensional force exerted by the spring actuated thrust means upon the lever means.

5. In a ski binding having longitudinally spaced holding devices adapted to respectively engage a ski boot at the toe and heel portions thereof, a boot toe holding device including a toe plate affixed to the ski boot, said toe plate having a projecting portion indented by a seating notch, holding means cooperative with said toe plate comprising a carrier means affixed to the ski, said carrier means including longitudinally spaced upstanding inner and outer end plates, a latching lever extending through said inner end plate, a spring actuated thrust rod extending through said outer end plate in normal axial alignment with said lever, means pivotally connecting the rearward end of said lever with the forward end of said thrust rod, the forward end of said lever having a latching stud to engage in the seating notch of the toe plate when the lever is in normal axial alignment with the thrust rod, and a radially extending fulcruming flange intermediate the ends of said lever adapted under the thrust of said thrust rod to bear flatly against the inner face of the inner end plate of the carrier means in the normally axially aligned position of the lever relative to the thrust rod, peripheral portions of the fulcruming flange providing fulcrum points impinging upon said inner end plate of the carrier means about which the lever may selectively pivot when the latch stud providing outer end of the lever is subjected to transversely applied or uplifting force sufficient to overpower the counterforce of the thrust rod, thereby to disengage the latch stud from the seating notch of the toe plate with boot toe releasing effect.

6. A ski binding as defined in claim 5 including means for adjusting the tensional force exerted by the spring actuated thrust rod upon the latching lever.

7. A ski binding as defined in claim 6 including means to longitudinally adjust the carrier means on the ski relative to a ski boot to be engaged by the boot toe holding device.

8. A ski binding as defined in claim 5 including means to longitudinally adjust the carrier means on the ski relative to a ski boot to be engaged by the boot toe holding device.

9. A ski binding as defined in claim 5 wherein the fulcruming flange is of greater downward radial projection than of lateral radial projection for the purposes described.

10. A ski binding comprising longitudinally spaced holding devices adapted to respectively engage a ski boot at toe and heel portions thereof, the boot toe holding device including a toe plate affixed to the ski boot and having a projecting portion indented by a seating notch, holding means cooperative with said toe plate comprising a latching lever and a spring actuated thrust means, a universal joint connecting said lever and thrust means in end to end relation, means to support the thus connected lever and thrust means in normal axial alignment with the outer end of the lever engaged in the seating notch of the toe plate with boot toe holding effect, the lever having a radially extending fulcruming flange intermediate its ends and normally bearing flatly against a portion of

the support under the pressure of the thrust means, peripheral portions of the fulcruming flange providing fulcrum points about which the lever may selectively pivot upon said portion of the support when the outer end of the lever is subjected to transversely applied or uplifting force sufficient to overpower the counterforce of the thrust means, thereby to disengage the lever from the seating notch of the toe plate with boot to relasing effect, and the boot heel holding device including a heel plate affixed to the ski boot, said heel plate having an upstanding flange at its outer end, a pivoted clamping plate, means on the ski to support said clamping plate, said supporting means having an upstanding stop member opposed to the heel plate flange, said heel plate flange having a fulcrum nosing to bear against said stop member, whereby to pivot the ski boot subject to lateral swinging movement in the event the boot toe holding device yields to transversely applied force, and spring actuated thrust means operative to normally maintain the clamping plate in holding engagement with the heel plate flange but adapted to yield to upward overpowering counterforce exerted against the clamping plate by the engaged boot heel whereby to disengage said clamping plate from the boot heel to thereby release the latter.



11. A ski binding as defined in claim 10 in which the spring actuated thrust means of both the boot toe holding device and the boot heel holding device are respectively provided with means for adjusting the tensional thrust thereof.

MITCHELL H. CUBBERLEY.


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