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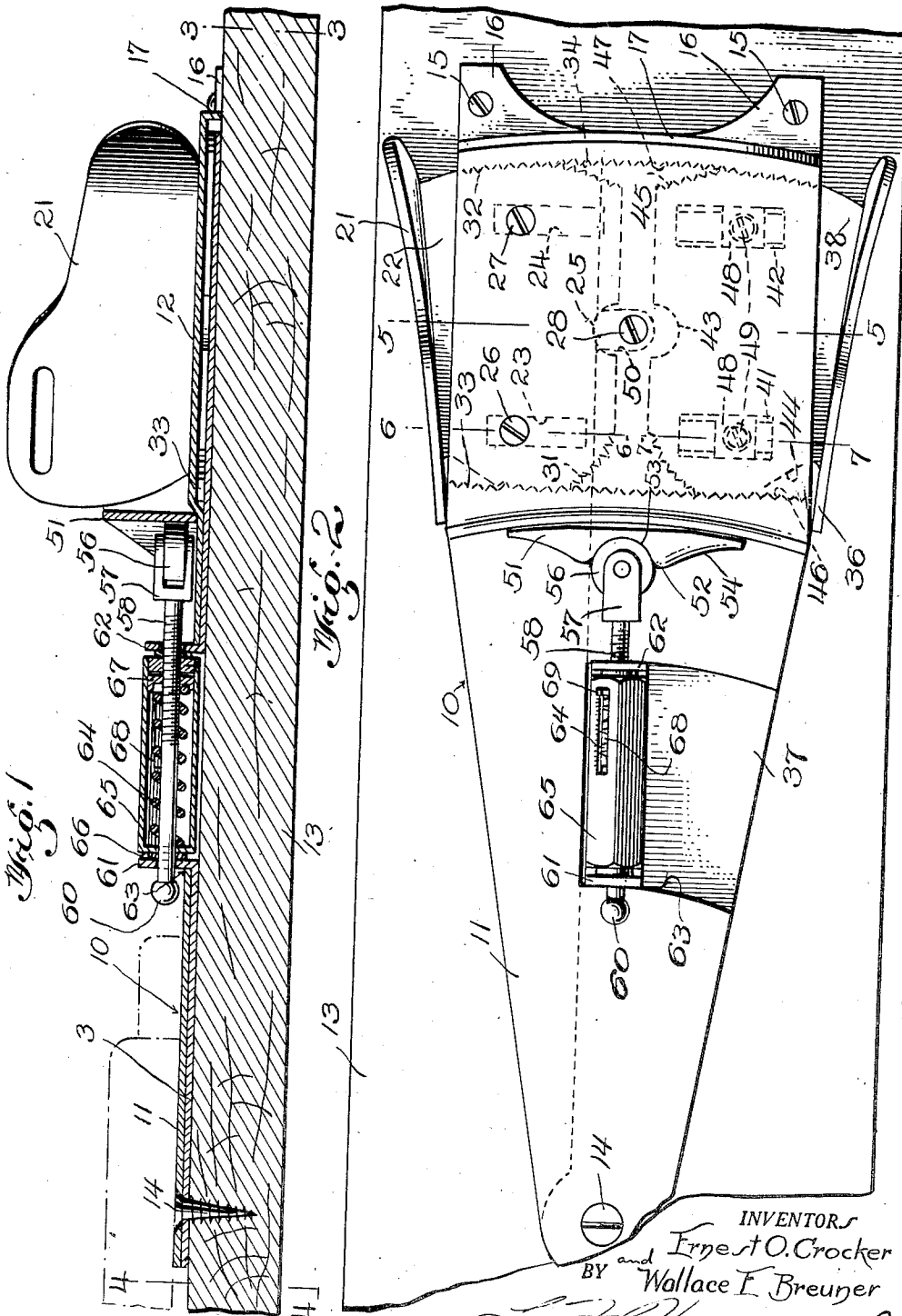
E. O. CROCKER ET AL

2,364,620

SAFETY SKI BINDING

Filed Sept. 25, 1942

3 Sheets-Sheet 1



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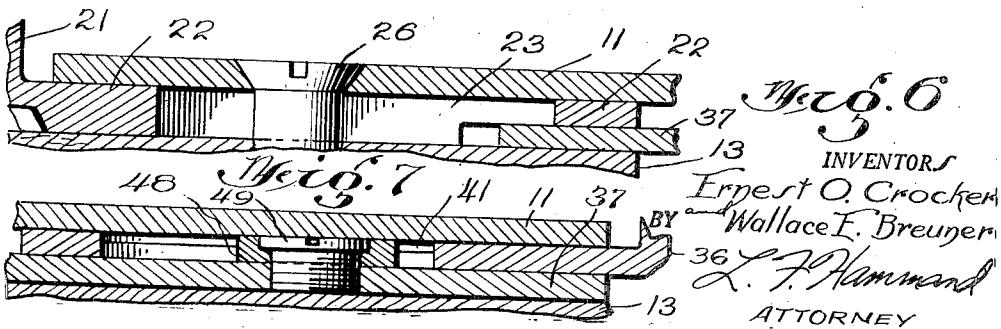
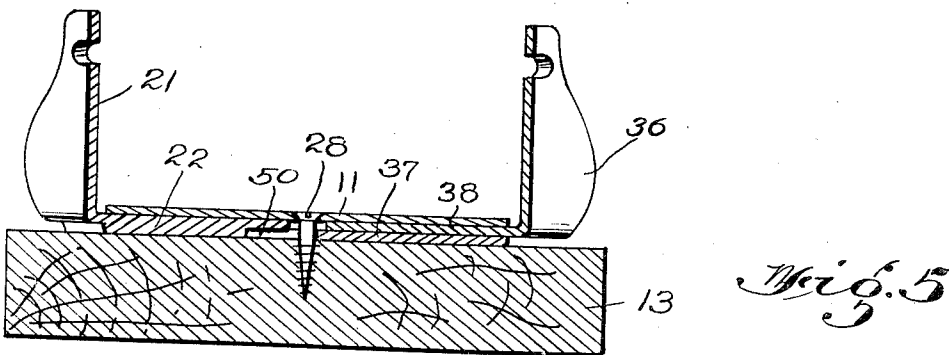
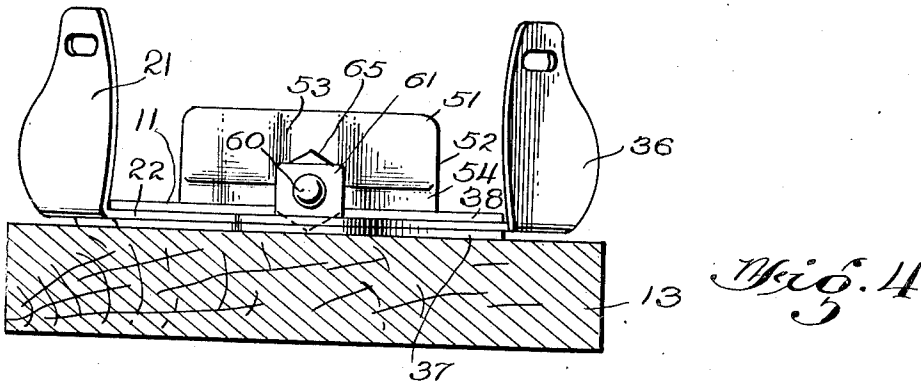
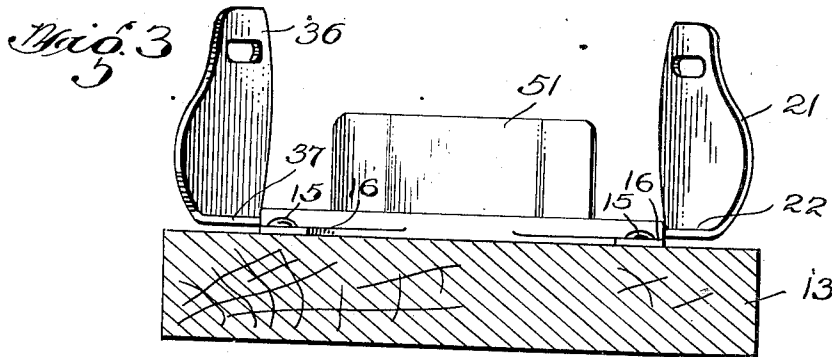
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SAFETY SKI BINDING

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3 Sheets-Sheet 2



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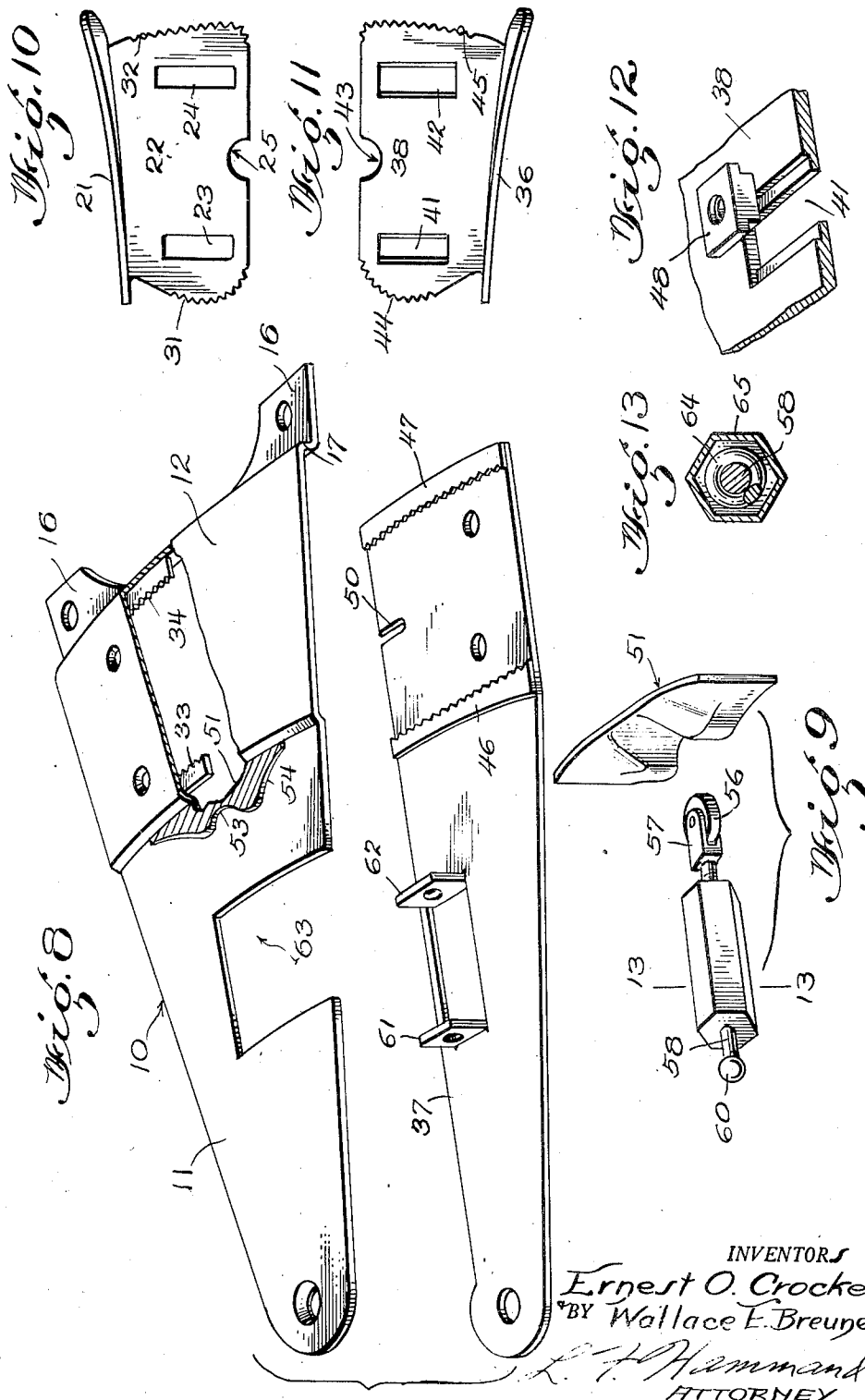
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SAFETY SKI BINDING

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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,364,620

SAFETY SKI BINDING

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5 Claims. (Cl. 280—11.35)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

The invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

The present invention pertains to ski bindings, and has reference more particularly to safety bindings having yieldable toe plates arranged to separate and release in response to a twisting movement of the ski boot relative to the ski, so that in the event of a serious fall the skier's foot will be released from the binding and will prevent any possibility of injury such as might result in the case of a permanently fixed non-releasable binding.

Prior art inventors have for some time recognized the necessity of some form of release for ski bindings and various expedients have been tried in an attempt to perfect mechanically satisfactory release mechanisms, but so far as known to the present inventors these have not been completely successful, since most of them either provide no means for allowing the toe plates to separate from each other or else provide spring devices acting directly between the toe plates, so that the tension exerted by the springs is increased as the toe plates are separated. With such an arrangement it will be obvious that the tension forcing the toe plates together is at its greatest when the skier's foot is severely twisted in the binding and incapable of withstanding great spring tension without some possibility of injury. Further, in some of the prior art devices the arrangement has been such that the sole of the skier's boot could directly contact portions of the releasing mechanism, with the result that in case a severe twisting should occur when the weight of the skier was supported by the ski the weight of the individual would tend to prevent perfect operation of the release mechanism and thus defeat its purpose.

It is, accordingly, the prime object of the present invention to provide a novel and improved safety ski binding of novel and improved mechanical design whereby the above disadvantages are overcome.

A further object of the invention resides in the provision of a pair of separable toe plates for a ski binding in combination with means to resist the separation of the toe plates during their initial movement when they lie in approximately normal spaced relationship with respect to each other, together with means to actively urge the toe plates apart into fully released position when the twisting action of the ski boot is sufficient to

move the toe plates into abnormally spaced relationship.

A further object of the invention resides in the provision of a ski binding including a step plate spaced above the upper surface of the ski and extending substantially the full width of a ski boot, so that the entire weight of the skier will be supported by the step plate, and the movable release devices may be positioned under the step plate where they may be entirely covered and thus free for release movement under any circumstances.

A further object of the invention resides in the provision of a safety ski binding of novel mechanical design and rugged construction well adapted to withstand physical abuse in service and capable of economical mass production methods of manufacture.

The foregoing objects are accomplished in the present invention by providing a relatively wide step plate on the upper surface of the ski and spaced apart above the ski sufficiently to permit free pivotal movement of a release plate located below and entirely covered by the step plate. A pair of vertical side toe plates are secured to the step plate and to the release plate respectively, and these are normally maintained in predetermined spaced relationship by a spring detent arranged to ride over a double incline cam, so that as the toe plates are forced apart by the initial twisting movement of the skier's boot the separation is resisted by the spring detent, but whenever the twist is sufficient to indicate an imminent serious fall the spring detent will ride across a dead center position of the cam and will then actively spring the toe plates apart into fully separated position to completely release the skier's boot and prevent injury when the fall occurs.

Referring now more specifically to the drawings attached to and forming a part of the present specification,

Fig. 1 is a central sectional view through a ski binding constructed in accordance with the teachings of this invention;

Fig. 2 is a plan view thereof;

Fig. 3 is a transverse sectional view taken substantially on the plane of the line 3—3 in Fig. 1;

Fig. 4 is a transverse sectional view taken substantially on the plane of the line 4—4 in Fig. 1;

Fig. 5 is a transverse sectional view taken substantially on the plane of the line 5—5 in Fig. 2;

Fig. 6 is a fragmental detail sectional view of the fixed toe plate fastening taken substantially on the plane of the line 6—6 in Fig. 2;

Fig. 7 is a fragmental sectional view of the

shiftable toe plate fastening taken substantially on the plane of the line 7—7 in Fig. 2;

Fig. 8 is an exploded perspective view of the step plate and release plate;

Fig. 9 is an exploded perspective view of the spring detent and double incline cam;

Fig. 10 is a plan view of the fixed toe plate;

Fig. 11 is a plan view of the shiftable toe plate;

Fig. 12 is an exploded perspective view of a fastening block and a portion of the flat fastening plate of the shiftable toe plate, and

Fig. 13 is a sectional view through the spring housing taken substantially on the plane of the line 13—13 in Fig. 9.

The ski binding includes, in general, a foot rest 10 having a forward extension 11, and generally rectangular rear step plate 12 offset slightly above the forward portion and of a width approximately equal to the width of a ski boot but slightly narrower than the full width of the ski 13. The step plate 12 is mounted on the ski by a front screw 14 at the forward end of the extension 11, and a pair of rear screws 15 extending through lugs 16 offset downwardly from the step plate as indicated at 17. The offset 17 is slightly greater than the combined thickness of the release plate and fastening flange of the shiftable toe plate to be hereinafter described, so that these mechanisms may be free for unrestricted movement under the step plate.

A fixed toe plate 21 is rigidly secured to the lower side of the step plate 12 by mechanism which, while it permits of adjustment to accommodate different widths of ski boots, does not allow movement of the toe plate after such adjustment is made. The fixed toe plate 21 includes an inwardly extending horizontal fastening flange 22 provided with slots 23, 24, and 25 to clear the wood screws 26, 27, and 28 respectively, so that the toe plate may be placed in position and clamped against movement by tightening the screws. The fastening flange 22 includes curved toothed surfaces 31 and 32 at its front and rear edges, the curved surfaces being arranged to mesh in locking relationship with toothed inserts 33 and 34 respectively. These inserts are welded or otherwise secured to the lower surface of the step plate. The arrangement is such that the teeth of the forward edge 31 will engage the teeth of the insert 33 and the teeth of the rearward edge 32 will engage the teeth of the insert 34, so that no relative movement between the toe plate 21 and the step plate 10 is possible when the screws are tight. It may also be mentioned that the fastening flange 22 is thickened, as indicated in Fig. 5, so that it will occupy the full space between the lower surface of the step plate 11 and the upper surface of the ski, thus acting as a spacer below the step plate.

Any conventional resilient strap adapted to pass through holes in the toe plates 21 and 36 may be used for holding the boot in the toe clamp.

A shiftable toe plate 36 is adjustably mounted on the release plate 37, so that different widths of boots may be accommodated by different adjustments of the toe plate with respect to the release plate, and so that the entire release assembly, consisting of the release plate, toe plate, and fastening means interconnecting them, may shift as a unit in order to release the boot of the skier in response to a twisting action between the boot and the ski binding.

The shiftable toe plate 36 is provided with a flat horizontal fastening flange 38 having should-

ered slots 41 and 42, a clearance notch 43, a curved, toothed forward edge 44, and curved, toothed rearward edge 45. The teeth of the forward edge 44 are arranged to mesh with the teeth on an insert 46 welded to the upper surface of the release plate 37, and the teeth of the rearward edge 45 will mesh with the teeth of a rear insert 47 welded to the extreme rear edge of the release plate 37. The shiftable toe plate 36 is adjustably fastened to the release plate 37 by sliding fastening plugs 48 carried by machine screws 49 threaded into the release plate 37, the arrangement being such that while the shiftable toe plate 36 may be adjustably positioned with respect to the release plate 37, yet when the machine screws 49 are tightened the entire assembly will act as a unit and the movement of the entire unit will be controlled by spring detent and cam mechanisms to be described hereinafter. The release plate 37 is notched as indicated at 50, to clear the screw 28.

The toe plate tension control devices of the present structure include a cam and spring detent mechanism associated with the step plate 12 and release plate 37, and operatively engaging each other. The cam consists of double incline cam 51 secured to the plate 10 by welding or any other suitable means, the arrangement being such that the roller of a spring detent mounted on the release plate will ride over the cam surface and accomplish the double function of the toe plate control devices as hereinbefore pointed out; that is, the cam 51 is provided with a rise 52 and a double incline consisting of the surfaces 53 and 54, it being obvious that when the roller is in engagement with the surface 53 it will resist spacing movement of the toe plates of the device, but when the roller is moved sufficiently to cross the rise 52 it will contact with the cam surface 54 to instantly spring the toe plates apart into fully released position. Thus while the fixed toe plate 21 is rigidly secured to the lower side of the step plate 12 by mechanism which does not allow movement of the toe plate, the shiftable toe plate 36 and release plate 37 may shift as a unit in order to permit relative separation of the toe plates and release the boot of the skier in response to a twisting action between the boot and the ski binding.

The cam roller 56 of the detent device is rotatably mounted in a bifurcated head portion 57 of a spring plunger consisting of a threaded rod extending through and between the lugs 61 and 62 on the release plate 37. The lugs 61 and 62 extend upwardly from the surface of the release plate, and the forward extension 11 of the plate 10 is cut away in an arcuate clearance slot 63 so that the release plate 37 will be free for pivotal movement about the screw 14 as a pivot. The head portion 57 is spaced slightly above the upper surface of the plate 10, as indicated in Fig. 1, so that there will be no frictional engagement between the head and the plate, but the width of the head is such that it can not rotate, and, since the rod 58 is permanently secured in the head, the rod will be non-rotatable so that suitable adjustment of the spring mechanism may be made by rotating the spring housing as will hereinafter appear.

It may be noted at this point, however, that the end of the plunger rod 58 opposite the head 57 is provided with an enlarged knob 60 of a diameter greater than the diameter of the perforation in the lug 61, so that the spring detent

unit will remain fully assembled at all times irrespective of the relationship between the step plate and release plate of the binding.

A spring adjustment to vary the pressure exerted by the roller 56 is provided by a coiled compression spring 64 surrounding the rod 58 and positioned inside of a hexagonal spring housing 65. The forward end of the spring bears against the end flange 66 of the housing and is thus supported by the lug 61. The rear end of the spring engages a hexagonal nut 67 threaded on the plunger rod 58, and loosely fitted on the inner surface of the housing 65, so that it may be adjusted longitudinally along the shaft by manual rotation of the housing. The housing 65 may, if desired, be provided with a longitudinal slot 68 on one of its faces in order that an indicating pin 69 attached to the adjusting nut may extend through the slot to give a visible indication of the degree of adjustment of the spring. For this purpose it is contemplated that suitable markings or legible indicia may be provided on the external surface of the spring housing adjacent the slot 68.

From the foregoing, it will be apparent that the present invention provides a novel and improved ski binding well calculated to overcome the inherent disadvantages of the various types of bindings heretofore in use. Further, it will be seen that the device illustrated in the drawings of this application is not liable to failure, even in the event that a severe twisting movement is exerted when the full weight of the skier is supported by the ski binding structure, with the result that the release mechanism is free for unrestricted operation under any circumstances. Further, it should be noted that the toe plate control devices, consisting of the spring detent and double incline cam mechanism, accomplish an entirely new function in the art, since whenever the toe plates are separated sufficiently to indicate that a serious fall is imminent the control devices respond by actively separating the toe plates to their fully released position.

The device illustrated in the drawings of the present application is submitted as a typical embodiment of the teachings of this invention and as one well adapted to illustration of the principles involved; but it is recognized that certain changes and modifications of the exact structure and arrangement of parts may be made without departing from the teachings or underlying principles of this disclosure, and it is therefore requested that the scope of the invention be regarded as limited only by the terms of the appended claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A ski binding including a step plate extending longitudinally of the ski, a release plate below said step plate and pivotally mounted with respect thereto; a pair of toe plates each including a portion underlying the step plate, and fastening means adapted to secure one of said toe plates to the step plate and the other of said toe plates to the release plate; toe plate control devices operatively interconnecting the step plate and release plate, said devices consisting of a spring detent carried by the release plate intermediate said toe plates and the forward end of said release plate, and adapted to engage a double incline cam carried by said step plate, whereby the initial movement of separation be-

tween the toe plates will be resisted by the spring detent, and continued separation after a predetermined point will be assisted by said spring detent and cam.

2. A ski binding including a step plate extending longitudinally of the ski, a release plate below said step plate and pivotally mounted with respect thereto, a pair of toe plates each including a portion underlying the step plate, and fastening means adapted to secure one of said toe plates to the step plate and the other of said toe plates to the release plate; toe plate control devices operatively interconnecting the step plate and release plate, said devices consisting of a spring detent carried by the release plate intermediate said toe plates and the forward end of said release plate, said spring detent extending through an opening in the forward portion of the step plate and adapted to engage a double incline cam carried by said step plate intermediate said opening and the toe plates, whereby the initial movement of separation between the toe plates will be resisted by the spring detent, and continued separation after a predetermined point will be assisted by said spring detent and cam.

3. A ski binding including a step plate, a release plate pivotally mounted with respect to said step plate; a pair of toe plates comprising a fixed and shiftable plate, each including a fastening portion and means for securing the fastening portions of the fixed end shiftable toe plates to the step plate and release plate respectively, and control means spaced from said toe plates and carried by the forward ends of said step plate and release plate, said control means on the step plate engaging the control means on the release plate, whereby said control means resists relative separation of said toe plate when in normally spaced operating position, and actively urges said toe plates apart into maximum spaced relationship with each other responsive to movement into abnormally spaced apart relationship.

4. A ski binding including a relatively long, narrow, thin step plate extending longitudinally of the ski and having the greater portion of its area spaced slightly above the upper surface of the ski; a release plate below said step plate and pivotally mounted with respect thereto at the front end of said plates; a pair of toe plates comprising a fixed and shiftable plate, each including a flat horizontal fastening portion under the step plate, having curved, toothed forward and rear edges; toothed edges associated with the step and release plates, and adapted to engage the toothed edges of the fixed and shiftable toe plates respectively; toe plate control devices operably interconnecting the step plate and release plate, said control devices comprising a double incline cam surface carried by one of said plates, and a spring detent carried by the other of said plates and adapted to engage said cam; and a pair of rear mounting portions of the step plate, the rear mounting portions being offset downwardly a distance greater than the thickness of the flat fastening portions to completely cover the flat fastening portion, prevent contact between the sole of the wearer and the fastening means between the release plate and the shiftable toe plate, and thus provide for free movement of the release plate and shiftable toe plate.

5. A ski binding including a step plate hav-

ing the greater portion of its area spaced slightly above the upper surface of the ski; a release plate below said step plate and pivotally mounted with respect thereto; a pair of toe plates comprising a fixed and a shiftable toe plate, each including a flat horizontal fastening portion under the step plate, the fixed and shiftable toe plates being secured to the step plate and release plate, respectively; toe plate control devices operably interconnecting the step plate and release plate, said control devices comprising a double incline cam carried by one of said plates and a spring detent carried by the other of said

plates and adapted to engage the said cam; and a portion of the step plate adjacent the shiftable toe plate offset downwardly a distance greater than the thickness of the flat fastening portion and secured to the top of the ski, so that the step plate will completely cover the flat fastening portion, prevent contact between the shoe of the wearer and the fastening means between the release plate and the shiftable toe plate, and thus provide for free movement of the release plate and the shiftable toe plate.

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