Sept. 20, 1971 R. G. SPADEMAN 3,606,370

SAFETY BINDING MECHANISM

Filed Oct. 7, 1969 2 Sheets-Sheet 1

FIG.1

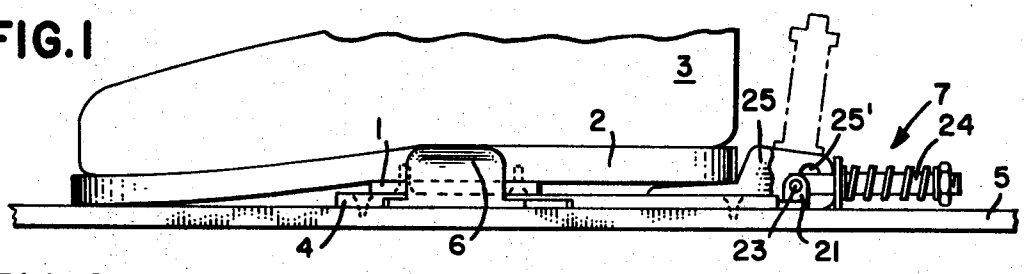


FIG.2

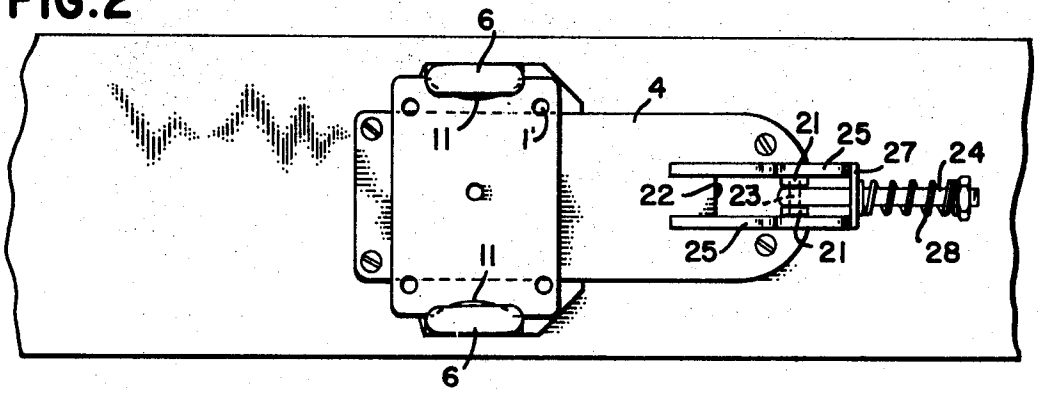


FIG.4

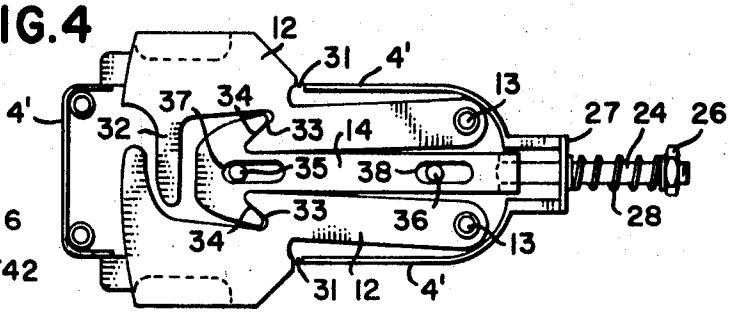
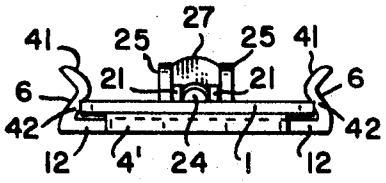


FIG.3



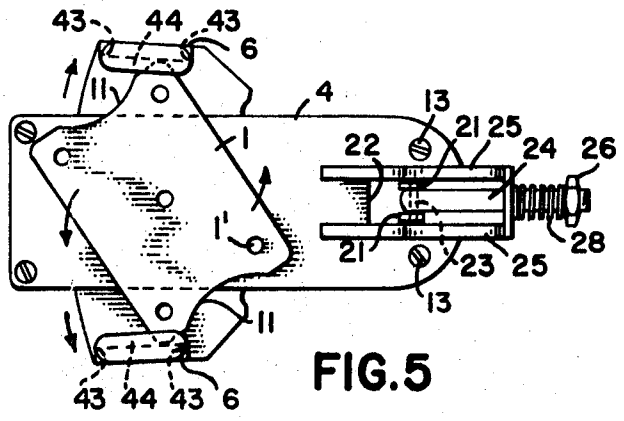
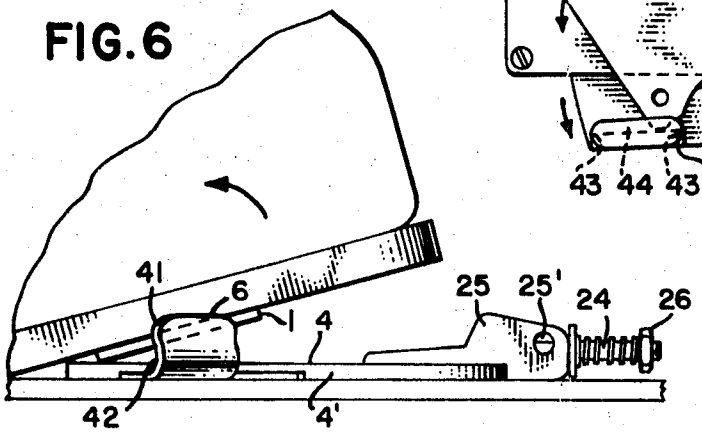


FIG.5

FIG.6



INVENTOR.
RICHARD G. SPADEMAN

BY J. Rosenblum

ATTORNEY

Sept. 20, 1971 R. G. SPADEMAN 3,606,370

SAFETY BINDING MECHANISM

Filed Oct. 7, 1969 2 Sheets-Sheet 2

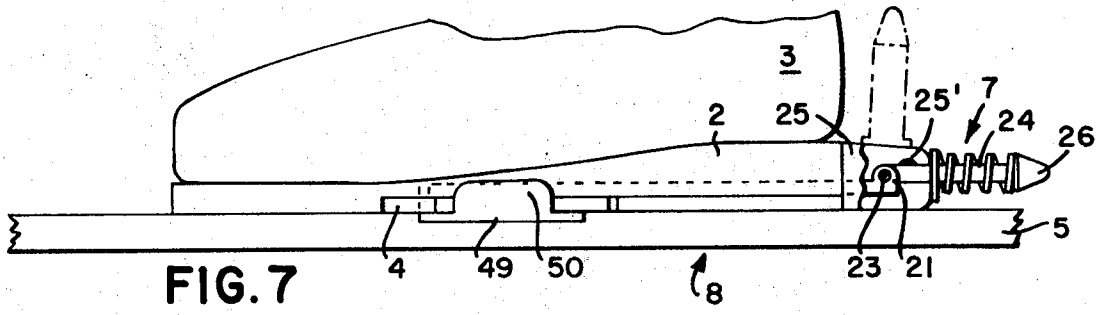


FIG. 7

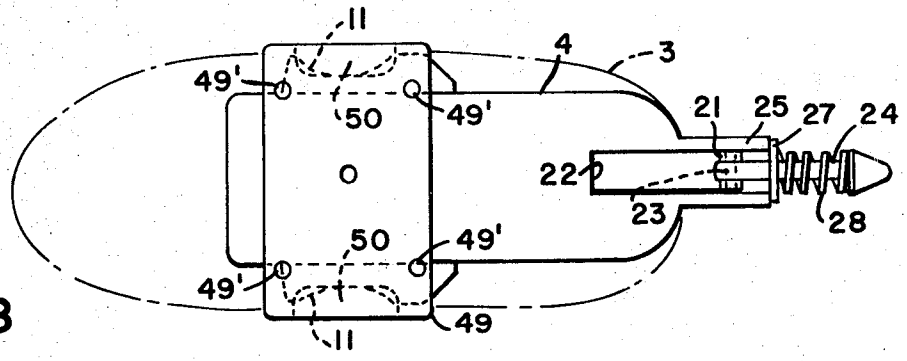


FIG. 8

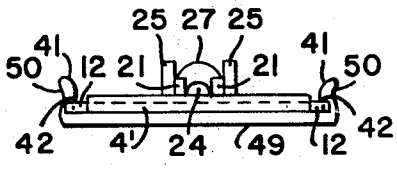


FIG. 9

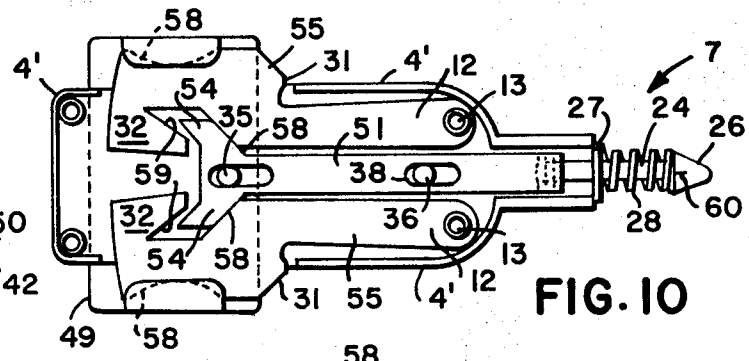


FIG. 10

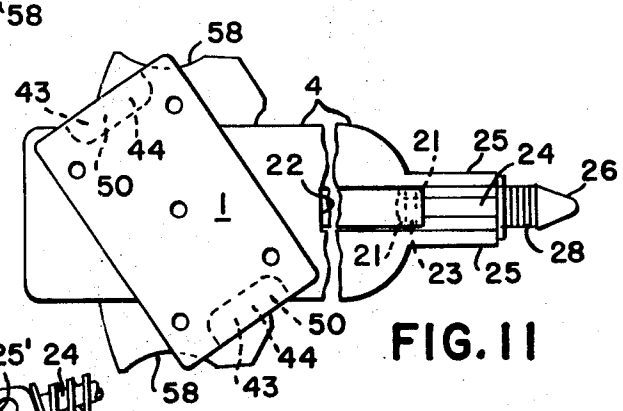
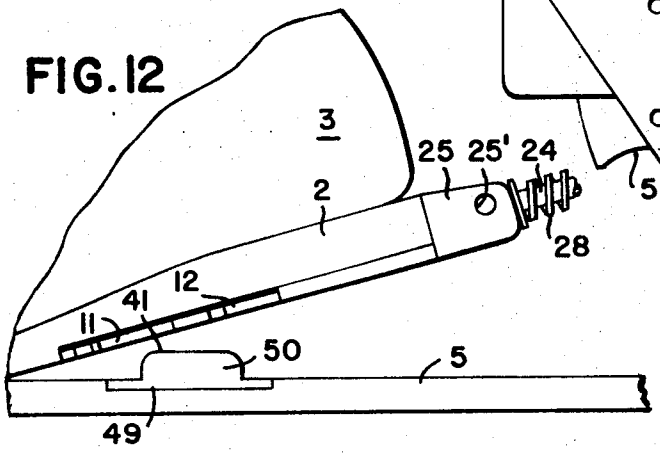


FIG. 11

FIG. 12



INVENTOR.
RICHARD G. SPADEMAN
BY Warren M. Becker
& J. Rosenblum
ATTORNEYS

United States Patent Office 3,606,370 Patented Sept. 20, 1971

3,606,370

SAFETY BINDING MECHANISM

Richard G. Spademan, 933 Addison Ave., Palo Alto, Calif. 94301

Continuation-in-part of abandoned application Ser. No. 769,682, Oct. 22, 1968. This application Oct. 7, 1969, Ser. No. 868,271

Int. Cl. A63c 9/08

U.S. Cl. 280—11.35T 11 Claims

ABSTRACT OF THE DISCLOSURE

A safety binding for use with snow skis and boots consisting of two separable but coacting parts comprising a lever mechanism and a rigid fixed plate. The plate and lever mechanism are each adapted to engage or be engaged by cooperating elements of the other. The lever mechanism comprises a moveable longitudinally-extending spring-biased connecting strip having a wedge shaped end which mates freely with conforming surfaces of a pivotable lever. As the strip is moved, the lever is caused to pivot so as to engage or be engaged by the rigid fixed plate for providing a releasable connection between the plate and the lever mechanism which resists all degrees of relative movement between the ski boot and ski without the necessity of a toe restraining device. The lever mechanism can be mounted in the sole of the booth with the fixed plate mounted on the ski or alternatively the mounting of the parts may be reversed.

BACKGROUND OF THE INVENTION

This is a continuation-in-part of my copending application Ser. No. 769,682, filed Oct. 22, 1968, entitled "Safety Binding Mechanism," and now abandoned.

The present invention relates in general to safety bindings of the type disclosed in my United States Patent 3,271,040, in which a mechanism including means releasably engaging the side portions of the ski boot releasably resists all degrees of movement of the ski boot relative to a ski, namely longitudinal, lateral, twisting and heel-lifting movement, without requiring the use of a toe fastening device. Such a construction not only reduces costs in view of resulting simplification and reduction in the number of parts, but also reduces the risk of leg injury when the toe of the boot encounters an impediment to forward movement during an impending downhill fall condition.

In implementing the structures disclosed in the above patent, however, it has been found that good mechanical stability is often difficult to achieve in view of the close spacing of the various contacting surfaces used to resist the different degrees of movement of the ski boot. It was also found that the binding was frequently subject to misalignment during installation on skis so as to adversely affect its function in operation.

SUMMARY OF THE INVENTION

In accordance with the invention there is provided an improved and simplified binding comprising a wholly-integrated spring-biased lever mechanism which coacts with and releasably engages a rigid fixed plate for providing a much more mechanically stable ski binding than heretofore available and one in which the moving parts are able to be mounted within the sole of a ski boot in the same wholly-integrated fashion. Mounting the majority of the binding in the sole of the skier's boot further reduces the cost of equipment by permitting the same boot to be used with a variety of skis without the need for additional expensive bindings or time-consuming and difficult installations which have often resulted in misalignment of the critical parts.

Accordingly, a principal feature of the invention is a lever which is pivotably mounted adjacent a longitudinally extending connecting strip which is spring-biased at one end and provided with a wedge shaped surface on the other. The wedge shaped surface on the connecting strip mates with and is maintained in sliding contact with a conforming wedge shaped surface on the lever. As the connecting strip is moved, an exterior edge of the lever is caused to engage or be engaged by a corresponding part of a rigid fixed plate fixed to the boot or ski depending on the desired installation.

In one embodiment, the fixed plate is mounted on the sole of the ski boot and the lever mechanism with vertically rising clamps adapted to releasably engage the ends of the plate is mounted on the ski.

In another embodiment, the fixed plate with corresponding vertically rising members is mounted on the ski and the lever mechanism with extendable arms adapted to engage the plate members is mounted on the sole of the boot.

A principal object achieved with the invention as will become more apparent from the detailed description below is a ski binding free from the mechanical instability of the heretofore available side restraint type binding and one which can be mounted in the sole of a ski boot.

Another object is a binding free of frequent misalignment during installation.

A third object is a binding which permits installation of the majority of the hardware in the sole of the boot thereby reducing the time, cost and inconvenience of mounting considerable hardware on the skis thereby permitting the use of a variety of skis without the need for additional expensive bindings or difficult adjustments.

DESCRIPTION OF THE DRAWINGS

The various other objects, features and advantages of the present invention will become more apparent upon a consideration of the following description, taken in connection with the accompanying drawing, wherein:

FIG. 1 is a side elevational view of a ski boot affixed to a ski by a safety binding in accordance with the present invention with the lever mechanism mounted on the ski;

FIG. 2 is a top plan view of the ski boot plate, ski and safety binding of FIG. 1, the remainder of the ski boot having been removed for clarity of illustration;

FIG. 3 is a front elevational view of the ski boot plate and safety binding of FIG. 1;

FIG. 4 is a bottom plan view of the ski boot plate and safety binding of FIG. 1;

FIG. 5 is a top plan view of the ski boot plate and safety binding of FIG. 1, shown as disengaged due to the twisting force of the ski boot;

FIG. 6 is a side elevational view of the ski boot, ski and safety binding of FIG. 1, shown as disengaged due to the heel-lifting force of the ski boot;

FIG. 7 is a side elevational view of a ski boot affixed to a ski by a safety binding in accordance with the present invention with the lever mechanism mounted in the sole of the ski boot;

FIG. 8 is a view taken in the direction of 8 in FIG. 7 of the ski boot mechanism and ski plate;

FIG. 9 is a front elevational view of the ski boot mechanism, ski plate and safety binding of FIG. 10;

FIG. 10 is a top plan view of the ski boot mechanism, ski plate and safety binding of FIG. 7;

FIG. 11 is a view of the underside of the ski boot mechanism, ski plate and safety binding of FIG. 7, shown

as disengaged due to the twisting force of the ski boot relative to the ski; and

FIG. 12 is a side elevational view of the ski boot, ski and safety binding of FIG. 7, show as disengaged due to the heel-lifting force of the ski boot.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIGS. 1–6, there is shown on embodiment of the present invention where the moving parts or lever mechanism is mounted on the ski. A plate **1** attached to the bottom of the sole **2** of a ski boot **3** rests on a plate **4** secured to the top of a ski **5**. Longitudinal, lateral, twisting and heel-lifting movement of the boot **3** relative to the ski **5** is releasably resisted by a safety binding including clamping tabs **6** pivotedly supported at each side of the ski and urged inot engagement with the boot plate **1** by means of a spring-loaded manually-actuated release mechanism **7**. The clamping tabs **6** are, in general, located to the rear fo the point of application of heel-lifting force on the boot, which point is to the rear of the boot toe by an amount which varies with the flexibility of the sole. Typically, with usual boot construction, this point is adjacent the ball of the skier's foot. With rigid soled boots this point is at the toe.

The boot plate **1** has a plurality of holes **1'** for purposes of affixing same as by screws to the bottom of the ski boot sole **2**. The ends of the plate **1**, projecting perpendicularly outwardly from the sides of the boot sole, have concave female surfaces **11** which are generally symmetrical with respect to a transverse axis of the boot **3**.

Each clamping tab **6** is fixedly mounted in upstanding relationship with respect to a lever of plate arm **12**. Each lever or arm **12** is positioned below the ski plate **4** and is pivotedly supported to said plate in parallel relationship thereto by means of a vertical rivet or pin **13**. The arms **12** are driven for pivoted motion about the pins **13**, thereby moving the clamping tabs **6** inwardly or outwardly with respect to the boot plate **1**, by a connecting plate strip **14** attached at one end to the release mechanism **7** and supported underneath the boot plate **1** in parallel relationship therewith. The ski plate **4** has a downwardly depending edge **4'** which supports the surface of plate **4** a sufficient height above the ski **5** to provide space for the clamping arms **12** and connecting strip **14**.

The connecting strip **14** has two upstanding members **21** extending upward from the rearward end thereof through a slot **22** in the ski plate **4**. The members **21** fixedly support a transverse pin **23** therebetween; and a rod **24** of the release mechanism **7** is pivotedly mounted for rotation about the pin **23**. Rearwardly stepped upstanding members **25** extend upward from the ski plate **4** with the connecting strip members **21** being disposed inwardly of, and parallel to, the members **25**. An adjustment nut **26** threaded to the rear end of the rod **24** retains a washer **27** slideably engaged against the rear surface of the ski plate upstanding members **25**, via a compression spring **28** retained between the adjustment nut **26** and the washer **27**. The upper surface of rod **24** can be provided with graduation markings of dots, crosses or numbers not shown which when lined up with corresponding indicia **60** on nut **26** provides a measure of the compression applied to spring **28**. As can be seen in FIGS. 1 and 6, the rear edges of the members **25** are curved and serve as a guide for manually pivoting the rod **24** from the clamped position (shown in full lines in FIG. 1) to the released position (shown in broken lines in FIG. 1).

As seen in FIG. 4, the clamping arms **12** extend through openings **31** in the downwardly depending edge **4'** of the ski plate **4**, and the maximum outward rotation of the arms **12** about the pins **13** is limited by the engagement of the arms **12** against the edge **4'** at the rearward end of the openings **31**. Inwardly directed tongue portions **32** are formed in the arms **12** so as to stabilize these arms **12** between the plate **4** and the ski **5** even when the arms **12** are in this maximum outward position. Each clamping arm **12** further has an outwardly inclined wedge surface **33** formed therein which conforms with a complementary wedge surface **34** formed in the forward end of the connecting strip **14**. Bosses **35** and **36** are formed in the undersurface of the plate **4** and project through respective slots **37** and **38** in the connecting strip **14** to thereby form an alignment guide for longitudinal movement of the strip **14** relative to the plate **4**. The compression spring **28**, acting through pin **23** and upstanding members **21**, biases the connecting surfaces **34** against the clamping arm surfaces **33**, thereby biasing the clamping arms **12** inwardly due to the wedging action of the surfaces **33** and **34**.

The configuration of the clamping tabs **6** is seen in FIGS. 3 and 5. As seen in FIG. 3, the tabs **6** are formed with an inwardly directed arc such that the portion **41** of the tab **6** above the boot plate **1** is upwardly and outwardly directed and the portion **42** which engages the boot plate **1** is upwardly and inwardly directed. As seen in FIG. 5, the outward edges of the tabs **6** are formed with inwardly curved convex male portions **43**, symmetrically disposed with respect to a transverse axis of the ski **5**, which mate in male-female relationship with the concave portions **11** of the boot plate **1**. The two engaging surfaces **43** are tangentially joined by a generally straight surface **44**.

In operation, when the skier desires to mount the ski **5**, the release mechanism **7** is unclamped by rotating the rod **24** counterclockwise as shown by the broken lines in FIG. 1. The wedge surfaces **34** of the connecting strip **14** are thereby disengaged from the wedge surfaces **33** of the clamping arms **12**, whereby the arms **12** are free to pivot outward about the pins **13**. The boot **3** is then placed with the female surfaces **11** of the boot plate **1** engaged inside the upward portions **41** of the clamping tabs **6**. The outwardly angled configuration of the tab portions **41** facilitates such insertion of the boot plate **1**. The boot is then placed to rest with the sole **2** on the ski plate **4**. As seen in FIG. 1, the rear of the boot is stopped by the upward stepped portion of the upstanding members **25** on the ski plate **4**. The heel of the boot rests on the lower stepped portions of the members **25** which serve to compensate for the thickness of plate **1**. Alternatively, plate **1** could be recessed in ski **5** and the lower stepped portion of the members **25** eliminated. Next the release mechanism **7** is activated by rotating the rod **24** clockwise overcenter as shown by the solid lines in FIG. 1, whereupon the spring **28** urges the wedge surfaces **34** against the wedge surfaces **33**, bringing the clamping tabs **6** into engagement with the boot plate **1** as seen in FIGS. 1, 2, 3 and 4. A clip or the like (not shown) may be inserted through the holes **25'** in the upstanding members **25** so that accidental upward movement of the rod **24** is prevented. The ski boot **3** then remains fixed to the ski **5** either until a premeditated release is accomplished by manual unclamping of the release mechanism **7**, or until an impending fall condition causes sufficient force to be transmitted to the safety binding for effecting safety release in a manner which will now be described in detail.

Under the engaged condition, shown in FIGS. 1, 2, 3 and 4, longitudinal, lateral and twisting movement of the boot **3** is resisted by the contacting of the female surfaces **11** of the boot plate **1** with the male surfaces **43** of the clamping tabs **6**. Further, heel-lifting movement is resisted by virtue of the fact that any lifting of the boot plate **1** along the inwardly included surfaces **42** of the clamping tabs **6** increases the friction between the plate and said inclined surfaces. When excessive force is transmitted by the boot to the binding, the clamping arms **12** transmit sufficient forwardly-directed force to the connecting strip **14**, via wedge surfaces **33** and **34**, to overcome the bias of the compression spring **28**. This biasing force can be adjusted for the desired release conditions by suitable

positioning of the adjusting nut **26**. Moreover, it should be noted that the amount of longitudinal force required for release is determined by the ratio of the length of the curved mating surfaces **43** of the clamping tabs **6** to the length of the straight surface **44** of said tabs, said force varying directly with the magnitude of said ratio.

When excessive twisting force is transmitted by the boot to the binding, the female surfaces **11** of the boot plate **1** cam over the male surfaces **43** of the clamping tabs **6**, against the bias of the spring **28**, whereby the boot plate becomes free of the ski as shown in FIG. 5. When excessive heel-lifting force is transmitted by the boot to the binding, the boot plate surfaces **11** cam over the inwardly directed surfaces **42** of the clamping tabs **6**, also against the bias of the spring **28**, whereby the boot plate becomes free of the ski as shown in FIG. 6.

Referring to FIGS. 7–12, there is shown an alternative mounting of the parts of the binding of the present invention on the boot **3**. As shown in FIGS. 7 and 12, the sole **2** of the boot **3** is cut out to receive the plate **4** which encloses portions of the spring-biased release mechanism **7** of the present invention and its associated moving parts.

In the present invention a plate **49** with mounting holes **49'** and vertically rising tabs **50** identical in cross-section to tabs **6** shown in FIG. 3 is mounted on the ski **5**. As shown in FIG. 10, the spring-biased release mechanism **7** is attached to a centrally located connecting strip **51** in the manner of strip **14** of FIG. 4 but has at its left end instead, a left and outwardly directed fin shaped wedge section **54** oppositely directed from that shown in FIG. 4 which mates to conforming surfaces **59** on pivotable members **55**. Pivotable members **55** are each cut out at their outer edge so as to present when extended a concave edge **58** for engagement with tabs **50**. Thus it will be seen from FIGS. 7 and 10 that in operation as the rod **24** is moved from an upright position shown in dotted lines clockwise to a horizontal position as shown in solid lines, the connecting strip **51** will be pulled to the right causing pivotable members **55** to be pushed apart and the exterior concave edges **58** thereof to releasably engage the vertical tabs **50** of plate **49** attached to or imbedded in ski **5**.

It is immediately apparent that except for the reversed mounting of the respective parts, the placement of the external tabs **50** on plate **49** and the reversal of the wedge effect with actuation of the release mechanism **7** to effect binding of the boot **3** to the ski **5**, the principle of operation is in all other respects substantially identical in both of the above-described configurations.

What is claimed is:

1. A safety binding including a substantially rigid fixed mating surface and an engaging means for releasably securing a ski boot to a ski at a point between the heel and toe of said ski boot, said engaging means comprising: a movable elongated connecting strip with a wedge shaped surface at one end; lever means having a first surface adapted for slideable contact with said wedge shaped surface of said connecting strip and a second surface adapted to releasably engage said substantially rigid fixed mating surface to resist fore and aft longitudinal movement of said ski boot relative to said ski; and resilient biasing means coupled to said connecting strip and to means fixed in position with respect to said lever means for urging said lever means into releasable engagement with said mating surface.

2. A safety binding according to claim **1** wherein said mating surface is a plate adapted for mounting on the sole of a ski boot, said engaging means is adapted for mounting on the surface of a ski and said resilient biasing means comprises a rod and spring coupled to said connecting strip for applying a biasing force to said connecting strip to retain in releasable engagement said engaging means and said plate.

3. A safety binding according to claim **1** wherein said mating surface is a plate adapted for mounting on the surface of a ski, said engaging means is adapted for mounting on a ski boot and said urging means comprises a rod and spring coupled to said connecting strip for applying a biasing force to said connecting strip to retain in releasable engagement said engaging means and said plate.

4. A safety binding according to claim **1** wherein said mating surface is a plate comprising a horizontal portion adapted for mounting to the surface of a ski and a vertically rising curved extension; said engaging means together with said lever means and connecting strip are adapted to be mounted to the sole of said ski boot and said second surface of said lever means is concave for engaging said curved extension for releasably resisting longitudinal, lateral, twisting and heel-lifting movement of said boot relative to said ski without requiring the use of a toe fastening device.

5. In a safety binding for releasably securing a ski boot to a ski according to claim **1** wherein said mating surface is located on said ski boot, said engaging means is adapted to be mounted on said ski and said lever means is adapted for pivoted engagement with said mating surface on said ski boot, said lever means having a surface which is inclined with respect to the direction of the pivoted movement thereof; and said connecting means has an inclined surface with respect to the direction of the pivoted movement of said lever means which engages the inclined surface of said engaging means; and means for resiliently urging the inclined surface of said connecting means against the inclined surface of said engaging means, to thereby urge said engaging means into releasable engagement with said boot.

6. The combination of claim **5** wherein: one each of said mating surfaces is located on the respective side portion of a ski boot and said engaging means further comprises a pair of lever means extending longitudinally of said ski and mounted for pivoted movement transverse said ski with a clamping tab extending upwardly from each of said lever means for releasably engaging said mating surfaces.

7. The combination of claim **6**, wherein said clamping tabs engage means on said ski boot for releasably resisting longitudinal, lateral, twisting and heel-lifting movement of said boot relative to said ski without requiring the use of a toe fastening device.

8. The combination of claim **7**, wherein the side edges of said clamping tabs are curved to provide male surfaces which engage said corresponding female surfaces of said mating surfaces.

9. The combination of claim **5**, wherein: said mating surface includes a longitudinally-extending female engaging surface curved inwardly of said ski boot on each side of said boot; and said clamping tabs are curved inwardly of said ski to provide an inwardly directed surface engaging said female surface and an outwardly directed surface disposed above said engaged female surface.

10. The combination of claim **5**, wherein said means for resiliently urging the inclined surface of said connecting means against the inclined surface of said engaging means comprise: a rod pivotedly secured to said connecting means; and a spring for resiliently urging said rod and said connecting means in a rearward direction when said rod is pivoted into a longitudinally extending position.

11. The combination of claim **10**, including a plate member adapted to be secured to said ski with said lever means and said connecting means disposed between said plate and said ski, said plate having a pair of longitudinally-extending rearwardly-stepped members extending upward therefrom, the forward portions of said stepped members providing a stabilizing contact for said boot and the rearward portions of said stepped members

being shaped to provide a guide for pivoting said spring-urged rod, said spring being a compression spring retained between said guide and an adjustment member on the rearward end of said rod.

References Cited

UNITED STATES PATENTS

2,245,850	6/1941	Brown et al.	280—11.35LB
2,381,793	8/1945	Wallace	280—11.35LB

2,682,416	6/1954	Knauf	280—11.35HA
3,271,040	9/1966	Spademan	280—11.35HA

FOREIGN PATENTS

53,727	3/1934	Norway	280—11.35LL
113,183	1/1926	Switzerland	280—11.35LB

BENJAMIN HERSH, Primary Examiner

M. L. SMITH, Assistant Examiner