United States Patent

[11] **3,578,349**

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[54] **SAFETY SKI BINDING**
22 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **280/11.35**
[51] **Int. Cl.** **A63c 9/086**
[50] **Field of Search** ..... 280/11.35 (C), 11.35 (CU), 11.35 (B), 11.35 (B)7, 11.35

[56] **References Cited**

UNITED STATES PATENTS

3,160,421	12/1964	Bugg	280/11.35(CA)
3,206,221	9/1965	Schneider	280/11.35(CA)
3,271,040	9/1966	Spademan	280/11.35(HA)
3,357,713	12/1967	See, Jr.	280/11.35(CA)
3,494,628	2/1970	Spademan	280/11.35(AA)

FOREIGN PATENTS

1,116,657	2/1956	France	280/11.35CA
255,445	1/1949	Switzerland	280/11.35CA
278,973	2/1952	Switzerland	280/11.35CA

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ABSTRACT: A safety ski binding in which the boot is secured to the ski by means of a plate fastened to the boot sole intermediate its heel and toe.

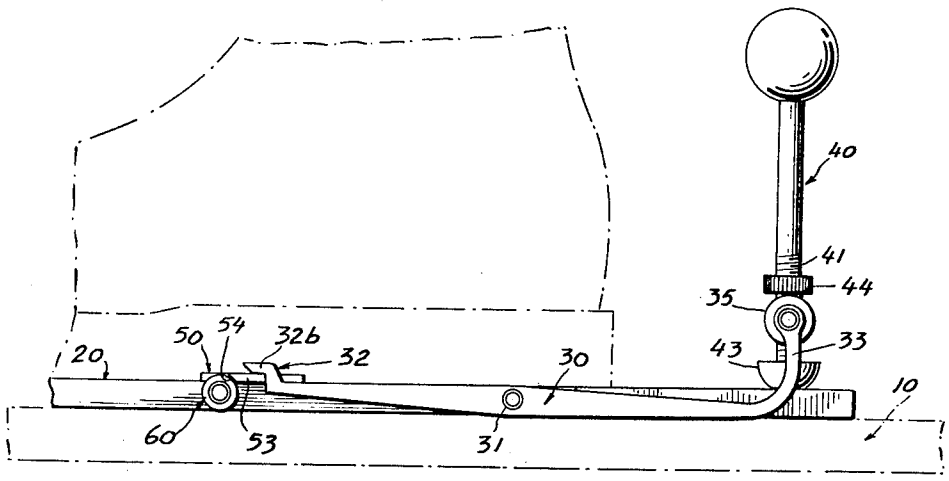


FIG1

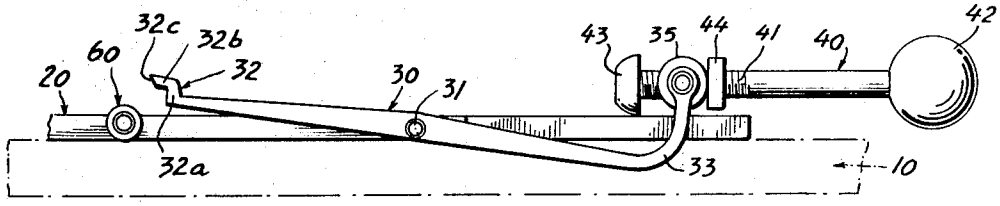


FIG2

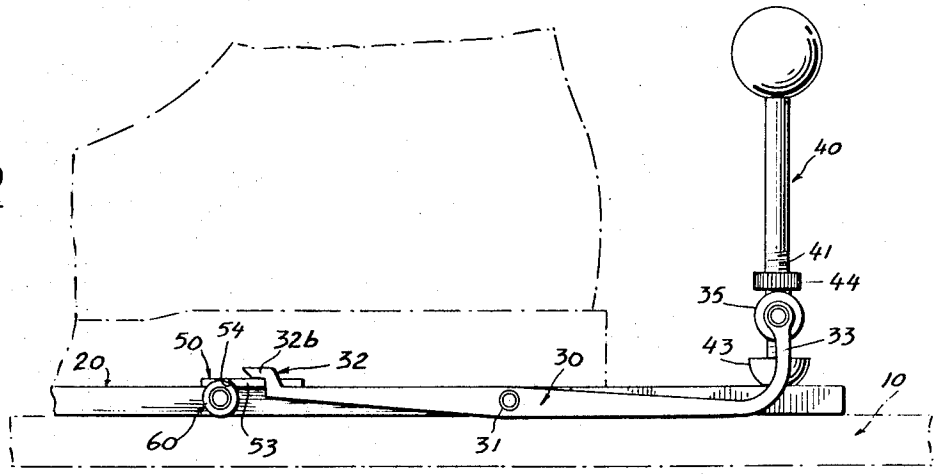


FIG9

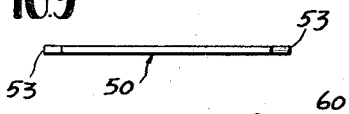


FIG3

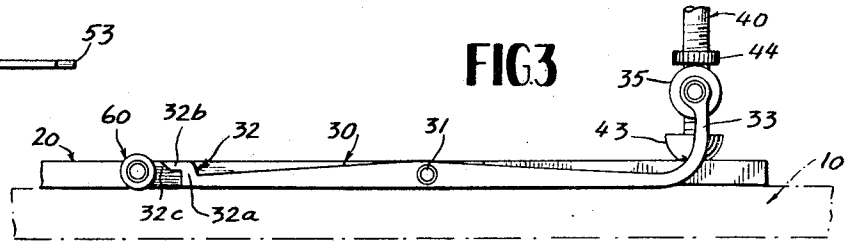


FIG6

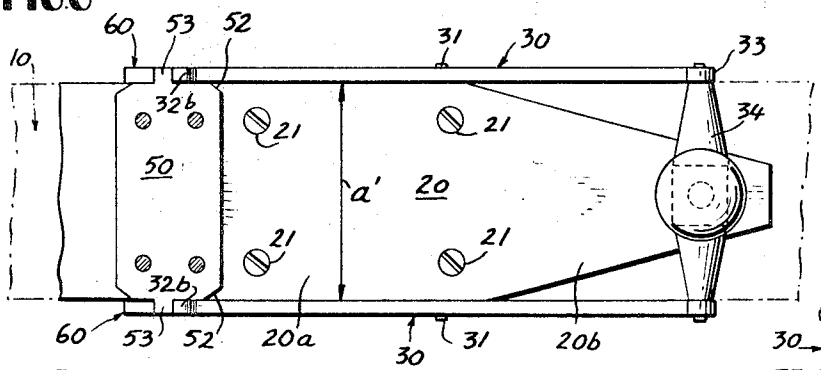


FIG5

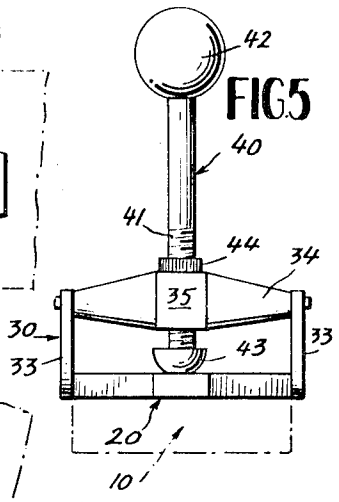


FIG7

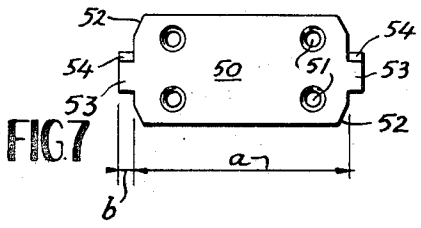


FIG4

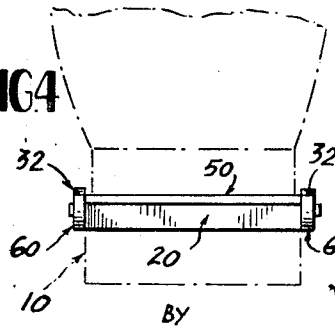
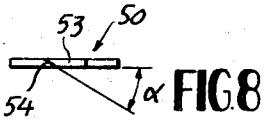


FIG8



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SAFETY SKI BINDING

The present invention relates to a safety ski binding.

Safe ski bindings of the most varied type have found wide applications in recent years to protect skiers against injury in case of falls. For the most part, the prior art safety ski bindings utilize a release mechanism to release the binding in case of excessive twisting force of the leg and a further release mechanism to release the ski binding in case of forward falls. Apart from the fact that generally two separate release mechanisms are used, increasing the number of parts, the time for installation and therewith the cost of the safety ski binding, the prior art safety ski bindings also entail the considerable disadvantage that they require special skills for proper adjustment, are highly sensitive and require readjustments in case of a change in the size of the ski boot of the person using the skis.

It is an object of the present invention to provide a safety ski binding which avoids the aforementioned shortcomings and drawbacks encountered in the prior art.

A further object of the present invention resides in a safety ski binding which is simple in construction, involves relatively few parts and can be used with any size ski boot.

Still a further object of the present invention resides in a safety ski binding which is relatively inexpensive, easy to install and particularly simple in its adjustment while at the same time enhancing ski-edge control.

The underlying problems are solved by the present invention in that the safety binding consists of a ski plate secured to the ski, on which are pivotally mounted along the longitudinal sides thereof, two levers provided at the forward ends with retaining pawls and interconnected at the rear end by a toggle lever assembly, preferably an adjustable toggle lever assembly, to provide the necessary spring loading. Additionally, forwardly of the pawls are mounted on each side of the ski plate a roller which is intended to guide the lateral projections of a sole plate mounted on the sole of the ski boot intermediate its toe and heel in such a manner that the pawls normally hold the projections and therewith the ski boot in place until a predetermined force in excess of the adjusted force occurs, thereby releasing the ski binding.

These and further objects, features, and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, one embodiment in accordance with the present invention and wherein:

FIG. **1** is a side elevational view of the safety ski binding in accordance with the present invention in the released condition;

FIG. **2** is a side elevational view, similar to FIG. **1**, of the safety ski binding in accordance with the present invention with the ski boot held in place by the engaged binding;

FIG. **3** is a side elevational view, similar to FIGS. **1** and **2**, illustrating the position of the parts after release of the ski boot;

FIG. **4** is an end elevational view on the safety ski binding in accordance with the present invention;

FIG. **5** is a rear elevational view on the toggle-lever arrangement of the safety ski binding in accordance with the present invention;

FIG. **6** is a top plan view on the safety ski binding in accordance with the present invention;

FIG. **7** is a plan view on the ski boot sole plate of the safety ski binding in accordance with the present invention;

FIG. **8** is a side elevational view of the sole plate of FIG. **8**; and

FIG. **9** is a transverse elevational view of the sole plate of FIG. **8**.

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, the ski which may be of any conventional construction is generally designated by reference numeral **10** on which is mounted the ski plate generally designated by reference numeral **20** which is fastened conventionally, for example, by screws **21** to the ski. The plate **20**, for ease of manufacture, is a solid plate having a substantially rectangular portion **20***a* and a tapering portion **20***b* (FIG. **6**) extending rearwardly from the rectangular portion **20***a*. One lever each, generally designated by reference numeral **30** is pivotally mounted by conventional means, indicated by reference numeral **31** on the side of the plate **20**. Each lever **30** includes a pawl generally designated by reference numeral **32** at its forward end which is formed by an upwardly extending portion **32***a* and an approximately horizontal forwardly extending portion **32***b* whereby the forward edge **32***c* (FIG. **1**) may be suitably shaped, for example, beveled off to facilitate the release of the boot and to facilitate engagement of the boot plate when inserting the boot in the binding.

Along the rear end, each lever is provided with an upwardly bent portion **33**, the upwardly extending ends **33** of the two levers being interconnected by a yoke member **34**, pivotally connected with each upwardly extending portion **33** and provided with an enlarged portion **35** in its center which is suitably bored and tapped to receive the threaded portion **41** of the adjusting member generally designated by reference numeral **40**. At its upper end, the adjusting member is provided with an actuating member **42** of ball-shaped configuration, though any other shape may be used. At its opposite end, the adjusting member **40** is provided with an engaging member **43** made of any suitable material, such as nylon, steel or the like, which is appropriately secured to the lower end of the adjusting member **40**. The engaging member **43** is of curved configuration, for example, of approximately hemispherical shape to facilitate spring-loading of the levers **30** during tightening of the ski binding and has a flat area on the bottom to ensure stability of the toggle in an upright position when the boot is clamped in place. Additionally, any conventional means, such as, a lock nut **44**, may be provided to hold the adjusting and actuating member **40** in its adjusted position. Elements **41**, **42**, **43** and **34** thus form a toggle lever assembly.

A boot plate generally designated by reference numeral **50** is suitably secured to the sole of the ski boot intermediate the toe and heel and more particularly within the area of the instep, for example, by means of screws (not shown) shown) which extend through countersunk hole **51** provided for that purpose. In lieu of a mounting by means of screws, any other conventional means may be used, such as bonding by means of an epoxy resin which may also be used in addition to the screws. The plate **50** has a generally rectangular shape with its four corners **52** beveled off. Additionally, the plate **50** is also provided with lateral projections projecting laterally beyond the contour of the boot. More particularly, the dimension a of the plate **52** corresponds to the dimension a' of the ski plate **20** whereby the dimension a should not exceed the dimension a' and preferably is slightly smaller. On the other hand, the dimension b i.e., the length of a projection **53**, is such that it extends into the path of the lever **30** and is substantially of the same length as the thickness of each lever.

As shown particularly in FIGS. **7**, **8** and **9**, each projection **53** is also provided with inclined surface **54** whose function will be explained more fully hereinafter. The angle α of the inclined surface with the horizontal is about 30° to 50°.

A roller generally designated by reference numeral **60** is mounted conventionally on each side of the plate **50** at a point forwardly of the pawl **32**. More particularly, the roller **60** should be spaced from the forward surface of portion **32***a* of the pawl to such an extent that it will just accommodate the projection **53**.

OPERATION

The safety release binding of the present invention functions as follows:

The binding is normally in its position illustrated in FIG. **1**, in which the member **40** is rotated through about 90° so as to be parallel to the surface of the ski. As a result thereof, the levers **30** assume an inclined position so that the forward end including the pawl of each lever is located above the surface of the plate **20**.

To mount a boot, provided with a sole plate **50**, on the ski, the boot is inserted from in front by sliding the boot backwardly until the lateral projections **53** engage behind the rollers **60** with the ramp surfaces **54** in engagement with the roller **60**. Thereafter, the actuating member **40** is pivoted counterclockwise through about 90° as viewed in FIGS. **1** and **2**, whereby the engaging member **43** engages with the surface of the plate **20**, thereby raising the rear portions **33** of the levers by pivoting the same about the pivot pins **31** so that the forward ends including the pawls are rotated counterclockwise and the forwardly extending portion **32***b* of the pawl engages the top of the lateral projections **53**. The levers and pawls **30**, **32** which are of steel, hardened and tempered after machining, act as springs, spring-loaded by the counterclockwise pivotal movement of the actuating member **40**. As a result thereof, each lever **30** functions as a second-class lever, pivoted approximately in the center, with one end bearing on the boot plate **50**, and the other end forced upward by means of the toggle lever **40** in order to exert the desired pressure on the boot plate to hold the same by a clamping action. The spring load can be adjusted by mere rotation of the toggle member **40**, thereby raising and lowering the position of the engaging member **43**. It is normally so adjusted that the boot is held in position during normal forces but is released when the forces at the boot, either twisting forces or forwardly directed forces exceed a predetermined value, determined by the adjustment of the member **40**. Once the force at the boot exceeds the predetermined force, the boot is able to slide out over the roller **60**, the pawl **32** snaps downward below the level of the ski plate top (FIG. **3**) to thereby permit the boot to slide away from the ski without any obstruction on the part of the lever **30** or its pawl **32**.

Thus, the pawls **32** are normally spring-loaded so as to maintain a rigid connection between the boot and the ski until a twisting force, nearly great enough to injure the skier's leg is encountered. When this force is reached, the spring-loading force on at least one of the pawls is exceeded, causing the pawl to lift and release the boot plate. For example, if the twisting force at the boot is clockwise, as viewed in plan view on the ski, the left pawl **32** will release, permitting the boot plate to twist out of its restraint by the pawls. If the twisting force is counterclockwise, the right pawl **32** will release, permitting disengagement of the plate **50** from the ski.

In the event the skier encounters an obstruction which stops one or both of the skis suddenly, the strong forward force on the boot plate will cause the pawls **32** to lift and to permit the boot plate **50** to slide forward out of engagement with the ski.

The rollers **60** rotatably connected to the sides of the ski plate **20**, bear against the forward, sloping edges **54** of the projections **53**, thereby forming an abutment means restraining forward motion of the boot plate when clamped down or held down by the clamping means constituted by the pawl **32**. This arrangement causes the boot plate projections **53** to move, in effect, up an inclined plane when releasing from the ski. Consequently, the release force in the ski binding of the present invention can be adjusted to a reliable, predictable value.

The roller pivot pins, the boot plate projections, the pawl-bearing surfaces and pivot pins should be suitably lubricated with a grease or with a solid-state lubricant such as molybdenum disulfide in order to reduce friction to a minimum and insure that the boot release force is of consistent magnitude.

It is also highly desirable as in other conventional release bindings to assure low friction at the points of contact between the boot sole and the ski plate by the use of metal or plastic plates attached to the sole at the toe end and at the heel. The toe plate is particularly important in assuring a reliable release. For the same purpose, the plate **20** may be extended forwardly or, in order to save weight, a separate section may be provided forwardly of the normal position of the sole plate **50** within the area of the toe portion of the boot so as to provide a level support for the boot. If so desired, the toggle lever structure may also be spring-loaded to prevent chatter in the released condition and may be provided with means to permit conventional anchoring of a strap to hold the ski in case of binding release.

The present invention provides several advantages over the prior art bindings.

1. The firm spring-pressure clamping the edges of the boot to the edges of the ski assures enhanced ski-edge control, permitting more precise, accurately controlled turns.

2. The installation of the binding is very simple, and unlike those of conventional bindings with separate heel and toe units, can be installed in a relatively short time with little skill. Additionally, the safety binding of the present invention eliminates the need of a careful, skilled adjustment, necessary with the prior art bindings to insure proper operation of the safety release feature thereof.

3. The safety binding of the present invention excels by simplicity in that it has fewer and more simple parts than any safety bindings used heretofore, especially those utilizing separate heel and toe units. Every boot, provided with a plate **50** will fit every ski with no adjustment required, a feature particularly important to rental applications.

4. The solid metal boot plate **50** has a "manufactured-in" fit relative to the ski plate pawl-roller assembly which is permanent and completely firm with zero clearance since the lever **30** and roller **60** are pivotally mounted to the plate **20** at the plant in proper relation to each other.

While I have shown and described only one embodiment in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to a person skilled in the art, for example, instead of the toggle lever assembly, a conventional spring means may be provided to spring-load the levers; and I therefore do not wish to be limited to these details but intend to cover all such changes and modifications as are within the scope of those skilled in the art.

I claim:

1. A safety ski binding, characterized in that a boot is clamped to a ski exclusively within an area intermediate its toe and heel portions, comprising a sole plate adapted to be mounted on the ski boot intermediate its sole and heel and provided with lateral projections, a ski plate mounted on the ski, lever means pivotally mounted along the sides of the ski plate and provided along the forward ends with pawl means, abutment means mounted forwardly of the forward ends of the pawl means along the sides of the ski plate at a distance from the forward surface of the pawl means corresponding substantially to the dimension of a projection, and means for spring-loading said lever means.

2. A safety ski binding according to claim **1**, characterized in that the spring-loading means includes connecting means interconnecting the rear ends of the lever means and means for holding the lever means in the engaged spring-loaded position.

3. A safety binding according to claim **2**, characterized in that the abutment means are pivotally mounted roller means.

4. A safety binding according to claim **3**, characterized in that the projections are provided with sloping surfaces adapted to engage with the roller means.

5. A safety binding according to claim **4**, characterized in that the connecting means includes a connecting portion pivotally connected with the rear ends of the lever means and receiving toggle-lever means having an engaging portion for engagement with the surface of the ski plate.

6. A safety binding according to claim **5**, characterized in that the toggle lever means is threadably received in the connecting portion to permit adjustment of the spring load of the lever means.

7. A safety binding according to claim **6**, characterized by locking means for locking the toggle lever means in its adjusted position.

8. A safety binding according to claim **7**, characterized in that the lever means have rearwardly upwardly extending portions pivotally connected with said connecting portion.

9. A safety binding according to claim 8, characterized in that the lever means including the pawl means are of such shape and configuration that the pawl means normally lie below the surface of the ski plate with a released boot and the toggle lever means in its position tightening the binding.

10. A safety binding according to claim 2, characterized in that the connecting means includes a connecting portion pivotally connected with the rear ends of the lever means and receiving toggle-lever means having an engaging portion for engagement with the surface of the ski plate.

11. A safety binding according to claim 10, characterized in that the toggle-lever means is threadably received in the connecting portion to permit adjustment of the spring load of the lever means.

12. A safety binding according to claim 11, characterized by locking means for locking the toggle-lever means in its adjusted position.

13. A safety binding according to claim 10, characterized in that the lever means have rearwardly upwardly extending portions pivotally connected with said connecting portion.

14. A safety binding according to claim 10, characterized in that the lever means including the pawl means are of such shape and configuration that the pawl means normally lie below the surface of the ski plate with a released boot and the toggle-lever means in its position tightening the binding.

15. A safety ski binding, characterized in that a boot is clamped to a ski within an area intermediate its toe and heel portions, comprising first means adapted to be mounted on the ski boot including lateral projecting means disposed substantially intermediate its sole and heel, second means including lever means pivotally mounted relative to the ski and provided along the forward end with clamping means operable to cooperate with said first means, abutment means fixedly secured relative to said ski and operable to cooperate with said lateral projecting means, and actuating means for spring-loading said first means in such a manner that said lever means clampingly holds the boot against said abutment means.

16. A safety ski binding according to claim 15, characterized in that said boot is clamped to said ski exclusively within the area intermediate its toe and heel portions.

17. A safety ski binding, characterized by first means secured to the sides of the ski and forming lateral abutments, second means adapted to be secured to a ski boot to provide lateral projections for cooperation with said abutments when the boot is in the normal, clamped position on the ski, and third means for clampingly holding said ski boot on the ski by cooperation with said second means including pivotally mounted lever means adapted to be spring-loaded and applying onto said second means a clamping force directed toward the ski and means for spring-loading said lever means.

18. A safety ski binding according to claim 17, characterized in that said lateral abutments are formed by rollers against which correspondingly shaped forwardly disposed surface portions of the lateral projections are clampingly held by said lever means.

19. A safety ski binding according to claim 18, characterized by a ski plate mounted on the ski, said rollers being mounted laterally of said ski plate.

20. A safety ski binding according to claim 19, characterized in that said lever means is of such length and is so pivotally mounted that upon release of the safety ski binding with the lever means spring-loaded, the part of the lever means extending forwardly of the pivotal mounting thereof is completely disposed below the bottom surface of the ski boot.

21. A safety ski binding according to claim 17, characterized in said said lever means, in the spring-loaded condition and upon release of the safety ski binding will be disposed with its lever portion extending forwardly of the pivotal mounting thereof completely below the bottom surface of the ski boot so that no obstruction exists impairing the lateral release of the boot.

22. A safety ski binding, characterized in that a boot is clamped to a ski within an area intermediate its toe and heel portions, essentially consisting of fixed abutments providing forwardly upwardly inclined abutment surfaces mounted to the sides of the ski, means providing lateral projections adapted to be mounted on the ski boot intermediate its sole and heel and provided with forwardly disposed surface portions for cooperation with the surfaces of said abutments, and clamping means adapted to be spring-loaded including lever means cooperating with said first-mentioned means to clamp the ski boot down onto the ski with the surface portions of the lateral projections in engagement with the abutment surfaces, said lever means being so pivotally mounted that in the spring-loaded condition thereof, upon release of the safety binding, no part thereof disposed forwardly of the pivotal mounting extends into the path of a lateral movement of the ski boot.