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Weckeiser

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[45] **Apr. 15, 1975**

[54] **RELEASE SKI BINDING FOR DOWNHILL AND CROSS-COUNTRY**

[76] Inventor: **Kurt A. Weckeiser,** 2450 42nd Ave., San Francisco, Calif. 94116

[22] Filed: **Mar. 21, 1974**

[21] Appl. No.: **453,354**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 229,043, Feb. 24, 1972, abandoned.

[52] **U.S. Cl.** ..... **280/11.35 D;** 280/11.35 E

[51] **Int. Cl.** **A63c 9/08**

[58] **Field of Search**.....280/11.35 A, 11.35 D, 280/11.35 E, 11.35 K, 11.35 T, 11.35 B

[56] **References Cited**

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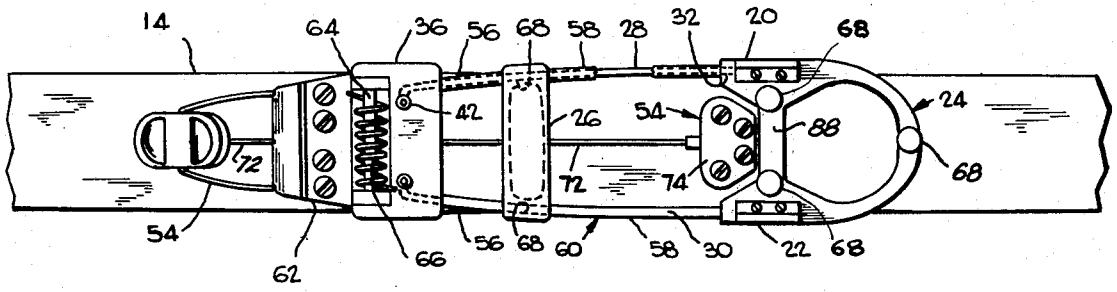
3,388,918	6/1968	Hollenback	280/11.35 Y X
3,575,437	4/1971	Unger	280/11.35 T X
3,578,349	5/1969	Edmund	280/11.35 K X
R26,972	10/1970	Spademan	280/11.35 T

Primary Examiner—Leo Friaglia
Assistant Examiner—R. Schrecengost
Attorney, Agent, or Firm—Warren, Rubin & Chickering

[57] **ABSTRACT**

A ski binding of the safety release type wherein the release assembly utilizes a torsion bar free of intermediate levers and the like to actuate directly the operative release member which engages the ski boot in position on the ski, thereby to provide not only a singularly simple and effective safety release assembly but one that is especially adaptable to a combination downhill (heel fixed) and cross country (heel free) releasable ski binding.

32 Claims, 17 Drawing Figures



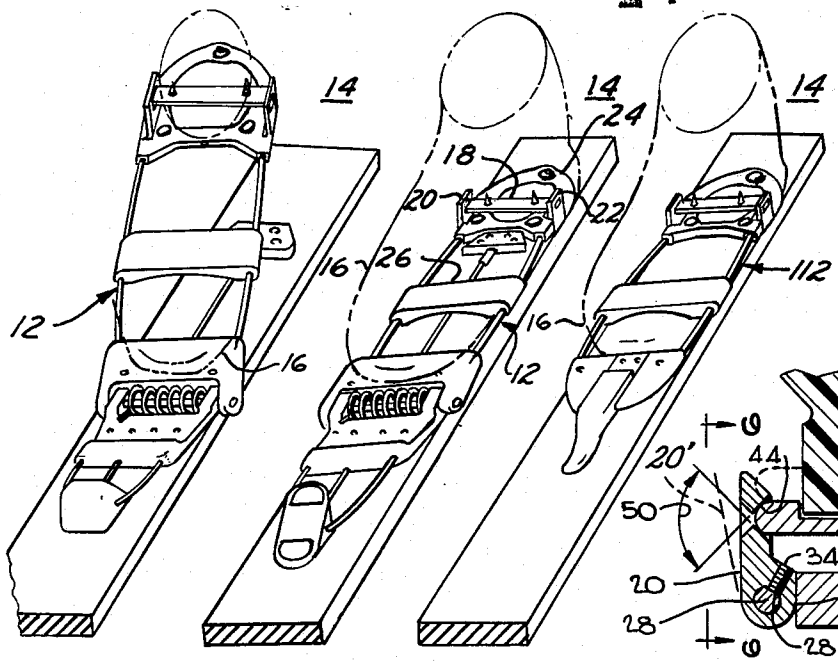


Fig-1B Fig-1A Fig-2

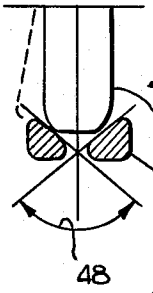


Fig-8

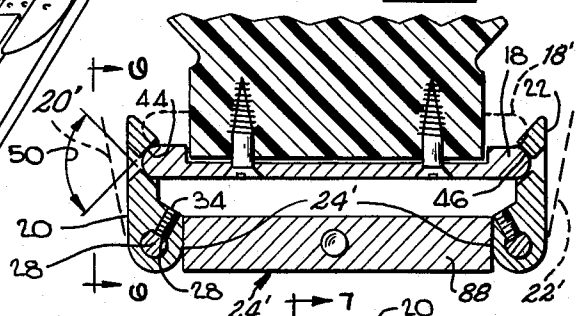


Fig-7

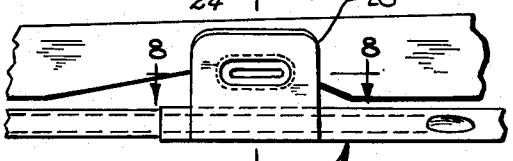


Fig-6

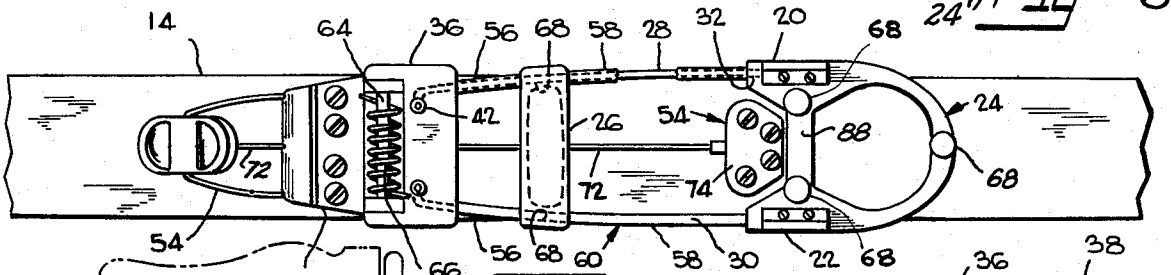


Fig-3

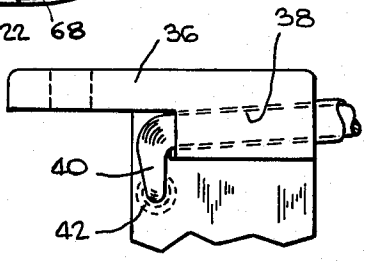


Fig-4

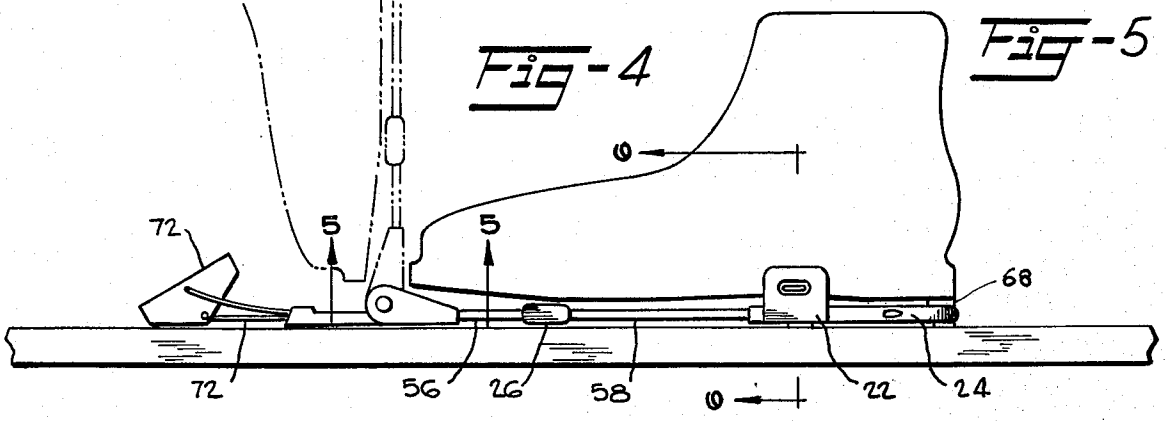


Fig-5

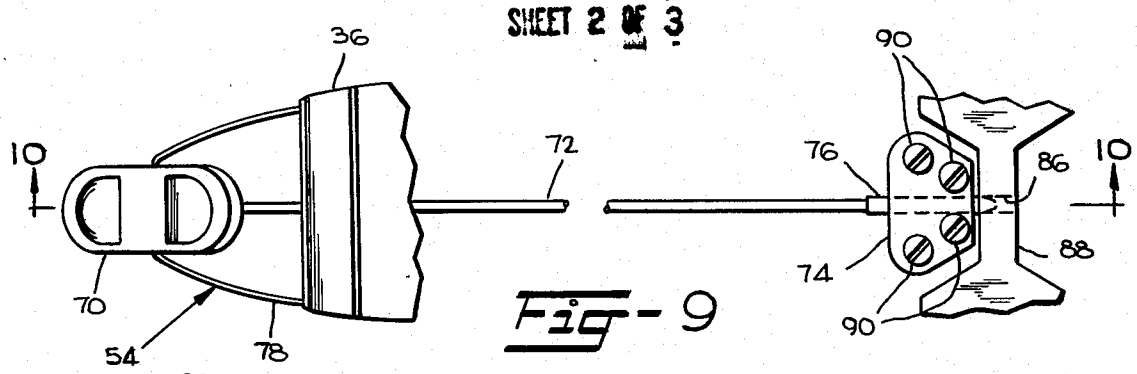


Fig-9

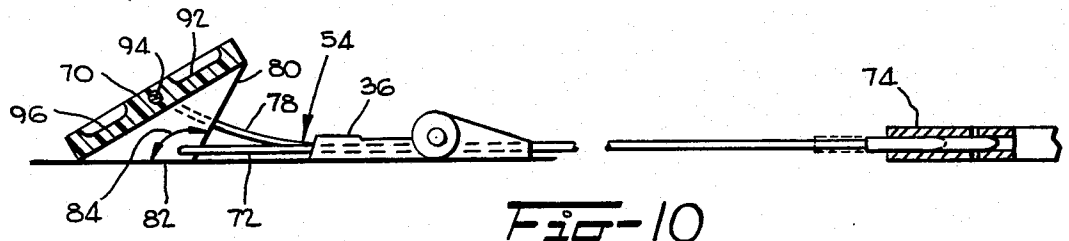


Fig-10

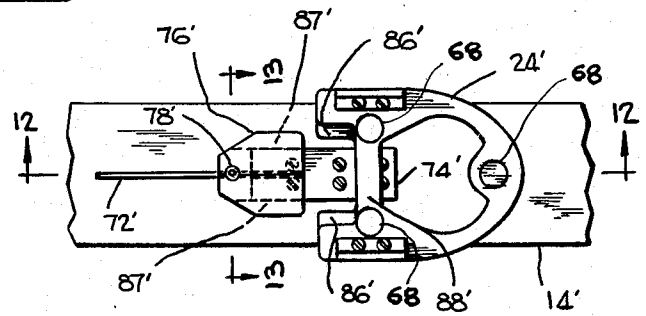


Fig-11

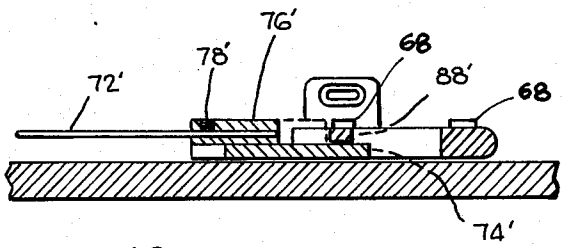


Fig-12

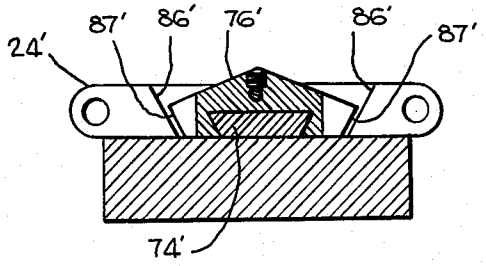


Fig-13

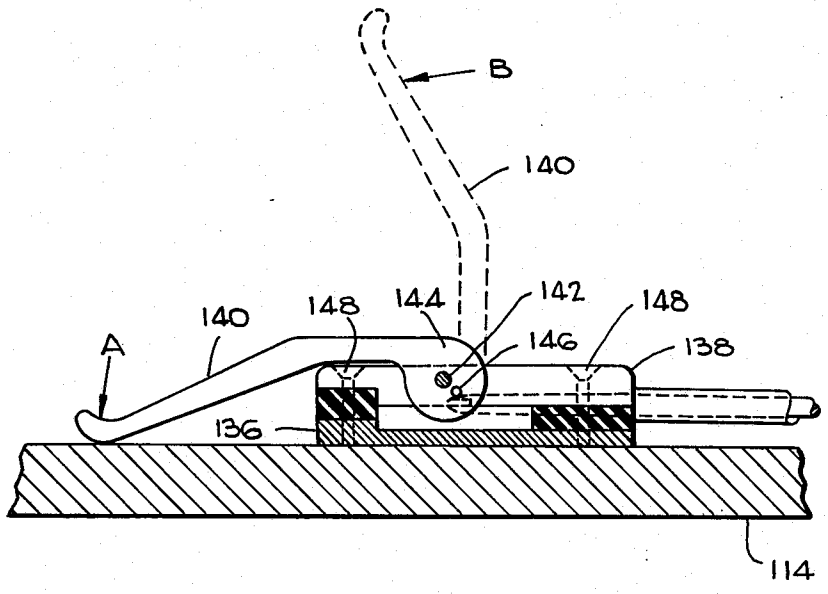


Fig-16

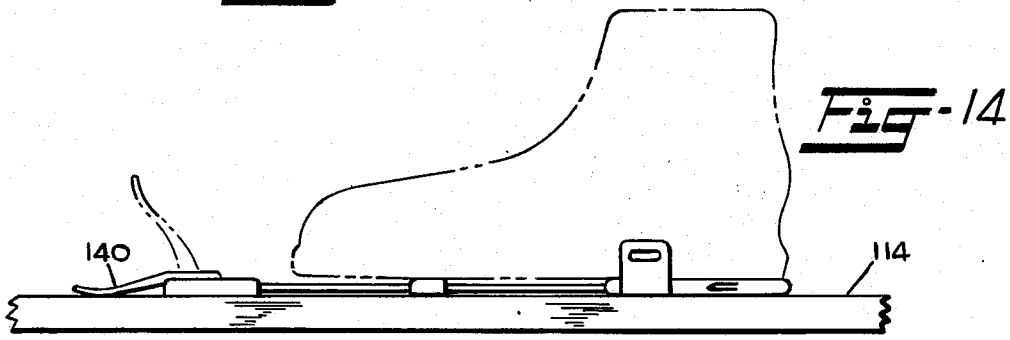


Fig-14

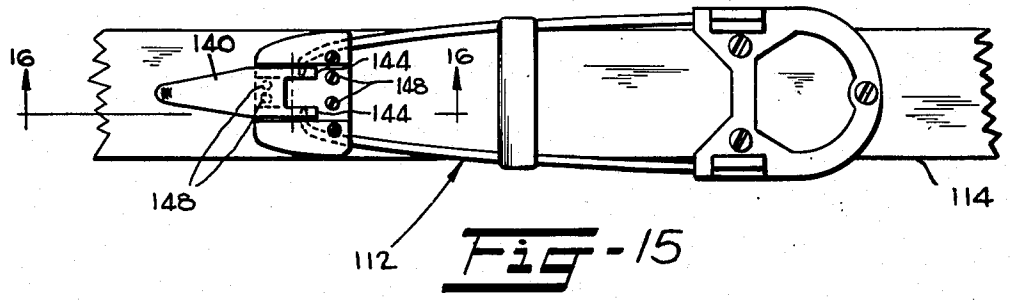


Fig-15

RELEASE SKI BINDING FOR DOWNHILL AND CROSS-COUNTRY

This application is a continuation-in-part of copending application, Ser. No. 229,043 and now abandoned, filed Feb. 24, 1972.

This invention relates to ski bindings and particularly those known as safety release bindings, i.e., bindings of the type that are intended to release a skier's boot from the ski when the boot, and hence the skier's foot, leg, and related musculo-skeletal system is subjected to undue strains from a twisting or uplifting force, or combination, great enough to cause the skier's leg to be broken, or inflict other injury to the limbs or body.

As used throughout this specification and claims which follow, a twisting force means any force — lateral, longitudinal or a force couple — acting in the plane of and upon the sole of a ski boot in respect to the ski on which it rides; and uplifting force means any force of the same general description but acting normal to the plane of the ski boot sole.

This invention also relates to ski bindings that may be used either for ordinary downhill skiing or for cross-country or ski touring. Generally speaking a binding adapted for downhill skiing must hold the skier's boot in fairly fixed position with respect to the ski, while in touring or cross-country skiing the skier is normally required to raise the heel of the boot freely when advancing along on level or uphill snow surfaces. These two diametrically opposed requirements, heel fixed and heel free, often desired by the same skier at different times and on the same skiis, combined into a single safety release ski binding has long been sought by skiers and the supplier industry. Until now, so far as I know, no entirely satisfactory solution for this problem has been found and it is to such solution that my invention also relates, a point amplified and explained in greater detail later.

In recent years there has been an enormous influx in the number of people who ski as a recreational sport. In response to their guest for safe ski bindings, the number of different safety release types available on the market have also proliferated. At first such bindings were of the type that only released the toe of the skier's boot when the latter was subjected to a twisting force generally caused by the weight of momentum of the skier's body creating a counteracting couple at the skiis, usually during a fall or unexpected catching of a ski tip or edge on the snow. Of course such release mechanisms are virtually ineffective when the direction of twisting occurs in a generally medial plane with respect to the skier's body, e.g. when the ski tips "dig in" and the skier tends to tumble headlong over the ski tips.

Thus followed the development of the so-called heel release, which replaced the older conventional cable binding. The heel release binding not only added some safety to the binding assembly, but usually has the added advantage and convenience of providing a "step-in" binding; that is, assuming all proper adjustments of the binding have been made, the skier merely steps into the binding (heel and toe piece) and the latter "snap" into engagement upon the boot, usually onto metal portions secured thereto for cooperation with a particular binding. There is no need usually to kneel or lean deeply over one's skiis and force a spring loaded mechanism into position.

It should be noted also that such advances in ski bindings became possible with the advent of the modern ski boot in which the sole is extraordinarily stiff, often reinforced with a steel plate or its equivalent. Thus the boot now itself comes into play as a part of the binding assembly. That is, with a sufficiently stiff boot sole it becomes possible to secure the boot to the ski by clamping the toe and heel to the ski independently, and rely upon the stiffness of the boot itself to unify the connection.

However, even the toe and heel release combination safety bindings with which I am familiar, suffer a number of disadvantages.

First of all, it should be appreciated that as skiing has become more popular as a form of outdoor recreation, so has cross country skiing or ski touring. However, in ski touring it is essential that the skier be able to raise the heel of his ski boot as he advances along relatively level or upward sloping snow surfaces. This is difficult, if not impossible to do with the so-called step-in bindings. Moreover, even if the heel of such bindings be at least partially releasable, the contemporary stiff soled ski boot makes an independent toe connection acting alone on the boot a difficult one at best. See for example the U.S. Pat. No. 3,575,437 to Unger for RELEASABLE HEEL RETAINER FOR SKI BINDING WITH MEANS FOR OPTIONAL SETTING FOR STARTING AND CROSS COUNTRY EVENTS patented Apr. 20, 1971; and U.S. Pat. No. 3,388,918 to Hollenback for SKI BINDING patented June 18, 1968. Neither of these references disclose nor suggest a stable mechanical solution for a boot to ski connection that also allows free movement of the heel. Since most skiers own but one pair of skiis, boots and bindings, and need to use the same for both touring and downhill skiing, a more satisfactory combination binding is not only desirable, but virtually a necessity.

Second, all of the bindings with which I am familiar, with the possible exception of the one disclosed in U.S. Pat. No. 3,578,349 to Edmund for SAFETY SKI BINDING patented May 11, 1971, rely upon an adjustable spring assembly to actuate the heel or toe release mechanism. (Edmund utilizes a pivoted flexural member or leaf spring that applies a frictional grip upon a mid-boot fitting, but this binding appears to lack uplift release and reliable lateral stability). The aforementioned spring assemblies generally require lever linkages to transform the spring forces and actuate the release members. Such assemblies prove to be relatively cranky to adjust for proper safe release, and often do not stay properly adjusted as skiing conditions vary. This occurs because of icing, clogging and other distractions which the average skier fails to compensate for in the course of a day's skiing. Thus the "last run" mishap, when proper functioning of the release binding is most needed, often encounters a "safety" binding that doesn't release, i.e., ends up unsafe and the skier often ends up injured.

Even the most recent improvements in bindings with which I am familiar, those in which the heel and toe release assemblies are judiciously eliminated in favor of a single mid-boot releasable clamp, see for example the U.S. Pat. No. Re 26,972 to Spademan for SAFETY BINDING patented Oct. 27, 1970, rely upon relatively complex spring actuator assemblies susceptible to the serious disadvantages noted above. Moreover, such release bindings are singularly difficult for adaption as

both a downhill (heel fixed) or cross country (heel free) ski binding.

Third, the prior art convertible bindings for downhill and ski touring with which I am familiar, do not all incorporate heel and toe safety releases. Those that do are generally of less than rugged construction, and little if any attention to prevent clogging by ice and snow appears to be considered. Thus the overall reliability of these devices is greatly reduced.

Thus it is an object of the present invention to provide a ski binding of the safety release type wherein the release assembly utilizes a torsion bar free of intermediate levers, springs, and the like, to actuate directly the operative release member which releasably engages the ski boot in position on the ski.

A feature and advantage of my invention is that such a simplified assembly including the elongate torsion bars provides a relatively easy structure for adaptation as a combination downhill (heel fixed) and cross-country (heel free) assembly.

More particularly it is an object of the present invention to provide a safety release binding wherein the aforementioned torsion bars also form the sides of a frame hingedly secured to the ski, so that the entire assembly may be pivoted at least as much as 90 degrees about an axis transverse to the ski approximate the ski boot toe to provide proper binding attitudes for downhill (heel fixed) and cross-country (heel free) usage.

It is also an object of the present invention to provide a latch lock mechanism shaped and positioned to cooperate with a portion of the hinged binding assembly to maintain the latter, alternatively at the user's election, in either a downhill (heel fixed) or a cross-country (heel free) skiing attitude.

It is a further object of the present invention to provide a safety release ski binding utilizing a torsion bar member for direct actuation of the operative release mechanism that holds the boot to the ski wherein such torsion bar member is provided with means to positively locate its angular displacement and thus preselect with relative certainty the amount of uplift or twisting force, or combination thereof, necessary to release the boot from engagement with the ski.

It is a feature of my invention that the torsion bar member, which actuates and engages the ski boot release member, may be used to improve safety ski bindings already known in the art; and, if thus utilized, to eliminate conventional and relatively complex lever and spring linkages. Thus various already known safety release bindings may be made not only far more economically, in that fewer parts and labor of assembly are required; but such a binding is generally less susceptible to the kinds of problems often encountered with present safety release bindings during actual operation, i.e., difficulty of adjustment to a relatively reliable release pressure for uplift as well as twisting forces, change in response due to change in skiing conditions, adjustment range necessary for various weights and builds of skiers, differences in ranges of adjustment necessary to properly accommodate men as well as women skiers, and so forth.

It is a further object of my invention to provide a safety release mechanism utilizing a torsion bar actuator in combination with bindings of the type characterized by a pair of upstanding side clamps, each movably mounted on opposite sides of a ski to engage and hold the skier's boot.

A feature and advantage of the foregoing is that such a binding is not only readily adapted to both downhill and cross-country skiing, as mentioned above; but also the same basic binding may be designed for downhill skiing alone, thus simplifying even further the binding assembly for the present majority of skiers who desire to possess downhill equipment only.

It is a further object of the present invention to provide a safety release binding utilizing a torsion bar actuator which embodies a release plate assembly positionable to adjust the initial angular displacement of the torsion bar and hence the pressure at which the release mechanism attached thereto will disengage from the boot; and further to provide such release plate with means for manual rotation by the skier, at his election, to release the boot from the binding entirely.

Numerous additional objects, features, and advantages of the present invention will become apparent to one of ordinary skill in the art upon reading the specification which follows making reference at the same time to the accompanying drawings, wherein the same or similar identifying numerals or letters refer to the same or corresponding parts in each of the several views.

Turning now to the drawings,

FIG. **1A** is a perspective view of one embodiment of my invention adaptable for either downhill skiing (heel fixed) or cross-country skiing (heel free), the position of the various parts in **1***a* shown for downhill skiing attitude;

FIG. **1B** is a perspective view similar to that of FIG. **1A** except that the binding is in the cross-country or ski touring position;

FIG. **2** is a perspective view of an alternate embodiment of my invention adapted for downhill skiing alone, and this embodiment is further disclosed in FIGS. **15–16,** inclusive, described below;

FIG. **3** is a plan view of the binding embodying my invention and shown in typical mounting on a ski;

FIG. **4** is a side elevation of the view shown in FIG. **3,** except that in addition to the binding position shown in FIG. **3,** the binding is also shown in phantom view with the heel of the binding freely rotated to an upright position, as in certain ski touring positions;

FIG. **5** is an enlarged detailed view of a portion of my invention taken along line **5—5** in FIG. **4**;

FIG. **6** is a fragmented and enlarged side view of a portion of the heel section of the binding embodying my invention;

FIG. **7** is a sectional view taken along line **7—7** of FIG. **6,** and in addition includes a partial dashed outline of portions of the assembly when such parts are releasing the boot from its skiing position to an uplifting force;

FIG. **8** is a sectional view taken along line **8—8** of FIG. **6** and also shows in dashed line certain parts and their position when the ski binding and boot associated therewith are imposed with a twisting force and the boot is releasing from the ski;

FIG. **9** is a partial plan view of a portion of my invention showing the latch lock device which maintains the binding in a downhill attitude; or alternatively as indicated by the dotted line position of certain of the parts, in a cross country or heel free attitude;

FIG. **10** is a partial sectional view taken along line **10—10** of FIG. **9**;

FIG. **11** shows an alternative embodiment of a latch lock mechanism similar to that of FIGS. **9** and **10,** ex-

cept that the heel catch mechanism is of a modified design;

FIG. 12 is a sectional view taken along line 12—12 of FIG. 11;

FIG. 13 is a sectional view taken along line 13 of FIG. 11;

FIG. 14 is a side elevation of an alternative embodiment of my invention adapted for downhill skiing only;

FIG. 15 is a plan view of the embodiment of my invention disclosed in FIG. 14; and, finally,

FIG. 16 is an enlarged sectional view of a portion of the binding taken along line 16—16 of FIG. 15.

The invention is best understood by referring first to FIGS. 1A and 1B wherein I show ski binding assembly 12 mounted to a ski 14. FIG. 1A shows the binding adjusted for downhill skiing, while FIG. 1B shows the same binding converted for cross-country or ski touring. FIG. 2 on the other hand shows a similar binding assembly 112 mounted on ski 114 but designed for downhill skiing only. Such an alternative arrangement of a binding embodying my invention is explained in greater detail hereinafter with reference to FIGS. 14–16, inclusive. As will be appreciated upon a continued reading of this specification, my basic release mechanism is particularly suited for a convertible downhill and ski touring binding; but the mechanism may be employed in other types of bindings as well, conferring numerous benefits thereby even to bindings found in the prior art, as will be explained in greater detail hereinafter.

Returning again to FIGS. 1A and 1B, the particular type of binding and arrangement shown therein includes ski boot 16 (phantom outline) having attached thereto across the bottom of its sole cross bar 18. The latter is secured to the sole of the boot by means of screws or other convenient fastening means just forwardly of the heel section of the boot. Bar 18 in turn is pressurably engaged by means of a pair of oppositely disposed, upstanding side clamps 20, 22 which in turn are rotatably mounted at their base on heel support 24, said side clamps being movable at least for a limited angular range, suggested by dashed lines 20', 22' and by adjacent solid outlines 20, 22 in FIG. 7. The sole of the skier's boot thus held to the ski is further supported by boot support bar 26 which is preferably fabricated of a substance such as hardened nylon or the like, so that the sole of the boot will slide freely thereover when being released from the binding. The location at bar 26 also provides adjustment for the amount of upward force that may be tolerated before the side clamps release the skier's boot, as will be explained hereinafter.

It is of particular importance to the understanding and appreciation of my invention to observe the structure with which I pressurably urge side clamps 20 and 22 into snug operational contact with cross bar 18 so as to engage and hold the ski boot in position during normal ski usage, and also disengage and release the boot from the ski in the event of a twisting or uplifting force, or combination thereof, of predetermined magnitude. That is a force which the user determines would, if imposed upon the boot in respect to the ski, cause possible injury to the skier. More specifically such engaging pressure is adjustably controlled in accordance with my invention by means of torsion bars 28, 30 (FIG. 3) whose mounting details will next be explained with respect to torsion bar 28 only, it being understood that the description is substantially the same for bar 30.

Torsion bar 28 may be fabricated of any suitable metal or plastic material so long as the torsional stiffness thereof for its selected cross sectional area and length of bar is sufficient to exert the range of pressures against the ski binding desired and necessary. As an example, in the presently described embodiment, I prefer to use a one-fourth inch diameter round steel stock. This bar is fabricated at one end so as to be snugly yet rotatably located within bore 32 of heel piece 24. The heel piece is also cut out so as to admit side clamp 20 into operable position, seen in a somewhat enlarged rendition in FIGS. 6 and 7. Side clamp 20 is in turn bored out through its base so as to be carried near one end of torsion bar 28 and firmly secured thereto by means of set screws 34 which cooperatively engage a flattened portion or land 28' formed on the torsion bar. The proximate end of the bar terminates in the run-out portion of bore 32 toward the tail of the heel piece.

The other end of torsion bar 28, the end away from side clamp 20, terminates below head plate 36 — see especially FIG. 5.

In the embodiment of the invention shown, head plate 36 is also a rotatable hinge plate for reasons to be explained hereinafter in connection with the binding used for cross country skiing (heel free). More specifically, this end of torsion bar 28 is rotatably housed in bored out portion 38 (FIG. 5) of plate 36, while the tip portion of the bar extending therefrom is shaped to form L shaped leg 40, the foot or terminus of the L being at nearly right angles to the main shaft of the torsion bar. The aforementioned terminus locates immediately beneath set screw 42 threadably carried by plate 36 and adjustable from the top side of the plate to contact the terminus of the L shaped leg.

As may now be appreciated, torsion bar 28 secured at one end to side clamp 20 and at its other end through and under head plate 36 provides a source of torsional pressure, which along with the torsional pressure exercised by opposite member 30, urges the attached side clamps 20 and 22 into engagement with ski boot cross bar 18, when the skier places his boot therebetween; as indicated above, this operational engagement with bar 18 is snug, being the result of the indicated torsional pressure or preload. As shown, the upright position (solid outline in FIG. 7) of clamps 20, 22 is determined by engagement with bar 18 when the boot is in place, and by engagement via stops (or abutments) with heel piece 24, at 24', when the boot is removed. Accordingly, as will be appreciated by those of ordinary skill in the art, upon boot placement, bars 28 and 30 will torsionally deflect against such torsional pressure in response to any outward movement of connected side clamps 20, 22 about the longitudinal axes of the torsion bars normal to such outward movement. Moreover such torsional deflection will cause a reactive force to be exerted by the torsion bars back through each of their associated clamps in opposition to such outward movement. The latter movement may be caused, for example, when a skier through his boot experiences an unexpected movement, such as a tumble or fall, so as to create a twisting or uplifting force, or combination thereof, in respect to the ski boot sole and the ski itself. Such forces, of course, if of great enough magnitude, may cause serious injury to the skier; but at the same time, upon proper adjustment of the degree of torsional

deflection of torsion bars **28** and **30,** the displacement of release members **20** and **22** may be made sufficient to release boot cross bar **18** and hence free the skier from his ski before injury. Note for example the position of the cross bar and side clamps shown by dashed lines **18'**, **20'**, and **22'** in FIG. **7.**

As may be readily appreciated from the foregoing description, one of the valued features of my invention is that the release members, i.e., side clamps **20** and **22,** of the ski binding, are releasably controlled by but a single moving part, the torsion bar itself, thus eliminating complex spring and/or lever arrangements so typical of the prior art safety ski bindings with which I am familiar.

Thus, the ski binding embodying my invention is greatly simplified in respect of the moving parts required for the release mechanism itself. I am thus able to provide a binding which is virtually free of possible interference from ice, snow or other variable ski conditions which may clog or foul more conventional ski bindings with which I am familiar.

Another feature of my invention which follows almost inseparably from the foregoing, is the positive and extremely simple means by which adjustment may be made of the indicated torsional preload, i.e., of the amount of pressure or force required before the boot release members, such as clamps **20** and **22,** will act to disengage the boot from the ski. More specifically, I first refer once again to set screw **42** carried by head plate **36.** By merely advancing this set screw inwardly, or outwardly, from its position in the head plate, the skier may quickly and positively cause torsion bar **28** to rotate in either a clockwise or counter-clockwise direction, thereby to shift, one way or the other, the bar's initial angular position or degree of preload. In this way, the user may adjust the torsion bar to an initial position which, when torsionally deflected therefrom by a preselected amount, will cause a reactive force from the torsion bar to be transmitted through side clamp **20.** Such a reactive force corresponds to a twisting or uplifting force, or combination thereof, of predetermined magnitude, as chosen by the user to suit his own body build, strength, and the like.

The amount of force that the skier must tolerate through his limbs, as imposed upon the ski boot in respect to the ski, may thus be adjusted in terms of a preselected amount of torsion bar deflection; any greater amount will cause the side clamp to disengage from and release the ski boot. See again FIG. **7.** In this manner I not only achieve a relatively simple and positive ski binding release adjustment, but one that is relatively easy to set to a reliable release pressure; and once set this adjustment will remain fairly fixed irrespective of skiing or snow conditions, because there is no way to clog or foul the single moving element, the torsion bar, of the release assembly. Moreover such a torsional deflection adjustment is one inherently capable of a broad range satisfactory for various weights and builds of skiers, as well as the differences commonly encountered to properly accommodate men as well as women skiers.

Further refinement in the degree of force necessary to free the skier's boot from the safety binding of my invention is a feature of my specific design of cross bar **18** and upstanding side clamps **20** and **22** into which the bar cooperatively fits. Moreover, I have found that a positive male-female fitting such as shown in FIG. **7** provides a relatively positive and chatter free boot to ski connection.

Generally speaking, the preferred relationship of the spacing between stops **24'** and the spacing between outwardly projecting clamp-engaging tips of the cross bar **18** is such that, once the boot is inserted in place (i.e., cross-bar tips engaged and retained by side clamps **20, 22**), at least one of the clamps **20, 22** is slightly relieved from the preload stop position (i.e., the position arrested by stops **24'**). For example, an actual embodiment of the invention which has proved to be highly effective, the tip-to-tip spacing of clamps **20, 22** when arrested by stops **24'** (i.e., without an inserted boot and its cross bar **18**) is 72 millimeters, but this spacing is enlarged to 72.2 millimeters when a boot and its cross bar **18** have been inserted and snapped into the retained position illustrated by solid lines in FIG. **7.** It will be appreciated that the 0.2 millimeter difference provides assurance that torsional preload applied against stops **24'** in the absence of a boot will be completely transferred to the cross bar **18** upon boot application to the binding structure.

With especial attention to FIGS. **6, 7** and **8** I show cross bar **18** whose tip ends are shaped to form more or less semi-ovaloids, the long axes thereof being parallel to the longitudinal axis of the skiis. Inner surfaces **44** and **46** of side clamps **20** and **22,** respectively, are shaped to form a profile that provides continuous tangential contact with the cross bar tips, when the ski boot is placed in operative position on the ski. To achieve this, inner surfaces **44** and **46** define a more or less elongate truncated cone. Specific dimensions of cross bar **18** and side clamps **20** and **22** may vary — depending upon selection of material and the like. I have found, however, that conical surfaces **44** and **46** whose end elements include angle **48** in the range of 75° to 125°, and preferrably 90°, and whose side elements include angle **50** in the range of 25° to 65°, and preferably 45°, gives satisfactory results in connection with cross bar **18.**

That is a cross bar and side clamp assembly fabricated in accordance with the foregoing description will generally provide release of the ski boot, for a given torsion bar setting, at a far lower horizontal twisting force, than comparable release under conditions of a heel uplifting force. The ratio however may be varied considerably by adjusting the position of boot support bar **26**: the closer support bar **26** to upright side clamps **20** and **22,** the smaller the amount of uplift force required to free the ski binding.

The actual placement and location of boot support bar **26** is perfected at the time the binding is first assembled and attached to the skis to suit a particular skier. This is done according to the present invention by appropriate selection of tubular covers **56** and **58.** These may be made of plastic, metal or other convenient and suitable hollow material, and are slipped over the torsion bars on either side of support bar **26** when placing the latter thereon during assembly. By fabricating covers **56** and **58** to appropriate complimentary lengths, so that the two covers and bar **26** occupy the entire length of bar **28** and **30** from heel support **24** to head plate **36,** support bar **26** may be firmly located with respect to the heel support and head plate. By making cover **56** longer and cover **58** shorter, the force required to be exerted on the sole of the skier's boot at cross bar **26** by an uplifting force transmitted through the skier's leg,

to cause separation of side clamps **20** and **22,** may be made progressively smaller, due to the location of support bar **26** approaching nearer to heel support **24.** The reverse of course is also true: the force at bar **26** may be increased by moving the latter away from the heel support.

In practice I provide my bindings with several lengths of plastic tubing cut to fit over torsion bars **28** and **30.** The user may select from these those which locate bar **26** in the proper position for his or her tolerance to injury from uplifting force; that is, support bar **26** is located to release side clamps **20** and **22,** for a particular angular adjustment of the torsion bars determined by the setting of set-screws **42,** at an uplifting force less than that which the user determines would cause injury to him or her on a ski slope. Such adjustment is made after that of the torsion bar to cause release of the skier's boot from a twisting force smaller than would cause injury.

As noted above, for a predetermined amount of torsion bar pressure exerted on side clamps **20** and **22,** the design of my clamps and bar **18** permit release at a far lower horizontal twisting force than heel lifting force; and selective placement of cross bar **26** permits the actual ratio of twisting to uplifting force necessary for release to be varied independently for a pre-set torsion bar setting or preload. Thus by specific selection of the adjustments described hereinabove, my invention may provide release of the skier's boot from the ski in the event a twisting or uplifting force, or combination thereof, of predetermined magnitude is imposed upon the boot in respect to the ski.

We come next to a principal feature of my invention: its especial adaptability as a combination downhill and crosscountry ski binding of unusual strength and simplicity, one which incorporates all of the safety features achieved by my novel torsion bar release design explained above. This feature is shown and understood best by referring to FIGS. **1A, 1B, 3** and **4.**

It is well known among skiers that downhill skiing requires that the entire boot of the skier, including the heel portion, remain firmly fixed in position on the ski, sometimes referred to herein as the "heel fixed" position as shown in FIG. **1A.** On the other hand, and in a diametrically contrary manner, cross country skiing, or ski touring as it is sometimes called, requires that the boot of the skier be permitted to rotate vertically about an axis transverse to the ski proximate the toe of the skier's boot, sometimes referred to herein as the "heel free" position. See FIG. **1B** and the position shown in FIG. **4** by phantom lines.

The heel free position is especially desirable when the cross country skier is advancing along a level snow surface, and becomes a virtual necessity for efficient movement uphill. Of course when the cross country skier is running downhill even when touring, conversion back to a heel fixed binding is desirable and generally necessary for safety, i.e., if the heel remains free, the skier is apt to tumble headlong over his skis.

I achieve such a convertible binding in accordance with the present invention by means of hinged boot support assembly **60** comprising torsion bars **28** and **30** in cooperation with rotatable hinge plate **36,** fixed hinge plate **62,** heel piece **24,** and latch lock assembly **54.** More particularly each of torsion bars **28** and **32** provide a side frame member for the hinged boot support assembly **60.** I have already described the manner in which torsion bars **28** and **30** are firmly supported and mounted at each of their ends to heel support **24** and head plate **36.** I now again direct attention to FIGS. **3** and **4** particularly to amplify my description in connection with the highly desirable convertible feature of my invention.

In the convertible embodiment of FIGS. **1A, 1B, 3** and **4,** head plate **36** comprises a movable section or rotatable hinge plate hingedly secured to fixed section **62** by means of pin **64,** fixed section or plate **62** in turn being secured to ski **14** by screws or other suitable fastening means. Coil spring **66** entwined about pin **64** is added to provide a positive return force to the entire hinged assembly **60.** Such spring action conveniently insures that when the assembly is in its heel free attitude, both when in use or while being carried, the entire assembly is returned to position on the ski.

The aforedescribed hinged assembly embodiment of my invention also relies for further strength and rigidity in its design upon a particular form and location of boot support bar **26.** As already explained, the specific position of the boot support bar enables the user to obtain proper adjustment of the binding release forces. At the same time, by designing bar **26** with transverse bores **68** sized to slidably yet snugly receive torsion bars **28** and **30,** I provide additional structural stiffening and reinforcement of the hinged boot support assembly, particularly by bracing the main longitudinal structural members, torsion bars **28** and **30.**

In the manner thus described, primarily by the twofold use of torsion bars **28** and **30** as improved safety release elements and as the main longitudinal structural elements of the entire hinged frame assembly to which such members so readily promote themselves, the important convertibility feature of my invention is made possible. However, this highly desirable feature is inextricably related to yet another; and that is the selective positioning and holding of the hinged boot support assembly in the heel free and heel fixed position.

This feature of my invention, the holding or release of the binding in the fixed heel attitude, is generally achieved in accordance with the present invention by means of lock assembly **54** mentioned briefly earlier and now described in greater detail with reference to FIGS. **3** and **4** and detailed section FIGS. **9** and **10.**

Lock assembly **54** comprises shifter **70,** actuating rod **72,** guide **74,** and lock bolt **76** (FIGS. **9** and **10**). Shifter **70** is fabricated of suitable metal, plastic, or other material and is securably held in position upon the ski by means of resilient, spring-like wire bands **78** which extend from points of securement on either side of the shifter, to the raised reinforced face of head plate **36** where the ends of the bands are firmly secured. The shifter is fabricated to a more or less triangular sectional shape (FIG. **10**), wherein two faces, sides **80** and **82,** converge to form an obtuse angle **84**; for example, in the embodiment shown angle **84** is approximately 120°.

Shifter **70** is also slotted through its transverse midsection so that rod **72** may be inserted therein and secured to the shifter at the apex of angle **84.** Head plate **36** is provided with a passageway along the mid line of its lower surface to accommodate rod **72** rearwardly to connection with lock bolt **76.** The latter in turn is mounted for reciprocal movement by rod **72** within guide **74,** and into and out of bore **86** formed in cross brace **88** of heel support **24.**

In the solid line rendition of FIGS. 9 and 10, lock bolt 76 is shown in position so as to engage bore 86 of heel cross brace 88. Since guide 74 is firmly connected to the user's ski by means of cap screws 90, the entire ski binding is maintained in the heel fixed position by engagement of bolt 76 with brace 88. To convert the binding to a cross country or heel free attitude it is merely necessary to depress shifter 70 at its upper most face, and most conveniently by applying pressure as with a ski pole in depression 92. This causes the shifter to rotate about terminus 94, where spring bands 78 hold the shifter, thereby forcing the apex of the shifter which carries rod 72 to move away from head piece 36, finally coming to rest on face 80 so that rod 72 and lock bolt 76 assume positions indicated by the interrupted lines of FIG. 10. In this latter position lock bolt 76 is disengaged from heel cross member 88, so that the latter is now free to rotate with the rest of the binding attached thereto, in the downhill or heel free attitude.

The heel may be resecured in the downhill position merely by placing the binding into the down position, and exerting pressure at depression 96 which reverses the above described action, forcing shift lock 76 back into bore 86 of the heel support cross member. Lock bolt 76 is tapered at its engaging end to assist in "finding" its way into bore 86, especially of ice or snow disturbs the exact alignment between guide 74 and heel piece 24.

It is a particular feature of the foregoing assembly that shifter 70 is not connected directly to the skis, but rather is springedly held in place by resilient bands 78 which themselves terminate in head plate 36. However, it is possible to mount shifter 70 at the rear of the ski for engagement by the lock bolt immediately into the rear of the heel piece, thus making it possible to even further simplify head plate 36.

It is also an advantageous feature of my novel shifter assembly that it acts in a positive, vibration free manner, being firmly maintained in one position or the other by the downward urging thereon of resilient bands 78, which force either face 80 or 82 of the shifter into firm contact with the face of the ski to which it is attached.

An alternative embodiment of my shifter assembly which has certain additional advantages is shown in FIGS. 11 and 12. The forward portion of the assembly for this alternate embodiment is identical to that which I have just described above, particularly the shifter itself, and hence such description is not repeated; but the manner of locking heel support 24 is different, as will be appreciated from the following description with reference to FIGS. 11–13.

Heel support 24′ is fabricated to provide sloped, upwardly facing surfaces 86′ at the inner, forwardly portion thereof. Surfaces 86′ in turn are shaped and located so that sliding retainer 76′, and particularly sloped side surfaces 87′, may overlay surfaces 86′ when retainer 76′ is advanced by rod 72′ to such position. Retainer 76′ is slidably secured to ski 14′ by means of guide 74′ secured thereto, the guide being shaped to provide overhanging side edges which fit into a cooperatively shaped slot therefore formed in the lower portion of retainer 76′ (FIG. 13). Rod 72′ is secured to retainer 76′ by terminating in elongate bore 77′ formed therethrough, and is firmly held in place once positioned therein by means of set screw 78′.

As may now be apparent from the foregoing, when it is desired to maintain the binding in the heel fixed attitude, the shifter forwardly of the ski binding may be rotated so as to place retainer 76′ over the heel support surface 86′; and, when the heel free attitude is desired, to change the shifter position so that retainer 76′ is removed therefrom, as shown in FIG. 11.

I have found that the foregoing alternate version of the latch lock assembly of my invention has the advantage of providing a more rugged downhill connection; and in addition may more readily accommodate a broad range of boot sizes. The latter advantage arises because heel support cross bar 88′ may be formed to clear guide 74′, so that the latter may extend rearwardly and forwardly of the normal heel support position. Accordingly, the initial position of heel support piece 24′, determined in great part by the size of the skier's boot, may be made anywhere adjacent to guide 74′, just so long as retainer 76′ may slidably engage surfaces 86′ and itself remain firmly retained by guide 74′. Exact positioning of retainer 76′ is easily accomplished merely by loosening set screw 78′ and sliding the retainer along rod 72′ until a desired position is reached for a given size boot, after which the set screw may be retightened. The entire assembly is then ready for use.

Before proceding now to a description and explanation of yet a further embodiment of my invention, one adapted for downhill skiing alone, it will be helpful to explain how a skier gets into and out of his skis equipped with bindings embracing my invention as described hereinabove.

Assuming that all adjustments of the bindings have been made, i.e., that the torsion bar settings as determined by set screw 42 adjustment and boot support bar 26 location have been properly set, a skier engages his skis merely by stepping into them. That is the boot to which cross bar 18 is attached is simply snapped into place by stepping down onto the binding (FIG. 7). The upper sloped finished surfaces of side clamps 20 and 22 assist in permitting cross bar 18 to wedge the clamps apart, and allow such entry. The cross bar itself, once the tips thereof are introduced to the inner surfaces and particularly indentations 44 of the side clamps, are instantly and firmly secured by the action of torsion bars 28 and 30, as explained hereinabove.

To remove the boots from one's skis, I prefer merely to twist or lift the boot against the binding, much as would be the case if I were coming out of the binding during a fall — see again FIG. 7, and particularly the interrupted line outlines of crossbar and side clamps. In this way too, I test my bindings for proper adjustment each time I leave my skis. Moreover, by omitting an additional boot release mechanism for completely releasing the boot from the ski (as contrasted to the safety release mechanism with which of course the binding is still equipped), I am able to keep the weight of my assembly at a minimum, a matter of some importance to the cross country skier.

Another advantage of the twist out release construction of my binding occurs especially in cross-country skiing. Here one may be required to suddenly abandon ones skiis in the event of avalanche or other sudden and unexpected hazard as may occur in relatively remote regions. With present bindings the delay necessarily encountered may be fatal. With the twist out bindings of my invention one may rapidly shed the skiis from boots, and be in better readiness to avert such danger.

However, in the case of a binding embodying my invention and adapted for downhill skiing primarily, I have found it preferable to include a boot release mechanism for easy removal of the boot from the ski, although such a binding could be substantially less costly and less complicated on the ski if such a release — which is not necessary but merely convenient — were omitted altogether. One embodiment of such a release, in connection with a downhill binding, is shown in FIGS. **2** and **14–16.**

With reference to the foregoing FIGS. **2** and **14–16,** I show a release mechanism which is substantially the same as that shown and described in connection with FIGS. **1A, 1B, 3** and **4,** except that in the embodiment now considered the binding is adapted for downhill skiing only. Hence, all components required in connection with the hinge assembly and latch lock assembly **54** (FIGS. **3** and **4**) are omitted. Moreover, I shall here explain only those additional elements required to achieve the boot release mechanism here referrrd to.

In this embodiment the head plate is modified to form new head plate **136.** The latter is recessed to receive carrier plate **138** which in turn carries toggle **140** by means of shaft **142** whose ends are suitably secured at each of lobes **144** of the toggle. The outer surfaces of lobes **144** are fabricated to form bosses **146** (one on each lobe), and these bosses protrude just far enough to bear down on the L-shaped leg **40** termini of torsion bars **28** and **30** when the toggle is placed in the down position exemplified by the solid line outlines of objects in FIG. **16.** The center of rotation of toggle **140** about pin **142** is located so that when the toggle is in the down position, the toggle is cammed shut by the upward force exerted by the torsion bars through L-shaped legs **40.**

Carrier plate **138** is adjustably located on head plate **136** by means of cap screws **148** which pass through free openings in plate **138** and cooperatively engage threaded holes in head plate **136.** Resilient separators **150,** which may be made of rubber, leaf springs, or any other suitable resilient separator material, maintains the interval between plate **138** and plate **136** upon a given setting of cap screws **148.** In this way, the pre-set angular positioning of torsion bars **28** and **30** may be made with the toggle in the closed or down position (A), since the toggle bosses **146** which determine such position are in turn raised or lowered by the setting of plate **138,** the latter carrying toggle **140** via shaft **142.**

When it is desired to completely remove the boot from the ski, as at the end of a day's skiing, such removal may be accomplished by raising the toggle to position (B) — indicated by the interrupted lines of FIGS. **14** and **16** — thereby relieving the pressure exerted on the torsion bars by bosses **146.**

The foregoing describes at least one embodiment of my invention for a convertible downhill or ski touring safety release ski binding along with alternative latch lock assemblies, and an alternative embodiment of a binding embracing my invention designed for downhill skiing only. The latter included an optional release mechanism for removing one's skis entirely, as when through with the day's skiing.

However, as mentioned earlier in this specification, one of the principal aspects of my invention and structure associated therewith, i.e., torsion bar members to actuate the operative ski boot release members, may be applied to various types of ski release assemblies, and conferring upon such devices many of the features and advantages described hereinabove with reference to the specific embodiments of my invention. For example a number of safety ski bindings are presently known which employ separate heel and toe release devices. Each are separately actuated by means usually of spring and lever assemblies which pressurably urge the toe or heel engaging member into holding contact with the skier's boot. Such assemblies may be largely if not entirely replaced with the torsion bar assembly of my invention adapted to provide adjustable pressure for urging the toe holding member or heel clamp into engagement with the skier's boot, even though in my judgment bindings which utilize heel and toe connections involve inherent disadvantages referred to in the introductory sections of this specification. Nonetheless, a number of manufacturers, and apparently a number of skiers, still prefer such bindings; and the application of this portion of my invention thereto would be desirable in order to minimize the total number of moving parts therein, hence reducing cost, improving overall mechanical reliability, and providing a relatively broad pressure adjustment range suitable for different user body types, weight and gender.

Having described my invention in some detail in the foregoing specification, certain additional features and advantages attendent thereto may now be explained for appreciation by an artisan having ordinary skill in the art.

The structure of the embodiments of my invention set forth hereinabove and shown on the accompanying drawings minimizes the likelihood that snow and/or ice might interfere with proper functioning, either by accumulation upon or around the binding itself or by ice or snow collected on the bottom of the skier's boot. Such interference is a common annoyance and inconvenience to a skier during actual skiing, particularly after a fall in deep snow when such accumulation is most likely to occur and remounting on skis is most difficult.

The binding embracing my invention generally avoids the aforementioned ice and snow interference problem because torsion bars **28** and **30** which form the side frame members thereof impose a relatively negligible surface upon or beneath which snow or ice may accumulate, and even if snow is present on the ski when the binding contacts the latter, the very shape of the covered torsion bars tends to squeeze any ice or snow away from interferring. Besides, as will be noticed from a careful study of my bindings, each of the torsion bars is slightly bowed outwardly toward the heel piece, and thus for the most part do not come down directly on the ski. Rather the torsion bars align themselves slightly away from the upper edge of the ski, thus reducing further the likelihood of jamming against ice or snow thereon.

Further, the lower surface of cross bar **26** is contoured as indicated by the dashed lines that appear thereunder in FIG. **3.** A careful study thereof shows the lower surfaces to be more or less hollowed out to a concave shape, so that only a relatively thin ridge of material along the outer edges contacts the ski at all, and again such a surface will tend to squeeze away any ice or snow that might tend to interfere.

Cross bar **26** carries a part of the skier's weight and is made of a low friction material such as plastic, to act as an anti-friction device for lateral release. Heel support piece **24** is provided with risers **68,** also made of

low-friction material for similar action. While I prefer to use low-friction materials for these components mechanical anti-friction devices could be substituted for either. Thus the entire weight of the skier rests on low friction material, or mechanical anti-friction devices, to provide a relatively reliable lateral release. At the same time bar **26** and risers **68** space the bottom of the boot away from ski and binding surfaces to minimize the possibility of interference with accumulations of snow and/or ice.

Also forward hinge plate **36** is shaped so that the underside thereof presents a generally concave or depressed surface with only relatively minor portions thereof forming contact ridges along the outer edges to minimize interference from ice and/or snow.

Of especial significance to the cross-country skier is that the binding embracing my invention is of relatively light weight. This is possible primarily through the dual use of torsion bars **28** and **30** not only as the basic release mechanism, but also as the main longitudinal structural members of the hinged frame so necessary for the heel free structure. In this way I eliminate heavier expedients such as plates and the like, which also must be in addition to the bindings themselves in prior art devices with which I am familiar for performing the same or similar function.

The weight of my binding may be even further reduced by using hollow torsion members of proper strength and material, such as light-weight metal alloys and the like; appropriate light-weight metal alloys for the heel piece and hinge members; and light-weight plastics and other suitable materials for boot support member **26** and risers **68.**

These and numerous other objects, features and advantages will become apparent to one of ordinary skill in the art upon a careful study of the foregoing specification and with reference to the accompanying drawings, from which the following claims are appended.

I claim:

1. In a ski binding assembly of the type characterized by a release member movably mounted on a ski to engage and hold at least a portion of a ski boot in position thereon during normal ski usage, and disengage and release such portion of the boot from the ski in the event a twisting or uplifting force, or combination thereof, of predetermined magnitude be imposed upon the boot in respect to the ski, the release assembly comprising:

torsion means connected to said release member to urge the latter into engagement with a ski boot positioned for use on a ski, and to torsionally deflect in response to a disengaging movement of the release member connected to said means about an axis thereof normal to said disengaging movement, such torsional deflection causing a reactive force to be exerted by said torsion means on said release member in opposition to the disengaging movement thereof.

2. The ski binding assembly in accordance with claim **1** and wherein further:

adjusting means associated with said torsion means to enable a user to cause the torsion means to be preset and torsionally deflect a preselected amount when the reactive force therefrom transmitted to said release member corresponds to a twisting or uplifting force, or combination thereof, of predetermined magnitude imposed upon the ski boot in respect to the ski, such preselected amount of deflection to cause said release member to disengage and release from the ski at least that portion of the ski boot normally engaged by said release member.

3. The ski binding assembly in accordance with claim **1** and wherein further said torsion means comprises:

an elongate member having one end thereof connected to said release member; and

plate means secured to said ski remote from said release member to rotatably carry the other end of said elongate member; and

adjusting means carried by said plate means proximate the terminus of said other end of the elongate member rotatably carried by the plate means, said adjusting means adapted for cooperative contact with said terminus to enable a user to cause said elongate member to be preset and torsionally deflect a preselected amount when the reactive force therefrom transmitted to said release member corresponds to a twisting or uplifting force, or combination thereof, of predetermined magnitude imposed upon the ski boot in respect to the ski, such preselected amount of deflection to cause said release member to disengage and release from the ski at least that portion of the ski boot normally engaged thereon by said release member.

4. The ski binding assembly in accordance with claim **3** and wherein further said elongate member comprises a first of two such members and is mounted for alignment along one side of said ski;

a second elongate member similar to said first member mounted for alignment along the other side of said ski, said second member having the end connected to said release member and the other rotatably carried by said plate means;

a boot support bar carried by said elongate members, said boot support bar adapted to provide a generally planar surface upon which a portion of the sole of the ski boot rests during skiing and in spaced relation to said release member, so that an uplifting force imposed upon the ski boot in respect of the ski is reactively resisted at the point of contact of the boot and said support bar to cause said release member to disengage and release from the boot when such uplifting force exceeds a predetermined magnitude; and

locating means associated with each of said elongate members to hold said boot support bar thereon at a predetermined position corresponding to the aforementioned spaced relation of the support bar to said released member.

5. The ski binding assembly in accordance with claim **4** and wherein further said boot support bar is fabricated to form a pair of parallel transverse passageways, one of said passageways located at each end of said bar for parallel alignment with the ski upon which it is to be carried and each shaped to receive therethrough a different one of said elongate members; and wherein further

said locating means comprise a plurality of hollow cover members shaped to slidably fit over each of said elongate members, said cover members fabricated to predetermined lengths so that the ends of a differnnt one thereof when located on said elongate members abut, respectively, said plate means and said boot support bar, and said boot support bar and a portion of the binding proximate said release means.

6. The ski binding assembly in accordance with claim 3 and boot release means adapted for mounting on a ski carrying said binding, said boot release means secured to said plate means to enable the user to selectively raise and lower said plate means with respect to the ski, said plate means when in the lower position to cause said adjusting means to operatively contact said terminus of the elongate member, and when in the raised position cause said adjusting means to move out of contact with said terminus, so that said elongate member may then freely rotate about the axis thereof normal to a disengaging movement of said release member, thus to provide for easy and complete removal of the boot from the ski.

7. The releasable ski binding in accordance with claim 4 and wherein further:

a cross bar for mounting on the sole of the skier's boot transverse thereto forwardly of the heel portion and rearwardly of the toe section, said bar shaped to form an engaging surface at the ends thereof on either side of the boot;

said release member connected to each of said elongate members comprise a pair of upstanding clamp members, a different one being connected to each of said elongate members, each said clamp fabricated to form a receiving surface for cooperative engagement with the engaging surface of said bar, so that when the skier places the bar carrying boot into position between said clamps, the boot is grasped therebetween and held firmly in position by the torsional deflection transmitted therethrough by said elongate members; and

support means to brace the ends of said elongate members proximate the sections thereof carrying said upstanding clamps.

8. The releasable ski binding in accordance with claim 7 and wherein further the engaging surfaces of said cross bar are shaped to define protrusions having a semi-ovaloid profile whose long axis when in position on the ski is parallel to the longitudinal axis thereof, and the receiving surfaces of said upstanding clamps are each shaped to form an elongate truncated cone oriented to provide continuous tangential contact with the tips of said cross bar when the bar carrying boot is in position on the ski.

9. The ski binding assembly in accordance with claim 1 and boot release means adapted for mounting on a ski carrying said binding, said boot release means interconnected to said torsion means to enable the user to selectively disconnect the torsion means and cause the latter to exert no reactive force in response to an applied disengaging movement of the release member, so that the torsion means may then freely rotate about the axis thereof normal to such applied disengaging movement, thus to provide for easy and complete removal of the boot from the ski.

10. In a ski binding assembly of the type characterized by a pair of upstanding side clamps each movably mounted on opposite sides of a ski to engage and hold a ski boot in position during normal ski usage, and disengage and release the boot from the ski in the event a twisting or uplifting force, or combination thereof, of predetermined magnitude be imposed upon the boot in respect to the ski, the release assembly comprising:

torsion means connected to each of said side clamps to urge said clamps into engagement with a ski boot placed therebetween, and to torsionally deflect in response to outward movement of the connected side clamp about an axis normal to said outward movement, such torsional deflection causing a reactive force to be exerted by said torsion means to said clamp in opposition to the outward movement thereof.

11. The release assembly in accordance with claim 10 and wherein further:

adjusting means associated with said torsion means to enable a user to cause the torsion means to be preset and torsionally deflect a preselected amount when the reactive force therefrom transmitted to the connected side clamp corresponds to a twisting or uplifting force, or combination thereof, of predetermined magnitude imposed upon the ski boot in respect to the ski, such preselected amount of deflection to cause said side clamp to disengage from and release the ski boot normally held in place on the ski thereby.

12. The ski binding assembly in accordance with claim 10 and wherein further said torsion means comprises:

a pair of elongate members, one disposed on either side of each ski to which said release assembly is mounted, one end of each said member connected to a different one of said upstanding side clamps; and

plate means secured to said ski remote from said upstanding clamps to rotatably carry each of the other ends of said elongate members; and

adjusting means carried by said plate means proximate the terminus of each of said other ends of the elongate members rotatably carried by the plate means, said adjusting means adapted for individual cooperative contact with said termini to enable a user to individually cause each of said elongate members to be preset and torsionally deflect a preselected amount when the reactive force therefrom transmitted to the respective upstanding side clamps corresponds to a twisting or uplifting force, or combination thereof, of predetermined magnitude imposed upon the ski boot in respect to the ski, such preselected amount of deflection in either one or both of said upstanding side clamps to cause the latter to disengage and release from the ski that portion of the ski boot normally engaged thereon by said upstanding side clamps.

13. The ski binding in accordance with claim 10 and adjusting means associated with said torsion means to enable a user to urge the torsion means to a preset position and torsionally deflect a preselected amount when the reactive force therefrom transmitted to the side clamp connected thereto corresponds to a twisting or uplifting force, or combination thereof, of predetermined magnitude imposed upon the ski boot in respect to the ski, such preselected amount of deflection to cause said side clamp to disengage from and release the ski boot normally held in place on the ski thereby;

boot release means adapted for mounting on the user's ski to positionably carry said adjusting means and enable the user to selectively position last said means, respectively, into and out of engagement with said torsion means, the latter being urged to said preset position when said boot release means is in engagement therewith, and retracted to a freely rotatable position when the boot release means is out of engagement, so that in the latter

condition the torsion means may freely rotate about the axis thereof normal to a disengaging movement of either one of said upstanding members to provide for easy and complete removal of the boot from the ski.

14. A releasable ski binding for use in downhill skiing, wherein the heel portion of the binding and the ski boot are in fixed contact with the ski, and, alternatively in cross country or ski touring, wherein the heel portion of the binding and the ski boot are free to pivotally rotate about an axis transverse to the ski proximate the toe of the boot, said binding comprising in combination:

a movable section to support the ski boot, said section carrying

a release member to engage and hold at least a portion of the boot in position on said section during normal usage, and disengage and release such portion of the boot from the ski in the event a twisting or uplifting force or combination thereof, of predetermined magnitude be imposed upon the boot in respect to the ski; and

torsion means connected to said release member to urge the latter into engagement with the boot, and to torsionally deflect in response to a disengaging movement of the release member about an axis of said torsion means normal to said disengaging movement, such torsional deflection causing a reactive force to be exerted by said means upon said release member in opposition to the latter's disengaging movement; and

a fixed section for attachment to a ski and rotatably carry said movable section for pivotal rotation about an axis transverse to the ski proximate the toe of the ski boot; and lock means for mounting on a ski proximate said movable section to engage and disengage the latter, said movable section when engaged by said lock means being held in fixed contact with the ski and, alternatively, when disengaged by the lock means, being pivotally secured to the ski and rotatable about the axis transverse thereto proximate the toe of a boot thereon.

15. The releasable ski binding in accordance with claim **14** and wherein further:

said torsion means comprises an elongate member having one end thereof connected to said release member; and

said movable section including plate means proximate said axis transverse to the ski and remote from said release member, said plate means to rotatably carry the other end of said elongate member; and

adjusting means carried by said plate means proximate the terminus of said other end of the elongate member rotatably carried by the plate means, said adjusting means adapted for cooperative contact with said terminus to enable a user to cause said elongate member to be preset and torsionally deflect a preselected amount when the reactive force therefrom transmitted to said release member corresponds to a twisting or uplifting force, or combination thereof, of predetermined magnitude imposed upon the ski boot in respect to the ski, such preselected amount of deflection to cause said release member to disengage and release from the ski at least that portion of the ski boot normally engaged thereon by said release member.

16. The releasable ski binding in accordance with claim **15** and wherein further said elongate member comprises a first of two such members and is mounted for alignment along one side of said ski;

a second elongate member similar to said first member mounted for alignment along the other side of said ski, said second member having one end connected to said release member and the other rotatably carried by said plate means;

a boot support bar carried by said elongate members, said boot support bar adapted to provide a generally planar surface upon which a portion of the sole of the ski boot rests during skiing and in spaced relation to said release members, so that an uplifting force imposed upon the ski boot in respect of the ski is respectively resisted at the point of contact of the boot and said support bar to cause said release member to disengage and release from the boot when such uplifting force exceeds a predetermined magnitude; and

locating means associated with each of said elongate members to hold said boot support bar thereon at a predetermined position corresponding to the aforementioned spaced relation of the support bar to said release member.

17. The releasable ski binding in accordance with claim **16** and wherein further said boot support bar is fabricated to form a pair of parallel transverse passageways, one of said passageways located at each end of said bar for parallel alignment with the ski upon which it is to be carried and each shaped to receive therethrough a different one of said elongate members; and wherein further

said locating means comprise a plurality of hollow cover members shaped to slidably fit over each of said elongate members, said cover members fabricated to predetermined lengths so that the ends of a different one thereof when located on said elongate members abut, respectively, said plate means and said boot support bar, and said boot support bar and a portion of the binding proximate said release means.

18. The releasable ski binding in accordance with claim **16** and wherein further:

a cross bar for mounting on the sole of the skier's boot transverse thereto forwardly of the heel portion and rearwardly of the toe section, said bar shaped to form an engaging surface at the ends thereof on either side of the boot;

said release member connected to each of said elongate members comprise a pair of upstanding clamp members, a different one being connected to each of said elongate members, each said clamp fabricated to form a receiving surface for cooperative engagement with the engaging surface of said bar, so that when the skier places the bar carrying boot into position between said clamps, the boot is grasped therebetween and held firmly in position by the torsional deflection transmitted therethrough by said elongate members; and

support means to brace the ends of said elongate members proximate the sections thereof carrying said upstanding clamps.

19. In a releasable ski binding of the type characterized by a movable section selectively rotatable about an axis transverse to the ski upon which such binding is adapted for mounting, so that the binding may be uti-

lized for either downhill (heel fixed) or cross-country (heel free) skiing, a lock assembly for mounting on the ski proximate said movable section to engage and disengage the latter, said movable section when engaged by said lock means being held in fixed contact with the ski and, alternatively, when disengaged by the lock means being rotatable as aforesaid, said assembly comprising:

lock means for reciprocal movement parallel to the longitudinal axis of said ski and engagement there along with a portion of said movable section to selectively engage and hold the movable section in the heel fixed position when said lock means is in a first position, and disengage and permit the movable section to freely rotate when said means is in a second position;

mounting means for attachment to the ski to slidably guide said lock means and maintain the latter in position on the ski; and

shifter means for securement to the ski, last said means interconnected to said lock means to reciprocally shift the latter from said first position to second position, and vice versa.

20. The lock assembly in accordance with claim **19** and wherein further said shifter means comprises:

a cam shaped to provide an apex and two faces adjacent thereto, said faces adapted and formed for alternative contact with the top surface of a ski;

means flexibly supporting said cam for manual rotation about a transverse axis thereof and cause the cam at the user's election to rotate about said axis and urge either one said face or the other into contact with the top surface of the ski, and simultaneously reciprocally displace said apex from one position to another;

rod means to interconnect said cam apex to said lock means, so that when said apex is displaced from the one position to the other said lock means is shifted from said first position to said second position, or, alternatively, vice versa.

21. The lock assembly in accordance with claim **20** and wherein further said means flexibly supporting said cam comprises a leaf spring having one end rotatably mounted at the transverse axis of the cam and the other end adapted for securement to the ski upon which the assembly may be mounted, said spring being fabricated to provide flexural deflection when secured to the ski so that said cam faces are pressurably engaged with the top surface of the ski.

22. The lock assembly in accordance with claim **19** and wherein further said lock means comprises a lock bolt having a generally cylindrical shape with a taper formed at the free end thereof; and

said movable section is formed to provide a passageway therein sized to receive said lock bolt and located so that the lock bolt is inserted therein when said shifter means is reciprocally shifted in one direction, and withdrawn therefrom when the shifter is shifted in the other direction.

23. The lock assembly in accordance with claim **19** and wherein further said lock means comprises:

a sliding retainer shaped to provide a pair of oppositely disposed, inwardly sloped surfaces; and a guide for slidable engagement with said retainer, said guide for securement to a ski upon which the assembly may be mounted; and

wherein further a portion of said movable section is shaped to provide a pair of outwardly sloped surfaces for slidable and complimentary engagement with the inwardly sloped surfaces of said sliding retainer, so that when the retainer is in said first lock means position said inwardly sloped surfaces thereof overlap the outwardly sloped surfaces of said movable section and retain the latter in the heel fixed position, and when in said second lock means position cause said surfaces to be out of contact with each other and permit the section to rotate with the heel free.

24. A ski binding assembly, comprising a pair of opposed release members pivotally mounted on a ski on spaced generally longitudinal axes, said members being adapted to engage and hold at least a portion of a ski boot in position on a ski during normal ski usage, and to disengage and release such portion of the boot from the ski in the event a twisting or uplifting force, or combination thereof, of predetermined magnitude be imposed upon the boot in respect to the ski; said pivot mounting in each case including a rod united to its release member with said release members normally upwardly directed in readiness for step-in boot engagement, and a preset torsionally stiff compliant connection of one end of each rod to a location on the ski offset from the rotary axis of the rod, the preset of each said connection being in the direction to constantly urge said arms toward each other.

25. The assembly of claim **24,** in which said assembly includes frame structure including a part removably securable to a ski, in which said pivot rods are journaled in first parts of said frame structure, and in which the offset locations for the preset compliant connections are at second locations of said frame structure.

26. The assembly of claim **24,** in which each said pivot rod is torsionally longitudinally removed from its associated release member, said compliant connection including an offsetting arm fixedly related to the longitudinally removed location on said rod.

27. The assembly of claim **26,** in which the offsetting arm of each said compliant connection comprises an integral bent end of the rod.

28. The assembly of claim **24,** in which stop means carried by the ski retains said release members preloaded in said normally upwardly directed orientation, the preset of said compliant connection establishing a torsional preload for both release members against said stop means.

29. The assembly of claim **25,** including frame-mounting structure by which said frame structure is hingedly connected to the ski.

30. The assembly of claim **28,** and including a boot-mountable member adapted to be simultaneously releasably engaged by and between said release members, the effective release-member-engageable span of said boot-mountable member being at least substantially the effective span between said release members when positioned by said stop means.

31. The assembly of claim **30,** in which said first-mentioned span slightly exceeds said second-mentioned span, whereby assurance is had that release-member engagement of said boot-mountable member will at all times involve full preload-force application to said boot-mountable member.

32. In combination, a boot-mountable member and a ski-binding assembly therefor; said binding assembly

comprising ski-mountable frame means, a pair of opposed upstanding release members pivotally mounted on said frame means on spaced generally longitudinal axes, said members being adapted to engage and hold said boot-mountable member herebetween during normal ski usage, and to disengage and release sid boot-mountable member in the event a twisting or uplifting force, or combination thereof, of predetermined magnitude be imposed upon said boot-mountable and ski-mountable members with respect to each other, said frame means including stop means limiting the extent to which said upstanding release members may be pivoted toward each other, and preset torsionally compliant means carried by said frame means and connected to apply a predetermined preload force normally driving each of said release members toward its stop-limited position; said boot-mountable member being so dimensioned at release-member-engageable portions thereof that at least one of said release members is removed from contact with said stop means when said boot-mountable member is engaged to said release members, whereby the full preload force of said compliant means is sustained by a boot-mountable member that is retained by said release members.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,877,712

DATED : April 15, 1975

INVENTOR(S) : KURT A. WECKEISER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 42, change "guest" to --quest--;

Column 11, line 27, change "of" to --if--;

Column 20, line 16 (Claim 14), change "respectively" to --reactively--; and

Column 23, line 6 (Claim 32), change "sid" to --said--.

Signed and Sealed this

fourteenth Day of *October 1975*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks