United States Patent [19]

Druss

[11] **3,810,643**

[45] **May 14, 1974**

[54] **SKI BINDING**

[75] Inventor: **Barry Lewis Druss**, Holliswood, N.Y.

[73] Assignee: **Chimera R. & D., Inc.**, Holliswood, N.Y.

[22] Filed: **Nov. 1, 1972**

[21] Appl. No.: **302,786**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 23,876, March 30, 1970, Pat. No. 3,727,932.

[52] **U.S. Cl.** ..... **280/11.35 R**

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

[58] **Field of Search** 280/11.35 R, 11.35 D, 11.35 E, 280/11.35 A, 11.35 K, 11.35 C; 36/2.5 AL

[56] **References Cited**

UNITED STATES PATENTS

3,061,325	10/1962	Glass	280/11.35 D
3,606,368	9/1971	Smolka et al.	280/11.35 D
3,727,932	4/1973	Druss et al.	280/11.35 K

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1,951,923	4/1971	Germany	280/11.35 K
444,735	2/1968	Switzerland	280/11.35 K

Primary Examiner—David Schonberg
Assistant Examiner—Milton L. Smith
Attorney, Agent, or Firm—Tab T. Thein

[57] **ABSTRACT**

A ski binding comprising an interengaging mechanism between the ski boot and the ski, allowing the skier to transfer his weight to the ski. The essential elements of the binding consist of a plug member and an interengaging socket member, one of the members being associated with the ski boot and the other with the ski. In a preferred form, the plug member is removably secured to the ski and the socket member is associated with the boot; it may be integrally formed with the sole or removably inserted in a recess formed therein. The ski binding has a central rotational member journaled in the plug member for selectively loading and at least partly unloading detent elements by means of interposed parts, such as pawls and supports therefor. The detent elements are either balls or plunger-like elements, by which the two members are allowed to become detached from one another. The socket member has an opening sufficient to receive the plug member. The latter may be made with flat outer sides so as to allow additional clearance between the interengaging members. A plurality of recesses are spaced on the inner wall of the socket member to register with the detent elements of the plug member. Any force whether longitudinal of the ski, or as a torque about the skier's body or legs, will develop a reactive force through or about the area of the geometric center of the binding. If the force is sufficient in magnitude and duration an automatic separation of the interengaging members is effected in response to the force. The invention also provides an over-center action lever arrangement by which the loading force on the detent elements can be selectively applied and at least partly removed when the skier attaches or removes the ski.

20 Claims, 7 Drawing Figures

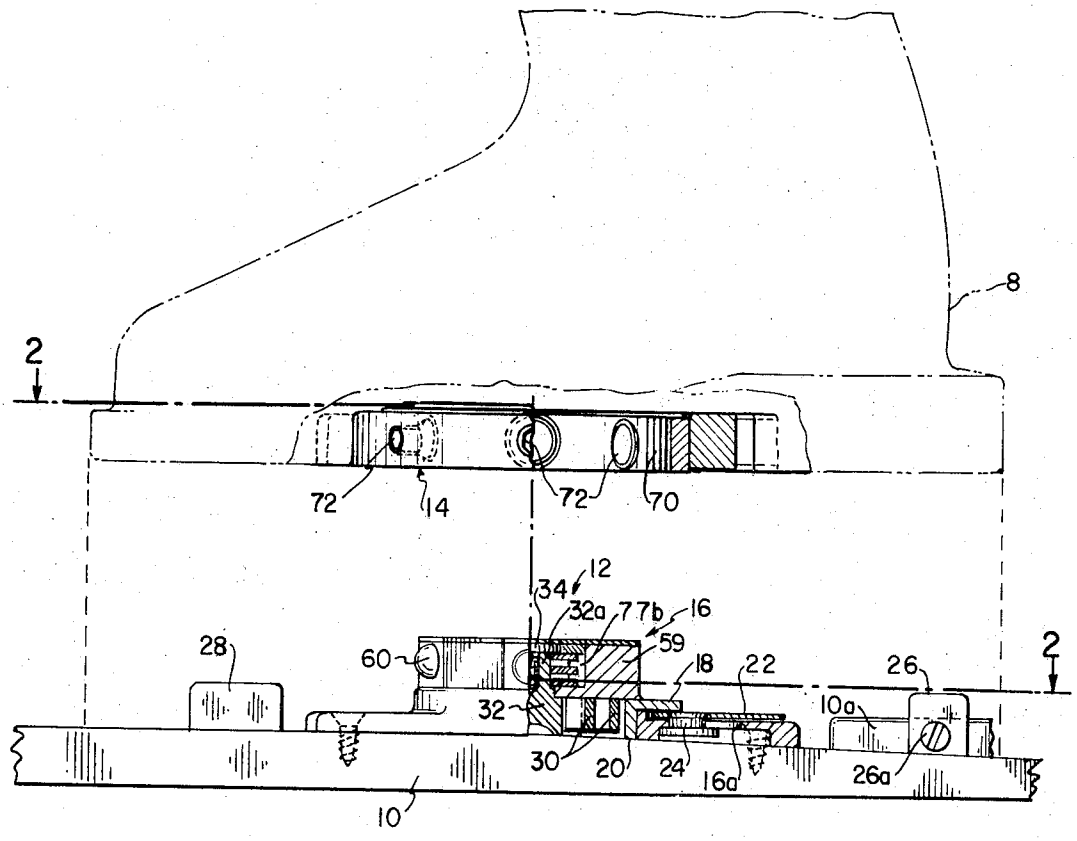


FIG. 1

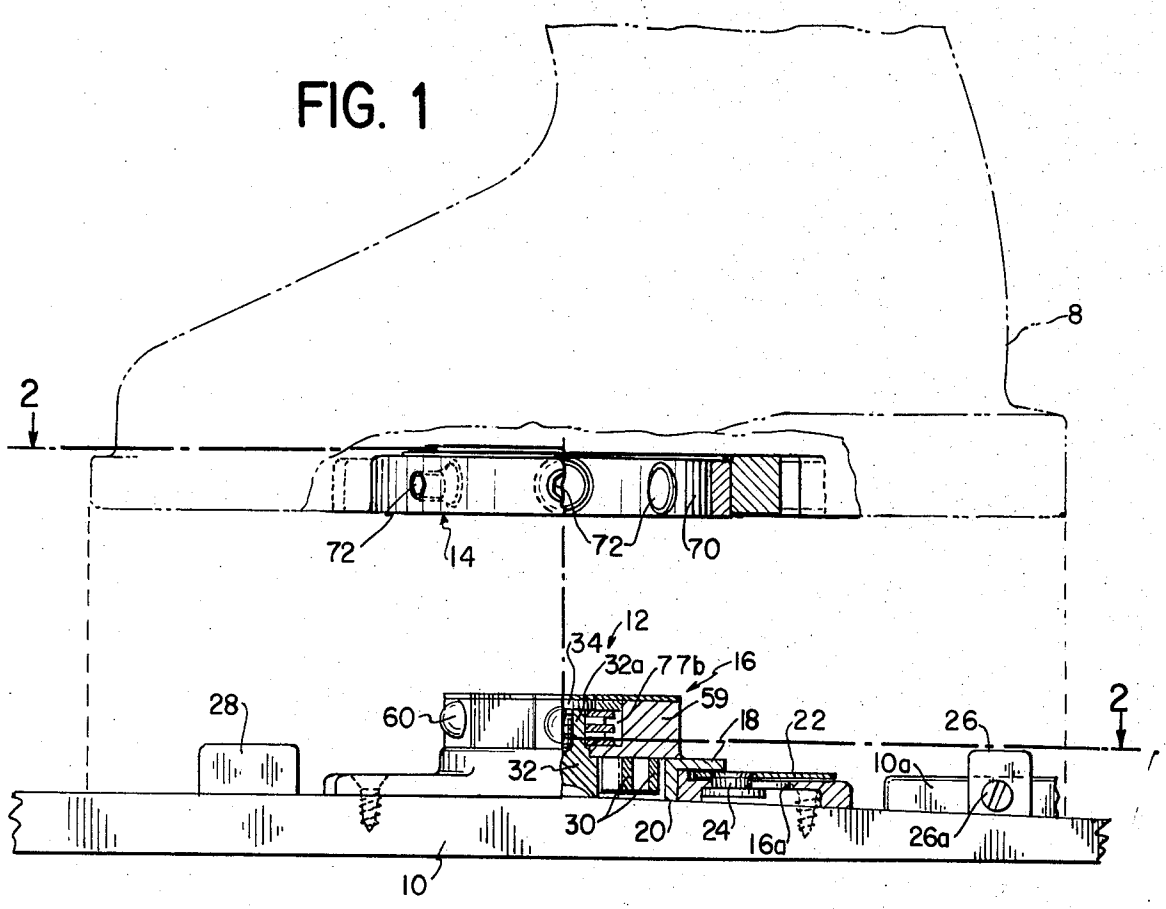

8
2
72
14
72
70
12
34
32a
77b
16
59
28
60
18
22
26
2
32
10a
30
20
24
16a
26a
10

FIG. 2

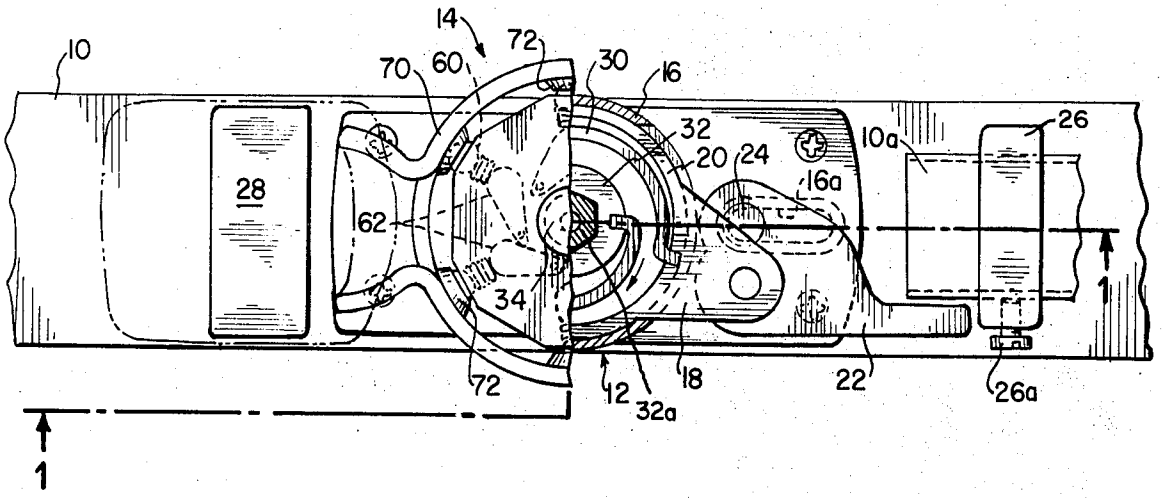

14
10
72
70
60
30
16
32
20
24
10a
26
28
16a
62
1
34
72
12
32a
18
22
26a
1

FIG. 3

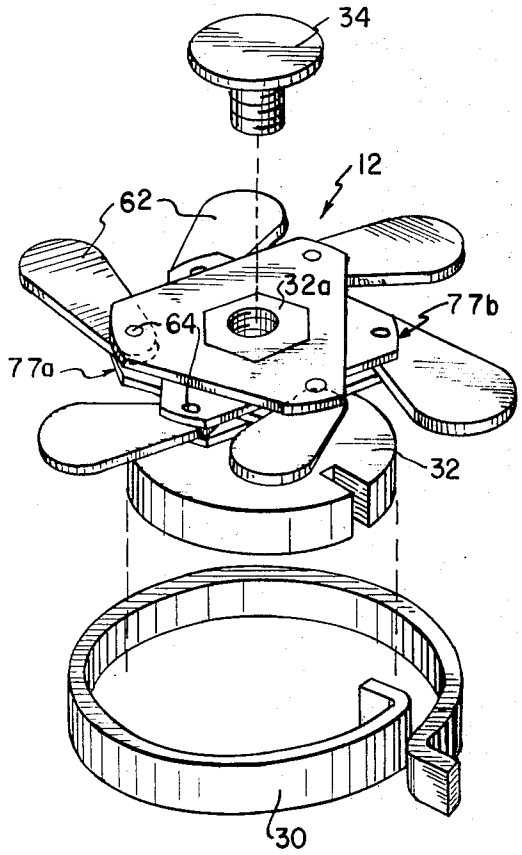


FIG. 6

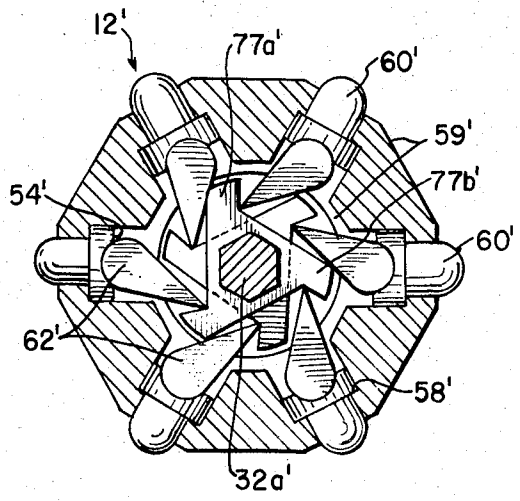


FIG. 4

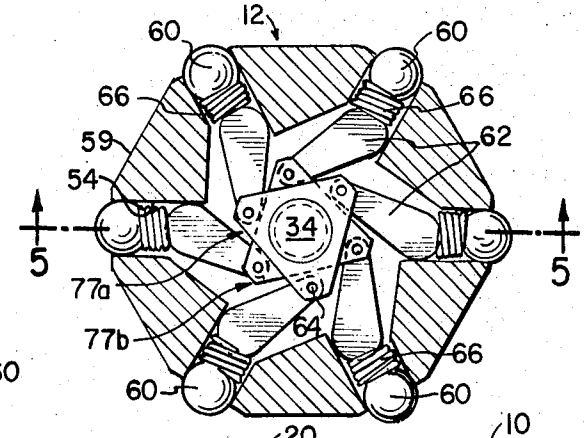


FIG. 5

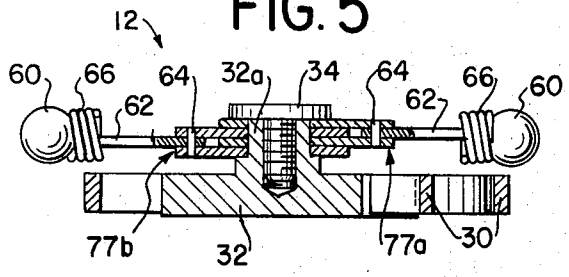
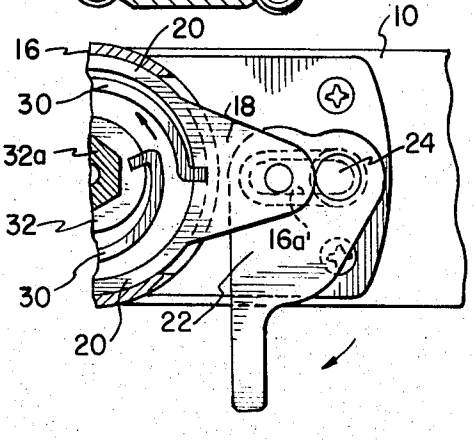


FIG. 7



SKI BINDING

This is a continuation-in-part application of Ser. No. 23,876 filed Mar. 30, 1970 by B. L. Druss and K. S. Williams, titled "Ski Binding", now U.S. Pat. No. 3,727,932 dated Apr. 17, 1973.

BACKGROUND OF THE INVENTION

1. Field of the Invention:

This invention relates to ski bindings and more particularly to bindings adapted to release automatically upon being subjected to a force of predetermined magnitude and duration. The binding is also characterized by a novel central arrangement for simultaneously applying loading force to detent elements between the members of the binding, and allowing optionally also to remove the loading force at least partly, e.g. when the skier attaches or removes his ski.

2. Prior Art:

Heretofore ski bindings provided means for attaching a skier's boot to a ski by mechanisms of varying degrees of complexity and reliability, with a common purpose of holding the boot to the ski during skiing maneuvers and to effect a release of the boot from the ski when the skier falls forwardly, backwardly or sidewardly or twists. Because of the basic design principle of substantially all of the prior ski bindings, the problem of effecting an accurate, reliable and substantially instantaneous release of the boot from the ski in response to forces which could cause injury to the skier has not been satisfactorily solved.

Previous ski bindings had to have means for attaching both the heel and the toe portion of the ski boot to the ski. Many different design forms provide in one way or another means to release either the heel portion or the toe portion so that with either released the other portion will be also disengaged. In some designs attempts are made to disengage both portions substantially simultaneously.

According to the present invention the connection between the ski boot and the ski is effected by means disposed intermediate the toe and heel portion but preferably in line with the axis of twist or rotation of the skier's leg.

With the boot being attached to the ski, the skier transfers his weight to the ski, namely in a so-called weight transfer area or range, usually defined as being between the farthest contact points from front to back, between the boot and the ski. In the inventive ski binding, front and rear rests limit this area, allowing at least one couple with respect to one of the two engaging portions of the binding. Preferably one rest is made adjustable lengthwise of the ski so as to regulate the weight transfer range.

It is a general object of this invention to overcome the shortcomings of prior-art ski bindings by a new principle, applied to a novel and practical embodiment.

It is a particular object of this invention to provide a ski binding wherein there is an effective connection between the ski boot and the ski.

It is still a further object of this invention to provide a reliable release when the skier falls, twists or is otherwise subjected to forces which would cause injury to him.

It is yet another object considered in the invention to provide a centralized mechanism acting uniformly and symmetrically on all detent elements, preferably with

appropriate main and pre-loading means, and optionally with a hand-operable lever mechanism which allows selective loading and unloading of the detenting action.

As compared to the known state of the prior art, it is most important that in the inventive device the interengaging mechanism is forward of the heel portion but rearward of the toe portion of the skier'boot, the only location where the advantageous and novel results can be attained. Some known prior-art structures provide the interengaging parts strictly under the heel of the boot, which is an unsuitable location if one attempted to obtain the required results of interengagement and indexing.

It should be noted that correct leverage for weight transfer could not be achieved with the prior-art devices, and this is efficiently solved in the present invention.

The detent means according to the invention provide positive indexing in the respective planes of the engaging (plug and socket) members or portions as well as in angular directions with respect to the longitudinal axes of the ski and the skier's boot. This is an entirely new concept in ski bindings, not discovered or applied so far, which has received wide acceptance both in domestic and foreign skiing circles.

The interengaging mechanism goes beyond all previous structure in that it provides more than just a locking or catching action; it provides controlled indexing, in various directions and angles, and is consequently far superior to the known devices.

The loading and unloading mechanism combined into the improved ski binding according to the invention carries the advantages even further, allowing for example strong indexing (e.g. for experienced skiers) to be unloaded or released without difficulty, despite the high forces that would have to be overcome between the detent elements (such as in case of a fall).

SUMMARY OF THE INVENTION

According to the invention a plug member and a socket member, constituting interengaging means, coact to hold the ski boot to the ski during normal use, and become disengaged when subjected to abnormal forces, the magnitude of which is predetermined and adjustably preset. One of the members, preferably the plug member, is connected directly to the ski, and the socket member is preferably attached to the boot, although a reversal is possible.

The earlier-mentioned weight transfer range is provided by at least one adjustable rest which allows said range to be preset according to the skier's needs; it will be understood that the farther away the rests are from the center of the interengaging means the greater is the leverage.

The plug member may have flat outer sides for increased clearance during disengagement. It is provided with a plurality of passages, at least three, extending radially in its body. Non-radial passages are also possible, as will be explained somewhat later. A preloading spring may be provided in each passage, if necessary, between a ball or plunger-like element protruding partially through the periphery of the plug member at the outer end of the spring and a pawl or other member acting on its inner surface.

In a modification of the inventive plug member according to this invention, the balls are substituted, as

has just been mentioned, by plunger-like members protruding in a similar manner, and the springs may be omitted, or their role taken over by a flat wound power spring acting centrally on the entire system, including all plunger members, by the intermediary of a central rotating member, as will be explained later.

The socket member is preferably provided with a plurality of recesses along the inner wall for register engagement with the protruding balls or plunger-like members of the plug member. The latter is adapted to be received in the opening of the socket member during normal skiing use and to be retained therein by the balls or plungers which are urged outwardly in the seated position within the respective recesses of the socket member.

The force exerted on the detents by the individual compression springs, or by the common flat spring, is selectively applied or released by the earlier-mentioned central rotating member and the associated mechanism, to engage the balls or plungers disposed in the passages of the plug member and to allow the required play for any one of them while the others are being acted upon.

When a force exceeding the adjusted release force of the plug member is developed through the binding the adjusting force is overcome, allowing the balls or plungers to become unseated from the recesses whereby the plug member is disengaged automatically and substantially instantaneously from the socket member, allowing the boot to be separated completely from the ski.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a side elevation of an exemplary assembly of the ski binding according to the invention, two engaging members being shown in separated or exploded relation, partly in section;

FIG. **2** is a plan view of FIG. **1**, taken therein substantially along the line **2 — 2**, showing the ski carrying one of the engaging members, in the form of a plug member, partly in section, also showing parts of the associated socket member attached in this case to the boot;

FIG. **3** is an enlarged partial exploded view of a central rotating mechanism of the plug member shown in FIGS. **1** and **2**; for simultaneously applying load to detent elements therein, with parts omitted for the sake of clarity;

FIG. **4** is a horizontal section taken through the plug member of FIGS. **1** through **3**, in a plane parallel to that of the ski;

FIG. **5** is a vertical section taken along the line **5 — 5** of FIG. **4**, with parts omitted;

FIG. **6** is a view similar to that of FIG. **4** of a modified plug member body, having plunger-like members instead of balls; and

FIG. **7** is a partial view taken from FIG. **2**, to show the loading and unloading mechanism forming part of the invention with its operating lever in an open, "unloaded" position (as against the closed, "loaded" position of FIG. **2**).

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, there is shown in FIGS. **1** and **2** a skier's boot **8** and a ski **10**, with portions of the inventive binding or interengaging means constituted by a plug member **12** and a socket member **14**, the former being removably secured to the ski while the latter is associated with the boot. The arrangement could also be reversed. The socket member **14** can be integrally formed with the sole of the boot **8** or removably inserted in a recess formed therein. Suitable latching means (not shown) can be used for the latter embodiment.

Details of the socket member are given in the above-referred earlier U.S. Pat. No. 3,727,932, and it will be sufficient to mention herein that it may include a frame **70** made of one or two symmetrical pieces, as shown in FIG. **2**, and lodging a number of recessed inserts **72** on its inner periphery, adapted to receive detent elements of the plug member, as will be explained hereunder. The number of recesses of course corresponds to that of the detent elements, e.g. six as shown in FIGS. **4** and **6**, with numerals **60, 60'** to be explained later. In FIG. **2**, four of the six recessed inserts **72** are visible. As a minimum, the invention provides three detent elements in the plug member and a corresponding number, namely three inserts in the socket member.

The ski **10** is shown with two spaced-apart rests, **26** and **28**, for supporting the skier's boot and providing at least one couple therefor. At least one of the rests should be made adjustable, and this is schematically shown in FIGS. **1** and **2** wherein the ski **10** may have one or two rail members **10***a* allowing rest **26** to be adjusted therealong in various positions and immobilized by a similarly schematically shown screw or the like securing member **26***A*.

The exemplary plug member **12** includes a housing **16** (see FIG. **2**) having a cut-out or opening on one side, for a tab **18** to protrude therethrough, which is rigid with or secured to an annular element **20** which has freedom of at least partial angular movement within the housing **16**. Tab **18** has a pivotal connection to a manually operable lever **22**, shown in FIG. **2** in its closed (loaded) position while the alternative, partial view of FIG. **7** shows the same in its opened (unloaded) position, as will be explained further. The housing may have an appropriate cover, as exemplified in FIG. **1**. It should be noted that in FIG. **2** a few internal elements have been omitted for the sake of clarity, as compared with the exact location where the section line **2 — 2** is shown in FIG. **1**.

Lever **22** has a second, floating pivot **24** which is slidable in an over-center slot of a portion **16***a* of the housing when actuated together with tab **18** and annular element **20** associated therewith. At the lower end of pivot **24**, a bearing collar is preferably attached.

When comparing FIGS. **2** and **7** it will be clear that by the cooperation of the described elements, element **20** is moved in counterclockwise direction, to a small degree, when lever **22** is opened for purposes of unloading or disengaging the interengaging mechanism. The pivot between tab **18** and lever **22** is allowed the same rotational movement as pivot **24** moves lengthwise in the slot of housing portion **16***a*. The over-center arrangement makes for easy yet secure locking of the lever in both terminal positions.

In FIG. **2** it can readily be seen that the skier has no difficulty in actuating lever **22** with his hand even when wearing ski gloves, or with his ski pole. Loading the binding is particularly easy, after engaging the boot onto the ski having the plug member thereon, with the boot carrying the socket member, by simply snapping

the lever into its closed position, hidden by the outer edge of the skier's boot.

Referring now to FIGS. 2, 3, 5 and 7, a flat wound spring 30 is shown, inside annular element 20, having inwardly bent inner and outwardly bent outer ends, as best seen in FIG. 3. Housing 16 has a central, circular opening for spring 30 (see Fig. 1). Inside the spring, substantially centrally of plug member 12, a central rotational member 32 is arranged, transmitting the action of spring 30, and other elements associated therewith, such as the annular element 20, to the detent elements to be described hereinafter.

The arrangement of these parts will best be seen from FIGS. 3 and 5, the latter corresponding to a (somewhat zig-zag) section across the axes of the important structural element of FIG. 4. The modification of FIG. 6 will be described later separately.

Rotational member 32 is arbor shaped and has an upwardly extending central core (or a separate portion attached thereto), identified by numeral 32*a*, carrying pairs of plate-shaped support members 77*a*, 77*b* (omitted for the sake of clarity from the right-hand side at the center of FIG. 2, underneath the section line). The support members have profiled cut-outs for rigid connection with the similarly fashioned central core, to which they can be secured by a screw 34 or similar means. By reference to FIG. 1 it will be seen that screw 34 also acts as an axle for the central mechanism, inside housing 16, just below its cover. Members 77*a*, 77*b* are shown to carry, in two groups, non-radially disposed pawls 62 which may be pivotally attached, such as shown (in FIG. 4) at 64.

It will be explained later, in connection with FIG. 6, that these pivots do not have to be structurally defined but constituted by respective engaging portions of the support members and the pawls.

As a matter of convenience and example, FIG. 5 shows the pairs of support members 77*a*, 77*b* in two planes, with the respective pawls similarly at different levels, although the members they engage (balls or spheres 60 and take-up or preloading elements 66, in the form of small springs) are preferably in the same plane, as are the recessed inserts 72 of the socket member 14.

The body of the plug member 12 is shown in FIG. 4 at 59, with a number of passages 54 therein, each for lodging one of the already mentioned balls 60 and optional pre-loading springs 66, interposed between pawls 62 and balls 60. It can be seen from the preceding description that a continuous force-transmitting path is provided from lever 22 by way of annular element 20 to flat spring 30, and thence to the pawls 62 (by the intermediary of rotational member 32 and supports 77*a*, 77*b*) and eventually to balls 60; if desired, also through the interposed springs 66.

The main source of biasing action is of course the flat spring 30 although it can be dispensed with, and a direct connection provided between element 20 and member 32 (rigid or semi-resilient) if springs 66 are in fact used and provide the required degree of preloading.

Passages 54 guide the elements therein, preferably in a radial direction of the plug member, although it should be noted that they might be provided in a non-radial arrangement, sloping away at a small angle from radial directions toward the center of the plug member.

Although the outer face of the plug member body 59 could be round, the preferred embodiment provides a flattened or polygonal outer surface, allowing additional clearance for the releasing action of the plug member with respect to the socket member.

The described mechanism allows the balls 60 to be selectively loaded or unloaded by actuating lever 22. In the position of FIG. 2, spring 30 is urged in clockwise direction, and so are the outer ends of pawls 62, into tight engagement with balls 60. In contradistinction, the position of lever 22 as shown in FIG. 7 releases spring 30 to some extent in counterclockwise direction, relaxing the pressure on pawls 62, and eventually decreasing the loading on the balls. In this condition the skier can easily engage or disengage the socket and plug members (that is, his boot with respect to the ski). The directions in which spring 30 is acted upon are shown in the two figures by small arrows.

So far a preferred, exemplary embodiment of the ski binding has been described, with possible modifications (addition or omission of parts). With reference to FIG. 6, a self-contained modification of the plug member will now be described, generally identified by numeral 12'. Body 59' is similar to that described for FIG. 4 except for slightly differently formed passages 54' which have narrowed-in shoulder portions 58' for receiving therein the inner ends of plunger-like elements 60', taking the place of the previously described ball-shaped detent elements. Their operation in connection with the recesses of the socket member is however the same.

The modification provides pawls 62' which need not be physically pivoted to respective support members 77*a*', 77*b*' because knife-edge shaped inner ends of said pawls operatively engage reentrant portions of the support members, as shown. Plug body 59' has a somewhat raised, annular portion partly to support pawls 62' which "float" between the support members (inside) and the inner ends of the plunger elements (outside), except of course for the action of flat wound spring 30 indirectly acting thereon, by the intermediary of rotational member 32, and the previously described central mechanism which is common to this modification. A central core portion 32*a*' is shown in FIG. 6 in section (in lieu of the screw 34 visible in FIG. 4). The embodiment of FIG. 6 could also have pre-loading springs like those shown in FIG. 4 at 66.

The substantially firm if not rigid connection between the boot and the ski, the releasing action of the inventive ski binding, and further details have been fully described in the earlier-mentioned U.S. Pat. No. 3,727,932 of which this is a continuation-in-part. The invention provides a most successful and useful means for reducing skiing accidents or injuries since the binding will automatically separate in response to the applied torque or moment before the injury can occur.

The present invention is more sophisticated than that of the earlier patent on account of the provision of its novel central detent loading means, whereby the loading force is applied symmetrically and simultaneously. The invention also provides an optional loading and unloading mechanism which greatly facilitates the use of the binding.

Various alternatives, modified and combined forms of the invention other than those specifically illustrated and described will be readily understood by those skilled in the art.

What I claim is:

1. A ski binding for removably attaching a skier's boot to a ski, comprising: an interengaging mechanism between the boot and the ski, said mechanism having engaging portions forward of the heel portion of the boot and rearward of the toe portion thereof, operatively secured to coextensive but opposing portions of said interengaging mechanism; said engaging portions being constituted by a plug member and a socket member, the former removably secured to the ski and the latter associated with the boot; detent means forming part of said plug and socket members for positive indexing therebetween in their respective planes as well as in angular directions with respect to the longitudinal axes of the boot and the ski; said plug member having at least three outwardly directed passages; said detent means including the same number of captive detent elements protruding from said passages, and the same number of recesses on the inner periphery of said socket member; said engaging portions reacting by relative rotational movement, movement out of said planes of the engaging portions, and a combination of said movements, upon occurrence of a force of predetermined magnitude and duration, thereby allowing release of said engaging portions from each other and of the boot from the ski when the skier encounters a major obstacle which results in said force; a central rotational zig-zag) in said plug member with freedom of at elements partial angular movement; associated with said detent elements for symmetrically and simultaneously applying loading force thereto; and non-radially disposed pawl members in at least one plane, interposed between said rotational member and said detent elements.

2. The ski binding as defined in claim 1, further comprising a mechanism associated with said plug member for selectively applying and at least partly removing said loading force to and from said detent elements, including a manually operable lever for actuating said mechanism when the skier attaches and removes the ski.

3. The ski binding as defined in claim 1, further comprising support means in said plug member for said pawl members, operatively associated with said rotational member.

4. The ski binding as defined in claim 3, wherein said support means has two symmetrical, spaced-apart planar sections, for equal numbers of said detent elements.

5. The ski binding as defined in claim 3, further comprising pivot means between said support means and said pawl members.

6. The ski binding as defined in claim 3, further comprising equalizing springs interposed between said pawl members and said detent elements.

7. The ski binding as defined in claim 3, wherein said support means has reentrant portions frictionally engaged by knife-edge shaped portions of said pawl members.

8. The ski binding as defined in claim 3, further comprising a housing forming part of said plug member, and an annular element in said housing in operative connection with said rotational member, for selectively applying and at least partly removing said loading force to and from said detent elements by the intermediary of said support means and said rotational member.

9. The ski binding as defined in claim 8, further comprising a manually operable lever pivotally connected with said annular element, for at least partially angularly moving and locking the same in its terminal positions.

10. The ski binding as defined in claim 9, wherein said lever is pivotally attached to a protruding tab portion of said annular element, and has a floating pivot slidable in a portion of said housing of the plug member.

11. The ski binding as defined in claim 8, further comprising a flat wound loading spring interposed between said annular element and said detent elements.

12. The ski binding as defined in claim 11, wherein said rotational member and said annular element have therein respective means for receiving the inner and outer ends of said flat wound spring.

13. The ski binding as defined in claim 12, wherein said receiving means are in the form of slots respectively provided in said rotational member and said annular element.

14. The ski binding as defined in claim 1, further comprising at least one adjustable rest on the ski, defining a weight transfer range for the skier, in a location selectively spaced apart from said engaging portions in forward and rearward directions along the extension of the ski, allowing pivotal movement of the boot with respect to the ski, and providing at least one couple with respect to one of said engaging portions.

15. The ski binding as defined in claim 1, wherein said plug member has a polygonal outer surface, allowing additional clearance with respect to said socket member.

16. The ski binding as defined in claim 1, wherein said detent elements are spheres, and said passages in the plug member have outer openings somewhat smaller than the diameter of said spheres.

17. The ski binding as defined in claim 1, wherein said detent elements are in the form of small plunger-like elements, and said passages in the plug member have narrowed-in shoulder portions against which said plunger-like elements bear while protruding toward said socket member.

18. The ski binding as defined in claim 1, wherein said passages in the plug member are non-radial and slope away at a slight angle from radial directions toward the center of said plug member.

19. The ski binding as defined in claim 1, wherein said socket member is integrally formed with the sole of the boot.

20. The ski binding as defined in claim 1, wherein said socket member is removably inserted in a recess formed in the sole of the boot.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,810,643 Dated May 14, 1974

Inventor(s) Barry Lewis Druss

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

Claim 1, seventh and sixth lines from the end (in column 7, lines 28 and 29 thereof) should read -- tational member journaled in said plug member with freedom of at least partial angular movement, associated with --.

Signed and sealed this 24th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
☆ U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334