United States Patent

[11] 3,630,539

[72] Inventors **Robert Lusser, deceased late of Munich, Germany by Heinz G. Wagner, administrator; Gustav Schmidt, Munich, Germany**

[21] Appl. No. **53,220**
[22] Filed **July 8, 1970**
[45] Patented **Dec. 28, 1971**

[73] Assignee **Lusser GmbH & Co., Ski-Sicherheitsbindungen KG Munich, Germany**

[32] Priority **July 23, 9169**
[33] **Germany**
[31] **P 19 37 501.0**

[54] HEEL SAFETY BINDING FOR A SKI

10 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **280/11.35 T**
[51] **Int. Cl.** **A63c 9/08**
[50] **Field of Search** ..... 280/11.35 T

[56] **References Cited**

UNITED STATES PATENTS

2,823,922	2/1958	Berlenbach	280/11.35 T
3,379,447	4/1968	Webster	280/11.35 T
3,467,407	9/1969	Unger	280/11.35 T

Primary Examiner—Leo Friaglia
Assistant Examiner—Robert R. Song
Attorney—Holman & Stern

ABSTRACT: A heel safety binding for a ski in which a pressure member extending transversely downwardly toward the front of the ski presses upon the rear edge of the heel of the ski boot or a metal heel fitting under a resilient prestress or tension and, upon attaining admissible maximum load, executes an upward angular movement against the prestress in the vertical longitudinal plane of the ski and during which movement the heel is released from the pressure member after a predetermined point in the upward path of movement. More particularly, the pressure member is connected at its upper portion with the upper leg of a substantially C-shaped leaf spring, the closed end of which faces the rear of the ski and the lower leg of which is mounted on a baseplate attached to the ski or directly to the ski.

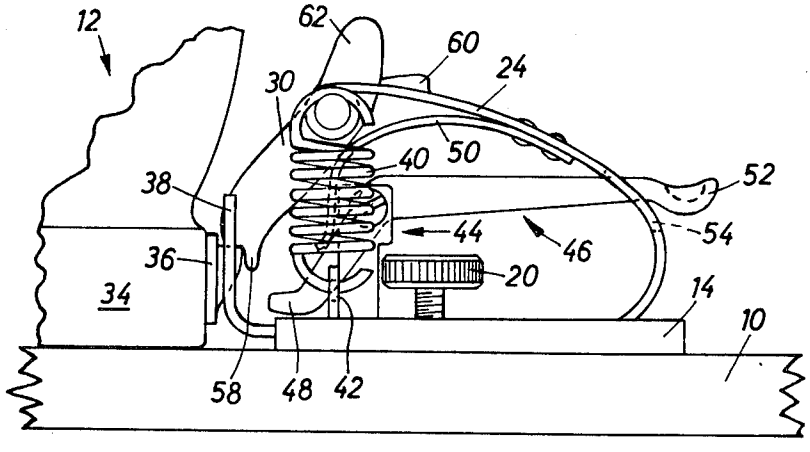


Fig. 1

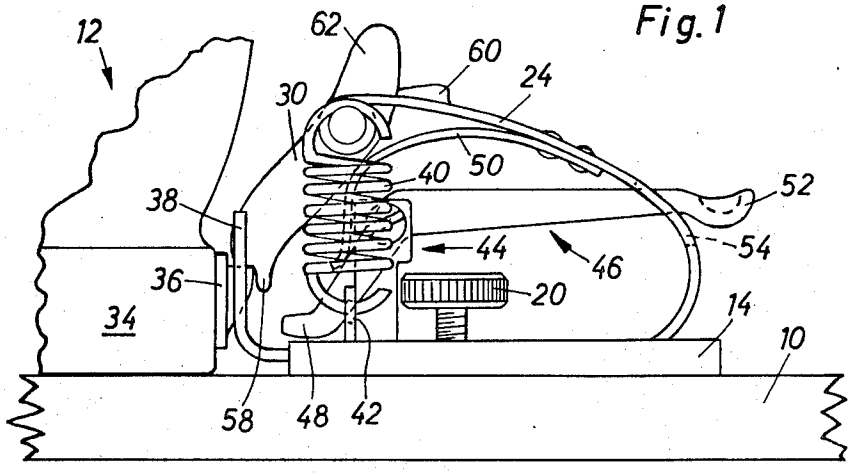


Fig. 2

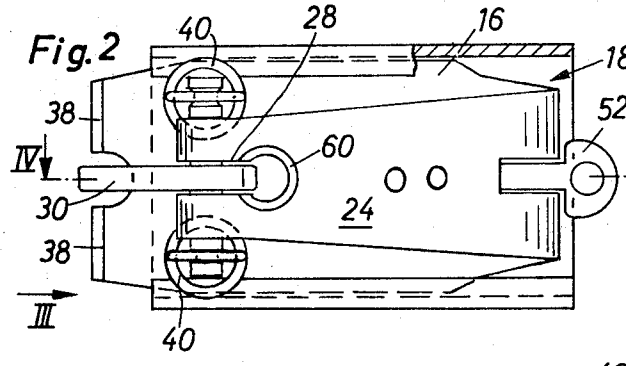


Fig. 3

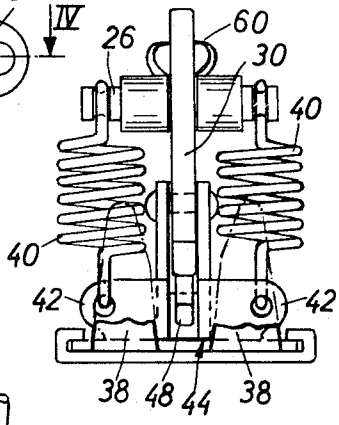


Fig. 4

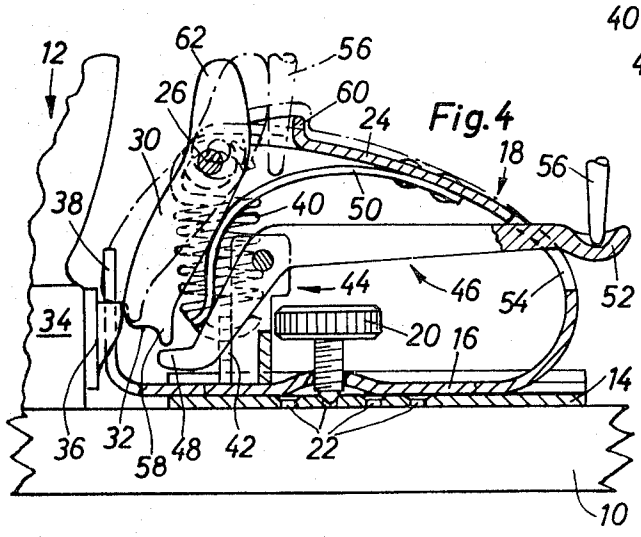
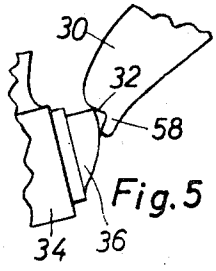


Fig. 5



INVENTOR

BY

HEEL SAFETY BINDING FOR A SKI

BACKGROUND OF THE INVENTION

This invention relates to a heel safety binding for a ski provided with a pressure member extending transversely downwardly toward the front of the ski under resilient prestress and which member presses upon the rear edge of the heel of the ski boot or a metal fitting at the heel and which, upon reaching a permissible maximum load performs an upward angular movement in the vertical longitudinal plane of the ski against the prestress and during which angular movement the heel of the ski boot will be released from the pressure member after a certain upward path of movement.

In a known binding of this general type, the transverse downwardly forwardly extending pressure member is guided at its front end by a guide means, which per se, is swingably located in a support positioned in the vertical longitudinal median plane of the ski, with the support extending upwardly from a baseplate mounted on the ski. The resilient prestress which urges the pressure member against a metal fitting at the rear of the heel of the ski boot is effected by a set of springs anchored at the bottom of the baseplate and which at the top engages a selector lever located approximately in the middle of the guide means and which lever from such position extends or projects upwardly. The selector lever is swingable in the same plane as the guide means and the pressure member, namely between a front final position in which the plane of the lines of application of the springs which engage the selected lever lies forwardly of the joint means connecting the selector lever with the guide means, and a rear final position in which such plane lies rearwardly of or behind the joint means. The front final position of the selector lever is the downhill skiing position in which the torsional moment of the tensions of the spring is high as regards the guide means and also in regard to the force with which the pressure member presses against the metal fitting of the heel. Upon attaining the permissible maximum load, the selector lever changes to its rear final position and in such position, the known binding allows a considerable movement of the boot heel in an upward direction and therefore is suitable for climbing or cross-country skiing. If, however, even in this position of the selector lever the maximum load is reached, the pressure member swings so far upwardly against the resistance of an additional spring which grips the pressure member that the metal fitting of the heel is released.

In another known binding of this character, one forwardly extending leg of an angle lever constitutes the pressure member and such lever is swingable about a horizontal axis extending transversely to the longitudinal direction of the ski. The second leg of the angle lever is tubular and includes a piston as well as a spring which is supported by a threaded plug or stopper at the upper end of the tubular leg and which presses the piston against a flattened portion of the swinging axis. The torsional moment of the spring as regards the swinging axis of the angle lever and also the force with which the pressure member presses against the heel of the boot is dependent upon the breadth of the flattened portion with a given prestress of the spring. In order that the flattened portion may be sufficiently wide, the diameters of the swinging axis and of the piston must be relatively large and the diameter of the tubular leg of the angle lever is correspondingly larger.

The two above-mentioned known bindings have proven satisfactory in practice but do have a considerable height if arranged in such a manner as to be capable of absorbing a certain impact for safety of the skier for which a considerable extent of flexibility of the spring must be available until the ski boot is released from the downhill skiing position. Moreover, the cost of production of the above two bindings is considerable and in connection with the first-described binding this is due to the number of components and in the second because of the required precision of the components constituting the binding. This cost, however is justified in the first-mentioned binding since it is possible to utilize the binding also for cross-country skiing which is seldom done by a large number of skiers.

SUMMARY OF THE INVENTION

The present invention is predicated on the problem of providing a particularly simple and lightweight heel safety ski binding which is insensitive to wear for downhill skiing and the problem has been solved by a binding in which the pressure member at its upper end is connected with the upper leg of a substantially C-shaped leaf spring connected via its lower leg to a baseplate or to the ski per se and which spring is closed towards the rear end of the ski.

The present leaf spring is advantageous as compared to the known guide arrangements in that it is quite resistant against lateral forces even when only of slight thickness with these lateral forces being transferred from the heel of the boot to the ski particularly when skiing on icy steep hills. The width of the leaf spring can be dimensioned at each point in such a manner that the desired flexibility characteristic exists, such as, for example, the spring can be relatively broad at the point located furthest toward the rear and where the sharpest curvature is present and can then taper inwardly towards the free end of the upper leg of the spring.

The present binding is particularly light in weight and can be easily produced if the pressure member is an elongation of the upper leg of the leaf spring and the pressure member and leaf spring are made as a single component. In a different type of construction, the pressure member is connected to the free end of the upper leg of the leaf spring via a suitable joint means.

The leaf spring can be selected in such a manner that the prestress developed by the spring and with which the pressure member presses on the rear edge of the heel of the ski boot or a metal fitting, will not be dangerous to sensitive or inexperienced skiers, particularly children, during a fall. For skiers, whose mode or type of skiing requires a higher prestress and whose physical condition permits such higher prestress, the prestress can also be augmented by connecting the two legs of the leaf spring at its open end or mouth with at least one tension spring. Depending upon the skier, tension springs of varying strength and/or diameter can be provided because the open end of the leaf spring provides sufficient space for permitting the attachment of such tension springs. If the pressure member is connected with the upper leg of the leaf spring via a joint means, a tension spring can be attached adjacent each end of the axis of the joint means.

The surface with which the pressure member presses against the heel or the metal heel fitting can be a substantially horizontal even plane in the operating position and if the ski is to be removed when attached to the ski boot with the present binding, it is easy to press the lower end of the pressure member rearwardly by hand until it slides off of the heel of the boot or the heel fitting whereby the foot is freed from the binding. Dismounting is even simpler with a preferred embodiment of the present heel binding in which the free end of the upper leg of the leaf spring is rolled around a hinge pin or spindle and is provided with a longitudinal slot or slit which receives the pressure member, with the slit defining a rest portion for the tip of the ski pole which may be pressed from the rear against an extension of the pressure member projecting upwardly above the hinge pin for releasing the lower end of the pressure member from the heel or heel fitting. With this type of construction, the skier does not have to bend down if he desires to move the ski since, when the leaf spring is constructed efficiently, its upper leg is so broad that the rear end of the slot in which the pressure member is received can be sufficiently widened for forming an easily accessible point for receiving the tip of the ski pole. The pivotal stress required for dismounting in regard to the swinging axis which lies lower than such accessible point can simply be produced by pressing the ski pole forward at its handle.

Since the pressure member, after mounting of the ski, is adapted to rest on the heel or the heel fitting with a certain prestress, the mouth or open end of the C-shaped left spring is to be somewhat widened during such mounting. For example, this can be accomplished by holding the upper leg of the leaf

spring and pulling the spring in an upward direction and the upper leg can be provided with a handle or the handle may be at the upper end of the pressure member thereby making it possible to adjust the binding. In order that the lower end of the pressure member after such end has reached the necessary height will "jump" forwardly as far as is required to press down the heel of the boot or the heel fitting, a smaller left spring may be provided at the underside of the upper leg of the leaf spring and such smaller spring will press the pressure member in a forward direction. If the pressure member is a part of the C-shaped leaf spring, the same action will occur even without an additional leaf spring.

According to a further embodiment of the invention, a bearing block is provided at the lower leg of the C-shaped leaf spring in which is located a two-armed lever swingable in a vertical longitudinal plane with the rearmost arm extending outwardly through an opening in the leaf spring and which rear arm can be pressed downwardly by the tip of a ski pole and the forwardmost arm is preferably considerably shorter and engages under the lower end of the pressure member which is thrust rearwardly by the heel when the ski boot is placed upon the ski and which is then lifted, by pressing down the rearmost arm into a position in which the pressure member under the action of the forwardly pressing spring force attains its operative position.

In the present binding, the axis of the angular movement which is executed by the pressure member during release operation during a fall is not precisely defined. Even if the pressure member is connected via a joint means with the C-shaped leaf spring, the pressure member is not only swung around the axis of the joint means during the release operation but the entire angular movement of the pressure member includes a component which results from the enlargement of the C-shaped leaf spring. Involved in this enlarging movement is at least the upper leg and the middle zone of the leaf spring and to ensure that the heel or the metal heel fitting is always released from the pressure member during a certain upward path of movement, independent from the path described by the upper arm of the leaf spring during enlargement, the point from which the pressure member extends away, it is advisable that the pressure member be provided with a nose or projection below a shoulder which presses on the upper rear edge of the heel or the metal heel fitting, which, if the heel moves upwardly after attaining an allowable maximum load, slides off from the rear edge of the heel or heel fitting and then presses the heel, after a certain upward path of movement, away from the shoulder.

In order that the pressure member is released from lateral guide forces and for guaranteeing that the ski boot is always centered on the ski when mounting, the forward end of the lower leg of the C-shaped leaf spring is displaced upwardly and is formed with two spaced-apart tines or prongs which receive the heel fitting and the lower end of the pressure member therebetween.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a view in side elevation of the present heel safety binding for a ski,

FIG. **2** is a plan view partly in section of the binding illustrated in FIG. **1**,

FIG. **3** is an elevational view viewed in the direction of arrow III in FIG. **2**,

FIG. **4** is a view taken along line IV—IV, the view looking in the direction of the arrows and in which the operative position is illustrated in dot-dash lines and the mounting position in full lines, and

FIG. **5** is a fragmentary view in elevation illustrating the release of the binding during a fall.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, it will be seen that a ski **10** to which is to be attached a ski boot **12** is provided with a baseplate **14** which may be secured thereto in any suitable fashion such as by means of screws (not illustrated). The guide plate **14** is bent upwardly and inwardly along its longitudinal edges so that it fits over the lateral edges of a lower substantially horizontal leg **16** of a C-shaped leaf spring generally denoted **18**. The leaf spring **18** is capable of adjustment in the longitudinal direction of the guide plate **14** and when in its properly adjusted position is maintained against accidental displacement by means of a knurled head screw **20** whose free end enters one of a plurality of apertures **22** provided in the guide plate **14**.

The leaf spring **18** is bend upwardly at its rear end or that end facing the rear end of the ski **10** thus providing an upper leg **24** which extends forwardly over the lower leg **16**. As clearly as shown in FIG. **2**, the upper leg **24** tapers inwardly towards its front or free end. The front end is rolled as indicated at **26***a* for receiving a hinge pin or pintle **26** and intermediate the ends of the rolled over portion **26***a*, the leg is provided with a longitudinally extending slot **28** which is open at the front thereof. A pressure member **30** is located on the hinge pin **26** within the slot **28** and the lower end of the pressure member **30** is provided with a shoulder **32** (FIG. **4**) which, in the normal operating position of the binding, illustrated in FIG. **1** presses on a metal heel fitting **36** attached to heel **34** of the ski boot **12**.

The forward end of the leg **16** of the spring **18** is displaced upwardly at approximately a right angle and is bifurcated to provide two prongs or tines **38** (FIG. **2**) between which the pressure member **30** extends and into which the heel fitting **36** engages in such a fashion that the latter is prevented from a lateral displacement. It should be mentioned that the tines or prongs **38** can be omitted if in some other manner there is provided means for preventing lateral displacement of the heel **34** of the boot **12** such as, for example, by retaining clips fixed to the ski **10** or the heel fitting **36** per se being bifurcated with the pressure member engaging between the sidewalls of the cup-shaped rear portion of the heel fitting and which are elongated in an upward direction similar to tines or prongs.

The prestress with which the pressure member **30** presses against the heel fitting **36** and thus maintains the heel **34** of the ski boot against the upper surface of the ski **10** is effected partially by the leaf spring **18**. The leaf spring **18** in its relaxed position is of the configuration illustrated in FIG. **4** and it is only upon mounting the ski to the ski boot **12** that the spring assumes the configuration illustrated in full lines in FIG. **1** and in dot-dash lines in FIG. **4**. The prestress developed by the leaf spring **18** is increased by two helical springs **40**. It will be noted that each spring **40** is provided with a hook or the like at its lower end which engages an eye **42** while the upper end of the spring is disposed in a groove provided adjacent the end of the hinge pin or spindle **26**.

The eyes **42** constitute part of the bearing block generally denoted **44** and at which is swingably positioned a lever **46** having front and rear arms **48** and **52** respectively. It will be seen that the lever **46** is disposed in the vertical longitudinal median plane of the ski and the binding. A small leaf spring **50** is rivited or otherwise secured at its rear end portion of the lower surface of the upper leg **24** of the spring **18** and the forward end of the spring **50** presses upon the front arm **48** of the lever **46**. The small spring **50** serves for maintaining the two armed levers **46** in the angular position illustrated in FIG. **4** and at the same time the spring **50** serves for pressing the lower end of the pressure member **30** in a forward direction. The rear arm **52** of the lever **46** projects rearwardly through a suitably formed opening **54** in the C-shaped leaf spring **18** and its rear portion is provided with a recess **52***a* which can receive the tip **56** of a ski pole to enable pressure to be exerted on the arm **52** (FIG. **4**) for swinging the lever **46** against the action of the leaf spring **50**. This particular arrangement serves the following purpose:

If, in order to mount the ski **10** to the ski boot **12**, the ski boot illustrated in FIG. **4** is positioned on the ski in such a manner that the heel fitting **36** engages between the two tines

38, then the fitting presses the lower end of the pressure member 30 rearwardly in the position illustrated in FIG. 4. In this position, a nose or projection 58 provided at the lower end of the pressure member 30 and extending downwardly is located immediately above the front arm 48 of the lever 46. If the rear end 52 of the lever 46 is pressed downwardly by the tip of the ski pole, the front arm 48 of the lever 46 acts upon the pressure member 40 during its upwardly directed swing until the shoulder 32 of the pressure member attains the height of the upper edge of the cup-shaped rear portion of the heel fitting 36. From this position, the leaf spring 50 presses the pressure member 30 into the operative position illustrated by FIG. 1 by full lines and in FIG. 4 by dot-dash lines. The rear arm 52 of the lever 46 is approximately three times the length of the front arm 48 and consequently the force with which the arm 52 must be pressed downwardly merely amounts to one third of the prestress with which the pressure member 30 presses upon the heel fitting 36 in the operative position.

The nose or projection 58 at the lower end of the pressure member 30 serves yet another purpose namely the purpose of increasing the safety of the binding. If, during a forward fall, the inertia which induces the skier to fall forwardly becomes so great that the heel 34 of the ski boot is drawn upwardly with a force which is greater than the prestress of the pressure member 30, the two helical springs 40 and the opening of the leaf spring are enlarged. The hinge pin or spindle 26 of the pressure member 30 moves upwardly and at the same time somewhat rearwardly with the pressure member 30 executing a swinging motion around the axis. During this motion, the nose or projection 58 comes into contact with the rear wall of the heel fitting 36 and is in camming engagement therewith. After a certain upward movement of the heel 34, the position of the pressure member in relation to the heel fitting 36 is obtained as is illustrated in FIG. 5. In this position, the nose or projection functions as a release and ensures that the fitting 36 is indeed released from the shoulder 32 of the pressure member 30. In this fashion, the upward path of movement which must be covered by the heel 34 until it is completely released by the binding is predetermined sufficiently precisely for avoiding injuries to the skier by possible delayed release of the binding even though the adjustment of the springs 18 and 40 was correct.

If a skiing movement is terminated by a normal dismounting of the skis instead of a fall as above-described, the tip 56 of a ski pole (FIG. 2) can be inserted into the rear portion of the slot 28 which is a funnellike component 60 and thus exert a forwardly directed pressure onto portion 62 of the pressure member 30 which extends upwardly above the hinge pin or spindle 26. As a consequence, the lower end of the pressure member is swung rearwardly and the shoulder 32 slides off the heel fitting 36.

This invention is not to be limited to the embodiment shown in the drawings but changes or modifications may be made therein so long as such changes or modifications cause no material departure from the spirit and scope of the appended claims.

I claim:

1. A heel safety binding comprising a pressure member mounted for swinging movement in a vertical longitudinal plane on a ski, said pressure member extending downwardly and forwardly for pressing on the rear edge or heel fitting of a ski boot under a resilient prestress, and upon attaining an admissible maximum load executing an upward angular movement against the resilient prestress in the vertical longitudinal plane and during which the heel of the ski boot is released from the pressure member after a predetermined point in the upward angular path, the improvement comprising a C-shaped leaf spring having an upper leg, a lower leg, a closed end, and an open end, said lower leg being mounted on the ski with said closed end facing the rear of the ski, and means operatively connecting the upper portions of the pressure member to the upper leg of the leaf spring.

2. The heel safety binding as claimed in claim 1 in which said pressure member is connected by means of a hinge pin with a free end of said upper leg.

3. The heel safety binding as claimed in claim 1 in which said upper and lower legs of the leaf spring are connected adjacent the open end by at least one helical spring.

4. The heel safety binding as claimed in claim 2 in which a helical spring is connected to said hinge pin adjacent each end thereof and to said lower leg of said leaf spring.

5. The heel safety binding as claimed in claim 2 in which said hinge pin extends through a rolled portion of the free end of said upper leg and said upper leg being provided with a longitudinal slot for receiving said pressure member, said slot merging with a connecting point rearwardly of said hinge pin for receiving the top of a ski pole for pressing from behind an extension of the pressure member projecting upwardly above the hinge pin for releasing the lower end of the pressure member from the rear edge or heel fitting of the ski boot.

6. The heel safety binding as claimed in claim 2 including a small leaf spring connected at one end of the undersurface of the upper leg of said C-shaped leaf spring and the opposite end of said small leaf spring pressing said pressure member forwardly.

7. The heel safety binding as claimed in claim 1 including a bearing block provided on the lower leg of said C-shaped leaf spring, a two-armed lever mounted on said bearing block for swinging movement in the vertical longitudinal plane, the rear arm of said lever extending through an opening in the closed end of said leaf spring capable of being pressed downwardly by the tip of a ski pole, the front arm of said lever being of lesser length than the rear arm and engaging under the lower end of said pressure member which is pressed rearwardly by positioning a ski boot onto the ski thereby raising the pressure member into a position from which it will independently arrive at its operative position under the action of a spring force which presses the same forwardly.

8. The heel safety binding as claimed in claim 1 in which the forward end of said lower leg of said C-shaped leaf spring is directed upwardly at an angle to said leg, said upwardly directed portion being bifurcated to provide two spaced tines which receive the heel fitting and the lower end of the pressure member.

9. The heel safety binding as claimed in claim 1 in which the lower leg of said C-shaped leaf spring is mounted on a baseplate secured to the ski so as to be adjustable in the longitudinal direction of the ski.

10. The heel safety binding as claimed in claim 1 wherein said pressure member at its downward end pressing on the rear edge or heel fitting of the ski boot, comprises: a shoulder formation engaging said rear edge or heel fitting in normal skiing operation; and an extension which partly forms said shoulder, the extension being in the form of a rounded nose which comes into camming engagement with the rear face of the rear edge or heel fitting of the ski boot so as to assist in the release of the boot from the safety binding when the heel of the boot is drawn upwardly with a force greater than a predetermined limit.

* * * * *