

[54] **HEEL SUPPORTING DEVICE OF A SKI SAFETY BINDING**

3,529,846 9/1970 Voster..... 280/11.35 T
 3,630,539 12/1971 Lusser..... 280/11.35 T
 3,697,094 10/1972 Salomon..... 280/11.35 T

[75] Inventor: **Brigitte Sittmann, Stuttgart, Germany**

Primary Examiner—Robert R. Song
Attorney—Craig, Antonelli & Hill

[73] Assignee: **Vereinigte Baubeschlagfabriken Grestch & Co. G.m.b.H., Leonberg near Stuttgart, Germany**

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[57] **ABSTRACT**

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A heel supporting device of a ski safety binding of the type as disclosed in the U.S. Pat. No. 3,529,846, in which in addition to the heel depressing spring further spring means are provided which during normal skiing permit the heel of the ski boot to be slightly lifted off the ski against their spring action without, however, causing the binding to be released from the boot. These additional spring means preferably consist of at least one bow-shaped spring element which is interposed between the ski and the heel and is in parallel connection with a bracing member which limits the stroke of the additional spring element.

[30] **Foreign Application Priority Data**

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[51] Int. Cl..... A63c 9/00

[58] Field of Search 280/11.35 T

[56] **References Cited**

UNITED STATES PATENTS

3,529,844 9/1970 Salomon..... 280/11.35 T

16 Claims, 5 Drawing Figures

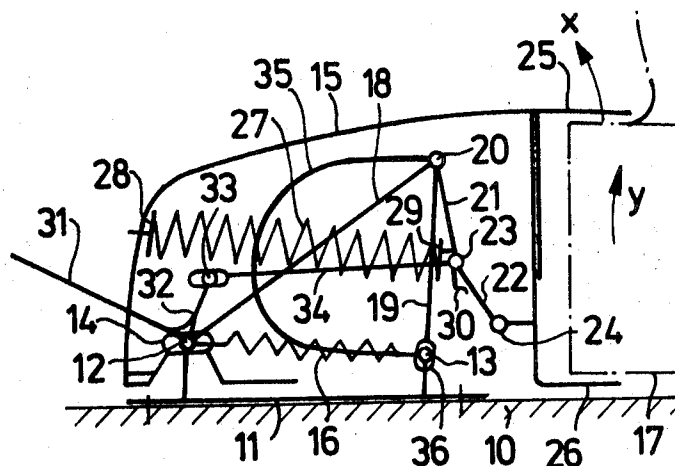


FIG. 3

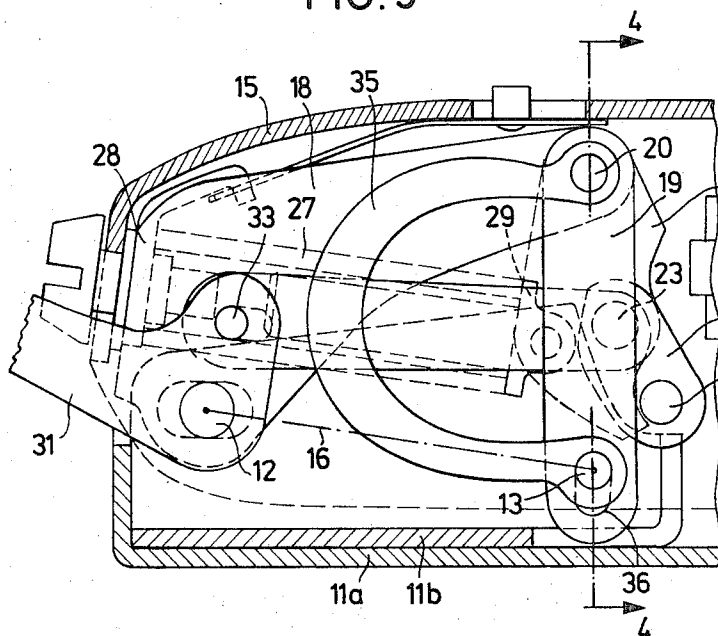


FIG. 4

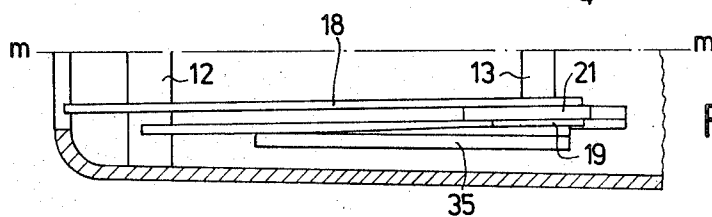
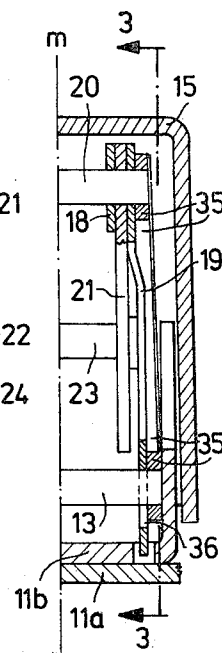


FIG. 5

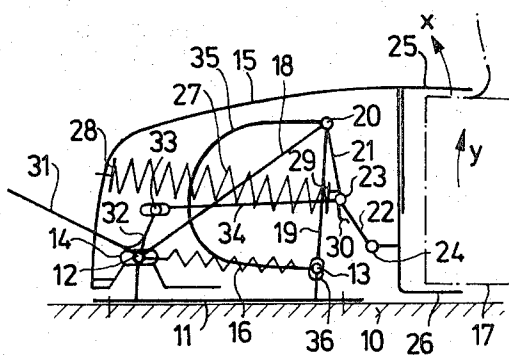


FIG. 1

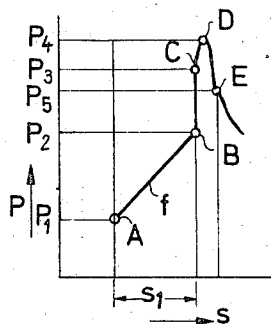


FIG. 2

HEEL SUPPORTING DEVICE OF A SKI SAFETY BINDING

The present invention relates to a heel supporting device of a ski safety binding of the type as disclosed in my previous U.S. Pat. No. 3,529,846, which device comprises a heel depressing element, hereafter called the heel depressor, which normally presses the heel under the action of a heel depressing spring upon the ski, but releases the heel when such a strong force acts in the upward direction upon the heel that the spring pressure of the heel depressing spring will be overcome.

It is an object of the present invention to provide a heel supporting device of the above-mentioned type which is designed so that, in order to prevent the ski boot from being prematurely released from the binding, a relatively strong force is required for lifting the heel so far from the ski that the binding will then be released, and which is further designed so as to permit the heel to move for a certain distance upwardly from the ski against the action of additional spring means substantially independently of the heel depressing spring and with a force lower than that of the initial tension of the heel depressing spring.

An important feature of the invention therefore consists in providing additional spring means which have a limited stroke and preferably a resilience lower than that of the heel depressing spring and are interposed between the heel or the heel depressor and the ski in a manner so as to permit a limited resilient upward movement of the heel without causing the heel to be released.

It is a further object of the invention to provide a heel supporting device of a design as described above which is of a very simple construction and the new parts of which may be easily combined and assembled with the parts of a heel supporting device as disclosed by the aforementioned patent. Another feature of the invention therefore consists in providing such a heel supporting device with additional spring means in the form of a bow-shaped spring bracket which, insofar as the direction of its force is concerned, is interposed between the ski and the heel depressor.

When employing a heel supporting device which is provided with a toggle-lever mechanism which is acted upon by the heel depressing spring and the first toggle arm of which is pivotably connected to the ski, while the second toggle arm is pivotably connected to the heel depressor, the additional spring means are preferably connected between the first toggle arm and the ski.

For limiting the stroke of the additional spring means, for permitting these means to be made of a relatively low-resilient strength, and for preventing them from impairing the required stability of the heel supporting device, it is another feature of the invention to design these additional spring means so that at the end of their stroke their effective force will be still lower than the force which is required for compressing the heel depressing spring to an extent that it will cause the heel depressor to start its releasing movement. According to a preferred embodiment of the invention, this is attained by connecting the additional spring means in parallel with a rigid element, for example, an arm, which is interposed with a certain amount of play between the ski and the heel or the toggle-lever

mechanism. The stroke of the additional spring means may be limited by providing a part of one of the joints of the interposed arm with a longitudinal slot. The rigid element or arm preferably also forms a bracing member for bracing the lever mechanism and for taking up the reaction forces which occur especially when the binding is being released.

Furthermore, the additional spring means are preferably provided with an initial tension when they are in their inactive position and that is, when the heel rests on the ski. Therefore, these means will only be actuated when the force which acts in the upward direction upon the heel exceeds a certain minimum value.

For attaining a uniform resilience and a structurally advantageous arrangement of the additional spring means within a heel supporting device of the type as disclosed in the mentioned patent, the invention further provides these spring means to consist of a pair of spring elements, preferably in the form of bow-shaped spring brackets, which are mounted in corresponding positions at both sides of the heel depressor.

The features and advantages of the present invention will become more clearly apparent from the following detailed description thereof which is to be read with reference to the accompanying drawings, in which

FIG. 1 shows a diagrammatic side view of the heel supporting device according to the invention;

FIG. 2 shows a spring diagram of the device;

FIG. 3 is a longitudinal section which is taken along the line 3 — 3 in FIG. 4 of an actual embodiment of the device as shown in FIG. 1;

FIG. 4 is a cross section which is taken along the line 4 — 4 in FIG. 3, but only shows one half of the device at one side of the central vertical plane $m - m$ and omits some of the internal parts of the device; while

FIG. 5 is a top view of the device as shown in FIG. 3, from which the upper covering wall is cut away and omitted and in which — like in FIG. 4 — only one half of the device is shown and some of its parts are omitted.

As illustrated diagrammatically in FIG. 1 of the drawings, a pair of pivot pins 12 and 13 which extend parallel to the upper surface of the ski 10 and transversely to the ski are rigidly secured to the ski, for example, by being mounted on a base plate 11 which, in turn, is secured to the ski. A heel depressor 15 is provided with a longitudinal slot 14 into which the pivot pin 12 engages. Thus, the heel depressor 15 is pivotable upwardly about the horizontal axis of pin 12 in the direction of the arrow x . A tension spring 16 draws the heel depressor 15 forwardly and against the heel 17 of a ski boot which is only indicated in dot-and-dash lines. A supporting or bracing device for the heel depressor 15 may consist, for example in accordance with the patent previously referred to, of two bracing arms 18 and 19 which are pivotably connected to each other at their upper ends and together form a unit of an inverted V-shape the apex of which is formed by the joint 20 between these arms. A toggle-lever mechanism consisting of the two toggle arms 21 and 22 is disposed between and connected to the joint 20 and the heel depressor 15. Arm 22 one end of which is pivotably connected to the arm 21 by a joint 23 is pivotably connected at its other end by a joint 24 to the heel depressor 15 which is provided on its upper front end with a heel-depressing element 25 which is adapted to engage upon the upper side of the heel 17 and is pref-

erably adjustable to different heights relative to the heel depressor 15, while on its lower front end the heel depressor 15 is provided with a projection 26 on which the heel 17 rests when the ski boot is held in the binding and rests on the ski.

A heel-depressing compression spring 27 the tension of which is preferably adjustable acts with its rear end by means of a bearing member 28 upon the heel depressor 15 in a position in which it has the tendency to open or release the heel depressor 15 from the heel, while its front end acts by means of a bearing member 29 upon the toggle-lever mechanism, for example, upon the toggle arm 21 or the joint 23 and thus tends to push the joint 23 forwardly toward a stop 30 with the tendency to close the heel depressor 15 and to press it toward the ski. The closing tendency is, however, greater than the opening tendency.

A releasing lever 31 for arbitrarily releasing the heel depressor 15 is pivotably mounted, for example, on the pivot pin 12 and has an arm 32 which by means of a pin 33 engages with a certain amount of play with a draw rod 34 which serves as a releasing rod and engages with the toggle-lever mechanism, for example, on the joint 23. Thus, if lever 31 is depressed, draw rod 34 will draw the joint 23 toward the rear against the action of the heel-depressing spring 27 so that the forwardly directed force of this spring which tends to press the heel against the ski will be overcome and merely the rearward pressure of this spring 27 upon the bearing bracket 28 will act upon the heel depressor 15 and exert a torque thereon which pivots the heel depressor in the direction of the arrow x so as to open the heel depressor and to release the heel of the boot.

In order to permit the heel to pivot resiliently upwardly for a short distance in the direction of the arrow y about a forward part of the boot which is held on the ski, and substantially independently of and below the initial pressure of the compression spring 27 acting in the direction toward the ski, an additional spring in the form of a resilient bow-shaped bracket 35 is provided between the ski and the heel depressor and thus between the ski and the heel insofar as the transmission of force is concerned. The ends of this spring bracket 35 are connected to the pivot pin 20 of the two bracing arms 18 and 19 and to the pivot pin 13 which by means of base plate 11 is rigidly secured to the ski. In order to permit such a limited resilient movement of the heel relative to the ski, the lower end of the bracing arm 19 is provided with a longitudinal slot 36 through which it is connected with a certain amount of play to the pin 13. Thus, the spring element 35 may spring back and forth to the extent as limited by the upper and lower ends of the longitudinal slot 36.

FIG. 2 shows an example of a suitable spring diagram of the heel depressor in which the upwardly directed spring force P and its dependence upon the spring stroke s is plotted, while f designates the spring characteristics of the spring element 35 which is preferably mounted between the joints formed by the pivot pins 13 and 20 so as to be under an initial tension and tending to press these two joints toward each other so that the upper end of the longitudinal slot 36 of the bracing arm 19 engages with an initial pressure upon the pivot pin 13. In the diagram as shown in FIG. 2, this normal position of the spring element 35 is indicated, for example, by the point A in which this element has an initial tension P_1 with which it presses the heel depressor

against the heel. If a force occurs which tends to move the heel 17 in the upward direction of the arrow y, the heel may move upwardly by carrying out a stroke s_1 which is in accordance with the section A-B of the spring diagram. The bow-shaped spring element 35 is thereby expanded since the slotted part 36 of the arm 19 will then slide in a substantially vertical direction on the pivot pin 13 and cause the tension of the spring element 35 to increase from the value P_1 to the value P_2 . This value P_2 is, however, still lower than the value of the force with which the heel depressor or the heel is pressed at this time by spring 27 against the ski. If the force acting in the upward direction upon the heel then increases, it must reach the maximum value P_3 which corresponds to the point C of the spring diagram until the spring 27 will react due to the fact that the joint 24 on the heel depressor 15 will then be lifted against the action of spring 27 upon the joint 23, whereby this joint 23 will shift toward the rear and further compress the spring 27. The further upward movement of the heel 17 and its eventual release from the heel depressor depend upon the dimensions and the resilient strength of spring 27 and the particular design of the toggle-lever arms 21 and 22 or a similar lever mechanism. During this upward movement, the heel is acted upon by a force which in the diagram according to FIG. 2 extends from the point B via the point C, in which spring 27 reacts with a tension P_3 , to the point D in which spring 27 is compressed to its maximum value P_4 , whereupon the effective force again decreases to the point E in which the heel will be released from the heel depressor. Between the resilient movement of the heel between the section A-B of the spring diagram which occurs during normal skiing and the releasing point E the spring force which the heel has to overcome must therefore pass through a maximum which normally prevents the heel from being released despite the addition of the spring element 35.

In FIGS. 3 to 5 which illustrate a reduction of the invention to actual practice, those parts which are similar to the parts as shown in FIG. 1 are also designated by the same reference numerals. The base plate 11 is in this case composed of two angular or trough-shaped plates 11a and 11b, respectively, which are screwed or welded together. The inner trough-shaped plate 11b carries the transverse pivot pins 12 and 13.

As further illustrated in FIGS. 4 and 5, each of which shows a cross section of one half of the heel suppressing device according to FIG. 3, the individual elements, especially the spring element 35 and the bracing arm 19 which limits the stroke of this spring element, are provided in pairs symmetrically at both sides of the central vertical plane $m - m$ of the device. The spring action and stroke of both spring elements 35 will thus be very uniform. In order to simplify its construction, the device is only provided with a single draw spring 16 and a single heel depressing spring 27. Both of these elements although not shown in FIGS. 4 and 5 are located within the central vertical plane $m - m$, while in FIG. 3 the draw spring 16 is only indicated by a dot-and-dash line forming its longitudinal axis.

Although my invention has been illustrated and described with reference to the preferred embodiment thereof, I wish to have it understood that it is in no way limited to the details of such embodiment but is capable of numerous modifications within the scope of the appended claims.

Thus, for example, in place of the toggle-lever mechanism as previously described any other suitable means may be provided which will produce the same effect.

Having thus fully disclosed my invention, what I claim is:

1. A heel supporting device of a ski binding for clamping a boot upon a ski comprising mounting means to be secured to a ski, a heel depressor having means normally acting upon the heel of the boot for depressing the same upon the ski, means for movably connecting said heel depressor to said mounting means, spring means for resiliently pressing said heel depressor upon said ski, transmitting means for transmitting the spring force of said spring means to said heel depressor, means operatively connected to said transmitting means for permitting said heel depressor to be lifted against the action of said spring means upon the application of an excessive force in the upward direction upon said heel depressor until the heel of the boot is released therefrom, an additional spring means interposed in the direction of force between said ski and said heel depressor, and means for limiting the resilient stroke of said additional spring means so as to permit the heel to move upwardly from the ski for a limited distance without causing the heel to be released from said heel depressor, and means for supporting one end of said additional spring means on said mounting means and the other end on said transmitting means.

2. A heel supporting device as defined in claim 1, further comprising a bracing unit including a first bracing lever, a second bracing lever, and means for pivotably connecting said two bracing levers to each other and also for pivotably connecting said two levers to said mounting means so that said mounting means and said two bracing levers together form a substantially triangular bracing unit, means for supporting said transmitting means on said bracing unit, said additional spring means consisting of at least one substantially C-shaped spring bracket in parallel connection within said bracing unit to one of said bracing levers, means for permitting a predetermined play at said last-mentioned bracing lever relative to said stroke limiting means, whereby said last-mentioned lever can carry out a stroke in accordance with said play and said additional spring means can carry out a corresponding resilient stroke.

3. A heel supporting device as defined in claim 2, in which said additional spring means consist of at least one substantially C-shaped spring bracket.

4. A heel supporting device as defined in claim 1, further comprising a bracing unit for bracing said transmitting means, said bracing unit including an intermediate member forming a first bracing lever, a second bracing lever, means for pivotably connecting said two bracing levers to each other, separate means for pivotably connecting the free ends of each of said bracing levers to said mounting means, said two bracing levers and said mounting means forming a substantially triangular bracing unit, said means for pivotably connecting a first of said bracing levers additionally serving as a means for pivotably connecting one end of said additional spring means to said mounting means and the other end to said second bracing lever, means for permitting a limited play at one of said connecting means for one of said bracing levers, said limited play being

determined by said stroke limiting means, said play permitting a limited stroke of said first bracing lever and a corresponding resilient stroke of said additional spring means.

5. A heel supporting device as defined in claim 1, wherein said additional spring means is under an initial tension when said heel depressor is pivoted downwardly upon said ski.

6. A heel supporting device as defined in claim 1, wherein said additional spring means consists of at least one substantially C-shaped spring bracket.

7. A heel supporting device of a ski binding for clamping a boot upon a ski comprising mounting means to be secured to a ski, a heel depressor having means normally acting upon the heel of the boot for depressing the same upon the ski, means for movably connecting said heel depressor to said mounting means, spring means for resiliently pressing said heel depressor upon said ski, transmitting means for transmitting the spring force of said spring means to said heel depressor, means operatively connected to said transmitting means for permitting said heel depressor to be lifted against the action of said spring means upon the application of an excessive force in the upward direction upon said heel depressor until the heel of the boot is released therefrom, an additional spring means consisting of at least one substantially C-shaped spring bracket interposed in the direction of force between said ski and said heel depressor, and means for limiting the resilient stroke of said additional spring means so as to permit the heel to move upwardly from the ski for a limited distance without causing the heel to be released from said heel depressor.

8. A heel supporting device of a ski binding for clamping a boot upon a ski comprising mounting means to be secured to a ski, a heel depressor having means normally acting upon the heel of the boot for depressing the same upon the ski, means for movably connecting said heel depressor to said mounting means, spring means for resiliently pressing said heel depressor upon said ski, transmitting means for transmitting the spring force of said spring means to said heel depressor, means operatively connected to said transmitting means for permitting said heel depressor to be lifted against the action of said spring means upon the application of an excessive force in the upward direction upon said heel depressor until the heel of the boot is released therefrom, an additional spring means interposed in the direction of force between said ski and said heel depressor, and means for limiting the resilient stroke of said additional spring means so as to permit the heel to move upwardly from the ski for a limited distance without causing the heel to be released from said heel depressor, said means for movably connecting said heel depressor includes pivot means having a pivot axis extending transverse to the longitudinal axis of the ski for permitting said heel depressor to pivot about said pivot axis, said transmitting means including a lever mechanism having at least one lever, and bracing means for pivotably mounting one end of said lever on said ski and the other end on said heel depressor, said lever assuming a dead-center position relative to said spring means, when said spring means presses said heel depressor by means of said lever against said ski, said heel depressor being pivotable upwardly to a heel releasing position only against the action of said spring means when said lever is

moved to a position exceeding said dead-center position, said bracing means for pivotably mounting said lever including said additional spring means and said means for limiting the stroke of said additional spring means.

9. A heel supporting device as defined in claim 8, wherein said bracing means for pivotably mounting said lever further include a bracing unit supported on the ski, a further lever, connecting means for pivotably connecting one end of said further lever to said bracing unit and its other end to said first lever, said two levers forming a toggle-lever mechanism, said spring means biasing said two levers into a position of straight alignment, and wherein said additional spring means includes at least one spring element, connecting means for connecting one end of said spring element to the ski and the other end to said bracing unit at least adjacent to said connecting means, one of said connecting means carrying said stroke limiting means and permitting a certain play at one end of said spring element.

10. A heel supporting device of a ski binding for clamping a boot upon a ski comprising mounting means to be secured to a ski, a heel depressor having means normally acting upon the heel of the boot for depressing the same upon the ski, means for movably connecting said heel depressor to said mounting means, heel depressing means for resiliently pressing said heel depressor upon said ski, transmitting means for transmitting the spring force of said spring means to said heel depressor in such a manner that, if an excessive force acts in the upward direction upon the heel depressor, said heel depressor will be lifted against the action of said spring means until said heel is released from said heel depressor, additional spring means interposed in the direction of force between said ski and said heel depressor, means for limiting the resilient stroke of said additional spring means so as to permit the heel to move upwardly from the ski for a limited distance without causing the heel to be released from said heel depressor, and a bracing means for bracing said transmitting means, said bracing means comprising an intermediate member, means for connecting one end of said intermediate member to said mounting means and means for connecting the other end to said transmitting means, means for permitting a predetermined play at one of said two last-mentioned connecting means a play thereby allowing a limited upward movement of said heel depressor, said stroke limiting means defining the maximum upward movement of said heel depressor, said connecting means being provided with means for connecting said additional spring means to said intermediate member whereby said additional spring means can carry out a resilient stroke in accordance with the limited stroke of said intermediate member as determined by said play.

11. A heel supporting device as defined in claim 10, in which said additional spring means consist of at least one substantially C-shaped spring bracket.

12. A heel supporting device as defined in claim 10, wherein said intermediate member includes a lever, said means for connecting said intermediate member to said mounting means includes pivot pins, and wherein said intermediate member is provided with an elongated hole for providing said predetermined play through which one of said pivot pins extends, the ends

of said hole forming stops for limiting the resilient stroke of said additional spring means.

13. A heel supporting device as defined in claim 12, in which said additional spring means consist of at least one substantially C-shaped spring bracket.

14. A heel supporting device of a ski binding for clamping a boot upon a ski comprising mounting means to be secured to a ski, a heel depressor having means normally acting upon the heel of the boot for depressing the same upon the ski, means for movably connecting said heel depressor to said mounting means, spring means for resiliently pressing said heel depressor upon said ski, transmitting means for transmitting the spring force of said spring means to said heel depressor, means operatively connected to said transmitting means for permitting said heel depressor to be lifted against the action of said spring means upon the application of an excessive force in the upward direction upon said heel depressor until the heel of the boot is released therefrom, an additional spring means interposed in the direction of force between said ski and said heel depressor, the maximum spring force of said additional spring means being lower than the spring force exerted by said spring means upon the heel on the ski, and means for limiting the resilient stroke of said additional spring means so as to permit the heel to move upwardly from the ski for a limited distance without causing the heel to be released from said heel depressor.

15. A heel supporting device of a ski binding for clamping a boot upon a ski comprising mounting means to be secured to a ski, a heel depressor having means normally acting upon the heel of the boot for depressing the same upon the ski, means for movably connecting said heel depressor to said mounting means, spring means for resiliently pressing said heel depressor upon said ski, transmitting means for transmitting the spring force of said spring means to said heel depressor, means operatively connected to said transmitting means for permitting said heel depressor to be lifted against the action of said spring means upon the application of an excessive force in the upward direction upon said heel depressor until the heel of the boot is released therefrom, an additional spring means interposed in the direction of force between said ski and said heel depressor, said additional spring means being under an initial tension when said heel depressor is pivoted downwardly toward said ski and means for limiting the resilient stroke of said additional spring means so as to permit the heel to move upwardly from the ski for a limited distance without causing the heel to be released from said heel depressor, whereby at the upper end of said resilient stroke as determined by said stroke limiting means the spring force of said additional spring means is lower than the spring force with which said heel depressing spring means press said heel depressor upon said heel on said ski.

16. A heel supporting device of a ski binding for clamping a boot upon a ski comprising mounting means to be secured to a ski, a heel depressor having means normally acting upon the heel of the boot for depressing the same upon the ski, means for movably connecting said heel depressor to said mounting means, spring means for resiliently pressing said heel depressor upon said ski, transmitting means for transmitting the spring force of said spring means to said heel depressor, means operatively connected to said

transmitting means for permitting said heel depressor to be lifted against the action of said spring means upon the application of an excessive force in the upward direction upon said heel depressor until the heel of the boot is released therefrom, an additional spring means consisting of a pair of substantially C-shaped spring brackets disposed at the opposite sides of the vertical longitudinal axis of said heel depressor inter-

posed in the direction of force between said ski and said heel depressor, and means for limiting the resilient stroke of said additional spring means so as to permit the heel to move upwardly from the ski for a limited distance without causing the heel to be released from said heel depressor.

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