

[54] **SKI BINDING**

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[56] **References Cited**

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[57] **ABSTRACT**

A safety ski binding includes a hollow mobile body carrying a boot-sole engaging jaw, this body being pivotally mounted about at least two distinct axes on a fixed supporting part of the binding. A spring controlling release of the binding is housed in the mobile body.

10 Claims, 7 Drawing Figures

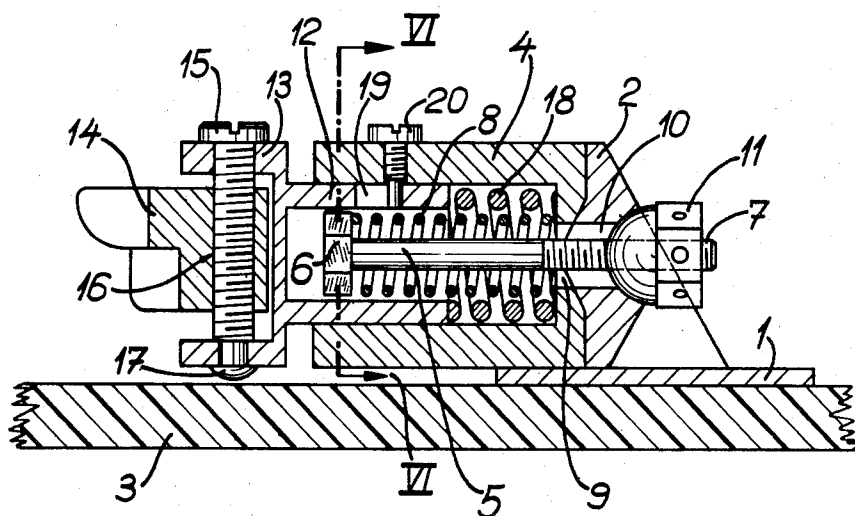


FIG. 1

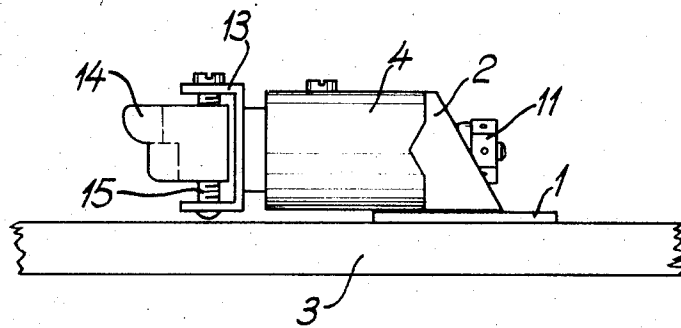


FIG. 2

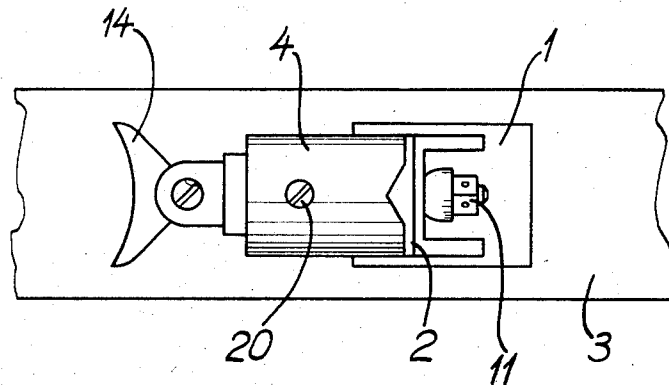


FIG. 3

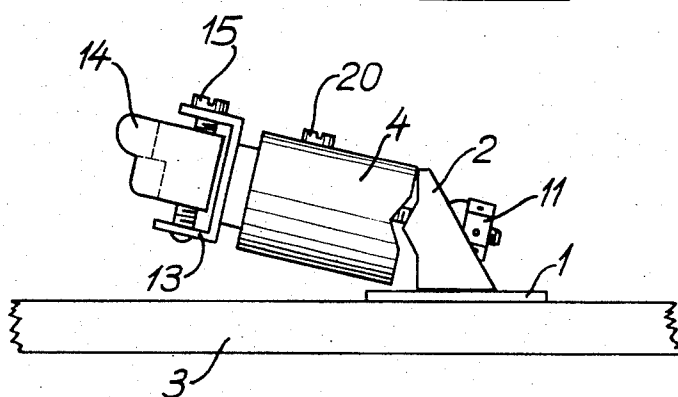


FIG. 6

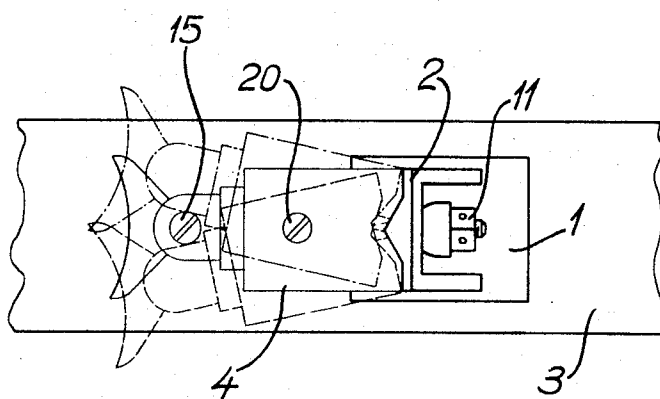
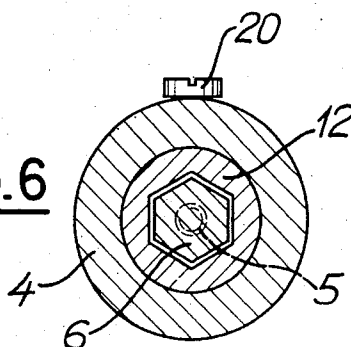


FIG. 4

SKI BINDING

The present invention relates to safety ski bindings.

It has already been proposed to provide rear or heel type safety ski bindings with a release mechanism providing for pivoting of a boot-holding jaw either universally or about distinct horizontal and vertical axes relative to the ski surface, thus enabling release of a boot in the event of both forward and sideward falls.

In known bindings of this type, it is the jaw which is pivotally mounted, and the remainder of the release mechanism (e.g. a spring urging a ball into a recess of the jaw) generally forms a stationary part of the binding. Such arrangements are generally complex and hence of high cost, and may involve manufacturing problems, an inadequate correlation between the efforts required for raising or lateral release, a liability to seize up and difficulties in adjustment of the releasing effort.

An object of the invention is to provide a relatively simple and efficient safety ski binding which enables release in the event of the lateral or raising efforts on a boot-holding jaw, the binding being of a new structure in which the main part of the release mechanism is included in a body which pivots with the jaw.

According to the invention, there is provided a safety ski binding comprising a plate adapted to be fixed on a ski surface, a stop member fixed on the plate, an elongate hollow body having a first end and a second end and a longitudinal axis extending from the first end to the second end, means for pivotally connecting said body towards the first end thereof to the stop member for pivotal movement of the body about at least two distinct pivoting axes, a boot-sole engaging jaw mounted on said body at said second end thereof, and adjustable spring means disposed within said body for holding said body in a rest position relative to said stop member with said longitudinal axis substantially parallel to said ski surface and with said jaw in a boot-sole engaging position and for opposing movement of said body away from said rest position by pivoting about at least one of said pivoting axes.

Another aspect of the invention consists of a ski binding comprising a plate adapted to be fixed on a ski surface, a support member on the plate, a body carrying a boot-sole engaging jaw, said body having a longitudinal axis passing generally through said jaw, means for pivotally connecting the body to the support member for pivotal movement about at least two distinct pivoting axes disposed in a plane perpendicular to said longitudinal axis and spaced apart along the direction of said longitudinal axis from the jaw, means for mounting at least said jaw for rotation relative to the support member about said longitudinal axis, and spring means for biasing the body and the jaw towards a rest position relative to the stop member with the jaw in a boot-sole engaging position.

The relatively simple conception of a binding according to the invention enables it not only to be used as a heel or rear binding, but also as a toe or front binding, and when used as a toe binding enables release of a held boot in the event of both backward and lateral falls of the skier, as well as falls involving oblique forces acting between the ski and boot. When used as a rear or heel binding, release of a held boot is provided in the event of forward and lateral falls as well as various "oblique" falls.

The first end of the body and the stop member preferably have cooperating facing bearing surfaces provided with complementary guide profiles which define the rest position of the body.

5 An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a side elevational view of a safety ski binding according to the invention mounted on a ski;

10 FIG. 2 is a plan view of the binding and ski of FIG. 1;

FIG. 3 is a view similar to FIG. 1, schematically showing the binding in a raised position due to the application of an upward force;

15 FIG. 4 is a view similar to FIG. 2, schematically showing the body and jaw of the binding in laterally displaced positions due to the application of lateral forces;

FIG. 5 is a longitudinal axial cross-section of the binding and ski of FIG. 1;

20 FIG. 6 is a cross-section taken along line VI—VI of FIG. 5; and

FIG. 7 shows the complementary profiles on the bearing surfaces.

The drawings show a toe or front binding the normal or rest position of which is shown in FIGS. 1, 2 and 5. The binding includes a base plate 1 on which a support or stop member 2 is securely fixed, the plate 1 being secured onto the upper face of a ski 3 by known means, not shown, such as screws.

30 The binding also includes a mobile hollow main body 4 of generally cylindrical shape. The body 4 is open at one end, i.e. the left hand end looking at FIGS. 1, 2 and 5, and is partially closed at its other end, i.e. the right hand end. The body 4 is connected to stop member 2 by a rod 5 having an enlarged head 6 at one end and a screw thread 7 at its other end. The right hand end of body 4 has a central bore 9 and the stop member 2 a corresponding central bore 10, through which bores the threaded end of rod 5 is passed. A coiled compression spring 8 is mounted about rod 5 and acts between head 6 and the rear face of the right hand end of body 4. A nut 11 is screwed on the thread 7 of rod 5, and has a ball-shaped bearing surface facing towards and bearing against a corresponding socket formed by a chamfered edge on member 2 about bore 10. The bores 9 and 10 are of larger diameter than the rod 5 to enable universal pivoting of the rod 5 about the ball-and-socket joint with a corresponding movement of body 4 relative to stop member 2.

50 A sliding piece 12 carrying a stirrup 13 is mounted for sliding movement in the open end of body 4. The stirrup 13 carries a boot-sole gripping jaw 14 on a screw 15 which threadably engages a tapped bore 16 of jaw 14. The screw 15 is held against axial translational movement relative to stirrup 13 by a rivet 17, but is free to be rotated to enable adjustment of the height of jaw 14 along screw 15, i.e. along a direction perpendicular to the surface of ski 3, in the rest position of the binding, to enable boot soles of different thicknesses to be accommodated.

60 A second compression coil spring 18 is lodged coaxially within the body 4, about the spring 8, the diameter of spring 18 being slightly less than the inner diameter of body 4. The spring 18 acts between the rear face of the right hand end part of body 4 and the inner end of sliding piece 12, and tends to urge the piece 12 and jaw 14 outwardly from the open end of body 4. The sliding

movement of piece 12 is limited by a screw 20 passing through a tapped hole in the upper face of body 4, an end of screw 20 engaging in an elongate slot 19 in the piece 12. The screw 20 also prevents rotation of jaw 14 and piece 12 relative to body 4 about the longitudinal axis of body 4.

In use, when a boot is held on ski 3 by jaw 14 in the rest position of the binding, the spring 18 is compressed by the reaction of the boot against a heel binding on the ski.

Alternatively, the jaw could be firmly fixed to body 4. The spring 18 and piece 12 can thus be dispensed with and an axial elastic play can be provided for, if desired, by an appropriate mechanism in the heel binding.

On the outer face of the partially closed right hand end part of body 4 is provided a bearing surface 21, see FIG. 7, which bears against a complementary bearing surface 22 on the stop member 2. The bearing surface 21 has a guide profile consisting of four recessed arms 23,24,25 and 26 of triangular cross-section disposed in the configuration of a cross, and the surface 22 a complementary guide profile consisting of four protruding arms 27,28,29 and 30 disposed respectively perpendicular to and parallel to the ski surface. These complementary guide profiles interengage in one another to define the rest position of the body 4.

The spring 8, compressed between head 6 and the right hand end part of body 4, firmly holds the bearing surface 21 in engagement with bearing surface 22, and the effective force of spring 8 can be set by rotation of nut 11, the rod 5 being held against rotation relative to body 4 and member 2 by engagement of its hexagonal head 6 in a corresponding opening of slide 12 (see FIG. 6).

Operation of the described binding, used in conjunction with a suitable rear or heel binding to hold a boot on ski 3, is as follows.

In the event the skier falling over backwards so that a lifting force is exerted on the boot toe, the jaw 14 is lifted together with the body 4 and an accompanying pivoting of rod 5. The bottom of the horizontal recessed arms 24,26 of surface 21 move outwardly and upwardly relative to the tops of the horizontal protruding arms 28,30 of the fixed surface 22. As shown in FIG. 3, while the rod 5 pivots about the axis of the ball and socket joint, the play of bore 9 about rod 5 allows the body 4 to tilt relative to rod 5 and pivot about an axis, parallel to the surface of ski 3, located in the neighborhood of surfaces 21,22. This raising of jaw 14 is opposed by spring 8 which becomes further compressed between head 6 and body 2. As long as the boot sole has not become disengaged from jaw 14, the spring 8 tends to return it to its rest position on ski 3. If the lifting effort exerted by the boot sole on jaw 14 exceeds a certain pre-adjusted value, the boot is freed. As soon as the boot is freed, the binding automatically returns to its rest position under the action of spring 8 and due to the coaction of the complementary guide profiles.

In the event of a side fall, the release operation is similar, but the body 4 pivots sideways, as indicated in FIG. 4, and it is the recessed arms 23,25 and their corresponding protruding arms 27,29 which coact together. These arms are disposed perpendicular to the surface of ski 3, and the body 4 therefore pivots about an axis in the neighborhood of surfaces 21,22 and perpendicular to the ski surface.

The binding also operates in the event of falls in which a force on the boot toe acts obliquely relative to the ski surface, or when other complex forces are in play. For example, a sideward fall causing a transverse torsional effort on the boot toe and on jaw 14, for example at 45° to the plane of the ski, can cause a rotation of jaw 14 and body 4 about the longitudinal axis of rod 5 to free the boot. Also the body can simultaneously pivot about two axes (e.g. transverse and vertical to the ski surface) or even combine such a pivoting with a torsion about the longitudinal axis of rod 5, with an accompanying sliding and pivoting of the guide profiles relative to one another.

The boot can thus be safely released when various efforts are exerted on the jaw 14, the limiting value of the required efforts being set by means of nut 11. During movement of body 4 relative to stop member 2, the rod 5 is free to move in the bores 9,10 of greater diameter.

The described embodiment concerns a front or toe binding. However, the same binding could be used to hold a boot heel, by simply adding a conventional pedal underneath jaw 14, and providing means for enabling the skier to voluntarily lift the jaw 14 to insert a boot therein. These means could, for example, be a lever fixed on or coacting with body 4 to enable it to be lifted against the action of spring 8. When used as a rear or heel binding, the release mechanism operates in case of lateral, forward and various complex lateral-forward falls.

The described binding can be used as a toe or heel binding in combination with any other suitable type of heel or toe binding respectively, or it is possible to use heel and toe bindings according to the invention in combination on the same skis.

In the described and illustrated example, the guide profiles are in the form of a cross. However, it is clear that in view of the various different skiing conditions and safety requirements, the guide profiles can have other shapes as convenient, for example, generally star shaped with only three arms, or five or six arms for example.

Other shapes of guide profile can be previewed. For example, one bearing surface could have a triangular, square or pentagonal groove disposed about its bore, and the other guide surface a complementary protruding triangle, square or pentagon. However, these alternative shape, or even a plurality of discrete complementary recesses and bosses may have the disadvantage of hindering the desired relative movements of the guide surfaces.

The described binding operates satisfactorily in practically all meteorological conditions. The setting of the release effort is not liable to be modified as a result of temperature changes, a particularly if rod 5, body 4 and stop member 2 are all made in the same material, or materials having close coefficients of thermal expansion. The space between the bearing surfaces is only accessible for relatively short periods, during release or possibly during replacement of a boot, and cannot become jammed with ice without the user noticing it. The lever arms between the boot-engaging part of the jaw and the axes of pivoting of body 4 is relatively long and this facilitates regular release in the event of any fall. Moreover, the configuration of the guide profiles, the universal mounting of rod 5 and the possibility of rotation of jaw 14 about the axis of rod 5, ensure efficient

and safe release for various efforts involved in different falls.

Adjustment of the release effort of the described binding is extremely simple, and only requires turning of nut 11. Verification of the adjustment to control whether the binding releases adequately can be done by the skier himself, by pushing the jaw upwards and sideways and observing the degree of movement of the body, for example by looking at the space which appears between the bearing surfaces.

In order to take into account the different values of forces involved in side and forward and rearward falls, which values can be measured or calculated, it is possible to provide, with a single adjustment of the releasing effort, different resistances to displacement of the jaw 14 upwards or sideways.

To achieve this, the pairs of recessed arms 24,26 and profiled arms 28,30 can be made longer or shorter than the arms 23,25 and 27,29. For example, if arms 24,26,28 and 30 are shorter than arms 23,25,27 and 29, for the same adjustment of nut 11, the binding will open easier under the effect of lateral forces (side falls) than for upward forces (forward or backward falls).

It can thus be seen that by forming the guide profiles in an appropriate manner, to obtain differential lever arms, it is possible to provide, with a single adjustable member, different release efforts as a function of the risks involved in different types of fall. For example, instead of having generally circular bearing surfaces (i.e. with the crosses of "square" configuration), these surfaces could be oval.

What is claimed is:

1. Safety ski binding, comprising a plate adapted to be fixed on a ski surface, a stop member fixed on the plate, an elongate hollow body having a first end and a second end and a longitudinal axis extending from the first end to the second end, means for pivotally connecting said body towards the first end thereof to the stop member for pivotal movement of the body about at least two distinct pivoting axes, a boot-sole engaging jaw mounted on said body at said second end thereof, and adjustable spring means disposed within said body for holding said body in a rest position relative to said stop member with said longitudinal axis substantially parallel to said ski surface and with said jaw in a boot-sole engaging position and for opposing movement of said body away from said rest position by pivoting about at least one of said pivoting axes.

2. Binding according to claim 1, in which said first end of the body has a first external bearing surface including a first guide profile, and said stop member has a second external bearing surface including a second guide profile, said first and second guide profiles being complementary and being adapted to interengage in one another with said first and second bearing surface held against one another in said rest position under the action of said spring means.

3. Binding according to claim 2, in which said guide profiles are star shapes having complementary recessed and protruding arms of triangular cross-section.

4. Binding according to claim 3, in which each of said star shapes has four arms in the configuration of a cross.

5. Binding according to claim 2, comprising means defining complementary openings in said first and second bearing surfaces, said means for pivotally connecting the body and stop member comprising a rod disposed along said longitudinal axis of the body, said rod passing through said complementary openings and having a first end part within said body and a second end part passing through said stop member, a ball-shaped bearing surface on said second end part, and a socket-shaped bearing surfaces on said stop member cooperating with said ball-shaped bearing surface to form a ball-and-socket joint between said stop member and said rod.

6. Binding according to claim 5 comprising a screw thread on said second end part of the rod, and a nut screwably mounted on said second end part, said nut including said ball-shaped bearing surface, and said spring means comprising an enlarged head on said first end part of the rod, a coil spring disposed within said body about said rod, said spring acting between said head of the rod and an inner surface at said first end of the body, and means for holding said rod against rotation relative to the body and stop member to enable adjustment of the force of said spring by rotation of said nut.

7. Binding according to claim 1, in which said body is a hollow cylinder open at said second end, and comprising means for mounting said jaw on said second end of the body for a limited sliding movement along the direction of said longitudinal axis, and second spring means disposed within said body for urging said jaw in the direction of said longitudinal axis outwardly from said second end of the body.

8. Binding according to claim 7, in which said jaw is mounted on a stirrup piece slidably mounted in said second end of the body, and comprising means for adjusting the position of the jaw relative to the stirrup piece and body in a direction perpendicular to the direction of said longitudinal axis and perpendicular to a transverse axis parallel to said ski surface.

9. Binding according to claim 2, in which said first and second guide profiles are shaped and dimensioned to oppose movement from said rest position by selected amounts for pivoting of said body about different pivoting axes.

10. Safety ski binding, comprising a plate attachable to a ski surface, a support member on the plate, a body carrying a boot-sole engaging jaw, said body having a longitudinal axis passing generally through said jaw, means for pivotally connecting the body to the support member for pivotal movement about at least two pivoting axes distinct from one another and disposed in a plane transverse to said longitudinal axis, the plane being spaced along the direction of said longitudinal axis from the jaw, means for mounting at least said jaw for rotation relative to the support member about said longitudinal axis, and spring means disposed within said body for biasing the body and thereby the jaw carried thereby relative to the support member towards a rest position in which the jaw is in a boot-sole engaging position.

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