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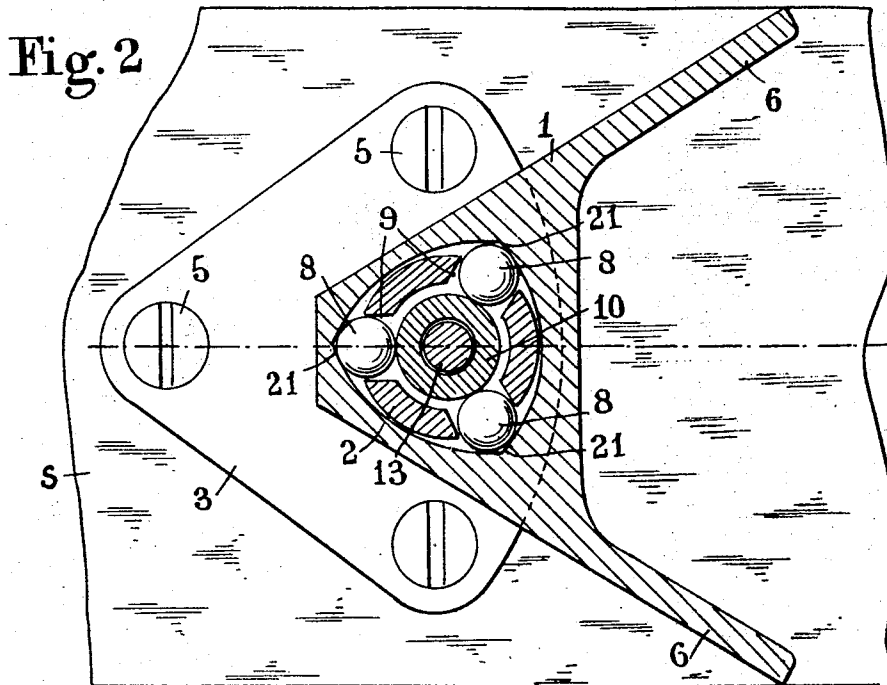
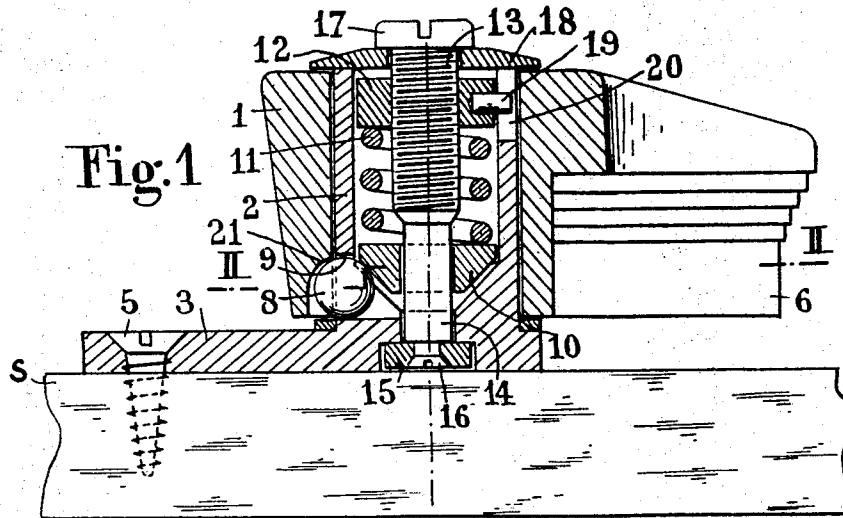
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3,544,124

SAFETY SKI BINDING

Filed Nov. 15, 1968

4 Sheets-Sheet 1



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Dec. 1, 1970

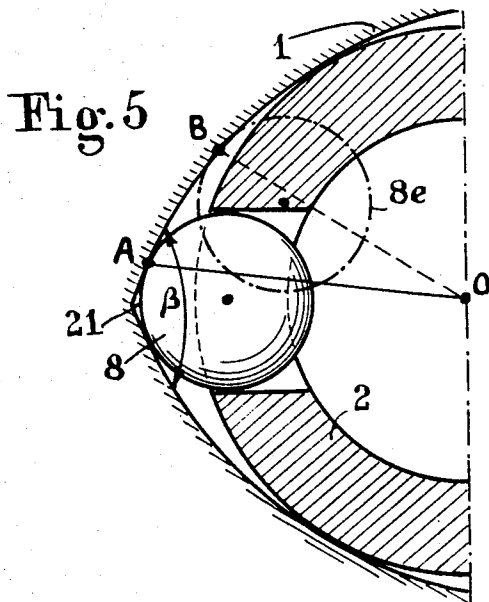
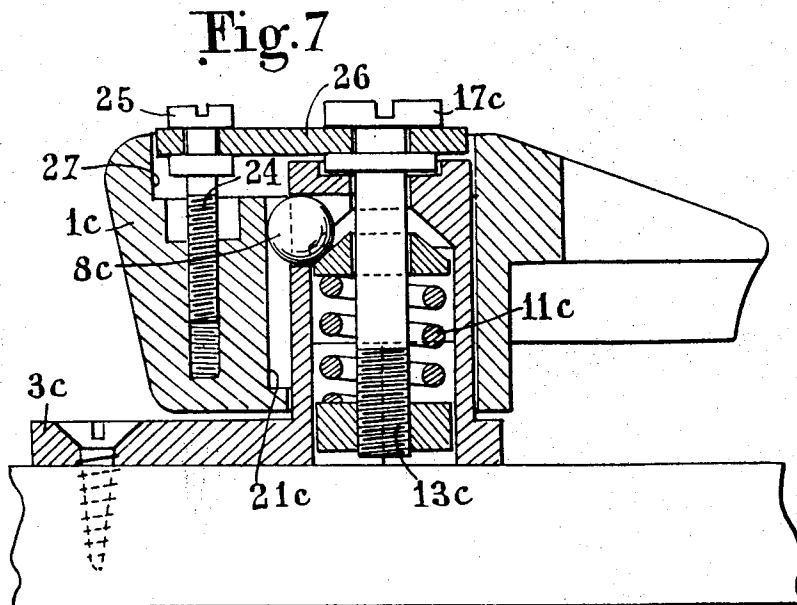
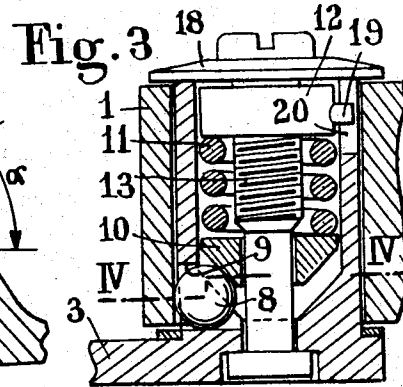
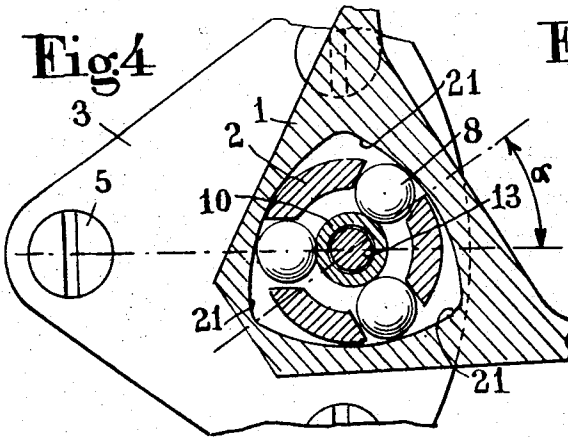
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SAFETY SKI BINDING

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4 Sheets-Sheet 2



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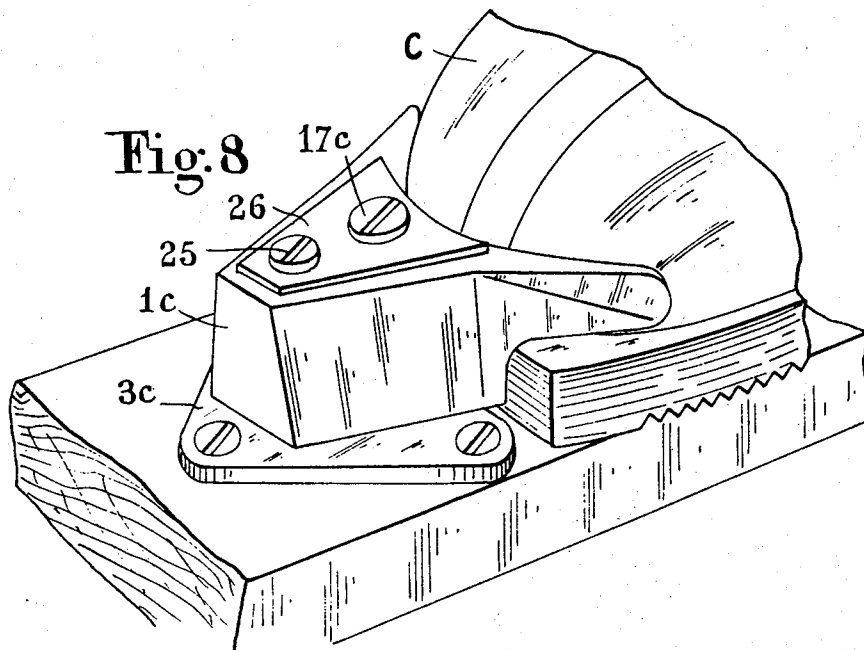
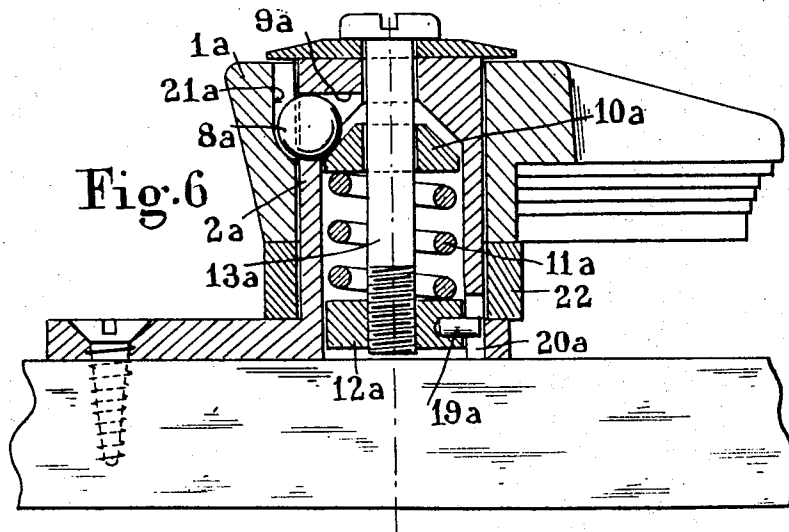
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SAFETY SKI BINDING

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4 Sheets-Sheet 3



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Dec. 1, 1970

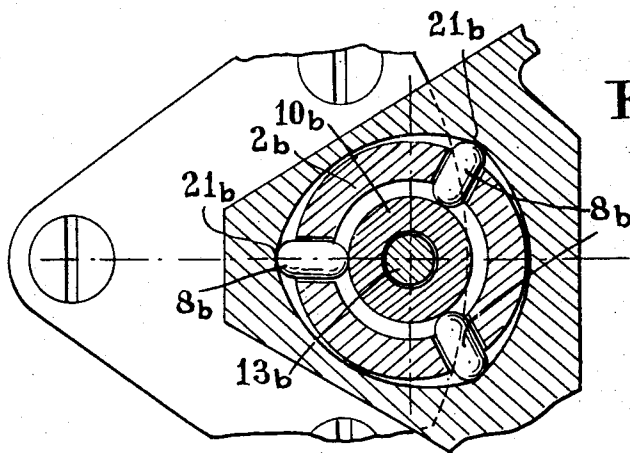
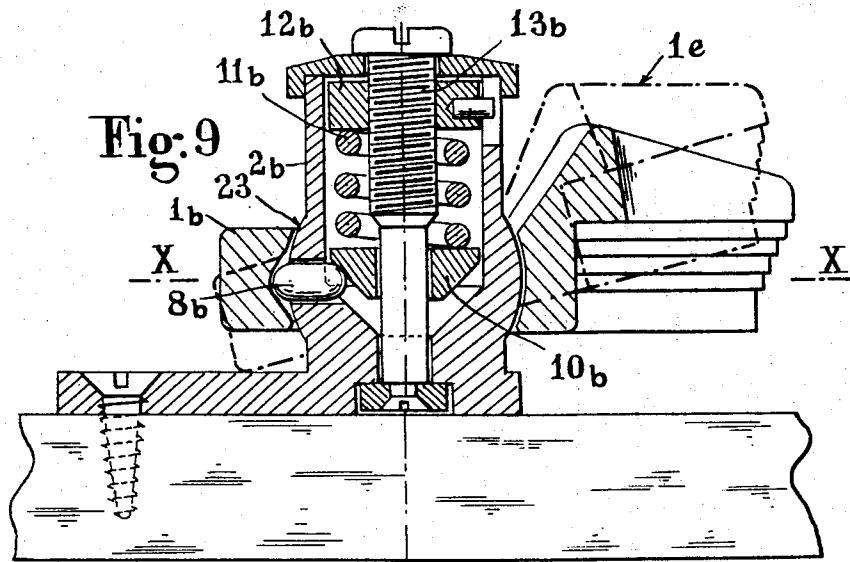
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3,544,124

SAFETY SKI BINDING

Filed Nov. 15, 1968

4 Sheets-Sheet 4



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3,544,124

SAFETY SKI BINDING

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27 Claims

ABSTRACT OF THE DISCLOSURE

A safety device for releasably binding the toe end of a ski boot to a ski comprising a base plate adapted to be secured to a ski, a hollow pivot member rigid with and extending upwardly at right angles to the base plate and an abutment member adapted to engage the toe portion of a ski boot and having a bore receiving the hollow pivot member whereby the abutment member is rotatably mounted on the hollow pivot member. The hollow pivot member has apertures through its upstanding walls with detent members positioned in said apertures and engageable in recesses in the bore of the abutment member to restrain the abutment member from pivoting about the pivot member with the hollow pivot member containing resilient means for biasing the detent members into the recesses.

The present invention relates in general to safety ski bindings and has specific reference to a safety toe-retaining device adapted to releasably hold the toe end of a ski boot of which the heel is already bound to the ski through any other suitable means.

As a rule these devices consist of an abutment or check member pivotally mounted on the ski by means of a vertical pivot and having a rear face provided with means adapted to retain the toe end of the ski boot. This rotary abutment member is constantly urged to its normal skiing position by a spring-loaded retaining mechanism adapted to permit the rotation of this abutment member and subsequently to release the toe end of the ski boot when an abnormally high torsional stress is exerted on the leg and foot of the user.

However, a premature or too sudden release of the skier's foot must be avoided for obvious reasons. To this end, the retaining mechanism of the rotary abutment member should be capable of constantly exerting a resilient return torque on this member during its rotation, this action being maintained throughout a relatively important angular movement of the abutment or check member. Thus, an effect usually referred to as a "long release stroke," during which the boot can rotate while remaining under the control of, and in mutual engagement with, the rotary abutment member, can be obtained.

Thus, in case of relatively moderate torque exerted on the boot, the abutment or check member can rotate to avoid a sprain of the skier's ankle or any other accident, the mechanism then urging the abutment member and therefore the skier's boot to its normal running position.

However, in case of greater torque the abutment member can continue its rotation until the boot is released completely, but due to the relatively long release stroke afforded by the abutment mechanism any premature, too rapid or sudden release of the skier's boot, which might prove dangerous for the skier's leg, is safely avoided.

To obtain this result, it is scarcely possible to use retaining mechanism comprising balls or other similar detent-positioning means. In fact, these mechanisms, which are advantageous on account of their inherent simplicity, are objectionable on the other hand because they cause a sudden release of the toe-retaining member when the de-

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tent-positioning balls or like elements have been expelled from their recesses.

However, other retaining mechanisms can produce the desired effect. Unfortunately, in most mechanisms capable of exerting a gradual and resilient return action on the abutment member the value of the resistance counteracting the rotation of this member increases gradually as a consequence of the more or less pronounced compression of the spring controlling this type of mechanism. Under these conditions, this resistance attains its maximum value just before the boot is eventually released, so that the boot is subsequently released rather too suddenly and accidents can result from this rapid release.

Therefore, a satisfactory result should be obtained by keeping the value of the resilient counteracting force nearly constant throughout the release stroke. This result is actually obtained with a few known ski-binding mechanism, but these are notoriously complicated and therefore costly, and besides they are generally cumbersome.

In view of the foregoing, it is the chief object of the present invention to provide a device capable of producing the various results set forth hereinabove but by using a particularly simple mechanism having moderate overall dimensions, notably in a horizontal plane. Besides, this mechanism is designed with a view to perfectly hold the abutment member against movement as long as no torque is impressed thereto.

To this end, the safety ski-binding according to this invention which is of the type broadly set forth hereinabove, is characterised in that said detent-positioning members are radially movable in the wall of said hollow pivot which is thinner than said detent-positioning members, and that said resilient thrust means are adapted to urge said detent-positioned members radially outwards into recesses formed in the inner wall of said abutment member, said recesses being so shaped that in case of abnormally high torque exerted on said abutment member said detent-positioning members are moved back towards the axis of said hollow pivot member.

Preferably, the recesses formed in the inner wall of the abutment member are widely outflared in the horizontal plane, as their section in this plane forms an angle of at least 90°, and these recesses as well as the rounded ends of the detent-positioning members are dimensioned to develop a resilient return torque of nearly constant value throughout an angular movement of relatively great amplitude of the abutment member.

During this angular movement the detent-positioning members are urged backwards, i.e. towards the pivot axis, thus reducing the lever arm through which the resilient reaction torque is exerted while the resistance provided by the spring means is increased. Under these conditions, these two effects compensate each other, at least partially, whereby the resistance counteracting the rotation of the abutment member is kept at a substantially constant value. Now as explained in the preamble of this specification this factor is particularly advantageous.

In a specific form of embodiment of the present invention the movable detent-positioning members consist of three balls disposed at spaced intervals on the periphery of the pivot member and, at the same level as these balls, the contour of the inner wall of the rotary abutment member has substantially the shape of a curvilinear triangle having its convex sides tangent, in their middle, to the outer surface of said pivot member, the bottom of said recesses corresponding to the vertices of said triangle.

Other features and advantages characterising the device of this invention will appear as the following description proceeds with reference to the attached drawing illustrating diagrammatically by way of example typical forms of embodiment of the invention. In the drawing:

FIG. 1 is a vertical section, taken along a longitudinal

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plane containing the center line of the ski, of a ski binding according to this invention;

FIG. 2 is a horizontal section taken upon the broken line II—II of FIG. 1;

FIG. 3 is a section similar to FIG. 1 but showing the same device during its operation, i.e. when the abutment member is rotated as a consequence of a torque impressed thereto by the toe end of the skier's boot;

FIG. 4 is a corresponding sectional view taken along the line IV—IV of FIG. 3;

FIG. 5 is a fragmentary diagrammatic horizontal section illustrating the movements performed by each resilient detent-positioning member during the operation of the device;

FIGS. 6 and 7 are sectional views similar to FIG. 1 but showing two modified forms of embodiment of the device;

FIG. 8 is a perspective view showing the form of embodiment of FIG. 7;

FIG. 9 is a similar section showing a still further modification of the device, and

FIG. 10 is a horizontal section taken upon the line X—X of FIG. 9.

In the example illustrated in FIGS. 1 to 5 inclusive of the drawing the main or abutment member 1 of the toe-engaging safety ski-binding according to this invention is rotatably mounted about a vertical pivot member 2 rigid or formed integrally with a base plate 3. This base plate 3 is secured to the top surface of the ski through any known and suitable means, such as screws 5, and positioned thereon so that the abutment member 1 registers with the toe end of the skier's boot. To this end the rear portion of the rotary member 1 comprises a pair of oblique divergent lateral arms 6 adapted to hold the toe end of the boot therebetween. Of course, this jaw-like member may be replaced by any other suitable and known means.

According to this invention, the pivot member 2 is hollow and the mechanism contemplated in the device illustrated in this specific form of embodiment includes three balls 8 disposed in radial apertures 9 formed to this end in the wall of said pivot member 2.

These apertures may be disposed at regular intervals around the periphery of the pivot member 2 with their axes disposed in a common horizontal plane. The balls 8 can thus move in this plane and their diameter is somewhat greater than the radial thickness of the wall of pivot member 2.

Coaxially mounted in this pivot member 2 is a resilient push member constantly urging the balls outwards. This push member may consist for example of a piston-like part 10 of which the frusto-conical outer wall engage the balls 8, spring means exerting a vertical downward pressure against said push member, as shown.

Said spring means advantageously consists of a coil compression spring 11 reacting against a nut 12 receiving an axial screw 13 extending vertically therethrough and within the pivot member 2. Thus push member 10 is slidably mounted on a lower, plain portion 14 of the shank of said screw.

The lower end of the screw shank extends through the base plate 3 and carries in a suitable cavity formed in the bottom face of said base plate 3 a washer 15 secured to said lower end by any suitable means, for example a small screw 16.

The upper portion of screw 13 comprises a conventional slotted head 17 under which a relatively large washer 18 is disposed for acting as a cap closing and sealing the hollow pivot member 2. Besides, the aforesaid nut 12 comprises at its outer periphery a radially projecting pin 19 engaging a longitudinal groove 20 formed in the inner wall of said hollow pivot member 2, in order positively to prevent the rotation of said nut 12. Under these conditions it is clear that when the screw 13 is rotated in either direction by inserting a screwdriver into its slot the nut 12 is moved up-or downwards, according

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to the direction in which the screw 13 is rotated, whereby the coil compression spring 11 acting upon the push member 10 is more or less prestressed. By construction, the push member 10 constantly urges the balls 8 outwards to hold them within recesses 21 formed in the inner wall of the rotary abutment member 1.

According to an essential feature characterising this invention these recesses 21 are widely outflared in a horizontal plane. In this plane their cross-sectional contour forms an angle β of at least 98° , for example, assuming the diameter of said balls to be 8 millimeters and the depth of the ball penetration into said recesses 21 of the order of 4.5 millimeters.

Moreover, in this example the contour of the inner wall of abutment member 1 has substantially the shape of a curvilinear triangle at the level of said balls 8. The bottom of the recesses 21 corresponds to the vertices of this triangle of which the convex sides are tangent, in their middle, to the outer surface of pivot member 2.

The arrangement and position of the bottom of these recesses are such that the three balls 8 engage these recesses when the abutment member 1 is in its normal position (see FIGS. 1 and 2).

Thus, the abutment member 1 is perfectly held in this position. In fact, the member 1 is held against rotation since the balls 8 disposed in the radial apertures 9 formed through the wall of pivot member 2 engage at the same time the bottom of the recesses 21 formed in the inner wall of said abutment member 1.

However, when an abnormally high torque is exerted on the skier's foot, this mechanism permits the rotation of the abutment member. In fact, the shape of these recesses 21 is such that they tend to drive the balls 8 towards the axis of the hollow pivot member 2 (see FIGS. 3, 4 and 5) when the abutment member 1 is moved angularly about its pivot axis.

However, since the recesses 21 are widely outflared, these balls 8 will remain in engagement with one or the other side of the relevant recesses during a longer period. Under these conditions, the resilient pressure exerted by each ball 8 on one of the sides of the corresponding recess will produce an elastic reaction tending to restore the abutment member 1 of the device and therefore the toe end of the boot to their initial positions.

From the foregoing it is clear that a relatively long angular boot-release movement is produced, and that this movement is attended throughout its duration by a corresponding resilient effort tending to restore the boot to its initial position. In other words, the device permits a partial rotation of the boot, followed by a return movement thereof to its normal position.

Now this partial rotation is sufficient to preclude any risk of accident caused by a complete locking of the boot, and furthermore it takes place without causing a complete release of the skier's boot, since this release would be useless in this case.

Moreover, it should be noted that during the rotation of the abutment member 1 each ball 8 is gradually moved towards the centre 0 of pivot member 2 (see FIG. 5). Under these conditions, the point of contact between the ball and the inner wall of abutment member 1 approaches this centre 0, thus causing a gradual reduction in the lever arm through which the reaction torque is exerted on abutment member 1. Thus, when each ball is for example in position 8e (as shown in dash-and-dot lines in FIG. 5) the corresponding lever arm 0B is smaller than the initial lever arm 0A.

Now the lever arm 0B decreases as the resilient force of spring 11 increases as a consequence of its increasing compression. These two parameters compensate each other, at least partially. Therefore, the value of the resilient reaction counteracting the rotation of abutment member 1 is kept at a nearly constant value, thus preventing a too sudden release of the skier's boot when the abutment member 1 has been rotated through an angle suffi-

cient to cause this release, i.e. an angle greater than the angle α shown in FIG. 4, which may have a value of the order of 30° to 35°.

Thus, this device is designed for releasing completely the skier's boot when an important torque is exerted thereon, but this release cannot take place too suddenly, as currently observed with many other known ski bindings.

Therefore, this device is characterised by a high degree of reliability inasmuch as the conditions of operation of the device can be adjusted at will by simply modifying the initial degree of prestress of spring 11. This operation is particularly easy since it consists simply in screwing more or less the screw 13.

Moreover, this mechanism is advantageous in that it has a great constructional simplicity due to the use of balls or other similar detent-positioning members. Under these conditions, the final cost of the device is relatively low.

Besides, this mechanism has small dimensions in the horizontal plane, due to the disposition of said balls 8 in the apertures of the walls of pivot member 2, and also to the arrangement of spring 11 and piston 10 in vertical superposed relationship within this pivot member. Now this specific arrangement does not increase the vertical dimensions of the device since a minimum height is required in any case for receiving the toe end of the skier's boot.

In this respect, it may be noted that the arrangement of parts constituting the present device is such that a single push member mounted for vertical movement inside a hollow pivot member is sufficient for exerting on the balls a pressure tending to move them in a horizontal plane.

It may also be noted that the detent-positioning members of this mechanism are advantageous in that they exert a direct interlocking action between the pivot member proper and the rotary abutment member 1, due to the regular angular spacing of these detent-positioning members in a common horizontal plane at the periphery of said pivot member.

However, it will be readily understood by anybody conversant with the art that this device should not be construed as being restricted to the single and specific form of embodiment described hereinabove by way of example with reference to FIGS. 1 to 5 of the drawing. In fact, the resiliently urged push member of the mechanism contemplated in first form of embodiment may be replaced by any other equivalent member or means, for example a pad of resilient material disposed within the hollow pivot member 2 and adapted to be more or less compressed by a suitable clamping member.

Besides, the balls 8 themselves may be replaced by any other suitable movable members engaging recesses formed in the inner wall of the rotary abutment member. Of course, the number of balls or other detent-positioning members substituted therefor is immaterial.

FIG. 6 illustrates another form of embodiment of the device wherein the push member arrangement is reversed. In other words, the tapered or frustoconical piston 10a constituting this push member is slidably mounted on the upper, smooth portion of the shank of the adjustment screw 13a provided in this device. Thus, the spring 11a urging this push member upwards will react against a nut 12a screwed on the lower, screw-threaded portion of screw 13a.

As in the preceding form of embodiment, the push member 10a engages with its tapered wall a plurality of balls 8a disposed in radial apertures 9a formed through the wall of the hollow pivot member 2a. Thus, these balls are urged outwards for engaging the relevant recesses 21a formed in the inner wall of the rotary abutment member 1a of the device. Thus, this device will operate like the preceding one.

However, in this case, the abutment member 1a may if necessary be lifted in conjunction with the screw 13a against the resistance of spring 11a, in order to avoid any

risk of jamming the toe end of the boot sole on the ski during the rotation of the assembly.

FIGS. 7 and 8 illustrate a modified form of embodiment of the device shown in FIG. 6. The only difference lies in fact that this modified arrangement comprises means for adjusting the height of the abutment member 1c with respect to the base plate 3c secured to the top surface of the ski.

This means consists of a vertical screw 24 engaging a tapped hole formed in the abutment member 1c and having its head 25 kept at a constant level. To this end, this head is rotatably mounted in a horizontal plate 26 in which the head 17c of the main screw 13c for adjusting the compression or prestressing of spring 11c is also rotatably mounted.

Thus, when the screw 25 is rotated in one or the other direction, the vertical position of the abutment member 1c can be modified as a function of the thickness of the toe end of the sole of the boot C to be held in position. During this adjustment the horizontal plate 26 sinks more or less into a cavity 27 formed to this end in the top surface of abutment member 1c. Moreover, to permit this vertical adjustment, the recesses 21c provided in the inner wall of abutment member 1c for receiving the balls 8c extend along a relatively considerable height of this member 1c.

FIGS. 9 and 10 illustrate another form of embodiment of the device constituting the subject-matter of this invention. In this modified structure the outer wall of the vertical pivot member 2b comprises a part-spherical portion 23 substantially level with the movable abutment member 1b and the inner wall of this member 1b has a corresponding part-spherical but concave configuration of substantially the same radius. The abutment member 1b can thus swivel in all directions on the spherical or ball-like portion 23 of the pivot member and constitutes somewhat a ball-and-socket joint therewith.

Thus, the movable abutment member 1b can not only rotate in a horizontal plane, as in all the preceding forms of embodiment, but also tilt in a vertical plane, for example to the position shown in dash-and-dot lines at 1e in FIG. 9, in which the toe end of the boot can also be released in case the skier falls backwards. However, it is clear that the movable abutment member 1b can swivel in all directions in the space in case of a skier's fall causing a combined torsional and stretching movement of the skier's leg.

Yet the mechanism contemplated in this arrangement is still the same as in the preceding case, except that in the example illustrated in FIGS. 9 and 10 the balls 8 are replaced by movable radial rods 8b having rounded ends.

These movable rods are urged outwards by a tapered piston 10b responsive to a coil compression spring 11b reacting against a nut 12b engaging the adjustment screw 13b of the mechanism. Thus, this push member constantly urges the movable rods 8b towards the bottom of the recesses 12b formed in the inner surface of the movable abutment member 1b. Preferably, these recesses are out-flared in all directions so as to take due account of the possibilities of movement of the movable abutment member 1b and ensure under all circumstances a relatively long release stroke with a resilient return action controlled by a substantially constant force.

However, the recesses 21b may comprise portions having different inclinations so that this mechanism will retain the movable member 1b more firmly in predetermined directions.

Of course, this abutment member may comprise two separate parts assembled in any suitable manner in order to facilitate the machining of the part-spherical surface of its inner wall, and also the recesses 21b.

But as already mentioned hereinabove, the device according to this invention can be embodied in many different ways without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim is:

1. A safety device for releasably binding the end of a ski boot to a ski which device comprises a base plate adapted to be secured to the top surface of the ski, a pivot member having an outer surface and a first bore, said first bore having an inner surface forming together with said outer surface a wall, said pivot member extending at substantially right angles to and rigid with said base plate, an abutment member rotatably mounted about said pivot member and having a second bore for receiving the pivot member, said second bore having a second inner surface, said wall having at least one aperture therethrough, a moveable detent positioning member disposed in said aperture, said detent positioning member being radially moveable in said aperture and having in the radial direction a length greater than the thickness of the wall, resilient thrust means disposed within said first bore for urging the detent positioning member radially outwards against said second inner surfaces, said second inner surface having at least one recess having a bottom, said recess being adapted to receive said detent positioning member when said abutment member is in its normal position.

2. A safety device as in claim 1 wherein said recess of said second inner surface is relatively widely outflared in a horizontal plane.

3. A safety device as in claim 2 wherein said recess of said second inner surface forms in section in said plane an angle of at least 90°.

4. A safety device as in claim 1 wherein said second inner surface has substantially the shape of a triangle and the bottom of said recess corresponds to a vertex of said triangle, said detent positioning member being normally positioned within said bottom.

5. A safety device as in claim 4 wherein said triangle is substantially curvilinear and each of its convex sides is substantially tangent at its middle to the outer surface of the pivot member.

6. A safety device as in claim 1 wherein said second inner surface has substantially the shape of a circle.

7. A safety device as in claim 1 wherein said resilient thrust means comprises a push member axially moveable within the first bore and spring means for urging said push member against said detent positioning member to urge the detent positioning member radially outward.

8. A safety device as in claim 7 wherein said push member has a tapered surface, said tapered surface engaging said detent positioning member.

9. A safety device as in claim 1 wherein said detent positioning member is ball-shaped.

10. A safety device as in claim 1 wherein said detent positioning member is a radial rod having rounded ends.

11. A safety device as in claim 1 wherein said wall has a plurality of apertures, a moveable detent positioning member is disposed in each of said apertures, the resilient thrust means urges each detent positioning member radially outwards against the second inner surface, the second inner surface has a plurality of recesses each having a bottom and each recess is adapted to receive a separate detent positioning member when the abutment member is in its normal position.

12. A safety device as in claim 11 wherein said recesses of said second inner surface are relatively widely outflared in a horizontal plane.

13. A safety device as in claim 12 wherein said recesses of said second inner surface form in section in said plane an angle of at least 90°.

14. A safety device as in claim 11 wherein said second inner wall has substantially the shape of a triangle and the bottoms of said recesses correspond to the vertices of said triangle, a detent positioning member being normally positioned within each of said bottoms.

15. A safety device as in claim 14 wherein said triangle is substantially curvilinear and each of its convex sides is substantially tangent at its middle to the outer surface of the pivot member.

16. A safety device as in claim 11 wherein said second inner surface has substantially the shape of a circle.

17. A safety device as in claim 11 wherein said resilient thrust means comprises a push member axially moveable within the first bore and spring means for urging said push member against each detent positioning member to urge each detent positioning member radially outward.

18. A safety device as in claim 17 wherein said push member has a tapered surface, said tapered surface engaging each detent positioning member.

19. A safety device as in claim 11 wherein each detent positioning member is ball-shaped.

20. A safety device as in claim 11 wherein each detent positioning member is a radial rod having rounded ends.

21. A safety device as in claim 11 wherein said apertures are positioned at spaced angular intervals on said wall and in a plane substantially parallel to the top surface to the ski.

22. A safety device for releasably binding the end of a ski boot to a ski which device comprises a base plate adapted to be secured to the top surface of the ski, a pivot member having a first vertical axis, an outer surface and a first bore, said first bore having an inner surface forming together with said outer surface a wall, said pivot member extending at substantially right angles to and rigid with said base plate, an abutment member rotatably mounted about said pivot member and having a second bore for receiving said pivot member, said second bore having a second inner surface, said wall having at least one aperture therethrough, a moveable detent positioning member having a second vertical axis disposed in said aperture, said detent positioning member being radially moveable in said aperture and having in the radial direction a length greater than the thickness of the wall, resilient thrust means disposed within said first bore for urging the detent positioning member radially outwards against said second inner surface having at least one first rest point, said detent positioning member being normally disposed at said one first rest point when said abutment member is in its normal position, said one first rest point being positioned such that a first line drawn from the second vertical axis to the first vertical axis, said first line being normal to both axes, defines a first length, said second inner surface having a shape such that when the abutment member is subjected to an angular movement relative to the pivot member the detent positioning member will contact the second inner surface of at least one second point, said one second point being positioned such that a second line drawn from the second vertical axis to the first vertical axis, said second line being normal to both axes, will be shorter in length than said first line.

23. A safety device for releasably binding the end of a ski boot to a ski which device comprises a base plate adapted to be secured to the top surface of the ski, a pivot member having a first vertical axis, an outer surface and a first bore, said first bore having an inner surface forming together with said outer surface a wall, said pivot member extending at substantially right angles to and rigid with said base plate, an abutment member rotatably mounted about said pivot member and having a second bore for receiving said pivot member, said second bore having a second inner surface, said wall having a plurality of apertures therethrough, a moveable detent positioning member having a second vertical axis disposed in each of said apertures, said detent positioning member being radially moveable in said aperture and having in the radial direction a length greater than the thickness of the wall, resilient thrust means disposed within said first bore for urging the detent positioning members radially outwards against said second inner surface, said second inner surface having a plurality of spaced rest points at which said detent positioning members are normally disposed when said abutment

member is in its normal position, said rest points being positioned such that a first line drawn from the second vertical axis to the first vertical axis, said first line being normal to both axes, defines a first length, said second inner surface having a shape such that when the abutment member is subjected to an angular movement relative to the pivot member the detent positioning members will contact the second inner surface at a plurality of spaced second points, said second points being positioned such that a second line drawn from the second vertical axis to the first vertical axis, said second line being normal to both axes, will be shorter in length than said first line.

24. A safety device for releasably binding the toe end of a ski boot to a ski, which comprises a base plate adapted to be secured to the top surface of a ski, a hollow pivot member having a wall having an outer surface and an inner surface, said pivot member extending at right angles to and rigid with said base plate, an abutment member rotatably mounted about said pivot member and having a bore for receiving said hollow pivot member, said bore having a second inner surface, a plurality of apertures formed in the wall of said hollow pivot member, a moveable detent positioning member disposed in each of said apertures, said detent positioning members being radially movable in said apertures, resilient thrust means disposed within said hollow pivot member and adapted to urge said detent positioning members radially outwards, said thrust means comprising a compression spring and a push member responsive to said spring, said push member having a tapered surface engaging said moveable detent positioning members, recesses formed in said second inner surface, each of said recesses adapted to receive a separate detent positioning member when said rotatably mounted abutment member is in its normal position, said recesses being relatively widely outflared in a horizontal plane, their section in said plane forming an angle of at least 90°, said moveable detent positioning members having rounded ends, said recesses as well as the rounded outer ends of said moveable detent positioning members generating a resilient return torque of nearly constant magnitude during a relatively long angular movement of said abutment member.

25. Safety device according to claim 24, wherein said moveable detent positioning members consist of three balls disposed at spaced angular intervals on the periphery of said pivot member, and at the level of said balls the contour of said second inner surface has the shape of a curvilinear triangle of which the convex sides are substantially tangent, in their middle, to the outer surface of the wall of said pivot member, said recesses having a bottom, the bottom of said recesses corresponding to the vertices of said triangle.

26. Safety device according to claim 24, wherein the recesses formed in the second inner surface consist of grooves extending vertically along a major portion of the abutment member, the abutment member being positioned vertically with respect to the base plate supporting said hollow pivot member, said vertical position being adjustable by means of a screw engaging a tapped hole of said abutment member, said screw having a head, said head being supported by a member constantly retained at the same level.

27. Safety device according to claim 24, wherein the outer surface of the wall of the pivot member comprises a part-spherical portion disposed at the level of said abutment member, said abutment member having a corresponding inner part-spherical surface whereby said abutment member can swivel in all directions, the recesses formed in said inner part-spherical surface being outflared in all directions.

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