Aug. 10, 1965 T. G. SMOLKA ET AL 3,199,885

FASTENING-DEVICE IN SAFETY SKI BINDINGS

Filed Oct. 16, 1963 3 Sheets-Sheet 1

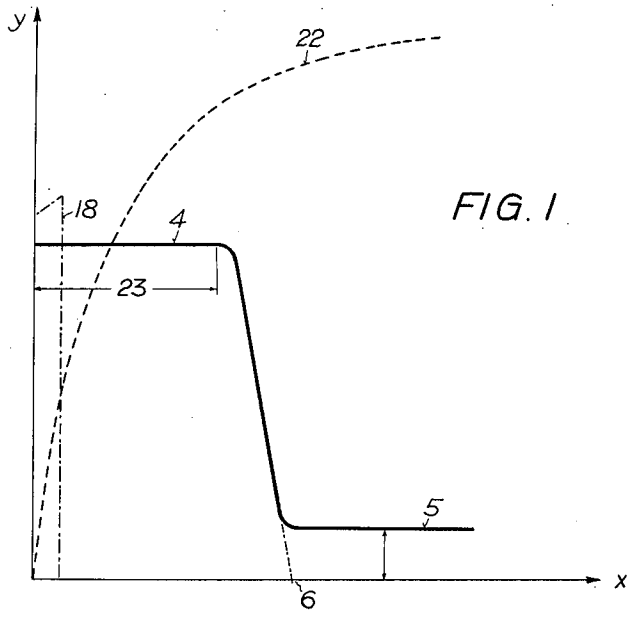


FIG. 1

FIG. 2

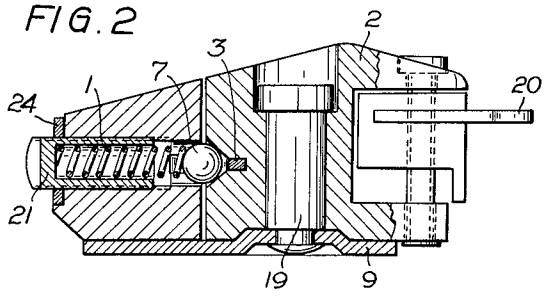
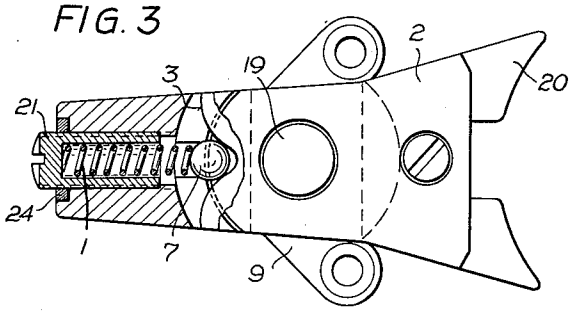


FIG. 3



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FASTENING-DEVICE IN SAFETY SKI BINDINGS

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FIG. 4

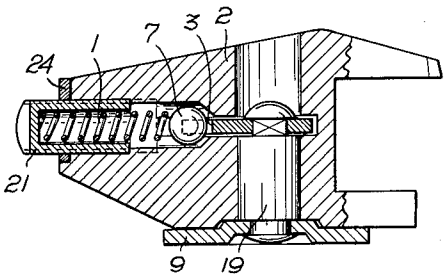


FIG. 5

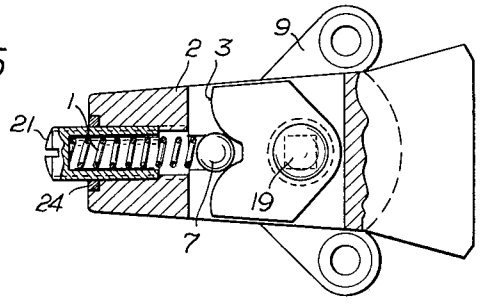


FIG. 6

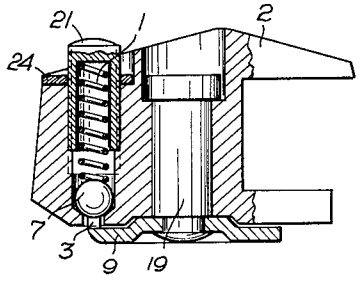


FIG. 7

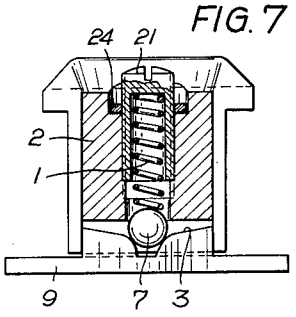


FIG. 8

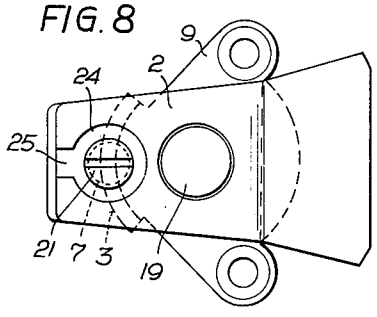
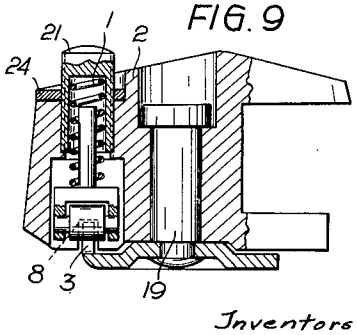


FIG. 9



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FASTENING-DEVICE IN SAFETY SKI BINDINGS

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FIG. 10

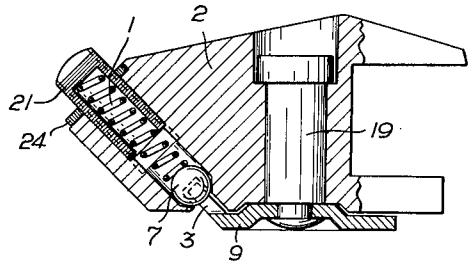


FIG. 11

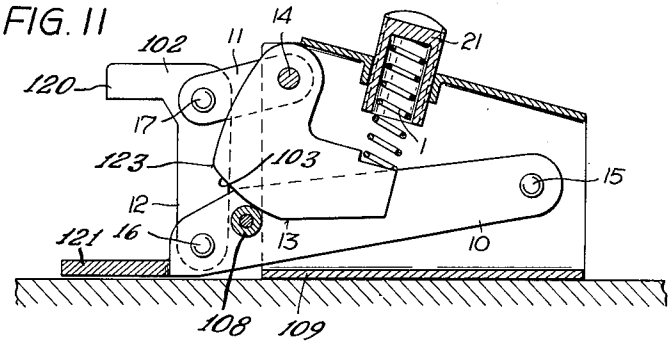
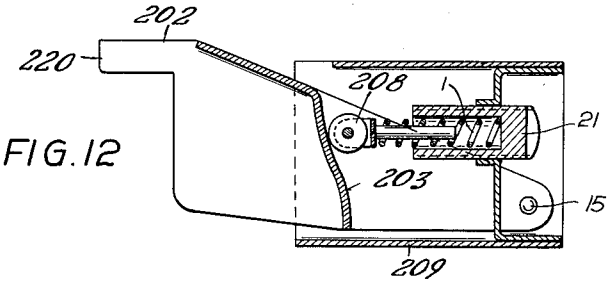


FIG. 12



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FASTENING DEVICE IN SAFETY SKI BINDINGS

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9 Claims. (Cl. 280—11.35)

The invention refers to a fastening device in safety ski bindings. The fastening device may be either a toe-jaw or a heel-detent. In devices of the kind mentioned it is known to provide a holding device which is movable against the force of a spring. The arrangment works in such way, that when it is overcharged because of a plunge, tumble, or fall of the skier, the holding device swings against the force of the spring, thus freeing the ski boot.

In the know devices it has been found to be of disadvantage that the force of the spring increases with increasing displacement of the holding device, and that the boot is freed only after a peak spring force is reached. Contrary to this, it is an object of the invention to provide a fastening device by which the spring force, that reacts on the holding device remains constant until the release.

In accordance with the invention, this objective is attained by providing a ski boot holding device with cam surface means, including a pair of similar cam surfaces, cooperable with a roller which is biased into engagement with the cam surface means by a spring whose force is exerted substantially rectilinearly on the roller. The cam surfaces have a geometrical contour such as to provide, for the movements of the holding means, a spring characteristic which deviates from the normal essentially rectilinear spring characteristic.

A further object of the invention is to provide an arrangement of this type in which the effective force of the spring, in the range of smaller movements of the holding device about an axis and relative to its normal working position, is substantially constant, and in which, in a range of larger movements of the holding device from its working position, the effective spring force is either maintained at a very much reduced but constant value or is made equal to zero. Advantageously, the holding means is mounted for swinging movement on the ski.

For an understanding of the principles of the invention reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a graph illustrating the effective spring force of the holding arrangement of the present invention, as compared with the effective spring forces of known holding devices;

FIG. 2 is a vertical, longitudinal sectional view through one form of fastening device embodying the invention;

FIG. 3 is a plan view, partly in section and partly broken away, of the fastening device shown in FIG. 2;

FIGS. 4 and 5 are views corresponding respectively to FIGS. 2 and 3, of another form of holding device embodying the invention;

FIGS. 6, 7 and 8 are, respectively, a longitudinal sectional view, a transverse sectional view and a plan view of another form of fastening device embodying the invention;

FIG. 9 is a longitudinal sectional view of the device

shown in FIGS. 7 and 8, but modified in respect to the cam surface engaging means;

FIG. 10 is a longitudinal sectional view of a fastening device of the type shown in FIGS. 6–9, but in which the spring force is directed obliquely relative to the upper surface of the ski;

FIG. 11 is a longitudinal sectional view through a further embodiment of a fastening device in accordance with the invention, and including a quadrilateral bell-crank link; and,

FIG. 12 is a longitudinal sectional view through still another form of fastening device embodying the invention.

Referring generally to the drawings, the fastening device comprises a holding device which is swingably, turnably, or otherwise articulated to the ski or to a support fastened on the ski. In the arrangements shown in FIGS. 1 through 10, the holding device 2 is secured to the ski by being mounted on a support 9 for pivotal movement about a generally vertical or upright bolt or pivot 19. In the arrangement of FIG. 11, the holding device 102 is secured to a support 109 by means of four-arm or quadrilateral linkage pivotally connected to support 109 by generally horizontally extending pivots 14 and 15. In the arrangement of FIG. 12, holding device 202 is pivoted to support 209 for pivotal movement about a generally horizontally extending pivot or pin 15.

In the usual manner, each holding device includes jaws 20, 120, or 220, as shown respectively in FIGS. 1 through 10, FIG. 11, and FIG. 12. These jaws are arranged to hold either the toe or the heel of the boot, and may comprise one or more parts as well as being relatively fixed or relatively movable.

In the embodiment of the invention shown in FIGS. 2 and 3, cam surfaces 3 are provided on the holding means 2. These cam surfaces 3 are interposed between the holding device 2 and a spring 1 fixed on the ski, for instance by means of the support 9. The spring 1 cooperates with the cam surfaces 3 by means of a ball 7 biased into engagement with cam surfaces 3 by spring 1. Instead of the ball there may be provided a roll. The force of the spring 1 is adjustable by means of the screw 21 with which is associated a friction ring 24. Depending on the geometrical contour of the cam surfaces 3, these cam surfaces result in a spring-characteristic, for the movements of the holding device 2, which deviates from the normal, essentially rectilinear, spring-characteristic. FIG. 1 graphically illustrates the difference in the spring characteristics. In the graph of FIG. 1, the travel of the holding means is represented by the x-axis and the effective spring force is represented by the y-axis. The normal, essentially rectilinear spring-characteristic is shown by the curve 18. The curve 22 shows a similar known spring-characteristic. The curve 4–5–6 illustrates the spring-characteristic according to the invention. As is evident, the spring-force is constant in the range 23 of smaller movements of the holding device 2 (part 4 of the curve). This has the result that, in smaller movements of the holding device 2, this holding device 2 will return to its original position when the load is lessened. Thus, in the area of part 4 of the curve an increase of work occurs. In case of larger movements of the holding device 2, by which the safety binding will be released, the force of the spring decreases immediately after the release and remains an essentially constant minor fraction of the original spring-force (part 5 of the curve), so that, after the freeing of the skiboot, the holding device 2 returns to its original position, and the binding can be entered anew immediately and easily. The fastening device may be built in such way that, after the

release, the force of the spring decreases to zero (part 6 of the curve).

In the embodiment according to FIGS. 2 and 3, the holding device 2 with the cam surfaces 3 is arranged to be swingable, whereas the spring 1 and the ball 7 are fixedly mounted on the ski by means of the support 9.

According to the invention, the cam surfaces 3 may also be provided on the support 9 fixed on the ski, whereas the ball or roll 7, cooperating with the cam surfaces 3, and the spring 1 are arranged on the movable holding device 2 (FIGS. 4, 5).

In the embodiments according to FIGS. 2 to 5, the spring 1 is arranged horizontally and the cam surfaces 3 are arranged vertically. The device may also be constructed in such a way that the longitudinal axis of the spring 1 is arranged vertically and the cam surfaces 3 are horizontal. In these embodiments, which are shown in FIGS. 6 to 9, the cam surfaces 3 are fixed, whereas the spring and ball are mounted in the swingable holding device 2. In the embodiment according to FIG. 9, the ball 7 is replaced by a roll 8, for example.

According to another embodiment shown in FIG. 10, the spring 1 and the cam surfaces 3 extend obliquely relative to the upper surface of the ski.

Referring to FIG. 11, the holding device 102 can also be provided in the form of a quadrilateral bellcrank linkage. As illustrated in FIG. 11, support 109, fixed to the ski, is provided with horizontally extending pivots 14 and 15 on which are pivotally secured links 10 and 11. These links, by virtue of the pivots 16 and 17, are pivotally interconnected by another link 12. Link 12 has its upper end formed as the jaws 120 and, at its bottom end, there is a heel-plate 121 to operate the fastening device when entering the latter. A cam surface means 13 is pivoted on pivot 14 of the quadrilateral linkage, and has a cam surface 103 cooperating with a roll 8 mounted on link 10. Cam surface means 13 is biased or loaded by spring 1, which is arranged in support 109. If the strain on the holding device is relatively small, the bellcrank link 12 is lifted slightly and roll 8 moves over the cam surface portion 103. During this movement the force of spring 1 is constant. In the event of a much larger strain, or of overstrain, on link 12, roll 8 will roll over the peak or break 123 of the cam surface, and the fastening device frees the boot. The force of the spring then decreases to zero. The fastening device remains open for entering again.

In FIG. 12 is shown an additional embodiment in which the cam surface 203 is provided on a holding device 202, which latter is swingable upwardly. The holding device 202 is pivoted to the support 209 at pivot 15. The spring 1 is, for example, arranged horizontally in support 209 and cooperates through a roll 3 with the climbing-surface 302.

Adjacent to the adjusting screw 21, a set piece, advantageously having the form of a ring 24, is provided (FIGS. 2 to 10). The set piece is held against turning-movements, for instance by a projection 25 (FIG. 8), and engages the adjusting screw 21 by means of friction. Thus the screw 21 is safe from being turned unintentionally. The set piece 24 may be formed of a synthetic, for instance.

We claim:

1. A safety ski binding comprising, in combination, support means adapted to be mounted on the top surface of a ski; a ski boot holding device mounted on said support means for turning about an axis, said holding device having a longitudinal axis extending longitudinally of the ski; cam surface means, a roller means, and spring means, all interposed between said support means and said holding device; said roller means being operatively engaged with said cam surface means and said spring means maintaining said roller means and said cam surface means in operative engagement; said spring means being mounted on one of said support means and said

holding device, and said cam surface means being mounted on the other of said support means and said holding device; said holding device swinging about its turning axis, when excessive pressure is applied against the ski boot, to release the latter; said cam surface means including a pair of similar and oppositely extending cam surfaces, the inner ends of said cam surfaces conjointly defining a relatively deep recess centered on the longitudinal axis of said holding means; each cam surface including a first surface portion extending from said recess and a second surface portion extending from said first surface portion; said first surface portion being inclined at a relatively small angle relative to the direction of action of said spring means, and said second surface portion being inclined at a sharply large angle relative to the direction of action of said spring means; whereby the effective force of the spring means is substantially constant in the range of smaller movements of said holding device relative to its normal operating position, and said spring means, in the range of larger movements of said holding device relative to its normal operative position, having a substantially constant effective force which ranges from a minor fraction of the effective force in the range of smaller movements of said holding device to zero.

2. A safety ski binding, as claimed in claim 1, wherein said cam surface means is fixed relative to said holding device, and said roller means and said spring means are mounted on said support means.

3. A safety ski binding, as claimed in claim 1, in which said cam means is fixed relative to said support means, said roller means and said spring means being mounted on said holding device.

4. A safety ski binding, as claimed in claim 1, wherein the direction of the spring action is substantially horizontal and said cam surfaces are perpendicular to said direction of action.

5. A safety ski binding, as claimed in claim 1, in which the direction of spring action is substantially vertical, said cam surfaces extending normal to said direction of action.

6. A safety ski binding, as claimed in claim 1, in which the turning axis of said boot holding device is perpendicular to the upper surface of the ski.

7. A safety ski binding, as claimed in claim 1, in which the direction of action of said spring is inclined to the upper surface of the ski; said cam surfaces being perpendicular to the direction of action of said spring means.

8. A safety ski binding comprising, in combination, support means adapted to be mounted on the top surface of a ski; a ski boot holding device mounted on said support means for turning about an axis, said holding device having a longitudinal axis extending longitudinally of the ski; cam surface means, a roller means, and spring means, all interposed between said support means and said holding device; said roller means being operatively engaged with said cam surface means and said spring means maintaining said roller means and said cam surface means in operative engagement; said spring means being mounted on one of said support means and said holding device, and said cam surface means being mounted on the other of said support means and said holding device; said holding device swinging about its turning axis, when excessive pressure is applied against the ski boot, to release the latter; said cam surface means including a cam surface having a first surface portion, normally engaged by said roller means in the boot holding position of said holding device, and a second surface portion extending from said first surface portion; said first surface portion being inclined at an angle, relative to the direction of action of said spring means, such that the effective force of the spring means is substantially constant in the range of smaller movements of said holding device relative to its normal operative position; and said second surface portion being inclined at a different angle,

relative to the direction of action of said spring means, such that, in the range of larger movements of said holding device relative to its normal operative position, said spring means has a substantially constant effective force which ranges from a minor fraction of the effective force in the range of smaller movements of said holding device to zero, the turning axis of said holding device being parallel to the upper surface of the ski.

9. A safety ski binding, as claimed in claim 8, in which said holding device comprises a quadrilateral linkage; said cam surface means being pivotal on a pivot of said linkage; said roller means being mounted on said linkage; said spring means being mounted on said support means and biasing said cam surface means into engagement with said roller means.

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