Jan. 12, 1943. A. McILVAINE 2,308,338

SAFETY SKI BINDING

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Fig 2

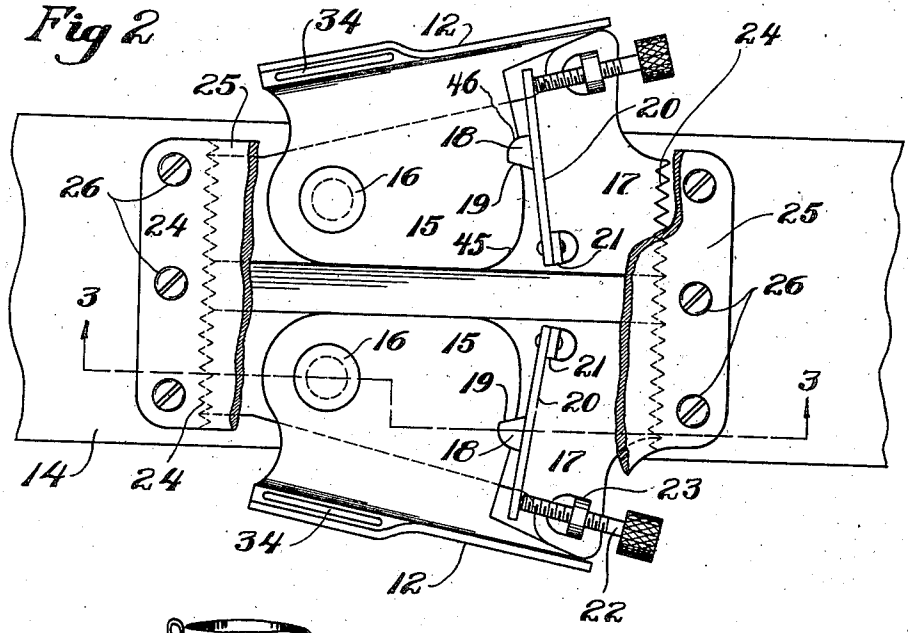


Fig 1

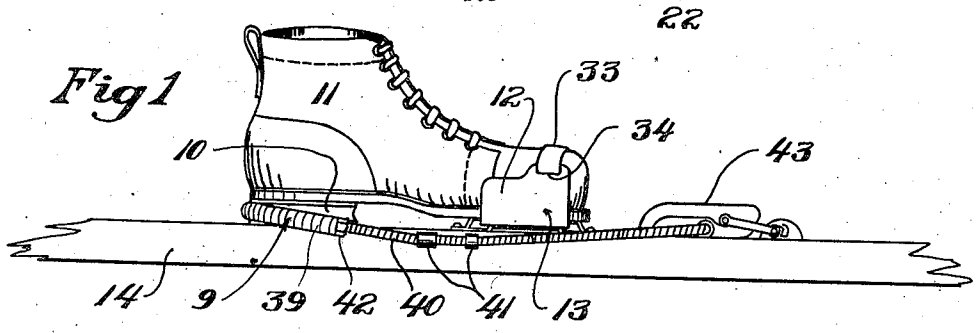
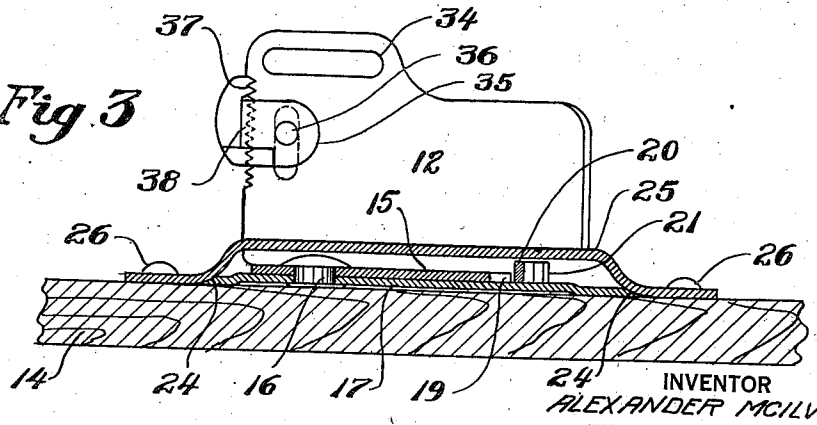


Fig 3



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Fig 5

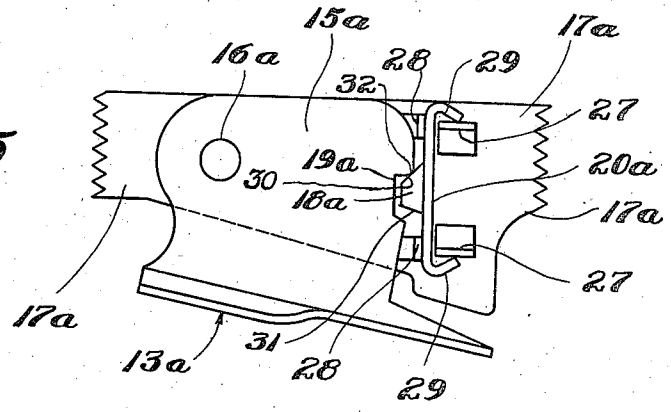


Fig 6

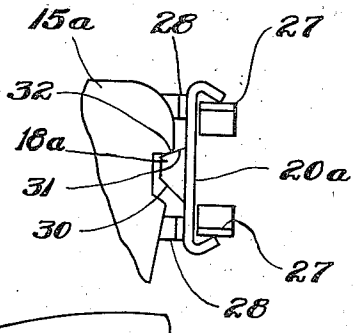
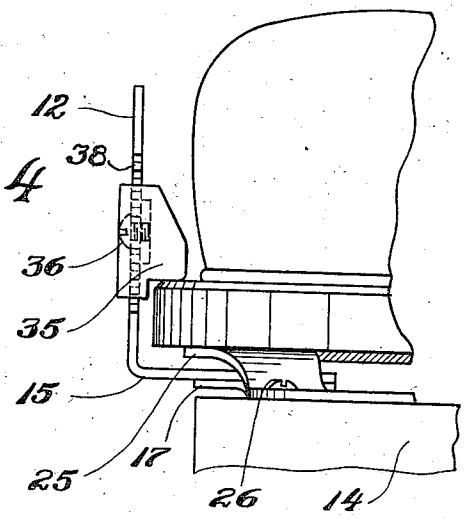


Fig 4



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UNITED STATES PATENT OFFICE

2,308,338

SAFETY SKI BINDING

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Application March 11, 1941, Serial No. 382,733

11 Claims. (Cl. 280—11.35)

This invention relates to improvements in ski bindings.

The principal object of the invention is to make the sport of skiing safer than it now is by providing bindings which will secure the skis firmly to the skier's boots during ordinary running and in the execution of normal turns, and which will function automatically to release the boots whenever the twisting strains upon the skier's legs are such that if continued or exceeded might very well result in a bad sprain or in the breaking of a bone.

It is a more specific object of the invention to provide a safety binding of the foregoing character having a clamping element which, though serving normally to hold the toe portion of a boot against lateral movement upon the ski, will yield and spread apart when the pressure upon it exceeds some predetermined safe limit to permit the boot to free itself from the ski and immediately relieve the skier's ankle of further strain.

It is yet another object of the invention to provide safety bindings in accordance with the foregoing having yielding connections between their toe clamping elements and the skis which may be adjusted by the individual user to release his boots under lateral stresses which for him may be dangerous. The novice who can expect to fall frequently may thus set his bindings to free his boots whenever his ankles are subjected to the slightest excess strain, whereas the more skilled skier who can avoid many hazardous situations may wish to adjust his bindings for release at a much higher limit. In each case, however, the adjustable character of the bindings permits the release to occur under circumstances which may represent real danger for the particular individual who is using them.

The foregoing and other objects of the invention, as well as various features thereof, will be better understood from a consideration of the following description in the light of the accompanying drawings in which:

Fig. 1 is a side elevational view of a fragment of a ski having a boot secured to it by means of the binding device of the present invention;

Fig. 2 is a plan view on an enlarged scale, of the ski of Fig. 1 and of the toe clamp portion of the binding, certain parts thereof being broken away better to show underlying ones;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is an end view illustrating a portion of the toe clamp of the binding and the manner in which it engages the ski boot; and,

Figs. 5 and 6 are plan views of a portion of a toe clamp embodying the invention in a modified form.

In the drawings and referring to Fig. 1, the numeral 9 designates generally a resilient strap element which is adapted to engage the grooved heel 10 of the ski boot 11 and to urge the toe portion of the boot into the tapered recess between the upright toe irons 12 of the toe clamping element 13 of the binding. These toe irons serve, as in any other binding, to prevent lateral movement of the boot upon the ski 14 while allowing full flexing of the toes, in the course of ordinary skiing activity. In accordance with the invention, however, the irons are not rigidly secured to the ski but are so mounted upon it as to be capable of yielding when the lateral pressure applied to them by the ski boot exceeds some predetermined value. Under such circumstances they spread apart, and by relieving the boot of lateral support, permit it to slip out of the binding under the urging of the resilient strap element. The yielding toe clamp thus serves automatically to release the skier's foot whenever it or his leg or ankle is subjected to dangerously high stress.

One preferred form of yielding toe clamp for such a binding, as illustrated in Figs. 2 and 3, comprises a pair of upright toe irons 12 having lateral flanges 15 which are pivotally connected at their forward ends, as indicated at 16, to base plates 17, and are normally held against swinging movement by the engagement of spring pressed pawls 18 with the notches 19 formed in the rear edges of their lateral flanges. In this form of the invention the pawls are mounted upon leaf springs 20 having their inner ends riveted or otherwise secured to lugs 21 which may be conveniently struck up from the base plates, and their outer ends backed by adjusting screws 22 threaded through similar lugs 23, which screws extend outwardly from the toe clamps so as to be readily accessible.

The toe irons are preferably mounted upon separate base plates 17, and are secured to the ski 14 in such manner that their positions may be adjusted to receive boots of different sizes. One way of accomplishing this is to serrate the ends of each of the base plates, as indicated at 24, and to form matching serrations in the underside of a cover plate 25 which is adapted to be fastened to the ski by means of screws 26 or in any other desired way. Thus, when the base plates have been set upon the ski in desired positions, their serrated ends will be engaged by the matching serrations of the cover to prevent lateral movement between these various elements.

The pawls 18 serve to hold the toe irons in such normal positions as to engage the sides of a ski boot and to support it laterally under pressures which are no greater than those encountered in ordinary skiing activity. When, however, the sidewise pressure upon the irons exceeds what may be called a safe value, the sloping cam surfaces of their notched portions 19 react against

the opposing cam faces of the pawls and force the pawls rearwardly out of the notches against the reaction of springs 20 to allow the irons to swing outwardly about their pivots and to permit the boot to free itself as heretofore described. The adjusting screws 22, of course, provide a ready means for varying the tension which the springs apply to the pawls, and hence for increasing or decreasing the limit at which those elements will release the toe irons.

Under certain circumstances both of the irons will give way to release their hold upon the boot. Usually, however, the pressure upon one of them will be greater than upon the other, and only that iron will yield. But whether one or both of the irons are released to swing about their pivots, the spacing between them will be increased to relieve the boot of lateral support and to allow it to separate from the ski.

While a very considerable force must be applied to the toe irons to effect their release, they may be returned and relocked in their normal positions by the application of a much lighter pressure. Thus, when either one or the other of the irons is swung inwardly, the rounded edge 45 of its lateral flange engages the opposing rounded outer edge 46 of the cam 18, and forces the cam gently backwards against the reaction of the spring until it reaches such a point that it may snap back into the notch 19 to lock the toe iron in normal position.

Another form of yielding toe clamp is illustrated in Figs. 5 and 6. The differences between this structure and that illustrated in Figs. 2 and 3 are to be found primarily in the construction of the spring pressed pawls which serve to hold the toe irons in their normal positions. Accordingly, Figs. 5 and 6 illustrate only a fragment of the complete toe clamp and reference may be had to Figs. 2 and 3 for an understanding of the details which are not shown. In this form of the invention the pawl 18*a* is mounted upon the front surface of a leaf spring 20*a* which is supported between oppositely disposed lugs 27 and 28 of the base plate 17*a*. The spring is held against lateral movement by its inturned ends 29 which engage the lugs 27, and it will be noted that these ends are bent inwardly to such an extent as partially to overlap the main body of the spring. Accordingly, when that element is bowed in a rearward direction, its end portions can move between the lugs without binding. The spring will, of course, be held down upon the base plate by the overlying cover plate 25.

The pawl 18*a* has two cam faces 30 and 31, of which one is considerably steeper than the other. In Fig. 5 the spring element is so disposed between its retaining lugs that the face 30 of the pawl engages the opposing rounded edge 32 of the notch 19*a* to hold the clamping element 13*a* in its normal position. When the pressure applied to the toe iron reaches some predetermined value, the rounded edge 32, reacting against the cam surface 30 forces the pawl out of the notch against the tension of spring 20*a* to effect the release of the toe iron. It will be evident that the initial tension of the spring and the slope of the cam face will determine the stress which must be applied to force the pawl rearwardly and effect release.

In Fig. 6 the spring element 20*a* has been turned end for end so that the steeper cam face 31 is now engaging the rounded projection 32 of the flange 15*a* to hold it against lateral movement. When the spring is thus positioned, it is evident that the stress which must be applied to the toe iron to force the cam out of the notch will be very much greater than was the case in the arrangement of Fig. 5. Thus, the reversal of the spring 20*a* provides for an adjustment of the point at which the clamping element will release the toe of the ski boot. If neither of the two release limits of any particular spring unit 20*a* suits the needs of an individual user, that unit can be easily replaced by one having its cam surfaces 30 and 31 so sloped as to provide satisfactory limits. While this form of the invention does not provide for such ready adjustment between extreme limits as that of Figs. 2 and 3, it has the offsetting advantage of extreme simplicity and of permanence of adjustment. There can be no accidental changing of the release limit in the device of Figs. 5 and 6, whereas such changes can very easily occur in the structure of Figs. 2 and 3.

The complete binding must, of course, include some means for holding the toe portion of the boot down upon the ski. If desired, a conventional strap 33 threaded through the slots 34 of the toe irons and extended across the toe of the boot may be employed for this purpose. Preferably, however, each of the toe irons is provided with a lug 35 extending along its inner face in such position as to overlie the opposite edges of the sole of the boot near its toe to hold it down upon the cover plate 25. The vertical positions of these lugs may be readily adjusted to accommodate soles of different thicknesses by loosening the screws 36 which extend through the vertical slots in the toe irons and re-engaging the serrations 37 on the front end of the lugs with the matching serrations 38 formed on the forward ends of the irons at some different points, after which the screws may again be tightened. While only one of these lugs is shown in Figs. 3 and 4, it will be evident that a substantially identical one will be provided on the opposite toe iron.

The resilient strap element 9 may be of any conventional construction. The one here shown comprises a coil spring 39 looped around the heel of the boot and secured at its opposite ends to a pair of cables 40 which extend along the opposite sides of the ski under clips 41 to some point forward of the toe clamping elements of the binding where they are secured to the ski. It is usual to provide such a binding with a threaded connection 42 between one end of the spring and the adjacent cable end so that the length of the cable may be varied to suit individual needs; and it is also usual to secure the forward ends of the cables to a toggle mechanism indicated at 43, which serves as a convenient means for tightening the strap at the time the skis are bound to the boots and, of course, for loosening it when the skis are to be removed. While this illustrated strap has certain advantages in providing ready adjustment and for quick attachment, it is evident that the present invention is not limited to its use. Any convenient form of strap may be employed in its place.

Since certain changes may be made in the embodiment of the invention by a mechanic skilled in the art and without departing from the fundamental teachings, it is intended that the foregoing shall be construed in a descriptive rather than in a limiting sense.

What I claim is:

1. A safety toe clamp for a ski binding comprising a base plate adapted to be secured to a ski, a pair of clamping members having upright

portions disposed in spaced relation to define a recess for the toe of a ski boot, at least one of said members being pivotally connected at a point forward of its center to said base plate, and means for normally holding said last mentioned member against swinging movement in such a position as to confine the toe portion of a ski boot between itself and the opposing member, said means comprising a part on said swinging member, a pawl carried by said base plate, and a spring for urging said pawl forwardly into engagement with said part, said part and pawl having mutually engaged surfaces which are so sloped that lateral pressure upon said swinging member in excess of a predetermined limit will force said pawl rearwardly and free said part whereby the rear end portion of the member may swing outwardly to permit the toe portion of such a ski boot to escape from the binding.

2. A safety toe clamp for a ski binding according to claim 1, further characterized in that said spring comprises a leaf spring which is disposed generally crosswise of the binding, in that said pawl is secured to said spring between its ends, and by means on said base plate for supporting said spring at its opposite ends.

3. A safety toe clamp for a ski binding comprising a pair of base plates, a pair of clamping members each having an upstanding flange adapted to engage the toe portion of a ski boot, and a lateral portion which is pivotally connected near the forward end of the member to one of said base plates, and each such lateral portion having a shoulder formed on its rear edge, a pair of pawls each having an inwardly sloping surface adapted to engage the complementally sloped shoulder of one of said clamping members thereby to hold that member against lateral swinging movement upon its base plate, and resilient means for urging said pawls forwardly into engaging relation with said shoulders of said clamping members, said base plates being adapted to be secured to a ski with their upstanding flanges disposed in such spaced relation as normally to engage the sides of the toe portion of a ski boot and support it against lateral movement upon the ski, and said pawls being adapted to be forced rearwardly against the tension of said resilient means out of engaging relation with said shoulders of said members when the upstanding flange portions thereof are subjected to lateral pressures in excess of a predetermined limit whereby to release said members and permit them to swing about their pivots to free such boot from the ski.

4. A safety ski binding according to claim 3, further characterized by the provision of means for varying the tension of said resilient means.

5. A safety ski binding according to claim 3, further characterized in that said resilient means comprise a pair of leaf springs each secured at one end to one of said base plates, in that said pawls are carried by said leaf springs between their ends, and by the provision of a pair of adjusting screws each carried by one of said base plates and engaging the free end of one of said springs.

6. A safety ski binding according to claim 3, further characterized in that said resilient means comprise a pair of leaf springs each carrying one of said pawls, by the provision of means on each of said base plates for engaging the opposite ends of one of said springs, and in that each of said pawls has a pair of cam faces of different slopes whereby when said spring is in one position, one of said faces is adapted to engage the projecting portion of the adjacent clamping member and when it is turned end for end, the other of said faces is adapted to engage the projecting portion of the member.

7. A safety ski binding according to claim 3, further characterized in that said resilient means comprise a pair of leaf springs each carrying one of said pawls, by the provision of oppositely disposed lugs upon each base plate for confining the opposite ends of one of said springs, and in that each of said pawls has a pair of cam faces of different slopes whereby when said spring is in one position, one of said faces is adapted to engage the projecting portion of the adjacent clamping member and when it is turned end for end, the other of said faces is adapted to engage the projecting portion of the member.

8. A safety ski binding according to claim 3, further characterized in that said resilient means comprise a pair of leaf springs each carrying one of said pawls and each having its ends inturned to such an extent as partially to overlap the main body of the spring, by the provision of spaced lugs on each base plate between which each end of one of said springs may be confined, and in that each of said pawls has a pair of cam faces of different slopes whereby when said spring is in one position, one of said faces is adapted to engage the projecting portion of the adjacent clamping member and when it is turned end for end, the other of said faces is adapted to engage the projecting portion of the member.

9. A safety toe clamp for a ski binding according to claim 3, further characterized in that the lateral portion of each member has a rounded inner rear corner, and in that each pawl has a sloping outer surface, said rounded corner of said member and said outer sloping surface of said pawl being adapted to cooperate to force the pawl rearwardly against the resilient means when said member is swung inwardly from its open toward its normal position.

10. A safety toe clamp for a ski binding comprising a pair of base plates, a pair of clamping members each having an upstanding flange adaped to engage the toe portion of a ski boot and a lateral flange portion, a pivotal connection between the forward portion of each lateral flange and the adjacent one of said base plates, each lateral flange having a forwardly extending notch in its rear edge which provides an inwardly sloping vertical shoulder, a pair of pawls each having an inwardly sloping surface adapted to engage the complementally sloped surface of one of said shoulders, a pair of leaf springs each disposed generally crosswise of one of said base plates and each carrying one of said pawls, means securing the inner end of each spring to its base plate, and a pair of adjusting screws each threaded to one of said base plates with its forward end supporting the outer end of the leaf spring carried by that plate and with its rear end projecting rearwardly from the clamping members.

11. A safety toe clamp for a ski binding according to claim 10, further characterized by a cover plate which is adapted to overlie the lateral flange portions of said clamping members and said base plates, means for securing said cover plate to a ski, and means on said cover for supporting said base plates against lateral movement.

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