

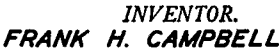
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SKI BINDING

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## SKI BINDING

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1

This invention relates to skiing apparatus and more particularly to a ski binding.

In skiing it is essential that the skis be held securely to the skier's boots but at the same time permit normal heel flexing and release therefrom under abnormal strain. In case of a bad fall, it is important that the ski be released from the boot to avoid the effects of large leverage actions which otherwise might be produced by the ski. A ski binding therefore should satisfy the following requirements:

1. A high degree of safety insuring that under normal conditions the ski will remain attached to the ski boot and that under abnormal strain the ski will be released quickly;

2. Adjustability to accomodate different size ski boots without detaching the binding from the ski;

3. Simplicity of operation, so that once adjusted to fit a given boot it may be quickly operated to bind or release the boot; and

4. Resiliency to permit the heel flexing action during skiing.

The present invention is directed to apparatus which satisfies each of these requirements to a degree heretofore unobtainable.

In accordance with the invention I provide a binder having a toe plate affixed to the ski and adapted to hold the toe of the ski boot against the ski, a cleat adapted to be affixed to the boot heel, and a spring loaded pawl affixed to the ski and adapted to releasably engage the cleat.

A feature of the invention is the manner in which the pressure required to release the ski from the boot is adjusted. The pawl engaging the cleat affixed to the boot heel is pivotally suspended from an end of a pivot pin. The pivot pin is mounted in a framework affixed to the ski. The opposite end of the pivot pin is connected to a lever arm by a helical spring. The lever arm is employed as a hand operated release means; rotation thereof determining counter-rotation of the pivot pin which releases or engages the pawl with the heel cleat.

The pressure with which the ski is held to the boot is a function of the strength of the helical spring and of the angle at which the pawl extends into the heel cleat. Heel flexure is against the spring loading which permits the boot heel to be raised above the ski a certain distance without release. When the boot heel is raised too far above the ski, as may occur in a fall, the pawl springs free of the cleat releasing the ski from the boot. The pawl angle is adjustable by adjusting the relative positions of the pivot pin and

2

the boot with respect to each other. Since release of the pawl other than by means of the lever arm, depends on counter-rotation of the pivot pin against the tension of the helical spring the angle included between the engaged pawl and the pivot pin will determine the amount of force to be applied to the pawl to overcome the spring tension. Thus, depending upon the size and degree of proficiency of the skier a binder may be adjusted at will to hold the ski against the ski boot with greater or less force.

Another feature of the invention is the means of permitting lateral release of the boot heel with respect to the ski under excessive strain. This is accomplished by provision of a laterally pivotable tongue on the free end of the pawl. The tongue engages the heel cleat holding it against the ski as described. This lateral release is also determined by the spring loading and the angular position of the pawl as is hereinafter apparent.

The invention may be more clearly understood from the following detailed description thereof taken in relation to the accompanying drawing in which:

Fig. 1 is an elevation of a ski boot and a portion of a ski showing one form of the apparatus holding the ski to the boot;

Fig. 2 is a plan view of a portion of the apparatus of Fig. 1 including the pawl and pivot pin;

Fig. 3 is an elevation of a ski and ski boot showing another embodiment of the invention binding the ski to the boot.

Fig. 4 is a detailed perspective view of the toe cleat of the apparatus of Fig. 3;

Fig. 5 is a plan view of a portion of the apparatus of Fig. 3 with the pawl and pivot pin removed to illustrate the mounting means.

Fig. 1 shows a ski 10 held to a boot 11 by a binder in accordance with one embodiment of the invention. The binder includes a toe clamp 12, a heel clamp 13 and a heel cleat 14 engaged by the clamp.

The toe clamp 12 comprises a base plate 15 affixed to the ski and provided with a plurality of transverse notches 16, 17 etc. on its upper face. A cleat 20 having a lip 21 extending over the toe of the sole of the boot has a plurality of transverse ribs 22, 23, etc. adapted to engage in the notches 16, 17 etc. of the base plate. Cleat 20 is held to the base 15 by a knurled nut 24 and is longitudinally adjustable by engaging the ribs 22, 23, etc. with different ones of the notches 16, 17, etc. To prevent lateral slippage of the boot toe, the front edge 25 of the cleat is pointed to fit into a notch formed in the boot sole.

The heel cleat 14 is firmly attached to the heel of the boot 11 with a plurality of screws 26, 27, 28. The cleat forms a rearwardly opening transverse cupped pocket 30 by means of which the heel is held against the ski by the heel binder.

The heel binder or clamp 13 comprises a framework 32 affixed to the ski and including a pair of brackets 32A, 32B. A pivot arm 34 is mounted on a shaft 36 pivotally supported between the brackets 32A, 32B. A pawl assembly 38 is pivotally mounted to the forward end of the pivot arm 34. The assembly 38 includes a link 38A pivotally affixed at one end to the arm 34 and a pawl 40 depending from the link and laterally pivotal on an axis 37 transverse to the axis of rotation of the pawl assembly. The pawl 40 is adapted to seat in the pocket 30 of the heel cleat. The opposite end of the pivot arm 34 is connected by a helical spring 42 to a lever 44. The lever 44 is pivoted to a framework 46 supported on a base 47. The framework 32 is notched at 48 and the base 47 is notched at 49 to fit therein. A dog 50 pivotally mounted on the base 47 engages one of the notches 48 in the framework 32 holding the base 47 in a set position.

The spring 42 is pivotally mounted to the lever 44 at 52 between the pivot points 51 of the lever and the outer end of the lever. The lever 44 has a yoke 54 at its pivoted end, opening toward the spring. The spring extends into the yoke where it is fastened to the lever adjacent the inner end of the yoke (i. e. at 52). The two legs of the yoke are pivoted at their outer ends to the framework 46 at the pivot points 51. Rotation of the lever 44 thus acts to exert or release tension on the spring 42.

With the binder mounted on the ski as shown the ski boot is placed thereon so that the lip 21 of the toe clamp engages the top of the boot sole. With the lever 44 in the release position (rotated counter-clockwise from the position shown in Fig. 1) the pawl 40 of the pawl assembly is inserted in the pocket 30 of the heel cleat. The lever 44 is rotated clockwise from the released position to the position shown in Fig. 1 exerting spring tension on the pivot arm 34 to force the pawl 40 into the pocket thrusting the boot forwardly and downwardly.

The force required to release the ski from the boot without releasing the lever arm 44 is a function of the included angle between the pawl assembly 38 and the pivot arm 34. This in turn is a function of the adjustment of the toe clamp 12 which determines the relative location of the boot heel with respect to the pivot point 36 of the lever arm 34. The smaller the included angle between the pawl assembly 38 and the pivot arm 34 the greater will be the force required to release the ski from the boot without releasing the lever arm 44. Conversely, the greater the angle the smaller the force required. Additionally, the releasing force may be adjusted by horizontal adjustment of the lever base 47 on the notched base 32; increasing or decreasing the spring tension.

Considering Fig. 1 it is apparent that the pivot arm 34 may be rotated clockwise through a comparatively small angle against the spring tension without releasing the boot. In this manner the boot heel may be raised above the ski, as for example when crouching, without coming loose from the ski. If sufficient force is applied to raise the boot to a point such that the pawl approaches a horizontal position, the pawl will snap upwardly out of the cleat pocket, releasing

the boot. By adjusting the position of the boot with respect to the pivot arm and thus the included angle between the pivot arm and pawl assembly the critical force required to release can be accommodated to the size and wants of the user.

As above mentioned, lateral release of the boot responsive to a sideways thrust is also a function of the spring tension. As shown in Fig. 2 the end of the pawl 40 which rides in the pocket 30 is flat. Any rotation of the pawl while in the pocket has the effect of elongating the pawl assembly. This is illustrated in Fig. 2 by the dotted line position of the pawl. Since any elongation of the pawl assembly must be accomplished against the spring loading it is apparent that rotation of the pawl to permit lateral release is a function of this loading.

The embodiment of the invention illustrated in Figs. 3, 4 and 5 constitutes a preferred form in view of the greater flexibility thereof. The binder shown in elevation in Fig. 3 comprises a toe clamp 60, a heel cleat 61 and a heel clamp 62 as in the foregoing embodiment.

The toe clamp 60 comprises an angle bracket 63 one leg of which is affixed to the ski by screws 64, 65. The vertical leg of the bracket 63 is provided with a pair of inwardly opening racks 66, 67 and has a vertically elongated slot 68 to receive a screw 69. An angle cleat 72 has a lip 72A adapted to engage over the toe of the boot sole and a flange 72B toothed along its vertical edges to fit within the racks 66, 67. The flange 72B is provided with a tapped hole 74 to receive the screw 69. In assembly the cleat 72 is placed in the rack 66, 67 at the desired elevation above the ski 10 and the screw 69 passing through the slot 68 into the tapped hole 74 holds the cleat 72 to the bracket 60. The lower portion of the bracket has a wedge shaped tit 75 which projects into a notch 76 in the boot sole to prevent lateral slipping.

In this embodiment the toe clamp is vertically adjustable but is not horizontally adjustable as in the embodiment shown in Fig. 1. To provide the necessary horizontal adjustment of the binding to accommodate different size ski boots the heel clamp 62 is made horizontally adjustable.

The heel clamp 62 operates to engage the pocketed cleat 61 affixed to the boot heel and similar to the member 14 in the foregoing embodiment. The clamp 62 includes a pawl assembly 80 having a laterally pivotal pawl 81, a pivot arm 82 pivotally mounted to brackets 83, 84 and a spring loaded release lever 86 all substantially similar to the apparatus shown in Figs. 1 and 2. In this embodiment however, a pair of guides 90, 92 are fixed to the ski 10 and the binding framework 94 is horizontally adjustable in the guides 90, 92.

The front guide 90 includes a plate 90A affixed to the ski and an overhanging lip 90B extending rearwardly along the ski and spaced above the upper surface of the ski. The forward end of the framework 94 is slid beneath the lip 90B to hold it to the ski. The rear guide 92 is anchored to the ski by screws 93, 95 and includes a forwardly opening shallow housing 92A having an elongated slot 96 and a plurality of elongated transverse slots 97, 98, etc. intercepting the elongated slot 96. The trailing end of the framework 94 is tapped at 100 to receive a wing screw 101 projecting through the elongated slot 96. The wing screw is threaded through a washer 102

5

having transverse ears 103, 104 extending into the transverse slot 98.

Longitudinal adjustment of the heel binder is accomplished by setting the lock washer and wing screw in any one of the several transverse slots 97, 98 etc. in the guide 92 and sliding the framework 94 until the hole 100 therein is in line with the wing screw. By screwing the wing screw into the hole the framework 94 is held in the position selected.

The release mechanism shown in Fig. 3 differs somewhat from that shown in Fig. 1 although the purposes accomplished are the same. In the apparatus of Fig. 1 the lever arm 44 is a second class lever with the load (constituting the spring 42) being between the fulcrum 46 and the point of force application at the outer end of the lever. The lever 86, in the apparatus of Fig. 3 on the other hand, operates as a first class lever with the fulcrum 86A in between the loading point 86B and the outer end of the lever where the force is applied.

The apparatus illustrated in Figs. 3, 4, and 5 is to be preferred over the apparatus of Figs. 1 and 2 for reasons of simplicity of construction and operation and ease of adjustability. As in the foregoing embodiment the force required to release the ski from the boot independent of the lever release is a function of the spacing between the boot heel and the pivot point of the arm 82. This spacing determines the included angle between the pawl assembly 80 and the pivot arm 82; this included angle constituting the determining factor in the force vector applied against the spring tension when the boot heel is lifted off the ski. In the apparatus of Fig. 3, this spacing is determined by adjustment of the heel binding framework 94 as described independent of the toe clamp 60.

Many modifications in the mechanism employed may occur to those skilled in the binding art without departing from the scope of the invention as described and claimed.

I claim:

1. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a support member affixed to the ski, a cleat adjustably mounted to the support member and adapted to engage and hold the toe of the boot to the ski, a heel clamp including a framework mounted to the ski, a pivot arm pivoted in the framework, a link, one end of the link being pivoted to one end of the pivot arm, a pawl extending from the other end of the link and free to pivot about an axis transverse to the axis of rotation of the link, a lever pivotally mounted to the framework and spaced from the pivot arm, a helical spring connecting the opposite end of the pivot arm to the lever, and a cleat affixed to the heel of the boot and adapted to receive the pawl.

2. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a support member affixed to the ski, a cleat adjustably mounted to the support member and adapted to engage and hold the toe of the boot to the ski, a heel clamp including a framework affixed to the ski, a pivot arm pivotally mounted to the framework above the ski, a pawl assembly, including a pawl, pivoted to one end of the arm, a lever pivotally mounted to the framework and spaced from the pivot arm, a helical spring connecting the other end of the pivot arm with the lever, and a cleat affixed to the heel of the boot and adapted to engage the pawl.

6

3. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a bracket affixed to the ski, a cleat vertically adjustable in the bracket and adapted to engage and hold the toe of the boot to the ski, a heel clamp including a framework slideably mounted to the ski, an arm pivoted in the framework, a pawl assembly, including a pawl, pivoted to one end of the arm, a lever pivoted to the framework and spaced from the pivot arm, a helical spring connecting the opposite end of the pivot arm to the lever, and a cleat affixed to the heel of the boot and adapted to engage the pawl.

4. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a bracket affixed to the ski and having a vertical rack, a cleat adjustable in the rack and adapted to engage and hold the toe of the boot to the ski, a heel clamp including a framework slideably mounted to the ski, a pivot arm pivoted in the framework, a pawl assembly, including a pawl, pivoted to one end of the arm, a lever pivotally mounted to the framework and spaced from the pivot arm, a helical spring connecting the opposite end of the pivot arm to the lever, and a cleat affixed to the heel of the boot and adapted to engage the pawl.

5. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a bracket affixed to the ski and having a vertical rack, a cleat adjustably affixed in the rack and adapted to engage and hold the toe of the boot to the ski, a heel clamp including a framework slideably mounted to the ski, a pivot arm pivotally mounted to the framework above the ski, a link, one end of the link being pivoted to one end of the pivot arm, a pawl extending from the other end of the link and free to pivot about an axis transverse to the axis of rotation of the link, a lever pivotally mounted to the framework and spaced from the pivot arm, a helical spring connecting the opposite end of the pivot arm to the lever, and a heel cleat affixed to the heel of the boot and adapted to engage the pawl.

6. Apparatus according to claim 5 wherein the heel cleat has an upwardly and outwardly opening pocket lying along the back of the heel, and the free end of the pawl is adapted to fit within the pocket.

7. Apparatus according to claim 6 wherein the end edge of the pawl is flat and transverse to the axis of rotation of the pawl.

8. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a bracket affixed to the ski and having a vertical rack, a cleat adjustably affixed in the rack and adapted to engage and hold the toe of the boot to the ski, a heel clamp including a pair of spaced guide members affixed to the ski, a framework slideably mounted in the guide members, means for fixing the position of the framework in the guide members, a pivot arm pivotally mounted to the framework above the ski, a pawl assembly, including a pawl, pivoted to one end of the pivot arm, a lever pivotally mounted to the framework and spaced from the pivot arm, a helical spring connecting the opposite end of the pivot arm to the lever, and a cleat affixed to the heel of the boot and adapted to engage the pawl.

9. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a bracket affixed to the ski and having a vertical rack, a toothed cleat adjustably affixed in the rack and projecting over the toe of the sole of the boot, a heel clamp including a pair of spaced guide

members affixed to the ski, a framework slidably mounted in the guide members, means for releasably fixing the position of the framework in the guide members, a pivot arm pivotally mounted to the framework above the ski, a link, one end of the link being rotatably affixed to one end of the pivot arm, a pawl extending from the other end of the link and free to rotate about an axis transverse to the axis of rotation of the link, a lever pivotally mounted to the framework and spaced from the pivot arm, a helical spring connecting the opposite end of the pivot arm to the lever, and a heel cleat affixed to the heel of the boot and adapted to releasably engage the pawl.

10. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a base plate affixed to the ski, a cleat affixed to and longitudinally adjustable on the base plate and adapted to engage and hold the toe of the boot to the ski, a heel clamp including a first framework affixed to the ski, a pivot arm rotatably mounted to the framework above the ski, a pawl assembly, including a pawl, pivoted to one end of the arm, a lever pivotally mounted to a second framework, a helical spring connecting the other end of the pivot arm to the lever, the second framework being mounted on the first framework and longitudinally adjustable thereon, and a cleat affixed to the boot heel and adapted to engage the pawl.

11. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a base plate affixed to the ski and having a plurality of transverse notches on its upper face, a cleat notched to fit in the notched base plate and being longitudinally adjustable thereon, the cleat adapted to engage and hold the toe of the boot to the ski, a heel clamp including a first framework affixed to the ski, a pivot arm rotatably mounted to the framework above the ski, a pawl assembly, including a pawl, pivoted to one end of the arm, a lever pivotally mounted to a second framework, a helical spring connecting the other end of the pivot arm to the lever, the second framework being mounted on the first framework and longitudinally adjustable thereon, and a cleat affixed to the boot heel and adapted to engage the pawl.

12. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a base plate affixed to the ski and having a plurality of transverse notches on its upper face, a cleat notched to fit in the notched base plate and being longitudinally adjustable thereon, the cleat adapted to engage and hold the toe of the boot to the ski, a heel clamp including a first framework affixed to the ski, a pivot arm pivotally mounted to the framework above the ski, a link, one end of the link being rotatably affixed to one end of the pivot arm, a pawl extending from the other end of the link and free to rotate about an axis transverse to the axis of rotation of the link, a lever pivotally mounted to a second framework, a helical spring connecting the other end of the pivot arm to the lever, the second framework being mounted on the first framework and longitudinally adjustable thereon, and a cleat affixed to the boot heel and adapted to engage the pawl.

13. In a ski, means for binding the ski to a ski boot comprising a toe clamp including a support member affixed to the ski, a cleat adjustably mounted to the support member and adapted to engage and hold the toe of the boot to the ski, a heel clamp including a framework affixed to

the ski, a pivot arm pivotally mounted to the framework above the ski, a pawl assembly, including a pawl, pivoted to one end of the arm, a cleat affixed to the heel of the boot and adapted to receive the pawl, and a spring connected between the other end of said pivot arm and said framework to load the pivot arm against rotation of said one end thereof away from the ski boot.

14. A binding for holding a ski to a boot comprising means for releasably holding the toe of the boot to the ski, a heel clamp including a framework adapted to be affixed to the ski, a pivot arm pivotally mounted to the framework to lie above the ski, a pawl assembly including a pawl, pivoted to one end of the arm, a lever pivotally mounted to the framework and spaced from the pivot arm, a helical spring connecting the other end of the pivot arm with the lever, and a cleat adapted to be affixed to the heel of the boot and to engage the pawl.

15. A binding for holding a ski to a boot comprising means for releasably holding the toe of the boot to the ski, a heel clamp including a framework adapted to be slidably mounted to the ski, a pivot arm pivotally mounted to the framework to lie above the ski, a link pivoted at one end to an end of the pivot arm, a pawl extending from the other end of the link and free to pivot about an axis transverse to the axis of rotation of the link, a lever pivotally mounted to the framework and spaced from the pivot arm, a helical spring connecting the opposite end of the pivot arm to the lever, and a heel cleat adapted to be affixed to the heel of the boot and to engage the pawl.

16. A binding for holding a ski to a boot comprising means adapted to be attached to the ski to releasably hold the toe of the boot to the ski, a heel clamp including a framework adapted to be affixed to the ski, a pivot arm pivotally mounted to the framework so as to lie above the ski when the framework is affixed thereto, a pawl assembly, including a pawl, pivoted to one end of the arm, a cleat for attachment to the heel of the boot and adapted to receive the pawl, and a spring connected between the other end of said pivot arm and said framework to load the pivot arm against rotation of said one end thereof away from the cleat.

17. A binding for holding a ski to a boot comprising means for holding the toe of the boot to the ski, a heel clamp including a framework adapted to be slidably mounted to the ski, a pivot arm pivotally mounted to the framework to lie above the ski, a link pivoted at one end to one end of the pivot arm, a pawl extending from the other end of the link and free to pivot about an axis transverse to the axis of rotation of the link, a cleat adapted to be affixed to the heel of the boot to engage the pawl, and a spring connected between the other end of said pivot arm and said framework to load the pivot arm against rotation of said one end thereof away from the ski boot.

18. A binding for holding a ski to a boot comprising a toe clamp including a support member adapted to be affixed to the ski, means adjustably mounted to the support member and adapted to engage and hold the toe of the boot to the ski, a heel clamp including a framework adapted to be affixed to the ski, a pivot arm pivotally mounted to the framework to lie above the ski, a pawl assembly, including a pawl, pivoted to one end of the arm, a lever pivotally

mounted to the framework and spaced from the pivot arm, a helical spring connecting the other end of the pivot arm with the lever, and a cleat adapted to be affixed to the heel of the boot to engage the pawl.

19. A binding for releasably holding a ski to one end of a boot and adapted to cooperate with means for holding the ski to the opposite end of the boot comprising a framework adapted to be affixed to the ski, a pivot arm pivotally mounted to the framework, a pawl assembly, including a pawl, pivoted to one end of the arm, a cleat adapted to be affixed to the boot to engage the pawl, and a helical spring connected between the other end of said pivot arm and the framework to load the pivot arm against rotation of

said one end thereof away from the cleat when the pawl is engaged in the cleat.

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#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

|    | Number    | Name     | Date          |
|----|-----------|----------|---------------|
| 10 | 2,433,161 | Schwarze | Dec. 23, 1947 |

#### FOREIGN PATENTS

|    | Number  | Country       | Date         |
|----|---------|---------------|--------------|
| 15 | 523,079 | Great Britain | July 4, 1940 |
|    | 528,863 | Germany       | July 4, 1931 |