

[54] TOEPIECE FOR CROSS-COUNTRY SKIING

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[51] Int. Cl.² A63C 9/20

[58] Field of Search. 280/11.35 B, 11.35 Z, 11.35 T

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[57] ABSTRACT

A toe piece for binding a boot to a cross-country ski, comprising a base plate for attachment to the ski, a lip for clamping the toe of a boot in the base plate, and means for causing the clamping. The means includes a first order lever on which the lip is mounted, and a bell crank for actuating the lever.

3 Claims, 6 Drawing Figures



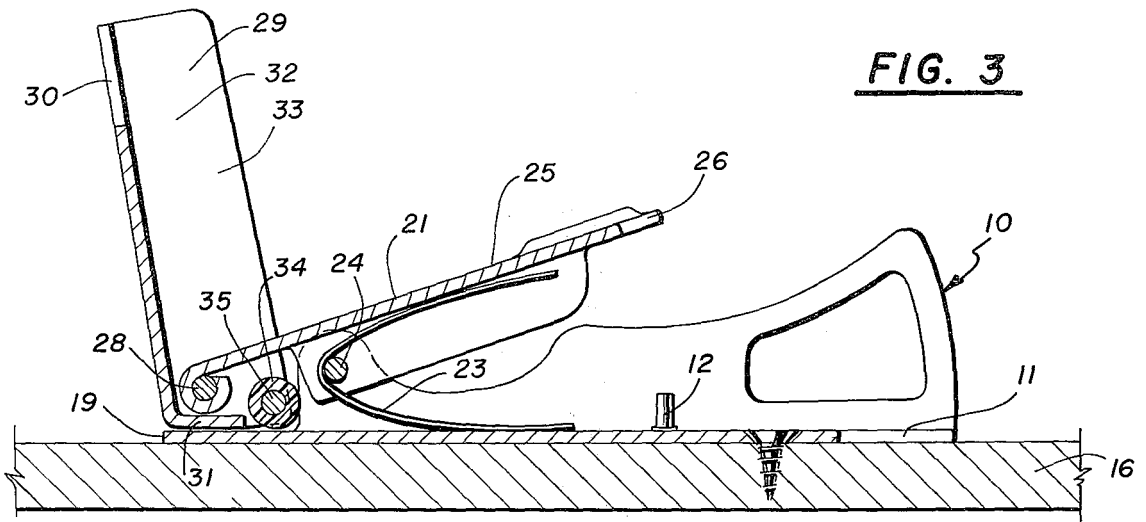


FIG. 3

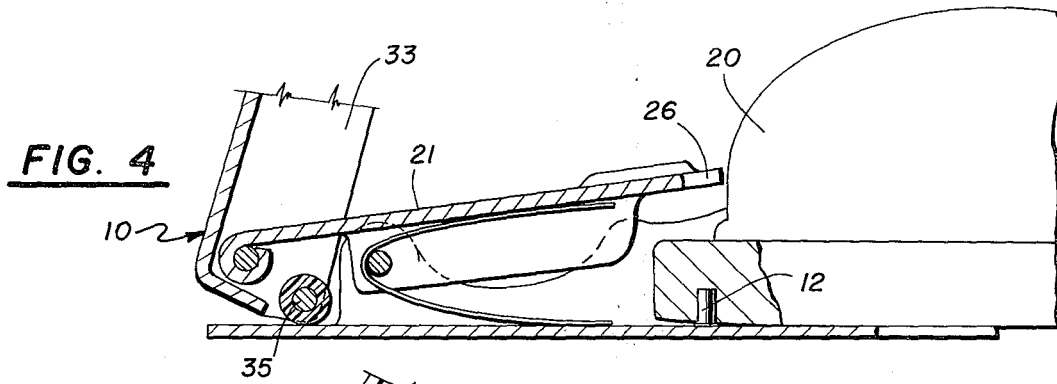


FIG. 4

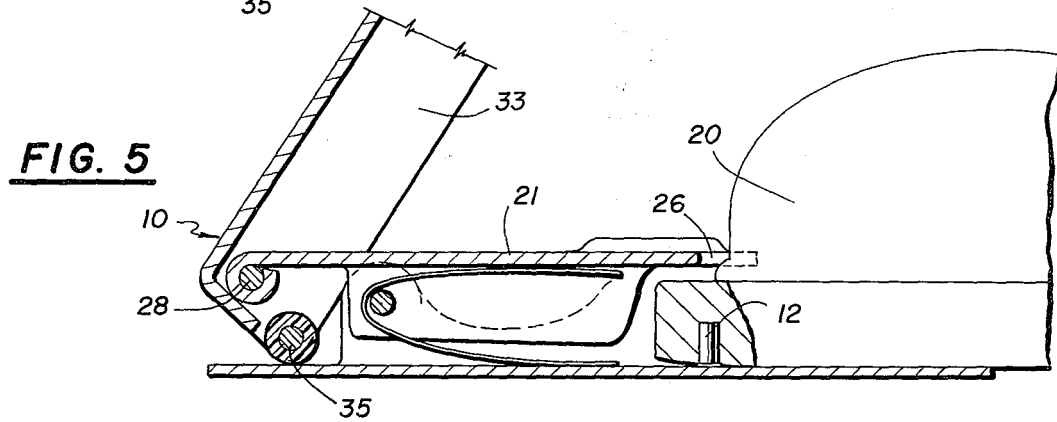
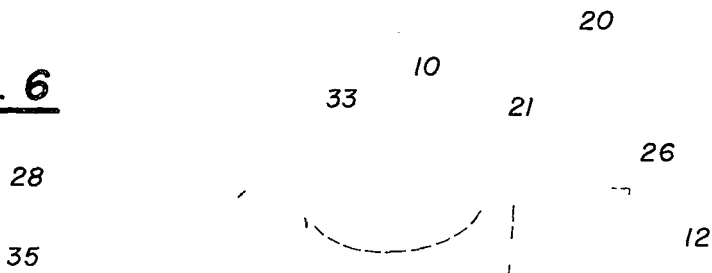


FIG. 5

FIG. 6



TOEPIECE FOR CROSS-COUNTRY SKIING

BACKGROUND OF THE INVENTION

It has been estimated that skis have been used as basic winter transportation for over 2,000 years. Even today skiing represents both a sport and a means of survival in many countries of the world. The activity of skiing is now rather rigidly divided between alpine skiing, which is concerned with the descending of slopes; jumping, which involves airborne trajectory; and cross-country or touring, which involves getting from one place to another on snow. It is the latter which is of primary interest here.

The main equipment problem in cross-country skiing is the binding by which the boot is held on the ski. Efficient cross-country skiing requires that the binding (1) stop any movement of the toe of the boot including accidental release, (2) allow the heel of the boot to move freely in the horizontal plane longitudinal to the ski, and (3) stop any heel movement out of the plane. In addition, the binding must be quick and easy to get into and out of. Also, its function must be unaffected by accumulation of ice and snow.

The original cross-country bindings involved leather straps tied to the boots and skis. That arrangement was deficient in all respects. The addition of buckles added little to removing the general awkwardness. The major breakthrough came with the invention of the metal toe-piece. In this design a toe-piece is attached to the ski, the toe-piece being capable of enclosing the toe of the boot. A leather strap passed from the toe-piece back around the heel of the boot and forward to the toe-piece. Its purpose was to hold the boot in the toe-piece. The stretching of the leather and the poor lateral support of the strap left much to be desired.

The next breakthrough involved replacing the leather strap and buckle with a metal cable and toggle-type tightener. This arrangement gave dependable maintenance of the toe in the toe-piece; and by properly anchoring the cable back from the toe-piece, lateral support of the heel could be improved although at the sacrifice of freedom of vertical movement.

The binding field was revolutionized with the invention of the pin-type toe-piece, which eliminated the need for straps or cables altogether. The idea was that if a row of vertical pins were provided in the toe-piece, and a row of corresponding holes were provided in the toe of the boot, and means were provided to hold the pins and holes together, the boot would be held in the toe-piece without additional hardware. Both good vertical heel freedom and lateral support result; and, in addition, the retail price of the required binding was nearly halved.

The pin-type toe-piece involves a horizontal plate with vertical sides which enclose the sides of the toe of the boot. A row of three or four vertically-directed pins extend from the horizontal plate and engage holes in the bottom of the toe of the boot. A wire bail, pivoted to the sides of the toe-piece comes down over the welt of toe of the boot and engages a clip, positioned just ahead of the toe-piece. The clip holds the bail in tension against the welt of the boot. This, in turn, holds the boot in engagement with the pins. The difficulties with this arrangement generally involve locking and releasing the bindings in the cold, using hands covered with heavy mittens. Engaging and disengaging the clip while bent over, in winter clothes, with mittens, and with the

binding covered with snow can be quite frustrating. Also, the fact that the clip is exposed to the elements and to underbrush can result in icing and accidental release. These and other difficulties experienced with the prior art devices have been obviated in a novel manner by the present invention.

It is, therefore, an outstanding object of the invention to provide a toe-piece which will fix the toe of a boot firmly to a ski while allowing the heel to move vertically but not laterally with respect to the ski.

Another object of this invention is the provision of a toe-piece which locks and releases the boot with a minimum of difficulty.

A further object of the present invention is the provision, of a toe-piece which is adapted for use with all boots using standard pin-type toe-pieces.

It is another object of the instant invention to provide a toe-piece in which the mechanical parts are protected from accumulation of ice and snow by an integral cover.

A still further object of the invention is the provision of a toe-piece which resists accidental release yet releases easily when release is desired.

It is a further object of the invention to provide a toe-piece which is simple and inexpensive to manufacture and capable of a long and useful life.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

SUMMARY OF THE INVENTION

This invention involves a toe-piece for holding a boot on a cross-country or touring ski. The toe-piece involves a base plate which is fixed to the ski and encloses the sides of the toe of the boot, a plurality of vertical pins which engage the bottom of the toe of the boot, and a clamp which from time to time holds the toe of the boot in engagement with the pins. The clamp involves a lip which engages the welt of the toe of the boot, a lip carrier which is a first-order lever attached to the base plate and which holds the lip on one arm, and a binding means which acts on the other arm of the lever to operate the lip.

BRIEF DESCRIPTION OF THE DRAWINGS

The character of the invention, however, may be best understood by reference to one of its structural forms, as illustrated by the accompanying drawings, in which:

FIG. 1 is a perspective view of a toe-piece embodying the principles of the present invention, in use,

FIG. 2 is a perspective view of the toe-piece mounted on a ski,

FIG. 3 is a sectional view taken along line III—III of FIG. 2,

FIG. 4 is a diagrammatic view of the toe-piece in its open position,

FIG. 5 is a diagrammatic view of the toe-piece in an intermediate position, and

FIG. 6 is a diagrammatic view of the toe-piece in its closed position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, wherein is shown a general view of the invention in use, the skier 40 is shown wearing boots 20. The toes of the boots are fastened to skis

16 by toe pieces 10. Throughout this description, recitation of direction such as forward, lateral, etc., should be taken as with respect to skier and toe pieces in this mode of use.

Referring to FIG. 2, wherein are best shown the general features of the present invention, the toe piece, indicated generally by the reference numeral 10, is shown as having a base plate 11, a plurality of pins 12, and a clamp 13.

The base plate 11, includes a horizontal plate 14 which is fixed to the upper horizontal surface 15 of the ski 16 by screws 17. The lateral edges of the horizontal plate 14 are bounded by vertical plates 18. The horizontal plate extends forward with respect to the ski 16 to a forward portion 19.

Extending vertically from the central portion of the horizontal plate 14 are a plurality of pins 12 which engage correspondingly positioned holes in the bottom of the toe of a boot 20. This relation stops horizontal movement of the boot.

As shown in FIG. 2, the clamp 13 includes a lip carrier 21, a binding means 22, and a spring 23.

Referring to FIG. 3, wherein the details of the clamp are best shown, the lip carrier 21 is pivoted at the lip carrier pivot 24 about a horizontal axis, lateral to the ski. The back arm 25 of the lip carrier 21 is formed into a lip 26 suitable for exerting downward pressure on the upper surface of the welt of the toe of a boot 20 when the lip is in its downward position. The lip carrier 21 also has a forward arm 27. A U-shaped leaf spring 23 is provided to bias the lip carrier 21 so that the lip is in its upward position.

Pivotaly mounted on the forward end 27 of the lip carrier 21 on horizontal and lateral binding axis 28, is a binding means 29. The binding means 29 is formed of a box-like closing lever 33 having a top plate 30, a front plate 31, and two side plates 32. The closing lever 33 has a roller 34 or contactor connected between the side plates 32 at their lower front corners. Above and to the rear, the roller axis 35 is the binding axis which, as mentioned above, connects the binding means 29 to the forward end 27 of the lip carrier 21. In viewing the mechanical working of the closing lever 33, it is useful to consider it as a bell crank or angular lever, having a first arm between the binding axis 28 and the roller axis 35, and a second arm extending from the binding axis 28 along the top plate 30. The closing lever 33 is shaped so that it can rest on the forward end of the base plate 11 and enclose a large part of the top and sides of the forward end of the base plate and a large part of the lip carrier 21.

The use and operation of the invention will now be readily understood in view of the above description and FIGS. 4, 5 and 6 which diagrammatically portray the steps by which the invention is closed for use. FIG. 4 shows the toe piece 10 in its open position, with its lip 26 and closing lever 33 in their open positions. The boot 20 is placed on the pin 12. The roller axis 35 is positioned close to the lip carrier 21.

FIG. 5 shows the effect of moving the closing lever 33 rearward. The pivoting action about the binding axis 29 causes the roller axis 35 to move away from the lip carrier 21. As a result, roller 34 contacts base plate 11 and exerts an upward force on the binding axis 28. This results in a downward movement of the lip 26 toward the boot 20 and pin 12. This downward movement of the lip 26 will continue until the binding axis 28 and

roller axis 35 are lined up vertically, and the closing lever is almost at the extent of its downward and rearward travel.

FIG. 6 shows the toe piece 10 in its closed position ready for use. Of importance are the positions of the lip 26 and the closing lever 33, and the relative position of the binding axis 28 and the roller axis 35. The lip 26 is in its downward position, thereby making it impossible to remove the boot 20 from the pins 12. The lip is locked in this position because the roller axis is positioned slightly ahead of the binding axis 28. Upward pressure on the lip 26 is converted by the lip carrier 21 to downward pressure on the binding axis 28. This, in turn, results in a forwardly directed pressure on the roller axis 35 which effects a downward pressure on the rearward end of the closing clamp 33. Since the closing clamp 33 is already at its limit, upward pressure on the lip has no effect. On the other hand, the simple lifting of the rearward end of the closing lever 33, reverses the closing process and allows the boot 20 to be removed. The considerable mechanical advantage in the closing lever 33 allows the operations of opening and closing to be accomplished with surprising ease.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material spirit thereof. It is not, however, desired to confine the invention to the exact form herein shown and described, but it is desired to include all such as properly come within the scope claimed.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent is:

1. A toe piece for fixing the toe of a boot to a ski, comprising:

- a. a base plate to be fixed to the upper horizontal surface of the ski,
- b. a vertical pin extending upwardly from the base plate to engage an aperture in a bottom surface of the toe of the boot,
- c. a lip movable between a first upper position and a second lower position where it engages an upper surface of the toe of the boot, the lip holding the toe of the boot on the base plate while in the second position, and not interfering with the boot in the first position,
- d. a lip carrier having a first end that carries the lip, and a second end, the lip carrier being pivotaly mounted between its first and second ends to the base plate on a horizontal axis lateral to the ski,
- e. binding means for causing the lip to engage and disengage the boot by controlling the distance between the second end of the lip carrier and the base plate, and thereby moving the lip between its first position and its second position, the binding means including a closing lever pivotaly mounted to the second end of the lip carrier, the closing lever having a first arm which is positioned between the second end of the lip carrier and the base plate, and a second arm, the movement of the second arm being limited from an open, generally vertical position which causes the lip to be in its first position free of the boot and causes upward force on the lip to be ineffective in moving the lip from its second lower position to its first upper position, to a closed generally horizontal position directed rearwardly from the pivot with the carrier, which causes the lip to be in its second position in contact with the boot

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and, during that movement, the first arm moving from a first position on one side of the vertical plane including the axis between the closing lever and the lip carrier, to a second position on the other side of the plane, thereby forming an over-center mechanism which forces the lip against the toe of the boot, the closing lever being in the form of a cover which encloses a portion of the base plate and lip carrier when the second arm is in its closed position, the closing lever including a top plate, a front plate and two side plates arranged so that when the second arm is in its closed position the top lies horizontal and above the axis between the lip carrier and the base plate, the front plate extends downwardly from the forward edge of the top plate and the side plates extend downwardly from the side edges of the top plate laterally outward of the laterally outward edges of the base plate, and a spring means to bias the lip toward its first upper

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position and thereby bias the first arm of the closing lever into contact with the base plate, the spring means including a U-shaped spring which passes around the axis between the lip carrier and the base plate and which contacts the lip carrier and the base plate.

2. A toepiece as recited in claim 1, wherein the first arm of the closing lever carrier a contactor which contacts the base plate, and the contactor is a greater vertical distance from the lip carrier when the first arm is in its second position than when it is in its first position, and the contactor is horizontally further from the first end of the lip carrier than the pivot between the lip carrier and the closing lever is when in the second position but it not in the first position.

3. A toepiece as recited in claim 2, wherein the contactor is a cylinder.

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