Nov. 6, 1951 M. H. CUBBERLEY 2,573,955

SAFETY SKI BINDING

Filed Jan. 13, 1949 2 SHEETS—SHEET 1

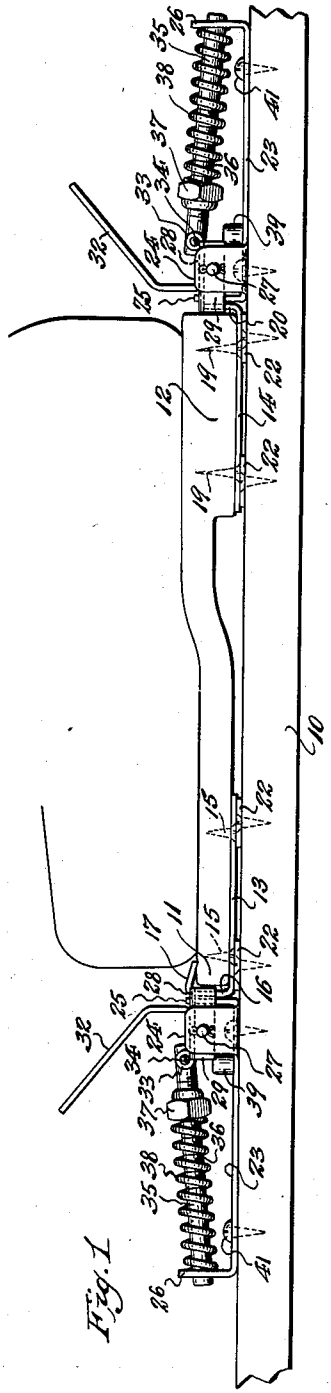


Fig. 1

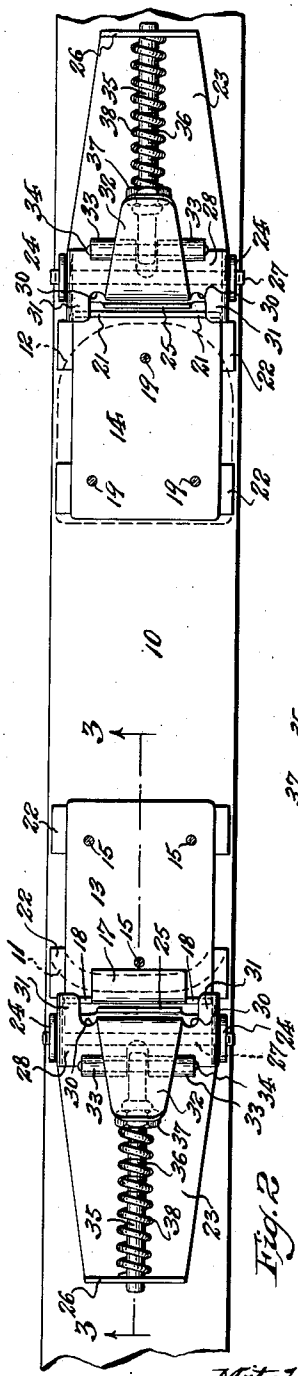


Fig. 2

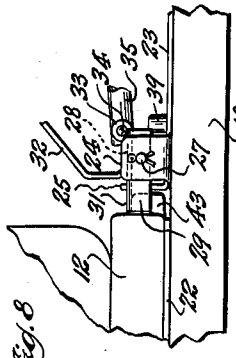


Fig. 8

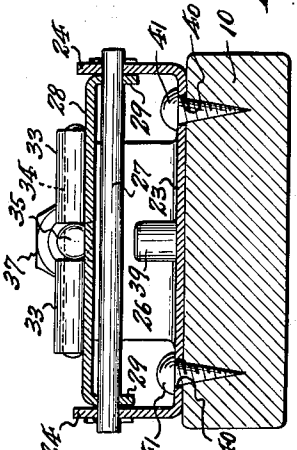


Fig. 6

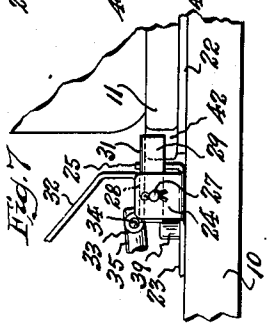


Fig. 7

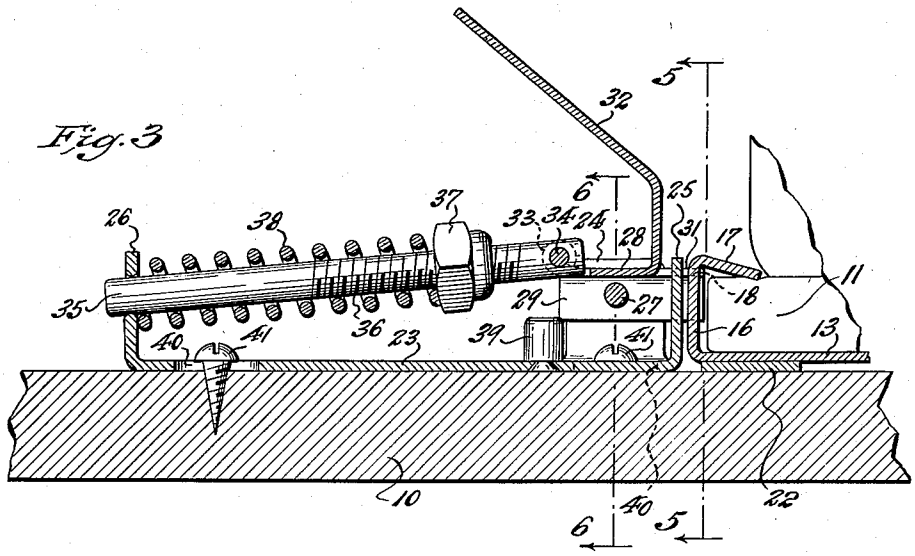
INVENTOR.
Mitchell H. Cubberley,
BY George D. Richards,
Attorney

Nov. 6, 1951 M. H. CUBBERLEY 2,573,955

SAFETY SKI BINDING

Filed Jan. 13, 1949 2 SHEETS—SHEET 2

Fig. 3



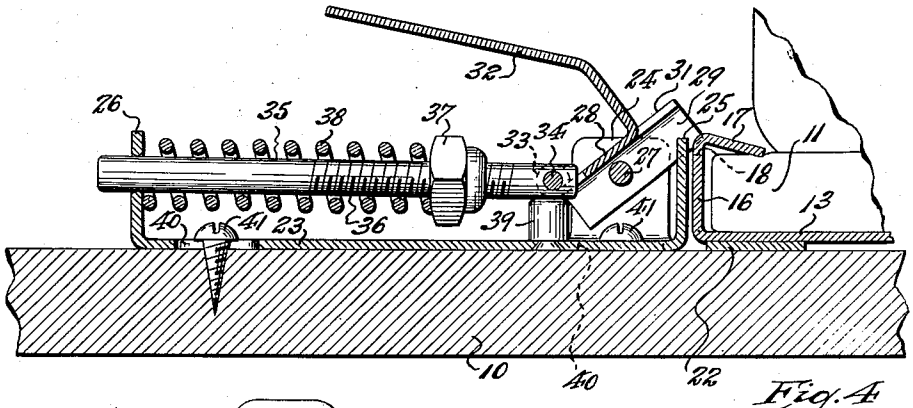
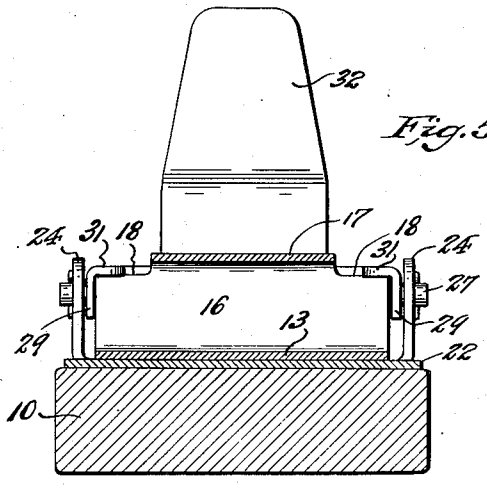


Fig. 4

Fig. 5



INVENTOR.
Mitchell H. Cubberley,
BY George D. Richards,
Attorney

Patented Nov. 6, 1951 2,573,955

UNITED STATES PATENT OFFICE

2,573,955

SAFETY SKI BINDING

Mitchell H. Cubberley, Belleville, N. J.

Application January 13, 1949, Serial No. 70,739

16 Claims. (Cl. 280—11.35)

1

This invention relates to an improved construction of safety ski binding or attachment harness.

The invention has for an object to provide a novel ski binding which is subject to quick and easy manipulation whereby to manually attach and detach a ski to the user's ski boot, and, which under certain conditions, is self-releasing for freeing the boot from the ski.

The invention has for another object to provide a novel ski binding whereby the toe and heel of a ski boot are separately gripped and held attached to a ski by manipulatable front and rear spring-loaded clamping devices which are adapted to independently exert regulatable predetermined hold down pressure upon the boot in direction substantially perpendicular to the plane of the ski, whereby to normally bind the ski to the boot; said clamping devices (as a safety factor) being so constructed as to be independently yieldable to force tending to lift the boot toe or heel, as the case may be, away from the ski, if the lifting force exceeds the normal spring induced hold down pressure, so that, in either case, the boot is automatically released from the ski, thus reducing to a minimum risk of injury to the ankle or leg of the user.

The invention has for a further object to provide a novel ski binding which will exchangeably fit both right and left ski boots, thus permitting interchanging of skis from one foot to the other so that the edges of the skis may be caused to wear evenly; it being known that the inside edges of skis are subject to greater wear in use than are outside edges thereof.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

Illustrative embodiments of this invention are shown in the accompanying drawings, in which:

Fig. 1 is a fragmentary side elevational view of a ski equipped with the novel ski binding of this invention, the clamping devices of which are respectively shown in their normal gripping relation to the toe and heel of a ski boot, whereby to operatively attach the ski to said boot; Fig. 2 is a plan view of the ski and ski binding of Fig. 1, the toe and heel portions of the engaged ski boot being shown by broken lines; Fig. 3 is a longitudinal vertical section, taken on line 3—3 in Fig. 2, but drawn on an enlarged scale; Fig. 4 is a longitudinal vertical section similar to that of Fig. 3, but showing the clamping device in released condition; Fig. 5 is a transverse vertical

2

section, taken on line 5—5 in Fig. 3; and Fig. 6 is another transverse vertical section, taken on line 6—6 in Fig. 3.

Figs. 7 and 8 are fragmentary side elevational views respectively showing the clamping devices of the ski binding as operative to grip ski boot toe and heel portions specially designed for cooperation therewith.

Similar characters of reference are employed in the hereinabove described views, to indicate corresponding parts.

Referring to the drawings, the reference character 10 indicates the body of a ski, and the reference characters 11 and 12 respectively indicate toe and heel portions of a ski boot to which the ski is to be operatively attached.

In order to adapt the ordinary or standard ski boot for cooperation with the novel toe and heel clamping devices of the ski binding of this invention, the sole of the ski boot is equipped with a specially designed toe plate 13, and the heel of the ski boot with a similar specially designed heel plate 14.

The toe plate 13 comprises a flat metallic body which is suitably affixed to the bottom of the sole of the ski boot, as by screws 15, so that its forward portion projects somewhat beyond the extremity of the toe portion 11 of the ski boot sole. Said forward end of the toe plate 13 terminates in an upstanding flange or abutment 16, which is preferably of a height somewhat in excess of the thickness of the ski boot sole. Integral with and extending rearwardly from the midportion of the flange or abutment 16 is a keeper tongue or lug 17 of substantially reduced width. This keeper lug 17 is downwardly bent or depressed to overlap and strongly grip the top marginal part of the toe portion 11 of the ski boot sole, and thus strongly reenforce the attachment of the toe plate 13 to the ski boot against loosening or separation from the latter under lifting stresses, and especially so that said stresses need not be solely borne by the relatively short attachment screws 15 by which the toe plate 13 is affixed to the ski boot sole. The outlying top edges 18 of the flange or abutment 16, which extend from opposite sides of said keeper tongue or lug 17, are adapted to be engaged by the toe clamping device of the ski binding, as will be more fully hereinafter explained.

The heel plate 14 also comprises a flat metallic body which is suitably affixed to the bottom of the heel of the ski boot, as by relatively long screws 19, so that its rearward portion projects somewhat beyond the rear end of the boot heel.

Said rearward end of the heel plate 14 terminates in an upstanding flange or abutment 20 of suitable height, the outlying top edges 21 of which are adapted to be engaged by the heel clamping device of the ski binding, as will likewise be more fully hereinafter explained. The heel plate flange or abutment 20 is not provided with a keeper tongue or lug, corresponding to the keeper lug or tongue 17 of the toe plate, as such is not necessary since heel lifting stresses are well adapted to be borne by the relatively long attachment screws 19 by which the heel plate is affixed to the ski boot heel.

Preferably the top of the ski 10 is provided with suitably shaped and located metallic support pads 22 to bear the toe plate 13 and heel plate 14 of the boot, and thus prevent said plates from abrading the body of the ski. Additionally said support pads also raise the boot above the top surface of the ski body, and thus minimize the tendency of snow to lump up or accumulate about the boot and between the same and the ski.

The front and rear clamping devices of the ski binding are alike in structure and mode of operation. Each said clamp device comprises a carrier frame formed by a bottom plate 23 having at its opposite sides, adjacent to its inner end, transversely aligned, upstanding bearing ears 24. The inner end of the frame bottom plate 23 is provided with an upstanding stop member 25 of reduced width. The outer end of the bottom plate 23 is provided with an upstanding perforate thrust bearing member 26. Extending between and supported by the bearing ears 24 is a transverse pivot pin or shaft 27. Fulcrumed on said pivot pin or shaft 27 is a clamp plate 28 which is provided at its opposite sides with dependent perforate side flanges 29 through which the pivot pin or shaft 27 extends so as to provide a fulcrum about which the clamp plate may turn. The medial forward marginal portion of the clamp plate 28 is cut back as at 30 to form forwardly projecting clamp tongues 31 at the respective sides of said clamp plate. These clamp tongues are bordered at their outer sides by the forward portions of said dependent side flanges 29. Said clamp tongues are adapted to straddle both the stop member 25 of the carrier frame and the keeper tongue or lug 17 of the toe plate 13. Integral with the clamp plate 28, and extending upwardly and rearwardly from said cut back forward marginal portion 30 thereof, is a lever member 32 by means of which the clamp plate may be manually manipulated. Integral with the medial rearward marginal portion of the clamp plate 28 is a pair of laterally spaced knuckle members 33. Pivotally joined to the rear end of said clamp plate by a cross-pin 34, which is carried by said knuckle members 33, is the forward end of a rearwardly extending thrust rod 35. The rearward end portion of said thrust rod 35 extends slidably through the perforate thrust bearing member 26 of the carrier frame, being thus fulcrumed by the latter substantially in the horizontal plane of the pivot pin or shaft 27 about which the clamp plate 28 turns. The forward portion of the thrust rod 35 is provided with screw-threads 36, and threaded thereon is an adjustable thrust nut 37. Mounted on and around the thrust rod 35, intermediate the thrust nut 37 and the thrust bearing member 26 of the carrier frame, is a compression spring 38.

To attach a ski to the user's boot, the latter is applied to the ski between the toe and heel clamping devices. To permit this, the clamping

devices are first opened to released positions (such e. g. as shown in Fig. 4) by swinging outward their lever members 32, thus upswinging the clamp plates 28 to raise the clamp tongues 31 out of the way, so that the boot with its toe and heel plates may be passed down between the clamping devices and footed upon the ski. Such upswinging of the clamp plates 28 effects a downswinging of the thrust rods 35 across dead center horizontal planes which intersect the fulcrumed outer ends of the thrust rods 35 and the axes of the pivot pins or shafts 27 about which the clamp plates turn. The thus downswung thrust rods 35 come to rest against stop posts 39 with which the bottom plates 23 of the carrier frames are provided. Under these circumstances, the thrust of the compression springs 38 upon the thrust nuts 37 is transmitted through the thrust rods 35 to the downswung outer ends of the clamp plates 28, whereby the latter and their clamp tongues 31 are held in the aforesaid upswung released positions.

The boot being in position upon the ski, the lever members 32 of the clamping devices are swung inwardly toward the boot, thus swinging down the clamp plates 28 so as to carry their clamp tongues 31 respectively down upon the top edges 18 of the toe plate flange or abutment 16 and upon the top edges 21 of the heel plate flange or abutment 20. Such downswinging of the clamp plates 28 causes the thrust rods 35 to be upswung across the previously mentioned dead center planes, whereby the compression springs 38 exert strong thrust through the thrust nuts 37 and thrust rods 35 upon the upswung outer ends of the clamp plates 28, whereby the latter and their clamp tongues 31 are downwardly urged so as to effect strong gripping pressure upon the flanges or abutments 16 and 20 of the respective toe and heel plates. It will be noted that the gripping pressure thus exerted by the clamping devices is in direction substantially perpendicular to the plane of the ski, and in direct opposition to stresses tending to lift either the toe or the heel of the boot away from its operative footing upon the ski.

Since, when the clamping devices are operative, the side flanges 29 of the clamp plates 28 lappingly abut the opposite vertical edges of the flanges or abutments 16 and 20 of the toe and heel plates, sidewise movements or shifting of the boot relative to the ski are prevented, and consequently twisting movements of the foot and boot assure proper steering control of the ski.

It will be understood that the clamping devices operate independently, and that the gripping pressure respectively exercised thereby at the toe and heel of the boot may be independently regulated, especially as to amount of release force to which they will respectively respond. Such regulations may be independently made by manipulating the thrust nuts 37 to predetermine the respective loads exerted by the compression springs 38. This is of great advantage, since the heel clamping pressure should be greater and require higher safety release force than is required at the toe of the boot, so as to better resist the greater heel lifting force which is normally due to stresses resulting from forward leaning of the body of the skier relative to the plane of the ski when skiing. The adjustability and regulation of clamping pressures is also of advantage since such pressures may be readily accommodated to the requirements of individual skiers; e. g. a large man would require to use

greater gripping pressure than would a small man or a woman.

It will be obvious, in the event of a fall or other occurrence which induces a force tending to separate either the toe or heel of the boot from the ski, and which is in excess of the spring loaded gripping force, that either the toe or the heel clamping device, as the case may be, will snap open, and thus release the boot from the ski. If one clamping device snaps open, the boot will lift away therefrom and will pull away from the other clamping device, even if the latter remains closed.

The heel clamping device holds the heel of the boot firmly down upon the ski so long as the force of the gripping pressure thereof (which acts perpendicularly to the plane of the ski) is not exceeded by a counter release force. This makes for improved performance and control in downhill skiing, and is a substantial improvement over bindings of the heel cable type which allows the heel to lift relative to the ski, since the holding force of the heel cable is not exercised perpendicularly to the plane of the ski, and since the component of such force which does act perpendicularly is relatively small.

It will be noted that forward and backward movements or shifts of the boot relative to the ski are prevented by the stop members **25** of the respective clamping devices which are respectively opposed to the upstanding flanges or abutments **16** and **20** of the toe and heel plates **13** and **14**.

In order to permit relative adjustment of the toe and heel clamping devices with respect to their longitudinally spaced apart relation, whereby to accommodate their positions for cooperation with ski boots of varying size or length, the carrier frames of the clamping devices can be mounted on the ski subject to longitudinal shifting adjustment toward and from one another. One means to this end comprises the provision of elongated slots **40** in the bottom plate **23** of the carrier frames, through which slots are passed fastening screws **41** by which the carrier frames are affixed to the ski body **10**. It will be obvious that by loosening said fastening screws **41**, the carrier frames can be longitudinally shifted, and, when thus adjusted in desired relative disposition, can again be firmly secured to the ski body by tightening home said fastening screws **41**.

The toe and heel clamping devices of the novel ski binding of this invention are of such construction and design that they will readily cooperate and engage with either a left or right ski boot. As a consequence of this, a pair of skis equipped with the ski bindings of this invention can be interchangeably applied to and worn on either the left or the right foot of the skier. Such interchangeability is of real advantage since it allows the skis to be exchanged from one foot to the other from time to time, whereby to assure even wearing of the ski edges; it being known that inside edges of skis wear faster than do the outside edges thereof.

The toe and heel plates **13** and **14** are provided in order to adapt the standard designs of ski boots now in common use for cooperation with the clamping devices of the ski binding of this invention, but it will be realized that it might well be desirable to have the clamping devices operate directly upon the toe sole and the heel portions of a ski boot. It is therefore contemplated that it may well prove to be economical and advantageous to manufacture ski boots with

specially shaped toe and heel portions adapted to be respectively engaged directly by the respective toe and heel clamping devices of the binding. An illustrative suggestion to this end is shown in Figs. 7 and 8, wherein (in Fig. 7) the toe sole of a ski boot is provided with a suitably shaped extension **42** which is adapted to be directly engaged by the toe clamping device, and wherein (in Fig. 8) the heel of the ski boot is provided with a suitably shaped extension **43** which is adapted to be directly engaged by the heel clamping device.

It will be understood that changes could be made in the safety ski binding of this invention without departing from the scope of the invention as defined by the following claims. It is, therefore, intended that the matter shown in the accompanying drawings and described in the foregoing specification shall be considered as illustrative and not in a limiting sense.

I claim:

1. A ski binding comprising longitudinally spaced clamping devices adapted to engage a ski boot respectively at toe and heel portions thereof, each clamping device comprising a carrier frame mounted on the ski, a transverse pivotal shaft supported by the frame adjacent its inner end, a clamp plate pivoted on said shaft, said clamp plate, in its downswung boot engaging position, being adapted to exert gripping pressure substantially perpendicular to the plane of the ski, spring actuated thrust means operative to impart gripping pressure to the clamp plate comprising a thrust rod supported at its rearward end portion by the outer end of said frame with its forward end portion pivotally connected with said clamp plate, and a compression spring purchased against the outer end of said frame for actuating said thrust rod.

2. A ski binding as defined in claim 1 wherein the carrier frames are provided at their inner ends with upstanding stop members for opposition to the ski boot, whereby to prevent longitudinal shifting displacement thereof relative to the ski.

3. A ski binding comprising longitudinally spaced clamping devices adapted to engage a ski boot respectively at toe and heel portions thereof, each clamping device comprising a carrier frame mounted on the ski, a transverse pivotal shaft supported by the frame adjacent its inner end, a clamp plate pivoted on said shaft, said clamp plate, in its downswung boot engaging position, being adapted to exert gripping pressure substantially perpendicular to the plane of the ski, spring actuated thrust means operative to impart gripping pressure to the clamp plate comprising a thrust rod supported at its rearward end portion by the outer end of said frame with its forward end portion pivotally connected with said clamp plate, said thrust rod having a screw-threaded section, a thrust nut adjustably mounted on said section, and a compression spring mounted on said thrust rod between said thrust nut and the outer end of said frame.

4. A ski binding comprising longitudinally spaced clamping devices adapted to engage a ski boot respectively at toe and heel portions thereof, each clamping device comprising a carrier frame, means for securing said carrier frame in longitudinally adjusted position on the ski, a transverse pivotal shaft supported by said frame adjacent to its inner end, a clamp plate pivoted on said shaft, said clamp plate, in its downswung

boot engaging position, being adapted to exert gripping pressure substantially perpendicular to the plane of the ski, spring actuated thrust means operative to impart gripping pressure to the clamp plate comprising a thrust rod supported at its rearward end portion by the outer end of said frame with its forward end portion pivotally connected with said clamp plate, said thrust rod having a screw-threaded section, a thrust nut adjustably mounted on said section, and a compression spring mounted on said thrust rod between said thrust nut and the outer end of said frame.

5. A ski binding comprising longitudinally spaced clamping devices adapted to engage a ski boot respectively at toe and heel portions thereof, each clamping device comprising a carrier frame mounted on the ski, a transverse pivotal shaft supported by the frame adjacent its inner end, a clamp plate pivoted on said shaft, said clamp plate having dependent side flanges, said clamp plate, in its downswung boot engaging position, being adapted to exert gripping pressure substantially perpendicular to the plane of the ski with its side flanges holding the engaged boot against lateral displacement relative to the ski, spring actuated thrust means operative to impart gripping pressure to the clamp plate comprising a thrust rod supported at its rearward end portion by the outer end of said frame with its forward end portion pivotally connected with said clamp plate, and a compression spring purchased against the outer end of said frame for actuating said thrust rod.

6. A ski binding comprising longitudinally spaced clamping devices adapted to engage a ski boot respectively at toe and heel portions thereof, each clamping device comprising a carrier frame mounted on the ski, a transverse pivotal shaft supported by the frame adjacent its inner end, a clamp plate pivoted on said shaft, said clamp plate having dependent side flanges, said clamp plate, in its downswung boot engaging position, being adapted to exert gripping pressure substantially perpendicular to the plane of the ski with its side flanges holding the engaged boot against lateral displacement relative to the ski, spring actuated thrust means operative to impart gripping pressure to the clamp plate comprising a thrust rod supported at its rearward end portion by the outer end of said frame with its forward end portion pivotally connected with said clamp plate, said thrust rod having a screw threaded section, a thrust nut adjustably mounted on said section, and a compression spring mounted on said thrust rod between said thrust nut and the outer end of said frame.

7. A ski binding as defined in claim 6 wherein the carrier frames are provided at their inner ends with upstanding stop members for opposition to the ski boot, whereby to prevent longitudinal shifting displacement thereof relative to the ski.

8. A ski binding as defined in claim 6 including a toe plate and a heel plate affixed to the bottom of the ski boot, each said plate having an upstanding abutment member exteriorly of the boot which is adapted to be engaged by an adjacent clamp plate and embraced by the side flanges thereof.

9. A ski binding as defined in claim 6 including a toe plate and a heel plate affixed to the bottom of the ski boot, each said plate having an upstanding abutment member exteriorly of the boot which is adapted to be engaged by an adjacent clamp plate and embraced by the side flanges thereof, and the abutment member of said toe plate having an angular keeper tongue to engage over the toe end of the ski boot sole.

10. A ski binding comprising longitudinally spaced clamping devices adapted to engage a ski boot respectively at toe and heel portions thereof, each clamping device comprising a carrier frame mounted on the ski, a transverse pivotal shaft supported by the frame adjacent its inner end, a clamp plate pivoted on said shaft, said clamp plate having a lever member for manipulating the same, said clamp plate, in its downswung boot engaging position, being adapted to exert gripping pressure substantially perpendicular to the plane of the ski, spring actuated thrust means operative to impart gripping pressure to the clamp plate comprising a thrust rod pivotally and slidably supported at its rearward end portion by the outer end of said frame in a horizontal plane which intersects that of the axis of the clamp plate pivoting shaft, means for pivotally coupling the forward end of said thrust rod with the rearward end of said clamp plate, said thrust rod having a screw-threaded section, a thrust nut adjustably mounted on said section, and a compression spring mounted on said thrust rod between said thrust nut and the outer end of said frame.

11. A ski binding comprising longitudinally spaced clamping devices adapted to engage a ski boot respectively at toe and heel portions thereof, each clamping device comprising a carrier frame mounted on the ski, a transverse pivotal shaft supported by the frame adjacent its inner end, a clamp plate pivoted on said shaft, said clamp plate having a lever member for manipulating the same, said clamp plate having dependent side flanges, said clamp plate, in its downswung boot engaging position, being adapted to exert gripping pressure substantially perpendicular to the plane of the ski with its side flanges holding the engaged boot against lateral displacement relative to the ski, spring actuated thrust means operative to impart gripping pressure to the clamp plate comprising a thrust rod supported at its rearward end portion by the outer end of said frame in a horizontal plane which intersects that of the axis of the clamp plate pivoting shaft, means for pivotally coupling the forward end of said thrust rod with the rearward end of said clamp plate, said thrust rod having a screw-threaded section, a thrust nut adjustably mounted on said section, and a compression spring mounted on said thrust rod between said thrust nut and the outer end of said frame, said carrier frames having upstanding stop members at their inner ends for opposition to the ski boot, whereby to prevent longitudinally shifting displacement thereof relative to the ski.

12. A ski binding as defined in claim 11 including means for securing the carrier frames in longitudinally adjusted positions on the ski.

13. A ski binding as defined in claim 11 including a toe plate and a heel plate affixed to the bottom of the ski boot, each said plate having an upstanding abutment member exteriorly of the boot which is adapted to be engaged by an adjacent clamp plate and embraced by the side flanges thereof.

14. A ski binding as defined in claim 11 including a toe plate and a heel plate affixed to the bottom of the ski boot, each said plate having an upstanding abutment member exteriorly of

the boot which is adapted to be engaged by an adjacent clamp plate and embraced by the side flanges thereof, and the abutment member of said toe plate having an angular keeper tongue to engage over the toe end of the ski boot sole.

15. In a ski binding, a clamping device to engage a ski boot, said device comprising a carrier frame mounted on the ski, a transverse pivotal shaft supported by the frame adjacent its inner end, a clamp plate pivoted on said shaft, said clamp plate, in its downswung boot engaging position, being adapted to exert gripping pressure substantially perpendicular to the plane of the ski, a spring actuated thrust means operative to impart gripping pressure to the clamp plate comprising a thrust rod supported at its rearward end portion by the outer end of said frame with its forward end portion pivotally connected with said clamp plate, said thrust rod having a screw-threaded section, a thrust nut adjustably mounted on said section, and a compression spring mounted on said thrust rod between said thrust nut and the outer end of said frame.

16. In a ski binding, a clamping device to engage a ski boot, said device comprising a carrier frame mounted on the ski, a transverse pivotal shaft supported by the frame adjacent its inner end, a clamp plate pivoted on said shaft, said

clamp plate, in its downswung boot engaging position, being adapted to exert gripping pressure substantially perpendicular to the plane of the ski, spring actuated thrust means operative to impart gripping pressure to the clamp plate comprising a thrust rod slidably supported at its rearward end portion by the outer end of the frame with its forward end portion pivotally connected with said clamp plate, and a compression spring purchased against the outer end of said frame for actuating said thrust rod.

MITCHELL H. CUBBERLEY.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,372,752	Holmes	Mar. 29, 1921
2,373,128	McIlvaine	Apr. 10, 1945

FOREIGN PATENTS

Number	Country	Date
38,014	Norway	Oct. 1, 1923
57,945	Norway	May 3, 1937
348,634	Great Britain	May 15, 1931
845,670	France	May 22, 1939