Feb. 24, 1970 TOKUYASU HASHIOKA ET AL 3,497,230

SAFETY SKI HEEL BINDING

Filed May 22, 1968 4 Sheets-Sheet 1

FIG. 1

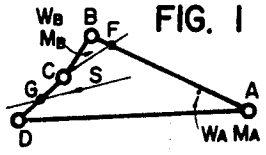


FIG. 2

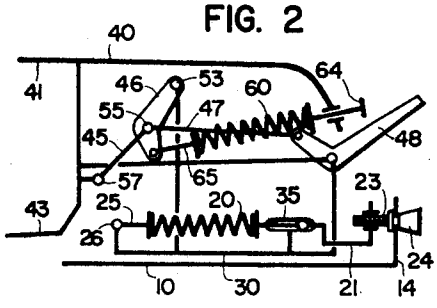
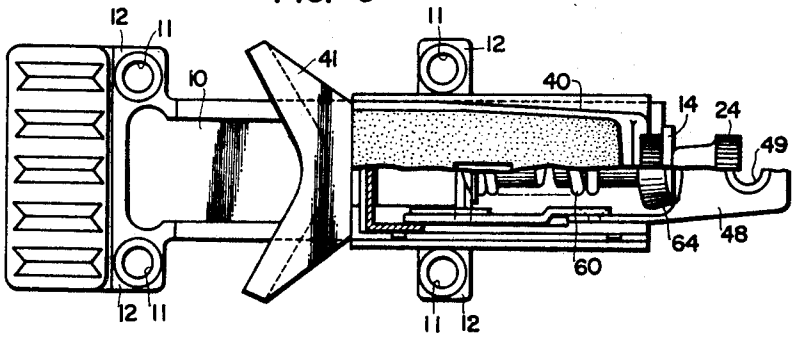


FIG. 3



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FIG. 4

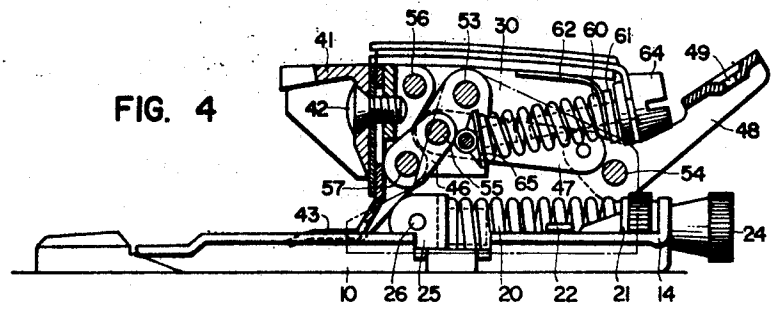
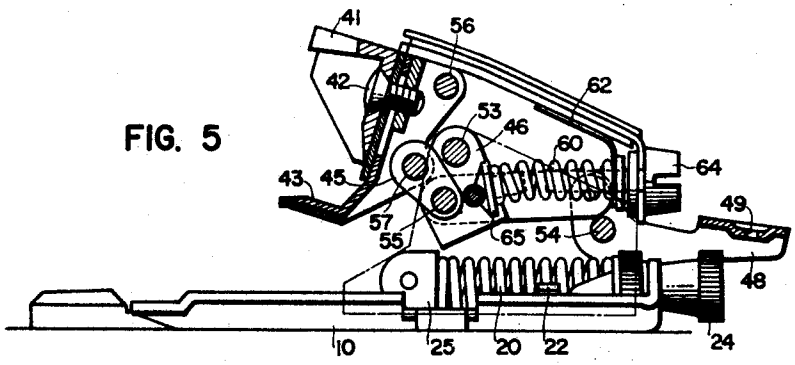


FIG. 5



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FIG. 6

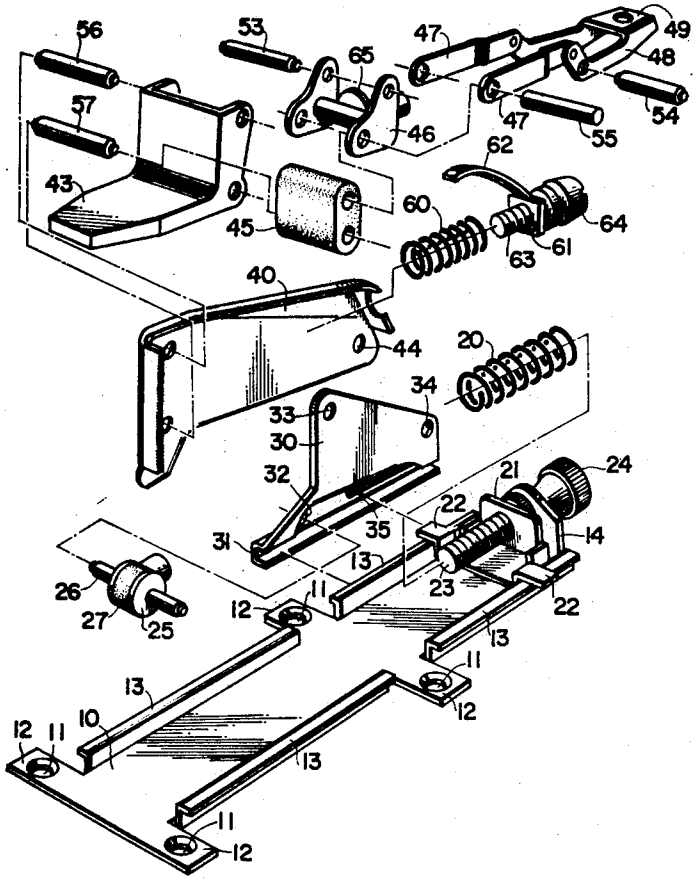
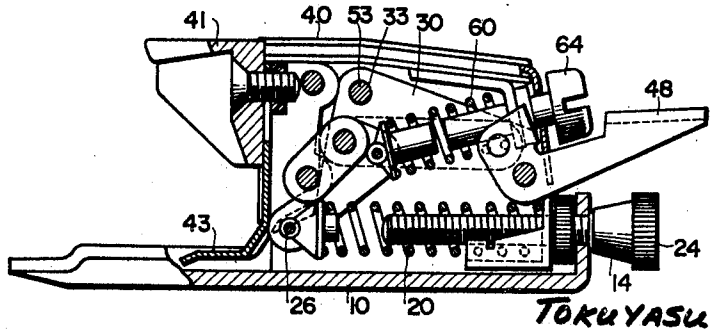


FIG. 7



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SAFETY SKI HEEL BINDING

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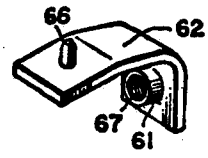
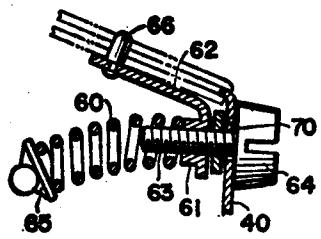


FIG. 8

FIG. 9



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SAFETY SKI HEEL BINDING

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Int. Cl. A63c 9/84
U.S. Cl. 280—11.35 6 Claims

ABSTRACT OF THE DISCLOSURE

A cableless safety ski heel binding is provided. The tightening force on the ski boot heel is obtained by a very simple operation of adjusting separately (1) the pressure of a spring arranged in the horizontal direction and (2) the pressure of a spring arranged inclined forwardly relative to the ski. The heel engaged with the binding is hardly moved upwardly by means of the latter spring, except when the heel releasing operation is effected.

BACKGROUND OF THE INVENTION

The present invention relates to a safety binding for the heel of a ski boot. This safety binding is attached to the ski together with a cooperating toe fixture.

A preferred safety ski heel binding removably fastens the boot heel by means of two separate stresses in the horizontal and vertical directions with respect to the ski. Various types of prior art devices have been proposed to control adjustment of these separate stresses and consequently of the "degree of safety."

In one type of conventional safety ski heel binding, the stresses in the horizontal and vertical directions are separately adjusted. But inconveniences and disadvantages have been experienced with the adjustment of the horizontal stress because the heel fixture is slidably positioned along the ski by separately loosening and tightening relatively many nuts screwed onto bolts.

In another type of such conventional safety bindings, the stresses in the said both directions are simultaneously and proportionally adjusted through a single adjusting means. However, it is difficult to accomplish a satisfactory and subtle adjustment of the heel tightening force with this type of binding.

Referring further to conventional safety ski heel bindings, turning displacement of the heel engaging means just before they go in the unlocking, i.e., heel-releasing, position is so relatively large that vertical play of the tightened heel may be experienced. Such vertical play occurs because of an upward thrust of the heel which is not enough to effect the heel-releasing operation.

SUMMARY OF THE INVENTION

It is an objective of the present invention to provide a safety ski heel binding wherein a more satisfactory adjustment of the heel tightening force is possible.

It is another objective of the present invention to provide a safety ski heel binding wherein the heel releasing operation is very "sharp," that is, the vertical play of the heel fastened in normal skiing operations is eliminated to an unobjectionable degree except when the heel releasing operation is effected.

In accordance with the present invention, a safety ski-heel binding comprises a base attached to the ski, side frames slidably guided in engagement with the base (in the lengthwise direction relative to the ski) through the medium of a spring arranged along the base, and a casing turnably fixed to the rear upper end portion of the

side frames. Two heel engaging means are cooperatingly positioned and fixed to the fore end face of casing. One is adapted for engaging the heel from below and the other for engaging the heel from the top. A swinging link is rockably pivoted at the upper portions thereof to the upper fore portions of the side frames, and at the lower fore portions thereof to a fore link turnably fixed at the other end thereof to the lower fore portions of the casing. An unlocking lever is rockably fixed to the rear upper end portions of the side frames where the casing is also turnably fixed. A connecting link is turnably connected at one end thereof to the fore end portions of the unlocking lever and at the other end thereof to the said lower fore portions of the swinging link. Another spring is provided between a spring-receiving means connected to the lower rear portions of the swinging link and a pressure adjusting means screwed into an adjusting screw rotatably fixed to the rear back portion of the casing.

It is essential in this invention that a dynamic production of the latter spring intersects the straight line between the centers of two pivots of the said fore link. Accordingly, the swinging link may be rockably pivoted to the lower fore portions of the side frames, not to the said upper fore portions of the side frames.

When the described safety binding is in the locking position, the heel is tightened by the stress of the said latter spring as well as that of the former spring.

In case an accidental severe upward thrust of the heel causes the foremost pivot of the fore link in the said lower fore portions of the casing to swing up above the dynamic production of the latter spring, the casing is thrown upwardly about the rear upper end portions of the side frames, thereby releasing the heel completely. Then, the stress of the latter spring contributes to the upwardly swinging movement of the casing through the swinging link. The degree of turning displacement of the said foremost pivot of the front link, until the center thereof is raised above the dynamic production of the latter spring, is so small that the heel releasing operation of the present binding is very sharp.

The heel tightening operation of the present safety binding is automatically carried out by stepping on and pressing down the heel engaging means with the boot heel.

When opening of the safety ski heel binding is desired, a little pressure may be exerted on the unlocking lever, for example, by way of a ski pole.

It is obvious, thus, that a more satisfactory heel tightening force is obtained by adjusting two separate springs described hereinbefore.

In order to make it easier to understand the other objectives and features of the present invention, a detailed explanation shall be made hereinafter with reference to the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 illustrates the basic structure of a toggle joint adapted as the operating principle of this invention;

FIG. 2 is the schematic diagram of the first embodiment of this invention;

FIG. 3 is a top plan view, partially cut-away, of the first embodiment according to this invention;

FIG. 4 is a side view, partially cut-away, of the first embodiment in the locking position;

FIG. 5 is a side view, partially cut-away, of the first embodiment in the unlocking position;

FIG. 6 is a perspective exploded view of the first embodiment with the portions, prior to its assembly;

FIG. 7 is a side view, partially cut-away, of the second embodiment according to this invention, in the locking position;

FIG. 8 is a perspective view of an extension arm of the pressure adjusting means adapted in another embodiment; and

FIG. 9 is a side view, partially cut-away, of pressure adjusting means showing an essential part thereof having the extension arm of FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the schematic diagrams according to FIGS. 1 and 2, A, B, C and D represent correspondingly four pivoting points **54**, **53**, **55** and **57**. A and B are therefore fixed relative to a frame of reference. F represents an intersection of AB and the extension of DC, and S represents a stress of the spring **60** best illustrated in FIG. 2. The extension of S intersects CD at G. It is essential in this invention that G intersects the straight line between C and D.

Suppose that AD and BC simultaneously rotate in the respective directions indicated by the arrows. Then, the resultant angular velocity WA about AD is smaller than the angular velocity WB about BC, because the rate of these angular velocities is known to be given by $WA/WB=BF/AF$. The moment of M_B of BC may be relatively small so as to resist the moment M_A of AD. The theory can now be extended to disclose the improved operation of the unlocking lever **48**. If one intends to open the safety ski heel binding according to this invention, one may exert a relatively small pressure onto the unlocking lever **48**.

With reference to the first embodiment illustrated in FIGS. 2 to 6, reference numeral **10** denotes a base attached to the ski. The base **10** has extension part pieces **12** with fixing holes **11**, guiding flanges **13** upwardly and then outwardly extending respectively on both sides thereof, and a vertical wall **14** at the rear end thereof, see FIG. 5. The side frames **30** have grooves **31** at their lower end portions which slidably engage with the guiding flanges **13**, respectively. For clarity, only one side frame **30** is shown in FIG. 6, and only one casing, however two of each, are used. A spring **20** is arranged along the axis of the ski. The spring **20** is connected at one end to a spring-receiving means **21** and at the other end thereof with a spring washer **25**. The adjusting screw **23** passing partly through the spring **20** is rotatably fixed to the vertical wall **14** and screwed into the spring-receiving means **21**. The adjusting screw **23** has a head **24** bearing on the rear face of the vertical wall **14**. The spring washer **25** is secured to the side frames **30** with a pin **26** fitted within holes **32** of the side frames. An elastic member **27**, preferably of rubber, is fitted around the spring washer **25**. The elastic member **27** is in contact with the upper face of the base to prevent looseness of the adjusting screw **23** caused by oscillation in skiing operations and consequently to maintain a desired pressure of the spring **20**. The spring-receiving means **21** is provided with projecting parts **22** passing through slots **35** in the side frames **30**.

A casing **40** fits over the side frames **30**. The casing **40** is turnably fixed to the side frames **30** by means of a pin **54** passing through holes **34** and **44**. A heel engaging means **41** is positioned adjustably for boots of different size and fixed with a fixing screw **42** to the fore end face of the casing **40**, see FIGS. 4 and 5. A heel bottom receiving means **43** is secured to the fore portions of the casing **40** with pins **56** and **57**.

Referring to a toggle linkage adapted for this invention, a swinging link **46** is rockably pivoted with a pin **53** in a hole **33** of the upper fore portions of the side frames **30**. A fore link **45** is turnably connected at one end thereof to the lower fore portions of the swinging link **46** with a pin **55** and at the other end thereof to the lower fore portions of the casing **40**, by means of the pin **57**. The swinging link **46** is provided with a spring-receiving means **65** connected to a bar thereof. An adjusting screw **63** is

rotatably fixed to the rear back portion of the casing **40** and has a head **64** bearing on the rear back portion of the casing **40**. A pressure adjusting means **61** is screwed into the adjusting screw **63** and an extension arm **62** thereof is in contact with the inner surface of the casing **40**. A spring **60** is arranged between the spring-receiving means **65** and the pressure adjusting screw **63**. The spring **60** is so arranged that the dynamic production (extension) thereof intersects the straight line, preferably the lower part thereof, between the centers of the pins **55** and **57** in the locking position. The unlocking lever **48** is rockably pivoted with the pin **54**. The fore end portions of the unlocking lever **48** is turnably connected to a connecting link **47**. The connecting link is turnably connected to the pin **55**.

In operation, when the safety binding is in the locking position as shown in FIG. 4, the heel of the boot is fixed in the position by the pressure of the spring **60** as well as that of the spring **20**. The desired pressures are obtained by a very simple operation of turning the respective heads **24** and **64**. Preferably, the extension arm **62** may be adapted by markings, for a pressure indicator **66** of the spring **60**. The locking position is automatically reached by stepping in the binding with the boot heel and pressing downwardly the heel bottom receiving means **43** against the pressure of the spring **60** and that of the spring **20**. In this case, the pressure of the spring **60** causes the casing **40** to turn counterclockwise about the pin **54** as soon as the pin **57** is lowered to the extent that the straight line between the pins **55** and **57** intersects the dynamic production (extension) of the spring **60**.

In case an abnormal severe upward thrust of the heel causes the pin **57** to swing upwardly above the dynamic production of the spring **60**, the casing **40** will be thrown up to release the heel.

If one intends to open the binding by hand, one may press down the unlocking lever **48**, for example, by putting the end portion of a ski pole into a hole **49** of the unlocking lever. In detail, when the pin **55** and consequently the swinging link **46** are pulled a little rearward through the connecting link **47** and the center of the pin **57** is carried upwardly above the dynamic production of the spring **60**, the casing **40** will be thrown up clockwise to disengage the heel satisfactorily.

With the improved arrangement of the springs **20** and **60** in mind, one can obtain a more satisfactory tightening force of the heel.

In FIG. 7, the second embodiment according to this invention has the swinging lever **46** rockably pivoted to the pin **26**, not to the pin **53**. Except in this respect, the second embodiment is just the same as the first embodiment.

In FIG. 8 an extension arm **62** is made of relatively thick material differing from thin spring sheet of the prior art. The fore end portion of the extension arm **62** is fitted with a pressure indicator **66** and the rear portion thereof is bent downwardly and a tapped hole **67** projecting inside is made on the rear portions thereof by rolling. An oval hole **70**, through which the adjusting screw **63** is inserted, is made at the rear back portions of the casing **40**, as shown in FIG. 9.

The extension arm **62** is so arranged, as shown in FIG. 9, that it can be moved back and forth by turning the head **64** of the adjusting screw **63**. As the hole **70** is made as an oval hole, an angle of the adjusting screw **63** to the casing **40** is somewhat changeable. Because of this, the extension arm **62** always keeps pressing the inner surface of the casing **40**, including the unlocking position in which the spring **60** is curved by compression, as shown in FIG. 9. The extension arm **62** is arranged so that the indicator **66**, projecting from the window hole of the casing **40**, is not provided with the flanges of the prior art which are utilized to move the extension arm **62** along the window hole. The flanges prevent the extension arm from moving smoothly when the snow is within it

and also they permit the snow to enter into the binding from the window. The extension arm being made of relatively thick material, it is easy to fit the indicator **66** onto the extension arm **62.**

We claim:

1. A safety ski heel binding comprising, in combination,

a base adapted to be attached to the ski,

side frames slidably guided along the base,

a casing fitting over the side frames and pivotally fixed with a first pin to the rear upper end portions of the side frames,

an upper heel engaging means and a lower heel engaging means cooperatingly connected at the fore end face of the casing,

a swinging link pivotally connected at the upper portion thereof with a second pin to the upper fore portions of the side frames and pivotally connected at the lower fore portions thereof with a third pin to a fore link, said fore link being turnably connected with a fourth pin to the lower fore portions of the said casing,

an unlocking lever rockably pivoted with the said first pin to the rear upper end portions of the said side frames,

a connecting link pivotally connected at one end thereof to the fore end portions of the unlocking lever and at the other end thereof to the said third pin,

a first spring arranged between a spring-receiving means connected to the lower rear portions of the said swinging link and a pressure adjusting means rotatably fixed to the rear back portions of the said casing and so arranged that, in the locking position, a dynamic production of the spring intersects the straight line between the center of the said third pin and that of said fourth pin and a second spring positioned between said base and said side frames to act against a spring adjustable means to slide said frames along said base.

2. A safety ski heel binding as claimed in claim **1,** wherein the second spring is arranged along the ski between a spring washer secured with a fifth pin to the lower fore portions of the said side frames and a spring-receiving means having projecting parts passing through slots in the lower portions of the side frames and screwed into an adjusting screw rotatably fixed at the rear end portion of the said base.

3. A safety ski heel binding as claimed in claim **2,** wherein an elastic member is fitted around the spring washer to be in contact with the upper face of the said base to prevent the said adjusting screw from becoming loose due to oscillation in skiing.

4. A safety ski heel binding as claimed in claim **2,** wherein the said swinging link at one end thereof is pivotally connected to the said fifth pin.

5. safety ski heel binding as in claim **1** wherein said pressure adjusting means for the first spring has an extension arm having indicator means and a pressure adjusting screw.

6. A safety ski heel binding as claimed in claim **5,** wherein the adjusting screw is inserted into an oval hole made on the rear back portions of the casing, the extension arm is made of thick material having a projecting pressure indicator at the fore portions thereof and a tapped hole projecting inside at the rear portions thereof is bent downwardly and is screwed to the adjusting screw by the tapped hole and the adjusting screw passed partly through the first spring at the fore end thereof and so arranged that the extension arm is in contact with the inner surface of the casing.

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