United States Patent

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[72] Inventor **Hans Martin**
6 Volkmarstrasse, Zurich, Switzerland

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[31] **14,825**

[54] **SECURING HEAD FOR SAFETY SKI BINDINGS**
10 Claims, 5 Drawing Figs.

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[51] Int. Cl. **A63c 9/00**
[50] Field of Search ..... 280/11, 35 (HA)

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Primary Examiner—Kenneth H. Betts
Assistant Examiner—Robert R. Song
Attorney—Werner W. Kleeman

ABSTRACT: There is disclosed a securing head for a safety ski binding that is capable for use as either a toe binding member or a heel binding member which includes two lever shaped jaws engageable with a ski boot and each turnable about an axis that is approximately vertical in relation to the ski and said jaws being urged to boot engaging position by at least one spring. Both jaws being the long lever arms of double arm levers, the short arms of which are acted on by a spring through a stroke reducer or motion or displacement limiting member which functions to shorten the axial movement of the spring in relation to the displacement of or stroke of the short lever arms when a force is exerted tending to move the jaws to release position.

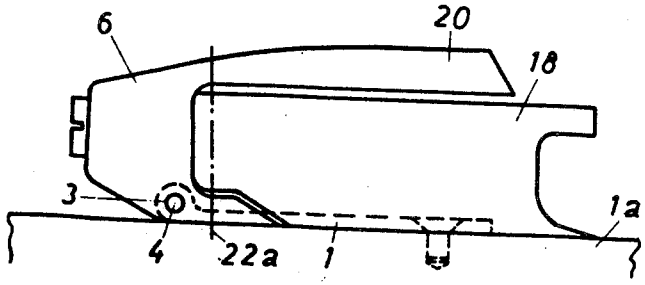
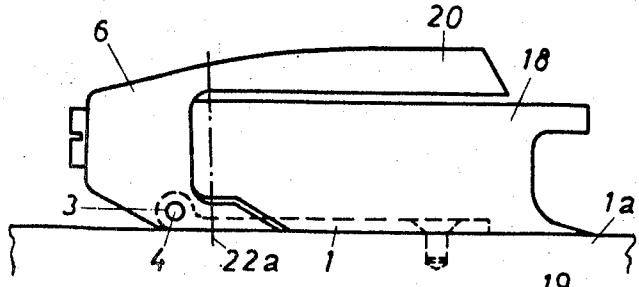


Fig. 1



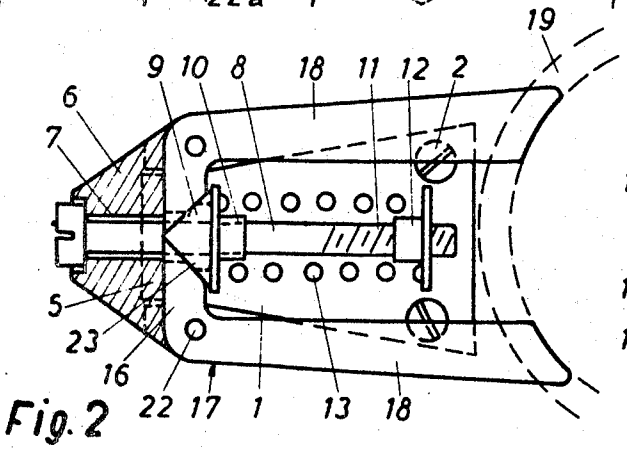
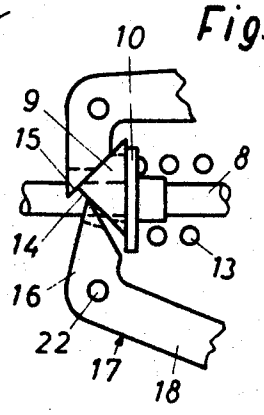


Fig. 2

Fig. 3



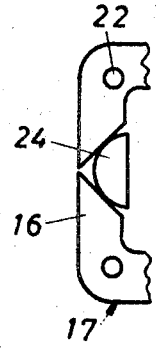


Fig. 4

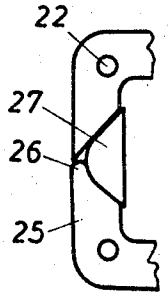


Fig. 5

INVENTOR

HANS MARTIN

BY Jacobi, Davidson & Kleeman

ATTORNEYS.

SECURING HEAD FOR SAFETY SKI BINDINGS

BACKGROUND OF THE INVENTION

The present invention relates broadly to the art of ski bindings.

More particularly, this invention relates to a securing head for a safety ski binding of the type which can be for cooperation with the toe and/or heel portions of a ski boot and which binding comprises two lever-shaped, spring biased jaws, engageable with a ski boot, and each turnable about an axis which is approximately vertical in relation to the ski.

Safety ski bindings are known in the prior art. They are all based essentially on the principle that the binding releases when a certain force is exceeded.

In a first group of known ski bindings, a spring loaded catch, latch, ball, pawl or the like is cooperable with a notch or socket. If the force acting upon the binding exceeds a certain value, then the catch, latch, ball, pawl or the like disengages from the notch or socket and the boot is released. The length of the path of travel which the notch or socket makes until release occurs is very short, so that even very brief impacts can cause release of the binding under conditions in which a release of the binding would not be necessary. Attempts have been made to obviate this drawback by a correspondingly increased spring tensioning, but this reduces the safety factor of the binding.

In a second group of known ski bindings, springs act directly upon the holding jaws or clamps of the bindings. In normal position, these jaws are under a certain spring load or tension which increases linearly as the jaw moves out laterally, until the ski boot is released after the jaw has reached a certain position. Due to the limited space available for mounting bindings on the ski, one uses short, thick springs having relatively steep spring characteristics. As a result, the spring load or tension in normal position differs substantially from the spring load or tension during release of the binding. Thus, one has the choice of increasing the spring load for normal position which makes the release force very large and thus endangers the skier, or one adjusts the springs to accommodate a lower release force in which event the load or tension is too low in normal position. Thus, the jaws would yield in response to forces which are of less magnitude then would be required for the safety of the skier. This also is undesirable.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide securing head arrangement for safety ski bindings that avoids the drawbacks and disadvantages of the known safety ski bindings.

In order to have a ski binding meet all requirements, it must be so constructed and arranged that the jaw means can be adjusted with sufficient spring load or tension in the normal position as would ensure firm seating of the binding, and at the same time the force required to effect release must not be essentially above the binding force or value in the normal position. Moreover, it is also necessary that a certain length of path be traveled between normal position and release position so that brief impacts, although greater than the spring pressure in normal position, thus causing the jaw means to yield, will not cause release of the binding so that the jaws can spring back into normal position.

Thus, it is an object of this invention to provide an arrangement that meets the above requirements and includes jaw means in the form of two double arm levers each having a short lever arm and a long lever arm, with spring means acting directly on the short lever arms through the intermediary of a stroke reducer or motion or displacement limiting member for reducing the motion effective at the spring in contrast to the motion of the short lever arm. As a result one obtains a flatter load characteristic of the jaw.

According to a feature of the invention, the stroke reducer or motion or displacement limiting member is slidable relative

to the end surface of one of the short lever arms and performs a lateral movement as it is shifted or retracted. The stroke reducer is suitably a triangular shaped sliding member two of whose sides cooperate with the end surfaces of the short lever arms and whose third side or base serves as a support surface for a pressure spring. By virtue of the lateral yield of the sliding member, the displacement tensioning the spring is less than the displacement or movement of the short lever arm when it is moving in the release direction.

According to a preferred embodiment the double arm lever is constructed as an angle lever whose short lever arm contacts in normal position a head piece in which an adjusting screw is supported for continuous adjustment of the tension of the pressure spring. The use of an angle lever results in a particularly compact construction of the securing head.

As a further feature, the adjusting screw passes through the sliding member and the pressure spring which is biased between one washer screwed upon the adjusting screw and another washer that bears against the base of the sliding member.

In a modified form of the invention one of the two short lever arms has a marginal protrusion whereby the short lever arms have different or unequal effective lengths. The short lever arms are constructed in this fashion so that the forces tending to push the jaws outwardly to a release position is unequal as regards the two jaws in that a larger force is required to release one jaw than is required to release the other. Preferably, the short lever arm having the longer effective length is provided on the jaw engaging the ski boot on the inside of the foot, since a greater force is exerted when the foot turns inwardly.

According to a further feature of the invention, the sliding member is provided with a lever arm engaging nose having the shape of a segment of a circle.

Additionally the arms of the double arm lever suitably form an approximate right angle.

BRIEF DESCRIPTION OF THE DRAWINGS

Further and more specific objects and advantages of the present invention will become more readily apparent from the following description when taken in connection with the accompanying drawings in which:

FIG. 1 is a side elevational view of the securing head of this invention;

FIG. 2 is a view partly in top plan and partly in horizontal section and illustrating the component parts of the invention;

FIG. 3 is a fragmentary view illustrating the operation of the slidable stroke reducer or motion or displacement limiting member of the invention;

FIG. 4 is a fragmentary top plan view illustrating a slidable member of the invention having a lever arm engaging nose shaped as a segment of a circle; and

FIG. 5 is a similar view illustrating an arrangement of the securing head of the invention in which one of the short lever arms of the jaws is provided with a marginal protrusion so that the short lever arms have different effective lengths.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings, reference numeral 1 denotes the base or securing plate of the securing head, the former being secured directly to ski 1*a*, for example by means of screws 2. To said securing plate 1 there is articulated a head piece 6 as shown in FIG. 1, by means of a hinge-joint 3 comprising a pin 4 and a hinge-joint eyelet 5. Headpiece 6 can be slightly biased, if required, by means of a flat spring, now shown. If it is not required that the securing head be able to pivot or tilt, then headpiece 6 is mounted rigidly upon the ski.

Headpiece 6 is equipped with a bore 7 in which is accommodated an adjusting screw 8. This screw 8 passes through a sliding member 9, and an axially movable spring washer 10 and has externally threaded portion 11 at its end upon which is

screwed a second spring washer **12**. Between both spring washers **10**, **12**, there is provided a pressure spring **13** whose tension can be adjusted continuously by turning screw **8**. In the arrangement as shown, pressure spring **13** supports itself on spring washer **12** and exerts force via the longitudinally or axially movable spring washer **10** upon sliding member **9**.

The sliding member **9** has the shape of a triangular member whose sides **14**, FIG. **3**, contact inclined or slanted surfaces **15** of the short lever arms **16** of angle levers **17**. Both long lever arms **18** of the angle levers **17** form at their free end jaws for holding the ski boot **19**, denoted by a dotted line. Further, the free ends of the short lever arms are forked so as to fit around the adjusting screw **8**.

The headpiece **6** includes a projecting cover part **20** which serves as a protection for the interior parts.

The securing head operates as follows:

The sliding member **9** which is under a spring force pushes the short lever arms **16** to bear against the inside wall of headpiece **6** and thus hold jaws **18** in normal inward position. If now a lateral force acts upon ski boot **19**, acting from top to bottom in the drawings, for example, then the lower jaw is pushed outwardly provided that the lateral force is greater than the counterforce being applied by virtue of the spring tension, FIG. **3**. In moving outwards, the lower jaw rotates or pivots around a pin or bolt **22** which is secured in headpiece **6** and extends nearly vertical along axis **22***a*, FIG. **1**. As the short lever arm **16** turns, sliding member **9** is retracted, but during this phase, the latter simultaneously performs a lateral displacement. If one now looks at the tip of the short arm **16** of jaw **18** which is swung out, and the tip of sliding member **9**, one can see that the tip of sliding member **9** has been displaced axially of screw **8** a distance less than that of the tip of short lever arm **16** although in normal position, FIG. **1**, both tips are on the same level. Thus, a reduction in stroke or displacement has been achieved by sliding member **9** so that the spring **13** has been compressed substantially less than would otherwise correspond to the stroke or displacement of the tip of short lever arm **16**. As a result, the counterforce acting upon the jaw increases correspondingly less than would otherwise be the case if it were to correspond to the spring characteristic of spring **11**. Thus, one achieves the initial mentioned objective, namely that the counterforce acting upon the jaw in dependency upon the path of travel which it takes as it swings at out increases only very slightly although the jaw has a relatively long path of travel at its disposal.

It is now possible to adjust the counterforce of or spring pressure acting on the jaw in normal position so strongly that the jaw remains permanently firm during normal skiing. As soon as a short or brief impact occurs which is greater than the force acting on the jaw, the jaw yields without, however, releasing the binding and springs back into normal position after termination of such an impact. Only when a force is exerted for a longer period of time which is greater than the counterforce of the jaw, will the ski boot be turned out completely or released from the securing head, without the counterforce of or force acting on the jaw being substantially higher at the moment of release than in normal position.

Thus, sliding member **9** acts together with the sliding surfaces of the short lever arms **16** as stroke reducer or motion limiting member in that it yields laterally in addition to its axial movement. For this reason, the opening for the adjusting screw **8** in sliding member **9** must have the shape of a slot **23**. FIG. **3** will illustrate how the sliding member **9** is displaced laterally relative to spring washer **10**.

In FIG. **4**, the sliding member, only diagrammatically illustrates, a member **24** having its nose in the shape of a segment of a circle. However, its function is the same as that of sliding member **9** in FIG. **3**. With the choice of different shapes of sliding members, the stroke or motion characteristic of said sliding member and thus the characteristic of the spring force in dependency upon the travel of rotation of the jaw can be varied or influenced.

Up to now, one has not paid attention to the fact that when the foot turns inwardly, it can take up and also exert a greater force. Accordingly from a physiological viewpoint, the securing head should be constructed to accommodate differential forces arising during the release of the ski binding. This can be achieved in the instant securing head by constructing the short lever arms of different lengths, in that, for example, in connection with the jaw on the inside of the foot, the short lever arm is made somewhat longer than the short lever arm of the jaw on the outside of the foot. Thus, FIG. **5** illustrates how this problem is solved by providing a protrusion **26** on a short lever arm **25**. The triangular sliding member **27** is here suitably rounded off, somewhat at its nose or tip, where the protrusion **26** engages. The protrusion **26** extends the effective length of lever arm **25**, as a result of which a greater force must be exerted on the jaw for overcoming the force of the spring. Moreover, the lateral displacement of sliding member **27** begins with a certain delay. This special construction of the short lever arm serves the purpose of permitting convenient adjustment of the spring to the conditions of skiing, as a function of the path of travel of the jaw. In addition, the securing head according to the invention, presents numerous possibilities, but with the stroke reduction of the spring being the essential feature. It is further advantageous in the instant securing head that when one jaw moves out laterally, the nonparticipating jaw does not become loose since it is continued to be acted upon by the force of the spring but that the latter remains loaded by the spring force. It may be stated by way of a practical example that the stroke or movement of the tip of the short lever arms **16** reaches approximately 9 millimeters when the jaw is swung out to its maximum, whereas the stroke or movement of sliding member **9** amounts only to half as much, i.e. approximately 4.5 mm. It would be impossible in view of the limited space available in a ski binding to provide a spring having usable tensions which would produce the same characteristics as obtained with the use of a stroke reducer, or motion or displacement limiting member.

The securing head pursuant to the invention can be used as a toe part as well as a heel part in a safety ski binding, with the toe part, for example, being raisable by means of a hinge-joint **3**, as shown in FIG. **1** in order to facilitate easy stepping into the ski binding.

It should be apparent from the foregoing detailed description, that the objects set forth at the outset to the specification have been successfully achieved.

I claim:

1. A securing head for a safety ski binding that is capable of use as a toe binding member or a heel binding member and including two lever-shaped jaws engageable with a ski boot, means mounting each of said jaws for turning movement about an axis extending approximately vertical in relation to a ski and spaced transversely thereof, at least one spring cooperably related with said jaws to urge them to an inner ski boot engaging position, each jaw comprising a double arm lever having a long lever arm engageable with a ski boot and a short lever arm extending inwardly of and substantially perpendicular to said long arm, and said spring acting on said short lever arms, and a motion limiting member interposed between said spring and said short lever arms so as to reduce the axial movement of the spring in relation to the movement of the short lever arms.

2. A securing head as claimed in claim **1**, in which said motion limiting member is a sliding member slidable on the end surface of one of said short lever arms and performing a lateral movement when retracted.

3. A securing head as claimed in claim **2**, in which said slidable member is triangular in shape and includes side surfaces cooperable with the end surfaces of said short lever arms and a base surface constituting a support surface for said spring.

4. A securing head as claimed in claim **2** and further including a headpiece, each double arm lever comprising an angle lever, each short lever arm of said double arm levers contacting in normal position said headpiece and an adjusting screw

supported by said headpiece for continuously adjusting the tension of said spring.

5. A securing head as claimed in claim 4, in which said sliding member and pressure spring surround said adjusting screw, a first spring washer in threaded engagement with said adjusting screw and a second spring washer surrounding said adjusting screw and bearing against said sliding member with said spring being interposed between said washers.

6. A securing head as claimed in claim 1 in which one of said short lever arms has a short marginal protrusion.

7. A securing head as claimed in claim 1, in which said short lever arms are of unequal effective length so that the force pushing the jaws out of their normal position is of unequal magnitude.

8. A securing head as claimed in claim 1, in which the longer of said short lever arms is provided on the jaw engageable with the ski boot on the inside of the foot.

9. A securing head as claimed in claim 1, in which said motion limiting member is a slidable member having the shape of a segment of a circle.

10. A securing head for a safety ski binding comprising a base plate adapted to be secured to a ski, a headpiece carried by said baseplate and having a surface extending transversely of the axis of a ski, said headpiece further having a bore therethrough extending longitudinally of a ski, a pair of ski boot engaging jaws, each jaw comprising a double arm lever having a long lever arm and a short lever arm, means pivoting each said double arm levers relative to said baseplate for turning movement about axes extending approximately vertically and aligned transversely of the ski, located in spaced relation to said surface of said headpiece with said long lever arms constituting ski boot engaging arms and said short lever arms extending toward one another and in ski boot engaging position bearing against said surface of said headpiece, an adjusting screw passing through said bore in said headpiece and having an externally threaded end portion, a first washer means in threaded engagement with said externally threaded end portion, a second washer means surrounding said adjusting screw and longitudinally movable therealong, a spring surrounding said adjusting screw and disposed between said washer means, and a displacement limiting member loosely surrounding said adjusting screw, slidably related to said second washer means and including surfaces bearing against said short arms of said double arm levers to hold them against said surface of said headpiece in normal ski binding position of said jaws and to allow lateral shifting of said member as a long arm of a double arm lever is displaced laterally outwards due to lateral forces acting on the binding during skiing.