

United States Patent Schriewer

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[54] **TOE IRON FOR SAFETY SKI BINDINGS**

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280/11 25 T

[58] **Field of Search**.....280/11.35 T

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[57] **ABSTRACT**

A soleholder member constituting a coupling link of a four-bar linkage, which comprises levers that are pivoted to a baseplate which is secured to the ski. The four-bar linkage is modified in that the levers consist of toggle joints, which have toggle arms that are pivoted to the baseplate and the arms in the normal position of the toe iron diverge and engage stationary stops, whereas the other toggle arms of the toggle joints in the position of the toe iron converge from the hinges. A spring urges the soleholder member to its normal position.

7 Claims, 4 Drawing Figures

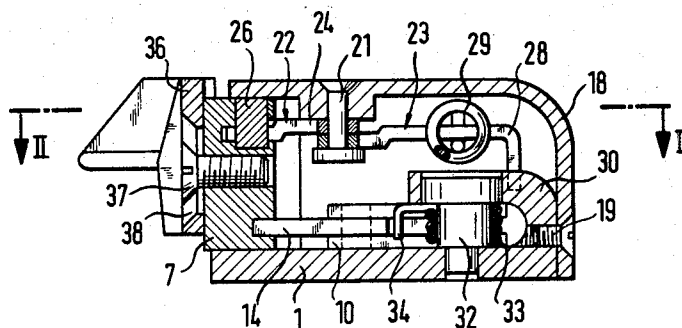


Fig.1

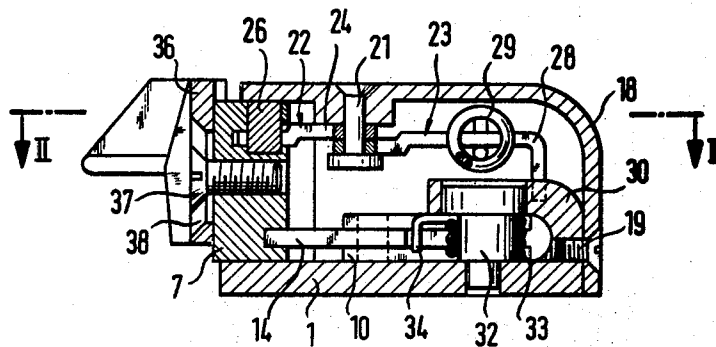
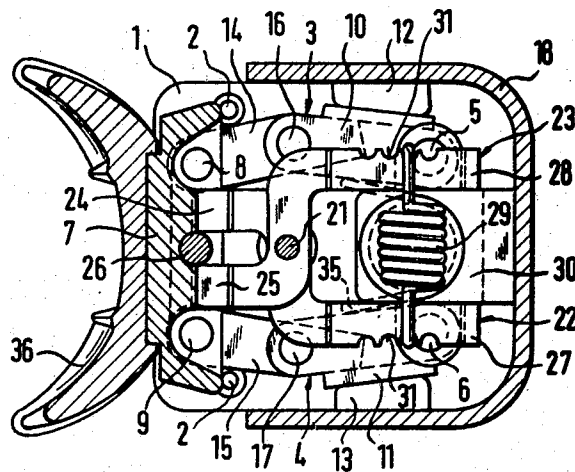


Fig.2



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Fig. 3

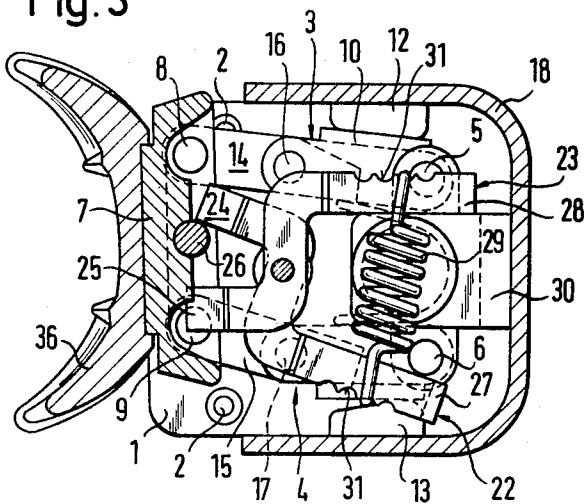
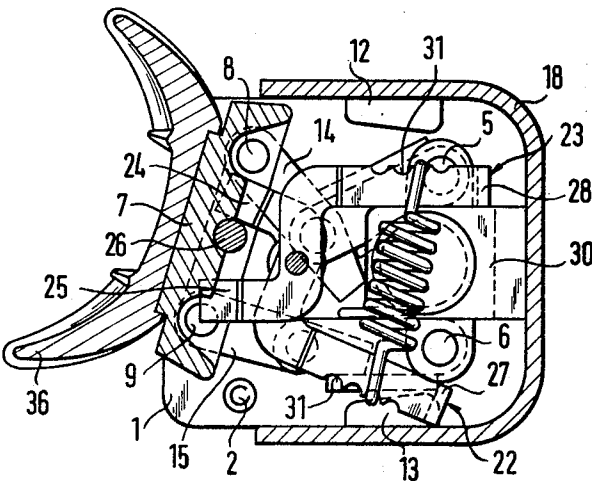


Fig. 4



TOE IRON FOR SAFETY SKI BINDINGS

The present invention relates to a toe iron for safety ski bindings, which toe iron comprises a soleholder member which constitutes a coupling link of a four-bar linkage, which comprises levers that are pivoted to a baseplate which is secured to the ski.

In that known toe iron, the four-bar linkage is designed so that the soleholder member is movable parallel to itself. When the toe iron is in its normal position, the soleholder member is locked in position relative to the baseplate by a ball detent device. The pressure by which the detent device is loaded can be varied to enable a setting of different forces required for a release.

This known toe iron has various disadvantages. The most essential disadvantage resides in that the soleholder member is locked relative to the baseplate by a detent device so that the toe iron is highly susceptible to shock. This results in unnecessary release actions and falls, which lead to atypical skiing injuries so that the skier is tempted to select an excessively hard setting for the toe iron. This setting may be result in a failure of the toe iron to release the boot in a critical instant so that the skier may suffer typical skiing injuries, which ought to have been avoided by the use of the safety binding.

It is an object of the present invention so to improve and design a toe iron for safety ski bindings of the kind previously described that the toe iron is free of the disadvantages of the known toe iron.

In a toe iron for safety ski bindings, which toe iron comprises a soleholder member which constitutes a coupling link of a four-bar linkage, which comprises levers that are pivoted to a baseplate which is secured to the ski, this object is accomplished according to the invention in that the four-bar linkage is modified in that the levers consist of toggles, which have links that are pivoted to the baseplate and said links in the normal position of the toe iron diverge and engage stationary stops, whereas the other links of said toggles in said position of the toe iron converge from the hinges, and a spring urges the soleholder member to its normal position. This design eliminates the undesired susceptibility to shock. The toggles are designed so that the soleholder member is moved before the safety release of the toe iron along an arc which is centered at least approximately on the imaginary axis of rotation of the skiing boot. In this way, a pivotal movement of the skiing boot does not result in a component of motion of said boot toward the tip of the ski under the action of the force which acts on the heel and forces the boot against the toe iron.

In a special embodiment of the invention, the spring may act on the soleholder member by two two-armed levers, which have fixed fulcrums and are pivotally movable in a horizontal direction. In such arrangement it has proved desirable to provide said two levers so as to form a gripper having jaw arms, which embrace a coupling element carried by the soleholder member whereas those arms of the levers which are opposite to said jaw arms are connected by a tension spring, which pulls the two arms against a stationary stop. The force required for a release can be varied in a simple manner if each lever arm is adapted to have the spring connected to it at least at two points. The selection of effort arms of different lengths in conjunction with a given spring force then enables a selection of the torque which is desired in each case.

Those toggle links which are pivoted to the baseplate are suitably under the influence of a weak return spring. This design will result in an exact return movement of the toggles after a safety release of the toe iron because the bearing friction will be overcome. In a development of this concept of the invention it has proved desirable to provide a single return spring for both toggle links which are pivoted to the baseplate and to use as a return spring an expanding spring having two legs acting on respective toggle links.

An embodiment of the invention will now be described more fully with reference to the accompanying drawing, in which

FIG. 1 is a central longitudinal sectional view showing a toe iron,

FIG. 2 is a sectional view taken on line II—II of FIG. 1 and showing the toe iron,

FIG. 3 is a sectional view which is similar to FIG. 2 but shows the toe iron immediately before a safety release and

FIG. 4 is a sectional view similar to FIG. 2 and shows the toe iron in an open position.

The toe iron for ski bindings which is shown on the drawings comprises a baseplate 1, which is adapted to be connected to a ski, e.g., by means of screws. For this purpose, the baseplate has two screw holes. Two toggles 3, 4 are arranged with mirror symmetry and are pivoted to the baseplate by respective pivot pins 5 and 6. The two toggles form parts of a modified four-bar linkage, which has a coupling link 7 in the form of a soleholder member. The coupling link is pivotally connected at 8 and 9 to the toggles. The arrangement of the toggles is such that in the normal position of the toe iron the toggle links 10, 11 pivoted to the baseplate diverge and engage stops 12 and 13, respectively, and the other toggle links 14, 15 converge from the hinges 16, 17, where they are connected to the toggle links 10, 11. The toggle links 10, 11 are sheet metal stampings, which are bent in U-shape, whereas the toggle links 14, 15 are plain sheet metal stampings. The stops 12, 13 consist of parts of a cover cap 18, which is held on the baseplate 1 by lateral guides, not shown, and a screw 19 (see FIG. 1).

The cover cap 18 carries a vertical pivot pin 21, on which two two-armed levers 22, 23 are mounted. These levers cooperate like a gripper. Their jaw arms 24, 25 embrace a coupling element 26, which consists of a vertical pin that is provided in the soleholder member 7. A prestressed tension spring 29 connects the other arms 27, 28 of the levers 22, 23 and pulls the two arms against a stationary stop 30, which is formed by a raised portion of the baseplate 1. The lever arms 27, 28 are provided in their outer longitudinal side, for instance, with four recesses 31, as shown, for receiving the hooklike end portions of the tension spring 29.

The raised portion 30 of the baseplate 1 constitutes a bracket, which defines with the baseplate a space that accommodates an expanding spring 33. The latter is held on a pin 32, which is mounted in the baseplate and its raised portion. The legs 34, 35 of the expanding spring 33 act on the links 10, 11 of the toggles 3, 4. The expanding spring is relatively weak and serves only as a return spring for the rocker lever to overcome the bearing friction thereof.

The sole-engaging element 36 is held on the soleholder member 7 by means of a screw 37, which extends through a slot 38 formed in the sole-engaging element so that the latter can be adjusted to skiing boot soles differing in thickness.

FIGS. 1 and 2 show the toe iron in its normal position. The spring 29 is hooked into the desired recesses 31 in the lever arms 27, 28 so that the toe iron is set to the desired force required for a release. If the soleholder member 7 is subjected to a force which is transverse to the longitudinal direction of the toe iron and is directed, e.g., upwardly in FIGS. 2 to 4 of the drawing and said force exceeds the initial stress of the spring 29, said force will impart to the four-bar linkage a movement against the force of the spring, as is shown in FIG. 3. The coupling element 26 of the soleholder member 7 causes the lever 22 to stress the tension spring 29 because the arm 28 of the lever 23 engages the stop 30. The toggle which is at the rear in the direction of movement, in the present case the toggle 4, performs a pivotal movement about the pivot pin 6 which is fixed to the baseplate whereas the link 10 of the toggle which is in front in the direction of movement, in the present case the toggle 3, engages the stop 12 so that only the link 14 of the toggle performs a pivotal movement about the hinge 16. This action imposes to the soleholder member 7 a movement on an arc which is at least approximately centered on the imaginary axis of rotation of the skiing boot on the ski. Upon a decrease of the force acting on the soleholder member, the spring 29 returns the four-bar linkage to its normal position shown in FIG. 2.

If a force which exceeds the desired force required for a release acts on the soleholder member not merely as a shock,

the four-bar linkage will initially move again as previously described. As soon as the toggle which is in front in the direction of movement, in the present case the toggle 3, assumes its straightened position, it will snap inwardly to the position shown in FIG. 4. This operation results in a pivotal movement of the soleholder member so that the latter releases the toe portion of the skiing boot virtually suddenly. When the skiing boot has been released, the spring 29 automatically returns the soleholder member 32 to its normal position. In this operation, the spring 32 ensures that the snapped-in toggle is reliably returned to its initial position.

The force required for a release can be changed only when the cover cap 18 has been removed. The screw 19 must be loosened for this purpose. If the manufacturer or seller of the toe iron sets the latter to a predetermined force required for a release and subsequently seals the screw 19, e.g., with lead, such seal will indicate that the force required for a release has not been changed thereafter.

What is claimed is:

1. A toe iron for safety ski bindings comprising a baseplate, pivot means secured to said baseplate, the axes thereof being perpendicular to said baseplate, a four-bar linkage pivotally mounted on said pivot means, said four-bar linkage comprising a pair of toggle links, each of said toggle links having forward and rearward toggle bars, said forward toggle bars being pivotally mounted on said pivot means, said rearward toggle bars being pivotally connected to a soleholder member, said soleholder member constituting a coupling link between said rearward toggle bars, said rearward toggle bars converging toward said pivotal connection in the normal position of the toe iron while said forward toggle bars diverge from said pivot means and stop means connected to said baseplate for preventing said forward toggle bars from pivoting outwardly from said normal position and spring means adapted to urge said soleholder member to its normal position.

2. A toe iron as claimed in claim 1 wherein said spring

means comprises two two-arm levers which act on said soleholder member, said two-armed levers having fixed fulcrums and being pivotally movable in a horizontal direction.

3. A toe iron as claimed in claim 2 wherein said levers have arms forming gripper means which embrace a coupling element carried by the soleholder member, the opposite arms of the levers being connected by a tension spring, said tension spring holding said opposite arms against stop means.

4. A toe iron as claimed in claim 3 wherein each lever arm can have the tension spring connected to it at at least two points.

5. A toe iron as claimed in claim 1 wherein said toggle bars which are pivoted to the baseplate are under the influence of a return spring.

6. A toe iron as claimed in claim 5 wherein said return spring comprises an expanding spring having two legs acting on the respective toggle bars.

7. A toe iron comprising a baseplate having a raised portion, said raised portion forming a bracket to accommodate expanding spring means thereunder, pivot means secured to said baseplate, a four-bar linkage rotatably mounted to said pivot means, said four-bar linkage comprising a pair of toggle bars pivotally mounted to said pivot means, rearward members of said toggle bars being pivotally connected to a soleholder member with the soleholder member forming a coupling link for the toggle bars, forward members of said toggle bars being urged outwardly by said expanding spring means against stop means fixed to said baseplate, a cover mounted to said baseplate, pivot means secured to said cover, a pair of two-armed levers pivotally mounted to said cover, each lever having one arm forming gripper means to engage a coupling element carried by the soleholder member with the arm opposite said gripper arm being connected by a tension spring which pulls said other two arms against said raised portion.

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