United States Patent

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[33] **Germany**
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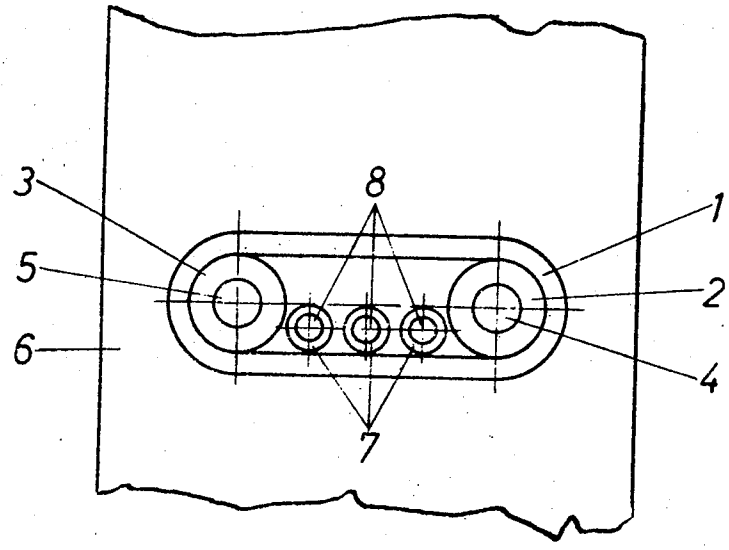
[54] **TOE IRON FOR SAFETY SKI BINDINGS**
5 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **280/11.35**
[51] **Int. Cl.** **A63c 9/00**
[50] **Field of Search** ..... 280/11.35 H, 11.35 A

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ABSTRACT: A toe-backing member movable relative to the ski and extending at right angles to the surface of the ski to resiliently take up harmless lateral shocks. The backing element comprises a flexible endless band, which extends around at least one retaining member, which is carried by a part that is secured to the ski.



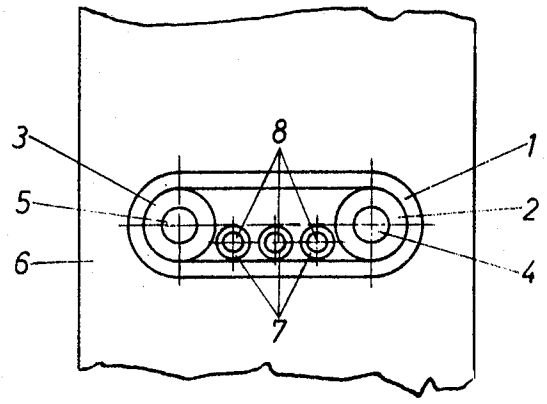


Fig. 1

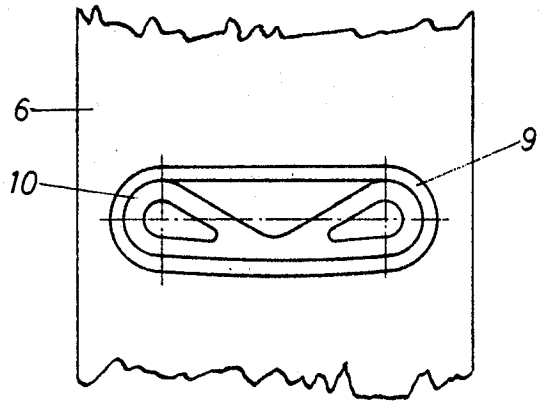


Fig. 2

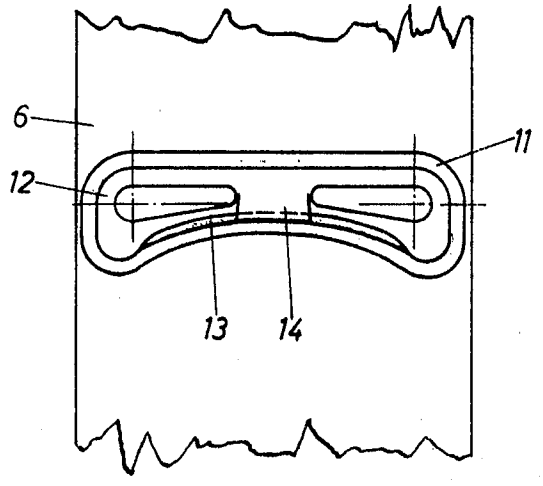


Fig. 3

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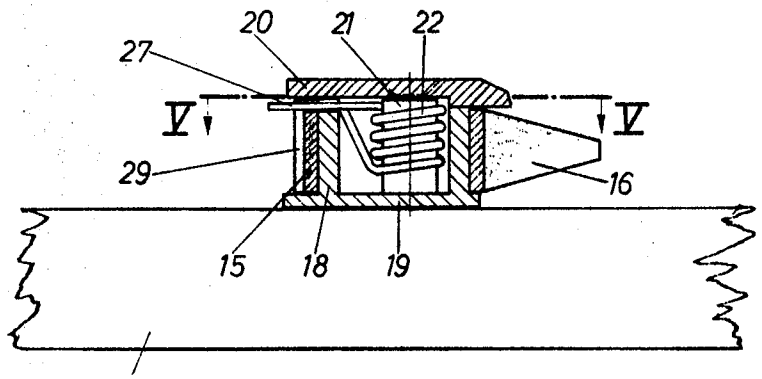


Fig.4

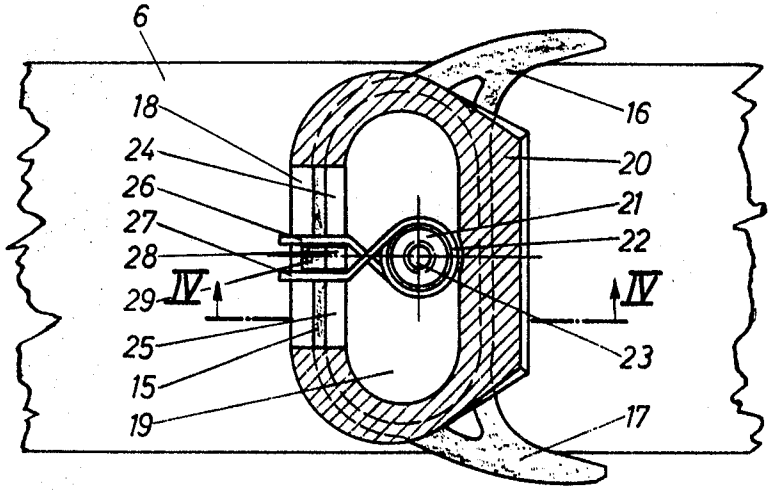


Fig.5

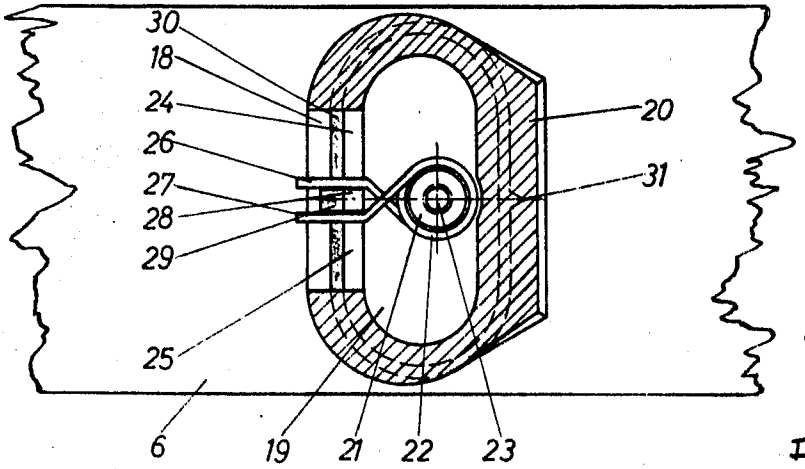


Fig.6

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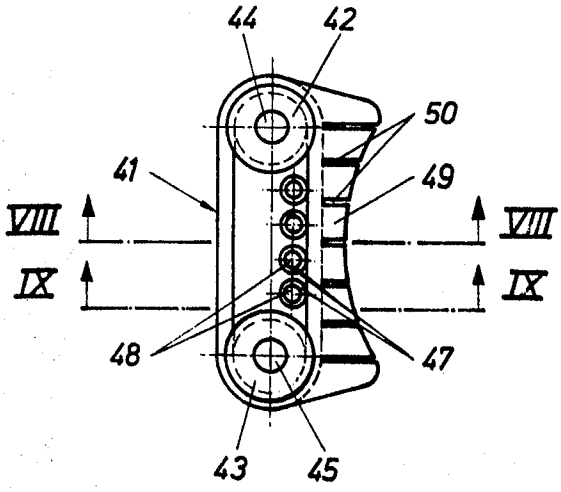


Fig. 7

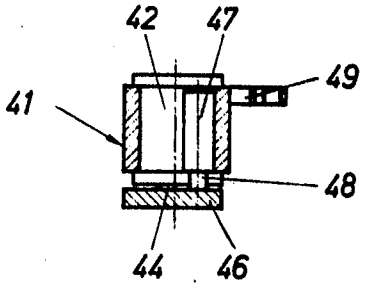


Fig. 8

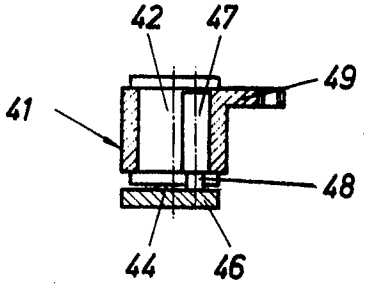


Fig. 9

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TOE IRON FOR SAFETY SKI BINDINGS

The present invention relates to toe irons for safety ski bindings, which toe irons comprise a toe-backing element, which is movable relative to the ski, extends at right angles to the surface of the ski, and resiliently takes up harmless lateral shocks.

Various types of such toe irons are known. In one known design, the backing element consists also of a sole holder, which is pivotally mounted on a vertical pin. In another design, the backing element consist also of a sole holder, which is first movable transversely to the longitudinal direction of the ski and is subsequently movable toward the tip of the ski. In the second design, the backing element is resiliently held to absorb shock in its normal position. In the known toe irons of the design described first, the backing element is resiliently held or is held quasi-rigidly in its normal position unless the deflecting force exceeds a predetermined limit. The release function of all these toe irons is impaired by the high friction between the toe portion of the skiing boot and the backing element. This disadvantage is particularly undesirable in shock-absorbing toe irons where the skiing boot is forced against the backing element and automatically follows the movement performed by the sole holder in response to a force acting in a releasing sense transversely to the longitudinal direction of the ski. If such force decreases without having caused a release, the skiing boot must be moved back. It has been found in practice that the restoring force of the toe irons is not sufficient for this purpose so that the skiing boot is caught in the binding in an oblique position relative to the ski and as a rule a fall results.

It is an object of the invention to improve a toe iron of the kind first previously described so that there is virtually no friction between the toe portion of the skiing boot and the backing element for the same.

In a toe iron for safety ski bindings, which toe iron comprises a toe-backing element, which is movable relative to the ski, and extends at right angles to the surface of the ski, and resiliently takes up harmless shocks, this object is accomplished in a simple manner in that the backing element consists of a flexible endless band, which extends around at least one retaining member, which is carried by a part that is secured to the ski. Depending on the requirements, the band may be guided along a straight or convex or concave line transversely to the longitudinal direction of the ski on that side of the band which contacts the toe of the skiing boot.

The band is preferably provided on its periphery with at least one outwardly directed extension, which ensures a positive coupling during a pivotal movement of the toe portion of the boot. If a single extension is provided, the same is disposed in the central vertical longitudinal plane in the normal position of the band. The sole of the boot is suitably provided with a notch for cooperating with that extension.

In a development of the inventive concept just described, the band may be provided with two extensions, which laterally embrace the toe portion of the boot.

Particularly if the band has a nonconcave configuration on the toe-contacting side, it has been found desirable to provide a spring element which is arranged to oppose a movement of the band out of its normal position.

If the band has a nonconcave configuration on the toe-contacting side, the retaining members for the band consist preferably of rollers, which are mounted on vertical pins that are secured to the ski.

It has proved particularly desirable to provide a baseplate and a cover plate, which guide the band between them, the cover plate protruding beyond the band on the side which faces the toe of the boot so that the cover plate prevents also a lifting of the sole of the boot from the ski.

In a special development of the toe iron according to the invention, the retaining member for the band may be pivotally mounted on a vertical pin, which is secured to the ski. In this case, the toe iron may be designed as a so-called double-pivot toe iron, which collapses in response to a twisting force that is dangerous to the leg of the skier. This collapse ensures an extremely quick release of the toe portion of the skiing boot.

According to a development of the invention, the lifting of the sole of the boot from the ski is prevented by simple means in that the band is provided with at least an approximately horizontal flange at least on that portion of the band which normally faces the toe portion of the skiing boot and said flange serves to overlie the top of the toe portion of the sole of the boot. In order to avoid a restriction of the freedom of movement of the band on the retaining member or members by the flange as well as an elongation of the flange material beyond the elastic limit, the flange may be formed with incisions.

Embodiments of the invention will now be described more fully and by way of example with reference to the accompanying drawings, in which

FIGS. 1 to 3 are top plan views showing different embodiments of the endless backing band according to the invention.

FIG. 4 is a vertical sectional view taken through a toe iron on line IV–IV of FIG. 5.

FIG. 5 is a sectional view taken through the toe iron on line V–V of FIG. 4.

FIG. 6 is a sectional view corresponding to FIG. 5 and taken through a toe iron according to a second embodiment.

FIG. 7 is a top plan view showing another embodiment of a toe iron.

FIGS. 8 and 9 are sectional views taken on lines VIII–VIII and IX–IX, respectively, of FIG. 7.

According to the present invention, the toe-backing element consists of a flexible endless band, which extends around at least one retaining element, which is mounted on a part that is secured to the ski. FIG. 1 shows an arrangement of the endless band 1. This band extends around two reversing rollers 2 and 3, which are mounted on pins 4 and 5, respectively, which are, e.g., riveted to a baseplate, not shown. The baseplate is adapted to be connected to the ski 6 by screws. The distance between the two reversing rollers 2 and 3 is so selected that the toe portion of the skiing boot is capable of a sufficiently large damped movement toward both sides so that harmless lateral shocks can be taken up resiliently. In this embodiment, that course of the band 1 which backs the toe portion of the skiing boot extends along a straight line which is transverse to the longitudinal direction of the ski.

In order to avoid a deflection of this course of the belt toward the tip of the ski under the pressure of the toe portion of the skiing boot, baking rollers 7 are provided between the two reversing rollers 2 and 3 and like the latter are freely rotatably mounted on pins 8, which are secured to the baseplate of the toe iron.

In the embodiment shown in FIG. 2, the rollers 2, 3 and 7 are omitted and the retaining member for the endless band 9 consists of a shaped member 10, which extends vertically from the baseplate (not shown) of the toe iron. In this case, that course of the band which contacts the toe portion of the skiing boot bears on the shaped member throughout its length. For this purpose, the shaped member is formed with a convex backing surface so that the band course extends slightly laterally and slightly forwardly toward the tip of the ski 6 on both sides of the center.

The same course of the band has an inverted configuration in the embodiment shown in FIG. 3, where the shaped member 12 for retaining the band has a concave toe-contacting surface. The toe-contacting course of this band has on its inside a longitudinal rib 13, which is dovetail-shaped in cross section. The shaped member is provided with two central retaining lugs 14, which contact the dovetail-shaped rib of the band on top and bottom so as to guide the band.

FIGS. 4 and 5 show a toe iron according to the invention, in which the band 15 is provided on its periphery with two extensions 16 and 17, which serve to laterally embrace the toe portion of the boot. The retaining member for the band consists of a shaped member 18, which has a horizontal wall forming

the baseplate **19** of the toe iron. That baseplate is connected to the ski by screws, not shown.

The band is guided between the baseplate **19** and a cover plate **20**, which is detachably mounted on the shaped member. The cover plate protrudes beyond the toe-contacting course of the band and thus prevents a lifting of the sole of the boot from the ski.

The baseplate **19** of the shaped member **18** carries a central vertical pin **21**, on which a torsion spring **22** is fitted. The pin has at its free end a tapped axial hole **23**, which is in threaded engagement with a screw for holding the cover plate **20**. The upper edge of that wall of the shaped member **18** which is directed toward the tip of the ski has two recesses **24** and **25**, through which respective arms **26** and **27** extend. Each of these arms is formed by one end portion of the spring. A central stop is provided between the two recesses and engageable by the spring arms. The band **15** has a driver rib **29**, which extends between the two spring arms **26** and **27** so that the movement of the band to both sides is opposed by the force of the spring **22**. Upon a decrease of the force which is transmitted to the band from the toe portion of the boot, the same is returned to its normal position by the spring **22**.

FIG. **6** shows a toe iron in an embodiment which is slightly modified from that of FIG. **5**. In this embodiment, the two extensions **16** and **17** of the band **15** are omitted and only one extension **31** is provided on the band **30** which serves to ensure a positive transmission of movement during the pivotal movement of the toe portion of the boot. The sole of the boot is suitably provided with a notch for cooperating with that extension. Besides, the design is exactly the same as that described before so that the description need not be repeated. The same reference characters are used for like parts.

The flexible endless bands according to the invention consist either of plastic material having a low coefficient of friction or are coated on the inside with antifriction material.

FIGS. **7** to **9** show a toe iron in which the band **41** extends around two reversing rollers **42** and **43**, just as in the arrangement shown in FIG. **1**. These rollers are mounted on pins **44** and **45**, respectively, which are held by suitable means in or on a baseplate **46**. Backing rollers **47** are disposed between the two reversing rollers and are also secured to the baseplate by pins **48**. The toe-contacting course of the band **41** has a horizontal flange **49** (see particularly FIGS. **8** and **9**), which serves to overlie the top of the toe portion of the sole of the skiing boot and thus prevents a lifting of the sole from the ski. The flange **49** is formed with incisions **50** in such a number that the band **41** can be reliably reversed.

What I claim is:

1. A toe iron for safety ski bindings comprising a toe-backing element, said toe-backing element being moveable relative to the ski, substantially transverse to its longitudinal direction and extending at right angles to the surface of the ski, to resiliently take up harmless shocks, said toe-backing element comprising a flexible endless band which extends around at least one retaining member, said retaining member being carried by a part which is secured to the ski.

2. A toe iron according to claim **1**, wherein each retaining member for the band comprises a roller, each of said rollers being mounted on a vertical pin secured to the ski.

3. A toe iron according to claim **1**, wherein the band is guided between a baseplate and a cover plate, said cover plate protruding beyond the band on the side facing the toe portion of the boot.

4. A toe iron according to claim **1**, wherein the band consists of plastic material having a low coefficient of friction.

5. A toe iron according to claim **1**, wherein the band is coated on the inside with antifriction material.