

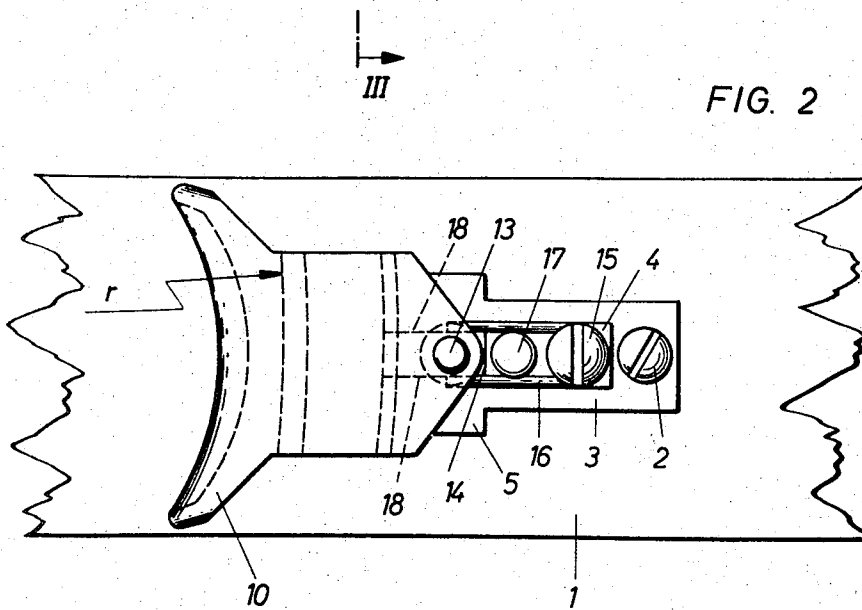
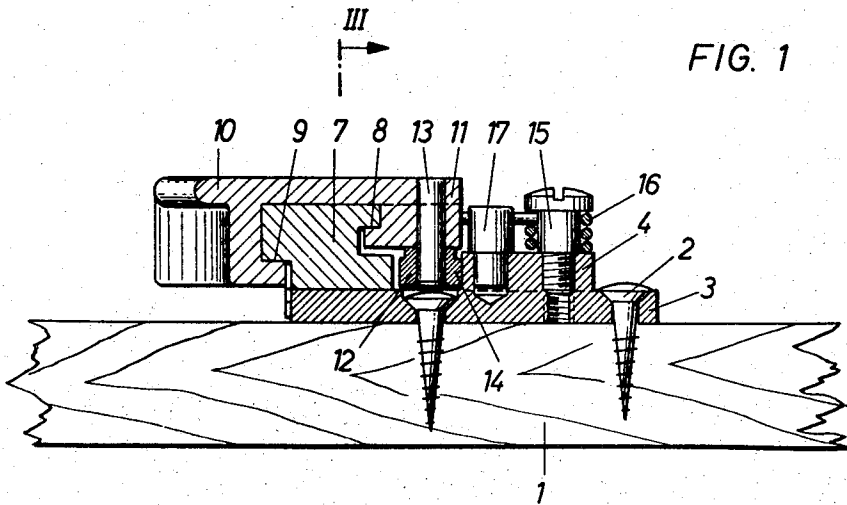
Dec. 17, 1968

H. MARKER
SAFETY TOE IRON

3,416,811

Filed March 20, 1967

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

FIG. 3

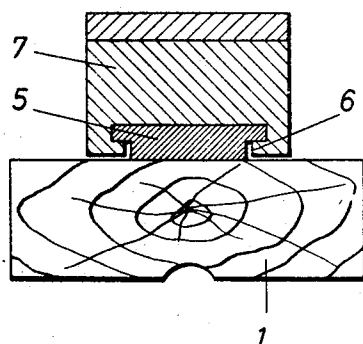
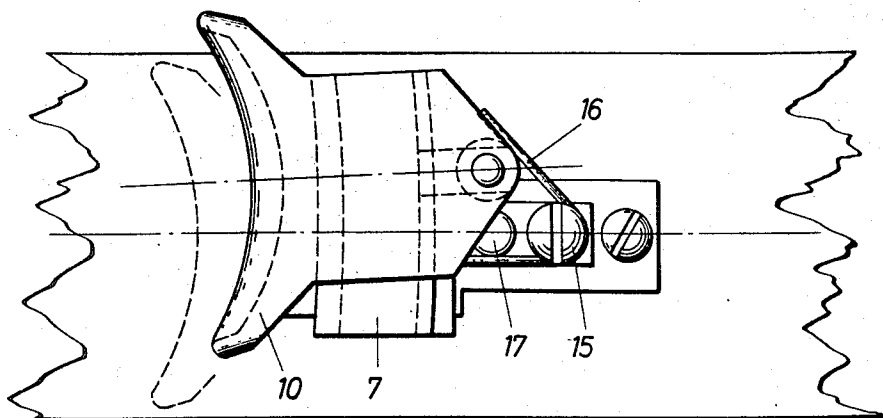


FIG. 4



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3,416,811

SAFETY TOE IRON

Hannes Marker, Hauptstrasse 51-53,

Garmisch-Partenkirchen, Germany

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ABSTRACT OF THE DISCLOSURE

A sole holder is slidably guided in a guide, which extends transversely to the longitudinal direction of the ski. The sole holder is movable forwardly after a predetermined transverse displacement. Resilient means tend to hold the sole holder in its normal position. The guide which extends transversely to the longitudinal direction of the ski is provided on a carriage, which is slidably guided in the longitudinal direction on a base member, which is secured to the ski. The base member comprises a restraining surface for the sole holder. This restraining surface determines the amount of the transverse displacement. The resilient means are arranged to restoring the sole holder from any displaced position to its initial position.

This invention relates to a safety toe iron which is intended for use in ski bindings and in which a sole holder is slidably guided in a guide, which extends transversely to the longitudinal direction of the ski, the sole holder is movable forwardly after a predetermined transverse displacement, and resilient means tend to hold the sole holder in its normal position.

Safety toe irons are known which permit no pivotal movement or only a very small pivotal movement of the boot relative to the ski before a release is effected. These toe irons are ordinarily provided with one of the usual ball detent devices and have the important disadvantage that the foot is released also in response to impact stresses, not only under the action of prolonged lateral and torsional forces, although the impact forces are not transmitted to the leg of the skier in most cases so that a release would not be required.

Other known safety toe irons are capable of damping impact forces within a larger range of displacement. In one embodiment, a vertical pivot pin mounted on the ski has an axial flat, which is engaged by an end of a spring-loaded piston, which is guided in the pivoted member of the toe iron. During an angular movement of the pivoted member, one edge of the flat depresses the spring-loaded piston against the spring force and a restoring torque is produced as the piston tends to return to its initial position. Under the action of a lateral force, the toe iron moves outwardly by an amount which depends on the amount of the acting force. This results in a pivotal movement of the toe iron and of the sole holder about the pivot pin. When the action of force ceases before a release, the toe iron tends to restore the boot to its central position. During this restoring movement, the movement of the sole holder has a component which opposes the action of the tightener spring, which urges the boot forwardly. If the force of the tightener spring exceeds a limit, which is not very high, and the toe iron is moved outwardly beyond a limiting angle, the boot may neither be released nor restored to the central position because the lateral force is insufficient for a release and the restoring force of the piston is

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insufficient for a restoring action against the force of the tightener spring. The resulting angular position of the foot relative to the ski will inevitably result in a fall.

In another known safety toe iron which has a wider damping range of displacement, the detent device which controls the release is not provided between the pivoted member and a part that is fixed to the ski, but between the pivoted member, which is mounted on the pivot pin, and the sole holder, which is pivoted to the pivoted member. In this case the sole holder bears on the boot with two engaging ribs, which are spaced from the center line. A pivotal movement of the boot relative to the ski will cause a pivotal movement of the sole holder about the pivot pin as the sole holder is connected by the detent device to the pivoted member. During this operation, the trailing engaging rib of the sole holder, with respect to the direction of the outward pivotal movement, performs an angular movement which has a component opposing the direction of the force of the tightener spring. As soon as the opposing action of the tightener becomes excessive, the detent device between the pivoted member and the sole holder will be so highly loaded that the force of the detent device is overcome and the sole holder and the pivoted member are pivotally moved relative to each other. This toe iron will be released whenever a predetermined torque has been reached but the range of the damping displacement effected before the release will depend on the tension of the tightener and will be the smaller the larger is the tension of the tightener. This toe iron has also the disadvantage that it is not returned to its central position after a release, such as the other safety toe iron which has been described. Both members must be re-connected by hand against the force of the detent device.

In another known safety toe iron, the sole holder comprises two levers, which are pivoted to respective fixed points disposed before the shoe and are held together by a spring in a position of rest, which corresponds to the central position of the boot. Upon a pivotal movement of the boot relative to the ski, the trailing sole holder lever, with respect to the direction of the outward pivotal movement, engages a stop and the other lever moves with the boot outwardly from its position of rest, which corresponds to the central position of the boot. During this pivotal movement about a point which is fixed to the ski, the latter sole holder lever performs a circular movement having a component in the direction of the tension of the tightener. When this abnormal force ceases to act, this sole holder lever tends to force the boot back against the action of the tension spring of the tightener. For this reason, this toe iron involves also the danger that an excessive tension of the tightener may prevent a return of the boot to its central position even though the binding has not yet released the boot.

The present invention is based on the previously known safety toe iron which has been described first hereinbefore. As with that toe iron, the sole holder is guided in a transverse direction on the ski, preferably along an arc of a circle centered adjacent to the heel, so that there will be no or no substantial displacement of the boot in the longitudinal direction of the ski during a transverse displacement of the sole holder and there will be no need for compensating such longitudinal movement if the boot is to be returned to its central position when an instantaneous lateral force has ceased to act. It is an object of the invention so to improve a toe iron of the known kind that impact forces are damped within a relatively large range of displacement and an instantaneous release of the foot is ensured beyond this range so that the foot

cannot be caught in an intermediate position and the toe iron will be automatically restored to its central position from any position, whether or not the foot has been released.

According to the invention, this object is accomplished in a safety toe iron of the kind defined first hereinbefore in that the guide which extends transversely to the longitudinal direction of the ski is provided on a carriage, which is slidably guided in the longitudinal direction on a base member, which is secured to the ski, the base member comprises a restraining surface for the sole holder, which restraining surface determines the range of the transverse displacement, and the resilient means are arranged to restore the sole holder from any displaced position to its initial position.

In a preferred development of the invention, the base member is provided with a wire torsion spring which has two rearwardly extending, free arms, which embrace abutments provided on the sole holder and on the base member, respectively, and guide faces for the abutment provided on the sole holder extend in the longitudinal direction of the ski on both sides of the abutment which is secured to the base member. The wire torsion spring is a particularly simple means for reliably producing the torque for effecting the restoring movement in the transverse direction and in the longitudinal direction because a release will cause a pivotal movement of one of the free arms of the torsion spring and this free arm will then tend initially to cooperate with the guide face so as to restore the abutment provided on the sole holder, and the sole holder itself, along the guide face, and thereafter to center the abutment provided on the sole holder in the central position along the restraining surface, which extends transversely to the longitudinal direction of the ski. That free arm of the torsion spring which is not involved in this action is held in position by the abutment provided on the base member.

The invention will be explained more fully in the following description with reference to the drawing, which shows two embodiments by way of example.

FIG. 1 is a longitudinal sectional view showing a safety toe iron according to the invention,

FIG. 2 is the corresponding top plan view,

FIG. 3 shows the toe iron of FIG. 1 in a transverse sectional view taken on line III—III of FIG. 1,

FIG. 4 is a top plan view showing the toe iron of FIGS. 1 to 3 in a released condition,

FIG. 5 is a longitudinal sectional view showing a further embodiment, and

FIG. 6 is a sectional view taken on line VI—VI of FIG. 5 showing the lower parts of the toe iron of FIG. 5.

In the embodiment shown in FIGS. 1 to 4, the base member 3 provided with a pad 4 is secured by screws 2 to the ski board 1. In its forward portion 5, the base member 3 is provided with grooves 6, which are engaged by the carriage 7, which is slidable along the grooves. The carriage 7 is provided with guide grooves 8, 9, which extend along circular arcs centered adjacent to the heel of the boot (radius r). The side sole holder 10 has ribs, which mate the grooves 8, 9, and is thus mounted on the carriage for sliding movement transversely to the longitudinal direction of the ski. The movement is facilitated by low-friction coverings of material, which are not shown and may be replaced by roller bearings or the like.

The sole holder 10 is provided in its forward portion 11 with a pin 13, which carries a roller 12. The pad 4 of the base member 3 is provided with a restraining surface 14 on the side facing the sole holder 10. The roller 12 engages the restraining surface 14. The pad 4 is further provided with a mounting pin 15 for the wire torsion spring, and with an abutment pin 17 for the two free arms of the torsion spring 16. The free arms of the wire torsion spring 16 are designed for laterally engaging the abutment pin 17 as well as the abutment faces 18 at the forward portion 11 of the sole holder.

In response to a force which acts transversely to the longitudinal direction of the ski on the boot in the sole holder 10, the latter and the toe edge of the sole of the boot will move along the guides 8, 9 against the force of the spring 16 while the roller 12 is rolling on the restraining surface 14. If the force is of sufficient strength, the sole holder 10 can move along the guides 8, 9 to such an extent that the roller 12 moves beyond the surface 14. As is shown in FIG. 4, the carriage 7 and the sole holder 10 can then move forwardly along the grooves 6 so that the boot is instantaneously released by the sole holder. Upon the release of the boot, the action of force on the sole holder ceases and the torsion spring 16 pushes the sole holder back to its central position. To this end the forward portion 11 of the sole holder 10 is first moved rearwardly and then toward the center.

FIGS. 5 and 6 show another design of the safety toe iron according to the invention. This embodiment can be manufactured at particularly low cost. The base plate 19 may be made from sheet metal and is secured by the screws 20 to the ski board 21. The baseplate 19 is upturned on two sides to form a guide 22, 23, which extends transversely to the longitudinal direction of the ski. A tongue 24 is struck from the baseplate and serves as a stop for the pin 25. A mounting pin 26 is provided in the baseplate and mounts the wire torsion spring 27, which has free arms engaging the pin 25 and the side faces of the tongue 24.

Low-friction coverings of plastics material are provided in the guide 22, 23, which receives a sliding member 28. The latter has upturned side lugs 29, which form a guide in the longitudinal direction of the ski. The sole holder 30, which is formed with mating grooves, is slidably mounted in this guide. A pin 25 is secured to the sole holder and serves as a stop for engaging the restraining surface of the tongue 24 and the free ends of the torsion spring 27.

Just as in the embodiment described hereinbefore, a lateral force acting on the boot will cause a displacement of the sole holder transversely to the longitudinal direction of the ski until the pin 25 has moved beyond the restraining surface 31 of the tongue 24 and the sole holder 30 can move forwardly together with the sliding member or carriage 28. When the foot has been released, the torsion spring 27 returns the sole holder to its initial position. To this end, the pin 25 is moved first along one of the side faces of the tongue 24 and then along its restraining surface 31. The low-friction coverings of plastics material are indicated at 32.

What is claimed is:

1. A safety toe iron which is intended for use in ski bindings and in which a sole holder is slidably mounted in a guide, said guide extending transversely to the longitudinal direction of the ski, said sole holder being movable forwardly after a predetermined transverse displacement, and resilient means tending to hold said sole holder in its normal position, characterized in that the said guide which extends transversely to the longitudinal direction of the ski is provided on a carriage, said carriage being slidably mounted in the longitudinal direction on a base member, said base member being secured to the ski, said base member comprising a retaining surface for the said sole holder, said restraining surface determining the range of the transverse displacement, and the said resilient means being arranged to restore the sole holder from any displaced position to its initial position.

2. A safety toe iron according to claim 1, characterized in that the guide which extends transversely to the longitudinal direction of the ski is curved along an arc of a circle which is centered adjacent to the heel.

3. A safety toe iron according to claim 1, characterized in that the said base member is provided with a wire torsion spring which has two rearwardly extending, free arms, said arms embracing abutments provided on the said sole holder and on the said base member, respectively, and said abutment on said sole holder having guide

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faces extending in the longitudinal direction of said ski on
both sides of said abutment on said sole holder.

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5 BENJAMIN HERSH, *Primary Examiner.*

L. D. MORRIS, JR., *Assistant Examiner.*