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[54] TOE IRON SAFETY SKI BINDINGS

7 Claims, 4 Drawing Figs.

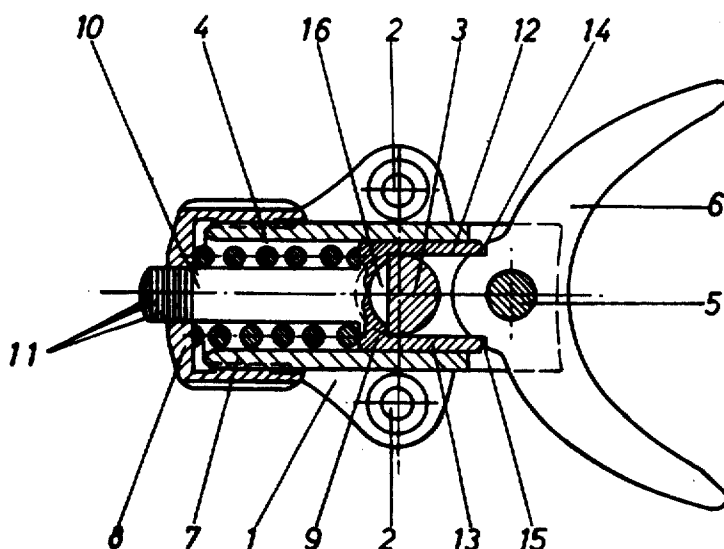
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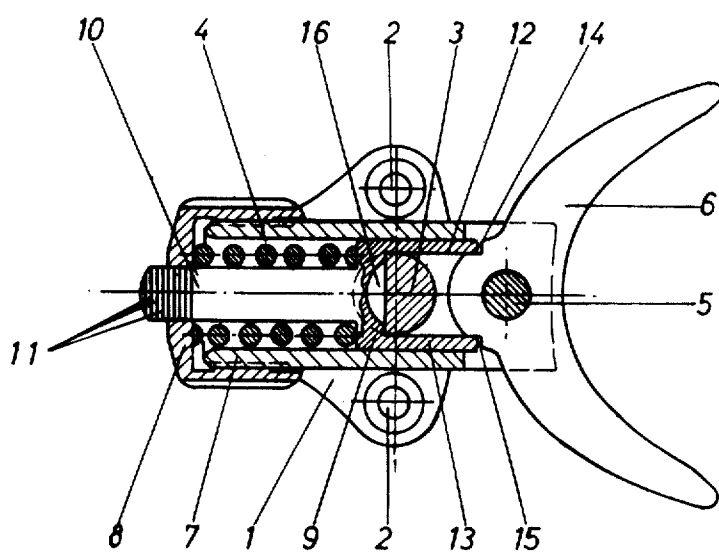
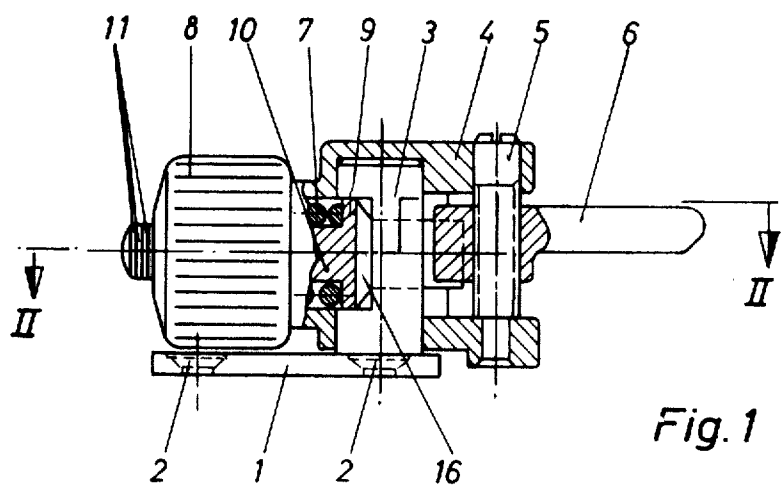
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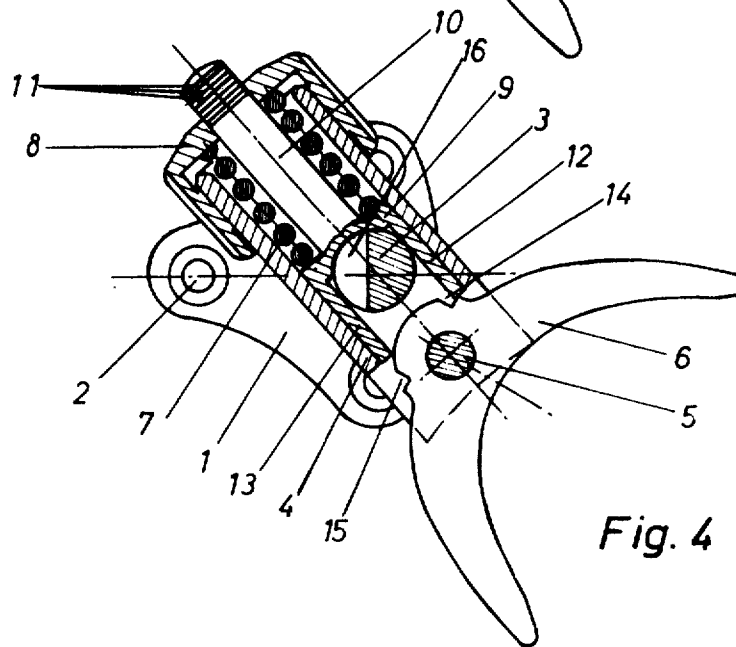
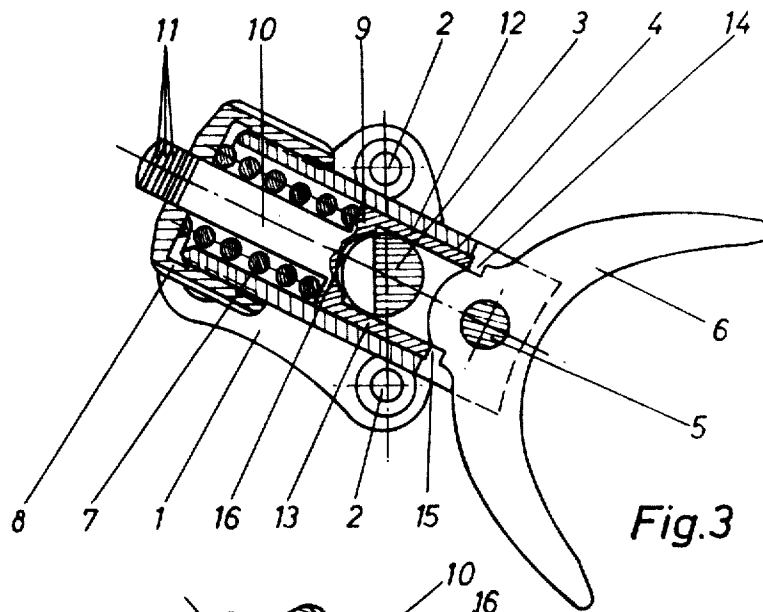
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ABSTRACT: A soleholder carrier is mounted on a toe iron member that is fixed to the ski. The soleholder carrier is mounted on said toe iron member for rotation about a vertical pivot pin against the force of a helical compression spring and forms a stop, which is engageable by the toe portion of the boot and is so shaped that the boot will not be moved in the longitudinal direction of the ski, or will be moved only to a negligible extent in said direction, before the toe iron has reached its released position. The helical compression spring is mounted in a horizontal recess of the soleholder carrier and bears at one end on the carrier by means of an adjustable stop. The spring acts at the other end by means of a piston on a flat formed on the pivot pin. The piston is formed with a vertical recess at its end facing the pivot pin. The width of said vertical recess is smaller than the width of the flat formed on the pivot pin.







TOE IRON SAFETY SKI BINDINGS

The present invention relates to a toe iron for safety ski bindings having a soleholder carrier, which is mounted on a toe iron member that is fixed to the ski. The soleholder carrier is mounted on said toe iron member for rotation about a vertical pivot pin against the force of a helical compression spring and forms a stop, which is engageable by the toe portion of the boot and shaped so that the boot will not be moved in the longitudinal direction of the ski, or will be moved only to a negligible extent in said direction, before the toe iron has reached its release position. The helical compression spring is mounted in a horizontal recess of the soleholder carrier and bears at one end on the carrier by means of an adjustable stop whereas the spring acts at the other end on a flat formed on the pivot pin by means of a piston.

In toe irons having a ball detent for locking a pivoted soleholder carrier relative to a member which is fixed to the ski, that known toe iron has the generally desirable feature that the forces which act obliquely or transversely to the longitudinal direction of the ski can be resiliently taken up by a progressively increasing resistance presented by the spring.

On the other hand, those toe irons have the disadvantage that the elastic zone is not limited so that the boot must virtually squeeze itself out of the soleholder. This gives rise to considerable friction forces, which do not enable a check and exact adjustment of the force which is really required for a release. There is then always the danger that the boot might be blocked in a position in which the boot is oblique relative to the ski and in which the ski can no longer be controlled, so that a fall is inevitable.

For this reason it is a main feature of the present invention to avoid these disadvantages in a simple manner in a toe iron of the kind first previously defined and thus to provide a toe iron which positively and suddenly releases the toe portion of the boot at the end of a sufficiently large elastic zone.

In a toe iron for safety ski bindings, which toe iron comprises a soleholder carrier, which is mounted on a toe iron member that is fixed to the ski, the soleholder carrier is mounted on said toe iron member for rotation about a vertical pivot pin against the force of a helical compression spring forming a stop. The stop is engageable by the toe portion of the boot and is so shaped that the boot will not be moved in the longitudinal direction of the ski, or will be moved only to a negligible extent in said direction, before the toe iron has reached its release position. The helical compression spring is mounted in a horizontal recess of the soleholder carrier and bears at one end on the carrier by means of an adjustable stop whereas the spring acts at the other end by means of a piston on a flat formed on the pivot pin. The piston is formed with a vertical recess at its end facing the pivot pin and the width of said vertical recess is smaller than the width of the flat formed on the pivot pin.

When a toe iron thus designed is subjected to a force which is transverse to the longitudinal direction of the ski and larger than the retaining force but smaller than the force required for a release, the helical compression spring will be compressed as a result of the pivotal movement of the soleholder carrier because the piston bears on the corresponding edge of the flattened pivot pin, just as in the known toe iron.

When the spring is relaxed because the force decreases, the toe iron is returned to its normal position. If the acting force is as large as or larger than the force required for a release, the soleholder carrier initially performs a pivotal movement against the progressively increasing spring force until the edge of the flattened pivot pin enters the recess of the piston. As the soleholder carrier then continues its pivotal movement, the piston is no longer moved against the spring so that in this pivotal movement the soleholder carrier must overcome only the relatively small bearing friction. When the elastic zone has been traversed, the toe portion of the boot is virtually suddenly released by the toe iron as soon as an exactly defined point has been reached.

It has proved desirable to provide a piston in which said recess is rounded, with its axis of curvature being parallel to the pivot pin and its radius of curvature equaling the radius of the pivot pin.

The axis of curvature of the recess lies preferably in the plane of symmetry of the piston. In case the toe iron is to release the boot on one side in response to a force which is different from the force required for a release on the other side, this can easily be accomplished in that the axis of curvature of the recess of the piston is correspondingly offset from its plane of symmetry. In this case, two different toe irons are required for a pair of skis and each toe iron must be properly marked.

The known toe iron first previously defined has an additional disadvantage in that a large force and a tool are required for an adjustment of the force that is required for a release.

In a development of the invention, this disadvantage is avoided in that that portion of the soleholder carrier which receives the helical compression spring is provided on its free end portion with external screw threads and that an internally threaded cap is threaded on said external screw threads and serves as an adjustable abutment for the spring.

The lead of the screw thread and the size of the cap are selected so that a manual adjustment can easily be effected without the aid of a tool.

A rod is desirably connected to the piston and extends outwardly through an axial bore in the cap so that the length of the rod end portion which protrudes from the cap may serve as a parameter which indicates the adjusted force that is required for a release. This is another advantage over the known toe iron, which enables only a more or less exact estimate of the adjusted force that is required for a release.

Another feature of the present invention can be desirably embodied in a toe iron in which a soleholder is mounted on its carrier for a free rotation about a vertical axis and is normally locked against a rotation by a locking means, preferably in a toe iron of the kind previously described, said feature residing in that the locking means for the soleholder is releasable in response to the outward pivotal movement of the carrier. In this design, soleholders having long wings may be used, for various known reasons.

The locking elements preferably consist of two extensions of the piston, which extensions extend like a fork past the pivot pin and coast with mating portions provided on the soleholder and consist of recesses, extensions or the like.

An embodiment of the invention will now be described in detail and by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a side elevation showing a toe iron which is partly cut open for a better representation.

FIG. 2 is a sectional view taken on line II-II in FIG. 1.

FIG. 3 is a view similar to FIG. 2 showing the toe iron with the soleholder carrier after a pivotal movement of the soleholder carrier almost to the release position.

FIG. 4 is a view similar to FIG. 3 and showing the soleholder carrier after a pivotal movement beyond the release position.

The toe iron comprises a baseplate 1, which has three screw holes 2, which enable a connection of the baseplate 1 to a ski with screws. A vertical pivot pin 3 is riveted into the baseplate. A soleholder carrier 4 is rotatably mounted on the pivot pin. A soleholder 6 is held on the carrier 4 by a vertical screw 5. In the normal position of the toe iron, the soleholder is locked against a pivotal movement by means which will be described hereinafter. By an actuation of the screw 5, the soleholder can be screwed to a higher or lower position for adaptation to skiing boot soles differing in thickness. On its side remote from the soleholder 6, the carrying member 4 has a hollow-cylindrical, horizontal part, which contains and carries a helical compression spring 7. This spring bears at one end on a screw cap 8, which is threaded on external screw threads formed on the end portion of the hollow-cylindrical part of the carrier 4. The spring 7 bears at its other end on a piston 9, which normally bears on a flat formed on the pivot pin 3. The piston has a

piston rod 10, which extends through the helical compression spring 7 and has a free end portion, which extends outwardly through an axial bore of the screw cap 8. The free end portion of the piston rod 10 is provided with markings, which consist, e.g., of thin washers 11 in different colors. As will be described in more detail hereinafter, these washers serve to indicate the adjusted force which is required for a release. At its end remote from the rod 10, the piston 9 carries two extensions 12 and 13, which extend like a fork past the pivot pin 3 and serve to lock the soleholder 6. To this end the extensions 12 and 13 cooperate with recesses 14 and 15 of the soleholder.

According to the present invention, that end face of the piston 9 which confronts the pivot pin 3 is formed with a rounded vertical recess 16. The chord length of the round portion of the recess is smaller than the width of the flat formed on the pivot pin so that the piston has two backing surfaces on opposite sides of the recess 16 and said backing surfaces normally engage the flat formed on the pivot pin. The arrangement of the recess 16 is such that its axis of curvature corresponds to the radius of the pivot pin. Besides, the axis of curvature of the recess lies in the plane of symmetry of the piston 9 so that the two backing surfaces of the piston are in mirror symmetry relative to each other.

FIG. 2 shows the toe iron in its normal position. When the soleholder 6 is subjected during skiing to a force which is transverse to the longitudinal direction of the ski and exceeds the retaining force, said force causes a pivotal movement of the carrier 4 about the pivot pin 3 because the soleholder is locked to the carrier. The helical compression spring 7 is compressed during this pivotal movement because the piston 9 bears on the corresponding edge of the flat. This position of the toe iron is shown in FIG. 3. When the force decreases, the restoring torque generated by the spring 7 causes the carrier 4 to return.

When the soleholder is subjected to a force which is transverse to the longitudinal direction of the ski and endangers the leg of the skier, the force will initially result again in a pivotal movement of the soleholder carrier 4 in the previously described manner. When the elastic zone, which is structurally defined, has been traversed, the pivotal movement of the carrier is continued beyond the elastic zone, which is structurally defined; the edge of the flat formed on the pivot pin 3 enters the recess 16 of the piston 9 so that the piston is not moved further against the spring 7 and the stress of the latter is not increased. As a result, only the bearing friction of the parts which rotate on the pivot pin 3 must be overcome during the second part of the pivotal movement. When the toe iron is initially in its normal position, an outward pivotal movement of the soleholder carrier 4 will also initiate the unlocking of the

soleholder 6. The arrangement is such that the interengagement between one extension 12 or 13 and the corresponding recess 14 or 15 of the soleholder will be eliminated when the soleholder carrier has been pivotally moved to the end of the elastic zone.

This design enables the use of a soleholder which embraces the toe portion of the boot to a large extent so that the skier can easily and quickly step into the binding.

What I claim is:

1. A toe iron for safety ski bindings comprising pivot axis means defining a pivot axis fixed to the ski, a soleholder carrier mounted on said pivot axis means and disposed to pivot about said pivot axis, a soleholder member pivotally mounted on said soleholder carrier, said pivot axis means defining a flat surface, a piston engaging the flat surface of pivot axis means, a spring mounted in said soleholder carrier biasing said piston toward said flat surface, with the surface of said piston engaging said flat surface defining a recess having a width smaller than the width of said flat surface.

2. A toe iron as set forth in claim 1 including a locking means restricting rotation of the soleholder member relative to the soleholder carrier and being releasable in response to a predetermined pivotal movement of the soleholder carrier.

3. A toe iron as set forth in claim 1, wherein said recess is rounded with its axis of curvature parallel to said pivot axis and its radius of curvature equal to the radius of curvature of the pivot axis means.

4. A toe iron as set forth in claim 3, wherein said recess has an axis of curvature lying in the plane of symmetry of said piston.

5. A toe iron as set forth in claim 1, wherein said spring is a helical compression spring and is received in a horizontal recess defined by said soleholder carrier and a cap is threadedly engaged with said soleholder carrier, said cap serving as an adjustable abutment for said helical compression spring.

6. A toe iron as set forth in claim 5, wherein a rod is connected to said piston and extends outwardly through an axial bore in said cap.

7. A toe iron for safety bindings comprising a pivot axis means, defining a pivot axis fixed to the ski, a soleholder carrier mounted on said pivot axis means and disposed to pivot about said pivot axis, a soleholder member pivotally mounted on said soleholder carrier, a spring-biased piston bearing against a flat surface of said pivot axis means, said piston being constructed to form forklike extensions, which extend past said pivot axis means to cooperate with mating portions defined by said soleholder member.