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Salomon

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[54] **SAFETY FIXING DEVICES FOR SKIS**

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[52] **U.S. Cl.** ..... **280/11.35 K**

[51] **Int. Cl.**[2] **A63C 9/08**

[58] **Field of Search**...280/11.35 Y, 11.35 E, 11.35 D, 280/11.35 A, 11.35 K, 11.35 R

[56] **References Cited**

UNITED STATES PATENTS

3,244,431	4/1966	Hatlapa	280/11.35 E
3,410,568	11/1968	Wiley	280/11.35 K
3,432,179	3/1969	Marker et al.	280/11.35 Y
3,489,424	1/1970	Gertsch et al.	280/11.35 K
3,672,694	6/1972	Whittaker	280/11.35 K
3,741,576	6/1973	Salomon	280/11.35 H

FOREIGN PATENTS OR APPLICATIONS

388,834	6/1965	Switzerland	280/11.35 Y

Primary Examiner—David Schonberg
Assistant Examiner—Milton L. Smith

[57] **ABSTRACT**

A safety binding device for securing one extremity of a boot on a ski, in which the boot is rigidly fixed on a first ramp adapted to co-operate with a second ramp secured to a bridge member mounted on the ski, the two ramps being symmetrically shaped with respect to the longitudinal axis of the boot, the bridge member including a portion movable between a first position in which the moving portion of the bridge member is raised with respect to the ski, and a second low position in which the moving portion of the bridge member is locked with respect to the ski, the second ramp mounted on the ski being rigidly fixed to the moving portion of the bridge member, the binding device being characterized in that, for each possible point of contact between the two ramps, the angle formed between the tangent to the profile of the ramp mounted on the ski and a straight line perpendicular to the longitudinal axis of the ski is constantly greater than the sum of the angle of friction at the point of contact of the two ramps and the angle formed between the longitudinal axes of the ski and the boot.

4 Claims, 2 Drawing Figures

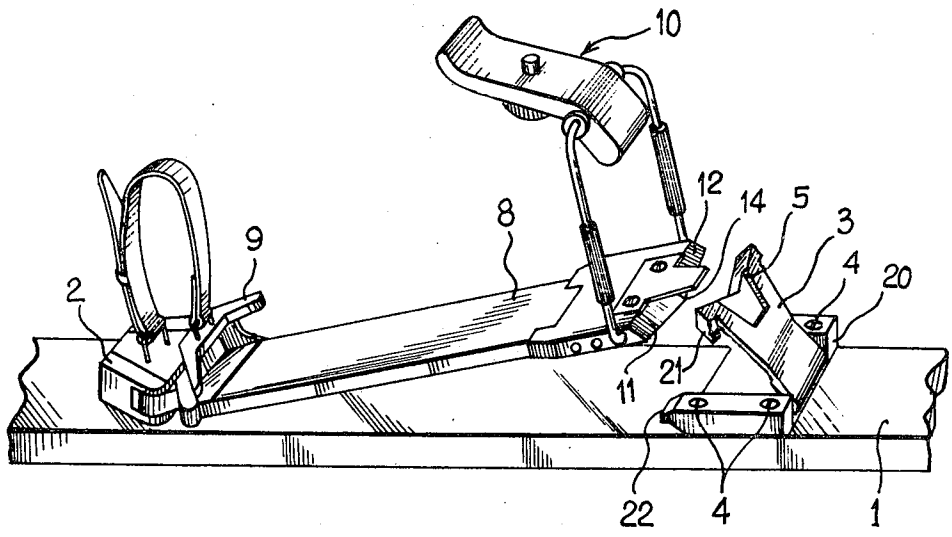


FIG.1

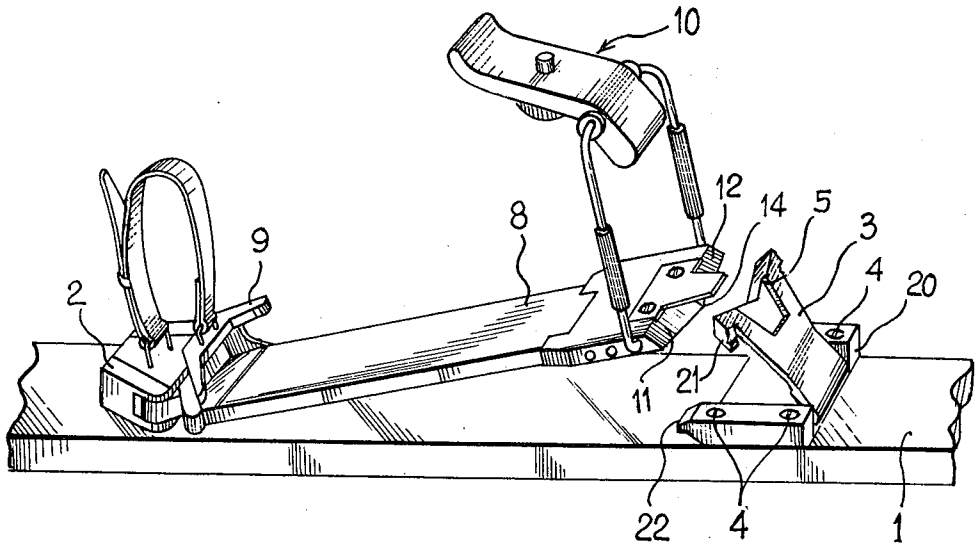


FIG.2

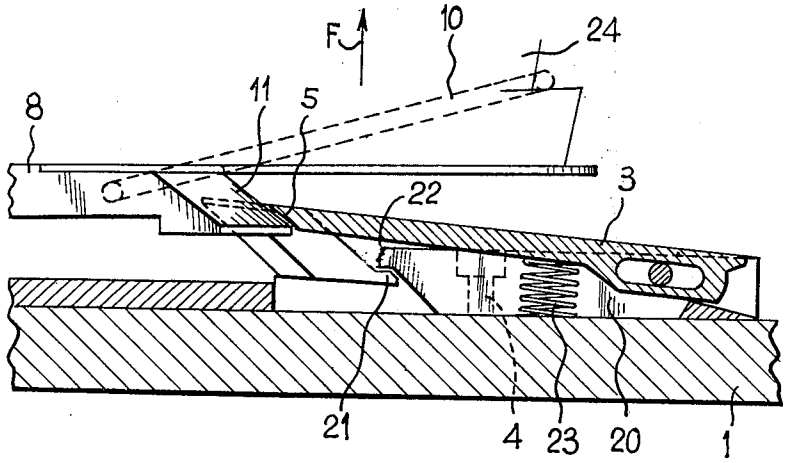


FIG.3

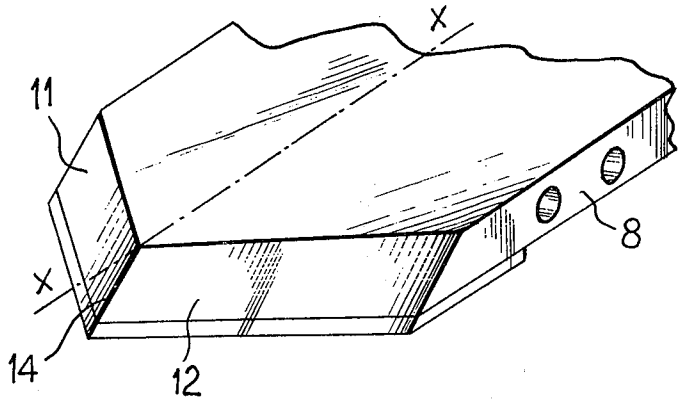
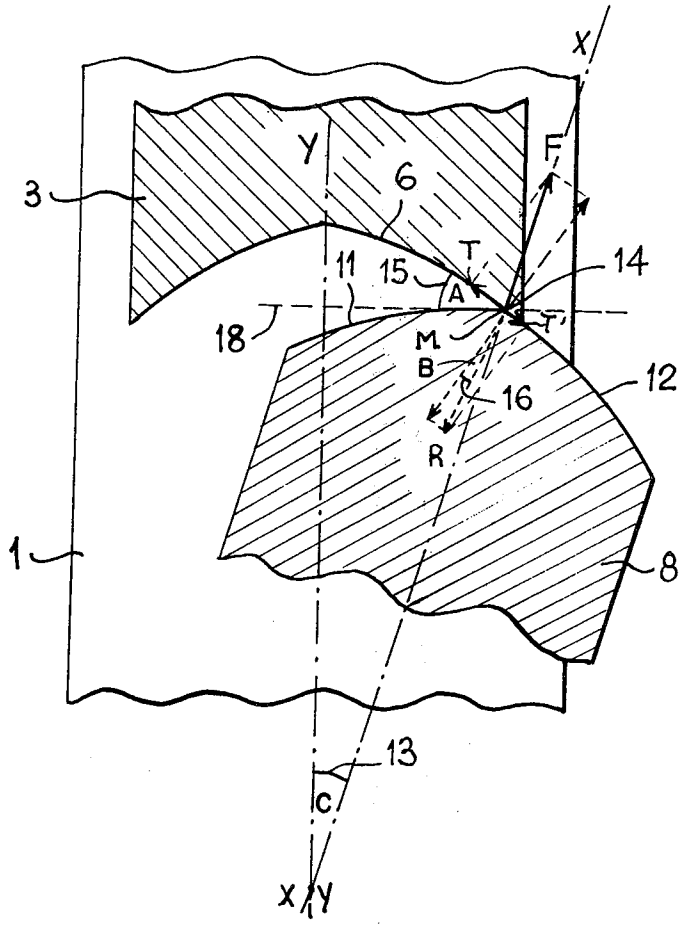


FIG.4



SAFETY FIXING DEVICES FOR SKIS

The present invention relates to safety binding devices for skis in which the boot is temporarily or permanently fixed to an added member intended to co-operate with a corresponding retaining member fixed to the ski.

This type of binding device has a certain number of disadvantages due to its structure, especially when putting on skis, in particular in the case where the added member is smaller in size than the sole and is thereby hidden from the skier's view, this member must nevertheless be engaged with maximum accuracy in the retention member fixed on the ski.

With known devices, this amounts to a delicate operation, necessitating on the skier's part, on the one hand a certain dexterity, and on the other hand checking to see if the boot is suitably in position with respect to the ski.

In order to comply with the conditions of safety and convenience of use, the co-operating members must ensure, in addition to the retention of the boot, its correct positioning with respect to the axis of the ski when putting on the latter, and this applies even in the case where the user might present his boot slantwise with respect to the axis of the ski. It is therefore essential to provide a guiding action between the members of the boot and of the ski in order to achieve correct positioning.

The present invention proposes to improve the performance of these binding devices of the added member type, by providing a new structure for the contacting profiles of these members.

Devices of the added member type have already been proposed; in particular they include a plate fixed temporarily under the sole of the boot and comprise on the one hand an elastic device co-operating with one extremity of the plate and on the other hand a fixed member in the form of a bridge co-operating with the other extremity of the plate.

In these known devices, the extremity of the plate co-operating with the bridge member has an inclined profile of wedge shape which comes into contact by the thrust of the elastic system, with a bridge profile which may have different shapes.

Thus, in a known construction, the profile of the plate is an inclined plane which is supported against an edge of the bridge member which has approximately the shape of a U in horizontal cross-section.

In another form of construction, the profile of the bridge member is constituted by one or more frusto-conical studs applied against inclined planes of the bridge member which has an arcuate form in horizontal cross-section.

However, these known constructions have the disadvantage either that they do not permit sufficient guiding of the added plate when putting-on the skis, or of necessitating a considerable force in order to overcome the friction forces between the plate and the skis. In fact, in these known constructions, the centering action can only be effected when the added member is in contact with the ski since the bridge member is fixed with respect to the ski.

The present invention proposes to provide a simple, economic and effective solution for the problems referred to above. In its general aspect, the invention is applied to a binding device ensuring the retention of a

boot on a ski, in which the boot includes a first ramp (formed either directly to the sole of the boot, or belonging to a member fixed permanently or temporarily to the boot) intended to co-operate with a second ramp fixed on the moving portion of a bridge member mounted on the ski; the two ramps are respectively symmetrical in relation to the longitudinal axis of the boot and in relation to the longitudinal axis of the ski.

The mobile portion of the bridge member is movable between two positions:

a first position in which the moving portion of the bridge is raised with respect to the ski;

a second position in which the mobile portion of the bridge is lowered and locked on the ski.

The transition from the first to the second position, by the action of the boot, is effected against the action of an elastic member.

In particular, the bridge member may be of the type described in the co-pending application of Aug. 21st 1973, Ser. No. 390,245 in the name of Georges, Pierre, Joseph, SALOMON.

According to the invention, the above device is characterized in that for each possible point of contact between the two ramp, the angle formed by the tangent to the profile of the ramp fixed to the mobile portion of the bridge member and a straight line perpendicular to the longitudinal axis of the ski is constantly greater than the sum of the friction angle at the point of contact of the two ramps and the angle formed by the longitudinal axes of the ski and the boot.

By means of the combination of this particular profile of one of the ramps and of a bridge member comprising a moving portion, the plate fixed on the boot slides without force on the opposite surface of the bridge member and is engaged in this latter. In fact, during the "step-in" phase of putting on the skis, the skier easily overcomes the friction forces between the bridge member and the plates, acting against the downward movement of the plate-moving portion assembly of the bridge. In particular, the skier utilizes the weight of his body to overcome the friction forces.

A well-known principle of the mechanics of parts in friction makes it possible to state that if the friction is overcome in one direction, it is overcome in all the other directions, and, especially in the present case, in the direction in which the friction forces oppose the re-centering of the boot. The result is that the inequality between the angle defined above must be understood in the strict sense, namely that it is only necessary for the angle formed by the tangent to the profile of the ramp fixed to the moving portion of the bridge member and a straight line perpendicular to the longitudinal axis of the ski should be constantly greater than or equal to the sum of the friction angles of the ramps sliding with respect to each other and of the angle formed by the longitudinal axes of the ski and the boot, in order that the centering action may be easy, in other words, even with ramp profiles having an angle less than that which would be necessary if the bridge member were fixed, the plate is centered without effort and very conveniently in the fixing device.

The invention, which combines a special ramp profile with a step-in bridge member comprising a moving portion, thus provides an automatic and effortless centering action of the added plate.

The profile of the ramp in a horizontal plane will advantageously be a broken line in the form of a V for ex-

ample, the point of which is located in the normal position, substantially on the axis of the ski. It will however be understood that it would be possible to adopt in the horizontal section a form other than the broken form, and especially a curved form.

In addition, although the invention is not limited to the particular case which will be described below, the invention will be described as applied to the case of a binding device with a plate added temporarily under the sole of the boot. It will be understood in fact, that the invention relating to the structure of the co-operating ramps, this structure could equally well be applied to the case in which one of the ramps is formed directly on the sole of the boot or belongs to a member permanently fixed on the sole.

There will now be described below, by way of non-limitative example, a preferred form of construction according to the invention, reference being made to the accompanying drawings, in which:

FIG. 1 shows a general view in perspective of a binding device of the type with a member added under the sole of the boot;

FIG. 2 is a partial vertical section of a detail to a larger scale of FIG. 1, showing the co-operation of the bridge profiles of the plate;

FIG. 3 represents a perspective view showing the shape of the ramp and the plate of FIG. 2;

FIG. 4 is a view in partial horizontal cross-section of a detail of FIG. 1, to a larger scale, showing the diagram of forces.

Referring now to FIG. 1, where has been shown at 1 a ski, on which there are fixed:

On the one hand an elastic system 2 co-operating with the front of the boot, and which may be of the type described in the co-pending application filed May 8th 1973, Ser. No. 358,329, in the name of Georges, Pierre, Joseph SALOMON and,

on the other hand, a bridge member 20 fixed with respect to the ski; the bridge member 20 comprises a moving portion 3 movable with respect to the ski between two positions:

a first position in which the moving portion of the bridge member is raised with respect to the ski (the case of FIG. 1);

a second ion position in which the moving portion of the bridge member is locked with respect to the ski by means of the nose 21 and the abutment 22 (the case of FIG. 2).

The transition from the first position to the second position, under the action of the boot, is effected against the action of a lifting spring 23 (FIG. 2) and especially against the action of the elastic device 2.

The front of the moving portion of the bridge member 3 has an inclined guiding ramp, indicated generally at 5 and having in the horizontal plane a V-shape 6 (FIG. 4).

In addition, a plate 8 is fixed temporarily under the sole of the boot 24, on which it is held:

On the one hand by a front jaw 9 under which is engaged the point of the boot and,

on the other hand by a locking system 10 of conventional type, which will not be described in detail.

The rear ramp formed on the plate 8 and intended to co-operate with the ramp 5 of the moving portion of the bridge member is essentially constituted by two surfaces 11 and 12 having a V-shape in horizontal section and converging towards the longitudinal axis X—X of the plate (FIGS. 1 and 3). The inter-section edge 14 of these two surfaces 11 and 12 is located in the vertical plane of symmetry.

There will now be described with reference to FIG. 4, showing the diagram of forces, the particular profile of the ramp 6. FIG. 4 is a view in partial horizontal cross-section of the ramp systems 6 and 11, 12, fixed respectively on the moving portion of the bridge member 3 and the plate 8.

The axis Y—Y is the longitudinal axis of the ski, the axis X—X is the longitudinal axis of the plate and also that of the boot. There has been designated by C the angle 13 formed by these two longitudinal axes of symmetry. The point M is the point of contact between the intersection edge 14 of the surfaces 11 and 12 and the ramp 6. There has been designated by A the angle 15 formed by the tangent to the profile 6 at the point of contact M with a straight line 18 perpendicular to the longitudinal axis of the ski. F designates the force applied by the skier's boot on the ramp 6. This force is directed along the axis X—X of the boot. It is noted that for all locations of the point M not on the longitudinal center line of the ski, the distance from the center of pivoting of the ski boot to the profile of the ramp on the boot is less than the distance from the center of pivoting to the point of the ramp on the bridge member located in the longitudinal axis of symmetry.

The edge 14, rigidly fixed to the plate 8, slides on the ramp 6 if, in the contact zone, the component T of the force F along the tangent or profile 6 is greater than the component T' of the friction force R along this same tangent to the profile 6. There has been designated by B the friction angle 16 at the point of contact M between edge 14 and the ramp 6; the angle of friction B is the arc of tangent is the coefficient of friction of the contacting ramps. It can be established very simply that this inequality between the forces T and T' results in a condition of the angles A, C and B.

According to the invention, the component T of the force applied by the skier is greater than the component T' of the friction force and the angle A is greater than the sum of the angles B and C: $A > B + C$. Thus, the profile of the ramp fixed on the bridge member must be such that the angle formed by the tangent to the profile of the ramp mounted on the ski and a straight line perpendicular to the longitudinal axis of the ski is constantly greater than the sum of the angle of friction and the angle formed by the longitudinal axes of the ski and the boot.

The edge 14 slides all the better as the angle A is large. However, for other reasons and especially to facilitate the operation of the safety system, especially during a lateral fall, it is preferable to limit the angle A to values comprised between 10° and 35° and preferably in the vicinity of 30°.

This result is obtained according to the invention by adjusting, as hereinafter explained the ramp profile defined above to the moving portion of a bridge member. In fact, when putting on the skis, the moving portion of the bridge is actuated by the shoe and pivots into the lowered position. To gain convenience and to overcome the friction forces, the skier can carry the weight of his body on the foot on which the ski is engaged. During this movement from the top to the bottom, the edge 14 slides over the ramp 5 fixed on the moving portion 3 of the bridge (FIGS. 1 and 2) in a vertical plane. For this reason, the friction forces acting in opposition

to the sliding movement of the edge **14** in another direction, especially in the transverse centering direction, are considerably reduced. In other words, the friction angle B is in the vicinity of zero. Thus, as soon as the edge **14** slides over the ramp **5** of the moving bridge member, under the action of the skier who puts on a ski, the foregoing relation between the angles is reduced to the following inequality:

$A > C$

The profile of the ramp fixed on the bridge member must be such that the angle formed by the tangent to the profile of this ramp and a straight line perpendicular to the longitudinal axis of the ski is constantly greater than or equal to the angle formed by the longitudinal axes of the boot and of the ski.

As shown in FIG. **4**, the angles formed by the longitudinal axis of the ski boot and the longitudinal axis of the ski and by the longitudinal axis of the ski boot and a line perpendicular to the longitudinal axis of the ski are complementary angles whose sum is equal to **90°**.

Also, the angle formed by the tangent to the profile of the ramp on the bridge member and the longitudinal axis of the ski boot is the sum of the angles formed by the line perpendicular to the longitudinal axis of the ski and the longitudinal axis of the ski boot and the tangent to the profile of the ramp on the bridge member and must be greater than a **90°** angle and is greater by the angle of friction.

Thus, by adopting the present type of ramp on a moving bridge member, the value of the angle A can be limited to values in the vicinity of **30°**, while retaining the advantage of automatic centering arrangement of the added plate.

The invention thus makes it possible to construct binding devices which operate correctly with relatively small angles A (**15**). The result is that the ramps of the bridge member may extend practically over the entire width of the ski without having too large longitudinal dimensions on the ski. The invention thus permits of ensuring a centering action from positions which are farther off-center than would be permitted by known binding devices. There is therefore an improvement in the convenience of use.

The invention is not restricted to the example of construction shown and described in detail, since various modifications may be made thereto without thereby departing from its scope.

What I claim is:

1. In a safety binding device for skis, a system for automatically positioning the boot of a skier with respect to the axis of the ski when the skier puts on his ski; the sole of the boot of the skier bearing a first ramp symmetrically shaped with respect to the longitudinal axis of the boot; said system being composed of a bridge-member mounted on the ski, said bridge member including:

a movable portion;

a second ramp fixed on said movable portion, said ramp being symmetrically shaped with respect to the longitudinal axis of the ski and adapted to cooperate with said first ramp for locking the boot with respect to the movable portion: the angle between the tangent to the profile of the second ramp and the axis of the first ramp of said ski boot exceeding **90** degrees and the profile of the first ramp being at a distance from the center of pivoting of the ski boot less than the distance from said center of pivoting to the point of the first ramp located in the longitudinal axis of symmetry;

said portion being movable between two positions:

a first position for which said portion is raised with respect to the ski,

a second low position for which said portion is folded onto the ski and locked with respect thereto and for which said first and second ramps cooperate to lock the boot with respect to said movable portion;

said movable portion being actuated from said first position to said second position by the skier with the sole of his boot when he puts on the ski.

2. A device as claimed in claim **1**, in which the profile of at least one of said ramps in horizontal section is of V-shape, having its point substantially on the axis of said ski.

3. A device as claimed in claim **1**, in which the profile of at least one of said ramps is a curved line in horizontal section.

4. A device as claimed in claim **1**, in which said first ramp rigidly fixed on the boot is fast with a member added removably to said boot.

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