United States Patent

[11] **3,578,804**

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[33] **France**
[31] **134,220**

[54] **SAFETY ABUTMENT OF SKI BINDING**
3 Claims, 9 Drawing Figs.

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

[56] **References Cited**
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3,037,785	6/1962	DePlace	280/11.35HA
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ABSTRACT: A safety abutment of a front ski safety binding for coacting with the rounded toe end of a ski boot upper instead of with the sole portion thereof, the abutment device being so designed that it can coact with ski boots of different designs and sizes.

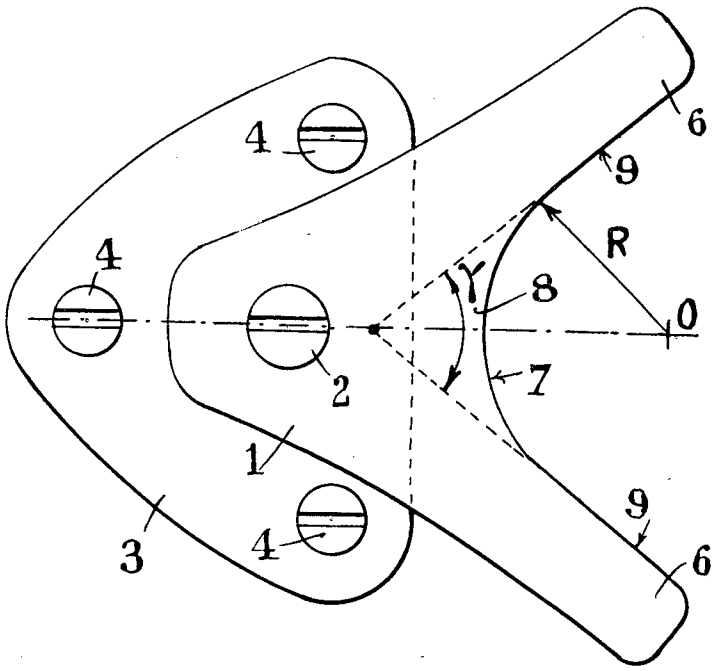

Fig. 1

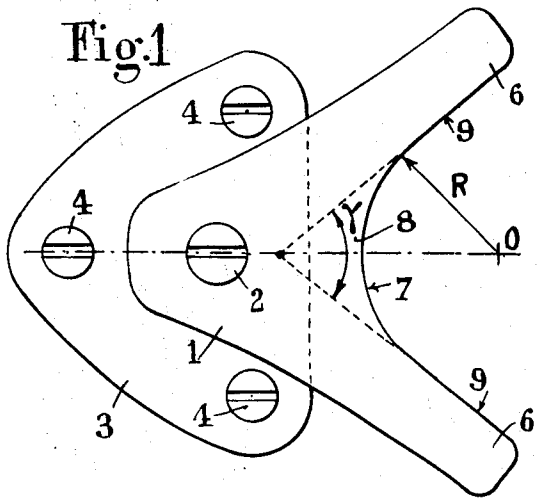

Fig. 2

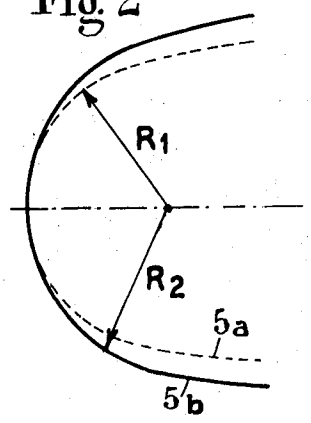

Fig. 4

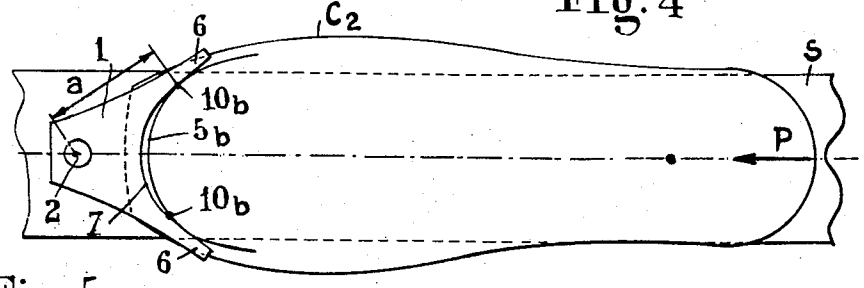

Fig. 5

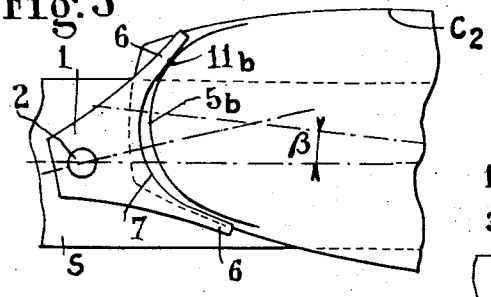

Fig. 3

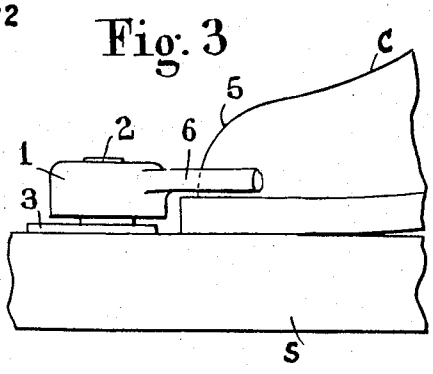

Fig. 6

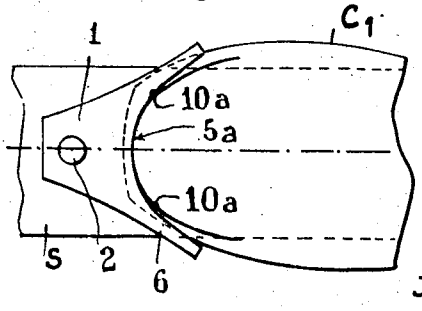

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Fig.7

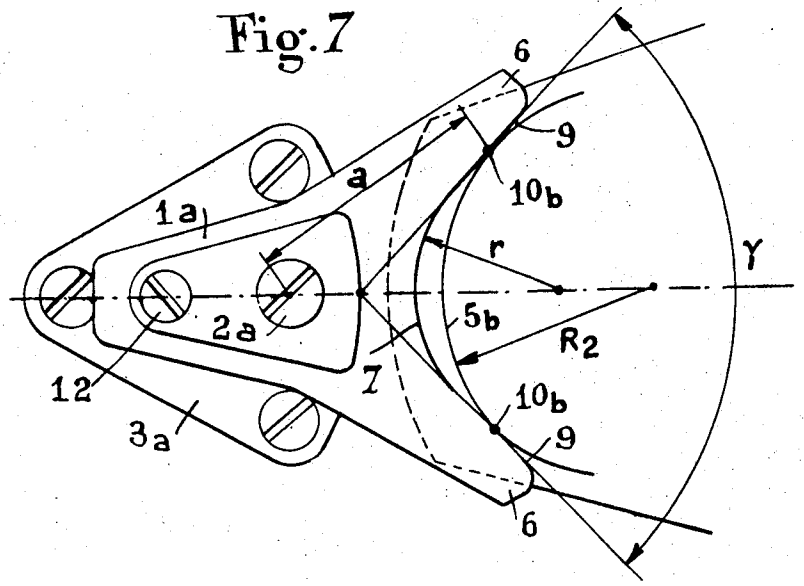


Fig.9

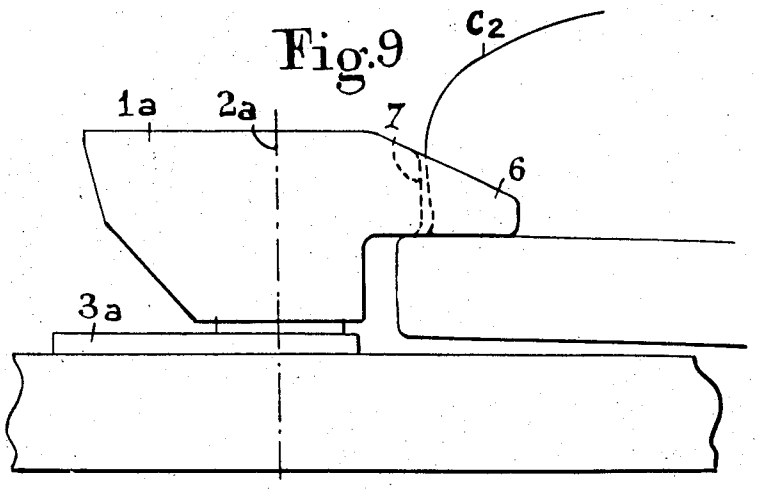
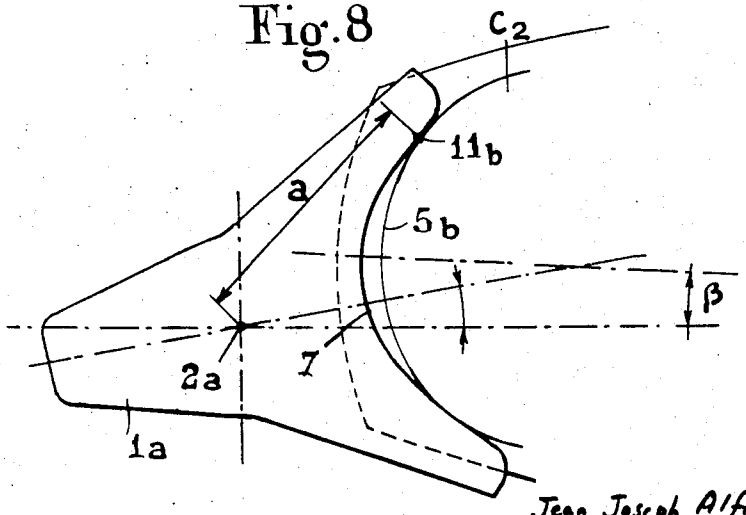


Fig.8



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SAFETY ABUTMENT OF SKI BINDING

The present invention relates to ski bindings and has specific reference to safety abutment devices adapted to retain the toe end of a ski boot in its normal position on a ski.

Abutment devices of this character comprise as a rule a jaw pivotally mounted on a vertical pivot and urged to its normal skiing position by a resilient holding mechanism.

Besides, the rear end of this jaw is so designed that it can properly receive the toe end of a ski boot and subsequently be capable of holding this end against motion both forwards and laterally on either side. In this respect, two different types of abutment devices are found among existing models.

In the first type, the abutment devices comprise at the rear a concave jaw forming a relatively wide angle adapted to receive the toe end of the sole of the boot to be held against movement.

The shape of this jaw is such that the toe end of the sole engages the jaw sides with the two "corners" of its toe end.

Under these conditions, the torsional stress to which the skier's leg is subjected, notably in case of fall, is transmitted to the jaw member of the abutment device through the medium of one or the other corner of the toe end of the boot sole. However, since the dimensions of the toe end of the sole of a ski boot vary considerably from one model to another, the depth of penetration of the toe end of the sole varies to a substantial degree according to cases. This is attended by appreciable differences between the various lever arm lengths obtaining when the toe end of a boot engages and actuates the abutment device in case of torsional effort.

Besides, it may be pointed out that when the toe end of the boot is released one of the corners of the toe end of the boot sole is caused to slide on the jaw until the toe end of the boot can clear the device completely. Now it is obvious that this release takes place more or less rapidly according to the magnitude of the depth of penetration of the sole into the jaw. Moreover, this movement does not always take place under satisfactory conditions. In fact, in some instances the sole is more or less wedged in the jaw. In any case, considerable frictional resistance develops during this release movement.

To avoid these various inconveniences, the safety abutment devices of the second type are designed with a view to coact with the rounded toe end of the upper instead of with the sole of the ski boot. Abutment devices of this type are described and illustrated in the applicant's U.S. Pat. No. 3,194,574.

The abutment devices of this second type comprise at the rear on the one hand a central bearing surface engageable by the toe edge of the boot sole and on the other hand a pair of lateral arms adapted to engage laterally the corners of the rounded toe end of the boot upper.

However, these two arms are pivotally mounted on the abutment body so that their angular spacing can be adjusted as a function of the width of the boot upper so as to engage the sides thereof when the toe end of the boot contacts the bearing surface provided on the abutment body.

Under these conditions, locking means are provided for adjusting separately the position of the two lateral arms.

This solution is then completely satisfactory but nevertheless it is objectionable in that it entails a greater intricacy in the structure of the abutment device and therefore to increase its cost.

It is therefore a primary object of this invention to simplify a safety abutment of this character, designed for coacting with the rounded toe end of a ski boot upper instead of with the sole thereof, this abutment device being so designed that they can coact with ski boots of different designs and sizes.

This safety abutment is characterized essentially in that as the two lateral arms provided at the rear end thereof form an unitary structure with the jaw body, they constitute with the central portion thereof a concave, smooth surface adapted to fit around the toe end of the boot upper. Now the contour of this surface in a horizontal plane comprises on the one hand a part-circular central portion having a radius of curvature corresponding to the smallest radius of curvature existing at the toe end of the ski boot upper, and on the other hand two rectilinear portions corresponding to the lateral arms and forming with each other an angle of the order of 70° to 95°, which is sufficient for receiving the rounded toe end of the boot upper having the greatest possible radius of curvature.

Since in the safety abutment device of this invention the lateral arms are an integral part of the jaw body, the manufacturing cost is reduced to a substantial extent. However, this abutment operates very satisfactorily, although the position of these lateral arms cannot be modified. This advantageous feature is due to the particular design and arrangement of the abutment jaw.

Besides, the operation of this abutment device will now be described in detail with reference to the annexed drawing illustrating diagrammatically by way of example two forms of embodiment of the invention. In the drawing:

FIG. 1 is a plane view to scale from above showing a safety abutment device according to the invention;

FIG. 2 illustrates diagrammatically the two maximum and minimum curvatures likely to be encountered with different types of rounded toe ends of ski boots uppers;

FIG. 3 is a side elevational view of the abutment device of FIG. 1, which in this case is shown on a different scale;

FIG. 4 is a plan view from above showing a ski boot retained in its normal position by a safety abutment device according to this invention, the rounded toe end of the boot upper being shown with the maximum radius of curvature;

FIG. 5 is a fragmentary plane view of the same boot and safety abutment device after the boot has pivoted through a certain angle as a consequence of a torsional stress exerted thereon;

FIG. 6 is a view similar to FIG. 4 but showing a boot upper having a minimum radius of curvature at its rounded toe end;

FIG. 7 is a plane view from above showing another form of embodiment of a safety abutment device according to this invention;

FIG. 8 is a similar view of the same abutment device after it has been pivoted through a certain angle, and

FIG. 9 is a side elevational view of the same abutment member.

In the example illustrated in FIGS. 1 to 6 of the drawing the safety abutment device according to this invention comprises a rotary body 1 pivotally mounted about a vertical pivot pin 2. This pin 2 is carried by a baseplate 3 adapted to be secured by means of screws 4 to the top surface of a ski.

The rear end of this abutment device has substantially the shape of a concave jaw adapted to receive preferably in snug-fitting engagement the rounded toe end 5 of the upper of a ski boot C. To this end, the abutment body carries two arms 6 extending laterally and rearwardly so as to form an angle therebetween.

These two arms are interconnected by a part-circular central portion 7 adjacent the central region 8 of the jaw body.

The two divergent arms 6 are formed integrally with this body. Besides, the inner faces of these arms and the aforesaid part-circular central portion 7 constitute together a smooth bearing surface adapted to be engaged by the rounded toe end 5 of the upper of a ski boot C.

As seen in plane view from above this bearing surface comprises on the one hand the above-defined part-circular portion 7 and on the other hand, laterally, two rectilinear portions 9 consisting of the inner faces of said arms 6. The radius of curvature r of said part-circular central portion corresponds to the smallest radius of curvature R_1 likely to be encountered on the toe end 5*a* of the upper of a ski boot.

As to the two rectilinear divergent portions 9 of this bearing surface, they form together an Γ of a value selected from the range of about 70° to 90°. The value of this angle should be sufficient to enable these two arms 6 to receive therebetween the rounded toe end 5*b* of the upper of a ski boot having the largest possible radius of curvature R_2 at the toe end of this upper.

As illustrated in FIG. 3 the lateral arms 6 overlie the side portions of the sole of the ski boot C. Under these conditions, these two arms can safely prevent the sole from being lifted off the ski top surface.

Of course, this abutment device comprises a mechanism of any known and suitable type for normally urging the jaw 1 to its skiing position, unless an abnormally high torsional stress is exerted thereon by the skier's boot.

It is clear that this abutment device is adapted to receive a boot C_1 of which the rounded toe end of the upper 5*a* has the smallest possible radius of curvature R_1.

In fact, in this case the curvature of the rounded toe end 5*a* is at the most coincident with the part-circular contour of the central portion 7 of the smooth bearing surface formed at the rear of the jaw. Thus, the contact area is limited by the endmost points 10*a* (see FIG. 6).

However, this same abutment device is also adapted to receive the rounded toe end 5*b* of the upper of a ski boot C_2 having the greatest possible radius of curvature R_2 at its toe end (see FIGS. 4 and 5).

In this last instance, the rounded toe end 5*b* of the ski boot upper does not engage the bottom of the part-circular portion 7 of the jaw bearing surface. However, this rounded toe end engages the smooth surface at points denoted 10*b* in FIG. 4.

It may be noted that the depth of penetration of the rounded toe end of the boot upper is changed, only very slightly in the two extreme cases contemplated hereinabove. As a result, the length of the lever arm *a* through which the boot actuates the body 1 of the abutment device for transmitting a torsional stress is also modified to a very small degree.

Thus, no appreciable change is observed as to the conditions of operation of the rotary jaw-retaining mechanism in either case.

Under these conditions, the safety abutment device according to this invention can advantageously be used for equipping skis let out on hire for it can safely be used with ski boots of different types and/or sizes, without requiring any modification of the initial setting of the mechanism when changing from one pair of boot to another.

In this respect it may be noted that with an abutment device coacting with the toe end of the sole of a ski boot considerable changes in the conditions of operation are observed due to the fact that the depth of penetration of the toe end of the sole into the jaw is attended by considerable variations according to the boot types and sizes.

In contrast thereto, this inconvenience is not found with the present invention. In fact, there is very slight difference in radius between the maximum and minimum curvatures 5*a* and 5*b* likely to be observed on the rounded toe end of the upper of a ski boot. In this respect it may also be noted that in the various existing ski boot models and even in their different sizes manufactured for men and women the differences in curvature of the rounded toe end of their upper are not very pronounced, as can be seen in FIG. 2.

Under these conditions, the amplitude of the pivoting movement performed by the ski boot before its complete release is substantially the same in the two extreme cases contemplated. Therefore, a very great amplitude can be obtained in either case before a complete release.

It may also be pointed out that the point whereat the rounded toe end of the sole bears against the device is shifted only very moderately from its initial position to its final position, i.e. just before the boot is released completely.

Thus, FIG. 5 illustrates a ski boot C_2 having pivoted through an angle β just before being released completely. Now in this position the point of engagement of the rounded toe end of its upper has attained the position denoted 11*b*, i.e. very close to its normal position shown at 10*b* in FIG. 4.

Considering the proximity of these two points the length of the lever arm *a* varies but slightly. Under these conditions, the resilient force retaining the boot can be kept at a nearly constant value if the holding and return mechanism incorporated in the abutment device is designed with a view to exert a constant effort during its operation.

Besides, it may be observed that the movement of the rounded toe end of the upper within the jaw of the abutment device takes place under very satisfactory conditions. Any risk of wedging the boot end is definitely avoided, as contrasted with the use of an abutment device clamping the toe end of the sole instead of the upper of a ski boot. Besides, the curved contact surfaces will slide very easily on each other and the frictional resistance thus developed is immaterial.

In this respect it may be emphasized that the leather wall of the rounded toe end of the upper of a ski boot has a smooth surface as contrasted with the front edge of a sole which is rather rough and has surface unevennesses due to the superposition of several layers.

Besides, the bearing surface 7, 9 of the jaw is very smooth. In any case, considering an aluminum jaw the latter can advantageously be polished to provide the desired smooth surface.

In the case of the abutment device according to this invention the thrust P exerted on the boot by the heel binding means is transmitted only through the rounded toe end 5 of the upper to the bearing surface 7, 9 of the jaw. In this respect it may be noted that after a certain "running-in" period the rounded toe end of the upper tends to accommodate the curvature of the part-circular portion 7 of the jaw. Thus, instead of having a two-point bearing 10*b* only in the case of a toe end having a relatively great radius of curvature, it will be seen that after a certain time the toe end of the boot upper will bear on the jaw through a relatively large surface area.

The pressure per surface unit is thus reduced considerably and this constitutes an obvious advantage of the device of this invention.

As already explained in the foregoing, the abutment device according to this invention may advantageously be arranged to afford a relatively great amplitude of the pivotal movement of the boot before its complete release. As long as this pivot angle β is not attained the boot remains in engagement with the jaw and can be restored to its initial position if the holding mechanism of the device provides the necessary resilient return force.

Thus, the boot is restored to its normal skiing position after short, low-amplitude torsional stress. Besides, it is clear that the boot will be released completely in case of a major torsion stress exerted during a longer time period.

FIGS. 7 to 9 of the drawing illustrate another form of embodiment of the safety abutment device of ski binding according to the present invention.

This device comprises on the one hand a retaining mechanism of the type described and illustrated in the U.S. Pat. application filed by the applicant on Nov. 1968 for "-Safety Ski Binding" and corresponding to the French Pat. application No. 128,874 filed on Nov. 20, 1967, this mechanism being designed to afford a greater amplitude of pivotal movement of the ski boot before its complete release.

This device 1*a* comprises a jaw having the same characteristics as in the device shown in FIG. 1.

In this specific form of embodiment the two rectilinear portions 9 of the bearing surface form with each other an angle Γ having a value of about 93°. The part-circular central portion 7 has a radius of curvature of about 1 inch so as to correspond substantially to the smallest possible radius of curvature of the rounded toe end of the upper of a ski boot. In the case of a ski boot having the maximum radius of curvature R_2 at the toe end of its upper, this toe end bears at points 10*b* against the two lateral arms 6 of the jaw.

In case of pivotal movement, only a very slight displacement is observed between the two endmost positions 10*b* and 11*b* of the point of contact through which the boot actuates the abutment device for pivoting same. The length of the lever arm *a* will thus vary very moderately between these two cases.

However, in this alternate form of embodiment the body 1*a* of the safety abutment device is adjustable in the vertical direction by means of an adjustment screw 12. Thus, its level can be adjusted in relation to the fastening or baseplate 3*a* as a function of the thickness of the sole 13 of the corresponding sole.

In either of the above-described forms of embodiment the jaw adapted to coact with the rounded toe end of the upper of a ski boot is disposed directly on the rear end of the rotary abutment body. However, it is clear that this jaw could also be independent and consist of a separate member pivoted for example to the abutment body.

Besides, various modifications and variations could be brought to the various forms of embodiment shown and described herein by way of example, without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. Safety abutment device for retaining the toe end of a ski boot, which toe end has a sole and a toe upper, comprising a jaw body rotatably mounted on a vertical pivot, resilient means interconnecting said jaw body and the vertical pivot for holding said jaw body against movement under normal conditions of use and releasing said jaw body under conditions of abnormal torsional stress, said jaw body comprising a central curved portion and two laterally extending arms integral with said central curved portion for receiving the toe upper therein, said toe upper being adapted to contact said arms and said central curved portion over a substantial portion thereof to provide for low contact stresses in said toe upper, said jaw body overlying said sole and being positioned such that the front portion of the sole does not abut any portion of said safety abutment device.

2. The safety abutment device specified in claim 1 wherein said arms are at an angle of between 70° and 95° with respect to each other.

3. The safety abutment device specified in claim 1 wherein said arms are straight.