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SKI SAFETY BINDING PROVIDED WITH ELASTIC SOLE PLATE

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3 Sheets-Sheet 1



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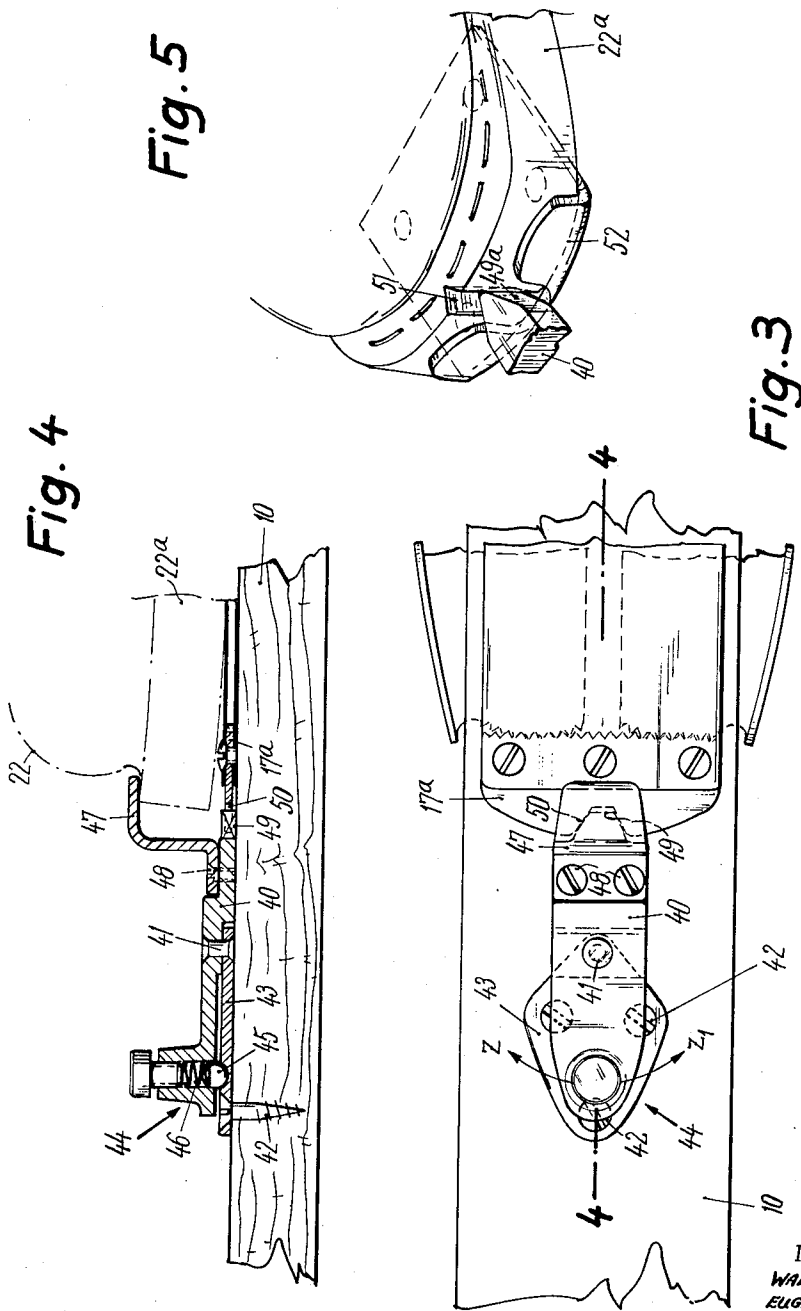
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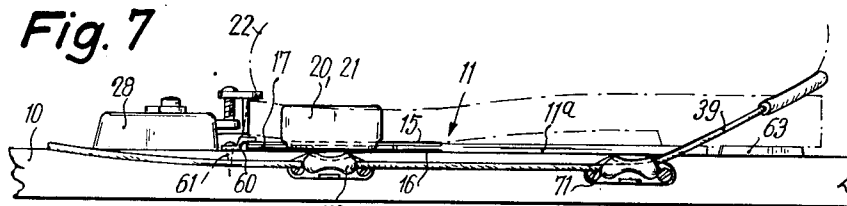
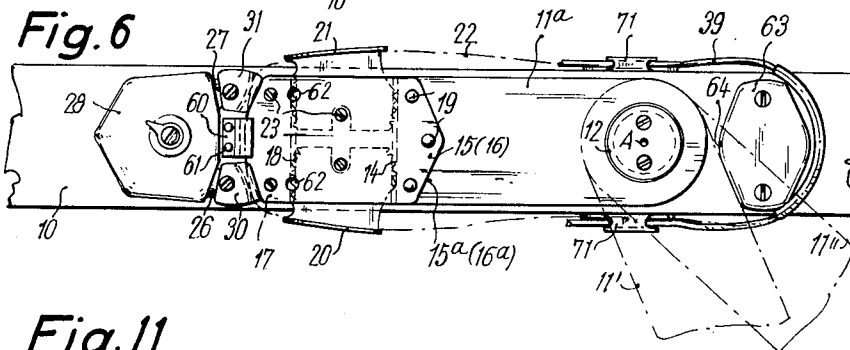
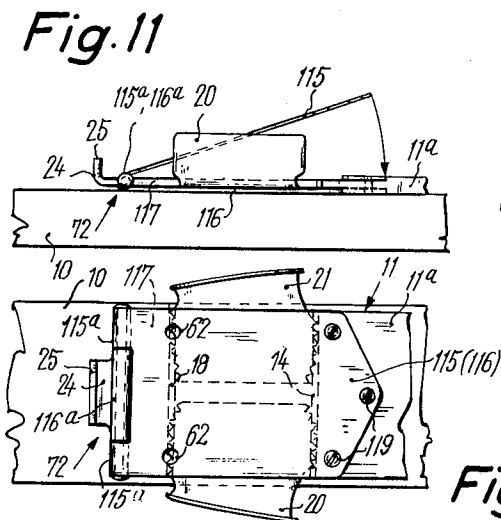
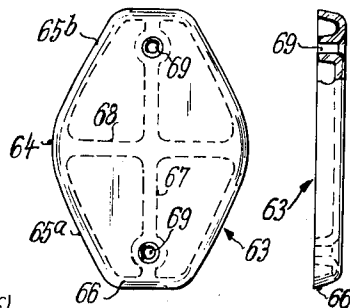
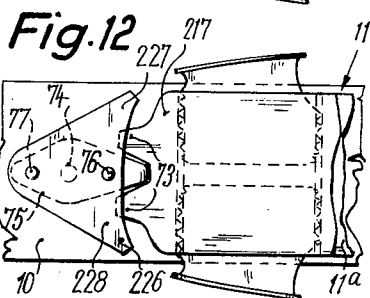
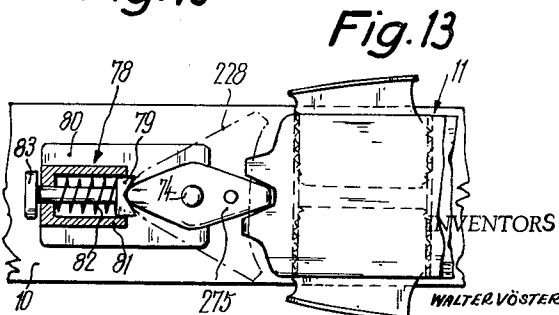
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SKI SAFETY BINDING PROVIDED WITH ELASTIC SOLE PLATE

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3,199,884

SKI SAFETY BINDING PROVIDED WITH ELASTIC SOLE PLATE

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V 20,228; July 8, 1961, V 20,937

9 Claims. (Cl. 280—11.35)

The present invention relates to a ski safety binding with a sole plate which is provided with lateral jaws especially at the front and is pivotable about a rear axis extending perpendicularly to the upper surface of the ski, and which is further provided with a releasable locking device at the front for holding the boot together with the sole plate in a central position from which the boot together with the sole plate can swing outwardly toward one side or the other when a lateral force acting upon the foot exceeds a certain strength. Those sole plates which have previously been used for this purpose and were made of metal have not proved satisfactory regardless of whether they were made of a rigid or flexible construction.

If the sole plate is of a rigid construction so as not only slightly to yield under torsion or bending stresses outside of the pivoting plane, the lack of flexibility may easily lead in a fall or accident to a strain upon the foot and to the danger that bones might be broken or another injury might occur. The forces which are then occurring may also damage the mounting of the sole plate on the ski and thus the ski itself and possibly render the ski useless for all times. Apart from this, such a pivoting plate also has the disadvantage of being relatively heavy.

Although a weaker sole plate which is made, for example, of sheet metal and has an unlimited pivotability is more suitable insofar as it can yield by being deformed when subjected by the foot to the stresses occurring in a fall, such a yielding—if sufficient—will generally result in a lasting distortion of the sole plate which practically excludes an immediate reuse of the ski binding after the fall. Efforts have also been made to avoid such a distortion of the sole plate by limiting the extent of the pivoting movement thereof, for example, to only a few angular degrees. This has, however, the result that the foot may not always be released when required.

It is a principal object of the present invention to provide a ski safety binding which overcomes the above-mentioned disadvantages, and it is an essential feature of the invention to provide a ski binding with a sole plate which fully or partly consists of an elastic plastic. Such a sole plate can by yielding elastically take up all of the stresses occurring in a fall since the plastic material has such an elasticity that, even when bent or distorted extremely, the sole plate will return to its original shape as soon as the stresses thereon discontinue. For this reason, the sole plate may also pivot freely to any extent and, due to its flexibility, it may then also slide over obstructions such as cable holders or the like and will thus insure that the foot will be released from the ski when necessary. Even if the forces act through a great leverage upon the sole plate, they cannot produce

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any damage since the stresses always remain within the elastic limit of the material. The sole plate and thus also the binding may again be used immediately. Such a sole plate has the further advantage of having a low weight and that it can be made at a low cost.

Another object of the invention is to provide a sole plate of a construction which insures that even though it involves the use of plastic, the boot will be securely held, especially by means of jaws, and which combines the greatest possible degree of security with the possibility of an immediate reuse of the ski binding and sole plate after a dangerous fall. According to a preferred embodiment of the invention, the rear part, that is, preferably the main part of the sole plate is made of plastic, while the front part of the sole plate is made of metal, preferably in the form of resilient cover plates which are connected to the lateral jaws by means of intermediate serrations or the like. It has been found that such a construction of the sole plate which consists only partly of plastic is sufficient to insure that the sole plate possesses the desired elastic properties as previously described.

The present invention further relates to the provision of means for taking up the forces which act upon the sole plate in a very particular and advantageous manner, and especially for transmitting the forces from the plastic part of the sole plate to the metal part thereof. It relates further to means for effecting the adjustment of the jaws in the simplest possible manner, and to means for maintaining and releasably locking the pivotable parts in a very reliable and simple manner in a normal central position, preferably by means of a projection on the sole plate which engages between two toe jaws which are pivotable in opposite directions to each other.

If desired, the connection between the sole plate and the locking device may also be effected merely by the boot of the skier. It is also possible to secure the sole plate against being lifted off the surface of the ski independently of the toe securing device. The manner of securing the sole plate in its central position or of securing it against being lifted is therefore not dependent upon the toe securing device so that the sole plate and the toe securing device may be mounted independently of each other or may be adapted to different boot lengths without requiring either the toe securing device or the sole plate to be made of different dimensions. By employing a separate locking or retarding device for the sole plate, it is also possible to prevent the latter from pivoting outwardly when not desired, that is, when the ski is not being used, for example, when it is carried or transported.

A further object of the invention is to provide a secure support for resting the boot on the ski even though the sole plate is relatively short and the heel of the boot therefore does not rest sufficiently or at all on the sole plate. For attaining this object, the invention further provides an additional heel plate which is secured to the ski and adapted to support the heel of the boot. Such a heel plate is especially of importance when used in connection with a sole plate of plastic since the latter should preferably not exceed a certain length because of its elastic properties. By providing such an additional heel plate, it is possible to attain a secure stand of the foot since the heel will then rest partly on the sole plate

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and partly on the solid heel plate or entirely on the latter. The sole plate also does not need to be exchanged for another and its position also does not need to be changed in order to be applicable for feet of different lengths, but it permits the same ski binding to be applied on feet of very different sizes.

The heel supporting plate is preferably made of plastic in the same way as the sole plate. Its peripheral edge is preferably tapered or curved and enlarged toward its lower end similar to a wedge or frustum so that it has a substantially trapezoidal cross section. Due to the wedge effect, the pivotable sole plate may therefore slide upwardly along the tapered peripheral edge of the heel plate, and the resilience of the plastic then permits the sole plate to bend accordingly so as to be slidable along the upper surface of the heel plate.

The objects, features, and advantages of the present invention will become more clearly apparent from the following detailed description thereof which is to be read with reference to the accompanying drawings, in which—

FIGURE 1 shows a plan view of one embodiment of the invention;

FIGURE 2 shows a cross section taken along line 2—2 of FIGURE 1;

FIGURE 3 shows a plan view of a modification of the invention;

FIGURE 4 shows a cross section taken along line 4—4 of FIGURE 3;

FIGURE 5 shows a perspective view of another modification;

FIGURE 6 shows a plan view of a further modification of the invention with a heel supporting plate;

FIGURE 7 shows a side view of the embodiment of the invention according to FIGURE 6;

FIGURE 8 shows a plan view of the heel supporting plate;

FIGURE 9 shows a side view of the heel supporting plate;

FIGURE 10 shows a further modification of the invention with a sole plate with cover plates which are hinged to each other;

FIGURE 11 shows a side view of the embodiment according to FIGURE 10; while

FIGURES 12 and 13 show plan views of two further modifications of the invention in which the front end of the sole plate is held by a releasable locking device.

In the drawings, FIGURES 1 and 2 show a ski 10 on which a sole plate 11 is mounted so as to be pivotable about a rear axis A which lies underneath the heel part of the ski boot and extends perpendicularly to the upper surface of the ski. Sole plate 11 is held upon the ski by means of a bearing disk 12 which permits the sole plate to be pivoted laterally and which is secured to the ski, for example, by a pair of screws 13. The sole plate consists of a main part 11a which is made of a suitable plastic and terminates at its front end in a transverse row of teeth 14, of two resilient sheet-metal plates 15 and 16 one above the other, and a front mounting plate 17 which preferably consists of steel and has on its rear end a row of teeth 18. Plates 15 and 16 are connected to the main part 11a of the sole plate by rivets 19.

Between the two resilient plates 15 and 16, the two lateral jaws 20 and 21 are inserted which hold the boot 22 at both sides of the toe portion and engage with the teeth 14 and 18. On their front ends, plates 15 and 16 are connected to the mounting plate 17 by one or more screws 23 which may be unscrewed partly or entirely to permit the lateral jaws 20 and 21 to be disengaged from the teeth 14 and 18 and then to be adjusted in the transverse direction, whereupon the screws may be tightened for locking the jaws in the respective positions to which they have been adjusted. Of course, plates 15 and 16 may also be nonadjustable and may then be

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integral with mounting plate 17 and the lateral jaws 20, 21. In this case, the outer ends of jaws 20 and 21 may be bent vertically upward in accordance with the width of a boot of one particular size.

The front end of the serrated mounting plate 17 is provided with a toothlike projection 24 which has an upwardly bent end 25. In order to prevent the sole plate from being lifted off the ski, this end portion 25 projects underneath the lower side of a stop member 25a on the housing of the front or toe securing unit 28. The toothlike projection 24 further engages between the two pivotable toe jaws 26 and 27 of this unit 28 in such a manner that the lateral surfaces 29 of projection 24 abut against the upper sole-holding members 30 and 31 of the toe jaws 26 and 27. These holding members 30 and 31 are preferably connected to the toe jaws 26 and 27 by means of screws 32 and 33 so as to be adjustable in a vertical direction in accordance with the thickness of the sole 22a of the ski boot 22. Holding members 30 and 31 are further provided with projections 30a and 31a which are adapted to overlap the upper edge of the sole 22a of the boot and thus to prevent the toe portion of the sole from being lifted off the sole plate.

The toe jaws 26 and 27 are individually pivotable about vertical axes 34 or 35, respectively, and are normally maintained in the central position as shown in FIGURE 1 by a releasable toe locking device 36, the resilient retaining or locking tension of which may be adjusted, for example by a lever 37 which is associated with a scale 38.

For mounting the boot on the ski or on the sole plate thereon, any suitable tightening device may be provided, for example, in the form of a heel spring or a cable 39 which surrounds the heel of the boot and the ends of which are secured to the ski or to the sole plate or to the lateral jaws 20 and 21. The tightening device may, however, also consist of a front tightener which is secured to the ski in front of the toe supporting unit 28 and, if desired, also of an additional rear tightener.

When the boot is in the normal position, it is pressed by the tightening device in the forward direction of the arrow x against the lateral jaws 20 and 21, and the edge of the sole 22a of the boot then extends underneath the projections 30a and 31a on the soleholding members 30 and 31 of the pivotable toe jaws 26 and 27.

If a strong lateral force is exerted upon the boot, for example, in a fall, which tends to swing the boot about the axis A either in the direction of the arrow y or y_1 , and if the torque then exceeds a certain value, the retaining or locking pressure of the locking device 36 will be overcome so that, as the result of the pressure which is exerted by the lateral surfaces 29 of the toothlike projection 24, 25 upon one of the two pivotable toe jaws 26, 27, this toe jaw will be pivoted in the direction of the arrow z or the arrow z_1 , respectively. The other toe jaw may then remain in its position without being pivoted and will thus not interfere with the pivoting movement of the boot to the opposite side. As the result of this pivoting movement, the sole 22a disengages from the projections 30a and 31a on the sole-holding members 30 and 31 so that the sole plate 11 with the boot 22 thereon will be fully released from the supporting unit 28.

FIGURES 3 and 4 illustrate a modification of the invention in which the toe securing and locking device comprises a single pivotable element 40 which serves as a toe jaw and is mounted so as to be pivotable about an axis 41 on a base plate 43 which is secured to the ski, for example, by screws 42. This element 40 is held in its normal position on base plate 43 by means of a resilient releasable locking device 44 which essentially consists, for example, of a ball 45 and an adjustable spring 46.

The pivotable element 40 carries a sole-holding member 47 which may be integral therewith or secured thereto,

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for example, by screws 48. At its rear end, element 40 is further provided with a projecting tooth 49 which engages into a notch 50 in the front end of sole plate 11 or rather of the mounting plate 17a which forms a part of the sole plate. In all other respects, the sole plate may be of the same construction as described with reference to FIGURES 1 and 2.

If an excessive lateral force occurs or an excessive torque is exerted upon or by the foot about the axis A, element 40 will be pivoted through the tooth and notch connection 49, 50 toward one side or the other and it will then turn about the axis 41 in the direction of the arrow z or z_1 while overcoming the resilient locking pressure of the locking device 44.

The modification of the invention as illustrated in FIGURE 5 differs primarily from the embodiment according to FIGURES 3 and 4 by the fact that tooth 49a of the pivotable element 40 projects over a plate 52 which is secured to the boot and engages into a vertical, for example, V-shaped notch 51 in the front end of the boot sole 22a as is frequently provided in ski boots. The boot is thus prevented from being lifted off the sole plate and ski. In this case, the sole plate does not need to extend to the front end of the boot. The special advantage of this construction is its great simplicity.

If desired, it is also possible—especially when employing two toe jaws—to prevent the boot from being lifted off the sole plate or the ski, for example, by vertically adjustable sole holders on the lateral jaws or on the sole plate, or by means of toe straps if, for example, no sole holding means are desired on the toe jaws. The sole holders may also be resiliently movable in the longitudinal direction. The sole holders 30 and 31 may, if desired, also be mounted so as to be rotatable, for example, about the axes 32 and 33.

The further embodiment of the invention according to FIGURES 6 and 7 corresponds in principle to the embodiment according to FIGURES 1 and 2. Sole plate 11 again consists of the main part 11a of plastic and the front mounting plate 17 and of the two resilient metal plates or cover plates 15 and 16 which are secured by screws 23 to each other and to the holding plate 17 and by rivets 19 to the plastic plate 11a. Similarly as in the embodiment according to FIGURES 1 and 2, the rear ends 15a and 16a of the metal or cover plates 15 and 16 are V-shaped and fitted into the plastic plate 11a so that their surfaces are in alignment with those of the plastic plate. The V-shaped interengagement of the adjacent parts of the sole plate insures that the stresses occurring when the plate is bent will be divided over a larger area so that the sole plate will be prevented from buckling or breaking in this area.

The sole plate is preferably mounted on the bearing member 12 so as to turn thereon with a sufficient friction to prevent it as much as possible from swinging outwardly of its own accord when the ski is not in use.

Contrary to the embodiments of the invention as previously described, the means for preventing the sole plate from being lifted off the ski consists of a Z-shaped bracket 60 of sheet metal which is secured to the ski, for example, by screws 61 and engages over the front end of the mounting plate 17.

Furthermore, the upper resilient metal plate 15 is provided above the teeth 18 with viewing holes 62 through which it may be observed whether or not the teeth are in proper engagement with each other.

The embodiment according to FIGURES 6 and 7 further comprises a heel plate 63 which like the main part of sole plate 11 consists of plastic. Its height above the upper surface of the ski is equal to that of the plastic plate 11a so that the heel of boot 22 will rest flatly on both plates simultaneously. Heel plate 63 has a substantially oval outer shape, and it is defined by outer edge portions 65a and 65b which extend obliquely toward the rear from a point 64 which lies within the central longitudinal plane

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of the ski. Its outer edges 66 also taper outwardly and thus it has a substantially trapezoidal cross section. In order to reduce the weight of this heel plate, it is made of a hollow troughlike shape with the open side facing toward the ski and with side walls which are reinforced by crossing webs 67 and 68. Heel plate 63 is secured to the ski by screws which are inserted through the bores 69 in the reinforcing web 67.

For mounting the boot 22 on the ski, a cable 39 is used which is placed around the heel of the boot and also under the cable holders 70 and 71, and may be tightened by a front tightener, not shown.

When the ski binding is tightened, sole plate 11 is securely held in position on the ski because the boot which is held at both sides by the lateral jaws 20 and 21 is pressed by cable 39 against the pivotable toe jaws 26 and 27 so that boot 22 and thus also sole plate 11 is held in the lateral directions by the toe securing unit 28.

If the skier falls or if such a strong lateral force is exerted upon the foot that the locking pressure of the toe securing unit 28 is overcome, sole plate 11 may pivot laterally about the vertical axis A to the extent of the movement of the boot until it engages upon the lateral surface 66 of heel plate 63, that is, to the position 11' in FIGURE 6. This corresponds to an angle of more than 90° relative to the normal position of the sole plate. The sole plate may, however, pivot still further, for example, to the position 11'' or beyond since the elasticity of the plastic permits plate 11a to climb up on the inclined surface 66 and then to slide over the heel plate 63. Even in serious falls and when the ski is completely turned around, there is no possibility that the sole plate, through the lateral jaws 20 and 21 which are connected to the boot, will exert a force upon the foot which may endanger it.

The embodiment of the invention as illustrated in FIGURES 10 and 11 is provided with resilient sheet-metal plates or cover plates 115 and 116 which are connected to each other at their front ends by a hinge 72 which extends transversely thereto. The lower plate 116 which is firmly secured to the mounting plate 117, for example, by being welded thereto, is for this purpose provided with a hinge eye 116a and the upper plate 115 with hinge eyes 115a. Mounting plate 117 may also be provided with a toothlike projection 24 which has an upwardly projecting end 25 for the same purpose as described with reference to FIGURES 1 and 2.

This embodiment permits an especially simple and reliable adjustment of the lateral jaws 20 and 21 since it is merely necessary to loosen or remove the screws 119 and to lift the metal plate 115 in the manner as shown in FIGURE 11, and then to adjust the lateral jaws 20 and 21 to the proper positions by a different engagement with the teeth 18 and 14. After the lateral jaws 20 and 21 have been adjusted, plate 115 is again pivoted downwardly and screws 119 are tightened. Also in this case, metal plate 115 may be provided with viewing holes 62.

In the further embodiment of the invention according to FIGURE 12, the front end of mounting plate 217 is provided with a pair of teeth 73 which are in engagement with an element 75 which is pivotable about an axis 74 and, in turn, has a toe securing element 228 pivotably connected thereto by means of a pivot pin 76. This toe-securing element 228 has projections 226 and 227 which are adapted to abut against the front edge of the sole of the ski boot or to overlap and engage upon the upper side of the front edge portion of the boot sole. The pivotable element 75 is connected to the toe-securing element 228, for example, by means of a releasable locking device, as indicated at 77 in FIGURE 12.

In place of the pivotable element 75 according to FIGURE 12 which is connected to the toe-securing element 228 by a releasable locking device it is also possible according to FIGURE 13 to provide a pivotable element 275 which is arrested in its normal central position by

a locking device 73 which is mounted on the ski, for example, in front of the element 275. Locking device 73 may consist, for example, of a member 79 which is slidably mounted in a housing 81 and is pressed by a spring 82 against the pivotable element 275 to maintain the same in its central position. Housing 81 may be secured either directly to the ski or indirectly by being mounted on a base plate 80. The extent of the movement of slide member 79 toward the element 275 may be limited by a stop 83.

The pivotable element 75 or 275 may also be connected to the ski as well as to the toe-bracing element 228 by releasable locking means. In place of a special locking device it is also often possible to provide simple friction means or a braking device which prevents the pivotable element or the toe-bracing element from pivoting when not desired. It is further possible in every case to insert suitable friction means or a braking device between the sole plate and the ski. The sole plate may also gradually decrease in strength from its rear end to its front end.

Although our invention has been illustrated and described with reference to the preferred embodiments thereof, we wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed our invention, what we claim is:

1. A ski safety binding comprising an elastic sole plate for supporting a ski boot, a heel plate secured to said ski behind said sole plate for supporting a portion of the heel of the boot, means for mounting said sole plate on the ski so as to be pivotal about an axis located in front of said heel plate and extending substantially perpendicularly to the upper surface of the ski, said heel plate increasing in width by tapering outwardly like a wedge at least at the front side facing said sole plate, and means including forwardly disposed detent means for retaining said sole plate together with the ski boot supported thereon in such a manner that upon pivotal movement of said sole plate the latter is deflected upwardly by the wedge-shaped enlarged front side of said heel plate.

2. A ski safety binding according to claim 1, wherein said sole plate is made over a substantial part thereof of plastic material.

3. A ski safety binding, comprising a sole plate for supporting a ski boot, means for mounting said sole plate at the rear part thereof so as to be pivotable about an axis extending substantially perpendicularly to the upper surface of the ski, locking means for normally maintaining said boot and said sole plate in a central position on said ski, said sole plate including a rear plate member made of elastic material adjacent to said rear axis, a front plate member of metal, means for connecting said two plate members to each other, lateral jaw means for holding said boot, and means for securing said jaw means to said metallic plate member, the front end portion of said rear plate member, as seen in plan view, having a substantially V-shaped recess reducing the thickness of said plate member, said metallic plate member having a thin rear end portion fitting into said recess and having a substantially corresponding V-shape.

4. A ski safety binding comprising a sole plate for supporting a ski boot, means for mounting said sole plate at the rear part thereof so as to be pivotable about an axis extending perpendicularly to the upper surface of the ski, locking means for normally maintaining said boot and said sole plate in a central position on said ski, said sole plate including a rear plate member consisting of plastic material as the support material thereof and located adjacent to said rear axis, a front plate member of metal, means for connecting said two plate members to each other, lateral jaw means for holding said boot, means for securing said jaw means to said metallic plate member,

said jaw means including a pair of lateral jaws each having teeth, said metallic plate member including a mounting member near the front end thereof and having teeth in engagement with the teeth of said lateral jaws, said metallic plate member further comprising a pair of resilient metal plates secured to said mounting member and adapted to maintain said lateral jaws in the position in which said teeth are in engagement with each other, said jaw means having further teeth, said rear plate member of plastic material having teeth on its front end in engagement with the further teeth of said jaw means.

5. A ski safety binding comprising a sole plate for supporting a ski boot, means for mounting said sole plate at the rear part thereof so as to be pivotable about an axis extending perpendicularly to the upper surface of the ski, locking means for normally maintaining said boot and said sole plate in a central position on said ski, said sole plate including a rear plate member consisting of plastic material as the support material thereof and located adjacent to said rear axis, a front plate member of metal, means for connecting said two members to each other, lateral jaw means for holding said boot, and means for securing said jaw means to said metallic plate member, the front end portion on said plastic plate member, as seen in a plan view, having a substantially V-shaped recess reducing the thickness of said plate member, said metallic plate member having a thin rear end portion fitting into said recess and having a substantially corresponding V-shape.

6. A ski safety binding comprising a sole plate for supporting a ski boot, means for mounting said sole plate at the rear part thereof so as to be pivotable about an axis extending perpendicularly to the upper surface of the ski, locking means for normally maintaining said boot and said sole plate in a central position on said ski, said sole plate including a rear plate member consisting of plastic material as the support material thereof and located adjacent to said rear axis, a front plate member of metal, means for connecting said two plate members to each other, lateral jaw means for holding said boot, and means for securing said jaw means to said metallic plate member, the front end portion of said plastic plate member, as seen in a plan view, having substantially V-shaped recess in its upper and lower sides reducing the thickness of said plate member, and a transverse row of teeth on said front end, said metallic plate member including a front mounting member having an element thereon engaging with said locking means and operatively associated therewith and further having a row of rear teeth, said jaw means consisting of a pair of angular lateral jaws having horizontal webs inserted between said rows of teeth and each having teeth at the front and rear ends thereof in engagement with said rows of teeth, and an upper and lower resilient metal cover plate secured to said mounting member and covering said horizontal webs of said jaws at the upper and lower sides thereof and having V-shaped ends, the rear V-shaped ends of said cover plates engaging into said V-shaped recesses in said plastic member, said means for connecting said plate members to each other connecting the front end of said plastic plate member having said V-shaped recess therein to the correspondingly shaped rear end of said cover plates.

7. A ski safety binding as defined in claim 6, in which said connecting means comprise connecting members passing through bores in said front end portion of said plastic plate member and in said rear end portion of said cover plates, the edge portions defining the corresponding bores in said cover plates projecting toward each other and being pressed into the material of said plastic plate member.

8. A ski safety binding as defined in claim 6 having viewing apertures in the upper cover plate above at least some of said teeth.

9. A ski safety binding as defined in claim 6 having hingelike means for connecting said two cover plates to each other so as to be pivotable about a horizontal trans-

verse hinge axis and adapted to permit the upper cover plate to be pivoted about said hinge axis.

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A. HARRY LEVY, *Primary Examiner.*

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