United States Patent [19]

Salomon

[11] **3,797,843**

[45] **Mar. 19, 1974**

[54] **DEVICE FOR SECURING A BOOT TO A BASE**

[76] Inventor: **Georges Pierre Joseph Salomon,** 34, Ave. de Lovercy, Annecy, France

[22] Filed: **Oct. 18, 1972**

[21] Appl. No.: **298,651**

[30] **Foreign Application Priority Data**

Oct. 19, 1971 France 71.37522

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

[51] **Int. Cl.** **A63c 9/08**

[58] **Field of Search**...280/11.35 T, 11.35 A, 11.35 D

[56] **References Cited**

UNITED STATES PATENTS

3,249,365	5/1966	Beyl	280/11.35 T
3,612,560	10/1971	Payrhammer	280/11.35 T

FOREIGN PATENTS OR APPLICATIONS

1,955,216	5/1971	Germany	280/11.35 T

Primary Examiner—Robert R. Song

[57] **ABSTRACT**

The device includes: a mounting connected to the base and located externally of the space covered by the boot during the operations of putting-on and taking-off the ski; an element for retaining the boot located at least partially within the space covered by the boot and pivoting, between the positions in which it locks and releases the boot, about a horizontal axis located in the mounting and running transversely thereto; and a resilient system allowing the device to move between a position in which the boot is locked and a position in which the boot is released. This system is characterized by resilient means supported by the base and urging the mounting into a position which is raised in relation to the base and in which the boot is released, and by another resilient means acting between the mounting and the retaining element and urging the retaining element into a position in which the boot is released.

19 Claims, 22 Drawing Figures

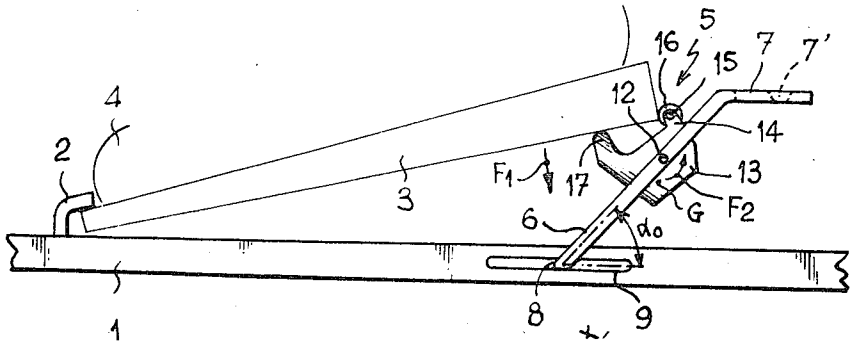


FIG.1

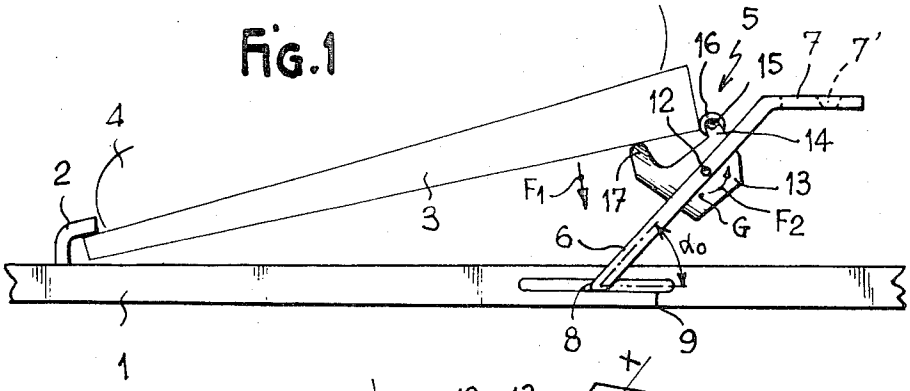


FIG.2

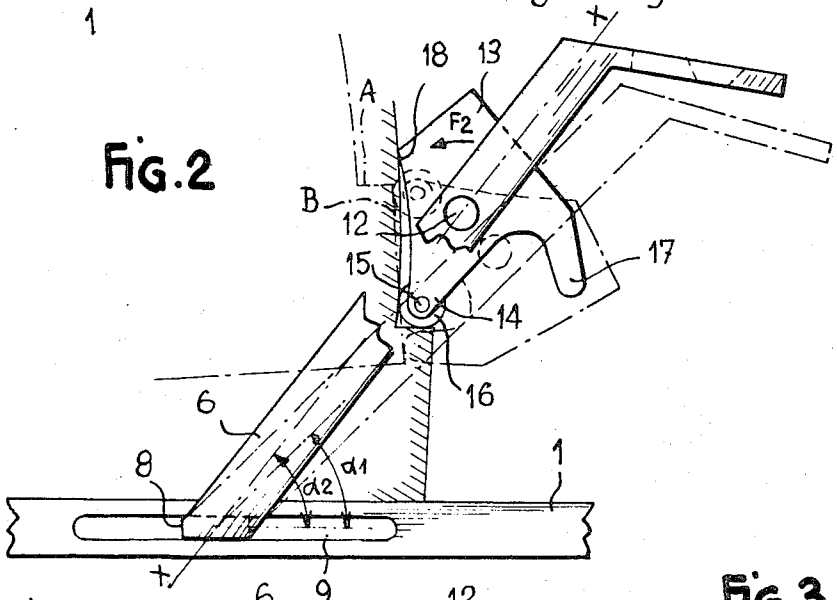


FIG.3

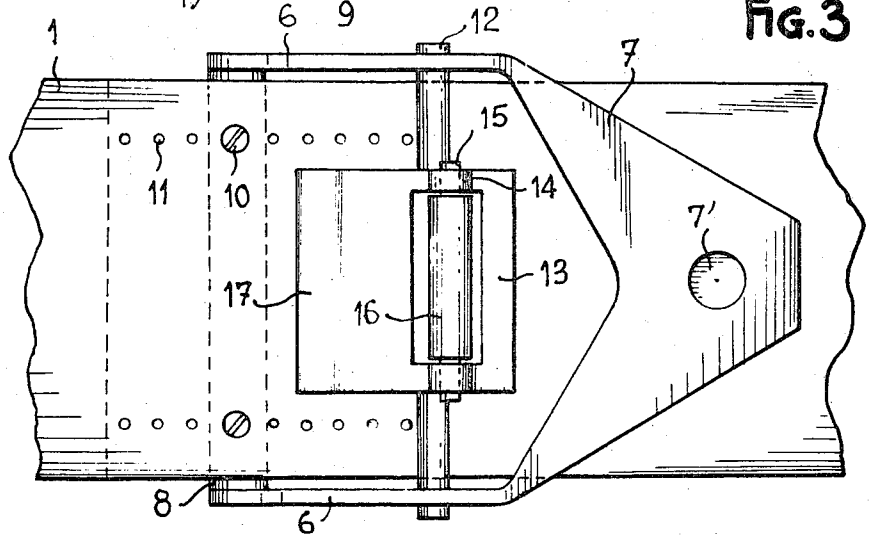


FIG. 4

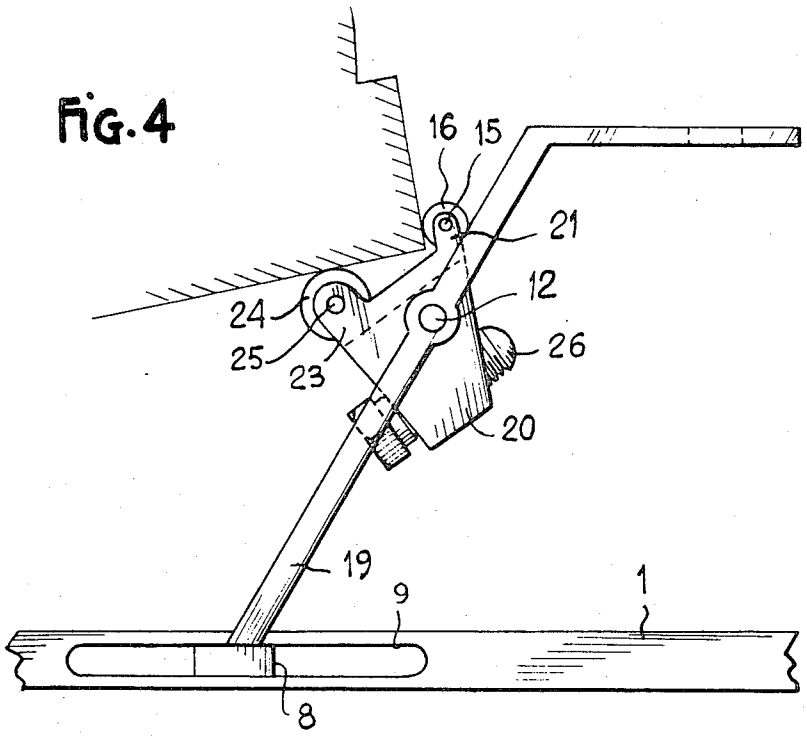

16
15
21
12
24
25
23
26
20
19
9
1
8

FIG. 5

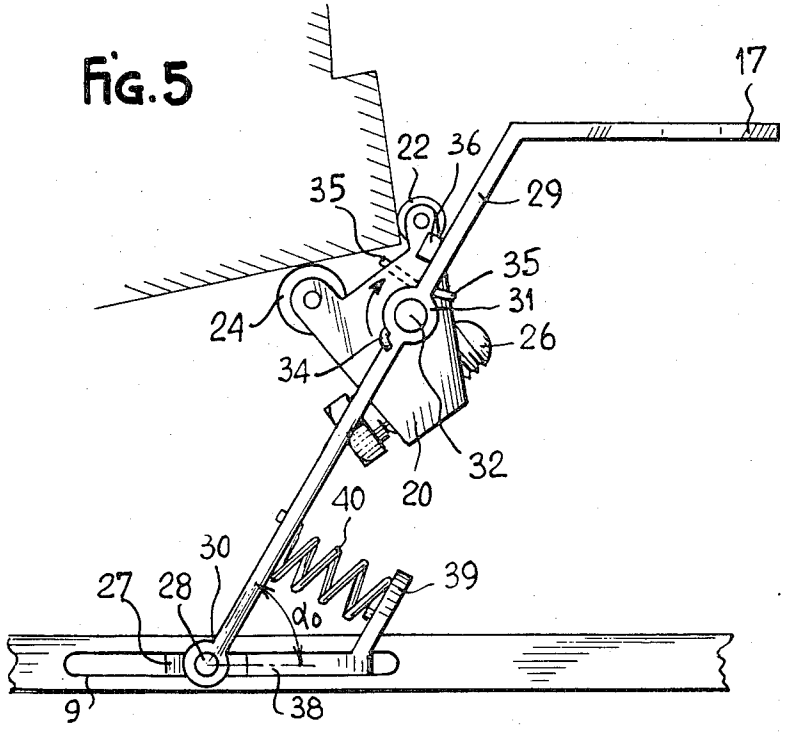

17
22
36
35
29
35
31
24
26
34
32
20
40
30
27
28
39
α_0
9
38

Fig.7

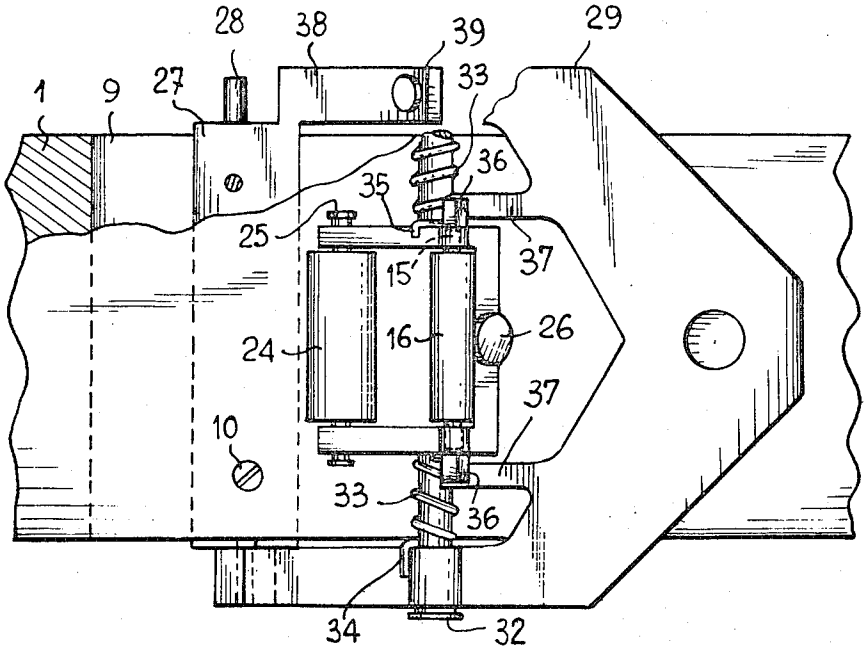

28
38
39
29
1
9
27
33
36
35
25
37
15
16
26
24
37
10
33
36
34
32

Fig.6

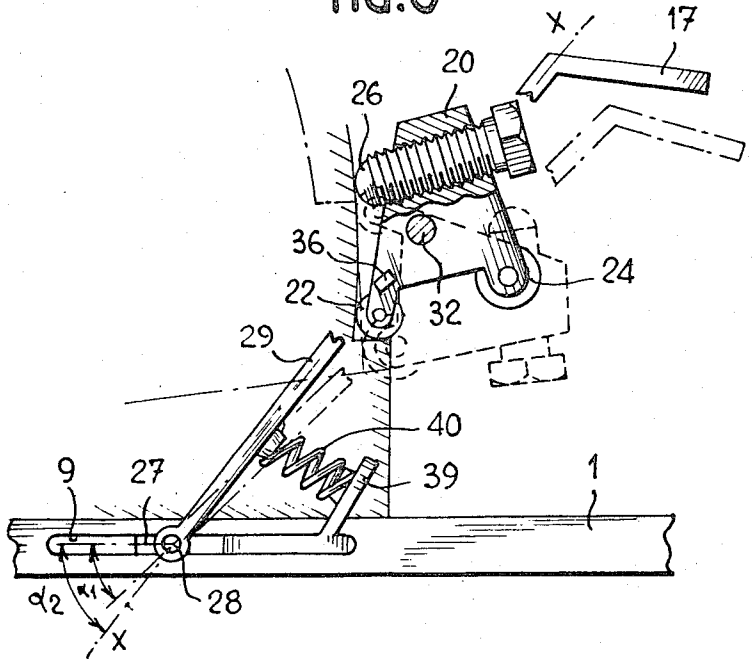

X
17
20
26
36
24
22
32
29
40
9
27
39
1
28
α2
X

FIG. 8

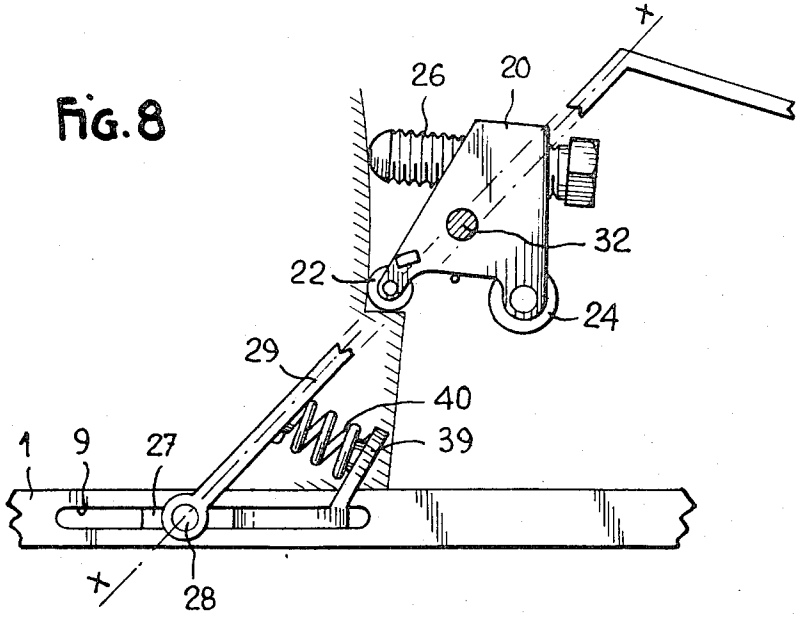

X
26
20
32
22
24
29
40
39
1
9
27
X
28

FIG. 9

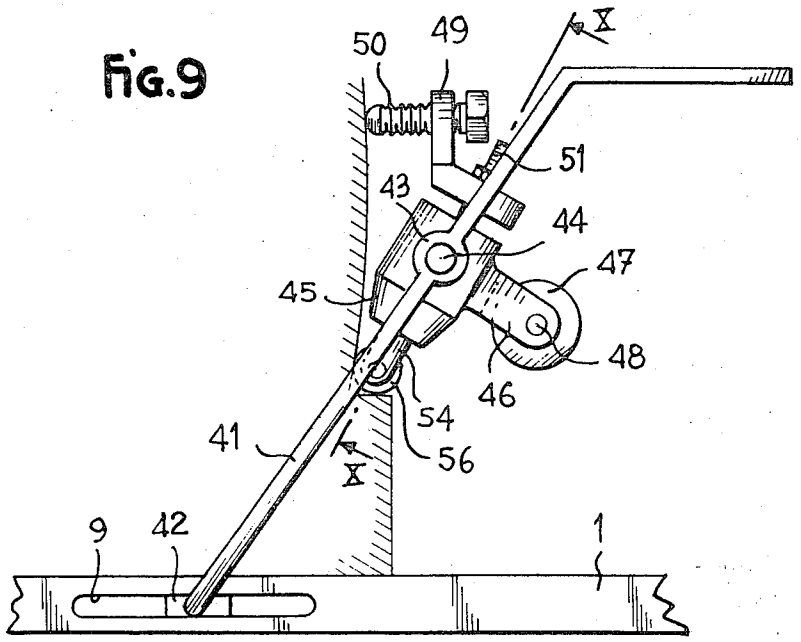

50
49
X
51
43
44
47
45
48
46
54
41
56
X
9
42
1

FIG.10

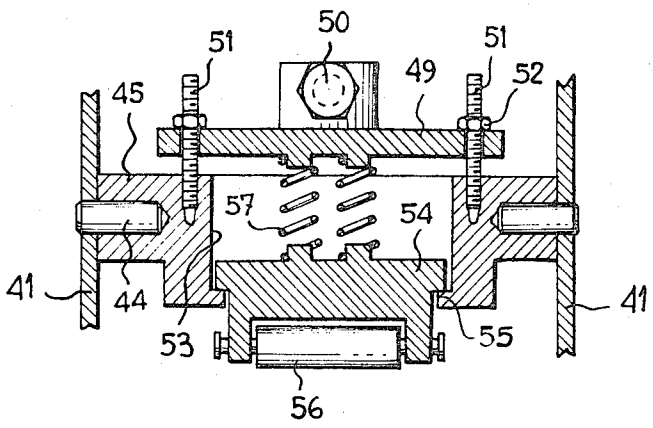


FIG.11

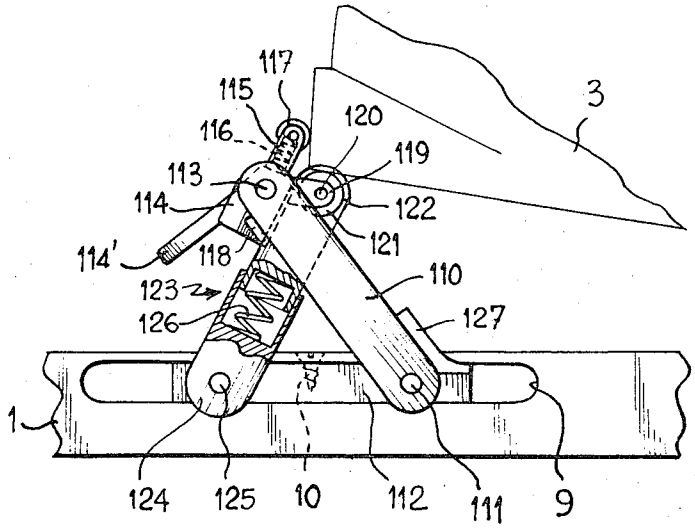


FIG.12

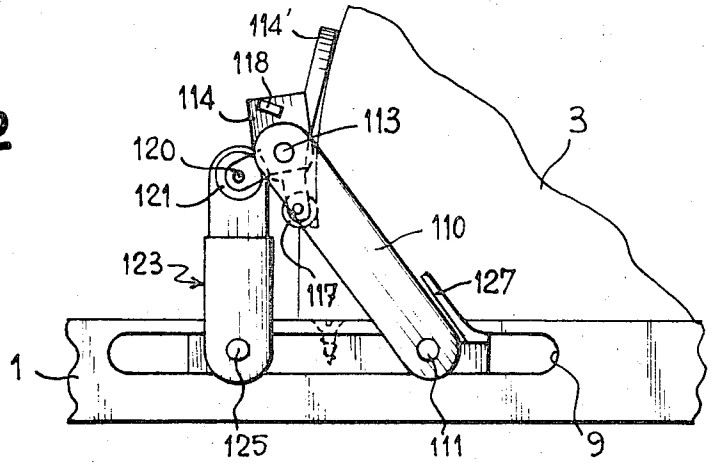


Fig. 13

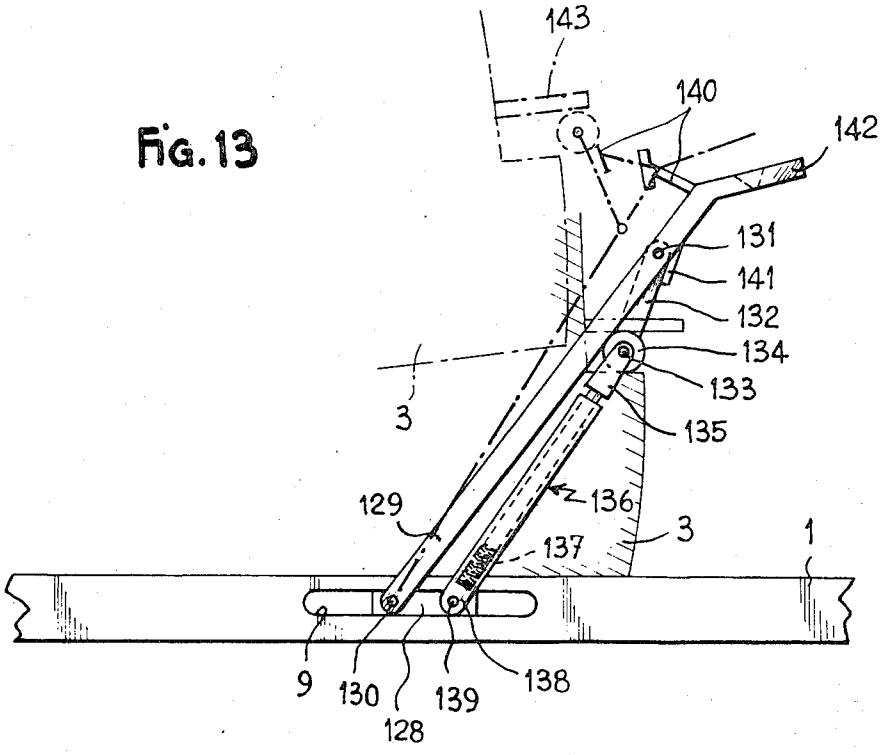

143
140
142
131
141
132
134
133
135
3
129
136
137
3
1
9
130
139
138
128

Fig. 16

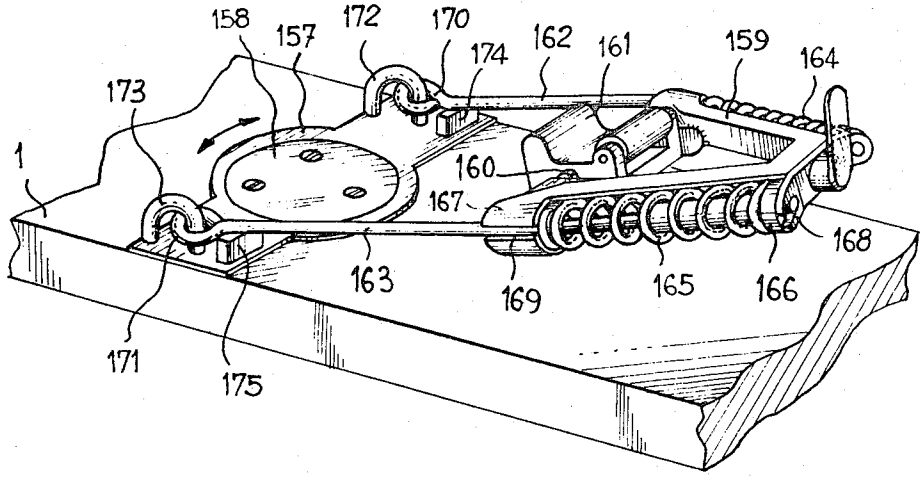

158
157
172
170
174
162
161
159
164
173
1
160
167
168
163
169
165
166
171
175

Fig. 14

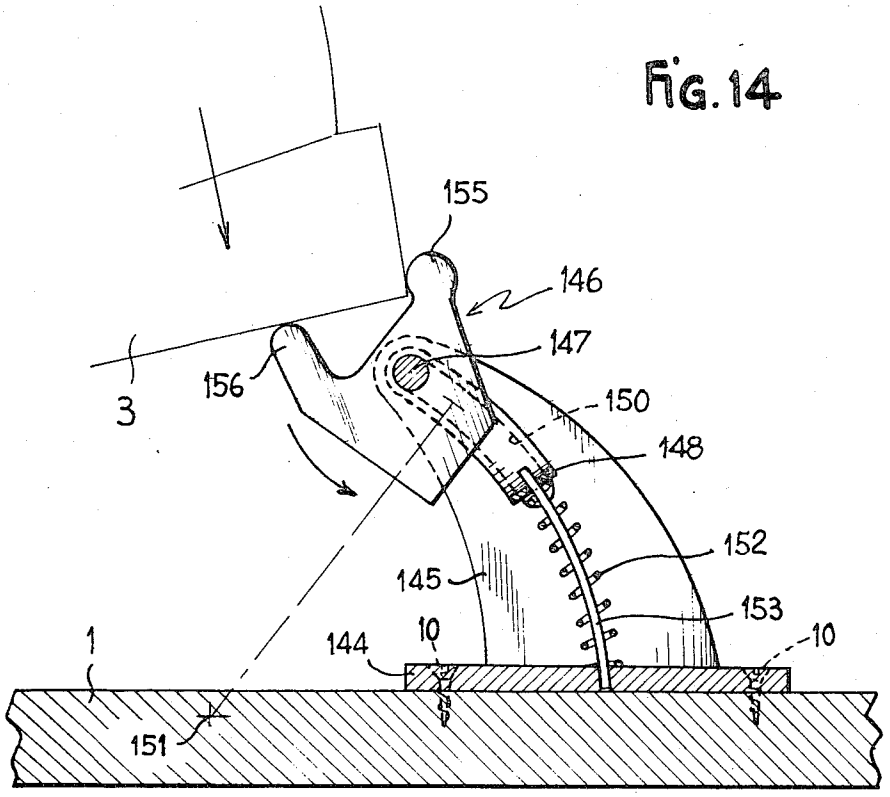

155
146
147
156
3
150
148
152
145
153
1
144
10
10
151

Fig. 15

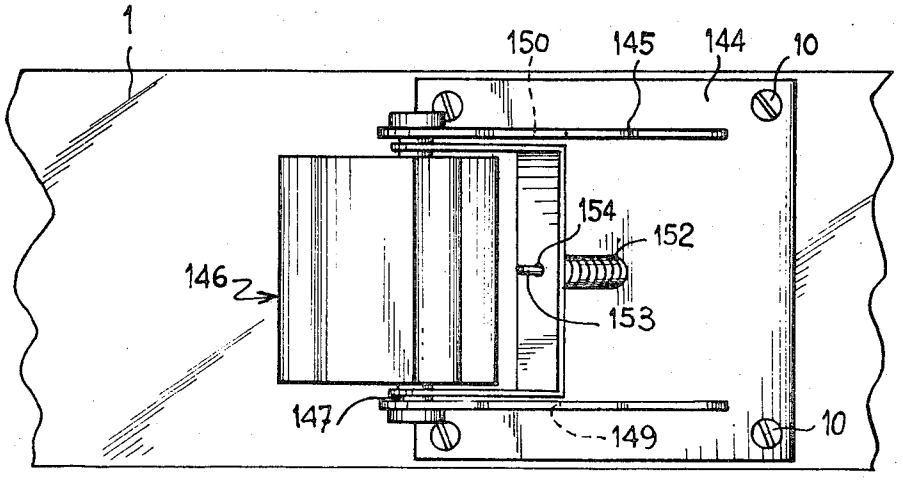

1
150
145
144
10
154
152
146
153
147
149
10

Fig.17

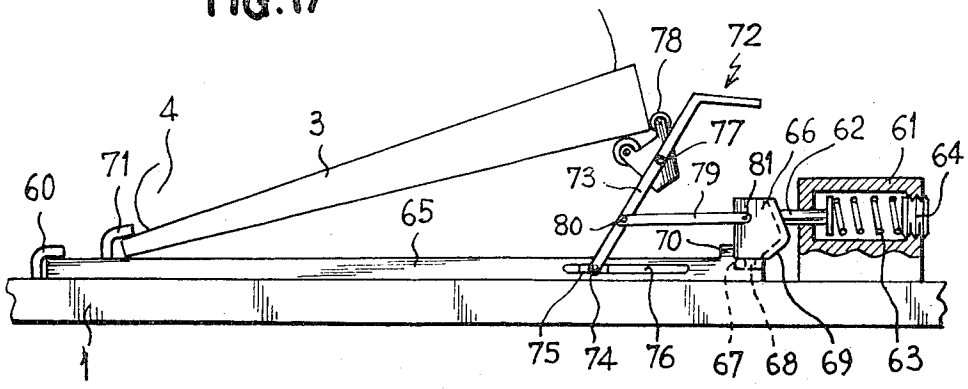

78
72
4
3
77
66
62
61
64
71
73
79
81
60
65
80
70
75
74
76
67
68
69
63
1

Fig.18

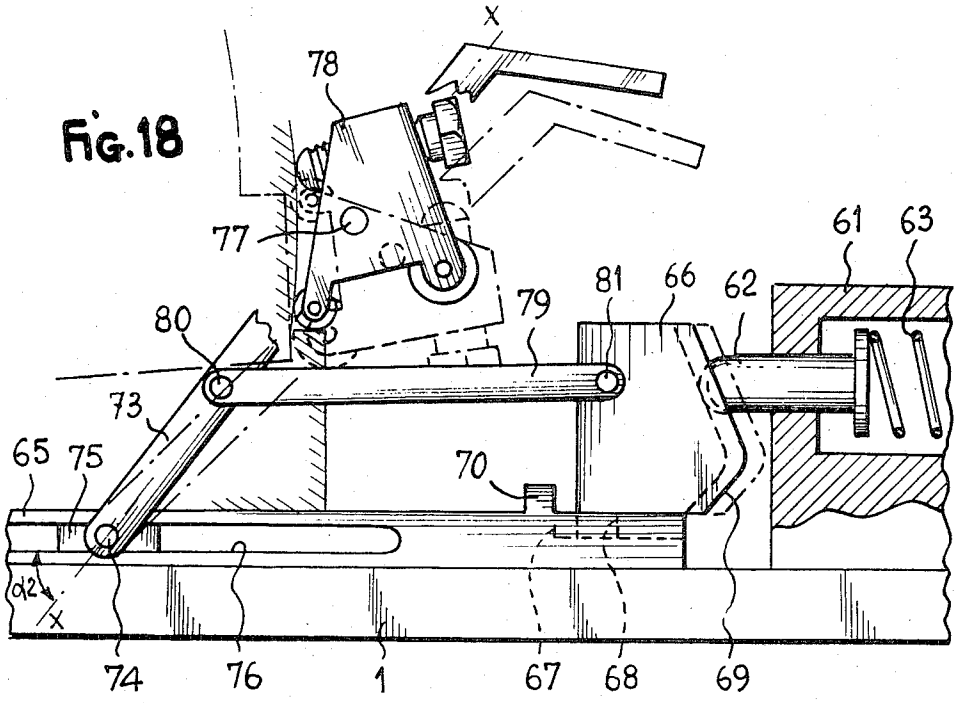

X
78
77
61
63
81
66
62
79
80
73
65
75
70
d2
X
74
76
1
67
68
69

FIG. 19

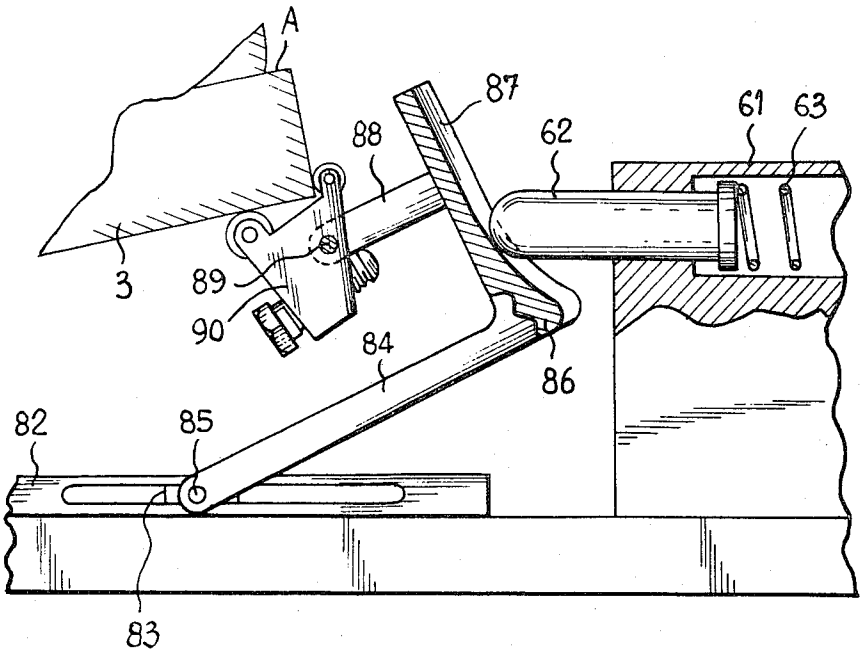


FIG. 20

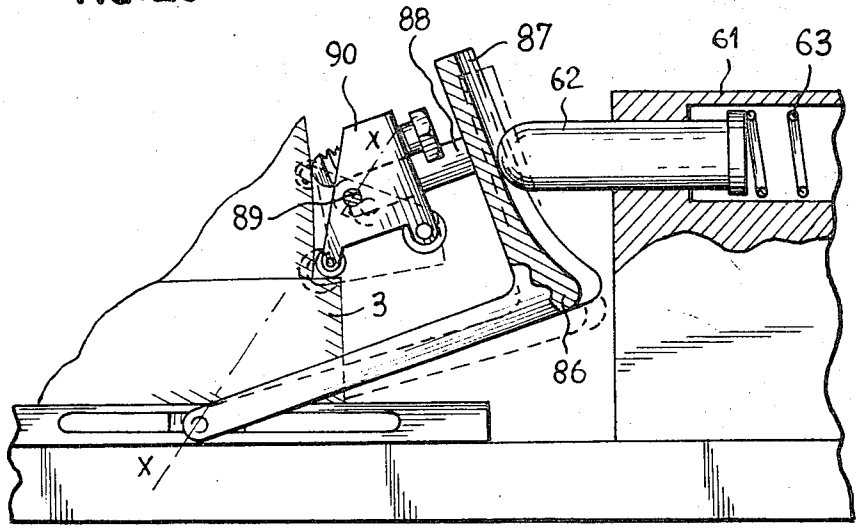


FIG. 21

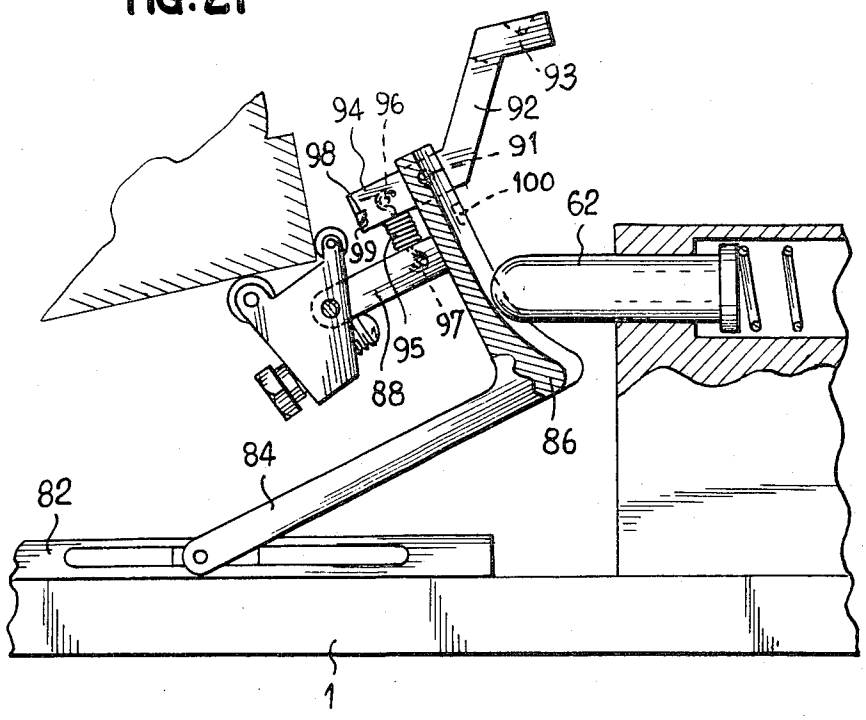
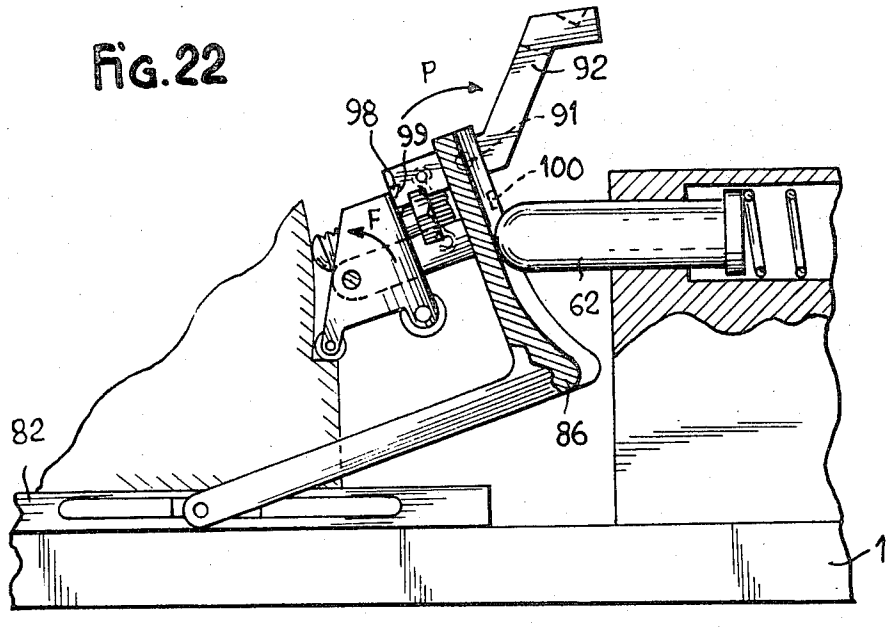

93
94
96
92
98
91
100
62
99
97
95
88
86
84
82
1

FIG. 22


P
92
98
99
91
100
F
62
82
86
1

DEVICE FOR SECURING A BOOT TO A BASE

The present invention relates to a device for securing a boot to a base. The base may consist more particularly of a sports article, such as a boot stretcher, a ski, ice skates or crampons, an intermediate plate to be fitted under the boot, or any other possible type of base.

Hereinafter, for the sake of clarity, the invention will be described solely as it relates to the securing of a boot to a ski, but it is to be understood that the invention is not restricted to this special case.

Existing ski bindings which allow skis to be put on and taken off, and provide a safety release, and which are generally intended to co-operate with the heel of the boot (the toe being held by a stop), may be divided into two main groups:

1. the first group is that of heel-pieces consisting of an element secured to the ski behind the location to be occupied by the boot; they comprise a jaw hinged to the element and connected to a resilient locking system. The jaw is adapted to assume two positions: an open position in which it leaves free the space to be occupied by the heel of the boot; and a locked position in which it is closed on to the boot. The jaw is frequently associated with a pedal supporting the heel of the boot, which makes it possible to put the ski on automatically (without using the hands). This is known as a "step-in" binding. This kind of binding involves a rather complex and voluminous, and therefore heavy, mechanism having a large number of parts requiring relative accurate assembly;

2. the second group covers those bindings known as "pivoting bindings." These bindings are in the form of a stirrup and usually comprise a resilient locking system, the stirrup being adapted to enclose the rear of the boot. The arms of the stirrup are attached to the ski in an area below the boot. The ends of the stirrup arms are usually hinged to a plate rotating about a pivot on the ski, in order not to interfere with the lateral release of the boot. Moreover, the arm hinges rotate freely, so that when the binding is in the inoperative position it generally rests upon the ski outside the area to be occupied by the boot. When the boot is present, the binding is stabilized in a specific locked position. This type of binding may also have a pedal for putting the ski on. Although pivot bindings may be simpler in design, lighter, and less costly than heel pieces, they have the disadvantage of requiring the use of the hands in order to put the skis on, even if they are "step-ins."

It is an object of the present invention to provide a new binding which will overcome the disadvantages of known bindings, while retaining the advantages thereof. More particularly, the invention relates to a very simple form of binding which consists of only two parts and which makes it possible to put the ski on automatically without using the hands.

Moreover, whereas known bindings require manual adjustment to adapt them to various sizes of boot, the structure of the present invention provides automatic adaptation to boots of slightly different lengths (one or two sizes, for example) and/or having soles of different thicknesses, although in the case of large variations in the length of the boot, a conventional length adjustment is, of course, indispensable; it will be understood that this automatic adaptation is mainly of interest where foreign bodies such as mud, snow, gravel, etc. have lodged under the sole of the boot, since it allows the binding to retain its safety features.

Like certain pivot bindings, the binding according to the present invention comprises at least one sole-retaining element hinged to a mounting attached to the base; a similar arrangement may be found, for example, in French Patents 1,110,856, 1,190,118, 1,549,275, 2,034,708, and in Swedish Patent No. 110,142. However, whereas in the known bindings a resilient locking system is interposed between the retaining element and the mounting and the latter is not subjected to any resilient action, the binding according to the present invention comprises resilient means urging, on the one hand the mounting and, on the other hand, the retaining element into a specific position, namely the position securing the boot. With the system according to the invention, the binding cannot be locked unless the boot is in place on the ski. With no boot on the ski, even if the user inadvertently actuates one of the parts of the device, the latter always returns automatically to the open position ready for the ski to be put on.

The invention is therefore concerned with a device for securing a boot to a base, particularly a base which is a part of a sports article and which is equipped with means for holding one of the ends of the boot, the device being characterized in that the resilient means acting between the base and the mounting is integral with the mounting itself, the mounting being made of a semi-rigid, flexible material, of which the part adjacent the base is fixed in relation thereto.

The retaining element comprises at least one jaw which is urged, when the device is inoperative, into a raised position in relation to the mounting by an out-of-balance effect transmitted by a counterweight or a spring; the jaw is free to move between at least two positions determined in relation to the hinging of the retaining element to the mounting, namely an upper position corresponding to the position in which the device is at rest or ready for putting the ski on, and in which the jaw is free to move about its hinge, and a lower position corresponding to the position in which the boot is applied to the base and the jaw is locked against the boot, at which time the retaining element may be locked by the resilient means acting upon the mounting.

The resilient means associated with the mounting may be the mounting itself, if the mounting is made of a semi-rigid, flexible material (such as a flexible steel rod); in this case, the lower part of the mounting will be embedded in the base so that it cannot rotate.

As a variant of this, the lower part of the mounting may be arranged to rotate freely on the base, in which case the resilient element may be a spring located between the base and the mounting or between the base and the retaining element.

It will be observed that the retaining element may comprise, in addition to the jaw, a pedal for putting on the ski, but such a pedal is needed only if the sole of the boot is more than about 1 cm in thickness.

It is obvious that, as another variant, the boot could be provided with a stationary projection which could act as a pedal, in which case the jaw would be resiliently mobile between the arms of the mounting connected to the base.

The device according to the invention may be mounted on a plate rotating about a stationary pivot on

the base (as in pivoting bindings), but this is not mandatory.

Where the device is mounted on a stationary base, any impairment of the lateral release of the boot may be prevented by arranging a space between the mounting of the device and the boot. Moreover, the resiliency of the mounting will lend itself to the displacement of the boot.

The device according to the invention also provides an elegant, simple, and effective solution of the problems raised by the bindings known as "plate bindings."

In conventional plate bindings, the sole of the boot is made temporarily integral with an intermediate plate, the end of which co-operate with retaining elements (the stop and the heel piece), the safety release occurring between the plate and the ski. The binding may then be provided with an automatic return of the plate on the ski, or "step-in."

On the other hand, the boot is attached to the plate by a somewhat simple attachment system which does not provide for automatic fitting of the ski or "step-in."

It would be possible to make this an automatic "step-in" system by fitting elements used in conjunction with known bindings, but this would involve the use of two heel-pieces, one on the ski releasing at a specific maximal stress (200 kg for example), and the other on the plate which would release only at a higher load (say 250 kg). This would provide all of the desired improvements, but at the cost of excessive bulk and weight. Furthermore, manual release of the heel-piece on the plate would be very awkward.

It will be understood that the invention would already provide advantages, even if use were made of two devices, such as those described above, one between the ski and the plate, and one between the plate and the boot.

The device according to the invention, however, provides a still simpler and more economical solution in the special case of plate bindings.

Thus it is proposed, according to the invention, to use between the plate and the ski a known system of safety binding consisting of a jaw serving as a stop for one end of the plate and a resilient locking block arranged on the ski in the vicinity of the other end of the plate and arranged to co-operate with a release ramp mounted on the plate, the ramp permitting both lateral and vertical safety release; and a device according to the invention is installed on the plate, the device being connected to the ramp which is mounted movably on the plate. In this case it is the resilient locking block co-operating with the ramp which not only makes this a "step-in" device for the boot on the plate, but also automatically returns the plate-boot unit to the ski. This is possible because the characteristics required on the resilient block are very much the same in both cases.

Several examples of embodiment of the invention, not to be regarded as restrictive, will now be described in conjunction with the drawings attached hereto, wherein:

FIG. 1 is a general, schematic side elevation of a ski equipped with a device according to a first example of embodiment of the invention;

FIG. 2 is a side elevation, to an enlarged scale, of the device in FIG. 1, shown in full lines in the locked position and, in dotted lines, in an intermediate position;

FIG. 3 is a plan view of the device in FIG. 1;

FIG. 4 is a side elevation of a second example of embodiment of the device;

FIG. 5 shows a third example of emboidment of the device;

FIG. 6 shows the device in FIG. 5 in two operating positions;

FIG. 7 is a plan view of the device in FIG. 5;

FIG. 8 shows the device in FIG. 5 in still another position;

FIG. 9 is a side elevation of a fourth example of embodiment of the invention;

FIG. 10 is a section along the line 10—10 in FIG. 9;

FIGS. 11 and 12 show two positions assumed by a binding according to a fifth example of embodiment;

FIG. 13 is a schematic illustration of a sixth example of embodiment;

FIG. 14 shows a seventh example of embodiment of a binding;

FIG. 15 is a partial plan view of the binding in FIG. 14;

FIG. 16 shows a modification of a known type of binding;

FIG. 17 is a side elevation of the device adapted to a plate binding;

FIG. 18 shows two operating positions assumed by the device in FIG. 17;

FIG. 19 shows a variant of the system adapted to a plate binding;

FIG. 20 shows two operating positions assumed by the device in FIG. 19;

FIG. 21 is a variant of the embodiment in FIGS. 19 and 20;

FIG. 22 shows the device in FIG. 21 in another position.

Identical elements bear the same reference numerals in all of the drawings. Moreover, the device according to the invention is described and represented hereinafter as designed to co-operate with the heel of a boot or the back of an intermediate plate, but it is to be understood that it could also be located at the front of the sole or the plate.

In FIG. 1, a ski 1 is provided with a front stop 2 intended to accommodate the front of the sole 3 of a ski boot 4. The back of the sole co-operates with a binding device indicated generally by the numeral 5. This device consists of a mounting in the form of a stirrup having two lateral arms integral with a plate 7 comprising a depression 7' in which the tip of a ski-pole may be placed in order to release the device intentionally.

Arms 6, themselves constituting a resilient means, are made of a semi-rigid and flexible material such as spring steel and are attached by their lower ends to a cross-piece 8 sliding in a slot 9 machined into the thickness of the ski. The cross-piece may nevertheless be locked in relation to the ski by means of screws 10 engaging in a series of tapped holes 11 in the ski. This arrangement makes it possible to adjust the position of device 5 in relation to the ski as a function of the size of boot 4.

As may be seen in FIG. 1, arms 6 of the mounting are attached to cross-piece 8 in a manner such that they rise above the ski at an angle of α_0 when the device is inoperative. It will also be observed that cross-piece 8 is very definitely below the sole of the boot.

Running between arms 6 is a horizontal member 12 on which a retaining element 13 is arranged to rotate freely, the element assuming, in its inoperative posi-

tion, by reason of its own weight, the position shown in FIG. 1; this merely requires that centre of gravity 5 of the retaining element be offset in relation to member 12, a resilient restoring force, produced by the weight, thus acting upon the retaining element by reason of the lever arm between member 12 and point G to which the tip of the retaining element is applied.

The retaining element has a jaw consisting of a pair of ears 14 in which is mounted a shaft 15 carrying a roller 16 which rotates freely thereon. It also comprises a projecting portion 17 running approximately in the same direction as jaw 14–16.

The operation of the device is as follows. When the heel of boot 4 is lowered in the direction of arrow F_1 in FIG. 1, the heel rests upon the end of pedal 17, causing the retaining element to rotate in the direction indicated. Roller 16 of the jaw is thus brought into contact with the back of the heel; after the retaining element has rocked in the direction of arrow F_2, arm 6 of the mounting descends as shown in dotted lines in FIG. 2; angle α_1 between the mounting and the ski is then less than angle α_0. In this position, jaw 16 and pedal 17 are both in contact with vertical plane B of the sole, the pedal imposing on the retaining element its angular position in relation to the sole and preventing it from rocking in a direction opposite to the desired direction. The heel of the boot continues to move towards the ski, the edge of the heel reaching the level of roller 16, which is released, rests on edge A, and allows the retaining element to rock further in the direction of arrow F_2. Mounting 6 then straightens up and the retaining element assumes the position shown in full lines in FIG. 2, the opposite edge 18 of roller 16 coming up against the boot. As may be seen in FIG. 2, locking of the retaining element is achieved when roller 16 passes over the dead centre located in the plane X—X defined by arms 6 of the mounting. This dead centre, or hard point, of the joint is passed over automaticaly as a result of the energy release by arms 6 as they stretch. FIG. 1 shows very clearly the importance of the recess arranged between pedal 17 and jaw 16, the recess allowing the lower edge of the sole to move. It will be understood, furthermore, that the device would also function if the bottom surface of the sole were to bear not only against projection 17, but also against projection 17 and jaw 16. In this case, projection 17 would determine the angle of attack of the jaw in relation to the sole until such time as the descent of the foot brings the device into the position shown in FIG. 1, when jaw 16 escapes from the bottom surface of the sole.

The mounting is thus under tension, i.e. angle α_2 that it forms with the ski is larger than angle α_1 but smaller than angle α_0, the angle in the position of rest. It will be understood that the device as shown in full lines in FIG. 2 will resist any attempt to lift the heel of the boot, although it may be unlocked at will by pressing plate 7 of the mounting with the tip of a ski-pole.

In FIG. 4, the mounting consists of circular-section spring-steel arms also integral with a lower cross-piece 8. Retaining element 20 rotates freely on shaft 12 in mounting 19 and is provided with two pairs of ears 21 and 23, one of them accommodating a roller 16 rotating freely on shaft 15 and acting as a jaw, while the other carries a second roller 24 serving as a pedal and rotating freely on shaft 25. At the end remote from rollers 16 and 24, element 20 is equipped with an adjusting screw 26, the rounded end of which comes into contact with the boot when the device is locked (as shown in full lines in FIG. 6). It will be understood that the slope of the retaining element in relation to arms 19 may be adjusted by making the shank of the screw project to a greater or lesser degree from the retaining element.

FIGS. 5 to 7 illustrate another example of embodiment of the device, in which the mounting, instead of being secured to the cross-piece, pivots thereon. To this end, cross-piece 27 has two lateral extensions 28 carrying eyes 30 at the ends of arms 29 of the mounting. In this case the arms may be completely rigid. Arms 29 have bearings 31 carrying a freely rotating shaft 32 integral with a retaining element 20, identical with that in FIG. 4, which is urged into the inoperative position shown in FIG. 5 by springs 33 surrounding shaft 32, one end of each of the springs resting against the retaining element at 35, while the other end rests against arms 29 at 34 (FIG. 7). It will be observed that the rotation of the retaining element is restricted by means of stops 36 thereon which rest, in the position shown in FIG. 5, against stop extensions 37 integral with mounting 29.

The mounting is maintained in the erected inoperative position by lateral springs 40 located between one of arms 29 of the mounting and a sloping bracket 39 running from an extension 38 of cross-piece 27. The ends of each of springs 40 are preferably, but not necessarily, secured to arms 29 and bracket 39 as shown, forward pivoting of the mounting being thus restricted.

The device of the examples of embodiment so far illustrated and described is not provided with a safety release since, as may be seen in FIGS. 2 and 6, the roller of the jaw passes over dead-centre X—X. There is no problem, however, in providing a safety release, especially in the device illustrated in FIGS. 4 to 7. As already stated, it is merely necessary to adjust screw 26 to prevent the roller from passing over the dead-centre. This configuration of the device is shown in FIG. 8.

The variant of the device shown in FIGS. 9 and 10 makes it possible to adapt the device, without impairing its function, to a wide range of sole thicknesses or to the case where a foreign body (mud, snow) becomes lodged under the sole of the boot when the ski is being put on. To this end, either the jaw alone (as illustrated), or the whole retaining element, is mounted resiliently in relation to the arms of the mounting.

Spring-steel arms 41 of the mounting are secured to a cross-piece 42 accommodated in ski 1 and they carry, in bearings 43, axes 44 on which retaining element 45 rotates freely. The latter comprises a fork 46 carrying a pedal-roller 47 on an axis 48. A part 49 carrying an adjusting screw 50 slides on threaded rods 51 engaging in the body of retaining element 45. Nuts 52 on threaded rods 51 limit the distance between part 49 and the retaining element. The body of element 45 has a cavity 53 in which there slides a fork 54 emerging to the outside through an opening 55. Fork 54 carries a jaw-roller 56 rotating freely on a shaft. Located between part 49 and fork 54 are two springs 57 urging the said fork outwardly.

It will be appreciated that roller 56 may move resiliently, as a function of sole thickness, against the action of springs 57.

In the following variants illustrated in FIGS. 11-12 and 13, the resilient means acting upon the mounting and upon the retaining element have been combined

into a single resilient system running between the base and the retaining element. With this arrangement, a first phase in the travel of the resilient system allows the retaining element to pivot in relation to the mounting, the latter remaining in the raised position; a second phase in the travel directly involves the mounting, which may pivot in turn in relation to the base.

In the variant illustrated in FIGS. **11** and **12**, the mounting consists of two rigid arms **110** pivoting freely at **111** on adjustable cross-piece **112** accommodated in a recess **9** in the ski and secured by screws **10**. The free ends of arms **110** are connected by a shaft **113** on which a retaining element **114** rotates freely, the general configuration of the element being similar to that of element **45** in FIGS. **9** and **10**, i.e. a jaw-roller **117** rotates freely on the axis of a fork **54** adapted to slide, against the action of springs **116**, in body **114** of the element. The body carries at least one stop **118** which comes into contact with arms **110** in order to restrict the rotation of element **114** in the inoperative position shown in FIG. **11**. Element **114** also has cheeks **119** carrying a shaft **120** on which there rotates freely a roller **121** which turns in a bore in head **122** of a telescopic assembly indicated in a general way at **123**, the head **122** being preferably rounded-off and serving as a pedal for sole **3** of the boot. Base **124** of the telescopic assembly pivots freely on axis **125**. The relative motion between head **122** and base **124** of the telescopic assembly takes place against or under the action of a spring **126**.

It will be observed that it would be possible to provide a stop **127** on cross-piece **112**, to limit the forward rotation of arm **110**. Furthermore, it will be of advantage to provide retaining element **114** with a lever **114'** for intentional removal of the ski.

The operation of this type of binding is simple and may be easily understood from FIGS. **11** and **12**. As may be seen in FIG. **12**, ski-removal lever **114'** comes up against the boot when the mechanism is in the locked position.

FIG. **13** is a schematic representation of another example of embodiment. The full lines show the device in the locked position, while the dotted lines indicate the inoperative position. A cross-piece **128**, adjustable in accordance with the length of the ski, carries lateral arms **129** of a mounting rotating freely on axes **130** and equipped with an axis **131** on which retaining element **132** rotates freely, the element being provided with a jaw-roller **134** free to rotate about axis **133**. The latter extends laterally, carrying at each end the head **135** of a telescopic resilient element **136** comprising a spring **137**, foot **138** of the element rotating freely on an axis **139** of cross-piece **128**. Telescopic element **136** urges roller **134** towards the position shown in dotted lines (in which the device is inoperative) where it is halted by a stop **140** on mounting **129**, which prevents it from pivoting further. In a similar manner, a stop **141** on mounting **129** prevents the retaining element from going beyond its operative position, shown in full lines. As a variant of this arrangement, this stopping of the retaining element in its operative position could be obtained by causing the said retaining element **132** to rest against the boot, as indicated in the foregoing examples. However, the solution indicated in FIG. **13** is preferred, since it facilitates removal of the ski, which may be make automatic by displacing mounting **129** and therefore stop **141**. This movement is accomplished by pressing ski-removal lever **142** which is an extension of mounting **129**.

It should be noted that, with this type of device, the pedal for automatically putting the ski on may, with advantage, be located on the boot, as shown at **143**, the pedal being either a projection from the boot or a part fitted thereto.

In the example of embodiment illustrated in FIGS. **14** and **15**, a base **144** is secured adjustably to ski **1** by screws **10**, the base comprising two uprights **145**, between which is located a retaining element **146**. The latter rotates freely about an axis **147** integral with a U-shaped stirrup **148**, the ends of axis **147** sliding in curved slots **149,150** machined in uprights **145** of the fixed base. These slots **145,150** allow stirrup **148** to move, the centre of the arcs being located at a point **151** below the sole of the boot; it will be understood that strirrup **148**, and therefore the retaining element, thus move along the arc of a circle, the centre of which is point **151**.

The retaining element is urged into the inoperative position shown in FIG. **14** by means of a spring **152** located between base **144** and the transverse arm of stirrup **148**. The spring is threaded over a rod **153** which follows the arc of a circle centered at point **151**, the lower end of the rod being integral with base **144**. The free end of rod **153** is accommodated, with a certain amount of play, in a hole **154** in the transverse arm of stirrup **148**.

It will be observed that in the ecample illustrated, jaw **155** and pedal **156** of the retaining element are both in the form of rounded projections on the retaining element. Although this is a workable arrangement, it is not as efficient as rollers. Element **146** may, of course, be provided with rollers, as in the preceding examples.

This type of device operates in a manner similar to that described more particularly in connection with FIGS. **1** to **5**.

It will now be shown, with reference to FIG. **16**, that it is quite possible to adapt known types of bindings to enable them to function in a manner identical with that of the bindings described above. The invention may thus be applied generally to a large number of structures.

In FIG. **16**, the binding is mounted in known fashion on a plate **157** which turns about a central pivot **158** secured to ski **1**. The binding comprises, in known fashion, a generally V-shaped element **159**. Hinged on an axis **160** between the arms of the V is a retaining element **161** which is similar to element **13** in FIG. **1**, for example, and is adapted to co-operate with the sole of the boot.

Semi-rigid rods **162,163** run partly within the arms of the V, springs **164,165** being threaded over the rods. One end of each spring rests against an adjustable stop **166** on the rod, while the other end rests against a projection **167** from the arm of the V. One of the said rods (**163**, for example) may be released from its housing through slots **168,169** located in the ends of one of the arms. Since this is a conventional design, it will not be described in detail. The free ends of semi-rigid rods **162,163** terminate in hooks **170,171** co-operating with arches **172,173** integral with plate **157**. This hook-arch attachment allows the device to rotate in all directions, which is indispensable if the binding is to release correctly.

When the binding, improved in accordance with the invention, is in the inoperative position, lateral rods **162,163** rest against stops **174,175** integral with plate **157**, which keep the binding raised from the ski. It will be understood that, when the ski is put on, the sole of the boot comes up against element **161** which it is able to push towards the ski by reason of the flexibility of rods **162,163** resting on stops **174,175**. After the boot has travelled a certain distance, and the element has pivoted, rods **162,163** will rise as explained in the preceding examples.

A description will now be given of cases in which the device according to the invention is used in conjunction with plate bindings.

In FIG. **17**, **1** indicates a ski comprising a front stop **60** and a resilient rear locking block **61** of conventional design. The locking block may contain a piston **62** acted upon by a spring **63** accommodated in the body of the block, the force exerted by the said spring being adjusted by means of a threaded plug **64**.

An intermediate plate **65**, designed to be attached to boot **4**, is engaged at its front end with stop **60** and co-operating at its rear end with piston **62** through a part **65** integral with the plate and comprising a ramp **69** of V-shaped cross-section. Since this type of device is known, it will not be described in detail. It will be sufficient to mention that it allows the plate, with the boot, to be released both vertically and in the plane of the ski.

In the case illustrated, however, part **66** is mounted on the plate in a manner such that it can slide longitudinally. To this end it has a base **68** which may be dovetailed, for example, and which engages in a corresponding guide housing **67** machined into the plate. Forward travel of part **66** is limited by stop **70**.

The plate itself has a front stop **71** which holds the front of the boot; at the rear it has a device indicated generally by the numeral **72**, the general structure of which resembles that of the device in FIGS. **5** to **8**.

Rigid mounting **73** of the device rotates freely, at **74**, on cross-piece **75** accommodated adjustably in slot **76** in the plate, and a retaining element **73**, identical with that in FIGS. **5** to **8**, rotates about an axis **77**.

Furthermore, each arm of the mounting is connected to part **66** by a link **79** hinged freely at **80** and **81** to the mounting and to part **66**.

In this type of binding, plate **65** is normally locked to the ski at all times. In order to obtain the automatic "step-in" feature, it is merely necessary to place the front of the sole under stop **71** and then to lower the heel onto the retaining element which operates as described hereinbefore, except that spring **63** is compressed and then expands partly, due to the fact that ramp **66** retreats and then advances.

When the binding executes a safety release, the boot comes away from the ski with plate **65**, to which it remains attached, although the pressure of spring **63** no longer acts upon ramp **66**. This is attributable to the fact that the jaw-roller of the retaining element has passed the dead-centre point of the hinge, as explained above. Automatic "step-in" of the plate-boot assembly is rendered possible by the shape of the chamfered lower portion **69** of the ramp.

In the variant illustrated in FIGS. **19** and **20**, plate **82** still accommodates a cross-piece **83** equipped with lateral axes **85**, but arms **84**, which rotate freely on axes **85**, are integral at their rear end with a plate **86** approximately perpendicular to arms **84** and provided with a ramp **87** designed to cooperate with piston **62** in the locking block. Furthermore, the front face of plate **86** is equipped with a fork **88** carrying an axis **89** on which a retaining element **90**, simlar to that in FIG. **4**, rotates freely.

As shown in full lines in FIG. **20**, the adjustment screw of the retaining element is adjusted to ensure that the jaw-roller passes over the dead-centre point X—X in the position in which it locks the boot to the plate.

Thus when the plate and the boot are safety-released, they remain attached to each other by the device. The plate may be conveniently released at will by applying pressure to the top of plate **86** (against the action of spring **63** if the plate is still attached to the ski).

It will be observed that correct operation of this device places the ramp in the specific position shown in relation to the locking block. A reference mark must therefore be placed on the ramp, in order to check whether the length adjustment of cross-piece **83** is correct.

FIGS. **21** and **22** illustrate a system similar to that in FIGS. **19** and **20**, except that a lever for removing the ski at will is hinged to the top of plate **86**. This lever may be in the form of a fork and may comprise, as an extension of arms **92** hinged at **91** to plate **86**, a small plate having a depression **93** for the tip of the ski-pole.

The lever is urged into the position shown in FIG. **21** by springs **95**, each spring being hinged by one end at **96** to an extension **94** of arm **92** and, by the other end, at **97** to an arm of fork **88** of the plate.

The lever also serves as a stop for the retaining element when the latter is in the locking position shown in FIG. **16**. This is achieved by the provision of projections **88** arranged on the lever and extending into the path of the retaining element, the projections exhibiting a flat front face for the support of the retaining element (FIG. **22**) and an inclined ramp **99** which allows lever **92** to move against the action of spring **95** when the retaining element pivots from its inoperative position into its locking position for the purpose of holding the boot (arrow F).

A stop **100** may also be provided on plate **86**, to restrict the pivoting of the lever in the direction of arrow P.

When it is desired to remove the ski, pressure is applied to lever **92** at depression **93**, causing the lever to pivot until it comes up against stop **100** and, at the same time, releasing the retaining element by moving stop **98** out of the way. Continued pressure on the lever lowers plate **88** which pushes piston **62** back and makes it possible to remove the ski. It will be observed that stop **98** on lever **92** prevents the retaining element from pivoting in a direction opposite to that of arrow F; with an arrangement of this kind, it is therefore no longer necessary that the jaw-roller of the retaining element shall pass beyond the dead-centre point, in order to make the binding irreversible, i.e. unreleasable.

The invention having now been set forth in relation to specific forms thereof, it is wished to have it understood that the invention is not limited in interpretation except by the terms of the following claims.

I claim:

1. A device for securing a boot to a base, especially a base constituting a sports article, equipped with a means for retaining one of the ends of the boot, said de-

vice being adapted to co-operate with the other end of the boot and comprising:

a mounting connected to said base and located externally of the space covered by the boot during the operations of putting-on and taking-off the ski;

an element for retaining the boot, said element being arranged in the mounting and located at least partially within the space covered by the boot, and pivoting, between the positions in which it locks and releases the boot, about a horizontal axis located in the mounting and running transversely thereto, said axis of pivot being vertically displaceable in relation to the base;

a resilient system allowing the device to move between a position in which the boot is locked and a position in which the boot is released;

said device being characterized in that the resilient system comprises a resilient means supported by the base and urging the mounting into a position which is raised in relation to the base and in which the boot is released, and a resilient means acting between the mounting and the retaining element and urging said retaining element into a position in which the boot is released.

2. A device according to claim **1**, characterized in that the resilient means acting between the base and the mounting is integral with said mounting, the latter consisting of a flexible, semi-rigid material, and the part thereof adjacent the base being fixed in relation thereto.

3. A device according to claim **1**, characterized in that the resilient means acting between the base and the mounting consists of a spring, one end of which rests against the base, while the other end rests against the mounting.

4. A device according to claim **1**, characterized in that the resilient means acting between the mounting and the retaining element consists of a counterweight to said retaining element which rotates freely upon its pivot axis.

5. A device according to claim **1**, characterized in that the resilient means acting between the mounting and the retaining element is in the form of a spring.

6. A device according to claim **5**, characterized in that the spring acting upon the retaining element bears against the mounting at one end and against the retaining element at the other end, said spring being distinct from the resilient means acting between the base and the mounting.

7. A device according to claim **1**, characterized in that the resilient means acting upon the retaining element, and the resilient means acting between the base and the mounting, are incorporated into each other and constitute a hinge element, the foot thereof being hinged to the base while the head is hinged to the retaining element.

8. A device according to claim **1**, characterized in that said mounting consists of two parallel arms between which the retaining element is mounted, said arms extending laterally from one side of the base to the other.

9. A device according to claim **1**, characterized in that the mounting is rigid and its lower end is hinged to pivot about a horizontal axis on the base, a system of springs running behing said horizontal axis, between the mounting and a fixed point on the base, to urge said device into a raised position.

10. A device according to claim **1**, characterized in that the retaining element rotates on an axis the movement of which is guided by a stationary ramp integral with the base, a spring running between the base and retaining element to urge the latter into its inoperative position.

11. A device according to claim **1**, characterized in that the retaining element comprises a jaw.

12. A device according to claim **11**, characterized in that the retaining element comprises, in addition to the jaw, a pedal running substantially in the same direction as said jaw, but offset therefrom in relation to the hinge axis of the retaining element on the mounting.

13. A device according to claim **12**, characterized in that the retaining element comprises, at the end remote from the jaw and pedal and on the other side of the hinge, an adjusting screw adapted to bear against the boot when the device is in the position in which it holds the boot to the base, said screw making it possible to adjust the angle of the retaining element in relation to the mounting.

14. A device according to claim **11**, characterized in that at least that part of the retaining element which is adapted to ensure retention of the boot is mounted in a manner such that it can move resiliently in relation to the mounting, a resilient element being provided between said pair of the retaining element and the assembly which is fixed in relation to the mounting.

15. A device according to claim **14** characterized in that the retaining element as a whole is held resiliently in relation to the mounting.

16. A device according to claim **14**, characterized in that the jaw consists of an independent part freely accommodated in the retaining-element block and urged, by means of springs, towards the exterior of the retaining element.

17. A device according to claim **1**, adapted to unite the boot with an intermediate plate held to the base by means of a safety-binding system which releases the plate and the boot in the event of excessive stress, said system consisting of a jaw acting as a stop for one end of the plate and, in the vicinity of the other end of the plate, of a resilient locking block co-operating with a ramp attached to the plate and providing for lateral and vertical safety release, characterized in that said device is connected to said ramp which is mounted so that it can move on the plate, the resilient locking block co-operating with the ramp ensuring the retention of the device in its raised inoperative position.

18. A device according to claim **17**, comprising a mounting associated with a retaining element and hinged to the plate, below the sole of the boot, by a freely rotating axis, characterized in that said mounting is connected, by means of a linkage with freely rotating hinges, to the ramp which is mounted on the plate so that it slides freely in the longitudinal direction in co-operation with guide elements.

19. A device according to claim **18**, comprising a retaining element characterized in that the latter is mounted to rotate upon a support integral with the ramp which effects the release, said ramp being in turn mounted to rotate freely on the intermediate plate in an area located under the sole of the boot.

* * * * *