Aug. 18, 1964 L. BERCHTOLD ETAL 3,145,027

SAFETY SKI BINDING

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FIG. 1

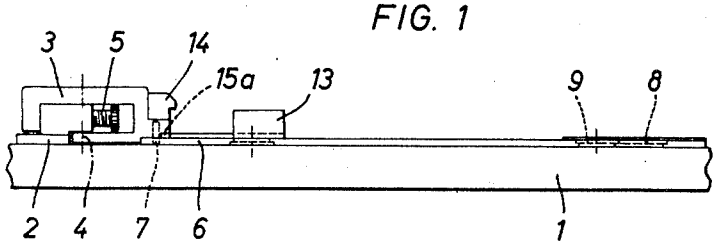


FIG. 2

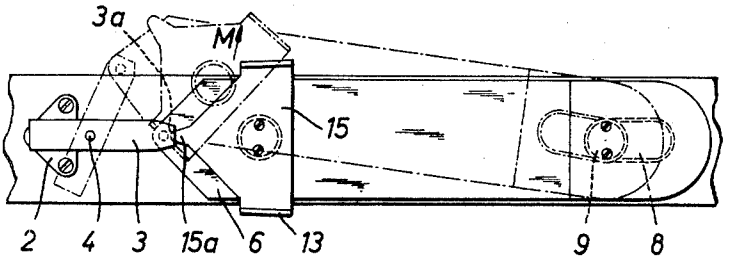
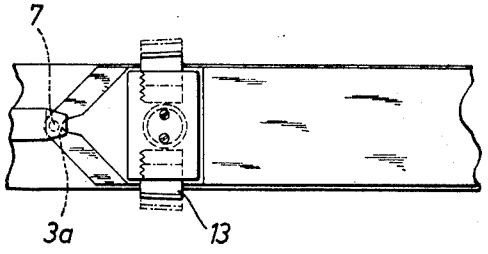


FIG. 3



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SAFETY SKI BINDING

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FIG. 4

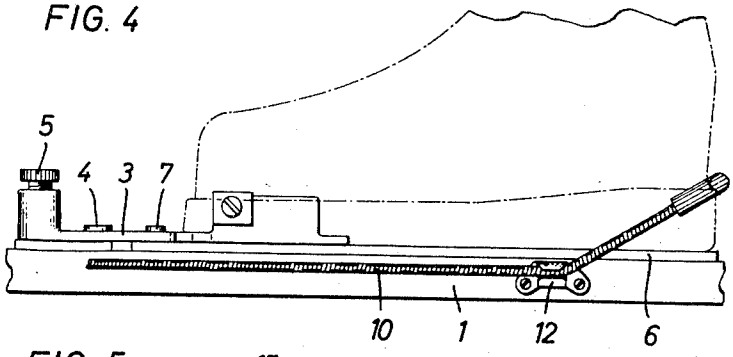

FIG. 5

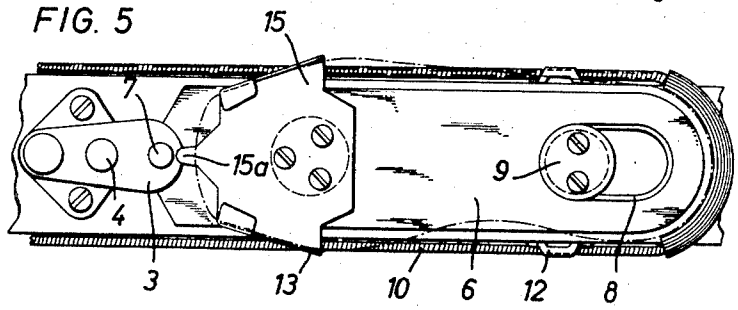

FIG. 6

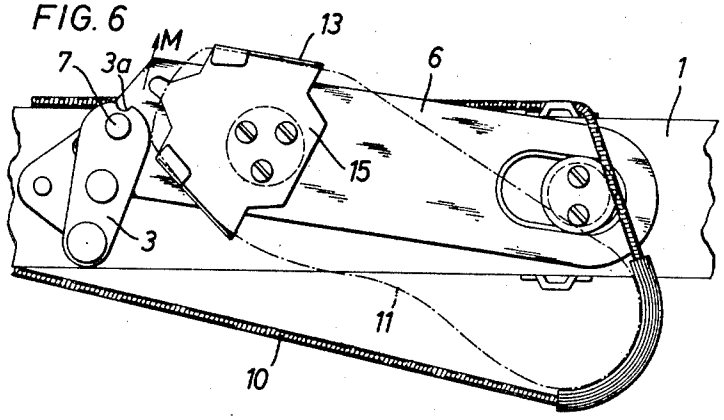

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FIG. 7

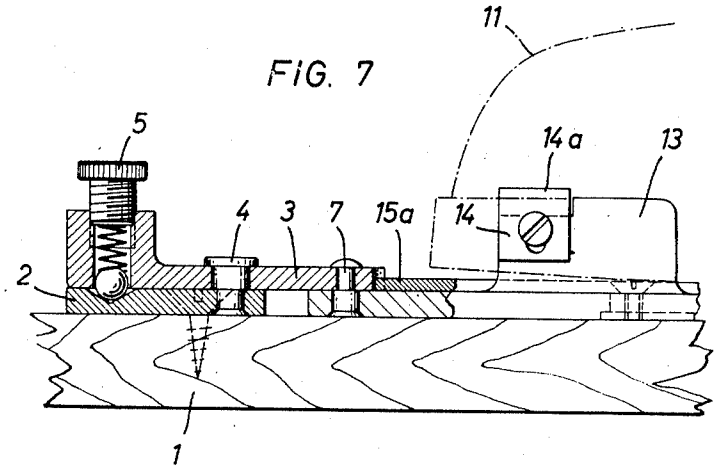

FIG. 8

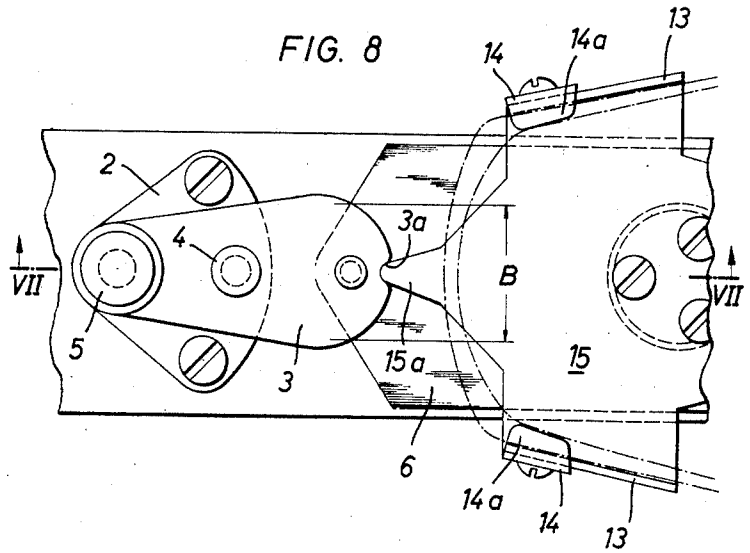

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FIG. 9

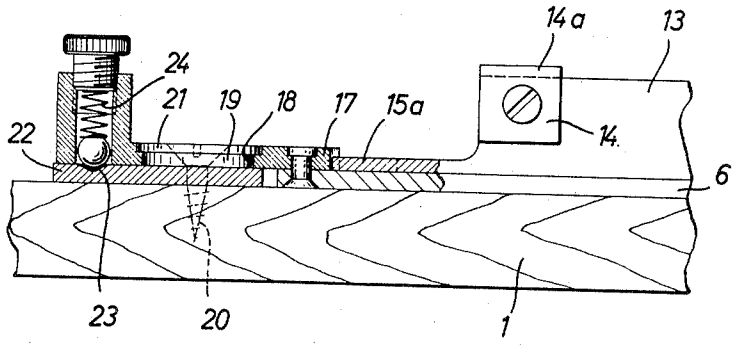
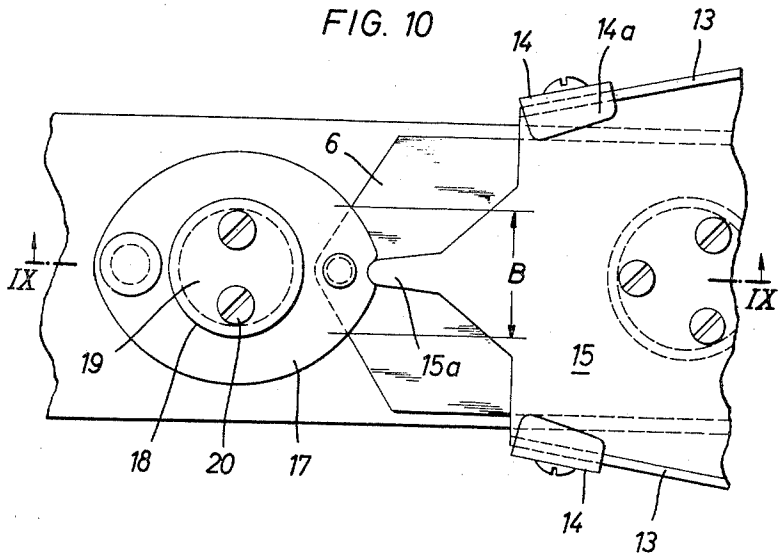


FIG. 10



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SAFETY SKI BINDING

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FIG. 11

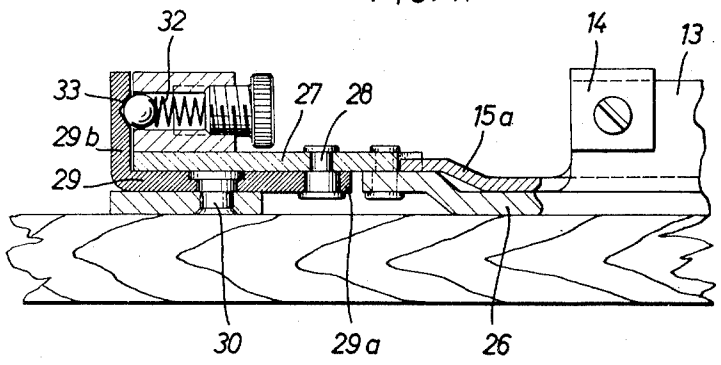
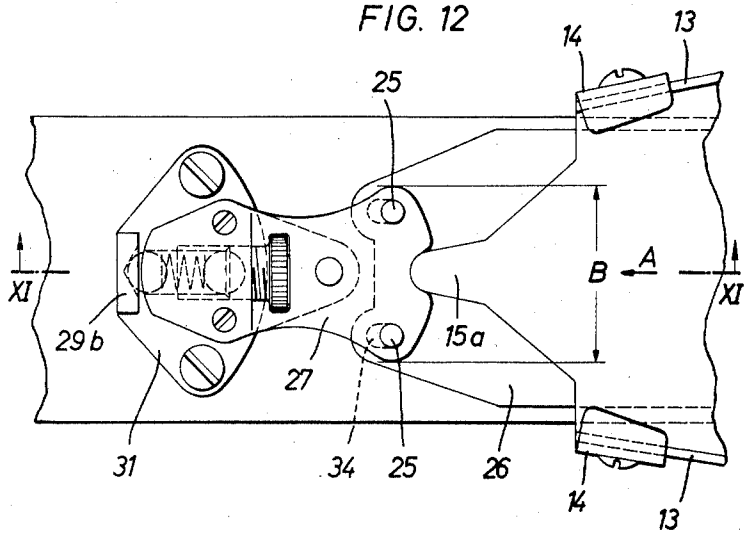


FIG. 12



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SAFETY SKI BINDING

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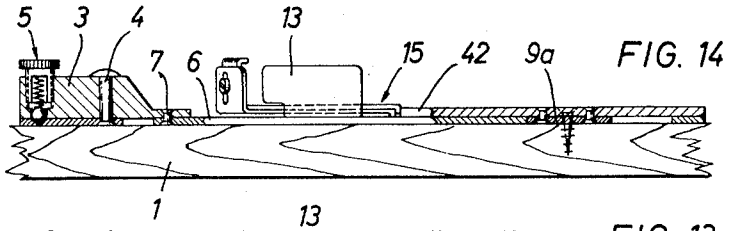

FIG. 14

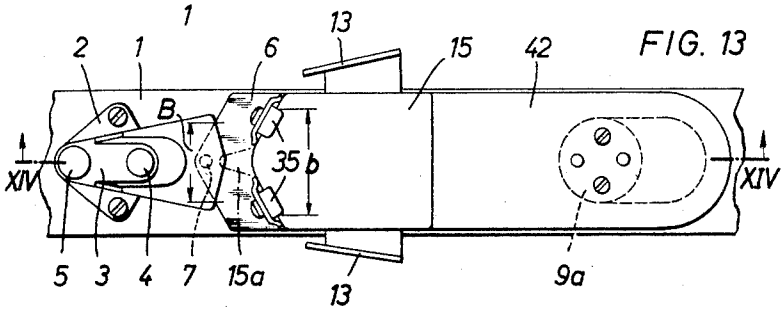

FIG. 13

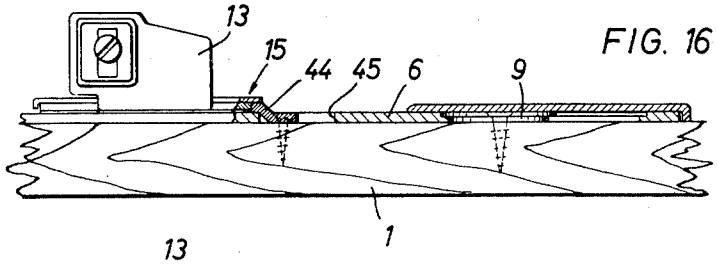

FIG. 16

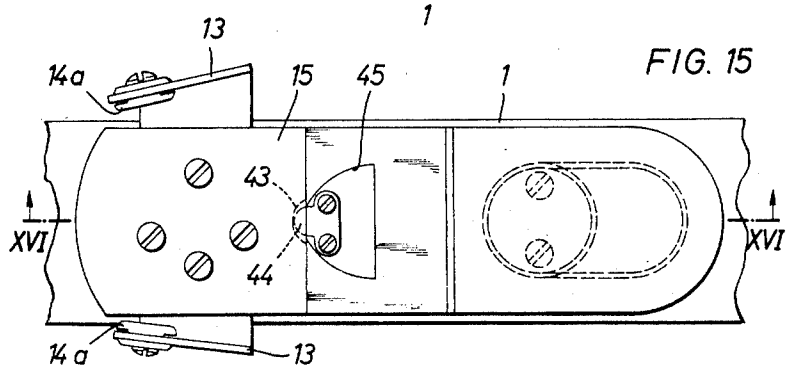

FIG. 15

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FIG. 18

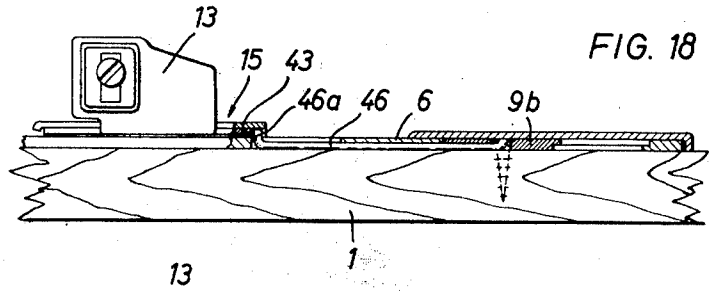


FIG. 17

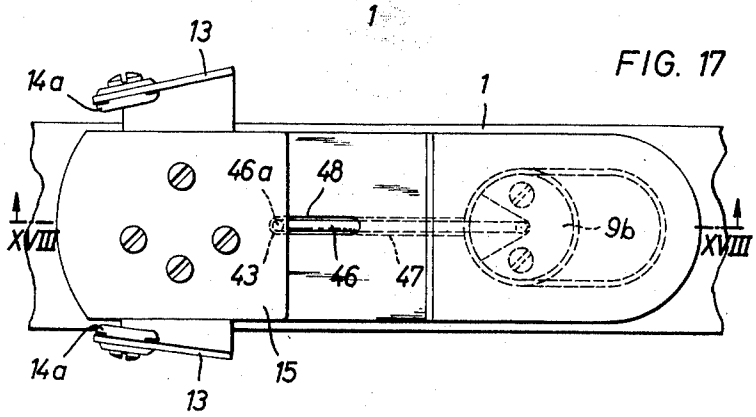


FIG. 19

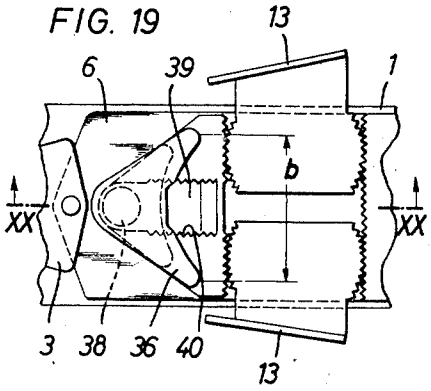
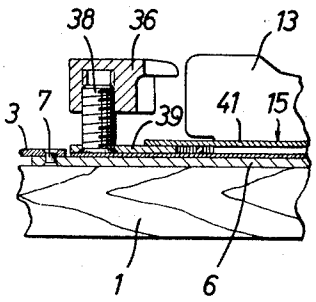


FIG. 20



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SAFETY SKI BINDING

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FIG. 21

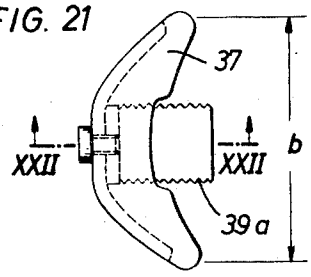

FIG. 22

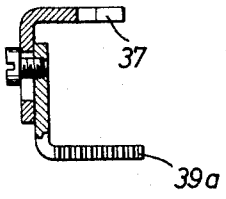

FIG. 24

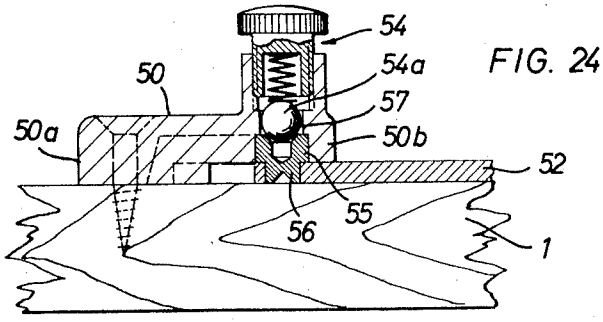

FIG. 23

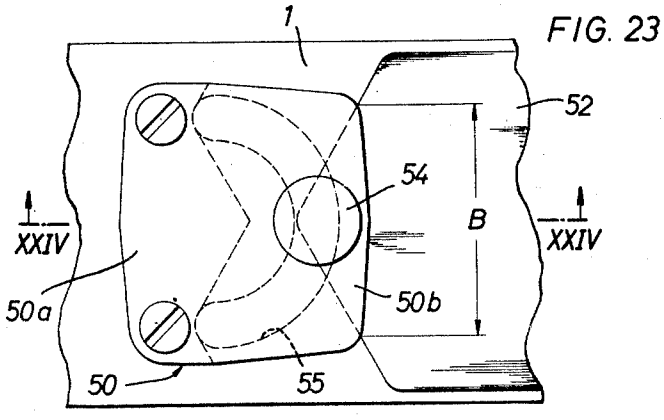

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FIG. 26

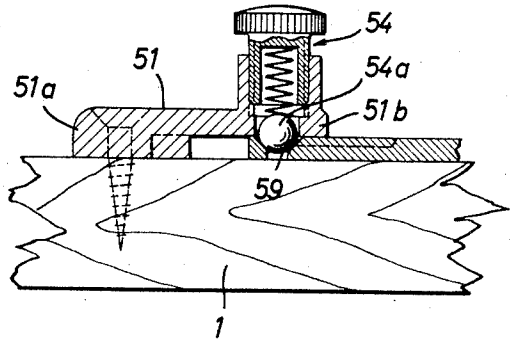
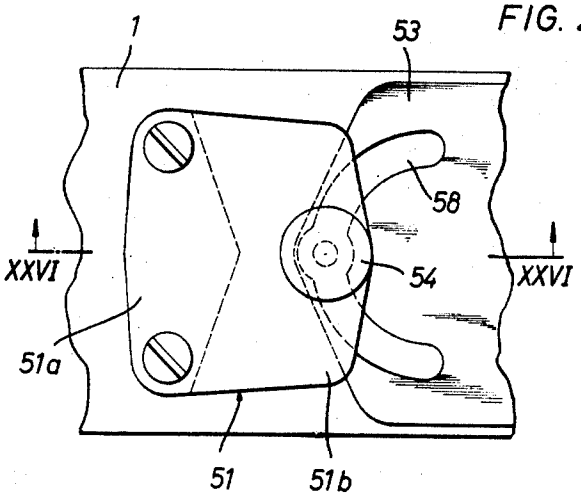


FIG. 25



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United States Patent Office 3,145,027 Patented Aug. 18, 1964

3,145,027

SAFETY SKI BINDING

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Claims priority, application Germany Feb. 6, 1961
28 Claims. (Cl. 280—11.35)

The present invention relates to ski bindings and more in particular concerns ski bindings of the safety type.

There have already been proposed ski bindings of the safety type comprising a swingable plate supporting the foot of the user, the said swingable plate extending from the region of the heel of the ski boot to the region of the front portion of the boot's sole, said plate being mounted to swing about an axis disposed in the region of the heel and extending perpendicular to the upper surface of the ski. In a ski binding of this known type, the forward end of the swingable plate co-operates with an anchoring or locking device which is operable upon the application of a preferably adjustable releasing moment, the said device, upon the application of an excessively great turning force or torque such as occasioned by a rotary fall of the skier, becoming operative to permit the swingable plate to swing about the said axis which is disposed in the region of the heel. There have also been proposed similar ski bindings of the safety type which are of such construction that upon the swingable plate performing a swinging motion, there will occur not only a rotation about the said axis in the region of the heel, but there will at the same time occur a forward motion with the rotary mounting in the region of the heel cooperating with a pin-and-slot connection associated with the swingable plate. This arrangement serves the purpose of ensuring that the ski boot will be reliably relieved of the pulling force of a cable loop co-operating with a forwardly disposed tensioning device even in cases in which the boot's toe section firmly abuts lateral jaws provided on the swingable plate, so that the boot is incapable of sliding forwardly in relation to the swinging plate.

However, it has been found that the mere swivel action of the swingable plate is insufficient to eliminate all of the torsional stresses which may possibly be applied to the foot and the leg of the skier during a rotary fall. While the line of action of the initial torsional force causing the release of the anchoring device will always be approximately disposed in the region of the heel, since the line of action approximately coincides with the natural axis of the leg, it is possible for the line of action, during a rotary fall of the skier, to assume any unpredictable position, the result of this fact being that the mere swinging action of the swingable plate about the fixed axis in the region of the heel will no longer be sufficient to provide a yielding action in relation to the torsional forces which now act about different axes. Therefore, there still exists a risk of dangerous leg injuries despite the presence of said swingable plate.

In a safety ski binding comprising a swingable plate provided with forwardly disposed lateral jaws and being mounted to swing about an axis disposed in the region of the heel and extending perpendicular to the upper side of the ski, said swingable plate co-operating at its forward end with an anchoring or locking device capable of being released upon the application of a preferably adjustable torque, the swingable plate being retained centrally by said device, the aforesaid drawbacks are eliminated according to the invention, by the provision of said lateral jaws on a separate jaw plate mounted for rotation on the forward part of the swingable plate and

held against rotation with the swingable plate in its central position, the arrangement being such that the positive engagement between the members locking the jaw plate will be released upon the swingable plate performing a swinging motion. By virtue of the fact that the jaw plate laterally holding the ski boot in position is mounted for independent rotation in relation to the swingable plate, the release of the safety binding will now permit the foot of the skier to be freely rotated in any direction and about any axes of rotation. Thus, during a rotary fall, the skier's foot can follow all forces, particularly torisonal forces, without being restrained by any parts of the binding. On the other hand, any undesirable rotation of the jaw plate in relation to the swingable plate is effectively precluded during the normal use of the ski, since the jaw plate remains locked to the swingable plate as long as the latter is retained in its central position. It is not before the swingable plate is swung out of its position upon the application of an excessively great turning force acting about the axis of rotation of the plate that the jaw plate will be unlocked through the disengagement of the positively acting locking members. Thus, a turning force acting only in the region of the jaw plate, for example during climbing uphill, with the tensioning cable disengaged from the rear hold-down hooks, will never cause the binding to be released.

According to another feature of the invention, the anchoring or locking device may be provided on a retaining member for the swingable plate, the retaining member being mounted on the ski in front of the swingable plate. Moreover, the said retaining member may be mounted for rotation about an axis perpendicular to the plane of the ski and against the opposition afforded by the anchoring or locking device, the retaining member also forming a locking member for the said jaw plate. According to the invention, the jaw plate locking members may comprise a lug projecting forwardly from the jaw plate and a complementary recess provided in the said retaining member. Furthermore, the retaining member may serve as an abutment for the front edge of the boot's sole and may be provided with a sole hold-down element.

It is of particular advantage to use a swingable plate whose mounting member is rigidly secured to the ski, there being provided a per se known pin-and-slot connection between the swingable plate and the mounting member, the said connection permitting the swingable plate to slide forwardly upon being released. With this arrangement, the swingable plate may be connected to the mounting member by means of a pivot pin.

According to still another feature of the invention, the spacing between the lateral jaws of the jaw plate may be made adjustable so as to permit the binding to be adjusted to accommodate ski boots of different sole widths. Also according to the invention, the rotary motion of the jaw plate may be provided for by a bearing disc disposed in a suitable recess formed in the swingable plate, the bearing disc having an annular flange extending beneath an annular recess surrounding the recess in the swingable plate, the bearing disc being rigidly secured as by screws to the jaw plate. The mounting member for the swingable plate itself may be formed by a bearing disc fastened to the ski as by screws, disposed in the recess of the swingable plate and extending over an annular recess surrounding the said first recess. This arrangement affords not only a low total height of the parts but also a type of connection between the rotary parts and the ski which safeguards against tipping. The bearing disc itself is described in detail in the U.S. Patent 2,836,428, especially in connection with FIGS. 6 and 7 thereof.

Where, as mentioned earlier, the anchoring or locking device is provided in front of the swingable plate on a

retaining member for the swingable plate, the retaining member being mounted on the ski, it is possible, according to the invention, to provide the jaw plate with one or two vertically adjustable sole hold-down elements adapted to extend over the front edge of the sole adjacent to the lateral edges of the sole or over the lateral edges themselves, and the retaining member, in turn, can engage a large surface area of the swingable plate. Thus, the sole hold-down elements will engage the sole at points which are relatively far removed from the center, this arrangement providing a better safeguard against tipping than an arrangement in which the sole hold-down element is solely provided on the forward mounting member. The tilt-proof connection between the boot and the ski is further supplemented by the fact that also the retaining member engages a large surface area of the swingable plate.

According to the invention, the sole hold-down element or elements may be disposed forwardly of the lateral jaws in such a way that they engage over the front edge of the sole in the vicinity of the lateral edges of the sole. In addition, the sole hold-down elements may be arranged for adjustment in relation to the jaw plate and along the longitudinal axis of the ski. There may also be provided a single sole hold-down element of greater width having a threaded hole co-operating with an externally threaded member mounted on the jaw plate, extending perpendicular to the plane of the ski and permitting both rotary and vertical adjustment of the hold-down element.

According to still another feature of the invention, the forward end of the retaining member may be fixedly secured to the ski, and the rear end of the retaining member may extend with a slight clearance over a wider portion of the swingable plate, the rear end of the retaining member accommodating the anchoring or locking device serving to retain the swingable plate in its central position. The under side of the retaining member may have formed therein a semicircular guide slot, and the forward end of the swingable plate may carry a guide pin disposed to engage in the guide slot and having a recess at its upper end, this recess receiving a spherical locking member. However, it is also possible to provide the upper side of the forward end of the swingable plate with a semicircular guide slot at the center of which there is formed a recess receiving the spherical locking member.

In another preferred embodiment of the invention, the said retaining member is mounted in a per se known manner to swivel about a pin extending perpendicular to the upper side of the ski. The retaining member may be formed with a large bearing hole accommodating a stepped bearing disc which is rigidly secured to the ski, the bearing disc having a collar or flange extending over the retaining member and supporting the same for rotation in relation to the ski, a base plate receiving the locking recess being provided below the bearing disc or the retaining member, respectively. It is further possible, according to the invention, to connect the rear end of the retaining member to the swingable plate with the aid of two widely spaced apart riveted bolts engaged in two elongated holes in the swingable plate, and to provide a two-armed lever mounted for rotation about a pivot pin connected to the ski, one arm of said lever being pivoted to the retaining member, the other arm being held in position in relation to the retaining member by the anchoring or locking device. The forward arm of the two-armed lever may be angled upwardly and may carry a recessed member cooperating with a locking member which is horizontally disposed on the retaining member.

Where the swingable plate is connected to the mounting member rigidly secured to the ski by means of a per se known pin-and-slot connection affording forward displacement of the swingable plate, it will be of particular advantage to arrange, for the purpose of locking the jaw plate when the swingable plate is in its central position, a locking member which, while not being slidable along the longitudinal axis of the ski, is adapted to engage the rear end of the jaw plate. In this case, the jaw plate locking arrangement is completely separated from the mounting of the swingable plate and from the means serving to lock the swingable plate in its central position, the result being that any torque applied to the jaw plate will not affect the holding means for the swingable plate so that it is impossible, even under special circumstances, that such torques might cause the safety binding to be released.

In a particularly advantageous embodiment of the invention, there is provided a supporting plate which is rigidly secured to the ski which extends with a small clearance over the rear portion of the swingable plate and forwardly up to the jaw plate where the supporting plate engages the rear edge of the jaw plate over a large area when the swingable plate is in its central position. It is desirable for the co-operating edges to be substantially rectilinear. In addition there may be provided a lug which extends forwardly from the jaw plate and engages in a recess of the retaining member which is rotatably mounted on the ski. Furthermore, the forward edge of the supporting plate may carry a lug which co-operates with a recess formed in the rear edge of the jaw plate.

However, it is also possible to form a recess in the rear end of the jaw plate and to provide a locking member connected to the ski and adapted to engage in the recess. According to the invention, the said locking member may also be formed as a locking hook which is attached to the ski by means of screws, and the swingable plate may be provided with a wide opening permitting the locking hook to enter rearwardly of the jaw plate. Besides that, the locking member may be in the form of a locking rod which is guided in a slot or a groove formed in the swingable plate, the rear end of the locking rod being directly or indirectly pivotally mounted on the ski co-axially with the pivot of the swingable plate.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawing, illustrating several exemplary non-limitative embodiments of the invention, wherein:

FIG. 1 is a side elevational view of a first embodiment of a safety ski binding according to the invention;

FIG. 2 shows the embodiment of FIG. 1 in plan view, the released position of the parts being indicated in dot-and-dash lines;

FIG. 3 is a plan view of a modification of the first embodiment;

FIG. 4 shows a side elevational view of a modified embodiment of this invention having a vertically disposed anchoring device;

FIG. 5 shows a top view of the embodiment of FIG. 4;

FIG. 6 shows the safety binding of FIG. 5 in released condition;

FIG. 7, in larger scale, shows a longitudinal across sectional view of the anchoring device of FIGS. 4–6 in an embodiment having adjustable sole hold-down elements;

FIG. 8 is a top view of the embodiment of FIG. 7;

FIG. 9 shows a cross section through the anchoring device of FIG. 7, the anchoring device being pivotally mounted by means for a bearing disc;

FIG. 10 is a top view of FIG. 9;

FIG. 11 shows another embodiment in greater detail of an anchoring device arranged in a horizontal position having modified means linking the anchoring device to the swingable plate;

FIG. 12 is a top view of the arrangement of FIG. 11;

FIG. 13 is a top view of another slightly modified embodiment of this invention having two separate sole hold-down members disposed adjacent the lateral edges of the sole;

FIG. 14 is a cross sectional view of FIG. 13 taken along line XIV—XIV.

FIG. 15 is a top view of another embodiment of this invention wherein the means locking the jaw plate with respect to the basic plate are located in the rear of the jaw plate;

FIG. 16 is partially a side elevational view and partially a cross sectional view taken along line XVI—XVI of FIG. 15;

FIG. 17 is a top view of a further embodiment of this invention having a locking bar to prevent rotation of the jaw plate with respect to the swingable plate in the normal position of the binding;

FIG. 18 is partly a side elevational view and partly a cross sectional view, taken along line XVIII—XVIII, of FIG. 17;

FIG. 19 shows an embodiment having a single hold-down element;

FIG. 20 is a partial cross sectional view taken along line XX—XX of FIG. 19;

FIG. 21 shows in greater detail a single sole hold-down element adjustable in height;

FIG. 22 is a cross sectional view taken along line XXII—XXII of FIG. 21;

FIG. 23 shows an embodiment with a semi-circular guide groove formed at the underside of the anchoring device and cooperating with a corresponding pin secured to the swingable plate;

FIG. 24 is a cross sectional view taken along line XXIV—XXIV of FIG. 23;

FIG. 25 shows details of a slightly modified linkage between the anchoring device and the swingable plate similar to the embodiment of FIGS. 23 and 24;

FIG. 26 is a cross-sectional view taken along the line XXVI—XXVI of FIG. 25.

In the first embodiment shown in FIGS. 1 to 3, the ski **1** carries a base plate **2** over which extends a retaining member **3** adapted to swing over the base plate about an axis **4** and further adapted to be locked in position by an anchoring device **5** (FIG. 7) when the base plate is in its central position. A trunnion **7** affords a pivotal connection between the swingable plate **6** and the retaining member **3**, the swingable plate having formed therein an elongated aperture **8** surrounded by a recessed shoulder, the elongated aperture **8** co-operating, in the region of the heel, with a bearing disc **9** so that the swingable plate can perform swinging motions and can also be slid forwardly, since the bearing disc has an upper flange, engaging the shoulder surrounding the elongated aperture **8**. Pivotally mounted on the swingable plate **6**, also with the aid of a bearing disc, is a jaw plate **15** carrying a pair of lateral jaws **13** which in FIGS. 1 and 2 are shown as being integrally formed with the plate **15**, whereas in FIG. 3 the jaw members are independent and formed with serrations permitting the jaws to be adjusted for the purpose of accommodating boot soles of different widths. The retaining member **3** carries a sole hold-down element **14** which is preferably vertically adjustable. When the swingable plate **6** is in its central position, a lug **15***a* formed on the jaw plate **15** engages in a recess **3***a* of retaining member **3** to lock the jaw plate in position.

The second embodiment shown in FIGS. 4 to 8 differs from the first embodiment just described in that the retaining member **3** is formed as a plate of small height having a vertically disposed anchoring device **5** the release torque of which is adjustable; the retaining member or plate **3** extends over the swingable plate **6** within a zone B of great width, and the sole hold-down elements **14** having angled lugs **14***a* extending over the edges of the sole are mounted for vertical adjustment on the lateral jaws **13**. This arrangement serves to hold the boot against tilting, since the lugs **14***a* engage the sole at points which are widely spaced apart. The arrangement of the sole hold-down elements on the jaw plate itself affords the additional advantage that, during any swinging motion of the retaining member **6**, the said elements will not exert any rearward pressure on the boot, since the elements will not have to be swung around along a circular path in opposition to the boot. As will be seen in FIGS. 4 to 6, the tensioning cable **10** is trained over the heel of the ski boot **11** and is held in the position shown in FIG. 4 by hold-down hooks **12**.

Upon an excessively great torsional force being applied to the skier's leg, a torque M will be set up which will be introduced into the forward end of the swingable plate **6** via the lateral jaws **13** and the jaw plate **15**. This will cause the anchoring device **5** of retaining member **3** to be released, so that the swingable plate can be swung around in the direction in which the torque M is acting. During the swinging motion of swingable plate **6** the anchoring or locking members are disengaged; in the case of the embodiments discussed thus far, the lug **15***a* slides out of engagement with the notch **3***a* of retaining member **3**. This action permits the jaw plate **15** carrying the lateral jaws **13** to swivel freely about its pivot, the result being that also the ski boot **11** can rotate with complete freedom in relation to the ski **1**, i.e. not only about an axis disposed in the region of the heel and extending perpendicular to the upper side of the ski. Thus, the risk of the skier's leg being injured by torsional stresses is eliminated in a dependable manner. Again, in the embodiment shown, the swingable plate **6**, when being swung round, can also yield in a forward direction in view of the pin-and-slot connection constituted by the bearing disc **9** co-operating with the elongated aperture **8**. Such forward motion of the swingable plate will slacken the tensioning cable **10** and will thus facilitate the swinging action of the ski boot together with the jaw plate **15**. Moreover, where the cable hold-down hooks **12** are of a construction such that they engage only one-half of the cable's cross section, so that they will release the cable upon a lateral pull being applied to the cable, it will be possible for the ski boot **11** and the cable **10** to assume the position shown in FIG. 6 shortly after the initiation of the releasing action. During this action, the ski boot can also slide out of the lateral jaws **13** so as to be freed completely from the ski. In the case of a torque acting about an axis located in the vicinity of jaw plate **15**, the safety binding will not be released, since the lug **15***a* is locked in the notch **3***a*, it being impossible for the lug to swing around without the swingable plate **6** being simultaneously moved forward as permitted by the pin-and-slot connection.

In the embodiments shown in FIGS. 9 to 12 and 15 to 18, respectively, the sole-hold-down members **14**, in similarity to the embodiment of FIGS. 4 to 8, are mounted for vertical adjustment on the lateral jaws **13**, the lugs **14***a* of members **14** extending over the upper sides of the lateral edges of the sole. The sole hold-down members shown in FIGS. 13 and 14 as well as in FIGS. 19 to 22 are substantially disposed forwardly of the lateral jaws **13** in such a manner as to engage over the front edge of the sole between points spaced apart by the large distance *b*. The embodiment of FIGS. 13 and 14 includes two separate sole hold-down members **35** disposed adjacent the lateral edges of the sole so as to engage the sole at points which are removed as far as possible from the center of the boot so as to prevent tipping of the boot in relation to the jaw plate **15**. The forward pull exerted on boot **11** by tensioning cable **10** is absorbed by the lateral jaws **13** which converge in a forward direction so that the toe portion of the boot will be wedged therebetween. The lateral jaws **13** are so arranged as to prevent the front edge of the sole from abutting the hold-down elements **35** which latter serve only the purpose of preventing the ski boot from being lifted away from ski. The sole hold-down elements disposed forwardly of the ski boot and extending over the sole's front edge afford several advantages over hold-down elements engaging the lateral edges of the sole. The extremely stiff

soles of the ski boots now preferred permit practically no deflection or bending. Therefore, during uphill climbing, requiring the heel of the boot to be raised by a large amount, the ski boot will be tilted upwardly about the front edge of the sole. Laterally disposed hold-down elements which are of necessity arranged to the rear of the boot's fulcrum constituted by the front edge of the sole would impede upward tilting of the ski boot, this being prevented by sole hold-down elements disposed forwardly of the ski boot.

Another advantage afforded by the forwardly mounted sole hold-down elements resides in the fact that, upon the binding being released, the ski boot will have to be moved to the rear by only a small amount in order to release the front edge of the sole from the hold-down elements and thus to permit the boot to be lifted from the ski. Since the necessary amount of rearward motion of the boot is shorter than in the case of laterally disposed sole hold-down elements, an even greater measure of protection against injuries to the skier is provided.

In order to provide for the sole hold-down elements extending over the front edge of the sole firmly to abut the front edge of the sole, it is desirable to make said elements adjustable in relation to the jaw plate 15 in the direction of the longitudinal axis of the ski so as to permit them to be adjusted to fit the ski boot to be used in conjunction with the binding. This adjustability may be afforded by the provision of any suitable known means. A particularly suitable arrangement will be described below in conjunction with FIGS. 19 to 22. Instead of using two separate sole hold-down elements it is possible to use a single hold-down element **37** as shown in FIGS. 21 and 22. Also the sole hold-down element **37** engages the upper side of the sole's front edge within a zone *b* of ample width and particularly in the vicinity of the lateral edges of the sole so as to prevent tilting of the ski boot.

The embodiment shown in FIGS. 19 and 20 also comprises only a single sole hold-down element **36** which is supported by a vertically disposed threaded member **38** extending perpendicular to the upper side of the ski and which is vertically adjustable through its co-operation with the threaded member. The threaded member **38** is fixedly mounted in a supporting plate **39** provided with serrations co-operating with complementary serrations **40** of the jaw plate so that the supporting plate **39** is longitudinally adjustable in relation to the jaw plate. This adjustability of the parts is best seen in FIG. 19 where the cover plate **41** of the rotatable jaw plate **15** has been omitted. The rotatable sole hold-down element **36** is not only adjustable in a vertical direction to permit easy matching with boot soles of different thicknesses but is also adapted to conform to different curvatures of the front edge of the boot's sole. Also the sole hold-down element **37** shown in FIGS. 21 and 22 is provided with serrations **39***a* co-operating with complementary serrations of jaw plate **15** to afford adjustability in a longitudinal direction.

In the embodiment shown in FIGS. 9 and 10, the retaining member **17** has formed in its center a large bearing hole **18** accommodating a bearing disc **19** also having a relatively large diameter. The bearing disc **19** is secured to the ski by means of screws **20**, the periphery of the bearing disc carrying a flange **21** extending over and co-operating with the margin of the bearing hole **18** in retaining member **17**. The retaining member **17** itself extends—similarly as plate **3** of FIGS. 7 and 8—over the swingable plate **6** within a zone *b* of great width. Arranged between the retaining member **17** and the ski is a base plate **22** having formed in its forward end an upwardly opening depression **23** co-operating with an adjustable anchoring or detent device **24**. In view of the large diameter of the bearing disc, an even better protection against tilting of the retaining member in relation to the ski is obtained. The operation of the embodiment of FIGS. 9 and 10 is essentially the same as that of the embodiments shown in FIGS. 1 to 8.

Another embodiment of the invention shown in FIGS. 11 and 12 makes use of the toggle-lever principle which is used in a well-known safety ski binding or fastening. In this embodiment, two rivets **25** supporting the swingable plate **26** are fixedly mounted in the retaining member **27** which, in turn, is mounted for rotation about a third rivet **28** which latter connects the retaining member to a double-armed lever **29** pivoted by another rivet **30** to the base plate **31** adapted to be secured to the ski. Thus, the retaining member is pivoted to arm **29***a* of lever **29**, whilst the other arm **29***b* co-operates with the detent device **32** provided on retaining member **27**. Here again member **27** extends over the swingable plate **26** in a zone having the width B.

In order to reduce the overall length and height of the binding or fastening mechanism, the one arm **29***b* of lever **29** is preferably angled upwardly, the recess **33** for the reception of the ball of detent mechanism **32** being formed in this upturned portion. This makes it possible to dispose the detent device **32** in a horizontal position so as to reduce the overall height of the ski binding. As shown in FIG. 12, the rivets **25** co-operate with slots **34** formed in the swingable plate **26**. The slots **34** are necessary to prevent any obstruction of the motion of swingable plate **26** in relation to retaining member **27** during the initial swinging motion of the swingable plate. The lateral jaws **13** are provided with sole hold-down elements **14** resembling those provided in the aforedescribed embodiments. As shown in FIG. 12, the retaining member **27** again overlies the swingable plate **26** within the wide portion B of the latter so as to provide a tilt-proof connection therebetween. The pull of the tensioning cable acting in the direction of arrow A in FIG. 12 forces the rear ends of the slots **34** of swingable plate **26** against the rivets **25**, causing the retaining member **27**, together with lever **29**, to be centered in its normal position shown in FIG. 12. In this embodiment, the releasing action resembles that of a known safety ski binding: The application of an excessively great torque causes the pressure exerted on one of the rivets **25** to be increased, this causing the detent device **32** to be released, thus permitting free relative swinging motion between the members **29**, **27** and **26**. Simultaneously, the pair of lateral jaws **13** are freed by a swinging motion as described earlier.

FIGS. 23 to 26 illustrate two further embodiments of retaining members which are stationary in relation to the ski. To this end, the forward end **50***a* or **51***a*, respectively, of the retaining member **50** and **51** is screw-fastened to the ski. The end **50***b* or **51***b*, respectively, overlies the associated swingable plate **52** or **53** within a zone of width B with the clearance therebetween being so small that no tilting of the swingable plate **52** or **53** is possible about the longitudinal axis of the ski. Provided in the rear end **50***b* or **51***b*, respectively, of the retaining members **50** and **51** is a detent device **54** adapted to hold the respective swingable plate **52** or **53** in its central position. In the embodiment of FIGS. 23 and 24, the retaining member has formed in its under side a semicircular guide groove **55**. The forward end of swingable plate **52** carries an upstanding guide pin **56** co-operating with guide groove **55** and provided at its upper end with a depression **57** receiving the spherical detent member **54***a*. The guide pin **56**, upon being released by the detent device **54**, slides along the guide groove **55**, thus positively controlling the motion of swingable plate **52**. This control action precludes any excessive swinging of plate **52** which might otherwise be damaged.

In the embodiment shown in FIGS. 25 and 26, the semicircular groove **58** is formed in the forward end of the swingable plate and on the upper side thereof. Formed in the middle of groove **58** is a depression **59** adapted to receive the detent ball **54***a* which, upon the detent de-

vice 54 being released, will roll along guide groove 58, thus controlling the motion of swingable plate 53.

As a matter of principle, a stationary retaining member of the aforedescribed type may be provided in any of the embodiments of ski binding or fastenings according to the invention described in the preceding paragraphs. This stationary retaining member, too, meets the requirement that it should overlie the swingable plate over a major part of its width so as to provide a tilt-proof connection between the two parts.

In the embodiments shown in FIGS. 13 to 18, the jaw plate locking device is of such construction as to afford a greater measure of assurance that the ski binding will not be released unintentionally. This effect is achieved by the fact that the jaw plate locking device is separated from the member serving to lock the swingable plate in its central position and no longer cooperates with a detent device. Therefore, in the present embodiments, there is provided a locking member adapted to engage the rear end of the jaw plate to lock the jaw plate in position, said locking member not being slidable in the direction of the longitudinal axis of the ski. The unlocking action is not produced by the swinging motion proper but by the sliding motion of the jaw plate accompanying the swinging motion. Even a maximum torsional force acting about the axis of rotation of the jaw plate can no longer cause the release of the safety binding.

In the embodiment of FIGS. 13 and 14, there is provided a supporting plate 42 which is rigidly connected to the bearing plate 9*a* which, in turn, is fastened to the ski, so that the supporting plate is stationary in relation to the ski 1; the supporting plate serves to lock the jaw plate 15 in position when the swingable plate 6 is centralised. For this purpose, the rear edge of jaw plate 15 abuts the front edge of supporting plate 42 throughout its length. Upon the binding being released, the swingable plate 6 is not only swung round but will also be guided forwardly, so that the rear edge of jaw plate 15 moves forwardly away from the front edge of supporting plate 42, thus causing jaw plate 15 to be unlocked, the jaw plate then being free to rotate on swingable plate 6 in the direction in which the forces act on the foot of the skier during a rotary fall.

During climbing, however, as well as during hiking or touring, should a rotary force occur which acts about an axis lying in the region of jaw plate 15, the only effect of such a force will be that one end of the rear edge of the jaw plate is pressed against the corresponding portion of the front edge of supporting plate 42 which is stationary and thus cannot slide in the direction of the longitudinal axis of the ski. The swingable plate 6 will not be swung round, nor will the jaw plate 15 be rotated, since the rotary force cannot act upon the retaining member 3.

What has been said in the preceding paragraph will also be applicable if the jaw plate 15 is additionally provided with a lug 15*a* indicated in dot-and-dash lines in FIG. 13, this lug, in similarity to the embodiments of FIGS. 1 to 12, engages in a notch 3*a* formed in retaining member 3. This additional lug does not serve to lock jaw plate 15 when the swingable plate 6 is centralised, but is only intended to hold the jaw plate in position in cases in which, due to manufacturing tolerances or as a result of extreme differences in temperature and the like, a small gap develops between jaw plate 15 and supporting plate 42, which gap might cause looseness of the jaw plate. Even where the lug 15*a* is provided, there is no risk of the binding being released erratically, since any swinging motion of the jaw plate 15 would be arrested after a length of travel determined by the width of the gap, since the jaw plate would abut the stationary supporting plate 42 long before the detent device could be released.

Instead of the lug 15*a* of jaw plate 15 co-operating with retaining member 3 or in addition thereto there may be provided a lug (not shown) on the forward edge of supporting plate 42, this latter lug co-operating with a cutout formed in the rear edge of jaw plate 15, this additional lug serving to lock the jaw plate in position when centralised, even though there might exist a gap between the opposing edges of the jaw plate and the supporting plate.

The embodiment shown in FIGS. 15 and 16 does not include a supporting plate extending up to the rear edge of jaw plate 15. In this case the locking action is provided by a locking hook 44 which is screw-fastened to ski 1 and co-operates with a cutout 43 formed in jaw plate 15, said cutout, if desired, being covered by the upper sheet metal member of the jaw plate. To prevent the hook 44 from impeding the swinging motion of swingable plate 6, the swinging plate has formed therein an aperture 45 which may be semicircular or slot-like in shape.

In still another embodiment shown in FIGS. 17 and 18, the cutout 43 of jaw plate 15 engages a locking bar 46 whose rearward end is pivotally mounted, for example in a bore of the bearing disc or of the ski itself, at the centre of bearing disc 9*b* in the under side of which there is formed a sector-shaped recess. The swingable plate 6 has either a longitudinal slot or, on its under side, a longitudinal groove 47 which, immediately behind jaw plate 15, communicates with a through opening 48. The upturned forward end 46*a* of locking rod 46 extends through opening 48 into cutout 43. Upon the adjustable locking moment of the retaining member provided in front of swingable plate 6 being exceeded, the swingable plate will be swung about bearing disc 9*b* and will simultaneously be moved forward by the action of the tensioning cable. Since the locking rod 46, while following the swinging motion, is held against any forward movement, the cutout 43 is disengaged from the end 46*a* of locking rod 46 and is thus released.

What is claimed is:

1. A safety binding for skies comprising a swingable plate, means pivotally mounting said swingable plate in a region constituting the heel portion and extending perpendicular to the upper side of a ski, a jaw plate pivotally mounted on a front portion of said swingable plate, means on said jaw plate to prevent movement of a boot held by said binding in a direction transverse to the longitudinal axis of said jaw plate secured laterally to said jaw plate, a retaining member cooperating with said swingable plate and being mounted forwardly of the latter on the ski, a detent device disposed on said retaining member and adapted to hold said swingable plate in a central position on said ski, said detent device adapted to be released upon the application of a torque exceeding an adjustable predetermined value, and locking means disposed between said jaw plate and said retaining member to hold the jaw plate in said central position, said locking means being interrupted upon a swinging motion being imparted to said swingable plate.

2. The safety binding according to claim 1, wherein the said retaining member is adapted to be rotated about an axis perpendicular to the upper side of the ski and against the resistance offered by the detent device.

3. The safety binding according to claim 2, wherein the locking means adapted to lock the jaw plate in position comprise a lug extending forwardly from the jaw plate and a complementary notch provided in the retaining member and co-operating with said lug.

4. The safety binding according to claim 1, wherein the said retaining member is adapted to serve as an abutment for the front edge of the ski boot sole and is provided with sole hold-down means.

5. The safety binding according to claim 1, wherein a bearing member is rigidly secured to the ski, the swingable plate having a slot disposed therein and having said bearing member extending therethrough to permit the swingable plate to slide forwardly.

6. The safety binding according to claim 5, wherein the bearing member for the swingable plate is constituted by a bearing disc secured to the ski by means of screws, the bearing disc being disposed in a recess of said slot of the swingable plate and having an upper flange overlying an annular groove in the swingable plate, said groove surrounding said recess.

7. The safety binding according to claim 5 wherein said jaw plate is provided at its rear end with a central notch, a locking member being mounted on the upper surface of said swingable plate engaging said notch when the swingable plate is in its central position.

8. The safety binding according to claim 7, wherein there is provided a supporting plate which is rigidly secured to the ski and extends with a small clearance over the rear portion of the swingable plate, the supporting plate extending forwardly up to the jaw plate, the forward edge of the supporting plate abutting the rear edge of the jaw plate along a section of considerable length when the swingable plate is in its central position.

9. The safety binding according to claim 8, wherein the co-operating edges of the supporting plate and the jaw plate are substantially rectilinear.

10. The safety binding according to claim 8, wherein the jaw plate has formed therein a forwardly extending lug adapted to engage in a cutout provided in the retaining member which is pivotally mounted on the ski.

11. The safety binding according to claim 8, wherein the forward edge of the supporting plate carries a lug co-operating with a cutout provided in the rear edge of the jaw plate.

12. The safety binding according to claim 7, wherein the rear end of the jaw plate is formed with a cutout in which engages a locking member connected to the ski.

13. The safety binding according to claim 12, wherein the said locking member is in the form of a locking hook which is screw-fastened to the ski, and wherein the swingable plate is formed with an aperture of ample width lying behind the jaw plate and permitting passage of said locking hook.

14. The safety binding according to claim 12, wherein the said locking member is in the form of a locking rod which is guided in a groove formed in the swingable plate, the rear end of the locking rod being pivotally connected to the ski at the center of rotation of the swingable plate.

15. The safety binding according to claim 1, wherein the swingable plate is connected by a pivot pin to said retaining member.

16. The safety binding according to claim 1, wherein means are provided to adjust the distance between the lateral jaws.

17. The safety binding according to claim 1, wherein for the purpose of pivotally mounting the jaw plate there is provided in a complementary recess of the swingable plate a bearing disc having an annular flange underlying an annular groove of the swingable plate surrounding said recess, said bearing disc being rigidly connected to the jaw plate by means of screws.

18. The safety binding according to claim 1, wherein the said jaw plate is provided with at least one vertically adjustable sole hold-down element overlying the front edge of the ski boot sole in the vicinity of the lateral edges of the sole, and wherein said retaining member overlaps the swingable plate in a zone of large width.

19. The safety binding according to claim 18, wherein the sole hold-down element is disposed forwardly of the lateral jaws in such a manner that it overlies the front edge of the ski boot sole in the vicinity of the lateral edges of the sole.

20. The safety binding according to claim 19, wherein the sole hold-down element includes means for adjusting same in relation to the jaw plate in the direction of the longitudinal axis of the ski.

21. The safety binding according to claim 19, wherein the sole hold-down element has ample width and is provided with a threaded hole co-operating with a threaded bolt member mounted on the jaw plate and extending perpendicular to the upper side of the ski, the hold-down element thus being adapted to be swivelled and to be adjusted in a vertical direction.

22. The safety binding according to claim 18, wherein the said retaining member has its forward end rigidly secured to the ski, the rear end of the retaining member overlies the swingable plate within a zone of greater width and with a smaller clearance, the detent device adapted to hold the swingable plate in its central position being mounted on the rear end of the retaining member.

23. The safety binding according to claim 22, wherein the retaining member has formed in its under side a semicircular guiding groove, and wherein the forward end of the swingable plate carries an upstanding guide pin extending into the guiding groove and provided at its upper end with a depression adapted to receive a spherical locking element.

24. The safety binding according to claim 22, wherein the forward end of the swingable plate has formed in its upper side a semicircular guiding groove which is provided at its center with a depression adapted to receive a spherical locking element.

25. The safety binding according to claim 18, wherein the retaining member includes means for pivotally mounting same for rotation in relation to the upper side of the ski.

26. The safety binding according to claim 25, wherein the retaining member has a large bearing aperture accommodating a stepped bearing disc rigidly secured to the ski and having a collar portion overlying the retaining member and thus pivotally connecting the retaining member to the ski, and a base plate having formed therein a detent depression being disposed beneath the bearing disc.

27. The safety binding according to claim 25, wherein the rear end of the retaining member carries two riveted bolts separated by a major distance and co-operating with two elongated holes formed in the swingable plate, and wherein a two-armed lever is provided which is pivotally mounted on a pivot pin connected to the ski, one arm of said lever being pivotally connected to the retaining member, the other arm of said lever being adapted to be locked in relation to the retaining member by the said detent device.

28. The safety binding according to claim 27, wherein the forwardly extending arm of the two-armed lever is angled upwardly and is provided with a detent depression co-operating with a detent device disposed horizontally on the retaining member.

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