The present invention relates to ski bindings, and more particularly to so-called front-release or toe bindings and also to heel units incorporating the same inventive features, although adapted for use with any kind of thong, cable or heel units, and vice versa.

Hitherto known ski bindings present several disadvantages. One of the most prominent drawbacks is that these bindings only flip out to the left or right and present a "break apart" action, while they do not provide protection against shearing and rolling stresses occurring in the course of skiing. Most release bindings must be snapped back together after they have been released. If the binding becomes clogged with snow, this may present considerable difficulties, particularly if the user wears heavy gloves.

Another noticeable disadvantage of known ski bindings is that they usually grip the sole of the ski boot in the middle and thus allow an unwanted rocking movement which, sometimes, lets the user "ski out" from the binding. Due to these and other inherent characteristics of hitherto known binding systems, they either did not release the skier's boot, resulting in serious accidents, or they released even when it was not necessary at all. For this reason, releasing bindings have been in disfavor for slalom and down-mountain skiing, where the non-releasing types had to be used so as to avoid the ski coming off the boot too easily. The fixed toe units mostly used for slalom, or the other hand, hold the boot off the ski about a quarter of an inch. These and other disadvantages and difficulties of conventional ski bindings are intended to be overcome by the present invention. One of its major objectives is to provide ski bindings which offer positive control over the ski, the skier can also operate a progressive or slow, yet absolutely safe release if abnormal conditions are met.

The new bindings offer, in all of the various embodiments, the so-called roll release, not found in any other type of binding, which lets the foot literally roll out sideways. The new bindings also allow lateral shear which works both at slow and high speeds while other bindings only operate on impact. The bindings also pull out backwards or straight up; this is often required when skiers are locked in the snow. The three types of release functions, viz., roll, shear and pull, are possible separately and simultaneously. Since the new bindings are capable of releasing at all angles, a composite release, e.g., combined shear and roll, is also possible.

Another objective is to provide novel type ski bindings equally well suited for racing, slalom and down-mountain use. The bindings according to the present invention are intended to offer the same "feel" for slalom as for regular skiing. In giant slalom, for example, a release binding was unheard of, and the skiers had to experience quite a difference in the control of the skis between the normally used release and the toe-iron type of (non-releasing) bindings. It is thus an objective of the present invention to provide universally adaptable release-type ski bindings.

A further objective is to provide simple ski bindings, easy to manufacture, to install and to use, having a minimum number of simple parts and adaptable to a wide variety of skiing tasks. Accordingly, it is also an objective to provide ski bindings which are equally suitable as toe units and as heel units, also adapted for use with a variety of dissimilar thong, cable, and other types of attachments and counter-parts.

One of the characteristic features of a preferred embodiment of the new ski bindings is the provision of one or more jaws or engaging plates, horizontally or vertically swingable with respect to the ski, which provide a frontal engagement with the ski boot. The boot is gripped at the two outside corners by appropriately shaped and bent jaw members allowing all three of the above-mentioned releasing actions. The engaging members are provided in alternative embodiments with bent jaw portions, rollers and the like.

Another important feature is the use of one or more springs provided around floating pins and attached to a stationary base member; this principle has never before been applied in ski toe units. A further feature is the provision of a cover-shaped lever above the biasing spring or springs, adapted to assist in opening the ski binding, or in putting back a thong-type connection after it has released. It should be emphasized, however, that even without the provision of the cover-shaped lever the novel ski binding can easily be put back by using the ski pole to open the front unit, so that the thong latch system need not be operated.

Other objects, features and advantages of the invention will become more fully apparent from the following description and the appended claims, reference being made to the accompanying drawings, in which:

FIG. 1 is a top view of one embodiment of the new front release ski binding according to the invention;

FIG. 2 is a sectional view taken along line II—II of FIG. 1;

FIG. 3 is a top view of an alternative embodiment having independently operating rollers;

FIG. 4 is a partial side view of one of the rollers shown in FIG. 5;

FIG. 5 is a top view of another variant of the new ski binding having vertically suspended swinging units;

FIG. 6 is a perspective view of a so-called racing unit, similar in construction to that of FIGS. 1 and 2 but providing longitudinal adjusting facility along the ski;

FIG. 7 is a perspective view of a heel unit having the same longitudinal adjustment as shown in FIG. 6; and

FIG. 8 is an exploded view of three major elements of a heel unit similar to that shown in FIG. 7 but adapted for fixed attachment to the ski.

FIGS. 1 and 2 show the first embodiment of the ski binding according to the invention, denoted 10 and attached to a ski 1. A base or ski plate 11 is secured to the ski, e.g. by means of screws 12. For a longitudinal adjustment of the plate 11, an adjustment slot 13 may be provided, accommodating an adjustment tab 14. The hole for the screw holding the tab 14 against the serrated edges of the slot 13 is counter-sunk to allow horizontal play. The slot and tab arrangement is particularly advantageous if the front binding is intended to be displaced along the ski. In this case, the ski plate 11 may be extended rearwardly (that is, to the right side of FIGS. 1 and 2) to cover the area on which the ski boot rests; a simple lengthwise slot with a screw 15 may be provided in the rear portion of plate 11 (not shown).

The rear end of plate 11 is bent upwards to form support plate 15. The L-shaped corners of plates 11 and 15 have lateral flanges 16 traversed by a bolt 17. On this bolt are pivotally secured the lower flanges 18 of a cup-shaped jaw member 19. The member 19 has two lateral, inwardly bent portions 19a, 19b and a slightly raised central portion 19c.
The support plate 15 has two openings 15' which accommodate the ends of bolts 20. Each bolt is surrounded by a compression spring 21. The other, threaded ends of bolts 20 are provided with nuts 22 having profiled portions 22a for accommodating the outer ends of the springs. Thus, the jaw-member portion 19c is urged by the springs 21 against the support plate 15. Owing to their special shape, the heads of bolts 20 cannot rotate in the openings 15'. The pretensioned springs regulate the force with which the jaw portions 19a, 19b hold the front portion of a ski bolt (not shown).

When the stress between the boot and the jaw portions surpasses a predetermined limit, the jaw member 19 is moved against the springs so that the binding is released. The springs 21 are notched to prevent turning or shifting while skiing. The knobs 22 are adapted for being adjusted with a special socket-type driver. This eliminates unwanted tampering. The slightly curved recess between the upper central portions of members 15 and 19c is adapted to take up the tip of a ski pole when the skier desires intentionally to open the binding, or to the put the binding back on the boot (e.g., in case of using thongs).

At 7, a cable or strap is shown, attached by means of a small ring to an aperture in member 19c, by means of which the binding and consequently the ski proper may be attached to an eye on the boot (not shown) so as to prevent the ski from running away.

It will be evident to those skilled in the art that instead of the two springs and bolts as shown, only one or even three similar systems may be used, because the function of the binding and consequently the ski proper may be attached to the boot in a similar manner. The method of attaching the ski proper may be attached to the boot in a similar manner. The method of attaching the ski proper.

In any event, the angle of incidence between the jaw member and the support plate is very important so as to hold down the boot toe into the binding even if it tends to curl upwards towards its front. The jaw member pulls such curved soles flat by virtue of the frontal engagement. It is understood that the boot automatically centers in the binding so that no adjustment is necessary. Upon release, the elements automatically return to their initial position.

FIGS. 3 and 4 show an alternative embodiment of the new ski binding provided with independently operating lateral rollers. A base plate 31 carries two separate lateral, upwardly bent spring supporting plates 35, bolts 40, springs 41 and nuts 42 are similar to their respective counterparts 15' and 20--22 of the binding shown in FIGS. 1, 2. Lateral flanges 36 of the L-shaped plates 31 and 35 carry, by means of a transverse bolt 37, rocking members 43a, 43b each carrying a respective roller 39a, 39b adapted to engage the ski boot in a manner similar to that of jaw 19. Here, each roller acts independently from the other so that lateral roll and upward pull-out releases, and combinations thereof, are even safer than with the previous binding.

In FIG. 4, a small bolt 44 is shown concealed inside the spring 41. This bolt can be adjusted to hold the rocking members 43a, 43b forward or back over the ski boot sole as desired. The bolt will thus allow the pieces to come together or to remain apart as desired. For the sake of clarity, the bolt 44 has not been shown in FIG. 3; also, the spring and the elements of the base plate are fastened to the latter have been omitted.

Another variant of the new ski binding is shown in FIGS. 5 and 5a, where the unit 50 comprises a base plate 51 and upwardly bent support-plate portions 55. Substantially in the rear center of the base plate, two vertical support plates 52 are provided for angularly bent support members 53. These members both have a forward, vertical plate portion engaged by a spring system as shown in the previous embodiments while a rearward, upper portion carries a roller 59 similar to rollers 39 of FIGS. 3, 4. This binding operates in a dependently corner release and allows the boot to move forward and to move out horizontally. The binding does not require a plate on the boot; vertical adjustment is attained through the use of shim plates.

A so-called racing unit 60 is shown in FIG. 6. The binding, when it is to operate with two spring systems, is identical with that disclosed in connection with FIGS. 1, 2. However, an intermediate plate 62 is shown to the ski 1 and has longitudinal slots 63, 64. The center slot 63 accommodates a bolt with a bottom portion bent down (shown) guided along a groove routed in the ski to prevent turning. The upper end of the bolt is threaded and carries a knurled knob 65 by which the adjustment and subsequent locking can be performed. The lateral slots 64 slidingly hold solid rivets (not shown) which connect them to coaxial slots 66 of a base plate 61 which carries the ski binding.

FIG. 7 shows a heel unit 70, identical in principle with the toe unit of FIGS. 1, 2 but used at the rear of the boot rather than at its front and having only one spring system (shown in dotted lines). This binding also has an intermediate plate 72 under the base plate 71, like in FIG. 6. Longitudinal adjustibility is provided by a knob 75 and the cooperating elements which are also similar to the previously described arrangement. A cover-shaped lever 77 is shown above the spring system, which has for forward lateral jaw extensions 77a, 77b. The lever 77 is hinged at 78 to a support plate 75a which carries the spring system in a way described and illustrated in the previous embodiment (e.g., plate 18 of FIGS. 1 and 2). The heel unit may be released by simply pushing down the lever 77 toward the ski 1, whereupon the extensions 77a, 77b become disengaged from the boot heel.

FIG. 8 is an exploded view of a complete heel unit 80 similar to that shown in FIG. 7, but adapted for fixed attachment to the ski. A cover-shaped lever 87 is shown which is rolled around on both sides to give more complete protection to the spring system. The lateral jaw extensions 87a, 87b are angled for a better grip on the boot plate. The L-shaped base and support plate 81, 85 has a serrated slot 83 with a serrated edge similar to slot 13 of FIGS. 1, 2; in cooperation with lateral slots 84 (similar to slots 66 of FIG. 6), slot 83 serves for the longitudinal adjustment of the plate 81 on the ski. The lowermost member of FIG. 8 is a boot plate 89 which is screwed onto the heel of the ski boot. Its corners are also angles 85. The terminates to the jaw extensions 87a, 87b by which they are engaged.

It is understood that the cover-shaped members 77, 87 of FIGS. 7, 8 could also be used in the embodiments shown in FIGS. 1 and 2, 3 and 4, 5, or 6. Similarly, other design features and details may be borrowed from one modification and used in the other since the basic principle is identical. The described embodiments have been shown as preferred variants without intention to limiting the claims to these particular designs.

It should be understood, of course, that the foregoing disclosure relates only to preferred embodiments of the invention and that it is intended to allow all changes and modifications of the examples described which do not constitute departures from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. A releasing-type front unit for ski bindings, comprising a base plate secured to and substantially coaxial with a portion of the ski, said base plate being substantially perpendicular to said ski, located in front of the skier's boot and having two bores therein; boot engaging means on said base-plate portion, including two lateral, adjacent jaws separately and pivotally attached said base-plate portion, said jaws being each provided with a roller for holding a respective lateral frontal boot
portion firmly in contact with said ski; two biasing means on said base-plate portion, each including a floating pin passing through a respective bore of the base-plate portion and pivotable therewith at one end, a compression spring surrounding said pin for urging the respective jaw toward said boot, and an adjustable knob threadedly secured to the other end of said pin, allowing a predetermined releasing force to be adjusted for said engaging means, so that the latter can move away from either lateral boot portion and release the boot from its contact with said ski if extraneous stresses acting on said boot exceed the force of the respective biasing means.

2. A releasing-type front unit for ski bindings, comprising a base-plate secured to and substantially coextensive with a portion of the ski, said base plate having an upright portion located in front of and surrounding a frontal portion of the skier's boot; upper boot engaging means on said base-plate portion in front of the skier's boot, including two jaws separately and pivotally attached to said base-plate portion, said jaws being each provided with a roller for engaging said frontal boot portion from above and holding it in contact with said ski; two biasing means pivotally attached to said base-plate portion, including separate spring means for each of said jaws, on the side of said base-plate portion facing away from said boot, and acting substantially parallel with each other in the direction of said ski, so that either side of said boot is releasable independently from the other if extraneous stresses acting on said boot exceed the force of said biasing means.

3. A front unit according to claim 2, wherein said jaws are pivotable about axes substantially perpendicular to said base plate, and wherein said spring means act at locations outward from said axes.

4. A releasing-type ski binding comprising a toe unit and a heel unit, each of said units comprising a base plate secured to and substantially coextensive with a portion of the ski, said base plates having each a portion substantially perpendicular to said ski, one of them in front of the skier's boot and the other behind the same, each base-plate portion having two bores therein; each of said units further comprising boot engaging means on the respective base-plate portions, each including a pair of lateral jaws separately and pivotally attached to the respective base-plate portion, said jaws being each provided with a roller for holding respective lateral front and rear boot portions in firm contact with said ski; a pair of biasing means for each unit, each including a floating pin passing through a respective bore of the respective base-plate portion and pivotable therewith at one end, a compression spring surrounding said pin for urging the respective jaw toward said boot, and an adjustable knob threadedly secured to the other end of said pin, allowing a predetermined releasing force to be adjusted for each engaging means, so that all jaws can move away independently from the respective lateral boot portions, in substantially opposite directions between said engaging means, and release the respective end of said boot from its contact with said ski if extraneous stresses acting on said boot exceed the force of the respective biasing means.

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