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B. ROUDEBUSH

3,127,623

SKIS AND BINDINGS THEREFOR

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Fig. 1.

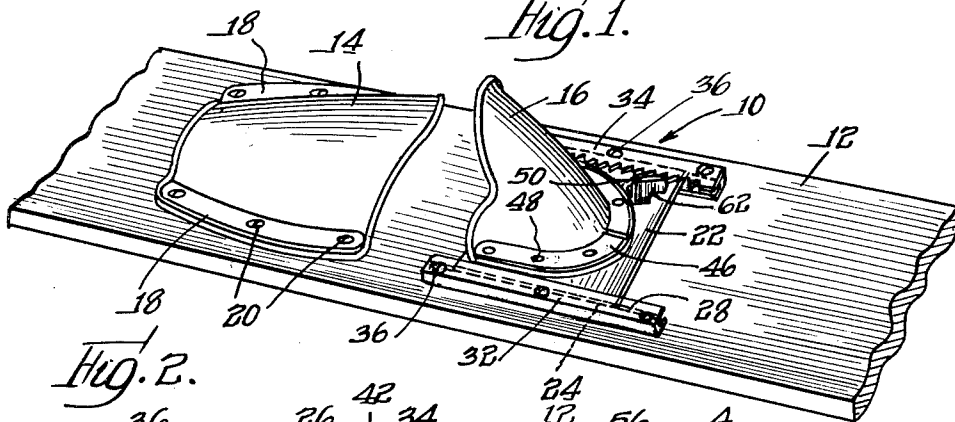


Fig. 2.

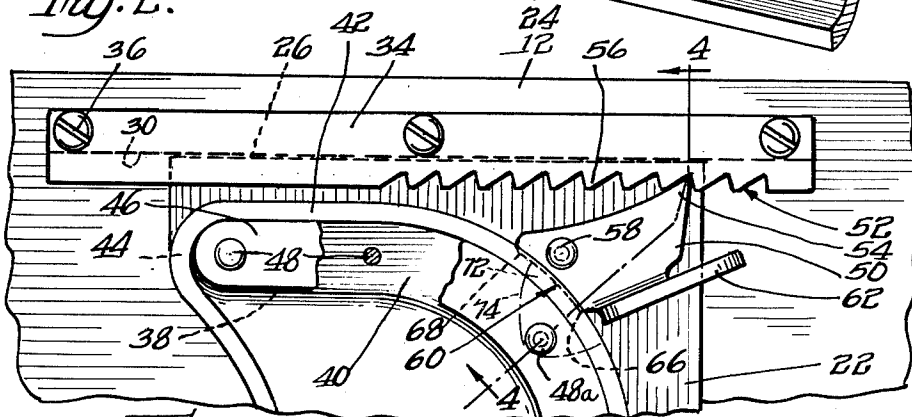


Fig. 3.

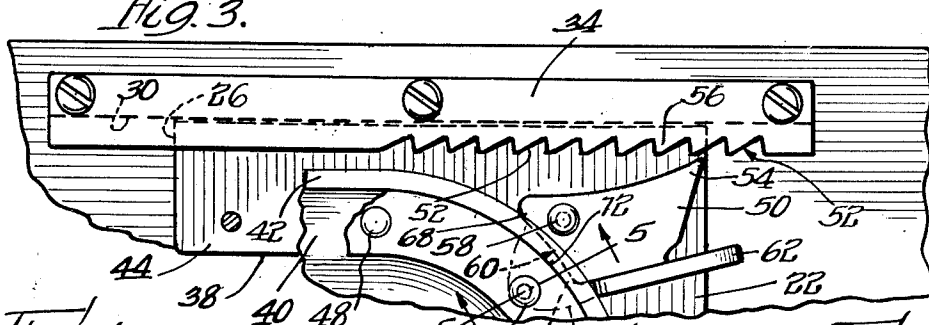


Fig. 4.

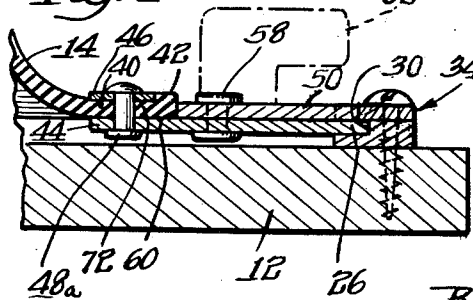
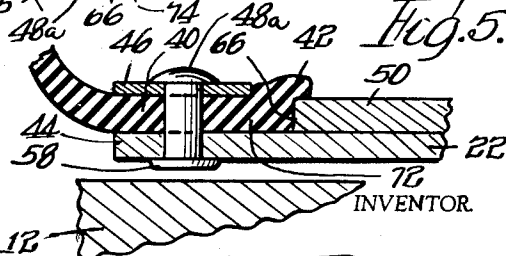


Fig. 5.



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SKIS AND BINDINGS THEREFOR

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The present invention relates to skis, particularly water skis, of the type in which each ski is secured to the foot of a user by means of a footpiece or foot-binding element and a heelpiece or heel-binding element, which are adjustable relative to each other longitudinally along the ski. Normally, the footpiece is secured in a stationary position on the ski, and the heelpiece is adjusted longitudinally along the ski, as necessary, to engage or support the heel of the user's foot which extends into the footpiece.

One object of the invention is to provide a ski to which the user's foot is secured by new and highly advantageous adjustable binding means.

Another object is to provide a ski assembly in which one binding element is releasably secured in desired working positions, adjusted longitudinally along a ski in relation to a coating binding element, by means of new and improved structure that is inherently well suited for exceptionally economical manufacture, and which affords worthwhile advantages in use.

A further object is to provide a ski assembly of the character recited in which the means used to hold a binding element in a working position adjusted longitudinally along the ski is at once radically simplified structurally and made extremely serviceable and dependable in use to the end that functional advantages are gained, and the cost of manufacturing the ski assembly is at the same time significantly minimized.

Another object is to provide a ski assembly of the above character which uses the resilient structure of a movable foot-engaging element of the assembly to great advantage in providing essential yieldable support to a very simple brake element or pawl which serves to releasably hold the movable foot-engaging element in various adjusted positions along a coating ski.

Another object is to provide a ski assembly of the character recited which, by virtue of a new and improved construction, is not subject to being weakened by corrosion and which is not vulnerable to damage in use, even though such use may be abusive.

A further object of the invention is to provide for skis, binding structure which, when applied to the skis, produces ski assemblies by which the preceding objects are obtained.

Other objects and advantages will be apparent from the following description of the exemplary embodiment of the invention illustrated in the drawings, in which:

FIGURE 1 is a perspective view of a water ski assembly embodying the invention, opposite ends of the skis being broken off to permit illustration of the binding structure on a larger scale;

FIG. 2 is a fragmentary plan view on an enlarged scale of adjustable binding structure incorporated in the ski assembly of FIG. 1;

FIG. 3 is a fragmentary plan view generally similar to FIG. 2, but showing the retaining pawl swung away from the normal position of the pawl illustrated in FIG. 2;

FIG. 4 is a fragmentary sectional view, taken along the irregular line 4—4 of FIG. 2; and

FIG. 5 is a fragmentary sectional view, taken along the line 5—5 of FIG. 3.

Referring to the drawings in greater detail, the water ski assembly, 10, forming the illustrated embodiment of the invention, comprises a water ski 12 to which the user's foot (not shown) is secured by means of two binding ele-

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ments 14, 16 mounted on the ski for adjustment relative to each other longitudinally along the ski.

The binding element 14 is designed to receive the user's foot, and is as shown preferably formed by a broad piece of yieldable polymeric material having two opposite marginal edges tightly clamped to the ski by two arcuate clamp plates 18 through which screws 20 extend into the ski. For convenience in description, the binding element 14 may be referred to as a footpiece or foot-receiving element which opens rearwardly into confronting relation to the other binding element 16.

The rearward binding element 16 is shaped to fit against the heel of the user's foot (not shown) and opens forwardly in confronting relation to the rearwardly open end of the footpiece 14. For convenience, the binding element 16 may be referred to as a heelpiece or heel-engaging element.

The heelpiece 16 itself has a generally conventional construction. It is formed of a yieldable polymeric material having a substantial degree of flexibility and resilience. Preferably, the heelpiece 16 is formed of rubber, such as the rubber which is generally used to form the heelpieces or heel supports of the bindings on conventional skis.

To provide an optimum fit of the heelpiece 16 against the heel of a user's foot extending into the footpiece 14, provision is made for adjusting the heelpiece longitudinally along the ski 12 toward and away from the footpiece 14. For this purpose, the heelpiece 16 is supported on a slide 22 which is formed essentially by a flat plate, also denoted for convenience by the number "22." The plate is supported for sliding movement longitudinally along the ski 12 by the two parallel side edges 24, 26, of the plate, FIGS. 1 and 2, which extend slidably into two longitudinal plate support grooves 28, 30 formed in two linear support guides 32, 34 secured by screws 36 to the ski 12 in spaced parallel relation to each other.

As viewed in transverse section, each of the support guides 32, 34 has a somewhat U-shaped configuration defining the groove in the guide which supports slidably the adjacent marginal edge of the plate 22. The shaping of the support guide 34 in transverse section is shown in FIG. 4.

Between its marginal side edges 24, 26, the plate 22 is shaped to define a large recess 38 which opens forwardly toward the footpiece 14 and allows the heel of the user's foot to rest on the underlying ski 12.

The heelpiece 16 has a lower marginal edge 40 terminating in a thickened peripheral bead 42. The lower marginal edge 40 of the heelpiece, which is integral with the heelpiece and formed of the same material, preferably rubber, is firmly clamped to the peripheral marginal edge 44, FIG. 3, of the plate 22 defining the heel-receiving recess 38. This clamping of the heelpiece marginal edge 40 is effected by a U-shaped clamp plate 46 secured in overlying relation to the heelpiece edge 40 by a plurality of rivets 48 anchored to the underlying plate 22 through the heelpiece edge 40. As shown, the clamp plate 46 is formed in two separate half-sections.

Thus, it will be evident that the lower marginal edge 40 of the resilient heelpiece 16 is sandwiched between the clamp plate 46 and the slide plate 22 in a manner such that the extreme edge of the clamped marginal portion of the heelpiece is exposed outwardly along the plate 22 between the two opposed plates 46 and 22.

In the preferred construction illustrated, the exposed extreme edge of the lower portion of the resilient heelpiece 16 extends slightly beyond the clamp plate 46 and is thickened to form the previously mentioned bead 42. As shown, the bead 42 which protrudes beyond the clamp plate 46 has a thickness substantially equal to the combined thickness of the clamp plate 46 and the clamped marginal edge portion of the heelpiece which is

sandwiched between the clamp plate 46 and support plate 22.

The exposed peripheral edge of the resilient heelpiece 16 which protrudes along the plate 22 from between the plates 46, 22 is used to great advantage in providing essential dynamic or yieldable support to a very simple brake element 50 that coacts with the adjacent guide 34 to hold the heelpiece 16 against rearward movement in various longitudinal positions to which the heelpiece may be adjusted.

Preferably, the brake element 50 is constituted by a generally flat pawl well adapted to be fashioned from sheet metal stock. For simplicity of identification, the pawl which constitutes the brake element is identified in the drawings by the same number "50."

The upper marginal edge of the elongated guide 34, which overlaps the slidable plate 22, is serrated to form a toothed rack 52 having a generally coplanar relationship to the pawl 50. As shown, the guide 34 is formed in two pieces, clamped together, but it can be made in one piece, if desired.

As viewed from above, the pawl 50 has a generally trapezoidal shape and defines at one corner a single tooth or point 54 adapted to engage any one of a series of teeth 56 on the rack 52 to hold the plate 22 and heelpiece 16 against rearward retraction along the ski.

A pivot pin 58 anchored to the plate 22 extends through the pawl 50 in a position remote from the tooth 54 to hold the pawl in parallel relation to the plate 22 for swinging movement about the pivot 58 between a normal position in which the pawl tooth 54 engages the rack 52, as shown in FIG. 2, to anchor the plate 22 against retraction, and a release position of the pawl 50, FIG. 3, in which the pawl is disengaged from the rack to permit free movement of the plate or slide 22 either toward or away from the footpiece 14.

The pawl or brake element 50 is shaped and pivotally supported in relation to the exposed edge of the resilient heelpiece 16 adjacent the plate 22, so that the resilient structure of the heelpiece provides to the pawl a dynamic support which yieldably holds the pawl in its normal position, FIG. 2, in which the pawl engages the rack 52.

Thus, as shown in FIG. 2, the pawl pivot 58 is spaced laterally inward from the rack 52, and is located adjacent the exposed peripheral bead 42 on the heelpiece in a position which is disposed a substantial distance forwardly of the pawl tooth 54 with respect to the ski 12.

The portion of the pawl 50 which extends, with reference to the ski 12, laterally inward from the pivot 58, is shaped to define on the pawl a support edge 60 which confronts the adjacent portion of the exposed edge or bead 42 on the resilient heelpiece 16. The position of the pivot 58 and the shaping of the pawl is such that the pawl supporting edge 60 fits closely against the heelpiece edge or bead 42 when the pawl is in its normal position in which the pawl tooth 54 coacts with the rack 50 to hold the plate 42 against retraction along the ski. Inward swinging movement of the pawl necessary to releasing of the slide or plate 22 for longitudinal movement is firmly yet yieldably resisted by the edge structure of the resilient heelpiece which opposes the pawl support edge 60.

A portion of the sheet metal stock from which the pawl 50 is formed is turned up along the laterally inner edge of the pawl to form integrally with the pawl an upwardly extending release ear or handle element 62 adapted to be conveniently grasped by the user for swinging the pawl inwardly away from the rack 52 to free the slide 22 for movement in either longitudinal direction along the ski.

This inward swinging movement of the pawl incident to releasing the slide 22 for free movement causes the laterally inward portion of the pawl support edge 60 to move against the adjacent edge of the yieldable heelpiece 16 which acts directly on the pawl to return the pawl

immediately to its normal rack engaging position as soon as the pawl is released.

In the preferred construction illustrated, the rack teeth 56 are shaped to coact with the pawl tooth 54 to positively lock the slide 22 against rearward retraction while at the same time serving, in the event of application of a substantial forward force to the slide 22, to cam the pawl tooth 54 inwardly. This provides for advancement of the heelpiece 16 toward the footpiece 14 by a simple forward force without the necessity for releasing the pawl by manual engagement of the release ear 62.

In this connection, it will be appreciated that even though the pawl 50 can be cammed inwardly by forward force on the slide 22 or heelpiece 16, the force required to move the slide 22 forwardly while the pawl is still free to act on the rack is sufficient to preclude unintended forward movement of the heelpiece from a preadjusted position on the ski.

It should be observed, with reference to FIGS. 2 and 3, that the pawl supporting edge 60 is shaped and positioned in relation to the pivot 58 so that a rather extensive inner portion 66 of the edge 60 is caused to move inwardly against the yieldable resistance of the heelpiece 16 when the pawl is swung inwardly. An outward portion 68 of the pawl edge 60 has a position in relation to the pivot 58 which causes the edge portion 68 to swing firmly into engagement with the adjacent edge of the heelpiece 16 as the pawl 50 swings back to its normal position in engagement with the rack 52. Thus, when the pawl 50 is in its normal position, both the inner and outer portions 66, 68 of the pawl support edge 60 firmly engage the adjacent edge of the heelpiece 16 to preclude any vibratory movement of the pawl which could be a source of noise.

Inward movement of the inner portion 66 of the pawl edge 60, incident to freeing of the slide 22 for longitudinal movement, is yieldably resisted by an opposing portion of the rubber heel piece edge, which portion is, for convenience in identification, identified in FIGS 2 to 5 by the reference number 72 and bounded generally by a phantom line 74, FIGS. 2 and 3. Optimum support for this portion 72 of the heelpiece 16, which is most active in providing dynamic yieldable support to the pawl 50, is provided not only by the underlying plate 22 and the overlying clamp plate 46, but also by positioning of one of the rivets 48 along the clamp plate 46 so that the rivet is in opposing alignment with the portion 66 of the pawl edge 60 which moves inwardly against the heelpiece edge, as recited.

The particular rivet which opposes the pawl edge portion 66 is identified in FIGS. 2 to 5 by the number 48, together with the suffix "a." Thus, positioned along the clamp plate 46, the rivet 48a immediately backs up the portion 72 of the heel piece which is exposed to the greatest compressive load by the pawl 50 and serves to provide further assurance against progressive displacement of this most dynamic portion 72 of the heelpiece from its normal positional relationship to coacting parts. The clamp plate 46 which overlies and applies pressure to the portion 72 of the heel piece sandwiched between the plate 46 and slide plate 22 can be accurately described as a "pressure member."

It will be appreciated that the dynamic support to the pawl 50 that yieldably holds the pawl in engagement with the coacting rack 52 is provided by the rubber or rubber-like resilient structure of the heelpiece 16 which is not subject to corrosion or breakage in use. As pivotally supported by the pin 58, the pawl 50 lies flat against the plate 22 where it is protected by both the guide 34 and the heelpiece 16.

The invention is claimed as follows:

1. A ski assembly comprising, a ski, foot binding means secured to said ski and opening rearwardly, guide means secured to said ski, a slide guided by said guide means for movement longitudinally along the ski, a heel engaging element disposed rearwardly of said foot binding means

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in confronting relation thereto, means clamping said heel engaging element to said slide for movement therewith toward and away from said foot binding means, said guide means including a rack extending longitudinally along the ski, a pawl pivotally mounted on said slide to swing into and out of engagement with said rack, said heel engaging element being formed of a resilient polymeric material and having a portion thereof positioned in contiguous relation to said pawl to yieldably urge the pawl into engagement with said rack, and means on said pawl for swinging the pawl against said portion of said heel engaging element to disengage the pawl from said rack to free said slide for movement longitudinally along the ski.

2. A ski assembly comprising, a ski, foot receiving means secured to said ski and opening rearwardly, guide means secured to said ski, a slide guided by said guide means for movement longitudinally along the ski, a heel engaging element disposed rearwardly of said foot receiving means in confronting relation thereto, means clamping said heel engaging element to said slide for movement therewith toward and away from said foot receiving means, said guide means including an anchor element extending longitudinally along the ski, a brake element pivotally mounted on said slide to swing into and out of engagement with said anchor element, said anchor element and said brake element being shaped and positioned in relation to each other to hold said slide against rearward movement along the ski when the brake element is in engagement with the anchor element, said heel engaging element being formed of a resilient polymeric material and having a portion thereof positioned in contiguous relation to said brake element to yieldably urge the brake element into engagement with said anchor element, and means for swinging said brake element against said portion of said heel engaging element to disengage said brake element from said anchor element to free said slide for linear movement along the ski.

3. A ski assembly comprising, a ski, first and second binding elements, one of said binding elements being shaped to receive a human foot therein, the other of said binding elements being shaped to fit against the heel of a human foot in said one binding element, said binding elements being positioned one ahead of the other on said ski, means securing said first binding element to said ski, a movable slide supporting said second binding element, guide means on said ski coacting with said slide to guide the latter for movement longitudinally along the ski to carry said second binding element toward and away from said first binding element, said guide means including an anchor member extending longitudinally along the skis, a brake element pivoted to said slide and having a normal position engaging said anchor member to restrain said slide from movement in a direction which carries said second binding element away from said first binding element, said second binding element being formed of a resilient polymeric material, and means securing said second binding element to said slide so that a resilient edge portion of said second binding element closely confronts a portion of said brake element to yieldably resist swinging movement of the brake element away from said normal position thereof in which the brake element coacts with said anchor member to hold said second binding element against movement away from said first binding element.

4. A ski assembly comprising, a ski, foot binding means mounted on said ski and opening rearwardly with respect thereto, guide means on said ski including an anchoring element extending longitudinally with respect to the ski, a slide guided by said guide means for movement longitudinally with respect to the ski, a movable brake element on said slide, means on said slide coacting with said brake element to confine movement of the brake element with respect to the slide to a predetermined path, said brake element having a normal position with respect to the slide in which the brake element engages said anchor-

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ing element to hold the slide against movement in at least one direction, a heel engaging element formed of a resilient polymeric material and being disposed at the rear of said foot binding means in confronting relation to said foot binding means, and means mounting said heel engaging element on said slide so that a resilient marginal edge of the heel engaging element is disposed in contiguous relation to a portion of said brake element to yieldably resist movement of the latter along said path away from said normal position of the brake element toward a release position of the brake element in which the brake element is released from the anchoring element to free the heel engaging element for movement along the ski.

5. Binding means for skis comprising, foot receiving means adapted for attachment to a ski, a heel engaging element formed of a resilient polymeric material and being shaped to confront said foot receiving means to hold a human foot therein, a movable slide, guide means adapted for attachment to a ski and coacting with said slide to guide the latter for movement toward and away from said foot receiving means, said guide means including a rack which is disposed generally parallel to the direction of guided movement of the slide with respect to the guide means, a pawl pivoted to said slide and having a normal position in which the pawl engages said rack to hold said slide against movement in at least one direction with respect to the guide means, means mounting said resilient heel engaging element on said slide to position one edge of the heel engaging element in confronting relation to said pawl to yieldably resist swinging movement of the pawl away from said normal position thereof, and means on said pawl for effecting manual movement of the pawl away from said normal position thereof against the yieldable resistance of said heel engaging element to release said slide for movement with reference to said guide means.

6. Binding means for skis comprising, foot receiving means adapted for attachment to a ski, a heel engaging element formed of a resilient polymeric material and being shaped to confront said foot receiving means to hold a human foot therein, a movable slide, guide means adapted for attachment to a ski and coacting with said slide to guide the latter for movement toward and away from said foot receiving means, said guide means including an anchoring element which is disposed generally parallel to the direction of guided movement of the slide with respect to the guide means, a brake element pivoted to said slide and having a normal position in which the brake element engages said anchoring element to hold said slide against movement in at least one direction with respect to the guide means, means mounting said resilient heel engaging element on said slide to position a resilient portion of the heel engaging element against said brake element to yieldably resist swinging movement of the brake element away from said normal position thereof, and means for moving said brake element away from said normal position thereof against the yieldable resistance of said heel engaging element to release the brake element from said anchoring element and free said slide for movement with reference to said guide means.

7. Binding means for skis comprising, foot receiving means adapted for attachment to a ski, a heel engaging element formed of a resilient polymeric material and being shaped to confront said foot receiving means to hold a human foot therein, a movable slide, guide means adapted for attachment to a ski and coacting with said slide to guide the latter for movement toward and away from said foot receiving means, said guide means including an anchoring element which is disposed generally parallel to the direction of guided movement of the slide with respect to the guide means, a swingable brake element pivoted to said slide and having a normal position in which the brake element engages said anchoring

element to hold said slide against movement in at least one direction with respect to the guide means, clamping means clamping one marginal edge of said heel engaging element to said slide so that a resilient marginal edge portion of said heel engaging element immediately confronts a segment of said brake element which moves against said portion of the heel engaging element as an incident to swinging of said brake element away from said normal position to release said anchoring element, said clamping means including a pressure member engaging the side of said marginal edge of said heel engaging element opposite from said slide, said clamping means including a fastening element for said pressure member extending between said pressure member and said slide through the marginal edge of said heel engaging element at a position along said marginal edge located opposite said segment of the brake element in spaced relation thereto to provide additional support to the portion of the marginal edge of the heel engaging element located between said fastening element and said segment of the brake element, and means for swinging said brake element against said clamped marginal edge of the heel engaging element to release the brake element from said anchoring element.

8. A ski assembly comprising, in combination, a ski, a rearwardly open foot receiving element secured to said ski, guide means secured to said ski and including a rack extending longitudinally therealong, a slide guided by said guide means for movement longitudinally along the ski, a heel engaging element formed of a resilient polymeric material and being disposed rearwardly of said foot receiving element in confronting relation thereto, said heel engaging element having a lower marginal edge supported on said slide, a clamp member engaging said marginal edge of the heel engaging element in a manner such that said marginal edge is sandwiched between said slide and said clamp member and has an exposed extreme edge, a pawl, a pivot pivotally supporting said pawl on said slide, said pawl having a toe shaped to engage said rack to support said slide against rearward displacement in different selected longitudinal positions along said ski, said pawl having a support edge immediately confronting said exposed extreme edge of said resilient heel engaging element in a position located in relation to said pivot so that said extreme edge of the heel engaging element reacts on the pawl to yieldably hold the pawl in engagement with said rack, said pawl having an upwardly extending ear thereon shaped for manual engagement to swing said pawl out of engagement with said rack against the yieldable resistance of said exposed edge of said resilient heel engaging element, and a fastening element for said clamp member extending through the marginal edge of said heel engaging element in opposed relation to said support edge on the pawl to provide additional support to the portion of said heel engaging element opposing said support edge on the pawl.

9. Binding means for skis comprising, a foot engaging element formed of a resilient polymeric material, a movable slide having support edges on opposite sides, two support channels adapted for attachment to a ski and being shaped to receive said respective support edges on said slide, a swingable brake element pivoted on said slide and having a normal position in which the brake element engages an adjacent one of said channels to hold said slide against movement in at least one direction along said channels, clamping means clamping one marginal edge of said foot engaging element to said slide so that a resilient marginal edge portion of said foot engaging element immediately confronts a segment of said brake element which moves against said portion of the

foot engaging element as an incident to swinging of said brake element away from said normal position thereof, said clamping means including a pressure member engaging the side of said marginal edge of said foot engaging element opposite from said slide, and said clamping means including a fastening element for said pressure member extending between said pressure member and said slide through the marginal edge of said foot engaging element at a position along said marginal edge located opposite said segment of the brake element in spaced relation thereto to provide additional support to the portion of the marginal edge of the foot engaging element located between said fastening element and said segment of the brake element which moves against said clamped marginal edge of the foot engaging element to release the brake element from said one channel.

10. Binding means for skis comprising, a foot engaging element formed of a resilient polymeric material, a movable slide having guide edges on opposite sides, two guide channels adapted for attachment to a ski and being shaped to receive said respective guide edges on said slide, a brake element pivoted to said slide and having a normal position in which the brake element engages an adjacent one of said channels to hold said slide against movement in at least one direction along said guide channels, means mounting said resilient foot engaging element on said slide to position a resilient portion of the foot engaging element against said brake element to yieldably resist swinging movement of the brake element away from said normal position thereof, and means for moving said brake element away from said normal position thereof against the yieldable resistance of said foot engaging element to release the brake element from said one channel and free said slide for movement along said channels.

11. A ski assembly comprising, a ski, first and second binding elements, one of said binding elements being shaped to receive a human foot therein, the other of said binding elements being shaped to fit against the heel of a human foot in said one binding element, said binding elements being positioned one ahead of the other on said ski, means securing said first binding element to said ski, a movable slide supporting said second binding element and having two support edges on opposite sides thereof, two support channels on said ski receiving said respective support edges on said slide to support said slide for movement longitudinally along the ski to carry said second binding element toward and away from said first binding element, one of said channels defining a rack extending longitudinally along the ski, a swingable pawl pivoted to said slide and having a normal position engaging said rack to restrain said slide from movement in a direction which carries said second binding element away from said first binding element, said second binding element being formed of a resilient polymeric material, means securing said second binding element to said slide so that a resilient edge portion of said second binding element closely confronts a portion of said pawl to yieldably resist swinging movement of the pawl out of engagement with said rack, and means for swinging said pawl out of engagement with said rack against the yieldable resistance of said edge portion of said second binding element to free said slide for movement along said channels.

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