June 2, 1959 G. P. BLOCK 2,888,692

SKI BINDER

Filed Dec. 28, 1956 3 Sheets-Sheet 1

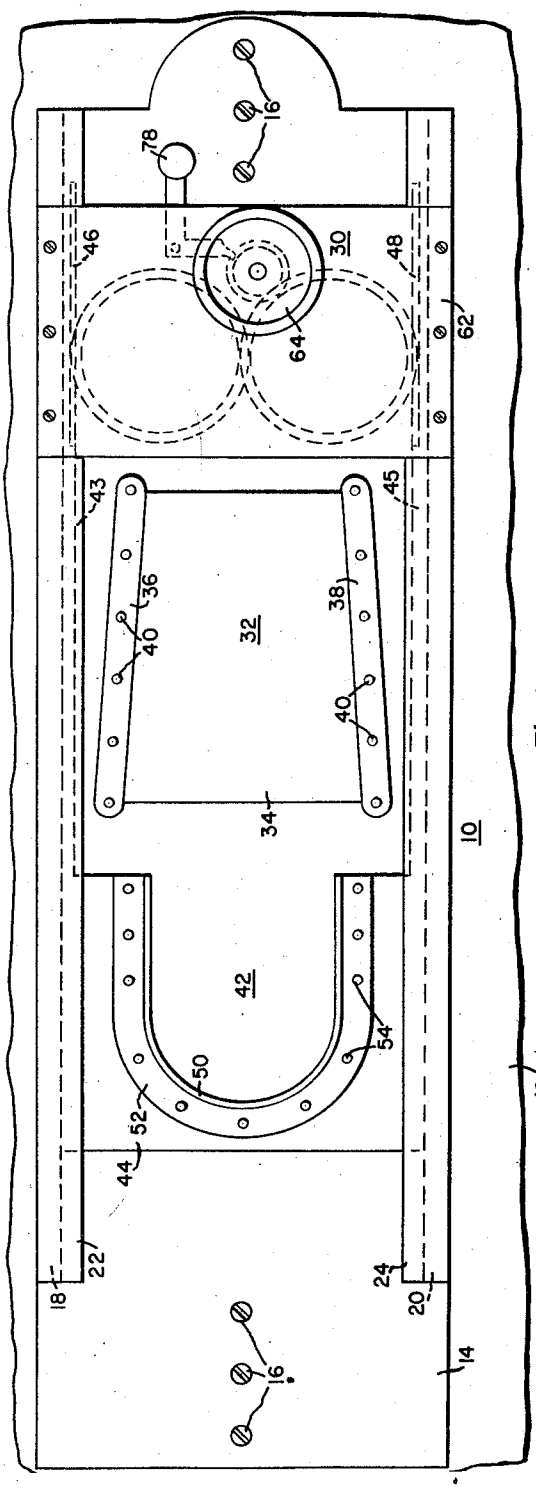
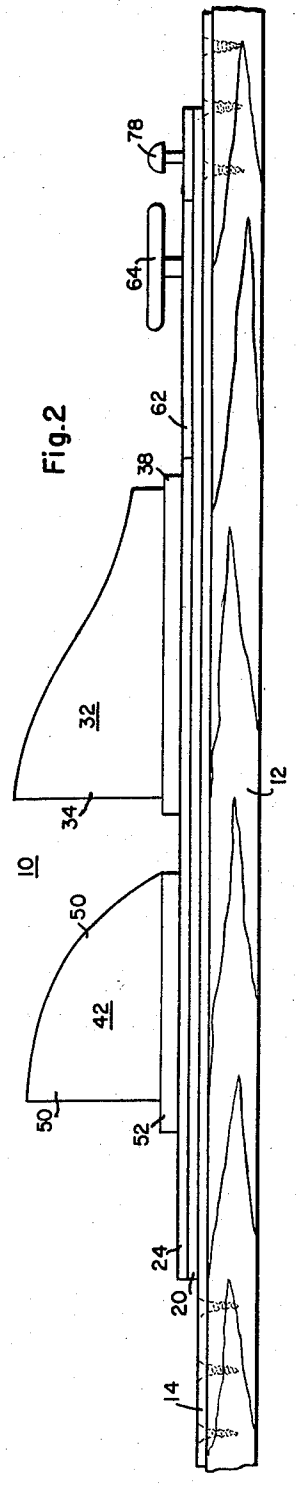


Fig.1

Fig.2



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SKI BINDER

Filed Dec. 28, 1956 3 Sheets-Sheet 2

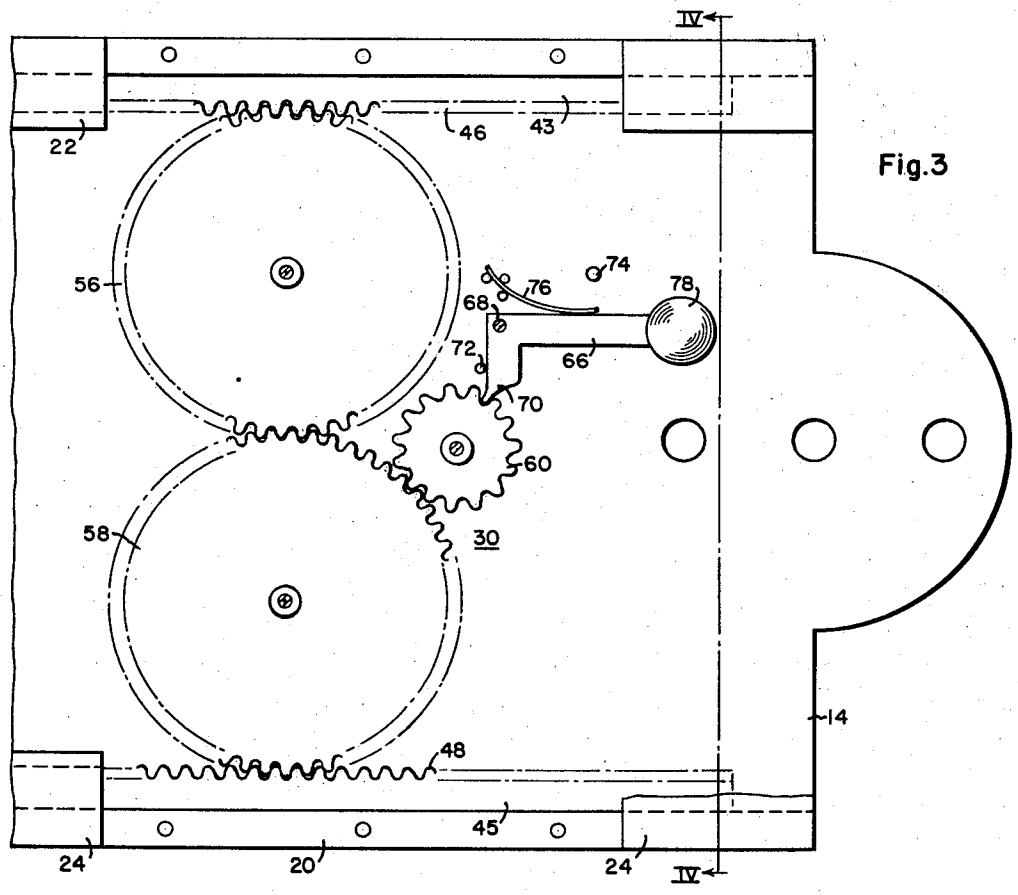

Fig.3

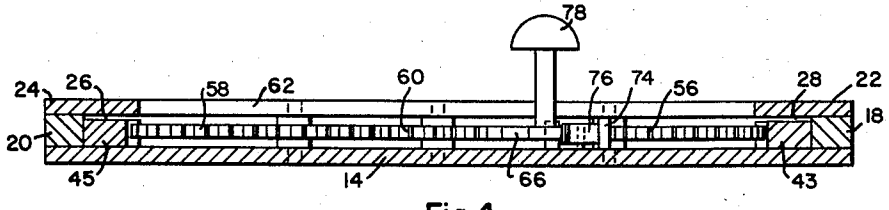

Fig.4

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SKI BINDER

Filed Dec. 28, 1956 3 Sheets-Sheet 3

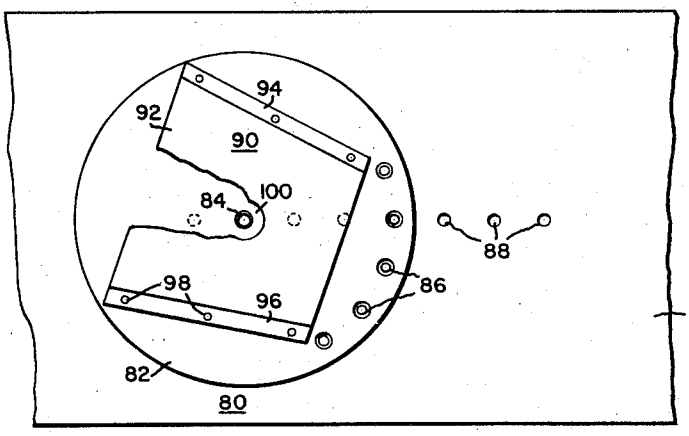

Fig.5

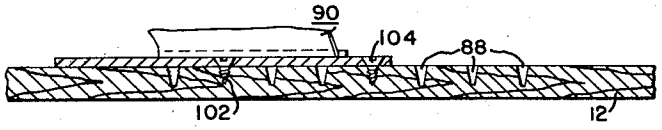

Fig.6

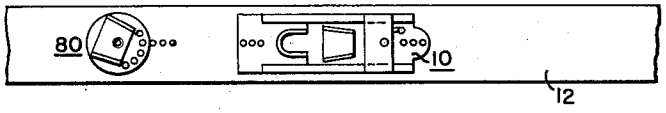

Fig.9

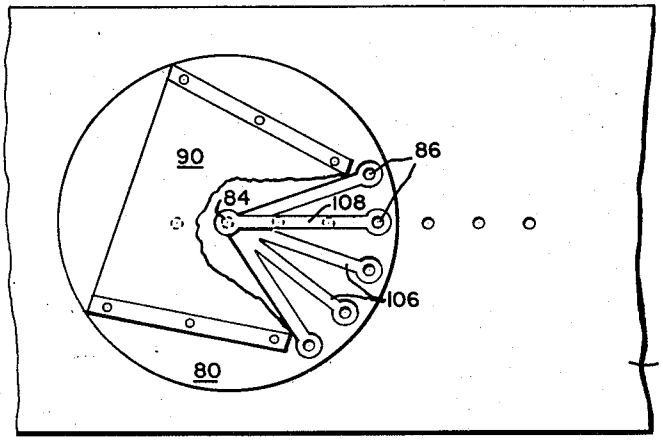

Fig.7

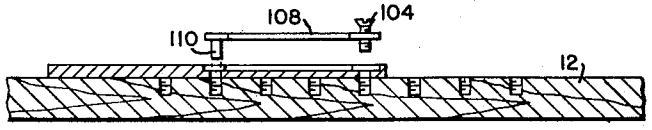

Fig.8

United States Patent Office

2,888,692

Patented June 2, 1959

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SKI BINDER

George P. Block, Troy, N.Y.

Application December 28, 1956, Serial No. 631,231

9 Claims. (Cl. 9—21)

This invention relates to ski binders, and in particular to foot retaining members for use with water skis.

Heretofore different types of fastenings have been used for securing water skis and the like to the feet of the skier, but the known fastenings or binders have not been readily adjustable to different sized feet. Further, the fastenings for the rear foot on a ski for slalom skiing have not been readily adjustable angularly with respect to the forward foot, with the result that it has been quite difficult for a slalom skier to maintain the proper balance while slalom skiing.

An object of this invention is to provide a ski binding comprising a foot retaining member that is readily adjusted to accommodate different sizes of feet.

Another object of this invention is to provide a foot retaining member having an adjustable heel receiving member with a positive gear drive for effecting an adjustment thereof and releasable locking means for cooperating with the gear drive to prevent accidental operation thereof and accidental displacement of the heel receiving means.

A further object of this invention is to provide a rear foot retaining member slidably and angularly adjustable relative to a forward foot retaining member for facilitating a proper positioning therebetween so that a skier can maintain a proper balance thereon while slalom skiing.

Other objects of this invention will become apparent from the following description when taken in conjunction with the accompanying drawings in which:

Figure 1 is a top plan view of a portion of a ski having an adjustable foot retaining member which embodies features of this invention thereon;

Fig. 2 is a view in side elevation of the structure of Fig. 1;

Fig. 3 is a plan view, greatly enlarged and with parts removed, of the actuating drive and locking mechanism for the foot retaining member of Fig. 1;

Fig. 4 is a view in section taken along the line IV—IV of Fig. 3;

Fig. 5 is a top plan view of an adjustable rear foot receiving member embodying features of this invention;

Fig. 6 is a view in side elevation of the structure of Fig. 5;

Fig. 7 is a top plan view of an adjustable rear foot receiving member illustrating another embodiment of this invention;

Fig. 8 is a view in side elevation with parts exploded of the embodiment of Fig. 7; and

Fig. 9 is a top plan view of a water ski with an adjustable forward foot retaining member and an adjustable rear foot retaining member mounted thereon in accordance with this invention.

Referring to the drawing and in particular to Figs. 1 and 2 thereof, this invention is illustrated by reference to a foot retaining member shown generally at **10** disposed on a water ski **12**. In this embodiment the foot retaining member **10** comprises a plurality of components and is preferably formed with a base member **14** of generally elongated rectangular shape, the opposite ends of which are provided with suitable openings for receiving retaining screws **16** therethrough for penetrating the wood ski **12** when the base member **14** is properly positioned thereon. As illustrated in Figs. 1 and 2, edge strip members **18** and **20** are disposed along the opposite sides of the upper surface of the rectangular base member **14** with inwardly extending flange strip members **22** and **24** disposed thereon along substantially the entire length of the edge strip members **18** and **20**. The flange strip members **22** and **24** project inwardly from the edge strip members **18** and **20** toward one another and are spaced from the base member **14** by such edge members so as to cooperate therewith and with the base member **14** to, in effect, form channels **26** and **28** as better illustrated in Fig. 4.

As illustrated in Fig. 3, the flange strip members **22** and **24** are discontinuous along the length of the edge strip members **18** and **20**, respectively, a space being provided intermediate the ends of the flange strip members for access to a gear drive shown generally at **30**, the purpose of which will be explained more fully hereinafter. The flange strip members **22** and **24** and the cooperating edge strip members **18** and **20**, respectively, are secured to the base plate member **14** in any suitable manner, such as by screws (not shown) when the members are formed of wood, or by welding (not shown) where the members are formed of sheet metal.

As illustrated in Figs. 1 and 2, a fixed toe receiving pocket **32** is fixedly secured on the base plate member **14**, such toe receiving pocket **32** being formed of a strap **34** of flexible resilient material such as an elastomer, for example rubber, synthetic rubber, polychlorobutadiene, polyisobutylene or the modified isobutylene synthentic rubbers. Any of the other synthetic rubber-like compounds may be satisfactorily utilized in this application. In practice the flexible strap **34** forming the toe receiving pocket **32** is secured along the opposite edges by means of hold-down strips **36** and **38** which are secured to the base plate member **14** as by means of suitable screws **40** spaced along the length of the strips **36** and **38**. The flexible strap member **34** is preferably shaped to have a large open end at the rear thereof and a small opening at the forward part thereof whereby the toe and instep portion of a person's foot (not shown) may be readily inserted into the toe receiving pocket **32** thus formed.

In order to properly support a person's foot in the toe receiving pocket **32**, a heel receiving pocket **42** is disposed for adjustable movement relative to the toe receiving pocket **32** so that the members **32** and **42** will cooperate to effectively retain different sized feet therein. The heel receiving pocket **42** in this instance is formed of a substantially U-shaped heel base plate **44** having a width sufficient that the edges thereof extend into and are retained within the channels **26** and **28** as illustrated in Fig. 4 with the legs **43** and **45** of the substantially U-shaped member extending lengthwise along the channels **26** and **28** with the inner edges of at least a portion of the legs **43** and **45** adjacent the ends thereof having gear teeth formed thereon adjacent the ends to, in effect, form racks **46** and **48**. The heel receiving pocket **42** is also formed of a substantially U-shaped flexible strap **50** of an elastomer material similar to the elastomer of the flexible strap **34** of the toe receiving portion, such heel receiving member being disposed about the edges of a cut out U-shape in the heel base plate **44**, the edges of the elastomer **50** being secured in position as by means of a hold-down U-shaped rigid strap **52** secured to the heel base plate **44** by means of spaced screws **54**.

In order to easily and readily effect a sliding movement of the heel receiving pocket **42** relative to the toe receiving pocket **32**, a gear drive **30** is disposed forward of the fixed toe receiving pocket **32** and is suitably

carried on the base plate member 14. The gear drive 30 of this embodiment is better illustrated in Fig. 3 and comprises two substantially large gear members 56 and 58 mounted for rotatable movement on the base plate member 14 in interlocking relation with one another and with associated racks 46 and 48, respectively, of the opposed legs 43 and 45, respectively, of the substantially U-shaped heel base plate 44 as referred to hereinbefore. In order to simultaneously drive the gears 56 and 58 and thus drive the heel retaining base plate 44, a pinion gear 60 is rotatably mounted on the base plate member 14 disposed to engage the gear 58. Each of the gears 56, 58 and 60 has the lower end of the shaft thereof disposed in a suitable bushing (not shown) in base plate member 14 and the upper end thereof disposed in a suitable bushing (not shown) in a retaining plate 62 which is disposed to seat on and extend across the strip members 18 and 20 to cover the gear drive 30. As illustrated in Figs. 3 and 4, the shaft of the pinion gear 60 extends through a bushing (not shown) in the retaining plate 62 and a suitable handle 64 illustrated in Fig. 2 is secured thereto for manually operating the pinion gear 60 to drive the gears 56 and 58 to actuate and effect a sliding movement of the heel base plate 44.

In order to effectively lock the gear drive 30 to prevent accidental movement thereof, a pawl 66 is disposed for pivotal movement about a shaft 68 disposed between the base plate member 14 and the retaining plate 62, the pawl 66 having a gear engaging end 70 disposed to mesh with the teeth of the pinion gear 60 for preventing movement of the pinion gear of the drive 30 in one direction. Suitable pin stops 72 and 74 are carried by the base plate member 14 for limiting the pivotal movement of the pawl 66, and a leaf spring 76 is disposed to bias the pawl 66 into engagement with the pinion gear 60. The pawl 66 is provided with a suitable handle 78 on the upper end of its shaft which extends upwardly to the level of the handle 64 of the pinion gear 60 so that both of the handles 64 and 78 can be readily grasped by a skier.

In operation, where the adjustable foot retaining member 10 is to have the heel base plate 44 moved so as to move the heel receiving pocket 42 forward towards the toe receiving pocket 32, the skier need not move the handle 78 as the forward movement of the base plate 44 as by means of an external force applied thereto or by turning the handle 64 of the pinion gear 60 will actuate the gear drive 30 and pinion gear 60 in a direction whereby the engaging end 70 of the pawl 66 will ride over the teeth of the pinion gear 60 against the bias of the spring 76 and engage the next succeeding gear tooth. However, if it is desired to move the heel base plate 44 rearwardly away from the toe receiving pocket 32, the skier must grasp the handle 78 of the pawl 66 to effect a pivotal movement thereof about the pivot 68 and against the bias of the spring 76 to a point where the pawl 66 becomes disengaged from the pinion gear 60. At such point the skier will effect a driving movement of the gear drive 30 by turning the handle 64 of the pinion gear 60 to effect the simultaneous drive of the gears 56 and 58 which engage the racks 46 and 48, respectively, to effect a sliding movement of the heel base plate 44 in the channels 26 and 28 away from the toe receiving pocket 32 to increase the distance between the heel receiving pocket 42 and the toe receiving pocket 32. When the heel base plate 42 is properly positioned with respect to the toe receiving pocket 32 for the particular skier who desires to use the ski, the handle 78 of the pawl 66 is released and the spring 76 effectively biases the pawl 66 about its shaft 68 into engagement with the teeth of the pinion gear 60 to effectively lock the gear drive 30 to prevent an accidental movement of the drive to move the heel receiving pocket 42 away from the toe receiving pocket 32.

In the embodiment illustrated in Fig. 5, the rear foot

retaining member 80 is preferably a disc or base plate member 82 substantially circular in shape and having a flat undersurface disposed to be seated on and secured to the ski 12 in alignment with the forward foot retaining member 10. In this embodiment the base plate member 82 is provided with a centrally disposed opening 84 and a plurality of spaced openings 86 disposed adjacent the forward edge thereof in an arc with respect to the central opening 84, the opening 84 and a selected one of the openings 86 being disposed when properly aligned and positioned to seat over and be in alignment with two of the spaced openings 88 provided in the ski 12. The disc or base plate member 82 also carries a toe receiving pocket 90 thereon, such pocket being formed of an elastomer strap 92 held in position on the plate 82 as by means of suitable hold-down bars 94 and 96 disposed along the edges of the elastomer strap, such holddown bars being secured to the plate 82 as by means of spaced screws 98. The strap 92 is usually provided with an opening 100 therein, the purpose of which will become apparent hereinafter.

In practice the base plate 82 is positioned on the ski 12 with the opening 84 positioned over a selected one of the openings 88 in the ski 12 depending upon the spacing desired between the rear foot retaining member 80 and the forward foot retaining member 10. A screw 102 as illustrated in Fig. 6 is then inserted through the opening 84 into engagement with the selected one of the openings 88 to hold the plate 82 the selected distance from the member 10. As will be apparent, a screw driver (not shown) can be inserted through the opening 100 in the strap 92 to engage and drive the screw 102 in a given direction. Thereafter the plate 82 is rotated about the screw 102 to angularly position the toe receiving pocket 90 relative to the forward foot retaining member 10 and so that one of the spaced openings 86 is in alignment with one of the openings 88 in the ski 12. When thus positioned, a screw 104 is inserted through the selected opening 86 into the cooperating opening 88 of the ski and both of the screws 102 and 104 are then tightened to lock the plate 82 in such selected position with the pocket 90 displaced angularly with respect to the forward member 10. As will be apparent longitudinal and angular adjustment of the rear foot retaining member 80 can be readily effected by the simple expedient of removing the screws 102 and 104 to permit movement of the plate 82.

In another embodiment of this invention the plate 82 as illustrated in Figs. 7 and 8 is provided with a plurality of grooves 106 extending between and terminating at the central opening 84 and each of the spaced openings 86. In this embodiment a bar 108 is provided having a length and size to seat in one of the grooves 106, one end of the bar 108 having a depending pin 110 thereon for fitting through the opening 84 into an aligned opening 88 and the other end of the bar 108 having an opening 112 therein for receiving the screw 104 which extends through the selected opening 86 into the aligned opening 88. With this embodiment it is evident that only one screw need be released to permit both a longitudinal and an angular adjustment of the base plate 82.

With the rear foot retaining member 80 constructed in accordance with the embodiments of either Figs. 5 or 7 it is apparent that the member 80 can be longitudinally or angularly adjusted or moved to any given position which will aid the skier in maintaining his balance on the ski 12 during slalom skiing. By providing the front foot retaining member 10 and the rear foot retaining member 80 as described hereinbefore, the ski can be readily used by persons of different sizes and having different stances on a ski for maintaining their balance. Further, the spacing between the forward foot and rear foot can be readily adjusted and no accidental movement of the adjustable members will be encountered in service.

The adjustable features of this invention are made pos-

sible through the use of standard components and as will be apparent, such adjustable members can be readily reproduced by anyone skilled in the art.

I claim:

1. In combination with a ski for use in slalom skiing, a forward foot retaining device and a rear foot retaining device disposed in spaced tandem relation to one another on the ski, the ski having a plurality of screw receiving openings disposed longitudinally therealong, the rear foot retaining device comprising a foot receiving base plate disposed to seat on the ski, a toe receiving pocket secured to the foot receiving base plate, the base plate having a central opening therein and a plurality of spaced openings disposed in a predetermined arc relative to the central opening, the spaced openings in the arc being disposed a distance from the central opening so that when the central opening is in alignment with a selected one of the screw receiving openings in the ski the plate can be rotated about the central opening to align one of the spaced openings in the arc with another one of the screw receiving openings in the ski, and removable means disposed to be positioned in the aligned openings for securing the plate to the ski in a predetermined position longitudinally and angularly with respect to the forward foot retaining device.

2. In combination with a ski for use in slalom skiing, a forward foot retaining device and a rear foot retaining device disposed in spaced tandem relation to one another on the ski, the ski having a plurality of screw receiving openings disposed longitudinally there along, the rear foot retaining device comprising a foot receiving base plate disposed to seat on the ski, a toe receiving pocket secured to the foot receiving base plate, the base plate having a central opening therein and a plurality of spaced openings disposed in a predetermined arc relative to the central opening, the spaced openings in the arc being disposed a distance from the central opening so that when the central opening is in alignment with a selected one of the screw receiving openings in the ski the plate can be rotated about the central opening to align one of the spaced openings in the arc with another one of the screw receiving openings in the ski, and screw means disposed in the pairs of aligned openings for securing the plate to the ski in a predetermined position longitudinally and angularly with respect to the forward foot retaining device.

3. In combination with a ski for use in slalom skiing, a forward foot retaining device and a rear foot retaining device disposed in spaced tandem relation to one another on the ski, the ski having a plurality of screw receiving openings disposed longitudinally there along, the rear foot retaining device comprising a foot receiving base plate disposed to seat on the ski, a toe receiving pocket secured to the foot receiving base plate, the base plate having a central opening therein and a plurality of spaced openings disposed in a predetermined arc relative to the central opening, the spaced openings in the arc being disposed a distance from the central opening so that when the central opening is in alignment with a selected one of the screw receiving openings in the ski the plate can be rotated about the central opening to align one of the spaced openings in the arc with another one of the screw receiving openings in the ski, the plate having a plurality of radially extending grooves on the face thereof extending from the central opening therein to each of the spaced openings in the arc, and a bar disposed to seat in a predetermined one of said grooves, the bar having a pin projecting downwardly therefrom adjacent one of its ends disposed to seat in the central opening of the plate and said selected one of the screw receiving openings in the ski and an opening in the other of its ends disposed to be in alignment with the spaced openings in the arc, and screw means disposed to extend through the opening of the bar, and a predetermined aligned one of the spaced openings in the arc into one of the openings in the ski

to lock the plate in a predetermined position longitudinally and angularly with respect to the forward foot retaining device.

4. In combination with a ski for use in slalom skiing, a forward foot retaining device and a rear foot retaining device disposed in spaced tandem relation to one another on the ski, the ski having a plurality of screw receiving openings disposed longitudinally therealong, the rear foot retaining device comprising a rotatable foot receiving base plate having a toe receiving pocket thereon, the rotatable base plate having a central opening therein and a plurality of spaced openings disposed in a predetermined arc relative to the central opening, the central opening being disposed to be selectively aligned with one of the screw receiving openings in the ski, the spaced openings in the arc of the rotatable plate being disposed a distance from the central opening thereof so that when the central opening is in alignment with a selected one of the screw receiving openings in the ski the rotatable plate can be rotated about the central opening to align one of the spaced openings in the arc with another one of the screw receiving openings in the ski, and removable screw means disposed to be positioned in the aligned openings for securing the rotatable plate to the ski in the predetermined position longitudinally and angularly with respect to the forward foot retaining device.

5. In combination with a ski for use in slalom skiing, a forward foot retaining device and a rear foot retaining device disposed in spaced tandem relation to one another on the ski, the rear foot retaining device being movable longitudinally of the ski through a number of predetermined positions relative to the forward foot retaining device, releasable means disposed for securing the rear foot retaining device in any of said predetermined positions, the rear foot retaining device also being rotatable in any of said predetermined positions when said releasable means is at least partially released to position the rear foot retaining device at a predetermined angle relative to the forward foot retaining device.

6. In combination with a ski for use in slalom skiing, a forward foot retaining device and a rear foot retaining device disposed in spaced tandem relation to one another on the ski, the rear foot retaining device being movable longitudinally of the ski through a number of predetermined positions relative to the forward foot retaining device, releasable means disposed for securing the rear foot retaining device in any of said predetermined positions, the rear foot retaining device also being rotatable in any of said predetermined positions when said releasable means is at least partially released to position the rear foot retaining device at a predetermined angle relative to the forward foot retaining device, and a second releasable means disposed to secure the rear foot retaining device in said predetermined angular position relative to the forward foot retaining device to prevent accidental rotation of the rear foot retaining device from said predetermined angular position.

7. In combination with a ski for use in slalom skiing, a forward foot retaining device and a rear foot retaining device disposed in spaced tandem relation to one another on the ski, the rear foot retaining device having a toe receiving pocket and being movable longitudinally of the ski through a number of predetermined positions relative to the forward foot retaining device, releasable means disposed for securing the rear foot retaining device in any of said predetermined positions, the rear foot retaining device also being rotatable in any of said predetermined positions when said releasable means is at least partially released to position the toe receiving pocket at a predeteremined angle relative to the forward foot retaining device.

8. In combination with ski for use in slalom skiing, a forward foot retaining device and a rear foot receiving device disposed in spaced tandem relation to one another

on the ski, the rear foot retaining device having a toe receiving pocket carried thereby, the rear foot retaining device being disposed for movement longitudinally of the ski through a number of predetermined positions relative to the forward foot retaining device, releasable means disposed for securing the rear foot retaining device in any of said predetermined positions, the rear foot retaining device also being rotatable in any of said predetermined positions when said releasable means is at least partially released to position the toe receiving pocket carried thereby at a predetermined angle relative to the forward foot retaining device, and a second releasable means disposed to secure the rear foot retaining device with the toe receiving pocket in said predetermined angular position relative to the forward foot retaining device to prevent accidental rotation of the toe receiving pocket from said predetermined angular position.

9. A foot retaining device for mounting on a base member comprising, a base plate, a toe receiving pocket carried by the base plate, the base plate having a pivotal opening therein and a plurality of spaced openings disposed in a predetermined arc relative to and spaced from the pivotal opening so that when the plate is rotated about the pivotal opening one of the spaced openings in the arc and the pivotal opening will be disposed to be in alignment along a predetermined line, and removable means disposed to be positioned in said aligned openings to secure the base plate to the base member and maintain the toe receiving pocket at a predetermined angle relative to said predetermined line.

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