Sept. 17, 1963 A. F. LOCKWOOD 3,103,672

WATER SKI WITH ADJUSTABLE BINDING

Filed July 18, 1961 2 Sheets-Sheet 1

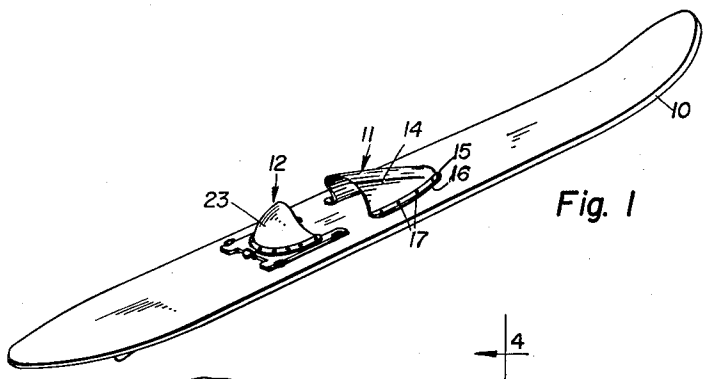


Fig. 1

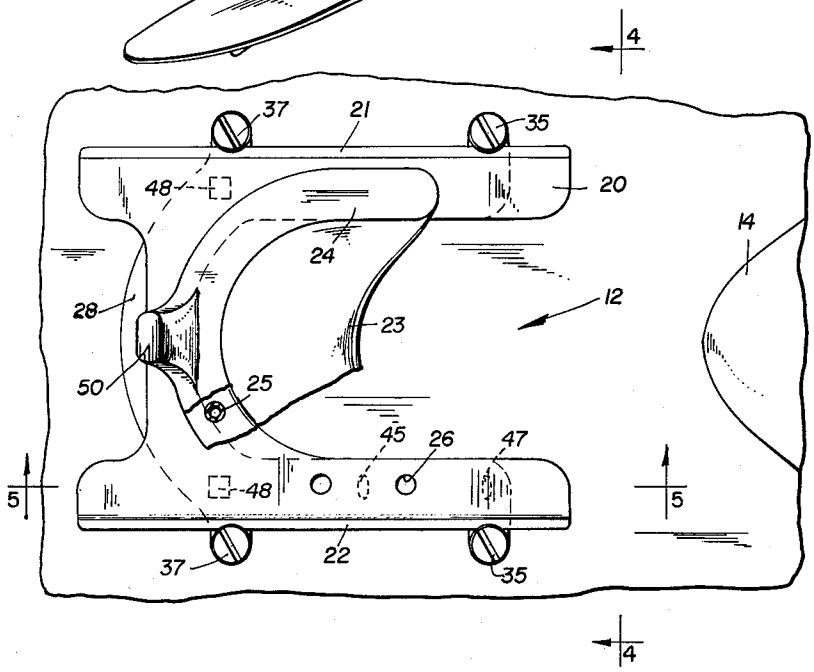


Fig. 2

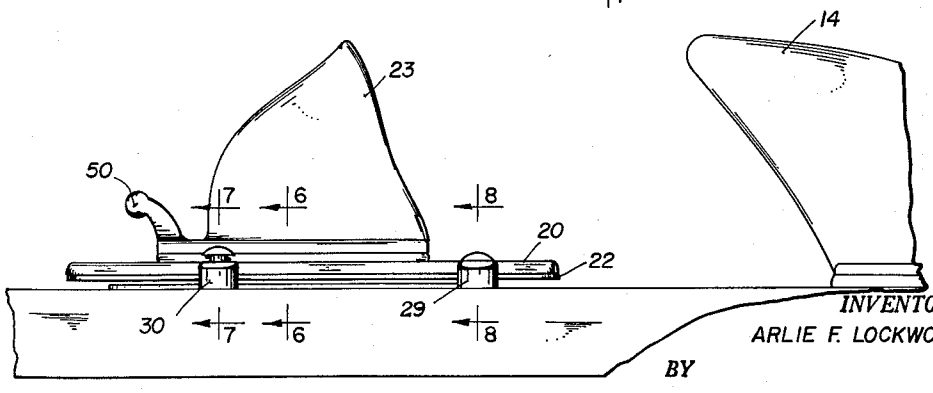


Fig. 3

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Fig. 4

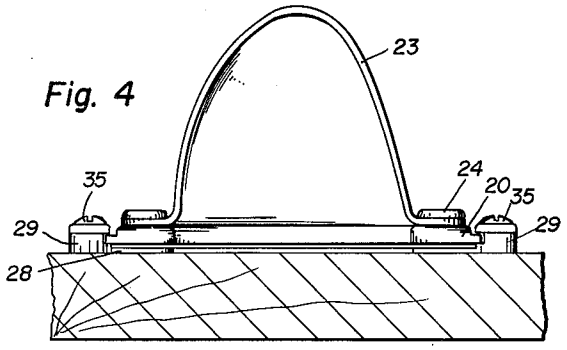


Fig. 6

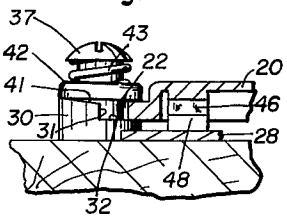


Fig. 5

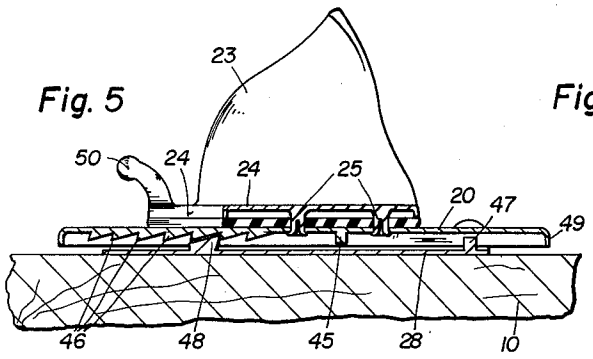


Fig. 7

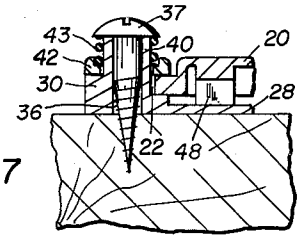


Fig. 8

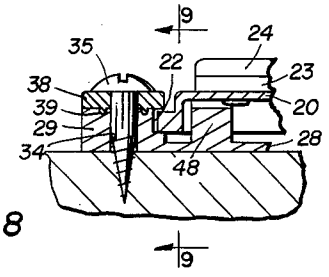


Fig. 9

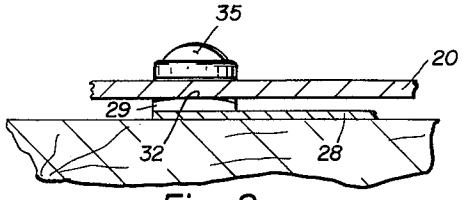


Fig. 10

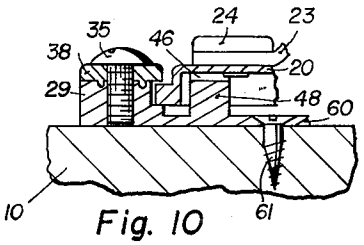
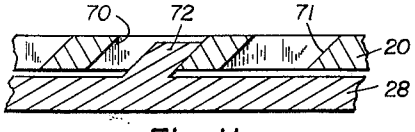


Fig. 11



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WATER SKI WITH ADJUSTABLE BINDING

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16 Claims. (Cl. 9—310)

My present invention comprises a water ski, having particular reference to the binding thereof. The present invention may be associated with any type of water ski, and comprises an improvement in the bindings therefor whereby rapid accommodation of the binding to the skier's foot may be accomplished by simple, sturdy means inexpensive of construction and inexpensively applicable to any ski, which may be easily adjusted to the skier's foot in the water, and which cannot become clogged or bound by foreign matter such as sand.

The objects and advantages of the present invention will be more readily apparent from inspection of the accompanying drawings, taken in connection with the following specification, wherein like numerals refer to like parts throughout.

In the drawings,

FIG. 1 is a view, in perspective, of a water ski having one form of the present invention applied thereto;

FIG. 2 is a partial plan view of FIG. 1, with parts broken away, and illustrating the present invention;

FIG. 3 is a side elevation of FIG. 2;

FIG. 4 is a partial vertical section taken substantially along line 4—4 of FIG. 2;

FIG. 5 is a partial vertical section taken substantially along line 5—5 of FIG. 2;

FIG. 6 is a partial vertical section, on a greatly enlarged scale, taken substantially along line 6—6 of FIG. 3;

FIG. 7 is a partial vertical section, on a greatly enlarged scale, taken substantially along line 7—7 of FIG. 3;

FIG. 8 is a partial vertical section, on a greatly enlarged scale, taken substantially along line 8—8 of FIG. 3;

FIG. 9 is a vertical section taken substantially along line 9—9 of FIG. 8;

FIG. 10 is a view similar to FIG. 7 showing certain details of a modified form of the invention; and

FIG. 11 shows a modification in detail.

In FIG. 1 there is illustrated a typical water ski 10 having the present invention applied thereto. The invention comprises a binding including a toe portion 11 and a heel portion 12. The two portions of the binding may be entirely separate from each other, as illustrated in FIG. 1, or there may be a metal plate extending from front to rear of the entire binding and adapted to be secured to the ski underlining the skier's foot as detailed in FIG. 10.

Referring to FIGS. 1 to 9, inclusive, this modification comprises a toe portion 11 including a flexible vamp 14 which is secured along its edges, preferably by rivets, between a pair of metal members 15 and 16. The flexible member is preferably made of rubber or synthetic substitute therefor and as conventional, being secured to the upper surface of the ski by suitable means such as screws 17.

The heel portion 12 is longitudinally aligned with the toe portion and comprises a substantially U-shaped rigid frame 20 having spaced-apart, thickened, lateral edge flanges 21 and 22 which extend longitudinally of the ski, parallel to the longitudinal centerline thereof. The heel portion also comprises a flexible heel-embracing member 23 which is adapted to embrace a portion of the heel, overhanging the heel bone at the back of the foot and embracing the sides of the heel. The flexible member is secured to the rigid U-shaped member 20 by a rigid, horseshoe-shaped member 24 which is provided with a

plurality of integral, depending, hollow rivet portions 25 which pass through suitable openings 26 in the rigid member 20 and are expanded at their lower ends to make a unitary construction of the three pieces.

Member 20 comprises U-shaped front and rear openings as seen in FIG. 2.

The heel portion is retained for limited longitudinal movement on the ski by guide means secured to the ski. The guide means comprises a substantially U-shaped plate 28, the arms of which underlie the arms of the member 20. Each arm of the member 28 is provided with a pair of guide posts, post 29 adjacent its forward end and post 30 adjacent its rearward end. Each of the posts is recessed, as indicated at 31, on its inwardly facing surface so as to present a small rounded line of contact to the adjacent lateral flange 21 or 22, as the case may be (FIG. 6). The recessed portion provides an upwardly curved bearing surface 32 (FIGS. 6 and 9), which present small surfaces of contact to the underside of the lateral edges of the movable frame 20. The movable frame is thereby guided by four tangentially positioned posts and rests upon four upwardly curved surfaces, so as to be supported for movement with a minimum of friction and in such manner that sand cannot accumulate between the guiding and guided surfaces.

The forward posts 29 are each provided with a central vertical bore 34 through which is passed the stem of a wood screw 35. Each rear post 30 is provided with a central vertical bore 36 through which is passed the stem of a wood screw 37. The screws 35 each retain a washer 38 which is provided with a small concentric bead 39 fitting into a macthing recess in the upper surface of the post 29, whereby the washer 38 is retained in centered relation with respect to the post. The washer 38 overhangs the edge of the plate 20 so as to retain the movable heel portion in association with the ski. Very small areas of contact are provided between the washers and the upper surface of the member 20 and the spacing between the washer and the member 20 in the vertical sense is slightly greater than the thickness of the guiding edge portions of the member 20. The movable portion is thereby retained by separable fastener means overhanging an edge portion thereof.

Each screw 37 is seated against an upwardly extending portion 40 of the post 30, which is of reduced diameter. The top of the lower part of post 30 is inwardly inclined as indicated at 41 (FIG. 6). Surrounding the reduced portion 40 and resting upon the inclined surface 41 is an upwardly facing spring seating washer 42 having a relatively large internal diameter so that the washer may cant without binding. Surrounding the reduced portion 40 between the head of the screw 37 and the washer 42 there is provided a coil spring 43. The spring is relatively weak and bears lightly upon the upper surface of the member 20 adjacent the longitudinal edge thereof, so that the rearward part of the member 20 is retained in association with the ski by separable fastener means, but may have limited vertical separation with respect thereto.

The metal members are die cast of high strength aluminum alloy. Depending from the lower surface of the member 20 in longitudinally aligned relation to each other are a limiting abutment 45 and a longitudinally aligned series of adjusting abutments in the form of serrations 46 (FIGS. 2 and 5). In vertically aligned relation thereto and in longitudinally aligned relation to each other, the member 28 is provided with an upwardly projecting limiting abutment 47 and an upwardly projecting detent 48. The member 20 is also provided with a continuous, downwardly projecting edge flange 49. The abutment 47 lies between the abutment 45 and the forward end of the flange 49 so that longitudinal movement of the heel portion 12 is limited. The detent 48 slopes forwardly

at an acute angle and the serrations 46 slope rearwardly at matching acute angles, so that a portion of each serration is adapted to underlie a portion of the detent 48 at whatever position the heel portion may occupy, so as to hold the heel portion in adjusted relation to the skier's foot. The flexible member 23 has sufficient stiffness and is rendered relatively stiff by the arched arrangement thereof, so that a force is transmitted from the skier's heel to the rear portion of the movable heel-engaging portion of the binding, thereby holding the heel portion in adjusted position adjusted to the skier's foot. Movement of the heel portion forwardly is readily accomplished merely by shoving forward thereagainst, the springs 43 yielding as the serrations click forward across the detent 48. The serrations 46 and the detent 48 stand alone, projecting respectively downward and upward from adjacent the surfaces of the members with which they are integral, so that sand may be flushed away from them. The flange 49 also materially prevents sand from getting into the region of the serrations and detent. However, the lower edge of the flange is materially spaced from the surface of the ski so that flushing may be accomplished.

It is to be appreciated, as indicated by the two detents 48 in FIG. 2, that there are preferably a set of serrations and adjacent detent at each side of the heel portion. However, only one limiting abutment arrangement may be provided.

The springs 43 are not required to hold the heelpiece in adjusted position during use of the binding, being provided merely to provide sufficient force to hold the binding in adjusted positions for demonstration purposes.

Preferably, the member 24 is provided at the rear with an upwardly and rearwardly extending projection 50, which may be engaged in order to manipulate the movable heel portion, this being easily accomplished even while the skier is in an awkward position in the water clamping the ski to his foot. When the heel portion is shoved rearwardly the flexible member exerts a force not only downwardly but rearwardly, so that the detent is interlocked with one of the serrations in its adjusted position, and it will require manual effort against the heel portion through the projection 50 so as to release the heel portion from engagement with the foot. However, in the event the skier tumbles, the skier's foot is readily released just as with any water ski binding.

FIG. 10 illustrates a modification of the invention, wherein all portions of the invention are substantially the same except that the post portions of the guide means, such as the post 29 illustrated, and the detent 48, are integral with a base plate 60 which extends forwardly from the heel portion and carries the toe portion on its forward end, the plate being adapted to be fixed to the ski by means of suitable wood screws 61. This construction renders the binding more suitable for replacement purposes, to replace other bindings removed from a ski by the purchaser of the binding, whereas the separate heel and toe portions, as illustrated in FIG. 1, may be readily affixed through the use of jigs and fixtures in factory production. The use of a connecting plate as illustrated in FIG. 10 renders it very simple to properly attach the binding to a ski.

FIG. 11 illustrates a modification wherein the adjusting abutments comprise a series of openings 70 having sloping forward walls 71, and the detent comprises an undercut pin 72.

Having illustrated and described preferred embodiments of the present invention, it should be realized that the same permits of further modification in detail and arrangement, such as by making the heel portion immoble and longitudinally guiding the toe portion. I claim all such modifications as come within the true spirit and scope of the following claims.

I claim:

1. A water ski including a binding,
said binding comprising a toe portion and a longitudinally aligned heel portion,

one of said portions being movable longitudinally of the ski and comprising a rigid frame and a flexible, foot-embracing member secured to said frame,
the other of said portions being fixed to the ski,
and guide means fixed to the ski and engaging said frame for guiding said movable portion longitudinally of the ski toward and away from said other portion,
said guide means and said frame having a plurality of longitudinally aligned abutments on one and a detent on the other in vertical alignment with said abutments for holding said movable portion in a position adjusted to a skier's foot,
said guide means also being provided with means permitting vertical movement of said frame relative to said guide means to permit limited vertical separation of said abutments and detent in order that said movable portion may be moved longitudinally of the ski,
and said flexible member transmitting pressure from the skier's foot to said frame to hold said abutments and detent engaged with each other when said flexible member is pressed against the skier's foot.

2. A water ski including a binding comprising a toe portion and a longitudinally aligned heel portion,
said heel portion being movable longitudinally of the ski and comprising a rigid frame and a flexible, heel-embracing member secured to said frame,
said toe portion being fixed to the ski,
and guide means fixed to the ski and engaging said frame for guiding said heel portion longitudinally of the ski toward and away from said toe portion,
said guide means and said frame comprising a plurality of longitudinally aligned abutments on one and a detent on the other in vertical alignment with said abutments for holding said heel portion in a forward position adjusted to a skier's foot,
said guide means permitting limited vertical movement of said frame relative to said guide means to permit limited vertical separation of said abutments and detent in order that said heel portion may be moved longitudinally of the ski,
and said flexible member transmitting pressure from the skier's heel to said frame to hold said abutments and detent engaged when said heel portion is pressed forwardly against the skier's heel.

3. The construction set forth in claim 1 wherein said movable portion and said guide means are separate from each other.

4. The construction set forth in claim 1 wherein said movable portion comprises a plate adapted to be secured to the ski to which said guide means are secured.

5. The construction set forth in claim 1 wherein said guide means comprises a plurality of separable fastener means overhanging a portion of said frame.

6. The construction set forth in claim 1 wherein said guide means comprises a plurality of separable fastener means overhanging a portion of said frame, and in which a pair of said guide means each comprises a spring for permitting said vertical separation.

7. The construction set forth in claim 1 wherein said abutments comprise openings in said frame having sloping walls,
and said detent comprises an undercut pin.

8. In a heel binding for a water ski, a rigid frame,
a flexible heel-embracing member secured to the frame,
rack means positioned below the frame and secured to the underside of the rear portion of the frame, the rack means having a plurality of undercut toothed surfaces spaced along the frame and directed rearwardly and downwardly,
a detent having an undercut surface projecting upwardly and forwardly and adapted to be fixed to a ski in a position for the undercut surface thereof to engage a selected one of the toothed surfaces,
and guide means adapted to be secured to a ski in posi-

tions bracketing the frame and guiding the frame along the ski,

the rear portions of the guide means serving to resiliently press the frame downwardly to urge the rack means to engagement with the detent and permitting the frame to be pushed forward and lifted to a position disengaging the rack means from the detent.

9. In a heel-binding for a water ski, a pair of guides having overhanging flanges,

means for securing the guides to a ski in positions extending along the ski parallel to one another and permitting limited movement of the rear portions of the flanges upwardly from the ski,

a frame slidable along the guides and having side edge portions held downwardly by the flanges of the guides,

a flexible heel-embracing member secured to the frame and serving when urged against the heel of a skier to press the frame rearwardly,

portions of the frame having spaced undercut abutments fixed to the bottom of the frame in positions extending along the rear portion of the frame and adjacent the side edge portions,

and a pair of upwardly projecting undercut detents fixed to the guides near the rear ends of the guides and in positions adapted to engage the undercut abutments.

10. In a heel-binding for a water ski, a base member having a pair of sides and provided with a forward pair of guide portions and a rear pair of guide portions,

the guide portions being positioned at the sides of the base member,

the base member also having a pair of teeth projecting upwardly and forwardly near the rear of the sides of the base member,

a frame having a U-shaped opening toward the front and slidable on and between the guide portions,

the frame also having a pair of rack portions on the bottom thereof extending along the rear portion thereof in positions adapted to be engaged by the teeth,

the rack portions having rearwardly and downwardly projecting toothed surfaces spaced therealong and adapted to interlock with the teeth of the base member,

a flexible cup-shaped heel-embracing member fixed to the frame,

means holding the frame downwardly at the forward pair of guide portions,

and means urging the frame downwardly at the rear pair of guide portions.

11. The construction of claim 10 wherein the frame has a U-shaped rear opening with the rack portions extending along the bottoms of the portions of the frame forming the sides of the rear opening.

12. A water ski including a binding,

said binding comprising a toe portion and a longitudinally aligned heel portion,

one of said portions being movable longitudinally of the ski and comprising a rigid frame and a flexible, foot-embracing member secured to said frame,

the other of said portions being fixed to the ski,

and guide means fixed to the ski and engaging said frame for guiding said movable portion longitudinally of the ski toward and away from said other portion,

said guide means and said frame having a plurality of longitudinally aligned abutments on one and a detent on the other in vertical alignment with said abutments for holding said movable portion in a position adjusted to a skier's foot,

said guide means permitting limited vertical separation of said abutments and detent in order that said movable portion may be moved longitudinally of the ski,

said guide means comprising a pair of centrally apertured posts transversely adjacent said detent and abutments,

separable fastening members secured against movement relative to said posts,

said fastening members having heads overhanging said posts,

a washer surrounding said posts and overlying a portion of said frame,

and a coil spring imposed between said separable fastener member head and said washer,

and said flexible member transmitting pressure from the skier's foot to said frame to hold said abutments and detent engaged with each other when said flexible member is pressed against the skier's foot.

13. A water ski including a binding,

said binding comprising a toe portion and a longitudinally aligned heel portion,

one of said portions being movable longitudinally of the ski and comprising a rigid frame and a flexible, foot-embracing member secured to said frame,

the other of said portions being fixed to the ski,

and guide means fixed to the ski and engaging said frame for guiding said movable portion longitudinally of the ski toward and away from said other portion,

said frame having a plurality of longitudinally aligned abutments and said guide means having a detent in vertical alignment with said abutments for holding said movable portion in a position adjusted to a skier's foot,

said abutments comprising serrations integral with said frame and facing downwardly, standing openly from surrounding downwardly facing surfaces of said frame,

said guide means permitting limited vertical separation of said abutments and detent in order that said movable portion may be moved longitudinally of the ski,

and said flexible member transmitting pressure from the skier's foot to said frame to hold said abutments and detent engaged with each other when said flexible member is pressed against the skier's foot.

14. In a heel binding for a water ski,

a rigid frame,

a flexible heel-embracing member secured to the frame,

rack means positioned below the frame and secured to the underside of the rear portion of the frame,

the rack means having a plurality of undercut toothed surfaces spaced along the frame and directed rearwardly and downwardly,

a detent having an undercut surface projecting upwardly and forwardly and adapted to be fixed to a ski in a position for the undercut surface thereof to engage a selected one of the toothed surfaces,

the detent projecting sufficiently upwardly from the ski as to hold the rack means in a position spaced substantially above the ski,

and guide means adapted to be secured to a ski in positions engaging opposite side portions of the frame and guiding the frame along the ski,

the rear portions of the guide means serving to resiliently press the frame downwardly to urge the rack means into engagement with the detent and permitting the frame to be pushed forward and lifted to a position disengaging the rack means from the detent.

15. In a heel binding for a water ski,

a rigid frame,

a flexible heel-embracing member secured to the frame,

a first toothed member on the bottom of the frame and having a rearwardly and downwardly projecting rear surface,

guide means fixed to the ski for guiding the frame along the ski,

and a second toothed member fixed to the ski in a

position in which a forward surface thereof projects forwardly and upwardly from the ski into the path of the rear surface of the first toothed member,

the guide means permitting vertical movement of the frame relative to the ski between a latching position in which rearward force on the heel-embracing member holds the rear surface of the first toothed member in engagement with the front surface of the second toothed member and a releasing position in which the first toothed member is entirely above the second toothed member and the frame can be moved freely rearwardly along the ski.

16. In a heel binding for a water ski,

guide means adapted to be secured to a ski and having rigid therewith an upwardly and forwardly projecting toothed surface,

a frame slidably mounted by the guide means and having rigid therewith a downwardly and rearwardly projecting toothed surface adapted to releasably interlock with the upwardly and forwardly projecting toothed surface,

a flexible heel-embracing member secured to the frame,

and means urging the frame downwardly relative to the guide means toward a position in which the toothed surfaces overlap so that a rearward force on the heel-embracing member urges the toothed surfaces into interlocking engagement,

the urging means also permitting the frame to be moved upwardly relative to the guide means to a position relative to the guide means in which the toothed surfaces are free of each other to permit the frame to be slid rearwardly of the guide means.

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