Feb. 17, 1942. J. S. SUMMERHAYES 2,273,541

SKI HARNESS

Filed Jan. 4, 1939 2 Sheets-Sheet 1

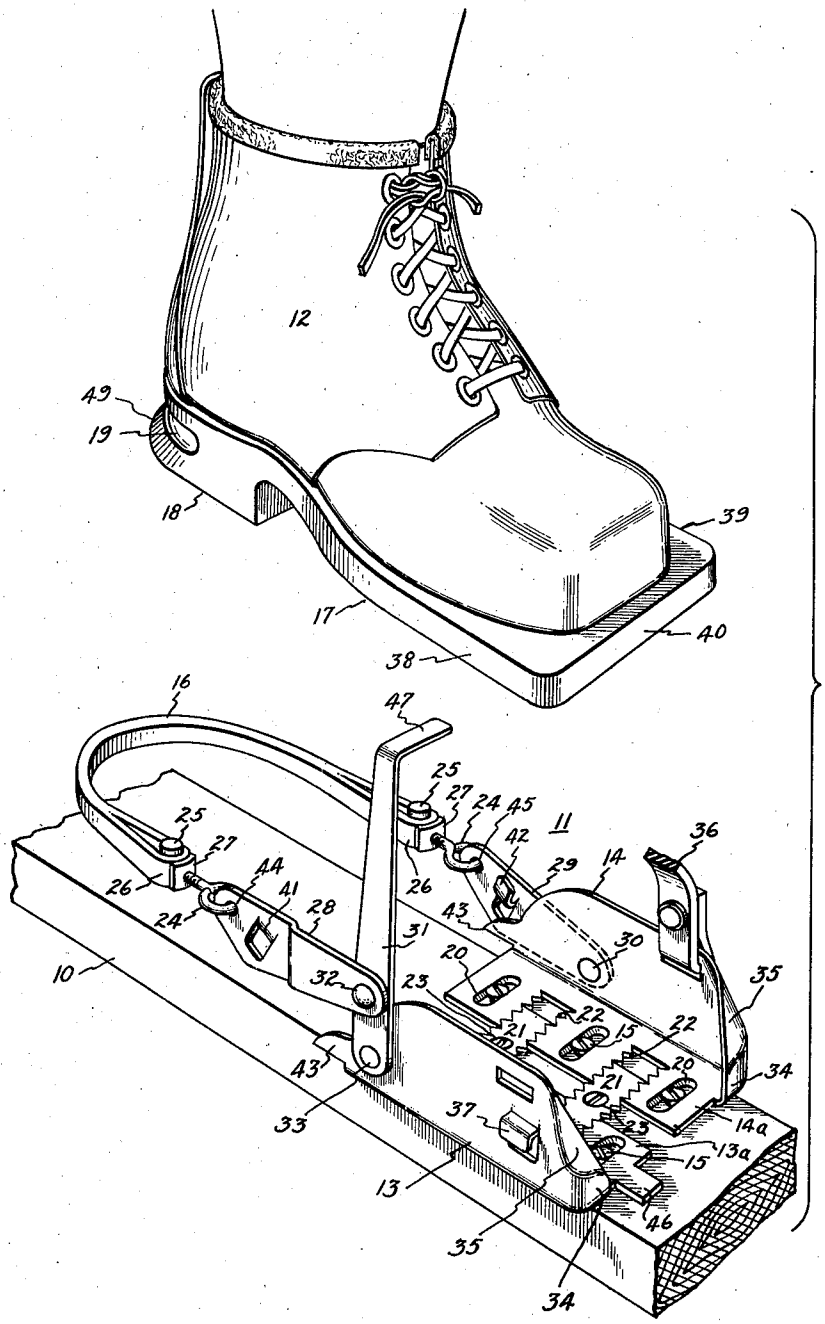


Fig. 1.

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Fig. 3.

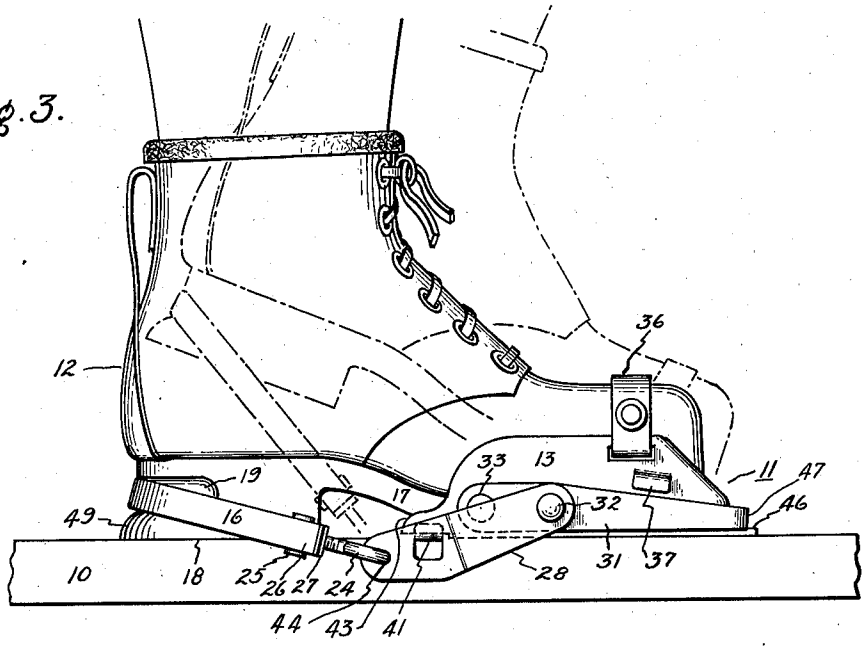
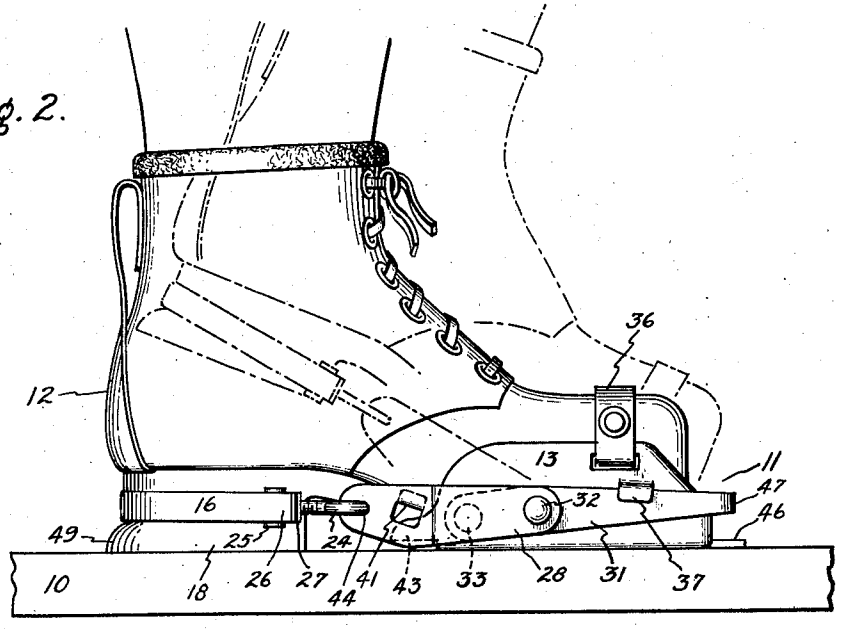


Fig. 2.



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2,273,541

SKI HARNESS

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Application January 4, 1939, Serial No. 249,267

11 Claims. (Cl. 280—11.35)

My invention relates to devices for securing a ski on a skier's foot.

In order to obtain maximum ease of handling and control of skis it is desirable that side movement or horizontal twisting of the ski on the boot be impossible, but it is also desirable that the normal pivotal or angular movement of the skier's foot about the toe and toe joints be impaired as little as possible.

The conventional ski binding or harness in use today comprises a pair of toe pieces and a heel strap so constructed that sufficient force may be applied when clamping a boot in the harness that the sole of the boot is held against the toe pieces and transverse or pivotal movement of the boot on the ski is relatively impossible. Vertical pivotal movement of the boot about the toe thereof is possible, but the sole must be sufficiently rigid to withstand the clamping force, consequently there is substantial restriction of both vertical angular movements required for comfortable walking. The rigid clamping of the boot and the restriction of free walking movement because of the highly stressed heel strap may result in injury to the foot of a skier under abnormal conditions as during a fall. The heavy stiff soled boots required for use with the conventional bindings tend to be more uncomfortable than other boots such as heavy hiking boots, and the stiff sole restricts the normal bending action of the skier's foot.

For downhill skiing it has been found advantageous to provide some mechanism which tends to pull the ski against the heel of the skier's boot. Many forms of "down-pull" devices are available but it has proved difficult to provide such devices which afford sufficient ease of changeover from "down-pull" to the normal or walking position, and which do not require loosening of the entire harness to effect the change.

Accordingly it is an object of my invention to provide an improved ski harness or binding which requires relatively small stresses in the heel strap thereof but which will firmly maintain a ski on a boot and prevent undesirable relative transverse movement of the ski and the boot sole.

Another object of my invention is to provide an improved ski binding or harness for holding a ski firmly on a boot during normal skiing but which shall afford ready release of the ski from the boot under abnormal stress.

Another object of my invention is to provide an improved ski binding including an easily adjustable heel strap attaching device which may be changed readily from a normal to a "down-pull" position, and vice versa, without altering the adjustment of the other parts of the binding.

A further object of my invention is to provide a ski boot and a harness for securing a ski on the boot for affording improved action and control and ready release of the ski in the event of abnormal stresses.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawings in which Fig. 1 is a perspective view of a ski boot and harness embodying my invention, the boot being shown above the harness in a position to be secured therein; Fig. 2 is a side elevation view of the boot secured in the harness with the harness in the normal or walking position; and Fig. 3 is a side elevation view showing a ski boot secured in the harness with the harness in the "down-pull" position.

Referring now to the drawings, in Fig. 1 I have shown a perspective view of a ski 10 provided with a harness or binding 11 and a boot 12 about to be lowered to the ski and to be secured in the harness. The harness comprises a pair of toe pieces 13 and 14 secured to the ski by screws 15, and a resilient heel strap of rubber or other suitable material. The toe pieces are longer than the toe pieces of conventional bindings and preferably are made with lengths of the order of one-third to one-half the length of the boot to be used therewith; the toe pieces being shown as having lengths substantially one-half the length of the boot 12. The boot 12 is provided with a sole 17, the front end of which is adapted to fit between the toe pieces 13 and 14 and a heel 18 provided with a groove 19 for retaining the heel strap 16 in place. The screws 15 pass through slots 20 in flat horizontal portions 13*a* and 14*a* of the toe pieces 13 and 14 respectively. The portions 13*a* and 14*a* are locked at any desired distance from each other by toothed plates 21 which engage toothed open slots 22 in the portions 13*a* and 14*a* and are secured to the ski by screws 23.

The heel strap 16 is provided with ring or hooks 24 one at each end secured to the strap by a threaded connection with metal plugs 25 around which pass loops 26 of the strap, the ends of the loops being held between the plugs 25 and retaining caps 27 also threaded on the hooks 24. The hooks 24 are connected to the

ends of links 28 and 29 pivotally secured to the toe pieces 13 and 14 respectively. The link 29 is directly pivoted to the toe piece 14 at 30, while the link 28 is pivoted at 32 to an intermediate link 31 which in turn is pivoted at one end to the toe piece 13 at 33. It is readily apparent that the link 31 comprises a take-up device for the quick adjustment of the heel strap 16 when fitting the boot in the harness. The take-up link is shown in its open position in Fig. 1 and in its closed position in Figs. 2 and 3.

When the boot is placed in the harness with the heel strap 16 in the groove 19 and the take-up link moved to its forward or closed position the heel strap pulls the boot into the harness against stops 34 at the forward end of the toe pieces 13 and 14 which limits the forward movement of the sole 17 between the toe pieces. The stops 34 preferably are formed as integral parts of the toe pieces and have upwardly and backwardly extending portions 35 which prevent direct upward movement of the toe of the sole between the toe pieces; a resilient toe strap 36 of rubber or other suitable material may also be used, if desired, to assist the portions 35 of the toe pieces in preventing direct upward movement of the boot between the toe pieces.

In Fig. 2 the ski is shown secured to the boot by the harness with the heel strap in its normal or walking position. The take-up link 31 is held in its forward position by a downwardly opening hook or catch 37 formed in the forward end of the toe piece 13. In the walking position the link 31 is held upwardly against the hook 37 by the upward component of pull exerted by the heel strap 16.

In order to prevent transverse movement of the boot sole and ski with respect to one another, I construct the toe or forward end of the boot sole with parallel sides 38 and 39 of substantially the same length as the toe pieces 13 and 14. This shape of the sole is unlike that of the conventional ski boot and makes possible a greater freedom of movement with much less stress in the heel strap and boot sole. The upright portions of the toe pieces 13 and 14 preferably are arranged parallel to each other and substantially parallel to the longitudinal axis of the ski, and are spaced apart the width of the sole 17 between the sides 38 and 39. The forward end of the sole as indicated at 40 is at right angles to the sides 38 and 39 so that it tends to hold the sole in position for pivotal or angular movement on a horizontal axis at right angles to the longitudinal axis of the ski. The long toe pieces 13 and 14 guide the parallel sides 38 and 39 of the sole, so that the skier's foot moves only in vertical planes longitudinally of the ski and not transversely of the upper surface of the ski. It will be apparent that the heel strap 16 need be only strong enough to hold the toe of the sole against the stops 34 during normal skiing conditions and need not be designed to exert additional force to prevent transverse movement of the sole and ski. This arrangement of the toe pieces and sides of the boot sole extending parallel and having lengths from one-third to one-half the length of the boot so that they cooperate to prevent transverse relative movement of the boot and ski and guide angular vertical movement of the boot makes it practical to employ a heel strap of rubber or similar resilient material. The use of a resilient heel strap affords great safety in the event of a fall or other accident since the stretching of the strap under abnormal stresses releases the boot from the toe pieces. Furthermore, since the force exerted by this rubber resilient heel strap is much less than that of the steel spring resilient heel strap of conventional bindings a much lighter boot sole may be used satisfactorily, and more natural walking action and resulting reduced fatigue are thereby made possible. In addition to the advantage of free angular movement in vertical planes without sacrifice of lateral control my ski harness has the further advantage that wear of the boot and sole is less than that of boots used with the conventional harness because of the lower heel strap stresses and reduced friction at the sides of the sole.

In Fig. 2 the pivoting of the heel strap 16 and link 28 is indicated in dot and dash lines. The boot has been shown, for ease of illustrating, as pivoting bodily about the front edge of the sole, however, it is to be understood that bending of the sole as in normal walking is also contemplated and obviously the resilient heel strap permits such bending while holding the boot and stops 34 in engagement. The toe strap 36 is often a desirable addition to assist in maintaining the boot in position, however, it is not necessary as by proper selection of the heel strap 16 the strap will hold the boot and toe pieces in position satisfactorily. In Fig. 2 the link 31 is shown in engagement with a hook or catch 37 formed on the toe piece 13. In the walking position the strap 16 exerts an upward component of pull at the pivot 32 which is intermediate the hook 37 and the pivot 33; this holds the link in position against the hook 37.

In Fig. 3 I have shown the link 28 in its "down-pull" position, it being understood that the link 29 is in a corresponding position on the other side of the harness. The links 28 and 29 are held in their "down-pull" positions by hooks or catches 41 and 42, respectively, which engage extension or lugs 43 at the rear ends of the toe pieces 13 and 14. The interengagement of the catches 41 and 42 and the lugs 43 prevents upward pivotal movement of the links 28 and 29 and the effective pivot points of the heel strap 16 are transferred to the hooks 24 which are pivoted to the links 28 and 29 at 44 and 45, respectively. As shown in Fig. 3 the pivot point 44 is below the top of the ski, and a downward pull is exerted by the strap 16 on the heel of the boot. The upward pull on the pivot 44 tends to rotate the link 28 about the hook 41 and thereby pushes the take-up link 31 downwardly; a stop 46 is formed on the horizontal portion of the toe piece 13 and a hooked end 47 of the link 31 bears on the stop 46 when the harness is in the "down-pull" position. Obviously other arrangements for holding the link 31 in its take-up position may be employed, however, I have shown a preferred arrangement which affords quick latching and releasing of the lever 31 for the purpose of adjusting the harness. The link 31 may be constructed of a material such as spring steel, so shaped and secured to the toe piece 13 that it tends to remain tightly against the side of the toe piece, but may be sprung out slightly to release it from the hook 37.

The dash and dot lines in Fig. 3 indicate the boot and heel strap after the boot has moved angularly about the toe of the sole. As in Fig. 2, for ease of illustration, no bending of the boot sole has been indicated, however, it is contemplated that it may bend as in normal walking. Since the angle of the heel strap 16 in the "down-

pull" position may be very steep I provide a projection 49 on the heel of the boot to assist the groove 19 in preventing the heel strap from slipping off the heel.

In order to secure a ski on a boot with the harness described above the toe pieces 13 and 14 are adjusted to fit the parallel sides of the boot. The take-up link 31 is then moved to its open position, it being shown partially open in Fig. 1, and the boot positioned between the toe pieces with the toe of the sole against the stops 34. The heel strap is then placed around the heel in the groove 19 and the take-up link moved to its forward or closed position in engagement with the hook 37. If the toe strap 36 is to be used it may be fitted over the boot toe when the toe is placed between the toe pieces. Should it be desired to use the "down-pull" the links 28 and 29 may be pushed downwardly and slightly outwardly so that the hooks 41 and 42 clear the lugs 43, and the hooks and lugs may then be engaged to hold the links in their "down-pull" position. The low heel strap tension made possible by this harness makes it practical and easy to engage or disengage the hooks 41 and 42 without loosening the take-up link 31; the change from normal or walking position to "down-pull" position of the heel strap may be made even without removing one's gloves or mittens. By placing only one of the links 28 and 29 in its "down-pull" position a lesser degree of down-pull may be obtained if desired.

By employing a harness having a heel strap which does not exert high stresses because it does not carry the load due to holding the ski and boot against transverse movement I have made possible a very safe form of ski binding. Under abnormal conditions such as in a fall or other accident the heel strap stretches and allows the boot to slip from the grip of the toe pieces before dangerous stresses are transmitted to the skier's foot. Furthermore, in addition to the greater safety thus obtained, I have also provided a harness which is of simple construction and easy to adjust even without the removal of one's mittens or gloves. Furthermore, I have provided a harness and boot so arranged and constructed that both boot and harness are lighter than the conventional ski boot and binding, the weight of a pair of boots and harnesses embodying my invention being in some cases as much as one to one and one-half pounds less than the conventional equipment.

From the foregoing it is readily apparent that I have provided an improved ski boot and harness for securing a ski on a ski boot which are of simple and light weight construction, provide a high degree of safety in case of falls or other accidents, and which may be adjusted readily under all conditions of use. In addition, I have provided a harness that gives greater comfort during walking on skis by allowing natural toe bending and angular movement of the foot without sacrificing lateral control. The low backstrap stresses made possible in this harness permit the part of the sole forward of the toe joints to rotate freely in the toe pieces, and furthermore much less boot wear is encountered.

While I have shown a particular embodiment of my invention other modifications will readily be apparent to those skilled in the art. I do not therefore, desire my invention to be limited to the particular construction shown and described and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A harness for securing a ski on a boot comprising a pair of upright toe pieces, means for mounting one of said toe pieces parallel to the longitudinal axis of a ski, said one of said toe pieces having a length of the order of one-third to one-half that of a boot to be used therewith, means for limiting forward movement of the boot between said toe pieces and for preventing upward movement of the end of the toe of a boot between said toe pieces, and resilient means for holding a boot in place between said toe pieces and against said forward movement limiting means, said toe pieces constituting the sole effective means for restraining the boot against lateral movement with respect to the ski, the inner upright sides of said toe pieces being free from obstructions whereby a boot may swing freely angularly toward and away from the ski about a transverse axis adjacent the front ends of said toe pieces.

2. A harness for securing a ski on a boot comprising a pair of upright toe pieces, means for securing said toe pieces to a ski longitudinally thereof and substantially parallel to each other, means arranged at the front end of at least one of said toe pieces for limiting forward movement of a boot sole between said toe pieces, means for preventing upward movement of the end of the toe of a boot sole between said toe pieces, and resilient means for maintaining a boot in position between said toe pieces, the length of each toe piece being of the order of one-third to one-half the length of the sole of a boot to be used therewith, said toe pieces having substantial vertical height and constituting the sole effective means for restraining the boot against lateral rotational movement with respect to the ski, the inner upright sides of said toe pieces being free from obstructions whereby a boot may swing freely angularly toward and away from the ski about a transverse axis adjacent the front ends of said toe pieces.

3. A harness for securing a ski on a boot comprising a pair of upright toe pieces, means for securing said toe pieces to a ski longitudinally thereof and substantially parallel to each other, means including a stop formed on at least one of said toe pieces for limiting forward movement of a boot sole between said toe pieces and for preventing direct upward movement of the end of the toe of the boot sole between said toe pieces, a resilient heel strap for holding a boot in place against said stop, said toe pieces having substantial vertical height and constituting the sole effective means for restraining the boot against lateral rotational movement with respect to the ski, the inner upright sides of said toe pieces being free from obstructions whereby a boot may swing freely angularly toward and away from the ski about a transverse axis adjacent the front ends of said toe pieces.

4. A harness for securing a ski on a boot comprising a pair of toe pieces, means for securing said toe pieces rigidly on a ski, a link pivotally secured at one end to one of said toe pieces and rotatable into a position extending forward from the pivot point thereof and along said one toe piece, a second link pivotally secured at one of its ends to said first mentioned link intermediate the ends thereof, a third link, said third link being

pivotally secured at one of its ends to the other of said toe pieces, and means including a resilient heel strap connecting the other one of the ends of said second link and the other one of the ends of said third link for holding a boot in place between said toe pieces, means for releasably latching said first mentioned link in said forward position whereby said first mentioned link may be employed to adjust said heel strap in securing a boot in said harness, and means for latching at least one of said second and third links in a position downwardly of its normal position to provide an increased downward component of the pull exerted by said heel strap on a boot in said harness.

5. In combination, a boot and a harness for securing a ski on said boot, said harness comprising a pair of upwardly extending toe pieces, means for securing said toe pieces rigidly to a ski, at least one of said toe pieces having a straight portion of substantial length arranged to be secured parallel to the longitudinal axis of the ski, said boot having a sole provided with a straight side portion adapted to extend parallel to the longitudinal axis of the ski in engagement with said one of said toe pieces, means for holding said boot sole for pivotal movement about the end of the toe thereof on a horizontal axis at right angles to the longitudinal axis of the ski, said holding means and said toe pieces cooperating to hold said ski against lateral movement on said boot and to guide angular movement of said boot about the end of the toe of said sole, said toe pieces having substantial vertical height and constituting the sole effective means for restraining the boot against lateral rotational movement with respect to the ski, the inner upright sides of said toe pieces being free from obstructions whereby said boot may swing freely angularly toward and away from the ski about a transverse axis adjacent the front ends of said toe pieces.

6. In combination, a boot and a harness for securing a ski on said boot, said harness comprising a pair of upright toe pieces, means for securing said toe pieces rigidly to a ski, at least one of said toe pieces having a substantial portion arranged to be secured parallel to the longitudinal axis of the ski, said boot having a sole provided with a straight side portion adapted to engage one of said toe pieces and a straight front end portion at right angles thereto, said portions of said sole and said toe pieces cooperating to hold said ski against lateral movement on said boot and to guide angular movement of said boot about a horizontal axis transverse to said ski, said boot being slidable longitudinally of said ski into and out of its position between said toe pieces, and means for limiting the forward movement of said boot between said toe pieces and for maintaining said boot in position between said toe pieces, the inner upright sides of said toe pieces being free from obstructions whereby said boot may swing freely angularly toward and away from the ski about a transverse axis adjacent the front ends of said toe pieces.

7. In combination, a boot and a harness for securing a ski on said boot, said harness comprising a pair of toe pieces, means for securing said toe pieces rigidly to a ski and substantially parallel to the longitudinal axis thereof, the length of each of said toe pieces being of the order of one-third to one-half the length of said boot, the sole of said boot having straight substantially parallel sides adapted to engage said toe pieces, means for retaining the sole of said boot in position between said toe pieces and for affording pivotal movement of said boot about the toe thereof on a horizontal axis transverse to said ski, said toe pieces and said straight sides of said boot sole cooperating to prevent transverse movement of said ski with respect to said boot, said toe pieces having substantial vertical height and constituting the sole effective means for restraining the boot against lateral rotational movement with respect to the ski.

8. In combination, a boot and a harness for securing a ski on said boot, said harness comprising a pair of toe pieces, means for securing said toe pieces rigidly to a ski and substantially parallel to the longitudinal axis thereof, the length of each of said toe pieces being of the order of one-third to one-half the length of said boot, the sole of said boot having straight substantially parallel sides adapted to engage said toe pieces and to prevent transverse relative movement between said boot and said ski, means for limiting forward movement of said boot between said toe pieces, resilient means for holding said boot in position between said toe pieces, the front end of the sole of said boot being straight and extending substantially at right angles to the straight sides of said sole, said toe pieces and said front end and sides of said sole cooperating to guide pivotal movement of said boot between said toe pieces and about the front edge of said sole.

9. In combination, a boot and a harness for securing a ski on said boot, said harness comprising a pair of toe pieces, means for securing said toe pieces rigidly to a ski and substantially parallel to the longitudinal axis thereof, the length of each of said toe pieces being of the order of one-third to one-half the length of said boot, the sole of said boot having straight substantially parallel sides adapted to engage said toe pieces, resilient means for retaining the sole of said boot in position between said toe pieces and for affording pivotal movement of said boot about the toe thereof on a horizontal axis transverse to said ski, said toe pieces and said straight sides of said boot sole cooperating to prevent transverse movement of said ski with respect to said boot, and a take-up device associated with said resilient means for affording ready attachment and release of said boot and said harness, said toe pieces having substantial vertical height and constituting the sole effective means for restraining the boot against lateral rotational movement with respect to the ski.

10. In combination, a boot and a harness for securing a ski on said boot, said harness comprising a pair of metal toe pieces, means for securing said toe pieces rigidly to a ski and substantially parallel to the longitudinal axis thereof, the length of each of said toe pieces being of the order of one-third to one-half the length of said boot, the sole of said boot having straight substantially parallel sides adapted to engage said toe pieces and to prevent relative transverse movement of said boot and said sole, means including stops formed on said toe pieces for limiting the forward movement of said boot therebetween and for preventing direct upward movement of the toe of said boot between said toe pieces, resilient means for maintaining said sole in place against said stops between said toe pieces, the front end of the sole of said boot being

straight and extending substantially at right angles to the straight sides of said sole, said toe pieces and the straight sides and front end of said sole cooperating to guide pivotal movement of said boot between said toe pieces and about the front end of said sole.

11. A harness for securing a ski on a boot having a square-toed sole, said harness comprising a pair of toe pieces of substantial vertical height, means for securing said toe pieces rigidly to a ski and substantially parallel to the longitudinal axis thereof, the length of each of said toe pieces being of the order of one-third to one-half the length of the boot to be used therewith, and means including a stop on at least one of said toe pieces and a resilient heel strap for retaining the sole of the boot in position between said toe pieces, said toe pieces having flat inner faces and affording free swinging movement of the sole of the boot therebetween angularly toward and away from the ski about a transverse axis adjacent said stop, said toe pieces and said stop being arranged to cooperate with the sole of the boot to prevent lateral rotational movement of the boot on the ski in all normal positions of the boot in the harness.

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