Sept. 25, 1956 GIICHI SHIMIZU 2,764,418

ANKLE AND HEEL BINDER MECHANISM FOR SKIS

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Fig. 1.

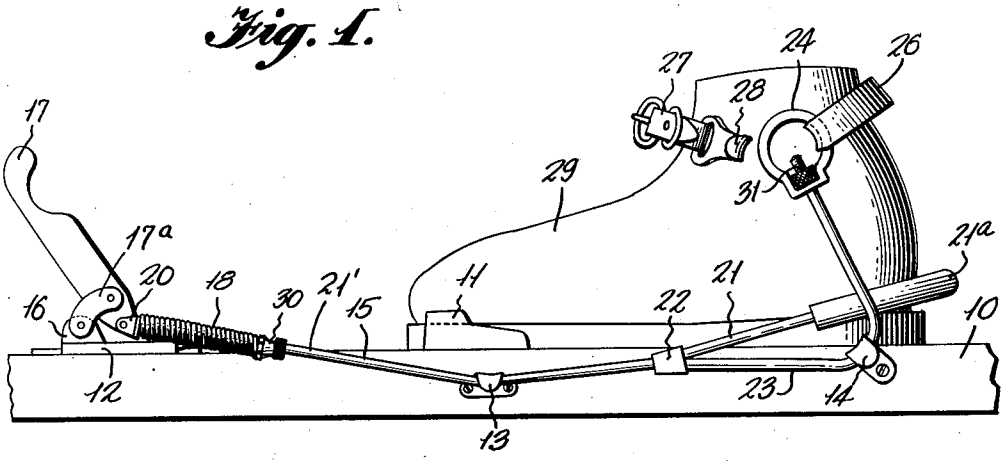


Fig. 2.

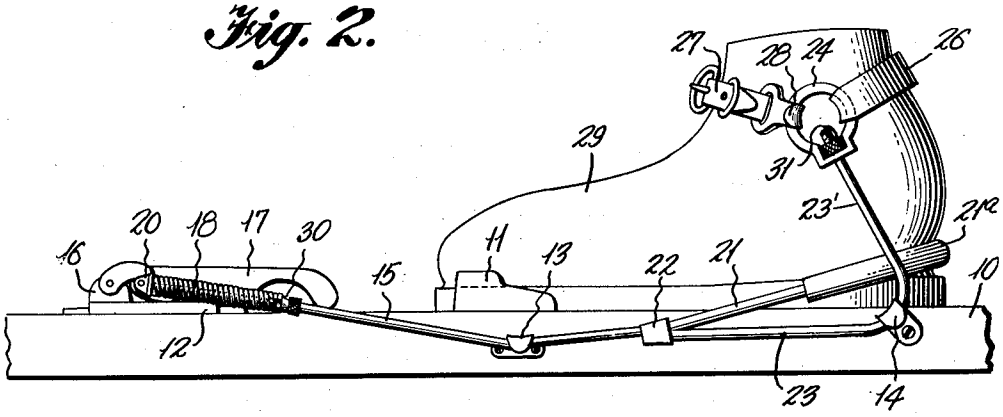
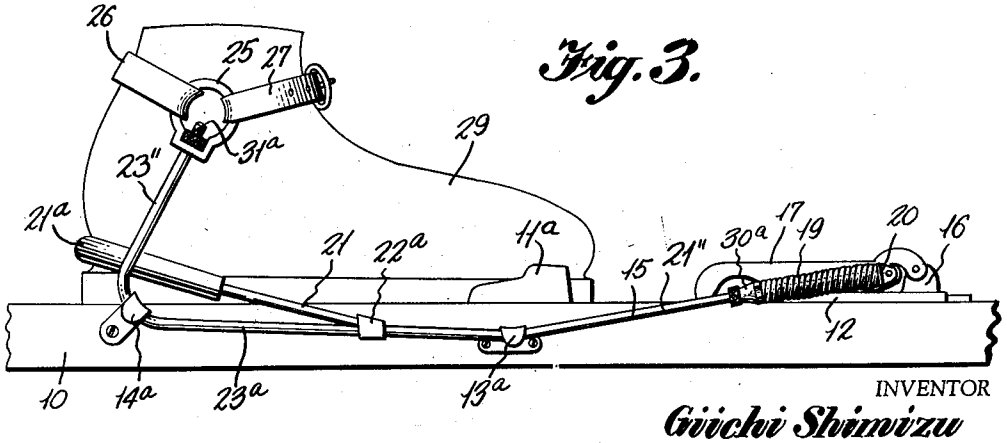


Fig. 3.



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ANKLE AND HEEL BINDER MECHANISM FOR SKIS

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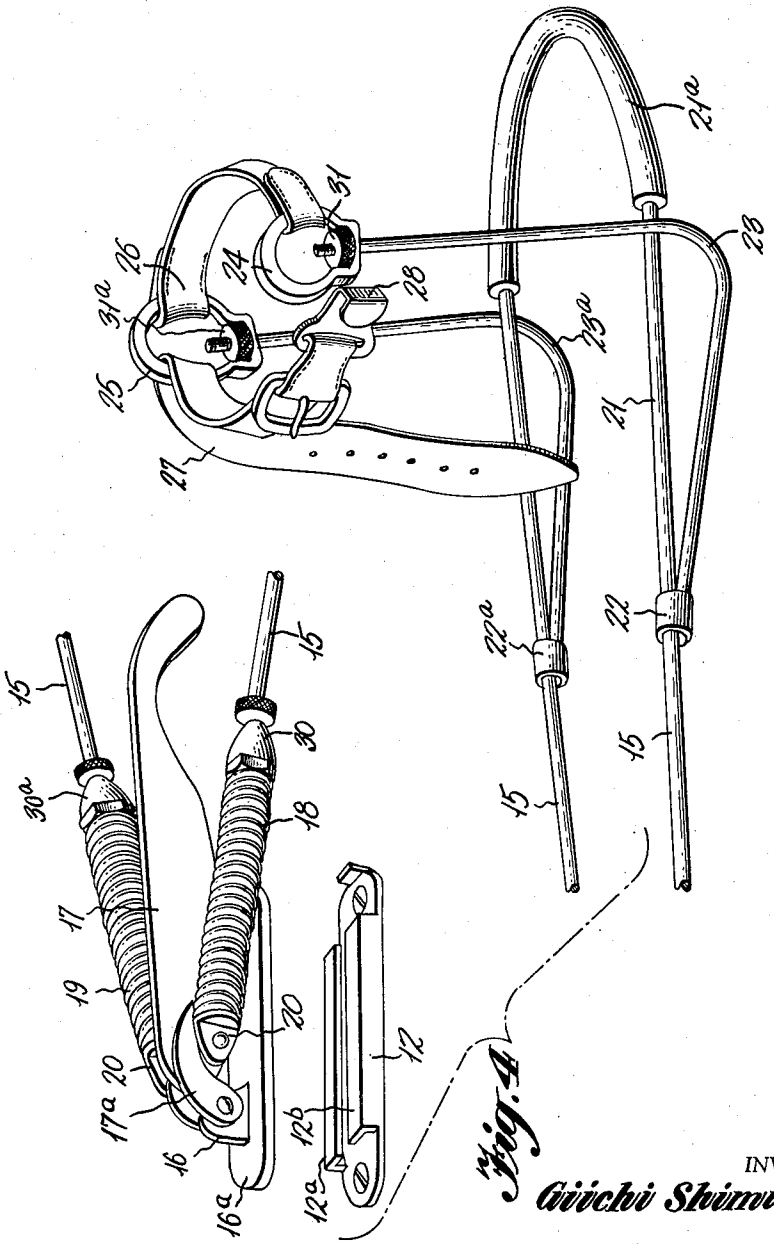


Fig. 4

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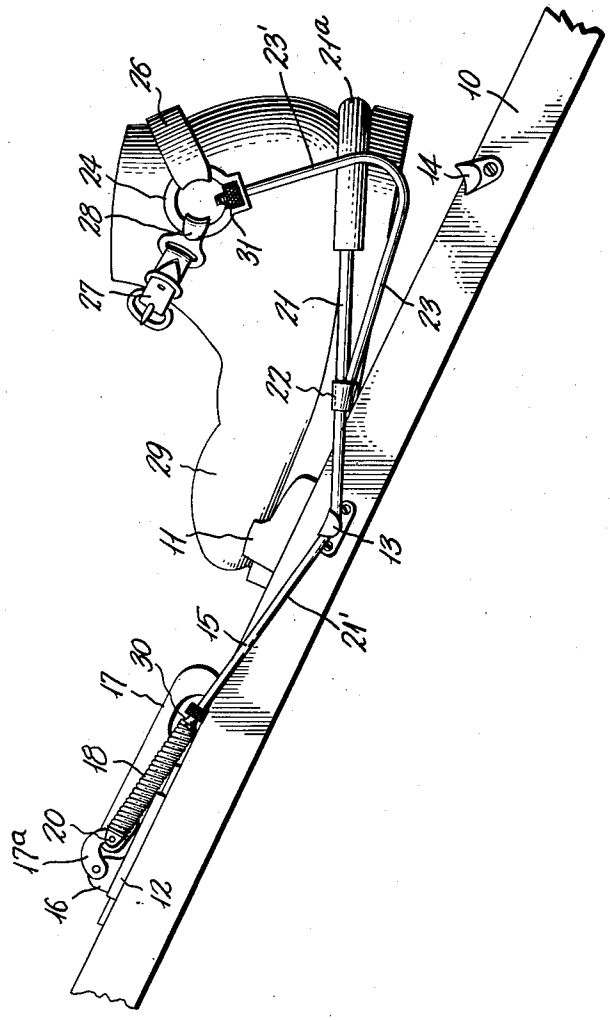
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ANKLE AND HEEL BINDER MECHANISM FOR SKIS

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Fig. 5.



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United States Patent Office 2,764,418 Patented Sept. 25, 1956

2,764,418

ANKLE AND HEEL BINDER MECHANISM FOR SKIS

Giichi Shimizu, Tokyo, Japan

Application February 18, 1954, Serial No. 411,238

4 Claims. (Cl. Cl. 280—11.35)

This invention relates to a binder designed to fasten a ski shoe to a ski.

The object of this invention is to provide a type of ski binder of sufficient strength, and simple construction, which can be quickly fastened or unfastened, allowing flexibility for the free movement of the leg during skiing and yet not endangering the skier, evenly distributing the strain exerted on the binder and the ski by taking advantage of various principles of mechanics.

The present invention can best be illustrated by reference to the accompanying drawings in which:

Figure 1 shows the ski binder made in accordance with my invention, being fitted over the ski shoe and ankle of the skier, the view shown being of the outer side of the leg.

Figure 2 shows the ski binder as it appears after being fitted over the ski shoe and ankle of a skier, the view shown being of the outer side of the leg.

Figure 3 shows the ski binder as it appears after being fitted over the ski shoe and ankle of a skier, the view shown being of the inner side of the leg.

Figure 4 shows that part of the ski binder which constitutes my invention.

Figure 5 shows the ski binder after the hold on the heel of the ski shoe has been released.

One of the problems to be solved in the designing of ski binders has been to provide a binder of simple construction, easy to manipulate in cold weather with gloved hands, providing sufficient strength to hold the ski shoe on the ski regardless of what stress or strain might be applied to the ski. During skiing the foot of the skier acts like the fulcrum of a lever, various loads acting at various parts of the ski to create parallelograms of force which must be absorbed at the junction of the shoe and the ski. It is essential that the ski binder have the construction, strength, and flexibility to absorb these resultant forces wihout discomfort or danger to the skier, insuring that at all times the ski shall be fastened to the shoe.

Present ski binders fasten only at the heel of the ski shoe by some kind of lever action placed either in front of the ski shoe or in back of the heel. They may also have some combination of ankle bands which are separate from the ski binder and require considerable adjustment and fastening. The present invention provides a ski binder whereby both the ankle and heel are fastened and controlled by the action of one lever and which properly distributes all forces created by loads acting on the ski by means of springs, leverage and counterforce so that no undue strain will be exerted against the ski shoe or leg of the skier and break the grip between the ski shoe, ski binder and ski, and allowing full flexibility for the actions of the skier.

Referring now to the drawing, wherein like characters designate corresponding parts throughout the several figures, the central portion of a convention ski, indicated by the reference character **10**, carries a ski boot sole holder consisting of a pair of brackets **11**, **11***a* affixed thereto and projecting upwardly from the upper surface of the ski, each being provided with a lip to overhang the upper edge of the sole of the ski boot. A grooved mounting

plate **12** designed to furnish the means interconnecting the ski and the ski binder assembly is affixed to the ski at a point forward of the ski boot sole holder. A pair of hooks **13** and **13***a* are provided on the left and right edges of the ski for receiving the heel binding component of the ski binder and hooks **14** and **14***a* are provided on the left and right side edges of the ski to locate the ankle leads of the ski binder in a manner later to be described. The hooks **13** and **13***a* are disposed at a point toward the forward edge of the sole of the ski boot and hooks **14** and **14***a* are disposed at a point approximately at the middle of the heel of the ski boot.

The ski binder **15** is coupled at its forward end to the grooved mounting plate **12** in the following manner. An upstanding tongue **16** formed integrally with an elongated plate **16***a* adapted to be received between the groove-defining lips **12***a*, **12***b* of the grooved mounting plate **12** pivotally supports a lock lever **17** by means of an overthrow link **17***a* which retains, when in locked position, the plate **16***a* in the groove-shaped mounting plate **12** and during locking of the lock lever draws the ski binder **15** forward and exerts tension thereon so as to firmly lock the ski boot in the toe holder **11**, **11***a*.

Coil springs **18** and **19** are connected to the forward ends **21'**, **21''** of a heel encircling binder loop **21** of spring cable which is trained under the hooks **13**, **13***a* and the coil springs extend to a common pivotal connection **20** on the lock lever **17**. It will be apparent that tension will be applied through the coil springs **18** and **19** to the heel binder loop **21** when the lock lever **17** is rocked to horizontal locked position as illustrated in Figures 2 and 3. A tubular sleeve **21***a* surrounds the rearwardly extending bight of the heel binding loop **21** to clasp the heel or the heel groove and prevent slippage thereof. In the preferred embodiment this tubular sleeve **21***a* is made of rubber.

Clasp members **22** and **22***a* are affixed to the legs of the heel binding loop **21** rearwardly of the hooks **13**, **13***a* and to the ends of angular ankle leads or cables **23** and **23***a* formed of a material similar or identical to that of the heel binding loop **21**. The angular ankle leads **23** and **23***a* are trained about the hooks **14**, **14***a* and are bent at the hooks **14** and **14***a* to define forwardly inclined legs extending at an acute angle to leg portions projecting between the hooks **14**, **14***a* and the clasps **22**, **22***a*. The upper ends of the upwardly inclined leg portions of the ankle leads **23**, **23***a* have threaded ends adapted to extend through complementary apertures in left and right ankle strap retaining rings **24** and **25**. A back strap **26** is connected between the retaining rings **24** and **25** to extend around the upper end portion of the ski boot and an adjustable strap **27** is affixed to the retaining ring **25** and is provided with a hook **28** to removably connect the other end of the adjustable strap **27** to the retaining ring **24**. The front strap **27** is provided with a buckle to permit adjustment of the strap length to the ski boot of the wearer. Adjustment nuts **30** and **30***a* are provided at the point of connection between the forward ends of the legs **21'**, **21''** of the heel binding loop **21** with the coil springs **18** and **19** to permit adjustment of the tension on the heel binding loop **21** and the shoe size which the heel binding loop **21** will properly accommodate. Adjustment nuts **31** and **31***a* threaded onto the ends of the upwardly inclined legs of the left and right ankle leads **23** and **23***a* are also provided to enable the skier to adjust the ankle binding straps to firmly grip the ski boot and hold the same against the ski.

In coupling the ski binder to the ski boot, the sole of the boot is disposed against the upper surface of the ski with the boot located within the heel binding loop **21** when the lock lever **17** is in unlocked condition as illustrated in Figure 1 and the hook **28** of the adjustable strap

27 disconnected from the retaining ring 24. The ski boot is then slid forwardly along the upper ski surface between the sole holder 11, 11*a* until the toe portion of the ski boot sole is wedged within the conventional inwardly facing grooves of the sole holders 11, 11*a*. The lock lever 17 is then rotated rearwardly to the locked position illustrated in Figures 2 and 3 which, due to the pivotal relation between the lock lever 17 and the upright tongue 16, draws the forward ends 21', 21'' of the heel binding loop 21 toward the mounting plate 12 to bring the tubular sleeve 21*a* surrounding the bight of the heel binding loop 21 into holding engagement with the ski boot heel. If the bight covering sleeve 21*a* is not in tight engagement with the heel groove or the recess above the heel, the heel binder can be adjusted to the desired degree of tightness by rotating the adjustment nuts 30, 30*a*. The hook 28 on the forward adjustable ankle strap 27 is then coupled to the retaining ring 24 and the strap 27 adjusted to the desired tightness. The adjustment nuts 31, 31*a* are then rotated on the threaded ends of the upper inclined legs 23', 23'' of the ankle leads 23, 23*a* while the ankle leads are trained about the hooks 14, 14*a* to adjust the vertical location of the straps 26 and 27.

Looking at the drawings and calculating the resultant forces which might be caused by loads exerted on the ski it can readily be seen that the disposition of the ankle fastening lead in combination with the retaining ring which is over the shin of the foot and held in place by the back strap and adjustable strap furnishes a powerful counterforce making possible the easy absorption of forces by the leg of the skier acting as a fulcrum and placing the momentum of all forces exerted by various loads on the ski at a convenient point on the ski best adapted to be absorbed by the skier's leg. The combination likewise permits the flexibility of movement needed by the skier.

When desired by the skier, the ankle fastening leads can easily be disengaged by the skier as shown in Figure 5.

Having thus described my invention, I claim:

1. In a ski binder of the type having a heel pull cable loop and releasable means secured to the ski forwardly of the ski boot station for applying tension to said heel pull cable, a pair of ankle binding cables, one disposed at each side of the ski, said ankle binding cables being bent intermediate their ends to form acute angularly related leg portions, means connecting the end of one of said leg portions of each of said ankle binding cables to said cable loop forwardly of the rearmost portion of said loop, retaining means adapted to be secured to the sides of the ski for engaging the bend of said ankle binding cable and restraining the same against movement upwardly of the ski, a pair of retaining rings, means adjustably connecting one of said retaining rings for vertical adjustment on the other of said ankle cable legs, and straps extending forwardly and rearwardly between said pair of retaining rings to encircle the ankle portion of a ski boot, the forwardmost one of said straps being adjustable.

2. In a ski binder of the type having a heel pull cable loop and releasable means secured to the ski forwardly of the ski boot station for applying tension to said heel pull cable, a pair of ankle binding cables, one disposed at each side of the ski, said ankle binding cables being bent intermediate their ends to form acute angularly related leg portions, one of said leg portions of each ankle binding cable forming a lower leg lying substantially in the plane of the ski and the other leg portion forming a forwardly inclined upper leg portion, means affixing the ends of said lower leg portions of said ankle binding cables to the legs of said cable loop forwardly of the heel-engaging portion of the loop, means adapted to be secured to the ski at each side thereof for engaging the bend of said ankle binding cables and retaining the same against vertical movement, a retaining ring associated with each of said ankle binding cables, means adjustably mounting a retaining ring on the upper leg of each of said ankle binding cables for adjusting the vertical position of the retaining ring on the upper ankle binding cable leg, and a pair of straps extending between said retaining rings forming front and rear ankle binding straps to encircle the ankle portion of a ski boot, said forward strap being adjustable.

3. In a ski binder of the type having a heel pull cable loop and releasable means secured to the ski forwardly of the ski boot station for applying tension to said heel pull cable, a pair of ankle binding cables, one disposed at each side of the ski, said ankle binding cables being bent intermediate their ends to form acute angularly related leg portions, one of said leg portions of each ankle binding cable forming a lower leg lying substantially in the plane of the ski and the other leg portion forming a forwardly inclined upper leg portion, means affixing the ends of said lower leg portions of said ankle binding cables to the legs of said cable loop forwardly of the heel-engaging portion of the loop, means adapted to be secured to the ski at each side thereof for engaging the bend of said ankle binding cables and retaining the same against vertical movement, a retaining ring associated with each of said ankle binding cables, means adjustably mounting a retaining ring on the upper leg of each of said ankle binding cables for adjusting the vertical position of the retaining ring on the upper ankle binding cable leg, a rear ankle strap affixed at each end to said retaining rings, and an adjustable front ankle strap affixed at one end to one of said retaining rings and carrying a hook on the other end thereof for detachably connecting said front strap with the other of said retaining rings.

4. In a ski binder of the type having a heel pull cable loop and releasable means secured to the ski forwardly of the ski boot station for applying tension to said heel pull cable, a pair of ankle binding cables, one disposed at each side of the ski, said ankle binding cables being bent intermediate their ends to form acute angularly related leg portions, one of said leg portions of each ankle binding cable forming a lower leg lying substantially in the plane of the ski and the other leg portion forming a forwardly inclined upper leg portion having a threaded upper end, means affixing the ends of said lower leg portions of said ankle binding cables to the legs of said cable loop forwardly of the heel-engaging portion of the loop, means adapted to be secured to the ski at each side thereof for engaging the bend of said ankle binding cables and retaining the same against vertical movement, a pair of retaining rings each having an aperture through which is projected in the plane of the ring the threaded end of one of said ankle binding cables, a threaded nut on the threaded ends of said ankle binding cables and bearing against the inner surface of the ring for adjusting the position of the ring on the upper leg of each of said ankle binding cables, a rear ankle strap affixed at each end to said retaining rings, and an adjustable front ankle strap affixed at one end to one of said retaining rings and carrying a hook on the other end thereof for detachably connecting said front strap with the other of said retaining rings.

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