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Smolka

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[54] **SAFETY SKI BINDING**

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[52] **U.S. Cl.** .... **280/11.35 M,** 340/279

[51] **Int. Cl.** **A63c 9/08**

[58] **Field of Search** .... 280/11.35 M, 11.35 R, 280/11.35 T; 340/407, 279; 128/2.1 R, 2.1 A, 2.1 E; 3/1.1

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[57] **ABSTRACT**

Safety release bindings for action between a ski and a ski boot. Means are provided for utilizing muscular stress of the skier and utilizing a preselected value of same for releasing the binding. In certain embodiments, the muscular stress is measured by the bio-electrical output of the skier's muscles. In other embodiments the muscular stress is measured by physical movement of the skier's foot within or with respect to his ski boot. In one embodiment, a primary measurement is made of such muscular stress while a secondary measurement is made of the stress between the ski boot and the ski, both of said stresses being required to coincide in order to release the ski.

4 Claims, 4 Drawing Figures

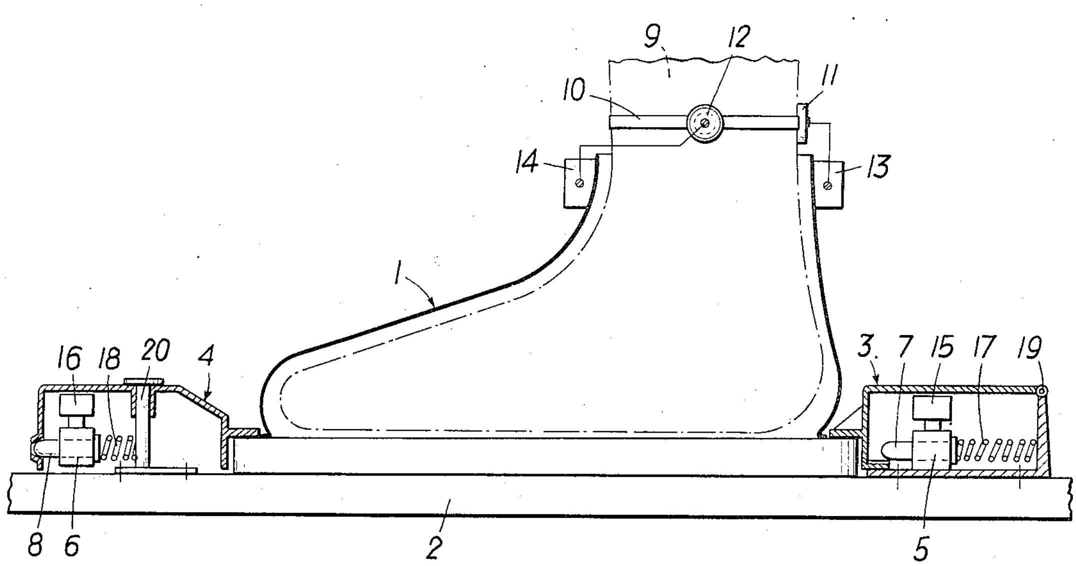


FIG. 1

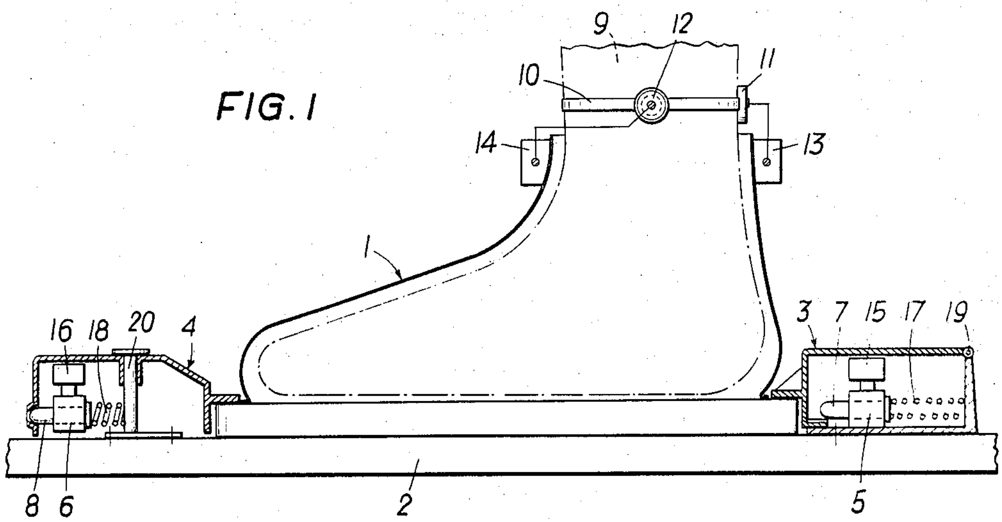


FIG. 2

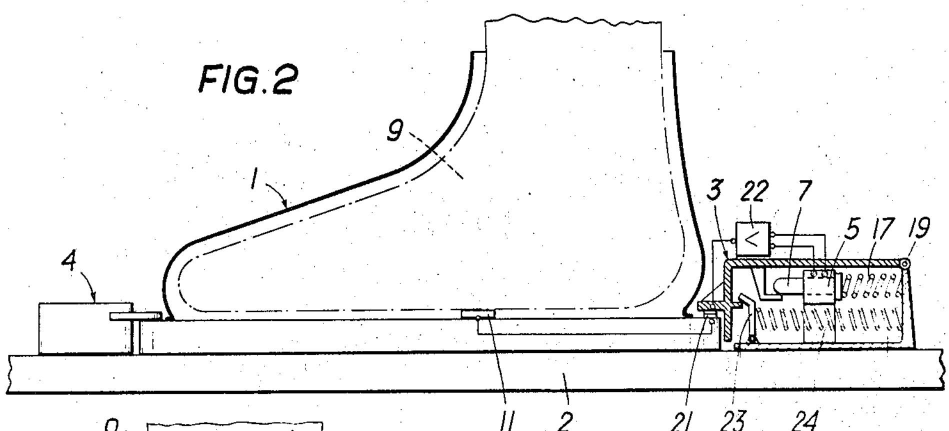


FIG. 4

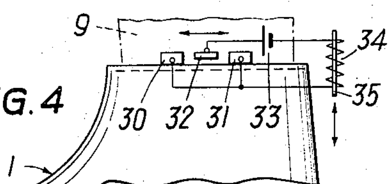
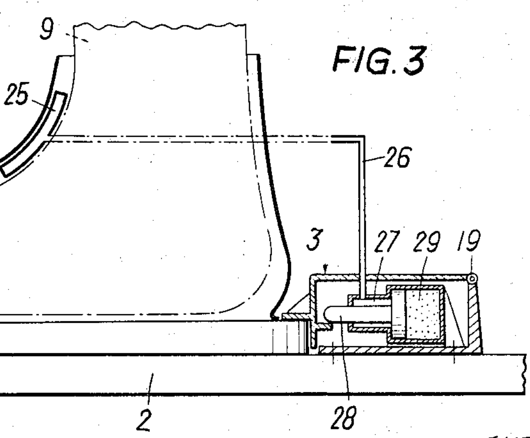


FIG. 3



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SAFETY SKI BINDING

The invention relates to a safety ski binding which releases the ski boot upon occurrence of an overload.

Ski bindings which are equipped with a spring-loaded lock are already known. If an overload occurs, the lock is released by overcoming a suitably adjusted spring force. While the adjustment is intended to be selected according to the weight and skiing capability of the user, it has not yet been possible to effect an adjustment which always completely corresponds to the desired conditions. Further, such an adjustment depends also on the build and the physical condition of the user and on the condition of the ski path. If the ski path is icy, different conditions exist than, for example, in powder snow. Furthermore the binding will open differently during a slow fall then if a sudden stress occurs. Additionally, the stresses of the body parts are transferred first onto the shoe and only then from the shoe to the binding. The safety release thus depends also on the structure of the shoe.

It has therefore already been suggested to open the binding at the will of the user. A switch for this purpose has heretofore been installed into the ski pole which upon operation by the skier opens an electrically responsive binding. In such a unit, it is left to the judgment and reaction capability of the user whether or not he should open the binding at a given moment. This, of course, often results in wrong decisions. Furthermore, the danger exists that the wires and contacts which are provided in the clothing of the user tear or are otherwise interrupted and it is also possible that the ski pole becomes lost.

Thus, the purpose of the invention is to avoid these disadvantages and to produce a ski binding in which directly or indirectly the stresses of the body parts are sensed and in which, before injuries occur, the binding is opened by a suitable signal.

This purpose is attained by providing at least one signal sender which directly or indirectly receives the stresses of the body parts and at least one signal receiver which is coupled with a locking mechanism of the binding. Therefore instead of relying for the opening of the binding on the decision of the user, the stresses are sensed by the signal sender and a corresponding signal is transmitted. If and when such signal reaches a preselected value, then a signal receiver provided in the binding operates the locking mechanism. Thus a binding is produced which depends neither on the choice of the user nor on a holding force which must be specially adjusted, but which reacts to the actually occurring stresses of the body parts.

The subject matter is illustrated in form of several exemplary embodiments in the drawing, in which

FIGS. 1 to 4 illustrate four different schematized constructions.

As appears clearly in FIG. 1, the shoe 1 is held on the ski 2 by a heel holder 3 and a jaw 4. Both in the heel holder 3 and also in the jaw 4, there are provided electromagnets 5 or 6, respectively, of which the cores 7, 8 respectively, form spring-loaded locks which normally hold the bindings in the position of use.

It is already known that bio-electrical currents occur during muscle movements. According to the first exemplary embodiment, sensors 11, 12 of known type are arranged on the foot or leg of the user, here the leg 9, by any convenient means, such as a bandage 10. Said sensors pick up and respond to these bio-electrical currents and transmit a suitable signal to the senders 13, 14. Said sensors 11, 12 could also be arranged in a stocking or the like. The bindings 3, 4 have receivers 15, 16 of any convenient and known type which are coupled to the electromagnets 5, 6. If the impulse has a certain frequency, the receivers operate the electromagnets which causes the cores 7, 8 to move against the force of the springs 17, 18 and thus the heel binding 3 can pivot about the axis 19 and the jaw 4 about the axis 20, so that the ski boot 1 is released. If necessary, one could provide here only one sender which operates both bindings 3, 4, for example each binding through a different channel.

According to FIG. 2 the sensor 11 is positioned on the sole of the foot 9 and is connected to an amplifier 22 through contacts 21 which are arranged on the boot 1 and the heel binding 3. Upon occurrence of a certain stress, for example, of the foot 9 forwardly, the muscles of the foot sole are also stressed. The sensor 11 again picks up the bio-electrical currents caused thereby and transmits an impulse to the amplifier 22. If this impulse is of preselected value, the amplifier 22 operates the electromagnet 5 which moves its core 7 back against the force of the spring 17. Thus, the binding can pivot upwardly about the axis 19 if also the second lock 23 is released against the force of the spring 24.

This second lock 23 is adjusted to a relatively small stress. Under special conditions strong stresses of the foot sometimes occur which stresses do not result in a fall and thus not in injuries. However, since the sensor 11 will operate the electromagnet 5 on the occurrence of a preselected stress on the foot muscles, if such a stress occurs the core forming the lock will be moved back and cause the heel binding 3 to release the boot. However, if in a given case no fall occurs, namely the boot imposes little or no load onto the heel binding 3, then the second lock 23 maintains the binding in the closed position. Nevertheless, if the direct load of the shoe onto the binding also exceeds, as already mentioned above, a preselected threshold value, then the binding opens.

According to FIG. 3, a deformable hollow member 25 is arranged within the shoe 1 and provided with a suitable supply of hydraulic or pneumatic pressure fluid. This hollow member 25 is connected to a cylinder-piston-assembly 27, 28 through a pressure fluid line 26. If the foot 9 is stressed, the hollow member 25 is compressed, through which the pressure fluid is urged through the line 26 into the cylinder 27 and thus the piston 28 forming a lock is moved back so that the binding is released. The piston 28 can be backed by a spring, or on an air or gas cushion 29, which tends to urge the piston constantly forwardly into the illustrated position.

In FIG. 4, two contacts 30, 31 are provided on the boot 1. A further contact 32 which is spaced from the contacts 30, 31 is arranged on the foot 9, for example on a bandage of the foot or on a stocking or the like. If now the foot 9 moves opposite the shoe 1 so that the contact 32 contacts one of the contacts 30 or 31, the circuit comprising a battery 33 and an electromagnet 34 is closed and the electromagnet 34, the core 35 of which functions as a lock, releases the binding in a corresponding manner, as in the above-described exemplary embodiment of FIGS. 1 or 2.

Of course, the invention is not limited to the illustrated exemplary embodiments. A number of modifications are possible which lie within the scope of the invention. For example, combinations involving electric-pneumatic or electric-hydraulic systems could be made. It is also possible to provide a force receiver on the ski or on or in the shoe or the like which force receiver has for example a strain responsive element and, upon stresses of the ski, shoe or the like, transmits an impulse selected according to the stresses of the body parts for opening the binding. Sensors which react to bio-electrical currents need not be arranged directly on the respective complex, namely directly at the foot, but they can be arranged practically at any conducting point of the body up to the head or the brain.

I claim:

1. In a safety ski binding which releases the ski shoe worn by a skier from the ski when an overload or stress condition occurs, the improvement comprising:

at least one signal generator mounted on one of said ski shoe and a limb of said skier and adapted to generate a first electrical signal in response to said stress condition between said ski shoe and said limb when said ski shoe is secured by said ski binding to said ski;

at least one of the components of said ski binding being responsive to an electrical signal to open and permit a release of said ski shoe;

at least one electrical signal receiver means responsive to said electrical signal and adapted to generate a second electrical signal in response to said first electrical signal and being connected in electrical circuit with said electrically responsive ski binding whereby said electrically responsive ski binding will release said ski shoe upon the occurrence of a second electrical signal.

2. The improvement according to claim 1, wherein said signal generator comprises a bio-electrical sensing device adapted to sense the bio-electrical currents produced by said limb of said skier during muscle movements and producing said first electrical signal.

3. The improvement according to claim 2, wherein said one component of said ski binding includes a boot engaging member pivotally secured to said ski and adapted to pivot between a boot engaging position and a boot release position and means defining an electromagnet having a movable core member engageable with said boot engaging member to hold said component in said boot engaging position, said second electrical signal being adapted to energize said electromagnet to move said movable core member out of engagement with said boot engaging member to permit a pivoting of said boot engaging member.

4. The improvement according to claim 3, wherein said bio-electrical sensing device is connected in electrical circuit with a signal transmitter mounted on said ski shoe, said receiver means being adapted to receive a signal transmitted by said signal transmitter to generate said second electrical signal.

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